DYESS TESTING LABORATORY, INC.

PROFESSIONAL TESTING & INSPECTIO
CHEMICAL & MATERIALS TESTIN

USINESS PHONE: 806 - 372-4911
ESIDENCE PHONE: 806 - 355-7734

506 SOUTH LIPSCOMB
AMARILLO, TEXAS 791C

March 3, 1975

Mr. Pat Christal
% City of Amarillo
P. O. Box 1971
Amarillo, Texas

Dear Sirs:

On Feb. 12, 1975 a site investigation was conducted on Section 126, Block 9, of the BS & F Survey Northwest of Amarillo. The soils investigation was performed to secure approval of this site as a sanitary landfill. This investigation was conducted as requested by your office.

The section of land is two miles North and two miles East of Bushland. The major portion of the section is pasture land, covered with native grass, and a large excavation utilized as a caliche pit. The section drains to the North & Northeast and is well drained in its present condition. Approximately 100 to 120 acres, located in the southwest quarter of the section, are under cultivation and irrigated permanent pasture.

The following general subsurface & site conditions exist at this section location:

1. The soil in the Northwest quarter-section is predominately caliche and sandy clay. This quarter has some abrupt grade changes from the canyons and hills. Some grade changes of 80 to 100-ft. will exist between the high and low areas. Some rock will be encountered in this quarter section.

2. A "caliche pit" is located at the East edge of the Northwest quarter-section. This pit has had an extensive quantity of

material removed and still has a significant amount of usuable caliche available.

3. The Northeast quarter section is "rolling" pastureland. The low hills have only 1 to 2-ft. of topsoil, turning to Reddish-tan to Dark tan Sandy Clay at all other depths. Rock was encountered at 50 to 55-ft. in this area.
4. The Southeast quarter section is fairly level pastureland. This area is easily excavated and should serve as an excellent area for a landfill operation.
5. The southwest quarter section is mostly farmland and under irrigation. This quarter section is nearly level with some grade change and drainage to the North and East. This quarter-section has more topsoil (3 to 5-ft.) than any other area of the section. No rock or sand was encountered in this quarter section to the 40-ft. drilled depth.

Soil classification and plastic properties are as follows:

Type soil	Liquid Limit(%)	Plasticity Index	Linear Shrinkage(%)	Permeabilit (cm/sec.)
Reddish-Tan"Caliche"(CL)	32.6	12.2	4.7	1.3×10^{-7}
DK.Reddish-Tan Sandy Clay(CL)	35.1	16.3	8.9	8.1×10^{-8}
Lt.Tan to Reddish-Tan Sandy Clay	36.7	17.8	9.7	2.3×10^{-8}
Lt.Tan "Caliche"(CL)	30.1	10.7	3.6	6.3×10^{-7}
Sand Reddish-Tan (SC)	28.1	8.6	2.3	7.7×10^{-5}
Brown to Dk.Brown(Topsoil)(CL)	38.9	18.2	10.3	2.9×10^{-8}
Lt.Reddish-Tan Sandy Clay(CL)	33.6	14.9	7.8	3.6×10^{-8}

Note: The above samples are typical of the soil types encountered at the locations indicated on the attached Logs of Borings.

The only areas where sand or rock will be a problem is the vicinit of Boring No. 3 and to the East to the area of Boring No. 9. The higher hills and deep canyons are located in the area between Borings No. 3, 4 and 9 (see attached Location of Borings. The sand encountered in Boring No. 3 will have a solid rock strata beneath it, however, due to "caving" the drill was withdrawn at the 40ft. depth.

This site should meet all Texas Water Quality Board requirements, for permeability, due to the impervious clay stratas in all areas except the sand in the Northwest portion, which, has a solid limestone or "caliche" strata beneath it. The area of this sand (Boring No. 3) will probably not be utilized, as a landfill, due to layers of hard to highly cemented limestone and caliche located fairly shallow depths.

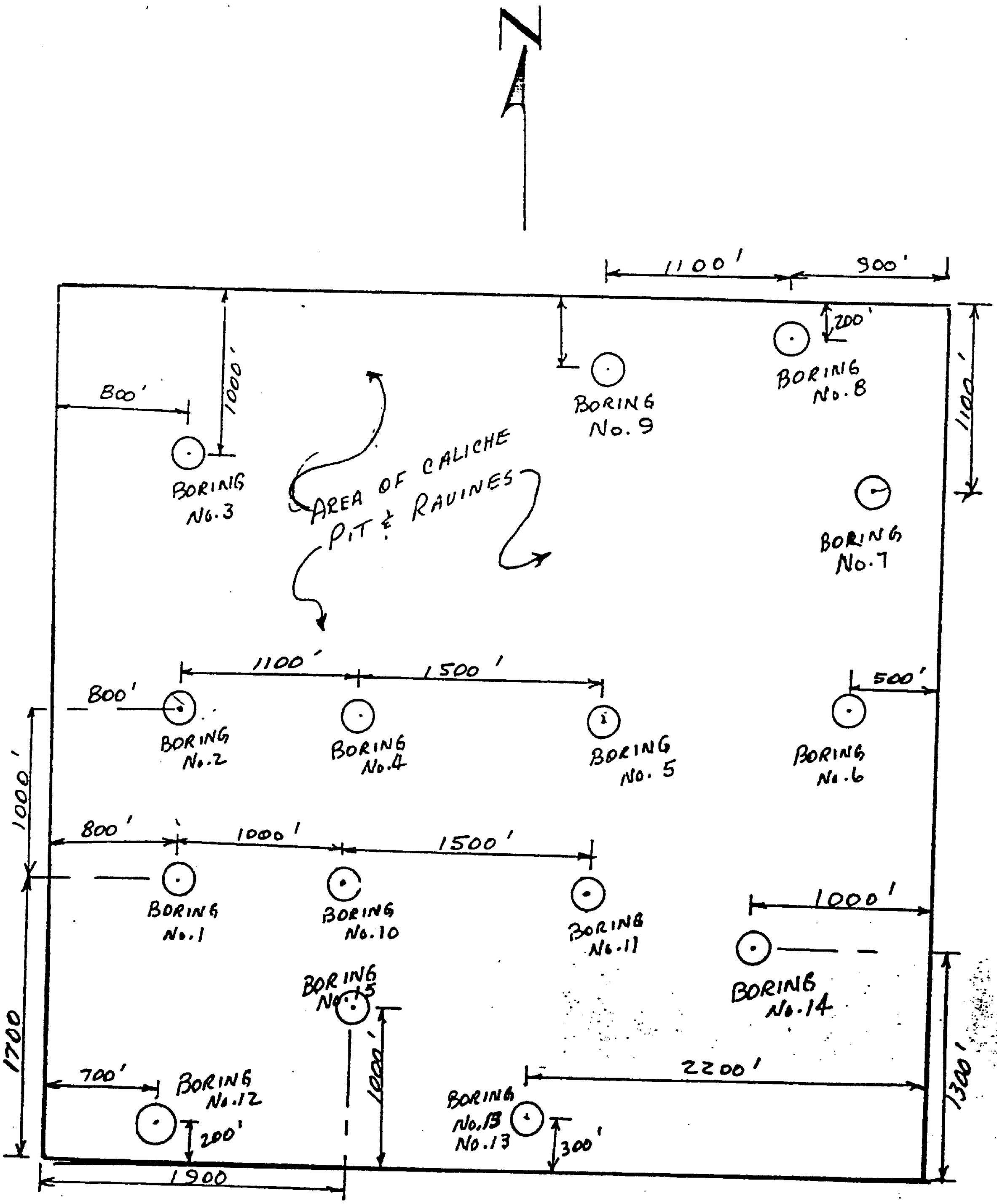
SUMMARY & CONCLUSIONS

The site of this soil investigation (Section 126, Block 9 - B.S. & F Survey) should serve as an adequate sanitary landfill. The Northwest Quarter-Section may have up to 10% or 15% of its area with unsuitable soil or rock conditions. The soil in all areas, has a permeability rate of less than 1.0 x 10^{-7}cm./sec., or is underlaid by an impervious strata of rock or highly cemented caliche. Groundwater in this area is at 175 to 210-ft. depth. The entire section is sloped to provide adequate drainage and should present no significant excavation problems. There are sufficient canyons to be filled with the excess soil, excavated from the burial trenches, to dispose of any waste.

BURL R. PETERSON
31437

Respectively Submitted

Burl R. Peterson P.E.
Burl R. Peterson, President



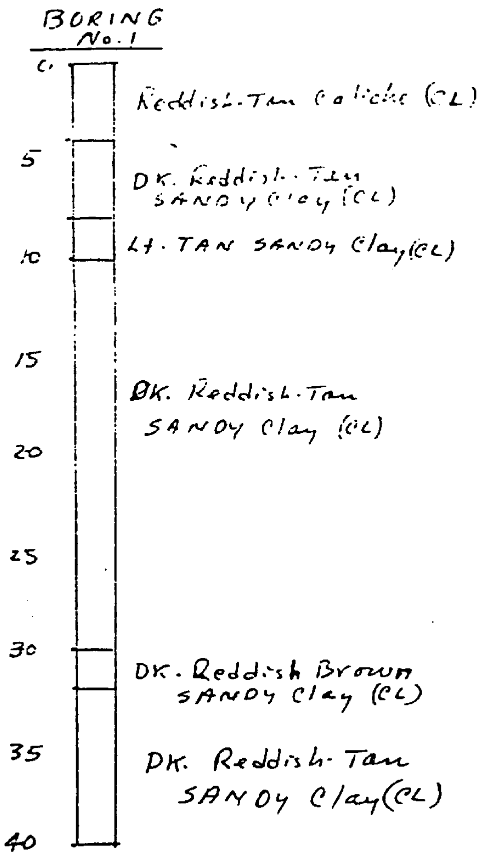
LOCATION OF BORINGS

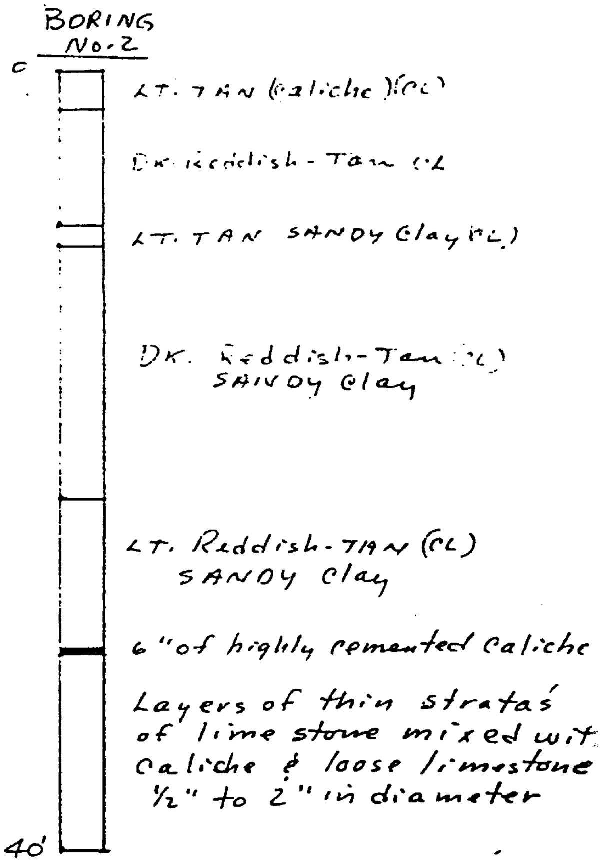
SECTION 126, BLOCK 9 - BS&F SURVEY

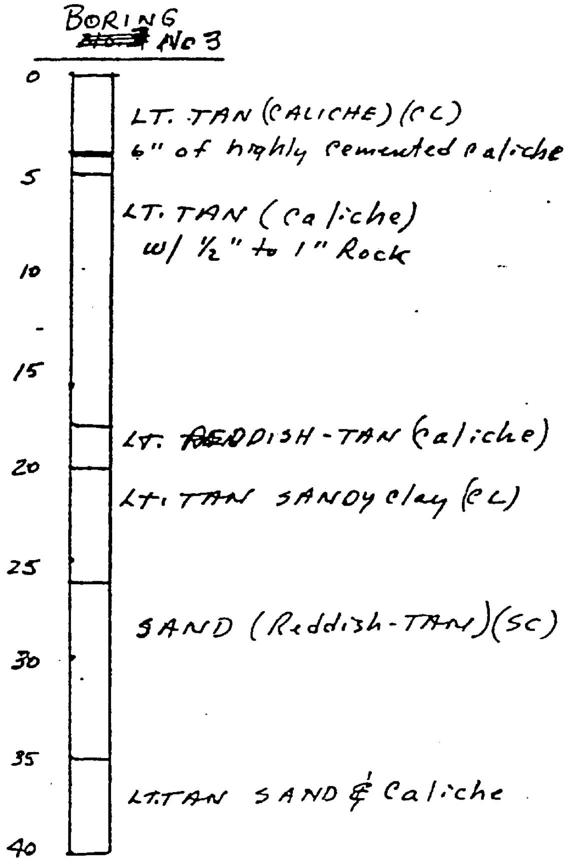
2/26/75

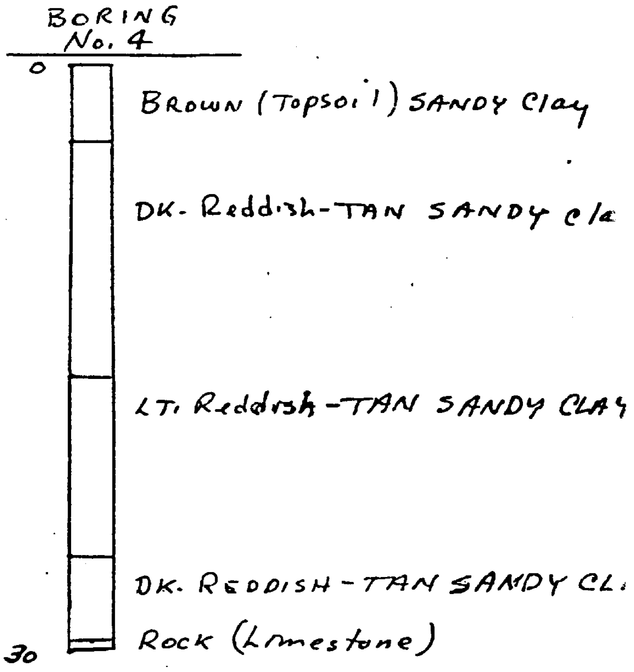
1" = 1000'

LOG OF BORINGS



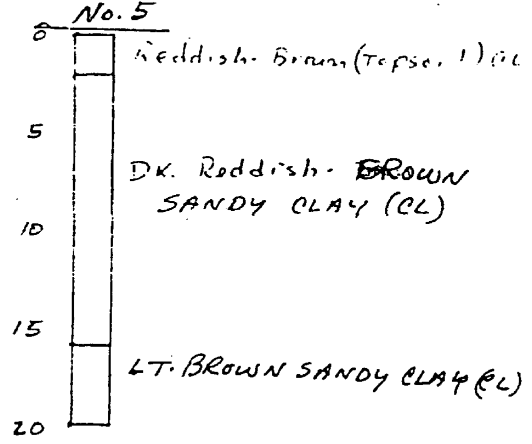






LOG OF BORINGS

BORING No. 5



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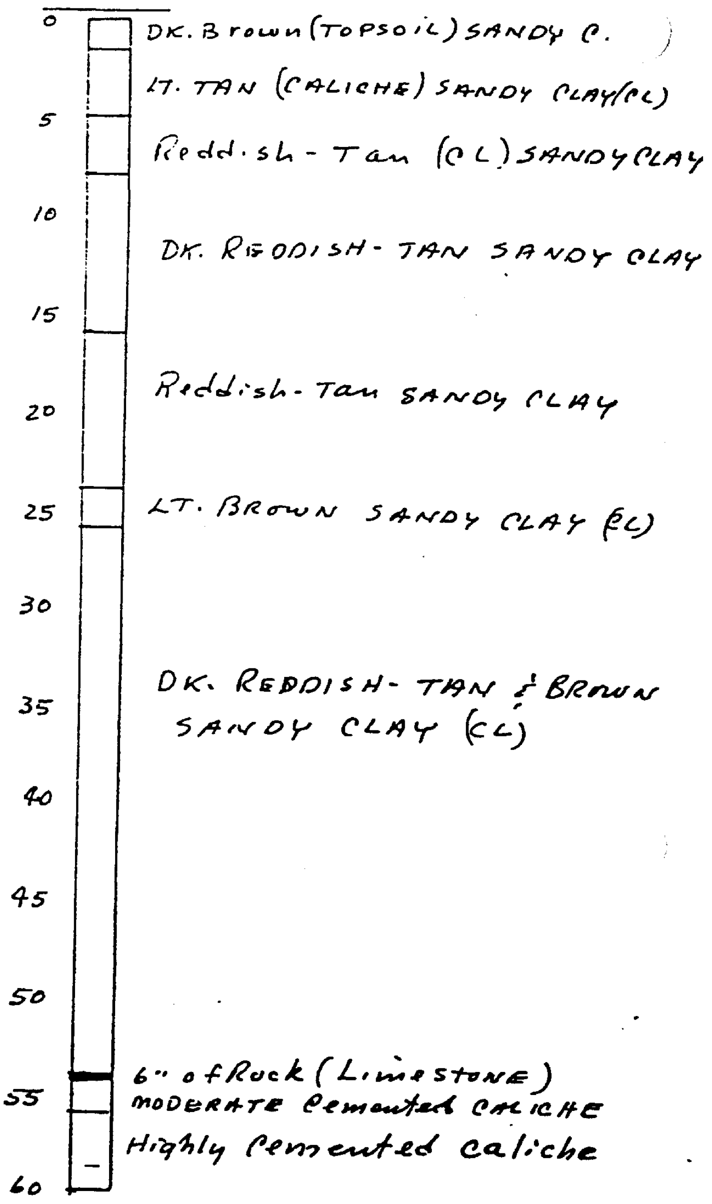

