Resource Conservation and Recovery Act Post-Closure Care Permit Application

For U.S.D.O.E.-Rocky Flats Plant
Hazardous & Radioactive Mixed Wastes

CO7890010526

5 October 1988

Volume VII

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BM (4)
2/9/90

ADMIN RECORD

REVIEWED FOR CLASSIFICATION/UCNI
By [illegible]
Date 4/1/90

A-SW-000289

APPENDIX A

SAMPLING PLAN

REVIEWED FOR CLASSIFICATION/UCNI
By [illegible]
Date 4/1/92

DEPARTMENT OF ENERGY
ALBUQUERQUE OPERATIONS OFFICE
ENVIRONMENT, SAFETY AND HEALTH DIVISION
ENVIRONMENTAL PROGRAMS BRANCH

COMPREHENSIVE ENVIRONMENTAL ASSESSMENT AND RESPONSE PROGRAM

PHASE 2:
ROCKY FLATS PLANT
SITE-SPECIFIC MONITORING PLAN

(Work Plan for Performance of Remedial Investigations and Feasibility Studies for all High-Priority Sites)

SAMPLING PLAN

February 1987

DRAFT

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1. INTRODUCTION

CEARP Phase 2 Confirmation consists of CEARP Phase 2a, Monitoring Plan, and CEARP Phase 2b, site characterization (remedial investigation). The Sampling Plan is one component of the Monitoring Plan for Rocky Flats Plant. The Monitoring Plan typically consists of five parts: Synopsis, Sampling Plan, Technical Data Management Plan, Health and Safety Plan, and Quality Assurance/Quality Control (QA/QC) Plan. Because of the Compliance Agreement made by the State of Colorado, Environmental Protection Agency, and Department of Energy (DOE), this Monitoring Plan also includes a Feasibility Study Plan.

CEARP uses a three-tiered approach in the preparation of monitoring plans: the CEARP Generic Monitoring Plan, the Installation Generic Monitoring Plan (IGMP), and Site Specific Monitoring Plans (SSMPs). This SSMP serves as the Work Plan for Performance of Remedial Investigations and Feasibility Studies for all High-Priority Sites required by the Compliance Agreement. Therefore, the acronym used to refer to this plan is SSMP/RIFS. This Rocky Flats Plant SSMP/RIFS Sampling Plan is the detailed work plan for implementation of CEARP Phase 2b site characterizations (remedial investigations) at Rocky Flats Plant and follows guidance provided in the IGMP/CSPCP. This SSMP/RIFS Sampling Plan is complemented by and inseparable from the Technical Data Management Plan and the Quality Assurance/Quality Control Plan. Sections of the Sampling Plan are supported by reference to the other plans and to the Synopsis. Emphasis is placed on integration of efforts for each of the CEARP Phases: Phase 3 (Technological Assessment), Phase 4 (Remedial Action), and Phase 5 (Compliance Verification and Monitoring).

Sampling at Rocky Flats Plant will be conducted using the integrated approach being implemented by CEARP. The integrated approach is summarized in the Synopsis and detailed here. The integrated approach includes characterization in stages, in which the results from the previous stage of sampling are used to design the next stage. This iterative process incorporates the experience and knowledge gained from each stage to minimize the total number of samples required to adequately characterize the site and to provide the necessary data base to prepare feasibility studies for alternative remedial actions. The benefit of staged sampling is greater flexibility within the sampling program with a minimum of cost.

1.1. PURPOSE

This SSMP/RIFS Sampling Plan provides the following basic components of sample/measurement collection and analysis for each high-priority site at Rocky Flats Plant:

- objectives and goals of the investigation
- justification for selected methods and procedures
- proposed sample locations
- proposed number and type of samples
- additional site-specific information requirements.

1.2. OBJECTIVES

The objectives of CEARP Phase 2b site characterizations (remedial investigations) at the high-priority sites at Rocky Flats Plant are to

- verify and characterize contaminant sources,
- determine the present areal and vertical extent of contamination,
- estimate the potential for contaminant migration (including rate and direction) to support risk assessment studies,
- support the technological assessments (feasibility studies) of alternative response actions, including the alternative of "no action," and
- support identification of long term monitoring and verification requirements, as appropriate.

2. SITE SURVEY AND MAPPING

Following the guidance in the IGMP/CSPCP Sampling Plan, all monitoring locations will be described in accordance with the Installation Coordinate System (ICS) for Rocky Flats Plant. The existing coordinate system is a grid system in English units (feet). Elevations will be described in English units, feet above MSL. Surveying will be done in conformance with surveying procedures established in the IGMP/CSPCP.

3. SITE-SPECIFIC MONITORING

Environmental conditions at Rocky Flats Plant have been monitored since shortly after operations began in 1952. In addition, special programs to characterize waste streams, environmental conditions, and past waste disposal practices have been conducted recently (DOE 1986b and DOE 1986f). CEARP Phase I identified approximately 70 sites or groupings of sites that could have adverse impacts on the environment. Additional data collected during preparation of the RCRA Part B Operating Permit Application identified several more potential sites. All potential sites at Rocky Flats Plant were designated as solid waste management units, assigned a reference number, and located on a base map (IGMP/CSPCP Sampling Plan, Plate 1).

A list of solid waste management units is presented in Appendix 1 of the RCRA Part B Operating Permit Application (3004[u] Waste Management Units) (DOE 1986f). These solid waste management units are divided into three categories. The first category includes those hazardous waste management units which will continue to operate and which require a RCRA Operating Permit. The second category includes those hazardous waste management units which are being closed under RCRA Interim Status. The third category includes those inactive waste management units (i.e., RCRA continuing release sites) that are identified under Section 3004(u) of RCRA. Another class of sites is regulated under CERCLA. These CERCLA areas identified at Rocky Flats Plant contain only radioactive wastes (DOE 1986f). However, for ease in referencing these units and/or areas, they have been collectively termed solid waste management units. A preliminary prioritization of solid waste management units based on the CEARP Phase I Installation Assessment was performed and summarized in a report titled "Preliminary Prioritization of Sites" (DOE 1986h).

The high-priority sites addressed in this SSMP/RIFS Monitoring Plan were selected and designated as high-priority sites because of their suspected relationship to preliminarily-identified contaminant plumes in groundwater. Several solid waste management units are included in most of the high-priority sites (Table 3.1 Synopsis) because of their physical proximity to each other. This results in high-priority sites that contain solid waste management units from various phases of CEARP. This is consistent with the staged approach being used by CEARP for site characterizations

(remedial investigations), where the higher priority solid waste management units within the high-priority sites are investigated first, and data from these characterizations (investigations) guide the remainder of the program.

The six high-priority sites identified at Rocky Flats Plant (Plate 1) are as follows:

- 881 Hillside Site
- 903 Pad Area Site
- Mound Area Site
- East Burial Trenches Site
- Present Landfill Site
- Solar Evaporation Ponds Site

The solar ponds and present landfill are RCRA regulated units undergoing closure. Plans for characterization of these sites have been incorporated into this SSMP and are consistent with the 40 CFR 265 Closure Plans for these facilities.

The three viable pathways for releases of contaminants from Rocky Flats Plant are air, surface water, and groundwater (DOE 1986b). Air pathway characterization studies will not be performed under CEARP, as the air pathway has been adequately characterized and documented by previous studies (DOE 1986b, RI 1986b). A site-specific discussion of the other pathways at each high-priority site is presented after each site description. A plant-wide discussion of pathways is presented in the SSMP/RIFS Synopsis.

Investigations at each high-priority site can be divided into source characterization, and migration pathway and plume characterization. Source characterization will generally consist of geophysical surveys, soil gas surveys and soil/waste sampling. Migration pathway and plume characterization will generally include geophysical surveys, soil gas surveys, soil sampling, monitor well installation, groundwater sampling, and surface water and sediment sampling. All CEARP Phase 2b site characterizations (remedial investigations) will be implemented using an integrated approach, in which geophysical and soil gas survey results are used to direct soil and groundwater sampling efforts.

Invasive sampling will be performed at many of the high-priority sites. General criteria that are considered in the sampling descriptions of this plan are as follows:

- If the solid waste management unit cannot be located through geophysical techniques, its suspected location will be sampled.

- Invasive samples from a solid waste management unit will be taken only if the presence of containers of liquid or other hazardous conditions is not anticipated.

- At least six samples will be submitted for laboratory analysis from each borehole depending on the amount of available material. The reader is referred to Section 6 of the IGMP Sampling Plan for rationale.

The following sections present high-priority site descriptions including discussions of associated solid waste management units and migration pathways, followed by detailed plans for source and migration pathway and plume characterization. Complete descriptions of the solid waste management units are contained in the RCRA Part B Operating Permit, Appendix 1 (DOE 1986f).

3.6. SOLAR EVAPORATION PONDS SITE

3.6.1. Site Description

3.6.1.1. Solid Waste Management Unit Descriptions

The Solar Evaporation Ponds Site consists of three separate ponds (SWMU Ref. No. 101): 207C (western pond), 207A (central pond), and 207B (eastern pond). Pond 207B is separated into three sectors (north, central and south). Ponds 207A and 207C contain low-level radioactive liquid process wastes (high in nitrates) being held for evaporation, treatment and solidification. Pond 207B North receives groundwater pumped from the interceptor trench north of the solar ponds. Pond 207B Center contains treated sanitary wastewater from the treatment plant. Pond 207B south is currently empty.

The solar evaporation ponds were constructed in separate phases between 1953 and 1970. Originally, the solar evaporation ponds were a single, two-celled, clay-lined impoundment near Building 779. This pond held low-level radioactive process wastes (high in nitrates) and effluent (mostly water) from treatment of acidic liquid wastes in Building 774. The original pond was used regularly from 1953 through 1965 and was removed as part of the construction of pond 207C. The effluent from the acidic waste treatment process was thick with aluminum hydroxide and difficult to filter. Therefore, an additional pond, 207A, was constructed in 1956 to hold the effluent prior to solidification and shipment offsite. Leakage problems developed in the planking and asphalt-lined ponds, so the three 207B ponds were constructed in 1960. The 207B ponds were also lined with planking and asphalt and eventually began to leak. The liners were repeatedly patched with various materials. In 1970, all of the ponds (207A and 207B) were full, so pond 207C was constructed for additional storage and evaporative potential. Pond 207C was constructed on the site of the original clay lined pond.

In addition to the high nitrate, low-level radioactive process waste and the treated aluminum hydroxide waste, the solar evaporation ponds have received sanitary sewage sludge, lithium metal, sodium nitrate, ferric chloride, lithium chloride, sulfuric acid, ammonium persulfate, hydrochloric acid, nitric acid, hexavalent

chromium and cyanide solutions. To the greatest extent possible, oils and solvents were not sent to the ponds so that surface scum would not hamper evaporation.

A series of trenches and drains was constructed on the north facing slope below the ponds to collect leakage between 1971 and 1981. Because of various construction projects in the area, only the most recent french drain, constructed in 1981, is functional. This system more than covers the east-west dimensions of the ponds and appears to be effective in collecting the seepage.

3.6.1.2. Surface Water

Surface water flows to both North and South Walnut Creeks from the solar evaporation ponds area. The northern slope of the solar evaporation ponds and the units in the 700 area drain toward the north (North Walnut Creek). Most of the runoff is contained by the perimeter road and enters the groundwater interceptor system which extends to the surface. The triangle area (SWMU ref. no. 165) drains directly to North Walnut Creek through a culvert. Runoff from the triangle area is collected in the A-series retention pond system. The southern areas of the solar evaporation ponds drain toward South Walnut Creek and runoff is collected in the B-series retention ponds.

3.6.1.3. Groundwater

Groundwater occurs in both the Rocky Flats Alluvium and in bedrock materials in the vicinity of the solar evaporation ponds. The Rocky Flats Alluvium varies in thickness from about 5 to 12 ft beneath the terrace, and the ponds themselves are probably underlain by a thin veneer of Rocky Flats Alluvium. The top of bedrock forms a mild structural ridge that trends down to the east-northeast. The northern slope from the ponds toward North Walnut Creek has been extensively reworked and most of the unconsolidated materials have been removed (claystone bedrock is exposed over much of the slope). The alluvium extends to the east along the ridge, although it is fully penetrated by the perimeter road.

Bedrock immediately beneath the Rocky Flats Alluvium in the vicinity of the solar evaporation ponds consists of claystone and sandstone of the Arapahoe Formation. Twelve borings have been made in the immediate vicinity of the ponds, and

sandstone comprises roughly 20 percent or less of the bedrock materials within 150 ft of the surface. The beds dip approximately 15 degrees to the east.

Alluvial groundwater flow in the vicinity of the ponds is generally to the north. There appears to be an area of unsaturated alluvium south of the ponds (Hurr 1976 and DOE 1986f) that indicates no flow in the alluvium to the south. The alluvium is fully penetrated by the perimeter road east of the ponds. There is no spring at the outcrop; therefore, there is no alluvial groundwater flow to the east. In addition, claystone bedrock is exposed on the slope to the north of the ponds. It appears that the alluvium beneath the ponds is recharged by subsurface flow from the west, and that the discharge is to the north in the form of subsurface flow in surficial materials and overland flow over the exposed claystone bedrock. Most, if not all of this water appears to be collected in the interceptor trench system.

Flow in bedrock is less well defined. Regional studies (Hurr 1976 and Robson 1981) indicate relatively shallow gradients of about 0.03 to the east (downdip). Site-specific data are currently lacking. However, it seems likely that there is a gradient to the east plus a gradient along the strike in the near-surface, controlled by topography. In addition, there is a downward gradient between the surficial materials and bedrock of about 0.3 in areas of continuous saturation between the two materials. It appears that there is not continuous saturation between the two materials at the eastern and southern edges of the ponds. These areas of discontinuous saturation between the materials are on the edges of alluvium saturation, where water is not always available to recharge the bedrock system.

Groundwater quality in surficial materials in the vicinity of the solar evaporation ponds is characterized by high TDS concentrations, high nitrate concentrations, high strontium concentrations, and possibly elevated radionuclides. Volatile organic compounds have been detected intermittently near the solar evaporation ponds.

3.6.2. Source Characterization

3.6.2.1. Geophysical Surveys

Geophysical surveys will not be performed at the Solar Evaporation Ponds Site; the pond locations are well defined.

3.6.2.2. Soil Gas Surveys

Soil gas surveys will not be conducted at the Solar Evaporation Ponds Site; the pond locations are well defined.

3.6.2.3. Soil/Waste Sampling

The liquids in the ponds and the sludges in Pond 207A have been adequately characterized by previous investigations (DOE 1986f). The sediments in the 207B ponds and in Pond 207C will be sampled during CEARP Phase 2 investigations. Soil sampling around the solar evaporation ponds will be conducted to evaluate the extent of soil contamination and is discussed in Section 3.6.3.2.

3.6.3. Migration Pathway and Plume Characterization

3.6.3.1. Soil Gas Surveys

Soil gas surveys will not be performed at the Solar Evaporation Ponds Site. Detailed soil and groundwater sampling at the site adequately defines groundwater plumes.

3.6.3.2. Soil Sampling

Soils on the berms of the solar evaporation ponds and on the hillside north of the ponds will be sampled to evaluate the extent of soil contamination. Approximately 20 borings are anticipated (Plate 3). Three borings will be located on the eastern berm of pond 207B, two borings will be drilled into the berm between ponds 207A and 207B, and two borings will be located on the berm between ponds 207A and 207C. Another six boreholes will be drilled on the hillside north of the solar evaporation ponds. Borings will extend to the water table or to the top of bedrock if top of bedrock is above the water table.

Soil sampling will be implemented in phases. After analyzing results from soil sampling on the pond berms and the north hillside, another 7 to 10 soil borings may

be drilled downgradient of the ponds outside the perimeter security zone. These borings may extend down the hillside to North Walnut Creek to delineate areas of contaminated soil. Soil sampling and analysis details will be provided in the revised Solar Evaporation Ponds Closure Plan.

3.6.3.3. Monitor Well Installation and Groundwater Sampling

Twenty-two new monitor wells were drilled around the solar evaporation ponds as part of the initial CEARP Phase 2b site characterization (remedial investigation). This monitoring system rings the solar evaporation ponds with alluvial and bedrock wells. In addition, there are several alluvial and bedrock monitor wells downgradient of the ponds in both North and South Walnut Creeks.

Because of the extensive groundwater monitoring system already in place at the solar evaporation ponds, only two new monitor wells are proposed downgradient of the ponds (Plate 4). One well will be installed in North Walnut Creek immediately north of existing well 13-86 to characterize groundwater flow in the North Walnut Creek valley fill alluvium. Another well will be located on the hillside north of the ponds.

3.6.3.4. Surface Water and Sediment Sampling

Surface water samples will be collected from established sampling locations up and downstream from the Solar Evaporation Ponds Site. Included will be stations along North Walnut Creek and South Walnut Creek. Surface water samples will also be collected from any springs or seeps occurring on the hillsides north of the solar evaporation ponds. Samples will be analyzed for the parameters in Tables 3.1 and 3.2 as appropriate.

Table 3.1. Source Sampling Parameters

Metals[a,b]
Hazardous Substance List - Metals
Beryllium
Chromium (hexavalent)
Lithium
Strontium

Organics
Hazardous Substances List - Volatiles[b]
Oil and Grease[a]

Radionuclides[b]
Gross Alpha
Gross Beta
Uranium 233, 234, and 238
Americium 241
Plutonium 239
Strontium 90
Cesium 137
Tritium

Other
TCLP
EP Toxicity
Characteristics (e.g., ignitability, corrosivity, reactivity)
pH
Cation Exchange Capacity

---

[a]These analyses will be performed on only one-third of the samples.
[b]These analyses may be performed on sediments.

Table 3.2. Groundwater and Surface Water Sampling Parameters

Field Parameters
pH
Specific Conductance
Temperature
Dissolved Oxygen*

Indicators
Total Dissolved Solids
Total Suspended Solids*

Metals**
Hazardous Substances List - Metals***
Beryllium***
Calcium
Chromium (hexavalent)***
Iron
Lithium***
Magnesium
Manganese
Potassium
Sodium
Strontium***
Zinc

Anions
Carbonate
Bicarbonate
Chloride
Sulfate
Nitrate

Organics
Hazardous Substances List - Volatiles
Oil and Grease***

Radionuclides
Gross Alpha
Gross Beta
Uranium 233, 234, and 238
Americium 241
Plutonium 239
Strontium 90
Cesium 137
Tritium

Table 3.2. (Continued)

Other
EP Toxicity
Characteristics (e.g., ignitability, corrosivity, reactivity)

---

* for surface water samples only
** dissolved metals for groundwater samples,
total and dissolved metals for surface water samples
***These analyses will be performed on only one-third of the samples.

4. SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Protocols for sample containers, sample preservation, and holding times will conform to those specified in the CGMP and IGMP/CSPCP Sampling Plans and Quality Assurance/Quality Control Plans.

5. SAMPLE CONTROL AND DOCUMENTATION

Procedures for sample control and documentation will conform to those specified in the CGMP and IGMP/CSPCP Quality Assurance/Quality Control Plans.

6. SAMPLE HANDLING, TRANSPORT, AND STORAGE

Procedures for sample handling, transport, and storage will conform to those specified in the CGMP and IGMP/CSPCP Quality Assurance/Quality Control Plans.

7. SAMPLE PREPARATION AND ANALYSES

Procedures for sample preparation and analyses will conform to those specified in the CGMP and IGMP/CSPCP Quality Assurance/Quality Control Plans.

8. REFERENCES

DOE 1986b: "Comprehensive Environmental Assessment and Response Program Phase 1: Draft Installation Assessment Rocky Flats Plant," US Department of Energy unnumbered draft report, April 1986.

DOE 1986f: "Resource Conservation and Recovery Act Part B - Operating Permit Application for USDOE Rocky Flats Plant, Hazardous and Radioactive Mixed Wastes," US Department of Energy unnumbered report, November 1986.

DOE 1986g: "Resource Conservation and Recovery Act Part B - Post-Closure Care Permit Application for USDOE Rocky Flats Plant, Hazardous and Radioactive Mixed Wastes," US Department of Energy unnumbered report, November 1986.

DOE 1986h: "Draft Preliminary Prioritization of Sites," US Department of Energy unnumbered draft report, July 1986.

Hurr 1976: R.T. Hurr, "Hydrology of a Nuclear-Processing Plant Site, Rocky Flats, Jefferson County, Colorado," US Geological Survey Open-File report 76-268, 1976.

RI 1986a: "Annual Environmental Monitoring Report: January-December 1985," Rockwell International Rocky Flats Plant, Golden, Colorado report RFP-ENV-85, April 1986.

RI 1986b: "Rocky Flats Plant Radioecology and Airborne Pathway Summary Report," Rockwell International, Rocky Flats Plant, Golden, Colorado unnumbered report, December 1986.

Robson 1981: Robson, S.G., J.C. Romero and S. Jawistowski, "Geologic Structure, Hydrology, and Water Quality of the Arapahoe Aquifer in the Denver Basin, Colorado," US Geologic Survey Hydrologic Atlas HA-647, 1981.

APPENDIX B

HYDROGEOLOGIC DATA

EXPLANATION OF SYMBOLS AND TERMS ON BORING LOGS

SAMPLE TYPE

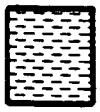
Split Spoon

NC Core

Continuous Drive

Bulk

GRAPHIC LOG

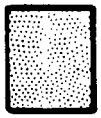


Clay or Claystone

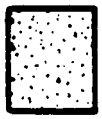
Clayey Sand or Sandy Clay

Silty Claystone

Cobbles, Gravel and/or Boulders

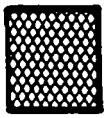


Sand and Sandstone



Sand and Gravel

Silt or Siltstone



Artificial Fill / Disturbed Ground

APPENDIX B-1

1986 MONITOR WELLS

INDEX OF DATA

Boring No.: 4-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

Project:	Rocky Flats Plant	LOG OF BORING NO.	4-86
Date Drilled	4/24/86	Coordinates	
Boring Method	Hollow Stem Auger	Ground Surface Elevation	5645

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM 0-0.7'. CLAY: dark brown; silty; trace granitic pebbles; moist. 0.7-1.5'. CLAY: medium to dark brown; some very fine-grained sand; moist. 1.5-2.7'. SAND: medium to dark brown; poorly sorted; fine to coarse; quartz and feldspar; silty clay partings; moist. 2.7-3.0'. CLAY: dark grayish brown; iron stains and trace granitic pebbles; silty; moist to wet. 3.0-8.0'-Sample. Recovered 1.7/5.0'=34%. 3.0-4.0'. CLAY: Same as above; moist to wet. 6.3-8.0'. CLAY: dark grayish brown; silty; iron stains and trace granitic pebbles; moist to wet. 8.0-10.5'-Sample. Recovered 0.7/2.5'=28%. 8.0-8.7'. CLAY: dark brown; silty; trace grading to some granitic cobbles; moist. 10.5-13.0'-Sample. Recovered 1.3/2.5'=52%. 11.7-12.2'. CLAY: medium to dark brown; some granitic pebbles and cobbles; sandy to gravelly; moist. Wet at 12.0'. 12.2-13.0'. CLAY: medium brown to medium gray; sandy to gravelly; some granitic pebbles and cobbles; iron staining; wet.			
	3						
	6						
	9						
	12						

Remarks Logged by: S. Paschke Checked by: _____

Project No.	Hydro-Search, Inc.	Page 1 of 2
106P06222		

Project:	Rocky Flats Plant	LOG OF BORING NO. 4-86
Date Drilled	4/21/86	Coordinates
Boring Method	Hollow Stem Auger	Ground Surface Elevation 5645

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	12			13.0-15.5'-Sample. Recovered 2.1/2.5'=84%. 13.0-14.7'. CLAY: medium gray; some fine to coarse sand and some granitic pebbles; iron staining; wet. 14.7-14.9'. CLAY: medium gray; some fine to coarse sand and granitic pebbles; iron staining; wet.			
	15			ARAPAHOE FORMATION 15.5-18.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: medium gray; slightly sandy; moist.			
	18			TOTAL DEPTH: 18.0'			
	21						
	24						

Remarks Logged by: S. Paschke Checked by:

Project No. 106P06222

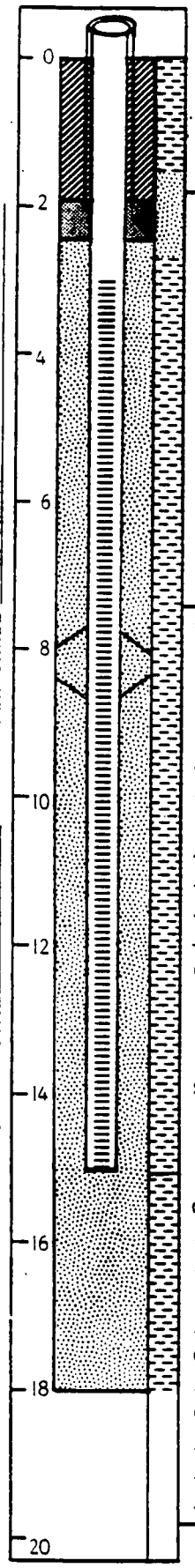
Hydro-Search, Inc.

WELL 4-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 40437.1 E 30774.2

ELEVATION: GROUND LEVEL 5636.60'
TOP OF CASING 5637.94'



PROJECT 106K6222 Rocky Flats Plant
PERSONNEL S. Paschke
LOCATION Golden, CO

DRILLING SUMMARY:

TOTAL DEPTH Well: 14.92' Hole: 18.00'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Doyle Styles)
RIG Mobile B-57
BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.52'	C1
3.52'	14.92'	S1

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.020" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Centralizer placed approximately mid-point on screened interval.

FILTER MATERIAL 12-20 silica sand
2.40' - 18.00'

CEMENT Portland Type I
0.00' - 1.95'

OTHER 3/8" bentonite pellets
1.95' - 2.40'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	4/24	1440	4/24	1600
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	4/24	1725	4/24	1730
FILTER PLACEMENT:	4/24	1730	4/24	1810
CEMENTING:	4/25	1010	4/25	1020
DEVELOPMENT:	8/29	1606	8/29	1606
OTHER:				
Bentonite	4/25	1000	4/25	1010

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 12.00' during drilling

Top of stainless steel casing: 1.34'

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

Well No.: 4-36

WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
8-29-86	1606	-	-	-	Dry-moist dark brown mud in bottom of hole

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0486	08/29/86	5636.60	5637.94	1.34	14.92	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/23/87					7.21	5630.73
	04/01/87					5.54	5632.40
	05/07/87					5.54	5632.40
	06/02/87					6.60	5631.34
	07/08/87					7.45	5630.49
	08/04/87					-1.00	DRY
	08/10/87					-1.00	DRY
	09/01/87					-1.00	DRY
	10/01/87					-1.00	DRY
	11/09/87					-1.00	DRY
	12/08/87					-1.00	DRY
	01/07/88					7.20	5630.74
	02/24/88					6.30	5631.64
	03/07/88					6.50	5631.44
	04/11/88					6.80	5631.14

INDEX OF DATA

Boring No.: 11-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 11-86

Date Drilled 9/5/86

Coordinates

Boring Method Hollow Stem Auger

Ground Surface Elevation 5723

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM 0.0-2.0'-Sample. Recovered 2.0/2.0'=100%. 0.0-0.7'. SAND AND GRAVEL: Grayish brown (5YR 3/2); some granitic pebbles; roots and grasses common; poorly sorted; angular; unconsolidated; dry. 0.7-2.0'-Sample. GRAVEL: grayish brown (5YR 3/2) fine- to medium-grained sand and gravel; few roots; poorly sorted; subangular; unconsolidated; dry.			
	2.5			2.0-3.0'-Sample. Recovered 1.0/1.0'=100%. GRAVEL: dark yellowish brown (10YR 4/2) with very coarse grained granitic pebbles; some red (5R 4/6) iron staining; poorly sorted; angular to subrounded; unconsolidated; dry.			
	5			3.0-6.0'-Sample. Recovered 0.0/3.0'=0%. 6.0-8.0'-Sample. Recovered 0.8/2.0'=40% SAND: grayish red (5R 4/2) coarse to fine-grained with several quartzite and granite pebbles; poorly sorted; angular; unconsolidated; dry. 8.0-10.0'-Sample. Recovered 1.5/2.0'=75%.			
	7.5			8.5-9.5'. SAND AND GRAVEL: dark yellowish brown (10YR 4/2) with gray quartzite pebbles; poorly sorted; angular; unconsolidated; dry.		▽	
				ARAPAHOE FORMATION 9.5-10.0'. CLAYSTONE: pale yellowish brown (10YR 6/2); slightly sandy; moderate yellowish brown (10YR 5/4) mottles; no pebbles; blocky texture; dry.			
	10						

Remarks Logged by: J. Bergman Checked by: _____

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 11-86

Date Drilled 9/5/86 **Coordinates**

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5723

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	10			10.0-11.5'-Sample. Recovered 2.0/1.5'=125%. 10.0-10.5'. CLAYSTONE: dark yellowish brown (10YR 4/2); dry.			
				10.5-11.0'. CLAYSTONE: light olive gray (5Y 5/2) and dark yellowish brown (10YR 4/2) clay with moderate yellowish brown (10YR 5/4) mottles; consolidated; dry.			
	12.5			11.0-11.5'. SANDSTONE: very light gray (N 8/0) with moderate brown (5YR 4/4) fine-grained to medium-grained sand; well sorted; rounded; consolidated; dry.			
				11.5-12.0'-Sample. Recovered 1.5/1.5'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4); dry.			
	15			12.0-13.0'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: moderate brown (5YR 4/4) and light olive gray (5Y 5/2) very fine-grained to fine-grained sand; homogeneous; well sorted; rounded; well cemented; dry. 13.0-14.0'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: medium light gray (N 6/0) fine-grained sand; few black organic particles; well sorted; silica cement; Last 1.0" contains pale yellowish brown (10YR 6/2) and light brown (5YR 6/4) fine-grained to very fine-grained sand; rounded; no clay; dry.			
	17.5			14.0-15.0'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: medium gray and medium light gray (N6/5) very fine-grained to fine-grained sand; some patches of pale yellowish brown (10YR 6/2) sand; well sorted; rounded; well cemented; dry.			
	20			TOTAL DEPTH: 15.0'			

Remarks Logged by: J. Bergman Checked by: _____

Project No. 106P06222

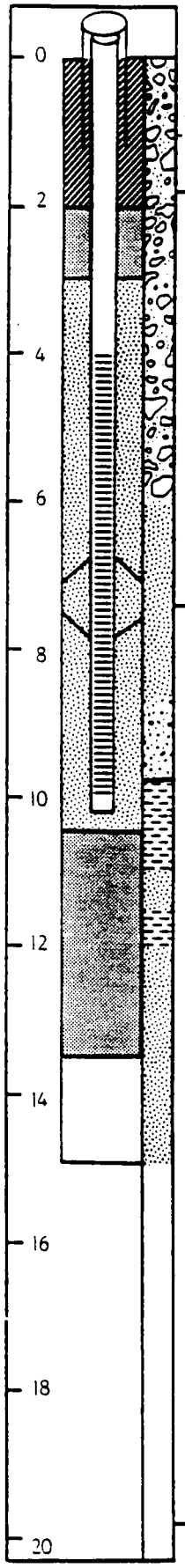
Hydro-Search, Inc.

WELL 11-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 40321.2 E 26931.0

ELEVATION: GROUND LEVEL 5712.19'
TOP OF CASING 5714.75'



LOCATION Golden, CO
PERSONNEL J. Bergman
PROJECT 10616222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 10.25' Hole: 15.00'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Tony Robinson)
RIG Acker
BIT(S) Bull nose bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.0'	3.94'	C1	
3.94'	10.25'	S1	

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
6.32' - 7.51'

FILTER MATERIAL 32.42 silica sand
3.00' - 10.50'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 3.00'
10.50' - 13.75'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/5	1315	9/5	1600
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/6	1020	9/6	1025
FILTER PLACEMENT:	9/6	1025	9/6	1030
CEMENTING:	9/6	1045	9/6	1050
DEVELOPMENT:	9/8	1500	9/18	1000
OTHER:				
Bentonite	9/6	1030	9/6	1035
	9/6	1015	9/6	1020

WELL DEVELOPMENT

See Well Development Summary Sheets.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.56'

Cave from TD to 13.75'

Well No.: 11-36

WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
09-08-86	1500				1 Well Bore Volume = 0.39 gal. 10 Well Bore Volumes = 3.9 gals.
09-08-86	1500	Bailed	0.5 gal.	Medium brown	Sand in bottom of well 0.5/3.9 gals. purged to date
09-08-86	1600	Bailed	1.5 gals.	Initially clear, then medium brown	500 ml sand 2.0/3.9 gals. purged to date
09-10-86	0935	Airlifted	1.5 gals.	Clear	Went dry after first airlift
09-11-86	1055	Bailed	0.75 gals.	Medium brown, moderately turbid	Large amount of filter sand in bottom of bailer. 2.75/3.9 gals. purged to date.
09-13-86	1340	Bailed	1.2 gals.	Brown to light brown, moderately turbid	Large amount of sand on bottom 3.9/3.9 gals. purged to date
09-16-86	1510	Bailed	1.1 gals.	Clear to light brown	Still large amounts of sand in well. 5/3.9 gals. purged to date
09-17-86	0915	Bailed	1.0 gals.	Clear to light brown	Still large amounts of sand in bottom. 6/3.9 gals. purged to date
09-17-86	1830	Airlifted	—	—	Very fine mist. Blew the sand out.
09-18-86	1000	Bailed	—	Clear to light brown	Sampled for VOA, Field Water Quality, and HSL metals

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1186	09/08/86	5712.19	5714.75	2.56	10.25	10.43	5704.32
	09/09/86					9.85	5704.90
	09/10/86					10.18	5704.57
	09/11/86					9.77	5704.98
	09/13/86					9.75	5705.00
	09/17/86					10.54	5704.21
	09/18/86					10.85	5703.90
	09/24/86					6.17	5708.58
	10/13/86					10.60	5704.15
	11/26/86					9.43	5705.32
	01/01/87					9.46	5705.29
	03/02/87					8.02	5706.73
	04/01/87					5.60	5709.15
	05/07/87					4.88	5709.87
	06/01/87					8.27	5706.48
	07/08/87					8.50	5706.25
	07/30/87					9.40	5705.35
	08/04/87					9.70	5705.05
	09/28/87					10.00	5704.75
	11/03/87					10.00	5704.75
	12/08/87					10.00	5704.75
	01/06/88					9.80	5704.95
	02/24/88					7.70	5707.05
	03/14/88					7.90	5706.85
	04/11/88					7.70	5707.05

INDEX OF DATA

Boring No.: 12-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 12-86

Date Drilled 9/6/86 **Coordinates**

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5788

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM 0.0-2.0'-Sample. Recovered 1.2/2.0'=60%. SAND: dark yellowish brown (10YR 4/2) very fine-grained sand and clay; trace gray quartzite pebbles; poorly sorted; angular; unconsolidated; moist.		▽	
	2.5			2.0-4.0'-Sample. Recovered 2.0/2.0'=100%. CLAY: dark yellowish brown (10YR 5/4) and moderate yellowish brown (10YR 4/2) with some quartzite and granite pebbles and cobbles; poorly sorted; angular; unconsolidated; damp.			
	5			4.0-6.0'-Sample. Recovered 2.0/2.0'=100%. SAND: moderate yellowish brown (10YR 5/4) fine-grained sand and gray quartzite pebbles; poorly sorted; angular to subrounded; unconsolidated; damp.			
	7.5			6.0-8.0'-Sample. Recovered 0.6/2.0'=30%. CLAY: moderate yellowish brown (10YR 5/4) clay and sandy clay with several granitic pebbles and cobbles; poorly sorted; angular; unconsolidated; damp.			
	10			8.0-10.0'-Sample. Recovered 2.0/2.0'=100%. SAND: pale yellowish brown (10YR 6/2) very fine-grained sand and clay; some granitic pebbles; poorly sorted; angular; unconsolidated; damp.		▼	

Remarks Logged by: J. Bergman Checked by: _____

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant	LOG OF BORING NO. 12-86
Date Drilled 9/6/86	Coordinates
Boring Method Hollow Stem Auger	Ground Surface Elevation 5788

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	10			10.0-11.0'-Sample. Recovered 1.0/1.0'=100%. CLAY: pale yellowish brown (10YR 6/2) clay with trace granitic pebbles poorly sorted; angular to rounded; unconsolidated; damp.			
				ARAPAHOE FORMATION			
	12.5			11.0-12.0'-Sample. Recovered 1.0/1.0'=100%. CLAYSTONE: pale yellowish brown (10YR 6/2) and light brown (5YR 5/6); consolidated; weathered; dry.			
				12.0-14.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2) with some moderate brown (5YR 4/4) mottles; consolidated; dry.			
	15			14.0-16.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2) and moderate yellowish brown; consolidated; dry.			
				TOTAL DEPTH: 16.0'			
	17.5						
	20						

Remarks Logged by: J. Bergman Checked by: _____

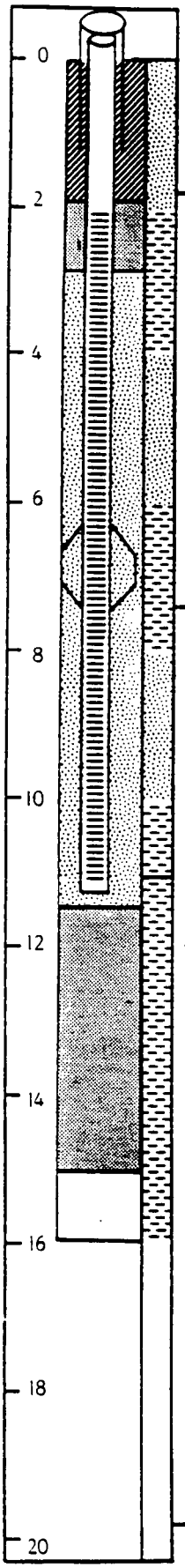
Project No. 106P06222	Hydro-Search, Inc.	Page 2 of 2

WELL 12-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 39343.3 E 24790.5

ELEVATION: GROUND LEVEL 5777.88'
TOP OF CASING 5780.56'



LOCATION Golden, CO
PERSONNEL J. Bergman
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 11.30' Hole: 16.00'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Tony Robinson)
RIG Acker
BIT(S) Bull nose bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.0'	2.04'	C1	
2.04'	11.3'	S1	

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 316 stainless steel
6.18' - 7.36'

FILTER MATERIAL 32-42 silica sand
2.40' - 11.50'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.40'
11.30' - 11.50'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/6	1315	9/6	1500
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/6	1655	9/6	1600
FILTER PLACEMENT:	9/6	1700	9/6	1730
CEMENTING:	9/6	1735	9/6	1740
DEVELOPMENT:	9/8	1345	9/9	1505
OTHER:				
Bentonite	9/6	1730	9/6	1735
	9/6	1650	9/5	1655

WELL DEVELOPMENT

See Well Development Summary Sheets.

COMMENTS:

Water encountered at 9.0' during drilling.

Top of stainless steel casing: 2.68'

Cave from TD to 15.10'

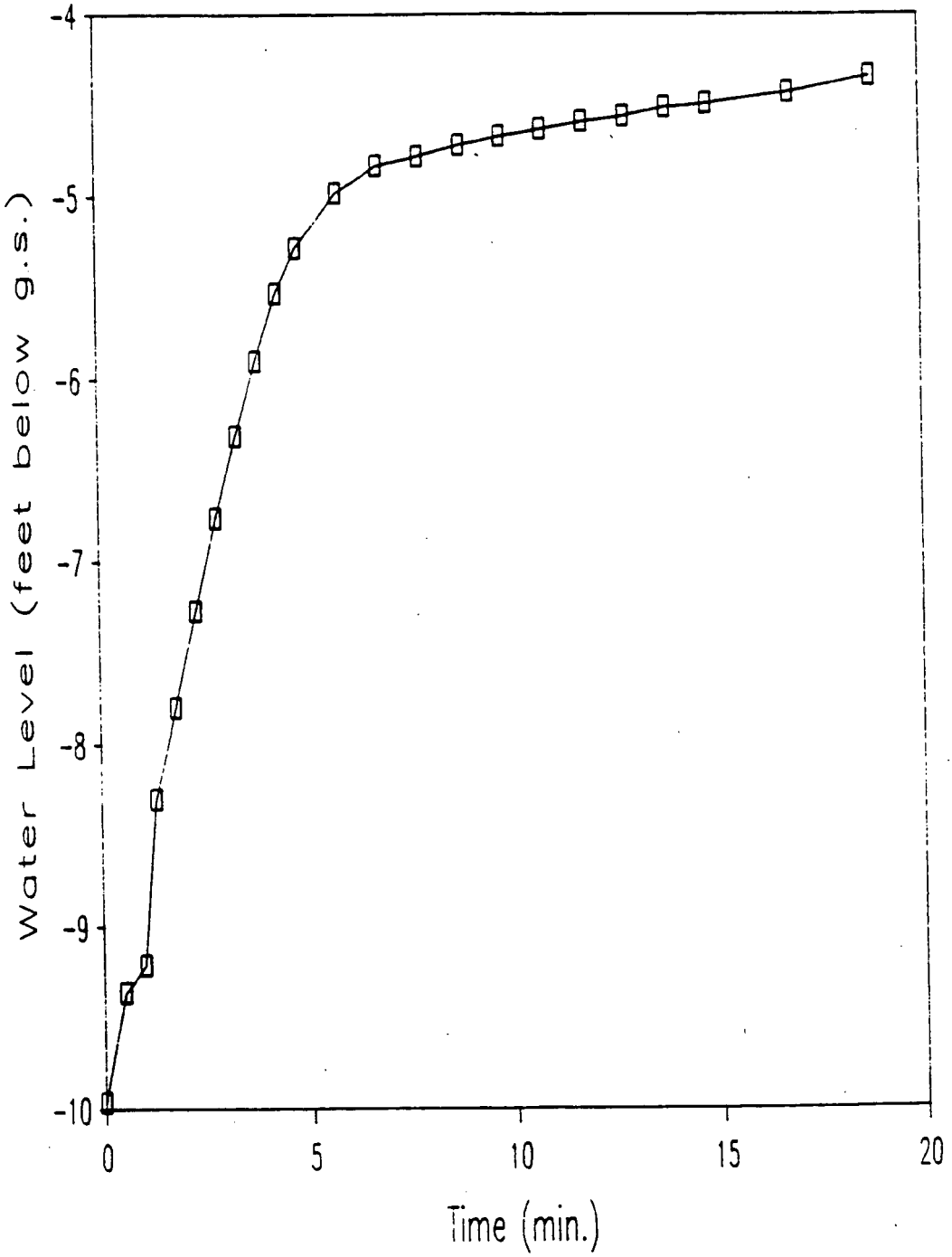
Well No.: 12-36

WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
09-08-86	1345				1 Well Bore Volume = .13 gal. 10 Well Bore Volumes = 1.3 gals.
09-08-86	1345	Airlifted	—	Light to medium brown	Airlifted for 1 hour. Well recovered 3' in 10 minutes
09-09-86	1505	Bailed	14 gals.	Clear to slightly turbid	Ready for sampling
09-11-86	0900	Bailed	—	Clear to slightly turbid	Sampled

AQUIFER TEST DATA

WELL 12-86



AQUIFER TEST DATA WELL 12-86

Type of Aquifer Test: Bail down - Recovery Project No.: 106P06222
How Q Measured: 4.5 gallon bucket Location: Rocky Flats Plant
How W.L.'s Measured: Olympic Well Sounder Personnel: J. Pearce, M. Bergman
Measuring Point for W.L.'s: Top of Casing
Elevation of Measuring Point: 5790.49

Depth of pump/airline:
Start bailing: Time: 1115.00
Stop bailing: Time: 1145.10
Duration of Aquifer Test: 49 minutes

TIME		WATER LEVEL DATA		COMMENTS
t = 30.16 min	at t' = 0	Static Water Level: 4.08'		
t	t'	Water Level	Draw-down	
0				Begin bailing
30.2	0	9.96	5.88	Stop bailing
30.7	.5	9.36	5.28	
31.2	1.0	9.21	5.13	
31.5	1.3	8.30	4.22	
32.0	1.8	7.80	3.72	
32.5	2.3	7.27	3.19	
33.0	2.8	6.76	2.68	
33.5	3.3	6.31	2.23	
34.0	3.8	5.90	1.82	
34.5	4.3	5.53	1.45	
35.0	4.8	5.28	1.20	
36.0	5.8	4.98	.90	
37.0	6.8	4.83	.75	
38.0	7.8	4.78	.70	
39.0	8.8	4.72	.64	
40.0	9.8	4.67	.59	90% Recovered at
41.0	10.8	4.63	.55	4.67'
42.0	11.8	4.59	.51	
43.0	12.8	4.56	.48	
44.0	13.8	4.51	.43	
45.0	14.8	4.49	.41	
47.0	16.8	4.43	.35	
49.0	18.8	4.34	.26	

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1286	09/08/86	5777.88	5780.56	2.68	11.30	6.00	5774.56
	09/09/86					5.75	5774.81
	09/25/86					6.17	5774.39
	09/26/86					6.60	5773.96
	10/13/86					4.36	5776.20
	11/26/86					5.60	5774.96
	01/01/87					3.42	5777.14
	02/01/87					2.68	5777.88
	04/01/87					3.35	5777.21
	05/06/87					2.68	5777.88
	06/01/87					2.55	5778.01
	07/08/87					5.00	5775.56
	08/04/87					5.30	5775.26
	09/28/87					4.80	5775.76
	11/03/87					3.90	5776.66
	02/04/88					-1.00	DRY
	03/14/88					-1.00	DRY
	04/11/88					2.70	5777.86

INDEX OF DATA

Boring No.: 13-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 13-86

Date Drilled 8/20/86 **Coordinates** N 38867.0 E 22951.0

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5837.22

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM			
				0.0-2.5'-Sample. Recovered 0.0/2.5'=0%. COBBLES: micaceous granite cobbles and pebbles; poorly sorted; unconsolidated; dry.			
				2.5-5.0'-Sample. Recovered 0.0/2.5'=0%. CLAY: dark yellowish brown (10YR 4/2); trace of sand and gravel; poorly sorted; unconsolidated; damp.			
	5			5.0-8.0'-Sample. Recovered 2.0/3.0=67%. CLAY: dark yellowish brown (10YR 4/2) and dusky brown (5YR 2/2) silty, sandy clay; gray quartzite cobbles from 6.7-7.0'; rounded; damp.			
				8.0-9.0'-Sample. Recovered 0.5/1.0'50%. GRAVEL: moderate yellowish brown (10YR 5/4) and medium light gray (N6) sandy gravel; some silty clay; poorly sorted; unconsolidated; damp.			
	10			ARAPAHOE FORMATION			
				9.0-13.0'-Sample. Recovered 3.5/4.0'=75%.			
				9.0-10.1'. CLAYSTONE: light olive gray (5Y 6/1); consolidated; dry.			
				10.1-10.7'. CLAYSTONE: grayish orange (10YR 7/4) sandy claystone; consolidated; dry.			
	15			10.7-13.0'. CLAYSTONE: light gray (N 7) silty claystone; consolidated; dry.			
				13.0-15.5'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4) silty claystone with traces of limonite concretions; blocky texture; consolidated; dry.			
	20			TOTAL DEPTH: 15.5'			

Remarks Logged by: L. Pivonka Checked by:

Project No. 106P06222

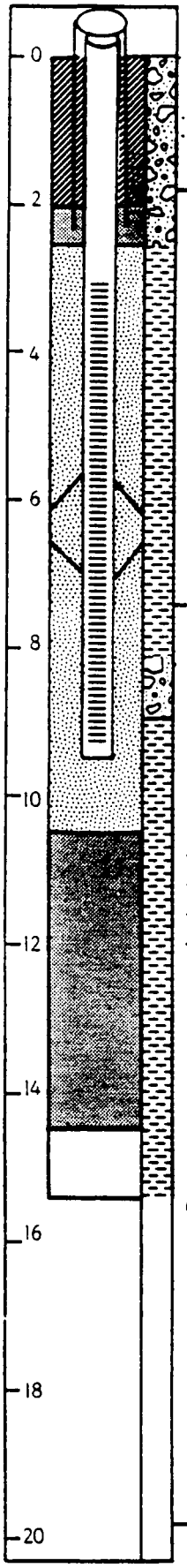
Hydro-Search, Inc.

WELL 3-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38867.0 E 22951.0

ELEVATION: GROUND LEVEL 5837.22'
TOP OF CASING 5839.94'



PROJECT 106196222 Rocky Flats Plant
LOCATION Golden, CO
PERSONNEL L. Pivonka

DRILLING SUMMARY:

TOTAL DEPTH Well: 9.50' Hole: 15.50'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)
RIG Mobile B-57
BIT(S) Bull nose bit

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.09'	C1			
3.09'	9.50'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
5.79' - 6.96'

FILTER MATERIAL 16-40 silica sand
2.50' - 10.50'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
10.50' - 14.50'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	8/20	1230	8/20	1340
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	8/20	1607	8/20	1609
FILTER PLACEMENT:	8/20	1609	8/20	1623
CEMENTING:	8/20	1630	8/20	1641
DEVELOPMENT:	9/3	1035	9/3	1035
OTHER:				
Bentonite	8/20	1623	8/20	1625
	8/20	1605	8/20	1607

WELL DEVELOPMENT

See Well Development Summary Sheets.

COMMENTS:

Water encountered at 5.0' during drilling.

Top of stainless steel casing: 2.72'

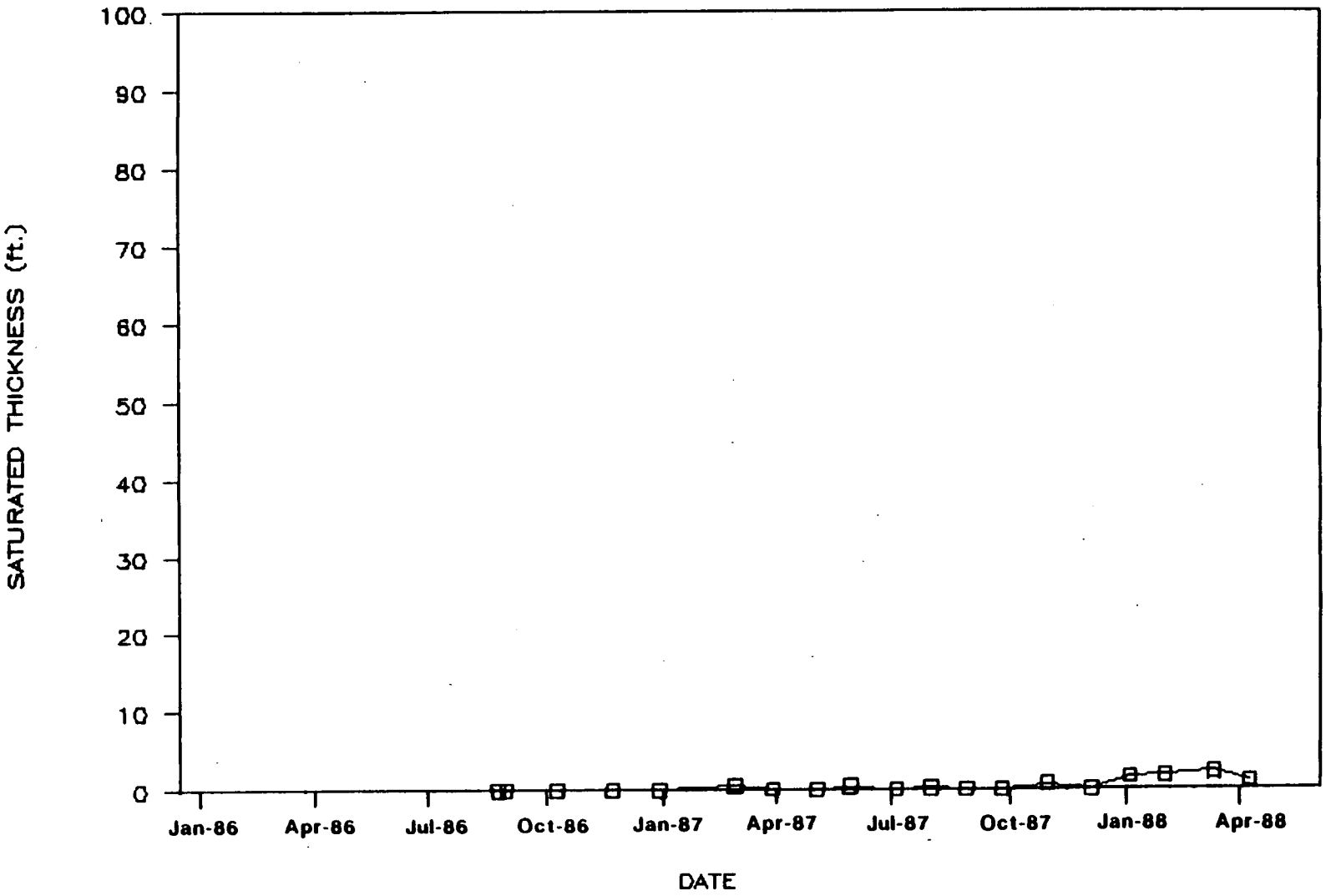
Cave from TD to 14.50'

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1386	08/27/86	5837.22	5839.94	2.72	9.50	-1.00	DRY
	09/03/86					-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					11.15	5828.79
	01/01/87					9.71	5830.23
	03/02/87					9.00	5830.94
	04/01/87					9.67	5830.27
	05/06/87					9.67	5830.27
	06/01/87					9.04	5830.90
	07/08/87					9.60	5830.34
	08/04/87					9.10	5830.84
	09/01/87					10.00	5829.94
	09/28/87					9.40	5830.54
	11/03/87					8.80	5831.14
	12/08/87					9.70	5830.24
	01/07/88					7.80	5832.14
	02/04/88					7.70	5832.24
	03/14/88					7.20	5832.74
	04/11/88					8.40	5831.54

SATURATED THICKNESS IN WELL # 13-86 (SP)



INDEX OF DATA

Boring No.: 14-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project:	Rocky Flats Plant	LOG OF BORING NO.	14-86
Date Drilled	8/19/86; 8/28/86	Coordinates	
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5846

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM			
				0-0.9'-Sample. Recovered 0.9/0.9'=100%. CLAY: dark gray (N 3) clay; some granitic gravel; blocky texture; poorly sorted; unconsolidated; dry.			
				0.9-4.7'-Sample. Recovered 3.6/3.8'=95%. CLAY: dark yellowish brown (10YR 4/2) and dusky yellowish brown (10YR 2/2) sandy, gravelly clay with some rounded gray quartzite cobbles; few iron stains; poorly sorted; unconsolidated; dry.			
	2.5						
	5			4.7-8.0'-Sample. Recovered 3.3/3.3'=100%. CLAY: grayish brown (5YR 3/2) silty clay; granitic gravel and cobbles from 7.7-8.0'; trace of iron staining mottled through entire interval; dry.			
	7.5						
				8.0-10.5'-Sample. Recovered 2.5/2.5'=100%. CLAY: dark yellowish brown (10YR 4/2) silty clay; some granitic pebbles and cobbles; trace iron staining; damp.			
	10						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by: _____

Project No. 106P06222	Hydro-Search, Inc.	Page 1 of 8

Project:	Rocky Flats Plant	LOG OF BORING NO.	14-86
Date Drilled	8/19/86; 8/28/86	Coordinates	
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5846

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	10			10.5-11.0'-Sample. Recovered 0.5/0.5'=100%. CLAY: Same as above; damp.			
				ARAPAHOE FORMATION			
	12.5			11.0-13.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4) with light gray (N 7) mottling; some iron staining and ironstone concretions; weathered; dry.			
				13.0-18.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: Same as above; dry.			
	15						
	17.5			18.0-23.0'-Sample. Recovered 2.3/5.0'=46%. CLAYSTONE: Same as above; dry.			
	20						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	14-86
Date Drilled	8/19/86; 8/28/86	Coordinates	
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5846

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20						
	22.5			23.0-23.3'-Sample. Recovered 0.3/0.3'=100%. CLAYSTONE: Same as above; dry.			
				23.3-25.5'-Sample. Recovered 2.2/2.2'=100%. CLAYSTONE: medium dark gray (N 4) claystone; blocky texture; no mottling; unweathered; dry.			
	25			25.5-28.0'-Sample. Recovered 2.0/2.5'=80%. CLAYSTONE: Same as above; dry.			
				28.0-30.5'-Sample. Recovered 2.1/2.5'=84%. CLAYSTONE: Same as above; dry.			
	27.5						
	30						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by: _____

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	14-86
Date Drilled	8/19/86; 8/28/86	Coordinates	N 38866.4 E 22737.6
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5844.71

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	30			31.6-32.6'-Sample. Recovered 1.0/1.0'=100%. RQD 0.9/1.0'=90%. CLAYSTONE: dark gray (N 3) massive; damp.			
				32.6-37.0'-Sample. Recovered 4.4/4.4'=100%. RQD 4.4/4.4'=100%.			
				32.6-33.2'. SILTSTONE: medium gray (N 5) massive well sorted; damp.			
	32.5			33.2-34.5'. CLAYSTONE: medium dark gray (N 4); damp.			
				34.5-35.3'. SILTSTONE: medium gray (N 5); clayey; grading downward into silty claystone; damp.			
				35.3-37.0'. CLAYSTONE: dark gray (N 3); silty; damp.			
	35			37.0-42.3'-Sample. Recovered 4.1/5.3=77%. RQD 3.4/4.1'=83%.			
				37.0-37.6'. CLAYSTONE: dark gray (N 3); damp.			
	37.5						
	40			38.9-39.7'. CLAYSTONE: dark gray (N 3); damp.			

Remarks Logged by: L. Pivonka & T. Gulliver Checked by:

Project No. 106P06222	Hydro-Search, Inc.	Page 4 of 8

Project:	Rocky Flats Plant	LOG OF BORING NO.	14-86
Date Drilled	8/19/86; 8/28/86	Coordinates	N 38866.4 E 22737.[illegible]
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5844.71

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	40						
				41.6-42.3'. CLAYSTONE: black (N 1); carbonaceous; damp.			
				42.3-46.5'-Sample. Recovered 4.2/4.2'=100%. RQD 3.4/4.2'=81%.			
	42.5			42.3-44.2'. SANDSTONE: light gray (N 7); very fine-grained; moderately sorted; rounded; massive; damp.			
				44.2-44.4'. CLAYSTONE: greenish gray (5G 6/1); damp.			
				44.4-46.5'. SANDSTONE: light gray (N 7); very fine-grained; moderately sorted; rounded; massive; damp.			
	45			46.5-51.5'-Sample. Recovered 5.0/5.0'=100% RQD 3.6/5.0'=72%..			
				46.5-50.6'. SANDSTONE: light gray (N 7); very fine-grained; silty; carbonaceous siltstone laminae; coal coated joints with 40-50 degree dip from 47.5-48.0'; moderately sorted; damp.			
	47.5						
	50						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	14-86
Date Drilled	8/19/86; 8/28/86	Coordinates	N 38866.4 E 22737.6
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5844.71

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	50			50.6-51.5'. SANDSTONE: light gray (N 7); very fine-grained; silty; abundant coal partings; moderately sorted; damp.			
				51.5-52.8'-Sample. Recovered 1.3/1.3'=100%. RQD 1.3/1.3'=100%.			
				51.5-52.2'. SANDSTONE: light gray (N 7); very fine-grained; silty; some coal partings; moderately sorted; damp.			
	52.5			52.2-52.4'. SANDSTONE: light gray (N 7); fine-grained; abundant carbonaceous detritus; moderately sorted; damp.			
				52.4-52.8'. SANDSTONE: light gray (N 7); fine-grained; laminated; moderately sorted; subrounded; damp.			
	55			52.8-56.3'-Sample. Recovered 2.9/4.5'=62%. RQD 1.8/2.9'=62%.			
				52.8-53.3'. SILTSTONE: dark gray (N 3); clayey; evenly laminated; damp.			
				53.3-54.0'. CLAYSTONE: grayish black (N 2); 0.10' thick sandstone beds from 53.7-54.0'; damp.			
				54.0-55.0'. Lost core.			
	57.5			55.0-56.3'. CLAYSTONE: grayish black (N 2); silty; laminated; 15 degree dip; damp.			
				56.3-60.9'-Sample. Recovered 2.8/4.5'=62%. RQD 1.8/4.5'=40%.			
				56.3-57.8'. CLAYSTONE: dark gray (N 3); silty; laminated; damp.			
	60			57.8-59.5'. Lost core.			

Remarks Logged by: L. Pivonka & T. Gulliver Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	14-86
Date Drilled	8/19/86; 8/28/86	Coordinates	N 38866.4 E 22737.6
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5844.71

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	60			59.5-60.9'. SILTSTONE: dark gray (N 3); clayey; laminated; 10 degree dip; damp. 60.9-65.9'-Sample. Recovered 5.0/5.0'=100%. RQD 1.0/5.0'=20%. 60.9-63.2'. SILTSTONE: dark gray (N 3); clayey; laminated; 10 degree dip; damp. 63.2-64.5'. Lost core. 64.5-65.9'. SILTSTONE: grayish black (N 2) to light gray (N 7); clayey; very fine-grained; laminated; damp. 65.9-70.9'-Sample. Recovered 5.0/5.0'=100%. RQD 3.6/5.0'=72%. SILTSTONE: grayish black (N 2) to light gray (N 7); clayey; very fine-grained; laminated; damp.			
	62.5						
	65						
	67.5						
	70						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	14-86

Date Drilled 8/19/86; 8/28/86 **Coordinates** N 38866.4 E 22737.6

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5844.71

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	70			70.9-74.5'-Sample. Recovered 3.6/3.6'=100%. RQD 2.6/3.6'=72%.			
				70.9-71.6'. SILTSTONE: Same as above; damp.			
				71.6-74.0'. CLAYSTONE: grayish black (N 2); silty; laminated; damp.			
				74.0-74.5'. Lost core.			
	72.5						
				TOTAL DEPTH: 74.5'			
	75						
	77.5						
	80						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by:

Project No. 106P06222

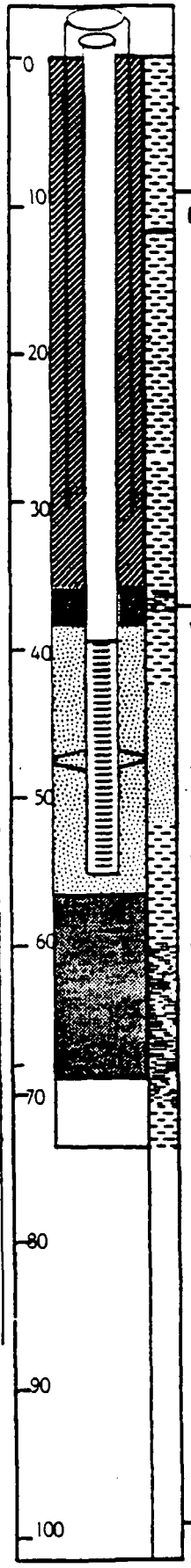
Hydro-Search, Inc.

WELL 14-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38866.4' E 22737.6

ELEVATION: GROUND LEVEL 5844.71'
TOP OF CASING 5846.73'



PROJECT 106P06222 Rocky Flats Plant
PERSONNEL L. Pivonka/T. Quilliver
LOCATION Golden, CO

DRILLING SUMMARY:

TOTAL DEPTH Well: 55.36' Hole: 74.00'

BOREHOLE DIAMETER 0.00' - 30.50': 7½"
30.50' - 74.00': 4 3/4"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue, Golden, CO
(Jim Horn, Paul Wiebe)

RIG 0.00' - 30.50': Mobile B-57; 30.50' - 74.00': Failing 1500

BIT(S) 0.00' - 30.50': Blade bit; 30.00' - 74.00': Chrisprill 3 3/4", Tricone 4 3/4" reamer

DRILLING FLUID 0.00' - 30.50': None
30.50' - 74.00': air/water mist

SURFACE CASING 5" x 33.16 steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	30.50'	C1			
0.00'	39.42'	C2			
39.42'	55.36'	S1			

CASING: C1 5" I.D. steel surface casing.
C2 2" I.D. Sch. 5, type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
46.79' - 48.02'

FILTER MATERIAL 32-42 silica sand: 38.15' - 55.36'; 16-20 silica sand: 55.36' - 56.85'

CEMENT Portland Type I
0.00' - 35.40'

OTHER 3/8" bentonite pellets
35.40' - 38.15'
56.85' - 69.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	8/19	1300	8/19	1610
NC core	8/29	0838	8/29	1343
Reaming	9/3	0900	9/3	0917
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
5" steel	8/19	1625	8/20	1008
2" stainless	9/3	1100	9/3	1105
FILTER PLACEMENT:	9/3	1105	9/3	1200
CEMENTING:	9/3	1200	9/3	1230
DEVELOPMENT:	9/5	1130	9/17	1100
OTHER:				
Bentonite	9/3	1200	9/3	1202
	9/3	0925	9/3	1020
Packer testing	9/2	1100	9/2	1700
Cementing 5" steel	8/20	1008	8/20	1030

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.02'

Cave from TD to 69.00'.

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY [illegible] DEPT _____ DATE 6/21/88

METHOD REV. BY [illegible] DEPT _____ DATE 6/21/88

APPROVED BY _____ DEPT _____ DATE _____

WELL 14-86

Hydraulic Conductivity (cm/sec) = 1.9×10^{-7}

Flowrate (gpm) = 0.277 gpm

Screened Interval (ft below G.L.) = 39.42 – 55.36'

39.42 – 42.3 claystone

42.3 – 44.2 sandstone

44.2 – 44.4 claystone

44.4 – 52.8 sandstone

52.8 – 53.3 siltstone

53.3 – 55.36 claystone

(54.0 – 55.0 lost core)

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1986 - pg 256.)

RFW 10-05-003/A-5/85

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

WELL 14-86

$$T\ (gpd/ft) = \frac{264\,Q}{\Delta s'} = \frac{(264)(0.277)}{1121} = 6.52\times10^{-2}$$

where $Q\ (gpm) = 7.75\ gal/28\ min = 0.277\ gpm$

$\Delta s'$ = ft. change in residual drawdown / log cycle

= 1121 ft (see attached plot)

$$K\ (gpd/ft^2) = T/b = 6.52\times10^{-2}/15.94 = 4.09\times10^{-3}$$

where $b\ (ft) = 15.94$

$$K\ (cm/sec) = 4.09\times10^{-3}\ gpd/ft^2 \times \frac{4.72\times10^{-5}\ cm/sec}{gpd/ft^2} = 1.9\times10^{-7}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$

$$t\ (min) = \frac{r^2 S}{4\,T\,u} = \frac{(.2)^2\,(10^{-3})}{(4)(6.52\times10^{-2})(.01)} \times \frac{1440\ min}{day} \times \frac{7.422\ gal}{ft^3}$$

= 165 min

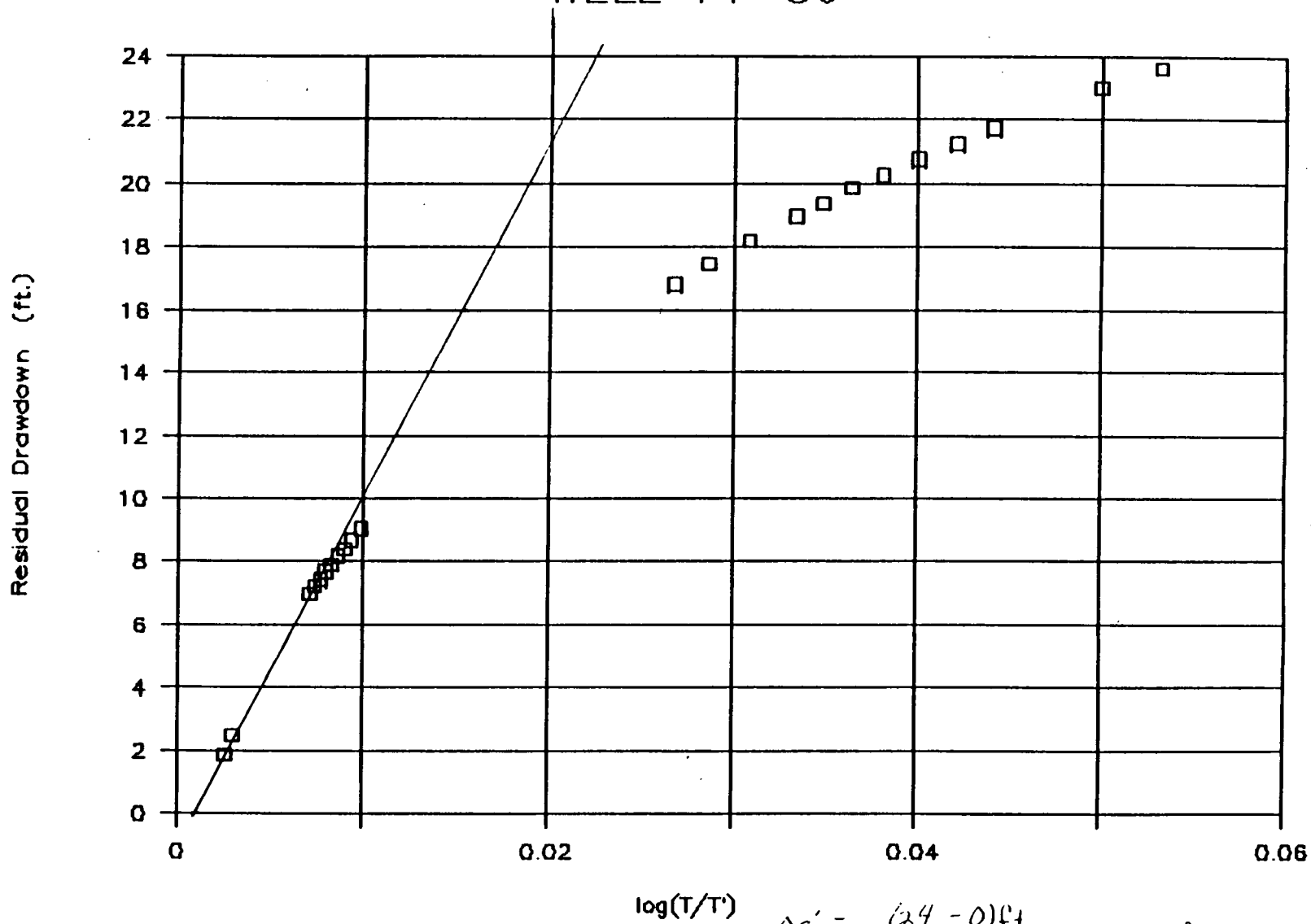
where $r\ (ft) = \left(\frac{4.75}{24}\right) ft = .20\ ft$

$S = 10^{-3}$ assumed S for confined aquifer

$\Delta s'$ is based on points where $t \geq 1520$ min.

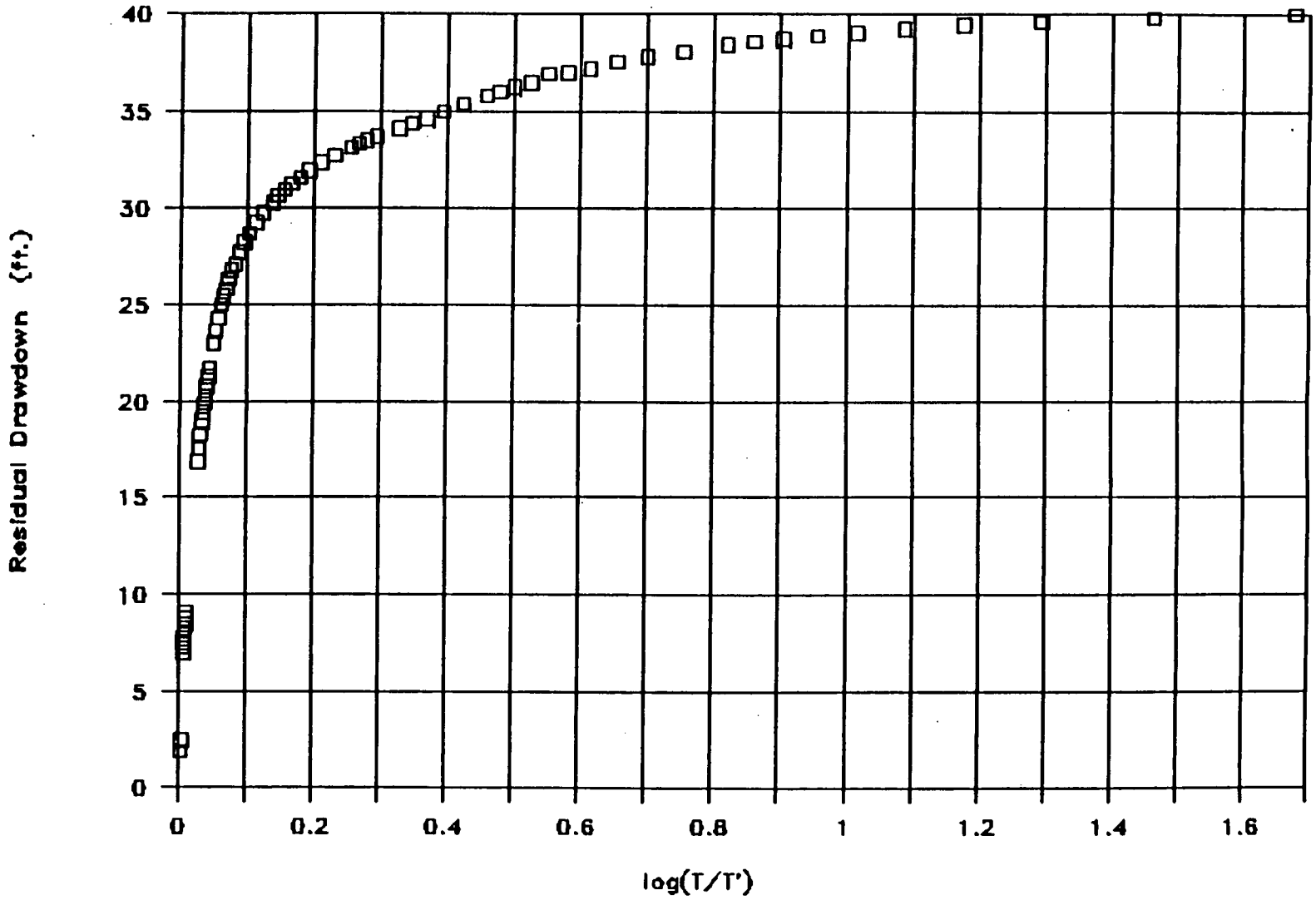
RFW 10-05-003/A-5/85

WELL 14-86

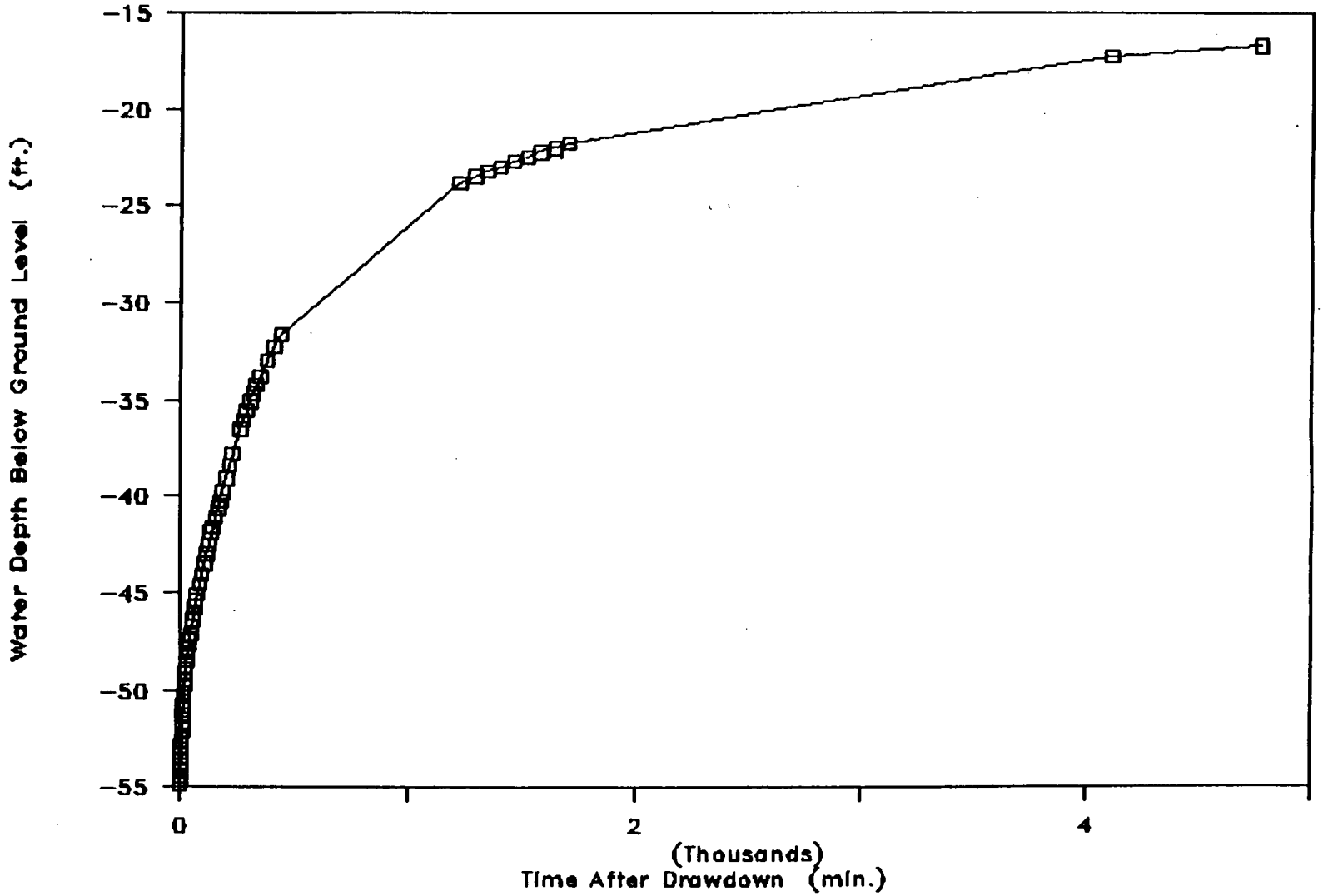


$$\Delta s' = \frac{(24-0)\,ft}{.0224-.0010} = 1121\ ft/\log\ cycle.$$

WELL 14-86


Residual Drawdown (ft.)
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
log(T/T')

WELL 14-86


-15
-20
-25
-30
-35
-40
-45
-50
-55
Water Depth Below Ground Level (ft.)
0
2
4
(Thousands)
Time After Drawdown (min.)

WELL 14-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	log(T/T')
28.60	0.60	54.79	39.99	1.68
29.00	1.00	54.59	39.79	1.46
29.50	1.50	54.40	39.60	1.29
30.00	2.00	54.22	39.42	1.18
30.50	2.50	54.03	39.23	1.09
31.00	3.00	53.84	39.04	1.01
31.50	3.50	53.67	38.87	0.95
32.00	4.00	53.51	38.71	0.90
32.50	4.50	53.37	38.57	0.86
33.00	5.00	53.23	38.43	0.82
34.00	6.00	52.86	38.06	0.75
35.00	7.00	52.58	37.78	0.70
36.00	8.00	52.32	37.52	0.65
37.00	9.00	52.00	37.20	0.61
38.00	10.00	51.74	36.94	0.58
39.00	11.00	51.71	36.91	0.55
40.00	12.00	51.27	36.47	0.52
41.00	13.00	51.02	36.22	0.50
42.00	14.00	50.80	36.00	0.48
43.00	15.00	50.58	35.78	0.46
45.00	17.00	50.16	35.36	0.42
47.00	19.00	49.74	34.94	0.39
49.00	21.00	49.44	34.64	0.37
51.00	23.00	49.16	34.36	0.35
53.00	25.00	48.91	34.11	0.33
57.00	29.00	48.48	33.68	0.29
59.00	31.00	48.29	33.49	0.28
61.00	33.00	48.11	33.31	0.27
63.00	35.00	47.93	33.13	0.26
68.00	40.00	47.52	32.72	0.23
73.00	45.00	47.13	32.33	0.21
78.00	50.00	46.75	31.95	0.19
83.00	55.00	46.40	31.60	0.18
88.00	60.00	46.05	31.25	0.17
93.00	65.00	45.75	30.95	0.16
98.00	70.00	45.44	30.64	0.15
103.00	75.00	45.11	30.31	0.14
113.00	85.00	44.57	29.77	0.12
123.00	95.00	44.05	29.25	0.11
133.00	105.00	43.51	28.71	0.10
143.00	115.00	43.03	28.23	0.09
153.00	125.00	42.53	27.73	0.09

WELL 14-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	log(T/T')
163.00	135.00	41.88	27.08	0.08
173.00	145.00	41.60	26.80	0.08
183.00	155.00	41.12	26.32	0.07
194.00	166.00	40.63	25.83	0.07
203.00	175.00	40.28	25.48	0.06
213.00	185.00	39.79	24.99	0.06
228.00	200.00	39.06	24.26	0.06
243.00	215.00	38.43	23.63	0.05
258.00	230.00	37.82	23.02	0.05
290.00	262.00	36.53	21.73	0.04
303.00	275.00	36.06	21.26	0.04
318.00	290.00	35.55	20.75	0.04
333.00	305.00	35.07	20.27	0.04
348.00	320.00	34.67	19.87	0.04
363.00	335.00	34.19	19.39	0.03
378.00	350.00	33.79	18.99	0.03
408.00	380.00	33.01	18.21	0.03
438.00	410.00	32.28	17.48	0.03
468.00	440.00	31.63	16.83	0.03
1248.00	1220.00	23.86	9.06	0.01
1318.00	1290.00	23.49	8.69	0.01
1368.00	1340.00	23.22	8.42	0.01
1428.00	1400.00	23.00	8.20	0.01
1488.00	1460.00	22.70	7.90	0.01
1548.00	1520.00	22.48	7.68	0.01
1603.00	1575.00	22.24	7.44	0.01
1668.00	1640.00	22.03	7.23	0.01
1728.00	1700.00	21.78	6.98	0.01
4133.00	4105.00	17.28	2.48	0.00
4803.00	4775.00	16.68	1.88	0.00

AQUIFER TEST DATA

WELL 14-26
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Pump down - Recovery
HOW Q MEASURED 4½ gal bucket
HOW W.L.'s MEASURED [illegible] DEPTH OF PUMP/AIRPIPE
RAD./DIST. OF/FROM PUMPING WELL Ø
PUMP ON: date 9/26/86 time
MEAS. POINT FOR W.L.'s [illegible]
PUMP OFF: date time
ELEVATION OF MEAS. POINT
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT
9/26/86

TIME t = 22 at t' = 0				WATER LEVEL DATA STATIC WATER LEVEL 14.20					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
1	11:05	original	/	15+1.85	2.05	14.80	N/A				WH	TD = 55.65 ft
	1107	Ø		15+1.85	2.05	14.80	Ø				"	Begin pumping
	11:11	4								2 gal		
	1114	7								1 gal		
	1116	9								½ gal		
	1118	11								½ gal		
	1123	16								½ gal		
	1129	22								0.75 gal		
	1135	22	Ø									
	1135:35	22.6	[illegible]	55+1.84	[illegible]	54.79	[illegible]					70% recovered = [illegible]
	1136:00	[illegible]		55+1.64		54.59	[illegible]					
	1136:30	29.5	1.5	55+1.45		54.40	[illegible]					
	1137:00	[illegible]	[illegible]	55+1.27		54.22	[illegible]					
	1137:30	30.5	2.5	55+1.08		54.03	-39.23					
	1138:00	31	[illegible]	55+0.89		53.84	-39.04					
	1138:30	31.5	[illegible]	55+0.72		53.67	-38.87					
	1139:00	[illegible]	[illegible]	55+0.56		53.51	-38.71					
	1139:30	[illegible]	4.5	55+0.42		53.37	-38.57					
	1140:00	[illegible]	[illegible]	55+0.28		53.23	-38.43				DP	
	1141	34	[illegible]	50+4.91		52.86	-38.06				DP	
	1142	35	[illegible]	50+4.63		52.58	-37.78				DP	
	1143	[illegible]	[illegible]	50+4.37		52.32	-37.52				WH	
	1144	[illegible]	[illegible]	50+4.05		52.00	-37.20				WH	
	1145	42	[illegible]	50+3.79		51.74	-36.94				WH	
	1146	[illegible]		50+3.56		51.71	-36.91				WH	
	1147	45	[illegible]	50+3.30		51.27	-36.47				WH	
	1148	41	[illegible]	50+3.07		51.02	-36.22				WH	
	1149	42	14	50+2.85		50.80	-36.00				WH	
	1150	[illegible]	15	50+2.63		50.58	-35.78				DP	
	1152	[illegible]	17	50+2.21		50.16	-35.36				DP	
	1154	[illegible]	[illegible]	50+1.79		49.74	-34.94				WH	
	1156	[illegible]	[illegible]	50+1.49		49.44	-34.64				WH	
	1158	[illegible]	[illegible]	50+1.21		49.16	-34.36				WH	
	1200	[illegible]	[illegible]	50+0.91		48.91	-34.11				DP	
	1202	[illegible]	[illegible]	50+0.74		48.67	-33.89				DP	
	1204	[illegible]	[illegible]	50+0.53		48.48	-33.68				DP	
	1206	[illegible]	[illegible]	50+0.34		48.29	-33.49				WH	
	1208	[illegible]	[illegible]	50+0.16		48.11	-33.31				WH	
	1210	[illegible]	[illegible]	45+4.98		47.98	-33.13				DP	
	1215	[illegible]	[illegible]	45+4.57		47.52	-32.72				WH	
	12:20	[illegible]	[illegible]	45+4.18		47.13	-32.33				DP	

AQUIFER TEST DATA

WELL 1486
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST Bail down - Recovery
HOW Q MEASURED 4½ gallon bucket
HOW W.L.'s MEASURED Olympic well sounder
RAD./DIST. OF/FROM PUMPING WELL 0
MEAS. POINT FOR W.L.'s N. side of inner casing
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date time
PUMP OFF: date time
DURATION OF AQUIFER TEST

LOCATION Eliss Wilcox Zone
PERSONNEL W. Herst D. Hollis
PROJECT Rocky Flats 10.6 P062.02

TIME t = 22.2 at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL 14.20 ft					DISCHARGE			
DAY	CLOCK TIME	t (min)	t' (min)		READING	CONVERSIONS OR CORRECTIONS	WATER LEVEL	s or (s-s')		READING	Q	RECORDED BY	COMMENTS
1	12:25	72	50		45+3.80	2.05	46.75	-31.95				WH	
	12:30	83	55		45+3.45	"	46.40	-31.60				DP	
	12:35	88	60		45+3.10	"	46.05	-31.25				DP	
	12:40	93	65		45+2.80	"	45.75	-30.95				DP	
	1245	98	70		45+2.44	"	45.44	-30.64				DP	
	1250	103	75		45+2.16	"	45.11	-30.31				DP	
	1256	109	80		—							DP	
	1300	113	85		45+1.62		44.57	-29.77				DP	
	[illegible]	123	95		45+1.10		44.25	-29.25				DP	
	[illegible]	133	105		45+0.56		43.51	-28.71				DP	
	[illegible]	143	115		45+0.08		43.22	-28.22				DP	
	[illegible]	153	125		40+4.58		42.53	-27.73				DP	
	[illegible]	165.8	137.8		40+3.93		41.88	-27.08				DP	
	[illegible]	172	145		40+3.15		41.60	-26.80				DP	
	1010	183	155		40+3.17		41.12	-26.32				DP	
	1020	194	166		40+2.68		40.63	-25.83				WH	
	1030	203	175		40+2.33		40.22	-25.48				DP	
	[illegible]	213	185		40+1.84		39.79	-24.99				DP	
	14:55	228	200		40+1.11		39.06	-24.26				DP	
	15:10	243	215		40+0.40		38.43	-23.63				WH	
	15:25	258	230		35+4.87		37.82	-23.02				DP	
	15:37	270	[illegible]		35+3.37		[illegible]	-21.72				WH	*Problems with [illegible]
	16:10	303	275		35+3.11		[illegible]	[illegible]				WH	Had to get a
	16:25	318	290		35+2.60		[illegible]	-20.75				WH	new one
	16:40	333	305		35+2.12		35.07	-20.27				WH	
	16:55	348	320		35+1.72		34.67	-19.87				WH	
	17:10	363	335		35+1.24		34.19	-19.39				WH	
	17:25	378	350		35+0.84		33.79	-18.99					
	1755	408	380		35+0.06		33.01	-18.21					
	1825	438	410		30+4.33		32.28	-17.48					
1	1855	468	440		30+3.68		31.63	-16.83					
2	0755	1248	1220		25+0.91		23.66	-9.06				MB	Re[illegible]
	0805	1258	1230		25+[illegible]		23.49	-2.67				MB	
	0955	1328	[illegible]		25+0.27		23.22	-2.42				MB	
	1055	1428	1400		25+0.05		23.00	-2.20				MB	
	1155	1488	1460		20+[illegible]		22.70	-2.90				MB	
	1255	1548	1520		20+4.53		22.48	-7.68				MB	
	1350	1603	1575		20+4.29		22.24	-7.44				MB	
	1455	1668	1640		20+4.08		22.03	-7.23				MB	
2	1555	1728	1700		20+3.83		21.78	-6.98				MB	
4	0800	4133	4105		15+4.33		[illegible]	-2.48				WH	>40% recovery
4	1110	4503	4475		15+3.73		16.08	-1.88				WH	

PACKER TEST ANALYSIS
WELL NO. 14-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/2/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 32.46 - 43.64
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 10.86

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00045692 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 2.30 * 2.31 = 18.07
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000154 FT/MIN
K = .00000078 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00429001 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 11.00 * 2.31 = 38.17
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000683 FT/MIN
K = .00000347 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00052039 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 2.40 * 2.31 = 18.30
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000173 FT/MIN
K = .00000088 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 14-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/2/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 43.26 - 54.44
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 10.86

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00122100 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 2.20 * 2.31 = 17.84
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000416 FT/MIN
K = .00000211 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00797079 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 9.00 * 2.31 = 33.55
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001444 FT/MIN
K = .00000734 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00037995 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 2.30 * 2.31 = 18.07
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000128 FT/MIN
K = .00000065 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 14-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/2/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 53.91 - 65.09
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 10.86

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 1.70 * 2.31 = 16.69
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000049 FT/MIN
K = .00000025 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00457975 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 20.00 * 2.31 = 58.96
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000472 FT/MIN
K = .00000240 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013962 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 10.86 + 1.90 + 2.40 * 2.31 = 18.30
R = BOREHOLE RADIUS = .16 FEET

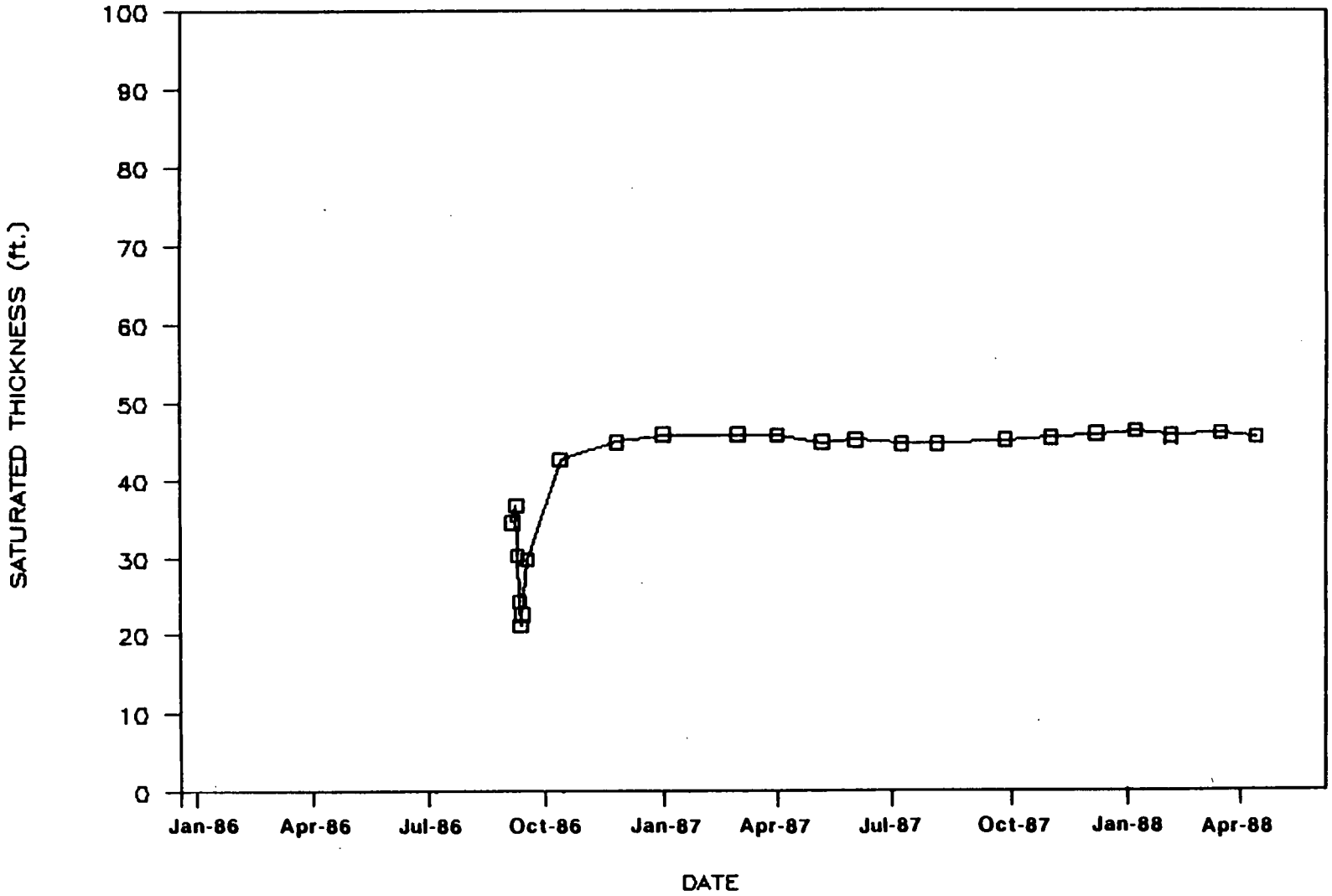
K = HYDRAULIC CONDUCTIVITY = .00000046 FT/MIN
K = .00000024 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1486	09/05/86	5844.71	5846.71	2.00	55.36	20.90	5825.81
	09/08/86					18.79	5827.92
	09/09/86					25.22	5821.49
	09/11/86					31.12	5815.59
	09/12/86					34.23	5812.48
	09/13/86					32.84	5813.87
	09/17/86					25.68	5821.03
	10/13/86					12.91	5833.80
	11/26/86					10.64	5836.07
	01/01/87					9.67	5837.04
	03/02/87					9.67	5837.04
	04/01/87					9.85	5836.86
	05/06/87					10.77	5835.94
	06/01/87					10.39	5836.32
	07/08/87					10.90	5835.81
	08/05/87					10.90	5835.81
	09/28/87					10.50	5836.21
	11/03/87					10.20	5836.51
	12/08/87					9.70	5837.01
	01/07/88					9.30	5837.41
	02/04/88					9.90	5836.81
	03/14/88					9.60	5837.11
	04/11/88					10.10	5836.61

SATURATED THICKNESS IN WELL # 14-86 (SP)



INDEX OF DATA

Boring No.: 15-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 15-86

Date Drilled 8/18/86

Coordinates N 38862.9 E 22711.3

Boring Method Hollow Stem Auger

Ground Surface Elevation 5845.61

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM			
				0-0.4'-Sample. Recovered 0.4/0.4'=100%. Medium CLAY: dark gray (N 4) top soil; trace granitic pebbles; poorly sorted; unconsolidated; dry.			
				0.4-5.0'-Sample. Recovered 4.0/4.6'=87%. GRAVEL: dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2) granitic and micaceous pebbles and cobbles with some clayey silt; poorly sorted; trace of iron stains; unconsolidated; dry.			
	5						
				5.0-6.0'-Sample. Recovered 1.0/1.0'=100%. GRAVEL: moderate yellowish brown (5YR 3/4) and pale yellowish brown (10YR 6/2) granititc pebbles and cobbles in a sand and silt matrix; poorly sorted; unconsolidated; dry.			
	10						
				6.0-8.0'-Sample. Recovered 1.0/2.0'=50%. CLAY: dark yellowish brown (10YR 4/2) silty clay; trace granitic pebbles; grades to black clay at 7.7'; unconsolidated; moist.			
				8.0-10.5'-Sample. Recovered 2.1/2.5'=84%. GRAVEL: dark yellowish brown (10YR 4/2) granitic pebbles in silty clay matrix; poorly sorted; unconsolidated; wet.			
	15						
				10.5-13.0'-Sample. Recovered 1.4/2.5'=100%.			
				10.5-12.5'. GRAVEL: dark yellowish brown (10YR 4/2) granitic pebbles in silty clay matrix; poorly sorted; unconsolidated; wet.			
	20			ARAPAHOE FORMATION			

Remarks Logged by: L. Pivonka

Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant	LOG OF BORING NO. 15-86
Date Drilled 8/18/86	Coordinates N 38862.9 E 22711.3
Boring Method Hollow Stem Auger	Ground Surface Elevation 5845.61

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			12.5-13.0'. CLAYSTONE: dark yellowish brown (10YR 4/2); trace iron staining; weathered; moist. 13.0-15.5'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: light olive gray (5Y 6/1) and dusky yellowish brown (10YR 2/2); weathered; dry. 15.5-18.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: light olive gray (5Y 6/1); trace iron staining; weathered; dry.			
	25						
				TOTAL DEPTH: 18.0'			
	30						
	35						
	40						

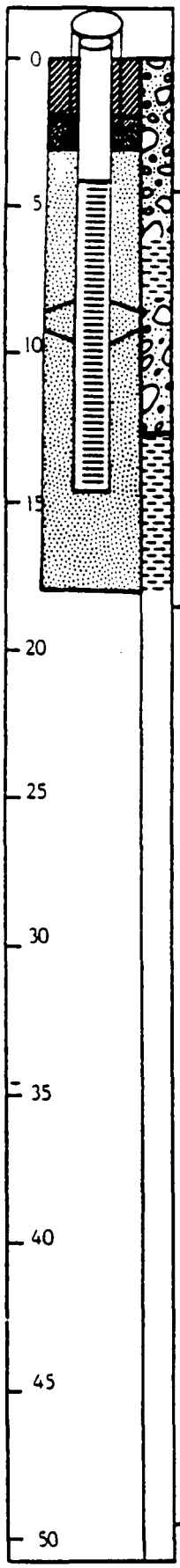
Remarks Logged by: L. Pivonka Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

WELL 5-86

WELL CONSTRUCTION SUMMARY



LOCATION Golden, Co

PERSONNEL L. Pivonka

PROJECT 106P06222 Rocky Flats Plant

LOCATION or COORDS: N 38862.9 E 22711.3

ELEVATION: GROUND LEVEL 5845.61'
TOP OF CASING 5847.93'

DRILLING SUMMARY:

TOTAL DEPTH Well: 14.69' Hole: 18.00'

BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)

RIG Mobile B-57

BIT(S) Bull nose bit

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	4.09'	C1
4.09'	14.69'	S1

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
8.34' - 9.52'

FILTER MATERIAL 12-20 silica sand
3.00' - 18.00'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 3.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	8/18	1405	8/18	1705
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	8/18	1705	8/18	1707
FILTER PLACEMENT:	8/18	1707	8/18	1720
CEMENTING:	8/18	1725	8/18	1730
DEVELOPMENT:	8/27	1205	9/9	1000
OTHER:				
Bentonite	8/18	1720	8/18	1722

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 6.5' during drilling.

