



**CONSERVATION SERVICES INCORPORATED**  
**DESIGN AND OPERATIONS PLAN**

Prepared for:

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Prepared by:

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October 4, 1991

*Dedicated to solving your waste management problems.*

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## 1.0 INTRODUCTION

This document presents the revised Design and Operations Plan for an asbestos and non-hazardous liquid solidification and disposal facility owned and operated by Conservation Services Incorporated (CSI). This facility is a continuation of a unique alternative to using current landfilling practices for disposing of liquid wastes. The site offers an environmentally sound method of disposal for asbestos, non-hazardous liquid wastes and various other materials not often accepted by sanitary landfills.

The information used to design this facility and prepare this report originated from a variety of sources including previously-approved sanitary landfill permit applications, the approved permit for operation of the existing CSI facility, and from site-specific field work. Additional information was taken from data gathered during operation of the CSI facility at 62nd and Huron. More specific portions of the Design and Operations Plan were revised according to comments and revisions of a previous plan that had Colorado Department of Health (CDH) approval but that was not issued a Certificate of Designation (CD) because of the proposed airport alignment. The engineering designs and field investigations conform with Colorado Solid Waste Siting, Design and Operations regulations, as amended October, 1985. Operations for the disposal of asbestos materials conform to Colorado Solid Waste regulations, effective May 1, 1988.

CSI had originally completed a Design and Operations Plan for a new facility in 1987 at another location. The submittal included a descriptive narrative related to land use issues and was approved by the Adams County Planning and Zoning Commission and the Adams County Commissioners. Following this approval, CSI submitted a detailed technical document outlining the geologic and hydrologic characteristics of the site, engineered features of the facility, protocol for accepting waste streams, a filling plan for the site, and a reclamation plan for the site. This Design and Operations Plan received approval from the Colorado Department of Health and was placed on the Adams County Planning and Zoning Commission agenda. Prior to the Planning Commission hearing, the Adams County residents voted to allow Denver to annex land for a proposed airport. The land includes the original proposed CSI site therefore it became necessary for CSI to find another suitable site. CSI conducted a site search and chose the property located in the northwestern quarter and the western half of the northeastern quarter of Section 25, Township 2 South, Range 64 West.

## 1.1 Site Selection Process

CSI conducted a site search to find a suitable site for the proposed facility. Each site was researched according to the following criteria:

- \* Site availability
- \* Geological characteristics
- \* Hydrogeological characteristics
- \* Site location
- \* Site size
- \* Accessibility

Sites meeting the initial screening process were studied further using a preliminary drilling program to determine the subsurface characteristics. The proposed site was determined to be feasible for the facility following the preliminary drilling program. An extensive site study was conducted and results are included in this report.

CSI submitted a narrative description of the proposed site in August, 1988. The description contains a general outline relating to current and proposed land uses and some background information relating to the site.

As the next step in the Adams County Certificate of Designation process, CSI has compiled and submitted a detailed Design and Operations Plan. The plan is divided into sections that detail information in the following areas:

- \* General Information
- \* Site Description
- \* Site Geology/Hydrogeology
- \* Facility Configuration
- \* Facility Operation
- \* Environmental Monitoring
- \* Construction Quality Assurance and Control
- \* Closure and Post-Closure

Existing operational information and the results of the field investigations indicate that the site is suitable for the CSI facility and that it can be developed, operated and closed in a manner consistent with current environmental standards.

## 2.0 GENERAL INFORMATION

### 2.1 Facility Need

The CSI facility offers a unique and environmentally sound alternative to non-hazardous liquid waste disposal methods currently used throughout much of the Front Range. Liquid wastes are disposed of in a variety of ways including landfilling, evaporation from surface impoundments, landfarming, and solidification and landfilling in specially-designed containment cells, as CSI is doing. The first three methods increase the probability of leachate infiltration resulting in a decrease in ground-water quality, and are often not environmentally-prudent practices. Most area landfills have banned the acceptance of any type of liquids. The CSI procedure involves mixing the liquids with a solidification agent, resulting in a solidified material that is landfilled in cells lined with impermeable materials.

In addition to the non-hazardous liquid waste solidification and special-waste disposal services, CSI offers: asbestos disposal in a segregated cell; transportation and waste handling services; facility clean-ups; emergency response; and consultation services. This broad range of services allows CSI to analyze and solve special-waste problems through consultation, special-waste management, and disposal for the industrial community in Colorado.

The currently operating CSI facility is unique in the Front Range area. The continued operation of such a facility benefits Denver and the metropolitan area both economically and environmentally. Economically, the benefits include the revenue brought into Adams County and the employment opportunities created by CSI. In addition to these more immediate benefits, CSI provides industry with the option to decrease long-term financial liabilities by disposing of special wastes in a controlled and secured area.

The environmental advantages will benefit Adams County and the entire Front Range. Disposal of non-hazardous materials is becoming a more publicized environmental issue and the CSI facility uses state-of-the-art techniques to carefully and safely dispose of the materials.



## 2.2 General Facility Description

The CSI facility is located at Schumaker Road and 88th Avenue (Figures 2.1 and 2.2). The total site area is 240 acres; however, only the eastern 135 acres will be utilized for the CSI facility. The 135 acres include approximately 10 acres for the non-hazardous liquid solidification area, less than 115 acres for the solidified waste disposal cell area, and an asbestos cell that will require approximately 4 acres.

The facility is located approximately 7 miles north-northwest of the Town of Bennett and 9 miles north-northeast of the Town of Watkins. A one-acre parcel of land located in the northwest corner of the 240-acre site is owned by the Bennett School District. The closest disposal cell to this parcel is 1100 feet and the CSI operations facility is 2900 feet from the land. Colorado Interstate Gas Company (CIG) operates a gas pipeline that is located in the southeastern corner of the site.

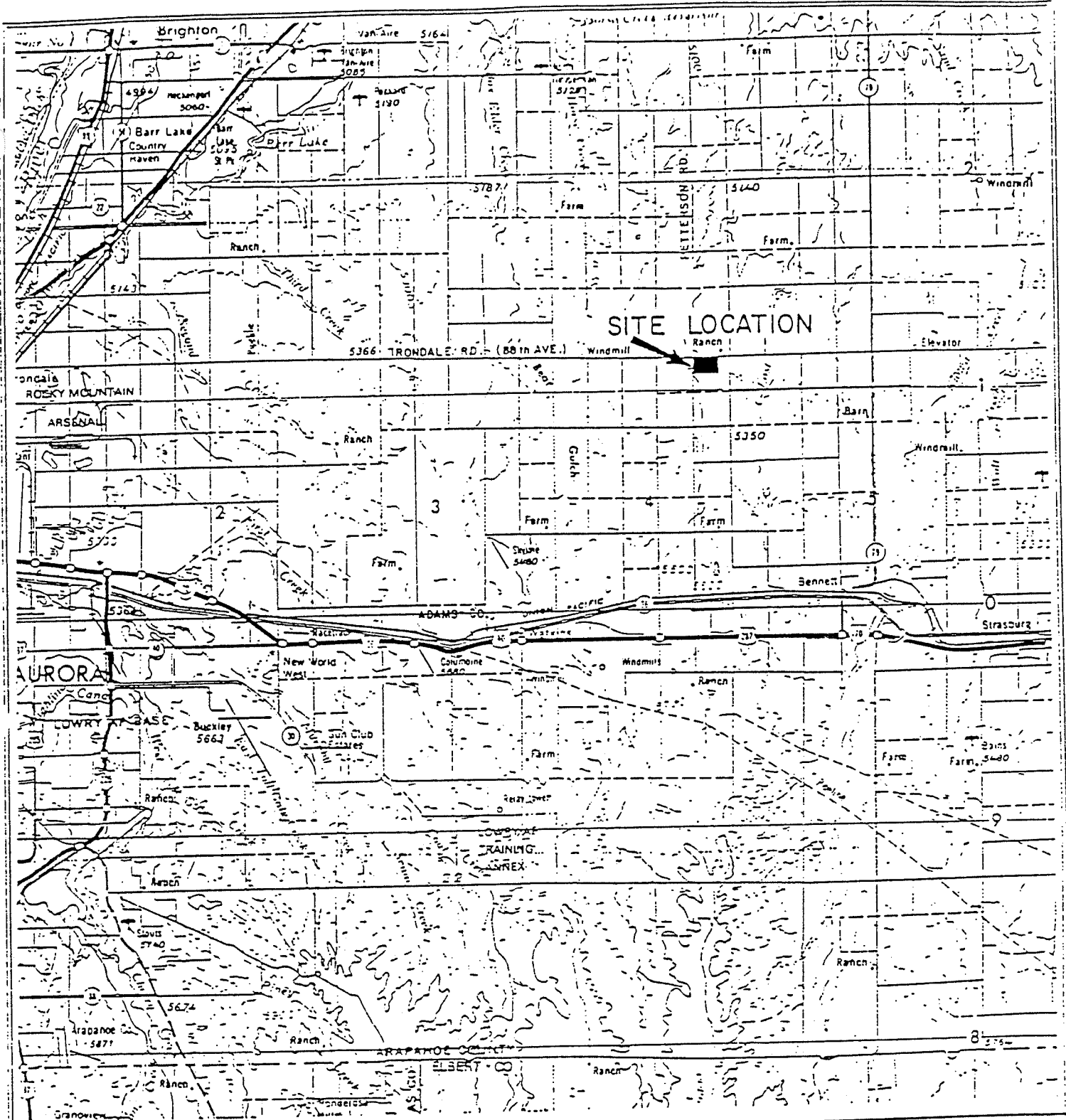
The legal description for the CSI site is:

The east 1/2 of the northeast 1/4 and the northeast 1/4 of the southeast 1/4 of Section 34; Township 2 South, Range 66 West of the 6th Principal Meridian, County of Adams, State of Colorado.

The only liquids accepted will be non-hazardous industrial waste liquids and sludges that can be solidified through the addition of a material such as cement kiln dust. The solidification process stabilizes the liquids and sludges into a cement-like material containing no free liquids and that is environmentally safe to handle and landfill.

The site consists of three areas: an operations area; a solidified waste disposal cell area; and an area used for the disposal of asbestos. Plate 1 is a diagram of the site layout.

The operations area is located on approximately 10 acres in the northcentral corner of the site. The operations area, shown in Figure 2.3, includes the following:

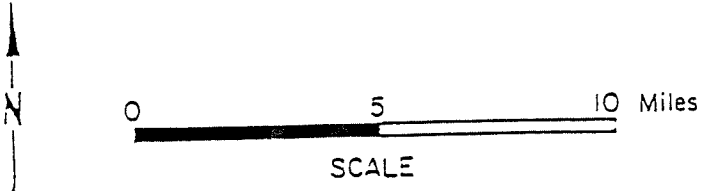


**SITE LOCATION**

5366 TRONDALE RD. (88th AVE.)

**FIGURE 2-1**

Conservation Services, Inc.  
 GENERAL SITE LOCATION



Industrial Compliance Inc.  
 511 Orchard Street  
 Golden, Colorado 80401



R 64 W

13

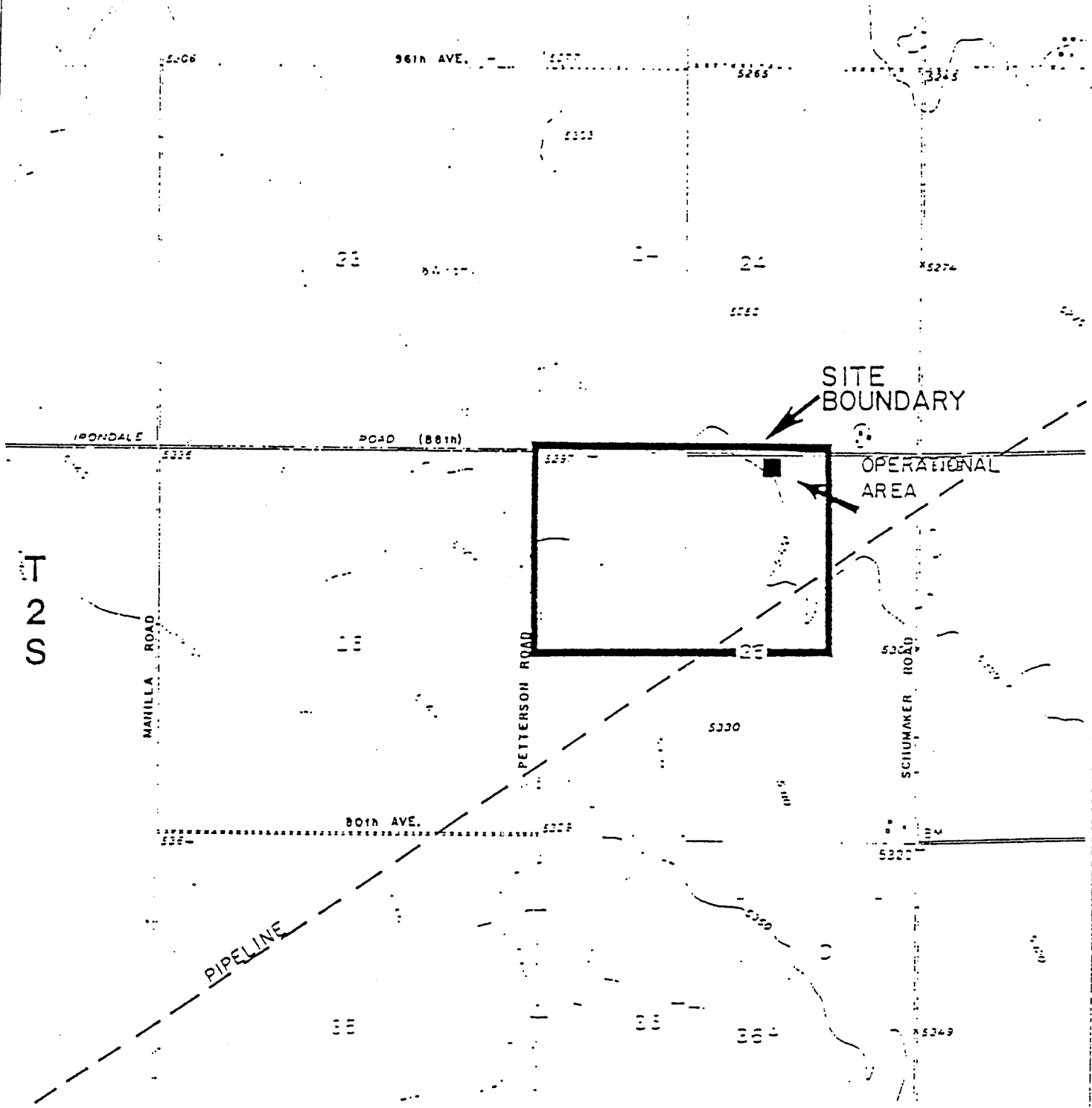
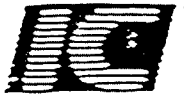


FIGURE 2-2

Conservation Services, Inc.

SITE LOCATION

Industrial Compliance Inc.  
 511 Orchard Street  
 Golden, Colorado 80401



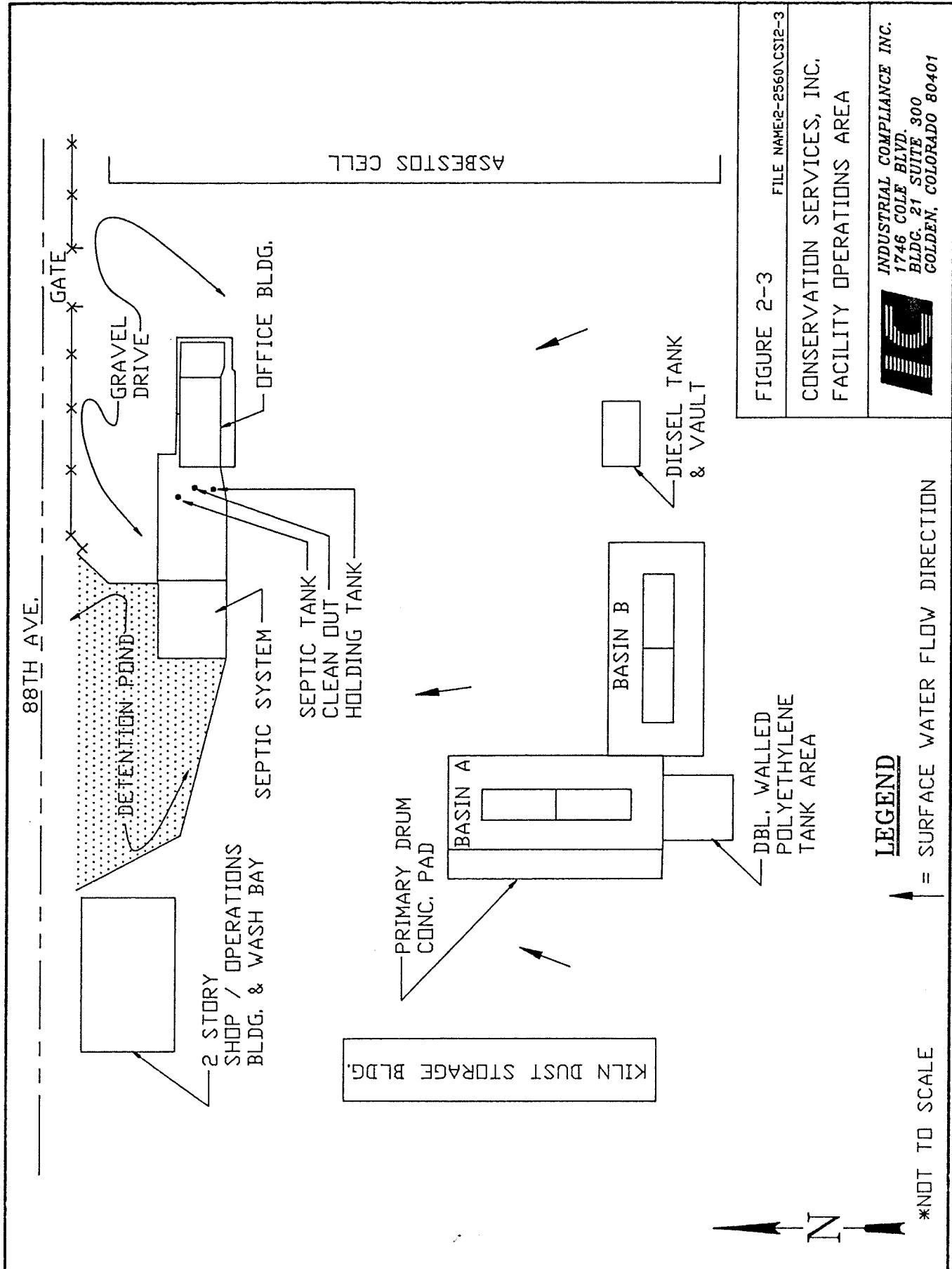


FIGURE 2-3  
FILE NAME: 2-2560\CS12-3

CONSERVATION SERVICES, INC.  
FACILITY OPERATIONS AREA

**INDUSTRIAL COMPLIANCE INC.**  
1746 COLE BLVD.  
BLDG. 21 SUITE 300  
GOLDEN, COLORADO 80401

**LEGEND**  
↑ = SURFACE WATER FLOW DIRECTION

\*NDT TO SCALE

Revised June 1991

- \* Offices
- \* Disposal office
- \* Sampling station
- \* Mixing basins
- \* Kiln dust storage
- \* Truck wash/maintenance shop
- \* Tank farm
- \* Drum storage area
- \* Equipment storage
- \* Parking spaces

Approximately 115 acres of the site will be used for solidified material filling. Specially-designed cells will be constructed using natural and synthetic materials to create nearly impermeable barriers on the cell bottom and sides. Following mixing, the solidified material is tested to ensure no free liquids are present and placed in the cell. Curing is allowed to complete in the cell. There will not be more than two cells or portions of cells available for disposal at any one time, except if a client specifically requires a cell to segregate their material (subject to Planning Commission approval as per resolution 5. G.). The cells will be closed and revegetated after they reach filling capacity so the disturbed areas of the site will be minimized.

An asbestos cell was constructed east the operations portion of the site. The disposal procedures are according to the CDH guidelines dated May 2, 1988.

Based on projections of filling 100,000 cy per year, the facility life is projected to be approximately 21 years.

#### 2.2.1 Site Access

Access to the CSI facility is from 88th Avenue (Irondale Rd.). Another potential access route to the facility is from I-70 to Colorado State Highway 79 and north to 88th Avenue. A traffic study completed by a traffic engineering consultant concludes that the traffic system is adequate to serve the site and is not expected to pose a problem (Appendix A).

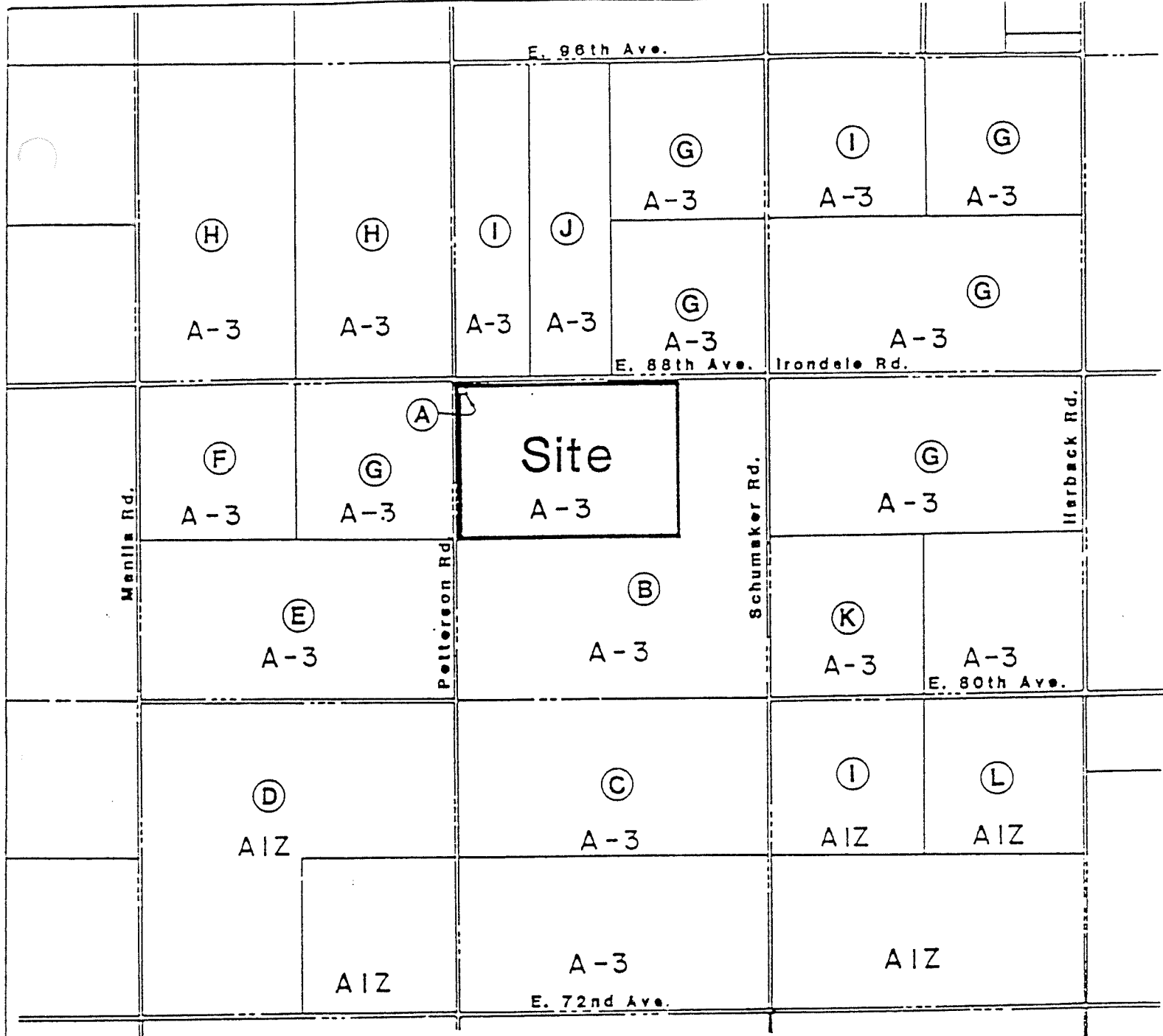
#### 2.3 Zoning and Land Use

The CSI facility land is presently zoned A-3/Agricultural. Zoning and land ownership in the vicinity of the site are included as Figure 2.4. Table 2.1 includes ownership information within an approximate 1 mile radius of the site. The letter next to

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each name coincides with the letter on the property map. Zoning of each parcel of land is included on Figure 2.4. The site is outside the boundaries of the influence area for the Front Range Airport expansion. The land surrounding the site is currently used for grazing and crop farming.

Adams County is in the process of completing a draft Environs Plan for the areas within the anticipated zone of influence of the proposed Denver Airport. The CSI site is in an area currently designated as potential residentially-zoned land because it is outside the noise impact area. The properties immediately to the north of the site are slated to be non-residentially zoned and have the potential to be used for light industry. The facility can be compatible with either of these uses in the future. Adams County feels it is unlikely that the area will be developed for another 30 to 50 years. The CSI facility will be closed by this time and uses for the land will be established as development begins. The site is also outside the influence zone of the proposed Front Range Airport expansion.



**AREA MAP OF PROPERTY OWNERS WITHIN 1 MILE**



A-3 AGRICULTURAL  
 AIZ AIRPORT INFLUENCE ZONE  
 (FRONT RANGE AIRPORT)

★ SEE TABLE 2-1 FOR OWNERSHIP INFO.

FIGURE 2-4

Conservation Services, Inc.  
 ADJACENT ZONING &  
 OWNERSHIP

Industrial Compliance Inc.  
 511 Grand Street  
 Golden, Colorado 80401



TABLE 2-1

OWNERSHIP WITHIN 1 MILE OF THE CSI FACILITY

- |    |  |    |  |
|----|--|----|--|
| A. | BENNETT SCHOOL DISTRICT #30<br>BENNETT, COLORADO 80102           | B. | JAMES AND NORA WAGNER<br>RT 1, BOX 24<br>BENNETT, COLORADO 80102                       |
| C. | SOPHIE J. WAGNER<br>5 N. 13TH AVENUE<br>BRIGHTON, COLORADO 80601 | D. | BYRON AND THELMA TRUPP<br>BENNETT, COLORADO 80102                                      |
| E. | SIDNEY ALLISON<br>RICHARD KIMBROUGH<br>SCOTIA, NEBRASKA 68875    | F. | HAROLD MORAN<br>601 CHAMBERS ROAD, #300<br>AURORA, COLORADO 80011                      |
| G. | BERNICE BULLARD<br>208 - 10TH AVENUE<br>LONGMONT, COLORADO 80501 | H. | IVAN AND IRENE STARK<br>33401 E. 88TH AVE.<br>RT. 1, BOX 77<br>COMMERCE CITY, CO 80022 |
| I. | VIRGIL PILAND<br>RT 1, BOX 20<br>BENNETT, COLORADO 80102         | J. | MARILYN CRONK<br>BOX 159<br>BENNETT, COLORADO 80102                                    |
| K. | DONALD AND ELLA TRUPP<br>BENNETT, COLORADO 80102                 | L. | J.W.C. DAVIS<br>BENNETT, COLORADO 80102  |



### 3.0 SITE DESCRIPTION

#### 3.1 Existing Site Topography

The original topography is presented on Plate 1. The site is located in gently-sloping farmland that drains from the high point of the site (approximately 1000 feet in from the western site boundary) radially to the east and west or northwest. The cells are located east of this high point.

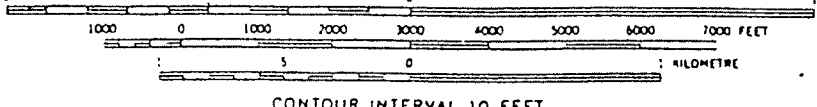
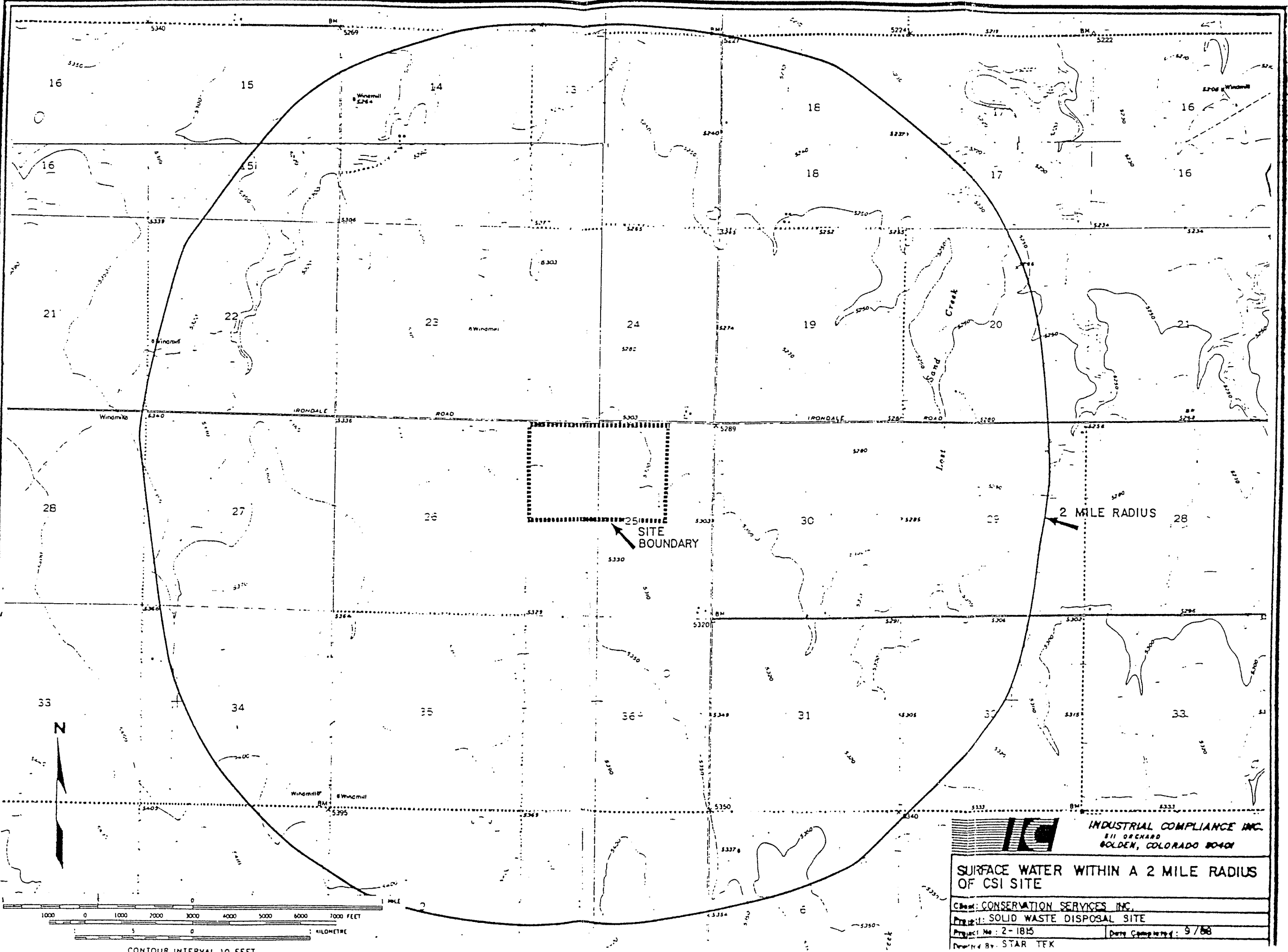
The property slopes an average of approximately 1.0 percent across the portions of the site that are for use. The steepest section of this portion of the property slopes approximately 3 percent. In the western unused portion of the site the slopes vary from less than 1 percent to 5 percent.


The general overland flow direction is from the west to the east in the eastern portion of the site and from the east to the west on the western third of the site. The site is used as farm land and was being plowed and seeded during site characterization activities.

#### 3.2 Surface-Water Drainage

Surface waters within a 2-mile radius are shown in Figure 3.1. The overland drainage from the site eventually flows in intermittent gullies to Lost Creek. The general drainage pattern for the site is shown in Figure 3.2. Lost Creek is an intermittent stream following a general south-to-north direction. Lost Creek is approximately 1.5 miles east of the site. Runoff from the eastern portion of the site will flow in intermittent streams that meet Lost Sand Creek approximately 1.5 miles northeast of the site. Runoff from the western portion of the site will flow in intermittent streams north until the stream meets Lost Creek approximately 8 miles north of the site.

There is no significant channelization on the site, with the exception of the very southwest corner of the property, nor is there any vegetation that would suggest any substantial volumes of water flowing through the site. The entire 240-acre site is currently farmed and water moves in the form of sheet flow. The drainage basins contributing to run-on in this area and to run-on to the site in general are shown in Figure 3.3.



|  |                      |
|--|----------------------|
|  <b>INDUSTRIAL COMPLIANCE INC.</b><br>811 ORCHARD<br>GOLDEN, COLORADO 80401 |                      |
| <b>SURFACE WATER WITHIN A 2 MILE RADIUS OF CSI SITE</b>  |                      |
| Client: CONSERVATION SERVICES INC.   |                      |
| Project: SOLID WASTE DISPOSAL SITE   |                      |
| Project No: 2-1815   | Date Completed: 9/88 |
| Drawn By: STAR TFK   |                      |

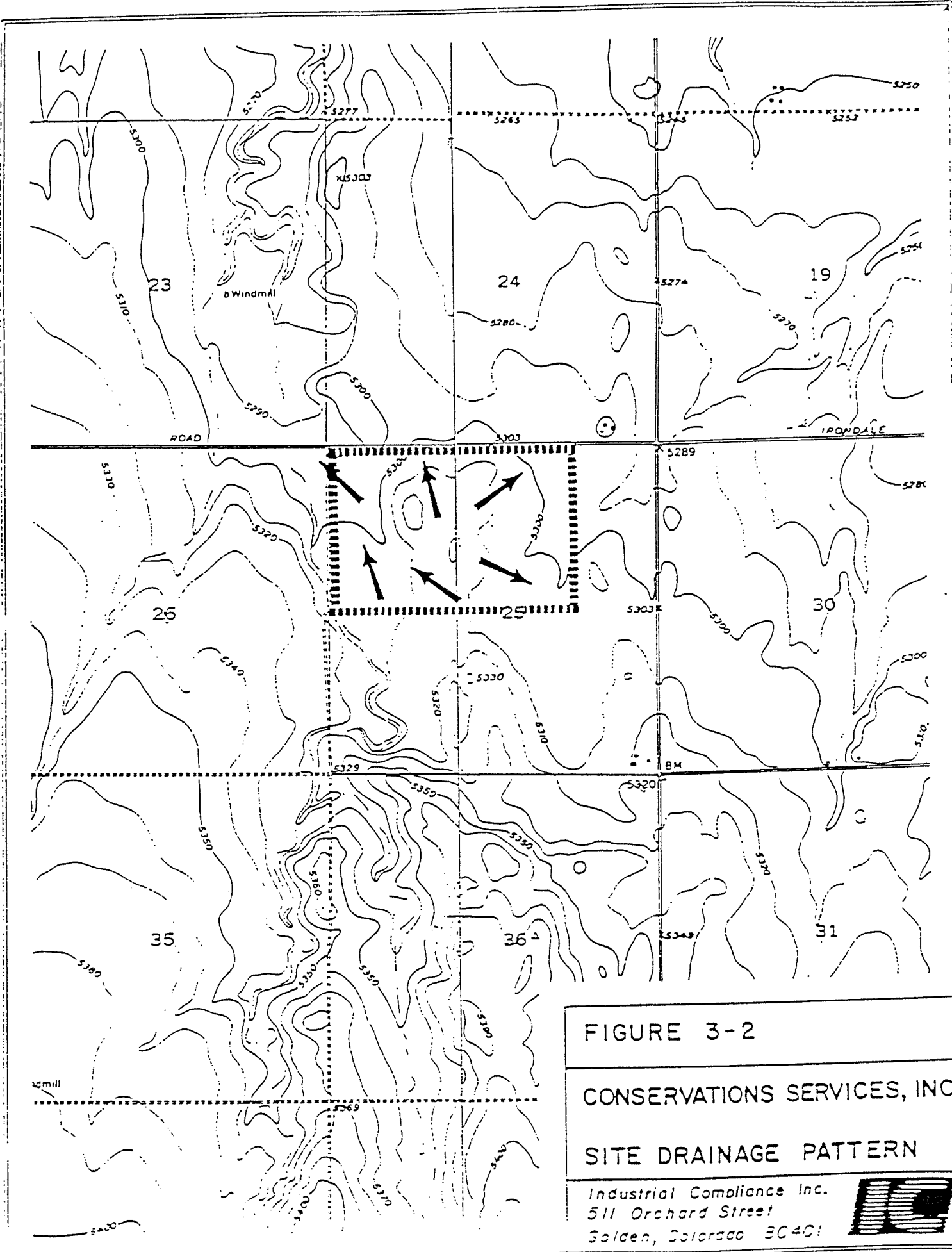


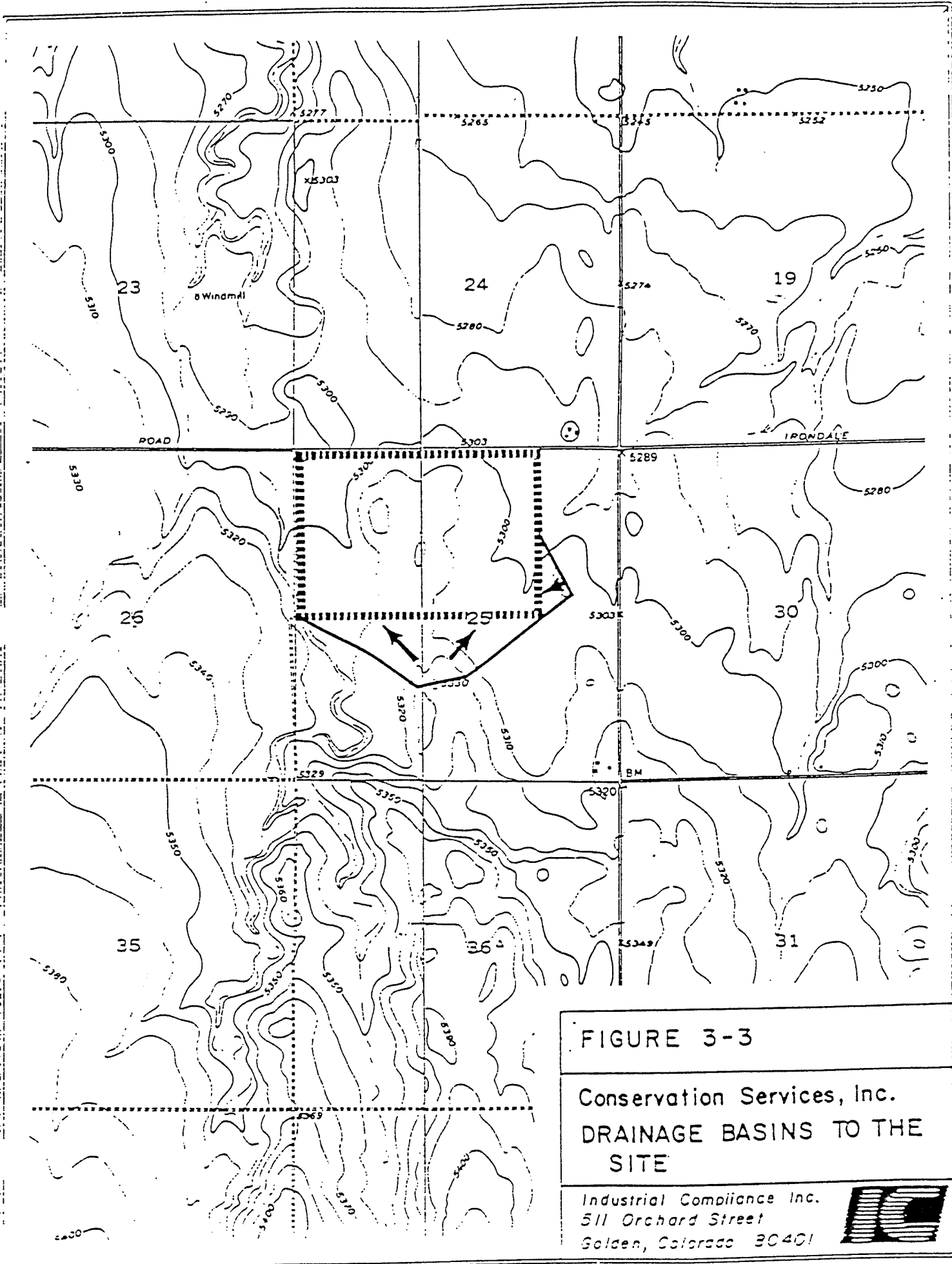
FIGURE 3-2

CONSERVATIONS SERVICES, INC.

SITE DRAINAGE PATTERN

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The southwest corner of the site shows an intermittent swale. This swale eventually leads to a bridge under 88th Avenue west of the site boundary. This swale is shown to be part of a 100-year flood plain for a one-hour storm event. The 135 acres for their facility are not in the flood plain. Appendix B includes a drainage report for the area with a flood plain map. At the time of filling in the southeastern portion of the property, a temporary berm will be constructed to route runoff from the open cells. The berm on the southern property boundary will be a minimum of 3.5 feet tall to handle any potential 100-year storm events. As filling continues to other areas, the cell will be capped and closed and the berm will be removed.

### 3.3 Climatology

Long term regional climatology data was obtained from records compiled by the National Oceanic and Atmospheric Administration (NOAA) and is typical of the Denver metropolitan region. The climatological summary for this area is presented in Appendix C of this report.

The average daily maximum temperature during the past 30 years is 64.3 degrees while the average daily minimum temperature is 36.2 degrees.

Appendix C includes climatology information regarding precipitation. Precipitation at the site is shown for 1985 and averaged from 1956 to 1985. The actual precipitation, as recorded by NOAA for 1985, is 16.31 inches with the greatest amount in a 24-hour period recorded as 1.57 inches in July. The maximum amount of rainfall in a 24-hour period was 3.55 inches in May 1973. The record annual mean precipitation from 1956 to 1985 is 14.62 inches. The greatest annual precipitation recorded from 1956 to 1985 is 23.31 inches in 1967.

The prevailing wind direction is from the south with the peak gusts from the west. Although the prevailing winds are from the south, the strongest winds are typically from the west and northwest. The average wind speed is approximately 9 miles per hour (mph) with the strongest gusts at 56 mph. A wind rose chart is included as Figure 3.4.

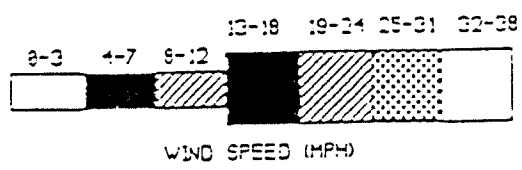
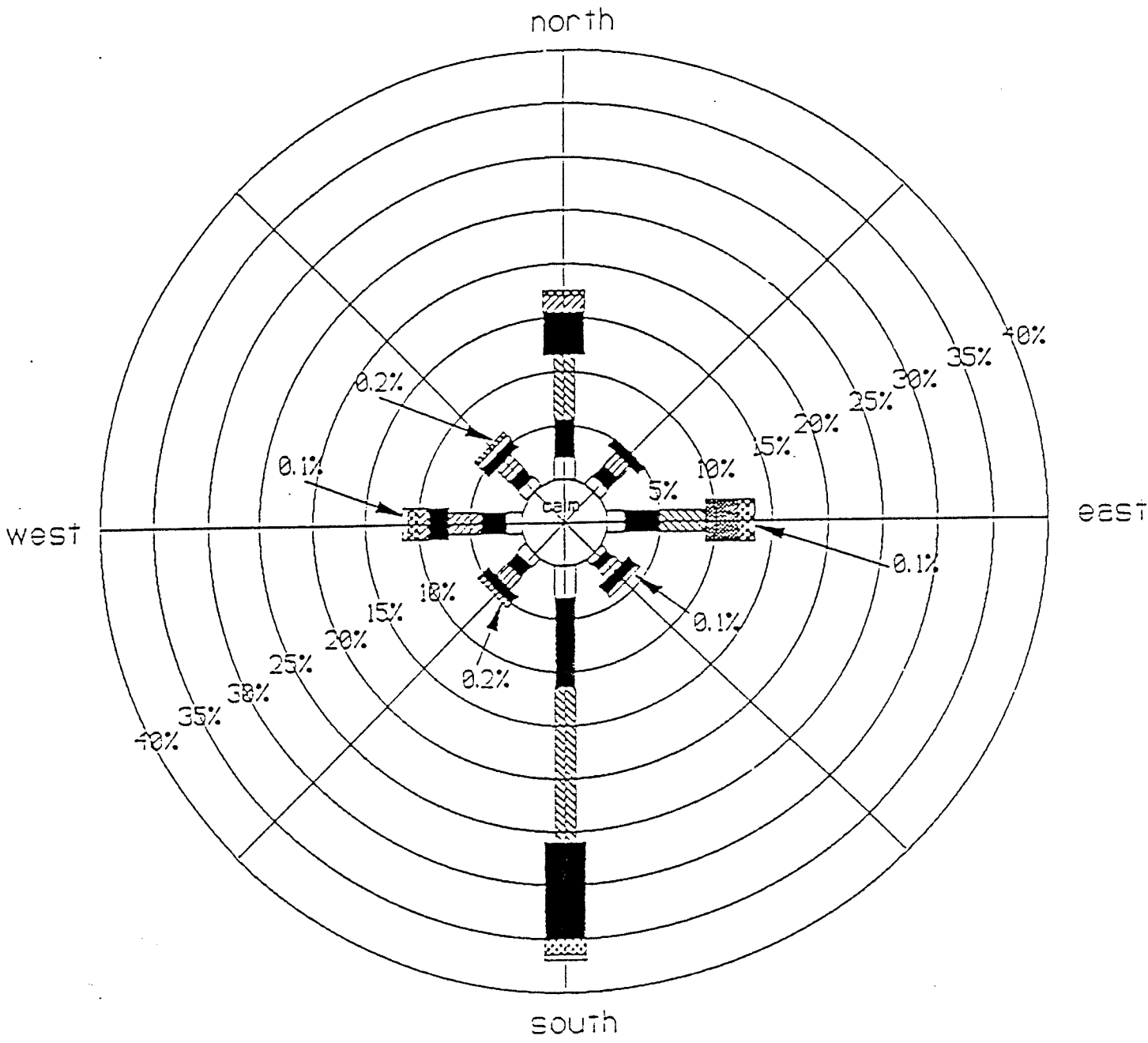
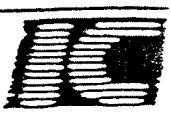


FIGURE 3-4

Conservation Services, Inc.

WINDROSE DIAGRAM

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## 4.0 GEOLOGY AND HYDROGEOLOGY

### 4.1 Regional Geology

#### 4.1.1 Regional Surficial Geology

The surficial materials found in the vicinity of the site include loess and eolian deposits and general pedisements derived from the Rocky Mountain system. The eolian and loess deposits are loam, silty loam, or very fine sandy loam and contain a relatively large percentage of very fine sand. Tertiary and Pleistocene sediments originating at the eastern edge of the Rocky Mountain system are common in this region. These deposits are variable in texture, but they are dominantly sandy loam, sandy clay loam, or clay loam. Strata of sand and variable contents of gravel are typical of these beds (Sampson and Baber, 1974).

#### 4.1.2 Regional Bedrock Geology

Bedrock in the area of the site includes rocks from virtually every geologic age group. Figure 4-1 is a generalized stratigraphic column showing formational relationships in the region. The formations discussed in this report are limited to a section of Upper Cretaceous age sedimentary rocks including, from bottom to top, the Pierre Shale, Fox Hills Sandstone, the Laramie and Arapahoe Formations and the Denver Formation. Formations below these do not warrant consideration because of their isolation from surficial processes.

The Pierre Shale is considered the basal unit of the major bedrock-aquifer system in the Denver Basin. The Pierre Shale is a marine deposit consisting primarily of shales with some interbedded siltstone and sandstone. Unit thickness ranges up to 8000 feet in the study area. The Pierre is characterized by extremely-low permeabilities and impervious clay layers distributed throughout the formation. Because of its extreme thickness and low permeability, formations below the Pierre are unaffected by the natural and artificial surficial processes in the vicinity of the site and will not be discussed further.

The Fox Hills Formation is a shallow marine deposit lying above the Pierre Formation. It is a silty sandstone with some interbedded shale units. The thickness of the Fox Hills Formation varies between 50 and 300 feet across the Denver Basin.

The Laramie Formation is a coastal plain deposit overlying the Fox Hills Formation. The Laramie is a series of alternating sandstones, claystones, and shales, with coal seams frequently

| AGE        | ROCK TYPE | UNIT     | THICKNESS     | LITHOLOGIC DESCRIPTION  |
|------------|-----------|----------|---------------|---|
| TERTIARY   |           | Tdu      | 1-20'<br>400' | SURFICIAL WEATHERED MATERIAL: silty, sandy, clay, light brown to light gray, weathered bedrock<br>DAWSON FORMATION: interbedded conglomerate, sandstone, and shale, light gray to yellow brown beds of pale green shale |
|            |           | TKd      | 300'          | DENYER FORMATION: interbedded shale, claystone, siltstone, and sandstone, dark brown to gray  |
| CRETACEOUS |           | Ka       | 700'          | ARAPAHOE FORMATION: interbedded sandstone, conglomerate, siltstone, and shale, gray to yellowish brown  |
|            |           | K1       | 200'          | LARAMIE FORMATION: claystone, shale, and sandstone, light gray to brown   |
|            |           | Km       | 50'           | FOX HILLS FORMATION: silty sandstone with interbedded shales, gray to brown   |
|            |           | Kp       | 6000'+        | PIERRE SHALE: shale, sandy shale, and some sandstone/siltstone lenses near the top, brown to dark gray-brown, friable   |
|            |           | Kn       | 350'          | NIOBRARA FORMATION: calcareous shale and limestone, gray to grayish-yellow  |
|            |           | Kcg      | 450'          | CARLILE SHALE: silty claystone and siltstone, olive-gray,<br>GREENHORN LIMESTONE: limestone, claystone, and siltstone, gray<br>GRANEROS SHALE: siltstone and claystone, dark gray                                       |
|            |           | Kd       | 230'          | DAKOTA GROUP: sandstone siltstone, carbonaceous shale, and conglomerate near the base, light to dark gray   |
|            |           | JURASSIC |               | Jmr   |
| Je         | 50'       |          |               | ENTRADA FORMATION: sandstone, light brown to gray   |
| TR         |           | TRP1     | 470'          | LYKINS FORMATION: shale, siltstone, and limestone, red to red brown,  |
| PERM       |           | P1       | 230'          | LYONS SANDSTONE: sandstone, orange to pink to gray,   |
| PENN       |           | PPT      | 900'          | FOUNTAIN FORMATION: sandstone, siltstone, and conglomerate, with thin shale beds, red-brown,  |
| PC         |           | —        | —             | Undifferentiated Precambrian igneous rocks  |

FIGURE 4-1

Conservation Services, Inc.  
GENERALIZED STRATIGRAPHIC COLUMN

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occurring in the upper portion of the formation. The Laramie Formation varies in thickness from 400 to 600 feet across the Denver Basin.

Overlying the Laramie Formation are the fluvial deposits characteristic of the Arapahoe Formation. The Arapahoe consists of a series of interbedded conglomerates, sandstones, siltstones, and shales. Unit thickness varies between 400 and 700 feet across the Denver Basin.

The Denver Formation is found immediately beneath the surficial materials in the study area. The Denver Formation is a Tertiary Upper-Cretaceous age continental-type deposit characterized by interbedded shale, claystone, siltstone, and sandstone. Lignite lenses are found in abundance throughout the Denver Formation. Unit thickness ranges between 200 and 1000 feet across the entire Denver Basin.

#### 4.1.3 Regional Geologic Structure

The landfill is located approximately 35 miles east of the structural axis of the Denver Basin. The basin is asymmetric, extending from around Pueblo, Colorado on the South, to Torrington, Wyoming on the North. On the western flank of the basin, the beds are near vertical at the contact with the Front Range, with a rapidly decreasing dip to the east. The town of Byers is at the approximate eastern boundary.

The beds near the landfill are on the eastern flank of the Basin, so they generally strike north-south and dip gently to the west at approximately 1 degree (Bryant and Others, 1981). The area is east and south of the most structurally complex region of the Denver Basin. The nearest major folds or faults are northwest of Broomfield, Colorado, approximately 35 miles northwest of the site. No indication of smaller-scale folding or faulting was found during the site-specific investigation.

#### 4.1.4 Regional Economic Geology

Oil wells are located approximately 0.25 miles west and 0.25 miles northeast of the site boundaries. According to maps produced by the Adams County Planning Department (1983) and the U.S. Geological Survey (1977), additional wells are located about one mile south-southeast of the site. These wells are associated with the Radar and Bear Gulch oil fields. Wells are also located approximately one mile northeast of the site, apparently associated with the Chieftain and Hawkeye fields. Natural gas

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fields exist approximately two miles east and four miles west of the site. Two high pressure gas lines, consisting of 18 and 24 inch diameter pipes, trend northeast-southwest through the southeast corner of the site.

The Denver Formation contains lignite to subbituminous coals that were mined through the early 1950's to satisfy local heating needs. The mining activities were concentrated in Boulder and Jefferson counties. According to the Adams County Planning Department (1983), the boundary of the Denver Formation coals in Adams county occurs approximately 5 miles southwest of the site. The Scranton mine is the nearest inactive coal mine in the area and is located near Watkins, about eight miles southwest of the site.

The site exists at least four miles outside any defined sand and gravel alluvial deposits. According to the Adams County Planning Department (1983), the nearest "probable aggregate resources" of sand and gravel occur approximately six miles east of the site along Kiowa creek and six miles west of the site along Box Elder Creek. Both of these deposits are identified by the CGS as valley fill material.

#### 4.1.5 Geologic Hazards

The nearest major folds or faults are approximately 35 miles northwest of the site. In addition, no apparent geologic hazards that would affect the development of the facility are associated with the site. As stated previously, no underground coal mining activity has occurred within the immediate vicinity of the site. Historically, minor earthquakes in the area of the Rocky Mountain Arsenal (RMA) have occurred; however, this activity has not resulted in land surface disturbances. The earthquakes have been attributed to deep well injection of hazardous fluids on the RMA property, located approximately 20 miles west of the study area (Hollister and Weimer, 1968). The fluids were injected to depths of 12,000 feet. Earthquake activity subsided several years after the cessation of fluid injection in 1966 and it appears that this activity does not pose a threat to the development of the landfill.

The Adams County Soils Survey (Sampson and Baber, 1974) reports that the soils present at the site have moderate shrink-swell potential. Soil samples collected at the site were tested in a geotechnical lab to determine the actual shrink-swell potential of the soils. The results indicate that the soils have a low or low to moderate shrink-swell potential that will not affect the

operations at the site. Testing results are included in Appendix D. Although this factor will not be important during the operational phase, it will be considered for all post-closure land uses.

## 4.2 Site Geology

### 4.2.1 Field Investigations

A total of seventy-seven soil borings (SB-1 through SB-46, P17-P36, and MW-101-MW302) were drilled in Section 25; Township 2 South, Range 64 West of the 6th Principal Meridian in Adams County, Colorado. These soil borings were used to assess the geologic and hydrologic characteristics of the subsurface materials at the site.

The initial 19 soil borings (SB-1 through SB-19) were drilled as part of the exploratory field program. This program was initiated to provide the geologic and hydrologic information necessary for the selection of an appropriate site. Based on the preliminary information, a site encompassing approximately 240 acres was selected in the northwestern portion of Section 25.

Once the 240 acre site boundary was defined, a more thorough subsurface investigation was conducted. Twenty-seven additional borings (SB-20 through SB-46) were drilled during this investigation to further characterize the geology and ground-water hydrology within the site boundary. Borings SB-5, SB-12 through SB-16, SB-18, and SB-19, were drilled outside of the site boundary as part of the site selection process and are not included.

Following the initial forty-six borings, a conceptual site layout (Plate 1) was produced and CSI was granted conditional approval of the site. As a condition of approval, an additional 20 soil borings and piezometers (P-17 through P-36) were installed to characterize conditions beneath disposal cells 3, 4, 7, 10, 14, 16, 17, 22, 9, 12, and 20. Eleven additional ground-water monitor wells (MW-101 through MW-302) were also installed. The piezometers were installed at appropriate locations to suitably define the vertical separation between the lowest point in each cell and the uppermost saturated materials. The locations of the borings and monitor wells are shown on Plates 2, 3 and 12.

The soil borings were advanced with a truck-mounted auger rig using 4-inch diameter solid-stem or 6-inch diameter hollow-stem augers. The depths of the soil borings ranged from 15 to 101 feet. Relatively undisturbed soil and bedrock samples were obtained using a 2-inch Modified California Barrel Sampler or a

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2-inch Split Spoon Sampler driven 18-inches into the soil by a 140 pound hammer dropping 30-inches. In addition, continuous, relatively undisturbed soil and bedrock cores were obtained from selected boreholes using a Central Mining Equipment (CME) continuous sampling system. The soil and bedrock samples, auger cuttings and cores were visually examined and logged in the field. The soils were classified in accordance with the Unified Soil Classification System (USCS). Lithologic and completion logs of the soil borings are presented in Appendix F. Actual field logs are included in Appendix D.

Selected soil/bedrock samples and bulk composite samples were submitted to a soils laboratory to evaluate the physical and engineering characteristics of the material. The results are summarized in section 4.2.4.

#### 4.2.2 Site Soil Classification

The soils at the site have been mapped by the U.S. Soil Conservation Service (Sampson and Barber, 1974). However, the SCS states that the available soils information is highly generalized and may not accurately reflect local variations of the existing conditions. Moreover, this information is only relevant to a maximum depth of 60 inches.

The existing soil association is the Weld-Adena-Colby. This association formed on nearly-level to steep, well drained upland areas in loamy wind-deposited material. Sampson and Barber (1974) show the site to contain Ascalon, Weld, and Vona series soils, as well as loamy alluvial land. These soils are classified as mollisols and aridisols. Approximately 50 percent of the site (central) is covered by Ascalon-Platner association soils. The west and west central portions of the site are overlain by loamy alluvial sand and Vona loamy sand (3 to 9 percent slopes) respectively. The eastern portion of the site is covered by Ascalon sandy loam (1 to 3 percent slopes), Ascalon sandy loam (3 to 5 percent slopes), and Weld loam (1 to 3 percent slopes).

Ascalon series soils, including the Ascalon-Platner association, are well drained and are found in nearly level to moderately sloping upland areas. These soils typically form in loamy material containing varying amounts of sand and gravel. The surface is usually non-calcareous; however, visible lime splotches are found below depths of about 20 inches. These soils absorb water at a moderate to rapid rate. The available water capacity is high and surface runoff is low to medium. Typically,

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30 to 50 percent of the material will pass through a #200 sieve. The field infiltration rate ranges from  $4 \times 10^{-4}$  to  $1 \times 10^{-3}$  cm/sec. The available water capacity varies from 0.13 to 0.15 inch/inch of soil. The water erosion hazard is moderate, the soils have low to moderate shrink-swell potential, and the soil blowing hazard is severe in unprotected areas.

Vona series soils are found on well drained, nearly level to moderately sloping upland areas. These soils form in wind deposited sandy material. In a representative profile, the surficial material is a non-calcareous loamy sand. The underlying material is a calcareous sandy loam with visible lime splotches. These soils absorb water rapidly, the available water capacity is moderate, and the surface runoff is medium. Typically, 20 to 40 percent of the material will pass a #200 sieve. The field infiltration rate varies from about  $4 \times 10^{-3}$  to  $1 \times 10^{-2}$  cm/sec. The available water capacity ranges from 0.1 to 0.12 inch/inch of soil. These soils have a low to moderate shrink swell potential, and a severe soil blowing hazard.

Weld series soils are found in well drained nearly level upland areas. They typically form in wind-worked loamy material. The surface is a non-calcareous loam while the lower profile is a calcareous sandy loam with visible lime splotches. These soils absorb water at a moderate rate and the available water capacity is high. Surface runoff potential is medium. In Weld series soils, 60 to 90 percent of the material typically pass a #200 sieve. The field infiltration rate ranges from approximately  $4 \times 10^{-5}$  to  $1 \times 10^{-4}$  cm/sec and the available water capacity varies from 0.15 to 0.17 inch/inch of soil. These soils have a moderate to severe water erosion hazard, a high shrink-swell potential, and the soil blowing hazard is severe in dry-land farm areas receiving less than normal annual precipitation.

Loamy alluvial soils are found in long drainages with areas of deep silty deposits on slopes of less than 3 percent. The surface layer is usually a non-calcareous loam or clay loam 6-10 inches thick. The underlying material is a stratified silt or clay loam with varying amounts of sand and gravel. This soil absorbs water at a moderate rate, is well drained, and has a high water capacity. The water erosion hazard is severe in all cultivated areas.

#### 4.2.3 Site Surficial Materials

The unconsolidated materials encountered during the drilling program can be classified into three categories: silty-sandy clay; silty sand; and gravel. Each of these materials are discussed below.

A light to dark brown silty, very-fine sandy clay was identified in all of the site soil borings. This deposit occurs in thicknesses that vary from 2 to 40 feet, with an average thickness of 17.2 feet. The thickest deposits generally occur throughout the central and northwestern portion of the site. This material was classified by visual field inspection (according to USCS) as CL/ML/SC. The field moisture contents ranged from dry to medium moist and the consistency ranged from medium stiff to very stiff.

A light-yellow-brown to light-gray silty, very-fine sand with varying amounts of clay was identified in 49 of the soil borings. Although these sand deposits occur sporadically, they appear to be more concentrated at the eastern portion of the site. These deposits are discontinuous and generally occur immediately above or below the silty-sand clay, interbedded within the silty-sandy clay or the claystone. The silty sand deposits vary in thickness between 1 and 19 feet, with an average thickness of 7.6 feet. The thickest deposits generally occur in the eastern portion of the site and in the drainage along the western boundary in the area of MW-201. This material was classified in the field as SC/SM. The field moisture content ranged from dry to wet with a consistency ranging from medium dense to dense.

Gravel deposits ranging in thickness of up to 1-foot were identified along the western portion of the site in borings SB-1 and SB-4 and MW-201. The gravels were encountered at a depth of 17-feet in SB-1, 8-feet in SB-4, and 16-feet in MW-201. These deposits are believed to be associated with a poorly developed north-south trending ephemeral stream channel. This ephemeral stream channel is generally comprised of reworked surficial materials. These gravels are generally interbedded with, or immediately overlying, a silty-sandy clay material. The gravel material was classified in the field as SM/GP. Water was found in the gravel intervals at both soil borings.

Plates 2, 3, and 12 show the soil boring and geologic cross-section locations. Geologic cross-sections were constructed of the site and are shown in plates 4, 5, and 6. The depths and thickness of the surficial materials are displayed in the above plates.

#### 4.2.4 Site Bedrock Deposits

The Denver Formation was the only bedrock unit encountered during the site-specific drilling program. This formation was identified by cuttings obtained during drilling that are representative of Denver Formation lithologies typically found in the metropolitan Denver area. The lithologies encountered at the site consisted of claystones with discontinuous lenses of moderately cemented sandstone and unconsolidated sand.

Claystone is the dominant bedrock material at the site. The claystone bedrock was encountered in all the soil borings drilled at the site, with the exception of SB-39 which was a shallow boring (less than 25 foot in depth) and monitor wells MW-102 and MW-201 (24-feet and 37-feet deep respectively). The depth to the claystone bedrock range from 1 to 43 feet, with an average depth of 18.6 feet. The claystone varied from light brown (weathered to slightly weathered zone) to olive, green-gray to gray (unweathered zone). The claystone was generally dry to slightly moist. It is typically medium to very plastic and very stiff to hard when drilled. Iron oxide staining was observed in all of the soil borings. Gypsiferous infilling was also observed, but at a lesser extent than the iron staining. In addition, the claystone occasionally contained interbedded lenses of sand, sandstone, siltstone, shale and lignite. These lenses generally varied in thickness from less than an inch to approximately 4 feet.

Thin lenses of weak-to-moderately-cemented silty, fine-grained sandstone were logged in 25 of the soil borings. The sandstone ranged in thickness from approximately 6-inches to 13 feet and occur as discontinuous lenses. The sandstone generally contains some silt. The color ranges from light to dark brown. All the moderately cemented sandstone lenses encountered were unsaturated.

Forty borings contained isolated lenses of sand intercalated within the predominant claystone. These lenses generally contained light to yellow brown to light gray silty, fine sand. The lenses range in thickness from less than a few inches to approximately 15 feet. The thickest sand intervals occurred in

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the northeastern and southeastern portions of the site. In many cases, the sand lenses within the claystone unit were saturated. These sand layers could not be traced laterally between borings and are considered to be discontinuous lenses.

The general characteristics of the bedrock material are shown in the geologic cross-sections (Plates 4, 5, and 6). These plates show the silty sand and sandstone lenses to be laterally and vertical discontinuous at the site.

#### 4.2.5 Representative Material Properties

Representative materials from the site were collected and geotechnical testing was completed to determine physical and engineering characteristics of soils at the site. Samples composited from auger cuttings ranging in depths from 10 to 30 feet were collected from borings SB-32, SB-37, and SB-41. These materials generally consisted of the surficial silty, sandy clay and weathered to non-weathered claystone bedrock. The laboratory testing included soil classification (sieve analysis and Atterberg limits), Standard Proctor tests (ASTM D-698), remolded permeability tests and swell-consolidation tests. The results of the laboratory testing are presented in Table 4-1 and on individual test data sheets in Appendix D.

The composite materials exhibit very low permeabilities. These were recompacted to 95 percent of Standard Proctor Density and permeabilities averaged  $3.8 \times 10^{-8}$  cm/s. This suggests that the surficial and bedrock materials are suitable for the construction of the low permeability liners and caps associated with the disposal cells.

### 4.3 Regional Hydrogeology

#### 4.3.1 Regional Ground-Water Basin

The site is located in the southern portion of the Lost Creek Ground-Water Basin. According to Nelson and others (1967), the Lost Creek Basin includes approximately 420 square miles in eastern Weld County, central Adams County and northern Arapahoe County. The important water-bearing geological members in the Lost Creek Ground-Water Basin include the Lost Creek Alluvium and sands of the Laramie and Fox Hills. Generally, the aquifers above the Fox Hills sandstone; including the Laramie, Arapahoe and Denver Formations, provide limited water supplies to stock



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TABLE 4-1  
 GEOTECHNICAL LABORATORY RESULTS

Material Classification

| <u>Soil Boring</u> | <u>Sample Interval (feet)</u> | <u>Atterberg Limits</u> |                         | <u>Sieve Analysis</u> |                 |                            |
|--------------------|-------------------------------|-------------------------|-------------------------|-----------------------|-----------------|----------------------------|
|                    |                               | <u>Liquid Limit</u>     | <u>Plasticity Index</u> | <u>Gravel (%)</u>     | <u>Sand (%)</u> | <u>Silt &amp; Clay (%)</u> |
| SB-32              | 15-25                         | 44                      | 6                       | 0.0                   | 10.0            | 90.0                       |
| SB-37              | 10-30                         | 46                      | 19                      | 0.0                   | 4.6             | 95.4                       |
| SB-41              | 10-25                         | 45                      | 25                      | 0.0                   | 2.6             | 97.4                       |

Moisture Density Relationships

| <u>Soil Boring</u> | <u>Sample Interval (feet)</u> | <u>Maximum Dry Density (PCF)</u> | <u>Optimum Moisture Content (%)</u> |
|--------------------|-------------------------------|----------------------------------|-------------------------------------|
| SB-32              | 15-25                         | 103.5                            | 18.5                                |
| SB-37              | 10-30                         | 102.5                            | 18.5                                |
| SB-41              | 10-25                         | 103.0                            | 19.0                                |

Material Permeability

| <u>Soil Borings</u> | <u>Sample Interval (feet)</u> | <u>Permeability (cm/s)<br/>(Remolded to 95%<br/>Standard Proctor Density)</u> |
|---------------------|-------------------------------|---|
| SB-32               | 15-25                         | $2.71 \times 10^{-8}$   |
| SB-37               | 10-30                         | $5.12 \times 10^{-8}$   |
| SB-41               | 10-25                         | $3.47 \times 10^{-8}$   |

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and domestic wells within the area. Since these aquifers are erratic, they are not considered large water supply sources within the Basin. The general characteristics of these aquifers are discussed in greater detail in Section 4.3.2.

The boundary of the Lost Creek Alluvium is the line of zero-saturated thickness of the Alluvium and the boundary of the Basin where the saturated thickness is greater than zero. The horizontal boundary of the sands of the Laramie and Fox Hills Formations is congruent with the boundary of the Basin. The vertical boundaries are the bottom of the Fox Hills sands and the top of the Laramie sands.

The principal source of ground water in the Lost Creek basin is the unconsolidated materials. The unconsolidated sediments include upland deposits, valley-fill deposits, and dune sand. The valley-fill deposits are the most important source of ground water for large capacity wells within the basin. These deposits which primarily consist of sand and gravel are generally thickest in the northern portion of the Basin.

#### 4.3.2 Regional Aquifer Distribution

Three major ground-water aquifer units occur beneath the CSI landfill site; the Laramie-Fox Hills, the Arapahoe, and the Denver aquifers. These aquifers are discussed in detail below.

##### 4.3.2.1 Laramie-Fox Hills Aquifer

The Laramie-Fox Hills Aquifer occurs in the lower sandstones of the Laramie and the upper part of the Fox Hills Formations. These sands appear to be hydraulically connected, so they are considered one aquifer. Near the site, the depth to the top of the aquifer is approximately 1200 feet with an average thickness of around 160 feet. In areas where the units are completely saturated, the Laramie-Fox Hills Aquifer is considered a confined unit. This is the situation beneath the site.

Insufficient water level data in the central part of the Denver basin, including the vicinity of the site, does not permit definition of the potentiometric surface in this area. Based on indirect data, Robson and Romero (1981) suggest that the direction of ground-water flow is towards the north-northeast. Figure 4-12 shows the potentiometric surface of the Laramie-Fox Hills Aquifer in 1978. Water derived from this unit is generally of good chemical quality and is characterized as a sodium bicarbonate.

#### 4.3.2.2 Arapahoe Aquifer

The Arapahoe Aquifer occurs in the sandstone and conglomerate beds characteristic of this unit. The depth to the top of the Arapahoe Formation is approximately 450 feet with a total thickness of the sandstone and conglomerate beds ranging up to 150 feet in the vicinity of the site. The Arapahoe is also considered a confined aquifer beneath the site. Robson and Romero (1981) placed the potentiometric surface elevation of the Arapahoe Formation in the immediate vicinity of the site at 5175 feet with a predominant flow direction to the northwest. Figure 4-13 shows the potentiometric surface of the Arapahoe Aquifer in 1978. The chemical quality of water derived from the Arapahoe is generally classified as a sodium bicarbonate type.

#### 4.3.2.3 Denver Aquifer

The Denver Aquifer is the uppermost aquifer beneath the landfill. Robson and Romero (1981) indicate less than 50 foot of saturated thickness. The base of the water-bearing strata is estimated to be 160 feet below land surface. The water bearing strata are described as irregular lenses of interbedded sandstone and siltstone that are hydraulically separated by thick sequences of claystone. Robson and Romero (1981) show the potentiometric surface elevation to be approximately 5250 feet, with ground-water flow towards the north (Figure 4-14). Wells in the Denver Aquifer generally yield from 0.05 to 1.0 gallons per minute per foot of drawdown.

In general, the Denver provides water of acceptable chemical quality source, although it is not as good as water derived from the Arapahoe or Laramie-Fox Hills aquifers. The water is classified as either sodium sulfate or sodium bicarbonate type.

### 4.4 Site Hydrogeology

#### 4.4.1 Water Well Inventory in the Vicinity of Site

Records on permitted ground water wells within a 2 mile radius of the site were reviewed at the Colorado Division of Water Resources, State Engineers office. The data examined included well locations to the nearest quarter section, water usage designation, total depth, water level, and approximate well yield. The information is presented in Table 4-2. Based on the limited information contained in the State files, it is not known if all of the listed wells are currently in existence and/or operation.

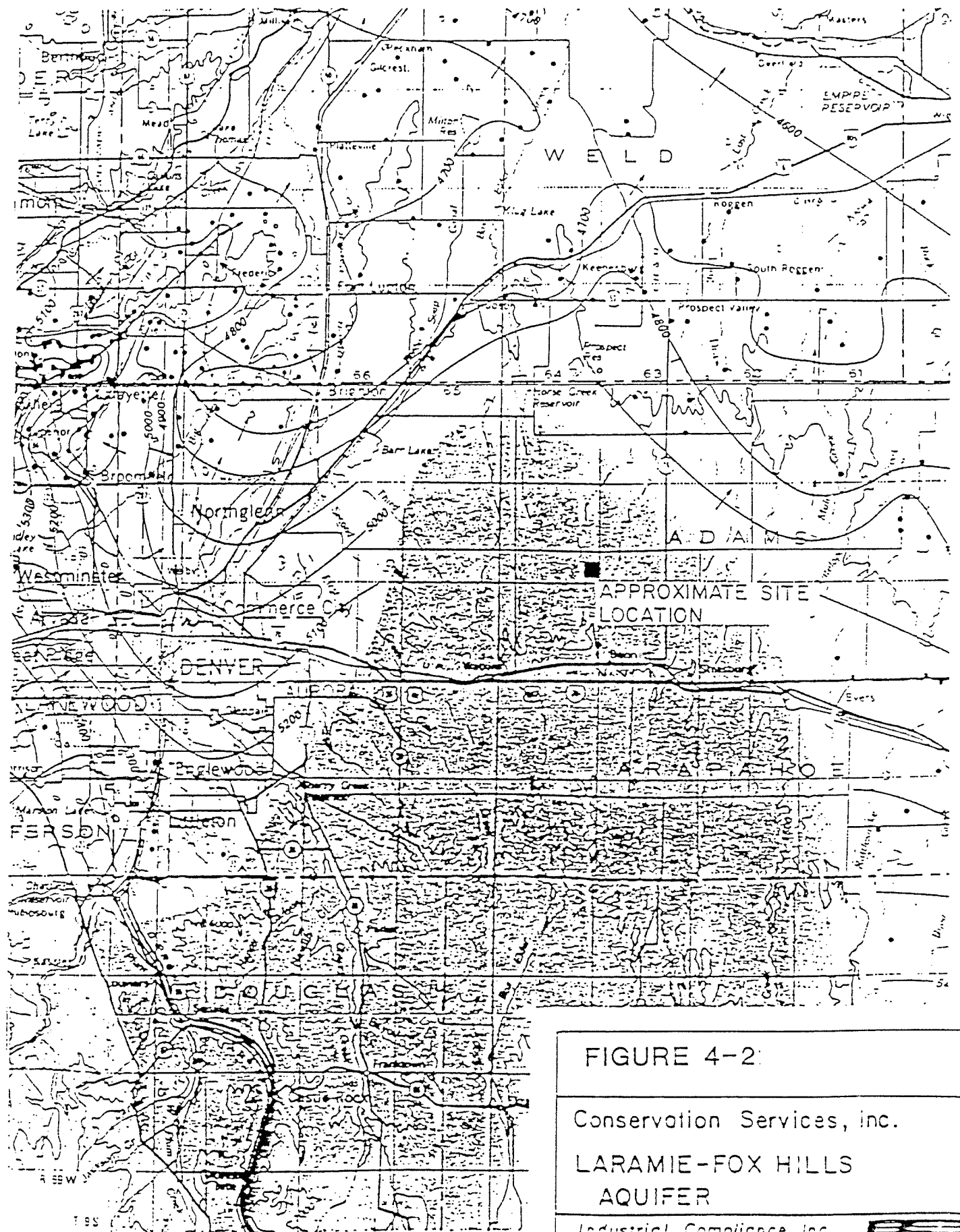


FIGURE 4-2:

Conservation Services, Inc.  
 LARAMIE-FOX HILLS  
 AQUIFER

Industrial Compliance Inc.  
 511 Orchard Street  
 Golden, Colorado 80401



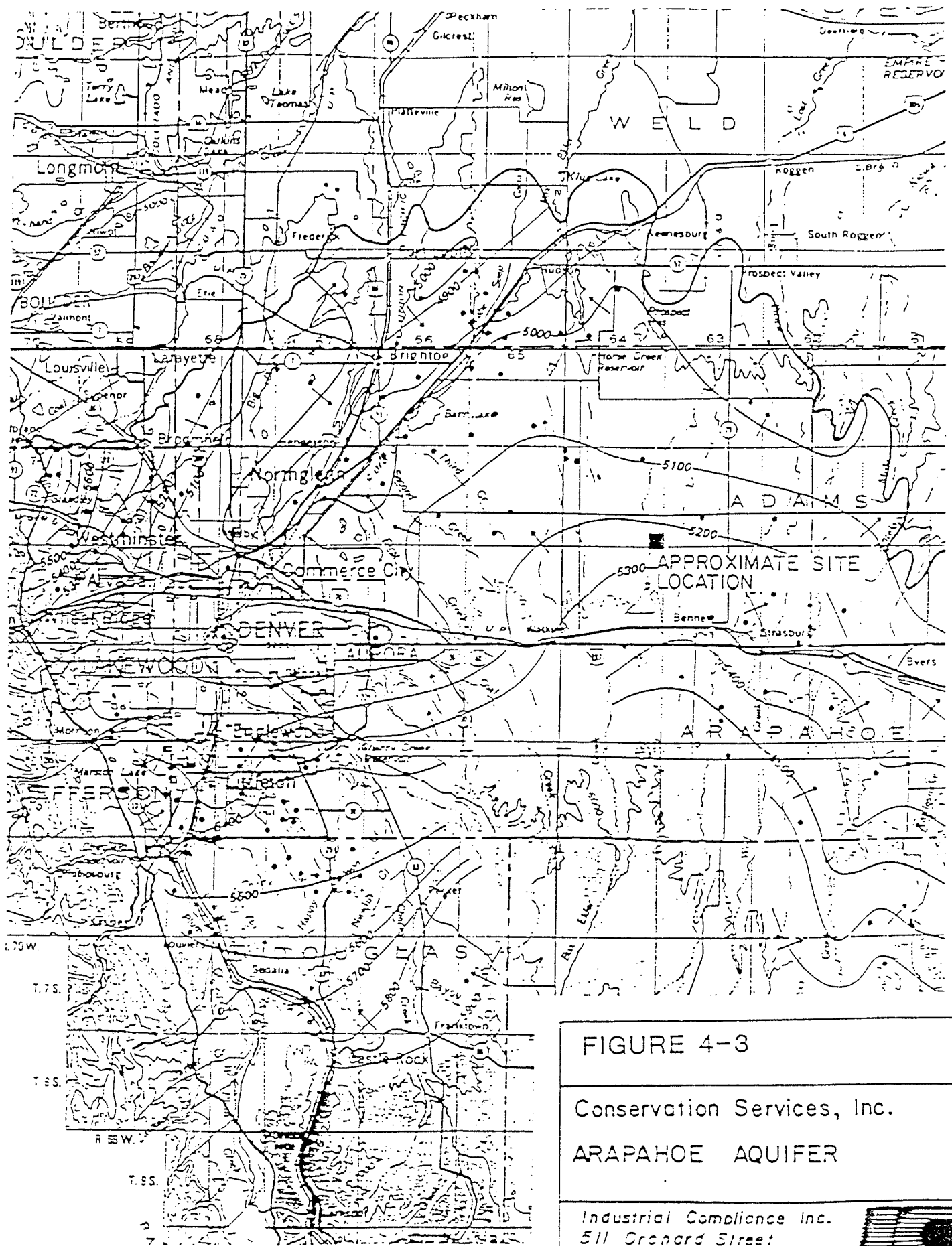


FIGURE 4-3

Conservation Services, Inc.  
 ARAPAHOE AQUIFER

Industrial Compliance Inc.  
 511 Grand Street  
 Golden, Colorado 80401



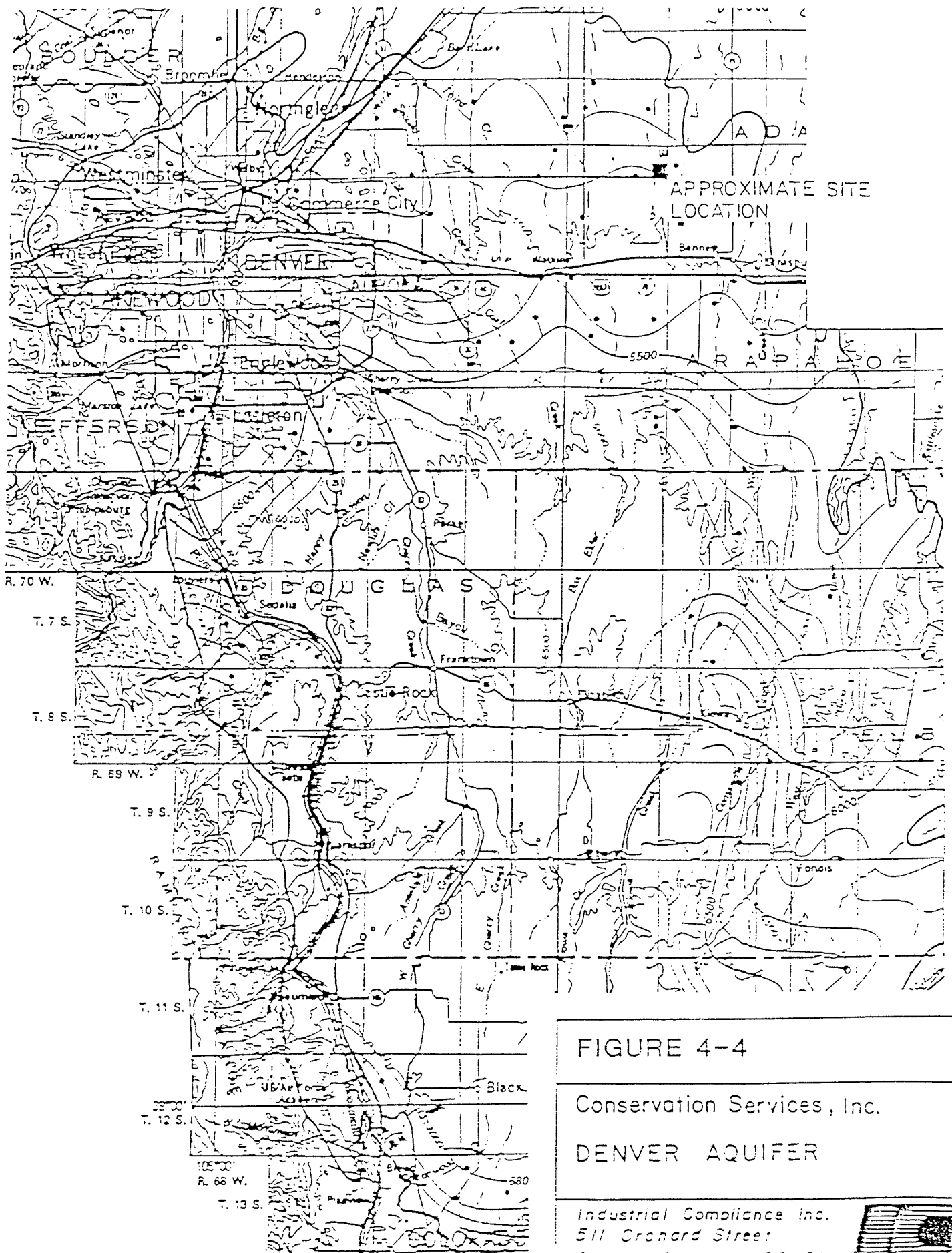


FIGURE 4-4

Conservation Services, Inc.

DENVER AQUIFER

Industrial Compliance Inc.  
 511 Orchard Street  
 Golden, Colorado 80401



Most of the registered water wells were completed in the Arapahoe Aquifer. These are domestic and /or stock use wells that are listed as producing an estimated maximum yield of 10 to 20 gallons per minute. In addition, two shallow wells, ranging from 60 to 80 feet in depth were identified west and northwest of the site, respectively. These wells were completed as windmills.

#### 4.4.2 Field Investigation

Sixty-nine of the seventy-seven soil borings were drilled within the CSI site boundary to assess the hydrogeologic characteristics of the subsurface material. The borings range from 16 to 101 feet in total depth. Thirteen soils borings were completed as monitoring wells, and thirty-six were completed as piezometers at the locations shown on Plates 2, 3 and 12. The monitoring wells vary from 16 to 90 feet in depth. The piezometer depths varied from 20 to 99 feet.

The monitoring wells were constructed with 2-inch, threaded, flush-jointed, polyvinyl chloride (PVC) pipe with 0.010-inch machine slotted, 5-foot or 10-foot screen sections. The annular space around the screen was backfilled with #10-20 Colorado Silica Sand. A two to three foot bentonite plug was placed on top of the sand. The remainder of the boring was grouted to the surface using a cement-bentonite mixture. Each well was secured at the surface with a locking steel protective casing. The monitoring well installation details are presented in Appendix E. The piezometers consisted of 3/4-inch or 1-inch diameter PVC pipe with hand-slotted screen intervals. The piezometer installation details are also presented in Appendix F.

The monitoring wells were bailed to develop the well prior to sampling. The initial two monitor wells installed were labeled MW-1 and MW-2. These were relabeled as MW-101 and MW-104 respectively following installation of the remaining monitor wells. Only sampling of MW-101 (MW-1) and MW-104 (MW-2) are discussed here. The other wells have been sampled on a quarterly basis since September of 1989, and the results have been sent regularly to CSI, CDH, and Adams County. Ground-water samples were collected from the intial two monitoring wells and submitted to a contract laboratory for analytical analysis of selected parameters. In addition, field measurements of pH, specific conductance and temperature were obtained from the monitoring wells and at selected piezometers and soil borings at the site. The results are summarized in Section 4.4.4.

TABLE 4-2

WELLS WITHIN A TWO-MILE RADIUS OF THE SITE

| <u>LOCATION</u>       | <u>DEPTH</u> | <u>AQUIFER</u> | <u>WATER LEVEL</u> | <u>YIELD *</u> | <u>USE</u> |
|-----------------------|--------------|----------------|--------------------|----------------|------------|
| SW1\4 SE1\4<br>SEC 18 | 315          | AR             | 92                 | 12             | 3          |
| SE1\4 SE1\4<br>SEC 18 | 315          | AR             | 90                 | 12             | 3          |
| SW1\4 NE1\4<br>SEC 20 | 140          | AR             | 95                 | 20             | 2          |
| NE1\4 NE1\4<br>SEC 31 | 208          | AR             | 50                 | 15             | 2          |
| NE1\4 SW1\4<br>SEC 14 | NA           | NA             | NA                 | 8              | 1          |
| SE1\4 NE1\4<br>SEC 23 | 80           | U              | 65                 | 10             | 3          |
| SE1\4 SE1\4<br>SEC 24 | 150          | AR             | 90                 | 15             | 3          |
| NE1\4 NE1\4<br>SEC 26 | 60           | U              | NA                 | 10             | 3          |
| SE1\4 NE1\4<br>SEC 36 | 280          | AR             | 140                | 15             | 1          |

U = UNCONSOLIDATED MATERIAL

AR = ARAPAHOE

NA = NOT AVAILABLE

1 = DOMESTIC

2 = STOCK

3 = DOM/STOCK

\* = THESE VALUES REPRESENT THE ESTIMATED MAXIMUM YIELD.



Aquifer testing was performed at the site to evaluate the hydraulic properties of the site-specific materials. This was accomplished by conducting packer tests and rising-head tests. In addition, laboratory permeability tests were performed on selected soil and bedrock samples. The results are discussed in Section 4.4.5.

#### 4.4.3 Ground Water Occurrence and Conditions

Ground water was encountered in 47 of the 77 soil borings drilled within the site boundary. The drilling investigation indicates that the depth to ground water varies from less than 10 to more than 80 feet. The soil boring logs (Appendix F) and geologic cross-sections (Plates 4,5 and 6) show the probable source lithology of water and depth to water encountered during the drilling program.

The ground water encountered at the site generally occurs within discontinuous sand lenses. The saturated material in these lenses is generally comprised of fine, silty sand. The saturated material either occurs immediately above the impervious claystone or as interbedded lenses within the claystone. The drilling program indicated that the perched lenses occur sporadically across the site. Furthermore, the saturated materials associated with these lenses appear to be isolated and discontinuous in both the horizontal and vertical direction. Some of these saturated lenses exist under semi-confined conditions as evidenced by P-17 and P-35. In P-17 a thin (<2-feet) water bearing interval was encountered at an elevation of approximately 5226'. Water subsequently was measured in this boring at an elevation of 5233'. To determine if the water measured in this boring originated from below 5233', P-35 was drilled adjacent to P-17 to an elevation of 5231' (below the water level in P-17 but above the water bearing zone). P-35 was dry at the time of drilling and has remained dry, indicating that the water in P-17 is under approximately 7-feet of head.

Shallow ground water was encountered along the western, northern and southern portions of the site. In the west, ground water is shallowest beneath a poorly-developed ephemeral stream channel. The north-south trending channel has little to no vertical relief and is currently being utilized for dry-land farming in the vicinity of the site. The ephemeral stream channel is comprised of reworked surficial materials. Soil borings SB-1, SB-4, SB-22, and MW-202 encountered water that ranged from 9.5 to 18 feet in depth. The ground-water in the area of SB-1, SB-4, and MW-202 was associated with thin (less than 1-foot thick) gravel/sand

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lenses that exist above the claystone bedrock. The water in the vicinity of SB-22 was associated within a 7-foot silty sand interval, of which the lower 5-foot portion was saturated. This silty sand material also existed directly above the claystone bedrock. The ground water in this area is probably associated with a shallow alluvial aquifer that lies above the impervious claystone bedrock (See cross-section D-D', plate 5 and cross-sections E-E' and F-F', plate 6). This shallow alluvial aquifer appears to be confined to the western third of the site.

Shallow discontinuous lenses of ground water were encountered in the north at SB-38, SB-39, SB-40 and SB-44. The depth to water varied from approximately 17 to 20 feet in this area. The ground-water in the area of SB-38, SB-39 and SB-40 was associated with relatively thin (less than 5-foot thick) silty sand lenses that overlie the claystone bedrock. The claystone bedrock in this area is topographically lower than areas to the south (See cross-section B-B', plate 4). The water in the vicinity of SB-44 is associated with a thin (3-foot thick) silty sand lens, which is interbedded within the claystone. Ground-water encountered in MW-103, MW-104 and P-34 ranged from 23 to 34-feet deep and also originates in lenses within the claystone bedrock.

In the south, a shallow perched lense was encountered at SB-6 and MW-106 where the ground water was approximately 15 feet below the ground surface. The water in the area of SB-6 and MW-106 is associated with a relatively thick (greater than 15-foot thick) silty sand lense that overlies claystone bedrock. The claystone bedrock in this area is topographically lower in elevations than areas to the north (See cross-section C-C', plate 5).

Ground water was encountered in the southeastern portion of the site in the area of SB-25, SB-30 and SB-46 (adjacent to each other), and SB-42 ranged from approximately 40 to 50 feet in depth. P-22, which is at a slightly lower elevation than these other borings, was dry at a depth of 54-feet. The water in the area of SB-25 is associated with relatively thin isolated silty sand lenses that are interbedded within the claystone bedrock. The water in the vicinity of SB-30 and SB-46, and SB-42 is characterized as having isolated, relatively thick (greater than 15-foot thick) saturated silty sand lenses. The thick silty sand intervals also occur as interbedded lenses within the claystone bedrock. Cross-sections A-A' and B-B', plate 4 and cross-section D-D', plate 5 show that the water in this area occurs as discontinuous lenses.

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Perched lenses of saturated material were encountered sporadically across the central portion of the site. This portion of the site also contained 19 borings that were dry at the time of completion. The borings ranged from 45 to 80 feet in total depth. The ground water, where encountered, varied from approximately 35 to 65 feet in depth. Samples collected during the field drilling program indicate the saturated material occurred in hydraulically-discontinuous, perched lenses (See geologic cross-sections, plates 4, 5, and 6).

Twelve monitoring wells and thirty-six piezometers were installed to assess the existing ground-water conditions within the saturated materials. The stabilized static water level in each monitoring well/piezometer has been measured periodically during the field investigation. Static water levels were also recorded from the open boreholes. The observed ground-water elevations for the piezometers are summarized in Table 4-3.

CONSERVATION SERVICES INC. PIEZOMETER WATER LEVEL DATA

| BORING | CELL NUMBER | BORING DEPTH | COMPLETION DEPTH | SURFACE ELEVATION | TOP OF PVC | SURFACE ELEVATION | TOP OF PVC | REVISED 5/11/90 |          |                | 7/14/88 to 7/26/88 |                | 8/25/88         |  |
|--------|-------------|--------------|------------------|-------------------|------------|-------------------|------------|-----------------|----------|----------------|--------------------|----------------|-----------------|--|
|        |             |              |                  |                   |            |                   |            | EASTING         | NORTHING | DEPTH TO WATER | WATER ELEVATION    | DEPTH TO WATER | WATER ELEVATION |  |
| P-1    | 18          | 79.0         | 79.0             | 5320.39           | 5322.00    | 5320.39           |            | 6506.1          | 8984.6   | N/A            | N/A                | 59.1           | 5261.3          |  |
| P-2    | 19          | 99.0         | 99.0             | 5309.11           | 5308.89    | 5309.11           |            | 7231.0          | 8951.3   | 67.0           | 5242.1             | 66.6           | 5242.5          |  |
| P-3    | N/A         | 20.0         | 20.0             | 5298.21           | 5300.53    | 5300.53           |            | 5474.5          | 8969.5   | 12.0           | 5286.2             | N/A            | N/A             |  |
| P-4    | 15          | 49.0         | 49.0             | 5322.16           | 5324.31    | 5322.16           |            | 6514.8          | 8113.7   | DRY            | N/A                | DRY            | N/A             |  |
| P-5    | 19          | 79.0         | 77.0             | 5309.12           | N/A        | 5309.12           |            | 7243.5          | 8950.0   | DRY            | N/A                | DRY            | N/A             |  |
| P-6    | 8           | 49.0         | 49.0             | 5297.78           | 5299.18    | 5297.78           |            | 8002.4          | 8122.3   | 45.0           | 5252.8             | 42.3           | 5255.5          |  |
| P-7    | N/A         | 59.0         | 59.0             | 5315.59           | 5316.99    | 5315.59           |            | 5815.8          | 8929.9   | DRY            | N/A                | N/A            | N/A             |  |
| P-8    | 15          | 71.5         | 70.0             | 5313.14           | 5316.44    | 5313.14           |            | 7095.9          | 8301.2   | DRY            | N/A                | DRY            | N/A             |  |
| P-9    | 2           | 75.0         | 75.0             | 5304.00           | N/A        | 5304.00           |            | N/A             | N/A      | N/A            | N/A                | N/A            | N/A             |  |
| P-10   | N/A         | 30.0         | 30               | 5308.26           | 5309.01    | 5308.26           |            | 7248.6          | 9825.5   | N/A            | N/A                | N/A            | N/A             |  |
| P-11   | 17          | 75.0         | 75.0             | 5319.25           | 5319.78    | 5319.25           |            | 6260.8          | 8646.9   | N/A            | N/A                | N/A            | N/A             |  |
| P-12   | 9           | 61.5         | 57.0             | 5301.78           | 5302.18    | 5301.78           |            | 7590.4          | 7926.6   | N/A            | N/A                | N/A            | N/A             |  |
| P-13   | N/A         | 66.5         | 66.5             | 5313.55           | 5315.85    | 5313.55           |            | 5959.0          | 9588.3   | DRY            | N/A                | DRY            | N/A             |  |
| P-14   | 1           | 74.0         | 74.0             | 5291.00           | N/A        | 5291.00           |            | N/A             | N/A      | N/A            | N/A                | N/A            | N/A             |  |
| P-15   | 11          | 55.0         | 55.0             | 5296.92           | 5300.27    | 5296.92           |            | 8339.4          | 7660.7   | N/A            | N/A                | N/A            | N/A             |  |
| P-16   | N/A         | 40.0         | 40.0             | 5326.70           | 5329.20    | 5326.70           |            | 6521.5          | 7435.1   | 13.5           | 5313.2             | N/A            | N/A             |  |
| P-17   | 1           | 69.0         | 69.0             | 5289.68           | 5292.91    | 5289.68           |            | 8677.0          | 9249.3   | N/A            | N/A                | N/A            | N/A             |  |
| P-18   | 3           | 65.0         | 65.0             | 5300.16           | 5303.90    | 5300.16           |            | 7868.6          | 8900.2   | N/A            | N/A                | N/A            | N/A             |  |
| P-19   | 4           | 64.0         | 64.0             | 5296.02           | 5298.84    | 5296.02           |            | 8553.1          | 8883.5   | N/A            | N/A                | N/A            | N/A             |  |
| P-20   | 5           | 64.0         | 64.0             | 5290.88           | 5294.15    | 5290.88           |            | 8553.3          | 8515.7   | N/A            | N/A                | N/A            | N/A             |  |
| P-21   | 6           | 54.0         | 54.0             | 5296.05           | 5299.33    | 5296.05           |            | 7910.7          | 8553.2   | N/A            | N/A                | N/A            | N/A             |  |
| P-22   | 12          | 54.0         | 53.7             | 5295.66           | 5298.09    | 5295.66           |            | 8549.4          | 8104.7   | N/A            | N/A                | N/A            | N/A             |  |
| P-23   | 7           | 50.9         | 50.9             | 5297.36           | 5299.99    | 5297.36           |            | 7802.6          | 8221.1   | N/A            | N/A                | N/A            | N/A             |  |
| P-24   | 9           | 49.0         | 48.4             | 5301.64           | 5303.44    | 5301.64           |            | 7773.1          | 8003.0   | N/A            | N/A                | N/A            | N/A             |  |
| P-25   | 10          | 44.0         | 44.0             | 5301.44           | 5303.74    | 5301.44           |            | 5301.27         | 5304.06  | N/A            | N/A                | N/A            | N/A             |  |
| P-26   | 16          | 60.0         | 60.0             | 5307.53           | 5309.74    | 5307.53           |            | 7262.4          | 8600.1   | N/A            | N/A                | N/A            | N/A             |  |
| P-27   | 13          | 54.5         | 54.5             | 5307.69           | 5310.29    | 5307.69           |            | 7180.2          | 7619.7   | N/A            | N/A                | N/A            | N/A             |  |
| P-28   | 14          | 59.0         | 59.0             | 5306.46           | 5309.21    | 5306.46           |            | 7288.6          | 7900.5   | N/A            | N/A                | N/A            | N/A             |  |
| P-29   | 15          | 59.8         | 59.8             | 5308.00           | 5310.35    | 5308.00           |            | 7260.7          | 8270.7   | N/A            | N/A                | N/A            | N/A             |  |
| P-30   | 17          | 54.0         | 54.0             | 5321.54           | 5323.17    | 5321.54           |            | 6710.7          | 8617.3   | N/A            | N/A                | N/A            | N/A             |  |
| P-31   | 21          | 59.0         | 59.0             | 5312.62           | 5315.34    | 5312.62           |            | 6720.3          | 9344.4   | N/A            | N/A                | N/A            | N/A             |  |
| P-32   | 20          | 59.0         | 59.0             | 5305.66           | 5308.06    | 5305.66           |            | 7282.2          | 9383.8   | N/A            | N/A                | N/A            | N/A             |  |
| P-33   | 22          | 59.0         | 59.0             | 5309.96           | 5311.77    | 5309.96           |            | 6722.9          | 9619.8   | N/A            | N/A                | N/A            | N/A             |  |
| P-34   | 23          | 49.0         | 49.0             | 5305.81           | 5308.24    | 5305.81           |            | 6774.1          | 9862.4   | N/A            | N/A                | N/A            | N/A             |  |
| P-35   | 1           | 59.0         | 59.0             | 5289.89           | 5292.49    | 5289.89           |            | 8675.9          | 9239.5   | N/A            | N/A                | N/A            | N/A             |  |
| P-36   | 3           | 51.0         | 51.0             | 5295.93           | 5298.94    | 5295.93           |            | 7935.4          | 8742.3   | N/A            | N/A                | N/A            | N/A             |  |

P - Piezometer

DRY - No water present at the time of measurement.

N/A - Not Applicable

Piezometers P-18 was replaced by P-36 in April 1990  
Piezometers P-1 through P-16 were abandoned July 1990.

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Table 4.3

CONSERVATION SERVICES INC. PIEZOMETER WATER LEVEL DATA

| BORING | 9/2/88         |                 | 9/22/88        |                 | 1/24/89        |                 | 2/28/89        |                 | 4/10/89        |                 | 1/29/90        |                 |
|--------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
|        | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION |
| P-1    | 59.2           | 5261.2          | 59.1           | 5261.3          | 58.0           | 5262.4          | 57.5           | 5262.9          | 58.1           | 5262.3          | 54.4           | 5266.0          |
| P-2    | 66.7           | 5242.4          | 66.8           | 5242.3          | 66.2           | 5242.9          | 68.0           | 5241.1          | 66.8           | 5242.3          | 66.5           | 5242.6          |
| P-3    | 12.0           | 5286.2          | 11.9           | 5286.3          | 12.1           | 5286.1          | 12.2           | 5286.0          | 12.3           | 5285.9          | 12.5           | 5285.7          |
| P-4    | DRY            | N/A             | DRY            | N/A             | 47.6           | 5274.6          | 47.8           | 5274.4          | 47.7           | 5274.5          | 47.7           | 5274.5          |
| P-5    | DRY            | N/A             | DRY            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             | 70.8           | 5238.3          |
| P-6    | 42.7           | 5255.1          | 41.8           | 5256.0          | 41.8           | 5256.0          | 41.6           | 5256.2          | 41.5           | 5256.3          | 40.5           | 5257.3          |
| P-7    | N/A            | N/A             | DRY            | N/A             | 57.8           | 5257.8          | 57.9           | 5257.7          | 58.4           | 5257.2          | 58.5           | 5257.1          |
| P-8    | DRY            | N/A             | DRY            | N/A             | 57.3           | 5255.8          | 57.5           | 5255.6          | 57.7           | 5255.4          | 56.9           | 5256.2          |
| P-9    | DRY            | N/A             | DRY            | N/A             | 73.7           | 5230.3          | 74.9           | 5229.1          | DRY            | N/A             | N/A            | N/A             |
| P-10   | 17.0           | 5291.3          | 17.1           | 5291.2          | 19.2           | 5289.1          | 21.9           | 5286.4          | 23.4           | 5284.9          | N/A            | N/A             |
| P-11   | 49.0           | 5270.3          | 52.1           | 5267.2          | 51.0           | 5268.3          | 50.8           | 5268.5          | 50.9           | 5268.4          | N/A            | N/A             |
| P-12   | 50.0           | 5251.8          | 40.2           | 5261.6          | 39.4           | 5262.4          | 39.2           | 5262.6          | 39.4           | 5262.4          | N/A            | N/A             |
| P-13   | DRY            | N/A             | 61.8           | 5251.8          | 47.9           | 5265.7          | 47.6           | 5266.0          | 47.8           | 5265.8          | 45.9           | 5267.7          |
| P-14   | N/A            | N/A             | DRY            | N/A             | 69.1           | 5221.9          | 60.1           | 5230.9          | 63.4           | 5227.6          | N/A            | N/A             |
| P-15   | N/A            | N/A             | 47.9           | 5249.0          | 47.1           | 5249.8          | 47.3           | 5249.6          | 47.1           | 5249.8          | 46.4           | 5250.5          |
| P-16   | 14.5           | 5312.2          | 14.3           | 5312.4          | 14.7           | 5312.0          | 14.9           | 5311.8          | 15.1           | 5311.6          | 15.8           | 5310.9          |
| P-17   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 56.3           | 5233.4          |
| P-18   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 55.5           | 5244.7          |
| P-19   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 54.6           | 5241.4          |
| P-20   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 55.7           | 5235.2          |
| P-21   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |
| P-22   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |
| P-23   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |
| P-24   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 40.7           | 5256.7          |
| P-25   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 41.2           | 5260.4          |
| P-26   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 40.4           | 5261.0          |
| P-27   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |
| P-28   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |
| P-29   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 53.6           | 5252.9          |
| P-30   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 57.0           | 5251.0          |
| P-31   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |
| P-32   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |
| P-33   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |
| P-34   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |
| P-35   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | 32.6           | 5273.2          |
| P-36   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | DRY            | N/A             |

P - Piezometer  
 DRY - No water present at the time of measurement.  
 N/A - Not Applicable  
 Piezometer P-18 was replaced by P-36 in April 1990  
 Piezometers P-1 through P-16 were abandoned July 1990.

CONSERVATION SERVICES INC. PIEZOMETER WATER LEVEL DATA

| BORING | 2/8/90 to 2/13/90 |                 | 3/30/90        |                 | 4/27/90        |                 | 5/11/90        |                 | 7/6/90         |                 | 8/17/90        |                 |
|--------|-------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
|        | DEPTH TO WATER    | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION |
| P-1    | 56.4              | 5265.6          | N/A            | N/A             | 56.0           | 5266.0          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-2    | 66.6              | 5242.3          | N/A            | N/A             | 67.0           | 5241.9          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-3    | 10.3              | 5290.2          | N/A            | N/A             | 12.6           | 5288.0          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-4    | DRY               | N/A             | N/A            | N/A             | 49.8           | 5274.5          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-5    | DRY               | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-6    | 41.8              | 5257.3          | N/A            | N/A             | 43.4           | 5255.8          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-7    | 57.9              | 5257.7          | N/A            | N/A             | DRY            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-8    | 59.8              | 5256.7          | N/A            | N/A             | 59.7           | 5256.7          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-9    | N/A               | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-10   | 26.0              | 5283.1          | N/A            | N/A             | 26.2           | 5282.8          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-11   | 48.9              | 5270.4          | N/A            | N/A             | 48.9           | 5270.9          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-12   | 51.6              | 5250.2          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-13   | 48.2              | 5267.6          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-14   | N/A               | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-15   | 49.7              | 5250.6          | N/A            | N/A             | 49.6           | 5250.7          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-16   | 18.2              | 5311.0          | N/A            | N/A             | 18.3           | 5310.9          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-17   | 59.4              | 5233.5          | 59.6           | 5233.3          | 59.3           | 5233.6          | N/A            | N/A             | N/A            | N/A             | 59.0           | 5233.9          |
| P-18   | 59.0              | 5244.9          | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-19   | 58.1              | 5240.7          | N/A            | N/A             | 58.9           | 5239.9          | N/A            | N/A             | N/A            | N/A             | 57.0           | 5239.5          |
| P-20   | 58.4              | 5235.8          | N/A            | N/A             | 57.6           | 5236.6          | N/A            | N/A             | N/A            | N/A             | 54.5           | 5236.4          |
| P-21   | 56.8              | 5242.6          | N/A            | N/A             | 53.1           | 5246.2          | N/A            | 5246.5          | N/A            | 5246.6          | 49.6           | 5246.5          |
| P-22   | DRY               | N/A             | N/A            | N/A             | DRY            | N/A             | N/A            | N/A             | N/A            | DRY             | DRY            | N/A             |
| P-23   | 43.4              | 5256.6          | N/A            | N/A             | 43.3           | 5256.7          | N/A            | N/A             | N/A            | 43.4            | 40.6           | 5256.8          |
| P-24   | 43.0              | 5260.5          | N/A            | N/A             | 43.0           | 5260.4          | N/A            | N/A             | N/A            | 42.9            | 41.3           | 5260.3          |
| P-25   | 42.8              | 5260.9          | N/A            | N/A             | 39.1           | 5264.6          | 39.6           | 5264.5          | 40.8           | 5263.3          | 38.8           | 5262.5          |
| P-26   | DRY               | N/A             | N/A            | N/A             | DRY            | N/A             | N/A            | N/A             | DRY            | DRY             | DRY            | N/A             |
| P-27   | DRY               | N/A             | N/A            | N/A             | DRY            | N/A             | N/A            | N/A             | DRY            | DRY             | DRY            | N/A             |
| P-28   | 56.5              | 5252.8          | N/A            | N/A             | 51.6           | 5257.6          | 51.2           | 5257.5          | 50.8           | 5257.9          | 48.0           | 5258.3          |
| P-29   | 55.7              | 5254.6          | N/A            | N/A             | 54.2           | 5256.2          | 54.3           | 5256.1          | 54.3           | 5256.1          | 52.0           | 5256.0          |
| P-30   | DRY               | N/A             | N/A            | N/A             | DRY            | N/A             | N/A            | N/A             | DRY            | DRY             | DRY            | N/A             |
| P-31   | DRY               | N/A             | N/A            | N/A             | DRY            | N/A             | N/A            | N/A             | DRY            | DRY             | DRY            | N/A             |
| P-32   | DRY               | N/A             | N/A            | N/A             | DRY            | N/A             | N/A            | N/A             | DRY            | DRY             | DRY            | N/A             |
| P-33   | DRY               | N/A             | N/A            | N/A             | DRY            | N/A             | N/A            | N/A             | DRY            | DRY             | DRY            | N/A             |
| P-34   | 35.2              | 5273.1          | N/A            | N/A             | 35.9           | 5272.3          | N/A            | N/A             | 36.3           | 5271.9          | 33.3           | 5272.5          |
| P-35   | DRY               | N/A             | DRY            | N/A             | DRY            | N/A             | N/A            | N/A             | DRY            | DRY             | DRY            | N/A             |
| P-36   | N/A               | N/A             | N/A            | N/A             | DRY            | N/A             | N/A            | N/A             | DRY            | DRY             | DRY            | N/A             |

P - Piezometer  
 DRY - No water present at the time of measurement.  
 N/A - Not Applicable  
 Piezometer P-18 was replaced by P-36 in April 1990  
 Piezometers P-1 through P-16 were abandoned July 1990.

CONSERVATION SERVICES INC. PIEZOMETER WATER LEVEL DATA

| BORING | 9/5/90         |                 | 10/6/90        |                 | 11/14/90       |                 | 12/11/90       |                 | 2/12/91        |                 |
|--------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
|        | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION | DEPTH TO WATER | WATER ELEVATION |
| P-1    | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-2    | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-3    | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-4    | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-5    | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-6    | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-7    | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-8    | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-9    | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-10   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-11   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-12   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-13   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-14   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-15   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-16   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-17   | 58.9           | 5234.0          | 58.6           | 5234.3          | 58.6           | 5234.3          | 58.5           | 5234.4          | 58.5           | 5234.4          |
| P-18   | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             | N/A            | N/A             |
| P-19   | 59.8           | 5239.0          | 59.9           | 5238.9          | 59.9           | 5238.9          | 59.6           | 5239.2          | 59.6           | 5239.2          |
| P-20   | 57.7           | 5236.5          | 57.6           | 5236.6          | 57.7           | 5236.6          | 57.6           | 5236.6          | 57.6           | 5236.6          |
| P-21   | 52.6           | 5246.7          | 52.5           | 5246.8          | 52.5           | 5246.8          | 52.5           | 5246.8          | 52.5           | 5246.8          |
| P-22   | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             |
| P-23   | 43.3           | 5256.7          | 43.1           | 5256.9          | 43.1           | 5256.9          | 42.9           | 5257.1          | 42.9           | 5257.1          |
| P-24   | 42.9           | 5260.5          | 42.8           | 5260.6          | 42.7           | 5260.7          | 42.5           | 5261.0          | 42.5           | 5261.0          |
| P-25   | 41.8           | 5262.3          | 41.9           | 5262.2          | 41.9           | 5262.2          | 41.7           | 5262.4          | 41.7           | 5262.4          |
| P-26   | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | 62.1           | 5247.6          | 62.1           | 5247.6          |
| P-27   | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             |
| P-28   | 50.3           | 5258.4          | 49.9           | 5258.8          | 49.7           | 5259.0          | 49.7           | 5259.1          | 49.7           | 5259.1          |
| P-29   | 54.3           | 5256.0          | 54.2           | 5256.2          | 54.2           | 5256.2          | 54.0           | 5256.4          | 54.0           | 5256.4          |
| P-30   | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             |
| P-31   | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             |
| P-32   | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             |
| P-33   | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             |
| P-34   | 36.1           | 5272.1          | 35.8           | 5272.4          | 35.6           | 5272.6          | 35.3           | 5273.0          | 35.3           | 5273.0          |
| P-35   | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             |
| P-36   | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             | DRY            | N/A             |

P - Piezometer  
 DRY - No water present at the time of measurement.  
 N/A - Not Applicable  
 Piezometer P-18 was replaced by P-36 in April 1990  
 Piezometers P-1 through P-16 were abandoned July 1990.

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The ground-water elevations are extremely variable across the site, ranging from as high as 5313 feet at SB-6 to below 5217 feet at SB-45. The geologic cross-sections (Plates 4, 5 and 6) show that steep ground-water gradients exist from one soil boring/piezometer to another, suggesting that the saturated materials encountered generally occur as hydraulically-discontinuous perched lenses across the site. Ground-water elevations were plotted to identify ground-water trends at the site, however, upon geologic review, no continuous ground-water trends could be ascertained. Therefore, a potentiometric map was not constructed.

Piezometer P-2 may be completed within the regional Denver Aquifer. Based on the regional hydrogeologic information available (Section 4.3.2.3) this is a plausible situation. Piezometer P-2 was completed to a depth of 99 feet (an elevation of 5212 feet). Saturated sands were encountered while drilling at a depth of approximately 89 feet. The water elevation at the completion of the piezometer was approximately 5242 feet. Subsequent static water measurements show that the stabilized water level elevation is approximately 5244 feet. This indicates that P-2 exhibits a potentiometric elevation head of over 20 feet, suggesting the ground water to be under confined conditions. Piezometer P-5 was installed near P-2 to a depth of 79 feet (elevation of 5232 feet) to verify that the material above this depth was unsaturated. This piezometer was dry at the time of completion and during subsequent water level measurements. Based on this information, the ground water in P-2 cannot be attributed to upper leakage within the borehole. Piezometer P-14, was installed to the east at a depth of 74 feet (an elevation of 5217 feet) was dry at the time of completion and during subsequent water level measurements. This piezometer was completed 5-foot below the elevation depth where P-2 encountered ground-water (see cross-section E-E', plate 6). Piezometer P-14 contained no sandstones, so the difference probably results from the erratic sands that comprise the Denver Aquifer. Soil boring SB-33, which is located between P-2 and P-14, was drilled to a depth of 80 feet (elevation of 5217 feet). The borehole was completed to the same elevation as P-14. However, this boring was dry at the time of completion but contained measurable amounts of water a few days later. This suggests that the water was probably a result of upper leakage within the borehole from thin, slightly saturated materials, which are not associated with the water observed at P-2 (see cross-section E-E', plate 6). Monitor wells MW-301 and MW-302 are also likely completed within the Denver Aquifer and both appear to contain a significant quantity of water under confined conditions.



#### 4.4.4 Ground-Water Chemistry

This section discusses only the initial two monitor wells MW-1 (MW-101) and MW-2 (MW-104) which are included in Appendix G. Quarterly sampling results of all wells have been submitted since September 1989.

Field parameters, such as pH, specific conductance, and temperature were measured at selected soil borings, piezometers and monitoring wells at the site. The field parameter results are presented in Table 4-4. Significant findings are summarized below:

- \* Ground-water pH ranged from 6.4 to 8.3
- \* Specific conductance, which is an indicator of ionized species, ranged from 600 to greater than 10,000 umhos/cm
- \* Temperature ranged from 13° to 16° celsius

Ground-water samples were obtained from monitoring wells MW-1 (MW-101) and MW-2 (MW-104) and submitted for analytical analysis. The analytical results are summarized in Table 4-5. The samples were analyzed for indicator parameters, pesticides and PCB's. Drinking water standards are also included in Table 4-5 for reference. Laboratory results are presented in Appendix F. Significant results are summarized below:

- \* Total dissolved solids (TDS) exceeded the Secondary Drinking Water Standards (SDWS) of 500 mg/l in both wells. The standard was exceeded by more than 3 times at MW-1 and 9 times at MW-2.
- \* Sulfate was detected in both wells in concentrations above the SDWS of 250 mg/l. The standard was exceeded by more than 9 times at MW-1 and 3 times at MW-2.
- \* Nitrate concentrations exceed the Primary Drinking Water Standards (PDWS) of 10 mg/l in both wells. The nitrate concentrations exceeded the standard by more than 5 times at MW-1 and 3 times at MW-2.
- \* Chloride concentrations exceed the SDWS of 250 mg/l in MW-1.
- \* Pesticides and PCB's were not detected.

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TABLE 4-4  
FIELD PARAMETER RESULTS

| <u>LOCATION</u> | <u>pH</u> | <u>SPECIFIC<br/>CONDUCTANCE<br/>(umhos/cm)</u> | <u>TOTAL<br/>DISSOLVED<br/>SOLIDS (mg/l)</u> | <u>TEMP.<br/>(degree C)</u> |
|-----------------|-----------|--|--|-----------------------------|
| MW-1            | 6.6       | 2,000  | 1,300  |                             |
| MW-2            | 6.4       | 4,400  | 2,800  | 13                          |
| P-2             |           | 600  | 400  |                             |
| P-6             |           | 1,800  | 1,100  |                             |
| P-10            | 7.0       | >10,000  | >6,000                                       | 16                          |
| P-11            | 6.7       | 3,300  | 2,100  | 14                          |
| P-13            | 7.2       | 3,100  | 2,300  | 14                          |
| P-15            | 7.1       | 1,600  | 1,000  |                             |
| P-16            | 8.3       | 800  | 5,600  | 16                          |
| SB-3            |           | 3,000  | 1,900  |                             |
| SB-11           |           | 3,800  | 2,400  |                             |
| SB-28           | 7.4       | 5,000  | 3,200  | 15                          |
| SB-40           | 6.8       | 4,600  | 2,900  | 14                          |

MW = MONITORING WELL

P = PIEZOMETER

SB = SOIL BORING

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TABLE 4-5  
GROUND-WATER ANALYTICAL RESULTS

| <u>Parameters</u>           | <u>Primary<br/>Drinking Water<br/>Standards<br/>(mg/l)</u> | <u>Secondary<br/>Drinking Water<br/>Standards<br/>(mg/l)</u> | <u>MW-1<br/>(mg/l)</u> | <u>MW-2<br/>(mg/l)</u> |
|-----------------------------|--|--|------------------------|------------------------|
| Alkalinity                  |  |  | 200.2                  | 173.9                  |
| Specific<br>Conductance     |  |  | 1730                   | 3900                   |
| Total Dis-<br>solved Solids |  | 500  | 1515                   | 4675                   |
| Calcium                     |  |  | 83                     | 468                    |
| Magnesium                   |  |  | 35.7                   | 194                    |
| Sodium                      |  |  | 274                    | 44.3                   |
| Potassium                   |  |  | 43.1                   | 22.5                   |
| Iron                        |  | 0.3  | <.05                   | <.05                   |
| Chloride                    |  | 250  | 336                    | 78                     |
| Nitrate                     | 10   |  | 55.6                   | 79                     |
| Sulfate                     |  | 250  | 2463                   | 716                    |
| Sodium<br>Adsorption Ratio  |  |  | 6.34                   | 4.35                   |
| TOX                         |  |  | 0.157                  | 0.94                   |
| TOC                         |  |  | 41                     | 37                     |
| Pesticides                  |  |  | BDL                    | BDL                    |
| PCB's                       |  |  | BDL                    | BDL                    |

BDL - Below Detection Limit

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- \* Total Organic Carbon (TOC) was detected at 41 mg/l in MW-1 and 37 mg/l in MW-2.
- \* Alkalinity ranged from 174 to 200 mg/l, which is indicative of hard to very hard water.

Total dissolved solids were estimated on the basis of the specific conductance measurements. The specific conductance multiplied by a factor of 0.63 gives the dissolved-solid concentration.

The analytical results showed different water types to exist at each of the monitoring wells. MW-1 (MW-101) is classified as a sodium-calcium-magnesium type water, where MW-2 (MW-104) is classified as a calcium-magnesium-sodium type water.

The samples from both monitoring wells have several constituents that exceed the PDWS and SDWS. Therefore, the shallow perched water that occurs at the site is considered to be of poor quality and unsuited for domestic use.

Waters can be classified for suitability for irrigation by their conductivity and the sodium absorption ratio, a parameter that is calculated based upon the concentrations of sodium, magnesium and calcium. The ground water had a salinity classification of C3 (high-salinity water) at MW-1 and C4 (very-high-salinity water) at MW-2. The U.S. Department of Agriculture classification states that:

- 1.) "High-salinity water (C3) cannot be used on soils that have restricted drainage. With adequate drainage, special management for salinity control may be required and plants with good salt tolerance should be selected."
- 2.) "Very-high salinity water (C4) is not suitable for irrigation under ordinary conditions. If used, the soils must be permeable, drainage must be adequate, considerable excess irrigation water must be applied, and very low tolerant crops should be selected".

The waters had sodium classifications of S2 (medium-sodium water) for MW-1 and MW-2. Water that is classified as S2 is "hazardous for use on fine-textured soils that have cation-exchange capacity. This water may be used on coarse-textured or organic

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soils with good permeability". Clearly, the shallow ground water found in the saturated low-permeability materials is unsuitable for irrigation purposes.

A final potential use is stock watering. McKee and Wolf (1963) report that stock can tolerate total dissolved solids concentrations up to 10,000 mg/l. They also state that the upper limit for livestock lies between 1,000 and 2,000 mg/l for sulfate and 1,000 mg/l for sodium. It appears that the water could be marginally suitable for livestock watering provided that it could be extracted in reasonable amounts.

#### 4.4.5 Hydrogeologic Characterization

Aquifer testing was performed at the site to evaluate the hydraulic properties of the site-specific materials. This was accomplished by conducting packer tests, and rising head tests. In addition, selected relatively undisturbed soil cores were submitted for laboratory testing.

Packer tests were conducted at six soil borings (SB-29, SB-30, SB-31, SB-34, SB-35 and SB-37). The packer test field data are presented in Appendix H. The packer test results are summarized in Table 4-6 and are shown in the geologic cross-section plates.

Two packer tests were conducted in the interbedded, silty sand material at the site. The hydraulic conductivity for this material ranged from  $1.1 \times 10^{-5}$  cm/s at SB-30 to  $1.3 \times 10^{-4}$  cm/s at SB-29 with an average value of  $7.1 \times 10^{-5}$  cm/s. Four packer tests were conducted in the claystone bedrock at the site. These tests were conducted at SB-31, SB-34, SB-35 and SB-37. The hydraulic conductivity values ranged from  $1.3 \times 10^{-5}$  to  $1.2 \times 10^{-6}$  cm/s with an average of  $4.9 \times 10^{-6}$  cm/s.

Rising head tests were conducted in the two monitoring wells (MW-1 and MW-2) to estimate the saturated hydraulic conductivity of the interbedded, silty sand materials. The rising head test field data are presented in Appendix I. Table 4-7 contains the results of these aquifer tests. The hydraulic conductivity for the monitoring wells range from  $1.5 \times 10^{-4}$  cm/s at MW-1 to  $1.8 \times 10^{-4}$  cm/s at MW-2 with an average of  $1.7 \times 10^{-4}$  cm/s.

Constant rate permeability tests were conducted in the laboratory on selected soil and bedrock samples collected from borings SB-31, SB-32, SB-34, SB-35, SB-37, and SB-41. These tests were performed to supplement the packer and rising head test data in an effort to estimate the vertical hydraulic conductivity of the

TABLE 4-6  
PACKER TEST RESULTS

| <u>CONDUCTIVITY<br/>SOIL BORING</u> | <u>TEST INTERVAL<br/>(feet)</u> | <u>LITHOLOGY</u> | <u>HYDRAULIC<br/>(cm/s)</u> |
|-------------------------------------|---------------------------------|------------------|-----------------------------|
| SB-29                               | 40-60                           | SILTY SAND (1)   | $1.3 \times 10^{-4}$        |
| SB-30                               | 30-55                           | SILTY SAND (1)   | $1.1 \times 10^{-5}$        |
| SB-31                               | 59.5-75.5                       | CLAYSTONE (2)    | $1.7 \times 10^{-6}$        |
| SB-34                               | 37-75                           | CLAYSTONE (2)    | $1.2 \times 10^{-6}$        |
| SB-35                               | 40.5-55                         | CLAYSTONE (2)    | $1.3 \times 10^{-5}$        |
| SB-37                               | 37-60                           | CLAYSTONE (2)    | $3.5 \times 10^{-6}$        |

- (1) The silty sand lenses are interbedded within the claystone bedrock.
- (2) The claystone bedrock material may contain thin silty sand, sandstone or carbonaceous lenses.

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TABLE 4-7  
RISING HEAD TEST RESULTS

| <u>SOIL BORING<br/>NUMBER</u> | <u>TEST<br/>INTERVAL (ft)</u> | <u>HYDRAULIC<br/>CONDUCTIVITY (cm/s)</u> |                      |
|-------------------------------|-------------------------------|--|----------------------|
| SB-43/MW-1                    | 20-25                         | SILTY SAND                               | $1.5 \times 10^{-4}$ |
| SB-44/MW-2                    | 50-55                         | SILTY SAND                               | $1.8 \times 10^{-4}$ |

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lithologic material at the site. The tests were performed in accordance with the American Society of Testing and Materials standards (ASTM D-2434). Table 4-8 contains the results of the constant rate permeability tests.

The samples obtained for laboratory permeability testing fall into two categories; composite and undisturbed. The composite samples were obtained from the auger cuttings, which generally ranged from 10 to 30 feet in depth. This material generally consisted of brown, silty clay with a trace of very fine sand. The permeabilities for this material range from  $2.7 \times 10^{-8}$  to  $5.1 \times 10^{-8}$  cm/s with an average of  $3.8 \times 10^{-8}$  cm/s. The relatively undisturbed samples were obtained from a specific lithologic interval using a California Barrel Sampler. The undisturbed samples submitted for laboratory testing were representative of the olive, greenish-gray claystone existing 40 to 50 feet below the ground surface at the site. This sample interval is significant, since it reflects the material underlying the disposal cells. The permeabilities for this material range from  $3.0 \times 10^{-8}$  to  $3.1 \times 10^{-7}$  cm/s with an average of  $9.3 \times 10^{-8}$  cm/s.

The packer and rising-head test results for the interbedded, silty sand material show similar permeability values, with an average horizontal permeability of  $1.2 \times 10^{-4}$  cm/s. This material occurs sporadically at the site as discontinuous lenses interbedded within the claystone bedrock. The horizontal permeabilities of the claystone, which were performed over test intervals ranging from 15 to 38 feet average  $4.9 \times 10^{-6}$  cm/s. The permeabilities of the claystone are approximately two orders of magnitude lower than that of the silty sand intervals. The vertical permeabilities for the surficial silty sandy clay material and for the claystone bedrock average  $3.8 \times 10^{-8}$  and  $9.3 \times 10^{-8}$  cm/s, respectively. These permeabilities are at least two orders of magnitude lower than the horizontal permeability values exhibited in the claystones and silty sands material.

The extremely low horizontal and vertical permeabilities of the natural material along with the extensive thickness of unsaturated materials, should effectively isolate the material in the disposal cells from the regional ground-water resources. Furthermore, the clay liners and sumps installed in each of the solidified waste disposal cells will provide additional environmental protection.



TABLE 4-8  
CONSTANT RATE PERMEABILITY TESTS

| <u>SOIL BORING</u> | <u>SAMPLE INTERVAL (feet)</u> | <u>LITHOLOGY</u> | <u>SAMPLE TYPE</u> | <u>PERMEABILITY (cm/s)</u> |
|--------------------|-------------------------------|------------------|--------------------|----------------------------|
| SB-31              | 45                            | (1)              | UNDISTURBED        | $5.1 \times 10^{-8}$       |
| SB-32              | 15-25                         | (2)              | COMPOSITE          | $2.7 \times 10^{-8}$       |
| SB-34              | 40                            | (1)              | UNDISTURBED        | $4.0 \times 10^{-8}$       |
| SB-35              | 50                            | (1)              | UNDISTURBED        | $3.1 \times 10^{-7}$       |
| SB-37              | 10-30                         | (2)              | COMPOSITE          | $5.1 \times 10^{-8}$       |
| SB-37              | 50                            | (1)              | UNDISTURBED        | $3.0 \times 10^{-8}$       |
| SB-                | 10-25                         | (2)              | COMPOSITE          | $3.5 \times 10^{-8}$       |
| SB-                | 40                            | (1)              | UNDISTURBED        | $3.3 \times 10^{-8}$       |

(1) Olive, greenish-gray-gray claystone

(2) Brown, silty clay with trace very fine sand (weathered claystone)

#### 4.4.6 Evidence of Perched Conditions

The hydrogeologic information from the field investigation provided conclusive evidence that the ground water encountered at the site exists under perched conditions. In addition, these perched saturated lenses occur sporadically and are hydraulically isolated in the vertical and horizontal directions. The evidence is as follows:

- \* The ground-water analytical results show different water types to exist at each monitoring well. In addition, the specific conductance which is an indicator of ionized species, ranged from 600 to greater than 10,000 umhos/cm in the piezometers/boreholes tested.
- \* SB-3, SB-11, SB-31, SB-33 and SB-34 were terminated in the claystone and were dry at the time of completion. During the course of the field investigation, these borings contained measurable amounts of water. This water is believed to be the result of downward leakage from discontinuous saturated lenses above the bottom of the borehole. The geologic cross-sections (Plates 4, 5, and 6) show that the water observed in these borings exist in thin discontinuous perched lenses across the site.
- \* P-18, P-21, P-25, P-26, P-28, and MW-105 were dry at completion but contained measurable amounts of water during the course of the field investigation. This water is believed to be a result of thin, low permeability intervals within the zone of investigation that took time to produce water.
- \* Perched lenses of water encountered at the site generally occurred on top of or within the impervious claystone. The elevations of the saturated materials varied greatly over relatively short distances across the site, suggesting that these lenses are hydraulically separated. A few examples of this situation include: 1) SB-38 and SB-39 were drilled to a depth elevation of 5278 and 5279, respectively, and are located within 100 feet of one another; however, the static water levels between the two sites varied over 7-feet. 2) SB-38 and SB-44 have similar water level elevations of 5291 and 5289 feet, respectively.

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However, SB-28, which was completed between these borings exhibited a water elevation of 5267 feet, a difference of more than 20 feet. 3) P-22 and P-23 are approximately 750-feet apart. P-23 contains water at an elevation of 5257' but P-22 is dry at an elevation of 5242-feet, a difference of 15-feet. Furthermore, no lenses of saturated material were encountered above this level. This suggests that the saturated lenses encountered at these borings are hydraulically separated. This situation exists across the site wherever saturated lenses of water were encountered. Further evidence is presented in the geologic cross-section (Plates 4, 5, and 6) which show that the saturated lenses are hydraulically separated below the site. A few selected examples include soil borings SB-35, SB-45 and SB-34 on cross-section A-A', SB-42, SB-17, SB-36 and SB-11 on cross-sections B-B', and SB-4, SB-3, SB-23, SB-32 and SB-42 on cross-section D-D'.

- \* Many of the borings were dry, while other borings completed within a few hundred feet encountered lenses of saturated material. This is evident upon review of the water level data and the geologic cross-sections. A few selected examples include soil borings SB-36, SB-11 and SB-40 on Cross-section B-B', SB-32 and SB-42 on cross-section D-D' and SB-22, SB-26 and SB-20 on cross-section E-E'.
- \* The CME continuous sampling system was used to drill SB-36 to a depth of 75 feet. The elevation depth of this boring was 5229 feet, one of the deeper borings at the site. Continuous 5-foot soil core samples were collected and inspected to the total depth of the borehole. No lenses of saturated material existed (see cross-section B-B', Plate 4).
- \* SB-2 was a dry hole completed to a depth of 60 feet. This boring was rebored with a larger diameter auger approximately two months later to a total depth of 65 feet. This boring was dry at the time of completion but contained measurable amounts of water a few days later. However, the materials sampled during drilling (between 60 and 65 feet in depth) were unsaturated. Moreover, the source of the water was identified in the field as being within an isolated perched zone at a depth of approximately 30 feet (see cross-section F-F', Plate 6).

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- \* Saturated conditions exist in the moderately low permeability ( $1 \times 10^{-6}$  to  $1 \times 10^{-4}$  cm/s) silty sand that occurs as discontinuous lenses either above or within thick sequences of low permeability ( $1 \times 10^{-8}$  to  $1 \times 10^{-6}$  cm/s) claystone, with unsaturated conditions both above and below.

In summary, the results of the field program indicate that the claystone forms a nearly impermeable boundary beneath the entire site. Sixty-seven of the seventy-six borings drilled within the property boundary were terminated in the claystone bedrock. The only boring not completed in the claystone was a shallow boring (less than 25 feet in depth). Laboratory analysis and field inspections show that the claystone is unsaturated. The shallow ground water encountered during the drilling program is therefore hydraulically separated from the water table. Moreover, the shallow ground-water occurs in discontinuous saturated lenses under perched conditions across the majority of the site or is isolated within the ephemeral stream alluvium in the western portion of the site.

#### 4.4.7 Perched Ground-Water Flow Paths and Velocities

The shallow ground water at the site exists as perched zones isolated by claystone aquitards above the Regional Denver Aquifer. The water will have a tendency to travel both laterally down-gradient within the perched zone and vertically toward the Denver Aquifer. Each component is discussed below.

##### 4.4.7.1 Lateral Migration

The shallow perched water will preferentially migrate laterally down-gradient along the top of the low-permeability aquitard towards either a discharge point or towards the edge of the aquitard. The ground water will cease to move laterally when the higher permeability materials pinch out against the low permeability clays. All perched saturated materials pinch out within the boundaries of the filling area; therefore, lateral migration outside of the filling area from these materials will not occur.

The horizontal velocity of the ground water in the perched zones was estimated at 8.8 feet per year. This estimate is based upon:

- \* An average ground-water gradient of 0.017.

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- \* A mean composite saturated horizontal hydraulic conductivity of  $1 \times 10^{-4}$  cm/sec.
- \* An estimated specific yield of 0.2 as derived from information found in Lohman (1979).

#### 4.4.7.2 Vertical Migration

The ground water will flow vertically through the thick sequence of unsaturated claystone towards the regional Denver Aquifer, where it will begin to flow north to northwest. All of the claystone materials logged were slightly moist to dry and dense to very dense.

Travel time calculations for water to flow vertically from the base of the disposal cell's clay liner to the Regional Denver Aquifer was estimated at 541 years. The calculations for the estimate are presented in Appendix J. Upon encountering regional saturation, the ground water would still have to travel a minimum of 2 miles until it encountered the nearest well completed in the Denver Aquifer. All bedrock wells shown in Table 4-2 are completed in the Arapahoe Aquifer which underlies the Denver Aquifer and is separated from it by an extensive thickness of low-permeability claystone.

Based on the above information and calculations, the potential impacts associated with vertical ground-water flow through the unsaturated claystone bedrock material will be negligible.

## 5.0 FACILITY CONFIGURATION

The CSI facility is on a 240-acre parcel of which only approximately 135 acres is presently approved for use in the Certificate of Designation. The operational area of the CSI facility is located in the northcentral portion of the site on approximately 10 acres. This area is shown in Figure 2.3. Access to the site is from 88th Avenue. The waste disposal cells are situated in the southern and eastern portion of the site on less than 115 acres and the asbestos cells will be on 4 acres in the northeastern corner of the site.

It should be noted that the site includes a portion of a pipeline owned and operated by the Colorado Interstate Gas Company. CSI will remain a minimum of 50' from either pipe and will not use the alignment as roadway in order to protect the easement. In addition, CSI will not place more than 4 feet of cover over the easement. The cover will be placed only to match final grades across the site.

### 5.1 Non-Hazardous Waste Characterization

CSI is currently capable of handling a wide range of non-hazardous waste materials typically not accepted at the majority of solid waste landfills along the Front Range. Non-solid wastes are to be solidified by CSI prior to being placed into the cell for final disposal. Solid materials are placed directly into the disposal cells but are tested first using the EPA Paint Filter Method to ensure there are no free liquids present. Every waste stream accepted by CSI must first be scrutinized via CSI's waste acceptance procedure which entails a detailed analysis performed either by an independent lab or by CSI. Independent laboratory analysis may be verified through additional analysis (i.e. ignitability, corrosivity, and reactivity) performed by CSI. The results of all analyses, in addition to other information (ie. knowledge of process, MSDS sheets, etc.), are reviewed by the CSI chemistry staff to ensure that only non-hazardous wastes are being accepted and disposed of in the cells. Upon review of all analyses, CSI may approve or deny acceptance, or request the generator to perform additional analysis. If the analysis indicates that the waste is compatible with CSI's waste disposal process, the waste is accepted and checked upon arrival at the site to ensure that the profiled material matches the material arriving at the site. Solidification of non-solid wastes will not occur at the site until the waste acceptance procedure, as described above and in Section 5.1.4.2 of this document, is in place.

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The most common wastes disposed of at CSI are soils contaminated with petroleum products which consist of approximately 37 to 45 percent of the total waste stream. Water that has been contaminated by non-hazardous sources makes up approximately 30 to 36 percent of the total waste stream. The remaining streams consist of a variety of wastes. Table 5.1 details the most common wastes accepted at CSI, and the approximate percentage each contributes to the total amount of materials accepted. CSI is capable of disposing of other types of non-hazardous waste not included in this table, but currently these are the most common.

CSI will consider accepting any waste for disposal that is not a hazardous waste as defined in the Resource Conservation and Recovery Act (RCRA). These wastes will, however, only be accepted after successfully completing CSI's approval and screening process. CSI will not accept any Small Quantity Generator Hazardous Wastes, as defined in RCRA.

CSI may accept sulfide and cyanide bearing wastes as per a letter received from CDH on May 7, 1986. CDH has set an allowable limit of 200 mg/kg. This limit is 300 mg/kg lower than the EPA recommended guideline of 500 mg/kg and CSI will continue to accept only the lower limit unless granted approval by the appropriate regulatory agencies to increase it to the EPA guideline. For any volume of wastes accepted from CERCLA, SARA, RCRA Subtitle "D" clean-up sites, and for volumes of other waste streams anticipated to exceed 10,000 yards from one site to be disposed of in 60 days or less, the appropriate regulatory agencies shall be notified of the type of waste, screening, handling and acceptance procedures being utilized, the anticipated date the project might proceed and end, and the anticipated haul routes.

Types of waste not acceptable at CSI include:

- \* Any and all hazardous waste as outlined in 40 CFR, Part 261.
- \* Any waste with greater than 50 parts per million of Polychlorinated Biphenyls (PCB).
- \* Any waste that cannot be legally treated by CSI.
- \* Any waste CSI chooses not to accept.

CSI's laboratory and staff provide professional comprehensive chemical analysis, field sampling services, and data

TABLE 5.1  
TYPICAL WASTES PROCESSED AT CONSERVATION SERVICES INC.

| WASTE DESCRIPTION   | PERCENTAGE<br>OF VOLUME | RELATIVE<br>VOLUME |
|---|-------------------------|--------------------|
| * Dry or solidified soil contaminated by petroleum products (gasoline, diesel, etc.)                                  | 37.0                    | 45.0               |
| * Liquids and solids from wastewater treatment plants   | 15.4                    | 19.0               |
| * "Dirty" water (includes ground water, runoff water, neutralized acids/bases, sand trap sludges, water-based paints) | 9.8                     | 12.0               |
| * "Oily" wastes (tank bottoms, oily sludges, pond sludges, asphalt clean-up, emulsified asphalt)                      | 5.7                     | 7.0                |
| * Water-oil emulsions (water-soluble cutting oils, coolants)  | 4.5                     | 5.0                |
| * FCC catalyst (primarily inert silica)   | 4.2                     | 5.0                |
| * Debris (concrete, plastic, scrap equipment, scrap steel, scrap empty containers*)                                   | 2.3                     | 3.0                |
| * Miscellaneous (mining ores, paint-dust residue, organic solid wastes)   | 3.2                     | 4.0                |
| Total .....   | 82.3                    | **..100.0          |

\* If the containers were previously used to hold non-hazardous liquids, the liquids are removed and solidified prior to disposing of the containers. If the containers hold non-hazardous solid materials, the drums may be disposed of in the cells without removing the materials. CSI accepts containers that were used to hold hazardous wastes. These containers must be empty as defined by requirements set forth in 40 CFR, Part 261.7 prior to acceptance by CSI.

\*\* The remaining 17.7 percent of the material disposed at CSI is from one client. Empirical data was used to compile these figures and it is expected that the various percentages in the remaining table will be relative if the one particular client were not included and each percentage were raised to add a total of 100 percent. These relative figures are included in the column on the right.



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interpretation services for the evaluation of a waste material. CSI is primarily involved with analyzing a waste's characteristics and constituents to determine whether it can be accepted for disposal. This is done by evaluating the process generating the waste, analyzing the waste for hazardous characteristics or constituents, and comparing both the analytical results and the process.

Laboratory analysis performed by CSI utilizing EPA approved methodologies will be done at their present laboratory site located at 2090 E. 104th Avenue in Denver. All analytical procedures are performed by qualified CSI personnel and the results reviewed and approved by CSI's chief chemist. The site for the CSI laboratory was selected for the purpose of serving the greatest number of clients in the Denver region. Samples being tested for landfilling at the CSI facility can be transported to the laboratory and tested more efficiently at this location.

#### 5.1.1 Laboratory Quality Assurance/Quality Control Plan

##### 5.1.1.1 Objective

It is CSI's policy that an active quality assurance/quality control (QA/QC) program is maintained to provide analytical data of known and supportable quality to ensure and maintain their high professional standards.

Within CSI's laboratory structure, QA/QC activities are practiced and enforced by analysts, the Laboratory Manager, and the Chief Chemist. QC activities are the checks performed on a routine basis to assure and document the quality of data generated. QA is the responsibility of the CSI management. They perform periodic audits and performance checks to ensure that the QC activities are being practiced.

##### 5.1.1.2 Sample Handling

All of the samples received by CSI's laboratory must be accompanied by the appropriate paperwork before they will be analyzed. It is the responsibility of the waste generator to provide CSI with the proper paperwork to go with the sample. It is the responsibility of the sample custodian to ensure that the proper paperwork accompanies the sample prior to accepting custody of the sample. The following paperwork must accompany each sample:

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- \* Chain of Custody Form (COC): The COC provides CSI with the necessary information pertaining to the methodology of sampling activity, analysis to be performed, and serves as a certification to ensure that the sample is representative of the waste generated. The COC must be signed by the generator in the presence of the sample collector who must also sign the form. A typical copy of the COC form is found in Appendix K.

An Industrial Waste Characterization Data form must be received prior to the waste being accepted for disposal. This form is discussed further in Section 5.1.4.1, Waste Characterization, and a copy of the form is included in Appendix K.

Samples are typically collected by CSI field or laboratory personnel instructed in the proper procedures and COC documentation requirements necessary when obtaining a representative sample. Each sample is submitted with the generator's name and the name of the waste material on the sample container. The laboratory personnel issues a unique 5-digit Laboratory Control Number (LCN) to the waste sample received. Once a LCN is assigned to a sample, it is placed on the sample container and entered into the Sample Log Book. The LCN is used to track the waste from the time it is submitted to CSI to the time it is either deemed unacceptable or the waste is received solidified (as necessary) and disposed of. The sample is kept in locked storage at a constant temperature until analysis is completed.

Samples collected by CSI personnel will be placed in containers compatible with the contents. Typical waste samples are collected in clean polyethylene containers with polyethylene caps, although many organic or petroleum-based samples are collected in glass containers. Samples requiring further analysis will be sent to independent labs following the proper chain-of-custody procedures and using the correct containers. Preservatives are to be used only when required by the analysis.

The progress of the sample analysis is documented during the analysis by the employee performing the test. The analysis is documented on a Laboratory Worksheet and tracked throughout the process via the LCN. A sample of the Laboratory Worksheet is included in Appendix K. The entire sample analysis noted on the Laboratory Worksheet is routinely completed in the same day. The analyst signs and dates the Laboratory Worksheet upon completion.

#### 5.1.1.3 Analytical Methodology

The CSI laboratory utilizes EPA-approved test methods as outlined in the U.S. Government publication SW-846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846). Copies of SW-846 are available to the CSI chemists in the laboratory.

In addition to SW-846, CSI also uses other accepted standard methodologies to screen for suspected contaminants. Prior to employing these screening methods, the method must be proven and documented in scientific publications, must be within the laboratory's capabilities as defined by the manufacturer, and meet with the approval of the Chief Chemist. CSI routinely uses the HACH colormetric methods for metals in water, and the toxic gas analyzer as qualitative screening methods. However, these methods may not accurately quantify the parameters. If the results of the screening methods indicate the presence of potential hazardous wastes, the sample is sent to an outside laboratory equipped to qualify and quantify the suspected wastes utilizing EPA-approved analytical methodologies. The outside laboratories utilized by CSI must first be audited by CSI's Chief Chemist to:

- \* ensure they have an active QA/QC plan in place
- \* ensure the laboratories are strictly adhering to EPA-approved analytical methods
- \* ensure they meet Good Laboratory Practice (GLP) standards as dictated by the nature of their business

All of the outside laboratories are subject to audits as deemed appropriate by the Chief Chemist.

#### 5.1.1.4 Instrument Maintenance

Calibration procedures establish the relationship between a calibration standard of known concentration and the measurement of that standard concentration by an instrument or analytical procedure. CSI's calibrations are performed when an analytical method is initially set up, when an instrument is subject to major maintenance, and routinely throughout a batch of multiple analyses (usually 10%).

Preventive maintenance is performed on all of CSI's laboratory equipment to minimize any instrument failures and to ensure that the equipment is working correctly and to capacity. Normally, the preventive maintenance is performed every 90 days or as suggested by the manufacturer. In most cases, backup equipment is kept in stock so the laboratory can function without significant downtime because of equipment failure. If the equipment is expected to be out of service for any significant time, an outside lab will be contracted to complete the analyses required. As part of the recordkeeping and documentation, CSI will maintain a log book to record equipment calibration and maintenance procedures.

#### 5.1.1.5 Corrective Action

One of the functions of an active QA/QC program is to identify problems in a timely manner and prescribe corrective actions.

Problems and corrective actions are discussed at the regularly scheduled quality control meetings held by the Chief Chemist. Some of the more common corrective actions taken at the CSI laboratory are:

- \* updates in analytical procedures
- \* equipment repair
- \* response to out of control results
- \* recurring sampling problems

#### 5.1.1.6 Recordkeeping

CSI maintains the highest degree of recordkeeping possible for tracking samples and waste received. All the samples submitted are accompanied by a sample chain of custody (COC) form and a waste characterization data sheet (WCD). All of the information on these forms are entered into a computer with the related laboratory results. All the wastes received at CSI are accompanied by a four-part manifest. The generator receives two copies of the manifest, the transporter receives one copy, and CSI's laboratory receives one copy. The laboratory copies of the manifests, along with the analysis performed on the waste received, are entered into a computer. The computer software that contains the sample, laboratory and manifest information is backed up frequently. Backup discs with the computer information are stored at CSI and in an alternate, secure place away from CSI's facilities.

### 5.1.2 Equipment and Capabilities

The CSI laboratory is equipped with a variety of analytical instrumentation to perform a wide range of tests. Appendix K contains a list of the equipment currently utilized by CSI personnel involved in the waste characterization process. The CSI employees responsible for performing the analyses are trained in the proper use of the instrumentation by the Chief Chemist. CSI has the capabilities to perform all the necessary tests to ensure that only non-hazardous wastes are being accepted for disposal.

These tests include, but are not limited to the following:

- \* Ignitability
- \* Corrosivity
- \* Reactivity
- \* Radioactivity

CSI has the capabilities to perform various other tests to determine the physical properties of the wastes and the ratio of solidification agent to waste necessary to effectively harden the mixed substance.

### 5.1.3 Personnel and Qualifications

CSI only utilizes properly trained personnel to perform the analysis necessary to determine if a waste is acceptable at the CSI facility. The job descriptions of the key people currently responsible for the analyses are included in Appendix L.

### 5.1.4 Waste Analysis Plan

The chemical sampling and analyses used to screen the incoming samples and fingerprint the incoming loads of waste coupled with the paperwork submitted by the generator will effectively screen all the waste streams and ensure that only non-hazardous wastes are accepted for disposal. The foregoing Sections (5.1 through 5.1.3) are the waste analysis plan and is designed to meet this requirement.

#### 5.1.4.1 Waste Characterization

Prior to analysis and acceptance of the waste, the generator must submit and sign all the necessary paperwork so CSI can characterize the waste stream. The WCD is the generator's certification that the information provided to CSI is complete and accurate. The WCD is based on the generator's knowledge of the waste-producing process and on chemical analyses performed on the waste. The generator will be required to document the chemical composition of each waste stream on the WCD, included in Appendix K. Each major constituent will be identified along with its concentration. If the concentration will vary from shipment to shipment, the potential range will be indicated on the WCD. All minor constituents, which fall under the listing of controlled contaminants and/or are toxic, must be identified and their concentration indicated. In general, trade names will not be acceptable. All the constituents will have to be described by International Union of Pure and Applied Chemistry (IUPAC) nomenclature or listed in an approved chemical handbook, such as the CRC Handbook of Chemistry and Physics. If the waste analysis constitutes revealing a trade secret, then the generator will be required to submit safety data sheets and a description of the chemical characteristics of each material. A questionnaire is included as part of the WCD as a more thorough check for hazardous wastes determinations. The following questions are included:

- \* Is the waste stream from a non-specific source listed in 40 CFR Part 261.31 (F-codes)?
- \* Is the waste stream from a specific source listed in 40 CFR part 261.32 (K-codes)?
- \* Is the waste from a discarded, commercial chemical product, off-specification species, container residue and/or spill residue listed in 40 CFR, Part 261.33 (P-codes and U-codes)?
- \* Does the waste have any hazardous characteristics listed in 40 CFR, Part 261.2, Subpart C (D-codes)?
- \* Is the waste specifically excluded from hazardous waste regulations in 40 CFR, Part 261.4? If so, in what portion of 40 CFR, Part 261.4 is the exclusion mentioned?

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The answer to any of the above questions must indicate that the waste disposed of at CSI is not a hazardous waste. Wastes that are excluded from hazardous waste regulations will be accepted only when the generator provides information showing the waste does not have hazardous characteristics or when it is proven that CSI's solidification process will prevent the excluded waste from having hazardous characteristics after the process is completed.

The waste stream approval process and bench scale testing provide data that allows CSI to determine compatibilities of various waste streams with another waste. The majority of the waste streams accepted at CSI have been found to be compatible.

CSI will help provide their clients with information to assist them in effectively completing the forms but does not make waste determination for them. The generator uses the information provided by CSI as well as any additional information available to make these waste determinations and complete the WCD.

#### 5.1.4.2 Waste Acceptance Procedure

CSI has incorporated stringent guidelines to ensure that all wastes accepted at the facility are non-hazardous. Each waste stream that is submitted to CSI for consideration must pass through the waste acceptance procedure as follows:

##### 1. WCD Review

Once the generator has submitted all of the appropriate paperwork and a representative sample, the WCD is reviewed by the Laboratory Manager or a CSI chemist. The CSI chemist will scrutinize the WCD to ensure that all of the pertinent information required by CSI is present, and that the generator has signed the WCD. If all of the information has been provided, the CSI chemist will review the chemical composition and characteristics of the waste stream to ensure that the material is a non-hazardous waste and that it is within CSI's capabilities to dispose of the waste. Based on the results of the review, a detailed analysis plan will be developed. The analysis plan will normally be completed by CSI, but may require the services of an outside lab on occasion.

If, based on the information provided by the generator, the waste is determined to be unacceptable for disposal at the CSI facility, a notice of rejection will either be verbal or will be delivered to the generator. CSI will document waste streams that have been rejected.

## 2. Analyses

Once the waste stream has been found acceptable in the review process, an analytical program will be instituted to ensure that the information provided on the WCD is accurate. If the profile sheet indicates the presence of a substance which may not be acceptable at the CSI facility and CSI is not equipped to quantify the substance, an outside lab will be used to determine the exact concentration of the material.

CSI will review the following analyses on all samples submitted for waste acceptance and disposal:

- \* Corrosivity - pH - A pH meter is used to measure the pH of liquids and one percent solutions of solids to determine whether the sample is basic or acidic.
- \* Ignitability - flash point - The Pensky-Martens closed cup flash point tester and stirrer is used to determine the flash point of liquids. Solids are also tested with the Pensky-Martens closed cup flash tester to evaluate the ability of the solid to sustain combustion, but solids do not have "flash points" per se.
- \* Reactivity - sulfides and cyanides - The Matheson/Kitagawa toxic gas analyzer is used to measure the concentrations of various gases, such as ammonia, hydrogen sulfide, and cyanide. Further tests are performed using ASTM standard methods to more completely quantify the concentration of these materials in the waste, or the sample is sent to an outside laboratory for testing.
- \* Total Metals - Ba, As, Cr, Pb, Cd, Hg, Se, Ag - The HACH spectrophotometer and HACH digesdahl are utilized for the detection of trace metals. Only total metals are run. When a problem metal is detected in sufficient quantity, the sample is sent to an outside laboratory for the Toxicity Characteristic Leaching Procedure (TCLP) metals test.
- \* Bielstiens - halogenation - The "Bielstiens" analysis is a spot test for chlorides. If the chlorides are from chlorine, the chlorine is measured on the HACH spectrophotometer. If chlorides could be from the presence of halogenated organics, the sample is sent to an outside laboratory for testing.



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The tests for total metals, halogenation and organics are qualitative tests. If the analysis indicates a potential for the waste to be hazardous, as defined in Section 5.1 above, the sample will be sent to an outside laboratory for additional testing. On organic samples where halogenated organic constituents are suspected, the samples will be tested for TOX and/or Volatile Organic Hydrocarbons (Method 8260 or its successor) to determine that it is not a hazardous waste.

Each sample will have a detailed description of its physical characteristics completed including:

- \* Solubility
- \* Percent moisture
- \* Suspended solids
- \* Odor
- \* Color
- \* Viscosity
- \* Density

If any of the results from these tests demonstrate a significant deviation from the information provided on the WCD, the waste will require further analysis as recommended by CSI.

Prior to unloading the material, the following procedures will be followed:

- \* The transport manifest is checked. CSI does not accept any shipments of waste without a manifest properly completed and signed by the generator of the waste or an authorized representative. The incoming material must meet the descriptions on the manifest. The manifests are retained in CSI's records with the analytical results from the waste screening process and the waste profile data sheets.
- \* CSI checks to ensure the waste has a Waste Characterization Data Sheet and is assigned a Waste Code Number (WCN).
- \* Waste streams are sampled as outlined in Section 5.1.4.3 by, or supervised by, on-site laboratory personnel.
- \* The waste is screened for compliance with appropriate CSI guidelines and to ensure the waste arriving at the site for disposal is the same as that which was analyzed at the laboratory and listed on the manifest and WCN. (Section 5.1.4.2 and 5.1.4.3)

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\* The truck is directed to the proper unloading areas.

Unloading is directed according to the type of shipment container and the treatment process recommended by the CSI chemist.

Drummed materials will be unloaded at the mixing basin or drum storage area and marked with a WCN and a shipping date. The drums will also be labeled as non-hazardous waste. The drums are then segregated in the storage area according to the client and source of the material. Drums without adequate lids will not be accepted prior to shipment to CSI. All drums on-site are required to be covered or have the bungs closed. If bungs are missing, the drum will be covered with a plastic lid. All barrels or drums containing liquid waste that is to be solidified will be processed within 15 working days of receiving the waste. Typically, drums are recycled to a steel scrap yard after they have been emptied. Drums that are placed in the disposal cell will be crushed prior to disposal.

Materials transported in tanker trucks or vacuum trucks will be unloaded to the tank farm for future disposal or they are emptied directly into the mixing basin for solidification and disposal.

Mixing of the materials will be completed in concrete mixing basins designed expressly for this purpose (Section 5.2.2.2). The solidifying agent, usually cement kiln dust, is stored on-site in a metal building open on one side. The CSI tests run on samples of incoming materials to determine the ratio of solidification agent to liquid required to properly solidify the mixture when placed in the disposal cell. This ratio will be used when bulk-mixing of the material is completed in the basin. Additionally, CSI will perform a Paint Filter Test on each mixed load prior to removal from the basin to determine whether free liquids are present. Each load is required to pass this test.

The solidification agent will be added to the liquid in the mixing basin and mixed by a track-mounted backhoe until only a cement-like mixture remains. The backhoe will place the mixed material in a dump truck that will transport the material to the cell. The placement and compaction of the material in the cells is discussed in Sections 5.2.3.5 and 5.2.3.6.

Each sample submitted to the CSI laboratory is tested to determine its optimum mixing ratio with the solidification agent. This test is simply called a solidification test and is documented in the Laboratory Worksheet. The solidification test is also used to estimate the amount of reagent needed to solidify

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the waste and any volume increase expected once the waste is solidified. This ratio is then used in the bulk mixing operations to ensure a liquid-to-solidification agent mixture that will result in an optimum pozzolanic process in the disposal cell.

If the waste stream submitted passes the WCD reviewing process and the test results confirm the information provided by the generator, the waste stream is accepted and assigned a WCN. The WCN differs from the LCN as the LCN is a 5-digit number assigned to each incoming sample, while the WCN is a number assigned to accepted waste streams. (Example: LCN - 01501, WCN - CO-02-072187-01501.)

#### 5.1.4.3 Waste Screening

Each approved waste stream arriving at the CSI facility is screened by a properly trained chemist or lab technician to ensure that the material profiled and accepted matches the material arriving at the facility for disposal.

When a waste arrives, the transporter must submit the appropriate paperwork (manifest, WCN) which is then reviewed by CSI to ensure that all the necessary information is present and that the generator has signed the manifest.

Sampling of the waste stream is performed by, or supervised by, CSI personnel who have been trained in the appropriate sampling protocols. One representative sample will be taken from bulk solids, bulk liquids, and drummed wastes.

Each sample will be submitted to the laboratory for a screening test, prior to unloading. The tests that will be run on each sample are as follows:

- \* Corrosivity
- \* Ignitability
- \* Reactivity
- \* Radioactivity

In addition to the above tests, the physical characteristics of the sample will be compared to those of the sample submitted for approval.

On projects where several shipments from the same source are being delivered in the same day, at least 10 percent of the loads will be screened.

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If any of these tests deviate significantly from the original results, the generator will be notified and the load will be rejected. If the load is rejected, the waste stream approval will be cancelled until the deviation can be explained by the generator or additional analytical work is completed.

CSI is performing a High Organic Content Waste (HOCW) study as a condition of the CD (see Section 7.3) to determine the effectiveness of the solidification process on HOCW. The HOCW study entails chemical analysis of the HOCW. Results of this study will be evaluated to verify that the screening tests are adequately characterizing the waste.

If, through analysis of a high organic content waste stream performed by CSI, it is determined by the appropriate regulatory agencies that the screening tests are inadequate for detecting waste that is hazardous due to its organic content, the waste analysis plan will be amended and approved by the appropriate regulatory agencies to ensure that no hazardous waste is accepted.

CSI clients often dispose of the same waste stream at the facility continuously. For wastes that are received on a continual basis, the generator will be required to sign a notice verifying that the waste stream has not changed. The notice will include the following questions:

- \* Has the waste stream changed? If so, explain the changes.
- \* Is there any new analytical information regarding the waste stream that has been completed during the past year?

## 5.2 Non-Hazardous Liquids Solidification and Disposal

Wastes that meet the requirements for disposal at the CSI facility and have proven amenable to CSI's treatment processes are accepted for treatment and solidification. The CSI chemist will assign the waste a WCN and recommend procedures for handling, treatment, and disposal of that particular waste stream. No waste will be accepted without a WCN.

### 5.2.1 Process Description and System Capacity

A WCN will be assigned only after sampling and analysis of each waste by CSI chemists. More detailed information regarding the waste analysis plan is contained in Section 5.1 of this report. Following assignation of a WCN and acceptance, transport of the waste to the facility will be scheduled. Either CSI or another qualified transporter will deliver the waste to CSI for solidification and disposal.

Solidification has been used at various other facilities to stabilize liquid materials. The mixing of cement kiln dust with the liquid waste creates a pozzolanic process that is tested in the laboratory prior to mixing the bulk material. The pozzolanic process consumes free liquids therefore prohibiting the creation of leachates when the material is placed in the cells. The bench test, previously completed during the waste characterization phase, determines an adequate liquid to kiln dust ratio to use when mixing. In addition, CSI will perform a Paint Filter Test (EPA Method 9095) upon completion of mixing to determine whether free liquids are present in the material prior to removing it from the basin. If the material fails the test, CSI will add additional solidification agent until the material passes. The waste can then be placed in the disposal cells.

It should be noted that CSI intends to use cement kiln dust as its solidification agent. Table 5.2 is an actual analysis of kiln dust used at the facility and is typical of other kiln dusts that will be used. With future changes in technology and enhancements of techniques used at CSI, it is possible that new agents may be used if they prove feasible. CSI will notify the appropriate agencies on the proposed change and any variations from the use of kiln dust will require approval by the appropriate agencies prior to its use.

The facility will be able to process a maximum of approximately 23,000 gallons of liquid in each half of the mixing basin at one time for a total of 46,000 gallons. The process requires

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TABLE 5.2

CONSERVATION SERVICES, INC.  
CONSTRUCTION TECHNOLOGY LABORATORIES, INC. SKOKIE, ILLINOIS

Report of Chemical Analysis

Sample No.: 83

Sample Type: Kiln Dust

pH of TCLP Extract: 12-13

| Analyte        | EPA max. TCLP concentration<br>mg/L | TCLP Results (mg/L) |        |        | Total Results (mg/kg) |       |      |
|----------------|-------------------------------------|---------------------|--------|--------|-----------------------|-------|------|
|                |                                     | Leachate            | MDL    | SQL    | Solid Sample          | MDL   | SQL  |
| Antimony (Sb)  | (none)                              | 1.17                | 0.10   | 0.16   | 151                   | 15    | 25   |
| Arsenic (As)   | 5.0                                 | <0.16               | 0.10   | 0.16   | 10.9                  | 5     | 8.4  |
| Barium (Ba)    | 100.0                               | 1.41                | 0.1    | 0.2    | 323                   | 10    | 20   |
| Beryllium (Be) | (none)                              | 0.013               | 0.002  | 0.003  | 3.58                  | 0.7   | 1    |
| Cadmium (Cd)   | 1.0                                 | 0.051               | 0.0091 | 0.015  | 44.0                  | 0.6   | 0.9  |
| Chromium (Cr)  | 5.0                                 | 0.082               | 0.008  | 0.01   | 35.6                  | 1.3   | 2.2  |
| Lead (Pb)      | 5.0                                 | 0.624               | 0.091  | 0.15   | 146                   | 3     | 4    |
| Mercury (Hg)   | 0.2                                 | 0.000756            | 0.0003 | 0.0005 | <0.006                | 0.005 | 0.01 |
| Silver (Ag)    | 5.0                                 | 0.062               | 0.005  | 0.009  | 9.55                  | 0.40  | 0.67 |
| Thallium (Tl)  | (none)                              | 0.70                | 0.07   | 0.1    | 86.1                  | 4.7   | 7.8  |

Notes:

- Tests performed in accordance with EPA TCLP protocols.
- EPA procedure 3050 used for total metals digestion, except Sb (3005) and Hg (7471).
- MDL (minimum detection limit) calculated from this analytical batch according to EPA procedure, MDL = three sigma divided by slope of calibration curve.
- SQL (minimum quantification limit) calculated from this analytical batch according to EPA procedure, SQL = five sigma divided by slope of calibration curve.
- The number of significant figures in each result varies depending on the absolute absorbance read from the spectrometer.



approximately 110 gallons of liquid waste solidified with kiln dust to yield one cubic yard of material for disposal in the cells; therefore, approximately 209 cubic yards of solidified material can be mixed in each half of the mixing basin. During current peak operations, 3 loads (per half of the mixing basin) can be mixed per day, totaling 627 cy of solidified material per day. Initially, CSI will construct only the first mixing basin. The second basin will be constructed as the market warrants, allowing them to process 1254 cy of solidified material per day during peak operations.

#### 5.2.2 Solidification Area

The CSI solidification area is located in the northcentral portion of the site and includes the mixing basins and auxiliary structures. The auxiliary structures and layout are shown in Figure 2.3 and include the laboratory, kiln dust storage, tank farm, water process area, drum storage area, equipment storage, and truck wash bay located in the two-story operations building.

##### 5.2.2.1 Location and Surface Water Control

The solidification area is arranged to minimize the effects of the wind and surface-water runoff. Surface-water runoff to this area will be controlled through the use of berms that will route water away from the area. Precipitation falling directly on the area will be routed off-site or will be collected and disposed of or used for dust control. Water in the mixing basin that is a direct result of precipitation will be minimal because of the raised walls of the basin. Precipitation on the mixing basin and primary drum storage apron will drain through seep holes located on the sidewalls of the mixing basin directly into the basin for solidification. The water that falls in the basins will be solidified and placed in the disposal cell with the other wastes. The drum storage pad and tank farm area will be bermed to route surface water runoff around these areas. Any direct precipitation onto the drum storage pad or into the tank farm diked area will be allowed to evaporate or will be collected and solidified. More detailed diversion information for the entire site is included in Section 5.4.

##### 5.2.2.2 Mixing Basin Design

The mixing basins at the CSI facility will be used to mix the non-hazardous liquids with the solidification agent. Also, the mixing basin may incorporate the drum storage area as shown on Figure 5.1a. Initially, one mixing basin will be constructed

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although a second basin may be constructed at a later date to allow increased mixing capacity, if the market warrants. The location of the mixing basins are shown in the facility configuration in Figure 2.3. Each basin is capable of mixing two 23,000 gallon batches of material. The original basin specifications are included in Plates 9 and 10. These specifications may be utilized for the second basin (Basin B), or if a different design is utilized, the specifications will be designated as Plates 12 and 13. The exterior dimensions of the basin will be approximately 100 feet by 20 feet, with a depth of 8.5 feet from the top of the basin walls to the basin bottom. The basin walls will be 6 inches above grade and 8 feet below grade. The excavated substrate beneath the basin bottom will be sloped from the longitudinal center to each end to ensure positive drainage to the leachate detection underdrain while the actual concrete basin bottom will be constructed at a level grade. The basin will be divided in the center by a concrete wall to allow CSI to more efficiently mix wastes. A 20-foot surface slab apron will surround the basin. All slabs and walls of the basins will be constructed of steel reinforced, 9-inch thick concrete. The concrete apron surrounding the basin will slope to the basins as described in Section 5.2.2.1. Curbs will be constructed around the mixing basin aprons to ensure drainage into the basin. All runoff collected in the basin will be solidified with other materials.

The entire mixing basin excavation will have the substrate prepared to ensure the synthetic liner will not be punctured. The base layer of material will consist of compacted solidification agent, if necessary. Otherwise, the excavated ground will act as the substrate. Above it, a synthetic High Density Polyethylene (HDPE) liner with a minimum thickness of 30 mils will be keyed into the ground surface beneath the concrete apron as shown in Plates 9 and 10. The synthetic liner will then be overlain with a minimum 6-inch, clean-sand drainage blanket. The entire underdrain system will be sloped to the underdrain wells located at each end of the basin, at minimum 1 percent grades to allow drainage and detection of potential leaks in the concrete basin.

Underdrain leachate detection wells will be located at the eastern and western ends of the basin. The underdrain leachate detection wells will consist of 6-inch, schedule 40, PVC pipe with the bottom 2.5 feet slotted, and will be protected with a steel cover and steel cap to be selected by the contractor and approved by a Registered Professional Engineer in the State of Colorado. The underdrain leachate detection wells are used as a leak detection and collection system for the basin.



### 5.2.2.3 Mixing Basin Construction

One of the two mixing basins (Basin A) has been constructed as per the specifications and drawing details in Plates 9 and 10. The construction of the basin has been documented in the Mixing Basin Construction Report. A second mixing basin (Basin B) will be constructed of an equal or better design than the existing mixing basin and may incorporate sloping walls and steel lining. If a different design is utilized, it will be designated as Plates 12 and 13. The base dimensions for the second basin will be approximately the same as the existing basin. The underdrain system will be separate from the underdrain system in the existing basin. Excavation for the existing mixing basin was to an approximate depth of 10 feet in order to place the underdrain system. The base dimension of the excavation is approximately 102 feet by 22 feet with a minimum 1 percent slope to the east and west from the center. At the edges of the excavation the slopes are 1 to 1, up to 6 inches below the ground surface to key the HDPE liner and minimize the potential for leaks. Areas at each end of the excavation are cut out to install the surface drainage sumps. The drainage sumps are also underlain by the HDPE liner.

Following excavation for the basin, the underdrain system was installed. The first layer of the underdrain system will be compacted kiln dust, if necessary. Compaction was completed by passing a smooth-drum roller a minimum of three times over the kiln dust. A HDPE liner, with a thickness of 30 mils, was then placed atop the prepared substrate sloping to the east and west at a minimum 1 percent grade and on the 1 to 1 slope to within 6 inches of the surface.

The base of the excavation was backfilled using clean sand as a drain material. The sand will form a base for the concrete basin bottom and was placed at a level grade. The sand material should have a maximum size of No. 4 sieve and a minimum size of No. 6 sieve and was placed at a minimum thickness of 6 inches to provide an adequate base for the concrete slab. No heavy equipment was allowed to operate on the liner or the sand above the liner, except for compaction purposes.

The mixing basin base slab was formed atop the sand layer using the specifications stated in Plates 9 and 10. All formwork conforms to these specifications and no stakes were driven into the sand to hold the forms in order to prevent potential penetration of the liner. The base slab was constructed to include a 2-inch deep by 4-inch wide key around the outside edge.

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A PVC waterstop was placed continuously around the slab and the vertical walls were centered on a key. Also formed into the base slab was reinforcing steel to strengthen the vertical basin walls as shown in Plates 9 and 10. Immediately prior to pouring the concrete for the base, the sand layer was saturated with water to allow the concrete to cure at a slower rate.

After pouring the concrete, a white pigmented liquid curing compound was applied to the base slab within 30 minutes of finishing. A second coat was applied within 30 minutes of the first coat at a 90 degree angle to the first coat. The base slab was covered with 6 mil polyethylene film for a minimum of 48 hours after pouring to protect the "green" concrete from potential adverse weather conditions and allow it to cure at a slower rate. Construction joints in the slab were placed as soon as possible without causing the concrete to ravel. The joints were cleaned and filled with joint compound.

The basin walls were formed and cast in one pour to reduce the potential for cracking. Reinforcing bar (as per the specifications on Plates 9 and 10) was used to strengthen the walls. The walls were centered on the key constructed around the perimeter of the base slab. The concrete was placed in lifts not to exceed 15 inches and each lift was vibrated mechanically. Upon completion of pouring, the walls were covered with burlap and kept wet for a length of time adequate to ensure proper curing of the concrete.

Control tests for the base slab and the vertical walls were made by an independent concrete testing firm. The control tests for the floor slab consisted of 6 standard 6-inch test cylinders cast and cured in accordance with all standard testing procedures. The control tests for the walls include the same tests for the slab with the addition of 6 standard field cylinders that are field cured.

The area around the outside of the vertical walls and inside the liners was filled with a clean sand compacted in intervals not to exceed 8 inches. The sand was compacted to 95 percent of the maximum dry density as per ASTM D698 (Standard Proctor).

The aprons skirting the mixing basins were 8 inches in thickness and reinforced with steel. The apron slabs were built atop a base of clean sand with a minimum thickness of 6 inches that is saturated immediately prior to placement of the concrete. Also prior to placement of the concrete, the surface drainage sump and the underdrain leachate detection wells were installed. Details of the surface drainage sump were provided by the contractor and

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approved by the engineer. The underdrain wells consist of 6-inch PVC, schedule 40, pipe with 2.5 feet of slotted pipe at the bottom, extending to the synthetic liner. Both wells reach ground surface. The surface drainage sumps will be protected with heavy duty manhole gratings and the underdrain sump protected using a steel grate at the surface of the concrete. The concrete surface around the underdrain wells will be gradually sloped up to minimize the addition of surface water to the underdrain well. All slabs are formed to slope to weep holes in the walls of the basin to allow liquid to drain directly into the basin.

The finishing and curing of the aprons conform to the specifications set on Plate 9.

#### 5.2.2.4 Auxiliary Structures

The auxiliary structures and designated areas in the facility operations area include the laboratory, administrative office, disposal office and maintenance shop, mixing basins, the sampling station, solidification agent storage building, truck wash bay, drum storage area, and tank farm. Additionally, there is an area set aside for equipment parking and employee parking. These structures and areas are shown in Figure 2.3.

Initially, the site was open only for cell disposal of solidified special wastes and asbestos wastes. The construction of the facility buildings and mixing basins and auxiliary structures followed at a later date. Permanent water and sewer facilities were placed at the site during construction of the buildings and operations area. Sewer facilities were constructed as an individual system with a septic tank and a leach field. Design of this water and sanitary system was approved by the proper state and county agencies and all necessary permits were obtained prior to their construction. All initial temporary buildings and sanitary facilities were taken out of commission as permanent structures were completed and will be removed from the site within 2 years of facility start-up. Excess drum storage is located east of the mixing basin area (Figure 5.1) and may be enclosed inside a building in the future. A diesel fuel tank inside a concrete vault is located south of the excess drum storage area.

The administrative office, disposal office and maintenance shop and wash bay are located in two buildings. The administrative offices houses CSI employees involved in overseeing the day-to-day affairs of the company including the invoicing, marketing,

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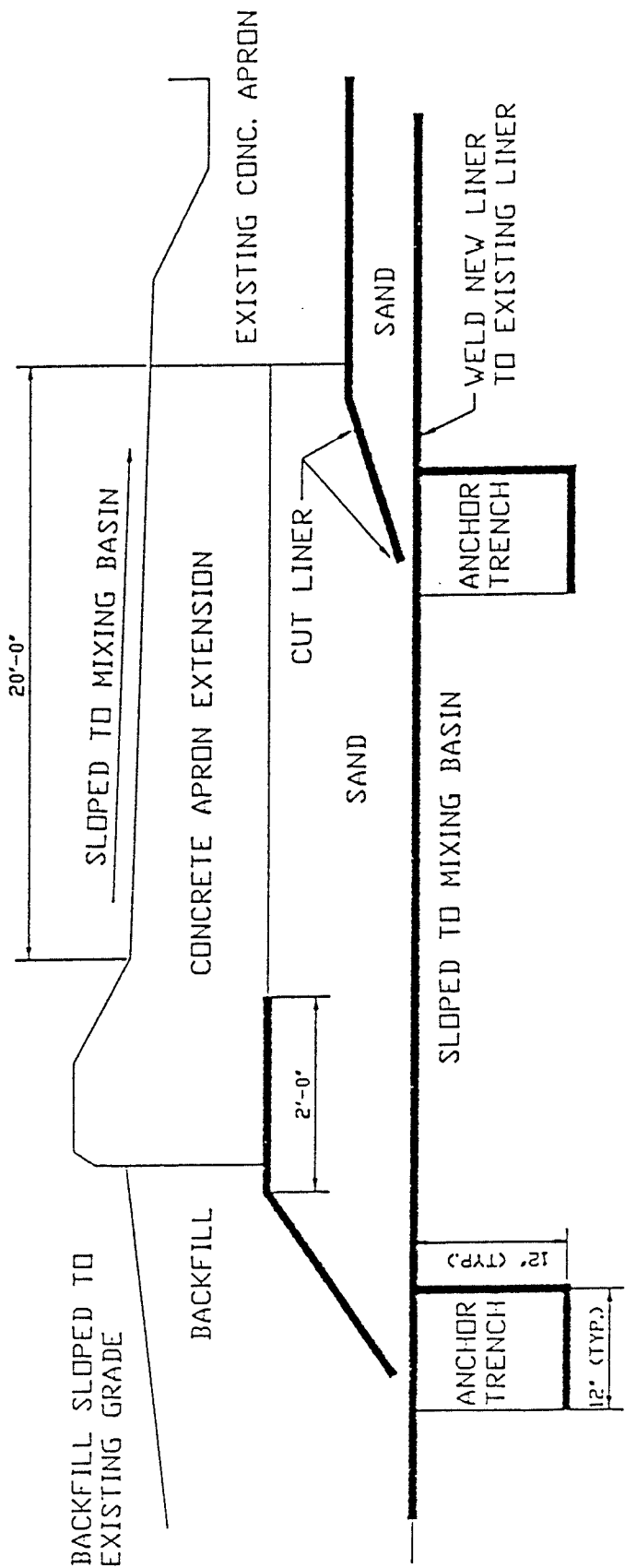
and overall project management work. The disposal office is used to track incoming shipments of waste, schedule solidification of the waste and keep records of the various customers, types of materials received, and amounts of materials solidified and disposed of. Screening of the incoming waste shipments is also performed in the disposal office. The maintenance shop and wash bay are part of the administrative office and is located north of the kiln dust storage building. The maintenance shop will house equipment and site-maintenance tools.

The sampling station is to be located inside the fenced facility and south of the offices to allow a convenient stopping point. The station is used to sample incoming waste streams previously analyzed and accepted by the CSI facility. Currently, the samples are collected on the mixing basin apron. The samples collected are screened to match the originally submitted sample. The sampling procedures and screening procedures are discussed in detail in Section 5.1.4.3.

The solidification agent storage area is an open-sided building located approximately 100 feet west of the mixing basins. The building will protect the solidification agent (kiln dust or future approved agent) from precipitation and wind. The building will be approximately 101 feet by 41 feet and is 24 feet in height. It is open at the front to allow unimpeded access with heavy equipment, and is sided on the remaining three sides. The storage building is sized large enough to hold approximately 300 tons of the agent. The solidification agent is restocked in the building on an as-needed basis.

The truck wash will be located in the northwest portion of the operational area in the administrative building. It consists of a concrete pad with a floor drain and underground holding tank to collect the wash water. All wash water collected will be placed in the mixing basin and solidified for disposal in the cells.

The primary concrete drum storage area is not yet constructed. It will be adjacent to the mixing basin on the west side. It will be designed to contain any releases or precipitation and to drain directly onto the mixing basin pad and into the mixing basin as shown on Figure 5.1. Drums will be stored on a bermed pad approximately 140 feet by 20 feet in area. The pad will overlay a synthetic liner similar to that used for the mixing basin and be directly and permanently tied to the mixing basin pad underdrain system. The drum storage pad is expected to be able to hold approximately 500 drums. Drums stored in the



- NOTES:
- 1.) REMOVE LINER AT CUT MARKS INDICATED.
  - 2.) WELD LINER EXTENSION TO EXISTING LINER.
  - 3.) SLOPE NEW PAD TO MIXING BASIN.
  - 4.) STRUCTURAL SPECIFICATIONS SAME AS EXISTING APRON.

LEGEND  
 ——— = SYNTHETIC LINER  
 \*NDT TO SCALE

FIGURE 5-1

CONSERVATION SERVICES, INC.  
 DRUM STORAGE EXTENSION PAD



INDUSTRIAL COMPLIANCE INC.  
 1746 COLE BLVD.  
 BLDG. 21 SUITE 300  
 GOLDEN, COLORADO 80401

Revised June 1991

eastern 25 feet of the storage pad will be required to be set on pallets in the event there is standing water. Precipitation or released liquids which collect in the mixing basin will be solidified within 72 hours of its accumulation if it has not evaporated. Ramps will be built over the berms to allow access to the pad. As noted in Section 5.2.1, drums are required to have lids during transport to CSI and storage at CSI. The lids can be plastic or steel but will prevent precipitation from entering the drum. Drums that are emptied will be either recycled or crushed and placed in a cell. Crushed drums will not be placed within two feet of the bottom, side slopes or final cap of the cell. In the event a drum (or drums) is spilled, the material and soil will be immediately removed and the soil will be replaced. Removal of the soil will be supervised by the Facility Manager or Chief Chemist. The incident will be fully documented and reported to CDH/TCHD within 7 days. A copy of the incident report will be kept at the site. Care will be taken to protect the HDPE liner but if it should be damaged it will be repaired prior to placement of any other drums within 10 feet of the damaged area. If material is spilled on the berm, that portion of the berm will be removed and rebuilt. In the case where the adjacent properties are developed for uses other than agricultural, a three-sided building will be erected around the drum storage pad as a visual screen.

A diesel fuel tank enclosed in a concrete vault allowing easy inspection is located southeast of the mixing basins.

The tank farm will be located south of and in close proximity to the mixing basin. Tanks are of polyethylene construction and sit inside individual polyethylene surround containment systems. The tanks have a capacity of 6500 gallons each with a containment system capacity of 6600 gallons each. The tanks will sit on a level compacted sand bed. The containment system will be translucent and designed for ease of leak detection and corrective action measures. A Spill Prevention Control and Countermeasures Plan (SPCC) will be prepared and reviewed by the proper agencies.

An earthen berm will be constructed that will extend nearly the length of the site along 88th Avenue and also along the eastern boundary of the facility operations area (Plate 1). The berm adjacent to 88th Avenue will be set back 65 feet from the northern property line to allow for the future expansion of 88th Avenue. The berm will be an aesthetic feature as well as a runoff diversion berm and will be used to screen the operations at the site. It will be approximately 8 feet in height and will

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have 1 to 1 side slopes. Following construction of the berm, it will be revegetated using trees and natural grasses and plants as outlined in Section 9.0. Upon closure of the site, the berm may be removed to blend with the topography of the site.

### 5.2.3 Solidified Waste Disposal Area

The solidified, non-hazardous liquid waste is removed from the mixing basins and transported to the waste disposal area where it is placed for final disposition. The solidified waste disposal area consists of individual disposal cells that cover approximately 115 acres of the site. Actual cell configuration may change in the future following approval by the appropriate regulatory agencies. In the southeast corner of the site cells are situated to remain a minimum of 50 feet from the Colorado Interstate Gas Company pipelines. As a condition of the permit, the solidified waste disposal cells are designed so that a minimum of 30-foot separation is maintained between the lowest point in the cell (top of clay liner) and ground-water beneath the cell. The hydrogeological characterization of the site has been used to design the cell depths.

#### 5.2.3.1 Cell Quantities and Site Life

The CSI disposal area consists of individual disposal cells located to the south and west of the operational area. The cells vary in depth and dimension. The depths of the cells range from 8 feet to 40 feet following construction of the liner and leachate collection system. The side walls of the cells are constructed at a 3 to 1 slope. Plate 1/2 show the overall layout of the facility and the cell locations.

Cells range in volume from a low of 40,150 cubic yards to a high of 679,700 cubic yards. The total volume of disposal airspace is estimated to be 2,977,850 cubic yards. Based on the volume received since opening the facility, the total site life is approximately 20 to 25 years. Table 5.3 includes cell volumes. If further individual cells are requested by clients, cells may be divided and redesigned in conformance with the standards in this plan as confirmed by approval of regulatory agencies. An additional cell may also be added in the area shown on Plate 1 if a cell can be designed in conformance with standards in this plan as confirmed by approval of regulatory agencies.

Plate 1 shows the overall layout of the facility and the cell locations.

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TABLE 5.3

CONSERVATION SERVICES INC. LANDFILL

APPROXIMATE CELL VOLUMES

SOLIDIFICATION DISPOSAL CELLS VOLUMES

| <u>CELL NUMBER</u>              | <u>CELL VOLUME (cubic yards)</u> |
|---------------------------------|----------------------------------|
| 1                               | 131,200                          |
| 2                               | 134,900                          |
| 3                               | 83,000                           |
| 4/5/8                           | 302,200                          |
| 6/7/9                           | 273,700                          |
| 10/11/12                        | 269,200                          |
| 13*                             | 40,150                           |
| 14*                             | 164,250                          |
| 15*                             | 165,700                          |
| 16*                             | 77,100                           |
| 17*                             | 69,500                           |
| 18/21/22/23                     | 679,700                          |
| 19/20                           | 321,450                          |
| TOTAL . . . . .                 | 2,712,050                        |
| *****                           |                                  |
| ASBESTOS CELL VOLUME . . . . .  | 169,100                          |
| *****                           |                                  |
| TOTAL DISPOSAL VOLUME . . . . . | 2,881,150                        |

\* These cells may be combined into one or more larger cells. If combined, the single cell volume for the combined cell is 611,000 cubic yards which increases the Total Solidified Cell Volume to 2,806,350 cubic yards and a Total Disposal Volume of 2,975,450 cubic yards.



#### 5.2.3.2 Cell Surface Water Control

Surface water runoff to the disposal cell area will be directed through the use of temporary berms. The surface water diversion system will be phased in to allow the unused portion of the site to continue to be farmed during facility operations. Berms will be constructed around the open cell and also around subsequent cells as construction begins. Sections 5.2.3.7 and 5.4 includes additional surface water control information. The berms are trapezoidal in shape and are constructed to a minimum height of 3 feet. They are placed to divert water from the west and south of the cells to areas away from the filling face as shown in Plate 2. This plate includes diversions for only the initial 40 acres of filling area. As filling continues to the cells on the southern boundary of the site, the temporary diversion berms will be constructed to a minimum height of 3.5 feet.

The cells are constructed to allow direct rainfall into the cell to drain from the perimeter of the cell into the sump. The cells may be constructed in phases to allow segregation of runoff water and to minimize the possibility of liner failure. Water touching the working face will be collected and solidified. Water not touching the working face will be collected and used for dust control or will be solidified. If evaporation has not taken place within 72 hours, the standing water will be pumped from the cell to be used for dust control or solidified in the mixing basin, as appropriate. Section 5.2.3.5 includes additional information on the segregation and handling procedures of runoff.

#### 5.2.3.3 Disposal Cell Design and Construction

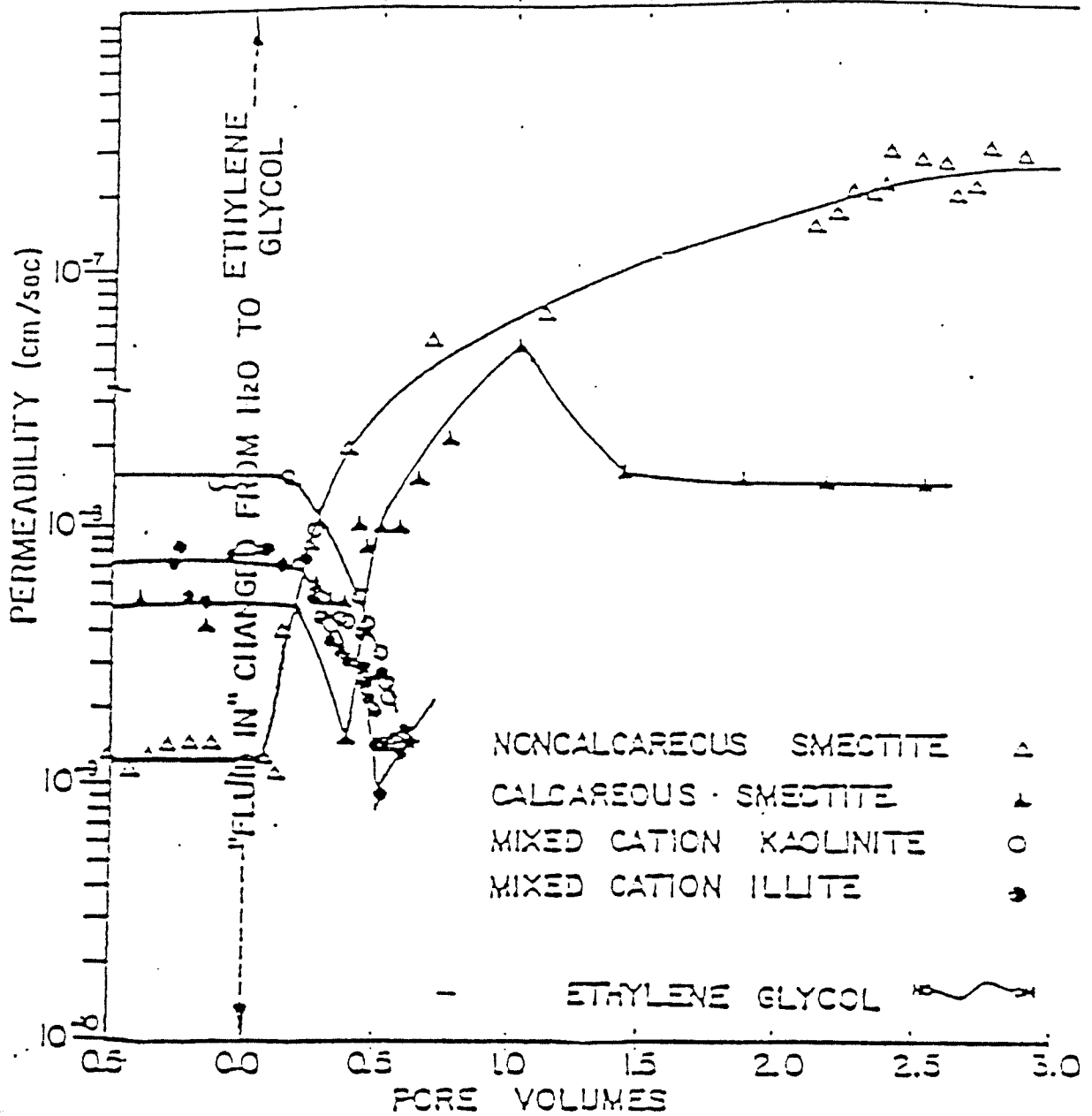
Disposal cells will be constructed that will vary dimensionally and in depth. This section is a general discussion of typical designs and construction criteria--refer to the specifications in Appendix Q for more specific information. Individual cell dimensions may change. Prior to initiating cell construction, a cell design will be submitted to Adams County for approval. Depths will vary in order for the top of the clay liner in the sump to remain a minimum of 30 feet from water located in perched zones underlying the site. The average depth of the finished filling area ranges from 8 to 40 feet. There are also 4 triangular-shaped cells in the southeast corner of the site. Diagrams and construction details for the cell liners are included on Plate 7 and Appendix Q. Cells may be constructed in phases with the exception of triangular cells that will be completely constructed.

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The cell liner construction will be compatible with the types of non-hazardous solidified wastes placed in the cells. Ethylene glycol is a typical substance that is solidified and disposed of at the CSI site. Ethylene glycol has not been shown to permeate high density polyethylene and clay liners in a liquid state as shown in the graph in Figure 5.2 (EPA, 1986). Compatibility information is discussed in Appendix N. The mixed cation kaolinite is a similar type of clay to that which will be used to construct the liner. The permeability of ethylene glycol through the clay actually decreases an order of magnitude from  $10^{-8}$  to  $10^{-9}$ . In test data submitted to the Pennsylvania Department of Environmental Resources (PDER), the effects of a waste comprised of one part oil contaminated soils and four parts water are shown (EPA, 1986). All the results show permeabilities in the range of  $10^{-7}$  or less (Appendix E). D'Appolonia Consulting Engineers, Inc. also completed permeability tests on four waste leachates used as permeants through a silty, clay soil. The results showed all permeabilities to be in the range of  $10^{-7}$  and are included in Appendix E (EPA, 1986). Calculations included in Appendix M show 99.4 percent of the material reaching the liner draining to the leachate collection system enhancing the compatibilities of the solidified materials with the clay liner. If leachate is not allowed to remain standing on the liner, the clay barrier will not be penetrated and degraded. The use of the Paint Filter Test prior to removing the waste from the basin will ensure free liquids are not entering the disposal cells.