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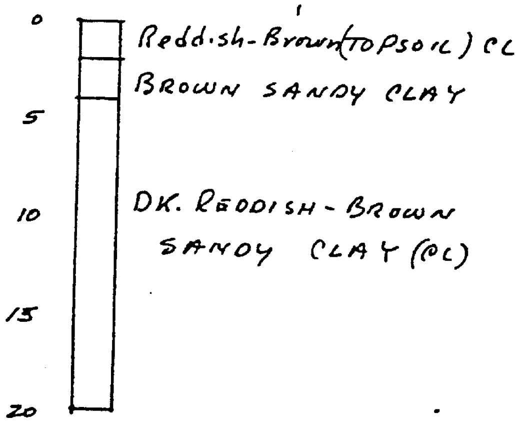

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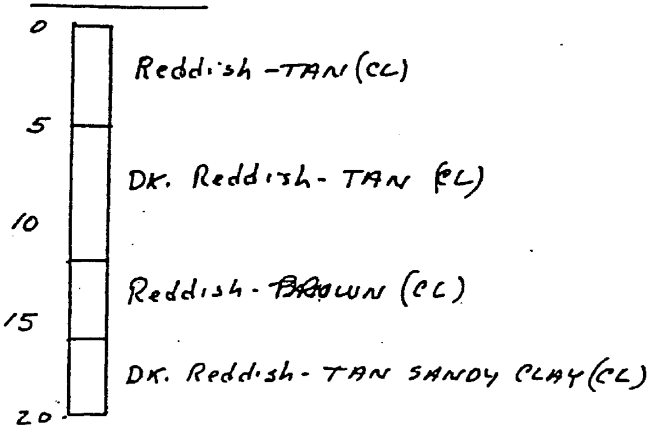

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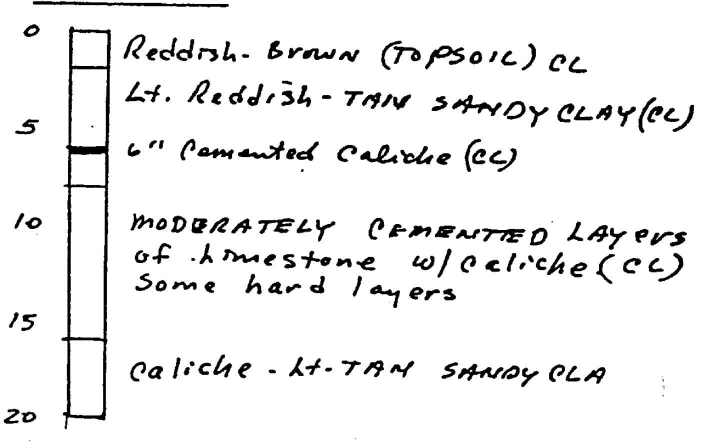

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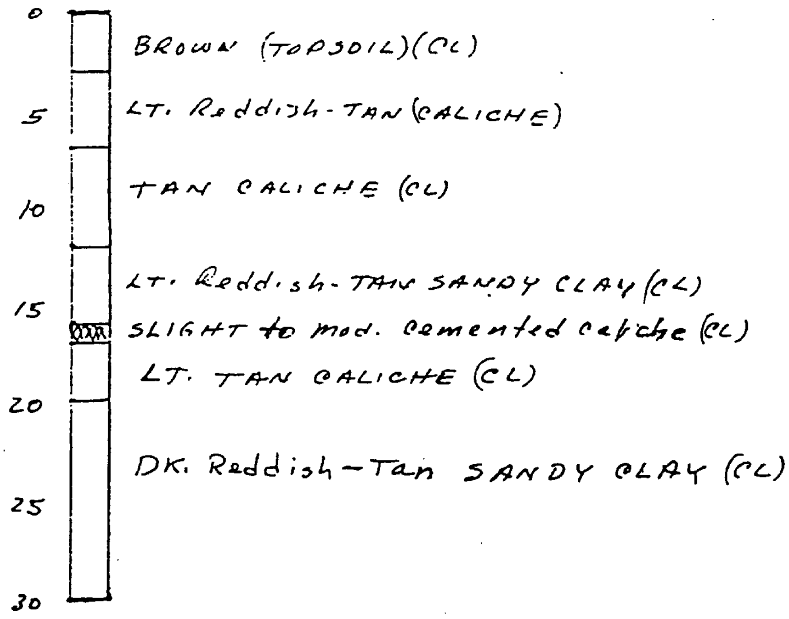

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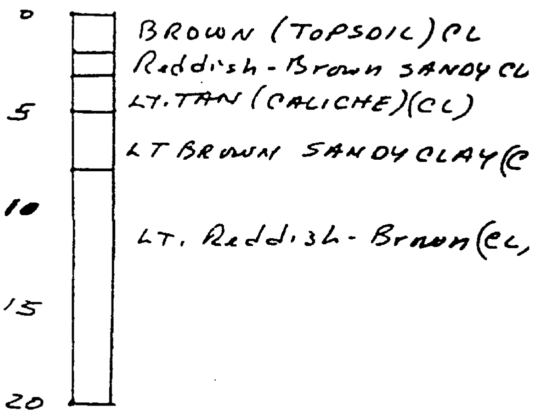

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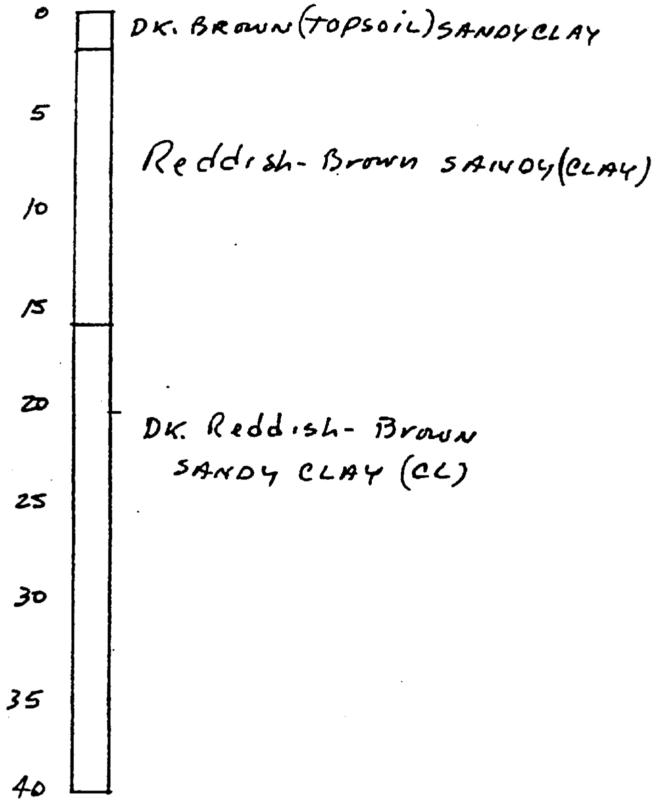
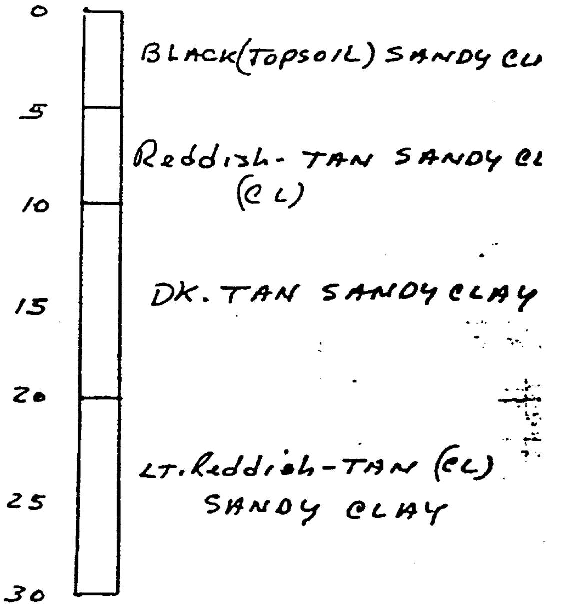
No. 12

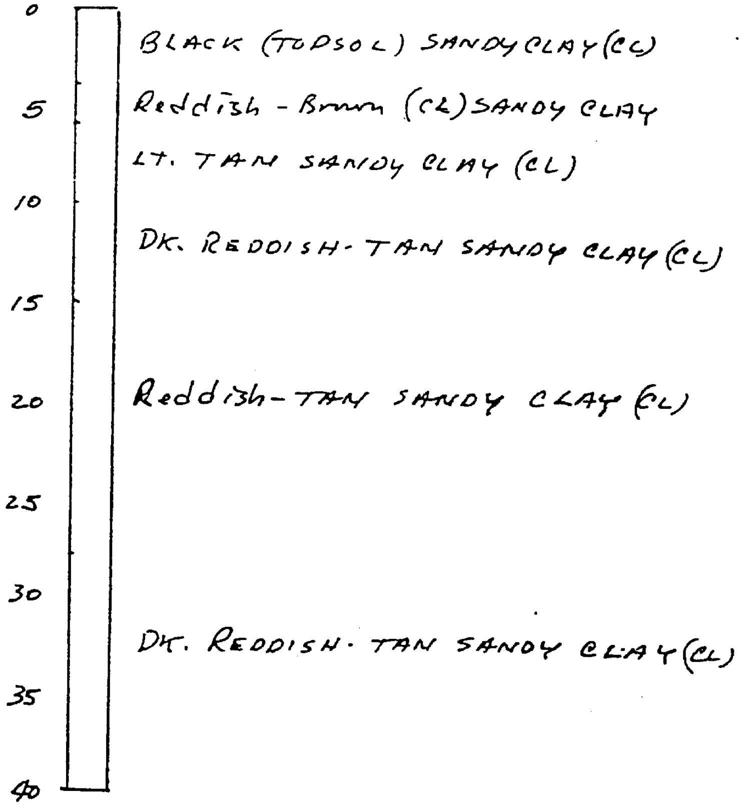


BORING
No. 13

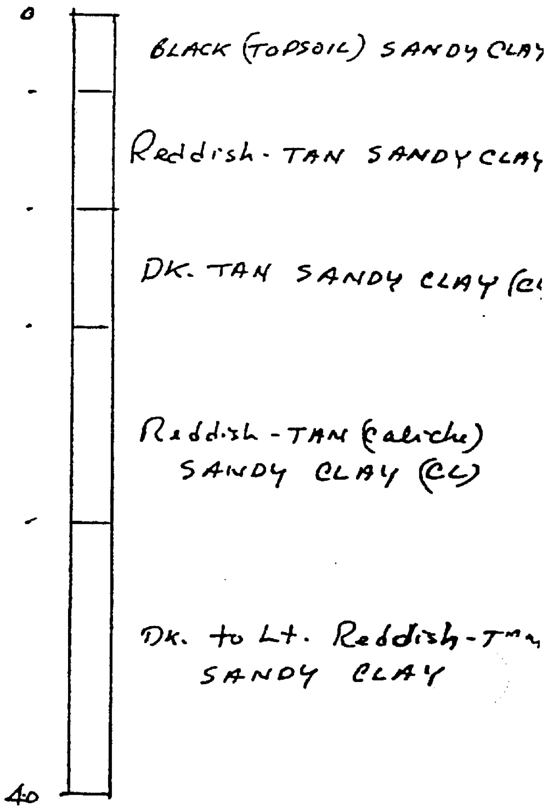


LOG OF BORINGS

BORING
No. 14



BORING
No. 15



APPENDIX G

1979 SITE INVESTIGATION REPORT

DYESS TESTING LABORATORY, INC.

PROFESSIONAL TESTING & INSPECTIC
CHEMICAL & MATERIALS TESTIN

BUSINESS PHONE: 806 - 372-4911
ESIDENCE PHONE: 806 - 355-7734

506 SOUTH LIPSCOMB
AMARILLO, TEXAS 791

September 28, 1979

City of Amarillo
% Pat Christal
P.O. Box 1971
Amarillo, Texas

Re: Landfill Site - Soil Borings

SITE INVESTIGATION & RESULTS

On 8/30/79 this Engineer drilled four (4) borings to determine the subsurface soils conditions. The main concern was the permeability and strata types to be utilized as a land fill area.

Boring No. 1 was located in the area of a liquid waste pit. The soil in this boring was sand from 0 to 26-ft. The soil is classified as Silty or Clayey Sand (SM-SC) and silty sand (SM) at all depths. The permeability of the soil from 0 to 3-ft. is 4.1 x 10^{-6}cm./sec. and 6.3 x 10^{-6}cm./sec. from 3 to 12-ft. This soil will require a lining, in any liquid pit, of at least 4-ft. of compacted clay soil. This soil should have a P.I. of at least 18 and a permeability rate K= 1.0 x 10^{-7}cm./sec. minimum. This lining should be compacted to at least 95% of maximum dry density (ASTM Designation: D698-70).

The borings 2, 3 & 4 were taken in the area of proposed future landfill sites. The areas were designated by Mr. Pat Christal and drilled to the 26-ft. depth. These borings indicate similar soil (SM & SM-SC) at all depths, except, boring No. 4 where some Sandy Clay (CL) was encountered to the 12-ft. depth. This soil was significantly more impervious than any soil in any other boring. The rate of flow for the soil in boring No. 4 (0 to 12-ft.) is K=3.1 x 10^{-7}cm./sec. Typical soil permeabilities in borings 2 & 3 at all depths are as follows:

Boring No. 2 0 to 15-ft. K = 4.6 x 10^{-6}cm./sec.
Boring No. 2 15 to 26-ft. K = 7.1 x 10^{-6}cm./sec.

Boring No. 3 0 to 10-ft. $K = 4.0 \times 10^{-6}$ cm./sec.
Boring No. 3 12 to 26-ft. $K = 5.3 \times 10^{-6}$ cm./sec.
Boring No. 4 12 to 26-ft. $K = 6.2 \times 10^{-6}$ cm./sec.

There are some isolated layers of cemented limestone in boring No. 3 & 4. The strata at 18-ft. was 4-in. in thickness and was moderately hard, however, normal earth moving equipment will be able to excavate the strata.

All soil properties are shown on the attached Summary of Tests. All soil stratas encountered are shown on the Log of Borings.

LIMITATIONS

The above recommendations are based on the assumption that the soil and soil properties in the area between the borings are reasonably uniform the similar to those found in the borings. It is also assumed that the moisture levels encountered at this site will not be permitted to materially increase over those shown on the tests.

If any unusual conditions, not described in this report, are encountered during construction, this laboratory should be notified immediately.