Top of stainless steel casing: 2.32'

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 15-86

Hydraulic Conductivity = NA

Flowrate (gpm) = 0.872

Screened Interval (ft below G.L.) = 4.33 (Static W.L.) - 14.69'

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1986 pg 256).

RFW 10-05-003/A-5/85

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

WELL 15-86

$$T\ (gpd/ft) = \frac{264\,Q}{\Delta s'} = \frac{(264)\ (0.872)}{24} = 9.59$$

where, $Q\ (gpm) = 20.5$ gallons / 23.5 minutes $= 0.872$ gpm

$\Delta s'$ = ft. change in residual drawdown / log cycle

$= 24'$ / log cycle (see attached plot)

$$K\ (gpd/ft^2) = T/b = 9.59/10.36 = .926$$

where $b\ (ft) = 14.69$ (Base of screen) $- 4.33$ (Static W.L.) $= 10.36'$

$$K\ (cm/sec) = 0.926\ gpd/ft^2 \times \frac{4.72\times10^{-5}\ cm/sec}{gpd/ft^2} = 4.3\times10^{-5}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$

$$t\ (min) = \frac{r^2 S}{4\,T\,u} = \frac{(.3)^2 \times .1}{4\ (9.59)\ (.01)} \times \frac{1440\ min}{day} \times \frac{7.482\ gal}{ft^3}$$

$= 253$ min

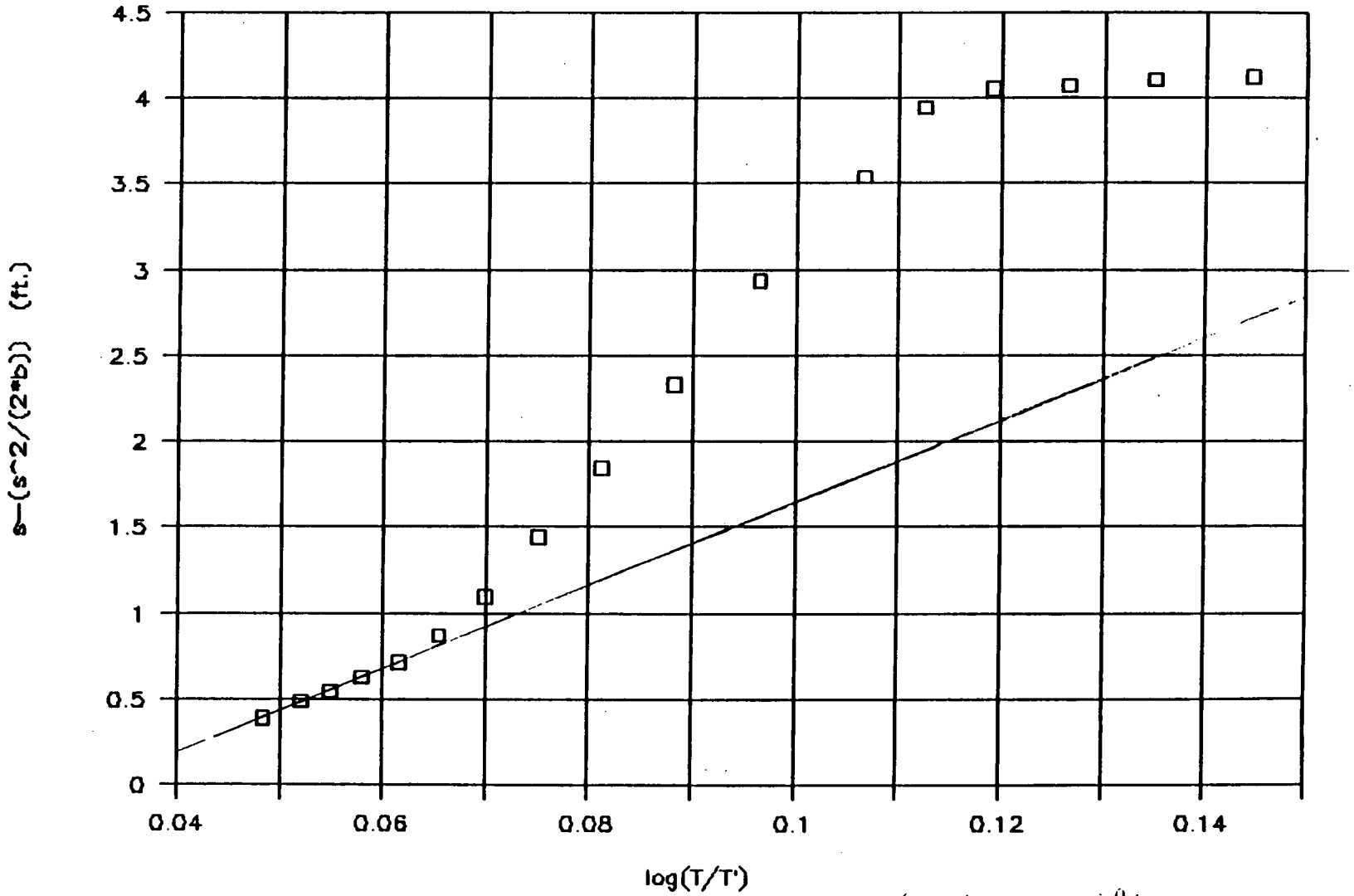
where $r\ (ft) = \left(\frac{7.25}{24}\right) ft = (0.30)\ ft$

$S = 0.1$ assumed S for unconfined aquifers.

$\Delta s'$ is invalid.

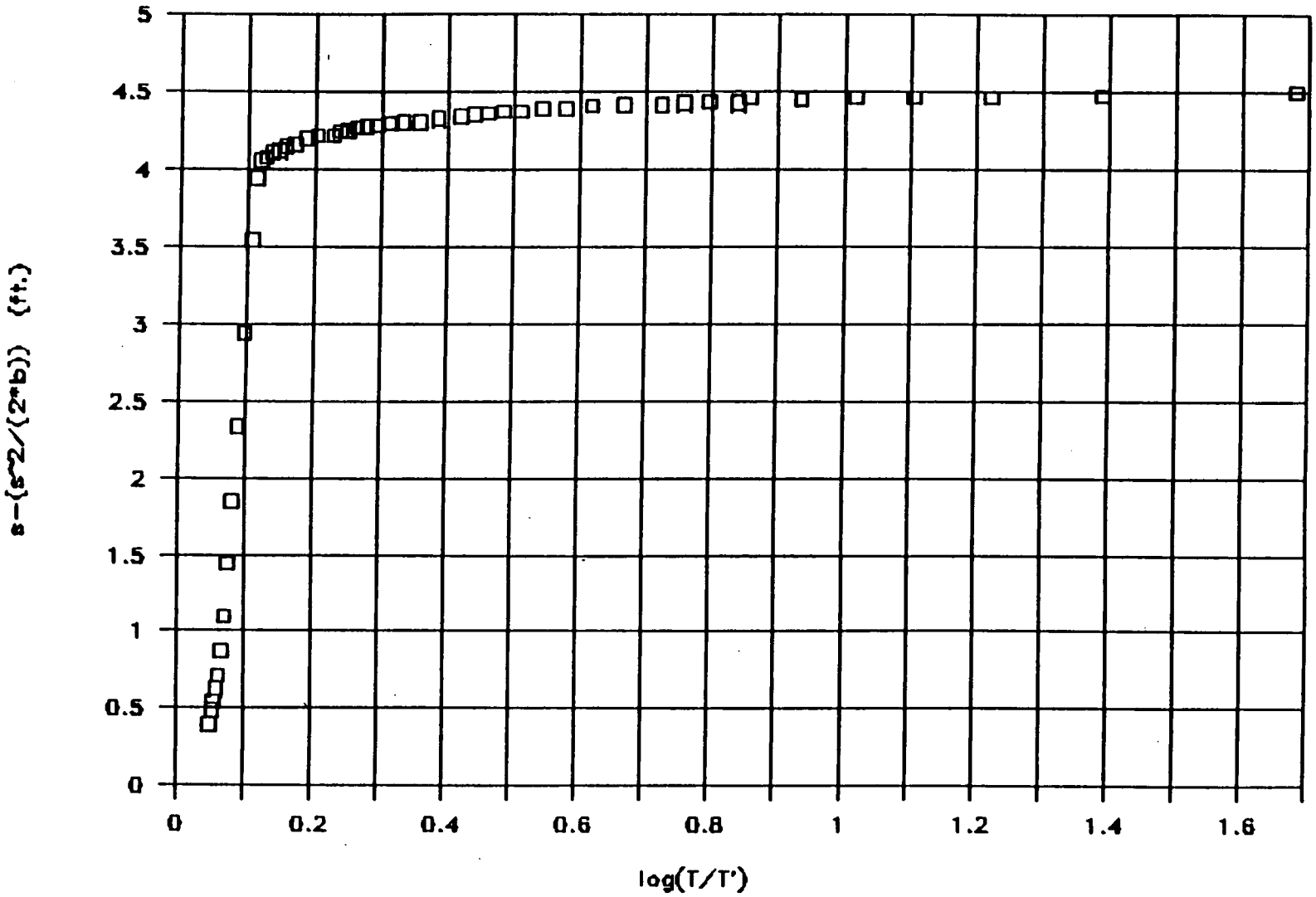
RFW 10-05-003/A-5/85

WELL 15-86

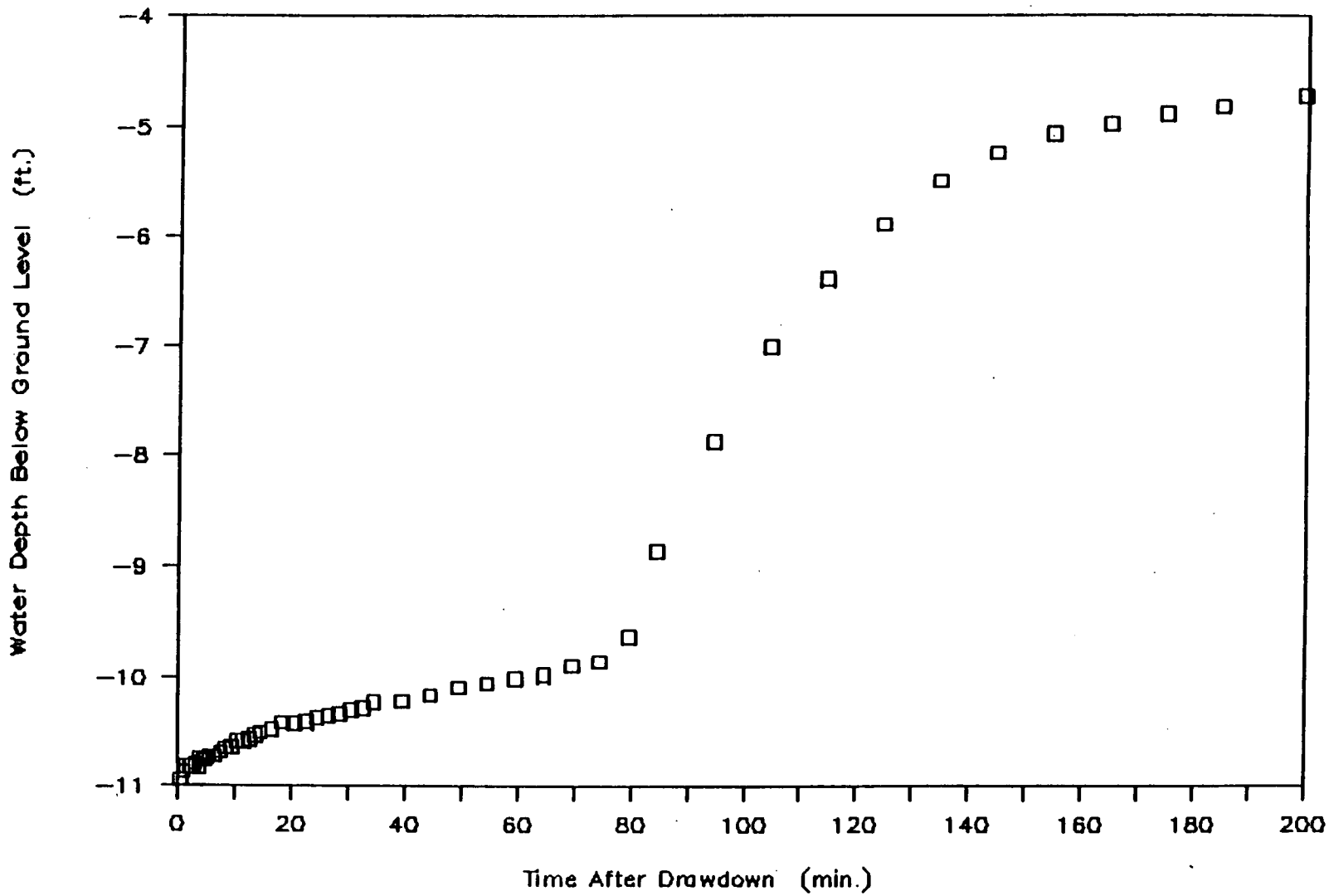


$$\Delta s' = \frac{(2.84 - 0.20)\,ft}{0.15 - 0.04} = 24'/\text{log cycle}$$

WELL 15-86



WELL 15-86


-4
-5
-6
-7
-8
-9
-10
-11
Water Depth Below Ground Level (ft.)
0
20
40
60
80
100
120
140
160
180
200
Time After Drawdown (min.)

WELL 15-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	s-(s^2/2b) b=10.36 ft. (ft.)	log(T/T')
24.00	0.50	10.94	6.61	4.50	1.68
24.50	1.00	10.87	6.54	4.48	1.39
25.00	1.50	10.82	6.49	4.46	1.22
25.50	2.00	10.82	6.49	4.46	1.11
26.00	2.50	10.82	6.49	4.46	1.02
26.60	3.10	10.80	6.47	4.45	0.93
27.30	3.80	10.82	6.49	4.46	0.86
27.50	4.00	10.75	6.42	4.43	0.84
28.00	4.50	10.76	6.43	4.43	0.79
28.50	5.00	10.74	6.41	4.43	0.76
29.00	5.50	10.72	6.39	4.42	0.72
30.00	6.50	10.72	6.39	4.42	0.66
31.00	7.50	10.69	6.36	4.41	0.62
32.00	8.50	10.65	6.32	4.39	0.58
33.00	9.50	10.64	6.31	4.39	0.54
34.00	10.50	10.59	6.26	4.37	0.51
35.00	11.50	10.59	6.26	4.37	0.48
36.00	12.50	10.57	6.24	4.36	0.46
37.00	13.50	10.54	6.21	4.35	0.44
38.00	14.50	10.51	6.18	4.34	0.42
40.00	16.50	10.48	6.15	4.32	0.38
42.00	18.50	10.42	6.09	4.30	0.36
44.00	20.50	10.43	6.10	4.30	0.33
46.00	22.50	10.41	6.08	4.30	0.31
48.00	24.50	10.37	6.04	4.28	0.29
50.00	26.50	10.36	6.03	4.28	0.28
52.00	28.50	10.34	6.01	4.27	0.26
54.00	30.50	10.30	5.97	4.25	0.25
56.00	32.50	10.28	5.95	4.24	0.24
58.00	34.50	10.23	5.90	4.22	0.23
63.00	39.50	10.22	5.89	4.22	0.20
68.00	44.50	10.17	5.84	4.19	0.18
73.00	49.50	10.09	5.76	4.16	0.17
78.00	54.50	10.06	5.73	4.15	0.16
83.00	59.50	10.01	5.68	4.12	0.14
88.00	64.50	9.98	5.65	4.11	0.13
93.00	69.50	9.90	5.57	4.07	0.13
98.00	74.50	9.86	5.53	4.05	0.12
103.00	79.50	9.63	5.30	3.94	0.11
108.00	84.50	8.86	4.53	3.54	0.11
118.00	94.50	7.87	3.54	2.94	0.10
128.00	104.50	7.01	2.68	2.33	0.09
138.00	114.50	6.38	2.05	1.85	0.08

WELL 15-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	s-(s^2/2b) b=10.36 ft. (ft.)	log(T/T')
148.00	124.50	5.89	1.56	1.44	0.08
158.00	134.50	5.49	1.16	1.10	0.07
168.00	144.50	5.24	0.91	0.87	0.07
178.00	154.50	5.07	0.74	0.71	0.06
188.00	164.50	4.98	0.65	0.63	0.06
198.00	174.50	4.89	0.56	0.54	0.05
208.00	184.50	4.83	0.50	0.49	0.05
223.00	199.50	4.73	0.40	0.39	0.05

AQUIFER TEST DATA

WELL 15-26
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF

TYPE OF AQUIFER TEST Constant Discharge
HOW Q MEASURED "5 gallon bucket"
HOW W.L.'s MEASURED Olympic well sounder
RAD./DIST. OF/FROM PUMPING WELL 6'
MEAS. POINT FOR W.L.'s Inside of 2" PVC
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 9/26/86 time 1512
PUMP OFF: date 9/26/86 time
DURATION OF AQUIFER TEST

LOCATION 1 miles west of Reno
PERSONNEL W. Hall D. Kirk
PROJECT Rock Flats 106 Pzo Dia
9/26/86

TIME t = ____ at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL 4.33 ft					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
1	1336	original			5+2.12	2.78	4.34	N/A					T.D. = 14.15
	1512	0			5+3.47	1.33+2.78	4.33	0					water = 4.34
	1512:30	0.5			5+4.19	1.33+2.78	5.08	1.75					Note: T.D. +
	1513:00	1			10-0.05	"	5.84	1.51					W.L. taken
	1513:30	1.5			10+0.61	"	6.50	2.17					before PVC pipe
	1514:00	2			10+1.27	"	7.16	2.83					inserted down-
	1514:30	2.5			10+1.93	"	7.82	3.49					hole.
	1515:00	3			10+2.57	"	8.46	4.13					
	1515:30	3.5			10+3.07	"	8.96	4.63					
	1516	4			10+3.57	"	9.46	5.13					
	1516:26	4.3			—	—	—	—		4	0.93 gpm		4 gal
	1517	5			10+4.21	"	10.10	5.77					
	1517:30	5.5			10+4.23	"	10.12	5.79					1.33 = PVC inside
	1518:00	6			10+4.12	"	10.01	5.68					2.78 = increase
	1518:30	6.5			10+4.21	"	10.10	5.77					check-up
	1519	7			10+4.26	"	10.15	5.82					
	1519:30	7.5			10+4.28	"	10.17	5.84					
	1520	8			10+4.28	"	10.17	5.84					
	1521	9			10+4.41	"	10.30	5.97		4	0.85 gpm		4 gal
	1522	10	10.2		10+4.43	"	10.32	5.99					
	1523	11			10+4.49	"	10.38	6.05					
	1524	12			10+4.51	"	10.40	6.07					
	1525	13			10+4.59		10.48	6.15	15:25:30	4	0.88 gpm		
	1526	14			10+4.60	"	10.51	6.18					
	1527	15			10+4.75		10.64	6.31					
	1528	16			10+4.79	"	10.68	6.35					
	1529	17			10+4.89	"	10.78	6.45	10:29:31	4	1 gpm		
	1530	18			10+4.98	"	10.87	6.54					15:35:17, 4.5 gal
	1532	20			15+0.16	"	11.05	6.72					+ w.l. @ 15 + 0.4;
	15:34	22			15+0.28	"	11.17	6.84					Pump off @
	15:35	17.23	3		15+0.53	"	11.42	7.09	15:35:17	4.5	0.83 gpm		15:35:30, Next
	15:36	24	0		15+0.05	"	10.94	-6.61					reading at 15:40
	15:36:30	24.5	0.5		10+4.98	"	10.87	-6.54					began recharge
	15:37	25	1		10+4.93	"	10.82	-6.49					
	15:37:30	25.5	1.5		10+4.93	"	10.82	-6.49					
	15:38	26	2		10+4.93	"	10.82	-6.49					
	15:38:30	26.5	2.5		10+4.91	"	10.80	-6.47					
	15:39:15	27.25	3.25		10+4.93	"	10.82	-6.49					
	15:39:30	27.5	3.5		10+4.86	"	10.75	-6.42					
	15:40:00	28	4		10+4.87	"	10.76	-6.43					
	15:40:30	28.5	4.5		10+4.85	"	10.74	-6.41					

AQUIFER TEST DATA

WELL 15-16
PUMPING or OBSERVATION WELL
~~PUMPING~~ or RECOVERY DATA
PAGE 2 OF

TYPE OF AQUIFER TEST Constant Discharge
HOW Q MEASURED 7" Allen orifice
HOW W.L.'s MEASURED Olympic well sounder
RAD./DIST. OF/FROM PUMPING WELL 0
MEAS. POINT FOR W.L.'s N. side of 1½" PVC
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date time
PUMP OFF: date time
DURATION OF AQUIFER TEST

LOCATION Fallon Pump Plant
PERSONNEL W. Hair, D. Karlik

PROJECT Rock Flats 106 Pos. 27

TIME t = ____ at t' = 0				WATER LEVEL DATA STATIC WATER LEVEL ____					DISCHARGE			
D ▲ ▼	CLOCK TIME	t	t'	READING	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s'		READING	Q	RECORDED BY	COMMENTS
15	41:00	29	5	10+4.83	1.33+2.78	10.72	-6.39				WH	
15	42:00	30	6	10+4.83	1.33+2.78	10.72	-6.39					
15	43:00	31	7	10+4.80	"	10.69	-6.36					
15	44:00	32	8	10+4.76	"	10.65	-6.32					
15	45:00	33	9	10+4.75	"	10.64	-6.31					90% Recovered @ 15 hr
15	46	34	10	10+4.70	"	10.59	-6.26				DP	
15	47	35	11	10+4.70	"	10.59	-6.26					
15	48	36	12	10+4.68	"	10.57	-6.24					
15	49	37	13	10+4.65	"	10.54	-6.21					
15	50	38	14	10+4.62	"	10.51	-6.18					
15	52	40	16	10+4.59	"	10.48	-6.15					
	1554	42	18	10+4.53	"	10.42	-6.09					
	1556	44	20	10+4.59	"	10.43	-6.10					
	1558	46	22	10+4.52	"	10.41	-6.08				DP	
	1600	48	24	10+4.48	"	10.37	-6.04				WH	
	1602	50	26	10+4.47	"	10.36	-6.03				WH	
	1604	52	28	10+4.45	"	10.34	-6.01				WH	
	1606	54	30	10+4.41	"	10.30	-5.97				WH	
	1608	56	32	10+4.39	"	10.28	-5.95				WH	
	1610	58	34	10+4.36	"	10.25	-5.90				DP	
	1615	63	39	10+4.33	"	10.22	-5.89					
	1620	68	44	10+4.28	"	10.17	-5.84					
	1625	73	49	10+4.20	"	10.09	-5.76				DP	
	1630	78	54	10+4.17	"	10.06	-5.73				DP	
	1635	83	59	10+4.12	"	10.01	-5.68				DP	
	1640	88	64	10+4.09	"	9.98	-5.65				DP	
	1645	93	69	10+4.01	"	9.90	-5.57				DP	
	1650	98	74	10+3.97	"	9.86	-5.53				DP	
	1655	103	79	10+3.74	"	9.63	-5.30				DP	
	1700	108	84	10+3.47	"	9.86	-4.53				DP	
	1710	118	94	10+1.98	"	7.87	-2.54				DP	
	1720	128	104	10+1.12	"	7.01	-2.68				DP	
	1730	138	114	10+0.88	"	6.38	-2.05				DP	
	1740	148	124	10+0.0	"	5.89	-1.56				DP	
	1750	158	134	5+9.60	"	5.49	-1.16				DP	
	1800	168	144	5+4.35		5.24	-0.91				WH	
	1810	178	154	5+4.18		5.07	-0.74				DP	
	1820	188	164	5+4.09	"	4.98	-0.65				DP	90% Recovered
	1830	198	174	5+4.00	"	4.89	-0.56				WH	
	1840	208	184	5+3.94		4.83	-0.50				WH	
	1855	223	199	5+3.84	"	4.73	-0.40				DP	

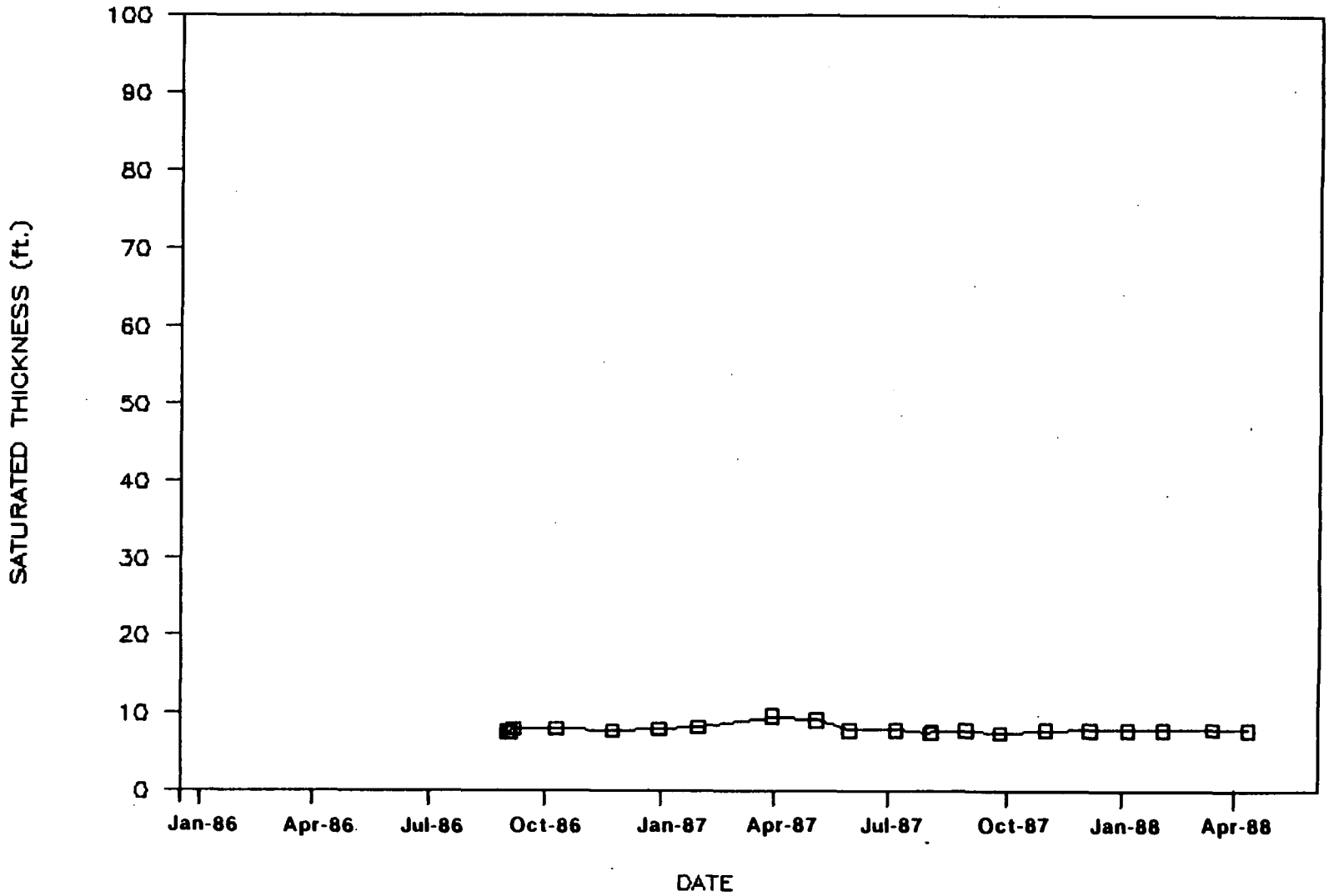
9/26/86

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1586	09/04/86	5845.61	5847.93	2.32	14.69	7.05	5840.88
	09/05/86					7.17	5840.76
	09/06/86					7.05	5840.88
	09/08/86					6.67	5841.26
	10/13/86					6.60	5841.33
	11/26/86					6.89	5841.04
	01/01/87					6.67	5841.26
	02/01/87					6.40	5841.53
	04/01/87					4.96	5842.97
	05/06/87					5.44	5842.49
	06/01/87					6.71	5841.22
	07/08/87					6.70	5841.23
	08/04/87					7.10	5840.83
	08/05/87					7.00	5840.93
	09/01/87					6.80	5841.13
	09/28/87					7.10	5840.83
	11/03/87					6.80	5841.13
	12/08/87					6.70	5841.23
	01/07/88					6.70	5841.23
	02/04/88					6.70	5841.23
	03/14/88					6.60	5841.33
	04/11/88					6.70	5841.23

SATURATED THICKNESS IN WELL # 15-86(SP)



INDEX OF DATA

Boring No.: 16-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project:	Rocky Flats Plant	LOG OF BORING NO.	16-86
Date Drilled	8/15/85; 8/25/86	Coordinates	N 38759.9 E 22159.7
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5864.74

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM			
				0-0.4'-Sample. Recovered 0.4/0.4'=100%. GRAVEL: dark yellowish orange (10YR 6/6) sandy, silty, and clayey; subangular grains of feldspar and quartz; poorly sorted; unconsolidated; dry.			
				0.4-5.0'-Sample. Recovered 4.0/4.6'=87%. CLAY: dusky yellowish brown (10YR 2/2) silty clay; some quartzite pebbles and cobbles; poorly sorted; subangular to subrounded gravel; unconsolidated; dry to damp.			
	5						
				5.0-6.5'-Sample. Recovered 1.5/1.5'=100%. GRAVEL: dark yellowish brown (10YR 4/2) sandy, silty and clayey; granitic pebbles; poorly sorted; unconsolidated; moist.			
	10			6.5-7.0'-Sample. Recovered 1.5/1.5'=100%. CLAY: dark yellowish brown (10YR 4/2); silty; trace iron staining; unconsolidated; damp.			
				ARAPAHOE FORMATION			
				7.0-10.5'-Sample. Recovered 3.5/3.5'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2); silty trace iron staining; laminated; weathered; dry.			
	15			10.5-13.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2); silty; trace iron staining; laminated; weathered; dry.			
				13.0-18.0'-Sample. Recovered 4.0/5.0'=80%. CLAYSTONE: dark yellowish brown (10YR 4/2); silty; iron stained; laminated; weathered; dry.			
	20						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	16-86
Date Drilled	8/15/86; 8/25/86	Coordinates	N 38759.9 E 22159.7
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5864.74

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			18.0-23.0'-Sample. Recovered 4.3/5.0'=86%. CLAYSTONE: medium gray (N 5); silty; laminated; unweathered; dry.			
				23.0-26.0'-Sample. Recovered 3.0/3.0'=100%. CLAYSTONE: medium gray (N 5); silty; trace iron staining; laminated; dry.			
				26.0-28.1'-Sample. Recovered 2.1/2.1=100%. RQD 1.9/2.1'=90%. CLAYSTONE: medium gray (N 4); carbonaceous laminae; some limonitic partings; damp.			
	25			28.1-32.8'-Sample. Recovered 4.7/4.7'=100%. RQD 4.7/4.7'=100%. CLAYSTONE: medium gray (N 4); carbonaceous laminae; some limonitic partings; damp.			
	30			32.8-34.0'-Sample. Recovered 1.2/1.2'=100%. RQD 1.2/1.2'=100%. CLAYSTONE: Same as above; damp.			
				34.0-39.0'-Sample. Recovered 3.8/5.0'=76%. RQD 3.4/3.8'=90%.			
				34.0-35.2'. Lost core.			
	35			35.2-37.0'. CLAYSTONE: medium gray (N 4); carbonaceous laminae; some limonitic partings; damp.			
				37.0-39.0'. CLAYSTONE: Same as above; damp.			
				39.0-44.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%.			
				39.0-40.1'. CLAYSTONE: Same as above; damp.			
	40						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	16-86
Date Drilled	8/15/86; 8/25/86	Coordinates	N 38759.9 E 22159.7
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5864.74

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	40			40.1-41.4'. SILTSTONE: medium gray (N 4); laminated; well sorted; damp.			
				41.4-41.9'. SILTSTONE: dark gray (N 3); laminated; well sorted; damp.			
				41.9-43.8'. SANDSTONE: medium gray (N 5); very fine-grained; massive; some carbonaceous detritus; damp.			
	45			43.8-44.0'. SILTSTONE: dark gray (N 3); clayey; laminated; damp.			
				44.0-49.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.5/5.0'=90%.			
				44.0-44.8'. SILTSTONE: dark gray (N 3); clayey; evenly laminated; damp.			
	50			44.8-49.0'. CLAYSTONE: dark gray (N 3); laminated; damp.			
				49.0-54.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.4/5.0'=88%.			
				49.0-49.6'. SILTSTONE: dark gray (N 3); slightly calcareous; laminated; damp.			
				49.6-51.2'. CLAYSTONE: grayish black (N 2); silty; damp.			
	55			51.2-52.3'. SILTSTONE: grayish black (N 2); clayey; laminated; damp.			
				52.3-54.0'. SILTSTONE: dark gray (N 3); some very fine-grained sand (light gray (N 7)); convolute bedding; damp to moist.			
				54.0-59.0'-Sample. Recovered 1.3/5.0'=26%. RQD 0/1.3'=0%.			
	60						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by:

Project No. 106P06222	Hydro-Search, Inc.	Page 3 of 4

Project:	Rocky Flats Plant	LOG OF BORING NO.	16-86
Date Drilled	8/15/86; 8/25/86	Coordinates	N 38759.9 E 22159.7
Boring Method	Hollow Stem Auger/NC Core	Ground Surface Elevation	5864.74

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	60			54.0-54.5'. CLAYSTONE: medium dark gray (N 4); massive; damp.			
				54.5-59.0'. SILTSTONE: dark gray (N 3) and very fine-grained light gray (N 7) sandstone; even interlaminated; damp.			
				59.0-64.0'-Sample. Recovered 5.0/5.0'=100%. RQD 2.5/5.0'=50%.			
	65			59.2-60.7'. SILTSTONE: medium gray (N 5); clayey; laminated; damp.			
				60.7-61.4'. CLAYSTONE: grayish black (N 2); laminated; damp.			
				61.4-64.0'. CLAYSTONE: medium gray (N 5); silty; laminated; damp.			
				TOTAL DEPTH: 64.0'			
	70						
	75						
	80						

Remarks Logged by: L. Pivonka & T. Gulliver Checked by: [illegible]

Project No. 106P06222

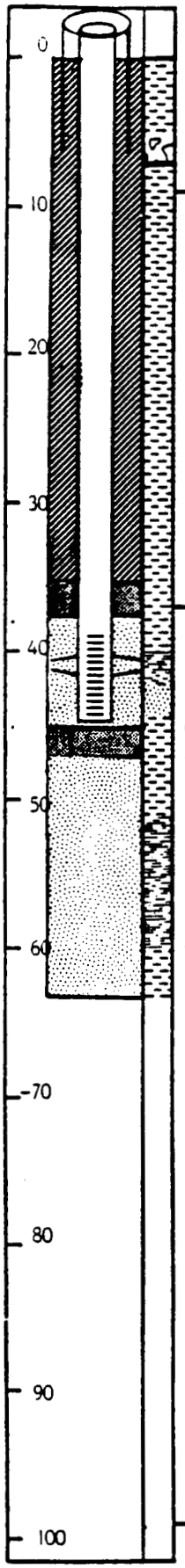
Hydro-Search, Inc.

WELL 16-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38759.9 E 22159.7

ELEVATION: GROUND LEVEL 5864.74'
TOP OF CASING 5866.60'



LOCATION Golden, CO
PERSONNEL L. Pivonka/T. Gulliver
PROJECT 106R06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 45.06' Hole: 64.00'

BOREHOLE DIAMETER 0.00' - 26.00': 7¼"
26.00'-45.00': 4 3/4" 45.00'-64.00': 3 7/8"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue, Golden, CO
Jim Horne, Paul Wiebe

RIG 0.00'-26.00' Mobile B57, 26.00'-64.00' failing 1500

BIT(S) 0.00'-26.00' Blade bit
26.00'-64.00' Christensen carbide, tricone 4 3/4 reamer

DRILLING FLUID 0.00'-26.00' None
26.00'-64.00' air/water mist

SURFACE CASING 5" x 28.55' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	26.00'	C1	
0.00'	39.06'	C2	
39.06'	45.06'	S1	

CASING: C1 5" I.D. steel surface casing
C2 2" I.D., Sch. 5, Type 316 stainless steel, threaded and flush jointed

SCREEN: S1 2" I.D., Sch. 5, Type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
40.49' - 41.73'

FILTER MATERIAL 32-42 silica sand
37.65' - 45.06'

CEMENT Portland Type I
0.00' - 35.25'

OTHER 3/8" bentonite pellets
35.25' - 37.65'
45.06' - 47.15'
10-20 silica sand: 47.15' - 64.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7¼" auger	8/15	1330	8/15	1530
NC core	8/25	0920	8/25	1200
Reaming	8/27	1700	8/27	1725
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
5" steel	8/18	0907	8/18	1110
2" stainless	8/28	1012	8/28	1014
FILTER PLACEMENT:	8/28	1018	8/28	1030
CEMENTING:	8/28	1130	8/28	1135
DEVELOPMENT:	9/2	1725	9/18	1240
OTHER:				
Bentonite	8/28	1040	8/28	1041
	8/28	0945	8/28	0948
Packer testing	8/27	0900	8/27	1645
Cementing 5" steel	8/18	0918	8/18	0938

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.86'

NC core 26.00' - 64.00'

Reamed from 26.00' - 45.00'

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 16-86

Hydraulic Conductivity (cm/sec) = 6×10^{-8}

Flowrate (gpm) = 0.5 gpm

Screened Interval (ft below G.L.) = 39.06 - 45.36

39.06 - 40.1 claystone

40.1 - 41.9 siltstone

41.9 - 43.8 sand stone

43.8 - 44.3 siltstone

44.3 - 45.36 claystone

Method of Analysis Residual-drawdown Plot

(Driscoll, 1986 - pg 256.)

RFW 10-05-003/A-5/85

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

WELL 16-86

$$T\ (gpd/ft) = \frac{264\,Q}{\Delta s'} = \frac{(264)\ (.5)}{17{,}100} = 7.72 \times 10^{-3}$$

where $Q\ (gpm) = 6\,gal/12\,min = .5\,gpm$

$\Delta s'$ = ft. change in residual drawdown / log cycle

= 17,100 ft/log cycle see attached plot

$$K\ (gpd/ft^2) = T/b = 7.72 \times 10^{-3}/6.00 = 1.29 \times 10^{-3}$$

where $b\ (ft) = 6.00\,ft$

$$K\ (cm/sec) = 1.29 \times 10^{-3}\,gpd/ft^2 \times \frac{4.72 \times 10^{-5}\,cm/sec}{gpd/ft^2} = 6 \times 10^{-8}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$

$$t\ (min) = \frac{r^2 S}{4\,T\,u} = \frac{(0.198) \times 10^{-3}}{(4)(7.72 \times 10^{-3})(.01)} \times \frac{1440\,min}{day} \times \frac{7.48\,gal}{ft^3}$$

$$= 1368\ min.$$

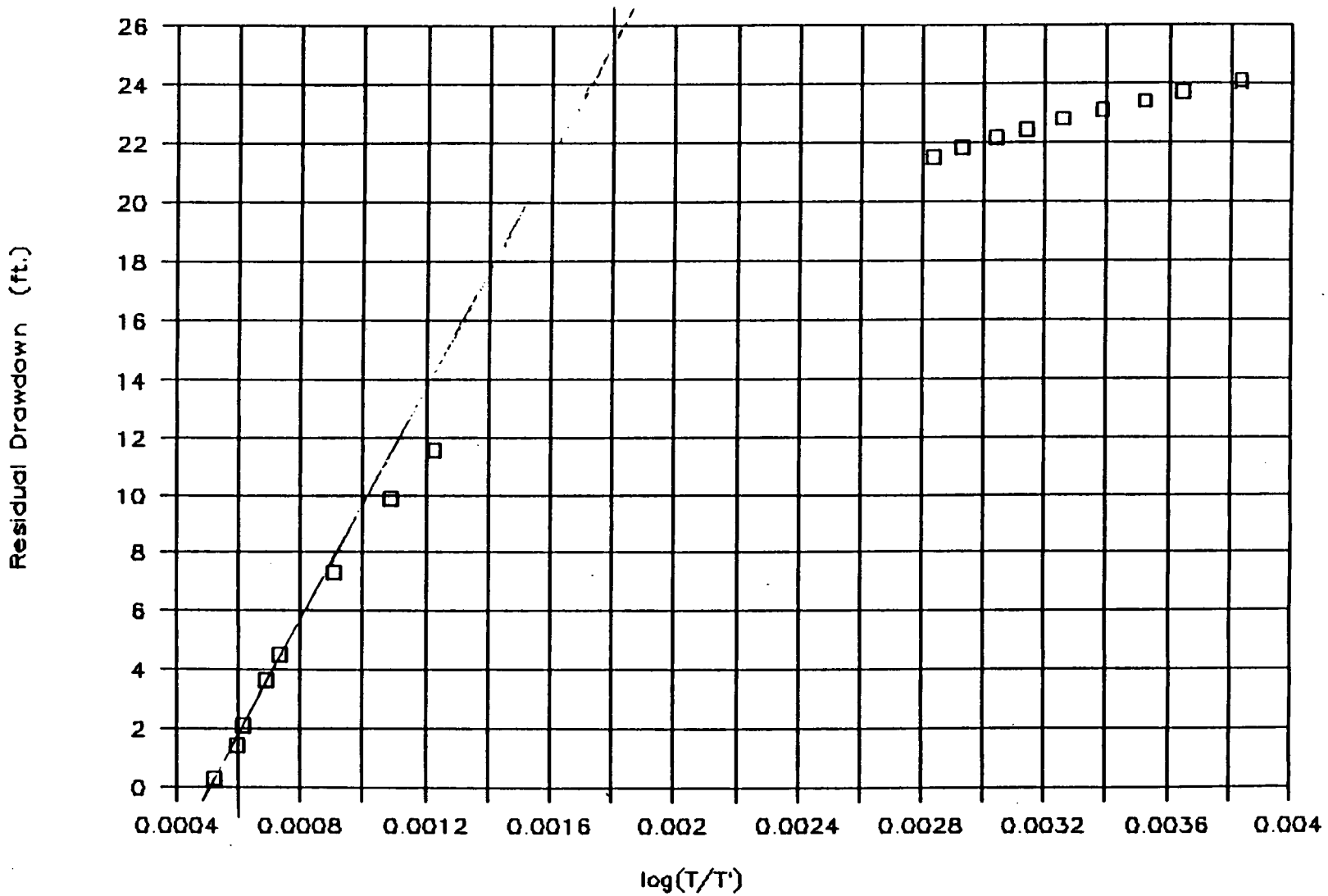
where $r\ (ft) = \left(\frac{4.75}{24}\right) ft = 0.198\,ft$

$S = 10^{-3}$ assumed S for confined aquifer

$\Delta s'$ is based on points where $t \geq 7551$ min.

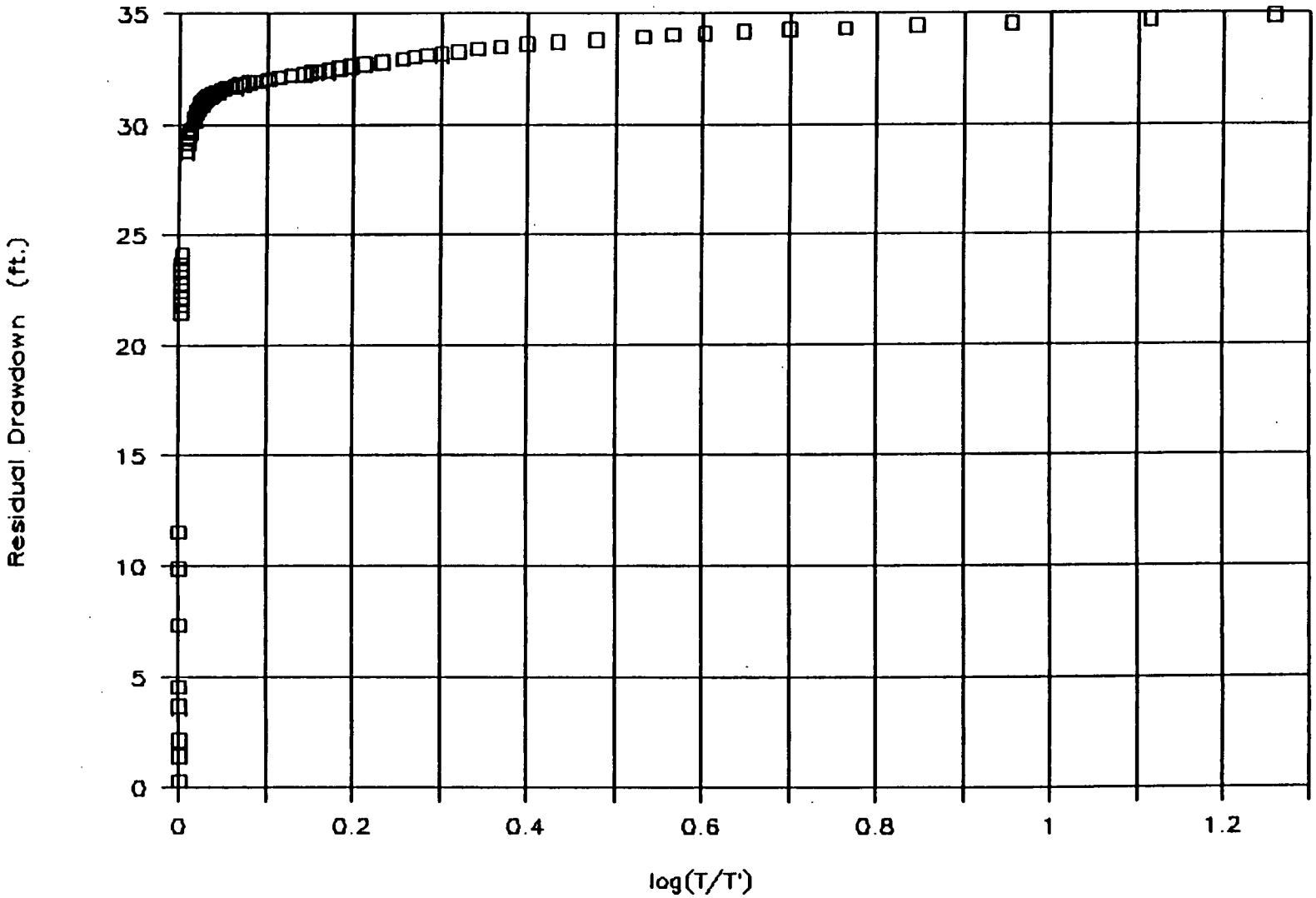
RFW 10-05-003/A-5/85

WELL 16-86

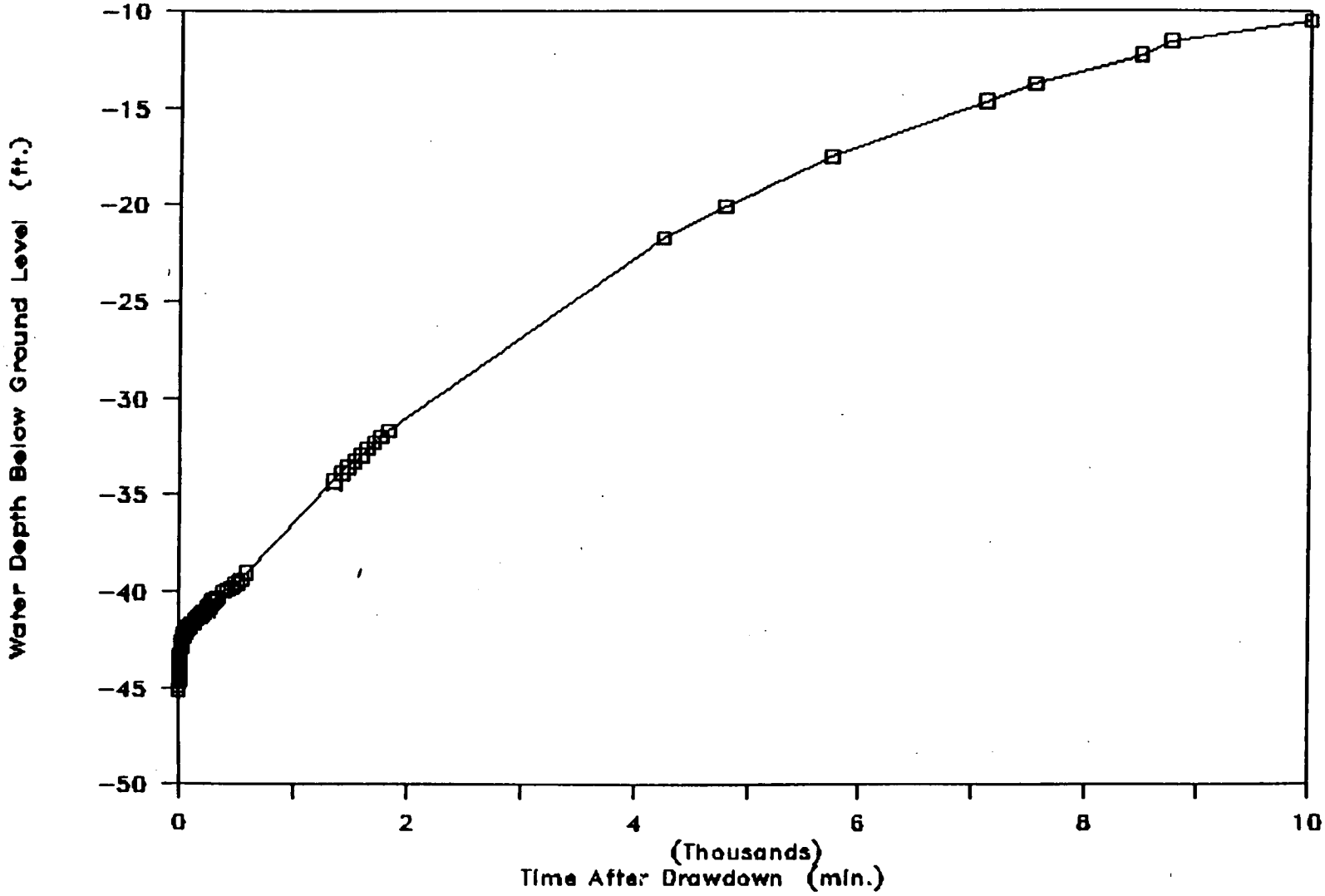


$$\Delta s' = \frac{(26-0)\ ft}{.00203 - .00051} = 17{,}100\ ft/_{log\ cycle}$$

WELL 16-86



WELL 16-86


-10
-15
-20
-25
-30
-35
-40
-45
-50
Water Depth Below Ground Level (ft.)
0
2
4
6
8
10
(Thousands)
Time After Drawdown (min.)

WELL 16-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	log(T/T')
137.00	125.00	41.63	31.45	0.04
147.00	135.00	41.52	31.34	0.04
157.00	145.00	41.44	31.26	0.03
167.00	155.00	41.43	31.25	0.03
177.00	165.00	41.34	31.16	0.03
187.00	175.00	41.30	31.12	0.03
197.00	185.00	41.29	31.11	0.03
212.00	200.00	41.17	30.99	0.03
227.00	215.00	41.11	30.93	0.02
257.00	245.00	40.86	30.68	0.02
272.00	260.00	40.77	30.59	0.02
287.00	275.00	40.69	30.51	0.02
302.00	290.00	40.58	30.40	0.02
317.00	305.00	40.47	30.29	0.02
332.00	320.00	40.40	30.22	0.02
347.00	335.00	40.32	30.14	0.02
401.00	389.00	39.97	29.79	0.01
437.00	425.00	39.92	29.74	0.01
467.00	455.00	39.77	29.59	0.01
497.00	485.00	39.64	29.46	0.01
527.00	515.00	39.54	29.36	0.01
557.00	545.00	39.36	29.18	0.01
596.00	584.00	39.04	28.86	0.01
1366.00	1354.00	34.26	24.08	0.00
1436.00	1424.00	33.86	23.68	0.00
1486.00	1474.00	33.58	23.40	0.00
1546.00	1534.00	33.29	23.11	0.00
1606.00	1594.00	32.96	22.78	0.00
1666.00	1654.00	32.61	22.43	0.00
1721.00	1709.00	32.32	22.14	0.00
1786.00	1774.00	32.00	21.82	0.00
1846.00	1834.00	31.67	21.49	0.00
4257.00	4245.00	21.72	11.54	0.00
4809.00	4797.00	20.06	9.88	0.00
5756.00	5744.00	17.50	7.32	0.00
7116.00	7104.00	14.70	4.52	0.00
7551.00	7539.00	13.83	3.65	0.00
8491.00	8479.00	12.31	2.13	0.00
8756.00	8744.00	11.62	1.44	0.00
10011.00	9999.00	10.50	0.32	0.00

WELL 16-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	log(T/T')
12.70	0.70	45.06	34.88	1.26
13.00	1.00	44.87	34.69	1.11
13.50	1.50	44.69	34.51	0.95
14.00	2.00	44.59	34.41	0.85
14.50	2.50	44.46	34.28	0.76
15.00	3.00	44.39	34.21	0.70
15.50	3.50	44.32	34.14	0.65
16.00	4.00	44.25	34.07	0.60
16.50	4.50	44.17	33.99	0.56
17.00	5.00	44.09	33.91	0.53
18.00	6.00	43.99	33.81	0.48
19.00	7.00	43.88	33.70	0.43
20.00	8.00	43.76	33.58	0.40
21.00	9.00	43.64	33.46	0.37
22.00	10.00	43.54	33.36	0.34
23.00	11.00	43.44	33.26	0.32
24.00	12.00	43.35	33.17	0.30
25.00	13.00	43.27	33.09	0.28
26.00	14.00	43.19	33.01	0.27
27.00	15.00	43.12	32.94	0.26
29.00	17.00	43.00	32.82	0.23
31.00	19.00	42.88	32.70	0.21
33.00	21.00	42.79	32.61	0.20
35.00	23.00	42.68	32.50	0.18
37.00	25.00	42.62	32.44	0.17
39.00	27.00	42.57	32.39	0.16
41.00	29.00	42.52	32.34	0.15
43.00	31.00	42.43	32.25	0.14
47.00	35.00	42.38	32.20	0.13
52.00	40.00	42.31	32.13	0.11
57.00	45.00	42.22	32.04	0.10
62.00	50.00	42.13	31.95	0.09
67.00	55.00	42.12	31.94	0.09
72.00	60.00	42.07	31.89	0.08
77.00	65.00	42.00	31.82	0.07
82.00	70.00	41.98	31.80	0.07
87.00	75.00	41.92	31.74	0.06
92.00	80.00	41.86	31.68	0.06
97.00	85.00	41.85	31.67	0.06
107.00	95.00	41.82	31.64	0.05
117.00	105.00	41.75	31.57	0.05
127.00	115.00	41.65	31.47	0.04

AQUIFER TEST DATA

WELL 16-26
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 3

TYPE OF AQUIFER TEST Bail down - Recovery
HOW Q MEASURED 4½ gallon bucket
HOW W.L.'s MEASURED Olympic well sounder
RAD./DIST. OF/FROM PUMPING WELL Ø
MEAS. POINT FOR W.L.'s N. side of inner casing
ELEVATION OF MEAS. POINT ?

DEPTH OF PUMP/AIRPIPE
PUMP ON: date time
PUMP OFF: date time
DURATION OF AQUIFER TEST

LOCATION Kinney Flats Plant, Golden, CO
PERSONNEL L. Hirst D. Barlick
PROJECT 106-6222

TIME t = 12 at t' = 0				WATER LEVEL DATA STATIC WATER LEVEL 10.12 - ?				DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t (min)	t' (min)	READING	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s'	READING	Q		
1	0909			10+2.26	2.02	10.18	Ø			WM	regional W.L.
	09MA	Ø								"	T.D. = 45.09+
	0915:15	1.25						1 gal		"	Bail 1 gallon
	0916:45	2.75						1 gal		"	Bail 1 gallon
	0918:25	4.4						1 gal		"	Bail 1 gallon
	0920:00	6						1 gal		"	Bail 1 gallon
	0922:05	8.1						1 gal		"	Bail 1 gallon
	0924:45	10.75						1 gal		"	Bail 1 gallon
	0926:00	12	Ø								Remove bailer
	0926:40	12.7	0.7	45+2.14	2.02	45.20	-34.66				Recovery = 13hr
	0927:00	13	1	45+1.95		44.87	-34.[illegible]				
	0927:30	13.5	1.5	45+1.77		44.69	-34.51				
	0928:00	14	2	45+1.67		44.59	-34.41				
	0928:30	14.5	2.5	45+1.54		44.46	-34.28				
	0929:00	15	3	45+1.47		44.39	-34.21				
	0929:30	15.5	3.5	45+1.40		44.32	-34.14				
	0930:00	16	4	45+1.33		44.25	-34.07				
	0930:30	16.5	4.5	45+1.26		44.17	-33.99				
	0931:00	17	5	45+1.17		44.09	-33.91				
	0932:00	18	6	45+1.07		43.99	-33.81				
	0933:00	19	7	45+0.96		43.88	-33.70				
	0934:00	20	8	45+0.84		43.76	-33.58				
	0935:00	21	9	45+0.72		43.64	-33.46				
	0936:00	22	10	45+0.62		43.54	-33.36				
	0937:00	23	11	45+0.52		43.44	-33.26				
	0938:00	24	12	45+0.43		43.35	-33.17				
	0939:00	25	13	45+0.35		43.27	-33.09				
	0940:00	26	14	45+0.27		43.19	-33.01				
	0941:00	27	15	45+0.20		43.12	-32.94				
	0943:	29	17	45+0.08		43.00	-32.82				
	0945	31	19	44+9.96		42.88	-32.70				
	0947	33	21	44+9.87		42.79	-32.61				
	0949	35	23	40-4.76		-5.21	-32.50				
	0951	37	25	40+4.70		42.62	-32.44				
	0953	39	27	40+4.65		42.57	-32.39				
	0955	41	29	40+4.60		42.52	-32.34				
	0957	43	31	40+4.51		-[illegible]	-32.25				
	0959	45	33	40+4.49		42.43	-32.25				
	1001	47	35	40+4.46		42.38	-32.20				
	1006	52	40	40+4.39		42.31	-32.13				
	1011	57	45	40+4.30		42.22	-32.04				

AQUIFER TEST DATA

WELL 12-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 3

TYPE OF AQUIFER TEST Pump down - Recovery
HOW Q MEASURED 4 1/2 gallon Bucket
HOW W.L.'s MEASURED Electric well Sounder
RAD./DIST. OF/FROM PUMPING WELL Ø
MEAS. POINT FOR W.L.'s [illegible]
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date time
PUMP OFF: date time
DURATION OF AQUIFER TEST

LOCATION Rocky Flats Plant, Golden, CO
PERSONNEL W. Hersy, L. Bulick
PROJECT 106 PO6 222

TIME t = 12 at t' = 0				WATER LEVEL DATA STATIC WATER LEVEL 40.18				DISCHARGE			
DAY	CLOCK TIME	t (min)	t' (min)	READING (feet)	CONVERSIONS or CORRECTIONS	WATER LEVEL	s or s' (feet)	READING	Q	RECORDED BY	COMMENTS
1	1016	62	50	40+4.21	-2.08	42.13	-31.95			WH	2" stream
	1021	67	55	40+4.20	"	42.12	-31.94			WH	
"	1026	72	60	40+4.15	"	42.07	-31.89			WH	
"	1031	77	65	40+4.08	"	42.00	-31.82			WH	
"	1036	82	70	40+4.06	"	41.98	-31.80			WH	
"	1041	87	75	40+4.00	"	41.92	-31.74			WH	
"	1046	92	80	40+3.94	"	41.86	-31.68			WH	
"	1051	97	85	40+3.13	"	41.25	-31.67			WH	
	1101	107	95	40+3.90		41.82	-31.64			WH	
	1111	117	105	[illegible]		41.75	-31.57			WH	
"	1121	127	115	40+3.73	"	41.65	-31.47			WH	
"	1131	137	125	40+3.71		41.63	-31.45			WH	
"	1141	147	135	40+3.60	"	41.52	-31.34			WH	
"	1151	157	145	40+3.56	"	41.44	-31.26			WH	
"	[illegible]	167	155	40+3.51	"	41.43	-31.25			WH	
"	1211	177	165	40+3.42	"	41.34	-31.16			WH	
"	1221	187	175	40+3.32	"	41.30	-31.12			WH	
"	1231	197	185	40+3.29		41.29	-31.11			WH	
"	1246	212	200	40+3.25		41.17	-30.99			WH	
"	1301	227	215	40+3.11	"	41.11	-30.93			WH	
"	1316	242	230	40+3.09		41.01	-30.83			WH	
	1331	257	245	40+2.86		40.86	-30.68			WH	
	1346	272	260	40+2.75		40.77	-30.59			WH	
	1401	287	275	40+2.69		40.69	-30.51			WH	
	1416	302	290	40+2.58		40.58	-30.40			WH	
	1431	317	305	40+2.55		40.47	-30.29			WH	
	1446	332	320	40+2.42		40.40	-30.16			WH	
	1501	347	335	40+2.40		40.32	-30.08			WH	
	1556	401	389	40+2.05		39.97	-29.79			WH	
	1631	437	425	40+2.00		39.92	-29.74			WH	
	1701	467	455	40+1.85		39.77	-29.59			WH	
	1731	497	485	40+1.72		39.64	-29.46			WH	
	1801	527	515	40+1.62		39.54	-29.36			OP	
	1831	557	545	40+1.44		39.36	-29.18			OP	
	1910	596	584	40+1.12		39.04	-28.86			WH	
			[illegible]								Power 13 hours overnite
2	8:00	1266	1254	35+1.34	[illegible]	34.26	-24.08			JP	
	09:00	1326	1314	35+1.94		33.86	-23.68			JP	
	10:00	1386	1374	35+0.66		33.58	-23.40			JP	
	11:00	1446	1434	35+0.37		33.29	-23.11			JP	
	12:00	1506	1494	35+.04		32.96	-22.78			JP	

AQUIFER TEST DATA

WELL 16-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 3 OF 3

TYPE OF AQUIFER TEST Bail Down - Recovery
HOW Q MEASURED 4½ gallon bucket
HOW W.L.'s MEASURED Electronic water sounder
RAD./DIST. OF/FROM PUMPING WELL 7
MEAS. POINT FOR W.L.'s Inside - top of casing
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date time
PUMP OFF: date time
DURATION OF AQUIFER TEST

LOCATION Rocky Flats Plant, Golden, CO
PERSONNEL [illegible]

PROJECT 106P06 222

TIME t = 12 at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL 10.18					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS OR CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
2	13:00:00	1666	1654		30+4.69	2.08	32.61	-22.43				JP	
	13:55:00	1721	1709		30+4.40	"	32.32	-22.14				JP	
	15:00:00	1786	1774		30+4.08	"	32.00	-21.82				JP	
2	10:00:00	1846	1834		30+3.75	"	31.67	-21.49				JP	
4	0811	4257	4245		20+3.80	"	21.72	-11.54				WH	
4	1723	4809	4797		20+2.14	"	20.06	-7.88				WH	
5	0910	5756	5744		15+4.58	"	17.50	-7.32				WH	90% = 13.67 ft
5	1610	6176	6164		15+3.73	"	17.65	-6.47				JP	
6	08:30	7116	7104		15 +1.78	"	14.70	-4.52					
6	15:45	7551	7539		15+0.91	"	13.83	-3.65				JP	
7	8:25	8491	8479		10+4.39	"	12.31	-2.13				JP	
7	17:50	8756	8744		10+3.70	"	11.62	-1.44				JP	
8	0945	10011	9999		10+2.58	"	10.50	0.32				JP	90% Recovery obtained

HYDRO-SEARCH RENO • DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

PACKER TEST ANALYSIS
WELL NO. 16-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/27/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 28.68 - 38.68
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00147231 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 2.70 * 2.31 = 12.65
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000766 FT/MIN
K = .00000389 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00332177 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 4.00 * 2.31 = 15.65
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001397 FT/MIN
K = .00000710 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 16-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/27/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 34.43 - 44.42
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00057539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 2.80 * 2.31 = 12.88
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000294 FT/MIN
K = .00000149 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00089354 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 7.80 * 2.31 = 24.43
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000241 FT/MIN
K = .00000122 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00093416 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 2.53 * 2.31 = 12.25
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000502 FT/MIN
K = .00000255 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 16-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/27/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 42.59 - 52.59
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00002031 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 3.80 * 2.31 = 15.19
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000009 FT/MIN
K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00114462 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 10.00 * 2.31 = 29.51
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000255 FT/MIN
K = .00000130 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00027077 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 2.70 * 2.31 = 12.65
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000141 FT/MIN
K = .00000072 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 16-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/27/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 52.43 - 62.43
MATERIAL TESTED: ARAPAHOE SILTSTONE
DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00009269 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 3.80 * 2.31 = 15.19
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000040 FT/MIN
K = .00000020 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00230638 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 15.00 * 2.31 = 41.06
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000370 FT/MIN
K = .00000188 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00014215 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 5.09 + 1.32 + 4.00 * 2.31 = 15.65
R = BOREHOLE RADIUS = .16 FEET

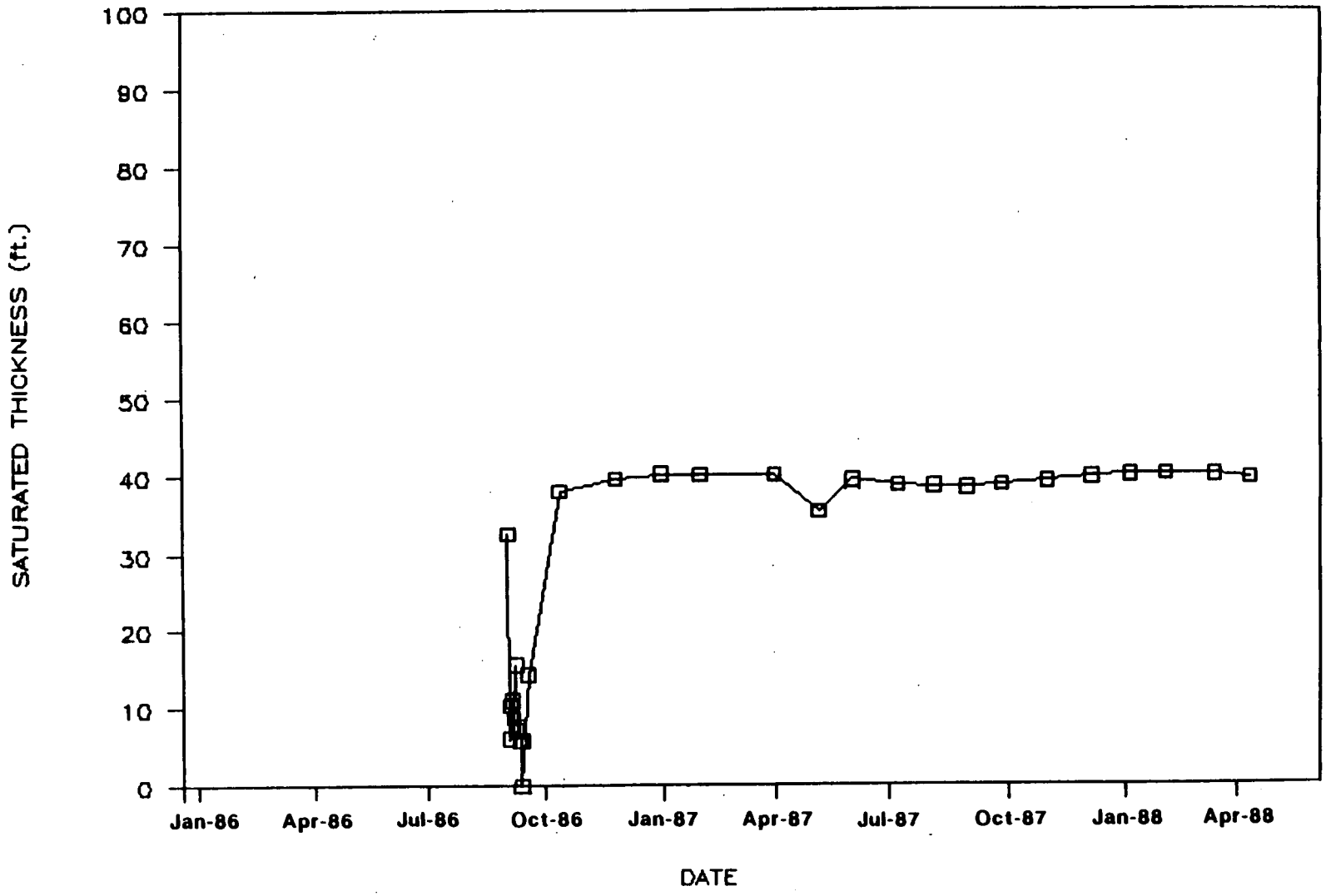
K = HYDRAULIC CONDUCTIVITY = .00000060 FT/MIN
K = .00000030 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1686	09/02/86	5864.74	5866.60	1.86	45.06	12.66	5853.94
	09/03/86					38.94	5827.66
	09/04/86					34.75	5831.85
	09/05/86					34.04	5832.56
	09/06/86					36.26	5830.34
	09/08/86					29.50	5837.10
	09/09/86					37.92	5828.68
	09/10/86					37.80	5828.80
	09/11/86					37.34	5829.26
	09/12/86					39.14	5827.46
	09/13/86					39.23	5827.37
	09/13/86					45.35	5821.25
	09/18/86					30.71	5835.89
	10/13/86					7.19	5859.41
	11/26/86					5.68	5860.92
	01/01/87					5.04	5861.56
	02/01/87					5.15	5861.45
	04/01/87					5.10	5861.50
	05/06/87					9.79	5856.81
	06/01/87					5.81	5860.79
	07/08/87					6.40	5860.20
	08/06/87					6.60	5860.00
	09/01/87					6.80	5859.80
	09/28/87					6.40	5860.20
	11/03/87					6.00	5860.60
	12/08/87					5.50	5861.10
	01/07/88					5.30	5861.30
	02/04/88					5.20	5861.40
	03/14/88					5.30	5861.30
	04/11/88					5.60	5861.00

SATURATED THICKNESS IN WELL # 16-86(SP)



INDEX OF DATA

Boring No.: 17-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 17-86

Date Drilled 8/14/86 **Coordinates** N 38752.3 E 22141.7

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5865.26

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM			
				0-0.5'-Sample. Recovered 0.5/0.5'=100%. CLAY: grayish orange (10YR 7/4); silty and sandy; trace granitic pebbles (subangular); poorly sorted; unconsolidated; dry.			
				0.5-5.0'-Sample. Recovered 3.5/4.5'=88%. GRAVEL: dusky yellowish brown (10YR 2/2); granitic pebbles and cobbles interbedded with silty clay stringers; approximately 3% iron staining in gravel stringers; poorly sorted; unconsolidated; damp.			
	5						
				5.0-8.0'-Sample. Recovered 3.0/3.0'=100%. GRAVEL: dark yellowish brown (10YR 4/2); interbedded granitic pebbles, sand, silt and clay; poorly sorted; subangular; wet.			
	10			8.0-13.0'-Sample. Recovered 2.0/5.0'=40%. 8.0-12.5'. GRAVEL: dark yellowish brown (10YR 4/2) and dark yellowish orange (10YR 6/6) granitic pebbles and cobbles; sandy and silty; poorly sorted; unconsolidated; wet.			
				ARAPAHOE FORMATION			
				12.5-13.0'. CLAYSTONE.			
	15			13.0-16.0'-Sample. Recovered 2.8/3.0'=93%. CLAYSTONE: Dusky yellowish brown (10YR 2/2) and dark yellowish orange (10YR 6/6); silty; consolidated; weathered; moist.			
				16.0-19.2'- Sample. Recovered 1.8/3.2'=56%. CLAYSTONE: dark yellowish brown (10YR 4/2); 10% iron staining; consolidated; moist.			
	20			TOTAL DEPTH: 19.2'			

Remarks Logged by: L. Pivonka Checked by: [illegible]

Project No. 106P06222

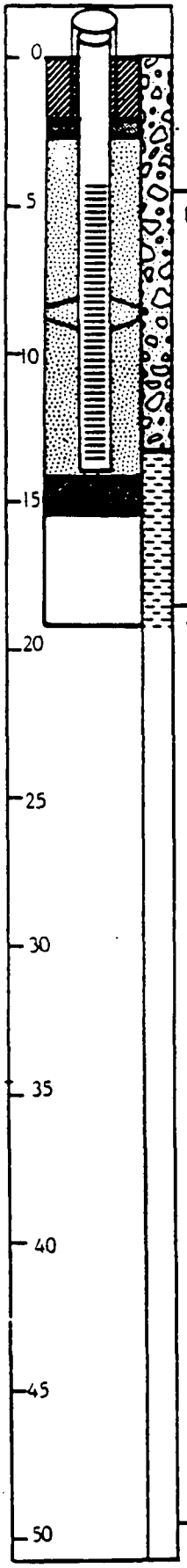
Hydro-Search, Inc.

WELL 17-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38752.3 E 22141.7

ELEVATION: GROUND LEVEL 5865.26'
TOP OF CASING 5866.55'



LOCATION Golden, CO
PERSONNEL L. Pivonka
PROJECT 116P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 13.98' Hole: 19.20'
BOREHOLE DIAMETER 7¼"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)
RIG Mobile B-57
BIT(S) Bull nose bit

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.73'	C1			
3.73'	13.98'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrapped screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
7.97' - 9.09'

FILTER MATERIAL 10-20 silica sand
2.50' - 14.00'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
14.00' - 15.25'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7¼" auger	8/14	0931	8/18	1020
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	8/15	1037	8/15	1040
FILTER PLACEMENT:	8/15	1040	8/15	1056
CEMENTING:	8/15	1100	8/15	1110
DEVELOPMENT:	9/2	1550	9/22	0920
OTHER:				
Bentonite	8/15	1058	8/15	1100
	8/15	1025	8/15	1040

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 4.8' during drilling.

Top of stainless steel casing: 1.29'

Cave from TD to 15.25'

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 17-86

Hydraulic Conductivity (cm/sec) = 4.8×10^{-6}

Static Water Level (ft below G.L.) = 4.63'

Screened Interval (ft below G.L.) = 3.73 - 13.98'

3.73 - 12.5' gravel

12.5 - 13.98' claystone

Method of Analysis: (Bouwer, 1978)

RFW 10-05-003/A-5/85

RAW DATA

WELL # 17-86

WELL DIAMETER= 7.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .19 GALLONS*
LENGTH OF AQUIFER TESTED= 9.35 FEET
VALUE OF HO= 1.17 FEET
STATIC WATER LEVEL= 4.63 FEET
LENGTH OF SCREEN= 13.98 FEET
WATER TABLE TO BOTTOM OF WELL= 9.35 FEET

* Actual volume of water removed not recorded. 0.19 gallons back-calculated from first recorded residual drawdown (1.17 ft).

SLUG TEST DATA:

TIME	WATER LEVEL (FEET)	TIME SINCE TEST BEGAN (MINUTES)
14. 7.15	5.80	42.25
14. 7.30	5.80	42.50
14. 8. 0	5.80	43.00
14. 8.30	5.78	43.50
14. 9. 0	5.72	44.00
14. 9.30	5.71	44.50
14.10. 0	5.70	45.00
14.11. 0	5.65	46.00
14.12. 0	5.61	47.00
14.13. 0	5.58	48.00
14.14. 0	5.53	49.00
14.15. 0	5.50	50.00
14.16. 0	5.48	51.00
14.17. 0	5.47	52.00
14.18. 0	5.44	53.00
14.19. 0	5.39	54.00
14.20. 0	5.39	55.00
14.21. 0	5.39	56.00
14.22. 0	5.39	57.00
14.23. 0	5.38	58.00
14.25. 0	5.38	60.00
14.30. 0	5.28	65.00
14.36.30	5.21	71.50
14.40. 0	5.22	75.00
14.50. 0	5.12	85.00
15. 0. 0	5.10	95.00
15.10. 0	5.01	105.00
15.20. 0	5.01	115.00
15.30. 0	5.01	125.00

WELL # 17-86

WELL DIAMETER= 7.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .19 GALLONS
LENGTH OF AQUIFER TESTED= 9.35 FEET
VALUE OF HO= 1.17 FEET
STATIC WATER LEVEL= 4.63 FEET

SLUG TEST DATA:

TIME SINCE TEST BEGAN (MINUTES)	WATER LEVEL (FEET)	DRAWDOWN (FEET)	HEAD RATIO	RECIPROCAL TIM (1/MINUTES)
42.25	5.80	1.17	1.000	.024
42.50	5.80	1.17	1.000	.024
43.00	5.80	1.17	1.000	.023
43.50	5.78	1.15	.983	.023
44.00	5.72	1.09	.932	.023
44.50	5.71	1.08	.923	.022
45.00	5.70	1.07	.915	.022
46.00	5.65	1.02	.872	.022
47.00	5.61	.98	.838	.021
48.00	5.58	.95	.812	.021
49.00	5.53	.90	.769	.020
50.00	5.50	.87	.744	.020
51.00	5.48	.85	.726	.020
52.00	5.47	.84	.718	.019
53.00	5.44	.81	.692	.019
54.00	5.39	.76	.650	.019
55.00	5.39	.76	.650	.018
56.00	5.39	.76	.650	.018
57.00	5.39	.76	.650	.018
58.00	5.38	.75	.641	.017
60.00	5.38	.75	.641	.017
65.00	5.28	.65	.556	.015
71.50	5.21	.58	.496	.014
75.00	5.22	.59	.504	.013
85.00	5.12	.49	.419	.012
95.00	5.10	.47	.402	.011
105.00	5.01	.38	.325	.010
115.00	5.01	.38	.325	.009
125.00	5.01	.38	.325	.008

WELL # 17-86

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

```
          PERMEABILITY=3.77E-04/ MATCH TIME (IN MINUTES)
          STORAGE COEF= 7.61E-02* ALPHA
     COMPUTER CALCULATES
          ALPHA=1.00E-05 MATCH TIME= 5.43E+01
          PERMEABILITY= 6.95E-06 CM/SEC
          STORAGE COEF=7.61E-07
          CORRELATION NUMBER=   .99
```

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

```
          HVORSLEV PERMEABILITY=6.48E-04 / LAG TIME
          BOUWER PERMEABILTY=7.66E-04 * -SLOPE

     COMPUTER CALCULATES
          HVORSLEV PERMEABILITY=6.47E-06 CM/SEC
          BOUWER PERMEABILITY=4.75E-06 CM/SEC
               REGRESSION STATISTICS
                    X ON Y
                      INTERCEPT=  .17
                      SLOPE=-5.98E-03
                    Y ON X
                      INTERCEPT=  .20
                      SLOPE=-6.42E-03
                    CORRELATION COEFFICIENT= -.97
     CALCULATIONS INDICATE THAT A VALUE OF   5.03 FEET FOR HO
          OR A VALUE OF     .964 INCHES FOR EFFECTIVE CASING DIA.
          MAY YIELD BETTER RESULTS
```

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES MET

```
          PERMEABILITY=1.10E-04 / SLOPE
          PERMEABILITY=2.07E-06 CM/SEC
               REGRESSION STATISTICS
                    X ON Y
                      INTERCEPT= -.12
                      SLOPE= 5.20E+01
                    Y ON X
                      INTERCEPT= -.15
                SLOPE= 5.39E+01
                    CORRELATION COEFFICIENT=  .98
```

WELL #	PERMEABILITY METHOD 1	PERMEABILITY METHOD 2	STORAGE COEF METHOD 2	PERMEABILITY METHOD 3	PERMEABILI METHOD 4
17-86	6.47E-06	6.95E-06	7.61E-07	2.07E-06	4.75E-06

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

AQUIFER TEST DATA

WELL 17-86
PUMPING or OBSERVATION WELL
PUMPING or ~~RECOVERY DATA~~
PAGE 1 OF 2

TYPE OF AQUIFER TEST Airlift Recovery Test
HOW Q MEASURED Tape
HOW W.L.'s MEASURED Clymer
RAD./DIST. OF/FROM PUMPING WELL 1'
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-19-86 time
PUMP OFF: date 11-19-86 time
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT

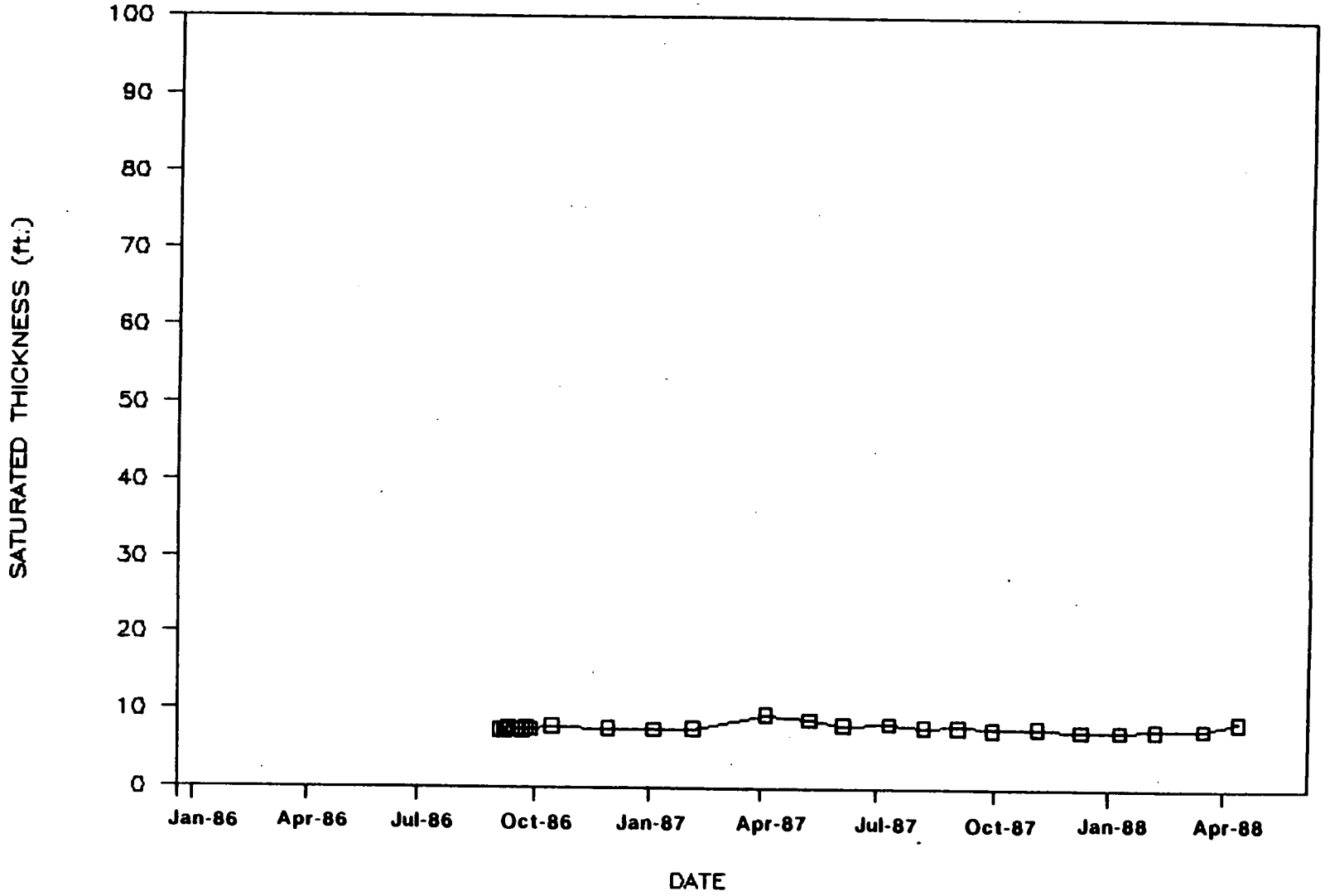
TIME (t = ____ at t' = 0)					WATER LEVEL DATA (STATIC WATER LEVEL 5+1.32 (Nov 87))					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s'		READING	Q		1.69
1						1.69						TG	
1	13:25												STARTED LIFTING
1	1355												STOPPED LIFTING
	1404												STOP LIFTING
													(LAST LIFT CONTINUED 5 MIN
	1406:30				5+.87								9.0% 6.43 = 54
	1406				2.65	? SIDE WALL WATER ?						TG	
	1406:30				1.84	1.69							
	1407	00			2.64	1.69	5.80	1.17					
	1407:30	.5			2.59	1.69	5.80	1.17					
	1408	1.0			2.49		5.80	1.17					
	1408:30	1.5			2.47		5.79	1.15					
	1409	2.0			2.41		5.72	1.09					
	1409:30	2.5			2.40		5.71	1.08					
	1410	3.0			2.39		5.70	1.07					
	1411	4			2.34		5.65	1.02					
	1412	5			2.30		5.61	0.98					
	1413	6			2.27		5.58	0.95					
	1414	7			2.22		5.53	0.90					
	1415	8			2.19		5.50	0.87					
	1416	9			2.17		5.48	0.85					
	1417	10			2.16		5.47	0.84					
	1418	11			2.13		5.44	0.81					
	1419	12			2.08		5.39	0.76					
	1420	13			2.08		5.39	0.76					
	1421	14			2.08		5.39	0.76					
	1422	15			2.08		5.39	0.76					
	1423	16			2.07		5.38	0.75					
	1425	18			2.07		5.38	0.75					
	1430	23			1.97		5.28	0.65					
	1436:30	~~25~~ 25			1.90		5.21	0.58					
	1440	~~28~~ 30			1.91		5.22	0.59					
	1450	40			1.81		5.12	0.49					
	1500	50			1.79		5.10	0.47					
	1510	60			1.70		5.01	0.38					
1	1520	70			1.70		5.01	0.38					
1	1530	80			1.70		5.01	0.38					
2	11:20				5+1.30		4.61	-0.02				MB	

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1786	09/02/86	5865.26	5866.55	1.29	13.98	6.49	5860.06
	09/05/86					6.54	5860.01
	09/06/86					6.50	5860.05
	09/08/86					6.22	5860.33
	09/09/86					6.31	5860.24
	09/17/86					6.46	5860.09
	09/19/86					6.50	5860.05
	09/22/86					6.33	5860.22
	09/25/86					6.43	5860.12
	10/13/86					6.10	5860.45
	11/26/86					6.35	5860.20
	01/01/87					6.42	5860.13
	02/01/87					6.35	5860.20
	04/01/87					4.54	5862.01
	05/06/87					5.10	5861.45
	06/01/87					5.84	5860.71
	07/08/87					5.70	5860.85
	08/05/87					6.10	5860.45
	09/01/87					6.00	5860.55
	09/28/87					6.30	5860.25
	11/03/87					6.10	5860.45
	12/08/87					6.40	5860.15
	01/07/88					6.40	5860.15
	02/04/88					6.30	5860.25
	03/14/88					6.20	5860.35
	04/11/88					5.20	5861.35

SATURATED THICKNESS IN WELL # 17-86 (SP)



INDEX OF DATA

Boring No.: 18-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 18-86

Date Drilled 8/21/86 to 8/22/86 **Coordinates** N 38532.4 E 22729.8

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5882.82

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ARTIFICAL FILL 0-0.6'-Sample. Recovered 0.6/0.6'=100%. GRAVEL: pale yellowish brown (10YR 6/2); granite and quartzite sandy gravel; poorly sorted; unconsolidated; dry.			
	5			0.6-5.0'-Sample. Recovered 3.4/4.4'=77%. CLAY: moderate yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/2); silty; trace gray micaceous quartzite cobbles; poorly sorted; hard; damp.			
				5.0-8.0'-Sample. Recovered 0.0/3.0'=0%.			
	10			ARAPAHOE FORMATION 8.0-10.5'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: medium light gray (N 6) to grayish black (N 2) with dark yellowish orange (10YR 6/6) mottling; sandy; sandy iron stained intervals from 8.0-8.2' and 9.5-10.3'; dry.			
				TOTAL DEPTH: 10.5'			
	15						
	20						

Remarks Logged by: L. Pivonka Checked by:

Project No. 106P06222

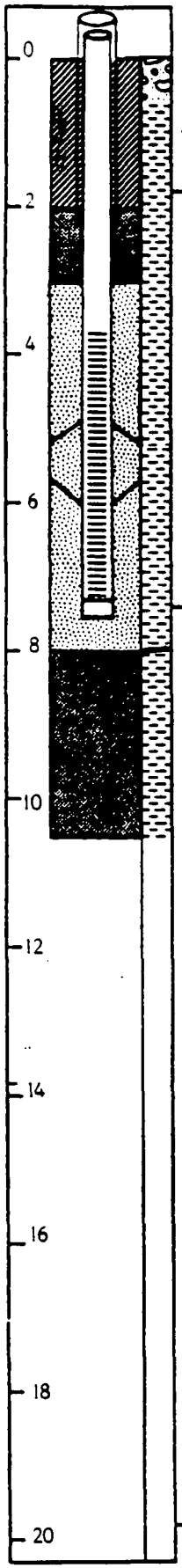
Hydro-Search, Inc.