Each cell will be constructed with a low permeability clay liner system that incorporates a high density polyethylene (HDPE) synthetic liner and leachate collection system at the base of the cell. The liner system includes a 2-foot compacted clay liner underlain by a 3-inch sand blanket (defined in the specifications) used as a capillary barrier. A 30-mil (minimum thickness) HDPE synthetic liner will be placed on top of the 2-foot clay liner in the base only. A 6-inch leachate collection blanket will be placed on the synthetic liner material as per specifications.

The cell will be initially overexcavated approximately 3 feet deeper than the final filling depth to properly construct the liner system. Varying volumes of soil will be removed from each cell excavation and are approximately the same as airspace volumes shown in Table 5.3. Again, these may change depending on cell configuration. Of the soil excavated, topsoil will be



Source: Anderson, 1981

FIGURE 5-2

Conservation Services, Inc.  
CLAY LINER COMPATIBILITY  
WITH ETHYLENE GLYCOL

Industrial Compliance Inc.  
511 Orchard Street  
Golden, Colorado 80401



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stockpiled separately from the other soils for later use in the final cap. An additional amount of clay material will be set aside for use in the liner system as well as soils used to cap and close cells filled to capacity at the time of excavation. The side walls will also require excavation beyond the actual filling area of the cell but only to a depth of 2 feet. The excavation of the base of each cell will be sloped to ensure positive drainage to the leachate collection sump. These slopes range from approximately 1 percent to 3 percent throughout the site. In addition, each cell base will be sloped laterally to its longitudinal center at a minimum 1 percent grade to ensure positive drainage to the leachate collection pipe. The lowest portion of the base of each cell is overexcavated to incorporate the leachate collection sump.

It should be noted that the topsoil removed during the excavation process must be stockpiled for later use as a portion of the cell cover. An ample amount of clay material with the proper geotechnical properties is available to cap the filled cells as each cell is filled to capacity. It may be necessary to stockpile the specified soils only for construction of the final cell cap and use soils from each subsequent cell excavation to complete the cover of the finished cell. In this way, topsoils will only require stockpiling for a short time period.

Excavated soils will exceed the need for lining materials. Portions of this amount of excavated soil will be used to construct berms on the north boundary of the site, and construct temporary diversions for routing surface water runoff. Soil will also be used to bring the portions of the site between the cells up to the grade of the closed cells.

In addition, much of the excess soil will be placed on the western third of the site and graded from the high point of the site to the western site boundary. The western boundary will also include a permanent channel to route runoff along the site. The soils will be unspecified and will be placed in an uncompacted state to allow revegetations and future uses as approved. Erosion prevention measures will be applied to excavated and stockpiled soils as detailed in Section 9.0 of this document. Fertilizer requirements are included in Section 9.0. Plate 11 includes a typical final grading plan for the site. Actual final grading may be modified depending on the amount of soils available.

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The bottom liner will consist of a layer of capillary material, the compacted clay liner, the HDPE synthetic liner, and the drainage bed with the leachate collection system (Plate 7). The capillary bed at the base of the excavation will be the initial layer placed. It is a minimum of 3 inches in depth and acts to reduce the capillary action of the underlying natural materials and maximize liner efficiency. The capillary bed will be placed and graded to ensure a positive slope is maintained to the longitudinal center and low portion of each cell.

The compacted clay liner will be placed on the sand bed to act as a barrier to any infiltration of liquids from the cells. A sump will be constructed to collect liquids accumulating in the cell as a result of precipitation. A drainage pipe will collect liquids from the edges of the cell and route the liquids to the sump. A minimum of 1 percent slope will be maintained from the edges of the cell to the drainage pipe. The base underlying the drainage pipe will be sloped approximately 1 to 3 percent to the sump.

The clay will be placed in lifts appropriate to the equipment used (approximately 6-inches) and will be compacted until it reaches a dry density equal to or greater than 95 percent of the Standard Proctor Density, as per ASTM-D-698. The moisture content of the material shall be maintained between optimum and +4 percent of optimum using the same testing criteria. The completed liner includes at least 2 feet of clay compacted to these specifications.

The material used for the clay liner will have a Unified Soil Classification (USC) of CL, CH, CL-CH, or SC and will have no more than 20 percent plus-200 mesh size material. In addition, the soil used for liner construction will have a plasticity index of no less than 10. Material which meets these specifications will have a recompacted permeability of  $1 \times 10^{-7}$  cm/sec or less.

Based on the geotechnical testing completed on samples collected from the site, there is ample material meeting these specifications available to complete the clay liner in each cell. Recompacted permeabilities on samples collected and tested were found to be in the range of  $2.71 \times 10^{-8}$  to  $5.12 \times 10^{-8}$  at 95 percent of Standard Proctor Density at optimum moisture content. Appendix E includes the geotechnical testing results of soil samples collected from the site.

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The side walls of the cells will have approximately 3 to 1 slopes and will be lined with clay materials meeting the same specifications as those of the bottom liner. There will not be an underlying sand blanket, synthetic liner, or drainage layer for a leachate collection system on the side slopes.

The liner may be constructed over the cell in phases and will be protected from the elements by covering it with solidified waste or unspecified soil. Section 5.2.3.5 includes additional information regarding the phased construction of the cells. If the liner is left exposed for a period exceeding 60 days, it will be scarified, recompacted and retested.

A high density synthetic liner of minimum 30-mil thick polyethylene (HDPE) will be installed over the base of each disposal cell immediately above the compacted clay liner. The manufacturer and installation contractor shall meet the specific requirements as detailed in Appendix Q.

The clay liner will be graded and smoothed. This will assure that no protrusions, sharp grade changes, or anomolous features will interfere with the integrity of the synthetic liner.

The synthetic liner will be keyed into the side-walls of the disposal cells through the use of an anchor trench. Details of the anchor trench construction are found in the specifications in Appendix Q. The clay liner material excavated from the trench will be replaced on top of the synthetic liner, recompacted as necessary to ensure a minimum of two feet of compacted clay liner and brought up to grade.

Synthetic membrane panels will be visually inspected for tears, punctures, and thin spots before final placement. The owner or owner's agent shall have the right to reject any material deemed unsuitable for the intended use.

Seaming of the synthetic liner panels will be kept to a minimum and only approved field seaming methods will be accepted.

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Stringent procedures will be followed during the installation of the HDPE synthetic liner. Both destructive and non-destructive tests will be performed on seams according to the methods and procedures outlined in the specifications. All repairs will be subject to non-destructive testing.

The entire facility operational area and opened cells will be fenced to prevent unauthorized access. Multiple cells may be enclosed within a single-fenced area. The fence may be removed following cap construction completion in order to allow farming to continue. If the land will not be farmed, the fence may remain and the land will be revegetated as necessary. When revegetation has been completed and healthy plantlife is growing, the fences may be removed and the land may be used for grazing or other approved uses by Adams County and the Colorado Department of Health.

#### 5.2.3.4 Leachate Collection System

This is a general discussion--refer to Appendix Q in the specifications for more detail. The leachate collection system, installed on the top of the clay liner, will be constructed in three phases, as outlined in Section 5.2.3.5, and will ultimately drain any free liquids from the cell to a sump for removal. The hydration and pozzolanic processes taking place during solidification, much like that of concrete, results in the absence of free liquids. Therefore, the leachate collection system is designed to remove liquids that may be the result of heavy rainfall or precipitation events. Appendix M includes calculations used in determining the design criteria for the system.

The leachate collection system will be constructed on top of the synthetic liner. The initial excavation of the cell includes overexcavating the leachate collection sump in order to place a clay liner to a depth of 2 feet under the sump. The clay and synthetic liners will be sloped to drain leachate from the edges of the cell to the drain pipe and on to the sump. Typically, the sump is located at the eastern edge in the center of each cell as shown in Plate 7, but may be located elsewhere depending on the actual cell configuration. The collection system includes a 6-inch drainage layer as defined in the specifications overlying the entire synthetic liner. The drainage material was used to fill the sumps in Cells #1 and #3 to an approximate depth of 2.5 feet. Future sumps will use an appropriate material as approved by the regulatory agencies and as outlined in the specifications. A perforated pipe(s) will extend underneath the drainage layer

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and be located according to the specific cell design. The pipe will be capped at the upgradient end and will extend to the sump. The sump itself is a drainage material-filled area approximately 3 feet by 3 feet and constructed to a depth of 2 feet. The dimensions of the sump may vary during construction but will meet requirements stated in the construction specifications. In addition, the pipe will be wrapped with a filter fabric to ensure it does not become plugged.

A collector well will be placed in the center of the sump. The well pipe will be slotted in the bottom portion of the sump to detect and remove any free liquids in the sump. The well will be placed to the ground surface following the 3 to 1 side slope or as necessary to assure integrity of the well. Completion will consist of securing the well stickup and placing steel protectors around the pipe. The collector well will be monitored on a periodic basis during filling of the cell and following capping of the cell as per Section 7.1. The pipe will be covered with a minimum of 3 feet of solidified material to protect it from heavy equipment.

The entire drainage layer will be overlain with a geotextile fabric to ensure the drainage layer system remains open and does not become filled with silt. The fabric material will be placed atop the drainage layer prior to placement of the solidified materials. In order to protect the fabric an appropriate amount of material will be placed on the fabric prior to allowing equipment on it.

The results of the calculations completed and presented in Appendix M indicate that the liner and leachate collection system described above will more than adequately protect the natural materials and any ground water beneath the cell from infiltration of liquids.

#### 5.2.3.5 Phased Cell Construction

The liner systems of the cells may be constructed in a phased manner depending on final cell design configuration. Phase One of each cell will be in the upland portion of the cell and will be constructed following excavation. The liner system, including capillary bed, the clay and synthetic liners, and the leachate drainage system, will be placed and feathered down to existing natural materials at the base of the cell. A berm of appropriate height will be constructed on top of the clay portion of the liner system to collect any runoff that touches the working face. The leachate collection piping will be left exposed to allow the



next phase of the system to be constructed as Phase One nears filling capacity. As Phase One nears filling capacity, the construction of Phase Two will begin. Phase Two construction will include placement of the liner system over the next portions of the cell. This phasing will continue until the liner system is placed over the remaining portions of the cell and sump area. The leachate collection portion of the system will be constructed and any temporary berm will be removed. Waters touching the working face will be removed within a 72-hour period and solidified in the mixing basin and will be analyzed two times per year for RCRA hazardous characteristics (including TCLP List, ignitability, corrosivity, and reactivity). Waters not touching the working face will be removed within a 72-hour period and will be either used for dust control or will be solidified in the mixing basin. Plate 7 includes typical cell construction and filling details.

#### 5.2.3.6 Waste Placement (Not Including Non-Friable Asbestos)

Each of the cells at the site will be filled in basically the same manner. The cells will be constructed as outlined in Section 5.2.3.5 and Appendix Q and will be filled as appropriate to the actual cell design. Plate 7 includes typical cell construction details.

The waste will be transported by dump truck from the mixing basins to the disposal cells for final placement. The dump trucks will place the material in the cell at its edge and a bulldozer or front-end loader will place it into the cells by carefully pushing it into the cell in a manner that protects the liner system. The pozzolanic process of the material allows final solidification without using the typical compaction techniques normally required at sanitary landfills. Instead, a single pass over the material with the spreading equipment is sufficient for compaction. Waste materials will be placed in this manner to the top of the clay liner on the sideslopes of the cell. Waste may also temporarily be piled above ground level while the next cell is being constructed. Proper berming or routing will be performed to ensure any runoff is contained within the limits of the cell boundary.

As filling progresses, additional phases of the cell may be constructed as outlined in Section 5.2.3.5 and Appendix Q. As filling nears the sump area, the collector well will be constructed and the sump will be filled with drainage material. The initial slotted portion of the riser pipe will be placed at the time the sump is filled with drainage material and is

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completed at the surface of the cell. A cell is completed when the waste material reaches the top of the clay liner.

The overall filling of the cells progresses from the cells in the eastern portion of the site to the cells in the west. Plate 1 shows the typical cell layout. Cells may be opened for disposal in order of necessity or as market conditions dictate. Temporary surface water diversion berms will be constructed as needed. During the life of the site, topsoil will be stockpiled for use in revegetation. Also, suitable soils for construction of the cell liner will be set aside during excavation of the cell. The remaining materials used for the final cap and cover may be taken from the cell being excavated concurrently with the closure of the previous cell. The topsoil and other materials will be placed in segregated areas to ensure an adequate amount of topsoil for use in revegetating the cell caps. In addition, the topsoil stockpile will be revegetated to reduce erosion from wind and precipitation if it is expected to remain unused for a period exceeding six months.

Non-friable asbestos may be placed in the solidified waste disposal cells as per the CDH letter from Poul E. Poulsen, dated December 10, 1990.

#### 5.2.3.7 Cell Cap and Cover Placement

Each cell will be capped to minimize the infiltration of surface water. The cells will be filled to the top of the clay liner and capped with a low permeability clay-cap system. Final cover over each cell will be a minimum of 4 feet in thickness, with the bottom 2-foot cap consisting of a compacted clay cover meeting the specifications presented in Appendix Q. The top 2 feet consists of 18 inches of uncompacted and unspecified soils overlain by 6 inches of topsoil. The final cover will allow for runoff and revegetation without construction of a crown. The topsoil will then be reseeded as per Section 9.1. As adjacent cells are filled, the areas between the cells may be filled with soil as necessary to smooth the site grades.

Clay cap construction may be completed in phases during the open period of a cell to help prevent infiltration of surface water into waste materials. Infiltration of surface water into waste materials will be controlled through: 1) sequencing of cell-filling; 2) covering areas filled to final grade with 6-inches of compacted clay cap material to minimize infiltration and promote run-off; 3) construction of temporary diversion berms to route surface water away from the cell and working face; 4) placement

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of unspecified fill material on the uncapped portion of the cell to prevent trucks in transit to the waste unloading area from picking up contaminated materials. Details of each of these components follows.

- 1) Filling shall begin in the topographically highest side of the cell which is completely lined and ready to accept waste. This will minimize the area of waste exposed to precipitation.
- 2) Once approximately one-half of the area of the cell approved for filling has been filled to final grade, approximately 6-inches of clay cap material will be compacted on top of the first one-third filled portion of the cell area of the cell approved for filling. When approximately three-quarters of that portion of the cell approved for filling has been filled to final grade, the next one-third of the filled portion of the cell area approved for filling shall receive the 6-inch clay cap material. In all cases sufficient working area in front of the face (50'-100'±) shall be left uncapped. As much as possible, disposal truck and equipment traffic shall be kept off such temporarily capped area. The thickness of the clay cap material will be controlled and verified with construction fill stakes. Material used for this partial cap will meet the requirements for clay cap material as presented in the construction specifications in Appendix Q. Because this is a short-term water control solution, compaction will be limited to the energy transmitted by the scrapers and other equipment during placement of the material. Specific compaction and density testing is not necessary. When final capping of the cell is started, this 6-inch layer will be scarified, processed, recompacted, and tested to meet the requirements for clay cap presented in the construction specifications.
- 3) Temporary berms will be constructed as necessary around the perimeter of the cell to prevent run-on to the cell (Section 5.4). Temporary berms will also be constructed on the cell to prevent precipitation that falls directly on the cell from contacting the working face and to promote run-off from the cell. The height and alignment of the berms will depend on their location and surrounding topography. Berms will be designed to route the 5-year, 24-hour storm safely off the area.

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- 4) A minimum of 6-inches of unspecified soils will be placed on top of the 6-inches of clay cap to protect it from dessication. Unspecified soils will also be placed as necessary on the uncapped portions of the cell to minimize the potential for vehicles to pick up waste materials on the tires and transport it to capped portions of the cell. Vehicle traffic will also be routed in such a way to minimize the potential for vehicle damage to the temporary cap. The unspecified soils will be removed prior to recompaction of the underlying 6-inches of clay cap material for final capping.

The size and configuration of partial caps and temporary berms will be dependant on individual cell design and dimensions.

### 5.3 Asbestos Disposal Cell

The CSI facility is designed to include an asbestos disposal cell. The asbestos cell is a separate cell from the solidified non-hazardous waste cells and will be used only for the disposal of asbestos-containing materials. As required by Colorado regulations, all friable and uncontained non-friable asbestos will be disposed only in this cell. All asbestos-containing materials will be handled according to appropriate regulations.

A pad may be constructed for temporary storage of containerized asbestos waste before placement into the disposal cell. Holding times will not exceed regulatory time limits. The asbestos disposal cell is located in the northeastern corner of the operations area, immediately east of the facilities area and immediately north of Solidified Waste Cell #1 (see revised Plate 1). The cell will be approximately 555 feet by 400 feet (surface dimensions) with an average depth of approximately 27 feet to the base of the cell (top of the clay liner). Although asbestos is not a potential ground-water contaminant, a two-foot thick clay liner will be constructed in the bottom of this cell to minimize the potential for any water which may occur to migrate from the cell. Revised Plate 1 shows the layout of all the cells at this site and revised Plate 8 shows a generalized design and fill plan for the cell.

The asbestos cell will have a total airspace capacity of approximately 169,100 cubic yards. This cell will be capable of containing approximately 326,120 55-gallon containers. The

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estimated life of this cell is dependent on the rate of disposal, but will not exceed the proposed 20 to 25 year life of the site.

### 5.3.1 Asbestos Cell Design and Construction

The asbestos cell will be excavated to an average depth of approximately 29 feet (approximately two feet below the finished base of the cell). The bottom of the cell will be sloped to the east at a grade of approximately three percent (3%) to facilitate drainage toward a sump which will be constructed in the east end of the cell. The sides of the cell will be sloped at approximately 2 (horizontal) to 1 (vertical) (2:1, see revised Plate 8). The cell may be expanded in the future with the approval of Adams County.

A clay liner and a leachate collection system will be constructed on the base of this cell (on top of the clay liner). After each phase of the cell is excavated to grade, a three-inch thick capillary barrier of sandy material will be placed in the bottom of the excavation. A 2-foot thick clay liner will be constructed over the capillary barrier. The clay liner will be constructed to provide the minimum grades of one percent from the sides of the cell toward the middle and one to three percent from the west end of the cell toward the east end. Although asbestos is not considered a potential ground-water contaminant and water is not expected in the cell, a 6-inch thick layer of drainage material (permeability  $\geq 1 \times 10^{-2}$  cm/sec) will be placed over the clay liner. A drainage pipe will be placed in the center of the cell to facilitate the transport of any collected liquids toward the east end of this cell. A filter fabric will be placed over the drainage layer prior to placing any waste in this cell.

Initially, any waters collected in the western (disposal area) portion of this cell will be disposed as described for the solidified waste cells (removed after 72 hours, solidified and disposed in one of the solidified waste cells). In the future, CSI may conduct studies which could determine if waters ponding in the cell may be disposed in other ways. These studies could include such things as:

- \* A study of the potential contaminants which may be associated with asbestos waste materials (surfactants and other products which may have been used for the application and removal of asbestos-containing materials); and,

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- \* Chemical analyses of waters which accumulate in the cell to determine if solidification is required.

The results of any studies supporting alternate disposal will be submitted to the appropriate regulatory agencies. Alternate methods for disposing of such waters will not be used without approval by the appropriate regulatory agencies.

The cell will be excavated and filled in two phases. The cell will be filled using approximately five to eight lifts, depending on the shape and size of the rigid containers, if the containers are buried on end or on their sides, and the amount of fill placed between lifts. The first phase of excavation has been completed and includes approximately the western two-thirds of the cell. The clay liner and leachate collection system are constructed over approximately one-half to two-thirds of this first phase (see revised Plate 8). As Phase One fills to capacity, the remainder of the cell will be excavated and the rest of the clay liner and leachate control systems constructed in the bottom of the cell. Phase Two filling will include the remainder of the cell.

The asbestos cell's perimeter has been entirely fenced as per the Colorado regulations. Access to the cell will be through a gate at the southwest corner of the cell. A storage area will be set in the southeastern corner of the fenced area (near the southeast corner of the Phase Two excavation - see revised Plate 8) and will be segregated with hazardous warning tape or a small fence with signs or warning tape. The storage area will be moved from the Phase Two area to the Phase One area when construction begins on Phase Two.

#### 5.3.2 Waste Placement

Friable and non-friable asbestos wastes will be accepted for disposal at the CSI facility. The friable and uncontained non-friable waste will be placed in the asbestos disposal area which is in a permanently segregated area away from the non-hazardous solidified waste disposal areas.

Non-friable asbestos waste will be accepted in either a contained or uncontained state. If it is contained in plastic 6-mil (or similar) bags or in rigid containers, the non-friable asbestos can be kept in the storage area prior to being placed in a cell. Any uncontained non-friable asbestos accepted at the facility will immediately be placed in the cell, covered with a minimum of six inches of soil, and compacted. Bagged non-friable asbestos

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also will be covered with a minimum of 6 inches of soil. Rigid containers will not be compacted. The handling of the non-friable asbestos will be done in such a way as to minimize any increase in friability of the waste.

Friable asbestos will be accepted only if the waste is packaged in containers as required by the Colorado regulations. The containers are to be labeled with the following words:

CAUTION  
Contains Asbestos  
Avoid Opening or Breaking Container  
Breathing Asbestos is Hazardous to  
Your Health

The containers will be covered with a minimum of six inches of soil within three days of placement in the cell. The rigid containers with friable asbestos will not be compacted.

All asbestos waste will be accepted on a pre-arranged schedule only. The waste will be unloaded from the transport vehicle at the storage area (see above). If the asbestos is non-friable and uncontained, it will be taken immediately into the asbestos disposal cell and covered with a minimum of six inches of soil. If the non-friable waste is packaged for disposal, it can be held in the storage area for up to 20 days before being placed in a cell. If the waste is friable, it must be prepackaged in containers such as required by the Colorado regulations. These containers may be held in the storage area for up to 20 days before being placed in the cell.

Wastes will be placed in the cell as shown on revised Plate 8.

- \* From the storage area, wastes will be transported down the east side of the cell to the bottom of the cell.
- \* Ramps will be constructed over the water control berm and over the drainage layer along the north and west sides of the cell to the southwest corner of the cell. The "ramps" along the north and west sides of the cell over the drainage sand and filter fabric will be approximately 6 inches thick and will be constructed of common fill material. These "ramps" will protect the filter fabric and drainage layer from damage during the transport and placement of asbestos waste in the first lift.

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- \* Asbestos wastes initially will be placed in the southwest corner of the cell. A "pad", constructed of common fill material to a thickness of approximately six inches, will be built in this corner of the cell. Asbestos materials will be placed on this "pad". As the "pad" is filled, it will be enlarged to accommodate additional wastes. Drainage fabric will be placed over the drainage sand only as the "pad" is enlarged. This method of placing the fabric will minimize the potential for the fabric to be damaged by wind and weather.

Containers (usually 55-gallon drums) will be placed vertically; vertical placement is expected to minimize the potential for damage to the containers and to increase the potential for filling any void spaces between the containers. All waste materials and containers will be covered as required by Section 8 of the Colorado Waste Facility Siting Rules (CCR Title 6, Chapter 1007, Article 2). The fine-grained common materials used to cover the asbestos wastes and containers will likely fill much of the space between the containers.

The first lift of waste materials will likely be completed before the second lift is started. The ramp(s) will be elevated to allow access to the second lift. Asbestos wastes and containers will be transported over the first lift using smaller loaders and other equipment with low ground pressures to minimize the potential for crushing containers placed in the first lift. Construction of the second lift also will likely begin in the southwest corner of the cell. Subsequent lifts will be constructed in the same manner as the second lift.

### 5.3.3 Waste Placement Revisions

Revisions to the method of waste placement may be made based upon on-site experience. Conditions which could result in changes to the proposed method of placement include, but are not limited to, excessive crushing of containers and excessive loss of air-space due to ramp construction. Revisions which may be made include, but are not limited to, constructing additional ramps to minimize travel distances across previous lifts, reducing the number of ramps to reduce loss of air-space, beginning placement of higher lifts before a lower lift is completed, placing waste in several areas (e.g., the northwest and southwest corners of a lift) at the same time, and placing containers on their sides instead of



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vertically. Revisions to the proposed plan for filling the asbestos cell will be discussed with the regulatory agencies prior to their implementation. A written description of the revisions will be provided to the regulatory agencies.

All CSI employees handling asbestos wastes within the fenced asbestos area will be required to wear the appropriate respiratory protection and required environmental and medical surveillance as required by OSHA regulations 29 CFR, Parts 1910 and 1926. Asbestos wastes will be placed in the cell only by CSI employees.

The asbestos cell will be capped following filling to capacity. The cap will consist of two feet of compacted, unspecified soils, an additional 1½ feet unspecified soil, and six inches of topsoil. The cap will be brought up to grades similar to those across the site and revegetated as per the specifications used for constructing the cells at this site.

#### 5.4 Surface Water Control

Surface water will be controlled to ensure that runoff is not allowed to enter the cell's working face and to ensure that water falling on the working face is not allowed to leave the site. Surface water runoff to the site will be controlled through the use of diversion berms. A permanent berm has been constructed on the site adjacent to 88th Avenue. The berm begins a minimum of 65 feet from the property line adjacent to 88th Avenue and will extend along the entire length of the site with the exception of approximately 680 feet in the northwest corner of the site. The berm will route runoff from the site and also act as a visual screen.

CSI is proposing to use temporary berms during filling activities to divert surface water from cells that are open (see Section 5.2.3.7). The use of berms, as opposed to the use of a permanent diversion channel around the entire site, will allow the undisturbed portions of the site to be farmed during operations. This will allow the site to remain compatible with the surrounding property uses. Temporary diversion berms will be constructed prior to cell construction, and following completion of the cell cap and cover, the berm will be removed so the area can be farmed again. The berms will be constructed to route water around all open cells. The berms to be constructed on the initial 40 acres of filling area are shown on Plate 2. The subsequent berms will be located to route runoff from the cells in a similar manner. The berm used to route runoff from cells on

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the southern boundary of the site will be constructed to a minimum height of 3.5 feet. This will control potential runoff from off-site.

It may be necessary to construct berms or ditches around waste materials temporarily stockpiled above ground level on active cells to contain runoff within the cell boundary.

A berm will also be constructed to route water from the asbestos cells. This berm will be maintained during the entire life of the cells and will be removed following completion of capping the cells. The berm will be constructed outside the fencing. The berms will be a minimum of 3 feet in height with 2-to-1 side slopes, with the exception of the berm used to route water from the open cells on the southern portion of the site. It will be a minimum of 3.5 feet in height with 2 to 1 side slopes. All temporary diversion berms will be constructed of unspecified soils. Before each subsequent cell is opened, a new berm will be built or the present berm will be added to. The berms will be inspected monthly and following each heavy rainstorm to ensure their integrity. Berm construction and location will also be noted in the as-built drawing required for each cell.

## 6.0 FACILITY OPERATION

### 6.1 Site Management

#### 6.1.1 Operations Schedule

The facility will generally operate and receive wastes between the hours of 7:00 A.M. and 5:30 P.M., Monday through Friday. There is the possibility that increases in incoming volumes may require crews to work weekends or for extended hours during the week, although this is not anticipated at this time. The facility will be closed for all major legal holidays.

#### 6.1.2 Personnel and Equipment Requirements

The CSI facility will employ approximately twenty people at the site. A more complete job description for each of those listed below is in Appendix L.

- \* Facility Manager
- \* Service Supervisor
- \* Chemist
- \* Lab Technician
- \* Drivers/Operators
- \* Laborers/Technicians

The facility has at its disposal the following equipment or equivalent available for use in operational activities:

- \* D8 Dozer Ripper
- \* 145 627 Scraper
- \* 155 627 Scraper
- \* #16 Blade
- \* 815 Caterpillar Compactor
- \* Kamatsu Backhoe
- \* John Deere Loader/Backhoe
- \* IT Loader 18 w/Fork lift, Boom, Blade, Bucket
- \* Clark Loader
- \* 1 Water Truck - 3000 gallons
- \* Welding Truck
- \* G.D. Air Compressor
- \* Generator Cat Set
- \* Rome Disk
- \* John Deere Disk

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- \* 3" Diaphragm Water Pump
- \* 6" Trash Pump Water
- \* Pump Master Water Pump
- \* 2 Dump Trucks
- \* R 30 Rock Truck

The personnel and equipment requirements may change as the amount of material being disposed at CSI increases.

#### 6.1.3 Facility Inspections and Daily Logs

Visual inspections of the facility will be done on a daily basis with the results of the inspections recorded in a daily inspection log. A copy of the daily facility inspection log is included in Appendix K. The daily inspection will be done by the Facility Manager and/or the Chief Chemist and includes:

- \* General housekeeping
- \* Site security
- \* Fencing
- \* Lighting
- \* Warning signs
- \* Mixing basins
- \* Tank farm
- \* Dust storage
- \* Truck wash pad
- \* Unloading and loading areas
- \* Asbestos storage area
- \* Treatment and solidification procedures
- \* Special handling procedures

In addition to the daily inspections and written log, CSI employees will inspect the safety equipment maintained for personal and company use. The inspections for personal safety equipment will be completed routinely by the owners of the equipment. These include inspections of respirators and other protective safety gear both before and after use. Supervisors will periodically inspect employees' safety gear to ensure proper maintenance.

The daily inspection logs will be kept at the facility for a minimum of three years. The inspection parameters may change as per the needs of the facility and requirements of state and federal regulations.

#### 6.1.4 Recordkeeping

The operations at the CSI facility require an increased number of records as compared to a more typical sanitary landfill. This is, in particular, because of the amount of analytical work required prior to acceptance or rejection of a waste stream. Additionally, adequate records must be kept to track the amount of asbestos materials disposed of at the site. Other operating records commonly kept at sanitary landfills are included at the CSI facility. All records will be made available to the Adams County Board of Commissioners, Tri-County Health Department (TCHD) and CDH upon their request. These forms are included in Appendix K.

##### 6.1.4.1 Non-Hazardous Liquid Waste Recordkeeping

Records will be kept on the amounts of incoming non-hazardous liquid wastes to be solidified. These records will be kept on a daily basis and will include the type of material (analysis results), amount of material (gallons, tons or cubic yards), amount of material following solidification (cubic yards), and the cell the material was placed in. The records will also include the date the material was delivered to the site, solidified and placed in the cell, and the generator of the waste stream. These records will be kept for a minimum of 3 years.

In addition to records of the wastes accepted at the site, written documentation will be kept on wastes not accepted at the site. This documentation will include the application date, generator of the waste, analytical testing results, and reason for the non-acceptance of the waste. The types of analytical recordkeeping required are included in Section 5.1.

Each solidified waste disposal cell location will be surveyed and documented into a permanent record that CSI will retain throughout the life of the facility. A permanent benchmark will be placed on the site in order to correctly locate and survey the cell dimensions and accurately reproduce the results. The survey will include an as-built drawing of each cell with the perimeter of the cell at ground level, the slope of the side walls of the cell, the cell liner construction details, the leachate collection system details, and the total filling depth of the cell. As-built drawings will be submitted to CDH, TCHD, and Adams County within 30 days of construction completion. The cell record will also include the beginning filling date, the date the final load of material was placed in the cell, and the date the cell cap and cover was completed.

#### 6.1.4.2 Analytical Recordkeeping

Recordkeeping requirements for the analytical results of the samples are included in Section 5.1.

#### 6.1.4.3 Asbestos Waste Recordkeeping

Records of the asbestos disposal cells will be kept and retained at the CSI facility for the life of the facility. The permanent record will include:

- \* As-built drawing of the disposal cell with survey coordinates
- \* Quantity of incoming waste
- \* Generator of the waste
- \* Date the waste was received

The cell depth, date of placement of the initial load, date of placement of the final load, total amount of material placed in the cell, and date of the cell cap completion will also be recorded. The records will be submitted to the Adams County Commissioners within 30 days after closure of each cell.

#### 6.1.4.4 Miscellaneous Recordkeeping

Records will be kept at CSI for other miscellaneous operations and occurrences at the CSI site such as:

- \* Personal injury on-site or during the course of work on a CSI project
- \* Spills of materials on-site in excess of 50 gallons
- \* Detection of leachate in the cells
- \* All monitoring records for ground-water sampling
- \* Liner damage and all actions completed to repair the liner
- \* Liner integrity during facility inspections

#### 6.1.5 Site Security

The entire perimeter of the facility operations area and the asbestos cells will be permanently fenced for the life of the facility to prevent unauthorized access. The fence will be a minimum of 8 feet. The main gate will be located on the access road into the facility from 88th Avenue (Figure 2.3). The main gate will be unlocked and kept open during business hours. Keys to the gate will be given to the area fire department in the event of an emergency. The facility operations area will be

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lighted to provide additional security. Nighttime security lighting will include a light pole in the northcentral portion of the facility operations area, a light mounted on the north side of the kiln dust storage shed, and lights mounted on the east and west sides of the administrative office which illuminate the entrance gate. Additional lighting is provided by four lights mounted on the open side of the kiln dust storage shed and flagpole lighting near the entrance gate. All cells opened and available for disposal will also be within a fenced area for safety and security purposes. The entire site perimeter will not be fenced in order to allow the unused portions of the site to be farmed during the life of the site. CSI will also remove the fences from the closed cells if the land is farmed again. If farming in the closed cells is not suitable, the cell will remain fenced. Fencing specifications for the cells will be the same as for the operations facility.

The asbestos disposal cell within the CSI site will be fenced off from the remainder of the site for safety and security reasons. The asbestos disposal areas barrier will include a portion of the site perimeter fence along the north and east boundaries and another fence that will be constructed and maintained around the remaining perimeter of the cell. The asbestos storage area is located within this secure area and as such, does not require a separate barrier, however, when asbestos is stored in the area, the containers are marked (as shown in Section 5.3.2) and the storage area perimeter will be outlined using yellow caution tape and placing warning signs. The fenceline outlining the asbestos disposal area includes two signs on each of the boundaries. The rectangular warning signs on the perimeter fencing will be located within 300 feet of each other and have the minimum measurements of 20 inches by 14 inches. The legend on each sign will conform to standard regulations.

All spacing between any two lines must be at least equal to the height of the upper of the two lines. The storage area is posted on the caution tape with warning signs as outlined above with exception that the posted sign says:

**Asbestos Waste Storage**

instead of "Asbestos Waste Disposal Area".

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Access to the asbestos disposal area will be through a gate along the western fence line of the operations area. Asbestos materials will not be stored in the facility operations area. The storage area for asbestos is located in the northeastern corner of the fenced cell area. CSI will accept friable asbestos only if it is packaged in rigid containers and properly labeled. The gate is open only during unloading and when CSI personnel are working in the asbestos disposal area.

Additional security measures may be taken to protect employees, visitors and equipment at the site as is deemed necessary by the CSI Facility Manager.

## 6.2 Control of Nuisance Situations

The nuisance situations created by the type of disposal taking place at the CSI facility are substantially less than those found at typical sanitary landfills. There is no waste being disposed of at the CSI facility which could cause a vector problem, and as such, vector, bird and rodent control measures are not necessary. Litter problems are not addressed in this section for the same reason. The conditions that are addressed in this section are dust, odor, fire prevention, and controlling water in open cells.

### 6.2.1 Dust Control

Dust will be created at the site because of the use of gravel access roads and the use of the solidification agents. Dust on the site roads will be controlled by watering the roads with the water truck. Water for dust control will either be purchased, pumped from water collected in the "clean" portions of the cells, or taken from a well (Sections 5.2.3.2 and 5.4). In addition to the use of water, the site supervisor may also choose to place calcium chloride on the roads for dust control. Application of these materials is discretionary and dust control is the responsibility of the Facility Manager.

The solidification agent dust is controlled by storing the agent in a building enclosed on three sides. There will not be any solidification agent stored outside the boundary of the building. Care will be taken in transporting the solidification agent between the storage building and the mixing basin to minimize spillage of the agent. Any solidification agent that is spilled and exposed to potential wind will be cleaned up and either replaced in the storage building or put in the mixing basin. The



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area between the storage building and the mixing basin will be watered as necessary to control dust. A fourth wall on the east side of the storage building will be added if other controls prove to be ineffective.

The winds at the site will not create the same types of blowing litter problems as typical sanitary landfills. Therefore, there is no wind speed parameter set for shutting down operations. Should wind cause a dust problem at the site, it is the Facility Manager's responsibility to determine whether operations will be halted until the wind subsides. CSI will obtain a fugitive dust emissions permit from the CDH prior to beginning operations at the site.

#### 6.2.2 Odor Control

Odors are not a frequent problem at the CSI facility, although control of odors is addressed in this section for the occasional times the need arises. If a particular waste stream creates an odor problem, it is immediately placed in the basin, mixed with the solidification agent and removed to the disposal cell. If for some reason the material cannot be solidified immediately, it will be placed in an enclosed holding tank in the tank farm to limit escape of the odors. Materials that are placed in the disposal cell with a persistent odor will be covered with the amount of soil necessary to alleviate the problem. The amount of cover soil used is left to the discretion of the operator and may vary with materials. Typically, cover soil is not required during placement of material in the cells, and it is possible that odor problems will be controlled through the placement of additional solidified material over the odorous material. The odors typical at the site are expected to dissipate within a few hundred feet of the cell.

#### 6.2.3 Fire Prevention

The CSI facility is within the boundaries of the Bennett fire District (BFD). The BFD will be notified of the types of services offered at CSI and the potential fire hazards involved, prior to beginning operation of the facility. The BFD will also be supplied with a blueprint of the facility showing the location of the various offices, the laboratory, and maintenance shop as well as being notified about the hazards associated with the materials stored in each (such as lab chemicals and cleaning agents). Keys to the facility gate will be kept with BFD to

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allow entry during the hours CSI employees are not on-site. CSI will conduct a site tour to familiarize BFD firemen with the facility and will make every effort to keep BFD informed about the site's progress.

Although there will be no burning of waste on-site, each piece of heavy equipment used at the site will have a fire extinguisher on-board to use in the event a small fire occurs. Equipment operators will be trained in the use of the extinguishers. Other fires can be extinguished by excavating the burning area and covering it with soil.

#### 6.2.4 Controlling Water in Open Cells

Water will accumulate in cells from precipitation. This water will be segregated into water touching the working face and water not touching the working face (see Section 5.2.3.7). If weather conditions permit, runoff from the working face will be evaporated to the atmosphere. If water has not evaporated within 72 hours from the time it fell, it will be collected, solidified, and disposed of into the cells. Water touching the working face will be analyzed 2 times per year for RCRA hazardous characteristics including TCLP List, corrosivity, ignitability, and reactivity. The results will be evaluated and may dictate the disposition of the water. Clean runoff, that has not touched the working face, will be pumped if it has not evaporated within 72 hours and will be used for dust control or will be solidified.

#### 6.3 Health and Safety

The operation of the CSI facility and the services provided by CSI make it necessary for the employees to have an understanding of health and safety requirements. This understanding or knowledge is gained in part by attending training programs and through field experience. It is the intention of CSI to hire qualified individuals to fill positions. When qualified individuals are not available to fill a particular position, the hiree will be trained for the position and closely supervised during an initial probationary period.

CSI has in place formal Contingency Plans and Safety Rules and Guidelines which cover emergency operations as well as everyday operations at the site.

The Contingency Plan is a preparedness and prevention plan designed to minimize the possibility of fire, explosion, or unplanned sudden or non-sudden release of potentially dangerous,

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hazardous, or environmentally threatening materials. The plan describes the action which will be taken by company personnel in response to an emergency. A list of emergency coordinators, state and local authority contacts, responsibilities, and procedures is included in the plan.

The Safety Rules and Guidelines are designed to prevent accidents, emergencies, and unsafe conditions. CSI believes that safety is essential for the smooth operation of any job and expects employees to contribute to the program by knowing and following all safety procedures.

Below are the training and health monitoring programs in place for employees of CSI:

#### Operator Training:

- \* 40 hr. OSHA training
- \* 8 hr. OSHA update once a year
- \* D.O.T. certification
- \* Yearly physical
- \* Yearly driving test
- \* Monthly safety meetings: spill control procedures, SCBA use, confined space entry procedures, etc.
- \* Special classes: asbestos workers class, recognizing and identifying hazardous materials, fire fighting training, etc.

#### Field and Lab Technicians Training:

- \* 40 hr. OSHA training
- \* 8 hr. OSHA training update once a year
- \* Yearly physical
- \* Monthly safety meetings
- \* Special classes

#### New Employees:

- \* 40 hr. OSHA training
- \* D.O.T. certification
- \* Physical
- \* Driving test
- \* 3 months on-the-job training with experienced operator or field tech

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- \* Orientation on Safety Rules and Guidelines and Contingency Plan
- \* New employee's role in emergency response and clean up procedures
- \* Special classes

The yearly physical will include monitoring for exposure to Polychlorinated Biphenyls (PCBs).

CSI employees are trained to use the proper safety gear according to the particular hazard associated with the task being undertaken. During many instances, CSI employees are required to wear EPA-Level C safety gear. This consists of:

- \* A half-face respirator with the proper cartridge
- \* Tyvek or Saranex protective suit
- \* Rubber gloves
- \* Rubber boots
- \* Hard hat with a face shield
- \* Eye protection

CSI employees are responsible to ensure that their safety gear is adequate for the particular task and that the safety gear is in working order at all times. Respirators will be initially fitted by an individual experienced in the use and fitting of respirators and the CSI employee will be shown the proper techniques used to care for the equipment. Respirators are used during many of the operations at the facility including:

- \* Mixing kiln dust and liquids
- \* Placing kiln dust in the mixing basin
- \* Unloading asbestos waste containers
- \* Placing asbestos containers in cells
- \* Unloading liquids to the mixing basin
- \* Handling hazardous waste and materials
- \* Other tasks as required by supervisor

The overall health and safety of the employees is of prime concern to CSI and is the responsibility of the Facility Manager. Periodic inspections of safety equipment and health and safety training programs will be completed by the Facility Manager, Chief Chemist or Supervisor.

Personnel (including truck drivers) not trained in the handling of hazardous materials will be excluded from participating in cleanups or other operational activities which may pose a risk to health and safety. CSI drivers and response personnel will

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cooperate fully with the local fire, police and environmental agencies and their representatives.

Health and safety is the responsibility of the Project Supervisor during a project being completed off-site. The Project Supervisor must be trained and experienced in health and safety procedures. A new hiree with little or no experience in the field will not be sent to complete any field work without adequate supervision.

## 7.0 ENVIRONMENTAL MONITORING

Monitoring for leachate, ground-water contamination and overall process monitoring will be completed at the CSI facility on a periodic basis. Methane gas, although typically monitored at sanitary landfills, will not be monitored at CSI because the operation and the materials disposed of do not form the gas. All monitoring is to be conducted to ensure the facility is performing as designed.

### 7.1 Leachate Monitoring

The leachate collection system constructed in the base of the solidified material disposal cells will be used to monitor the formation of liquids in the cells. Each cell at the facility will be checked for the formation of liquids on a monthly basis following installation of the leachate collection well and removal system but prior to final capping. The combination of the liner system, and the fact that none of the solidified waste disposal cells are closer than a minimum 30 feet from the top of clay in the sump to any measured ground-water level, makes it very doubtful that any leachate would ever impact the natural system. If liquids are in a sump in a removable quantity, they will be pumped or bailed out and solidified. Monthly monitoring for the presence of liquids will preclude the possibility of any liquids remaining on the liner for any substantial length of time. Monitoring of the leachate collection system will be done on a quarterly basis, corresponding to the scheduled ground-water monitoring quarters, following final capping of the cell. Final capping is defined as the date that the 2-foot of compacted clay and the 1.5-feet of unspecified soils has been placed on the cell and verified. Prior to final capping of each cell it is likely that water will be collected as a result of precipitation events. Water found in the leachate collection system prior to, and including, the two consecutive scheduled ground-water monitoring quarters immediately following final capping of the cell will not be defined as significant leachate (Section 7.4.1). The leachate collection well and removal system is discussed in Section 5.2.3.4 and closure of the wells is discussed in Section 9.3.

The underdrain system for the mixing basin will be monitored on a monthly basis to ensure that if leachate were to form, it would not remain on the liner for any substantial period of time. The underdrain system is shown in the mixing basin design specifications on Plates 9 and 10.

## 7.2 Ground-Water Monitoring

The ground-water monitoring system was installed prior to placement of fill at the site and includes 12 monitoring wells. Plate 2 shows the locations of the monitor wells.

The wells are placed and constructed to monitor three situations present at the site:

- 1) Perched ground water: Wells 101-108 were completed into perched water zones on the edges of the site as shown on Plate 2. The water in these zones are hydraulically separated and chemically unequilibrated from each other. The wells provide detection information if a release from outer cells were to occur.
- 2) Alluvial ground water: The western portion of the site includes water at shallower depths related to an alluvial system. Monitor wells 201 and 202 were installed into this shallow ground water.
- 3) Denver Aquifer ground water: Well 301 was completed to a depth of 78.4-feet. Since well 301 contained water from the Denver Aquifer, well 302 was placed approximately 2000 feet east and was also completed into the Denver Aquifer at a depth of 89.8-feet.

The location of these monitor wells appears sufficient to determine if a release has occurred. Because the materials CSI disposes of are typically lighter than water or water soluble, the wells will be screened to include the upper zone of saturated material. In the perched zones, the saturated interval will likely be less than 10 foot in thickness and in these cases the entire interval will be screened. The slotted length of pipe was placed to approximately 3 feet above the top of the uppermost saturated interval in case of water level fluctuations. A typical diagram of the construction of a ground-water monitor well is included in Figure 7.1.

Temporal data was collected by sampling all wells a minimum of 4 times prior to beginning filling at the site. This data will be used in statistical analyses of subsequent monitoring episodes.

The wells will be sampled in accordance with Environmental Protection Agency (EPA) sampling protocols. Proper chain-of-custody procedures will be followed during each sampling event.

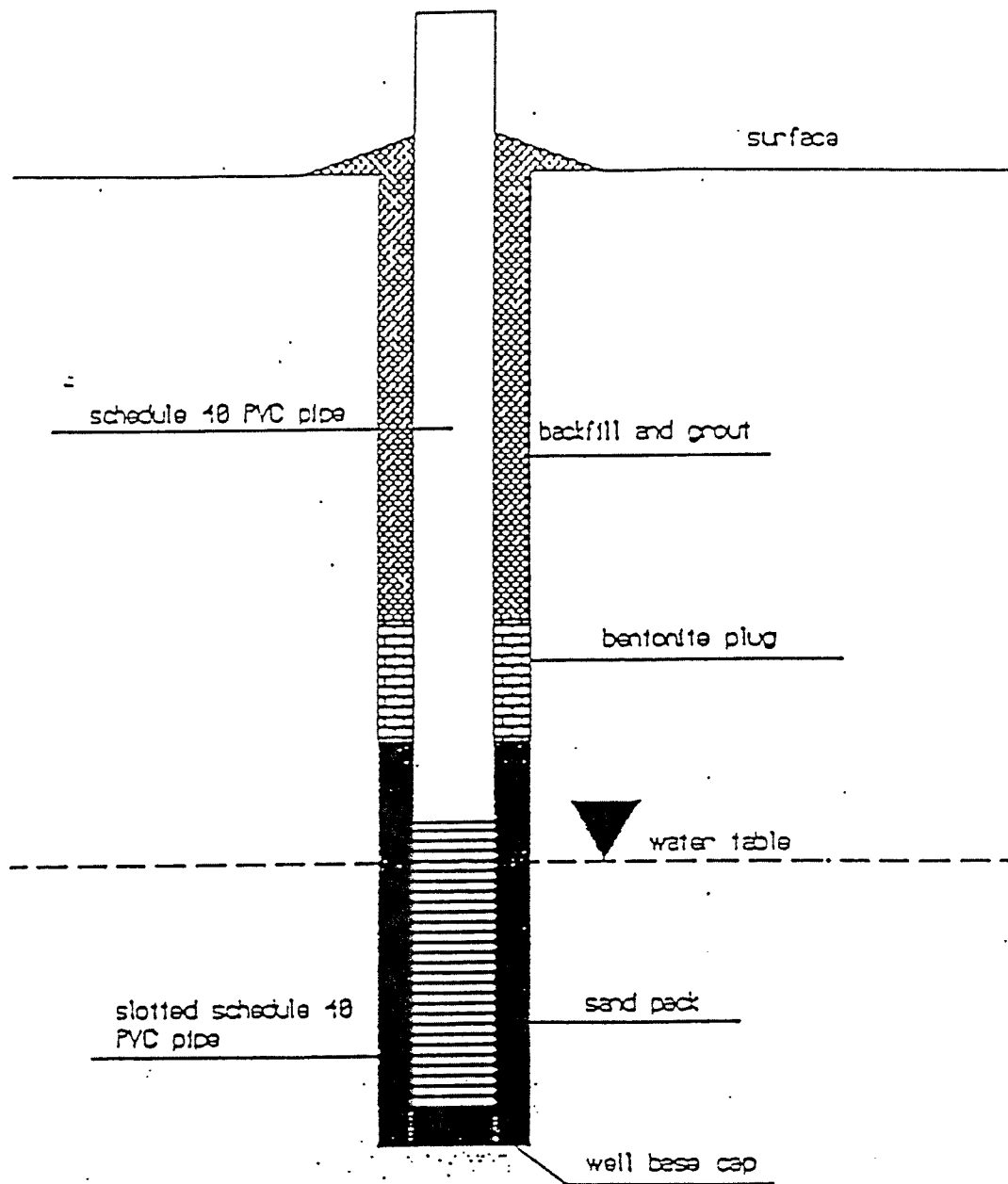


FIGURE 7-1

Conservation Services, Inc.  
 TYPICAL GROUND WATER  
 MONITOR WELL CONSTRUCTION

Industrial Compliance Inc.  
 511 Orchard Street  
 Golden, Colorado 80401





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All water samples will be collected and analyzed for the following parameters four times per year to gather background water-quality data:

- Arsenic
- Barium
- Cadmium
- Calcium
- Sodium
- Chloride
- Ammonia
- Specific Conductance (field)
- Total Organic Halogen (TOX)
- Magnesium
- Potassium
- Sulfate
- Total Dissolved Solids (TDS)
- Chemical Oxygen Demand (COD)
- Total Organic Carbon (TOC)
- Lead
- Iron
- Alkalinity
- Nitrate-Nitrite
- pH (field)
- Phenols

The operator of the facility shall make justifiable changes in the monitoring plan as needed if the appropriate regulatory agencies would like to amend the sampling parameter list. Once background data is established using the above parameter list, a reduced parameter list for quarterly monitoring may be established with regulatory approval.

### 7.3 Operational Monitoring

Site inspections and the operational monitoring at the facility are completed on a daily basis and the results are entered into a logbook as outlined in Section 6.1.3.

As an additional set of operational monitoring criteria, CSI will complete the following:

- \* Two times per year, for five years following approval of the revised D & O, a sample of High Organic Content Waste (HOCW) will be collected and analyzed to determine the effectiveness of the solidification process on HOCW. HOCW will be defined on a selection

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process as follows: the sample selected will correspond to scheduled deliveries of known waste streams that contain approximately 2% to 50% oil, grease, or organic materials. The onsite laboratory will notify the CSI chemist when sufficient amounts of this waste stream exist in the mixing basin. A sample will be taken from the entire batch of this waste in the basin (app. 20,000-25,000 gallons) both prior to solidification and after solidification. The samples will be analyzed for TCLP (all compounds on the TCLP list), Oil and Grease, Total Organic Carbons, and Total Organic Halides. This HOCW study will be completed as a condition of the Adams County Permit.

- \* A solidified waste sample will be collected and a geotechnical analysis will be performed to determine whether leachates are released under pressure. This test will be completed annually during the first two years of operations.
- \* A sample of solidified material will be collected from a disposal cell and will be analyzed using the Toxicity Characteristic Leachate Procedure (TCLP) test. This analysis will be performed semi-annually during the initial 5 years of site operations.

The results of these tests will be evaluated and forwarded to the appropriate regulatory agencies.

In addition, the waste analysis may be amended to include other analyses if required by the EPA. The waste analysis plan may be further modified if it is determined by CSI, or appropriate regulatory agencies that the proposed analysis is inadequate to detect all hazardous materials.

The temporary berms constructed will also be inspected to ensure they are effective. Monitoring will be done to check for potential erosional damage and breeches in the construction. This will be completed on a monthly basis and after any substantial precipitation event.

## 7.4 Negative Monitoring Results

### 7.4.1 Definition of Negative Monitoring Results

Negative monitoring results for ground-water monitor wells at the CSI facility are defined as two situations. The first situation is if water is found in monitor wells that have previously been dry.

The second situation defined as negative monitoring results is taken from 40 CFR, Part 264.97(h). This section discusses statistical determinations relating to background sampling analytical results for hazardous waste facilities. Although CSI is not a hazardous waste facility, these methods, or similar methods of equal validity, is a generally accepted standard and also a conservative measure for the CSI facility. Because there is no up-gradient vs. down-gradient ground water system at the site, the method listed under Part 264.97 (h)(1)(i) is not appropriate. Part 264.97 (h)(1)(ii) and Part 264.97 (h)(2) allows for the use of equivalent statistical methods to allow for site-specific ground-water conditions. A statistical method negotiated with, and approved by the appropriate regulatory agencies will be used to define a negative monitoring event. The background data used to analyze the parameters will be collected from four monitoring episodes prior to filling operations at the facility.

Additionally, the leachate collection wells in the cells are monitored and negative monitoring results are defined as the detection of significant leachate in the wells. It is, however, very likely that precipitation events will result in waters being collected in the sumps before they are covered with solidified materials. The removal of these waters will continue during the life of the cell and the post-closure period but notifiable monitoring will begin only after the sump can no longer be visually inspected.

Leachate detected in the underdrain system of the mixing basin also will be defined as negative monitoring results.

Any visible amounts of asbestos fibers released to the atmosphere will be defined as negative monitoring results.

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#### 7.4.2 Proposed Action in the Event of Negative Monitoring Results

If, at any time during the life of the site or during the post-closure period of the site negative monitoring results are obtained, the appropriate regulatory agencies will be notified within 5 working days of determination of negative monitoring results. The operator will request to meet with these agencies to discuss the results. If necessary, confirmation sampling and testing will be conducted. If the negative monitoring results are confirmed, the operator will evaluate the data and present a plan of action to the county and the state within 30 days. The plan will include specific actions to be undertaken and a time schedule required to correct the situation. The plan will be implemented on approval by the appropriate regulatory agencies. Any situations that pose an immediate threat to human health or the environment will be corrected as quickly as possible.

If leachate is detected in the leachate collection system, the appropriate regulatory agencies will be notified within five days from the date of detection. The leachate will be analyzed and probable source of origin will be interpreted. The suitability for onsite solidification and disposal will be subject to regulatory approval. Upon analysis, a plan of action will be submitted to the appropriate regulatory agencies which will include the amount of leachate, determination of whether the leachate represents a long-term or short-term problem, and corrective action to be taken. Regardless of formal requests by the regulatory agencies, Subtitle C corrective action procedures may be used if applicable.

If leachate is found in the underdrain system of the mixing basin, the basin will be immediately emptied and inspected for cracks or leaks. The cracks or leaks will be sealed prior to returning the basin to use. County Zoning and Certificate of Designation Regulations, State Health Department Rules and Regulations, Federal Rules and Regulations (including Subtitle C, if applicable), and any other rules and regulations by appropriate agencies that have jurisdiction at the time negative monitoring results occur, shall all be consulted to determine the appropriate procedures and corrective actions to be used.

Negative monitoring of the asbestos storage area or disposal cell will be corrected immediately. Any leaking containers detected in the storage area will be immediately placed in the cell and covered with a minimum of 6 inches of cover material. If leaks are detected emitting from the cell, an adequate amount of cover will be placed over the containers to abate the release.

## 8.0 CONSTRUCTION QUALITY ASSURANCE AND CONTROL

Construction quality control will be used to ensure that facility designs are implemented and the cells are built in accordance with the plan. This section will focus on the materials used to construct the solidified waste disposal cell liners and the caps for both the solidified waste disposal cells and asbestos waste disposal cell. More specific details of the construction Quality Assurance/Quality Control (QA/QC) are found in the construction specifications in Appendix Q.

### 8.1 Material Specifications

Different materials are used to construct the liners in the solidified waste disposal cells. These include clay for the base and side slope liner and cell cap; a synthetic liner on top of the base clay liner; material for a capillary barrier beneath the clay liner; drainage material to ensure proper drainage to the leachate collection system in each cell; a filter fabric to ensure the drainage material remains open for drainage; an unspecified soil to increase the potential for revegetation on the cell caps and protect the clay cap; and topsoil for revegetation of the cap. The specifications for these materials are outlined in Section 5.2.3.3 and in Appendix Q.

### 8.2 Excavation Inspections

To ensure that excavations for the cells are completed in accordance with the design standards, and that conditions met are consistent with those described in this Design and Operations Plan, excavation inspections will be made for each cell. The inspections will be conducted by an independent consultant who will then produce a written report that includes all observations made in each newly excavated cell. Copies of the excavation report will be submitted to both Adams County and CDH. The excavation inspections will be completed prior to placement of the liner in the solidified cells and prior to placement of any asbestos materials in the asbestos disposal cell. In addition, the configuration of the cell will be measured by a registered professional land surveyor, with the results included on an as-built diagram.

### 8.3 Clay Liner and Final Cell Cap Inspections

To ensure that the clay liners and cell caps for the solidified waste cells are constructed in accordance with the specifications contained in this report, an independent soils and testing firm will be employed to observe and test the materials prior to placement and following compaction. The program will consist of initial material classification tests for every 3000 cy of clay material placed in the liner and for every 2000 cy of clay material placed in the cap. This type of testing will ensure that the materials placed are suitable for their intended use. In addition, compaction and moisture content testing will be conducted on the compacted clay liners and cover. Specific requirements for the construction and testing can be found in the Specification in Appendix Q. Initial filling of the cells over the lined portions will not be allowed without an engineering report from the construction quality control contractor indicating the materials have been placed in accordance with the specifications noted in this report. Any portions of the clay liner left exposed to the elements for more than 60 days will be scarified, recompacted, and retested to ensure they meet the specifications. Copies of the engineering reports will be provided to Adams County and CDH.

The asbestos cells only require certification that a minimum of 1.5 feet of compacted, unspecified soils and 6 inches of topsoil have been placed on the cap. Testing procedures specified for the solidified waste disposal cells are not required to be met when capping the asbestos cell.

### 8.4 As-Built Diagrams

Each cell will be required to have an as-built diagram completed and submitted to the regulatory agencies within 30-days following completion of construction. The diagram will include:

- \* Total cell depth
- \* Surface dimensions of the cell
- \* Side slope grades
- \* Cell base grades both laterally and longitudinally
- \* Surface water diversion berms construction and location

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## 9.0 CLOSURE AND POST-CLOSURE REQUIREMENTS

### 9.1 Closure

Closure at the facility will be completed during filling of the final disposal cell and will conform to all State and Federal regulations. CDH and the Adams County Commissioners will be notified at least sixty days in advance of the final closure date in addition to placing signs at the facility entrance to notify the public of closure. The buildings at the site may be removed or saved for reuse upon approval by the appropriate agencies. The tanks at the site may also be removed for reuse. The mixing basins at the site will be demolished and placed in the last cell prior to closure or they will be decontaminated, demolished, and placed in a suitable demolition landfill off-site. The decontamination will be completed using a non-hazardous cleansing agent and a high pressure wash. Any wash water generated will be properly disposed of.

Foundations that may remain at the site will be removed and placed in the final cell or, if they are not contaminated, removed to a demolition landfill.

The drum storage area components will be excavated and placed in the final cell, if contaminated. Uncontaminated components will be properly disposed of or reused. This will include the sand bed, synthetic liner and overlying soil bed. Any berms surrounding the tank farm will be removed. If there is visible soil staining, the soil will be placed in the final cell. If there is no visible staining, the soils will be graded to match the contours of the site.

The final cell will be capped and revegetated following removal of the materials in the operations area. Water balance calculations are included in Appendix O. It is anticipated that the final site configuration will be very similar to the area's appearance prior to operations. The topography will approximate the same contours and slope at similar grades to the existing site, though the entire site elevation will be raised approximately 4 feet from the initial elevations as noted on Plate 1. Following capping of the final cell, the remaining disturbed portions of the site will be brought to similar grades, revegetated and post-closure maintenance procedures will begin. Plate 11 shows the approximate topography of the closed site. The soils excavated from the cells will be spread over the unused portions of the site and feathered to meet the existing

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topography on the western site boundary. The fill will result in grades being reduced from the steepest at approximately 6 percent to 3 percent.

The total amount of soil that will be available after cell construction is expected to be minimal. Any additional soil will be sold or removed off-site during the life of the facility, or placed in the area designated on Plate 1. If additional soil for clay construction is needed, it may be imported from off site from the adjacent property to the south or other property in the area. Prior to such importation, the appropriate agencies shall be consulted on what approvals are needed for such importation. Final grading plans shown on the grading plan may be modified depending on the availability of soils at closure and potential post-closure uses. A final grading plan will be submitted upon closure for review and approval of appropriate agencies.

Soils will be spread only after harvest has been completed so interference with farming activities will be minimized. The topsoil will be stripped and stockpiled prior to spreading the excavated soil. After spreading is complete, the topsoil will be replaced and the farming activities will continue. It is possible that the additional soil will require a change from the normal soil preparation. Soils will be tested by an agricultural lab to determine the proper types and amounts of fertilizer to be used for farming and revegetation prior to seeding.

## 9.2 Reclamation and Revegetation

All disturbed areas of the site will be reclaimed in accordance with this closure plan. The cells will be capped and reclaimed following completion of filling. In this way, the site will remain as close as possible to its original state. The reclamation process includes the procedures specified in this section for topsoil storage, fertilization, seed bed preparation, and seeding. CSI reserves the right to use the land for any uses that may be approved by the appropriate agencies.

During the excavation of the cells, a minimum of 6 inches of topsoil will be removed and stockpiled separately from the other excavated materials. The stockpile location will depend on the cell to be excavated, but it will generally be on undisturbed ground in the vicinity of the excavated cell. It will be placed as not to disturb the CSI or the farming operations. The topsoil will be stockpiled for varying lengths of time per cell. Cells



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that are expected to remain open for periods exceeding six months will require their topsoil stockpiles to be revegetated with native grasses. This will minimize the potential for erosion.

Interim reclamation will be employed until all portions of the property have been filled; final reclamation will be undertaken once final grades are achieved for an area. The initial 40 acres contains the facility area, the asbestos cell, and four waste cells; the balance of the site, except for topsoil and overburden stockpiles and excess overburden deposition area on western portions of the property, will remain in agricultural production. As other areas are excavated for cell use and taken out of agricultural production, previously filled areas will receive interim revegetation or final revegetation depending upon whether final grades have been achieved. Generally, approximately 40 acres of property will be disturbed at any one time and will not be in crop production, lying fallow, and will not be revegetated with either interim or final revegetation. The balance will be in topsoil and overburden stockpiles, excess overburden deposition area and previously filled areas which have received interim or final revegetation, and in unexcavated and unfilled areas still being farmed.

As areas are excavated, topsoil and overburden will be stored in piles and receive interim revegetation if they will be left undisturbed for more than 6 months. Overburden may also be exported offsite in trucks that bring in waste, or sold off for projects that need fill material. Since the exact final grades will be determined by the amount of overburden available, final grading and revegetation may not occur until the end of the life of the facility on all or portions of the property. Both interim and final revegetation will be an ongoing process, and annual evaluations and a final evaluation will be made to determine if areas need to be revegetated during the site's operation and prior to final closure.

Interim and final reclamation will proceed according to the standards outlined below.

\* Interim revegetation will consist of seeding as follows:

| <u>Grass</u>         | <u>% of mix</u> | <u>PLS/Acre Seeding Rate</u> |
|----------------------|-----------------|------------------------------|
| Pubescent Wheatgrass | 100             | 9.0                          |

All rates above are for drill seeding; rates should be doubled when broadcast seeding.

- \* All topsoil and overburden stockpiles that will be left exposed for 6 months or more, all disturbed areas intended for later grading prior to final grading, overburden deposition areas that aren't at final grade, and all temporary and permanent drainage channel areas shall be seeded as outlined above. For areas larger than 10 acres in size, 1/2 ton per acre of hay, straw, or barnyard manure should be employed as mulch to protect the soil from erosion.
- \* For interim revegetation, all areas that were subject to traffic, internal haul routes, or other compaction in excess of natural conditions, shall be scarified to a depth of 4-6 inches prior to seeding. The same scarification should also occur for final revegetation prior to topsoil replacement, except that over fill areas the scarification should only be undertaken after the minimum of 18 inches of overburden has been placed over any filled areas where the clay cap is in place.
- \* Upon completion of any area where final revegetation is proposed, topsoil will be replaced over an area at a minimum thickness of 6 inches over a minimum 18 inches of unspecified material, over a minimum 2-foot thickness compacted clay cap. The ground surface beneath the topsoil will be prepared prior to placement of the topsoil, although some consolidation of the surface is to be expected due to the equipment used for revegetation and to natural processes during precipitation.
- \* Final revegetation will consist of seeding as follows:

| <u>Grass</u>               | <u>Rate</u> | <u>% of mix</u> | <u>PLS/acre</u><br><u>Seeding Rate</u> |
|----------------------------|-------------|-----------------|--|
| Pastura Blue Grama         | 1.5         | 20              | 0.3                                    |
| Vaughn Side Oats Grama     | 4.5         | 25              | 10/25                                  |
| Arriba Western Wheat Grass | 8.0         | 25              | 2.0                                    |
| Goshen Prairie Sandreed    | 3.5         | 30              | 1.05                                   |
| Prairie Clover             | Trace       |                 |  |

All above rates are for drill seeding; rates should be doubled when broadcast seeded. Prior to final revegetation, soil tests will be undertaken to determine fertilizer needs. Barnyard manure may also be employed both for mulch and to replace part of the fertilizer need.

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- \* If possible, prior to final revegetation, especially in the overburden deposition areas and for all large areas (100+ acres) proposed for revegetation at one time, either milo or sterile sorghum should be planted between May 15 and June 30 as a cover crop at a rate of 10 pounds per acre. Drill seeding of the final revegetation seed should then occur between November 1 and April 1 when the soil is not wet or frozen. If a cover crop has not been employed for areas larger than 10 acres in size, 1/2 ton per acre of hay, straw, or barnyard manure should be employed as mulch to protect the soil from erosion.
  
- \* Weed control to prevent undesirable plants such as Canadian Thistle, Mush Thistle, Knapweed (all varieties), Leafy Spurge and Russian Thistle shall be controlled by cutting and chemical spraying. For interim revegetation areas, mowing should be employed several times during the summer months when weeds reach a height of approximately 18 inches. For final revegetation, an initial application of "Glean" or similar chemical shall be used, then mowing as needed until a satisfactory stand of grass is established and is in the 5-leaf or larger stage of growth.

Upon completion of filling each cell, it will be capped and revegetated. The cap will be constructed according to the specifications included in Section 5.2.3.6 and Appendix Q of this report. The entire cap, with the exception of the topsoil, may be placed immediately upon reaching cell capacity or in phases as filling progresses. The topsoil will be placed immediately prior to fertilizing and seeding.

This revegetation plan is according to guidance from the Soil Conservation Survey. Modifications to these reseeding specifications can be made, if necessary, following the inspection of progress on the initial cell revegetation.

### 9.3 Post-Closure Monitoring

The ground-water monitoring wells installed at the site will be sampled and analyzed for the parameters specified in Section 7.2 for a period of ten years following site closure. Site post-closure monitoring will take place following completion of the final cap and cover of the last cell. If, at any time during the post-closure period, negative monitoring results are confirmed, the actions proposed in Section 7.4 will be undertaken.

In addition to the ground-water monitoring well sampling, the leachate collection wells in each cell will be monitored on a quarterly basis for a period of 10 years following cell closure. If any leachate is found to exist, CSI will notify CDH and Adams County within 5 working days of discovery and request a meeting with the agencies. The leachate will be analyzed for the same parameters as the ground-water monitor wells to determine a potential source. A plan of action will be presented to the state which may include increasing the frequency of monitoring and a work plan which includes volumes to be pumped and analytical results. The leachate will be pumped and transported to the mixing basin for solidification and disposal with the approval of the county. The county may determine that additional analysis of the leachate is warranted to determine its suitability for onsite disposal. If this determination is made, the operator shall perform such additional analysis prior to solidification. If leachate is continually being generated following 6 months of monitoring, CSI will notify CDH and Adams County and prepare a corrective action plan to remediate the problem. The cells are not expected to produce any leachate following placement of the final cap and a 10-year monitoring period is sufficient to detect any potential problems with the cell. If the cells remain dry during this monitoring period, the leachate collection wells will be abandoned to allow redevelopment of the site. Leachate post-closure monitoring results will be submitted to the appropriate agencies.

### 9.4 Post-Closure Inspections and Maintenance

Post-Closure inspections at solid waste landfill sites are typically conducted to detect possible settling of the refuse and cracking occurrences in the clay caps. The solidified materials disposed of in the cells at the CSI site have much less potential for significant settling and therefore settlement inspections will be maintained on an annual basis during the post-closure period.

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The caps of the cells will be inspected for cracking, erosion and condition of the vegetation on a semi-annual basis with one of the inspections being completed in the late spring when thaw and runoff is most likely to cause damage. The erosion potential for the area is minimal as evidenced by the soil loss calculations completed and included as Appendix P. Any damage detected will be promptly repaired.

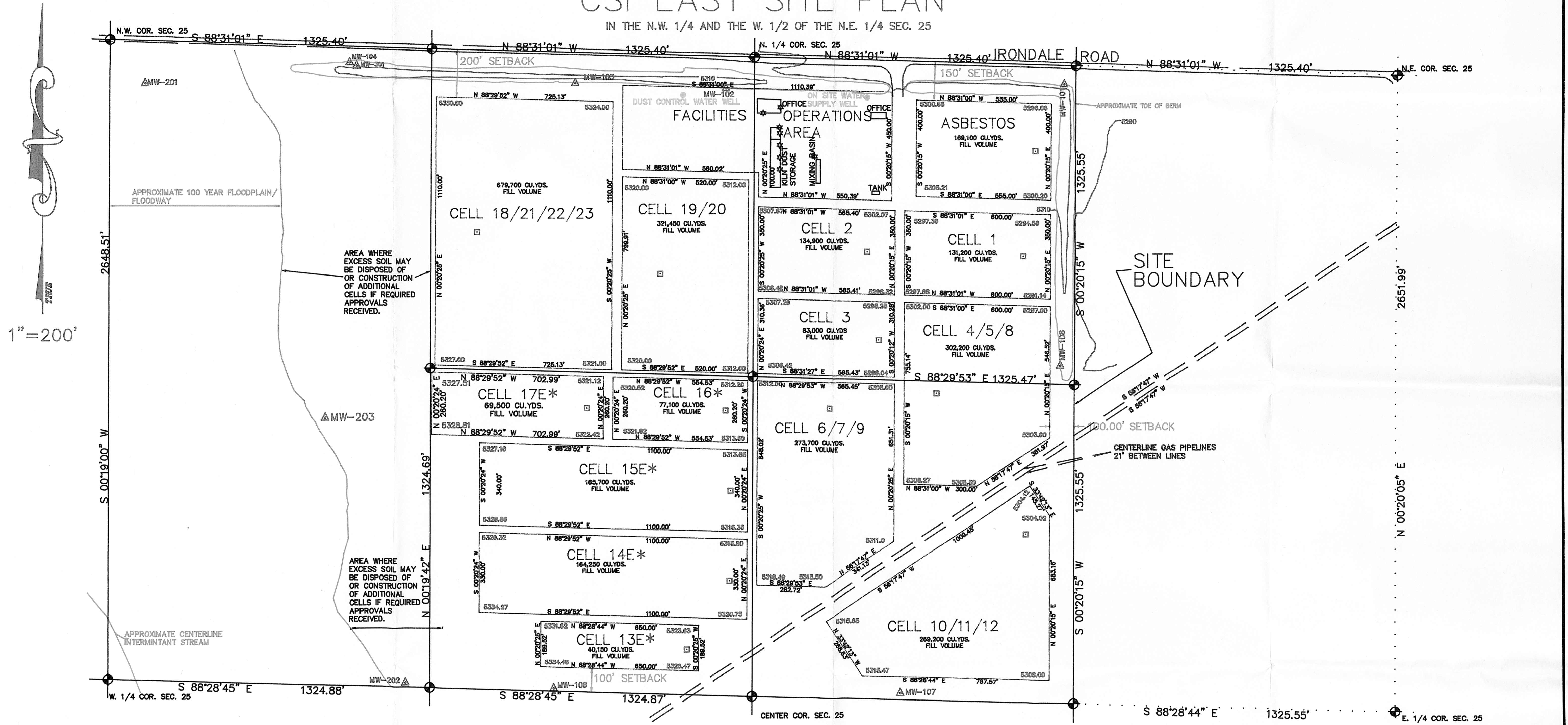
#### 9.5 Projected Post-Closure Land Use

Future land use at the CSI site will be determined with the completion of a revised Adams County Comprehensive Plan. There are no specific redevelopment plans existing at this time although the type of disposal that has occurred at the site does not preclude redevelopment, as is sometimes the case at typical sanitary landfills. Geotechnical analyses completed on the materials suggest that the materials are suitable to support typical foundation loads of 1000 to 2000 pounds per square foot. The materials placed in the cells will support loads typically associated with construction of light commercial or industrial buildings. Construction of buildings for open space and recreational uses is also feasible. Methane gas generation, severe slopes, and settling problems are not likely to occur at this site, making it possible to develop the land in a number of ways following the site closure. Adams County, TCHD, CDH, and local governing bodies will be notified of post-closure land use and will be involved in determining whether that use could impact the integrity of the closed facility.



# CSI EAST SITE PLAN

IN THE N.W. 1/4 AND THE W. 1/2 OF THE N.E. 1/4 SEC. 25

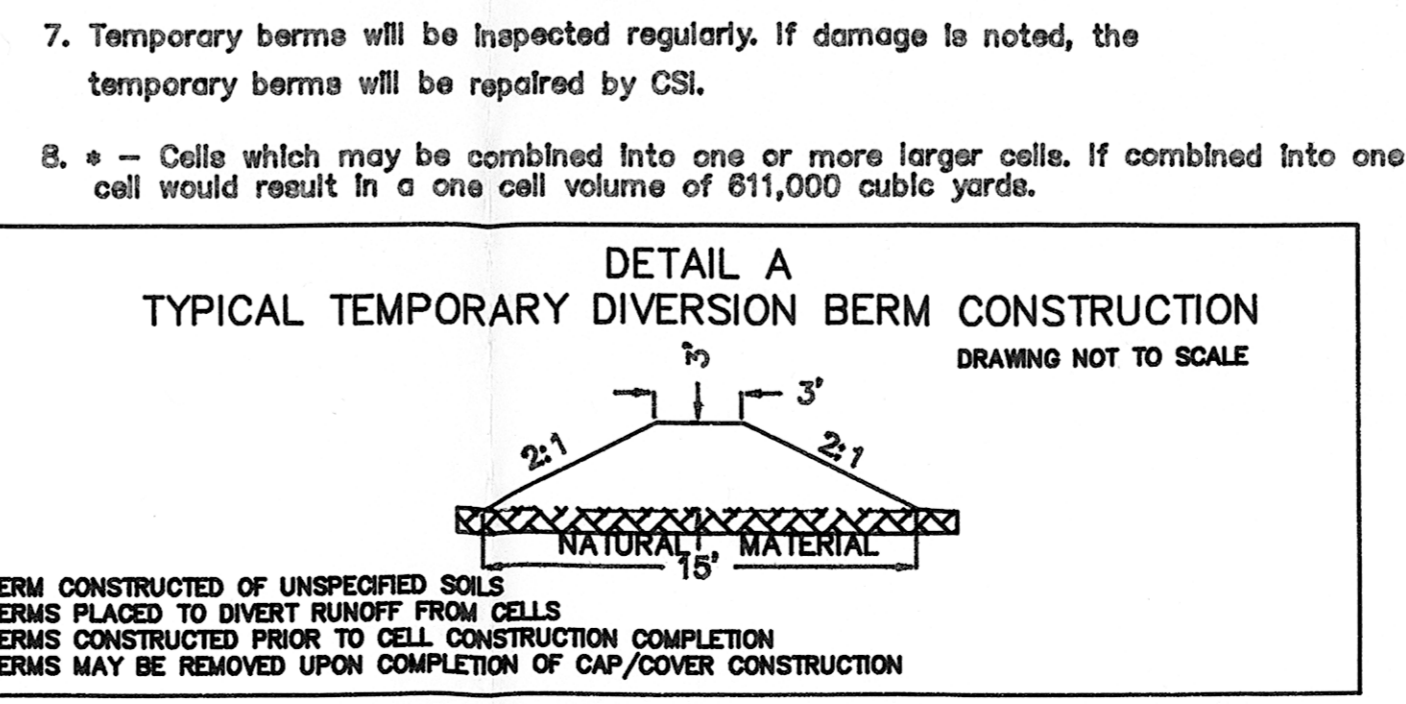


1" = 200'

**SYMBOLS:**

- DENOTES APPROXIMATE LOCATION OF SUMP IN CELL
- ▲ DENOTES MONITOR WELL AND NUMBER
- ELEVATIONS SHOWN IN CORNERS OF CELL ARE EXCAVATION ELEVATIONS
- ☆ DENOTES LIGHT POLE OR LIGHT ATTACHED TO BUILDING/STRUCTURE

1. Monitor Wells are located and installed to monitor three situations:
  - Perched zones of water. - 100 Series Wells
  - Alluvial ground water. - 200 Series Wells
  - Denver aquifer water. - 300 Series Wells.
  - See text for specifics on each well.
2. Wells were sampled 4 times prior to filling at the site to obtain representative background information regarding water quality.
3. Temporary berms will be used to route runoff from open cells.
4. Temporary berms will be constructed and graded to produce runoff grades of approximately 1 percent.
5. Temporary berms will be revegetated to reduce erosion potential.
6. Typical temporary berm construction is shown in Detail A.



7. Temporary berms will be inspected regularly. If damage is noted, the temporary berms will be repaired by CSI.
8. \* - Cells which may be combined into one or more larger cells. If combined into one cell would result in a one cell volume of 611,000 cubic yards.

TOTAL SOLIDIFICATION CELL VOLUMES - 2,712,050 CU.YDS.  
(With Combined Cells 13-17 - 2,806,350 CU.YDS.)  
TOTAL FRIABLE ASBESTOS CELL VOLUME - 169,100 CU.YDS.  
TOTAL SITE VOLUME - 2,881,150 CU.YDS.  
(With Combined Cells 13-17 - 2,975,450 CU.YDS.)

**ADCO CONSULTANTS, INC.**  
2090 EAST 104TH AVENUE, SUITE 305  
THORNTON, COLORADO 80233  
(303) 450-2204

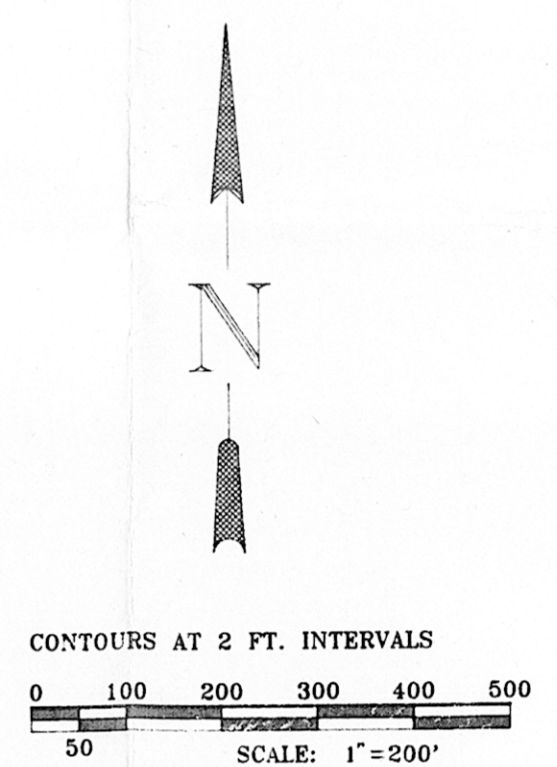
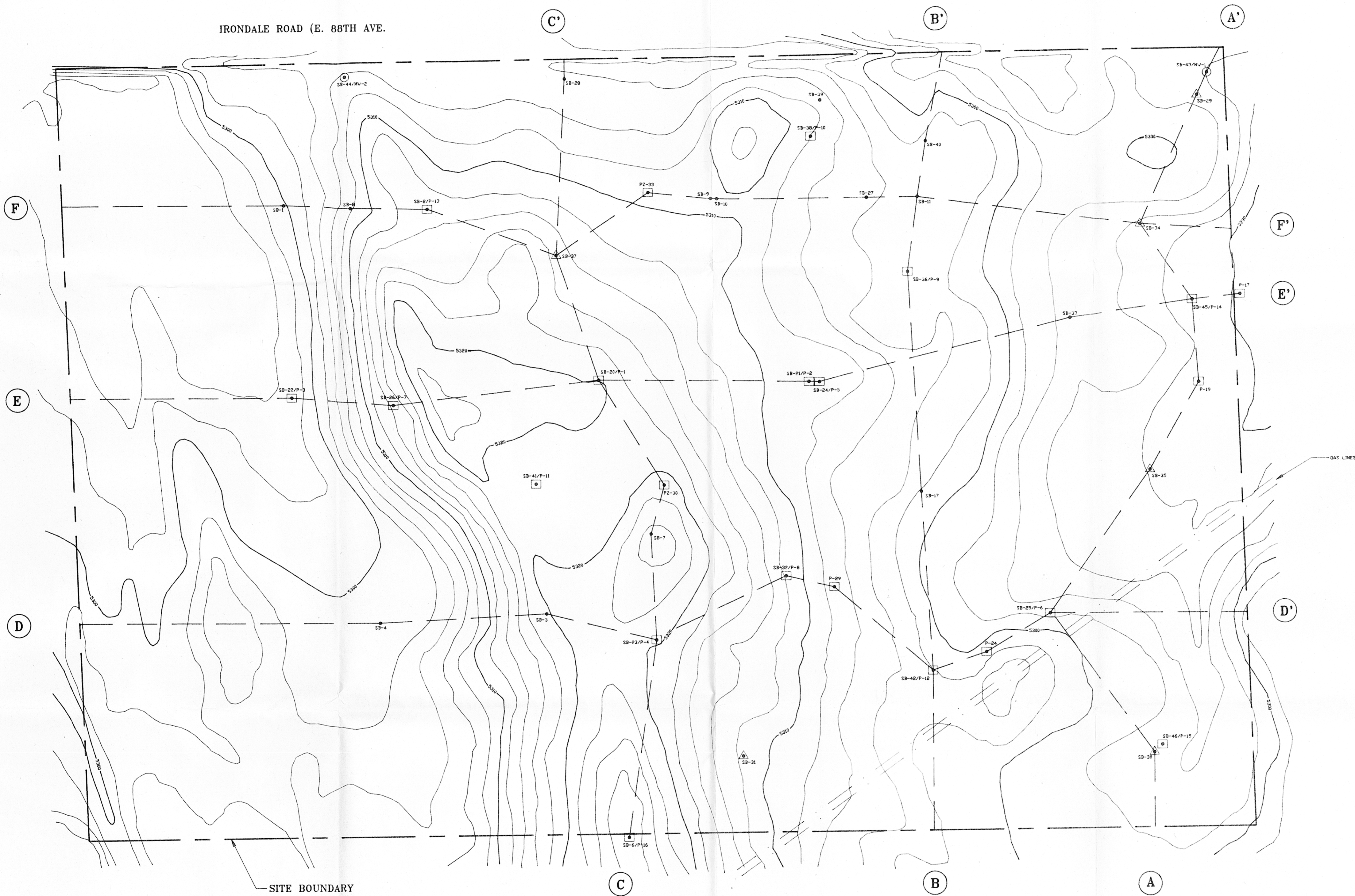
**R.W. BAYER & ASSOCIATES**  
1333 WEST 120TH AVENUE, SUITE 109  
WESTMINSTER, COLORADO 80234  
(303) 452-4433

FILE NAME: PLATE1

|                     |                        |
|---------------------|------------------------|
| DRAWN BY: G.A.B.    | REVISED: 05/14/92      |
| CHECKED BY: R.N.F.  | DATE: 09/18/91         |
| JOB NO.: R.B.-91115 | DRAWING NO.: PLATE 1,2 |
|                     | SHEET 1 OF 1           |



IRONDALE ROAD (E. 88TH AVE.)



- LEGEND**
- SB-# = SOIL BORING
  - SB-#-#/#/#-# = SOIL BORING COMPLETED AS A MONITOR WELL
  - SB-#/#/#-# = SOIL BORING COMPLETED AS A PIEZOMETER
  - SB-#-# = PACKER TEST LOCATION

NOTE:  
#SOIL BORINGS SB-5, SB-10, SB-13, SB-14,  
SB-15, SB-16, SB-18 AND SB-19 WERE DRILLED  
OUTSIDE THE PROPOSED SITE BOUNDARY.

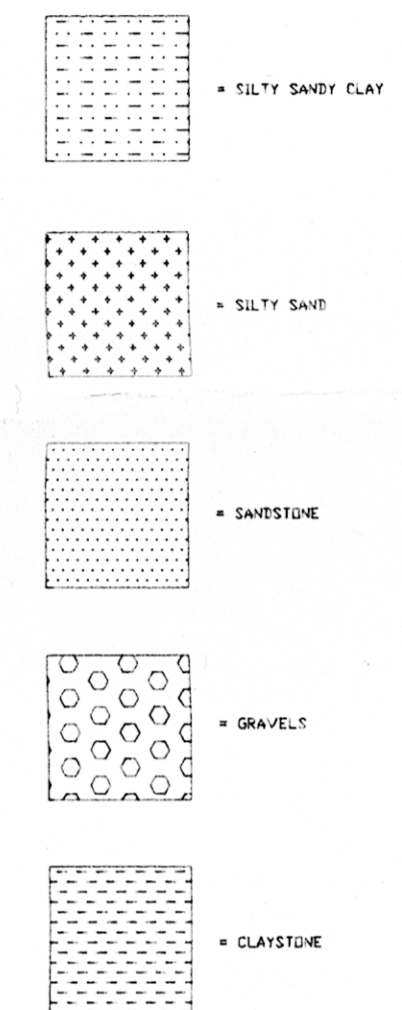
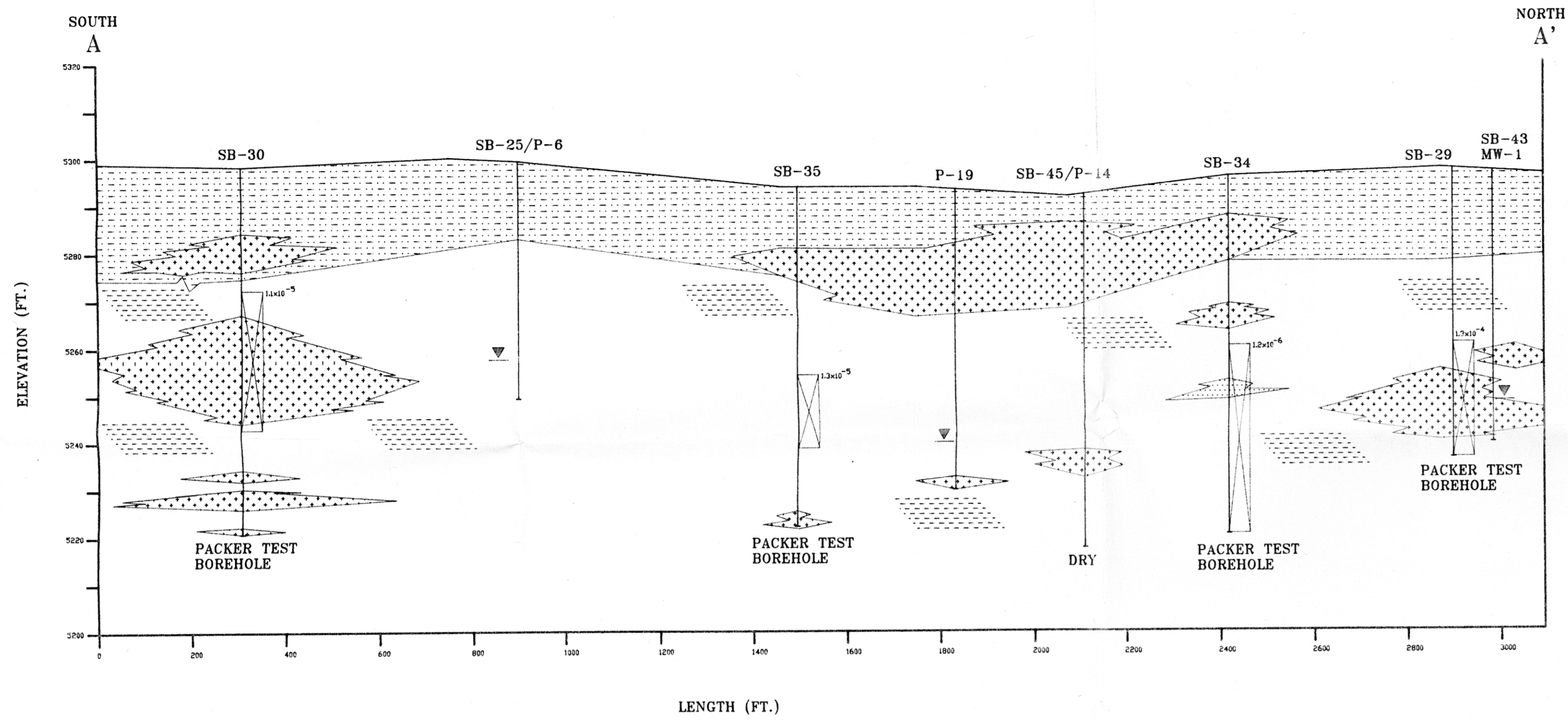
SITE BOUNDARY

**INDUSTRIAL COMPLIANCE INC.**  
1746 COLE BLVD.  
BLDG. 21 SUITE 300  
GOLDEN, COLORADO 80401

**PLATE 3**  
**SOIL BORING & GEOLOGIC CROSS SECTION LOCATIONS**

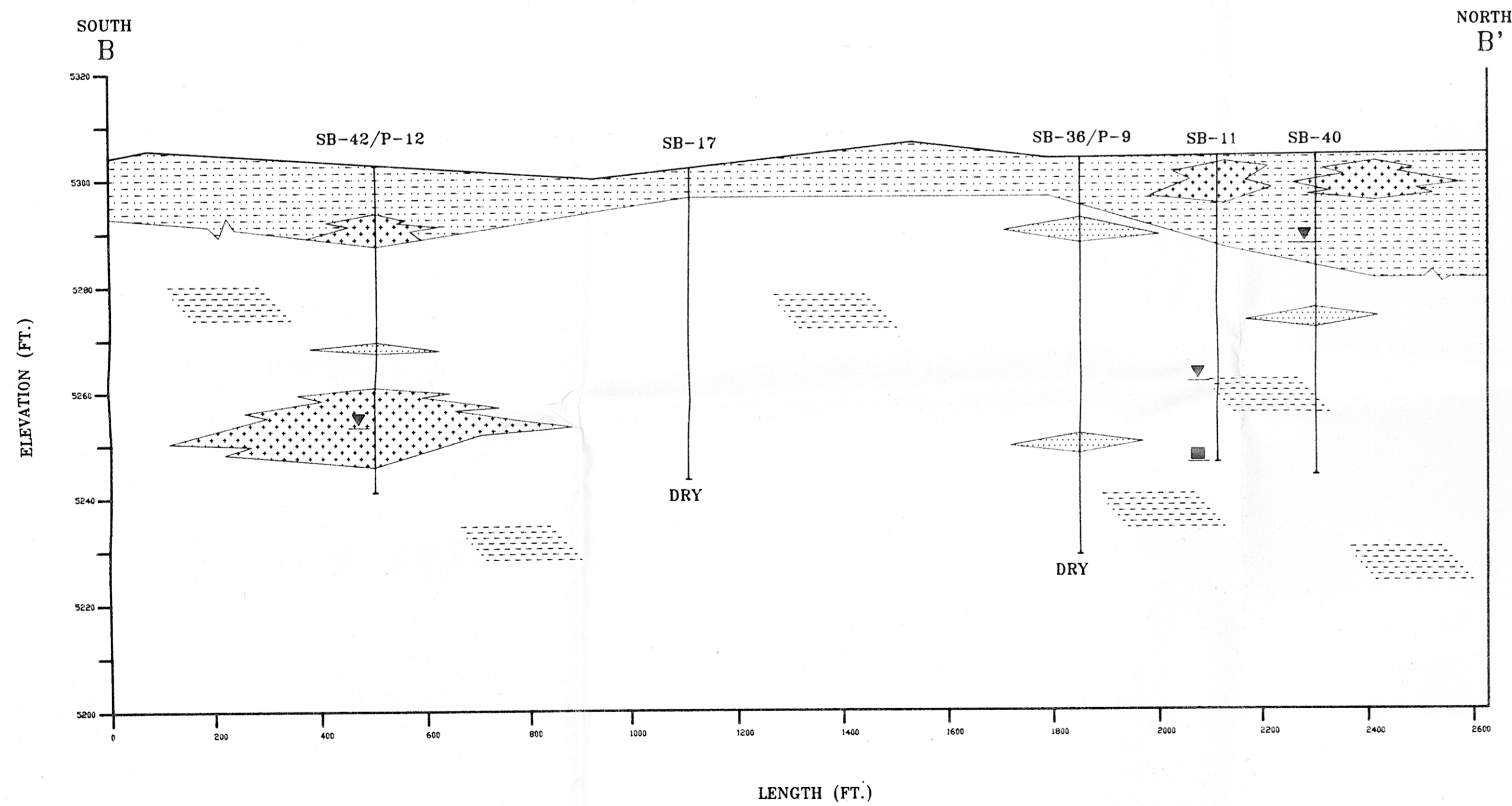
|   |                         |
|---|-------------------------|
| CLIENT: CONSERVATION SERVICES, INC.       | DATE COMPLETED: 9/88    |
| PROJECT NO: 2-2560                        | FILE NAME: 2-2560P3     |
| GENERATED BY: INDUSTRIAL COMPLIANCE, INC. |                         |
| DRAWN BY: W.H.T. APPROVED BY: M.M.        |                         |
| DATE: 03/05/91                            | DATE: 03/05/91          |
| REVISED BY: W.H.T./M.M.                   | REVISED BY: W.H.T./M.M. |
| 03/06/91                                  |                         |





- ▽ STABILIZED WATER LEVEL
- DRY AT TIME OF COMPLETION
- ⊗ PAKER TEST INTERVAL AND ASSOCIATED PERMEABILITY (cvs)
- SB = SILE BOREING
- P = FIELDMETER
- MW = MONITOR WELL
- INFERRED GEOLIGIC CONTACT

NOTE:  
 \*STIL BOREINGS SB-25, SB-35, SB-34, AND SB-35  
 \*ARE USED FOR PAKER TESTING. THEREFORE  
 WATER LEVEL INFORMATION AFTER DRILLING  
 WAS NOT USED.

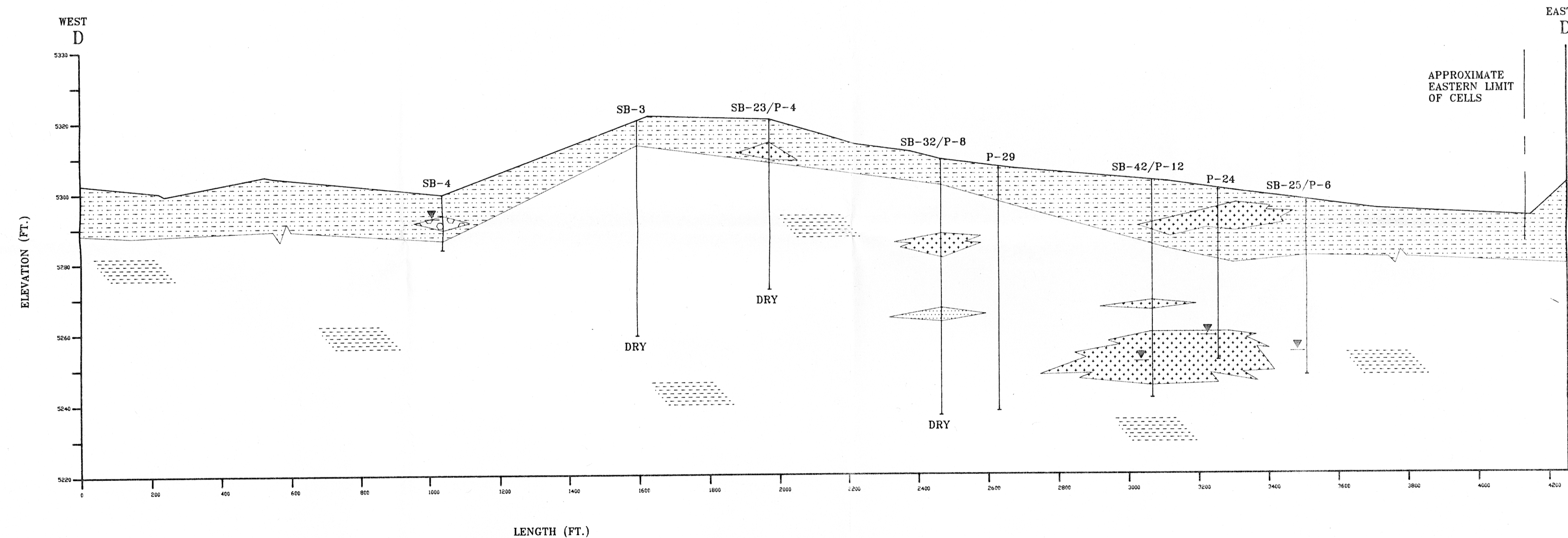
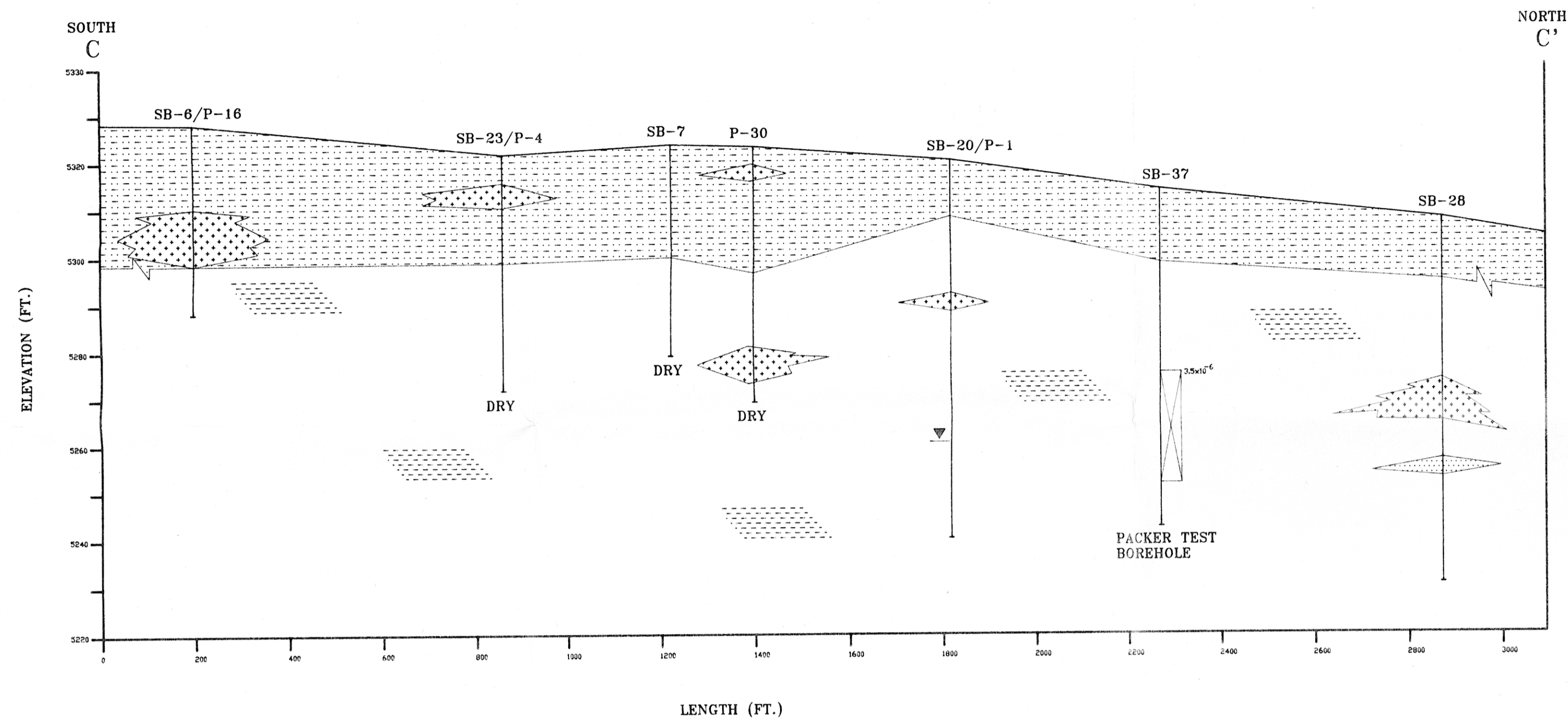


INDUSTRIAL COMPLIANCE INC.  
 1746 COLE BLVD.  
 BLDG. 21 SUITE 300  
 GOLDEN, COLORADO 80401

**PLATE 4**  
**GEOLOGICAL CROSS SECTIONS A-A', B-B'**

|   |                      |
|---|----------------------|
| CLIENT: CONSERVATION SERVICES, INC.       |                      |
| PROJECT: SOLID WASTE DISPOSAL SITE        |                      |
| PROJECT NO. 2-2560                        | DATE COMPLETION 9/88 |
| GENERATED BY: INDUSTRIAL COMPLIANCE, INC. |                      |
| DRAWN BY: W.H.T.                          | APPROVED BY: M.M.    |
| DATE: 03/05/91                            | FILE NAME: 2-2560P4  |
| REVISOR BY:                               | DATE:                |
| 09/06/91                                  | W.H.T./M.M.          |
|   | W.H.T./M.M.          |





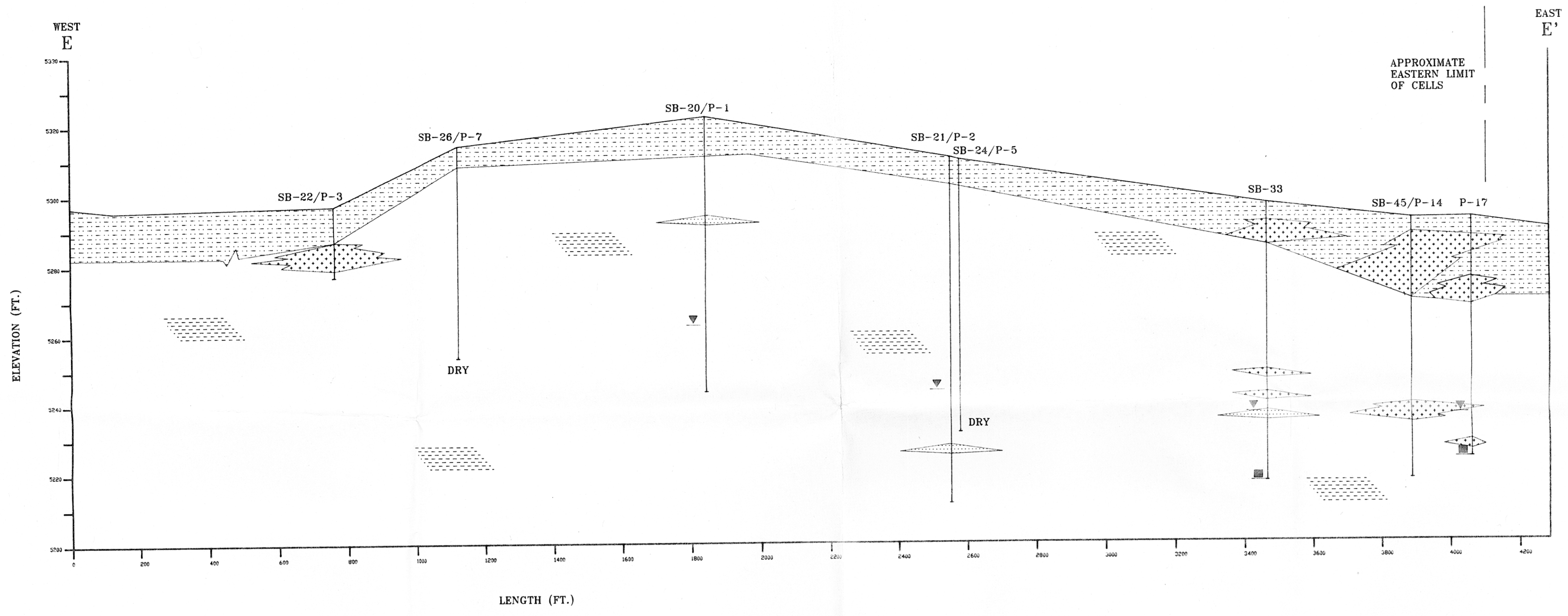
- = SILTY SANDY CLAY
  - = SILTY SAND
  - = SANDSTONE
  - = GRAVEL
  - = CLAYSTONE
  - = STABILIZED WATER LEVEL
  - = DRY AT TIME OF COMPLETION
  - =  $1.2 \times 10^{-6}$   
= PACKER TEST INTERVAL AND ASSOCIATED PERMEABILITY (cm/s)
  - SB** = SOIL BORING
  - P** = FIELD METER
  - MW** = MONITOR WELL
  - = INFERRED GEOLOGIC CONTACT
- NOTE: SOIL BORINGS SB-29, SB-30, SB-34, AND SB-35 WERE USED FOR PACKER TESTING; THEREFORE, WATER LEVEL INFORMATION AFTER DRILLING WAS NOT USED.

INDUSTRIAL COMPLIANCE INC.  
1746 COLE BLVD.  
BLDG. 21 SUITE 300  
GOLDEN, COLORADO 80401

**PLATE 5**  
GEOLOGICAL CROSS SECTIONS C-C', D-D'

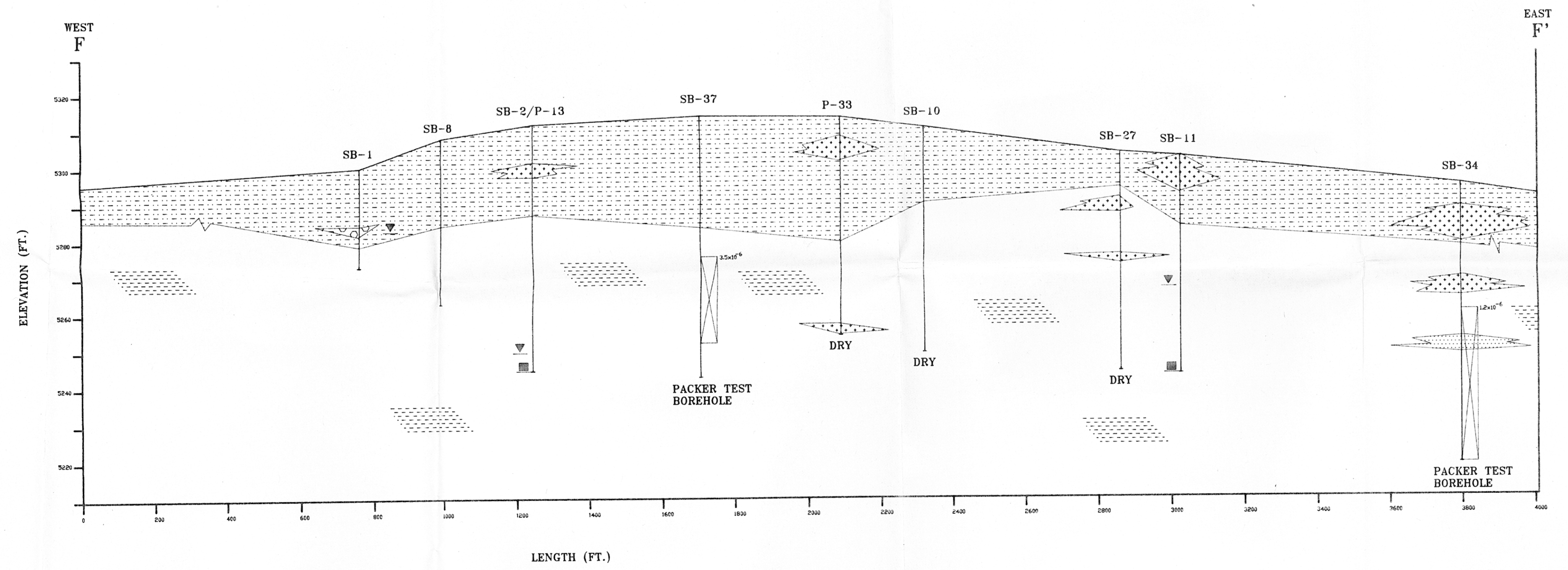
|                                     |           |                      |          |
|-------------------------------------|-----------|----------------------|----------|
| CLIENT: CONSERVATION SERVICES, INC. |           | DATE COMPLETED: 9/88 |          |
| PROJECT: SOLID WASTE DISPOSAL SITE  |           | FILE NAME: 2-2560-5  |          |
| PROJECT NO: 2-2560                  |           | DATE: 03/05/91       |          |
| DRAWN BY: W.H.T. APPROVED BY: M.M.  |           | DATE: 09/06/91       |          |
| REVISOR:                            | REVISION: | DATE:                | REVISOR: |
|                                     |           |                      |          |
|                                     |           |                      |          |





- = SILTY SANDY CLAY
- = SILTY SAND
- = SANDSTONE
- = GRAVEL
- = CLAYSTONE
- = STABILIZED WATER LEVEL
- = DRY AT TIME OF COMPLETION
- = PACKER TEST INTERVAL AND ASSOCIATED PERMEABILITY (CM/SEC)
- SB = SOIL BORING
- p = PIEZOMETER
- MW = MONITOR WELL
- = INFERRED GEOLOGIC CONTACT

NOTE: WELL BORINGS SB-20, SB-21, SB-22, SB-24, SB-26, SB-33, SB-45, P-17, AND P-17 WERE USED FOR PACKER TESTING. THEREFORE, WATER LEVEL INFORMATION AFTER DRILLING WAS NOT USED.



INDUSTRIAL COMPLIANCE INC.  
1746 COLE BLVD.  
BLDG. 21 SUITE 300  
GOLDEN, COLORADO 80401

**PLATE 6**  
GEOLOGICAL CROSS SECTIONS E-E', F-F'

|                                     |                      |                                    |                      |
|-------------------------------------|----------------------|------------------------------------|----------------------|
| CLIENT: CONSERVATION SERVICES, INC. |                      |                                    |                      |
| PROJECT: SOLID WASTE DISPOSAL SITE  |                      |                                    |                      |
| PROJECT NO: 2-2560                  | DATE COMPLETED: 9/88 | DRAWN BY: W.H.T. APPROVED BY: M.M. |                      |
| DATE: 03/30/91                      | REVISOR: V.H.T./M.M. | DATE: 09/26/91                     | REVISOR: V.H.T./M.M. |
| 03/30/91                            | V.H.T./M.M.          | 09/26/91                           | V.H.T./M.M.          |



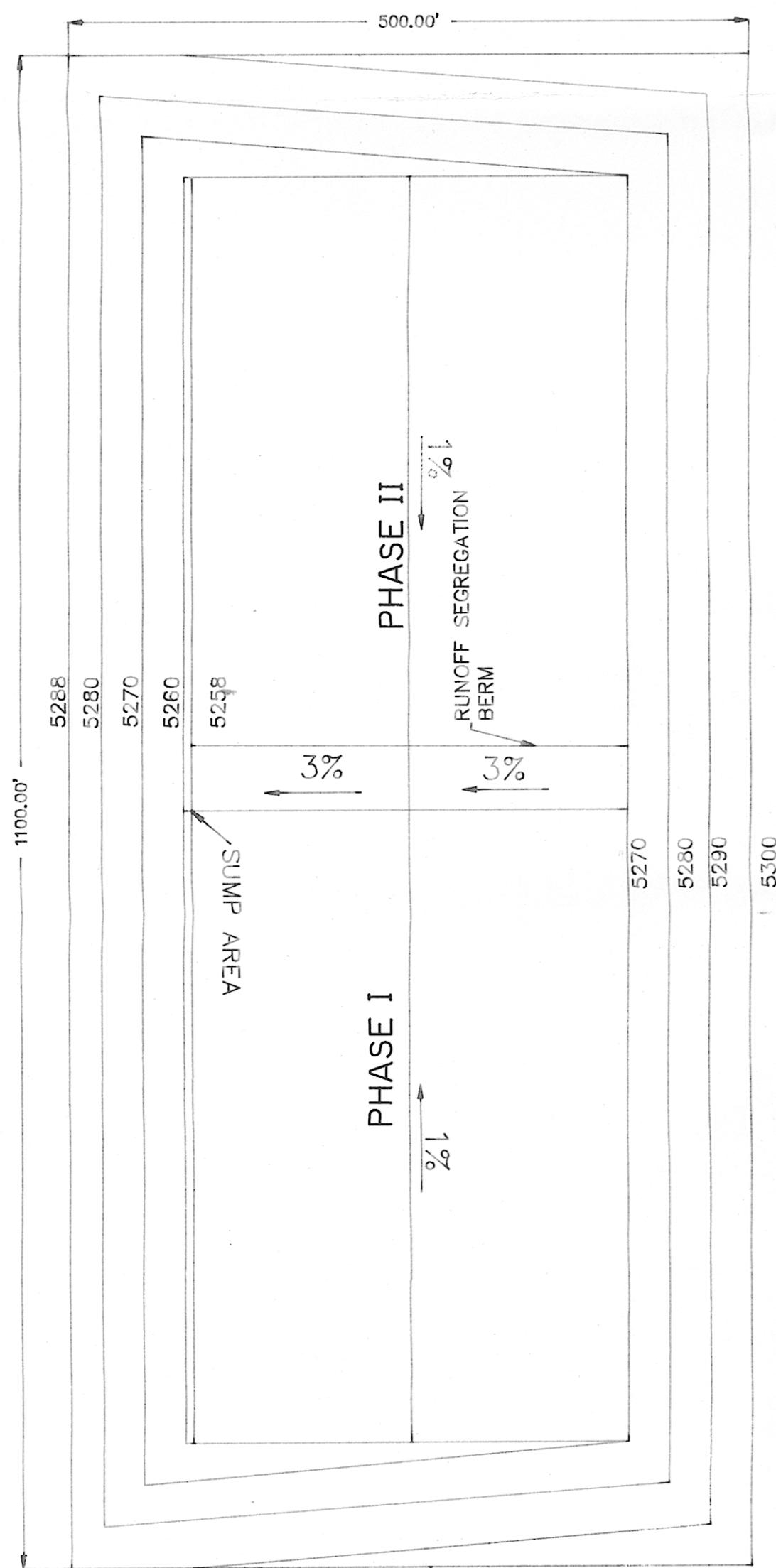
# CSI EAST SOLIDIFIED WASTE DISPOSAL CELL DESIGN

IN THE N. 1/2 OF SECTION 25, T.2S., R.64W.

**PLATE 7 NOTES:**

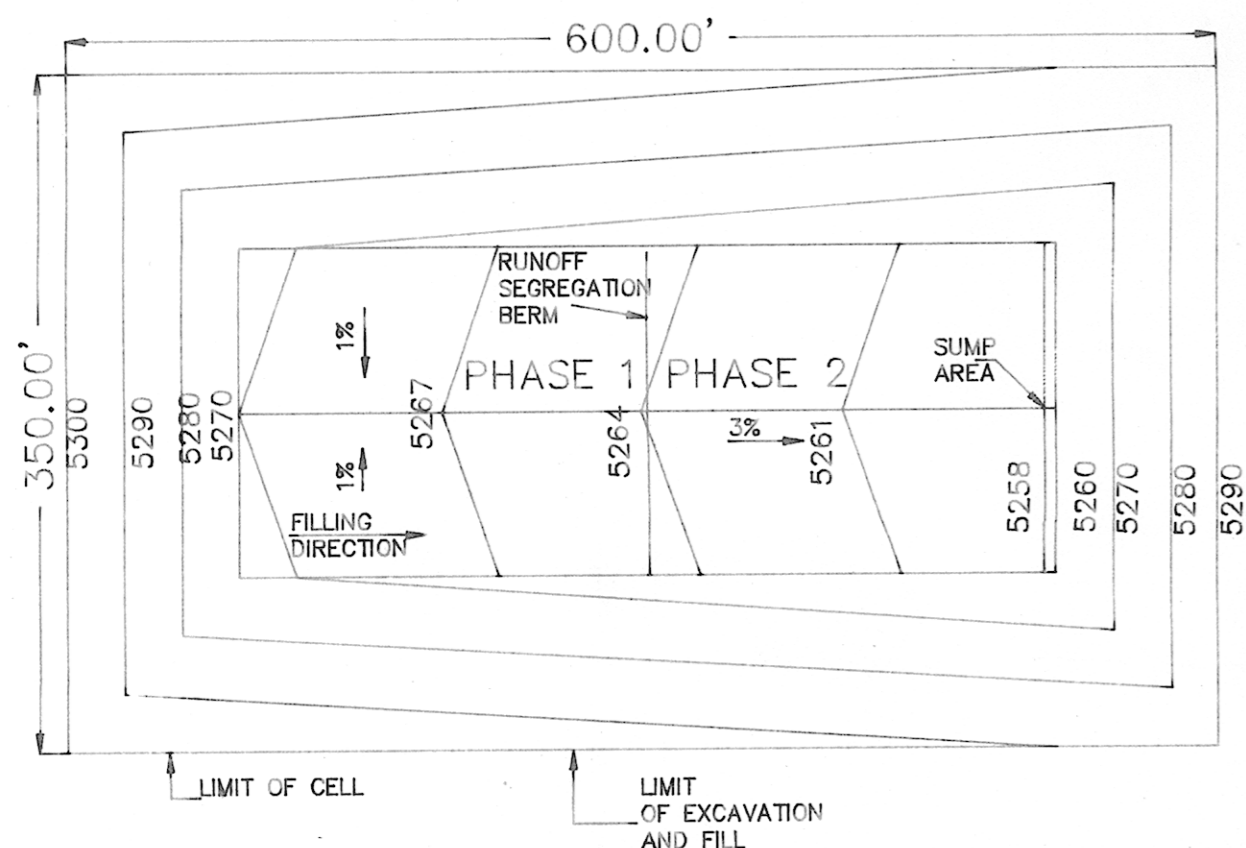
- 1) Cell designs are typical for all the solidified waste disposal cells.
- 2) Cell dimensions and depths will vary according to site conditions.
- 3) All cells will have 3 to 1 side slopes.
- 4) All solidified waste disposal cells will have liner systems including:
  - \* A minimum of 3 inches of sand as a capillary barrier.
  - \* 2 feet of compacted clay.
  - \* sump drainage material over sand blanket in sump area.
  - \* 6 inches of sand blanket.
  - \* A PVC leachate collection pipe wrapped with a geotextile filter fabric.
  - \* A filter fabric overlying the sand blanket & sump drainage material.
- 5) Cell bases will slope laterally to the center or side of the cell.
- 6) A minimum of 18 inches of solidified material will be placed on the filter fabric prior to driving on it.
- 7) Cells will have waters collected if it has not evaporated within 72 hours. Waters collected will be solidified and disposed of.
- 8) Filling direction will be from higher elevations to the base of a cell to sump area.
- 9) The clay liner will be protected by covering it with either waste materials or unspecified soils within 60 days of its placement. If this is not done the liner will be scarified, recompacted and retested.
- 10) The cap and cover system will be a minimum of 4 feet in thickness.
- 11) Cells will be filled to the elevation of the proposed final grades.
- 12) Elevations on the plates are used only as a reference for a typical cell design.
- 13) Open cells will be sloped and partially temporarily capped to minimize storm water infiltration of waste material.

TYPICAL FILLING PLAN FOR CELL WITH SIDE SUMP  
(Utilizing Cell # 24 as Example)

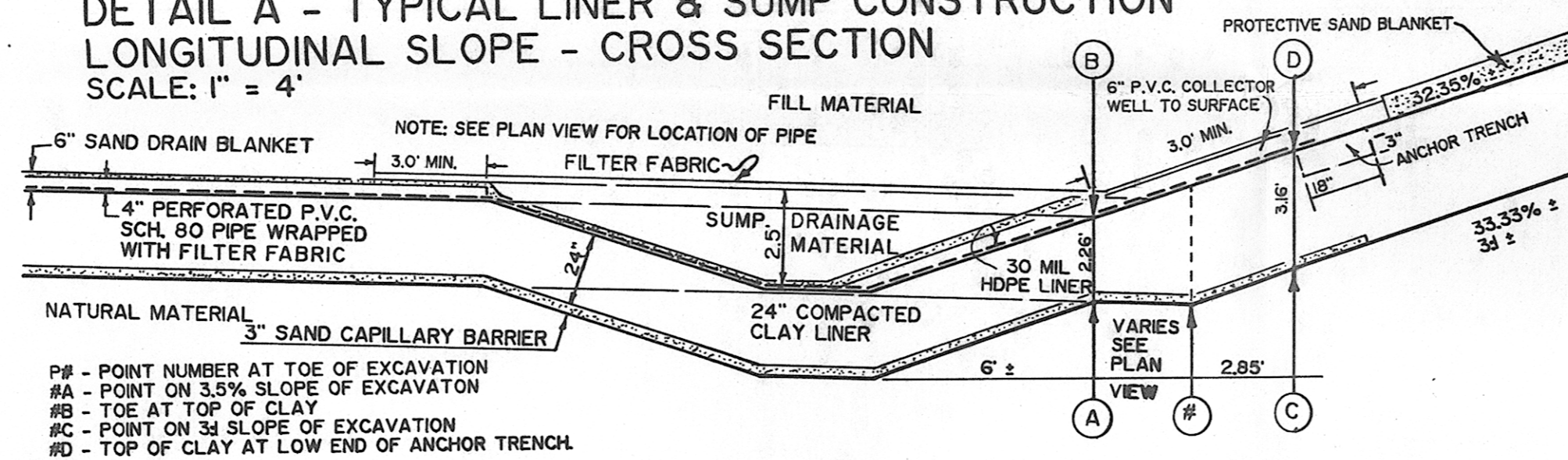


SCALE: 1"=100'

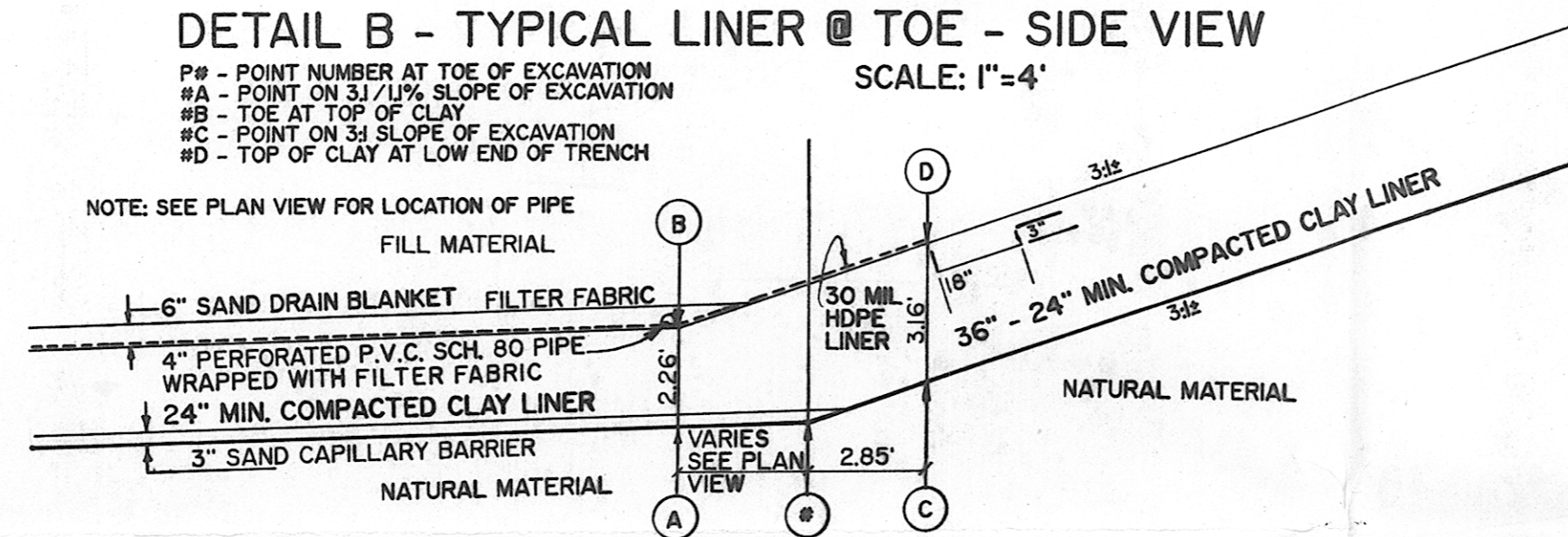
TYPICAL FILLING PLAN FOR CELL WITH END SUMP  
(Utilizing Cell #1 as Example)



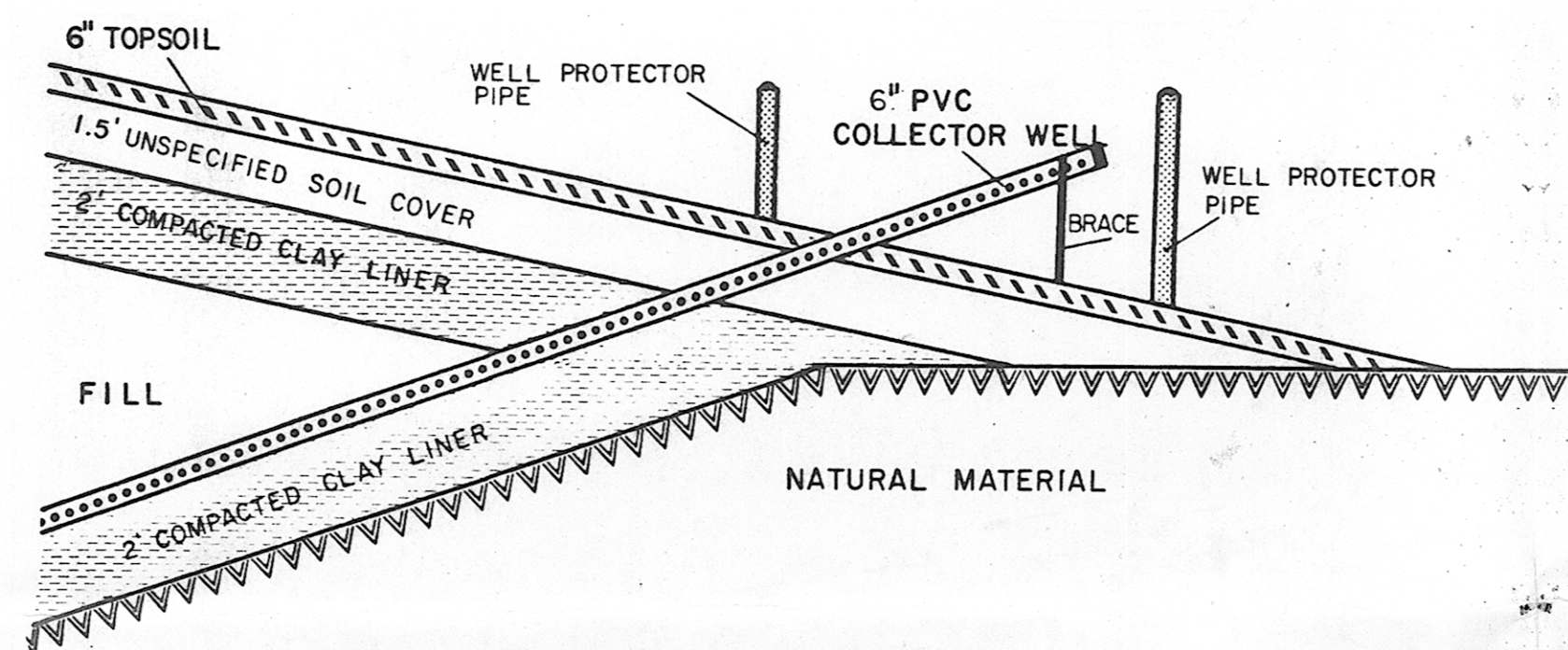
DETAIL A - TYPICAL LINER & SUMP CONSTRUCTION  
LONGITUDINAL SLOPE - CROSS SECTION  
SCALE: 1" = 4'



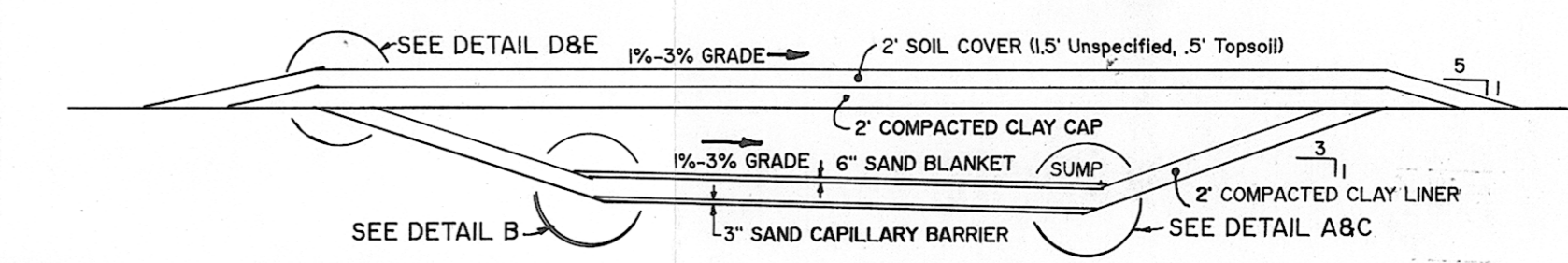
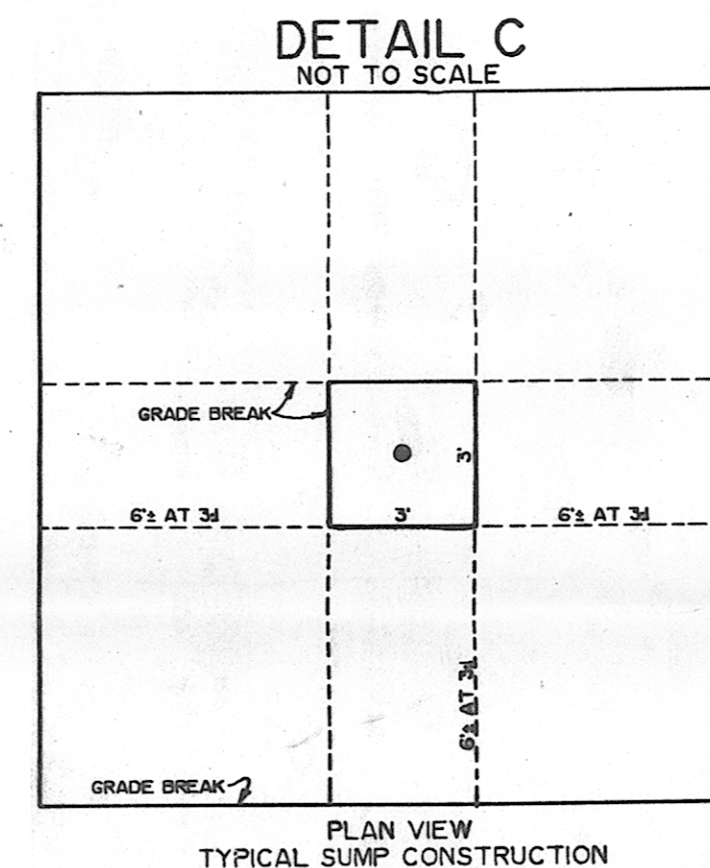
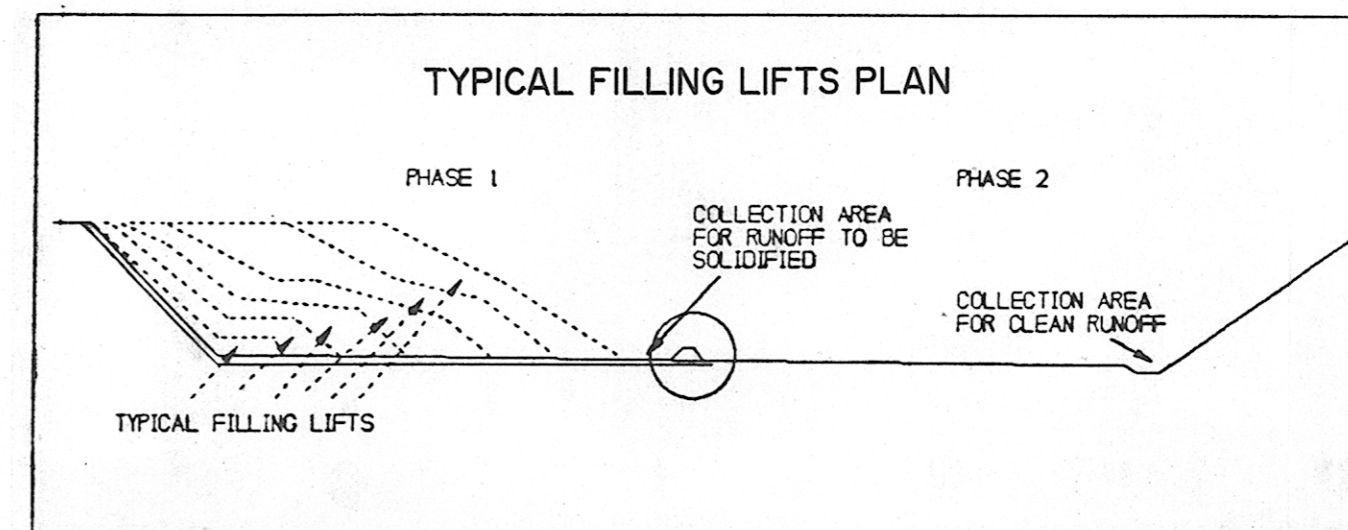
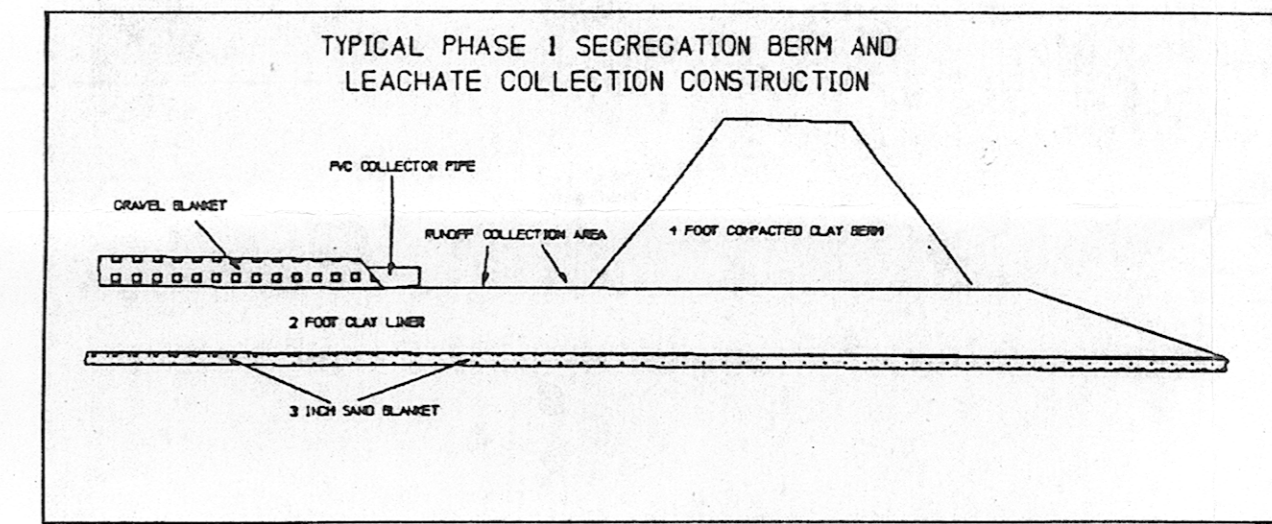
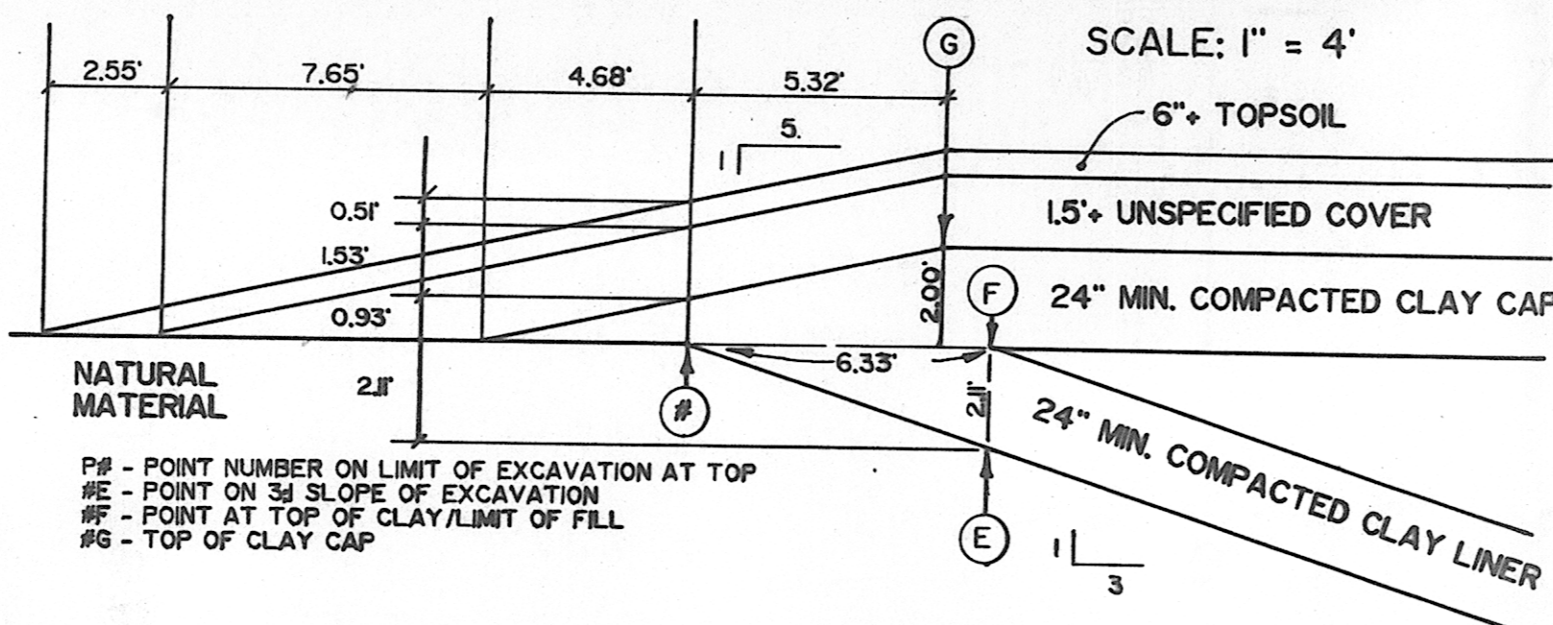
DETAIL B - TYPICAL LINER @ TOE - SIDE VIEW  
SCALE: 1"=4'



DETAIL E - LEACHATE COLLECTION WELL  
RISER PIPE - SIDE VIEW



DETAIL D - TYPICAL CELL CAP CONSTRUCTION - SIDE VIEW  
SCALE: 1" = 4'



TYPICAL DISPOSAL CELL DESIGN  
NOT TO SCALE

ADCO CONSULTANTS, INC.  
2090 EAST 104TH AVENUE, SUITE 305  
THORNTON, COLORADO 80233  
(303) 450-2204

R.W. BAYER & ASSOCIATES  
1333 WEST 120TH AVENUE, SUITE 109  
WESTMINSTER, COLORADO 80234  
(303) 452-4433

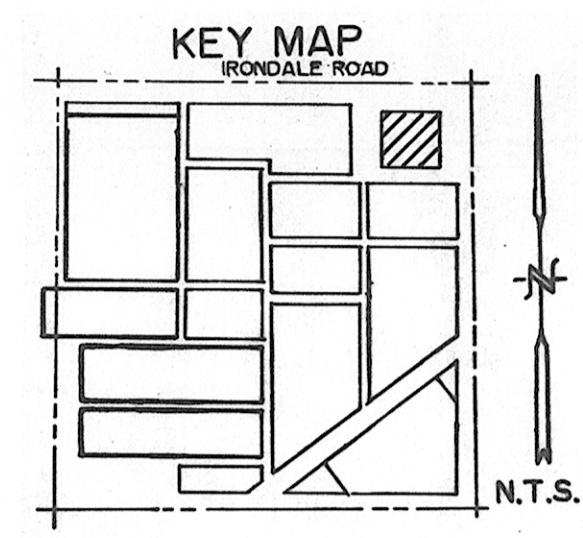
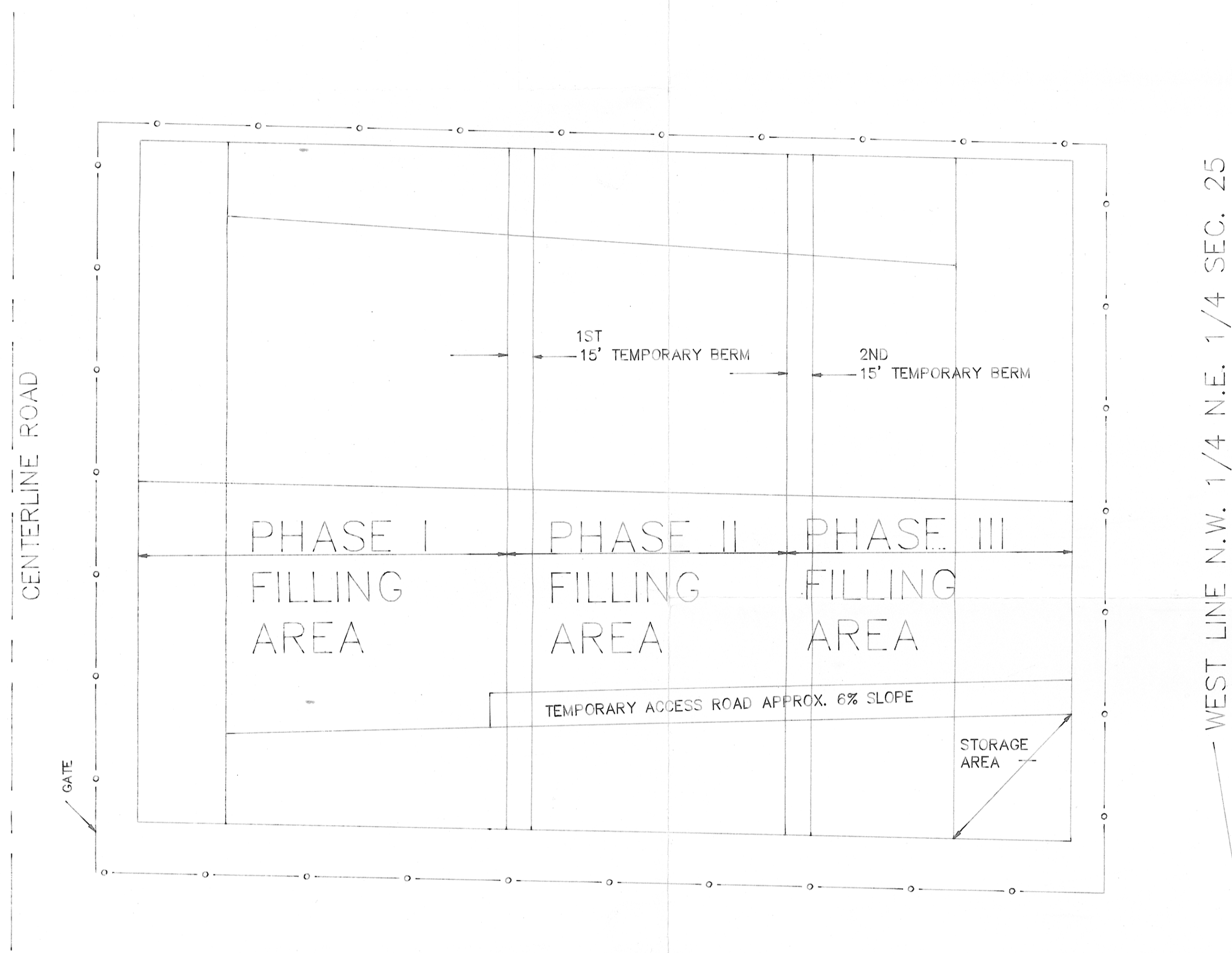
| NO. | DATE | DESCRIPTION | BY |
|-----|------|-------------|----|
|     |      |             |    |
|     |      |             |    |
|     |      |             |    |

|             |          |              |          |
|-------------|----------|--------------|----------|
| DRAWN BY:   | G.A.B.   | DATE:        | 09/20/91 |
| CHECKED BY: | R.N.F.   | DRAWING NO.: | PLATE 7  |
| JOB NO.:    | RB-91115 | SHEET        | 1 OF 1   |

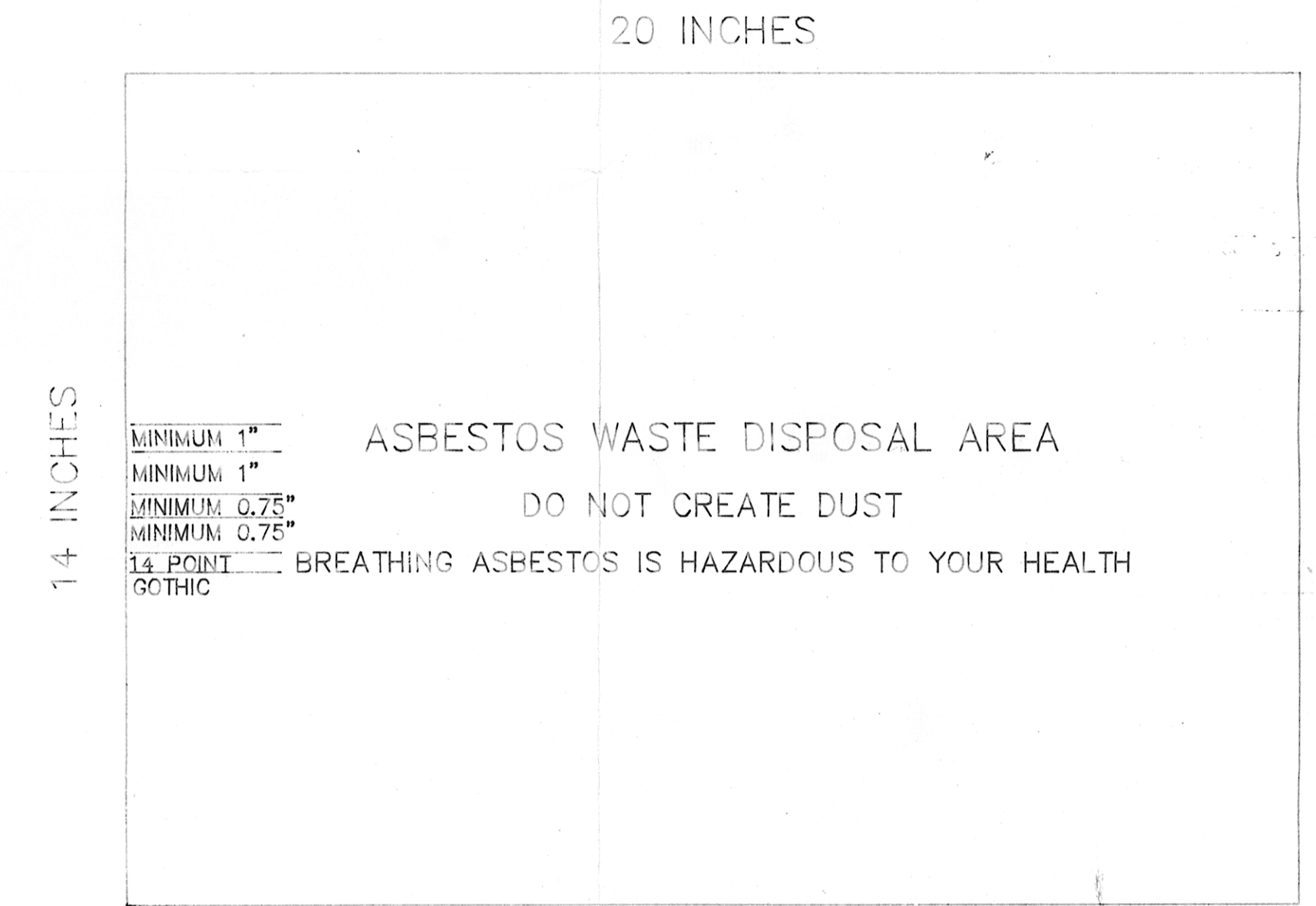
FILE NAME: PLATE7



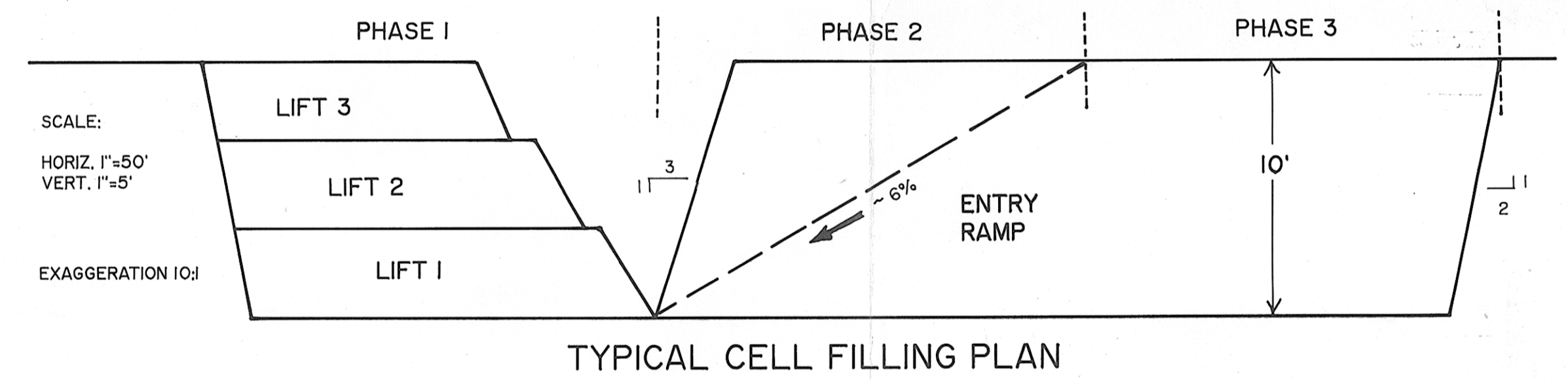
# CSI EAST ASBESTOS CELL DESIGN & FILLING PLAN IN THE N.W. 1/4 OF THE N.E. 1/4 SECTION 25



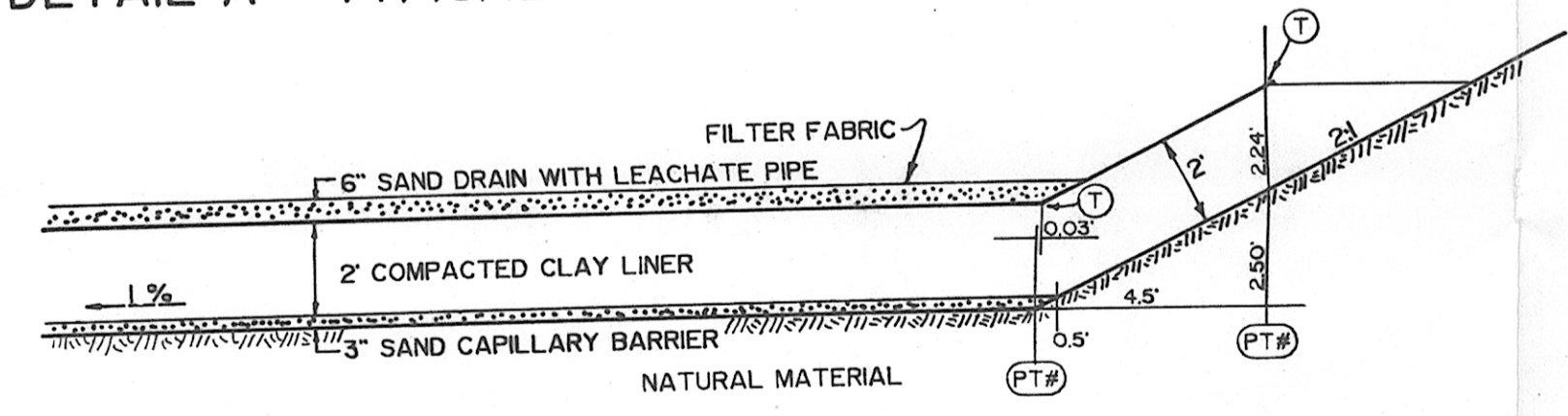
SCALE: 1" = 50'



NOTES: WARNING SIGNS WILL BE PLACED ON THE ASBESTOS DISPOSAL AREA  
SIGNS WILL BE SPACED 300 FEET APART  
SIGNS WILL BE SIZED A MINIMUM OF 20 INCHES BY 14 INCHES  
THE ASBESTOS STORAGE AREA WILL BE OUTLINED WITH HAZARD TAPE  
SIGNS WILL BE POSTED ON THE HAZARD TAPE STATING: "ASBESTOS WASTE STORAGE"



DETAIL A - TYPICAL LINER @ TOE - SIDE VIEW



DETAIL B - TYPICAL LINER & SUMP CONSTRUCTION LONGITUDINAL SLOPE - CROSS SECTION

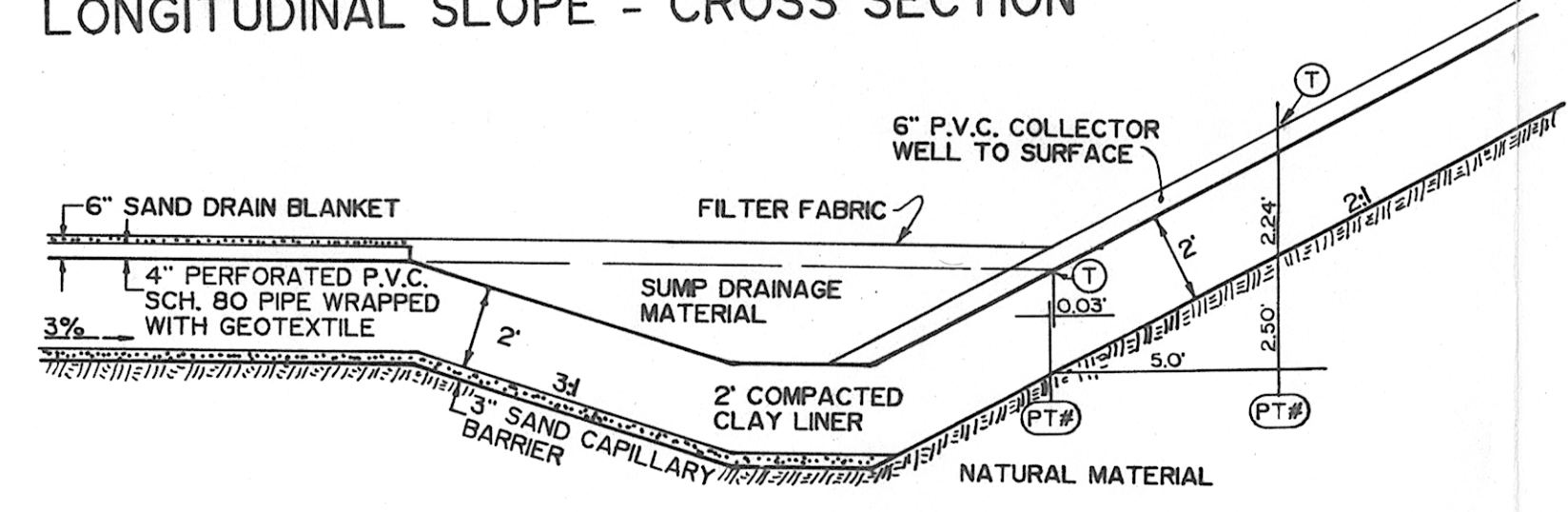
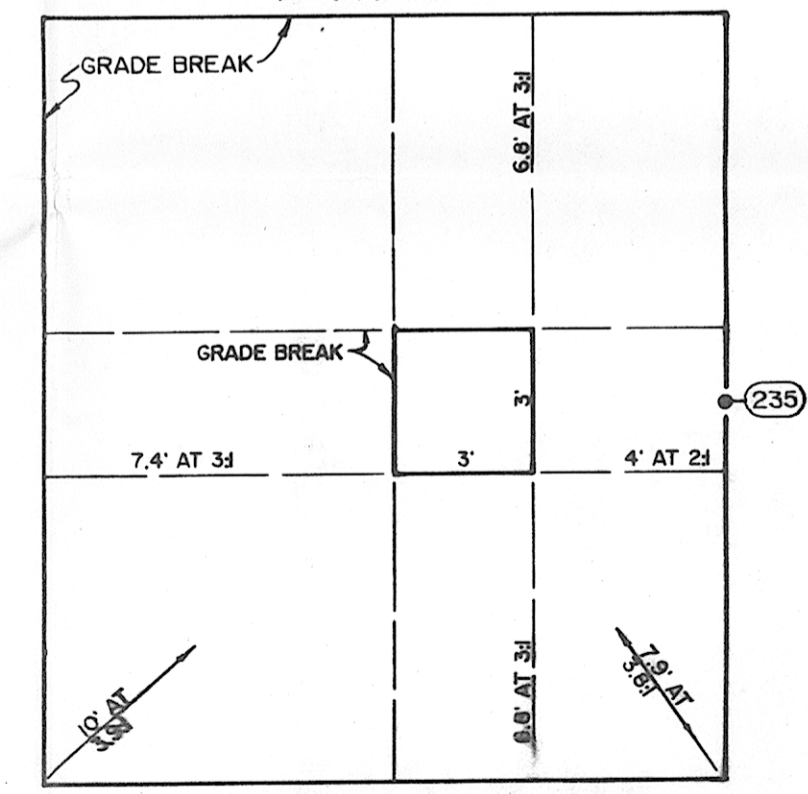


PLATE 8 NOTES:

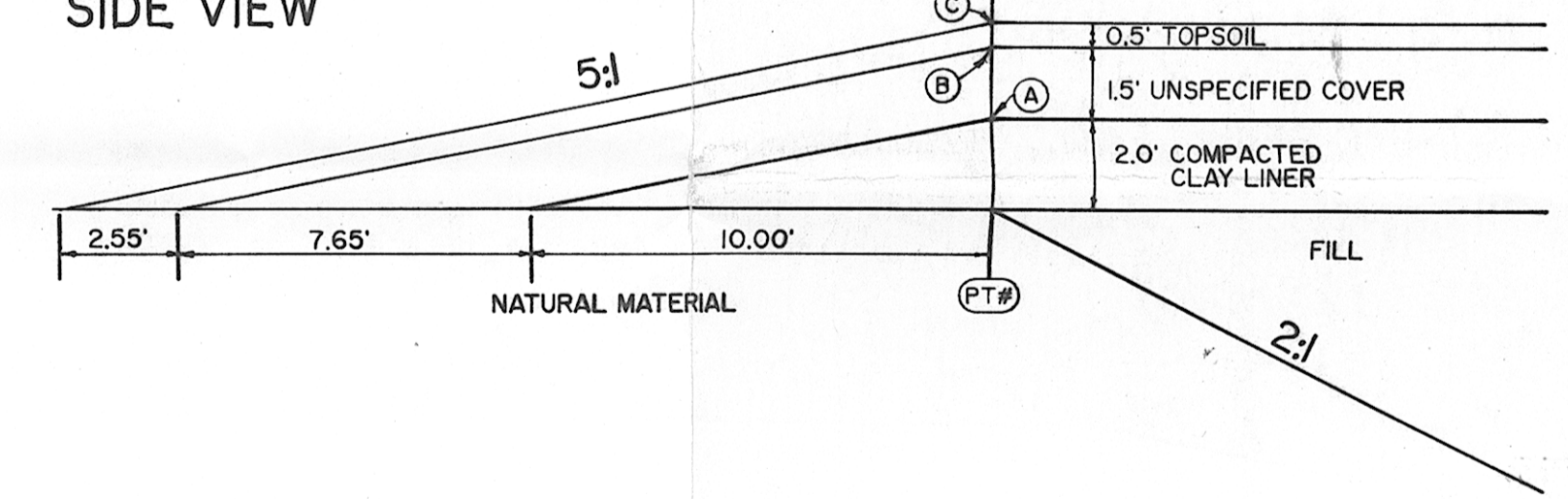
- 1) There is one asbestos cell with a total air capacity of 169,100 cubic yards. The cell will be excavated to a depth of 25+ feet at the west end to 35+ feet at the east end.
- 2) Asbestos cells will be filled in three to five phases according to whether containers are placed on their sides or upright.
- 3) The asbestos storage area will be located in the southeastern corner of the asbestos disposal area and as the new cell phases are excavated, it will be moved to the closed phases.
- 4) Cell designs on this plate is typical of the cell's construction.
- 5) Asbestos wastes will be accepted only in rigid containers.
- 6) Containers will be placed in the cells by trained CSI personnel only.
- 7) Containers will be covered with 6 inches of soil following placement in the cells. The containers will not be compacted.
- 8) Precipitation waters will be collected in the cell at the east-center of each filling phase.
- 9) The cells has been secured by placing an 8-foot chain link fence around each cell as it is constructed.
- 10) The asbestos cell will be excavated with 2 to 1 side slopes except for the road cut area where side slopes will be a minimum of 3 to 1.
- 11) The access road into the cell will be graded to an approximate 6% slope.
- 12) Warning signs will be constructed and placed as shown in the Design and Operations Plan and on this plate.
- 13) The cell cap consists of a minimum of 2.0 feet of compacted clay, 1.5 feet of unspecified fill and 6 inches of topsoil. Additional unspecified fill may be placed over the cell to match the grades across the site.
- 14) Disposal of asbestos wastes will comply with all applicable state regulations.

DETAIL C



SUMP DETAIL - PLAN VIEW  
SCALE: 1" = 4'

DETAIL D - TYPICAL CELL CAP CONSTRUCTION SIDE VIEW



ADCO CONSULTANTS, INC.  
2090 EAST 104TH AVENUE, SUITE 305  
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1333 WEST 120TH AVENUE, SUITE 109  
WESTMINSTER, COLORADO 80234  
(303) 452-4433

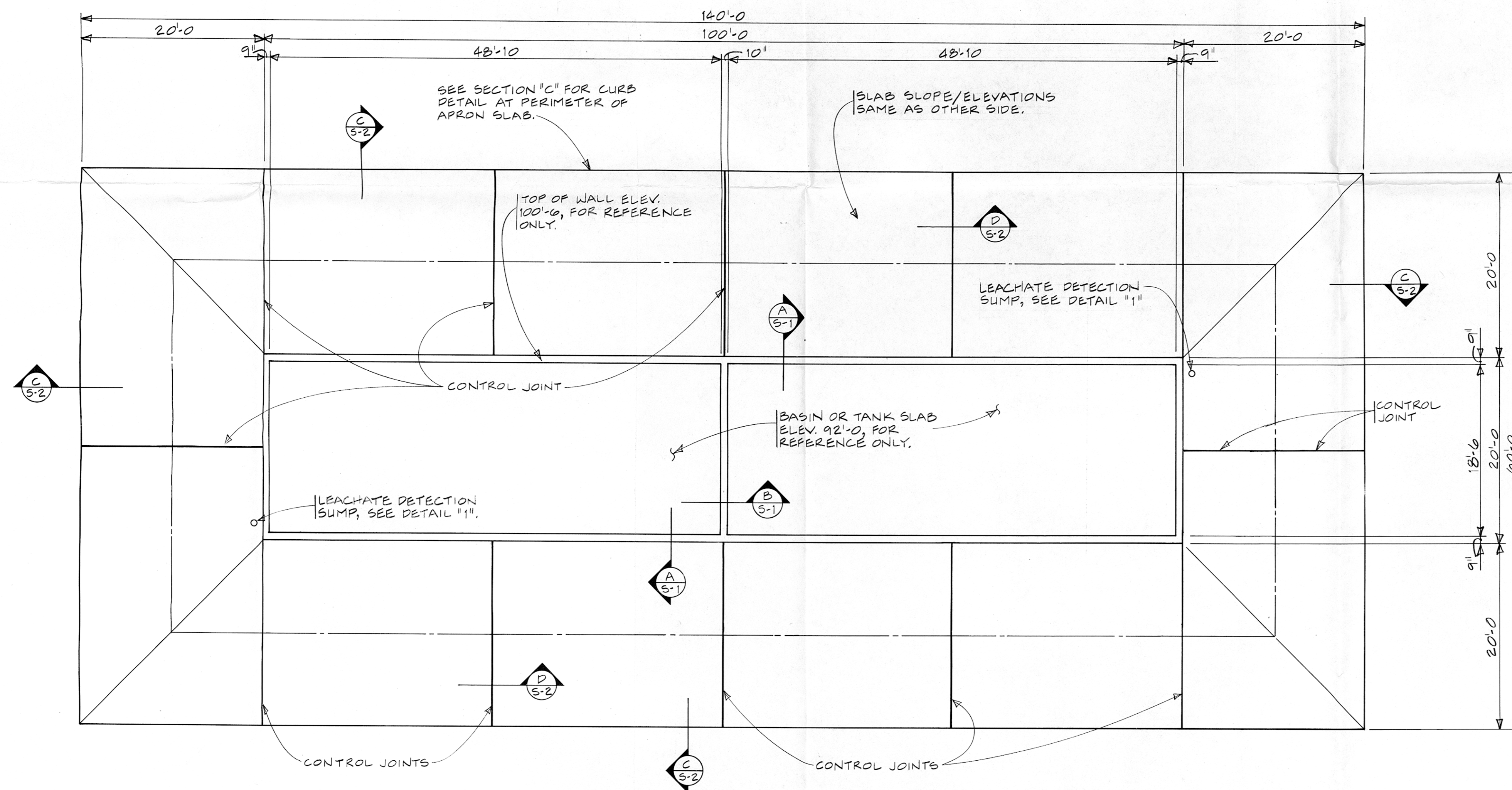
|             |            |              |          |
|-------------|------------|--------------|----------|
| DRAWN BY:   | G.A.B.     | DATE:        | 09/19/91 |
| CHECKED BY: | R.N.F.     | DRAWING NO.: | PLATE 8  |
| JOB NO.:    | R.B.-91115 | SHEET        | 1 OF 1   |

FILE NAME: PLATE8

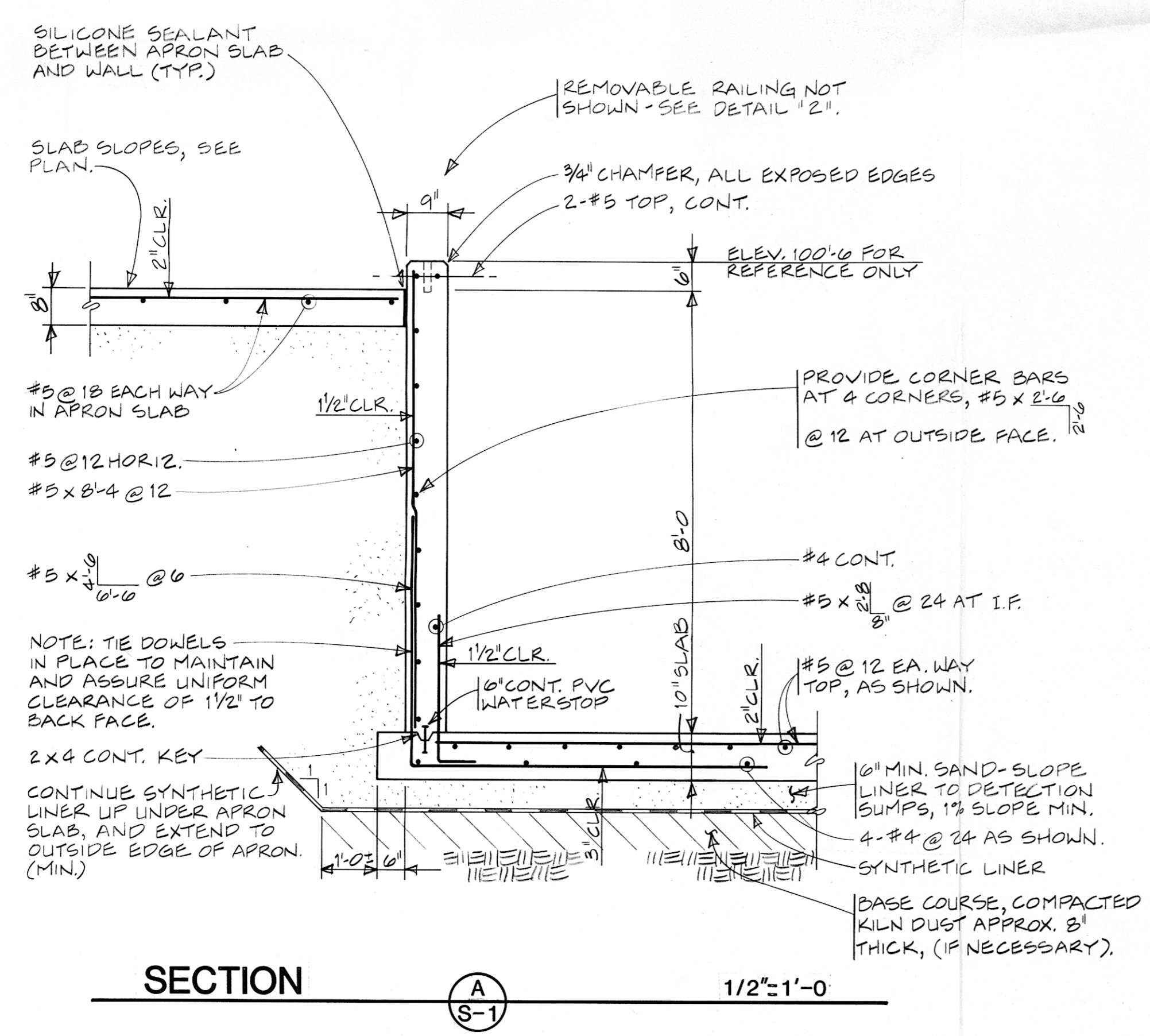


**GENERAL NOTES**

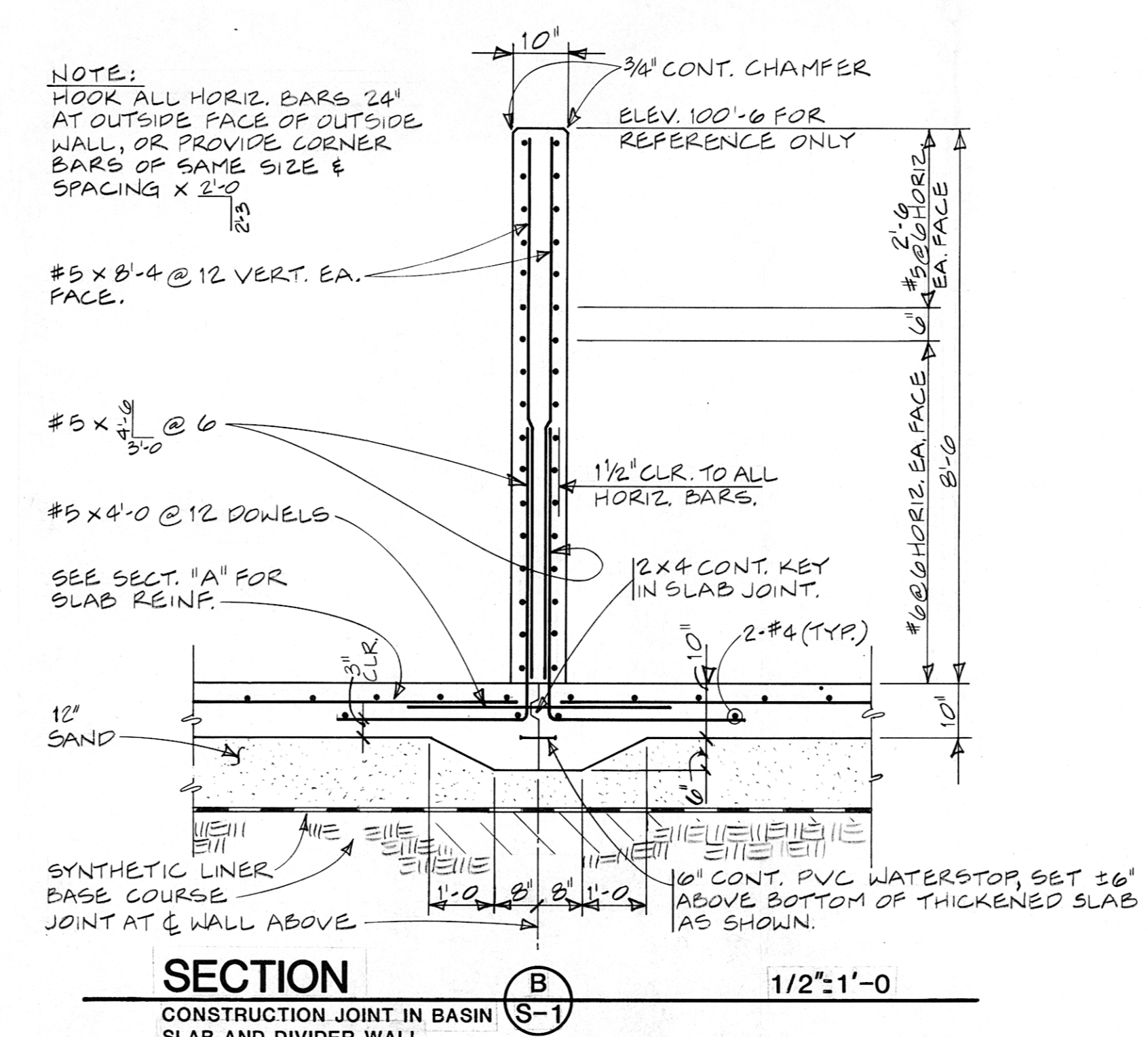
1. LIVE LOADS USED IN DESIGN:
  - A. EQUIVALENT FLUID PRESSURE ON OUTSIDE FACE OF WALLS ----- 70 PCF
  - B. SURCHARGE (LATERAL LOAD) ----- 100 PSF
2. CONCRETE:
  - A. ALL CONCRETE SHALL DEVELOP 4000 PSI COMPRESSIVE STRENGTH IN 28 DAYS.
  - B. CONCRETE MIX SHALL CONTAIN A MINIMUM OF 6 SACKS OF CEMENT PER CUBIC YARD, EVEN THOUGH HIGHER STRENGTHS MAY BE ATTAINED WITH USE OF A WATER REDUCING AGENT. USE ASTM C 150 TYPE II CEMENT.
  - C. ALL CONCRETE SHALL BE MADE WITH 3/4" MAXIMUM SIZE AGGREGATE.
  - D. PLACE CONCRETE WITH A SLUMP OF 4 INCHES, WITH A MAXIMUM VARIATION OF PLUS OR MINUS 1 INCH. ALL CONCRETE IS TO BE CONSOLIDATED WITH MECHANICAL VIBRATORS.
  - E. MAXIMUM WATER-CEMENT RATIO TO BE 0.48.
  - F. PROVIDE 6% AIR ENTRAINMENT IN CONCRETE, PLUS OR MINUS 2% BY VOLUME.
  - G. CONCRETE SHALL NOT BE PLACED IF MINIMUM AIR TEMPERATURE IS EXPECTED TO FALL BELOW 40°F IN THE 7 DAY PERIOD FOLLOWING PLACEMENT OF CONCRETE. PROVIDE EXTERNAL HEAT AND INSULATION BLANKETS TO PROTECT CONCRETE IF TEMPERATURES DROP BELOW 40°F.
  - H. CALCIUM CHLORIDE ADDITIVE IN CONCRETE WILL NOT BE ALLOWED EXCEPT BY WRITTEN PERMISSION OF ENGINEER.
  - I. THE OWNER WILL ENGAGE A CONCRETE TESTING COMPANY TO OBTAIN AND TEST CONCRETE SPECIMENS. THE CONTRACTOR MUST COORDINATE HIS SCHEDULES SO THE SPECIMENS MAY BE TAKEN DURING CONCRETE PLACEMENTS. FOUR (4) SPECIMENS OR CYLINDERS SHALL BE TAKEN FOR EVERY 30 CUBIC YARD POUR, AND FOR EACH AND EVERY POUR MADE. BREAK ONE CYLINDER AT 7 DAYS, AND TWO AT 28 DAYS. HOLD THE FOURTH CYLINDER IN CASE THERE IS A QUESTION ON 28 DAY STRENGTH. REPORT TEST RESULTS TO ENGINEER WITHIN 2 DAYS AFTER BREAKS.
  - J. DO NOT BACKFILL AGAINST WALLS UNTIL CONCRETE IN FIELD (NOT LABORATORY SPECIMENS) EXCEEDS 3000 PSI COMPRESSIVE STRENGTH, OR 7 DAYS, WHICHEVER IS GREATER.
  - K. CONCRETE JOINTS IN A HORIZONTAL PLANE WILL NOT BE ALLOWED, EXCEPT AS DETAILED. ANY STOP IN CONCRETE WORK MUST BE MADE WITH VERTICAL BULKHEADS. ALL CONSTRUCTION JOINTS SHALL BE AS DETAILED OR APPROVED BY THE ENGINEER. BASIN WALLS MUST BE CAST IN ONE POUR. BASIN SLAB TO BE CAST IN TWO POURS.
  - L. APPLY WHITE PIGMENTED LIQUID CURING COMPOUND (CONFORMING TO ASTM C309) TO SLABS WITHIN 30 MINUTES OF FINISHING. APPLY SECOND COAT OF COMPOUND WITHIN 30 MINUTES OF FIRST COAT, APPLIED AT 90° TO THE FIRST. COVER SLABS WITH 6 MIL POLYETHYLENE FILM FOR 48 HOURS AFTER POURING.
  - M. FORMWORK WILL CONFORM TO SHAPES, LINES, AND DIMENSIONS OF MEMBERS SHOWN ON THE DRAWING AND BE SUFFICIENTLY TIGHT TO PREVENT LEAKAGE OF MORTAR. COAT ALL FORMWORK PRIOR TO PLACING REINFORCEMENT. FORMWORK WILL NOT EMPLOY STAKES DRIVEN INTO THE SAND DRAIN MATERIAL, TO PREVENT PENETRATING SYNTHETIC LINER.
  - N. COVER TOP OF WALLS WITH BURLAP, KEPT WET FOR 4 DAYS AFTER POURING. FORMWORK CAN BE REMOVED NO LESS THAN 4 DAYS AFTER POURING.
3. REINFORCING STEEL:
  - A. ALL REINFORCING SHALL CONFORM TO ASTM 615(S1), GRADE 60.
  - B. NO SPLICES OR REINFORCEMENT SHALL BE MADE EXCEPT AS DETAILED OR AUTHORIZED BY THE ENGINEER. LAP SPLICES, WHERE PERMITTED, SHALL BE A MINIMUM OF 36 BAR DIAMETERS.
  - C. STAGGER SPLICES A MINIMUM OF 4'-0" FOR ADJACENT HORIZONTAL CONTINUOUS BARS.
  - D. DETAIL BARS IN ACCORDANCE WITH A.C.I. DETAILING MANUAL AND A.C.I. BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, LATEST EDITIONS. PROVIDE ALL ACCESSORIES NECESSARY TO SUPPORT REINFORCING AT POSITIONS SHOWN ON THE DRAWINGS.
  - E. SHOP DRAWINGS FOR REINFORCING MUST BE REVIEWED BY THE ENGINEER PRIOR TO FABRICATION.
  - F. THE ENGINEER MUST OBSERVE THE PLACEMENT OF REINFORCING PRIOR TO PLACING CONCRETE. CALL A MINIMUM OF 24 HOURS BEFORE PLACING CONCRETE, AND REVERIFY IF REQUIRED.