Respectively Submitted,

Burl R Peterson P.E.
Burl R. Peterson, President

BURL R. PETERSON
31437

CC: Above

SUMMARY OF TESTS

PROJECT A Landfill for the City of Amarillo, Texas

CLIENT City of Amarillo

Drilled on:
DATE: 8/30/79

BORING NO.	DEPTH FEET	TYPE OF MATERIAL	MOISTURE CONTENT %	LINEAR SHRINKAGE %	LIQUID LIMIT	PLASTICITY INDEX	NO. BLOWS	SOIL CLASSIFICATION	ALLOWABLE LOAD BEARING VALUE LBS./SQ FT
1	1	Reddish Tan Silty & Clayey Sands	5.7	3.2	23.2	5.8		SM-SC	
	3	Dk. Reddish Tan Silty Sand	6.0	1.6	20.3	2.7		SM	
	12	Same	6.0	Similar to Soil @ 3-ft.				SM	
	20	Lt. Reddish Tan Silty & Clayey Sands	6.6	3.2	23.3	5.7		SM-SC	
	26	Dk. Reddish Tan Silty Sand	4.4	3.0	23.0	5.2		SM	
2	1	Brown Silty & Clayey Sands	7.8	3.4	23.6	5.9		SM-SC	
	3½	Lt. Reddish Silty & Clayey Sands	3.5	3.0	22.6	4.5		SM-SC	
	12	Same	4.1	Similar to Soil @ 3½-ft.				SM-SC	
	16 to 26	Reddish Tan Silty Sand	4.2	3.6	25.3	5.9		SM	

DYESS TESTING LABORATORY, INC.

SUMMARY OF TESTS

PROJECT A Landfill for the City of Amarillo, Texas

CLIENT City of Amarillo

Drilled on:
DATE: 8/30/79

BORING NO.	DEPTH FEET	TYPE OF MATERIAL	MOISTURE CONTENT %	LINEAR SHRINKAGE %	LIQUID LIMIT	PLASTICITY INDEX	NO. BLOWS	SOIL CLASSIFICATION	ALLOWABLE LOAD BEARING VALUE LBS./SQ FT
3	1	Dk. Brown Clayey Sand	12.5	6.2	30.1	12.3		SC	
	2	Lt. Reddish Tan Silty & Clayey Sands	3.4	3.3	23.9	5.9		SM-SC	
	8	4" Limestone Rock		Moderately Hard					
	10	Reddish Tan Silty Sand	3.5	3.0	23.2	5.1		SM	
	15 to 26	Lt. Reddish Tan Silty & Clayey Sands	3.4	3.0	22.8	4.6		SM-SC	
4	1	Dk. Brown Sandy Clay	12.4	5.6	27.9	9.1		CL	
	3	Brown Sandy Clay	5.2	5.5	26.3	8.7		CL	
	9	Dk. Tan Sandy Clay	5.0	5.6	28.0	9.0		CL	
	12	Reddish Tan Silty Sand	3.4	3.1	23.0	5.6		SM	
	* 15 to 26	Lt. Reddish Tan Silty & Clayey Sands	3.6	3.2	23.3	5.6		SM-SC	
	*4"	Limestone @ 18'							

DYESS TESTI LABORATORY, INC.

KEY TO CLASSIFICATION USED ON LOGS

MAJOR DIVISIONS			GROUP SYMBOLS	DESCRIPTIONS
COARSE-GRAINED SOILS More Than Half of Material is LARGER Than No. 200 Sieve Size.	GRAVELS More Than Half of Coarse Fraction is LARGER Than No. 4 Sieve Size.	Clean Gravels (Little or no Fines)	GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines.
			GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines.
		Gravels With Fines (Appreciable Amount of Fines)	GM	Silty Gravels, Gravel-Sand-Silt Mixtures.
			GC	Clayey Gravels; Gravel-Sand-Clay Mixtures.
	SANDS More Than Half of Coarse Fraction is SMALLER Than No. 4 Sieve Size.	Clean Sands (Little or no Fines)	SW	Well-Graded Sands, Gravelly Sands, Little or no Fines.
			SP	Poorly-Graded Sands, Gravelly Sands, Little or no Fines.
		Sands With Fines (Appreciable Amount of Fines)	SM	Silty Sands, Sand-Silt Mixtures.
			SC	Clayey Sands, Sand-Clay Mixtures.
FINE-GRAINED SOILS More Than Half of Material is SMALLER Than No. 200 Sieve Size.	SILTS and CLAYS Liquid Limit Less Than 50		ML	Inorganic Silts & Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity.
			CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy. Clays, Silty Clays, Lean Clays.
			OL	Organic Silts & Organic Silty Clays of Low Plasticity.
	SILTS and CLAYS Liquid Limit Greater Than 50		MH	Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils, Elastic Silts.
			CH	Inorganic Clays of High Plasticity, Fat Clays.
			OH	Organic Clays of Medium to High Plasticity, Organic Silts.
Highly Organic Soils			Pt	Peat & Other Highly Organic Soils

Ref. (Unified Soil Classification System) Corps of Engineers, U.S. ARMY, T.M. NO. 3-357

LOG OF BORING

PROJECT: A Landfill for the City of Amarillo, Texas
BORING NO.: 1 & 2
CLIENT: City of Amarillo - % Pat Christal
LOCATION: As Directed by Pat Christal
Date: 9/27/79
Ground Elevation: Existing

Legend: ▨ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
			BORING NO. 1
		▨	Reddish Tan Silty & Clayey Sands (SM-SC)
5 10		▨	Dk. Reddish Tan Silty Sand (SM)
15		▨	Dk. Reddish Tan Silty Sand (SM)
20		▨	Lt. Reddish Tan Silty & Clayey Sands (SM-SC)
25		▨	Dk. Reddish Tan Silty Sand (SM)
			Borings Nos. 1 & 2 were advanced to the 26-ft. depth without the use of drilling fluid. No groundwater or hard rock was encountered to the drilled depth.
			BORING NO. 2
		▨	Brown Silty & Clayey Sands (SM-SC)
5 10 15		▨ ▨	Lt. Reddish Silty & Clayey Sands (SM-SC)
20 25		▨	Reddish Tan Silty Sand (SM)

DYESS TESTING LABORATORY, Inc.

LOG OF BORING

PROJECT: A Landfill for the City of Amarillo, Texas
BORING NO.: 3 & 4
CLIENT: City of Amarillo - % Pat Christal
LOCATION: As Directed by Pat Christal
Date: 9/27/79
Ground Elevation: Existing

Legend: ▣ Sample   X Penetration   ▼ Water

Depth, Feet	Description of Stratum
	BORING NO. 3
	Dk. Brown Clayey Sand (SC)
5	Lt. Reddish Tan Silty & Clayey Sands (SM-SC)
	4" Limestone Rock
	Lt. Reddish Tan Silty & Clayey Sands (SM-SC)
10	Reddish Tan Silty Sand (SM)
15, 20, 25	Lt. Reddish Tan Silty & Clayey Sands (SM-SC)
	Borings No. 3 & 4 were advanced to the 26-ft. depth without the use of drilling fluid. No groundwater was encountered. Hard rock was encountered in both borings, in No. 3 @ 8' & in Boring No. 4 @ 18'
	BORING NO. 4
	Dk. Brown Sandy Clay (CL)
5	Brown Sandy Clay (CL)
10	Dk. Tan Sandy Clay (CL)
	Reddish Tan Silty Sand (SM)
15	Lt. Reddish Tan Silty & Clayey Sands
	4" Limestone
20, 25	Lt. Reddish Tan Silty & Clayey Sands

APPENDIX B
LIMITED GROUNDWATER CHARACTERIZATION INVESTIGATION

LIMITED GROUNDWATER CHARACTERIZATION INVESTIGATION

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL PERMIT NO. 73
POTTER COUNTY, TEXAS

Prepared by:

HDR Engineering, Inc.
12700 Hillcrest Road, Suite 125
Dallas, Texas 75230
(214) 960-4400

December 1994

Brad A. McCardell
Geologist
12/15/94

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL PERMIT NO. 73
POTTER COUNTY, TEXAS

TABLE OF CONTENTS

Table of Contents Cont.

Figures

Tables

Appendices

1.0 INTRODUCTION

The City of Amarillo operates a Type I Municipal Solid Waste Landfill (MSWL) under permit No. 73 issued by the Texas Department of Health, dated March 17, 1975. This report presents data collected during a limited groundwater characterization investigation at the existing facility. In conjunction with the groundwater data, a soils investigation report has been prepared by Dyess-Peterson Drilling and Testing, Inc. (Amarillo, Texas). Both of these reports were prepared to satisfy the requirements of Attachments 4 and 5 in the Texas Natural Resource Conservation Commission (TNRCC) MSWL 30 TAC 330 regluations.

The purpose of this limited groundwater characterization investigation was to 1) drill, sample borings, and install monitor wells to assess subsurface soil and groundwater conditions, and 2) bring the facility into compliance with the MSWL regulations for groundwater monitoring. The monitor wells were installed in accordance with the HDR Engineering, Inc (HDR) plan entitled, Groundwater Monitoring System Plan, For City of Amarillo Municipal Solid Waste Landfill Permit No. 73, Potter County, Texas, dated August 31, 1993 and approved by Mr. Dick Smith of the TNRCC (letter, dated December 14, 1993).

2.0 BACKGROUND

2.1 Site Conditions

The permitted landfill consists of one square mile of property located approximately 4 miles west of the City of Amarillo and two miles north of Interstate 40 (Figure 1). Currently, approximately 80 - 90 acres of property have been developed as landfill. Landfilling is currently taking place near the center of the one square mile and consists of an areal fill method (Figure 2).

Prior to this investigation, 19 borings were drilled during two geotechnical investiagtions conducted in February 1975 and August 1979. These two investigations focused on characterizing the soil conditions for development of the landfill. A groundwater ivestigation was not performed during either of these previous investigations. These two investigations indicated that the site consisted of a sandy clayey top soil that is underlain by sandy clay, silty sand, clayey sand, and caliche to the total depth drilled of 50 feet.

2.2 Physiography and Topography

The site lies within the Southern High Plains (High Plains) physiographic region in theTexas Panhandle (Figure 3). The High Plains ecompasses approximately 22,000 square miles and extends eastward where it is defined by a sharp escarpment several hundred feet high (Cronin, 1971). The Southern High Plains form a relatively flat plateau that slopes toward the southeast at approximately 10 feet per mile. The surficial deposits consist mainly of clays and loams (Nativ, 1988) and also sandy and silty loams and fine sandy loams (Knowles, 1984). Figure 4 shows a distribution of soil types within Potter County, Texas.

Immediately to the north of the site is the Canadian River Basin, which has eroded much of the overlying surficial material and created essentially a large valley or canyon feature. Several tributaries branch off the main system creating valley and plateau features which gives rise to a much more pronounced relief in this area compared to areas farther south on the High Plains.

The site topography ranges from approximately elevation 3,700 feet on the northern section to approximately 3,800 feet on the southern section (Figure 5). The majority of the site is fairly flat with little relief. However, the northern section of the property is dissected by three main drainage features that divert drainage from the site to the north. These drainage features are most likely associated with the Canandian River Basin. The change in relief on the northern section of the site can be as much as 100 feet.

2.3 Climate and Precipitation

The High Plains area is essentially characterized as a semi-arid climate with an average mean precipitation ranging from 13 to nearly 20 inches annually (NOAA, No. 81, 1992). According to the data collected for a 30 year average, precipitation averages approximately 19 inches annually in the Amarillo area (TxDOT, 1993). The greatest amount of rainfall occurs during the months of May through July. In the High Plains area, evaporation rates typically range from 60 to 91 inches annually. This portion of Texas is typically windy with an average velocity of 15.5 mph in the winter months. The average annual wind velocity is 13.7 mph.

2.4 Area Well Survey

A review of agency files was conducted to locate existing wells in the area of the landfill. The agency search consisted of reviewing file records from the TNRCC, Texas Department of Water Resources, and the Texas Water Development Board (TWDB). At least 23 wells are reported. Of the 23 wells reported, 14 wells are within a one-mile radius of the site. Three of the 23 wells are located on the western portion of the landfill property. The first well, No. 07-56-301, is used by the landfill periodically to control dust on the access roads; the second well, identification unknown, is used as a source of potable water, and the third well, identification unknown, is connected to a windmill that is not operational. Figure 6 shows the location of the wells relative to the landfill. Except for the wells on site, the remaining wells are used for irrigation purposes and draw water from the Ogallala Formation. One well (State No. 07-56-307) is also used as an observation well. This well is located just to the south of the landfill. Data from the TWDB indicates that the yields from these wells when they were installed ranged from 400 to 800 gallons per minute. Recent data is unavailable. Information for the wells found during the search is presented in Appendix A.

Water quality data collected from well No. 07-56-307 in 1980 indicated a total dissolved solids (TDS) concentration of 350 milligrams per liter (MGL).

3.0 REGIONAL GEOLOGY

3.1 Stratigraphy

The stratigraphy of the High Plains consists of deposits ranging in age from the Permian to Recent. In general, the deposits consist of sandstone, shales, limestones clays, sands, and windblown deposits of sands and clays near the surface. The primary water-bearing deposits in the High Plains area are usually from the Cretaceous and Tertiary deposits. Of these deposits, the Ogallala (Pliocene Age) and the Washita, Fredericksburg, and Trinity groups (Cretaceous Age) supply the majority of the usable water in the High Plains. The general stratigraphy for the area is summarized in Figure 7.

In the vicinity of the Amarillo area, the Jurassic and Cretaceous deposits are absent. The stratigraphy consists in general of the Ogallala Formation unconformably overlying rocks of Triassic and Permian Ages (Nativ, 1988). In the Amarillo area, the Ogallala Formation specifically overlies rocks of Triassic age (Figure 8). Directly overlying the Ogallala are deposists consisting primarily of silty sands, fine sands, clays, and loams of the Blackwater Draw Formation that have been deposited by either wind or fluvial deposition. Near the top of the Ogallala Formation, caliche is typically encountered which is usually referred to as the "Caprock". The caprock forms an east facing escarpment toward the eastern most extent of the High Plains area. Triassic deposits are exposed north of Amarillo along the Canadian River Basin where the Canadian River has eroded the overlying Ogallala Formation. The thickness of these deposits has been measured upto 150 feet along portions of the Canadian River valley. The Triassic deposits are of continental origin (Cronin, 1971) and have been named the "Dockum Group" and typically consist of varicolored shale to sandy shale, sandstone, and conglomerate. Depending on the location within the High Plains, the Dockum Group can be subdivided into at least three formations consisting of 1) Tecovas Formation (basal member), 2) Santa Rosa Formation (middle member), and

3) Chinle Formation (upper member). The Triassic deposits also are typically referred to as the "redbed" because of their reddish color throughout the section.

3.2 Depositional History

According to Seni (1980), the Ogallala Formation was deposited in a deltaic environment as a series of overlapping alluvial fans derived from deposits from the uplift of the southern Rocky Mountains to the west. Figure 9 shows a generalized depositional facies map of the Ogallala. Prior to the deposition of the Ogallala, streams originating from the west eroded the existing Permian, Triassic, Jurassic, and Cretaceous strata forming valleys and basins. The erosion of these strata occurred until at least late Miocene to early Pliocene at the time when the climate was arid.

The Dockum Group is of continental origin and is believed to have been deposited as river-channel and flood-plain deposits (Cronin, 1971). Seni, 1988 indicates the depositional setting involved braided and meandering streams, alluvial fan deltas, lacustrine deltas, lacustrine systems, and mud flats. These deposits were laid down in a basin feature that underwent folding prior to and after deposition. The resultant surface of the Triassic deposits was one of valleys and basins.

3.3 Structure

The site lies within the northern portion of the Palo Duro Basin, which is considered a small subbasin to the Permian Basin of southwest Texas (Gustavson and others, 1981). To the northeast is the Amarillo uplift and to the south is the Matador Arch. The uplifts are thought to have occurred as the result of movement along high-angle reverse faults. Faulting within the region created displacement of small blocks which in turn formed subbasins, such as the Palo Duro Basin and others in this area. Figure 10 shows a generalized structure map of the region.

4.0 REGIONAL HYDROGEOLGOY

4.1 Ogallala Formation

The Ogallala Formation (also called the High Plains aquifer) is the major aquifer of the High Plains area. In Texas, the areal extent of the Ogallala is approximately 111,000 square kilometers (Figure 11). The Ogallala consists primarily of fluvial unconsolidated clastic depostis of sand, silt, clay and basal gravel. As discussed in Section 3.2, the Ogallala was deposited as a series of overlapping alluvial fans or lobes. Seni, 1980 describes three distinct fan lobes consisting of 1) Dalhart-Amarillo, 2) Clovis-Plainview, and 3) Brownfield-Lubbock. The site lies within the Dalhart-Amarillo fan lobe.