WELL 8-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38532.4 E 22729.8

ELEVATION: GROUND LEVEL 5882.82'
TOP OF CASING 5885.49'



LOCATION Golden, CO
PERSONNEL L. Pivonka
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 7.50' Hole: 10.50'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)
RIG Mobile B-57
BIT(S) Bull nose bit

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.74'	C1			
3.74'	7.50'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
4.84' - 6.01'

FILTER MATERIAL 32-42 silica sand
3.00' - 8.00'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" Bentonite Pellets
2.00' - 3.00'
8.00' - 10.50'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	8/21	0937	8/21	1023
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	8/26	0836	8/26	0837
FILTER PLACEMENT:	8/26	0837	8/26	0840
CEMENTING:	8/26	0842	8/26	0846
DEVELOPMENT:	9/3	1015	9/3	1015
OTHER:				
Bentonite	8/26	0840	8/26	0842
	8/26	0834	8/26	0836

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.67'

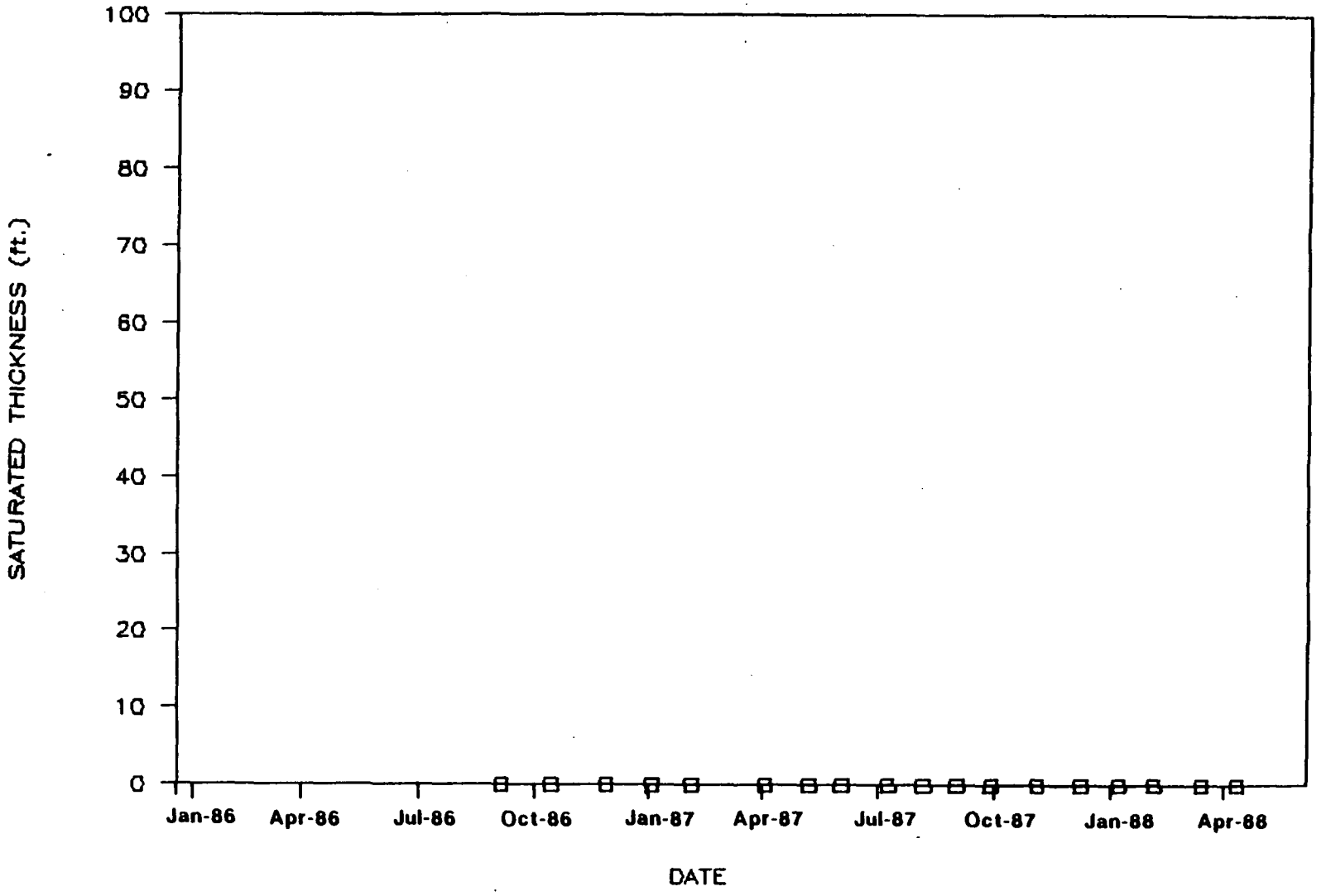
HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1886	09/03/86	5882.82	5885.49	2.67	7.50	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/01/87					-1.00	DRY
	04/01/87					-1.00	DRY
	05/06/87					-1.00	DRY
	06/01/87					-1.00	DRY
	07/08/87					-1.00	DRY
	08/06/87					-1.00	DRY
	09/01/87					-1.00	DRY
	09/28/87					-1.00	DRY
	11/03/87					-1.00	DRY
	12/08/87					-1.00	DRY
	01/07/88					-1.00	DRY
	02/04/88					-1.00	DRY
	03/14/88					-1.00	DRY
	04/11/88					-1.00	DRY

SATURATED THICKNESS IN WELL # 18-86(SP)



INDEX OF DATA

Boring No.: 20-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 20-86

Date Drilled 9/4/86 **Coordinates** N 38110.3 E 21253.7

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5960.47

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ARTIFICIAL FILL			
				0-2.0'-Sample. Recovered 1.7/2.0'=85%. SAND: grayish orange (10YR 7/4) to dark yellowish orange (10YR 6/6) fine- to coarse grained sand; some granitic pebbles and cobbles; fragments of medium gray (N 5) claystone; no apparent bedding; poorly sorted; unconsolidated; dry.			
	5			2.0-4.0'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: dark yellowish orange (10YR 6/6) granite and quartzite pebbles and cobbles; some very fine-grained sand; slightly calcareous; no bedding evident; poorly sorted; unconsolidated; dry.			
				4.0-6.5'-Sample. Recovered 0.3/2.5'=12%. GRAVEL: dark yellowish orange (10YR 6/6) granitic pebbles and cobbles; some fine-grained sand; poorly sorted; unconsolidated; dry.			
	10			6.5-7.5'-Sample. Recovered 0/1.0'=0%. BOULDER: drilled out large quartzite boulder.			
				7.5-12.5'-Sample. Recovered 0.1/5.0'=2%. 7.5-10.0'-Cuttings. CEMENT RUBBLE; dry.			
	15			ARAPAHOE FORMATION			
				12.5-17.5'-Sample. Recovered 5.0/5.0'=100%.			
				12.5-14.8'. CLAYSTONE: dark yellowish orange (10YR 6/6); silty; damp.			
	20						

Remarks Logged by: T. Murphy Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 20-86

Date Drilled 9/4/86

Boring Method Hollow Stem Auger

Coordinates N 38110.3 E 21253.7

Ground Surface Elevation 5960.47

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			14.8-17.5'. CLAYSTONE: greenish gray (5GY 6/1) to dark gray (N 3); some black (N 1) organic fragments; interbedded sand layers consisting of medium to fine-grained sand and silty sand. well sorted; damp.			
				17.5-22.5'-Sample. Recovered 4.5/4.5'=100%. CLAYSTONE: medium brownish gray (5YR 4/4) to olive gray (5Y 4/1); silty; firm; damp.			
	25						
				TOTAL DEPTH: 22.5'			
	30						
	35						
	40						

Remarks Logged by: T. Murphy

Checked by: [illegible]

Project No. 106P06222

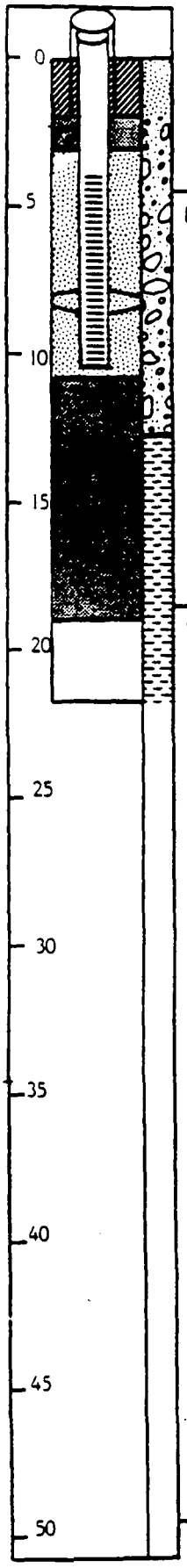
Hydro-Search, Inc.

WELL 20-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38110.3 E 21253.7

ELEVATION: GROUND LEVEL 5960.47'
TOP OF CASING 5962.12'



LOCATION Golden, CO
PERSONNEL T. Murphy
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 10.55' Hole: 22.00'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) Clay bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	-	4.21'	C1				
4.21'	-	10.55'	S1				

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed. 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
6.62' - 7.77'

FILTER MATERIAL 32-42 silica sand
3.00' - 11.00'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 3.00'
19.20' - 11.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7¼" auger	9/4	1429	9/4	1530
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/4	1722	9/4	1724
FILTER PLACEMENT:	9/4	1724	9/4	1730
CEMENTING:	9/5	1020	9/5	1033
DEVELOPMENT:	9/12	1307	9/12	1307
OTHER:				
Bentonite	9/4	1730	9/4	1731
	9/4	1715	9/4	1720

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.65'

Cave from TD to 19.20'

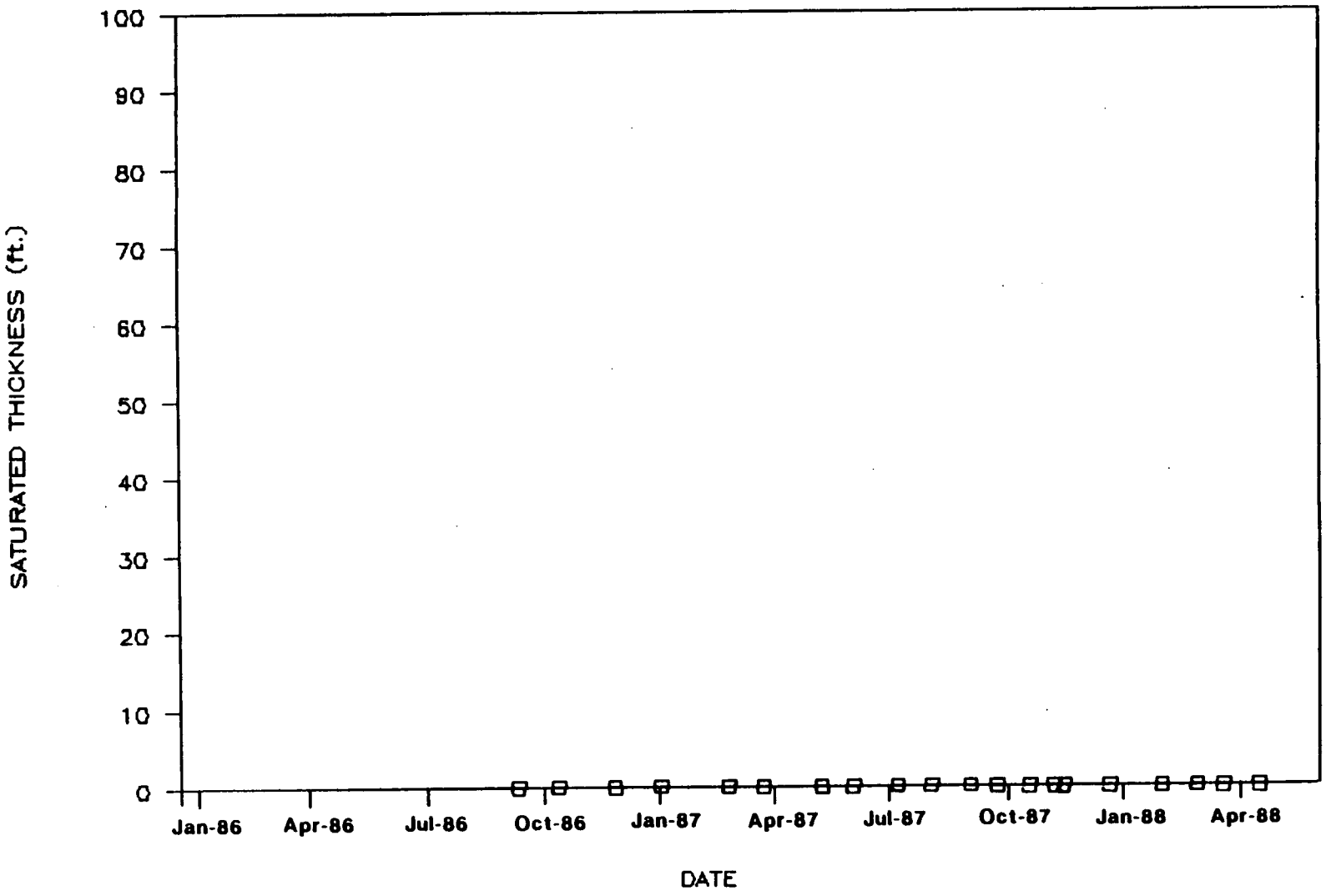
HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2086	09/12/86	5960.47	5962.12	1.65	10.55	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/24/87					-1.00	DRY
	05/08/87					-1.00	DRY
	06/03/87					-1.00	DRY
	07/08/87					11.80	5950.32
	08/04/87					12.00	5950.12
	09/03/87					-1.00	DRY
	09/24/87					-1.00	DRY
	10/21/87					-1.00	DRY
	11/09/87					-1.00	DRY
	11/17/87					-1.00	DRY
	12/22/87					-1.00	DRY
	02/01/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY

SATURATED THICKNESS IN WELL # 20-86(SP)



INDEX OF DATA

Boring No.: 22-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant	LOG OF BORING NO. 22-86
Date Drilled 9/8/86	Coordinates N 37734.9 E 21307.7
Boring Method: Hollow Stem Auger	Ground Surface Elevation 5976.81

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ROCKY FLATS ALLUVIUM 0-3.0'-Sample. Recovered 1.3/3.0'=43%. CLAY: grayish brown (5YR 3/2) to dusky brown (5YR 3/2); some quartzite pebbles; poorly sorted; soft; unconsolidated; wet.			
	2.5			3.0-5.0'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: dark reddish brown (10YR 3/4) to grayish olive (10Y 4/2) granite and quartzite pebbles and cobbles; some sand, silt and clay; poorly sorted; unconsolidated; wet.			
	5			5.0-7.0'-Sample. Recovered 1.3/2.0'=65%. GRAVEL: pale olive (10Y 3/2) granitic pebbles and coarse to fine-grained sand; silty; trace clay; poorly sorted; calcareous; damp.		▽	
	7.5			7.0-10.0'-Sample. Recovered 0.6/3.0'=20%. GRAVEL: pale olive (10Y 3/2) granitic pebbles and cobbles; some coarse to fine-grained sand and silt; trace clay; poorly sorted; angular; damp.			
	10						

Remarks Logged by: T. Murphy Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 22-86

Date Drilled 9/8/86

Boring Method Hollow Stem Auger

Coordinates N 37734.9 E 21307.7

Ground Surface Elevation 5976.81

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	10			10.0-12.0'-Sample. Recovered 2.0/2.0'=100%. 10.0-11.0'. GRAVEL: Same as above; wet.			
				ARAPAHOE FORMATION 11.0-12.0'. SANDSTONE: medium light gray (N 6); medium to fine-grained silty sand with some clay; few dark yellowish orange (10YR 6/6) iron staining; moderately sorted; firm; moist.			
	12.5			12.0-14.0'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: medium light gray (N 6); medium to fine-grained sand and silty sand; increased iron staining; clayey layers at 12.9 and 13.4'; well sorted; firm; moist.			
	15			14.0-16.0'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: medium light gray (N 6); medium to fine-grained sand and silty sandstone with interbedded claystone; increase in clay content; slightly calcareous fractures at 14.4'; moderately sorted; firm; moist.			
	17.5			16.0-18.0'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: medium light gray (N 6) interbedded sandstone and claystone; increase in dark yellowish orange iron staining (10YR 6/6); increase in clay content; moderately sorted; firm; moist.			
	20			18.0-19.0'-Sample. Recovered 1.0/1.0'=100%. CLAYSTONE: greenish gray (5GY 6/1) to medium light gray (N 6); with interbedded fine-grained, silty, clayey sand; firm; moist.			

Remarks Logged by: T. Murphy

Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 22-86

Date Drilled 9/8/86

Coordinates N 37734.9 E 21307.7

Boring Method Hollow Stem Auger

Ground Surface Elevation 5976.81

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			19.0-21.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: Same as above; moist.			
				21.0-23.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark gray (N 4) to greenish gray (5GY 6/1); with interbedded fine-grained, clayey sandstone; some iron staining; firm; moist.			
	22.5			23.0-24.0'-Sample. Recovered 1.0/1.0'=100%. CLAYSTONE: dark gray (N 4) to greenish gray (5GY 6/1); with minor interbedded fine-grained sandstone; firm; moist.			
				24.0-26.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark gray (N 4) to greenish gray (5GY 6/1); with interbedded fine-grained medium to dark gray (N 5 to N 6) sandsstone; firm; damp.			
	25						
				TOTAL DEPTH: 26.0'			
	27.5						
	30						

Remarks Logged by: T. Murphy

Checked by:

Project No. 106P06222

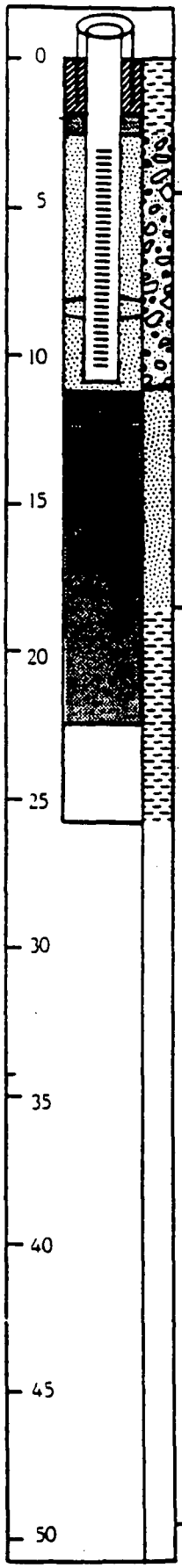
Hydro-Search, Inc.

WELL 22-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37734.9 E 21307.7

ELEVATION: GROUND LEVEL 5976.81'
TOP OF CASING 5978.05'



LOCATION Golden, CO
PERSONNEL T. Murphy
PROJECT 1061K6222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 11.20' Hole: 26.00'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) T5

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.20'	C1			
3.20'	11.20'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
6.10' - 7.35'

FILTER MATERIAL 32-42 silica sand
2.50' - 11.40'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
11.40' - 22.60'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/8	1000	9/8	1629
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/8	1734	9/8	1735
FILTER PLACEMENT:	9/8	1738	9/8	1742
CEMENTING:	9/8	1748	9/8	1800
DEVELOPMENT:	9/12	1620	9/19	134
OTHER:				
Bentonite	9/8	1742	9/8	1748
	9/8	1723	9/8	1725

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 10.5' during drilling

Top of stainless steel casing: 1.24'

Cave from TD to 22.60'

WESTON

MANAGERS DESIGNERS/CONSULTANTS

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE 6/21/88

APPROVED BY _____

DEPT _____ DATE _____

WELL 22-86

Hydraulic Conductivity (cm/sec) = 8.7×10^{-6}

Static Water Level (ft below G.L.) = 7.27'

Screened Interval (ft below G.L.) = 3.20-11.20'

3.20 - 11.00' Gravel

11.0 - 11.20' sandstone

Method of Analysis. (Bouwer, 1978).

RFW 10-05-003/A-5/85

12:01:59.68 BAIL DOWN - RECOVERY ANALYSIS FOR WELL 22-86 FRI 06-10-1988

RAW DATA

WELL # 22-86

WELL DIAMETER= 7.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .64 GALLONS *
LENGTH OF AQUIFER TESTED= 3.93 FEET
VALUE OF H0= 3.93 FEET
STATIC WATER LEVEL= 7.27 FEET
LENGTH OF SCREEN= 8.00 FEET
WATER TABLE TO BOTTOM OF WELL= 3.93 FEET

*Bailed well dry in 6 min.; 6.4 gal. = volume in casing & screen.

SLUG TEST DATA:

TIME	WATER LEVEL (FEET)	TIME SINCE TEST BEGAN (MINUTES)
0. 8.30	10.46	8.50
0. 9. 0	10.39	9.00
0. 9.30	10.17	9.50
0.10. 0	10.11	10.00
0.10.30	10.07	10.50
0.11. 0	9.93	11.00
0.11.30	9.81	11.50
0.12. 0	9.72	12.00
0.12.30	9.64	12.50
0.13. 0	9.52	13.00
0.14. 0	9.35	14.00
0.15. 0	9.17	15.00
0.16. 0	8.98	16.00
0.17. 0	8.85	17.00
0.18. 0	8.74	18.00
0.19. 0	8.49	19.00
0.20. 0	8.37	20.00
0.21. 0	8.20	21.00
0.22. 0	8.10	22.00
0.23. 0	8.02	23.00
0.24. 0	7.93	24.00
0.30. 0	7.92	30.00
0.40. 0	7.91	40.00
0.49. 0	7.85	49.00
0.54. 0	7.82	54.00
0.59. 0	7.80	59.00
1. 4. 0	7.78	64.00
1. 9. 0	7.74	69.00
1.21. 0	7.71	81.00
1.34. 0	7.69	94.00
1.44. 0	7.66	104.00
1.54. 0	7.63	114.00
2. 5. 0	7.61	125.00
2.14. 0	7.58	134.00
2.24. 0	7.54	144.00

WELL # 22-86

WELL DIAMETER= 7.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .64 GALLONS
LENGTH OF AQUIFER TESTED= 3.93 FEET
VALUE OF H0= 3.93 FEET
STATIC WATER LEVEL= 7.27 FEET

SLUG TEST DATA:

TIME SINCE TEST BEGAN (MINUTES)	WATER LEVEL (FEET)	DRAWDOWN (FEET)	HEAD RATIO	RECIPROCAL TIME (1/MINUTES)
8.50	10.46	3.19	.812	.118
9.00	10.39	3.12	.794	.111
9.50	10.17	2.90	.738	.105
10.00	10.11	2.84	.723	.100
10.50	10.07	2.80	.712	.095
11.00	9.93	2.66	.677	.091
11.50	9.81	2.54	.646	.087
12.00	9.72	2.45	.623	.083
12.50	9.64	2.37	.603	.080
13.00	9.52	2.25	.573	.077
14.00	9.35	2.08	.529	.071
15.00	9.17	1.90	.483	.067
16.00	8.98	1.71	.435	.063
17.00	8.85	1.58	.402	.059
18.00	8.74	1.47	.374	.056
19.00	8.49	1.22	.310	.053
20.00	8.37	1.10	.280	.050
21.00	8.20	.93	.237	.048
22.00	8.10	.83	.211	.045
23.00	8.02	.75	.191	.043
24.00	7.93	.66	.168	.042
30.00	7.92	.65	.165	.033
40.00	7.91	.64	.163	.025
49.00	7.85	.58	.148	.020
54.00	7.82	.55	.140	.019
59.00	7.80	.53	.135	.017
64.00	7.78	.51	.130	.016
69.00	7.74	.47	.120	.014
81.00	7.71	.44	.112	.012
94.00	7.69	.42	.107	.011
104.00	7.66	.39	.099	.010
114.00	7.63	.36	.092	.009
125.00	7.61	.34	.087	.008
134.00	7.58	.31	.079	.007
144.00	7.54	.27	.069	.007

12:02:08.46 BAIL DOWN - RECOVERY ANALYSIS FOR WELL 22-86 FRI 06-10-1988

WELL # 22-86

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=8.98E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 7.61E-02* ALPHA
COMPUTER CALCULATES
ALPHA=1.00E-05 MATCH TIME= 7.5
PERMEABILITY= 1.20E-04 CM/SEC
STORAGE COEF=7.61E-07
CORRELATION NUMBER= 1.00

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=1.15E-03 / LAG TIME
BOUWER PERMEABILTY=1.00E-03 * -SLOPE

COMPUTER CALCULATES
PERMEABILITY VARIES MORE THAN 20% DEPENDING ON THEEQUATION

FOR X ON Y: HVORSLEV PERMEABILITY=5.38E-05 CM/SEC
BOUWER PERMEABILITY=7.43E-06CM/SEC
FOR Y ON X: HVORSLEV PERMEABILITY=4.32E-05 CM/SEC
BOUWER PERMEABILITY=9.94E-06 CM/SEC
AVERAGE HVORSLEV PERMEABILITY=4.79E-05 CM/SEC
AVERAGE BOUWER PERMEABILITY=8.69E-06 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= -.27
SLOPE=-7.40E-03
Y ON X
INTERCEPT= -.17
SLOPE=-9.90E-03
CORRELATION COEFFICIENT= -.86
CALCULATIONS INDICATE THAT A VALUE OF 6.72 FEET FOR H0
OR A VALUE OF 1.529 INCHES FOR EFFECTIVE CASING DIA.
MAY YIELD BETTER RESULTS

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METH

PERMEABILITY=8.79E-04 / SLOPE
PERMEABILITY=3.09E-05 CM/SEC
REGRESSION STATISTICS
X ON Y
INTERCEPT= -.03
SLOPE= 2.79E+01
Y ON X
INTERCEPT= -.08
SLOPE= 2.90E+01
CORRELATION COEFFICIENT= .98

12:05:27.40 BAIL DOWN - RECOVERY ANALYSIS FOR WELL 22-86 FRI 06-10-

WELL #	PERMEABILITY METHOD 1	PERMEABILITY METHOD 2	STORAGE COEF METHOD 2	PERMEABILITY METHOD 3	PERMEABILIT METHOD 4
22-86	4.79E-05	1.20E-04	7.61E-07	3.09E-05	8.69E-06

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

AQUIFER TEST DATA

WELL 22-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Bail down recovery
HOW Q MEASURED V-A (bailed)
HOW W.L.'s MEASURED Calvamile
RAD./DIST. OF/FROM PUMPING WELL 3
MEAS. POINT FOR W.L.'s carbide
ELEVATION OF MEAS. POINT [illegible]

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 9/26 time
PUMP OFF: date time
DURATION OF AQUIFER TEST 136 min.

LOCATION Rocky Flats Plant, Golden, CO
PERSONNEL M. Bergman, T. Pierce
PROJECT 106P06222

	TIME t = 0858:00 at t' = 0				WATER LEVEL DATA STATIC WATER LEVEL 5+3.52'					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
1	0845				5+3.52	-1.25'w	7.27						static
	0850	0											Begin bailing
	0856	6							5'	~325			Bailed dry
0858 →	0858	8	0		10+2.78	"	10.53	-0.07	-3.26			gp	Begin recovery 0858:00
	130		:30		10+2.71	"	10.46	-0.07	-3.19				
	0859		1:00		10+2.64	"	10.39	-0.22	-3.12				
	:30		1:30		10+2.47	"	10.17	-0.06	-2.90				
	0900		2:00		10+2.36	"	10.11	-0.04	-2.84				
	:30		2:30		10+2.32	"	10.07	-0.14	-2.80				
	0901		3:00		10+2.18	"	9.93	-0.12	-2.66				
	:30		3:30		10+2.06	"	9.81	-0.09	-2.54				
	0902		4:00		10+0.97	"	9.72	-0.08	-2.45				
	:30		4:30		10+0.89	"	9.64	-0.12	-2.37				
	0903		5:00		10+0.77	"	9.52	-0.17	-2.25				
	0904		6:00		10+0.60	"	9.35	-0.18	-2.08				
	0905		7:00		10+0.42	"	9.17	-0.19	-1.90				
	0906		8:00		10+0.23	"	8.98	-0.13	-1.71				
	0907		9:00		10+0.10	"	8.85	-0.11	-1.58				
	0908		10:00		5+4.99	"	8.74	-0.25	-1.47				
	0909		11:00		5+4.74	"	8.49	-0.12	-1.22				
	0910		12:00		5+4.62	"	8.37	-0.17	-1.10				
	0911		13:00		5+4.45	"	8.20	-0.10	-0.93				
	0912		14:00		5+4.35	"	8.10	-0.08	-0.83				
	0913		15:00		5+4.27	"	8.02	-0.09	-0.75				
	0914		16:00		5+4.18	"	7.93	-0.00	-0.66				
	0916		18:00		5+4.18	"	7.93	-0.00	-0.66				
	0918		20:00		5+4.18	"	7.93	-0.01	-0.66				
	0920		22:00		5+4.17	"	7.92	-0.00	-0.65				
	0922		24:00		5+4.17	"	7.92	-0.00	-0.65				
	0924		26:00		5+4.17	"	7.92	0.00	-0.65				
	0926		28:00		5+4.17	"	7.92	0.00	-0.65				
	0928		30:00		5+4.17	"	7.92	-0.01	-0.65				
	0930		32:00		5+4.16	"	7.91	+0.01	-0.64				
	0932		34:00		5+4.17	"	7.92	0.00	-0.65				
	0934		36:00		5+4.17	"	7.92	-0.07	-0.65				
	0937		41:00		5+4.10	"	7.85	-0.03	-0.58				
	0942		46:00		5+4.07	"	7.82	-0.02	-0.55				
	0949		53:00		5+4.05	"	7.80	-0.02	-0.53				
	0954		58:00		5+4.03	"	7.78	-0.04	-0.51				
	0959		63:00		5+3.99	"	7.74	0.00	-0.47				
1	1005	7 hrs	69:00		5+3.99	-1.25'w	7.74	-0.03	-0.47			gp	Gain 1 min.

AQUIFER TEST DATA

WELL 22-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST Rail down - recovery
HOW Q MEASURED N/A
HOW W.L.'s MEASURED [illegible]
RAD./DIST. OF/FROM PUMPING WELL [illegible]
MEAS. POINT FOR W.L.'s [illegible] 2" steel [illegible] csg.
ELEVATION OF MEAS. POINT 7

DEPTH OF PUMP/AIRPIPE
PUMP ON: date [illegible] time [illegible]
PUMP OFF: date [illegible] time [illegible]
DURATION OF AQUIFER TEST 136 min.

LOCATION Rocky Flats - Plant, Golden Co.
PERSONNEL J. Price, M. Angier

PROJECT 106 P06 222

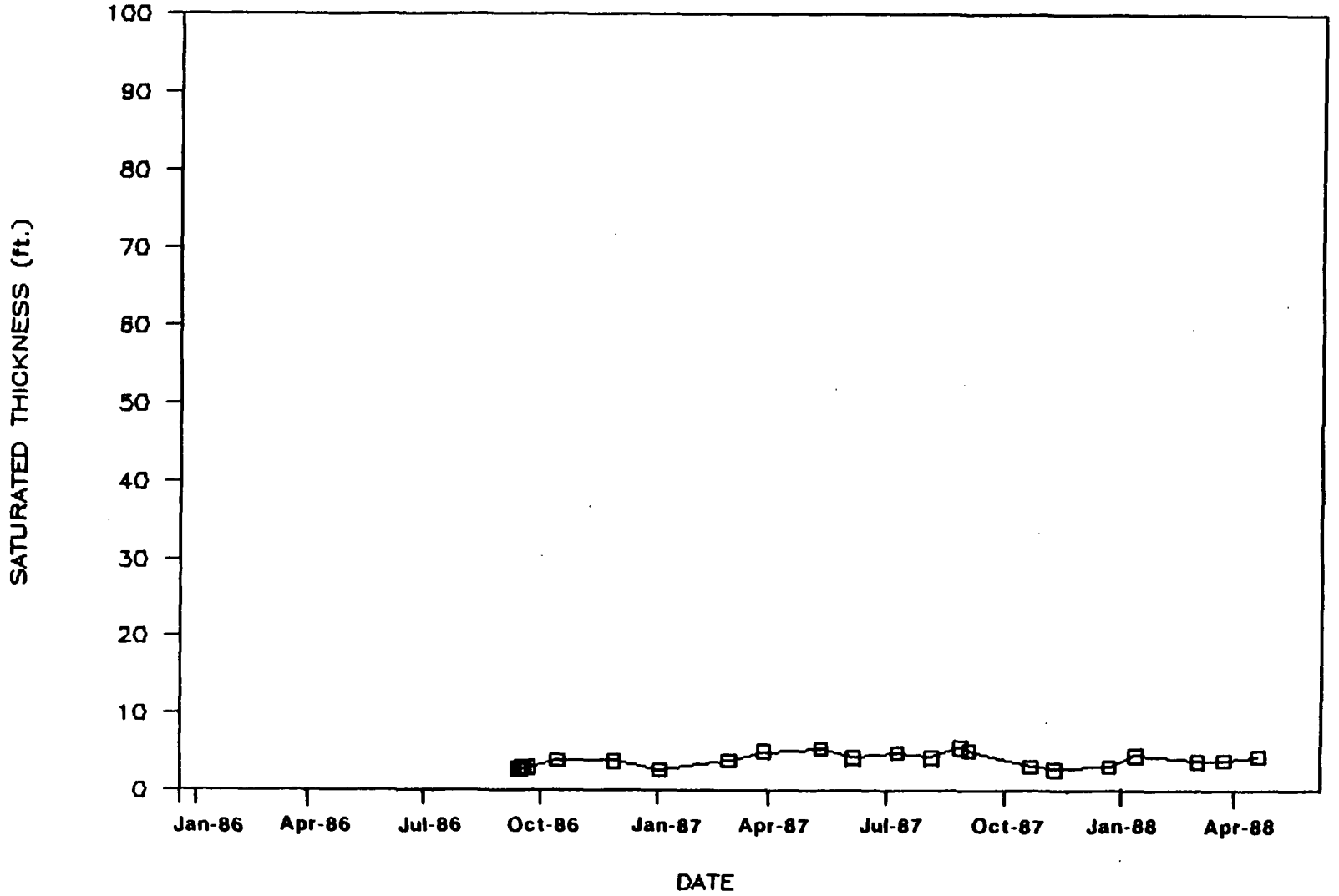
TIME t = ____ at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL ____					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSION & CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
1	1017		73:00		5+3.96	-1.25 [illegible]	7.71	0.00	-0.44			GP	Gain 1 min.
	1018		76:00		5+3.96		7.71	0.00	-0.44				
	1019		81:00		5+3.96		7.71	-0.02	-0.44				
	1024		86:00		5+3.94		7.69	-0.03	-0.42				
	1034		96:00		5+3.91		7.66	-0.03	-0.39				10 min intervals
	1044		106:00		5+3.88		7.63	-0.02	-0.36				
	1055		117:00		5+3.86		7.61	-0.03	-0.34				
	1104		126:00		5+3.83		7.58	-0.04	0.31				~90% Recovery
	1114		136:00		5+3.79	-1.25 [illegible]	7.54	-0.	0.27			GP	
		Calc	90%	recovery		(11.78 - 8.52)		0.90 =	2.93				
						11.78 - 2.93 = 8.85'							
								→ 5+3.85					

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2286	09/12/86	5976.81	5978.05	1.24	11.20	8.38	5969.67
	09/13/86					8.52	5969.53
	09/15/86					8.25	5969.80
	09/16/86					8.22	5969.83
	09/17/86					8.28	5969.77
	09/19/86					8.22	5969.83
	10/13/86					7.22	5970.83
	11/26/86					7.35	5970.70
	01/01/87					8.50	5969.55
	02/25/87					7.29	5970.76
	03/24/87					6.17	5971.88
	05/08/87					5.71	5972.34
	06/03/87					6.80	5971.25
	07/08/87					6.25	5971.80
	08/04/87					6.80	5971.25
	08/27/87					5.60	5972.45
	09/03/87					5.90	5972.15
	10/21/87					8.00	5970.05
	11/09/87					8.40	5969.65
	12/21/87					8.00	5970.05
	01/11/88					6.60	5971.45
	02/29/88					7.30	5970.75
	03/21/88					7.20	5970.85
	04/18/88					6.70	5971.35

SATURATED THICKNESS IN WELL # 22-86 (SP)



INDEX OF DATA

Boring No.: 23-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 **Coordinates** N 37355.0 E 21154.4

Boring Method Hollow Stem Auger/NC core **Ground Surface Elevation** 5981.18

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ARTIFICIAL FILL 0-2.5'-Sample. Recovered 1.5/2.5'=60%. Pale GRAVEL: reddish brown (10R 5/4) to light olive gray (5Y 5/2) sand, silt and pebbles; some quartzite cobbles; calcareous; poorly sorted; angular; unconsolidated; dry. 2.5-5.0'-Sample. Recovered 1.2/2.5'=48%. GRAVEL: yellowish gray (5Y 8/4) sand, silt and pebbles; calcareous; poorly sorted; angular; damp. 5.0-7.0'-Sample. Recovered 0.7/2.0'=35%. GRAVEL: pale olive (10Y 6/2) granite and quartzite pebbles; some sand; trace clay and silt; calcareous; poorly sorted; compacted; damp. 7.0-9.5'-Sample. Recovered 1.7/2.5'=68%. 7.0-8.2'. GRAVEL: Same as above; damp.			
	5						
	10			ARAPAHOE FORMATION 8.2-9.5'. CLAYSTONE: pale olive (10Y 6/2); silty; calcite along fractures at 8.5', 9.0', and 9.5'; some dark yellowish orange (10YR 6/6) staining; firm; damp. 9.5-12.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: yellowish gray to greenish gray (5Y 7/2 to 5GY 6/1); sandy and silty in upper 1.5' increasing in clay content with depth; some dark yellowish orange (10YR 6/6) iron staining; ironstone at 10.5'; calcareous layers at 9.5' and 10.7'; firm; damp.			
	15						
	20						

Remarks Logged by: T. Murphy Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 **Coordinates** N 37355.0 E 21154.4

Boring Method Hollow Stem Auger/NC core **Ground Surface Elevation** 5981.18

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2) to olive gray (5Y 3/2); silty; calcareous layer at 13.5'; firm; damp.			
				17.0-22.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); silty; trace calcite at 18.1'; trace dark yellowish orange (10YR 6/6) iron staining; firm; damp.			
	25			22.0-27.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray to olive gray (5Y 5/2 to 5Y 3/2); silty; some dark yellowish orange (10YR 6/6) iron staining; some black organic fragments; firm; damp.			
				27.0-32.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: medium dark gray (N 4); silty; firm; damp.			
	30			33.0-38.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.9/5.0'=98%. CLAYSTONE: dusky yellow (5Y 6/4) to light olive gray (5Y 5/2) to medium light gray (N 5); trace silt; some organic fragments; dark yellowish orange (10YR 6/6) mottling in light olive gray areas; no apparent fractures; moderately soft to firm; damp.			
	35			38.0-40.9'-Sample. Recovered 2.0/2.9'=69%. RQD 2.0/2.0'=100%. CLAYSTONE: medium light gray (N 5); iron staining at 39.0'; subvertical fracture with iron staining from 39.0' to 39.8'; core has a mottled appearence with yellowish gray (5Y 8/1) stains throughout; firm to moderately soft; damp.			
	40						

Remarks Logged by: T. Murphy Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 **Coordinates** N 37355.0 E 21154.4

Boring Method. Hollow Stem Auger/NC core **Ground Surface Elevation** 5981.18

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	40			40.9-45.9'-Sample. Recovered 2.8/5.0'=56%. RQD 1.6/2.8'=57%. CLAYSTONE: olive gray (5Y 4/1); trace silt; some organic fragments; vertical limonite filled fracture from 40.9' to 42.5'; horizontal limonite filled fracture at 41.9'; firm to moderately soft; damp.			
	45			45.9-50.9'-Sample. Recovered 4.8/5.0=96%. RQD 4.2/4.8'=86%. 45.9'-50.2'. CLAYSTONE: medium (N 5) to medium dark gray (N 4). Highly fractured interval with limonite along fracture planes (2 mm wide) from 48.3' to 49.6'; top 4.0' of core has abundant organics (wood fragments); firm; damp.			
	50			50.2'-50.9'. CLAYSTONE: dusky yellow (5Y 6/4).			
				50.9-55.9'-Sample. Recovered 4.0/5.0'=80%. RQD 2.6/4.0'=65%. 50.9'-51.5'. CLAYSTONE: light olive gray (5Y 5/2); heavy limonite along fracture planes. 51.5'-52.6'. CLAYSTONE: medium dark gray (N 4) claystone with interbedded dusky yellow (5Y 6/4) clayey siltstone. 52.6'-55.9'. CLAYSTONE: medium dark gray (N 4); silty; occasional subvertical fracture with limonite stain (up to 0.7' long); firm; damp.			
	55			55.9-60.9'-Sample. Recovered 3.8/4.6'=83%. RQD 2.5/3.8'=66%. CLAYSTONE: olive gray (5Y 3/2) to medium dark gray (N 4); silty; trace iron staining at top of core; firm; damp.			
	60						

Remarks Logged by: T. Murphy Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 **Coordinates** N 37355.0 E 21154.4

Boring Method · Hollow Stem Auger/NC core **Ground Surface Elevation** 5981.18

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	60			60.9-65.5'-Sample. Recovered 4.6/4.6'=100%. RQD 4.3/4.6'=93%. SILTSTONE: dark gray (N 3) grading downward into dark greenish gray (5GY 4/1) clayey siltstone; some organic wood fragments; firm; damp.			
	65			65.5-70.5'-Sample. Recovered 5.0/5.0'=100%. RQD 3.7/5.0'=74%. SILTSTONE: dark greenish gray (5GY 4/1); clayey; trace very fine-grained sand; dark gray (N 3) clayey siltstone from 68.5 to 70.5'; calcareous layer at 66.5 with slight dark yellowish orange (10YR 6/6) iron stains; firm; damp.			
	70			70.5-75.5'-Sample. Recovered 2.5/5.0'=50%. RQD 0.0/2.5'=0%. CLAYSTONE: dark greenish gray (5GY 4/1); silty; trace very fine-grained sand; highly fractured; some organic fragments in vertical fractures; crumbly; damp.			
	75			75.5-80.5'-Sample. Recovered 4.8/5.0'=96%. RQD 2.3/4.8'=48%. SILTSTONE: dark greenish gray (5GY 4/1); some clay and very fine-grained sand; few organics; very pale orange (10YR 8/2) calcareous clay layer at 77.5'; firm; damp.			
	80						

Remarks Logged by: T. Murphy Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 **Coordinates** N 37355.0 E 21154.4

Boring Method - Hollow Stem Auger/NC core **Ground Surface Elevation** 5931.18

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	80			80.5-85.5'-Sample. Recovered 4.6/5.0'=92%. RQD 2.7/4.6'=59%. SILTSTONE: dark gray (N 3) to dark greenish gray (5GY 4/1); interbedded 0.1' to 0.3' beds of sandy siltstone; convoluted bedding in places; occasional clayey siltstone; firm; damp.			
	85			85.5-90.5'-Sample. Recovered 5.0/5.0'=100%. RQD 1.4/5.0'=28%. SILTSTONE: dark gray (N 3) to dark greenish gray (5GY 4/1); interbedded sandy siltstone beds (0.5' thick; occasional clayey siltstone layers; organics throughout; calcareous concretions from 87.8' to 88.4'; firm; damp.			
	90			90.5-95.5'-Sample. Recovered 5.0/5.0'=100%. RQD 1.2/5.0'=24%. SILTSTONE: dark gray (N 3); interbedded sandy siltstone and clayey siltstone beds; sand is very fine-grained; vertical fracture from 92.5'-95.5' due to drilling; crumbly; firm; damp.			
	95			95.5-100.5'-Sample. Recovered 4.8/5.0'=96%. RQD 3.8/5.0'=76%. SILTSTONE: dark gray (N 3); trace very fine-grained sand throughout; some organics; laminated; light olive gray (5Y 6/1) mottling around organic fragments; firm; damp.			
	100						

Remarks Logged by: T. Murphy Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 **Coordinates** N 37355.0 E 21154.4

Boring Method Hollow Stem Auger/NC core **Ground Surface Elevation** 5981.18

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	100			100.5-105.5'-Sample. Recovered 5.0/5.0'=100%. RQD 2.1/5.0'=42%. SILTSTONE: dark gray (N 3); sandy; interbedded silty sandstone beds at 102.6' and 103.8' (approximately 0.4' thick). Sandstone layers consist of medium gray (N 5) very fine-grained, silty sand; moderately sorted; convoluted bedding characteristic of interbedded siltstone and sandstone layers; some calcareous concretions in sandy siltstone layers; abundant organics; firm to hard; damp.			
	105			105.5-110.5'-Sample. Recovered 3.2/5.0'=64%. RQD 1.9/3.2'=59%. SANDSTONE: dark gray (N 3); very fine-grained; silty; clayey; lower 1.2' of core is clayey siltstone; soft to firm; damp.			
	110			110.5-116.5'-Sample. Recovered 4.6/5.0'=92%. RQD 3.6/4.6'=78%. 110.5'-113.3'. SILTSTONE: dark gray (N 3); clayey; increasing sand content through interval.			
				113.3'-115.5'. SANDSTONE: medium gray (N 5); fine to very fine-grained; occasional clay-filled vertical fracture; moderately sorted; firm; damp. 115.5-120.5'-Sample. Recovered 5.0/5.0'=100%. RQD 4.0/5.0'=80%. 115.5'-116.5'. SANDSTONE: medium gray (N 5); fine to very fine-grained; moderately sorted; firm; damp. Gradational change to siltstone at 116.5'.			
	115			116.5-120.5'. SILTSTONE: dark gray (N 3); very fine-grained; sandy; some clay; well sorted; organic fragments in subvertical fractures and horizontal layers; subvertical fractures have slickensides; fractures are 1.0' to 1.5' apart.			
	120						

Remarks Logged by: T. Murphy Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 **Coordinates** N 37355.0 E 21154.4

Boring Method. Hollow Stem Auger/NC core **Ground Surface Elevation** 5981.18

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	120			120.5-125.5'-Sample. Recovered 5.0/5.0'=100%. RQD 3.9/5.0'=78%. SILTSTONE: dark gray (N 3) to medium gray (N 5); clayey; with interbedded sandy siltstone; sand is fine to very fine-grained; moderately sorted; some organic fragments; slickensides along fracture planes.			
	125			125.5-130.5'-Sample. Recovered 4.8/5.0'=96%. RQD 4.2/4.8'=88%. SILTSTONE: dark gray (N 3) to medium gray (N 5); clayey; with occasional interbedded sandy siltstone; occasional light brown (5YR 6/4) calcareous concretions; moderately sorted; firm; damp.			
	130			TOTAL DEPTH: 130.5'			
	135						
	140						

Remarks Logged by: T. Murphy Checked by:

Project No. 106P06222

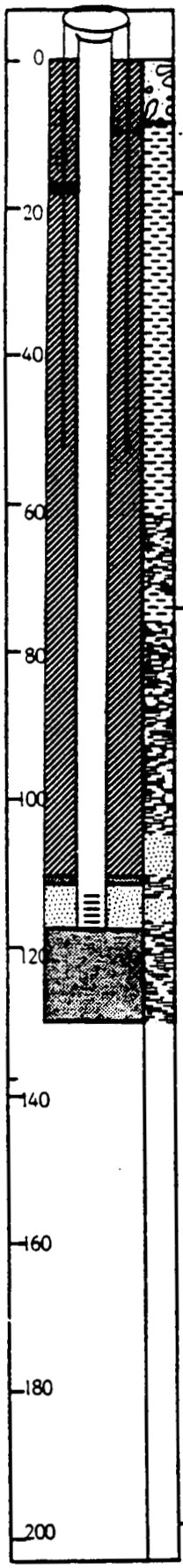
Hydro-Search, Inc.

WELL 23-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37355.0 E 21154.4

ELEVATION: GROUND LEVEL 5981.18'
TOP OF CASING 5981.91'



LOCATION Golden, CO
PERSONNEL T. Murphy
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 117.00' Hole: 130.50'

BOREHOLE DIAMETER 0.00' - 32.00': 7½"
32.00' - 130.50': 5 5/8"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue, Golden, CO
(Dave Jarvie)

RIG Mobile B-57

BIT(S) 0.00' - 32.00': TS
32.00' - 130.50': Carbide bit

DRILLING FLUID 0.00' - 32.00': None
32.00' - 130.50': air/water mist

SURFACE CASING 5" x 32.50' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	32.00'	C1			
0.00'	113.25'	C2			
113.00'	117.25'	S1			

CASING: C1 5" I.D. steel surface casing
C2 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS None (see comments)

FILTER MATERIAL 32-42 silica sand
112.00' - 117.50'

CEMENT Portland Type I
0.00' - 111.00'

OTHER 3/8" bentonite pellets
111.00' - 112.00'
117.50' - 130.50'

CONSTRUCTION TIME LOG:

TASK	START DATE	START TIME	FINISH DATE	FINISH TIME
DRILLING:	1986		1986	
7½" auger	9/11	1500	9/11	1800
NC core	9/19	1000	9/23	1500
Reaming	9/26	1217	9/26	1541
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
5" steel	9/12	1000	9/12	1115
2" stainless	9/26	1637	9/26	1650
FILTER PLACEMENT:	9/26	1738	9/26	2021
CEMENTING:	9/27	0830	9/27	1037
DEVELOPMENT:	10/1	1200	10/1	1200
OTHER:				
Bentonite	9/26	2021	9/26	2130
	9/26	1542	9/26	1545
Packer testing	9/23	1500	9/26	1217
Cementing 5" steel	9/12	1130	9/12	1225

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 0.73'

Built well in NC rod; no centralizers used.

Protective casing and stainless steel casing were bent and had to be cut. New top of stainless steel casing: 0.08'.

PROGRAM SLUGT, VERSION 4.OCT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:
(1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3,NO.1 OF WRR ENTITLED 'RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER')
(2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WRR ENTITLED 'A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS')

PROJECT NO.: 6-011B-87 CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant DATE OF SLUG TEST: 2-2-88

FIELD INVESTIGATOR: K. McNeill

WELL NO.: 22-86

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES
INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES
DIAMETER OF DRILLED HOLE = 5.63 INCHES
ESTIMATED POROSITY OF GRAVEL PACK = .25
LENGTH OF SCREEN OR INTAKE PORTION = 5.50 FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 11.70 FEET
THICKNESS OF SATURATED AQUIFER ZONE = 5.50 FEET
FALLING-HEAD INDEX =) ('1' IF FALLING,'0' IF RISING)
NUMBER OF HEAD-TIME DATA POINTS = 13

TIME (sec)	HEAD (FEET)
41.00	1.220
51.00	1.220
60.00	1.220
90.00	1.220
127.00	1.220
157.00	1.220
217.00	1.220
307.00	1.220
462.00	1.220
702.00	1.220
942.00	1.220
1042.00	1.210
1242.00	1.210

H0 WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE T COMPUTED VALUES FOR H0 (FEET)

1.2210
1.2219

METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS

COMPUTED VALUE OF H0 = [illegible] FEET

NOTE: TRANSMISSIVITY UNITS ARE IN FT**2/sec AND PERMEABILITY UNITS ARE IN FT/sec

ALPHA	STORATIVITY	MEAN TRANSMIS-SIVITY	MEAN PERMEA-BILITY	MINIMUM TRANS.	MAXIMUM TRANS.	RATIO OF "T" RANGE TO MEAN	ROOT MEAN SQUARE OF TIME DEVIATIONS	DIFFERENCE IN RMS
1.000E-01	1.000E-01	2.020E-09	3.672E-10	2.343E-10	5.383E-09	2.549700	319.55	.00
1.000E-02	1.000E-02	5.902E-09	1.073E-09	6.741E-10	1.549E-08	2.510021	328.91	-9.36
1.000E-03	1.000E-03	1.682E-08	3.058E-09	1.732E-09	3.978E-08	2.262192	461.62	-132.71
1.000E-04	1.000E-04	3.567E-08	6.485E-09	3.662E-09	8.414E-08	2.256329	465.81	-4.18
1.000E-05	1.000E-05	5.927E-08	1.078E-08	6.230E-09	1.431E-07	2.309766	428.95	36.86
1.000E-06	1.000E-06	8.866E-08	1.612E-08	9.618E-09	2.210E-07	2.384044	383.50	45.44
1.000E-07	1.000E-07	1.196E-07	2.174E-08	1.324E-08	3.042E-07	2.433341	358.19	25.31
1.000E-08	1.000E-08	1.486E-07	2.701E-08	1.660E-08	3.814E-07	2.455873	348.20	9.99
1.000E-09	1.000E-09	1.771E-07	3.221E-08	1.991E-08	4.574E-07	2.469429	342.72	5.48
1.000E-10	1.000E-10	2.059E-07	3.742E-08	2.325E-08	5.343E-07	2.482592	337.30	4.92

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METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = [illegible] FT/sec = [illegible] CM/sec

TRANSMISSIVITY = [illegible] FT**2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = [illegible] FT/sec = [illegible] CM/sec

TRANSMISSIVITY = [illegible] FT**2/sec

WELL NO.: [illegible]

INPUT DATA ARE:

INNER CASING DIAMETER = [illegible] INCHES
INNER SCREEN OR OPEN-HOLE DIAMETER = [illegible] INCHES
DIAMETER OF DRILLED HOLE = [illegible] INCHES

LENGTH OF SCREEN OR INTAKE PORTION = [illegible] FEET
DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = [illegible] FEET
THICKNESS OF SATURATED AQUIFER ZONE = [illegible] FEET

NUMBER OF HEAD-TIME DATA POINTS = 12

TIME (sec	HEAD (FEET)
41.00	1.220
51.00	1.220
60.00	1.220
90.00	1.220
127.00	1.220
157.00	1.220
217.00	1.220
337.00	1.220
462.00	1.220
702.00	1.220
942.00	1.220
1042.00	1.210
1342.00	1.210

HO WAS COMPUTED FROM KNOWN VOLUME OF SLUG

VOLUME OF SLUG ENTERED = .03250 CUBIC FEET

METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS

COMPUTED RESULTS:

COMPUTED VALUE OF HO = 1.49 FEET

NOTE: TRANSMISSIVITY UNITS ARE IN FT**2/sec AND PERMEABILITY UNITS ARE IN FT/sec

ALPHA	STORATIVITY	MEAN TRANSMIS-SIVITY	MEAN PERMEA-BILITY	MINIMUM TRANS.	MAXIMUM TRANS.	RATIO OF "T" RANGE TO TEAM	ROOT MEAN SQUARE OF TIME DEVIATIONS	DIFFERENCE IN RMS
1.000E-01	1.000E-01	2.775E-06	5.146E-07	2.880E-07	8.797E-06	2.064610	517.68	.00
1.000E-02	1.000E-02	8.409E-06	1.527E-06	8.611E-07	2.665E-05	2.066737	514.36	-.58
1.000E-03	1.000E-03	1.532E-05	2.786E-06	1.559E-06	4.857E-05	2.067929	514.54	-.28
1.000E-04	1.000E-04	2.227E-05	4.049E-06	2.259E-06	7.059E-05	2.068277	514.66	-.13
1.000E-05	1.000E-05	2.905E-05	5.282E-06	2.942E-06	9.206E-05	2.068523	514.72	-.06
1.000E-06	1.000E-06	3.570E-05	6.492E-06	3.613E-06	1.132E-04	2.068674	514.76	-.04
1.000E-07	1.000E-07	4.227E-05	7.685E-06	4.275E-06	1.340E-04	2.068767	514.79	-.02
1.000E-08	1.000E-08	4.878E-05	8.869E-06	4.931E-06	1.546E-04	2.068832	514.81	-.02
1.000E-09	1.000E-09	5.524E-05	1.004E-05	5.582E-06	1.751E-04	2.068890	514.83	-.02
1.000E-10	1.000E-10	6.166E-05	1.121E-05	6.230E-06	1.954E-04	2.068937	514.83	-.01

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 37.25 - 48.43
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00055508 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 42.84 + 5.00 + 18.16 * 2.31 = 89.79
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000039 FT/MIN
K = .00000020 CM/SEC

P2/3 TEST

TEST ABORTED, PACKER FAILED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 44.68 - 52.35
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00104246 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 7.67 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 48.51 + 5.00 + 21.27 * 2.31 = 102.65
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000085 FT/MIN
K = .00000043 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00406155 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 7.67 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 48.51 + 5.00 + 29.71 * 2.31 = 122.15
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000279 FT/MIN
K = .00000141 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00009477 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 7.67 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 48.51 + 5.00 + 21.27 * 2.31 = 102.65
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN
K = .00000004 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 52.35 - 63.55
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 57.95 + 5.00 + 14.66 * 2.31 = 96.81
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000009 FT/MIN
K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00255878 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 57.95 + 5.00 + 10.66 * 2.31 = 87.57
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000183 FT/MIN
K = .00000093 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00023015 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 57.95 + 5.00 + 24.66 * 2.31 = 119.91
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 66.10 - 77.30
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00033846 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 71.70 + 5.00 + 30.57 * 2.31 = 147.32
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000014 FT/MIN
K = .00000007 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00197662 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 71.70 + 5.00 + 43.57 * 2.31 = 177.35
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN
K = .00000036 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00004062 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 71.70 + 5.00 + 30.57 * 2.31 = 147.32
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN
K = .00000001 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 67.80 - 79.00
MATERIAL TESTED: ARAPAHOE FORMATION
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00296493 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 73.40 + 5.00 + 31.30 * 2.31 = 150.70
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000123 FT/MIN
K = .00000063 CM/SEC

P2/3 TEST TEST ABORTED

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 73.40 + 5.00 + 43.90 * 2.31 = 179.81
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 73.40 + 5.00 + .00 * 2.31 = 78.40
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 71.80 - 83.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00121847 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 77.40 + 5.00 + 33.02 * 2.31 = 158.68
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000048 FT/MIN
K = .00000024 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 78.00 - 79.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00296493 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 1.00 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.50 + 5.00 + 31.30 * 2.31 = 155.80
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000606 FT/MIN
K = .00000308 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 82.72 - 93.92
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00162462 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 88.32 + 5.00 + 37.72 * 2.31 = 180.45
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000056 FT/MIN
K = .00000029 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 84.05 - 95.25
MATERIAL TESTED: ARAPAHOE FORMATION
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00208493 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 89.65 + 5.00 + 39.58 * 2.31 = 186.08
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN
K = .00000036 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 23-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 09/23/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 104.21 - 115.40
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00043323 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 109.81 + 5.00 + 48.75 * 2.31 = 227.42
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

P2/3 TEST

TEST ABORTED, IMPROPER PACKER SEAL

2ND P1/3 TEST

Q = INJECTION RATE = .00102893 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 109.81 + 5.00 + 48.75 * 2.31 = 227.42
R = BOREHOLE RADIUS = .14 FEET

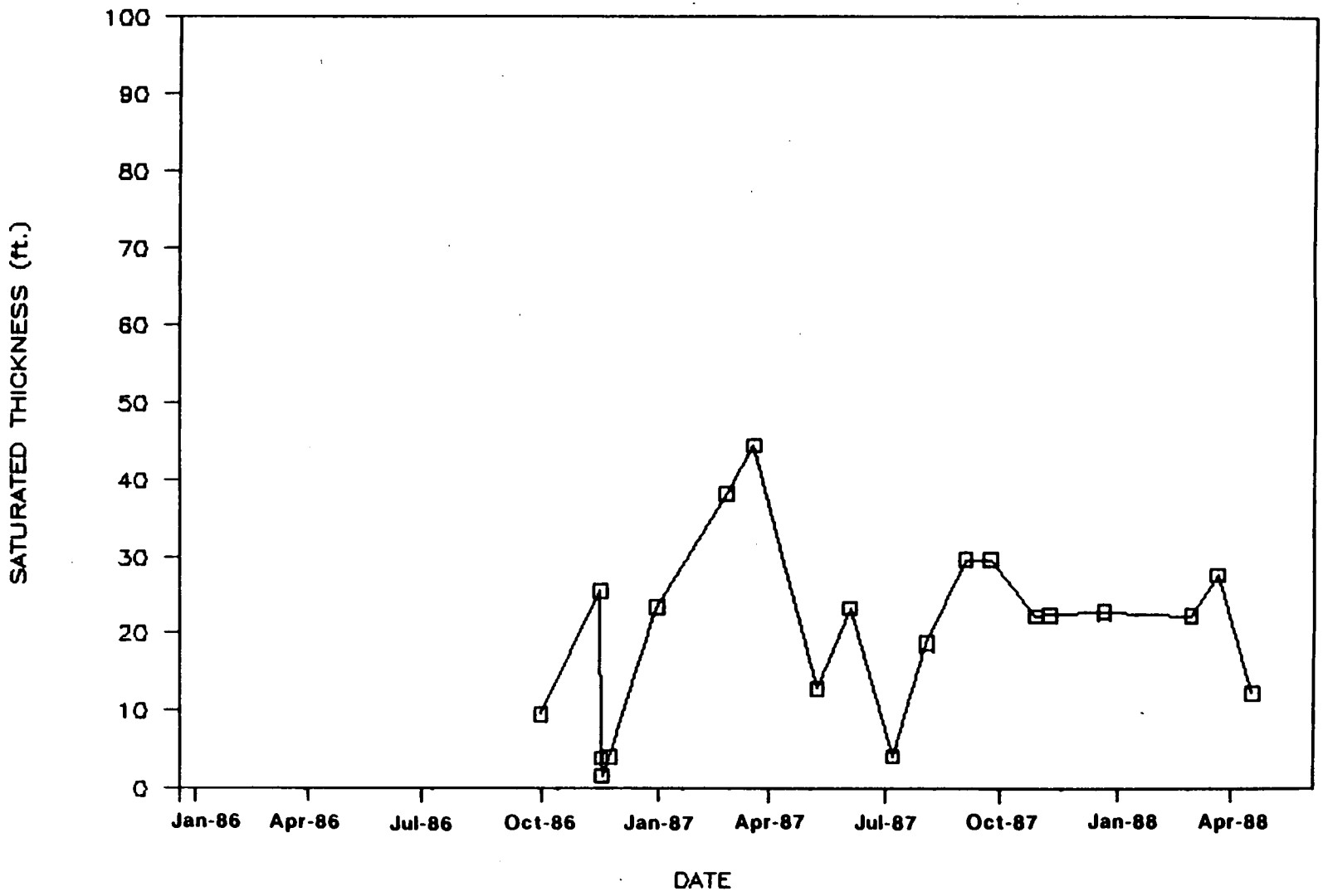
K = HYDRAULIC CONDUCTIVITY = .00000028 FT/MIN
K = .00000014 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2386	10/01/86	5981.18	5981.91	0.73	117.25	107.8	5874.16
	11/17/86					91.79	5890.12
	11/18/86					113.2	5868.66
	11/19/86					115.6	5866.30
	11/25/86					113.2	5868.69
	01/01/87					93.92	5887.99
	02/25/87					79.25	5902.66
	03/18/87					73.00	5908.91
	05/08/87					104.4	5877.53
	06/03/87					94.02	5887.89
	07/08/87					113.0	5868.86
	08/04/87					98.60	5883.31
	09/03/87					87.80	5894.11
	09/23/87					87.80	5894.11
	10/28/87					95.10	5886.81
	11/09/87					94.90	5887.01
	12/21/87					94.50	5887.41
	02/29/88					95.00	5886.91
	03/21/88					89.70	5892.21
	04/18/88					104.9	5877.01

SATURATED THICKNESS IN WELL # 23-86 (SP)



INDEX OF DATA

Boring No.: 24-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 24-86

Date Drilled 9/12/86

Coordinates N 37354.8 E 21172.8

Boring Method. Hollow Stem Auger

Ground Surface Elevation 5980.45

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			**ARTIFICIAL FILL** 0-2.5'-Sample. Recovered 2.0/2.5'=80%. GRAVEL: yellowish gray (5Y 7/2) to light olive gray (5Y 5/2) granitic pebbles and coarse sand; some silt; trace clay; base of sample is grayish brown (5YR 3/2); poorly sorted; soft; dry.			
	5			2.5-5.0'-Sample. Recovered 0.9/2.5'=36%. GRAVEL: yellowish gray (5Y 7/2) to light olive gray (5Y 5/2) granite and quartzite pebbles; pale greenish yellow (10Y 8/2) sandy matrix; poorly sorted; angular; crumbly; dry.			
				5.0-7.0'-Sample. Recovered 0.0/2.0'=0%. Large boulder prevented sample recovery.			
	10			7.0-12.0'-Sample. Recovered 5.0/5.0'=100%. 7.0-7.2'. GRAVEL: Same as above; dry.			
				ARAPAHOE FORMATION 7.2-12.0'. CLAYSTONE: pale olive (10Y 6/2) to greenish gray (5GY 6/1); silty; some fine-grained sand and silty sand stringers at 7.8'; sand is slightly calcareous; claystone contains dark yellowish orange (10YR 6/6) iron staining; calcareous pockets along fractures throughout sample; firm; damp.			
	15			TOTAL DEPTH: 12.0'			
	20						

Remarks Logged by: T. Murphy

Checked by: [illegible]

Project No. 106P06222

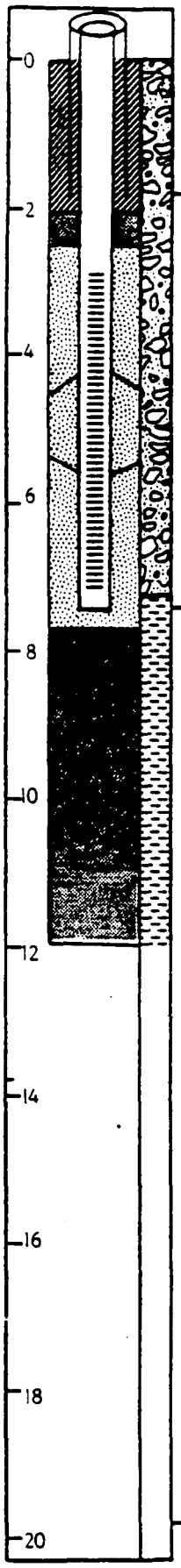
Hydro-Search, Inc.

WELL 24-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37354.8 E 21172.8

ELEVATION: GROUND LEVEL 5980.45'
TOP OF CASING 5982.07'



LOCATION Golden, CO
PERSONNEL T. Murphy
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 7.45' Hole: 12.00'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) T5

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	2.95'	C1			
2.95'	7.45'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed. 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
4.34' - 5.59'

FILTER MATERIAL 32-42 silica sand
2.50' - 7.70'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
7.70' - 11.90'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/12	1320	9/12	1400
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/12	1525	9/12	1526
FILTER PLACEMENT:	9/12	1526	9/12	1530
CEMENTING:	9/12	1532	9/12	1535
DEVELOPMENT:	9/16	1650	9/16	1650
OTHER:				
Bentonite	9/12	1530	9/12	1532
	9/12	1520	9/12	1525

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.62'

Cave from TD to 11.90'

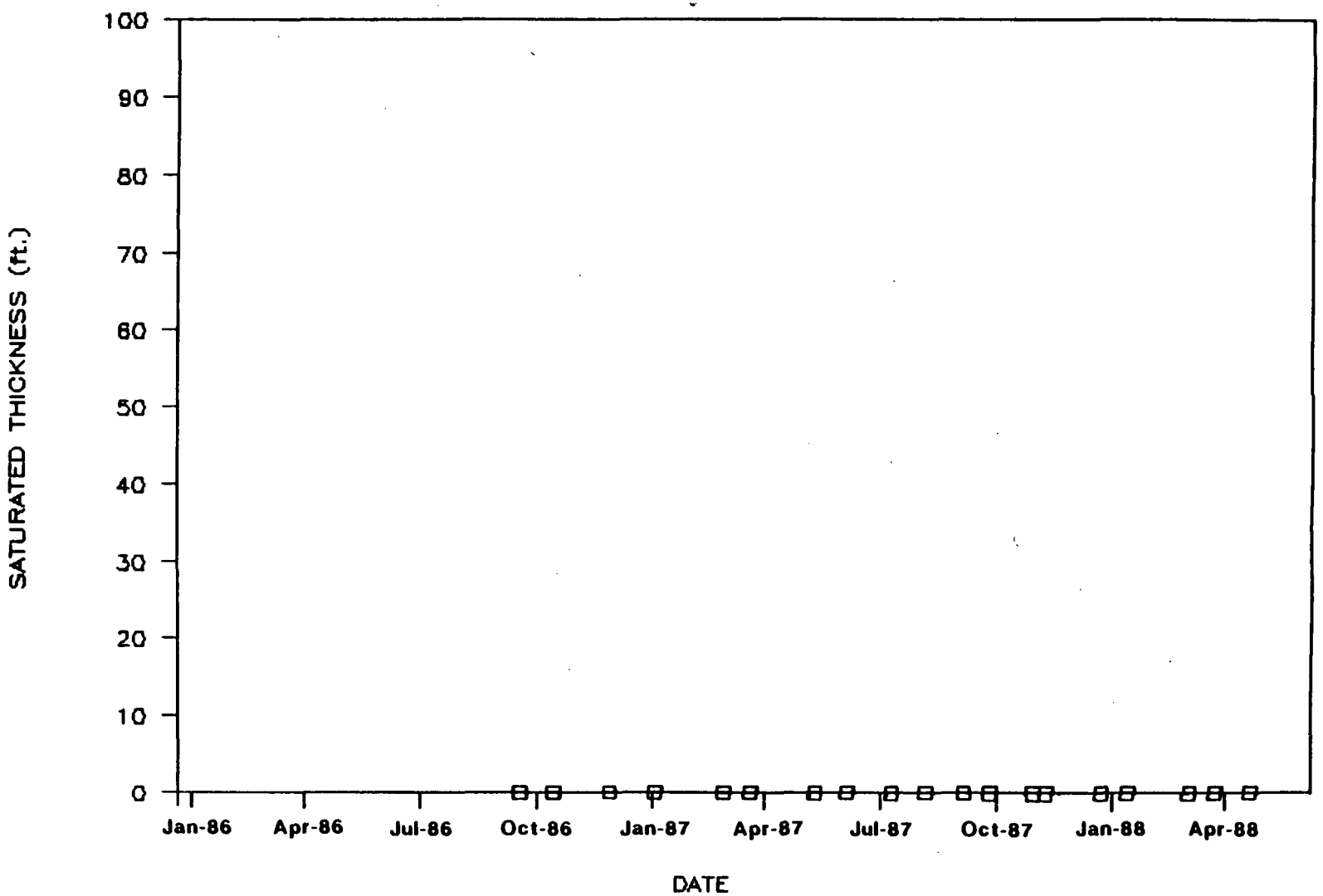
HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2486	09/16/86	5980.45	5982.07	1.62	7.25	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/18/87					-1.00	DRY
	05/08/87					-1.00	DRY
	06/03/87					-1.00	DRY
	07/08/87					8.65	5973.42
	08/04/87					-1.00	DRY
	09/03/87					-1.00	DRY
	09/24/87					-1.00	DRY
	10/28/87					-1.00	DRY
	11/09/87					-1.00	DRY
	12/21/87					-1.00	DRY
	01/11/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					8.70	5973.37

SATURATED THICKNESS IN WELL # 24-86 (SP)



INDEX OF DATA

Boring No.: 25-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project:	Rocky Flats Plant	LOG OF BORING NO.	25-86
Date Drilled	9/13/86 - 9/17/86	Coordinates	N 37426.3 E 21726.5
Boring Method	NC Core	Ground Surface Elevation	5974.45

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			**ARTIFICIAL FILL** 0-2.0'-Cuttings. GRAVEL: granite and quartzite pebbles and large cobbles; dry. 2.0-9.0'-Cuttings. GRAVEL: pale yellowish brown (10YR 6/2); clayey; some silt and sand; 50% fines; dry to slightly damp.			
	5			9.0-11.0'-Cuttings. CLAY: gray orange (10YR 7/4); sandy and silty; caliche stringers; 1-2% quartzite pebbles; damp. 11.0-13.0'-Cuttings. CLAY: gray orange (10YR 7/2); gravelly; silty; 20% quartzite pebbles; caliche stringers; damp. 13.0-17.0'-Cuttings. CLAY: Same as above; light olive brown (5Y 5/6); damp.			
	10						
	15			**ARAPAHOE FORMATION** 17.0-19.5'-Cuttings. CLAYSTONE: moderate yellowish brown (10YR 5/4); sub-plastic; damp. 19.5-20.0'-Cuttings. CLAYSTONE: grayish brown (5YR 3/2); plastic; moist.			
	20						

Remarks Logged by: T. Gulliver & T. Murphy Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	25-86
Date Drilled	9/13/86 - 9/17/86	Coordinates	N 37426.3 E 21726.5
Boring Method	NC Core	Ground Surface Elevation	5974.45

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			20.0-22.0'-Cuttings. CLAYSTONE: light grayish brown (5YR 6/1); firm; damp.			
				22.0-37.0'-Cuttings. CLAYSTONE: light grayish brown (5YR 6/1); silty; very wet (cored with water).			
	25						
	30						
	35						
				37.0-41.6'-Sample. Recovered 0.0/4.6'=0%.			
	40						

Remarks Logged by: T. Gulliver & T. Murphy Checked by: HP

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	25-86
Date Drilled	9/13/86 - 9/17/86	Coordinates	N 37426.3 E 21726.5
Boring Method	NC Core	Ground Surface Elevation	5974.45

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	40						
	45			41.6-46.6'-Sample. Recovered 5.0/5.0'=100%. RQD 3.0/5.0'=60%. CLAYSTONE: light olive gray (5Y 5/2) to olive gray (5Y 3/2); light brown to dark yellowish orange (10YR 6/6) iron staining; trace silt; ironstone; altered claystone concretions from 46.0-46.6'; firm; damp.			
	50			46.6-51.6'-Sample. Recovered 5.0/5.0'=100%. RQD 3.6/5.0'=72%. CLAYSTONE: light brown (10YR 6/6) grading to medium dark gray (N 4); ironstone from 46.6-47.0'; heavy iron staining at 48.0'; high angle fractures with calcite along fracture planes; firm; moist.			
	55			51.6-56.6'-Sample. Recovered 5.0/5.0'=100%. RQD 4.3/5.0'=86%. CLAYSTONE: grayish black (N 2) to dark gray (N 3); occasional dark yellowish orange (10YR 6/6) iron staining; some coaly layers and fragments; firm; damp.			
	60			56.6-61.6'-Sample. Recoverd 5.5/5.0'=100%. RQD 3.5/5.0'=57%. CLAYSTONE: grayish black (N 2); silty; organic wood fragments; fractures due to drilling; firm; damp.			

Remarks Logged by: T. Gulliver & T. Murphy Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	25-86
Date Drilled	9/13/86 - 9/17/86	Coordinates	N 37426.3 E 21726.5
Boring Method	NC Core	Ground Surface Elevation	5974.45

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	60			61.6-66.6'-Sample. Recovered 4.0/5.0'=80%. RQD 3.4/4.0'=92%. CLAYSTONE: light olive gray (5Y 5/2); silty; occasional very fine-grained sandstone laminations at 63.5'; calcareous at 63.0'; hard; dry to damp.			
	65			66.6-71.6'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: grayish black (N 3); thin interbedded silty claystone and clayey siltstone; highly fractured with numerous subvertical slickensides; crumbly to firm; damp.			
	70						
				71.6-74.0'-Sample. Recovered 0.0/2.4'=0%.			
				74.0-79.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.2/5.0'=85%. SANDSTONE: dark greenish gray (5GY 4/1); very fine-grained; silty; some clay; laminations of siltstone; convoluted bedding; moderately sorted; firm; damp.			
	75						
	80			79.0-81.1'-Sample. Recovered 2.1/2.1'=100%. RQD 1.3/2.1'=62%. SANDSTONE: Same as above; damp.			

Remarks Logged by: T. Gulliver & T. Murphy Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project:	Rocky Flats Plant	LOG OF BORING NO.	25-86
Date Drilled	9/13/86 - 9/17/86	Coordinates	N 37426.3 E 21726.5
Boring Method	NC Core	Ground Surface Elevation	5974.45

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	80			81.1-82.6'-Sample. Recovered 1.3/1.5'=87%. RQD 0.6/1.3'=46%. SANDSTONE: Same as above; some black coal lenses; firm; damp.			
				82.6-85.6'-Sample. Recovered 3.0/3.2'=94%. RQD 1.3/3.0'=43%. SILTSTONE: grayish black (N 3); alternating laminations of very fine-grained sandy siltstone and clayey siltstone; very fine coaly lenses; thinly bedded; some convoluted bedding; firm; dry to damp.			
	85			85.5-89.8'-Sample. Recovered 2.4/4.2'=57%. RQD 0.0/2.4'=0%. SILTSTONE: Same as above; dry to damp.			
	90			TOTAL DEPTH: 89.8'			
	95						
	100						

Remarks Logged by: T. Gulliver & T. Murphy Checked by: [illegible]

Project No. 106P06222

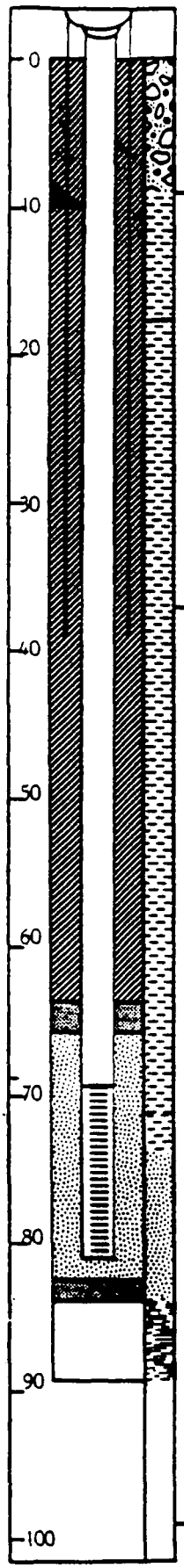
Hydro-Search, Inc.

WELL 25-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37426.3 E 21726.5

ELEVATION: GROUND LEVEL 5974.45'
TOP OF CASING 5976.55'



PROJECT 106P06222 Rocky Flats Plant
PERSONNEL T. Murphy
LOCATION Golden, CO

DRILLING SUMMARY:

TOTAL DEPTH Well: 82.00' Hole: 89.80'

BOREHOLE DIAMETER 0.00' - 38.50': 7½"
38.50' - 89.80': 3 3/4"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)

RIG Mobile B-57

BIT(S) 0.00' - 38.56': Blade bit; 38.56' - 89.80': Carbide bit

DRILLING FLUID 0.00' - 38.50': None; 38.50' - 89.80': air/water mist

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	38.50'	C1			
0.00'	59.90'	C2			
59.90'	82.00'	S1			

CASING: C1 5" I.D. steel surface casing
C2 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS None (see comments)

FILTER MATERIAL 32-42 silica sand
66.10' - 83.60'

CEMENT Portland Type I
0.00' - 64.00'

OTHER 3/8" bentonite pellets
64.00' - 66.10'
83.60' - 84.60'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	8/26	1401	8/27	1330
NC core	9/13	1400	9/16	1700
Reaming	9/17	1030	9/17	1315
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
5" steel	8/27	1353	8/27	1421
2" stainless	9/17	1537	9/17	1545
FILTER PLACEMENT	9/17	1526	9/17	1804
CEMENTING:	9/18	0904	9/18	1010
DEVELOPMENT:	9/30	1430	10/1	0945
OTHER:				
Bentonite	9/17	1805	9/17	1816
	9/17	1505	9/17	1506
Cementing 5" steel	8/27	1540	8/27	1606

WELL DEVELOPMENT

See Well Development Summary Sheet

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.10'

Cave from TD to 84.60'

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 25-86

Hydraulic Conductivity (cm/sec) = 7×10^{-8}

Flowrate (gpm) = 0.0593 gpm

Screened Interval (ft below G.L.) = 59.9-82.00'

59.9- 71.6 claystone

71.6- 74.0 missing core

74.0- 82.0 sandstone

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1986 - pg 256.)

RFW 10-05-003/A-5/85

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

WELL 25-86

$$T\ (gpd/ft) = \frac{264\,Q}{\Delta s'} = \frac{(264)(0.0593)}{451} = 3.47\times10^{-2}$$

where $Q\ (gpm) = 1.75\ gal/29.5\ min = 0.0593\ gpm$

$\Delta s'$ = ~~2t~~. change in residual drawdown / log cycle

= 451 ft/log cycle (see attached plot)

$$K\ (gpd/ft^2) = T/b = 3.47\times10^{-2}/22.1 = 1.57\times10^{-3}$$

where $b\ (ft) = 22.1\ ft$

$$K\ (cm/sec) = 1.57\times10^{-3}\ gpd/ft^2 \times \frac{4.72\times10^{-5}\ cm/sec}{gpd/ft^2} = 7\times10^{-8}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$.

$$t\ (min) = \frac{r^2 S}{4\,T\,u} = \frac{(0.156)^2\ 10^{-3}}{4\,(3.47\times10^{-2})(0.01)} \times \frac{1440\ min}{day} \times \frac{7.482\ gal}{ft^3}$$

$= 189$ min.

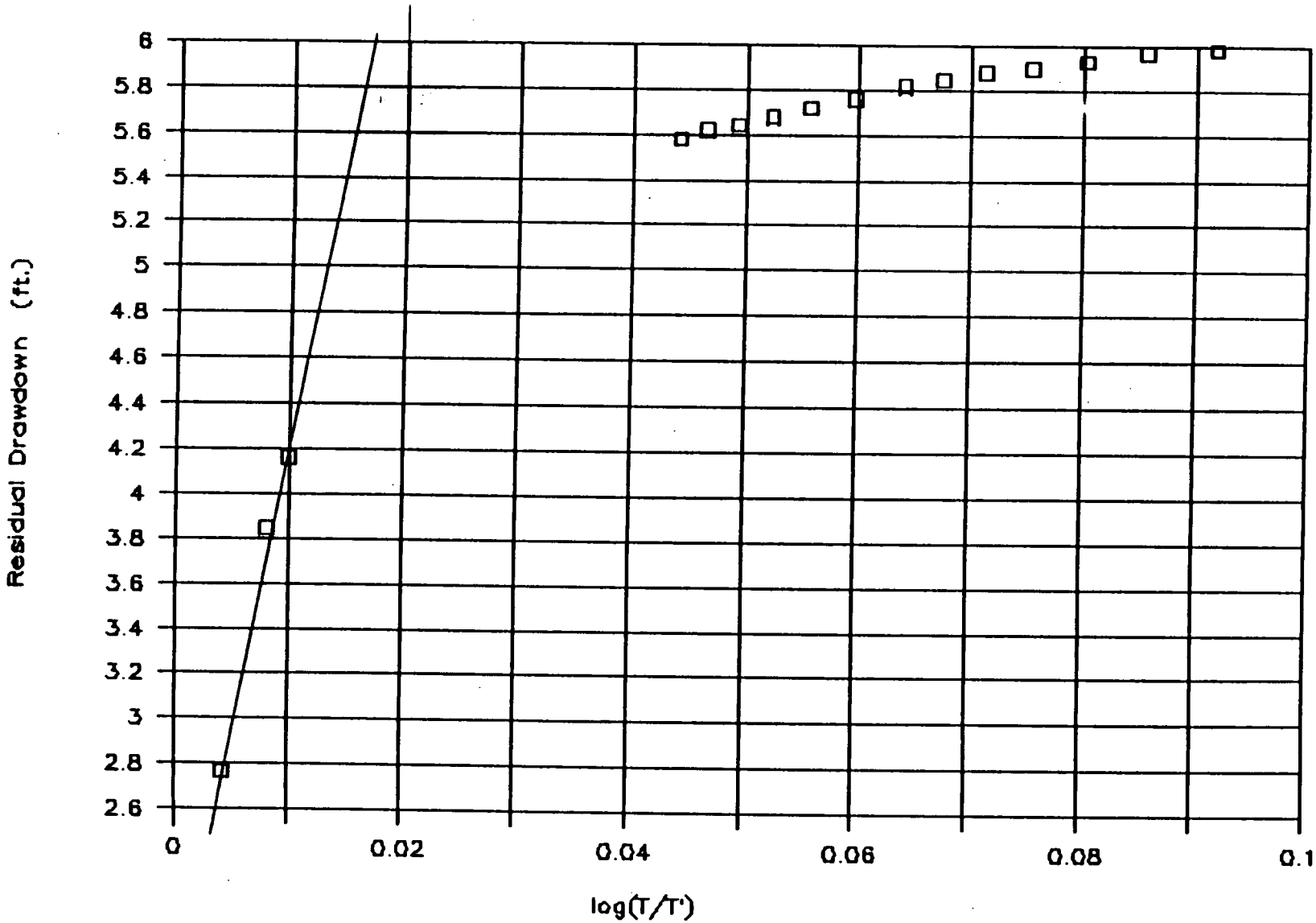
where $r\ (ft) = \left(\frac{3.75}{24}\right) ft = (0.156)\ ft$

$S = 10^{-3}$ assumed S for confined aquifer

Δs is based on points where $t \geq 1303$ min.

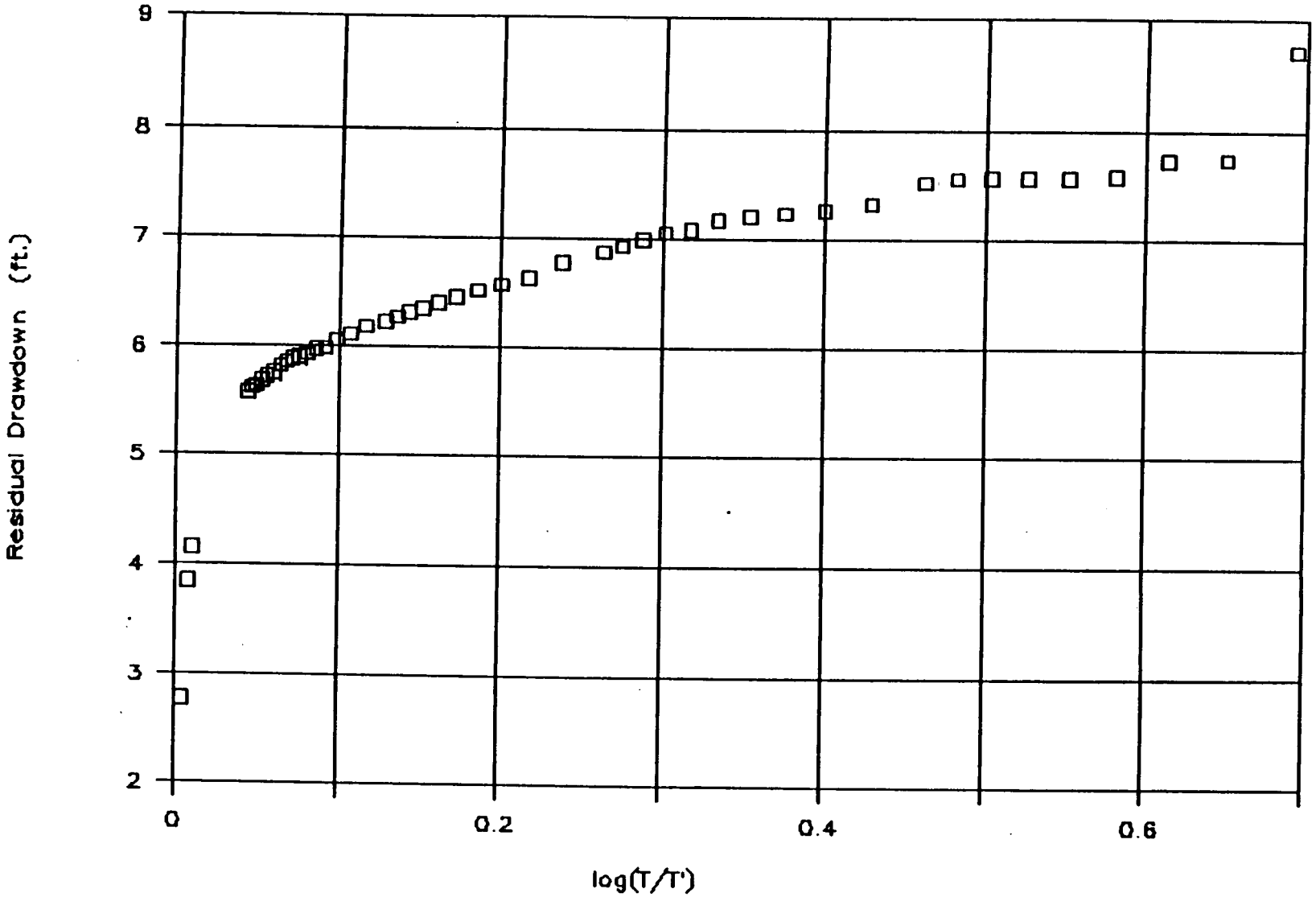
RFW 10-05-003/A-5/85

WELL 25-86

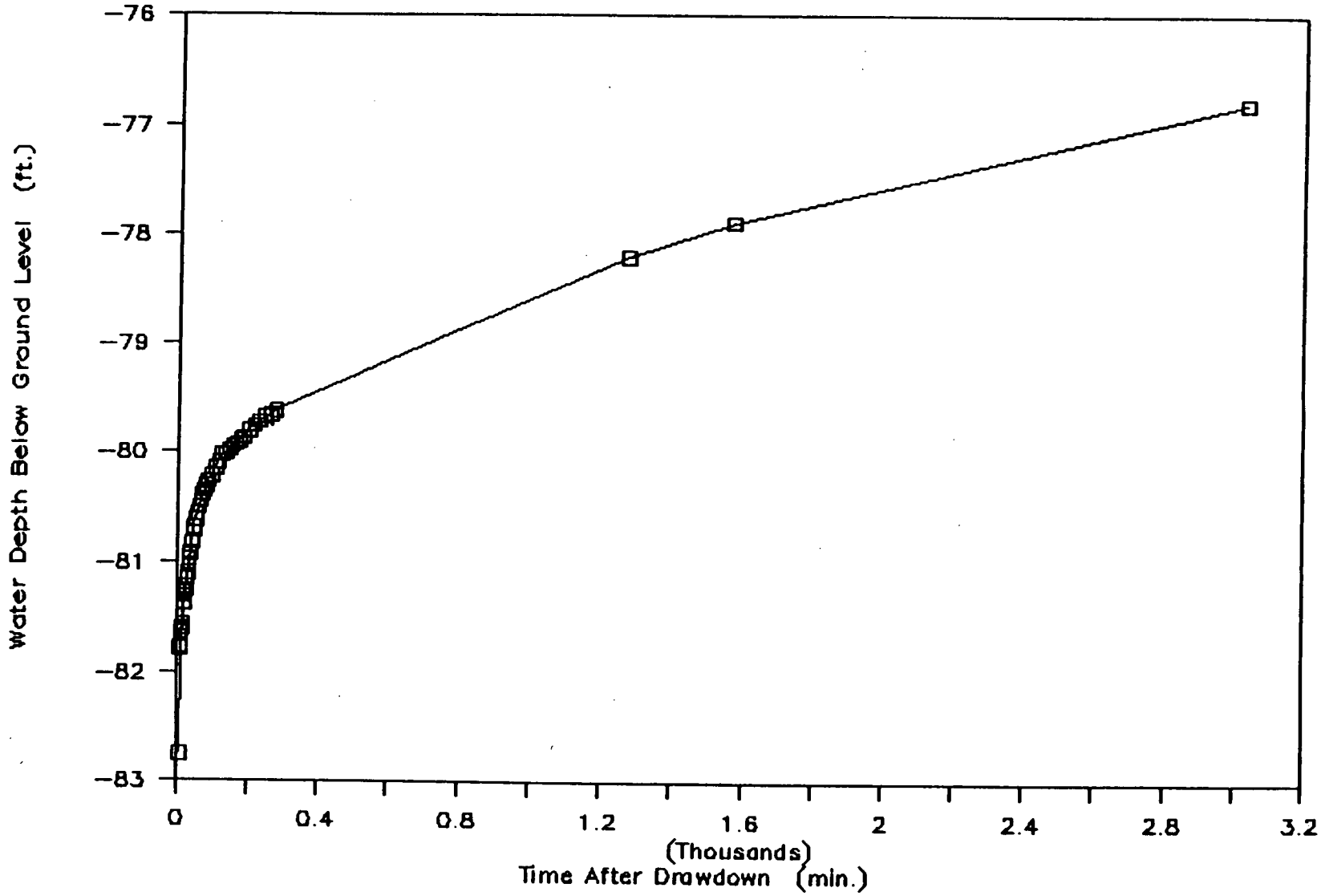


$$\Delta s' = \frac{(6-0)\,ft}{.0170-.0037} = 451\ ft/\log\ cycle$$

WELL 25-86



WELL 25-86


-76
-77
-78
-79
-80
-81
-82
-83
Water Depth Below Ground Level (ft.)
0
0.4
0.8
1.2
1.6
2
2.4
2.8
3.2
(Thousands)
Time After Drawdown (min.)