**PLAN**  
1/8"=1'-0"  
SEE SHEET S-2 FOR LONGITUDINAL AND TRANSVERSE SECTIONS.



**SECTION**  
A  
1/2"=1'-0"

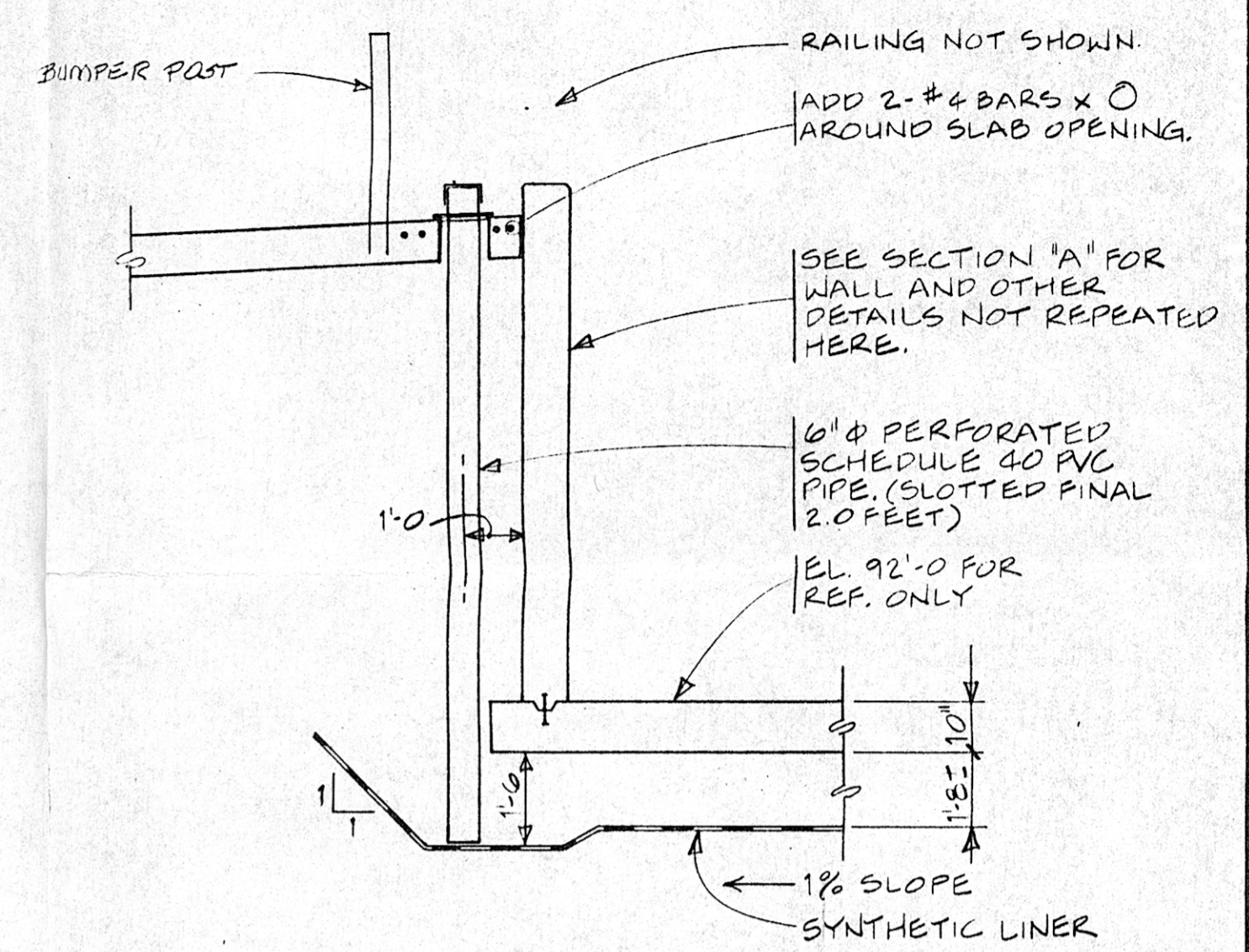
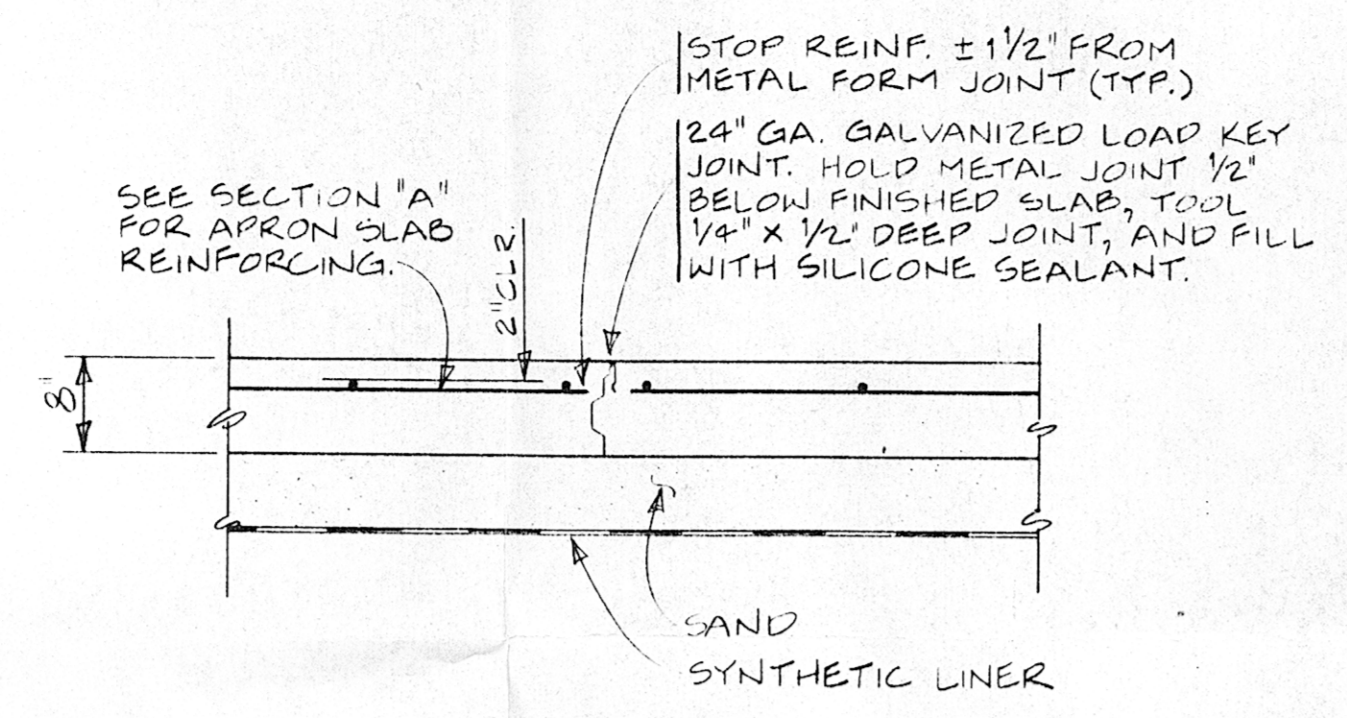
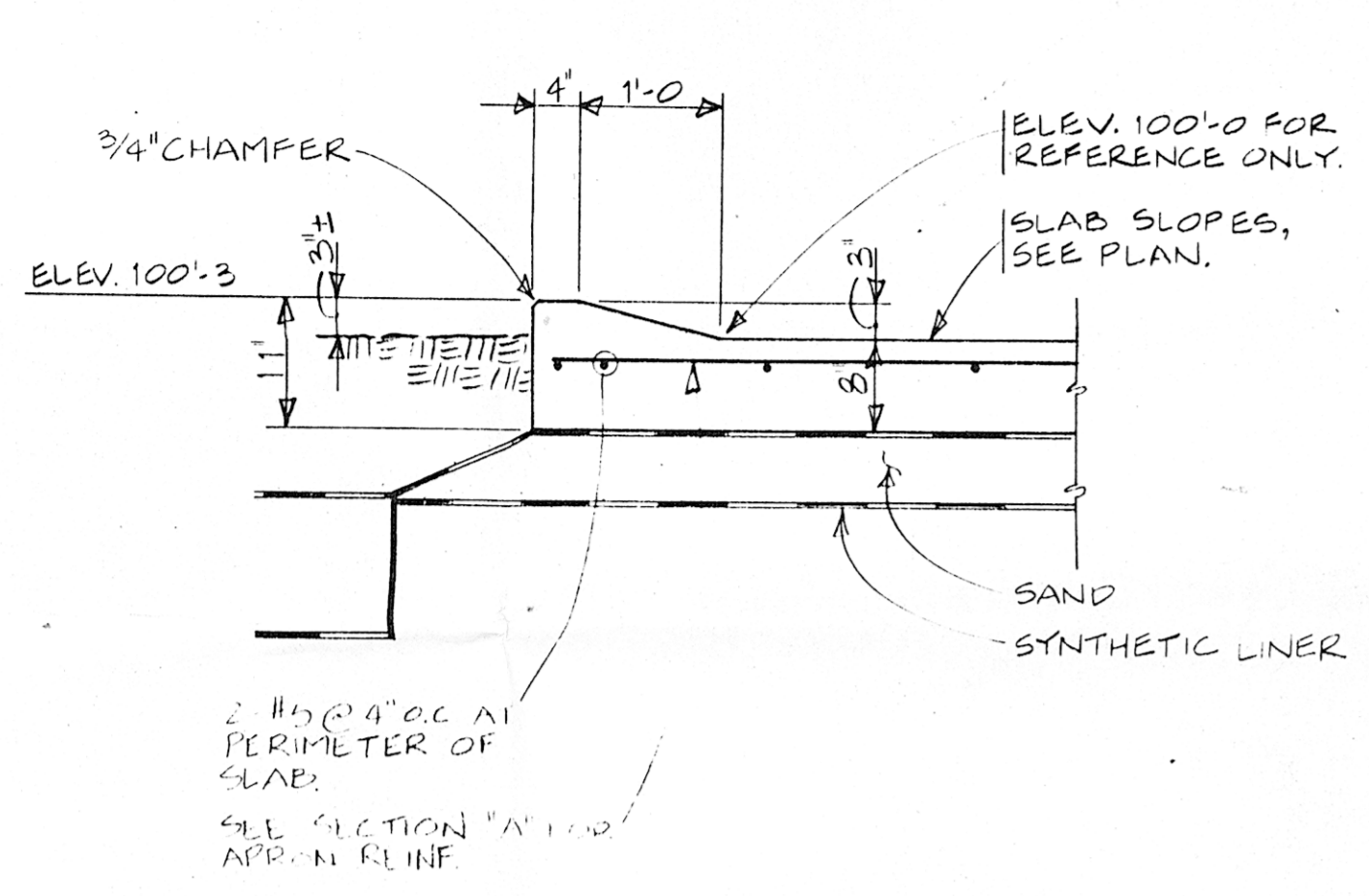


**SECTION**  
B  
1/2"=1'-0"  
CONSTRUCTION JOINT IN BASIN SLAB AND DIVIDER WALL

**FIGURE 6A**

|   |   |
|---|---|
| <b>PLATE 9 PLAN AND SECTIONS</b>          |   |
| <b>MIXING BASIN</b>                       |   |
| <b>CONSERVATION SERVICES INCORPORATED</b> |   |
| DATE JULY 23, 1987                        | MICKEY AND SCHNEIDER, INC. CONSULTING ENGINEERS |
| BY FRM/LLK                                | 7500 W. MISSISSIPPI AVE. SUITE 236              |
| CHECKED FRM                               | LAKEWOOD, COLORADO 80226 (303) 922-1118         |
| JOB NO. 87269                             | SHEET NO. S-1 OF 2                              |

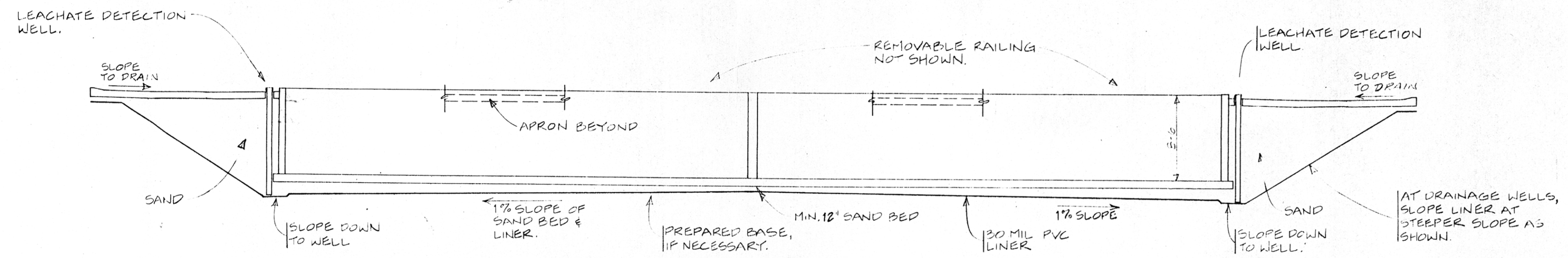




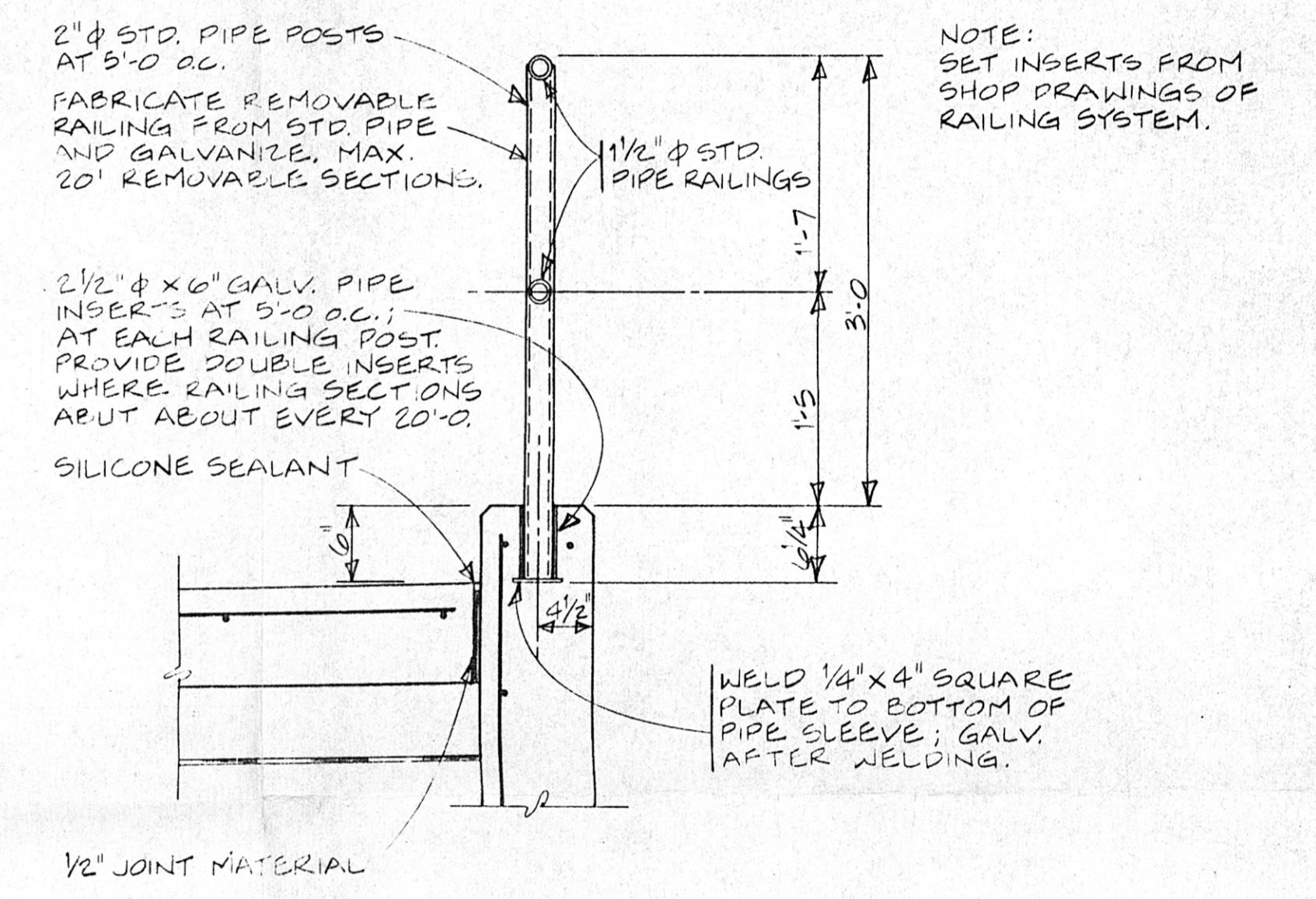
**SECTION C**  
TYPICAL CURB AT APRON SLAB  
3/4"=1'-0"

**SECTION D**  
TYPICAL CONTROL OR CONSTRUCTION JOINT IN APRON SLAB  
3/4"=1'-0"

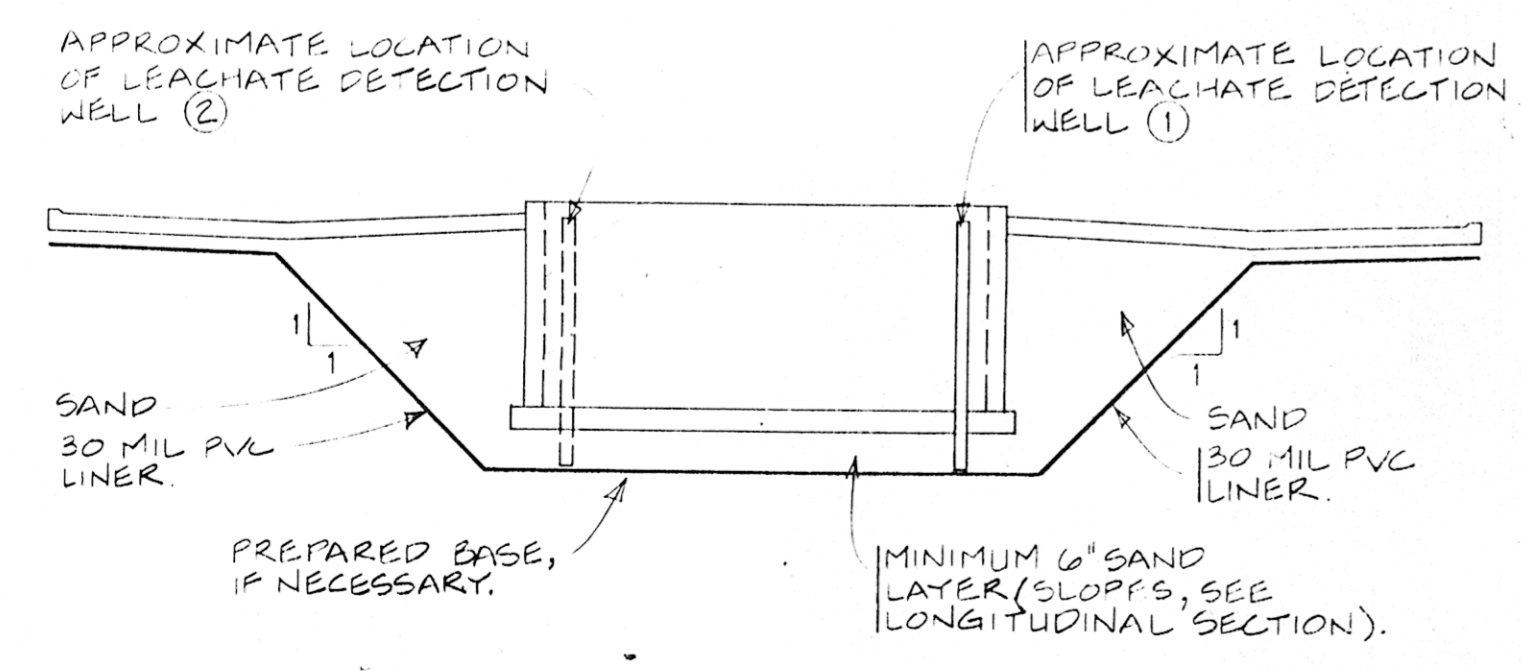
**DETAIL 1**  
LECHATE DETECTION SUMP  
3/8"=1'-0"



**LONGITUDINAL SECTION**  
1/8"=1'-0"



**DETAIL 2**  
REMOVABLE PIPE RAILING  
1"=1'-0"



**TRANSVERSE SECTION**  
1/8"=1'-0"

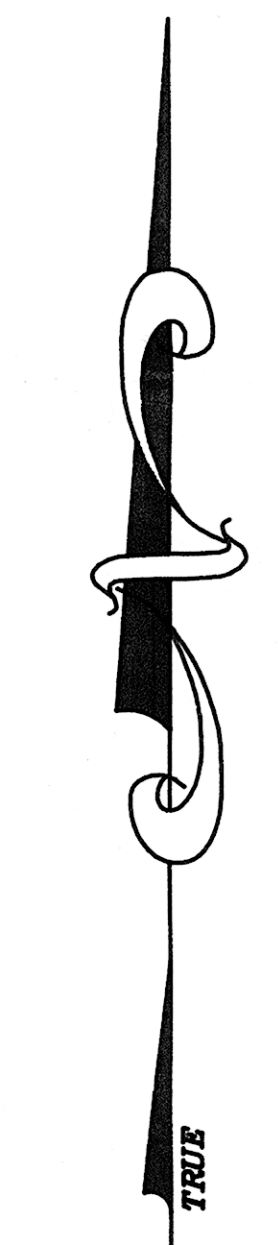
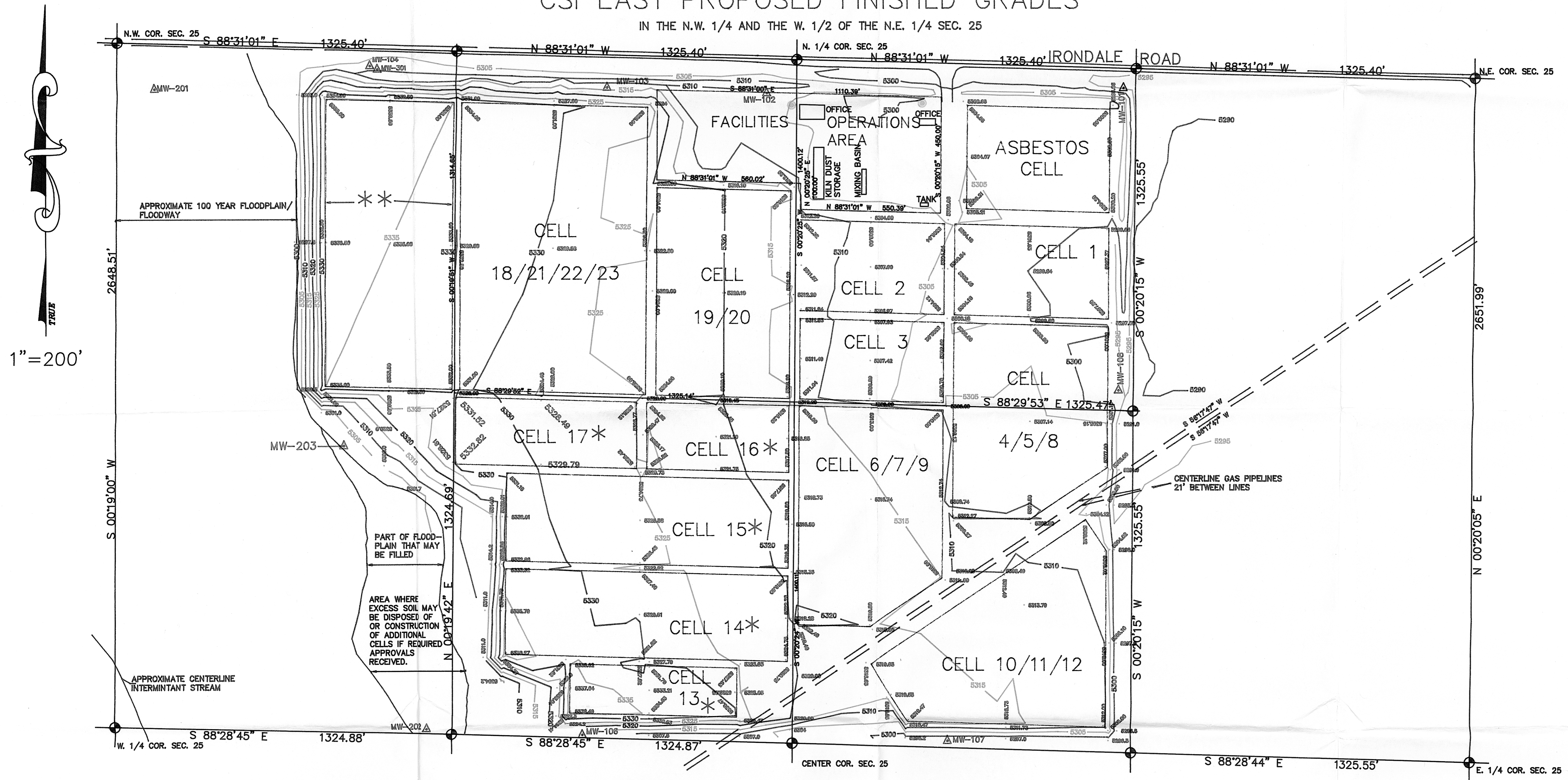
FIGURE 6B

|   |  |                      |
|---|--|----------------------|
| <b>PLATE 10 SECTIONS AND DETAILS</b>      |  |                      |
| <b>MIXING BASIN</b>                       |  |                      |
| <b>CONSERVATION SERVICES INCORPORATED</b> |  |                      |
| DATE JULY 23, 1987                        | MICKY AND SCHNEIDER, INC. CONSULTING ENGINEERS | SHEET NO. <b>S-2</b> |
| BY FRM/LLK                                | 7500 W. MISSISSIPPI AVE.                       | SUITE 236            |
| CHECKED FRM                               | LAKEWOOD, COLORADO 80226                       | (303) 922-1118       |
| JOB NO. 87269                             |  | OF 2                 |



# CSI EAST PROPOSED FINISHED GRADES

IN THE N.W. 1/4 AND THE W. 1/2 OF THE N.E. 1/4 SEC. 25



1" = 200'

**SYMBOLS:**  
 ▲ DENOTES MONITOR WELL AND NUMBER  
 PT#TB DENOTES TOP OF BERM/END OF CELL CAP  
 PT#F/G DENOTES TOP OF CELL CAP  
 PT#TOE DENOTES TOE OF BERM AT EXISTING GROUND

- FINAL GRADE NOTES:**
- Elevation points are for interim revegetation.
  - In some cases, especially at boundaries between cells, final grades may require a different elevation than the points shown above, and replacement of interim revegetation.
  - Whenever a cell or a group of cells achieves final grades and revegetation, an as-built drawing shall be submitted.
  - Prior to site closure an as-built final grading plan shall be submitted.
  - \* - Final grades for these cell areas may change if one or more of these cells are combined into larger cells.
  - \*\* - Final grades in this area dependent upon future approval for construction of additional cell. Probable maximum heights of grades shown.

ADCO CONSULTING, INC  
 2090 EAST 104TH AVENUE, SUITE 305  
 THORNTON, COLORADO 80233  
 (303) 450-2204

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 1333 WEST 120TH AVENUE, SUITE 109  
 WESTMINSTER, COLORADO 80234  
 (303) 452-4433

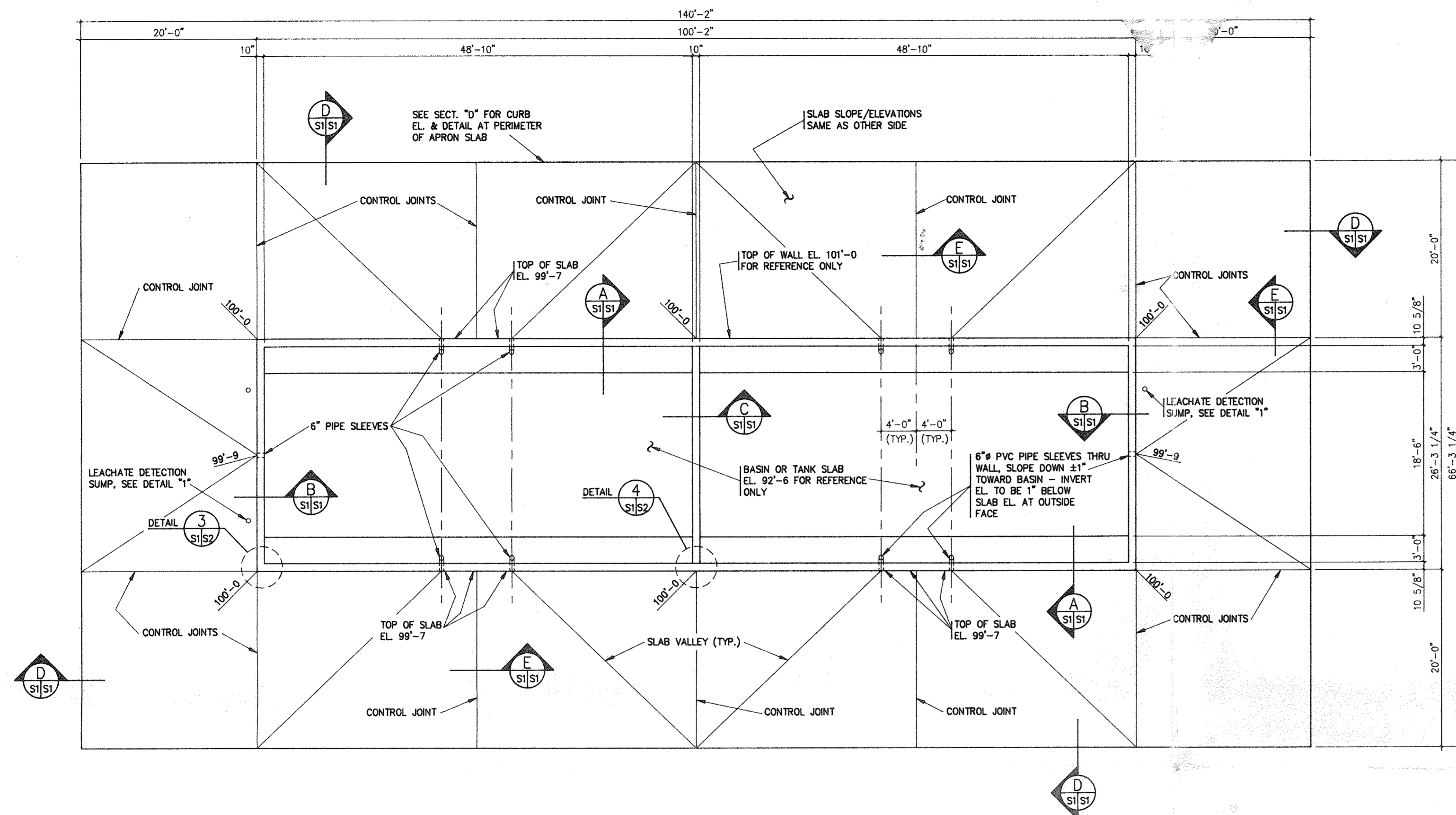
FILE NAME: GRADE

|                    |                       |
|--------------------|-----------------------|
| DRAWN BY: G.A.B.   | DATE: 09/10/91        |
| CHECKED BY: R.N.F. | DRAWING NO.: PLATE 11 |
| JOB NO.: 91115RWB  | SHEET 1 OF 1          |

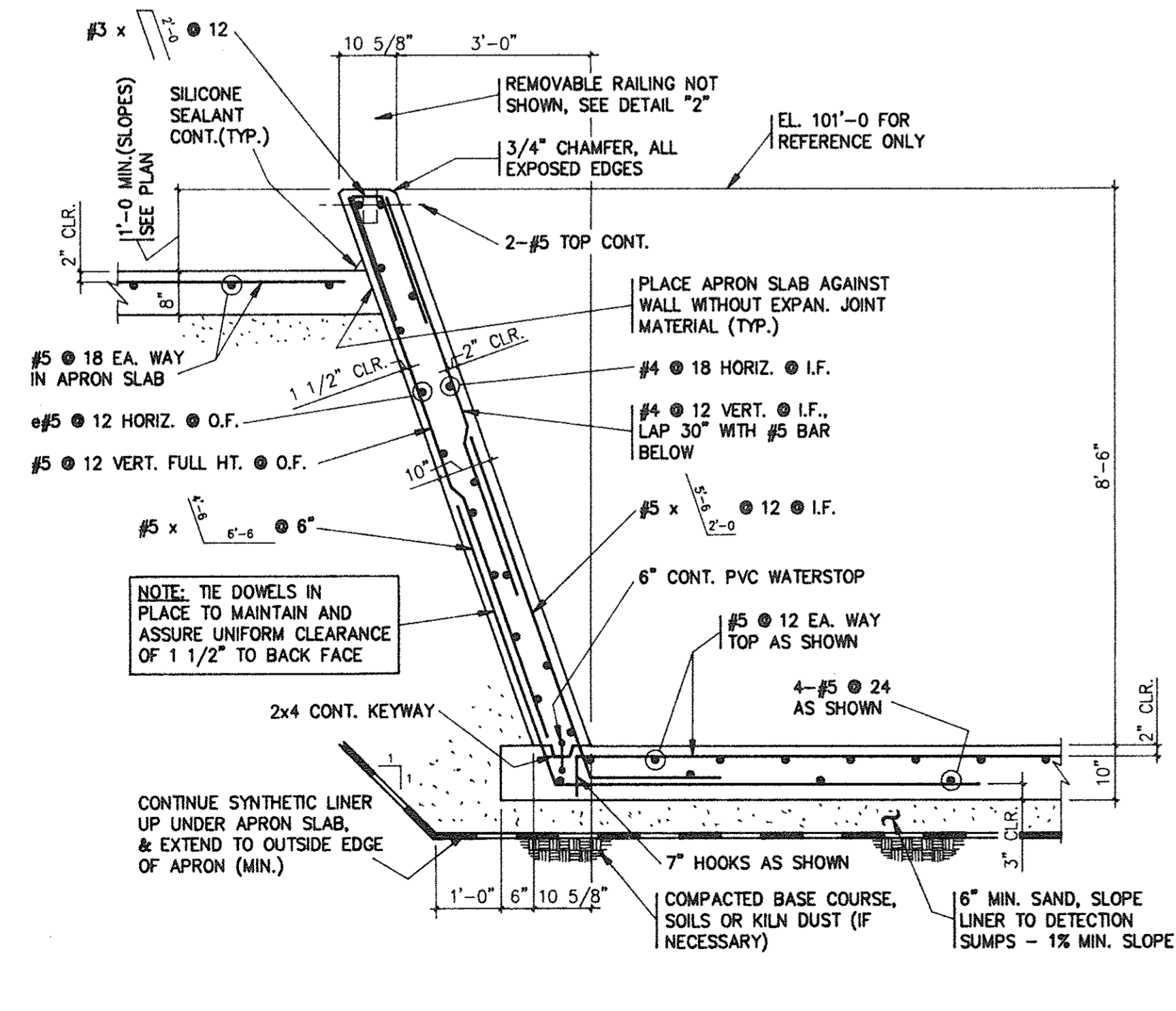


# GENERAL NOTES

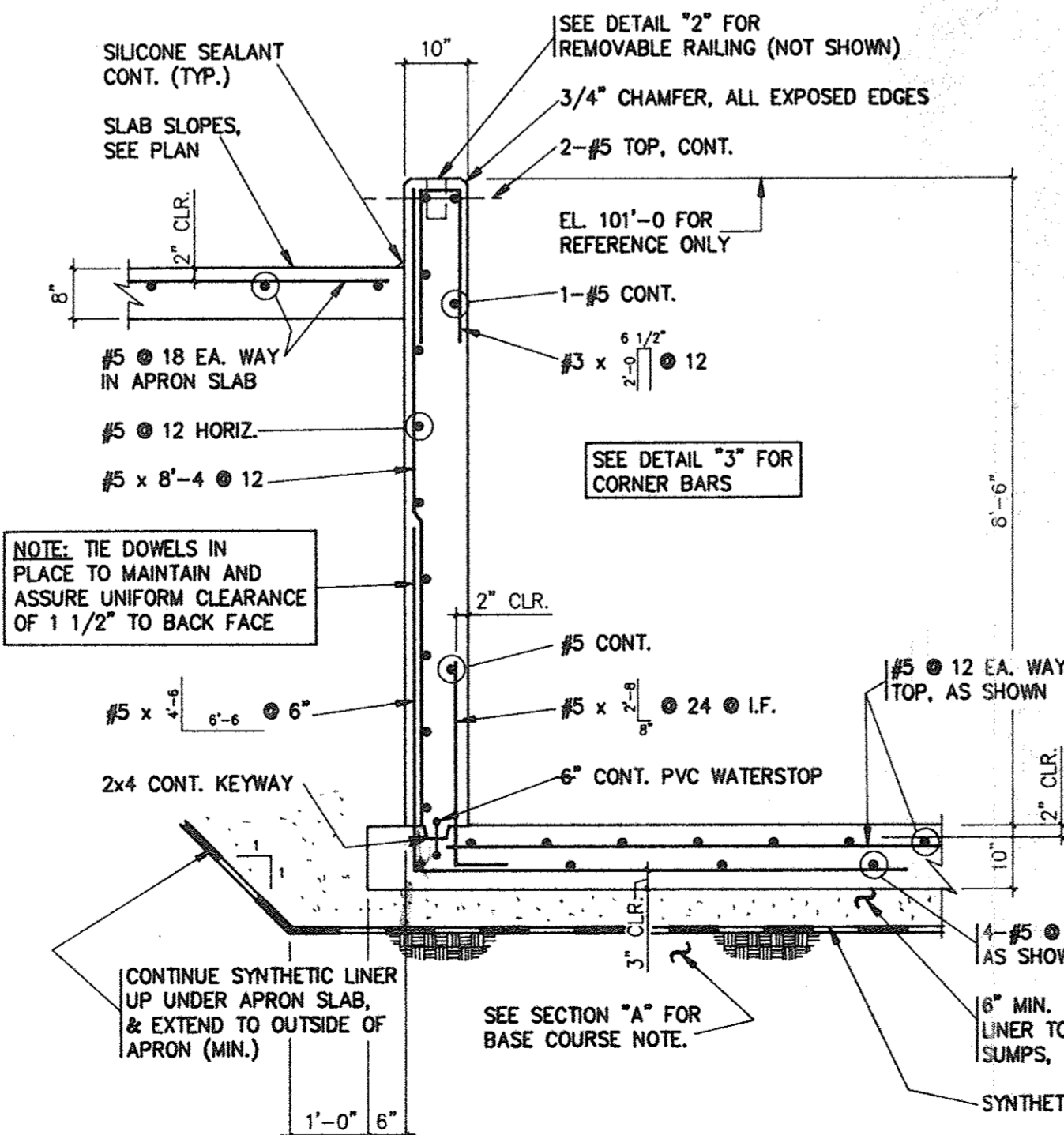
- LIVE LOADS USED IN DESIGN:
  - A. EQUIVALENT FLUID PRESSURE ON OUTSIDE FACE OF WALLS-----70 PCF
  - B. SURCHARGE (LATERAL LOAD)-----100 PSF
- CONCRETE:
  - A. ALL CONCRETE SHALL DEVELOP 4000 PSI COMPRESSIVE STRENGTH IN 28 DAYS.
  - B. CONCRETE MIX SHALL CONTAIN A MINIMUM OF 7 SACKS OF CEMENT PER CUBIC YARD, EVEN THOUGH HIGHER STRENGTHS MAY BE ATTAINED WITH USE OF A WATER REDUCING AGENT. USE ASTM C 150 TYPE II CEMENT.
  - C. ALL CONCRETE SHALL BE MADE WITH 3/4 INCH MAXIMUM SIZE AGGREGATE.
  - D. PLACE CONCRETE WITH A SLUMP OF 4 INCHES, WITH A MAXIMUM VARIATION OF PLUS OR MINUS 1 INCH. ALL CONCRETE IS TO BE CONSOLIDATED WITH MECHANICAL VIBRATORS.
  - E. MAXIMUM WATER-CEMENT RATIO TO BE 0.43.
  - F. PROVIDE 6% AIR ENTRAINMENT IN CONCRETE, PLUS OR MINUS 2% BY VOLUME.
  - G. CONCRETE SHALL NOT BE PLACED IF MINIMUM AIR TEMPERATURE IS EXPECTED TO FALL BELOW 40°F IN THE 7 DAY PERIOD FOLLOWING PLACEMENT OF CONCRETE.
  - H. CALCIUM CHLORIDE ADDITIVE IN CONCRETE WILL NOT BE ALLOWED EXCEPT BY WRITTEN PERMISSION OF ENGINEER.
  - I. THE OWNER WILL ENGAGE A CONCRETE TESTING COMPANY TO OBTAIN AND TEST CONCRETE SPECIMENS. THE CONTRACTOR MUST COORDINATE HIS SCHEDULES SO THE SPECIMENS MAY BE TAKEN DURING CONCRETE PLACEMENTS. FOUR (4) SPECIMENS OR CYLINDERS SHALL BE TAKEN FOR EVERY 30 CUBIC YARD POUR, AND FOR EACH AND EVERY POUR MADE. BREAK ONE CYLINDER AT 7 DAYS, AND TWO AT 28 DAYS. HOLD THE FOURTH CYLINDER IN CASE THERE IS A QUESTION ON 28 DAY STRENGTH. REPORT TEST RESULTS TO ENGINEER WITHIN 2 DAYS AFTER BREAKS.
  - J. DO NOT BACKFILL AGAINST WALLS UNTIL CONCRETE IN FIELD (NOT LABORATORY SPECIMENS) EXCEEDS 3000 PSI COMPRESSIVE STRENGTH, OR 7 DAYS, WHICHEVER IS GREATER. SHORING AND FORMING MUST REMAIN IN PLACE AT SLOPED SIDE WALLS UNTIL CONCRETE REACHES A MINIMUM OF 3000 PSI COMPRESSIVE STRENGTH.
  - K. CONCRETE JOINTS IN A HORIZONTAL PLANE WILL NOT BE ALLOWED, EXCEPT AS DETAILED. ANY STOP IN CONCRETE WORK MUST BE MADE WITH VERTICAL BULK-HEADS. ALL CONSTRUCTION JOINTS SHALL BE AS DETAILED OR APPROVED BY THE ENGINEER. BASIN WALLS AND SLAB TO BE CAST IN TWO POURS TO ALLOW FOR CONCRETE SHRINKAGE.
  - L. APPLY WHITE PIGMENTED LIQUID CURING COMPOUND (CONFORMING TO ASTM C309) TO SLABS WITHIN 30 MINUTES OF FINISHING. APPLY SECOND COAT OF COMPOUND WITHIN 30 MINUTES OF FIRST COAT, APPLIED AT 90° TO THE FIRST. COVER SLABS WITH 6 MIL POLYETHYLENE FILM FOR 48 HOURS AFTER POURING.
  - M. FORMWORK WILL CONFORM TO SHAPES, LINES AND DIMENSIONS OF MEMBERS SHOWN ON THE DRAWING AND BE SUFFICIENTLY TIGHT TO PREVENT LEAKAGE OF MORTAR. COAT ALL FORMWORK PRIOR TO PLACING REINFORCEMENT. FORMWORK WILL NOT EMPLOY STAKES DRIVEN INTO THE SAND DRAIN MATERIAL, TO PREVENT PENETRATING SYNTHETIC LINER.
  - N. COVER TOP OF WALLS WITH BURLAP, KEPT WET FOR 4 DAYS AFTER POURING. FORMWORK CAN BE REMOVED NO LESS THAN 4 DAYS AFTER POURING.
- REINFORCING STEEL:
  - A. ALL REINFORCING SHALL CONFORM TO ASTM 615(S1), GRADE 60.
  - B. NO SPLICES OR REINFORCEMENT SHALL BE MADE EXCEPT AS DETAILED OR AUTHORIZED BY THE ENGINEER. LAP SPLICES, WHERE PERMITTED, SHALL BE A MINIMUM OF 36 BAR DIAMETERS.
  - C. STAGGER SPLICES A MINIMUM OF 4'-0" FOR ADJACENT HORIZONTAL CONTINUOUS BARS.
  - D. DETAIL BARS IN ACCORDANCE WITH A.C.I. DETAILING MANUAL AND A.C.I. BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, LATEST EDITIONS.
  - E. PROVIDE ALL ACCESSORIES NECESSARY TO SUPPORT REINFORCING AT POSITIONS SHOWN ON THE DRAWINGS.
  - F. SHOP DRAWINGS FOR REINFORCING MUST BE REVIEWED BY THE ENGINEER PRIOR TO FABRICATION.
  - G. THE ENGINEER MUST OBSERVE THE PLACEMENT OF REINFORCING PRIOR TO PLACING CONCRETE. CALL A MINIMUM OF 24 HOURS BEFORE PLACING CONCRETE, AND REVERIFY IF REQUIRED.



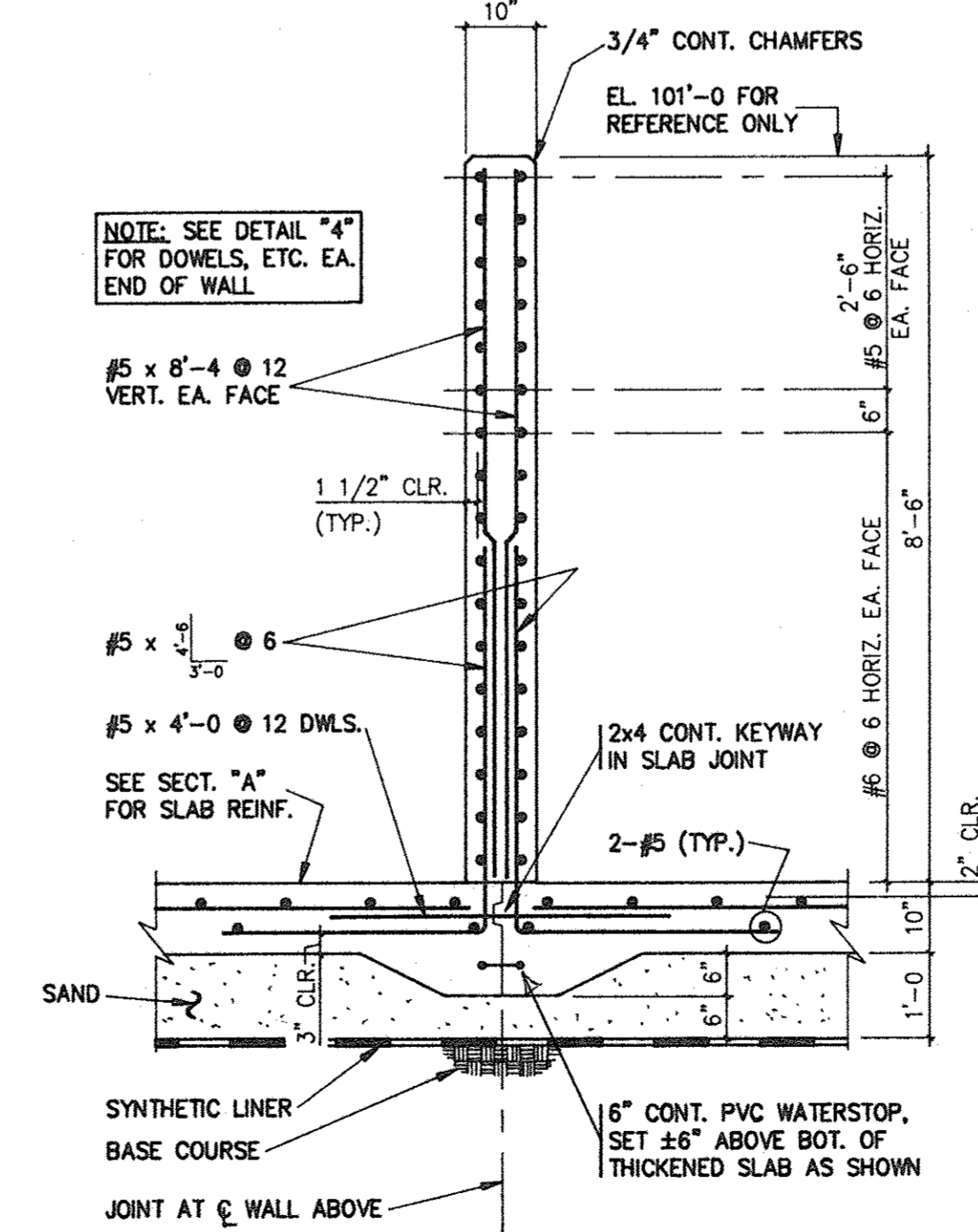
**PLAN VIEW**  
1/8"=1'-0"  
SEE SHEET S-2 FOR LONGITUDINAL AND TRANSVERSE SECTIONS.



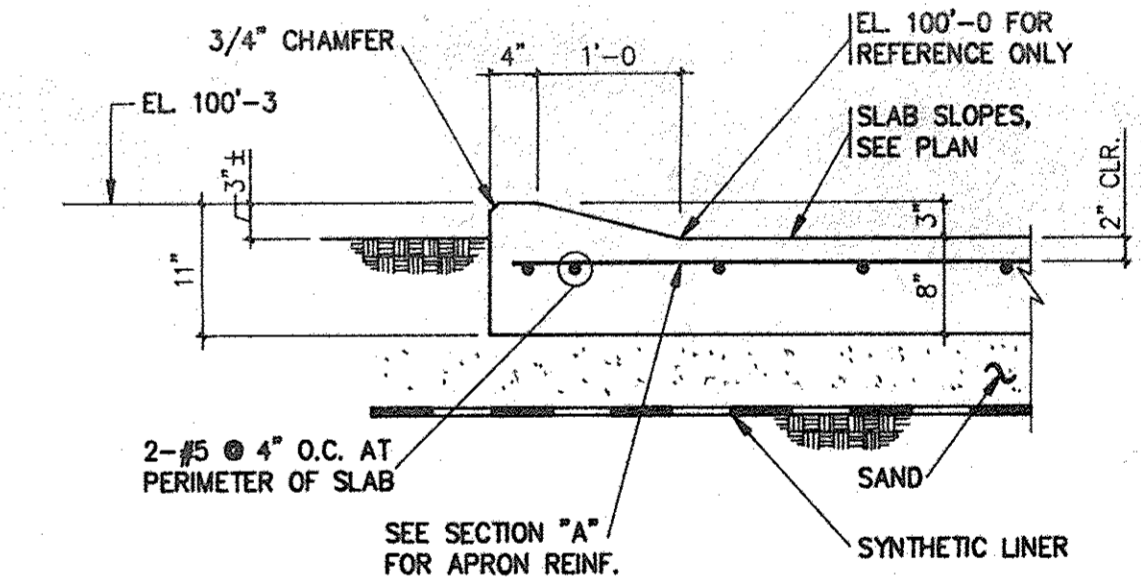
**SECTION A**  
TYPICAL SIDE WALLS  
1/2"=1'-0"



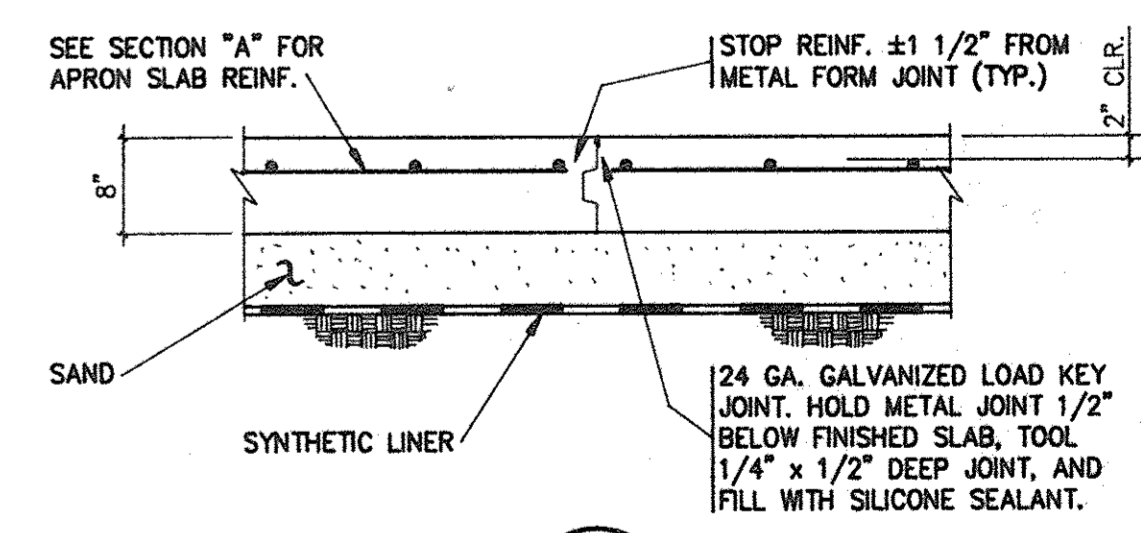
**SECTION B**  
TYPICAL END WALLS  
1/2"=1'-0"



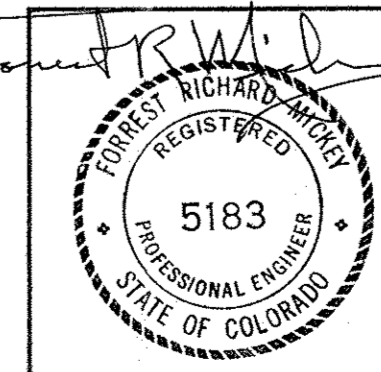
**SECTION C**  
CONSTRUCTION JOINT IN BASIN SLAB, AND DIVIDER WALL  
1/2"=1'-0"



**SECTION D**  
TYP. CURB AT APRON SLAB  
3/4"=1'-0"



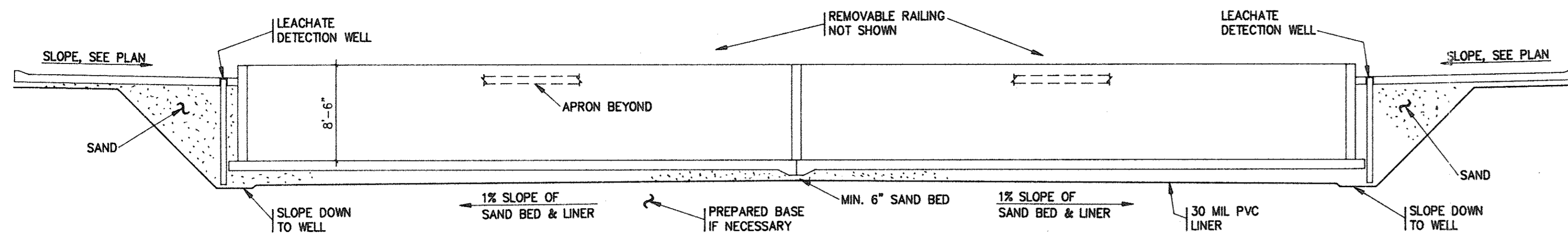
**SECTION E**  
TYP. CONTROL OR CONST. JOINT IN APRON SLAB  
3/4"=1'-0"



PLAN AND SECTIONS  
**MIXING BASIN NO. 2**  
**CONSERVATION SERVICES, INC.**  
41800 EAST 88th AVENUE  
BENNETT, COLORADO 80102

|         |               |                            |                      |           |
|---------|---------------|----------------------------|----------------------|-----------|
| DATE    | AUG. 23, 1991 | MICKEY AND SCHNEIDER, INC. | CONSULTING ENGINEERS | SHEET NO. |
| BY      | FRM/JSP       | 7500 WEST MISSISSIPPI AVE. | SUITE 236            | S-1       |
| CHECKED | FRM           | LAKEWOOD, COLORADO 80226   | (303) 922-1118       | OF 2      |
| JOB NO. | 87269         |                            |                      |           |

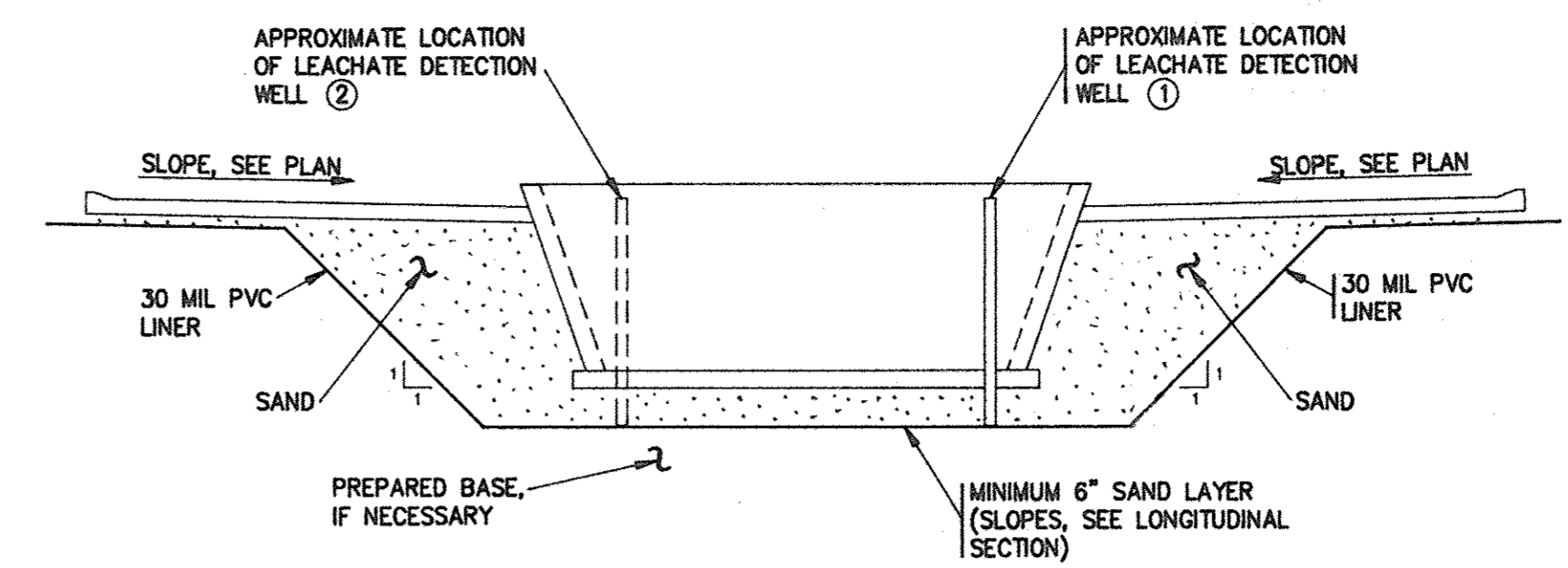




**LONGITUDINAL SECTION**

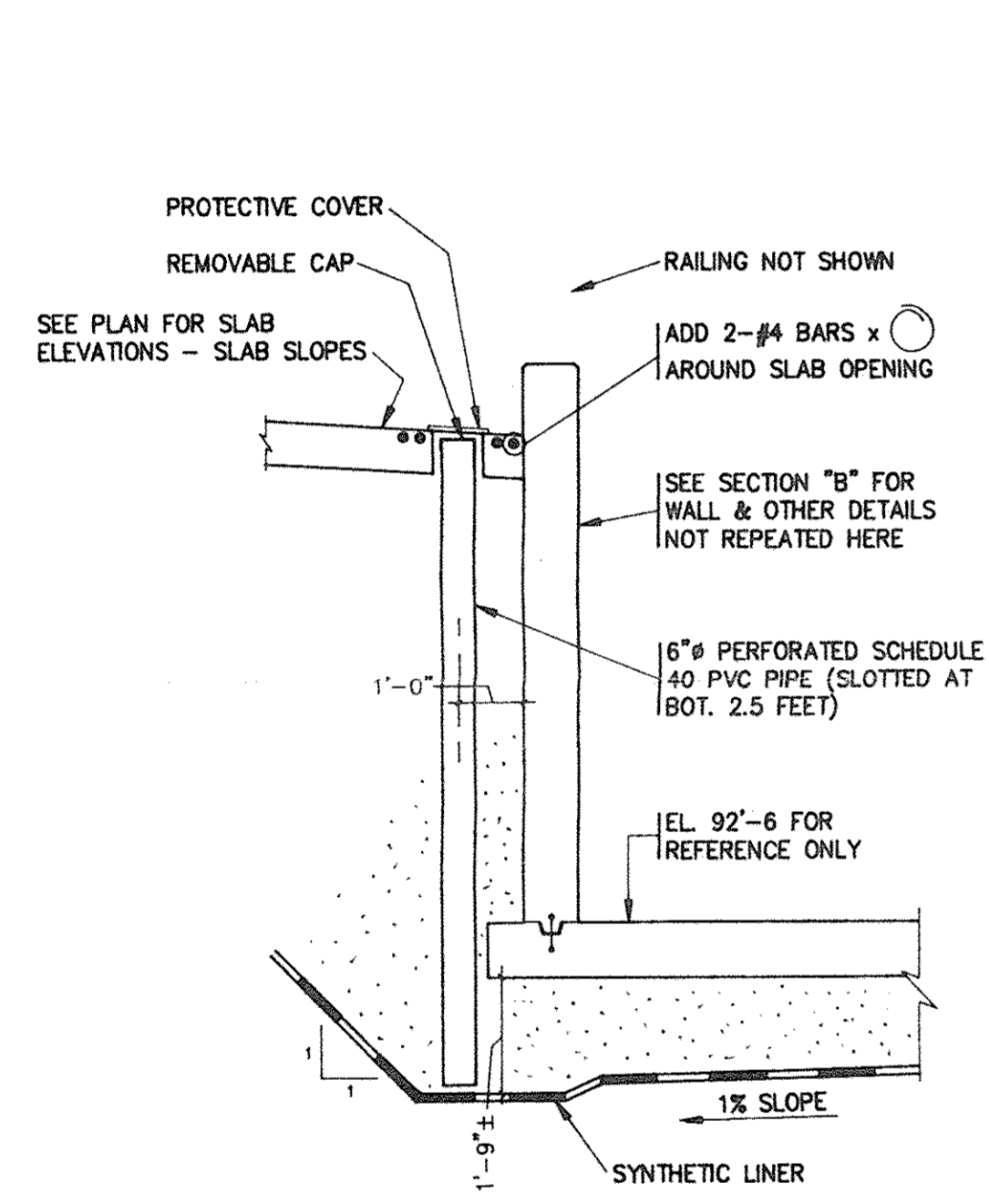
1/8"=1'-0"

- NOTES:**
1. SOILS MUST BE PREPARED PRIOR TO PLACEMENT OF LINER TO PROVIDE AN EVEN BED SO THAT LINER WILL NOT BE PUNCTURED. IF ROCKS OR OTHER IRREGULAR MATERIALS ARE PRESENT IN SOILS, PLACE A BASE COURSE OF APPROXIMATELY 8" OF COMPACTED KILN DUST BENEATH LINER.
  2. SYNTHETIC LINER IS TO BE 30 MIL PVC.
  3. A CLEAN SAND IS TO BE USED FOR DRAINAGE MATERIAL. MINIMUM THICKNESS OF SAND BENEATH BASIN SLAB, AT DIVIDER WALL, TO BE 6" - SLOPE TOWARD LEACHATE WELLS AT 1 PERCENT SLOPE AS SHOWN.
  4. HEAVY EQUIPMENT WILL NOT BE ALLOWED ON LINER OR SAND.



**TRANSVERSE SECTION**

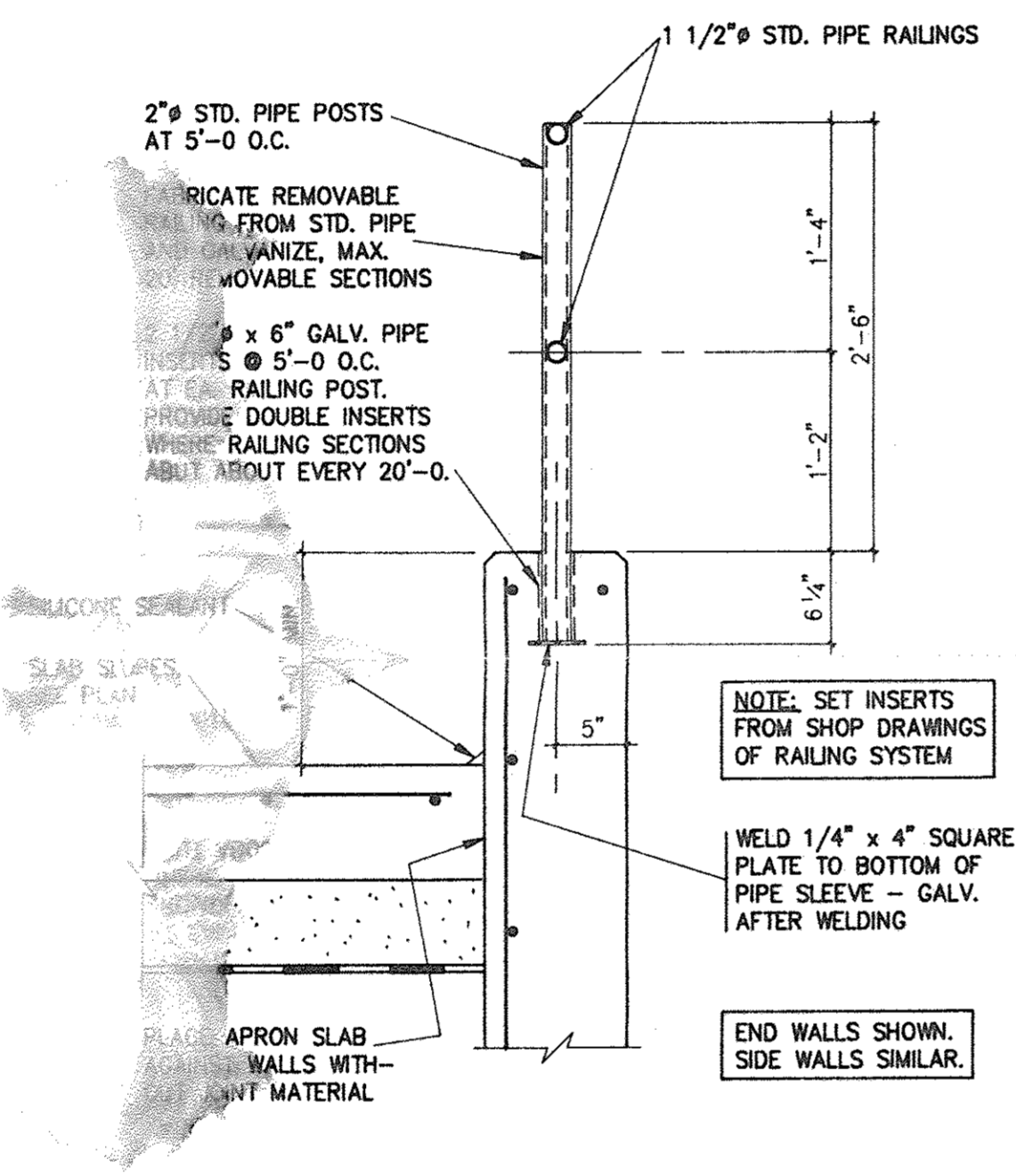
1/8"=1'-0"



**DETAIL 1**

1 S1/S2

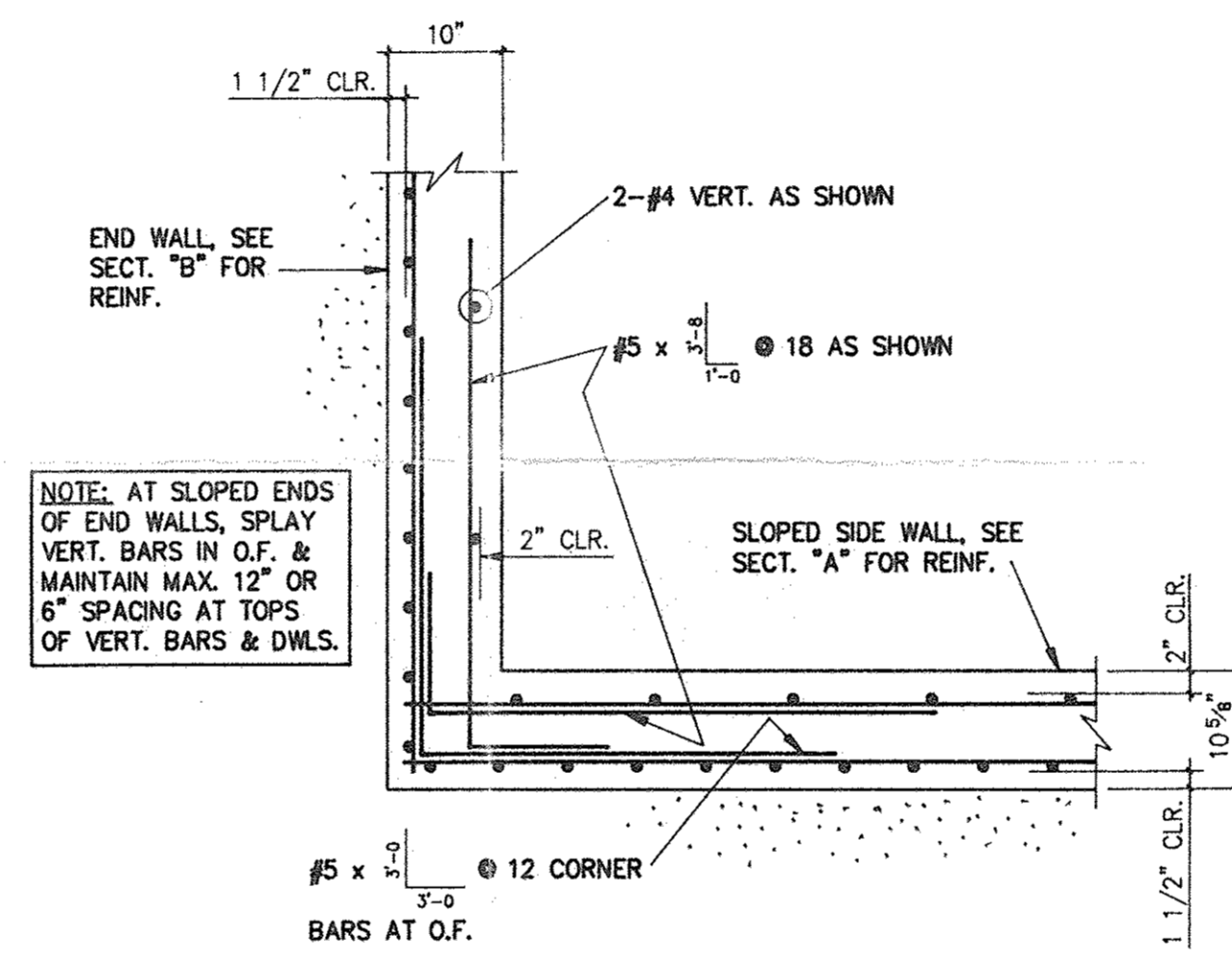
3/8"=1'-0"



**DETAIL 2**

2 S1/S2

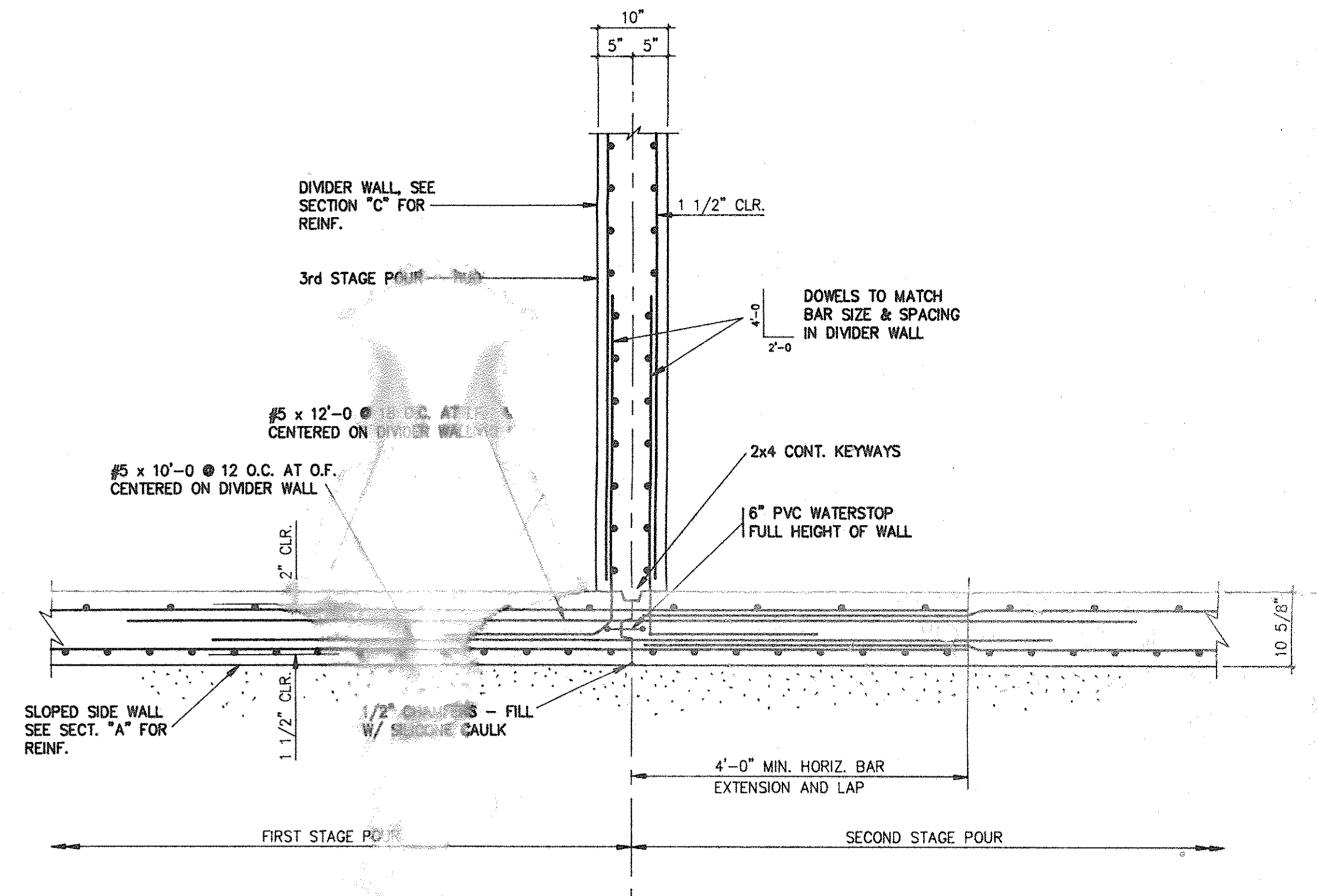
1"=1'-0"



**DETAIL 3**

3 S1/S2

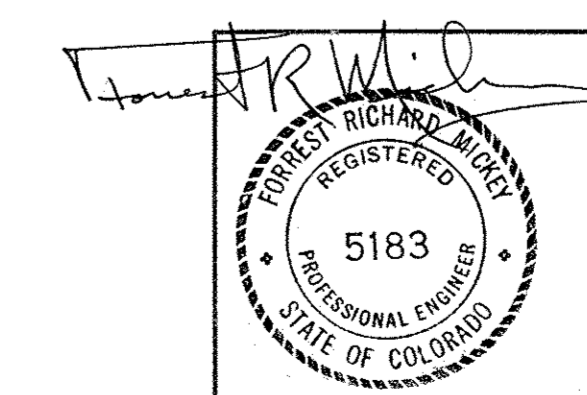
3/4"=1'-0"



**DETAIL 4**

4 S1/S2

3/4"=1'-0"



**SECTIONS AND DETAILS**

MIXING BASIN NO. 2  
CONSERVATION SERVICES, INC.  
41800 EAST 88th AVENUE  
BENNETT, COLORADO 80102

|         |               |  |                             |
|---------|---------------|--|-----------------------------|
| DATE    | AUG. 23, 1991 | MICKEY AND SCHNEIDER, INC. CONSULTING ENGINEERS        | SHEET NO.<br>S-2            |
| BY      | FRM/JSP       |  |                             |
| CHECKED | FRM           |  |                             |
| JOB NO. | 87269         |  |                             |
|         |               |  |                             |
|         |               | 7500 WEST MISSISSIPPI AVE.<br>LAKEWOOD, COLORADO 80226 | SUITE 236<br>(303) 922-1118 |

**APPENDIX A - TRAFFIC STUDY**

# Leigh, Scott & Cleary, Inc.

TRANSPORTATION PLANNING  
& TRAFFIC ENGINEERING CONSULTANTS  
Offices in Denver and Colorado Springs

1889 York Street  
Denver, Colorado 80206  
(303) 333-1105

October 11, 1988

Mr. Gerald W. Knudsen, P.E.  
Industrial Compliance, Inc.  
511 Orchard St.  
Golden, CO 80401

RE: 88th & Schumaker  
Disposal Facility  
(LSC #880740)

Dear Mr. Knudsen:

We have completed a revised traffic analysis of the proposed Conservation Services Non-Hazardous Solid Wastes Disposal Facility which is planned to be located along the south side of Irondale Road (88th Avenue) and west of Schumaker Road in Adams County, Colorado. The following comments summarize our findings.

#### Location and Project Description

The location of the proposed Conservation Services Facility is shown in Figure 1. The only direct access to and from the site is planned along Irondale Road. In the vicinity of the site, Irondale Road is a two-lane paved roadway approximately 24 feet wide. The remaining roads in the vicinity are two-lane gravel routes with widths which vary between 20 and 30 feet. Two types of wastes will be delivered to the site--solid and liquid. When the project is fully operational, approximately 20 workers will be employed at the site and future maximum site usage may increase the employee count to 30.

#### Traffic Generation - Initial Operations

Traffic entering and exiting the site can be divided into five categories; solid materials delivery trucks, liquid waste delivery trucks, asbestos waste delivery trucks, employee trips and equipment/supply delivery trucks. Based upon observed activity at the Conservation Services, Inc. landfill at 777 West 62nd Avenue in Denver, Colorado, and past experience of Conservation Services, Inc., it is conservatively estimated that the site will initially generate a maximum of 5 solid materials delivery trucks, 7 liquid waste delivery trucks and 2 supply trucks per day. In addition, approximately 3 asbestos delivery trucks are anticipated per week. An assumption of about two vehicle-trips per employee per day results in about 70 total vehicle-trips being generated by the site per day (30 heavy truck trips and 40 automobile/ pickup truck trips). This traffic activity will occur only on weekdays between 7:00 A.M. and 5:30 P.M.

Traffic Generation - Future Operations

The estimates cited above reflect total daily delivery of about 160 cubic yards of equivalent solid waste material to the proposed facility. This level of activity is expected to be reached within the first year of operations. In the future, however, the facility could accept a maximum of 385 cubic yards of equivalent solid waste materials per day which would require an additional ten employees (30 total employees). If this activity level is achieved, truck traffic generation would increase proportionately to about 70 vehicle-trips per day and employee traffic would increase to 60 trips per day (130 total daily vehicle-trips).

Distribution

Figure 1 also illustrates the estimated directional distribution of site-generated traffic. Three different distributions are anticipated. Initially, the largest concentration of disposal site vehicles will be along Irondale Road where 70 percent of the traffic is anticipated. With the closure of Irondale in conjunction with the construction of Denver's new regional airport, the distribution will be primarily oriented towards I-70 via Imboden and Manilla Roads. Similarly, the third distribution assumes the closure of Manilla Road south of Irondale in conjunction with the possible expansion of the Front Range Airport.

Traffic Impacts

Current traffic activity along Irondale Road near the site is estimated to be about 500 vehicle-trips per day. It is further estimated that both Imboden and Manilla Roads presently accommodate less than 200 vehicle-trips per day. Traffic generated by the Conservation Services Facility will add as much as 130 trips per day to Irondale and about 104 daily trips to Imboden. These increases can easily be accommodated considering current capacity of these routes--about 5,000 vehicles per day on Irondale and about 1,000 on Imboden. In addition, the amount of facility-generated traffic to be added to the surrounding road system should not create any significant reduction in traffic safety. The affected routes are provided with adequate traffic controls, right-of-way assignment at all affected intersections is controlled by two-way Stop signs, and relatively low speed limits are posted.

\* \* \*

Mr. Gerald W. Knudsen

Page 3

October 11, 1988

We trust that our findings will assist with further planning for the proposed Conservation Services facility. Please call if we can be of additional assistance.

Respectfully submitted,

LEIGH, SCOTT & CLEARY, INC.

By *Philip N. Scott III*  
Philip N. Scott III, P.E.

PNS/mlc

Enclosure: Figure 1

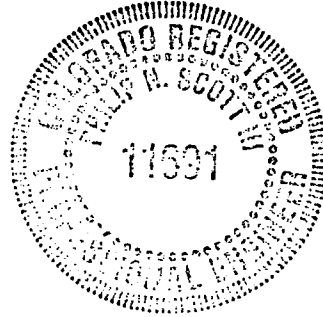
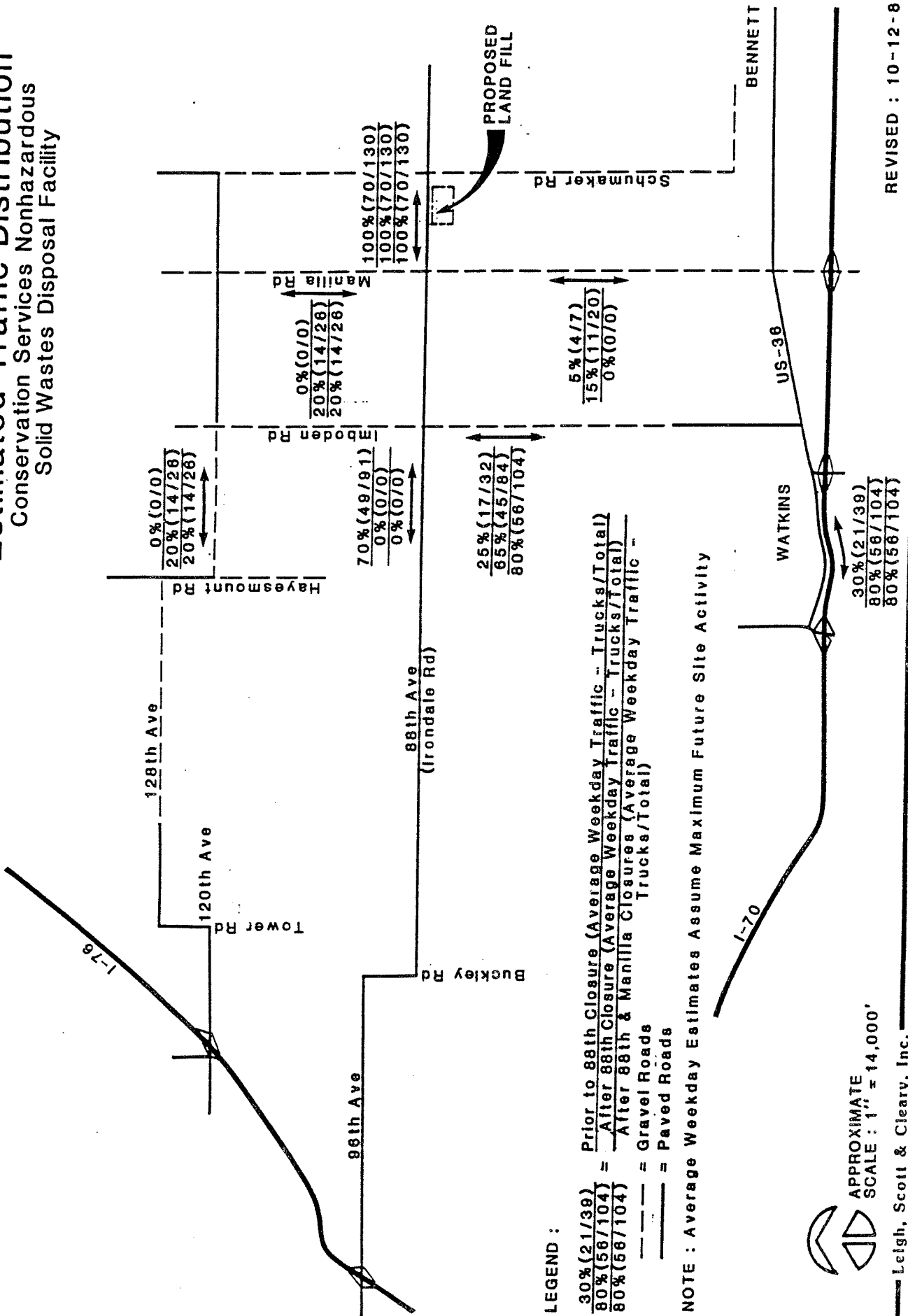


Figure 1

# Site Location and Estimated Traffic Distribution

Conservation Services Nonhazardous  
Solid Wastes Disposal Facility



**LEGEND :**

- 30% (21/39) = Prior to 88th Closure (Average Weekday Traffic - Trucks/Total)
- 80% (56/104) = After 88th Closure (Average Weekday Traffic - Trucks/Total)
- 80% (56/104) = After 88th & Manilla Closures (Average Weekday Traffic - Trucks/Total)
- = Gravel Roads
- = Paved Roads

NOTE : Average Weekday Estimates Assume Maximum Future Site Activity



APPROXIMATE  
SCALE : 1" = 14,000'

Leigh, Scott & Cleary, Inc.

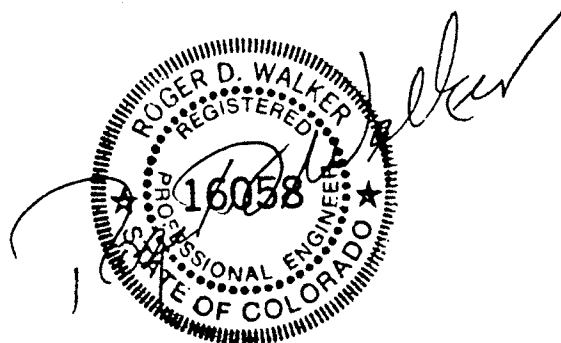
**APPENDIX B - DRAINAGE AND FLOOD PLAIN REPORT**

**CSI OFFSITE DRAINAGE  
PRELIMINARY ANALYSIS**

**OCTOBER, 1988**

**Prepared by:**

**QCI Development Consultants  
11990 Grant St.  
Suite 310  
Northglenn, Co. 80233  
450-0917**





## CSI OFFSITE DRAINAGE PRELIMINARY ANALYSIS

### Introduction

Conservation Services, Inc., CSI, has requested a Certificate of Designation for:

1. Offices and Plant for solidification of non-hazardous liquid waste,
2. Landfill of solidified waste, contaminated soil, asbestos and other EPA designated non-hazardous materials.

The size of the site is approximately 240 acres located at approximately 1/4 mile west of the SW corner of 88th Ave. (Irondale Rd.) and Schumacher Rd. (30N). It is more particularly described as the NW 1/4 and the W 1/2, NE 1/4 of Section 25, T2S, R64W of the 6th PM, County of Adams, State of Colorado.

Present zoning on the property is A-3 and the property lies within the "Airport Area" Overlay Zone District of the County. The municipal growth area is projected to be Aurora. Existing land use is agricultural. No specific land use or zoning designations are yet available for future development patterns. As such this Report shall be deemed a Preliminary Analysis, approximating by use of the Colorado Urban Hydrograph Procedure those flow rates impacting the site under present basin characteristics.

The purpose of this Report is to quantify present storm water run off from upstream basins affecting the site. The Colorado Urban Hydrograph Procedure was utilized as the most expedient and appropriate method of calculation for this Preliminary Analysis. Full HEC-II analysis or SWMM analysis will probably someday be conducted by the UD&FCD for FHAD mapping but this level of detailed study is not warranted at this time for this single user or until land use patterns of the area become more defined. We therefore encourage the reader to utilize the data as preliminary for the planning and determination of site facilities with respect to the approximate flow rates shown herein.

### Existing Conditions

The site is presently agricultural. It and the surrounding fields appear to be farmed in dry land grasses of varying types. Topography is very gentle from south to north. The property is divided by a ridge running from south to north through its approximate center. The east side of the site is intended to be the operational area. The west side of the site is intended to be an area for disposal and grading of surplus fill material.

Run off from the south enters the east portion at the site's south property line. No defined drainage way or swale exists. The offsite basin consists of approximately 288 acres of dry land farming and is defined as Basin A herein. Basin B of this Report is the east portion of the site itself. Basins A and B sheet flow to approximately the southwest corner of 88th Ave. and Schumacher Rd. No culvert of drainage structure exists.

Both basins A & B are poorly defined in the gentle rolling country of this area. Farming operations generally furrowing perpendicular to the topography inhibit run off and generally retain water. Soil Conservation Service mapping of these basins was examined and it was determined that the general Hydrologic Soil Group was "B". The maps in the Appendix of this Report describe the areas noted as Basins A and B.

The west portion of the site is impacted by Basins C & D as defined herein. Both of these basins are large, encompassing approximately seven square miles each. Their size makes them more defined with more obvious drainage paths at their low points. These are the basins that are likely for study by UD&FCD in the future. They are presently agricultural however, gently sloping to a common confluence at the extreme southwest corner of the site. A Hydrologic Soil Group "C" was arbitrarily chosen for these basins as the most conservative soil group.

#### Developed Conditions

This Report has assumed a run off coefficient of 0% impervious, for its analysis. This coefficient is intended to represent the present land use for the area. It is applied to all the offsite (Basins A,C,D) and onsite (Basin B) basins. No upstream detention is assumed. In reality, at time of development, detention policies are usually enforced for areas such as this where no defined waterway exists.

#### Hydrology and Methodology

The UD&FCD "Colorado Urban Hydrograph Procedure Computer Program - PC Version", January, 1985 was used in concert with the UD&FCD Manual for analysis. The following basin and storm parameters were applied:

| Description                       | Basins |      |     |     |
|-----------------------------------|--------|------|-----|-----|
|                                   | A      | A&B  | C   | D   |
| Area (sq. mi.)                    | 0.45   | 0.77 | 7.0 | 7.1 |
| Sub-basin length (mi.)            | 1.4    | 2.2  | 8.3 | 8.1 |
| Sub-basin centroid distance (mi.) | 0.7    | 1.1  | 5.2 | 4.6 |

|                                   |        |        |        |        |
|-----------------------------------|--------|--------|--------|--------|
| Percent Impervious                | 0      | 0      | 0      | 0      |
| Slope (ft/ft)                     | 0.010  | 0.0066 | 0.006  | 0.0068 |
| Pervious detention (inches)       | 0.35   | 0.35   | 0.35   | 0.35   |
| Impervious detention (inches)     | 0.1    | 0.1    | 0.1    | 0.1    |
| Hydrologic soil group             | B      | B      | C      | C      |
| Rainfall (100yr.-1hr.)            | 2.75   | 2.75   | 2.75   | 2.75   |
| Initial Infiltration Rate (in/hr) | 4.5    | 4.5    | 3.0    | 3.0    |
| Decay rate                        | 0.0018 | 0.0018 | 0.0018 | 0.0018 |
| Final Infiltration Rate (in/hr)   | 0.6    | 0.6    | 0.5    | 0.5    |

The data produced the following 100 year flow rates that the CSI site must provide for:

Entering the east portion of  
the site from the south, Basin A:  $Q_{100} = 255\text{cfs}$

Exiting the east portion of  
the site at the NE corner, Basin A&B:  $Q_{100} = 295\text{cfs}$

At the southwest corner of  
the site, Basins C&D combined at a  
common time to peak of 225 minutes:  $Q_{100} = 2261\text{cfs}$

### West Floodplain

Based on the hydrology developed and the topography available the approximate limits of the 100 year floodplain affecting the west portion of the site has been plotted. The floodplain enters the site at the southwest corner, Section A-A, as a broad relatively shallow floodplain. A flow split occurs through Sections B-B, and C-C creating an area of shallow flooding east of the main channel. Sections B-B and C-C have been calculated assuming the full 2261 cfs remains in the main channel. This would necessitate filling the area of shallow flooding and would cause a rise of approximately 0.3' in water surface profile at Section A-A.

## Conclusions

The flow rates are based on present developed conditions with no upstream detention. Future development changes to Schumacher Rd. or other land parcels may alter the upstream characteristics of the basin. These alterations will occur over time however and any resulting impact to the CSI site can be analyzed on a case by case basis. Provisions by the CSI site to accommodate the flow rates projected above will afford operational stability until such time as full hydraulic analysis based on projected land use patterns can be created.

APPENDIX

B. Drainage &  
Flood Plain

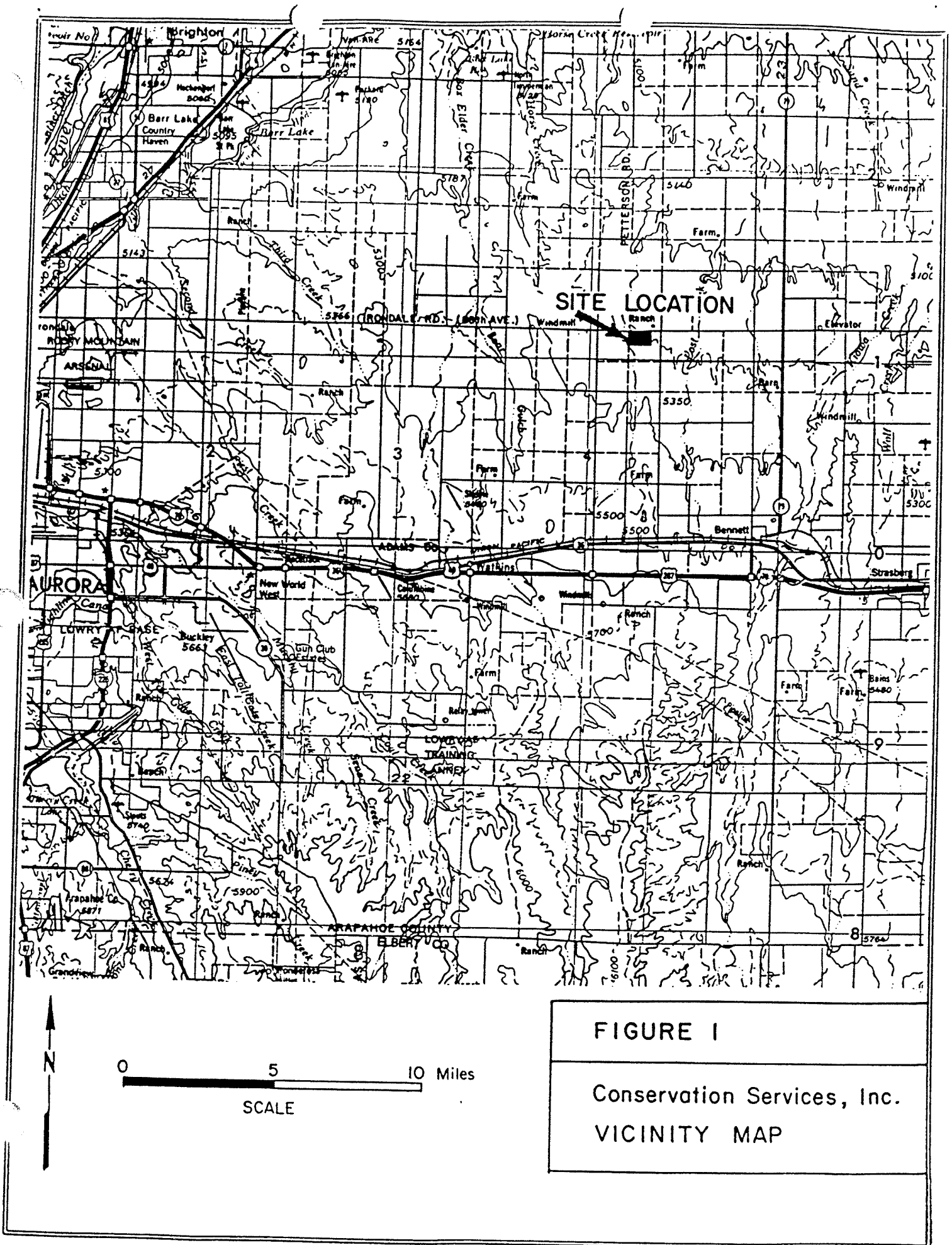
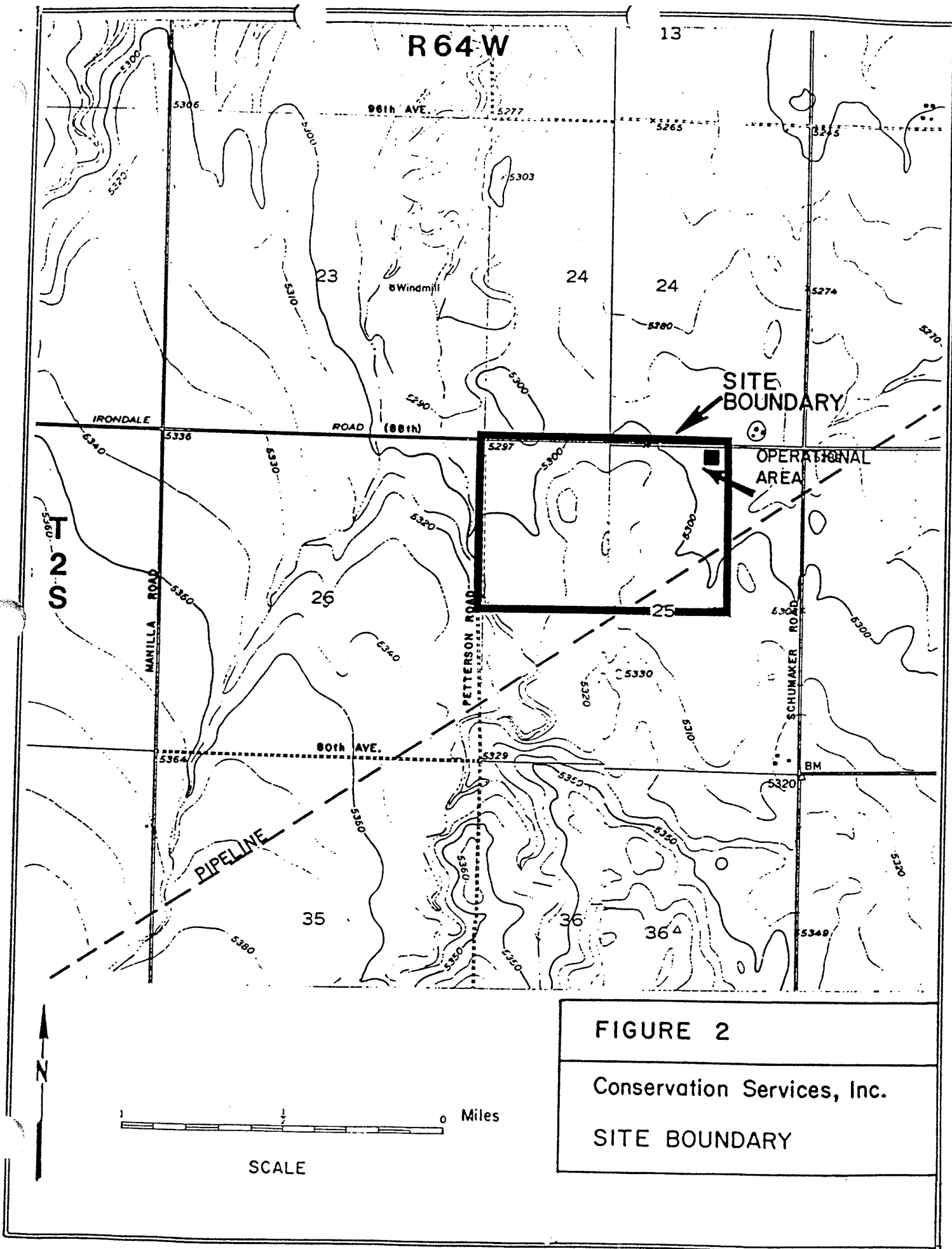


FIGURE I

Conservation Services, Inc.  
VICINITY MAP

0 5 10 Miles

SCALE



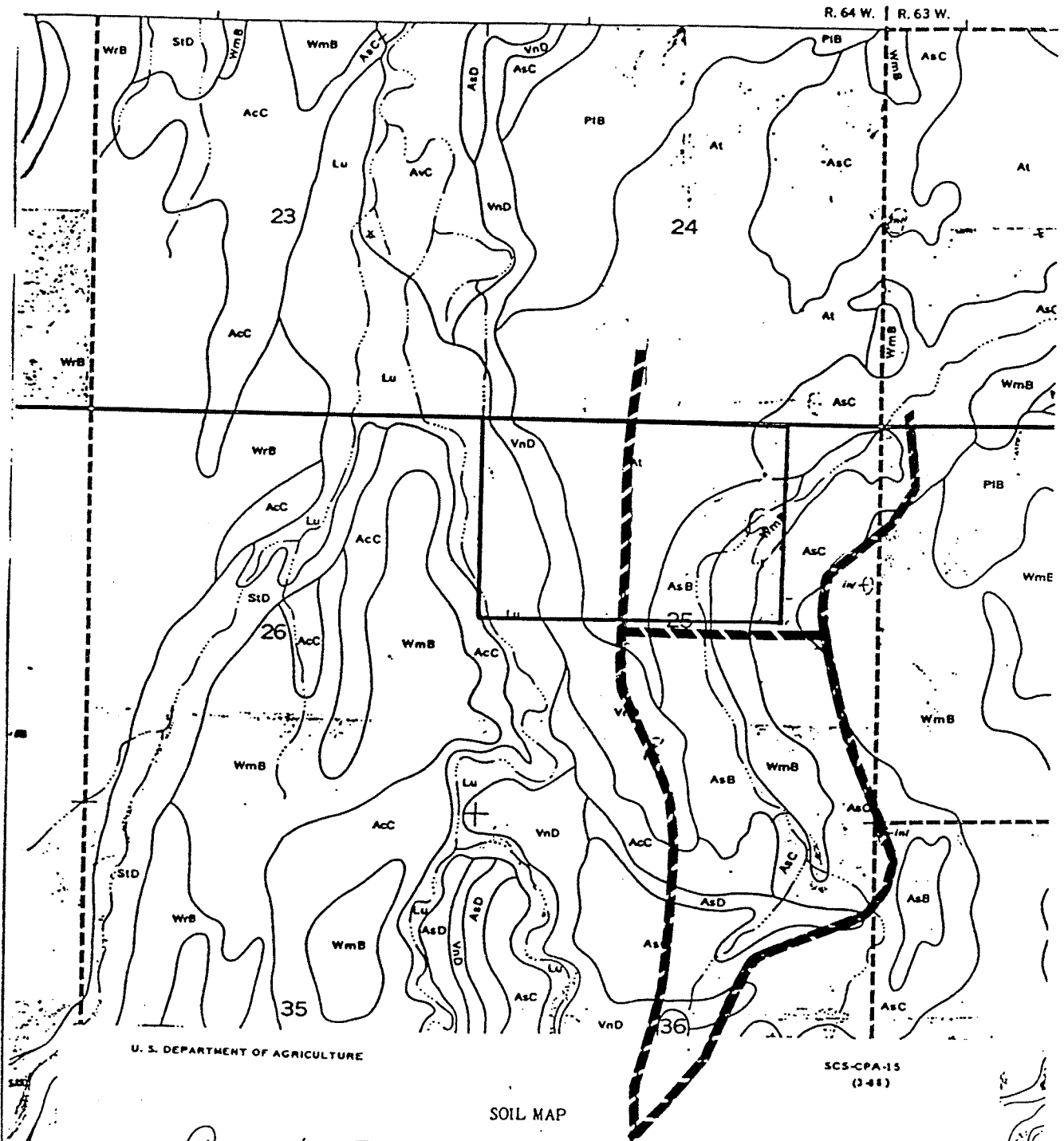
Symbol

Name

Hyd. Soil Group

|     |                 |     |
|-----|-----------------|-----|
| AsC | Ascalon         | B   |
| AsD | Ascalon         | B   |
| AcC | Adena-Colby     | C-B |
| AsB | Ascalon         | B   |
| WmB | Weld            | C   |
| VnD | Vona            | B   |
| At  | Ascalon-Platner | B-C |

ADAMS COUNTY, COLORADO — SHEET NUMBER 55



U. S. DEPARTMENT OF AGRICULTURE

SCS-CPA-15  
(3-48)

SOIL MAP

Owner Conservation Service, Inc. Operator \_\_\_\_\_  
 County Adams State CO  
 Soil survey sheet(s) or code nos. 55 Approximate scale 1" = 1667 ft  
 Prepared by U. S. Department of Agriculture, Soil Conservation Service cooperating  
 with East Adams Soil Conservation District



TABLE 3-1 (42)  
RECOMMENDED RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

| LAND USE OR<br>SURFACE CHARACTERISTICS               | PERCENT<br>IMPERVIOUS | FREQUENCY     |     |     |     |
|--|-----------------------|---------------|-----|-----|-----|
|  |                       | 2             | 5   | 10  | 100 |
| <u>Business:</u>                                     |                       |               |     |     |     |
| Commercial Areas                                     | 95                    | .87           | .87 | .88 | .89 |
| Neighborhood Areas                                   | 70                    | .60           | .65 | .70 | .80 |
| <u>Residential:</u>                                  |                       |               |     |     |     |
| Single-Family  | *                     | .40           | .45 | .50 | .60 |
| Multi-Unit (detached)                                | 50                    | .45           | .50 | .60 | .70 |
| Multi-Unit (attached)                                | 70                    | .60           | .65 | .70 | .80 |
| 1/2 Acre Lot or Larger                               | *                     | .30           | .35 | .40 | .60 |
| Apartments   | 70                    | .65           | .70 | .70 | .80 |
| <u>Industrial:</u>                                   |                       |               |     |     |     |
| Light Areas  | 80                    | .71           | .72 | .76 | .82 |
| Heavy Acres  | 90                    | .80           | .80 | .85 | .90 |
| <u>Parks, Cemeteries:</u>                            | 7                     | .10           | .10 | .35 | .60 |
| <u>Playgrounds:</u>                                  | 13                    | .15           | .25 | .35 | .65 |
| <u>Schools:</u>                                      | 50                    | .45           | .50 | .60 | .70 |
| <u>Railroad Yard Areas</u>                           | 40                    | .40           | .45 | .50 | .60 |
| <u>Undeveloped Areas:</u>                            |                       |               |     |     |     |
| Historic Flow Analysis-                              | 2                     | (See "Lawns") |     |     |     |
| Greenbelts; Agricultural                             |                       |               |     |     |     |
| Offsite Flow Analysis<br>(when land use not defined) | 45                    | .43           | .47 | .55 | .65 |
| <u>Streets:</u>                                      |                       |               |     |     |     |
| Paved  | 100                   | .87           | .88 | .90 | .93 |
| Gravel   | 13                    | .15           | .25 | .35 | .65 |
| <u>Drive and Walks:</u>                              | 96                    | .87           | .87 | .88 | .89 |
| <u>Roofs:</u>  | 90                    | .80           | .85 | .90 | .90 |
| <u>Lawns, Sandy Soil</u>                             | 0                     | .00           | .01 | .05 | .20 |
| <u>Lawns, Clayey Soil</u>                            | 0                     | .05           | .10 | .20 | .40 |

NOTE: These Rational Formula coefficients may not be valid for large basins.

\*See Figure 2-1 for percent impervious.

TABLE 2-1

## TYPICAL DEPRESSION RETENTION FOR VARIOUS LAND COVERS

(all values in inches)  
(For use with CUHP Method)

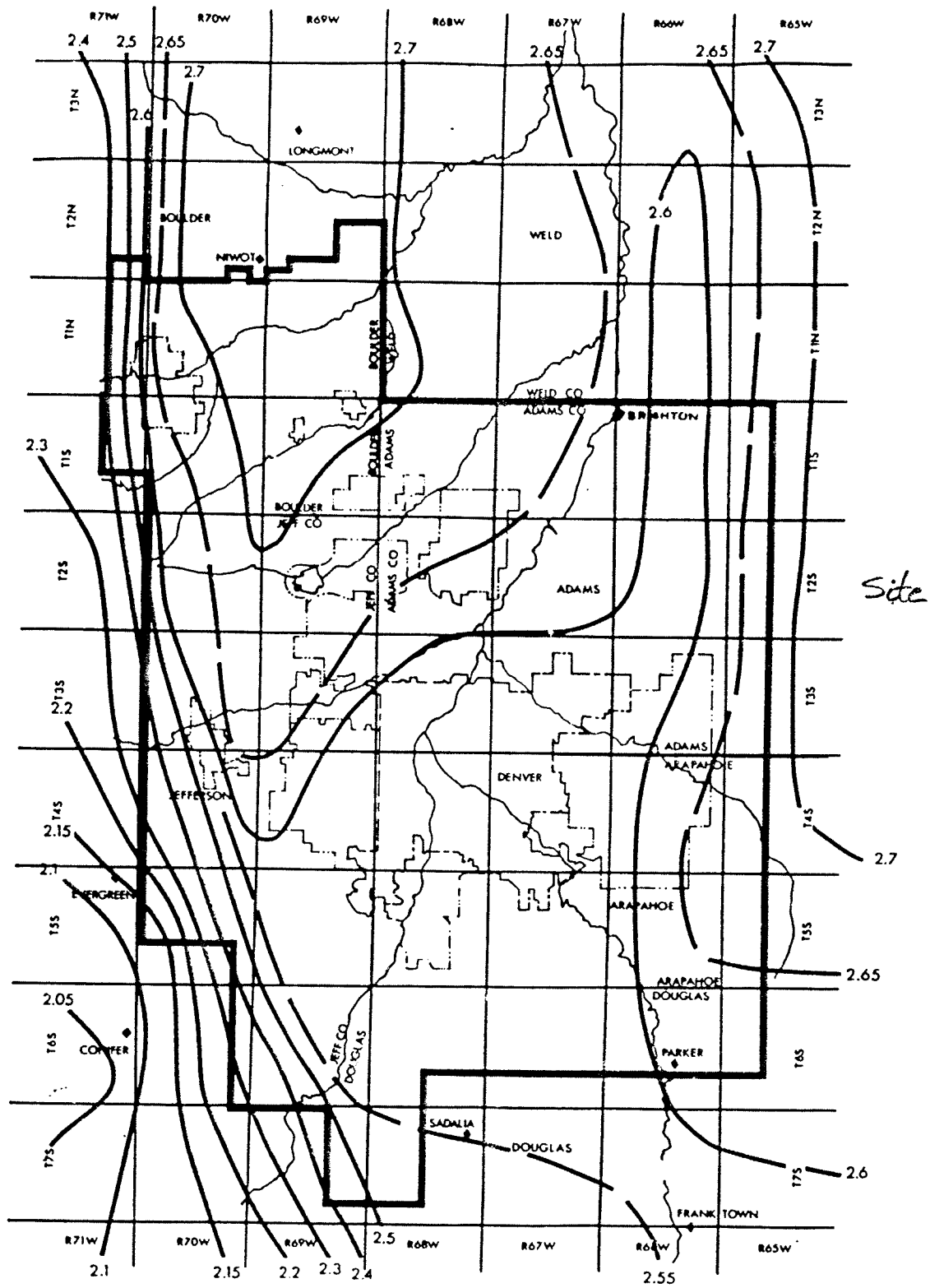
| <u>Land Cover</u>              | <u>Depression &amp; Detention</u> | <u>Recommended</u> |
|--------------------------------|-----------------------------------|--------------------|
| Impervious:                    |                                   |                    |
| Large Paved Areas              | 0.05 - 0.15                       | <u>0.1</u>         |
| Roofs - Flat                   | 0.1 - 0.3                         | <u>0.1</u>         |
| Roofs - Sloped                 | 0.05 - 0.1                        | 0.05               |
| Pervious                       |                                   |                    |
| Lawn Grass                     | 0.2 - 0.5                         | <u>0.35</u>        |
| Wooded Area and<br>Open Fields | 0.2 - 0.6                         | <u>0.4</u>         |

TABLE 2-2

## RECOMMENDED HORTON'S EQUATION PARAMETERS

| <u>SCS Hydrologic<br/>Soil Group</u> | <u>Infiltration (in/hr)</u>       |                                 | <u>Decay<br/>Coefficient</u> |
|--------------------------------------|-----------------------------------|---------------------------------|------------------------------|
|                                      | <u>Initial - <math>f_i</math></u> | <u>Final - <math>f_o</math></u> |                              |
| A                                    | 5.0                               | 1.0                             | 0.0007                       |
| B                                    | 4.5                               | 0.6                             | 0.0018                       |
| C                                    | 3.0                               | 0.5                             | 0.0018                       |
| D                                    | 3.0                               | 0.5                             | 0.0018                       |

FIGURE 2-5. 100 YEAR, 1 HOUR RAINFALL



URBAN DRAINAGE & FLOOD CONTROL DISTRICT  
**RAINFALL**  
 DEPTH - DURATION - FREQUENCY

# Weighted Slope

Basins - A

$$S = \left( \frac{2500(.012)^{.24} + 800(.0375)^{.24} + 4100(.007)^{.24}}{7400} \right)^{4.17}$$

$$= \left( \frac{865 + 364 + 1246}{7400} \right)^{4.17}$$

$$= 0.010 \text{ ft/ft}$$

0.010 ft/ft Fig 4-1

Basins A & B

$$S = \left( \frac{865 + 364 + 1246 + 4200(.0026)^{.24}}{11,600} \right)^{4.17}$$

$$= 0.0066 \text{ ft/ft}$$

0.0066 ft/ft Fig 4-1

## Weighted slope

Basin C

$$S = \frac{(4900(.004)^{.24} + 3800(.005)^{.24} + 12,000(.0075)^{.24} + 23,000(.006)^{.24})^{4.17}}{43,700}$$

$$= \frac{(1302 + 1065 + 3708 + 6737)^{4.17}}{43,700}$$

$$= 0.006 \text{ ft/ft}$$

Basin D

$$S = \frac{(4900(.004)^{.24} + 13,000(.005)^{.24} + 5500(.005)^{.24} + 19,500(.010)^{.24})^{4.17}}{42,900}$$

$$= \frac{(1302 + 3645 + 1542 + 6457)^{4.17}}{42,900}$$

$$= 0.0068 \text{ ft/ft}$$

## Time of Concentration

Basin A:

weighted slope = 1%

grassed waterway Fig 3-2  $V = 1.6$  fps

$L = 7400'$

$t = 77$  mins.

Basin A & B:

weighted slope = 0.66%

grassed waterway Fig 3-2  $V = 1.6$  fps

$L = 11,600'$

$t = 121$  mins.

U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME  
 CUHPE/PC VERSION MODIFIED IN JANUARY 1985  
 PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 0  
 CSI EAST DRAINAGE BASIN A

BASIN ID: A -- BASIN COMMENT: 288 ACRES BASIN A

| AREA OF BASIN (SOMI) | LENGTH OF BASIN (MI) | DIST TO CENTROID (MI) | IMPERVIOUS AREA (PCT) | SLOPE (FT/FT) | UNIT DURATION (MIN) |
|----------------------|----------------------|-----------------------|-----------------------|---------------|---------------------|
| .45                  | 1.40                 | .70                   | .00                   | .0100         | 5.00                |

COEFFICIENT (REFLECTING TIME TO PEAK) .163  
 COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF) .312

CALCULATED UNIT HYDROGRAPH

| TIME TO PEAK (MIN) | TIME OF CONCENTRATION (MIN) | PEAK RATE OF RUNOFF (CFS/SOMI) | UNIT HYDROGRAPH PEAK (CFS) | VOLUME OF RUNOFF (AF) |
|--------------------|-----------------------------|--------------------------------|----------------------------|-----------------------|
| 31.75              | 77.00                       | 410.04                         | 184.52                     | 24.00                 |

WIDTH AT 50 = 73. MIN. WIDTH AT 75 = 38. MIN. K50 = .26 K75 = .35

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PVIOUS RET. = .35 IN. MAX. IMPVIOUS RET. = .10 IN.  
 INFILTRATION = 4.50 IN./HR. DECAY = .00180/SECOND FNINFL = .60 IN./HR.

| TIME | UNIT HYDROGRAPH | * | TIME | UNIT HYDROGRAPH | * | TIME | UNIT HYDROGRAPH | * |
|------|-----------------|---|------|-----------------|---|------|-----------------|---|
| 0.   | 0.              | * | 100. | 77.             | * | 200. | 21.             | * |
| 5.   | 22.             | * | 105. | 72.             | * | 205. | 20.             | * |
| 10.  | 66.             | * | 110. | 68.             | * | 210. | 19.             | * |
| 15.  | 113.            | * | 115. | 63.             | * | 215. | 18.             | * |
| 20.  | 150.            | * | 120. | 60.             | * | 220. | 17.             | * |
| 25.  | 174.            | * | 125. | 56.             | * | 225. | 15.             | * |
| 30.  | 184.            | * | 130. | 52.             | * | 230. | 15.             | * |
| 35.  | 183.            | * | 135. | 49.             | * | 235. | 14.             | * |
| 40.  | 174.            | * | 140. | 46.             | * | 240. | 13.             | * |
| 45.  | 162.            | * | 145. | 43.             | * | 245. | 12.             | * |
| 50.  | 149.            | * | 150. | 41.             | * | 250. | 11.             | * |
| 55.  | 140.            | * | 155. | 38.             | * | 255. | 11.             | * |
| 60.  | 133.            | * | 160. | 36.             | * | 260. | 10.             | * |
| 65.  | 125.            | * | 165. | 33.             | * | 265. | 9.              | * |
| 70.  | 117.            | * | 170. | 31.             | * | 270. | 9.              | * |
| 75.  | 109.            | * | 175. | 29.             | * | 275. | 8.              | * |
| 80.  | 101.            | * | 180. | 28.             | * | 280. | 8.              | * |
| 85.  | 94.             | * | 185. | 26.             | * | 285. | 0.              | * |
| 90.  | 87.             | * | 190. | 24.             | * | 0.   | 0.              | * |
| 95.  | 82.             | * | 195. | 23.             | * | 0.   | 0.              | * |

BASIN ID: A -- BASIN COMMENT: 288 ACRES BASIN A

\*\*\*\* STORM NO. - 1 \*\*\*\* DATE OR RETURN PERIOD - 100 YR.

| TIME<br>(MIN.) | INCREMENT<br>RAINFALL<br>(IN) | TOTAL<br>EXCESS<br>PRECIP | STORM<br>HYDROGRAPH<br>(CFS) | * | TIME<br>(MIN.) | INCREMENT<br>RAINFALL<br>(IN) | TOTAL<br>EXCESS<br>PRECIP | STORM<br>HYDROGRAPH<br>(CFS) | * |
|----------------|-------------------------------|---------------------------|------------------------------|---|----------------|-------------------------------|---------------------------|------------------------------|---|
| 0.             | .00                           | .000                      | 0.                           | * | 165.           | .00                           | .000                      | 81.                          | * |
| 5.             | .03                           | .000                      | 0.                           | * | 170.           | .00                           | .000                      | 76.                          | * |
| 10.            | .08                           | .000                      | 0.                           | * | 175.           | .00                           | .000                      | 71.                          | * |
| 15.            | .13                           | .000                      | 0.                           | * | 180.           | .00                           | .000                      | 67.                          | * |
| 20.            | .22                           | .000                      | 0.                           | * | 185.           | .00                           | .000                      | 63.                          | * |
| 25.            | .38                           | .077                      | 2.                           | * | 190.           | .00                           | .000                      | 59.                          | * |
| 30.            | .69                           | .621                      | 19.                          | * | 195.           | .00                           | .000                      | 55.                          | * |
| 35.            | .38                           | .325                      | 57.                          | * | 200.           | .00                           | .000                      | 52.                          | * |
| 40.            | .22                           | .164                      | 107.                         | * | 205.           | .00                           | .000                      | 48.                          | * |
| 45.            | .17                           | .117                      | 157.                         | * | 210.           | .00                           | .000                      | 45.                          | * |
| 50.            | .14                           | .086                      | 200.                         | * | 215.           | .00                           | .000                      | 43.                          | * |
| 55.            | .11                           | .059                      | 230.                         | * | 220.           | .00                           | .000                      | 40.                          | * |
| 60.            | .11                           | .059                      | 248.                         | * | 225.           | .00                           | .000                      | 38.                          | * |
| 65.            | .11                           | .060                      | 255.                         | * | 230.           | .00                           | .000                      | 35.                          | * |
| 70.            | .05                           | .005                      | 255.                         | * | 235.           | .00                           | .000                      | 33.                          | * |
| 75.            | .05                           | .005                      | 248.                         | * | 240.           | .00                           | .000                      | 31.                          | * |
| 80.            | .03                           | .000                      | 239.                         | * | 245.           | .00                           | .000                      | 29.                          | * |
| 85.            | .03                           | .000                      | 229.                         | * | 250.           | .00                           | .000                      | 27.                          | * |
| 90.            | .03                           | .000                      | 218.                         | * | 255.           | .00                           | .000                      | 26.                          | * |
| 95.            | .03                           | .000                      | 205.                         | * | 260.           | .00                           | .000                      | 24.                          | * |
| 100.           | .03                           | .000                      | 192.                         | * | 265.           | .00                           | .000                      | 22.                          | * |
| 105.           | .03                           | .000                      | 179.                         | * | 270.           | .00                           | .000                      | 21.                          | * |
| 110.           | .03                           | .000                      | 167.                         | * | 275.           | .00                           | .000                      | 20.                          | * |
| 115.           | .03                           | .000                      | 156.                         | * | 280.           | .00                           | .000                      | 19.                          | * |
| 120.           | .03                           | .000                      | 146.                         | * | 285.           | .00                           | .000                      | 17.                          | * |
| 125.           | .00                           | .000                      | 136.                         | * | 290.           | .00                           | .000                      | 16.                          | * |
| 130.           | .00                           | .000                      | 127.                         | * | 295.           | .00                           | .000                      | 15.                          | * |
| 135.           | .00                           | .000                      | 119.                         | * | 300.           | .00                           | .000                      | 14.                          | * |
| 140.           | .00                           | .000                      | 112.                         | * | 305.           | .00                           | .000                      | 13.                          | * |
| 145.           | .00                           | .000                      | 105.                         | * | 310.           | .00                           | .000                      | 8.                           | * |
| 150.           | .00                           | .000                      | 98.                          | * | 315.           | .00                           | .000                      | 5.                           | * |
| 155.           | .00                           | .000                      | 92.                          | * | 320.           | .00                           | .000                      | 3.                           | * |
| 160.           | .00                           | .000                      | 86.                          | * | 325.           | .00                           | .000                      | 2.                           | * |

TOTAL PRECIP. = 3.18 (1-HOUR RAIN = 2.75)      EXCESS PRECIP. = 1.578 INCHES  
 VOLUME OF EXCESS PRECIP = 38. ACRE-Feet  
 PEAK Q = 255. CFS      TIME OF PEAK = 65. MIN.  
 INFILT. = 4.50 IN/HR      DECAY = .00180      FNINF = .60 IN/HR  
 MAX.PERV.RET. = .35 IN.      MAX.IMP.RET. = .10 IN.

RATIONAL FORMULA C = .50  
 I = 2.3 INCHES/HOUR  
 A = 288.0 ACRES  
 O = 334. CFS

\*\*\* WARNING : THE AREA IS TOO LARGE (GREATER THAN 160 ACRES) FOR AN APPLICATION OF THE RATION,  
 AND THE ABOVE ESTIMATED PEAK MAY NOT BE RIGHT.



U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 0

CSI EAST DRAINAGE BASIN A&B

BASIN ID: A&B -- BASIN COMMENT: 493 ACRES BASIN A&B

| AREA OF BASIN (SOMI) | LENGTH OF BASIN (MI) | DIST TO CENTROID (MI) | IMPERVIOUS AREA (PCT) | SLOPE (FT/FT) | UNIT DURATION (MIN) |
|----------------------|----------------------|-----------------------|-----------------------|---------------|---------------------|
| .77                  | 2.20                 | 1.10                  | .00                   | .0060         | 5.00                |

| COEFFICIENT (REFLECTING TIME TO PEAK) | COEFFICIENT (RELATED TO PEAK RATE OF RUNOFF) |
|---------------------------------------|--|
| .163                                  | .339   |

CALCULATED UNIT HYDROGRAPH

| TIME TO PEAK (MIN) | PEAK RATE OF RUNOFF (CFS/SOMI) | UNIT HYDROGRAP PEAK (CFS) | VOLUME OF RUNOFF (AF) |
|--------------------|--------------------------------|---------------------------|-----------------------|
| 53.53              | 254.76                         | 196.17                    | 41.07                 |

WIDTH AT 50 = 118. MIN. WIDTH AT 75 = 61. MIN. K50 = .27 K75 = .37

RAINFALL LOSSES INPUT W/ BASIN DATA

|                              |  |
|------------------------------|--|
| MAX. PERVIOUS RET. = .35 IN. | MAX. IMPERVIOUS RET. = .10 IN.             |
| INFILTRATION = 4.50 IN./HR.  | DECAY = .00180/SECOND FNINFL = .60 IN./HR. |

| TIME | UNIT HYDROGRAPH | ' | TIME | UNIT HYDROGRAPH | ' | TIME | UNIT HYDROGRAPH | ' |
|------|-----------------|---|------|-----------------|---|------|-----------------|---|
| 0.   | 0.              | * | 155. | 86.             | * | 310. | 25.             | * |
| 5.   | 10.             | * | 160. | 83.             | * | 315. | 24.             | * |
| 10.  | 31.             | * | 165. | 80.             | * | 320. | 23.             | * |
| 15.  | 59.             | * | 170. | 76.             | * | 325. | 22.             | * |
| 20.  | 89.             | * | 175. | 73.             | * | 330. | 21.             | * |
| 25.  | 119.            | * | 180. | 70.             | * | 335. | 20.             | * |
| 30.  | 144.            | * | 185. | 68.             | * | 340. | 19.             | * |
| 35.  | 165.            | * | 190. | 65.             | * | 345. | 18.             | * |
| 40.  | 180.            | * | 195. | 62.             | * | 350. | 18.             | * |
| 45.  | 190.            | * | 200. | 60.             | * | 355. | 17.             | * |
| 50.  | 195.            | * | 205. | 58.             | * | 360. | 16.             | * |
| 55.  | 196.            | * | 210. | 55.             | * | 365. | 16.             | * |
| 60.  | 193.            | * | 215. | 53.             | * | 370. | 15.             | * |
| 65.  | 188.            | * | 220. | 51.             | * | 375. | 14.             | * |
| 70.  | 181.            | * | 225. | 49.             | * | 380. | 14.             | * |
| 75.  | 173.            | * | 230. | 47.             | * | 385. | 13.             | * |
| 80.  | 164.            | * | 235. | 45.             | * | 390. | 13.             | * |
| 85.  | 156.            | * | 240. | 43.             | * | 395. | 12.             | * |
| 90.  | 149.            | * | 245. | 42.             | * | 400. | 12.             | * |
| 95.  | 144.            | * | 250. | 40.             | * | 405. | 11.             | * |
| 100. | 139.            | * | 255. | 38.             | * | 410. | 11.             | * |
| 105. | 134.            | * | 260. | 37.             | * | 415. | 10.             | * |
| 110. | 128.            | * | 265. | 35.             | * | 420. | 10.             | * |
| 115. | 123.            | * | 270. | 34.             | * | 425. | 10.             | * |
| 120. | 118.            | * | 275. | 33.             | * | 430. | 9.              | * |
| 125. | 113.            | * | 280. | 31.             | * | 435. | 9.              | * |
| 130. | 108.            | * | 285. | 30.             | * | 440. | 9.              | * |
| 135. | 102.            | * | 290. | 29.             | * | 445. | 8.              | * |
| 140. | 97.             | * | 295. | 28.             | * | 450. | 8.              | * |
| 145. | 94.             | * | 300. | 27.             | * | 455. | 8.              | * |
| 150. | 90.             | * | 305. | 26.             | * | 460. | 0.              | * |

BASIN ID: A&B -- BASIN COMMENT: 493 ACRES BASIN A&B

\*\*\*\* STORM NO. = 1 \*\*\*\* DATE OR RETURN PERIOD = 100 YR

| TIME<br>(MIN.) | INCREMENT<br>RAINFALL<br>(IN) | TOTAL<br>EXCESS<br>PRECIP | STORM<br>HYDROGRAPH<br>(CFS) | * | TIME<br>(MIN.) | INCREMENT<br>RAINFALL<br>(IN) | TOTAL<br>EXCESS<br>PRECIP | STORM<br>HYDROGRAPH<br>(CFS) | * |
|----------------|-------------------------------|---------------------------|------------------------------|---|----------------|-------------------------------|---------------------------|------------------------------|---|
| 0.             | .00                           | .000                      | 0.                           | * | 255.           | .00                           | .000                      | 79.                          | * |
| 5.             | .03                           | .000                      | 0.                           | * | 260.           | .00                           | .000                      | 76.                          | * |
| 10.            | .08                           | .000                      | 0.                           | * | 265.           | .00                           | .000                      | 73.                          | * |
| 15.            | .13                           | .000                      | 0.                           | * | 270.           | .00                           | .000                      | 70.                          | * |
| 20.            | .22                           | .000                      | 0.                           | * | 275.           | .00                           | .000                      | 67.                          | * |
| 25.            | .38                           | .077                      | 1.                           | * | 280.           | .00                           | .000                      | 65.                          | * |
| 30.            | .69                           | .621                      | 9.                           | * | 285.           | .00                           | .000                      | 62.                          | * |
| 35.            | .38                           | .325                      | 27.                          | * | 290.           | .00                           | .000                      | 60.                          | * |
| 40.            | .22                           | .164                      | 55.                          | * | 295.           | .00                           | .000                      | 57.                          | * |
| 45.            | .17                           | .117                      | 90.                          | * | 300.           | .00                           | .000                      | 55.                          | * |
| 50.            | .14                           | .086                      | 128.                         | * | 305.           | .00                           | .000                      | 53.                          | * |
| 55.            | .11                           | .059                      | 166.                         | * | 310.           | .00                           | .000                      | 51.                          | * |
| 60.            | .11                           | .059                      | 201.                         | * | 315.           | .00                           | .000                      | 49.                          | * |
| 65.            | .11                           | .060                      | 232.                         | * | 320.           | .00                           | .000                      | 47.                          | * |
| 70.            | .05                           | .005                      | 257.                         | * | 325.           | .00                           | .000                      | 45.                          | * |
| 75.            | .05                           | .005                      | 276.                         | * | 330.           | .00                           | .000                      | 43.                          | * |
| 80.            | .03                           | .000                      | 288.                         | * | 335.           | .00                           | .000                      | 41.                          | * |
| 85.            | .03                           | .000                      | 294.                         | * | 340.           | .00                           | .000                      | 40.                          | * |
| 90.            | .03                           | .000                      | 295.                         | * | 345.           | .00                           | .000                      | 38.                          | * |
| 95.            | .03                           | .000                      | 292.                         | * | 350.           | .00                           | .000                      | 37.                          | * |
| 100.           | .03                           | .000                      | 284.                         | * | 355.           | .00                           | .000                      | 35.                          | * |
| 105.           | .03                           | .000                      | 275.                         | * | 360.           | .00                           | .000                      | 34.                          | * |
| 110.           | .03                           | .000                      | 264.                         | * | 365.           | .00                           | .000                      | 32.                          | * |
| 115.           | .03                           | .000                      | 254.                         | * | 370.           | .00                           | .000                      | 31.                          | * |
| 120.           | .03                           | .000                      | 244.                         | * | 375.           | .00                           | .000                      | 30.                          | * |
| 125.           | .00                           | .000                      | 234.                         | * | 380.           | .00                           | .000                      | 29.                          | * |
| 130.           | .00                           | .000                      | 225.                         | * | 385.           | .00                           | .000                      | 28.                          | * |
| 135.           | .00                           | .000                      | 216.                         | * | 390.           | .00                           | .000                      | 26.                          | * |
| 140.           | .00                           | .000                      | 208.                         | * | 395.           | .00                           | .000                      | 25.                          | * |
| 145.           | .00                           | .000                      | 199.                         | * | 400.           | .00                           | .000                      | 24.                          | * |
| 150.           | .00                           | .000                      | 191.                         | * | 405.           | .00                           | .000                      | 23.                          | * |
| 155.           | .00                           | .000                      | 182.                         | * | 410.           | .00                           | .000                      | 23.                          | * |
| 160.           | .00                           | .000                      | 174.                         | * | 415.           | .00                           | .000                      | 22.                          | * |
| 165.           | .00                           | .000                      | 166.                         | * | 420.           | .00                           | .000                      | 21.                          | * |
| 170.           | .00                           | .000                      | 159.                         | * | 425.           | .00                           | .000                      | 20.                          | * |
| 175.           | .00                           | .000                      | 152.                         | * | 430.           | .00                           | .000                      | 19.                          | * |
| 180.           | .00                           | .000                      | 146.                         | * | 435.           | .00                           | .000                      | 18.                          | * |
| 185.           | .00                           | .000                      | 140.                         | * | 440.           | .00                           | .000                      | 18.                          | * |
| 190.           | .00                           | .000                      | 134.                         | * | 445.           | .00                           | .000                      | 17.                          | * |
| 195.           | .00                           | .000                      | 129.                         | * | 450.           | .00                           | .000                      | 16.                          | * |
| 200.           | .00                           | .000                      | 124.                         | * | 455.           | .00                           | .000                      | 16.                          | * |
| 205.           | .00                           | .000                      | 119.                         | * | 460.           | .00                           | .000                      | 15.                          | * |
| 210.           | .00                           | .000                      | 114.                         | * | 465.           | .00                           | .000                      | 14.                          | * |
| 215.           | .00                           | .000                      | 109.                         | * | 470.           | .00                           | .000                      | 14.                          | * |
| 220.           | .00                           | .000                      | 105.                         | * | 475.           | .00                           | .000                      | 13.                          | * |
| 225.           | .00                           | .000                      | 101.                         | * | 480.           | .00                           | .000                      | 12.                          | * |
| 230.           | .00                           | .000                      | 97.                          | * | 485.           | .00                           | .000                      | 7.                           | * |
| 235.           | .00                           | .000                      | 93.                          | * | 490.           | .00                           | .000                      | 5.                           | * |
| 240.           | .00                           | .000                      | 89.                          | * | 495.           | .00                           | .000                      | 3.                           | * |
| 245.           | .00                           | .000                      | 86.                          | * | 500.           | .00                           | .000                      | 2.                           | * |
| 250.           | .00                           | .000                      | 82.                          | * | 505.           | .00                           | .000                      | 1.                           | * |

TOTAL PRECIP. = 3.18 (1-HOUR RAIN = 2.75) EXCESS PRECIP. = 1.578 INCHES  
 VOLUME OF EXCESS PRECIP = 65. ACRE-Feet  
 PEAK Q = 295. CFS TIME OF PEAK = 90. MIN.  
 INFILT. = 4.50 IN/HR DECAY = .00180 FNINF = .60 IN/HR  
 MAX.PERV.RET. = .35 IN. MAX.IMP.RET. = .10 IN.

U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME  
 CUHPE/PC VERSION MODIFIED IN JANUARY 1985  
 PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 0  
 CSI WEST DRAINAGE BASIN C

BASIN ID: C -- BASIN COMMENT: 4480 ACRES BASIN C

| AREA OF BASIN<br>(SOMI) | LENGTH OF BASIN<br>(MI) | DIST TO CENTROID<br>(MI) | IMPERVIOUS AREA<br>(PCT) | SLOPE<br>(FT/FT) | UNIT DURATION<br>(MIN) |
|-------------------------|-------------------------|--------------------------|--------------------------|------------------|------------------------|
| 7.00                    | 8.30                    | 5.20                     | .00                      | .0060            | 5.00                   |

| COEFFICIENT<br>(REFLECTING TIME TO PEAK) | COEFFICIENT<br>(RELATED TO PEAK RATE OF RUNOFF) |
|--|---|
| .163                                     | .471  |

CALCULATED UNIT HYDROGRAPH

| TIME TO PEAK<br>(MIN) | PEAK RATE OF RUNOFF<br>(CFS/SOMI) | UNIT HYDROGRAP PEAK<br>(CFS) | VOLUME OF RUNOFF<br>(AF) |
|-----------------------|-----------------------------------|------------------------------|--------------------------|
| 205.93                | 88.98                             | 622.89                       | 373.33                   |

WIDTH AT 50 = 337. MIN. WIDTH AT 75 = 175. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

MAX. PERVIOUS RET. = .35 IN. MAX. IMPERVIOUS RET. = .10 IN.  
 INFILTRATION = 3.00 IN./HR. DECAY = .00180/SECOND FNINFL = .50 IN./HR.

| TIME | UNIT<br>HYDROGRAPH | * | TIME | UNIT<br>HYDROGRAPH | * | TIME  | UNIT<br>HYDROGRAPH | * |
|------|--------------------|---|------|--------------------|---|-------|--------------------|---|
| 0.   | 0.                 | * | 420. | 318.               | * | 840.  | 85.                | * |
| 5.   | 5.                 | * | 425. | 312.               | * | 845.  | 83.                | * |
| 10.  | 12.                | * | 430. | 307.               | * | 850.  | 82.                | * |
| 15.  | 22.                | * | 435. | 302.               | * | 855.  | 81.                | * |
| 20.  | 34.                | * | 440. | 297.               | * | 860.  | 79.                | * |
| 25.  | 47.                | * | 445. | 293.               | * | 865.  | 78.                | * |
| 30.  | 63.                | * | 450. | 288.               | * | 870.  | 77.                | * |
| 35.  | 80.                | * | 455. | 283.               | * | 875.  | 76.                | * |
| 40.  | 98.                | * | 460. | 279.               | * | 880.  | 75.                | * |
| 45.  | 118.               | * | 465. | 275.               | * | 885.  | 73.                | * |
| 50.  | 138.               | * | 470. | 270.               | * | 890.  | 72.                | * |
| 55.  | 160.               | * | 475. | 266.               | * | 895.  | 71.                | * |
| 60.  | 182.               | * | 480. | 262.               | * | 900.  | 70.                | * |
| 65.  | 205.               | * | 485. | 258.               | * | 905.  | 69.                | * |
| 70.  | 228.               | * | 490. | 254.               | * | 910.  | 68.                | * |
| 75.  | 251.               | * | 495. | 250.               | * | 915.  | 67.                | * |
| 80.  | 275.               | * | 500. | 246.               | * | 920.  | 66.                | * |
| 85.  | 298.               | * | 505. | 242.               | * | 925.  | 65.                | * |
| 90.  | 321.               | * | 510. | 238.               | * | 930.  | 64.                | * |
| 95.  | 344.               | * | 515. | 235.               | * | 935.  | 63.                | * |
| 100. | 366.               | * | 520. | 231.               | * | 940.  | 62.                | * |
| 105. | 387.               | * | 525. | 227.               | * | 945.  | 61.                | * |
| 110. | 407.               | * | 530. | 224.               | * | 950.  | 60.                | * |
| 115. | 426.               | * | 535. | 220.               | * | 955.  | 59.                | * |
| 120. | 444.               | * | 540. | 217.               | * | 960.  | 58.                | * |
| 125. | 461.               | * | 545. | 214.               | * | 965.  | 57.                | * |
| 130. | 479.               | * | 550. | 210.               | * | 970.  | 56.                | * |
| 135. | 499.               | * | 555. | 207.               | * | 975.  | 55.                | * |
| 140. | 517.               | * | 560. | 204.               | * | 980.  | 54.                | * |
| 145. | 533.               | * | 565. | 201.               | * | 985.  | 54.                | * |
| 150. | 548.               | * | 570. | 197.               | * | 990.  | 53.                | * |
| 155. | 561.               | * | 575. | 194.               | * | 995.  | 52.                | * |
| 160. | 573.               | * | 580. | 191.               | * | 1000. | 51.                | * |
| 165. | 584.               | * | 585. | 188.               | * | 1005. | 50.                | * |
| 170. | 593.               | * | 590. | 185.               | * | 1010. | 50.                | * |
| 175. | 601.               | * | 595. | 183.               | * | 1015. | 49.                | * |
| 180. | 608.               | * | 600. | 180.               | * | 1020. | 48.                | * |
| 185. | 613.               | * | 605. | 177.               | * | 1025. | 47.                | * |
| 190. | 617.               | * | 610. | 174.               | * | 1030. | 47.                | * |
| 195. | 620.               | * | 615. | 171.               | * | 1035. | 46.                | * |
| 200. | 622.               | * | 620. | 169.               | * | 1040. | 45.                | * |
| 205. | 623.               | * | 625. | 166.               | * | 1045. | 44.                | * |
| 210. | 623.               | * | 630. | 164.               | * | 1050. | 44.                | * |
| 215. | 621.               | * | 635. | 161.               | * | 1055. | 43.                | * |
| 220. | 619.               | * | 640. | 158.               | * | 1060. | 42.                | * |
| 225. | 615.               | * | 645. | 156.               | * | 1065. | 42.                | * |
| 230. | 611.               | * | 650. | 154.               | * | 1070. | 41.                | * |
| 235. | 606.               | * | 655. | 151.               | * | 1075. | 40.                | * |
| 240. | 600.               | * | 660. | 149.               | * | 1080. | 40.                | * |
| 245. | 593.               | * | 665. | 146.               | * | 1085. | 39.                | * |
| 250. | 586.               | * | 670. | 144.               | * | 1090. | 39.                | * |
| 255. | 577.               | * | 675. | 142.               | * | 1095. | 38.                | * |
| 260. | 568.               | * | 680. | 140.               | * | 1100. | 37.                | * |
| 265. | 558.               | * | 685. | 138.               | * | 1105. | 37.                | * |
| 270. | 548.               | * | 690. | 135.               | * | 1110. | 36.                | * |
| 275. | 537.               | * | 695. | 133.               | * | 1115. | 36.                | * |
| 280. | 525.               | * | 700. | 131.               | * | 1120. | 35.                | * |
| 285. | 513.               | * | 705. | 129.               | * | 1125. | 34.                | * |
| 290. | 500.               | * | 710. | 127.               | * | 1130. | 34.                | * |
| 295. | 487.               | * | 715. | 125.               | * | 1135. | 33.                | * |
| 300. | 474.               | * | 720. | 123.               | * | 1140. | 33.                | * |
| 305. | 464.               | * | 725. | 121.               | * | 1145. | 32.                | * |
| 310. | 457.               | * | 730. | 119.               | * | 1150. | 32.                | * |
| 315. | 451.               | * | 735. | 118.               | * | 1155. | 31.                | * |
| 320. | 445.               | * | 740. | 116.               | * | 1160. | 31.                | * |
| 325. | 438.               | * | 745. | 114.               | * | 1165. | 30.                | * |
| 330. | 432.               | * | 750. | 112.               | * | 1170. | 30.                | * |
| 335. | 426.               | * | 755. | 110.               | * | 1175. | 29.                | * |
| 340. | 419.               | * | 760. | 109.               | * | 1180. | 29.                | * |
| 345. | 413.               | * | 765. | 107.               | * | 1185. | 29.                | * |
| 350. | 407.               | * | 770. | 105.               | * | 1190. | 28.                | * |
| 355. | 400.               | * | 775. | 104.               | * | 1195. | 28.                | * |
| 360. | 394.               | * | 780. | 102.               | * | 1200. | 27.                | * |
| 365. | 388.               | * | 785. | 100.               | * | 1205. | 27.                | * |
| 370. | 381.               | * | 790. | 99.                | * | 1210. | 26.                | * |
| 375. | 375.               | * | 795. | 97.                | * | 1215. | 26.                | * |
| 380. | 369.               | * | 800. | 96.                | * | 1220. | 26.                | * |
| 385. | 362.               | * | 805. | 94.                | * | 1225. | 25.                | * |
| 390. | 356.               | * | 810. | 93.                | * | 1230. | 25.                | * |
| 395. | 350.               | * | 815. | 91.                | * | 1235. | 24.                | * |
| 400. | 343.               | * | 820. | 90.                | * | 1240. | 24.                | * |
| 405. | 337.               | * | 825. | 89.                | * | 1245. | 24.                | * |
| 410. | 331.               | * | 830. | 87.                | * | 0.    | 0.                 | * |
| 415. | 324.               | * | 835. | 86.                | * | 5.    | 0.                 | * |

BASIN ID: C

-- BASIN COMMENT: 4480 ACRES BASIN C

\*\*\*\* STORM NO. = 1 \*\*\*\*

DATE OR RETURN PERIOD = 100 YR

| TIME<br>(MIN.) | INCREMENT<br>RAINFALL<br>(IN) | TOTAL<br>EXCESS<br>PRECIP | STORM<br>HYDROGRAPH<br>(CFS) | * | TIME<br>(MIN.) | INCREMENT<br>RAINFALL<br>(IN) | TOTAL<br>EXCESS<br>PRECIP | STORM<br>HYDROGRAPH<br>(CFS) | * |
|----------------|-------------------------------|---------------------------|------------------------------|---|----------------|-------------------------------|---------------------------|------------------------------|---|
| 0.             | .00                           | .000                      | 0.                           | * | 625.           | .00                           | .000                      | 323.                         | * |
| 5.             | .03                           | .000                      | 0.                           | * | 630.           | .00                           | .000                      | 318.                         | * |
| 10.            | .08                           | .000                      | 0.                           | * | 635.           | .00                           | .000                      | 313.                         | * |
| 15.            | .13                           | .000                      | 0.                           | * | 640.           | .00                           | .000                      | 308.                         | * |
| 20.            | .22                           | .000                      | 0.                           | * | 645.           | .00                           | .000                      | 303.                         | * |
| 25.            | .38                           | .153                      | 1.                           | * | 650.           | .00                           | .000                      | 298.                         | * |
| 30.            | .69                           | .635                      | 5.                           | * | 655.           | .00                           | .000                      | 294.                         | * |
| 35.            | .38                           | .337                      | 13.                          | * | 660.           | .00                           | .000                      | 289.                         | * |
| 40.            | .22                           | .175                      | 24.                          | * | 665.           | .00                           | .000                      | 285.                         | * |
| 45.            | .17                           | .127                      | 39.                          | * | 670.           | .00                           | .000                      | 280.                         | * |
| 50.            | .14                           | .095                      | 57.                          | * | 675.           | .00                           | .000                      | 276.                         | * |
| 55.            | .11                           | .068                      | 78.                          | * | 680.           | .00                           | .000                      | 271.                         | * |
| 60.            | .11                           | .068                      | 103.                         | * | 685.           | .00                           | .000                      | 267.                         | * |
| 65.            | .11                           | .068                      | 130.                         | * | 690.           | .00                           | .000                      | 263.                         | * |
| 70.            | .05                           | .013                      | 160.                         | * | 695.           | .00                           | .000                      | 259.                         | * |
| 75.            | .05                           | .013                      | 192.                         | * | 700.           | .00                           | .000                      | 255.                         | * |
| 80.            | .03                           | .000                      | 226.                         | * | 705.           | .00                           | .000                      | 251.                         | * |
| 85.            | .03                           | .000                      | 262.                         | * | 710.           | .00                           | .000                      | 247.                         | * |
| 90.            | .03                           | .000                      | 300.                         | * | 715.           | .00                           | .000                      | 243.                         | * |
| 95.            | .03                           | .000                      | 338.                         | * | 720.           | .00                           | .000                      | 239.                         | * |
| 100.           | .03                           | .000                      | 378.                         | * | 725.           | .00                           | .000                      | 236.                         | * |
| 105.           | .03                           | .000                      | 418.                         | * | 730.           | .00                           | .000                      | 232.                         | * |
| 110.           | .03                           | .000                      | 458.                         | * | 735.           | .00                           | .000                      | 228.                         | * |
| 115.           | .03                           | .000                      | 498.                         | * | 740.           | .00                           | .000                      | 225.                         | * |
| 120.           | .03                           | .000                      | 538.                         | * | 745.           | .00                           | .000                      | 221.                         | * |
| 125.           | .00                           | .000                      | 578.                         | * | 750.           | .00                           | .000                      | 218.                         | * |
| 130.           | .00                           | .000                      | 616.                         | * | 755.           | .00                           | .000                      | 214.                         | * |
| 135.           | .00                           | .000                      | 653.                         | * | 760.           | .00                           | .000                      | 211.                         | * |
| 140.           | .00                           | .000                      | 689.                         | * | 765.           | .00                           | .000                      | 208.                         | * |
| 145.           | .00                           | .000                      | 723.                         | * | 770.           | .00                           | .000                      | 205.                         | * |
| 150.           | .00                           | .000                      | 756.                         | * | 775.           | .00                           | .000                      | 201.                         | * |
| 155.           | .00                           | .000                      | 789.                         | * | 780.           | .00                           | .000                      | 198.                         | * |
| 160.           | .00                           | .000                      | 822.                         | * | 785.           | .00                           | .000                      | 195.                         | * |
| 165.           | .00                           | .000                      | 854.                         | * | 790.           | .00                           | .000                      | 192.                         | * |
| 170.           | .00                           | .000                      | 885.                         | * | 795.           | .00                           | .000                      | 189.                         | * |
| 175.           | .00                           | .000                      | 913.                         | * | 800.           | .00                           | .000                      | 186.                         | * |
| 180.           | .00                           | .000                      | 940.                         | * | 805.           | .00                           | .000                      | 183.                         | * |
| 185.           | .00                           | .000                      | 964.                         | * | 810.           | .00                           | .000                      | 180.                         | * |
| 190.           | .00                           | .000                      | 986.                         | * | 815.           | .00                           | .000                      | 178.                         | * |
| 195.           | .00                           | .000                      | 1006.                        | * | 820.           | .00                           | .000                      | 175.                         | * |
| 200.           | .00                           | .000                      | 1024.                        | * | 825.           | .00                           | .000                      | 172.                         | * |
| 205.           | .00                           | .000                      | 1039.                        | * | 830.           | .00                           | .000                      | 169.                         | * |
| 210.           | .00                           | .000                      | 1052.                        | * | 835.           | .00                           | .000                      | 167.                         | * |
| 215.           | .00                           | .000                      | 1063.                        | * | 840.           | .00                           | .000                      | 164.                         | * |
| 220.           | .00                           | .000                      | 1072.                        | * | 845.           | .00                           | .000                      | 162.                         | * |
| 225.           | .00                           | .000                      | 1078.                        | * | 850.           | .00                           | .000                      | 159.                         | * |
| 230.           | .00                           | .000                      | 1083.                        | * | 855.           | .00                           | .000                      | 157.                         | * |
| 235.           | .00                           | .000                      | 1085.                        | * | 860.           | .00                           | .000                      | 154.                         | * |
| 240.           | .00                           | .000                      | 1086.                        | * | 865.           | .00                           | .000                      | 152.                         | * |
| 245.           | .00                           | .000                      | 1085.                        | * | 870.           | .00                           | .000                      | 149.                         | * |
| 250.           | .00                           | .000                      | 1082.                        | * | 875.           | .00                           | .000                      | 147.                         | * |
| 255.           | .00                           | .000                      | 1077.                        | * | 880.           | .00                           | .000                      | 145.                         | * |
| 260.           | .00                           | .000                      | 1070.                        | * | 885.           | .00                           | .000                      | 142.                         | * |
| 265.           | .00                           | .000                      | 1062.                        | * | 890.           | .00                           | .000                      | 140.                         | * |
| 270.           | .00                           | .000                      | 1053.                        | * | 895.           | .00                           | .000                      | 138.                         | * |
| 275.           | .00                           | .000                      | 1042.                        | * | 900.           | .00                           | .000                      | 136.                         | * |
| 280.           | .00                           | .000                      | 1029.                        | * | 905.           | .00                           | .000                      | 134.                         | * |
| 285.           | .00                           | .000                      | 1016.                        | * | 910.           | .00                           | .000                      | 132.                         | * |
| 290.           | .00                           | .000                      | 1001.                        | * | 915.           | .00                           | .000                      | 130.                         | * |
| 295.           | .00                           | .000                      | 984.                         | * | 920.           | .00                           | .000                      | 128.                         | * |
| 300.           | .00                           | .000                      | 967.                         | * | 925.           | .00                           | .000                      | 126.                         | * |
| 305.           | .00                           | .000                      | 948.                         | * | 930.           | .00                           | .000                      | 124.                         | * |
| 310.           | .00                           | .000                      | 929.                         | * | 935.           | .00                           | .000                      | 122.                         | * |
| 315.           | .00                           | .000                      | 908.                         | * | 940.           | .00                           | .000                      | 120.                         | * |
| 320.           | .00                           | .000                      | 886.                         | * | 945.           | .00                           | .000                      | 118.                         | * |
| 325.           | .00                           | .000                      | 865.                         | * | 950.           | .00                           | .000                      | 116.                         | * |

|      |     |      |      |   |       |     |      |      |   |
|------|-----|------|------|---|-------|-----|------|------|---|
| 330. | .00 | .000 | 845. | * | 955.  | .00 | .000 | 114. | * |
| 335. | .00 | .000 | 829. | * | 960.  | .00 | .000 | 113. | * |
| 340. | .00 | .000 | 815. | * | 965.  | .00 | .000 | 111. | * |
| 345. | .00 | .000 | 801. | * | 970.  | .00 | .000 | 109. | * |
| 350. | .00 | .000 | 788. | * | 975.  | .00 | .000 | 107. | * |
| 355. | .00 | .000 | 775. | * | 980.  | .00 | .000 | 106. | * |
| 360. | .00 | .000 | 763. | * | 985.  | .00 | .000 | 104. | * |
| 365. | .00 | .000 | 752. | * | 990.  | .00 | .000 | 102. | * |
| 370. | .00 | .000 | 741. | * | 995.  | .00 | .000 | 101. | * |
| 375. | .00 | .000 | 730. | * | 1000. | .00 | .000 | 99.  | * |
| 380. | .00 | .000 | 718. | * | 1005. | .00 | .000 | 98.  | * |
| 385. | .00 | .000 | 707. | * | 1010. | .00 | .000 | 96.  | * |
| 390. | .00 | .000 | 696. | * | 1015. | .00 | .000 | 95.  | * |
| 395. | .00 | .000 | 685. | * | 1020. | .00 | .000 | 93.  | * |
| 400. | .00 | .000 | 674. | * | 1025. | .00 | .000 | 92.  | * |
| 405. | .00 | .000 | 663. | * | 1030. | .00 | .000 | 90.  | * |
| 410. | .00 | .000 | 652. | * | 1035. | .00 | .000 | 89.  | * |
| 415. | .00 | .000 | 641. | * | 1040. | .00 | .000 | 88.  | * |
| 420. | .00 | .000 | 630. | * | 1045. | .00 | .000 | 86.  | * |
| 425. | .00 | .000 | 618. | * | 1050. | .00 | .000 | 85.  | * |
| 430. | .00 | .000 | 607. | * | 1055. | .00 | .000 | 84.  | * |
| 435. | .00 | .000 | 596. | * | 1060. | .00 | .000 | 82.  | * |
| 440. | .00 | .000 | 585. | * | 1065. | .00 | .000 | 81.  | * |
| 445. | .00 | .000 | 574. | * | 1070. | .00 | .000 | 80.  | * |
| 450. | .00 | .000 | 563. | * | 1075. | .00 | .000 | 78.  | * |
| 455. | .00 | .000 | 553. | * | 1080. | .00 | .000 | 77.  | * |
| 460. | .00 | .000 | 544. | * | 1085. | .00 | .000 | 76.  | * |
| 465. | .00 | .000 | 535. | * | 1090. | .00 | .000 | 75.  | * |
| 470. | .00 | .000 | 526. | * | 1095. | .00 | .000 | 74.  | * |
| 475. | .00 | .000 | 518. | * | 1100. | .00 | .000 | 72.  | * |
| 480. | .00 | .000 | 509. | * | 1105. | .00 | .000 | 71.  | * |
| 485. | .00 | .000 | 501. | * | 1110. | .00 | .000 | 70.  | * |
| 490. | .00 | .000 | 493. | * | 1115. | .00 | .000 | 69.  | * |
| 495. | .00 | .000 | 486. | * | 1120. | .00 | .000 | 68.  | * |
| 500. | .00 | .000 | 478. | * | 1125. | .00 | .000 | 67.  | * |
| 505. | .00 | .000 | 471. | * | 1130. | .00 | .000 | 66.  | * |
| 510. | .00 | .000 | 463. | * | 1135. | .00 | .000 | 65.  | * |
| 515. | .00 | .000 | 456. | * | 1140. | .00 | .000 | 64.  | * |
| 520. | .00 | .000 | 449. | * | 1145. | .00 | .000 | 63.  | * |
| 525. | .00 | .000 | 442. | * | 1150. | .00 | .000 | 62.  | * |
| 530. | .00 | .000 | 435. | * | 1155. | .00 | .000 | 61.  | * |
| 535. | .00 | .000 | 428. | * | 1160. | .00 | .000 | 60.  | * |
| 540. | .00 | .000 | 422. | * | 1165. | .00 | .000 | 59.  | * |
| 545. | .00 | .000 | 415. | * | 1170. | .00 | .000 | 58.  | * |
| 550. | .00 | .000 | 409. | * | 1175. | .00 | .000 | 57.  | * |
| 555. | .00 | .000 | 402. | * | 1180. | .00 | .000 | 56.  | * |
| 560. | .00 | .000 | 396. | * | 1185. | .00 | .000 | 55.  | * |
| 565. | .00 | .000 | 390. | * | 1190. | .00 | .000 | 55.  | * |
| 570. | .00 | .000 | 384. | * | 1195. | .00 | .000 | 54.  | * |
| 575. | .00 | .000 | 378. | * | 1200. | .00 | .000 | 53.  | * |
| 580. | .00 | .000 | 372. | * | 1205. | .00 | .000 | 52.  | * |
| 585. | .00 | .000 | 366. | * | 1210. | .00 | .000 | 51.  | * |
| 590. | .00 | .000 | 360. | * | 1215. | .00 | .000 | 50.  | * |
| 595. | .00 | .000 | 355. | * | 1220. | .00 | .000 | 50.  | * |
| 600. | .00 | .000 | 349. | * | 1225. | .00 | .000 | 49.  | * |
| 605. | .00 | .000 | 344. | * | 1230. | .00 | .000 | 48.  | * |
| 610. | .00 | .000 | 338. | * | 1235. | .00 | .000 | 47.  | * |
| 615. | .00 | .000 | 333. | * | 1240. | .00 | .000 | 47.  | * |
| 620. | .00 | .000 | 328. | * | 1245. | .00 | .000 | 46.  | * |

TOTAL PRECIP. = 3.18 (1-HOUR RAIN = 2.75)      EXCESS PRECIP. = 1.751 INCHES  
 VOLUME OF EXCESS PRECIP = 654. ACRE-FEET  
 PEAK Q = 1086. CFS      TIME OF PEAK = 240. MIN.  
 INFILT. = 3.00 IN/HR      DECAY = .00180      FNINF = .50 IN/HR  
 MAX.PERV.RET. = .35 IN.      MAX.IMP.RET. = .10 IN.

U.D.F.C.D. CUHP RUNOFF ANALYSIS EXECUTED ON DATE AT TIME

CUHPE/PC VERSION MODIFIED IN JANUARY 1985

PRINT OPTION NUMBER SELECTED FOR THIS BASIN IS 0

CSI WEST DRAINAGE BASIN D

BASIN ID: D -- BASIN COMMENT: 4544 ACRES BASIN D

| AREA OF BASIN<br>(SOMI) | LENGTH OF BASIN<br>(MI) | DIST TO CENTROID<br>(MI) | IMPERVIOUS AREA<br>(PCT) | SLOPE<br>(FT/FT) | UNIT DURATION<br>(MIN) |
|-------------------------|-------------------------|--------------------------|--------------------------|------------------|------------------------|
| 7.10                    | 8.10                    | 4.60                     | .00                      | .0060            | 5.00                   |

| COEFFICIENT<br>(REFLECTING TIME TO PEAK) | COEFFICIENT<br>(RELATED TO PEAK RATE OF RUNOFF) |
|--|---|
| .163                                     | .472  |

CALCULATED UNIT HYDROGRAPH

| TIME TO PEAK<br>(MIN) | PEAK RATE OF RUNOFF<br>(CFS/SOMI) | UNIT HYDROGRAP PEAK<br>(CFS) | VOLUME OF RUNOFF<br>(AF) |
|-----------------------|-----------------------------------|------------------------------|--------------------------|
| 192.07                | 95.69                             | 679.42                       | 378.67                   |

WIDTH AT 50 = 314. MIN. WIDTH AT 75 = 163. MIN. K50 = .35 K75 = .45

RAINFALL LOSSES INPUT W/ BASIN DATA

|                              |  |
|------------------------------|--|
| MAX. PERVIOUS RET. = .35 IN. | MAX. IMPERVIOUS RET. = .10 IN.             |
| INFILTRATION = 3.00 IN./HR.  | DECAY = .00180/SECOND PNINFL = .50 IN./HR. |

| TIME | UNIT<br>HYDROGRAPH | TIME | UNIT<br>HYDROGRAPH | TIME  | UNIT<br>HYDROGRAPH |
|------|--------------------|------|--------------------|-------|--------------------|
| 0.   | 0.                 | 420. | 313.               | 840.  | 75.                |
| 5.   | 6.                 | 425. | 308.               | 845.  | 74.                |
| 10.  | 15.                | 430. | 303.               | 850.  | 73.                |
| 15.  | 27.                | 435. | 298.               | 855.  | 72.                |
| 20.  | 41.                | 440. | 293.               | 860.  | 71.                |
| 25.  | 57.                | 445. | 288.               | 865.  | 69.                |
| 30.  | 76.                | 450. | 283.               | 870.  | 68.                |
| 35.  | 96.                | 455. | 278.               | 875.  | 67.                |
| 40.  | 118.               | 460. | 273.               | 880.  | 66.                |
| 45.  | 142.               | 465. | 269.               | 885.  | 65.                |
| 50.  | 166.               | 470. | 264.               | 890.  | 64.                |
| 55.  | 192.               | 475. | 260.               | 895.  | 63.                |
| 60.  | 218.               | 480. | 255.               | 900.  | 62.                |
| 65.  | 245.               | 485. | 251.               | 905.  | 61.                |
| 70.  | 272.               | 490. | 247.               | 910.  | 60.                |
| 75.  | 300.               | 495. | 243.               | 915.  | 59.                |
| 80.  | 327.               | 500. | 239.               | 920.  | 58.                |
| 85.  | 354.               | 505. | 235.               | 925.  | 57.                |
| 90.  | 380.               | 510. | 231.               | 930.  | 56.                |
| 95.  | 406.               | 515. | 227.               | 935.  | 55.                |
| 100. | 430.               | 520. | 223.               | 940.  | 54.                |
| 105. | 454.               | 525. | 219.               | 945.  | 53.                |
| 110. | 476.               | 530. | 216.               | 950.  | 52.                |
| 115. | 496.               | 535. | 212.               | 955.  | 51.                |
| 120. | 516.               | 540. | 208.               | 960.  | 50.                |
| 125. | 539.               | 545. | 205.               | 965.  | 49.                |
| 130. | 561.               | 550. | 202.               | 970.  | 49.                |
| 135. | 580.               | 555. | 198.               | 975.  | 48.                |
| 140. | 598.               | 560. | 195.               | 980.  | 47.                |
| 145. | 613.               | 565. | 192.               | 985.  | 46.                |
| 150. | 627.               | 570. | 188.               | 990.  | 45.                |
| 155. | 639.               | 575. | 185.               | 995.  | 45.                |
| 160. | 650.               | 580. | 182.               | 1000. | 44.                |
| 165. | 658.               | 585. | 179.               | 1005. | 43.                |
| 170. | 666.               | 590. | 176.               | 1010. | 42.                |
| 175. | 671.               | 595. | 173.               | 1015. | 42.                |
| 180. | 675.               | 600. | 170.               | 1020. | 41.                |
| 185. | 678.               | 605. | 167.               | 1025. | 40.                |
| 190. | 679.               | 610. | 164.               | 1030. | 40.                |
| 195. | 679.               | 615. | 162.               | 1035. | 39.                |
| 200. | 678.               | 620. | 159.               | 1040. | 38.                |
| 205. | 675.               | 625. | 156.               | 1045. | 38.                |
| 210. | 671.               | 630. | 154.               | 1050. | 37.                |
| 215. | 666.               | 635. | 151.               | 1055. | 36.                |
| 220. | 660.               | 640. | 149.               | 1060. | 36.                |
| 225. | 653.               | 645. | 146.               | 1065. | 35.                |
| 230. | 644.               | 650. | 144.               | 1070. | 35.                |
| 235. | 635.               | 655. | 141.               | 1075. | 34.                |
| 240. | 625.               | 660. | 139.               | 1080. | 33.                |
| 245. | 614.               | 665. | 137.               | 1085. | 33.                |
| 250. | 602.               | 670. | 134.               | 1090. | 32.                |
| 255. | 589.               | 675. | 132.               | 1095. | 32.                |
| 260. | 576.               | 680. | 130.               | 1100. | 31.                |
| 265. | 561.               | 685. | 128.               | 1105. | 31.                |
| 270. | 547.               | 690. | 125.               | 1110. | 30.                |
| 275. | 531.               | 695. | 123.               | 1115. | 30.                |
| 280. | 515.               | 700. | 121.               | 1120. | 29.                |
| 285. | 505.               | 705. | 119.               | 1125. | 29.                |
| 290. | 497.               | 710. | 117.               | 1130. | 28.                |
| 295. | 490.               | 715. | 115.               | 1135. | 28.                |
| 300. | 482.               | 720. | 113.               | 1140. | 27.                |
| 305. | 475.               | 725. | 111.               | 1145. | 27.                |
| 310. | 467.               | 730. | 110.               | 1150. | 26.                |
| 315. | 460.               | 735. | 108.               | 1155. | 26.                |
| 320. | 453.               | 740. | 106.               | 1160. | 26.                |
| 325. | 445.               | 745. | 104.               | 1165. | 25.                |
| 330. | 438.               | 750. | 102.               | 1170. | 25.                |
| 335. | 430.               | 755. | 101.               | 1175. | 24.                |
| 340. | 423.               | 760. | 99.                | 1180. | 24.                |
| 345. | 415.               | 765. | 97.                | 1185. | 23.                |
| 350. | 408.               | 770. | 96.                | 1190. | 23.                |
| 355. | 401.               | 775. | 94.                | 1195. | 23.                |
| 360. | 393.               | 780. | 92.                | 1200. | 22.                |
| 365. | 386.               | 785. | 91.                | 1205. | 22.                |
| 370. | 378.               | 790. | 89.                | 1210. | 22.                |
| 375. | 371.               | 795. | 88.                | 1215. | 21.                |
| 380. | 363.               | 800. | 86.                | 1220. | 21.                |
| 385. | 356.               | 805. | 85.                | 1225. | 20.                |
| 390. | 348.               | 810. | 84.                | 1230. | 20.                |
| 395. | 341.               | 815. | 82.                | 1235. | 20.                |
| 400. | 335.               | 820. | 81.                | 1240. | 19.                |
| 405. | 329.               | 825. | 79.                | 1245. | 19.                |
| 410. | 324.               | 830. | 78.                | 0.    | 0.                 |
| 415. | 318.               | 835. | 77.                | 6.    | 0.                 |



BASIN ID: D

-- BASIN COMMENT: 4544 ACRES BASIN D

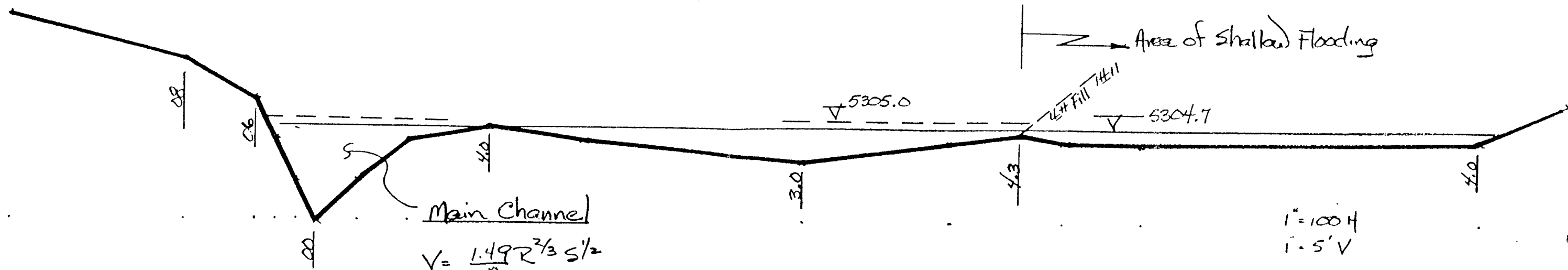
\*\*\*\* STORM NO. = 1 \*\*\*\*

DATE OR RETURN PERIOD = 100 YR

| TIME<br>(MIN.) | INCREMENT<br>RAINFALL<br>(IN) | TOTAL<br>EXCESS<br>PRECIP | STORM<br>HYDROGRAPH<br>(CFS) | * | TIME<br>(MIN.) | INCREMENT<br>RAINFALL<br>(IN) | TOTAL<br>EXCESS<br>PRECIP | STORM<br>HYDROGRAPH<br>(CFS) | * |
|----------------|-------------------------------|---------------------------|------------------------------|---|----------------|-------------------------------|---------------------------|------------------------------|---|
| 0.             | .00                           | .000                      | 0.                           | * | 625.           | .00                           | .000                      | 306.                         | * |
| 5.             | .03                           | .000                      | 0.                           | * | 630.           | .00                           | .000                      | 301.                         | * |
| 10.            | .08                           | .000                      | 0.                           | * | 635.           | .00                           | .000                      | 296.                         | * |
| 15.            | .13                           | .000                      | 0.                           | * | 640.           | .00                           | .000                      | 291.                         | * |
| 20.            | .22                           | .000                      | 0.                           | * | 645.           | .00                           | .000                      | 286.                         | * |
| 25.            | .38                           | .153                      | 1.                           | * | 650.           | .00                           | .000                      | 281.                         | * |
| 30.            | .69                           | .635                      | 6.                           | * | 655.           | .00                           | .000                      | 277.                         | * |
| 35.            | .38                           | .337                      | 16.                          | * | 660.           | .00                           | .000                      | 272.                         | * |
| 40.            | .22                           | .175                      | 29.                          | * | 665.           | .00                           | .000                      | 267.                         | * |
| 45.            | .17                           | .127                      | 47.                          | * | 670.           | .00                           | .000                      | 263.                         | * |
| 50.            | .14                           | .095                      | 69.                          | * | 675.           | .00                           | .000                      | 258.                         | * |
| 55.            | .11                           | .068                      | 94.                          | * | 680.           | .00                           | .000                      | 254.                         | * |
| 60.            | .11                           | .068                      | 124.                         | * | 685.           | .00                           | .000                      | 250.                         | * |
| 65.            | .11                           | .068                      | 157.                         | * | 690.           | .00                           | .000                      | 246.                         | * |
| 70.            | .05                           | .013                      | 193.                         | * | 695.           | .00                           | .000                      | 242.                         | * |
| 75.            | .05                           | .013                      | 231.                         | * | 700.           | .00                           | .000                      | 237.                         | * |
| 80.            | .03                           | .000                      | 273.                         | * | 705.           | .00                           | .000                      | 233.                         | * |
| 85.            | .03                           | .000                      | 315.                         | * | 710.           | .00                           | .000                      | 230.                         | * |
| 90.            | .03                           | .000                      | 360.                         | * | 715.           | .00                           | .000                      | 226.                         | * |
| 95.            | .03                           | .000                      | 406.                         | * | 720.           | .00                           | .000                      | 222.                         | * |
| 100.           | .03                           | .000                      | 452.                         | * | 725.           | .00                           | .000                      | 218.                         | * |
| 105.           | .03                           | .000                      | 499.                         | * | 730.           | .00                           | .000                      | 215.                         | * |
| 110.           | .03                           | .000                      | 546.                         | * | 735.           | .00                           | .000                      | 211.                         | * |
| 115.           | .03                           | .000                      | 592.                         | * | 740.           | .00                           | .000                      | 207.                         | * |
| 120.           | .03                           | .000                      | 638.                         | * | 745.           | .00                           | .000                      | 204.                         | * |
| 125.           | .00                           | .000                      | 682.                         | * | 750.           | .00                           | .000                      | 200.                         | * |
| 130.           | .00                           | .000                      | 725.                         | * | 755.           | .00                           | .000                      | 197.                         | * |
| 135.           | .00                           | .000                      | 767.                         | * | 760.           | .00                           | .000                      | 194.                         | * |
| 140.           | .00                           | .000                      | 806.                         | * | 765.           | .00                           | .000                      | 191.                         | * |
| 145.           | .00                           | .000                      | 844.                         | * | 770.           | .00                           | .000                      | 187.                         | * |
| 150.           | .00                           | .000                      | 883.                         | * | 775.           | .00                           | .000                      | 184.                         | * |
| 155.           | .00                           | .000                      | 922.                         | * | 780.           | .00                           | .000                      | 181.                         | * |
| 160.           | .00                           | .000                      | 958.                         | * | 785.           | .00                           | .000                      | 178.                         | * |
| 165.           | .00                           | .000                      | 991.                         | * | 790.           | .00                           | .000                      | 175.                         | * |
| 170.           | .00                           | .000                      | 1023.                        | * | 795.           | .00                           | .000                      | 172.                         | * |
| 175.           | .00                           | .000                      | 1051.                        | * | 800.           | .00                           | .000                      | 169.                         | * |
| 180.           | .00                           | .000                      | 1077.                        | * | 805.           | .00                           | .000                      | 166.                         | * |
| 185.           | .00                           | .000                      | 1100.                        | * | 810.           | .00                           | .000                      | 164.                         | * |
| 190.           | .00                           | .000                      | 1120.                        | * | 815.           | .00                           | .000                      | 161.                         | * |
| 195.           | .00                           | .000                      | 1137.                        | * | 820.           | .00                           | .000                      | 158.                         | * |
| 200.           | .00                           | .000                      | 1152.                        | * | 825.           | .00                           | .000                      | 155.                         | * |
| 205.           | .00                           | .000                      | 1163.                        | * | 830.           | .00                           | .000                      | 153.                         | * |
| 210.           | .00                           | .000                      | 1172.                        | * | 835.           | .00                           | .000                      | 150.                         | * |
| 215.           | .00                           | .000                      | 1178.                        | * | 840.           | .00                           | .000                      | 148.                         | * |
| 220.           | .00                           | .000                      | 1182.                        | * | 845.           | .00                           | .000                      | 145.                         | * |
| 225.           | .00                           | .000                      | 1183.                        | * | 850.           | .00                           | .000                      | 143.                         | * |
| 230.           | .00                           | .000                      | 1182.                        | * | 855.           | .00                           | .000                      | 140.                         | * |
| 235.           | .00                           | .000                      | 1179.                        | * | 860.           | .00                           | .000                      | 138.                         | * |
| 240.           | .00                           | .000                      | 1174.                        | * | 865.           | .00                           | .000                      | 136.                         | * |
| 245.           | .00                           | .000                      | 1166.                        | * | 870.           | .00                           | .000                      | 133.                         | * |
| 250.           | .00                           | .000                      | 1157.                        | * | 875.           | .00                           | .000                      | 131.                         | * |
| 255.           | .00                           | .000                      | 1145.                        | * | 880.           | .00                           | .000                      | 129.                         | * |
| 260.           | .00                           | .000                      | 1132.                        | * | 885.           | .00                           | .000                      | 127.                         | * |
| 265.           | .00                           | .000                      | 1117.                        | * | 890.           | .00                           | .000                      | 125.                         | * |
| 270.           | .00                           | .000                      | 1100.                        | * | 895.           | .00                           | .000                      | 123.                         | * |
| 275.           | .00                           | .000                      | 1082.                        | * | 900.           | .00                           | .000                      | 121.                         | * |
| 280.           | .00                           | .000                      | 1062.                        | * | 905.           | .00                           | .000                      | 119.                         | * |
| 285.           | .00                           | .000                      | 1040.                        | * | 910.           | .00                           | .000                      | 117.                         | * |
| 290.           | .00                           | .000                      | 1018.                        | * | 915.           | .00                           | .000                      | 115.                         | * |
| 295.           | .00                           | .000                      | 994.                         | * | 920.           | .00                           | .000                      | 113.                         | * |
| 300.           | .00                           | .000                      | 969.                         | * | 925.           | .00                           | .000                      | 111.                         | * |
| 305.           | .00                           | .000                      | 944.                         | * | 930.           | .00                           | .000                      | 109.                         | * |
| 310.           | .00                           | .000                      | 922.                         | * | 935.           | .00                           | .000                      | 107.                         | * |
| 315.           | .00                           | .000                      | 903.                         | * | 940.           | .00                           | .000                      | 105.                         | * |
| 320.           | .00                           | .000                      | 886.                         | * | 945.           | .00                           | .000                      | 104.                         | * |
| 325.           | .00                           | .000                      | 870.                         | * | 950.           | .00                           | .000                      | 102.                         | * |
| 330.           | .00                           | .000                      | 841.                         | * | 955.           | .00                           | .000                      | 98.                          | * |
| 335.           | .00                           | .000                      | 827.                         | * | 960.           | .00                           | .000                      | 97.                          | * |
| 340.           | .00                           | .000                      | 813.                         | * | 965.           | .00                           | .000                      | 95.                          | * |
| 345.           | .00                           | .000                      | 800.                         | * | 970.           | .00                           | .000                      | 94.                          | * |
| 350.           | .00                           | .000                      | 787.                         | * | 975.           | .00                           | .000                      | 94.                          | * |
| 355.           | .00                           | .000                      | 787.                         | * | 980.           | .00                           | .000                      | 92.                          | * |

|      |     |      |      |   |       |     |      |     |   |
|------|-----|------|------|---|-------|-----|------|-----|---|
| 360. | .00 | .000 | 774. | * | 985.  | .00 | .000 | 90. | * |
| 365. | .00 | .000 | 761. | * | 990.  | .00 | .000 | 89. | * |
| 370. | .00 | .000 | 748. | * | 995.  | .00 | .000 | 87. | * |
| 375. | .00 | .000 | 735. | * | 1000. | .00 | .000 | 86. | * |
| 380. | .00 | .000 | 722. | * | 1005. | .00 | .000 | 85. | * |
| 385. | .00 | .000 | 709. | * | 1010. | .00 | .000 | 83. | * |
| 390. | .00 | .000 | 696. | * | 1015. | .00 | .000 | 82. | * |
| 395. | .00 | .000 | 683. | * | 1020. | .00 | .000 | 80. | * |
| 400. | .00 | .000 | 670. | * | 1025. | .00 | .000 | 79. | * |
| 405. | .00 | .000 | 657. | * | 1030. | .00 | .000 | 78. | * |
| 410. | .00 | .000 | 644. | * | 1035. | .00 | .000 | 76. | * |
| 415. | .00 | .000 | 630. | * | 1040. | .00 | .000 | 75. | * |
| 420. | .00 | .000 | 618. | * | 1045. | .00 | .000 | 74. | * |
| 425. | .00 | .000 | 606. | * | 1050. | .00 | .000 | 73. | * |
| 430. | .00 | .000 | 595. | * | 1055. | .00 | .000 | 71. | * |
| 435. | .00 | .000 | 584. | * | 1060. | .00 | .000 | 70. | * |
| 440. | .00 | .000 | 574. | * | 1065. | .00 | .000 | 69. | * |
| 445. | .00 | .000 | 564. | * | 1070. | .00 | .000 | 68. | * |
| 450. | .00 | .000 | 554. | * | 1075. | .00 | .000 | 67. | * |
| 455. | .00 | .000 | 545. | * | 1080. | .00 | .000 | 66. | * |
| 460. | .00 | .000 | 535. | * | 1085. | .00 | .000 | 64. | * |
| 465. | .00 | .000 | 526. | * | 1090. | .00 | .000 | 63. | * |
| 470. | .00 | .000 | 518. | * | 1095. | .00 | .000 | 62. | * |
| 475. | .00 | .000 | 509. | * | 1100. | .00 | .000 | 61. | * |
| 480. | .00 | .000 | 500. | * | 1105. | .00 | .000 | 60. | * |
| 485. | .00 | .000 | 492. | * | 1110. | .00 | .000 | 59. | * |
| 490. | .00 | .000 | 484. | * | 1115. | .00 | .000 | 58. | * |
| 495. | .00 | .000 | 475. | * | 1120. | .00 | .000 | 57. | * |
| 500. | .00 | .000 | 467. | * | 1125. | .00 | .000 | 56. | * |
| 505. | .00 | .000 | 460. | * | 1130. | .00 | .000 | 55. | * |
| 510. | .00 | .000 | 452. | * | 1135. | .00 | .000 | 54. | * |
| 515. | .00 | .000 | 444. | * | 1140. | .00 | .000 | 53. | * |
| 520. | .00 | .000 | 437. | * | 1145. | .00 | .000 | 53. | * |
| 525. | .00 | .000 | 430. | * | 1150. | .00 | .000 | 52. | * |
| 530. | .00 | .000 | 422. | * | 1155. | .00 | .000 | 51. | * |
| 535. | .00 | .000 | 415. | * | 1160. | .00 | .000 | 50. | * |
| 540. | .00 | .000 | 408. | * | 1165. | .00 | .000 | 49. | * |
| 545. | .00 | .000 | 401. | * | 1170. | .00 | .000 | 48. | * |
| 550. | .00 | .000 | 395. | * | 1175. | .00 | .000 | 48. | * |
| 555. | .00 | .000 | 388. | * | 1180. | .00 | .000 | 47. | * |
| 560. | .00 | .000 | 382. | * | 1185. | .00 | .000 | 46. | * |
| 565. | .00 | .000 | 375. | * | 1190. | .00 | .000 | 45. | * |
| 570. | .00 | .000 | 369. | * | 1195. | .00 | .000 | 44. | * |
| 575. | .00 | .000 | 363. | * | 1200. | .00 | .000 | 44. | * |
| 580. | .00 | .000 | 357. | * | 1205. | .00 | .000 | 43. | * |
| 585. | .00 | .000 | 351. | * | 1210. | .00 | .000 | 42. | * |
| 590. | .00 | .000 | 345. | * | 1215. | .00 | .000 | 41. | * |
| 595. | .00 | .000 | 339. | * | 1220. | .00 | .000 | 41. | * |
| 600. | .00 | .000 | 333. | * | 1225. | .00 | .000 | 40. | * |
| 605. | .00 | .000 | 328. | * | 1230. | .00 | .000 | 39. | * |
| 610. | .00 | .000 | 322. | * | 1235. | .00 | .000 | 39. | * |
| 615. | .00 | .000 | 317. | * | 1240. | .00 | .000 | 38. | * |
| 620. | .00 | .000 | 311. | * | 1245. | .00 | .000 | 37. | * |

TOTAL PRECIP. = 3.18 (1-HOUR RAIN = 2.75)      EXCESS PRECIP. = 1.751 INCHES  
 VOLUME OF EXCESS PRECIP = 663. ACRE-FEET  
 PEAK Q = 1183. CFS      TIME OF PEAK = 225. MIN.  
 INFILT. = 3.00 IN/HR      DECAY = .00180      FNINF = .50 IN/HR  
 MAX.PERV.RET. = .35 IN.      MAX.IMP.RET. = .10 IN.