Throughout much of the High Plains, the Ogallala Formation is unconfined (water table conditions). In the Amarillo area, the depth to groudwater is approximately 200 to 230 feet below ground surface and the saturated thickness ranges from 0 (near the Canadian Breaks) to approximately 100 feet (Mcreynolds, 1990). The Canadian River Basin as well as withdrawal of groundwater are controlling factors on the depth and saturated thickness. The regional groundwater flow direction is toward the south-southeast (Figure12) which is controlled by the structure of the High Plains. The rate of movement is on the order of 60 to 150 feet per year. The rate of movement is controlled by the gradient (approximately 0.008 ft/ft) and permeability of the material in the saturated zone. According to data presented by Knowles and others, 1984, transmissivities in the Ogallala range from approximately 315 to 201,000 gallons per day per foot (gpd/ft) with an average of 30,400 gpd/ft. In the Amarillo area, the transmissivities have been calculated to range from 6,000 to 7,000 gpd/ft (Cronin, 1971). The data presented by Cronin is in agreement with aquifer test data published by the Texas Water Development Board, Report 98 for wells in nearby Randall County. The hydraulic conductivity can range from several hundred to over 1,000 gallons per day per square foot (gpd/ft^2). Based on data published by Nativ, 1988, from an aquifer test conducted near the Randall/Potter County line, the hydraulic conductivity was approximately less than or equal to 200 gpd/ft^2.

Recharge to the Ogallala Formation is usually small. According to data published by Knowles and others, 1984, an average of less than 0.2 inches of water reaches the water table as natural recharge. Areas where natural recharge is the highest are usually associated with where the Ogallala outcrops and caliche layers are absent, through Quaternary deposits that overlie the Ogallala, and potentially along river channels of flowing streams.

Discharge from the Ogallala occurs through natural outlets such as seeps and springs or as leakage to the underlying formations (Nativ, 1988). Similar chemical composition between the Ogallala aquifer and underlying formations that the Ogallala is in contact with suggest that flow between the Ogallala and deeper aquifers does occur. Pumping, however accounts for the greatest amount of discharge from the Ogallala.

4.1.1 Water Quality

The water quality of the Ogallala aquifer is acceptable for numerous applications. Generally, the concentrations of total dissolved solids and chloride increase from north to south on the High Plains. This is usually caused by a thinning of the aquifer and its shallower depths which make it susceptible to surface contamination from various activities. Total dissolved solids (TDS) in the Amarillo area as reported by Nativ, 1988 and Knowles and others, 1984 indicate that TDS are around 400 milligrams per liter (mg/L). Chemical data collected in August 1980 from well 07-56-307 , located just south of the site, indicated a TDS and chloride concentration of 350 and 7 mg/L, respectively. More recent data collected in September 1988 from well 06-49-101, located approximately one mile east of the site, indicated TDS and chloride concentrations of 321 and 4 mg/L, respectively. These values are well within acceptable drinking water limits.

4.2 Dockum Group

The Dockum Group is divided into at least three distinct formations. The lowermost or basal formation is the Tecovas Formation that consists of shales and clays. In localized areas the Tecovas contains lenses of fine-grained sandstone and conglomerates. The middle member is the Santa Rosa Sandstone, which is the major water-producing unit within the Dockum Group. The Santa Rosa consists of fine to coarse-grained, cross-bedded sandstone and conglomerate with interbedded shale and clay (Knowles and others, 1984). The upper formation is the Chinle Formation that consists of clays and shales. In certain areas of the section, thin layers of micaceous sandstone and conglomerate are present, which can yield small quantities of water.

The water-bearing formations of the Dockum Group are under confined conditions, except where the formation outcrops toward the east and Canadian River Basin. Groundwater flow is generally toward the east-southeast direction. Over most of the High Plains, the Dockum Group is not in hydraulic communication with the overlying Ogallala or the Cretaceous Edwards/Trinity Group. This is because of the potentiometric head difference between the Dockum Group and overlying aquifers. Also, the chemical makeup of the water between the aquifers indicates that hydraulic connection is not occurring. In the Amarillo area, the head difference between the Ogallala and underlying Dockum Group is approximately 200 feet (Dutton and others, 1986 and Nativ, 1988). Other areas within the High Plains suggest hydraulic interconnection. Recharge to the Dockum Group is negligible and according to data published by Dutton and others, 1986 it may be as low as 0.188 inches per year. Dutton and others, 1986 suggest that recharge to the Dockum Group may come from the overlying Ogallala and Edward/Trinity Formations where a downward component of flow occurs. Recharge from precipitation on the outcrop is also believed to be negligible (Dutton and others, 1986).

Water quality within the Dockum Group tends to be variable depending on it's location, but generally is considered poor because of mineralization.

5.0 SITE CONDITIONS

5.1 Groundwater Level Measurements

The groundwater encountered on site is from the Ogallala Formation. No perched groundwater above the saturated zone of the Ogallala was encountered during the drilling program. Groundwater was encountered in the eleven borings ranging from approximately 143 to 148 feet below ground surface (bgs) on the northern portion of the site to approximately 205 to 215 feet bgs on the southern portion of the site. Groundwater level measurements have been collected in the monitor wells since July 1994. Since September 20, 1994, water level measurements have been collected once a week. Table 1 summarizes the post-development stabilized groundwater elevations from July to December 7, 1994. Groundwater elevations range from approximately 3,614 feet in MW-5 to approximately 3,590 feet in MW-1 through MW-3. Hydrographs for the wells are shown on Figures 13 and 14. Except for two measurements for P-3 on October 5 and 12, 1994, the water level readings are fairly consistent for all of the wells. The two measurements for P-3 are believed to be measurement errors. The groundwater elevations are in agreement with the data in the Hydrologic Atlas for Potter County, Texas, published by the High Plains Underground Water Conservtion District No. 1 (HPUWCD).

5.1.1 Groundwater Flow and Gradients

Groundwater level measurements for three dates, September 28, October 12, and October 26, 1994 are plotted on Figures 15 through 17). The data indicates that the groundwater flow is toward the southwest in the northern portion of the site and then becomes more southerly toward the southern portion of the site. Groundwater flow on the southern portion of the site is in good agreement with regional maps from the HPUWCD. The gradient in the northern portion of the site ranges from approximately 0.005 to 0.007ft/ft, and in the southern portion of the site the gradient is approximately 0.003 ft/ft. Variations in the gradient for the Ogallala are not uncommon because of the depositional history of the formation. Since the Ogallala was deposited on an irregular surface consisting of valleys and ridges, the thickness of the formation is not uniform which can cause variations in the hydraulic properties. In addition, groundwater withdrawal from pumping can also cause variations in the gradient and flow direction over time.

5.2 Aquifer Testing

On September 20 and 21, 1994, Slug tests were conducted in wells MW-2, MW-3, MW-6, P-1, P-2, and P-3 to estimate the horizontal hydraulic conductivity. The procedure involved lowering a submersible pump in the wells and pumping them for approximately one hour. The discharge rate was checked periodically during pumping. After one hour the pump was shut off and the water level recovery was measured using an electric well sounder and a Hermit 2000 data logger. The rate of recovery was measured until the water level was nearly equal to the static level prior to pumping. The data was analyzed using Hvorslev's Method G, Bouwer and Rice (1976), and an equilibrium well equation (Driscoll, 1986). Table 2 summarizes the results of the slug tests. The data and calculations are presented in Appendix B.

The results of the hydraulic conductivity using the Bouwer and Rice method range from approximately 6.58×10^{-4} centimeters per second (cm/sec) in well MW- 3 to approximately 1.47×10^{-3} cm/sec in well P-1. The results using the Hvorslev method range from approximately 1.80×10^{-4} cm/sec in well MW-3 to approximately 3.77×10^{-2} cm/sec in well P-1. The two methods show comparable results. When the two methods are averaged, the hydraulic conductivity ranges from 4.52×10^{-4} cm/sec in well MW-3 to 1.96×10^{-2} cm/sec in well P-1. These average values are in the range of fine-grained sand to silty sand mixtures. An equilibrium equation (Driscoll, 1986) was also used to compare the results. The results from the equilibrium equation are comparable to the other two methods.

5.3 Estimated Groundwater Velocity

Based on the slug test values for the two methods, an estimated rate of groundwater movement can be calculated using a variation of Darcy's equation. Using an effective porosity of approximately 30 percent and a hydraulic gradient of 0.006 ft/ft calculated for the northern portion of the site and 0.003 ft/ft for the southern portion of the site, the flow velocity ranges from approximately 20 to 50 feet per year.

$$K = \frac{K i}{n}$$

K = Hydraulic Conductivity, 2.01×10^{-3} (north) 5.54×10^{-3} (south), cm/sec
i = Hydraulic Gradient, 0.006 ft/ft (north), 0.003 ft/ft (south)
n = Effective Porosity, 0.30

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9) Texas Department of Transportation, Climate Data for Texas, September 1993.

10) Soil Survey of Potter County, Texas, USDA SCS, Feb. 1980.

TABLE 1

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

GROUNDWATER ELEVATIONS

DATE MEASURED

WELL NO.	ELEVATION (FT) TOC	7/26/94	8/9/94	8/10/94	8/15/94	8/17/94	8/19/94	8/23/94	8/24/94	9/20/94
MW-1	3816.82	NA	NA	3599.07	3594.42	3592.22	NA	NA	NA	3590.24
MW-2	3809.54	3593.14	3593.04	NA	NA	3592.94	NA	NA	NA	3590.44
MW-3	3792.72	NA	3591.12	NA	NA	3592.17	NA	NA	NA	NA
MW-4	3750.26	NA	NA	NA	NA	3597.87	NA	NA	NA	3596.26
MW-5	3737.39	NA	NA	NA	NA	NA	NA	3617.34	3617.09	3613.78
MW-6	3750.40	NA	NA	NA	NA	NA	3603.90	NA	3603.88	3601.55
P-1	3812.31	NA	3596.96	NA	NA	3596.98	NA	NA	NA	3595.12
P-2	3797.95	NA	3597.49	NA	NA	3597.49	NA	NA	NA	3594.75
P-3	3746.34	NA	3545.88	NA	NA	3545.88	NA	NA	NA	3599.57

TABLE 1 cont.

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

GROUNDWATER ELEVATIONS

DATE MEASURED

WELL NO.	ELEVATION (FT) TOC	9/28/94	10/5/94	10/12/94	10/19/94	10/26/94	10/31/94	11/9/94	11/16/94	11/23/94
MW-1	3816.82	3588.65	3590.32	3590.27	3590.32	3590.27	3590.22	3590.17	3590.22	3590.22
MW-2	3809.54	3587.34	3590.44	3590.44	3590.44	3590.44	3590.39	3590.39	3590.39	3590.34
MW-3	3792.72	3588.98	3590.12	3590.07	3590.12	3590.12	3589.97	3589.97	3590.02	3590.02
MW-4	3750.26	3595.69	3596.51	3596.56	3596.51	3596.66	3596.66	3596.76	3596.81	3596.91
MW-5	3737.39	3613.03	3613.84	3613.89	3613.84	3613.94	3613.99	3614.09	3614.24	3614.34
MW-6	3750.40	3601.06	3601.55	3601.55	3601.55	3601.50	3601.50	3601.50	3601.45	3601.45
P-1	3812.31	3594.51	3595.20	3595.01	3595.11	3595.16	3594.96	3595.01	3595.06	3595.11
P-2	3797.95	3594.11	3594.80	3594.75	3594.75	3594.80	3594.65	3594.65	3594.75	3594.75
P-3	3746.34	3599.24	3597.59	3597.54	3599.59	3599.54	3599.44	3599.44	3599.44	3599.49

TABLE 1 cont.

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

GROUNDWATER ELEVATIONS

DATE MEASURED

WELL NO.	ELEVATION (FT) TOC	11/30/94	12/7/94							
MW-1	3816.82	3589.92	3590.12							
MW-2	3809.54	3590.34	3590.24							
MW-3	3792.72	3590.02	3590.02							
MW-4	3750.26	3597.06	3597.06							
MW-5	3737.39	3614.39	3614.39							
MW-6	3750.40	3601.45	3601.40							
P-1	3812.31	3595.01	3594.65							
P-2	3797.95	3594.75	3594.65							
P-3	3746.34	3599.44	3599.39							

TABLE 2

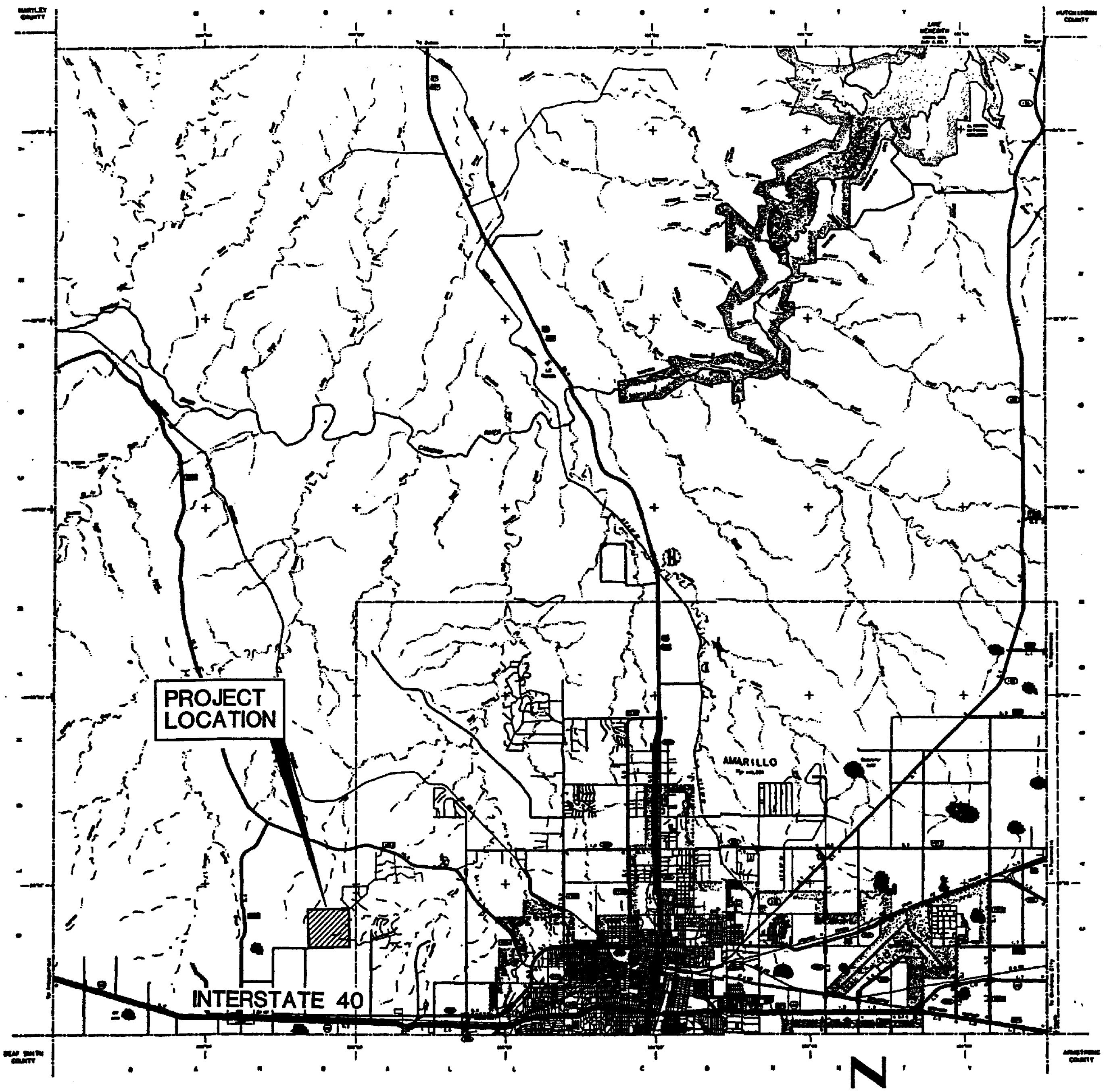
SUMMARY OF SLUG TESTING RESULTS

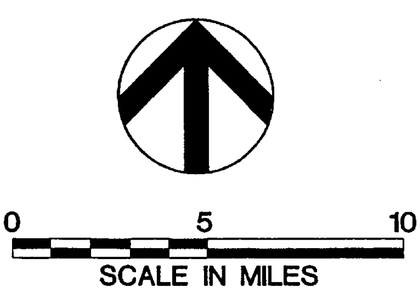
Well No.	Bouwer and Rice	Hvorslev Method G	Equilibrium Well Equation
MW-2	6.58×10^{-4}	1.32×10^{-3}	3.34×10^{-3}
MW-3	7.24×10^{-4}	1.80×10^{-4}	4.40×10^{-4}
MW-6	1.35×10^{-3}	1.33×10^{-3}	3.30×10^{-3}
P-1	1.47×10^{-3}	3.77×10^{-2}	-------
P-2	1.25×10^{-3}	1.03×10^{-3}	-------
P-3	1.09×10^{-3}	4.28×10^{-3}	3.77×10^{-3}