WELL 25-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	log(T/T')
37.00	7.50	82.75	8.71	0.69
38.00	8.50	81.78	7.74	0.65
39.00	9.50	81.77	7.73	0.61
40.00	10.50	81.63	7.59	0.58
41.00	11.50	81.61	7.57	0.55
42.00	12.50	81.61	7.57	0.53
43.00	13.50	81.61	7.57	0.50
44.00	14.50	81.60	7.56	0.48
45.00	15.50	81.57	7.53	0.46
47.00	17.50	81.37	7.33	0.43
49.00	19.50	81.30	7.26	0.40
51.00	21.50	81.28	7.24	0.38
53.00	23.50	81.25	7.21	0.35
55.00	25.50	81.22	7.18	0.33
57.00	27.50	81.13	7.09	0.32
59.00	29.50	81.10	7.06	0.30
61.00	31.50	81.03	6.99	0.29
63.00	33.50	80.97	6.93	0.27
65.00	35.50	80.92	6.88	0.26
70.00	40.50	80.82	6.78	0.24
75.00	45.50	80.68	6.64	0.22
80.00	50.50	80.61	6.57	0.20
85.00	55.50	80.56	6.52	0.19
90.00	60.50	80.49	6.45	0.17
95.00	65.50	80.44	6.40	0.16
100.00	70.50	80.39	6.35	0.15
105.00	75.50	80.35	6.31	0.14
110.00	80.50	80.31	6.27	0.14
115.00	85.50	80.26	6.22	0.13
125.00	95.50	80.22	6.18	0.12
135.00	105.50	80.14	6.10	0.11
145.00	115.50	80.09	6.05	0.10
155.00	125.50	80.02	5.98	0.09
165.00	135.50	80.01	5.97	0.09
175.00	145.50	79.97	5.93	0.08
185.00	155.50	79.94	5.90	0.08
195.00	165.50	79.92	5.88	0.07
205.00	175.50	79.89	5.85	0.07
215.00	185.50	79.86	5.82	0.06
230.00	200.50	79.80	5.76	0.06
245.00	215.50	79.76	5.72	0.06
260.00	230.50	79.72	5.68	0.05
275.00	245.50	79.68	5.64	0.05
290.00	260.50	79.66	5.62	0.05
305.00	275.50	79.62	5.58	0.04
1303.00	1273.50	78.20	4.16	0.01
1602.00	1572.50	77.89	3.85	0.01
3061.00	3031.50	76.81	2.77	0.00

AQUIFER TEST DATA

WELL 25.86
PUMPING or OBSERVATION WE
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Step Down Rec. Test
HOW Q MEASURED 4 Gal Bucket
HOW W.L.'s MEASURED Chalk
RAD./DIST. OF/FROM PUMPING WELL 1'
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-12-86 time 10:35
PUMP OFF: date 11-12-86 time 11:04:30
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT

TIME (t = ____ at t' = 0)					WATER LEVEL DATA (STATIC WATER LEVEL: 76+.64 (not Abs))					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSION CORRECTION	WATER LEVEL	s or s'		READING	Q		
1	11:05				~~11~~ TD	1.50							T.D. 84.40
	11:05½	.5			~~11~~ TD								11:04:30 - FIN RUN
	11:06	1.0			~~11~~ TD								AT 4 - AUT.
	11:06½	1.5			~~11~~ TD								
	11:07	2.0			~~11~~ TD								WL = 76+
	11:07½	2.5			11 TD								all = 1.75
	11:08	3.0			11 TD								
	11:08½	3.5			11 TD								
	11:09	4.0			11 TD								
	11:09½	4.5			11 TD								
	11:10	5.0			11 TD								
	~~11:10½~~												
	1111	6.0			80+3.40								
	1112	7			80+3.25	1.50	82.75	8.71				CW	
	1113	8			80+3.28	1.50	81.78	7.74				CW	
	1114	9			80+3.27		81.77	7.73				CW	
	1115	10			80+3.13		81.63	7.59				"	
	1116	11			80+3.11		81.61	7.57				"	
	1117	12			80+3.11		81.61	7.57				"	
	1118	13			80+3.11		81.61	7.57				"	
	1119	14			80+3.10		81.60	7.56				"	
	1120	15			80+3.07		81.57	7.53				"	
	1122	17			80+2.87		81.37	7.33				CW	
	1124	19			80+2.80		81.30	7.26				AB	
	1126	21			80+2.78		81.28	7.24					
	1128	23			80+2.75		81.25	7.21					
	1130	25			80+2.72		81.22	7.18					
	1132	27			80+2.63		81.13	7.09					
	1134	29			80+2.60		81.10	7.06					
	1136	31			80+2.53		81.03	6.99					
	1138	33			80+2.47		80.97	6.93					
	1140	35			80+2.42		80.92	6.88					
	1145	40			80+2.32		80.82	6.78					
	1150	45			80+2.18		80.68	6.64					
	1155	50			80+2.11		80.61	6.57					
	1200	55			80+2.06		80.56	6.52					
	1205	60			80+1.99		80.49	6.45					
	1210	65			80+1.94		80.44	6.40					
	1215	70			80+1.89		80.39	6.35					
	1220	75			80+1.85		80.35	6.31					
	1225	80			80+1.81		80.31	6.27					

AQUIFER TEST DATA

WELL 25-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST Bail Down Recov. Test
HOW Q MEASURED 4 Gal Bucket
HOW W.L.'s MEASURED Sounder
RAD./DIST. OF/FROM PUMPING WELL 1'
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-12-86 time
PUMP OFF: date 11-13-86 time
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT

TIME (t = ____ at t' = 0)					WATER LEVEL DATA (STATIC WATER LEVEL 75.54)					DISCHARGE			
DAY	CLOCK TIME	t	t'		READING	CORRECTIONS	WATER LEVEL	s or s'		READING	Q	RECORDED BY	COMMENT
	12:30	85			80+1.76	1.50	80.26	6.22					
	12:40	95			80+1.72		80.22	6.18					
	12:50	105			80+1.64		80.14	6.10					
	13:00	115			80+1.59		80.09	6.05					
	13:10	125			80+1.52		80.02	5.98					
	13:20	135			80+1.51		80.01	5.97					
	13:30	145			80+1.47		79.97	5.93					
	13:40	155			80+1.44		79.94	5.90					
	13:50	165			80+1.42		79.92	5.88					
	14:00	175			80+1.39		79.89	5.85					
	14:10	185			80+1.36		79.86	5.82					
	14:25	200			80+1.30		79.80	5.76					
	14:40	215			80+1.26		79.76	5.72					
	14:55	230			80+1.22		79.72	5.68					
1	15:10	245			80+1.18		79.68	5.64					
1	15:25	260			80+1.16		79.66	5.62					
1	15:40	275			80+1.12		79.62	5.58					
2	8:18				75+4.70		78.70	4.16					
2	13:17				75+4.39			3.85					
3	13:36				75+3.31			2.77	90%				
6	8:46				75+0.31								
6	15:27				75+0.15								
7	8:22				74+4.96								
7													

PACKER TEST ANALYSIS
WELL NO. 25-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/06/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 35.88 - 47.06
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00128193 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 41.47 + 9.00 + .00 * 2.31 = 50.47
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000153 FT/MIN
K = .00000078 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00407424 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 41.47 + 5.33 + 5.00 * 2.31 = 58.35
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000421 FT/MIN
K = .00000214 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00050092 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 41.47 + 6.87 + .00 * 2.31 = 48.34
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000063 FT/MIN
K = .00000032 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 25-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/06/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 48.05 - 59.23
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00001692 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 53.64 + 10.70 + .00 * 2.31 = 64.34
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00005802 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 53.64 + 5.33 + 10.30 * 2.31 = 82.76
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN
K = .00000002 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 25-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/06/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 58.86 - 70.04
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005802 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 64.45 + 10.84 + .00 * 2.31 = 75.29
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN
K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00187212 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 64.45 + 5.33 + 12.00 * 2.31 = 97.50
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000116 FT/MIN
K = .00000059 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00078693 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 64.45 + 8.69 + .00 * 2.31 = 73.14
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000065 FT/MIN
K = .00000033 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 25-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/06/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 69.36 - 80.54
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00006092 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.95 + 10.67 + .00 * 2.31 = 85.62
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN
K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00993387 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.95 + 5.33 + 15.00 * 2.31 = 114.93
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000521 FT/MIN
K = .00000265 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00213231 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.95 + 10.06 + .00 * 2.31 = 85.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000151 FT/MIN
K = .00000077 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 25-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/06/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 83.29 - 94.47
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00038077 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 69.92 + 10.60 + .00 * 2.31 = 80.52
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000029 FT/MIN
K = .00000014 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00782772 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 69.92 + 5.33 + 18.90 * 2.31 = 118.91
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000397 FT/MIN
K = .00000202 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00811115 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.18 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 69.92 + 10.20 + .00 * 2.31 = 80.12
R = BOREHOLE RADIUS = .16 FEET

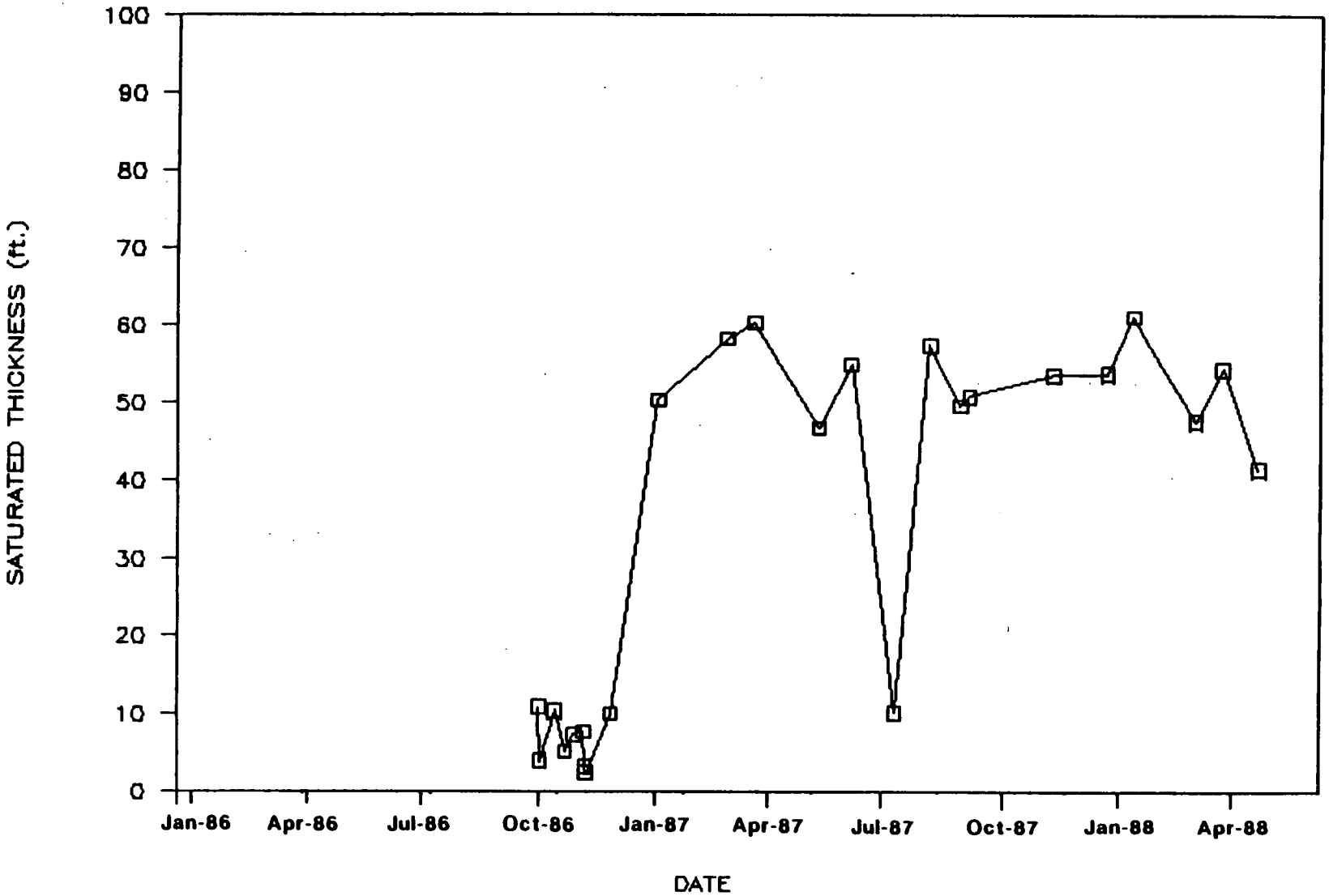
K = HYDRAULIC CONDUCTIVITY = .00000611 FT/MIN
K = .00000310 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2586	09/30/86	5974.45	5976.55	2.10	82.00	71.05	5905.50
	10/01/86					77.93	5898.62
	10/13/86					71.42	5905.13
	10/21/86					76.73	5899.82
	10/28/86					74.59	5901.96
	11/05/86					74.24	5902.31
	11/06/86					78.65	5897.90
	11/07/86					79.52	5897.03
	11/26/86					71.94	5904.61
	01/01/87					31.83	5944.72
	02/25/87					23.92	5952.63
	03/18/87					21.75	5954.80
	05/08/87					35.38	5941.17
	06/03/87					27.25	5949.30
	07/08/87					71.70	5904.85
	08/04/87					24.70	5951.85
	08/27/87					32.60	5943.95
	09/03/87					31.40	5945.15
	11/09/87					28.60	5947.95
	12/21/87					28.40	5948.15
	01/11/88					21.00	5955.55
	02/29/88					34.60	5941.95
	03/21/88					27.80	5948.75
	04/18/88					40.70	5935.85

SATURATED THICKNESS IN WELL # 25-86 (SP)



INDEX OF DATA

Boring No.: 26-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 26-86

Date Drilled 8/22/86

Boring Method Hollow Stem Auger

Coordinates N 37425.8 E 21737.2

Ground Surface Elevation 5974.48

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			**ARTIFICIAL FILL**			
				0-1.5'-Sample. Recovered 1.3/1.5'=87%. GRAVEL: light brown (5YR 6/4) granite and quartzite pebbles and cobbles; sandy; poorly sorted; angular to subangular; dry.			
				1.5-4.0'-Sample. Recovered 0/2.5'=0%.			
	2.5			4.0-7.0'-Sample. Recovered 2.6/3.0'=87%.			
				4.0-4.5'. Same as above; dry.			
				4.5-7.0'. SAND: very pale orange (10YR 8/2) to grayish orange (10YR 7/4); very coarse to fine-grained; some granite and quartzite pebbles and cobbles; silty; grades into dark yellow orange (10YR 6/6) sand at base of sample; bedding apparent due to size variation; poorly sorted; subangular to angular; damp.			
	5			7.0-9.0'-Sample. Recovered 0.0/2.0'=0%.			
				9.0-12.0'-Sample. Recovered 3.0/3.0'=100%.			
				9.0-9.5'. Same as above; damp.			
	7.5			**ARAPAHOE FORMATION**			
				9.5-12.0'. CLAYSTONE: light olive brown (5Y 5/6); some silt; trace sand; sand layers from 10.4-10.7' and 11.4-11.6'; sand is very pale orange (10YR 8/2); coarse-grained; moderately sorted; subangular; trace calcareous cement; unconsolidated; soft; wet; clay is firm; moist.			
	10						

Remarks Logged by: T. Murphy

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 26-86

Date Drilled 8/22/86

Boring Method Hollow Stem Auger

Coordinates N 37425.8 E 21737.2

Ground Surface Elevation 5974.48

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	10						
	12.5			12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: medium dark gray (N 4) with grayish orange (10YR 7/4) and pale olive (10YR 6/2) mottling; some silt with very coarse-grained sand lenses less than 0.2' thick; ironstone layer at 12.9-13.2' with calcareous cement; firm; moist.			
	15						
				TOTAL DEPTH: 17.0'			
	17.5						
	20						

Remarks Logged by: T. Murphy

Checked by: [illegible]

Project No. 106P06222

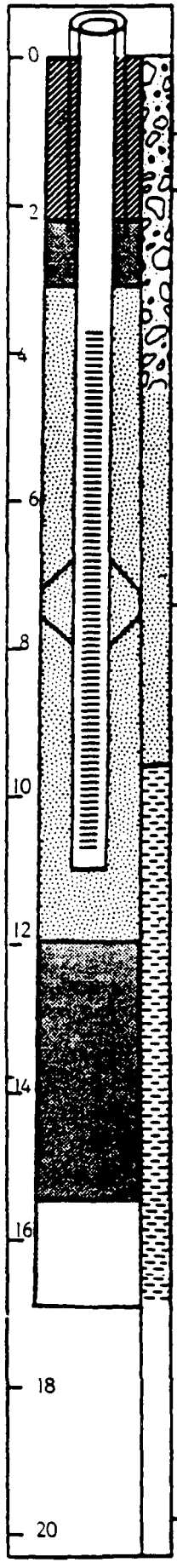
Hydro-Search, Inc.

WELL 26-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37425.8 E 21737.2

ELEVATION: GROUND LEVEL 5974.48'
TOP OF CASING 5976.49'



PROJECT 106P06222 Rocky Flats Plant
PERSONNEL T. Murphy
LOCATION Golden, CO

DRILLING SUMMARY:

TOTAL DEPTH Well: 11.00' Hole: 17.00'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.75'	C1			
3.75'	11.00'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
6.80' - 8.00'

FILTER MATERIAL 32-42 silica sand
3.10' - 12.20'

CEMENT Portland Type I
0.00' - 2.20'

OTHER 3/8" bentonite pellets
2.20' - 3.10'
12.20' - 15.50'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	8/22	1235	8/22	1400
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	8/22	1555	8/22	1556
FILTER PLACEMENT:	8/22	1556	8/22	1504
CEMENTING:	8/22	1607	8/22	1611
DEVELOPMENT:	9/12	1415	9/17	1110
OTHER:				
Bentonite	8/22	1604	8/22	1602
	8/22	1550	8/22	1555

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 9.46', recorded 1 day after well completed.

Top of stainless steel casing: 2.01'

Cave from TD to 15.50'

WESTON

MANAGERS DESIGNERS/CONSULTANTS

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 26-86

Hydraulic Conductivity (cm/sec) = 4×10^{-8}

Static Water Level (ft below G.L.) = 3.95'

Screened Interval (ft below G.L) = 3.75 - 11.00'

3.75 - 4.5 gravel

4.5 - 9.5 sand

9.5 - 11.00 claystone

Method of Analysis: (Bouwer, 1978)

RFW 10-05-003/A-5 85

RAW DATA

WELL # 26-86

WELL DIAMETER= 7.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .75 GALLONS
LENGTH OF AQUIFER TESTED= 7.05 FEET
VALUE OF HO= 6.85 FEET*
STATIC WATER LEVEL= 3.95 FEET
LENGTH OF SCREEN= 7.25 FEET
WATER TABLE TO BOTTOM OF WELL= 7.05 FEET

* The Ho calculated for a recovery of 0.75 gallons is 4.60 feet. Because this is less than the first residual drawdown recorded (6.85 feet) at T= 15.5 minutes, Ho has been set at 6.85 feet for this analysis.

SLUG TEST DATA:

TIME	WATER LEVEL (FEET)	TIME SINCE TEST BEGAN (MINUTES)
12. 5.30	10.80	15.50
12. 6. 0	10.60	16.00
12. 6.30	10.51	16.50
12. 7. 0	10.45	17.00
12. 7.30	10.38	17.50
12. 8. 0	10.35	18.00
12. 8.30	10.30	18.50
12. 9. 0	10.25	19.00
12. 9.30	10.22	19.50
12.10. 0	10.08	20.00
12.11. 0	10.05	21.00
12.12. 0	10.02	22.00
12.13. 0	9.94	23.00
12.14. 0	9.90	24.00
12.15. 0	9.90	25.00
12.16. 0	9.84	26.00
12.17. 0	9.82	27.00
12.18. 0	9.82	28.00
12.19. 0	9.74	29.00
12.20. 0	9.69	30.00
12.22. 0	9.65	32.00
12.24. 0	9.62	34.00
12.26. 0	9.59	36.00
12.28. 0	9.50	38.00
12.30. 0	9.50	40.00
12.32. 0	9.45	42.00
12.34. 0	9.45	44.00
12.36. 0	9.44	46.00
12.38. 0	9.41	48.00
12.40. 0	9.41	50.00
12.45. 0	9.39	55.00
12.50. 0	9.34	60.00
12.55. 0	9.31	65.00
13. 0. 0	9.26	70.00
13. 5. 0	9.23	75.00
13.10. 0	9.22	80.00
13.15. 0	9.18	85.00
13.20. 0	9.15	90.00
13.25. 0	9.14	95.00
13.35. 0	9.11	105.00

[illegible]	[illegible]	[illegible]
13.55. 0	9.02	125.00
14. 5. 0	9.00	135.00
14.15. 0	8.99	145.00
14.25. 0	8.99	155.00
14.35. 0	8.98	165.00
14.45. 0	8.96	175.00
14.55. 0	8.96	185.00
15. 5. 0	8.96	195.00
15.20. 0	8.93	210.00
15.35. 0	8.92	225.00
32.12. 0	8.82	1222.00
37.26. 0	8.75	1536.00
61.33. 0	8.78	2983.00
***43. 0	8.93	7013.00
***20. 0	8.90	7410.00
***19. 0	8.97	8429.00
***38. 0	8.90	8808.00

WELL # 26-86

WELL DIAMETER= 7.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER REMOVED OR ADDED TO WELL= .75 GALLONS
LENGTH OF AQUIFER TESTED= 7.05 FEET
VALUE OF HO= 6.85 FEET
STATIC WATER LEVEL= 3.95 FEET

SLUG TEST DATA:

TIME SINCE TEST BEGAN (MINUTES)	WATER LEVEL (FEET)	DRAWDOWN (FEET)	HEAD RATIO	RECIPROCAL TIME (1/MINUTES)
15.50	10.80	6.85	1.000	.065
16.00	10.60	6.65	.971	.063
16.50	10.51	6.56	.958	.061
17.00	10.45	6.50	.949	.059
17.50	10.38	6.43	.939	.057
18.00	10.35	6.40	.934	.056
18.50	10.30	6.35	.927	.054
19.00	10.25	6.30	.920	.053
19.50	10.22	6.27	.915	.051
20.00	10.08	6.13	.895	.050
21.00	10.05	6.10	.891	.048
22.00	10.02	6.07	.886	.045
23.00	9.94	5.99	.874	.043
24.00	9.90	5.95	.869	.042
25.00	9.90	5.95	.869	.040
26.00	9.84	5.89	.860	.038
27.00	9.82	5.87	.857	.037
28.00	9.82	5.87	.857	.036
29.00	9.74	5.79	.845	.034
30.00	9.69	5.74	.838	.033
32.00	9.65	5.70	.832	.031
34.00	9.62	5.67	.828	.029
36.00	9.59	5.64	.823	.028
38.00	9.50	5.55	.810	.026
40.00	9.50	5.55	.810	.025
42.00	9.45	5.50	.803	.024
44.00	9.45	5.50	.803	.023
46.00	9.44	5.49	.801	.022
48.00	9.41	5.46	.797	.021
50.00	9.41	5.46	.797	.020
55.00	9.39	5.44	.794	.018
60.00	9.34	5.39	.787	.017
65.00	9.31	5.36	.782	.015
70.00	9.26	5.31	.775	.014
75.00	9.23	5.28	.771	.013
80.00	9.22	5.27	.769	.013
85.00	9.18	5.23	.764	.012
90.00	9.15	5.20	.759	.011
95.00	9.14	5.19	.758	.011
105.00	9.11	5.16	.753	.010
115.00	9.06	5.11	.746	.009
125.00	9.02	5.07	.740	.008
135.00	9.00	5.05	.737	.007
145.00	8.99	5.04	.736	.007

165.00	8.98	5.03	.734	.006
175.00	8.96	5.01	.731	.006
185.00	8.96	5.01	.731	.005
195.00	8.96	5.01	.731	.005
210.00	8.93	4.98	.727	.005
225.00	8.92	4.97	.726	.004
1222.00	8.82	4.87	.711	.001
1536.00	8.75	4.80	.701	.001
2983.00	8.78	4.83	.705	.000
7013.00	8.93	4.98	.727	.000
7410.00	8.90	4.95	.723	.000
8429.00	8.97	5.02	.733	.000
8808.00	8.90	4.95	.723	.000

```
08:37:23.83     BAILDOWN - RECOVERY ANALYSIS FOR WELL 26-86      MON 06-20-1988

          WELL # 26-86

        --------------------

          PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

                    PERMEABILITY=5.00E-04/ MATCH TIME (IN MINUTES)
                    STORAGE COEF= 7.61E-02* ALPHA
               COMPUTER CALCULATES
                    ALPHA= .10      MATCH TIME= 1.52E+03
                    PERMEABILITY= 3.29E-07 CM/SEC
                    STORAGE COEF=7.61E-03
                    CORRELATION NUMBER=    .98

        --------------------

          PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

                    HVORSLEV PERMEABILITY=7.88E-04 / LAG TIME
                    BOUWER PERMEABILTY=1.30E-03 * -SLOPE

               COMPUTER CALCULATES
                    PERMEABILITY VARIES MORE THAN 20% DEPENDING ON THEEQUATION

                         FOR X ON Y: HVORSLEV PERMEABILITY=1.68E-08 CM/SEC
                                     BOUWER PERMEABILITY=9.45E-09CM/SEC
                         FOR Y ON X: HVORSLEV PERMEABILITY=1.02E-07 CM/SEC
                                     BOUWER PERMEABILITY=6.20E-08 CM/SEC
                         AVERAGE HVORSLEV PERMEABILITY=2.89E-08 CM/SEC
                         AVERAGE BOUWER PERMEABILITY=3.57E-08 CM/SEC
                         REGRESSION STATISTICS
                              X ON Y
                                INTERCEPT= -.09
                                SLOPE=-7.26E-06
                              Y ON X
                                INTERCEPT= -.06
                                SLOPE=-4.76E-05
                              CORRELATION COEFFICIENT= -.39
               CALCULATIONS INDICATE THAT A VALUE OF   8.70 FEET FOR HO
                    OR A VALUE OF    1.774 INCHES FOR EFFECTIVE CASING DIA.
                    MAY YIELD BETTER RESULTS

        --------------------

          PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METH

                    PERMEABILITY=5.74E-04 / SLOPE
                    PERMEABILITY=2.11E-05 CM/SEC
                         REGRESSION STATISTICS
                              X ON Y
                                INTERCEPT= 4.88
                                SLOPE= 2.71E+01
                              Y ON X
                                INTERCEPT= 4.88
                          SLOPE= 2.74E+01
                              CORRELATION COEFFICIENT=  .99
```

WELL #	PERMEABILITY METHOD 1	PERMEABILITY METHOD 2	STORAGE COEF METHOD 2	PERMEABILITY METHOD 3	PERMEABILITY METHOD 4
26-86	2.89E-08	3.29E-07	7.61E-03	2.11E-05	3.57E-08

* METHOD 1 IS HVORSLEV
METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS
METHOD 3 IS FERRIS AND KNOWLES
METHOD 4 IS BOUWER

AQUIFER TEST DATA

WELL 26-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE ____ OF ____

TYPE OF AQUIFER TEST baildown rec. test
HOW Q MEASURED 4 gall bucket
HOW W.L.'s MEASURED J Olympic
RAD./DIST. OF/FROM PUMPING WELL 1"
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT SW = 2.3

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11/12/86 time 11.50
PUMP OFF: date 11/12/86 time 12:04
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT

TIME (t = ____ at t' = 0)				WATER LEVEL DATA (STATIC WATER LEVEL 5+1.25)					DISCHARGE		RECORDED BY	COMMENTS
DATE	CLOCK TIME	t	t'	READING	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s'		READING	Q		TD 13.33
	1205			~~10+3.0~~		~~10.0~~	~~6.84~~ ?				CW	11.50 STARTED BAILING
	1205½	.5		10+3.1	2.30	10.80	6.85					1204 STOPPED BAILING
	1206	1.0		10+2.9	2.30	10.60	6.65					.75 - RATE 3 GPM
	1206½	1.5		10+2.81		10.51	6.56					
	1207	2.0		10+2.75		10.45	6.5					
	1207½	2.5		10+2.68		10.38	6.43					
	1208	3.0		10+2.65		10.35	6.4					
	1208½	3.5		10+2.60		10.30	6.35					(Reading) 10.4 Rec. = 6.9
	1209	4.0		10+2.55		10.25	6.30					
	1209½	4.5		10+2.50		10.22	6.27					
	1210	5		10+2.38		10.08	6.13					
	1211	6		10+2.35		10.05	6.1					
	1212	7		10+2.32		10.02	6.07					
	1213	8		10+2.24		9.94	5.99					
	1214	9		10+2.2		9.90	5.95					
	1215	10		10+2.2		9.90	5.95					
	1216	11		10+2.14		9.84	5.89					
	1217	12		10+2.12		9.82	5.87					
	1218	13		10+2.12		9.82	5.87					
	1219	14		10+2.04		9.74	5.79					
	1220	15		10+1.99		9.69	5.74					
	1222	17		10+1.95		9.65	5.7					
	1224	19		10+1.92		9.62	5.67					
	1226	21		10+1.89		9.59	5.64					
	1228	23		10+1.80		9.50	5.55					
	1230	25		10+1.80		9.50	5.55					
	1232	27		10+1.75		9.45	5.50					
	1234	29		10+1.75		9.45	5.50					
	1236	31		10+1.74		9.44	5.49					
	1238	33		10+1.71		9.41	5.46					
	1240	35		10+1.71		9.41	5.46					
	1245	40		10+1.69		9.39	5.44					
	1250	45		10+1.64		9.34	5.39					
	1255	50		10+1.61		9.31	5.36					
	1300	55		10+1.56		9.26	5.31					
	1305	60		10+1.53		9.23	5.28					
	1310	65		10+1.52		9.22	5.27					
	1315	70		10+1.48		9.18	5.23					
	1320	75		10+1.45		9.15	5.20					
	1325	80		10+1.44		9.14	5.19					
	1335	90		10+1.41		9.11	5.16				(W)	

AQUIFER TEST DATA

WELL 26-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE ____ OF ____

TYPE OF AQUIFER TEST ____
HOW Q MEASURED ____
HOW W.L.'s MEASURED ____
RAD./DIST. OF/FROM PUMPING WELL ____
MEAS. POINT FOR W.L.'s ____
ELEVATION OF MEAS. POINT ____

DEPTH OF PUMP/AIRPIPE ____
PUMP ON: date ____ time ____
PUMP OFF: date ____ time ____
DURATION OF AQUIFER TEST ____

LOCATION ____
PERSONNEL ____
PROJECT ____

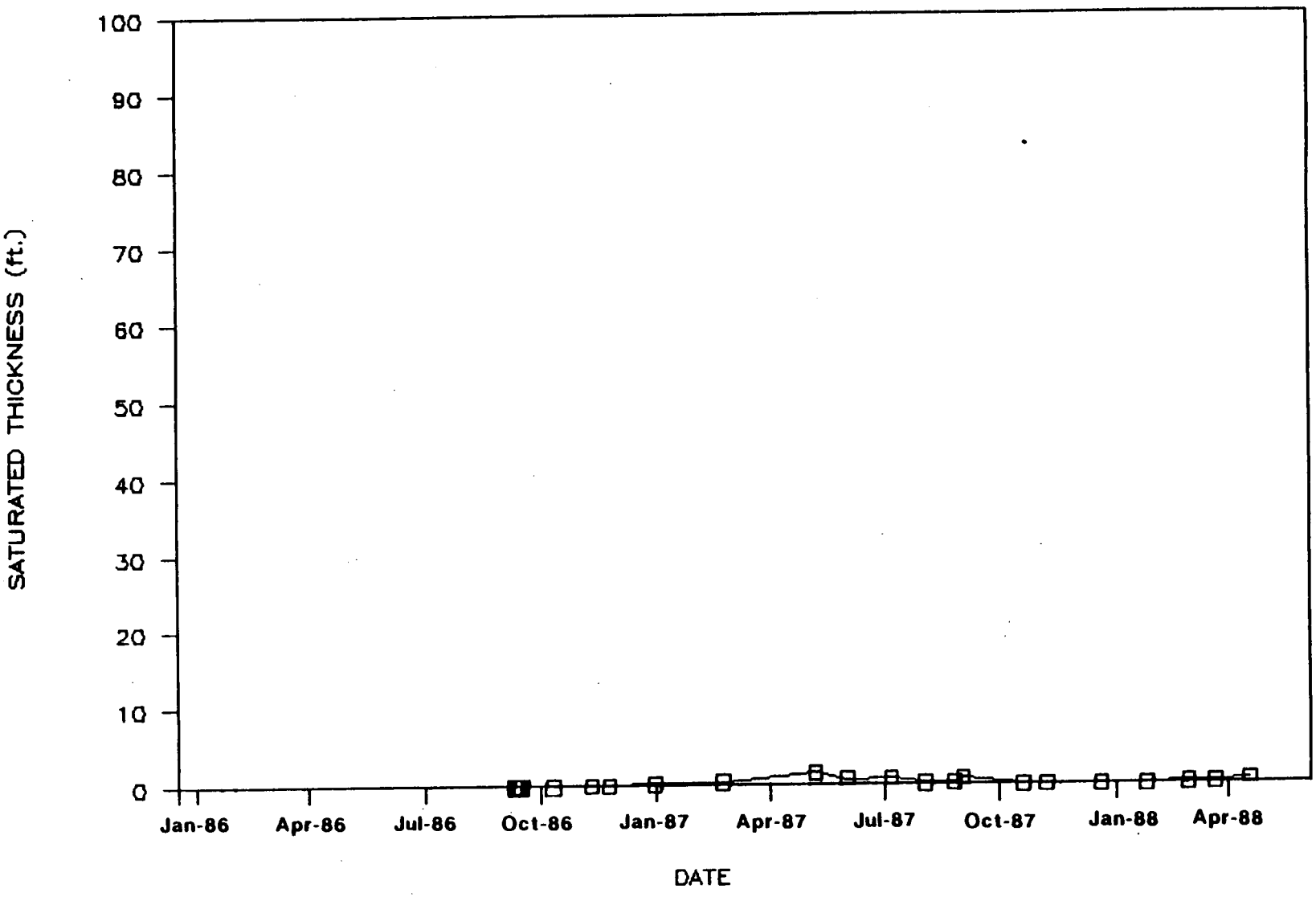
TIME (t = ____ at t' = 0)					WATER LEVEL DATA (STATIC WATER LEVEL 5+1.25)					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
	1345	100			10+1.36	2.80	9.06	5.11				Au	
	1355	110			10+1.32	"	9.02	5.07					
	1405	120			10+1.30		9.00	5.05					
	1415	130			10+1.29		8.99	5.04					
	1425	140			10+1.29		8.99	5.04					
	1435	150			10+1.28		8.98	5.03					
	1445	160			10+1.26		8.96	5.01					
	1455	170			10+1.26		8.96	5.01					
	1505	180			10+1.26		8.96	5.01					
1	1520	195			10+1.23		8.93	4.98					
1	1535	210			10+1.22		8.92	4.97					
2	8:12				10+1.12		8.82	4.87					
2	13:24				10+1.05		8.75	4.80					
3	13:33				10+1.08		8.78	4.83					
6	8:43				10+1.23		8.98	4.98					
6	15:20				10+1.20		8.90	4.95					
7	8:19				10+1.27		8.97	5.02					
7	14:38				10+1.20		8.90	4.95					
									ENOUGH DARREL SAYS				

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2686	01/27/86	5974.48	5976.49	2.01	11.00	11.60	5964.89
	09/12/86					11.34	5965.15
	09/13/86					11.54	5964.95
	09/15/86					11.45	5965.04
	09/16/86					11.63	5964.86
	09/17/86					11.64	5964.85
	09/18/86					11.67	5964.82
	10/13/86					11.86	5964.63
	11/12/86					11.60	5964.89
	11/26/86					11.32	5965.17
	01/01/87					10.71	5965.78
	02/25/87					10.54	5965.95
	05/08/87					9.48	5967.01
	06/03/87					10.25	5966.24
	07/08/87					10.20	5966.29
	08/04/87					10.80	5965.69
	08/27/87					10.70	5965.79
	09/03/87					10.20	5966.29
	10/21/87					11.50	5964.99
	11/09/87					11.60	5964.89
	12/21/87					11.60	5964.89
	01/27/88					11.60	5964.89
	02/29/88					10.80	5965.69
	03/21/88					10.70	5965.79
	04/18/88					10.40	5966.09

SATURATED THICKNESS IN WELL # 26-86 (SP)



INDEX OF DATA

Boring No.: 27-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 **Coordinates** N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5961.86

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/ Inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ARTIFICIAL FILL 0-2.0'-Sample. Recovered 1.0/2.0'=50%. GRAVEL: dusky brown (5YR 2/2) granite and quartzite coarse sand, pebbles and cobbles; some fine-grained sand; silty; slightly calcareous; poorly sorted; subangular; unconsolidated; dry. 2.0-4.0'-Sample. Recovered 0.9/2.0'=45%. GRAVEL: Same as above; calcareous; horizontal bedding; poorly sorted; unconsolidated; dry. 4.0-7.0'-Sample. Recovered 3.0/3.0'=100%. GRAVEL: very pale orange (10YR 6/2) to grayish orange (10YR 7/4) pebbles; grades downward into yellowish orange (10YR 6/6) coarse-grained sand; trace silt and clay; noncalcareous; poorly sorted; subangular; damp. 7.0-8.0'-Sample. Recovered 0.0/1.0'=0%. 8.0-12.0'-Sample. Recovered 4.0/4.0'=100%. 8.0-9.2'. GRAVEL: very pale orange (10YR 6/2) to grayish orange (10YR 7/4) pebbles with dark yellowish orange (10YR 6/6) coarse-grained sand; gravel layer at bottom; poorly sorted; unconsolidated; wet.			
	5						
	10						
	15			ARAPAHOE FORMATION 9.2-12.0'. CLAYSTONE: pale olive (10Y 4/2) to grayish olive (10Y 4/2) with dark yellowish orange (10YR 6/6) mottling; silty; coarse-grained sandstone stringer at 9.8'; firm; weathered; damp.			
	20						

Remarks Logged by: T. Murphy & J. Bergman Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 **Coordinates** N 37794.1 E 22134.9

Boring Method Hollow Stem Auger NC Core **Ground Surface Elevation** 5961.86

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottling. At 15.5' grades into medium dark gray (N 4) claystone; unweathered; damp to wet.			
				17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.			
				17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.			
	25			19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark yellowish orange (10YR 6/6) mottling along fractures; some ironstone in fractures; firm; damp.			
				23.0-28.5'-Sample. Recovered 3.5/5.0'=69%. RQD 2.9/3.5=87%. CLAYSTONE: dark yellowish orange (10YR 6/6); sandy; grades downward into a dusky yellow (5Y 6/4) sandy claystone; several patches of white very fine-grained sand; consolidated; dry.			
	30			28.5-33.5'-Sample. Recovered 2.0/5.0'=40%. RQD 1.5/2.0'=75%. CLAYSTONE: light gray (N 7) and pale yellowish brown (10YR 6/2); white caliche at 31.5' (0.25" thick); strong reaction strongly with HCL; consolidated; dry.			
	35			33.5-38.5'-Sample. Recovered 2.1/5.0'=42%. RQD 2.1/2.1'=100%. CLAYSTONE: dark yellowish orange (10YR 6/6) with moderate yellowish brown (10YR 5/4) limonite stains; grades downward into a pale yellowish brown (10YR 6/2) slightly sandy claystone; consolidated; dry.			
	40						

Remarks Logged by: T. Murphy & J. Bergman Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 **Coordinates** N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5961.86

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	40			38.5-43.5'-Sample. Recovered 3.6/5.0'=73%. RQD 3.6/3.6'=100%. CLAYSTONE: light olive gray (5Y 5/2); some fine to very fine-grained sand; dark yellowish orange (10YR 6/6) mottling; black organic fragments; few caliche stringers; consolidated; dry.			
	45			43.5-47.5'-Sample. Recovered 1.6/4.0'=40%. RQD 0.8/1.6'=50%. CLAYSTONE: yellowish brown (10YR 2/2) with some moderate yellowish orange (10YR 6/6) mottling; sandy; few black organic fragments; consolidated; damp.			
	50			47.5-52.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2); no mottling; homogenous; consolidated; dry.			
				52.5-57.5'-Sample. Recovered 3.5/5.0'=70%. RQD 2.5/3.5'=71%. CLAYSTONE: Same as above; dry.			
	55			57.5-62.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2) with moderate yellowish brown (10YR 5/4) mottling; at 59.0' and 59.5' hit a thin layer 0.3' and 0.1' thick, respectively, of moderate yellowish brown (10YR 5/4) siltstone nodules; very fine-grained; dry.			
	60						

Remarks Logged by: T. Murphy & J. Bergman Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 **Coordinates** N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5961.86

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	60						
				62.5-67.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2); sandy; several moderate yellowish brown (10YR 5/4) siltstone nodules at 66.4', 66.9' and 67.0'; each layer is less than .05' wide; consolidated; moist.			
	65						
				67.5-72.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2); sandy; moderate yellowish brown (10YR 5/4) siltstone nodules; consolidated; moist.			
	70						
				72.5-77.5'-Sample. Recovered 4.4/5.0'=88%. RQD 4.4/4.4'=100%. CLAYSTONE: olive gray (5Y 3/2); sandy; layer of moderate yellowish brown (10YR 5/4) siltstone nodules 73.8'; consolidated; moist.			
	75						
				77.5-82.5'-Sample. Recovered 4.5/5.0=90%. RQD 4.5/4.5'=100%. CLAYSTONE: olive gray (5Y 3/2); sandy; black organic fragments; consolidated; damp.			
	80						

Remarks Logged by: T. Murphy & J. Bergman Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 **Coordinates** N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5961.86

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	80						
				82.5-87.5'-Sample. Recovered 5.0/5.5'=91%. RQD 5.0/5.0'=100%. CLAYSTONE: Same as above; damp.			
	85			87.5-92.5'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2); moderate yellowish brown (10YR 5/4) siltstone nodules 91.8'; black organic fragments; consolidated; damp.			
	90						
				92.5-97.5'-Sample. Recovered 3.2/5.0'=64%. RQD 3.0/3.2'=94%. CLAYSTONE: olive gray (5Y 3/2); black organic fragments; consolidated; dry.			
	95						
				97.5-102.5'-Sample. Recovered 5.0/5.0'=100%. RQD 2.5/5.0'=50%. SILTSTONE: olive gray (5Y 3/2); very fine-grained; slightly sandy; black organic fragments; laminated; homogeneous; consolidated; dry.			
	100						

Remarks Logged by: T. Murphy & J. Bergman Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 **Coordinates** N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5961.86

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	100						
				102.5-107.5-Sample. Recovered 3.8/5.0'=76%. RQD 3.0/3.8=79%. SILTSTONE: Same as above; dry.			
	105			107.5-110.5'-Sample. Recovered 3.0/3.0'=100%. RQD 3.0/3.0'100%. SILTSTONE: Same as above; dry.			
	110			110.5-113.5'-Sample. Recovered 0.25/3.0'=8%. RQD 0.0/0.25'=0%. SILTSTONE: Same as above; dry.			
				113.0-117.0'-Sample. Recovered 2.2/4.0'=55%. RQD 0.1/2.2'=5%. CLAYSTONE: Olive gray (5Y 3/2); silty; some very fine-grained sand; black organic fragments; homogenous; consolidated; damp.			
	115						
				117.0-122.0'-Sample. Recovered 3.5/5.0'=70%. RQD 2.7/3.5'=77%. CLAYSTONE: olive gray (5Y 3/2); silty; few organics; homogenous; damp.			
	120						

Remarks Logged by: T. Murphy & J. Bergman Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 **Coordinates** N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5961.86

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	120			122.0-127.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'100%. CLAYSTONE: olive gray (5Y 3/2); silty; some very fine-grained sand; few organic fragments; homogenous; hard; dry.			
				127.0-132.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'= 100%.			
	125			127.0-129.0'. CLAYSTONE: olive gray (5Y 3/2); sandy; black organic fragments; homogeneous; consolidated; dry.			
				129.0-132.0'. SANDSTONE: clay grades into light gray (N 7) sandstone; silty; very fine-grained; thin clay laminae; few organics; well sorted; rounded; consolidated; dry.		▽	
	130			132.0-137.0'-Sample. Recovered 3.5/5.0'=70%. RQD 2.3/3.5=66%. 132.0-133.9'. SANDSTONE: light gray (N 7); silty; very fine-grained; very thin clay laminae; well sorted; rounded; consolidated; dry.			
	135			133.9-137.0. CLAYSTONE: grades into olive gray (5Y 3/2) claystone; silty and sandy; laminations in sandy intervals; no organics; consolidated; dry.			
				137.0-142.0'-Sample. Recovered 3.2/5.0'=64%. RQD 2.2/3.2'=69%. CLAYSTONE: olive gray (5Y 3/2); light brown (5YR 6/4) mottling; no organics; homogenous; slightly damp.			
	140						

Remarks Logged by: T. Murphy & J. Bergman Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 **Coordinates** N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5961.86

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	140						
				142.0-147.0'-Sample. Recovered 5.0/5.0'=100%. RQD 3.8/5.0'=76%. CLAYSTONE: olive gray (5Y 3/2); silty; some very fine-grained sand; grades downward into very fine-grained gray (N 7) sandstone; silty; few organics; laminated; well sorted; rounded; consolidated; dry.			
	145						
				147.0-152.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'100%. CLAYSTONE: olive gray (5Y 3/2) silty claystone and pale olive (10Y 6/2) very fine-grained silty sandstone; sandstone layers are less than 0.1' thick; well sorted; few organics; 2 dusky yellow (5Y 6/4) siltstone pockets at 148.0'; sample exhibits increased clay content with depth; consolidated; hard; slightly damp.			
	150						
				152.0-157.0'-Sample. Recovered 3.1/5.0'=62%. RQD 0.8/3.1'=26%. CLAYSTONE: alternating bands of olive gray (5Y 3/2) claystone and very fine-grained gray (N 7) silty sandstone; grades downward into olive gray (5Y 3/2) silty claystone; pale yellowish brown (10YR 6/2) siltstone nodule at 155.0'; consolidated; slightly damp.			
	155						
				TOTAL DEPTH: 157.0'			
	160						

Remarks Logged by: T. Murphy & J. Bergman Checked by:

Project No. 106P06222

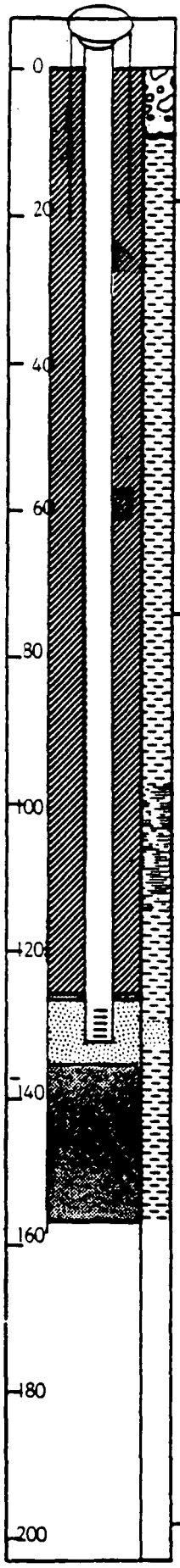
Hydro-Search, Inc.

WELL 27-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37794.1 E 22134.9

ELEVATION: GROUND LEVEL 5961.86'
TOP OF CASING 5963.26'



PROJECT 106P06222 Rocky Flats Plant
PERSONNEL T. Murphy/J. Bergman
LOCATION Golden, CO

DRILLING SUMMARY:

TOTAL DEPTH Well: 133.00' Hole: 157.00'

BOREHOLE DIAMETER 0.00' - 22.00': 7½"
22.00' - 157.00': 5 5/8"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue, Golden, CO
(Dave Jarvie, Robert Roach)

RIG 0.00' - 22.00': Mobile B-57; 22.00' - 157.00': Failing

BIT(S) 0.00' - 22.00': T5; 22.00' - 157.00': coring bit; stone bit, tricone

DRILLING FLUID 0.00' - 22.00': none; 22.00' - 157.00': air/water mist

SURFACE CASING 5" x 22.6' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	21.00'	C1			
0.00'	128.50'	C2			
128.50'	133.00'	S1			

CASING: C1 5" I.D. steel surface casing
C2 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS None

FILTER MATERIAL 32-42 silica sand
127.50' - 135.70'

CEMENT Portland Type I
0.00' - 126.50'

OTHER 3/8" bentonite pellets
126.50' - 127.00'
135.75' - 157.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	8/29	0935	8/29	1200
NC core	9/11	1545	9/17	1615
Reaming	9/19	0905	9/19	0945
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
5" steel	8/29	1300	8/29	1330
2" stainless	9/22	1110	9/22	1135
FILTER PLACEMENT:	9/22	1140	9/22	1150
CEMENTING:	9/23	1820	9/24	0920
DEVELOPMENT:	9/30	1215	10/1	0912
OTHER:				
Bentonite	9/22	1520	9/22	1620
	9/19	1625	9/19	1700
Packer testing				
Cementing 5" steel	8/29	1330	8/29	1400

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 8.0' during drilling.

Top of stainless steel casing: 1.40'

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 27-86

Hydraulic Conductivity (cm/sec) = 1.9×10^{-7}

Flowrate (gpm) = 0.0833 gpm

Screened Interval (ft below G.L.) = 128.5 - 133.0'

128.5 - 129.0 claystone

129.0 - 133.0 sandstone

Method of Analysis: Residual-Drawdown Plot

(Driscoll, 1986 - pg 256.)

RFW 10-05-003/A-5/85

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

WELL 27-86

$$T\,(gpd/ft) = \frac{264\,Q}{\Delta s'} = \frac{(264)\,(0.0833)}{1216} = 1.81 \times 10^{-2}$$

where $Q\,(gpm) = 1.5\,gal/18\,min = 0.0833\,gpm$

$\Delta s'$ = ft. change in residual drawdown / log cycle

= 1,216 ft (see attached plot)

$$K\,(gpd/ft^2) = T/b = 1.81 \times 10^{-2}/4.5 = 4.02 \times 10^{-3}$$

where $b\,(ft) = 4.50\,ft$

$$K\,(cm/sec) = 4.02 \times 10^{-3}\,gpd/ft^2 \times \frac{4.72 \times 10^{-5}\,cm/sec}{gpd/ft^2} = 1.9 \times 10^{-7}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$

$$t\,(min) = \frac{r^2 S}{4\,T\,u} = \frac{(.234)^2\,(10^{-3})}{4\,(1.81 \times 10^{-2})\,(0.01)} \times \frac{1440\,min}{day} \times \frac{7.48\,gal}{ft^3}$$

= 715 min

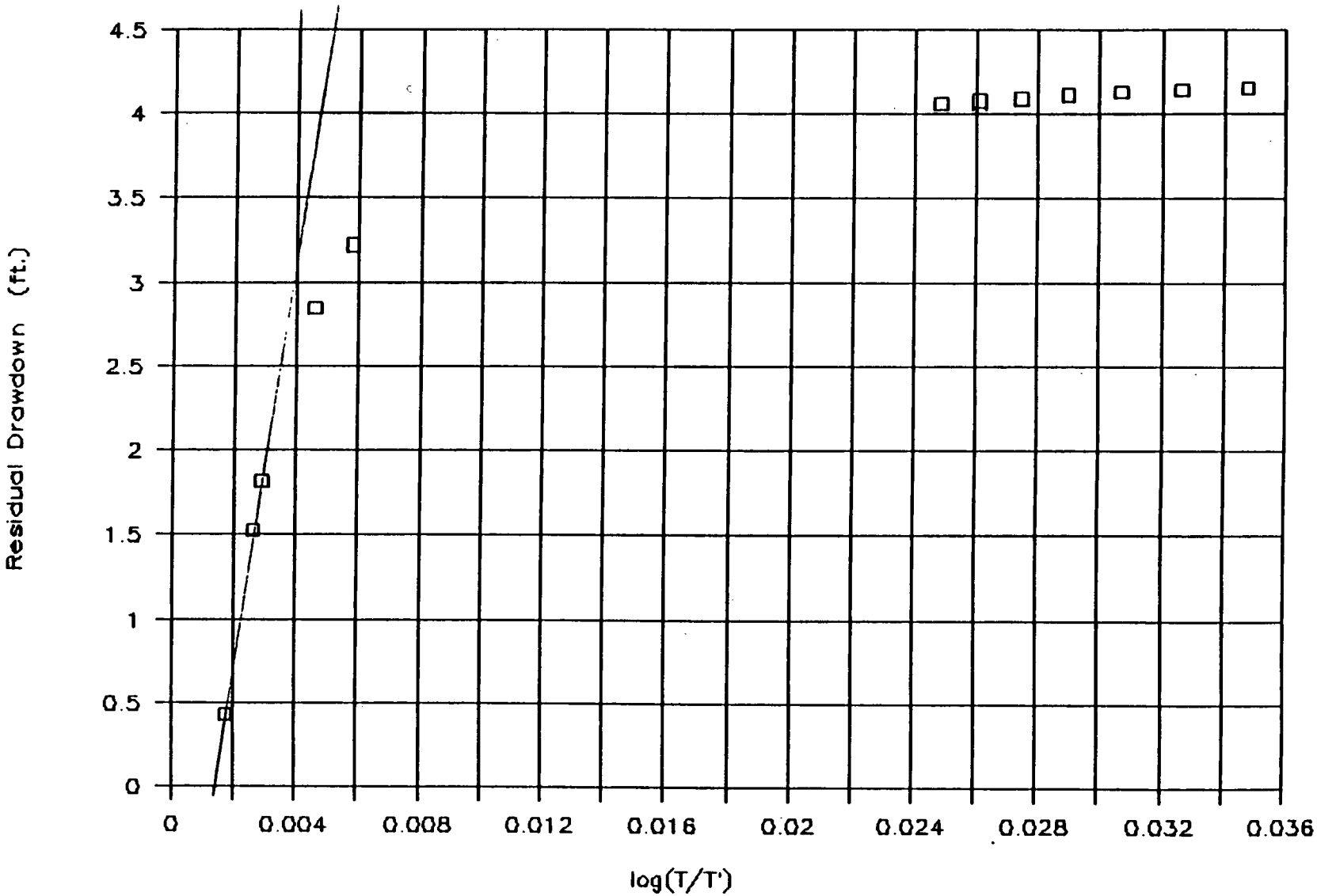
where $r\,(ft) = \left(\frac{5\frac{5}{8}}{24}\right) ft = .234\,ft$

$S = 10^{-3}$ assumed S for confined aquifer

$\Delta s'$ is based on points where $t \geq 2721$ min

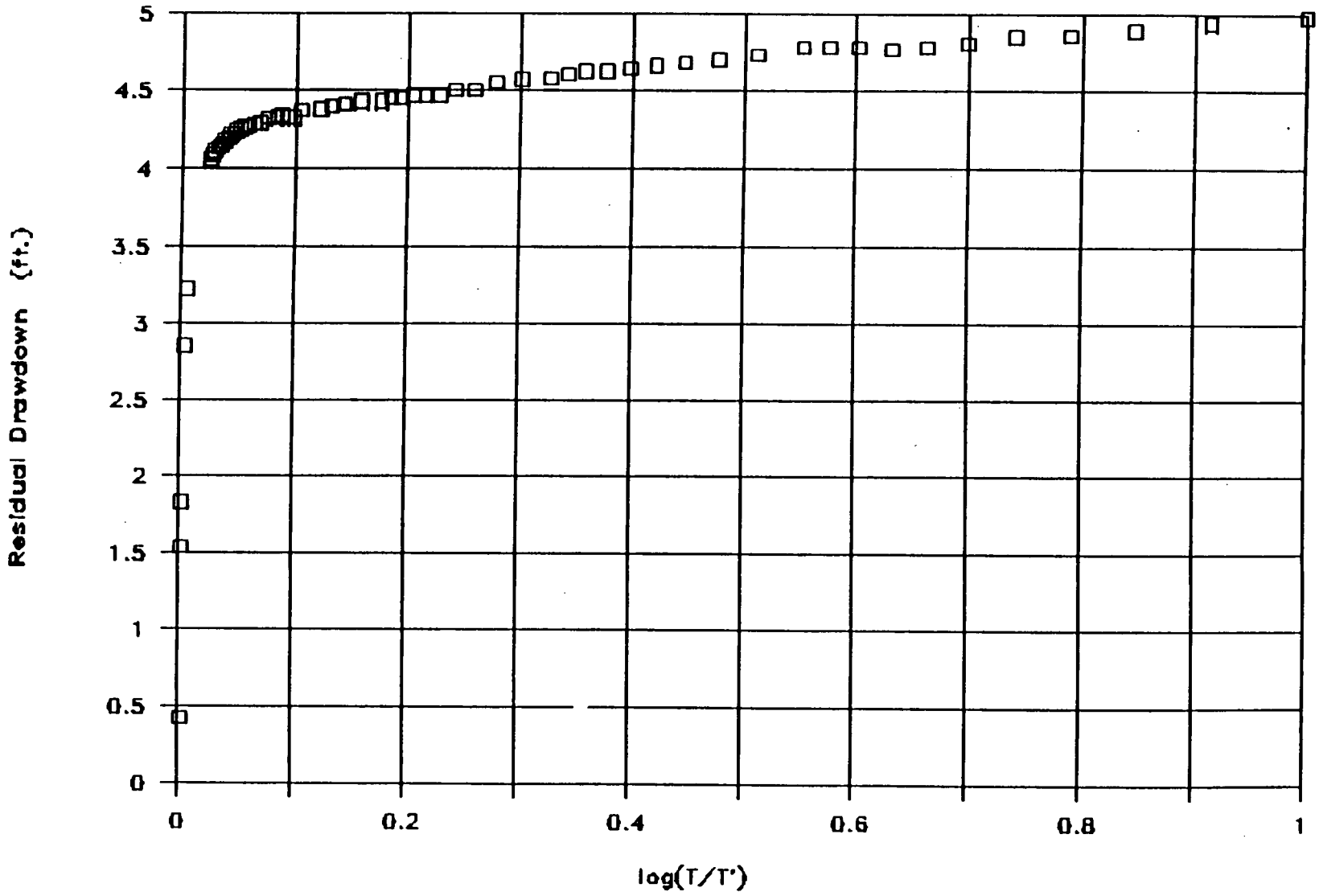
RFW 10-05-003/A-5/85

WELL 27-86

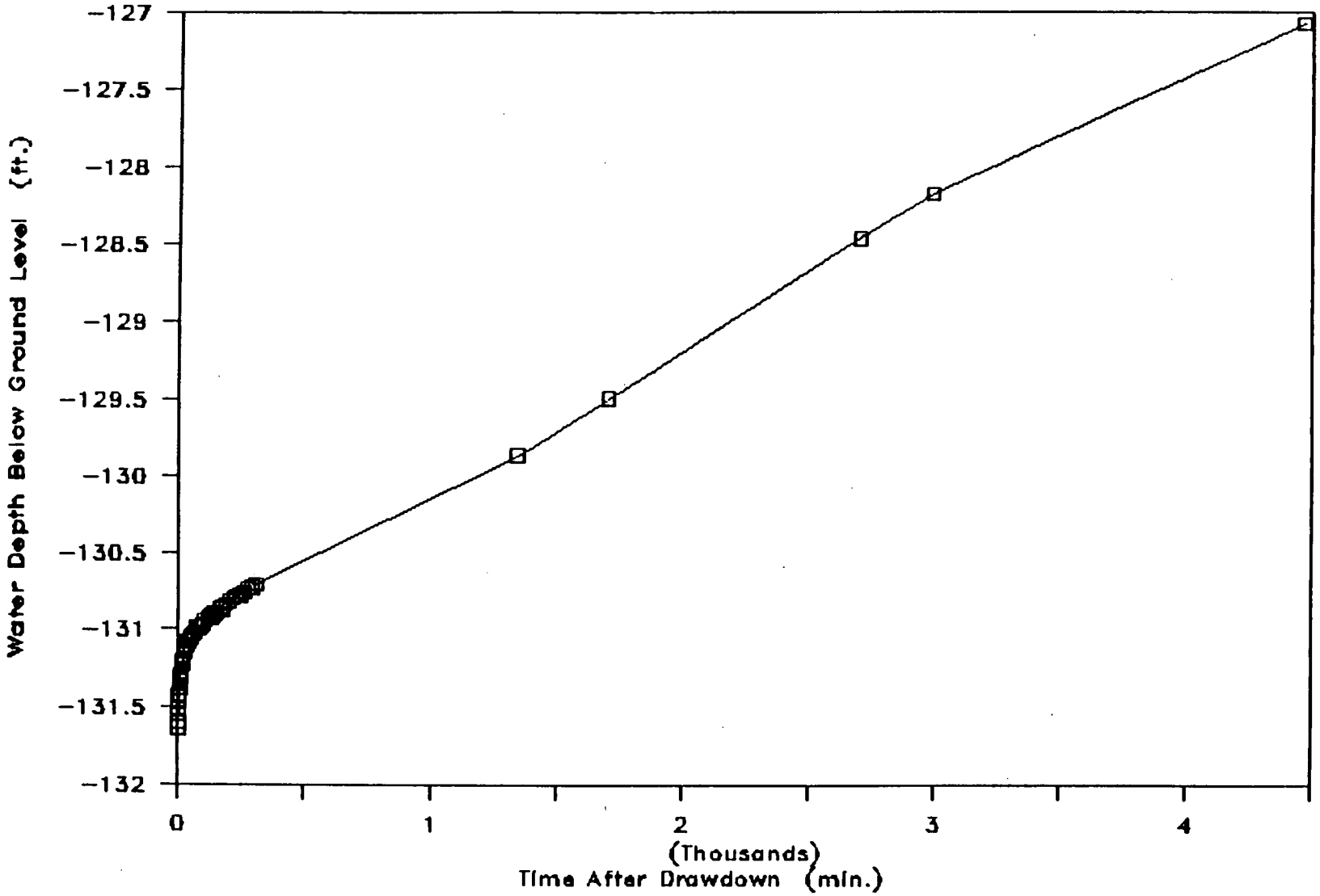


$\Delta s' = \frac{(4.5-0)\ ft}{.0051-.0014} = 1216\ ft/$ log cycle

WELL 27-86



WELL 27-86


-127
-127.5
-128
-128.5
-129
-129.5
-130
-130.5
-131
-131.5
-132
Water Depth Below Ground Level (ft.)
0
1
2
3
4
(Thousands)
Time After Drawdown (min.)

WELL 27-86

T	T'	Water Level (ft.)	s Rsd Drwdn (ft.)	log(T/T')
20.00	2.00	131.63	4.98	1.00
20.50	2.50	131.59	4.94	0.91
21.00	3.00	131.54	4.89	0.85
21.50	3.50	131.51	4.86	0.79
22.00	4.00	131.50	4.85	0.74
22.50	4.50	131.46	4.81	0.70
23.00	5.00	131.43	4.78	0.66
23.50	5.50	131.42	4.77	0.63
24.00	6.00	131.43	4.78	0.60
24.50	6.50	131.43	4.78	0.58
25.00	7.00	131.43	4.78	0.55
26.00	8.00	131.38	4.73	0.51
27.00	9.00	131.35	4.70	0.48
28.00	10.00	131.33	4.68	0.45
29.00	11.00	131.31	4.66	0.42
30.00	12.00	131.29	4.64	0.40
31.00	13.00	131.27	4.62	0.38
32.00	14.00	131.27	4.62	0.36
33.00	15.00	131.25	4.60	0.34
34.00	16.00	131.23	4.58	0.33
36.00	18.00	131.22	4.57	0.30
38.00	20.00	131.20	4.55	0.28
40.00	22.00	131.15	4.50	0.26
42.00	24.00	131.15	4.50	0.24
44.00	26.00	131.12	4.47	0.23
46.00	28.00	131.12	4.47	0.22
48.00	30.00	131.12	4.47	0.20
50.00	32.00	131.10	4.45	0.19
52.00	34.00	131.10	4.45	0.18
54.00	36.00	131.08	4.43	0.18
59.00	41.00	131.08	4.43	0.16
64.00	46.00	131.06	4.41	0.14
69.00	51.00	131.05	4.40	0.13
74.00	56.00	131.03	4.38	0.12
84.00	66.00	131.02	4.37	0.10
89.00	71.00	130.98	4.33	0.10
94.00	76.00	130.98	4.33	0.09
99.00	81.00	130.99	4.34	0.09
104.00	86.00	130.98	4.33	0.08
114.00	96.00	130.97	4.32	0.07
124.00	106.00	130.94	4.29	0.07
134.00	116.00	130.93	4.28	0.06

WELL 27-86

T	T'	Water Level (ft.)	s Rsd Drwdn (ft.)	log(T/T')
144.00	126.00	130.92	4.27	0.06
154.00	136.00	130.91	4.26	0.05
164.00	146.00	130.90	4.25	0.05
174.00	156.00	130.89	4.24	0.05
184.00	166.00	130.87	4.22	0.04
194.00	176.00	130.86	4.21	0.04
204.00	186.00	130.84	4.19	0.04
219.00	201.00	130.82	4.17	0.04
234.00	216.00	130.80	4.15	0.03
249.00	231.00	130.79	4.14	0.03
264.00	246.00	130.78	4.13	0.03
279.00	261.00	130.76	4.11	0.03
294.00	276.00	130.74	4.09	0.03
309.00	291.00	130.73	4.08	0.03
324.00	306.00	130.71	4.06	0.02
1360.00	1342.00	129.87	3.22	0.01
1720.00	1702.00	129.50	2.85	0.00
2721.00	2703.00	128.47	1.82	0.00
3011.00	2993.00	128.18	1.53	0.00
4483.00	4465.00	127.08	0.43	0.00

AQUIFER TEST DATA

WELL 37-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST [illegible]
HOW Q MEASURED Agal. [illegible]
HOW W.L.'s MEASURED [illegible]
RAD./DIST. OF/FROM PUMPING WELL 1"
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-11-86 time
PUMP OFF: date 11-11-86 time
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT

TIME: t = _____ at t' = 0

WATER LEVEL DATA: STATIC WATER LEVEL 126.65 (NAT.)

DAY	CLOCK TIME	t	t'		READING	CONVERSIONS or CORRECTIONS	WATER LEVEL	s or s'		DISCHARGE READING	DISCHARGE Q	RECORDED BY	COMMENTS
1	11:30	0.0			130+3.23	-1.30	131.63	4.98				CW	11:10 [illegible]
1	11:30½	.5			[illegible]	[illegible]	131.59	4.94				CW	
	11:31	1.0			[illegible]		131.54	4.89				"	11:28 Stop [illegible]
	11:31½	1.5			130+3.11		131.51	4.86				"	[illegible] 1.5 [illegible]
	11:32	2.0			130+3.10	"	131.50	4.85					
	11:32½	2.5			130+3.06		131.46	4.81					
	1133	3.0			130+3.03		131.43	4.78					50% recovery =
	11:33½	3.5			[illegible]-3.02		131.42	4.77			(READING)		128.74'
	1134	4.0			130+3.03		131.43	4.78					
	11:34½	4.5			[illegible]		[illegible]	4.78					
125	1135	5.0			[illegible]		131.43	4.78					
	1136	6			[illegible]+2.99		131.40	4.73					
	1137	7			[illegible] 2.99		131.35	4.70					
	1138	8			[illegible]		131.33	4.68					
	1139	9			[illegible]		131.31	4.66					
	1140	10			[illegible]		131.29	4.64					
	1141	11			130+2.93		131.27	4.62					
	1142	12			130+2.87		131.27	4.62					
	1143	13			130+2.85		131.25	4.60					
	1144	14			130+2.83		131.23	4.58					
	1146	16			130+2.82		131.22	4.57					
	1148	18			[illegible]		131.20	4.55					
	1150	20			[illegible]		131.15	[illegible]					
	1152	22			[illegible]		131.15	[illegible]					
	1154	24			[illegible]		131.12	4.47					
	1156	26			[illegible]		131.12	4.47					
	1158	28			[illegible]		131.12	4.47					
	1200	30			[illegible]		131.10	4.45					
	1202	32			[illegible]+2.70		131.10	4.45					
	1204	34			[illegible]		131.08	4.43					
	1209	39			[illegible]		131.08	4.43					
	1214	44			[illegible]		[illegible]	4.41					
	1219	49			130+2.65		131.05	4.40					
	1224	54			130+2.63		131.03	[illegible]					
	1229	59											
	1234	64			[illegible]		131.02	4.37					
	1239	69			130+2.58		130.98	4.33					
	1244	74			130+2.58		130.98	4.33					
	1249	79			130+2.59		130.99	4.34					
	1254	84			[illegible]		[illegible]	4.33					
	1304	94			[illegible]		[illegible]	4.33					

AQUIFER TEST DATA

WELL 37-4C
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST
HOW Q MEASURED
HOW W.L.'s MEASURED
RAD./DIST. OF/FROM PUMPING WELL
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date time
PUMP OFF: date time
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT

TIME					WATER LEVEL DATA					DISCHARGE		RECORDED BY	COMMENTS
t = ____ at t' = 0					STATIC WATER LEVEL 126.65 (est)								
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS or CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
1	13:14	104			130+2.34	-1.60	130.94	4.29				BB	
1	13:24	114			130+2.33	-1.60	130.93	4.28				"	
	13:34	124			130+2.32	"	130.92	4.27				"	
	13:44	134			130+2.31		130.91	4.26					
	13:54	144			130+2.30		130.90	4.25					
	14:04	154			130+2.29		130.89	4.24					
	14:14	164			130+2.27		130.87	4.22					
	14:24	174			130+2.26		130.86	4.21					
	14:34	184			130+2.24		130.84	4.19					
	14:49	199			130+2.22		130.82	4.17					
	15:04	214			130+2.20		130.80	4.15					
	15:19	229			130+2.19		130.79	4.14					
	15:34	244			130+2.18		130.78	4.13					
	15:49	259			130+2.16		130.76	4.11					
	16:04	274			130+2.14		130.74	4.09					
1	16:19	289			130+2.13		130.73	4.08					
1	16:34	304			130+2.11		130.71	4.06					
1	16:40	310											
2	9:50				130+1.47								
2	15:50				130+1.10								
3	8:31				130+.07								
3	13:21				125+4.78		50%						
4	13:53				125+3.68								
7	8:59				125+0.34								
7	8:39				125+0.03								
8	8:36				120+4.27								
8													

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 24.29 - 35.84
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00264001 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.55 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 30.07 + 5.00 + 2.00 * 2.31 = 39.69
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000394 FT/MIN
K = .00000200 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00196308 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.55 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 30.07 + 5.00 + 3.50 * 2.31 = 43.15
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000270 FT/MIN
K = .00000137 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J.BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 24.65 - 35.84
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00264001 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 30.24 + 5.00 + 2.00 * 2.31 = 39.86
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000402 FT/MIN
K = .00000204 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00196308 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 30.24 + 5.00 + 3.50 * 2.31 = 43.33
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000275 FT/MIN
K = .00000140 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 35.84 - 47.03
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00078523 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 41.43 + 5.00 + 2.00 * 2.31 = 51.05
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000093 FT/MIN
K = .00000047 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00124554 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 41.43 + 5.00 + 5.50 * 2.31 = 59.14
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000128 FT/MIN
K = .00000065 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00006769 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 41.43 + 5.00 + 2.00 * 2.31 = 51.05
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN
K = .00000004 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 42.58 - 53.77
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00001354 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 48.18 + 5.00 + 2.00 * 2.31 = 57.80
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00001354 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 48.18 + 5.00 + 8.00 * 2.31 = 71.65
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN
K = .00000001 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 48.18 + 5.00 + .00 * 2.31 = 53.18
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLAT PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 70.96 - 82.15
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00287016 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.56 + 5.00 + 2.50 * 2.31 = 87.33
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000200 FT/MIN
K = .00000101 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .01111511 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.56 + 5.00 + 14.50 * 2.31 = 115.05
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000587 FT/MIN
K = .00000298 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00476555 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.56 + 5.00 + 2.00 * 2.31 = 86.18
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000336 FT/MIN
K = .00000171 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
PLANT JOB NO. 106P06222
E TESTED: 9/15/86 BY: J. BERGMAN
VAL (FEET BELOW G.S.): 70.96 - 82.15
L TESTED: ARAPAHOE CLAYSTONE
WATER (FEET BELOW G.S.): 129.14

$$= \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

EST
Q = INJECTION RATE = .00287016 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.56 + 5.00 + 2.50 * 2.31 = 87.33
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000200 FT/MIN
K = .00000101 CM/SEC

Q = INJECTION RATE = .01111511 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
T INTERVAL IS ABOVE WATER TABLE
D = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.56 + 5.00 + 14.50 * 2.31 = 115.05
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000587 FT/MIN
K = .00000298 CM/SEC

EST
Q = INJECTION RATE = .00476555 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.56 + 5.00 + 2.00 * 2.31 = 86.18
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000336 FT/MIN
K = .00000171 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 82.15 - 93.34
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00054154 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 87.74 + 5.00 + 2.00 * 2.31 = 97.36
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000034 FT/MIN
K = .00000017 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .01650343 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 87.74 + 5.00 + 17.30 * 2.31 = 132.71
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000755 FT/MIN
K = .00000384 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00119139 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 87.74 + 5.00 + 2.00 * 2.31 = 97.36
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000074 FT/MIN
K = .00000038 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 96.43 - 107.62
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00113723 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 102.03 + 5.35 + 2.00 * 2.31 = 112.00
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000062 FT/MIN
K = .00000031 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00104246 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 102.03 + 5.35 + 20.00 * 2.31 = 153.57
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000041 FT/MIN
K = .00000021 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 102.03 + 5.35 + 2.00 * 2.31 = 112.00
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN
K = .00000004 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 96.43 - 107.62
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00113723 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 102.03 + 5.35 + 2.00 * 2.31 = 112.00
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000062 FT/MIN
K = .00000031 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00104246 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 102.03 + 5.35 + 20.00 * 2.31 = 153.57
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000041 FT/MIN
K = .00000021 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 102.03 + 5.35 + 2.00 * 2.31 = 112.00
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN
K = .00000004 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 107.62 - 118.81
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 113.21 + 5.35 + 2.00 * 2.31 = 123.18
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00048739 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 113.21 + 5.35 + 23.00 * 2.31 = 171.69
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000017 FT/MIN
K = .00000009 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00002708 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 113.21 + 5.35 + 2.00 * 2.31 = 123.18
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN
K = .00000001 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 107.62 - 118.81
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 113.21 + 5.35 + 2.00 * 2.31 = 123.18
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00048739 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 113.21 + 5.35 + 23.00 * 2.31 = 171.69
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000017 FT/MIN
K = .00000009 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00002708 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 113.21 + 5.35 + 2.00 * 2.31 = 123.18
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN
K = .00000001 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 118.81 - 130.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 124.40 + 5.35 + 2.00 * 2.31 = 134.38
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00067693 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 124.40 + 5.35 + 26.00 * 2.31 = 189.82
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000022 FT/MIN
K = .00000011 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00008123 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 124.40 + 5.35 + 2.00 * 2.31 = 134.38
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN
K = .00000002 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 130.00 - 141.19
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00004062 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 129.14 + 5.35 + 2.00 * 2.31 = 139.11
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00369601 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 129.14 + 5.35 + 27.50 * 2.31 = 198.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000113 FT/MIN
K = .00000058 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00035200 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 129.14 + 5.35 + 2.00 * 2.31 = 139.11
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000015 FT/MIN
K = .00000008 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 27-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 138.37 - 149.56
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00006769 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 129.14 + 5.35 + 3.00 * 2.31 = 141.42
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00036554 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 129.14 + 5.35 + 30.50 * 2.31 = 204.94
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000011 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 129.14 + 5.35 + 3.00 * 2.31 = 141.42
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

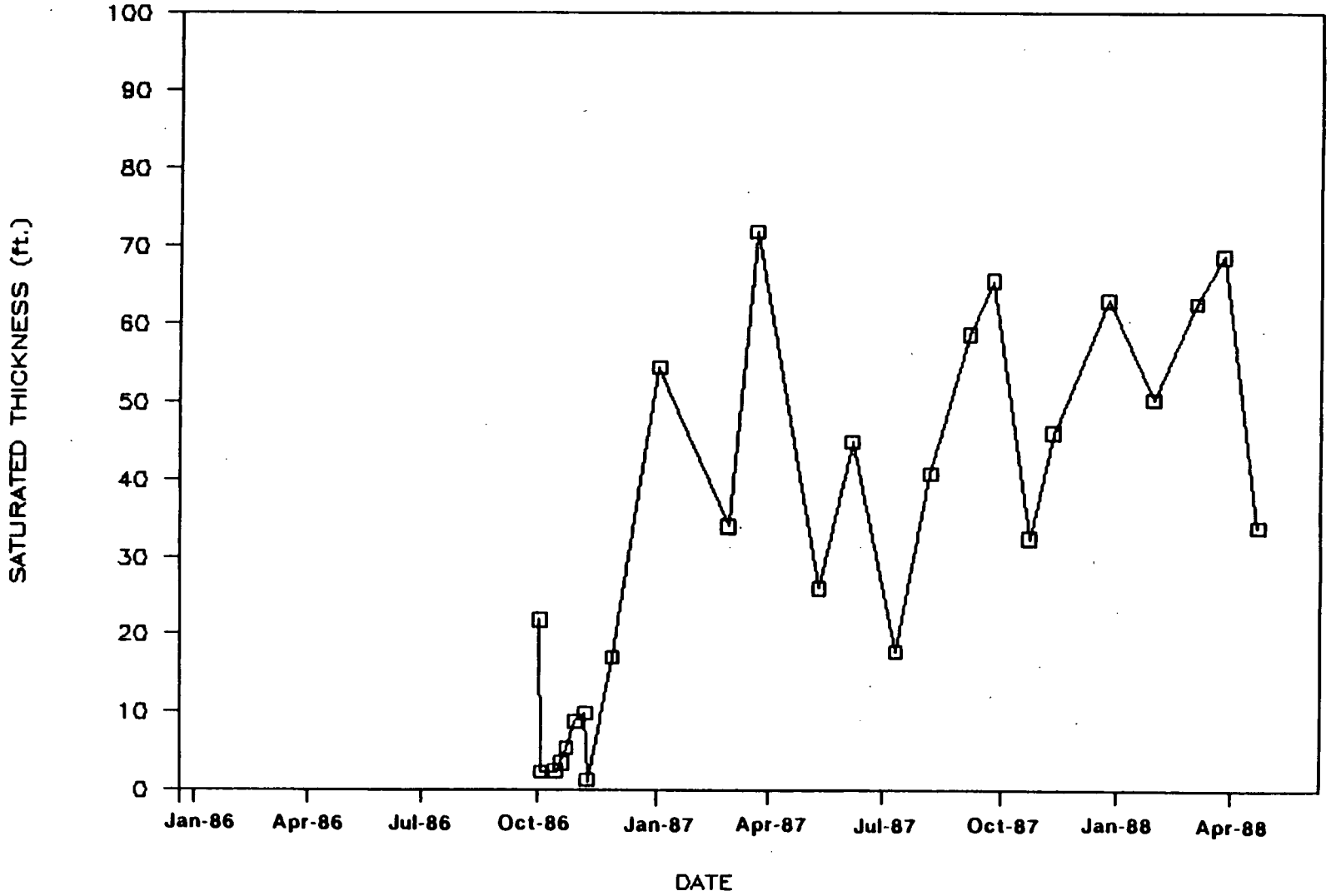
NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2786	09/30/86	5961.86	5963.26	1.40	133.00	111.2	5852.04
	10/01/86					130.6	5832.66
	10/13/86					130.5	5832.78
	10/17/86					129.4	5833.85
	10/21/86					127.5	5835.76
	10/28/86					124.2	5839.09
	11/05/86					123.1	5840.16
	11/07/86					131.6	5831.66
	11/26/86					115.9	5847.32
	01/01/87					78.71	5884.55
	02/25/87					99.04	5864.22
	03/19/87					61.25	5902.01
	05/08/87					107.0	5856.22
	06/03/87					88.22	5875.04
	07/08/87					115.2	5848.11
	08/04/87					92.40	5870.86
	09/03/87					74.50	5888.76
	09/22/87					67.60	5895.66
	10/21/87					100.7	5862.56
	11/09/87					87.10	5876.16
	12/22/87					70.10	5893.16
	01/27/88					82.80	5880.46
	02/29/88					70.50	5892.76
	03/21/88					64.40	5898.86
	04/18/88					99.30	5863.96

SATURATED THICKNESS IN WELL # 27-86(SP)



INDEX OF DATA

Boring No.: 28-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 28-86

Date Drilled 8/28/86 **Coordinates**

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5964

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ARTIFICIAL FILL 0-1.0'-Sample. Recovered 0.8/1.0'=80%. GRAVEL: grayish orange pink (5YR 7/2) to very pale orange (10YR 8/2) granite, quartzite and sandstone pebbles; sandy; silty, calcareous; poorly sorted; subangular to subrounded; unconsolidated; dry.			
	2			1.0-2.0'-Sample. Recovered 0.0/1.0'=0%. 2.0-4.0'-Sample. Recovered 1.5/2.0'=75%. GRAVEL: Same as above; trace silt and very light gray (N 8) sand; grayish orange (10YR 7/4) gravel layer from 3.5-4.0'; calcareous; poorly sorted; unconsolidated; dry.			
	4			4.0-5.5'-Sample. Recovered 1.5/1.5'=100%. GRAVEL: Same as above; trace silt and very light gray (N 8) sand; white (N 9) fine silt layer at 4.9'; calcareous; dusky yellow green (5GY 5/2) fine-grained sand and silt layer from 5.4-5.5'; moderately sorted; unconsolidated; dry.			
	6			5.5-8.0'-Sample. Recovered 0.0/2.5'=0%.		▽	
	8						

Remarks Logged by: T. Murphy Checked by: _____

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 28-86

Date Drilled 8/28/86 **Coordinates**

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5964

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	8			8.0-12.5'-Sample. Recovered 4.5/4.5'=100%.			
				8.0-8.4'. GRAVEL: Same as above; trace silt and very light gray (N 8) sand; poorly sorted; subangular to subrounded; unconsolidated; dry.			
				ARAPAHOE FORMATION			
	10			8.4-12.5'. CLAYSTONE: pale olive (10YR 6/2) with dark yellowish orange (10YR 6/6) mottling; trace silt; thin coarse sand lense at 9.1-9.2'; slightly calcareous; weathered; damp.			
	12			12.5-15.5'-Sample. Recovered 3.0/3.0'=100%. CLAYSTONE: pale olive (10YR 6/2) with dark yellowish orange (10YR 6/6) mottles; trace silt; weathered; grades downward into brownish gray (5YR 4/1) claystone; damp.			
	14						
	16			TOTAL DEPTH: 15.5'			

Remarks Logged by: T. Murphy Checked by:_____

Project No. 106F06222

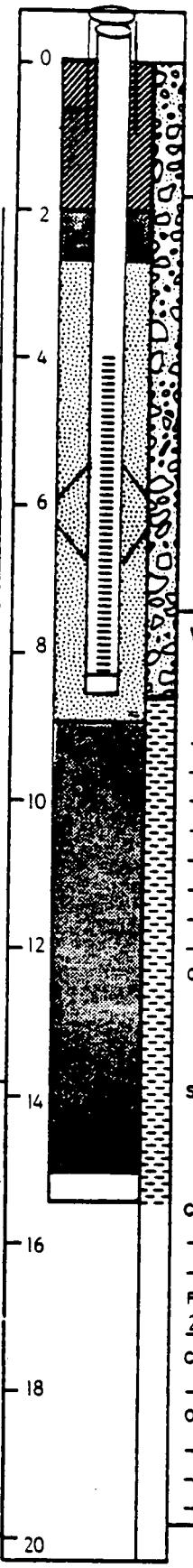
Hydro-Search, Inc.

WELL 2S-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37816.2 E 22137.1

ELEVATION: GROUND LEVEL 5961.23'
TOP OF CASING 5963.77'



PROJECT 10616222 Rocky Flats Plant
LOCATION Golden, CO
PERSONNEL T. Murphy

DRILLING SUMMARY:

TOTAL DEPTH Well: 8.60' Hole: 15.50'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) T5

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	4.03'	C1
4.03'	8.60'	S1

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
6.75' - 5.55'

FILTER MATERIAL 32-42 silica sand
2.70' - 9.70'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.70'
9.70' - 15.10'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	8/29	1007	8/29	1230
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	8/29	1532	8/29	1532
FILTER PLACEMENT:	8/29	1530	8/29	1615
CEMENTING:	8/29	1630	8/29	1632
DEVELOPMENT:	9/12	1325	9/18	1300
OTHER:				
Bentonite	8/29	1615	8/29	1630
	8/29	1515	8/29	1530

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.54'

Cave from TD to 15.10'

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 28-86

Hydraulic Conductivity (cm/sec) = NA

Flowrate (gpm) = 0.069

Screened Interval (ft below G.L.) = 6.19 (Static W.L.) - 9.96'

Note TD measured at time of test was 9.96 ft below Ground level This was used in analysis as Base of screened interval. T.D. measured June 21, 1988 was 9.47 ft below Ground level.

Method of Analysis Residual-drawdown Plot (Driscoll, 1986 - pg 256.)

RFW 10-05-003/A-5/85

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

WELL 28-86

$$T\,(gpd/ft) = \frac{264\,Q}{\Delta s'} = \frac{264\,(.0690)}{289} \quad 6.30 \times 10^{-2}$$

where $Q\,(gpm) = 1\,\text{gallon}/14.5\,\text{min} = 0.0690\,gpm$

$\Delta s'$ = ft. change in residual drawdown / log cycle

= 289 ft/log cycle (see attached plot)

$$K\,(gpd/ft^2) = T/b = 6.30 \times 10^{-2}/5.8 = 1.09 \times 10^{-2}$$

where $b\,(ft) = 11.99 - D) - 6.19 = 5.8\,ft$

$$K\,(cm/sec) = 1.09 \times 10^{-2}\,gpd/ft^2 \times \frac{4.72 \times 10^{-5}\,cm/sec}{gpd/ft^2} = 5.1 \times 10^{-7}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$.

$$t\,(min) = \frac{r^2 S}{4\,T\,u} = \frac{(.302)^2\,(.1)}{4\,(1.09 \times 10^{-2})(.01)} \times \frac{1440\,min}{day} \times \frac{7.422\,gal}{ft^3}$$

$$= 225{,}376\ min.$$

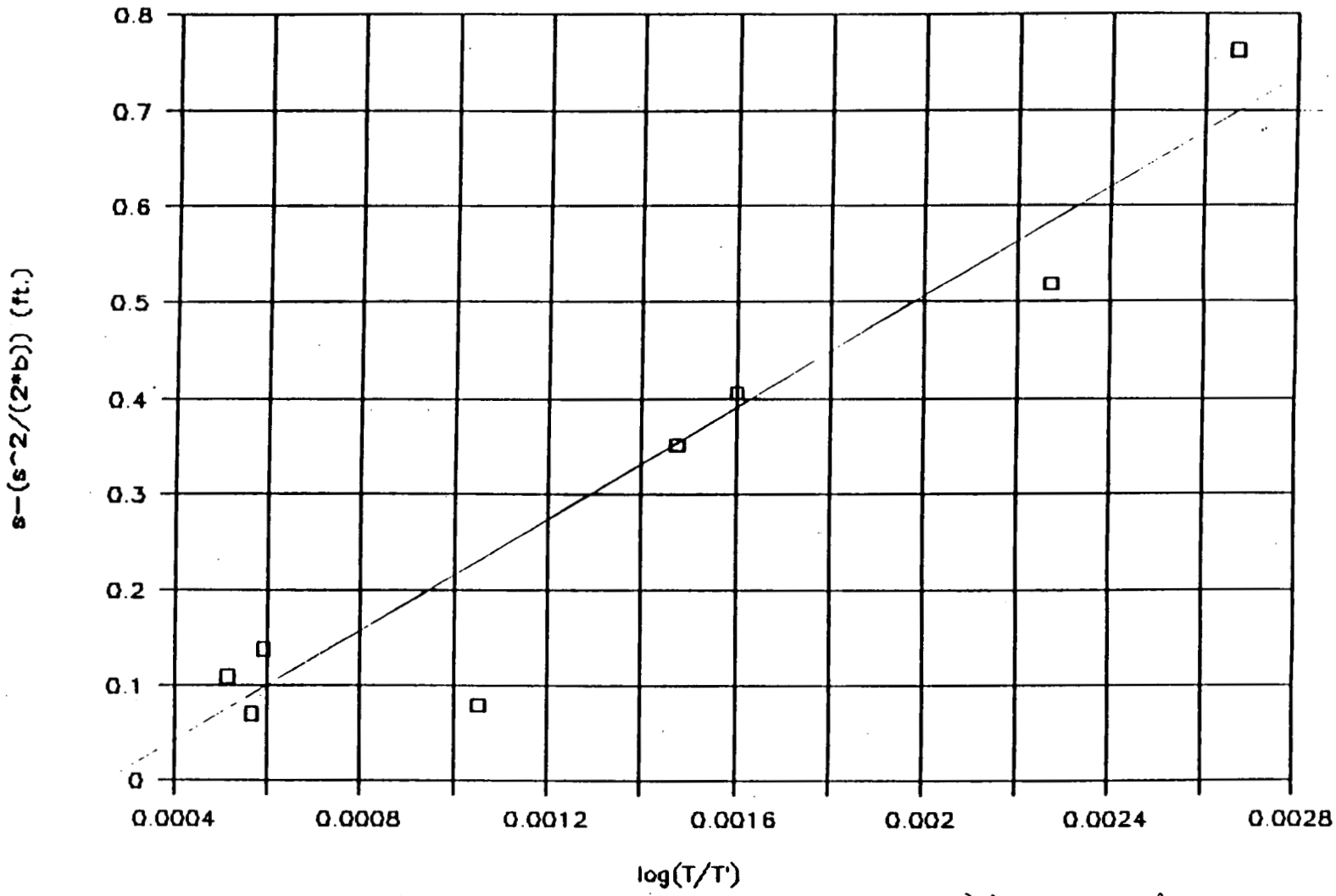
where $r\,(ft) = \left(\frac{7.25}{24}\right) ft = .302\ ft$

S = 0.1 assumed S for unconfined aquifers.

$\Delta s'$ is involved.

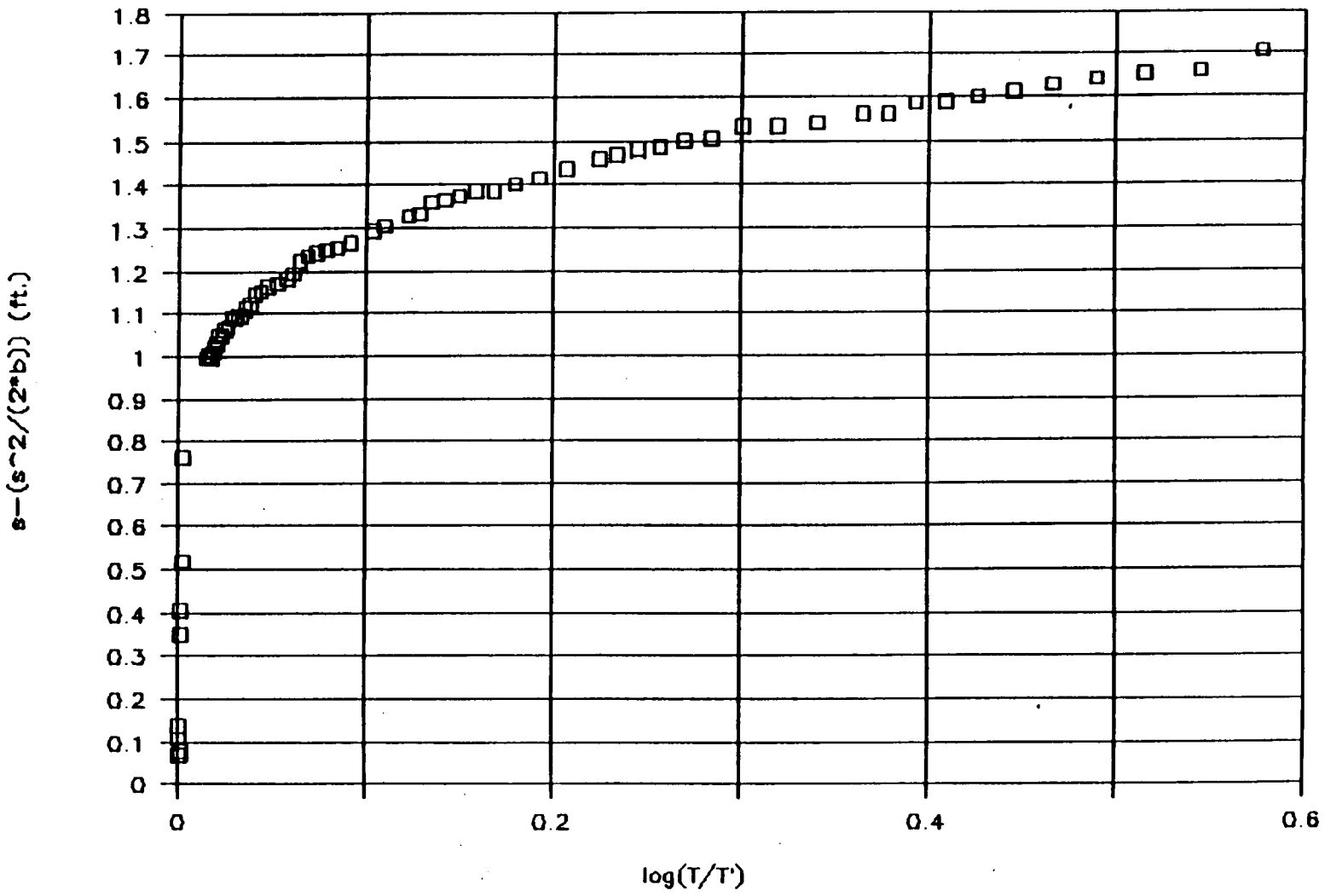
RFW 10-05-003/A-5/85

WELL 28-86

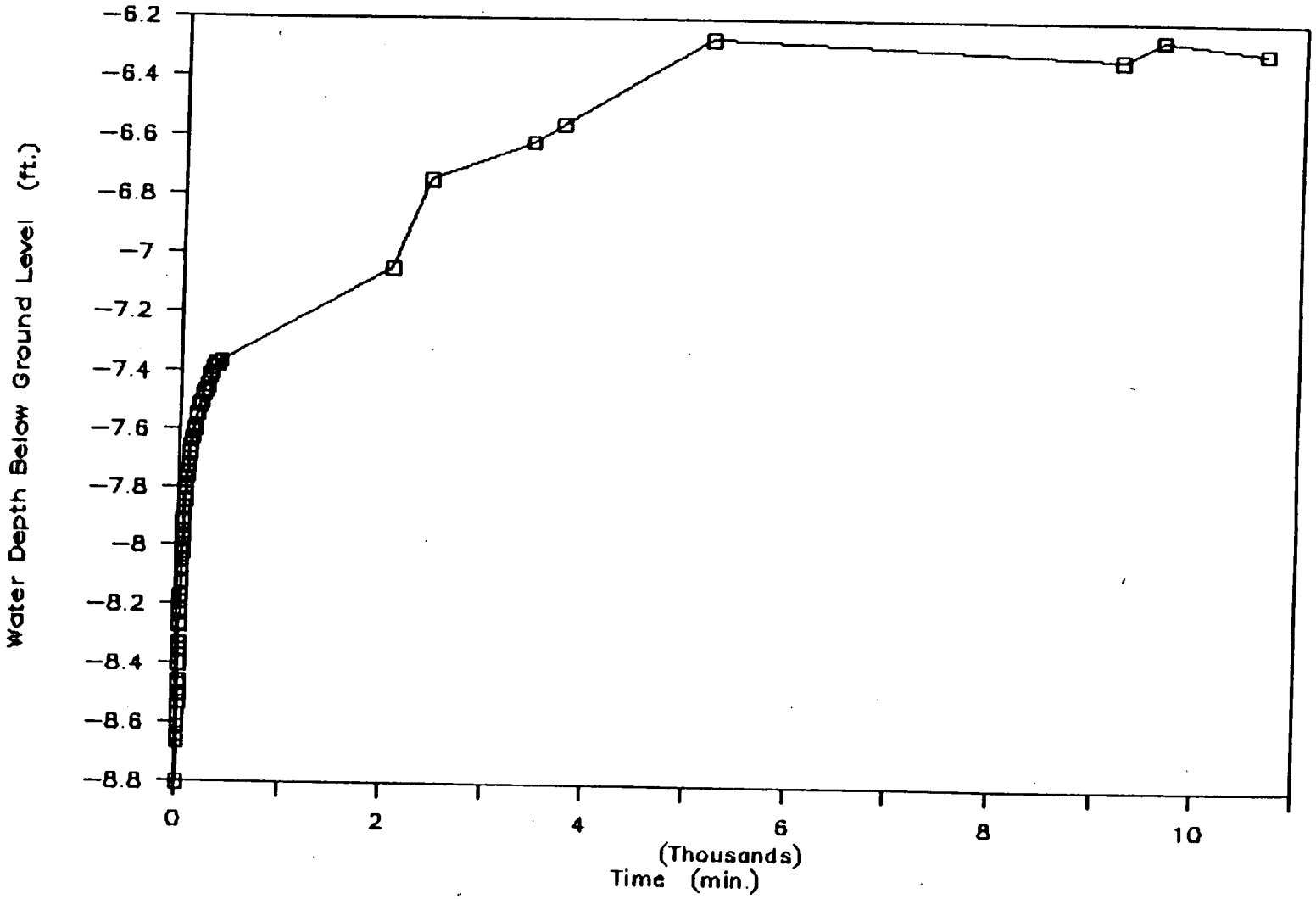


$\Delta s' = \frac{(.756 - .043)\ ft}{.0028 - .0004} = 2.89\ ft/\log\ cycle$

WELL 28-86


1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
s-(s^2/(2*b)) (ft.)
0
0.2
0.4
0.6
log(T/T')

WELL 28-86


Water Depth Below Ground Level (ft.)
-6.2
-6.4
-6.6
-6.8
-7
-7.2
-7.4
-7.6
-7.8
-8
-8.2
-8.4
-8.6
-8.8
0
2
4
6
8
10
(Thousands)
Time (min.)