Main Channel

$$V = \frac{1.49 R^{2/3} S^{1/2}}{n}$$

$n = 0.04$  high grass, depth greater than grasses  
 $S = 0.003$

@  $d = 4.7'$   $R = \frac{A}{P} = \frac{365}{220} = 1.66$

$V = 2.87 \text{ fps}; Q = 1050 \text{ cfs}$

Full Section

$$V = \frac{1.49 R^{2/3} S^{1/2}}{n}$$

$n = 0.05$  high grass, mature field crops

$S = 0.003$

$Q = 2261 \text{ cfs}$

@  $d = 4.7'$   $R = \frac{A}{P} = \frac{1375}{1250} = 1.1$

$V = 1.75 \text{ fps}; Q = 2400 \text{ cfs} > 2261 \text{ cfs OK}$

Full Section w/o Area of Shallow Flooding

$$V = \frac{1.49 R^{2/3} S^{1/2}}{n}$$

$n = 0.05$

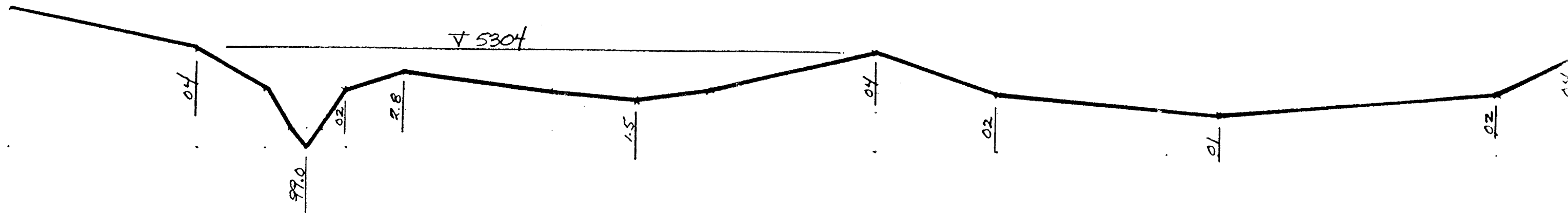
$S = 0.003$

$Q = 2261 \text{ cfs}$

@  $d = 5.0'$   $R = \frac{A}{P} = \frac{1140}{770} = 1.48$

$V = 2.13 \text{ fps}; Q = 2430 \text{ cfs} > 2261 \text{ cfs OK}$

SEC A-A



$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

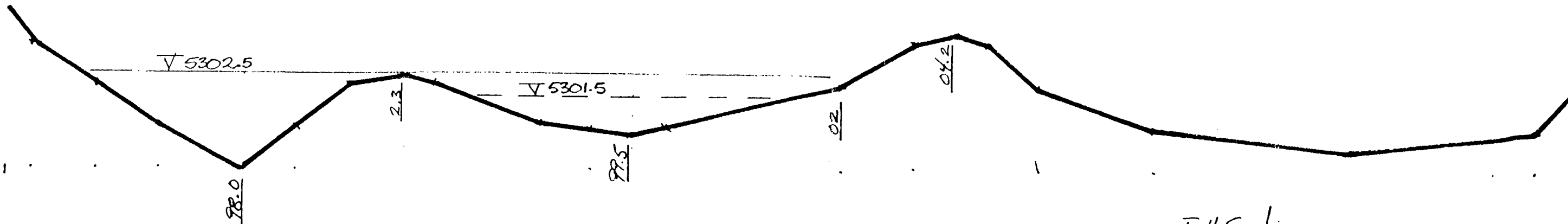
$$n = 0.05$$

$$S = 0.003$$

$$\text{@ } d = 5' \quad R = \frac{A}{P} = \frac{1150}{710} = 1.62$$

$$V = 2.26 \text{ fps}; \quad Q = 2600 \text{ cfs} > 2261 \text{ cfs} \quad \text{OK}$$

**SEC B-B**



Main Channel

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

$$n = 0.05$$

$$S = 0.003$$

@ d = 4.5'

$$R = \frac{A}{P} = \frac{625 A^2}{315} = 1.98$$

$$V = 2.59 \text{ fps}; Q \approx 1600 \text{ cfs}$$

$$\frac{2261}{(1600)} \\ 660 \text{ spillover}$$

Full Section

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

$$n = 0.05$$

$$S = 0.003$$

$$\text{@ } d = 4.5' \quad R = \frac{A}{P} = \frac{1400 A^2}{760} = 1.84$$

$$V = 2.46 \text{ cfs}; Q = 3450 \neq 2261 \text{ cfs}$$

Spillover Section

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

$$n = 0.05$$

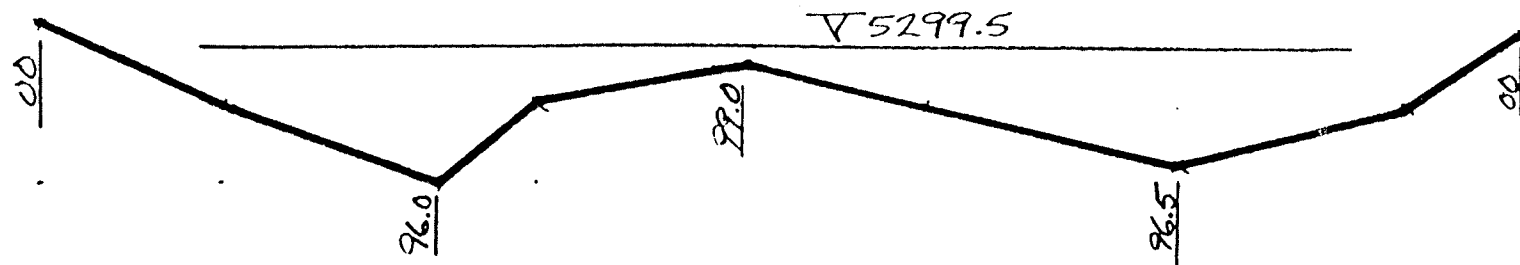
$$S = 0.003$$

@ d = 2'

$$R = \frac{A}{P} = \frac{345}{320} = 1.08$$

$$V = 1.72 \text{ fps}; Q \approx 600 \text{ cfs}$$

**SEC C-C**



**SEC D-D**

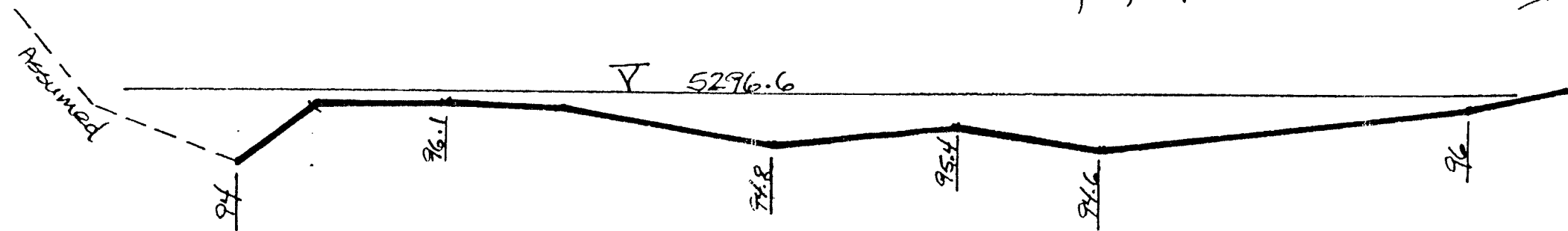
$$V = \frac{1.49 R^{2/3} S^{1/2}}{n}$$

$$n = 0.05$$

$$S = 0.003$$

$$R = \frac{A}{P} = \frac{1140}{730} = 1.56$$

$$V = 2.20 \text{ fps}; Q = 2500 \text{ cfs} > 2261 \text{ OK}$$



**SEC E-E**

$$V = \frac{1.49 R^{2/3} S^{1/2}}{n}$$

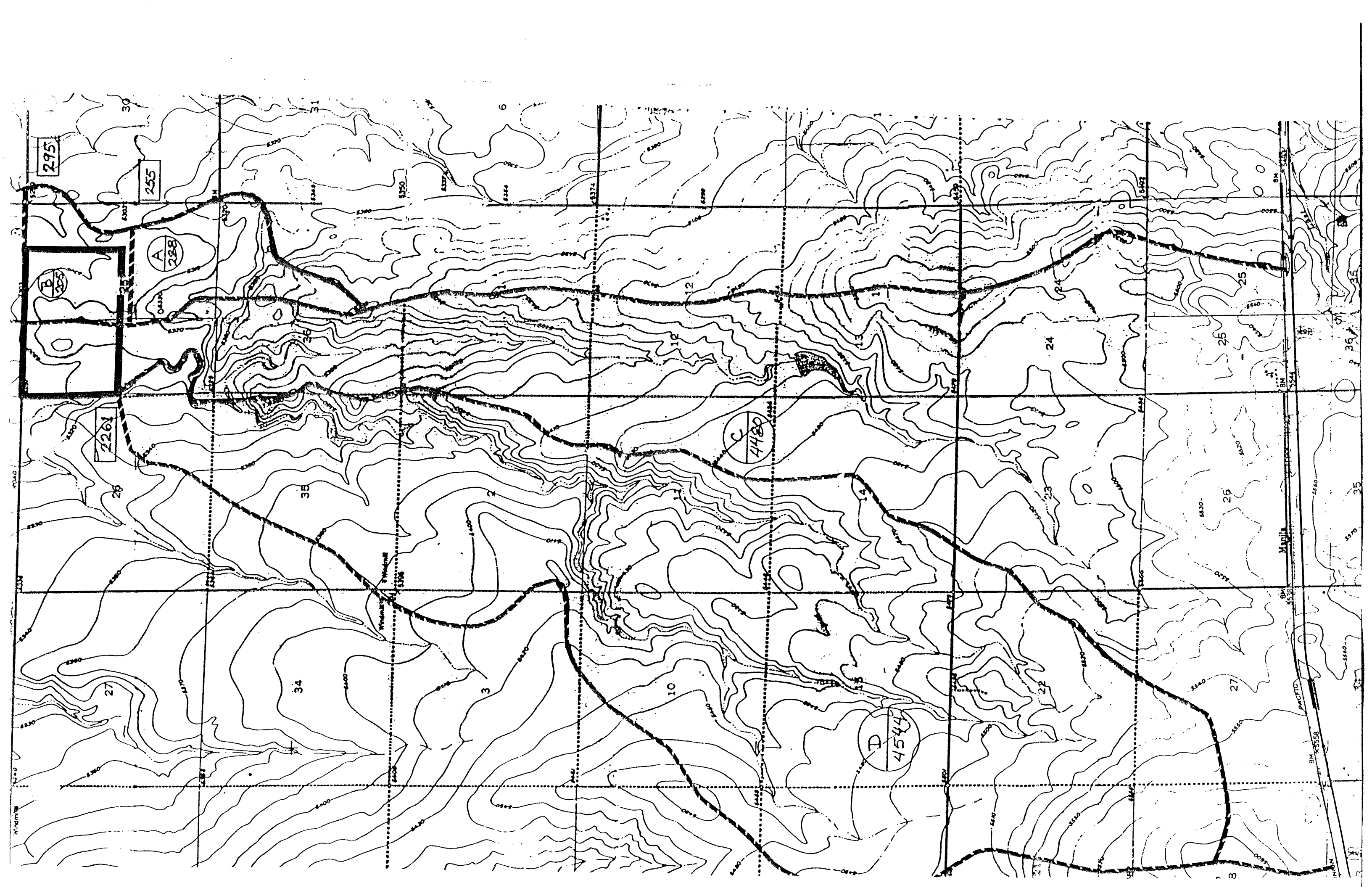
$$n = 0.05$$

$$S = 0.003$$

$$R = \frac{A}{P} = \frac{1250 \text{ ft}^2}{1040} = 1.20$$

$$V = 1.85 \text{ fps}; Q = 2300 \text{ cfs} > 2261 \text{ cfs OK}$$





**APPENDIX C - CLIMATOLOGY**

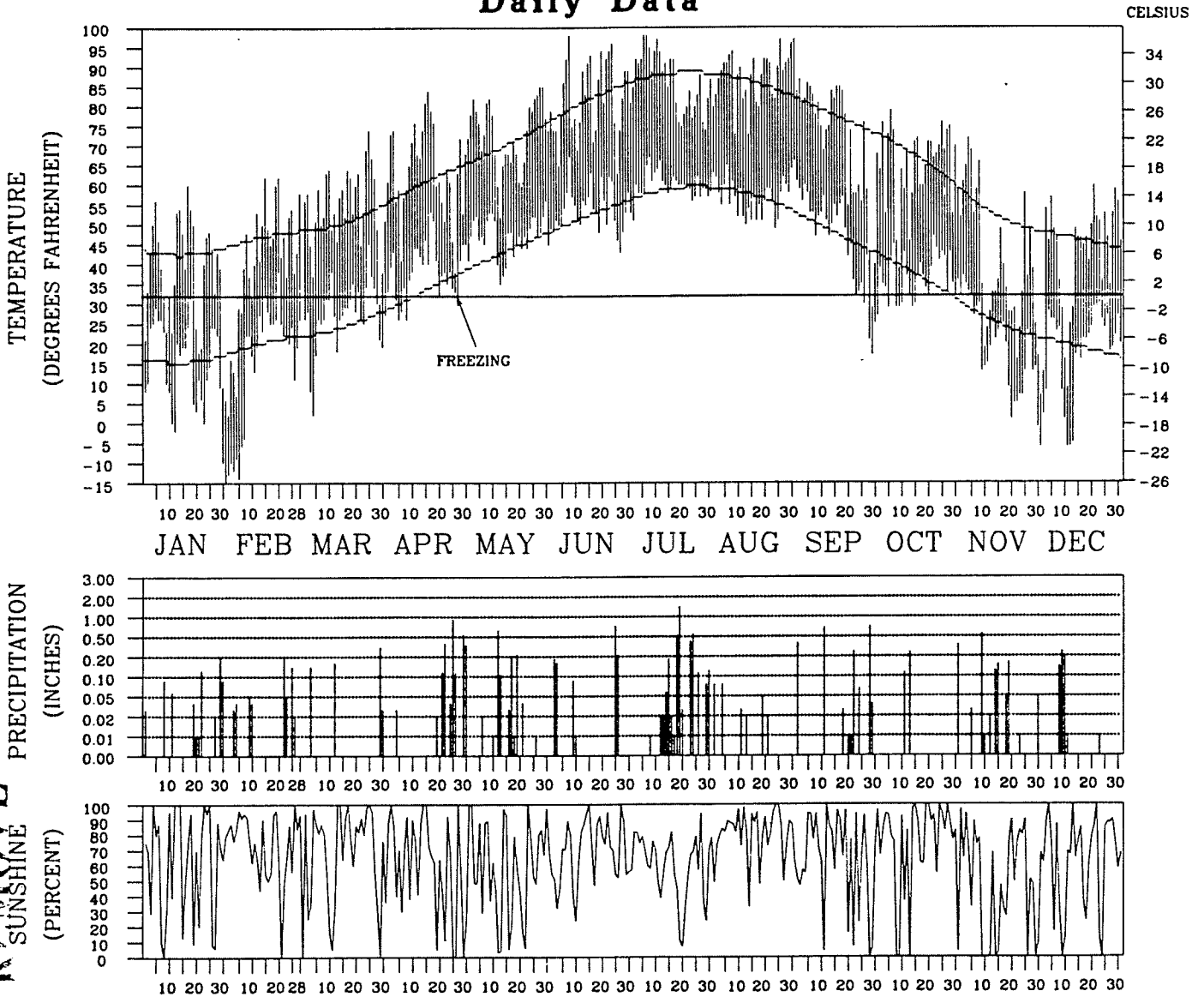
# 1985 LOCAL CLIMATOLOGICAL DATA

## ANNUAL SUMMARY WITH COMPARATIVE DATA

### DENVER, COLORADO



### Daily Data



TEMPERATURE DEPICTS NORMAL MAXIMUM, NORMAL MINIMUM AND ACTUAL DAILY HIGH AND LOW VALUES (FAHRENHEIT)  
 PRECIPITATION IS MEASURED IN INCHES. SCALE IS NON-LINEAR  
 SUNSHINE IS PERCENT OF THE POSSIBLE SUNSHINE

I CERTIFY THAT THIS IS AN OFFICIAL PUBLICATION OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, AND IS COMPILED FROM RECORDS ON FILE AT THE NATIONAL CLIMATIC DATA CENTER, ASHEVILLE, NORTH CAROLINA, 28801

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SUNSHINE

**noaa**

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE

NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

*Kenneth D. Halpern*  
 DIRECTOR  
 NATIONAL CLIMATIC DATA CENTER

# METEOROLOGICAL DATA FOR 1985

DENVER, COLORADO

LATITUDE: 39°45' N LONGITUDE: 104°52' W ELEVATION: FT. GRND 5282 BARO 5287 TIME ZONE: MOUNTAIN WBAN: 23062

|                                 | JAN   | FEB   | MAR   | APR   | MAY   | JUNE  | JULY  | AUG   | SEP   | OCT   | NOV   | DEC   | YEAR      |
|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------|
| <b>TEMPERATURE °F:</b>          |       |       |       |       |       |       |       |       |       |       |       |       |           |
| Averages                        |       |       |       |       |       |       |       |       |       |       |       |       |           |
| -Daily Maximum                  | 37.5  | 40.4  | 54.5  | 63.8  | 73.0  | 82.0  | 86.3  | 87.7  | 71.5  | 65.1  | 40.4  | 41.6  | 62.0      |
| -Daily Minimum                  | 13.6  | 14.9  | 27.1  | 38.1  | 46.9  | 53.9  | 59.6  | 57.0  | 46.1  | 36.3  | 19.1  | 17.2  | 35.8      |
| -Monthly                        | 25.6  | 27.7  | 40.8  | 51.0  | 60.0  | 68.0  | 73.0  | 72.4  | 58.8  | 50.7  | 29.8  | 29.4  | 48.9      |
| -Monthly Dewpt.                 | 13.3  | 13.8  | 19.7  | 28.4  | 36.5  | 40.5  | 47.2  | 44.7  | 38.5  | 28.1  | 17.4  | 12.8  | 28.4      |
| Extremes                        |       |       |       |       |       |       |       |       |       |       |       |       |           |
| -Highest                        | 60    | 62    | 74    | 84    | 85    | 98    | 98    | 97    | 87    | 79    | 72    | 60    | 98        |
| -Date                           | 17    | 20    | 25    | 16    | 29    | 8     | 7     | 31    | 2     | 6     | 4     | 21    | JUL 7     |
| -Lowest                         | -15   | -14   | 2     | 26    | 35    | 43    | 51    | 49    | 17    | 27    | -1    | -6    | -15       |
| -Date                           | 31    | 5     | 4     | 8     | 13    | 27    | 2     | 24    | 29    | 1     | 30    | 12    | JAN 31    |
| <b>DEGREE DAYS BASE 65 °F:</b>  |       |       |       |       |       |       |       |       |       |       |       |       |           |
| Heating                         | 1215  | 1041  | 742   | 412   | 167   | 42    | 0     | 1     | 241   | 435   | 1051  | 1094  | 6441      |
| Cooling                         | 0     | 0     | 0     | 1     | 19    | 137   | 256   | 238   | 63    | 0     | 0     | 0     | 714       |
| <b>% OF POSSIBLE SUNSHINE</b>   |       |       |       |       |       |       |       |       |       |       |       |       |           |
|                                 | 62    | 73    | 68    | 59    | 59    | 69    | 60    | 80    | 63    | 73    | 48    | 63    | 65        |
| <b>AVG. SKY COVER (tenths)</b>  |       |       |       |       |       |       |       |       |       |       |       |       |           |
| Sunrise - Sunset                | 5.5   | 5.5   | 5.1   | 6.0   | 5.5   | 5.3   | 6.3   | 4.2   | 5.4   | 3.9   | 7.0   | 5.5   | 5.4       |
| Midnight - Midnight             | 5.3   | 4.8   | 4.8   | 5.7   | 5.3   | 5.1   | 5.8   | 4.0   | 5.5   | 3.8   | 6.6   | 4.9   | 5.1       |
| <b>NUMBER OF DAYS:</b>          |       |       |       |       |       |       |       |       |       |       |       |       |           |
| Sunrise to Sunset               |       |       |       |       |       |       |       |       |       |       |       |       |           |
| -Clear                          | 11    | 7     | 12    | 8     | 11    | 9     | 3     | 11    | 11    | 16    | 5     | 9     | 113       |
| -Partly Cloudy                  | 9     | 13    | 7     | 8     | 10    | 12    | 19    | 14    | 7     | 8     | 9     | 11    | 127       |
| -Cloudy                         | 11    | 8     | 12    | 14    | 10    | 9     | 9     | 6     | 12    | 7     | 16    | 11    | 125       |
| Precipitation                   |       |       |       |       |       |       |       |       |       |       |       |       |           |
| .01 inches or more              | 10    | 8     | 4     | 9     | 10    | 6     | 15    | 6     | 9     | 3     | 10    | 5     | 95        |
| Snow, Ice pellets               |       |       |       |       |       |       |       |       |       |       |       |       |           |
| 1.0 inches or more              | 4     | 3     | 3     | 0     | 0     | 0     | 0     | 0     | 1     | 1     | 5     | 3     | 20        |
| Thunderstorms                   | 0     | 0     | 0     | 2     | 7     | 8     | 13    | 9     | 4     | 0     | 0     | 0     | 43        |
| Heavy Fog, visibility           |       |       |       |       |       |       |       |       |       |       |       |       |           |
| 1/4 mile or less                | 3     | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 7     | 0     | 11        |
| <b>Temperature °F</b>           |       |       |       |       |       |       |       |       |       |       |       |       |           |
| -Maximum                        |       |       |       |       |       |       |       |       |       |       |       |       |           |
| 90° and above                   | 0     | 0     | 0     | 0     | 0     | 8     | 12    | 15    | 0     | 0     | 0     | 0     | 35        |
| 32° and below                   | 10    | 7     | 1     | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 10    | 7     | 36        |
| -Minimum                        |       |       |       |       |       |       |       |       |       |       |       |       |           |
| 32° and below                   | 31    | 27    | 24    | 6     | 0     | 0     | 0     | 0     | 5     | 10    | 27    | 31    | 161       |
| 0° and below                    | 5     | 7     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 4     | 17        |
| <b>AVG. STATION PRESS. (mb)</b> |       |       |       |       |       |       |       |       |       |       |       |       |           |
|                                 | 837.5 | 834.4 | 833.1 | 834.4 | 835.1 | 837.5 | 840.2 | 838.5 | 837.5 | 836.8 | 832.4 | 837.8 | 836.1     |
| <b>RELATIVE HUMIDITY (%)</b>    |       |       |       |       |       |       |       |       |       |       |       |       |           |
| Hour 05                         | 73    | 70    | 65    | 64    | 65    | 57    | 62    | 63    | 69    | 63    | 75    | 58    | 65        |
| Hour 11                         | 54    | 49    | 38    | 40    | 34    | 31    | 35    | 29    | 42    | 36    | 57    | 46    | 41        |
| Hour 17 (Local Time)            | 59    | 52    | 33    | 35    | 35    | 29    | 35    | 26    | 40    | 33    | 60    | 51    | 41        |
| Hour 23                         | 75    | 71    | 54    | 55    | 56    | 49    | 55    | 52    | 60    | 59    | 70    | 59    | 60        |
| <b>PRECIPITATION (inches):</b>  |       |       |       |       |       |       |       |       |       |       |       |       |           |
| Water Equivalent                |       |       |       |       |       |       |       |       |       |       |       |       |           |
| -Total                          | 0.68  | 0.59  | 0.69  | 2.61  | 1.33  | 1.46  | 3.71  | 0.28  | 2.33  | 0.77  | 1.20  | 0.66  | 16.31     |
| -Greatest (24 hrs)              | 0.29  | 0.26  | 0.34  | 0.98  | 0.77  | 0.93  | 1.57  | 0.08  | 0.80  | 0.38  | 0.57  | 0.40  | 1.57      |
| -Date                           | 29-30 | 22-23 | 29    | 24-25 | 12-13 | 25-26 | 18-19 | 4     | 28-29 | 31    | 9     | 8-9   | JUL 18-19 |
| Snow, Ice pellets               |       |       |       |       |       |       |       |       |       |       |       |       |           |
| -Total                          | 12.5  | 8.7   | 7.6   | 0.8   | T     | 0.0   | 0.0   | 0.0   | 8.7   | 1.9   | 17.0  | 10.3  | 67.5      |
| -Greatest (24 hrs)              | 5.4   | 3.3   | 3.4   | 0.7   | T     | 0.0   | 0.0   | 0.0   | 8.7   | 1.9   | 7.1   | 6.9   | 8.7       |
| -Date                           | 29-30 | 22-23 | 29    | 26    | 13    |       |       |       | 28-29 | 13    | 9     | 8-9   | SEP 28-29 |
| <b>WIND:</b>                    |       |       |       |       |       |       |       |       |       |       |       |       |           |
| Resultant                       |       |       |       |       |       |       |       |       |       |       |       |       |           |
| -Direction (!!!)                | 136   | 121   | 187   | 295   | 185   | 126   | 176   | 168   | 142   | 151   | 036   | 160   | 160       |
| -Speed (mph)                    | 0.4   | 0.4   | 1.8   | 0.7   | 1.7   | 2.0   | 1.6   | 3.1   | 2.0   | 1.3   | 0.8   | 1.3   | 1.1       |
| Average Speed (mph)             | 6.6   | 7.3   | 10.3  | 8.9   | 8.6   | 8.3   | 7.9   | 7.6   | 7.9   | 7.5   | 6.7   | 7.5   | 7.9       |
| Fastest Obs. 1 Min.             |       |       |       |       |       |       |       |       |       |       |       |       |           |
| -Direction (!!!)                | 31    | 04    | 28    | 33    | 30    | 27    | 30    | 35    | 04    | 30    | 06    | 30    | 33        |
| -Speed (mph)                    | 29    | 25    | 35    | 41    | 31    | 31    | 31    | 26    | 30    | 32    | 22    | 29    | 41        |
| -Date                           | 17    | 25    | 26    | 3     | 30    | 25    | 4     | 18    | 22    | 22    | 5     | 17    | APR 3     |
| Peak Gust                       |       |       |       |       |       |       |       |       |       |       |       |       |           |
| -Direction (!!!)                | NW    | NE    | W     | N     | N     | W     | NW    | NW    | N     | NW    | N     | W     | N         |
| -Speed (mph)                    | 41    | 39    | 52    | 45    | 45    | 46    | 44    | 48    | 44    | 41    | 37    | 37    | 53        |
| -Date                           | 15    | 25    | 26    | 4     | 13    | 21    | 4     | 6     | 24    | 22    | 5     | 23    | APR 4     |

# NORMALS, MEANS, AND EXTREMES

DENVER, COLORADO

LATITUDE: 39°45'N    LONGITUDE: 104°52'W    ELEVATION: FT. GRND 5262 BARO 5287    TIME ZONE: MOUNTAIN    WBAN: 23062

|                                   | (a) | JAN  | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEP  | OCT  | NOV  | DEC  | YEAR     |
|-----------------------------------|-----|------|------|------|------|------|------|------|------|------|------|------|------|----------|
| <b>TEMPERATURE °F:</b>            |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| Normals                           |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| -Daily Maximum                    |     | 43.1 | 46.9 | 51.2 | 61.0 | 70.7 | 81.6 | 88.0 | 85.8 | 77.5 | 66.8 | 52.4 | 46.1 | 64.3     |
| -Daily Minimum                    |     | 15.9 | 20.2 | 24.7 | 33.7 | 43.6 | 52.4 | 58.7 | 57.0 | 47.7 | 36.9 | 25.1 | 18.9 | 36.2     |
| -Monthly                          |     | 29.5 | 33.5 | 38.0 | 47.4 | 57.2 | 67.0 | 73.3 | 71.4 | 62.6 | 51.9 | 38.8 | 32.5 | 50.2     |
| Extremes                          |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| -Record Highest                   | 51  | 73   | 76   | 84   | 85   | 96   | 104  | 104  | 101  | 97   | 88   | 79   | 75   | 104      |
| -Year                             |     | 1982 | 1963 | 1971 | 1960 | 1942 | 1936 | 1939 | 1938 | 1960 | 1947 | 1941 | 1980 | JUL 1939 |
| -Record Lowest                    | 51  | -25  | -30  | -11  | -2   | 22   | 30   | 43   | 41   | 17   | 3    | -8   | -21  | -30      |
| -Year                             |     | 1963 | 1936 | 1943 | 1975 | 1954 | 1951 | 1972 | 1964 | 1985 | 1969 | 1950 | 1983 | FEB 1936 |
| <b>NORMAL DEGREE DAYS:</b>        |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| Heating (base 65°F)               |     | 1101 | 879  | 837  | 528  | 253  | 74   | 0    | 0    | 135  | 414  | 789  | 1004 | 6014     |
| Cooling (base 65°F)               |     | 0    | 0    | 0    | 0    | 11   | 134  | 261  | 203  | 63   | 8    | 0    | 0    | 680      |
| <b>% OF POSSIBLE SUNSHINE</b>     | 36  | 71   | 71   | 70   | 67   | 64   | 71   | 71   | 73   | 74   | 72   | 64   | 67   | 70       |
| <b>MEAN SKY COVER (tenths)</b>    |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| Sunrise - Sunset                  | 37  | 5.6  | 5.8  | 6.1  | 6.0  | 6.2  | 5.0  | 4.9  | 4.9  | 4.4  | 4.5  | 5.4  | 5.4  | 5.4      |
| <b>MEAN NUMBER OF DAYS:</b>       |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| Sunrise to Sunset                 |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| -Clear                            | 51  | 10.0 | 8.1  | 7.8  | 6.9  | 6.1  | 9.6  | 9.1  | 10.0 | 13.5 | 13.5 | 10.3 | 10.6 | 115.5    |
| -Partly Cloudy                    | 51  | 9.2  | 8.8  | 10.3 | 10.7 | 12.1 | 12.3 | 15.9 | 13.8 | 8.9  | 9.0  | 9.4  | 9.8  | 130.2    |
| -Cloudy                           | 51  | 11.7 | 11.4 | 12.8 | 12.5 | 12.8 | 8.1  | 6.1  | 7.3  | 7.6  | 8.5  | 10.2 | 10.6 | 119.5    |
| <b>Precipitation</b>              |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| .01 inches or more                | 51  | 5.8  | 5.7  | 8.6  | 8.8  | 10.6 | 8.8  | 9.2  | 8.6  | 6.2  | 5.3  | 5.3  | 5.2  | 88.3     |
| Snow, Ice pellets                 |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| 1.0 inches or more                | 51  | 2.3  | 2.4  | 3.7  | 2.5  | 0.5  | 0.0  | 0.0  | 0.0  | 0.3  | 1.2  | 2.5  | 2.3  | 17.7     |
| <b>Thunderstorms</b>              |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| Heavy Fog Visibility              | 51  | 0.0  | 0.*  | 0.2  | 1.5  | 6.3  | 9.8  | 11.1 | 8.2  | 3.4  | 0.9  | 0.1  | 0.0  | 41.4     |
| 1/4 mile or less                  | 45  | 1.2  | 1.6  | 1.0  | 0.8  | 0.5  | 0.4  | 0.4  | 0.6  | 0.6  | 0.7  | 1.2  | 1.0  | 10.1     |
| <b>Temperature °F</b>             |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| -Maximum                          |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| 90° and above                     | 25  | 0.0  | 0.0  | 0.0  | 0.0  | 0.3  | 5.9  | 15.2 | 9.3  | 2.2  | 0.0  | 0.0  | 0.0  | 32.9     |
| 32° and below                     | 25  | 6.9  | 4.2  | 3.0  | 0.5  | 0.0  | 0.0  | 0.0  | 0.0  | 0.*  | 0.3  | 2.5  | 5.1  | 22.6     |
| -Minimum                          |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| 32° and below                     | 25  | 30.0 | 26.4 | 25.4 | 12.0 | 1.7  | 0.0  | 0.0  | 0.0  | 1.0  | 8.7  | 24.7 | 29.1 | 158.9    |
| 0° and below                      | 25  | 4.3  | 1.7  | 0.5  | 0.*  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.2  | 2.7  | 9.5      |
| <b>AVG. STATION PRESS. (mb)</b>   |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| <b>RELATIVE HUMIDITY (%)</b>      |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| Hour 05                           | 25  | 64   | 66   | 67   | 67   | 70   | 69   | 68   | 69   | 68   | 64   | 69   | 64   | 67       |
| Hour 11 (Local Time)              | 25  | 46   | 43   | 42   | 38   | 39   | 37   | 35   | 36   | 38   | 36   | 44   | 45   | 40       |
| Hour 17                           | 25  | 49   | 43   | 41   | 35   | 38   | 35   | 34   | 35   | 34   | 35   | 49   | 51   | 40       |
| Hour 23                           | 25  | 63   | 64   | 62   | 58   | 61   | 59   | 56   | 58   | 59   | 59   | 65   | 63   | 61       |
| <b>PRECIPITATION (inches):</b>    |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| <b>Water Equivalent</b>           |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| -Normal                           |     | 0.51 | 0.69 | 1.21 | 1.81 | 2.47 | 1.58 | 1.93 | 1.53 | 1.23 | 0.98 | 0.82 | 0.55 | 15.31    |
| -Maximum Monthly                  | 51  | 1.44 | 1.66 | 4.56 | 4.17 | 7.31 | 4.69 | 6.41 | 5.85 | 4.67 | 4.17 | 2.97 | 2.84 | 7.31     |
| -Year                             |     | 1948 | 1960 | 1983 | 1942 | 1957 | 1967 | 1965 | 1979 | 1961 | 1969 | 1946 | 1973 | MAY 1957 |
| -Minimum Monthly                  | 51  | 0.01 | 0.01 | 0.13 | 0.03 | 0.06 | 0.09 | 0.17 | 0.06 | 0.05 | 0.01 | 0.01 | 0.03 | 0.03     |
| -Year                             |     | 1952 | 1970 | 1945 | 1963 | 1974 | 1980 | 1939 | 1960 | 1944 | 1962 | 1949 | 1977 | SEP 1944 |
| -Maximum in 24 hrs                | 51  | 1.02 | 1.01 | 2.79 | 3.25 | 3.55 | 3.16 | 2.42 | 3.43 | 2.44 | 1.71 | 1.29 | 2.00 | 3.55     |
| -Year                             |     | 1962 | 1953 | 1983 | 1967 | 1973 | 1970 | 1965 | 1951 | 1936 | 1947 | 1975 | 1982 | MAY 1973 |
| <b>Snow, Ice pellets</b>          |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| -Maximum Monthly                  | 51  | 23.7 | 18.3 | 30.5 | 28.3 | 13.6 | 0.3  |      | 21.3 | 31.2 | 39.1 | 30.8 | 39.1 | 39.1     |
| -Year                             |     | 1948 | 1960 | 1983 | 1935 | 1950 | 1951 |      | 1936 | 1969 | 1946 | 1973 | 1946 | NOV 1946 |
| -Maximum in 24 hrs                | 51  | 12.4 | 9.5  | 18.0 | 17.3 | 10.7 | 0.3  |      | 19.4 | 12.4 | 15.9 | 23.6 | 23.6 | 23.6     |
| -Year                             |     | 1962 | 1953 | 1983 | 1957 | 1950 | 1951 |      | 1936 | 1969 | 1983 | 1982 | 1982 | DEC 1982 |
| <b>WIND:</b>                      |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| Mean Speed (mph)                  | 37  | 8.7  | 9.0  | 9.8  | 10.2 | 9.4  | 8.9  | 8.4  | 8.1  | 8.0  | 7.9  | 8.4  | 8.7  | 8.8      |
| Prevailing Direction through 1963 |     | S    | S    | S    | S    | S    | S    | S    | S    | S    | S    | S    | S    | S        |
| Fastest Mile                      |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| -Direction (!!!)                  | 31  | N    | NW   | NW   | NW   | SE   | S    | SW   | N    | NW   | NW   | W    | NE   | SW       |
| -Speed (MPH)                      | 31  | 53   | 49   | 53   | 56   | 54   | 47   | 56   | 42   | 47   | 45   | 48   | 51   | 56       |
| -Year                             |     | 1976 | 1953 | 1952 | 1960 | 1978 | 1956 | 1965 | 1978 | 1955 | 1958 | 1962 | 1953 | JUL 1965 |
| Peak Gust                         |     |      |      |      |      |      |      |      |      |      |      |      |      |          |
| -Direction (!!!)                  | 2   | NW   | N    | W    | N    | SE   | W    | NE   | NW   | W    | NW   | NW   | NW   | W        |
| -Speed (mph)                      | 2   | 41   | 51   | 52   | 53   | 48   | 46   | 45   | 48   | 56   | 41   | 44   | 47   | 56       |
| -Date                             |     | 1985 | 1984 | 1985 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1984 | SEP 1984 |

(!!!) See Reference Notes on Page 6B.  
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PRECIPITATION (inches)

DENVER, COLORADO

| YEAR        | JAN  | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEP  | OCT  | NOV  | DEC  | ANNUAL |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|--------|
| 1956        | 0.39 | 0.77 | 0.89 | 0.72 | 2.36 | 0.44 | 4.17 | 1.83 | 0.01 | 0.27 | 1.25 | 0.62 | 13.72  |
| 1957        | 0.32 | 0.73 | 1.09 | 4.13 | 7.31 | 1.09 | 1.29 | 2.03 | 0.42 | 2.62 | 0.49 | 0.06 | 21.58  |
| 1958        | 0.73 | 1.00 | 1.48 | 1.73 | 4.46 | 1.47 | 3.50 | 1.17 | 1.51 | 0.37 | 0.74 | 0.64 | 18.80  |
| 1959        | 1.24 | 1.31 | 2.85 | 1.35 | 3.33 | 0.44 | 0.83 | 0.25 | 1.82 | 2.46 | 0.40 | 0.26 | 16.54  |
| 1960        | 0.77 | 1.66 | 0.89 | 2.56 | 2.27 | 0.63 | 1.31 | 0.06 | 0.38 | 2.46 | 0.49 | 1.50 | 14.98  |
| 1961        | 0.07 | 0.66 | 2.51 | 1.06 | 4.12 | 1.11 | 1.60 | 1.21 | 4.67 | 0.77 | 0.93 | 0.30 | 19.01  |
| 1962        | 1.33 | 1.05 | 0.52 | 1.10 | 0.84 | 1.52 | 0.54 | 0.46 | 0.19 | 0.05 | 0.68 | 0.17 | 8.45   |
| 1963        | 0.71 | 0.21 | 1.42 | 0.03 | 0.68 | 3.59 | 0.55 | 2.52 | 1.25 | 0.31 | 0.45 | 0.51 | 12.23  |
| 1964        | 0.26 | 1.04 | 1.38 | 1.25 | 2.53 | 0.82 | 0.72 | 0.27 | 0.41 | 0.18 | 0.88 | 0.40 | 10.14  |
| 1965        | 1.00 | 1.27 | 1.20 | 1.05 | 1.82 | 4.14 | 6.41 | 1.06 | 2.58 | 0.45 | 0.36 | 0.53 | 21.87  |
| 1966        | 0.30 | 1.28 | 0.32 | 1.46 | 0.34 | 1.41 | 1.04 | 2.06 | 1.15 | 0.96 | 0.32 | 0.17 | 10.81  |
| 1967        | 0.84 | 0.39 | 0.79 | 3.95 | 4.77 | 4.69 | 3.25 | 0.83 | 0.60 | 1.13 | 1.01 | 1.06 | 23.31  |
| 1968        | 0.51 | 0.74 | 0.85 | 2.39 | 0.71 | 0.50 | 1.34 | 2.53 | 0.59 | 0.75 | 0.71 | 0.51 | 12.13  |
| 1969        | 0.17 | 0.43 | 1.10 | 1.33 | 6.12 | 2.99 | 1.81 | 0.79 | 1.67 | 4.17 | 0.62 | 0.32 | 21.52  |
| 1970        | 0.10 | 0.01 | 1.34 | 0.97 | 0.64 | 3.83 | 1.67 | 0.54 | 2.47 | 0.88 | 1.19 | 0.09 | 13.73  |
| 1971        | 0.35 | 0.78 | 0.53 | 1.98 | 1.34 | 0.23 | 1.20 | 0.85 | 2.85 | 0.44 | 0.16 | 0.25 | 10.96  |
| 1972        | 0.36 | 0.44 | 0.50 | 3.52 | 0.49 | 2.94 | 0.63 | 2.71 | 2.07 | 0.82 | 1.69 | 0.70 | 16.87  |
| 1973        | 1.31 | 0.16 | 1.76 | 3.73 | 5.06 | 0.20 | 2.47 | 1.28 | 2.85 | 0.47 | 0.83 | 2.84 | 22.96  |
| 1974        | 1.03 | 0.82 | 1.32 | 2.28 | 0.06 | 2.01 | 2.34 | 0.16 | 0.98 | 1.68 | 1.06 | 0.29 | 14.03  |
| 1975        | 0.23 | 0.37 | 1.19 | 1.14 | 2.80 | 2.11 | 2.78 | 2.00 | 0.24 | 0.30 | 1.88 | 0.47 | 15.51  |
| 1976        | 0.19 | 0.54 | 1.34 | 1.27 | 1.34 | 0.63 | 2.31 | 2.50 | 1.88 | 0.93 | 0.32 | 0.16 | 13.41  |
| 1977        | 0.16 | 0.27 | 1.24 | 2.13 | 0.34 | 1.02 | 2.98 | 1.00 | 0.10 | 0.48 | 0.59 | 0.03 | 10.34  |
| 1978        | 0.27 | 0.27 | 1.07 | 1.82 | 3.46 | 1.17 | 0.54 | 0.26 | 0.07 | 1.45 | 0.50 | 0.82 | 11.70  |
| 1979        | 0.34 | 0.42 | 1.25 | 1.41 | 3.53 | 2.39 | 0.81 | 5.85 | 0.36 | 1.28 | 1.66 | 1.06 | 20.36  |
| 1980        | 0.64 | 0.45 | 1.15 | 2.54 | 2.73 | 0.09 | 2.93 | 1.65 | 0.63 | 0.10 | 0.66 | 0.10 | 13.67  |
| 1981        | 0.29 | 0.35 | 2.27 | 1.01 | 3.76 | 0.63 | 0.90 | 1.16 | 0.35 | 0.79 | 0.42 | 0.66 | 12.59  |
| 1982        | 0.32 | 0.09 | 0.18 | 0.34 | 3.48 | 2.26 | 0.92 | 1.16 | 1.38 | 1.51 | 0.47 | 2.34 | 14.45  |
| 1983        | 0.15 | 0.07 | 4.56 | 2.10 | 3.62 | 2.65 | 1.75 | 1.51 | 0.13 | 0.39 | 2.63 | 0.63 | 20.19  |
| 1984        | 0.18 | 0.81 | 1.19 | 2.42 | 0.65 | 1.26 | 2.11 | 3.20 | 0.47 | 3.47 | 0.27 | 0.46 | 16.49  |
| 1985        | 0.68 | 0.59 | 0.69 | 2.61 | 1.33 | 1.46 | 3.71 | 0.28 | 2.33 | 0.77 | 1.20 | 0.66 | 16.31  |
| Record Mean | 0.47 | 0.57 | 1.13 | 1.99 | 2.40 | 1.49 | 1.71 | 1.43 | 1.10 | 1.02 | 0.68 | 0.63 | 14.62  |

See Reference Notes on Page 6B.  
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AVERAGE TEMPERATURE (deg. F)

DENVER, COLORADO

| YEAR        | JAN  | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEP  | OCT  | NOV  | DEC  | ANNUAL |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|--------|
| 1956        | 34.0 | 27.7 | 40.1 | 45.5 | 60.9 | 73.4 | 72.2 | 69.7 | 65.5 | 55.9 | 37.2 | 35.7 | 51.5   |
| 1957        | 25.8 | 40.7 | 39.1 | 41.4 | 53.9 | 65.9 | 73.5 | 72.6 | 61.4 | 51.4 | 36.8 | 39.6 | 50.2   |
| 1958        | 32.9 | 37.4 | 32.8 | 44.6 | 61.7 | 68.1 | 70.3 | 73.6 | 64.4 | 53.9 | 40.6 | 35.8 | 51.4   |
| 1959        | 30.0 | 30.2 | 37.6 | 45.6 | 56.2 | 70.9 | 72.6 | 73.0 | 61.1 | 48.1 | 37.6 | 36.5 | 50.0   |
| *1960       | 27.6 | 24.8 | 38.1 | 50.5 | 57.2 | 68.3 | 73.2 | 73.4 | 65.0 | 52.0 | 39.5 | 26.5 | 49.7   |
| 1961        | 31.7 | 35.2 | 38.9 | 46.0 | 55.7 | 66.1 | 71.5 | 72.2 | 56.3 | 50.0 | 34.7 | 27.7 | 48.9   |
| 1962        | 19.5 | 29.9 | 34.6 | 50.3 | 59.8 | 65.5 | 72.9 | 72.5 | 62.4 | 53.4 | 41.3 | 33.8 | 49.7   |
| 1963        | 19.1 | 37.3 | 37.3 | 50.0 | 60.9 | 66.7 | 74.8 | 68.7 | 65.9 | 57.9 | 41.7 | 28.5 | 50.8   |
| 1964        | 30.6 | 27.4 | 33.0 | 46.6 | 58.8 | 65.0 | 75.8 | 70.4 | 62.5 | 52.7 | 40.0 | 33.2 | 49.7   |
| 1965        | 35.0 | 27.4 | 29.0 | 51.2 | 57.1 | 63.9 | 72.7 | 70.2 | 55.7 | 55.1 | 43.3 | 35.0 | 49.6   |
| 1966        | 28.6 | 28.4 | 42.5 | 44.6 | 58.7 | 64.6 | 76.9 | 70.8 | 65.0 | 52.2 | 41.5 | 31.9 | 50.5   |
| 1967        | 34.0 | 35.1 | 42.9 | 48.2 | 52.6 | 60.6 | 69.1 | 68.2 | 62.1 | 52.5 | 40.5 | 26.5 | 49.4   |
| 1968        | 29.7 | 34.2 | 40.6 | 43.0 | 53.9 | 67.8 | 71.7 | 68.1 | 60.9 | 51.9 | 35.7 | 28.9 | 48.9   |
| 1969        | 35.0 | 35.4 | 32.2 | 52.2 | 59.3 | 61.5 | 74.7 | 73.9 | 64.5 | 39.0 | 39.1 | 32.5 | 49.9   |
| 1970        | 30.6 | 38.6 | 33.5 | 43.7 | 58.8 | 65.2 | 72.0 | 73.9 | 59.5 | 45.9 | 39.1 | 33.3 | 49.5   |
| 1971        | 32.1 | 30.6 | 38.5 | 47.8 | 54.2 | 69.0 | 70.6 | 72.8 | 57.5 | 49.4 | 39.1 | 31.9 | 49.5   |
| 1972        | 30.5 | 36.2 | 44.8 | 48.5 | 57.0 | 68.3 | 70.2 | 71.0 | 62.1 | 52.1 | 32.9 | 24.9 | 49.9   |
| 1973        | 27.3 | 35.5 | 39.9 | 43.2 | 55.6 | 67.5 | 71.0 | 73.5 | 59.9 | 54.5 | 39.5 | 31.6 | 49.9   |
| 1974        | 23.7 | 35.2 | 43.2 | 47.9 | 61.6 | 68.4 | 74.7 | 69.5 | 59.4 | 52.4 | 38.0 | 31.2 | 50.5   |
| 1975        | 31.7 | 30.6 | 37.3 | 44.1 | 54.3 | 64.3 | 72.7 | 70.8 | 59.5 | 53.2 | 36.8 | 37.5 | 49.4   |
| 1976        | 32.3 | 39.3 | 37.1 | 49.2 | 56.7 | 66.3 | 75.3 | 70.2 | 61.8 | 48.4 | 39.5 | 35.5 | 51.0   |
| 1977        | 29.2 | 38.0 | 39.9 | 51.1 | 60.7 | 71.9 | 74.3 | 70.2 | 66.6 | 53.3 | 40.3 | 35.1 | 52.5   |
| 1978        | 25.8 | 31.4 | 43.3 | 50.3 | 54.4 | 66.9 | 74.7 | 69.6 | 65.0 | 53.1 | 37.8 | 24.6 | 49.7   |
| 1979        | 18.0 | 34.2 | 40.5 | 49.1 | 54.8 | 65.8 | 73.7 | 69.5 | 66.3 | 53.8 | 33.3 | 34.5 | 49.5   |
| 1980        | 26.0 | 34.5 | 38.0 | 47.7 | 57.1 | 71.9 | 76.4 | 73.2 | 65.8 | 52.4 | 41.9 | 41.2 | 52.2   |
| 1981        | 37.3 | 36.2 | 41.2 | 56.4 | 57.1 | 70.4 | 75.9 | 72.0 | 68.2 | 52.6 | 45.9 | 35.8 | 54.1   |
| 1982        | 30.3 | 32.0 | 41.1 | 47.4 | 55.1 | 63.1 | 72.7 | 73.1 | 61.7 | 49.0 | 35.7 | 30.9 | 49.3   |
| 1983        | 31.9 | 36.6 | 36.2 | 41.0 | 51.4 | 62.8 | 73.3 | 74.4 | 64.9 | 52.7 | 37.0 | 17.5 | 48.3   |
| 1984        | 27.3 | 34.1 | 37.2 | 42.3 | 60.0 | 66.5 | 74.9 | 71.8 | 60.7 | 44.8 | 39.7 | 32.8 | 49.3   |
| 1985        | 25.6 | 27.7 | 40.8 | 51.0 | 60.0 | 68.0 | 73.0 | 72.4 | 58.8 | 50.7 | 29.8 | 29.4 | 48.9   |
| Record Mean | 30.0 | 32.9 | 38.7 | 47.5 | 56.8 | 66.7 | 72.8 | 71.3 | 62.7 | 51.5 | 39.5 | 32.3 | 50.2   |
| Max         | 42.7 | 45.4 | 51.3 | 60.2 | 69.5 | 80.6 | 86.6 | 85.0 | 76.9 | 65.4 | 52.5 | 44.9 | 63.4   |
| Min         | 17.3 | 20.4 | 26.1 | 34.8 | 44.0 | 52.8 | 58.9 | 57.7 | 48.5 | 37.6 | 26.5 | 19.6 | 37.0   |

See Reference Notes on Page 6B.  
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HEATING DEGREE DAYS Base 65 deg. F

DENVER, COLORADO

| SEASON    | JULY | AUG | SEP | OCT | NOV  | DEC  | JAN  | FEB  | MAR  | APR | MAY | JUNE | TOTAL |
|-----------|------|-----|-----|-----|------|------|------|------|------|-----|-----|------|-------|
| 1956-57   | 1    | 20  | 66  | 277 | 829  | 901  | 1206 | 674  | 795  | 701 | 333 | 74   | 5877  |
| 1957-58   | 0    | 0   | 141 | 420 | 838  | 782  | 986  | 765  | 990  | 606 | 138 | 36   | 5702  |
| 1958-59   | 14   | 4   | 106 | 342 | 724  | 898  | 1081 | 968  | 841  | 572 | 273 | 25   | 5848  |
| 1959-60   | 0    | 6   | 191 | 518 | 815  | 876  | 1151 | 1159 | 827  | 434 | 245 | 38   | 6260  |
| # 1960-61 | 7    | 13  | 90  | 396 | 759  | 1187 | 1026 | 828  | 804  | 560 | 299 | 65   | 6034  |
| 1961-62   | 14   | 0   | 273 | 459 | 902  | 1150 | 1411 | 976  | 934  | 437 | 175 | 72   | 6803  |
| 1962-63   | 0    | 19  | 112 | 352 | 703  | 961  | 1417 | 768  | 848  | 442 | 156 | 50   | 5828  |
| 1963-64   | 6    | 7   | 29  | 229 | 690  | 1125 | 1059 | 1082 | 982  | 545 | 230 | 72   | 6056  |
| 1964-65   | 0    | 16  | 123 | 375 | 743  | 981  | 921  | 1044 | 1108 | 411 | 245 | 63   | 6030  |
| 1965-66   | 6    | 7   | 296 | 302 | 645  | 924  | 1122 | 1017 | 691  | 604 | 204 | 82   | 5900  |
| 1966-67   | 0    | 9   | 61  | 391 | 699  | 1018 | 954  | 832  | 679  | 498 | 388 | 135  | 5664  |
| 1967-68   | 0    | 16  | 108 | 389 | 729  | 1186 | 1086 | 885  | 751  | 655 | 343 | 38   | 6190  |
| 1968-69   | 10   | 35  | 145 | 399 | 871  | 1114 | 925  | 821  | 1011 | 378 | 204 | 144  | 6057  |
| 1969-70   | 2    | 0   | 56  | 801 | 769  | 998  | 1061 | 734  | 969  | 632 | 200 | 78   | 6300  |
| 1970-71   | 2    | 0   | 198 | 584 | 770  | 977  | 1018 | 958  | 817  | 508 | 329 | 25   | 6184  |
| 1971-72   | 24   | 0   | 273 | 479 | 771  | 1019 | 1063 | 832  | 621  | 486 | 246 | 4    | 5818  |
| 1972-73   | 42   | 1   | 107 | 397 | 960  | 1239 | 1162 | 820  | 771  | 646 | 290 | 56   | 6505  |
| 1973-74   | 8    | 0   | 166 | 321 | 758  | 1029 | 1277 | 831  | 671  | 507 | 197 | 67   | 5772  |
| 1974-75   | 0    | 9   | 199 | 381 | 803  | 1043 | 1024 | 957  | 852  | 621 | 332 | 85   | 6306  |
| 1975-76   | 0    | 4   | 195 | 363 | 840  | 843  | 1006 | 740  | 859  | 469 | 254 | 64   | 5637  |
| 1976-77   | 0    | 7   | 142 | 509 | 759  | 907  | 1105 | 749  | 771  | 414 | 137 | 0    | 5500  |
| 1977-78   | 0    | 14  | 38  | 358 | 737  | 920  | 1206 | 936  | 665  | 435 | 335 | 87   | 5733  |
| 1978-79   | 0    | 20  | 96  | 366 | 811  | 1245 | 1450 | 854  | 751  | 473 | 313 | 81   | 6460  |
| 1979-80   | 0    | 20  | 58  | 347 | 941  | 939  | 1204 | 876  | 828  | 514 | 247 | 9    | 5983  |
| 1980-81   | 0    | 4   | 56  | 386 | 683  | 731  | 853  | 801  | 727  | 260 | 243 | 26   | 4770  |
| 1981-82   | 0    | 12  | 19  | 375 | 570  | 898  | 1071 | 918  | 733  | 522 | 306 | 92   | 5516  |
| 1982-83   | 3    | 0   | 151 | 487 | 875  | 1050 | 1017 | 789  | 885  | 712 | 419 | 129  | 6517  |
| 1983-84   | 3    | 0   | 87  | 372 | 833  | 1469 | 1163 | 889  | 854  | 673 | 183 | 51   | 6577  |
| 1984-85   | 0    | 1   | 183 | 622 | 753  | 990  | 1215 | 841  | 742  | 412 | 167 | 42   | 6168  |
| 1985-86   | 0    | 1   | 241 | 435 | 1051 | 1094 |      |      |      |     |     |      |       |

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COOLING DEGREE DAYS Base 65 deg. F

DENVER, COLORADO

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEP | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|-----|-------|
| 1969 | 0   | 0   | 0   | 0   | 35  | 44   | 312  | 284 | 46  | 0   | 0   | 0   | 721   |
| 1970 | 0   | 0   | 0   | 0   | 16  | 93   | 222  | 282 | 40  | 0   | 0   | 0   | 653   |
| 1971 | 0   | 0   | 0   | 0   | 0   | 149  | 203  | 248 | 53  | 0   | 0   | 0   | 653   |
| 1972 | 0   | 0   | 0   | 0   | 6   | 110  | 210  | 207 | 28  | 1   | 0   | 0   | 562   |
| 1973 | 0   | 0   | 0   | 0   | 2   | 138  | 199  | 270 | 21  | 1   | 0   | 0   | 631   |
| 1974 | 0   | 0   | 0   | 0   | 36  | 176  | 307  | 157 | 39  | 0   | 0   | 0   | 715   |
| 1975 | 0   | 0   | 0   | 0   | 3   | 69   | 246  | 192 | 39  | 0   | 0   | 0   | 554   |
| 1976 | 0   | 0   | 0   | 0   | 3   | 112  | 324  | 176 | 52  | 0   | 0   | 0   | 667   |
| 1977 | 0   | 0   | 0   | 0   | 11  | 214  | 297  | 182 | 93  | 0   | 0   | 0   | 799   |
| 1978 | 0   | 0   | 0   | 0   | 12  | 152  | 308  | 171 | 103 | 2   | 0   | 0   | 748   |
| 1979 | 0   | 0   | 0   | 0   | 2   | 112  | 275  | 163 | 102 | 7   | 0   | 0   | 661   |
| 1980 | 0   | 0   | 0   | 2   | 10  | 224  | 358  | 263 | 88  | 1   | 0   | 0   | 946   |
| 1981 | 0   | 0   | 0   | 7   | 6   | 195  | 346  | 236 | 121 | 1   | 0   | 0   | 912   |
| 1982 | 0   | 0   | 0   | 0   | 6   | 42   | 247  | 257 | 59  | 0   | 0   | 0   | 611   |
| 1983 | 0   | 0   | 0   | 0   | 7   | 69   | 264  | 301 | 91  | 0   | 0   | 0   | 732   |
| 1984 | 0   | 0   | 0   | 0   | 33  | 104  | 315  | 218 | 60  | 0   | 0   | 0   | 730   |
| 1985 | 0   | 0   | 0   | 1   | 19  | 137  | 256  | 238 | 63  | 0   | 0   | 0   | 714   |

See Reference Notes on Page 6B.  
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SNOWFALL (inches)

DENVER, COLORADO

| SEASON      | JULY | AUG | SEP  | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUNE | TOTAL |
|-------------|------|-----|------|------|------|------|------|------|------|------|------|------|-------|
| 1956-57     | 0.0  | 0.0 | 0.0  | 0.6  | 21.3 | 6.3  | 5.3  | 1.6  | 8.9  | 25.5 | 8.8  | 0.0  | 78.3  |
| 1957-58     | 0.0  | 0.0 | T    | 3.9  | 3.0  | 0.8  | 8.9  | 12.0 | 14.4 | 14.1 | 0.0  | 0.0  | 57.1  |
| 1958-59     | 0.0  | 0.0 | T    | 2.6  | 9.7  | 7.7  | 17.4 | 17.5 | 26.8 | 17.6 | T    | 0.0  | 99.3  |
| 1959-60     | 0.0  | 0.0 | 12.9 | 11.8 | 5.3  | 2.7  | 10.7 | 18.3 | 9.0  | 9.3  | T    | 0.0  | 80.0  |
| 1960-61     | 0.0  | 0.0 | 0.0  | 4.6  | 5.1  | 17.8 | 1.0  | 7.9  | 29.2 | 8.6  | 6.4  | 0.0  | 80.6  |
| 1961-62     | 0.0  | 0.0 | 5.8  | 6.2  | 11.4 | 3.8  | 17.2 | 11.3 | 6.8  | 10.0 | 0.0  | 0.0  | 72.5  |
| 1962-63     | 0.0  | 0.0 | 0.7  | 0.0  | 5.0  | 1.2  | 9.1  | 2.1  | 18.0 | 0.2  | 0.0  | 0.0  | 36.3  |
| 1963-64     | 0.0  | 0.0 | 0.0  | 1.1  | 3.5  | 5.9  | 2.6  | 12.7 | 18.4 | 12.1 | 1.0  | 0.0  | 57.3  |
| 1964-65     | 0.0  | 0.0 | 0.0  | T    | 6.0  | 4.4  | 13.2 | 17.1 | 14.9 | 0.3  | T    | 0.0  | 55.9  |
| 1965-66     | 0.0  | 0.0 | 5.5  | 0.0  | 5.5  | 5.6  | 3.6  | 14.6 | 2.8  | 6.4  | 2.9  | 0.0  | 46.9  |
| 1966-67     | 0.0  | 0.0 | T    | 8.3  | 3.0  | 1.9  | 9.9  | 4.4  | 6.6  | 3.6  | 3.0  | 0.0  | 40.7  |
| 1967-68     | 0.0  | 0.0 | 0.0  | 1.7  | 9.4  | 13.1 | 3.0  | 7.3  | 9.2  | 15.1 | T    | 0.0  | 58.8  |
| 1968-69     | 0.0  | 0.0 | 0.0  | 0.4  | 5.8  | 6.9  | 2.8  | 4.2  | 13.2 | T    | 0.0  | 0.0  | 33.3  |
| 1969-70     | 0.0  | 0.0 | 0.0  | 31.2 | 5.1  | 3.1  | 0.9  | 0.3  | 20.5 | 4.7  | T    | 0.0  | 65.8  |
| 1970-71     | 0.0  | 0.0 | 4.6  | 5.9  | 9.2  | 0.9  | 8.6  | 11.9 | 9.6  | 6.0  | T    | 0.0  | 56.7  |
| 1971-72     | 0.0  | 0.0 | 17.2 | 3.1  | 1.4  | 8.4  | 10.9 | 9.1  | 7.1  | 17.2 | 0.0  | 0.0  | 74.4  |
| 1972-73     | 0.0  | 0.0 | 0.0  | 9.7  | 19.4 | 9.8  | 12.1 | 3.0  | 15.1 | 24.8 | 1.0  | 0.0  | 94.9  |
| 1973-74     | 0.0  | 0.0 | 0.0  | 2.3  | 9.3  | 30.8 | 8.2  | 10.3 | 12.8 | 17.8 | 0.0  | T    | 91.5  |
| 1974-75     | 0.0  | 0.0 | 1.8  | 1.0  | 11.9 | 2.1  | 3.6  | 4.0  | 14.3 | 10.9 | 6.1  | 0.0  | 55.7  |
| 1975-76     | 0.0  | 0.0 | 0.0  | 2.7  | 15.2 | 7.3  | 3.2  | 6.4  | 18.7 | 1.2  | 0.0  | 0.0  | 54.7  |
| 1976-77     | 0.0  | 0.0 | 0.0  | 7.2  | 4.5  | 3.1  | 2.4  | 3.1  | 9.6  | 4.7  | 0.0  | 0.0  | 34.6  |
| 1977-78     | 0.0  | 0.0 | 0.0  | 3.3  | 4.1  | 0.7  | 5.5  | 6.2  | 8.6  | 4.6  | 13.5 | 0.0  | 46.5  |
| 1978-79     | 0.0  | 0.0 | T    | 2.7  | 6.9  | 14.2 | 9.1  | 5.9  | 18.2 | 8.1  | 8.2  | 0.0  | 73.2  |
| 1979-80     | 0.0  | 0.0 | 0.0  | 2.7  | 22.3 | 16.5 | 12.3 | 9.6  | 12.1 | 10.0 | T    | 0.0  | 85.5  |
| 1980-81     | 0.0  | 0.0 | 0.0  | 1.5  | 7.1  | 1.2  | 4.1  | 4.3  | 24.0 | 2.9  | T    | 0.0  | 45.1  |
| 1981-82     | 0.0  | 0.0 | 0.0  | 2.8  | 3.3  | 9.9  | 4.8  | 1.8  | 2.1  | 2.0  | T    | 0.0  | 26.7  |
| 1982-83     | 0.0  | 0.0 | 0.0  | 1.2  | 1.8  | 27.1 | 1.3  | 0.8  | 30.5 | 11.3 | 7.6  | 0.0  | 81.6  |
| 1983-84     | 0.0  | 0.0 | T    | T    | 29.3 | 11.5 | 3.4  | 7.9  | 12.0 | 16.8 | T    | 0.0  | 80.9  |
| 1984-85     | 0.0  | 0.0 | 5.2  | 13.1 | 2.3  | 5.0  | 12.5 | 8.7  | 7.6  | 0.8  | T    | 0.0  | 55.2  |
| 1985-86     | 0.0  | 0.0 | 8.7  | 1.9  | 17.0 | 10.3 |      |      |      |      |      |      |       |
| Record Mean | 0.0  | 0.0 | 1.7  | 3.7  | 8.3  | 7.1  | 7.8  | 7.4  | 13.0 | 9.1  | 1.8  | T    | 60.0  |

See Reference Notes on Page 6B.  
Page 6A

REFERENCE NOTES

DENVER, COLORADO

GENERAL

T - TRACE AMOUNT.  
BLANK ENTRIES DENOTE MISSING/UNREPORTED DATA.  
# INDICATES A STATION OR INSTRUMENT RELOCATION.  
SEE STATION LOCATION TABLE ON PAGE 8.

EXCEPTIONS

PAGE 3  
1. FASTEST MILE WINDS ARE THROUGH AUGUST 1981.  
PAGES 4A, 4B, 6A  
RECORD MEANS ARE THROUGH THE CURRENT YEAR,  
BEGINNING IN 1872 FOR TEMPERATURE  
1872 FOR PRECIPITATION  
1935 FOR SNOWFALL

SPECIFIC

PAGE 2  
PH - INCLUDES LAST DAY OF PREVIOUS MONTH

PAGE 3

(a) - LENGTH OF RECORD IN YEARS, ALTHOUGH INDIVIDUAL MONTHS MAY BE MISSING.  
\* LESS THAN .05  
NORMALS - BASED ON THE 1951-1980 RECORD PERIOD.  
EXTREMES - DATES ARE THE MOST RECENT OCCURRENCE.  
WIND DIR. - NUMERALS SHOW TENS OF DEGREES CLOCKWISE FROM TRUE NORTH. "00" INDICATES CALM.  
RESULTANT DIRECTIONS ARE GIVEN TO WHOLE DEGREES.

## DENVER, COLORADO

Denver enjoys the invigorating climate that prevails over much of the central Rocky Mountain region, without the extremely cold mornings of the high elevations during winter, or the hot afternoons of summer at lower altitudes. Extremely warm or cold weather in Denver is usually of short duration.

Situated a long distance from any moisture source, and separated from the Pacific Ocean by several high mountain barriers, Denver enjoys low relative humidity, light precipitation, and abundant sunshine.

Air masses from four different sources influence Denver weather. These include arctic air from Canada and Alaska, warm, moist air from the Gulf of Mexico, warm, dry air from Mexico and the southwestern deserts, and Pacific air modified by its passage over mountains to the west.

In winter, the high altitude and mountains to the west combine to moderate temperatures in Denver. Invasions of cold air from the north, intensified by the high altitude, can be abrupt and severe. However, many of the cold air masses that spread southward out of Canada never reach the altitude of Denver, but move off over the lower plains to the east. Surges of air from the west are moderated in their descent down the east face of the Rockies, and reach Denver in the form of chinook winds that often raise temperatures into the 60s, even in midwinter.

In spring, polar air often collides with warm, moist air from the Gulf of Mexico and these collisions result in frequent, rapid and drastic weather changes. Spring is the cloudiest, windiest, and wettest season in the city. Much of the precipitation falls as snow, especially in March and early April. Stormy periods are interspersed with stretches of mild, sunny weather that quickly melt previous snow cover.

Summer precipitation falls mainly from scattered thunderstorms during the afternoon and evening. Mornings are usually clear and sunny, with clouds forming during early afternoon to cut off the sunshine at what would otherwise be the hottest part of the day. Severe thunderstorms, with large hail and heavy rain occasionally occur in the city, but these conditions are more common on the plains to the east.

Autumn is the most pleasant season. Few thunderstorms occur and invasions of cold air are infrequent. As a result, there is more sunshine and less severe weather than at any other time of the year.

Based on the 1951-1980 period, the average first occurrence of 32 degrees Fahrenheit in the fall is October 8 and the average last occurrence in the spring is May 3.

# STATION LOCATION

DENVER, COLORADO

| Location  | Occupied from | Occupied to | Airline distance and direction from previous location | Latitude North | Longitude West | Elevation above |                            |                  |                      |                  |                 |                          |                     |              |    | * Type<br>M = AMOS<br>T = AUTOB   | Remarks |                  |                               |
|---|---------------|-------------|---|----------------|----------------|-----------------|----------------------------|------------------|----------------------|------------------|-----------------|--------------------------|---------------------|--------------|----|---|---------|------------------|-------------------------------|
|   |               |             |   |                |                | Sea level       | Ground                     |                  |                      |                  |                 |                          |                     |              |    |   |         | Hygrothermometer | Automatic Observing Equipment |
|   |               |             |   |                |                |                 | Ground at temperature site | Wind instruments | Extrema thermometers | Psychrometer     | Sunshine Switch | Tipping bucket rain gage | Weighting rain gage | 8" rain gage |    |   |         |                  |                               |
| <b>COOPERATIVE</b>  |               |             |   |                |                |                 |                            |                  |                      |                  |                 |                          |                     |              |    |   |         |                  |                               |
| One or more locations   | 11/1859       | 12/1873     | NA  |                |                |                 |                            |                  |                      |                  |                 |                          |                     |              |    | Voluntary observers, broken record.   |         |                  |                               |
| <b>CITY</b>   |               |             |   |                |                |                 |                            |                  |                      |                  |                 |                          |                     |              |    |   |         |                  |                               |
| 16th (formerly G Street) & Larimer Streets  | 11/10/71      | 3/15/73     | NA  | 39° 45'        | 105° 00'       | 5177            | 51                         | #20              | #20                  |                  |                 |                          |                     |              |    | # - Estimated.  |         |                  |                               |
| Woodward Building on Market (formerly Holiday Street) between 15th & 16th Streets | 3/15/73       | 11/30/75    | 400' WNW  | 39° 45'        | 105° 00'       | 5212            | 71                         | 37               | 36                   |                  |                 |                          |                     |              |    |   |         |                  |                               |
| McClintock Block 16th Street  | 11/30/75      | 7/1/77      | 350' ESE  | 39° 45'        | 105° 00'       | 5214            | #70                        | #32              | #32                  |                  |                 |                          | #50                 |              |    | # - Estimated.  |         |                  |                               |
| Broadwell Block on Larimer Street   | 7/1/77        | 6/13/81     | 200' ENE  | 39° 45'        | 105° 00'       | 5214            | 80                         | 45               | 44                   |                  |                 |                          | 60                  |              |    |   |         |                  |                               |
| Tabor Block, 16th & Larimer Streets   | 6/13/81       | 12/1/87     | 200' WSW  | 39° 45'        | 105° 00'       | 5204            | 109                        | 73               | 72                   |                  |                 |                          | 86                  |              |    |   |         |                  |                               |
| Patterson & Thomas Block 17th & Curtis Streets                                    | 12/1/87       | 5/1/91      | 1100' ESE   | 39° 45'        | 105° 00'       | 5218            | 103                        | 86               | 86                   |                  |                 |                          | 79                  |              |    |   |         |                  |                               |
| Club Building 1700 Block on Arapahoe Street                                       | 5/1/91        | 10/1/95     | 375' N  | 39° 45'        | 105° 00'       | 5229            | 121                        | 108              | 107                  |                  | 97              |                          | 97                  |              |    |   |         |                  |                               |
| U. S. Post Office 16th & Arapahoe Streets   | 10/1/95       | 12/8/04     | 600' SW   | 39° 45'        | 105° 00'       | 5214            | 151                        | 83<br>a79        | 83<br>a79            |                  | 74              |                          | 74                  |              |    | a - Effective 6/13/96.  |         |                  |                               |
| Boston Building 17th & Champa Streets   | 12/8/04       | 1/29/16     | 800' E  | 39° 45'        | 105° 00'       | 5219            | 136<br>b172                | 129              | 128                  |                  | 119             |                          | 119                 |              |    | b - Effective 3/1/10.   |         |                  |                               |
| New Post Office Building 19th & Stout Streets                                     | 1/29/16       | Present     | 1000' ENE   | 39° 45'        | 105° 00'       | 5221            | 113<br>c                   | 106              | 108                  | NA               | 98<br>c         | NA<br>d98                | 98<br>c             | NA           | NA | c - Removed 4/1/50.<br>d - Installed 4/1/50.  |         |                  |                               |
| <b>AIRPORT</b>  |               |             |   |                |                |                 |                            |                  |                      |                  |                 |                          |                     |              |    |   |         |                  |                               |
| Administration Building Stapleton Airfield  | 9/15/31       | 6/25/47     | NA  | 39° 46'        | 104° 53'       | 5292            | 59                         | 46               | 46                   |                  |                 |                          | 5                   | 42           |    |   |         |                  |                               |
| WB-FAA Building Stapleton Airfield †  | 6/25/47       | 5/7/69      | 0.3 mi. NW  | 39° 46'        | 104° 53'       | 5292<br>15283   | 72<br>g20                  | 6                | 6                    | NA<br>e19<br>f40 | 4               | 6                        | 5                   | NA<br>h5     | NA | e - Installed 3/31/50.<br>f - Effective 2/1/57.<br>g - Effective 7/8/60. Fastest mile data from 40' prior to 7/12/60.<br>h - Commissioned 5200' ESE of thermometer site 8/1/60.<br>i - Effective 8/1/60.<br>j - Not moved 5/7/69. |         |                  |                               |
| † Stapleton Int'l AP (Effective 10/1/64)  |               |             |   |                |                |                 |                            |                  |                      |                  |                 |                          |                     |              |    |   |         |                  |                               |
| W. B. Forecast Office †† Stapleton International Airport                          | 5/7/69        | 1/20/82     | 1.7 mi. ESE   | 39° 45'        | 104° 52'       | 5283            | j20                        | 5                | 5                    | 22               | 4               | 4                        | 4                   | j5           | NA |   |         |                  |                               |
| †† Weather Service Forecast Office (Effective 1970)                               |               |             |   |                |                |                 |                            |                  |                      |                  |                 |                          |                     |              |    |   |         |                  |                               |
| Weather Service Forecast Office Stapleton International Airport                   | 1/20/82       | Present     | 1 mi. N   | 39° 46'        | 104° 52'       | 5282            | 33                         | 5                | 5                    | 25               | 4               | 4                        | 4                   | 5            | NA |   |         |                  |                               |

SUBSCRIPTION: Price and ordering information available through: National Climatic Data Center, Federal Building, Asheville, North Carolina 28801

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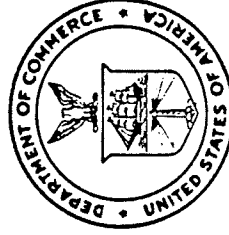
CLIMATOGRAPHY OF THE UNITED STATES NO. 82 - 5  
DECENNIAL CENSUS OF UNITED STATES CLIMATE--  
**SUMMARY OF HOURLY OBSERVATIONS**

105th Meridian Time Zone

**DENVER, COLORADO**

Stapleton Airfield

1951 - 1960



Washington, D.C.: 1963

Reprinted February 1974

PREFACE AND EXPLANATION OF TABLES

This summary of surface weather data is one of a series prepared under the Decennial Census of United States Climate, 1960 program. Similar summaries are being published for most Weather Bureau stations. All data are based on monthly data published in Local Climatological Data Supplements for all or part of the period 1951 - 1960. Where the full 10-year period is not covered by the monthly data, summaries are based on the period 1956 - 1960.

This series supersedes the series entitled "Climatology of the United States No. 30 - Summary of Hourly Observations", which was published in 1956. It differs from this earlier information in that a longer, more representative period is used for summarization

wherever possible. Comparability between stations is improved in the Decennial Census series by the use of identical 10-year and 5-year periods.

The tables in this pamphlet are similar to Tables A through E in the monthly Local Climatological Data Supplements except that Tables B, D, and E give percentage frequencies instead of total occurrences. In these tables all hourly observations are represented unless otherwise specified. The total number of observations used is indicated on each page under the month name. In the percentage tables "4" indicates more than 0 but less than 0.5 in Table E and 0.05 in Tables B and D. Values are not adjusted to make their sums exactly equal to column or row totals.

STATION LOCATION

DENVER, COLORADO  
STAPLETON AIRFIELD

| Location  | Occupied from | Occupied to | Airline distance and direction from previous location | Latitude | Longitude | Elevation above (feet) |  |                  |                      |              |                  |                           |                     |              |  | Remarks |
|---|---------------|-------------|---|----------|-----------|------------------------|--|------------------|----------------------|--------------|------------------|---------------------------|---------------------|--------------|--|---------|
|   |               |             |   |          |           | Sea level              |  | Ground           |                      |              |                  |                           |                     |              |  |         |
|   |               |             |   |          |           | Ground                 | Actual barometer elevation (H <sub>g</sub> ) | Wind instruments | Extreme thermometers | Psychrometer | Telepsychrometer | Tippling bucket rain gage | Weighting rain gage | 8" rain gage |  |         |
| WB-FAA BLDG MODIFICATION CTR STAPLETON AIRFIELD | 6/25/47       | 8/1/60      | 1/4 MI NW   | 39°46'N  | 104°53'W  | 5292                   | 5298   | 40               | 6                    | 6            | 4                | 3                         | 3                   |              | (a)<br>Mean Hourly Speed and Prevailing Direction from 72' above ground atop the FAA Tower prior to 7/8/60. Fastest Mile from 40' above ground at listed location prior to 7/12/60. Hygrothermometer installed at remote site 5200' ESE of listed location 8/1/60. (b) Temperature and Relative Humidity data shown in this publication are from 6' above ground at listed location prior to 8/1/60. |         |
|   | 8/1/60        | PRESENT     | NO CHANGE   | 39°46'N  | 104°53'W  | 5292                   | 5298   | 72<br>20a        | 6b<br>6b             | 5<br>4       | 4<br>3           | 3<br>3                    |                     |              |  |         |

LOCATION AND TOPOGRAPHY:

The airport is located at the northeast edge of the northeast edge of Denver on slightly higher ground than most of the city. Denver is on the Great Plains about 40 miles east of the main range of the Rocky Mountains (10,000 to 14,000 feet above sea level) and 18 miles east of the foothills (6000 to 8000 feet elevation). These ranges run almost due north and south. About 40 miles south of Denver is the Palmer Lake Divide, a connecting spur that extends due east of the main range. Its altitude varies from 8600 feet where it joins the Rockies to about 4000 feet near the Kansas line. The South Platte river flows from the southwest to the northeast about 5 miles west and 2-1/2 miles north of the airport.

SMOKE SOURCES:

Smoke is important only during the colder half of the year. At this time some smoke from the city is carried over the airport on a light west wind (southwest to northwest) but rarely limits visibility to less than three miles.



**A TEMPERATURE AND WIND SPEED--RELATIVE HUMIDITY OCCURRENCES:**

| WIND<br>DIR | 0-4 MPH |         |         |         | 5-16 MPH |         |         |         | 15-24 MPH |        |        |       | 25 MPH AND OVER |       |       |       | TOTAL OBS |
|-------------|---------|---------|---------|---------|----------|---------|---------|---------|-----------|--------|--------|-------|-----------------|-------|-------|-------|-----------|
|             | 0-4     | 5-16    | 15-24   | 25+     | 0-4      | 5-16    | 15-24   | 25+     | 0-4       | 5-16   | 15-24  | 25+   | 0-4             | 5-16  | 15-24 | 25+   |           |
| 74-76       | 6       | 10      | 10      | 10      | 4        | 4       | 4       | 4       | 4         | 4      | 4      | 4     | 4               | 4     | 4     | 4     | 20        |
| 69-65       | 10      | 24      | 24      | 24      | 59       | 59      | 59      | 59      | 14        | 17     | 17     | 17    | 17              | 17    | 17    | 17    | 56        |
| 64-60       | 16      | 1       | 1       | 1       | 69       | 69      | 69      | 69      | 17        | 17     | 17     | 17    | 17              | 17    | 17    | 17    | 153       |
| 59-55       | 25      | 2       | 2       | 2       | 132      | 132     | 132     | 132     | 3         | 3      | 3      | 3     | 3               | 3     | 3     | 3     | 284       |
| 54-50       | 28      | 4       | 4       | 4       | 141      | 141     | 141     | 141     | 8         | 8      | 8      | 8     | 8               | 8     | 8     | 8     | 382       |
| 49-45       | 34      | 4       | 4       | 4       | 173      | 173     | 173     | 173     | 14        | 14     | 14     | 14    | 14              | 14    | 14    | 14    | 515       |
| 44-40       | 47      | 23      | 23      | 23      | 197      | 197     | 197     | 197     | 19        | 19     | 19     | 19    | 19              | 19    | 19    | 19    | 823       |
| 39-35       | 14      | 47      | 47      | 47      | 56       | 56      | 56      | 56      | 25        | 25     | 25     | 25    | 25              | 25    | 25    | 25    | 915       |
| 34-30       | 1       | 36      | 36      | 36      | 74       | 74      | 74      | 74      | 4         | 4      | 4      | 4     | 4               | 4     | 4     | 4     | 1029      |
| 29-25       | 3       | 11      | 11      | 11      | 101      | 101     | 101     | 101     | 12        | 12     | 12     | 12    | 12              | 12    | 12    | 12    | 1429      |
| 24-20       | 3       | 11      | 11      | 11      | 122      | 122     | 122     | 122     | 16        | 16     | 16     | 16    | 16              | 16    | 16    | 16    | 1701      |
| 19-15       | 1       | 11      | 11      | 11      | 145      | 145     | 145     | 145     | 27        | 27     | 27     | 27    | 27              | 27    | 27    | 27    | 2424      |
| 14-10       | 1       | 11      | 11      | 11      | 177      | 177     | 177     | 177     | 37        | 37     | 37     | 37    | 37              | 37    | 37    | 37    | 2844      |
| 09-05       | 1       | 11      | 11      | 11      | 209      | 209     | 209     | 209     | 41        | 41     | 41     | 41    | 41              | 41    | 41    | 41    | 3155      |
| 04-00       | 1       | 11      | 11      | 11      | 241      | 241     | 241     | 241     | 51        | 51     | 51     | 51    | 51              | 51    | 51    | 51    | 3769      |
| -01/-05     | 1       | 11      | 11      | 11      | 273      | 273     | 273     | 273     | 61        | 61     | 61     | 61    | 61              | 61    | 61    | 61    | 4383      |
| -06/-10     | 1       | 11      | 11      | 11      | 305      | 305     | 305     | 305     | 71        | 71     | 71     | 71    | 71              | 71    | 71    | 71    | 5007      |
| -11/-15     | 1       | 11      | 11      | 11      | 337      | 337     | 337     | 337     | 81        | 81     | 81     | 81    | 81              | 81    | 81    | 81    | 5621      |
| -16/-20     | 1       | 11      | 11      | 11      | 369      | 369     | 369     | 369     | 91        | 91     | 91     | 91    | 91              | 91    | 91    | 91    | 6235      |
| -21/-25     | 1       | 11      | 11      | 11      | 401      | 401     | 401     | 401     | 101       | 101    | 101    | 101   | 101             | 101   | 101   | 101   | 6849      |
| TOTAL       | 142,205 | 329,178 | 203,677 | 106,711 | 484,557  | 498,179 | 412,461 | 237,639 | 92,459    | 95,621 | 61,619 | 6,199 | 6,199           | 6,199 | 6,199 | 6,199 | 8,792     |

**C OCCURRENCES OF PRECIPITATION AMOUNTS:**

| INTENSITIES  | FREQUENCY OF OCCURRENCE FOR EACH HOUR OF THE DAY |    |    |    |    |    |                     |    |    |    |    |    |             |    |    |    |    |    |
|--------------|--|----|----|----|----|----|---------------------|----|----|----|----|----|-------------|----|----|----|----|----|
|              | A.M. HOUR ENDING AT                              |    |    |    |    |    | P.M. HOUR ENDING AT |    |    |    |    |    | NO. OF DAYS |    |    |    |    |    |
| TRACE        | 1  | 2  | 3  | 4  | 5  | 6  | 1                   | 2  | 3  | 4  | 5  | 6  |             | 1  | 2  | 3  | 4  | 5  |
| 01 TO 04 H   | 29   | 32 | 24 | 25 | 27 | 32 | 22                  | 25 | 28 | 24 | 23 | 23 | 21          | 27 | 28 | 31 | 29 | 30 |
| 05 TO 08 H   | 4  | 5  | 10 | 16 | 17 | 11 | 3                   | 7  | 4  | 3  | 4  | 5  | 5           | 5  | 8  | 4  | 6  | 7  |
| 09 TO 12 H   | 10   | 7  | 6  | 14 | 17 | 11 | 1                   | 6  | 9  | 12 | 11 | 8  | 6           | 5  | 7  | 6  | 5  | 10 |
| 13 TO 16 H   |  |    |    |    |    |    |                     |    |    |    |    |    |             |    |    |    |    |    |
| 17 TO 20 H   |  |    |    |    |    |    |                     |    |    |    |    |    |             |    |    |    |    |    |
| 21 TO 24 H   |  |    |    |    |    |    |                     |    |    |    |    |    |             |    |    |    |    |    |
| 25 TO 24 H   |  |    |    |    |    |    |                     |    |    |    |    |    |             |    |    |    |    |    |
| 100 TO 144 H |  |    |    |    |    |    |                     |    |    |    |    |    |             |    |    |    |    |    |
| 144 TO 198 H |  |    |    |    |    |    |                     |    |    |    |    |    |             |    |    |    |    |    |
| 198 TO 252 H |  |    |    |    |    |    |                     |    |    |    |    |    |             |    |    |    |    |    |
| 252 TO 306 H |  |    |    |    |    |    |                     |    |    |    |    |    |             |    |    |    |    |    |
| TOTAL        | 43   | 44 | 40 | 45 | 48 | 48 | 44                  | 38 | 41 | 42 | 38 | 36 | 40          | 36 | 39 | 41 | 44 | 43 |

**D PERCENTAGE FREQUENCIES OF CEILING-VISIBILITY:**

| VISIBILITY (MILES) | CEILING (FEET) |     |     |     |     |     |     |     |     |      |      |      |      |
|--------------------|----------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
|                    | 0              | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900  | 1000 | 1000 | 1000 |
| 0 TO 1/8           | 1              | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1    | 1    | 1    |
| 3/8 TO 3/4         | 1              | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1    | 1    | 1    |
| 1/2 TO 3/4         | 1              | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1    | 1    | 1    |
| 3/4 TO 1           | 1              | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1    | 1    | 1    |
| 7 TO 15            | 1              | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1    | 1    | 1    |
| 20 TO 30           | 1              | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1    | 1    | 1    |
| 35 OR MORE         | 1              | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1    | 1    | 1    |
| TOTAL              | 0.1            | 0.9 | 1.0 | 4.0 | 3.6 | 1.5 | 2.5 | 4.0 | 6.0 | 10.0 | 4.0  | 10.0 |      |

**B PERCENTAGE FREQUENCIES OF WIND DIRECTION AND SPEED:**

| DIRECTION | HOURLY OBSERVATIONS OF WIND SPEED (MILES PER HOUR) |      |       |       |       |       |       |       |       |       |       |       |       |
|-----------|--|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|           | 0-5  | 6-10 | 11-15 | 16-20 | 21-24 | 25-30 | 31-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 |
| N         | 5  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| NNE       | 5  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| NE        | 8  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| ENE       | 6  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| E         | 4  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| ESE       | 7  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| SE        | 7  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| SSE       | 4  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| S         | 1  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| SSW       | 6  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| SW        | 6  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| WSW       | 2  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| W         | 2  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| WNW       | 2  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| NW        | 2  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| NNW       | 4  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| CALM      | 7  | 1    | 2     | 2     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| TOTAL     | 9.2  | 22.5 | 13.3  | 13.0  | 7.4   | 7.1   | 5.8   | 2.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   |

**E PERCENTAGE FREQUENCIES OF SKY COVER, WIND, AND RELATIVE HUMIDITY:**

| HOURS OF DAY | CLOUDS SCALE (0-10) |     |      | WIND SPEED (M.P.H.) |      |       | RELATIVE HUMIDITY (%) |       |        |
|--------------|---------------------|-----|------|---------------------|------|-------|-----------------------|-------|--------|
|              | 0-4                 | 5-7 | 7-10 | 0-4                 | 5-12 | 12-24 | 0-30                  | 30-49 | 49-100 |
| 00           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 01           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 02           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 03           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 04           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 05           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 06           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 07           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 08           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 09           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 10           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 11           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 12           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 13           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 14           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 15           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 16           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 17           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 18           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 19           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 20           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 21           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 22           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 23           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| 24           | 5                   | 1   | 1    | 7                   | 6    | 3     | 2                     | 7     | 20     |
| AVG          | 5.5                 | 1.5 | 1.5  | 6.9                 | 5.8  | 3.0   | 2.4                   | 7.4   | 20.5   |





A TEMPERATURE AND WIND SPEED-RELATIVE HUMIDITY OCCURRENCES:

| WIND<br>DIRECTION | 0-5 MPH |      |       | 5-14 MPH |      |       | 15-24 MPH |      |       | 25 MPH AND OVER |      |       | TOTAL OBS. |     |     |    |     |     |    |    |    |    |    |    |      |
|-------------------|---------|------|-------|----------|------|-------|-----------|------|-------|-----------------|------|-------|------------|-----|-----|----|-----|-----|----|----|----|----|----|----|------|
|                   | 0-5     | 5-14 | 15-24 | 0-5      | 5-14 | 15-24 | 0-5       | 5-14 | 15-24 | 0-5             | 5-14 | 15-24 |            |     |     |    |     |     |    |    |    |    |    |    |      |
| N                 | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| NNE               | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| NE                | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| E                 | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| ESE               | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| SE                | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| SSE               | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| S                 | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| SSW               | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| SW                | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| WSW               | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| W                 | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| WNW               | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| NW                | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| NNW               | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| CALM              | 1       | 1    | 1     | 1        | 1    | 1     | 1         | 1    | 1     | 1               | 1    | 1     | 1          |     |     |    |     |     |    |    |    |    |    |    |      |
| TOTAL             | 283     | 226  | 234   | 113      | 115  | 83    | 114       | 97   | 6     | 440             | 477  | 308   | 650        | 371 | 223 | 86 | 106 | 120 | 13 | 64 | 35 | 10 | 10 | 15 | 7200 |

B OF WIND DIRECTION AND SPEED:

| DIRECTION | HOURLY OBSERVATIONS OF WIND SPEED |   |    |   |   |   |   |   |   |    |    |    | TOTAL |
|-----------|-----------------------------------|---|----|---|---|---|---|---|---|----|----|----|-------|
|           | 1                                 | 2 | 3  | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |       |
| N         | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| NNE       | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| NE        | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| E         | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| ESE       | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| SE        | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| SSE       | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| S         | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| SSW       | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| SW        | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| WSW       | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| W         | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| WNW       | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| NW        | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| NNW       | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| CALM      | 1                                 | 1 | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  | 1     |
| TOTAL     | 8                                 | 0 | 23 | 5 | 1 | 4 | 6 | 3 | 7 | 9  | 3  | 9  | 7     |

C OCCURRENCES OF PRECIPITATION AMOUNTS:

| INTENSITIES | FREQUENCY OF OCCURRENCE FOR EACH HOUR OF THE DAY |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
|-------------|--|----|----|----|----|----|---------------------|----|----|----|----|----|----|----|----|----|
|             | A.M. HOUR ENDING AT                              |    |    |    |    |    | P.M. HOUR ENDING AT |    |    |    |    |    |    |    |    |    |
|             | 1  | 2  | 3  | 4  | 5  | 6  | 7                   | 8  | 9  | 10 | 11 | 12 | 1  | 2  | 3  |    |
| TRACE       | 23   | 26 | 20 | 22 | 22 | 26 | 22                  | 23 | 20 | 19 | 24 | 28 | 31 | 38 | 38 | 37 |
| 0.1 TO .04  | 10   | 6  | 5  | 6  | 6  | 9  | 6                   | 7  | 10 | 5  | 4  | 7  | 7  | 8  | 11 | 11 |
| 0.05 TO .09 | 11   | 10 | 14 | 15 | 13 | 9  | 10                  | 14 | 13 | 9  | 10 | 12 | 4  | 5  | 6  | 11 |
| 0.10 TO .14 | 2  | 2  | 2  | 1  | 2  | 2  | 2                   | 2  | 2  | 1  | 2  | 2  | 2  | 1  | 1  | 3  |
| 0.15 TO .19 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.20 TO .24 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.25 TO .29 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.30 TO .34 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.35 TO .39 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.40 TO .44 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.45 TO .49 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.50 TO .54 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.55 TO .59 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.60 TO .64 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.65 TO .69 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.70 TO .74 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.75 TO .79 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.80 TO .84 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.85 TO .89 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.90 TO .94 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| 0.95 TO .99 |  |    |    |    |    |    |                     |    |    |    |    |    |    |    |    |    |
| TOTAL       | 66   | 64 | 62 | 63 | 61 | 63 | 63                  | 60 | 59 | 61 | 66 | 64 | 60 | 58 | 57 | 61 |

D PERCENTAGE FREQUENCIES OF CEILING-VISIBILITY:

| VISIBILITY (MILES) | PERCENTAGE FREQUENCIES OF CEILING-VISIBILITY |   |   |   |   |   |            |   |   |   |    |  |
|--------------------|--|---|---|---|---|---|------------|---|---|---|----|--|
|                    | 0 TO 1/8                                     |   |   |   |   |   | 1/8 TO 3/4 |   |   |   |    |  |
|                    | 0  | 1 | 2 | 3 | 4 | 5 | 6          | 7 | 8 | 9 | 10 |  |
| 0 TO 1/8           | 1  | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 | 1 | 1  |  |
| 1/8 TO 3/4         | 1  | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 | 1 | 1  |  |
| 3/4 TO 1           | 1  | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 | 1 | 1  |  |
| 1 TO 2 1/2         | 1  | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 | 1 | 1  |  |
| 2 1/2 TO 5         | 1  | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 | 1 | 1  |  |
| 5 TO 10            | 1  | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 | 1 | 1  |  |
| 10 TO 30           | 1  | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 | 1 | 1  |  |
| 30 OR MORE         | 1  | 1 | 1 | 1 | 1 | 1 | 1          | 1 | 1 | 1 | 1  |  |
| TOTAL              | 3  | 3 | 3 | 3 | 3 | 3 | 3          | 3 | 3 | 3 | 3  |  |

E PERCENTAGE FREQUENCIES OF SKY COVER, WIND, AND RELATIVE HUMIDITY:

| HOURS OF DAY | CLOUDS SCALE 0-10 |     |      | WIND SPEED (M.P.H.) |      |       | RELATIVE HUMIDITY (%) |       |        |
|--------------|-------------------|-----|------|---------------------|------|-------|-----------------------|-------|--------|
|              | 0                 | 1-2 | 3-10 | 0-4                 | 5-12 | 13-24 | 0-30                  | 31-50 | 51-100 |
| 00           | 46                | 15  | 37   | 6                   | 22   | 28    | 3                     | 12    | 24     |
| 01           | 49                | 14  | 36   | 8                   | 61   | 28    | 3                     | 11    | 25     |
| 02           | 51                | 12  | 37   | 8                   | 66   | 25    | 2                     | 10    | 25     |
| 03           | 49                | 15  | 36   | 9                   | 66   | 22    | 3                     | 9     | 24     |
| 04           | 48                | 13  | 39   | 11                  | 64   | 24    | 1                     | 9     | 26     |
| 05           | 40                | 18  | 43   | 10                  | 64   | 25    | 1                     | 9     | 28     |
| 06           | 36                | 13  | 51   | 8                   | 63   | 29    | 1                     | 9     | 28     |
| 07           | 37                | 13  | 50   | 9                   | 60   | 28    | 3                     | 15    | 20     |
| 08           | 34                | 16  | 50   | 11                  | 59   | 27    | 3                     | 14    | 26     |
| 09           | 35                | 16  | 49   | 13                  | 53   | 30    | 3                     | 16    | 20     |
| 10           | 34                | 18  | 48   | 11                  | 49   | 34    | 5                     | 16    | 20     |
| 11           | 32                | 19  | 49   | 6                   | 52   | 35    | 7                     | 16    | 23     |
| 12           | 29                | 19  | 52   | 7                   | 51   | 33    | 6                     | 14    | 22     |
| 13           | 24                | 21  | 54   | 7                   | 50   | 34    | 8                     | 15    | 18     |
| 14           | 22                | 22  | 56   | 7                   | 44   | 39    | 10                    | 15    | 13     |
| 15           | 21                | 21  | 58   | 3                   | 45   | 40    | 12                    | 17    | 13     |
| 16           | 23                | 18  | 59   | 7                   | 44   | 41    | 16                    | 17    | 13     |
| 17           | 21                | 18  | 61   | 5                   | 41   | 44    | 10                    | 15    | 16     |
| 18           | 25                | 16  | 59   | 5                   | 46   | 45    | 5                     | 14    | 19     |
| 19           | 27                | 17  | 56   | 9                   | 53   | 34    | 4                     | 17    | 12     |
| 20           | 35                | 19  | 46   | 9                   | 55   | 32    | 4                     | 16    | 10     |
| 21           | 41                | 16  | 41   | 8                   | 56   | 33    | 3                     | 14    | 11     |
| 22           | 47                | 13  | 40   | 8                   | 56   | 33    | 2                     | 14    | 12     |
| 23           | 48                | 13  | 39   | 7                   | 57   | 34    | 2                     | 16    | 12     |
| AVG          | 36                | 16  | 48   | 6                   | 55   | 32    | 5                     | 13    | 20     |
| TOTAL        | 8                 | 0   | 23   | 5                   | 1    | 4     | 6                     | 3     | 7      |

**A TEMPERATURE AND WIND SPEED-RELATIVE HUMIDITY OCCURRENCES:**

| WIND<br>DIR<br>SPEED<br>MPH | 0-4 MPH |     |     |     | 5-14 MPH |     |     |      | 15-24 MPH |     |     |     | 25 MPH AND OVER |     |    |    | TOTAL OBS. |    |    |    |   |   |     |    |   |   |
|-----------------------------|---------|-----|-----|-----|----------|-----|-----|------|-----------|-----|-----|-----|-----------------|-----|----|----|------------|----|----|----|---|---|-----|----|---|---|
|                             | N       | NE  | E   | SE  | S        | SW  | W   | NW   | N         | NE  | E   | SE  | S               | SW  | W  | NW |            |    |    |    |   |   |     |    |   |   |
| 93/90                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 87/85                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 84/80                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 79/75                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 74/70                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 69/65                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 64/60                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 59/55                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 54/50                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 49/45                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 44/40                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 39/35                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 34/30                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 29/25                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| 24/20                       |         |     |     |     |          |     |     |      |           |     |     |     |                 |     |    |    |            |    |    |    |   |   |     |    |   |   |
| TOTAL                       | 221     | 297 | 297 | 151 | 163      | 761 | 142 | 1079 | 557       | 476 | 271 | 521 | 406             | 280 | 93 | 75 | 104        | 87 | 38 | 14 | 5 | 3 | 107 | 24 | 4 | 6 |

**B OF WIND DIRECTION AND SPEED:**

| DIRECTION | HOURLY OBSERVATIONS OF WIND SPEED<br>(IN MPH) |     |      |       |       |       |       |       |       |       |       |        | TOTAL |
|-----------|---|-----|------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
|           | 1-3   | 4-7 | 8-17 | 18-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | 75-84 | 85-94 | 95-104 |       |
| N         | 1   | 1   | 2    | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2      | 21    |
| NE        | 1   | 1   | 2    | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2      | 21    |
| E         | 1   | 1   | 2    | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2      | 21    |
| SE        | 1   | 1   | 2    | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2      | 21    |
| S         | 1   | 1   | 2    | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2      | 21    |
| SW        | 1   | 1   | 2    | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2      | 21    |
| W         | 1   | 1   | 2    | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2      | 21    |
| NW        | 1   | 1   | 2    | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2      | 21    |
| CALM      | 1   | 1   | 2    | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2      | 21    |
| TOTAL     | 9   | 12  | 24   | 24    | 24    | 24    | 24    | 24    | 24    | 24    | 24    | 24     | 240   |

**C OCCURRENCES OF PRECIPITATION AMOUNTS:**

| INTENSITIES      | FREQUENCY OF OCCURRENCE FOR EACH HOUR OF THE DAY |     |     |     |                     |     |     |     |                       |     |     |     |                   |     |     |     |                                 |     |     |     |     |     |     |     |
|------------------|--|-----|-----|-----|---------------------|-----|-----|-----|-----------------------|-----|-----|-----|-------------------|-----|-----|-----|---------------------------------|-----|-----|-----|-----|-----|-----|-----|
|                  | A.M. HOUR ENDING AT                              |     |     |     | P.M. HOUR ENDING AT |     |     |     | NO. OF WIND DIRECTION |     |     |     | NO. OF WIND SPEED |     |     |     | NO. OF WIND DIRECTION AND SPEED |     |     |     |     |     |     |     |
| TRACE            | 1  | 2   | 3   | 4   | 1                   | 2   | 3   | 4   | 1                     | 2   | 3   | 4   | 1                 | 2   | 3   | 4   | 1                               | 2   | 3   | 4   | 1   | 2   | 3   | 4   |
| 0.1 IN           | 22   | 22  | 19  | 18  | 23                  | 24  | 16  | 9   | 14                    | 21  | 21  | 28  | 31                | 34  | 42  | 46  | 34                              | 40  | 30  | 32  | 33  | 33  | 23  | 7   |
| 0.2 IN           | 6  | 10  | 13  | 12  | 4                   | 10  | 8   | 7   | 8                     | 2   | 4   | 5   | 8                 | 5   | 7   | 4   | 9                               | 6   | 9   | 6   | 7   | 3   | 11  | 11  |
| 0.3 IN           | 14   | 14  | 12  | 13  | 15                  | 6   | 7   | 8   | 11                    | 11  | 10  | 8   | 11                | 17  | 16  | 15  | 12                              | 11  | 15  | 15  | 17  | 18  | 12  | 33  |
| 0.4 IN           | 3  | 2   | 1   | 4   | 4                   | 2   | 2   | 1   | 4                     | 3   | 3   | 3   | 6                 | 7   | 4   | 6   | 1                               | 3   | 4   | 3   | 2   | 2   | 2   | 22  |
| 0.5 IN           | 1  | 1   |     |     |                     |     |     |     |                       |     |     |     |                   |     |     |     |                                 |     |     |     |     |     |     | 12  |
| 1.00 TO 1.99 IN  | 48   | 49  | 46  | 43  | 41                  | 43  | 43  | 33  | 39                    | 34  | 35  | 37  | 44                | 53  | 59  | 74  | 72                              | 60  | 63  | 57  | 58  | 61  | 57  | 52  |
| 2.00 IN AND OVER |  |     |     |     |                     |     |     |     |                       |     |     |     |                   |     |     |     |                                 |     |     |     |     |     |     | 16  |
| TOTAL            | 111  | 111 | 111 | 111 | 111                 | 111 | 111 | 111 | 111                   | 111 | 111 | 111 | 111               | 111 | 111 | 111 | 111                             | 111 | 111 | 111 | 111 | 111 | 111 | 111 |

**D PERCENTAGE FREQUENCIES OF CEILING-VISIBILITY:**

| VISIBILITY (MILES) | PERCENTAGE FREQUENCIES OF CEILING-VISIBILITY |     |     |     |     |     |     |     |     |     |
|--------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 0  | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 |
| 0 TO 1/8           |  |     |     |     |     |     |     |     |     |     |
| 1/8 TO 3/8         |  |     |     |     |     |     |     |     |     |     |
| 3/8 TO 1/2         |  |     |     |     |     |     |     |     |     |     |
| 1/2 TO 3/4         |  |     |     |     |     |     |     |     |     |     |
| 3/4 TO 1           |  |     |     |     |     |     |     |     |     |     |
| 1 TO 1 1/2         |  |     |     |     |     |     |     |     |     |     |
| 1 1/2 TO 2         |  |     |     |     |     |     |     |     |     |     |
| 2 TO 3             |  |     |     |     |     |     |     |     |     |     |
| 3 TO 4             |  |     |     |     |     |     |     |     |     |     |
| 4 TO 5             |  |     |     |     |     |     |     |     |     |     |
| 5 TO 10            |  |     |     |     |     |     |     |     |     |     |
| 10 TO 20           |  |     |     |     |     |     |     |     |     |     |
| 20 TO 30           |  |     |     |     |     |     |     |     |     |     |
| 30 TO 50           |  |     |     |     |     |     |     |     |     |     |
| 50 TO 100          |  |     |     |     |     |     |     |     |     |     |
| TOTAL              | 100  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**E PERCENTAGE FREQUENCIES OF SKY COVER, WIND, AND RELATIVE HUMIDITY:**

| CLOUDS SCALE 0-10 | WIND SPEED (MPH) |      |       |       |       |       |       |       |       |       |       |       | RELATIVE HUMIDITY (%) |
|-------------------|------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|
|                   | 0-4              | 5-10 | 11-15 | 16-20 | 21-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | 75-84 | 85-94 |                       |
| 00                | 49               | 16   | 35    | 6     | 62    | 28    | 1     | 7     | 20    | 30    | 17    | 18    | 7                     |
| 01                | 50               | 14   | 34    | 10    | 64    | 26    | 1     | 6     | 20    | 28    | 20    | 15    | 17                    |
| 02                | 51               | 15   | 35    | 9     | 64    | 27    | 1     | 5     | 19    | 25    | 21    | 20    | 11                    |
| 03                | 53               | 13   | 34    | 11    | 61    | 27    | 4     | 4     | 15    | 28    | 19    | 21    | 11                    |
| 04                | 44               | 17   | 39    | 9     | 73    | 19    | 4     | 4     | 13    | 27    | 17    | 23    | 11                    |
| 05                | 41               | 15   | 44    | 14    | 65    | 21    | 1     | 5     | 22    | 31    | 20    | 21    | 13                    |
| 06                | 41               | 14   | 45    | 13    | 66    | 20    | 1     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 07                | 40               | 13   | 47    | 13    | 65    | 21    | 1     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 08                | 39               | 14   | 47    | 13    | 65    | 21    | 2     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 09                | 40               | 14   | 45    | 17    | 61    | 19    | 2     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 10                | 38               | 18   | 44    | 14    | 60    | 24    | 2     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 11                | 34               | 22   | 44    | 9     | 56    | 24    | 2     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 12                | 32               | 21   | 47    | 8     | 56    | 24    | 2     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 13                | 25               | 23   | 52    | 6     | 55    | 25    | 4     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 14                | 18               | 23   | 59    | 3     | 53    | 30    | 4     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 15                | 17               | 23   | 61    | 3     | 47    | 36    | 5     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 16                | 16               | 20   | 63    | 4     | 45    | 46    | 6     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 17                | 17               | 20   | 63    | 4     | 45    | 46    | 6     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 18                | 19               | 24   | 57    | 3     | 51    | 42    | 4     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 19                | 25               | 19   | 56    | 7     | 37    | 30    | 5     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 20                | 30               | 22   | 48    | 11    | 37    | 31    | 1     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 21                | 34               | 25   | 39    | 8     | 59    | 32    | 1     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 22                | 44               | 15   | 41    | 8     | 55    | 37    | 1     | 4     | 21    | 31    | 11    | 10    | 10                    |
| 23                | 47               | 14   | 39    | 6     | 59    | 31    | 1     | 4     | 21    | 31    | 11    | 10    | 10                    |
| AVERAGE           | 35               | 18   | 47    | 9     | 58    | 31    | 2     | 4     | 21    | 31    | 11    | 10    | 10                    |



**A TEMPERATURE AND WIND SPEED—RELATIVE HUMIDITY OCCURRENCES.**

| WIND<br>DIR<br>SPEED<br>TEMP<br>REL. HUM. | 0-4 MPH |     |     |     | 5-14 MPH |     |     |     | 15-24 MPH |     |     |     | 25 MPH AND OVER |     |     |    | TOTAL O.K. |    |
|---|---------|-----|-----|-----|----------|-----|-----|-----|-----------|-----|-----|-----|-----------------|-----|-----|----|------------|----|
|   | 0       | 1   | 2   | 3   | 0        | 1   | 2   | 3   | 0         | 1   | 2   | 3   | 0               | 1   | 2   | 3  |            |    |
| 104/100                                   |         |     |     |     |          |     |     |     |           |     |     |     |                 |     |     |    |            |    |
| 99/95                                     | 7       |     |     |     | 26       |     |     |     | 3         |     |     |     | 61              | 18  |     |    | 41         | 3  |
| 94/90                                     | 76      | 15  |     |     | 209      | 1   |     |     | 138       | 18  |     |     | 61              | 18  |     |    | 435        | 3  |
| 89/85                                     | 115     |     |     |     | 479      | 34  |     |     | 362       | 182 |     |     | 116             | 66  |     |    | 800        | 9  |
| 84/80                                     | 107     | 58  | 2   |     | 162      | 182 | 1   |     | 38        | 114 | 4   |     | 2               | 19  |     |    | 895        | 10 |
| 79/75                                     | 47      | 156 | 15  |     | 182      | 351 | 42  |     | 15        | 121 | 64  | 3   | 2               | 19  |     |    | 981        | 11 |
| 74/70                                     | 18      | 124 | 87  | 4   | 35       | 352 | 241 | 13  | 5         | 64  | 89  | 2   | 5               | 4   |     |    | 1211       | 12 |
| 69/65                                     | 10      | 83  | 124 | 55  | 7        | 143 | 366 | 130 | 36        | 5   | 2   | 2   | 5               | 2   |     |    | 1140       | 13 |
| 64/60                                     | 4       | 20  | 101 | 71  | 53       | 20  | 7   | 143 | 146       | 106 | 60  | 2   | 11              | 35  | 16  | 12 | 11131      | 14 |
| 59/55                                     | 1       | 6   | 32  | 31  | 36       | 6   | 2   | 13  | 68        | 96  | 82  | 34  | 1               | 3   | 3   | 2  | 424        | 15 |
| 54/50                                     |         |     |     |     |          |     |     |     |           |     |     |     |                 |     |     |    | 99         | 16 |
| 49/45                                     |         |     |     |     |          |     |     |     |           |     |     |     |                 |     |     |    |            |    |
| TOTAL                                     | 385     | 442 | 366 | 172 | 117      | 354 | 436 | 523 | 1065      | 394 | 245 | 126 | 387             | 397 | 205 | 43 | 16         | 3  |

**B PERCENTAGE FREQUENCIES OF WIND DIRECTION AND SPEED.**

| DIRECTION | HOURLY OBSERVATIONS OF WIND SPEED |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       | AVG WIND |
|-----------|-----------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
|           | 0-3                               | 4-7  | 8-11 | 12-15 | 16-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70-74 |          |
| N         | 0                                 | 1    | 2    | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 11    | 12    | 13    | 14    | 7.2   | 10.2     |
| NNE       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| N E       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| ENE       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| E         | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| ESE       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| SE        | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| SSE       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| S         | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| SSW       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| SW        | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| WSW       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| W         | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| WNW       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| W         | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| WNW       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| NW        | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| N         | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| NNE       | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| N         | 0                                 | 1    | 1    | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1.4   | 1.4      |
| TOTAL     | 11.6                              | 28.5 | 42.0 | 5.3   | 4.6   | 3.4   | 0.8   | 0.1   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 100   | 9.4      |

**C OCCURRENCES OF PRECIPITATION AMOUNTS.**

| INTERMITTENT     | FREQUENCY OF OCCURRENCE FOR EACH HOUR OF THE DAY |    |    |    |    |    |    |    |    |    |    |    |
|------------------|--|----|----|----|----|----|----|----|----|----|----|----|
|                  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 |
| TRACE            | 11   | 14 | 10 | 11 | 13 | 12 | 13 | 7  | 6  | 8  | 10 | 13 |
| 0.01 IN          | 4  | 7  | 5  | 1  | 2  | 2  | 3  | 1  | 1  | 1  | 1  | 3  |
| 0.02 TO 0.04 IN  | 6  | 1  | 2  | 2  | 2  | 2  | 3  | 1  | 1  | 1  | 1  | 1  |
| 0.05 TO 0.09 IN  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| 0.10 TO 0.14 IN  |  |    |    |    |    |    |    |    |    |    |    |    |
| 0.15 TO 0.19 IN  |  |    |    |    |    |    |    |    |    |    |    |    |
| 0.20 IN AND OVER |  |    |    |    |    |    |    |    |    |    |    |    |
| TOTAL            | 22   | 22 | 19 | 16 | 17 | 16 | 17 | 13 | 10 | 11 | 9  | 11 |

**E PERCENTAGE FREQUENCIES OF SKY COVER, WIND, AND RELATIVE HUMIDITY.**

| MONTH | CLOUDS SCALE 0-10 |     | WIND SPEED (M.P.H.) |      | RELATIVE HUMIDITY (%) |        |
|-------|-------------------|-----|---------------------|------|-----------------------|--------|
|       | 0-4               | 5-9 | 0-3                 | 4-13 | 0-30                  | 31-100 |
| 00    | 59                | 15  | 26                  | 6    | 64                    | 28     |
| 01    | 60                | 15  | 25                  | 11   | 62                    | 26     |
| 02    | 64                | 15  | 22                  | 12   | 66                    | 22     |
| 03    | 66                | 14  | 20                  | 15   | 68                    | 16     |
| 04    | 59                | 21  | 20                  | 15   | 68                    | 16     |
| 05    | 59                | 19  | 23                  | 17   | 69                    | 14     |
| 06    | 58                | 18  | 23                  | 19   | 70                    | 11     |
| 07    | 58                | 18  | 24                  | 16   | 71                    | 12     |
| 08    | 61                | 17  | 22                  | 20   | 70                    | 10     |
| 09    | 65                | 15  | 20                  | 21   | 70                    | 9      |
| 10    | 64                | 17  | 19                  | 18   | 72                    | 10     |
| 11    | 61                | 21  | 18                  | 13   | 71                    | 17     |
| 12    | 50                | 26  | 21                  | 9    | 72                    | 19     |
| 13    | 38                | 30  | 32                  | 8    | 65                    | 26     |
| 14    | 29                | 30  | 40                  | 7    | 60                    | 31     |
| 15    | 26                | 25  | 49                  | 5    | 55                    | 38     |
| 16    | 20                | 24  | 56                  | 4    | 47                    | 46     |
| 17    | 22                | 21  | 57                  | 5    | 47                    | 46     |
| 18    | 25                | 25  | 58                  | 5    | 57                    | 34     |
| 19    | 25                | 25  | 51                  | 6    | 56                    | 33     |
| 20    | 29                | 26  | 45                  | 12   | 55                    | 30     |
| 21    | 40                | 25  | 35                  | 19   | 63                    | 26     |
| 22    | 48                | 23  | 30                  | 10   | 61                    | 29     |
| 23    | 57                | 16  | 27                  | 10   | 63                    | 26     |
| AVG   | 47                | 21  | 32                  | 12   | 64                    | 24     |

**D PERCENTAGE FREQUENCIES OF CEILING—VISIBILITY.**

| VISIBILITY (MILES) | CEILING (FEET) |     |     |     |
|--------------------|----------------|-----|-----|-----|
|                    | 0              | 100 | 200 | 300 |
| 0 TO 1/8           |                |     |     |     |
| 3/8 TO 1/2         |                |     |     |     |
| 1 TO 2 1/2         |                |     |     |     |
| 3 TO 10            |                |     |     |     |
| 20 TO 30           |                |     |     |     |
| 35 OR MORE         |                |     |     |     |
| TOTAL              |                |     |     |     |



A TEMPERATURE AND WIND SPEED-RELATIVE HUMIDITY OCCURRENCES:

| WIND<br>DIR<br>TEMP<br>(°F) | 0-4 MPH |     |     |     | 5-14 MPH |    |      |      | 15-24 MPH |     |     |    | 25 MPH AND OVER |     |     |    | TOTAL |       |    |    |   |   |       |
|-----------------------------|---------|-----|-----|-----|----------|----|------|------|-----------|-----|-----|----|-----------------|-----|-----|----|-------|-------|----|----|---|---|-------|
|                             | N       | S   | E   | W   | N        | S  | E    | W    | N         | S   | E   | W  | N               | S   | E   | W  |       |       |    |    |   |   |       |
| 99/ 95                      | 1       |     |     |     |          |    |      |      |           |     |     |    |                 |     |     |    |       | 8     |    |    |   |   |       |
| 94/ 90                      | 16      |     |     |     |          |    |      |      |           |     |     |    |                 |     |     |    |       | 85    |    |    |   |   |       |
| 89/ 85                      | 87      |     |     |     |          |    |      |      |           |     |     |    |                 |     |     |    |       | 322   |    |    |   |   |       |
| 84/ 80                      | 99      | 5   |     |     |          |    |      |      |           |     |     |    |                 |     |     |    |       | 572   |    |    |   |   |       |
| 79/ 75                      | 125     | 19  | 1   |     |          |    |      |      |           |     |     |    |                 |     |     |    |       | 700   |    |    |   |   |       |
| 74/ 70                      | 69      | 60  | 24  | 4   |          |    |      |      |           |     |     |    |                 |     |     |    |       | 703   |    |    |   |   |       |
| 69/ 65                      | 60      | 99  | 24  | 4   |          |    |      |      |           |     |     |    |                 |     |     |    |       | 843   |    |    |   |   |       |
| 64/ 60                      | 24      | 95  | 40  | 7   | 19       | 8  | 129  | 412  | 144       | 25  | 22  | 2  |                 |     |     |    | 1078  |       |    |    |   |   |       |
| 59/ 55                      | 5       | 91  | 75  | 12  | 14       | 13 | 65   | 351  | 276       | 57  | 24  | 10 | 14              | 57  | 27  | 8  | 4     | 11105 |    |    |   |   |       |
| 54/ 50                      | 2       | 47  | 74  | 37  | 16       | 28 | 161  | 248  | 83        | 53  | 16  | 4  | 10              | 37  | 27  | 8  | 4     | 831   |    |    |   |   |       |
| 49/ 45                      |         | 15  | 55  | 33  | 48       | 10 | 2    | 44   | 167       | 102 | 66  | 25 | 1               | 1   | 18  | 6  | 9     | 616   |    |    |   |   |       |
| 44/ 40                      |         |     | 21  | 19  | 18       | 21 | 5    | 35   | 35        | 38  | 12  | 1  | 1               | 12  | 1   | 5  | 1     | 212   |    |    |   |   |       |
| 39/ 35                      |         |     | 5   | 3   | 4        | 4  | 4    | 4    | 4         | 4   | 4   | 4  | 4               | 4   | 4   | 4  | 4     | 74    |    |    |   |   |       |
| 34/ 30                      |         |     | 1   | 8   | 10       |    |      |      |           |     |     |    |                 |     |     |    |       | 51    |    |    |   |   |       |
| TOTAL                       | 498     | 431 | 309 | 116 | 127      | 73 | 1673 | 1453 | 962       | 327 | 239 | 84 | 394             | 280 | 130 | 22 | 19    | 14    | 25 | 17 | 3 | 1 | 27200 |

B OF WIND DIRECTION AND SPEED:

| DIRECTION | HOURLY OBSERVATIONS OF WIND SPEED |     |      |       |       |       |       |       |       |       |       |       |       |       |       |       | AVG |     |   |
|-----------|-----------------------------------|-----|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|-----|---|
|           | 0-3                               | 4-7 | 8-11 | 12-14 | 15-17 | 18-20 | 21-23 | 24-26 | 27-29 | 30-32 | 33-35 | 36-38 | 39-41 | 42-44 | 45-47 | 48-50 |     |     |   |
| N         | 8                                 | 1   | 2    | 4     | 1     | 4     |       |       |       |       |       |       |       |       |       |       | 6.6 | 9.6 |   |
| NNE       | 7                                 | 1   | 6    | 1     | 7     | 1     | 0     |       |       |       |       |       |       |       |       |       | 3   | 1   |   |
| NE        | 8                                 | 1   | 7    | 1     | 8     | 1     | 0     |       |       |       |       |       |       |       |       |       | 2   | 4   |   |
| E         | 5                                 | 1   | 5    | 1     | 5     | 1     | 0     |       |       |       |       |       |       |       |       |       | 2   | 4   |   |
| ESE       | 6                                 | 1   | 7    | 1     | 6     | 1     | 0     |       |       |       |       |       |       |       |       |       | 1   | 1   |   |
| SE        | 9                                 | 1   | 7    | 1     | 3     | 6     | 7     |       |       |       |       |       |       |       |       |       | 2   | 1   |   |
| SSE       | 7                                 | 1   | 7    | 1     | 3     | 6     | 2     |       |       |       |       |       |       |       |       |       | 6   | 1   |   |
| S         | 1                                 | 5   | 4    | 8     | 6     | 2     | 2     | 8     |       |       |       |       |       |       |       |       | 6   | 1   |   |
| SSW       | 8                                 | 3   | 8    | 7     | 5     | 5     | 5     |       |       |       |       |       |       |       |       |       | 18  | 0   |   |
| SW        | 1                                 | 0   | 2    | 3     | 1     | 7     | 8     |       |       |       |       |       |       |       |       |       | 5   | 0   |   |
| WSW       | 6                                 | 1   | 2    | 1     | 0     | 3     |       |       |       |       |       |       |       |       |       |       | 3   | 0   |   |
| W         | 7                                 | 1   | 0    | 8     | 5     |       |       |       |       |       |       |       |       |       |       |       | 3   | 0   |   |
| WNW       | 5                                 | 1   | 1    | 8     | 5     |       |       |       |       |       |       |       |       |       |       |       | 2   | 1   |   |
| NW        | 1                                 | 1   | 1    | 8     | 1     | 6     | 9     |       |       |       |       |       |       |       |       |       | 4   | 1   |   |
| NNW       | 5                                 | 1   | 4    | 1     | 4     | 6     |       |       |       |       |       |       |       |       |       |       | 1   | 2   |   |
| CALM      | 1                                 | 2   |      |       |       |       |       |       |       |       |       |       |       |       |       |       | 1   | 2   |   |
| TOTAL     | 13                                | 1   | 30   | 49    | 4     | 118   | 9     | 2     | 9     | 6     | 1     |       |       |       |       |       | 100 | 8   | 9 |

C OCCURRENCES OF PRECIPITATION AMOUNTS:

| INTENSITIES | FREQUENCY OF OCCURRENCE FOR EACH HOUR OF THE DAY |    |    |    |    |    |      |    |   |    |    |    |                     |    |    |    |    |    |         |    |    |    |    |    |   |   |   |   |   |   |   |   |   |    |    |    |
|-------------|--|----|----|----|----|----|------|----|---|----|----|----|---------------------|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----|----|----|
|             | A.M. HOUR ENDING AT                              |    |    |    |    |    | NOON |    |   |    |    |    | P.M. HOUR ENDING AT |    |    |    |    |    | NO DATA |    |    |    |    |    |   |   |   |   |   |   |   |   |   |    |    |    |
| THICK       | 1  | 2  | 3  | 4  | 5  | 6  | 7    | 8  | 9 | 10 | 11 | 12 | 1                   | 2  | 3  | 4  | 5  | 6  | 7       | 8  | 9  | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 01 TO 04 IN | 3  | 3  | 2  | 6  | 2  | 1  | 2    | 1  | 2 | 1  | 2  | 1  | 2                   | 1  | 2  | 1  | 2  | 1  | 2       | 1  | 2  | 1  | 2  | 1  | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1  | 2  | 1  |
| 05 TO 08 IN | 2  | 2  | 6  | 1  | 2  | 1  | 1    | 3  | 5 | 2  | 4  | 1  | 1                   | 3  | 5  | 2  | 4  | 1  | 1       | 3  | 5  | 2  | 4  | 1  | 1 | 3 | 5 | 2 | 4 | 1 | 1 | 3 | 5 | 2  | 4  | 1  |
| 09 TO 12 IN | 1  | 2  | 1  | 1  | 3  | 1  | 1    | 1  | 1 | 1  | 1  | 1  | 1                   | 1  | 1  | 1  | 1  | 1  | 1       | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 13 TO 16 IN | 15   | 15 | 14 | 14 | 17 | 19 | 15   | 11 | 9 | 13 | 10 | 10 | 15                  | 21 | 19 | 20 | 23 | 28 | 30      | 27 | 29 | 22 | 24 | 20 | 9 |   |   |   |   |   |   |   |   |    |    |    |
| TOTAL       | 15   | 15 | 14 | 14 | 17 | 19 | 15   | 11 | 9 | 13 | 10 | 10 | 15                  | 21 | 19 | 20 | 23 | 28 | 30      | 27 | 29 | 22 | 24 | 20 | 9 |   |   |   |   |   |   |   |   |    |    |    |

E PERCENTAGE FREQUENCIES OF SKY COVER, WIND, AND RELATIVE HUMIDITY:

| HOUR OF DAY | CLOUDS SCALE 0-10 |     |      | WIND SPEED (M.P.H.) |       |       | RELATIVE HUMIDITY (%) |       |       |    |    |   |
|-------------|-------------------|-----|------|---------------------|-------|-------|-----------------------|-------|-------|----|----|---|
|             | 0-3               | 4-7 | 8-10 | 4-13                | 14-23 | 24-30 | 4-13                  | 14-23 | 24-30 |    |    |   |
| 00          | 75                | 8   | 17   | 12                  | 65    | 22    | 11                    | 40    | 28    | 8  | 11 | 3 |
| 01          | 72                | 11  | 17   | 11                  | 68    | 20    | 10                    | 34    | 33    | 11 | 10 | 3 |
| 02          | 76                | 10  | 14   | 12                  | 66    | 22    | 9                     | 32    | 33    | 12 | 10 | 4 |
| 03          | 75                | 8   | 17   | 15                  | 63    | 21    | 6                     | 31    | 33    | 14 | 10 | 6 |
| 04          | 73                | 10  | 17   | 11                  | 71    | 18    | 5                     | 31    | 34    | 13 | 10 | 6 |
| 05          | 70                | 11  | 18   | 12                  | 71    | 17    | 7                     | 29    | 32    | 15 | 10 | 6 |
| 06          | 66                | 12  | 22   | 15                  | 62    | 22    | 6                     | 31    | 33    | 15 | 9  | 6 |
| 07          | 64                | 14  | 21   | 12                  | 68    | 20    | 12                    | 40    | 28    | 10 | 7  | 3 |
| 08          | 65                | 13  | 22   | 18                  | 62    | 20    | 21                    | 44    | 22    | 6  | 5  | 2 |
| 09          | 63                | 15  | 22   | 21                  | 66    | 14    | 38                    | 38    | 15    | 3  | 5  | 1 |
| 10          | 64                | 14  | 23   | 23                  | 64    | 13    | 54                    | 29    | 10    | 3  | 3  | 1 |
| 11          | 62                | 17  | 22   | 16                  | 71    | 13    | 62                    | 25    | 8     | 2  | 3  | 1 |
| 12          | 59                | 18  | 23   | 12                  | 70    | 17    | 73                    | 16    | 8     | 2  | 1  | 1 |
| 13          | 53                | 20  | 26   | 14                  | 62    | 23    | 177                   | 13    | 7     | 1  | 1  | 1 |
| 14          | 48                | 21  | 31   | 11                  | 64    | 25    | 177                   | 13    | 7     | 1  | 1  | 1 |
| 15          | 47                | 22  | 31   | 7                   | 61    | 31    | 2                     | 76    | 13    | 7  | 1  | 1 |
| 16          | 44                | 24  | 32   | 5                   | 59    | 34    | 2                     | 74    | 15    | 8  | 2  | 1 |
| 17          | 43                | 22  | 34   | 6                   | 60    | 31    | 1                     | 69    | 18    | 8  | 3  | 1 |
| 18          | 49                | 19  | 32   | 17                  | 57    | 24    | 2                     | 56    | 27    | 11 | 3  | 2 |
| 19          | 51                | 20  | 29   | 16                  | 58    | 25    | 1                     | 41    | 35    | 16 | 3  | 4 |
| 20          | 67                | 19  | 25   | 13                  | 63    | 23    | 1                     | 30    | 42    | 18 | 5  | 4 |
| 21          | 60                | 18  | 22   | 10                  | 65    | 25    | 2                     | 21    | 45    | 21 | 6  | 5 |
| 22          | 67                | 12  | 20   | 11                  | 67    | 22    | 1                     | 18    | 42    | 22 | 8  | 2 |
| 23          | 70                | 11  | 19   | 10                  | 67    | 22    | 1                     | 13    | 43    | 24 | 8  | 3 |
| AVG         | 61                | 15  | 23   | 13                  | 64    | 22    | 1                     | 36    | 30    | 19 | 6  | 5 |

D PERCENTAGE FREQUENCIES OF CEILING-VISIBILITY:

| VISIBILITY (MILES) | CEILING (FEET) |     |     |     |     |     |     |     |     |      |
|--------------------|----------------|-----|-----|-----|-----|-----|-----|-----|-----|------|
|                    | 0              | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | TOT. |
| 0 TO 1/8           | +              | +   | +   | +   | +   | +   | +   | +   | +   | +    |
| 1/8 TO 1/4         | +              | +   | +   | +   | +   | +   | +   | +   | +   | +    |
| 1/4 TO 1/2         | +              | +   | +   | +   | +   | +   | +   | +   | +   | +    |
| 3 TO 6             | +              | +   | +   | +   | +   | +   | +   | +   | +   | +    |
| 7 TO 15            | +              | +   | +   | +   | +   | +   | +   | +   | +   | +    |
| 20 TO 30           | +              | +   | +   | +   | +   | +   | +   | +   | +   | +    |
| 35 OR MORE         | +              | +   | +   | +   | +   | +   | +   | +   | +   | +    |
| TOTAL              | +              | +   | +   | +   | +   | +   | +   | +   | +   | +    |



A TEMPERATURE AND WIND SPEED-RELATIVE HUMIDITY OCCURRENCES:

| WIND<br>DIR<br>SPEED<br>TEMP | 0-4 MPH |     |      |     | 5-14 MPH |      |      |      | 15-24 MPH |     |     |     | 25 MPH AND OVER |     |    |    | TOTAL<br>OBS |      |    |    |   |   |   |       |
|------------------------------|---------|-----|------|-----|----------|------|------|------|-----------|-----|-----|-----|-----------------|-----|----|----|--------------|------|----|----|---|---|---|-------|
|                              | 0-4     |     | 5-14 |     | 0-4      |      | 5-14 |      | 15-24     |     | 25  |     | 30              |     | 35 |    |              |      |    |    |   |   |   |       |
|                              | R       | W   | R    | W   | R        | W    | R    | W    | R         | W   | R   | W   | R               | W   | R  | W  |              |      |    |    |   |   |   |       |
| 89/ 85                       | 1       |     |      |     |          |      |      |      |           |     |     |     |                 |     |    |    |              | 2    |    |    |   |   |   |       |
| 84/ 80                       |         | 68  |      |     |          |      |      |      |           |     |     |     |                 |     |    |    |              | 97   |    |    |   |   |   |       |
| 79/ 75                       |         | 211 | 11   | 1   |          |      |      |      |           |     |     |     |                 |     |    |    |              | 329  |    |    |   |   |   |       |
| 74/ 70                       |         | 249 | 11   | 1   |          |      |      |      |           |     |     |     |                 |     |    |    |              | 433  |    |    |   |   |   |       |
| 69/ 65                       |         | 263 | 60   | 1   |          |      |      |      |           |     |     |     |                 |     |    |    |              | 528  |    |    |   |   |   |       |
| 64/ 60                       |         | 122 | 16   | 1   |          |      |      |      |           |     |     |     |                 |     |    |    |              | 348  |    |    |   |   |   |       |
| 59/ 55                       |         | 81  | 44   | 1   |          |      |      |      |           |     |     |     |                 |     |    |    |              | 286  |    |    |   |   |   |       |
| 54/ 50                       |         | 57  | 86   | 26  |          |      |      |      |           |     |     |     |                 |     |    |    |              | 210  |    |    |   |   |   |       |
| 49/ 45                       |         | 20  | 83   | 67  | 7        |      |      |      |           |     |     |     |                 |     |    |    |              | 170  |    |    |   |   |   |       |
| 44/ 40                       |         | 5   | 54   | 90  | 40       |      |      |      |           |     |     |     |                 |     |    |    |              | 150  |    |    |   |   |   |       |
| 39/ 35                       |         | 1   | 34   | 65  | 50       | 39   | 13   | 21   | 65        | 140 | 128 | 91  | 37              | 4   |    |    |              | 1984 |    |    |   |   |   |       |
| 34/ 30                       |         |     | 4    | 24  | 24       | 41   | 41   | 22   | 72        | 48  | 62  | 99  | 2               | 11  | 4  | 2  | 3            | 1    |    |    |   |   |   |       |
| 29/ 25                       |         |     | 7    | 10  | 3        | 5    |      |      |           |     |     |     |                 |     |    |    |              | 1    |    |    |   |   |   |       |
| 24/ 20                       |         |     |      |     |          |      |      |      |           |     |     |     |                 |     |    |    |              | 1    |    |    |   |   |   |       |
| TOTAL                        | 504     | 472 | 369  | 163 | 166      | 1210 | 1549 | 1333 | 891       | 384 | 375 | 243 | 437             | 237 | 92 | 22 | 18           | 23   | 41 | 22 | 1 | 3 | 2 | 27450 |

B OF WIND DIRECTION AND SPEED:  
PERCENTAGE FREQUENCIES

| DIRECTION | HOURLY OBSERVATIONS OF WIND SPEED<br>(IN MPH PER HOUR) |   |     |   |      |   |       |   |       |   |       |   |       |   |       |   |       |   |       |   |       |   |       |   | TOTAL |            |   |   |
|-----------|--|---|-----|---|------|---|-------|---|-------|---|-------|---|-------|---|-------|---|-------|---|-------|---|-------|---|-------|---|-------|------------|---|---|
|           | 0-3  |   | 4-7 |   | 8-11 |   | 12-15 |   | 16-19 |   | 20-23 |   | 24-27 |   | 28-31 |   | 32-35 |   | 36-39 |   | 40-43 |   | 44-47 |   |       | AT<br>OVER |   |   |
|           | R  | W | R   | W | R    | W | R     | W | R     | W | R     | W | R     | W | R     | W | R     | W | R     | W | R     | W | R     | W |       |            |   |   |
| N         | 6  | 1 | 7   | 2 | 6    | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 7          |   |   |
| NNE       | 6  | 1 | 9   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| NNE       | 7  | 2 | 0   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| ENE       | 5  | 1 | 4   | 1 | 4    | 1 | 4     | 1 | 4     | 1 | 4     | 1 | 4     | 1 | 4     | 1 | 4     | 1 | 4     | 1 | 4     | 1 | 4     | 1 | 4     | 1          | 4 |   |
| E         | 9  | 1 | 9   | 1 | 6    | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1          | 6 |   |
| ESE       | 5  | 1 | 6   | 1 | 6    | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1 | 6     | 1          | 6 |   |
| SE        | 7  | 2 | 0   | 1 | 3    | 5 | 1     | 3 | 5     | 1 | 3     | 5 | 1     | 3 | 5     | 1 | 3     | 5 | 1     | 3 | 5     | 1 | 3     | 5 | 1     | 3          | 5 |   |
| SSE       | 8  | 1 | 6   | 1 | 3    | 5 | 1     | 3 | 5     | 1 | 3     | 5 | 1     | 3 | 5     | 1 | 3     | 5 | 1     | 3 | 5     | 1 | 3     | 5 | 1     | 3          | 5 |   |
| S         | 1  | 6 | 0   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| SSW       | 1  | 1 | 5   | 3 | 6    | 8 | 4     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| SW        | 8  | 1 | 9   | 1 | 4    | 6 | 1     | 4 | 6     | 1 | 4     | 6 | 1     | 4 | 6     | 1 | 4     | 6 | 1     | 4 | 6     | 1 | 4     | 6 | 1     | 4          | 6 |   |
| WSW       | 5  | 1 | 0   | 6 | 2    | 6 | 1     | 6 | 1     | 6 | 1     | 6 | 1     | 6 | 1     | 6 | 1     | 6 | 1     | 6 | 1     | 6 | 1     | 6 | 1     | 6          | 1 | 6 |
| W         | 3  | 9 | 6   | 4 | 1    | 1 | 1     | 1 | 1     | 1 | 1     | 1 | 1     | 1 | 1     | 1 | 1     | 1 | 1     | 1 | 1     | 1 | 1     | 1 | 1     | 1          | 1 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2          | 6 |   |
| WNW       | 1  | 0 | 1   | 9 | 1    | 4 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1 | 7     | 2 | 6     | 1          | 7 |   |
| W         | 7  | 1 | 4   | 1 | 7    |   |       |   |       |   |       |   |       |   |       |   |       |   |       |   |       |   |       |   |       |            |   |   |



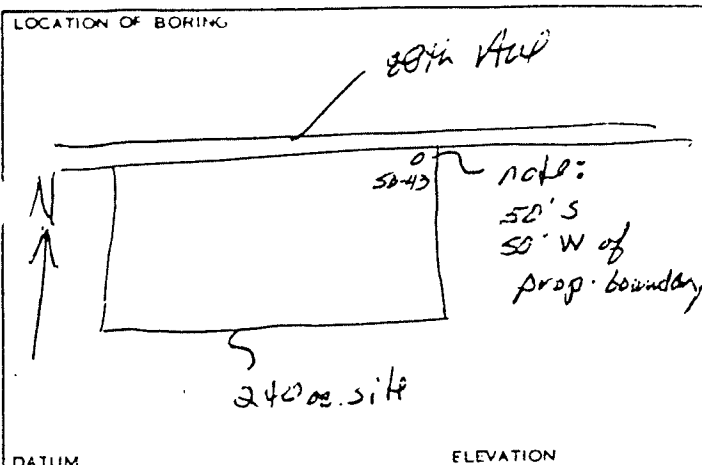




**APPENDIX D - ORIGINAL FIELD DATA AND BORING LOGS**

DRILLING CONTR Wagner Exp.

BY J. G. DATE 7/17/88 CHK'D BY \_\_\_\_\_



|   |                      |                                |
|---|----------------------|--------------------------------|
| JOB NO<br><b>2-1815</b>                                   | CLIENT<br><b>CSI</b> | LOCATION<br><b>Wagner Exp.</b> |
| DRILLING METHOD<br><b>CMF-75<br/>Auger Rig w/ 4" O.D.</b> |                      | BORING NO<br><b>MW-101</b>     |
| SAMPLING METHOD<br><b>Split Spun</b>                      |                      | SHEET<br><b>1 of 3</b>         |
| WATER LEVEL   |                      | DRILLING                       |
| TIME  | DATE                 | START TIME<br><b>7:50</b>      |
| CASING DEPTH  | DATE                 | FINISH TIME<br><b>9/19/88</b>  |

| DATUM        |                                  | ELEVATION       |                          | SURFACE CONDITIONS: |               |  |
|--------------|----------------------------------|-----------------|--------------------------|---------------------|---------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH   |
|              |                                  |                 |                          |                     | 0             |  |
|              |                                  |                 |                          |                     | 1             |  |
|              |                                  |                 |                          |                     | 2             | CL Br si cl w/ some sil sl moist                               |
|              |                                  |                 |                          |                     | 3             |  |
|              |                                  |                 |                          |                     | 4             |  |
|              |                                  |                 |                          |                     | 5             |  |
|              |                                  |                 |                          |                     | 6             |  |
|              |                                  |                 |                          |                     | 7             | ML Br fi-me sa cl, sl moist                                    |
|              |                                  |                 |                          |                     | 8             |  |
|              |                                  |                 |                          |                     | 9             |  |
|              |                                  |                 |                          |                     | 10            |  |
|              |                                  |                 |                          |                     | 11            |  |
|              |                                  |                 |                          |                     | 12            |  |
|              |                                  |                 |                          |                     | 13            |  |
|              |                                  |                 |                          |                     | 14            |  |
|              |                                  |                 |                          |                     | 15            |  |
|              |                                  |                 |                          |                     | 16            |  |
|              |                                  |                 |                          |                     | 17            |  |
|              |                                  |                 |                          |                     | 18            |  |
|              |                                  |                 |                          |                     | 19            | CL5 V hard drilling - Br-gy claystone w/ some calcite sl moist |
|              |                                  |                 |                          |                     | 20            |  |

|                      |  |                  |         |                      |
|----------------------|--|------------------|---------|----------------------|
| LOCATION OF BOREHOLE |  | JOB NO.          | CLIENT  | LOCATION             |
|                      |  | DRILLING METHOD: |         | BORING NO.<br>MW-101 |
|                      |  | SAMPLING METHOD: |         | SHEET<br>2 of 3      |
| DATUM                |  | ELEVATION        |         | DRILLING             |
|                      |  | WATER LEVEL      | 0       | START TIME           |
|                      |  | TIME             | 8:30    | FINISH TIME          |
|                      |  | DATE             | 9/19/88 | DATE                 |
|                      |  | CASING DEPTH     | 31.5    |                      |

DRILLING CONTRACT

| SAMPLER TYPE | INCHES DEPTH | DEPTH OF CASING | SAMPLE NO. DEPTH | BLOWS/FT | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS   |
|--------------|--------------|-----------------|------------------|----------|---------------|------------|--|
| /            | /            | /               | /                | /        | 20            |            |  |
| /            | /            | /               | /                | /        | 1             |            |  |
| /            | /            | /               | /                | /        | 2             |            |  |
| /            | /            | /               | /                | /        | 3             |            |  |
| /            | /            | /               | /                | /        | 4             |            |  |
| /            | /            | /               | /                | /        | 25            |            | 25-30<br>Auger cuttings - Br si cl - (cls?)<br>sl moist                                  |
| /            | /            | /               | /                | /        | 6             |            |  |
| /            | /            | /               | /                | /        | 7             |            |  |
| /            | /            | /               | /                | /        | 8             |            |  |
| /            | /            | /               | /                | /        | 9             |            |  |
| SP 18        | 18           |                 | 16               | 14       | 30            | Grab       | si fi sa cl<br>Br si <del>cl</del> w/ some calcite<br>replacement<br>dry - sl moist      |
| SP 18        | 18           |                 | 30               | 23       | 1             |            | checked for water - dry  |
| /            | /            | /               | /                | /        | 2             |            |  |
| /            | /            | /               | /                | /        | 3             |            | Drilling very hard - SAA   |
| /            | /            | /               | /                | /        | 4             |            |  |
| /            | /            | /               | /                | /        | 35            |            |  |
| /            | /            | /               | /                | /        | 6             |            |  |
| /            | /            | /               | /                | /        | 7             |            | Br si fi sa dry - sl moist   |
| /            | /            | /               | /                | /        | 8             | ML         |  |
| /            | /            | /               | /                | /        | 9             |            |  |
| /            | /            | /               | /                | /        | 40            |            | Br - dk br si sa cl - moist - damp in<br>upper partings. (moisture from granular matrix) |

BY: \_\_\_\_\_ DATE: \_\_\_\_\_ CHK'D BY: \_\_\_\_\_



|                    |  |  |  |                   |        |                      |
|--------------------|--|--|--|-------------------|--------|----------------------|
| LOCATION OF BORING |  |  |  | JOE NO.           | CLIENT | LOCATION             |
|                    |  |  |  | DRILLING METHOD   |        | BORING NO.<br>MW-101 |
|                    |  |  |  |                   |        | SHEET<br>3 of 3      |
|                    |  |  |  | SAMPLING METHOD   |        | DRILLING             |
|                    |  |  |  | WATER LEVEL       |        | START TIME           |
|                    |  |  |  | 54.6 54.3 48.3    |        | FINISH TIME<br>10:10 |
|                    |  |  |  | TIME              |        | DATE                 |
|                    |  |  |  | 10:20 10:45 11:50 |        | DATE<br>9/19/88      |
|                    |  |  |  | DATE              |        | DATE<br>9/19/88      |
|                    |  |  |  | CASING DEPTH      |        |                      |
|                    |  |  |  | 56.5 56.5 55'     |        |                      |

| DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|---------------|------------|--|
| 0             |            | w/ well installed  |
| 0.5           |            |  |
| 1             |            |  |
| 2             |            |  |
| 3             |            |  |
| 4             |            |  |
| 4.5           | CL5        | Br sil (cls) sl moist  |
| 5             |            |  |
| 5.5           | ML         | Br sil v. f. sil - br sil. f. sil / intervals sl moist - moist |
| 6             |            | moist. soil - dry  |
| 7             |            |  |
| 8             |            |  |
| 9             |            |  |
| 10            |            |  |
| 11            |            |  |
| 12            |            |  |
| 13            |            |  |
| 14            |            |  |
| 15            |            |  |
| 16            |            |  |
| 17            |            |  |
| 18            |            |  |
| 19            |            |  |
| 20            |            |  |
| 21            |            |  |
| 22            |            |  |
| 23            |            |  |
| 24            |            |  |
| 25            |            |  |
| 26            |            |  |
| 27            |            |  |
| 28            |            |  |
| 29            |            |  |
| 30            |            |  |
| 31            |            |  |
| 32            |            |  |
| 33            |            |  |
| 34            |            |  |
| 35            |            |  |
| 36            |            |  |
| 37            |            |  |
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| 39            |            |  |
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| 42            |            |  |
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| 45            |            |  |
| 46            |            |  |
| 47            |            |  |
| 48            |            |  |
| 49            |            |  |
| 50            |            |  |
| 51            |            |  |
| 52            |            |  |
| 53            |            |  |
| 54            |            |  |
| 55            |            |  |
| 56            |            |  |
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| 60            |            |  |
| 61            |            |  |
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| 64            |            |  |
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| 71            |            |  |
| 72            |            |  |
| 73            |            |  |
| 74            |            |  |
| 75            |            |  |
| 76            |            |  |
| 77            |            |  |
| 78            |            |  |
| 79            |            |  |
| 80            |            |  |
| 81            |            |  |
| 82            |            |  |
| 83            |            |  |
| 84            |            |  |
| 85            |            |  |
| 86            |            |  |
| 87            |            |  |
| 88            |            |  |
| 89            |            |  |
| 90            |            |  |
| 91            |            |  |
| 92            |            |  |
| 93            |            |  |
| 94            |            |  |
| 95            |            |  |
| 96            |            |  |
| 97            |            |  |
| 98            |            |  |
| 99            |            |  |
| 100           |            |  |

DRILLING - DATE

CHK'D BY

DATE

(3) REV 11-88

Boring completed as a Monitoring Well 2" pvc, threaded flush joined. 5' screen length (9.5' actual) saw T.D. of well 55', screen 50-55, sand 48-55 Best. pellets 45-48, cement cement 0-45, steel 4" steel prot. casing at surface (5' length 2' non stick)



511 Orchard Street Golden, CO 80401  
 Irondele Rd.

~~Underground~~ Berm  
 # - 200' - # MW-302  
 MW-102

5357.5  
 29.3  
 5298.5

5307.5  
 24.5  
 5282.95



Location Diagram

DATUM ELEVATION

|                             |               |                      |
|-----------------------------|---------------|----------------------|
| JOB NO.<br>7-1875-          | CLIENT<br>CSI | LOCATION             |
| DRILLING METHOD: CME-75     |               | BORING NO.<br>MW-102 |
| 6" O.D. HSA                 |               | SHEET<br>1 of 2      |
| SAMPLING METHOD: Continuous |               | DRILLING             |
|                             |               | START TIME<br>1020   |
|                             |               | FINISH TIME<br>1130  |
| WATER LEVEL: Muddy 24.65'   |               | DATE<br>1/12/90      |
| TIME: 1600 1120             |               | DATE<br>1/12/90      |
| DATE: 1/12/90 1/15/90       |               | DATE<br>1/12/90      |
| CASING DEPTH: Open Open     |               | DATE<br>1/12/90      |

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
| Cont         | /                                |                 | /                         |                   |             | 0             |            | Silty/Sand, brn, f gr, sl-med clay - sl mst - mst @ base.           |
|              | /                                |                 | /                         |                   |             |               |            | Sand, brn, f-mgr, v silty, sl-med clay - sl mst                     |
|              | /                                |                 | /                         |                   |             | 5             |            | SAA   |
|              | /                                |                 | /                         |                   |             |               |            | Sandy brn, f-tr cgr, sbind-rnd, med w srt, v clay - sl mst - mst    |
|              | /                                |                 | /                         |                   |             |               |            | > 2-1" thick sand lenses, sl clayey - mst                           |
|              | /                                |                 | /                         |                   |             |               |            | clay, brn, frm, med sdy - dec mst                                   |
| Cont         | /                                |                 | /                         |                   |             | 10            |            | Sand, brn, mgr, med w srt, med-v clay - mst                         |
|              | /                                |                 | /                         |                   |             |               |            | clay, wh - lt gy brn, v wthrd & calc, crumbly - mst                 |
| Cont         | /                                |                 | /                         |                   |             | 15            |            | clay, brn, frm, sl wthrd, sl slty, tr ex, calc nodls, - sl mst      |
|              | /                                |                 | /                         |                   |             |               |            | SAA   |
|              | /                                |                 | /                         |                   |             |               |            | clay, gy-gn brn, inc frm, n-sl slty, inc ex; sl mst                 |
|              | /                                |                 | /                         |                   |             | 20            |            | clay, dk gy-gn brn, frm-v frm, dns, n slty, tr sks, med ex - sl mst |

DATE  
 CHK'D BY

|                  |  |        |  |                      |             |
|------------------|--|--------|--|----------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION             |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>MW-102 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>2 OF 2      |             |
|                  |  |        |  | DRILLING             |             |
| WATER LEVEL      |  |        |  | START TIME           | FINISH TIME |
| TIME             |  |        |  | DATE                 | DATE        |
| DATE             |  |        |  |                      |             |
| CASING DEPTH     |  |        |  |                      |             |

Location Diagram

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
| crst         | /                                |                 | /                         |                   |             | 20            |            |   |
|              | /                                |                 | /                         |                   |             |               |            | Clay, gn-brn, sl fcm, v slty, sl inc msT  |
|              | /                                |                 | /                         |                   |             |               |            | 4" silt, gn brn, sl sdy, mod cly, n indur - msT +<br>Clay, gn-brn a/c   |
|              | /                                |                 | /                         |                   |             | 5             |            | Sand/silt, hn-gn brn, vvfgr, sl cly w/tn clay intervals - msT   |
| crmi         | /                                |                 | /                         |                   |             |               |            | Clay, gn brn - dk gy fcm - v fcm, n-sl slty intervals,<br>com ex, inc dk gy & carb @ base w/tr<br>sk.s = s/msT  |
|              | /                                |                 | /                         |                   |             | 30            |            | <p>Sat MW</p> <p>Depth of Well 29.0'</p> <p>Top of Screen 19.0'</p> <p>Top of Sand 17.75' 4 Bags 10-20</p> <p>Top of Base 16.0' 1 Bucket</p> <p>Grout to 5fc 10 bags Portland</p> |

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

511 Orchard Street Golden, CO 80401

|                          |            |                       |
|--------------------------|------------|-----------------------|
| JOB NO. 2-1815           | CLIENT CSI | LOCATION Irondale Rd. |
| DRILLING METHOD: CME-750 |            | BORING NO. MW-103     |
| 8" O.D. HSA              |            | SHEET 1 OF 3          |
| Drizzling - Muddy        |            | DRILLING              |
| SAMPLING METHOD: Split   |            | START TIME 08:30      |
| 1                        |            | FINISH TIME 15:40     |
| WATER LEVEL              |            | DATE 9/12             |
| TIME                     |            | DATE 9/12             |
| DATE                     |            |                       |
| CASING DEPTH             |            |                       |

Irondale Rd.

112'  
MW-103

Depth of Well 48.5'  
Top of Screen 38.5'  
Top of Sand 36.5' - 5' bucket N  
Top of Bent 34.5' + bucket  
Grout 34.5' -> sfc

Location Diagram

DATUM ELEVATION: OVA Reading

SURFACE CONDITIONS:

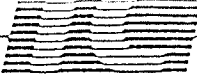
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLWS/FT SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRADE | SURFACE CONDITIONS   |
|--------------|----------------------------------|-----------------|--------------------------|-----------------|-------------|---------------|------------|--|
|              |                                  |                 |                          |                 |             | 0             |            | Weeds - muddy clay & silt  |
|              |                                  |                 |                          |                 |             |               | SC         | Sand, H brn, very fine, silty - dry  |
|              |                                  |                 |                          |                 |             |               |            | SAB - sl - med clay w/ thin clay lenses - dry                                |
|              |                                  |                 |                          |                 |             | 5             |            | SAB - Clay - gy brn - brn purp, frm, sl grav lenses - mst                    |
|              |                                  |                 |                          |                 |             |               | ML         |  |
|              |                                  |                 |                          |                 |             |               |            | SAB  |
| SS           | 12" / 12"                        |                 | 9-10                     | 9/6             |             | 10            |            | Clay - brn, sl frm, sl sdy, tr gyp - sl mst                                  |
|              |                                  |                 |                          |                 |             |               | CL         | Clay - gy, med frm, n sdy, v ox ip, sl carb mat, sl mst                      |
|              |                                  |                 |                          |                 |             | 15            |            | Clay - gy gn, inc frm, v ox ip, tr carb plant mat, sl mst                    |
|              |                                  |                 |                          |                 |             | 20            |            | Clay, gy gn, frm, dec ox, gyp xls nod, v mn frac fld, -sl mst - gds to dk gy |

DRILLING CONTR. Kuhn Exp.

DATE 9/12/89 CHK'D BY



511 Orchard Street Golden, CO 80401



|                            |               |                           |
|----------------------------|---------------|---------------------------|
| JOB NO.<br>2-1815          | CLIENT<br>CSI | LOCATION<br>Trinidad Rd   |
| DRILLING METHOD:<br>See p1 |               | BORING NO.<br>MW-103      |
| SAMPLING METHOD:<br>See p1 |               | SHEET<br>3 of 3           |
| WATER LEVEL                |               | DRILLING                  |
| TIME                       | DATE          | START TIME<br>FINISH TIME |
| CASING DEPTH               | DATE          | DATE                      |

See p.1

Location Diagram

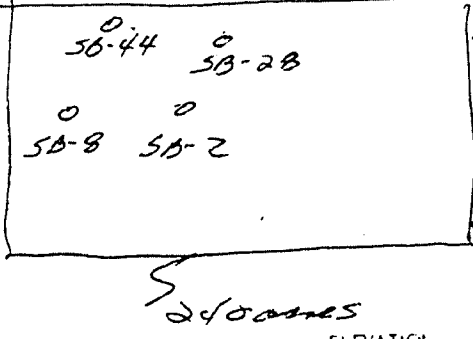
DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
|              |                                  |                 |                           |                   |             | 40            | ML         | Clay, brngy, frm, slty & v sdy lenses, mst  |
| SS           | 13' / 12"                        |                 | 44-45                     | 16/6<br>16/6      |             | 5             | CL         | SFA<br>Clay, dk purp brn, sl frm, med ox, v carb, n sdy - mst<br>Clay, brngy, inc frm, sl ox, n sdy - sl mst  |
| SS           | 12' / 12"                        |                 | 49-50                     | 15/6<br>25/6      |             | 50            |            | Clay, gy brn, frm-v frm, sl ox, tr carb mat, n sdy - sl mst<br>B.T. @ 50'<br>W/pt pull auger & leave overnight star see if makes water.<br>Pull Auger - case @ 42.0'. No measurable H2O<br>Cover hole w/ bucket & berm. |
|              |                                  |                 |                           |                   |             |               |            | 9/13 9:00 Case @ 43'<br>Water ≈ 41' BGS   |
|              |                                  |                 |                           |                   |             |               |            | 14:45 9/13 Began setting pipe<br>Backfill w/Hole plug 50' → 48'   |

DRILLING CONTR.

BY \_\_\_\_\_ CHK'D BY \_\_\_\_\_ DATE \_\_\_\_\_

|                                       |                                       |                            |                                |
|---------------------------------------|---------------------------------------|----------------------------|--------------------------------|
| LOCATION OF BORING<br><b>80th Ave</b> | JOB NO.<br><b>2-1815</b>              | CLIENT<br><b>CSI</b>       | LOCATION<br><b>Wagner Farm</b> |
|                                       | DRILLING METHOD<br><b>CME-75</b>      | BORING NO.<br><b>MW-10</b> |                                |
|                                       | SAMPLING METHOD<br><b>Split Spoon</b> |                            | SHEET<br><b>1 of 2</b>         |
|                                       | WATER LEVEL                           | START TIME<br><b>1020</b>  | FINISH TIME                    |
|                                       | TIME                                  | DATE<br><b>9/19/88</b>     | DATE                           |
|                                       | DATE                                  |                            |                                |
|                                       | CASING DEPTH                          |                            |                                |



Note:  
SB-44  
approx  
50' from  
prop.  
boundary

| SAMPLER TYPE | INCHES OPENED | DEPTH OF CASING | SAMPLE INTERVAL | BLOWS/FT | DEPTH (FEET) | SOIL GRAPH | SURFACE CONDITIONS                                 |
|--------------|---------------|-----------------|-----------------|----------|--------------|------------|--|
|              |               |                 |                 |          | 0            |            | <b>Br. si. v. fi. sa cl</b>                        |
|              |               |                 |                 |          | 1            |            | <b>Br. m. sa cl, sl. moist</b>                     |
|              |               |                 |                 |          | 2            |            |  |
|              |               |                 |                 |          | 3            |            |  |
|              |               |                 |                 |          | 4            |            |  |
|              |               |                 |                 |          | 5            |            | <b>Br. m. sa cl, sl. moist</b>                     |
|              |               |                 |                 |          | 6            |            |  |
|              |               |                 |                 |          | 7            |            |  |
|              |               |                 |                 |          | 8            |            |  |
|              |               |                 |                 |          | 9            |            |  |
|              |               |                 |                 |          | 10           |            |  |
|              |               |                 |                 |          | 11           |            |  |
|              |               |                 |                 |          | 12           |            | <b>Br. olive gray claystone, sl. moist</b>         |
|              |               |                 |                 |          | 13           |            |  |
|              |               |                 |                 |          | 14           |            |  |
|              |               |                 |                 |          | 15           |            |  |
|              |               |                 |                 |          | 16           |            | <b>olive gray claystone - lim. some, sl. moist</b> |
|              |               |                 |                 |          | 17           |            |  |
|              |               |                 |                 |          | 18           |            |  |
|              |               |                 |                 |          | 19           |            |  |

DRILLING: ONTAP. 1/2" TEST. 1/2" O.D.

DATE **9/19/88** CHK'D BY



|                  |  |  |         |            |             |      |
|------------------|--|--|---------|------------|-------------|------|
| LOCATION OF BORE |  |  | JOB NO. | CLIENT     | LOCATION    |      |
| DRILLING METHOD  |  |  |         | BORING NO. |             |      |
|                  |  |  |         | MW-104     |             |      |
| SAMPLING METHOD  |  |  |         | SHEET      |             |      |
|                  |  |  |         | 2 of 2     |             |      |
|                  |  |  |         | DRILLING   |             |      |
|                  |  |  |         | START TIME | FINISH TIME |      |
| WATER LEVEL      |  |  |         | 24.8       | 24.4        | 22.1 |
| TIME             |  |  |         | 12:50      | 12:55       | 1:30 |
| DATE             |  |  |         | 9/19/88    | "           | "    |
| CASING DEPTH     |  |  |         | 26.5 gpm   | 26.5 gpm    | 24'  |
|                  |  |  |         | DATE       | DATE        |      |
|                  |  |  |         |            | 9/19/88     |      |

DATE: \_\_\_\_\_ ELEVATION: \_\_\_\_\_ SURFACE CONDITIONS: (see well)

| SAMPLED TYPE | INCHES DEPTH AT 0 FEET | DEPTH OF CASING | SAMPLE DEPTH | BLOWS/FT SAMPLED | DEPTH IN FEET | SOIL C/PARH | SURFACE CONDITIONS                                    |
|--------------|------------------------|-----------------|--------------|------------------|---------------|-------------|---|
|              |                        |                 |              |                  | 20            |             | Olive gy chrystone - iron stained<br>sl. moist        |
|              |                        |                 |              |                  | 1             |             |   |
|              |                        |                 |              |                  | 2             |             | Lt br-br sil. f. sil. cl<br>sl. moist - damp          |
|              |                        |                 |              |                  | 3             |             |   |
|              |                        |                 |              |                  | 4             |             |   |
| Silt Sp      | 18-18                  |                 | 25           | 11-15            | 25            | Grab        | Olive gy chrystone - abun. iron staining<br>sl. moist |
|              |                        |                 |              |                  | 6             |             |   |
|              |                        |                 |              |                  | 7             |             | T.D. 26.5'  |
|              |                        |                 |              |                  | 8             |             | Monitoring Well set to 25'                            |
|              |                        |                 |              |                  | 9             |             | 5' screen 20-25'                                      |
|              |                        |                 |              |                  |               |             | sand 19-25 #10-20 sil.                                |
|              |                        |                 |              |                  |               |             | limestone 18-19                                       |
|              |                        |                 |              |                  | 30            |             | concrete 0-16.  |
|              |                        |                 |              |                  | 1             |             | 5' x 4" steel protective casing<br>at surface         |
|              |                        |                 |              |                  | 2             |             |   |
|              |                        |                 |              |                  | 3             |             |   |
|              |                        |                 |              |                  | 4             |             |   |
|              |                        |                 |              |                  | 35            |             |   |
|              |                        |                 |              |                  | 6             |             |   |
|              |                        |                 |              |                  | 7             |             |   |
|              |                        |                 |              |                  | 8             |             |   |
|              |                        |                 |              |                  | 9             |             |   |

DRILLING COMPANY

BY \_\_\_\_\_

DATE \_\_\_\_\_

C-31 (REV. 11-80)

CHK'D BY \_\_\_\_\_

Industrial Compliance Inc.

511 Orchard Street Golden, CO 80401

MW-105

Depth of Well 49.3'  
 Top of Screen 39.3'  
 Top of Sand 21.3' - 11 bags.  
 Top of Bent 19.2' - 1 bucket

Cell 18

MW-105

grout to sfc.



Location Diagram

DATUM

ELEVATION:

|                             |                  |                                |
|-----------------------------|------------------|--------------------------------|
| JOB NO.<br>2-1815           | CLIENT<br>C.S.I. | LOCATION<br>Irondale Rd.       |
| DRILLING METHOD: CME-75     |                  | BORING NO.<br>MW-105           |
| SAMPLING METHOD: Split Spun |                  | SHEET<br>1 of                  |
| WATER LEVEL<br>Dry          | TIME<br>0930     | DRILLING<br>START TIME<br>9:20 |
| DATE<br>9/21                | CASING DEPTH     | FINISH TIME<br>16:27           |
|                             |                  | DATE<br>9/20                   |

DRILLING CONTR. Caxmes - Westery

| SAMPLER TYPE | INCHES DRIVER RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                         |
|--------------|-------------------------|-----------------|-------------------------|-------------------|-------------|---------------|------------|---|
|              |                         |                 |                         |                   |             | 0             |            | Sand, clayey - mst                          |
|              |                         |                 |                         |                   |             |               | SC         | Sand, brn, fgr, mod clay - mst              |
|              |                         |                 |                         |                   |             |               | ML         | Claygy brn, sfrm, sl grav - mst             |
|              |                         |                 |                         |                   |             | 5             |            | SAA   |
|              |                         |                 |                         |                   |             |               |            | Clay, brn yel, sl fcm, n grav - mst         |
|              |                         |                 |                         |                   |             |               |            | Clay, brngy, sfrm, n grav - sl mst - mst    |
| SS           | 12" / 2"                |                 | 10-11                   | 19/6<br>33/6      |             | 10            | SC         | Sand, brn, vt-fgr, sl clayey - sl mst - mst |
|              |                         |                 |                         |                   |             |               |            | SAA   |
| SS           | 12"                     |                 | 15-16                   | 9/6<br>10/6       |             | 15            | CL         | Clay, gy-rust, frm, v ox ip - sl mst - mst  |
|              |                         |                 |                         |                   |             |               |            | ≈ 1' softer ddy                             |
|              |                         |                 |                         |                   |             |               |            | Clay-gy-brn intbd A/A - mst                 |

BY: DATE CHK'D BY



511 Orchard Street Golden, CO 80401

|                  |  |                      |             |
|------------------|--|----------------------|-------------|
| DRILLING METHOD: |  | BORING NO.<br>MW-105 |             |
| SAMPLING METHOD: |  | SHEET<br>3 OF 3      |             |
| WATER LEVEL      |  | START TIME           | FINISH TIME |
| TIME             |  |                      |             |
| DATE             |  | DATE                 | DATE        |
| CASING DEPTH     |  |                      |             |

Location Diagram

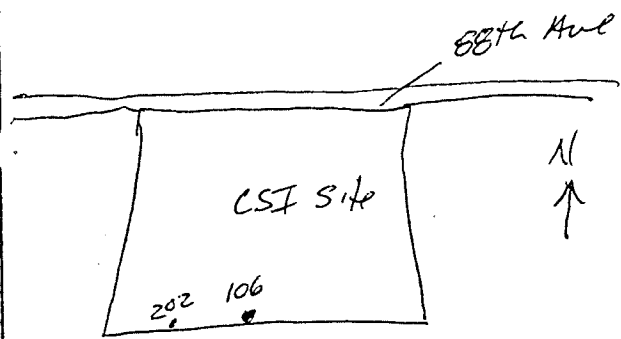
DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVER<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT.<br>SAMPLER | OVA<br>Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|-----------------------------------|-----------------|----------------------------|----------------------|----------------|---------------|------------|---|
| SS           | 12"<br>12"                        |                 | 40-41<br>12/6<br>16/6      |                      |                | 40            | CL         | Clay, gy, inc frm, trsl slty, n carb, n ox - sl mst   |
| SS           | 12"<br>12"                        |                 | 45-46<br>12/6<br>21/6      |                      |                | 45            |            | Clay, gy brn-rust, frm, med slty, ox - sl mst - mst   |
| SS           | 12"<br>12"                        |                 | 50-51<br>15/6<br>28/6      |                      |                | 50            |            | SAR - sl mst - mst<br>Clay, dk gy, frm - v frm, <del>dk</del> dns, n sdy, n ex brki - sl mst<br>BT @ 51'<br>Will leave auger in hole overnight & set well tomorrow<br>Pull Auger up ~ 3' off bottom<br>9/21 Dry before setting well<br>Add 1 gal H <sub>2</sub> O to Hydrate Bentonite.<br>Well dry after hydration |

DRILLING CONTR.

BY DATE CHK'D BY

LOCATION OF BORING:



JOB NO

2-1815

CLIENT

CSI

LOCATION:

CSI Landfill

DRILLING METHOD:

CME-55

BORING NO:

RAW 106

Auger Rig w/  
4 1/4 Hollow Stem Augers

SHEET

1 of 2

SAMPLING METHOD:

Split

DRILLING

WATER LEVEL

dry

15'6"

15.9'

START

FINISH

TIME

8:05

9:30

10:30

TIME

DATE

DATE

8/25

8/25

8/25

8/25/89

CASING DEPTH

14'

16'

23'

DATUM

ELEVATION

SURFACE CONDITIONS:

(hole drilled to 20')

Wheat stubble field

| SAMPLER TYPE | INCHES DRIVEN / RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | RL CAS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|---------------------------|-----------------|--------------------------|--------------------|---------------|------------|
|              |                           |                 |                          |                    | 0             |            |
|              |                           |                 |                          |                    | 1             | SM / SW    |
|              |                           |                 |                          |                    | 2             |            |
|              |                           |                 |                          |                    | 3             |            |
|              |                           |                 |                          |                    | 4             |            |
|              |                           |                 |                          |                    | 5             |            |
|              |                           |                 |                          |                    | 6             |            |
|              |                           |                 |                          |                    | 7             |            |
|              |                           |                 |                          |                    | 8             |            |
|              |                           |                 |                          |                    | 9             |            |
|              |                           |                 |                          |                    | 10            |            |
|              |                           |                 |                          |                    | 11            |            |
|              |                           |                 |                          |                    | 12            |            |
|              |                           |                 |                          |                    | 13            |            |
|              |                           |                 |                          |                    | 14            |            |
|              |                           |                 |                          |                    | 15            |            |
|              |                           |                 |                          |                    | 16            |            |
|              |                           |                 |                          |                    | 17            |            |
|              |                           |                 |                          |                    | 18            |            |
|              |                           |                 |                          |                    | 19            |            |
|              |                           |                 |                          |                    | 20            |            |
|              |                           |                 |                          |                    | 21            |            |
|              |                           |                 |                          |                    | 22            |            |
|              |                           |                 |                          |                    | 23            |            |
|              |                           |                 |                          |                    | 24            |            |
|              |                           |                 |                          |                    | 25            |            |
|              |                           |                 |                          |                    | 26            |            |
|              |                           |                 |                          |                    | 27            |            |
|              |                           |                 |                          |                    | 28            |            |
|              |                           |                 |                          |                    | 29            |            |
|              |                           |                 |                          |                    | 30            |            |

0-5 Auger cuttings Brown  
me-co sand w/ some fines  
dry

5-10 Auger cuttings - Brown me-co  
sand w/ some fines  
sl moist

10-15' Auger cuttings - Brownish-  
Brown fi-co sand w/  
some fines  
sl moist

Auger cuttings @ ~14' damp

Br - ~~at~~ Brownish-yell. fi-me sand  
w/ few fines  
damp - pulled augers 1-foot &  
waited 10min - checked water level - dry.

Claystone Auger cuttings - wet

DATE 8/25/89

REV 11.001

LOCATION OF BORING:

JOB NO

Z-1815

CLIENT

CSI

LOCATION:

CSI Landfill

Site

DRILLING METHOD

See p. 1

BORING NO

NW-106

SHEET

2 of 2

SAMPLING METHOD

See p. 1

DRILLING

START

TIME

11:00

FINIS

TIME

WATER LEVEL

15.91

TIME

10:30

DATE

8/24

DATE

8/25/09

CASING DEPTH

23'

See p. 1

DATUM

ELEVATION

SURFACE CONDITIONS:

See p. 1

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|----------------------------------|-----------------|--------------------------|------------------|---------------|------------|
| Spt          | 18 / 18                          | 20              | 20-215 (8, 14, 22)       | 8                | 20            | clay shale |
|              |                                  |                 |                          |                  | 1             |            |
|              |                                  |                 |                          |                  | 2             |            |
| Spt          | 10 / 23                          | 23              | 23-245 (7, 11, 15)       | 7                | 3             | TS         |
|              |                                  |                 |                          |                  | 4             |            |
|              |                                  |                 |                          |                  | 25            |            |
|              |                                  |                 |                          |                  | 6             |            |
|              |                                  |                 |                          |                  | 7             |            |
|              |                                  |                 |                          |                  | 8             |            |
|              |                                  |                 |                          |                  | 9             |            |
|              |                                  |                 |                          |                  | 30            |            |
|              |                                  |                 |                          |                  | 1             |            |
|              |                                  |                 |                          |                  | 2             |            |
|              |                                  |                 |                          |                  | 3             |            |
|              |                                  |                 |                          |                  | 4             |            |
|              |                                  |                 |                          |                  | 5             |            |
|              |                                  |                 |                          |                  | 6             |            |
|              |                                  |                 |                          |                  | 7             |            |
|              |                                  |                 |                          |                  | 8             |            |
|              |                                  |                 |                          |                  | 9             |            |
|              |                                  |                 |                          |                  | 0             |            |

Gray to DK gray claystone w/ some iron staining  
dense, dry

SAIT

TS boring at 23'

Well Sot ~~106~~ # 106 to TA=23'  
\* see notes for details

DATE 8/25/09 CHK'D BY

1-31-REV 11-001

511 Orchard Street Golden, CO 80401

MW-107  
 Depth of Well  
 Top of Screen  
 Top of Sand 37.1' 4 bags  
 Top of Bent 35.2' - 1 bucket  
 MW-107  
 grant to sfc - 12 bags

|  |               |                                      |
|--|---------------|--------------------------------------|
| JOB NO<br>2-1815                             | CLIENT<br>CSI | LOCATION<br>Frondale Rd.             |
| DRILLING METHOD:<br>CME-75<br>#0 8" O.D. HSA |               | BORING NO.<br>MW-107                 |
| SAMPLING METHOD:<br>Split Spoon              |               | SHEET<br>1 of 3                      |
| WATER LEVEL                                  |               | DRILLING                             |
| TIME   | DATE          | START TIME<br>11:15<br>DATE<br>9/20  |
| CASING DEPTH                                 | DATE          | FINISH TIME<br>14:20<br>DATE<br>9/20 |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA | Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-----|---------|---------------|------------|--|
|              |                                  |                 |                           |                   |     |         | 0             | SC         | Sand, brn, mod - v cly   |
|              |                                  |                 |                           |                   |     |         |               | CL         | Clay, brn, frm, n-sly sdy - sl mst                                       |
|              |                                  |                 |                           |                   |     |         | 5             |            | SAA  |
|              |                                  |                 |                           |                   |     |         | 10            | SS         | 12" / 12" 10-11 4/6 6/6<br>Clay, brn, frm, v sly sdy - sl mst            |
|              |                                  |                 |                           |                   |     |         |               | SC         | Sand, brn, f gr, mod cly - sl mst  |
|              |                                  |                 |                           |                   |     |         |               | CL         | Clay, gy brn, frm - v frm, n sly - sl mst                                |
|              |                                  |                 |                           |                   |     |         | 15            | SS         | 12" / 12" 15-16 6/6 9/6<br>Clay, brn, frm - sl frm, med sdy mgr - sl mst |
|              |                                  |                 |                           |                   |     |         |               | CL         | SAA  |
|              |                                  |                 |                           |                   |     |         | 20            |            |  |

DRILLING CONTR. L.C. MUE

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



LOCATION OF BORING:

JOB NO

CLIENT

LOCATION:

CSI

Fremdale Rd

DRILLING METHOD

BORING NO

MW-107

SHEET

2 of 3

SAMPLING METHOD

DRILLING

WATER LEVEL

START TIME

FINISH TIME

TIME

DATE

DATE

DATE

CASING DEPTH

DATE

ELEVATION

| SAMPLED TYPE | INCHES DIA<br>PIPE USED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | BLOWS-FT<br>SAMPLER | DEPTH<br>IN FEET | SOIL<br>GRAPH | SURFACE CONDITIONS:                                      |
|--------------|-------------------------|-----------------|---------------------------|---------------------|------------------|---------------|--|
| SS           | 12"<br>12"              |                 | 30-21<br>7/16<br>11/16    |                     | 20               | CL            | Clay A/A, brn, frm, med-v sdy f-mgr - sl mst - tr gyp    |
|              |                         |                 |                           |                     | 1                |               |  |
|              |                         |                 |                           |                     | 2                |               |  |
|              |                         |                 |                           |                     | 3                |               |  |
|              |                         |                 |                           |                     | 4                |               |  |
| SS           | 12"<br>12"              |                 | 25-24<br>8/16<br>11/16    |                     | 25               | CL            | Clay A/A   |
|              |                         |                 |                           |                     | 6                |               | Clay, dk purp-rust, v carb, v ox. com gyp veins - sl mst |
|              |                         |                 |                           |                     | 7                |               |  |
|              |                         |                 |                           |                     | 8                |               |  |
|              |                         |                 |                           |                     | 9                |               |  |
| SS           | 12"<br>12"              |                 | 30-31<br>8/16<br>14/16    |                     | 30               | CL            | Clay, rust brn, frm, n-sl sdy, v ox - sl mst             |
|              |                         |                 |                           |                     | 1                |               |  |
|              |                         |                 |                           |                     | 2                |               |  |
|              |                         |                 |                           |                     | 3                |               |  |
|              |                         |                 |                           |                     | 4                |               |  |
| SS           | 12"<br>12"              |                 | 35-36<br>9/16<br>18/16    |                     | 35               | CL            | Clay, SAA  |
|              |                         |                 |                           |                     | 6                |               | Sand, brn, mod cly, fgr - sl mst                         |
|              |                         |                 |                           |                     | 7                | SP            |  |
|              |                         |                 |                           |                     | 8                |               |  |
|              |                         |                 |                           |                     | 9                |               |  |
|              |                         |                 |                           |                     | 40               |               |  |

DATE: \_\_\_\_\_ CHECKED BY: \_\_\_\_\_

511 Orchard Street Golden, CO 80401

|                  |  |     |  |            |  |             |  |
|------------------|--|-----|--|------------|--|-------------|--|
| JCS NO.          |  | CSJ |  | LOCATION   |  | Ironton Rd. |  |
| DRILLING METHOD: |  |     |  | BORING NO. |  |             |  |
|                  |  |     |  | PW-107     |  |             |  |
| SAMPLING METHOD: |  |     |  | SHEET      |  |             |  |
|                  |  |     |  | 3 OF 3     |  |             |  |
|                  |  |     |  | DRILLING   |  |             |  |
| WATER LEVEL      |  |     |  | START TIME |  | FINISH TIME |  |
| TIME             |  |     |  | DATE       |  | DATE        |  |
| DATE             |  |     |  |            |  |             |  |
| CASING DEPTH     |  |     |  |            |  |             |  |

Location Diagram

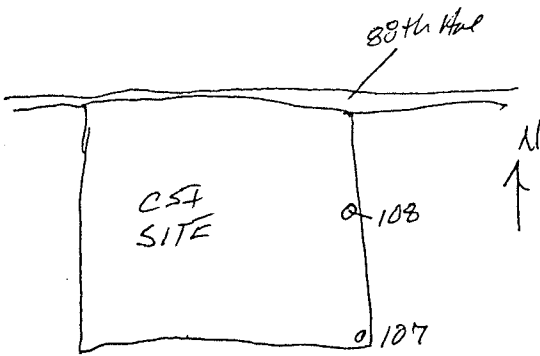
DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
| SS           | 12" / 12"                        |                 | 40 / 41                   | 10/6<br>34/6      |             | 40            | SL         | Sand, brn, vf. fgr, slty, sl clay - sl mst - mst<br>Wait 1/2 hr for water - no water  |
|              |                                  |                 |                           |                   |             |               | CL         | Auger Cuttings Clay, brn, frm, n sdy - sl mst - mst<br>SS, wh-blk carb, fgr, mod cmt<br>Clay a/a  |
| SS           | 12" / 12"                        |                 | 45 / 46                   | 10/6<br>13/6      |             | 45            | YCL        | Clay, dlay-rust, inc frm, n sdy, ox ip - sl mst - mst   |
| SS           | 12" / 12"                        |                 | 50 / 51                   | 10/6<br>22/6      |             | 50            | CL         | Clay, dk-mgy, frm, tr carb ptgs, n sdy - sl mst - mst<br>B.T. @ 51'<br>Dry str, dily - leave auger in hole to see if makes water<br>9/21 - water @ 48.1' bgs - depth of hole 48.5' Before setting well. |

DRILLING CONT.

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHKD BY \_\_\_\_\_

LOCATION OF BORING:



|  |               |                           |
|--|---------------|---------------------------|
| JCR# NO<br>2-1815  | CLIENT<br>CSI | LOCATION:<br>CSI Landfill |
| DRILLING METHOD<br>CME-75<br>Auger Rig 4 1/4" Hollow<br>Steel Augers |               | BORING NO<br>MLW-108      |
| SAMPLING METHOD<br>Split Spoon                                       |               | SHEET<br>1 of 3           |
| DRILLING   |               |                           |
| WATER LEVEL  |               | START TIME<br>1250        |
| TIME   |               | FINIS TIME                |
| DATE   |               | DATE                      |
| CASING DEPTH   |               |                           |

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>DEPTH | FLWS/FT.<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|-----------------------------------|-----------------|--------------------|---------------------|---------------|------------|
|              |                                   |                 |                    |                     | 0             |            |
|              |                                   |                 |                    |                     | 1             |            |
|              |                                   |                 |                    |                     | 2             |            |
|              |                                   |                 |                    |                     | 3             | ML         |
|              |                                   |                 |                    |                     | 4             |            |
|              |                                   |                 |                    |                     | 5             |            |
|              |                                   |                 |                    |                     | 6             |            |
|              |                                   |                 |                    |                     | 7             | ML<br>SM   |
|              |                                   |                 |                    |                     | 8             |            |
|              |                                   |                 |                    |                     | 9             |            |
|              |                                   |                 |                    |                     | 10            |            |
|              |                                   |                 |                    |                     | 11            |            |
|              |                                   |                 |                    |                     | 12            |            |
|              |                                   |                 |                    |                     | 13            | SM         |
|              |                                   |                 |                    |                     | 14            |            |
|              |                                   |                 |                    |                     | 15            |            |
|              |                                   |                 |                    |                     | 16            |            |
|              |                                   |                 |                    |                     | 17            |            |
|              |                                   |                 |                    |                     | 18            | CL         |
|              |                                   |                 |                    |                     | 19            |            |
|              |                                   |                 |                    |                     | 20            |            |

| SURFACE CONDITIONS:  |  |
|--|--|
| Wheat Field (stable)   |  |
| 0-5 Auger Cuttings - DK br silt w/ some v. fine sand<br>dry - sl moist |  |
| 5-10 - auger cuttings  |  |
| Br silty sand w/ some clay<br>sl moist                                 |  |
| 10-15 Auger Cuttings   |  |
| Br <del>me</del> silty fi-med. sand w/ some clay<br>sl. moist          |  |
| 15-20 Auger Cuttings   |  |
| Grades w/ more clay<br>sl. moist                                       |  |

DATE 9/6/89 CHK'D BY  
1-31 (REV 11-80)

LOCATION OF BORING:

|                              |               |                                   |
|------------------------------|---------------|-----------------------------------|
| JOBT NO<br>2-1815            | CLIENT<br>CSI | LOCATION:<br>CSI Landfill         |
| DRILLING METHOD:<br>See p. 1 |               | BORING NO<br>MW 108               |
| SAMPLING METHOD:<br>See p. 1 |               | SHEET<br>2 of 3                   |
| WATER LEVEL                  |               | DRILLING<br>START TIME<br>8:00 AM |
| TIME                         |               | DATE<br>9/7/09                    |
| DATE                         |               | FINISH TIME                       |
| CASING DEPTH                 |               | DAT.                              |

See p. 1

| DATUM        |                                  |                 |                          |                   | ELEVATION     |                | SURFACE CONDITIONS:  |  |
|--------------|----------------------------------|-----------------|--------------------------|-------------------|---------------|----------------|--|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH     | SURFACE CONDITIONS:  |  |
| Spt          | 10 / 10                          | 20              | 6 / 6                    | 6                 | 20            | SM             | See p. 1   |  |
|              |                                  |                 |                          |                   | 1             |                | Br silty fine sand w/ some clay sl. moist  |  |
|              |                                  |                 |                          |                   | 2             |                |  |  |
|              |                                  |                 |                          |                   | 3             |                |  |  |
|              |                                  |                 |                          |                   | 4             |                |  |  |
| Spt          | 10 / 18                          | 25              | 7 / 13                   | 7                 | 25            | Weak claystone | Br clay w/ some small pieces of olive gy clay throughout, some w. f. sand (prob. weak claystone) sl. moist |  |
|              |                                  |                 |                          |                   | 6             |                |  |  |
|              |                                  |                 |                          |                   | 7             |                |  |  |
|              |                                  |                 |                          |                   | 8             |                |  |  |
|              |                                  |                 |                          |                   | 9             |                |  |  |
| Spt          | 18 / 18                          | 30              | 10 / 22                  | 10                | 30            | Clst.          | Olive gray claystone, w/ some iron staining dry - sl. moist  |  |
|              |                                  |                 |                          |                   | 1             |                |  |  |
|              |                                  |                 |                          |                   | 2             |                |  |  |
|              |                                  |                 |                          |                   | 3             |                |  |  |
|              |                                  |                 |                          |                   | 4             |                |  |  |
|              |                                  |                 |                          |                   | 5             |                | Augercutting 39A   |  |
|              |                                  |                 |                          |                   | 6             |                |  |  |
|              |                                  |                 |                          |                   | 7             |                | Augercutting - BK gray - Black clay dry - sl. moist  |  |
|              |                                  |                 |                          |                   | 8             |                |  |  |
|              |                                  |                 |                          |                   | 9             |                |  |  |

DATE 10/15/09 CHK'D BY

LOCATION OF BORING:

JOB NO

2-1815

CLIENT

CSI

LOCATION:

CSI Lot 11

DRILLING METHOD

See p. 1

BORING NO

MN-108

SHEET

3 of 3

SAMPLING METHOD

See p. 1

DRILLING

START TIME

11:45

DATE

DATE

9/7/85

See p. 1

DATUM

ELEVATION

SURFACE CONDITIONS:

See p. 1

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | FLWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|----------------------------------|-----------------|--------------------------|------------------|---------------|------------|
| Spt          | 18 / 18                          | 40              | 15 / 29<br>50/51         |                  | 40            | dst        |
|              |                                  |                 |                          |                  | 1             |            |
|              |                                  |                 |                          |                  | 2             |            |
|              |                                  |                 |                          |                  | 3             |            |
|              |                                  |                 |                          |                  | 4             |            |
| Spt          | 18 / 18                          | 45              | 32 / 50<br>51/52         |                  | 45            |            |
|              |                                  |                 |                          |                  | 6             |            |
|              |                                  |                 |                          |                  | 7             |            |
|              |                                  |                 |                          |                  | 8             |            |
|              |                                  |                 |                          |                  | 9             |            |
| Spt          | 18 / 18                          | 50              | 20 / 22<br>30            |                  | 50            |            |
|              |                                  |                 |                          |                  | 1             |            |
|              |                                  |                 |                          |                  | 2             |            |
|              |                                  |                 |                          |                  | 3             |            |
|              |                                  |                 |                          |                  | 4             |            |
|              |                                  |                 |                          |                  | 5             |            |
|              |                                  |                 |                          |                  | 6             |            |
|              |                                  |                 |                          |                  | 7             |            |
|              |                                  |                 |                          |                  | 8             |            |
|              |                                  |                 |                          |                  | 9             |            |

Olive gy clay stone w/ some v. fine sand stringers gray-brown dry

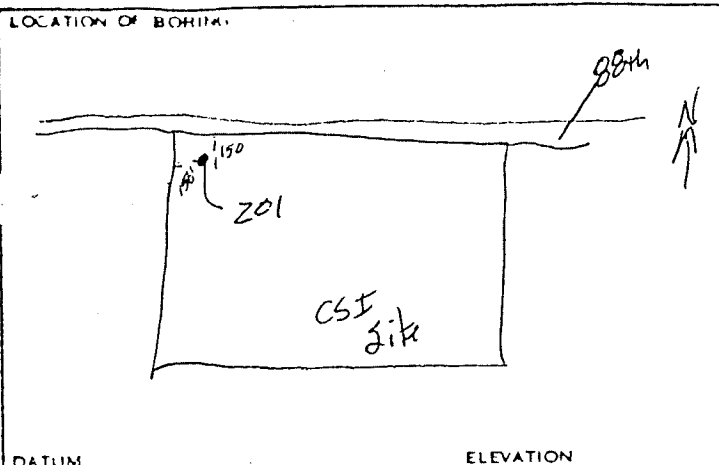
Br si sand w/in clay stone dry

Olive gray - dk gray clay stone dry

Will set MN-108 to TD = 50' see Well logs for details

DATE 11/17/85 CHECKED BY

1-81 .REV 11-80



|  |               |                          |
|--|---------------|--------------------------|
| JOBT NO<br>7-1815  | CLIENT<br>CSI | LOCATION:<br>Ludlow Site |
| DRILLING METHOD:<br>CME-55 Auger Rig<br>4 1/4" ID Hollow Stem Augers |               | BORING NO<br>MM-201      |
| SAMPLING METHOD:<br>Split Spoon                                      |               | SHEET<br>1 of 2          |
| DRILLING   |               |                          |
| WATER LEVEL  |               | START TIME<br>1215       |
| TIME   |               | FINIS TIME               |
| DATE   |               | DATE<br>9/23/89          |
| CASING DEPTH   |               | DATE                     |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN RECOVERED | DEPTH OF CASING | SAMPLER NO     | BLWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|-------------------------|-----------------|----------------|------------------|---------------|------------|
|              |                         |                 |                |                  | 0             |            |
|              |                         |                 |                |                  | 1             | SUL        |
|              |                         |                 |                |                  | 2             |            |
|              |                         |                 |                |                  | 3             |            |
|              |                         |                 |                |                  | 4             |            |
|              |                         |                 |                |                  | 5             |            |
|              |                         |                 |                |                  | 6             |            |
|              |                         |                 |                |                  | 7             | SM         |
|              |                         |                 |                |                  | 8             |            |
|              |                         |                 |                |                  | 9             |            |
| Sgt          | 12/18                   | 10              | 55-1<br>10-1.5 | 7                | 10            | SM<br>SW   |
|              |                         |                 |                |                  | 11            |            |
|              |                         |                 |                |                  | 12            |            |
|              |                         |                 |                |                  | 13            |            |
|              |                         |                 |                |                  | 14            |            |
|              |                         |                 |                |                  | 15            |            |
| Sgt          | 18/10                   | 15              | 55-2<br>15-6.5 | 7<br>12<br>20    | 15            | SM         |
|              |                         |                 |                |                  | 16            |            |
|              |                         |                 |                |                  | 17            |            |
|              |                         |                 |                |                  | 18            |            |
|              |                         |                 |                |                  | 19            |            |
|              |                         |                 |                |                  | 20            |            |

SURFACE CONDITIONS:  
wheat stubble

0-5 Br si sand, dry to sl moist

5-10 SAA, sl moist

14-Br sand w/ some silt, sl moist  
gtz sand-fi-course

SAA

SAA

GW  
Grady's to hime-co sand w/ some sm. gravels 1/4" φ  
sl moist gtz sand & gravels

See p. 2

DATE 8/23/89 CHK'D BY

LOCATION OF BORING:

JOB NO

Z-1815

CLIENT

C.S.F

LOCATION:

Landfill Site

DRILLING METHOD

See p. 1

BORING NO

ML-201

SHEET

2 of 2

SAMPLING METHOD

See p. 1

DRILLING

WATER LEVEL

Dry Dry Dry @ 26' 32

TIME

2:05 2:30 8:00 1:50

DATE

8/23 8/23 8/24 8/24

START

TIME

FINISH

TIME

2:30

DATE

DATE

8/23/89

CASING DEPTH

25 24.5 1 35

See p. 1

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | FLOW/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|--------------------------|------------------|---------------|------------|----------------------|
| SPt          | 18/18                            | 20              | 55-3 / 20-25             | 32               | 20            | SM         | 1/2" hole case @ 26' |
|              |                                  |                 |                          |                  | 1             |            |                      |
|              |                                  |                 |                          |                  | 2             |            |                      |
|              |                                  |                 |                          |                  | 3             |            |                      |
|              |                                  |                 |                          |                  | 4             |            |                      |
| SPt          | 10/18                            | 25              | 55-4 / 25-26             | 84 / 10"         | 25            | SM / ML    |                      |
|              |                                  |                 |                          |                  | 6             |            |                      |
|              |                                  |                 |                          |                  | 7             |            |                      |
|              |                                  |                 |                          |                  | 8             |            |                      |
|              |                                  |                 |                          |                  | 9             |            |                      |
| SPt          | 6/9                              | 30              | 55-5 / 30-31             | 100 / 9"         | 30            | SM         |                      |
|              |                                  |                 |                          |                  | 1             |            |                      |
|              |                                  |                 |                          |                  | 2             |            |                      |
|              |                                  |                 |                          |                  | 3             |            |                      |
|              |                                  |                 |                          |                  | 4             |            |                      |
| SPt          | 18/18                            | 35              | 55-6 / 35-36             | 23 / 66          | 35            | SM         |                      |
|              |                                  |                 |                          |                  | 6             |            |                      |
|              |                                  |                 |                          |                  | 7             |            |                      |
|              |                                  |                 |                          |                  | 8             |            |                      |
|              |                                  |                 |                          |                  | 9             |            |                      |
|              |                                  |                 |                          |                  | 10            |            |                      |

Br. v. fi. si sa, sl moist w/ some iron staining @ 21' Br. v. f. si sa w/ pieces of gray claystone (claystone hard dry) sand slt. moist.

w/ some clay

Br v. f. si sa slt moist to moist will wait + check poss. w.l. (waited 5 min - dry)

Br v. f. sa w/ some competent sandstone lenses slt moist

TD @ 231' will wait to see if hole makes water - will pull 1-5' auger section

left hole open to 30' will check H<sub>2</sub>O 8/24/89

\*Cont. drilling @ 12:45 8/24/89 from casing @ 26' depth

Br fi-me si sa, wet pull 5' auger waited 30 min for w.l. @ 2:30 w.l. = 30.9

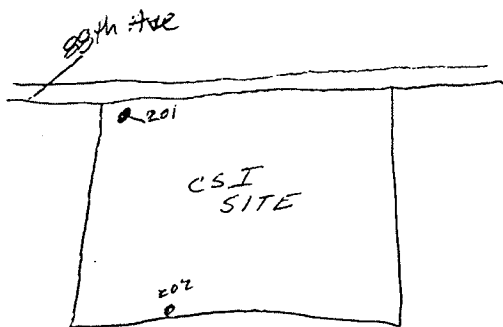
Completed 2" PVC well to TD = 37' w/ 10' screen well #201

DATE 8/23/89 CHK'D BY

REV 11-89



LOCATION OF BORING:



|  |               |                                |
|--|---------------|--------------------------------|
| JOB NO<br>2-1815   | CLIENT<br>CSI | LOCATION<br>CSI and fill site  |
| DRILLING METHOD<br>CME Auger Rig<br>4 1/4 ID Hollow Stem Auger |               | BORING NO<br>Z02               |
| SAMPLING METHOD<br>Split Spoons                                |               | SHEET<br>1 of 1                |
| WATER LEVEL<br>Damp 9.1  |               | DRILLING<br>START TIME<br>3:10 |
| TIME<br>4:20pm 8:00  |               | FINIS TIME                     |
| DATE<br>8/23/89 8/24/89  |               | DATE<br>8/23/89                |
| CASING DEPTH<br>5' 5'  |               |                                |

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVER RECOVERED | DEPTH OF CASING | SAMPLE NO       | ROWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|-------------------------|-----------------|-----------------|------------------|---------------|------------|--|
|              |                         |                 |                 |                  | 0             |            | wheat stubble  |
|              |                         |                 |                 |                  | 1             | ML<br>SM   | 0-4 DK br silty sand, dry  |
|              |                         |                 |                 |                  | 2             |            |  |
|              |                         |                 |                 |                  | 3             |            |  |
|              |                         |                 |                 |                  | 4             |            |  |
|              |                         |                 |                 |                  | 5             | SM         | Br silty fi-coarse sand<br>sl. moist   |
|              |                         |                 |                 |                  | 6             |            |  |
|              |                         |                 |                 |                  | 7             |            |  |
|              |                         |                 |                 |                  | 8             |            |  |
|              |                         |                 |                 |                  | 9             |            | SAA, sl moist - wet  |
| SP           | 18<br>R                 | 10              | SS-1<br>10-11.5 | (3)<br>(9)       | 10            | SW<br>ML   | Med-Co gtz sand, wet<br>Br si v. fine sand to sandy silt<br>sl. moist - moist<br>meas. w.l. - dry.   |
|              |                         |                 |                 |                  | 11            |            |  |
|              |                         |                 |                 |                  | 12            |            |  |
|              |                         |                 |                 |                  | 13            |            |  |
| SP           | 18                      | 15              | SS-2<br>15-16.5 | (18)<br>(25)     | 15            | CLst       | Olive gray claystone w/ some iron staining<br>dry<br>TD = 16' 4" 8/24/89<br>Stopped @ 4:15 pm<br>will pull 10' auger, allow for static w.l. over night<br>then set well according in AM. |
|              |                         |                 |                 |                  | 16            |            |  |
|              |                         |                 |                 |                  | 17            |            |  |
|              |                         |                 |                 |                  | 18            |            |  |
|              |                         |                 |                 |                  | 19            |            | Hole was drilled to TD = 16' 9" (8/24/89)  |
|              |                         |                 |                 |                  | 20            |            | Complete well Z02 to TD = 16' 4" see notes for details   |

DATE 8/29/89 CHK'D BY

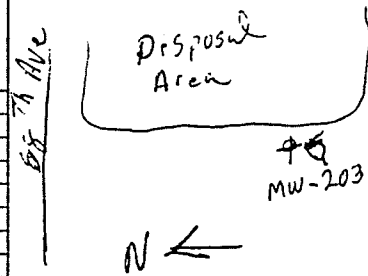
11-31 REV 11-88



INDUSTRIAL COMPLIANCE  
 AN SP ENVIRONMENTAL SYSTEMS COMPANY  
 1746 COLE BLVD.  
 BLDG. 21 SUITE 300  
 GOLDEN, COLORADO 80401  
 (303)277-1400  
 FAX (303)277-1405

LOG OF BORING NUMBER: MW-203  
 SHEET NUMBER: 1 OF 1

LOCATION DIAGRAM:



|   |                             |
|---|-----------------------------|
| CLIENT: CSI   | DRILLING METHOD: #39-CMC 75 |
| PROJECT NAME: CST                                     | LINE DRILLING               |
| PROJECT NUMBER: 2-2502                                |                             |
| PROJECT LOCATION: Bennett Co                          | SAMPLING METHOD: CONTINUOUS |
| BORING LOCATION: adjacent to MW-105 & MW-105A, MW-223 |                             |
| START DATE: 2-14-92                                   | FINISH DATE:                |
| START TIME: 0915                                      | FINISH TIME:                |
|   | DATE:                       |

| SAMPLER TYPE | SAMPLE NO. & DEPTH    | QVA READING | SPT | DEPTH IN FEET | SOIL GRAPH | SOIL DESCRIPTION AND DRILLING CONDITIONS  |
|--------------|-----------------------|-------------|-----|---------------|------------|---|
| Cont.        | 1/0-8'<br>1/2" return | N/A         |     | 2             | ML         | Moist tan silty clay, plant material (silty loam)<br>Moist dark brown silty clay, minor fine grained sand     |
| Cont.        | 2/5-10'               | N/A         |     | 7             |            | No Return on 5-10 interval - cutting of tan silty clay, minor sand (fine grained)                             |
|              | 1/2 barrel<br>3/10-15 |             |     | 10            |            | Silty, clayey sand (fine to med grained) tan to lt. brown, moist.   |
|              |                       |             |     | 12            |            | 12.5-14.5 sand w/ minor silt, increase q/s side to grained above clay contact, moist to wet at contact.       |
|              | 4/15-20<br>2" return  |             |     | 14            | CL         | 14.5' Claystone bedrock? unpeened, slightly sandy - not drained. cutting substituted, sand very fine grained. |
|              |                       |             |     | 16            |            | 16-22' lt brown fine to medium grained sand, substituted; minor silt.   |
|              | 5/                    |             |     | 20            | SM         |   |
|              |                       |             |     | 22            | TD=22.0    | 21.5' Claystone Bedrock TD at 22'   |

LOGIST: James ROGERS  
 DATE:  
 DRILLING CONTRACTOR: LAYNE ENVIRONMENTAL

511 Orchard Street Golden, CO 80401

Irondale Rd.

|                          |               |                          |
|--------------------------|---------------|--------------------------|
| JOB NO.<br>2-1815        | CLIENT<br>CSF | LOCATION<br>Irondale Rd. |
| DRILLING METHOD: CME-75* |               | BORING NO.<br>MW-301     |
| 8" O.D. HSA.             |               | SHEET<br>1 OF 4          |
| SAMPLING METHOD: split   |               | DRILLING                 |
| WATER LEVEL<br>63.8'     |               | START TIME<br>1330       |
| TIME<br>1155             |               | FINISH TIME<br>1300      |
| DATE<br>0922             |               | DATE<br>9/21             |
| CASING DEPTH             |               | DATE<br>9/22             |

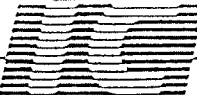
MW-2  
 Depth of Well 78.4' bgs  
 Top of Screen 68.4'  
 Top of Sand 60.5' 5 bags  
 MW-301  
 Top of Boat 58.5' 1 bucket  
 Grout to sfc  
 23 bags

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS:           |             |               |   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------------------|-------------|---------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER             | OVA Reading | DEPTH IN FEET | SOIL GRAPH  |
|              |                                  |                 |                           |                               |             | 0             | Clay, dk brn, sdy - mst   |
|              |                                  |                 |                           |                               |             |               | CL Clay, lt brn, slty, mod sdy - dry                                      |
|              |                                  |                 |                           |                               |             | 5             | SAA   |
|              |                                  |                 |                           |                               |             |               | Clay - m - dk brn, sl frm, mod sdy - mst                                  |
| SS           | 12" / 12"                        |                 | 10-11                     | 6/6<br><del>9/6</del><br>17/6 | 11/6        | 10            | CL Clays dk gy purp, frm, carb, lng gyp xls, n sdy - mst                  |
|              |                                  |                 |                           |                               |             |               | Clay, dk gy - blk, v carb, n sdy - mst                                    |
|              |                                  |                 |                           |                               |             |               | Clay, brn, sl frm, n sdy - mst - v mst                                    |
| SS           | 12" / 12"                        |                 | 15-16                     | 9/6<br>17/6                   |             | 15            | Clay, gy brn - rst, frm, n sdy, tr carb - ptgs, ox ip, gyp - sl mst - mst |
|              |                                  |                 |                           |                               |             |               | SAA - inc mst   |
|              |                                  |                 |                           |                               |             | 20            |   |

BY: [Signature] DATE: 9/21/22  
 CHECKED BY: [Signature]

511 Orchard Street Golden, CO 80401



JOB NO.

2-1815

CLIENT

CSI

LOCATION

Irondale Rd

DRILLING METHOD:

See p1

BORING NO.

MW-301

SHEET

2 OF 4

SAMPLING METHOD:

See p1

DRILLING

START TIME

FINISH TIME

WATER LEVEL

TIME

DATE

CASING DEPTH

DATE

DATE

Location Diagram

See p1

| DATUM        |                         | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |   |
|--------------|-------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVER RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
| 55           | 12" / 12"               |                 | 20-21                     | 7 1/6 / 11 1/6      |             | 20            | CL         | Clay, ala - mst<br>SAA, mst - v mst   |
|              |                         |                 |                           |                     |             |               |            | Subst SS, gy, hd, v f gr, w amt - dry   |
| 55           | 12" / 12"               |                 | 25-26                     | 11 1/6 / 14 1/6     |             | 25            | CL         | Clay, brn - rst, frm, slty lnses - mst<br>Clay, gy brn - blk, inc frm, n slty, carb lnses - S mst - mst |
|              |                         |                 |                           |                     |             |               |            | Clay, brn, frm, n sdy - mst - v mst   |
| 55           | 12" / 12"               |                 | 30-31                     | 10 1/6 / 15 1/6     |             | 30            | CL         | Clay, gy brn, frm, n sdy, sl ex - sl mst  |
| 55           | 12" / 12"               |                 | 35-36                     | 11 1/6 / 16 1/6     |             | 35            | CL         | Clay, gy, frm, n sdy, dec ox - sl mst   |
|              |                         |                 |                           |                     |             | 40            |            |   |

DRILLING CONTINUED

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

511 Orchard Street Golden, CO 80401

|                            |  |               |  |                       |             |
|----------------------------|--|---------------|--|-----------------------|-------------|
| JOB NO.<br>2-1815          |  | CLIENT<br>CSI |  | LOCATION<br>Ivendale  |             |
| DRILLING METHOD:<br>See p1 |  |               |  | BORING NO.<br>MIU-301 |             |
| SAMPLING METHOD:<br>See p1 |  |               |  | SHEET<br>3 of 4       |             |
| WATER LEVEL                |  |               |  | START TIME            | FINISH TIME |
| TIME                       |  |               |  | DATE                  | DATE        |
| DATE                       |  |               |  |                       |             |
| CASING DEPTH               |  |               |  |                       |             |

See p1

Location Diagram

| DATUM        |                                 |                 | ELEVATION                 |                   |             | SURFACE CONDITIONS:   |
|--------------|---------------------------------|-----------------|---------------------------|-------------------|-------------|---|
| SAMPLER TYPE | INCHES DRYEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading |   |
| 55           | 12" / 12"                       |                 | 40-41                     | 15/6<br>29/6      | 40          | CL Clay, grey brn, frm, mod sdy - sl mst<br>Sand, brn gy, v fgr, mod clay - mst           |
|              |                                 |                 |                           |                   |             | SC  |
|              |                                 |                 |                           |                   |             | CL  |
| 55           | 12" / 12"                       |                 | 45-46                     | 20/6<br>45/6      | 45          | Clay, grey brn, frm, n sdy, sl ex ip, sbly ip - sl mst<br><br>Clay, a/a - bcm mst - v mst |
|              |                                 |                 |                           |                   |             |   |
| 55           | 12" / 12"                       |                 | 50-51                     | 12/6<br>19/6      | 50          | Clay, a/a - sl mst - mst<br>* Pull 4" auger - let sit overnight<br>w.l. 9/22 A.M. = 47.1' |
|              |                                 |                 |                           |                   |             |   |
| 55           | 12" / 12"                       |                 | 55-56                     | 19/6<br>35/6      | 55          | Clay, dk purp brn - blk, frm - v frm, n sdy, n ox, carb ip - sl mst                       |
|              |                                 |                 |                           |                   |             |   |
|              |                                 |                 |                           |                   |             |   |

INDUSTRIAL COMPLIANCE

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

100

511 Orchard Street Golden, CO 80401

|                             |               |                         |
|-----------------------------|---------------|-------------------------|
| JOB NO.<br>2-1015           | CLIENT<br>CST | LOCATION<br>Irondale Rd |
| DRILLING METHOD:<br>See pl  |               | BORING NO.<br>MW-301    |
| SAMPLING METHOD:<br>See pl. |               | SHEET<br>4 OF 4         |
| WATER LEVEL                 |               | DRILLING                |
| TIME                        |               | START TIME              |
| DATE                        |               | FINISH TIME             |
| CASING DEPTH                |               | DATE                    |

See pl

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading   |
| SS           | 12" / 12"                        |                 | 60-61                     | 13/6<br>31/6        | 60  |
|              |                                  |                 |                           |                     | CL  |
|              |                                  |                 |                           |                     | Clay - dk gy - blk, frm - v frm, v sl sdy, tr carb mat - sl mst - dry |
|              |                                  |                 |                           |                     | Clay - blk, frm - v frm, v sl sdy - sl mst                            |
| SS           | 12" / 12"                        |                 | 65-66                     | 19/6<br>35/6        | 65  |
|              |                                  |                 |                           |                     | Clay, blk, frm - v frm, n sdy, tr carb, - dry - sl mst                |
|              |                                  |                 |                           |                     | stiffer chrlg.  |
| SS           | 12" / 12"                        |                 | 69-70                     | 39/6<br>57/6        | 70  |
|              |                                  |                 |                           |                     | SC Sand, gy, vf - fgr, frm, sb ang, v sl clay - mst - v mst           |
| SS           | 9" / 9"                          |                 | 75-75 1/2                 | 40/6<br>50/3        | 75  |
|              |                                  |                 |                           |                     | SC Sand, gy, fgr, v sl clay - sat                                     |
| SS           | 10" / 10"                        |                 | 80-80 1/2                 | 40/6<br>50/3        | 80  |
|              |                                  |                 |                           |                     | SC Sand, gy, fgr, frm, sb ang - sat                                   |

PROBING CURVES

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

511 Orchard Street Golden, CO 80401

Irondale Rd.

S. of Berm

5'

NW of Asbestos Cell

MW-302

200'

MW-102

Depth of Well 89.8' bgs  
 Top of Screen 79.8'  
 Top of Sand 77.0' 5.5 bags  
 Top of Bent 75.5' 1 bag hole plug  
 Great to sfc 28 bags Portland

Location Diagram

DATUM ELEVATION

|                              |  |               |  |                          |             |
|------------------------------|--|---------------|--|--------------------------|-------------|
| JOB NO.<br>2-1815            |  | CLIENT<br>CSI |  | LOCATION<br>Irondale Rd. |             |
| DRILLING METHOD: CME-75      |  |               |  | BORING NO.<br>MW-302     |             |
| 8" O.D. HSA                  |  |               |  | SHEET<br>1 of 5          |             |
| SAMPLING METHOD: Split Spoon |  |               |  | DRILLING                 |             |
| WATER LEVEL                  |  | TIME          |  | START TIME               | FINISH TIME |
| DATE                         |  | DATE          |  | 9/25                     | 9/26        |
| CASING DEPTH                 |  | DATE          |  | 9/25                     | 9/26        |

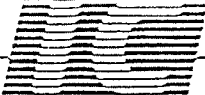
| SAMPLER TYPE | INCHES DRIVEN INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA | Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                      |
|--------------|--------------------------------|-----------------|-------------------------|-------------------|-----|---------|---------------|------------|--|
|              |                                |                 |                         |                   |     |         | 0             |            | Sand, lt brn, slty, v clay - sl mst      |
|              |                                |                 |                         |                   |     |         |               | SC         | Sand, lt brn, vf gr slty, mod clay - dry |
|              |                                |                 |                         |                   |     |         | 5             |            |  |
|              |                                |                 |                         |                   |     |         |               | CL         | Clay, brn, slfrm, mod sdy - sl mst       |
|              |                                |                 |                         |                   |     |         | 10            |            | Clay, lt brn, ala - inc mst              |
|              |                                |                 |                         |                   |     |         |               |            |  |
|              |                                |                 |                         |                   |     |         | 15            |            | Clay, brn, frm, n-sl sdy - mst           |
|              |                                |                 |                         |                   |     |         |               |            |  |
|              |                                |                 |                         |                   |     |         | 20            |            |  |

DRILLING COMPANY: Kayne-Western

BY: [Signature] DATE: \_\_\_\_\_ CHK'D BY: \_\_\_\_\_



511 Orchard Street Golden, CO 80401



|                            |  |               |  |                         |             |
|----------------------------|--|---------------|--|-------------------------|-------------|
| JOB NO.<br>2-1815          |  | CLIENT<br>CSI |  | LOCATION<br>Irondale Rd |             |
| DRILLING METHOD:<br>See pl |  |               |  | BORING NO.<br>MW-302    |             |
| SAMPLING METHOD:<br>See pl |  |               |  | SHEET<br>2 of 5         |             |
| WATER LEVEL                |  |               |  | START TIME              | FINISH TIME |
| TIME                       |  |               |  | DATE                    | DATE        |
| DATE                       |  |               |  |                         |             |
| CASING DEPTH               |  |               |  |                         |             |

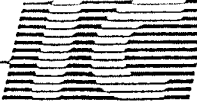
See pl.

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA   |
| SS           | 12" / 12"                        |                 | 20 21                     | 6/6<br>9/6          | Reading   |
|              |                                  |                 |                           |                     | 20  |
|              |                                  |                 |                           |                     | CL  |
|              |                                  |                 |                           |                     | Clay, brn-rst, sl frm, com ox, carb mat - mst           |
|              |                                  |                 |                           |                     | Clay, dk gy-blk, n sdy, frm, v carb - mst               |
|              |                                  |                 |                           |                     | 25  |
|              |                                  |                 |                           |                     | Clay, m brn, frm, sl sdy? - mst                         |
|              |                                  |                 |                           |                     | 30  |
| SS           | 12" / 12"                        |                 | 30 31                     | 15/6<br>18-6        | Reading   |
|              |                                  |                 |                           |                     | 30  |
|              |                                  |                 |                           |                     | CL  |
|              |                                  |                 |                           |                     | Sand, lt brn, fgr, sl - med clay - mst - wet            |
|              |                                  |                 |                           |                     | Clay, brn-rst - dk gy, frm, n sdy, ox ip - sl mst - mst |
|              |                                  |                 |                           |                     | Pull auger up 5' - W.L. after 45 min @ 29.1' bgs        |
|              |                                  |                 |                           |                     | 35  |
|              |                                  |                 |                           |                     | Stiffer drlg  |
|              |                                  |                 |                           |                     | CL  |
|              |                                  |                 |                           |                     | Clay? - brn, frm, n sdy - mst?                          |
|              |                                  |                 |                           |                     | Probably sand @ 36'                                     |
|              |                                  |                 |                           |                     | SC  |
|              |                                  |                 |                           |                     | 40  |

DRILLING CONTINUED

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



|                             |  |               |  |                         |             |
|-----------------------------|--|---------------|--|-------------------------|-------------|
| JOB NO.<br>2-1815           |  | CLIENT<br>CSI |  | LOCATION<br>Ivendale Rd |             |
| DRILLING METHOD:<br>See p1  |  |               |  | BORING NO.<br>MW-302    |             |
| SAMPLING METHOD:<br>See p.1 |  |               |  | SHEET<br>3 of 5         |             |
| WATER LEVEL                 |  |               |  | START TIME              | FINISH TIME |
| TIME                        |  |               |  | DATE                    | DATE        |
| CASING DEPTH                |  |               |  | DRILLING                |             |

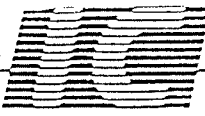
See p1.