AVERAGE OF THE BOUWER AND RICE AND HVORSLEV METHODS

MW-2	9.89×10^{-4}
MW-3	4.52×10^{-4}
MW-6	1.34×10^{-3}
P-1	1.96×10^{-2}
P-2	1.14×10^{-3}
P-3	2.69×10^{-3}

All values reported in centimeters per second (cm/sec)





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GENERAL HIGHWAY MAP,
POTTER COUNTY, TEXAS
1989

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CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

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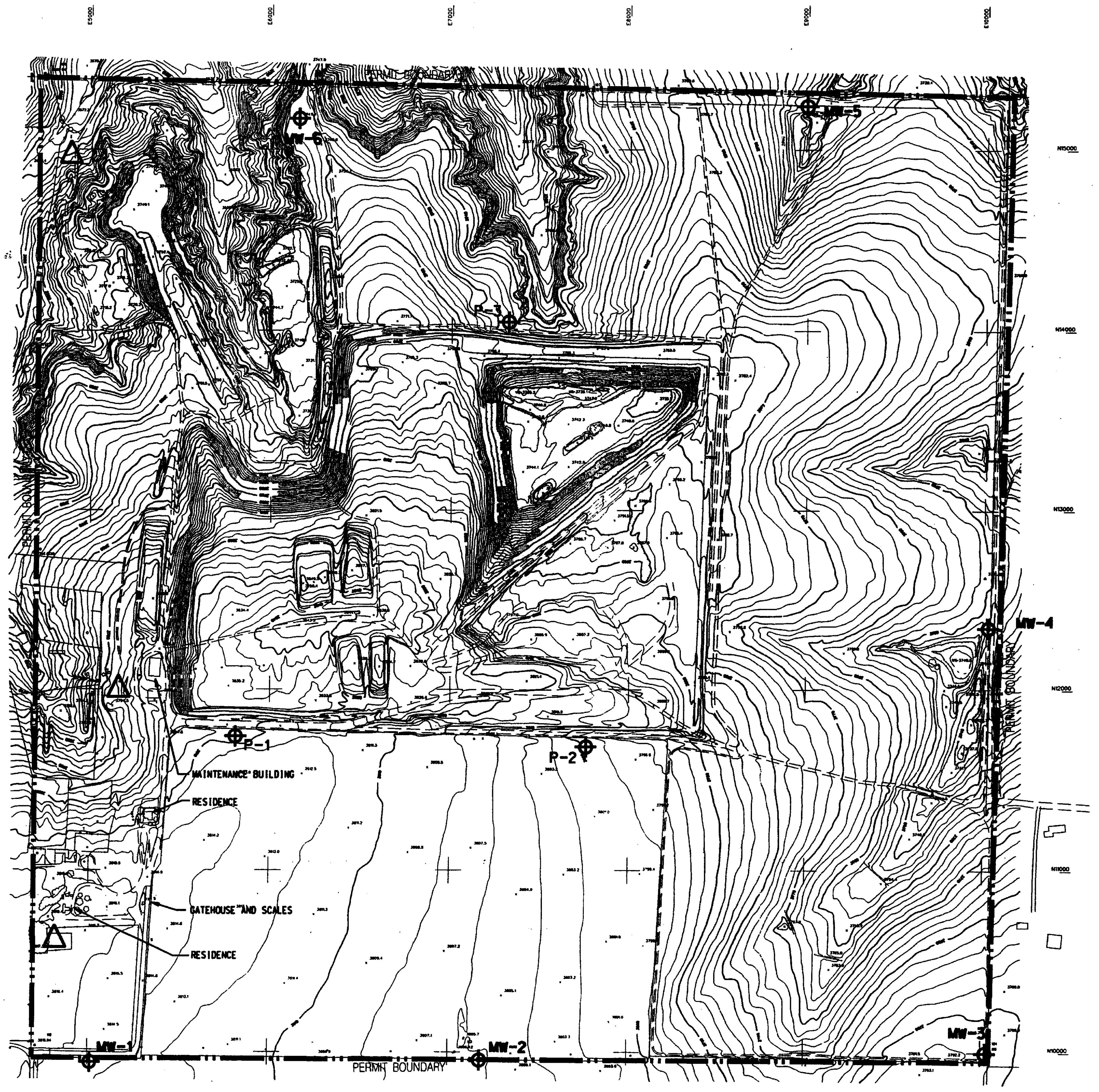

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△	EXISTING WATER WELLS
⊕	MONITOR WELL LOCATION
━ ▪ ▪ ▪	PERMIT BOUNDARY

NOTES

1. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY UNITED AERIAL MAPPING, SAN ANTONIO, TEXAS FROM AERIAL PHOTOGRAPHY DATED MARCH 9,1993. VERTICAL DATUM BASED ON MEAN SEA LEVEL. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO, COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.

2. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.

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HDR Engineering, Inc.

CITY OF AMARILLO
MUNICIPAL LANDFILL

SITE MAP

Project Manager
T. HOTCHKISS

Designed
HDR

Drafted
HDR

Checked

Project Number
06625-015-037

Date
NOVEMBER, 1994

Issue

Figure Number
2

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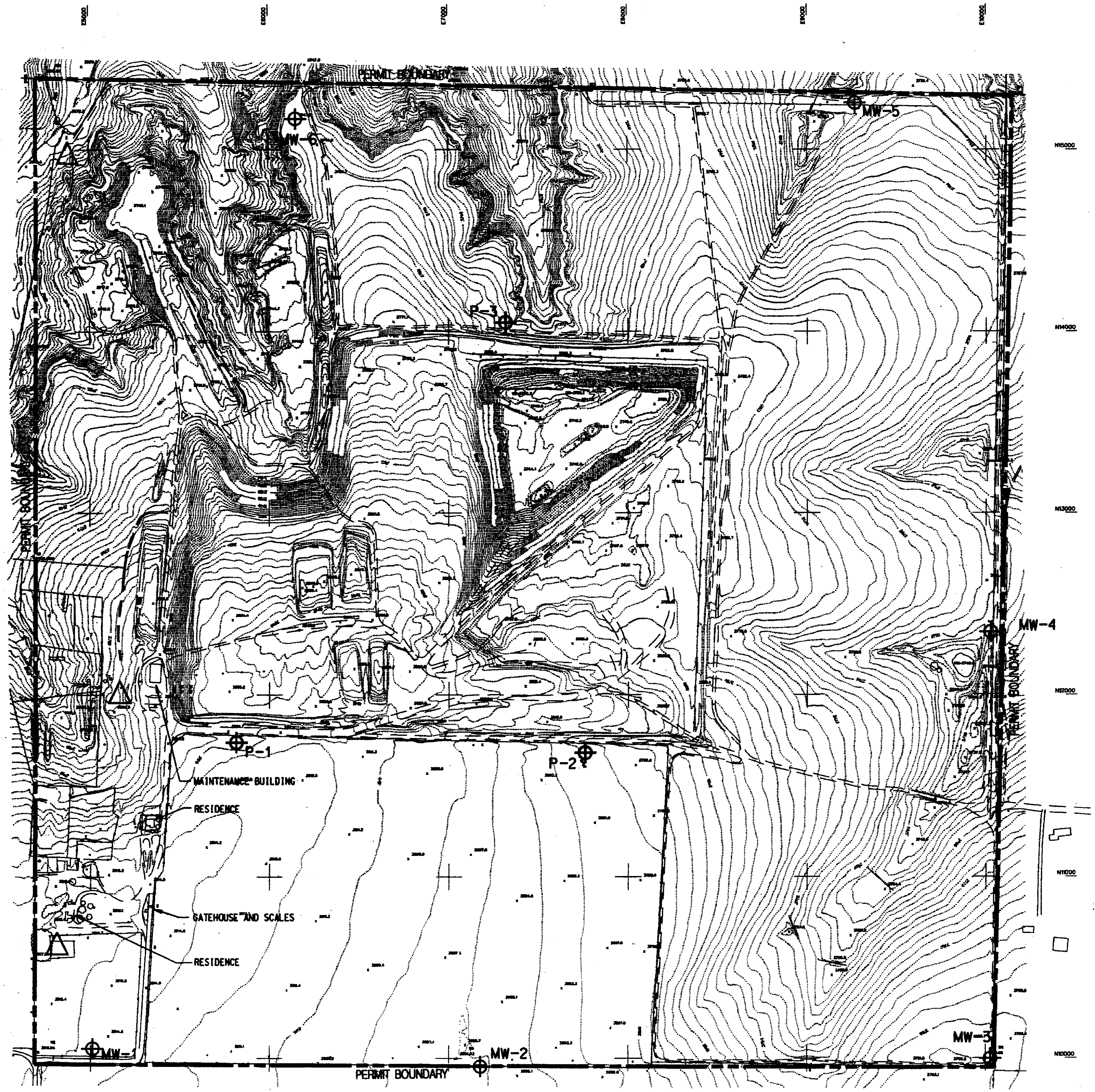

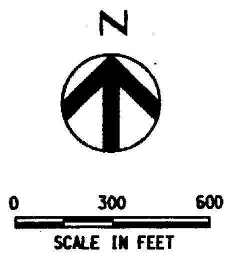

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CITY OF AMARILLO
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

SITE MAP

LEGEND

△	EXISTING WATER WELLS
⌖	MONITOR WELL LOCATION
▬	PERMIT BOUNDARY

NOTES

1. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY UNITED AERIAL MAPPING. SAN ANTONIO. TEXAS FROM AERIAL PHOTOGRAPHY DATED MARCH 9.1993. VERTICAL DATUM BASED ON MEAN SEA LEVEL. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO. COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.

2. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.

Project Manager	T. HOTCHKISS
Designed	HDR
Drafted	HDR
Checked	
Project Number	06625-015-037
Date	DECEMBER, 1994 NOVEMBER, 1994

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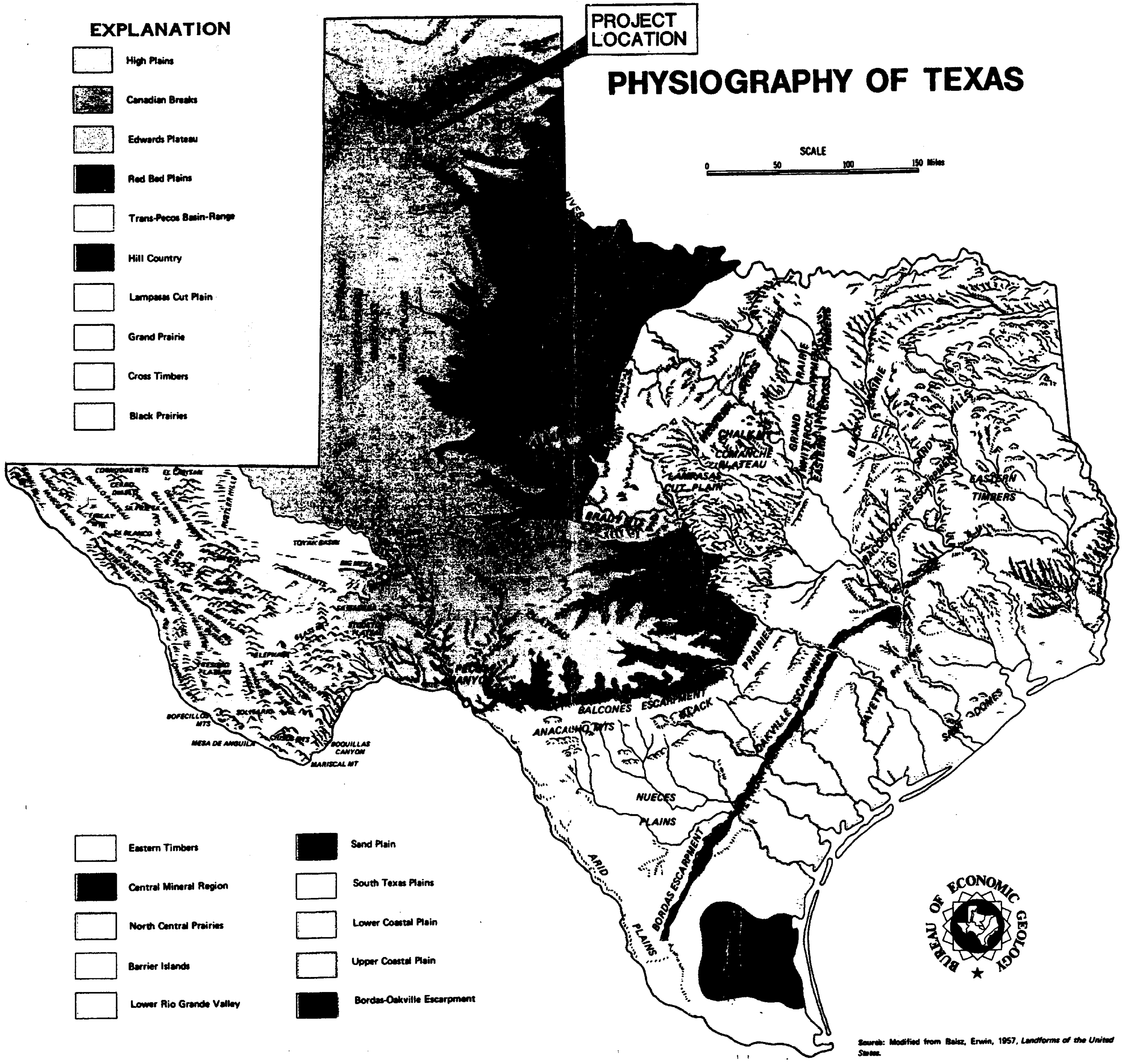
PHYSIOGRAPHY OF TEXAS



EXPLANATION

☐ High Plains
▨ Canadian Breaks
▨ Edwards Plateau
■ Red Bed Plains
☐ Trans-Pecos Basin-Range
■ Hill Country
☐ Lampasas Cut Plain
☐ Grand Prairie
☐ Cross Timbers
☐ Black Prairies
☐ Eastern Timbers
■ Central Mineral Region
☐ North Central Prairies
☐ Barrier Islands
☐ Lower Rio Grande Valley
■ Sand Plain
☐ South Texas Plains
☐ Lower Coastal Plain
☐ Upper Coastal Plain
■ Bordas-Oakville Escarpment

Source: Modified from Raisz, Erwin, 1957, *Landforms of the United States.*

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CITY OF AMARILLO
MUNICIPAL LANDFILL

PHYSIOGRAPHIC MAP

Project Manager
T. HOTCHKISS
Designed
HDR
Drafted
HDR
Checked

Project Number
06625-015-037
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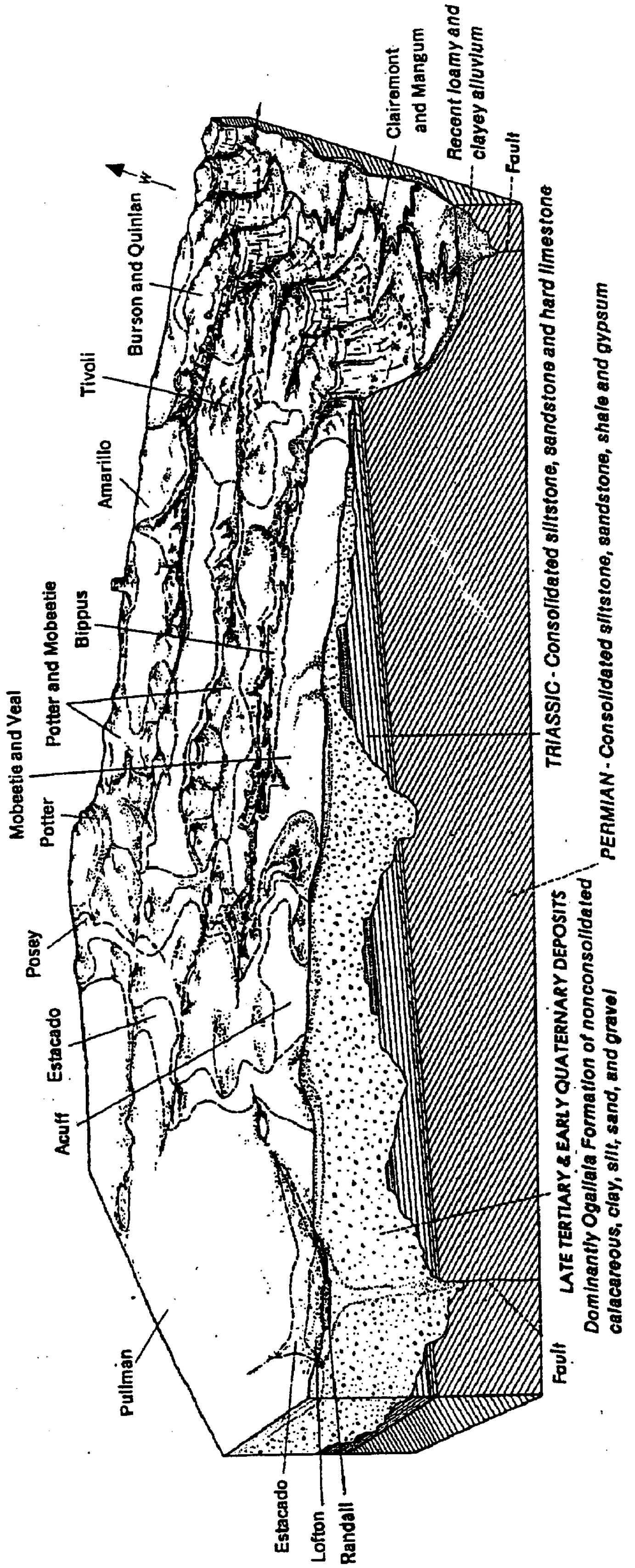
NOVEMBER, 1994
Issue

Figure Number
3



Pattern of soils in Potter County.