WELL 28-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	s-(S^2/2b) b=2.41 ft. (ft.)	log(T/T')
17.00	4.50	8.80	2.61	1.71	0.58
17.50	5.00	8.66	2.47	1.66	0.54
18.00	5.50	8.64	2.45	1.65	0.51
18.50	6.00	8.61	2.42	1.64	0.49
19.00	6.50	8.57	2.38	1.63	0.47
19.50	7.00	8.53	2.34	1.61	0.44
20.00	7.50	8.50	2.31	1.60	0.43
20.50	8.00	8.47	2.28	1.59	0.41
21.00	8.50	8.46	2.27	1.59	0.39
21.50	9.00	8.40	2.21	1.56	0.38
22.00	9.50	8.40	2.21	1.56	0.36
23.00	10.50	8.35	2.16	1.54	0.34
24.00	11.50	8.33	2.14	1.53	0.32
25.00	12.50	8.33	2.14	1.53	0.30
26.00	13.50	8.27	2.08	1.51	0.28
27.00	14.50	8.26	2.07	1.50	0.27
28.00	15.50	8.23	2.04	1.49	0.26
29.00	16.50	8.22	2.03	1.48	0.24
30.00	17.50	8.19	2.00	1.47	0.23
31.00	18.50	8.17	1.98	1.46	0.22
33.00	20.50	8.12	1.93	1.44	0.21
35.00	22.50	8.08	1.89	1.42	0.19
37.00	24.50	8.05	1.86	1.40	0.18
39.00	26.50	8.02	1.83	1.39	0.17
41.00	28.50	8.02	1.83	1.39	0.16
43.00	30.50	8.00	1.81	1.38	0.15
45.00	32.50	7.98	1.79	1.37	0.14
47.00	34.50	7.97	1.78	1.36	0.13
49.00	36.50	7.92	1.73	1.33	0.13
51.00	38.50	7.91	1.72	1.33	0.12
56.00	43.50	7.87	1.68	1.31	0.11
59.00	46.50	7.85	1.66	1.29	0.10
66.00	53.50	7.80	1.61	1.27	0.09
71.00	58.50	7.78	1.59	1.25	0.08
76.00	63.50	7.77	1.58	1.25	0.08
81.00	68.50	7.76	1.57	1.24	0.07
86.00	73.50	7.75	1.56	1.24	0.07
91.00	78.50	7.73	1.54	1.23	0.06
96.00	83.50	7.68	1.49	1.20	0.06
101.00	88.50	7.66	1.47	1.18	0.06
111.00	98.50	7.64	1.45	1.17	0.05
121.00	108.50	7.63	1.44	1.16	0.05

WELL 28-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	s-(S^2/2b) b=2.41 ft. (ft.)	log(T/T')
131.00	118.50	7.61	1.42	1.15	0.04
141.00	128.50	7.60	1.41	1.15	0.04
151.00	138.50	7.56	1.37	1.12	0.04
161.00	148.50	7.55	1.36	1.11	0.04
171.00	158.50	7.52	1.33	1.10	0.03
181.00	168.50	7.52	1.33	1.10	0.03
191.00	178.50	7.51	1.32	1.09	0.03
201.00	188.50	7.51	1.32	1.09	0.03
216.00	203.50	7.48	1.29	1.07	0.03
231.00	218.50	7.47	1.28	1.06	0.02
246.00	233.50	7.45	1.26	1.05	0.02
261.00	248.50	7.45	1.26	1.05	0.02
276.00	263.50	7.42	1.23	1.03	0.02
291.00	278.50	7.41	1.22	1.02	0.02
306.00	293.50	7.39	1.20	1.01	0.02
321.00	308.50	7.38	1.19	1.00	0.02
336.00	323.50	7.38	1.19	1.00	0.02
351.00	338.50	7.38	1.19	1.00	0.02
381.00	368.50	7.37	1.18	1.00	0.01
2039.00	2026.50	7.05	0.86	0.76	0.00
2397.00	2384.50	6.75	0.56	0.52	0.00
3396.00	3383.50	6.62	0.43	0.41	0.00
3689.00	3676.50	6.56	0.37	0.35	0.00
5159.00	5146.50	6.27	0.08	0.08	0.00
9188.00	9175.50	6.33	0.14	0.14	0.00
9588.00	9575.50	6.26	0.07	0.07	0.00
10605.00	10592.50	6.30	0.11	0.11	0.00

AQUIFER TEST DATA

WELL RE-56
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST [illegible]
HOW Q MEASURED [illegible]
HOW W.L.'s MEASURED [illegible]
RAD./DIST. OF/FROM PUMPING WELL
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT = 2.03 (TOC 5 cement)

Finished Drilling 10:04:30

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-11-86 time
PUMP OFF: date time
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT

TIME (t = ____ at t' = 0)				WATER LEVEL DATA (6.19) STATIC WATER LEVEL 5+3.22 -2.03					DISCHARGE			COMMENTS
DAY	CLOCK TIME	t	t'	READING	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s'		READING	Q	RECORDED BY	TD. 11.5' [illegible]
/	[illegible]	1/2		10+.83	-2.03	8.8	2.61					
	10:05:30	1		10+.69	-2.03	8.66	2.47					Bail 1 [illegible]
	10:06	1.5		10+.67	"	8.69	2.45					
	10:06:30	2		10+.64	"	8.61	2.42					Finished bailing
	10:07	2.5		10+.60	"	8.57	2.38					10:04:30
	10:07:30	3		10+.56		8.53	2.34					
	10:08	3.5		10+.53		8.5	2.31					started bailing
	10:08:30	4		10+.50		8.47	2.28					9:48
	10:09	4.5		10+.49		8.46	2.27					
	10:09:30	5		10+.43		8.40	2.21					
	10:10	6		10+.43		8.40	2.21					
	10:11	7		10+.38		8.35	2.16		(reading)			0% REC = 8.48
	10:12	8		10+.338		8.303	2.113					
	10:13	9		10+.333		8.303	2.113					
	10:14	10		10+.30		8.27	2.08					
	10:15	11		10+.29		8.26	2.07					
	10:16	12		10+.26		8.23	2.04					
	10:17	13		10+.25		8.22	2.03					
	10:18	14		10+.22		8.19	2.0					
	10:19	15		10+.20		8.17	1.98					
	10:20	17		10+.15		8.12	1.93					
	10:23	19		10+.11		8.08	1.89					
	10:25	20		10+.08		8.05	1.86					
	10:27	22		10+.05		8.02	1.83					
	10:29	24		10+.05		8.02	1.83					
	10:31	27		10+.03		8.00	1.81					
	10:33	29		10+.01		7.98	1.79					
	10:35	31		10+.00		7.97	1.78					
	10:37	33		10-.05		7.92	1.73					
	10:39	35		10-.06		7.91	1.72					
	10:44	40		10-.10		7.87	1.68					
	10:49	45		10-.12		7.85	1.66					
	10:54	50		10-.17		7.8	1.61					
	10:59	55		10-.19		7.78	1.59					
	11:04	60		10-.20		7.77	1.58					
	11:09	65		10-.21		7.76	1.57					
	11:14	70		10-.22		7.75	1.56					
	11:19	75		10-.24		7.73	1.54					
	11:24	80		10-.29		7.68	1.49					
	11:29	85		10-.319		7.659	1.469					
	11:34	75		10-.330		7.64	1.45					

AQUIFER TEST DATA

WELL 28-SC
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST
HOW Q MEASURED
HOW W.L.'s MEASURED
RAD./DIST. OF/FROM PUMPING WELL
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-11-86 time 9:48:00
PUMP OFF: date 11-11-86 time 10:04:30
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT

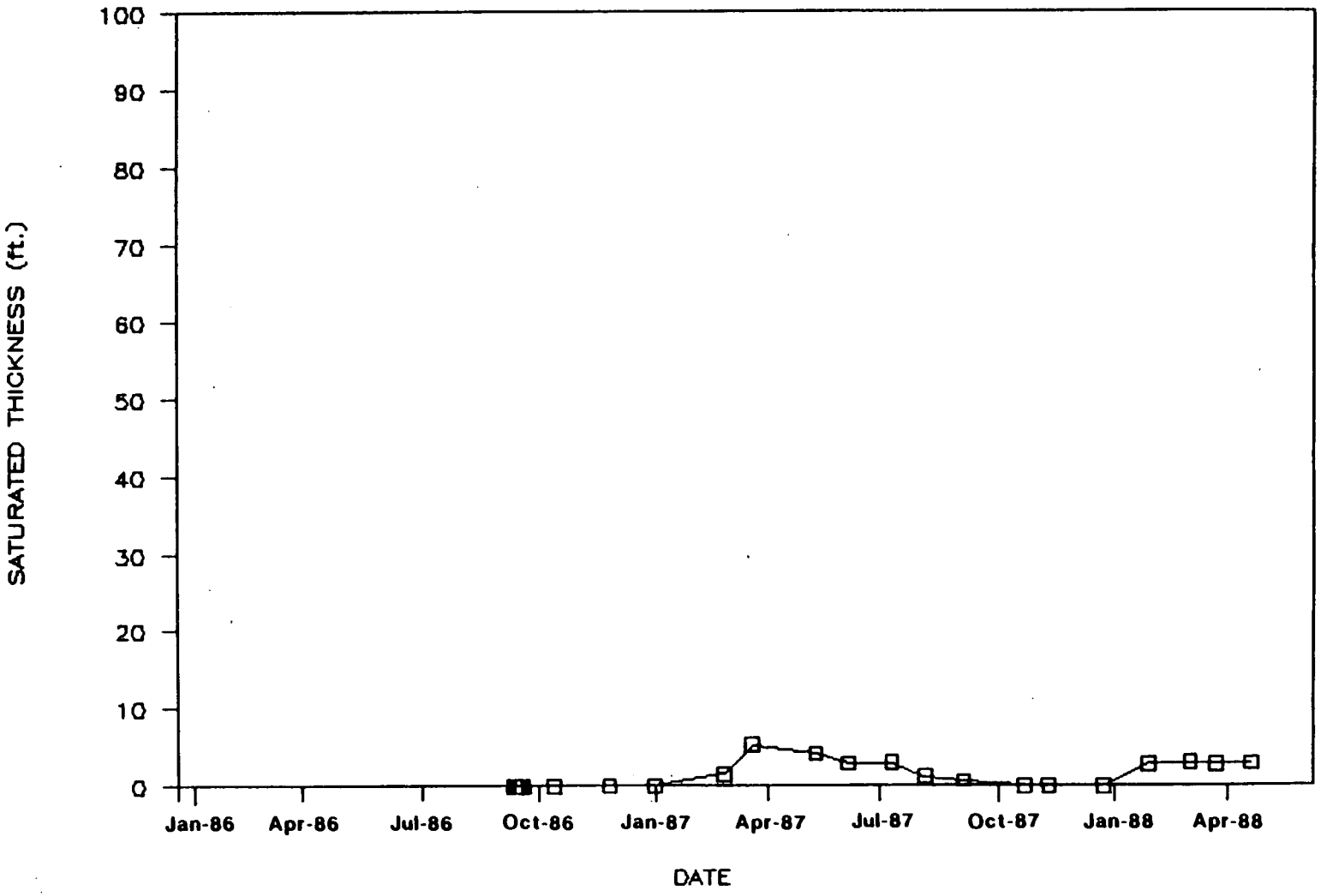
TIME t = ____ at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL ____					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
	1149	105			10-.34	-2.03	7.63	1.44					
	1159	115			10-.365	"	7.605	1.415					
	1209	125			10-.375	"	7.595	1.405					
	1219	135			10-.41		7.56	1.37					
	1229	145			10-.425		7.545	1.355					
	1239	155			10-.45		7.52	1.33					
	1249	165			10-.45		7.52	1.33					
	1259	175			10-.46		7.51	1.32					
	1309	185			10-.465		7.505	1.315					
	1324	200			10-.495		7.475	1.285					
	1339	215			10-.50		7.47	1.28					
	1354	230			10-.52		7.45	1.260					
	1409	245			10-.525		7.445	1.255					
	1429	260			10-.55		7.42	1.23					
	1439	275			10-.5465		7.405	1.215					
	1454	290			10-.585		7.385	1.195					
	1509	305			10-.590		7.38	1.190					
	1524	320			10-.590		7.38	1.190					
1	1539	335			10-.590		7.38	1.19					
1	1609	365			10-.60		7.37	1.18					
2	9:47				5+4.08	-2.07							
2	15:45				5+3.78								
3	8:24				5+3.65								
3	13:17				5+3.59		90%						
4	13:47				5+3.30								
7	8:50				5+3.36								
7	15:36				5+3.29								
8	8:33				5+3.33								
8													

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2886	09/12/86	5961.23	5963.77	2.54	8.60	10.54	5953.23
	09/13/86					10.67	5953.10
	09/15/86					10.36	5953.41
	09/16/86					10.78	5952.99
	09/17/86					10.80	5952.97
	09/18/86					10.63	5953.14
	10/13/86					9.10	5954.67
	11/26/86					8.51	5955.26
	01/01/87					8.79	5954.98
	02/25/87					7.00	5956.77
	03/19/87					3.25	5960.52
	05/08/87					4.38	5959.39
	06/03/87					5.73	5958.04
	07/08/87					5.65	5958.12
	08/04/87					7.40	5956.37
	09/03/87					8.00	5955.77
	10/21/87					8.90	5954.87
	11/09/87					8.70	5955.07
	12/22/87					8.70	5955.07
	01/27/88					5.80	5957.97
	02/29/88					5.60	5958.17
	03/21/88					5.80	5957.97
	04/18/88					5.70	5958.07

SATURATED THICKNESS IN WELL # 28-86 (SP)



INDEX OF DATA

Boring No.: 29-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 29-86

Date Drilled 9/9/86

Boring Method Hollow Stem Auger

Coordinates N 37610.3 E 22584.1

Ground Surface Elevation 5958.26

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ROCKY FLATS ALLUVIUM 0.0-2.0'-Sample. Recovered 0.5/2.0'=25%. GRAVEL: grayish brown (5YR 3/2) to dusky brown (5YR 2/2) granite and quartzite pebbles and cobbles; sand and silt matrix; bimodal sorting; subangular; unconsolidated; loose; damp.			
	5			2.0-3.6'-Sample. Recovered 1.6/1.6'=100%. GRAVEL: moderate brown (5YR 4/4) granite and quartzite pebbles and cobbles; sandy; some silt; poorly sorted; subangular; well packed; damp.			
				3.6-6.5'-Sample. Recovered 0.0/3.0'=0%. Cuttings. GRAVEL: light brown (5YR 5/6) granite and quartzite pebbles and cobbles; unconsolidated; dry.			
	10			6.5-7.5'-Sample. GRAVEL: light brown (5YR 6/4) granitic pebbles and cobbles; medium to coarse sand; poorly sorted; angular; unconsolidated; dry to damp.			
				7.5-12.5'-Sample. Recovered 4.3/5.0'=86%. 7.5-8.7'. CLAY: olive gray (5Y 3/2) and grayish brown (9YR 2/2); gravelly; some sand and silt; caliche stringers; soft; moist.			
	15			ARAPAHOE FORMATION 8.7-12.5'. CLAYSTONE: yellowish gray (5Y 7/2) to dusky yellow (5Y 6/4); silty; weathered; firm; moist.			
	20						

Remarks Logged by: T. Murphy

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 29-86

Date Drilled 9/9/86

Boring Method Hollow Stem Auger

Coordinates N 37610.3 E 22584.1

Ground Surface Elevation 5958.26

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			12.5-17.5'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: pale olive (10Y 6/2) with dark yellowish orange (10YR 6/6) mottling; fine-grained to coarse-grained sand stringers; occasional calcite in fractures (dark yellowish orange 10YR 6/6); 50% sand and 50% claystone; firm; moist.			
	25			17.5-22.5'-Sample. Recovered 2.0/5.0'=40%. SANDSTONE: dark yellowish orange (10YR 6/6) and light gray (N 7); silty; some clay; moist; soft.			
				22.5-25.5'. Lost core.			
				TOTAL DEPTH: 25.5'			
	30						
	35						
	40						

Remarks Logged by: T. Murphy

Checked by:

Project No. 106P06222

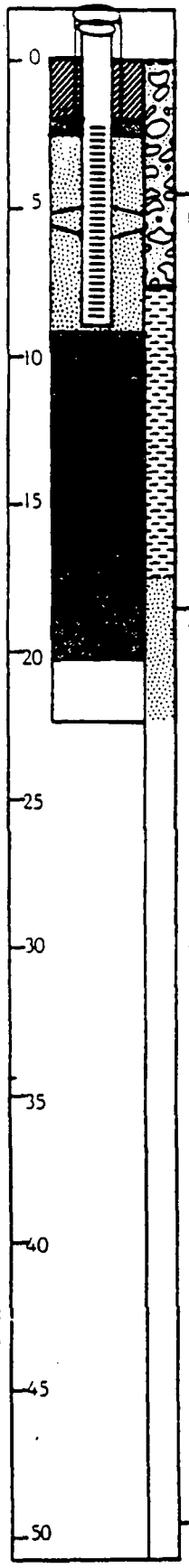
Hydro-Search, Inc.

WELL 29-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37610.3 E 22584.1

ELEVATION: GROUND LEVEL 5958.26'
TOP OF CASING 5959.95'



LOCATION Golden, CO
PERSONNEL T. Murphy
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 8.77' Hole: 22.50'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) TS

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	2.83'	C1			
2.83'	8.77'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
5.00' - 6.20'

FILTER MATERIAL 32-42 silica sand
2.50' - 9.10'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
9.10' - 20.30'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/9	1230	9/9	1410
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/9	1550	9/9	1552
FILTER PLACEMENT:	9/9	1600	9/9	1605
CEMENTING:	9/9	1610	9/9	1615
DEVELOPMENT:	9/12	1410	9/12	1410
OTHER:				
Bentonite	9/9	1605	9/9	1610
	9/9	1540	9/9	1542

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.69'

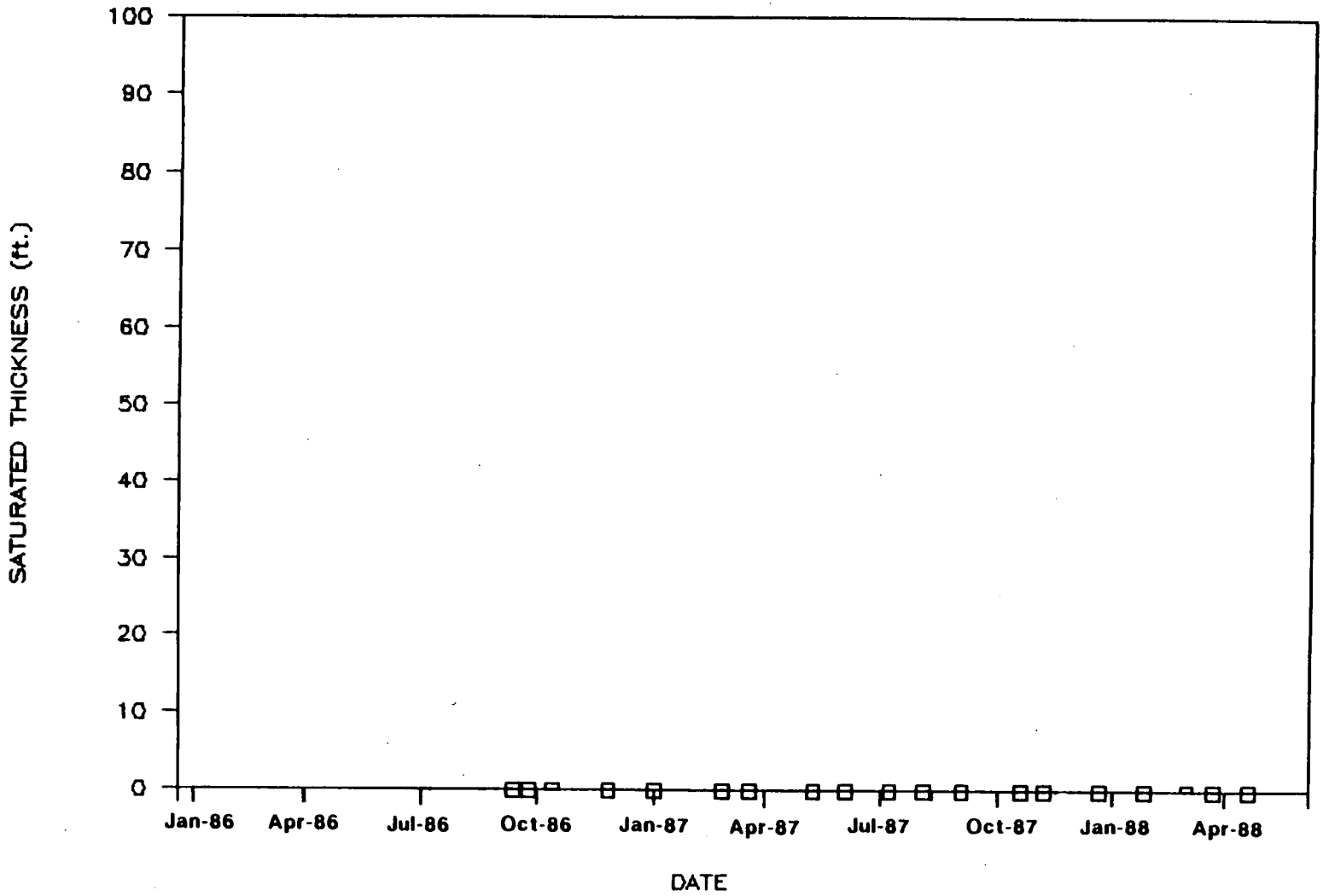
Cave from TD to 20.30'

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2986	09/12/86	5958.26	5959.95	1.69	8.77	-1.00	DRY
	09/24/86					-1.00	DRY
	09/24/86					-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/19/87					-1.00	DRY
	05/08/87					8.85	5951.10
	06/03/87					9.82	5950.13
	07/08/87					-1.00	DRY
	08/04/87					-1.00	DRY
	09/03/87					-1.00	DRY
	10/21/87					-1.00	DRY
	11/09/87					-1.00	DRY
	12/22/87					-1.00	DRY
	01/27/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY

SATURATED THICKNESS IN WELL # 29-86 (SP)



INDEX OF DATA

Boring No.: 30-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 30-86

Date Drilled 9/6/86

Boring Method Hollow Stem Auger

Coordinates N 38092.5 E 21819.6

Ground Surface Elevation 5956.21

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ARTIFICIAL FILL 0.0-2.0'-Sample. Recovered 1.2/2.0'=60%. 0.0-0.8'. GRAVEL: granite and quartzite pebbles; sandy; silty; poorly sorted; wet. 0.8-2.0'. CLAYSTONE: dusky brown (5Y 2/2) and olive gray (5Y 3/2); silty; moist to wet.			
	5			ARAPAHOE FORMATION 2.0-4.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); some dark yellowish orange (10YR 6/6) iron staining; slightly calcareous; silty; firm; moist. 4.0-6.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); some dark yellowish orange (10YR 6/6) iron staining; fragments of calcite; some light olive gray (5Y 5/2) fine-grained sand; soft to moderately firm; moist.			
	10			6.0-11.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); some dark yellowish orange (10YR 6/6) iron stains; calcite concretion at 6.3'; firm; damp.			
	15			11.0-16.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2) to olive brown (5Y 4/4); firm; damp. TOTAL DEPTH: 16.0'			
	20						

Remarks Logged by: T. Murphy

Checked by: JWP

Project No. 106P06222

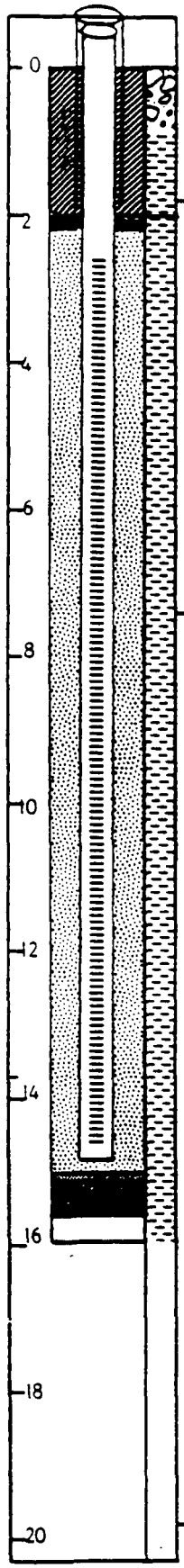
Hydro-Search, Inc.

WELL 30-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38092.5 E 21819.6

ELEVATION: GROUND LEVEL 5956.21'
TOP OF CASING 5957.62'



PROJECT 106P06222 Rocky Flats Plant
LOCATION Golden, CO
PERSONNEL T. Murphy

DRILLING SUMMARY:

TOTAL DEPTH Well: 14.93' Hole: 16.00'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) Blade bit

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	2.48'	C1			
2.48'	14.93'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel

FILTER MATERIAL 32-42 silica sand
2.20' - 15.10'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.20'
15.10' - 15.60'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/6	1200	9/6	1430
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/6	1630	9/6	1635
FILTER PLACEMENT:	9/6	1635	9/6	1650
CEMENTING:	9/6	1650	9/6	1700
DEVELOPMENT:	9/12	1010	9/19	1030
OTHER:				
Bentonite	9/6	1641	9/6	1642
	9/6	1625	9/6	1630

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.41'

Cave from TD to 15.60'

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 30-86

Hydraulic Conductivity (cm/sec) = NA

Flowrate (gpm) = 0.22

Screened Interval (ft below G.L.) = 4.11 (Static W.L.) - 14.93'

Method of Analysis: Residual-drawdown Plot (Driscoll, 1986 - pg 256).

RFW 10-05-003/A-5/85

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

WELL 30-86

$$T\ (gpd/ft) = \frac{264\,Q}{\Delta S'} = \frac{(264)\ (.22)}{294} = .198$$

where $Q\ (gpm) = 2.75\ gallon / 12.5\ minute = 0.22\ gpm$

$\Delta S' =$ ~~?~~ t. change in residual drawdown / log cycle

$= 294' /$ log cycle (see attached plot)

$$K\ (gpd/ft^2) = T/b = 0.198 / 10.82 = 0.0183$$

where $b\ (ft) = 14.93 - 4.11$ (Static W.L.) $= 10.82$ ft

$$K\ (cm/sec) = 0.0183\ gpd/ft^2 \times \frac{4.72 \times 10^{-5}\ cm/sec}{gpd/ft^2} = 8.6 \times 10^{-7}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$.

$$t\ (min) = \frac{r^2 S}{4\,T\,u} = \frac{(.3)^2\ .1}{4\ (0.198)\ (.01)} \times \frac{1440\ min}{day} \times \frac{7.482\ gal}{ft^3}$$

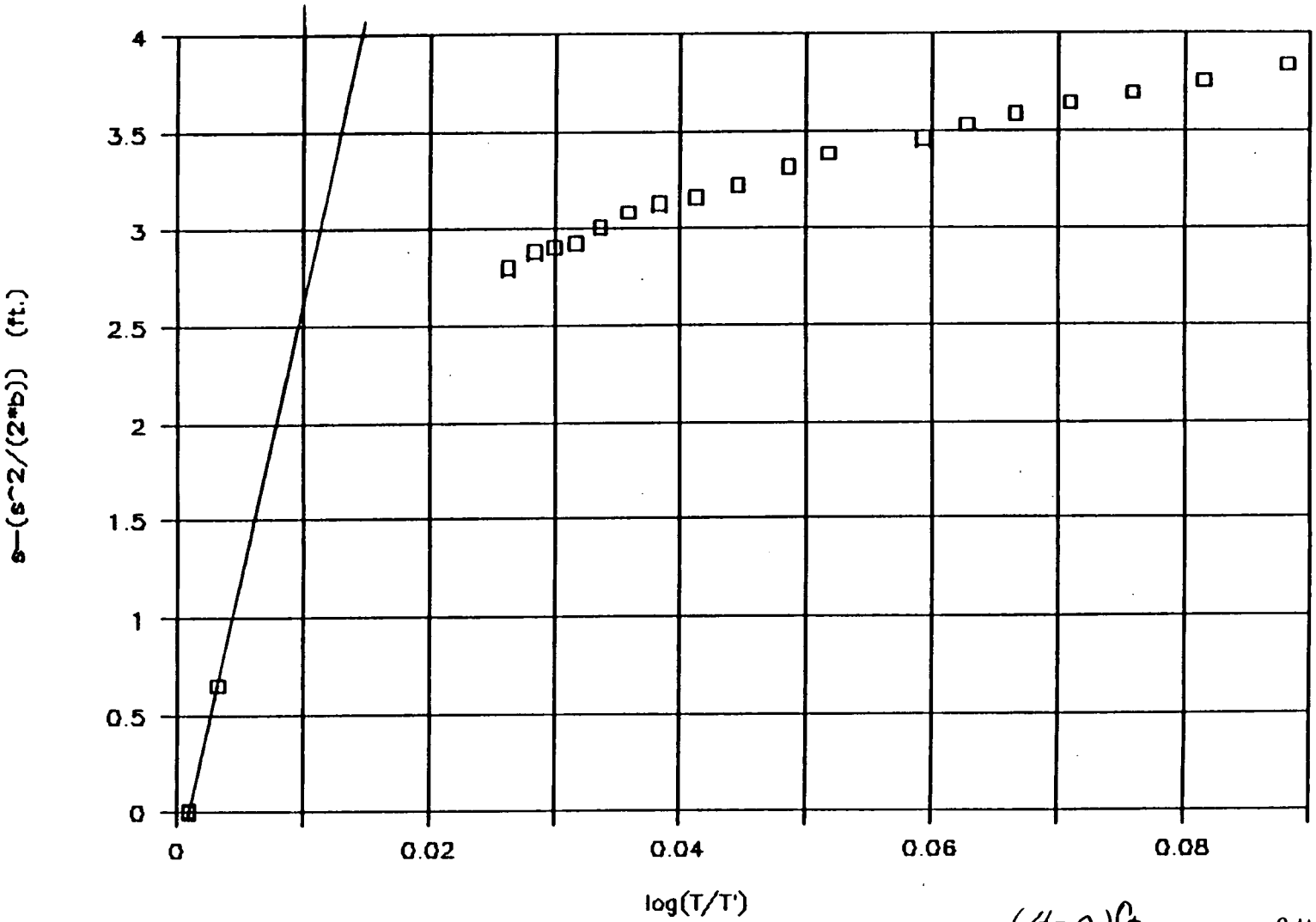
$= 12,243$ min

where $r\ (ft) = \left(\frac{7.25}{24}\right) ft = (.30)\ ft$

$S = 0.1$ assumed S for unconfined aquifers.

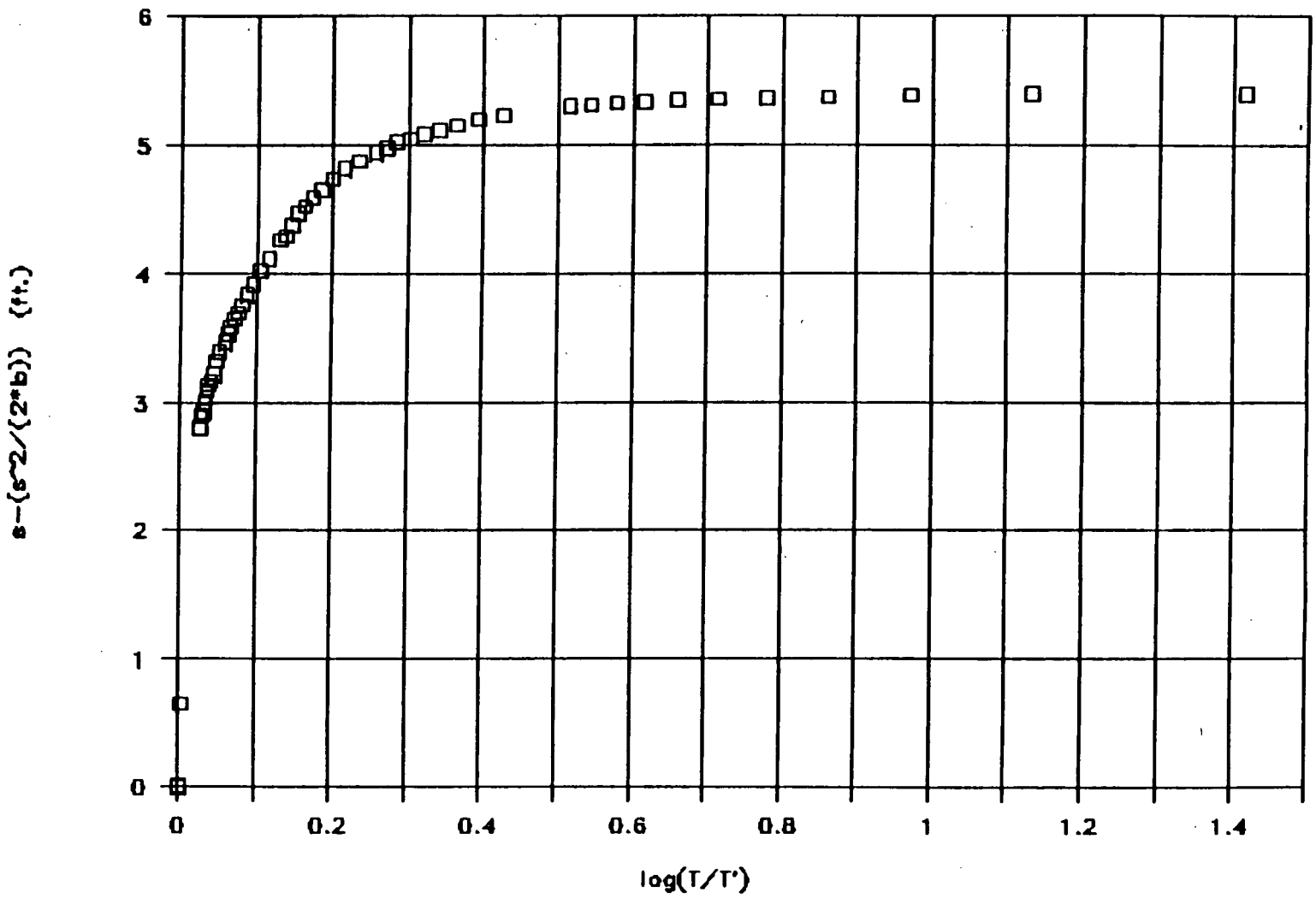
RFW 10-05-003/A-5/85

WELL 30-86

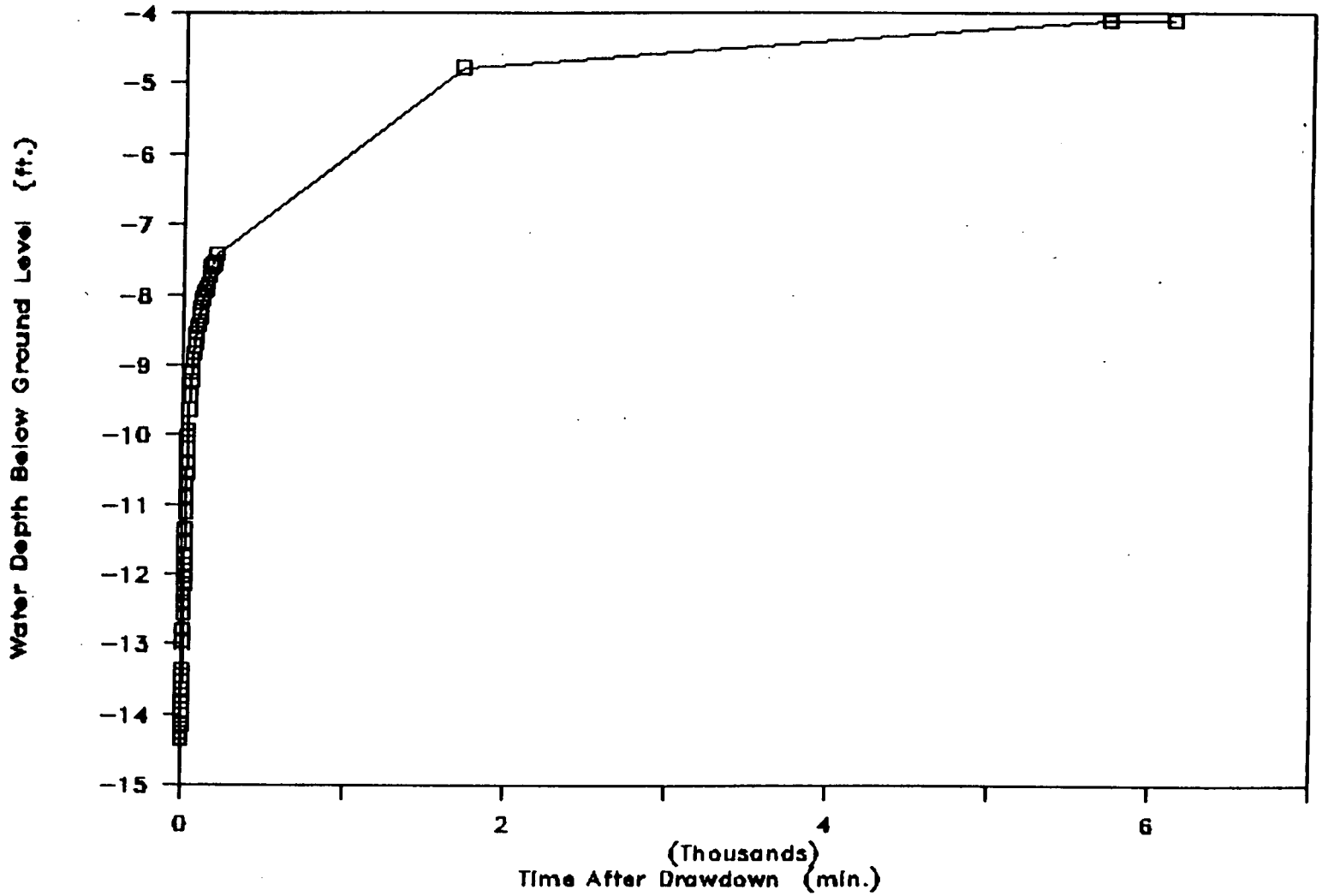


$$\Delta s' = \frac{(4-0)\,ft}{0.0146 - 0.0010} = 294'/\text{log cycle}$$

WELL 30-86



WELL 30-86


-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
Water Depth Below Ground Level (ft.)
0
2
4
6
(Thousands)
Time After Drawdown (min.)

WELL 30-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s Rsd Drwdn (ft.)	s-(s^2/2b) b=10.82 ft. (ft.)	log(T/T')
13.00	0.50	14.34	10.23	5.39	1.41
13.50	1.00	14.26	10.15	5.39	1.13
14.00	1.50	14.15	10.04	5.38	0.97
14.50	2.00	14.01	9.90	5.37	0.86
15.00	2.50	13.93	9.82	5.36	0.78
15.50	3.00	13.83	9.72	5.35	0.71
16.00	3.50	13.73	9.62	5.34	0.66
16.50	4.00	13.63	9.52	5.33	0.62
17.00	4.50	13.53	9.42	5.32	0.58
17.50	5.00	13.44	9.33	5.31	0.54
18.00	5.50	13.35	9.24	5.29	0.51
20.00	7.50	12.95	8.84	5.23	0.43
21.00	8.50	12.79	8.68	5.20	0.39
22.00	9.50	12.56	8.45	5.15	0.36
23.00	10.50	12.41	8.30	5.12	0.34
24.00	11.50	12.28	8.17	5.09	0.32
25.00	12.50	12.13	8.02	5.05	0.30
26.00	13.50	12.03	7.92	5.02	0.28
27.00	14.50	11.87	7.76	4.98	0.27
28.00	15.50	11.76	7.65	4.95	0.26
30.00	17.50	11.53	7.42	4.88	0.23
32.00	19.50	11.36	7.25	4.82	0.22
34.00	21.50	11.11	7.00	4.74	0.20
36.00	23.50	10.88	6.77	4.65	0.19
38.00	25.50	10.72	6.61	4.59	0.17
40.00	27.50	10.55	6.44	4.52	0.16
42.00	29.50	10.41	6.30	4.47	0.15
44.00	31.50	10.20	6.09	4.38	0.15
46.00	33.50	10.01	5.90	4.29	0.14
48.00	35.50	9.94	5.83	4.26	0.13
53.00	40.50	9.64	5.53	4.12	0.12
58.00	45.50	9.44	5.33	4.02	0.11
63.00	50.50	9.23	5.12	3.91	0.10
68.00	55.50	9.09	4.98	3.83	0.09
73.00	60.50	8.94	4.83	3.75	0.08
78.00	65.50	8.83	4.72	3.69	0.08
83.00	70.50	8.74	4.63	3.64	0.07
88.00	75.50	8.64	4.53	3.58	0.07
93.00	80.50	8.55	4.44	3.53	0.06
98.00	85.50	8.44	4.33	3.46	0.06
111.00	98.50	8.31	4.20	3.38	0.05
118.00	105.50	8.20	4.09	3.32	0.05

WELL 30-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s Rsd Drwdn (ft.)	s-(s^2/2b) b=10.82 ft. (ft.)	log(T/T')
128.00	115.50	8.05	3.94	3.22	0.04
138.00	125.50	7.96	3.85	3.17	0.04
148.00	135.50	7.91	3.80	3.13	0.04
158.00	145.50	7.84	3.73	3.09	0.04
168.00	155.50	7.72	3.61	3.01	0.03
178.00	165.50	7.60	3.49	2.93	0.03
188.00	175.50	7.57	3.46	2.91	0.03
198.00	185.50	7.54	3.43	2.89	0.03
213.00	200.50	7.42	3.31	2.80	0.03
1725.00	1712.50	4.78	0.67	0.65	0.00
5748.00	5735.50	4.12	0.01	0.01	0.00
6147.00	6134.50	4.11	0.00	0.00	0.00

AQUIFER TEST DATA

WELL 30-86
PUMPING or ~~OBSERVATION~~ WELL
PUMPING or ~~RECOVERY~~ DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Bail Down Rec Test
HOW Q MEASURED 4 Gal Bucket
HOW W.L.'s MEASURED Tape
RAD./DIST. OF/FROM PUMPING WELL IN
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-13-86 time 9:27
PUMP OFF: date 11-13-86 time 9:39:30
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL
PROJECT

TIME (t = ____ at t' = 0)				WATER LEVEL DATA (4.1) STATIC WATER LEVEL 5+.61 not abt					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'	READING	CONVERSION or CORRECTIONS	WATER LEVEL	s or s'		READING	Q		T.D. 16.40 not abt
1	9:40			15+.89	1.50	14.34	10.23				CW	
	9:40½			15+.96	1.50	14.26	10.15				CW	9:29 start
	9:41			15+.65	1.50	14.15	10.04					9:39:30 finish
	9:41½			15+.61		14.01	9.90					
	9:42			15+.43		13.93	9.82					rec: 2.75
	9:42½			15+.33		13.83	9.72					gal
	9:43			15+.23		13.73	9.62					
	43½			15+.13		13.63	9.52					
	44			15+.03		13.53	9.42					
	44½			10+4.94		13.44	9.33					
	45			10+4.85		13.35	9.24					15.24
	46			~~10+4.75~~								9.01
	47			10+4.45		12.95	8.84				W	10.23
	48			10+4.29		12.79	8.68					
	49			10+4.06		12.56	8.45					
	50			10+3.91		12.41	8.30					
	51			10+3.78		12.28	8.17					
	52			10+3.63		12.13	8.02					
	53			10+3.53		12.03	7.92					
	54			10+3.37		11.87	7.76					
	9:55			10+3.26		11.76	7.65					
	9:57			10+3.08		11.58	7.42					
	9:59			10+2.86		11.36	7.25					
	10:01			10+2.61		11.11	7.00					
	10:03			10+2.39		10.88	6.77					
	10:05			10+2.22		10.72	6.61					
	10:07			10+2.05		10.55	6.44					
	10:09			10+1.91		10.41	6.30					
	10:11			10+1.70		10.2	6.09					
	10:13			10+1.51		10.01	5.90					
	10:15			10+1.44		9.94	5.83					
	10:20			10+1.14		9.64	5.53					
	10:25			10+.94		9.44	5.33					
	10:30			10+.73		9.23	5.12					
	10:35			10+.59		9.09	4.98					
	10:40			10+.49		8.99	4.88					
	10:45			10+.33		8.83	4.72					
	10:50			10+.24		8.74	4.63					
	10:55			10+.14		8.64	4.53					
	11:00			10+.05		8.55	4.44					
	11:05			5+4.94		8.44	4.33					

READING 6.63 = 96

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AQUIFER TEST DATA

WELL 30-36
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST
HOW Q MEASURED
HOW W.L.'s MEASURED
RAD./DIST. OF/FROM PUMPING WELL
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-13-86 time
PUMP OFF: date 11-13-86 time
DURATION OF AQUIFER TEST

LOCATION
PERSONNEL Cal Hall
PROJECT

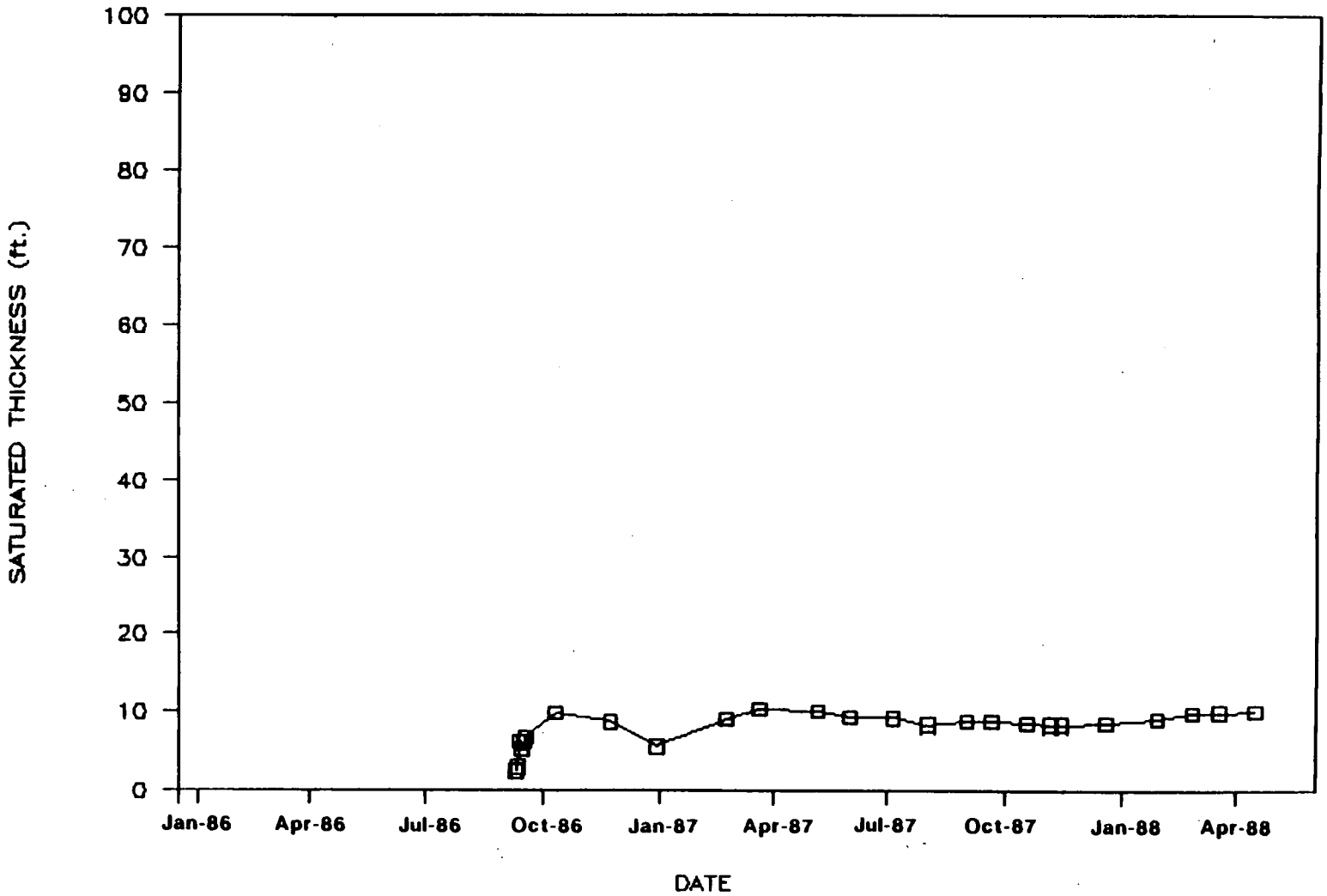
TIME t = _____ at t' = 0					WATER LEVEL DATA 4.11 STATIC WATER LEVEL 5+.61 (not corr.)					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
	1118				4.81+5'	1.50	8.31	4.20					
	1125				5'+4.70	"	8.20	4.09					
	1135				5+4.55	"	8.05	3.94					
	1145				5+4.46'	"	7.96	3.85					
	1155				6+4.41'	"	7.91	3.80					
	1205				5+4.34'	"	7.84	3.73					
	1215				5+4.22	"	7.72	3.61					
	1225				5+4.10'		7.60	3.49					
/	1235				5+4.07		7.57	3.46					
/	1245				5+4.04		7.54	3.43					
/	1300				5+3.92		7.42	3.31					
									90%				
2	14:12				5+1.28								
5	9:15				5+0.62								
5	15:54				5+0.61								
6	8:53				5+0.82								
6													

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3086	09/12/86	5956.21	5957.62	1.41	14.93	12.33	5945.29
	09/13/86					11.94	5945.68
	09/15/86					8.67	5948.95
	09/16/86					9.67	5947.95
	09/17/86					8.87	5948.75
	09/18/86					8.66	5948.96
	09/19/86					8.14	5949.48
	10/13/86					5.07	5952.55
	11/26/86					6.21	5951.41
	01/01/87					9.33	5948.29
	02/25/87					5.90	5951.72
	03/23/87					4.58	5953.04
	05/08/87					4.79	5952.83
	06/03/87					5.62	5952.00
	07/08/87					5.70	5951.92
	08/04/87					6.50	5951.12
	09/03/87					6.10	5951.52
	09/23/87					6.10	5951.52
	10/21/87					6.40	5951.22
	11/09/87					6.50	5951.12
	11/17/87					6.50	5951.12
	12/22/87					6.40	5951.22
	02/01/88					5.90	5951.72
	02/29/88					5.10	5952.52
	03/21/88					5.00	5952.62
	04/18/88					4.90	5952.72

SATURATED THICKNESS IN WELL # 30-86 (SP)



INDEX OF DATA

Boring No.: 31-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 31-86

Date Drilled 9/2/86

Coordinates N38066.2 E 21661.8

Boring Method Hollow Stem Auger

Ground Surface Elevation 5064.21'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ARTIFICIAL FILL			
				0-2.0'-Sample. Recovered 2.0/2.0'=100%. 0-0.9': SILTY GRAVEL: grayish brown (5YR 2/2) very fine-grained sand, silt and gravel; few roots; poorly sorted; angular; unconsolidated; dry.			
	5			ARAPAHOE FORMATION			
				0.9-2.0': SAND: light gray (N 8/0) to dusky brown (5YR 3/2) medium to fine-grained; some clayey sand; moderately sorted; firm; apparent bedding from variation in clay fraction; alternating layers of sand and clayey sand; dark yellow stain (10YR 6/6) increase in sand and silt percent from 1.5-2.0'; firm; damp.			
	10						
				2.0-4.0'-Sample. Recovered 1.2/2.0'=60%. SAND: light gray (N 8/0) to grayish orange (10YR 4/4); medium-grained sand, some clay and silt; dark yellowish orange (10YR 6/6) mottles; calcareous sand from 3.0-3.5'; firm; damp.			
	15						
				4.0-7.0'-Sample. Recovered 3.0/3.0'=100%. SAND: grayish orange (10YR 7/4); silty and clayey sand at 4.9 and 6.2'; calcareous fracture at 6.8'; medium to fine-grained; quartz predominates; soft; damp.			
	20						

Remarks Logged by: T. Murphy

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 31-86

Date Drilled 9/2/86 **Coordinates** N 38066.2 E 21661.8

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5964.21'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20						
				7.0-12.0'-Sample. Recovered 5.0/5.0'=100%. SAND: grayish orange (10YR 7/4); medium to fine-grained; moderately clean; some silt; slight color variation to pale olive (10YR 6/2) with depth; soft; damp.			
	25						
				12.0-17.0'-Sample. Recovered 4.0/5.0'=80%. 12.0-14.9': SAND: pale olive (10YR 6/2) to grayish orange (10YR 7/4); medium to fine-grained; moderately clean; some silt; soft; damp.			
	30			14.9-16.5': CLAYSTONE: grayish olive (10Y 9/2); dark yellowish orange (10YR 6/6) mottles; occasional thin sand layers at 14.8 and 15.8'; slightly calcareous; firm; damp.			
				16.5-17.0': CLAYSTONE: dark olive gray (5Y 3/2); silty; black wood fragments; firm; damp.			
	35			17.0-22.0'-Sample. Recovered 5.0/5.0'=100%. 17.2-17.7': CLAYSTONE: dark olive gray (5Y 3/2); silty; black wood fragments; firm; damp.			
				17.7-20.0': SAND: pale olive (10Y 6/2); yellowish orange (10YR 6/6) mottles; some fine-grained sand; occasional sand lenses 0.2' thick; silty; firm; damp.			
	40						

Remarks Logged by: T. Murphy Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 31-86

Date Drilled 9/2/86

Boring Method Hollow Stem Auger

Coordinates N 38066.2 E 21661.8

Ground Surface Elevation 5964.21'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	40			20.0-20.9': CLAYSTONE: moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6); dark yellowish orange (10YR 6/6) stains; firm; damp.			
				20.9-22.0': CLAYSTONE: moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6); dark yellowish orange (10YR 6/6) stains; iron-stone; firm; damp.			
	45						
				TOTAL DEPTH: 22.0'			
	50						
	55						
	60						

Remarks Logged by: T. Murphy

Checked by:

Project No. 106P06222

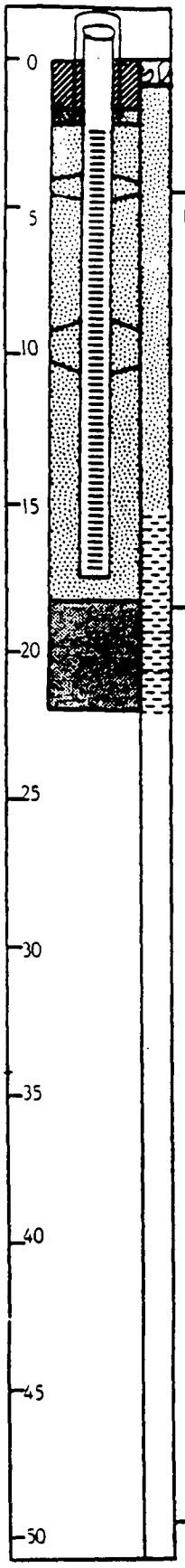
Hydro-Search, Inc.

WELL 31-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38066.2 E 21661.8

ELEVATION: GROUND LEVEL 5964.21'
TOP OF CASING 5966.67'



LOCATION Golden, CO
PERSONNEL T. Murphy
PROJECT 106K06222 - Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 17.32' Hole: 22.00'
BOREHOLE DIAMETER 7½"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue, Golden, CO
Dave Jarvie
RIG Mobile B-57
BIT(S) T-5

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'		2.46'	C1				
2.46'	-	17.32'	S1				

CASING: C1 2" I.D., Sch. 5 Type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D., Sch. 5 Type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
4.00' - 5.00'; 9.00' - 10.80'

FILTER MATERIAL 32-42 silica sand
2.40' - 18.30'

CEMENT Portland Type I
0.00' - 1.80'

OTHER 3/8" bentonite pellets
1.80' - 2.40'
18.30' - 22.00'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	9/2	1100	9/2	1255
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/2	1445	9/2	1450
FILTER PLACEMENT:	9/2	1503	9/2	1510
CEMENTING:	9/2	1515	9/2	1530
DEVELOPMENT:	9/12	1240	9/12	1240
OTHER:				
Bentonite	9/2	1510	9/2	1515
	9/2	1430	9/2	1445

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.46'

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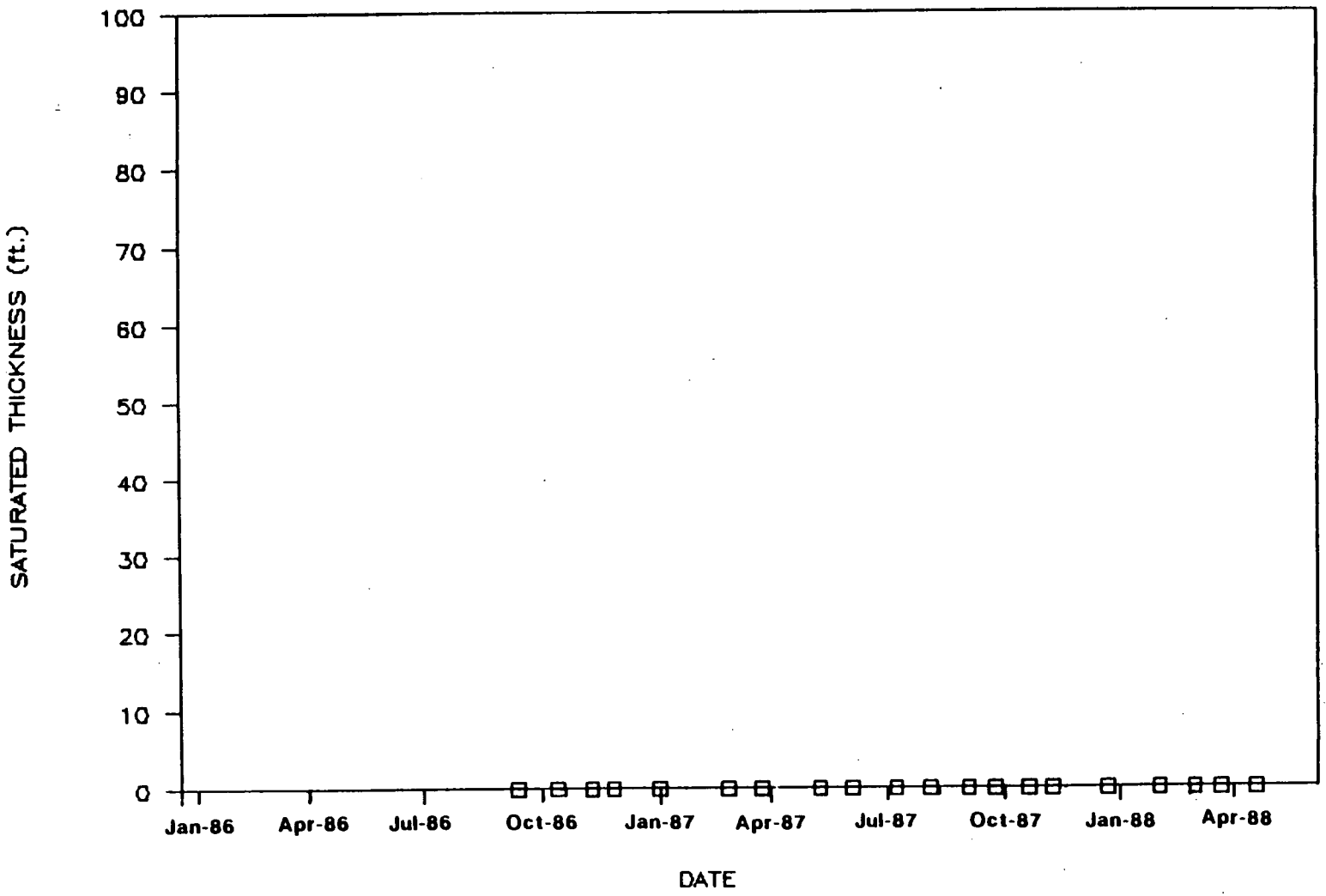
ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3186	09/12/86	5964.21	5966.67	2.46	17.32	-1.00	DRY
	10/13/86					-1.00	DRY
	11/09/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/23/87					-1.00	DRY
	05/08/87					-1.00	DRY
	06/03/87					-1.00	DRY
	07/08/87					-1.00	DRY
	08/04/87					-1.00	DRY
	09/03/87					-1.00	DRY
	09/24/87					-1.00	DRY
	10/21/87					-1.00	DRY
	11/09/87					-1.00	DRY
	12/22/87					-1.00	DRY
	02/01/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY

SATURATED THICKNESS IN WELL # 31-86 (SP)



INDEX OF DATA

Boring No.: 32-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 22-86

Date Drilled 9/3/86, 9/22/86-9/25/86 **Coordinates** N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5984.26'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ARTIFICIAL FILL			
				0-2.0'-Sample. Recovered 2.0/2.0'=100%.			
				0-0.8': TOP SOIL: dark yellowish brown (10YR 4/2); unconsolidated; dry.			
				ARAPAHOE FORMATION			
	5			0.8-2.0': SANDSTONE: light gray (N 7); medium to fine-grained; mostly fine-grained sand and silt; slightly calcareous; massive; no apparent bedding; well sorted; firm; dry.			
				2.0-4.0'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: light gray (N 7); dark yellowish orange (10YR 6/6) stains; increase in silt content; soft; well sorted; dry.			
	10			4.0-7.0'-Sample. Recovered 3.0/3.0'=100%. SANDSTONE: light gray (N 7) with dark yellowish orange (10YR 6/6) mottling; increased clay and silt at 4.8' to 6.3'; bedding 0.05' thick; apparent bedding from variations in staining; leaf imprints; very slightly calcareous along fractures; soft; damp.			
	15			7.0-12.0'-Sample. Recovered 5.0/5.0'=100%. SANDSTONE: medium light gray (N 6) to medium dark gray (N 4); fine to very fine-grained; silty with some clay; dark yellowish orange (10YR 6/6) stains; clayey sand layers alternate with sand layers 0.5-0.8' thick; soft; damp.			
	20						

Remarks Logged by: T. Murphy & J. Bergman Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 33-86

Date Drilled 9/3/86, 9/22/86-9/25/86 **Coordinates** N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NX Core **Ground Surface Elevation** 5964.46'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	20			12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. 12.0-16.5': SANDSTONE: medium light gray (N 6) to medium dark gray (N 4); fine to very fine-grained; silty with some clay; dark yellowish orange (10YR 6/6) stains; soft; damp. 16.5-17.0': CLAYSTONE: medium gray (N 5) to dark gray (N 2) and pale olive (10YR 6/2); black wood fragments; amount of clay and thickness of beds increase with depth; firm; damp.			
	25			17.0-22.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: grayish olive (10Y 4/2) to medium gray (N 5); dark yellowish orange (10YR 6/6) mottles; calcareous thin sand lenses at 18.0 and 18.5'; lenses are 0.01-0.02' thick; firm; damp.			
	30			22.0-27.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: grayish olive (10Y 4/2) to medium gray (N 5); dark yellowish orange (10YR 6/6) mottles; firm; damp.			
				25.0-31.0'-Sample. Recovered 0.0/6.0'=0%.			
	35			31.0-36.0'-Sample. Recovered 2.8/5.0'=56%. RQD=1.7/2.8'=12%. CLAYSTONE: pale yellowish brown (10YR 6/2) clay and silty clay; abundant moderate yellowish brown (10YR 5/4) mottles; very well sorted; few organics; consolidated; damp.			
	40			36.0-41.5'-Sample. Recovered 0.0/5.5'=0%.			

Remarks Logged by: T. Murphy & J. Bergman Checked by: WJP

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86
Boring Method Hollow Stem Auger/NC Core

Coordinates N 38063.7 E 21640.7
Ground Surface Elevation 5964.46'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	40			41.5-47.0'-Sample. Recovered 2.0/5.5'=36%. RQD=0.3/2.0'=17%. CLAYSTONE: olive gray (5Y 3/2); abundant dark yellowish orange (10YR 6/6) limonite stains predominantly along vertical fractures; consolidated; very well sorted; moist.			
	45			47.0-52.0'-Sample. Recovered 3.7/5.0'=74%. RQD=2.0/3.7'=54%. CLAYSTONE: light olive gray (5Y 5/2); abundant dark yellowish orange (10YR 6/6) and dusky red (5R 3/2) iron staining along fractures; some organics; very well sorted; consolidated; moist.			
	50			52.0-57.0'-Sample. Recovered 4.0/5.0'=80%. RQD=3.5/4.0'=88%. CLAYSTONE: olive gray (5Y 3/2); abundant dark yellowish orange (10YR 6/6) stains; few dusky red (5R 3/2) stains; few organics; very well sorted; consolidated; slightly damp.			
	55			57.0-62.0'-Sample. Recovered 4.3/5.0'=86%. RQD= 3.2/4.3'=75%. CLAYSTONE: olive gray (5Y 3/2); some black organic fragments; few wood fragments; some moderate yellowish brown siltstone; very well sorted; consolidated; firm; damp.			
	60						

Remarks Logged by: T. Murphy & J. Bergman

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86 **Coordinates** N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5964.46'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	60			62.0-67.0'-Sample. Recovered 5.0/5.0'=100%. RQD=4.0/5.0'=80%. CLAYSTONE: olive gray (5Y 3/2); few yellowish orange mottles (10YR 5/4); no organics; very well sorted; consolidated; damp.			
	65			67.0-72.0'-Sample. Recovered 0.6/5.0'=12%. RQD=0.0/0.6'=0%. CLAYSTONE: olive gray (5Y 3/2); few moderate yellowish brown (10YR 5/4) mottles; well sorted; consolidated; no organics; homogenous; damp.			
	70			72.0-77.0'-Sample. Recovered 2.5/5.0'=50%. RQD=0.6/2.5'=24%. CLAYSTONE: olive gray (5Y 3/2); very well sorted; consolidated; homogenous; several black organic fragments; slightly damp.			
	75			78.0-83.0'-Sample. Recovered 3.0/5.0'=60%. RQD=2.2/3.0'=73%. CLAYSTONE: olive gray (5Y 3/2); moderate yellowish brown (10YR 5/4) siltstone nodules; well sorted; consolidated; homogenous; no organics; moist.			
	80						

Remarks Logged by: T. Murphy & J. Bergman Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant	LOG OF BORING NO. 32-86
Date Drilled 9/3/86, 9/22/86 - 9/25/86	Coordinates N 38065.7 E 21640.7
Boring Method Hollow Stem Auger/NX Core	Ground Surface Elevation 5954.26'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	80			83.0-87.0'-Sample. Recovered 3.0/4.0'=75%. RQD=1.4/3.0'=47%. CLAYSTONE: olive gray (5Y 3/2); common moderate yellowish brown (10YR 5/4) mottles and siltstone nodules; well sorted; consolidated; homogenous; moist.			
	85			87.0-92.0'-Sample. Recovered 3.8/5.0'=76%. RQD=0.0/3.8'=0%. CLAYSTONE: olive gray (5Y 3/2); interbedded gray (N 7) sandy and silty clay; very fine-grained; well sorted; consolidated; nicely laminated 0.7'thick; moist.			
	90			92.0-97.0'-Sample. Recovered. 2/5.0'=64%. RQD=2.9/3.2'=91%. SILTY SANDSTONE: light gray (N 7) interbedded with olive gray (5Y 3/2) silty clay; very fine-grained; very well sorted; rounded; consolidated; dry.			
	95			97.0-103.0'-Sample. Recovered 3.6/6.0'=60%. RQD=1.3/3.6=36%. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; very fine-grained; little sand; few moderate yellowish brown mottles (10YR 5/4); very well sorted; consolidated; slightly damp.			
	100						

Remarks Logged by: T. Murphy & J. Bergman Checked by: [illegible]

Project No. 106P06222	Hydro-Search, Inc.	Page 5 of 7

Project: Rocky Flats Plant

LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86 **Coordinates** N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5064.46'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	100			103.0-107.0'-Sample. Recovered 2.3/4.0'=58%. RQD=0.0/2.3'=0%. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; some very fine-grained sand; very well sorted; rounded; slightly damp.			
	105			107.0-112.0'-Sample. Recovered 2.3/5.0'=46%. RQD=1.1/2.3'=48%. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; very well sorted; consolidated; slightly damp.			
	110			112.0-117.0'-Sample. Recovered 4.2/5.0'=83%. RQD=2.8/4.2'=67%. 112.8-115.2': CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; abundant yellowish brown (10YR 5/4) pebble and gravel-sized nodules; angular; moderately sorted; dry. 115.2-117': SAND: light gray (N 7/0); very fine-grained; gradational contact; very well sorted; rounded; consolidated; dry.			
	115			117.0-122.0'-Sample. Recovered 2.2/5.0'=44%. RQD=0.5/2.2'=23%. SAND: light gray (N 7/0); very fine-grained and silty sand; very well sorted; rounded; consolidated; lower 1.0' becomes laminated with alternating layers of olive gray (5Y 3/2) clay and gray (N 7) very fine-grained sand; dry.			
	120						

Remarks Logged by: T. Murphy & J. Bergman Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86 **Coordinates** N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 6063.26'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	120			122.0-127.0'-Sample. Recovered 4.2/5.0'=84%. RQD=4.0/4.2'=95%. SILTY SAND: light gray (N 7/0); fine and very fine-grained sand and silty sand; thinly laminated with alternating layers of olive gray (5Y 3/2) clay and light gray (N 7) sand; well sorted; consolidated; rounded; dry.			
	125			127.0-132.0'-Sample. Recovered 2.0/5.0'=40%. RQD=0.8/2.0'=40%. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; one moderate yellowish brown (10YR 5/4) siltstone layer at 131.0' 0.02'wide; very well sorted; consolidated; rounded; dry.			
	130			132.0-135.0'-Sample. Recovered 1.5/3.0'=50%. RQD=0.0/3.0'=0%. CLAYSTONE: olive gray (5Y 3/2); no mottles; well sorted; consolidated; homogenous; dry.			
	135			TOTAL DEPTH: 135.0'			
	140						

Remarks Logged by: T. Murphy & J. Bergman Checked by:

Project No. 106P06222

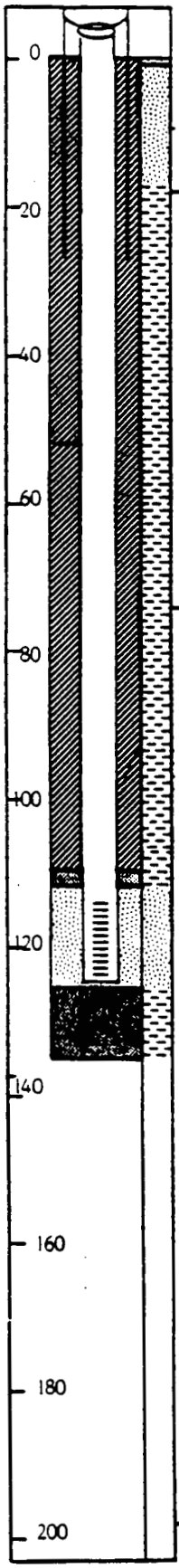
Hydro-Search, Inc.

WELL 32-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 38065.7 E 21640.7

ELEVATION: GROUND LEVEL 5964.46'
TOP OF CASING 5966.96'



PROJECT 10KR06222 Rocky Flats Plant
PERSONNEL T. Murphy/J. Bergman
LOCATION Golden, CO

DRILLING SUMMARY:

TOTAL DEPTH Well: 125.50' Hole: 135.00'

BOREHOLE DIAMETER 0.00' - 27.00': 7½"
27.00' - 135.00': 5 5/8"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue, Golden, CO
(Dave Jarvie, Robert Roach)

RIG 0.00'-27.00' Mobile B-57; 27.00'-135.00'

BIT(S) 0.00' - 27.00': T-5
27.00' - 135.00': Carbide bit

DRILLING FLUID 0.00' - 27.00': None
27.00' - 135.00': air/water mist

SURFACE CASING 5" x 30.50' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	27.00'	C1			
0.00'	114.90'	C2			
114.90'	125.50'	S1			

CASING: C1 5" I.D. steel surface casing
C2 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS None

FILTER MATERIAL 32-42 silica sand
112.00' - 114.00'

CEMENT Portland Type I
0.00' - 112.00'

OTHER 3/8" bentonite pellets
112.00' - 114.00'
126.00' - 135.00'

CONSTRUCTION TIME LOG:

TASK	START DATE	START TIME	FINISH DATE	FINISH TIME
DRILLING:	1986		1986	
7½" auger	9/3	1030	9/3	1210
NC core	9/23	1600	9/25	1515
Reaming	9/27	1000	9/27	1200
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
5" steel	9/3	1445	9/3	1505
2" stainless	9/29	0920	9/29	0950
FILTER PLACEMENT:	9/29	1055	9/29	1415
CEMENTING:	9/29	1530	9/29	1630
DEVELOPMENT:	10/14	1430	11/7	0945
OTHER:				
Bentonite	9/29	1415	9/29	1445
	9/27	1305	9/27	1310
Packer testing	9/25	1330	9/27	0940
Cementing 5" steel	9/3	1506	9/3	1530

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 2.50'

HYDRO-SEARCH RENO•DENVER CONSULTING HYDROLOGISTS-GEOLOGISTS

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 32-86

Hydraulic Conductivity (cm/sec) = 9×10^{-8}

Flowrate (gpm) = 5.81×10^{-2} gpm

Screened Interval (ft below G.L.) = 114.90' - 125.50'

114.90 - 115.20' claystone

115.2 - 125.50' silty sandstone

Method of Analysis: Residual-Drawdown Plot

(Driscoll, 1986 - pg 256.)

RFW 10-05-003/A-5/85

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

WELL 32-86

$$T\ (gpd/ft) = \frac{264\,Q}{\Delta S'} = \frac{264\,(5.81\times10^{-2})}{778} = 1.97\times10^{-2}$$

where $Q\ (gpm) = 3.75\ gal/64.5\ min = 5.81\times10^{-2}\ gpm$

$\Delta S'$ = ft. change in residual drawdown / log cycle

= 778 ft/log cycle (see attached plot)

$$K\ (gpd/ft^2) = T/b = \frac{1.97\times10^{-2}}{15.6} = 1.26\times10^{-3}$$

where $b\ (ft) = 15.6$ ft

$$K\ (cm/sec) = 1.26\times10^{-3}\ gpd/ft^2 \times \frac{4.72\times10^{-5}\ cm/sec}{gpd/ft^2} = 7\times10^{-8}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$.

$$t\ (min) = \frac{r^2 S}{4\,T\,u} = \frac{(0.234^2)\,(10^{-3})}{(4)\,(1.97\times10^{-2})\,(.01)} \times \frac{1440\ min}{day} \times \frac{7.482\ gal}{ft^3}$$

= 749 min.

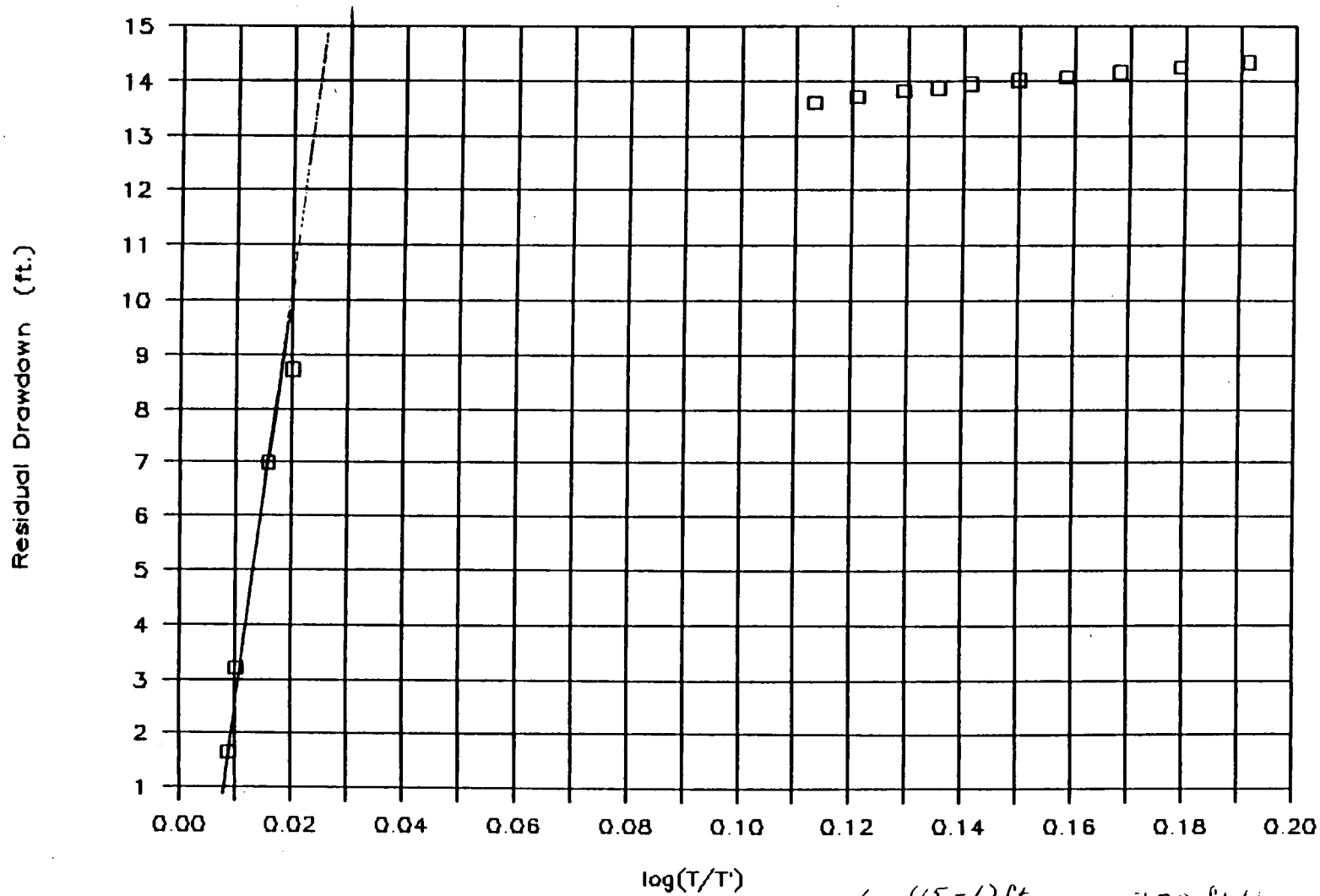
where $r\ (ft) = \left(\frac{5\frac{5}{8}}{24}\right) ft = 0.234\ ft$

$S = 10^{-3}$ assumed S for confined aquifer

$\Delta S'$ was based on pts based on $t \geq 1425$ min.

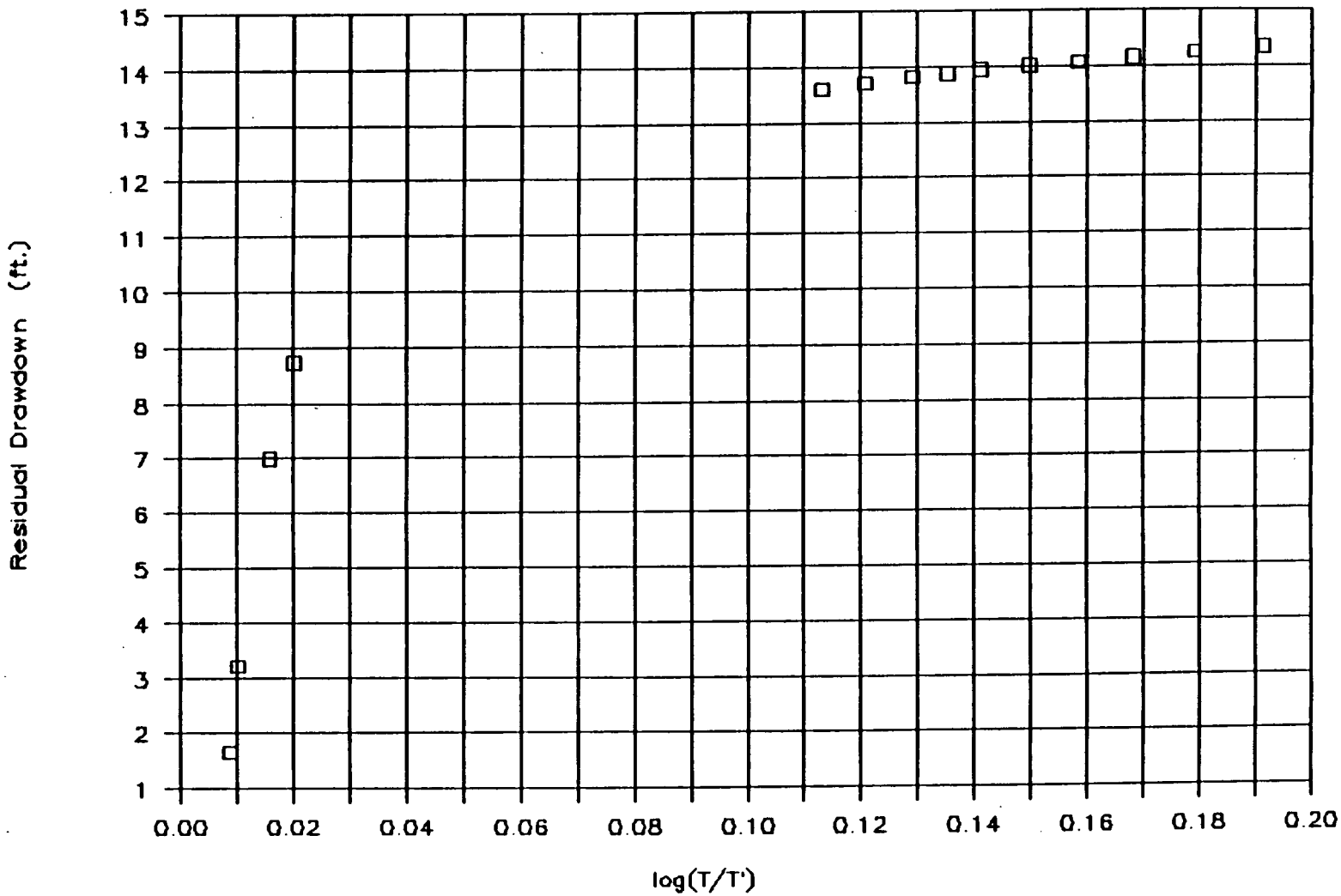
RFW 10-05-003/A-5/85

WELL 32-86

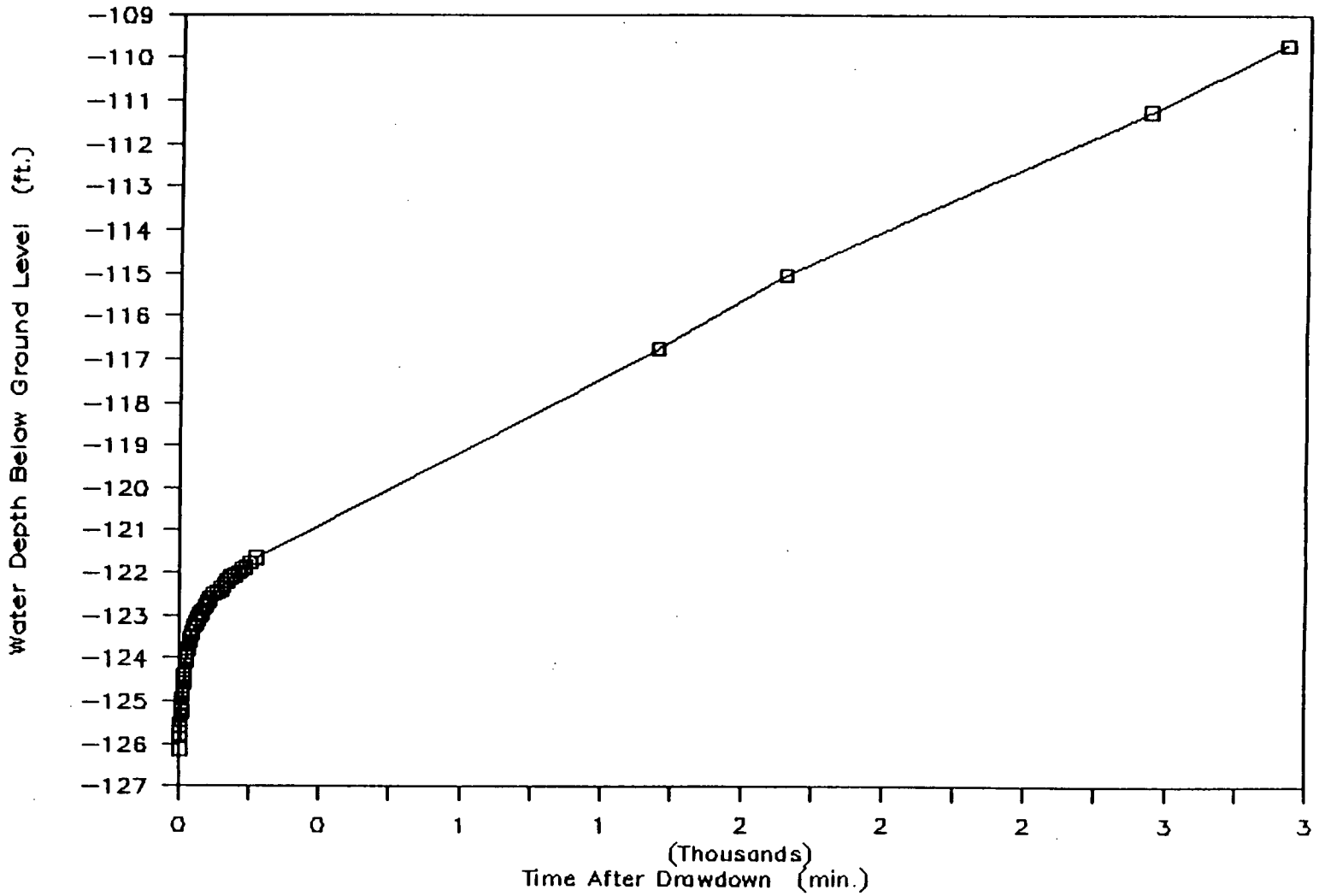


$\Delta s' = \frac{(15-1)\,ft}{.026-.008} = 778$ ft/log cycle

WELL 32-86


Residual Drawdown (ft.)
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
log(T/T')

WELL 32-86


-109
-110
-111
-112
-113
-114
-115
-116
-117
-118
-119
-120
-121
-122
-123
-124
-125
-126
-127
Water Depth Below Ground Level (ft.)
0
0
1
1
2
2
2
3
3
(Thousands)
Time After Drawdown (min.)

WELL 32-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	log(T/T')
66.00	1.50	126.13	18.08	1.64
67.00	2.50	125.75	17.70	1.43
67.50	3.00	125.60	17.55	1.35
68.00	3.50	125.58	17.53	1.29
68.50	4.00	125.56	17.51	1.23
69.00	4.50	125.46	17.41	1.19
69.50	5.00	125.36	17.31	1.14
70.00	5.50	125.35	17.30	1.10
70.50	6.00	125.25	17.20	1.07
71.00	6.50	125.20	17.15	1.04
72.00	7.50	125.08	17.03	0.98
73.00	8.50	124.96	16.91	0.93
74.00	9.50	124.84	16.79	0.89
75.00	10.50	124.77	16.72	0.85
76.00	11.50	124.67	16.62	0.82
77.00	12.50	124.57	16.52	0.79
78.00	13.50	124.50	16.45	0.76
79.00	14.50	124.41	16.36	0.74
80.00	15.50	124.31	16.26	0.71
81.00	16.50	124.28	16.23	0.69
83.00	18.50	124.08	16.03	0.65
85.00	20.50	123.96	15.91	0.62
87.00	22.50	123.86	15.81	0.59
89.00	24.50	123.79	15.74	0.56
91.00	26.50	123.68	15.63	0.54
93.00	28.50	123.61	15.56	0.51
95.00	30.50	123.53	15.48	0.49
97.00	32.50	123.46	15.41	0.47
99.00	34.50	123.41	15.36	0.46
101.00	36.50	123.37	15.32	0.44
106.00	41.50	123.24	15.19	0.41
111.00	46.50	123.18	15.13	0.38
116.00	51.50	123.08	15.03	0.35
121.00	56.50	122.99	14.94	0.33
126.00	61.50	122.94	14.89	0.31
131.00	66.50	122.86	14.81	0.29
136.00	71.50	122.79	14.74	0.28
141.00	76.50	122.75	14.70	0.27
146.00	81.50	122.68	14.63	0.25
151.00	86.50	122.62	14.57	0.24
161.00	96.50	122.50	14.45	0.22
171.00	106.50	122.45	14.40	0.21

WELL 32-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	log(T/T')
181.00	116.50	122.39	14.34	0.19
191.00	126.50	122.29	14.24	0.18
201.00	136.50	122.21	14.16	0.17
211.00	146.50	122.12	14.07	0.16
221.00	156.50	122.06	14.01	0.15
232.50	168.00	121.98	13.93	0.14
241.00	176.50	121.92	13.87	0.14
251.00	186.50	121.86	13.81	0.13
266.00	201.50	121.75	13.70	0.12
281.00	216.50	121.65	13.60	0.11
1425.00	1360.50	116.77	8.72	0.02
1789.00	1724.50	115.06	7.01	0.02
2814.00	2749.50	111.26	3.21	0.01
3199.00	3134.50	109.70	1.65	0.01

AQUIFER TEST DATA

WELL: 32-36
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST: 3rd Down Recovery Test
HOW Q MEASURED: 2 Gal Bucket
HOW W.L.'s MEASURED: Sounder
RAD./DIST. OF/FROM PUMPING WELL:
MEAS. POINT FOR W.L.'s:
ELEVATION OF MEAS. POINT:

DEPTH OF PUMP/AIRPIPE:
PUMP ON: date 11-10-96 time 10:41:00
PUMP OFF: date 11-10-96 time 11:45:30
DURATION OF AQUIFER TEST:

LOCATION
PERSONNEL
PROJECT

TIME t = ____ at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL 105 + 3.00					DISCHARGE		RECORDED BY	COMMENTS T.D. 22.03'
DAY	CLOCK TIME	t	t'	110.13	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL	s or s'	108.05	READING	Q		
1	11:48	0.0			128+3.63	-2.50	126.13	18.08				CW	10:41 [illegible]
	11:48½	1.0			125+3.25	-2.50	125.75	17.70				CW	[illegible]
	11:48½	1.5			125+3.10	-2.50	125.60	17.55				"	Finished Calib.
	11:49	2.0			125+3.08		125.58	17.53				"	11:45:30
	11:49½	2.5			125+3.06		125.56	17.51				"	
	11:50	3.0			125+2.96		125.46	17.41				"	Fac. 3.7 = gall
	11:50½	3.5			125+2.86		125.36	17.31				"	
	11:51	4.0			125+2.85		125.35	17.30					
	[illegible]	4.5			125+2.75		125.25	17.20					
	11:52	5.0			125+2.70		125.20	17.15					
	11:53	6.0			125+2.68		125.18	17.13		(Reading)			-C% = 115.[illegible] Recovery
	[illegible]	7.0			[illegible]		124.96	16.91					
	[illegible]	8			[illegible]		124.84	16.79					
	[illegible]	9			[illegible]		124.77	16.72					
	[illegible]	10			125+2.17		124.67	16.62					
	[illegible]	11			125+[illegible]		124.57	16.52					
	[illegible]	12			125+[illegible]		124.50	16.45					
	12:[illegible]	13			125+1.91		124.41	16.36					
	12:[illegible]	14			125+1.81		124.31	16.26					
	[illegible]	15			[illegible]		124.29	16.23					
	[illegible]	17			[illegible]		124.08	16.22					
		19			[illegible]		123.96	16.21					
		21			125+1.36		[illegible]	15.81					
		23			125+1.29		[illegible]	15.74					
	[illegible]	25			125+1.18		[illegible]	15.63					
	[illegible]	27			125+1.11		123.61	15.56					
	12:[illegible]	29			125+1.03		123.53	15.48					
	12:13	31			125+.96		123.46	15.41					
	12:20	33			125+.91		123.41	15.36					
	[illegible]	35			125+.87		123.37	15.32					
	12:27	40			125+.74		123.24	15.19					
	12:32	45			125+.68		123.18	15.13					
	12:37	50			125+.58		123.08	15.03					
	12:42	55			125+.49		122.99	14.94					
	12:47	60			125+.44		122.94	14.89					
	12:52	65			125+.36		122.86	14.81					
	12:57	70			125+.29		122.79	14.74					
	13:02	75			125+.25		122.75	14.70					
	13:07	80			125+.19		122.69	14.63					
	13:12	85			125+.12		122.62	14.57					
	13:22	95			125+.00		[illegible]	14.45					

AQUIFER TEST DATA

WELL 32-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST Bail Cover Recovery
HOW Q MEASURED Agator Circle
HOW W.L.'s MEASURED Olympic
RAD./DIST. OF/FROM PUMPING WELL
MEAS. POINT FOR W.L.'s
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date 11-10-96 time
PUMP OFF: date 11-12-96 time
DURATION OF AQUIFER TEST

LOCATION Quincy, Washington
PERSONNEL Jeff Kepler, C. Wolfe
PROJECT 10/10/2002 Quincy Fire District

TIME t = ____ at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL ____					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t	t'		READING	CONVERSIONS CORRECTIONS	WATER LEVEL	s or s'	108.05	READING	Q		
0	1332	105			120+4.95	-2.50	122.45	14.40					
	1342	115			120+4.89	-2.50	122.39	14.34					
	1352	125			120+4.79		122.29	14.24					
	1402	135			120+4.71		122.21	14.16					
	1412	145			120+4.62		122.12	14.07					
	1422	155			120+4.56		122.06	14.01					
	1432	50 166.50			120+4.48		121.98	13.93					
	1442	176.50			120+4.42		121.92	13.87					
	1452	186.5			120+4.36		121.86	13.81					
1	1507	201.5			120+4.25		121.75	13.70					
1	1522	216.5			120+4.15		121.65	13.60					
	~~1537~~												
2	1026				115+4.27		116.77	8.72					
2	1630				115+2.56		115.06	7.01					
3	09:35				110+3.76								
3	16:00				110+2.20				90%				
4	13:4[illegible]				105+2.49								
5	14:03				100+2.68								
8	9:10				90+1.67								
8	15:47				90+0.70								
9	8:46				85+3.44								
9													

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 45.20 - 55.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00106954 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 50.20 + 6.20 + 3.50 * 2.31 = 64.49
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000110 FT/MIN
K = .00000056 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00180062 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 50.20 + 6.20 + 8.00 * 2.31 = 74.88
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000159 FT/MIN
K = .00000081 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00027077 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 50.20 + 6.20 + 3.00 * 2.31 = 63.33
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000028 FT/MIN
K = .00000014 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 55.20 - 65.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00062277 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 60.20 + 6.20 + 3.50 * 2.31 = 74.48
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000055 FT/MIN
K = .00000028 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00016246 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 60.20 + 6.20 + 10.50 * 2.31 = 90.65
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 65.20 - 75.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00104246 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000090 FT/MIN
K = .00000046 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00188185 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 12.80 * 2.31 = 99.65
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000125 FT/MIN
K = .00000064 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00041969 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 2.00 * 2.31 = 74.70
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000037 FT/MIN
K = .00000019 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 75.20 - 85.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00018954 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000016 FT/MIN
K = .00000008 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00115077 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 15.50 * 2.31 = 105.89
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000072 FT/MIN
K = .00000037 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 2.50 * 2.31 = 75.86
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 85.20 - 95.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00035200 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000030 FT/MIN
K = .00000015 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00024369 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 17.50 * 2.31 = 110.50
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000015 FT/MIN
K = .00000007 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 2.00 * 2.31 = 74.70
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 95.20 - 105.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00085293 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000073 FT/MIN
K = .00000037 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00140800 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 20.00 * 2.31 = 116.28
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000080 FT/MIN
K = .00000041 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00014892 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000013 FT/MIN
K = .00000007 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106PO6222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 95.20 - 105.92
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00085293 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.72 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN
K = .00000035 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00140800 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.72 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 20.00 * 2.31 = 116.28
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN
K = .00000039 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00014892 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.72 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 105.20 - 115.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00163816 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 22.00 * 2.31 = 120.90
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000090 FT/MIN
K = .00000046 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00029785 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000026 FT/MIN
K = .00000013 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 32-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 116.08 - 126.08
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00086646 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000074 FT/MIN
K = .00000038 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00174647 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 24.00 * 2.31 = 125.52
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000092 FT/MIN
K = .00000047 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00050092 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 3.00 * 2.31 = 77.01
R = BOREHOLE RADIUS = .16 FEET

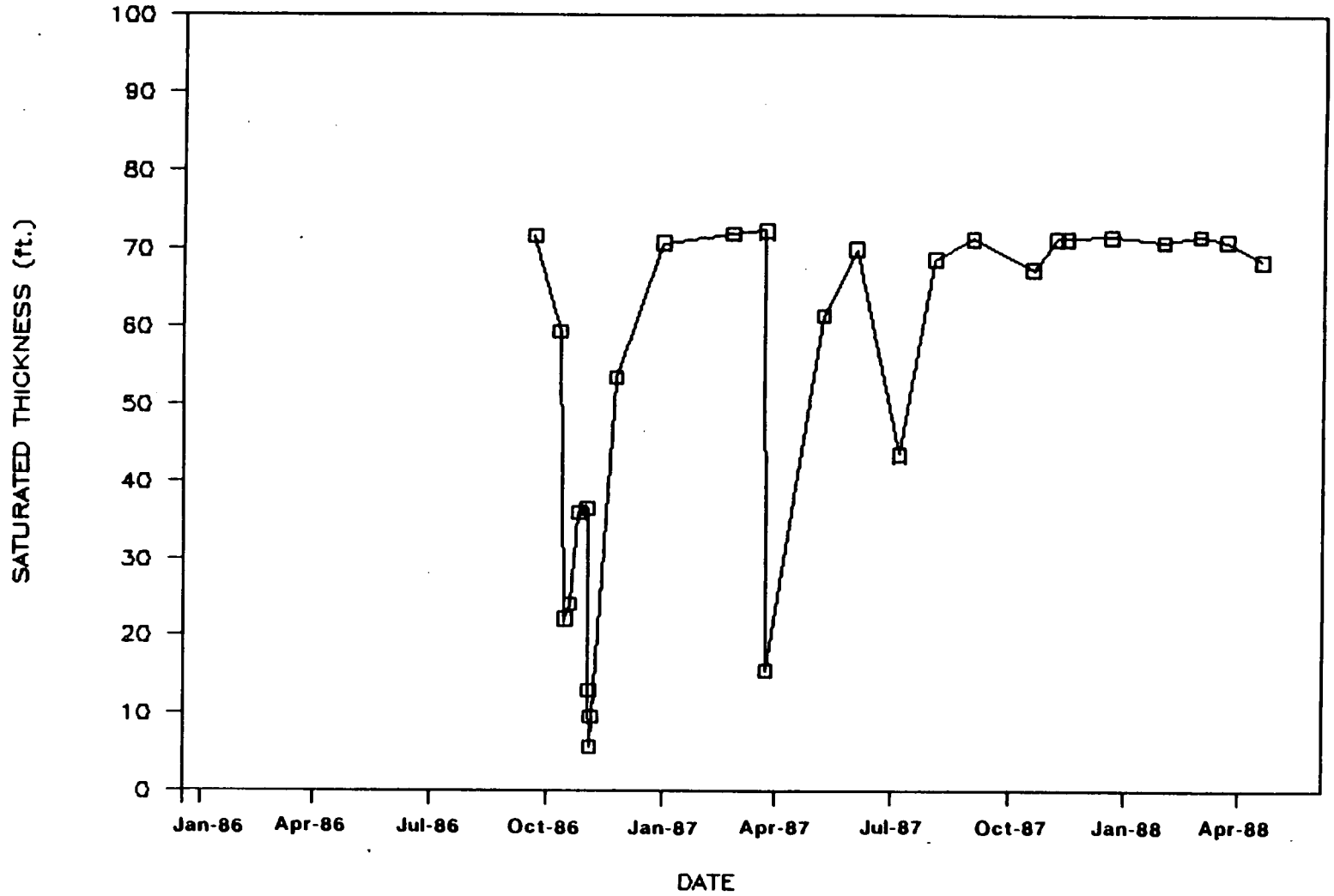
K = HYDRAULIC CONDUCTIVITY = .00000043 FT/MIN
K = .00000022 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3286	09/22/86	5964.46	5966.96	2.50	125.50	54.00	5912.96
	09/22/86					54.00	5912.96
	10/13/86					66.34	5900.62
	10/17/86					103.5	5863.46
	10/21/86					101.5	5865.44
	10/28/86					89.67	5877.29
	11/04/86					89.20	5877.76
	11/05/86					112.6	5854.36
	11/06/86					119.8	5847.19
	11/07/86					115.9	5851.07
	11/26/86					72.32	5894.64
	01/01/87					54.92	5912.04
	02/25/87					53.77	5913.19
	03/23/87					53.33	5913.63
	03/24/87					110.0	5856.96
	05/08/87					64.33	5902.63
	06/03/87					55.74	5911.22
	07/08/87					82.10	5884.86
	08/04/87					57.00	5909.96
	09/03/87					54.40	5912.56
	10/21/87					58.30	5908.66
	11/09/87					54.40	5912.56
	11/17/87					54.40	5912.56
	12/22/87					54.10	5912.86
	02/01/88					54.80	5912.16
	02/29/88					54.00	5912.96
	03/21/88					54.70	5912.26
	04/18/88					57.20	5909.76

SATURATED THICKNESS IN WELL # 32-86 (SP)



INDEX OF DATA

Boring No.: 33-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 33-86

Date Drilled 9/10/86

Boring Method Hollow Stem Auger

Coordinates N 36960.9 E 21896.5

Ground Surface Elevation 5049.28'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			ROCKY FLATS ALLUVIUM			
				0-4.8'-Sample. Recovered 3.1/4.8'= 65%. GRAVEL: light olive gray (5Y 5/2)to olive gray (5Y 3/2); clayey silt and sand matrix; quartzite pebbles; poorly sorted; subangular; crumbles; dry.			
	5						
				4.8-6.8'-Sample. Recovered 2.0/2.0'=100%. GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry.			
	10			ARAPAHOE FORMATION			
				6.8-11.8'-Sample. Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL: light olive gray (5Y 5/2); clayey sand matrix; quartzite cobbles and gravel clasts; angular to subangular; moderate sorting; loose; dry.			
	15						
				7.0-11.8': CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.			
	20						

Remarks Logged by: T. Murphy

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 33-86

Date Drilled 9/10/86 **Coordinates** N 36960.9 E 21896.5

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5949.28'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20						
	25						
	30			11.8-16.8'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well sorted; consolidated; fractured; firm; damp.			
	35			TOTAL DEPTH: 16.8'			
	40						

Remarks Logged by: T. Murphy Checked by:

Project No. 106P06222

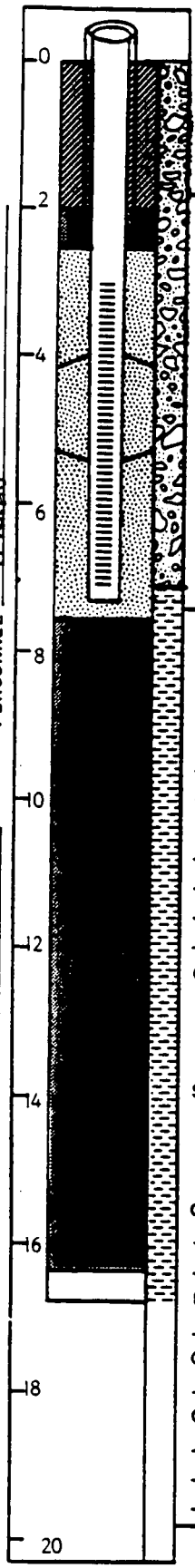
Hydro-Search, Inc.