Location Diagram

| DATUM        |                                  | DEPTH OF CASING |            | SAMPLE NO.        |             | BLOWS/FT. SAMPLER |            | OVA Reading   |  | DEPTH IN FEET |  | SOIL GRAPH |  | SURFACE CONDITIONS: |  |
|--------------|----------------------------------|-----------------|------------|-------------------|-------------|-------------------|------------|---|--|---------------|--|------------|--|---------------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET     | SOIL GRAPH |   |  |               |  |            |  |                     |  |
| SS           | 12" / 12"                        |                 | 40-41      | 24/6<br>38/6      |             | 40                | SC         | Sand, brn, fgr, sl clay - wet - sat.<br>Pull up auger w.h. after 15 min 36.8' bgs |  |               |  |            |  |                     |  |
| SS           | 12" / 12"                        |                 | 45-46'     | 14/6<br>14/6      |             | 45                | CL         | Clay, brn-gy, frm, ox ip, v sdy - v mst - wet<br>* Water coming in hole           |  |               |  |            |  |                     |  |
| SS           | 12" / 12"                        |                 | 50-51      | 12/6<br>20/6      |             | 50                | CL<br>SC   | ALT: Clay, brn-rst, frm, mod - v sdy - mst<br>Sand, brn, mod clay, fgr - v mst    |  |               |  |            |  |                     |  |
| SS           | 12" / 12"                        |                 | 55-56      | 10/6<br>17/6      |             | 55                | CL         | Clay, gykn, frm, ox ip, sl sdy ip - sl mst  |  |               |  |            |  |                     |  |
|              |                                  |                 |            |                   |             | 60                |            |   |  |               |  |            |  |                     |  |

DRILLING LOG

BY: \_\_\_\_\_ DATE: \_\_\_\_\_ CHK'D BY: \_\_\_\_\_



511 Orchard Street Golden, CO 80401

|                             |  |               |  |                         |             |
|-----------------------------|--|---------------|--|-------------------------|-------------|
| JOB NO.<br>2-1815           |  | CLIENT<br>CSI |  | LOCATION<br>Ivendale Rd |             |
| DRILLING METHOD:<br>See p.1 |  |               |  | BORING NO.<br>MW-302    |             |
| SAMPLING METHOD:<br>See p.1 |  |               |  | SHEET<br>4 of 5         |             |
| WATER LEVEL                 |  |               |  | START TIME              | FINISH TIME |
| TIME                        |  |               |  | DATE                    | DATE        |
| CASING DEPTH                |  |               |  |                         |             |

See p.1

Location Diagram

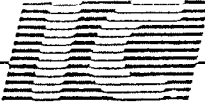
| DATUM        |                                  |                 | ELEVATION                 |                   |             | SURFACE CONDITIONS: |  |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET       | SOIL GRAPH   |
| SS           | 12" / 12"                        |                 | 60-61                     | 16/6<br>28/6      |             | 60                  | CL Claystr - dk gy bl, inc frm, n sdy, tr carb mat<br>dry - sl mst                                   |
| SS           | 12" / 12"                        |                 | 65-66                     | 21/6<br>30/6      |             | 65                  | CL Claystr, dk gy, frm, sl sdy, tr carb mat - dry - sl mst<br>BC sand, gy fgr, sl - mod clay - v mst |
| SS           | 12" / 12"                        |                 | 67-68                     | 24/6<br>38/6      |             |                     | CL clay dk gy, v frm, sdy lnses - dry - sl mst   |
| SS           | 12" / 12"                        |                 | 70-71                     | 53/6<br>32/6      |             | 70                  | CL clay, a/a, 2" blk lignite @ base - mst  |
| SS           | 12" / 12"                        |                 | 75-76                     | 16/6<br>24/6      |             | 75                  | CL Clay, dk gy, frm, n-sl sdy - dry - sl mst   |

WILHELMSON CONSULTING

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

871

511 Orchard Stree: Golden, CO 80401



|                             |               |                        |
|-----------------------------|---------------|------------------------|
| JOB NO.<br>2-1815           | CLIENT<br>CSI | LOCATION<br>Kondale Rd |
| DRILLING METHOD:<br>See p 1 |               | BORING NO.<br>MW-302   |
| SAMPLING METHOD:<br>See p 1 |               | SHEET<br>5 OF 5        |
| WATER LEVEL                 |               | START TIME             |
| TIME                        |               | FINISH TIME            |
| DATE                        |               | DATE                   |
| CASING DEPTH                |               |                        |

See p. 1

Location Diagram

| DATUM        |                                  |                 | ELEVATION                 |                   |     | SURFACE CONDITIONS: |               |            |   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-----|---------------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA | Reading             | DEPTH IN FEET | SOIL GRAPH |   |
| SS           | 12" / 12"                        |                 | 80-81                     | 22/6<br>43/6      |     |                     | 80            | CL         | Clay, dk gy, frm-vfrm, n sdg - dry-s/mst  |
| SS           | 10" / 10"                        |                 | 85-86                     | 26/6<br>50/4      |     |                     | 85            | SC         | Sand, gy, fgr, sl claye slty @ top - wet-sat  |
| SS           | 12" / 12"                        |                 | 88-89                     | 23/6<br>37/6      |     |                     | 90            | CL         | Sand, blk-sat bcm clay @ base & wet<br>Clay, dk gy-blk, vfrm, n sdg - dry - mst<br>Pull up auger. W.L. 1/2 hr @ 85.4' |
|              |                                  |                 |                           |                   |     |                     |               |            | No Returns  |
| SS           | 12" / 12"                        |                 | 95-96                     | 26/6<br>42/6      |     |                     | 95            | CL         | Clay, dk gy, frm-vfrm, tr carb mat, n sdg<br>dry-s/mst  |
|              |                                  |                 |                           |                   |     |                     |               |            | No Returns  |
| SS           | 12" / 12"                        |                 | 101-102                   | 26/6              |     |                     | 100           | CL         | Clay - blk  |

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

DRILLING CONTRACT

BY \_\_\_\_\_









LOCATION OF BORING: 88th Blvd

JOB NO: 2-1815 CLIENT: CSI LOCATION: Wagon Farm

DRILLING METHOD: CME-75 BORING NO: SB-2

4" Solid Stem auger

SAMPLING METHOD: Spot Sample SHEET: 3 of 3

DRILLING: 7 of 3

|              |             |              |  |  |            |                |             |                |
|--------------|-------------|--------------|--|--|------------|----------------|-------------|----------------|
| WATER LEVEL  | <u>dry</u>  | <u>61.8</u>  |  |  | START TIME | <u>1:45</u>    | FINISH TIME | <u>3:00</u>    |
| TIME         | <u>3:20</u> | <u>4:00</u>  |  |  | DATE       | <u>9/19/88</u> | DATE        | <u>9/19/88</u> |
| CASING DEPTH | <u>66.5</u> | <u>66.5'</u> |  |  |            |                |             |                |

DATUM: 240 ELEVATION

DRILLING CONTR. Station Exp.

| SAMPLED TYPE | INCHES DOWN BLOW/FEET | DEPTH OF CASING | SAMPLE NO | ROWS/FT SOLID/FT | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                                     |
|--------------|-----------------------|-----------------|-----------|------------------|---------------|------------|---|
|              |                       |                 |           |                  | 0             |            | Note: Reamed out existing SB-2                          |
|              |                       |                 |           |                  | 1             |            |   |
|              |                       |                 |           |                  | 2             |            |   |
|              |                       |                 |           |                  | 3             |            |   |
|              |                       |                 |           |                  | 4             |            |   |
|              |                       |                 |           |                  | 5             |            |   |
|              |                       |                 |           |                  | 6             |            |   |
|              |                       |                 |           |                  | 7             |            |   |
|              |                       |                 |           |                  | 8             |            |   |
|              |                       |                 |           |                  | 9             |            |   |
| SS           | 18/18                 |                 | 60        | 24<br>37<br>35   | 60            | Grab       | Grey-gy clay w/ some carbon material<br>dry - sl. moist |
|              |                       |                 |           |                  | 1             |            |   |
|              |                       |                 |           |                  | 2             |            |   |
|              |                       |                 |           |                  | 3             |            |   |
|              |                       |                 |           |                  | 4             |            |   |
| SS           | 18/18                 |                 | 65        | 30<br>30<br>30   | 65            | Grab       | Gy siltstone dry - sl. moist                            |
|              |                       |                 |           |                  | 6             |            |   |
|              |                       |                 |           |                  | 7             |            | TD. Procd. Sat to 66.5 w/ ~ 2' stickup w/ 10' stickhead |
|              |                       |                 |           |                  | 8             |            |   |
|              |                       |                 |           |                  | 9             |            |   |
|              |                       |                 |           |                  | 10            |            |   |

BY: JEC DATE: 9/19/88 CHK'D BY:





Industrial Compliance Incorporated

511 Orchard Street Golden, Colorado 80401

FIELD DRILLING LOG

Date: 7/9/28 Sheet 2 of 2

Project CSII Job No. 2-1815
Bund Elev. Boring No. SB-3 Dia. 4" T.D. 60'
Project Manager MS Approval Date
Field Engr./Geol. AT Driller Boyles Bicos RIG SUCO TRACK

Water Table At Drilling: Dry
Water: Depth 1st Encountered:
Water - After ø
Caved - After ø
Water Table After Drilling:
Water at depth
Date By
Dry at depth
Couldn't Find Covered

Table with 7 columns: PID (DPM), Depth, SOIL CLASS, Field Soil Description, SPT Pen, Moler, Color. Contains handwritten entries for soil descriptions like 'SAND', 'color change Blue/gray, sl. silty sand plastic', and 'TID BL GRAY sl. silty'.

Table with 8 columns: Depth, Sample-Spoon (Calif., Std., Shelby, Auger), Standard Penetrat. (Field, Final), Comments, Laboratory Sample Description, T. Contains handwritten notes: 'Bridgelyoff @ 15 dry & 35 wet. Hole open to 59' after clearing bridge'.

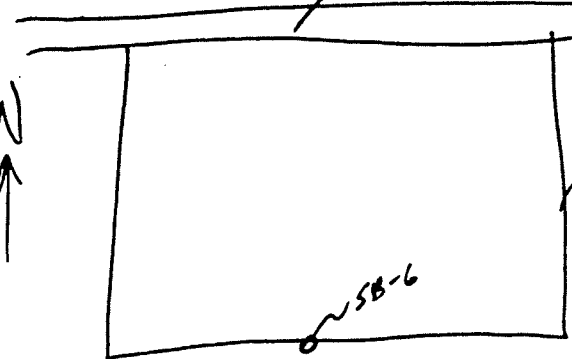






DRILLING CONTR *Datum Effco Co*

BY *JEC* DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|   |                         |                         |  |
|---|-------------------------|-------------------------|--|
| LOCATION OF BORING: <i>88th Ave</i><br> | JOB NO<br><i>2-1815</i> | CLIENT<br><i>CSI</i>    | LOCATION:<br><i>Wagner Farm</i>                    |
| DRILLING METHOD: <i>CME-75</i><br><i>4" solid stem auger</i>  |                         |                         | BORING NO<br><i>SB-6</i><br>SHEET<br><i>1 of 2</i> |
| SAMPLING METHOD: <i>split spoon + grab</i>  |                         |                         |  |
| WATER LEVEL: <i>14.3</i>  |                         | START TIME: <i>2:10</i> | FINISH TIME: <i>2:50</i>                           |
| TIME: <i>3:10</i>   |                         | DATE: <i>9/20/88</i>    | DATE: <i>9/20/88</i>                               |
| CASING DEPTH: <i>40</i>   |                         |                         |  |

| DATUM        |                        | ELEVATION       |           | SURFACE CONDITIONS: |               |  |
|--------------|------------------------|-----------------|-----------|---------------------|---------------|--|
| SAMPLED TYPE | INCHES DRIVEN PER FOOT | DEPTH OF CASING | SAMPLE NO | FLAWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH   |
|              |                        |                 |           |                     | 30            | <i>0-25' Reamed existing SB-6 see SB-6 for 0-25' lithology</i>                             |
|              |                        |                 |           |                     | 1             |  |
|              |                        |                 |           |                     | 2             | <i>25-30' lt br si sa, wet</i>   |
|              |                        |                 |           |                     | 3             |  |
|              |                        |                 |           |                     | 4             |  |
|              |                        |                 |           |                     | 35            | <i>30-35 lt br si fi sa w/ trace br clay, wet</i>  |
|              |                        |                 |           |                     | 6             |  |
|              |                        |                 |           |                     | 7             |  |
|              |                        |                 |           |                     | 8             |  |
|              |                        |                 |           |                     | 9             |  |
|              |                        |                 |           |                     | 40            | <i>35-40 lt br si fi cl sa, grades w/ more clay, wet</i>                                   |
|              |                        |                 |           |                     | T.D.          |  |
|              |                        |                 |           |                     | 1             |  |
|              |                        |                 |           |                     | 2             | <i>Piezo set to 40'</i>  |
|              |                        |                 |           |                     | 3             | <i>Piezo consisted of 3/4" pvc pipe w/ 25' hand-slotted screen</i>                         |
|              |                        |                 |           |                     | 4             |  |
|              |                        |                 |           |                     | 5             | <i>Note:</i>   |
|              |                        |                 |           |                     | 6             | <i>The immediate area is a perched zone. The boring/piezo is located on top of a hill.</i> |
|              |                        |                 |           |                     | 7             |  |
|              |                        |                 |           |                     | 8             |  |
|              |                        |                 |           |                     | 9             |  |
|              |                        |                 |           |                     | 0             |  |



FIELD DRILLING LOG

Date: 7-11-88 Sheet 1 of 1

Project CSI II Job No. 2-1815
Boring No. SB-7 Dia. 4 T.D. 45'
Project Manager MS Approval Date
Field Engr./Geol. V Driller Byles Bros. Rig S-20 TRAK

Water Table At Drilling: Water: Depth 1st Encountered: 10' Dry
Water - After ø
Caved - After ø
Water Table After Drilling: Water at depth
Date By
Dry at depth
Couldn't Find Covered

Table with columns: PID (ppm), Depth, SOIL CLASS, Field Soil Description, SPT Pen, Moist, Color. Rows include soil descriptions like 'mod. Brn., F-med gm.', 'mod. Brn., SA, some SP clumps 6"-1 1/4" dia', 'Lt. Brn., silty, sl moisture. uf-F grain, comp plastic', '17-18 good BREAK, BR-gray, abnt. Fe st, med-coal plastic', 'sl. silty, + sandy, Lt-med Brn', '28' Harder - unweathered BR', 'CL med. fic. sl. sandy - silty', '30' Hard ss stringers, not much returns. S, A, A', '36' easier Drilling S A A', 'TID med. Brn silty, S, SAND'

Table with columns: Depth, Samples-Spoon (Calif., Std., Shelby, Auger), Standard Penetrat. (Field, Final), Comments: 28-TD CUTTINGS RETURNING UP, Laboratory Sample Description, Test














































| Depth | Graphic Log  | Lithology and Physical Condition   | Well Construction Detail | Notes            |
|-------|--|--|--------------------------|------------------|
|       |  | V. SANDY CLAY LT-med BROWN.  | CL                       |                  |
| 10    |   | ROCK<br>med BROWN CLAYSTONE w. thin<br>lt. med. ss. nod.                                       | CL                       | Q @ 9' = 25/12   |
| 20    |  | Brown grey BROWN CLS Fe stain<br>to 22 1/2 ft.   | CLS                      | Q @ 19' = 32/12" |
| 30    |  | POSSIBLE LIGNITE nod @ 26-28'<br>SAND LT GY BROWN, CLAYEY<br>SL. MOIST-LKY VFGH<br>well sorted | SC                       | Q @ 19' = 50/5"  |
| 40    |  | 1' HARD DELG.<br>med BROWN CLAYSTONE<br>SL. MOIST, TR-NO SAND,                                 | CLS                      |                  |
| 50    |  |  |                          |                  |

|  |  |  |
|--|--|--|
| Project <u>CSI-2</u><br>Elevation _____<br>Date Drilled <u>7-25-88</u>   | Type of Rig <u>Che-55</u><br>Total Depth _____<br>Logged By <u>[Signature]</u> |  |
| SUBSURFACE EXPLORATION LOG   |  | Job No _____<br>Date _____<br>Figure _____ |
| Industrial Compliance Inc.  511 Orchard Street Golden, CO 80401 |  |  |

| Depth | Graphic Log | Lithology and Physical Condition   | Well Construction Detail | Notes   |
|-------|-------------|--|--------------------------|---|
|       |             | cont 1   |                          |   |
| 60    |             | VERY HARD WEATHERING<br>Blue shale   | Denver Fm SH             | added some water<br>+ 2A & CR-6                         |
| 70    |             | DRUG RAISED UP SLIGHTLY - POSSIBLY<br>med brown silts w/ blue shale water<br>V. MOIST - MET - INCR SANDY<br>V. HARD layer < 1' POSS. SAND. | DENVER Fm SH             |   |
| 80    |             | Blue sh.<br>w/ INTERBED SAND<br>layers < 1'  |                          | water meas in<br>Piez. @ 72' 5"<br>Directly after DRUG. |
| 90    |             | Trace 79'  |                          |   |
| 100   |             |  |                          |   |

Project CS1-2  
 Elevation \_\_\_\_\_  
 Date Drilled 7 25 78

Type of Rig cone 55  
 Total Depth 79'  
 Logged By SAD

SUBSURFACE EXPLORATION LOG



Job No \_\_\_\_\_  
 Date \_\_\_\_\_  
 Figure \_\_\_\_\_

| Depth | Lithology and Physical Condition                    | Well Construction Detail | Notes   |
|-------|---|--------------------------|---|
|       | SANDY CLAY mod BROWN - SL MOD ST                    | CL/SC                    |   |
| -10   | SAND VF-F GRAY. SL CLAYEY, mod. BROWN m-well sorted | SC                       | couldn't find where SANDS mixed<br>DRILL @ 9'<br>15/12" |
|       | CLAY med-DK BROWN. SL. MOIST SL-MOD SANDY           | CLS                      |   |
| -20   | CLAY med-DK BROWN - Grey BROWN Fe STM.              | CLS                      | DRILL @ 19'<br>30/12"                                   |
|       | Light layer? IRON RAY                               |                          |   |
| -30   | CLAY DK BROWN SANDY GRAY                            |                          | DRILL @ 29' =<br>18/12"                                 |
| -40   |   |                          |   |
| -50   |   |                          |   |

Project \_\_\_\_\_  
 Elevation \_\_\_\_\_  
 Date Drilled 7-25-88

Type of Rig CME-55  
 Total Depth \_\_\_\_\_  
 Logged By JD

SUBSURFACE EXPLORATION LOG

Industrial Compliance Inc.




511 Orchard Street, Golden, CO 80401

Job No \_\_\_\_\_

Date \_\_\_\_\_

Figure \_\_\_\_\_

| Depth | Lithology and Physical Condition                                  | Well Construction Detail | Notes  |
|-------|---|--------------------------|--|
|       | covt 2  |                          |  |
| 60    | Danvey Fm<br><br>HARD SS LAYERS. < 1'<br>possible water after 65' | SH                       |  |
| 70    |   | SH                       |  |
| 80    | 1' HARD SS.   | SH                       | Pull out @ 79'<br>WAIT 2 HOURS FOR<br>water - NO water |
| 90    | possible water.<br>V. SANDY - V. gr. silty water                  |                          |  |
| 100   | 99'   |                          | water @<br>59' after delay                             |

|  |  |                           |
|--|--|---------------------------|
| Project _____  |  | Type of Rig <u>CNO 55</u> |
| Elevation _____  |  | Total Depth <u>99'</u>    |
| Date Drilled <u>2-25-84</u>  |  | Logged By <u>SD</u>       |
| SUBSURFACE EXPLORATION LOG   |  | Job No _____              |
| Industrial Compliance Inc.  |  | Date _____                |
| 511 Orchard Street Golden, CO 80401  |  | Figure _____              |

| Depth | Graphic Log | Lithology and Physical Condition   | Well Construction Detail | Notes                                       |
|-------|-------------|--|--------------------------|---|
|       |             | SE-20  |                          |   |
|       |             | 8  |                          |   |
| 5     |             | <p>SHINY CLAY<br/>MOD ST, BROWN<br/>SL MOIST</p>                                 | CC                       |   |
|       |             | <p>MOCK MOIST</p>  |                          |   |
| 10    |             | <p>SAND, SOME CLAY, MOD BROWN,<br/>F GRAINED M-S SILENT<br/>water approx 11'</p> | SC                       | DRIVE @ 9' =<br>6/12"                       |
| 15    |             | <p>SAND<br/>F-MOD GRA. MOD MOD BROWN<br/>SL CLAYEY, WET.</p>                     | SC                       |   |
|       |             | <p>BDR @ 17'<br/>GYREN CLS MOIST - V MOIST</p>                                   |                          | DRIVE @ 17' =                               |
| 20    |             | <p>FOC 20</p>  |                          | water @<br>12' 1" dia<br>DELOC. IN<br>H=30. |
| 25    |             |  |                          |   |

TH-20

|                             |                              |
|-----------------------------|------------------------------|
| Project _____               | Type of Rig <u>CME 55</u>    |
| Elevation _____             | Total Depth <u>20</u>        |
| Date Drilled <u>7-25-88</u> | Logged By <u>[Signature]</u> |

| Depth | Lithology and Physical Condition   | Well Construction Detail | Notes                    |
|-------|--|--------------------------|--------------------------|
|       | <p style="text-align: right;">- E - 2</p> <p style="text-align: center;">4</p> <p>SAND/CLAY<br/>Dey - SL moist</p> | SC                       |                          |
| 10    | <p>SS<br/>SL moist</p>   | SC                       | URINE @ 9' = 18/72"      |
|       | <p>CLS BK<br/>LIG 5/CLS</p>  | CL                       |                          |
| 20    | <p>CLS M GYSEN-BRN, SL SAND/<br/>SL moist, TR. LIG.<br/>ABN Fe Str</p>   | CLS                      | DR @ 19' = 26/12"        |
| 30    | <p>CLS MED GYSEN-BRN TR. SAND/<br/>SL moist ABN Fe Str<br/>BUT BRN.</p>  | CLS                      | DR @ 29' = 31/12"        |
| 40    | <p>BRMING DAEKEL<br/>SL moist</p>  | CLS                      |                          |
| 50    | <p>TOC 49'</p>   |                          | DEY @ 49' after<br>TEST. |

Project \_\_\_\_\_  
 Elevation \_\_\_\_\_  
 Date Drilled 7-25-88

Type of Rig Cme-55  
 Total Depth 49'  
 Logged By [Signature]



| Depth | Graphic Log | Lithology and Physical Condition | Well Construction Detail | Notes                 |
|-------|-------------|----------------------------------|--------------------------|-----------------------|
|       |             | SANDY CLAY                       | CL                       |                       |
| -10   |             | SAND VF-F gr. med brown          | SC                       | 150 DRIPS (see 210.2) |
| -20   |             | CLAY med-LK brown SL SANDY       | CLS                      |                       |
|       |             | Beaming grey color ABN. Fe Stn.  | CLS                      |                       |
|       |             | POSS. lignite layer              |                          |                       |
| -30   |             | CLAY - LK BROWN - Grey Brown     | CLS                      |                       |
| -40   |             |                                  |                          |                       |
| -50   |             |                                  |                          |                       |

Project 2-1815  
 Elevation \_\_\_\_\_  
 Date Drilled 7-26-88

Type of Rig Cno 55  
 Total Depth 79'  
 Logged By SC

| Depth<br>Graphic Log                               | Lithology and Physical Condition   | Well Construction<br>Detail | Notes  |
|--|--|-----------------------------|--|
| <p>60</p> <p>70</p> <p>80</p> <p>90</p> <p>100</p> | <p>DRY PER SMOKE</p> <p>HARD SS MUD &lt; 1'</p> <p>TO @ 79' PIPE SET @ 77'</p> |                             | <p>DRY @ 77'</p> <p>plug<br/>after DRUG.</p> |

Project 2-1815

Elevation \_\_\_\_\_

Date Drilled 7-26-88

Type of Rig \_\_\_\_\_

Total Depth 79'

Logged By \_\_\_\_\_

| Depth | Graphic Log | Lithology and Physical Condition   | Well Construction Detail | Notes                 |
|-------|-------------|--|--------------------------|-----------------------|
|       |             | St. 0-1<br>6   |                          |                       |
|       |             | STRONG SAND med BROWN, SL MOIST  | CL/SC                    |                       |
| 10    |             | Decreasing Struc<br>MOD. SANDY S.A.<br>med BROWN SL MOIST                                      | CL                       | DR. @ 9' = 12/12"     |
|       |             | Bedrock  | CLS                      |                       |
| 20    |             | DK GRAY BROWN-BROWN<br>TO 21' - TO CASE WATER<br>MOD-SL STRONG.                                | CLS                      | DRIVE @ 19' = 20/12"  |
|       |             | LEAN SAND  | CLS                      |                       |
| 30    |             | 1/2 SAND BROWN - DK GRAY CLAY<br>SL MOIST. PASS SOME HG.<br>Banding med grey CLAY.<br>NO SAND, | CLS                      | DRIVE @ 29' = 26/12"  |
| 40    |             | DRUG EASED UP - PASS. WATER.<br>Banding INCR. MOIST<br>SANDY-SANDY                             |                          |                       |
|       |             | ↓  |                          |                       |
| 50    |             | DRUG   |                          | WL @ 45'<br>then DRUG |

Project 2-1815  
 Elevation \_\_\_\_\_  
 Date Drilled 7-26-88

Type of Rig CME-55  
 Total Depth 49'  
 Logged By [Signature]



SUBSURFACE EXPLORATION LOG

Job No \_\_\_\_\_  
 Date \_\_\_\_\_  
 Figure \_\_\_\_\_

| Depth | Graphic Log | Lithology and Physical Condition                        | Well Construction Detail | Notes                   |
|-------|-------------|---|--------------------------|-------------------------|
|       |             | S/O. 7  |                          |                         |
|       |             | ANDY only med brown                                     | CL/SC                    |                         |
| 5     |             | mod grey brown - brown<br>SE SANDY<br>Bedrock @ 5'      | CL/SC<br>CL5             | Drill @ 9' =<br>19/12"  |
| 10    |             | Festr.<br>ABNT Gypsum XLS                               | CL5                      |                         |
| 15    |             | some sandy layers < 1' BY DRILL<br>some organic matter. | CL5                      |                         |
| 20    |             | mod med grey brown (CL)<br>Poss. Lig @ 21'              | CL5                      | Drill @ 19' =<br>19/12" |
| 25    |             | can't turn next sheet                                   |                          |                         |

Project 2-1815  
 Elevation \_\_\_\_\_  
 Date Drilled 7-25-88

Type of Rig Cme 55  
 Total Depth \_\_\_\_\_  
 Logged By JA

| Depth  | Graphic Log   | Lithology and Physical Condition                             | Well Construction Detail | Notes  |
|--|---|--|--------------------------|--|
|  |   | SE-06<br>cont SD 7   |                          |  |
| 30   |   | CU. L-10 / spray. <sup>TRNT</sup> F-2 str<br>2' dig. and ten |                          | DRY @ 29' =<br>16/12"                              |
| 35   |   |  |                          |  |
| 40   |   | Den. Fin<br>Blue grey shale                                  | 5+                       |  |
| 45   |   |  |                          |  |
| 50   |   |  |                          |  |
| 59   |  | Poss. water @ 56'  |                          | DRY @ 59'<br>after 20' dia<br>might make<br>water! |
| Project <u>2-1815</u>  |   | Type of Rig <u>Cme 55</u>                                    |                          |  |
| Elevation _____  |   | Total Depth <u>59'</u>                                       |                          |  |
| Date Drilled <u>4-26-88</u>  |   | Logged By <u>SD</u>  |                          |  |
| SUBSURFACE EXPLORATION LOG   |   |  | Job No. _____            |  |
| Industrial Compliance Inc.  |   |  | Date: _____              |  |
| 511 Orchard Street Golden, CO 80401  |   |  | Figure _____             |  |

|   |  |                    |                     |                        |
|---|--|--------------------|---------------------|------------------------|
| LOCATION OF BORING<br>↑ N<br>88PL Ave<br>SB-27<br>0 |  | JCEI NO.<br>2-1815 | CLIENT<br>CSI       | LOCATION<br>Wayne Farm |
| DRILLING METHOD: CME Auger<br>Ring                  |  |                    | BORING NO.<br>SB-27 |                        |
| SAMPLING METHOD: Grab, split                        |  |                    | SHEET<br>1 of 3     |                        |
| WATER LEVEL   |  |                    | START TIME          | FINISH TIME            |
| TIME  |  |                    | DATE                | DATE                   |
| CASING DEPTH  |  |                    | DATE<br>7/26/08     |                        |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_ SURFACE CONDITIONS: Br Si SA

| SAMPLER TYPE | INCHES DRIVER INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|--------------------------------|-----------------|-------------------------|-------------------|---------------|------------|---|
|              |                                |                 |                         |                   | 0             | CLC        | Sandy clay  |
|              |                                |                 |                         |                   | 1             |            |   |
|              |                                |                 |                         |                   | 2             |            |   |
|              |                                |                 |                         |                   | 3             |            |   |
|              |                                |                 |                         |                   | 4             |            | Becoming calcareous   |
|              |                                |                 |                         |                   | 5             |            |   |
|              |                                |                 |                         |                   | 6             |            |   |
|              |                                |                 |                         |                   | 7             |            |   |
| SPT 18/18    |                                |                 | A-95 14/12"             |                   | 8             | CLS        | Lt-med gy claystone - bedrock                                   |
|              |                                |                 |                         |                   | 9             |            |   |
|              |                                |                 |                         |                   | 10            |            |   |
|              |                                |                 |                         |                   | 1             |            |   |
|              |                                |                 |                         |                   | 2             |            | @ ~12' sand, v.f. gravel, absent clay, Lt-med brown             |
|              |                                |                 |                         |                   | 3             | SMA<br>WL  |   |
|              |                                |                 |                         |                   | 4             |            |   |
|              |                                |                 |                         |                   | 5             |            |   |
|              |                                |                 |                         |                   | 6             | CLS        |   |
|              |                                |                 |                         |                   | 7             |            |   |
|              |                                |                 |                         |                   | 8             |            |   |
| SPT 18/18    |                                |                 | 26/12<br>14-205         |                   | 9             | CLS        | Lt-med DK Gy, claystone, some iron staining, trace organic mat. |

DRILLING CONTR. Carson

DATE 7/24/08 CHK'D BY SA

LOCATION OF BORING

JOB NO

CLIENT

LOCATION

2-1815

CSF

Wagner Farm

DRILLING METHOD:

See p 1

BORING NO

SB-27

SHEET

2 of 3

SAMPLING METHOD:

See p 1

DRILLING

START TIME

WATER LEVEL

FINISH TIME

TIME

DATE

DATE

CASING DEPTH

See p 1

DATUM

ELEVATION

SURFACE CONDITIONS:

See p 1

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>DEPTH | BLOWS/FT.<br>SAMPLER | DEPTH<br>IN FEET | SOIL GRAPH |
|--------------|-----------------------------------|-----------------|--------------------|----------------------|------------------|------------|
|              |                                   |                 |                    |                      | 20               |            |
|              |                                   |                 |                    |                      | 1                |            |
|              |                                   |                 |                    |                      | 2                |            |
|              |                                   |                 |                    |                      | 3                |            |
|              |                                   |                 |                    |                      | 4                |            |
|              |                                   |                 |                    |                      | 5                |            |
|              |                                   |                 |                    |                      | 6                |            |
|              |                                   |                 |                    |                      | 7                |            |
|              |                                   |                 |                    |                      | 8                |            |
| SPT          | 18/18                             |                 | 44/18              | 44/18                | 9                |            |
|              |                                   |                 |                    |                      | 30               |            |
|              |                                   |                 |                    |                      | 1                |            |
|              |                                   |                 |                    |                      | 2                |            |
|              |                                   |                 |                    |                      | 3                |            |
|              |                                   |                 |                    |                      | 4                |            |
|              |                                   |                 |                    |                      | 5                |            |
|              |                                   |                 |                    |                      | 6                |            |
|              |                                   |                 |                    |                      | 7                |            |
|              |                                   |                 |                    |                      | 8                |            |
|              |                                   |                 |                    |                      | 9                |            |
|              |                                   |                 |                    |                      | 4                |            |

SM SiSa - v. fine gr. lt-med br  
ML  
CLs DK gy claystone, Fe stain,  
slk moist

SPT

DRILLING CONTR. *CSF*

BY *SD* DATE *7/26/00* CHK'D BY

DATE *7/26/00* CHK'D BY

|                    |  |                  |            |             |            |
|--------------------|--|------------------|------------|-------------|------------|
| LOCATION OF BORING |  | JOB NO.          | CLIENT     | LOCATION    |            |
| <i>See p. 1</i>    |  | 2-1815           | CSI        | Wagner Farm |            |
|                    |  | DRILLING METHOD: |            |             | BORING NO. |
|                    |  | <i>See p. 1</i>  |            |             | SB-27      |
|                    |  | SAMPLING METHOD: |            |             | SHEET      |
|                    |  |                  | 3 of 3     |             |            |
|                    |  |                  | DRILLING   |             |            |
| WATER LEVEL        |  |                  | START TIME | FINISH TIME |            |
| TIME               |  |                  |            |             |            |
| DATE               |  |                  | DATE       | DATE        |            |
| CASING DEPTH       |  |                  |            |             |            |
| 57' open           |  |                  |            | 7/24/00     |            |

DRILLING CONTR. *Casida*

| DATUM        |                                 | ELEVATION       |                           | SURFACE CONDITIONS: |               |   |
|--------------|---------------------------------|-----------------|---------------------------|---------------------|---------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECORDED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH                                      |
|              |                                 |                 |                           |                     | 40            |   |
|              |                                 |                 |                           |                     | 1             |   |
|              |                                 |                 |                           |                     | 2             |   |
|              |                                 |                 |                           |                     | 3             |   |
|              |                                 |                 |                           |                     | 4             | Possible water @ 44'                            |
|              |                                 |                 |                           |                     | 5             | CLS by dense claystone                          |
|              |                                 |                 |                           |                     | 6             |   |
|              |                                 |                 |                           |                     | 7             |   |
|              |                                 |                 |                           |                     | 8             |   |
|              |                                 |                 |                           |                     | 9             |   |
|              |                                 |                 |                           |                     | 50            | SUA   |
|              |                                 |                 |                           |                     | 1             |   |
|              |                                 |                 |                           |                     | 2             |   |
|              |                                 |                 |                           |                     | 3             |   |
|              |                                 |                 |                           |                     | 4             | CLS   |
|              |                                 |                 |                           |                     | 5             | SUA   |
|              |                                 |                 |                           |                     | 6             |   |
|              |                                 |                 |                           |                     | 7             |   |
|              |                                 |                 |                           |                     | 8             |   |
|              |                                 |                 |                           |                     | 59            | Claystone - gray T.D @ 59' - Dry after drilling |
|              |                                 |                 |                           |                     | 60            |   |

DATE *7/24/00* CHK'D BY *SD*



|  |  |                  |                    |                         |
|--|--|------------------|--------------------|-------------------------|
| LOCATION OF BORING<br>↑ N<br>88th Ave<br>05B-1<br>~240' W                |  | JOB NO<br>2-1315 | CLIENT<br>CSI      | LOCATION<br>Waynes Farm |
| DRILLING METHOD: C.M.E-75 w/<br>6" ID - 3 3/4" OD Hollow stem<br>Augers. |  |                  | BORING NO<br>SB-28 | SHEET<br>1 of 4         |
| SAMPLING METHOD Calif./Split spoon/<br>Grab                              |  |                  | DRILLING           |                         |
| WATER LEVEL  |  |                  | START TIME<br>0925 | FINISH TIME             |
| TIME   |  |                  | DATE<br>8/23/88    | DATE                    |
| DATE   |  |                  | CASING DEPTH       |                         |

DRILLING CONTR. De Ann Exp.

| DATUM        |                                  | ELEVATION       |                                       | SURFACE CONDITIONS: |               |            |
|--------------|----------------------------------|-----------------|---------------------------------------|---------------------|---------------|------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH              | BLOWS/FT SAMPLER    | DEPTH IN FEET | SOIL GRAPH |
|              |                                  |                 |                                       | 19<br>16 (20)       | 0             | ML<br>SC   |
|              |                                  |                 |                                       |                     | 1             |            |
|              |                                  |                 |                                       |                     | 2             |            |
|              |                                  |                 |                                       |                     | 3             |            |
|              |                                  |                 |                                       |                     | 4             |            |
| Calif        | 18/18                            | 5               | SS-1<br>5-6.5<br>10<br>16 (20)        | 6                   | 5             |            |
|              |                                  |                 |                                       |                     | 6             |            |
|              |                                  |                 |                                       |                     | 7             |            |
|              |                                  |                 |                                       |                     | 8             |            |
|              |                                  |                 |                                       |                     | 9             |            |
| Calif        | 18/18                            | 10              | No Sample<br>12-11.5<br>13<br>17 (29) | 9                   | 10            | SE         |
|              |                                  |                 |                                       |                     | 1             | CL         |
|              |                                  |                 |                                       |                     | 2             |            |
|              |                                  |                 |                                       |                     | 3             |            |
|              |                                  |                 |                                       |                     | 4             |            |
| SBP          | 18/18                            | 15              | 14<br>18<br>20 (30) Grab sample       | 14                  | 15            |            |
|              |                                  |                 |                                       |                     | 6             |            |
|              |                                  |                 |                                       |                     | 7             |            |
|              |                                  |                 |                                       |                     | 8             |            |
|              |                                  |                 |                                       |                     | 9             |            |
| 18/18        |                                  | 20              | 12<br>18 (30) Grab                    | 12                  | 20            |            |

Br si sa w/ some cl - recently disked field

Auger cuttings - br si sd cl, moist

Br-1/4 gy si sa cl w/ some thin si sa interbeds some iron staining present, moist

Lt. Br-br si sa cl w/ some thin si si sa lenses some iron staining, moist - grades to olive gy clay at 11' w/ 2-3" of si si sa above. clay dy - silty

CL Auger cutting - DK br si cl moist

Proctor #20 bag sample collected 10-30'

Olive gy clay w/ si sand lenses - 2-3" thick dry - silty moist - olive gy cl - dry iron staining in cl + sa

Olive gy - gy cl w/ abun. iron staining grades to dk gy to dk cl w/ abun carbon & iron staining dry

DATE 8/23/88 CHK'D BY

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|                    |  |            |                     |          |
|--------------------|--|------------|---------------------|----------|
| LOCATION OF BORING |  | JOB NO     | CLIENT              | LOCATION |
| DRILLING METHOD:   |  |            | BORING NO:<br>55-28 |          |
| SAMPLING METHOD:   |  |            | SHEET<br>2 of 4     |          |
| WATER LEVEL        |  |            | 39.5                | 39.2     |
| TIME               |  |            | 1120                | 1150     |
| DATE               |  |            | 6/22/00             | "        |
| CASING DEPTH       |  |            | 37                  | 27       |
| DRILLING           |  | START TIME | FINISH TIME         |          |
| DATE               |  | DATE       |                     |          |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH    | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH       | SURFACE CONDITIONS  |
|--------------|----------------------------------|-----------------|-----------------------------|------------------|---------------|------------------|---|
|              |                                  |                 |                             |                  | 0             | CL               |   |
|              |                                  |                 |                             |                  | 1             | CL<br>Crown zone |   |
|              |                                  |                 |                             |                  | 2             |                  |   |
|              |                                  |                 |                             |                  | 3             |                  |   |
|              |                                  |                 |                             |                  | 4             |                  |   |
| Calif        | 18 / 18                          | 25              | 55-2<br>35<br>47<br>55/53"  |                  | 25            | CL<br>SE         | Buff - H gy s sa cl w/ some 2-3" H br<br>Ei sa lenses, Alum iron staining<br>dry          |
|              |                                  |                 |                             |                  | 6             | CL               |   |
|              |                                  |                 |                             |                  | 7             |                  |   |
|              |                                  |                 |                             |                  | 8             |                  |   |
|              |                                  |                 |                             |                  | 9             |                  | 1100  |
| Calif        | 18 / 18                          | 30              | 55-3<br>39<br>52<br>38 (67) |                  | 30            | CL               | gy Cl. stone, iron stained <del>in</del> dry<br>No apparent sand lenses<br>(Sample - wet) |
|              |                                  |                 |                             |                  | 1             |                  |   |
|              |                                  |                 |                             |                  | 2             |                  |   |
|              |                                  |                 |                             |                  | 3             |                  | Drilling Soften up<br>4 auger cuts @ 35' br sa cl moist-                                  |
|              |                                  |                 |                             |                  | 4             |                  |   |
| Calif        | 18 / 18                          | 35              | 55-4<br>39<br>75/45" grad   |                  | 35            | SM<br>SW<br>1.1L | Brn F: gtz sand, moist-wet<br>Calif + grab sample   |
|              |                                  |                 |                             |                  | 6             |                  |   |
|              |                                  |                 |                             |                  | 7             |                  |   |
|              |                                  |                 |                             |                  | 8             |                  |   |
|              |                                  |                 |                             |                  | 9             |                  |   |
|              |                                  |                 |                             |                  | 40            |                  |   |

DRILLING CONTR.

CHK'D BY

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|                    |  |  |  |                  |  |                 |  |          |  |
|--------------------|--|--|--|------------------|--|-----------------|--|----------|--|
| LOCATION OF BORING |  |  |  | JOB NO           |  | CLIENT          |  | LOCATION |  |
|                    |  |  |  | DRILLING METHOD: |  |                 |  |          |  |
| SAMPLING METHOD:   |  |  |  |                  |  | SHEET<br>3 OF 4 |  | DRILLING |  |
| WATER LEVEL        |  |  |  | START TIME       |  | FINISH TIME     |  | DATE     |  |
| TIME               |  |  |  | DATE             |  | DATE            |  | DATE     |  |
| CASING DEPTH       |  |  |  | DATE             |  | DATE            |  | DATE     |  |

| DATUM        |                                  | ELEVATION       |                          | SURFACE CONDITIONS: |               |                |
|--------------|----------------------------------|-----------------|--------------------------|---------------------|---------------|----------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT SAMPLER    | DEPTH IN FEET | SOIL GRAPH     |
| Cal. F       | 18                               | 40              | 35-36                    | 21<br>30<br>38      | 40            | SW<br>SW<br>ML |
|              |                                  |                 |                          |                     | 1             |                |
|              |                                  |                 |                          |                     | 2             |                |
|              |                                  |                 |                          |                     | 3             |                |
|              |                                  |                 |                          |                     | 4             | C/S            |
| Cal. F       | 18                               | 45              | 55-56                    | 27<br>32<br>45      | 45            | SS             |
|              |                                  |                 |                          |                     | 6             |                |
|              |                                  |                 |                          |                     | 7             |                |
|              |                                  |                 |                          |                     | 8             |                |
|              |                                  |                 |                          |                     | 9             |                |
| SP           | 18                               | 50              | 40                       | 40                  | 50            | SS             |
|              |                                  |                 |                          |                     | 1             |                |
|              |                                  |                 |                          |                     | 2             |                |
|              |                                  |                 |                          |                     | 3             |                |
|              |                                  |                 |                          |                     | 4             |                |
| SP           | 18                               | 55              | 17                       | 17                  | 55            | SS             |
|              |                                  |                 |                          |                     | 6             |                |
|              |                                  |                 |                          |                     | 7             |                |
|              |                                  |                 |                          |                     | 8             |                |
|              |                                  |                 |                          |                     | 9             |                |
|              |                                  |                 |                          |                     | 60            |                |

Bright sand, moist

DK gy dense clstone

Drilling cont. to be hard from ~ 41.5'

gy clstone, dry <sup>sl. moist</sup> w/ iron staining

lt. br. f. gtz ss, dry

SS fabric

Bluegy clstone 51.1 - 51.5

Bluegy-dk gy clstone, dry

DRILLING CONTR

CHK'D BY

DATE

628.1 (3) (REV. 11-80)

|                    |  |  |  |         |        |            |             |
|--------------------|--|--|--|---------|--------|------------|-------------|
| LOCATION OF BORING |  |  |  | JOB NO  | CLIENT | LOCATION   |             |
| DRILLING METHOD:   |  |  |  |         |        | BORING NO  |             |
|                    |  |  |  |         |        | 58-28      |             |
| SAMPLING METHOD:   |  |  |  |         |        | SHEET      |             |
|                    |  |  |  |         |        | 4 of 4     |             |
|                    |  |  |  |         |        | DRILLING   |             |
| WATER LEVEL        |  |  |  | 50      |        | START TIME | FINISH TIME |
| TIME               |  |  |  | 1550    |        |            | 1540        |
| DATE               |  |  |  | 8/22/80 |        | DATE       | DATE        |
| CASING DEPTH       |  |  |  | 0       |        |            | 8/22/80     |

DRILLING CONTR.

| DATUM       |                                  |                 |                    | ELEVATION        |  | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS  |
|-------------|----------------------------------|-----------------|--------------------|------------------|--|---------------|------------|---|
| SAMPLE TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO          | BLOWS/FT SAMPLER |  |               |            |   |
|             |                                  |                 |                    |                  |  | 60            |            |   |
|             |                                  |                 |                    |                  |  | 1             |            | Drilling same material as 55' sample                                    |
|             |                                  |                 |                    |                  |  | 2             |            |   |
|             |                                  |                 |                    |                  |  | 3             |            |   |
|             |                                  |                 |                    |                  |  | 4             |            |   |
| St          | 18/18                            | 65              | 22<br>37<br>54     | Grab             |  | 65            |            | DK gy claystone, dry w/ some 1/2" - 1" HgX V.F. sil lenses - silty sand |
|             |                                  |                 |                    |                  |  | 6             |            |   |
|             |                                  |                 |                    |                  |  | 7             |            |   |
|             |                                  |                 |                    |                  |  | 8             |            |   |
|             |                                  |                 |                    |                  |  | 9             |            |   |
|             |                                  |                 |                    |                  |  | 70            |            |   |
|             |                                  |                 |                    |                  |  | 1             |            |   |
|             |                                  |                 |                    |                  |  | 2             |            |   |
|             |                                  |                 |                    |                  |  | 3             |            |   |
|             |                                  |                 |                    |                  |  | 4             |            |   |
| Calc        | 18/18                            | 75              | 55-7<br>49<br>80/5 | Grab             |  | 75            |            | Blue gy - grey claystone, w/ some dry crystalline (siliceous)           |
|             |                                  |                 |                    |                  |  | 6             |            |   |
|             |                                  |                 |                    |                  |  | 7             |            | Soil Boring Terminated @ 76.5'  |
|             |                                  |                 |                    |                  |  | 8             |            |   |
|             |                                  |                 |                    |                  |  | 9             |            |   |
|             |                                  |                 |                    |                  |  | 80            |            |   |

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|  |                                   |                    |                     |
|--|-----------------------------------|--------------------|---------------------|
| LOCATION OF BORING<br>7N<br>← 98th Ave<br> | JOB NO<br>2-1815                  | CLIENT<br>CSI      | LOCATION<br>Wagon   |
|  | DRILLING METHOD: CME-75           |                    | BORING NO.<br>SB-29 |
|  | Solid 4" Auger                    |                    | SHEET<br>1 of 4     |
|  | SAMPLING METHOD: Cal.f/split/grab |                    | DRILLING            |
| WATER LEVEL                                |                                   | START TIME<br>1620 | FINISH TIME         |
| TIME                                       |                                   | DATE<br>8/22/88    | DATE                |
| DATE                                       |                                   | CASING DEPTH       |                     |

DRILLING CONTR. Datum Explorer

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |               |  |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|---------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH                                       |
|              |                                  |                 |                           |                     | 0             | Br si sa w/ some clay, dry                       |
|              |                                  |                 |                           |                     | 1             | SC Br si sa cl, moist                            |
|              |                                  |                 |                           |                     | 2             | <del>SC</del>                                    |
|              |                                  |                 |                           |                     | 3             |  |
|              |                                  |                 |                           |                     | 4             | Br me-co gt <sup>si</sup> sa w/ some clay, moist |
| grab         |                                  |                 |                           |                     | 5             | grab   |
|              |                                  |                 |                           |                     | 6             | SML  |
|              |                                  |                 |                           |                     | 7             |  |
|              |                                  |                 |                           |                     | 8             |  |
|              |                                  |                 |                           |                     | 9             |  |
| spt          | 18                               | 10              |                           | 5 4 f               | 10            | grab Br fi-co si sa, moist                       |
|              |                                  |                 |                           |                     | 11            | @ 11.1' 14.6r si cl sa, moist (ie grades cl)     |
|              |                                  |                 |                           |                     | 12            |  |
|              |                                  |                 |                           |                     | 13            |  |
|              |                                  |                 |                           |                     | 14            |  |
|              |                                  |                 |                           |                     | 15            | SC   |
|              |                                  |                 |                           |                     | 16            | CL 14.5 - Auger cuttings Br si cl, moist         |
|              |                                  |                 |                           |                     | 17            |  |
|              |                                  |                 |                           |                     | 18            |  |
|              |                                  |                 |                           |                     | 19            |  |
| spt          | 18                               | 20              |                           | 13 15               | 20            | CL Br si sa cl dry - sl moist                    |
| grab         |                                  |                 |                           |                     |               | grab   |

BY JEC DATE 8/22/88 CHK'D BY \_\_\_\_\_

|                     |  |        |                    |             |
|---------------------|--|--------|--------------------|-------------|
| LOCATION OF BORING: |  | JOB NO | CLIENT             | LOCATION    |
| DRILLING METHOD     |  |        | BORING NO<br>SB-29 |             |
| SAMPLING METHOD     |  |        | SHEET<br>2 of 4    |             |
| WATER LEVEL         |  |        | START TIME         | FINISH TIME |
| TIME                |  |        | DATE               | DATE        |
| CASING DEPTH        |  |        | DRILLING           |             |
| DATE                |  |        | START TIME         | FINISH TIME |
| DATE                |  |        | DATE               | DATE        |

DRILLING CONTR

| DATUM        |                                  | ELEVATION       |                          | SURFACE CONDITIONS: |               |            |
|--------------|----------------------------------|-----------------|--------------------------|---------------------|---------------|------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH |
| SP           | 18 / 18                          | 20              | 70 / 15                  | 25 grab             | 20            |            |
|              |                                  |                 |                          |                     | 1             | CL         |
|              |                                  |                 |                          |                     | 2             |            |
|              |                                  |                 |                          |                     | 3             |            |
|              |                                  |                 |                          |                     | 4             |            |
| Calif        | 18 / 18                          | 25              | 55-1 / 15                | 20 grab             | 25            |            |
|              |                                  |                 |                          |                     | 6             |            |
|              |                                  |                 |                          |                     | 7             | CL         |
|              |                                  |                 |                          |                     | 8             |            |
|              |                                  |                 |                          |                     | 9             |            |
| Calif        | 18 / 18                          | 30              | 55-2 / 11, 13, 26        | 41                  | 30            |            |
|              |                                  |                 |                          |                     | 1             |            |
|              |                                  |                 |                          |                     | 2             |            |
|              |                                  |                 |                          |                     | 3             |            |
|              |                                  |                 |                          |                     | 4             |            |
| Calif        | 18 / 18                          | 35              | 55-3 / 11, 13, 26        | 41                  | 35            |            |
|              |                                  |                 |                          |                     | 6             |            |
|              |                                  |                 |                          |                     | 7             |            |
|              |                                  |                 |                          |                     | 8             |            |
|              |                                  |                 |                          |                     | 9             |            |
|              |                                  |                 |                          |                     | 40            |            |

Grades sandier @ ~ 21. Lt br-br si cl sa, moist  
some calcite deposit in sample

Br si, sa clay, w/ some thin fi sa lenses moist

Br. si sa cl, moist

pulled sample @ 1728

31. Si sa cl w/ some 1/4" pea gravel  
afew sand (br fi) stringers  
moist

8/23/88 Started drilling @ 745

CHK'D BY

DATE

BY

|                    |  |  |  |                 |  |              |  |           |        |
|--------------------|--|--|--|-----------------|--|--------------|--|-----------|--------|
| LOCATION OF BORING |  |  |  | JOB NO          |  | CLIENT       |  | LOCATION  |        |
|                    |  |  |  | DRILLING METHOD |  |              |  | BORING NO |        |
|                    |  |  |  |                 |  |              |  | 515-29    |        |
|                    |  |  |  | SAMPLING METHOD |  |              |  | SHEET     |        |
|                    |  |  |  |                 |  |              |  | 3 of 4    |        |
|                    |  |  |  |                 |  |              |  | DRILLING  |        |
|                    |  |  |  | WATER LEVEL     |  |              |  | START     | FINISH |
|                    |  |  |  | TIME            |  |              |  | TIME      | TIME   |
|                    |  |  |  | DATE            |  |              |  | DATE      | DATE   |
| DATUM              |  |  |  | ELEVATION       |  | CASING DEPTH |  |           |        |

DRILLING CONT'D

| SAMPLE TYPE    | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. / SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|----------------|----------------------------------|-----------------|--------------------------|---------------------|---------------|------------|--|
| Col. F 18/18   | 40                               | 55-4            | 36<br>25<br>39           | (24) grab           | 40            | CL         | lt br si v. fi sa cl, w/ some iron staining in clay dry - sl moist w/ occasional si. fi. sa (br) sand stringers                              |
| Col. F 15/15   | 45                               | 55-5            | 38<br>46<br>71/3"        | Grab                | 45            | ML / CL    | lt br - br v. fi sa w/ some clay, dry - sl moist some iron staining (i.e. less clay than above)  |
| Col. F 10"/10" |                                  | 55-6            | 37<br>85/4"              | Grab                | 50            | ML         | Br si/psa w/ trace clay, moist - damp (inside barrel wet) sl. ft. in barrel moist - damp so probably in saturated zone directly above sample |
|                |                                  |                 |                          |                     | 55            |            | Auger cutting - v. wet lt. br si cl/psa  |
|                |                                  |                 |                          |                     | 60            | CLS        | Stiffer Drilling   |

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                    |  |  |  |           |  |                    |  |            |  |            |  |             |  |
|--------------------|--|--|--|-----------|--|--------------------|--|------------|--|------------|--|-------------|--|
| LOCATION OF BORING |  |  |  | JOB NO    |  | CLIENT             |  | LOCATION   |  |            |  |             |  |
| DRILLING METHOD    |  |  |  |           |  | BORING NO<br>SB-29 |  |            |  |            |  |             |  |
| SAMPLING METHOD    |  |  |  |           |  | SHEET<br>4 of 4    |  |            |  |            |  |             |  |
| WATER LEVEL        |  |  |  |           |  | 57'                |  | 49.2       |  | 48.9       |  | 48.5        |  |
| TIME               |  |  |  |           |  | 940                |  | 1030       |  | 1045       |  | 1105        |  |
| DATE               |  |  |  |           |  | 8/23/88            |  | 8/23/86    |  | 8/23/86    |  | "           |  |
| CASING DEPTH       |  |  |  |           |  | 61.5' open         |  | 61.5' open |  | 61.5' open |  | "           |  |
| DATUM              |  |  |  | ELEVATION |  |                    |  | DRILLING   |  | START TIME |  | FINISH TIME |  |
|                    |  |  |  |           |  |                    |  |            |  |            |  |             |  |

DRILLING CONTR

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                                      |
|--------------|----------------------------------|-----------------|--------------------------|------------------|---------------|------------|--|
| SP<br>SP     | 18 / 18                          |                 | 24<br>24                 | 24               | 60            | C/S        | Gay claystone, w/ adobe iron staining<br>dry - sl. moist |
|              |                                  |                 |                          |                  | 1             |            |  |
|              |                                  |                 |                          |                  | 2             |            | Boring Terminated @ 61.5'                                |
|              |                                  |                 |                          |                  | 3             |            |  |
|              |                                  |                 |                          |                  | 4             |            |  |
|              |                                  |                 |                          |                  | 5             |            |  |
|              |                                  |                 |                          |                  | 6             |            |  |
|              |                                  |                 |                          |                  | 7             |            |  |
|              |                                  |                 |                          |                  | 8             |            |  |
|              |                                  |                 |                          |                  | 9             |            |  |
|              |                                  |                 |                          |                  | 0             |            |  |
|              |                                  |                 |                          |                  | 1             |            |  |
|              |                                  |                 |                          |                  | 2             |            |  |
|              |                                  |                 |                          |                  | 3             |            |  |
|              |                                  |                 |                          |                  | 4             |            |  |
|              |                                  |                 |                          |                  | 5             |            |  |
|              |                                  |                 |                          |                  | 6             |            |  |
|              |                                  |                 |                          |                  | 7             |            |  |
|              |                                  |                 |                          |                  | 8             |            |  |
|              |                                  |                 |                          |                  | 9             |            |  |
|              |                                  |                 |                          |                  | 0             |            |  |

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|  |  |                    |                    |                         |
|--|--|--------------------|--------------------|-------------------------|
| LOCATION OF BORING<br>88th Ave<br>               |  | JOB NO<br>2-1815   | CLIENT<br>CSI      | LOCATION<br>Waynes Farm |
| DRILLING METHOD: CME-75, 4"<br>solid stem augers |  |                    | BORING NO<br>SB-30 |                         |
| SAMPLING METHOD: Calif, split, grab              |  |                    | SHEET<br>1 of 4    |                         |
| WATER LEVEL                                      |  | START TIME<br>1:30 | FINISH TIME        |                         |
| TIME   |  | DATE<br>8/23/88    | DATE               |                         |
| DATE   |  | CASING DEPTH       |                    |                         |

| DATUM        |                                  | ELEVATION       |                          | SURFACE CONDITIONS: |               |  |
|--------------|----------------------------------|-----------------|--------------------------|---------------------|---------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH   |
|              |                                  |                 |                          |                     | 0             | CL DK br si v. fi sa cl, sl moist                  |
|              |                                  |                 |                          |                     | 1             |  |
|              |                                  |                 |                          |                     | 2             |  |
|              |                                  |                 |                          |                     | 3             | H. br si v. fi sa w/ some cl, sl moist             |
|              |                                  |                 |                          |                     | 4             | SM/CL  |
|              |                                  |                 |                          |                     | 5             |  |
| grab         |                                  |                 | 5-10'                    | grab                | 6             | Lt br si v. fi sa cl, sl moist (grab sample 5-10') |
|              |                                  |                 |                          |                     | 7             | CL   |
|              |                                  |                 |                          |                     | 8             |  |
|              |                                  |                 |                          |                     | 9             |  |
| split sp.    | 18 / 18                          |                 | 10 / 10                  | 67 / 18             | 10            | Br si cl w/ some v. fi sa sl moist                 |
|              |                                  |                 |                          |                     | 11            |  |
|              |                                  |                 |                          |                     | 12            |  |
|              |                                  |                 |                          |                     | 13            |  |
| split sp.    | 18                               |                 | 15 / 15                  | 13 / 13             | 15            | Lt br fi-me gt sa, sl moist                        |
|              |                                  |                 |                          |                     | 16            | trace of clay 16.2 - 16.5'                         |
|              |                                  |                 |                          |                     | 17            |  |
|              |                                  |                 |                          |                     | 18            |  |
|              |                                  |                 |                          |                     | 19            |  |
|              |                                  |                 |                          |                     | 20            | Auger Cuttings - Br si sa w/ some clay to silty cl |

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BY JEC  
DATE 8/23/88  
CHK'D BY

|                    |  |  |  |                  |        |          |             |
|--------------------|--|--|--|------------------|--------|----------|-------------|
| LOCATION OF BORING |  |  |  | JOB NO           | CLIENT | LOCATION |             |
|                    |  |  |  | DRILLING METHOD: |        |          | BORING NO   |
|                    |  |  |  |                  |        |          | JB-30       |
|                    |  |  |  | SAMPLING METHOD: |        |          | SHEET       |
|                    |  |  |  |                  |        |          | 2 of 4      |
|                    |  |  |  |                  |        |          | DRILLING    |
|                    |  |  |  | WATER LEVEL      |        |          | START TIME  |
|                    |  |  |  | TIME             |        |          | FINISH TIME |
|                    |  |  |  | DATE             |        |          | DATE        |
|                    |  |  |  | CASING DEPTH     |        |          |             |

| DATUM         |                                  | ELEVATION       |                          |                  |               | SURFACE CONDITIONS: |   |
|---------------|----------------------------------|-----------------|--------------------------|------------------|---------------|---------------------|---|
| SAMPLER TYPE  | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH          |   |
| Calif         | 18 / 18                          |                 | 20 / 21                  | 12 (30) bag      | 20            | ML                  | Br si cl v. fi sa w/ Abun white streaks (i.e. calcite?) dry - sl moist<br>No Calif saved<br>grades to dk br si cl @ 21.3' |
|               |                                  |                 |                          |                  | 1             |                     |   |
|               |                                  |                 |                          |                  | 2             |                     |   |
|               |                                  |                 |                          |                  | 3             |                     |   |
|               |                                  |                 |                          |                  | 4             |                     |   |
|               |                                  |                 |                          |                  | 5             |                     |   |
| Spt 3p        | 18 / 18                          |                 | 25 / 2                   | 8 (2) bag        | 25            | CL5                 | Lt br - dk br si v. fi sa cl, sl moist<br>some calcite + iron streaks   |
|               |                                  |                 |                          |                  | 6             |                     |   |
|               |                                  |                 |                          |                  | 7             |                     |   |
|               |                                  |                 |                          |                  | 8             |                     |   |
|               |                                  |                 |                          |                  | 9             |                     | Hit rock @ ~29' thin or 21" thick - probably comp. sandst<br>lens w/in claystn  |
| Calif 9" / 9" |                                  |                 | 30 / 30                  | 36 / 7 1/2"      | 30            | CL5                 | Greenish-Gy CL5 w/ some thin v. fi sa stringers<br>dry - sl moist<br>grades to iron stained v. fi sa (weath. ss) @ 31.2'  |
|               |                                  |                 |                          |                  | 1             |                     |   |
|               |                                  |                 |                          |                  | 2             | ML                  | br-yell   |
|               |                                  |                 |                          |                  | 3             |                     | Auger cutting iron stained si sa  |
|               |                                  |                 |                          |                  | 4             |                     |   |
| Calif 8" / 8" |                                  |                 | 35 / 7 1/2"              | 36 grab          | 35            |                     | Iron stain / si v. fi sa, dry - sl moist<br>(No cohesion) - <sup>Calif</sup> sample not obtainable                        |
|               |                                  |                 |                          |                  | 6             |                     |   |
|               |                                  |                 |                          |                  | 7             |                     |   |
|               |                                  |                 |                          |                  | 8             |                     |   |
|               |                                  |                 |                          |                  | 9             |                     |   |
|               |                                  |                 |                          |                  | 10            |                     |   |

DRILLING CONTR.

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                    |                      |         |                    |          |
|--------------------|----------------------|---------|--------------------|----------|
| LOCATION OF BORING |                      | JOB NO  | CLIENT             | LOCATION |
| DRILLING METHOD    |                      |         | BORING NO<br>56-30 |          |
| SAMPLING METHOD    |                      |         | SHEET<br>3 of 4    |          |
|                    |                      |         | DRILLING           |          |
| WATER LEVEL        | 48                   | 48.2    | START TIME         | 1615     |
| TIME               | 1530                 | 0920    | DATE               | 8/23/00  |
| DATE               | 8/23/00              | 8/24/00 |                    |          |
| CASING DEPTH       | 51.5' (and 55' open) |         |                    |          |

DRILLING CONTR.

| DATUM        |                                  | ELEVATION       |                          | SURFACE CONDITIONS: |               |            |  |
|--------------|----------------------------------|-----------------|--------------------------|---------------------|---------------|------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH |  |
| Calif        | 11 / 11                          |                 | 55-2 / 10                | 42 / 7 1/5          | grab          | 40         | SAA sl moist - moist   |
|              |                                  |                 |                          |                     |               | 1          |  |
|              |                                  |                 |                          |                     |               | 2          |  |
|              |                                  |                 |                          |                     |               | 3          |  |
|              |                                  |                 |                          |                     |               | 4          |  |
| Calif        | 12 / 12                          |                 | 55-3 / 45                | 39 / 6 5/8          | grab          | 45         | SAA sl coarser sa (i.e. fi - me gr sa) moist - alt, either at or near water table zone. Some thin competent ss lenses (sand cleaner than above sample) |
|              |                                  |                 |                          |                     |               | 6          |  |
|              |                                  |                 |                          |                     |               | 7          |  |
|              |                                  |                 |                          |                     |               | 8          |  |
|              |                                  |                 |                          |                     |               | 9          |  |
| Calif        |                                  |                 | 55-4 / 50                | 29 / 57             | grab          | 50         | SM / SP dk br me gr sa, wet  |
|              |                                  |                 |                          |                     |               | 1          |  |
|              |                                  |                 |                          |                     |               | 2          |  |
|              |                                  |                 |                          |                     |               | 3          | cls  |
|              |                                  |                 |                          |                     |               | 4          |  |
| Calif        |                                  |                 | 55-5 / 55                | 30 / 52             | grab          | 55         | gy claystone dry - sl moist  |
|              |                                  |                 |                          |                     |               | 6          |  |
|              |                                  |                 |                          |                     |               | 7          |  |
|              |                                  |                 |                          |                     |               | 8          |  |
|              |                                  |                 |                          |                     |               | 9          |  |
|              |                                  |                 |                          |                     |               | 60         |  |

CHK'D BY

DATE

628.1 (3) (REV. 11-00)

Drilling cont. @ 730 8/25/00 to a depth of 65' to verify clay

|                    |  |        |        |                    |             |
|--------------------|--|--------|--------|--------------------|-------------|
| LOCATION OF BORING |  | JOB NO | CLIENT | LOCATION           |             |
| DRILLING METHOD:   |  |        |        | BORING NO<br>SB-30 |             |
| SAMPLING METHOD:   |  |        |        | SHEET<br>4 of 4    |             |
| WATER LEVEL        |  |        |        | START TIME         | FINISH TIME |
| TIME               |  |        |        | DATE               | DATE        |
| DATE               |  |        |        | START TIME         | FINISH TIME |
| CASING DEPTH       |  |        |        | DATE               | DATE        |
| ELEVATION          |  |        |        | DATE               | DATE        |

DRILLING CONTR.

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLE | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS  |
|--------------|----------------------------------|-----------------|--------------------------|------------------|---------------|------------|---|
|              |                                  |                 |                          |                  | 60            |            | Hard drilling   |
|              |                                  |                 |                          |                  | 1             |            |   |
|              |                                  |                 |                          |                  | 2             |            |   |
|              |                                  |                 |                          |                  | 3             |            |   |
|              |                                  |                 |                          |                  | 4             |            |   |
| SPT 28       | 14 / 14                          |                 | 27 / 48 / 60 1/2" Grab   |                  | 65            | SM 58      | Br fi sa w/ abun dk matrix  |
|              |                                  |                 |                          |                  | 6             |            | @ 65.6' - 65.8' - Gy clst. loose sl. moist (sa above + below moist-wet) |
|              |                                  |                 |                          |                  | 7             |            |   |
|              |                                  |                 |                          |                  | 8             |            |   |
|              |                                  |                 |                          |                  | 9             |            |   |
|              |                                  |                 |                          |                  | 70            |            |   |
|              |                                  |                 |                          |                  | 1             |            |   |
|              |                                  |                 |                          |                  | 2             |            |   |
|              |                                  |                 |                          |                  | 3             |            |   |
|              |                                  |                 |                          |                  | 4             |            |   |
| SPT 28       | 14 / 14                          |                 | 31 / 37 / 100 1/2" Grab  |                  | 75            | SP         | Gy clst w/ gy grt sand lenses, sa moist-wet clay sl moist               |
|              |                                  |                 |                          |                  | 6             | SP         |   |
|              |                                  |                 |                          |                  | 7             |            | T.D. @ 76.5'  |
|              |                                  |                 |                          |                  | 8             |            |   |
|              |                                  |                 |                          |                  | 9             |            |   |
|              |                                  |                 |                          |                  | 0             |            |   |

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|  |                         |            |             |
|--|-------------------------|------------|-------------|
| LOCATION OF BORING<br>                       | JOB NO                  | CLIENT     | LOCATION    |
|  | 2-1815                  | CSI        | Wagner Farm |
|  | DRILLING METHOD: CME-75 |            | BORING NO   |
|  | 4" Solid Stem Augers    |            | 515 - 8     |
| SAMPLING METHOD: Calif. Split-Spoon and Grab |                         | SHEET      | 1 OF 4      |
| WATER LEVEL                                  |                         | START TIME | FINISH TIME |
| TIME   |                         | 0930       |             |
| DATE   |                         | DATE       | DATE        |
| CASING DEPTH                                 |                         | 8/24/88    |             |

DRILLING CONTR *Darwin Eng.*

| DATUM        |                                 |                 |            | ELEVATION         |           | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS: <i>Br. si. &amp; f. sa w/ some - 1</i>       |
|--------------|---------------------------------|-----------------|------------|-------------------|-----------|---------------|------------|--|
| SAMPLER TYPE | INCHES DRIVER INCHES PENETRATED | DEPTH OF CASING | SAMPLER NO | BLOWS/FT. SAMPLER |           |               |            |  |
|              |                                 |                 |            |                   |           | 0             |            | <i>dk br si cl, sl moist</i>                                     |
|              |                                 |                 |            |                   |           | 1             | <i>CL</i>  |  |
|              |                                 |                 |            |                   |           | 2             |            |  |
|              |                                 |                 |            |                   |           | 3             |            | <i>lt br si cl, sl moist</i>                                     |
|              |                                 |                 |            |                   |           | 4             |            | <i>w/ trace w. f. sa</i>   |
|              |                                 |                 |            |                   |           | 5             |            |  |
|              |                                 |                 |            |                   |           | 6             |            |  |
|              |                                 |                 |            |                   |           | 7             |            |  |
|              |                                 |                 |            |                   |           | 8             |            |  |
|              |                                 |                 |            |                   |           | 9             |            |  |
| <i>Calif</i> | <i>18</i>                       |                 |            |                   |           | 10            | <i>CLS</i> | <i>olivegy cl stone, aban. iron staining, dry - sl. moist</i>    |
|              | <i>16</i>                       |                 | <i>10</i>  | <i>13</i>         | <i>30</i> | 11            |            |  |
|              |                                 |                 |            |                   |           | 12            |            |  |
|              |                                 |                 |            |                   |           | 13            |            |  |
|              |                                 |                 |            |                   |           | 14            |            |  |
|              |                                 |                 |            |                   |           | 15            |            | <i>Auger cuttings SAMP</i>                                       |
|              |                                 |                 |            |                   |           | 16            |            |  |
|              |                                 |                 |            |                   |           | 17            |            | <i>Clay Bag Sample 2016 collected from 10 - 25' Proctor Test</i> |
|              |                                 |                 |            |                   |           | 18            |            |  |
|              |                                 |                 |            |                   |           | 19            |            |  |
|              |                                 |                 |            |                   |           | 20            |            |  |

BY *JEC* DATE *8/24/88* CHK'D BY

|                    |  |            |                    |          |
|--------------------|--|------------|--------------------|----------|
| LOCATION OF BORING |  | JOB NO     | CLIENT             | LOCATION |
| DRILLING METHOD    |  |            | BORING NO<br>SB-31 |          |
| SAMPLING METHOD    |  |            | SHEET<br>2 of 4    |          |
| WATER LEVEL        |  |            | 34.5'              |          |
| TIME               |  |            | 1140               |          |
| DATE               |  |            | 8/24/88            |          |
| CASING DEPTH       |  |            | 36.50m             |          |
| DATUM              |  | ELEVATION  |                    |          |
|                    |  | DRILLING   |                    |          |
|                    |  | START TIME | FINISH TIME        |          |
|                    |  | DATE       | DATE               |          |

DRILLING CONTR.

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLER NO / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|------------------|---------------|------------|---|
| SP           | 18 / 18                          |                 | 20                        | 53 / 42          | 20            | CL5        | Olive gy claystone, dry - <del>stained</del><br>round iron stain. |
|              |                                  |                 |                           |                  | 1             | ML         | 1' sand lens, 1/4 lb iron stained v.f. sa, dry                    |
|              |                                  |                 |                           |                  | 2             |            |   |
|              |                                  |                 |                           |                  | 3             | CL5        |   |
|              |                                  |                 |                           |                  | 4             |            |   |
|              |                                  |                 |                           |                  | 5             |            | Auger cutting - claystone   |
|              |                                  |                 |                           |                  | 6             |            |   |
|              |                                  |                 |                           |                  | 7             |            |   |
|              |                                  |                 |                           |                  | 8             |            | Auger cuttings - 1/4 lb si v.f. sa w/ some cl sl. moist           |
|              |                                  |                 |                           |                  | 9             | SM         |   |
| SP           | 16 / 16                          |                 | 30                        | 25 / 20 / 4      | 30            |            | 1/4 lb si v.f. glz sa w/ trace clay moist - damp                  |
|              |                                  |                 |                           |                  | 1             |            |   |
|              |                                  |                 |                           |                  | 2             |            |   |
|              |                                  |                 |                           |                  | 3             |            | Auger cutting - SAA, v. moist wet                                 |
|              |                                  |                 |                           |                  | 4             |            |   |
| Colt         | 16 / 16                          |                 | 35                        | 27 / 30 / 4      | 35            | CL5        | Olive gray to gy clstone, with thin iron staining. dry - sl moist |
|              |                                  |                 |                           |                  | 6             |            |   |
|              |                                  |                 |                           |                  | 7             |            |   |
|              |                                  |                 |                           |                  | 8             |            |   |
|              |                                  |                 |                           |                  | 9             |            | Auger cuttings CL5  |
|              |                                  |                 |                           |                  | 40            |            |   |

BY \_\_\_\_\_ DATE \_\_\_\_\_

CHK'D BY \_\_\_\_\_

|                    |  |  |  |        |  |        |                     |            |             |
|--------------------|--|--|--|--------|--|--------|---------------------|------------|-------------|
| LOCATION OF BORING |  |  |  | JOB NO |  | CLIENT |                     | LOCATION   |             |
| DRILLING METHOD:   |  |  |  |        |  |        | BORING NO           |            |             |
|                    |  |  |  |        |  |        | SB <del>30</del> 31 |            |             |
| SAMPLING METHOD:   |  |  |  |        |  |        | SHEET               |            |             |
|                    |  |  |  |        |  |        | 3 of 4              |            |             |
|                    |  |  |  |        |  |        | DRILLING            |            |             |
| WATER LEVEL        |  |  |  | TIME   |  | DATE   |                     | START TIME | FINISH TIME |
|                    |  |  |  |        |  |        |                     |            |             |
| CASING DEPTH       |  |  |  |        |  |        |                     | DATE       | DATE        |
|                    |  |  |  |        |  |        |                     |            |             |

DRILLING CONTR.

| DATUM        |                                   |                 |                           | ELEVATION            |  | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                  |
|--------------|-----------------------------------|-----------------|---------------------------|----------------------|--|---------------|------------|--------------------------------------|
| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | BLOWS/FT.<br>SAMPLER |  |               |            |                                      |
|              |                                   |                 |                           |                      |  | 40            |            | Auger grinding over rock @ 41-41.5   |
|              |                                   |                 |                           |                      |  | 1             |            | fine ss lens                         |
|              |                                   |                 |                           |                      |  | 2             |            |                                      |
|              |                                   |                 |                           |                      |  | 3             |            |                                      |
|              |                                   |                 |                           |                      |  | 4             | CIS        |                                      |
| Calif        | 16/16                             |                 | 55-230<br>44<br>145 @ 1/4 | 6106                 |  | 45            |            | olivaceous claystone, dry-silicified |
|              |                                   |                 |                           |                      |  | 6             |            |                                      |
|              |                                   |                 |                           |                      |  | 7             |            |                                      |
|              |                                   |                 |                           |                      |  | 8             |            |                                      |
|              |                                   |                 |                           |                      |  | 9             |            |                                      |
|              |                                   |                 |                           |                      |  | 50            |            | Auger cutting - same as above (SAA)  |
|              |                                   |                 |                           |                      |  | 1             |            |                                      |
|              |                                   |                 |                           |                      |  | 2             |            |                                      |
|              |                                   |                 |                           |                      |  | 3             |            |                                      |
|              |                                   |                 |                           |                      |  | 4             |            |                                      |
|              |                                   |                 |                           |                      |  | 55            |            | Auger cuttings - SAA                 |
|              |                                   |                 |                           |                      |  | 6             |            |                                      |
|              |                                   |                 |                           |                      |  | 7             |            |                                      |
|              |                                   |                 |                           |                      |  | 8             |            |                                      |
|              |                                   |                 |                           |                      |  | 9             |            |                                      |
|              |                                   |                 |                           |                      |  | 60            |            |                                      |

CHK'D BY

DATE

|                    |  |  |  |                  |        |          |            |
|--------------------|--|--|--|------------------|--------|----------|------------|
| LOCATION OF BORING |  |  |  | JOB NO           | CLIENT | LOCATION |            |
|                    |  |  |  | DRILLING METHOD: |        |          | BORING NO  |
|                    |  |  |  |                  |        |          | SB-31      |
|                    |  |  |  | SAMPLING METHOD: |        |          | SHEET      |
|                    |  |  |  |                  |        |          | 4 of 4     |
|                    |  |  |  | DRILLING         |        |          |            |
|                    |  |  |  | WATER LEVEL      |        |          | START TIME |
|                    |  |  |  | TIME             |        |          | 1530       |
|                    |  |  |  | DATE             |        |          | DATE       |
|                    |  |  |  | CASING DEPTH     |        |          | 8/24/88    |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|--------------------------|-------------------|---------------|------------|--|
| 30           |                                  |                 | 60                       | 27<br>34<br>60/5" | 0             | CLS        | DK gy Claystone, with some rust-iron staining dry (lower part - weather shale) |
|              |                                  |                 |                          |                   | 1             |            |  |
|              |                                  |                 |                          |                   | 2             |            |  |
|              |                                  |                 |                          |                   | 3             |            |  |
|              |                                  |                 |                          |                   | 4             |            |  |
|              |                                  |                 |                          |                   | 65            |            | Augercuttings SMA  |
|              |                                  |                 |                          |                   | 6             |            | Very hard drilling   |
|              |                                  |                 |                          |                   | 7             |            |  |
|              |                                  |                 |                          |                   | 8             |            |  |
|              |                                  |                 |                          |                   | 9             |            |  |
|              |                                  |                 |                          |                   | 70            |            | Augercuttings SMA  |
|              |                                  |                 |                          |                   | 1             |            | Very hard drilling   |
|              |                                  |                 |                          |                   | 2             |            |  |
|              |                                  |                 |                          |                   | 3             |            |  |
|              |                                  |                 |                          |                   | 4             |            |  |
| Colt A       |                                  |                 | 53<br>75                 | 55<br>60/4"       | 75            |            | DK gy weather-sh. - claystone dry - sl moist                                   |
|              |                                  |                 |                          |                   | 6             |            |  |
|              |                                  |                 |                          |                   | 7             |            |  |
|              |                                  |                 |                          |                   | 8             |            |  |
|              |                                  |                 |                          |                   | 9             |            |  |
|              |                                  |                 |                          |                   | 80            |            |  |

DRILLING CONTR.

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



DRILLING CONTR. De Leon Lyle

See Location Map

|                    |  |  |  |  |               |                       |                |
|--------------------|--|--|--|--|---------------|-----------------------|----------------|
| LOCATION OF BORING |  |  |  | JOB NO<br>2-1815   | CLIENT<br>CSI | LOCATION<br>Wagner    |                |
|                    |  |  |  | DRILLING METHOD<br>CME-75, 6"OD<br>3 1/4" ID hollow stem auger |               | BORING NO<br>SB-832   |                |
|                    |  |  |  | SAMPLING METHOD<br>Calif, split spoon, grab                    |               | SHEET<br>1 of 4       |                |
|                    |  |  |  | DRILLING   |               |                       |                |
|                    |  |  |  | WATER LEVEL  |               | START<br>TIME<br>1200 | FINISH<br>TIME |
|                    |  |  |  | TIME   |               | DATE<br>8/25/88       |                |
|                    |  |  |  | DATE   |               | DATE                  |                |
|                    |  |  |  | CASING DEPTH   |               |                       |                |

| DATUM           |                               |                    |                       | ELEVATION            |  | DEPTH<br>IN FEET | SOIL<br>GRAPH | SURFACE CONDITIONS.  |
|-----------------|-------------------------------|--------------------|-----------------------|----------------------|--|------------------|---------------|--|
| SAMPLER<br>TYPE | INCHES<br>DRIVEN<br>RECOVERED | DEPTH OF<br>CASING | SAMPLE<br>NO<br>DEPTH | BLOWS/FT.<br>SAMPLER |  |                  |               |  |
|                 |                               |                    |                       |                      |  | 0                |               | dk br sil cl w/ some fi sa                                   |
|                 |                               |                    |                       |                      |  | 1                | CL            | dk br sil cl w/ trace fi sa<br>sl moist                      |
|                 |                               |                    |                       |                      |  | 2                |               |  |
|                 |                               |                    |                       |                      |  | 3                |               |  |
|                 |                               |                    |                       |                      |  | 4                |               |  |
|                 |                               |                    |                       |                      |  | 5                |               | lt. br sil cl w/ trace f. sa<br>sl. moist                    |
|                 |                               |                    |                       |                      |  | 6                |               |  |
|                 |                               |                    |                       |                      |  | 7                |               |  |
|                 |                               |                    |                       |                      |  | 8                |               |  |
|                 |                               |                    |                       |                      |  | 9                |               |  |
|                 |                               |                    |                       |                      |  | 10               |               | DK br sil cl - (little to no fi sa)<br>sl. moist             |
|                 |                               |                    |                       |                      |  | 11               |               | (LS)   |
|                 |                               |                    |                       |                      |  | 12               |               |  |
|                 |                               |                    |                       |                      |  | 13               |               |  |
|                 |                               |                    |                       |                      |  | 14               |               |  |
|                 |                               |                    |                       |                      |  | 15               | CL            | DK br sil cl - (no fi sa)<br>sl moist                        |
|                 |                               |                    |                       |                      |  | 16               |               |  |
|                 |                               |                    |                       |                      |  | 17               |               |  |
|                 |                               |                    |                       |                      |  | 18               |               | Protor 25lb bag. Sample collected from<br>15' - 25' interval |
|                 |                               |                    |                       |                      |  | 19               |               | Auger cuttings: 1+ br sil cl w/ some v. fi sa                |
|                 |                               |                    |                       |                      |  | 20               |               |  |

BY: JEC DATE: 8/25/88 CHK'D BY:

|                    |  |  |  |              |             |           |  |
|--------------------|--|--|--|--------------|-------------|-----------|--|
| LOCATION OF BORING |  |  |  | JOB NO       | CLIENT      | LOCATION  |  |
| DRILLING METHOD:   |  |  |  |              |             | BORING NO |  |
|                    |  |  |  |              |             | 5B-32     |  |
| SAMPLING METHOD:   |  |  |  |              |             | SHEET     |  |
|                    |  |  |  |              |             | 2 of 4    |  |
|                    |  |  |  |              |             | DRILLING  |  |
| WATER LEVEL        |  |  |  | START TIME   | FINISH TIME |           |  |
| TIME               |  |  |  | DATE         | DATE        |           |  |
| DATE               |  |  |  | CASING DEPTH |             |           |  |

DRILLING CONTR.

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS   |               |            |  |
|--------------|----------------------------------|-----------------|---------------------------|----------------------|---------------|------------|--|
| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECORDED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | BLOWS/FT.<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH |  |
| 50t<br>5P    | 18<br>18                         |                 | 20<br>16                  | 11<br>12 (28) grab   | 0             | CL         | DK br si-cl w/ some interbedded organics iron stained grades to ltgy si-cl - to si-sa w/ some clay at 21' sl moist |
|              |                                  |                 |                           |                      | 1             | ML<br>CL   |  |
|              |                                  |                 |                           |                      | 2             |            |  |
|              |                                  |                 |                           |                      | 3             |            | Auger cuttings - dk br si-cl sl moist  |
|              |                                  |                 |                           |                      | 4             |            |  |
|              |                                  |                 |                           |                      | 5             |            |  |
|              |                                  |                 |                           |                      | 6             |            |  |
|              |                                  |                 |                           |                      | 7             |            |  |
|              |                                  |                 |                           |                      | 8             |            |  |
|              |                                  |                 |                           |                      | 9             |            |  |
|              |                                  |                 |                           |                      | 10            |            |  |
|              |                                  |                 |                           |                      | 11            |            |  |
|              |                                  |                 |                           |                      | 12            |            |  |
|              |                                  |                 |                           |                      | 13            |            |  |
|              |                                  |                 |                           |                      | 14            |            |  |
|              |                                  |                 |                           |                      | 15            |            |  |
|              |                                  |                 |                           |                      | 16            |            |  |
|              |                                  |                 |                           |                      | 17            |            |  |
|              |                                  |                 |                           |                      | 18            |            |  |
|              |                                  |                 |                           |                      | 19            |            |  |
|              |                                  |                 |                           |                      | 20            |            |  |
|              |                                  |                 |                           |                      | 21            |            |  |
|              |                                  |                 |                           |                      | 22            |            |  |
|              |                                  |                 |                           |                      | 23            |            |  |
|              |                                  |                 |                           |                      | 24            |            |  |
|              |                                  |                 |                           |                      | 25            | ML         | Auger cuttings - br si-cl fi sa sl moist   |
|              |                                  |                 |                           |                      | 26            |            |  |
|              |                                  |                 |                           |                      | 27            |            |  |
|              |                                  |                 |                           |                      | 28            |            |  |
|              |                                  |                 |                           |                      | 29            |            |  |
|              |                                  |                 |                           |                      | 30            |            |  |
|              |                                  |                 |                           |                      | 31            |            |  |
|              |                                  |                 |                           |                      | 32            |            |  |
|              |                                  |                 |                           |                      | 33            |            |  |
|              |                                  |                 |                           |                      | 34            |            |  |
|              |                                  |                 |                           |                      | 35            |            |  |
|              |                                  |                 |                           |                      | 36            |            |  |
|              |                                  |                 |                           |                      | 37            |            |  |
|              |                                  |                 |                           |                      | 38            |            |  |
|              |                                  |                 |                           |                      | 39            |            |  |
|              |                                  |                 |                           |                      | 40            |            |  |
|              |                                  |                 |                           |                      | 41            |            |  |
|              |                                  |                 |                           |                      | 42            |            |  |
|              |                                  |                 |                           |                      | 43            |            |  |
|              |                                  |                 |                           |                      | 44            |            |  |
|              |                                  |                 |                           |                      | 45            |            |  |
|              |                                  |                 |                           |                      | 46            |            |  |
|              |                                  |                 |                           |                      | 47            |            |  |
|              |                                  |                 |                           |                      | 48            |            |  |
|              |                                  |                 |                           |                      | 49            |            |  |
|              |                                  |                 |                           |                      | 50            |            |  |
|              |                                  |                 |                           |                      | 51            |            |  |
|              |                                  |                 |                           |                      | 52            |            |  |
|              |                                  |                 |                           |                      | 53            |            |  |
|              |                                  |                 |                           |                      | 54            |            |  |
|              |                                  |                 |                           |                      | 55            |            |  |
|              |                                  |                 |                           |                      | 56            |            |  |
|              |                                  |                 |                           |                      | 57            |            |  |
|              |                                  |                 |                           |                      | 58            |            |  |
|              |                                  |                 |                           |                      | 59            |            |  |
|              |                                  |                 |                           |                      | 60            |            |  |
|              |                                  |                 |                           |                      | 61            |            |  |
|              |                                  |                 |                           |                      | 62            |            |  |
|              |                                  |                 |                           |                      | 63            |            |  |
|              |                                  |                 |                           |                      | 64            |            |  |
|              |                                  |                 |                           |                      | 65            |            |  |
|              |                                  |                 |                           |                      | 66            |            |  |
|              |                                  |                 |                           |                      | 67            |            |  |
|              |                                  |                 |                           |                      | 68            |            |  |
|              |                                  |                 |                           |                      | 69            |            |  |
|              |                                  |                 |                           |                      | 70            |            |  |
|              |                                  |                 |                           |                      | 71            |            |  |
|              |                                  |                 |                           |                      | 72            |            |  |
|              |                                  |                 |                           |                      | 73            |            |  |
|              |                                  |                 |                           |                      | 74            |            |  |
|              |                                  |                 |                           |                      | 75            |            |  |
|              |                                  |                 |                           |                      | 76            |            |  |
|              |                                  |                 |                           |                      | 77            |            |  |
|              |                                  |                 |                           |                      | 78            |            |  |
|              |                                  |                 |                           |                      | 79            |            |  |
|              |                                  |                 |                           |                      | 80            |            |  |
|              |                                  |                 |                           |                      | 81            |            |  |
|              |                                  |                 |                           |                      | 82            |            |  |
|              |                                  |                 |                           |                      | 83            |            |  |
|              |                                  |                 |                           |                      | 84            |            |  |
|              |                                  |                 |                           |                      | 85            |            |  |
|              |                                  |                 |                           |                      | 86            |            |  |
|              |                                  |                 |                           |                      | 87            |            |  |
|              |                                  |                 |                           |                      | 88            |            |  |
|              |                                  |                 |                           |                      | 89            |            |  |
|              |                                  |                 |                           |                      | 90            |            |  |
|              |                                  |                 |                           |                      | 91            |            |  |
|              |                                  |                 |                           |                      | 92            |            |  |
|              |                                  |                 |                           |                      | 93            |            |  |
|              |                                  |                 |                           |                      | 94            |            |  |
|              |                                  |                 |                           |                      | 95            |            |  |
|              |                                  |                 |                           |                      | 96            |            |  |
|              |                                  |                 |                           |                      | 97            |            |  |
|              |                                  |                 |                           |                      | 98            |            |  |
|              |                                  |                 |                           |                      | 99            |            |  |
|              |                                  |                 |                           |                      | 100           |            |  |

BY \_\_\_\_\_ DATE \_\_\_\_\_

CHK'D BY \_\_\_\_\_

|                    |  |  |  |              |             |           |  |
|--------------------|--|--|--|--------------|-------------|-----------|--|
| LOCATION OF BORING |  |  |  | JOB NO       | CLIENT      | LOCATION  |  |
| DRILLING METHOD:   |  |  |  |              |             | BORING NO |  |
|                    |  |  |  |              |             | SB-32     |  |
| SAMPLING METHOD:   |  |  |  |              |             | SHEET     |  |
|                    |  |  |  |              |             | 3 of 4    |  |
|                    |  |  |  |              |             | DRILLING  |  |
| WATER LEVEL        |  |  |  | START TIME   | FINISH TIME |           |  |
| TIME               |  |  |  | DATE         | DATE        |           |  |
| DATE               |  |  |  | CASING DEPTH |             |           |  |

DATUM

ELEVATION

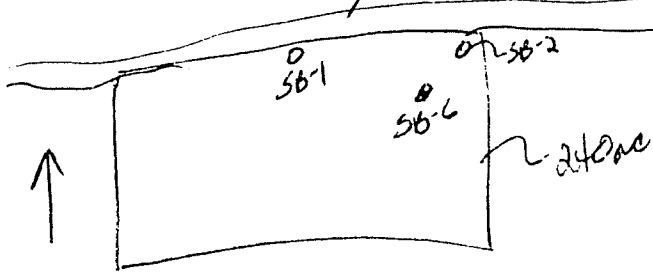
SURFACE CONDITIONS:

DRILLING CONTR.

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

928.1 (3) (REV. 11.00)

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | BLOWS/FT.<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                     |
|--------------|-----------------------------------|-----------------|---------------------------|----------------------|---------------|------------|---|
| SP<br>SP     | 18<br>10                          |                 |                           | Grab                 | 40            |            | Lt. gy clstone, dry                     |
|              |                                   |                 |                           |                      | 1             |            |   |
|              |                                   |                 |                           |                      | 2             | CLS        |   |
|              |                                   |                 |                           |                      | 3             |            |   |
| SP<br>SP     | 18<br>18                          |                 | 18<br>36                  | Grab                 | 4             | SS         |   |
|              |                                   |                 |                           |                      | 5             | ML         | Lt br - buff silty sa w/ some cl<br>dry |
|              |                                   |                 |                           |                      | 6             |            |   |
|              |                                   |                 |                           |                      | 7             |            |   |
|              |                                   |                 |                           |                      | 8             |            |   |
|              |                                   |                 |                           |                      | 9             |            |   |
| alif         | 18<br>18                          |                 | 35<br>50                  | 18<br>43             | 50            | CLS        | Orangey clst, dry - sl moist            |
|              |                                   |                 |                           |                      | 1             |            |   |
|              |                                   |                 |                           |                      | 2             |            |   |
|              |                                   |                 |                           |                      | 3             |            |   |
|              |                                   |                 |                           |                      | 4             |            |   |
|              |                                   |                 |                           |                      | 5             |            | Auger cuttings (SUA)                    |
|              |                                   |                 |                           |                      | 6             |            |   |
|              |                                   |                 |                           |                      | 7             |            |   |
|              |                                   |                 |                           |                      | 8             |            |   |
|              |                                   |                 |                           |                      | 9             |            |   |
|              |                                   |                 |                           |                      | 60            |            |   |

|  |                          |            |             |
|--|--------------------------|------------|-------------|
| LOCATION OF BORING   | JOB NO.                  | CLIENT     | LOCATION    |
| <i>88th Ave</i><br> | 2-1815                   | CSI        | Wagner Farm |
|  | DRILLING METHOD:         | BORING NO. |             |
|  | CME - 75, 6" OD          | SB-633     |             |
|  | 3/4 IN Hollow Stem Auger | SHEET      |             |
|  |                          | 1 of 4     |             |
|  | SAMPLING METHOD:         | DRILLING   |             |
|  | Calif, Split Spoon, Grab | START TIME | FINISH TIME |
|  |                          | 3:30       |             |
|  | WATER LEVEL              | DATE       | DATE        |
|  |                          | 8/25/88    |             |
|  | TIME                     |            |             |
|  | DATE                     |            |             |
|  | CASING DEPTH             |            |             |

DRILLING CONTR *Wagner Farm*

| DATUM        |               |                 |           |                   | ELEVATION     |            | SURFACE CONDITIONS:   |  |
|--------------|---------------|-----------------|-----------|-------------------|---------------|------------|---|--|
| SAMPLER TYPE | INCHES DRIVEN | DEPTH OF CASING | SAMPLE NO | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |   |  |
|              |               |                 |           |                   | 0             |            | <i>Br si fi sa w/ some clay (recently disked field)</i>                     |  |
|              |               |                 |           |                   | 1             | ML         | <i>Lt. br si fi sa w/ trace cl dry - sl moist</i>                           |  |
|              |               |                 |           |                   | 2             |            |   |  |
|              |               |                 |           |                   | 3             |            |   |  |
|              |               |                 |           |                   | 4             |            |   |  |
|              |               |                 |           |                   | 5             | CL         | <i>DK br si sa cl dry - sl moist</i>  |  |
|              |               |                 |           |                   | 6             |            |   |  |
|              |               |                 |           |                   | 7             |            |   |  |
|              |               |                 |           |                   | 8             |            |   |  |
|              |               |                 |           |                   | 9             |            |   |  |
|              |               |                 |           |                   | 10            | ML         | <i>Lt br - br si v. fi sa w/ some mgtz grains, some clay dry - sl moist</i> |  |
|              |               |                 |           |                   | 11            |            |   |  |
|              |               |                 |           |                   | 12            |            |   |  |
|              |               |                 |           |                   | 13            |            |   |  |
|              |               |                 |           |                   | 14            |            |   |  |
|              |               |                 |           |                   | 15            | CL         | <i>DK br to gy si cl, dry - sl moist</i>                                    |  |
|              |               |                 |           |                   | 16            |            |   |  |
|              |               |                 |           |                   | 17            |            |   |  |
|              |               |                 |           |                   | 18            |            |   |  |
|              |               |                 |           |                   | 19            |            |   |  |
|              |               |                 |           |                   | 20            |            |   |  |

BY *JPC* DATE *8/26/88* CHK'D BY

|                    |  |                 |        |                     |
|--------------------|--|-----------------|--------|---------------------|
| LOCATION OF BORING |  | JOB NO          | CLIENT | LOCATION            |
|                    |  | DRILLING METHOD |        | BORING NO<br>5B-633 |
|                    |  | SAMPLING METHOD |        | SHEET<br>2 OF 4     |
| DATUM              |  | ELEVATION       |        | DRILLING            |
|                    |  | WATER LEVEL     |        | START TIME          |
|                    |  | TIME            |        | FINISH TIME         |
|                    |  | DATE            |        | DATE                |
|                    |  | CASING DEPTH    |        |                     |

DRILLING CONTR

| SAMPLER TYPE | INCHS DRIVEN / INCHS RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|--------------------------------|-----------------|--------------------------|------------------|---------------|------------|--|
| Spt 5p       | 18 / 18                        |                 | 20                       | 14 20 26 Grab    | 20            | CL         | By silty w/ some f. sa stringers abund. iron staining, dry - sl. moist     |
|              |                                |                 |                          |                  | 1             |            |  |
|              |                                |                 |                          |                  | 2             |            |  |
|              |                                |                 |                          |                  | 3             |            |  |
|              |                                |                 |                          |                  | 4             |            |  |
| Spt 5p       | 18 / 18                        |                 | 25                       | 17 25 30 Grab    | 25            | CLS        | Olive gy clstone, abund iron staining<br>lt. no sand, dry                  |
|              |                                |                 |                          |                  | 6             |            | 8/26/98 - cont. drill - cuttings STA                                       |
|              |                                |                 |                          |                  | 7             |            |  |
|              |                                |                 |                          |                  | 8             |            |  |
|              |                                |                 |                          |                  | 9             |            |  |
| Spt 5p       | 18 / 18                        |                 | 30                       | 14 33 43 Grab    | 30            | CLS        | lt olive gy clst, abund iron staining, dry<br>quies a little sand at 31.4' |
|              |                                |                 |                          |                  | 1             |            |  |
|              |                                |                 |                          |                  | 2             |            |  |
|              |                                |                 |                          |                  | 3             |            |  |
|              |                                |                 |                          |                  | 4             |            |  |
| Spt 5p       | 18 / 18                        |                 | 35                       | 12 25 25 Grab    | 35            |            | Gy clst, some iron staining, dry - sl. moist<br>w/ a few carbon streaks    |
|              |                                |                 |                          |                  | 6             |            |  |
|              |                                |                 |                          |                  | 7             |            |  |
|              |                                |                 |                          |                  | 8             |            |  |
|              |                                |                 |                          |                  | 9             |            |  |
|              |                                |                 |                          |                  | 40            |            |  |

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                    |         |        |        |                     |
|--------------------|---------|--------|--------|---------------------|
| LOCATION OF BORING |         | JOB NO | CLIENT | LOCATION            |
| DRILLING METHOD    |         |        |        | BORING NO<br>5B-833 |
| SAMPLING METHOD:   |         |        |        | SHEET<br>3 of 4     |
| WATER LEVEL        |         |        |        | DRILLING            |
| TIME               | 8:20    |        |        | START TIME          |
| DATE               | 9/26/88 |        |        | FINISH TIME         |
| CASING DEPTH       | 40'     |        |        | DATE                |

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |               |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|---------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT SAMPLER    | DEPTH IN FEET | SOIL GRAPH  |
| Calif        | 18 / 18                          |                 | 55-1 / 40                 | 32 / 39             | 40            | CL5 Olive gy clst w/ some iron staining<br>dry - sl moist               |
|              |                                  |                 |                           |                     | 1             |   |
|              |                                  |                 |                           |                     | 2             |   |
|              |                                  |                 |                           |                     | 3             |   |
|              |                                  |                 |                           |                     | 4             |   |
| Spt / Sp     | 18 / 18                          |                 | 45 / 45                   | 15 / 27             | 45            | Grab SAA, more iron staining dry - sl moist                             |
|              |                                  |                 |                           |                     | 6             |   |
|              |                                  |                 |                           |                     | 7             |   |
|              |                                  |                 |                           |                     | 8             |   |
|              |                                  |                 |                           |                     | 9             |   |
| Calif        |                                  |                 | 55-7 / 50                 | 15 / 27             | 50            | gy-clayey clst dry - sl moist   |
|              |                                  |                 |                           |                     | 1             |   |
|              |                                  |                 |                           |                     | 2             | Grades to br-yellow clay at 51.2 dry - sl moist                         |
|              |                                  |                 |                           |                     | 3             | Grades to br-yellow s.f. sa 51.3 dry - sl moist<br>(sand iron stained)  |
|              |                                  |                 |                           |                     | 4             | ML  |
|              |                                  |                 |                           |                     | 5             |   |
| Spt          | 18 / 18                          |                 | 55-9 / 9                  | 15 / 9              | 55            | Grab Br yellow s.f. sa dry - sl moist                                   |
|              |                                  |                 |                           |                     | 6             | Grades to dk gy - bk cl w/ Adam carbon pieces throughout dry - sl moist |
|              |                                  |                 |                           |                     | 7             |   |
|              |                                  |                 |                           |                     | 8             |   |
|              |                                  |                 |                           |                     | 9             |   |
|              |                                  |                 |                           |                     | 60            |   |

DRILLING CONTR

BY \_\_\_\_\_ DATE \_\_\_\_\_

CHK'D BY \_\_\_\_\_

|                    |  |                  |        |                     |
|--------------------|--|------------------|--------|---------------------|
| LOCATION OF BORING |  | JOB NO           | CLIENT | LOCATION            |
|                    |  | DRILLING METHOD: |        | BORING NO<br>3B-835 |
|                    |  | SAMPLING METHOD: |        | SHEET<br>4 of 4     |
| DATUM              |  | WATER LEVEL      |        | DRILLING            |
| ELEVATION          |  | TIME             |        | START TIME          |
|                    |  | DATE             |        | FINISH TIME         |
|                    |  | CASING DEPTH     |        | DATE                |

| SAMPLER TYPE | INCHES DRIVEN RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER |      | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|-------------------------|-----------------|-------------------------|-------------------|------|---------------|------------|--|
| 5pr<br>3pr   | 18<br>18                |                 | 60                      | 38<br>48          | Grab | 60            |            | DK gy sil cl w/ some bk carbon pieces, dry - sl moist                    |
|              |                         |                 |                         |                   |      | 1             | NL         | Grabs to greenish-gy sil. f. sil dry - sl moist                          |
|              |                         |                 |                         |                   |      | 2             |            | w/ some dk gy - bk carbon nodules  |
|              |                         |                 |                         |                   |      | 3             |            |  |
|              |                         |                 |                         |                   |      | 4             |            |  |
|              |                         |                 |                         |                   |      | 6.5           | CLS        | Angular cuttings dk gy - bk cl dry - sl moist                            |
|              |                         |                 |                         |                   |      | 7             |            |  |
|              |                         |                 |                         |                   |      | 8             |            |  |
|              |                         |                 |                         |                   |      | 9             |            |  |
| cut          | 9<br>9                  |                 | 5-3<br>70               | 28<br>50/3        |      | 70            | CLS        | Gy - DK gy cl w/ carbon streaks dry - sl moist                           |
|              |                         |                 |                         |                   |      | 1             |            |  |
|              |                         |                 |                         |                   |      | 2             |            |  |
|              |                         |                 |                         |                   |      | 3             |            |  |
|              |                         |                 |                         |                   |      | 4             |            |  |
|              |                         |                 |                         |                   |      | 5             | CLS        | Angular cuttings gy cl dry - sl moist                                    |
|              |                         |                 |                         |                   |      | 6             |            |  |
|              |                         |                 |                         |                   |      | 7             |            |  |
|              |                         |                 |                         |                   |      | 8             |            |  |
|              |                         |                 |                         |                   |      | 9             |            | DK gy cl / stone w/ shale interbeds dry - sl moist, some carbon material |
| 5pr          | .5<br>.5                |                 | 80                      | 60.5              | Grab | 80            |            | T.D. Boring @ 80'  |

DRILLING CONTR

CHK'D BY

DATE

4311 (3) (REV. 11-80)

DRILLING CONTR *Debra L. Spitzer*

|   |                  |               |                                 |
|---|------------------|---------------|---------------------------------|
| LOCATION OF BORING:<br>                                 | JOB NO<br>2-1815 | CLIENT<br>CSI | LOCATION<br>LeBogner Farm       |
| DRILLING METHOD <i>CME-75</i><br>4" OD Solid Stem Auger |                  |               | BORING NO<br>515-34             |
| SAMPLING METHOD:  |                  |               | SHEET<br>1 of 4                 |
| WATER LEVEL   |                  |               | DRILLING<br>START TIME<br>11:15 |
| TIME  |                  |               | FINISH TIME                     |
| DATE  |                  |               | DATE<br>8/26/88                 |
| CASING DEPTH  |                  |               | DATE                            |

| DATUM        |                                  | ELEVATION       |                          | SURFACE CONDITIONS: <i>Br sil w/ some f gtz sa</i> |               |   |
|--------------|----------------------------------|-----------------|--------------------------|--|---------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER                                  | DEPTH IN FEET | SOIL GRAPH  |
|              |                                  |                 |                          |  | 0             | CL DK br sil w/ some sa dry-s/moist                       |
|              |                                  |                 |                          |  | 1             |   |
|              |                                  |                 |                          |  | 2             |   |
|              |                                  |                 |                          |  | 3             |   |
|              |                                  |                 |                          |  | 4             |   |
|              |                                  |                 |                          |  | 5             | CL lt br sil w/ some sa dry-s/moist                       |
|              |                                  |                 |                          |  | 6             |   |
|              |                                  |                 |                          |  | 7             |   |
|              |                                  |                 |                          |  | 8             |   |
|              |                                  |                 |                          |  | 9             |   |
|              |                                  |                 |                          |  | 10            | ML/SC lt br si sa w/ some cl dry                          |
|              |                                  |                 |                          |  | 11            |   |
|              |                                  |                 |                          |  | 12            |   |
|              |                                  |                 |                          |  | 13            |   |
|              |                                  |                 |                          |  | 14            |   |
|              |                                  |                 |                          |  | 15            | SC lt br si <del>gtz</del> gtz sa, fi-me w/ some clay dry |
|              |                                  |                 |                          |  | 16            |   |
|              |                                  |                 |                          |  | 17            |   |
|              |                                  |                 |                          |  | 18            |   |
|              |                                  |                 |                          |  | 19            |   |
|              |                                  |                 |                          |  | 20            | Auger cuttings SAA dry-s/moist<br>Some calcite deposits   |

BY: *EC*  
 DATE: 8/26/88  
 CHK'D BY:



|                     |  |        |        |                     |
|---------------------|--|--------|--------|---------------------|
| LOCATION OF BORING: |  | JOB NO | CLIENT | LOCATION            |
| DRILLING METHOD     |  |        |        | BORING NO<br>51B-34 |
| SAMPLING METHOD     |  |        |        | SHEET<br>2 of 4     |
| WATER LEVEL         |  |        |        | DRILLING            |
| TIME                |  |        |        | START TIME          |
| DATE                |  |        |        | FINISH TIME         |
| CASING DEPTH        |  |        |        | DATE                |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT<br>SAMPLER |      | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|-----------------------------------|-----------------|----------------------------|---------------------|------|---------------|------------|--|
| S/S<br>59    | 18<br>18                          |                 | 20<br>13                   | 13                  | Grab | 20            | ML         | Br si c/s <sup>1. Figs 59</sup> dry - sl. moist<br>Some calcareous streaks                                 |
|              |                                   |                 |                            |                     |      | 1             |            |  |
|              |                                   |                 |                            |                     |      | 2             |            |  |
|              |                                   |                 |                            |                     |      | 3             |            |  |
|              |                                   |                 |                            |                     |      | 4             |            |  |
|              |                                   |                 |                            |                     |      | 25            |            | SAA  |
|              |                                   |                 |                            |                     |      | 6             |            |  |
|              |                                   |                 |                            |                     |      | 7             | ML<br>SM   |  |
|              |                                   |                 |                            |                     |      | 8             |            | dkbr gtz<br>Hesperian Hays - Fi-me/sa, dirty (s. lky) sa<br>dry - sl. moist                                |
|              |                                   |                 |                            |                     |      | 9             |            |  |
| S/S<br>30    | 18<br>18                          |                 | 30<br>27                   | 12<br>15            | Grab | 30            | ML<br>SML  | Brown si figtz sa, some dr clay<br>dry - sl moist<br>Grades clayier towards bottom i.e. ~ 31.2'<br>br clay |
|              |                                   |                 |                            |                     |      | 1             |            |  |
|              |                                   |                 |                            |                     |      | 2             |            |  |
|              |                                   |                 |                            |                     |      | 3             |            |  |
|              |                                   |                 |                            |                     |      | 4             |            |  |
| S/S<br>15p   | 18<br>18                          |                 | 35<br>31                   | 18<br>31            | Grab | 35            |            | Gray (stone), Abun. iron staining<br>dry - sl. moist   |
|              |                                   |                 |                            |                     |      | 6             |            |  |
|              |                                   |                 |                            |                     |      | 7             |            |  |
|              |                                   |                 |                            |                     |      | 8             |            |  |
|              |                                   |                 |                            |                     |      | 9             |            |  |
|              |                                   |                 |                            |                     |      | 40            |            |  |

DRILLING CONTR \_\_\_\_\_

DATE \_\_\_\_\_ BY \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                     |  |  |  |                  |  |        |  |              |  |
|---------------------|--|--|--|------------------|--|--------|--|--------------|--|
| LOCATION OF BORING: |  |  |  | JOB NO           |  | CLIENT |  | LOCATION     |  |
|                     |  |  |  | DRILLING METHOD: |  |        |  | BORING NO    |  |
|                     |  |  |  |                  |  |        |  | SB-34        |  |
|                     |  |  |  | SAMPLING METHOD: |  |        |  | SHEET        |  |
|                     |  |  |  |                  |  |        |  | 3 of 4       |  |
|                     |  |  |  | WATER LEVEL      |  |        |  | DRILLING     |  |
|                     |  |  |  |                  |  |        |  | START TIME   |  |
|                     |  |  |  | TIME             |  |        |  | DATE         |  |
|                     |  |  |  |                  |  |        |  |              |  |
|                     |  |  |  | DATE             |  |        |  | DATE         |  |
|                     |  |  |  |                  |  |        |  |              |  |
| DATUM               |  |  |  | ELEVATION        |  |        |  | CASING DEPTH |  |
|                     |  |  |  |                  |  |        |  |              |  |

DRILLING CONTR

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|-----------------------------------|-----------------|----------------------------|---------------------|---------------|------------|--|
| Calif        | 13/18                             |                 | 55-1<br>40                 | 23<br>34<br>48      | 40            | CL5        | olive gy clst w/ some iron staining<br>dry - sl. moist                                 |
|              |                                   |                 |                            |                     | 1             |            |  |
|              |                                   |                 |                            |                     | 2             |            |  |
|              |                                   |                 |                            |                     | 3             |            | Harder drilling  |
|              |                                   |                 |                            |                     | 4             |            |  |
| 30 ft<br>sp  | 10/10                             |                 | 45<br>50/4                 | 37<br>50/4          | 5             | ML         | lt br - br v. f. gltz sa<br>dry - <del>sl. moist</del>                                 |
|              |                                   |                 |                            |                     | 6             |            |  |
|              |                                   |                 |                            |                     | 7             |            |  |
|              |                                   |                 |                            |                     | 8             | CL5        |  |
|              |                                   |                 |                            |                     | 9             |            |  |
| Calif        | 17/17                             |                 | 55-2<br>50                 | 38<br>39<br>50/5    | 50            | ML         | white<br>gy clst w/ some replacement, dry<br>2" lt br v. f. gltz sa loose 50.4 - 50.6" |
|              |                                   |                 |                            |                     | 1             |            | 51.2 - 51.5 buff - br - yell ss., dry<br>w/ olive gy clstone                           |
|              |                                   |                 |                            |                     | 2             |            |  |
|              |                                   |                 |                            |                     | 3             | CL5        |  |
|              |                                   |                 |                            |                     | 4             |            |  |
|              |                                   |                 |                            |                     | 5             |            | DK gy clstone  |
|              |                                   |                 |                            |                     | 6             |            |  |
|              |                                   |                 |                            |                     | 7             |            |  |
|              |                                   |                 |                            |                     | 8             |            |  |
|              |                                   |                 |                            |                     | 9             |            |  |
|              |                                   |                 |                            |                     | 60            |            |  |

BY \_\_\_\_\_ CHK'D BY \_\_\_\_\_ DATE \_\_\_\_\_

|                    |  |        |                    |             |
|--------------------|--|--------|--------------------|-------------|
| LOCATION OF BORING |  | JOB NO | CLIENT             | LOCATION    |
| DRILLING METHOD:   |  |        | BORING NO<br>SB-74 |             |
| SAMPLING METHOD:   |  |        | SHEET<br>4 OF 4    |             |
| WATER LEVEL        |  |        | START TIME         | FINISH TIME |
| TIME               |  |        | DATE               | DATE        |
| CASING DEPTH       |  |        | DRILLING           |             |
| DATE               |  |        | 8/24/00            | 2:45        |
| DATE               |  |        | 8/26/00            | 8/26/00     |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|---------------|------------|---|
| SPT<br>SP    |                                  |                 | 60                        | 22<br>21<br>33    | 0             | CLS        | Dry clstone w/ some thin layers of br clstone and br silty sa stringers dry |
|              |                                  |                 |                           |                   | 1             |            |   |
|              |                                  |                 |                           |                   | 2             |            |   |
|              |                                  |                 |                           |                   | 3             |            |   |
|              |                                  |                 |                           |                   | 4             |            |   |
|              |                                  |                 |                           |                   | 65            |            | Gy - dk gy clst   |
|              |                                  |                 |                           |                   | 6             |            |   |
|              |                                  |                 |                           |                   | 7             |            |   |
|              |                                  |                 |                           |                   | 8             |            |   |
|              |                                  |                 |                           |                   | 9             |            |   |
| Calif        |                                  |                 | 70                        | 30/4"             | 70            |            | SAA   |
|              |                                  |                 |                           |                   | 1             |            |   |
|              |                                  |                 |                           |                   | 2             |            |   |
|              |                                  |                 |                           |                   | 3             |            |   |
|              |                                  |                 |                           |                   | 4             |            |   |
| Calif        | 4"<br>4"                         |                 | 50/4"                     | Grab              | 75            |            | Weak-sh. bedrx dry<br>(No Calif collected - grab)<br>TD @ 75'               |
|              |                                  |                 |                           |                   | 6             |            |   |
|              |                                  |                 |                           |                   | 7             |            |   |
|              |                                  |                 |                           |                   | 8             |            |   |
|              |                                  |                 |                           |                   | 9             |            |   |
|              |                                  |                 |                           |                   | 80            |            |   |

DRILLING CONTR \_\_\_\_\_

CHK'D BY \_\_\_\_\_

DATE \_\_\_\_\_

4281 (3) (REV. 11.00)

|   |                                |                         |                         |
|---|--------------------------------|-------------------------|-------------------------|
| LOCATION OF BORING: <i>88th Ave</i>           | JOB NO: <i>2-1815</i>          | CLIENT: <i>CSI</i>      | LOCATION: <i>Wagner</i> |
|   | DRILLING METHOD: <i>CMC-75</i> | BORING NO: <i>SB-35</i> |                         |
|   | 4" Solid Stem Auger            |                         | SHEET: <i>1 of 4</i>    |
| SAMPLING METHOD: <i>Calif, Split Spn, 606</i> |                                |                         | DRILLING                |
| WATER LEVEL                                   |                                |                         | START TIME: <i>3:40</i> |
| TIME  |                                |                         | FINISH TIME             |
| DATE  |                                |                         | DATE: <i>8/2/68</i>     |
| CASING DEPTH                                  |                                |                         | DATE                    |

DRILLING CONTR: *Daten Exp*

| DATUM        |                                   |                 |                           | ELEVATION           |                  |               | SURFACE CONDITIONS: <i>Br si cl w/ some fine ss</i> |  |
|--------------|-----------------------------------|-----------------|---------------------------|---------------------|------------------|---------------|---|--|
| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | BLOWS/FT<br>SAMPLER | DEPTH<br>IN FEET | SOIL<br>GRAPH |   |  |
|              |                                   |                 |                           |                     | 0                |               |   |  |
|              |                                   |                 |                           |                     | 1                |               |   |  |
|              |                                   |                 |                           |                     | 2                |               |   |  |
|              |                                   |                 |                           |                     | 3                |               |   |  |
|              |                                   |                 |                           |                     | 4                | <i>CL</i>     | <i>Br-dk br si v. f. sa cl</i>                      |  |
|              |                                   |                 |                           |                     | 5                |               | <i>sl. moist</i>                                    |  |
|              |                                   |                 |                           |                     | 6                |               |   |  |
|              |                                   |                 |                           |                     | 7                |               |   |  |
|              |                                   |                 |                           |                     | 8                |               |   |  |
|              |                                   |                 |                           |                     | 9                |               |   |  |
|              |                                   |                 |                           |                     | 10               | <i>CL</i>     | <i>Br si v. f. sa cl</i>                            |  |
|              |                                   |                 |                           |                     | 11               |               | <i>sl. moist</i>                                    |  |
|              |                                   |                 |                           |                     | 12               |               |   |  |
|              |                                   |                 |                           |                     | 13               |               |   |  |
|              |                                   |                 |                           |                     | 14               |               |   |  |
|              |                                   |                 |                           |                     | 15               |               | <i>SAA</i>  |  |
|              |                                   |                 |                           |                     | 16               |               |   |  |
|              |                                   |                 |                           |                     | 17               | <i>SC</i>     | <i>Auger cuttings grade more sandy</i>              |  |
|              |                                   |                 |                           |                     | 18               |               | <i>i.e. br no gr. sa w/ some cl</i>                 |  |
|              |                                   |                 |                           |                     | 19               |               |   |  |
|              |                                   |                 |                           |                     | 20               |               |   |  |

BY: *J.P.C.*  
DATE: *8/2/68*  
CHK'D BY: \_\_\_\_\_

|                    |  |                  |        |                                |
|--------------------|--|------------------|--------|--------------------------------|
| LOCATION OF BORING |  | JOB NO           | CLIENT | LOCATION                       |
|                    |  | DRILLING METHOD: |        | BORING NO<br>SB- <del>82</del> |
|                    |  | SAMPLING METHOD: |        | SHEET<br>2 of 4                |
| DATUM              |  | ELEVATION        |        | DRILLING                       |
|                    |  | WATER LEVEL      |        | START TIME                     |
|                    |  | TIME             |        | FINISH TIME                    |
|                    |  | DATE             |        | DATE                           |
|                    |  | CASING DEPTH     |        |                                |

DRILLING CONTR

| SAMPLER TYPE | INCHES DEPTH INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO | BLOWS/FT SAMPLER |      | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|-------------------------------|-----------------|-----------|------------------|------|---------------|------------|--|
| SP<br>3P     | 18<br>18                      |                 | 20        | 10<br>15         | Grab | 0             | CL         | br - gy cl - abun iron staining and calcite deposits, few v. thin v. f. sa stringers sl moist  |
|              |                               |                 |           |                  |      | 1             |            |  |
|              |                               |                 |           |                  |      | 2             |            |  |
|              |                               |                 |           |                  |      | 3             |            |  |
|              |                               |                 |           |                  |      | 4             |            |  |
|              |                               |                 |           |                  |      | 25            |            | Br & v. f. sa cl sl moist  |
|              |                               |                 |           |                  |      | 6             |            |  |
|              |                               |                 |           |                  |      | 7             |            |  |
|              |                               |                 |           |                  |      | 8             | CLS        | Angularly br - olive gy cl   |
|              |                               |                 |           |                  |      | 9             |            |  |
| SP<br>3P     | 18<br>18                      |                 | 30        | 12<br>19         | Grab | 30            |            | olive-gy cl stone w/ abun iron staining dry - sl moist sample contain 1/2" piece of ceauth. ss |
|              |                               |                 |           |                  |      | 1             |            |  |
|              |                               |                 |           |                  |      | 2             |            |  |
|              |                               |                 |           |                  |      | 3             |            |  |
|              |                               |                 |           |                  |      | 4             |            |  |
| SP<br>3P     | 18<br>18                      |                 | 35        | 12<br>31         | Grab | 35            |            | Brownish-gy cl stone w/ some iron staining and abun v. thin f. sa lenses dry - sl moist        |
|              |                               |                 |           |                  |      | 6             |            |  |
|              |                               |                 |           |                  |      | 7             |            |  |
|              |                               |                 |           |                  |      | 8             |            |  |
|              |                               |                 |           |                  |      | 9             |            |  |
|              |                               |                 |           |                  |      | 40            |            |  |

CHK'D BY

DATE

ICB 1.3 (REV. 11-90)

|                    |         |                  |          |             |
|--------------------|---------|------------------|----------|-------------|
| LOCATION OF BORING |         | JOB NO.          | CLIENT   | LOCATION    |
| 17. K2: 781-3561   |         | DRILLING METHOD: |          | BORING NO.  |
|                    |         | SAMPLING METHOD: |          | SHEET       |
| DATUM              |         | ELEVATION        |          | DRILLING    |
| CASING DEPTH       |         | 40' open         | 50' open | 55' open    |
| WATER LEVEL        | 39.4    | dry              | 54.6     | STAR TIME   |
| TIME               | 850     | 1015             | 1030     | FINISH TIME |
| DATE               | 8/30/88 | 8/30/88          | 8/30/88  | DATE        |

| SAMPLER TYPE | INCHES TO OPEN | DEPTH OF CASING | SAMPLE NO. | BLOWS/FT | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS  |
|--------------|----------------|-----------------|------------|----------|---------------|------------|---|
| Cal.F        | 14             | 40              | SS-1       | 22       | 40            | CLS        | Br - claystone w/ some bi sil. ss.<br>lens ss dry - sil moist   |
|              |                |                 |            |          | 1             |            |   |
|              |                |                 |            |          | 2             |            | 8/30/88 @ 925 started drilling  |
|              |                |                 |            |          | 3             |            |   |
|              |                |                 |            |          | 4             |            |   |
| SPT SP       | 18             | 45              | SS-2       | 10       | 45            | CLS        | Br - clayey c/s stone, dry - sil moist<br>Abund. iron staining; a few w. fi silica<br>stringers, dry                                |
|              |                |                 |            |          | 6             |            |   |
|              |                |                 |            |          | 7             |            |   |
|              |                |                 |            |          | 8             |            |   |
|              |                |                 |            |          | 9             |            |   |
| Cal.F        | 18             | 50              | SS-3       | 34       | 50            | CLS        | fine -<br>Gy c/s stone w/ some bi sil. gtz sa intervals<br>c/s stone dry - sil moist, sa - damp - moist - wet<br>(checked w.e. dry) |
|              |                |                 |            |          | 1             |            |   |
|              |                |                 |            |          | 2             |            |   |
|              |                |                 |            |          | 3             |            |   |
|              |                |                 |            |          | 4             |            |   |
| SPT SP       | 18             | 55              | SS-4       | 14       | 55            | CLS        | Dk gy c/s (bedrock)   |
|              |                |                 |            |          | 6             |            | (Packer tested from ~40-55' interval)   |
|              |                |                 |            |          | 7             |            |   |
|              |                |                 |            |          | 8             |            |   |
|              |                |                 |            |          | 9             |            |   |
|              |                |                 |            |          | 60            |            |   |

DRILLING CONT'D

CHK'D BY

|                    |                  |        |            |                      |
|--------------------|------------------|--------|------------|----------------------|
| LOCATION OF BORING | JOB NO           | CLIENT | LOCATION   |                      |
|                    | DRILLING METHOD  |        |            | BORING NO            |
|                    |                  |        |            | SB- <del>35</del> 35 |
|                    | SAMPLING METHOD: |        |            | SHEET                |
|                    |                  |        |            | 4 of 4               |
|                    |                  |        |            | DRILLING             |
| WATER LEVEL        |                  |        | START TIME | FINISH TIME          |
| TIME               |                  |        |            | 1:05                 |
| DATE               |                  |        | DATE       | 8/30/00              |
| CASING DEPTH       |                  |        |            |                      |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN PER FEET | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|------------------------|-----------------|-------------------------|------------------|---------------|------------|--|
| SPT          | 16<br>18               |                 | 33<br>33<br>50/4 Grab   |                  | 60            | CS         | DK gy silt - (siltstone?) (SAA)<br>dry - sl. moist                   |
|              |                        |                 |                         |                  | 1             |            |  |
|              |                        |                 |                         |                  | 2             |            |  |
|              |                        |                 |                         |                  | 3             |            |  |
|              |                        |                 |                         |                  | 4             |            |  |
|              |                        |                 |                         |                  | 5             |            | SAA - Hammer cuttings  |
|              |                        |                 |                         |                  | 6             |            |  |
|              |                        |                 |                         |                  | 7             |            |  |
|              |                        |                 |                         |                  | 8             |            |  |
|              |                        |                 |                         |                  | 9             |            |  |
| SPT          | 5"<br>5"               |                 | 70<br>70                | 30/5 Grab        | 70            | SP         | Salt + Pepper ore - cc gtz sa - wet<br>v' clean - little to no fines |
|              |                        |                 |                         |                  | 1             |            |  |
|              |                        |                 |                         |                  | 2             |            | B.T. @ 70"   |
|              |                        |                 |                         |                  | 3             |            |  |
|              |                        |                 |                         |                  | 4             |            |  |
|              |                        |                 |                         |                  | 5             |            |  |
|              |                        |                 |                         |                  | 6             |            |  |
|              |                        |                 |                         |                  | 7             |            |  |
|              |                        |                 |                         |                  | 8             |            |  |
|              |                        |                 |                         |                  | 9             |            |  |
|              |                        |                 |                         |                  | 0             |            |  |

DRILLING CONTR

BY \_\_\_\_\_ DATE \_\_\_\_\_  
CHK'D BY \_\_\_\_\_

|                    |  |                                 |        |               |               |
|--------------------|--|---------------------------------|--------|---------------|---------------|
| LOCATION OF BORING |  | JOB NO.                         | CLIENT | LOCATION      |               |
|                    |  | 2-1815                          | CSI    | 16 Wagon Farm |               |
|                    |  | DRILLING METHOD: CME-75         |        |               | BORING NO.    |
|                    |  | 6" OD cont. sampling auger      |        |               | 5636          |
|                    |  | SAMPLING METHOD: cont. sampling |        |               | SHEET: 1 of 4 |
| DATUM              |  | ELEVATION                       |        | DRILLING      |               |
|                    |  |                                 |        | START TIME    |               |
|                    |  |                                 |        | 1:40          |               |
|                    |  |                                 |        | DATE          |               |
|                    |  |                                 |        | 8/30/88       |               |
|                    |  |                                 |        | FINISH TIME   |               |
|                    |  |                                 |        | DATE          |               |
|                    |  |                                 |        |               |               |

DRILLING CONTR. Data

| SAMPLER PIPE | INCHES DEPTH | DEPTH OF CASING | SAMPLE NO. | BLOWS/FT SAMPLED | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS  |
|--------------|--------------|-----------------|------------|------------------|---------------|------------|---|
|              |              |                 |            |                  | 0             |            |   |
|              |              |                 |            |                  | 1             |            |   |
|              |              |                 |            |                  | 2             |            |   |
|              |              |                 |            |                  | 3             |            |   |
|              |              |                 |            |                  | 4             |            |   |
|              |              |                 |            |                  | 5             |            | DK br si v.f. sa cl, dry  |
|              |              |                 |            |                  | 6             |            |   |
|              |              |                 |            |                  | 7             |            |   |
|              |              |                 |            |                  | 8             |            |   |
|              |              |                 |            |                  | 9             |            |   |
|              |              |                 |            |                  | 10            | CL         | Br si cl w/ some sa, dry<br>v. hard drilling                      |
|              |              |                 |            |                  | 11            |            |   |
|              |              |                 |            |                  | 12            |            |   |
|              |              |                 |            |                  | 13            | SS         | hit a compact ss lense, br, fi grained ss<br>dry                  |
|              |              |                 |            |                  | 14            |            |   |
|              |              |                 |            |                  | 15            |            | Br si cl w/ some sa, dry  |
|              |              |                 |            |                  | 16            |            | Drilling v. hard, ss lense<br>brown - buff compact ss, fi gr, dry |
|              |              |                 |            |                  | 17            |            |   |
|              |              |                 |            |                  | 18            | SS         |   |
|              |              |                 |            |                  | 19            |            |   |
|              |              |                 |            |                  | 20            |            | DK br - bk si cl w/ some sa, 5' moist                             |

BY: JEC  
DATE: 8/30/88  
CHK'D BY:  
REV. 11-80



|                    |  |                 |        |                            |
|--------------------|--|-----------------|--------|----------------------------|
| LOCATION OF BORING |  | JOB NO.         | CLIENT | LOCATION                   |
|                    |  | DRILLING METHOD |        | BORING NO.<br><b>SB-96</b> |
|                    |  | SAMPLING METHOD |        | SHEET<br><b>2 of 4</b>     |
| DATUM              |  | ELEVATION       |        | DRILLING                   |
|                    |  | WATER LEVEL     |        | START TIME                 |
|                    |  | TIME            |        | FINISH TIME                |
|                    |  | DATE            |        | DATE                       |
|                    |  | CASING DEPTH    |        |                            |

DRILLING CONT'D

| SAMPLED PIPE           | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. | BLONS/FT | DEPTH IN FEET | SOIL GRAPH      | SURFACE CONDITIONS:   |
|------------------------|-----------------------------------|-----------------|------------|----------|---------------|-----------------|---|
|                        |                                   |                 |            |          | 0             |                 |   |
|                        |                                   |                 |            |          | 1             |                 | br sil  |
|                        |                                   |                 |            |          | 2             |                 |   |
|                        |                                   |                 |            |          | 3             |                 |   |
|                        |                                   |                 |            |          | 4             |                 | Put on cont. sampler at 25'   |
| Continuous<br>sample 5 | 5'                                |                 | 25-30      | Grab     | 25            | C15             | Gray claystone, dry - sil moist and<br>abundant iron staining + some carbon<br>material, some calcite replacement   |
|                        |                                   |                 |            |          | 6             |                 |   |
|                        |                                   |                 |            |          | 7             |                 |   |
|                        |                                   |                 |            |          | 8             |                 | <del>br sil</del>   |
|                        |                                   |                 |            |          | 9             |                 |   |
| Cont                   | 5'<br>5'                          |                 | 30-35      | Grab     | 30            |                 | SAA - dry, little to no calcite, abundant<br>twigs material (fossils)   |
|                        |                                   |                 |            |          | 1             |                 |   |
|                        |                                   |                 |            |          | 2             |                 | (siltstone?)  |
|                        |                                   |                 |            |          | 3             |                 | Grades to br sil cl 33.5 - 34.5<br>dry, abundant fossilized leaves, twigs   |
|                        |                                   |                 |            |          | 4             |                 |   |
| Cont                   | 5'<br>5'                          |                 | 35-40      | Grab     | 35            | C15             | Gray claystone, iron stained dry 34.5 - 35'<br>35-35.7' dk br iron stained claystone, dry<br>35.7-35.9' lt br sil fine sandy<br>35.9-37.3' <del>br sil</del> - siltstone, dry<br>some iron staining |
|                        |                                   |                 |            |          | 6             | ML<br>siltstone |   |
|                        |                                   |                 |            |          | 7             |                 | 37.3-37.9' br-lt br sil cl - siltstone, dry   |
|                        |                                   |                 |            |          | 8             | C15             | 37.8-39.1' br claystone, dry  |
|                        |                                   |                 |            |          | 9             | C15             | 39.1-40' dk br-lt br sil fine sand<br>sil clay - siltstone, dry   |
|                        |                                   |                 |            |          | 40            | ML<br>-CL       |   |

BY \_\_\_\_\_  
CHK'D BY \_\_\_\_\_  
DATE \_\_\_\_\_

|                     |  |                 |         |                     |
|---------------------|--|-----------------|---------|---------------------|
| LOCATION OF BORING: |  | JOB NO.         | CLIENT  | LOCATION:           |
|                     |  | DRILLING METHOD |         | BORING NO.<br>SB-36 |
|                     |  | SAMPLING METHOD |         | SHEET<br>3 of 4     |
| DATUM               |  | ELEVATION       |         | DRILLING            |
|                     |  | WATER LEVEL     | dry     | START TIME          |
|                     |  | TIME            | 5:5     | 8:20                |
|                     |  | DATE            | 8/20/88 | 8/31/88             |
|                     |  | CASING DEPTH    | 47 open | 47 open             |

DRILLING CONTP

| SAMPLED TYPE | INCHES DRIVEN<br>INCHES RECORDED | DEPTH OF CASING | SAMPLE NO.<br>DEPTH | BLWS/FT<br>SAMPLED | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|---------------------|--------------------|---------------|------------|--|
| Cont         | 5'<br>5'                         | 45              | 40-45               | Grab               | 40            |            | Br - lt gy sil cl 40-41.3', dry<br>some iron staining  |
|              |                                  |                 |                     |                    | 1             |            |  |
|              |                                  |                 |                     |                    | 2             |            | 41.3-45' dk br sil cl - claystone<br>dry - sl moist  |
|              |                                  |                 |                     |                    | 3             |            |  |
|              |                                  |                 |                     |                    | 4             |            |  |
|              |                                  |                 |                     |                    | 4.5           | CLS        | lt br sil v. fine sa, dry in barrel (49-45.0)<br>olive gray claystone, iron stained, dry<br>(changed 45' to 47') |
|              |                                  |                 |                     |                    | 6             |            |  |
| Calif        | 18<br>18                         |                 | 55'<br>47           | P<br>27<br>35      | 7             |            | olive gy claystone, iron stained dry - stains  |
|              |                                  |                 |                     |                    | 8             |            |  |
|              |                                  |                 |                     |                    | 9             |            |  |
| Cont         | 5'<br>5'                         | 55              | 50-55               | Grab               | 50            | CLS        | olive gy claystone, some iron staining<br>dry  |
|              |                                  |                 |                     |                    | 1             |            |  |
|              |                                  |                 |                     |                    | 2             |            |  |
|              |                                  |                 |                     |                    | 3             |            | @ 53' grades to lt br - yell br sil v. fi sa w/<br>some clay, dry  |
|              |                                  |                 |                     |                    | 4             | M/C        | @ 54' br - olive gy claystone w/ some sil v. fi sand<br>dry  |
| Cont         | 5'<br>5'                         | 60              | 55-60               | Grab               | 55            |            | Br - olive gy cl w/ some iron staining, dry  |
|              |                                  |                 |                     |                    | 6             |            |  |
|              |                                  |                 |                     |                    | 7             |            | @ 57.5' grades to dk gy sil stone, few iron staining<br>(with shale) dry   |
|              |                                  |                 |                     |                    | 8             |            |  |
|              |                                  |                 |                     |                    | 9             |            |  |
|              |                                  |                 |                     |                    | 60            |            |  |

CHK'D BY

DATE

28 1 (3) REV. 11-80

|                     |  |                 |         |                            |
|---------------------|--|-----------------|---------|----------------------------|
| LOCATION OF BORING: |  | JOB NO.         | CLIENT  | LOCATION:                  |
|                     |  | DRILLING METHOD |         | BORING NO.<br><b>SB-36</b> |
|                     |  | SAMPLING METHOD |         | SHEET<br><b>4 of 4</b>     |
| DATE                |  | WATER LEVEL     | TIME    | DRILLING TIME              |
| ELEVATION           |  | dry             | 1130    | 1040                       |
|                     |  | DATE            | 8/31/88 | DATE                       |
|                     |  | CASING DEPTH    | 75 open | DATE                       |
|                     |  |                 |         | 8/3/88                     |

DRILLING CONTR.

| SAMPLER TYPE | INCHES DRIVEN INCHES BEFORE | DEPTH OF CASING | SAMPLE NO. | BLOMS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|-----------------------------|-----------------|------------|------------------|---------------|------------|---|
| Cont         | 5' / 5'                     | 65              | 60-65      | Grab             | 60            | Siltst     | DKgy siltstone dry @ 60.8 - 61.1 - 1/4" silty ss, dry                   |
|              |                             |                 |            |                  | 1             | SAL        | grades to DKgy siltstone w/ a few sm, less than 1/2" silty ss lens      |
|              |                             |                 |            |                  | 2             | Siltst     |   |
|              |                             |                 |            |                  | 3             |            |   |
|              |                             |                 |            |                  | 4             |            | (lignite) @ 64.5' grades to bk (organic) siltstone dry                  |
| Cont         | 5' / 5'                     | 70              | 65-70      | Grab             | 5             |            | BK (organic lignite) siltstone, dry                                     |
|              |                             |                 |            |                  | 6             |            | @ 66.5' grades to olivegy siltstone, silty, dry                         |
|              |                             |                 |            |                  | 7             |            | @ 67.2' grades to greenish gy claystone, dry                            |
|              |                             |                 |            |                  | 8             |            | @ 67.7' grades back to olivegy-dkgy silty-siltstone, dry                |
|              |                             |                 |            |                  | 9             |            |   |
| Cont         | 5' / 5'                     | 75              | 70-75'     | Grab             | 70            |            | SAA DKgy - <del>dkgy</del> siltstone No iron staining, dry              |
|              |                             |                 |            |                  | 1             |            |   |
|              |                             |                 |            |                  | 2             |            |   |
|              |                             |                 |            |                  | 3             |            |   |
|              |                             |                 |            |                  | 4             |            |   |
|              |                             |                 |            |                  | 5             |            |   |
|              |                             |                 |            |                  | 6             |            | B.T @ 75'   |
|              |                             |                 |            |                  | 7             |            | Installed 1" piezometer in casing (no evidence of water while drilling) |
|              |                             |                 |            |                  | 8             |            | Piezo - 75' w/ 10' slotted  |
|              |                             |                 |            |                  | 9             |            |   |
|              |                             |                 |            |                  | 80            |            |   |

CHK'D BY

DATE

| Depth | Graphic Log<br>Lithology and Physical Condition                    | Well Construction Detail | Notes  |
|-------|--|--------------------------|--|
|       | SB-20<br>X   |                          |  |
|       | V. SANDY CLTY LT-med BROWN.  | CL                       |  |
| 10    | BDROCK<br>MED BROWN CLAYSTONE W/ SANDY<br>LAYER, SL. MOIST         | CLS                      | DRILL @ 9' = 25/12"                                    |
| 20    | BROWN-GRY BROWN CLS, Festr.<br>TR. mica/GP.                        | CLS                      | DRILL @ 19' =<br>32/12"                                |
|       | POSSIBLE LIGNITE Layer @ 26-28'                                    |                          |  |
| 30    | SAND LT GY BROWN, CLTYEY<br>SL. MOIST-DRY. VF GRIN.<br>WELL SORTED | SC                       | PROBLY <sup>SNIP</sup> D-29'<br>DRILL @ 19' =<br>50/5" |
|       | 1' HARD DELG.  |                          |  |
| 40    | Med BROWN CLAYSTONE<br>SL. MOIST, TR-NO SAND,                      | CLS                      |  |
| 50    |  |                          |  |


Project CSI-2  
 Elevation \_\_\_\_\_  
 Date Drilled 7-25-88

Type of Rig CME-55  
 Total Depth \_\_\_\_\_  
 Logged By [Signature]

SUBSURFACE EXPLORATION LOG

Industrial Compliance Inc.  
 511 Orchard Street Golden, CO 80401

Ashtic \_\_\_\_\_  
 Date \_\_\_\_\_  
 Figure \_\_\_\_\_

| Depth | Graphic Log   | Lithology and Physical Condition   | Well Construction Detail | Notes  |
|-------|---|--|--------------------------|--|
|       |   | SB-20<br>cont. X   |                          |  |
| 60    |  | VERY HARD DRILLING<br>Blue shale<br>Denver Fm?   | SH                       | Added some water<br>to aid DRLG                        |
| 70    |   | DRLG SAISED UP SLIGHTLY - POSSIBLY water<br>med BROWN CLS w/ BLUE SHALE<br>V. MOIST - WET - INCR SANDY<br>V. HARD Layer < 1' POSS. SAND. |                          |  |
|       |   | Blue Sh.<br>w/ INTERBED SAND<br>layers < 1'  | DENVER Fm SH             |  |
| 80    |   | TRAC 79'   |                          | water meas in<br>Piez. @ 72'5"<br>Directly after DRLG. |
| 90    |   |  |                          |  |
| 100   |   |  |                          |  |

Project CS1-2  
 Elevation \_\_\_\_\_  
 Date Drilled 7-25-88

Type of Rig one 55  
 Total Depth 79'  
 Logged By SAD

| Depth | Graphic Log | Lithology and Physical Condition                      | Well Construction Detail | Notes   |
|-------|-------------|---|--------------------------|---|
|       |             | SB-21   |                          |   |
|       |             | SAND & CLAY med BROWN - SL moist                      | CL/SC                    |   |
| -10   |             | SAND VF-F GRAIN. SL CLAYEY, med. BROWN m-well sorted. | SC                       | couldn't tell where SAND started<br>DRIVE @ 9' 15/12" |
|       |             | CLAY, med-DK. BROWN. SL. moist SL-MOD SANDY           | CLS                      |   |
| -20   |             | CLAY SCINING DK. BROWN - GREY BROWN Fe STM.           | CLS                      | DRIVE @ 19' 30/12"                                    |
|       |             | light layer? DRUG EASY                                |                          |   |
| -30   |             | CLAY DK BROWN - GREY BROWN                            |                          | Proctor 15-29' Smp<br>DRIVE @ 29' = 18/12"            |
| -40   |             |   |                          |   |
| -50   |             |   |                          |   |

Project \_\_\_\_\_  
 Elevation \_\_\_\_\_  
 Date Drilled 7-25-88

Type of Rig CM2-55  
 Total Depth \_\_\_\_\_  
 Logged By SD

SUBSURFACE EXPLORATION LOG

Industrial Compliance Inc.  
 511 Orchard Street Golden, CO 80401



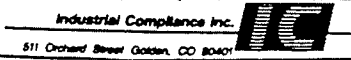
Job No \_\_\_\_\_  
 Date \_\_\_\_\_  
 Figure \_\_\_\_\_

| Depth | Lithology and Physical Condition                                  | Well Construction Detail | Notes  |
|-------|---|--------------------------|--|
|       | SB-21<br>cut 2  |                          |  |
| 60    | Denver Fm<br><br>HARD SS layers, < 1'<br>possible water after 65' | SH                       |  |
| 70    |   | SH                       |  |
| 80    | 1' HARD SS.   | SH                       | Pull out @ 79'<br>WAIT 2 HOURS FOR<br>WATER - NO WATER |
| 90    | possible water.<br>V. SANDY - VF gr. saturated                    |                          |  |
| 100   | 99'   |                          | water @<br>69' after delay                             |

Project \_\_\_\_\_  
 Elevation \_\_\_\_\_  
 Date Drilled 7-25-78

Type of Rig CME 55  
 Total Depth 99'  
 Logged By SJO

SUBSURFACE EXPLORATION LOG



Job No \_\_\_\_\_  
 Date \_\_\_\_\_  
 Figure \_\_\_\_\_

| Depth | Graphic Log | Lithology and Physical Condition  | Well Construction Detail | Notes   |
|-------|-------------|---|--------------------------|---|
|       |             | SB-22<br><del>SB</del>  |                          |   |
| 5     |             | SANDY CLAY<br>med-LT, BROWN<br>SL MOIST.                                | CC                       |   |
|       |             | INCR MOIST  |                          |   |
| 10    |             | SAND, some clay, med Brown,<br>F grained m-w silted<br>water approx 11' | SC                       | DRIVE @ 9' =<br>6/12"                         |
| 15    |             | SAND<br>F-med GRAINOD, med Brown<br>SL CLAYey, wet.                     | SC                       |   |
|       |             | BDR @ 17'   |                          | DRIVE @ 17' =                                 |
|       |             | GYBEN CLS MOIST - V MOIST.  |                          |   |
| 20    |             | DC 20   |                          | water @<br>12' 1" after<br>DRUG. IN<br>Piezo. |
| 25    |             |   |                          |   |

TH-22

Project \_\_\_\_\_  
 Elevation \_\_\_\_\_  
 Date Drilled 7-25-88

Type of Rig Cnc 55  
 Total Depth 20  
 Logged By SD



| Depth | Graphic Log | Lithology and Physical Condition                                    | Well Construction Detail | Notes                    |
|-------|-------------|---|--------------------------|--------------------------|
|       |             | SB-23   |                          |                          |
|       |             | H   |                          |                          |
|       |             | SAND/CLAY<br>DRY - SL moist   | SC                       |                          |
| -10   |             | BDRK?<br>SS<br>SL moist.  | SC                       | DRIVE @ 9' =<br>18/12"   |
|       |             | CLS DK, BROWN<br>Lig? / CLS   | CL                       |                          |
| -20   |             | CLS MED GYSEN-BRN, SL SANDY<br>SL MOIST, TR. Lig.<br>ABNT. Fe Str   | CLS                      | DRIVE @ 19' =<br>26/12"  |
| -30   |             | CLS MED GYSEN-BRN, TR. SANDY<br>SL MOIST. ABNT. Fe Str.<br>BUT DGR. | CLS                      | DRIVE @ 29' =<br>31/12"  |
| -40   |             | BECOMING DARKER,<br>SL MOIST  | CLS                      |                          |
| -50   |             | TOC 49'   |                          | DRY @ 49' after<br>DRUG. |

Project \_\_\_\_\_  
 Elevation \_\_\_\_\_  
 Date Drilled 7-25-88

Type of Rig Cme-55  
 Total Depth 49'  
 Logged By SA

SUBSURFACE EXPLORATION LOG

Industrial Compliance Inc.  
 511 Orchard Street Golden, CO 80401

Asst. Title \_\_\_\_\_  
 Date \_\_\_\_\_  
 Figure \_\_\_\_\_

| Depth<br>Graphic Log | Lithology and Physical Condition<br><i>SB-24</i> | Well Construction<br>Detail | Notes                            |
|----------------------|--|-----------------------------|----------------------------------|
|                      | <i>SANDY CLAY</i>                                | <i>CC/SC</i>                |                                  |
| <i>10</i>            | <i>SAND VF-F gm.<br/>med Brown</i>               | <i>SC</i>                   | <i>NO DRIVES<br/>(see 810-2)</i> |
| <i>20</i>            | <i>CLAY med-DK BROWN<br/>SL SANDY</i>            | <i>CLS</i>                  |                                  |
|                      | <i>BEARING GREY BROWN<br/>ABNT Fe Stn.</i>       | <i>CLS</i>                  |                                  |
| <i>30</i>            | <i>POSS. Lignite Layer</i>                       |                             |                                  |
| <i>40</i>            | <i>CLAY - DK BROWN - Grey BROWN</i>              | <i>CLS</i>                  |                                  |
| <i>50</i>            |  |                             |                                  |

Project 2-1815  
 Elevation \_\_\_\_\_  
 Date Drilled 7-26-88

Type of Rig Cme 55  
 Total Depth 79'  
 Logged By SD

SUBSURFACE EXPLORATION LOG

| Depth | Graphic Log | Lithology and Physical Condition                   | Well Construction Detail | Notes                               |
|-------|-------------|--|--------------------------|-------------------------------------|
|       |             | SB-24<br><del>8</del>                              |                          |                                     |
|       |             | <p>~ Denver Blue</p> <p>HARD SS layers &lt; 1'</p> |                          |                                     |
| 60    |             |  |                          |                                     |
| 70    |             |  |                          |                                     |
| 80    |             | TO @ 79'      pipe set @ 77'                       |                          | DRY @ 77'<br>p. eyed<br>after DRUG. |
| 90    |             |  |                          |                                     |
| 100   |             |  |                          |                                     |

Project 2-1815  
 Elevation \_\_\_\_\_  
 Date Drilled 7-26-88

Type of Rig \_\_\_\_\_  
 Total Depth 79'  
 Logged By \_\_\_\_\_

SUBSURFACE EXPLORATION LOG

Industrial Compliance Inc.

511 Orchard Street Golden, CO 80401



Asst. No. \_\_\_\_\_

Date \_\_\_\_\_

Figure \_\_\_\_\_

SAO-6

1

| Depth | Graphic Log | Lithology and Physical Condition  | Well Construction Detail | Notes                   |
|-------|-------------|---|--------------------------|-------------------------|
|       |             | SB-25<br>K  |                          |                         |
|       |             | SANDY cnty. med BROWN,<br>SL moist  | CL/S                     |                         |
| 10    |             | Decreasing SAND<br>MOD. SANDY CLAY<br>med BROWN<br>SL moist                                     | CL                       | DRIVE @ 9' =<br>12/12"  |
|       |             | Bedrock   | CLS                      |                         |
| 20    |             | DK GREY BROWN-BROWN<br>Fe STN, TR. CARB MATR<br>NOB-SL SANDY.                                   | CLS                      | DRIVE @ 19' =<br>20/12" |
|       |             | DECR. SAND  | CLS                      |                         |
| 30    |             | DK GREY BROWN - DK GREY CLAY<br>SL moist, PASS some lg.?<br>Becoming mod grey CLAY,<br>NO SAND, | CLS                      | DRIVE @ 29' =<br>26/12" |
| 40    |             | DRLG EASED UP - PASS. WATER.<br>Becoming INCR. MOIST<br>& SLTY-SNDY                             |                          |                         |
|       |             | ↓   |                          |                         |
| 50    |             | -D @ 49'  |                          | WL @ 45'<br>after DRLG. |

Project 2-1815  
 Elevation \_\_\_\_\_  
 Date Drilled 7-26-88

Type of Rig CME-55  
 Total Depth 49'  
 Logged By SAO

SUBSURFACE EXPLORATION LOG

Industrial Compliance Inc.  
 511 Orchard Street Golden, CO 80401

Job No \_\_\_\_\_  
 Date \_\_\_\_\_  
 Type \_\_\_\_\_

| Depth | Lithology and Physical Condition                        | Well Construction Detail | Notes                   |
|-------|---|--------------------------|-------------------------|
|       | SB-26   |                          |                         |
|       | SP-7  |                          |                         |
|       | SANDY clay med brown                                    | CL/S                     |                         |
|       | med grey brown - brown<br>52 SANDY                      | CL/S                     |                         |
| 5     | Bedrock →<br>25'  | CL/S                     | Drive @ 9' =<br>19/12"  |
| 10    | Festn.<br>ABNT Gypsum xls                               | CL/S                     |                         |
| 15    | some SANDY layers < 1' BY DRILG.<br>Some organic matrl. | CL/S                     |                         |
| 20    | med GRAY - Grey brown CLAY<br>Poss. Lig @ 21'           | CL/S                     | Drive @ 19' =<br>19/12" |
| 25    | cont. on next sheet                                     |                          |                         |

|                             |                           |
|-----------------------------|---------------------------|
| Project <u>2-1815</u>       | Type of Rig <u>CME 55</u> |
| Elevation _____             | Total Depth _____         |
| Date Drilled <u>7-26-88</u> | Logged By <u>SA</u>       |



DRILLING CONTR. *C. S. S. Co.*

|                                       |  |  |                      |                               |
|---------------------------------------|--|--|----------------------|-------------------------------|
| LOCATION OF BORING<br><i>887L Ave</i> |  | JOB NO.<br><i>2-1815</i>               | CLIENT<br><i>CSI</i> | LOCATION<br><i>Wayne Farm</i> |
|                                       |  | DRILLING METHOD:<br><i>CME Auger</i>   |                      | BORING NO.<br><i>SB-27</i>    |
|                                       |  | <i>Ring</i>                            |                      | SHEET<br><i>1 of 3</i>        |
|                                       |  | SAMPLING METHOD:<br><i>Grab, split</i> |                      | DRILLING                      |
|                                       |  | WATER LEVEL                            |                      | START TIME                    |
|                                       |  | TIME                                   |                      | FINISH TIME                   |
|                                       |  | DATE                                   |                      | DATE                          |
|                                       |  | CASING DEPTH                           |                      | <i>7/26/00</i>                |

| DATUM         |                               |                 |                         |                   | ELEVATION     |            | SURFACE CONDITIONS: <i>Br s.s.</i>                                    |  |
|---------------|-------------------------------|-----------------|-------------------------|-------------------|---------------|------------|---|--|
| SAMPLER TYPE  | INCHES DRIVER INCHES RECEIVED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |   |  |
|               |                               |                 |                         |                   | 0             | <i>CLC</i> | <i>Sandy Clay</i>   |  |
|               |                               |                 |                         |                   | 1             |            |   |  |
|               |                               |                 |                         |                   | 2             |            |   |  |
|               |                               |                 |                         |                   | 3             |            |   |  |
|               |                               |                 |                         |                   | 4             |            | <i>Becoming calcareous</i>  |  |
|               |                               |                 |                         |                   | 5             |            |   |  |
|               |                               |                 |                         |                   | 6             |            |   |  |
|               |                               |                 |                         |                   | 7             |            |   |  |
|               |                               |                 |                         |                   | 8             |            | <i>Lt.-med gy C/stone - bedrock</i>                                   |  |
| <i>SPT 18</i> | <i>18</i>                     |                 | <i>19/ 12"</i>          |                   | 9             | <i>CLS</i> |   |  |
|               |                               |                 |                         |                   | 10            |            |   |  |
|               |                               |                 |                         |                   | 1             |            |   |  |
|               |                               |                 |                         |                   | 2             |            | <i>@ ~ 12' sand, v.f. grained, absent clay, Lt-med brown</i>          |  |
|               |                               |                 |                         |                   | 3             | <i>SMA</i> |   |  |
|               |                               |                 |                         |                   | 4             | <i>TL</i>  |   |  |
|               |                               |                 |                         |                   | 5             |            |   |  |
|               |                               |                 |                         |                   | 6             | <i>CLS</i> |   |  |
|               |                               |                 |                         |                   | 7             |            |   |  |
|               |                               |                 |                         |                   | 8             |            |   |  |
| <i>SPT 20</i> | <i>20</i>                     |                 | <i>26/12</i>            |                   | 9             | <i>CLS</i> | <i>Lt-med DK Gy, claystone, some non staining, trace organic mat.</i> |  |
|               |                               |                 |                         |                   | 10            |            |   |  |

50  
 DATE *7-24-00* CHK'D BY  
 I (S) (REV. 11-00)

|                    |  |                             |               |                         |  |
|--------------------|--|-----------------------------|---------------|-------------------------|--|
| LOCATION OF BORING |  | JOB NO.<br>2-1815           | CLIENT<br>CSF | LOCATION<br>Wagner Farm |  |
| See p 1            |  | DRILLING METHOD:<br>See p 1 |               | BORING NO.<br>SB-27     |  |
|                    |  | SAMPLING METHOD:<br>See p 1 |               | SHEET<br>2 of 3         |  |
| DATUM              |  | ELEVATION                   |               | DRILLING                |  |
| WATER LEVEL        |  | START TIME                  |               | FINISH TIME             |  |
| TIME               |  | DATE                        |               | DATE                    |  |
| CASING DEPTH       |  | DATE                        |               | DATE                    |  |

DRILLING CONTR. *Cash*

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | BLOWS/FT.<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH      | SURFACE CONDITIONS:   |
|--------------|-----------------------------------|-----------------|---------------------------|----------------------|---------------|-----------------|---|
|              |                                   |                 |                           |                      | 20            |                 | See p 1   |
|              |                                   |                 |                           |                      | 1             |                 |   |
|              |                                   |                 |                           |                      | 2             |                 |   |
|              |                                   |                 |                           |                      | 3             |                 |   |
|              |                                   |                 |                           |                      | 4             |                 |   |
|              |                                   |                 |                           |                      | 5             |                 |   |
|              |                                   |                 |                           |                      | 6             |                 |   |
|              |                                   |                 |                           |                      | 7             |                 |   |
|              |                                   |                 |                           |                      | 8             |                 |   |
| SPT          | 18/18                             |                 | 44/18                     |                      | 9             | SM<br>ML<br>CLs | SiSa - v. fine. lt-med br<br>DK gy claystone, Fe stain,<br>slk. moist |
|              |                                   |                 |                           |                      | 30            |                 |   |
|              |                                   |                 |                           |                      | 1             |                 |   |
|              |                                   |                 |                           |                      | 2             |                 |   |
|              |                                   |                 |                           |                      | 3             |                 |   |
|              |                                   |                 |                           |                      | 4             |                 |   |
|              |                                   |                 |                           |                      | 5             |                 |   |
|              |                                   |                 |                           |                      | 6             |                 |   |
|              |                                   |                 |                           |                      | 7             |                 |   |
|              |                                   |                 |                           |                      | 8             |                 |   |
|              |                                   |                 |                           |                      | 9             |                 |   |
|              |                                   |                 |                           |                      | 4             |                 | SM  |

BY: *SD*  
DATE: *7/26/88*  
CHK'D BY:



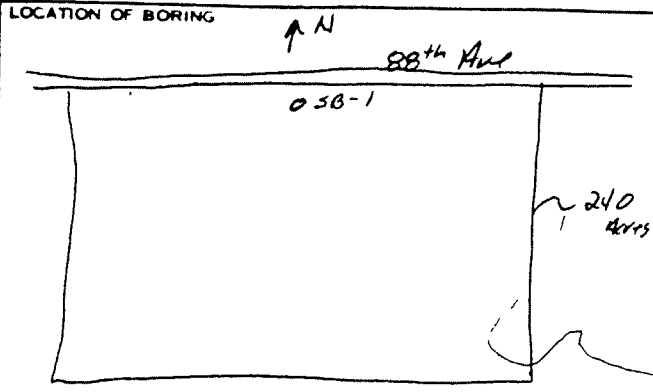
|   |                                     |                       |                                |
|---|-------------------------------------|-----------------------|--------------------------------|
| LOCATION OF BORING<br><br><i>See p. 1</i> | JCEI NO.<br><i>2-1815</i>           | CLIENT<br><i>C SI</i> | LOCATION<br><i>Wagner Farm</i> |
|   | DRILLING METHOD:<br><i>See p. 1</i> |                       | BORING NO.<br><i>SB-27</i>     |
|   | SAMPLING METHOD:<br><i>See p. 1</i> |                       | SHEET<br><i>3 of 3</i>         |
|   | WATER LEVEL                         | <i>dry</i>            | DRILLING                       |
|   | TIME                                |                       | START TIME                     |
|   | DATE                                | <i>7/24/08</i>        | FINISH TIME                    |
| DATUM                                     | ELEVATION                           | CASING DEPTH          | <i>59' den</i>                 |

DRILLING CONTR. *Cash*

| SAMPLER TYPE | INCHES DRIVER INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|--------------------------------|-----------------|-------------------------|-------------------|---------------|------------|--|
|              |                                |                 |                         |                   | 40            |            | <i>See p. 1</i>  |
|              |                                |                 |                         |                   | 1             |            |  |
|              |                                |                 |                         |                   | 2             |            |  |
|              |                                |                 |                         |                   | 3             |            |  |
|              |                                |                 |                         |                   | 4             |            | <i>Possible water @ 44'</i>                                    |
|              |                                |                 |                         |                   | 5             | <i>CLS</i> | <i>by dense claystone</i>                                      |
|              |                                |                 |                         |                   | 6             |            |  |
|              |                                |                 |                         |                   | 7             |            |  |
|              |                                |                 |                         |                   | 8             |            |  |
|              |                                |                 |                         |                   | 9             |            |  |
|              |                                |                 |                         |                   | 50            |            | <i>SUA</i>   |
|              |                                |                 |                         |                   | 1             |            |  |
|              |                                |                 |                         |                   | 2             |            |  |
|              |                                |                 |                         |                   | 3             |            |  |
|              |                                |                 |                         |                   | 4             | <i>CLS</i> |  |
|              |                                |                 |                         |                   | 5             |            | <i>SUA</i>   |
|              |                                |                 |                         |                   | 6             |            |  |
|              |                                |                 |                         |                   | 7             |            |  |
|              |                                |                 |                         |                   | 8             |            |  |
|              |                                |                 |                         |                   | 59            |            | <i>Claystone - gray<br/>T.D @ 59' - Dry after<br/>drilling</i> |

DATE *7/24/08* CHK'D BY *SD*

Industrial Compliance Inc.



|  |               |                                |
|--|---------------|--------------------------------|
| JOB NO.<br>2-1815  | CLIENT<br>CSI | LOCATION<br>Wagner Farm        |
| DRILLING METHOD: CME-75 w/<br>6" ID - 3 1/2" OD hollow stem<br>Augers. |               | BORING NO.<br>5B-28            |
| SAMPLING METHOD: Calif./Split spoon/<br>Grab                           |               | SHEET<br>1 of 4                |
| WATER LEVEL  |               | DRILLING<br>START TIME<br>0925 |
| TIME   |               | FINISH TIME                    |
| DATE   |               | DATE<br>8/23/88                |
| CASING DEPTH   |               |                                |

DRILLING CONTR. De Ann Eng'g

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH           | BLOWS/FT<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|-----------------------------------|-----------------|-------------------------------------|---------------------|---------------|------------|--|
|              |                                   |                 |                                     | 10<br>16 (20)       | 0             |            | Br si sa w/ some cl - recently disked field  |
|              |                                   |                 |                                     |                     | 1             | ML<br>SC   | Auger cuttings - br si sa cl, moist  |
|              |                                   |                 |                                     |                     | 2             |            |  |
|              |                                   |                 |                                     |                     | 3             |            |  |
|              |                                   |                 |                                     |                     | 4             |            |  |
| Calif        | 18<br>18                          | 5               | 55-1<br>5-65<br>10<br>16 (20)       | 6                   | 5             |            | Br-1/4 gy si sa cl w/ some <sup>thin</sup> f. sa interbedded some iron staining present, moist   |
|              |                                   |                 |                                     |                     | 6             |            |  |
|              |                                   |                 |                                     |                     | 7             |            |  |
|              |                                   |                 |                                     |                     | 8             |            |  |
|              |                                   |                 |                                     |                     | 9             |            |  |
| Calif        | 18<br>18                          | 10              | No Sample<br>11-15<br>12<br>17 (20) | 9                   | 10            |            | Lt. Br- br si sa cl w/ some thin si fi sa lenses some iron staining, moist - grades to olive gy clay at 11' w/ 2-3" of si fi sa above. clay dry - somewhat weathered below. v/ abun staining |
|              |                                   |                 |                                     |                     | 11            | SC         | CL   |
|              |                                   |                 |                                     |                     | 12            |            | Auger cutting - DK br si cl <del>dry</del> moist   |
|              |                                   |                 |                                     |                     | 13            |            |  |
|              |                                   |                 |                                     |                     | 14            |            | Proctor #20 bag sample collected 10-30'  |
|              |                                   |                 |                                     |                     | 15            |            | (CL)   |
| split        | 18<br>18                          | 15              | 14<br>18<br>20 (20) grab sample     | 15                  | 15            |            | olive gy clay w/ f. sand lenses - 2-3" thick day - sl. moist - olive gy cl - dry iron staining in cl + sa  |
|              |                                   |                 |                                     |                     | 16            |            |  |
|              |                                   |                 |                                     |                     | 17            |            |  |
|              |                                   |                 |                                     |                     | 18            |            |  |
|              |                                   |                 |                                     |                     | 19            |            |  |
|              |                                   |                 |                                     |                     | 20            |            | (CL)<br>Olive gy - gy cl w/ abun iron staining grades to dk gy to dk cl w/ abun carbon & iron staining dry   |

DATE 8/23/88 CHK'D BY

Industrial Compliance Inc.

|                    |  |            |                    |          |
|--------------------|--|------------|--------------------|----------|
| LOCATION OF BORING |  | JOB NO     | CLIENT             | LOCATION |
| DRILLING METHOD:   |  |            | BORING NO<br>55-28 |          |
| SAMPLING METHOD:   |  |            | SHEET<br>2 of 4    |          |
| WATER LEVEL        |  |            | 39.5               | 39.2     |
| TIME               |  |            | 1120               | 1150     |
| DATE               |  |            | 8/22/08            | "        |
| CASING DEPTH       |  |            | 37                 | 37       |
| DRILLING           |  | START TIME | FINISH TIME        |          |
| DATE               |  | DATE       | DATE               |          |

DRILLING CONTR

| DATUM        |                         | ELEVATION       |           | SURFACE CONDITIONS: <i>(drilled to 40')</i> |               |                    |
|--------------|-------------------------|-----------------|-----------|---|---------------|--------------------|
| SAMPLER TYPE | INCHES DRIVEN RECOVERED | DEPTH OF CASING | SAMPLE NO | BLOWS/FT SAMPLER                            | DEPTH IN FEET | SOIL GRAPH         |
|              |                         |                 |           |   | 20            | CLS                |
|              |                         |                 |           |   | 1             | <i>grab sample</i> |
|              |                         |                 |           |   | 2             |                    |
|              |                         |                 |           |   | 3             |                    |
|              |                         |                 |           |   | 4             |                    |
| Calif        | 18/18                   | 25              | 55-2      | 26<br>27                                    | 25            | CLS                |
|              |                         |                 |           |   | 6             | CLS                |
|              |                         |                 |           |   | 7             |                    |
|              |                         |                 |           |   | 8             |                    |
|              |                         |                 |           |   | 9             |                    |
| Calif        | 18/18                   | 30              | 55-3      | 29<br>38                                    | 30            | CLS                |
|              |                         |                 |           |   | 1             |                    |
|              |                         |                 |           |   | 2             |                    |
|              |                         |                 |           |   | 3             |                    |
|              |                         |                 |           |   | 4             |                    |
| Calif        | 18/18                   | 35              | 55-4      | 59<br>75                                    | 35            | CLS                |
|              |                         |                 |           |   | 6             | ML                 |
|              |                         |                 |           |   | 7             |                    |
|              |                         |                 |           |   | 8             |                    |
|              |                         |                 |           |   | 9             |                    |
|              |                         |                 |           |   | 40            |                    |

CHK'D BY

DATE

BY

Industrial Compliance Inc.

|                    |  |        |                    |             |
|--------------------|--|--------|--------------------|-------------|
| LOCATION OF BORING |  | JOB NO | CLIENT             | LOCATION    |
| DRILLING METHOD: - |  |        | BORING NO<br>SB-28 |             |
| SAMPLING METHOD:   |  |        | SHEET<br>3 of 4    |             |
| WATER LEVEL        |  |        | DRILLING           |             |
| TIME               |  |        | START TIME         | FINISH TIME |
| DATE               |  |        | DATE               | DATE        |
| CASING DEPTH       |  |        |                    |             |

DRILLING CONTR

| DATUM        |                                  | ELEVATION       |                          |                  |               |                 |      | SURFACE CONDITIONS: |                                       |
|--------------|----------------------------------|-----------------|--------------------------|------------------|---------------|-----------------|------|---------------------|---------------------------------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH      |      |                     |                                       |
| Cal. F       | 18                               | 40              | 55-5                     | 27<br>32<br>28   | 40            | SS<br>SLT<br>ML | Grab |                     | Br. f. sand, moist                    |
|              |                                  |                 |                          |                  | 1             |                 |      |                     | DK gy dense clstone                   |
|              |                                  |                 |                          |                  | 2             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 3             |                 |      |                     | Drilling cont. to be had from ~ 41.5' |
|              |                                  |                 |                          |                  | 4             | CL              |      |                     |                                       |
| Cal. F       | 18                               | 45              | 55-6                     | 27<br>32<br>45   | 45            |                 | Grab |                     | Gy clstone, dry, w/ iron staining     |
|              |                                  |                 |                          |                  | 6             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 7             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 8             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 9             |                 |      |                     |                                       |
| SP           | 18                               | 50              | 55-6                     | 40<br>17/58      | 50            | SS              | Grab |                     | SS friable<br>Lt. br. f. gtz, dry     |
|              |                                  |                 |                          |                  | 1             |                 |      |                     | bluish gy clstone 51.1 - 51.5         |
|              |                                  |                 |                          |                  | 2             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 3             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 4             |                 |      |                     |                                       |
| SP           | 18                               | 55              | 55-6                     | 17<br>34<br>38   | 55            |                 | Grab |                     | bluish-gy - dk gy clstone, dry        |
|              |                                  |                 |                          |                  | 6             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 7             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 8             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 9             |                 |      |                     |                                       |
|              |                                  |                 |                          |                  | 60            |                 |      |                     |                                       |

CHK'D BY

DATE

BY

Industrial Compliance Inc.

|                    |  |  |  |                  |  |                        |  |                     |  |
|--------------------|--|--|--|------------------|--|------------------------|--|---------------------|--|
| LOCATION OF BORING |  |  |  | JOB NO.          |  | CLIENT                 |  | LOCATION            |  |
|                    |  |  |  | DRILLING METHOD: |  |                        |  |                     |  |
| SAMPLING METHOD:   |  |  |  |                  |  | SHEET<br><b>4 of 4</b> |  |                     |  |
| WATER LEVEL        |  |  |  |                  |  | 50                     |  | DRILLING            |  |
| TIME               |  |  |  |                  |  | 1350                   |  | START TIME          |  |
| DATE               |  |  |  |                  |  | 8/27/00                |  | FINISH TIME<br>1540 |  |
| CASING DEPTH       |  |  |  |                  |  | 0                      |  | DATE<br>8/22/00     |  |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

DRILLING CONTR \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN RECOVERED | DEPTH OF CASING | SAMPLE NO      | BLWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|-------------------------|-----------------|----------------|------------------|---------------|------------|
| /            | /                       | /               | /              | /                | 60            |            |
| /            | /                       | /               | /              | /                | 1             |            |
| /            | /                       | /               | /              | /                | 2             |            |
| /            | /                       | /               | /              | /                | 3             |            |
| /            | /                       | /               | /              | /                | 4             |            |
| St 18/18     | 18/18                   | 65              | 22<br>37<br>54 | Grab             | 65            |            |
| /            | /                       | /               | /              | /                | 6             |            |
| /            | /                       | /               | /              | /                | 7             |            |
| /            | /                       | /               | /              | /                | 8             |            |
| /            | /                       | /               | /              | /                | 9             |            |
| /            | /                       | /               | /              | /                | 70            |            |
| /            | /                       | /               | /              | /                | 1             |            |
| /            | /                       | /               | /              | /                | 2             |            |
| /            | /                       | /               | /              | /                | 3             |            |
| /            | /                       | /               | /              | /                | 4             |            |
| Calc 18/18   | 18/18                   | 75              | 55-7<br>80/5   | Grab             | 75            |            |
| /            | /                       | /               | /              | /                | 6             |            |
| /            | /                       | /               | /              | /                | 7             |            |
| /            | /                       | /               | /              | /                | 8             |            |
| /            | /                       | /               | /              | /                | 9             |            |
| /            | /                       | /               | /              | /                | 80            |            |

SURFACE CONDITIONS:

Drilling same material as 55' sample

Red

DK gy claystone, dry w/ some thin shaly r.f. sa lenses - (siltstone)

Olwy - gy claystone, w/ some dry crystalline (siltstone)

Soil Boring Terminated @ 76.5'

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                        |   |               |                                 |
|------------------------|---|---------------|---------------------------------|
| LOCATION OF BORING<br> | JOB NO<br>2-1815                          | CLIENT<br>CSI | LOCATION<br>Wagon               |
|                        | DRILLING METHOD: CME-75<br>Solid 4" Auger |               | BORING NO.<br>SB-29             |
|                        | SAMPLING METHOD: Calif/split/grab         |               | SHEET<br>1 of 4                 |
|                        | WATER LEVEL                               |               | DRILLING<br>START TIME<br>16:20 |
| TIME                   |   | FINISH TIME   |                                 |
| DATE                   |   | DATE          | 8/22/88                         |
| CASING DEPTH           |   |               |                                 |

| DATUM        |                         |                 |            | ELEVATION         |               | SURFACE CONDITIONS: |   |
|--------------|-------------------------|-----------------|------------|-------------------|---------------|---------------------|---|
| SAMPLER TYPE | INCHES DRIVEN RECOVERED | DEPTH OF CASING | SAMPLE NO. | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH          |   |
|              |                         |                 |            |                   | 0             |                     | Br si sa w/ some clay, dry                        |
|              |                         |                 |            |                   | 1             | SC                  | Br si sa cl, moist                                |
|              |                         |                 |            |                   | 2             |                     |   |
|              |                         |                 |            |                   | 3             |                     |   |
|              |                         |                 |            |                   | 4             |                     | Br me-co gtz <sup>si</sup> sa w/ some clay, moist |
| grab         |                         |                 |            |                   | 5             |                     |   |
|              |                         |                 |            |                   | 6             |                     |   |
|              |                         |                 |            |                   | 7             |                     |   |
|              |                         |                 |            |                   | 8             |                     |   |
|              |                         |                 |            |                   | 9             |                     |   |
| split        | 18                      | 10              |            | 5                 | 10            | grab                | Br fi-co si sa, moist                             |
|              |                         |                 |            |                   | 11            |                     | @ 11.1' H. br si, cl sa, moist (i.e. grades cl)   |
|              |                         |                 |            |                   | 12            |                     |   |
|              |                         |                 |            |                   | 13            |                     |   |
|              |                         |                 |            |                   | 14            |                     |   |
|              |                         |                 |            |                   | 15            | SC                  |   |
|              |                         |                 |            |                   | 16            | CL                  | 16.5 - Auger cuttings Br si cl, moist             |
|              |                         |                 |            |                   | 17            |                     |   |
|              |                         |                 |            |                   | 18            |                     |   |
|              |                         |                 |            |                   | 19            |                     |   |
| split        | 18                      | 20              |            | 10                | 20            | CL                  | Br si sa cl dry-sil moist                         |

DRILLING CONTR. Datum Explorer

BY JEC  
DATE 8/22/88  
CHK'D BY

Industrial Compliance Inc.

|                    |  |                  |                        |            |                     |
|--------------------|--|------------------|------------------------|------------|---------------------|
| LOCATION OF BORING |  | JOB NO           | CLIENT                 | LOCATION   |                     |
|                    |  | DRILLING METHOD: |                        |            | BORING NO.<br>SB-29 |
| SAMPLING METHOD:   |  |                  | SHEET<br>2 of 4        |            |                     |
| WATER LEVEL        |  |                  | Dry                    | DRILLING   |                     |
| TIME               |  |                  | 740                    | START TIME | FINISH TIME         |
| DATE               |  |                  | 8/23/88                | DATE       | DATE                |
| CASING DEPTH       |  |                  | 37' <del>in hole</del> |            |                     |

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |               |            |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|---------------|------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT SAMPLER    | DEPTH IN FEET | SOIL GRAPH |
| SP           | 18 / 18                          | 20              | 7 / 15                    | 23                  | 20            | CL         |
|              |                                  |                 |                           |                     | 1             | CL         |
|              |                                  |                 |                           |                     | 2             |            |
|              |                                  |                 |                           |                     | 3             |            |
|              |                                  |                 |                           |                     | 4             |            |
| Calif        | 18 / 18                          | 25              | 55-1 / 20                 | 20                  | 25            | CL         |
|              |                                  |                 |                           |                     | 6             |            |
|              |                                  |                 |                           |                     | 7             |            |
|              |                                  |                 |                           |                     | 8             |            |
|              |                                  |                 |                           |                     | 9             |            |
| Calif        | 18 / 18                          | 30              | 55-2 / 11, 15, 26         | 21                  | 30            | CL         |
|              |                                  |                 |                           |                     | 1             |            |
|              |                                  |                 |                           |                     | 2             |            |
|              |                                  |                 |                           |                     | 3             |            |
|              |                                  |                 |                           |                     | 4             |            |
| Calif        | 18 / 18                          | 35              | 55-3 / 11, 15, 26         | 21                  | 35            | CL         |
|              |                                  |                 |                           |                     | 6             |            |
|              |                                  |                 |                           |                     | 7             |            |
|              |                                  |                 |                           |                     | 8             |            |
|              |                                  |                 |                           |                     | 9             |            |
|              |                                  |                 |                           |                     | 40            |            |

Grades sandier @ ~ 21. Lt br-br si cl sa, moist  
some calcite deposit in sample

Br si-sa clay, w/ some thin fi sa lenses moist

Br. silty cl, moist

pulled sample @ 1728

Br. Si sa cl w/ some 1/4" pea gravel  
also sand (br fi) stringers moist

8/23/88 Started drilling @ 745

DRILLING CONTR

BY \_\_\_\_\_ CHK'D BY \_\_\_\_\_ DATE \_\_\_\_\_

|                    |  |        |                     |             |
|--------------------|--|--------|---------------------|-------------|
| LOCATION OF BORING |  | JOB NO | CLIENT              | LOCATION    |
| DRILLING METHOD:   |  |        | BORING NO<br>515-29 |             |
| SAMPLING METHOD:   |  |        | SHEET<br>3 of 4     |             |
| WATER LEVEL        |  |        | DRILLING            |             |
| TIME               |  |        | START TIME          | FINISH TIME |
| DATE               |  |        | DATE                | DATE        |
| CASING DEPTH       |  |        |                     |             |

| DATUM        |                                  | ELEVATION       |                          |                    |               | SURFACE CONDITIONS: |   |
|--------------|----------------------------------|-----------------|--------------------------|--------------------|---------------|---------------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER  | DEPTH IN FEET | SOIL GRAPH          |   |
| Colif        | 15/18                            | 40              | 55-4<br>25<br>37         | 28<br>46<br>7 1/2" | 40            | CL                  | lt br si v. fi sa cl, w/ some iron staining in clay. dry - sl moist w/ occasional s.f. sa (br.) sand stringers  |
| Colif        | 15/15                            | 45              | 55-5                     | 28<br>46<br>7 1/2" | 45            | ML<br>CL            | lt br - br si v. fi<br>some iron staining (i.e. less clay than above)   |
| Colif        | 10"/10"                          |                 | 55-6                     | 37<br>8 1/4"       | 50            | ML                  | Br si v. fi<br>Br si v. fi w/ trace clay, moist - damp (aside barrel wet), sl. ft. in barrel moist - damp so probably in saturated zone directly above sample |
|              |                                  |                 |                          |                    | 55            |                     | Heavier cutting - v. wet lt. br si cl / sa  |
|              |                                  |                 |                          |                    | 60            | CLS                 | Stiffer Drilling  |

DRILLING CONTR

CHK'D BY

DATE



Industrial Compliance Inc.

|                    |  |         |         |                 |        |      |          |                     |      |
|--------------------|--|---------|---------|-----------------|--------|------|----------|---------------------|------|
| LOCATION OF BORING |  |         |         | JOB NO.         | CLIENT |      | LOCATION |                     |      |
|                    |  |         |         | DRILLING METHOD |        |      |          | BORING NO.<br>5B-29 |      |
| SAMPLING METHOD:   |  |         |         | SHEET<br>4 of 4 |        |      |          | DRILLING            |      |
|                    |  |         |         | WATER LEVEL     |        | 57'  | 49.2     | 48.9                | 48.5 |
| TIME               |  | 940     | 1030    | 1045            | 1105   | DATE | DATE     |                     |      |
| DATE               |  | 8/23/88 | 8/23/86 | 8/23/86         | "      |      |          |                     |      |
| CASING DEPTH       |  | 61.5 ft | 61.5 ft | 61.5 ft         | "      |      |          |                     |      |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|----------------------------------|-----------------|---------------------------|------------------|---------------|------------|
| SA<br>SP     | 18 / 18                          |                 | 30 / 24                   | 24               | 60            | CL5        |
|              |                                  |                 |                           |                  | 1             |            |
|              |                                  |                 |                           |                  | 2             |            |
|              |                                  |                 |                           |                  | 3             |            |
|              |                                  |                 |                           |                  | 4             |            |
|              |                                  |                 |                           |                  | 5             |            |
|              |                                  |                 |                           |                  | 6             |            |
|              |                                  |                 |                           |                  | 7             |            |
|              |                                  |                 |                           |                  | 8             |            |
|              |                                  |                 |                           |                  | 9             |            |
|              |                                  |                 |                           |                  | 0             |            |
|              |                                  |                 |                           |                  | 1             |            |
|              |                                  |                 |                           |                  | 2             |            |
|              |                                  |                 |                           |                  | 3             |            |
|              |                                  |                 |                           |                  | 4             |            |
|              |                                  |                 |                           |                  | 5             |            |
|              |                                  |                 |                           |                  | 6             |            |
|              |                                  |                 |                           |                  | 7             |            |
|              |                                  |                 |                           |                  | 8             |            |
|              |                                  |                 |                           |                  | 9             |            |
|              |                                  |                 |                           |                  | 0             |            |

SURFACE CONDITIONS:

Gray claystone, w/ abn iron staining  
dry - sl resist

Boring Terminated @ 61.5'

DRILLING CONTR.

BY \_\_\_\_\_ DATE \_\_\_\_\_  
CHK'D BY \_\_\_\_\_

DRILLING CONTR *Da Sun Ely*

|  |                                 |                                   |  |
|--|---------------------------------|-----------------------------------|--|
| <p>LOCATION OF BORING</p>  | <p>JOB NO<br/><b>2-1815</b></p> | <p>CLIENT<br/><b>CSI</b></p>      | <p>LOCATION<br/><b>Wagner Farm</b></p> |
| <p>DRILLING METHOD: <b>CME-75, 4"</b><br/><i>solid stem augers</i></p> |                                 | <p>BORING NO<br/><b>SB-30</b></p> |  |
| <p>SAMPLING METHOD: <b>Calif, split, grab</b></p>                      |                                 | <p>SHEET<br/><b>1 of 4</b></p>    |  |
| <p>WATER LEVEL</p>   |                                 | <p>DRILLING</p>                   |  |
| <p>TIME</p>  |                                 | <p>START TIME<br/><b>1200</b></p> | <p>FINISH TIME</p>                     |
| <p>DATE</p>  |                                 | <p>DATE<br/><b>8/23/88</b></p>    | <p>DATE</p>                            |
| <p>CASING DEPTH</p>  |                                 | <p>DATE</p>                       |  |

| DATUM        |                         |                 |           |                   | ELEVATION |    | DEPTH IN FEET | SOIL GRAPH   | SURFACE CONDITIONS:  |
|--------------|-------------------------|-----------------|-----------|-------------------|-----------|----|---------------|--|--|
| SAMPLER TYPE | INCHES DRIVEN RECOVERED | DEPTH OF CASING | SAMPLE NO | BLOWS/FT. SAMPLER |           |    |               |  |  |
|              |                         |                 |           |                   |           | 0  | CL            | DK br si v. fi sa cl, sl moist                     | Lt br - br si v. fi sa w/ some clay, dry - recently disked field |
|              |                         |                 |           |                   |           | 1  |               |  |  |
|              |                         |                 |           |                   |           | 2  |               |  |  |
|              |                         |                 |           |                   |           | 3  |               |  |  |
|              |                         |                 |           |                   |           | 4  | SM/CL         |  |  |
|              |                         |                 |           |                   |           | 5  |               |  |  |
| grab         |                         |                 | 5-10'     | grab              |           | 6  |               |  |  |
|              |                         |                 |           |                   |           | 7  | CL            | Lt br si v. fi sa cl, sl moist (grab sample 5-10') |  |
|              |                         |                 |           |                   |           | 8  |               |  |  |
|              |                         |                 |           |                   |           | 9  |               |  |  |
| sp           | 18/18                   |                 | 10        | 7 11 18           |           | 10 |               | Br si cl w/ some v. fi sa sl moist                 |  |
|              |                         |                 |           |                   |           | 11 |               |  |  |
|              |                         |                 |           |                   |           | 12 |               |  |  |
|              |                         |                 |           |                   |           | 13 |               |  |  |
| sp           | 18                      |                 | 15        | 13 13 26          |           | 15 |               | Lt br fi-me gt sa, sl moist                        |  |
|              |                         |                 |           |                   |           | 16 |               | trace of clay 16.2 - 16.5'                         |  |
|              |                         |                 |           |                   |           | 17 |               |  |  |
|              |                         |                 |           |                   |           | 18 |               |  |  |
|              |                         |                 |           |                   |           | 19 |               |  |  |
|              |                         |                 |           |                   |           | 20 |               |  |  |

BY *REC* DATE **8/23/88** CHK'D BY

|                    |  |  |  |                  |  |        |  |              |  |
|--------------------|--|--|--|------------------|--|--------|--|--------------|--|
| LOCATION OF BORING |  |  |  | JOB NO           |  | CLIENT |  | LOCATION     |  |
|                    |  |  |  | DRILLING METHOD  |  |        |  | BORING NO.   |  |
|                    |  |  |  |                  |  |        |  | JB-30        |  |
|                    |  |  |  | SAMPLING METHOD: |  |        |  | SHEET        |  |
|                    |  |  |  |                  |  |        |  | 2 of 4       |  |
|                    |  |  |  | WATER LEVEL      |  |        |  | DRILLING     |  |
|                    |  |  |  |                  |  |        |  | START TIME   |  |
|                    |  |  |  |                  |  |        |  | DATE         |  |
|                    |  |  |  |                  |  |        |  | DATE         |  |
| DATUM              |  |  |  | ELEVATION        |  |        |  | CASING DEPTH |  |

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|--------------------------|------------------|---------------|------------|--|
| Calif        | 18 / 18                          |                 | 20 / 21                  | 13 (38) bog      | 20            | ML         | Br si cl v. f. sa w/ Abun white streaks (i.e. calcite?) dry - sl moist<br>No Calif saved<br>streaks to dk br si cl @ 21.3' |
|              |                                  |                 |                          |                  | 1             |            |  |
|              |                                  |                 |                          |                  | 2             |            |  |
|              |                                  |                 |                          |                  | 3             |            |  |
|              |                                  |                 |                          |                  | 4             |            | (CLS)  |
| SP<br>3p     | 18 / 18                          |                 | 25 / 12                  | 9 @ 60g          | 25            | CLS        | lt dk br si v. f. sa sl moist<br>some calcite & iron streaks   |
|              |                                  |                 |                          |                  | 6             |            |  |
|              |                                  |                 |                          |                  | 7             |            |  |
|              |                                  |                 |                          |                  | 8             |            |  |
|              |                                  |                 |                          |                  | 9             |            | Hit rock @ 29' thin & 21' thick - probably comp sandstone<br>lens w/ ch claystone  |
| Calif        | 9" / 9"                          |                 | 35 / 30                  | 36 7 1/2"        | 30            | CLS        | Greenish-grey CLS w/ some thin v. f. sa stringers<br>dry - sl moist<br>grades to iron stained v. f. sa (weath. ss) @ 31.2' |
|              |                                  |                 |                          |                  | 1             |            |  |
|              |                                  |                 |                          |                  | 2             | ML         | ki-yell  |
|              |                                  |                 |                          |                  | 3             |            | Auger cutting iron stained si sa   |
|              |                                  |                 |                          |                  | 4             |            | brandy-yell  |
| Calif        | 8" / 8"                          |                 | 35 / 7 1/2"              | grab             | 35            |            | Iron stained si v. f. sa dry - sl moist<br>(No cohesion) - Calif sample not obtainable                                     |
|              |                                  |                 |                          |                  | 6             |            |  |
|              |                                  |                 |                          |                  | 7             |            |  |
|              |                                  |                 |                          |                  | 8             |            |  |
|              |                                  |                 |                          |                  | 9             |            |  |
|              |                                  |                 |                          |                  | 10            |            |  |

DRILLING CONTR.

CHK'D BY

DATE

Industrial Compliance Inc.

|                    |  |            |                     |          |
|--------------------|--|------------|---------------------|----------|
| LOCATION OF BORING |  | JOB NO     | CLIENT              | LOCATION |
| DRILLING METHOD:   |  |            | BORING NO.<br>56-30 |          |
| SAMPLING METHOD:   |  |            | SHEET<br>3 of 4     |          |
| WATER LEVEL        |  |            | 48                  | 48.2     |
| TIME               |  |            | 1530                | 0920     |
| DATE               |  |            | 8/23/00             | 8/24/00  |
| CASING DEPTH       |  |            | 51.5 (60) 55 open   |          |
| DATUM              |  | ELEVATION  |                     |          |
|                    |  | DRILLING   |                     |          |
|                    |  | START TIME | FINISH TIME         |          |
|                    |  |            | 1615                |          |
|                    |  | DATE       | DATE                |          |
|                    |  |            | 8/23/00             |          |

DRILLING CONTR.

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER | ELEVATION | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|--------------------------|-------------------|-----------|---------------|------------|--|
| QIF          | 11 / 11                          |                 | 55-39 / 40               | 42 / 7 1/5        | grab      | 40            |            | SAA sl moist - moist.  |
| QIF          | 12 / 12                          |                 | 55-39 / 45               | 39 / 45 1/6"      | grab      | 45            |            | SAA, sl. coarser sa (i.e. fi - me grs sa) moist-qty, either at or near grab zone. Some thin compact ss lenses (sand cleaner than above sample) |
| QIF          |                                  |                 | 55-4 / 50                | 29 / 47           | grab      | 50            |            | SM SP NK br me gr sa, wet  |
| QIF          |                                  |                 | 55-5 / 55                | 30 / 54           |           | 55            |            | dry claystone dry - sl moist   |
|              |                                  |                 |                          |                   |           | 60            |            | Drilling cont. @ 730 8/25/00 to a depth of 65' to verify clay  |

BY \_\_\_\_\_ CHK'D BY \_\_\_\_\_ DATE \_\_\_\_\_

Industrial Compliance Inc.

|                    |  |  |  |                  |  |          |  |           |  |
|--------------------|--|--|--|------------------|--|----------|--|-----------|--|
| LOCATION OF BORING |  |  |  | JOB NO           |  | CLIENT   |  | LOCATION  |  |
|                    |  |  |  | DRILLING METHOD: |  |          |  | BORING NO |  |
|                    |  |  |  |                  |  |          |  | SB-30     |  |
|                    |  |  |  | SAMPLING METHOD: |  |          |  | SHEET     |  |
|                    |  |  |  |                  |  |          |  | 4 of 4    |  |
|                    |  |  |  | WATER LEVEL      |  | 48.4'    |  | 48.1      |  |
|                    |  |  |  | TIME             |  | 0820     |  | 0940      |  |
|                    |  |  |  | DATE             |  | 8/25/08  |  | 9/25/08   |  |
|                    |  |  |  | CASING DEPTH     |  | 65 open  |  | 75 open   |  |
| DATUM              |  |  |  | ELEVATION        |  | DRILLING |  | START     |  |
|                    |  |  |  |                  |  | TIME     |  | FINISH    |  |
|                    |  |  |  |                  |  | DATE     |  | DATE      |  |
|                    |  |  |  |                  |  |          |  | 0920      |  |
|                    |  |  |  |                  |  |          |  | 8/25/08   |  |

DRILLING CONTR.