MAP SOURCE:
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY OF POTTER COUNTY, FEBRUARY, 1980

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CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

DISTRIBUTION OF SOIL TYPES

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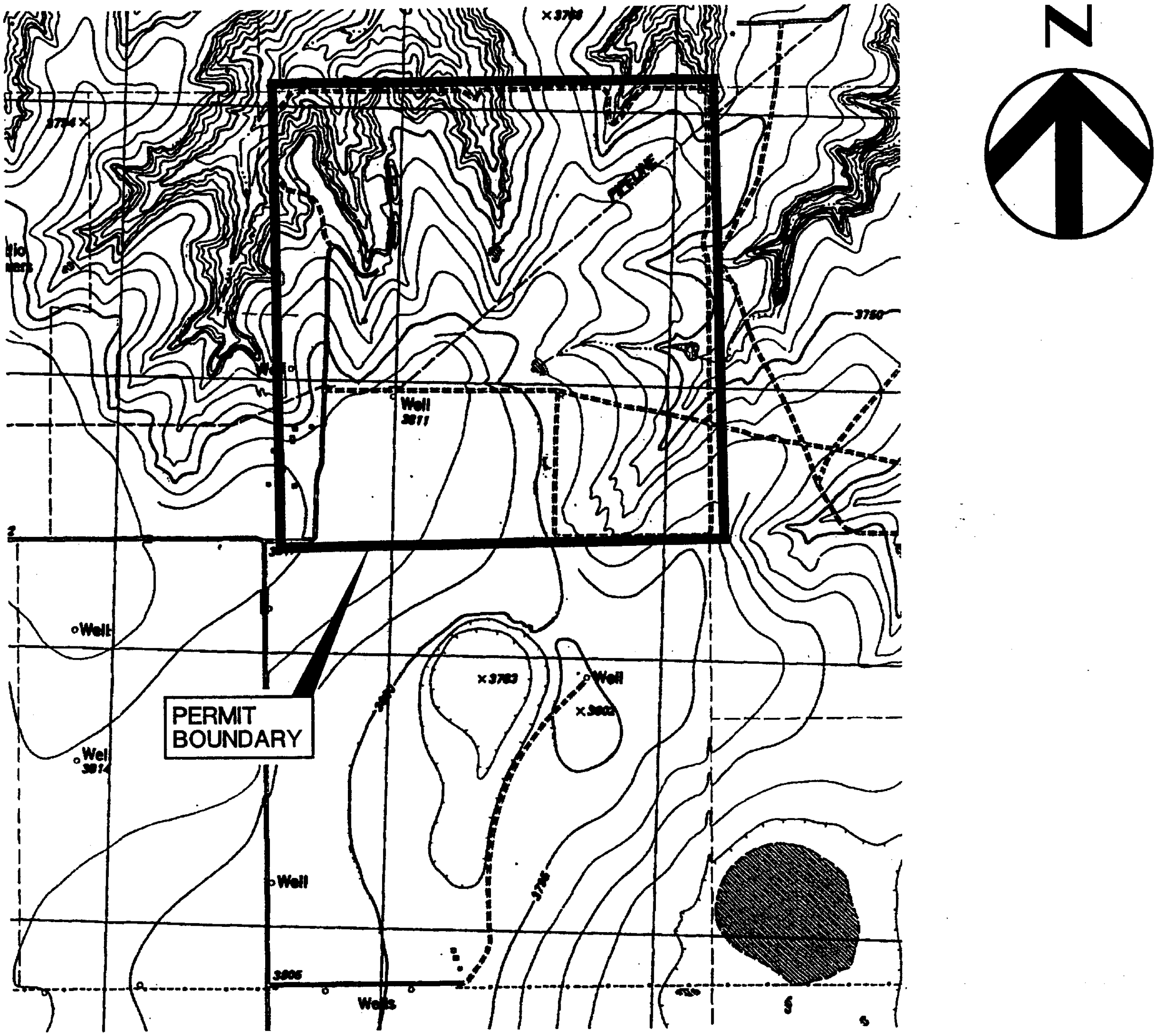

MAP SOURCE:
USGS 7.5 MINUTE QUADRANGLE, BUSHLAND, TEXAS, 1984

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CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

TOPOGRAPHIC MAP

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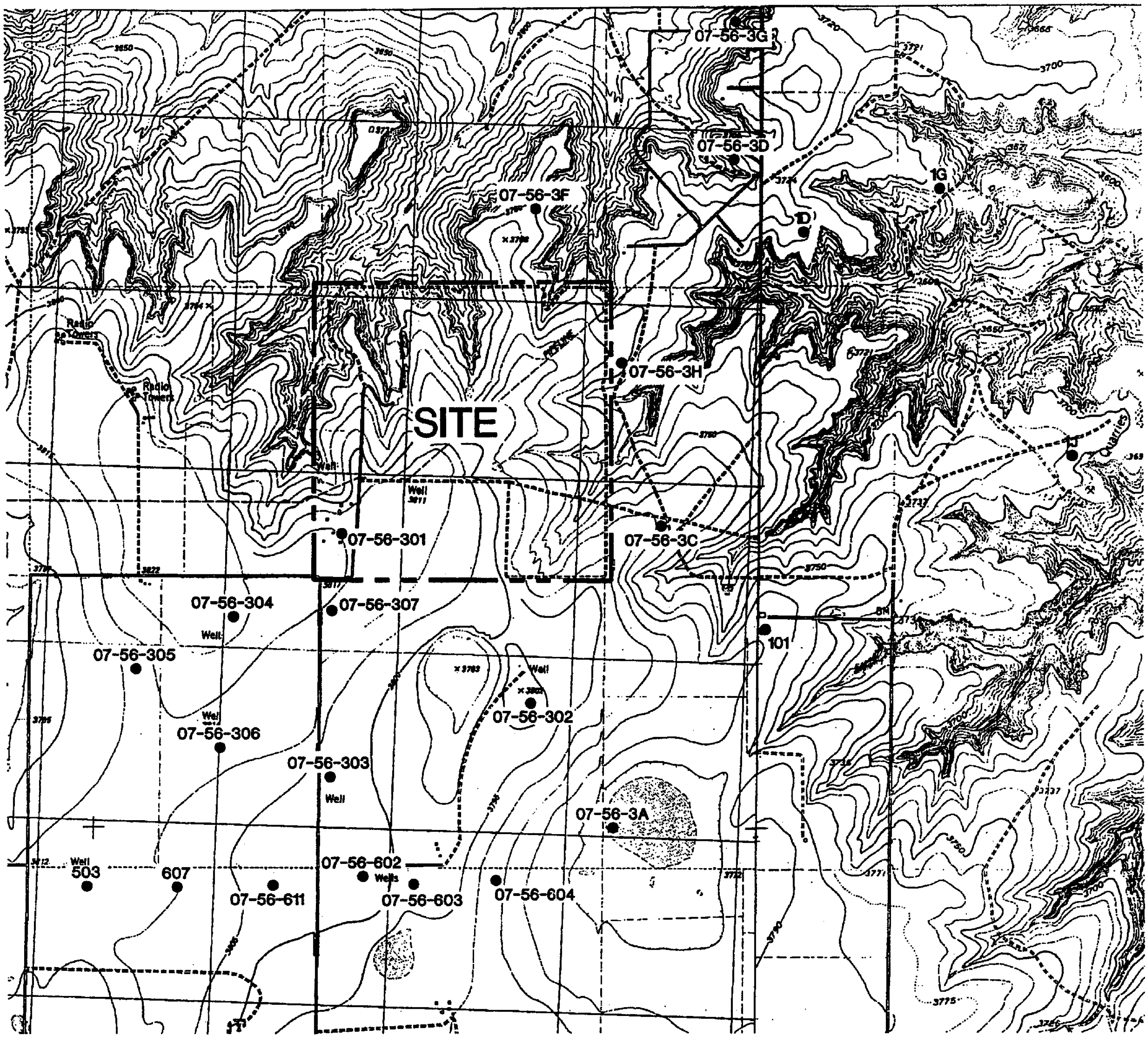

MAP SOURCES:
USGS 7.5 MINUTE QUADRANGLES
BUSHLAND, TEXAS, 1984
AMARILLO WEST, TEXAS, 1960
(PHOTOREVISED 1967 AND 1973)

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CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

AREA WELL SURVEY

Date
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System	Series	Formation or Group	Thickness (feet)	Lithologic Description	Water Supply
Quaternary	Recent		0–15	Chiefly Windblown sand and silt.	Yields no water to wells. Sandy areas form excellent recharge facilities.
	Pleistocene		0–144	Sand, clay, diatomaceous earth, volcanic ash, limestone.	Mostly above water table. Does not yield large supplies.
Tertiary	Pliocene	Ogallala Formation	0–500	Fine to coarse sand and gravel; clay, silt, and caliche.	Yields large supplies of water throughout the Southern High Plains
Cretaceous		Not present in Amarillo area.	Unconformity		
Triassic		Dockum Group Tecovas Formation Santa Rosa sand–stone Chinle Formation equivalent	150–1800+	Varicolored shale and sandy shale, gray or brown crossbedded sandstone and conglomerate.	Probably capable of yielding small to moderate supplies of water; most of the water is at least slightly saline.
Permian		Not present in Amarillo area.			

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DEPOSITIONAL SYSTEMS,*
OGALLALA FORMATION, TEXAS
REPORT NO. 105, 1980

HDR

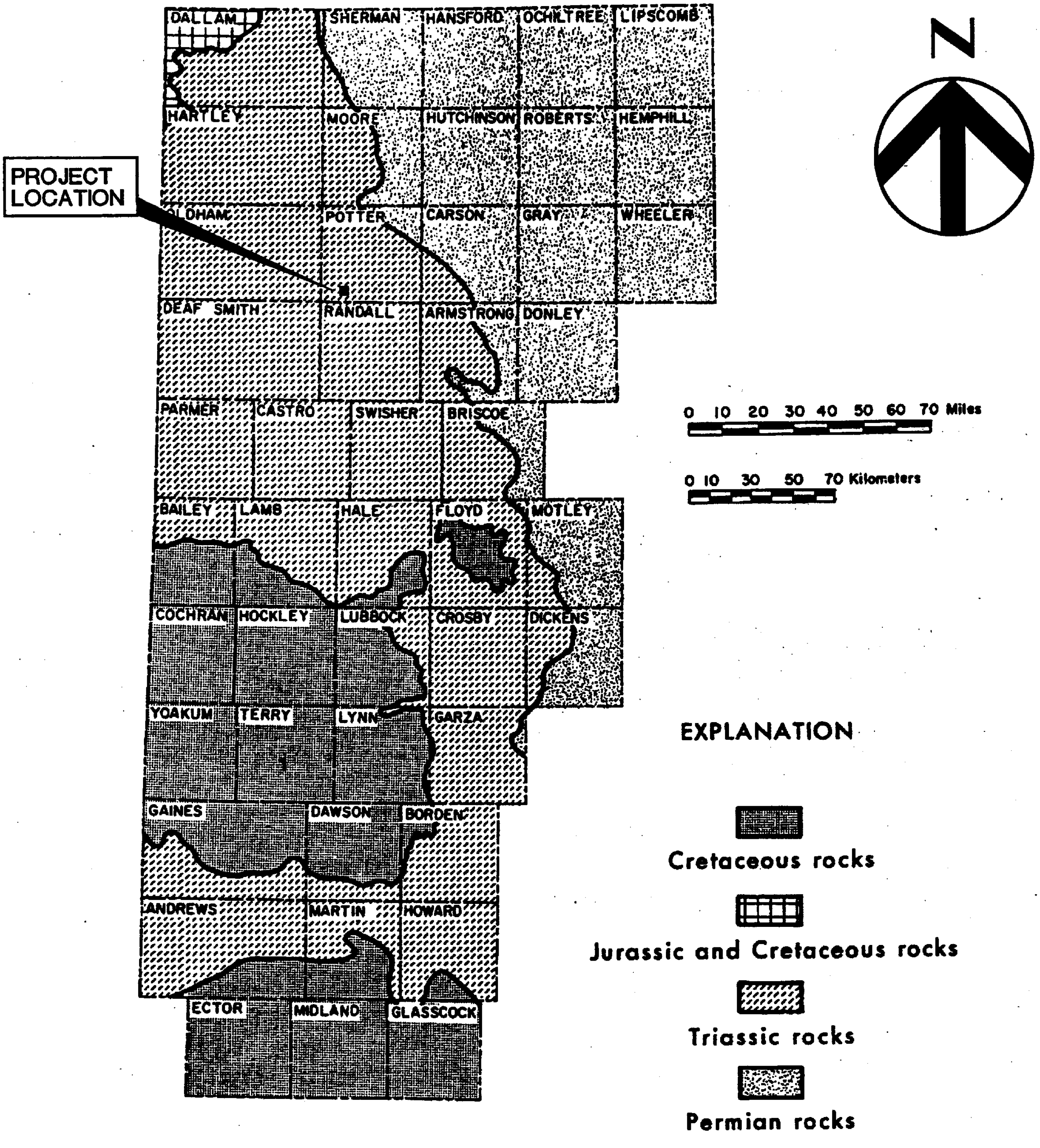
HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

GENERALIZED STRATIGRAPHY

Date
11/94

Figure
7



MAP SOURCE:
EVALUATING THE GROUNDWATER RESOURCES OF THE HIGH PLAINS OF TEXAS,
REPORT 288, VOL. I, MAY, 1984.
TEXAS DEPARTMENT OF WATER RESOURCES