WELL 33-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 36960.8 E 21896.5

ELEVATION: GROUND LEVEL 5949.28'
TOP OF CASING 5950.70'



LOCATION Golden, CO
PERSONNEL T. Murphy
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 7.34' Hole: 16.80'
BOREHOLE DIAMETER 7¼"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) T5

DRILLING FLUID None

SURFACE CASING 5" x 4' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG ___ GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	2.99'	C1			
2.99'	7.34'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
4.07' - 5.32'

FILTER MATERIAL 32-42 silica sand
2.50' - 7.50'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
7.50' - 16.40'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7¼" auger	9/10	1055	9/10	1130
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	9/10	1310	9/10	1317
FILTER PLACEMENT:	9/10	1302	9/10	1305
CEMENTING:	9/10	1331	9/10	1335
DEVELOPMENT:	9/12	1530	9/12	1530
OTHER:				
Bentonite	9/10	1305	9/10	1310
	9/10	1250	9/10	1255

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.42'

Cave from TD to 16.40'

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3386	09/12/86	5949.28	5950.70	1.42	7.34	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/24/87					-1.00	DRY
	05/08/87					-1.00	DRY
	06/03/87					-1.00	DRY
	07/08/87					-1.00	DRY
	08/04/87					-1.00	DRY
	09/03/87					-1.00	DRY
	09/24/87					-1.00	DRY
	10/21/87					-1.00	DRY
	11/09/87					-1.00	DRY
	12/01/87					-1.00	DRY
	12/21/87					-1.00	DRY
	01/11/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY

INDEX OF DATA

Boring No.: 34-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86 **Coordinates** N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5910.44'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			**VALLEY FILL**			
				0-1.3'-Sample. Recovered 1.3/1.3'=100%. CLAY: grayish olive (10Y 4/2) to light olive gray (5Y 5/2) silty clay; some sand, gravel and cobbles; subrounded; poorly sorted; grasses at surface; dry.			
	5			2.0-4.0'-Sample. Recovered 1.9/2.0'=95%. SILTY CLAY: moderate to dark yellowish brown (10YR 6/2); white feldspar grains along with quartzite and granite particles; poorly sorted; subangular; few roots; dry.			
				4.0-7.0'-Sample. Recovered 0.0/3.0'=0%.			
	10			7.0-12.0'-Sample. Recovered 2.5/5.0'=50%. CLAYSTONE: olive gray (5Y 4/1); trace silt and sand; gravel lense at 8.6'; grades downward into light olive gray (5Y 5/2) clay; large subrounded cobble at bottom; soft; sticky; damp to moist.			
				12.0-17.0'-Sample. Recovered 2.7/5.0'=54%.			
	15			12.0-16.1'. GRAVEL: light olive gray (5Y 5/2) with abundant pink granite and quartzite; poorly sorted; angular to subangular; some sand; trace clay; wet.			
				ARAPAHOE FORMATION			
	20			16.1-17.0'. CLAYSTONE: dusky yellow (5Y 7/6); abundant medium light gray (N 6) horizontal mottles; well sorted; consolidated; firm; damp.			

Remarks Logged by: T. Murphy & L. Pivonka Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

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Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5910.44'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			17.0-22.8'-Sample. Recovered 4.8/4.8'=100%. CLAYSTONE: light olive gray (5Y 5/2) clay with some silt; dark yellowish orange (10YR 6/6) mottles; well sorted; firm; damp.			
				22.8-27.8'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); some silt; some dark yellowish orange (10YR 6/6) mottles; well sorted; firm; damp.			
	25						
				27.8-32.8'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light olive gray (5Y 5/2) and medium gray (N 5); limonite stains dark yellowish orange (10YR 6/6) abundant; black wood fragments common; trace silt and sand; iron stain along fractures; well sorted; firm; damp.			
	30						
				32.8-37.8'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: olive gray (5Y 3/2) with minor dark yellowish orange (10YR 6/6) limonite stains; black wood fragments common; trace silt and sand; well sorted; firm; damp.			
	35						
				38.0-43.8'-Sample. Recovered 5.8/5.8'=100%. CLAYSTONE: dark gray (N 3); silty with trace of FeO stringers; some charcoal wood fragments; well sorted; consolidated; damp.			
	40						

Remarks Logged by: T. Murphy & L. Pivonka Checked by:

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86 **Coordinates** N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5910.44'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	40			43.8-45.0'-Sample. Recovered 1.2/1.2'=100%. SANDSTONE: dark gray (N 3); clay-rich; greenish gray (5GY 6/1) clay; well sorted; consolidated; damp.			
	45			45.0-48.0'-Sample. Recovered 3.0/3.0'=100%. SANDSTONE: medium gray (N 5) laminated sandstone 0.5" thick with dark gray (N 3) claystone interbeds 0.1" thick; some of the thicker laminae contain coal material; very light gray (N 8) sandy clasts within the lower 1.5'; well sorted; consolidated; damp.			
	50			48.0-52.3'-Sample. Recovered 0.2/4.3'=5%. SANDSTONE: medium light gray (N 6); silty; laminated; well sorted; consolidated; damp.			
				52.3-53.4'-Sample. Recovered 1.1/1.1'=100%. SANDSTONE: medium light gray (N 6); silty; laminated; well sorted; consolidated; damp.			
	55			53.4-54.4'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: medium gray (N 5); laminated; well cemented with calcium carbonate; consolidated; damp.			
	60						

Remarks Logged by: T. Murphy & L. Pivonka Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86 **Coordinates** N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5910.44'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	60			54.4-55.6'-Sample. Recovered 1.2/1.2'=100%. SANDSTONE: medium gray (N 5); laminated; well cemented with calcium carbonate; consolidated; damp.			
				55.6-59.3'-Sample. Recovered 3.7/3.7'=100%. CLAYSTONE: dark gray (N 3); variable quantities of silt and sand; abundant clay; consolidated; well sorted; firm; moist.			
	65			59.3-62.5'-Sample. Recovered 3.2/3.2'=100%. CLAYSTONE: dark gray (N 3); silty; light gray (N 7) mottling; firm; consolidated; well sorted; moist.			
				62.5-64.5'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: light gray (N 7) clay laminated sandstone; gradational contact; well sorted; consolidated; moist.			
	70			64.5-69.3'-Sample. Recovered 4.8/4.8'=100%. SANDSTONE: light gray (N 7) and medium light gray (N 6) silty sandstone with trace of wood fossils; sand content increases with depth; consolidated; well sorted; firm; dry.			
	75			69.3-71.0'-Sample. Recovered 1.7/1.7'=100%. CLAYSTONE: medium gray (N 5) silty and fine-grained sandy claystone; well sorted; firm; damp.			
	80						

Remarks Logged by: T. Murphy & L. Pivonka Checked by:

Project No. 106P06222

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Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86 **Coordinates** N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5910.44'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	80			71.0-74.3'-Sample. Recovered 3.3/3.3'=100%. CLAYSTONE: dark gray (N 3); blocky texture; well sorted; firm; damp.			
				74.3-75.3'-Sample. Recovered 0.6/1.0'=60%. CLAYSTONE: dark gray (N 3); grayish orange (10YR 7/4) mottles; well sorted; consolidated; damp.			
	85			75.3-78.5'-Sample. Recovered 3.2/3.2'=100%. SANDSTONE: medium gray (N 5) silty sandstone; well sorted; consolidated; damp.			
				78.5-83.5'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: medium dark gray (N 4); blocky texture; well sorted; consolidated; damp.			
	90			83.5-86.0'-Sample. Recoverd 2.5/2.5'=100%. CLAYSTONE: medium dark gray (N 4); blocky texture; trace of pale yellowish orange (10YR 8/6) nodules; well sorted; consolidated; damp.			
				86.0-86.6'-Sample. Recovered 0.6/0.6'=100%. CLAYSTONE: medium dark gray (N 4); blocky texture; trace of pale yellowish orange (10YR 8/6) nodules; well sorted; consolidated; damp.			
	95			86.6-89.0'-Sample. Recovered 2.4/2.4'=100%. CLAYSTONE: greenish gray (5GY 6/1) silty sandstone with clay laminae; well sorted; consolidated; damp.			
	100						

Remarks Logged by: T. Murphy & L. Pivonka Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 34-86

Date Drilled 8/20/86, 8/26/86,8/28/86 **Coordinates** N 37171.4 E 23088.4

Boring Method Hollow Stem Auger/NC Core **Ground Surface Elevation** 5910.44'

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	100			96.0-100.0'-Sample. Recovered 4.0/4.0'=100%. CLAYSTONE: medium dark gray (N 4); gradational contact; some very fine-grained sand; well sorted; consolidated; damp.			
	105			TOTAL DEPTH: 100.0'			
	110						
	115						
	120						

Remarks Logged by: Checked by:

Project No. 106P06222

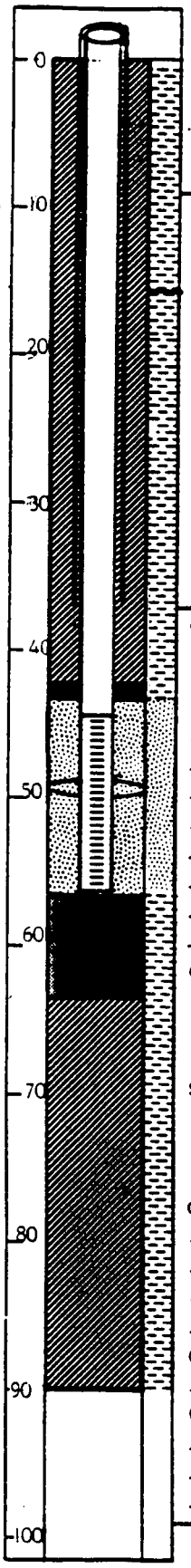
Hydro-Search, Inc.

WELL 34-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37171.4 E 23088.4

ELEVATION: GROUND LEVEL 5910.44'
TOP OF CASING 5912.78'



LOCATION Golden, CO
PERSONNEL T. Murphy/L. Pivonka
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 56.25' Hole: 100.00'
BOREHOLE DIAMETER 0.00' - 37.80': 7½"
37.80' - 100.00': 4 3/4"
DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue, Golden
(David Jarvie, Jim Horn)
RIG Mobile B-57
BIT(S) 0.00' - 37.80': Blade bit
37.80' - 100.00': Bull nose rock bit
DRILLING FLUID None

SURFACE CASING 5" x 40.8' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	37.80'	C1			
0.00'	44.24'	C2			
44.24'	56.25'	S1			

CASING: C1 5" I.D. steel
C2 2" I.D., Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D., Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
22.47' - 23.70'
49.01' - 50.26'

FILTER MATERIAL 32-42 silica sand
43.00' - 56.50'

CEMENT Portland Type I
0.00' - 42.00' ; 90.00' - 64.50'

OTHER 3/8" bentonite pellets
42.00' - 43.00'
56.50' - 64.50'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7½" auger	8/20	1251	8/20	1545
4 3/4" core	8/26	1503	9/2	1202
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
5" steel	8/21	0800	8/21	1335
2" stainless	9/3	0845	9/3	0900
FILTER PLACEMENT:	9/3	0900	9/3	1145
CEMENTING:	9/2	1604	9/2	1716
DEVELOPMENT:	9/5	1000	9/12	1015
OTHER:				
Cementing 5" casing	8/21	1359	8/21	1456
Lower cement	9/3	1150	9/3	1210
Bentonite	9/3	0823	9/3	0845
	9/3	1145	9/3	1150
Packer test	8/29	1056	8/29	1725

WELL DEVELOPMENT

See Well Development Summary Sheet

COMMENTS:

Water encountered at 48.0' during drilling.

Top of stainless steel casing: 2.34'

Cave from T.D. to 90.0'

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY JLP DEPT _____ DATE 6/21/88

METHOD REV. BY JLP DEPT _____ DATE 6/21/88

APPROVED BY _____

DEPT _____ DATE _____

WELL 34-86

Hydraulic Conductivity (cm/sec) = 3.1×10^{-6}

Flowrate (gpm) = 0.409

Screened Interval (ft below G.L.) = 44.24 - 56.25'

44.24 - 55.6 sandstone
55.6 - 56.25 claystone

Method of Analysis: Residual-drawdown Plot
(Driscoll, 1986 - pg 256.)

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

WELL 34-86

$$T\ (gpd/ft) = \frac{264\,Q}{\Delta S'} = \frac{(264)\ (.409)}{137} = .788$$

where $Q\ (gpm) = 9$ gallons / 22 minutes $= 0.409$ gpm

$\Delta S'$ = ft. change in residual drawdown / log cycle

= 137 ft / log cycle (see attached plot)

$$K\ (gpd/ft^2) = T/b = .788/12.01 = 6.56 \times 10^{-2}$$

where $b\ (ft) = 12.01'$

$$K\ (cm/sec) = 6.56 \times 10^{-2}\ gpd/ft^2 \times \frac{4.72 \times 10^{-5}\ cm/sec}{gpd/ft^2} = 3.1 \times 10^{-6}$$

This method is valid where $u \leq 0.01$

solving for t for $u \leq 0.01$.

$$t\ (min) = \frac{r^2\,S}{4\,T\,u} = \frac{(0.198)^2\ \ 10^{-3}}{4\,(.788)\,(.01)} \times \frac{1440\ min}{day} \times \frac{7.482\ gal}{ft^3}$$

= 13 minutes

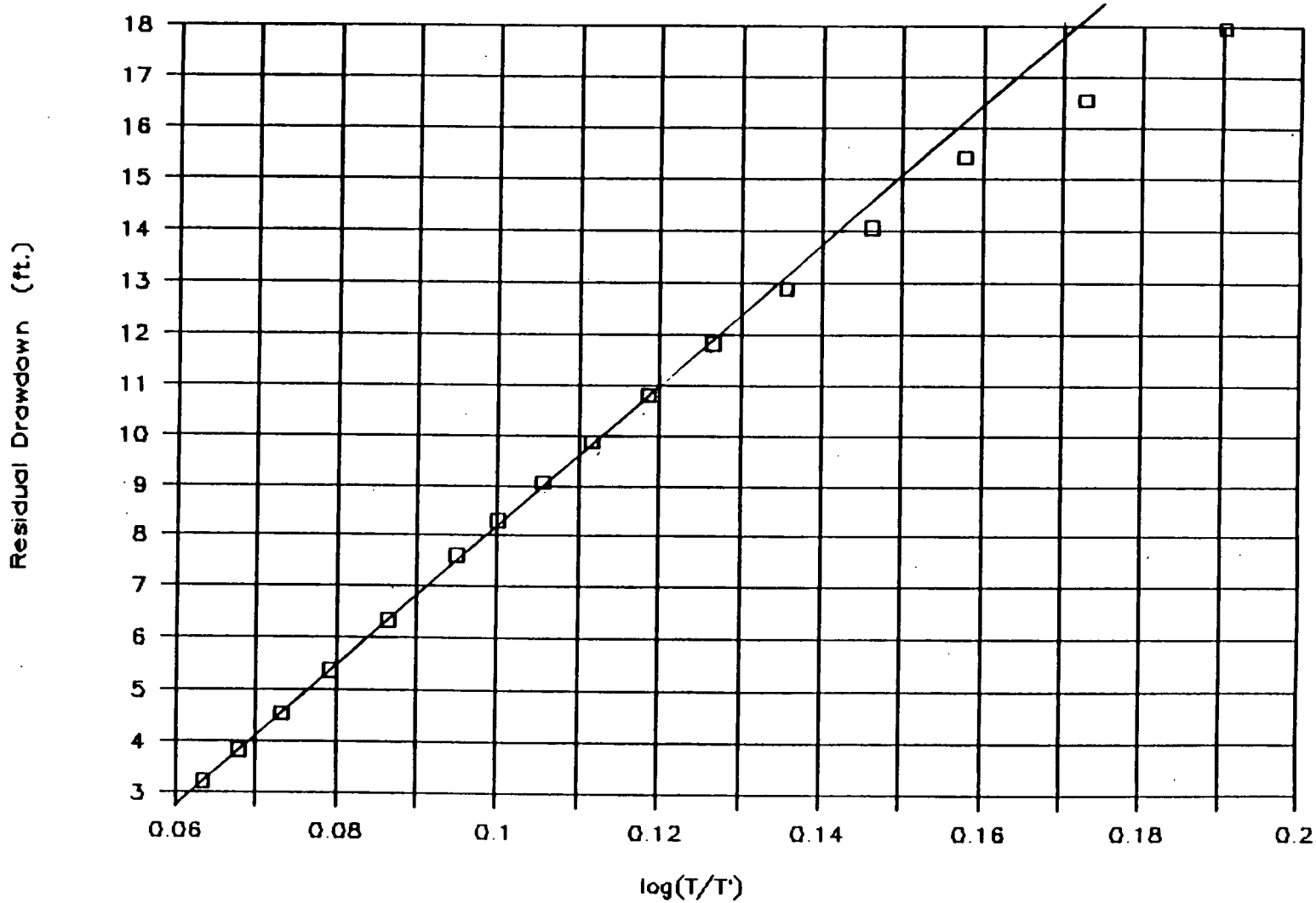
where $r\ (ft) = \left(\frac{4.75}{24}\right) ft = (0.198)\ ft$

$S = 10^{-3}$ assumed S for confined aquifer

$\Delta S'$ is based on points where $t \geq 70$ min.

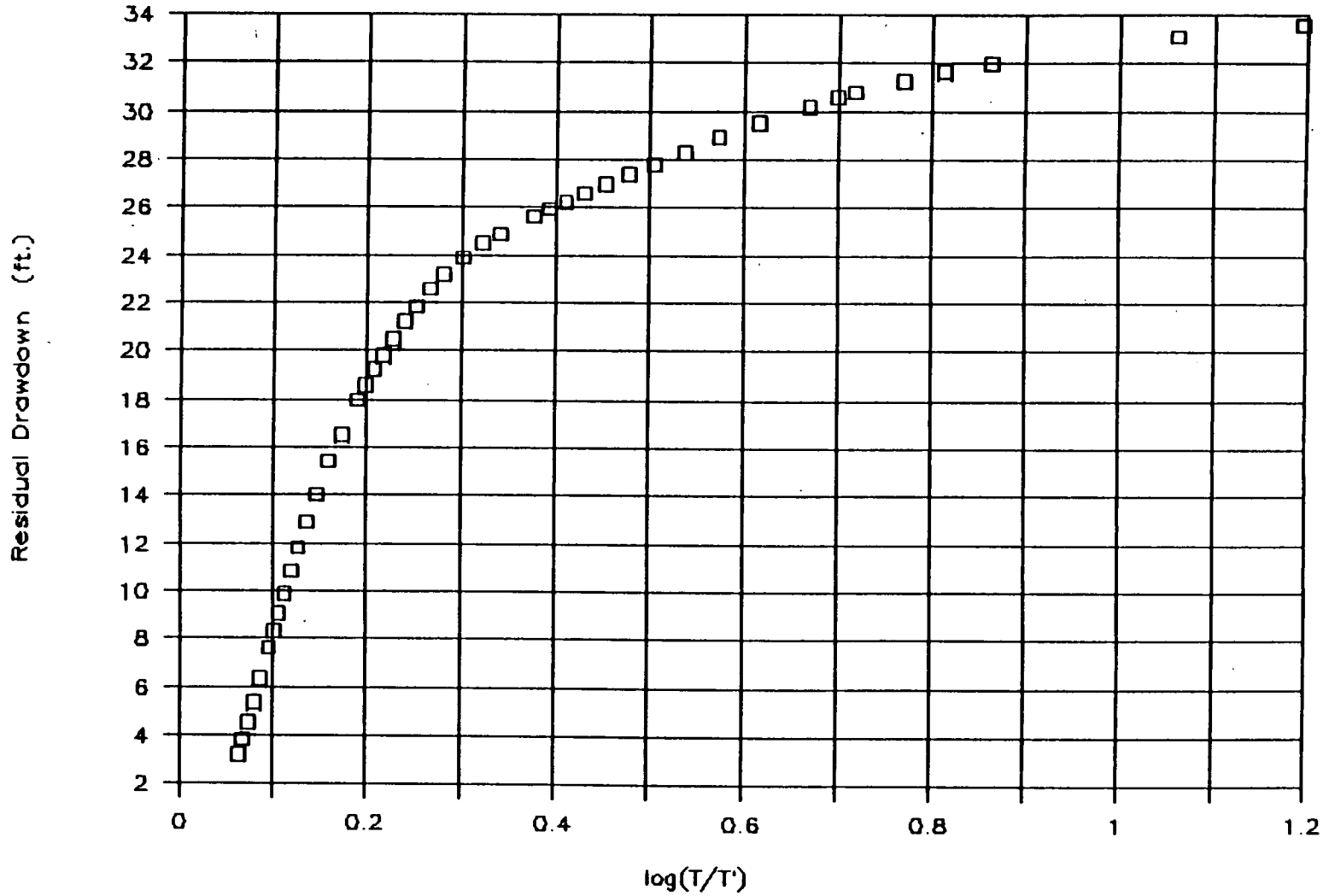
RFW 10-05-003/A-5/85

WELL 34-86

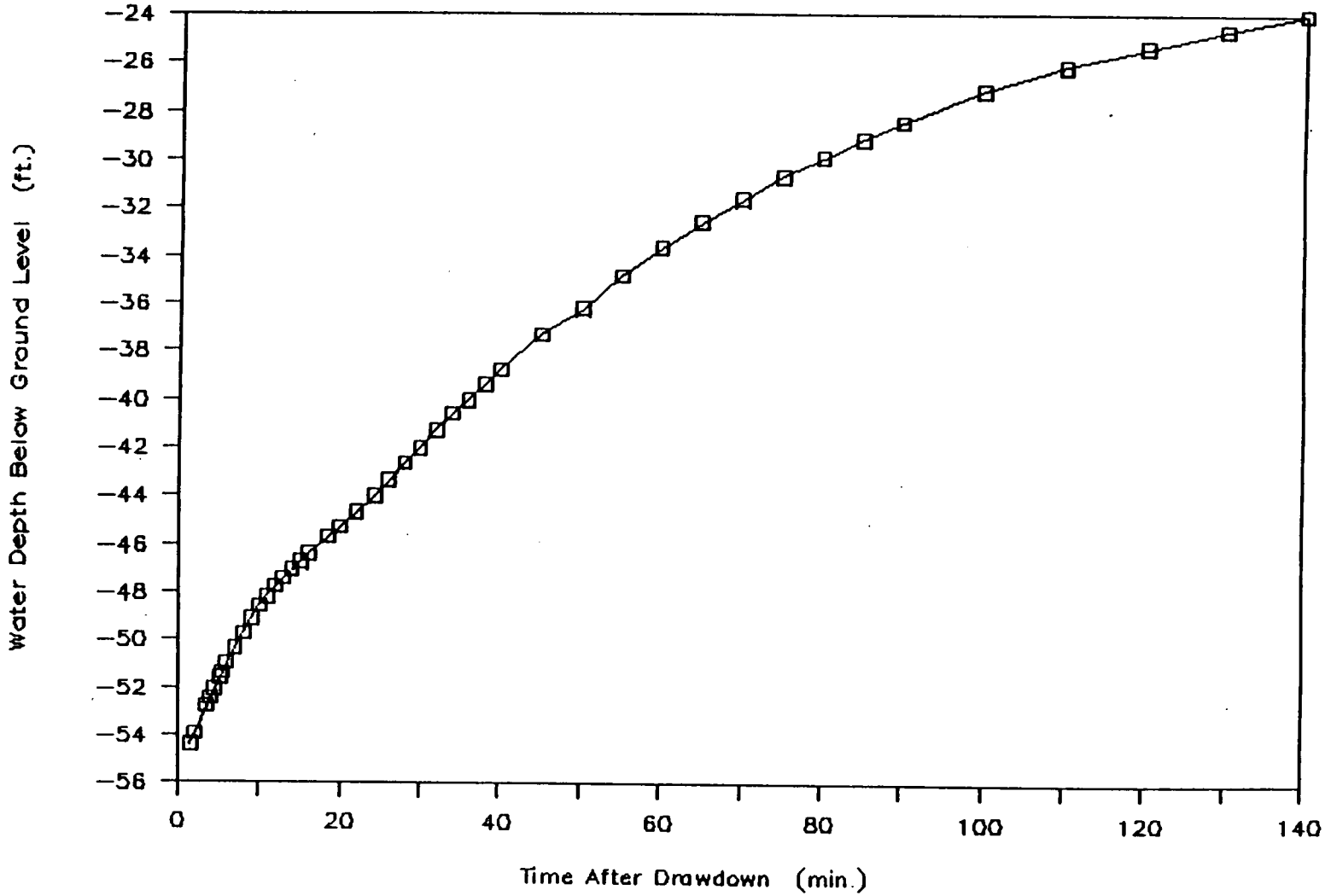


$$\Delta s' = \frac{18.0 - 3.0}{.1715 - .0617} = 137 \text{ ft/log cycle}$$

WELL 34-86


Residual Drawdown (ft.)
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0.2
0.4
0.6
0.8
1
1.2
log(T/T')

WELL 34-86


-24
-26
-28
-30
-32
-34
-36
-38
-40
-42
-44
-46
-48
-50
-52
-54
-56
Water Depth Below Ground Level (ft.)
0
20
40
60
80
100
120
140
Time After Drawdown (min.)

WELL 34-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s' Rsd Drwdn (ft.)	log(T/T')
23.50	1.50	54.39	33.59	1.19
24.10	2.10	53.91	33.11	1.06
25.50	3.50	52.77	31.97	0.86
26.00	4.00	52.44	31.64	0.81
26.50	4.50	52.06	31.26	0.77
27.20	5.20	51.59	30.79	0.72
27.50	5.50	51.37	30.57	0.70
28.00	6.00	50.97	30.17	0.67
29.00	7.00	50.35	29.55	0.62
30.00	8.00	49.73	28.93	0.57
31.00	9.00	49.11	28.31	0.54
32.00	10.00	48.58	27.78	0.51
33.00	11.00	48.20	27.40	0.48
34.00	12.00	47.77	26.97	0.45
35.00	13.00	47.40	26.60	0.43
36.00	14.00	47.06	26.26	0.41
37.00	15.00	46.75	25.95	0.39
38.00	16.00	46.41	25.61	0.38
40.50	18.50	45.69	24.89	0.34
42.00	20.00	45.29	24.49	0.32
44.00	22.00	44.68	23.88	0.30
46.30	24.30	44.02	23.22	0.28
48.00	26.00	43.37	22.57	0.27
50.00	28.00	42.64	21.84	0.25
52.00	30.00	42.03	21.23	0.24
54.00	32.00	41.30	20.50	0.23
56.00	34.00	40.62	19.82	0.22
58.00	36.00	40.05	19.25	0.21
60.00	38.00	39.42	18.62	0.20
62.00	40.00	38.77	17.97	0.19
67.00	45.00	37.33	16.53	0.17
72.20	50.20	36.21	15.41	0.16
77.00	55.00	34.85	14.05	0.15
82.00	60.00	33.68	12.88	0.14
87.00	65.00	32.62	11.82	0.13
92.00	70.00	31.60	10.80	0.12
97.00	75.00	30.68	9.88	0.11
102.00	80.00	29.87	9.07	0.11
107.00	85.00	29.12	8.32	0.10
112.00	90.00	28.42	7.62	0.09
122.00	100.00	27.15	6.35	0.09
132.00	110.00	26.18	5.38	0.08
142.00	120.00	25.36	4.56	0.07
152.00	130.00	24.64	3.84	0.07
162.00	140.00	24.02	3.22	0.06

AQUIFER TEST DATA

WELL 34-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Baildown - Recovery Test
HOW Q MEASURED 4" Spillen Bucket
HOW W.L.'s MEASURED Olympic Well Sounder
RAD./DIST. OF/FROM PUMPING WELL Ø
MEAS. POINT FOR W.L.'s N. Side of Inner Casing
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
Bailer PUMP ON: date 9-29-86 time 9:18
PUMP OFF: date 9-29-86 time 9:40
DURATION OF AQUIFER TEST 158.6 MIN

LOCATION
PERSONNEL
PROJECT
9-29-86

TIME t = 22 at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL 20.80'					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t MIN	t' MIN		READING FT	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s' FT		READING	Q		
1	0831				20+3.15	2.35	20.80	N/A				DP	ORIGINAL W.L.
	0918	Ø			20+2.85	"	20.50	0.30				"	START Bailing
	0921:20	3.3								2 gal		"	Bailed 2 Gal
	925:15	7.25								2 gal		"	Bailed 2 Gal
	9:30:05	12.1								2 gal		"	Bailed 2 Gal
	9:35:35	18.6								2 gal		"	Bailed 2 Gal
	9:40:00	22	Ø							1 gal		"	Bailed 1 Gal STOPPED BAILING
	9:41:30	23.5	1.5		55+1.79	"	54.39	-33.59				"	90% Recovered at 24
	9:42:04	24.1	2.1		55+1.26	"	53.91	-33.11				"	
	9:42:34	24.6	2.6		55-0.01	"	52.64	-31.84				"	
	9:43:00	25	3		55+0.96	"	53.11	-32.31				"	
	9:43:30	25.5	3.5		55+0.12	"	52.77	-31.90				"	
	9:44:00	26	4		55-0.21	"	52.44	-31.64				"	
	9:44:30	26.5	4.5		50+4.41	"	52.06	-31.26				"	
	9:45:00	27.2	5.2		50+3.94	"	51.59	-30.79				"	
	9:45:33	27.5	5.5		50+3.72	"	51.37	-30.57				"	
	9:46:03	28	6		50+3.32	"	50.97	-30.17				"	
	9:47:00	29	7		50+2.70	"	50.75	-29.55				"	
	9:48	30	8		50+2.08	"	49.73	-28.93				"	
	9:49	31	9		50+1.46		49.11	-28.31				"	
	9:50	32	10		50+0.93	"	48.58	-27.78				"	
	9:51	33	11		50+0.55		48.20	-27.40				"	
	9:52	34	12		50+0.12	"	47.77	-26.97				"	
	9:53	35	13		45+0.75	"	47.40	-26.60				"	
	9:54	36	14		45+4.41	"	47.06	-26.26				"	
	9:55	37	15		45+4.10	"	46.75	-25.95				"	
	9:56	38	16		45+3.76	"	46.41	-25.61				"	
	9:57:30	40.5	18.5		45+3.04	"	45.69	-24.89				"	
	1000	42	20		45+2.64	"	45.29	-24.49				"	
	1002	44	22		45+2.03		44.68	-23.88				"	
	1004:15	46.25	24.25		45+1.37	"	44.02	-23.22				"	
	1006	48	26		45+0.72	"	43.37	-22.57				"	
	1008	50	28		45-0.01	"	42.64	-21.84				"	
	1010	52	30		40+4.38	"	42.03	-21.23				"	
	1012	54	32		40+3.65	"	41.30	-20.50				"	
	1014	56	34		40+2.97	"	40.62	-19.82				"	
	1016	58	36		40+2.40		40.05	-19.25				"	
	1018	60	38		40+1.77	"	39.42	-18.62				"	
	1020	62	40		40+1.12	"	38.77	-17.97				"	
	1025	67	45		35+4.68	"	37.33	-16.53				"	
	1030:12	72.2	50.2		35+3.56	"	36.21	-15.41				"	

AQUIFER TEST DATA

WELL 34-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Baildown - Recovery Test
HOW Q MEASURED 4½ Gallon Bucket
HOW W.L.'s MEASURED Olympic Well Sounder
RAD./DIST. OF/FROM PUMPING WELL Ø
MEAS. POINT FOR W.L.'s N. Side of Inner Casing
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
Bailer PUMP ON: date 9-29-86 time 9:18
PUMP OFF: date 9-29-86 time 9:40
DURATION OF AQUIFER TEST 158.6 MIN

LOCATION
PERSONNEL
PROJECT
9-29-86

TIME t = 22 at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL 20.80'					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t MIN	t' MIN		READING FT	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s' FT		READING	Q		
1	0831				20+3.15	2.35	20.80	N/A				OP	ORIGINAL W.L.
	0918	Ø			20+2.85	"	20.50	0.30				"	START Bailing
	0921:20	3.3								2 gal		"	Bailed 2 Gal
	0925:15	7.25								2 gal		"	Bailed 2 Gal
	0930:05	12.1								2 gal		"	Bailed 2 Gal
	9:36:35	18.6								2 gal		"	Bailed 2 Gal
	9:40:00	22	Ø							1 gal		"	Bailed 1 Gal STOPPED BAILING
	9:41:30	23.5	1.5		55+1.79	"	54.39	-33.59				"	90% Recovered at 2
	9:42:04	24.1	2.1		55+1.26	"	53.91	-33.11				"	
	9:42:34	24.6	2.6		55-0.01	"	52.64	-31.84				"	
	9:43:00	25	3		55+0.46	"	53.11	-32.31				"	
	9:43:30	25.5	3.5		55+0.12	"	52.77	-31.90				"	
	9:44:00	26	4		55-0.21	"	52.44	-31.64				"	
	9:44:30	26.5	4.5		50+4.41	"	52.06	-31.26				"	
	9:45:02	27.2	5.2		50+3.94	"	51.59	-30.79				"	
	9:45:33	27.5	5.5		50+3.72	"	51.37	-30.57				"	
	9:46:02	28	6		50+3.32	"	50.97	-30.17				"	
	9:47:00	29	7		50+2.70	"	50.35	-29.55				"	
	9:48	30	8		50+2.08	"	49.73	-28.93				"	
	9:49	31	9		50+1.46		49.11	-28.31				"	
	9:50	32	10		50+0.93	"	48.58	-27.78				"	
	9:51	33	11		50+0.55		48.20	-27.40				"	
	9:52	34	12		50+0.12	"	47.77	-26.97				"	
	9:53	35	13		45+4.75	"	47.40	-26.60				"	
	9:54	36	14		45+4.41	"	47.06	-26.26				"	
	9:55	37	15		45+4.10	"	46.75	-25.95				"	
	9:56	38	16		45+3.76	"	46.41	-25.61				"	
	9:58:30	40.5	18.5		45+3.04	"	45.69	-24.89				"	
	1000	42	20		45+2.64	"	45.29	-24.49				"	
	1002	44	22		45+2.03		44.68	-23.88				"	
	1004:15	46.25	24.25		45+1.37	"	44.02	-23.22				"	
	1006	48	26		45+0.72	"	43.37	-22.57				"	
	1008	50	28		45-0.01	"	42.64	-21.84				"	
	1010	52	30		40+4.38	"	42.03	-21.23				"	
	1012	54	32		40+3.65	"	41.30	-20.50				"	
	1014	56	34		40+2.97	"	40.62	-19.82				"	
	1016	58	36		40+2.40	"	40.05	-19.25				"	
	1018	60	38		40+1.77	"	39.42	-18.62				"	
	1020	62	40		40+1.12	"	38.77	-17.97				"	
	1025	67	45		35+4.68	"	37.33	-16.53				"	
	1030:12	72.2	50.2		35+3.56	"	36.21	-15.41				"	

PACKER TEST ANALYSIS
WELL NO. 34-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/29/86 BY: L. PIVONKA
TEST INTERVAL (FEET BELOW G.S.): 46.01 - 56.00
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 20.46

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00165170 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 3.30 + 3.50 * 2.31 = 31.84
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000341 FT/MIN
K = .00000173 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 3.30 + 10.00 * 2.31 = 46.86
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00601109 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 3.30 + 3.50 * 2.31 = 31.84
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001240 FT/MIN
K = .00000630 CM/SEC

PACKER TEST ANALYSIS
WELL NO. I4-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/29/86 BY: L. PIVONKA
TEST INTERVAL (FEET BELOW G.S.): 55.01 - 65.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 20.46

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00380432 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 3.30 + 3.00 * 2.31 = 30.69
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000815 FT/MIN
K = .00000414 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00902772 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 3.30 + 12.50 * 2.31 = 52.63
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001127 FT/MIN
K = .00000573 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00143508 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 3.30 + 3.00 * 2.31 = 30.69
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000307 FT/MIN
K = .00000156 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 34-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/29/86 BY: L. PIVONKA
TEST INTERVAL (FEET BELOW G.S.): 76.71 - 86.70
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 20.46

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00077169 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 3.30 + 13.50 + 2.31 = 54.94
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000092 FT/MIN
K = .00000047 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 3.30 + .00 + 2.31 = 23.76
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 3.30 + .00 + 2.31 = 23.76
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 34-86
ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 8/29/86 BY: L. PIVONKA
TEST INTERVAL (FEET BELOW G.S.): 85.10 - 95.09
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 20.46

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00054154 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 2.80 + 4.00 * 2.31 = 32.50
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000109 FT/MIN
K = .00000056 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00860736 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 2.80 + 19.00 * 2.31 = 67.15
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000842 FT/MIN
K = .00000428 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 20.46 + 2.80 + 4.00 * 2.31 = 32.50
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3486	09/05/86	5910.44	5912.78	2.34	56.25	22.38	5890.40
	09/08/86					22.40	5890.38
	09/09/86					22.63	5890.15
	09/10/86					22.77	5890.01
	09/11/86					23.48	5889.30
	09/12/86					24.25	5888.53
	10/13/86					22.96	5889.82
	11/26/86					22.77	5890.01
	01/01/87					22.38	5890.40
	02/01/87					22.17	5890.61
	03/17/87					22.05	5890.73
	05/08/87					21.98	5890.80
	06/02/87					22.80	5889.98
	07/07/87					21.65	5891.13
	07/27/87					22.10	5890.68
	08/04/87					22.40	5890.38
	09/01/87					22.20	5890.58
	09/29/87					22.40	5890.38
	11/03/87					23.50	5889.28
	12/01/87					22.26	5890.52
	12/21/87					23.30	5889.48
	01/11/88					22.10	5890.68
	02/29/88					22.00	5890.78
	03/21/88					22.00	5890.78
	04/18/88					21.90	5890.88

INDEX OF DATA

Boring No.: 35-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

X Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 35-86

Date Drilled 8/19/86

Coordinates N 37177.0 E 23114.4

Boring Method Hollow Stem Auger

Ground Surface Elevation 5909.2

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM 0-2.0'-Sample. Recovered 2.0/2.0'=100%. CLAY: olive gray (5Y 3/2); dark yellowish orange (10YR 6/6) mottles; grades downward into dark yellowish brown (10YR 4/2) clay; some silt; trace gravel and cobble size clasts of quartzite and granite; subangular to subrounded; dry to damp.			
	5			2.0-2.7'-Sample. Recovered 0.7/0.7'=100%. CLAY: dark yellowish brown (10YR 4/2); dark yellowish orange (10YR 6/6) mottles common; some silt; trace gravel and cobble size clasts of quartzite and granite; subangular to subrounded; dry to damp.			
	10			2.7-3.7'-Sample. Recovered 0.0/0.7'=0%. 3.7-5.7'-Sample. Recovered 2.0/2.0'=100%. 3.7-5.0'. CLAY: dark yellowish brown (10YR 4/2); dark yellowish orange (10YR 6/6) mottles common; some silt; trace gravel and cobble size clasts of quartzite and granite; subangular to subrounded; dry to damp.			
	15			5.0-5.7'. CLAY: light olive gray (5Y 5/2); silty; well sorted; consolidated; firm; damp to moist. 5.7-6.5'. No sample. Depth correction.			
	20			6.5-8.5'-Sample. Recovered 1.7/2.0'=85%. CLAY: olive black (5Y 2/1); silt; trace sand and gravel; moderately well sorted; soft; wet.			

Remarks Logged by: T. Murphy

Checked by: [illegible]

Project No. 106P06222

Hydro-Search, Inc.

Project: Rocky Flats Plant

LOG OF BORING NO. 35-86

Date Drilled 8/19/86 **Coordinates** N 37177.0 E 23114.4

Boring Method Hollow Stem Auger **Ground Surface Elevation** 5909.2

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	20			8.5-10.5'-Sample. Recovered 2.0/2.0'=100%. CLAY: olive black (5Y 2/1) to light olive gray (5Y 5/2); silty with gravel lenses; trace fine-grained sand; poorly sorted; subangular; firm; wet.			
				ARAPAHOE FORMATION			
	25			10.5-12.5'-Sample. Recovered 2.0/2.0'=100%. CLAY: light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6) mottles; sand layer at 12.0-12.5'; fine-grained; silty; moist; firm.			
				12.5-14.0'-Sample. Recovered 1.5/1.5'=100%. CLAYSTONE: light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6) mottles; no gravel; silty; firm; moist.			
	30			14.0-16.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6) mottles; no gravel; silty; layers of ironstone; firm; moist.			
				16.0-18.0'-Sample. Recovered 1.8/2.0'=90%. CLAYSTONE: pale olive (10Y 6/2) to light olive gray (5Y 5/2); minor dark yellowish orange (10YR 6/6) mottling; apparent bedding due to color variations; firm; damp to moist.			
	35			TOTAL DEPTH: 18.0'			
	40						

Remarks Logged by: T. Murphy Checked by:

Project No. 106P06222

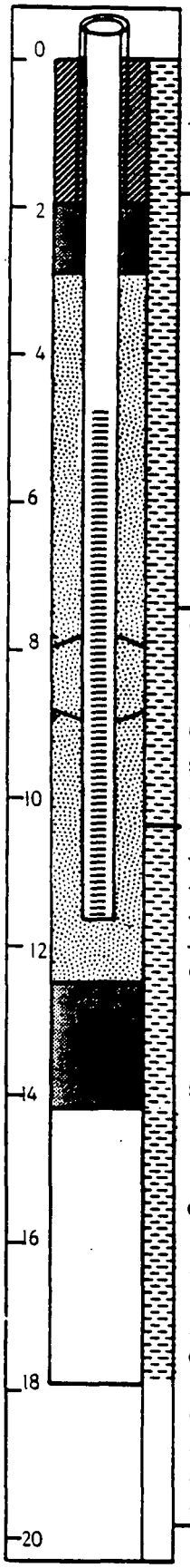
Hydro-Search, Inc.

WELL 35-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37177.0 E 23114.4

ELEVATION: GROUND LEVEL 5909.20'
TOP OF CASING 5911.54'



PROJECT 106X06222 Rocky Flats Plant
LOCATION Golden, CO
PERSONNEL T. Murphy

DRILLING SUMMARY:

TOTAL DEPTH Well: 11.60' Hole: 18.00'
BOREHOLE DIAMETER 7¼"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Dave Jarvie)
RIG Mobile B-57
BIT(S) T5

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	-	4.86'	C1		-		
4.86'	-	11.60'	S1		-		

CASING: C1 2" I.D. Sch. 5 type 316 stain-
C2 less steel, threaded and flush
C3 jointed.
C4

SCREEN: S1 2" I.D. Sch. 5 type 316 stain-
S2 less steel, threaded and flush
S3 jointed, 0.010" wire wrap screen
S4 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
7.80' - 8.85'

FILTER MATERIAL 16-40 silica sand
2.90' - 12.60'

CEMENT Portland Type I
0.00' - 1.95'

OTHER 3/8" bentonite pellets
1.95' - 2.90'
12.60' - 14.20'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7¼" auger	8/19	1258	8/19	1558
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	8/20	1012	8/20	1015
FILTER PLACEMENT:	8/20	1015	8/10	1020
CEMENTING:	8/20	1025	8/20	1040
DEVELOPMENT:	9/3	1000	9/11	1155
OTHER:				
Bentonite	8/20	1020	8/20	1025
	8/20	1008	8/20	1012

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

Water encountered at 8.0' during drilling.

Top of stainless steel casing: 2.34'

Cave from TD to 14.20'

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____

WELL 35-86

Hydraulic Conductivity (cm/sec) = NA

Flowrate (gpm) =

Screened Interval (ft below G.L.) =

Method of Analysis: Residual-drawdown Plot

(Driscoll, 1986 - pg 256.)

RFW 10-05-003/A-5/85

WESTON

SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____ | APPROVED BY

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____ | DEPT _____ DATE _____

WELL 35-86

$$T\ (gpd/ft) = \frac{264\,Q}{\Delta s'} = \frac{(264)(.25)}{17.5} = 3.77$$

where $Q\ (gpm) = 1.5$ gallons / 6 minutes $= 0.25$ gpm

$\Delta s'$ = ft. change in residual drawdown / log cycle

= 17.5 ft/log cycle (see attached plot)

$$K\ (gpd/ft^2) = T/b = 3.77/6.74 = 0.559$$

where $b\ (ft) = 6.74$ ft

$$K\ (cm/sec) = 0.559\ gpd/ft^2 \times \frac{4.72 \times 10^{-5}\ cm/sec}{gpd/ft^2} = 2.6 \times 10^{-5}$$

This method is valid where $u = 0.01$

solving for t for $u = 0.01$.

$$t\ (min) = \frac{r^2 S}{4\,T\,u} = \frac{(.302)^2\ .1}{4\,(3.77)\,(.01)} \times \frac{1440\ min}{day} \times \frac{7.482\ gal}{ft^3}$$

$$= 652\ min.$$

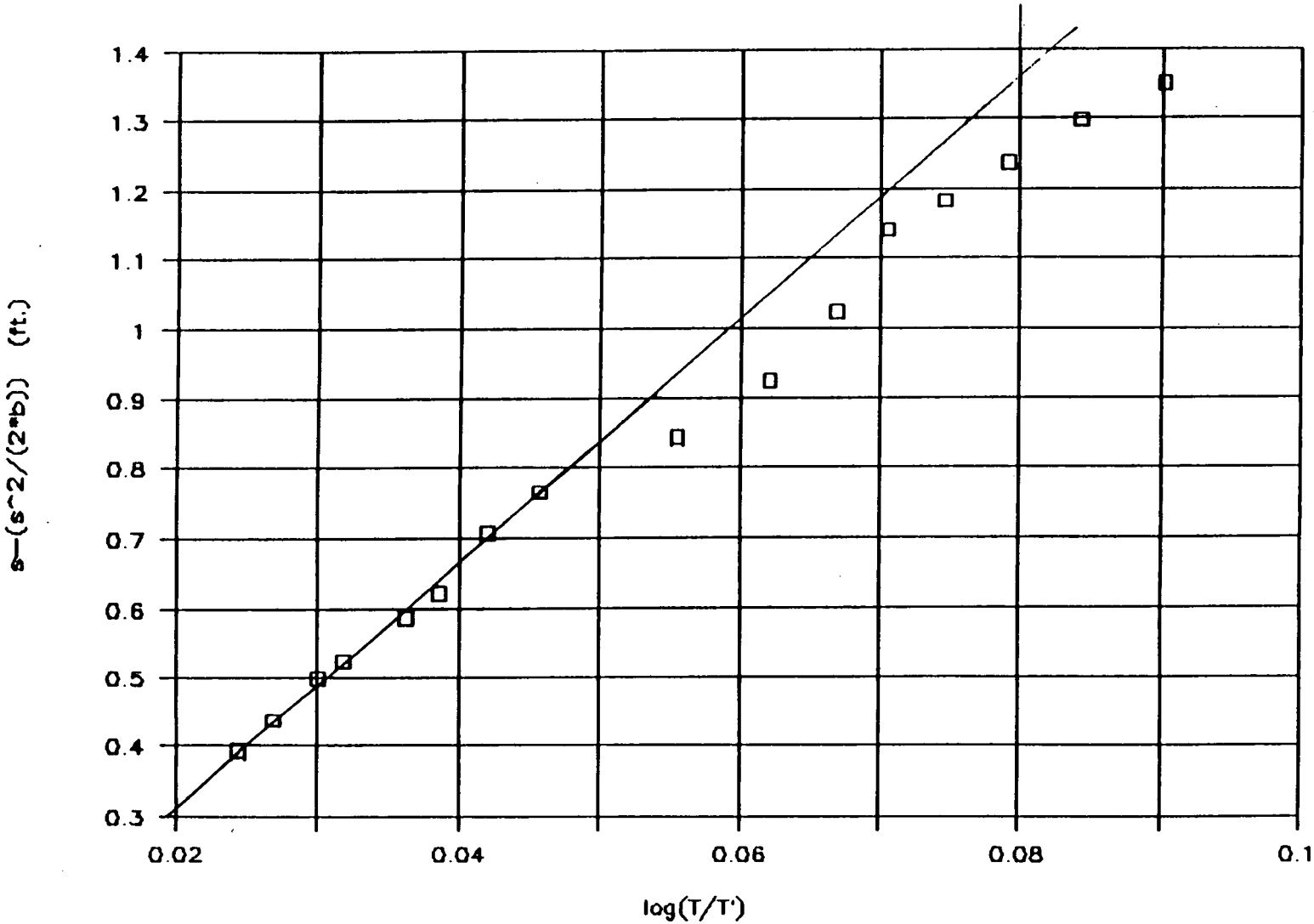
where $r\ (ft) = \left(\frac{7.25}{24}\right) ft = (.302)\ ft$

S = assumed S for confined aquifer

$\Delta s'$ is invalid.

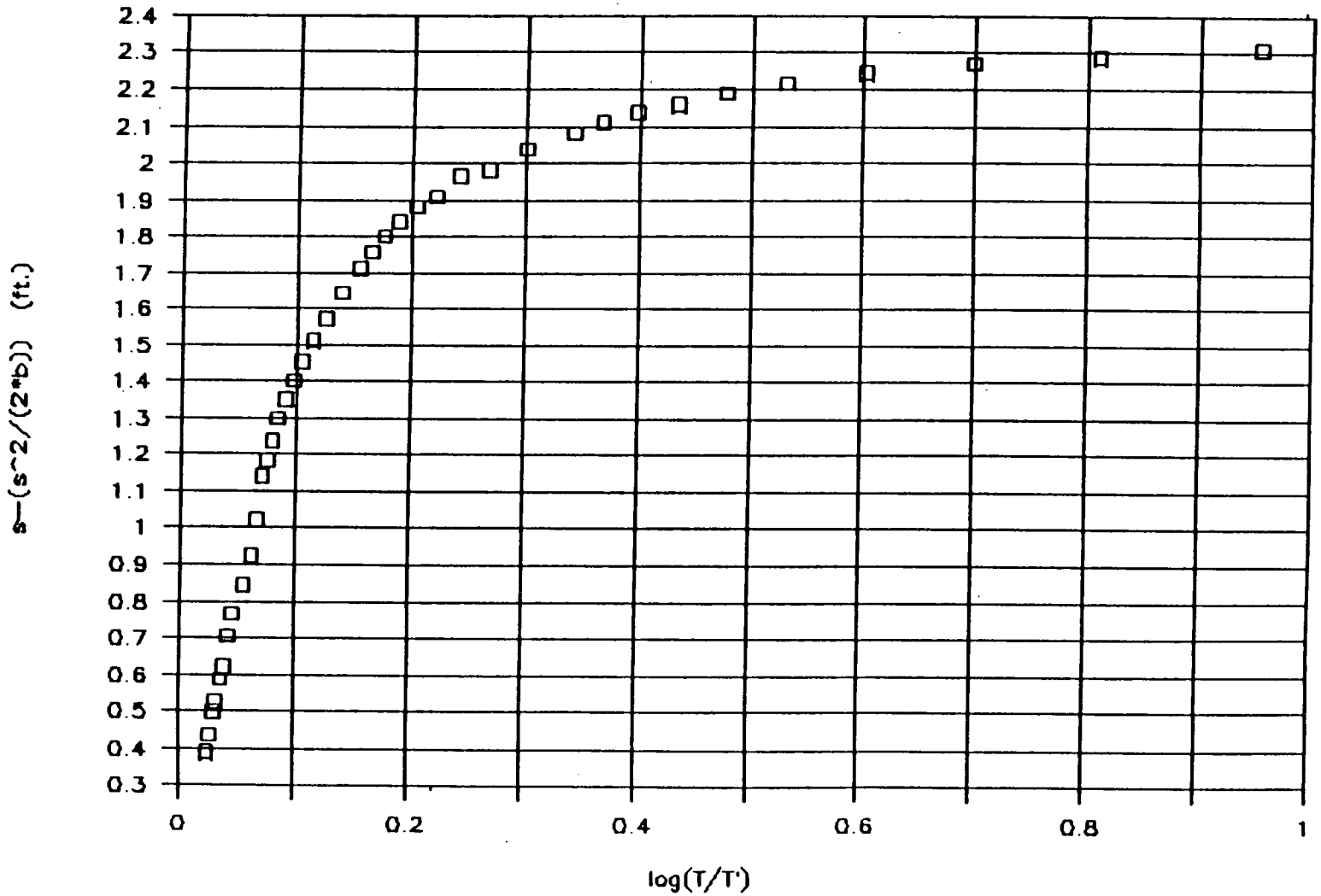
RFW 10-05-003/A-5/85

WELL 35-86

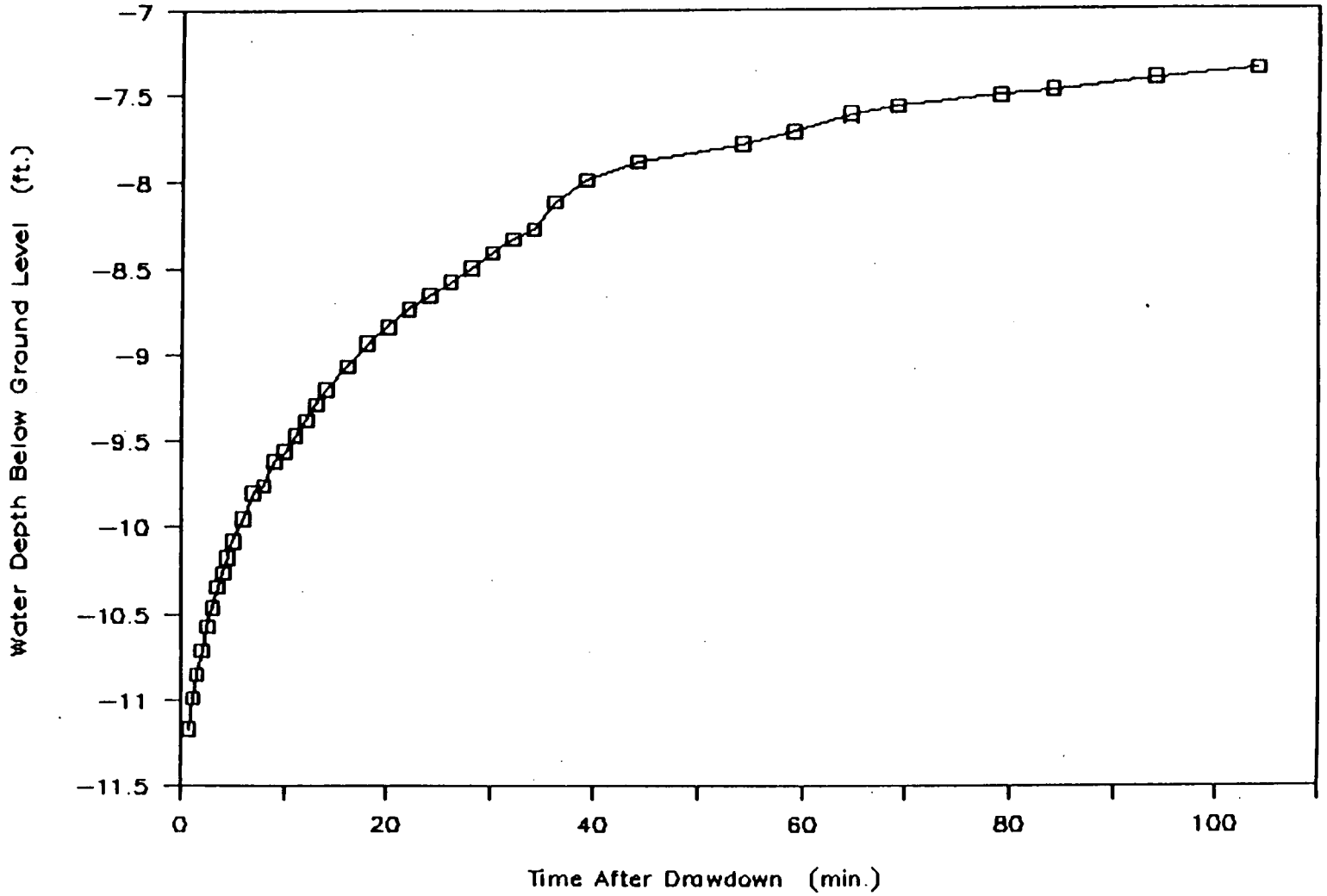


$$\Delta s' = \frac{(1.40 - 0.31)\,ft}{.0822 - .0200} = 17.5\ ft/\log cycle$$

WELL 35-86


2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
s—(s^2/(2*b)) (ft.)
0
0.2
0.4
0.6
0.8
1
log(T/T')

WELL 35-86


-7
-7.5
-8
-8.5
-9
-9.5
-10
-10.5
-11
-11.5
Water Depth Below Ground Level (ft.)
0
20
40
60
80
100
Time After Drawdown (min.)

WELL 35-86

T Time (min.)	T' T Prime (min.)	Water Level (ft.)	s Rsd Drwdn (ft.)	s-(s^2/2b) b=10.82 ft. (ft.)	log(T/T')
6.75	0.75	11.17	4.23	2.31	0.95
7.10	1.10	10.99	4.05	2.29	0.81
7.50	1.50	10.85	3.91	2.27	0.70
8.00	2.00	10.71	3.77	2.25	0.60
8.50	2.50	10.57	3.63	2.22	0.53
9.00	3.00	10.46	3.52	2.19	0.48
9.50	3.50	10.34	3.40	2.16	0.43
10.00	4.00	10.26	3.32	2.14	0.40
10.50	4.50	10.17	3.23	2.11	0.37
11.00	5.00	10.08	3.14	2.08	0.34
12.00	6.00	9.95	3.01	2.04	0.30
13.00	7.00	9.80	2.86	1.98	0.27
14.00	8.00	9.76	2.82	1.97	0.24
15.00	9.00	9.62	2.68	1.91	0.22
16.00	10.00	9.56	2.62	1.88	0.20
17.00	11.00	9.47	2.53	1.84	0.19
18.00	12.00	9.38	2.44	1.80	0.18
19.00	13.00	9.29	2.35	1.76	0.16
20.00	14.00	9.20	2.26	1.71	0.15
22.00	16.00	9.07	2.13	1.64	0.14
24.00	18.00	8.94	2.00	1.57	0.12
26.00	20.00	8.84	1.90	1.51	0.11
28.00	22.00	8.74	1.80	1.45	0.10
30.00	24.00	8.66	1.72	1.40	0.10
32.00	26.00	8.58	1.64	1.35	0.09
34.00	28.00	8.50	1.56	1.30	0.08
36.00	30.00	8.41	1.47	1.24	0.08
38.00	32.00	8.33	1.39	1.18	0.07
40.00	34.00	8.27	1.33	1.14	0.07
42.00	36.00	8.11	1.17	1.02	0.07
45.00	39.00	7.98	1.04	0.92	0.06
50.00	44.00	7.88	0.94	0.85	0.06
60.00	54.00	7.78	0.84	0.76	0.05
65.00	59.00	7.71	0.77	0.71	0.04
70.50	64.50	7.61	0.67	0.62	0.04
75.00	69.00	7.57	0.63	0.59	0.04
85.00	79.00	7.50	0.56	0.53	0.03
90.00	84.00	7.47	0.53	0.50	0.03
100.00	94.00	7.40	0.46	0.44	0.03
110.00	104.00	7.35	0.41	0.39	0.02

AQUIFER TEST DATA

WELL 35-36
(PUMPING) or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 1 OF 2

TYPE OF AQUIFER TEST Bail Down - Recovery
HOW Q MEASURED 5 gallon bucket
HOW W.L.'s MEASURED Olympic well sounder
RAD./DIST. OF/FROM PUMPING WELL 0
MEAS. POINT FOR W.L.'s inner casing
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date time
PUMP OFF: date time
DURATION OF AQUIFER TEST

9/25/86 LOCATION Inside Front Gate
PERSONNEL J. Heist D. Parlik
PROJECT Rocky Flats OU Pond

TIME t = 6.0 at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL 6.94					DISCHARGE		RECORDED BY	COMMENTS
DAY	CLOCK TIME	t (min)	t' (min)		READING	CONVERSIONS & CORRECTIONS	WATER LEVEL	s or s'		READING	Q (gpm)		
												CJH	
	1255	0	0		5+4.25	2.31s/u	6.94	0				"	Begin bailing
	1255	45	0.75					N/A		1	1.33	"	Bail 1 gallon
	1259	30	4.5					N/A		0.5	0.67	"	Bail 0.5 gallon
	1301		6	0								"	Stop bailing.
	1301	45	6.75	0.75	10+3.58	"	11.17	4.23					T.O. of well Ell.
	1302	05	7.5	1.1	10+3.30	"	10.99	4.05					Reading @ 1301
	1302	30	7.5	1.5	10+3.16	"	10.85	3.91					assumed = T.
	1303	00	8	2	10+3.02	"	10.71	3.77					
	1303	30	8.5	2.5	10+2.88	"	10.57	3.63					2.31 = inner casing
	1304	00	9	3	10+2.77	"	10.46	3.52					[illegible]
	1304	30	9.5	3.5	10+2.65	"	10.34	3.40					
	1305	00	10	4	10+2.57	"	10.26	3.32					
	1305	30	10.5	4.5	10+2.48	"	10.17	3.23					90% Recovery: 7.
	1306	00	11	5	10+2.39	"	10.08	3.14					
	1307	00	12	6	10+2.26	"	9.95	3.01					
	1308	00	13	7	10+2.11	"	9.80	2.86					
	1309	00	14	8	10+2.07	"	9.76	2.82					
	1310	00	15	9	10+1.93	"	9.62	2.68					
	1311	00	16	10	10+1.87	"	9.56	2.62					
	1312	00	17	11	10+1.78	"	9.47	2.53					
	1313	00	18	12	10+1.69	"	9.38	2.44					
	1314	00	19	13	10+1.60	"	9.29	2.35					
	1315	00	20	14	10+1.51	"	9.20	2.26					
	1317	00	22	16	10+1.33	"	9.07	2.13					
	1319	00	24	18	10+1.25	"	8.94	2.00					
	1321	00	26	20	10+1.15	"	8.84	1.90					
	1323		28	22	10+1.05	"	8.74	1.80					
	1325	00	30	24	10+0.97	"	8.66	1.72					
	1327	00	32	26	10+0.89	"	8.58	1.64					
	1329		34	28	10+0.81	"	8.50	1.56					
	1331	00	36	30	10+0.72	"	8.41	1.47					
	1333	00	38	32	10+0.64	"	8.33	1.39					
	1335	00	40	34	10+0.58	"	8.27	1.33					
	1340		45	39	10+0.42	"	8.11	1.17					
	1345		50	44	10+0.29	"	7.98	1.04					
	1350		55	49	10+0.19	"	7.88	0.94					
	1355		60	54	10+0.09	"	7.78	0.84					
	1400		65	59	10+0.02	"	7.71	0.77					
	1405	30	70.5	64.5	5+4.92	"	7.61	0.67					
	1410		75	69	5+4.88	"	7.57	0.63					

AQUIFER TEST DATA

WELL 35-86
PUMPING or OBSERVATION WELL
PUMPING or RECOVERY DATA
PAGE 2 OF 2

TYPE OF AQUIFER TEST Bail Down - Recovery
HOW Q MEASURED
HOW W.L.'s MEASURED Olympic well Sounder
RAD./DIST. OF/FROM PUMPING WELL 0
MEAS. POINT FOR W.L.'s N. side of inner casing
ELEVATION OF MEAS. POINT

DEPTH OF PUMP/AIRPIPE
PUMP ON: date time
PUMP OFF: date time
DURATION OF AQUIFER TEST

LOCATION Inside inner cast parts
PERSONNEL D. Pavlick w. Major

PROJECT Rocky Flats 106PO8222

TIME t = 60.0 at t' = 0					WATER LEVEL DATA STATIC WATER LEVEL 6.94					DISCHARGE		RECORDED BY	COMMENTS
DATE	CLOCK TIME	t	t'		READING	CONVERSION CORRECTIONS	WATER LEVEL	s or s'		READING	Q		
	1415	80	74		5+4.83	2.31 S/U	7.52	0.58				LH	
	1420	85	79		5+4.81	"	7.50	0.56					
	1425	90	84		5+4.78	"	7.47	0.53					
	1435	100	94		5+4.71	"	7.40	0.46				"	90% Recovery
	1445	110	104		5+4.66	"	7.35	0.41				"	

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3586	09/03/86	5909.20	5911.54	2.34	11.60	9.35	5902.19
	09/08/86					9.04	5902.50
	09/09/86					9.14	5902.40
	09/10/86					9.16	5902.38
	09/11/86					9.24	5902.30
	09/12/86					9.29	5902.25
	10/13/86					9.13	5902.41
	11/26/86					9.47	5902.07
	01/01/87					9.38	5902.16
	02/01/87					8.96	5902.58
	03/17/87					6.50	5905.04
	05/08/87					6.00	5905.54
	06/02/87					7.90	5903.64
	07/07/87					6.70	5904.84
	07/27/87					8.10	5903.44
	08/04/87					6.40	5905.14
	09/01/87					8.60	5902.94
	09/29/87					9.00	5902.54
	11/03/87					8.80	5902.74
	12/01/87					8.40	5903.14
	12/21/87					8.50	5903.04
	01/11/88					8.30	5903.24
	02/29/88					7.10	5904.44
	03/21/88					6.80	5904.74
	04/18/88					7.00	5904.54

INDEX OF DATA

Boring No.: 36-86

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

Project: Rocky Flats Plant

LOG OF BORING NO. 36-86

Date Drilled 8/25/86

Boring Method Hollow Stem Auger

Coordinates N 37395.4 E 23715.3

Ground Surface Elevation 5881.94

Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Water Content (%) 20 40	Other Tests
	0			**VALLEY FILL ALLUVIUM**			
				0-0.3'-Sample. Recovered 0.3/0.3'=100%. CLAY: moderate yellowish brown (10YR 5/4); silty; poorly sorted; unconsolidated; damp.			
				0.3-4.3'-Sample. Recovered 2.0/4.0'=50%. CLAY: light brown (5YR 5/6) and dark yellowish brown (10YR 4/2); silty; some granitic cobbles; trace iron concretions; poorly sorted; unconsolidated; damp.			
	5						
				4.3-5.5'-Sample. Recovered 0.9/1.2'=75%. GRAVEL: dark yellowish brown (10YR 4/2); granitic pebbles and cobbles; silty and clayey; trace iron concretions; poorly sorted; unconsolidated; damp.			
				ARAPAHOE FORMATION			
	10			5.5-8.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: medium light gray (N 6) and light olive gray (5Y 4/1); trace iron staining; weathered; consolidated; moist.			
				8.0-10.2'-Sample. Recovered 2.2/2.2'=100%. CLAYSTONE: dark yellowish orange (10YR 6/6); some medium light gray (N 6); sandy with 30-40% iron staining; consolidated; moist.			
	15						
				TOTAL DEPTH: 10.2'			
	20						

Remarks Logged by: L. Pivonka

Checked by: [illegible]

Project No. 106P06222

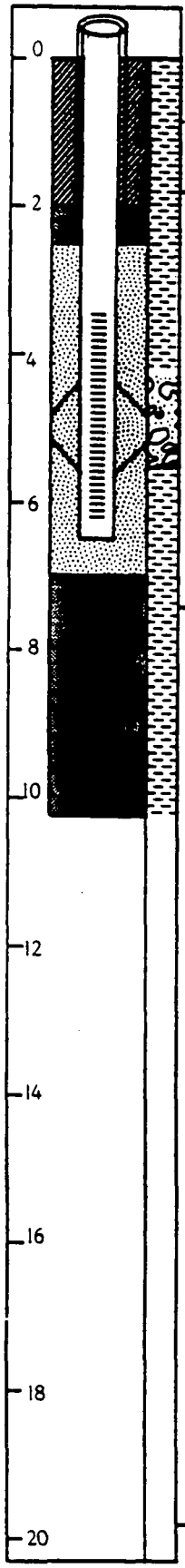
Hydro-Search, Inc.

WELL 36-86

WELL CONSTRUCTION SUMMARY

LOCATION or COORDS: N 37395.4 E 23715.3

ELEVATION: GROUND LEVEL 5881.94'
TOP OF CASING 5883.78'



LOCATION Golden, CO
PERSONNEL L. Pivonka
PROJECT 106P06222 Rocky Flats Plant

DRILLING SUMMARY:

TOTAL DEPTH Well: 6.50' Hole: 10.20'
BOREHOLE DIAMETER 7¼"

DRILLER Boyles Brothers Drilling Co.
15865 W. 5th Avenue
Golden, CO (Jim Horn)
RIG Mobile B-57
BIT(S) T-5

DRILLING FLUID None

SURFACE CASING 5" x 5' steel w/ locking cap

WELL DESIGN:

BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG ___

CASING STRING(S): C=CASING S=SCREEN

0.00'	3.50'	C1			
3.50'	6.49'	S1			

CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed.

SCREEN: S1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.

CENTRALIZERS Type 304 stainless steel
4.42' - 5.59'

FILTER MATERIAL 32-42 silica sand
2.50' - 7.00'

CEMENT Portland Type I
0.00' - 2.00'

OTHER 3/8" bentonite pellets
2.00' - 2.50'
7.00' - 10.20'

CONSTRUCTION TIME LOG:

TASK	START DATE 1986	START TIME	FINISH DATE 1986	FINISH TIME
DRILLING:				
7¼" auger	8/25	1014	8/25	1520
GEOPHYS. LOGGING:	—	—	—	—
CASING:				
2" stainless	8/25	1523	8/25	1525
FILTER PLACEMENT:	8/25	1525	8/25	1530
CEMENTING:	8/25	1533	8/25	1546
DEVELOPMENT:	8/27	1120	9/3	1055
OTHER:				
Bentonite	8/25	1530	8/25	1533
	8/25	1520	8/25	1523

WELL DEVELOPMENT

See Well Development Summary Sheet.

COMMENTS:

No water encountered during drilling.

Top of stainless steel casing: 1.84'

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3686	08/27/86	5881.94	5883.78	1.84	6.49	9.28	5874.50
	09/03/86					-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					7.02	5876.76
	02/01/87					6.17	5877.61
	05/06/87					6.08	5877.70
	06/01/87					5.83	5877.95
	07/08/87					5.65	5878.13
	07/27/87					5.80	5877.98
	08/04/87					7.00	5876.78
	09/01/87					5.80	5877.98
	09/28/87					7.60	5876.18
	11/03/87					7.70	5876.08
	12/01/87					7.65	5876.13
	12/08/87					7.30	5876.48
	01/07/88					7.50	5876.28
	02/24/88					7.40	5876.38
	03/14/88					7.30	5876.48
	04/11/88					5.80	5877.98

APPENDIX B-2

1987 MONITOR WELLS

INDEX OF DATA

Boring No.: 21-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location: Rocky Flats Plant: Mound Area
Coordinates: N 36980.21 E 22693.84
Total Depth: 17.00'

Borehole/Well No.: 21-87
Ground Surface Elevation: 5927.58'
Water Level Encountered: 7.0'
Static: Dry

Drilling Company: Boyles Bros
Date Drilled: October 16, 1987
Drilling Method: Hollow Stem Auger
Logged By: K. D. Holliway
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: None
Checked By: _____
Site Manager

_____
CEARP Manager

Comments: _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM** 0.0-2.0' SAMPLE. Recovered 1.9/2.0' = 95%. SANDY CLAY: dark yellowish brown (10 YR 4/2) to dusky yellowish brown (10 YR 2/2); quartzite cobbles, broken to subangular; sand very fine-grained; poorly sorted; unconsoldiated; grass and roots to 0.2'; reactive to HCl; damp. 2.0-4.0' SAMPLE. Recovered 1.0/2.0' = 50%. SANDY CLAY: same as above; damp. 4.0-7.0' SAMPLE. Recovered 0.3/3.0' = 10%. CLAY: light olive gray (5 Y 5/2); broken quartzite cobbles; trace very fine-grained sand; unconsolidated; damp. 7.0-9.5' SAMPLE. Recovered 2.5/2.5' = 100%. 7.0-8.8': CLAY: light olive gray (5 Y 5/2); occasional subrounded quartzite pebbles; trace very fine-grained sand; some iron nodules; damp to moist. 8.8-9.5': SANDY CLAY: dusky yellowish brown (10 YR 2/2); very fine-grained sand; some organics; moist to wet.	HNu Background=1.3 OVA Background=2.8 Alpha Background = 0.1 0.0-2.0': Readings on core: HNu = 7.0; OVA = 3.2. 2.0-4.0': Readings on core: HNu = 200; OVA = 3.6. 7.0-9.5': Readings on core: HNu = 5.0; OVA = 3.8.
5				
10				
15				
20				

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36980.21 E 22693.84
Total Depth: 17.00'

Borehole/Well No.: 21-87
Ground Surface Elevation: 5927.58'
Water Level Encountered: 7.0'
Static: Dry

Drilling Company: Boyles Bros
Date Drilled: October 16, 1987
Drilling Method: Hollow Stem Auger
Logged By: K. D. Holliway
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: None
Checked By: _____
Site Manager

_____
CEARP Manager

Comments: _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			9.5-12.0' SAMPLE. Recovered 2.5/2.5' = 100%. 9.5-10.4': SANDY CLAY: light olive gray (5 Y 5/2); occasional subrounded to rounded quartzite pebbles; very fine-grained sand; trace caliche; damp to moist.	
			ARAPAHOE FORMATION	
			10.4-12.0': SANDY CLAYSTONE: light olive gray (5 Y 5/2) to medium gray (N 5/0) with dark yellowish orange (10 YR 6/6) iron staining; very fine-grained sand; trace caliche; damp to moist.	
			12.0-14.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above; damp to moist.	
			14.5-17.0' SAMPLE. Recovered 2.3/2.5' = 92%. CLAYSTONE: olive gray (5 Y 4/1) with trace dark yellowish orange (10 YR 6/6) iron staining; some very fine-grained sand more than above; trace caliche; damp to moist.	
			TOTAL DEPTH: 17.00'	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant: Mound Area

Coordinates N 36980.21 E 22693.84

Total Depth: Well 10.555'

Borehole 17.00'

Formation of Completion Rocky Flats Alluvium

Casing Material Sch 5, type 316 TFJ stainless steel

Screen Material 0.010" wire wrap, type 316 TFJ stainless steel

Date Installed Oct. 16, 1987

Installed By K. D. Holliway
Geologist

Well No. 21-87

Elevation: Ground Surface 5927.58'

Top of Casing 5929.36'

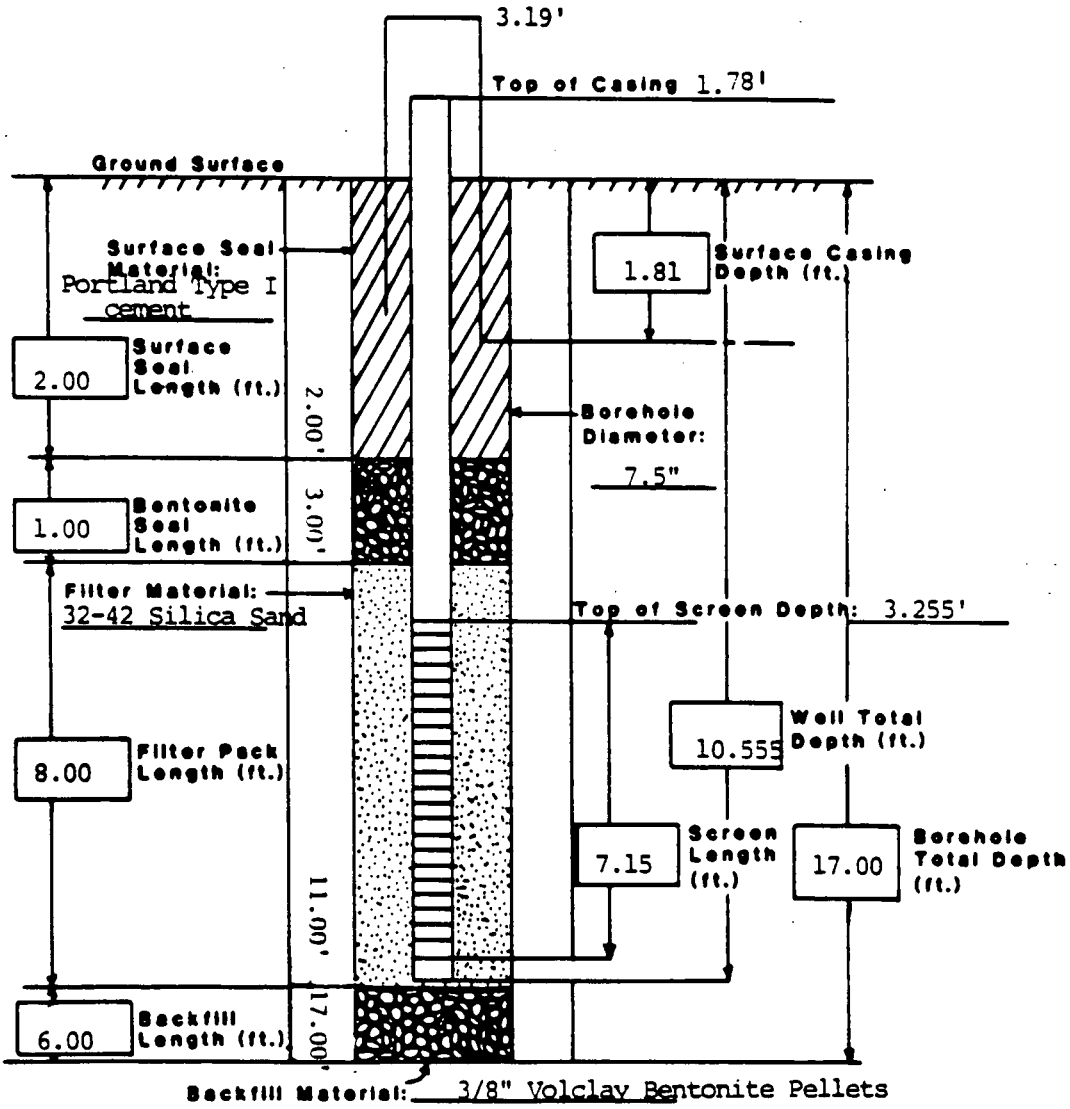
Casing Diameter 2" ID

Surface Casing Diameter 5" ID

Approved By _____
Site Manager

_____
CEARP Manager

Comments _____



Well No.: 21-87

WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87	---	Pumping	-----	Sandy	Water level 7.63' after pumping

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2187	11/12/87	5927.58	5929.36	1.78	10.40	7.30	5922.06
	12/01/87					-1.00	DRY
	12/22/87					7.20	5922.16
	01/27/88					7.40	5921.96
	02/29/88					7.10	5922.26
	03/21/88					8.40	5920.96
	04/18/88					7.80	5921.56

INDEX OF DATA

Boring No.: 22-87BR

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Borehole/Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Berman
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____
Site Manager

CEARP Manager

Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**COLLUVIUM**	HNu Background=0.6 OVA Background=1.2
			0.0-2.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYEY SAND: moderate yellowish brown (10 YR 4/2) to dusky yellowish brown (10 YR 2/2); subrounded to subangular quartzite cobbles and pebbles; sand fine-grained to coarse-grained; poorly sorted; calcareous; unconsolidated; some caliche; dry.	0-2.0': Readings on core: HNu = 1.0; OVA = 4.0.
5			2.0-4.0' SAMPLE. Recovered 1.5/2.0' = 75%. CLAYEY SAND: same as above; dry.	2.0-4.0': Readings on core: HNu = 4.0; OVA = 1.2.
			4.0-6.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: light olive gray (5 Y 5/2) to dusky yellowish brown (10 YR 2/2); trace subrounded quartzite cobbles; trace very fine-grained sand; trace caliche; damp.	4.0-6.0': Readings on core: HNu = Background; OVA = 1.6.
10			6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: same as above except with dark yellowish orange (10 YR 6/6) iron staining and stringers of brownish gray (5 YR 4/1) claystone; damp.	6.0-8.0': Readings on core: HNu = 1.2; OVA = 10. 8.0': Readings in augers: OVA = 100.0; HNu = 1.2.
15			8.0-10.2' SAMPLE. Recovered 2.2/2.2' = 100%. CLAY: light olive brown (5 Y 5/6) to light olive gray (5 Y 5/2); some iron staining; some sand; trace caliche; damp.	8.0-10.2': Readings in core: HNu = Background; OVA = 2.0. 10.2-12.2': Readings on core: HNu = 2.0; OVA = 20.
20				

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Berman
Geologist

Borehole/Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)
Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____
Site Manager

CEARP Manager

Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			10.2-12.2' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: light olive gray (5 Y 5/2); some very fine-grained sand stained dark yellowish orange (10 YR 6/6); subrounded quartzite cobbles; some iron staining; trace caliche; damp.	12.2-26.5': No readings above background on the core.
25			12.2-14.2' SAMPLE. Recovered 2.0/2.0' = 100%. 12.2-12.8': SANDY CLAY: same as above; moist to wet.	26.5-27.5': Readings on core: HNu = Background; OVA = 1.6.
			ARAPAHOE FORMATION	
			12.8-14.2': SANDY CLAYSTONE: same as above except no quartzite cobbles; moist to wet.	28.5-29.5': Readings on core: HNu = 2.0; OVA = 1.0.
30			14.2-16.2' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: light olive gray (5 Y 5/2); some very fine-grained sand; some dusky yellow (5 Y 6/4); trace caliche; damp to moist.	
35			16.2-18.2' SAMPLE: Recovered 2.0/2.0' = 100%. CLAYSTONE: olive gray (5 Y 4/1); occasional dark yellowish orange (10 YR 6/6) iron staining; trace very fine-grained sand; trace caliche; damp.	
			18.2-20.2' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: same as above; damp.	
40				

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Borehole/Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Berman
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____
Site Manager

_____
CEARP Manager

Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			20.2-22.2' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: same as above; damp.	
			Hole readjusted to 22.50'.	
			22.5-23.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above except light olive gray (5 Y 5/2) with trace dark yellowish orange (10 YR 6/6) iron staining; no caliche; dry.	45.60-52.55': Packer Test Interval #7.
45			23.5-24.5' SAMPLE. Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above except no iron staining; homogenous; dry to slightly damp.	
50			24.5-25.5' SAMPLE. Recovered 1.4/1.0' = 140%. CLAYSTONE: same as above; dry to slightly damp.	52.55-62.20': Packer Test Interval #6.
			25.5-26.5' SAMPLE. Recovered 1.4/1.0' = 140%. CLAYSTONE: light olive gray (5 Y 5/2) with trace dark yellowish orange (10 YR 6/6) iron staining in small fractures; trace very fine-grained sand; trace silt; damp to dry.	
55			26.5-27.5' SAMPLE. Recovered 1.2/1.0' = 120%. CLAYSTONE: same as above; damp.	
60				

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Borehole/Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Berman
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____
Site Manager

_____
CEARP Manager

Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60			**27.5-28.5' SAMPLE.** Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above; damp to moist.	62.20-71.85': Packer Test Interval #5.
			28.5-29.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above except more iron staining; damp.	
65			**29.5-30.5' SAMPLE.** Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above; trace organics; damp.	
			30.5-31.5' SAMPLE. Recovered 1.5/1.0' = 150%. SANDY CLAYSTONE: light olive gray (5 Y 5/2) with dark yellowish orange (10 YR 6/6) iron staining and grayish orange (10 YR 7/4) very fine-grained interbedded sands; occasional limonite nodules; some silt; some organics; dry.	71.85-81.50': Packer Test Interval #4.
70				
			31.5-32.5' SAMPLE. Recovered 1.0/1.0' = 100%. SANDY CLAYSTONE: olive black (5 Y 2/1) to light olive gray (5 Y 5/2); limonite nodules and iron staining moderate brown (5 YR 4/4); very fine-grained interbedded sands, grayish orange (10 YR 7/4); some silt; trace organics; dry.	
75				
80				

LOG OF BOREHOLE

Location Rocky Flats Plant; Mound Area
Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Borehole/Well No. 22-87BR
Ground Surface Elevation 5930.70'
Water Level Encountered 12.2'
Static 5852.04' (12/01/87)

Drilling Company Boyles Bros
Date Drilled Sept 30 & Oct 7-8, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Berman
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By _____
Site Manager

_____
CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
80			32.5-33.5' SAMPLE. Recovered 1.2/1.0' = 120%. CLAYSTONE: same as above except no interbedded sands; no nodules; less sand; dry.	81.50-91.15': Packer Test Interval #3. 82.70-92.35': Packer Test Interval #2.
			33.5-34.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: light olive gray (5 Y 5/2) to olive black (5 Y 2/1) with some moderate yellowish brown iron staining (10 YR 5/4); some very fine-grained sand; some silt; some organics; brittle; dry.	
85			34.5-35.5' SAMPLE. Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above; dry.	
90			35.5-36.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: olive black (5 Y 2/1) to grayish black (N 2/0); some very fine-grained sand; some silt; some organics; trace limonite nodules; dry. Weathered/unweathered contact = 36.0'.	92.35-102.0': Packer Test Interval #1.
95			36.5-37.5' SAMPLE. Recovered 2.0/1.0' = 200%. CLAYSTONE: olive black (5 Y 2/1); some very fine-grained sand in fractures with dark yellowish orange (10 YR 6/6) iron staining; some organics; dry to slightly damp.	
100				

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Borehole/Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Berman
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____
Site Manager

CEARP Manager

Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
100			**37.5-38.5' SAMPLE.** Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above with more sands; dry.	
			38.5-39.5' SAMPLE. Recovered 1.3/1.0' = 130%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); some very fine-grained sand with moderate yellowish brown (10 YR 5/4) staining; some silt; some organics; dry.	
105			**39.5-40.5' SAMPLE.** Recovered 1.2/1.0' = 120%. CLAYSTONE: same as above with less sands and less iron staining; dry.	
110			**40.5-41.5' SAMPLE.** Recovered 1.2/1.0' = 120%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); very fine-grained calcareous sand in fractures with moderate yellowish brown (10 YR 5/4) staining; at 41.2' band of caliche (or calcareous sand) reacts strongly with HCl; some organics; dry.	
115			**41.5-42.5' SAMPLE.** Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above; dry.	
			42.5-43.5' SAMPLE. Recovered 1.4/1.0' = 140%. CLAYSTONE: same as above; dry.	

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Borehole/Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Berman
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____
Site Manager

_____
CEARP Manager

Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			45.1-49.50' SAMPLE. Recovered 3.7/4.5' = 82%. RQD = 2.6/3.7' = 70%. 45.1-45.6': CLAYSTONE: dark greenish gray (5 GY 4/1); dense; very broken; probably slough. 45.6-47.4': SANDSTONE: dark greenish gray (5 GY 4/1); fine-grained; well sorted; some moderate brown (5 YR 4/4) iron stains; trace organics; fracture (~80°) at 46.5-46.7' filled with iron stains; moist. 47.4-49.5': CLAYSTONE: dark greenish gray (5 GY 4/1); dense; no stains; homogenous; dry to moist.	
			49.5-52.5' SAMPLE. Recovered 2.7/3.0' = 90%. RQD = 1.2/2.7' = 44%. CLAYSTONE: olive gray (5 Y 3/2); no silt; no sand; homogenous; trace organic fragments; consolidated; moist.	
			52.5-56.5' SAMPLE. Recovered 3.9/4.0' = 98%. RQD = 3.9/3.9' = 100%. CLAYSTONE: same as above; moist.	
			56.5-60.5' SAMPLE. Recovered 3.8/4.0' = 95%. RQD = 1.3/3.8' = 34%. CLAYSTONE: dark gray (N 3/0) to grayish black (N 2/0); dense; homogenous; some carbonaceous debris; moist to wet.	

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Borehole/Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Berman
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____
Site Manager

CEARP Manager

Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			60.5-64.5' SAMPLE. Recovered 3.6/4.0' = 90%. RQD = 3.6/3.6' = 100%. CLAYSTONE: dark gray (N 3/0); dense; consolidated; homogenous; some carbonaceous debris; sandy from 60.9-61.4'; moist to wet.	
			64.5-68.5' SAMPLE. Recovered 3.3/4.0' = 83%. RQD = 2.1/3.3' = 64%. 64.5-66.6': CLAYSTONE: same as above. 66.6-67.8': MUDSTONE: brownish gray (5 YR 4/1); very fine-grained; "sulphur-like" smell when HCl is added; abundant carbonaceous fragments; fragments strongly react with HCl; cement only slightly reacts when powdered; very hard and dense; dry.	
			68.5-72.5' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.7/4.0' = 93%. CLAYSTONE: brownish black (5 YR 2/1); trace very fine-grained sand; abundant organic fragments; moist to wet.	
			72.5-76.5' SAMPLE. Recovered 3.7/4.0' = 93%. RQD = 3.7/3.7' = 100%. CLAYSTONE: same as above; no sand; fractures at 76.0' and 76.3' (~45°); moist to wet.	

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Borehole/Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Berman
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____ Site Manager
_____ CEARP Manager

Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			76.5-80.5' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.6/4.0' = 90%. CLAYSTONE: same as above.	
			TOTAL DEPTH OF HOLE: 78.50'; ADJUST DEPTH.	
			78.5-82.5' SAMPLE. Recovered 3.7/4.0' = 93%. RQD = 3.7/3.7' = 100%. 78.5-81.5': CLAYSTONE: same as above. 81.5-82.5': SANDSTONE: medium gray (N 5/0); well sorted; fine to very fine-grained; rounded; some silt; some organics; consolidated; homogenous; moist.	
			82.5-86.5' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.0/4.0' = 75%. SANDSTONE: medium gray (N 5/0); fine to medium-grained; rounded; well sorted; consolidated; calcareous cementation from 86.3-86.5'-strongly reacts with HCl; some clay layers <1" thick present throughout; wet to moist.	