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH  | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|---------------|------------|--|
|              |                                  |                 |                           |                   | 60            |            | Hard drilling  |
|              |                                  |                 |                           |                   | 1             |            |  |
|              |                                  |                 |                           |                   | 2             |            |  |
|              |                                  |                 |                           |                   | 3             |            |  |
|              |                                  |                 |                           |                   | 4             |            |  |
| SPT SP       | 14 / 14                          |                 | 65<br>27<br>48<br>60 1/2" | Grab              | 65            | SAA        | Br fi SA w/ gr sa w/ abund K matrix                                      |
|              |                                  |                 |                           |                   | 6             |            | @ 65.6' - 65.8' - Gy clst. lensed sl. moist (SA above & below moist-wet) |
|              |                                  |                 |                           |                   | 7             |            |  |
|              |                                  |                 |                           |                   | 8             |            |  |
|              |                                  |                 |                           |                   | 9             |            |  |
|              |                                  |                 |                           |                   | 70            |            |  |
|              |                                  |                 |                           |                   | 1             |            |  |
|              |                                  |                 |                           |                   | 2             |            |  |
|              |                                  |                 |                           |                   | 3             |            |  |
|              |                                  |                 |                           |                   | 4             |            |  |
| SPT SP       | 14 / 14                          |                 | 73<br>31<br>37<br>60 1/2" | Grab              | 75            | (LS)       | Gy clst w/ gy gtz sand lenses, sa moist-wet clay sl moist                |
|              |                                  |                 |                           |                   | 6             | SP         |  |
|              |                                  |                 |                           |                   | 7             | SP         |  |
|              |                                  |                 |                           |                   | 8             |            |  |
|              |                                  |                 |                           |                   | 9             |            |  |
|              |                                  |                 |                           |                   | 0             |            | T.D. @ 76.5'   |

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

DRILLING CONTR *Dasham Expl.*

|  |                                 |  |  |
|--|---------------------------------|--|--|
| <p>LOCATION OF BORING</p>  | <p>JOB NO<br/><b>2-1815</b></p> | <p>CLIENT<br/><b>CSI</b></p>                         | <p>LOCATION<br/><b>Wagner Farm</b></p> |
| <p>DRILLING METHOD: <b>CME-75</b></p> <p><b>4" Solid Stem Augers</b></p> |                                 | <p>BORING NO<br/><b>31</b></p> <p><b>515 - 8</b></p> |  |
| <p>SAMPLING METHOD: <b>Calif. / Split-Spoon and Grab</b></p>             |                                 | <p>SHEET<br/><b>1 of 4</b></p>                       |  |
| <p>WATER LEVEL</p>   |                                 | <p>DRILLING</p>                                      |  |
| <p>TIME</p>  |                                 | <p>START TIME<br/><b>0930</b></p>                    | <p>FINISH TIME</p>                     |
| <p>DATE</p>  |                                 | <p>DATE<br/><b>8/24/08</b></p>                       | <p>DATE</p>                            |
| <p>CASING DEPTH</p>  |                                 | <p>DATE</p>  |  |

| DATUM        |                                  | ELEVATION       |           | SURFACE CONDITIONS: <b>Br. si. v. f. sa w/ some cl</b> |               |            |
|--------------|----------------------------------|-----------------|-----------|--|---------------|------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO | BLOWS/FT. SAMPLER                                      | DEPTH IN FEET | SOIL GRAPH |
|              |                                  |                 |           |  | 0             | <b>CL</b>  |
|              |                                  |                 |           |  | 1             |            |
|              |                                  |                 |           |  | 2             |            |
|              |                                  |                 |           |  | 3             | <b>CL5</b> |
|              |                                  |                 |           |  | 4             |            |
|              |                                  |                 |           |  | 5             | <b>CL5</b> |
|              |                                  |                 |           |  | 6             |            |
|              |                                  |                 |           |  | 7             | <b>CL5</b> |
|              |                                  |                 |           |  | 8             |            |
|              |                                  |                 |           |  | 9             | <b>CL5</b> |
|              |                                  |                 |           |  | 10            |            |
|              |                                  |                 |           |  | 11            | <b>CL5</b> |
|              |                                  |                 |           |  | 12            |            |
|              |                                  |                 |           |  | 13            | <b>CL5</b> |
|              |                                  |                 |           |  | 14            |            |
|              |                                  |                 |           |  | 15            | <b>CL5</b> |
|              |                                  |                 |           |  | 16            |            |
|              |                                  |                 |           |  | 17            | <b>CL5</b> |
|              |                                  |                 |           |  | 18            |            |
|              |                                  |                 |           |  | 19            | <b>CL5</b> |
|              |                                  |                 |           |  | 20            |            |

BY **JEC** DATE **8/24/08** CHK'D BY \_\_\_\_\_

dk br si cl, sl moist

lt br si cl, sl moist w/ trace w. f. sa

olivegy cl stone Adam iron staining dry - sl. moist

Auger cuttings **SHA**

Clay Bag Sample 2016 collected from 10 - 20' Proctor Test

Industrial Compliance Inc.

|                    |  |  |  |                  |  |         |  |                    |             |
|--------------------|--|--|--|------------------|--|---------|--|--------------------|-------------|
| LOCATION OF BORING |  |  |  | JOB NO           |  | CLIENT  |  | LOCATION           |             |
|                    |  |  |  | DRILLING METHOD  |  |         |  | BORING NO<br>SB-31 |             |
| DATUM              |  |  |  | SAMPLING METHOD: |  |         |  | DRILLING           |             |
|                    |  |  |  | WATER LEVEL      |  | 34.5'   |  | START TIME         | FINISH TIME |
|                    |  |  |  | TIME             |  | 1140    |  |                    |             |
|                    |  |  |  | DATE             |  | 9/24/88 |  |                    |             |
|                    |  |  |  | CASING DEPTH     |  | 36.50m  |  |                    |             |

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO | BLOWS/FT SAMPLER | ELEVATION | SOIL GRAPH | SURFACE CONDITIONS: |   |
|--------------|----------------------------------|-----------------|-----------|------------------|-----------|------------|---------------------|---|
|              |                                  |                 |           |                  |           |            | DEPTH IN FEET       | DESCRIPTION   |
| SP<br>SP     | 18<br>18                         |                 | 20        | 53<br>42         | 20        | CLS        | 20                  | Olive gy claystone, dry - <del>stained</del><br>stained iron stain. |
|              |                                  |                 |           |                  | 1         | ML         | 1                   | 1' sand lens, 1/4" iron stained v. fi sa, dry                       |
|              |                                  |                 |           |                  | 2         |            |                     |   |
|              |                                  |                 |           |                  | 3         |            |                     |   |
|              |                                  |                 |           |                  | 4         | CLS        |                     |   |
|              |                                  |                 |           |                  | 5         |            |                     | Auger cutting - claystone   |
|              |                                  |                 |           |                  | 6         |            |                     |   |
|              |                                  |                 |           |                  | 7         |            |                     |   |
|              |                                  |                 |           |                  | 8         |            |                     | Auger cuttings - 1/4" br si fi sa w/ some cl sl. moist              |
|              |                                  |                 |           |                  | 9         | SM         |                     |   |
| SP<br>SP     | 16<br>16                         |                 | 30        | 25<br>60/4       | 30        |            | 30                  | 1/4" br si v. fi. glz sa w/ trace clay moist - damp                 |
|              |                                  |                 |           |                  | 1         |            |                     |   |
|              |                                  |                 |           |                  | 2         |            |                     |   |
|              |                                  |                 |           |                  | 3         |            |                     | Auger cutting - SAA, v. moist - wet                                 |
|              |                                  |                 |           |                  | 4         |            |                     |   |
| Cal A        | 16<br>16                         |                 | 35        | 27<br>60/4       | 35        |            | 35                  | Olive gray to gy clstone, with brown iron staining. dry - sl moist  |
|              |                                  |                 |           |                  | 6         | CLS        |                     |   |
|              |                                  |                 |           |                  | 7         |            |                     |   |
|              |                                  |                 |           |                  | 8         |            |                     |   |
|              |                                  |                 |           |                  | 9         |            |                     | Auger cuttings CLS  |
|              |                                  |                 |           |                  | 40        |            |                     |   |

DRILLING CONTR.

CHK'D BY

DATE

Industrial Compliance Inc.

|                    |                  |        |                            |
|--------------------|------------------|--------|----------------------------|
| LOCATION OF BORING | JOB NO           | CLIENT | LOCATION                   |
|                    | DRILLING METHOD: |        | BORING NO.<br><b>SB-31</b> |
|                    | SAMPLING METHOD: |        | SHEET<br><b>3 of 4</b>     |
|                    |                  |        | DRILLING                   |
|                    | WATER LEVEL      |        | START TIME                 |
|                    | TIME             |        | FINISH TIME                |
|                    | DATE             |        | DATE                       |
|                    | CASING DEPTH     |        |                            |

DRILLING CONTR

| DATUM        |                                  | ELEVATION       |                          | SURFACE CONDITIONS: |               |                                     |
|--------------|----------------------------------|-----------------|--------------------------|---------------------|---------------|-------------------------------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH                          |
|              |                                  |                 |                          |                     | 40            |                                     |
|              |                                  |                 |                          |                     | 1             | Sh or ss lens                       |
|              |                                  |                 |                          |                     | 2             |                                     |
|              |                                  |                 |                          |                     | 3             |                                     |
|              |                                  |                 |                          |                     | 4             | CIS                                 |
| Calf         | 16/16                            |                 | 55-230 / 44 / 45 5/4     | 61/6                | 45            | olimy claystone, dry-s/mast         |
|              |                                  |                 |                          |                     | 6             |                                     |
|              |                                  |                 |                          |                     | 7             |                                     |
|              |                                  |                 |                          |                     | 8             |                                     |
|              |                                  |                 |                          |                     | 9             |                                     |
|              |                                  |                 |                          |                     | 50            | Auger cutting - same as above (SMA) |
|              |                                  |                 |                          |                     | 1             |                                     |
|              |                                  |                 |                          |                     | 2             |                                     |
|              |                                  |                 |                          |                     | 3             |                                     |
|              |                                  |                 |                          |                     | 4             |                                     |
|              |                                  |                 |                          |                     | 55            | Auger cuttings - SAA                |
|              |                                  |                 |                          |                     | 6             |                                     |
|              |                                  |                 |                          |                     | 7             |                                     |
|              |                                  |                 |                          |                     | 8             |                                     |
|              |                                  |                 |                          |                     | 9             |                                     |
|              |                                  |                 |                          |                     | 60            |                                     |

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



Industrial Compliance Inc.

|                    |                  |        |          |                                  |             |
|--------------------|------------------|--------|----------|----------------------------------|-------------|
| LOCATION OF BORING | JOB NO           | CLIENT | LOCATION |                                  |             |
|                    | DRILLING METHOD: |        |          | BORING NO<br>SB- <del>4</del> 31 |             |
|                    | SAMPLING METHOD: |        |          | SHEET<br>4 of 4                  |             |
|                    |                  |        |          | DRILLING                         |             |
|                    | WATER LEVEL      |        |          | START TIME                       | FINISH TIME |
|                    | TIME             |        |          |                                  | 1530        |
| DATE               |                  |        | DATE     | DATE                             |             |
| CASING DEPTH       |                  |        |          | 8/24/88                          |             |

| DATUM        |                                  |                 |                               | ELEVATION         |    | DEPTH IN FEET | SOIL GRAPH  | SURFACE CONDITIONS: |
|--------------|----------------------------------|-----------------|-------------------------------|-------------------|----|---------------|---|---------------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH      | BLOWS/FT. SAMPLER |    |               |   |                     |
| SP           |                                  |                 | 60<br>21<br>27<br>34<br>60/57 | grab              | 60 | CLS           | DK gy claystone, with some rust-iron staining dry (Denver Fm - weather shale) |                     |
|              |                                  |                 |                               |                   | 1  |               |   |                     |
|              |                                  |                 |                               |                   | 2  |               |   |                     |
|              |                                  |                 |                               |                   | 3  |               |   |                     |
|              |                                  |                 |                               |                   | 4  |               |   |                     |
|              |                                  |                 |                               |                   | 65 |               | Augercuttings SFA   |                     |
|              |                                  |                 |                               |                   | 6  |               | Very hard drilling  |                     |
|              |                                  |                 |                               |                   | 7  |               |   |                     |
|              |                                  |                 |                               |                   | 8  |               |   |                     |
|              |                                  |                 |                               |                   | 9  |               |   |                     |
|              |                                  |                 |                               |                   | 70 |               | Augercuttings SFA   |                     |
|              |                                  |                 |                               |                   | 1  |               | Very hard drilling  |                     |
|              |                                  |                 |                               |                   | 2  |               |   |                     |
|              |                                  |                 |                               |                   | 3  |               |   |                     |
|              |                                  |                 |                               |                   | 4  |               |   |                     |
| Col. A       |                                  |                 | 55<br>75<br>60/4"             | 55<br>60/4"       | 75 |               | DK gy weather-sh. - claystone dry - sl moist                                  |                     |
|              |                                  |                 |                               |                   | 6  |               |   |                     |
|              |                                  |                 |                               |                   | 7  |               |   |                     |
|              |                                  |                 |                               |                   | 8  |               |   |                     |
|              |                                  |                 |                               |                   | 9  |               |   |                     |
|              |                                  |                 |                               |                   | 80 |               |   |                     |

DRILLING CONTR.

BY \_\_\_\_\_ CHK'D BY \_\_\_\_\_ DATE \_\_\_\_\_

DRILLING CONTR. *Do Youm Exp Co*

|  |  |                         |                            |                           |
|--|--|-------------------------|----------------------------|---------------------------|
| LOCATION OF BORING   |  | JOB NO<br><i>2-1815</i> | CLIENT<br><i>CSI</i>       | LOCATION<br><i>Wagner</i> |
| DRILLING METHOD<br><i>CME-75, 6"OD<br/>3 1/4" ID hollow stem auger</i> |  |                         | BORING NO<br><i>SB-532</i> |                           |
| SAMPLING METHOD: <i>Calif, split spoon grab</i>                        |  |                         | SHEET<br><i>1 of 4</i>     |                           |
| DATUM  |  | ELEVATION               |                            | DRILLING                  |
|  |  |                         |                            | START TIME<br><i>1200</i> |
|  |  |                         |                            | FINISH TIME               |
|  |  |                         |                            | DATE<br><i>8/25/88</i>    |
|  |  |                         |                            | DATE                      |
|  |  | CASING DEPTH            |                            |                           |

*See location map*

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|---------------|------------|---|
|              |                                  |                 |                           |                   | 0             | <i>CL</i>  | <i>dk br sil cl w/ some f. sa<br/>sl moist</i>                        |
|              |                                  |                 |                           |                   | 1             |            |   |
|              |                                  |                 |                           |                   | 2             |            |   |
|              |                                  |                 |                           |                   | 3             |            |   |
|              |                                  |                 |                           |                   | 4             |            |   |
|              |                                  |                 |                           |                   | 5             |            | <i>Lt. br sil cl w/ trace f. sa<br/>sl moist</i>                      |
|              |                                  |                 |                           |                   | 6             |            |   |
|              |                                  |                 |                           |                   | 7             |            |   |
|              |                                  |                 |                           |                   | 8             |            |   |
|              |                                  |                 |                           |                   | 9             |            |   |
|              |                                  |                 |                           |                   | 10            |            | <i>dk br sil cl - (little to no f. sa)<br/>sl moist</i>               |
|              |                                  |                 |                           |                   | 11            |            | <i>(CLS)</i>  |
|              |                                  |                 |                           |                   | 12            |            |   |
|              |                                  |                 |                           |                   | 13            |            |   |
|              |                                  |                 |                           |                   | 14            |            |   |
|              |                                  |                 |                           |                   | 15            | <i>CL</i>  | <i>dk br sil cl - (no f. sa)<br/>sl moist</i>                         |
|              |                                  |                 |                           |                   | 16            |            |   |
|              |                                  |                 |                           |                   | 17            |            |   |
|              |                                  |                 |                           |                   | 18            |            | <i>Proctor 25 lb bag Sample collected from<br/>15' - 25' interval</i> |
|              |                                  |                 |                           |                   | 19            |            | <i>Auger cuttings: 1 lb br sil cl w/ some v. f. sa</i>                |
|              |                                  |                 |                           |                   | 20            |            |   |

BY: *JEC*  
DATE: *8/25/88*  
CHK'D BY:

Industrial Compliance Inc.

|                    |  |         |                            |             |
|--------------------|--|---------|----------------------------|-------------|
| LOCATION OF BORING |  | JOB NO. | CLIENT                     | LOCATION    |
| DRILLING METHOD:   |  |         | BORING NO.<br><b>SB-32</b> |             |
| SAMPLING METHOD:   |  |         | SHEET<br><b>2 of 4</b>     |             |
| WATER LEVEL        |  |         | DRILLING                   |             |
| TIME               |  |         | START TIME                 | FINISH TIME |
| DATE               |  |         | DATE                       | DATE        |
| DATUM              |  |         | ELEVATION                  |             |
| CASING DEPTH       |  |         |                            |             |

| SAMPLER TYPE | INCHES DRIVEN INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|--------------------------------|-----------------|-----------|-------------------|---------------|------------|--|
| SP           | 18/18                          |                 | 20        | 12 (28) grab      | 2             | CL         | DK br si-cl w/ some interbedded organics iron staining grades to Hgy si-cl - to si-sa w/ some clay at 21" sl moist |
|              |                                |                 |           |                   | 1             | ML/CL      |  |
|              |                                |                 |           |                   | 2             |            |  |
|              |                                |                 |           |                   | 3             |            | Heavy cuttings - dk br si-cl sl moist  |
|              |                                |                 |           |                   | 4             |            |  |
|              |                                |                 |           |                   | 5             |            |  |
|              |                                |                 |           |                   | 6             | ML         | Heavy cuttings - br si-cl Fi SA sl moist   |
|              |                                |                 |           |                   | 7             |            |  |
|              |                                |                 |           |                   | 8             | CLS        |  |
|              |                                |                 |           |                   | 9             |            |  |
|              |                                |                 |           |                   | 10            |            |  |
|              |                                |                 |           |                   | 11            |            |  |
|              |                                |                 |           |                   | 12            |            |  |
|              |                                |                 |           |                   | 13            |            |  |
|              |                                |                 |           |                   | 14            |            |  |
|              |                                |                 |           |                   | 15            |            |  |
|              |                                |                 |           |                   | 16            |            |  |
|              |                                |                 |           |                   | 17            |            |  |
|              |                                |                 |           |                   | 18            |            |  |
|              |                                |                 |           |                   | 19            |            |  |
|              |                                |                 |           |                   | 20            |            |  |
|              |                                |                 |           |                   | 21            |            |  |
|              |                                |                 |           |                   | 22            |            |  |
|              |                                |                 |           |                   | 23            |            |  |
|              |                                |                 |           |                   | 24            |            |  |
|              |                                |                 |           |                   | 25            |            |  |
|              |                                |                 |           |                   | 26            |            |  |
|              |                                |                 |           |                   | 27            |            |  |
|              |                                |                 |           |                   | 28            |            |  |
|              |                                |                 |           |                   | 29            |            |  |
|              |                                |                 |           |                   | 30            |            | olive gy redstone, w/ Aban iron staining dry   |
|              |                                |                 |           |                   | 31            |            |  |
|              |                                |                 |           |                   | 32            |            |  |
|              |                                |                 |           |                   | 33            |            |  |
|              |                                |                 |           |                   | 34            |            |  |
|              |                                |                 |           |                   | 35            |            |  |
|              |                                |                 |           |                   | 36            |            |  |
|              |                                |                 |           |                   | 37            |            |  |
|              |                                |                 |           |                   | 38            |            |  |
|              |                                |                 |           |                   | 39            |            |  |
|              |                                |                 |           |                   | 40            |            |  |
|              |                                |                 |           |                   | 41            |            |  |
|              |                                |                 |           |                   | 42            |            |  |
|              |                                |                 |           |                   | 43            |            |  |
|              |                                |                 |           |                   | 44            |            |  |
|              |                                |                 |           |                   | 45            |            |  |
|              |                                |                 |           |                   | 46            |            |  |
|              |                                |                 |           |                   | 47            |            |  |
|              |                                |                 |           |                   | 48            |            |  |
|              |                                |                 |           |                   | 49            |            |  |
|              |                                |                 |           |                   | 50            |            |  |
|              |                                |                 |           |                   | 51            |            |  |
|              |                                |                 |           |                   | 52            |            |  |
|              |                                |                 |           |                   | 53            |            |  |
|              |                                |                 |           |                   | 54            |            |  |
|              |                                |                 |           |                   | 55            |            |  |
|              |                                |                 |           |                   | 56            |            |  |
|              |                                |                 |           |                   | 57            |            |  |
|              |                                |                 |           |                   | 58            |            |  |
|              |                                |                 |           |                   | 59            |            |  |
|              |                                |                 |           |                   | 60            |            |  |
|              |                                |                 |           |                   | 61            |            |  |
|              |                                |                 |           |                   | 62            |            |  |
|              |                                |                 |           |                   | 63            |            |  |
|              |                                |                 |           |                   | 64            |            |  |
|              |                                |                 |           |                   | 65            |            |  |
|              |                                |                 |           |                   | 66            |            |  |
|              |                                |                 |           |                   | 67            |            |  |
|              |                                |                 |           |                   | 68            |            |  |
|              |                                |                 |           |                   | 69            |            |  |
|              |                                |                 |           |                   | 70            |            |  |
|              |                                |                 |           |                   | 71            |            |  |
|              |                                |                 |           |                   | 72            |            |  |
|              |                                |                 |           |                   | 73            |            |  |
|              |                                |                 |           |                   | 74            |            |  |
|              |                                |                 |           |                   | 75            |            |  |
|              |                                |                 |           |                   | 76            |            |  |
|              |                                |                 |           |                   | 77            |            |  |
|              |                                |                 |           |                   | 78            |            |  |
|              |                                |                 |           |                   | 79            |            |  |
|              |                                |                 |           |                   | 80            |            |  |
|              |                                |                 |           |                   | 81            |            |  |
|              |                                |                 |           |                   | 82            |            |  |
|              |                                |                 |           |                   | 83            |            |  |
|              |                                |                 |           |                   | 84            |            |  |
|              |                                |                 |           |                   | 85            |            |  |
|              |                                |                 |           |                   | 86            |            |  |
|              |                                |                 |           |                   | 87            |            |  |
|              |                                |                 |           |                   | 88            |            |  |
|              |                                |                 |           |                   | 89            |            |  |
|              |                                |                 |           |                   | 90            |            |  |
|              |                                |                 |           |                   | 91            |            |  |
|              |                                |                 |           |                   | 92            |            |  |
|              |                                |                 |           |                   | 93            |            |  |
|              |                                |                 |           |                   | 94            |            |  |
|              |                                |                 |           |                   | 95            |            |  |
|              |                                |                 |           |                   | 96            |            |  |
|              |                                |                 |           |                   | 97            |            |  |
|              |                                |                 |           |                   | 98            |            |  |
|              |                                |                 |           |                   | 99            |            |  |
|              |                                |                 |           |                   | 100           |            |  |

DRILLING CONTR.

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                    |  |        |                     |             |
|--------------------|--|--------|---------------------|-------------|
| LOCATION OF BORING |  | JOB NO | CLIENT              | LOCATION    |
| DRILLING METHOD:   |  |        | BORING NO.<br>SB-32 |             |
| SAMPLING METHOD:   |  |        | SHEET<br>3 of 4     |             |
| WATER LEVEL        |  |        | START TIME          | FINISH TIME |
| TIME               |  |        | DATE                | DATE        |
| DATE               |  |        | DATE                | DATE        |
| CASING DEPTH       |  |        |                     |             |

DRILLING CONTR.

| DATUM        |                                  | ELEVATION       |                          | SURFACE CONDITIONS: |               |  |
|--------------|----------------------------------|-----------------|--------------------------|---------------------|---------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH                             |
| SP           | 18 / 18                          |                 | 18 / 25                  | Grab                | 40            | CLS Lt. gy clstone, dry                |
|              |                                  |                 |                          |                     | 1             |  |
|              |                                  |                 |                          |                     | 2             | CAS                                    |
|              |                                  |                 |                          |                     | 3             |  |
| SP           | 18 / 18                          |                 | 18 / 36                  | Grab                | 45            | SS Lt br - buff surf ss w/ some cl dry |
|              |                                  |                 |                          |                     | 6             |  |
|              |                                  |                 |                          |                     | 7             |  |
|              |                                  |                 |                          |                     | 8             |  |
|              |                                  |                 |                          |                     | 9             |  |
| SP           | 18 / 18                          |                 | 55 / 50                  | 18 / 27             | 50            | CLS orangey clst, dry - sl. moist      |
|              |                                  |                 |                          |                     | 1             |  |
|              |                                  |                 |                          |                     | 2             |  |
|              |                                  |                 |                          |                     | 3             |  |
|              |                                  |                 |                          |                     | 4             |  |
|              |                                  |                 |                          |                     | 5             | Auger cuttings (SUA)                   |
|              |                                  |                 |                          |                     | 6             |  |
|              |                                  |                 |                          |                     | 7             |  |
|              |                                  |                 |                          |                     | 8             |  |
|              |                                  |                 |                          |                     | 9             |  |
|              |                                  |                 |                          |                     | 60            |  |

BY \_\_\_\_\_ CHK'D BY \_\_\_\_\_ DATE \_\_\_\_\_

Industrial Compliance Inc.

|                    |                   |                  |                        |            |                            |
|--------------------|-------------------|------------------|------------------------|------------|----------------------------|
| LOCATION OF BORING |                   | JOB NO.          | CLIENT                 | LOCATION   |                            |
|                    |                   | DRILLING METHOD: |                        |            | BORING NO.<br><b>SB-32</b> |
| SAMPLING METHOD:   |                   |                  | SHEET<br><b>4 of 4</b> |            |                            |
| DRILLING           |                   |                  |                        | START TIME | FINISH TIME                |
| WATER LEVEL        | <b>Dry</b>        | <b>Dry</b>       |                        |            |                            |
| TIME               | <b>1500</b>       | <b>1300</b>      |                        |            | <b>1440</b>                |
| DATE               | <b>8/25/88</b>    | <b>9/20/88</b>   |                        |            | <b>9/25/88</b>             |
| CASING DEPTH       | <b>71.5' open</b> | <b>70' PVC</b>   |                        |            |                            |

| DATUM        |                                   | ELEVATION       |                           |                     |                  | SURFACE CONDITIONS: |   |
|--------------|-----------------------------------|-----------------|---------------------------|---------------------|------------------|---------------------|---|
| SAMPLER TYPE | INCHES DRIVER<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | BLOWS/FT<br>SAMPLER | DEPTH<br>IN FEET | SOIL<br>GRAPH       |   |
| <b>SP</b>    | <b>18</b>                         |                 | <b>60</b>                 | <b>27<br/>35</b>    | <b>60</b>        | <b>ML</b>           | <b>Lt gy to gy si v. f. sa w/ some cl. dry</b>  |
|              |                                   |                 |                           |                     | 1                |                     | <b>Siltstone</b>  |
|              |                                   |                 |                           |                     | 2                |                     |   |
|              |                                   |                 |                           |                     | 3                |                     |   |
|              |                                   |                 |                           |                     | 4                |                     |   |
|              |                                   |                 |                           |                     | 5                |                     |   |
|              |                                   |                 |                           |                     | 6                |                     |   |
|              |                                   |                 |                           |                     | 7                |                     |   |
|              |                                   |                 |                           |                     | 8                |                     |   |
|              |                                   |                 |                           |                     | 9                |                     |   |
|              |                                   |                 |                           |                     | 10               |                     |   |
| <b>SP</b>    | <b>18</b>                         |                 | <b>70</b>                 | <b>32<br/>43</b>    | <b>70</b>        |                     | <b>BK to si v. f. sa w/ abun organics, some lignite streaks. Grades to gy si f. sa @ 71' w/ some lignite streaks and blue-green clay nodules. Dry</b> |
|              |                                   |                 |                           |                     | 1                |                     |   |
|              |                                   |                 |                           |                     | 2                |                     |   |
|              |                                   |                 |                           |                     | 3                |                     | <b>TD Hole @ 71.5'</b>  |
|              |                                   |                 |                           |                     | 4                |                     | <b>Hole Reamed on 9/20/88</b>   |
|              |                                   |                 |                           |                     | 5                |                     | <b>Piczo set to 70 w/ 15' skirt @ 9/20/88</b>   |
|              |                                   |                 |                           |                     | 6                |                     |   |
|              |                                   |                 |                           |                     | 7                |                     |   |
|              |                                   |                 |                           |                     | 8                |                     |   |
|              |                                   |                 |                           |                     | 9                |                     |   |
|              |                                   |                 |                           |                     | 0                |                     |   |

DRILLING CONTR.

CHK'D BY

DATE

101 (3) (REV. 11-80)

|                    |  |  |  |                  |  |        |  |           |  |
|--------------------|--|--|--|------------------|--|--------|--|-----------|--|
| LOCATION OF BORING |  |  |  | JOB NO.          |  | CLIENT |  | LOCATION  |  |
|                    |  |  |  | DRILLING METHOD: |  |        |  | BORING NO |  |
|                    |  |  |  |                  |  |        |  | SB-32     |  |
|                    |  |  |  | SAMPLING METHOD: |  |        |  | SHEET     |  |
|                    |  |  |  |                  |  |        |  | 4 of 4    |  |
|                    |  |  |  | DRILLING         |  |        |  | START     |  |
|                    |  |  |  | WATER LEVEL      |  |        |  | TIME      |  |
|                    |  |  |  | Dry              |  |        |  | 1440      |  |
|                    |  |  |  | TIME             |  |        |  | DATE      |  |
|                    |  |  |  | 1500             |  |        |  | 8/25/88   |  |
|                    |  |  |  | DATE             |  |        |  | DATE      |  |
|                    |  |  |  | 8/25/88          |  |        |  | 8/25/88   |  |
|                    |  |  |  | CASING DEPTH     |  |        |  |           |  |
|                    |  |  |  | 71.5' open       |  |        |  | 70 pie    |  |

| DATUM        |                               | ELEVATION       |                        |                  |               |            |   | SURFACE CONDITIONS: |  |
|--------------|-------------------------------|-----------------|------------------------|------------------|---------------|------------|---|---------------------|--|
| SAMPLER TYPE | INCHS DRIVEN INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH |   |                     |  |
| SP           | 18                            |                 | 35                     | 35               | 60            | ML         | Lt gy to gy si v. fi. sa w/ some cl. dry  |                     |  |
| SP           | 18                            |                 | 50                     | Grab             |               |            | 5.1 cm  |                     |  |
|              |                               |                 |                        |                  | 1             |            |   |                     |  |
|              |                               |                 |                        |                  | 2             |            |   |                     |  |
|              |                               |                 |                        |                  | 3             |            |   |                     |  |
|              |                               |                 |                        |                  | 4             |            |   |                     |  |
|              |                               |                 |                        |                  | 5             |            |   |                     |  |
|              |                               |                 |                        |                  | 6             |            |   |                     |  |
|              |                               |                 |                        |                  | 7             |            |   |                     |  |
|              |                               |                 |                        |                  | 8             |            |   |                     |  |
|              |                               |                 |                        |                  | 9             |            |   |                     |  |
|              |                               |                 |                        |                  | 10            |            |   |                     |  |
| SP           | 18                            |                 | 32                     | 47               | 70            | Grab       | BK to si v. fi. sa w/ aben organics, some lignite streaks. Grades to gy si fi sa @ 71' w/ some lignite streaks and blue-green clay nodules. Dry |                     |  |
| SP           | 18                            |                 | 43                     |                  |               |            |   |                     |  |
|              |                               |                 |                        |                  | 1             |            |   |                     |  |
|              |                               |                 |                        |                  | 2             |            |   |                     |  |
|              |                               |                 |                        |                  | 3             |            | TD Hole @ 71.5'   |                     |  |
|              |                               |                 |                        |                  | 4             |            | Hole Reamed on 9/20/88  |                     |  |
|              |                               |                 |                        |                  | 5             |            | Piezo set to 70 w/ 15' skirted @ 9/20/88  |                     |  |
|              |                               |                 |                        |                  | 6             |            |   |                     |  |
|              |                               |                 |                        |                  | 7             |            |   |                     |  |
|              |                               |                 |                        |                  | 8             |            |   |                     |  |
|              |                               |                 |                        |                  | 9             |            |   |                     |  |
|              |                               |                 |                        |                  | 10            |            |   |                     |  |

DRILLING CONTR

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                                       |  |               |                         |
|---------------------------------------|--|---------------|-------------------------|
| LOCATION OF BORING<br><i>88th Ave</i> | JOB NO.<br>2-1815  | CLIENT<br>CSI | LOCATION<br>Wagner Farm |
|                                       | DRILLING METHOD: <i>CME - 75, 6" OD</i><br><i>3/4 ID Hollow Stem Auger</i> |               | BORING NO.<br>SB-E33    |
|                                       | SAMPLING METHOD: <i>Calif, Split Spoon, Grab</i>                           |               | SHEET<br>1 of 4         |
| WATER LEVEL                           |  |               | DRILLING                |
| TIME                                  |  |               | START TIME<br>3:30      |
| DATE                                  |  |               | FINISH TIME             |
| CASING DEPTH                          |  |               | DATE<br>8/25/88         |

| DATUM        |                                   | ELEVATION       |                           | SURFACE CONDITIONS:  |               |   |
|--------------|-----------------------------------|-----------------|---------------------------|----------------------|---------------|---|
| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | BLOWS/FT.<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH  |
|              |                                   |                 |                           |                      | 0             | <i>Br si fi sa w/ some clay</i><br><i>(recently disked field)</i>                       |
|              |                                   |                 |                           |                      | 1             | <i>ML Lt br si fi sa w/ trace cl</i><br><i>dry - sl moist</i>                           |
|              |                                   |                 |                           |                      | 2             |   |
|              |                                   |                 |                           |                      | 3             |   |
|              |                                   |                 |                           |                      | 4             |   |
|              |                                   |                 |                           |                      | 5             | <i>CL DK br si sa cl</i><br><i>dry - sl moist</i>                                       |
|              |                                   |                 |                           |                      | 6             |   |
|              |                                   |                 |                           |                      | 7             |   |
|              |                                   |                 |                           |                      | 8             |   |
|              |                                   |                 |                           |                      | 9             |   |
|              |                                   |                 |                           |                      | 10            | <i>ML Lt br - br si v. fi sa w/ some mgz</i><br><i>grains, some clay dry - sl moist</i> |
|              |                                   |                 |                           |                      | 11            |   |
|              |                                   |                 |                           |                      | 12            |   |
|              |                                   |                 |                           |                      | 13            |   |
|              |                                   |                 |                           |                      | 14            |   |
|              |                                   |                 |                           |                      | 15            | <i>CL DK br to gy si cl, dry - sl moist</i>   |
|              |                                   |                 |                           |                      | 16            |   |
|              |                                   |                 |                           |                      | 17            |   |
|              |                                   |                 |                           |                      | 18            |   |
|              |                                   |                 |                           |                      | 19            |   |

DRILLING CONTR *De Haven*

BY *JPC* DATE *8/26/88* CHK'D BY





Industrial Compliance Inc.

|                    |  |                  |                        |             |
|--------------------|--|------------------|------------------------|-------------|
| LOCATION OF BORING |  | JOB NO.          | CLIENT                 | LOCATION    |
|                    |  | DRILLING METHOD: |                        |             |
| SAMPLING METHOD:   |  |                  | SHEET<br><b>3 of 4</b> |             |
| WATER LEVEL        |  |                  |                        | DRILLING    |
| TIME               |  |                  |                        | START TIME  |
| DATE               |  |                  |                        | FINISH TIME |
| CASING DEPTH       |  |                  |                        | DATE        |

| DATUM        |                                  | ELEVATION       |                          | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|--------------------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH |               |            |   |
| Calif        | 18 / 18                          |                 | 55 / 40                  | 39            | CLS        | olive gy clst w/ some iron staining<br>dry - sl. moist<br>*(Calif barrel had some wet spots on it, may have drilled thru v. then saturated barrel. I returned for v.l. - dry after drive) |
| SPT          | 18 / 18                          |                 | 55 / 45                  | 27            | Grab       | SAA, more iron staining dry - sl. moist   |
| Calif        |                                  |                 | 55 / 50                  | 50            |            | gy-olive gy clst dry - sl. moist  |
|              |                                  |                 |                          | 51.2          | ML         | Grades to br-yellow clay at 51.2 dry - sl. moist  |
|              |                                  |                 |                          | 51.3          |            | Grades to br-yellow f. f. sa 51.3 dry - sl. moist (sand iron stained)   |
| SPT          | 18 / 18                          |                 | 90.5                     | 90.5          | Grab       | Br yellow si v. f. sa dry - sl. moist   |
|              |                                  |                 |                          |               |            | Grades to dk gy - bk cl w/ abun carbon pieces throughout dry - sl. moist  |

DRILLING CONTR

CHK'D BY

DATE

I (3) REV 11-80

|                    |  |  |  |                  |                |            |                           |
|--------------------|--|--|--|------------------|----------------|------------|---------------------------|
| LOCATION OF BORING |  |  |  | JOB NO           | CLIENT         | LOCATION   |                           |
|                    |  |  |  | DRILLING METHOD: |                |            | BORING NO<br><b>3B-33</b> |
|                    |  |  |  |                  |                |            | SHEET<br><b>4 of 4</b>    |
|                    |  |  |  | SAMPLING METHOD: |                |            | DRILLING                  |
|                    |  |  |  | WATER LEVEL      | <b>dry</b>     | START TIME | FINISH TIME               |
|                    |  |  |  | TIME             | <b>1:00</b>    |            | <b>10:30</b>              |
|                    |  |  |  | DATE             | <b>8/26/08</b> | DATE       | <b>8/26/08</b>            |
| DATUM              |  |  |  | ELEVATION        |                |            |                           |
|                    |  |  |  | CASING DEPTH     | <b>80 open</b> |            |                           |

DRILLING CONTR

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES PENETRATED | DEPTH OF CASING | SAMPLE NO | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|------------------------------------|-----------------|-----------|-------------------|---------------|------------|---|
| <b>SP</b>    | <b>18</b>                          |                 | <b>60</b> | <b>38</b>         | <b>60</b>     |            | <b>DK gy silty w/ some bk carbon pieces, dry - sl moist</b>                   |
|              |                                    |                 |           | <b>48</b>         | <b>1</b>      | <b>MZ</b>  | <b>Grades to greenish-gy silty clay, dry - sl moist</b>                       |
|              |                                    |                 |           |                   | <b>2</b>      |            | <b>w/ some dk gy - bk carbon nodules</b>                                      |
|              |                                    |                 |           |                   | <b>3</b>      |            |   |
|              |                                    |                 |           |                   | <b>4</b>      |            |   |
|              |                                    |                 |           |                   | <b>6.5</b>    | <b>CLS</b> | <b>Augercuttings dk gy - bk cl dry - sl moist</b>                             |
|              |                                    |                 |           |                   | <b>7</b>      |            |   |
|              |                                    |                 |           |                   | <b>8</b>      |            |   |
|              |                                    |                 |           |                   | <b>9</b>      |            |   |
| <b>SP</b>    | <b>9</b>                           |                 | <b>53</b> | <b>28</b>         | <b>70</b>     | <b>CLS</b> | <b>Gy - DK gy cl w/ carbon streaks dry - sl moist</b>                         |
|              |                                    |                 | <b>70</b> | <b>50/3</b>       | <b>1</b>      |            |   |
|              |                                    |                 |           |                   | <b>2</b>      |            |   |
|              |                                    |                 |           |                   | <b>3</b>      |            |   |
|              |                                    |                 |           |                   | <b>4</b>      |            |   |
|              |                                    |                 |           |                   | <b>5</b>      | <b>CLS</b> | <b>Augercuttings gy cl dry - sl moist</b>                                     |
|              |                                    |                 |           |                   | <b>6</b>      |            |   |
|              |                                    |                 |           |                   | <b>7</b>      |            |   |
|              |                                    |                 |           |                   | <b>8</b>      |            |   |
|              |                                    |                 |           |                   | <b>9</b>      |            | <b>DK gy cl/stone w/ shale interbeds dry - sl moist, some carbon material</b> |
| <b>SP</b>    | <b>5</b>                           |                 |           |                   | <b>60</b>     | <b>CLS</b> |   |

CHK'D BY

DATE

1.1 (3) (REV. 11-00)

|  |                                |                      |                                 |
|--|--------------------------------|----------------------|---------------------------------|
| LOCATION OF BORING:<br><i>B5th HWP</i> | JOB NO.<br><i>2-1815</i>       | CLIENT<br><i>CSI</i> | LOCATION<br><i>Lebanon Farm</i> |
|  | DRILLING METHOD: <i>CME-75</i> |                      | BORING NO.<br><i>SB-34</i>      |
|  | 4" OD Solid Stem Augers        |                      | SHEET<br><i>1 of 4</i>          |
| SAMPLING METHOD:                       |                                |                      | DRILLING                        |
| WATER LEVEL                            |                                | START TIME           | FINISH TIME                     |
| TIME                                   |                                | <i>1115</i>          |                                 |
| DATE                                   |                                | DATE                 | DATE                            |
| CASING DEPTH                           |                                | <i>8/26/88</i>       |                                 |

| DATUM        |                                  |                 |                          |                  | ELEVATION     |            | SURFACE CONDITIONS: <i>br sil cl w/ some f. gte sa</i>          |
|--------------|----------------------------------|-----------------|--------------------------|------------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH |   |
|              |                                  |                 |                          |                  | 0             | CL         | <i>DK br sil cl w/ some sa dry-s/moist</i>                      |
|              |                                  |                 |                          |                  | 1             |            |   |
|              |                                  |                 |                          |                  | 2             |            |   |
|              |                                  |                 |                          |                  | 3             |            |   |
|              |                                  |                 |                          |                  | 4             |            |   |
|              |                                  |                 |                          |                  | 5             | CL         | <i>lt br sil cl w/ some sa dry-s/moist</i>                      |
|              |                                  |                 |                          |                  | 6             |            |   |
|              |                                  |                 |                          |                  | 7             |            |   |
|              |                                  |                 |                          |                  | 8             |            |   |
|              |                                  |                 |                          |                  | 9             |            |   |
|              |                                  |                 |                          |                  | 10            | ML/SC      | <i>lt br si sa w/ some cl dry</i>                               |
|              |                                  |                 |                          |                  | 11            |            |   |
|              |                                  |                 |                          |                  | 12            |            |   |
|              |                                  |                 |                          |                  | 13            |            |   |
|              |                                  |                 |                          |                  | 14            |            |   |
|              |                                  |                 |                          |                  | 15            | SC         | <i>lt br sil cl w/ gtz sa, fi-me w/ some clay dry</i>           |
|              |                                  |                 |                          |                  | 16            |            |   |
|              |                                  |                 |                          |                  | 17            |            |   |
|              |                                  |                 |                          |                  | 18            |            |   |
|              |                                  |                 |                          |                  | 19            |            | <i>Auger cuttings SAA dry-s/moist<br/>Some calcite deposits</i> |

DRILLING CONTR *Da Sun Drilling*

BY *EC* DATE *8/26/88* CHK'D BY

|                    |  |        |                     |             |
|--------------------|--|--------|---------------------|-------------|
| LOCATION OF BORING |  | JOB NO | CLIENT              | LOCATION    |
| DRILLING METHOD:   |  |        | BORING NO<br>51B-34 |             |
| SAMPLING METHOD:   |  |        | SHEET<br>2 of 4     |             |
| WATER LEVEL        |  |        | DRILLING            |             |
| TIME               |  |        | START TIME          | FINISH TIME |
| DATE               |  |        | DATE                | DATE        |
| CASING DEPTH       |  |        |                     |             |

| DATUM        |                                  | ELEVATION       |           |                   |               |            |   | SURFACE CONDITIONS: |  |
|--------------|----------------------------------|-----------------|-----------|-------------------|---------------|------------|---|---------------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |   |                     |  |
| SP           | 18 / 18                          |                 | 20        | 13 / 13           | 20            | ML         | Br si clay - silty - sl. moist. some calc. streaks    |                     |  |
|              |                                  |                 |           |                   | 1             |            |   |                     |  |
|              |                                  |                 |           |                   | 2             |            |   |                     |  |
|              |                                  |                 |           |                   | 3             |            |   |                     |  |
|              |                                  |                 |           |                   | 4             |            |   |                     |  |
|              |                                  |                 |           |                   | 25            |            | SAA   |                     |  |
|              |                                  |                 |           |                   | 6             |            |   |                     |  |
|              |                                  |                 |           |                   | 7             | ML         |   |                     |  |
|              |                                  |                 |           |                   | 8             | SM         | dkbr qtz - fi-me sa, dirty (silty) sa dry - sl. moist |                     |  |
|              |                                  |                 |           |                   | 9             |            |   |                     |  |
| SP           | 18 / 18                          |                 | 30        | 15 / 27           | 30            | ML / SVL   | Brown si figtz sa, some dr clay dry - sl. moist       |                     |  |
|              |                                  |                 |           |                   | 1             |            | grades change towards bottom i.e. ~ 31-2' br clay     |                     |  |
|              |                                  |                 |           |                   | 2             |            |   |                     |  |
|              |                                  |                 |           |                   | 3             |            |   |                     |  |
|              |                                  |                 |           |                   | 4             |            |   |                     |  |
| SP           | 18 / 18                          |                 | 35        | 18 / 31           | 35            |            | gray clstone, Abun. iron staining dry - sl. moist     |                     |  |
|              |                                  |                 |           |                   | 6             |            |   |                     |  |
|              |                                  |                 |           |                   | 7             |            |   |                     |  |
|              |                                  |                 |           |                   | 8             |            |   |                     |  |
|              |                                  |                 |           |                   | 9             |            |   |                     |  |

DRILLING CONTR

BY \_\_\_\_\_ DATE \_\_\_\_\_  
CHK'D BY \_\_\_\_\_

|                    |  |  |  |        |  |                    |  |             |  |
|--------------------|--|--|--|--------|--|--------------------|--|-------------|--|
| LOCATION OF BORING |  |  |  | JOB NO |  | CLIENT             |  | LOCATION    |  |
| DRILLING METHOD    |  |  |  |        |  | BORING NO<br>55-34 |  |             |  |
| SAMPLING METHOD    |  |  |  |        |  | SHEET<br>3 of 4    |  |             |  |
| WATER LEVEL        |  |  |  |        |  | START TIME         |  | FINISH TIME |  |
| TIME               |  |  |  |        |  | DATE               |  | DATE        |  |
| CASING DEPTH       |  |  |  |        |  | DATE               |  | DATE        |  |

| DATUM        |                                  |                 |                          | ELEVATION        |               |            |   | SURFACE CONDITIONS: |  |
|--------------|----------------------------------|-----------------|--------------------------|------------------|---------------|------------|---|---------------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH |   |                     |  |
| Calif        | 13 / 8                           |                 | 55-1 / 40                | 23 / 48          | 40            | CL5        | Olive gy clst w/ some iron staining dry - slimeist        |                     |  |
|              |                                  |                 |                          |                  | 1             |            |   |                     |  |
|              |                                  |                 |                          |                  | 2             |            |   |                     |  |
|              |                                  |                 |                          |                  | 3             |            | Harder drilling   |                     |  |
|              |                                  |                 |                          |                  | 4             | SS         | SS  |                     |  |
| 31           | 10 / 10                          |                 | AS / 50                  | 37 / 4           | 5             | ML         | Hbr - br v. fi grtz sa dry - <del>slimeist</del>          |                     |  |
|              |                                  |                 |                          |                  | 6             |            |   |                     |  |
|              |                                  |                 |                          |                  | 7             |            |   |                     |  |
|              |                                  |                 |                          |                  | 8             | CL5        |   |                     |  |
|              |                                  |                 |                          |                  | 9             |            |   |                     |  |
| Calif        | 17 / 17                          |                 | 55-2 / 50                | 38 / 5           | 50            | ML         | 6v clst w/ some <sup>cutite</sup> replacement, dry        |                     |  |
|              |                                  |                 |                          |                  | 1             |            | 2" Hbr v. fi grtz sa loose 50.4 - 50.6"                   |                     |  |
|              |                                  |                 |                          |                  | 2             |            | 51.2 - 51.5 buff - br - yell ss., dry w/ olive gy clstone |                     |  |
|              |                                  |                 |                          |                  | 3             | CL5        |   |                     |  |
|              |                                  |                 |                          |                  | 4             |            |   |                     |  |
|              |                                  |                 |                          |                  | 5             |            | DKgy clstone  |                     |  |
|              |                                  |                 |                          |                  | 6             |            |   |                     |  |
|              |                                  |                 |                          |                  | 7             |            |   |                     |  |
|              |                                  |                 |                          |                  | 8             |            |   |                     |  |
|              |                                  |                 |                          |                  | 9             |            |   |                     |  |
|              |                                  |                 |                          |                  | 10            |            |   |                     |  |

DRILLING CONTR

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                    |  |        |                    |             |
|--------------------|--|--------|--------------------|-------------|
| LOCATION OF BORING |  | JOB NO | CLIENT             | LOCATION    |
| DRILLING METHOD:   |  |        | BORING NO<br>5B-74 |             |
| SAMPLING METHOD:   |  |        | SHEET<br>4 of 4    |             |
| WATER LEVEL        |  |        | START TIME         | FINISH TIME |
| TIME               |  |        | DATE               | DATE        |
| CASING DEPTH       |  |        | DRILLING           |             |
|                    |  |        | START TIME         | FINISH TIME |
|                    |  |        | DATE               | DATE        |
|                    |  |        | 8/26/88            |             |

| DATUM | ELEVATION | SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|-------|-----------|--------------|----------------------------------|-----------------|-----------|-------------------|---------------|------------|---|
|       |           | SIF<br>SP    |                                  |                 | 60        | 22<br>33          | 0             | CL5        | dry claystone w/ some thin layers of<br>br claystone and br silt. fine stringers<br>dry |
|       |           |              |                                  |                 |           |                   | 1             |            |   |
|       |           |              |                                  |                 |           |                   | 2             |            |   |
|       |           |              |                                  |                 |           |                   | 3             |            |   |
|       |           |              |                                  |                 |           |                   | 4             |            |   |
|       |           |              |                                  |                 |           |                   | 5             |            |   |
|       |           |              |                                  |                 |           |                   | 6             |            |   |
|       |           |              |                                  |                 |           |                   | 65            |            | Gy - dk gy clst   |
|       |           |              |                                  |                 |           |                   | 6             |            |   |
|       |           |              |                                  |                 |           |                   | 7             |            |   |
|       |           |              |                                  |                 |           |                   | 8             |            |   |
|       |           |              |                                  |                 |           |                   | 9             |            |   |
|       |           | Calif        |                                  |                 | 70        | 50/4"             | 0             |            | SAA   |
|       |           |              |                                  |                 |           |                   | 1             |            |   |
|       |           |              |                                  |                 |           |                   | 2             |            |   |
|       |           |              |                                  |                 |           |                   | 3             |            |   |
|       |           |              |                                  |                 |           |                   | 4             |            |   |
|       |           | Calif        | 4"<br>4"                         |                 | 75        | 50/4" Grab        | 0             |            | Weather-Shell bed rx dry<br>(No Calif collected - grab)                                 |
|       |           |              |                                  |                 |           |                   | 1             |            |   |
|       |           |              |                                  |                 |           |                   | 2             |            |   |
|       |           |              |                                  |                 |           |                   | 3             |            |   |
|       |           |              |                                  |                 |           |                   | 4             |            |   |
|       |           |              |                                  |                 |           |                   | 5             |            |   |
|       |           |              |                                  |                 |           |                   | 6             |            |   |
|       |           |              |                                  |                 |           |                   | 7             |            |   |
|       |           |              |                                  |                 |           |                   | 8             |            |   |
|       |           |              |                                  |                 |           |                   | 9             |            |   |
|       |           |              |                                  |                 |           |                   | 0             |            | TD @ 75'  |

DRILLING CONTR

BY \_\_\_\_\_ DATE \_\_\_\_\_  
CHK'D BY \_\_\_\_\_

|                                |  |                     |                    |
|--------------------------------|--|---------------------|--------------------|
| LOCATION OF BORING<br>88th Ave | JOB NO.<br>2-1815                                | CLIENT<br>CSI       | LOCATION<br>Wagner |
|                                | DRILLING METHOD<br>ONE-75<br>4" Solid Stem Auger | BORING NO.<br>SB-35 |                    |
|                                | SAMPLING METHOD<br>Calit, Split Spn, 6mb         | SHEET<br>1 of 4     |                    |
| WATER LEVEL                    |  | DRILLING            | START TIME         |
| TIME                           |  |                     | 3:40               |
| DATE                           |  |                     | DATE               |
| CASING DEPTH                   |  |                     | 8/2/88             |

| DATUM        |                                   |                 |                           | ELEVATION           |    | DEPTH IN FEET | SOIL GRAPH                      | SURFACE CONDITIONS:<br>Br si cl w/ some fi - me 59 |
|--------------|-----------------------------------|-----------------|---------------------------|---------------------|----|---------------|---------------------------------|--|
| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | FLWS/FT.<br>SAMPLER |    |               |                                 |  |
|              |                                   |                 |                           |                     | 0  |               |                                 |  |
|              |                                   |                 |                           |                     | 1  |               |                                 |  |
|              |                                   |                 |                           |                     | 2  |               |                                 |  |
|              |                                   |                 |                           |                     | 3  |               |                                 |  |
|              |                                   |                 |                           |                     | 4  | CL            | Br-dk br si v. fi sa cl         |  |
|              |                                   |                 |                           |                     | 5  |               | sl. moist                       |  |
|              |                                   |                 |                           |                     | 6  |               |                                 |  |
|              |                                   |                 |                           |                     | 7  |               |                                 |  |
|              |                                   |                 |                           |                     | 8  |               |                                 |  |
|              |                                   |                 |                           |                     | 9  |               |                                 |  |
|              |                                   |                 |                           |                     | 10 | CL            | Br si v. fi. sa cl              |  |
|              |                                   |                 |                           |                     | 11 |               | sl. moist                       |  |
|              |                                   |                 |                           |                     | 12 |               |                                 |  |
|              |                                   |                 |                           |                     | 13 |               |                                 |  |
|              |                                   |                 |                           |                     | 14 |               |                                 |  |
|              |                                   |                 |                           |                     | 15 |               | SAA                             |  |
|              |                                   |                 |                           |                     | 16 |               |                                 |  |
|              |                                   |                 |                           |                     | 17 | SC            | Auger cuttings grade more sandy |  |
|              |                                   |                 |                           |                     | 18 |               | i.e. br me gr. sa w/ some cl    |  |
|              |                                   |                 |                           |                     | 19 |               |                                 |  |
|              |                                   |                 |                           |                     | 20 |               |                                 |  |

DRILLING CONTR. *D. S. S. Exp.*

BY *JCC*  
DATE *8/26/88* CHK'D BY  
1.13 (REV 11.88)

|                    |  |  |  |                  |  |        |  |             |  |
|--------------------|--|--|--|------------------|--|--------|--|-------------|--|
| LOCATION OF BORING |  |  |  | JOB NO           |  | CLIENT |  | LOCATION    |  |
|                    |  |  |  | DRILLING METHOD: |  |        |  | BORING NO   |  |
|                    |  |  |  |                  |  |        |  | SB-23       |  |
|                    |  |  |  | SAMPLING METHOD: |  |        |  | SHEET       |  |
|                    |  |  |  |                  |  |        |  | 2 of 4      |  |
|                    |  |  |  | WATER LEVEL      |  |        |  | DRILLING    |  |
|                    |  |  |  | TIME             |  |        |  | START TIME  |  |
|                    |  |  |  | DATE             |  |        |  | FINISH TIME |  |
|                    |  |  |  | CASING DEPTH     |  |        |  | DATE        |  |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|----------------------------------|-----------------|--------------------------|-------------------|---------------|------------|
| Spt SP       | 18 / 18                          |                 | 20 / 15                  | Grab              | 2             | CL         |
|              |                                  |                 |                          |                   | 1             |            |
|              |                                  |                 |                          |                   | 2             |            |
|              |                                  |                 |                          |                   | 3             |            |
|              |                                  |                 |                          |                   | 4             |            |
|              |                                  |                 |                          |                   | 25            |            |
|              |                                  |                 |                          |                   | 6             |            |
|              |                                  |                 |                          |                   | 7             |            |
|              |                                  |                 |                          |                   | 8             | CLS        |
|              |                                  |                 |                          |                   | 9             |            |
| Spt SP       | 18 / 18                          |                 | 30 / 19                  | Grab              | 30            |            |
|              |                                  |                 |                          |                   | 1             |            |
|              |                                  |                 |                          |                   | 2             |            |
|              |                                  |                 |                          |                   | 3             |            |
|              |                                  |                 |                          |                   | 4             |            |
| Spt SP       | 18 / 18                          |                 | 35 / 31                  | Grab              | 35            |            |
|              |                                  |                 |                          |                   | 6             |            |
|              |                                  |                 |                          |                   | 7             |            |
|              |                                  |                 |                          |                   | 8             |            |
|              |                                  |                 |                          |                   | 9             |            |

SURFACE CONDITIONS:

br - gy cl - abun iron staining and carbonate deposits, few v. thin v. fi sa stringers sl moist

Br v. fi sa cl sl moist

Augmentary br - olive gy cl

olive - gy cl stone w/ abun iron staining dry - sl moist sample contain 1/2" piece of weather. ss

Brownish - gy cl stone w/ some iron staining and a few v. thin fi sa lenses dry - sl moist

DRILLING CONTR

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK D BY \_\_\_\_\_



|                    |  |                 |  |          |  |                   |  |
|--------------------|--|-----------------|--|----------|--|-------------------|--|
| LOCATION OF BORING |  | JOB NO          |  | CLIENT   |  | LOCATION          |  |
| M.K.: 781-3561     |  | DRILLING METHOD |  |          |  | BORING NO         |  |
|                    |  |                 |  |          |  | SB-835            |  |
|                    |  | SAMPLING METHOD |  |          |  | SHEET             |  |
|                    |  |                 |  |          |  | 3 of 4            |  |
|                    |  |                 |  |          |  | DRILLING          |  |
|                    |  | WATER LEVEL     |  | 39.4 day |  | 54.8              |  |
|                    |  | TIME            |  | 856      |  | 1015 1030         |  |
|                    |  | DATE            |  | 8/30/88  |  | 8/30/88 8/30/88   |  |
|                    |  | CASING DEPTH    |  | 40' open |  | 50' open 55' open |  |
|                    |  | START TIME      |  |          |  | FINISH TIME       |  |
|                    |  | DATE            |  |          |  | DATE              |  |

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVER<br>INCHES OVERBIT | DEPTH OF CASING | SAMPLE NO<br>SAMPLER DEPTH | BLOWS/FT<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|---------------------------------|-----------------|----------------------------|---------------------|---------------|------------|---|
| Cal. P       | 14                              |                 | 55-1<br>40                 | 22<br>26<br>29/4    | 40            | CLS        | Br - claystone w/ some br sil. s.s. intervals<br>dry - sl moist   |
|              |                                 |                 |                            |                     | 1             |            |   |
|              |                                 |                 |                            |                     | 2             |            | 8/30/88 @ 925 started drilling.   |
|              |                                 |                 |                            |                     | 3             |            |   |
|              |                                 |                 |                            |                     | 4             |            |   |
| 30" sp       | 18/18                           |                 | 45<br>10<br>18             | Grab                | 5             | CLS        | Br - olive gy cl/stone, dry - sl moist<br>Abund. iron staining; a few sil. s.s. stringers, dry                                      |
|              |                                 |                 |                            |                     | 6             |            |   |
|              |                                 |                 |                            |                     | 7             |            |   |
|              |                                 |                 |                            |                     | 8             |            |   |
|              |                                 |                 |                            |                     | 9             |            |   |
| Cal. P       | 18/18                           |                 | 55-2<br>50                 | 24<br>32<br>36      | 50            |            | olive -<br>gy clstone w/ some br sil. f. gy s.s. intervals<br>clstone dry - sl moist, s.s. damp - moist - wet<br>(checked with log) |
|              |                                 |                 |                            |                     | 1             |            |   |
|              |                                 |                 |                            |                     | 2             |            |   |
|              |                                 |                 |                            |                     | 3             |            |   |
|              |                                 |                 |                            |                     | 4             |            |   |
| 30" sp       | 18/18                           |                 | 55<br>14<br>22             | Grab                | 55            | CLS        | Dk gy cls (bedrock)   |
|              |                                 |                 |                            |                     | 6             |            | (Packer tested from ~40-55' interval)   |
|              |                                 |                 |                            |                     | 7             |            |   |
|              |                                 |                 |                            |                     | 8             |            |   |
|              |                                 |                 |                            |                     | 9             |            |   |

DRILLING CONT'D

CHK'D BY

Industrial Compliance Inc.

|                    |  |         |                             |             |
|--------------------|--|---------|-----------------------------|-------------|
| LOCATION OF BORING |  | JOB NO. | CLIENT                      | LOCATION    |
| DRILLING METHOD:   |  |         | BORING NO.<br><b>SB-035</b> |             |
| SAMPLING METHOD:   |  |         | SHEET<br><b>4 of 4</b>      |             |
| WATER LEVEL        |  |         | DRILLING                    |             |
| TIME               |  |         | START TIME                  | FINISH TIME |
| DATE               |  |         | DATE                        | DATE        |
| CASING DEPTH       |  |         | DATE<br><b>8/3/00</b>       |             |

| DATUM        |                                | ELEVATION       |                          | SURFACE CONDITIONS: |               |   |
|--------------|--------------------------------|-----------------|--------------------------|---------------------|---------------|---|
| SAMPLER TYPE | INCHES DRIVEN INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | DEPTH IN FEET | SOIL GRAPH  |
| <i>SP</i>    | <i>10</i>                      |                 | <i>33</i><br><i>33</i>   | <i>50/4</i> "Grab"  | <i>60</i>     | <i>CS</i>   |
|              |                                |                 |                          |                     | 1             |   |
|              |                                |                 |                          |                     | 2             |   |
|              |                                |                 |                          |                     | 3             |   |
|              |                                |                 |                          |                     | 4             |   |
|              |                                |                 |                          |                     | 5             | <i>SAA - Auger cuttings</i>   |
|              |                                |                 |                          |                     | 6             |   |
|              |                                |                 |                          |                     | 7             |   |
|              |                                |                 |                          |                     | 8             |   |
|              |                                |                 |                          |                     | 9             |   |
| <i>SP</i>    | <i>5 5/8"</i>                  |                 | <i>50/5</i> "Grab"       |                     | <i>70</i>     | <i>SP</i>   |
|              |                                |                 |                          |                     | 1             | <i>Salt + Pepper ore - co grtz sa - wet</i><br><i>v. clean - like to no lines</i> |
|              |                                |                 |                          |                     | 2             |   |
|              |                                |                 |                          |                     | 3             | <i>B.T. @ 70'</i>   |
|              |                                |                 |                          |                     | 4             |   |
|              |                                |                 |                          |                     | 5             |   |
|              |                                |                 |                          |                     | 6             |   |
|              |                                |                 |                          |                     | 7             |   |
|              |                                |                 |                          |                     | 8             |   |
|              |                                |                 |                          |                     | 9             |   |

DRILLING CONTR

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                     |  |                                 |             |               |
|---------------------|--|---------------------------------|-------------|---------------|
| LOCATION OF BORING: |  | JOB NO                          | CLIENT      | LOCATION:     |
|                     |  | 2-1815                          | CSI         | Wagon Farm    |
|                     |  | DRILLING METHOD: CME-75         |             | BORING NO:    |
|                     |  | 6" OD cont. sampling auger      |             | 0536          |
|                     |  | SAMPLING METHOD: cont. sampling |             | SHEET: 1 of 4 |
| WATER LEVEL         |  | START TIME                      | FINISH TIME |               |
| TIME                |  | 1:40                            |             |               |
| DATE                |  | DATE                            | DATE        |               |
| CASING DEPTH        |  |                                 |             | 8/30/00       |

| DATUM        |                             | ELEVATION       |                         | SURFACE CONDITIONS: Br-sicl w/ some v.f. sa |               |   |
|--------------|-----------------------------|-----------------|-------------------------|---|---------------|---|
| SAMPLER TYPE | INCHES DRIVE INCHES RECOVER | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER                           | DEPTH IN FEET | SOIL GRAPH                                      |
|              |                             |                 |                         |   | 0             |   |
|              |                             |                 |                         |   | 1             |   |
|              |                             |                 |                         |   | 2             |   |
|              |                             |                 |                         |   | 3             |   |
|              |                             |                 |                         |   | 4             |   |
|              |                             |                 |                         |   | 5             | DK br si v.f. sa cl, dry                        |
|              |                             |                 |                         |   | 6             |   |
|              |                             |                 |                         |   | 7             |   |
|              |                             |                 |                         |   | 8             |   |
|              |                             |                 |                         |   | 9             |   |
|              |                             |                 |                         |   | 10            | CL Br si cl w/ some sa, dry v. hard drilling    |
|              |                             |                 |                         |   | 11            |   |
|              |                             |                 |                         |   | 12            |   |
|              |                             |                 |                         |   | 13            | hit a competent ss lense, br, fi grained ss dry |
|              |                             |                 |                         |   | 14            |   |
|              |                             |                 |                         |   | 15            | Br si cl w/ some sa, dry                        |
|              |                             |                 |                         |   | 16            | Drilling v. hard, ss lense                      |
|              |                             |                 |                         |   | 17            | stagnant buff competent s.s., fi gr, dry        |
|              |                             |                 |                         |   | 18            |   |
|              |                             |                 |                         |   | 19            |   |
|              |                             |                 |                         |   | 20            |   |
|              |                             |                 |                         |   | 21            |   |
|              |                             |                 |                         |   | 22            |   |
|              |                             |                 |                         |   | 23            |   |
|              |                             |                 |                         |   | 24            |   |
|              |                             |                 |                         |   | 25            |   |
|              |                             |                 |                         |   | 26            |   |
|              |                             |                 |                         |   | 27            |   |
|              |                             |                 |                         |   | 28            |   |
|              |                             |                 |                         |   | 29            |   |
|              |                             |                 |                         |   | 30            |   |

DRILLING CONTRACTOR: [Signature]

DATE: 8/30/00  
 CHK'D BY: [Signature]  
 (3) REV. 11-001

|                     |  |                 |        |                    |
|---------------------|--|-----------------|--------|--------------------|
| LOCATION OF BORING: |  | JOB NO          | CLIENT | LOCATION:          |
|                     |  | DRILLING METHOD |        | BORING NO<br>SB-96 |
|                     |  | SAMPLING METHOD |        | SHEET<br>2 of 4    |
| DATUM               |  | WATER LEVEL     |        | DRILLING           |
|                     |  | TIME            |        | START TIME         |
| ELEVATION           |  | DATE            |        | FINISH TIME        |
|                     |  | CASING DEPTH    |        | DATE               |

DRILLING CONTR

| SAMPLER TYPE        | INCHES DRIVER RECORD | DEPTH OF CASING | SAMPLE NO | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|---------------------|----------------------|-----------------|-----------|------------------|---------------|------------|---|
|                     |                      |                 |           |                  | 0             |            |   |
|                     |                      |                 |           |                  | 1             |            | br silt   |
|                     |                      |                 |           |                  | 2             |            |   |
|                     |                      |                 |           |                  | 3             |            |   |
|                     |                      |                 |           |                  | 4             |            | Put on cont. sampler at 25'   |
| Continuous sample 5 | 5'                   |                 | 25-30     | Grab             | 25            | CLS        | Gray claystone, dry - sl moist red brown iron staining + some carbon material, some calcite replacement   |
|                     |                      |                 |           |                  | 6             |            |   |
|                     |                      |                 |           |                  | 7             |            |   |
|                     |                      |                 |           |                  | 8             |            | <del>br silt clay</del>   |
|                     |                      |                 |           |                  | 9             |            |   |
| Cont                | 5' 5'                |                 | 30-35     | Grab             | 30            |            | SAA - dry, little to no calcite, abun leaves, twig material (fossils)   |
|                     |                      |                 |           |                  | 1             |            |   |
|                     |                      |                 |           |                  | 2             |            | (siltstone?)  |
|                     |                      |                 |           |                  | 3             |            | Grades to br silt 33.5 - 34.5 dry, abun fossilized leaves, twigs  |
|                     |                      |                 |           |                  | 4             |            |   |
| Cont                | 5' 5'                |                 | 35-40     | Grab             | 35            | CLS        | Gray claystone, iron stained dry 34.5 - 35'   |
|                     |                      |                 |           |                  | 6             | ML         | 35-35.7' dk br iron stained claystone, dry<br>35.7-35.9' - lt br silt fine sand<br>35.9-37.3' - <del>br silt</del> siltstone, dry<br>some iron staining |
|                     |                      |                 |           |                  | 7             |            | 57.3 - 37.8' br-lt br silt - siltstone dry  |
|                     |                      |                 |           |                  | 8             | CLS        | 37.8 - 39.1' br claystone, dry  |
|                     |                      |                 |           |                  | 9             | CLS        | 39.1 - 40' alter br - lt br silt fine sand<br>sl clay - siltstone, dry  |
|                     |                      |                 |           |                  | ML            |            |   |

CHK'D BY

DATE

31 REV. 11-80

*[Handwritten signature]*

|                     |  |                 |         |                     |
|---------------------|--|-----------------|---------|---------------------|
| LOCATION OF BORING: |  | JOB NO.         | CLIENT  | LOCATION:           |
|                     |  | DRILLING METHOD |         | BORING NO.<br>5B-36 |
|                     |  | SAMPLING METHOD |         | SHEET<br>3 of 4     |
| DATUM               |  | ELEVATION       |         | DRILLING:           |
|                     |  | WATER LEVEL     | dry     | START TIME          |
|                     |  | TIME            | 5:15    | FINISH TIME         |
|                     |  | DATE            | 8/29/88 | DATE                |
|                     |  | CASING DEPTH    | 47 open | DATE                |

DRILLING CONTR

| SAMPLER TYPE | INCHES DRIVE<br>INCHES RETRIEVED | DEPTH OF CASING | SAMPLE NO | FLOW/FT<br>SAMPLER | DEPTH<br>IN FEET | SOIL<br>GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|-----------|--------------------|------------------|---------------|---|
| Cont         | 5'<br>5'                         | 45              | 40-45     | Grab               | 40               |               | Br - lt gy sil cl 90-41.3' dry<br>some iron staining  |
|              |                                  |                 |           |                    | 1                |               |   |
|              |                                  |                 |           |                    | 2                |               | 41.3-45' dk br sil cl - claystone<br>dry - sl moist   |
|              |                                  |                 |           |                    | 3                |               |   |
|              |                                  |                 |           |                    | 4                |               |   |
|              |                                  |                 |           |                    | 4.5              | CLS           | lt br sil v. fine sa, dry in barrel (41.9-45.0)<br>Olive gray claystone, iron stained, dry<br>(Assigned 45-47') |
|              |                                  |                 |           |                    | 6                |               |   |
| Calif        | 18<br>18                         |                 | 55-<br>47 | R<br>33            | 7                |               | Olive gy claystone, iron stained dry - sl moist   |
|              |                                  |                 |           |                    | 8                |               |   |
|              |                                  |                 |           |                    | 9                |               |   |
| Cont         | 5'<br>5'                         | 55              | 50-55     | Grab               | 50               | CLS           | Olive gy claystone, some iron staining<br>dry -   |
|              |                                  |                 |           |                    | 1                |               |   |
|              |                                  |                 |           |                    | 2                |               |   |
|              |                                  |                 |           |                    | 3                |               | @ 53' grades to lt br - yell. br sil v. fi sa w/<br>some clay, dry  |
|              |                                  |                 |           |                    | 4                | MV<br>CL      | @ 54' br - olive gy claystone w/ some sil. fi sand<br>dry   |
| Cont         | 5'<br>5'                         | 60              | 55-60     | Grab               | 55               |               | Br - olive gy cl w/ some iron staining, dry   |
|              |                                  |                 |           |                    | 6                |               |   |
|              |                                  |                 |           |                    | 7                |               | @ 57.5' grades to dk gy siltstone, few iron staining<br>(with shale) dry  |
|              |                                  |                 |           |                    | 8                |               |   |
|              |                                  |                 |           |                    | 9                |               |   |

CHK'D BY

DATE

(3) (REV. 11-88)

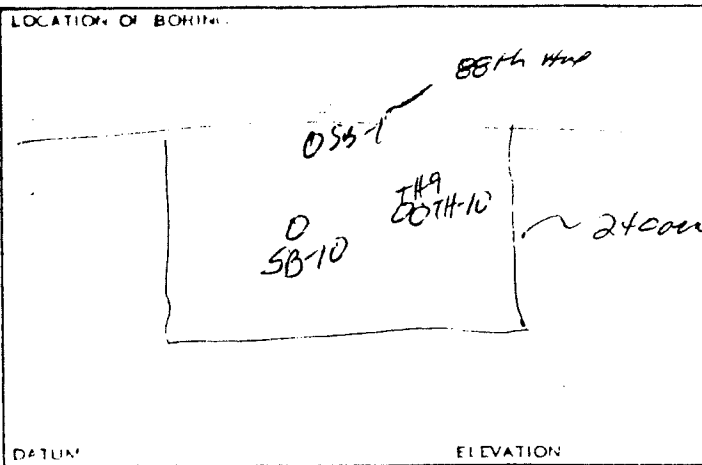
|                     |  |                 |        |                     |
|---------------------|--|-----------------|--------|---------------------|
| LOCATION OF BORING: |  | JOB NO          | CLIENT | LOCATION:           |
|                     |  | DRILLING METHOD |        | BORING NO:<br>SB-96 |
|                     |  | SAMPLING METHOD |        | SHEET<br>4 of 4     |
| DATUM               |  | WATER LEVEL     |        | DRILLING            |
| ELEVATION           |  | TIME            |        | START TIME          |
|                     |  | DATE            |        | FINISH TIME         |
|                     |  | CASING DEPTH    |        | DATE                |
|                     |  | 75 open         |        | DATE                |
|                     |  |                 |        | 8/2/88              |

DRILLING CONTR

| SAMPLER TYPE | INCHES DRIVER INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO SAMPLE DEPTH | BLOMS/FT SAW-DIE | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|--------------------------------|-----------------|------------------------|------------------|---------------|------------|--|
| Cont         | 5' / 5'                        | 65              | 60-65                  | Grab             | 60            | siltst     | dk gy siltstnd dry @ 60.8 - 61.1 - 1+ d - si fi 59, dry                  |
|              |                                |                 |                        |                  | 1             | ALL        | grades to dk gy siltstnd w/ a few sm, less than 1/2" si v. fi 30 lens    |
|              |                                |                 |                        |                  | 2             | siltst     |  |
|              |                                |                 |                        |                  | 3             |            |  |
|              |                                |                 |                        |                  | 4             |            | @ 64.5' grades to bk (lignite) (organic) siltstnd dry                    |
| Cont         | 5' / 5'                        | 70              | 65-70                  | Grab             | 5             |            | BK (organic lignite) siltstnd, dry                                       |
|              |                                |                 |                        |                  | 6             |            | @ 66.5' grades to olive gy siltstnd, silt, dry                           |
|              |                                |                 |                        |                  | 7             |            | @ 67.8' grades to greenish gy claystnd, dry                              |
|              |                                |                 |                        |                  | 8             |            | @ 67.7' grades back to olive gy - dk gy silt - siltstnd, dry             |
|              |                                |                 |                        |                  | 9             |            |  |
| Cont         | 5' / 5'                        | 75              | 70-75'                 | Grab             | 70            |            | SAA dk gy - <del>st</del> siltstnd No iron staining, dry                 |
|              |                                |                 |                        |                  | 1             |            |  |
|              |                                |                 |                        |                  | 2             |            |  |
|              |                                |                 |                        |                  | 3             |            |  |
|              |                                |                 |                        |                  | 4             |            |  |
|              |                                |                 |                        |                  | 5             |            |  |
|              |                                |                 |                        |                  | 6             |            | B.T. @ 75'   |
|              |                                |                 |                        |                  | 7             |            | Installed 1" piezometer in borings (no evidence of water while drilling) |
|              |                                |                 |                        |                  | 8             |            | Piez - 75' w/ 10' slotted  |
|              |                                |                 |                        |                  | 9             |            |  |

CHK'D BY DATE

DRILLING CONTR. *Decker Expl*



|   |                       |                                 |
|---|-----------------------|---------------------------------|
| JOB NO:<br><i>2-1815</i>                            | CLIENT:<br><i>CSI</i> | LOCATION:<br><i>Wagner Farm</i> |
| DRILLING METHOD:<br><i>CME-75</i>                   |                       | BORING NO:<br><i>37</i>         |
| <i>4" solid stem augers</i>                         |                       | <i>SB-10</i>                    |
| SAMPLING METHOD:<br><i>Calif. Split Spoon, Grab</i> |                       | SHEET:<br><i>1 of 4</i>         |
| WATER LEVEL   |                       | START TIME:<br><i>11:50</i>     |
| TIME  |                       | FINISH TIME                     |
| DATE  |                       | DATE:<br><i>8/31/88</i>         |
| CASING DEPTH  |                       |                                 |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DEVIATION RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE FROM | ROWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|----------------------------|-----------------|------------------------|-----------------|---------------|------------|
|              |                            |                 |                        |                 | 0             |            |
|              |                            |                 |                        |                 | 1             |            |
|              |                            |                 |                        |                 | 2             |            |
|              |                            |                 |                        |                 | 3             |            |
|              |                            |                 |                        |                 | 4             |            |
|              |                            |                 |                        |                 | 5             |            |
|              |                            |                 |                        |                 | 6             |            |
|              |                            |                 |                        |                 | 7             |            |
|              |                            |                 |                        |                 | 8             |            |
|              |                            |                 |                        |                 | 9             |            |
|              |                            |                 |                        |                 | 10            |            |
|              |                            |                 |                        |                 | 11            |            |
|              |                            |                 |                        |                 | 12            |            |
|              |                            |                 |                        |                 | 13            |            |
|              |                            |                 |                        |                 | 14            |            |
|              |                            |                 |                        |                 | 15            |            |
|              |                            |                 |                        |                 | 16            |            |
|              |                            |                 |                        |                 | 17            |            |
|              |                            |                 |                        |                 | 18            |            |
|              |                            |                 |                        |                 | 19            |            |
|              |                            |                 |                        |                 | 20            |            |

SURFACE CONDITIONS: *Br. s: cl w/ some sa*  
*dry*

*DK br s: cl w/ some f. sa*  
*dry - sl. moist*

*CL Br s: cl w/ some f. sa*  
*dry - sl. moist*

*Proctor Sample Collected from*  
*10' - 30'*

*Br cl w/ few f. sa*

*SAT*

11 JEC  
 DATE *8/31/88*  
 CHK'D BY \_\_\_\_\_

|                    |  |  |  |            |  |             |  |               |  |
|--------------------|--|--|--|------------|--|-------------|--|---------------|--|
| LOCATION OF BORING |  |  |  | JOB NO.    |  | CLIENT      |  | LOCATION      |  |
| DRILLING METHOD    |  |  |  |            |  |             |  | BORING NO. 37 |  |
|                    |  |  |  |            |  |             |  | SB-19         |  |
| SAMPLING METHOD    |  |  |  |            |  |             |  | SHEET 2 of 4  |  |
|                    |  |  |  |            |  |             |  | DRILLING      |  |
| WATER LEVEL        |  |  |  | START TIME |  | FINISH TIME |  |               |  |
| TIME               |  |  |  |            |  |             |  |               |  |
| DATE               |  |  |  | DATE       |  | DATE        |  | DATE          |  |
| CASING DEPTH       |  |  |  |            |  |             |  |               |  |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLE TYPE | INCHES DEPTH INCHES DEPTH | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | FLAWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|-------------|---------------------------|-----------------|-------------------------|------------------|---------------|------------|---|
|             |                           |                 |                         |                  | 0             |            | Br cl, sl moist - moist   |
|             |                           |                 |                         |                  | 1             | CL         |   |
|             |                           |                 |                         |                  | 2             |            |   |
|             |                           |                 |                         |                  | 3             |            |   |
|             |                           |                 |                         |                  | 4             |            |   |
| Soil Sp.    | 18/18                     |                 | 25 11 17                | Grab             | 5             |            | Brownish-yellow - gy cl w/ some v. fi si sa lenses, dry some iron staining and some calcite x-tals (cl - claystone) |
|             |                           |                 |                         |                  | 6             |            |   |
|             |                           |                 |                         |                  | 7             |            |   |
|             |                           |                 |                         |                  | 8             |            |   |
|             |                           |                 |                         |                  | 9             |            |   |
| Soil Sp.    | 18/18                     |                 | 30 17 25 36             | Grab             | 30            |            | Olivegy si cl, some iron staining dry   |
|             |                           |                 |                         |                  | 1             |            | Grades to yellow-br <del>cl</del> si v. fi sa lenses 31.1 - 31.3' w/ some calcite x-tals                            |
|             |                           |                 |                         |                  | 2             |            | Grades back to olivegy cl   |
|             |                           |                 |                         |                  | 3             |            |   |
|             |                           |                 |                         |                  | 4             |            | (claystone)   |
| Soil Sp.    | 18/18                     |                 | 35 17 28                | Grab             | 35            |            | Olivegy cl dry - sl moist 35.2 - 35.4 - 12. br si v. fi sa layer, dry some iron staining in clay                    |
|             |                           |                 |                         |                  | 6             |            |   |
|             |                           |                 |                         |                  | 7             |            |   |
|             |                           |                 |                         |                  | 8             |            |   |
|             |                           |                 |                         |                  | 9             |            |   |

DRILLING FONTIP

CHK D BY \_\_\_\_\_ DATE \_\_\_\_\_



|                    |  |  |  |         |  |        |  |  |  |
|--------------------|--|--|--|---------|--|--------|--|--|--|
| LOCATION OF BORING |  |  |  | JOB NO. |  | CLIENT |  | LOCATION                                     |  |
| DRILLING METHOD:   |  |  |  |         |  |        |  | BORING NO. <sup>37</sup><br>5B- <del>8</del> |  |
| SAMPLING METHOD:   |  |  |  |         |  |        |  | SHEET<br>3 of 4                              |  |
| WATER LEVEL        |  |  |  |         |  |        |  | DRILLING:                                    |  |
| TIME               |  |  |  |         |  |        |  | START TIME                                   |  |
| DATE               |  |  |  |         |  |        |  | FINISH TIME                                  |  |
| CASING DEPTH       |  |  |  |         |  |        |  | DATE   |  |

DRILLING CONT'D

| DATUM        |                                   | ELEVATION       |                |                    |               |            |  | SURFACE CONDITIONS: |  |
|--------------|-----------------------------------|-----------------|----------------|--------------------|---------------|------------|--|---------------------|--|
| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLER NO.    | ROWS/FT<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH |  |                     |  |
| Calif        | 5<br>5                            | 40              | 50/5"          |                    | 40            |            | Lt br silty fgs sa w/ some gy clay interbedded, dry<br>(No sample collected - Calif)   |                     |  |
|              |                                   |                 |                |                    | 1             |            |  |                     |  |
|              |                                   |                 |                |                    | 2             |            |  |                     |  |
|              |                                   |                 |                |                    | 3             |            |  |                     |  |
|              |                                   |                 |                |                    | 4             |            |  |                     |  |
| 50/30        | 18<br>10                          | 45              | 50             | Grab               | 5             |            | Olive gy cl dry/moist  |                     |  |
|              |                                   |                 |                |                    | 6             |            | Grades <del>at</del> to br-yell sil cl @ 45.7 dry<br>at 46.02 grades br-yell-lt br silty fgs sa, dry w/ some olive gy clay interbedded |                     |  |
|              |                                   |                 |                |                    | 7             |            |  |                     |  |
|              |                                   |                 |                |                    | 8             |            |  |                     |  |
|              |                                   |                 |                |                    | 9             |            |  |                     |  |
| Calif        | 18<br>18                          | 55              | 50             | 26<br>38           | 50            |            | chkd. (claystone)<br>DK br silty-cl, dry Little to<br>No iron staining   |                     |  |
|              |                                   |                 |                |                    | 1             |            |  |                     |  |
|              |                                   |                 |                |                    | 2             |            |  |                     |  |
|              |                                   |                 |                |                    | 3             |            |  |                     |  |
|              |                                   |                 |                |                    | 4             |            |  |                     |  |
| 50/30        | 18<br>18                          | 55              | 20<br>25<br>25 | Grab               | 5             |            | olive gy cl (claystone) w/ some iron stained intervals, dry  |                     |  |
|              |                                   |                 |                |                    | 6             |            |  |                     |  |
|              |                                   |                 |                |                    | 7             |            |  |                     |  |
|              |                                   |                 |                |                    | 8             |            |  |                     |  |
|              |                                   |                 |                |                    | 9             |            |  |                     |  |

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                     |  |         |                         |             |
|---------------------|--|---------|-------------------------|-------------|
| LOCATION OF BORING: |  | JOB NO. | CLIENT                  | LOCATION    |
| DRILLING METHOD:    |  |         | BORING NO.<br>SIB-18-37 |             |
| SAMPLING METHOD:    |  |         | SHEET<br>4 of 4         |             |
| WATER LEVEL         |  |         | START TIME              | FINISH TIME |
| TIME                |  |         | DATE                    | DATE        |
| CASING DEPTH        |  |         | DRILLING DATE           |             |
|                     |  |         | 8/3/88                  |             |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DEPTH INCHES B/CORE | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | ROWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|----------------------------|-----------------|-------------------------|-----------------|---------------|------------|
| 30" SP       | 10/18                      |                 | 60                      | 24<br>40        | 60            | Grab       |
|              |                            |                 |                         |                 | 1             |            |
|              |                            |                 |                         |                 | 2             |            |
|              |                            |                 |                         |                 | 3             |            |
|              |                            |                 |                         |                 | 4             |            |
|              |                            |                 |                         |                 | 5             |            |
|              |                            |                 |                         |                 | 6             |            |
|              |                            |                 |                         |                 | 7             |            |
|              |                            |                 |                         |                 | 8             |            |
|              |                            |                 |                         |                 | 9             |            |
| Cal'd        | 4" / 4"                    |                 | 70                      | 70 / 4"         | 70            | Grab       |
|              |                            |                 |                         |                 | 1             |            |
|              |                            |                 |                         |                 | 2             |            |
|              |                            |                 |                         |                 | 3             |            |
|              |                            |                 |                         |                 | 4             |            |
|              |                            |                 |                         |                 | 5             |            |
|              |                            |                 |                         |                 | 6             |            |
|              |                            |                 |                         |                 | 7             |            |
|              |                            |                 |                         |                 | 8             |            |
|              |                            |                 |                         |                 | 9             |            |
|              |                            |                 |                         |                 | 0             |            |

SURFACE CONDITIONS:

1160 - br-yell. sil cl, dry, iron stained

@ 60.8' olive gy sil cl, dry, some iron staining

@ 2:50 stopped to packer test 37-60'  
filled packer + cont. drilling @ 350

Claystone - olive gy

dry-stones

Gx ~~sil~~ v. fi. sa siltstone / lo  
gy sil. fi. sa, sh. moist - moist

D.T. @ 70'

DRILLING CONT'D

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



|                     |  |          |          |         |  |            |             |            |  |
|---------------------|--|----------|----------|---------|--|------------|-------------|------------|--|
| LOCATION OF BORING: |  |          |          | JOB NO. |  | CLIENT     |             | LOCATION   |  |
| DRILLING METHOD:    |  |          |          |         |  |            |             | BORING NO. |  |
|                     |  |          |          |         |  |            |             | SB-36      |  |
| SAMPLING METHOD:    |  |          |          |         |  |            |             | SHEET      |  |
|                     |  |          |          |         |  |            |             | 2 of 2     |  |
|                     |  |          |          |         |  |            |             | DRILLING:  |  |
| WATER LEVEL         |  | 22.8     | 17.5'    |         |  | START TIME | FINISH TIME |            |  |
| TIME                |  | 5:30     | 7:30     |         |  |            | 8:22        |            |  |
| DATE                |  | 8/31/88  | 9/1/88   |         |  | DATE       | DATE        |            |  |
| CASING DEPTH        |  | 25' open | 25' open |         |  |            | 9/1/88      |            |  |

DRILLING CONTR.

| DATUM        |                                   | ELEVATION       |                             |                     |    | DEPTH IN FEET | SOIL GRAPH |
|--------------|-----------------------------------|-----------------|-----------------------------|---------------------|----|---------------|------------|
| SAMPLER TYPE | INCHES DRIVEN<br>INCHES BY WEIGHT | DEPTH OF CASING | SAMPLER NO.<br>SAMPLE DEPTH | BLows/FT<br>SAMPLER |    |               |            |
|              |                                   |                 |                             |                     | 20 | CL            |            |
|              |                                   |                 |                             |                     | 1  |               |            |
|              |                                   |                 |                             |                     | 2  |               |            |
|              |                                   |                 |                             |                     | 3  |               |            |
|              |                                   |                 |                             |                     | 4  |               |            |
| SPT<br>SP    | 18<br>18                          |                 | 25<br>32                    | 17<br>32            | 25 | ML            |            |
|              |                                   |                 |                             |                     | 6  | SM            |            |
|              |                                   |                 |                             |                     | 7  |               |            |
|              |                                   |                 |                             |                     | 8  |               |            |
|              |                                   |                 |                             |                     | 9  |               |            |
| SPT<br>SP    | 18<br>18                          |                 | 30<br>17                    | 11<br>17            | 30 |               |            |
|              |                                   |                 |                             |                     | 1  |               |            |
|              |                                   |                 |                             |                     | 2  |               |            |
|              |                                   |                 |                             |                     | 3  |               |            |
|              |                                   |                 |                             |                     | 4  |               |            |
|              |                                   |                 |                             |                     | 5  |               |            |
|              |                                   |                 |                             |                     | 6  |               |            |
|              |                                   |                 |                             |                     | 7  |               |            |
|              |                                   |                 |                             |                     | 8  |               |            |
|              |                                   |                 |                             |                     | 9  |               |            |
|              |                                   |                 |                             |                     | 0  |               |            |

SURFACE CONDITIONS:

Br si cl w/ less sand than above, sl. moist

Br si & sa w/ some clay sl. moist - moist

Grades to si fi sa @ 26' sl. moist

Olivegy claystone, iron stained dry - sl. moist

T.A. @ 30'  
Set 1" hand scribed PVC to 30'

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                     |  |   |                       |                                 |             |
|---------------------|--|---|-----------------------|---------------------------------|-------------|
| LOCATION OF BORING: |  | JOB NO:<br><b>2-1815</b>                    | CLIENT:<br><b>CSE</b> | LOCATION:<br><b>Wagon Falls</b> |             |
|                     |  | DRILLING METHOD:<br><b>CME-75</b>           |                       | BORING NO:<br><b>39</b>         |             |
|                     |  | <b>4" Solid Stem</b>                        |                       | <b>56-12</b>                    |             |
|                     |  | SAMPLING METHOD:<br><b>Calif. Split Spc</b> |                       | SHEET:<br><b>1 of 2</b>         |             |
| DATUM               |  | ELEVATION                                   |                       | DRILLING:                       |             |
|                     |  | WATER LEVEL                                 | 24.2                  | 23.7                            | 22.1        |
|                     |  | TIME  | 8:40                  | 8:55                            | 9:15        |
|                     |  | DATE  | 9/1/00                | 9/1/00                          | 9/1/00      |
|                     |  | CASING DEPTH                                | 25' spc               | 25' spc                         | 25' spc     |
|                     |  | START TIME                                  | 8:25                  |                                 | FINISH TIME |
|                     |  | DATE  | 9/1/00                |                                 | DATE        |

DRILLING CONT'D

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>DEPTH | FLAWS/FT<br>SAMPLER | DEPTH<br>IN FEET | SOIL<br>GRAPH | SURFACE CONDITIONS:                              |
|--------------|-----------------------------------|-----------------|---------------------|---------------------|------------------|---------------|--|
|              |                                   |                 |                     |                     | 0                |               | <b>Bn Si cl w/ some sa</b>                       |
|              |                                   |                 |                     |                     | 1                |               |  |
|              |                                   |                 |                     |                     | 2                |               | <b>0-5 Bn si sl. cl me-co gr + sa sl. moist</b>  |
|              |                                   |                 |                     |                     | 3                |               |  |
|              |                                   |                 |                     |                     | 4                |               |  |
|              |                                   |                 |                     |                     | 5                |               | <b>5-10 Bn - si cl w/ some v. fi sa sl moist</b> |
|              |                                   |                 |                     |                     | 6                |               |  |
|              |                                   |                 |                     |                     | 7                |               |  |
|              |                                   |                 |                     |                     | 8                |               |  |
|              |                                   |                 |                     |                     | 9                |               |  |
|              |                                   |                 |                     |                     | 10               |               | <b>10-15 Lt. br si cl, sl moist</b>              |
|              |                                   |                 |                     |                     | 11               |               |  |
|              |                                   |                 |                     |                     | 12               |               |  |
|              |                                   |                 |                     |                     | 13               |               |  |
|              |                                   |                 |                     |                     | 14               |               |  |
|              |                                   |                 |                     |                     | 15               |               | <b>15-20 Lt. Bn. si cl w/ sa v. fi sa moist</b>  |
|              |                                   |                 |                     |                     | 16               |               |  |
|              |                                   |                 |                     |                     | 17               |               |  |
|              |                                   |                 |                     |                     | 18               |               |  |
|              |                                   |                 |                     |                     | 19               |               |  |
|              |                                   |                 |                     |                     | 20               |               |  |

CHK'D BY

DATE

|                                     |  |         |                 |             |                                      |
|-------------------------------------|--|---------|-----------------|-------------|--------------------------------------|
| LOCATION OF BORING: <b>88th Ave</b> |  | JOB NO: | CLIENT:         | LOCATION:   |                                      |
|                                     |  |         | DRILLING METHOD |             | BORING NO. <b>39</b><br><b>SB-12</b> |
|                                     |  |         | SAMPLING METHOD |             | SHEET <b>2 of 2</b>                  |
| WATER LEVEL                         |  |         | DRILLING        |             |                                      |
| TIME                                |  |         | START TIME      | FINISH TIME |                                      |
| DATE                                |  |         | DATE            | DATE        |                                      |
| CASING DEPTH                        |  |         | 9/1/88          |             |                                      |

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN INCHES RECOVERED | DEPTH OF CASING | SAMPLER NO. SAMPLE DEPTH | BLOMS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                         |
|--------------|--------------------------------|-----------------|--------------------------|------------------|---------------|------------|---|
|              |                                |                 |                          |                  | 20            |            | 20-25 Br. si F-sand<br>some cl<br>moist-wet |
|              |                                |                 |                          |                  | 1             |            |   |
|              |                                |                 |                          |                  | 2             |            |   |
|              |                                |                 |                          |                  | 3             |            |   |
|              |                                |                 |                          |                  | 4             |            |   |
|              |                                |                 |                          |                  | 25            |            | B.T. @ 25'                                  |
|              |                                |                 |                          |                  | 6             |            |   |
|              |                                |                 |                          |                  | 7             |            |   |
|              |                                |                 |                          |                  | 8             |            |   |
|              |                                |                 |                          |                  | 9             |            |   |
|              |                                |                 |                          |                  | 0             |            |   |
|              |                                |                 |                          |                  | 1             |            |   |
|              |                                |                 |                          |                  | 2             |            |   |
|              |                                |                 |                          |                  | 3             |            |   |
|              |                                |                 |                          |                  | 4             |            |   |
|              |                                |                 |                          |                  | 5             |            |   |
|              |                                |                 |                          |                  | 6             |            |   |
|              |                                |                 |                          |                  | 7             |            |   |
|              |                                |                 |                          |                  | 8             |            |   |
|              |                                |                 |                          |                  | 9             |            |   |
|              |                                |                 |                          |                  | 0             |            |   |

DRILLING CONT'D

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



|                     |  |  |  |                  |          |                     |
|---------------------|--|--|--|------------------|----------|---------------------|
| LOCATION OF BORING: |  |  |  | JOB NO.          | CLIENT:  | LOCATION:           |
|                     |  |  |  | DRILLING METHOD: |          | BORING NO.<br>SB-40 |
|                     |  |  |  |                  |          | SHEET<br>2 of 4     |
|                     |  |  |  | SAMPLING METHOD: |          | DRILLING:           |
|                     |  |  |  | WATER LEVEL      | 23' wet  | 23.7'               |
|                     |  |  |  | TIME             | 9:25     | 9:36                |
|                     |  |  |  | DATE             | 9/1/08   | 9/1/08              |
|                     |  |  |  | CASING DEPTH     | 25' open | 25' open            |
|                     |  |  |  |                  | 23.1     | 22.7                |
|                     |  |  |  |                  | 9:41     | 9:50                |
|                     |  |  |  |                  | 9/1/08   | "                   |
|                     |  |  |  |                  | 25' open | "                   |
|                     |  |  |  | START TIME       |          | FINISH TIME         |
|                     |  |  |  | DATE             |          | DATE                |

DATUM: \_\_\_\_\_ ELEVATION: \_\_\_\_\_

| SAMPLER PIPE | INCHES DRIVER PROVED | DEPTH OF CASING | SAMPLE NO. / DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|----------------------|-----------------|--------------------|------------------|---------------|------------|
|              |                      |                 |                    |                  | 20            |            |
|              |                      |                 |                    |                  | 1             |            |
|              |                      |                 |                    |                  | 2             |            |
|              |                      |                 |                    |                  | 3             |            |
|              |                      |                 |                    |                  | 4             |            |
| SP 21        | 18                   |                 | 25                 | 13<br>19         | 25            | Grab       |
|              |                      |                 |                    |                  | 6             |            |
|              |                      |                 |                    |                  | 7             |            |
|              |                      |                 |                    |                  | 8             |            |
|              |                      |                 |                    |                  | 9             |            |
| SP 21        | 18                   |                 | 30                 | 12<br>14         | 30            | Grab       |
|              |                      |                 |                    |                  | 1             |            |
|              |                      |                 |                    |                  | 2             |            |
|              |                      |                 |                    |                  | 3             |            |
|              |                      |                 |                    |                  | 4             |            |
| SP 21        | 18                   |                 | 35                 | 15<br>21         | 35            | Grab       |
|              |                      |                 |                    |                  | 6             |            |
|              |                      |                 |                    |                  | 7             |            |
|              |                      |                 |                    |                  | 8             |            |
|              |                      |                 |                    |                  | 9             |            |
|              |                      |                 |                    |                  | 10            |            |

SURFACE CONDITIONS:

lt br cl w/ some v. f. sa  
20-25' sl moist - moist

ol/med gy cl, abun iron staining  
dry - sl moist

Auger cutting br-gy cl, stiff

lt br-gy si v. f. sa sl moist - moist  
@ 30.3 grades to br si me sa. wet  
@ 30.6 sharp contact w/ gy cl & br-gy cl  
dry - sl moist cl contains abun.  
carbon pieces, some iron staining

W.L. @ ~ 25'

dk br - olive gy cl w/ some iron staining  
dry - sl moist

W.L. @ ~ 24'

DRILLING CONTR.

DATE: \_\_\_\_\_ CHK'D BY: \_\_\_\_\_



|                    |                    |              |                    |
|--------------------|--------------------|--------------|--------------------|
| LOCATION OF BORING | JOB NO.            | CLIENT       | LOCATION           |
|                    | DRILLING METHOD    |              | BORING NO.<br>SB40 |
|                    | SEMI-CASING METHOD |              | SHEET<br>3 of 4    |
|                    | WATER LEVEL        |              | DRILLING           |
|                    | TIME               |              | START TIME         |
|                    | DATE               |              | FINISH TIME        |
| DATUM              | ELEVATION          | CASING DEPTH | DATE               |

DRILLING CONTR

| SAMPLE TYPE | INCHES DRIVEN<br>INCHES RECORDED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT<br>SAMPLE | DEPTH IN FEET | SOIL GRAPH |
|-------------|----------------------------------|-----------------|----------------------------|--------------------|---------------|------------|
| Calif       | 18<br>12                         |                 | 55<br>40                   | 16<br>25           | 40            |            |
|             |                                  |                 |                            |                    | 1             |            |
|             |                                  |                 |                            |                    | 2             |            |
|             |                                  |                 |                            |                    | 3             |            |
|             |                                  |                 |                            |                    | 4             |            |
|             |                                  |                 |                            |                    | 45            |            |
|             |                                  |                 |                            |                    | 6             |            |
|             |                                  |                 |                            |                    | 7             |            |
|             |                                  |                 |                            |                    | 8             |            |
|             |                                  |                 |                            |                    | 9             |            |
| SP<br>SP    | 18<br>18                         |                 | 50<br>50                   | 18<br>25           | 50            | Gravel     |
|             |                                  |                 |                            |                    | 1             |            |
|             |                                  |                 |                            |                    | 2             |            |
|             |                                  |                 |                            |                    | 3             |            |
|             |                                  |                 |                            |                    | 4             |            |
|             |                                  |                 |                            |                    | 5             |            |
|             |                                  |                 |                            |                    | 6             |            |
|             |                                  |                 |                            |                    | 7             |            |
|             |                                  |                 |                            |                    | 8             |            |
|             |                                  |                 |                            |                    | 9             |            |
| Calif       | 18<br>18                         |                 | 55<br>55                   | 27<br>30           | 60            |            |

SURFACE CONDITIONS:

Olive gy - gy cl (claystone) some iron staining, dry - sl moist

Drilling cont. to be semi-hard br-gy cl cuttings

Olive gy cl (claystone) w/ some iron staining dry - sl moist

CHK'D BY

DATE

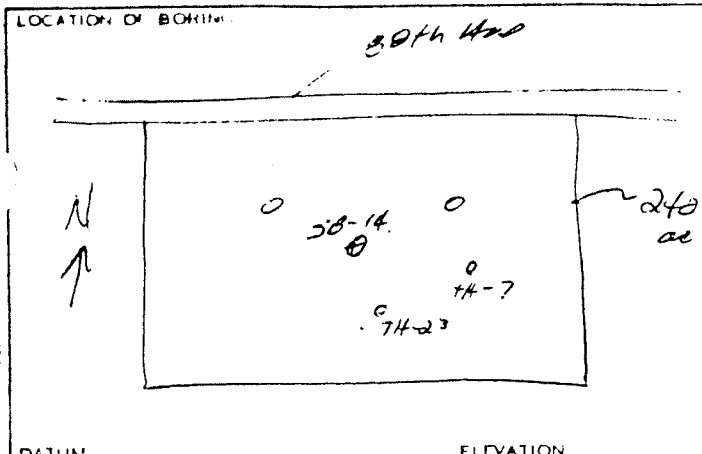
1 (2) REV 11-80

|                     |  |  |  |                  |        |                     |
|---------------------|--|--|--|------------------|--------|---------------------|
| LOCATION OF BORING: |  |  |  | JOB NO.          | CLIENT | LOCATION            |
|                     |  |  |  | DRILLING METHOD: |        | BORING NO.<br>SB-42 |
|                     |  |  |  | SAMPLING METHOD: |        | SHEET<br>4 of 4     |
| DATUM               |  |  |  | WATER LEVEL      |        | DRILLING            |
| ELEVATION           |  |  |  | TIME             | DATE   | START TIME<br>1230  |
|                     |  |  |  | DATE             | DATE   | 9/1/88              |
|                     |  |  |  | CASING DEPTH     |        |                     |

DRILLING CONTR.

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | FLAWS/FT<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|-----------------------------------|-----------------|----------------------------|---------------------|---------------|------------|---|
| Calif 10     | 10                                | 55.2            | 327<br>53                  |                     | 6.0           |            | Br si sa cl, sl moist-moist<br>@ 60.4 - <del>quartz</del> <sup>moisture</sup> br si fi sa - wet<br>@ 60.7 sharp contact/ gray sil - (silts) <sup>dry</sup><br>dry - sl. moist - dry |
|              |                                   |                 |                            |                     | 1             |            |   |
|              |                                   |                 |                            |                     | 2             |            |   |
|              |                                   |                 |                            |                     | 3             |            |   |
|              |                                   |                 |                            |                     | 4             |            | B.T. @ 60'  |
|              |                                   |                 |                            |                     | 5             |            |   |
|              |                                   |                 |                            |                     | 6             |            |   |
|              |                                   |                 |                            |                     | 7             |            |   |
|              |                                   |                 |                            |                     | 8             |            |   |
|              |                                   |                 |                            |                     | 9             |            |   |
|              |                                   |                 |                            |                     | 0             |            |   |
|              |                                   |                 |                            |                     | 1             |            |   |
|              |                                   |                 |                            |                     | 2             |            |   |
|              |                                   |                 |                            |                     | 3             |            |   |
|              |                                   |                 |                            |                     | 4             |            |   |
|              |                                   |                 |                            |                     | 5             |            |   |
|              |                                   |                 |                            |                     | 6             |            |   |
|              |                                   |                 |                            |                     | 7             |            |   |
|              |                                   |                 |                            |                     | 8             |            |   |
|              |                                   |                 |                            |                     | 9             |            |   |
|              |                                   |                 |                            |                     | 0             |            |   |

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



|  |                 |                                       |
|--|-----------------|---------------------------------------|
| JOEY NO.<br>2-1815                                 | CLIENT<br>C.S.I | LOCATION<br>Wagner Farm               |
| DRILLING METHOD<br>CME - 75<br>4" solid stem auger |                 | BORING NO.<br>41<br>5B- <del>01</del> |
| SAMPLING METHOD<br>Catit, 3 split spoon<br>Grab    |                 | SHEET<br>1 of 4                       |
| WATER LEVEL  |                 | START TIME<br>1:30                    |
| TIME   |                 | DATE<br>9/1/8                         |
| DATE   |                 | FINISH TIME                           |
| CASING DEPTH                                       |                 | DATE                                  |

DRILLING CONTP

| DATUM        |                               | ELEVATION       |                         | SURFACE CONDITIONS: Br s.c.l w/ some sa dry |               |   |
|--------------|-------------------------------|-----------------|-------------------------|---|---------------|---|
| SAMPLER TYPE | INCHES DRIVEN INCHES RECORDED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | FLOW/FT SAMPLER                             | DEPTH IN FEET | SOIL GRAPH                                |
|              |                               |                 |                         |   | 0             |   |
|              |                               |                 |                         |   | 1             |   |
|              |                               |                 |                         |   | 2             | CL Br - dk br s.c.l w/ some sa sl moist   |
|              |                               |                 |                         |   | 3             |   |
|              |                               |                 |                         |   | 4             |   |
|              |                               |                 |                         |   | 5             |   |
|              |                               |                 |                         |   | 6             |   |
|              |                               |                 |                         |   | 7             |   |
|              |                               |                 |                         |   | 8             |   |
|              |                               |                 |                         |   | 9             |   |
|              |                               |                 |                         |   | 10            | CL DK br si cl sl moist                   |
|              |                               |                 |                         |   | 11            |   |
|              |                               |                 |                         |   | 12            | Proctor 20lb bag sample collected 10-9-85 |
|              |                               |                 |                         |   | 13            |   |
|              |                               |                 |                         |   | 14            |   |
|              |                               |                 |                         |   | 15            |   |
|              |                               |                 |                         |   | 16            |   |
|              |                               |                 |                         |   | 17            |   |
|              |                               |                 |                         |   | 18            | ML lt br si sa w/ some cl sl moist        |
|              |                               |                 |                         |   | 19            |   |
|              |                               |                 |                         |   | 20            |   |

BY \_\_\_\_\_ DATE \_\_\_\_\_

CHK'D BY \_\_\_\_\_

|                     |  |  |  |                  |         |           |                      |
|---------------------|--|--|--|------------------|---------|-----------|----------------------|
| LOCATION OF BORING: |  |  |  | JOB NO.          | CLIENT: | LOCATION: |                      |
|                     |  |  |  | DRILLING METHOD: |         |           | BORING NO.<br>SB-418 |
|                     |  |  |  |                  |         |           | SHEET<br>2 of 4      |
|                     |  |  |  | SAMPLING METHOD: |         |           | DRILLING             |
|                     |  |  |  | WATER LEVEL      | dry     |           | START TIME           |
|                     |  |  |  | TIME             | 2:20    |           | FINISH TIME          |
|                     |  |  |  | DATE             | 9/1/88  |           | DATE                 |
| DATUM:              |  |  |  | CASING DEPTH     | 35' sp  |           |                      |

| SAMPLE NO. | INCHES DEPTH | DEPTH OF CASING | SAMPLE NO. | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|------------|--------------|-----------------|------------|------------------|---------------|------------|---|
|            |              |                 |            |                  | 20            | CL         | 20-25' Br si cl w/ some sa sl. moist  |
|            |              |                 |            |                  | 1             |            |   |
|            |              |                 |            |                  | 2             |            |   |
|            |              |                 |            |                  | 3             |            |   |
|            |              |                 |            |                  | 4             |            |   |
| 24         | 18           |                 | 25         | 13               | 25            | Grab       | Olwegy - Gy cl (claystone) w/ some iron staining dry - sl. moist<br>A few v. fi. sa stringers, iron stained, dry  |
|            |              |                 |            |                  | 6             |            |   |
|            |              |                 |            |                  | 7             |            |   |
|            |              |                 |            |                  | 8             |            |   |
|            |              |                 |            |                  | 9             |            |   |
| 50         | 18           |                 | 30         | 12               | 30            | Grab       | 24.6r-6r si cl w/ some f. sa sl. moist<br>@ 30.3 Br. si f. sa w/ trace clay, iron stained moist - sl. wet<br>@ 30.9' olwegy cl, some iron staining, dry - sl. moist |
|            |              |                 |            |                  | 1             | SM         |   |
|            |              |                 |            |                  | 2             |            |   |
|            |              |                 |            |                  | 3             |            |   |
|            |              |                 |            |                  | 4             |            | Check for w.v. @ 35'  |
| 54         | 18           |                 | 35         | 12               | 35            | Grab       | Gy - dk gy si cl (claystone) w/ some iron staining dry - sl. moist  |
|            |              |                 |            |                  | 6             |            |   |
|            |              |                 |            |                  | 7             |            |   |
|            |              |                 |            |                  | 8             |            |   |
|            |              |                 |            |                  | 9             |            |   |
|            |              |                 |            |                  | 0             |            |   |

DRILLING CONTR.

CHK'D BY

DATE

1 (3) (REV. 11-80)

|                     |  |  |  |                  |        |           |                      |
|---------------------|--|--|--|------------------|--------|-----------|----------------------|
| LOCATION OF BORING: |  |  |  | JOB NO.          | CLIENT | LOCATION: |                      |
|                     |  |  |  | DRILLING METHOD: |        |           | BORING NO.<br>58-412 |
|                     |  |  |  | SAMPLING METHOD: |        |           | SHEET<br>3 of 4      |
|                     |  |  |  | WATER LEVEL      |        |           | DRILLING             |
|                     |  |  |  | TIME             |        |           | START TIME           |
|                     |  |  |  | DATE             |        |           | FINISH TIME          |
|                     |  |  |  | CASING DEPTH     |        |           | DATE                 |

| DATUM        |                                   | ELEVATION       |                           | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|-----------------------------------|-----------------|---------------------------|---------------------------|------------------|---------------|------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES PENETRATED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH |                           |                  |               |            |
| 21-F         | 18/18                             |                 | 55-1 / 40                 | 27 / 26                   |                  | 40            |            |
|              |                                   |                 |                           |                           |                  | 1             |            |
|              |                                   |                 |                           |                           |                  | 2             |            |
|              |                                   |                 |                           |                           |                  | 3             |            |
|              |                                   |                 |                           |                           |                  | 4             |            |
| 50-F         | 18/18                             |                 | 45                        | 12 / 33                   | Grab             | 45            |            |
|              |                                   |                 |                           |                           |                  | 6             |            |
|              |                                   |                 |                           |                           |                  | 7             |            |
|              |                                   |                 |                           |                           |                  | 8             |            |
|              |                                   |                 |                           |                           |                  | 9             |            |
| 30-F         | 18/18                             |                 | 50                        | 22 / 48                   | Grab             | 50            |            |
|              |                                   |                 |                           |                           |                  | 1             |            |
|              |                                   |                 |                           |                           |                  | 2             |            |
|              |                                   |                 |                           |                           |                  | 3             |            |
|              |                                   |                 |                           |                           |                  | 4             |            |
| 30-F         | 18/18                             |                 | 55                        | 30 / 50                   | Grab             | 55            |            |
|              |                                   |                 |                           |                           |                  | 6             |            |
|              |                                   |                 |                           |                           |                  | 7             |            |
|              |                                   |                 |                           |                           |                  | 8             |            |
|              |                                   |                 |                           |                           |                  | 9             |            |
|              |                                   |                 |                           |                           |                  | 60            |            |

SURFACE CONDITIONS:

(silt)

Olive gy of claystone w/ some iron string, dry

Heavier cuttings dk gy silt

Olivegy-gy-dkgy silt (siltstone) little - no iron string dry

dkgy

DK gy, A siltstone, dry, little - no iron string @ 50.9 - br. silt. f. ss, dry - sl. matrix @ 51.1 - dkgy siltstone, dry

Olivegy-dkgy siltstone w/ some silt w/ f. ss stringers, dry Grades sandier towards bottom

DRILLING CONTR.

BY \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                     |  |  |  |                  |          |                         |
|---------------------|--|--|--|------------------|----------|-------------------------|
| LOCATION OF BORING: |  |  |  | JOB NO.          | CLIENT:  | LOCATION:               |
|                     |  |  |  | DRILLING METHOD: |          | BORING NO. <b>41</b>    |
|                     |  |  |  |                  |          | <del>SB-12</del>        |
|                     |  |  |  | SAMPLING METHOD: |          | SHEET <b>4 of 4</b>     |
|                     |  |  |  |                  |          | DRILLING:               |
|                     |  |  |  | WATER LEVEL      | 64.7     | 63.8                    |
|                     |  |  |  | TIME             | 4:20     | 4:30                    |
|                     |  |  |  | DATE             | 9/1/88   | 9/1/88                  |
|                     |  |  |  | CASING DEPTH     | 65' open | 70' open                |
|                     |  |  |  | START TIME       |          | FINISH TIME <b>8:40</b> |
|                     |  |  |  | DATE             |          | DATE <b>9/2/88</b>      |

DRILLING CONTR.

DETM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT. SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|-----------------------------------|-----------------|----------------------------|-------------------|---------------|------------|
|              |                                   |                 |                            |                   | 60            |            |
|              |                                   |                 |                            |                   | 1             |            |
|              |                                   |                 |                            |                   | 2             |            |
|              |                                   |                 |                            |                   | 3             |            |
|              |                                   |                 |                            |                   | 4             |            |
| Spt          | 9/9                               |                 | 65<br>50/6<br>50/3         | Grab              | 65            | 5A4        |
| Spt          | 12/12                             |                 |                            |                   | 6             |            |
| Spt          | 14/14                             |                 |                            |                   | 7             | 5A4        |
| Spt          | 12/12                             |                 |                            |                   | 8             |            |
| Spt          | 10/10                             |                 |                            |                   | 9             |            |
|              |                                   |                 |                            |                   | 70            |            |
|              |                                   |                 |                            |                   | 1             |            |
|              |                                   |                 |                            |                   | 2             |            |
|              |                                   |                 |                            |                   | 3             |            |
| Spt          | 18/18                             |                 | 82<br>75.5                 | Grab              | 4             |            |
|              |                                   |                 |                            |                   | 5             |            |
|              |                                   |                 |                            |                   | 6             |            |
|              |                                   |                 |                            |                   | 7             |            |
|              |                                   |                 |                            |                   | 8             |            |
|              |                                   |                 |                            |                   | 9             |            |
|              |                                   |                 |                            |                   | 0             |            |

SURFACE CONDITIONS:

w.l. → 53.6' 49.0'

Time → 7:30 8:50

Date → 9/2/88 9/2/88

Casing → 70' open

60  
1  
2  
3  
4  
5A4  
6  
7  
8  
9  
70  
1  
2  
3  
4  
5  
6  
7  
8  
9  
0

Auger cuttings dk gy - dk br s.c.l

Br si v. light sa  
clt wet  
Not sample retained, grab sample

5A4

3A4 w/sand gy, sa si w/some clay  
9/2/88 - overnight w.l @ 53.6'

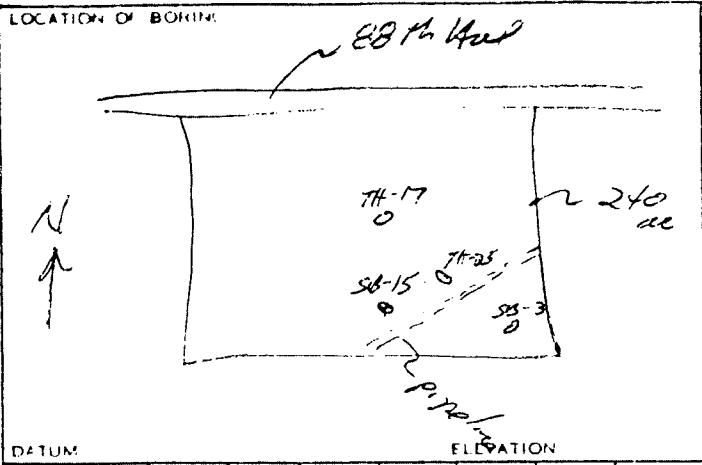
Drilling got hard - dk gy s.c.l

DK gy st clay, some carbon flakes - pieces.  
dry - sl moist

B.T. @ 75.5'

Will run packer test on lower sand interval  
π 60 - 75.5'

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



|                                     |                       |   |
|-------------------------------------|-----------------------|---|
| JOB NO:<br><b>2-1815</b>            | CLIENT:<br><b>CSF</b> | LOCATION:<br><b>Wagner Farm</b>         |
| DRILLING METHOD:<br><b>CME - 75</b> |                       | BORING NO:<br><b>42</b><br><b>SB-15</b> |
| <b>4" solid stem</b>                |                       | SHEET:<br><b>1 of 4</b>                 |
| SAMPLING METHOD:                    |                       | DRILLING:                               |
| WATER LEVEL:                        |                       | START TIME:<br><b>1:55</b>              |
| TIME:                               |                       | FINISH TIME:                            |
| DATE:                               |                       | DATE:<br><b>9/2/88</b>                  |
| CASING DEPTH:                       |                       |   |

DRILLING CONTR: *X* *Thomas E. H. P.*

| SAMPLE TYPE | INCHES DRIVER<br>INCHES DEPTH | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|-------------|-------------------------------|-----------------|----------------------------|---------------------|---------------|------------|
|             |                               |                 |                            |                     | 0             |            |
|             |                               |                 |                            |                     | 1             | CL         |
|             |                               |                 |                            |                     | 2             |            |
|             |                               |                 |                            |                     | 3             |            |
|             |                               |                 |                            |                     | 4             |            |
|             |                               |                 |                            |                     | 5             | ML         |
|             |                               |                 |                            |                     | 6             | SM         |
|             |                               |                 |                            |                     | 7             |            |
|             |                               |                 |                            |                     | 8             |            |
|             |                               |                 |                            |                     | 9             |            |
|             |                               |                 |                            |                     | 10            | ML         |
|             |                               |                 |                            |                     | 11            |            |
|             |                               |                 |                            |                     | 12            |            |
|             |                               |                 |                            |                     | 13            |            |
|             |                               |                 |                            |                     | 14            |            |
|             |                               |                 |                            |                     | 15            |            |
|             |                               |                 |                            |                     | 16            |            |
|             |                               |                 |                            |                     | 17            |            |
|             |                               |                 |                            |                     | 18            |            |
|             |                               |                 |                            |                     | 19            | CL         |
|             |                               |                 |                            |                     | 20            |            |

SURFACE CONDITIONS: *Br. silty w/ some f. sq*

*0-3 NK br silty sl moist*

*4-6 Lt br silty-clayey w/ some clay sq w/ some clay sl moist*

*7-9 Grades ~~clay~~ w/ more clay sl moist*

*10-15 Br silty v. f. sq, little no clay sl moist*

*17-18 NK br silty w/ some silty moist*

1 (3) (REV. 11-80) DATE *9/2/88* CHK'D BY *J.P.C.*

|                     |  |  |  |                  |        |           |                                      |
|---------------------|--|--|--|------------------|--------|-----------|--------------------------------------|
| LOCATION OF BORING: |  |  |  | JOB NO.          | CLIENT | LOCATION: |                                      |
|                     |  |  |  | DRILLING METHOD: |        |           | BORING NO. <b>42</b><br><b>SB-15</b> |
|                     |  |  |  | SAMPLING METHOD: |        |           | SHEET <b>2 of 4</b>                  |
| DATUM:              |  |  |  | WATER LEVEL:     |        |           | DRILLING:                            |
| ELEVATION:          |  |  |  | TIME             |        |           | START TIME                           |
|                     |  |  |  | DATE             |        |           | FINISH TIME                          |
|                     |  |  |  | CASING DEPTH:    |        |           | DATE                                 |
|                     |  |  |  |                  |        |           | DATE                                 |

DRILLING CONT'D

| SAMPLED TYPE | INCHES DRIVEN BY OVERBIT | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|--------------------------|-----------------|-------------------------|------------------|---------------|------------|--|
|              |                          |                 |                         |                  | 20            |            |  |
|              |                          |                 |                         |                  | 1             |            |  |
|              |                          |                 |                         |                  | 2             |            | Stiff drilling   |
|              |                          |                 |                         |                  | 3             |            | DK br - gy cl w/ some iron staining<br>sl moist                    |
|              |                          |                 |                         |                  | 4             |            |  |
|              |                          |                 |                         |                  | 25            |            |  |
|              |                          |                 |                         |                  | 6             |            | 25-30' SAA<br>dk br gy cl, sl moist                                |
|              |                          |                 |                         |                  | 7             |            |  |
|              |                          |                 |                         |                  | 8             |            |  |
|              |                          |                 |                         |                  | 9             |            |  |
|              |                          |                 |                         |                  | 30            |            |  |
|              |                          |                 |                         |                  | 1             |            | 30-35' SAA   |
|              |                          |                 |                         |                  | 2             |            |  |
|              |                          |                 |                         |                  | 3             |            |  |
|              |                          |                 |                         |                  | 4             |            |  |
|              |                          |                 |                         |                  | 35            |            | 20-34' <del>stiff drilling</del> Br - yell-br silty sa<br>sl moist |
|              | 18                       |                 | 551                     | 20               |               |            | Lt br - yell-br silty sa, dry - sl moist                           |
|              | 18                       |                 | 55                      | 30               |               | Grab       | Gy sil cl - silty sand, some iron staining<br>dry - sl moist       |
|              |                          |                 |                         |                  | 6             |            |  |
|              |                          |                 |                         |                  | 7             |            |  |
|              |                          |                 |                         |                  | 8             |            |  |
|              |                          |                 |                         |                  | 9             |            |  |
|              |                          |                 |                         |                  | 40            |            | Auger cuttings Br - gy silty w/ some sa<br>sl moist                |

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

CHK'D BY: \_\_\_\_\_

40



|                     |         |         |         |                        |
|---------------------|---------|---------|---------|------------------------|
| LOCATION OF BORING: |         | JOB NO. | CLIENT  | LOCATION:              |
| DRILLING METHOD     |         |         |         | BORING NO. 42<br>5B-15 |
| SAMPLING METHOD     |         |         |         | SHEET 3 of 4           |
| WATER LEVEL         |         |         |         | DRILLING:              |
| TIME                | 44.2    | 44.3    | 45.8    | START TIME             |
| DATE                | 9/2/88  | 9/2/88  |         | FINISH TIME            |
| CASING DEPTH        |         |         |         | DATE                   |
|                     | 45 open | 45 open | Scrapen | DATE                   |

DRILLING CONTR

| DATUM        |                                   | ELEVATION       |                             |                    |               | SURFACE CONDITIONS: |  |
|--------------|-----------------------------------|-----------------|-----------------------------|--------------------|---------------|---------------------|--|
| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLER NO.<br>SAMPLE DEPTH | FEET/FT<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH          |  |
|              |                                   |                 |                             |                    | 90            |                     |  |
|              |                                   |                 |                             |                    | 1             |                     |  |
|              |                                   |                 |                             |                    | 2             |                     | Auger cuttings SAA<br>Br sil cl w/ some v. f. sa<br>sl moist     |
|              |                                   |                 |                             |                    | 3             | ML<br>CL            | @ ~ 43' Br-yell sil sa w/ some cl<br>sl moist                    |
|              |                                   |                 |                             |                    | 4             |                     |  |
| SP<br>58     | 10<br>16                          |                 | 45<br>35<br>97<br>50/4      | Grab               | 45            | ML<br>SM            | Br-yell sil v. f. sa, wet<br>Sand drier towards bottom of sample |
|              |                                   |                 |                             |                    | 6             |                     |  |
|              |                                   |                 |                             |                    | 7             |                     |  |
|              |                                   |                 |                             |                    | 8             |                     |  |
|              |                                   |                 |                             |                    | 9             |                     |  |
| SP<br>50     | 6<br>13                           |                 | 50<br>70/6'                 | Grab               | 50            |                     | SAA, moist -<br>wet  |
|              |                                   |                 |                             |                    | 1             |                     |  |
|              |                                   |                 |                             |                    | 2             |                     |  |
|              |                                   |                 |                             |                    | 3             |                     |  |
|              |                                   |                 |                             |                    | 4             |                     |  |
|              |                                   |                 |                             |                    | 5             |                     | SAA  |
|              |                                   |                 |                             |                    | 6             |                     |  |
|              |                                   |                 |                             |                    | 7             |                     | Drilling got harder  |
|              |                                   |                 |                             |                    | 8             |                     |  |
|              |                                   |                 |                             |                    | 9             |                     |  |
|              |                                   |                 |                             |                    | 0             |                     |  |

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                          |         |         |                                      |
|--------------------------|---------|---------|--------------------------------------|
| LOCATION OF BORING:      | JOB NO: | CLIENT: | LOCATION:                            |
| DRILLING METHOD:         |         |         | BORING NO. <i>42</i><br><i>SB-15</i> |
| SAMPLING METHOD:         |         |         | SHEET<br><i>4 of 4</i>               |
| WATER LEVEL: <i>49.9</i> |         |         | DRILLING<br>START TIME:              |
| TIME: <i>5:15</i>        |         |         | FINISH TIME: <i>4:10</i>             |
| DATE: <i>7/2/88</i>      |         |         | DRILLING DATE: <i>9/2/88</i>         |
| CASING DEPTH: <i>57'</i> |         |         |                                      |

DEPTH ELEVATION

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT<br>SAMPLER    | SOIL GRAPH  | DEPTH IN FEET |
|--------------|-----------------------------------|-----------------|----------------------------|------------------------|-------------|---------------|
| <i>SPT</i>   | <i>18</i><br><i>18</i>            |                 |                            | <i>30</i><br><i>30</i> | <i>Grat</i> | <i>60</i>     |
|              |                                   |                 |                            |                        |             | 1             |
|              |                                   |                 |                            |                        |             | 2             |
|              |                                   |                 |                            |                        |             | 3             |
|              |                                   |                 |                            |                        |             | 4             |
|              |                                   |                 |                            |                        |             | 5             |
|              |                                   |                 |                            |                        |             | 6             |
|              |                                   |                 |                            |                        |             | 7             |
|              |                                   |                 |                            |                        |             | 8             |
|              |                                   |                 |                            |                        |             | 9             |
|              |                                   |                 |                            |                        |             | 10            |
|              |                                   |                 |                            |                        |             | 11            |
|              |                                   |                 |                            |                        |             | 12            |
|              |                                   |                 |                            |                        |             | 13            |
|              |                                   |                 |                            |                        |             | 14            |
|              |                                   |                 |                            |                        |             | 15            |
|              |                                   |                 |                            |                        |             | 16            |
|              |                                   |                 |                            |                        |             | 17            |
|              |                                   |                 |                            |                        |             | 18            |
|              |                                   |                 |                            |                        |             | 19            |
|              |                                   |                 |                            |                        |             | 20            |

SURFACE CONDITIONS:

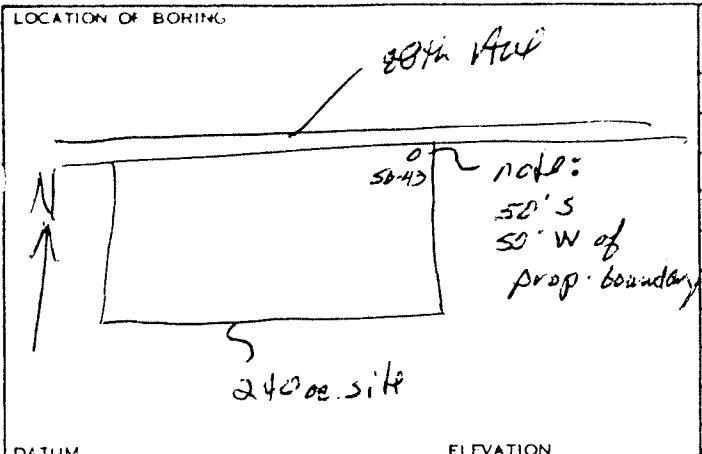
*BK silty w/ Abian lignite throughout  
sl moist*

*T.D. hole @ 61.5'*

*Installed 1" piezo to 57'  
20' slotted*

DRILLING CONTR

BY \_\_\_\_\_ DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



|  |                   |                |                          |
|--|-------------------|----------------|--------------------------|
| LOCATION OF BORING:                      | JOB NO:<br>2-1815 | CLIENT:<br>CSI | LOCATION:<br>Wagner Twp. |
| DRILLING METHOD:<br>Auger Rig w/ 4" O.D. | CME-75            |                | BORING NO:<br>SB-43      |
| SAMPLING METHOD:<br>Split Spun           |                   |                | SHEET:<br>1 of 3         |
| DRILLING                                 |                   |                | START TIME:<br>7:50      |
| WATER LEVEL                              |                   |                | FINISH TIME:             |
| TIME                                     |                   |                | DATE:<br>9/19/88         |
| DATE                                     |                   |                | DATE:<br>9/19/88         |
| CASING DEPTH                             |                   |                |                          |

DRILLING CONTR: *Johns Exp.*

DATUM \_\_\_\_\_ ELEVATION \_\_\_\_\_

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT.<br>SAMPLER | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|-----------------------------------|-----------------|----------------------------|----------------------|---------------|------------|--|
|              |                                   |                 |                            |                      | 0             |            |  |
|              |                                   |                 |                            |                      | 1             |            |  |
|              |                                   |                 |                            |                      | 2             | CL         | Br si cl w/ some s.s. sl moist                             |
|              |                                   |                 |                            |                      | 3             |            |  |
|              |                                   |                 |                            |                      | 4             |            |  |
|              |                                   |                 |                            |                      | 5             |            |  |
|              |                                   |                 |                            |                      | 6             |            |  |
|              |                                   |                 |                            |                      | 7             | ML         | Br fi-me sa cl, sl moist                                   |
|              |                                   |                 |                            |                      | 8             |            |  |
|              |                                   |                 |                            |                      | 9             |            |  |
|              |                                   |                 |                            |                      | 10            |            |  |
|              |                                   |                 |                            |                      | 11            |            |  |
|              |                                   |                 |                            |                      | 12            |            |  |
|              |                                   |                 |                            |                      | 13            | CL         | dk br si w/ ti sa cl sl moist                              |
|              |                                   |                 |                            |                      | 14            |            |  |
|              |                                   |                 |                            |                      | 15            |            |  |
|              |                                   |                 |                            |                      | 16            |            |  |
|              |                                   |                 |                            |                      | 17            |            |  |
|              |                                   |                 |                            |                      | 18            |            |  |
|              |                                   |                 |                            |                      | 19            | CLS        | W hard drilling - Br-gy claystone sl moist w/ some calcite |
|              |                                   |                 |                            |                      | 20            |            |  |

BY: *JEC* DATE: *9/17/88* CHK'D BY: \_\_\_\_\_

|                    |  |         |        |                     |
|--------------------|--|---------|--------|---------------------|
| LOCATION OF BORING |  | JOE NO. | CLIENT | LOCATION            |
| DRILLING METHOD    |  |         |        | BORING NO.<br>SP-43 |
| SAMPLING METHOD    |  |         |        | SHEET<br>2 of 3     |
| WATER LEVEL        |  |         |        | START TIME          |
| TIME               |  |         |        | FINISH TIME         |
| DATE               |  |         |        | DATE                |
| CASING DEPTH       |  |         |        | DATE                |

DEPTH ELEVATION

| SAMPLED TYPE | INCHES DRIVEN<br>INCHES DEPTH | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT<br>CASING | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS   |
|--------------|-------------------------------|-----------------|----------------------------|--------------------|---------------|------------|--|
|              |                               |                 |                            |                    | 20            |            |  |
|              |                               |                 |                            |                    | 1             |            |  |
|              |                               |                 |                            |                    | 2             |            |  |
|              |                               |                 |                            |                    | 3             |            |  |
|              |                               |                 |                            |                    | 4             |            |  |
|              |                               |                 |                            |                    | 25            |            | 25-30<br>Auger cuttings - Br si cl - (cls?)<br>sl moist                                    |
|              |                               |                 |                            |                    | 6             |            |  |
|              |                               |                 |                            |                    | 7             |            |  |
|              |                               |                 |                            |                    | 8             |            |  |
|              |                               |                 |                            |                    | 9             |            |  |
| SP<br>SP     | 18<br>18                      |                 | 16<br>14<br>30<br>23       | Grab               | 30            |            | si fisa cl<br>Br si <del>fisa</del> w/ some calcite<br>replacement<br>dry - sl moist       |
|              |                               |                 |                            |                    | 1             |            | checked for water - dry  |
|              |                               |                 |                            |                    | 2             |            |  |
|              |                               |                 |                            |                    | 3             |            | Drilling very hard - SAA   |
|              |                               |                 |                            |                    | 4             |            |  |
|              |                               |                 |                            |                    | 35            |            |  |
|              |                               |                 |                            |                    | 6             |            |  |
|              |                               |                 |                            |                    | 7             |            | Br si fisa dry - sl moist  |
|              |                               |                 |                            |                    | 8             |            |  |
|              |                               |                 |                            |                    | 9             |            |  |
|              |                               |                 |                            |                    | 40            |            | Br - dk br si sa cl - moist - damp in<br>auger cuttings. (moisture from surrounding areas) |

DRILLING CONTR.

BY DATE CHK'D BY

ML

DRILLING CONT'D

|                     |  |  |  |                 |              |            |
|---------------------|--|--|--|-----------------|--------------|------------|
| LOCATION OF BORING: |  |  |  | JOB NO.         | CLIENT       | LOCATION   |
|                     |  |  |  | DRILLING METHOD |              | BORING NO. |
|                     |  |  |  |                 |              | 56-4/3     |
|                     |  |  |  | SAMPLING METHOD |              | SHEET      |
|                     |  |  |  |                 |              | 303        |
|                     |  |  |  | WATER LEVEL     | 54.6         | 54.3       |
|                     |  |  |  | TIME            | 10:20        | 10:45      |
|                     |  |  |  | DATE            | 9/17/88      | 9/19/88    |
|                     |  |  |  | CASING DEPTH    | 56.5' approx | 55'        |
|                     |  |  |  | START TIME      |              | 10:10      |
|                     |  |  |  | FINISH TIME     |              |            |
|                     |  |  |  | START DATE      |              | 9/19/88    |
|                     |  |  |  | FINISH DATE     |              |            |

| DATUM        |                            | ELEVATION       |            |                     |      | DEPTH IN FEET |  | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------|-----------------|------------|---------------------|------|---------------|--|------------|--|
| SAMPLER TYPE | INCHES DRIVEN BELOW GROUND | DEPTH OF CASING | SAMPLE NO. | BLOWS/FT SAMPLED    |      |               |  |            |  |
| 5' x 3" SP   | 18<br>18                   |                 | 40         | 10<br>12<br>14      | Grab | 40            |  |            | W/ well installed  |
|              |                            |                 |            |                     |      | 1             |  |            |  |
|              |                            |                 |            |                     |      | 2             |  |            |  |
|              |                            |                 |            |                     |      | 3             |  |            |  |
|              |                            |                 |            |                     |      | 4             |  |            |  |
| 5' x 3" SP   | 18<br>18                   |                 | 45         | 11<br>17<br>26      | Grab | 45            |  |            | Br sil (cls) sl moist  |
|              |                            |                 |            |                     |      | 6             |  |            |  |
|              |                            |                 |            |                     |      | 7             |  |            |  |
|              |                            |                 |            |                     |      | 8             |  |            |  |
|              |                            |                 |            |                     |      | 9             |  |            |  |
| 5' x 3" SP   | 18<br>18                   |                 | 50         | 30<br>37<br>50 1/2" | Grab | 50            |  |            | Br sil w/ fine - br sil fine cl intervals sl moist - moist   |
|              |                            |                 |            |                     |      | 1             |  |            | mod. wet - dry   |
|              |                            |                 |            |                     |      | 2             |  |            |  |
|              |                            |                 |            |                     |      | 3             |  |            | Auger cutting - Br sil sa w/ some cl moist - wet   |
|              |                            |                 |            |                     |      | 4             |  |            |  |
| 55           | 18<br>18                   |                 | 55         | 13<br>20<br>21      | Grab | 55            |  |            | Br sil - Gy (clay sand) - Denver Fm  |
|              |                            |                 |            |                     |      | 6             |  |            |  |
|              |                            |                 |            |                     |      | 7             |  |            | B.T. @ 56.5'   |
|              |                            |                 |            |                     |      | 8             |  |            | Boring completed as a Monitoring well 2" p.c. threaded, flush jointed. 5' screen length (4.5' actual screen) |
|              |                            |                 |            |                     |      | 9             |  |            | T.D. of well 55', screen 50-55, sand 48-55   |
|              |                            |                 |            |                     |      | 60            |  |            | Best. pellets 45-48, cement 0-45, steel 4" steel prot. casing at surface (5' length)                         |
|              |                            |                 |            |                     |      |               |  |            | 2' PVC stick-up  |

CHK'D BY DATE

BY DATE

I 1 (3) - REV. 11-80

|                                     |                                     |                          |                              |
|-------------------------------------|-------------------------------------|--------------------------|------------------------------|
| LOCATION OF BORING: <b>88th Ave</b> | JOB NO.: <b>2-1815</b>              | CLIENT: <b>CSI</b>       | LOCATION: <b>Wagner Farm</b> |
|                                     | DRILLING METHOD: <b>CME-75</b>      | BORING NO.: <b>SB-44</b> |                              |
|                                     | <b>4" Solid Stem Auger</b>          |                          | SHEET: <b>1 of 2</b>         |
|                                     | SAMPLING METHOD: <b>Split Spoon</b> | DRILLING:                |                              |
|                                     | WATER LEVEL                         | START TIME               | FINISH TIME                  |
|                                     | TIME                                | <b>1020</b>              |                              |
|                                     | DATE                                | DATE                     | <b>9/19/08</b>               |
| DIAMETER                            | ELEVATION                           |                          | CASING DEPTH                 |

SURFACE CONDITIONS: **Br. si. v. fi. sa. cl**

| SAMPLE TYPE | INCHES DEPTH | DEPTH OF CASING | SAMPLE NO. | REMARKS | DEPTH IN FEET | SOIL CIPRPH |
|-------------|--------------|-----------------|------------|---------|---------------|-------------|
|             |              |                 |            |         | 0             |             |
|             |              |                 |            |         | 1             |             |
|             |              |                 |            |         | 2             |             |
|             |              |                 |            |         | 3             |             |
|             |              |                 |            |         | 4             |             |
|             |              |                 |            |         | 5             |             |
|             |              |                 |            |         | 6             |             |
|             |              |                 |            |         | 7             |             |
|             |              |                 |            |         | 8             |             |
|             |              |                 |            |         | 9             |             |
|             |              |                 |            |         | 10            |             |
|             |              |                 |            |         | 1             |             |
|             |              |                 |            |         | 2             |             |
|             |              |                 |            |         | 3             |             |
|             |              |                 |            |         | 4             |             |
|             |              |                 |            |         | 5             |             |
|             |              |                 |            |         | 6             |             |
|             |              |                 |            |         | 7             |             |
|             |              |                 |            |         | 8             |             |
|             |              |                 |            |         | 9             |             |
|             |              |                 |            |         | 10            |             |

**Br. me. sa. cl, sl. moist**

**Br. ~~me~~ cl. me. sa. sl. moist**

**Br. olive gray claystone, sl. moist**

**olive gray claystone - iron stained, sl. moist**

DRILLING / ONTR. **D. A. K. E. P. L. O.**

BY: **J. E. C.** DATE: **9/19/08** CHK'D BY:

|                      |  |         |        |             |
|----------------------|--|---------|--------|-------------|
| LOCATION OF BOREHOLE |  | JOB NO. | CLIENT | LOCATION    |
| DRILLING METHOD      |  |         |        | BORING NO.  |
| SAMPLING METHOD      |  |         |        | SHEET       |
| WATER LEVEL          |  |         |        | DRILLING    |
| TIME                 |  |         |        | START TIME  |
| DATE                 |  |         |        | FINISH TIME |
| CASING DEPTH         |  |         |        | DATE        |

5B-44  
2 of 2  
1:00  
9/19/00

Datum: ELEVATION:

| SAMPLER TYPE | INCHES DEPTH BY DRIVE | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | FEET/SFT SAMPLER | DEPTH IN FEET | SOIL GRAPH |
|--------------|-----------------------|-----------------|-------------------------|------------------|---------------|------------|
|              |                       |                 |                         |                  | 20            |            |
|              |                       |                 |                         |                  | 1             |            |
|              |                       |                 |                         |                  | 2             |            |
|              |                       |                 |                         |                  | 3             |            |
|              |                       |                 |                         |                  | 4             |            |
| SPT 3p       | 18-19                 |                 | 25 11/15                | Grab             | 25            |            |
|              |                       |                 |                         |                  | 6             |            |
|              |                       |                 |                         |                  | 7             |            |
|              |                       |                 |                         |                  | 8             |            |
|              |                       |                 |                         |                  | 9             |            |
|              |                       |                 |                         |                  | 30            |            |
|              |                       |                 |                         |                  | 1             |            |
|              |                       |                 |                         |                  | 2             |            |
|              |                       |                 |                         |                  | 3             |            |
|              |                       |                 |                         |                  | 4             |            |
|              |                       |                 |                         |                  | 35            |            |
|              |                       |                 |                         |                  | 6             |            |
|              |                       |                 |                         |                  | 7             |            |
|              |                       |                 |                         |                  | 8             |            |
|              |                       |                 |                         |                  | 9             |            |
|              |                       |                 |                         |                  | 0             |            |

SURFACE CONDITIONS: (pvc well)

Olive gy claystone - iron stained sl. moist

2' br-br sil. f. sil. cl sl. moist - damp

Olive gy claystone - abn. iron staining sl. moist

T.D. 26.5'

Monitoring Well set to 25'

5' screen 20-25'

sand 19-25 #10-20 sieve

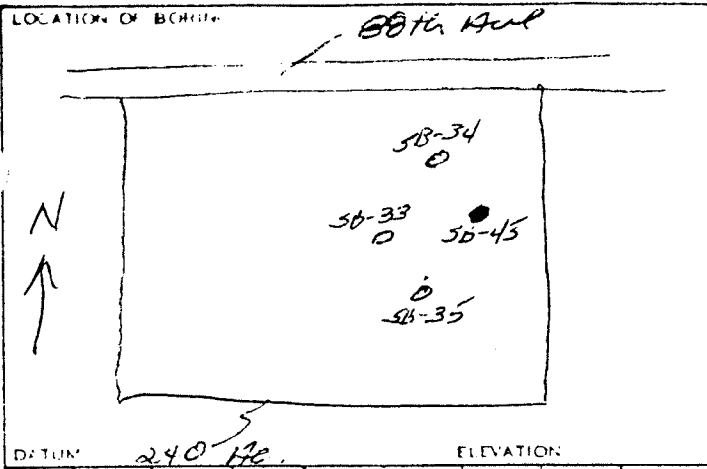
Bentonite 18-19

cement 0-16.

5' x 4" steel protective casing at surface

DRILLING CONTRACT

BY: \_\_\_\_\_ CHK'D BY: \_\_\_\_\_ DATE: \_\_\_\_\_



|  |                       |                                 |
|--|-----------------------|---------------------------------|
| JOB NO:<br><i>2-1815</i>               | CLIENT:<br><i>CSI</i> | LOCATION:<br><i>Wagner Farm</i> |
| DRILLING METHOD:<br><i>CME-75</i>      |                       | BORING NO:<br><i>SB-45</i>      |
| <i>4" solid stem auger</i>             |                       | SHELL:<br><i>1 &amp; 4</i>      |
| SAMPLING METHOD:<br><i>Split Spoon</i> |                       | DRILLING:                       |
| WATER LEVEL:                           |                       | START TIME:<br><i>3:35</i>      |
| TIME:                                  |                       | FINISH TIME:                    |
| DATE:                                  |                       | DATE:<br><i>9/19/88</i>         |
| CASING DEPTH:                          |                       |                                 |

DRILLING LOG BY *L. Johnson Exp.*

| SAMPLED TYPE | INCHES DOWN | DEPTH OF CASING | SAMPLE NO. | FEET SAMPLED | DEPTH IN FEET | SOIL C-DEPTH |
|--------------|-------------|-----------------|------------|--------------|---------------|--------------|
| /            | /           | /               | /          | /            | 0             |              |
| /            | /           | /               | /          | /            | 1             |              |
| /            | /           | /               | /          | /            | 2             |              |
| /            | /           | /               | /          | /            | 3             |              |
| /            | /           | /               | /          | /            | 4             |              |
| /            | /           | /               | /          | /            | 5             |              |
| /            | /           | /               | /          | /            | 6             |              |
| /            | /           | /               | /          | /            | 7             |              |
| /            | /           | /               | /          | /            | 8             |              |
| /            | /           | /               | /          | /            | 9             |              |
| /            | /           | /               | /          | /            | 10            |              |
| /            | /           | /               | /          | /            | 11            |              |
| /            | /           | /               | /          | /            | 12            |              |
| /            | /           | /               | /          | /            | 13            |              |
| /            | /           | /               | /          | /            | 14            |              |
| /            | /           | /               | /          | /            | 15            |              |
| /            | /           | /               | /          | /            | 16            |              |
| /            | /           | /               | /          | /            | 17            |              |
| /            | /           | /               | /          | /            | 18            |              |
| /            | /           | /               | /          | /            | 19            |              |
| /            | /           | /               | /          | /            | 20            |              |

SURFACE CONDITIONS:  
*Br. sil c / w/ some sand*

*0-4 Br-dk br. sil c / w/ some sa, sl. moist*

*4-5 Br. si m2 sa w/ some cl sl. moist*

*Grades to fi sa  
Br si fi cl sa sl. moist*

*Gr sandier  
Br si fi sa w/ trace cl sl. moist*

BY: *JEC* DATE: *9/17/88* CHK'D BY:



|                    |  |  |  |            |             |            |  |
|--------------------|--|--|--|------------|-------------|------------|--|
| LOCATION OF BORING |  |  |  | JOB NO.    | CLIENT      | LOCATION   |  |
| DRILLING METHOD    |  |  |  |            |             | BORING NO. |  |
|                    |  |  |  |            |             | SB-45      |  |
| SAMPLING METHOD    |  |  |  |            |             | SHEET      |  |
|                    |  |  |  |            |             | 2 of 4     |  |
|                    |  |  |  |            |             | DRILLING   |  |
| WATER LEVEL        |  |  |  | START TIME | FINISH TIME |            |  |
| TIME               |  |  |  |            |             |            |  |
| DATE               |  |  |  | DATE       | DATE        |            |  |
| CASING DEPTH       |  |  |  |            |             |            |  |

DRILLING CONTINUED

| DATE         |             | ELEVATION       |             |                  |               |            |  | SURFACE CONDITIONS |  |
|--------------|-------------|-----------------|-------------|------------------|---------------|------------|--|--------------------|--|
| SAMPLER TYPE | INCHES DOWN | DEPTH OF CASING | SAMPLER NO. | FLOW-LET SAMPLER | DEPTH IN FEET | SOIL GRAPH |  |                    |  |
|              |             |                 |             |                  | 0             |            |  |                    |  |
|              |             |                 |             |                  | 1             |            |  |                    |  |
|              |             |                 |             |                  | 2             |            |  |                    |  |
|              |             |                 |             |                  | 3             |            |  |                    |  |
|              |             |                 |             |                  | 4             |            | Br. sil. cl (claystone)<br>dry - sl. moist                 |                    |  |
|              |             |                 |             |                  | 5             |            |  |                    |  |
|              |             |                 |             |                  | 6             |            | Bt - olive gy cls  |                    |  |
|              |             |                 |             |                  | 7             |            |  |                    |  |
|              |             |                 |             |                  | 8             |            |  |                    |  |
|              |             |                 |             |                  | 9             |            |  |                    |  |
| SS           | 18<br>10    |                 | 30          | 192<br>25        | 30            | Grab       | Olive gy claystone - abun iron staining<br>dry - sl. moist |                    |  |
|              |             |                 |             |                  | 1             |            |  |                    |  |
|              |             |                 |             |                  | 2             |            |  |                    |  |
|              |             |                 |             |                  | 3             |            |  |                    |  |
|              |             |                 |             |                  | 4             |            |  |                    |  |
|              |             |                 |             |                  | 5             |            | SAPA   |                    |  |
|              |             |                 |             |                  | 6             |            |  |                    |  |
|              |             |                 |             |                  | 7             |            |  |                    |  |
|              |             |                 |             |                  | 8             |            |  |                    |  |
|              |             |                 |             |                  | 9             |            |  |                    |  |
|              |             |                 |             |                  | 0             |            |  |                    |  |

CHK'D BY

DATE

11-131 (REV. 11-90)

DRILLING CONT'D

|                     |  |  |  |             |  |              |            |           |  |
|---------------------|--|--|--|-------------|--|--------------|------------|-----------|--|
| LOCATION OF BORING: |  |  |  | JOB NO:     |  | CLIENT:      |            | LOCALITY: |  |
| DRILLING METHOD:    |  |  |  |             |  |              | BORING NO: |           |  |
|                     |  |  |  |             |  |              | SB-45      |           |  |
| SAMPLING METHOD:    |  |  |  |             |  |              | SHEET:     |           |  |
|                     |  |  |  |             |  |              | 3 of 4     |           |  |
|                     |  |  |  |             |  |              | DRILLING:  |           |  |
| WATER LEVEL:        |  |  |  | START TIME: |  | FINISH TIME: |            |           |  |
| TIME:               |  |  |  |             |  |              |            |           |  |
| DATE:               |  |  |  | DATE:       |  | DATE:        |            | DATE:     |  |
| CASING DEPTH:       |  |  |  |             |  |              |            |           |  |

| DATUM        |                                  | ELEVATION       |                           |                     |                  |               |  | SURFACE CONDITIONS: |  |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|------------------|---------------|--|---------------------|--|
| SAMPLED PIPE | INCHES DRIVEN<br>INCHES RETURNED | DEPTH OF CASING | SAMPLE NO<br>SAMPLE DEPTH | BLOWS/FT<br>SAMPLED | DEPTH<br>IN FEET | SOIL<br>GRAPH |  |                     |  |
|              |                                  |                 |                           |                     | 40               |               | SRAH   |                     |  |
|              |                                  |                 |                           |                     | 1                |               |  |                     |  |
|              |                                  |                 |                           |                     | 2                |               |  |                     |  |
|              |                                  |                 |                           |                     | 3                |               |  |                     |  |
|              |                                  |                 |                           |                     | 4                |               |  |                     |  |
| SS           | 10<br>18                         |                 | 45<br>12<br>24            | Grab 4              | 5                |               | olive gy claystone, few iron stains<br>dry - sl moist                |                     |  |
|              |                                  |                 |                           |                     | 6                |               |  |                     |  |
|              |                                  |                 |                           |                     | 7                |               |  |                     |  |
|              |                                  |                 |                           |                     | 8                |               | Color change to dark tan<br>Br claystone, sl moist @ 48.5'           |                     |  |
|              |                                  |                 |                           |                     | 9                |               |  |                     |  |
|              |                                  |                 |                           |                     | 30               |               |  |                     |  |
|              |                                  |                 |                           |                     | 1                |               |  |                     |  |
|              |                                  |                 |                           |                     | 2                |               | Grades sandier   |                     |  |
|              |                                  |                 |                           |                     | 3                |               |  |                     |  |
|              |                                  |                 |                           |                     | 4                | SC            |  |                     |  |
| SS           | 11<br>11                         |                 | 24<br>35<br>50/5          | Grab 5              | 5                |               | 14' br si v. fi sa - dry, grades to<br>11' br si v. fi sandstone dry |                     |  |
|              |                                  |                 |                           |                     | 6                | SS            |  |                     |  |
|              |                                  |                 |                           |                     | 7                |               |  |                     |  |
|              |                                  |                 |                           |                     | 8                |               | Olive gy claystone<br>dry - sl moist                                 |                     |  |
|              |                                  |                 |                           |                     | 9                |               |  |                     |  |
|              |                                  |                 |                           |                     | 60               |               |  |                     |  |

DATE: \_\_\_\_\_ CHK'D BY: \_\_\_\_\_

|                      |  |         |                     |             |
|----------------------|--|---------|---------------------|-------------|
| LOCATION OF BOREHOLE |  | JOB NO. | CLIENT              | LOCATION    |
| DRILLING METHOD      |  |         | BORING NO.<br>50-45 |             |
| SAMPLING METHOD      |  |         | SHEET<br>4 of 4     |             |
| WATER LEVEL          |  |         | START TIME          | FINISH TIME |
| TIME                 |  |         | DATE                | DATE        |
| CASING DEPTH         |  |         | DRILLING DATE       |             |

| SAMPLED IN THE | INCHES DOWN | DEPTH OF CASING | SAMPLE NO. | BLOWS/FT       | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS                            |
|----------------|-------------|-----------------|------------|----------------|---------------|------------|---|
|                |             |                 |            |                |               |            |   |
|                |             |                 |            |                | 60            |            |   |
|                |             |                 |            |                | 1             |            |   |
|                |             |                 |            |                | 2             |            |   |
|                |             |                 |            |                | 3             |            |   |
|                |             |                 |            |                | 4             |            |   |
|                |             |                 |            |                | 65            |            | Olive gy claystone<br>dry - sl. moist         |
|                |             |                 |            |                | 6             |            |   |
|                |             |                 |            |                | 7             |            |   |
|                |             |                 |            |                | 8             |            |   |
|                |             |                 |            |                | 9             |            | Stopped drill @ 70' @ 5:00. Will resume in AM |
| SS             | 11/11       |                 | 70         | 40<br>50/5     | 70            |            | Olive gy claystone - siltstone<br>dry - moist |
| SS             | 15/18       |                 | 71         | 20<br>30<br>40 | 1             |            | SAA   |
|                |             |                 |            |                | 2             |            |   |
| SS             | 18/19       |                 | 72.5       | 36<br>48<br>42 | 3             |            | SAA   |
|                |             |                 |            |                | 4             |            |   |
|                |             |                 |            |                | 5             |            | T.D. @ 74'                                    |
|                |             |                 |            |                | 6             |            | Installed 3/4" pipe w/ 15'<br>slotted length  |
|                |             |                 |            |                | 7             |            |   |
|                |             |                 |            |                | 8             |            |   |
|                |             |                 |            |                | 9             |            |   |
|                |             |                 |            |                | 0             |            |   |

DRILLING CONT'D

CHK'D BY

DATE

1113 (REV. 11-00)

|                                  |  |                     |                              |
|----------------------------------|--|---------------------|------------------------------|
| LOCATION OF BOREHOLE<br>89th Ave | LOG NO.<br>2-1815                                  | CLIENT<br>CSI       | LOCATION<br>Wagner Farm      |
|                                  | DRILLING METHOD: CME-75<br>4-inch solid stem auger |                     | BORING NO.<br>SB-46          |
|                                  | SAMPLING METHOD: Split Spoon,<br>grab              |                     | SHEET<br>1 of 1              |
|                                  | WATER LEVEL<br>47.9                                | TIME<br>3:45        | DRILLING START TIME<br>12:45 |
|                                  | DATE<br>9/20/88                                    | CASING DEPTH<br>55' | FINISH TIME<br>1:10          |
| DATE                             | DATE   | DATE                | DATE                         |
|                                  |  | 9/20/88             | 9/20/88                      |

| SAMPLER TYPE | INCHES DEPTH | DEPTH OF CASING | SAMPLE NO. | BLOWS/FT | ELEVATION | DEPTH IN FEET | SOIL GRADES |
|--------------|--------------|-----------------|------------|----------|-----------|---------------|-------------|
|              |              |                 |            |          |           | 0             |             |
|              |              |                 |            |          |           | 1             |             |
|              |              |                 |            |          |           | 2             |             |
|              |              |                 |            |          |           | 3             |             |
|              |              |                 |            |          |           | 4             |             |
|              |              |                 |            |          |           | 5             |             |
|              |              |                 |            |          |           | 6             |             |
|              |              |                 |            |          |           | 7             |             |
|              |              |                 |            |          |           | 8             |             |
|              |              |                 |            |          |           | 9             |             |
|              |              |                 |            |          |           | 0             |             |
|              |              |                 |            |          |           | 1             |             |
|              |              |                 |            |          |           | 2             |             |
|              |              |                 |            |          |           | 3             |             |
|              |              |                 |            |          |           | 4             |             |
|              |              |                 |            |          |           | 5             |             |
|              |              |                 |            |          |           | 6             |             |
|              |              |                 |            |          |           | 7             |             |
|              |              |                 |            |          |           | 8             |             |
|              |              |                 |            |          |           | 9             |             |
|              |              |                 |            |          |           | 0             |             |

SURFACE CONDITIONS:

Note: SB-46 was drill approx 10' NE of SB-30. The Lithology was similar to SB-30, therefore the reader is advised to review the lithology recorded during the drilling of SB-30.

SB-46 was drilled to a T.D. of 55'. A piece consisting of 3/4" pvc pipe with 20' slotted screen was installed in the boring.

DRILLING CONTR: Deacon Expe

BY: JEC

DATE: 9/20/88

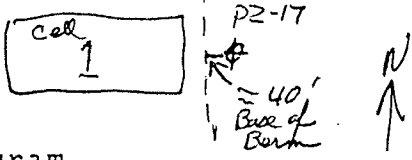
CHK'D BY:

9/20/88 (REV 11-80)

511 Orchard Street Golden, CO 80401

88<sup>th</sup>

|  |               |                                |
|--|---------------|--------------------------------|
| JOB NO<br>2-1815-                      | CLIENT<br>CSI | LOCATION<br>Trendle Rd.        |
| DRILLING METHOD: CML-75<br>8" O.D. HSA |               | BORING NO.<br>PZ-17            |
| SAMPLING METHOD: Continuous            |               | SHEET<br>1 OF 4                |
| WATER LEVEL<br>Dry                     |               | DRILLING<br>START TIME<br>1040 |
| TIME<br>1530                           |               | FINISH TIME<br>1420            |
| DATE<br>1/10/90                        |               | DATE<br>1/10/90                |
| CASING DEPTH                           |               |                                |



Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                                    |
|--------------|-------------------------|-----------------|-------------------------|-------------------|-------------|---------------|------------|--|
|              |                         |                 |                         |                   |             | 0             |            | Discard Weed Field                                     |
|              |                         |                 |                         |                   |             |               |            | Clay, m brn, silty, v sl sdy - sl mst                  |
|              |                         |                 |                         |                   |             | 5             |            |  |
|              |                         |                 |                         |                   |             |               |            | Sand, m brn, fgr, silty - mod clayey - mst             |
|              |                         |                 |                         |                   |             | 10            |            | SRA, inc clay & mst                                    |
|              |                         |                 |                         |                   |             |               |            | Sand/Clay, m brn, frm fgr - mst                        |
|              |                         |                 |                         |                   |             |               |            | SAND, m brn, f-tr m gr, sb rnd, mod clay - mst - v mst |
|              |                         |                 |                         |                   |             | 15            |            | Clay, brn gy, frm, mod sdy - mst - v mst               |
|              |                         |                 |                         |                   |             |               |            | Clay, a la inc dk brn, sl - mod sdy -                  |
|              |                         |                 |                         |                   |             |               |            | Clay, gy, sl frm, n sdy - mst                          |
|              |                         |                 |                         |                   |             | 20            |            | Sand, m brn, fgr, sb rnd, mod clay - silty - mst       |

DATE CHK'D BY

511 Orchard Street Golden, CO 80401

|                  |  |                     |             |
|------------------|--|---------------------|-------------|
| DRILLING METHOD: |  | BORING NO.<br>PZ-17 |             |
| SAMPLING METHOD: |  | SHEET<br>2 of 4     |             |
| WATER LEVEL      |  | START TIME          | FINISH TIME |
| TIME             |  | DATE                | DATE        |
| CASING DEPTH     |  |                     |             |

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH  |
|              |                                  |                 |                           |                     |             | 20            | Sand, mbrn, f gr, w srt, sb rnd, sl clay - mst  |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             | 5             | Clay, gy brn, frm, s-l med sdy - sl mst<br>Clay, gn brn, frm, n med sdy - mst             |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             | 30            | S.A.A. - sl mst   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             | 5             | 2" silty clay - dry - v sl mst<br>Clay, gn brn, v frm, n silty, ox ip w carb mat - sl mst |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             | 5             | 2" silty v f gr sand, sl clay - sl mst<br>Clay gn brn - olive gn - a/a n silty            |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             | 40            | Clay, gn rust brn, sl frm, v silty - sl mst - mst   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |
|              |                                  |                 |                           |                     |             |               |   |

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_

|                  |  |        |  |            |             |
|------------------|--|--------|--|------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION   |             |
| DRILLING METHOD: |  |        |  | BORING NO. |             |
|                  |  |        |  | PZ-17      |             |
| SAMPLING METHOD: |  |        |  | SHEET      |             |
|                  |  |        |  | 3 OF 4     |             |
|                  |  |        |  | DRILLING   |             |
| WATER LEVEL      |  |        |  | START TIME | FINISH TIME |
| TIME             |  |        |  |            |             |
| DATE             |  |        |  | DATE       | DATE        |
| CASING DEPTH     |  |        |  |            |             |

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |   |
|              |                                  |                 |                           |                     |             | 40            |            | Clay, dk purp brn, v frm, carb, n slty - sl mst                             |
| crst         |                                  |                 |                           |                     |             |               |            |   |
|              |                                  |                 |                           |                     |             |               |            | clay, gn brn - olgn, frm, ox ip, sl slty ip - sl mst                        |
|              |                                  |                 |                           |                     |             |               |            | tr sks  |
| crst         |                                  |                 |                           |                     |             |               |            | clay, gn brn, frm, v slty, mod vt sdy ox - sl mst                           |
|              |                                  |                 |                           |                     |             | 5             |            | SAA, slty - sl mst  |
|              |                                  |                 |                           |                     |             |               |            | clay, gn brn - olgn, frm, n slty, sl ox - sl mst                            |
|              |                                  |                 |                           |                     |             |               |            | sl slty in 1-2" intervals -   |
|              |                                  |                 |                           |                     |             |               |            | SAA   |
|              |                                  |                 |                           |                     |             |               |            | sand, brn, vt gr slty, sbrnd, vsl cly, ss frags - dry - sl mst              |
|              |                                  |                 |                           |                     |             |               |            | clay, olgn - gn brn, frm, sl slty lenses - dry - sl mst                     |
|              |                                  |                 |                           |                     |             | 50            |            | Clay A/A  |
|              |                                  |                 |                           |                     |             |               |            | Sand, brn, fgr slty, sl cly, ss frag - sl mst                               |
|              |                                  |                 |                           |                     |             |               |            | clay, dk brn - brgy, v frm, n sdy - sl mst                                  |
|              |                                  |                 |                           |                     |             |               |            | tr sks  |
|              |                                  |                 |                           |                     |             | 5             |            | Clay SAA - sl slty < 1" doses - sl mst                                      |
|              |                                  |                 |                           |                     |             |               |            |   |
|              |                                  |                 |                           |                     |             |               |            | clay, bcm dk gy aol carb, dec ox, n slty - sl mst                           |
|              |                                  |                 |                           |                     |             |               |            |   |
|              |                                  |                 |                           |                     |             | 60            |            | clay, dk gy - blk, v frm, sl hd slty @ top 1" tr bid hor frag w/ox - sl mst |

CHK'D BY  
DATE





|                                   |  |            |  |                          |  |
|-----------------------------------|--|------------|--|--------------------------|--|
| JOB NO. 2-1815-                   |  | CLIENT CSZ |  | LOCATION Irondele Rd.    |  |
| DRILLING METHOD: CME-75<br>4" SSA |  |            |  | BORING NO. PZ-18         |  |
| SAMPLING METHOD: SS               |  |            |  | SHEET 1 OF 4             |  |
| WATER LEVEL Dry                   |  |            |  | DRILLING START TIME 0750 |  |
| TIME 1400                         |  |            |  | FINISH TIME 1323         |  |
| DATE 1/11/90                      |  |            |  | DATE 1/11/90             |  |
| CASING DEPTH                      |  |            |  | DATE 1/11/90             |  |

Cell 3 → PZ-18 #230

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |  |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |  |
|              |                                  |                 |                           |                     |             | 0             |            |  |
|              |                                  |                 |                           |                     |             |               |            | Silty, Sdy Clay, brn, slms <sup>T</sup>  |
|              |                                  |                 |                           |                     |             | 5             |            |  |
| SS           | 18" / 18"                        |                 | 10-11.5                   | 4/6                 |             | 10            |            | Sand, brn, +-mgr. slsilty clay - slms <sup>T</sup><br>Clay, brn - lt brn wh frm, slsilty - ms <sup>T</sup> |
|              |                                  |                 |                           | 7/8                 |             |               |            |  |
|              |                                  |                 |                           | 8/14                |             |               |            |  |
|              |                                  |                 |                           |                     |             | 15            |            | Clay, brn, frm, sdy Interst, - slms <sup>T</sup>   |
|              |                                  |                 |                           |                     |             |               |            |  |
|              |                                  |                 |                           |                     |             | 20            |            | Clay, brn dk brngy, frm, drc sdy - slms <sup>T</sup>   |

CHK'D BY  
DATE

511 Orchard Street Golden, CO 80401

|                  |  |        |  |                     |             |
|------------------|--|--------|--|---------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION            |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ-18 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>2 of 4     |             |
| WATER LEVEL      |  |        |  | DRILLING            |             |
| TIME             |  |        |  | START TIME          | FINISH TIME |
| DATE             |  |        |  | DATE                | DATE        |
| CASING DEPTH     |  |        |  |                     |             |

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | Reading                    |     | DEPTH IN FEET | SOIL GRAPH |
|--------------|----------------------------------|-----------------|---------------------------|----------------------------|-----|---------------|------------|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER          | OVA |               |            |
| SS           | 18" / 18"                        |                 | 20-215                    | 5 1/6<br>9 1/6<br>12 1/6   |     | 20            |            |
|              |                                  |                 |                           |                            |     | 5             |            |
| SS           | 18" / 18"                        |                 | 30-315                    | 12 1/6<br>17 1/6<br>21 1/6 |     | 30            |            |
|              |                                  |                 |                           |                            |     | 5             |            |
| SS           | 18" / 18"                        |                 | 35-365                    | 15 1/6<br>19 1/6<br>15 1/6 |     | 5             |            |
|              |                                  |                 |                           |                            |     | 40            |            |

SURFACE CONDITIONS:

Clay, dk brn, +rm, med sdy - slms

Sand/silt, brn, sl-mud sp, sl ox - slms - ms

Clay, lt brngy, sl frm, v slty, sl ox - slms

Clay, dk gy brn, v frm, dns, med - v cv, 1 slty, ptg - slms

Clay, brngy brn dk gy in base, v frm, sl ox, - slms

DATE  
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511 Orchard Street Golden, CO 80401

|                  |  |        |  |                     |             |
|------------------|--|--------|--|---------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION            |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ-18 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>3 OF 4     |             |
|                  |  |        |  | DRILLING            |             |
| WATER LEVEL      |  |        |  | START TIME          | FINISH TIME |
| TIME             |  |        |  | DATE                | DATE        |
| DATE             |  |        |  |                     |             |
| CASING DEPTH     |  |        |  |                     |             |

Location Diagram

DATUM ELEVATION

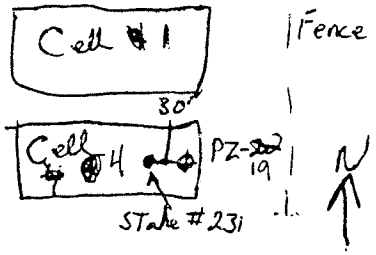
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO / SAMPLE DEPTH | BLOWS/FT. SAMPLER    | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|--------------------------|----------------------|-------------|---------------|------------|--|
| SS           | 18" / 18"                        |                 | 40-41.5'                 | 5/6<br>6/6<br>12/6   |             | 40            |            | Clay, dk grey - rus' v. fin, med. blk. sand, med. ac. nstly - slms   |
| SS           | 18" / 18"                        |                 | 45-46.5'                 | 10/6<br>15/6<br>23/6 |             | 5             |            | Clay, dk grey - rus' fin. med. - v. blk. sand, med. ac. nstly - slms<br>from ex. doc. & nstly @ base                                       |
| SS           | 18" / 18"                        |                 | 50-51.5'                 | 10/6<br>15/6<br>23/6 |             | 50            |            | Clay, dk grey - rus' fin. med. - v. blk. sand, med. ac. nstly - slms   |
| SS           | 18" / 18"                        |                 | 55-56.5'                 | 8/6<br>18/6<br>23/6  |             | 5             |            | Clay, dk grey - rus' fin. med. - v. blk. sand, med. ac. nstly - slms<br>Clay, dk grey - rus' v. fin. med. blk. sand, med. ac. nstly - slms |

DATE CHK'D BY



511 Orchard Street Golden, CO 80401

|  |               |                                     |
|--|---------------|-------------------------------------|
| JOB NO.<br>2-1875                      | CLIENT<br>CSI | LOCATION<br>Trondak                 |
| DRILLING METHOD: CME-75<br>8" O.D. HSA |               | BORING NO.<br>PZ-2019               |
| SAMPLING METHOD: Contin                |               | SHEET<br>1 of 4                     |
| WATER LEVEL 57.8'                      |               | DRILLING                            |
| TIME 1500                              | DATE 1/15/90  | START TIME 1200<br>FINISH TIME 1405 |
| CASING DEPTH                           |               | DATE 1/15/90<br>DATE 1/15/90        |



Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH | DESCRIPTION   |
|              |                                  |                 |                           |                     |             | 0             |            | Drilled in Stockpile S of Cell #1 ~ Top 5' is stockpile material<br><del>Bottom stockpile S of Cell #1 (~ Top 5' is stockpile material)</del><br>Clay, brn, sl frm, v sdy gdy to clay, sand - sl ms |
|              |                                  |                 |                           |                     |             | 5             |            | Clay, dk gy brn, frm, sl - mod sdy fgr - sl ms  |
|              |                                  |                 |                           |                     |             | 10            |            | Clay, brn, frm, mod sdy - sl ms<br>Clay, brn-gy, inc frm, v sl sdy - sl ms  |
|              |                                  |                 |                           |                     |             | 15            |            | SAA - sl ms ms<br>4" sand; v clayey<br>Sand, m brn, f-gr, w srt, mod clay - sl ms - ms<br>Clay, brn, frm, sl - mod sdy - sl ms  |
|              |                                  |                 |                           |                     |             | 20            |            |   |

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



511 Orchard Street Golden, CO 80401

|                  |  |        |  |                       |  |
|------------------|--|--------|--|-----------------------|--|
| JOB NO.          |  | CLIENT |  | LOCATION              |  |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ-2019 |  |
| SAMPLING METHOD: |  |        |  | SHEET<br>3 of 4       |  |
| WATER LEVEL      |  |        |  | DRILLING              |  |
| TIME             |  |        |  | START TIME            |  |
| DATE             |  |        |  | FINISH TIME           |  |
| CASING DEPTH     |  |        |  | DATE                  |  |

Location Diagram

| DATUM        |                         | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |   |
|--------------|-------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVER RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |   |
| Cont         | /                       |                 | /                         |                     |             | 40            |            | SAA<br>Sand, rust-gy brn, vt-f gr, skrd, sl cly - mst - v mst |
|              | /                       |                 | /                         |                     |             |               |            | Clay dk gy-gngy, frm-v frm, n sdy - sl mst                    |
| Cont         | /                       |                 | /                         |                     |             | 5             |            | SAA<br>Clay, dk purp brn, frm, n sdy, v carb - sl mst - mst   |
|              | /                       |                 | /                         |                     |             |               |            | Clay, mgy, frm-v frm, n sdy, n fract - sl mst                 |
| Cont         | /                       |                 | /                         |                     |             | 50            |            | SAA<br>SIT, gy gr, med clay, vvf gr sdy - mst                 |
|              | /                       |                 | /                         |                     |             |               |            | Clay, elgn-gbrn, frm, sl stly - sl mst                        |
|              | /                       |                 | /                         |                     |             |               |            | Clay, R/A - sl mst, SIT, ala mst                              |
|              | /                       |                 | /                         |                     |             |               |            | SIT brn, sl clay, vvf gr sdy - mst                            |
|              | /                       |                 | /                         |                     |             |               |            | SAND, brn, vt-f gr, stly, sl cly, nsit - sl mst - mst         |
| Cont         | /                       |                 | /                         |                     |             | 5             |            | Clay, elgn-dk gy, frm-v frm, n sdy, n stly, ox 1 p, sl mst    |
|              | /                       |                 | /                         |                     |             |               |            | SAA   |
|              | /                       |                 | /                         |                     |             |               |            | Clay, SAA - wet along horiz frac.                             |
|              | /                       |                 | /                         |                     |             | 60            |            |   |

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|                  |  |        |  |                                   |             |
|------------------|--|--------|--|-----------------------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION                          |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ <del>10</del> 19 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>4 OF 4                   |             |
|                  |  |        |  | DRILLING                          |             |
| WATER LEVEL      |  |        |  | START TIME                        | FINISH TIME |
| TIME             |  |        |  | DATE                              | DATE        |
| DATE             |  |        |  | DATE                              | DATE        |
| CASING DEPTH     |  |        |  |                                   |             |

Location Diagram

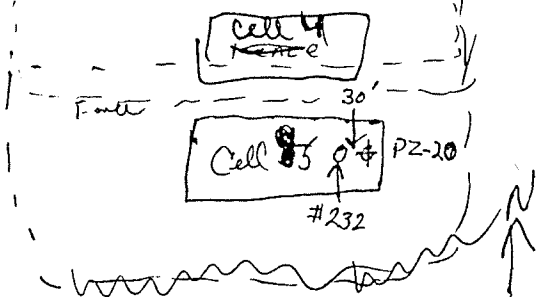
DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|--|
|              |                                  |                 |                           |                   |             | 60            |            | Clay, SAA  |
|              |                                  |                 |                           |                   |             |               |            | SAND, brn, vL-fgr, silty, sl-med clay - wet  |
|              |                                  |                 |                           |                   |             |               |            | SAA wet-sat  |
|              |                                  |                 |                           |                   |             |               |            | B.T. @ 64'   |
|              |                                  |                 |                           |                   |             |               |            | Set 3/4" Open end Borer @ 64' BGS  |
|              |                                  |                 |                           |                   |             |               |            | Slot up to 23" BGS   |
|              |                                  |                 |                           |                   |             |               |            | Wash Screen to 22' BGS   |
|              |                                  |                 |                           |                   |             |               |            | Hole Plug to SFC 8 bags  |
|              |                                  |                 |                           |                   |             |               |            | * Slotted intervals slightly deeper because this hole is on 3-5' stratified material |

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Location Diagram

|                  |                 |        |             |          |
|------------------|-----------------|--------|-------------|----------|
| JOB NO.          | 2-1875          | CLIENT | CSI         | LOCATION |
| DRILLING METHOD: | CME-75          |        | BORING NO.  | PZ-20    |
|                  | 8" O.D. H5A     |        | SHEET       | 1 OF 4   |
| SAMPLING METHOD: | SS/Cnt. 9'-T.D. |        | DRILLING    |          |
| WATER LEVEL      | 54.55'          |        | START TIME  | 1240     |
| TIME             | 1600            |        | FINISH TIME | 1500     |
| DATE             | 1/12/90         |        | DATE        | 1/12/90  |
| CASING DEPTH     | Open w/ Pz 20   |        |             |          |

| DATUM        |                                   | ELEVATION       |                            | SURFACE CONDITIONS:  |                |               |  |
|--------------|-----------------------------------|-----------------|----------------------------|----------------------|----------------|---------------|--|
| SAMPLER TYPE | INCHES DRIVER<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT.<br>SAMPLER | OVA<br>Reading | DEPTH IN FEET | SOIL GRAPH   |
|              |                                   |                 |                            |                      |                | 0             | Clay, dk brn, silty, vsl sdy - sl mst - mst                    |
|              |                                   |                 |                            |                      |                | 5             | Clay, lt brn, vsilty, mod fgr sdy, dry - sl mst                |
|              |                                   |                 |                            |                      |                | 10            | Sand, brn, m gr, sb rnd, sl clay, mod w srt - sl mst<br>vsilty |
|              |                                   |                 |                            |                      |                | 15            | Clay, brn, frm, n-mod sdy intervals - sl mst                   |
|              |                                   |                 |                            |                      |                |               | SAA  |
|              |                                   |                 |                            |                      |                |               | sand, brn, f-mgr, sb rnd, mod clay - sl mst                    |
|              |                                   |                 |                            |                      |                |               | Sand, m brn, f-mgr, sb rnd, sl-mod clay - inc mst              |
|              |                                   |                 |                            |                      |                |               | Sand, m brn, m gr, inc w srt, sl clay - sl mst - mst           |
|              |                                   |                 |                            |                      |                | 20            |  |

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|                  |  |        |  |            |        |
|------------------|--|--------|--|------------|--------|
| JOB NO.          |  | CLIENT |  | LOCATION   |        |
| DRILLING METHOD: |  |        |  | BORING NO. |        |
|                  |  |        |  | PZ-20      |        |
| SAMPLING METHOD: |  |        |  | SHEET      |        |
|                  |  |        |  | 2 of 4     |        |
|                  |  |        |  | DRILLING   |        |
|                  |  |        |  | START      | FINISH |
| WATER LEVEL      |  |        |  | TIME       | TIME   |
| TIME             |  |        |  |            |        |
| DATE             |  |        |  | DATE       | DATE   |
| CASING DEPTH     |  |        |  |            |        |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
|              |                                  |                 |                           |                   |             | 20            |            | Sand, brn bcm gn, f gr, sbrnd, mod clay - sl mst                            |
|              |                                  |                 |                           |                   |             |               |            | Clay, gn brn-brn, frm, sl-mod sdy, slox - sl mst                            |
|              |                                  |                 |                           |                   |             | 5             |            | SAA   |
|              |                                  |                 |                           |                   |             |               |            | Clay, gn brn-gy - rest, n sdy, n-vsl sity - sl mst                          |
|              |                                  |                 |                           |                   |             |               |            | 4" sit  |
|              |                                  |                 |                           |                   |             |               |            | Clay, gn brn-gy, frm, mod sity - sl mst                                     |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy - ol gn, frm, dnse, sl frac, n sdy, n sity - sl mst             |
|              |                                  |                 |                           |                   |             | 30            |            | Sand, brn, vfg gr, v sity, sl-mod clay, huy ex, sl mst - mst                |
|              |                                  |                 |                           |                   |             |               |            | Sand, brn, vfg gr, v sity, sl-mod clay, huy ex - sl mst - mst               |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy, frm, dnse, tr gn brn ex, n sdy, - sl mst                       |
|              |                                  |                 |                           |                   |             | 5             |            | Clay, dk gy - gn brn, frm, dnse, n sity, tr frac w/ex mst in frags - sl mst |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk purp brn, frm, n sity, tr ex, dnse - sl mst - mst                  |
|              |                                  |                 |                           |                   |             |               |            | SAA   |
|              |                                  |                 |                           |                   |             | 40            |            | Sand, brn - gn brn, vfg gr, sity, sl clay - sl mst - mst                    |

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|                  |  |        |  |                     |             |
|------------------|--|--------|--|---------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION            |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ-20 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>3 of 4     |             |
|                  |  |        |  | DRILLING            |             |
| WATER LEVEL      |  |        |  | START TIME          | FINISH TIME |
| TIME             |  |        |  | DATE                | DATE        |
| DATE             |  |        |  |                     |             |
| CASING DEPTH     |  |        |  |                     |             |

Location Diagram

DATUM ELEVATION

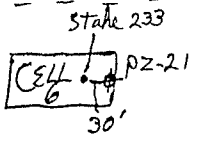
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|--|
|              |                                  |                 |                           |                   |             | 40            |            | Clay, dk gy - alg brn, frm - v frm, n slty - sl mst                    |
|              |                                  |                 |                           |                   |             |               |            | SAA  |
|              |                                  |                 |                           |                   |             | 5             |            | Sand / Clay, alg - brn, frm, v frm - sd mster than anything above      |
|              |                                  |                 |                           |                   |             |               |            | Clay, alg - dk gy, v frm, sl ex, n sdg - sl mst                        |
|              |                                  |                 |                           |                   |             |               |            | Clay, ala, sl sdg, ip, fis - mst                                       |
|              |                                  |                 |                           |                   |             | 50            |            | Clay A/A, dec fis  |
|              |                                  |                 |                           |                   |             |               |            | Clay, alg, v frm, dus, n sdg - sl mst                                  |
|              |                                  |                 |                           |                   |             | 5             |            | SAA  |
|              |                                  |                 |                           |                   |             |               |            | SAND, brn, f gr, slty, sl clay - wet - sat                             |
|              |                                  |                 |                           |                   |             |               |            | Clay, alg, n sdg - sl mst - 1" wet sand band                           |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy, v frm - hd, dus - sl mst - to clay fract                  |
|              |                                  |                 |                           |                   |             |               |            | SAA  |
|              |                                  |                 |                           |                   |             | 60            |            | Sand, m brn, hd, f gr, med w sat, eh rd, sl mst, v sl clay - wet - sat |

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



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|                         |  |                    |  |                      |  |
|-------------------------|--|--------------------|--|----------------------|--|
| JOB NO. 2-1815-         |  | CLIENT CSZ         |  | LOCATION Trudell Rd. |  |
| DRILLING METHOD: CME-75 |  |                    |  | BORING NO. PZ-21     |  |
| 8" O.D. HSA.            |  |                    |  | SHEET 1 OF 3         |  |
| SAMPLING METHOD: Contn  |  |                    |  | DRILLING             |  |
| WATER LEVEL Dry         |  | START TIME 0850    |  | FINISH TIME 1130     |  |
| TIME 1225               |  | DATE 1/17/90       |  | DATE 1/17/90         |  |
| DATE 1/17/90            |  | CASING DEPTH Piezo |  | DATE 1/17/90         |  |



Location Diagram

| DATUM        |                         | ELEVATION       |                         | SURFACE CONDITIONS: |             |               |            |   |
|--------------|-------------------------|-----------------|-------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVER RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |   |
| Cont         |                         |                 |                         |                     |             | 0             |            | Sand, brn, fgr, v slty, med cly - sl mst                    |
|              |                         |                 |                         |                     |             |               |            | Clay, brn, n frm, sl sdy a slty - sl mst                    |
|              |                         |                 |                         |                     |             |               |            | SAA inc sdy.  |
| Cont         |                         |                 |                         |                     |             | 5             |            | Sand, brn, vf-fgr, sbrnd, med clay - sl mst                 |
|              |                         |                 |                         |                     |             |               |            | Sand, brn, vf-fgr, v slty, sl clay - sl mst                 |
|              |                         |                 |                         |                     |             |               |            | SAA   |
|              |                         |                 |                         |                     |             | 10            |            | SAND, brn, fgr, slty, med cly, hd - sl mst                  |
|              |                         |                 |                         |                     |             |               |            | SAA   |
|              |                         |                 |                         |                     |             |               |            | SAA   |
|              |                         |                 |                         |                     |             | 15            |            | Clay, lt brn-wh mat, frm, med-v slty, calc - sl mst         |
|              |                         |                 |                         |                     |             |               |            | Clay, dk gy-brn rst, v frm, n slty, slax - sl mst<br>sl fis |
|              |                         |                 |                         |                     |             | 20            |            |   |

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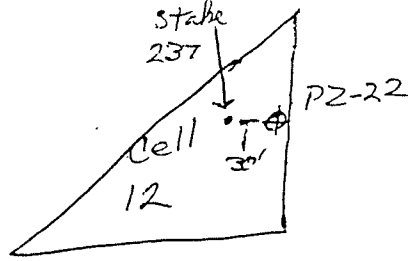
|                  |  |        |  |                     |             |
|------------------|--|--------|--|---------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION            |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>P2-21 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>3 OF 3     |             |
| WATER LEVEL      |  |        |  | DRILLING            |             |
| TIME             |  |        |  | START TIME          | FINISH TIME |
| DATE             |  |        |  | DATE                | DATE        |
| CASING DEPTH     |  |        |  |                     |             |

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |  |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |  |
| cont         |                                  |                 |                           |                     |             | 40            |            | Clay, ggn, frm, fis ip, n slty - s/mst                           |
|              |                                  |                 |                           |                     |             |               |            | Clay, olgn, frm, med ex, n sdy, sl slty lens - s/mst             |
|              |                                  |                 |                           |                     |             | 5             |            | SAA  |
|              |                                  |                 |                           |                     |             |               |            | SAA  |
|              |                                  |                 |                           |                     |             |               |            | SAA/VVF gr sand, brn-g brn, sl-med clay - inc mst<br>slmst - mst |
|              |                                  |                 |                           |                     |             | 50            |            | Clay, olgn-gy, frm, v sl slty ip, n sdy - s/mst                  |
|              |                                  |                 |                           |                     |             |               |            | Clay, blk, frm, sl fis, n slty - s/mst                           |
|              |                                  |                 |                           |                     |             |               |            | Clay, olgn-gy a/a - s/mst  |
|              |                                  |                 |                           |                     |             |               |            | Clay, blk, a/a - s/mst   |
|              |                                  |                 |                           |                     |             | 5             |            | BT @ 54'   |
|              |                                  |                 |                           |                     |             |               |            | Set 3/4" Pipe @ 54.0'  |
|              |                                  |                 |                           |                     |             |               |            | Hard Slotted 22.0'   |
|              |                                  |                 |                           |                     |             |               |            | Squeegee to 20.5'  |
|              |                                  |                 |                           |                     |             |               |            | Point Hole Plug to SFC 8 bags                                    |

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DATE \_\_\_\_\_

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|                             |  |                  |  |                      |  |
|-----------------------------|--|------------------|--|----------------------|--|
| JOB NO. 2-1815-             |  | CLIENT CST       |  | LOCATION Tundale Rd. |  |
| DRILLING METHOD: CME-75     |  |                  |  | BORING NO. PZ-22     |  |
| 6" O.D. HSA                 |  |                  |  | SHEET 1 OF 3         |  |
| SAMPLING METHOD: Continuous |  |                  |  | DRILLING             |  |
| WATER LEVEL Dry             |  | START TIME 12:30 |  | FINISH TIME 1:43     |  |
| TIME 1500                   |  | DATE 1/17/90     |  | DATE 1/17/90         |  |
| CASING DEPTH                |  | DATE 1/17/90     |  | DATE 1/17/90         |  |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|--|
|              |                                  |                 |                           |                   |             | 0             |            | Sand/SILT, dk brn, fgr, clayey - sl/mst  |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk brn, frm, med - v sdy - dry - sl/mst                                  |
|              |                                  |                 |                           |                   |             |               |            | Sand, brn, f-tr c gr, p srt, med clay, silty - dry - sl/mst                    |
|              |                                  |                 |                           |                   |             |               |            | Sand, lt brn-brn, vt-f gr, silty, sl-mod clay - sl/mst                         |
|              |                                  |                 |                           |                   |             | 5             |            | SAA - sl inc clay  |
|              |                                  |                 |                           |                   |             |               |            |  |
|              |                                  |                 |                           |                   |             | 10            |            | Clay, lt brn, n frm, v silty, sl sdy - sl/mst                                  |
|              |                                  |                 |                           |                   |             |               |            |  |
|              |                                  |                 |                           |                   |             |               |            | SAA, inc sdy   |
|              |                                  |                 |                           |                   |             |               |            | SAND, lt-brn vt-tr mgr, med srt, v sl - mod clay, random clayey spots - sl/mst |
|              |                                  |                 |                           |                   |             | 15            |            | SAA - v clayey   |
|              |                                  |                 |                           |                   |             |               |            |  |
|              |                                  |                 |                           |                   |             |               |            | SAA  |
|              |                                  |                 |                           |                   |             | 20            |            |  |

DATE \_\_\_\_\_  
CHK'D BY \_\_\_\_\_





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|                  |  |        |  |                     |             |
|------------------|--|--------|--|---------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION            |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ-22 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>3 of 3     |             |
| WATER LEVEL      |  |        |  | DRILLING            |             |
| TIME             |  |        |  | START TIME          | FINISH TIME |
| DATE             |  |        |  | DATE                | DATE        |
| CASING DEPTH     |  |        |  |                     |             |

Location Diagram

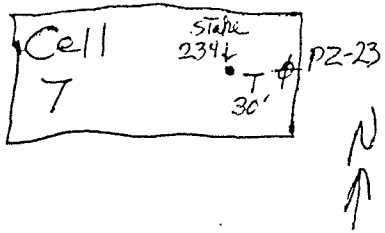
| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |   |
|              |                                  |                 |                           |                     |             | 40            |            | Clay, SAR   |
|              |                                  |                 |                           |                     |             |               |            | Clay, dk purple brn, frm, n sdy, calc, sl fis ip - sl mst |
|              |                                  |                 |                           |                     |             |               |            |   |
|              |                                  |                 |                           |                     |             | 5             |            | Clay, clgn-gy, frm-vfrm, n.sdy. - sl mst                  |
|              |                                  |                 |                           |                     |             |               |            | Clay, clgn-gy, frm, SIT lenses - mst                      |
|              |                                  |                 |                           |                     |             |               |            | 2" mst sit  |
|              |                                  |                 |                           |                     |             |               |            | 1" mst sit  |
|              |                                  |                 |                           |                     |             |               |            | Clay, gngy, silty - sl mst - mst                          |
|              |                                  |                 |                           |                     |             | 50            |            | Clay, clngy, frm, n slty - sl mst                         |
|              |                                  |                 |                           |                     |             |               |            | SIT, brngn, v f gr sdy, sl cly - sl mst - mst             |
|              |                                  |                 |                           |                     |             |               |            | Clay, dk purp brn, frm, n slty - sl mst                   |
|              |                                  |                 |                           |                     |             |               |            | sand, brngn, v f gr, silty, sl cly - inc mst              |
|              |                                  |                 |                           |                     |             |               |            | Clay, dk gyan, slty - sl mst                              |
|              |                                  |                 |                           |                     |             |               |            | SAND, brngn, v f gr, silty, sl-med clay - mst             |
|              |                                  |                 |                           |                     |             |               |            | Clay, dk gy-rust, n slty, sl mst                          |
|              |                                  |                 |                           |                     |             |               |            | B.T. @ 54'  |
|              |                                  |                 |                           |                     |             | 5             |            |   |
|              |                                  |                 |                           |                     |             |               |            | Set 3/4" Pipe @ 53.7'                                     |
|              |                                  |                 |                           |                     |             |               |            | Hand slot to 19.7'  |
|              |                                  |                 |                           |                     |             |               |            | Squeeze to  |

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511 Orchard Street Golden, CO 80401

|   |  |                 |  |                          |             |
|---|--|-----------------|--|--------------------------|-------------|
| JOB NO.<br>2-1815                         |  | CLIENT<br>C.S.I |  | LOCATION<br>Traville Rd. |             |
| DRILLING METHOD:<br>CME-75<br>8" O.D. HSA |  |                 |  | BORING NO.<br>PZ-23      |             |
| SAMPLING METHOD:<br>Continuous            |  |                 |  | SHEET<br>1 OF 3          |             |
|   |  |                 |  | DRILLING                 |             |
| WATER LEVEL                               |  | 50.7'           |  | START TIME               | FINISH TIME |
| TIME                                      |  | 1230            |  | 0935                     | 1140        |
| DATE                                      |  | 1/18/90         |  | DATE                     | DATE        |
| CASING DEPTH                              |  |                 |  | 1/18/89                  | 1/18/89     |



Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |   |
|              |                                  |                 |                           |                     |             | 0             |            | Silty Clay - sdy - v sl mst   |
|              |                                  |                 |                           |                     |             |               |            | Clay, dk gy, brn, frm, sl sdy - sl mst  |
|              |                                  |                 |                           |                     |             | 5             |            | Clay, lt brn, sl frm, calc, sl sdy - dry - sl mst<br>met calc                             |
|              |                                  |                 |                           |                     |             |               |            | Clay, SAA   |
|              |                                  |                 |                           |                     |             |               |            | Clay, SAA - dry - sl mst  |
|              |                                  |                 |                           |                     |             | 10            |            | Sand, brn, vt-fgr, mod srt, sl clay - sl mst  |
|              |                                  |                 |                           |                     |             |               |            | Clay, gy wth mat, frm, calc, sl-mod sdy - sl mst  |
|              |                                  |                 |                           |                     |             |               |            | SAND, brn, vlt-fgr, sl silty clay - sl mst  |
|              |                                  |                 |                           |                     |             |               |            | Clay, brn bcngr, n-fcm, v silty, sl sdy - sl mst  |
|              |                                  |                 |                           |                     |             | 15            |            | Clay, dk gy - ang, frm, n silty, mod calc, calc<br>hor oriented, carb ip, hvy ox - sl mst |
|              |                                  |                 |                           |                     |             |               |            | SAA   |
|              |                                  |                 |                           |                     |             | 20            |            |   |

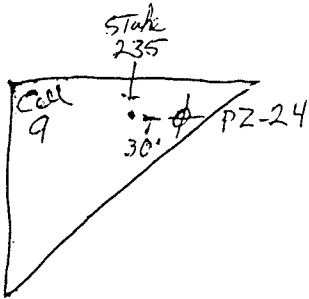
DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_







511 Orchard Street Golden, CO 80401



Location Diagram

|   |  |               |  |                          |             |
|---|--|---------------|--|--------------------------|-------------|
| JOB NO.<br>2-1875-                        |  | CLIENT<br>CSI |  | LOCATION<br>Irondale Rd. |             |
| DRILLING METHOD:<br>CME-75<br>8" O.D. HSA |  |               |  | BORING NO.<br>PZ-24      |             |
| SAMPLING METHOD:<br>Continuous            |  |               |  | SHEET<br>1 of 3          |             |
| WATER LEVEL                               |  | 41.55         |  | START TIME               | FINISH TIME |
| TIME                                      |  | 1540          |  | 1300                     | 1516        |
| DATE                                      |  | 1/18/90       |  | DATE                     | DATE        |
| CASING DEPTH                              |  | Piezo         |  | 1/18/90                  | 1/18/90     |

| DATUM        |                                |                 |                         |                   |             | ELEVATION     | SURFACE CONDITIONS: |  |
|--------------|--------------------------------|-----------------|-------------------------|-------------------|-------------|---------------|---------------------|--|
| SAMPLER TYPE | INCHES DRIVER INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH          |  |
| Cont         | /                              | /               | /                       | /                 |             | 0             |                     | Clay, topsoil - dk brn, silty - mst  |
|              | /                              | /               | /                       | /                 |             |               |                     | Clay, lt brn, silty, calc nodules - silty - dry - sl mst   |
|              | /                              | /               | /                       | /                 |             | 5             |                     | Sand, brn, f-mgr, med-v clay - sl mst  |
|              | /                              | /               | /                       | /                 |             |               |                     | SAA, dec clay - sl inc mst   |
|              | /                              | /               | /                       | /                 |             | 10            |                     | Sand, brn, f-trmgr, sbrnd, sl clay - sl mst - mst  |
|              | /                              | /               | /                       | /                 |             |               |                     | Sand, #A, inc clay brn med-v clay - sl mst - mst   |
|              | /                              | /               | /                       | /                 |             |               |                     | Clay, brngy, frm, med silty, calc nodules - sl mst   |
|              | /                              | /               | /                       | /                 |             |               |                     | Clay, brn wh mat, lse, calc? med silty intils - sl mst - mst   |
|              | /                              | /               | /                       | /                 |             | 15            |                     | Clay, dk gy, brn, sl frm, med silty intils dec #<br>fr hd calc nodules & hd<br>dk gy clay frags - sl mst - mst |
|              | /                              | /               | /                       | /                 |             |               |                     | SAA  |
|              | /                              | /               | /                       | /                 |             |               |                     | Clay, brngy, frm, hd calc? nodules - sl silty - sl mst - mst<br>fr gran  |
|              | /                              | /               | /                       | /                 |             | 20            |                     |  |

DATE \_\_\_\_\_  
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|                  |  |        |  |                     |             |
|------------------|--|--------|--|---------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION            |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ-24 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>2 OF 3     |             |
|                  |  |        |  | DRILLING            |             |
| WATER LEVEL      |  |        |  | START TIME          | FINISH TIME |
| TIME             |  |        |  | DATE                | DATE        |
| DATE             |  |        |  |                     |             |
| CASING DEPTH     |  |        |  |                     |             |

Location Diagram

DATUM ELEVATION

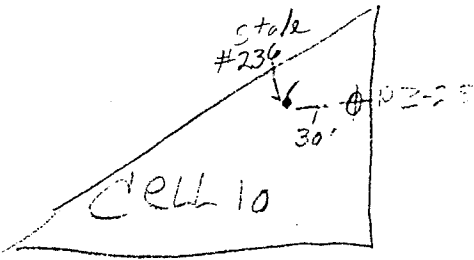
| SAMPLER TYPE | INCHES DRIVER RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|-------------------------|-----------------|-------------------------|-------------------|-------------|---------------|------------|---|
|              |                         |                 |                         |                   |             | 20            |            | Clay, gray, frm, v slty - sl mst - mst  |
|              |                         |                 |                         |                   |             |               |            | Clay, dk gy, frm, n slty - sl mst   |
|              |                         |                 |                         |                   |             |               |            | Clay, lt brn - gray, sl frm, v slty, sl vlt gr sdy, ox ip - sl mst                                    |
|              |                         |                 |                         |                   |             |               |            | Sand, brn gy, vlt gr slty, sl clay - sl mst - mst   |
|              |                         |                 |                         |                   |             | 5             |            | Clay, gy brn - rust, v frm, v sl vlt gr sdy to clayey sand v slty - sl mst                            |
|              |                         |                 |                         |                   |             |               |            | Clay, dk gy, v frm, n sdy, n slty - sl mst  |
|              |                         |                 |                         |                   |             |               |            | SAND/CLAY thin lams, frm, vlt gr slty - sl mst 2-1" wh lmsn lenses - brn for sd @ base                |
|              |                         |                 |                         |                   |             | 30            |            | Clay, dk gy, lse for sd w/ht dkay clay frags, fis - sl mst - mst                                      |
|              |                         |                 |                         |                   |             |               |            | Clay, dkay - gray, sl frm, fis ip, sl ox, frac open? n sdy - sl mst                                   |
|              |                         |                 |                         |                   |             |               |            | SAA   |
|              |                         |                 |                         |                   |             |               |            | Clay, olgn - gygn, v frm, ox, frac, n sdy - sl mst - mst  |
|              |                         |                 |                         |                   |             | 5             |            | Clay, olgn gy, frm - v frm, n slty, n sdy - sl mst  |
|              |                         |                 |                         |                   |             |               |            | SANDS, rust brn, vlt gr, slty, sl clay - mst - v mst 1-2" thick (Suspect will make H <sub>2</sub> O!) |
|              |                         |                 |                         |                   |             |               |            | Clay A/A  |
|              |                         |                 |                         |                   |             |               |            | SAND/F - mst - v mst  |
|              |                         |                 |                         |                   |             |               |            | Clay A/A  |
|              |                         |                 |                         |                   |             | 40            |            | SAND  |

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|   |  |               |  |                                |  |
|---|--|---------------|--|--------------------------------|--|
| JOB NO.<br>2-1815-                        |  | CLIENT<br>CSI |  | LOCATION<br>Trinidad 11        |  |
| DRILLING METHOD:<br>CME-75<br>8" O.D. HSF |  |               |  | BORING NO.<br>PZ-25            |  |
| SAMPLING METHOD:<br>Continuous            |  |               |  | SHEET<br>1 of 3                |  |
| WATER LEVEL<br>Dry                        |  |               |  | DRILLING<br>START TIME<br>1600 |  |
| TIME<br>1130                              |  |               |  | FINISH TIME<br>1100            |  |
| DATE<br>1/19/90                           |  |               |  | DATE<br>1/18/90                |  |
| CASING DEPTH                              |  |               |  | DATE<br>1/19/90                |  |

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |   |
| cont         | /                                |                 |                           |                     |             | 0             |            | Clay, tan, dk brn, sl sdy - moist                           |
|              |                                  |                 |                           |                     |             |               |            | Clay, lt-m brn, f-m, sl sdy & silty - dry - sl moist        |
|              |                                  |                 |                           |                     |             | 5             |            |   |
| cont         | /                                |                 |                           |                     |             |               |            | SRP, m brn, f-m gr, sb red, v silty - sl moist              |
|              |                                  |                 |                           |                     |             | 10            |            | Clay, brn, n-f m, v silty - sl moist                        |
|              |                                  |                 |                           |                     |             |               |            | Clay, med dk brn, f-m, med sdy - sl moist                   |
|              |                                  |                 |                           |                     |             |               |            | Clay, brn wh mat, f-m, n sdy, red - dry - sl moist          |
|              |                                  |                 |                           |                     |             | 15            |            | Inv. sdy  |
| cont         | /                                |                 |                           |                     |             |               |            | Clay/sand, iron, f-m, silty - sl moist - moist              |
|              |                                  |                 |                           |                     |             |               |            | Clay, dk grey, dk brown, f-m, sdy, med m - sl moist - moist |
|              |                                  |                 |                           |                     |             | 20            |            | Sand, gy brn, v-f gr, dk, sl clay, sl or - moist            |

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|                  |  |        |  |            |             |  |
|------------------|--|--------|--|------------|-------------|--|
| JOB NO.          |  | CLIENT |  |            | LOCATION    |  |
| DRILLING METHOD: |  |        |  | BORING NO. |             |  |
|                  |  |        |  | PZ-25      |             |  |
| SAMPLING METHOD: |  |        |  | SHEET      |             |  |
|                  |  |        |  | 2 OF 3     |             |  |
|                  |  |        |  | DRILLING   |             |  |
| WATER LEVEL      |  |        |  | START TIME | FINISH TIME |  |
| TIME             |  |        |  |            |             |  |
| DATE             |  |        |  | DATE       | DATE        |  |
| CASING DEPTH     |  |        |  |            |             |  |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|--|
|              |                                  |                 |                           |                   |             | 20            |            |  |
| cont         |                                  |                 |                           |                   |             |               |            | Sand diff. inc mst   |
|              |                                  |                 |                           |                   |             |               |            | SAND, brn, vf-fgr, sl'rad, slty, dk clay - mst - v mst                             |
|              |                                  |                 |                           |                   |             | 5             |            | Clay, gy brn, broken in; hd sh a Fe frag, n sdy; mst - v mst                       |
| cont         |                                  |                 |                           |                   |             |               |            | Clay, dk purb-dkgy; frm, n sdy - mst<br>B.T. @ 29' 0" height                       |
|              |                                  |                 |                           |                   |             | 30            |            | SAA  |
|              |                                  |                 |                           |                   |             |               |            | SAND, brn, vf-fgr, slty, sl clay - sl mst<br>int'bd n sdy clay.                    |
|              |                                  |                 |                           |                   |             | 5             |            | Clay, algn-dkgy; gngy, frm-v frm, n slty, n sdy, sl frag, @ top - sl mst<br>med ex |
|              |                                  |                 |                           |                   |             |               |            | SAA  |
|              |                                  |                 |                           |                   |             | 40            |            |  |

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DATE

511 Orchard Street Golden, CO 80401

|                  |  |        |  |  |                     |             |
|------------------|--|--------|--|--|---------------------|-------------|
| JOB NO.          |  | CLIENT |  |  | LOCATION            |             |
| DRILLING METHOD: |  |        |  |  | BORING NO.<br>PZ-25 |             |
| SAMPLING METHOD: |  |        |  |  | SHEET<br>3 of 3     |             |
| WATER LEVEL      |  |        |  |  | DRILLING            |             |
| TIME             |  |        |  |  | START TIME          | FINISH TIME |
| DATE             |  |        |  |  | DATE                | DATE        |
| CASING DEPTH     |  |        |  |  |                     |             |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                                     |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
|              |                                  |                 |                           |                   |             | 40            |            | Clay, dk purp gy, v fm, n slty - s/mst                  |
|              |                                  |                 |                           |                   |             |               |            | Clay, gn-brn, frm-lse, 2 slty sdy intervals - s/mst-mst |
|              |                                  |                 |                           |                   |             |               |            | Clay, gn gy-cl gn-dk gy, frm, n slty - s/mst            |
|              |                                  |                 |                           |                   |             |               |            | B.T. @ 44'  |
|              |                                  |                 |                           |                   |             | 5             |            | Set 3/4" Pipe @ 44.0'                                   |
|              |                                  |                 |                           |                   |             |               |            | Hard slot to 20.0'                                      |
|              |                                  |                 |                           |                   |             |               |            | Squeegee to 20.0'                                       |
|              |                                  |                 |                           |                   |             |               |            | Ben Seal to 5ft & legs                                  |

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DATE

511 Orchard Street Golden, CO 80401

1 Operations Area  
1 Fence

Cell 16 # PZ-26 on stake 241



|                             |  |            |  |                      |                  |
|-----------------------------|--|------------|--|----------------------|------------------|
| JOB NO. 2-1815-             |  | CLIENT CST |  | LOCATION Trundle Rd. |                  |
| DRILLING METHOD: CME-75     |  |            |  | BORING NO. PZ-26     |                  |
| 8" O.D. HSA                 |  |            |  | SHEET 1 OF 3         |                  |
| SAMPLING METHOD: Continuous |  |            |  | DRILLING             |                  |
| WATER LEVEL Dry             |  |            |  | START TIME 1215      | FINISH TIME 1200 |
| TIME 1300                   |  |            |  | DATE 1/19/90         | DATE 1/22/90     |
| DATE 1/22/90                |  |            |  |                      |                  |
| CASING DEPTH                |  |            |  |                      |                  |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVER RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|-------------------------|-----------------|-------------------------|-------------------|-------------|---------------|------------|---|
|              |                         |                 |                         |                   |             | 0             |            | Clay, dk gy, top sil, sl/sly - moist                          |
|              |                         |                 |                         |                   |             |               |            | Clay, lt brn, frm, calc, sl/sly - dry - sl moist              |
|              |                         |                 |                         |                   |             |               |            |   |
|              |                         |                 |                         |                   |             |               |            |   |
|              |                         |                 |                         |                   |             | 5             |            | Clay, dk, inc silty   |
|              |                         |                 |                         |                   |             |               |            | Sand, brn, vf gr, v sl silty, sl clay - sl moist              |
|              |                         |                 |                         |                   |             |               |            |   |
|              |                         |                 |                         |                   |             | 10            |            | SAND, brn, vf-gr, v sl silty, n clay - dry - mod moist        |
|              |                         |                 |                         |                   |             |               |            |   |
|              |                         |                 |                         |                   |             |               |            | Clay, dk gy - maroon, frm, n silty, sl/sly - dry              |
|              |                         |                 |                         |                   |             |               |            |   |
|              |                         |                 |                         |                   |             | 15            |            | Clay, inc dk gy, sl silty & silty ptgs, mod-v ox, & sil moist |
|              |                         |                 |                         |                   |             |               |            |   |
|              |                         |                 |                         |                   |             |               |            | SAA - lsc powdery dk red organic mat                          |
|              |                         |                 |                         |                   |             |               |            |   |
|              |                         |                 |                         |                   |             | 20            |            | Sand, next page   |

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|                  |  |        |  |            |             |
|------------------|--|--------|--|------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION   |             |
| DRILLING METHOD: |  |        |  | BORING NO. |             |
|                  |  |        |  | PZ-26      |             |
| SAMPLING METHOD: |  |        |  | SHEET      |             |
|                  |  |        |  | 2 of 3     |             |
|                  |  |        |  | DRILLING   |             |
| WATER LEVEL      |  |        |  | START TIME | FINISH TIME |
| TIME             |  |        |  |            |             |
| DATE             |  |        |  | DATE       | DATE        |
| CASING DEPTH     |  |        |  |            |             |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|--|
| cut          | /                                | /               | /                         | /                 |             | 20            |            | Clay, dk gy, frm, n sdy, sl ex - sl mst                              |
|              | /                                | /               | /                         | /                 |             |               |            | Clay, brn-rust, vfrm, slty, mod sdy fgr, v ex - sl mst               |
|              | /                                | /               | /                         | /                 |             | 5             |            | Clay, dk gy-brn-rust, n slty, n sdy - sl m                           |
|              | /                                | /               | /                         | /                 |             |               |            | Clay, R/R, brn maroon, org - sl mst                                  |
|              | /                                | /               | /                         | /                 |             |               |            | sl slty lenses - sl ms   |
|              | /                                | /               | /                         | /                 |             | 30            |            | Sand, Hgy brn, v f gr, v slty, sl cly-dry-sl mst                     |
|              | /                                | /               | /                         | /                 |             |               |            | Sand, gy brn, f gr, n-sl slty, n clay - dry-sl mst                   |
|              | /                                | /               | /                         | /                 |             |               |            | Clay, dk purp gy - gy, v frm, n sdy, ex - sl mst                     |
|              | /                                | /               | /                         | /                 |             | 5             |            | Clay, dk purp - gy - sl gy frm - v frm, n slty, n sdy, v ex - sl mst |
|              | /                                | /               | /                         | /                 |             |               |            | SAA  |
|              | /                                | /               | /                         | /                 |             | 40            |            |  |

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|                  |  |        |  |                     |             |
|------------------|--|--------|--|---------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION            |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ-26 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>3 of 3     |             |
| WATER LEVEL      |  |        |  | DRILLING            |             |
| TIME             |  |        |  | START TIME          | FINISH TIME |
| DATE             |  |        |  | DATE                | DATE        |
| CASING DEPTH     |  |        |  |                     |             |

Location Diagram

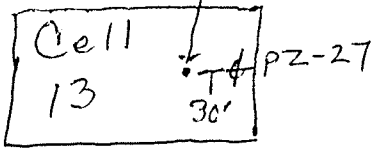
| DATUM        |                                | ELEVATION       |                         | SURFACE CONDITIONS: |             |               |            |  |
|--------------|--------------------------------|-----------------|-------------------------|---------------------|-------------|---------------|------------|--|
| SAMPLER TYPE | INCHES DRIVER INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |  |
| cont         | /                              | /               | /                       | /                   | /           | 40            |            | slty/sdy/clay, vvf-f gr, frm-hd, wvy lens<br>sl mst          |
| /            | /                              | /               | /                       | /                   | /           |               |            | Clay, alg-brn, frm-v frm, n slty, n sdy,<br>v ex ip - sl mst |
| /            | /                              | /               | /                       | /                   | /           | 5             |            | SAA  |
| /            | /                              | /               | /                       | /                   | /           |               |            | SAA  |
| cont         | /                              | /               | /                       | /                   | /           | 50            |            | SAA  |
| /            | /                              | /               | /                       | /                   | /           |               |            | SAA  |
| cont         | /                              | /               | /                       | /                   | /           | 5             |            | Clay, alg-brn, frm, slty lens, - sl mst                      |
| /            | /                              | /               | /                       | /                   | /           |               |            | Clay, blk, v frm, n sdy, fls ip - sl mst                     |
| /            | /                              | /               | /                       | /                   | /           |               |            | Sand, brn, vlt gr, hd w cnt, sl ex - sl mst                  |
| /            | /                              | /               | /                       | /                   | /           |               |            | shale, dk gy, hd - refusal - BT @ 1415 1/1600                |
| /            | /                              | /               | /                       | /                   | /           |               |            | Drill w/cater bit  |
| /            | /                              | /               | /                       | /                   | /           | 60            |            |  |

Set 3/4" @ 60'  
 Hand slt to 35'  
 Wash Sand to 35'  
 Hole plug to 20'  
 Casing to 11'  
 Hole plug to 5ft  
 10 bags

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 DATE

511 Orchard Street Golden, CO 80401

5Tide 238



|                             |  |            |                  |                     |             |
|-----------------------------|--|------------|------------------|---------------------|-------------|
| JOB NO. 2-1815-             |  | CLIENT CST |                  | LOCATION Erondah Rd |             |
| DRILLING METHOD: CME-75     |  |            | BORING NO. PZ-27 |                     |             |
| 8" O.D. HSA                 |  |            | SHEET 1 of 3     |                     |             |
| SAMPLING METHOD: Continuous |  |            | DRILLING         |                     |             |
| WATER LEVEL                 |  | Dry        |                  | START TIME          | FINISH TIME |
| TIME                        |  | 1545       |                  | 1200                | 1450        |
| DATE                        |  | 1/22       |                  | DATE                | DATE        |
| CASING DEPTH                |  |            |                  | 1/22/90             | 1/22/90     |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                          |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|--|
| Cont         | /                                |                 |                           |                   |             | 0             |            | Clay, brn, frm, calc, sdy iq - sl mst        |
|              |                                  |                 |                           |                   |             |               |            | Clay A/A - dry - sl mst                      |
|              |                                  |                 |                           |                   |             |               |            | Sandy/Clay, brn, f-m gr, v sdy clay - sl mst |
| Cont         | /                                |                 |                           |                   |             | 5             |            | SAA  |
|              |                                  |                 |                           |                   |             |               |            |  |
| Cont         | /                                |                 |                           |                   |             | 10            |            | SAA  |
|              |                                  |                 |                           |                   |             |               |            |  |
| Cont         | /                                |                 |                           |                   |             | 15            |            | Clay, gngy, frm, n sdy - sl mst              |
|              |                                  |                 |                           |                   |             |               |            |  |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk purp brn, frm, sl fis, carb, sl mst |
|              |                                  |                 |                           |                   |             |               |            |  |
|              |                                  |                 |                           |                   |             |               |            | Clay, brn, med sdy, stty, sl oc, - sl mst    |
|              |                                  |                 |                           |                   |             | 20            |            |  |

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|                  |  |        |  |            |             |
|------------------|--|--------|--|------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION   |             |
| DRILLING METHOD: |  |        |  | BORING NO. |             |
|                  |  |        |  | PZ-27      |             |
| SAMPLING METHOD: |  |        |  | SHEET      |             |
|                  |  |        |  | 3 of 3     |             |
|                  |  |        |  | DRILLING   |             |
| WATER LEVEL      |  |        |  | START TIME | FINISH TIME |
| TIME             |  |        |  |            |             |
| DATE             |  |        |  | DATE       | DATE        |
| CASING DEPTH     |  |        |  |            |             |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVER<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT.<br>SAMPLER | OVA<br>Reading | DEPTH<br>IN FEET | SOIL<br>GRAPH | SURFACE CONDITIONS:                             |
|--------------|-----------------------------------|-----------------|----------------------------|----------------------|----------------|------------------|---------------|---|
|              |                                   |                 |                            |                      |                | 40               |               | SAA   |
|              |                                   |                 |                            |                      |                |                  |               | Clay, dk gray, v firm, n sdy - s/mst            |
|              |                                   |                 |                            |                      |                | 5                |               | SAA   |
|              |                                   |                 |                            |                      |                |                  |               | CLAY/SS, brn-gy, ex'tha wvy lam - s/mst         |
|              |                                   |                 |                            |                      |                |                  |               | Clay, dk gray, v firm, n sdy, - s/mst           |
|              |                                   |                 |                            |                      |                | 50               |               | Clay, dk blgy, v firm-hd, n sdy, n frac - s/mst |
|              |                                   |                 |                            |                      |                |                  |               | Clay, brn-rst, firm-v firm, n sdy - s/mst       |
|              |                                   |                 |                            |                      |                | 5                |               | SAA   |
|              |                                   |                 |                            |                      |                |                  |               | B.T. 54.5                                       |
|              |                                   |                 |                            |                      |                |                  |               | Set 3/8" Pipe @ 54.5'                           |
|              |                                   |                 |                            |                      |                |                  |               | Hard slot to 24.5'                              |
|              |                                   |                 |                            |                      |                |                  |               | Wash Sand to 24.0'                              |
|              |                                   |                 |                            |                      |                |                  |               | Ben Seal to 11.0'                               |
|              |                                   |                 |                            |                      |                |                  |               | Cutting to 9.0'                                 |
|              |                                   |                 |                            |                      |                |                  |               | Ben Seal to SFC 9 bags                          |

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|                  |  |        |  |                     |  |
|------------------|--|--------|--|---------------------|--|
| JOB NO.          |  | CLIENT |  | LOCATION            |  |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ-28 |  |
| SAMPLING METHOD: |  |        |  | SHEET<br>3 of 3     |  |
| WATER LEVEL      |  |        |  | DRILLING            |  |
| TIME             |  |        |  | START TIME          |  |
| DATE             |  |        |  | FINISH TIME         |  |
| CASING DEPTH     |  |        |  | DATE                |  |

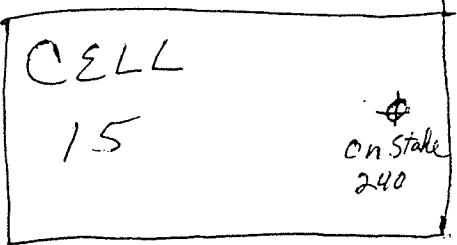
Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECORDED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                                    |
|--------------|---------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|--|
|              |                                 |                 |                           |                   |             | 40            |            | Clay, mgY-gngY-dkgy, v frm, mod ox, nsity, n sdy-s/mst |
|              |                                 |                 |                           |                   |             |               |            | Sandy, ox tender-s/mst                                 |
|              |                                 |                 |                           |                   |             |               |            | Clay SAA   |
|              |                                 |                 |                           |                   |             | 5             |            | Clay, ltgygn-dkgy-v frm n sity, n sdy, sl-mod ox-s/mst |
|              |                                 |                 |                           |                   |             |               |            | SAA  |
|              |                                 |                 |                           |                   |             |               |            | wet, prob from setting barrel on ground                |
|              |                                 |                 |                           |                   |             | 50            |            | Clay, brn-gy brn-gy, frm, n sdy-s/mst                  |
|              |                                 |                 |                           |                   |             |               |            | SAA  |
|              |                                 |                 |                           |                   |             |               |            | Clay, dkgy-blk, v frm, fis-s/mst                       |
|              |                                 |                 |                           |                   |             |               |            | Sandy, fgr, ox-s/mst                                   |
|              |                                 |                 |                           |                   |             |               |            | Clay a/a   |
|              |                                 |                 |                           |                   |             | 5             |            | 4" SAND, Brn, hd, fgr, ox-s/mst - mst                  |
|              |                                 |                 |                           |                   |             |               |            | Clay, dkgy-blk, v frm, n sity, n sdy-s/mst             |
|              |                                 |                 |                           |                   |             |               |            | RT. @ 59' Set 3/4" Pipe @ 59'                          |
|              |                                 |                 |                           |                   |             |               |            | Hand silt to 25' Sand to 24'                           |
|              |                                 |                 |                           |                   |             |               |            | Ben Sed to SFC 7 bags (cutting 14-15')                 |
|              |                                 |                 |                           |                   |             | 60            |            |  |

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511 Orchard Street Golden, CO 80401



|  |  |            |  |                    |                  |
|--|--|------------|--|--------------------|------------------|
| JOB NO. 2-1845                         |  | CLIENT CSI |  | LOCATION Inverdale |                  |
| DRILLING METHOD: CME-75<br>8" O.D. HSA |  |            |  | BORING NO. PZ-29   |                  |
| SAMPLING METHOD: Continuous            |  |            |  | SHEET 1 of 3       |                  |
| WATER LEVEL Moist                      |  |            |  | DRILLING           |                  |
| TIME 1512                              |  |            |  | START TIME 1200    | FINISH TIME 1430 |
| DATE 1/23/90                           |  |            |  | DATE 1/23/90       | DATE 1/23/90     |
| CASING DEPTH                           |  |            |  |                    |                  |

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |  |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|--|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH   |
|              |                                  |                 |                           |                     |             | 0             |  |
|              |                                  |                 |                           |                     |             | 5             |  |
|              |                                  |                 |                           |                     |             | 10            | Clay, gn brn, frm, mod ex - s/mst                        |
|              |                                  |                 |                           |                     |             | 15            | SFA  |
|              |                                  |                 |                           |                     |             | 15            | Clay, dk gy - purp, frm, sl cack - s/mst                 |
|              |                                  |                 |                           |                     |             | 20            | Sand, lt brn, vvf gr, v slt, sl - mod clay - dry - s/mst |

DATE \_\_\_\_\_ CHK'D BY \_\_\_\_\_



511 Orchard Street Golden, CO 80401



|                  |  |        |  |            |             |
|------------------|--|--------|--|------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION   |             |
| DRILLING METHOD: |  |        |  | BORING NO. |             |
|                  |  |        |  | PZ-29      |             |
| SAMPLING METHOD: |  |        |  | SHEET      |             |
|                  |  |        |  | 3 of 3     |             |
|                  |  |        |  | DRILLING   |             |
| WATER LEVEL      |  |        |  | START TIME | FINISH TIME |
| TIME             |  |        |  |            |             |
| DATE             |  |        |  | DATE       | DATE        |
| CASING DEPTH     |  |        |  |            |             |

Location Diagram

DATUM ELEVATION

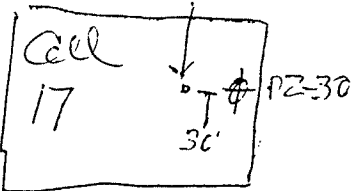
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
|              |                                  |                 |                           |                   |             | 46            |            | Clay dk brn-gy, sl-v frm, fis ip, sl sdy ip-s/mst               |
|              |                                  |                 |                           |                   |             |               |            | SAND, lt brn, fgr, vstly, sl clay - sl mst                      |
|              |                                  |                 |                           |                   |             |               |            | SAA - sl mst  |
|              |                                  |                 |                           |                   |             | 5             |            | <del>SAND lt brn, fgr, vstly, sl clay - sl mst</del><br>Clay AA |
|              |                                  |                 |                           |                   |             |               |            | Clay, lt gngy-dk gy brn, frm-v frm.                             |
|              |                                  |                 |                           |                   |             |               |            |   |
|              |                                  |                 |                           |                   |             | 50            |            | Clay, dk gy, dk purp, frm, fis, med ox, n sdy-s/mst             |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy brn, frm-v frm, fis, n sdy - sl mst                 |
|              |                                  |                 |                           |                   |             |               |            | Sand, lt brn, fgr, vstly, hd, ox - sl mst                       |
|              |                                  |                 |                           |                   |             |               |            | Clay/AA:  |
|              |                                  |                 |                           |                   |             |               |            | Clay, hem blk, frm, fis, n sdy - sl mst                         |
|              |                                  |                 |                           |                   |             |               |            | SAA   |
|              |                                  |                 |                           |                   |             | 5             |            | Clay, dk gy, v frm, n sdy, sl mst                               |
|              |                                  |                 |                           |                   |             |               |            | Sandy lenses v fgr stly - sl mst - mst                          |
|              |                                  |                 |                           |                   |             |               |            | < 1" thick  |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy, vstly, med, sl mst - mst                           |
|              |                                  |                 |                           |                   |             |               |            | Clay, thin wavy, sdy, med hd ox - sl mst                        |
|              |                                  |                 |                           |                   |             |               |            | Lenses  |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy, v frm - hd, stly, fis, fis - sl mst                |
|              |                                  |                 |                           |                   |             | 60            |            | B.T. 59.8'  |

Set 3/4" @ 59.8'  
 Hand Seal to 35'  
 Sand str 34'  
 Ben Seal to 20'  
 Cut off to 10'  
 Ben Seal to 8 bags

DATE

511 Orchard Street Golden, CO 80401

State #242



|                             |  |              |  |                       |  |
|-----------------------------|--|--------------|--|-----------------------|--|
| JOB NO. 2-1875              |  | CLIENT C.S.Z |  | LOCATION Irondele Rd. |  |
| DRILLING METHOD: CME-75     |  |              |  | BORING NO. PZ-30      |  |
| 8" O.D. HSA                 |  |              |  | SHEET 1 of 3          |  |
| SAMPLING METHOD: Continuous |  |              |  | DRILLING              |  |
| WATER LEVEL                 |  | START TIME   |  | FINISH TIME           |  |
| TIME                        |  | 1540         |  | 1020                  |  |
| DATE                        |  | DATE         |  | DATE                  |  |
| CASING DEPTH                |  | 1/23/90      |  | 1/24/90               |  |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
|              |                                  |                 |                           |                   |             | 0             |            | Clay, dk brn, topsoil - moist-wet                                       |
| cont         |                                  |                 |                           |                   |             |               |            | Clay, lt brn wh mat, frm, calc, sdy - dry sl moist                      |
|              |                                  |                 |                           |                   |             |               |            | Sand, brn, f gr, silty, sl clay - sl moist - dry                        |
|              |                                  |                 |                           |                   |             | 5             |            | Clay, lt-brn - wh mat, frm, calc, sl sdy - dry - sl moist               |
| cont         |                                  |                 |                           |                   |             |               |            | Clay, brn - rust, frm - v frm, v sdy, gdy to sandy clay, med ox - moist |
|              |                                  |                 |                           |                   |             |               |            | Clay, dec. sandy - moist  |
|              |                                  |                 |                           |                   |             |               |            | Clay, gy brn - rd tan, frm, ox, n sdy - sl moist                        |
| cont         |                                  |                 |                           |                   |             | 10            |            | Sand, brn, v f gr, v silty, sl-med clay, ex - sl moist - moist          |
|              |                                  |                 |                           |                   |             |               |            | Clay, gy brn, frm - sl frm, sl sdy, ip - sl moist                       |
|              |                                  |                 |                           |                   |             | 15            |            | Clay, gy brn - gngy, sl frm - frm, n sdy - sl moist                     |
| cont         | 3'                               |                 |                           |                   |             |               |            | SAA   |
|              |                                  |                 |                           |                   |             | 20            |            |   |

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|                  |  |        |  |            |             |  |
|------------------|--|--------|--|------------|-------------|--|
| JOB NO.          |  | CLIENT |  |            | LOCATION    |  |
| DRILLING METHOD: |  |        |  | BORING NO. |             |  |
|                  |  |        |  | PZ-30      |             |  |
| SAMPLING METHOD: |  |        |  | SHEET      |             |  |
|                  |  |        |  | 2 of 3     |             |  |
|                  |  |        |  | DRILLING   |             |  |
| WATER LEVEL      |  |        |  | START TIME | FINISH TIME |  |
| TIME             |  |        |  |            |             |  |
| DATE             |  |        |  | DATE       | DATE        |  |
| CASING DEPTH     |  |        |  |            |             |  |

Location Diagram

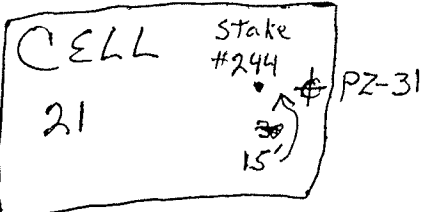
DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVER INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|--------------------------------|-----------------|-------------------------|-------------------|-------------|---------------|------------|---|
| cont         | 3'                             |                 |                         |                   |             | 20'           |            | Clay, gy brn - gn brn, frm, ex, n sdy - sl/mst                |
| cont         | 3'                             |                 |                         |                   |             | 5'            |            | SAA<br>BT @ 24' for today                                     |
|              |                                |                 |                         |                   |             | 30'           |            | SAA<br>Clay, dk gy - gngy, frm - v frm, n sdy - sl/mst        |
|              |                                |                 |                         |                   |             |               |            | Sand, lt - m brn, vvf - f gr, slty, n-sl clay, sb rnd, sl/mst |
|              |                                |                 |                         |                   |             |               |            | Clay, gngy - dk gy, v frm, n sdy - sl/mst                     |
|              |                                |                 |                         |                   |             | 5'            |            | Clay, gngy - dk brn, v frm, n sdy, med - vox - sl/mst         |
|              |                                |                 |                         |                   |             |               |            | SAA   |
|              |                                |                 |                         |                   |             | 49'           |            |   |

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511 Orchard Street Golden, CO 80401



|  |  |               |  |                      |             |
|--|--|---------------|--|----------------------|-------------|
| JOB NO. 2-1815-                        |  | CLIENT C.S.I. |  | LOCATION Trundle Rd. |             |
| DRILLING METHOD: CME-75<br>8" O.D. HSA |  |               |  | BORING NO. PZ-31     |             |
| SAMPLING METHOD: Continuous            |  |               |  | SHEET 1 of 3         |             |
|  |  |               |  | DRILLING             |             |
| WATER LEVEL                            |  |               |  | START TIME           | FINISH TIME |
| TIME                                   |  |               |  | 1140                 | 1350        |
| DATE                                   |  |               |  | DATE                 | DATE        |
| CASING DEPTH                           |  |               |  | 1/24/90              | 1/24/90     |

Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |   |
|              |                                  |                 |                           |                     |             | 0             |            | Clay, dk brn, slty - msT                                  |
|              |                                  |                 |                           |                     |             |               |            | Clay, gy brn, sl frm, sl sdy ip - msT                     |
|              |                                  |                 |                           |                     |             | 5             |            | SAA   |
|              |                                  |                 |                           |                     |             |               |            | Clay, wh - lt gy, v cbb, n frm, - msT                     |
|              |                                  |                 |                           |                     |             | 10            |            | SAA   |
|              |                                  |                 |                           |                     |             |               |            | Iron strc / et-Rock - maroon, v hd - in w/cantact         |
|              |                                  |                 |                           |                     |             | 15            |            | SAND, H brn, hd, pred f gc, sh and med w/sit - clay-silt  |
|              |                                  |                 |                           |                     |             | 20            |            | SAND, H brn, hd, wt-f gc, med w/sit, n clay - clay - silt |

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|                  |  |        |  |            |             |  |
|------------------|--|--------|--|------------|-------------|--|
| JOB NO.          |  | CLIENT |  |            | LOCATION    |  |
| DRILLING METHOD: |  |        |  | BORING NO. |             |  |
|                  |  |        |  | PZ-31      |             |  |
| SAMPLING METHOD: |  |        |  | SHEET      |             |  |
|                  |  |        |  | 3 of 3     |             |  |
|                  |  |        |  | DRILLING   |             |  |
| WATER LEVEL      |  |        |  | START TIME | FINISH TIME |  |
| TIME             |  |        |  |            |             |  |
| DATE             |  |        |  | DATE       | DATE        |  |
| CASING DEPTH     |  |        |  |            |             |  |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                                    |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|--|
|              |                                  |                 |                           |                   |             | 40            |            | Clay, gybra-rst, v. firm, med ex-s/mst                 |
|              |                                  |                 |                           |                   |             |               |            | SAA  |
|              |                                  |                 |                           |                   |             | 5             |            | SAA  |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy, firm, med, sl fis - s/mst                 |
|              |                                  |                 |                           |                   |             |               |            | SAA  |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy-gybra, sl firm-firm, fis ip - s/mst        |
|              |                                  |                 |                           |                   |             | 50            |            | SAA  |
|              |                                  |                 |                           |                   |             |               |            | Sand, blk, v. firm, v. ex, thin wavy lam - s/mst - dry |
|              |                                  |                 |                           |                   |             | 5             |            | thin sdy inter - friable - s/mst +                     |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy, blk, firm, n sdy - s/mst                  |
|              |                                  |                 |                           |                   |             |               |            | SAA  |
|              |                                  |                 |                           |                   |             |               |            | Set 3/8" @ 59'   |
|              |                                  |                 |                           |                   |             |               |            | Hand shot 30'  |
|              |                                  |                 |                           |                   |             |               |            | Sand to 30'  |
|              |                                  |                 |                           |                   |             |               |            | 5 Heli-Plug # 19'                                      |
|              |                                  |                 |                           |                   |             |               |            | Casing to 17'  |
|              |                                  |                 |                           |                   |             | 60            |            |  |

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511 Orchard Street Golden, CO 80401

JOB NO.

2-1815

CLIENT

CST

LOCATION

Terrade Rd

DRILLING METHOD:

8" CME-75  
8" O.D. HSA

BORING NO.

PZ-32

SHEET

1 of 3

SAMPLING METHOD:

SS / Continuous

DRILLING

WATER LEVEL

Dry

START

FINISH

TIME

1030

TIME

TIME

1515

0935

DATE

1/25/90

DATE

DATE

1/24/90

1/25/90

CASING DEPTH

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|
|              |                                  |                 |                           |                   |             | 0             |            |
|              |                                  |                 |                           |                   |             | 1             |            |
|              |                                  |                 |                           |                   |             | 2             |            |
|              |                                  |                 |                           |                   |             | 3             |            |
|              |                                  |                 |                           |                   |             | 4             |            |
|              |                                  |                 |                           |                   |             | 5             |            |
|              |                                  |                 |                           |                   |             | 6             |            |
|              |                                  |                 |                           |                   |             | 7             |            |
|              |                                  |                 |                           |                   |             | 8             |            |
|              |                                  |                 |                           |                   |             | 9             |            |
|              |                                  |                 |                           |                   |             | 10            |            |
|              |                                  |                 |                           |                   |             | 11            |            |
|              |                                  |                 |                           |                   |             | 12            |            |
|              |                                  |                 |                           |                   |             | 13            |            |
|              |                                  |                 |                           |                   |             | 14            |            |
|              |                                  |                 |                           |                   |             | 15            |            |
|              |                                  |                 |                           |                   |             | 16            |            |
|              |                                  |                 |                           |                   |             | 17            |            |
|              |                                  |                 |                           |                   |             | 18            |            |
|              |                                  |                 |                           |                   |             | 19            |            |
|              |                                  |                 |                           |                   |             | 20            |            |

SURFACE CONDITIONS:

SITY SDY - clay - mst

SAND, H brn, vt-fgr, sl clay - dry - sl/mst

SAND, brn, fgr, slty, sl clay - dry - sl/mst

Clay, gray, frm, m sdy - sl/mst

SFA, ex ip - sl/mst

Clay, lt brn, frm, slty, sl sdy - sl/mst - mst

DATE CHK'D BY



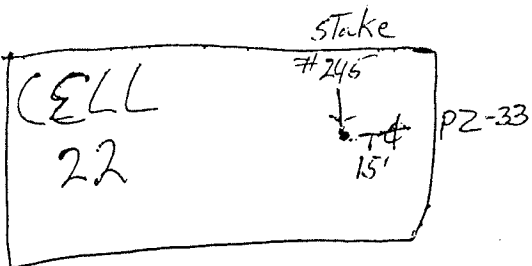




511 Orchard Street Golden, CO 80401



|  |  |               |  |                         |             |
|--|--|---------------|--|-------------------------|-------------|
| JOB NO.<br>2-1815--                        |  | CLIENT<br>CST |  | LOCATION<br>Trundle Rd. |             |
| DRILLING METHOD:<br>CME-75<br>8" O. D. HSA |  |               |  | BORING NO.<br>PZ-33     |             |
| SAMPLING METHOD:<br>SS/Continuous          |  |               |  | SHEET<br>1 of 3         |             |
|  |  |               |  | DRILLING                |             |
| WATER LEVEL                                |  | Dry           |  | START TIME              | FINISH TIME |
| TIME                                       |  | 1420          |  | 1045                    | 1330        |
| DATE                                       |  | 1/25/90       |  | DATE                    | DATE        |
| CASING DEPTH                               |  |               |  | 1/25/90                 | 1/25/90     |



Location Diagram

| DATUM        |                                  | ELEVATION       |                           | SURFACE CONDITIONS: |             |               |            |   |
|--------------|----------------------------------|-----------------|---------------------------|---------------------|-------------|---------------|------------|---|
| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER   | OVA Reading | DEPTH IN FEET | SOIL GRAPH |   |
| SS           | /                                |                 | /                         |                     |             | 0             |            | Clay, tan/bn, sl sdy - msT  |
|              | /                                |                 | /                         |                     |             |               |            | Clay, dk bn, med sdy - msT  |
|              | /                                |                 | /                         |                     |             |               |            | Clay, m bn, sl-med sdy, slty - sl msT   |
| SS           | /                                |                 | /                         |                     |             | 5             |            | Silt, H gy brn, vvf gr sdy, med sdy - dry   |
| SS           | /                                |                 | /                         |                     |             | 10            |            | Silt, H gy brn, vvf gr sdy, sl-med clay - dry<br>Clay, dk gy brn, frm, dns, n sdy - sl msT                |
|              | /                                |                 | /                         |                     |             | 15            |            |   |
| SS           | /                                |                 | /                         |                     |             | 20            |            | Silt, H br, vvf gr sdy, sl-med clay - sl msT - msT<br>Clay, dk gy - an gy, frm, n-sl slty, sl pr - sl msT |

CHK'D BY  
DATE

511 Orchard Street Golden, CO 80401

|                  |        |                     |
|------------------|--------|---------------------|
| JOB NO.          | CLIENT | LOCATION            |
| DRILLING METHOD: |        | BORING NO.<br>PZ-33 |
| SAMPLING METHOD: |        | SHEET<br>2 of 3     |
| DRILLING         |        |                     |
| WATER LEVEL      |        | START TIME          |
| TIME             |        | FINISH TIME         |
| DATE             |        | DATE                |
| CASING DEPTH     |        |                     |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN<br>INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO.<br>SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|-----------------------------------|-----------------|----------------------------|-------------------|-------------|---------------|------------|---|
| /            | /                                 | /               | /                          | /                 |             | 26            |            |   |
| /            | /                                 | /               | /                          | /                 |             |               |            |   |
| /            | /                                 | /               | /                          | /                 |             |               |            |   |
| /            | /                                 | /               | /                          | /                 |             |               |            |   |
| /            | /                                 | /               | /                          | /                 |             | 5             |            | Clay, purpln-gy, frm, carb, med ex - slms t                   |
| /            | /                                 | /               | /                          | /                 |             |               |            |   |
| /            | /                                 | /               | /                          | /                 |             |               |            |   |
| /            | /                                 | /               | /                          | /                 |             |               |            | Sand, lt brn, n consd - w cont ex, clay ip, vvf gr, silty-dry |
| /            | /                                 | /               | /                          | /                 |             |               |            | Clay, gy brn, frm v frm, n silty, dgs - slms t                |
| /            | /                                 | /               | /                          | /                 |             |               |            | Clay AA   |
| /            | /                                 | /               | /                          | /                 |             | 30            |            |   |
| /            | /                                 | /               | /                          | /                 |             |               |            | Clay, dk purp brn - blk, frm, carb, sl ex - slms t            |
| /            | /                                 | /               | /                          | /                 |             |               |            | Clay, gy brn, v frm, dgs - slms t                             |
| /            | /                                 | /               | /                          | /                 |             | 5             |            | SAA   |
| /            | /                                 | /               | /                          | /                 |             |               |            | Clay/Sand, frm - hd & ex woy. lams, dry                       |
| /            | /                                 | /               | /                          | /                 |             |               |            | SAND, lt brn, hd, vvf gr, silty, clay ip - dry                |
| /            | /                                 | /               | /                          | /                 |             | 40            |            | SAA, inc silty clay - slms t                                  |

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511 Orchard Street Golden, CO 80401

|                  |  |        |  |            |        |
|------------------|--|--------|--|------------|--------|
| JOB NO.          |  | CLIENT |  | LOCATION   |        |
| DRILLING METHOD: |  |        |  | BORING NO. |        |
|                  |  |        |  | PZ-37      |        |
| SAMPLING METHOD: |  |        |  | SHEET      |        |
|                  |  |        |  | 3 of 3     |        |
|                  |  |        |  | DRILLING   |        |
| WATER LEVEL      |  |        |  | START      | FINISH |
| TIME             |  |        |  | TIME       | TIME   |
| DATE             |  |        |  | DATE       | DATE   |
| CASING DEPTH     |  |        |  |            |        |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVER RECOVERED | DEPTH OF CASING | SAMPLE NO. SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:  |
|--------------|-------------------------|-----------------|-------------------------|-------------------|-------------|---------------|------------|--|
| cont         | /                       | /               | /                       | /                 |             | 40            |            | Clay, dk gy-grgy, v f m, dnc, tr slty nch, n sdy - sl mst  |
|              | /                       | /               | /                       | /                 |             |               |            | SAA - 1" x 1/4" calc vein  |
|              | /                       | /               | /                       | /                 |             | 5             |            | Clay, Sand, brn-gy, hd, thn ox lens, v f gr, slty i p, dry - sl mst                                    |
|              | /                       | /               | /                       | /                 |             |               |            | Clay, dk gy-dk purp gy, v f m, n sdy sl ox - sl mst  |
|              | /                       | /               | /                       | /                 |             | 50            |            | SAA  |
|              | /                       | /               | /                       | /                 |             |               |            | SAA  |
|              | /                       | /               | /                       | /                 |             | 5             |            | Sand, 1/4" brn, hd, v f gr, thn wvy clay lens - v sl mst   |
|              | /                       | /               | /                       | /                 |             |               |            | Sand, 1/4" brn, fgr, slty, fri, Fe stores, sl clay - dry   |
|              | /                       | /               | /                       | /                 |             |               |            | Sand, a l w hd & ox - dry  |
|              | /                       | /               | /                       | /                 |             |               |            | Clay, dk gy, v f m, n sdy, ox ip - sl mst  |
|              | /                       | /               | /                       | /                 |             | 60            |            | Set 3/4" @ 59' Sand to 30' Cuttings to 10'<br>Hole bit to 30' Hole plug to 17' Hole plug to slc 8 legs |

DATE CHECK'D BY





511 Orchard Street Golden, CO 80401

|                  |  |        |  |            |             |
|------------------|--|--------|--|------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION   |             |
| DRILLING METHOD: |  |        |  | BORING NO. |             |
|                  |  |        |  | PZ-34      |             |
| SAMPLING METHOD: |  |        |  | SHEET      |             |
|                  |  |        |  | 3 of 3     |             |
|                  |  |        |  | DRILLING   |             |
| WATER LEVEL      |  |        |  | START TIME | FINISH TIME |
| TIME             |  |        |  |            |             |
| DATE             |  |        |  | DATE       | DATE        |
| CASING DEPTH     |  |        |  |            |             |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:                               |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
|              |                                  |                 |                           |                   |             | 40            |            | Clay, brn slty & lam - inc mst                    |
|              |                                  |                 |                           |                   |             |               |            | SAND, brngy, fgr, sl-mod clay, sl slty - wet-sat  |
|              |                                  |                 |                           |                   |             |               |            | SAA - Sat   |
|              |                                  |                 |                           |                   |             | 5             |            | Clay, dk gy-brngy, fm-v fm, n slty, ex ip sl mst  |
|              |                                  |                 |                           |                   |             |               |            | SAA, v frac & wet in frac s. (pos wet from above) |
|              |                                  |                 |                           |                   |             | 50            |            | B.T. @ 49'  |
|              |                                  |                 |                           |                   |             |               |            | Sat 3/4" @ 49' -                                  |
|              |                                  |                 |                           |                   |             |               |            | Hand Slat to 12'                                  |
|              |                                  |                 |                           |                   |             |               |            | Sand to 11'                                       |
|              |                                  |                 |                           |                   |             |               |            | Hole Plug to sfc 4 bags.                          |

DATE \_\_\_\_\_ CHECKED BY \_\_\_\_\_



511 Orchard Street Golden, CO 80401

|  |               |                                  |
|--|---------------|----------------------------------|
| JOB NO.<br>2-2562                          | CLIENT<br>CSI | LOCATION<br>88 <sup>th</sup> Ave |
| DRILLING METHOD: CME-55<br>7 1/4" O.D. HSA |               | BORING NO.<br>PZ-36              |
| SAMPLING METHOD: <i>Citrus</i>             |               | SHEET<br>1 of 3                  |
|  |               | DRILLING                         |
| WATER LEVEL                                | Dry           | START TIME                       |
| TIME                                       | 1300          | FINISH TIME                      |
| DATE                                       | 5/10          | DATE                             |
| CASING DEPTH                               |               | 5/10 5/10                        |

Cell = 3

PZ-36 ↑ N

Fence

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
|              |                                  |                 |                           |                   |             | 0             |            |   |
| cont         |                                  |                 |                           |                   |             |               |            | Clay, dk brngy, frm n-v sl sdg - sl mst                               |
|              |                                  |                 |                           |                   |             |               |            |   |
|              |                                  |                 |                           |                   |             |               |            | Clay, brn, n-sl frm, mod-v sdg - dry - sl mst                         |
|              |                                  |                 |                           |                   |             | 5             |            |   |
| cont         |                                  |                 |                           |                   |             |               |            | Sand, brn, vf-fgr, sl-mod clay, v sl mst                              |
|              |                                  |                 |                           |                   |             |               |            | Clay, brngy, frm, calc 10, mod sdg - dry - sl mst                     |
|              |                                  |                 |                           |                   |             |               |            | Sand, brn, fgr, mod w srt, sl cly, - sl mst                           |
|              |                                  |                 |                           |                   |             |               |            | SAA - inc cly   |
|              |                                  |                 |                           |                   |             | 10            |            |   |
| cont         |                                  |                 |                           |                   |             |               |            | SAA - brn, fgr, mod srt, slty, sl-mod clay - sl mst                   |
|              |                                  |                 |                           |                   |             |               |            |   |
|              |                                  |                 |                           |                   |             |               |            | SAA - v sl mst  |
|              |                                  |                 |                           |                   |             | 15            |            |   |
| cont         |                                  |                 |                           |                   |             |               |            | Clay, dk gybrn - gray clystr, v frm, n sdg, calc nod's (v sdg top 8") |
|              |                                  |                 |                           |                   |             |               |            |   |
|              |                                  |                 |                           |                   |             | 20            |            |   |

DATE 5/10/02 CHK'D BY



511 Orchard Street Golden, CO 80401

|                  |  |        |  |                     |             |
|------------------|--|--------|--|---------------------|-------------|
| JOB NO.          |  | CLIENT |  | LOCATION            |             |
| DRILLING METHOD: |  |        |  | BORING NO.<br>PZ-36 |             |
| SAMPLING METHOD: |  |        |  | SHEET<br>2 of 3     |             |
|                  |  |        |  | DRILLING            |             |
| WATER LEVEL      |  |        |  | START TIME          | FINISH TIME |
| TIME             |  |        |  | DATE                | DATE        |
| DATE             |  |        |  |                     |             |
| CASING DEPTH     |  |        |  |                     |             |

Location Diagram

DATUM ELEVATION

| SAMPLER TYPE | INCHES DRIVEN / INCHES RECOVERED | DEPTH OF CASING | SAMPLE NO. / SAMPLE DEPTH | BLOWS/FT. SAMPLER | OVA Reading | DEPTH IN FEET | SOIL GRAPH | SURFACE CONDITIONS:   |
|--------------|----------------------------------|-----------------|---------------------------|-------------------|-------------|---------------|------------|---|
|              |                                  |                 |                           |                   |             | 20            |            | Clay, brngy, frm, v sdy, fgr, sl calc - sl mst                    |
|              |                                  |                 |                           |                   |             |               |            |   |
|              |                                  |                 |                           |                   |             |               |            | Clay, purp gy - gngy, frm, n sdy, ox ip - sl mst                  |
|              |                                  |                 |                           |                   |             |               |            |   |
|              |                                  |                 |                           |                   |             | 5             |            | Clay, gngy - rust, frm, n-sl sdy / uses, ox ip, fis -<br>v sl mst |
|              |                                  |                 |                           |                   |             |               |            |   |
|              |                                  |                 |                           |                   |             |               |            | Clay, dk gy, frm, n sdy, v sl mst                                 |
|              |                                  |                 |                           |                   |             | 30            |            | Clay, dk gy - gngy, frm, n sdy, ox ip - sl mst                    |
|              |                                  |                 |                           |                   |             |               |            | S.A.A.  |
|              |                                  |                 |                           |                   |             |               |            |   |
|              |                                  |                 |                           |                   |             | 5             |            | Clay, gngy - gy, frm, n sdy, ox ip, slty @ base - sl mst          |
|              |                                  |                 |                           |                   |             |               |            |   |
|              |                                  |                 |                           |                   |             |               |            | S.A.A.  |
|              |                                  |                 |                           |                   |             | 40            |            |   |

DATE CHK'D BY



**APPENDIX E - FIELD AND LABORATORY SOILS TEST RESULTS**

# Accent ENGINEERING, INC.

5624 Yukon Street  
Arvada, CO 80002  
(303) 425-8700

RECEIVED SEP 23 1988

September 21, 1988

Industrial Compliance Incorporated  
511 Orchard Street  
Golden, Colorado 80401

Job No. 88-00-42774-00

Attention: Mr. Curtis J. Ahrendsen

Subject: Results of Laboratory Testing

Dear Mr. Ahrendsen:

At your request, laboratory testing was performed on eight samples provided to our laboratory by your office. The laboratory testing consisted of three Standard Proctors (ASTM D-698, method A), three Atterberg Limits (Liquid Limits and Plastic Limits), three Mechanical Analysis (Gradations), and eight Permeability tests. Three of the samples for the Permeability tests were remolded at 95% compaction of the Optimum Proctor values. The results of these tests are summarized in Table 1.

Please contact our office if you have any questions regarding this letter or when additional testing is required.

Respectfully submitted,

ACCENT ENGINEERING, INC.



H. Andrew Asgarian, P.E.  
Project Engineer

HAA/pak  
ici42774.haa

| Sample # | Soil Description  | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Atterberg Limits |    | Permeability $10^{-8}$ cm/sec | Sieve Analysis |          |                 | Remarks                           |
|----------|-------------------|---------------------------|------------------------------|------------------|----|-------------------------------|----------------|----------|-----------------|-----------------------------------|
|          |                   |                           |                              | LL               | PI |                               | Gravel (%)     | Sand (%) | Silt & Clay (%) |                                   |
| SB-4     | Claystone Bedrock | -                         | -                            | -                | -  | 5.05                          | -              | -        | -               | Undisturbed Sample                |
| SB-5     | Claystone Bedrock | 103.5                     | 18.5                         | 44               | 6  | 2.71                          | 0.0            | 10.0     | 90.0            | Standard Proctor, Remolded Sample |
| SB-7     | Claystone Bedrock | -                         | -                            | -                | -  | 4.04                          | -              | -        | -               | Undisturbed Sample                |
| SB-8     | Claystone Bedrock | -                         | -                            | -                | -  | $3.11 \times 10^{-7}$         | -              | -        | -               | Undisturbed Sample                |
| SB-10    | Claystone Bedrock | 102.5                     | 18.5                         | 46               | 19 | 5.12                          | 0.0            | 4.6      | 95.4            | Standard Proctor (ASTM-D698)      |
| SB-10    | Claystone Bedrock | -                         | -                            | -                | -  | 2.99                          | -              | -        | -               | Remolded Sample                   |
| SB-14    | Claystone Bedrock | 103.0                     | 19.0                         | 45               | 25 | 3.47                          | 0.0            | 2.6      | 97.4            | Standard Proctor, Remolded Sample |
| SB-14    | Claystone Bedrock | -                         | -                            | -                | -  | 3.26                          | -              | -        | -               | Remolded Sample                   |

LABORATORY TEST RESULTS

JOB NO.: 88-00-42774-00

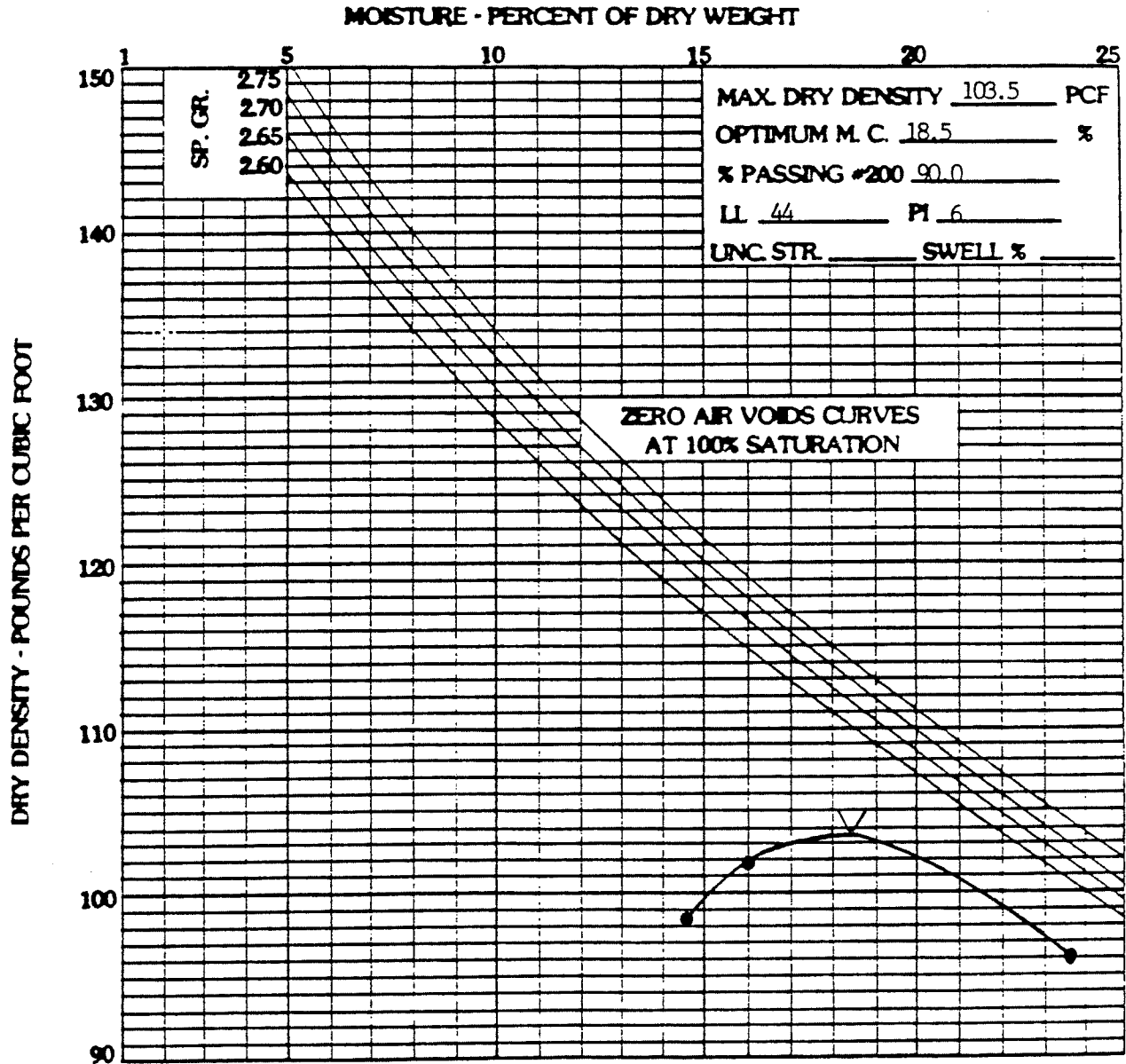
ACCENT ENGINEERING, INC.

DATE: September 20, 1988

TABLE: 1

SAMPLE OF Claystone Bedrock

SAMPLE NO. SB-5



PROCTOR CURVE

JOB NO.: 88-00-42774-00

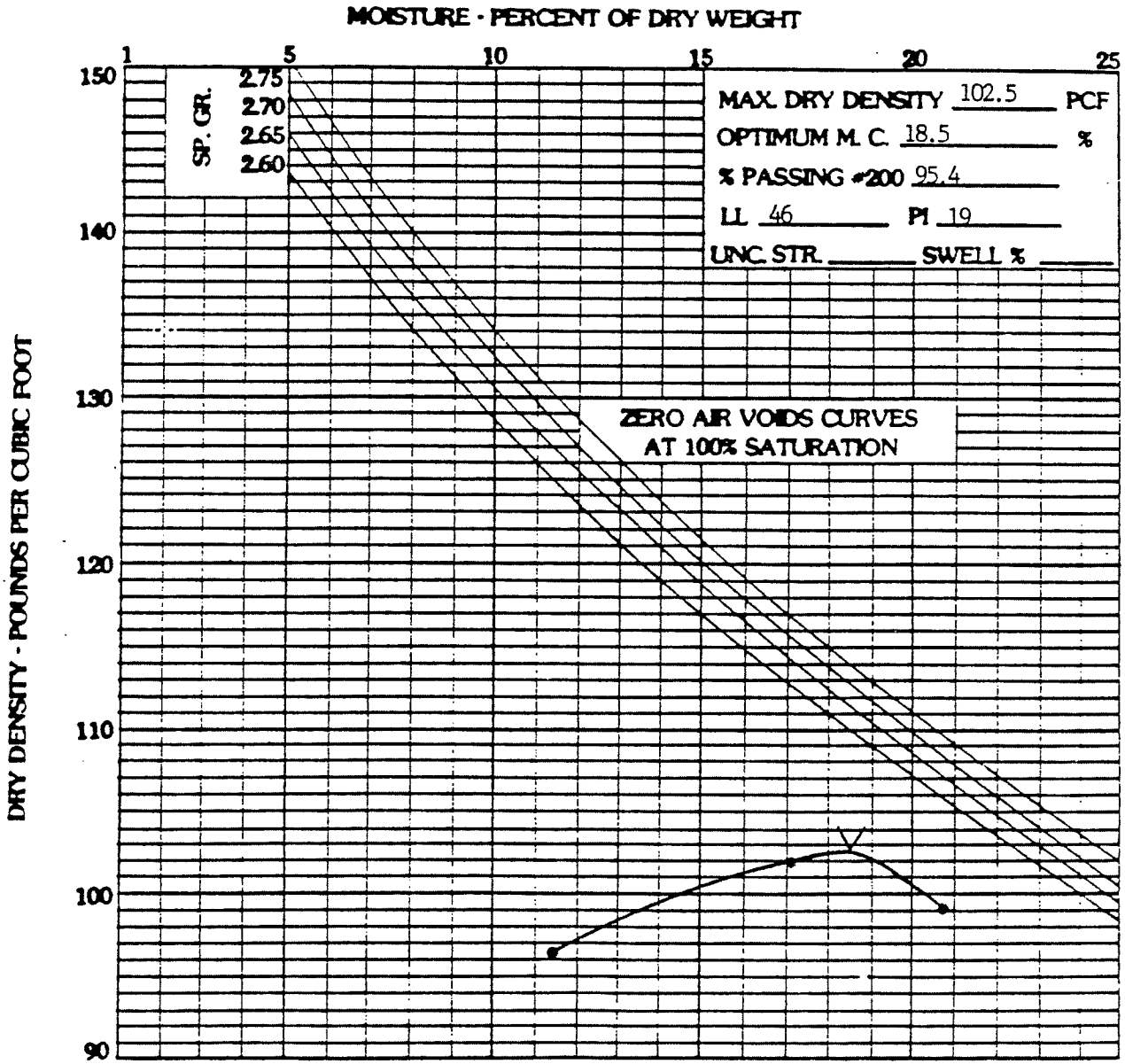
ACCENT ENGINEERING, INC.

DATE: September 21, 1988

FIGURE 1

SAMPLE OF Claystone Bedrock

SAMPLE NO. SB-10



PROCTOR CURVE

JOB NO.: 88-00-42774-00

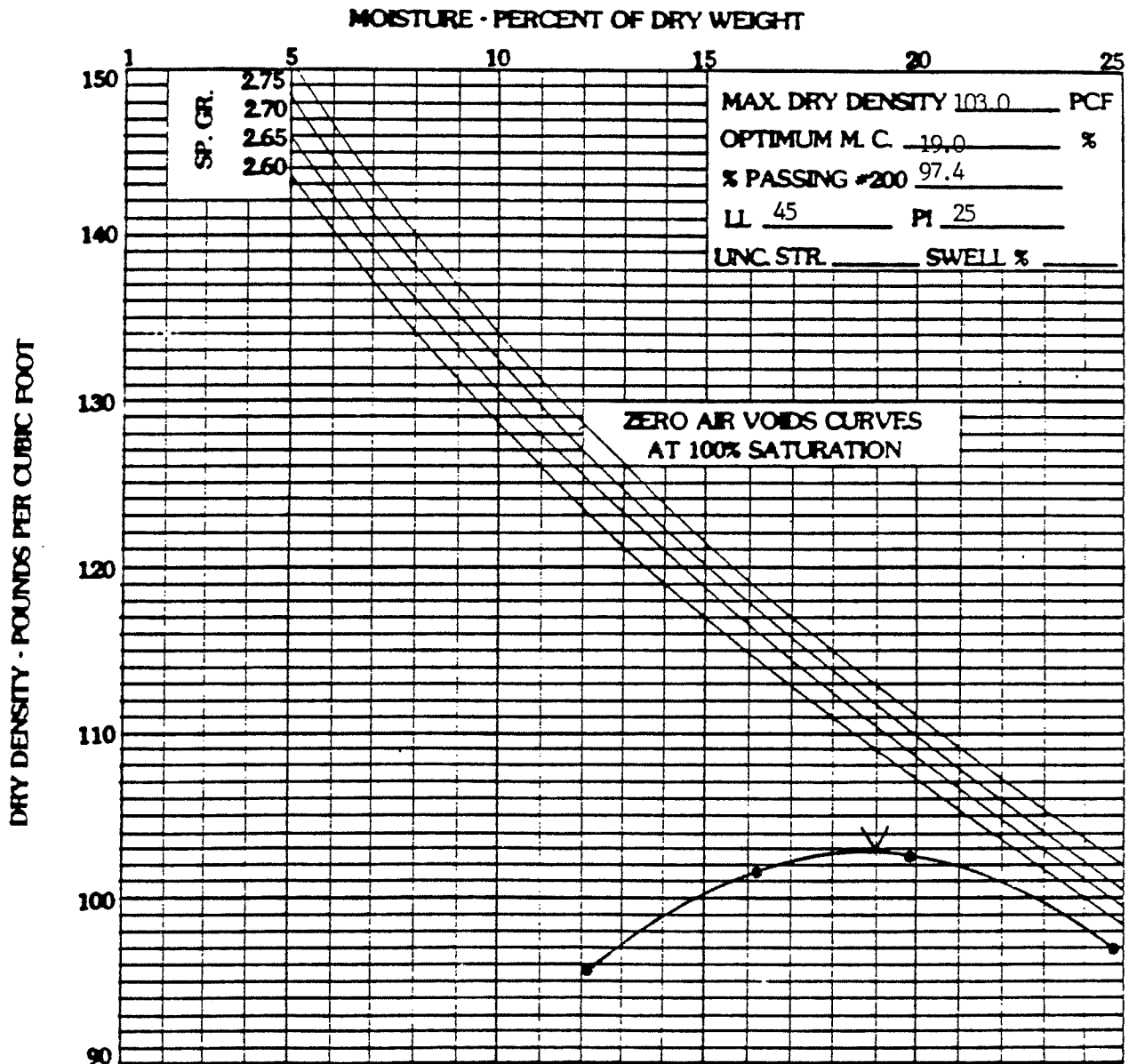
ACCENT ENGINEERING, INC.

DATE: September 21, 1988

FIGURE 2

SAMPLE OF Claystone Bedrock

SAMPLE NO. SB-14



PROCTOR CURVE

JOB NO.: 88-00-42774-00

ACCENT ENGINEERING, INC.

DATE: September 21, 1988

FIGURE 3

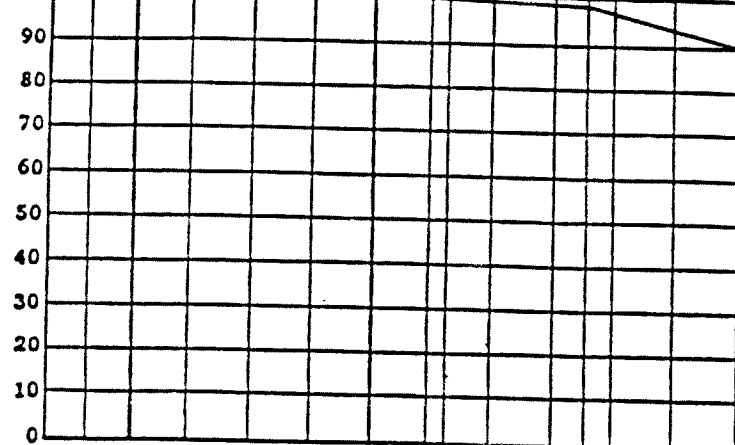


**SIEVE ANALYSIS**

|                       |        |      |                      |        |        |      |
|-----------------------|--------|------|----------------------|--------|--------|------|
| Cobbles               | Gravel |      |                      | Sand   |        |      |
|                       | coarse | fine |                      | coarse | medium | fine |
| Clear Square Openings |        |      | U.S. Standard Series |        |        |      |

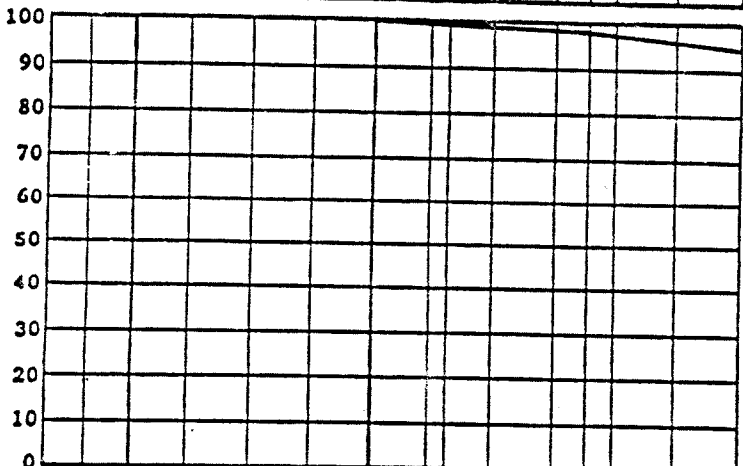
8" 5" 3" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200

PERCENT PASSING



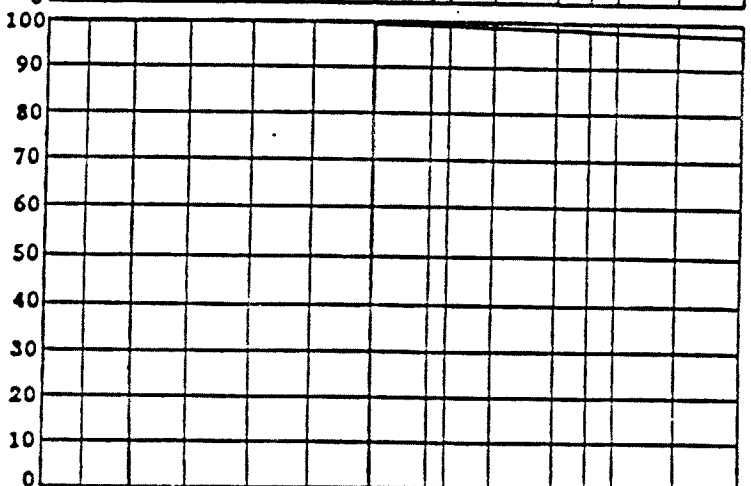
Sample of Claystone Bedrock  
 from test hole SB-5  
 at depth \_\_\_\_\_ feet.  
 Atterberg limits:  
 Liquid Limits 44  
 Plasticity Index 6  
 Classification: Unified A-5  
 AASHTO \_\_\_\_\_  
 Group Index \_\_\_\_\_

PERCENT PASSING



Sample of Claystone Bedrock  
 from test hole SB-10  
 at depth \_\_\_\_\_ feet.  
 Atterberg Limits:  
 Liquid Limits 46  
 Plasticity Index 19  
 Classification: Unified A-7-6  
 AASHTO \_\_\_\_\_  
 Group Index \_\_\_\_\_

PERCENT PASSING



Sample of Claystone Bedrock  
 from test hole SB-14  
 at depth \_\_\_\_\_ feet.  
 Atterberg Limits:  
 Liquid Limits 45  
 Plasticity Index 25  
 Classification: Unified A-7-6  
 AASHTO \_\_\_\_\_  
 Group Index \_\_\_\_\_

200 127 76.2 38.1 19.1 9.52 4.76 2.38 1.19 .590 .297 .149 .074  
 Grain Size in Millimeters

MECHANICAL ANALYSIS TEST RESULTS

JOB NO. : 88-00-42774-00

**ACCENT ENGINEERING, INC.**

DATE: September 21, 1988

FIGURE 4

*Accent*

**ENGINEERING, INC.**

5624 YUKON STREET  
ARVADA, CO 80002  
(303) 425-8700

RECEIVED OCT 4 1988

September 28, 1988

Industrial Compliance Incorporated  
511 Orchard Street  
Golden, Colorado 80401

Job No. 88-00-42785-00

Attention: Mr. Curtis J. Ahrendsen

Subject: Results of Laboratory Testing

Dear Mr. Ahrendsen:

At your request, swell/consolidation tests were performed on two samples provided to our laboratory by your office. The results of these tests are shown in Figure 1.

Please contact our office if you have any questions regarding this letter or when additional testing is required.

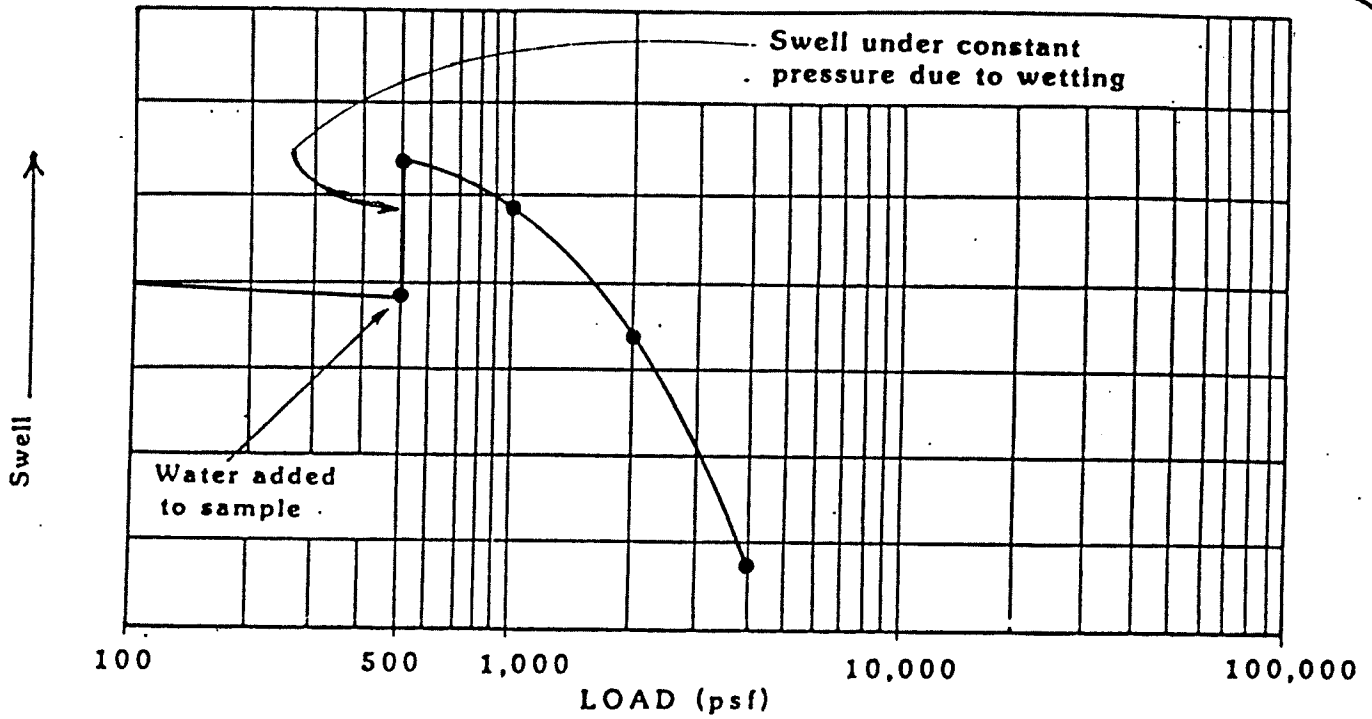
Respectfully submitted,

ACCENT ENGINEERING, INC.



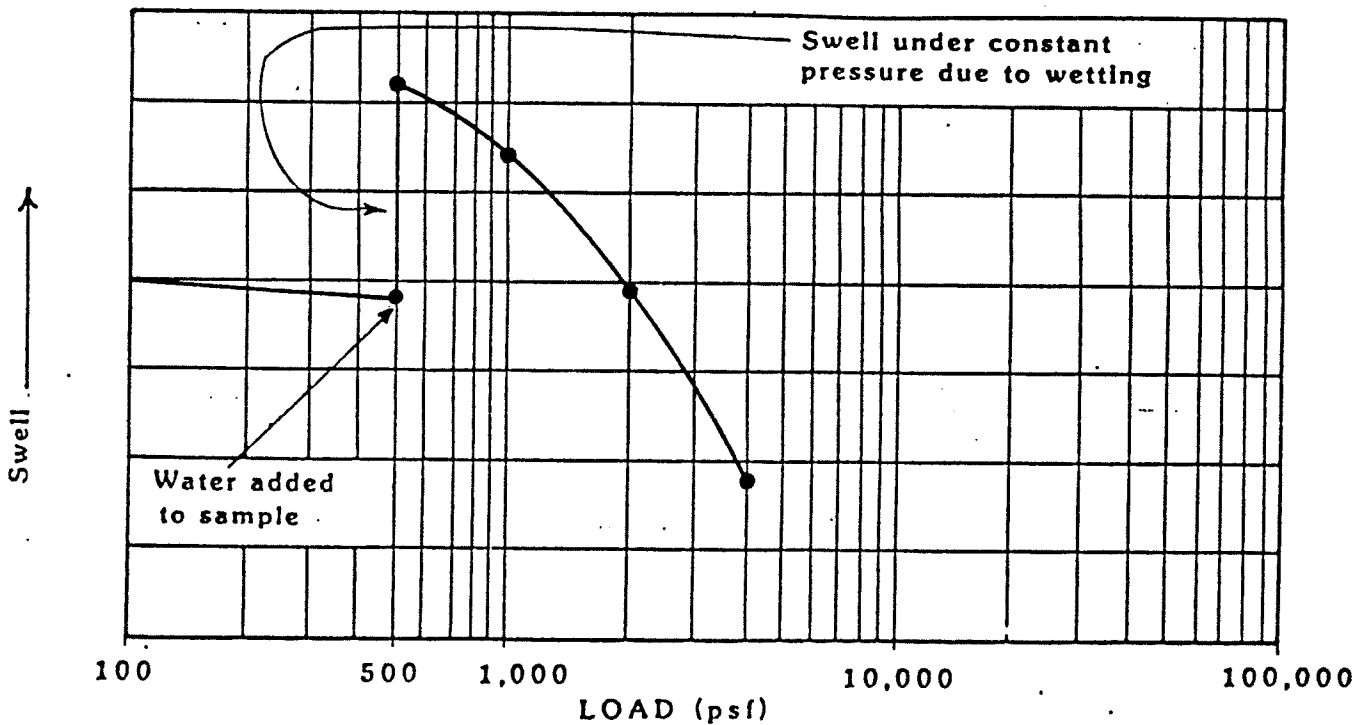
H. Andrew Asgarian, P.E.  
Project Engineer

HAA/pmk  
ici42785.haa



Sample of Claystone bedrock from test hole SB-4 at depth 10-11.5 feet.

Natural Moisture Content \_\_\_\_\_ % Natural Dry Density \_\_\_\_\_ pcf.

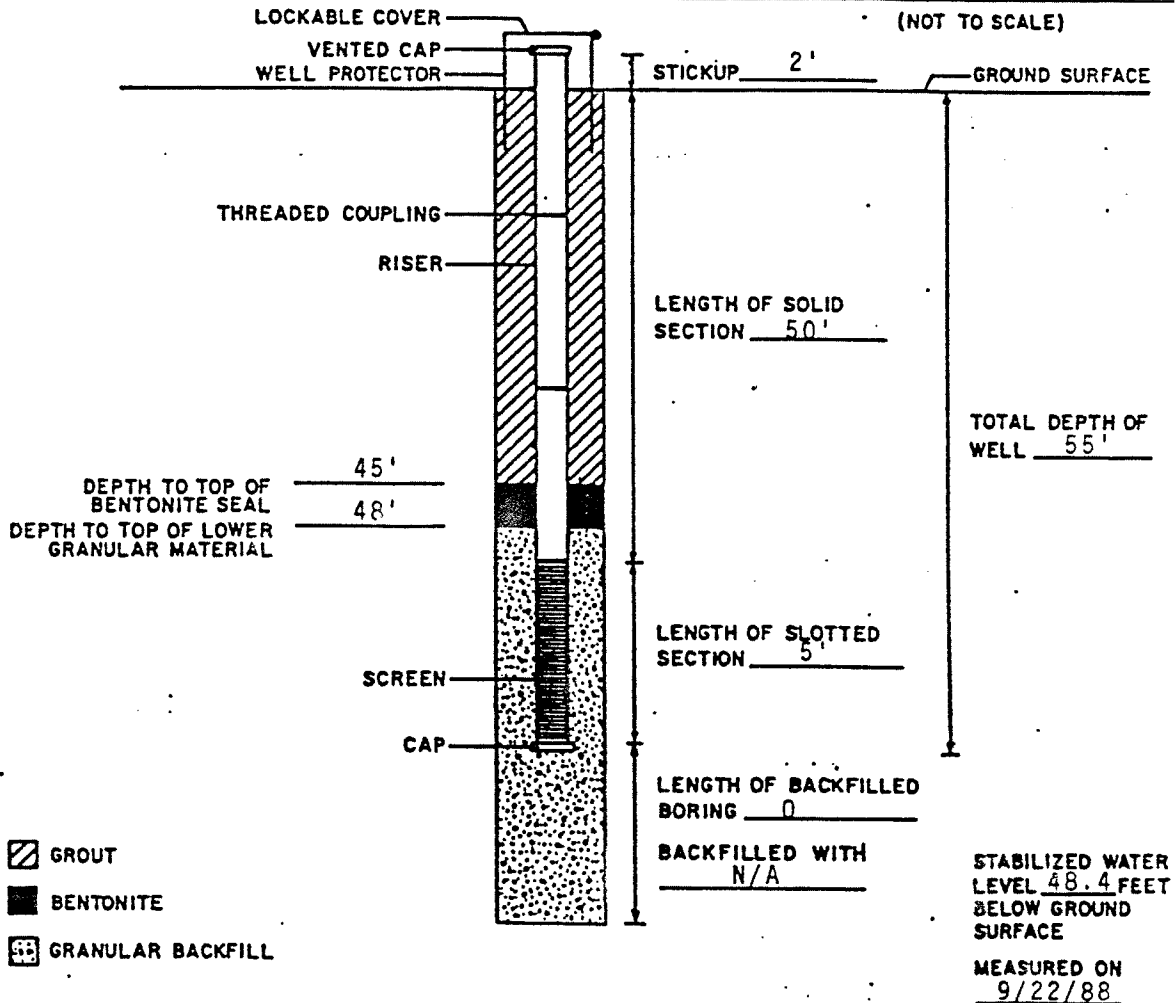


Sample of Claystone bedrock from test hole SB-14 at depth 25-26.5 feet.

Natural Moisture Content \_\_\_\_\_ % Natural Dry Density \_\_\_\_\_ pcf.

**APPENDIX F - MONITOR WELL AND PIEZOMETER COMPLETION FORMS**

JOB NAME Conservation Services Inc. WELL NUMBER MW-1  
 JOB NUMBER 2-1815 INSTALLATION DATE 9/19/88 LOCATION CSI Site  
 DATUM FOR WATER LEVEL MEASUREMENT Top of PVC Casing  
 DATUM ELEVATION 5296 GROUND SURFACE ELEVATION 5294  
 SCREEN DIAMETER AND MATERIAL 2" SCH40 PVC SLOT SIZE 0.010"  
 RISER DIAMETER AND MATERIAL 2" SCH40 PVC BOREHOLE DIAMETER 4"  
 GRANULAR BACKFILL MATERIAL Colorado Silica Sand #10-20 REPRESENTATIVE JEC  
 DRILLING TECHNIQUE Auger DRILLING CONTRACTOR Datum Exp1



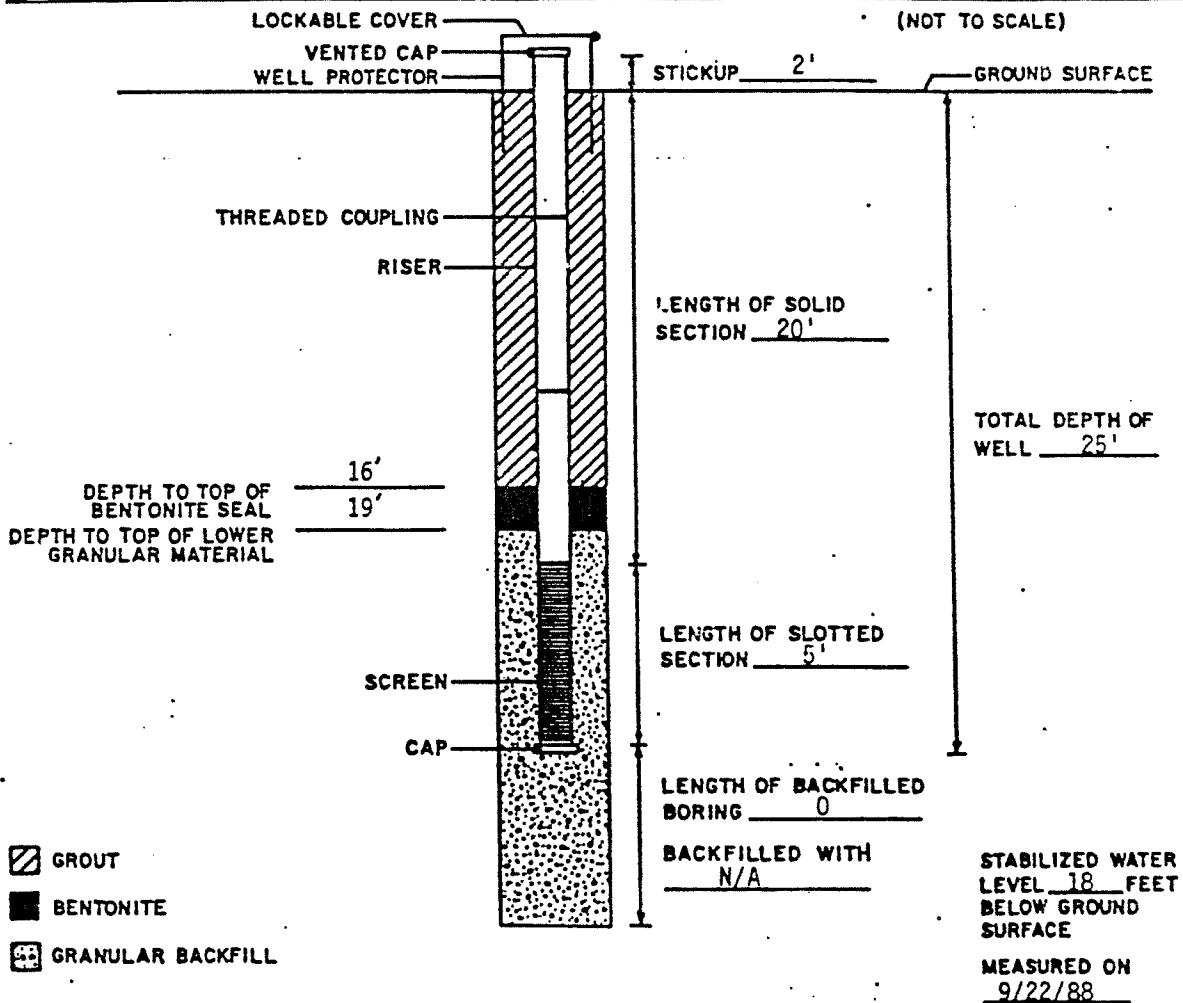
## APPENDIX F

### MONITORING WELL (MW-1) COMPLETION DIAGRAM

Industrial Compliance Inc.  
 511 Orchard Street  
 Golden, Colorado 80401



JOB NAME Conservation Services Inc. WELL NUMBER MW-2  
 JOB NUMBER 2-1815 INSTALLATION DATE 9/19/88 LOCATION CSI Site  
 DATUM FOR WATER LEVEL MEASUREMENT Top of PVC Casing  
 DATUM ELEVATION 5309 GROUND SURFACE ELEVATION 5307  
 SCREEN DIAMETER AND MATERIAL 2" SCH40 PVC SLOT SIZE 0.010"  
 RISER DIAMETER AND MATERIAL 2" SCH40 PVC BOREHOLE DIAMETER 4"  
 GRANULAR BACKFILL MATERIAL Colorado Silica Sand #10-20 REPRESENTATIVE JEC  
 DRILLING TECHNIQUE Auger DRILLING CONTRACTOR Datum Expl.



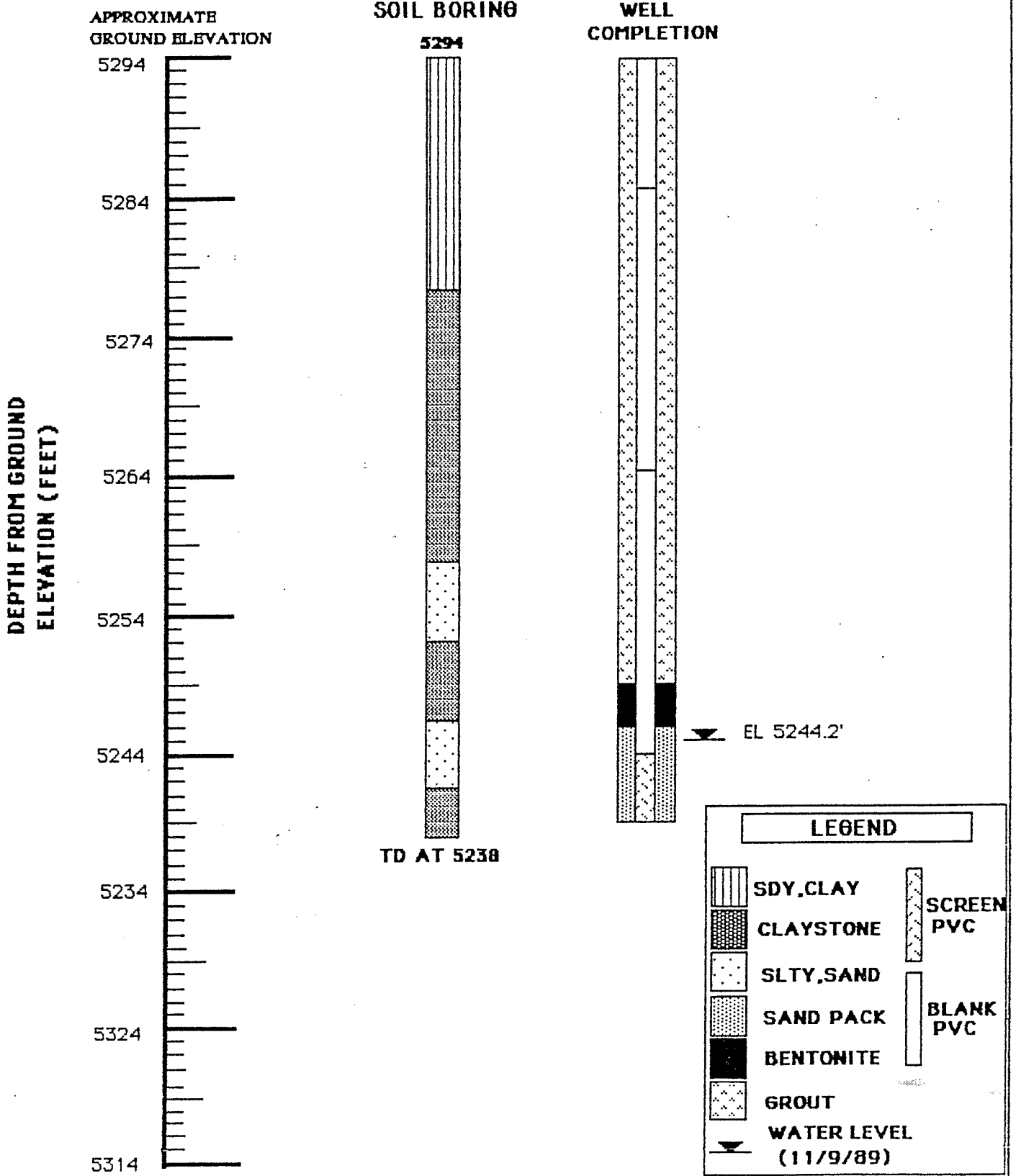
APPENDIX F

MONITORING WELL (MW-2)  
 COMPLETION DIAGRAM

Industrial Compliance Inc.  
 511 Orchard Street  
 Golden, Colorado 80401



# LOG OF MONITOR WELL MW-101



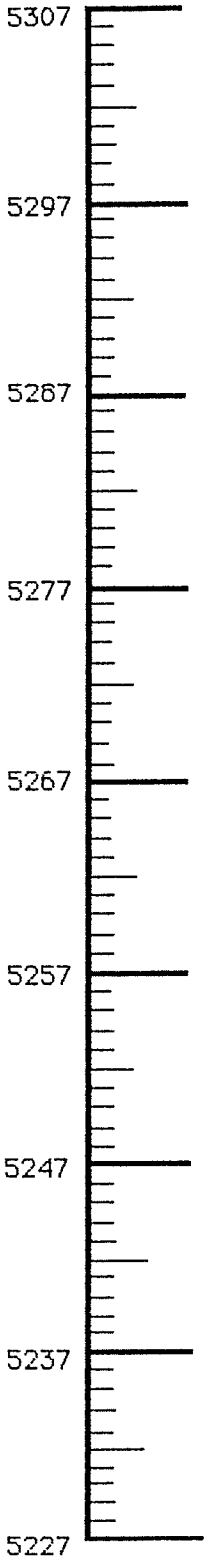
# LOG OF MONITOR WELL MW-102

APPROXIMATE  
GROUND ELEVATION

SOIL BORING  
5307.5

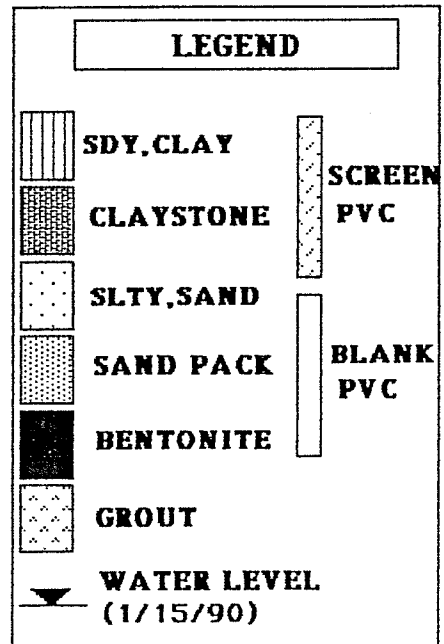
WELL  
COMPLETION

DEPTH FROM GROUND  
ELEVATION (FEET)



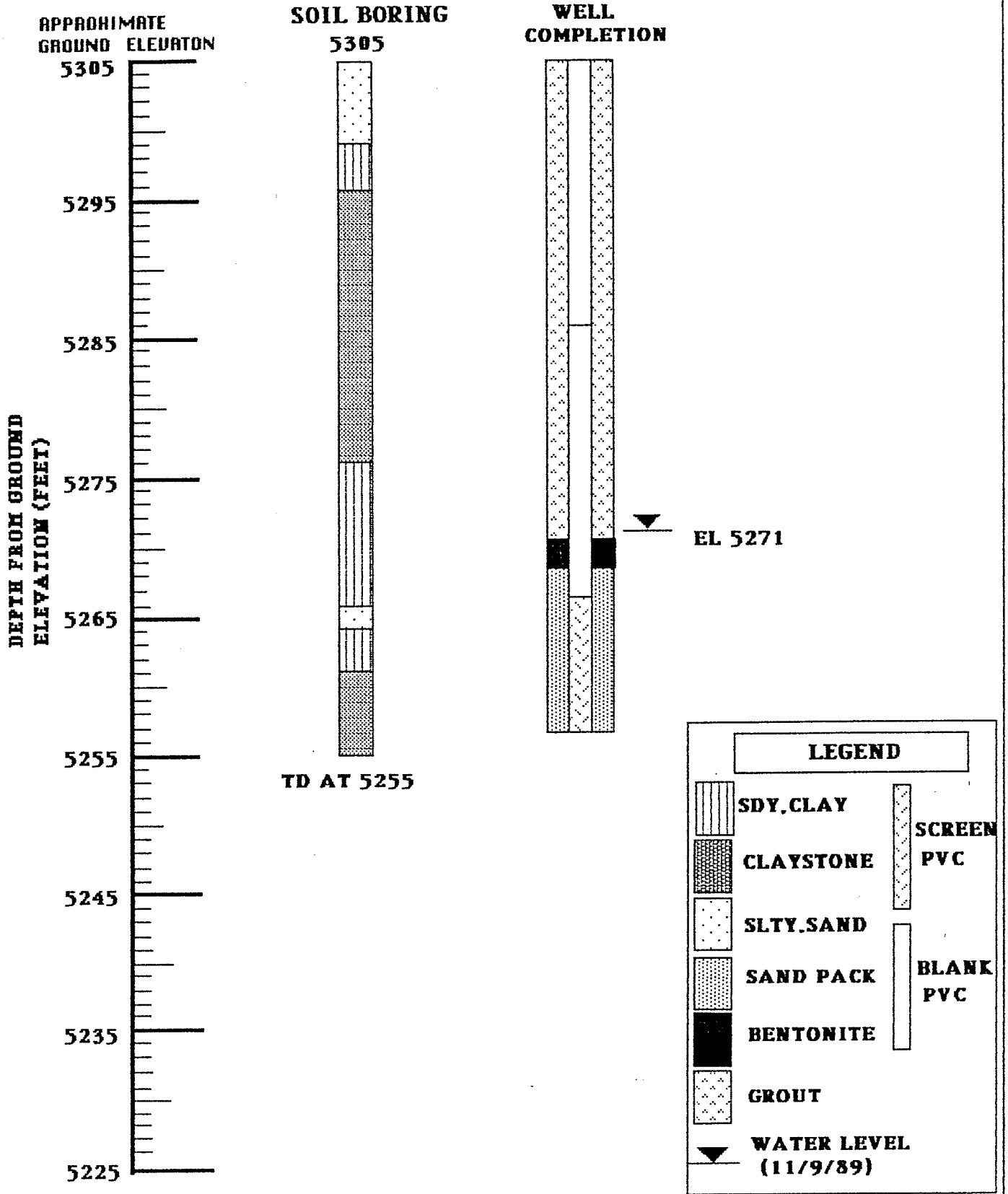
EL 5283

TD AT 5278.5

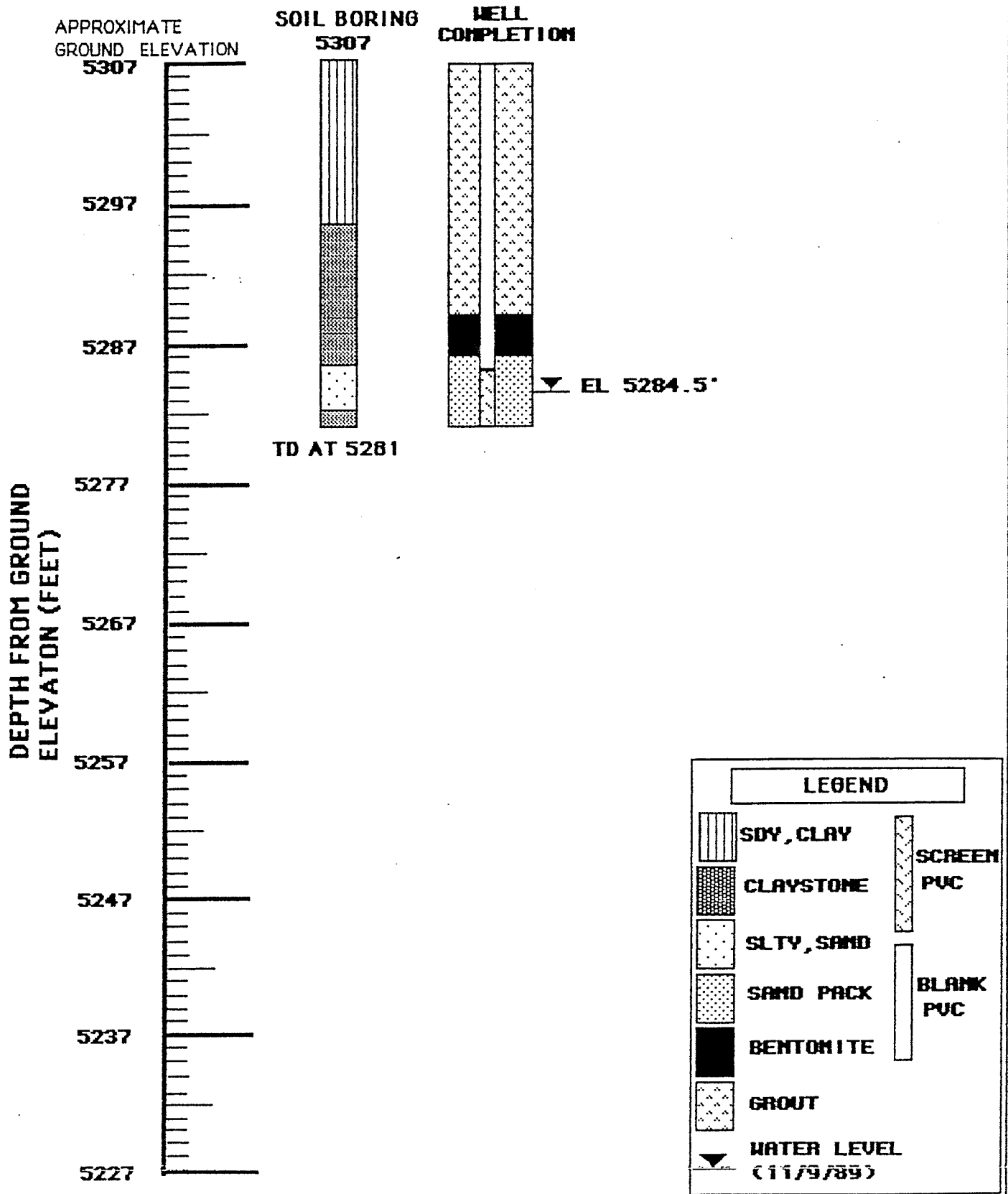




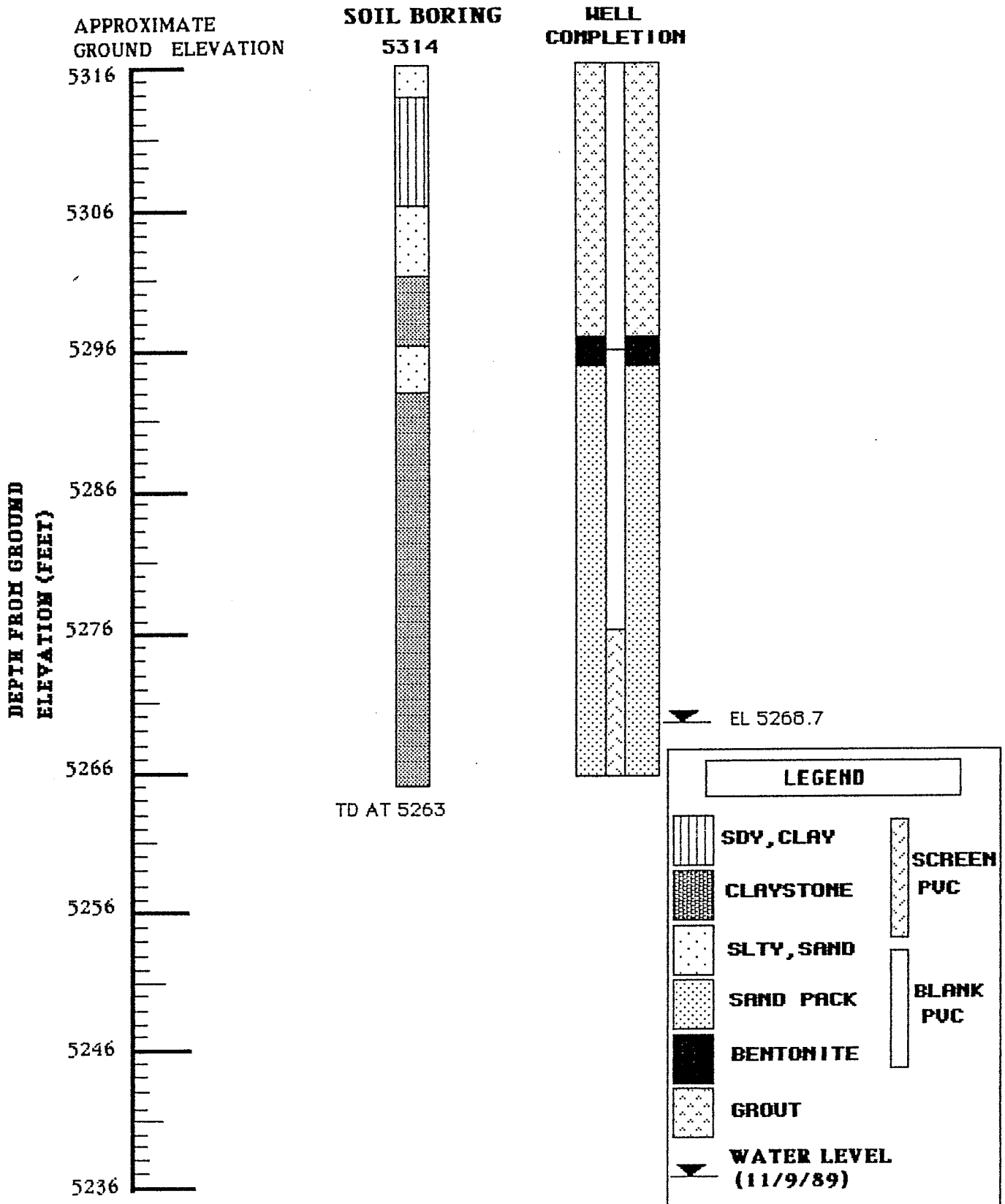
# LOG OF MONITOR WELL MW-103



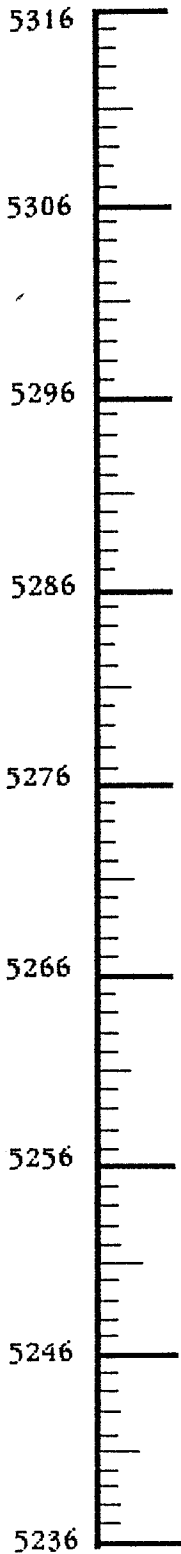
# LOG OF MONITOR WELL MW-104



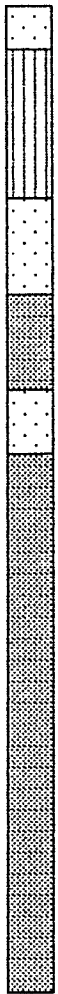
# LOG OF MONITOR WELL MW-105



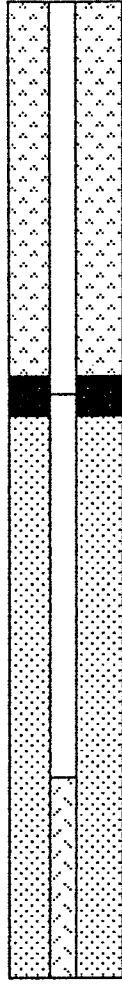
APPROXIMATE  
GROUND ELEVATION



**SOIL BORING**  
5314



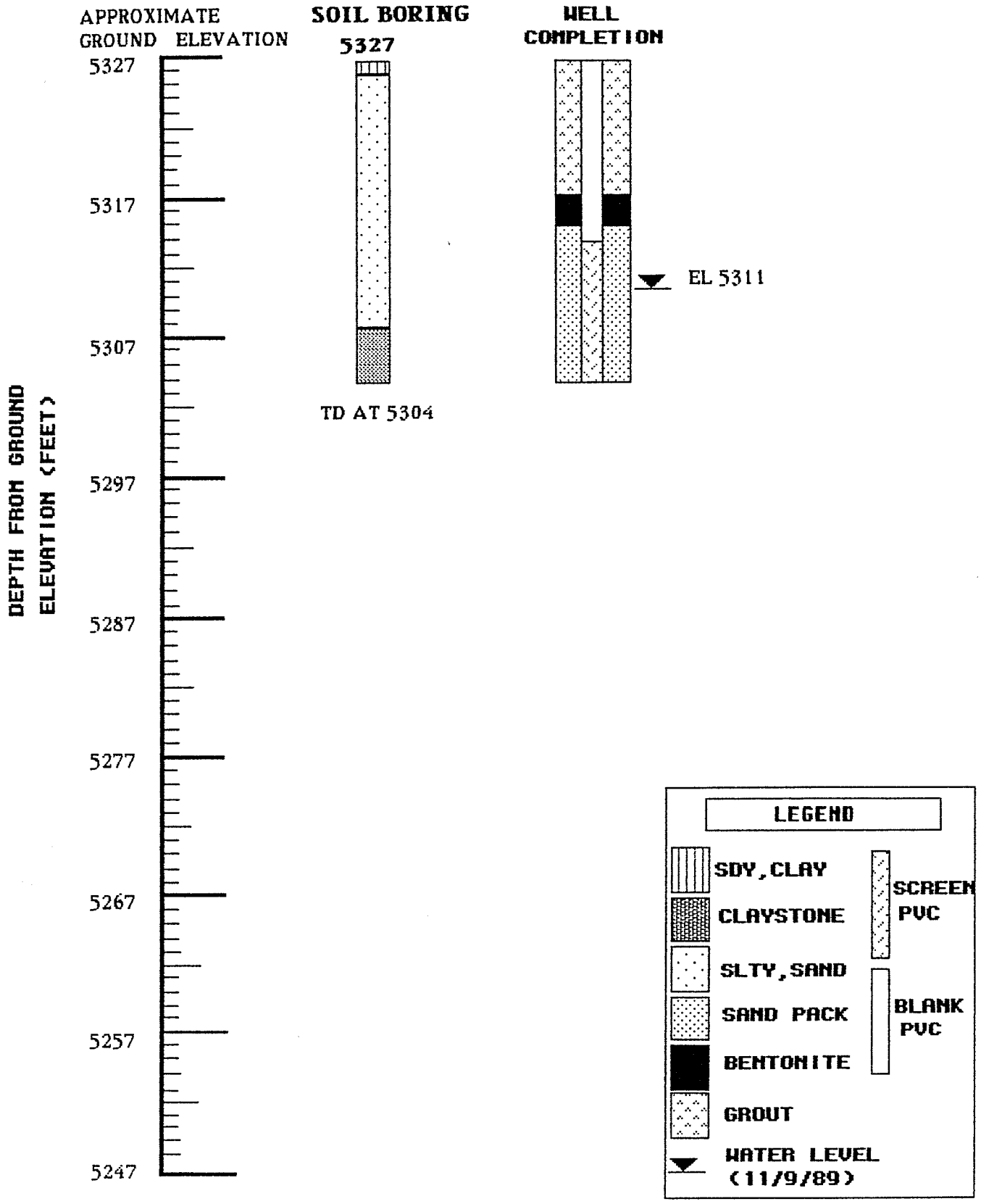
**WELL COMPLETION**



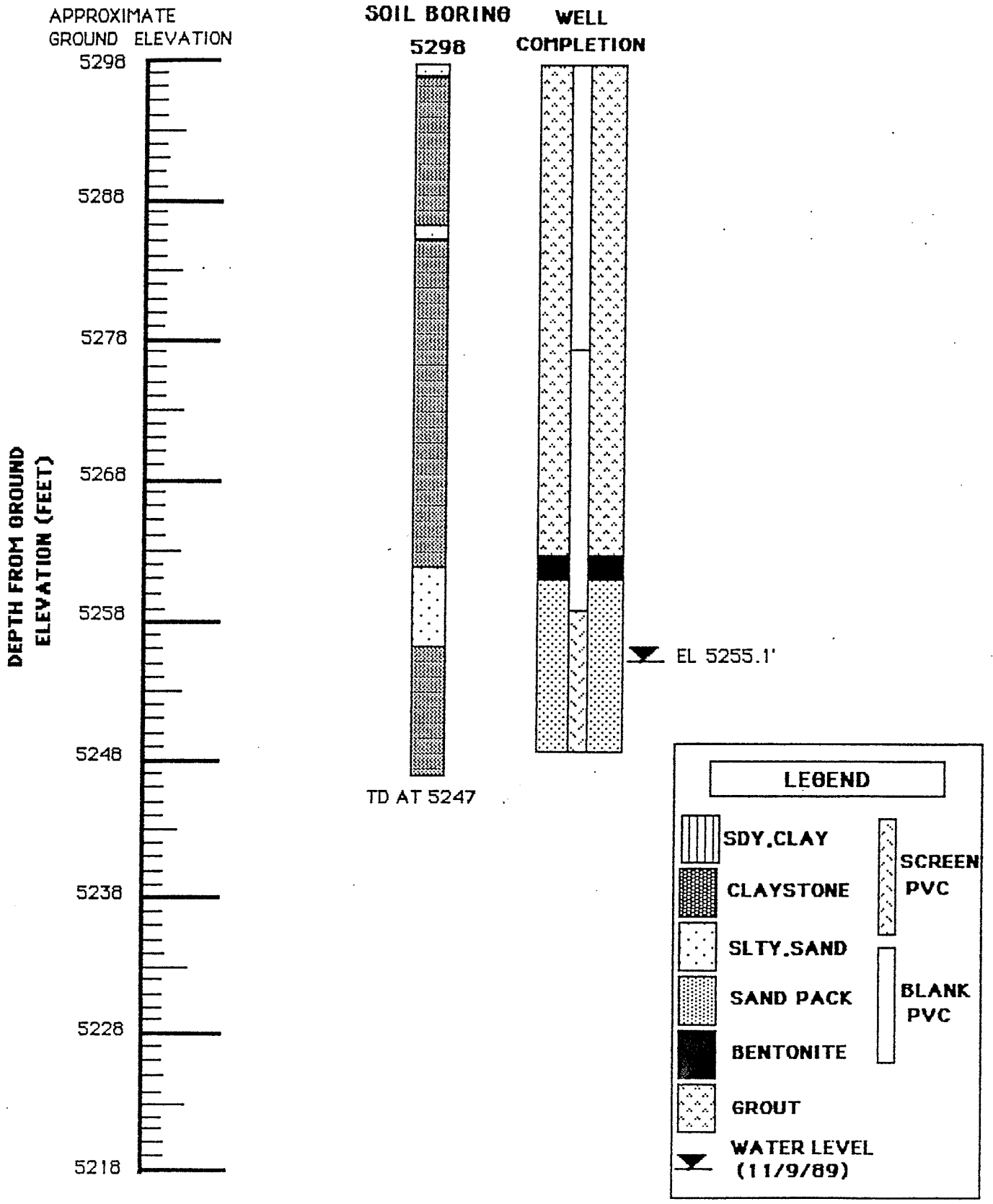
**LEGEND**

|  |                              |  |                   |
|--|------------------------------|--|-------------------|
|  | <b>SDY, CLAY</b>             |  | <b>SCREEN PUC</b> |
|  | <b>CLAYSTONE</b>             |  | <b>BLANK PUC</b>  |
|  | <b>SLTY, SAND</b>            |  |                   |
|  | <b>SAND PACK</b>             |  |                   |
|  | <b>BENTONITE</b>             |  |                   |
|  | <b>GROUT</b>                 |  |                   |
|  | <b>WATER LEVEL (11/9/89)</b> |  |                   |

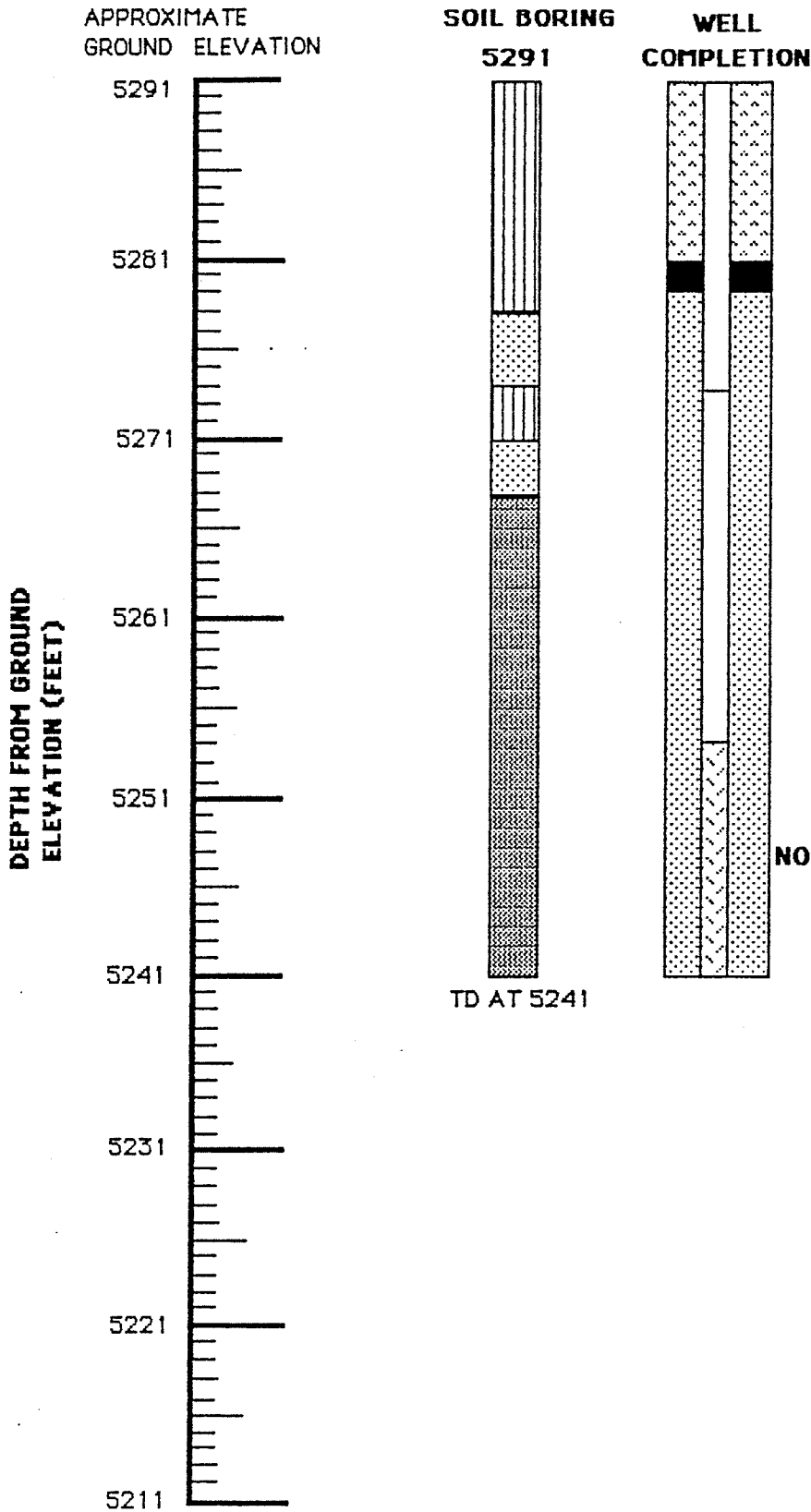
# LOG OF MONITOR WELL MW-106



# LOG OF MONITOR WELL MW-107



# LOG OF MONITOR WELL MW-108

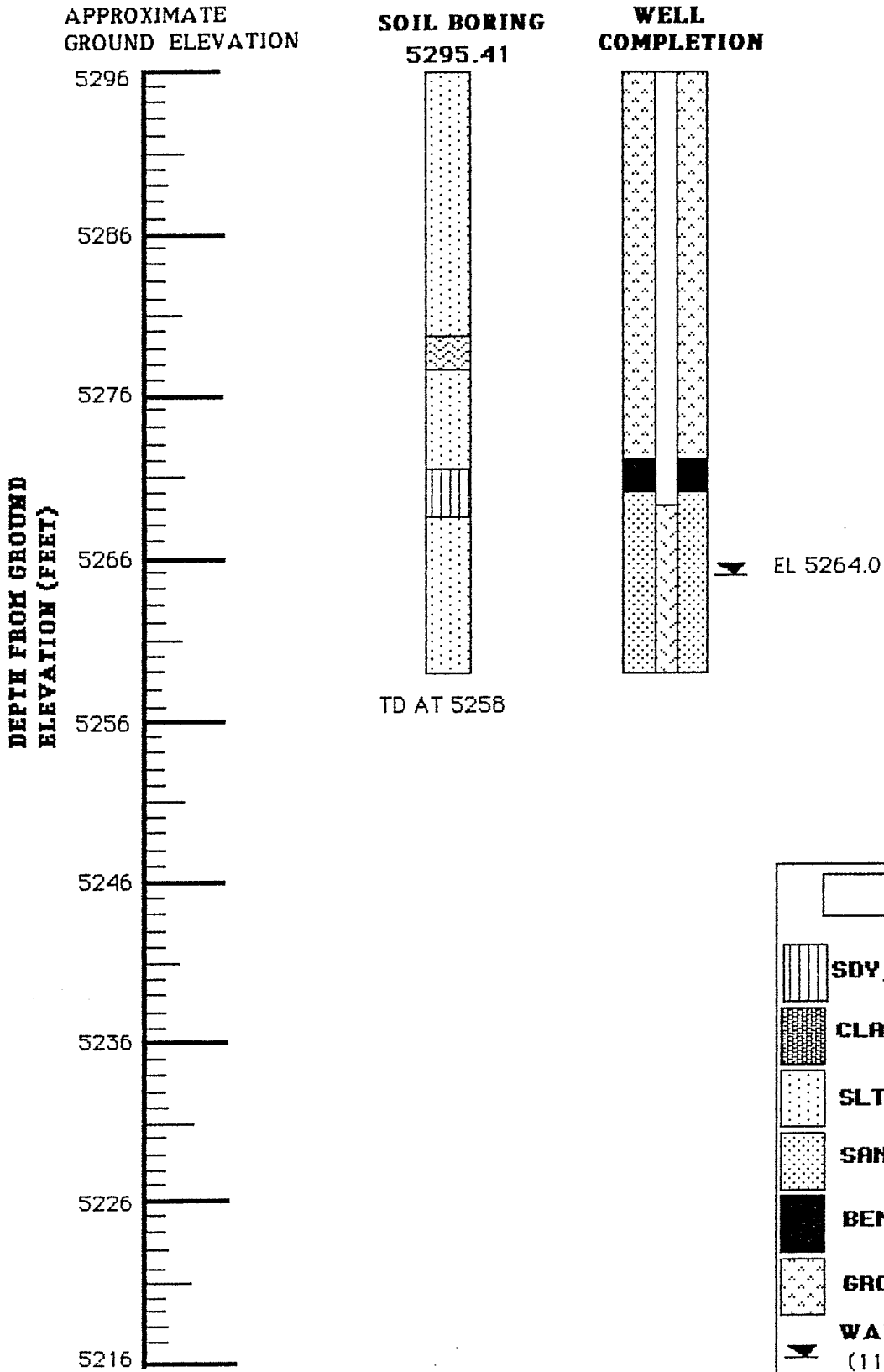


NOTE: WELL WAS DRY ON (11/9/89)

**LEGEND**

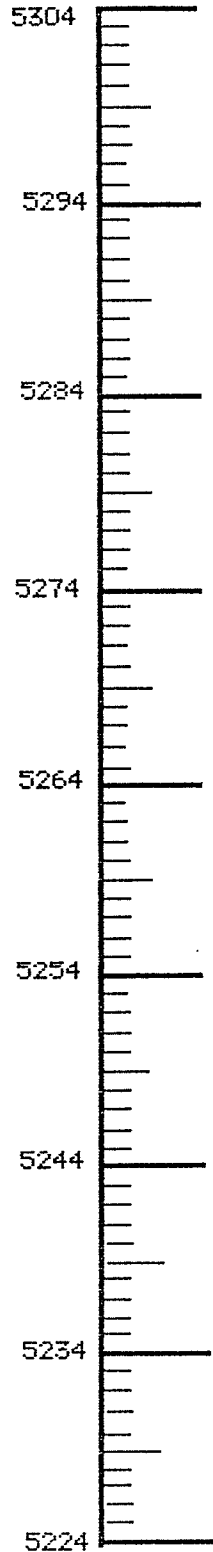
|   |   |
|---|---|
| <ul style="list-style-type: none"> <li> SDY. CLAY</li> <li> CLAYSTONE</li> <li> SLTY. SAND</li> <li> SAND PACK</li> <li> BENTONITE</li> <li> GROUT</li> </ul> | <ul style="list-style-type: none"> <li> SCREEN PVC</li> <li> BLANK PVC</li> </ul> |
|---|---|

# LOG OF MONITOR WELL MW-201

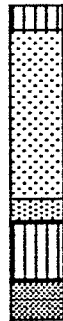


# LOG OF MONITOR WELL MW-202

APPROXIMATE  
GROUND ELEVATION

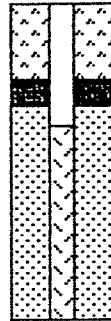


SOIL BORING  
5304.95



TD AT 5289

WELL  
COMPLETION



EL 5294.4

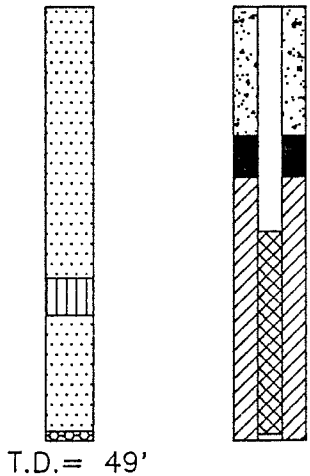
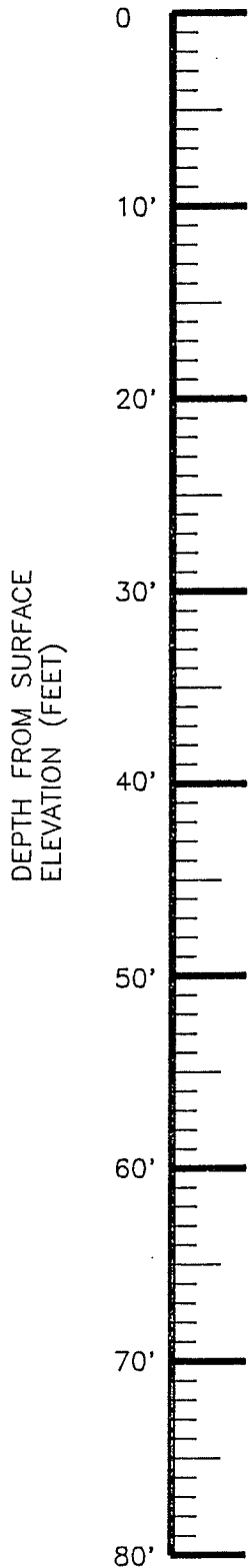
| LEGEND |                          |
|--------|--------------------------|
|        | SDY, CLAY                |
|        | CLAYSTONE                |
|        | SLTY, SAND               |
|        | SAND PACK                |
|        | BENTONITE                |
|        | GROUT                    |
|        | WATER LEVEL<br>(11/9/89) |
|        | SCREEN<br>PUC            |
|        | BLANK<br>PUC             |



# LOG OF MONITOR WELL MW-203

DEPTH BELOW  
GROUND SURFACE

BORING  
EL. = 5300.03' WELL  
COMPLETION

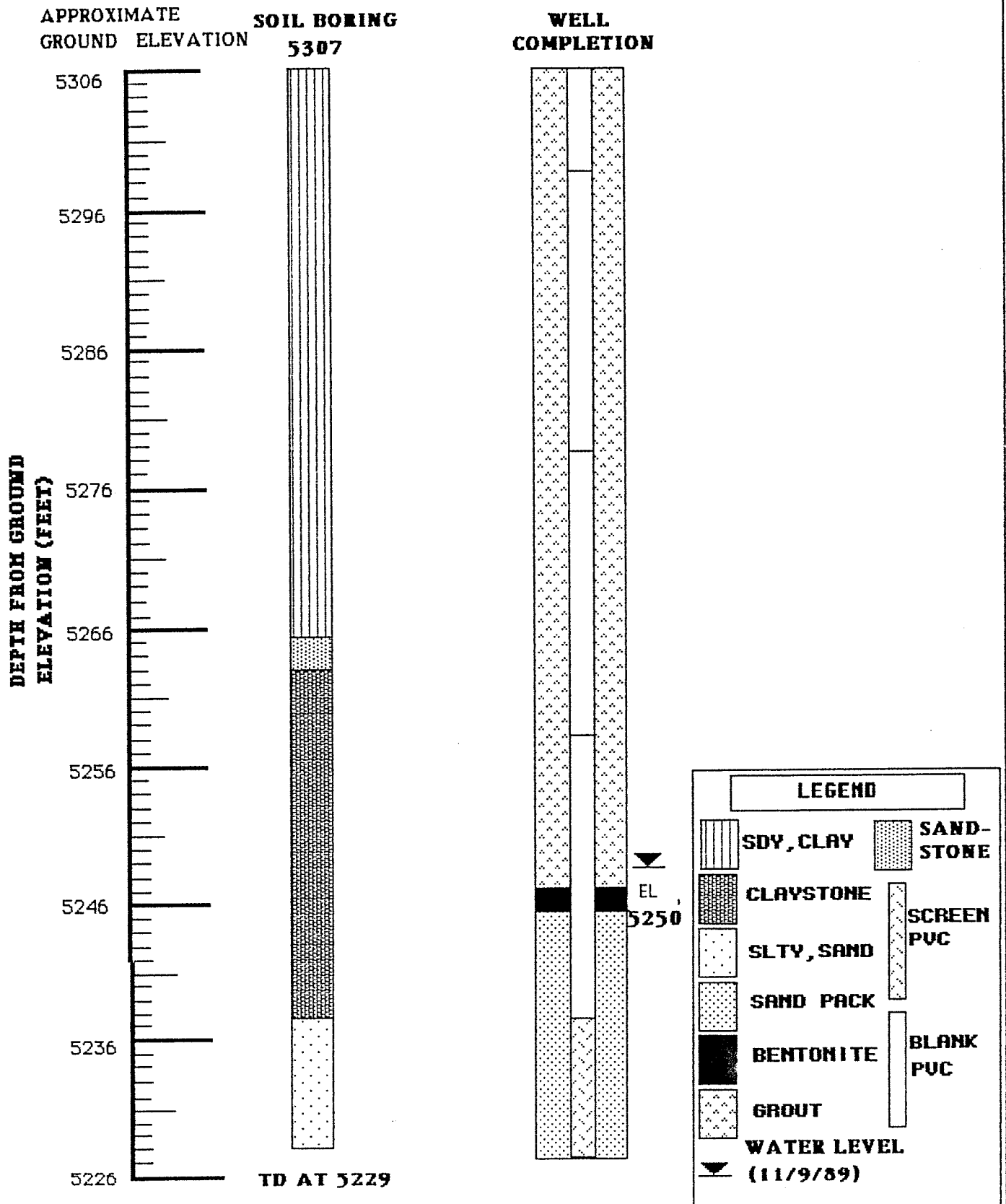


### LEGEND

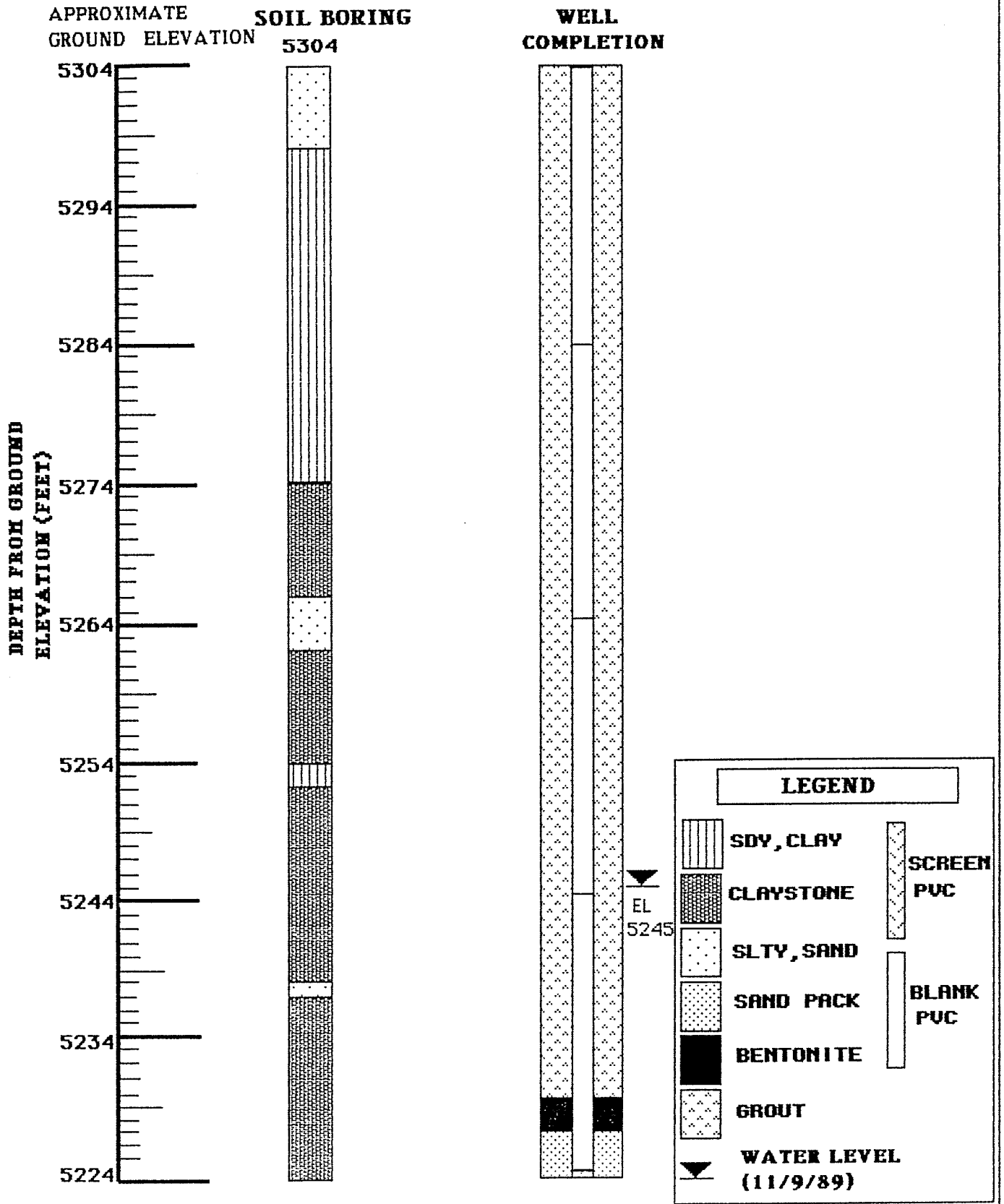
|  |  |
|--|--|
| <p><b>SOIL</b></p> <ul style="list-style-type: none"> <li> CLAY</li> <li> CLAYSTONE</li> <li> SLTY, SAND</li> <li> SAND PACK</li> </ul> <p>EL. = SURF. ELEVATION<br/>T.D. = TOTAL DEPTH<br/>▼ W.L. = WATER LEVEL</p> | <p><b>COMPLETION</b></p> <ul style="list-style-type: none"> <li> SCREEN PVC</li> <li> BLANK PVC</li> <li> #3 SAND</li> <li> BENTONITE</li> <li> GROUT</li> </ul> |
|--|--|

|   |                          |   |
|---|--------------------------|---|
|   |                          | <b>INDUSTRIAL COMPLIANCE</b><br>1746 COLE BLVD.<br>BLDG. 21 SUITE 300<br>GOLDEN, COLORADO 80401 |
| <h2 style="margin: 0;">MW-203</h2> <h3 style="margin: 0;">LITHOLOGIC AND WELL COMPLETION LOG</h3> |                          |   |
| CLIENT: CSI   |                          |   |
| PROJECT: CSI-BENNETT, COLO.   |                          |   |
| PROJECT NO: 2-2560  | DATE COMPLETED: 05/20/92 |   |
| GENERATED BY: INDUSTRIAL COMPLIANCE   |                          |   |
| DRAWN BY: W.H.T.  | APPROVED BY: M.A.M.      | FILE NAME: CSIMW203   |

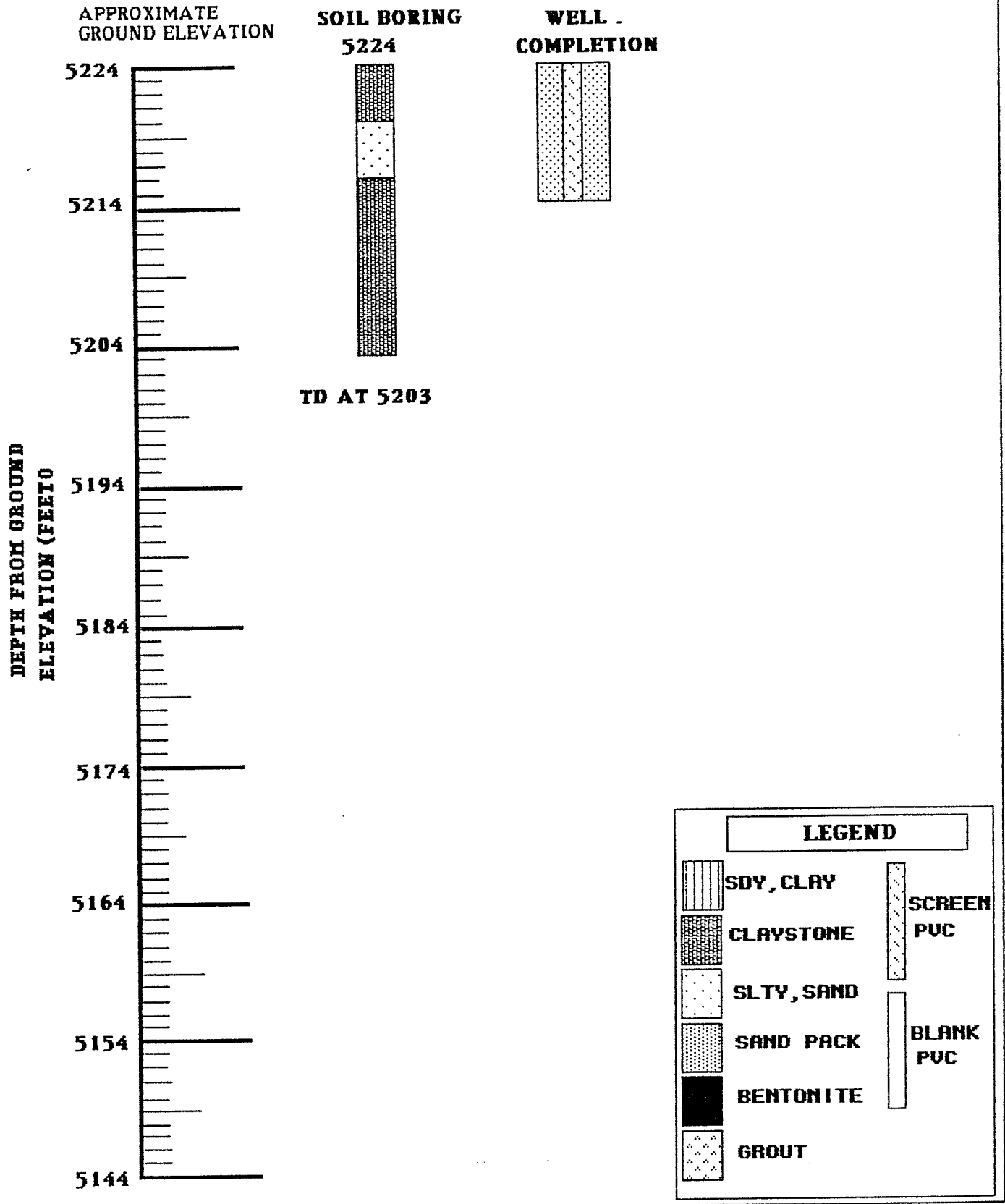
# LOG OF MONITOR WELL MW-301



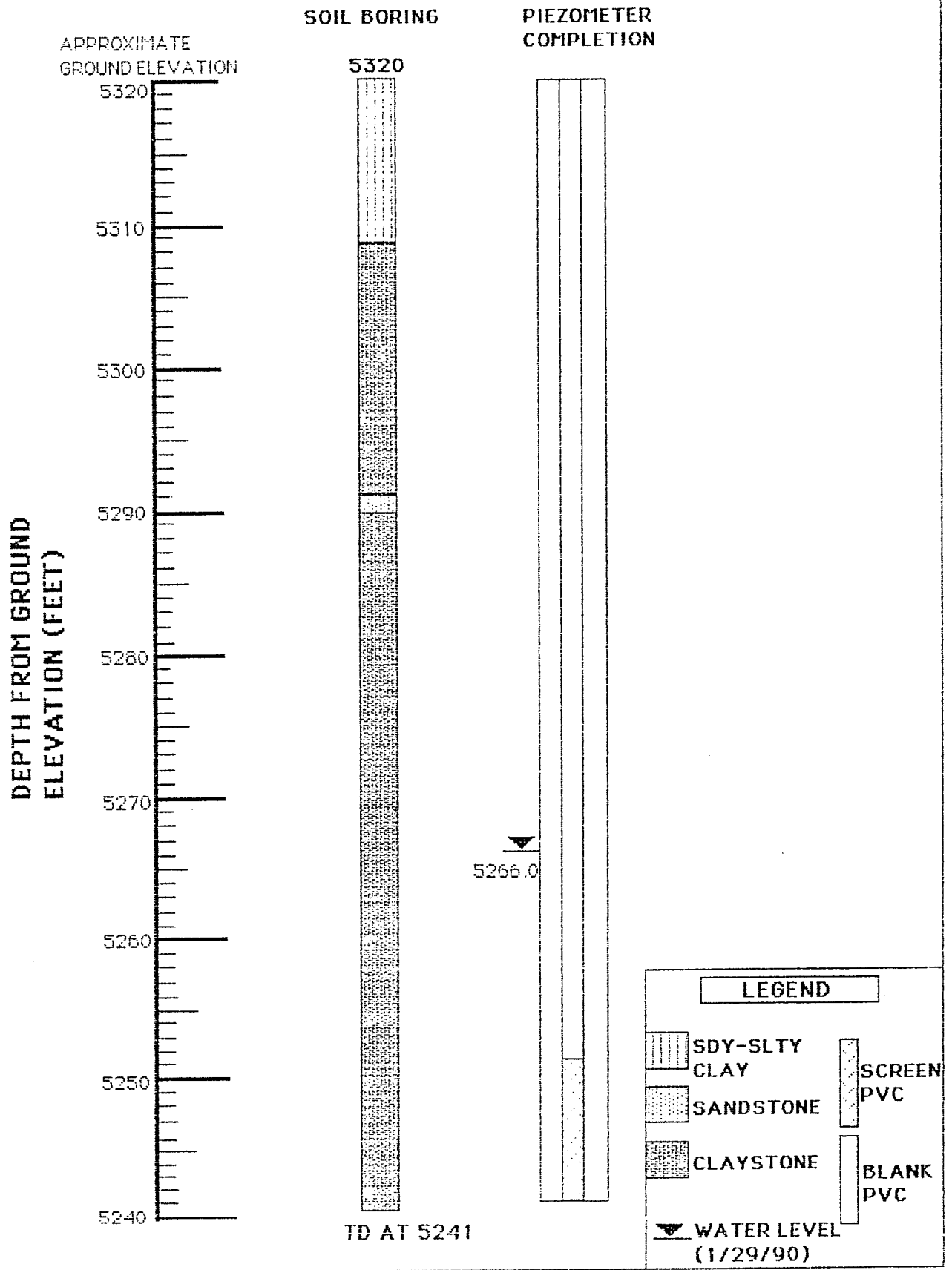
# LOG OF MONITOR WELL MW-302



# LOG OF MONITOR WELL MW-302 CONT.

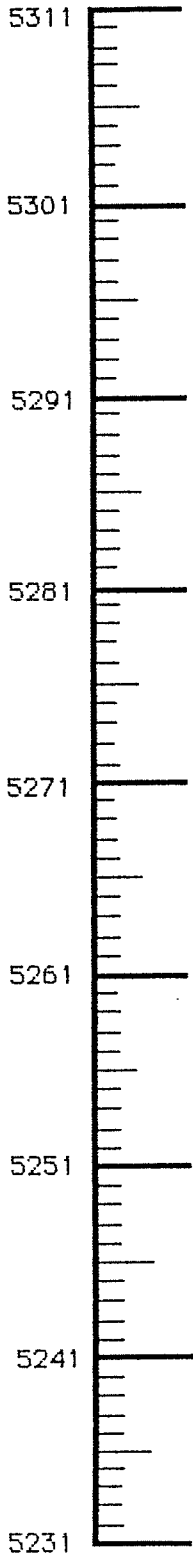


# LOG OF PIEZOMETER P-1



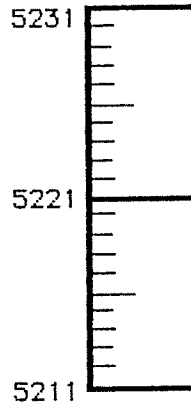
# LOG OF PIEZOMETER P-2

APPROXIMATE  
GROUND ELEVATION



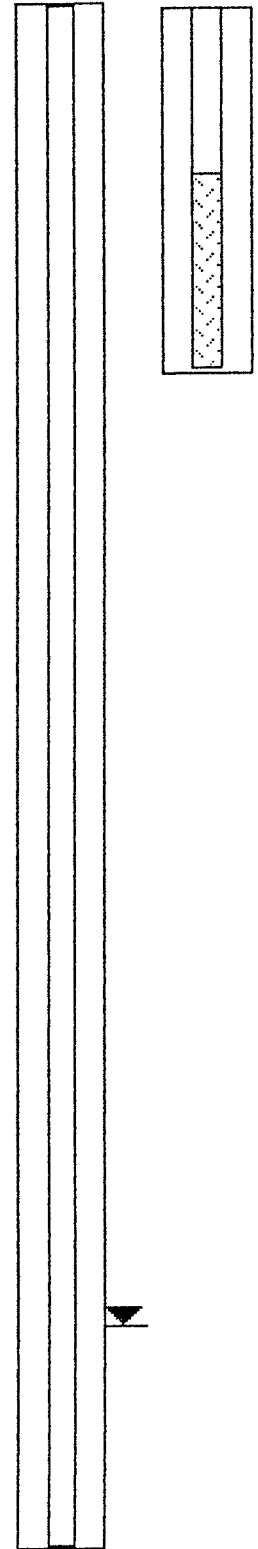
## SOIL BORING

5311



TD AT 5212

## PIEZOMETER COMPLETION



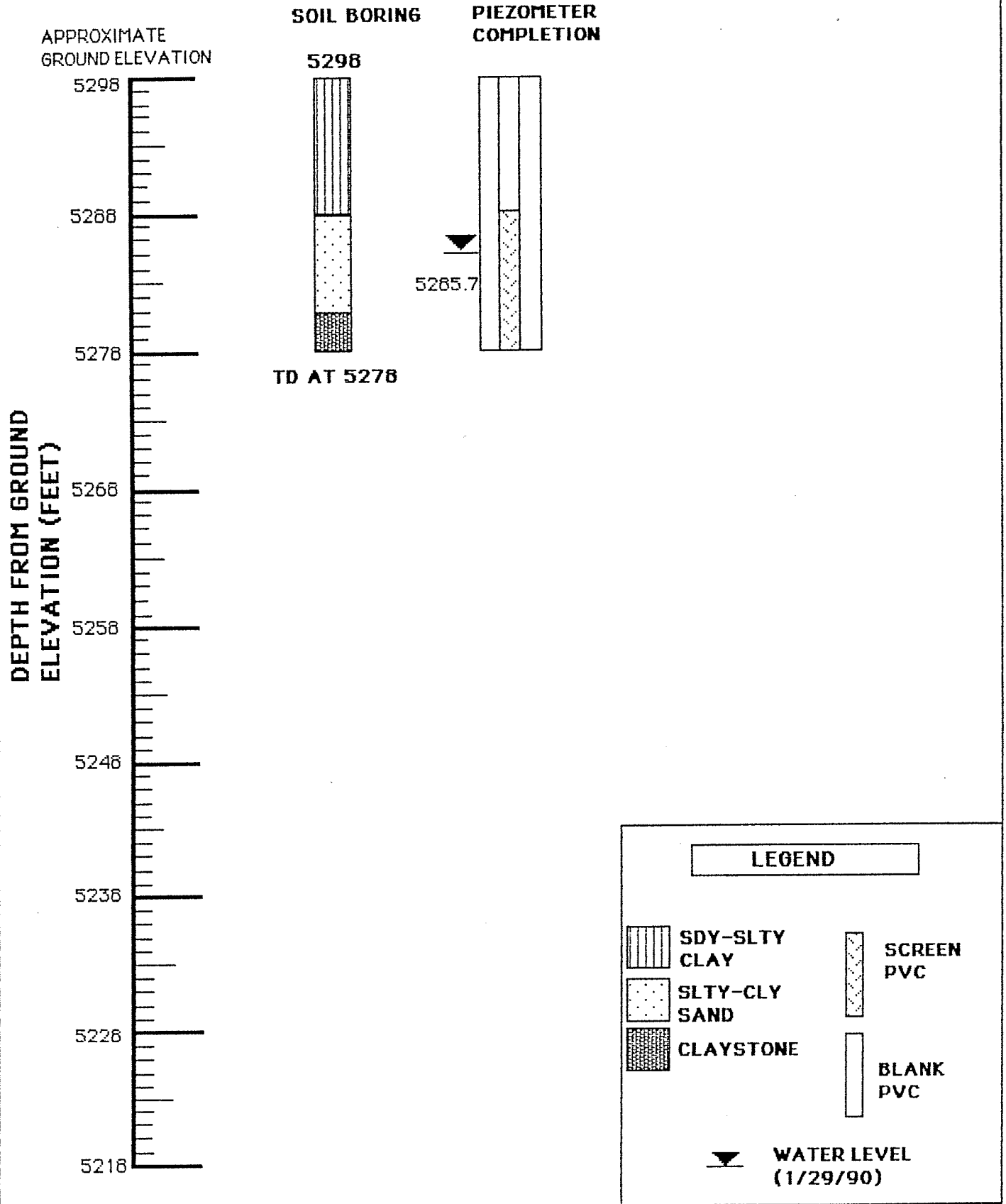
DEPTH FROM GROUND  
ELEVATION (FEET)

**LEGEND**

|   |   |
|---|---|
| <ul style="list-style-type: none"> <li> SDY-SLTY CLAY</li> <li> SLTY-CLY. SAND</li> <li> SANDSTONE</li> <li> CLAYSTONE</li> </ul> | <ul style="list-style-type: none"> <li> SCREEN PVC</li> <li> BLANK PVC</li> </ul> |
|---|---|

WATER LEVEL  
(1/29/90)

# LOG OF PIEZOMETER P-3



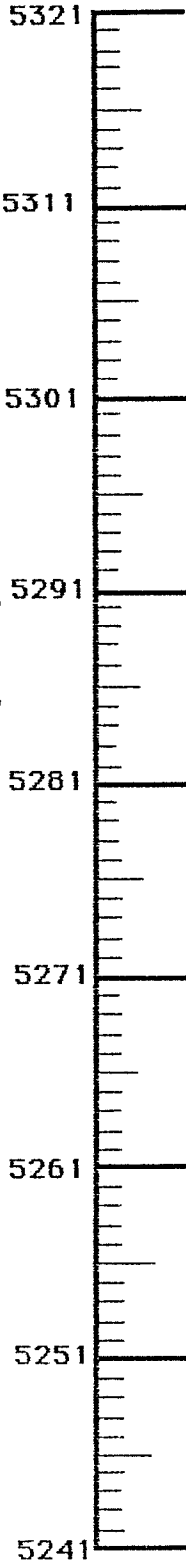
# LOG OF PIEZOMETER P-4

APPROXIMATE  
GROUND ELEVATION

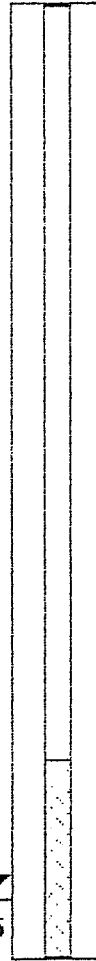
SOIL BORING

PIEZOMETER  
COMPLETION

5321



TD AT 5272



5274.5

## LEGEND



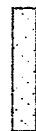
SDY-SLTY  
CLAY



SLTY-CLY  
SAND



CLAYSTONE



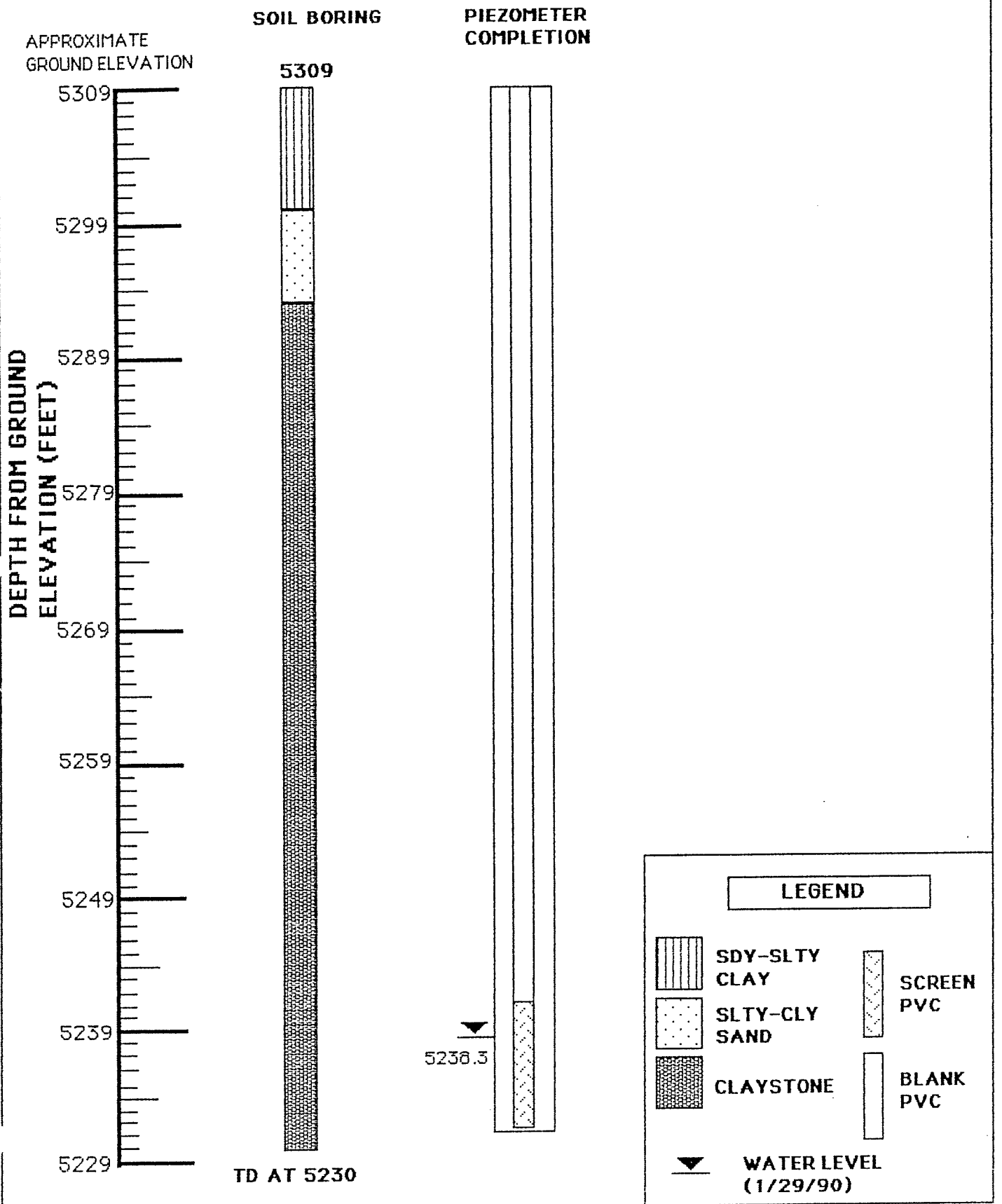
SCREEN  
PVC



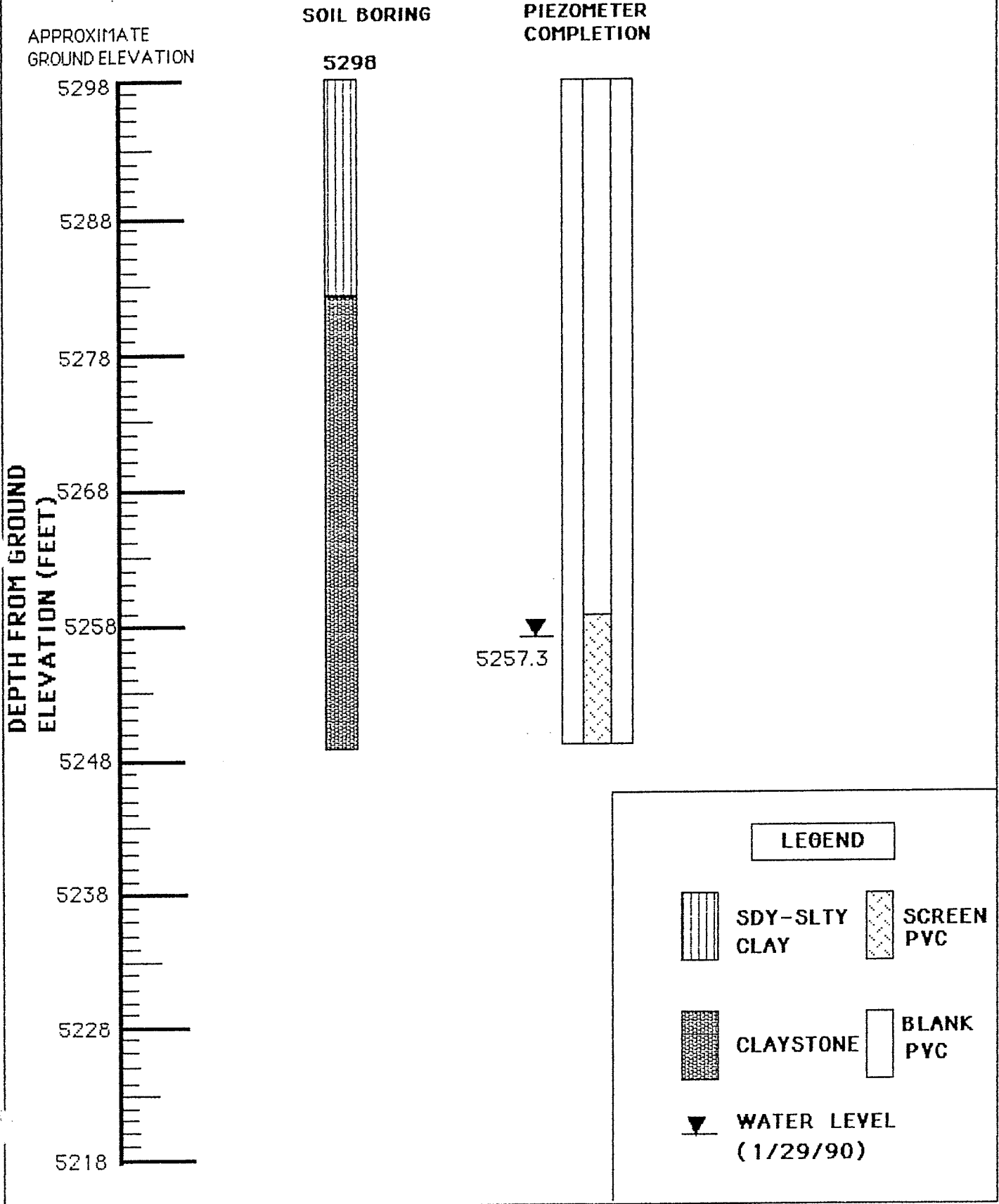
BLANK  
PVC



# LOG OF PIEZOMETER P-5



# LOG OF PIEZOMETER P-6



# LOG OF PIEZOMETER P-7

SOIL BORING

PIEZOMETER  
COMPLETION

APPROXIMATE  
GROUND ELEVATION

5316

DEPTH FROM GROUND  
ELEVATION (FEET)

5316

5305

5296

5286

5276

5266

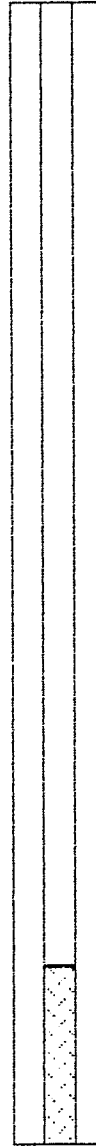
5256

5246

5236

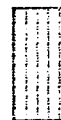


5256.6



5257.1

## LEGEND



SDY-SLTY  
CLAY



SCREEN  
PVC



CLAYSTONE

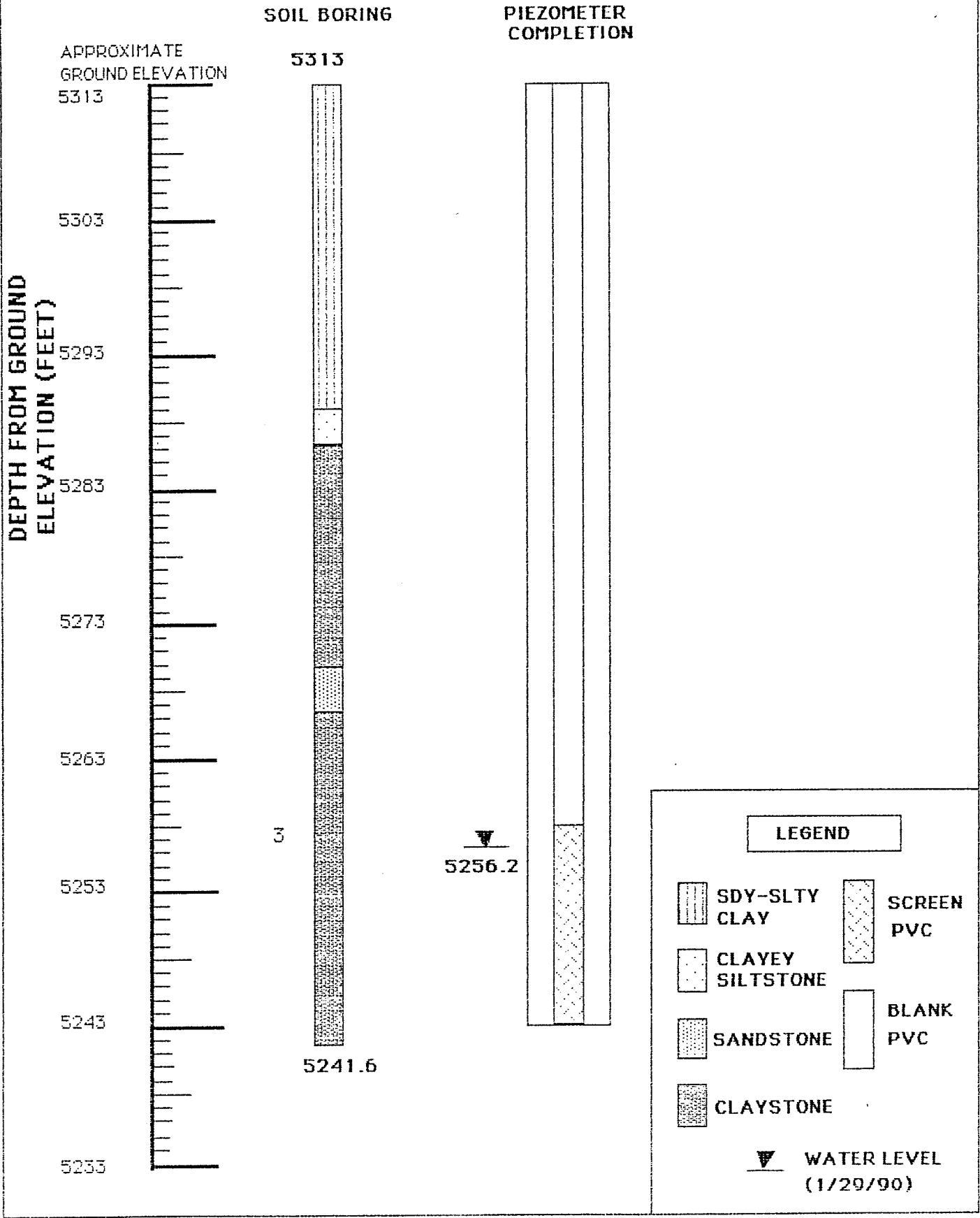


BLANK  
PVC

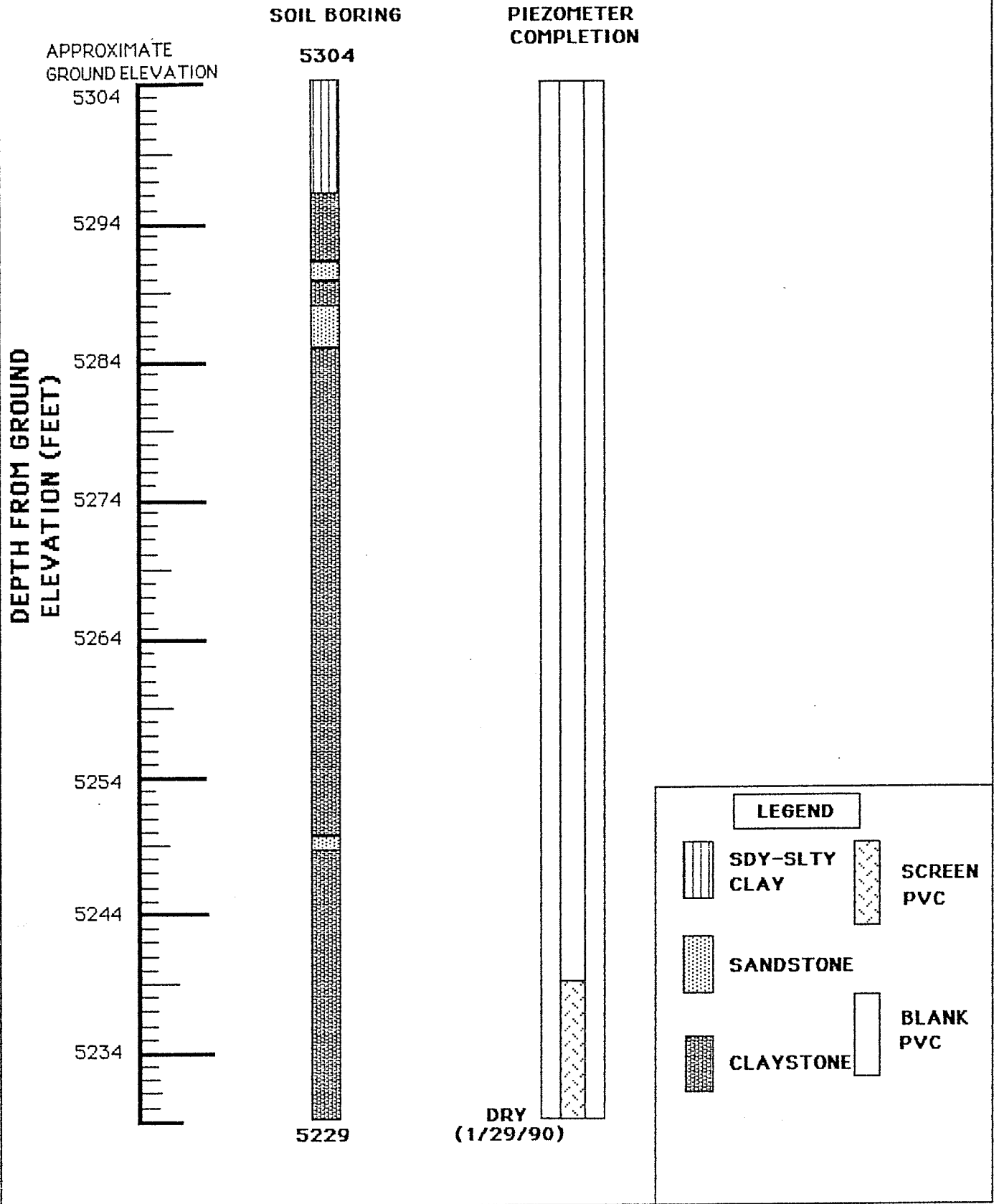


WATER LEVEL  
(1/29/90)

# LOG OF PIEZOMETER P-8

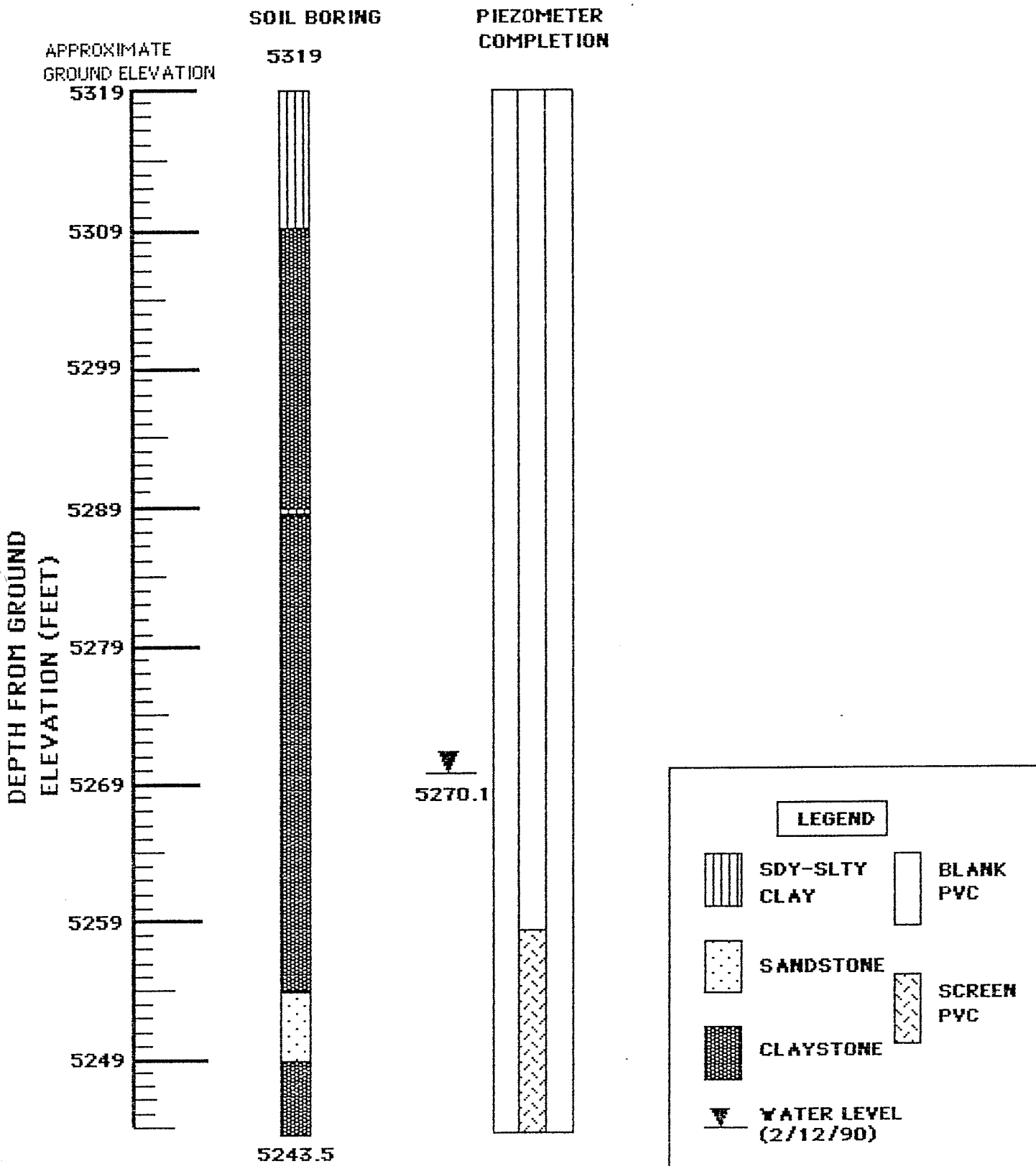


# LOG OF PIEZOMETER P-9

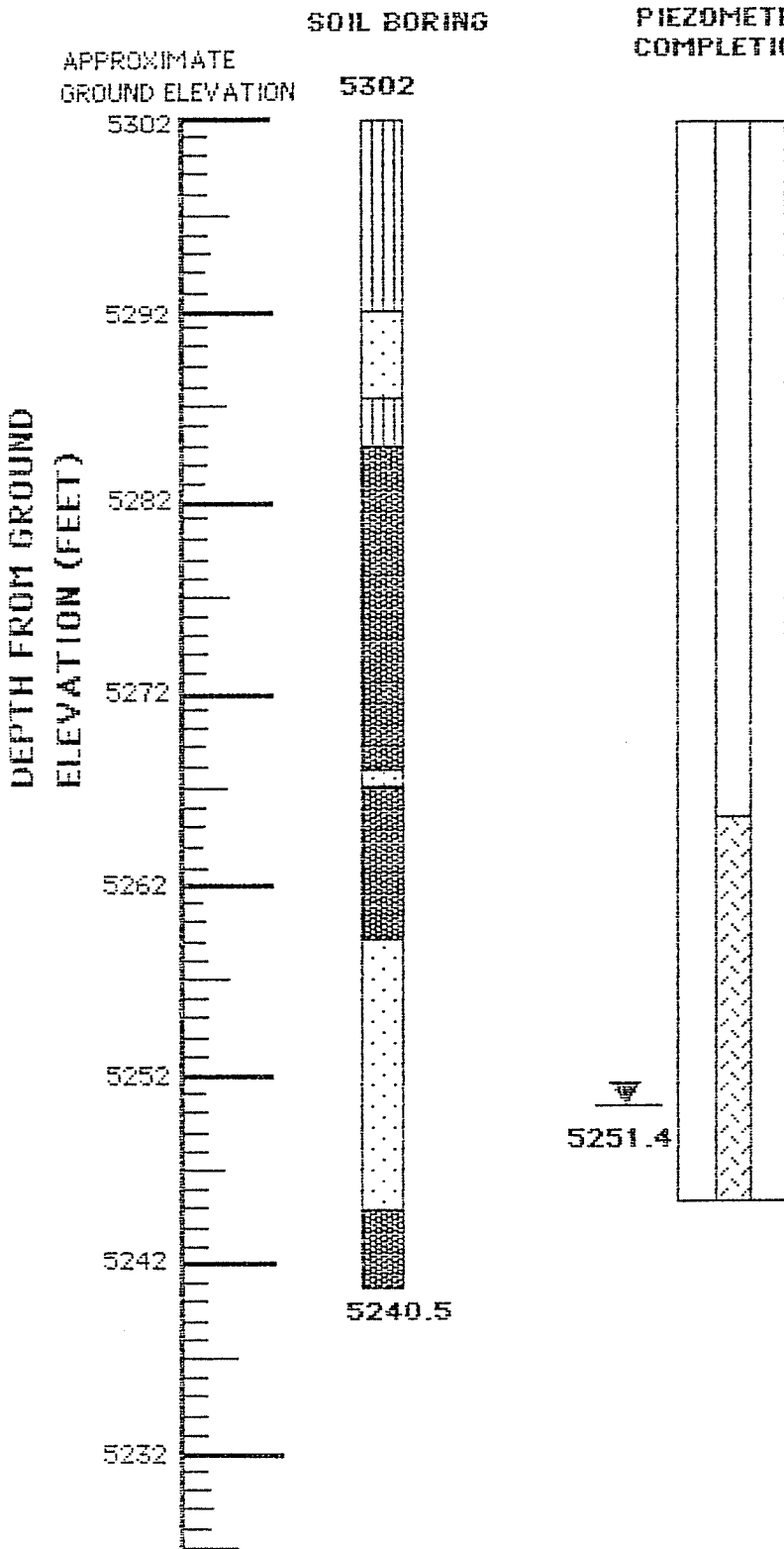




# LOG OF PIEZOMETER P-11



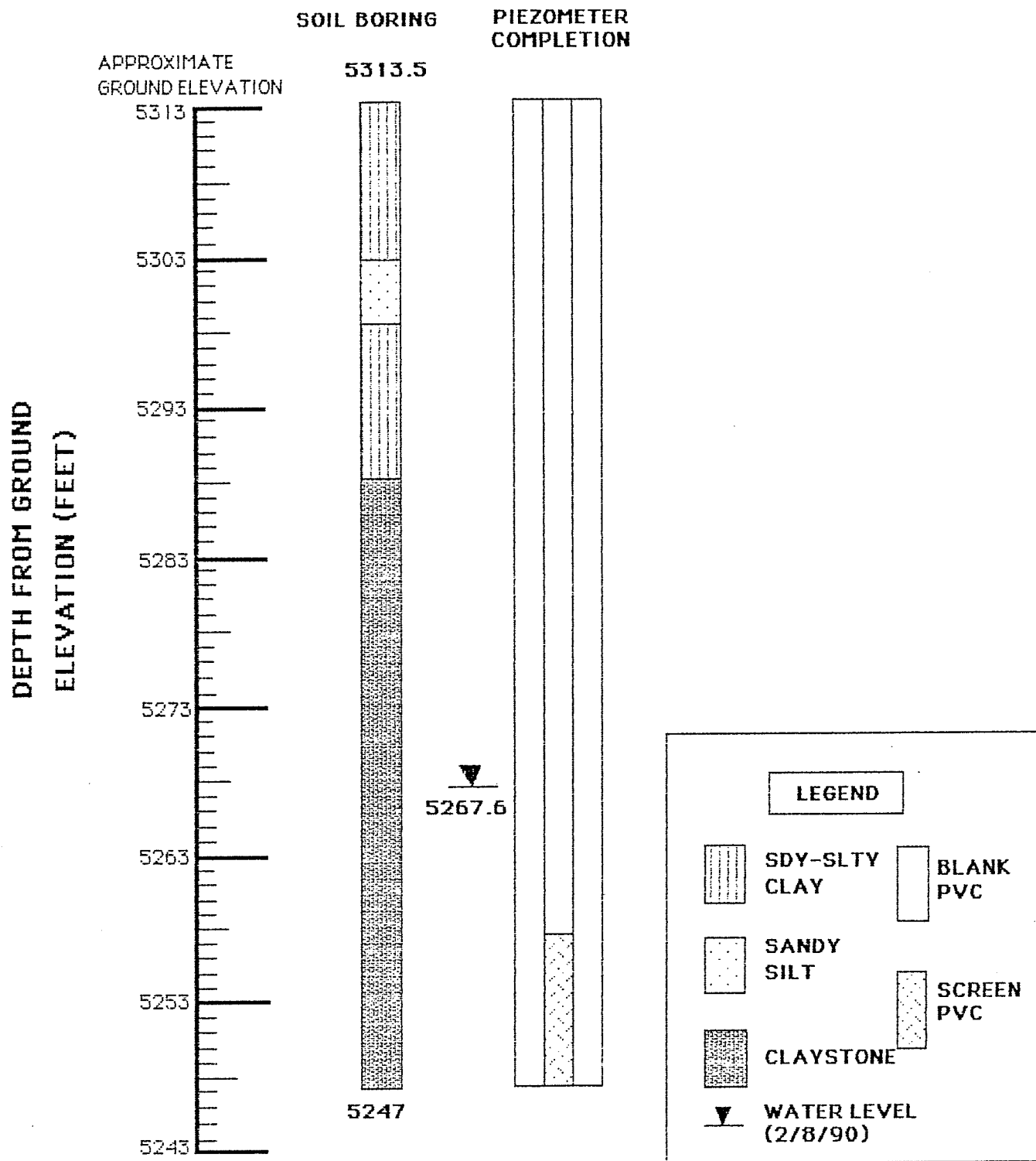
# LOG OF PIEZOMETER P-12



| LEGEND |               |                              |            |
|--------|---------------|------------------------------|------------|
|        | SDY-SLTY CLAY |                              | BLANK PVC  |
|        | SANDSTONE     |                              | SCREEN PVC |
|        | CLAYSTONE     | <b>WATER LEVEL (2/12/90)</b> |            |



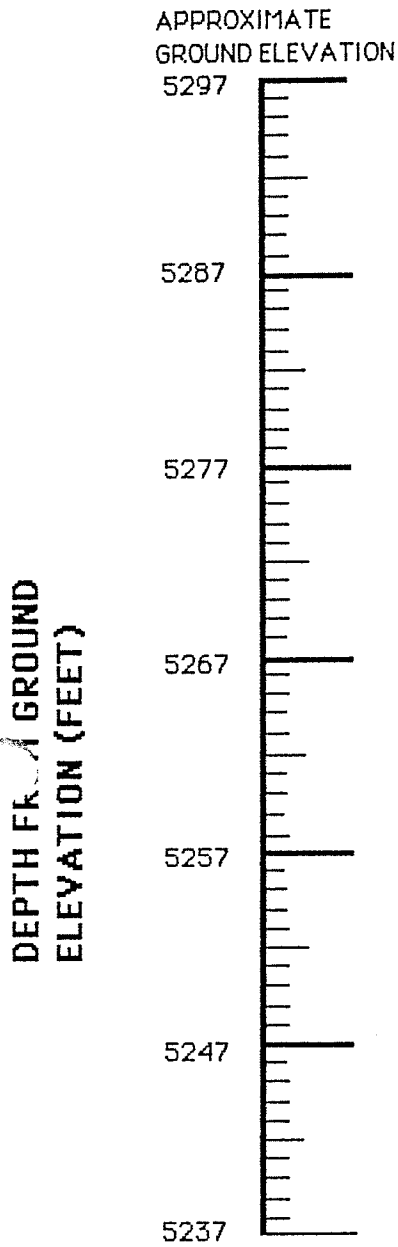
# LOG OF PIEZOMETER P-13



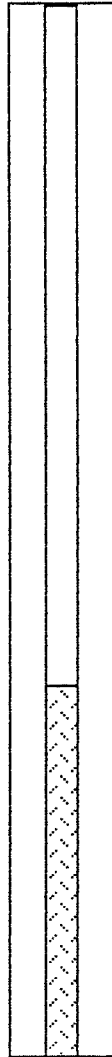


# LOG OF PIEZOMETER P-15

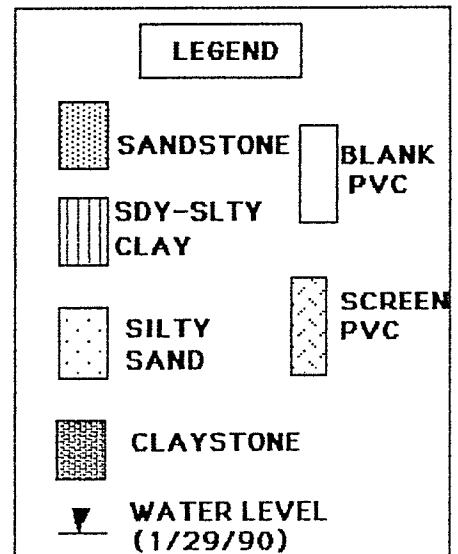
**SOIL BORING      PIEZOMETER  
COMPLETION**