HDR

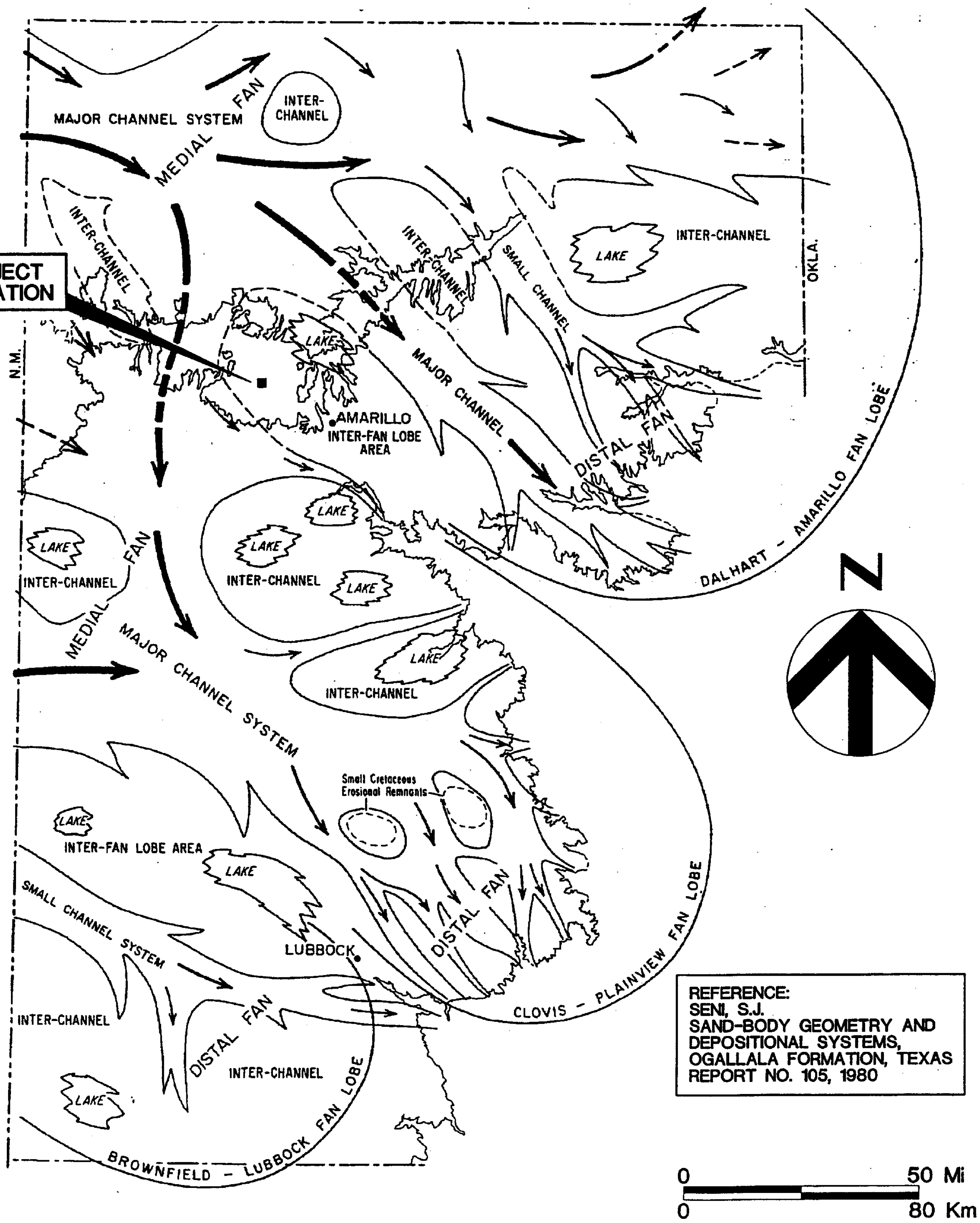
HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
GEOLOGIC UNITS UNDERLYING
THE OGALLALA FORMATION

Date
11/94

Figure
8

FILENAME: E:\AMARILLO\DWG\AMAFIG2



REFERENCE:
SENI, S.J.
SAND-BODY GEOMETRY AND DEPOSITIONAL SYSTEMS, OGALLALA FORMATION, TEXAS
REPORT NO. 105, 1980

FILENAME: \AMARILLO\DWG\AMADPFAC

HDR

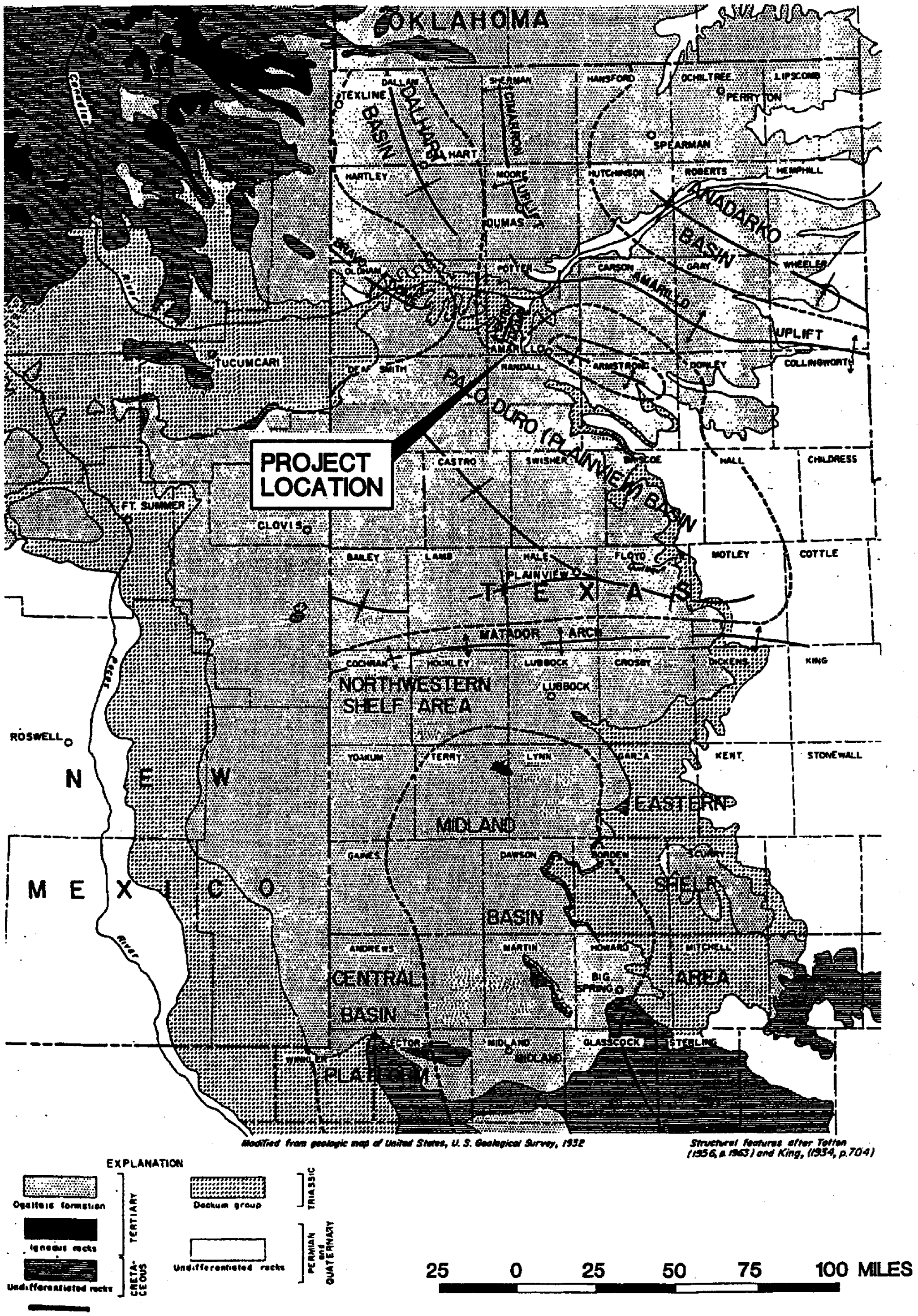
HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

DEPOSITIONAL FACIES MAP

Date
11/94

Figure
9



Modified from geologic map of United States, U. S. Geological Survey, 1932

Structural features after Totten (1956, p.1963) and King, (1934, p.704)

REFERENCE: CRONIN, J.G.
A SUMMARY OF THE OCCURRENCE AND DEVELOPMENT
OF GROUNDWATER IN THE SOUTHERN HIGH PLAINS
OF TEXAS, TEXAS BOARD OF WATER ENGINEERS,
BULLETIN 6107, 1971.

HDR

HDR Engineering, Inc.

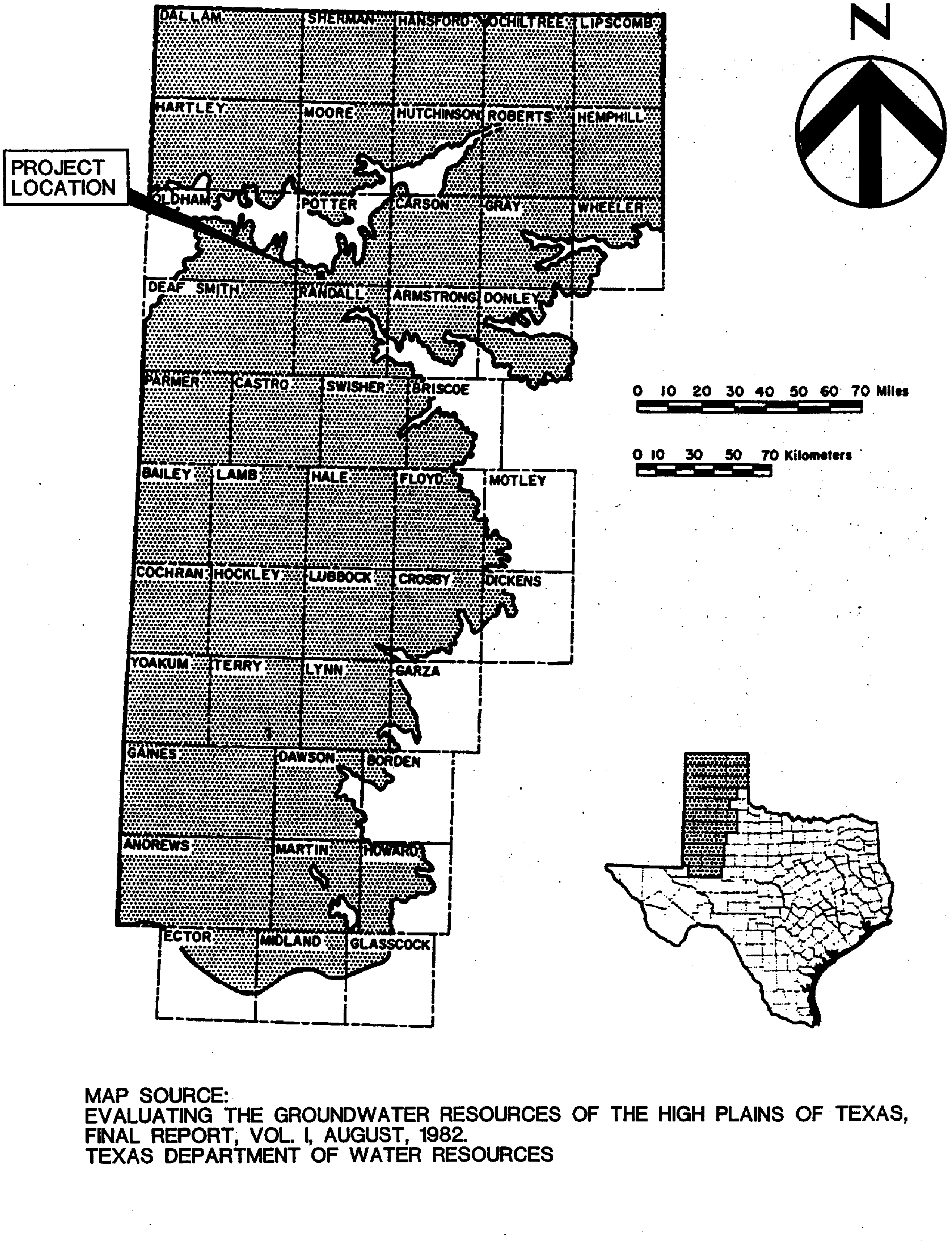
CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

REGIONAL STRUCTURE MAP

Date
11/94

Figure
10

FILENAME: AMARGSTC



MAP SOURCE:
EVALUATING THE GROUNDWATER RESOURCES OF THE HIGH PLAINS OF TEXAS,
FINAL REPORT, VOL. I, AUGUST, 1982.
TEXAS DEPARTMENT OF WATER RESOURCES

HDR

HDR Engineering, Inc.

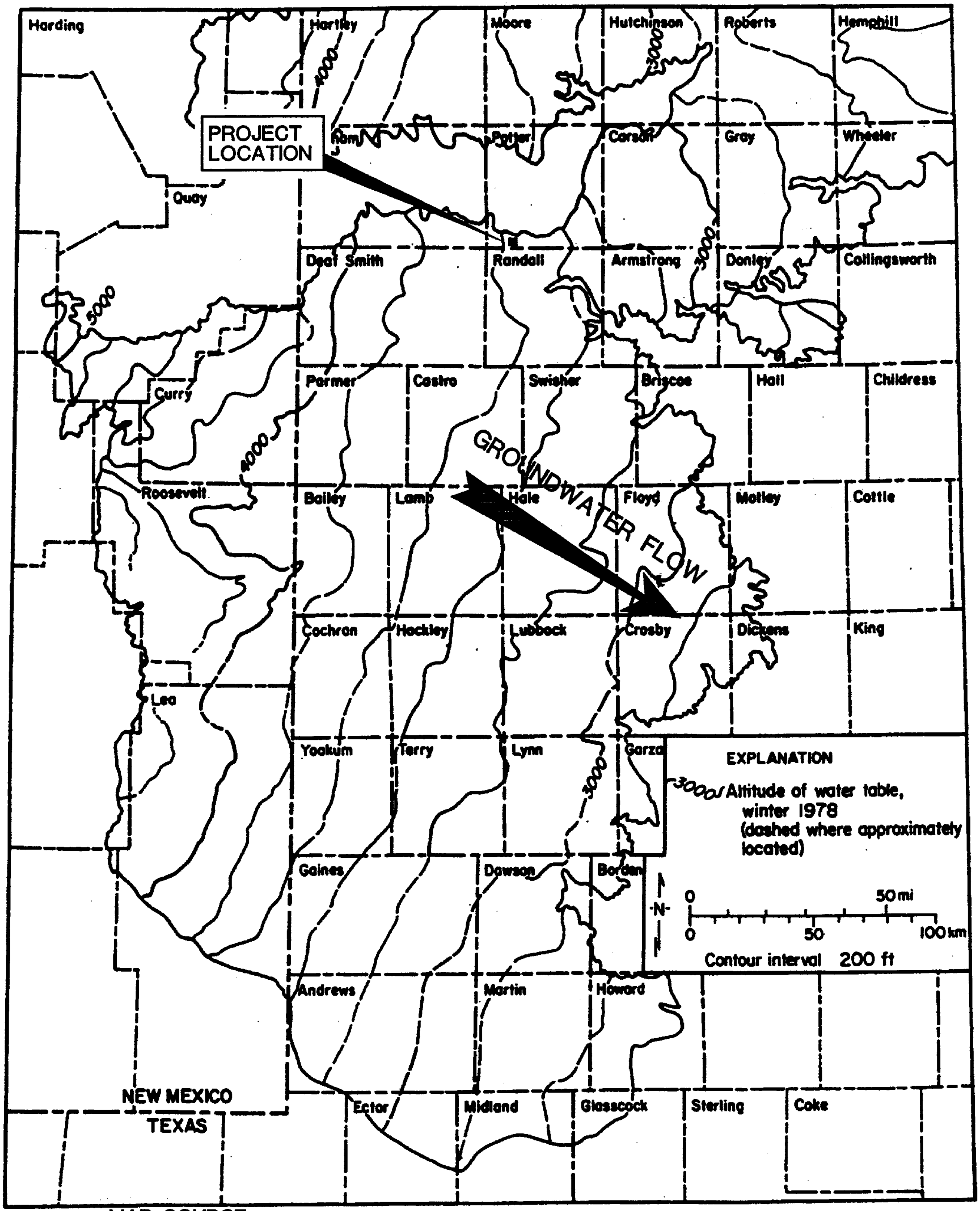
CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

HIGH PLAINS AQUIFER

Date
11/94

Figure
11

FILENAME: L:\AMARILLO\DWG\AMAFIG1



MAP SOURCE:
HYDROGEOLOGY AND HYDROCHEMISTRYOF THE OGALLALA AQUIFER, SOUTHERN HIGH PLAINS, TEXAS PANHANDLE AND EASTERN NEW MEXICO, 1988.
BUREAU OF ECONOMIC GEOLOGY

HDR

HDR Engineering, Inc.