LOG OF BOREHOLE

Location: Rocky Flats Plant; Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Borehole, Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Bergman
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____
Site Manager

_____
CEARP Manager

Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			86.5-90.5' SAMPLE. Recovered 2.6/4.0' = 65%. RQD = 1.3/2.6' = 50%. 86.5-87.1': SANDSTONE: medium light gray (N 6/0); fine to medium-grained; rounded; well sorted; calcareous cement; very dense and consolidated; dry. 87.1-88.5': INTERBEDDED SANDSTONE AND CLAYSTONE: sandstone layers medium gray (N 5/0); 0.5" to 2" thick; claystone layers medium dark gray (N 4/0); consolidated; moist. 88.5-89.1': CLAYSTONE: medium dark gray (N 4/0) with some very thin (<0.5') sandstone layers; same sand as above; moist. 90.5-95.0' SAMPLE. Recovered 4.0/4.5' = 89%. RQD = 3.3/4.0' = 83%. INTERBEDDED SANDSTONE/ CLAYSTONE: medium light gray (N 6/0) sandstone and medium dark gray (N 4/0) claystone; sandstone layers .05 to 1' thick; claystone layers 0.2-0.5' thick; decrease sandstone content with depth; crossbedded sands; moist to wet.	

LOG OF BOREHOLE

Location: Rocky Flats Plant: Mound Area
Coordinates: N 36934.99 E 22715.72
Total Depth: 110.40'

Borehole, Well No.: 22-87BR
Ground Surface Elevation: 5930.70'
Water Level Encountered: 12.2'
Static: 5852.04' (12/01/87)

Drilling Company: Boyles Bros
Date Drilled: Sept 30 & Oct 7-8, 1987
Drilling Method: Hollow Stem Auger; Rotary Core
Logged By: K.D. Holliway; J.B. Bergman
Geologist

Driller: R. Sharp
Helper: T. Merritt
Drilling Fluid: 0.0 - 45.1' None; 45.1' - 110.4' Water
Checked By: _____
Site Manager

_____
CEARP Manager

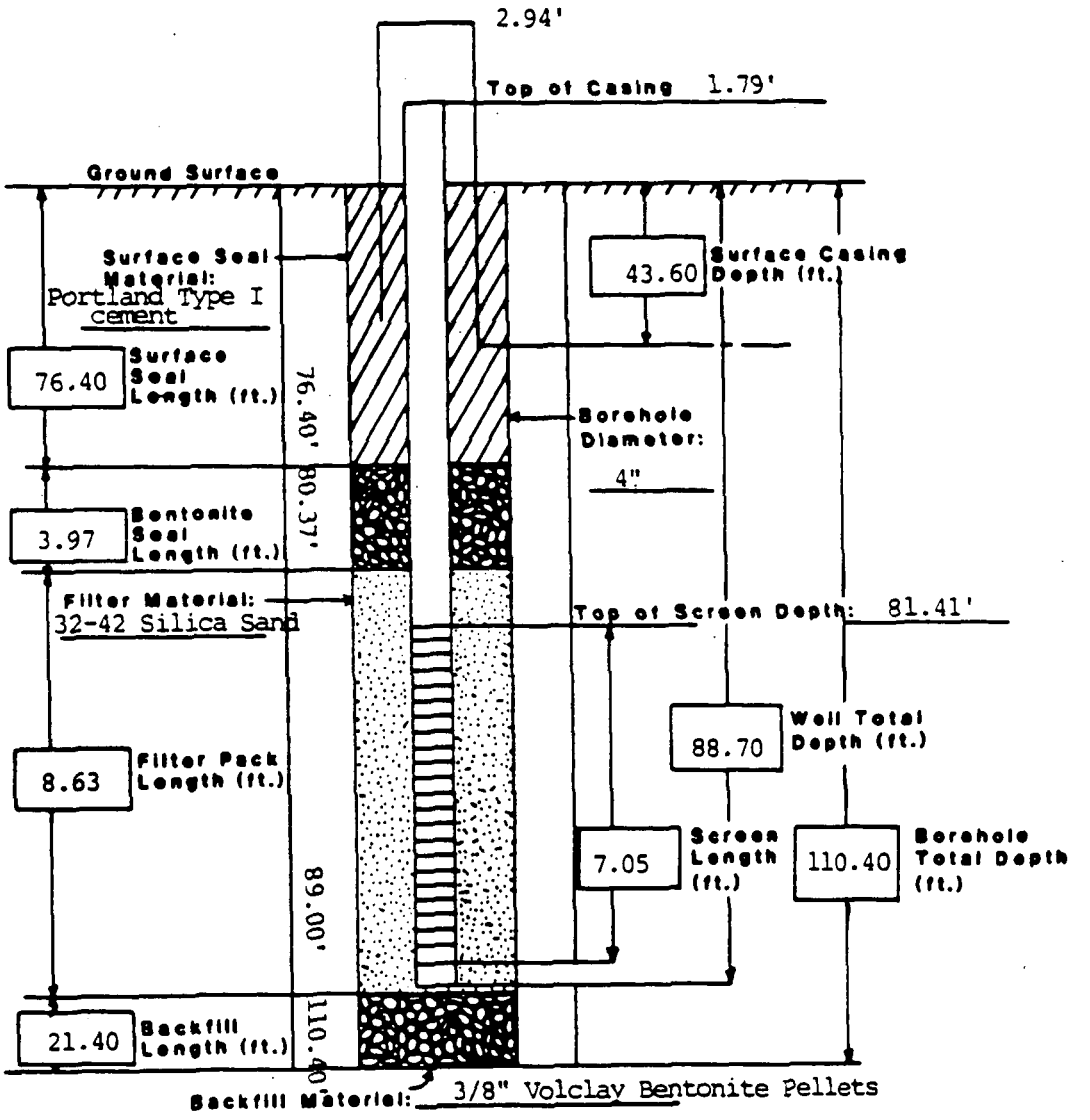
Comments: Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			95.0-99.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 2.8/4.0' = 70%. INTERBEDDED SANDSTONE/ CLAYSTONE: same as above with claystone layer from 97.3-98.7'; moist to wet.	
			99.0-103.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 1.3/2.0' = 65%. INTERBEDDED SANDSTONE/ CLAYSTONE: same as above with less sand content; layers are not distinct gradual changes; moist to wet.	
			102.0-107.0' SAMPLE. Recovered 5.0/5.0' = 100%. RQD = 5.0/5.0' = 100%. CLAYSTONE: medium dark gray (N 4/0); trace silt; trace carbonaceous fragments; homogenous; consolidated; dense; moist (picked up one foot of core from last run).	
			107.0-111.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 0.0/2.0' = 0%. CLAYSTONE: same as above; very broken; moist.	
			TOTAL DEPTH: 110.40'	

WELL COMPLETION INFORMATION

Location: Rocky Flats Plant; Mound Area
Well No.: 22-87BR
Coordinates: N 36934.99 E 22715.72
Elevation: Ground Surface: 5930.70'
Total Depth: Well: 88.70'
Top of Casing: 5932.49'
Borehole: 110.40'
Formation of Completion: Arapahoe Formation
Casing Material: Sch 5, type 316 TFJ stainless steel
Casing Diameter: 2" ID
Screen Material: 0.010" wire wrap, type 316 TFJ stainless steel
Surface Casing Diameter: 5" ID
Date Installed: Oct. 10, 1987
Approved By: _____ Site Manager
Installed By: K. D. Holliway, Geologist
_____ CEARP Manager

Comments: Surface casing set to 43.60' by K. D. Holliway October 9, 1987



Well No.: 22-87BR

WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/2/87	---	Pumping	-----	Sandy	Water level 22.15' after pumping

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; Mound Area

Well No.: 22-87BR

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0.1663'

Static Water Level: 78.66'

Date of Water Level: 12/1/87

Page 1 of 2

Comments: Test interval #5 failed on 2/3 pressure test and second 1/3 pressure test due to water gain in acrylic tube and test intervals #6 and 7 failed on second 1/3 pressure test.

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
1	92.35	102.00	15	0	7.50	3.45	10.95	0.88	10/09/87	Kass	JBB
			15	18.5	7.50	N/A	7.50	1.66	10/09/87	Kass	JBB
			15	0	7.50	2.70	10.20	0.59	10/09/87	Kass	JBB
2	82.70	92.35	15	0	7.50	2.12	9.62	2.93	10/09/87	Kass	JBB
			15	16.5	7.50	N/A	7.50	3.88	10/09/87	Kass	JBB
			15	0	7.50	2.95	10.45	2.56	10/09/87	Kass	JBB
3	81.50	91.15	15	0	7.50	3.62	11.12	2.67	10/09/87	Kass	JBB
			15	16.05	7.50	N/A	7.50	4.43	10/09/87	Kass	JBB
			15	0	7.50	1.94	9.44	1.90	10/09/87	Kass	JBB
4	71.85	81.50	15	0	7.50	4.38	11.88	0.03	10/09/87	KCL	JBB
			15	13.5	7.50	N/A	7.50	0.15	10/09/87	KCL	JBB
			15	0	7.50	5.37	12.87	0.00	10/09/87	KCL	JBB
5	62.20	71.85	15	0	6.70	4.91	11.61	0.01	10/12/87	KCL	KDH
			15	11.8	6.70	N/A	6.70	-0.03	10/12/87	KCL	KDH
			15	0	6.70	4.41	11.11	-0.37	10/12/87	KCL	KDH
6	52.55	62.20	15	0	6.70	5.35	12.05	0.05	10/12/87	KCL	KDH
			15	9.5	6.70	N/A	6.70	0.12	10/12/87	KCL	KDH
			15	0	6.70	1.52	8.22	-0.11	10/12/87	KCL	KDH

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Area; Mound Area

Well No.: 22-87BR (CON'T)

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0.1663'

Static Water Level: 78.66'

Date of Water Level: 12/1/87

Page 2 of 2

Comments:

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
7	45.60	52.55	15	0	6.70	4.45	11.15	0.06	10/12/87	KCL	KDH
			15	8.0	6.70	N/A	6.70	0.15	10/12/87	KCL	KDH
			15	0	6.70	2.86	9.56	-0.44	1012/87	KCL	KDH

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/12/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 45.60 - 52.55
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00008688 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 6.95 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 49.07 + 11.15 + .00 * 2.31 = 60.22
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001233 FT/MIN
K = .00000006 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00021721 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 6.95 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 49.07 + 6.70 + 8.00 * 2.31 = 74.25
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000002500 FT/MIN
K = .00000013 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/12/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 52.55 - 62.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00007240 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 57.38 + 12.05 + .00 * 2.31 = 69.43
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000698 FT/MIN
K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00017377 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 57.38 + 6.70 + 9.50 * 2.31 = 86.02
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001353 FT/MIN
K = .00000007 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/12/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 62.20 - 71.85
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00001448 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 67.03 + 11.61 + .00 * 2.31 = 78.64
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000123 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST
TEST ABORTED

2ND P1/3 TEST
TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 71.85 - 81.50
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.68 + 11.88 + .00 * 2.31 = 88.56
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000328 FT/MIN
K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00021721 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.68 + 7.50 + 13.50 * 2.31 = 115.36
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001261 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 81.50 - 91.15
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00386629 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 11.12 + .00 * 2.31 = 89.78
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000288 FT/MIN
K = .00000146 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00641485 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 7.50 + 16.05 * 2.31 = 123.24
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000349 FT/MIN
K = .00000177 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00275129 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 9.44 + .00 * 2.31 = 88.10
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000209 FT/MIN
K = .00000106 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 82.70 - 92.35
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00424278 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 9.62 + .00 * 2.31 = 88.28
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000322 FT/MIN
K = .00000163 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00561843 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 7.50 + 16.50 * 2.31 = 124.28
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000303 FT/MIN
K = .00000154 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00370700 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 10.45 + .00 * 2.31 = 89.11
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000279 FT/MIN
K = .00000141 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 22-87BR
ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 92.35 - 102.00
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00127428 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 10.95 + .00 * 2.31 = 89.61
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000095 FT/MIN
K = .00000048 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00240376 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 7.50 + 18.50 * 2.31 = 128.90
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000125 FT/MIN
K = .00000063 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00085435 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 78.66 + 10.20 + .00 * 2.31 = 88.86
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000064 FT/MIN
K = .00000033 CM/SEC

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2287	11/12/87	5930.70	5932.49	1.79	88.46	50.70	5881.79
	12/01/87					80.45	5852.04
	12/22/87					50.50	5881.99
	01/27/88					80.50	5851.99
	02/29/88					80.70	5851.79
	03/21/88					80.60	5851.89
	04/18/88					80.50	5851.99

INDEX OF DATA

Boring No.: 37-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37507.14 E 22119.81
Total Depth 13.0'

Borehole/Well No. 37-87
Ground Surface Elevation 5967.03'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled October 26, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED**	
			0.0-2.0' SAMPLE Recovered 1.11/2.0' = 70%. GRAVEL AND SAND: moderate brown (5 YR 3/4) to grayish brown (5 YR 3/2); medium and coarse sand with small gravel (0.55 mm to 2.25 mm); subangular; angular and few subrounded; weakly cemented; light; moist.	HNu background=0.6. OVA background = 2.6. Ludlum background = 0.0. 2.0-3.7': Readings in augers: HNu = 0.2; OVA = 3.2.
5			2.0-4.0' SAMPLE Recovered 1.7/2.0' = 85%. 2.0-2.7': GRAVEL AND SAND: same as above.	
			ROCKY FLATS ALLUVIUM	
10			2.7-3.7': CLAYEY GRAVEL: reddish brown; weakly to moderately cemented; poorly sorted; angular and subangular gravels; few rounded; slightly calcareous; light moist.	
			4.0-7.0' SAMPLE. Recovered 0.8/3.0' = 27%. CLAYEY GRAVEL: same as above.	
15			7.0-9.5' SAMPLE. Recovered 2.5/2.5' = 100%. 7.0-8.5': SAND AND GRAVEL: light brown (5 YR 5/6) to a moderate brown (5 YR 4/4) sand; well-sorted and range (2.0-1.5 mm) to 0.5-0.0 Ø with gravel 0.25 mm to 1.5 mm and scattered large size; medium dense; weakly cemented; moist.	
20				

LOG OF BOREHOLE

Location: Rocky Flats Plant; Solar Pond Area
Coordinates: N 37507.14 E 22119.81
Total Depth: 13.0'

Borehole/Well No.: 37-87 (cont'd.)
Ground Surface Elevation: 5967.03'
Water Level Encountered: None
Static:

Drilling Company: Boyles Bros.
Date Drilled: October 26, 1987
Drilling Method: Hollow Stem Auger
Logged By: R. Treat, Geologist

Driller: T. High
Helper: B. Keeney
Drilling Fluid: None
Checked By: Site Manager

CEARP Manager

Comments:

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARAPAHOE FORMATION**	
			8.5-9.5' CLAYSTONE: light gray (N 7/0) medium plastic, very calcareous in upper 12" to slightly calcareous; streaked and highly effervescess with HCl; massive; blocky; weathered; moist.	
5			9.5-13.0' SAMPLE. Recovered 3.5/3.5' = 100%. CLAYSTONE: light gray (N 7/0) to varying brownish gray; slightly oxide stained; blocky; massive; highly to moderately plastic; weathered; moist.	
			TOTAL DEPTH: 13.0'	
10				
15				
20				

WELL COMPLETION INFORMATION

Location: Rocky Flats Plant; Solar Ponds Area

Well No. 37-87

Coordinates N 37507.14 E 22119.81

Elevation: Ground Surface 5967.03'

Total Depth: Well 9.0'

Top of Casing 5969.02'

Borehole 13.0'

Formation of Completion Rocky Flats Alluvium

Casing Material Sch 5, Type 316, TFJ Stainless Steel

Casing Diameter 2" ID

Screen Material 0.010" wire wrap, Type 316, TFJ Stainless Steel

Surface Casing Diameter 5" ID

Date Installed October 27, 1987

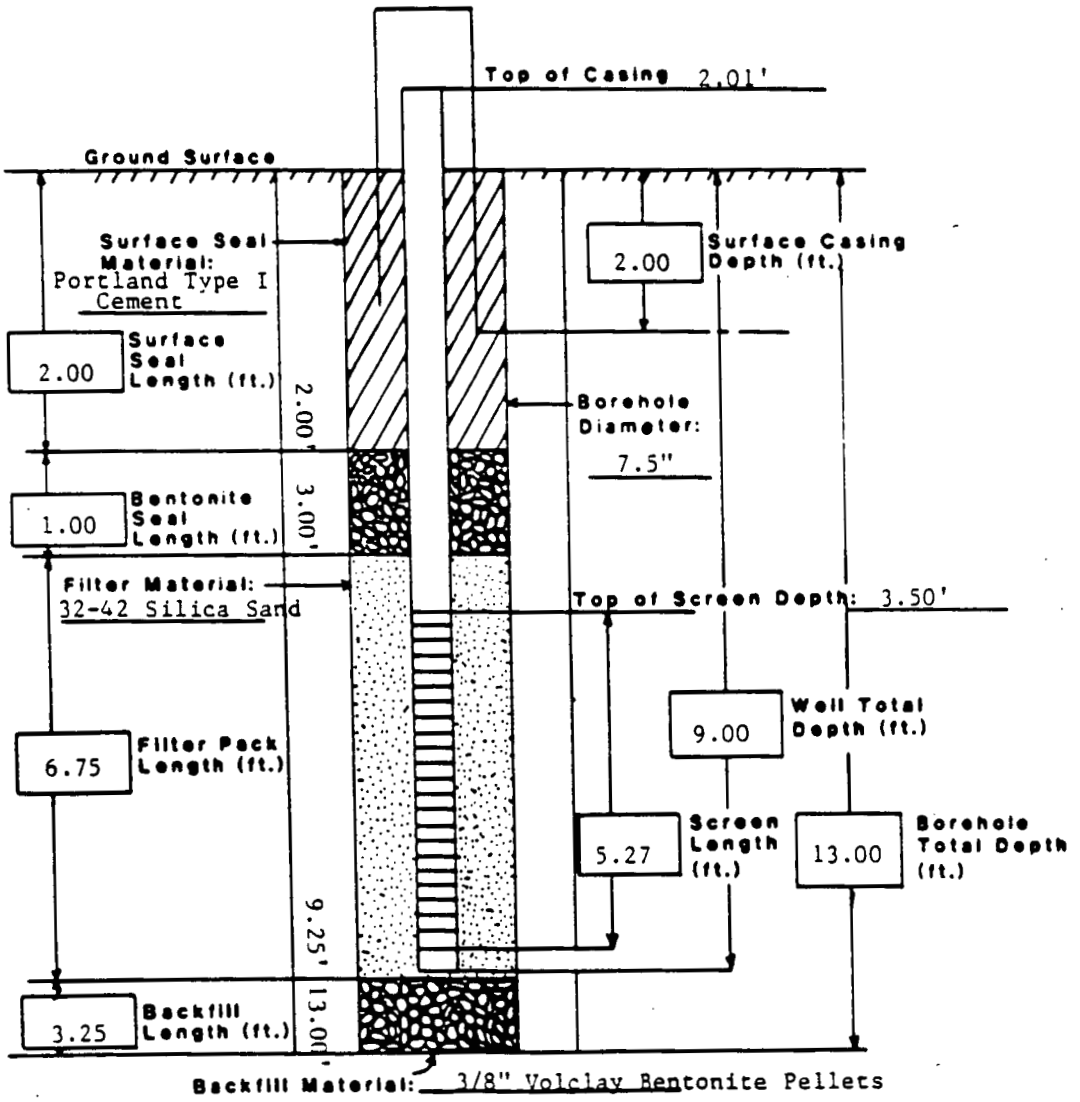
Approved By

Installed By R. Treat
Geologist

Site Manager

CEARP Manager

Comments



Well No.: 37-87

WELL DEVELOPMENT SUMMARY SHEET

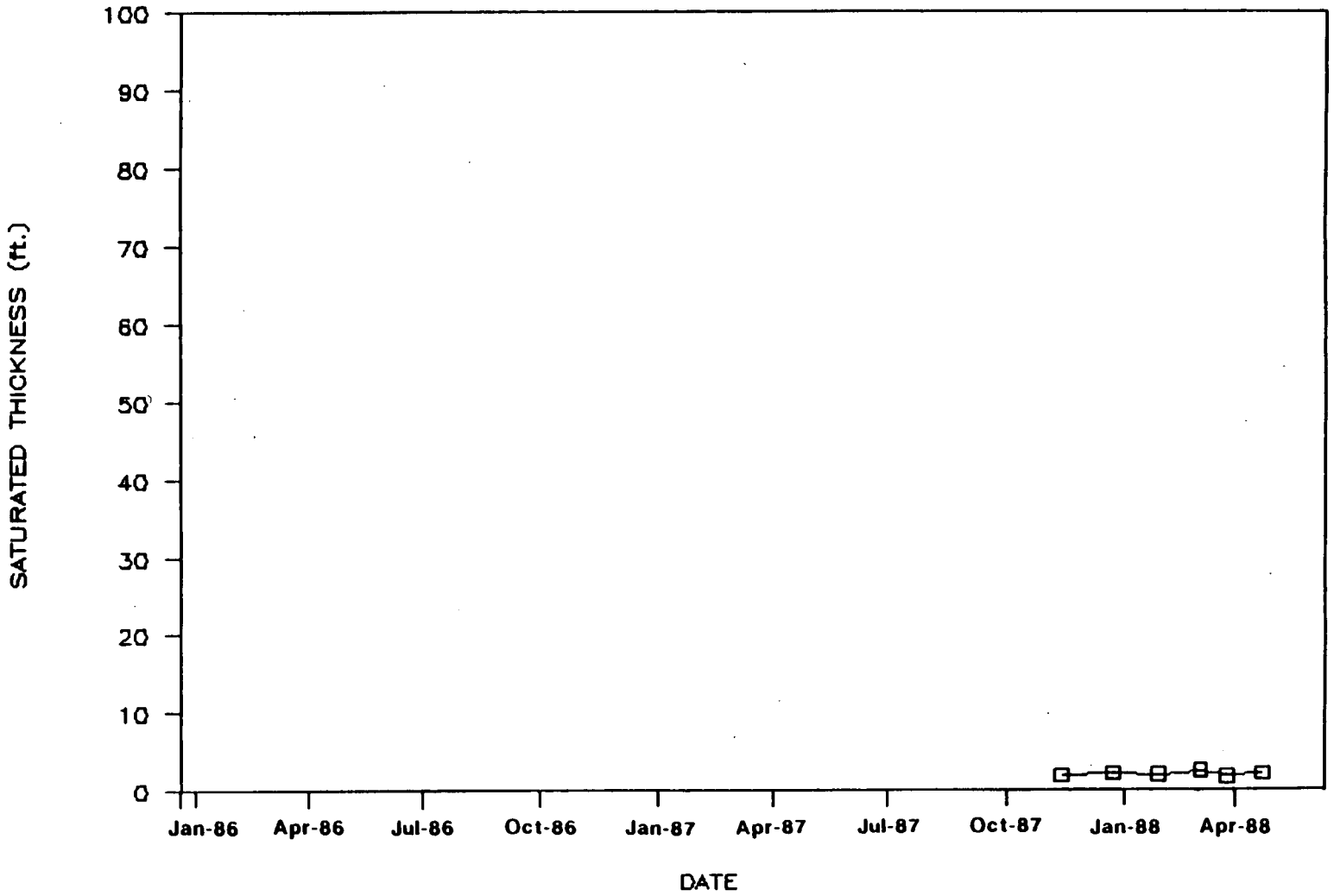
DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87	---	Pumping	-----	Slightly brown	Water level 7.63' from top of casing after pumping

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3787	11/12/87	5967.03	5969.02	1.99	8.77	6.90	5962.12
	12/22/87					6.60	5962.42
	01/27/88					6.80	5962.22
	02/29/88					6.30	5962.72
	03/21/88					7.00	5962.02
	04/18/88					6.60	5962.42

SATURATED THICKNESS IN WELL # 37-87(SP)



INDEX OF DATA

Boring No.: 38-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37370.70 E 22020.53
Total Depth 14.0'

Borehole/Well No. 38-87
Ground Surface Elevation 5971.79'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled October 27, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0.0-2.0' SAMPLE. Recovered 0.8/2.0 = 45%. GRAVEL AND SAND: very pale orange (10 YR 8/2) to dark brown with gravel subangular, angular (0.5 mm to 3.25 mm) with possible scattered cobbles, fine-grained sand; weakly cemented; light moist.	HNu background=0.4. OVA background = 0.6. Ludlum background = 0.0. No readings above background.
5			2.0-4.0' SAMPLE. Recovered 0.8/2.0' = 45%. GRAVEL: slightly sandy to very sandy; sand range (3.0-2.5 Ø) to (2.5-1.0 Ø) with gravel (0.75 mm to 3.25 mm); angular; calcareous; weakly cemented; subangular; well to poorly sorted; light moist.	
10			**ROCKY FLATS ALLUVIUM** 4.0-7.0' SAMPLE. Recovered 1.2/3.0 = 40%. SAND AND GRAVEL: light brown (5 YR 5/6) to pale brown (5 YR 5/2) with sand (3.0-2.5 Ø) and scattered sands (1.5-1.0 mm); gravel (0.25 mm to 2.00 mm); weakly cemented; poorly sorted; angular-subangular gravel; light moist.	
15				
20				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Borehole/Well No. 38-87 (cont'd.)
Coordinates N 37370.70 E 22020.53
Ground Surface Elevation 5971.79'
Total Depth 14.0'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Driller T. High
Date Drilled October 27, 1987
Helper B. Keeney
Drilling Method Hollow Stem Auger
Drilling Fluid None
Logged By R. Treat
Geologist
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			7.0-10.0' SAMPLE. Recovered 3.0/3.0' = 100%. 7.0-7.5': CLAYEY SAND: light brown (5 YR 6/4) Fine-grained sand (3.0-2.5 Ø); gravel to 1.75 mm; subangular and subrounded; some scattered gravel; moderately calcareous; weakly cemented; moist.	
			ARAPAHOE FORMATION	
			7.5-9.0': CLAYSTONE: very pale orange (10 YR 8/2) to medium light gray (N 6/0); very calcareous; massive; medium plastic; blocky; weathered; moist.	
			9.0-10.0': CLAYSTONE: medium light gray (N 6/0); massive; highly plastic; blocky; only slightly calcareous; streaked; weathered; moist.	
			10.0-14.0' SAMPLE. Recovered 5.2/4.0 = 130%. CLAYSTONE: medium light gray (N 6/0) down to approximately 11.2'; transition to light gray and severely oxide (Fe) stained brown; medium plastic; massive; only slightly calcareous streaked; blocky; weathered; moist.	
			TOTAL DEPTH: 14.0'.	

WELL COMPLETION INFORMATION

Location: Rocky Flats Plant; Solar Ponds Area

Well No. 38-87

Coordinates N 37370.70 E 22020.53

Elevation: Ground Surface 5971.79'

Top of Casing 5973.95'

Total Depth: Well 9.50'

Borehole 14.00'

Formation of Completion Rocky Flats Alluvium

Casing Material Sch 5, Type 316, TFJ Stainless Steel

Casing Diameter 2" ID

Screen Material 0.010" wire wrap, Type 316, TFJ Stainless Steel

Surface Casing Diameter 5" ID

Date Installed October 28, 1987

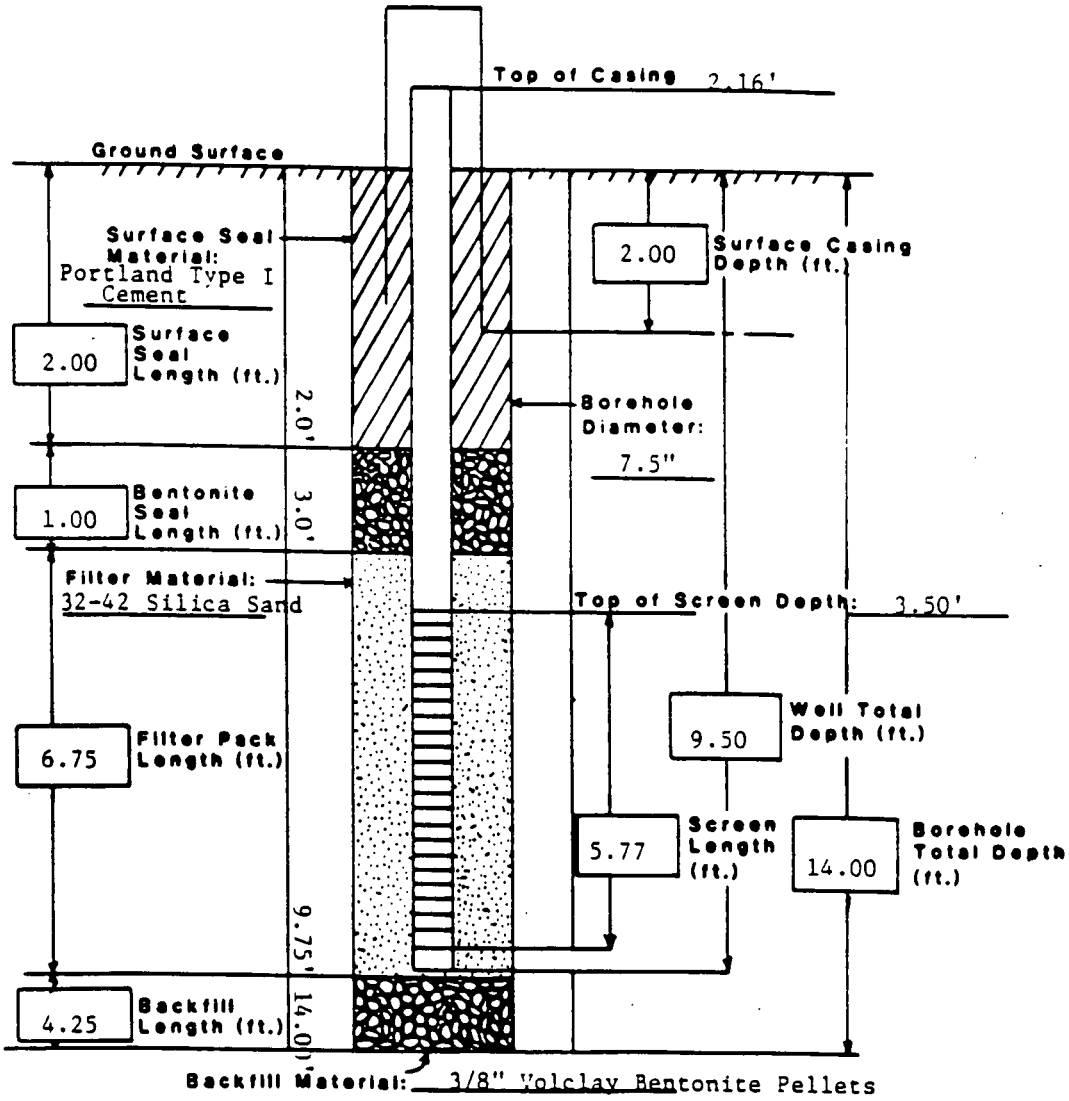
Approved By

Site Manager

Installed By R. Treat
Geologist

CEARP Manager

Comments



Well No.: 38-87

WELL DEVELOPMENT SUMMARY SHEET

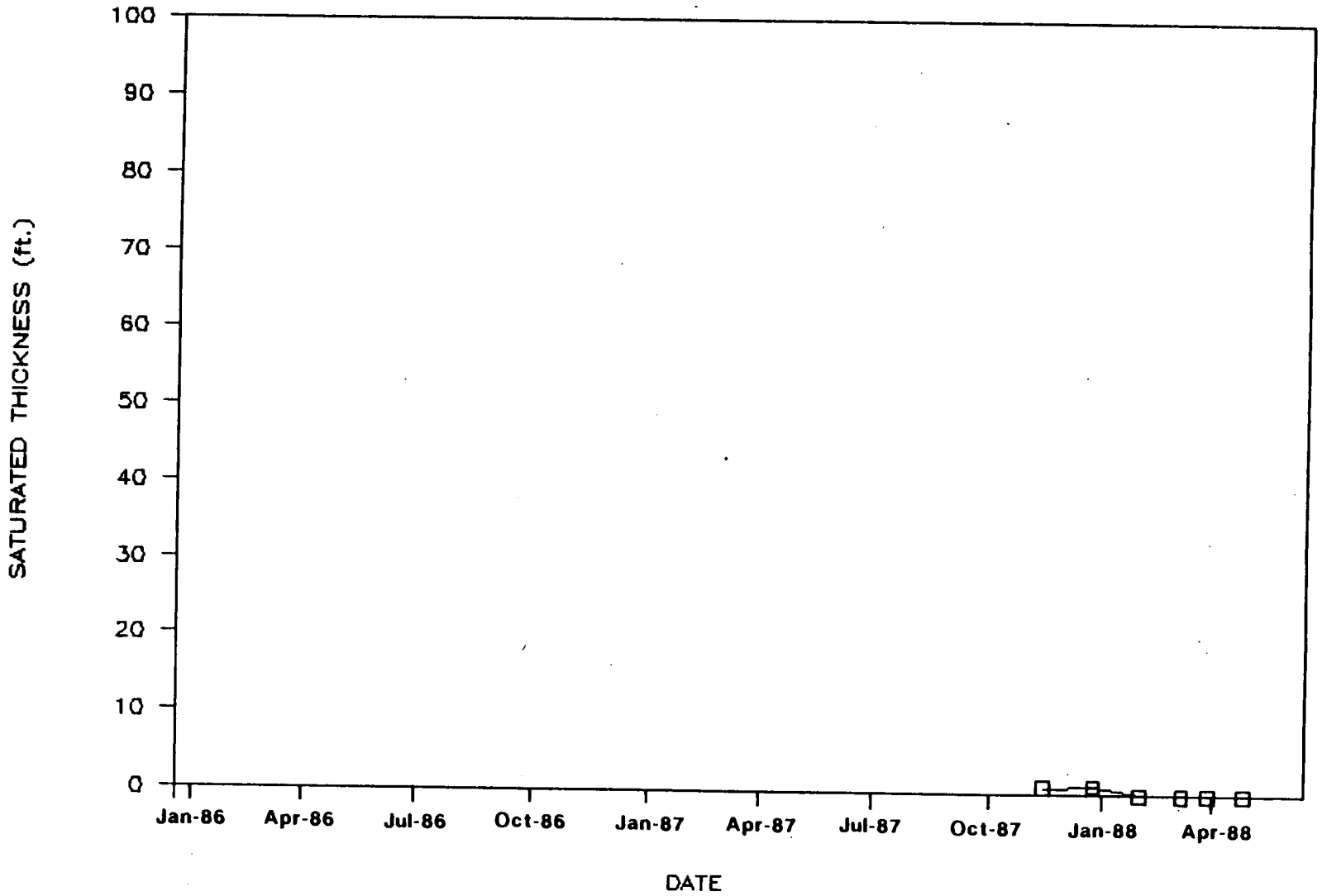
DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87	---	Pumping	-----	No particulates	Water depth from top of casing was 7.34' after pumping

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3887	11/12/87	5971.79	5973.95	2.16	9.27	8.30	5965.65
	12/21/87					8.20	5965.75
	01/27/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY

SATURATED THICKNESS IN WELL # 38-87 (SP)



INDEX OF DATA

Boring No.: 39-87BF. /SP08-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Pond Area
Coordinates N 38094.04 E 22166.32
Total Depth 140.00'

Borehole/Well No. 39-87BR/SP08-87
Ground Surface Elevation 5947.10'
Water Level Encountered _____
Static _____

Drilling Company Bovles Bros.
Date Drilled Oct. 29-30 and Nov. 6-10, 1987
Drilling Method Hollow Stem Auger; NC Core
Logged By R. Treat; K.D. Holliway
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____
Site Manager

_____
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0.0-2.0' SAMPLE. Recovered 0.7/2.0' = 35%. GRAVEL AND CLAY: dark dusky brown (5 YR 2/2) to mixed light brown; weakly cemented; subangular, subrounded quartzite gravel; poorly sorted; low plastic; slightly sandy; fine-grained; light moist. 2.0-3.5' SAMPLE. Recovered 1.5/1.5' = 100%. 2.0-3.2': GRAVEL AND CLAY: dark yellowish orange (10 YR 6/6) to moderate yellowish orange (10 YR 5/4) with gravel to 4.00 mm and larger; sand varying (2.0-1.5 Ø to 0.5-1.0 Ø); light moist. 3.2-3.5': CLAY: dark yellowish orange (10 YR 6/6) moderately cemented; slightly sandy; fine-grained; occasional small scattered gravel; highly plastic; very moist. 3.5-6.5' SAMPLE. Recovered 3.0/3.0' = 100%. 3.5-5.2': CLAY: moderate brown (5 YR 4/4) to varying gray; considerably oxide stained; low plastic; fine-grained sand (3.0-2.5 Ø); weakly cemented; claystone fragments; moist. **ARAPAHOE FORMATION** 5.2-6.5': CLAYEY SANDSTONE: light gray (N 7/0); fine-grained sand (3.0-2.5 Ø) and finer; weakly cemented; weathered; moist.	HNu background=0.2. OVA Bachground=2.8 Ludlum background = 0.0 0.0-2.0': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above backgrouud. 2.0-3.5': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above background. 3.5-6.5': Upper contact sample: SP088703UC. 6.5-8.5': Contact sample: SP088706CT. 9.0-11.5': Bedrock sample: SP088709BR. 11.5-14.0': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). 14.0-16.5': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8).
5				
10				
15				
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)
Ground Surface Elevation _____
Water Level Encountered _____
Static _____
Driller _____
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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			6.5-9.0' SAMPLE. Recovered 2.0/2.5 = 80%. SANDSTONE: light gray (N 7/0) to severely oxide stained brown; fine-grained sand (3.0-2.5 Ø); weakly cemented; massive; slight clay binder; weathered; moist.	19.0': Readings in augers: HNu = 0; OVA = 28.
25			9.0-11.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: varying oxide (Fe) browns to grays; fine-grained sand as above; massive; weakly cemented; weathered; moist.	
30			11.5-14.0' SAMPLE. Recovered 1.5/2.5' = 60%. CLAYEY SANDSTONE: as stated above continued moderately oxide stained; weathered.	
35			14.0-16.5' SAMPLE. Recovered 2.0/2.5' = 80%. CLAYEY SANDSTONE: light gray (N 7/0) to severely oxide stained brown; sand (3.0-2.5 Ø); massive; low plastic; weakly to moderately cemented; weathered; moist.	
40			16.5-19.0' SAMPLE. Recovered 2.3/2.5 = 92%. CLAYEY TO VERY CLAYEY SANDSTONE: oxide stained brown to light gray; low plastic; massive; weakly cemented; weathered; moist.	

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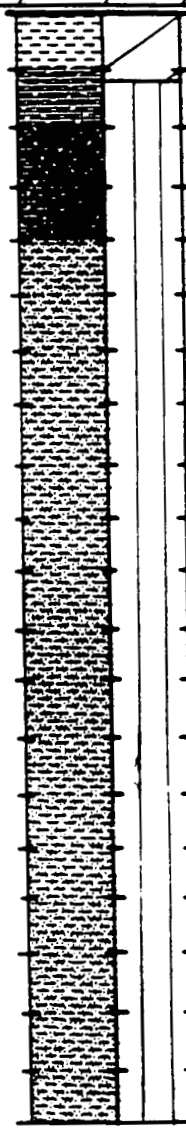
40			19.0-21.5' SAMPLE. Recovered 1.4/2.5' = 56%. CLAYEY SANDSTONE: moderately oxide stained to light gray (N 7/0) massive, fine-grained; weathered; moist.	
			21.5-24.0' SAMPLE. Recovered 1.8/2.5 = 72%. CLAYEY SANDSTONE: light gray (N 7/0) to severely oxide stained brown; low plastic sands (3.5-3.0 Ø to 2.5-2.0 Ø); weakly cemented; massive; moist.	
45			24.0-26.5' SAMPLE. Recovered 1.2/2.5 = 60%. 24.0-25.0': CLAYEY SANDSTONE: as noted above; moist. 25.0-25.2': CLAYSTONE: medium gray (N 4/0); massive; blocky; remaining slightly sandy (3.5-3.0 Ø); low plastic; weathered; moist.	50.10-59.75': Packer Test Interval #10. 59.75-69.40': Packer Test Interval # 9.
50			26.5-29.0' SAMPLE. Recovered 2.5/2.5 = 100%. CLAYSTONE: medium gray (N 7/0) massive; medium plastic; slightly blocky; now only slightly oxide stained in streaks at 28.5 and 28.8' for 2" streaks.	
55			29.0-31.5' SAMPLE. Recovered 1.3/2.5 = 52%. SANDY CLAYSTONE: as noted above but now moderately oxide (Fe) stained; massive; medium plastic; weathered; moist.	
60				

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60			31.5-34.0' SAMPLE. Recovered 2.2/2.5' = 88%. SANDY CLAYSTONE: upper formation (31.5-32.0') then slightly sandy, fine-grained; severely oxide stained brown to a light medium gray (N 6/0); massive; low to medium plastic; weathered; blocky; moist.	69.40-79.05': Packer Test Interval # 8.
65			34.0-36.5' SAMPLE. Recovered 2.5/2.5 = 100%. CLAYSTONE: dark gray (N 3/0) to medium gray (N 5/0); massive; medium plastic; blocky; slightly sandy; fine-grained; moist.	
70			36.5-39.0' SAMPLE. Recovered 1.7/2.5 = 68%. CLAYSTONE: moderate brown (5 YR 4/4) to medium dark gray (N 6/0); massive; blocky; medium plastic; slightly sandy; weathered; streaked, moist.	
75			39.0-41.5' SAMPLE. Recovered 2.2/2.5 = 88%. CLAYSTONE/SHALE: medium dark gray (N 4/0); massive; blocky slightly sandy; fine-grained; medium plastic; moist.	
80			41.5-44.0' SAMPLE. Recovered 1.2/2.5 = 48%. CLAYSTONE/SHALE: medium dark gray (N 4/0).; massive; medium plastic somewhat blocky; just slightly sandy; light moist.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
80			41.3-45.4' SAMPLE. Recovered 1.68/4.10' = 41%. RQD = 1.04/1.68' = 62%. 41.3-41.8': CLAYSTONE PLUG. 41.8-42.35': SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted; unconsolidated; blocky; soft to medium hardness; damp. 42.35-44.03': SANDY SILTY CLAYSTONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness; some organics; damp.	79.05-88.70': Packer Test Interval # 7. 88.70-98.35': Packer Test Interval # 6. 98.35-108.00': Packer Test Interval # 5.
85				
90			45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sandstone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint; occasional organics throughout core; damp.	
95				
100				

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
100			49.5-54.0' SAMPLE. Recovered 4.20/4.50' = 93.30%. RQD = 2.70/3.90' = 69%. 49.5-50.7': SANDY CLAYSTONE: olive gray (5 Y 3/2); cuttings from above; moist. 50.7-54.0': SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); same as 45.40-49.50' interval; at 52.25' have some fine-grained sand stained dark yellowish orange (10 YR 6/6); lenses of fine-grained sand increase down core; at 53.5'-54.0' clay is predominant; damp.	108.00-117.65': Packer Test Interval # 4. 115.65-125.30': Packer Test Interval # 3. 117.65-127.30': Packer Test Interval # 2. 122.68-132.33': Packer Test Interval # 1.
105			54.0-57.0' SAMPLE. Recovered 3.3/3.0' = 110%. RQD = 2.45/3.30' = 74%. SANDY CLAYSTONE: same as above with nodules of very pale orange (10 YR 8/2) clay and very fine-grained sand increasing down core; at 56.22' have leaf imprint; less fine-grained sand lenses; damp.	
110			57.0-61.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. SANDY CLAYSTONE: same as above with more fine-grained sand lenses; clay nodules still present; more organics than above; clay increases down core with 60.0-61.0' mostly clay; damp.	
115			61.0-65.0' SAMPLE. Recovered 0.0/4.0' = 0%. Lost core.	
120				

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120			65.0-66.0' SAMPLE. Recovered 1.5/1.0' = 150%. RQD = 0%. CLAYSTONE: light greenish gray (5 GY 4/1) to dark greenish gray (5 GY 2/1) from 65.0-65.3'; rest of core olive black (5 Y 2/1); trace very fine-grained sand; core mangled from drilling; appears unconsolidated and blocky; damp to moist.	
125			66.0-70.0' SAMPLE. Recovered 5.0/4.0' = 125%. RQD = 2.6/5.0' = 52%. 66.0-67.5': CLAYSTONE: olive black (5 Y 2/1) to brownish black (5 YR 2/1); trace silt and very fine-grained sand; some organics; blocky; consolidated; damp.	
130			67.5-68.5': CLAYSTONE: olive black (5 Y 2/1) to brownish black (5 YR 2/1); trace silt and very fine-grained sand; some organics; blocky; consolidated; damp. 68.5-69.5': CLAYSTONE: olive black (5 Y 2/1) to greenish black (5 GY 2/1) to black (N 1/0); trace silt; blocky; damp. 69.5-70.0': CLAYSTONE: medium bluish gray (5 B 5/1) to medium gray (N 5/0); highly plastic; block; moist.	
135			70.0-74.0' SAMPLE. Recovered 0.6/4.0' = 15%. RQD = 0%. CLAYSTONE: olive black (5 Y 2/1) to medium dark gray (N 4/0); blocky; homogenous; plastic; damp.	
140				

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			74.0-76.0' SAMPLE. Recovered 3.85/2.0' = 193%. RQD = 2.26/3.85' = 59%. Picked up 1.85' from previous run. 72.15-74.0': CLAYSTONE: olive black (5 Y 2/1) with lenses of black (N 1/0); blocky, homogenous; plastic; damp. 74.0-76.0': CLAYSTONE: olive black (5 Y 2/1) to medium gray (N 5/0), blocky, homogenous; plastic; damp.	
			76.0-80.0' SAMPLE. Recovered 2.13/4.0' = 53%. RQD = 1.50/2.13' = 70%. CLAYSTONE: olive black (5 Y 2/1); some silt; some organics; trace very fine-grained sand interbeds; homogenous; blocky; medium hardness; damp.	
			80.0-82.0' SAMPLE. Recovered 2.62/2.01 = 131%. RQD = 1.62/2.62' = 62%. SANDY CLAYSTONE: olive black (5 Y 2/1); some very fine-grained sand, poorly sorted, subangular to subrounded fine-grained sand occurring in lenses and interbeds; some silt; some organics; small coal seams; blocky; fairly homogenous; medium hardness; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			82.0-84.0' SAMPLE. Recovered 2.38/2.0' = 119%. RQD = 2.15/2.38' = 90%. SANDY CLAYSTONE/CLAYEY SANDSTONE INTERBEDS: olive black (5 Y 2/1) to dark gray (N 3/0); sand very fine-grained to fine-grained, poorly sorted, occurs in lenses and interbeds; occasional stringers of coal in small fractures with no orientation; some silt; some organics; consolidated; medium hardness; from 83.0-84.0' have small lenses of fairly well sorted fine-grained (3.0-2.5 Ø) sand, subrounded; quartzitic, yellowish gray (5 Y 8/1); damp with sand lenses moist. 84.0-86.0' SAMPLE. Recovered 2.0/2.0' = 100%. RQD = 1.76/2.0' = 86%. SANDY CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0) with yellowish gray (5 Y 8/1) fine-grained sand lenses occasional, poorly sorted; occasional stringers of coal; some silt; some organics; consolidated; damp. 86.0-88.0' SAMPLE. Recovered 2.0/2.0' = 100%. RQD = 2.0/2.0' = 100%. SANDY SILTSTONE: same as above except less sand; no coal stringers; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			88.0-92.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.63/4.0' = 91%. 88.0-91.0': SANDY SILTSTONE: olive black (5 Y 2/1) and dark gray (N 3/0); some clay; lots of silt; some very fine-grained fairly well sorted sand with lenses of a fine-grained, well sorted sand; damp. 91.0-92.0': SILTY SANDSTONE: olive black (5 Y 2/1) with yellowish gray (5 Y 8/1) to pinkish gray (5 YR 8/1) fine-grained sand, fairly well sorted; sand in lenses and interbeds; some clay; some organics; small planes of lamination present in sand lenses; consolidated; damp. 92.0-96.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.83/4.0' = 96%. 92.0-94.25': SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated; damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-grained sand; damp. 95.2-96.0': SILTY SANDSTONE: same as 92.0-94.25'; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			96.0-100.0' SAMPLE. Recovered 4.3/4.0' = 107%. ROD = 4.0/4.3' = 93%. 96.0-97.35': SANDY SILTSTONE: olive black (5 Y 2/1); very fine-grained sand, fairly well sorted in siltstone matrix; some clay; some organics; some lamination planes; consolidated; at 96.10-96.50' and 97.2-97.35' have lenses of a light olive gray (5 Y 6/1) to olive black (5 Y 2/1), fairly well sorted, moist, fine-grained sand; damp. 97.35-99.0': SILTSTONE: olive black (5 Y 2/1); very fine-grained sand yielding to claystone downcore and disappearing at 98.85'; consolidated; some clay; lots silt; occasional nodules of grayish orange (10 YR 7/4) clay, prominent from 97.35-98.0'; some organics; damp. 99.0-100.0': CLAYEY SILTSTONE: olive black (5 Y 2/1); trace very fine-grained sand; lots of silt; lots of clay; consolidated; some organics; occasional grayish orange (10 YR 7/4) nodules of clay; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			100.0-104.0' SAMPLE. Recovered 2.61/4.0' = 65.3%. RQD = 2.50/2.61' = 96%. 100.0-101.0': CLAYEY SILTSTONE: olive black (5 Y 2/1); trace very fine-grained sand; fairly homogenous; consolidated; damp. 101.0-101.5': SILTY SANDSTONE: yellowish gray (5 Y 8/1) to olive black (5 Y 2/1); sand from very fine-grained in upper portion to fine-grained in lower portion fairly well sorted, subrounded; some silt; little clay; consolidated; damp to moist. 101.5-102.61': CLAYSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); highly plastic; blocky; homogenous; no silt or sand; damp to moist. 104.0-108.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.27/4.0' = 82%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); trace silt; blocky; homogenous; damp to moist.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			108.0-112.0' SAMPLE. Recovered 3.9/4.0' = 98%. RQD = 3.49/3.9' = 89.5%. 108.0-110.0': SILTSTONE: olive black (5 Y 2/1); some very fine-grained sand; some clay; some organics; fairly homogenous; consolidated; hard; more sand down core; damp. 110.0-111.90': SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 GY 6/1) with some yellowish gray (5 Y 8/1); very fine-grained (3.5-4.0 Ø) to fine-grained (3.0-2.5 Ø); fairly well sorted; subangular to subrounded; some silt; trace clay; some leaf and plant stem organics, increases down core; sand fines as goes down core with occasional lenses of the coarser grains; massive; damp to moist.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			112.0-116.0' SAMPLE. Recovered 4.67/4.0' = 117%. RQD = 3.23/4.67' = 69%. 112.0-112.5': SANDY SILTSTONE: olive black (5 Y 2/1); 40% silt; 40% organics; 20% sand; consolidated; damp to moist. 112.5-115.75': SANDSTONE: greenish gray (5 GY 6/1) to dark greenish gray (5 G 4/1) with some yellowish gray (5 Y 8/1); fine-grained (3.0-2.0 Ø) to medium-grained (2.0-1.5 Ø) sand, fining down core; occasional lenses of clay and silt associated with organics occurring throughout the core; sand massive with zones of contorted bedding; consolidated; at 112.75' have a fracture of coal with small fractures of coal or organics occurring throughout the core; damp to moist. 115.75-116.0': SILTY SANDSTONE: olive black (5 Y 2/1); very silty; sand fine-grained to medium-grained as above, occurring in lenses; many organics with clay associated; very hard; consolidated; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			116.0-120.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 0.45/2.0' = 22.5%. 116.0-116.3': CUTTINGS OF SILTSTONE AND CLAYSTONE: reworked. 116.3-116.9': SANDY SILTSTONE: olive black (5 Y 2/1) with yellowish gray (5 Y 8/1) and greenish gray (5GY 6/1) fine-grained sand in lenses; some clay; some organics; massive; consolidated; damp to moist. 116.9-118.0': CLAYEY SANDY SILTSTONE: olive black (5 Y 2/1); heavy silt influence; sand is very fine-grained; some organics; massive; consolidated; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			120.0-122.0' SAMPLE. Recovered 4.6/2.0' = 230%. RQD 3.97/4.6' = 86%. 118.0-120.0': CLAYEY SILTSTONE: olive black (5 Y 2/1) to greenish black (5 GY 2/1); trace very fine-grained sand; some organics; occasional seams of coal; massive; blocky; fairly homogenous; consolidated; damp. 120.0-121.4': CLAYEY SILTSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); trace very fine-grained sand in lenses; some organics; massive; consolidated; damp. 121.4-122.0': SANDSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); some silt in top of core giving way to sand; fine-grained to medium-grained (2.0-1.5 Ø) sand, subrounded to subangular; feldspathic and quartzitic; fairly well sorted; massive; homogenous; consolidated; few organics; damp to moist.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			122.0-126.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.65/4.0' = 91%. 122.0-122.85': SANDSTONE: greenish gray (5 G 6/1) to greenish black (5 G 2/1); some silt; fine-grained to medium-grained (2.5-1.5 Ø) sand, subrounded to subangular, fairly well sorted; some organics; massive; consolidated; moist. 122.85-126.0': SANDSTONE/SILTSTONE: greenish gray (5 G 6/1) to greenish black (5 G 2/1); very fine-grained sand with lenses of fine-grained to medium-grained sand as above (122.0-122.85'); some organics more than above; clay influence with organics; sand decreases down core giving way to more silt, a little clay, and more organics; massive; consolidated; damp. 126.0-130.0' SAMPLE. Recovered 1.5/4.0' = 37.5%. RQD = 0.75/1.5' = 50%. SANDSTONE: medium dark gray (N 4/0) to light gray (N 7/0); very fine-grained to fine-grained (3.5-2.5 Ø) feldspathic and quartzitic sand; fairly well sorted; massive; occasional trace lamination planes; sand fines down core; some organics; some silt; from 127.3-127.5' have zone of clay influence; moist to wet.	

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Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			130.0-132.0' SAMPLE. Recovered 4.35/2.0' = 217.5%. RQD = 3.68/4.35' = 84.6%. 127.5-129.4': CLAYEY SILTSTONE: dark greenish gray (5 G 4/1) to greenish black (5 G 2/1); no organics, hard; massive; fairly homogenous; consolidated; damp to dry. 129.4-129.7': SILTY CLAYSTONE: same as above; damp to dry. 129.7-130.0': SILTY SANDSTONE: same as above with some clay; very fine-grained sand; moist. 130.0-132.0': SILTY SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); very fine-grained (3.5-4.0 Ø) to fine-grained (3.0-2.5 Ø), fairly well sorted sand; some silt; massive; consolidated; damp to moist.	
			132.0-136.0' SAMPLE Recovered 4.18/4.0' = 104.5%. RQD = 3.76/4.18' = 90%. 132.0-132.4': SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); fine-grained (2.0-3.0 Ø) sand; fairly well sorted; some silt; massive; consolidated; damp. 132.4-136.0': SILTY CLAYSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); trace very fine-grained sand; silt in top of core gives way to clay down core; fairly homogenous; massive; consolidated; hard; no organics; damp.	

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

_____
CEARP Manager

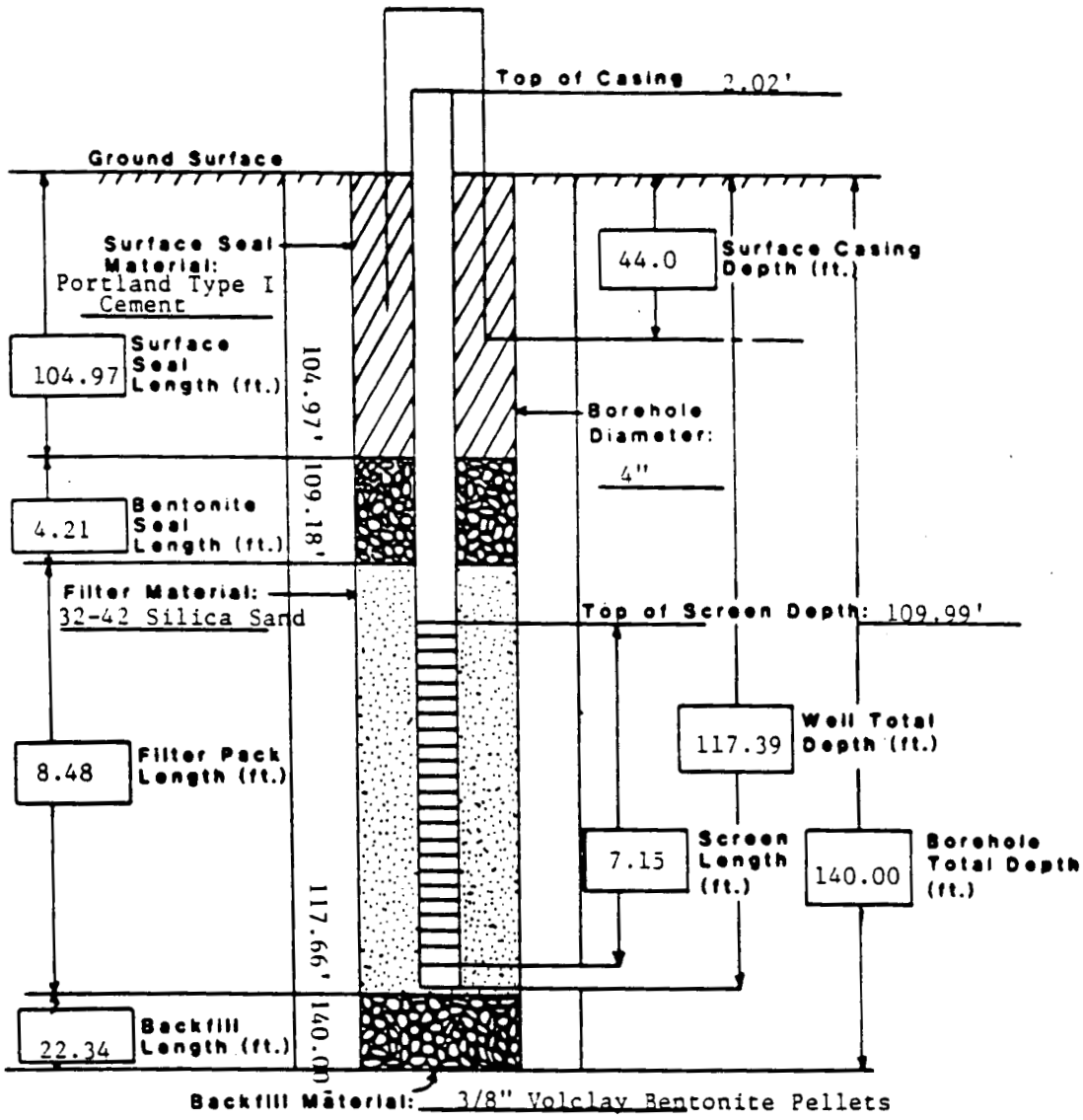
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			136.0-140.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 0.6/2.0' = 30%. CLAYSTONE: medium gray (N 5/0) to dark gray (N 3/0); some silt; homogenous; massive; blocky; no organics; damp.	
			TOTAL DEPTH: 140.00'.	

WELL COMPLETION INFORMATION

Location: Rocky Flats Plant; Solar Ponds Area
Well No. 39-87BR/SP08-87
Coordinates: N 38094.04 E 22166.32
Elevation: Ground Surface 5947.10'
Total Depth: Well 117.39'
Top of Casing 5949.12'
Borehole 140.00'
Formation of Completion: Arapahoe Formation
Casing Material: Sch 5, Type 316, TFJ Stainless Steel
Casing Diameter: 2" ID
Screen Material: 0.010" wire wrap, Type 316, TFJ Stainless Steel
Surface Casing Diameter: 5" ID
Date Installed: November 17-18, 1987
Approved By: _____ Site Manager
Installed By: K.D. Holliway, Geologist
_____ CEARP Manager

Comments: Surface casing set to 44.0' by R. Treat on October 30, 1987.



Well No.: 39-878R

WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87	---	Pumping	------	Dirty brown	Water level 43.53' after pumping

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant: Solar Ponds Area

Well No.: 39-87BR

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0.1663'

Static Water Level: 83.98'

Date of Water Level: 4/18/88

Page 1 of 2

Comments: Interval #2 (117.65 - 127.30') failed

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
1	122.68	132.33	15	0	5.90	4.25	10.15	0.03	11/11/87	Kass	KDH
			15	29.7	5.90	-	5.90	0.12	11/11/87	Kass	KDH
			15	0	5.90	2.712	8.702	-0.02	11/11/87	Kass	KDH
3	115.65	125.30	15	0	5.90	3.94	9.84	-0.08	11/11/87	Kass	KDH
			15	28	5.90	-	5.90	1.21	11/11/87	Kass	KDH
			15	0	5.90	2.528	8.428	-0.095	11/11/87	Kass	KDH
4	108.00	117.65	15	0	5.90	4.172	10.162	-0.025	11/11/87	Kass	KDH
			15	26	5.90	-	5.90	0.18	11/11/87	Kass	KDH
			15	0	5.90	3.558	9.458	-0.01	11/11/87	Kass	KDH
5	98.35	108.00	15	0	5.90	3.904	9.804	-0.01	11/12/87	KCL	KDH
			15	24	5.90	-	5.90	0.11	11/12/87	KCL	KDH
			15	0	5.90	2.519	8.419	-0.035	11/12/87	KCL	KDH
6	88.70	98.35	15	0	5.90	5.638	11.538	-0.010	11/12/87	KCL	KDH
			15	21.7	5.90	-	5.90	0.07	11/12/87	KCL	KDH
			15	0	5.90	5.537	11.437	-0.015	11/12/87	KCL	KDH
7	79.05	88.70	15	0	5.90	4.437	10.337	0.02	11/12/87	KCL	KDH
			15	19.4	5.90	-	5.90	0.08	11/12/87	KCL	KDH
			15	0	5.90	4.228	10.128	-0.015	11/12/87	KCL	KDH

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; Solar Ponds Area

Well No.: 39-87BR (cont'd.)

Borehole Diameter: _____

Acrylic Tube Diameter: _____

Static Water Level: _____

Date of Water Level: _____

Page 2 of 2

Comments: _____

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
8	69.40	79.05	15	0	5.90	3.68	9.58	0.00	11/12/87	KCL	KDH
			15	17.1	5.90	-	5.90	0.10	11/12/87	KCL	KDH
			15	0	5.90	1.760	7.660	0.00	11/12/87	KCL	KDH
9	59.75	69.40	15	0	5.90	4.060	9.96	0.00	11/12/87	KCL	KDH
			15	14.8	5.90	-	5.90	0.13	11/12/87	KCL	KDH
			15	0	5.90	2.81	8.71	0.00	11/12/87	KCL	KDH
10	50.10	59.75	15	0	5.90	3.794	9.694	-0.050	11/13/87	KCL	KDH
			15	15.08	5.90	-	5.90	0.05	11/13/87	KCL	KDH
			15	0	5.90	3.585	9.485	-0.015	11/13/87	KCL	KDH

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 50.10 - 59.75
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00007240 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 54.92 + 5.90 + 15.08 • 2.31 = 95.66
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN
K = .00000003 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 59.75 - 69.40
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 64.57 + 9.96 + .00 * 2.31 = 74.53
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

P2/3 TEST

Q = INJECTION RATE = .00018825 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 64.57 + 5.90 + 14.80 * 2.31 = 104.66
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 64.57 + 8.71 + .00 * 2.31 = 73.28
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE
Q=0

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 69.40 - 79.05
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 9.58 + .00 * 2.31 = 83.81
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

P2/3 TEST

Q = INJECTION RATE = .00014480 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 5.90 + 17.10 * 2.31 = 119.63
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN
K = .00000004 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 7.66 + .00 * 2.31 = 81.89
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 79.05 - 88.70
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00002896 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.88 + 10.34 + .00 * 2.31 = 94.21
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00011584 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.88 + 5.90 + 19.40 * 2.31 = 134.59
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000006 FT/MIN
K = .00000003 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 88.70 - 98.35
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00010136 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 21.70 * 2.31 = 140.01
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN
K = .00000002 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 98.35 - 108.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00015929 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 24.00 * 2.31 = 145.32
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN
K = .00000004 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 108.00 - 117.65
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00026065 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 26.00 • 2.31 = 149.94
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 115.65 - 125.30
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00175214 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 28.00 * 2.31 = 154.56
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN
K = .00000039 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 122.68 - 132.33
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 10.15 + .00 * 2.31 = 94.13
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN
K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00017377 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 29.70 * 2.31 = 158.49
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN
K = .00000004 CM/SEC

2ND P1/3 TEST

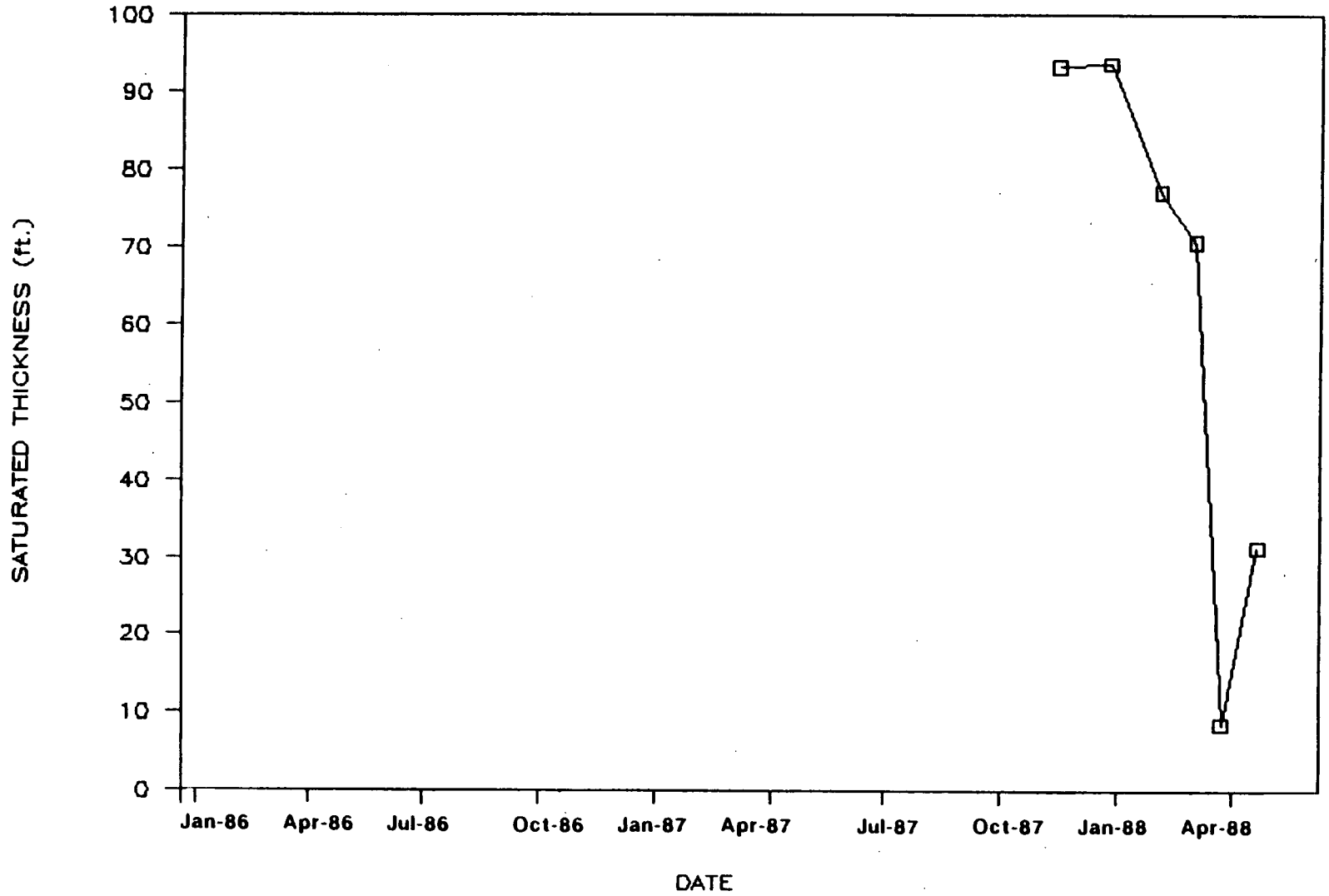
TEST ABORTED

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3987	11/12/87	5947.10	5949.12	2.02	117.14	23.90	5925.22
	12/22/87					23.60	5925.52
	02/01/88					40.20	5908.92
	02/29/88					46.60	5902.52
	03/21/88					108.6	5840.52
	04/18/88					86.00	5863.12

SATURATED THICKNESS IN WELL # 39-87(SP)



INDEX OF DATA

Boring No.: 56-87 /SP16-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

X Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87
Ground Surface Elevation 5978.51'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliway
Geologist

Driller T. High
Helper B. Keenev
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**TOP SOIL** 0.0-2.0' SAMPLE. Recovered 2.0/2.0' = 100%. 0.0-0.5': TOP SOIL: varied greens and browns; grass and ice; subangular; cobbles up to 1" diameter; sandy clay; frozen. **ARTIFICIAL FILL/DISTURBED** 0.5-1.1': CLAYEY SAND: pale yellowish brown (10 YR 6/2) to dark yellowish brown (10 YR 4/2); very coarse-grained (2.0-1.5 Ø to 1/4"), poorly sorted sand; subrounded to angular; small quartzite gravel up to 1" diameter; unconsolidated; moist to frozen. 1.1-2.0': SANDY CLAY: moderate brown (5 YR 3/4); some very coarse-grained, poorly sorted, subrounded to angular sand; angular quartzite gravel up to 3" diameter; varied green to yellow red orange to red staining throughout core; damp.	HNu background=1.2. OVA Bachground=1.6 Ludlum background = 0.0 0.0-2.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.9 (1.2). 0.0-2.0': Field screen sample: SP168702FS. 2.0-3.5': Field screen readings: HNu = 1.2 (1.2); OVA = 1.2 (1.2). 4.0-6.0': Field screen readings: HNu = 1.6 (1.6); OVA = 1.2 (1.2). 6.0-8.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0). 6.0-8.0': Upper contact sample: SP168708UC. 10.0-11.2': Contact sample:SP168710CT 11.2-13.4': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0).
5				
10				
15				
20				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87 (cont'd.)
Ground Surface Elevation 5978.51'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliway
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			2.0-4.0' SAMPLE. Recovered 1.5/2.0' = 75%. CLAYEY SAND AND GRAVEL: light brown (5 YR 5/6) with pale yellowish orange (10 YR 8/6) and dark yellowish orange (10 YR 6/6) with trace moderate reddish brown (10 YR 4/6), mostly in sand zones; very coarse-grained, poorly sorted sand, subangular to angular; quartzite gravel subangular to broken, to 3" diameter; becomes sandier down core with medium-grained (2.5-1.5 Ø) fairly sorted, subangular sand; damp.	11.2-13.4': Bedrock Sample: SP168711BR
			4.0-6.0' SAMPLE. Recovered 2.0/2.0' = 100%. SANDY CLAY: moderate yellowish brown (10 YR 5/4) to dark yellowish brown (10 YR 4/2) with some yellowish gray (5 Y 7/2) especially towards bottom of core; subangular to angular quartzite gravel up to 2" diameter increases down core; quartzitic sand and pebbles, sub-rounded to subangular medium-grained (2.0-1.5 Ø) to coarse-grained up to 1/4" diameter; poorly sorted; unconsolidated; some caliche increases down core; damp to moist.	

OF
BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87 (cont'd.)
Ground Surface Elevation 5978.51'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliway
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. 6.0-6.3':GRAVEL: angular to broken; some fine-grained sand; dry. 6.3-7.0': CLAYEY SAND: dusky yellow (5 Y 6/4) to yellowish gray (5 Y 7/2); some clay; sand is very fine-grained to fine-grained (2.5-2.0 Ø); fairly well sorted; unconsolidated; some caliche (strong reaction to HCl); damp to moist. 7.00-8.00': CLAYEY SAND AND GRAVEL: yellowish gray (5 Y 7/2) with light brown (5 YR 5/6) and moderate reddish brown (10 R 4/6) staining; fine-grained (2.5-2.0 Ø) to coarse-grained, poorly sorted, subrounded to subangular sand; subangular gravel; lots of caliche; unconsolidated; moist.	
			8.0-10.0' SAMPLE. Recovered 0.0/2.0' = 0%. Lost core.	
			ARAPAHOE FORMATION	
			Q/Ka contact estimated at 9.40' by drilling and cuttings.	
			10.0-11.2' SAMPLE. Recovered 1.8/1.2' = 150%. SANDY CLAYSTONE: light olive gray (5 Y 5/2) to yellowish gray (5 Y 7/2) with dark yellowish orange (10 YR 6/6) iron staining; very fine-grained to fine-grained sand; some caliche; consolidated; damp.	

LOG OF BOREHOLE

Location: Rocky Flats Plant; Solar Pond Area
Borehole/Well No.: 56-87/SP16-87 (cont'd.)
Coordinates: N 37654.23 E 21319.10
Ground Surface Elevation: 5978.51'
Total Depth: 13.40'
Water Level Encountered: None
Static:

Drilling Company: Boyles Bros.
Driller: T. High
Date Drilled: January 7, 1988
Helper: B. Keeney
Drilling Method: Hollow Stem Auger
Drilling Fluid: None
Logged By: KD Holliway, Geologist
Checked By: Site Manager
CEARP Manager

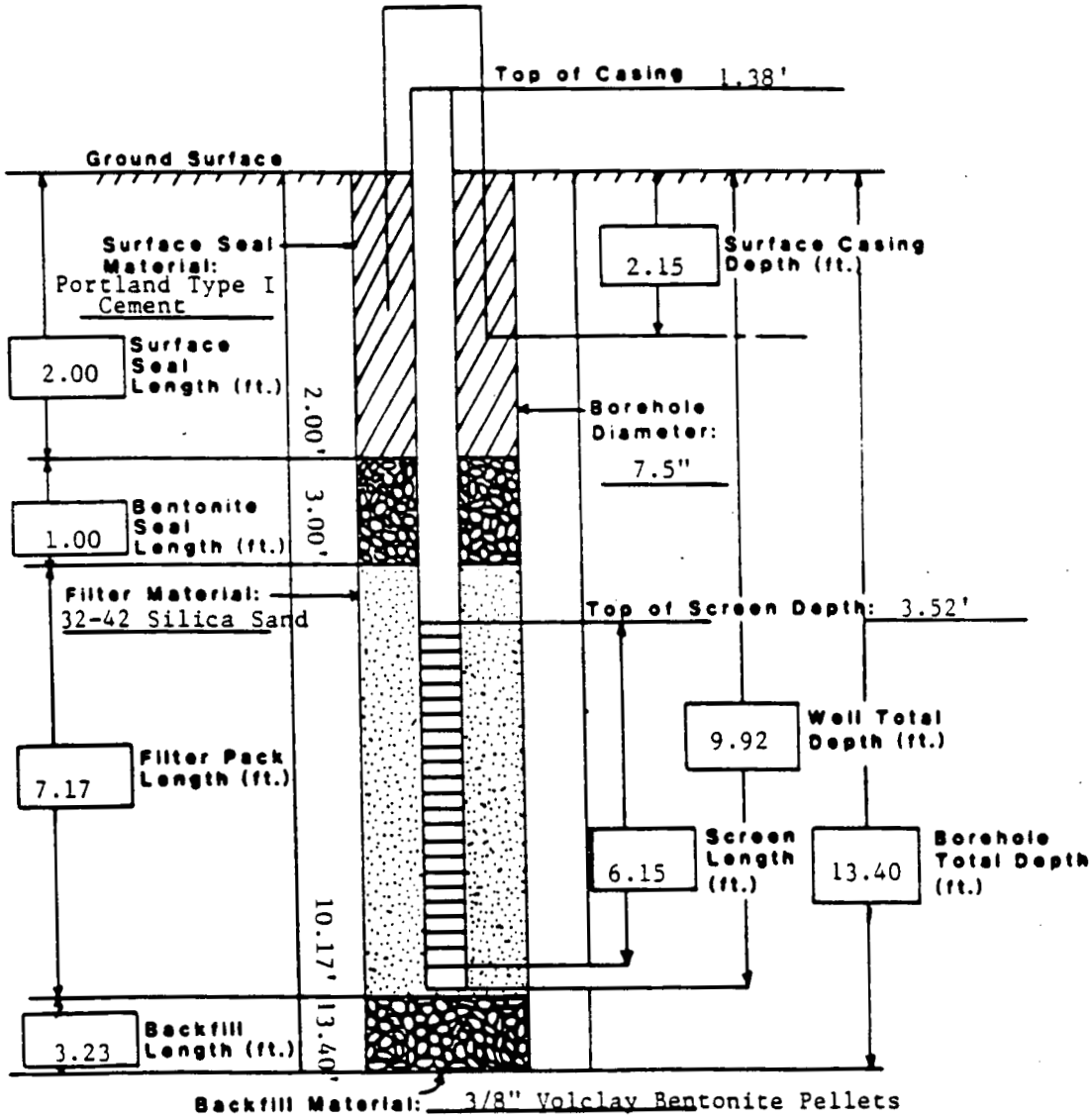
Comments:

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			11.2-13.4' SAMPLE. Recovered 2.2/2.2' = 100%. SANDY CLAYSTONE: same as above with occasional iron nodules.	
			TOTAL DEPTH: 13.40'.	

WELL COMPLETION INFORMATION

Location: Rocky Flats Plant; Solar Ponds Area
Well No. 56-87/SP16-87
Coordinates: N 37654.23 E 21319.10
Elevation: Ground Surface 5978.51'
Total Depth: Well 9.92'
Top of Casing 5979.89'
Borehole 13.40'
Formation of Completion: Rocky Flats Alluvium
Casing Material: Sch 5, Type 316, TFJ Stainless Steel
Casing Diameter: 2" ID
Screen Material: 0.010" wire wrap, Type 316, TFJ Stainless Steel
Surface Casing Diameter: 5" ID
Date Installed: January 8, 1987
Approved By: _____ Site Manager
Installed By: K.D. Holliway, Geologist
_____ CEARP Manager

Comments: _____



Well No.: 55-87

WELL DEVELOPMENT SUMMARY SHEET

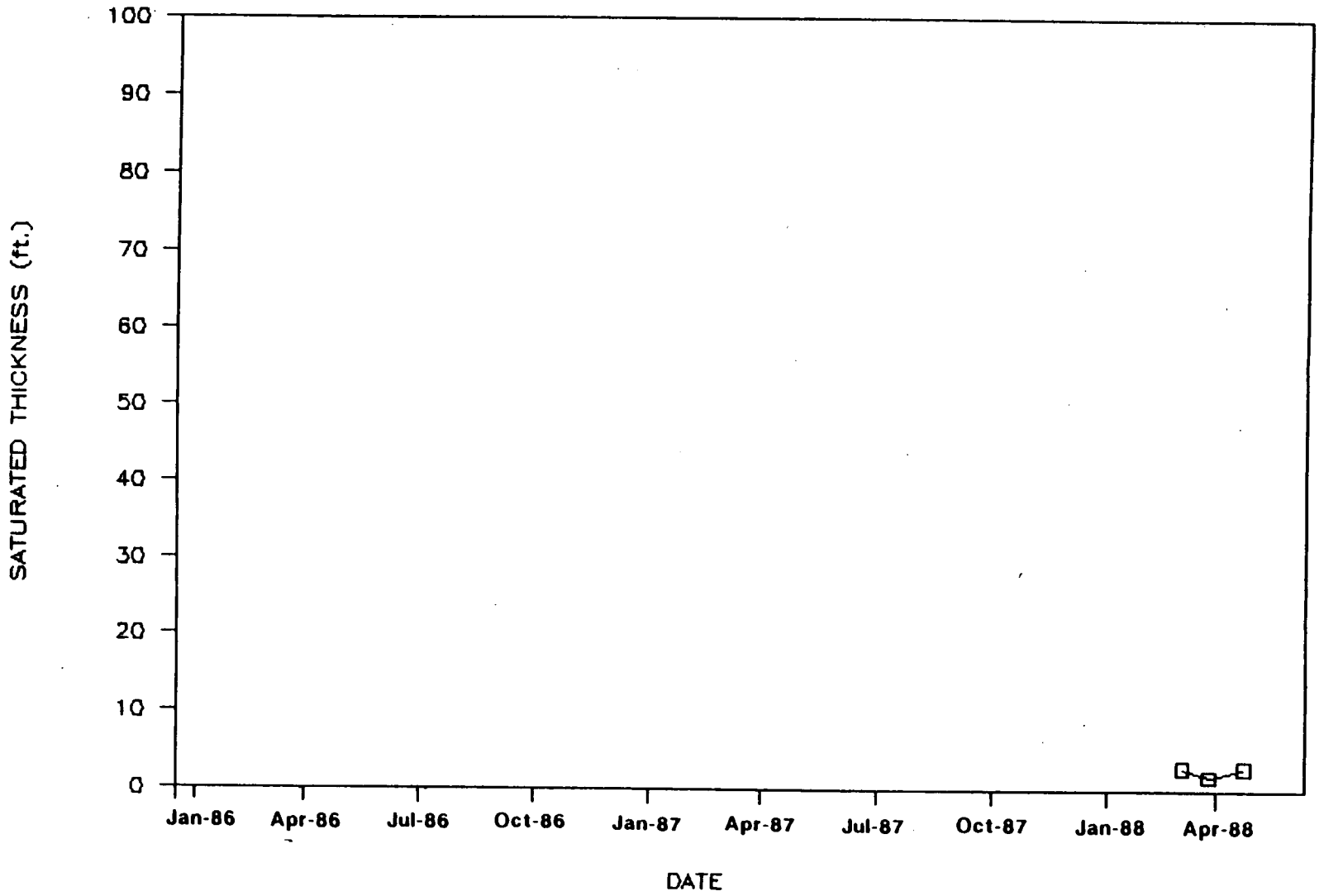
DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
1/14/88	0800	Pumping	-------	----------	Water level 0' before pumping; Water level 0' after pumping.
					Hole depth: 10.3'

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5687	02/29/88	5978.51	5979.89	1.38	9.67	6.70	5973.19
	03/21/88					7.80	5972.09
	04/18/88					6.70	5973.19

SATURATED THICKNESS IN WELL # 56-87 (SP)



APPENDIX B-3

1987 BOREHOLES

INDEX OF DATA

Boring No.: SP01-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37792 E 21209
Total Depth 30.2'

Borehole/Well No. SP01-87
Ground Surface Elevation *5982.7'
Water Level Encountered 15.2'
Static

Drilling Company Boyles Bros.
Date Drilled October 27-28, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			ARTIFICIAL FILL/DISTURBED	
			0.0-2.0' SAMPLE. Recovered 1.2/2.0' = 60%. 0-0.6': SAND: moderate yellowish brown (10 YR 5/4); silt and clay, asphalt; slight HCl reaction. 0.6-1.2': CLAY: moderate yellowish brown (10 YR 5/4); dense; large pebbles; caliche; dry.	HNu Background=0.8 OVA Background=1.0 Ludlum Background=0.0
			2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: dense; large angular clasts of igneous origin; reacts with HCl; slightly moist.	No Ludlum readings above background
5			4.0-5.0' SAMPLE. Recovered 1.2/1.0' = 120%. 4.0-4.1': CLAY: same as above. 4.1-4.35': layer of asphalt 4.35-5.0': CLAY: same as layer above except one large chunk of redwood; appears to be a stake.	0.0-1.2': Field Screen Reading: HNu=0.4(0.4); OVA=1.2(0.6).
				0.0-1.2': Field Screen Sample: SP018700FS.
				4.0-5.0': Reading on Core: HNu=1.4; OVA=1.2.
				4.0-5.0': Direct Hit Sample: SP018704DH.
10			5.0-8.0' SAMPLE. Recovered 1.3/3.0' = 43%. 5.0-7.7': CLAY: moderate yellowish brown (10 YR 5/4) with some spots of dark yellowish orange (10 YR 6/6); sandy; silty; pebbly; clasts are subangular to highly angular; dry. 7.7-8.0': CLAY: moderate reddish brown (10 YR 4/6); some coarse sand; slightly moist.	5.0-6.3': Reading on Core: HNu=3.4; OVA=1.2.
				5.0-6.3': Direct Hit Sample: SP018705DH.
			8.0-10.5' SAMPLE. Recovered 2.0/2.5' = 80%. 8.0-9.1': CLAY: same as above. 9.1-10.0': SAND: moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6); no HCl reaction; very poorly sorted; size ranges from clay to pebbles; clasts are very angular; dry.	8.0-10.0': Readings on Core: HNu=3.4; OVA=1.2.
				10.5': Readings in Breathing Zone: HNu=0.6; OVA=2.5.
15			10.5-12.7' SAMPLE. Recovered 1.65/2.5' = 66%. SAND: same as above; contains some subrounded small cobbles; dry.	10.5-12.2': Readings on Core: HNu=1.0; OVA=2.8.
				10.5-12.2': Direct Hit/Upper Contact Sample: SP 018711DH.
			12.7-15.2' SAMPLE. Recovered 1.2/2.5' = 48%. 12.7-13.2': SAND: moderate reddish brown (10 YR 4/6); conglomeratic sand; poorly sorted; silt; clay and large pebbles angular to subrounded; sand; slight HCl reaction; dry.	12.7-13.9': Readings on Core: HNu=1.0; OVA=2.8.
20				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Borehole/Well No. SP01-87(cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20 25 30 35 40			ARAPAHOE FORMATION 13.2-13.9': SANDSTONE: yellowish gray (5 Y 7/2); clean; mottled oxidation; dark yellowish orange (10 YR 6/6); well sorted, small amount of clay; slightly moist. 15.2-17.7' SAMPLE. Recovered 1.5/2.5' = 60%. SANDSTONE: moderate yellowish brown (10 YR 5/4) to yellowish gray (5 Y 7/2); claystone soaked except last 0.15 ft where it is wet to moist. 17.7-20.2' SAMPLE. Recovered 2.35/2.5' = 94%. 17.7-17.9': CLAYSTONE: light olive gray (5 Y 5/2); very fissile; no sand; moist. 17.9-18.9': SANDSTONE: alternating bands of yellowish gray (5 Y 7/2) and dark yellowish orange (10 YR 6/6); coarse-grained; subrounded; moist to dry. 18.9-20.05': SANDSTONE: yellowish gray (5 Y 7/2); highly stained with dark yellowish orange (10 YR 6/6); fractures; well consolidated; fine to coarse-grained; no HCl reaction; moist. 20.2-22.7' SAMPLE. Recovered 2.1/2.5' = 84%. SANDSTONE: same as above. 22.7-25.2' SAMPLE. Recovered 2.1/2.5' = 84%. SANDSTONE: dark yellowish orange (10 YR 6/6) and yellowish gray (5 Y 7/2); fine-grained; well consolidated; slightly moist. 25.2-27.7' SAMPLE. Recovered 2.4/2.5' = 96%. 25.2-25.9': CLAYSTONE: dark yellowish orange (10 YR 6/6) and yellowish gray (5 Y 7/2); sand; dry. 25.9-27.6': SANDSTONE: dark yellowish orange (10 YR 6/6) and yellowish gray (5 Y 7/2); coarse-grained; dry. 27.7-30.2' SAMPLE. Recovered 2.65/2.5' = 120%. SANDSTONE: same as above except sand is finer-grained. TOTAL DEPTH: 30.2'.	12.7-14.9': Direct Hit/Contact Sample: SP018713DH. 15.2-16.7': Readings on Core: HNu=2.1; OVA=10.0. 15.2-16.7': Bedrock Sample: SP0187168R. 20.2-22.3': Readings on Core: HNu=2.3; OVA=1.8. 20.2-22.3': Direct Hit Sample: SP018721DH. 22.7-24.8': Readings on Core: HNu=0.2; OVA=4.3. 22.7-24.8': Direct Hit Sample: SP018723DH. 25.2-27.6': Readings on Core: HNu = 0.3; OVA = 0.6. 27.7-30.2': Readings on Core: HNu = 0.3; OVA = 0.6.

INDEX OF DATA

Boring No.: SP02-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37980 E 21532
Total Depth 15.1'

Borehole/Well No. SP02-87
Ground Surface Elevation *5976.6'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled October 29, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED**	
			0-2.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: grayish brown (5 YR 3.2); sand, silt and gravel; clasts are angular; no roots; well indurated; dry.	HNu Background=0.9 OVA Background = 0.5-5.0 Ludlum Background = 0.0 No readings above background
			2.0-4.0' SAMPLE. Recovered 1.7/2.0' = 81%. CLAY: grayish brown (5 YR 3/2); poorly sorted, with sand silt and gravel; no reaction with HCl; dry.	
5			4.0-7.0' SAMPLE. Recovered 1.7/3.0' = 53%. CLAY: same as above.	
			Total depth measured at 7.6'. Readjust depth.	
			7.6-10.1' SAMPLE. Recovered 2.7/2.5' = 108%. 7.6-7.85': CLAY: same as above. 7.85-9.0': CALICHE: very pale orange (10 YR 8/2), reacts violently with HCl; silt size; dry. 9.0-10.1': CLAY: pale yellowish orange (10 YR 8/6); caliche; reacts violently with HCl; some angular pebbles; sand and silt; dry.	0.0-10.1': Composite Sample: SP02870008. (VOAs taken at 7.6-10.1). 7.6-10.1': Upper Contact Sample: SP028708UC. 10.1-12.6': Contact Sample: SP028711CT. 12.6-15.1': Bedrock sample: SP0287138R.
10			**ARAPAHOE FORMATION**	
			10.1-12.6' SAMPLE. Recovered 2.6/2.5' = 104%. SANDSTONE: yellowish gray (5 Y 7/2) with bands of light yellowish orange; fine to coarse-grained sand; caliche; coal; turns green with contact with HCl; dry.	
15			12.6-15 .1' SAMPLE. Recovered 2.7/2.5 = 108%. SANDSTONE: same as above except mottled with light yellowish orange; the sand is coarser; slightly moist near the bottom.	
			TOTAL DEPTH: 15.1'.	
20				

INDEX OF DATA

Boring No.: SP03-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37485 E 21532
Total Depth 20.4'

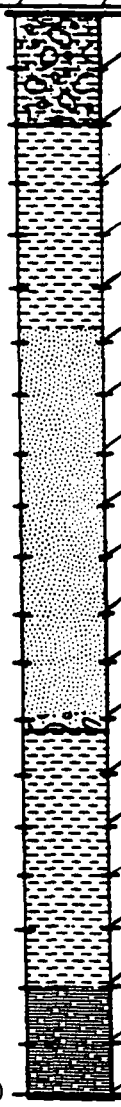
Borehole/Well No. SP03-87
Ground Surface Elevation *5978.7'
Water Level Encountered 12.8'
Static

Drilling Company Boyles Bros.
Date Drilled October 21 and 26, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0-2.0' SAMPLE. Recovered 1.75/2.0' = 86%. SOIL: dark yellowish brown (10 YR 4/2); roots in the upper 0.4 ft; sizes range from clay to small cobbles; clasts are very angular and not oriented in any order; very poorly sorted; dry. **ROCKY FLATS ALLUVIUM** 2.0-4.0' SAMPLE. Recovered 1.5/2.0' = 75%. 2.0-3.1': CLAY: same as above. 3.1-3.5': CLAY: same as above except much more clay; grayish black (N 2/0); moist. 4.0-5.0' SAMPLE. Recovered 0.6/1.0' = 60%. CLAY: same as above except a large quartzite cobble. 5.0-8.0' SAMPLE. Recovered 1.85/3.0' = 62%. 5.0-5.7': CLAY: dusky red (5 R 3/4); some sand, pebbles to 2.5" diameter; clasts range from rounded to angular; moist. 5.7-6.85': SAND: moderate yellowish brown (10 YR 5/4); small cobbles and clay clasts range from rounded to angular; no HCl reaction. 8.0-10.5' SAMPLE. Recovered 1.1/2.5' = 44%. SAND: moderate yellowish brown (10 YR 5/4); mottled with very pale orange (10 YR 8/2); silty sand; large quartzite clasts that are subrounded to angular; high amount of caliche; very poorly sorted, dry. 10.5-12.8' SAMPLE. Recovered 1.3/2.5' = 52%. SAND: moderate yellowish brown (10 YR 5/4); poorly sorted; quartzite clasts that range in size from small cobbles to large pebbles; some silt; very little clay; no HCl reaction.	HNu Background=0.4 OVA Background = 0.0-2.2 Ludlum Background = 0.0 2.0-3.5': Reading on Core: HNu=2.0; OVA=20. 2.0-3.5': Direct Hit Sample: SP038702DH. 4.0': Reading in Augers: HNu=4; OVA=39. 4.0-4.6': Field Screen Sample: SP038703FS (VOAs only). 10.3-11.6': Readings on Core: HNu=0.3; OVA=3.6. 10.3-11.6': Direct Hit/Upper Contact Sample: SP038711DH. 12.8-14.4': Readings on Core: HNu=0.3; OVA=2.6.
5				
10				
15				
20				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Borehole/Well No. SP03-87(cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			12.8-15.2' SAMPLE. Recovered 1.6/2.5' = 64%. 12.8-13.2': GRAVEL: moderate yellowish brown (10 YR 5/4); very poorly sorted; clasts are highly angular; clay, silt and sand; saturated; encountered water table at the top of the run. ARAPAHOE FORMATION 13.2-14.4':CLAYSTONE: light olive gray (5 YR 3/2); mottled light brown (5 YR 5/6); dense; pockets of caliche; semi-moist to dry	12.8-14.4': Contact Sample: SP038713CT.
25			15.2-17.7' SAMPLE. Recovered 1.7/2.5' = 68%. CLAYSTONE: same as above except getting sandy near the bottom of the run. Total depth with plopper 17.9'. Adjust depth. 17.9-20.4' SAMPLE. Recovered 1.8/2.5' = 72%. 17.9-18.0': CLAYSTONE: light olive gray (5 Y 5/2); stained light brown (5 YR 5/6); dense; no HCl reaction; moist to wet. 18.0-19.7': SILTSTONE: dark yellowish orange (10 YR 6/6); some coarse-grained sand clasts; pockets of caliche; dry.	15.2-16.9': Readings on Core: HNu=0.4; OVA=5.2. 15.2-16.9': Bedrock Sample: SP0387168R. 17.9-19.7': Readings on Core: HNu=0.3; OVA=2.6.
30			TOTAL DEPTH: 20.4'.	
35				
40				

INDEX OF DATA

Boring No.: SP04-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37561 E 21820
Total Depth 37.0'

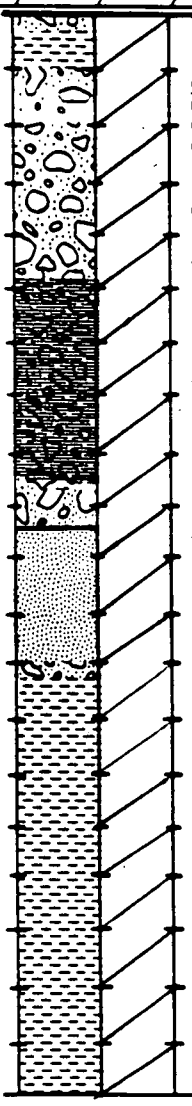
Borehole/Well No. SP04-87
Ground Surface Elevation *5971.8'
Water Level Encountered 12.0'
Static

Drilling Company Boyles Bros.
Date Drilled October 30 and November 3 and 4, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By
Site Manager

CERP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0.0-2.0' SAMPLE. Recovered 1.2/2.0' = 60%. 0-0.0.3': PEBBLE: large. 0.3-0.9': CLAY: moderate yellowish brown (10 YR 5/4); sand; silt and pebbles; clasts are angular to subrounded; slight reaction to HCl; moist. 0.9-1.2': IGNEOUS ROCK: some fractures. 2.0-4.0' SAMPLE. Recovered 1.7/2.0' = 85%. GRAVEL: dusky brown (5 YR 2/2); cobbles to 4 inches in diameter, held together with clay; no HCl reaction; moist. 4.0-7.0' SAMPLE. Recovered 1.8/3.0' = 60%. 4.0-4.8': GRAVEL: same as above. 4.8-5.8': CALICHE; very pale orange (10 YR 8/2); silt; small angular cobbles similar to the clasts above; dry. 7.0-9.5' SAMPLE. Recovered 1.7/2.5' = 68%. 7.0-8.3': CALICHE: same as above. 8.3-8.7': GRAVEL: with caliche, similar to caliche above; dry; spotted with moist areas. **ARAPAHOE FORMATION** 9.5-12.0' SAMPLE. Recovered 0.6/2.5' = 24%. SANDSTONE: yellowish gray (5 Y 7/2; contains small pebbles; grains are rounded to subrounded; coarse-grained; some clay; very moist. 12.0-14.5' SAMPLE. Recovered 2.9/2.5' = 116%. 12.0-12.2': GRAVEL: moderate yellowish brown (10 YR 5/4); come clay and sand; wet. 12.2-14.5': CLAYSTONE: light olive gray (5 YR 5/2); mottled with dark yellowish orange (10 YR 6/6); moist.	HNu Background = 0.4-0.5 OVA Background = 0.6-3.6 No Ludlum readings taken 2.0-3.7': Readings on Core: HNu = 15; OVA = 0.4. 2.0-3.7': Direct Hit Sample: SP0487020H. 4.0-5.8': Reading on Core: HNu=400; OVA=0.2. 4.0-5.8': Direct Hit Sample: SP0487040H. 4.0-5.8': Duplicate Sample: SP0487004D. 7.0': Readings in Breathing Zone: HNu=1.2; OVA=1.0. 7.0-9.5': Readings on Core: HNu=750; OVA=0.2. 7.0-8.7': Direct Hit/Upper Contact Sample: SP0487070H. 10.5': Readings in Breathing Zone: HNu=0.6; OVA=2.5. 9.5-11.1': Readings on Core: HNu=20; OVA=7.8. 9.5-11.1': Direct Hit/Contact Sample: SP0487100H (VOAs only). 12.0-14.5': Readings on Core: HNu=85; OVA=3.3. 12.0-14.5': Direct Hit/Water Table/ Bedrock Sample: SP0487120H.
5				
10				
15				
20				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Borehole/Well No. SP04-87(cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			14.5-17.0' SAMPLE. Recovered 2.7/2.5' = 108%. 14.5-15.1': CLAYSTONE: light olive gray (5 Y 5/2) stained with dark yellowish orange (10 YR 6/6); blocky structure, concretions of caliche; moist. 15.1-17.0': Same as above; wet. 17.0-19.5' SAMPLE. Recovered 2.6/2.5' = 104%. 17.0-17.2': CLAYSTONE: same as above. 17.2-18.3': CLAYSTONE: dark yellowish orange (10 YR 6/6); slightly moist. 18.3-19.5': CLAYSTONE: olive gray (5 Y 3/2) mottled with dark yellowish orange (10 YR 6/6); very slightly moist. 19.5-22.0' SAMPLE. Recovered 2.6/2.5' = 104%. CLAYSTONE: same as above. 22.0-24.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above except a little more sand. 24.5-27.0' SAMPLE. Recovered 2.5/2.5' = 100%. 24.5-25.0': CLAYSTONE: same as above except less sand, more consolidated and dry. 25.0-27.0': CLAYSTONE: olive gray (5 Y 2/2); some coal; slightly sandy; dry. 27.0-29.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above except layers of oxidation from 0.2 to 0.4 ft in thickness; dark yellowish orange (10 YR 6/6); grades from pure claystone at the top to very sandy claystone at the bottom; pockets of caliche in unweathered areas; dry. 29.5-32.0' SAMPLE. Recovered 2.7/2.5' = 108%. CLAYSTONE: same as above except much more sandy; dry.	14.5-17.0': Readings on Core: HNu=1.0; OVA=2.8. 14.5-17.0': Field Screen Reading: HNu=650(0.5); OVA=3.6(32). 14.5-17.0': Field Screen Sample: SP048715FS 17.0-19.5': Readings on Core: HNu=45; OVA=3.2. 17.0-19.5': Direct Hit Sample: SP048717DH. 19.5-22.0': Readings on Core: HNu=60; OVA=3.0. 19.5-22.0': Direct Hit Sample: SP048720DH. 22.0-24.5': Readings on Core: HNu = 450; OVA = 30. 22.0-24.5': Direct Hit Sample: SP048722DH. 24.5-27.0': Readings on Core: HNu=45; OVA=3.0. 24.5-27.0': Direct Hit Sample: SP048725DH. 27.0-29.5': Readings on Core: HNu=4.0; OVA=5.8. 27.0-29.5': Direct Hit Sample: SP048727DH. 29.5-32.0': Readings on Core: HNu=0.0; OVA=5.4. 29.5-32.0': Direct Hit Sample: SP048730DH.
25				
30				
35				
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LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates
Total Depth

Drilling Company
Date Drilled
Drilling Method
Logged By
Geologist

Borehole/Well No. SP04-87 (cont'd.)
Ground Surface Elevation
Water Level Encountered
Static

Driller
Helper
Drilling Fluid
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			32.0-34.5' SAMPLE. Recovered 2.7/2.5' = 108%. CLAYSTONE: dark yellowish orange (10 YR 6/6) mottled with grayish orange pink (5 YR 7/2); very thin seams of coal; no HCl reaction; weathered; slightly moist. 34.5-37.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: olive gray (5 Y 3/2) mottled with dark yellowish orange (10 YR 6/6); sandy; contains some coal; dry. TOTAL DEPTH: 37.0'.	32.0-34.5': Readings on Core: HNu=0.2; OVA=1.8. 32.0-34.5': Direct Hit Sample: SP048732DH. 34.5-37.0': Readings on Core: HNu=0.0; OVA=0.5. 34.5-37.0': Field Screen Readings HNu=0(0.0); OVA=0.8(0.8).