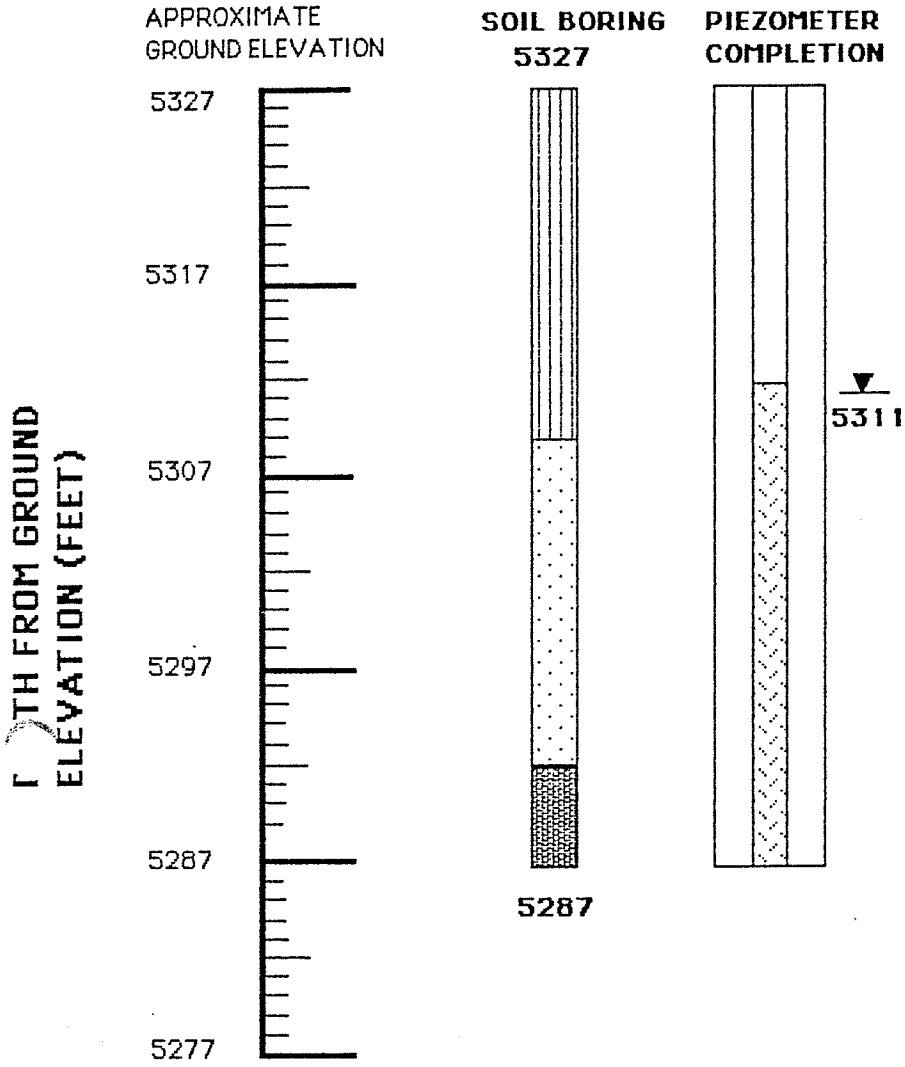
**5297**









▼  
**5250.5**



# LOG OF PIEZOMETER P-16

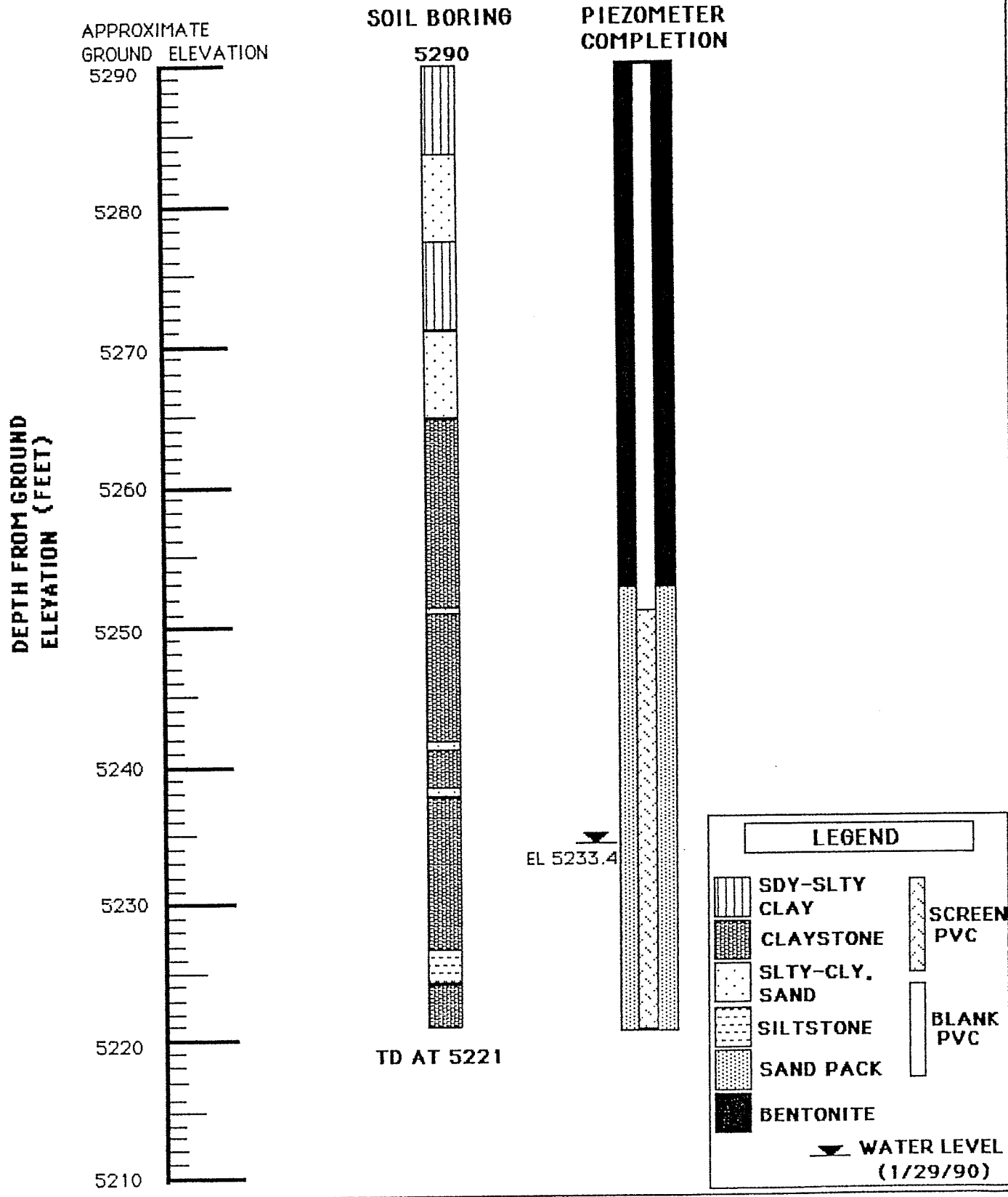


**LEGEND**

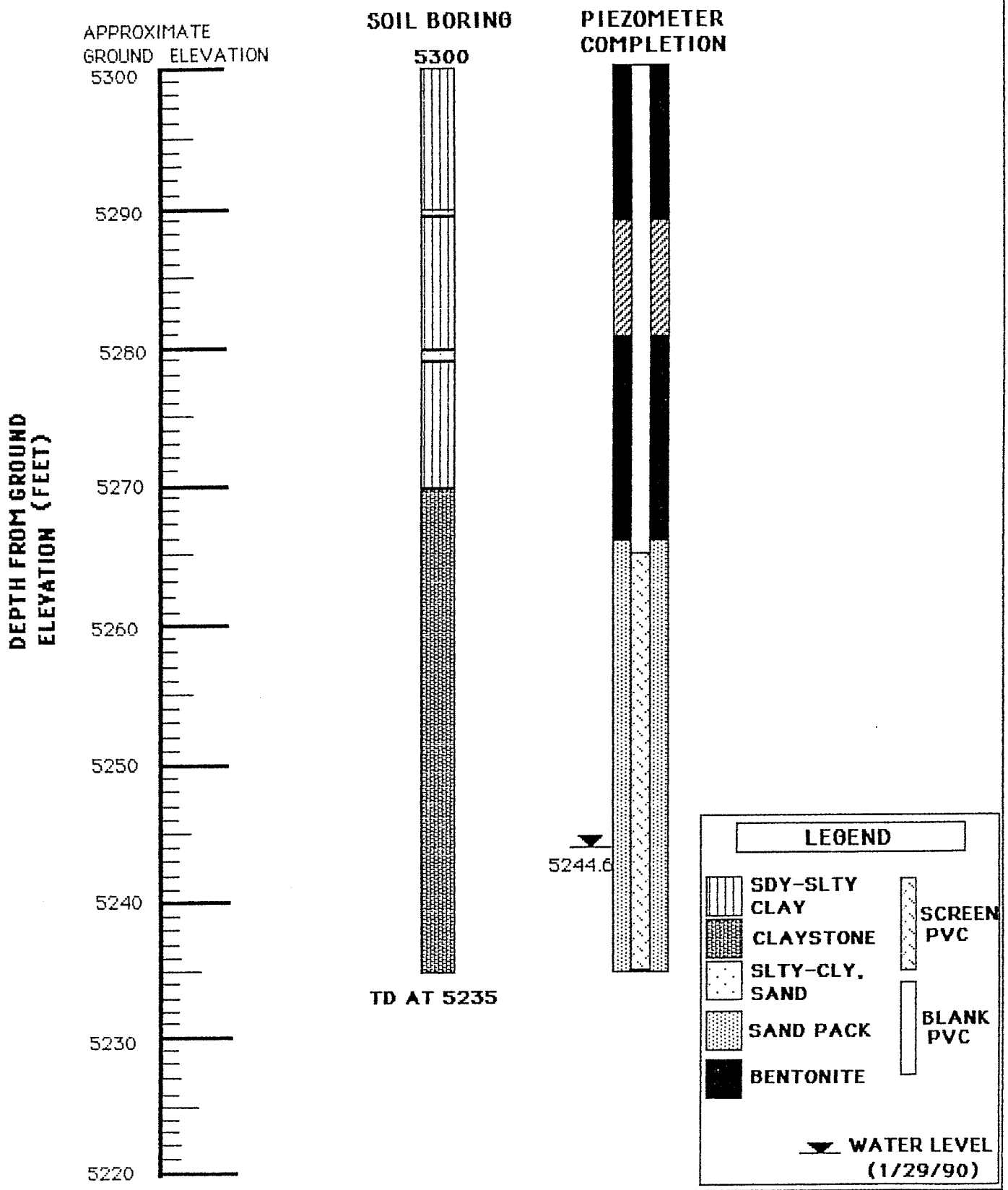
|   |  |
|---|--|
|  SDY-SLTY CLAY |  BLANK PVC  |
|  SILTY SAND    |  SCREEN PVC |
|  CLAYSTONE     |  |
|  WATER LEVEL   |  |

(1/29/90)

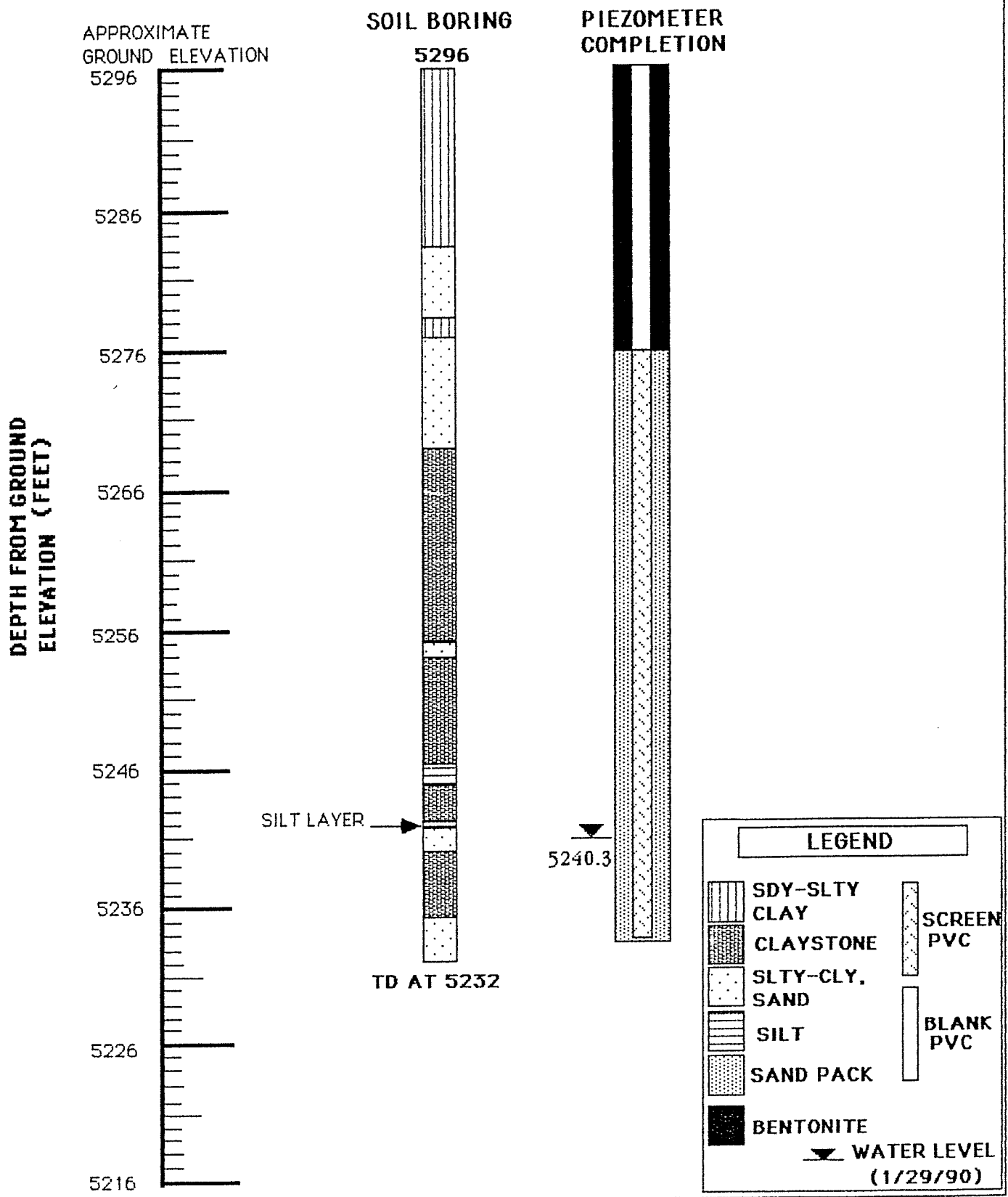
# LOG OF PIEZOMETER P-17



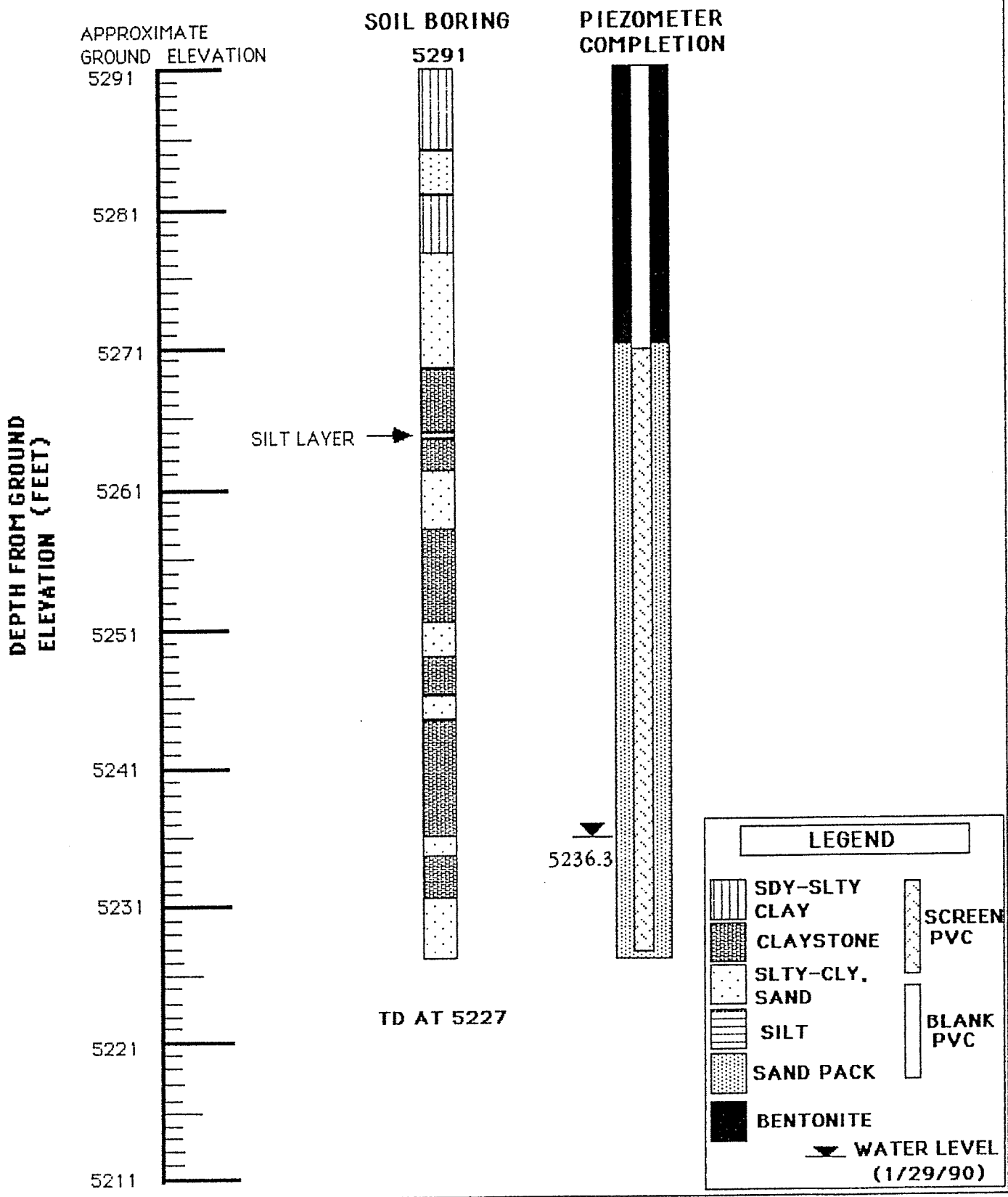
# LOG OF PIEZOMETER P-18



# LOG OF PIEZOMETER P- 19

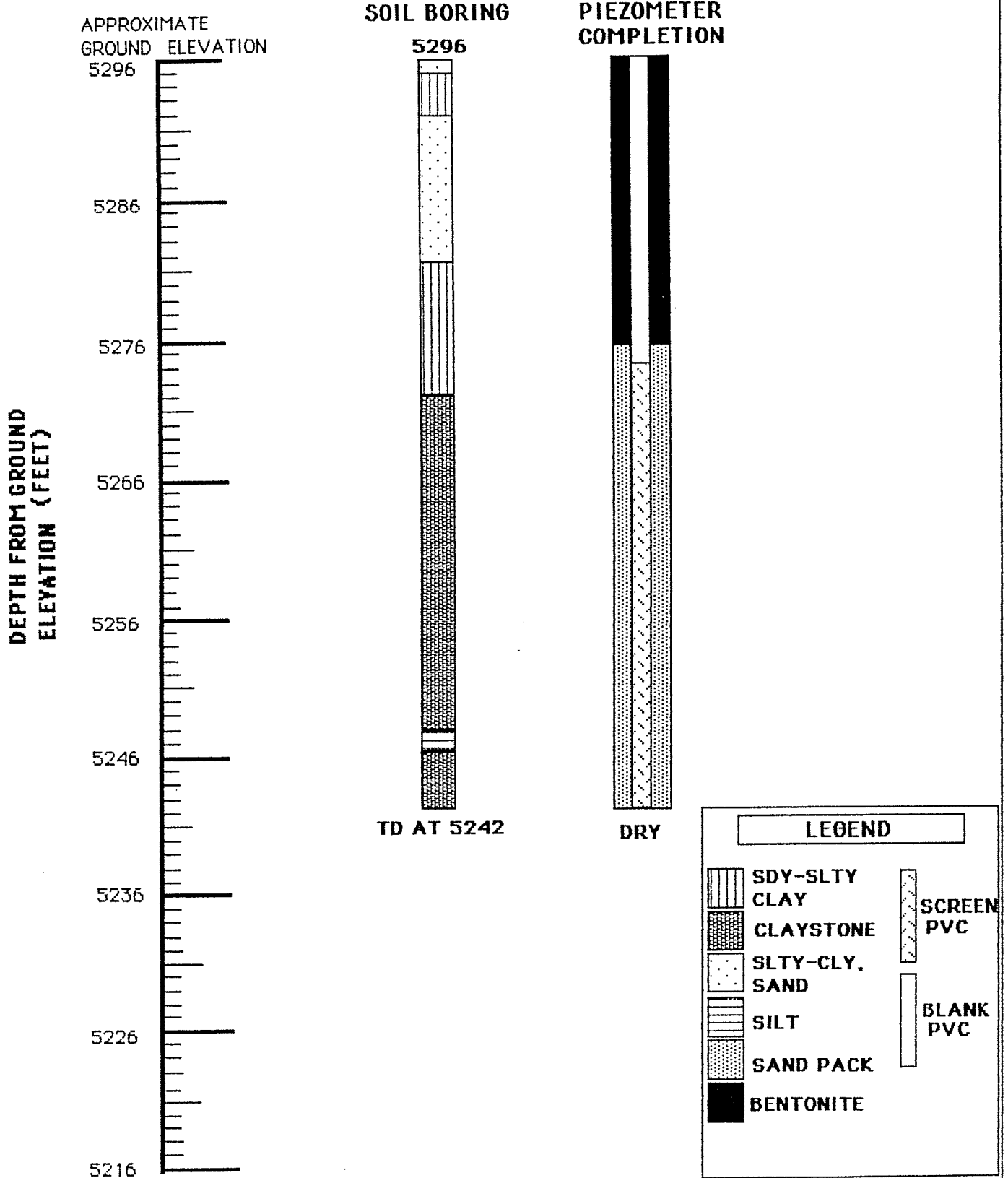


# LOG OF PIEZOMETER P- 20

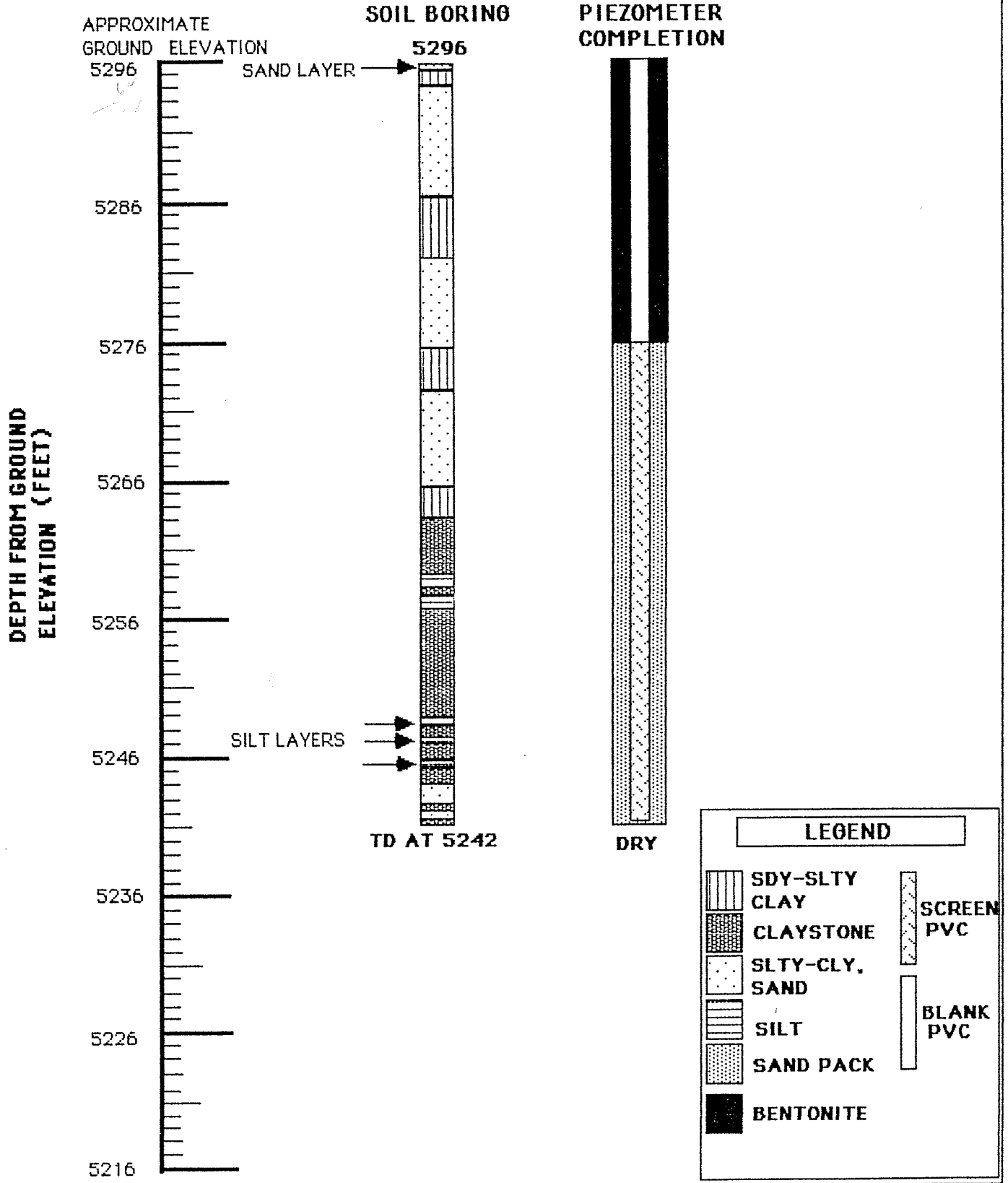




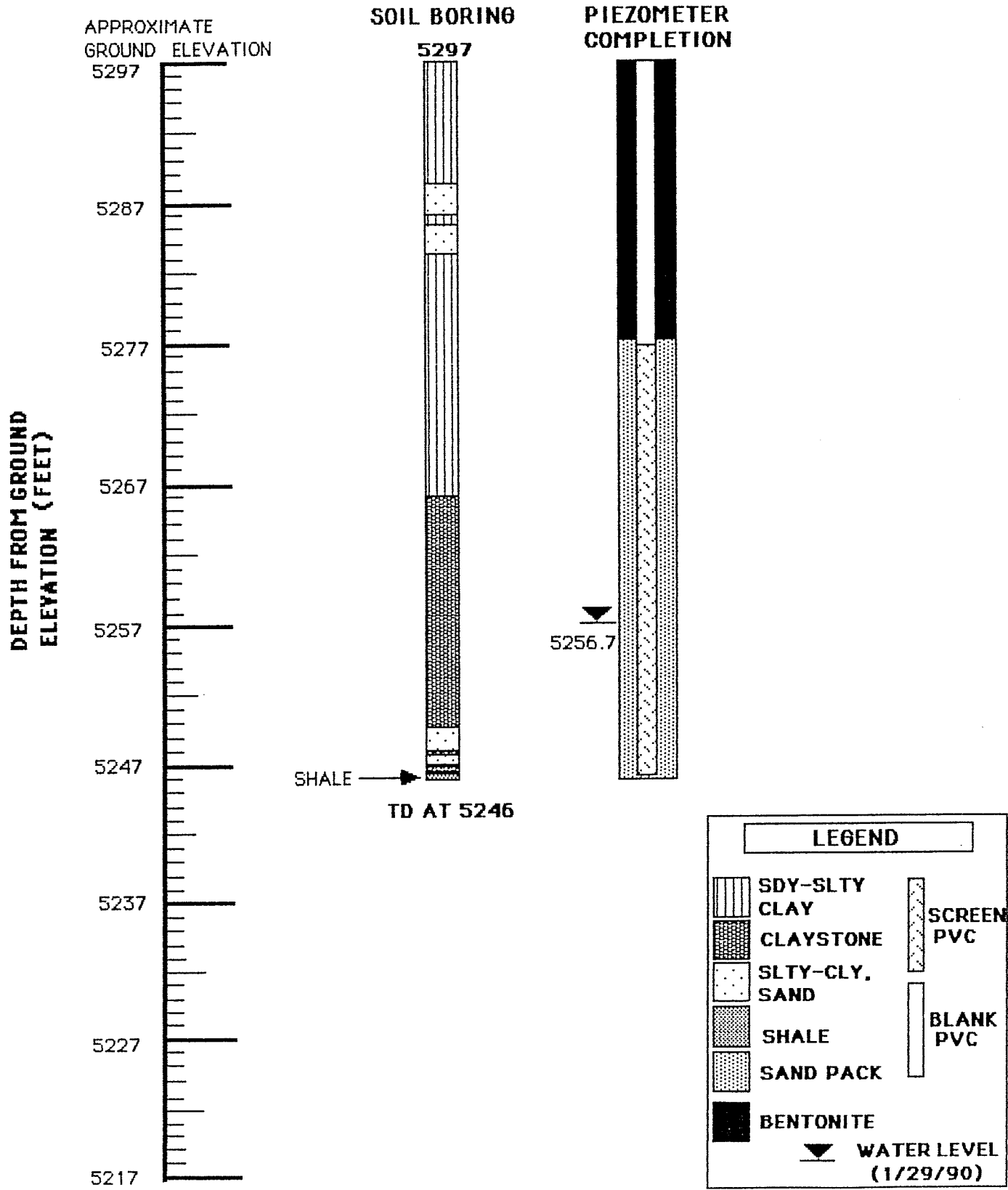
# LOG OF PIEZOMETER P-21



# LOG OF PIEZOMETER P-22

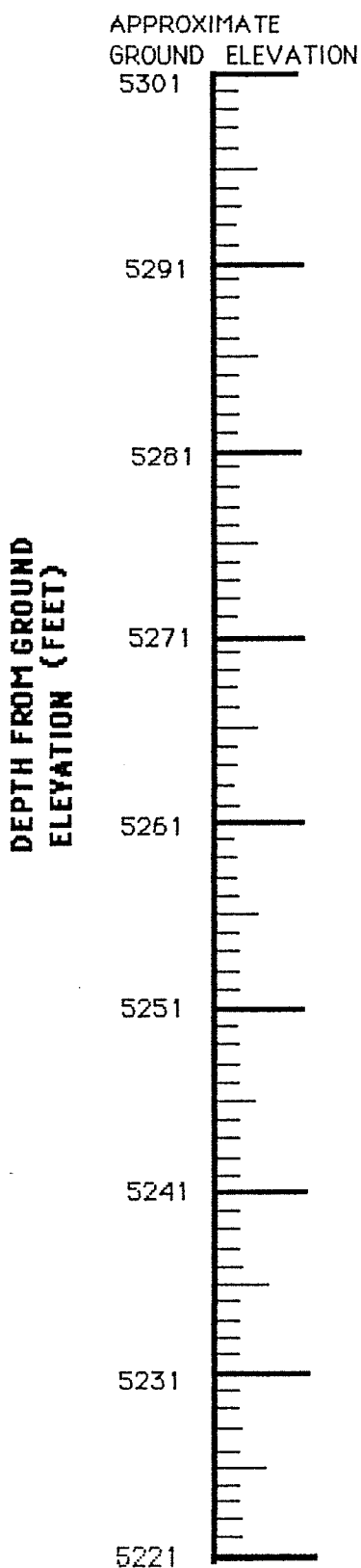


# LOG OF PIEZOMETER P-23





# LOG OF PIEZOMETER P-25



## SOIL BORING

5301

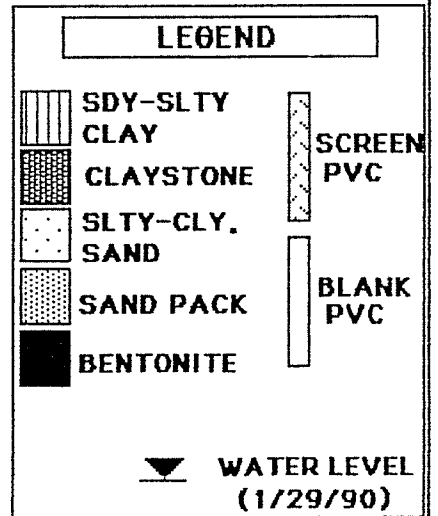


TD AT 5257

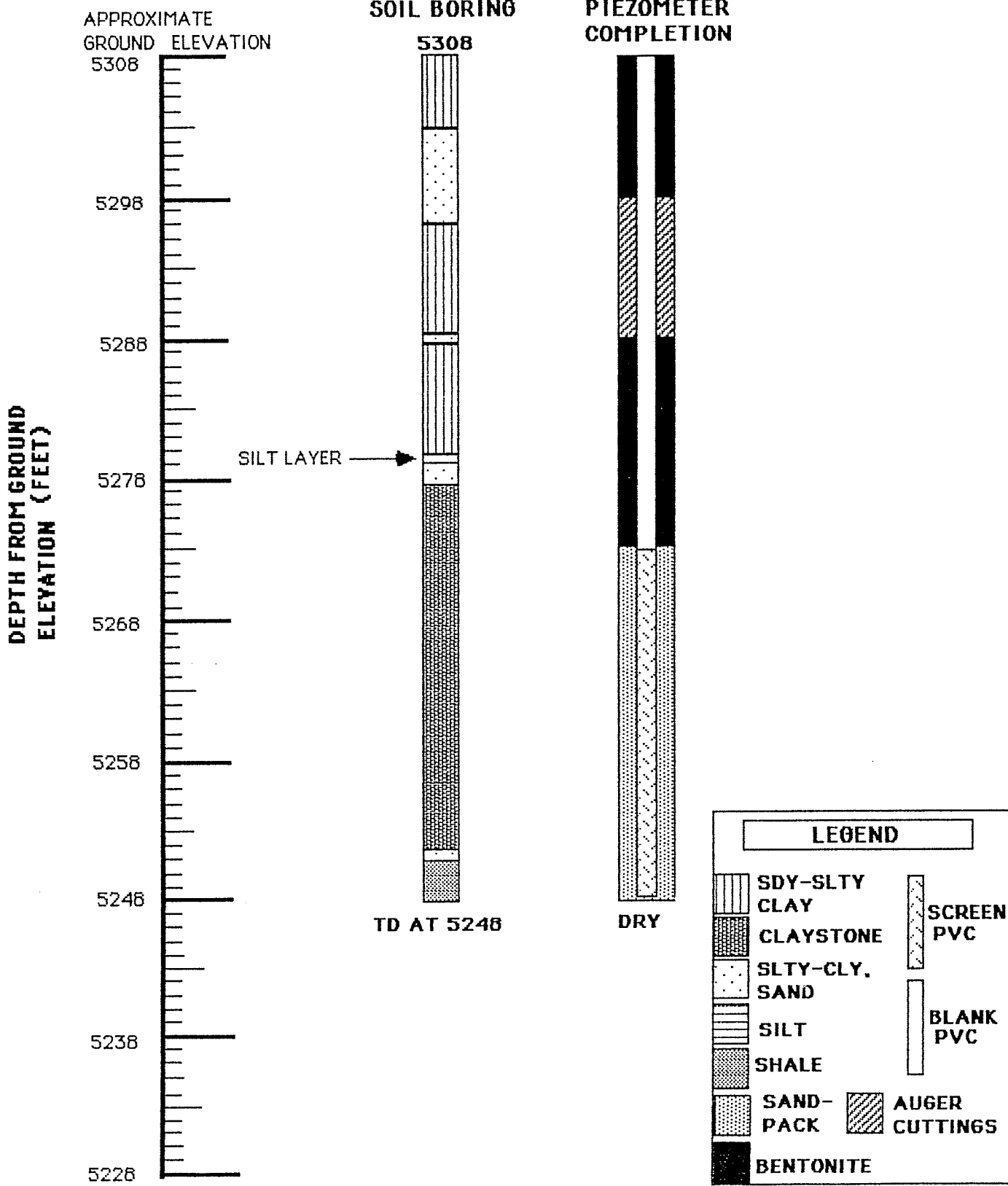
## PIEZOMETER COMPLETION



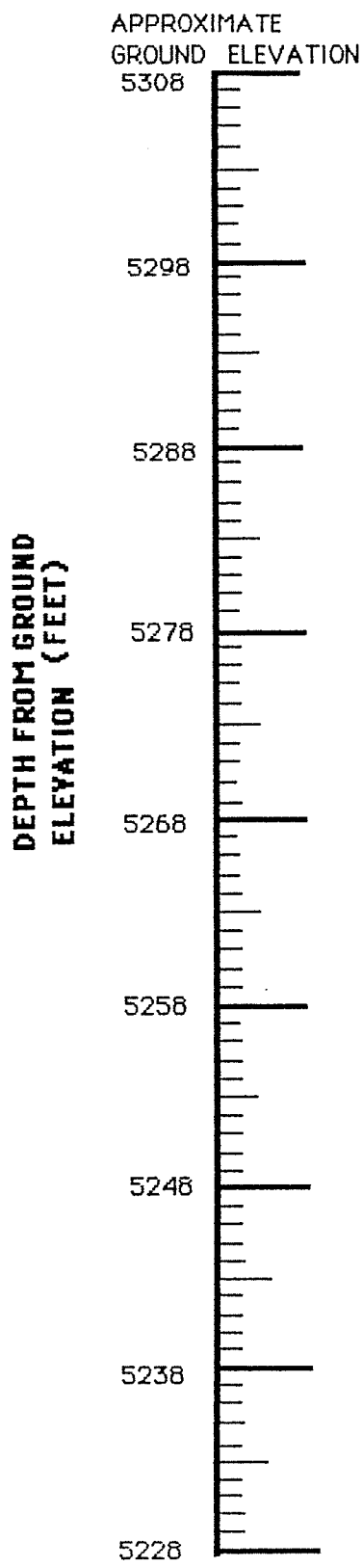
5258.7



# LOG OF PIEZOMETER P-26

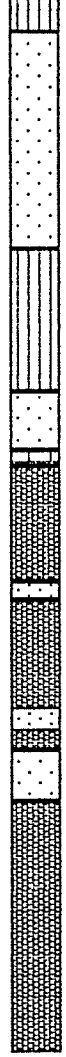


# LOG OF PIEZOMETER P-27



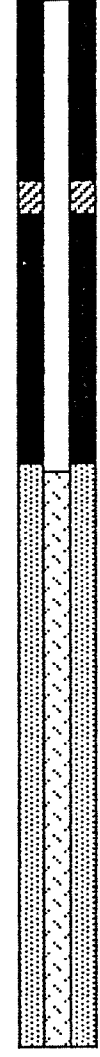
## SOIL BORING

5308










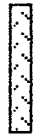

TD AT 5253.5

## PIEZOMETER COMPLETION

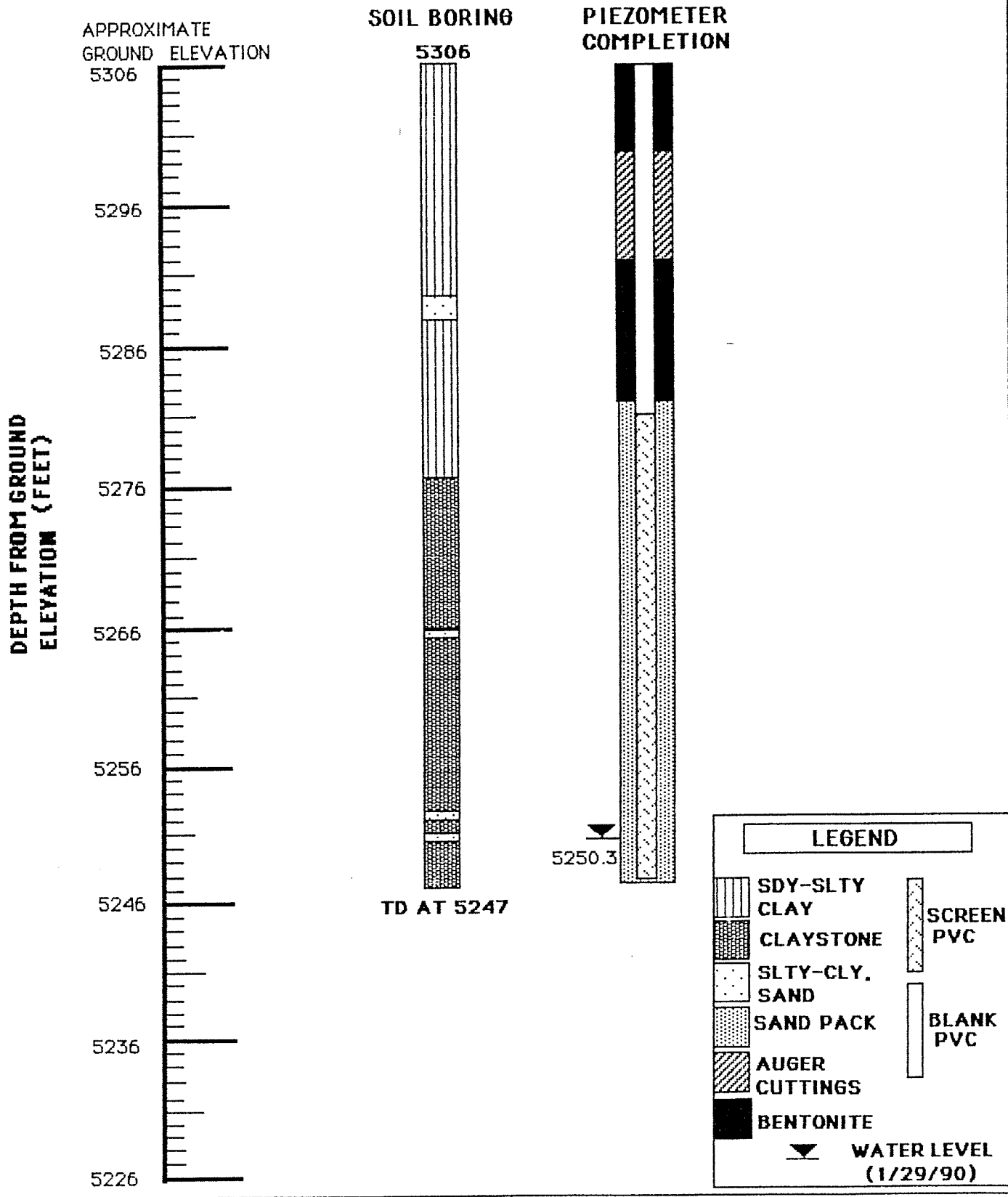


DRY

### LEGEND

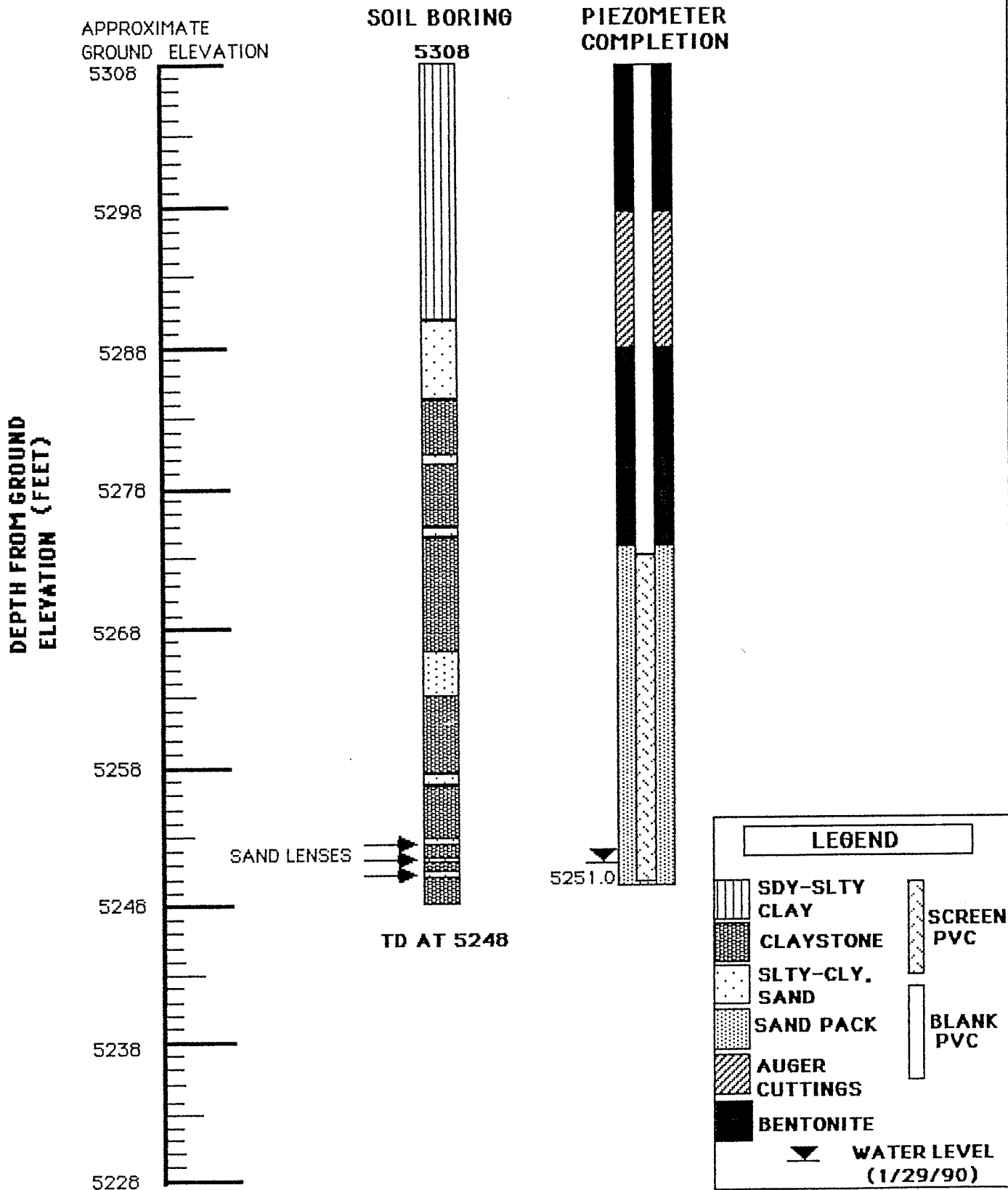
-  SDY-SLTY CLAY
-  CLAYSTONE
-  SLTY-CLY. SAND
-  LIMESTONE
-  SAND-PACK
-  AUGER CUTTINGS
-  BENTONITE
-  SCREEN PVC
-  BLANK PVC

# LOG OF PIEZOMETER P-28

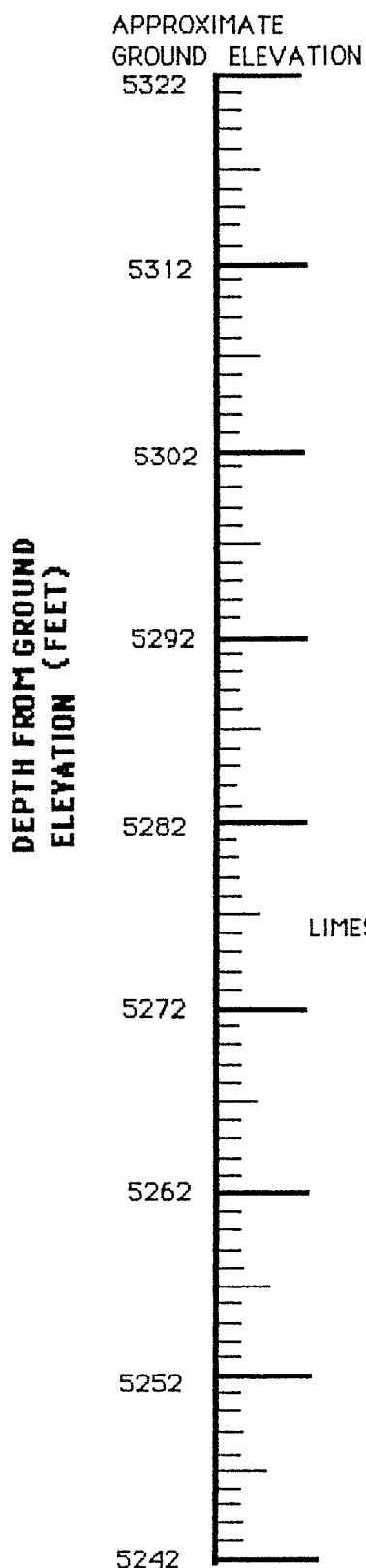




# LOG OF PIEZOMETER P-29

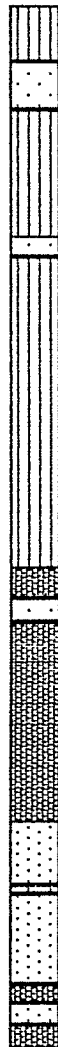


# LOG OF PIEZOMETER P-30



## SOIL BORING

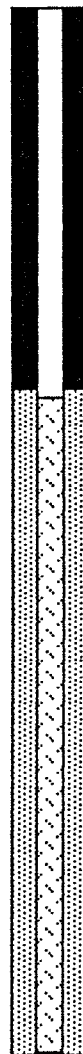
5322



TD AT 5268

LIMESTONE →

## PIEZOMETER COMPLETION

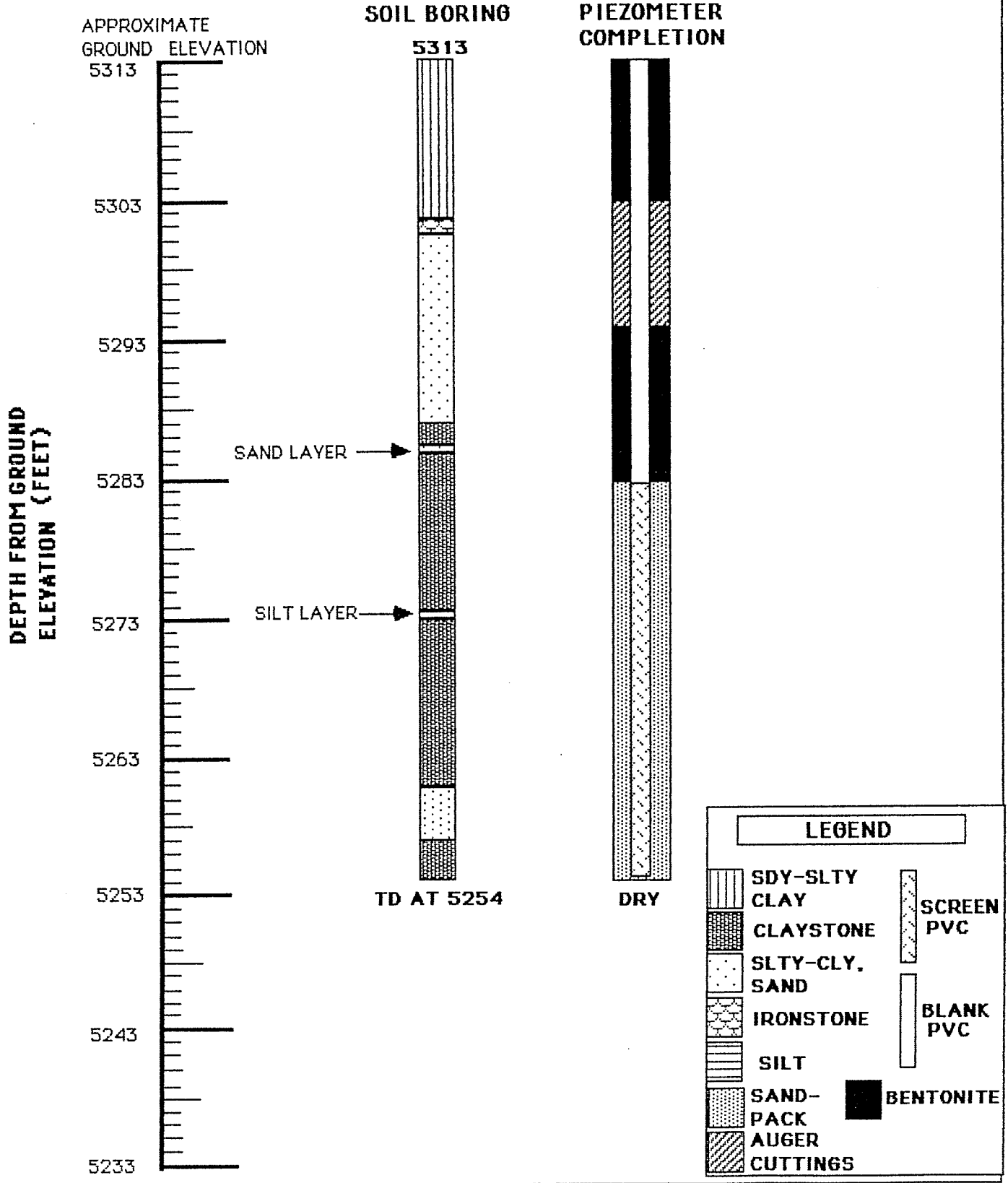


DRY

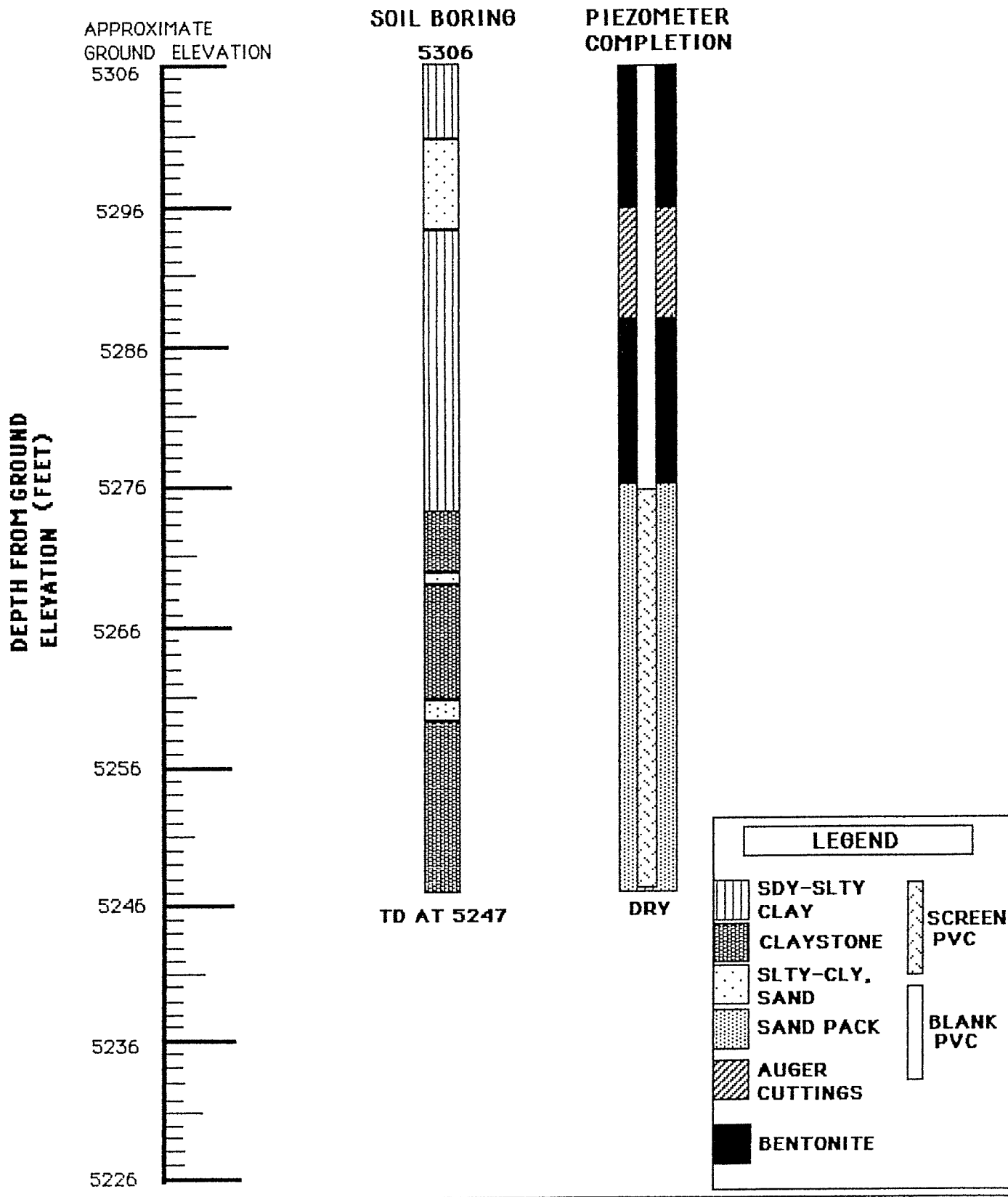
### LEGEND

- |  |                |  |            |
|--|----------------|--|------------|
|  | SDY-SLTY CLAY  |  | SCREEN PVC |
|  | CLAYSTONE      |  | BLANK PVC  |
|  | SLTY-CLY. SAND |  |            |
|  | LIMESTONE      |  |            |
|  | SAND PACK      |  |            |
|  | BENTONITE      |  |            |

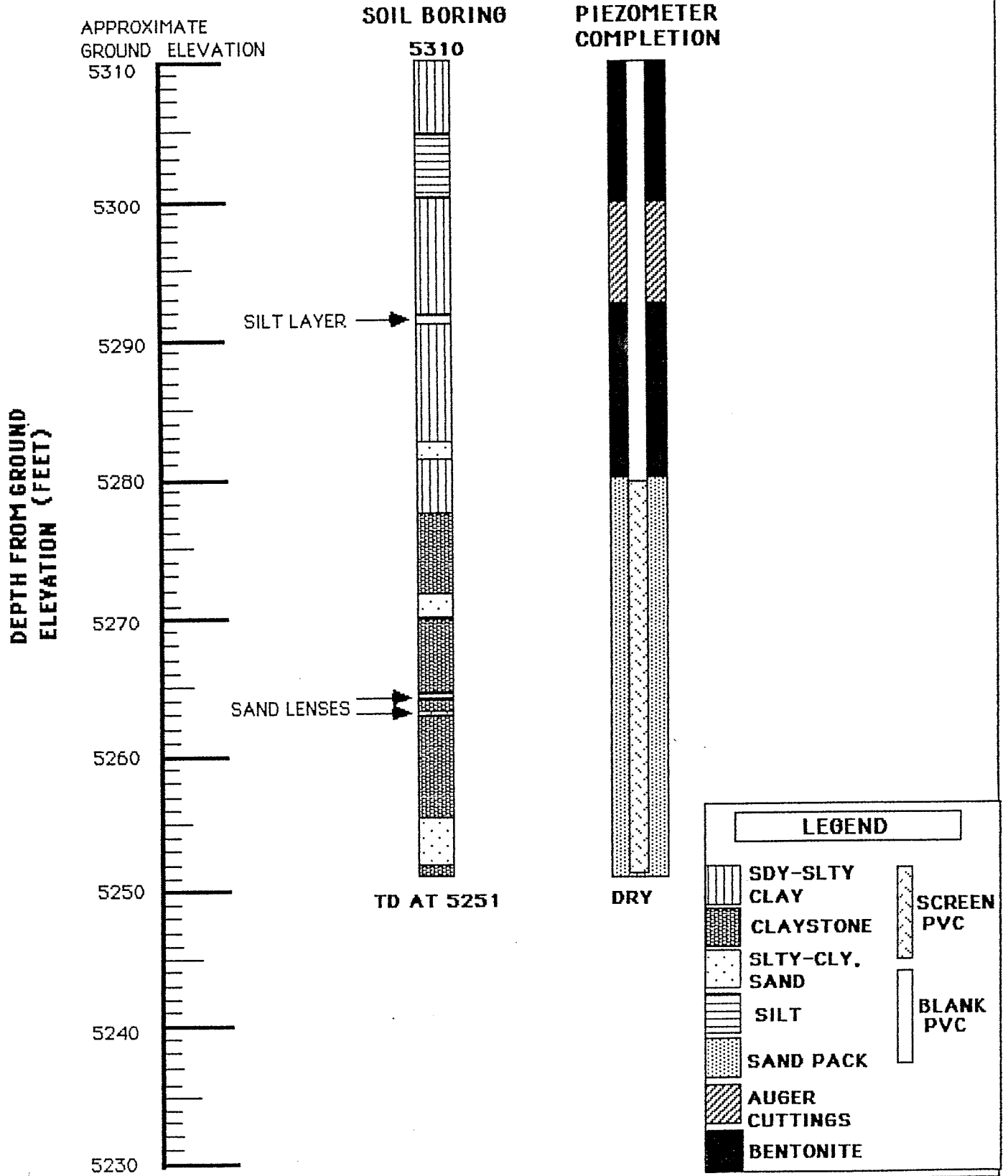
# LOG OF PIEZOMETER P-31



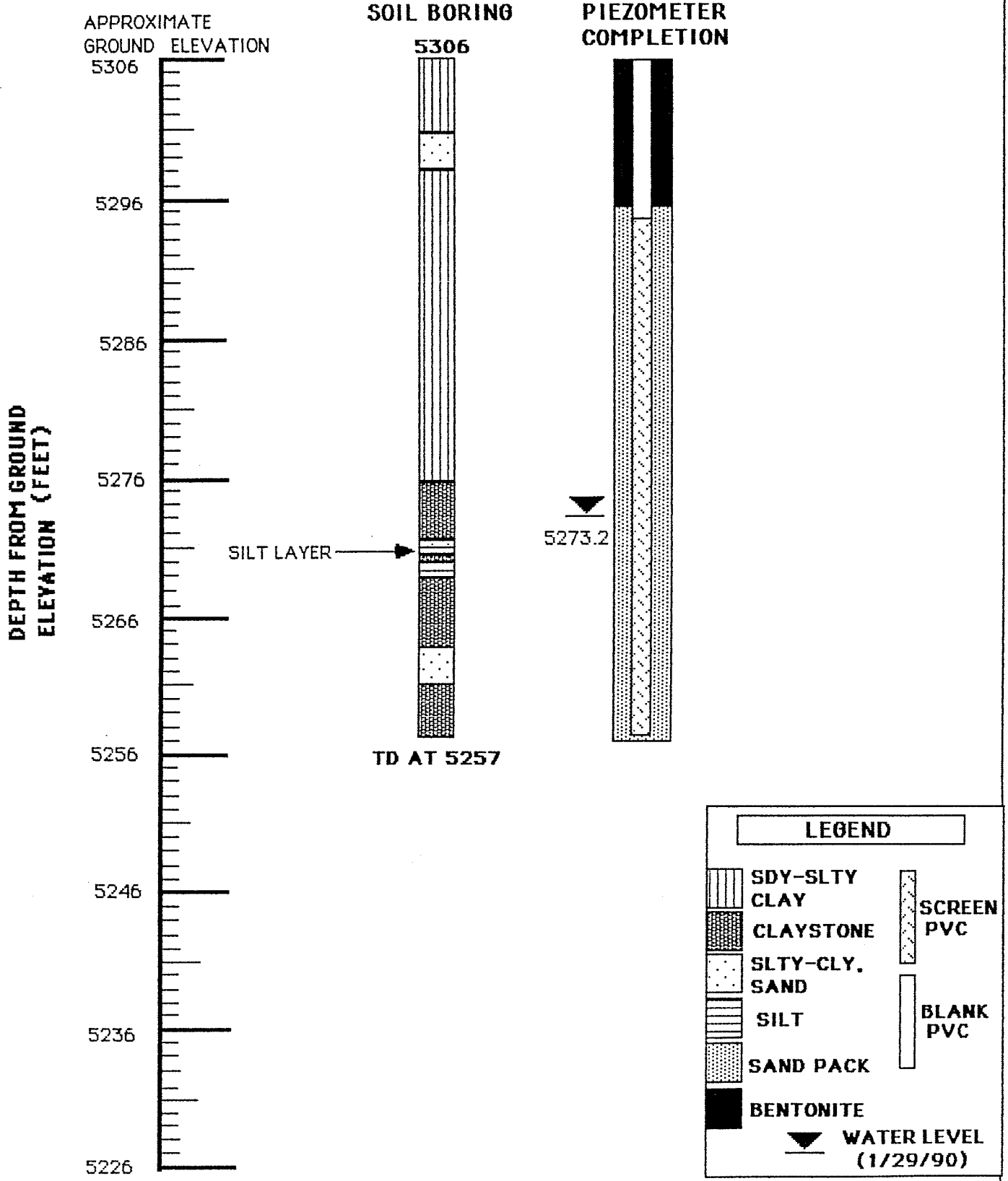
# LOG OF PIEZOMETER P-32



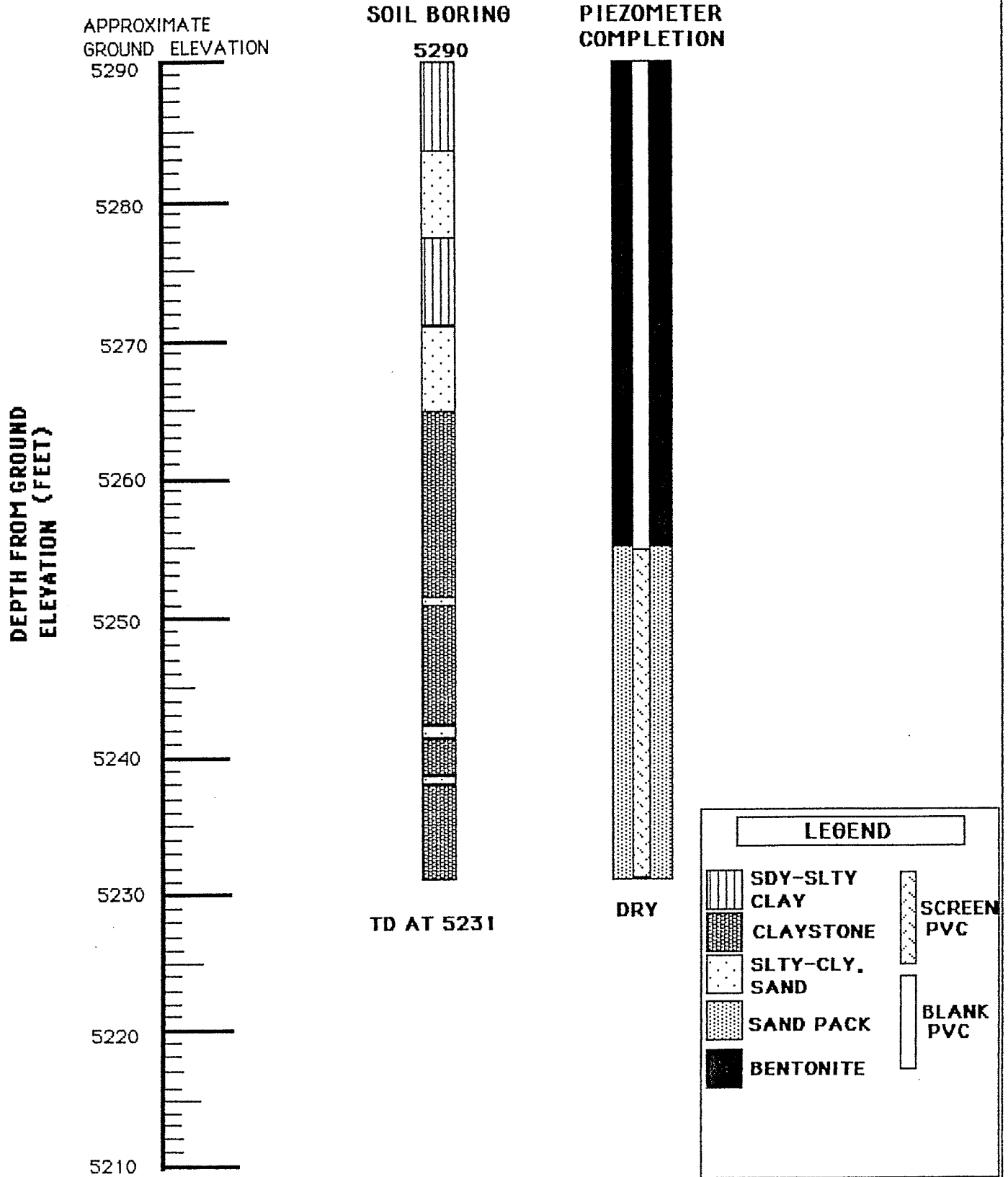
# LOG OF PIEZOMETER P-33



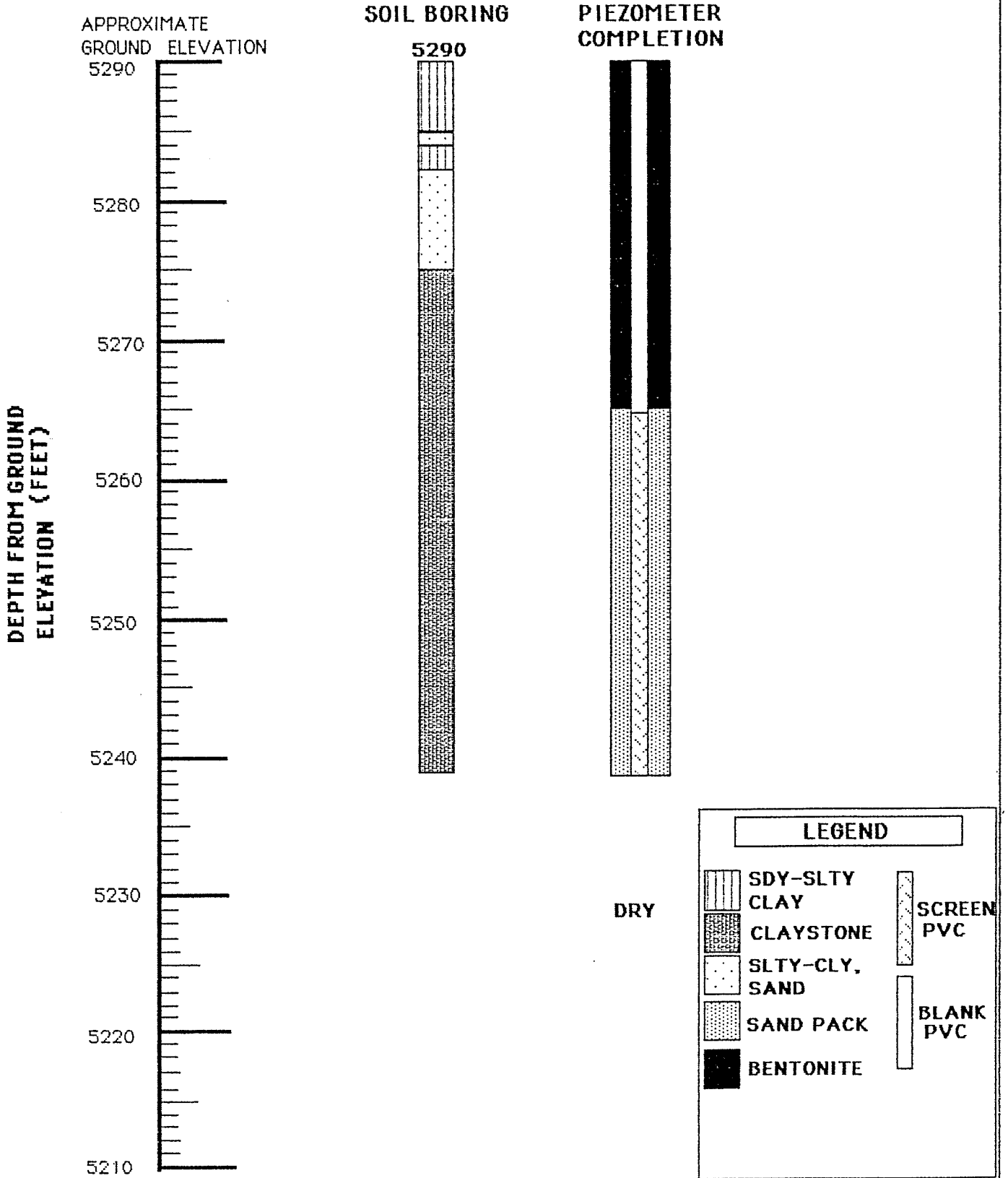
# LOG OF PIEZOMETER P-34



# LOG OF PIEZOMETER P-35



# LOG OF PIEZOMETER P-36





**APPENDIX G - WATER QUALITY RESULTS**

# Evergreen Analytical, Inc.



4036 Youngfield  
Wheat Ridge, Colorado 80033  
(303) 425-6021

RECEIVED OCT 3 1988

September 29, 1988

Industrial Compliance  
511 Orchard Rd.  
Golden, CO 80401

Attn: John Cocroft

Data Report: 88-09-584-5091

Dear Mr. Cocroft,

Attached are your analyses. If you have any questions concerning the reported information, please contact me.

The samples reported here will be disposed of 30 days after the above date unless other arrangements are made.

Thank you for using Evergreen Analytical.

Very truly yours,

A handwritten signature in cursive script that reads "John H. Barney".

John H. Barney  
President

encl.

cc: file

# Evergreen Analytical, Inc.



4036 Youngfield  
Wheat Ridge, Colorado 80033  
(303) 425-6021

## SAMPLE CROSS REFERENCE LIST

Client Industrial Compliance, Inc

Client Project # 1815 Lab Project # 5091

Date of Report September 29, 1988

| <u>Evergreen<br/>Sample No.</u> | <u>Client<br/>Sample No.</u> | <u>Analysis</u>                                     |
|---------------------------------|------------------------------|---|
| X5635 A                         | MW-1                         | Dissolved Metals, Ca, Fe<br>Mg, K, Na               |
| X5635 B                         | MW-1                         | Pesticides  |
| X5635 C/D                       | MW-1                         | TOC, TOX  |
| X5635 E/F                       | MW-1                         | Cl, TDS, Spec. Cond.,<br>Alka, $SO_4^{2-}$ , $NO_3$ |
| X5636 A                         | MW-2                         | Dissolved Metals, Ca, Fe<br>Mg, K, Na               |
| X5636 B                         | MW-2                         | Pesticides  |
| X5636 C/D                       | MW-2                         | TOC, TOX  |
| X5636 E/F                       | MW-2                         | Cl, TDS, Spec. Cond.<br>Alka, $SO_4^{2-}$ , $NO_3$  |

# Evergreen Analytical, Inc.



4036 Youngfield  
Wheat Ridge, Colorado 80033  
(303) 425-6021

Client Industrial Compliance, Inc.

Client Project # 1815 Lab Project # 5091

Date of Report September 29, 1988

|                  |                                      |                                      |
|------------------|--------------------------------------|--------------------------------------|
| Evergreen smpl # | X5635                                | X5636                                |
| Client sample #  | <u>MW-1</u>                          | <u>MW-2</u>                          |
| Alk              | 200.2 mg CaCO <sub>3</sub> to pH 4.5 | 173.9 mg CaCO <sub>3</sub> to pH 4.5 |
| Cl <sup>-</sup>  | 336 ppm                              | 78 ppm                               |
| TDS              | 4675 mg/L                            | 1515 mg/L                            |
| Nitrate          | 55.6 ppm                             | 79 ppm                               |
| Sp. Cond         | 3900 micromos                        | 1730 micromos                        |
| Sulfate          | 2463 ppm                             | 716 ppm                              |
| TOC              | 41 mg/L                              | 37 mg/L                              |
| TOX              | 157 ug/L                             | 94 ug/L                              |
| Pesticides       | none detected                        | none detected                        |

*Note: The TDS and Sp. Cond. values have been transposed for MW-1 and MW-2.*

# Evergreen Analytical, Inc.



4036 Youngfield  
Wheat Ridge, Colorado 80033  
(303) 425-6021

## INORGANIC ANALYSIS DATA SHEET

Client Industrial Compliance Project No. 5091  
Client Sample No. MW-2 Date of Analysis 9/28-29/88  
Lab Sample No. X5636A

### Elements Identified and Measured\*

Matrix: Water  Soil \_\_\_\_\_ Sludge \_\_\_\_\_ Other \_\_\_\_\_

ug/l or mg/Kg dry weight (Circle one)

|                           |                              |
|---------------------------|------------------------------|
| 1. Aluminum _____         | 13. Magnesium <u>194,000</u> |
| 2. Antimony _____         | 14. Manganese _____          |
| 3. Arsenic _____          | 15. Mercury _____            |
| 4. Barium _____           | 16. Nickel _____             |
| 5. Beryllium _____        | 17. Potassium <u>22,500</u>  |
| 6. Cadmium _____          | 18. Selenium _____           |
| 7. Calcium <u>468,000</u> | 19. Silver _____             |
| 8. Chromium _____         | 20. Sodium <u>443,000</u>    |
| 9. Cobalt _____           | 21. Thallium _____           |
| 10. Copper _____          | 22. Tin _____                |
| 11. Iron <u>&lt;50</u>    | 23. Vanadium _____           |
| 12. Lead _____            | 24. Zinc _____               |
| Cyanide _____             | Percent Solids (%) _____     |

\*All concentrations corrected for reagent blanks

Comments: \_\_\_\_\_

Inorganic Supervisor *[Signature]*

Quality Assurance Officer *CM Smith*

# Evergreen Analytical, Inc.



4036 Youngfield  
Wheat Ridge, Colorado 80033  
(303) 425-6021

## INORGANIC ANALYSIS DATA SHEET

Client Industrial Compliance Project No. 5091  
Client Sample No. MW-1 Date of Analysis 9/28-29/88  
Lab Sample No. X5635A

### Elements Identified and Measured\*

Matrix: Water  Soil \_\_\_\_\_ Sludge \_\_\_\_\_ Other \_\_\_\_\_

ug/l or mg/Kg dry weight (Circle one)

|                          |                             |
|--------------------------|-----------------------------|
| 1. Aluminum _____        | 13. Magnesium <u>35,700</u> |
| 2. Antimony _____        | 14. Manganese _____         |
| 3. Arsenic _____         | 15. Mercury _____           |
| 4. Barium _____          | 16. Nickel _____            |
| 5. Beryllium _____       | 17. Potassium <u>43,100</u> |
| 6. Cadmium _____         | 18. Selenium _____          |
| 7. Calcium <u>83,000</u> | 19. Silver _____            |
| 8. Chromium _____        | 20. Sodium <u>274,000</u>   |
| 9. Cobalt _____          | 21. Thallium _____          |
| 10. Copper _____         | 22. Tin _____               |
| 11. Iron <u>&lt;50</u>   | 23. Vanadium _____          |
| 12. Lead _____           | 24. Zinc _____              |
| Cyanide _____            | Percent Solids (%) _____    |

\*All concentrations corrected for reagent blanks

Comments: \_\_\_\_\_

Inorganic Supervisor WKA

Quality Assurance Officer CM Smith

1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

METHOD BLANK  
WB9-22-88

Lab Name: EVERGREEN ANALYTICAL Contract: 5091

Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: \_\_\_\_\_

Matrix: (soil/water) WATER Lab Sample ID: WB9-22-88

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ECD1005

Level: (low/med) LOW Date Received: \_\_\_\_\_

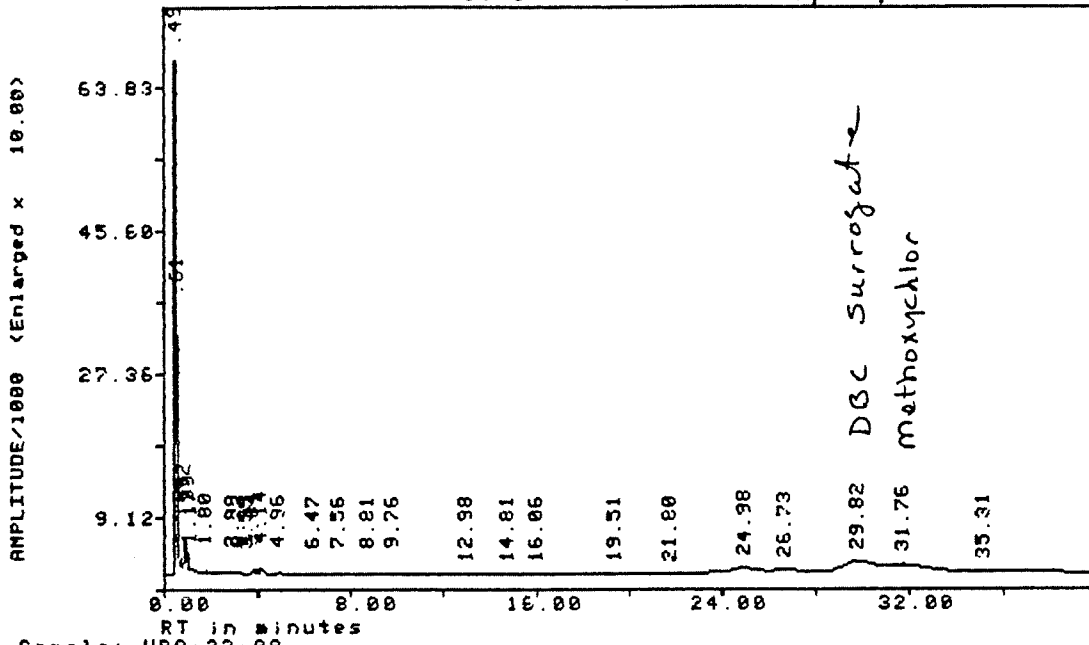
% Moisture: not dec. - dec. - Date Extracted: 9-22-88

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 9-23-88

GPC Cleanup: (Y/N) N pH: \_\_\_\_\_ Dilution Factor: 1

| CAS NO.    | COMPOUND            | CONCENTRATION UNITS:<br>(ug/L or ug/Kg) <u>ug/L</u> | Q |
|------------|---------------------|---|---|
| 319-84-6   | alpha-BHC           | 0.05  | U |
| 319-85-7   | beta-BHC            | 0.05  | U |
| 319-86-8   | delta-BHC           | 0.05  | U |
| 58-89-9    | gamma-BHC (Lindane) | 0.05  | U |
| 76-44-8    | Heptachlor          | 0.05  | U |
| 309-00-2   | Aldrin              | 0.05  | U |
| 1024-57-3  | Heptachlor epoxide  | 0.05  | U |
| 959-98-8   | Endosulfan I        | 0.05  | U |
| 60-57-1    | Dieldrin            | 0.10  | U |
| 72-55-9    | 4,4'-DDE            | 0.10  | U |
| 72-20-8    | Endrin              | 0.10  | U |
| 33213-65-9 | Endosulfan II       | 0.10  | U |
| 72-54-8    | 4,4'-DDD            | 0.10  | U |
| 1031-07-8  | Endosulfan sulfate  | 0.10  | U |
| 50-29-3    | 4,4'-DDT            | 0.10  | U |
| 72-43-5    | Methoxychlor        | 1.09  | B |
| 53494-70-5 | Endrin ketone       | 0.10  | U |
| 5103-71-9  | alpha-Chlordane     | 0.50  | U |
| 5103-74-2  | gamma-Chlordane     | 0.50  | U |
| 8001-35-2  | Toxaphene           | 1.0   | U |
| 12674-11-2 | Aroclor-1016        | 0.5   | U |
| 11104-28-2 | Aroclor-1221        | 0.5   | U |
| 11141-16-5 | Aroclor-1232        | 0.5   | U |
| 53469-21-9 | Aroclor-1242        | 0.5   | U |
| 12672-29-6 | Aroclor-1248        | 0.5   | U |
| 11097-69-1 | Aroclor-1254        | 1.0   | U |
| 11096-82-5 | Aroclor-1260        | 1.0   | U |

Method Blank 9/22/88



Sample: WB9-22-88  
Method: /DATA/ECD1BASE.MTH  
Result: ECD1005  
Injected on Fri Sep 23, 1988 4:48:43 pm



1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

MW-1

Lab Name: EVERGREEN ANALYTICAL Contract: 5091

Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: \_\_\_\_\_

Matrix: (soil/water) WATER Lab Sample ID: X5635 B

Sample wt/vol: 850 (g/mL) ml Lab File ID: ECD1006

Level: (low/med) LOW Date Received: 9-20-88

% Moisture: not dec. - dec. - Date Extracted: 9-22-88

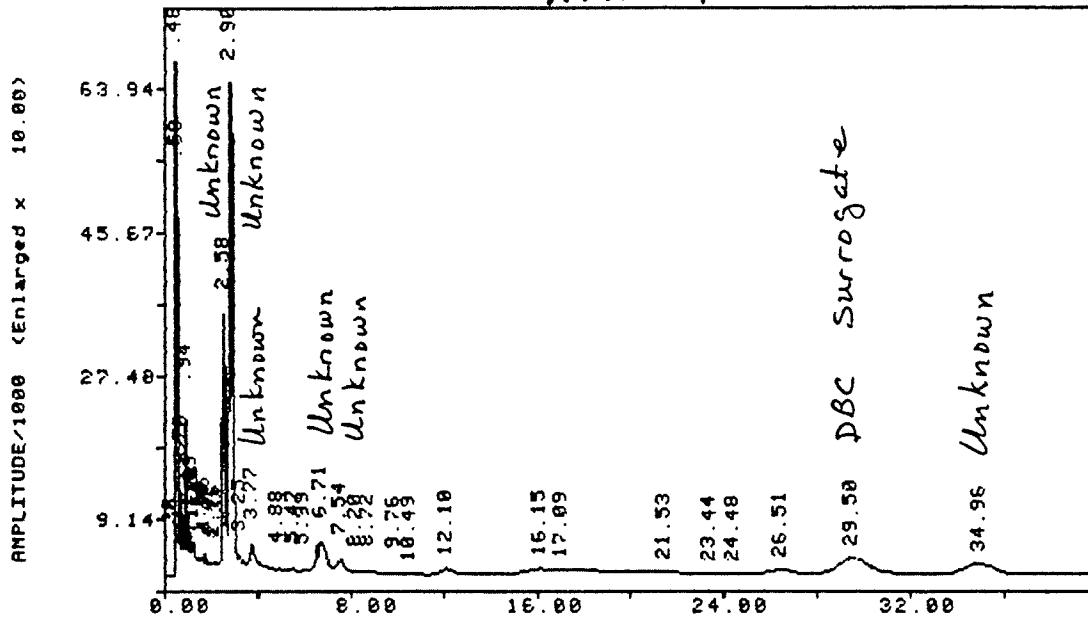
Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 9-23-88

GPC Cleanup: (Y/N) N pH: 6.0 Dilution Factor: 1.

CONCENTRATION UNITS:  
(ug/L or ug/Kg) ug/L

| CAS NO.    | COMPOUND            | CONCENTRATION UNITS:<br>(ug/L or ug/Kg) <u>ug/L</u> | Q |
|------------|---------------------|---|---|
| 319-84-6   | alpha-BHC           | 0.05  | u |
| 319-85-7   | beta-BHC            | 0.05  | u |
| 319-86-8   | delta-BHC           | 0.05  | u |
| 58-89-9    | gamma-BHC (Lindane) | 0.05  | u |
| 76-44-8    | Heptachlor          | 0.05  | u |
| 309-00-2   | Aldrin              | 0.05  | u |
| 1024-57-3  | Heptachlor epoxide  | 0.05  | u |
| 959-98-8   | Endosulfan I        | 0.05  | u |
| 60-57-1    | Dieldrin            | 0.10  | u |
| 72-55-9    | 4,4'-DDE            | 0.10  | u |
| 72-20-8    | Endrin              | 0.10  | u |
| 33213-65-9 | Endosulfan II       | 0.10  | u |
| 72-54-8    | 4,4'-DDD            | 0.10  | u |
| 1031-07-8  | Endosulfan sulfate  | 0.10  | u |
| 50-29-3    | 4,4'-DDT            | 0.10  | u |
| 72-43-5    | Methoxychlor        | 0.50  | u |
| 53494-70-5 | Endrin ketone       | 0.10  | u |
| 5103-71-9  | alpha-Chlordane     | 0.50  | u |
| 5103-74-2  | gamma-Chlordane     | 0.50  | u |
| 8001-35-2  | Toxaphene           | 1.0   | u |
| 12674-11-2 | Aroclor-1016        | 0.5   | u |
| 11104-28-2 | Aroclor-1221        | 0.5   | u |
| 11141-16-5 | Aroclor-1232        | 0.5   | u |
| 53469-21-9 | Aroclor-1242        | 0.5   | u |
| 12672-29-6 | Aroclor-1248        | 0.5   | u |
| 11097-69-1 | Aroclor-1254        | 1.0   | u |
| 11096-82-5 | Aroclor-1260        | 1.0   | u |

MW-1



1D  
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

MW-2

Lab Name: EVERGREEN ANALYTICAL Contract: 5091

Lab Code: \_\_\_\_\_ Case No.: \_\_\_\_\_ SAS No.: \_\_\_\_\_ SDG No.: \_\_\_\_\_

Matrix: (soil/water) WATER Lab Sample ID: Y5636B

Sample wt/vol: 900 (g/mL) ml Lab File ID: ECD1007

Level: (low/med) LOW Date Received: 9-20-88

% Moisture: not dec. - dec. - Date Extracted: 9-22-88

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 9-23-88

GPC Cleanup: (Y/N) N pH: 6.0 Dilution Factor: 1

CAS NO.                      COMPOUND                      CONCENTRATION UNITS:  
(ug/L or ug/Kg) ug/L                      Q

|                 |                     |      |   |
|-----------------|---------------------|------|---|
| 319-84-6-----   | alpha-BHC           | 0.05 | u |
| 319-85-7-----   | beta-BHC            | 0.05 | u |
| 319-86-8-----   | delta-BHC           | 0.05 | u |
| 58-89-9-----    | gamma-BHC (Lindane) | 0.05 | u |
| 76-44-8-----    | Heptachlor          | 0.05 | u |
| 309-00-2-----   | Aldrin              | 0.05 | u |
| 1024-57-3-----  | Heptachlor epoxide  | 0.05 | u |
| 959-98-8-----   | Endosulfan I        | 0.05 | u |
| 60-57-1-----    | Dieldrin            | 0.10 | u |
| 72-55-9-----    | 4,4'-DDE            | 0.10 | u |
| 72-20-8-----    | Endrin              | 0.10 | u |
| 33213-65-9----- | Endosulfan II       | 0.10 | u |
| 72-54-8-----    | 4,4'-DDD            | 0.10 | u |
| 1031-07-8-----  | Endosulfan sulfate  | 0.10 | u |
| 50-29-3-----    | 4,4'-DDT            | 0.10 | u |
| 72-43-5-----    | Methoxychlor        | 0.50 | u |
| 53494-70-5----- | Endrin ketone       | 0.10 | u |
| 5103-71-9-----  | alpha-Chlordane     | 0.50 | u |
| 5103-74-2-----  | gamma-Chlordane     | 0.50 | u |
| 8001-35-2-----  | Toxaphene           | 1.0  | u |
| 12674-11-2----- | Aroclor-1016        | 0.5  | u |
| 11104-28-2----- | Aroclor-1221        | 0.5  | u |
| 11141-16-5----- | Aroclor-1232        | 0.5  | u |
| 53469-21-9----- | Aroclor-1242        | 0.5  | u |
| 12672-29-6----- | Aroclor-1248        | 0.5  | u |
| 11097-69-1----- | Aroclor-1254        | 1.0  | u |
| 11096-82-5----- | Aroclor-1260        | 1.0  | u |



**APPENDIX H - PACKER TEST RESULTS**



Industrial  
Compliance  
Incorporated

511 Orchard Street  
Golden, Colorado 80401

PACKER PERMEABILITY - DATA SHEET

Boring No. SB-29 Job No. CSI-2-1815  
 Boring Radius (r) 2" (ft) Engineer JEC  
 Depth of Boring (d) 60' (ft) Date 9/2/00  
 Depth to Static Water (A) 47.3 (ft) Flow Meter No. 41007029  
 Depth to Center of Packer (B) 38' (ft) Height of Gauge above  
 Gauge Pressure (P) 10 + 22 (psi) Ground Surface (C) 0 (ft)

| Flow Data |         |            |           | Notes |
|-----------|---------|------------|-----------|-------|
| Time      | Gallons | Cubic Feet | Flow Rate |       |
| 0         | 0       | 0          |           |       |
| 1         |         |            | 609.0     |       |
| 2         |         |            | 613.7     |       |
| 3         |         |            | 618.1     |       |
| 4         |         |            | 622.6     |       |
| 5         |         | 627.1      | 627.1     |       |
| 6         |         |            | 631.8     |       |
| 7         |         |            | 635.8     |       |
| 8         |         |            | 639.9     |       |
| 9         |         |            | 644.8     |       |
| 10        |         |            | 648.2     |       |
| 11        |         |            | 652.5     |       |
| 12        |         |            | 656.9     |       |
| 13        |         |            | 660.2     |       |
| 14        |         |            | 664.1     |       |
| 15        |         |            | 667.9     |       |
| 16        |         |            | 671.7     |       |
| 17        |         |            | 675.5     |       |
| 18        |         |            | 679.2     |       |
| 19        |         |            | 683.0     |       |
| 20        |         |            | 686.8     |       |
|           |         |            | 690.3     |       |

22 psi  
Flow Rate  
692.0  
697.7  
703.2  
708.4  
713.8  
719.0  
724.2  
729.2  
734.5  
739.4  
744.6

meter reading @ 574.5  
 Start @ 1242  
 Packer set at 71 psi  
 Bottom packer 40'  
 Center packer 38'  
 Constant psi  
 Completed @ 1:20

Average Q = \_\_\_\_\_ ft<sup>3</sup>/min

$K = \frac{Q}{2rLH} \ln \frac{L}{r} : L \geq 10r$   
 $K = \frac{Q}{2rLH} \sinh^{-1} \frac{L}{2r} : 10r > L \geq r$

CALCULATIONS  
 L = d - B  
 H = B + C + (L/2) + (P)(2.31) - S  
 where S = B + L/2 - A  
 Note: If no free water is encountered,  
 S = 0

BORING BR-29

$$L = d - B = 60' - 38' = 22'$$

$$S = 8 + \frac{1}{2} - A = 38' + 11' - 47.3' = 1.7'$$

$$C = 0$$

$$\text{for } P=10: H = 38' + 0' + 11' + 10(2.31) - 1.7' = 70.4'$$

$$\times \frac{\text{ft}^3}{450 \text{ gal} \cdot \text{sec}} = 2.2 \times 10^{-3}$$

$$Q: \textcircled{1} \text{ for } 0-5 \text{ min Flow rate} = \frac{631.8 - 609.0}{5 \text{ min}} = 22.8 \text{ gal}/5 \text{ min} = 4.56 \text{ gal}/\text{min} \times \frac{1 \text{ ft}^3}{7.48 \text{ gal}} \times \frac{1 \text{ min}}{60 \text{ sec}} = .01 \text{ ft}^3/\text{sec}$$

$$\textcircled{2} \text{ for } 5-10 \text{ min Flow rate} = \frac{652.5 - 631.8}{5 \text{ min}} = 4.14 \text{ gal}/\text{min} \times 2.2 \times 10^{-3} = 9.1 \times 10^{-3} \text{ ft}^3/\text{sec}$$

$$\textcircled{3} \text{ for } 10-15 \text{ min Flow rate} = \frac{671.7 - 652.5}{5 \text{ min}} = 3.84 \text{ gal}/\text{min} \times 2.2 \times 10^{-3} = 8.4 \times 10^{-3} \text{ ft}^3/\text{sec}$$

$$\textcircled{4} \text{ for } 15-20 \text{ min Flow rate} = \frac{690.3 - 671.7}{5 \text{ min}} = 3.72 \text{ gal}/\text{min} \times 2.2 \times 10^{-3} = 8.2 \times 10^{-3} \text{ ft}^3/\text{sec}$$

$$Q_{\text{ave}} = \frac{\sum_{i=1}^4 Q_i}{4} = 8.9 \times 10^{-3} \text{ ft}^3/\text{sec}$$

$$r = .17' \quad L = 22' \quad \text{so } k = \frac{Q}{2\pi L H} \ln \frac{L}{r} \quad \frac{L}{r} = \frac{22}{.17} \quad \ln \frac{L}{r} = 4.9$$

$$k = \frac{8.9 \times 10^{-3} \text{ ft}^3/\text{s}}{2\pi(22)(70.4)} (4.9) = 4.5 \times 10^{-6} \text{ ft}/\text{s} \times \frac{30.48 \text{ cm}}{\text{ft}} = \underline{1.4 \times 10^{-4} \text{ cm/s}}$$

$$L = 22'$$

$$S = 1.7'$$

$$C = 0$$

$$H = 38' + 0' + 11' + 22(2.31) - 1.7' = 98.12'$$

$$Q: \textcircled{1} \text{ } 0-5 \text{ min} = \frac{719 - 692}{5 \text{ min}} = 5.4 \text{ gal}/\text{min} \times 2.2 \times 10^{-3} = .01 \text{ ft}^3/\text{sec}$$

$$\textcircled{2} \text{ } 5-10 \text{ min} = \frac{744.6 - 719}{5 \text{ min}} = 5.12 \text{ gal}/\text{min} \times 2.2 \times 10^{-3} = .01 \text{ ft}^3/\text{s}$$

$$Q_{\text{ave}} = .01 \text{ ft}^3/\text{s}$$

$$k = \frac{Q}{2\pi L H} \ln \frac{L}{r} = \frac{.01 \text{ ft}^3/\text{s}}{2\pi(22')(98.12')} (4.9) = 5.6 \times 10^{-6} \text{ ft}/\text{s} \times \frac{30.48 \text{ cm}}{\text{ft}} = \underline{1.1 \times 10^{-4} \text{ cm}}$$

$$k_{\text{ave}} = \underline{1.25 \times 10^{-4} \text{ cm/s}}$$



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PACKER PERMEABILITY - DATA SHEET

Boring No. SB-30 Job No. CSI 2-1815  
 Boring Radius (r) 2" (ft) Engineer JFC  
 Depth of Boring (d) 55 (ft) Date 8/24/88  
 Depth to Static Water (A) 47.7 (ft) Flow Meter No. 4 1007029  
 Depth to Center of Packer (B) 28 (ft) Height of Gauge above  
 Gauge Pressure (P) 10 (psi) Ground Surface (C) 0 at surface (ft)

| <u>Flow Data</u>   |                                 |                      |                  | <u>Notes</u>  |
|--------------------|---------------------------------|----------------------|------------------|---|
| <u>Time (Min.)</u> | <u>Meter reading</u><br>Gallons | <u>Cubic</u><br>Feet | <u>Flow Rate</u> |   |
| 0                  | 24 3.0                          |                      |                  | Length of pipe<br>14' 1"<br>10' 1"<br>6'<br><hr/> 30' 2"<br><br>Packer - single bladder - 44"<br>working length of 33"<br>packer placed w/ 50 psi |
| 1                  | 24 8.5                          |                      |                  |   |
| 2                  | 25 3.8                          |                      |                  |   |
| 3                  | 25 9.0                          |                      |                  |   |
| 4                  | 26 3.6                          |                      |                  |   |
| 5                  | 26 8.3                          |                      |                  |   |
| 6                  | 27 2.8                          |                      |                  |   |
| 7                  | 27 7.2                          |                      |                  |   |
| 8                  | 28 1.5                          |                      |                  |   |
| 9                  | 28 5.8                          |                      |                  |   |
| 10                 | 29 0.2                          |                      |                  |   |
| 11                 | 29 4.2                          |                      |                  |   |
| 12                 | 29 8.3                          |                      |                  |   |
| 13                 | 30 2.3                          |                      |                  |   |
| 14                 | 30 6.2                          |                      |                  |   |
| 15                 | 31 2.0                          |                      |                  |   |
| 16                 | 31 3.9                          |                      |                  |   |
| 17                 | 31 7.7                          |                      |                  |   |
| 18                 | 32 1.4                          |                      |                  |   |
| 19                 | 32 5.2                          |                      |                  |   |
| 20                 | 32 8.8                          |                      |                  |   |
|                    |                                 |                      | Average Q =      | ft <sup>3</sup> /min  |

$$K = \frac{Q}{2.3LH} \ln \frac{L}{r} \quad L \geq 10r$$

$$K = \frac{Q}{2.3LH} \sinh^{-1} \frac{L}{2r} \quad L \geq 10r > L \geq r$$

CALCULATIONS

$$L = d - B$$

$$H = B + C + (L/2) + (P)(2.31) - S$$

$$\text{where } S = B + L/2 - A$$

Note: If no free water is encountered,  
S = 0





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PACKER PERMEABILITY - DATA SHEET

Boring No. SB-30 Job No. CSI 2-1815  
 Boring Radius (r) 2" (ft) Engineer JEC  
 Depth of Boring (d) 55 (ft) Date 8/24/88  
 Depth to Static Water (A) 47.7 (ft) Flow Meter No. 41007029  
 Depth to Center of Packer (B) 28 (ft) Height of Gauge above  
 Gauge Pressure (P) 20 (psi) Ground Surface (C) 0 at surface (ft)

| <u>Flow Data</u> |                |                   |                         | <u>Notes</u> |
|------------------|----------------|-------------------|-------------------------|--------------|
| <u>Time</u>      | <u>Gallons</u> | <u>Cubic Feet</u> | <u>20 psi Flow Rate</u> |              |
| 0                |                | 0                 | 33 6.0                  |              |
| 1                |                |                   | 34 4.3                  |              |
| 2                |                |                   | 35 2.2                  |              |
| 3                |                |                   | 35 9.2                  |              |
| 4                |                |                   | 36 7.1                  |              |
| 5                |                |                   | 37 4.1                  |              |
| 6                |                |                   | 38 0.4                  |              |
| 7                |                |                   | 38 5.7                  |              |
| 8                |                |                   | 39 0.6                  |              |
| 9                |                |                   | 39 5.5                  |              |
| 10               |                |                   | 40 0.8                  |              |
| 11               |                |                   | 40 5.7                  |              |
| 12               |                |                   | 40 9.3                  |              |
| 13               |                |                   | 41 3.2                  |              |
| 14               |                |                   |                         |              |
| 15               |                |                   |                         |              |

30 psi

42 5.0  
43 2.1  
43 5.5  
44 3.6  
44 6.6  
45 2.6  
45 9.6  
46 7.2  
47 7.0

lower psi  
222620

psi surges

Average Q = ft<sup>3</sup>/min

$$K = \frac{Q}{2rLH} \ln \frac{L}{r} : L \geq 10r$$

$$K = \frac{Q}{2rLH} \sinh^{-1} \frac{L}{2r} : 10r > L \geq r$$

CALCULATIONS

L = d - B

H = B + C + (L/2) + (P)(2.31) - S

where S = B + L/2 - A

Note: If no free water is encountered, S = 0

BORING SB-30

PSI = 10

$$d - b = L = 55 - 28 = 27'$$

C = 0

$$S = D + \frac{L}{2} - A = 28 + 13.5 - 47.7 = -6.2'$$

$$H = 28 + 0 + 13.5 + 10(2.31) + 6.2 = 70.8'$$

Q: ① for 0-5 min =  $\frac{26.83 - 24.3}{5 \text{ min}} = .519 \text{ gal/min} \times 2.2 \times 10^{-3} = 1.1 \times 10^{-3} \text{ ft}^3/\text{s}$

② 5-10 min =  $\frac{29.02 - 26.83}{5 \text{ min}} = .44 \text{ gal/min} \times 2.2 \times 10^{-3} = 9.6 \times 10^{-4} \text{ ft}^3/\text{s}$

③ 10-15 min =  $\frac{31 - 29.02}{5 \text{ min}} = .409 \text{ gal/min} \times 2.2 \times 10^{-3} = 8.7 \times 10^{-4} \text{ ft}^3/\text{s}$

④ 15-20 min =  $\frac{32.38 - 31}{5 \text{ min}} = .389 \text{ gal/min} \times 2.2 \times 10^{-3} = 8.3 \times 10^{-4} \text{ ft}^3/\text{s}$

$Q_{ave} = 9.4 \times 10^{-4} \text{ ft}^3/\text{s}$

$L = 27' \geq 10r \approx 117'$   $k = \frac{Q}{2\pi LH} \ln \frac{L}{r}$   $\ln \frac{L}{r} = \ln \frac{27}{5.17} = 5.1$

$k = \frac{9.4 \times 10^{-4} \text{ ft}^3/\text{s}}{2\pi(27')(70.8')} (5.1) = 4 \times 10^{-7} \text{ ft/s} \times \frac{30.48 \text{ cm/ft}}{1} = \underline{1.2 \times 10^{-5} \text{ cm/s}}$

PSI = 20 L = 27'

C = 0

S = -6.2'

H = 28 + 0 + 13.5 + 20(2.31) + 6.2 = 93.9'

Q: ① 0-5 min =  $\frac{37.41 - 23.60}{5 \text{ min}} = .76 \text{ gal/min} \times 2.2 \times 10^{-3} = 1.7 \times 10^{-3} \text{ ft}^3/\text{s}$

② 5-10 min =  $\frac{40.08 - 37.41}{5 \text{ min}} = .53 \text{ gal/min} \times 2.2 \times 10^{-3} = 1.2 \times 10^{-3} \text{ ft}^3/\text{s}$

③ 10-15 min =  $\frac{41.32 - 40.08}{3 \text{ min}} = .41 \text{ gal/min} \times 2.2 \times 10^{-3} = 9.1 \times 10^{-4} \text{ ft}^3/\text{s}$

$Q_{ave} = 1.3 \times 10^{-3} \text{ ft}^3/\text{s}$

$k = \frac{Q}{2\pi LH} (5.1) = \frac{1.3 \times 10^{-3} \text{ ft}^3/\text{s}}{2\pi(27')(93.9')} (5.1) = 4.2 \times 10^{-7} \text{ ft/s} \times 30.48 \text{ cm/ft} = \underline{1.3 \times 10^{-5} \text{ cm/s}}$

PSI = 30 L = 27'

C = 0

S = -6.2'

H = 28 + 0 + 13.5 + 30(2.31) + 6.2 = 117'

Q =  $\frac{44.66 - 42.5}{4 \text{ min}} = .54 \text{ gal/min} \times 2.2 \times 10^{-3} = 1.2 \times 10^{-3} \text{ ft}^3/\text{s}$

$k = \frac{Q}{2\pi LH} (5.1) = \frac{1.2 \times 10^{-3} \text{ ft}^3/\text{s}}{2\pi(27')(117')} (5.1) = 3.1 \times 10^{-7} \text{ ft/s} \times 30.48 \text{ cm/ft} = \underline{9.4 \times 10^{-6} \text{ cm/s}}$

$K_{ave} = \frac{\sum_{i=1}^3 k_i}{3} = \frac{1.2 \times 10^{-5} + 1.3 \times 10^{-5} + 9.4 \times 10^{-6}}{3} = \underline{1.1 \times 10^{-5} \text{ cm/s}}$



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PACKER PERMEABILITY - DATA SHEET

Boring No. 5B-31 Job No. CSI 2-1815  
 Boring Radius (r) 2.0" (ft) Engineer JEC  
 Depth of Boring (d) 75.5 (ft) Date 7/2/00  
 Depth to Static Water (A) 49.2 (ft) Flow Meter No. 41007029  
 Depth to Center of Packer (B) 57.5 (ft) Height of Gauge above  
 Gauge Pressure (P) 12.0 x 23 (psi) Ground Surface (C) At surface 0' (ft)

| Flow Data |         |            |                  |                  | Notes   |
|-----------|---------|------------|------------------|------------------|---|
| Min Time  | Gallons | Cubic Feet | 12 psi Flow Rate | 23 psi Flow Rate |   |
| 0         |         |            | 553.7            | 554.25           | Started to get equip. @ 8:50 AM<br><br>Set bottom of packer @ 57.5', center of packer @ 57.5'<br><br>Packer test @ 75 psi<br><br>Initial meter reading 550.2<br><br>Start time @ 9:25 AM<br>Stopped @ 9:50 AM |
| 1         |         |            | 553.7            | 554.35           |   |
| 2         |         |            | 553.7            | 554.45           |   |
| 3         |         |            | 553.8            | 554.575          |   |
| 4         |         |            | 553.8            | 554.7            |   |
| 5         |         |            | 553.8            | 554.8            |   |
| 6         |         |            | 553.8            | 554.9            |   |
| 7         |         |            | 553.8            | 555.0            |   |
| 8         |         |            |                  | 555.1            |   |
| 9         |         |            |                  | 555.2            |   |
| 10        |         |            |                  | 555.3            |   |
| 11        |         |            |                  | 555.4            |   |
| 12        |         |            |                  | 555.5            |   |
| 13        |         |            |                  | 555.6            |   |
| 14        |         |            |                  | 555.7            |   |
| 15        |         |            |                  | 555.8            |   |

Average Q = \_\_\_\_\_ ft<sup>3</sup>/min

$$K = \frac{Q}{2rLH} \ln \frac{L}{r} : L \geq 10r$$

$$K = \frac{Q}{2rLH} \sinh^{-1} \frac{L}{2r} : 10r > L \geq r$$

CALCULATIONS

$$L = d - B$$

$$H = B + C + (L/2) + (P)(2.31) - S$$

$$\text{where } S = B + L/2 - A$$

Note: If no free water is encountered, S = 0

BORING SB-31

PSI = 12

$$d = 75.5' \quad B = 57.5' \quad C = 0 \quad A = 49.2'$$

$$L = d - B = 18.0$$

$$S = 57.5' + 9.0 - 49.2' = 17.3'$$

$$H = 57.5' + 0 + 9 + 12(2.31) - 17.3 = 76.9'$$

$$Q: \textcircled{1} 0-7 \text{ min} = \frac{553.8 - 553.7}{7 \text{ min}} = \frac{.1}{7} \text{ gal/min} \times 2.2 \times 10^{-3} = 3.1 \times 10^{-5} \text{ ft}^3/\text{s}$$

$$K = \frac{Q}{2\pi L H \ln \frac{L}{r}} \quad \ln \frac{L}{r} = 4.7$$

$$K = \frac{3.1 \times 10^{-5} \text{ ft}^3/\text{s}}{2\pi (18')(76.9')(4.7)} = 1.7 \times 10^{-8} \text{ ft/sec} \times 30.48 \text{ cm/ft} = \underline{5.2 \times 10^{-7} \text{ cm/s}}$$

PSI = 23

$$H = 57.5 + 0 + 9 + 23(2.31) - 17.3 = 102.3'$$

$$Q: \textcircled{1} 0-3 \text{ min} = \frac{554.575 - 554.25}{3} = .11 \text{ gal/min} \times 2.2 \times 10^{-3} = 2.4 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$\textcircled{2} 3-6 \text{ min} = \frac{554.9 - 554.575}{3} = .11 \text{ gal/min} = 2.4 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$\textcircled{3} 6-9 \text{ min} = \frac{555.2 - 554.9}{3} = .10 \text{ gal/min} \times 2.2 \times 10^{-3} = 2.2 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$\textcircled{4} 9-12 \text{ min} = \frac{555.5 - 555.2}{3} = .1 \text{ gal/min} = 2.2 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$\textcircled{5} 12-15 \text{ min} = \frac{555.8 - 555.5}{3} = .1 \text{ gal/min} = 2.2 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$Q_{ave} = \frac{\sum_{i=1}^5 Q_i}{5} = 2.3 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$K = \frac{Q}{2\pi L H \ln \frac{L}{r}} (4.7) = \frac{2.3 \times 10^{-4} \text{ ft}^3/\text{s}}{2\pi (18')(102.3)} (4.7) = 9.3 \times 10^{-8} \text{ ft/s} \times 30.48 \text{ cm/ft} = \underline{2.8 \times 10^{-6} \text{ cm/s}}$$

$$K_{ave} = \frac{\sum_{i=1}^2 k_i}{2} = \underline{1.7 \times 10^{-6} \text{ cm/s}}$$



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PACKER PERMEABILITY - DATA SHEET

Boring No. SB-34 Job No. CSI 2-1815  
 Boring Radius (r) 2" (ft) Engineer JEC  
 Depth of Boring (d) 75' (ft) Date 9/2/88  
 Depth to Static Water (A) 67.4 (ft) Flow Meter No. 4100 7029  
 Depth to Center of Packer (B) 35' (ft) Height of Gauge above  
 Gauge Pressure (P) 12 + 25 + 40 (psi) Ground Surface (C) 1.6 (ft)  
*Gauge on G.S.*

| <u>Flow Data</u> |                |                   |                               | <u>Notes</u> |           |
|------------------|----------------|-------------------|-------------------------------|--------------|-----------|
| <u>Time</u>      | <u>Gallons</u> | <u>Cubic Feet</u> | <u>12</u><br><u>Flow Rate</u> | <u>25</u>    | <u>40</u> |
| 0                |                |                   | 569.9                         | 573.0        | 575.60    |
| 1                |                |                   | 570.1                         | 573.45       | 575.65    |
| 2                |                |                   | 570.1                         | 573.8        | 575.70    |
| 3                |                |                   | 570.1                         | 574.2        | 575.75    |
| 4                |                |                   | 570.1                         | 574.4        | 575.80    |
| 5                |                |                   | 570.1                         | 574.45       | 575.85    |
| 6                |                |                   | 570.1                         | 574.5        | 575.90    |
| 7                |                |                   | 570.1                         | 574.55       | 575.95    |
| 8                |                |                   |                               | 574.575      | 576.00    |
| 9                |                |                   |                               | 574.60       |           |
| 10               |                |                   |                               | 574.65       |           |
| 11               |                |                   |                               | 574.675      |           |
| 12               |                |                   |                               | 574.70       |           |
| 13               |                |                   |                               | 574.75       |           |
| 14               |                |                   |                               | 574.775      |           |
| 15               |                |                   |                               | 574.80       |           |
| 16               |                |                   |                               | 574.825      |           |
| 17               |                |                   |                               | 574.85       |           |
| 18               |                |                   |                               | 574.86       |           |
| 19               |                |                   |                               | 574.875      |           |
| 20               |                |                   |                               | 574.90       |           |

Notes setup @ 2 1100  
 Start up @ 2 1100  
 Starting water  
 reading 555.4  
 Bottom packer @ 37  
 Center " @ 35  
 Packer setup 70psi  
 Maintained constant  
 PSI throughout  
 all tests

Average Q = \_\_\_\_\_ ft<sup>3</sup>/min

$$K = \frac{Q}{2LH} \ln \frac{L}{r} : L \geq 10r$$

$$K = \frac{Q}{2LH} \operatorname{csinh}^{-1} \frac{L}{2r} : 10r > L \geq r$$

CALCULATIONS

$$L = d - B$$

$$H = B + C + (L/2) + (P)(2.31) - S$$

$$\text{where } S = B + L/2 - A$$

Note: If no free water is encountered,  
 S = 0

BORING SB-34

PSI=12

$$d = 75' \quad B = 35' \quad C = 1.6' \quad A = 67.4'$$

$$L = d - B = 40'$$

$$S = 35' + 20' - 67.4 = -12.4$$

$$H = 35' + 1.6' + 20' + 12(2.31) + 12.4 = 96.7'$$

$$Q_i = \frac{570.1 - 569.9}{7 \text{ min}} = .03 \text{ gal/min} \times 2.2 \times 10^{-3} = 6.3 \times 10^{-5} \text{ ft}^3/\text{s}$$

$$L = 20' \rightarrow z = 10(1.7') \quad k = \frac{6.3 \times 10^{-5} \text{ ft}^3/\text{s}}{2\pi(20')(96.7')} \times \ln \frac{20}{1.7} = 2.5 \times 10^{-8} \text{ ft/s} \times 30.48 \text{ cm/ft} = \underline{7.6 \times 10^{-7} \text{ cm/s}}$$

PSI = 25

$$H = 35' + 1.6' + 20' + 25(2.31) + 12.4 = 126.8'$$

$$Q_1 = \frac{574.45 - 573.0}{5 \text{ min}} = .29 \text{ gal/min}$$

$$Q_2 = \frac{574.65 - 574.45}{5 \text{ min}} = .04 \text{ gal/min}$$

$$Q_3 = \frac{574.8 - 574.65}{5 \text{ min}} = .03 \text{ gal/min}$$

$$Q_4 = \frac{574.9 - 574.8}{5 \text{ min}} = .02 \text{ gal/min}$$

$$Q_{\text{ave}} = \frac{\sum_{i=1}^4 Q_i}{4} = .1 \text{ gal/min} \times 2.2 \times 10^{-3} = 2.1 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$k = \frac{2.1 \times 10^{-4} \text{ ft}^3/\text{s}}{2\pi(20')(126.8')} \times 4.8 = 6.3 \times 10^{-8} \text{ ft/sec} \times 30.48 \text{ cm/ft} = \underline{1.9 \times 10^{-6} \text{ cm/s}}$$

PSI = 40

$$H = 35' + 1.6' + 20' + 40(2.31) + 12.4 = 161.4'$$

$$Q_1 = \frac{575.8 - 575.6}{4} = .05 \text{ gal/min} \quad \text{ix}$$

$$Q_2 = \frac{576.0 - 575.8}{4} = .05 \text{ gal/min}$$

$$Q_{\text{ave}} = .05 \text{ gal/min} \times 2.2 \times 10^{-3} = 1.1 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$k = \frac{1.1 \times 10^{-4} \text{ ft}^3/\text{s}}{2\pi(20')(161.4')} \times 4.8 = 2.6 \times 10^{-8} \text{ ft/s} \times 30.48 \text{ cm/ft} = \underline{7.9 \times 10^{-7} \text{ cm/s}}$$

$$k_{\text{ave}} = \frac{\sum_{i=1}^3 k_i}{3} = 1.2 \times 10^{-6} \text{ cm/s}$$



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PACKER PERMEABILITY - DATA SHEET

Boring No. SB-35 Job No. CSI 2-1815  
 Boring Radius (r) 2.00 (ft) Engineer JFC  
 Depth of Boring (d) 55 (ft) Date 8/30/88  
 Depth to Static Water (A) 54.8 (ft) Flow Meter No. \_\_\_\_\_  
 Depth to Center of Packer (B) 30.5 (ft) Height of Gauge above \_\_\_\_\_  
 Gauge Pressure (P) 20 (psi) Ground Surface (C) 0 (ft)

| <u>Flow Data</u> |                |                   |                  | <u>Notes</u>   |
|------------------|----------------|-------------------|------------------|--|
| <u>Time</u>      | <u>Gallons</u> | <u>Cubic Feet</u> | <u>Flow Rate</u> |  |
| 0                |                |                   | <del>507.2</del> | Test interval 40-55<br>sandy layers @ 50'<br>39' 2 3/4"<br>+ 11"<br>40' 1 3/4" - bottom of packer<br><br>Starting meter reading 492.7'<br>jump in psi = 20 |
| 1                |                |                   | <del>507.5</del> |  |
| 2                |                |                   | <del>507.8</del> |  |
| 3                |                |                   | 508.1            |  |
| 4                |                |                   | 508.4            |  |
| 5                |                |                   | 508.8            |  |
| 6                |                |                   | 509.4            |  |
| 7                |                |                   | 509.8            |  |
| 8                |                |                   | 507.9            |  |
| 9                |                |                   | 510.0            |  |
| 10               |                |                   | 510.0            |  |
| 11               |                |                   | 510.0            |  |
| 12               |                |                   |                  |  |
| 13               |                |                   |                  |  |
| 14               |                |                   |                  |  |
| 15               |                |                   |                  |  |

Average Q = \_\_\_\_\_ ft<sup>3</sup>/min

$$K = \frac{Q}{2rLH} \ln \frac{L}{r} : L \geq 10r$$

$$K = \frac{Q}{2rLH} \sinh^{-1} \frac{L}{2r} : 10r > L \geq r$$

**CALCULATIONS**

L = d - B  
 H = B + C + (L/2) + (P)(2.31) - S  
 where S = B + L/2 - A

Note: If no free water is encountered,  
 S = 0

PACKER PERM DATA

2-1815 C3I

BORING SB-35

PI = 20

$$d = 55' \quad B = 38.5' \quad C = 0' \quad A = 54.8' \quad r = .17'$$

$$L = d - B = 16.5'$$

$$S = 38.5' + 8.25' - 54.8' = -8.05'$$

$$H = 38.5' + 0' + 8.25' + 20(2.31) + 8.05' = 101.0'$$

$$Q: \quad Q_1 = \frac{508.4 - 507.2}{5} = .22 \text{ gal/min}$$

$$Q_2 = \frac{510.0 - 508.8}{6} = .2 \text{ gal/min}$$

$$Q_{ave} = .3 \text{ gal/min} \times 2.2 \times 10^{-3} = 5.7 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$L = 16.5' \geq (.17)(10)$$

$$k = \frac{5.7 \times 10^{-4} \text{ ft}^3/\text{s}}{2\pi(16.5')(101)'} \times \ln \frac{16.5'}{.17'} = 2.5 \times 10^{-7} \text{ ft}^2/\text{s} \times 30.48 \text{ cm}^2/\text{ft}^2 = 7.6 \times 10^{-6} \text{ cm}^2/\text{s}$$





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Incorporated

511 Orchard Street  
Golden, Colorado 80401

PACKER PERMEABILITY - DATA SHEET

Boring No. SB-35 Job No. CSI 2-1815  
 Boring Radius (r) 2.0 (ft) Engineer JEC  
 Depth of Boring (d) 55 (ft) Date 8/22/88  
 Depth to Static Water (A) 54.8 (ft) Flow Meter No. \_\_\_\_\_  
 Depth to Center of Packer (B) 38.5 (ft) Height of Gauge above \_\_\_\_\_  
 Gauge Pressure (P) 40 (psi) Ground Surface (C) 0 (ft)

| <u>Flow Data</u> |                |                   |                  | <u>Notes</u> |
|------------------|----------------|-------------------|------------------|--------------|
| <u>Time</u>      | <u>Gallons</u> | <u>Cubic Feet</u> | <u>Flow Rate</u> |              |
| 0                |                |                   | 512.0            |              |
| 1                |                |                   | 518.7            |              |
| 2                |                |                   | 514.8            |              |
| 3                |                |                   | 515.8            |              |
| 4                |                |                   | 516.75           |              |
| 5                |                |                   | 517.6            |              |
| 6                |                |                   | 518.3.5          |              |
| 7                |                |                   | 519.0            |              |
| 8                |                |                   | 519.8            |              |
| 9                |                |                   | 520.4            |              |
| 10               |                |                   | 521.2            |              |

*packer started to slip*

Average Q = \_\_\_\_\_ ft<sup>3</sup>/min

$$K = \frac{Q}{2.3LH} \ln \frac{L}{r} : L \geq 10r$$

$$K = \frac{Q}{2.3LH} \sinh^{-1} \frac{L}{2r} : 10r > L \geq r$$

**CALCULATIONS**

$$L = d - B$$

$$H = B + C + (L/2) + (P)(2.31) - S$$

where  $S = B + L/2 - A$

Note: If no free water is encountered, S = 0

BORING SB-35

$$PSI = 40$$

$$d = 55' \quad D = 38.5' \quad C = 0 \quad A = 54.8'$$

$$L = d - C = 55' - 38.5' = 16.5'$$

$$S = 38.5' + 8.25' - 54.8' = -8.05'$$

$$H = 38.5' + 0' + 8.25' + 40(2.31) + 8.05 = 147.2'$$

$$Q_1 = \frac{516.75 - 512}{4} = 1.29 \text{ gal/min}$$

$$Q_2 = \frac{521.2 - 516.75}{6} = 0.749 \text{ gal/min}$$

$$Q_{ave} = 1.9 \text{ gal/min} \times 2.2 \times 10^{-3} = 2.1 \times 10^{-3} \text{ ft}^3/\text{s}$$

$$L \geq 10(1.7)$$

$$k = \frac{2.1 \times 10^{-3} \text{ ft}^3/\text{s}}{2\pi(16.5')(147.2')} \times \ln \frac{16.5' - 4.6}{1.7'} = 6.3 \times 10^{-7} \text{ ft/s} \times 30.48 \text{ cm/ft} = 1.9 \times 10^{-5} \text{ cm/s}$$



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PACKER PERMEABILITY - DATA SHEET

Boring No. SB-37 Job No. CSI 2-1815  
 Boring Radius (r) 2" (ft) Engineer IEC  
 Depth of Boring (d) 60' (ft) Date 8/21/90  
 Depth to Static Water (A) 0 (dry) (ft) Flow Meter No. 41007029  
 Depth to Center of Packer (B) 35' (ft) Height of Gauge above  
 Gauge Pressure (P) 18 @ 20 (psi) Ground Surface (C) At Surface (ft)

| <u>Flow Data</u> |                |                   |                        | <u>Notes</u> |   |
|------------------|----------------|-------------------|------------------------|--------------|---|
| <u>Time</u>      | <u>Gallons</u> | <u>Cubic Feet</u> | <u>10psi Flow Rate</u> | <u>20psi</u> |   |
| 0                |                |                   | 545.5                  | 547.1        | <i>note reading prior to test 520.05</i><br><br>70 psi on packer<br><br>started @ 15:19<br><br>Packer bottom set at 37' |
| 1                |                |                   | 546.225                | 547.6        |   |
| 2                |                |                   | 545.725                | 547.7        |   |
| 3                |                |                   | 545.725                | 547.9        |   |
| 4                |                |                   | 545.725                | 548.3        |   |
| 5                |                |                   | 545.725                | 548.6        |   |
| 6                |                |                   |                        | 548.9        |   |
| 7                |                |                   |                        | 549.2        |   |
| 8                |                |                   |                        | 549.5        |   |
| 9                |                |                   |                        | 549.8        |   |
| 10               |                |                   |                        | 550.1        |   |
| 11               |                |                   |                        |              |   |
| 12               |                |                   |                        |              |   |
| 13               |                |                   |                        |              |   |
| 14               |                |                   |                        |              |   |
| 15               |                |                   |                        |              |   |

Average Q = \_\_\_\_\_ ft<sup>3</sup>/min

$$K = \frac{Q}{2.3LH} \ln \frac{L}{r} : L \geq 10r$$

$$K = \frac{Q}{2.3LH} \sinh^{-1} \frac{L}{2r} : 10r > L \geq r$$

**CALCULATIONS**  
 $L = d - B$   
 $H = B + C + (L/2) + (P)(2.31) - S$   
 where  $S = B + L/2 - A$   
 Note: If no free water is encountered,  $S = 0$

10/11/90

BORING SB-37

$$PSI = 12$$

$$d = 60' \quad B = 35' \quad A = \text{NA} \quad r = .17 \quad C = 0$$

$$L = d - B = 25'$$

$$S = 0$$

$$H = 35' + 0' + 12.5' + 12(2.31) - 0 = 75.2'$$

$$Q: = \frac{.725 - .70}{5} = 5 \times 10^{-3} \text{ gal/min} \times 2.2 \times 10^{-3} = 1.1 \times 10^{-5} \text{ ft}^3/\text{s}$$

$$L \geq 10r$$

$$k = \frac{1.1 \times 10^{-5} \text{ ft}^3/\text{s}}{2\pi(25')(75.2')} \times \ln \frac{25'}{.17} = 4.7 \times 10^{-9} \text{ ft/s} \times 30.48 \text{ cm/ft} = \underline{1.4 \times 10^{-7} \text{ cm/s}}$$

$$PSI = 20$$

$$H = 35' + 0' + 12.5' + 20(2.31) - 0 = 93.7'$$

$$Q: = \frac{550.1 - 547.1}{10} = .3 \text{ gal/min} \times 2.2 \times 10^{-3} = 6.6 \times 10^{-4} \text{ ft}^3/\text{s}$$

$$k = \frac{6.6 \times 10^{-4} \text{ ft}^3/\text{s}}{2\pi(25')(93.7')} \times 5 = 2.2 \times 10^{-7} \text{ ft/s} \times 30.48 \text{ cm/ft} = \underline{6.8 \times 10^{-6} \text{ cm/s}}$$

$$k_{\text{ave}} = 3.5 \times 10^{-6} \text{ cm/s}$$

**APPENDIX I - RISING HEAD TEST RESULTS**

Rising Head Test MW-1

CSI  
2-1815

Using Formula presented for condition (c) in  
Cedergren (1967).

$$K = \frac{R^2}{2L(t_2 - t_1)} \ln\left(\frac{L}{R}\right) \ln\left(\frac{h_1}{h_2}\right)$$

$$K = \frac{0.17^2}{2(5)(6 - 1.5)} \ln\left(\frac{5}{0.17}\right) \ln\left(\frac{.92}{.80}\right)$$

$$K = 3.0 \times 10^{-4} \text{ ft/min}$$

$$K = 1.5 \times 10^{-4} \text{ cm/sec}$$

Rising Head Test MW-1  
 CSI 2-1815

Static W.L. = 50.6 ft.

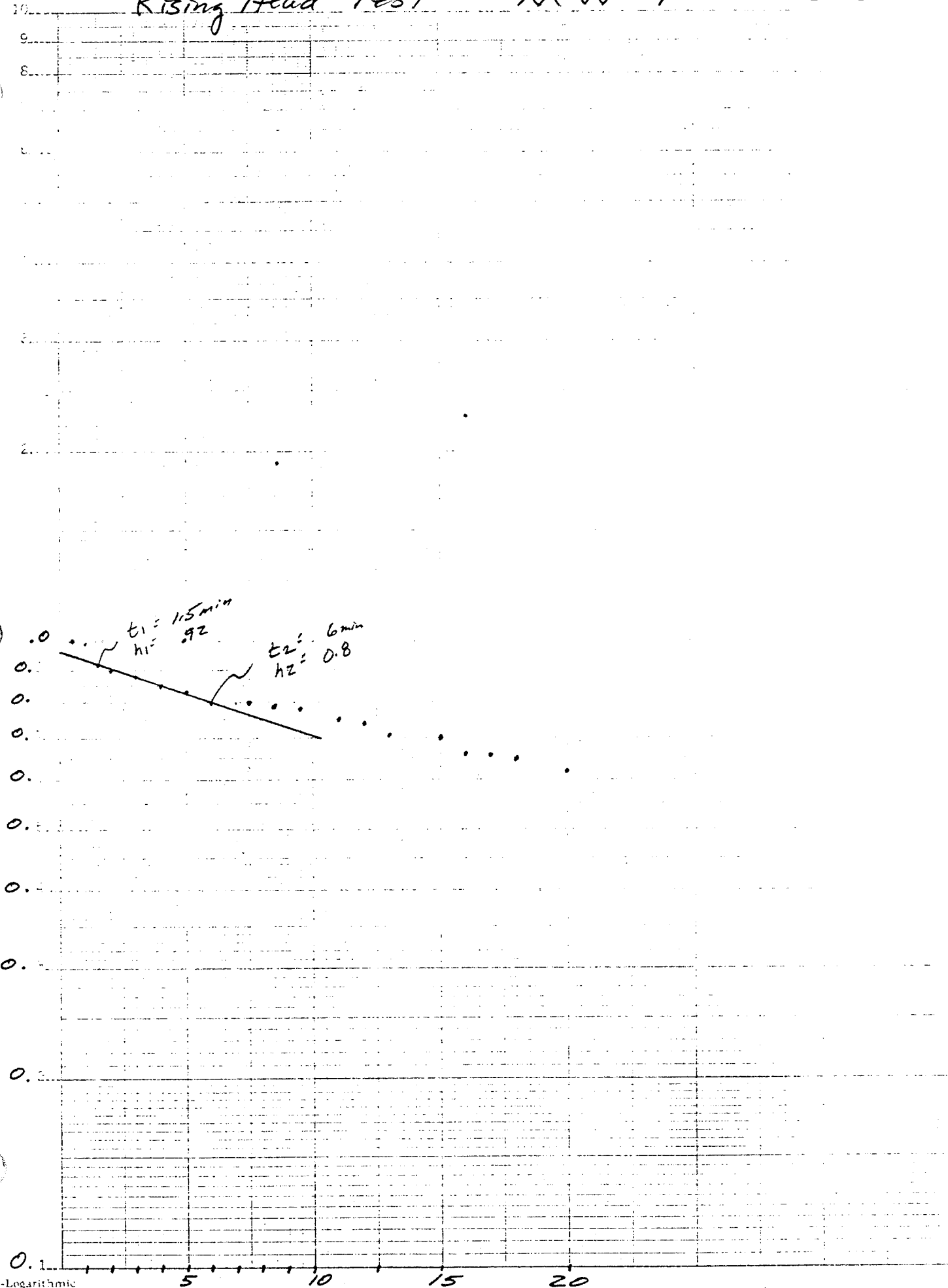
| Time (min) | $\Delta H$ (W.L. - Static L.) | H/H <sub>0</sub> |
|------------|-------------------------------|------------------|
| 0.5        | 52.58 - 50.6 = 1.98           | 1.00             |
| 1.0        | 52.56 - " = 1.96              | .99              |
| 1.5        | 52.42 - " = 1.82              | .92              |
| 2.0        | 52.38 - " = 1.78              | .90              |
| 2.5        | 52.38 - " = 1.78              | .90              |
| 3.0        | 52.35 - " = 1.75              | .88              |
| 3.5        | 52.33 - " = 1.73              | .87              |
| 4          | 52.29 - " = 1.69              | .85              |
| 5          | 52.25 - " = 1.65              | .83              |
| 6          | 52.19 - " = 1.59              | .80              |
| 7.5        | 52.19 - " = 1.59              | .80              |
| 8.5        | 52.17 - " = 1.57              | .79              |
| 9.5        | 52.15 - " = 1.55              | .78              |
| 11         | 52.08 - " = 1.48              | .75              |
| 12         | 52.06 - " = 1.46              | .74              |
| 13         | 52.00 - " = 1.40              | .71              |
| 15         | 51.98 - " = 1.38              | .70              |
| 16         | 51.92 - " = 1.32              | .67              |
| 17         | 51.90 - " = 1.30              | .66              |
| 18         | 51.88 - " = 1.28              | .65              |
| 20         | 51.83 - " = 1.23              | .62              |

# Rising Head Test

MW-1

CSI  
2-1815

$t/H_0$   
(feet)





Rising Head Test MW-2

CSI  
2-18/5

Using Formula presented for condition (C)  
in Cedergreen (1967).

$$K = \frac{R^2}{2L(t_2 - t_1)} \ln\left(\frac{L}{R}\right) \ln\left(\frac{h_1}{h_2}\right)$$

$$K = \frac{0.17^2}{2(5)(12-1.5)} \ln\left(\frac{5}{0.17}\right) \ln\left(\frac{97}{67}\right)$$

$$K = 3.4 \times 10^{-4} \text{ ft/min}$$

$$K = 1.8 \times 10^{-4} \text{ cm/s}$$

Rising Head Test  
CS# 2-1815

MW-2

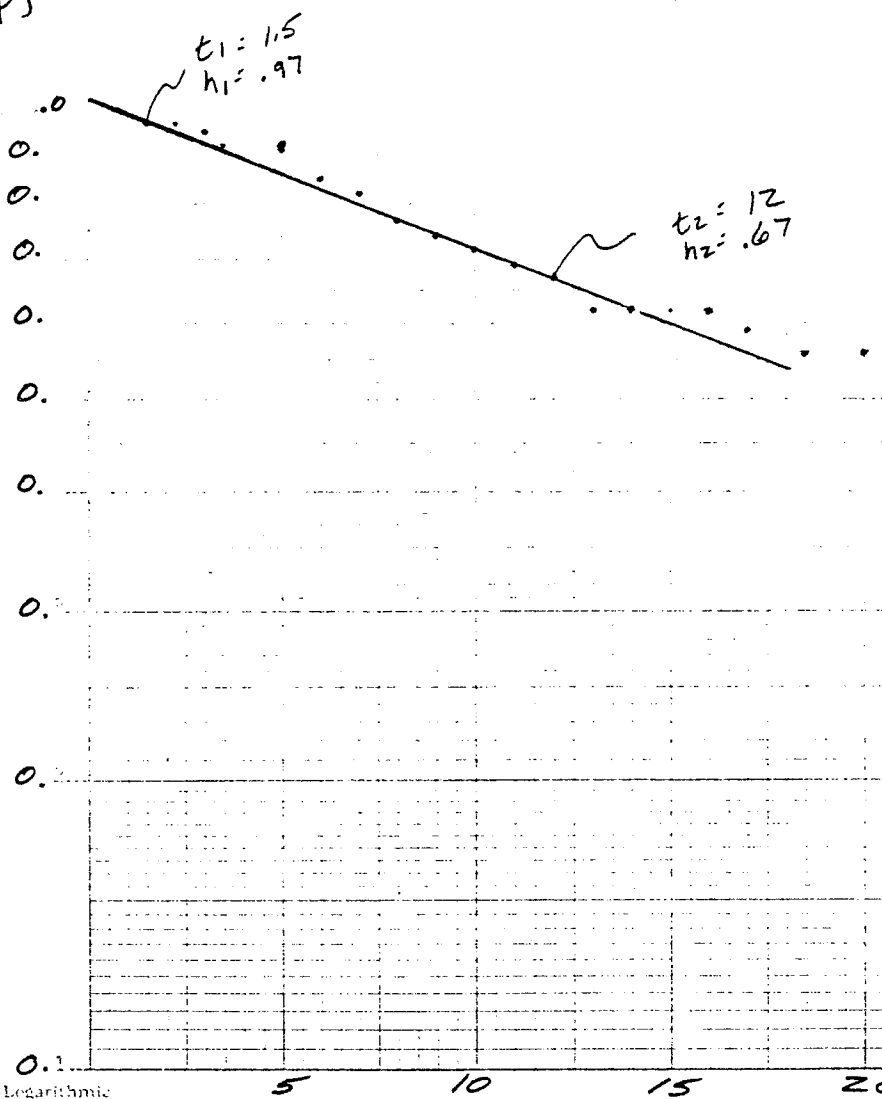
Static W.L. = 20.0

| Time (min.) | $\Delta H$ (W.L. - Static L.) | H/H <sub>0</sub> |
|-------------|-------------------------------|------------------|
| 0.75        | 21.95 - 20.0 = 1.95           | 1.00             |
| 1.5         | 21.90 - = 1.9                 | .97              |
| 2.25        | 21.90 - = 1.9                 | .97              |
| 3           | 21.85 - = 1.85                | .95              |
| 3.5         | 21.8 - = 1.8                  | .92              |
| 4.17        | 21.8 - = 1.8                  | .92              |
| 5           | 21.8 - = 1.8                  | .92              |
| 6           | 21.65 - = 1.65                | .85              |
| 7           | 21.6 - = 1.6                  | .82              |
| 8           | 21.5 - = 1.5                  | .77              |
| 9           | 21.45 - = 1.45                | .74              |
| 10          | 21.4 - = 1.4                  | .72              |
| 11          | 21.35 - = 1.35                | .69              |
| 12          | 21.3 - = 1.3                  | .67              |
| 13          | 21.2 - = 1.2                  | .62              |
| 14          | 21.2 - = 1.2                  | .62              |
| 16          | 21.2 - = 1.2                  | .62              |
| 17          | 21.15 - = 1.15                | .59              |
| 18.5        | 21.1 - = 1.1                  | .56              |
| 20          | 21.1 - = 1.1                  | .56              |

# Rising Head Test MW-2

CSI  
2-18/15

$h/H_0$   
(Feet)



**APPENDIX J - ESTIMATED TRAVEL TIME OF WATER**

## TRAVEL TIME CALCULATIONS

Calculations of the required travel time consists of the time required for water to flow from the base of the clay liner to the regional Denver Aquifer.

Basic assumptions:

- A. The Denver Formation in the vicinity of the site consists of approximately 90% claystone and 10% silty sand.
- B. Using an average elevation of the bottom of the clay liner of 5285 feet and an average elevation of the top of the Denver Aquifer of 5175 feet, the average vertical distance from the bottom of the clay liner and the top of the Denver Aquifer is 110 feet.
- C. There is approximately 11 feet of saturated silty sand and 99 feet of unsaturated claystone between the bottom of the liner and the top of the Denver aquifer.

Travel time calculation from the base of the clay liner to the top of the Denver aquifer (claystone and silty sand material):

- 1). Unsaturated flow conditions (McWhorter and Nelson, 1979)

$$T = z_0 (\theta) / [q_u^{1-1/n} (k_s^{1/n})]$$

Where:

T = travel time through unsaturated material

$z_0$  = flow path length in unsaturated material = vertical distance between bottom of the clay liner and top of the Denver Aquifer (99 feet or 3018 centimeters).

$\theta$  = effective porosity = 0.1 (claystone) and 0.2 (silty sand).

$q_u$  = volume of infiltrated liquid water ; assuming a unit hydraulic gradient and an area of one square unit,  
 $q_u$  = unsaturated vertical hydraulic conductivity ( $k_u$ ).  
From field permeability tests,  $k_u$  is estimated to be  $1.0 \times 10^{-8}$  cm/s.

$k_s$  = saturated vertical hydraulic conductivity =  $1.0 \times 10^{-7}$  cm/s.

n = Brooks Corey parameter = 4.0

$$T = (3018)(0.10)/[1 \times 10^{-8}]^{3/4}(1 \times 10^{-7})^{1/4} = 1.7 \times 10^{10} \text{ sec.}$$

2). Saturated Flow Conditions: (McWhorter and Nelson, 1979).

$$T = z_0(\theta)/k_s$$

Where:

T = travel time through saturated material

$z_0$  = flow path length through saturated material = 11 feet or 335 centimeters

$$\theta = 0.2$$

$$k_s = 1 \times 10^{-6} \text{ cm/s}$$

$$T = (335)(0.2)/(1 \times 10^{-6}) = 8.4 \times 10^7 \text{ sec.}$$

Total travel time through the upper Denver Formation material:

$$1.7 \times 10^{10} + 8.4 \times 10^7 = 1.71 \times 10^{10} = 542 \text{ years.}$$

**APPENDIX K - ANALYTICAL LABORATORY PAPERWORK AND FORMS**

TABLE 3

Equipment

CSI has the following equipment:

1. Pinsky-Martens Closed Cup Flash Point Tester (Precision Scientific No. 74537) with Electric Heater and Slo-Speed Stirrer.
2. Corning pH Meter 5 (no. 475001) with Temperature Compensator and Calomel Combination Electrode Additional Electrodes; X-EL Flat Surface Combination Electrode, Ammonia Electrode.
3. Damon IEC HN-SII Centrifuge
4. Ohaus Moisture Determination Balance
5. Hach DR-3000 Spectrophotometer
6. Neotronics DigiFlam 850 Flammable Gas Monitor
7. Matheson-Kitagawa Tox Gas Analyzer
8. VRW Microdispenser Micro Pipet
9. VRW Hydrometer Set (No. 34630)
10. Gilmont Falling Ball Type Viscosimeter
11. Hach Digesdahl Digestion Apparatus
12. Alert Monitor 4 Radiation Meter
13. Hot Plates
14. Hood
15. Desicator
16. Balance
17. Burettes
18. Refrigerator
19. Glassware
20. Plasticware
21. Reagent Chemicals
22. Computer





**CONSERVATION SERVICES, INC.**

777 West 62nd Ave.  
Denver, Colorado 80216  
(303) 426-8158

# INDUSTRIAL WASTE DISPOSAL MANIFEST

012218

## PART I: TO BE COMPLETED BY SHIPPER/GENERATOR

COMPANY NAME \_\_\_\_\_

BUSINESS ADDRESS \_\_\_\_\_

ADDRESS OF SHIPMENT ORIGIN \_\_\_\_\_

AUTHORIZED CONTACT \_\_\_\_\_ EMERGENCY PHONE \_\_\_\_\_

RECEIVER'S NAME \_\_\_\_\_

BUSINESS ADDRESS \_\_\_\_\_

SITE ADDRESS \_\_\_\_\_ PHONE: \_\_\_\_\_

| QUANTITY | UNITS | WASTE DESCRIPTION | CSI WASTE CODE NUMBER |
|----------|-------|-------------------|-----------------------|
|          |       |                   |                       |
|          |       |                   |                       |
|          |       |                   |                       |
|          |       |                   |                       |
|          |       |                   |                       |
|          |       |                   |                       |
|          |       |                   |                       |
|          |       |                   |                       |

The materials described above were consigned to the Carrier named below. I certify that the foregoing is true and correct to the best of my knowledge.

SIGNATURE OF AUTHORIZED AGENT X \_\_\_\_\_

DATE: \_\_\_\_\_

TYPE OR PRINT ABOVE NAME: \_\_\_\_\_

## PART II TO BE COMPLETED BY CARRIER/DRIVER

CARRIER NAME \_\_\_\_\_

BUSINESS ADDRESS \_\_\_\_\_

PHONE NO. \_\_\_\_\_

I certify that the materials in the quantity described above are received by me for shipment to the above destination.

SIGNATURE OF AUTHORIZED AGENT X \_\_\_\_\_

DATE: \_\_\_\_\_

TYPE OR PRINT ABOVE NAME: \_\_\_\_\_

## PART III TO BE COMPLETED BY RECEIVER

RECEIVER'S NAME \_\_\_\_\_

PHONE NO. \_\_\_\_\_

SITE ADDRESS \_\_\_\_\_

RECEIVER'S COMMENTS \_\_\_\_\_

I certify that the materials in the quantities described in Part I are received by me.

SIGNATURE OF AUTHORIZED AGENT X \_\_\_\_\_

DATE: \_\_\_\_\_

TYPE OR PRINT ABOVE NAME: \_\_\_\_\_

COMPUTER ENTRY DATA FORMS

WCD

Form: 1 Type: 1

Account Number:  
Lab Control No:  
Series:

Waste Code Number:  
EPA Generator ID:  
Date:

Company:  
Business Address:  
Contact:

Waste Description:  
Waste Process:

Anticipated Volume:  
Anticipated Units:  
Per:

Outside Lab Report:  
Attached MSDS:  
Lab/MSDS Date:

Sample Included:  
Taken By:  
Sample Date:

Signed:  
Date Signed:

Account Number:  
Lab Control No:  
Series: 1

LSR Date:  
Salesman:

Company:  
Contact:

Action Requested: CSI DISPOSAL  
Comments:

>> CHEMICAL ANALYSIS

Material Submitted:  
Sample Date:  
Process Involved:  
Handling Precautions:  
Analysis Requested:

Take to Outside Lab For:  
Outside Lab Used:  
Lab Signature:

>> LABORATORY REPLY

RCRA Characteristics: NONE  
Possible RCRA Contaminants: NONE  
Additional Testing Needed:  
Additional Materials Needed:  
Neutralization Requirements:  
Waste Category:  
Type of Treatment: SOLIDIFICATION  
Reagent Type: KILN DUST  
Waste/Water Ratio:  
Waste/Reagent Ratio:  
Volume Increase:  
Direct Waste To:  
Comments:

Waste Code Number:  
Date Signed:  
Signed:

SAMPLE DATA

Form: 2 Type: 2

Account Number:  
Lab Control No:  
Series: 1

Company:

Location of Sampling:  
Waste Process:

Date Sampled:  
Time Sampled:

Waste Description:  
Sample Equipment:

Composite Samples:  
Number of Sub-Samples:  
Volume of Sub-Samples:

Field Info/Comments:

Sampler:  
Sampler Title:  
Sampler Company:

COMPOSITE SAMPLE

Form: 2 Type: 3

Account Number:  
Lab Control No:  
Series: 1

Date Sampled:  
Time Sampled:

Waste Description:  
Waste Process:

Name of Composite Sample:

Samples Making Composite:

| <u>Lab Control No</u> | <u>Sample No.</u> | <u>Volume to Composite</u> |
|-----------------------|-------------------|----------------------------|
|-----------------------|-------------------|----------------------------|

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

Reason for Composite:

Composite will be used for:

Composited By:  
Date:  
Time:

LAB WORKSHEET

Form: 2 Type: 4

Account No:  
Lab Control No:  
Series: 1

Physical State:

Description:

Density:

Solubility:

Ignitability: IN DEGREES FAHRENHEIT

Closed Cup Flash Point: >150

Corrosivity Initial pH:

Reactivity: NONE

Sulfides Quantitative: NONE

Cyanides Quantitative: NONE

Ammonia Quantitative: NONE

Chlorides Spot Test:

Radioactivity: NONE

Suspended Solids: NONE

Moisture: NONE

Viscosity: NONE

Kiln Dust Type:

Waste/Water Ratio:

Ratio:

Volume Increase:

Neutralization Numbers:

Comments:

Analyst:

Date:

MANIFEST

Form: 3 Type: 1

Manifest No:  
Class: A  
Date:

Company:  
Business Address:  
Address of Origin:  
Contact:  
Emergency Phone:

Facility:

Quantity:  
Units:  
Waste Description:  
Waste Code Number:

Generator Agent:

Carrier Name:  
Carrier Address:  
Carrier Phone:  
Carrier Agent:

Receiver Name: CONSERVATION SERVICES, INC.  
Receiver Phone: 303-426-8158  
Site Address: 777 W. 62ND AVENUE DENVER, CO 80216  
Receiver Comments:  
Receiver Agent:



WASTE CHARACTERIZATION FORMS



777 West 62nd  
Denver, Colorado 80216  
(303) 426 8158

CSI Waste Code No. \_\_\_\_\_

EPA Generator I.D. No. (If Any) \_\_\_\_\_

**INDUSTRIAL WASTE CHARACTERIZATION DATA**

Directions: In order for us to determine whether we can lawfully and safely transport, treat, and dispose of your waste material, we must obtain certain information about the chemical and physical properties of the waste and its chemical composition. Please be complete in your answers; if your response is "none" or "not available", so indicate. Answers must be printed in ink or typewritten and the completed form must be signed. Please make a copy of this form for your records.

1) Generator Name \_\_\_\_\_ Date \_\_\_\_\_

2) Generating Facility Complete Address \_\_\_\_\_  
\_\_\_\_\_

3) Company Contacts:  
General \_\_\_\_\_ Title \_\_\_\_\_ Phone \_\_\_\_\_  
Technical \_\_\_\_\_ Title \_\_\_\_\_ Phone \_\_\_\_\_  
Emergency \_\_\_\_\_ Title \_\_\_\_\_ Phone \_\_\_\_\_

4) General Waste Description \_\_\_\_\_

5) Process Generating Waste \_\_\_\_\_  
\_\_\_\_\_

6) Anticipated Volume \_\_\_\_\_ [ ] Gallons [ ] Tons [ ] Cubic Yards [ ] Drums [ ] Other \_\_\_\_\_  
Per: [ ] Day [ ] Month [ ] Year or [ ] One Time [ ] Other \_\_\_\_\_

7) Is this Waste a "Hazardous Waste" as defined by Regulations of the U.S.E.P.A. pursuant to Section 3001 of the Resource and Recovery Act?  
\_\_\_\_\_ (See 40 CFR, Part 261 for what is a "Hazardous Waste.")

8) Waste Properties

- a) Vapor Pressure (mm of Hg (@ 25°C) \_\_\_\_\_
- b) Flash Point \_\_\_\_\_ [ ] °F [ ] °C (closed cup only)
- c) Phases/layers: [ ] Single [ ] Bilayered [ ] Multilayered
- d) Physical State (@ 20°C): [ ] Solid [ ] Liquid [ ] Semi-Solid [ ] Other \_\_\_\_\_
- e) Solubility (g/100g H<sub>2</sub>O (@ 20°C) \_\_\_\_\_ (f) pH \_\_\_\_\_
- g) Density \_\_\_\_\_ [ ] lb/ft<sup>3</sup> [ ] lb/yd<sup>3</sup> [ ] lb/gal [ ] g/cc
- h) Odor: [ ] Strong [ ] Mild [ ] None
- i) Complete waste composition (with ranges – indicate % or ppm). Attach additional pages if necessary
 

|   |   |
|---|---|
| A organic<br>_____<br>_____<br>_____<br>_____ | B inorganic<br>_____<br>_____<br>_____<br>_____ |
|---|---|

9) Is the information provided in Section 8 above based upon Laboratory analysis or Material Safety Data Sheets (MSDS) of the waste material? \_\_\_\_\_ Date of most recent analysis \_\_\_\_\_

10) Does this waste stream contain Biologic Materials, Pathogens, or Etiological Agents? \_\_\_\_\_ If yes, specify type and concentration \_\_\_\_\_

11) Does this waste stream contain any Polychlorinated Biphenyls (PCB)? \_\_\_\_\_ If yes, specify concentration \_\_\_\_\_

12) Sample included [ ] Taken By \_\_\_\_\_ Date \_\_\_\_\_

13) Required personnel protective equipment and procedures \_\_\_\_\_

I hereby certify that the above attached description is complete and accurate to the best of my knowledge and ability to determine, that no deliberate or willful omissions of composition or properties exists, and that all known or suspected hazards have been disclosed.

Generator's Authorized Signatory

Signature X \_\_\_\_\_ Date \_\_\_\_\_

me \_\_\_\_\_ Title \_\_\_\_\_  
Print or Type

Confidentiality Agreement: As consideration for the Generator's release of the above information and any other supplemental data, the undersigned agrees to treat such information as confidential property and will not disclose such information to others except as is required by law, and in such circumstances only after first giving notice to the Generator.

By \_\_\_\_\_ Title \_\_\_\_\_  
Name CSI Representative



**CONSERVATION  
SERVICES, INC.**

777 West 62nd  
Denver, Colorado 80216  
(303) 426-8158

CHEMICAL WASTE REPRESENTATIVE  
SAMPLE DATA FORM

Generator: \_\_\_\_\_  
Company's Name

\_\_\_\_\_  
Company's Address

Location of Sampling: \_\_\_\_\_  
Unit, Pond, Pit Tank, Etc.

Process Producing Waste: \_\_\_\_\_

Date Sampled: \_\_\_\_\_ Time Sampled: \_\_\_\_\_ AM/PM

Type of Waste: \_\_\_\_\_  
Sludge, Wastewater, Solid, Mix, Etc. - Specify

Volume of Sample Collected: \_\_\_\_\_

Type of Sample: Circle

|          |       |         |       |       |      |                    |
|----------|-------|---------|-------|-------|------|--------------------|
| Coliwasa | Grain | Trier   | Scoop | Arger | Pond | Weighted<br>Bottle |
| Thief    | Other | _____   |       |       |      |                    |
|          |       | Specify |       |       |      |                    |

Composite Sample: \_\_\_\_\_

Number of Samples: \_\_\_\_\_

Volume of Sub-Samples: \_\_\_\_\_

Field Information: Comments

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I certify this sample is representative of the waste to be managed. Collector:

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Company

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Phone Number



COMPOSITE SAMPLE FORM

PAGE \_\_\_\_ OF \_\_\_\_

GENERATOR

LAB CONTROL NO. \_\_\_\_\_

\_\_\_\_\_

TYPE OF WASTE

\_\_\_\_\_

PROCESS PRODUCING WASTE

\_\_\_\_\_

NAME OF COMPOSITE SAMPLE (NEW)

\_\_\_\_\_

NAME OF SAMPLES MAKING COMPOSITE (OLD)

|     | LAB CONTROL NO. | SAMPLE NO. | VOLUME TO COMPOSITE |
|-----|-----------------|------------|---------------------|
| 1)  | _____           | _____      | _____               |
| 2)  | _____           | _____      | _____               |
| 3)  | _____           | _____      | _____               |
| 4)  | _____           | _____      | _____               |
| 5)  | _____           | _____      | _____               |
| 6)  | _____           | _____      | _____               |
| 7)  | _____           | _____      | _____               |
| 8)  | _____           | _____      | _____               |
| 9)  | _____           | _____      | _____               |
| 10) | _____           | _____      | _____               |

THE REASON FOR MAKING THE COMPOSITE SAMPLE.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

THE COMPOSITE SAMPLE WILL BE USED FOR.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ANALYST \_\_\_\_\_

DATE \_\_\_\_\_ TIME \_\_\_\_\_

CONSERVATION SERVICES, INC. LABORATORY WORKSHEET

CUSTOMER: \_\_\_\_\_ CONTACT: \_\_\_\_\_  
WASTE CODE: CO-01- \_\_\_\_\_ - \_\_\_\_\_ MANIFEST NO.: \_\_\_\_\_  
RECEIVED: DATE \_\_\_\_\_ TIME \_\_\_\_\_ VOLUME \_\_\_\_\_

PHYSICAL STATE (top to bottom 1 2 3 4) \_\_\_\_\_ LIQUID \_\_\_\_\_ % \_\_\_\_\_ SOLID \_\_\_\_\_ %  
\_\_\_\_\_ OIL \_\_\_\_\_ % \_\_\_\_\_ SLUDGE \_\_\_\_\_ % \_\_\_\_\_ OTHER \_\_\_\_\_

DESCRIPTION COLOR \_\_\_\_\_ ODOR \_\_\_\_\_ LOOK \_\_\_\_\_

DENSITY \_\_\_\_\_ ( ) lb/cu.yd ( ) lb/gal ( ) g/cc

MISCIBILITY Miscible in water? ( ) yes ( ) no

SOLUBILITY Soluble in water? ( ) very ( ) slight ( ) none

IGNITABILITY %LEL \_\_\_\_\_ at \_\_\_\_\_ °F

CLOSED CUP FLASH POINT \_\_\_\_\_ °F

CORROSIVITY INITIAL pH \_\_\_\_\_ ( \_\_\_\_\_ % sample solution)

REACTIVITY Any reactions with ( ) AIR ( ) WATER ( ) KILN DUST  
Describe: \_\_\_\_\_

ACID ADJUST: 20 ml of a \_\_\_\_\_ % sample solution  
took \_\_\_\_\_ ml of 10% HCl, final pH \_\_\_\_\_  
REACTIONS \_\_\_\_\_

BASE ADJUST: 20 ml of a \_\_\_\_\_ % sample solution  
took \_\_\_\_\_ ml of 10% NaOH, final pH \_\_\_\_\_  
REACTIONS \_\_\_\_\_

SULFIDES Spot test ( ) positive ( ) negative QUANTITATIVE \_\_\_\_\_

CYANIDES QUANTITATIVE \_\_\_\_\_

AMMONIA QUANTITATIVE \_\_\_\_\_

CHLORIDES Spot test ( ) very ( ) slight ( ) none

RADIOACTIVITY Greater ( ) or Less ( ) than background

SUSPENDED SOLIDS After Centrifuge \_\_\_\_\_ % of total volume

MOISTURE \_\_\_\_\_ % MOISTURE by evaporation

VISCOSITY \_\_\_\_\_ cp (centipoises)

ANALYST \_\_\_\_\_ DATE \_\_\_\_\_

CUSTOMER: \_\_\_\_\_ DATE: \_\_\_\_\_  
WASTE CODE: CO-01-\_\_\_\_\_-\_\_\_\_\_

SOLIDIFICATION REQUIREMENTS

KILN DUST TYPE \_\_\_\_\_ WEIGHT OF WASTE 100MLS= \_\_\_\_\_

WASTE/WATER RATIO \_\_\_\_\_ % WASTE \_\_\_\_\_ % WATER  
RATIO FIGURES START: 200 MLS KD= \_\_\_\_\_ G  
FINISH: \_\_\_\_\_ MLS KD= \_\_\_\_\_ G  
TOTAL: \_\_\_\_\_ MLS KD= \_\_\_\_\_ G

$$\frac{200 \text{ MLS KD}}{x} = \frac{154.0 \text{ G KD}}{x}$$

KILN DUST TYPE \_\_\_\_\_ WEIGHT OF WASTE 100MLS= \_\_\_\_\_

WASTE/WATER RATIO \_\_\_\_\_ % WASTE \_\_\_\_\_ % WATER  
RATIO FIGURES START: \_\_\_\_\_ MLS KD= \_\_\_\_\_ G  
FINISH: \_\_\_\_\_ MLS KD= \_\_\_\_\_ G  
TOTAL: \_\_\_\_\_ MLS KD= \_\_\_\_\_ G

$$\frac{200 \text{ MLS KD}}{x} = \frac{154.0 \text{ G KD}}{x}$$

RATIO \_\_\_\_\_ VOLUME INCREASE \_\_\_\_\_

COMMENTS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NEUTRALIZATION REQUIREMENTS

| TITRANT USED: _____  | START | FINISH | MLS USED | FINAL pH |
|----------------------|-------|--------|----------|----------|
| INDICATOR TYPE _____ | _____ | _____  | _____    | _____    |
| _____                | _____ | _____  | _____    | _____    |
| _____                | _____ | _____  | _____    | _____    |

To get a pH of \_\_\_\_\_ approximately \_\_\_\_\_ gallons of \_\_\_\_\_  
is needed for each \_\_\_\_\_ of waste.

COMMENTS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ANALYST \_\_\_\_\_ DATE \_\_\_\_\_



777 West 62nd  
Denver, Colorado 80216  
(303) 426-8158

## LABORATORY SERVICE REQUEST

|  |   |   |                   |
|--|---|---|-------------------|
| DATE   | SALESMAN  | LAB CONTROL NUMBER                        | LSR SERIES NUMBER |
| GENERATOR NAME   |   | COMPANY CONTACT                           |                   |
| GENERATOR ADDRESS  |   | PHONE                                     |                   |
| ATTACHED FORMS <input type="checkbox"/> WCD <input type="checkbox"/> ANALYTICAL DATA <input type="checkbox"/> MSDS <input type="checkbox"/> SAMPLE DATA <input type="checkbox"/> CUSTODY <input type="checkbox"/> COMPOSITE <input type="checkbox"/> OTHER |   |   |                   |
| VOLUME/FREQUENCY   | ACTION REQUESTED <input type="checkbox"/> CSI <input type="checkbox"/> DISPOSAL | OTHER (COMMENTS) <input type="checkbox"/> | PRIORITY          |
| OTHER COMMENTS   |   |   |                   |
| GENERAL WASTE DESCRIPTION  |   |   | DATE SAMPLED      |
| PHYSICAL STATE   | COLOR   | ODOR                                      |                   |
| PROCESS GENERATING WASTE   |   |   |                   |
| HANDLING PRECAUTIONS   |   |   |                   |
| INFORMATION ON SAMPLE BOTTLE   |   |   |                   |
| ANALYSIS REQUESTED <input type="checkbox"/> RCRA CHARACTERISTICS <input type="checkbox"/> OIL AND GREASE <input type="checkbox"/> GC/MS PHENOL/CN <input type="checkbox"/> PCB <input type="checkbox"/> FLASH POINT  |   |   |                   |
| <input type="checkbox"/> EP TOXICITY METALS <input type="checkbox"/> PRIORITY POLLUTANTS <input type="checkbox"/> GC/MS VOA <input type="checkbox"/> PHENOL <input type="checkbox"/> pH  |   |   |                   |
| <input type="checkbox"/> F001-F005 SOLVENTS <input type="checkbox"/> TOTAL RCRA METALS <input type="checkbox"/> GC/MS BNA <input type="checkbox"/> SULFIDES <input type="checkbox"/> TCLP  |   |   |                   |
| <input type="checkbox"/> EP TOXICITY PESTICIDES <input type="checkbox"/> ORGANIC CARBON <input type="checkbox"/> GC/MS PEST/PCB <input type="checkbox"/> CHLORIDES   |   |   |                   |
| <input type="checkbox"/> TOTAL ORGANIC HALIDES (TOX) <input type="checkbox"/> BTU <input type="checkbox"/> GC/MS METAL <input type="checkbox"/> ORGANIC SCAN FOR _____   |   |   |                   |
| <input type="checkbox"/> OTHER _____   |   |   |                   |
| OUTSIDE LAB USED   |   | LAB SIGNATURE                             |                   |

## LABORATORY REPLY

|  |                             |
|--|-----------------------------|
| WASTE HAS RCRA CHARACTERISTICS <input type="checkbox"/> YES <input type="checkbox"/> NO  | SPECIFY RCRA CHARACTERISTIC |
| POSSIBLE RCRA LISTED CONTAMINANTS  |                             |
| ADDITIONAL TESTING NEEDED  |                             |
| ADDITIONAL MATERIALS NEEDED  | DATE                        |
| ADDITIONAL MATERIALS NEEDED  | DATE                        |
| NEUTRALIZATION REQUIREMENTS  |                             |
| WASTE CATEGORY   |                             |
| TYPE OF TREATMENT <input type="checkbox"/> SOLIDIFICATION <input type="checkbox"/> DIRECT BURIAL <input type="checkbox"/> NEUTRALIZATION THEN SOLIDIFICATION <input type="checkbox"/> SEE COMMENTS |                             |
| REAGENT TYPE <input type="checkbox"/> KILN DUST <input type="checkbox"/> FLY ASH <input type="checkbox"/> OTHER  | SAFETY EQUIPMENT REQUIRED   |
| RATIO WASTE/WATER  | RATIO WASTE/REAGENT         |
| VOLUME INCREASE  |                             |
| DIRECT WASTE TO <input type="checkbox"/> BASIN ONE <input type="checkbox"/> BASIN TWO <input type="checkbox"/> DISPOSAL CELL <input type="checkbox"/> OTHER  |                             |
| COMMENTS   |                             |
|  |                             |
|  |                             |
| WASTE CODE NUMBER  |                             |

DATE: \_\_\_\_\_ SIGNED: \_\_\_\_\_



**APPENDIX L - CSI PERSONNEL JOB DESCRIPTIONS**

JOB DESCRIPTIONS

## FACILITY MANAGER

### I. RESPONSIBILITIES

#### A. Schedule site operations

1. Supervise and direct equipment operations on the site
2. Supervise tank farm and solidification activities on the site
3. Supervise the scheduling of reagent deliveries for the solidification process
4. The Facility Manager is designated as the emergency response coordinator for the site

#### B. Ensure that site operations adhere to all safety rules and regulations

1. Perform daily inspections of the site
2. Assist the technical department or sub-contractors in monitoring activities and operations
3. Supervise sub-contractors with regard to safety procedures
4. Ensure that the solidification operators adhere to all the safety rules and regulations

#### C. Maintain Site

1. Supervise road and access maintenance

2. Supervise grounds maintenance
3. Supervise general site housekeeping (i.e. maintenance, snow removal, etc.)

D. Personnel

1. Ensure that all employees meet CSI and D.O.T. hiring requirements, where applicable
2. Ensure that all employees are trained in the use of their assigned equipment, and that they understand and are able to perform their assigned tasks efficiently
3. Ensure that all employees are trained in material handling and emergency response procedures
4. Monitor drivers daily logs
5. Keep up with local, state, and federal laws regarding the handling of waste materials

E. Equipment

1. Institute and maintain an equipment inspection and prevention maintenance program
2. Institute and maintain a truck and tank testing and inspection program

F. Marketing and Employee Relations

1. Assist CSI Sales personnel with any scheduling or waste handling difficulties that might arise
2. Set up and manage a comprehensive safety program at the site
  - a. Hold regular district safety meetings at least monthly, or as necessary.
    1. These meetings should include a

safety or health topic

2. Discuss any safety problems the operation is experiencing
  3. Commend people who are doing a good job as far as safety is concerned
  4. Discuss improvements or ideas to improve the company's safety program
- b. Attend organized safety or training meetings and/or seminars and prepare a summary of information gathered at such meetings
  - c. Help establish and monitor a disciplinary policy for the company
3. Security Program
- a. Prepare a manual for security monitoring at the site. This will include:
    1. Setting up schedules for building and machinery safety equipment inspections, including, but not limited, to fire extinguishers, eyewashes, escape routes, etc.
    2. Setting up schedules for daily inspections of perimeter fencing, lighting, general housekeeping, incimate weather preparation, etc. and making sure written daily logs are kept to verify such inspections
    3. If guards are employed, he will be

responsible for their training and schedules

b. Prepare a program for vehicle inspection and verification of condition

1. See that all vehicles engaged in the transportation of waste or reagent products are inspected for:

a. Safety equipment

b. Lights, brakes, tires, etc.

c. Proper paperwork

d. That the truck is clean (if leaving site)

e. General appearance

2. Supervise site security inspection to reduce or eliminate theft of company property

#### G. Hiring and Training Procedures

##### 1. Hiring

a. Must approve all hourly personnel, office and/or clerical people hired for the site

b. Be responsible for checking references, driving records, and to be sure all employees have complete physicals (a) before they are hired, and (b) at least once per year thereafter

c. Be sure all new employees receive, understand, and acknowledge receipt of all orientation literature including, but not limited to,

safety material, training manuals, job descriptions, etc.

2. Training

- a. Be responsible for designing procedures to help train new employees.
- b. Be responsible for instituting and maintaining formal written training procedures.

H. Record Keeping and Follow-up Procedures

1. Record Keeping

- a. Prepare and review any accident reports, and be sure all necessary reports and/or correspondence is completed and submitted in a timely fashion.
- b. Be responsible for completing the necessary OSHA forms and/or reports.
- c. Be responsible for completing workmen's compensation and vehicle accident reports.
- d. Also keep a permanent file of:
  - 1. Employee commendations or reprimands
  - 2. Monthly safety meetings
  - 3. Safety committee meetings
- e. Maintain building and machinery safety equipment inspection file
- f. Maintain security guard logs and inspection file, if necessary
- g. Keep equipment operation & maintenance logs
- h. Keep site inspection records

- i. Reagent deliveries
  - j. Verify waste inventories
  - k. Record all treatment & solidification operations
  - l. Keep equipment utilization & maintenance records
2. Follow-up Procedures
- a. Travel to jobs-in-progress, as necessary to observe working techniques and safety procedures of employees and supervisors, on a spot check basis
  - b. Institute on-site safety and housekeeping inspections. These inspections are to be confirmed in writing and held at least once per week

## II. AUTHORITY

- A. Supervise site operators & helpers
- B. Site emergency response coordinator
- C. Off-site emergency response team leader
- D. Has disciplinary control over all hourly employees
- E. May make disciplinary action recommendations for safety violations involving salaried personnel to the Vice President of Operations

## III. COMPENSATION

- A. This position will be salaried
- B. Other Compensations
  - 1. Expense account
  - 2. Vehicle: pickup truck or equivalent with insurance, maintenance, and fuel will be provided
  - 3. Incentive bonuses may be provided



#### IV. OBJECTIVES

- A. Insure effective, safe, and economical operations
- B. Set-up and maintain and prescribe safety and training program
- C. Help establish and maintain a budget for the site
- D. Set-up and maintain an effective respiratory and safety equipment training program
- E. Insure that all drivers attend Defensive Driving Courses
- F. Get involved in community activities
- G. Establish a good repor with local and state law enforcement officials
- H. Help maintain a good CSI image in the community and with regulatory officials

#### V. QUALIFICATIONS

- A. High school diploma (minimum)
- B. Familiar with heavy equipment operation & maintenance
- C. Safety training and emergency response experience
- D. Preventative maintenance of heavy equipment experience
- E. Some business administration training

SERVICE SUPERVISOR.

I. RESPONSIBILITIES

- A. Customer job site project supervisor. He is to coordinate trucks, drivers/operators, laborers, sub-contractors to meet job specifications toward a successful project completion
- B. He is accountable for all CSI and CSI sub-contracted employees on the customer's location
- C. Responsible for enforcement of safety policies and procedures at any and all work sites. He must see that there is no deviation from established procedures or safety rules. He is to see that all violations are brought to the attention of the appropriate persons, and is empowered to make such field changes as are necessary to ensure compliance with all regulations
- D. He is responsible for reporting and recording all events on a job including safety violations, accident reports, daily work performed, and any other reports required by CSI Management
- E. He is responsible for on-site customer contact relevant to the job and for maintaining good customer relations
- F. He is responsible for ensuring that all employees are

trained in the use of their assigned equipment and for monitoring daily job logs

II. AUTHORITY

- A. Reports to Facility Manager
- B. Has disciplinary control over all CSI truck drivers/operators, laborers, and supervisory authority over all CSI sub-contracted employees
- C. Customer job site and facility off-site emergency response coordinator

III. COMPENSATION

- A. Will be a salaried position
- B. Provided with pickup truck, fuel, maintenance, and insurance
- C. Incentive bonus may be provided

## CHEMIST

### I. RESPONSIBILITIES

- A. Set-up and coordinate health and technical program for the District
  - 1. Health Program
    - a. Prepare and supervise a written respiratory program, according to OSHA standards and guidelines
    - b. Prepare, coordinate, and circulate safety data information sheets on waste streams handled at this site to the appropriate personnel
    - c. Make sure that all appropriate employees are informed of the proper chemical handling procedures for waste streams handled at the site
    - d. Supervise training sessions for employees on respirator, health, and chemical handling procedures
    - e. To make regular, at least once a week, inspections of facilities, including but not limited to first aid stations, safety equipment storage and condition, safety showers and

eyewashes, employee locker rooms, etc. He also shall maintain a permanent written record of all such inspections

- f. Monitor facility laboratory for proper safety and health techniques
- g. Coordinate with Facility Manager as to the proper safety gear required for work on-site or in customer's plant

2. Technical Program

- a. Coordinate with the Sales Engineers on the following for each waste stream
  - 1. Waste Characterization Data Sheet
  - 2. Sample of the waste to be handled
  - 3. Treatment and disposal recommendation for waste stream
- b. Be sure each waste stream has been approved by Facility Manager for disposal and/or treatment. On any special waste, coordinate with the proper EPA or Health Department officials
- c. Communicate with customer's Technical Staff to help with problems and/or questions regarding treatment or disposal at the site
- d. Give approval for disposal, transfer, or shipping of waste to/from the site after the following criteria are met
  - 1. Proper paperwork accompanies the waste
  - 2. Analysis of waste to assure identity
  - 3. Designation of proper safety gear and

procedures

4. Filling out a waste disposal or shipping authorization sheet

B. Record keeping and follow-up procedures

1. Record Keeping

- a. Set up monthly reporting to the State Health Department to include:
  1. Waste received
  2. Waste code numbers
  3. Volumes
  4. Dates
  5. Treatment and disposal method
  6. Disposal site used
- b. Report of analysis on monitoring wells, leachate detection wells, and air quality monitoring
- c. CSI internal weekly reports of waste handled, volumes, treatment, and disposal method

2. Follow-up Procedures

- a. Travel to and communicate with customer's technical staff about questions and/or problems regarding waste treatment at the site
- b. Help Sales Engineers and other CSI personnel with technical problems concerning waste registration, treatment, or disposal

C. Hiring and Training

1. Hiring

- a. Interview and select possible candidates for

technician positions

- b. Will select, with the approval of the Facility Manager, people to fill these positions

## 2. Training

- a. Supervise the training of all appropriate personnel with regard to health, technical, and chemical handling procedures
- b. Will assist in the program selection for guest speakers at training and safety meetings
- c. Will prepare chemical handling demonstration for the monthly safety meetings
- d. Be responsible for training technicians as to proper laboratory techniques and CSI policies

## II. AUTHORITY AND QUALIFICATIONS

### A. Reporting and supervision of technical personnel

#### 1. Reporting

- a. Facility Manager: for day-to-day activities and site specific duties and for adhering to company procedures, etc.
- b. Also reports to CSI Vice President on policy matters
- c. Both the Facility Manager and Vice President must agree before any terminations or merit increases are instituted

#### 2. Supervision

- a. Supervise technicians
- b. Supervise waste handling procedures and personnel on site

- c. Recommend to the Facility Manager disciplinary action for people that do not adhere to these policies and procedures

B. Qualifications

1. Must have a degree in Chemistry
2. At least one year experience in proper laboratory procedures
3. One year experience in chemical waste handling is desired
4. Familiar with RCRA, U.S.E.P.A. and Colorado Solid Waste Regulations and guidelines
5. Must complete advanced first aid training within six months after hiring

III. COMPENSATION

- A. This position will be salaried

NOTE: The hiring, firing, and any raises must be approved by both the Facility Manager and the Vice President of CSI

- B. Other Compensations

1. Vehicle allowance
2. Expense account
3. Incentive bonus may be provided

IV. OBJECTIVES

- A. Establish and maintain a good repor with customer's technical staff
- B. Be willing to help with any technical problems and/or questions on or off the site
- C. Set-up complete records, logs, and reports to proper



agencies

- D. Make sure Federal, State, and CSI rules and regulations are followed
- E. Set-up and make sure the health program meets or exceeds industry and OSHA standards
- F. Supervise waste handling procedures on and off site to protect people and the environment
- G. Attend appropriate courses and seminars to ensure our programs are kept up-to-date
- H. Get involved with local and state chemical associations and with environmental community activities
- I. Establish and maintain a good repor with Federal, State, and Local Health Department officials
- J. Help maintain a good CSI image in the community

## LAB TECHNICIAN

### I. RESPONSIBILITIES

- A. Approval of waste streams from customer to be brought on-site for treatment/solidification
- B. Approval for disposal, transfer, or shipping of waste to/from the site after the following criteria are met:
  - 1. Proper paperwork accompanies the waste
  - 2. Sampling and analysis of waste to assure identity
  - 3. Designation of proper safety gear and procedures to be followed
  - 4. Filling out a Waste Disposal Transportation Authorization Sheet
- C. Supervise unloading of waste
  - 1. Ensure that wastes are discharged in the proper locations
  - 2. Ensure compliance with safety rules
- D. Help Chemist with inspections of facilities including but not limited to, first aid station, safety equipment storage and condition, safety showers and eyewashes, employee locker room, etc.
- E. Help Chemist with training sessions for employees on respirators, health, and chemical handling procedures

- F. Dispense first aid on-site
- G. Supervise weekly tank guaging and daily cleanup of tank farm
- H. Cleaning of respirators
- I. Sample all monitoring facilities
- J. Perform other routine duties as assigned by the Chemist

II. RECORD KEEPING

- A. Updating Waste Characterization reference books
- B. Log Lab Recommendations and Service Requests
- C. Daily logging of activities on-site
- D. Daily logging of waste movement

III. QUALIFICATIONS

- A. Must have a high school education
- B. At least one year college Chemistry or one year experience in laboratory and in waste handling procedures
- C. Will be required to have advanced first aid training within 6 months after hiring

IV. AUTHORITY

- A. This position reports to Chemist
- B. Supervision of truck drivers during loading/unloading to ensure proper discharge of waste and compliance with safety rules

V. COMPENSATION

- A. This is an hourly position

## DRIVER/OPERATOR

### I. RESPONSIBILITIES

- A. Be familiar with all equipment to be used
- B. Inspection: It is the responsibility of each driver to inspect his vehicle and report maintenance needs before operation
  - 1. Drivers' daily vehicle inspection report will be completed and signed prior to leaving your terminal
    - a. Pay special attention to all tank valves, flanges, hatches, dust caps and gaskets for leaks, loose fittings, etc.
  - 2. Do not operate a piece of defective equipment that could cause an accident or a spill. The Service Supervisor or Facility Manager, as appropriate, must be notified.
- C. Loading and Unloading of Materials: It shall be the responsibility of each driver to observe all safety rules and wear all required safety equipment during loading or unloading operations
- D. Transportation:
  - 1. Follow all federal, state and local laws regarding

the safe operation of a motor vehicle

2. Follow the designated route to your destination
  3. Always maintain a professional attitude
  4. Frequently check your trailer through the use of your mirrors. Look for leaks, seepage, vapors or puddles when stopped for various traffic conditions or driving breaks
  5. There will be no smoking or open flames within 50 feet of the vehicle. Smoking is allowed in the cab of the vehicle, and extinguish all smoking material in the ashtray
- E. Observe all plant and/or CSI safety rules and regulations

## II. RECORD KEEPING

- A. Maintain proper documentation and paperwork
- B. Maintain daily logs and vehicle maintenance reports

## III. AUTHORITY

- A. Reports to Service Supervisor and/or Facility Manager

## IV. COMPENSATION

- A. This is an hourly paid position

LABORER

I. RESPONSIBILITIES

Will assist drivers on in-plant work and also any jobs that may occur on CSI's facilities

II. AUTHORITY

This position reports to Chemist and Facility Manager

III. COMPENSATION

This is an hourly paid position

**APPENDIX M - CLAY LINER EFFICIENCY CALCULATIONS**

## INTRODUCTION

A clay liner and drainage system has been designed. Conservative assumptions and calculations were made in all cases to provide a large safety margin. The design calculations take into account effects of capillary pressure in the partially saturated zone beneath the liner. Capillary pressure increases the gradient across the liner thus increasing the flow. A sand layer beneath the clay liner has been included to minimize capillary effects. To increase flow to the drain pipe, a gravel layer was placed on top of the liner.

## ASSUMPTIONS AND METHOD

Seepage calculations were made using the method developed by McWhorter and Nelson (1978). The following equations determine whether or not the foundation material, sand beneath the liner, is saturated or unsaturated:

$$h_f = y + D_g + D_l - K_f \left( \frac{D_g}{K_g} + \frac{D_l}{K_l} \right)$$

$h_f < h_d$ , unsaturated flow beneath liner

$h_f \geq h_d$ , saturated flow beneath liner

where

$y$  = depth of water standing on surface of cell  
 $D_g$  = saturated depth in gravel above the liner  
 $D_l$  = saturated depth of liner  
 $K_f$  = hydraulic conductivity of foundation material  
 $K_g$  = hydraulic conductivity of gravel above the liner  
 $K_l$  = hydraulic conductivity of liner  
 $h_d$  = displacement pressure of foundation material  
 $h_f$  = pore water pressure head at the liner foundation interface

Darcy velocity through the liner was then calculated using the following form of Darcy's equation:

$$q = \frac{y + D_g + D_l - h_d(q/K_f)^{-1/(2+3)}}{\frac{D_g}{K_g} + \frac{D_l}{K_l}}$$

where

$q$  = Darcy velocity  
= pore size distribution.

Darcy's equation was also used to compute flow to the drain pipes through the gravel layer. Displacement pressure was estimated using the following equation (McWhorter and Nelson,



1978):

$$h_d = -9.66(K_f/n - r) - .401$$

where

$n$  = porosity of foundation material  
 $r$  = residual volumetric water content of foundation material.

Values for porosity, initial volumetric water content, hydraulic conductivity, and residual volumetric water content, were assumed based on field observations and selected values from McWhorter and Sunada (1977). Transit times were calculated assuming that the liner is saturated, which is almost equivalent to taking the U.S. EPA modified transit time equation (1986). The McWhorter method is more conservative since the pore water pressure estimate at the liner foundation interface is more negative than the displacement pressure used in the modified transit time equation.

#### DESCRIPTION OF CASES

Since the percentage of water flowing into the drains versus water which could flow through the liner is a function of the boundary conditions and time, three cases were considered. In the first case no flow to the drain is assumed since the flow rate could be so low that the negative pore water pressure is the dominant driving mechanism. In the second and third cases, it was assumed that sufficient head has developed on top of the liner to drive water into the drain pipe. In the second case the head on top of the liner is zero and in the third it is 0.5 feet. In all cases it was assumed that the liner was initially saturated. If the liner is compacted to near standard procter density and optimum moisture content, the saturated approximation for the liner will be sufficiently accurate.

Since laboratory hydraulic conductivities are sometimes difficult to obtain in the field, each case was calculated for two liner hydraulic conductivities. The laboratory determined value of  $1.0E-7$  cm/sec and a potential real field value of  $1.0E-6$  cm/sec. With good fill control, a value of  $1.0E-7$  cm/sec is expected.

Materials exhibiting different hydraulic conductivities were considered for placement above and below the liner with respect to facilitating drainage, decreasing the gradient across the liner, and cost effectiveness.

## RESULTS AND CONCLUSIONS

Under normal operating conditions, no flow through the waste materials to the liner is expected. The U.S. EPA water balance method (Fenn et al., 1975) indicates that net movement of water resulting from precipitation in the cell cap is upward. Free water left over from the hydration process in the solidified kiln ash is negligible when the proper mixing ratio is used. The ratio will be determined in the CSI lab on a per material basis.

If a worst case event occur where there is water present, calculations indicate that it is necessary to use a material (gravel) above the liner having a hydraulic conductivity greater than or equal to 1 cm/sec on a one percent grade to ensure complete drainage. Otherwise, as much as 50 percent of the water could flow through the liner. A drain pipe diameter of 5 inches is required on a one percent grade.

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Should flow through the solid waste materials occur and assuming no drainage, approximately 330 days of continuous seepage to the liner would be required for complete penetration of the liner. With extremely low Darcy velocities, that is less than  $4.0E-7$  cm/sec, 100 percent of the flow is into the liner rather than into the drain pipe. With higher Darcy velocities, that is greater than  $4.0E-7$  cm/sec, a maximum of 0.4 percent of the total volume of water would flow into the liner, assuming a liner hydraulic conductivity of  $1.0E-7$  cm/sec. If a hydraulic conductivity of  $1.0E-6$  cm/sec is assumed, a maximum of 3.0 percent would flow into the liner.

Since no flow is expected from precipitation, free water from the solidification process is insignificant, and the transit time is substantial, it is our opinion that the gravel drain system, liner, and capillary sand barrier are adequate to protect soil and groundwater from contamination.

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**APPENDIX N - COMPATIBILITY INFORMATION**

- Under optimum compaction, a 91.4-cm (3-foot) liner of the clay in a tank 7.01 m (23 feet) deep containing benzene can begin to leak within 36 days.

4.5.22.1.3 Discussion--Although the soil sample used in the Trinity Engineering experiments is not adequately characterized, the results of the test clearly indicate potential for large permeability increases resulting from exposure to concentrated nonpolar hydrocarbons. The apparatus and test procedures used differ substantially from those used in permeability tests conducted by other investigators.

The data also illustrate the importance of moisture content during compaction. The performance of clay-soil liner in contact with chemicals such as benzene could be drastically influenced by the uniformity of the moisture content when the liner material was installed and compacted.

#### 4.5.22.2 Test Data Submitted to Pennsylvania Department of Environmental Resources--

The Pennsylvania Department of Environmental Resources has received data pertinent to clay liner/chemical compatibility. The data pertain to specific sites and specific wastes and were submitted to the State by consulting engineers. Testing procedures vary and information needed to evaluate the data is not always provided in the reports. All test results show the clay liner permeabilities to be "within the range required" after exposure to the wastes tested.

Report A deals with tests to evaluate effects on a liner material in contact with a waste comprised of one part oil contaminated soil and four parts water. For the permeability tests, samples were air dried and then recompacted, at  $\pm 2$  percent of optimum moisture content, to 95 percent of maximum dry density. Stainless steel molds 10.2 cm (4 inches) in diameter and 11.7 cm (4.6 inches) in height were used. After trimming, the molded sample was transferred to a constant head permeability device. A back-pressure was applied to two of the four samples during saturation with 0.01 N calcium sulfate solution. Permeability measurements with the calcium sulfate showed no significant differences between the results for samples with or without backpressure. Thus, it was concluded that the effect of entrapped air was minimal.

After permeability tests with the standard calcium sulfate, the liner samples were placed in contact with the test fluid, sealed, and placed on a rocking table for 30 days. Three of the samples were tested with the waste fluid and one with calcium sulfate solution. After 30 days, the samples were drained and the permeability tests repeated. Reported results are shown in Table 4-15.

No discernible color change was observed after a 30-day exposure to the waste fluid. No shrinkage along the sides of the mold was observed, although a change in height of approximately 0.64 cm (0.25 inch) was reported.

TABLE 4-15. PERMEABILITY TEST RESULTS<sup>a</sup>  
(Pennsylvania Case A)

| Sample         | Coefficient of permeability (cm/s) |   |
|----------------|------------------------------------|---|
|                | With 0.01 N CaSO <sub>4</sub>      | After exposure to test fluid <sup>b</sup> |
| A <sup>c</sup> | $1.1 \times 10^{-7}$               | $1.2 \times 10^{-7d}$                     |
| B <sup>c</sup> | $5.9 \times 10^{-8}$               | $3.9 \times 10^{-8}$                      |
| C              | $9.4 \times 10^{-8}$               | $1.1 \times 10^{-7}$                      |
| D              | $1.7 \times 10^{-7}$               | Not tested                                |

<sup>a</sup>Test data reported to Pennsylvania Department of Environmental Resources.

<sup>b</sup>Test fluid was one part oil-contaminated soil to four parts water.

<sup>c</sup>Samples under backpressure during initial permeability tests.

<sup>d</sup>Control sample--tested after 30-day exposure to 0.01 N CaSO<sub>4</sub>.

The waste tested--one part oil contaminated soil and four parts water--was not characterized further. Neither the extent of the oil contamination nor the characteristics of the contaminated oil were reported. It may be assumed that either tap water or deionized water was used to prepare the waste fluid. The extent to which the oil or its contaminants would be extracted by the water is unknown but probably very small. Although it is not discussed in the report, the waste material in contact with the clay liner sample may have involved three phases, with oil being the lightest phase.

No indication of the length of the permeability testing procedure or pore volumes displaced is given. The hydraulic heads used in the tests also are not reported. These details may be stated in a letter that is referenced in the report. Soil characterization data were not included.

Report B describes the results of a similar investigation in which liner samples from a disposal site were tested with four different wastes. The permeabilities are reported in Table 4-16. All samples showed slight (twofold) increases in permeability after a 30-day exposure to the wastes. It is notable that "control sets" exposed for 30 days to 0.01 N CaSO<sub>4</sub> showed similar increases.

Soil properties are listed below:

Cation exchange capacity: 11.1 meq/100 g soil  
Predominant exchangeable cation: Calcium  
Major mineral fraction: Alpha quartz  
Other minerals (trace to minor): Microcline, Adularia, Muscovite, Kaolinite  
Percent clay size ( 0.002 mm): 13  
Percent silt size (0.002 mm -0.05 mm): 30  
Percent sand size (0.05 mm -2.0 mm): 22  
Percent larger than 2.0 mm: 35  
Liquid limit (percent water): 31  
Plastic limit (percent water): 22

Wastes used in the tests were not characterized beyond the description given in the table. Presumably, they were diluted with water as was done in Case A, but this is not stated in the report. The duration of the tests, pore volumes replaced, and hydraulic head are not provided in the report.

Report C provides permeability data on a soil sample tested with chrome ore leachate. The leachate (pH = 13.0) contained 1,400 mg/L total chromium and 1,200 mg/L hexavalent chromium. A constant head test, conducted at a pressure of 20 psi, gave a permeability of  $1.2 \times 10^{-8}$  cm/s. With the falling head method, a permeability of  $2.2 \times 10^{-8}$  cm/s was measured.

Soil characterization and details of the test method were not provided in the brief report.

TABLE 4-16. PERMEABILITY TEST RESULTS<sup>a</sup>  
(Pennsylvania Case B)

| Sample | Coefficient of permeability (cm/s) |                         |  |
|--------|------------------------------------|-------------------------|--|
|        | Before exposure to waste           | After exposure to waste | Waste  |
| A      | $1.4 \times 10^{-8}$               | $2.0 \times 10^{-8}$    | Electric furnace baghouse dust                     |
| B      | $1.4 \times 10^{-8}$               | $2.1 \times 10^{-8}$    | Tar decanter sludge (high in organics)             |
| C      | $1.8 \times 10^{-8}$               | $3.0 \times 10^{-8}$    | Neutralized pickle liquor rinse water sludge       |
| D      | $1.8 \times 10^{-8}$               | $3.0 \times 10^{-8}$    | Hot strip mill recycle system sludge (high in oil) |

<sup>a</sup>Test data reported to Pennsylvania Department of Environmental Resources.



pore volumes of test permeant fluid were passed through the samples. Elevated hydraulic gradients 110 and 450 were used for the tests, and cell pressures were 2.5 and 4.5 kg/cm<sup>2</sup>. Test times ranged from 100 to 350 days. In three of the samples, more than 12 pore volumes were exchanged.

Project C--A waste fluid characterized by high salt concentration and high total organic carbon was tested in four soil samples. The samples contained varying proportions of two soils--a fine-to-coarse sand, and a sandy clay with 1 to 3 percent commercial bentonite.

Permeability tests were run at a hydraulic gradient of 20. After initial permeability increases in some samples, the permeabilities decreased. Samples were tested for 692 days. For each sample, between 2 and 13 pore volumes were exchanged. The permeability decrease noted was approximately 1 order of magnitude for a cement bentonite sample. For the other three soil mixtures, permeability decreased by a factor of 2 to 4.

The constituents present in the permeant are not known precisely. Available chemical analysis data indicate that the chemical concentrations in the waste material vary considerably from year to year.

Project D--Slight decreases in permeability were reported for clay-soil samples (with bentonite) exposed to contaminated groundwater samples taken from piezometers. Soil samples were 25 percent flyash, 25 percent uncontaminated clay, 25 percent contaminated clay, and 25 percent silt. Bentonite (1 percent) was added.

Two permeant fluids were tested; pH values were 10.57 (Sample A) and 8.8 (Sample B). Specific conductance was reported at 35,300 and 13,200 µmho/cm at 25 °C.

Samples were tested at a gradient of 190 with cell pressure at 1.5 kg/cm<sup>2</sup>. Test duration was 90 days with more than three pore volumes exchanged. Final permeabilities were determined to be below  $1 \times 10^{-8}$  cm/s.

Project E--Permeability tests were run on a silty clay soil from a proposed facility with four waste leachates as the permeant fluid. Soil samples were compacted in the laboratory (95 percent of standard Proctor density). Chemical characteristics of the waste fluids tested are shown in Table 4-17.

Permeability tests were performed at a hydraulic gradient of 47 and cell pressure of 0.75 kg/cm<sup>2</sup>. Total test time was 40 to 50 days. The results of the permeability tests are given in Table 4-18. All samples were saturated with 0.01 N calcium sulfate solution prior to introduction of the waste fluid.

Project F--Permeability data on undisturbed Shelby tube samples tested with tap water showed permeability values ranging from  $6.1 \times 10^{-8}$  to  $2.0 \times 10^{-9}$  cm/s with an average of  $1.0 \times 10^{-8}$  cm/s. Fifty-seven samples were tested with total test time varying from 6 to 10 days. Hydraulic gradient was 25 to 50, and cell pressure was 3.5 to 5.5 kg/cm<sup>2</sup>.

TABLE 4-18. RESULTS OF PERMEABILITY TESTS, PROJECT E<sup>a</sup>

| Sample fluid | Permeant                 | Pore volumes exchanged | Permeability (cm/s)    |
|--------------|--------------------------|------------------------|------------------------|
| P-1          | 0.01 N CaSO <sub>4</sub> | -                      | 1.6 × 10 <sup>-7</sup> |
|              | No. 3 leachate           | 0 - 3.2                | 1.7 × 10 <sup>-7</sup> |
|              |                          | 3.2 - 12.7             | 1.4 × 10 <sup>-7</sup> |
| P-2          | 0.01 N CaSO <sub>4</sub> | -                      | 1.1 × 10 <sup>-7</sup> |
|              | No. 4 leachate           | 0 - 8.8                | 1.3 × 10 <sup>-7</sup> |
| P-3          | 0.01 N CaSO <sub>4</sub> | -                      | 1.4 × 10 <sup>-7</sup> |
|              | Sludge leachate          | 0 - 4.7                | 1.5 × 10 <sup>-7</sup> |
|              |                          | 4.7 - 13.5             | 2.4 × 10 <sup>-7</sup> |
|              |                          | 13.5 - 17.2            | 4.2 × 10 <sup>-7</sup> |
| P-4          | 0.01 N CaSO <sub>4</sub> | -                      | 1.1 × 10 <sup>-7</sup> |
|              | Composite leachate       | 0 - 0.8                | 1.2 × 10 <sup>-7</sup> |
|              |                          | 0.8 - 5.6              | 8.1 × 10 <sup>-7</sup> |

<sup>a</sup>Data from D'Appolonia Consulting Engineers, Inc., 1983.



**APPENDIX P - EROSION AND SOIL LOSS CALCULATIONS**