INDEX OF DATA

Boring No.: SP05-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37865 E 21810
Total Depth 21.8'

Borehole/Well No. SP05-87
Ground Surface Elevation *5971.6'
Water Level Encountered 15.3'
Static

Drilling Company Boyles Bros.
Date Drilled November 5 and 6, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt; S. Bradfield
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**TOPSOIL** 0.0-2.0' SAMPLE. Recovered 0.4/2.0' = 20%. SOIL: moderate yellowish brown (10 YR 5/4); roots; sand; clay; silt; dry. **ARTIFICIAL FILL/DISTURBED** 2.0-4.0' SAMPLE. Recovered 1.3/2.0' = 65%. GRAVEL: dusky yellowish brown (10 YR 2/2) small cobbles; pebbles; sand, silt, and clay; angular particles; wet to moist. 4.0-7.0' SAMPLE. Recovered 1.6/3.0' = 53%. 4.0-4.7': GRAVEL: same as above. 4.7-7.0': CLAY: dark reddish brown (10 R 3/4); some sand and small angular cobbles; dense; dry. 7.0-9.5' SAMPLE. Recovered 1.3/2.5' = 52%. SAND: very pale orange (10 YR 8/2) and dark yellowish orange (10 YR 6/6); sand, silt, and cobbles; high amount of caliche; poorly sorted; dry. 9.5-12.0' SAMPLE. Recovered 1.1/2.5' = 44%. SAND: same as above except slightly moist near the bottom. Total depth of borehole measured 12.8'; adjust depth. 12.8-15.3' SAMPLE. Recovered 1.6/2.5' = 64%. SAND: light olive gray (5 Y 5/2); small cobbles; pebbles; silt; clay clasts are angular; slight HCl reaction; wet on top 0.3 ft; moist in the rest of the run. 15.3-17.3' SAMPLE. Recovered 2.0/2.0' = 100%. 15.3-16.3': GRAVEL: same as above except less sand; strong HCl reaction; very wet.	HNu Background=1.2 OVA Background=0.8 No Ludlum readings taken 0.0-0.4': Readings on Core: HNu = 1.0; OVA = 1.2. 0.0-0.4': Direct Hit Sample: SP058700DH (VOAs and Rads only). 2.0-3.3': Reading on Core: HNu=0.8; OVA=11. 2.0-3.3': Direct Hit Sample: SP058702DH. 4.0-5.6': Readings on Core: HNu=0.8; OVA=4.8. 4.0-5.6': Direct Hit Sample: SP058704DH. 7.0-8.3': Readings on Core: HNu=9; OVA=7.8. 7.0-8.3': Direct Hit Sample: SP058707DH. 9.5-10.6': Readings on Core: HNu=3.0; OVA=4.8. 9.5-10.6': Direct Hit Sample: SP058710DH. 12.8-14.4': Readings on Core: HNu=2.2; OVA=2.8. 12.8-14.4': Direct Hit Sample: SP058712DH. 15.3-17.3': Readings on Core: HNu=1.0; OVA=2.8. 15.3-17.3': Direct Hit Sample: SP058716DH.
5				
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LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Borehole/Well No. SP05-87(cont'd.)

Coordinates

Ground Surface Elevation

Total Depth

Water Level Encountered

Static

Drilling Company

Driller

Date Drilled

Helper

Drilling Method

Drilling Fluid

Logged By

Geologist

Checked By

Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			**ARAPAHOE FORMATION** 17.8-19.8' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: dusky yellow (5 Y 6/4) to light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); blocky structure; no HCl reaction; moist to wet. 19.8-21.8' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: Same as above except small pockets of caliche; moist. TOTAL DEPTH: 21.8'.	17.8-19.8': Field Screen Readings: HNu=0.0(0.0); OVA=0.4(0.4). 19.8-21.8': Field Screen Readings: HNu=0.0(0.0); OVA=0.4(0.4).
25				
30				
35				
40				

INDEX OF DATA

Boring No.: SP06-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37900 E 22100
Total Depth 30.7'

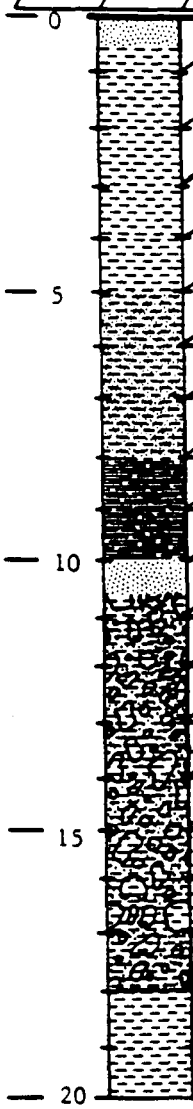
Borehole/Well No. SP06-87
Ground Surface Elevation *5972.9'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled November 18 and 19, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.



Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED**	HNu Background=0.7 OVA Background=0.8 Ludlum Background=0.0
			0.0-2.0' SAMPLE. Recovered 0.7/2.0' = 35%. 0.0-0.4': SOIL: dark yellowish brown (10 YR 4/2); sandy; grass and roots; wet to moist. 0.4-0.7': CLAY: moderate yellowish brown (10 YR 5/4) mottled with very pale orange (10 YR 8/2); caliche; sand; small angular cobbles; moist.	0.0-0.7': Readings on Core: HNu = 0.2; OVA = 0.7. 0.0-0.7': Field Screen Readings: HNu=0.4(0.3); OVA=0.6(0.6).
5			2.0-4.0' SAMPLE. Recovered 1.7/2.0' = 85%. CLAY: same as above, except slightly larger clasts; moist.	2.0-3.7': Readings on Core: HNu=0.6; OVA=0.7. 2.0-3.7': Field Screen Readings: HNu=400(45); OVA=0.8(0.6).
			4.0-5.0' SAMPLE. Recovered 0.0/1.0' = 0%. QUARTZITE: angular block.	2.0-3.7': Field Screen Sample: SP068702FS.
			5.0-8.0' SAMPLE. Recovered 1.5/3.0' = 50%. CLAYEY SAND: dark yellowish orange (10 YR 6/6); large angular pebbles; slight HCl reaction; dry.	5.0-6.5': Readings on Core: HNu=0.4; OVA=0.8. 5.0-6.5': Field Screen Readings: HNu=0.4(0.4); OVA=0.0(0.0).
10			8.0-10.5' SAMPLE. Recovered 2.4/2.5' = 96%. 8.0-10.0': SOIL: dusky brown (5 YR 2/2); roots; clay, sand, silt, and small angular cobbles; dry. 10.0-10.4': SAND: pale yellowish brown (10 YR 6/2); contains clay and silt; small angular cobbles; no HCl reaction; dry.	8.0-10.4': Readings on Core: HNu=0.0; OVA=1.7. 8.0-10.4': Direct Hit Sample: SP068708DH.
			10.5-13.0' SAMPLE. Recovered 1.9/2.5' = 76%. CALICHE: very pale orange (10 YR 8/2); sand, silt, clay, small cobbles and pebbles; clasts are angular; dry to slightly moist.	10.5-12.4': Readings on Core: HNu=5.0; OVA=1.9; Ludlum=1. 10.5-12.4': Direct Hit Sample: SP068711DH.
15			13.0-15.5' SAMPLE. Recovered 1.3/2.5' = 52%. CALICHE: same as above except the sample is coarser at the bottom.	13.0-14.3': Readings on Core: HNu=1.2; OVA=20.0;Ludlum=1.
			15.5-18.0' SAMPLE. Recovered 1.2/2.5' = 48%. CALICHE: same as above but not as coarse; more small angular cobbles; slightly moist.	13.0-14.3': Direct Hit Sample: SP068713DH.
20				

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Ponds Area
Borehole/Well No. SP06-87(cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20 25 30 35 40			**ARAPAHOE FORMATION** 18.0-20.5' SAMPLE. Recovered 5.0/2.5' = 200%. CLAYSTONE: light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); some sand near the bottom of the run; pockets of caliche; moist. 20.5-23.0' SAMPLE. Recovered 3.3/2.5' = 132%. 20.5-21.0': SANDSTONE: dark yellowish orange (10 Y 6/6) mottled with very pale orange (10 YR 8/2); grains are well rounded; high amount of caliche; well rounded pebbles; dry. 21.0-23.0': CLAYSTONE: light olive gray (5 Y 6/2) mottled with dark yellowish orange (10 YR 6/6); pockets of sand; no caliche; slightly moist to dry. Total depth of borehole measured 23.2'; adjust depth. 23.2-25.7' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above. 25.7-28.2' SAMPLE. Recovered 2.8/2.5' = 112%. CLAYSTONE: olive gray (5 Y 3/2); slightly weathered; contains sand near the top of the run; dry. 28.2-30.7' SAMPLE. Recovered 3.0/2.5' = 120%. CLAYSTONE: olive gray (5 Y 3/2); mottled with light brown (5 YR 5/6); slightly sandy; blocky structure; dry. TOTAL DEPTH: 30.7'	15.5-17.7': Readings on Core: HNu=1.0; OVA=3.0. 15.5-17.7': Direct Hit Sample: SP0687160H. 18.0-20.5': Readings on Core: HNu=0.0; OVA=2.3. 18.0-20.5': Direct Hit Sample: SP0687180H. 20.5-23.0': Readings on Core: HNu=0.0; OVA=2.0. 20.5-23.0': Direct Hit Sample: SP0687210H. 23.2-25.7': Readings on core: HNu = 2.2; OVA = 7.4. 23.2-25.7': Direct hit sample: SP0687240H. 25.7-28.2': Readings on core: HNu = 1.0; OVA = 6.4. 25.7-28.2': Direct hit sample: SP0687260H. 28.2-30.7': Readings on core: HNu = 1.0; OVA = 1.8; Ludlum = 5. 28.2-30.7': Field screen readings: HNu = 1.0(1.0); OVA = 1.4(1.4).

INDEX OF DATA

Boring No.: SP07-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 37485 E 22100
Total Depth 31.0'

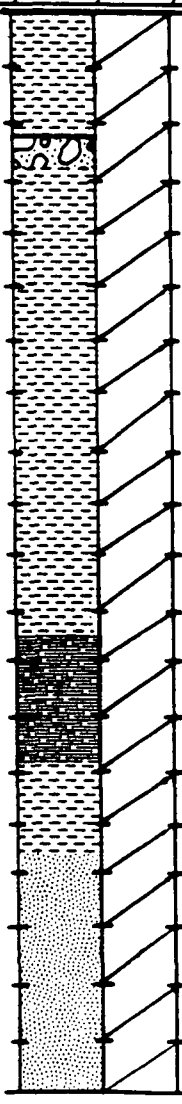
Borehole/Well No. SP07-87
Ground Surface Elevation *5973.6'
Water Level Encountered 18.0'
Static

Drilling Company Boyles Bros.
Date Drilled November 12 and 13, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0.0-2.0' SAMPLE. Recovered 1.8/2.0' = 90%. CLAY: moderate yellowish brown (10 YR 5/4); small angular cobbles; pebbles; sand and silt; green grass and roots; caliche; moist. 2.0-4.0' SAMPLE. Recovered 1.8/2.0' = 90%. 2.0-2.2': CLAY: same as above. **ROCKY FLATS ALLUVIUM** 2.2-2.5': GRAVEL: dark reddish brown (10 R 3/4); clasts are very angular quartzite; clay in between clasts; very sticky; moist. 2.5-3.8': CLAY: moderate brown (5 YR 4/4); pebbles; sand and silt; dry. 4.0-5.0' SAMPLE. Recovered 1.2/1.0' = 120%. CLAY: same as above except much larger clasts; dry. 5.0-8.0' SAMPLE. Recovered 1.3/3.0' = 43%. 5.0-5.8': CLAY: Same as above. 5.8-6.3': CLAY: dusky yellowish brown (10 YR 2/2) at the top grading to dark yellowish orange (10 YR 6/6) at the bottom; gravel, sand and silt; pockets of caliche; slightly moist to dry. 8.0-10.5' SAMPLE. Recovered 2.3/2.5' = 92%. 8.0-8.5': CLAY: same as above. 8.5-10.3': CLAY: dusky brown (5 YR 2/2); roots; caliche; cobbles; sand; pebbles; silt; moist. 10.5-13.0' SAMPLE. Recovered 1.7/2.5' = 68%. 10.5-11.3': CLAY: same as above except slightly more wet. 11.3-12.2': SILT: pale yellowish brown (10 YR 6/2); clasts of angular pebbles and coarse-grained sand; no HCl reaction; dry.	HNu Background = 0.0-0.8. OVA Background = 0.0-0.6. Ludlum Background = 0.0. 0.0-1.8': Readings on core: HNu = 0.1; OVA = 6.0. 0.0-1.8': Direct hit sample: SP0787000H. 2.0-3.8': Readings on core: HNu = 4.0; OVA = 11. 2.0-3.8': Direct hit sample: SP0787020H. 4.0-5.0': Readings on core: HNu = 0.8; OVA = 0.0. 4.0-5.0': Field screen readings: HNu = 0.5(0.5); OVA = 0.6(0.5). 5.0-6.3': Readings on core: HNu = 0.6; OVA = 0.0. 5.0-6.3': Field screen readings: HNu = 0.5(0.5); OVA = 0.4(0.4). 8.0-10.3': Readings on core: HNu = 0.5; OVA = 0.8. 8.0-10.3': Field screen readings: HNu = 0.3(2.2); OVA = 6.8(3.2). 8.0-10.3': Field screen sample: SP078708FS. 10.5-12.2': Readings on core: HNu = 1.0; OVA = 24. 10.5-12.2': Direct hit sample: SP0787110H.
5				
10				
15				
20				

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Ponds Area
Borehole/Well No. SP07-87(cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CERP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			13.0-15.5' SAMPLE. Recovered 1.8/2.5' = 72%. 13.0-13.8': SILT: same as above. 13.8-14.8': CLAY: mottled dark greenish yellow (10 Y 6/6) and grayish olive (10 Y 4/2); sand; silt; pebbles and small cobbles; moist. 15.5-18.0' SAMPLE. Recovered 1.2/2.5' = 48%. SAND: grayish orange (10 YR 7/4); coarse; clay; large angular pebbles; high amount of caliche; moist. 18.0-20.5' SAMPLE. Recovered 1.3/2.5' = 52%. SAND: Same as above but more coarse; wet. 20.5-23.0' SAMPLE. Recovered 3.8/2.5' = 155%. 20.5-21.3': SAND: same as above. ARAPAHOE FORMATION 21.3-23.0': CLAYSTONE: light olive gray (5 Y 5/2) mottled with pale yellowish orange (10 YR 8/6); dense; moist. 23.0-26.0' SAMPLE. Recovered 5.0/3.0' = 167%. CLAYSTONE: same as above. 26.0-28.5' SAMPLE. Recovered 3.0/2.5' = 120%. 26.0-27.2': CLAYSTONE: same as above. 27.2-28.5': CLAYSTONE: olive gray (5 Y 3/2); mottled with light brown (5 YR 5/6); dense; dry. 28.5-31.0' SAMPLE. Recovered 3.3/2.5' = 132%. CLAYSTONE: same as above. TOTAL DEPTH: 31.0'	13.0-14.8': Readings on core: HNu = 0.4; OVA = 30. 13.0-14.8': Direct hit sample: SP078713DH. 15.5-16.7': Readings on core: HNu = 1.0; OVA = 11. 15.5-16.7': Direct hit sample: SP078716DH. 18.0-19.3': Readings on core: HNu = 0.6; OVA = 11. 18.0-19.3': Water table sample: SP078718WT. 20.5-23.0': Readings on core: HNu = 1020; OVA = 2.0. 20.5-23.0': Contact sample: SP078721CT. 23.0-26.0': Readings on core: HNu = 95; OVA = 5.2. 23.0-26.0': Bedrock sample: SP078723BR. 26.0-28.5': Readings on core: HNu = 0.4; OVA = 4.0; Ludlum = 2. 26.0-28.5': Direct hit sample: SP078726DH. 28.5-31.0': Readings on core: HNu = 0.6; OVA = 0.2; Ludlum = 1. 28.5-31.0': Field screen readings: HNu = 140(140); OVA = 0.5(0.4).
25				
30				
35				
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INDEX OF DATA

Boring No.: 39-87BR/SP08-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

X Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Pond Area
Coordinates N 38094.04 E 22166.32
Total Depth 140.00'

Borehole/Well No. 39-87BR/SP08-87
Ground Surface Elevation 5947.10'
Water Level Encountered _____
Static _____

Drilling Company Boyles Bros.
Date Drilled Oct. 29-30 and Nov. 6-10, 1987
Drilling Method Hollow Stem Auger; NC Core
Logged By R. Treat; K.D. Holliway
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By _____
Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0.0-2.0' SAMPLE. Recovered 0.7/2.0' = 35%. GRAVEL AND CLAY: dark dusky brown (5 YR 2/2) to mixed light brown; weakly cemented; subangular, subrounded quartzite gravel; poorly sorted; low plastic; slightly sandy; fine-grained; light moist. 2.0-3.5' SAMPLE. Recovered 1.5/1.5' = 100%. 2.0-3.2': GRAVEL AND CLAY: dark yellowish orange (10 YR 6/6) to moderate yellowish orange (10 YR 5/4) with gravel to 4.00 mm and larger; sand varying (2.0-1.5 Ø to 0.5-1.0 Ø); light moist. 3.2-3.5': CLAY: dark yellowish orange (10 YR 6/6) moderately cemented; slightly sandy; fine-grained; occasional small scattered gravel; highly plastic; very moist. 3.5-6.5' SAMPLE. Recovered 3.0/3.0' = 100%. 3.5-5.2': CLAY: moderate brown (5 YR 4/4) to varying gray; considerably oxide stained; low plastic; fine-grained sand (3.0-2.5 Ø); weakly cemented; claystone fragments; moist. **ARAPAHOE FORMATION** 5.2-6.5': CLAYEY SANDSTONE: light gray (N 7/0); fine-grained sand (3.0-2.5 Ø) and finer; weakly cemented; weathered; moist.	HNu background=0.2. OVA Bachground=2.8 Ludlum background = 0.0 0.0-2.0': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above background. 2.0-3.5': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above background. 3.5-6.5': Upper contact sample: SP088703UC. 6.5-8.5': Contact sample: SP088706CT. 9.0-11.5': Bedrock sample: SP088709BR. 11.5-14.0': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). 14.0-16.5': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8).
5				
10				
15				
20				

LOG OF BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			6.5-9.0' SAMPLE. Recovered 2.0/2.5 = 80%. SANDSTONE: light gray (N 7/0) to severely oxide stained brown; fine-grained sand (3.0-2.5 Ø); weakly cemented; massive; slight clay binder; weathered; moist.	19.0': Readings in augers: HNu = 0; OVA = 28.
25			9.0-11.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: varying oxide (Fe) browns to grays; fine-grained sand as above; massive; weakly cemented; weathered; moist.	
30			11.5-14.0' SAMPLE. Recovered 1.5/2.5' = 60%. CLAYEY SANDSTONE: as stated above continued moderately oxide stained; weathered.	
35			14.0-16.5' SAMPLE. Recovered 2.0/2.5' = 80%. CLAYEY SANDSTONE: light gray (N 7/0) to severely oxide stained brown; sand (3.0-2.5 Ø); massive; low plastic; weakly to moderately cemented; weathered; moist.	
40			16.5-19.0' SAMPLE. Recovered 2.3/2.5 = 92%. CLAYEY TO VERY CLAYEY SANDSTONE: oxide stained brown to light gray; low plastic; massive; weakly cemented; weathered; moist.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			19.0-21.5' SAMPLE. Recovered 1.4/2.5' = 56%. CLAYEY SANDSTONE: moderately oxide stained to light gray (N 7/0) massive, fine-grained; weathered; moist.	
			21.5-24.0' SAMPLE. Recovered 1.8/2.5 = 72%. CLAYEY SANDSTONE: light gray (N 7/0) to severely oxide stained brown; low plastic sands (3.5-3.0 Ø to 2.5-2.0 Ø); weakly cemented; massive; moist.	
45			24.0-26.5' SAMPLE. Recovered 1.2/2.5 = 60%. 24.0-25.0': CLAYEY SANDSTONE: as noted above; moist. 25.0-25.2': CLAYSTONE: medium gray (N 4/0); massive; blocky; remaining slightly sandy (3.5-3.0 Ø); low plastic; weathered; moist.	50.10-59.75': Packer Test Interval #10. 59.75-69.40': Packer Test Interval # 9.
50			26.5-29.0' SAMPLE. Recovered 2.5/2.5 = 100%. CLAYSTONE: medium gray (N 7/0) massive; medium plastic; slightly blocky; now only slightly oxide stained in streaks at 28.5 and 28.8' for 2" streaks.	
55			29.0-31.5' SAMPLE. Recovered 1.3/2.5 = 52%. SANDY CLAYSTONE: as noted above but now moderately oxide (Fe) stained; massive; medium plastic; weathered; moist.	
60				

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60			31.5-34.0' SAMPLE. Recovered 2.2/2.5' = 88%. SANDY CLAYSTONE: upper formation (31.5-32.0') then slightly sandy, fine-grained; severely oxide stained brown to a light medium gray (N 6/0); massive; low to medium plastic; weathered; blocky; moist.	69.40-79.05': Packer Test Interval # 8.
65			34.0-36.5' SAMPLE. Recovered 2.5/2.5 = 100%. CLAYSTONE: dark gray (N 3/0) to medium gray (N 5/0); massive; medium plastic; blocky; slightly sandy; fine-grained; moist.	
70			36.5-39.0' SAMPLE. Recovered 1.7/2.5 = 68%. CLAYSTONE: moderate brown (5 YR 4/4) to medium dark gray (N 6/0); massive; blocky; medium plastic; slightly sandy; weathered; streaked, moist.	
75			39.0-41.5' SAMPLE. Recovered 2.2/2.5 = 88%. CLAYSTONE/SHALE: medium dark gray (N 4/0); massive; blocky slightly sandy; fine-grained; medium plastic; moist.	
80			41.5-44.0' SAMPLE. Recovered 1.2/2.5 = 48%. CLAYSTONE/SHALE: medium dark gray (N 4/0).; massive; medium plastic somewhat blocky; just slightly sandy; light moist.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
80			41.3-45.4' SAMPLE. Recovered 1.68/4.10' = 41%. RQD = 1.04/1.68' = 62%. 41.3-41.8': CLAYSTONE PLUG. 41.8-42.35': SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted; unconsolidated; blocky; soft to medium hardness; damp. 42.35-44.03': SANDY SILTY CLAYSTONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness; some organics; damp.	79.05-88.70': Packer Test Interval # 7. 88.70-98.35': Packer Test Interval # 6. 98.35-108.00': Packer Test Interval # 5.
85				
90			45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sandstone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint; occasional organics throughout core; damp.	
95				
100				

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
100			49.5-54.0' SAMPLE. Recovered 4.20/4.50' = 93.30%. RQD = 2.70/3.90' = 69%. 49.5-50.7': SANDY CLAYSTONE: olive gray (5 Y 3/2); cuttings from above; moist. 50.7-54.0': SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); same as 45.40-49.50' interval; at 52.25' have some fine-grained sand stained dark yellowish orange (10 YR 6/6); lenses of fine-grained sand increase down core; at 53.5'-54.0' clay is predominant; damp.	108.00-117.65': Packer Test Interval # 4. 115.65-125.30': Packer Test Interval # 3. 117.65-127.30': Packer Test Interval # 2. 122.68-132.33': Packer Test Interval # 1.
105			54.0-57.0' SAMPLE. Recovered 3.3/3.0' = 110%. RQD = 2.45/3.30' = 74%. SANDY CLAYSTONE: same as above with nodules of very pale orange (10 YR 8/2) clay and very fine-grained sand increasing down core; at 56.22' have leaf imprint; less fine-grained sand lenses; damp.	
110			57.0-61.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. SANDY CLAYSTONE: same as above with more fine-grained sand lenses; clay nodules still present; more organics than above; clay increases down core with 60.0-61.0' mostly clay; damp.	
115			61.0-65.0' SAMPLE. Recovered 0.0/4.0' = 0%. Lost core.	
120				

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
120				
125			65.0-66.0' SAMPLE. Recovered 1.5/1.0' = 150%. RQD = 0%. CLAYSTONE: light greenish gray (5 GY 4/1) to dark greenish gray (5 GY 2/1) from 65.0-65.3'; rest of core olive black (5 Y 2/1); trace very fine-grained sand; core mangled from drilling; appears unconsolidated and blocky; damp to moist.	
130			66.0-70.0' SAMPLE. Recovered 5.0/4.0' = 125%. RQD = 2.6/5.0' = 52%. 66.0-67.5': CLAYSTONE: olive black (5 Y 2/1) to brownish black (5 YR 2/1); trace silt and very fine-grained sand; some organics; blocky; consolidated; damp. 67.5-68.5': CLAYSTONE: olive black (5 Y 2/1) to brownish black (5 YR 2/1); trace silt and very fine-grained sand; some organics; blocky; consolidated; damp. 68.5-69.5': CLAYSTONE: olive black (5 Y 2/1) to greenish black (5 GY 2/1) to black (N 1/0); trace silt; blocky; damp. 69.5-70.0': CLAYSTONE: medium bluish gray (5 B 5/1) to medium gray (N 5/0); highly plastic; block; moist.	
135			70.0-74.0' SAMPLE. Recovered 0.6/4.0' = 15%. RQD = 0%. CLAYSTONE: olive black (5 Y 2/1) to medium dark gray (N 4/0); blocky; homogenous; plastic; damp.	
140				

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			74.0-76.0' SAMPLE. Recovered 3.85/2.0' = 193%. RQD = 2.26/3.85' = 59%. Picked up 1.85' from previous run. 72.15-74.0': CLAYSTONE: olive black (5 Y 2/1) with lenses of black (N 1/0); blocky, homogenous; plastic; damp. 74.0-76.0': CLAYSTONE: olive black (5 Y 2/1) to medium gray (N 5/0), blocky, homogenous; plastic; damp.	
			76.0-80.0' SAMPLE. Recovered 2.13/4.0' = 53%. RQD = 1.50/2.13' = 70%. CLAYSTONE: olive black (5 Y 2/1); some silt; some organics; trace very fine-grained sand interbeds; homogenous; blocky; medium hardness; damp.	
			80.0-82.0' SAMPLE. Recovered 2.62/2.01 = 131%. RQD = 1.62/2.62' = 62%. SANDY CLAYSTONE: olive black (5 Y 2/1); some very fine-grained sand, poorly sorted, subangular to subrounded fine-grained sand occurring in lenses and interbeds; some silt; some organics; small coal seams; blocky; fairly homogenous; medium hardness; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			82.0-84.0' SAMPLE. Recovered 2.38/2.0' = 119%. RQD = 2.15/2.38' = 90%. SANDY CLAYSTONE/CLAYEY SANDSTONE INTERBEDS: olive black (5 Y 2/1) to dark gray (N 3/0); sand very fine-grained to fine-grained, poorly sorted, occurs in lenses and interbeds; occasional stringers of coal in small fractures with no orientation; some silt; some organics; consolidated; medium hardness; from 83.0-84.0' have small lenses of fairly well sorted fine-grained (3.0-2.5 Ø) sand, subrounded; quartzitic, yellowish gray (5 Y 8/1); damp with sand lenses moist.	
			84.0-86.0' SAMPLE. Recovered 2.0/2.0' = 100%. RQD = 1.76/2.0' = 86%. SANDY CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0) with yellowish gray (5 Y 8/1) fine-grained sand lenses occasional, poorly sorted; occasional stringers of coal; some silt; some organics; consolidated; damp.	
			86.0-88.0' SAMPLE. Recovered 2.0/2.0' = 100%. RQD = 2.0/2.0' = 100%. SANDY SILTSTONE: same as above except less sand; no coal stringers; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			<u>88.0-92.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.63/4.0' = 91%. 88.0-91.0': SANDY SILTSTONE: olive black (5 Y 2/1) and dark gray (N 3/0); some clay; lots of silt; some very fine-grained fairly well sorted sand with lenses of a fine-grained, well sorted sand; damp. 91.0-92.0': SILTY SANDSTONE: olive black (5 Y 2/1) with yellowish gray (5 Y 8/1) to pinkish gray (5 YR 8/1) fine-grained sand, fairly well sorted; sand in lenses and interbeds; some clay; some organics; small planes of lamination present in sand lenses; consolidated; damp.	
			<u>92.0-96.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 3.83/4.0' = 96%. 92.0-94.25': SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated; damp. 94.25-95.2': SANDY SILTSTONE. SILTY SANDSTONE: same as above with finer-grained sand; damp. 95.2-96.0': SILTY SANDSTONE: same as 92.0-94.25'; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			96.0-100.0' SAMPLE. Recovered 4.3/4.0' = 107%. RQD = 4.0/4.3' = 93%. 96.0-97.35': SANDY SILTSTONE: olive black (5 Y 2/1); very fine-grained sand, fairly well sorted in siltstone matrix; some clay; some organics; some lamination planes; consolidated; at 96.10-96.50' and 97.2-97.35' have lenses of a light olive gray (5 Y 6/1) to olive black (5 Y 2/1), fairly well sorted, moist, fine-grained sand; damp. 97.35-99.0': SILTSTONE: olive black (5 Y 2/1); very fine-grained sand yielding to claystone downcore and disappearing at 98.85'; consolidated; some clay; lots silt; occasional nodules of grayish orange (10 YR 7/4) clay, prominent from 97.35-98.0'; some organics; damp. 99.0-100.0': CLAYEY SILTSTONE: olive black (5 Y 2/1); trace very fine-grained sand; lots of silt; lots of clay; consolidated; some organics; occasional grayish orange (10 YR 7/4) nodules of clay; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			100.0-104.0' SAMPLE. Recovered 2.61/4.0' = 65.3%. RQD = 2.50/2.61' = 96%. 100.0-101.0': CLAYEY SILTSTONE: olive black (5 Y 2/1); trace very fine-grained sand; fairly homogenous; consolidated: damp. 101.0-101.5': SILTY SANDSTONE: yellowish gray (5 Y 8/1) to olive black (5 Y 2/1); sand from very fine-grained in upper portion to fine-grained in lower portion fairly well sorted, subrounded: some silt; little clay; consolidated; damp to moist. 101.5-102.61': CLAYSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); highly plastic; blocky; homogenous: no silt or sand; damp to moist. 104.0-108.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.27/4.0' = 82%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); trace silt; blocky; homogenous; damp to moist.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			108.0-112.0' SAMPLE. Recovered 3.9/4.0' = 98%. RQD = 3.49/3.9' = 89.5%. 108.0-110.0': SILTSTONE: olive black (5 Y 2/1); some very fine-grained sand; some clay; some organics; fairly homogenous; consolidated; hard; more sand down core; damp. 110.0-111.90': SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 GY 6/1) with some yellowish gray (5 Y 8/1); very fine-grained (3.5-4.0 Ø) to fine-grained (3.0-2.5 Ø); fairly well sorted; subangular to subrounded; some silt; trace clay; some leaf and plant stem organics, increases down core; sand fines as goes down core with occasional lenses of the coarser grains; massive; damp to moist.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			112.0-116.0' SAMPLE. Recovered 4.67/4.0' = 117%. RQD = 3.23/4.67' = 69%. 112.0-112.5': SANDY SILTSTONE: olive black (5 Y 2/1); 40% silt; 40% organics; 20% sand; consolidated; damp to moist. 112.5-115.75': SANDSTONE: greenish gray (5 GY 6/1) to dark greenish gray (5 G 4/1) with some yellowish gray (5 Y 8/1); fine-grained (3.0-2.0 Ø) to medium-grained (2.0-1.5 Ø) sand, fining down core: occasional lenses of clay and silt associated with organics occurring throughout the core; sand massive with zones of contorted bedding; consolidated; at 112.75' have a fracture of coal with small fractures of coal or organics occurring throughout the core; damp to moist. 115.75-116.0': SILTY SANDSTONE: olive black (5 Y 2/1); very silty; sand fine-grained to medium-grained as above, occurring in lenses; many organics with clay associated; very hard; consolidated; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			116.0-120.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 0.45/2.0' = 22.5%. 116.0-116.3': CUTTINGS OF SILTSTONE AND CLAYSTONE: reworked. 116.3-116.9': SANDY SILTSTONE: olive black (5 Y 2/1) with yellowish gray (5 Y 8/1) and greenish gray (5GY 6/1) fine-grained sand in lenses; some clay; some organics; massive; consolidated; damp to moist. 116.9-118.0': CLAYEY SANDY SILTSTONE: olive black (5 Y 2/1); heavy silt influence; sand is very fine-grained: some organics; massive; consolidated; damp.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			120.0-122.0' SAMPLE. Recovered 4.6/2.0' = 230%. RQD 3.97/4.6' = 86%. 118.0-120.0': CLAYEY SILTSTONE: olive black (5 Y 2/1) to greenish black (5 GY 2/1); trace very fine-grained sand; some organics; occasional seams of coal; massive; blocky; fairly homogenous; consolidated; damp. 120.0-121.4': CLAYEY SILTSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); trace very fine-grained sand in lenses; some organics; massive; consolidated; damp. 121.4-122.0': SANDSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); some silt in top of core giving way to sand; fine-grained to medium-grained (2.0-1.5 Ø) sand, subrounded to subangular; feldspathic and quartzitic; fairly well sorted; massive; homogenous; consolidated; few organics; damp to moist.	

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Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			122.0-126.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.65/4.0' = 91%. 122.0-122.85': SANDSTONE: greenish gray (5 G 6/1) to greenish black (5 G 2/1); some silt; fine-grained to medium-grained (2.5-1.5 Ø) sand, subrounded to subangular, fairly well sorted; some organics; massive; consolidated; moist. 122.85-126.0': SANDSTONE/SILTSTONE: greenish gray (5 G 6/1) to greenish black (5 G 2/1); very fine-grained sand with lenses of fine-grained to medium-grained sand as above (122.0-122.85'); some organics more than above; clay influence with organics; sand decreases down core giving way to more silt, a little clay, and more organics; massive; consolidated; damp. 126.0-130.0' SAMPLE. Recovered 1.5/4.0' = 37.5%. RQD = 0.75/1.5' = 50%. SANDSTONE: medium dark gray (N 4/0) to light gray (N 7/0); very fine-grained to fine-grained (3.5-2.5 Ø) feldspathic and quartzitic sand; fairly well sorted; massive; occasional trace lamination planes; sand fines down core; some organics; some silt; from 127.3-127.5' have zone of clay influence; moist to wet.	

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Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			130.0-132.0' SAMPLE Recovered 4.35/2.0' = 217.5%. RQD = 3.68/4.35' = 84.6%. 127.5-129.4': CLAYEY SILTSTONE: dark greenish gray (5 G 4/1) to greenish black (5 G 2/1); no organics, hard; massive; fairly homogenous; consolidated; damp to dry. 129.4-129.7': SILTY CLAYSTONE: same as above; damp to dry. 129.7-130.0': SILTY SANDSTONE: same as above with some clay; very fine-grained sand; moist. 130.0-132.0': SILTY SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); very fine-grained (3.5-4.0 Ø) to fine-grained (3.0-2.5 Ø), fairly well sorted sand; some silt; massive; consolidated; damp to moist.	
			132.0-136.0' SAMPLE Recovered 4.18/4.0' = 104.5%. RQD = 3.76/4.18' = 90%. 132.0-132.4': SANDSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); fine-grained (2.0-3.0 Ø) sand; fairly well sorted; some silt; massive; consolidated; damp. 132.4-136.0': SILTY CLAYSTONE: dark greenish gray (5 G 4/1) to greenish gray (5 G 6/1); trace very fine-grained sand; silt in top of core gives way to clay down core; fairly homogenous; massive; consolidated; hard; no organics; damp.	

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____
Geologist

Borehole/Well No. 39-87BR/SP08-87 (con't.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____
Site Manager

_____
CEARP Manager

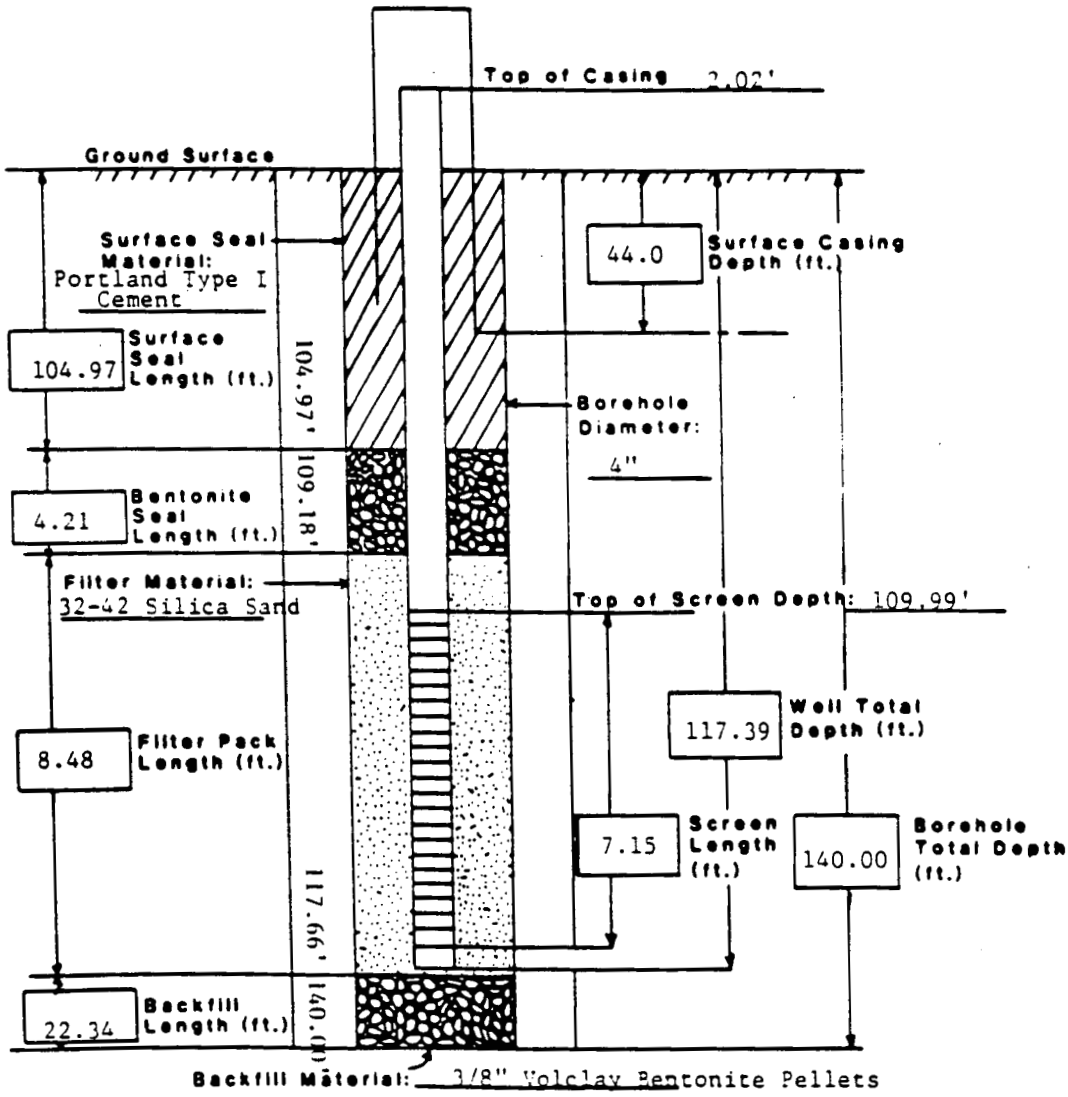
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			136.0-140.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 0.6/2.0' = 30%. CLAYSTONE: medium gray (N 5/0) to dark gray (N 3/0); some silt; homogenous; massive; blocky; no organics; damp.	
			TOTAL DEPTH: 140.00'.	

WELL COMPLETION INFORMATION

Location: Rocky Flats Plant: Solar Ponds Area
Well No. 39-87BR/SP08-87
Coordinates: N 38094.04 E 22166.32
Elevation: Ground Surface 5947.10'
Total Depth: Well 117.39'
Top of Casing 5949.12'
Borehole 140.00'
Formation of Completion: Arapahoe Formation
Casing Material: Sch 5, Type 316, TFJ Stainless Steel
Casing Diameter: 2" ID
Screen Material: 0.010" wire wrap, Type 316, TFJ Stainless Steel
Surface Casing Diameter: 5" ID
Date Installed: November 17-18, 1987
Approved By: _____ Site Manager
Installed By: K.D. Holliway, Geologist
_____ CEARP Manager

Comments: Surface casing set to 44.0' by R. Treat on October 30, 1987.



Well No.: 39-87BR

WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87	---	Pumping	------	Dirty brown	Water level 43.53' after pumping

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; Solar Ponds Area

Well No.: 39-87BR

Borehole Diameter: 0.333'

Acrylic Tube Diameter: 0.1663'

Static Water Level: 83.98'

Date of Water Level: 4/18/88

Page 1 of 2

Comments: Interval #2 (117.65 - 127.30') failed

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
1	122.68	132.33	15	0	5.90	4.25	10.15	0.03	11/11/87	Kass	KDH
			15	29.7	5.90	-	5.90	0.12	11/11/87	Kass	KDH
			15	0	5.90	2.712	8.702	-0.02	11/11/87	Kass	KDH
3	115.65	125.30	15	0	5.90	3.94	9.84	-0.08	11/11/87	Kass	KDH
			15	28	5.90	-	5.90	1.21	11/11/87	Kass	KDH
			15	0	5.90	2.528	8.428	-0.095	11/11/87	Kass	KDH
4	108.00	117.65	15	0	5.90	4.172	10.162	-0.025	11/11/87	Kass	KDH
			15	26	5.90	-	5.90	0.18	11/11/87	Kass	KDH
			15	0	5.90	3.558	9.458	-0.01	11/11/87	Kass	KDH
5	98.35	108.00	15	0	5.90	3.904	9.804	-0.01	11/12/87	KCL	KDH
			15	24	5.90	-	5.90	0.11	11/12/87	KCL	KDH
			15	0	5.90	2.519	8.419	-0.035	11/12/87	KCL	KDH
6	88.70	98.35	15	0	5.90	5.638	11.538	-0.010	11/12/87	KCL	KDH
			15	21.7	5.90	-	5.90	0.07	11/12/87	KCL	KDH
			15	0	5.90	5.537	11.437	-0.015	11/12/87	KCL	KDH
7	79.05	88.70	15	0	5.90	4.437	10.337	0.02	11/12/87	KCL	KDH
			15	19.4	5.90	-	5.90	0.08	11/12/87	KCL	KDH
			15	0	5.90	4.228	10.128	-0.015	11/12/87	KCL	KDH

PACKER TEST DATA SHEET

Job No.: 2029-17-02

Location: Rocky Flats Plant; Solar Ponds Area

Well No.: 39-87BR (cont'd.)

Borehole Diameter: _____

Acrylic Tube Diameter: _____

Static Water Level: _____

Date of Water Level: _____

Page 2 of 2

Comments: _____

Test Interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H_2O Height	Gage Height +Avg. H_2O Height	Δh	Date of Test	Lithology	Geologist
8	69.40	79.05	15	0	5.90	3.68	9.58	0.00	11/12/87	KCL	KDH
			15	17.1	5.90	-	5.90	0.10	11/12/87	KCL	KDH
			15	0	5.90	1.760	7.660	0.00	11/12/87	KCL	KDH
9	59.75	69.40	15	0	5.90	4.060	9.96	0.00	11/12/87	KCL	KDH
			15	14.8	5.90	-	5.90	0.13	11/12/87	KCL	KDH
			15	0	5.90	2.81	8.71	0.00	11/12/87	KCL	KDH
10	50.10	59.75	15	0	5.90	3.794	9.694	-0.050	11/13/87	KCL	KDH
			15	15.08	5.90	-	5.90	0.05	11/13/87	KCL	KDH
			15	0	5.90	3.585	9.485	-0.015	11/13/87	KCL	KDH

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 50.10 - 59.75
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00007240 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 54.92 + 5.90 + 15.08 * 2.31 = 95.66
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN
K = .00000003 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 59.75 - 69.40
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 64.57 + 9.96 + .00 * 2.31 = 74.53
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

P2/3 TEST

Q = INJECTION RATE = .00018825 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 64.57 + 5.90 + 14.80 * 2.31 = 104.66
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 64.57 + 8.71 + .00 * 2.31 = 73.28
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE
Q=0

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 69.40 - 79.05
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 9.58 + .00 * 2.31 = 83.81
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

P2/3 TEST

Q = INJECTION RATE = .00014480 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 5.90 + 17.10 * 2.31 = 119.63
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN
K = .00000004 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 7.66 + .00 * 2.31 = 81.89
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;
Q=0

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 79.05 - 88.70
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00002896 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.88 + 10.34 + .00 * 2.31 = 94.21
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN
K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00011584 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.88 + 5.90 + 19.40 * 2.31 = 134.59
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000006 FT/MIN
K = .00000003 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 88.70 - 98.35
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST
TEST ABORTED

P2/3 TEST
Q = INJECTION RATE = .00010136 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 21.70 * 2.31 = 140.01
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN
K = .00000002 CM/SEC

2ND P1/3 TEST
TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 98.35 - 108.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00015929 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 24.00 * 2.31 = 145.32
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN
K = .00000004 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 108.00 - 117.65
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00026065 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 26.00 * 2.31 = 149.94
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 115.65 - 125.30
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00175214 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 28.00 * 2.31 = 154.56
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN
K = .00000039 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS
WELL NO. 39-87BR
ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 122.68 - 132.33
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} LN\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 10.15 + .00 * 2.31 = 94.13
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN
K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00017377 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 29.70 * 2.31 = 158.49
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN
K = .00000004 CM/SEC

2ND P1/3 TEST

TEST ABORTED

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3987	11/12/87	5947.10	5949.12	2.02	117.14	23.90	5925.22
	12/22/87					23.60	5925.52
	02/01/88					40.20	5908.92
	02/29/88					46.60	5902.52
	03/21/88					108.6	5840.52
	04/18/88					86.00	5863.12

INDEX OF DATA

Boring No.: SP09-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 38144 E 21872
Total Depth 11.0'

Borehole/Well No. SP09-87
Ground Surface Elevation *5945.0'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled November 2, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0.0-1.5' SAMPLE. Recovered 1.3/1.5' = 87%. CLAY: dusky brown (5 YR 2/2); sandy with organic roots; few scattered gravels; low plastic; moist. 1.5-3.0' SAMPLE. Recovered 1.1/1.5' = 73%. 1.5-1.7': CLAY: moderate yellowish brown (10 YR 5/4); fine-grained sand as noted above; moist. 1.7-2.6': SAND AND GRAVEL: few scattered gravels; varying light brown to medium dark brown; weakly cemented; poorly sorted; rounded and subrounded gravels ranging 0.75 mm to 4.25 mm; quartzose composition; light moist. 3.0-6.0' SAMPLE. Recovered 2.1/3.0' = 70%. 3.0-4.2': SAND AND GRAVEL: mixed yellowish brown (10 YR 5/4); moderately oxide stained; fine- and medium-grained sand (2.5-2.0 Ø to 0.0-0.5 Ø); gravel subrounded and rounded quartzite; weakly cemented; lightly moist. 4.2-5.1': CLAY: yellowish gray (5 YR 7/2) to light olive brown (5 Y 5/6); moderately calcareous; highly plastic; moderately cemented; moist.	HNu Background=0.3 OVA Background=0.0 Ludlum Background = 0.0 0.0-1.3': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0). 1.5-2.6': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0). 3.0-5.1': Upper contact sample: SP098703UC. 6.0-8.5': Contact sample: SP098706CT. 8.5-11.0': Bedrock sample: SP098708BR. 8.5-11.0': Field screen reading: HNu = 0.0(0.0); OVA = 0.0(0.0).
5				
10				
			ARAPAHOE FORMATION 6.0-8.5' SAMPLE. Recovered 3.5/2.5' = 140%. CLAYSTONE: medium gray (N 5/0); slightly oxide stained; medium plastic; blocky; weathered; massive; moist. 8.5-11.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: sandy; medium gray (N 5/0); fine-grained sand (3.5-3.0 Ø); low plastic; massive; blocky; moderately oxide stained levels; weathered; moist. TOTAL DEPTH: 11.0'	
15				
20				

INDEX OF DATA

Boring No.: SP10-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 38185 E 21480
Total Depth 22.7'

Borehole/Well No. SP10-87
Ground Surface Elevation *5941.0'
Water Level Encountered 21.0'
Static

Drilling Company Boyles Bros.
Date Drilled November 9-11, 1987
Drilling Method Hollow Stem Auger
Logged By J. Bacchus
Geologist

Driller R. Sharp
Helper T. Merritt
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED**	
			0.0-2.0' SAMPLE. Recovered 1.8/2.0' = 90%. CLAY: dark yellowish brown (10 YR 4/2) mottled with dark yellowish orange (10 YR 6/6); silt and sand; abundant roots at the top; caliche; moist.	0.0-1.8': Direct hit sample: SP108700DH.
			2.0-4.0' SAMPLE. Recovered 1.9/2.0' = 95%. 2.0-2.4': CLAY: same as above.	2.0-3.9': Direct hit sample: SP108702DH.
5			**ARAPAHOE FORMATION**	4.0-5.0': Direct hit sample: SP108704BR.
			2.4-3.9': CLAYSTONE: dark yellowish orange (10 YR 6/6) mottled with very pale yellowish orange (10 YR 8/6) and pale olive (10 Y 6/2); sandy; caliche; moist.	5.0-7.0': Direct hit sample: SP108705DH.
			4.0-5.0' SAMPLE. Recovered 1.6/1.0' = 160%. CLAYSTONE: same as above; moist.	7.0-9.0': Direct hit sample: SP108707DH.
10			5.0-7.0' SAMPLE. Recovered 2.2/2.0' = 91%. CLAYSTONE: same as above, except less sand, less caliche, and slightly less oxidation.	9.0-11.0': Direct hit sample: SP1087090H.
			7.0-9.0' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: Same as above except more consolidated; no caliche; moist.	11.0-13.0': Direct hit sample: SP108711DH.
			9.0-11.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: Same as above except moist to dry.	13.0-14.9': Direct hit sample: SP108713DH.
15			11.0-13.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); blocky structure; some fine-grained sand; slightly moist.	
			13.0-15.0' SAMPLE. Recovered 1.9/2.0' = 95%. SANDSTONE: light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); fine-grained; high amount of clay; no HCl reaction; dry.	
20				

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Ponds Area
Borehole/Well No. SP10-87(cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			15.0-17.0' SAMPLE. Recovered 1.9/2.0' = 95%. SANDSTONE: same as above except less clay, coarser sand; sand gets coarser at bottom. 17.0-19.0' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: light olive gray (5 Y 5/2) and dark yellowish orange (10 YR 6/6); very sandy, fining downward; coarse sand at the top, clay at the bottom; dry.	15.0-16.9': Direct hit sample: SP108715DH. 17.0-19.0': Direct hit sample: SP108717DH. 17.0-19.0': Duplicate sample: SP1087017D.
25			19.0-21.0' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); HCl reaction in the dark yellowish orange areas only; dry.	19.0-21.0': Direct hit sample: SP108719DH. 21.0-23.0': Water table sample: SP108721WT.
30			21.0-23.0' SAMPLE. Recovered 2.2/2.0' = 110%. 21.0-21.4': CLAYSTONE: same as above except some fine-grained sand and wet. 21.4-23.0': CLAYSTONE: light olive gray (5 Y 5/2); mottled with light yellowish orange; dry. Total depth of borehole measured 22.7'; adjust depth. 22.7-23.7' SAMPLE. Recovered 2.0/1.0' = 200%. CLAYSTONE: same as above.	22.7-23.7': Direct hit sample: SP108723DH. 23.7-25.7': Direct hit sample: SP108724DH.
35			23.7-25.7' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: same as above. 25.7-27.7' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: same as above, except a little less mottled.	
40			TOTAL DEPTH: 27.7'	

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Boring No.: SP11-87

Completed as well? No

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____ Well Development Summaries

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____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Borehole/Well No. SP11-87
Coordinates * N 38590 E 21342
Ground Surface Elevation *5904.5'
Total Depth 34.0'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Driller T. High
Date Drilled November 3-5, 1987
Helper B. Keeney
Drilling Method Hollow Stem Auger
Drilling Fluid None
Logged By R. Treat
Geologist
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0.0-1.5' SAMPLE. Recovered 1.5/1.5' = 100%. 0.0-0.3': SANDY CLAY: dusky brown (5 Y 2/2); low plastic; roots; fill; light moist. 0.3-1.5': CLAY: dark yellowish orange (10 YR 6/6); fine-grained sand with gravel to 3.2 mm; subrounded and rounded; low plastic; sandy; gravel; moderately oxide stained; light moist.	0.0-1.5': Field screen reading: HNu = 0.0(0.0); OVA = 0.0(0.0). 1.5-3.5': Field screen reading: HNu = 0.0(0.0); OVA = 0.0(0.0). 3.5-6.3': Field screen reading: HNu = 0.0(0.0); OVA = 0.0(0.0). 0.0-8.5': Composite sample: SP11870008.
5			1.5-3.5' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: mixed brown and severely oxide stained; much noted claystone fragments and some sandstone particles; fine-grained sand; weakly cemented; fill; moist.	
			3.5-6.3' SAMPLE. Recovered 3.2/2.8' = 114%. SANDY CLAYSTONE: mixed oxide stained brown; gravel; weakly cemented; low plastic; 1.75 mm fragment of asphalt noted at approximately 5.5'.	6.3-8.5': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0). 8.8-11.3': Readings on core: HNu = 0; OVA = 13.5.
10			6.3-8.8' SAMPLE. Recovered 2.2/2.5' = 88%. CLAY: oxide stained brown to light gray and dark brown; claystone fragments; sandy to very sandy; fine-grained; weakly cemented; massive; very moist.	8.8-11.3': Direct hit sample: SP118708DH. 11.5-14.0': Readings on core: HNu = 0; OVA = 95.
			8.8-11.5' SAMPLE. Recovered 2.5/2.7' = 93%. CLAY: brown to dusky brown (5 YR 2/2); claystone fragments; very much clay; few roots noted; slightly sandy; small and medium size scattered gravel; weakly cemented; low to medium plastic lenses; very moist.	
15			11.5-14.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAY: dark gray (N 4/0) to dark gray (N 3/0); claystone fragments and clay with occasional gravel; varying gravel, rounded (1.75-2.50 mm); medium plastic; moderately to weakly cemented; moist to very moist at bottom.	11.5-14.0': Direct hit sample: SP118711DH.
20				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area

Borehole/Well No. SP11-87(cont'd.)

Coordinates

Ground Surface Elevation

Total Depth

Water Level Encountered

Static

Drilling Company

Driller

Date Drilled

Helper

Drilling Method

Drilling Fluid

Logged By

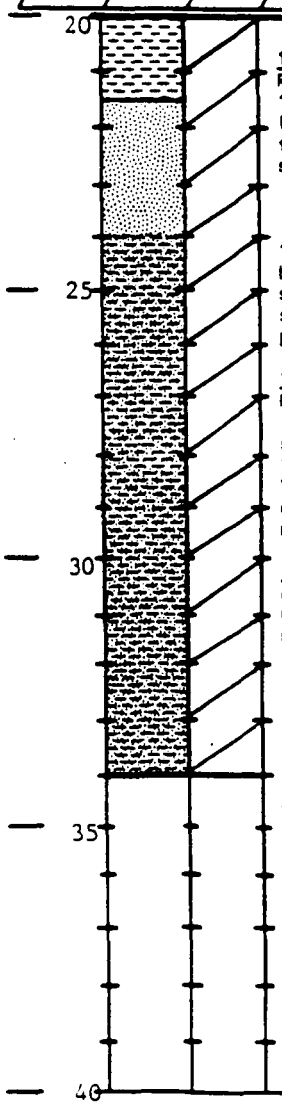
Geologist

Checked By

Site Manager

CEARP Manager

Comments



Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			14.0-16.5' SAMPLE. Recovered 1.1/2.5' = 44%. 14.0-14.5': CLAY: medium dark gray (N 4/0) to light gray (N 7/0) with some brown; claystone fragments; scattered gravel; slightly oxide stained; weakly cemented; highly plastic; moist. COLLUVIUM 14.5-15.1': CLAY: grayish black (N 2/0) to brownish black (5 YR 2/2); scattered gravel; subrounded and subangular to 2.75 mm; slightly sandy; fine-grained; slightly organic; low plastic; moist.	14.0-15.1': Readings on core: HNu = 0; OVA = 95. 14.0-15.1': Direct hit sample: SP118714DH. 16.5-17.8': Readings on core: HNu = 0; OVA = 76. 16.5-17.8': Direct hit sample: SP118716DH. 19.0-19.5': Readings on core: HNu = 0; OVA = 310. 19.0-19.5': Direct hit/upper contact sample: SP118719DH. 21.5': Readings in augers: HNu = 0; OVA = 210. 21.5-24.0': Readings on core: HNu = 1.5; OVA = 98. 21.5-24.0': Direct hit/contact sample: SP118721DH. 24.0-26.5': Readings on core: HNu = 0; OVA = 58. 24.0-26.5': Direct hit/bedrock sample: SP118724DH.
25			16.5-19.0' SAMPLE. Recovered 1.3/2.5' = 52%. 16.5-17.0': CLAY: brownish black (5 YR 2/2); scattered gravel; same as above. 17.0-17.8': CLAY: moderate yellowish brown (10 YR 5/4) to grayish brown (5 YR 3/2); moderately cemented; medium plastic; slightly sandy and moist.	
30			19.0-21.5' SAMPLE. Recovered 0.5/2.5' = 20%. CLAY: mixed brown and gray; medium plastic; moderately cemented; slightly sandy; very fine-grained; little scattered gravel; moist. ARAPAHOE FORMATION 21.5-24.0' SAMPLE. Recovered 2.5/2.5' = 100%. SANDSTONE: medium light gray (N 6/0) to medium dark gray (N 4/0); moderately oxide stained brown; low plastic; fine-grained sand (3.0-2.5 Ø); poorly sorted; somewhat blocky and moist.	
35			24.0-26.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: noted lignite fragments; gray as noted above; slightly to moderately oxide stained streaks; blocky; massive; low plastic; weakly cemented; fine-grained sand; moist.	
40				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Borehole/Well No. SP11-87 (cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			26.5-29.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); severely oxide stained brown streaks; low plastic; massive; somewhat blocky; moist.	26.5-29.0': Readings on core: HNu = 0; OVA = 38.
			29.0-31.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: medium dark gray (N 4/0) with slight oxide staining; lignite particles scattered about; fine-grained sand (3.0-2.5 ϕ); low plastic; massive; weakly to moderately cemented; moist.	26.5-29.0': Direct hit sample: SP1187260H.
			31.5-34.0' SAMPLE. Recovered 2.5/2.5' = 100%. SANDSTONE/CLAYSTONE INTERBED-DED: dark gray (N 3/0) varying to medium gray (N 5/0) with slight to moderate oxide stained lenses of light brown (5 YR 5/6); fine-grained sand (3.0-2.5 ϕ); massive claystone; low to medium plastic; blocky; poorly sorted sand; moist to light moist at bottom.	29.0': Readings in augers: HNu = 0; OVA = 220.
			TOTAL DEPTH: 34.0'	29.0-31.5': Direct hit sample: SP1187290H.
				29.0-31.5': Readings in core: HNu = 0; OVA = 11.5.
				31.5-34.0': Field screen readings: HNu = 0(0); OVA = 0(0).

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Completed as well? No

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____ Water Level Data

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LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 38635 E 21855
Total Depth 46.5'

Borehole/Well No. SP12-87
Ground Surface Elevation *5893.0'
Water Level Encountered 39.0'
Static

Drilling Company Boyles Bros.
Date Drilled November 9-11, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED**	
			0.0-1.5' SAMPLE. Recovered 1.0/1.5' = 67%. SANDY CLAY: moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6); fine-grained sand (2.5-2.0 Ø); poorly sorted; weakly cemented; moist.	HNu Background=0.0 OVA Background=0.2 Ludlum Background = 0.0
			1.5-3.5' SAMPLE. Recovered 2.0/2.0' = 100%. 1.5-2.0': CLAY: moderate brown (5 YR 4/4); slightly sandy; some small-size scattered gravel; rounded; moderately cemented; moist. 2.0-3.5': CLAY: medium gray (N 5/0) to varying brown of moderate yellowish brown (10 YR 5/4); fine-grained sand; weakly cemented; low plastic; fill; moist.	0.0-1.0': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).
5				1.5-3.5': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).
				3.5-6.5': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).
			3.5-6.5' SAMPLE. Recovered 3.0/3.0' = 100%. 3.5-4.5': CLAY: light brown (5 YR 5/6); sandy and scattered gravel; moderately cemented; fine- and medium-grained sand (1.5-1.0 Ø to 0.5-0.0 Ø); gravel ranging 1.50 mm; rounded; low plastic; moist. 4.5-6.5': CLAY: medium gray (N 5/0); low plastic; sandy (3.0-2.5 Ø); weakly cemented; some thin clay pockets; poorly sorted sand; slightly oxide stained; weathered; claystone fragments; moist.	0.0-9.0': Composite sample: SP12870009.
10				6.5-9.0': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).
				9.0-11.5': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).
				11.5-14.0': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).
			6.5-9.0' SAMPLE. Recovered 2.5/2.5' = 100%. SAND AND CLAY: very pale orange (10 YR 8/2) to medium light gray (N 6/0) and medium gray (N 5/0); blotchy; weakly cemented; low plastic; moist.	14.0-16.5': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.2).
15				9.0-16.5': Composite sample: SP12870916.
			9.0-11.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAY AND SAND: moderate yellowish brown (10 YR 5/4) to dark gray (N 3/0) to medium light gray (N 6/0); noted 0.4' lense of clayey sand at approximately 10.8-11.2' with gravel; low plastic; weakly cemented; fine- and medium-grained sand lenses; moist.	
20				

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Ponds Area
Borehole/Well No. SP12-87(cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			11.5-14.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAY: grayish brown (5 YR 3/2) to dark yellowish brown (10 YR 5/4); small (1.50 mm) gravel; rounded; claystone fragments medium dark gray (N 4/0); low plastic; weakly to moderately cemented; scattered gravels and claystone; moist.	
			14.0-16.5' SAMPLE. Recovered 3.2/2.5' = 128%. CLAY: some claystone lenses; as noted above for colors with small and medium scattered gravel (1.25 mm to 3.4 mm); rounded, subrounded, and subangular; slightly sandy; moderate to low plasticity; few scattered roots noted; moist.	
25			16.5-19.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAY: mixed brown to varying gray; with claystone fragments; scattered gravel; slightly to moderately oxide stained; medium to low plastic; slightly sandy to sandy lenses; fine- and medium-grained; moist.	16.5-19.0': Readings on core: HNu = 0; OVA = 6.8. 16.5-19.0': Direct hit sample: SP1287160H.
30			19.0-21.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAY: multi-colored brown and gray; with some claystone fragments; noted organic lense at 21.0-21.4'; dusky brown (5 YR 2/2); numerous roots; low to medium plastic; weakly cemented; light moist to moist.	19.0-21.5': Readings on core: HNu = 6.8; OVA = 132. 19.0-21.5': Direct hit sample: SP1287190H.
			21.5-24.0' SAMPLE. Recovered 2.5/2.5' = 100%. 21.5-21.8': CLAY: varying brown; medium- and large-size gravel (3.50 mm); moist.	21.5-24.0': Readings on core: HNu = 0; OVA = 76. 21.5-24.0': Direct hit sample: SP1287210H.
35			COLLUVIUM	
			21.8-24.0': CLAY: dusky brown (5 YR 2/2) to brownish black (5 YR 2/2); scattered gravel (1.50 mm); rounded and subrounded; much roots noted; low plastic; sand (3.5-3.0 ϕ); light moist to moist.	
40				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Borehole/Well No. SP12-87(cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			24.0-26.5' SAMPLE. Recovered 1.2/2.5' = 48%. SAND: moderate yellowish brown (10 YR 5/4) to light brown (5 YR 5/6) and little dark yellowish orange (10 YR 6/6); slightly clayey to very clayey with gravel; well sorted sand ranging (2.0-1.5 Ø to 0.5-1.0 Ø); subrounded; rounded; and few subangular gravels ranging 1.25 mm to 3.75 mm and larger; weakly cemented; light moist.	24.0-25.2': Readings on core: HNu = 0; OVA = 124. 24.0-25.2': Direct hit sample: SP128724DH. 26.5-27.3': Readings on core: HNu = 0.0; OVA = 125.
45			26.5-29.0' SAMPLE. Recovered 0.8/2.5' = 32%. CLAY: varying brown to medium gray (N 5/0); slightly sandy with small scattered gravels; medium plastic; slightly calcareous; moderately plastic; moist.	26.5-27.3': Direct hit/upper contact sample: SP128726DH.
			29.0-31.5' SAMPLE. Recovered 2.5/2.5' = 100%. 29.0-29.7': SANDY CLAY: pale brown (5 YR 5/2) to moderate yellowish brown (10 YR 5/4); slightly oxide stained; fine-grained sand (3.0-2.5 Ø); weakly cemented; low plastic; light moist.	29.0-31.5': Readings on core: HNu = 0; OVA = 38. 29.0-31.5': Direct hit/contact sample: SP128729DH.
50			ARAPAHOE FORMATION	31.5-32.2': Readings on core: HNu = 0; OVA = 72.
			29.7-31.5': SANDY CLAYSTONE: medium light gray (N 6/0) to medium dark gray (N 4/0); fine-grained sand (3.5-3.0 Ø); massive; blocky; low plastic; weakly to somewhat moderately cemented; weathered; moist.	31.5-32.2': Direct hit/bedrock sample: SP128731DH.
			31.5-34.0' SAMPLE. Recovered 0.7/2.5' = 28%. CLAYSTONE: medium gray (N 5/0) to dark gray (N 3/0); medium plastic; slightly oxide stained; massive; slightly sandy; weathered; moist.	34.0-34.5': Readings on core: HNu = 0; OVA = 78. 34.0-34.5': Direct hit sample: SP128734DH.
55			34.0-36.5' SAMPLE. Recovered 0.5/2.5' = 20%. SANDY CLAYSTONE: same as above.	39.0-41.0': Readings on core: HNu = 0; OVA = 22.
			36.5-39.0' SAMPLE. Recovered 0.0/2.5' = 0%.	
60				

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Ponds Area
Borehole/Well No. SP12-87 (cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			39.0-41.0' SAMPLE. Recovered 2.0/2.0' = 100%. SANDSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); slightly oxide streaked; much lignite influence; fine-grained sand (3.0-2.5 Ø); weakly cemented; weathered; light moist.	39.0-41.0': Direct hit sample: SP128739DH.
			41.5-44.0' SAMPLE. Recovered 2.5/2.5' = 100%. SANDSTONE: varying pale brown (5 YR 5/2) to grayish brown (5 YR 3/2) to dark gray (N 3/0); now only moderately influenced with lignite seams; slightly oxide stained; fine-grained sand; weakly to moderately cemented; weathered; light moist.	41.5-44.0': Readings on core: HNu = 0; OVA = 8.8. 41.5-44.0': Direct hit sample: SP128741DH. 44.0-46.5': Readings on core: HNu = 0; OVA = 0.
			44.0-46.5' SAMPLE. Recovered 2.5/2.5' = 100%. SANDSTONE: clayey pale brown (5 YR 5/2) to grayish brown (5 YR 3/2); weakly to moderately cemented; fine-grained sand (3.5-3.0 Ø and 3.0-2.5 Ø); poorly sorted; weathered; light moist.	44.0-46.5': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).
			TOTAL DEPTH: 46.5'	

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Completed as well? No

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LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 38350 E 22120
Total Depth 16.5'

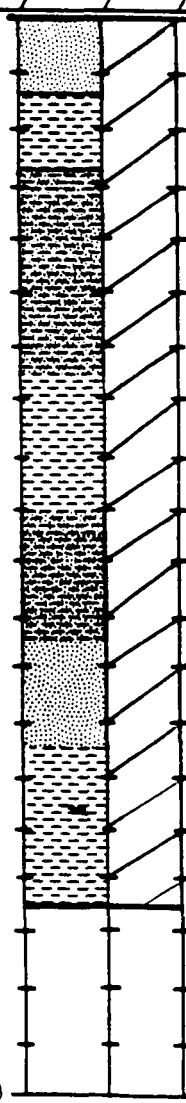
Borehole/Well No. SP13-87
Ground Surface Elevation *5925.0'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled November 6, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0.0-1.5' SAMPLE. Recovered 1.5/1.5' = 100%. 0.0-1.3': SAND grayish orange (10 YR 7/4); silty and slightly clayey; fine-grained sand (3.5-3.0 Ø); weakly cemented; poorly sorted with upper 0.2' organic with many roots noted; light moist. **ROCKY FLATS ALLUVIUM** 1.3-1.5': CLAY: grayish brown (5 YR 3/2); moderately cemented; medium plastic; some scattered gravel; lightly moist. 1.5-3.5' SAMPLE. Recovered 2.0/2.0' = 100%. 1.5-2.7': CLAY: grayish brown (5 YR 3/2); moderately to highly cemented; medium plastic; slightly sandy; very fine-grained; moist. **ARAPAHOE FORMATION** 2.7-3.5': SANDY CLAYSTONE: medium light gray (N 6/0); low plastic; massive; blocky; fine-grained sand (3.5-3.0 Ø); weathered; moist. 3.5-6.5' SAMPLE. Recovered 3.0/3.0' = 100%. SANDY CLAYSTONE: medium dark gray (N 4/0); fine-grained sand (3.5-3.0 Ø); massive; just slightly oxide stained; blocky; medium plastic; moderately cemented; weathered; moist. 6.5-9.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: sandy to very sandy as noted in previous run; medium to low plastic; weakly cemented; slightly to moderately oxide stained; weathered; moist. 9.0-11.5' SAMPLE. Recovered 2.5/2.5' = 100%. 9.0-9.2': SANDY CLAYSTONE: as noted above. 9.2-11.5': CLAYEY SANDSTONE: medium light gray (N 6/0) to moderately and severely oxide stained brown of dark yellowish orange (10 YR 6/6) to moderate yellowish brown (10 YR 5/4); weakly to moderately cemented; fine-grained sand (3.0-2.5 Ø); poorly sorted; weathered; moist.	HNu Background=0.8 OVA Background=3.2 Ludlum Background = 0.0 0.0-1.5': Upper contact sample: SP138700UC. 1.5-3.5': Contact sample taken: SP138701CT. 3.5-6.5': Bedrock sample taken: SP138703BR. 6.5-9.0': Direct hit sample: SP138706DH. 6.5-9.0': Duplicate sample: SP138760UP. 9.0-11.5': Direct hit sample: SP138709DH.
5				
10				
15				
20				

LOG OF BOREHOLE

Location Rocky Flats Plant: Solar Ponds Area **Borehole/Well No.** SP13-87 (cont'd.)

Coordinates _____ **Ground Surface Elevation** _____

Total Depth _____ **Water Level Encountered** _____

Static _____

Drilling Company _____ **Driller** _____

Date Drilled _____ **Helper** _____

Drilling Method _____ **Drilling Fluid** _____

Logged By _____ **Checked By** _____

Geologist — Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			11.5-14.0' SAMPLE. Recovered 2.5/2.5' = 100%. 11.5-13.5': SANDSTONE: clayey to very clayey lenses; color as stated above; fine-grained sand (3.0-2.5 ϕ); weakly cemented; moderately oxide stained; moist; 13.5-14.0': CLAYSTONE: medium dark gray (N 4/0); slightly sandy; massive; medium plastic; blocky; fine-grained sand; poorly sorted; weathered; light moist. 14.0-16.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: medium gray (N 5/0) to medium dark gray (N 4/0); slightly sandy to sandy lensed; only slight oxide staining apparent; pale yellowish orange (10 YR 8/6); blocky; massive; weathered; moist. TOTAL DEPTH: 16.5'	11.5-14.0': Direct hit sample: SP1387110H. 14.2': Readings in augers: HNu = 14.2' OVA = 0.0. 14.0-16.5': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).

INDEX OF DATA

Boring No.: SP14-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 38622 E 22328
Total Depth 7.0'

Borehole/Well No. SP14-87
Ground Surface Elevation *5890.0'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled November 11 and 12, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED** 0.0-2.0' SAMPLE. Recovered 0.4/2.0' = 20%. CLAY: dusky brown (5 YR 2/2); slightly sandy with gravel; low plastic; weakly cemented; moist; very organic in upper 0.4'; with roots. 2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 100%. 2.0-3.2': CLAY: dark yellowish orange (10 YR 6/6) to moderate yellowish brown (10 YR 5/4); low to medium plastic; scattered gravel; moderately cemented; moist. **ARAPAHOE FORMATION** 3.2-4.0': CLAYSTONE AND SANDSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); weakly cemented; poorly sorted; fine-grained sand (3.0-2.5 ϕ); low plastic; weathered; light moist. 4.0-7.0' SAMPLE. Recovered 3.0/3.0' = 100%. SANDY CLAYSTONE: medium dark gray (N 4/0); medium plastic; blocky; slightly oxide stained; streaked and slightly calcareous lensed; massive; fine-grained sand (3.5-3.0 ϕ); weakly to moderately cemented; weathered; moist. TOTAL DEPTH: 7.0'	HNu Background=1.1 OVA Background=0.0 Ludlum Background = 0.0 0.0-0.4': Upper contact sample: SP148700UC (VOAs only). 0.0-0.4': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0). 2.0-4.0': Contact sample: SP148702CT. 4.0-7.0': Bedrock sample taken: SP148704BR.
5				
10				
15				
20				

INDEX OF DATA

Boring No.: SP15-87

Completed as well? No

Data in File

X Log of Borehole

____ Well Construction Summaries

____ Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

____ Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Coordinates * N 38273 E 22674
Total Depth 19.5'

Drilling Company Boyles Bros.
Date Drilled November 12 and 13, 1987
Drilling Method Hollow Stem Auger
Logged By R. Treat
Geologist

Borehole/Well No. SP15-87
Ground Surface Elevation *5927.0'
Water Level Encountered 12.3'
Static

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments Borehole backfilled with Portland Type I Cement.
*Coordinates and elevation estimated from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**ARTIFICIAL FILL/DISTURBED**	
			0.0-2.0' SAMPLE. Recovered 1.5/2.0' = 75%. CLAY: dark yellowish orange (10 YR 6/6) to moderate brown (5 YR 4/4) and light brown (5 YR 5/6) to medium gray (N 5/0); claystone pieces; sandy with scattered gravel; rounded and subrounded; quartzite composition; low plastic; weakly cemented; light moist to moist lensed.	HNu Background=0.0 OVA Background=0.0 Ludlum Background = 0.0 0.0-1.5': Field screen readings: HNu = 0.0(0.0); OVA = 2.2(2.7).
5			2.0-4.0' SAMPLE. Recovered 0.8/2.0' = 40%. CLAY: with claystone and sandstone; colors varying as stated above with scattered gravel; weakly cemented; fine-grained sand; light moist.	2.0-2.8': Direct hit sample: SP158702DH. 2.0-2.8': Readings on core: HNu = 0; OVA = 12.5.
			4.0-7.0' SAMPLE. Recovered 0.4/3.0' = 13%. CLAY: with claystone and some scattered gravel; multi-colored brown to gray; low plastic; weakly cemented; subrounded and rounded gravel; light moist.	4.0-4.4': Readings on core: HNu = 0; OVA = 4.85. 4.0-4.4': Direct hit sample: SP158704DH (VOAs only).
10			7.0-8.0': No recovery. Drilled with center bit.	
			8.0-10.0' SAMPLE. Recovered 2.0/2.0' = 100%. CLAY: light brown (5 YR 6/4) to moderate yellowish brown (10 YR 5/4) and grayish brown (5 YR 3/2); slightly sandy to very sandy lensed; fine-grained sand (3.5-3.0 Ø); weakly to moderately cemented; low to medium plastic; scattered gravel to 2.75 mm; rounded; soil very organic in composition and smell; moist.	8.0-10.0': Readings on core: HNu = 0; OVA = 44. 8.0-10.0': Direct hit sample: SP158708DH. 8.0-10.0': Duplicate sample: SP158708D.
			ROCKY FLATS ALLUVIUM	
15			10.0-12.0' SAMPLE. Recovered 2.0/2.0' = 100%. 10.0-10.5': CLAYEY SAND: light brown (5 YR 5/6); scattered gravel; fine-grained sand (2.5-2.0 Ø to 2.0-1.5 Ø); rounded gravel; weakly cemented; moist. 10.5-11.5': CLAY: light gray (N 7/0) to light olive gray (5 Y 5/2) and pale brown (5 YR 5/2); slightly organic; moderately cemented; moist. 11.5-12.0': CLAY: very sandy; moderate brown (5 YR 4/4) to moderate yellowish brown (10 YR 5/4); fine-grained sand (3.5-3.0 Ø); moderately cemented; low plastic; moist.	10.0-12.0': Readings on core: HNu = 0; OVA = 28. 10.0-12.0': Direct hit sample: SP158710DH. 12.0': Readings in augers: HNu = 0; OVA = 2.2
20				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Ponds Area
Borehole/Well No. SP15-87 (cont'd.)
Coordinates _____
Ground Surface Elevation _____
Total Depth _____
Water Level Encountered _____
Static _____
Drilling Company _____
Driller _____
Date Drilled _____
Helper _____
Drilling Method _____
Drilling Fluid _____
Logged By _____ Geologist
Checked By _____ Site Manager
_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			12.0-14.5' SAMPLE. Recovered 2.5/2.5' = 100%. SAND: moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6) to light gray (N 7/0) and medium gray (N 5/0), streaked; slightly clayey to very clayey; sand (2.5-2.0 Ø); weakly cemented; wet approximately 12.0-12.3', then very moist.	12.0-14.5': Readings on core: HNu = 0; OVA = 2.2. 12.0-14.5': Water table; upper contact; direct hit sample: SP158712WT.
			14.5-17.0' SAMPLE. Recovered 2.5/2.5' = 100%. 14.5-14.9': SAND: very clayey as noted in previous run.	
			ARAPAHOE FORMATION	
			14.9-17.0': SANDY CLAYSTONE: light brown (5 YR 5/6) to predominantly medium light gray (N 6/0); weathered; moderately oxide stained; medium plastic; massive; fine-grained sand (3.5-3.0 Ø); blocky; weakly to moderately cemented; moist.	14.5-17.0': Contact sample: SP158714CT.
			17.0-19.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: medium light gray (N 6/0) to medium dark gray (N 4/0); weathered; sandy (3.5-3.0 Ø); blocky; massive; medium plastic; moderately cemented; moist.	17.0-19.5': Bedrock sample: SP158717BR.
			TOTAL DEPTH: 19.5'	

INDEX OF DATA

Boring No.: 56-87/SP16-87

Completed as well? Yes

Data in File

X Log of Borehole

X Well Construction Summaries

X Well Development Summaries

____ Hydraulic Conductivity Test Data and Results

____ Packer Test Data and Results

X Water Level Data

____ Saturated Thickness Hydrographs

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

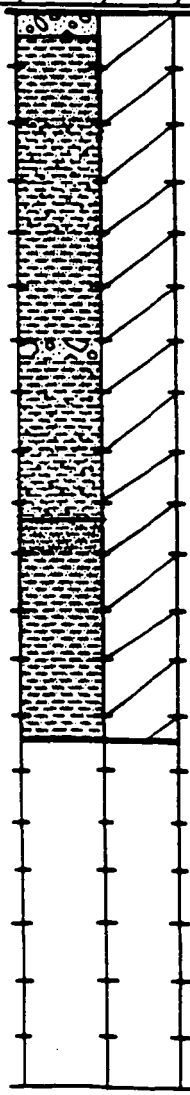
Borehole/Well No. 56-87/SP16-87
Ground Surface Elevation 5978.51'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliway
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			**TOP SOIL** 0.0-2.0' SAMPLE. Recovered 2.0/2.0' = 100%. 0.0-0.5': TOP SOIL: varied greens and browns; grass and ice; subangular; cobbles up to 1" diameter; sandy clay; frozen. **ARTIFICIAL FILL/DISTURBED** 0.5-1.1': CLAYEY SAND: pale yellowish brown (10 YR 6/2) to dark yellowish brown (10 YR 4/2); very coarse-grained (2.0-1.5 Ø to 1/4"), poorly sorted sand; subrounded to angular; small quartzite gravel up to 1" diameter; unconsolidated; moist to frozen. 1.1-2.0': SANDY CLAY: moderate brown (5 YR 3/4); some very coarse-grained, poorly sorted, subrounded to angular sand; angular quartzite gravel up to 3" diameter; varied green to yellow red orange to red staining throughout core; damp.	HNu background=1.2. OVA Bachground=1.6 Ludlum background = 0.0 0.0-2.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.9 (1.2). 0.0-2.0': Field screen sample: SP168702FS. 2.0-3.5': Field screen readings: HNu = 1.2 (1.2); OVA = 1.2 (1.2). 4.0-6.0': Field screen readings: HNu = 1.6 (1.6); OVA = 1.2 (1.2). 6.0-8.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0). 6.0-8.0': Upper contact sample: SP168708UC. 10.0-11.2': Contact sample:SP168710CT 11.2-13.4': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0).
5				
10				
15				
20				

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87 (cont'd
Ground Surface Elevation 5978.51'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliway
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			2.0-4.0' SAMPLE. Recovered 1.5/2.0' = 75%. CLAYEY SAND AND GRAVEL: light brown (5 YR 5/6) with pale yellowish orange (10 YR 8/6) and dark yellowish orange (10 YR 6/6) with trace moderate reddish brown (10 YR 4/6), mostly in sand zones; very coarse-grained, poorly sorted sand, subangular to angular; quartzite gravel subangular to broken, to 3" diameter; becomes sandier down core with medium-grained (2.5-1.5 Ø) fairly sorted, subangular sand; damp.	11.2-13.4': Bedrock Sample: SP168711BR
			4.0-6.0' SAMPLE. Recovered 2.0/2.0' = 100%. SANDY CLAY: moderate yellowish brown (10 YR 5/4) to dark yellowish brown (10 YR 4/2) with some yellowish gray (5 Y 7/2) especially towards bottom of core; subangular to angular quartzite gravel up to 2" diameter increases down core; quartzitic sand and pebbles, sub-rounded to subangular medium-grained (2.0-1.5 Ø) to coarse-grained up to 1/4" diameter; poorly sorted; unconsolidated; some caliche increases down core; damp to moist.	

LOG
OF
BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87 (cont'd
Ground Surface Elevation 5978.51'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliway
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. 6.0-6.3':GRAVEL: angular to broken; some fine-grained sand; dry. 6.3-7.0': CLAYEY SAND: dusky yellow (5 Y 6/4) to yellowish gray (5 Y 7/2); some clay; sand is very fine-grained to fine-grained (2.5-2.0 Ø); fairly well sorted; unconsolidated; some caliche (strong reaction to HCl); damp to moist. 7.00-8.00': CLAYEY SAND AND GRAVEL: yellowish gray (5 Y 7/2) with light brown (5 YR 5/6) and moderate reddish brown (10 R 4/6) staining; fine-grained (2.5-2.0 Ø) to coarse-grained, poorly sorted, subrounded to subangular sand; subangular gravel; lots of caliche; unconsolidated; moist.	
			8.0-10.0' SAMPLE. Recovered 0.0/2.0' = 0%. Lost core.	
			ARAPAHOE FORMATION	
			Q/Ka contact estimated at 9.40' by drilling and cuttings.	
			10.0-11.2' SAMPLE. Recovered 1.8/1.2' = 150%. SANDY CLAYSTONE: light olive gray (5 Y 5/2) to yellowish gray (5 Y 7/2) with dark yellowish orange (10 YR 6/6) iron staining; very fine-grained to fine-grained sand; some caliche; consolidated; damp.	

LOG OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area
Coordinates N 37654.23 E 21319.10
Total Depth 13.40'

Borehole/Well No. 56-87/SP16-87 (cont'd
Ground Surface Elevation 5978.51'
Water Level Encountered None
Static

Drilling Company Boyles Bros.
Date Drilled January 7, 1988
Drilling Method Hollow Stem Auger
Logged By KD Holliway
Geologist

Driller T. High
Helper B. Keeney
Drilling Fluid None
Checked By
Site Manager

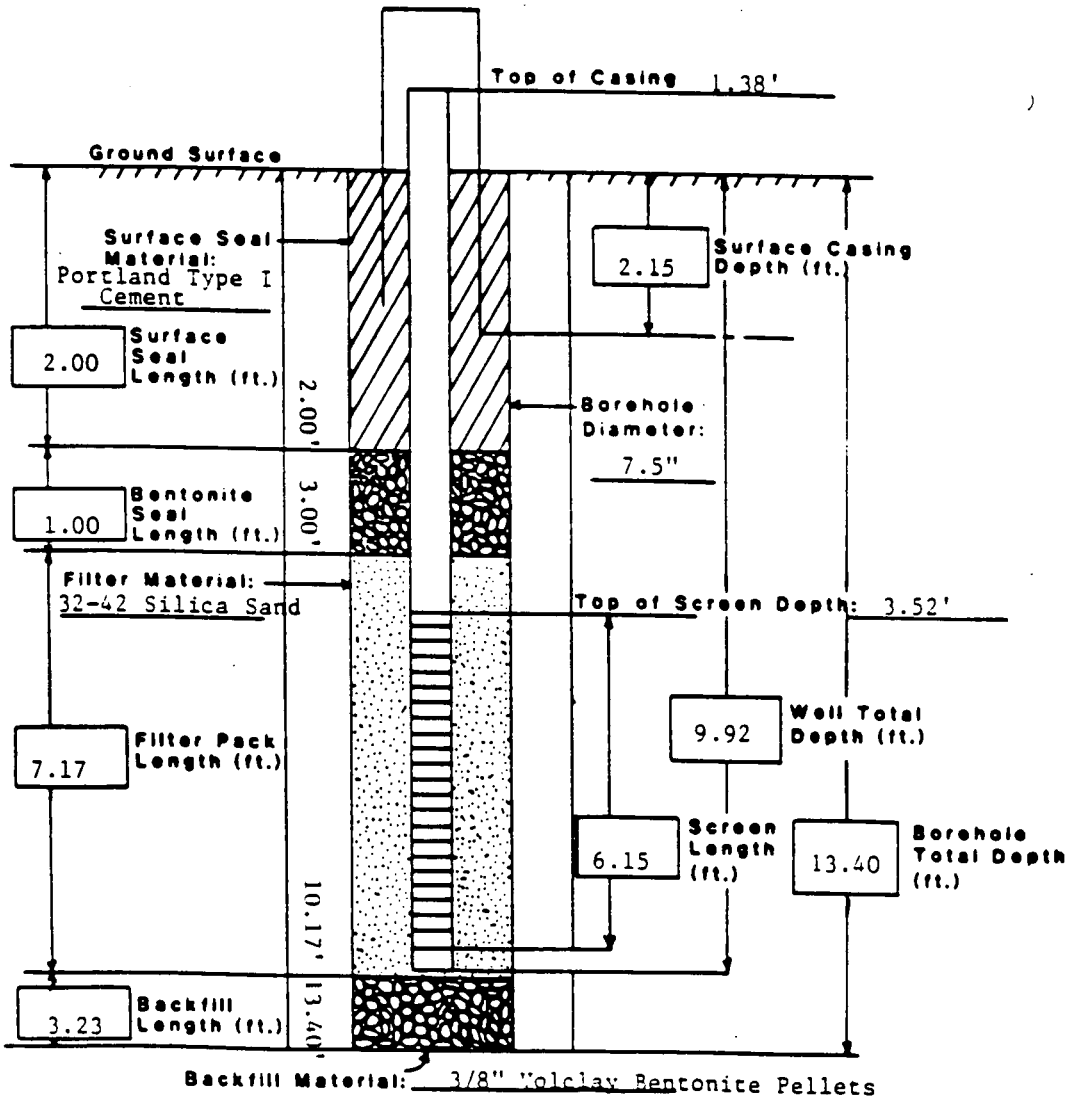
CEARP Manager

Comments

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			11.2-13.4' SAMPLE. Recovered 2.2/2.2' = 100%. SANDY CLAYSTONE: same as above with occasional iron nodules.	
			TOTAL DEPTH: 13.40'.	

WELL COMPLETION INFORMATION

Location: Rocky Flats Plant; Solar Ponds Area
Well No. 56-87/SP16-87
Coordinates N 37654.23 E 21319.10
Elevation: Ground Surface 5978.51'
Total Depth: Well 9.92'
Top of Casing 5979.89'
Borehole 13.40'
Formation of Completion Rocky Flats Alluvium
Casing Material Sch 5, Type 316, TFJ Stainless Steel
Casing Diameter 2" ID
Screen Material 0.010" wire wrap, Type 316, TFJ Stainless Steel
Surface Casing Diameter 5" ID
Date Installed January 8, 1987
Approved By
Installed By K.D. Holliway
Geologist
Site Manager
CEARP Manager
Comments



Well No.: 56-87

WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
1/14/88	0800	Pumping	-------	----------	Water level 0' before pumping; Water level 0' after pumping.
					Hole depth: 10.3'

ROCKY FLATS SOLAR PONDS

WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5687	02/29/88	5978.51	5979.89	1.38	9.67	6.70	5973.19
	03/21/88					7.80	5972.09
	04/18/88					6.70	5973.19