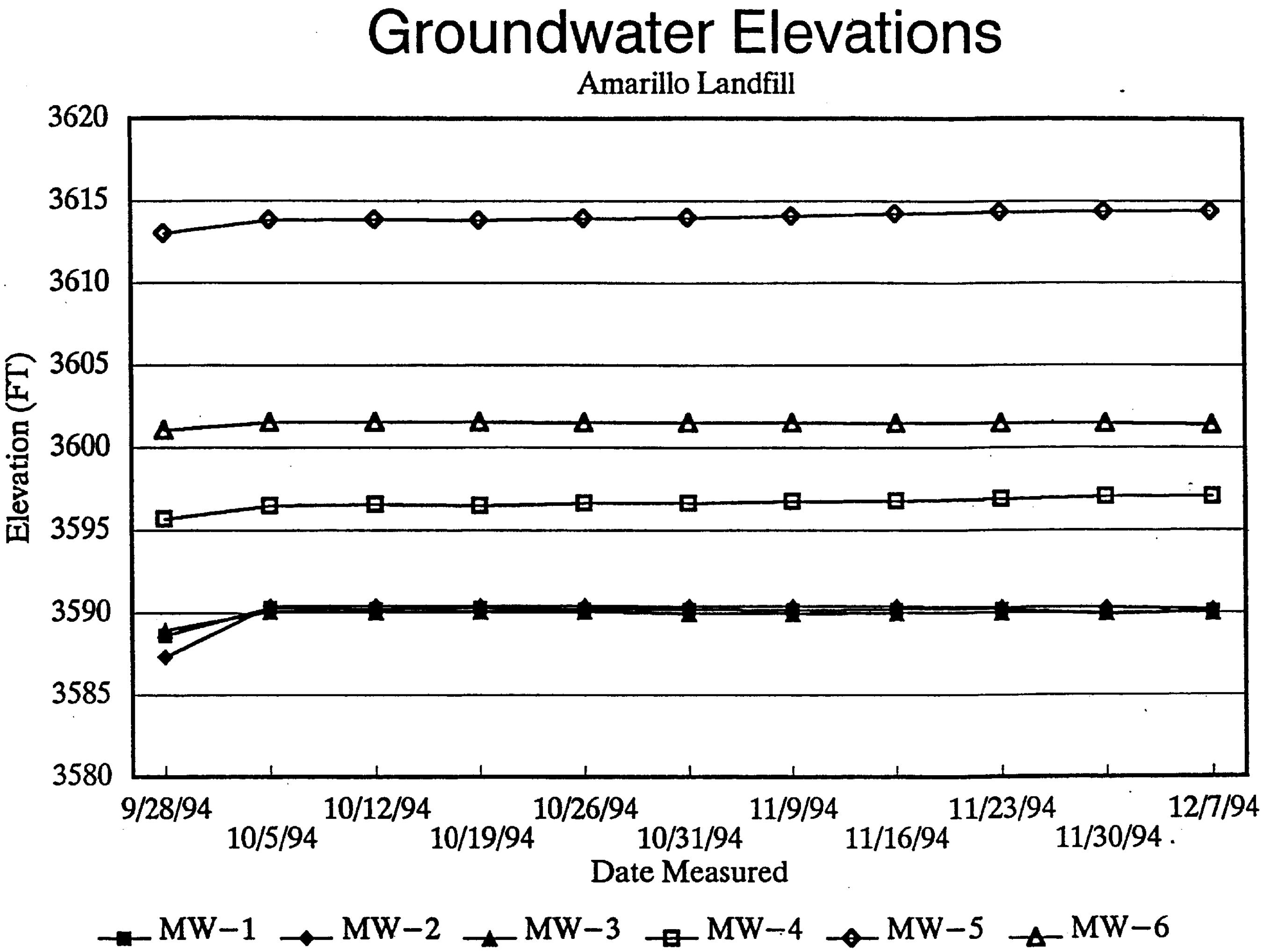
CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

REGIONAL GROUNDWATER CONTOUR MAP

Date
11/94

fIGURE
12

FILENAME: E:\AMARILLO\DWG\OGALLA



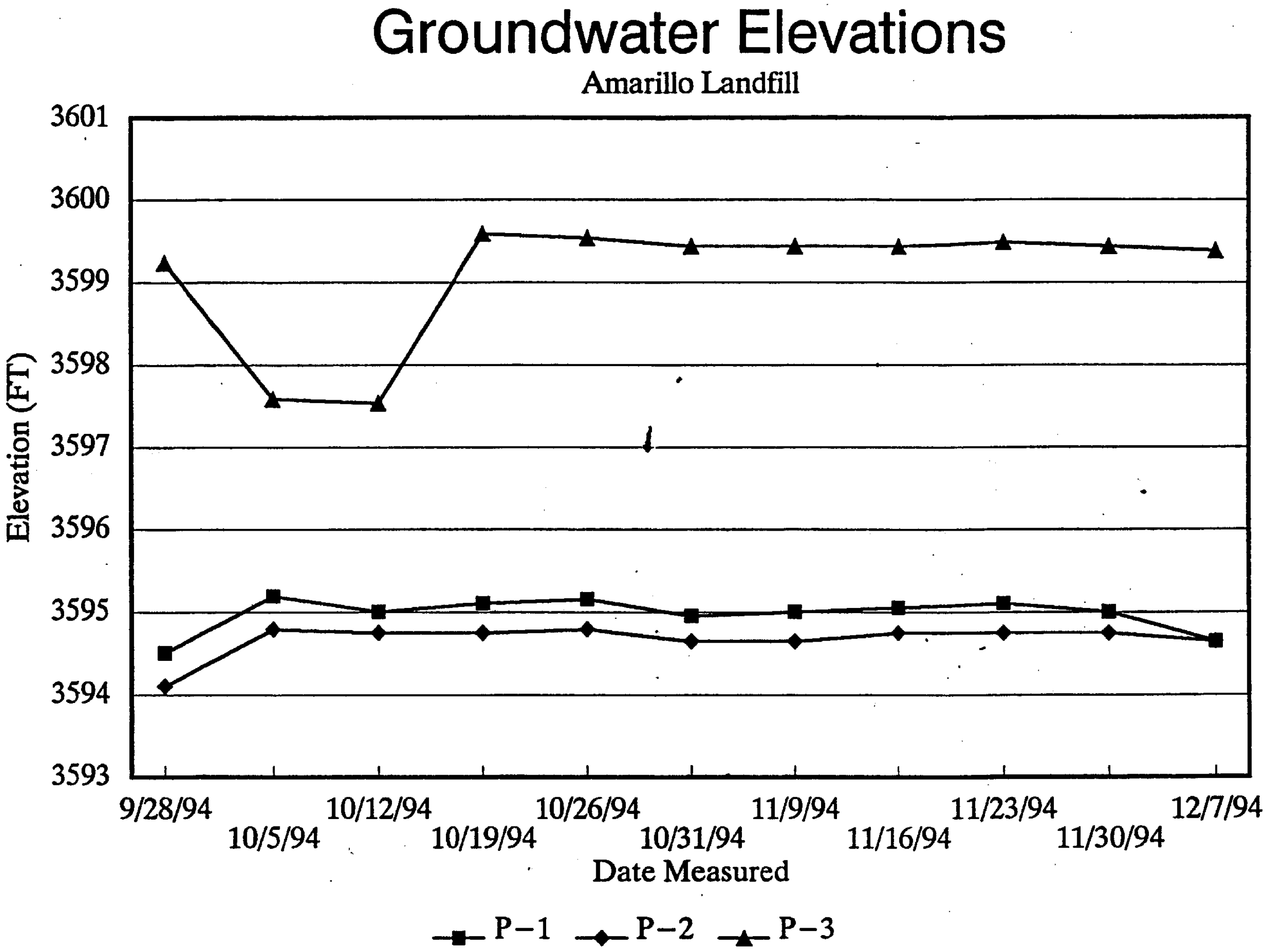
HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
HYDROGRAPHS
MW-1 THROUGH MW-6

Date
11/94

Figure
13

FILENAME: E:\AMARILLO\DWG\AMAHYD1



HDR

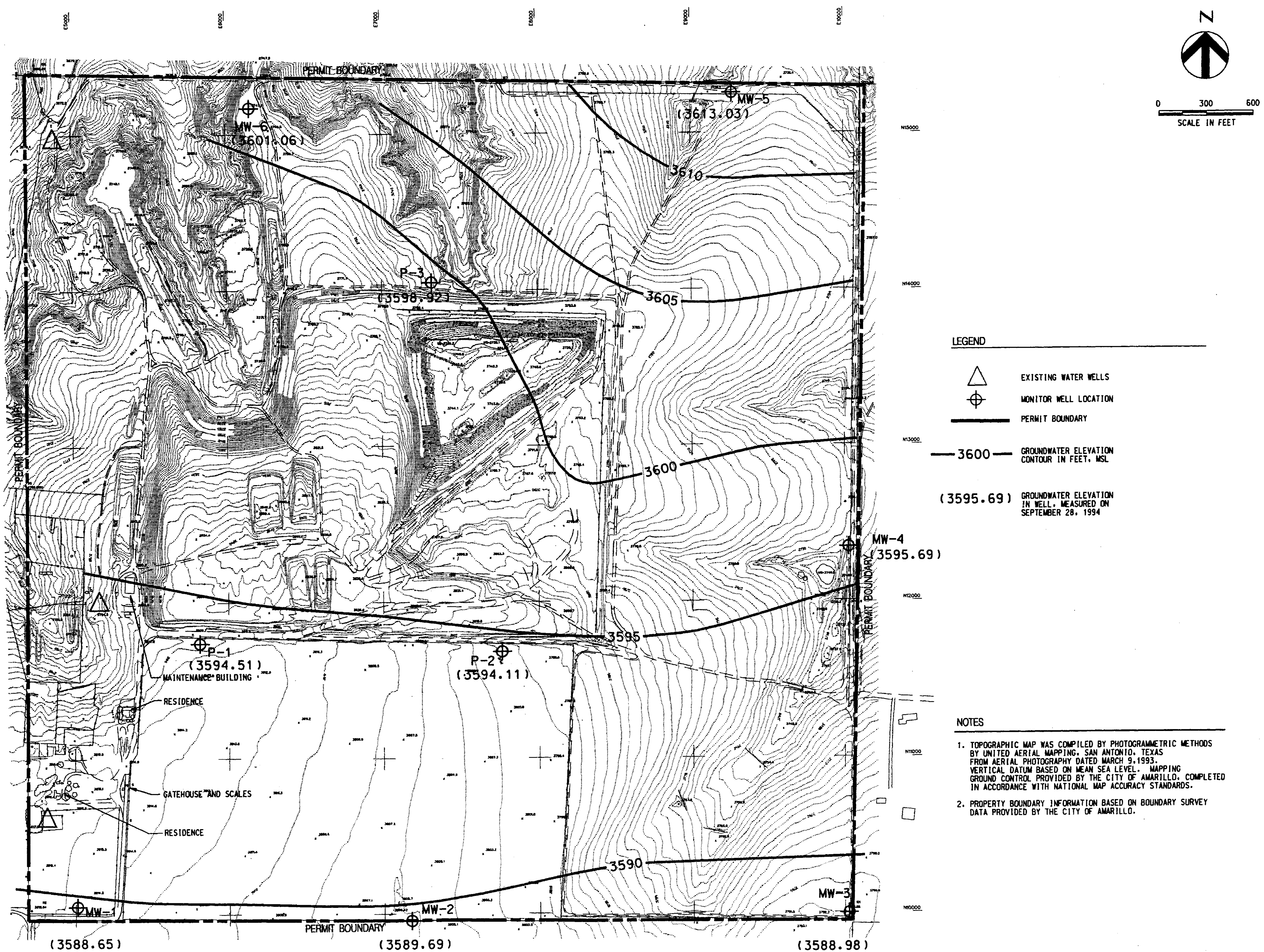
HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
HYDROGRAPHS
P-1 THROUGH P-3

Date
11/94

Figure
14

FILENAME: AMAMWHYD



LEGEND

△	EXISTING WATER WELLS
⊕	MONITOR WELL LOCATION
▬▬	PERMIT BOUNDARY
—3600—	GROUNDWATER ELEVATION CONTOUR IN FEET, MSL
(3595.69)	GROUNDWATER ELEVATION IN WELL, MEASURED ON SEPTEMBER 28, 1994

NOTES

1. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY UNITED AERIAL MAPPING, SAN ANTONIO, TEXAS FROM AERIAL PHOTOGRAPHY DATED MARCH 9,1993. VERTICAL DATUM BASED ON MEAN SEA LEVEL. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO, COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.
2. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.

FILE: e:\amarillo\subdmods\amgw928.dgn
DATE: 2-Dec-94 14:16

HDR
HDR Engineering, Inc.

CITY OF AMARILLO
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

GROUNDWATER CONTOUR MAP SEPT. 28, 1994

Project Manager
T. HOTCHKISS

Designed
HDR

Drafted
HDR

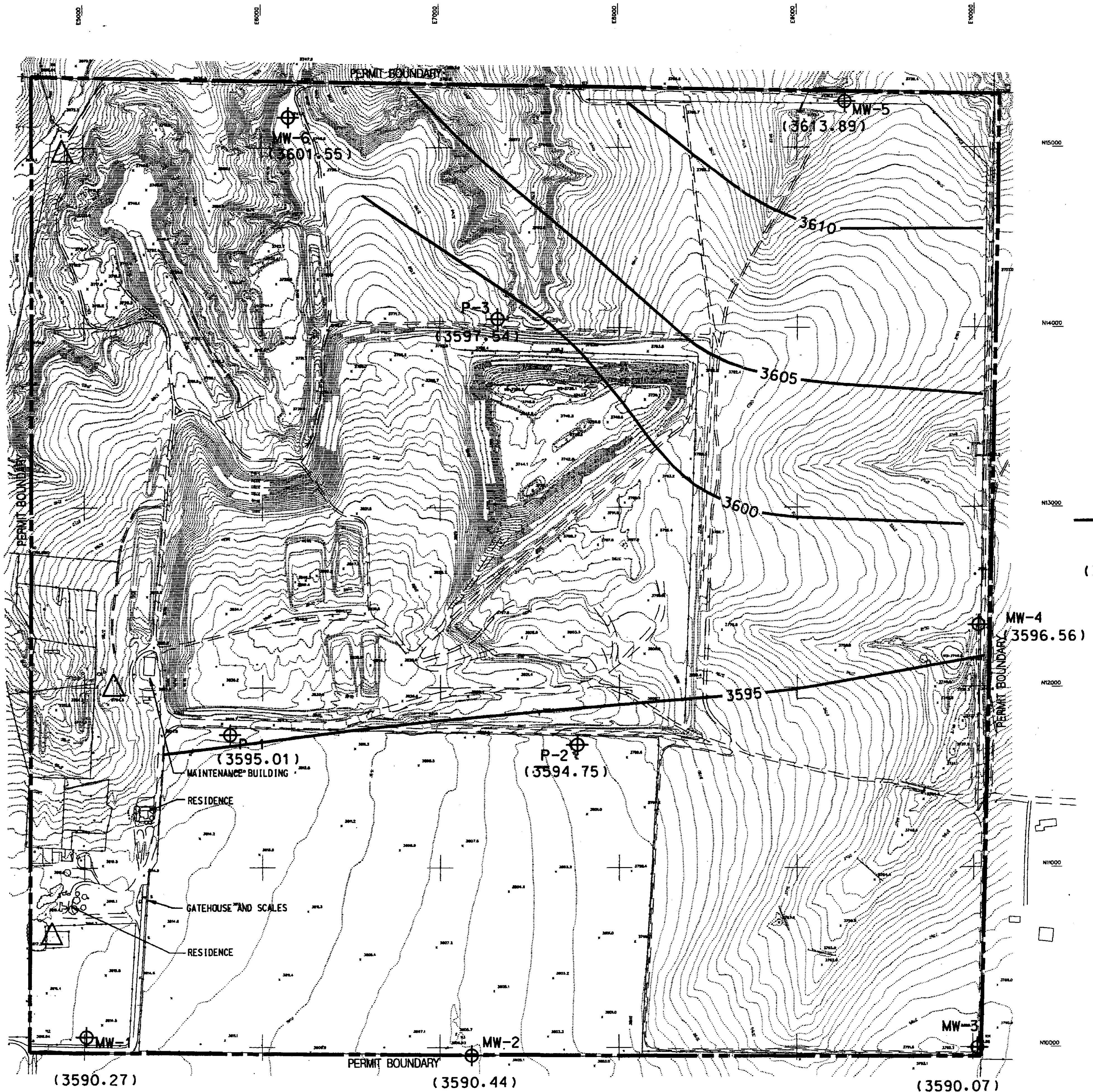
Checked

Project Number
06625-015-037

Date
DECEMBER, 1994
NOVEMBER, 1994

NOT FOR CONSTRUCTION

Drawing Number
Figure Number
15



N

0 300 600
SCALE IN FEET

LEGEND

△	EXISTING WATER WELLS
⊕	MONITOR WELL LOCATION
▬	PERMIT BOUNDARY
—3600—	GROUNDWATER ELEVATION CONTOUR IN FEET, MSL
(3595.69)	GROUNDWATER ELEVATION IN WELL, MEASURED ON OCTOBER 12, 1994

NOTES

1. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY UNITED AERIAL MAPPING, SAN ANTONIO, TEXAS FROM AERIAL PHOTOGRAPHY DATED MARCH 9,1993. VERTICAL DATUM BASED ON MEAN SEA LEVEL. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO, COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.
2. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.

FILE: e:\amarillo\subdmods\amgw928.dgn
DATE: 1-Dec-94 16:57

HDR
HDR Engineering, Inc.

CITY OF AMARILLO
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

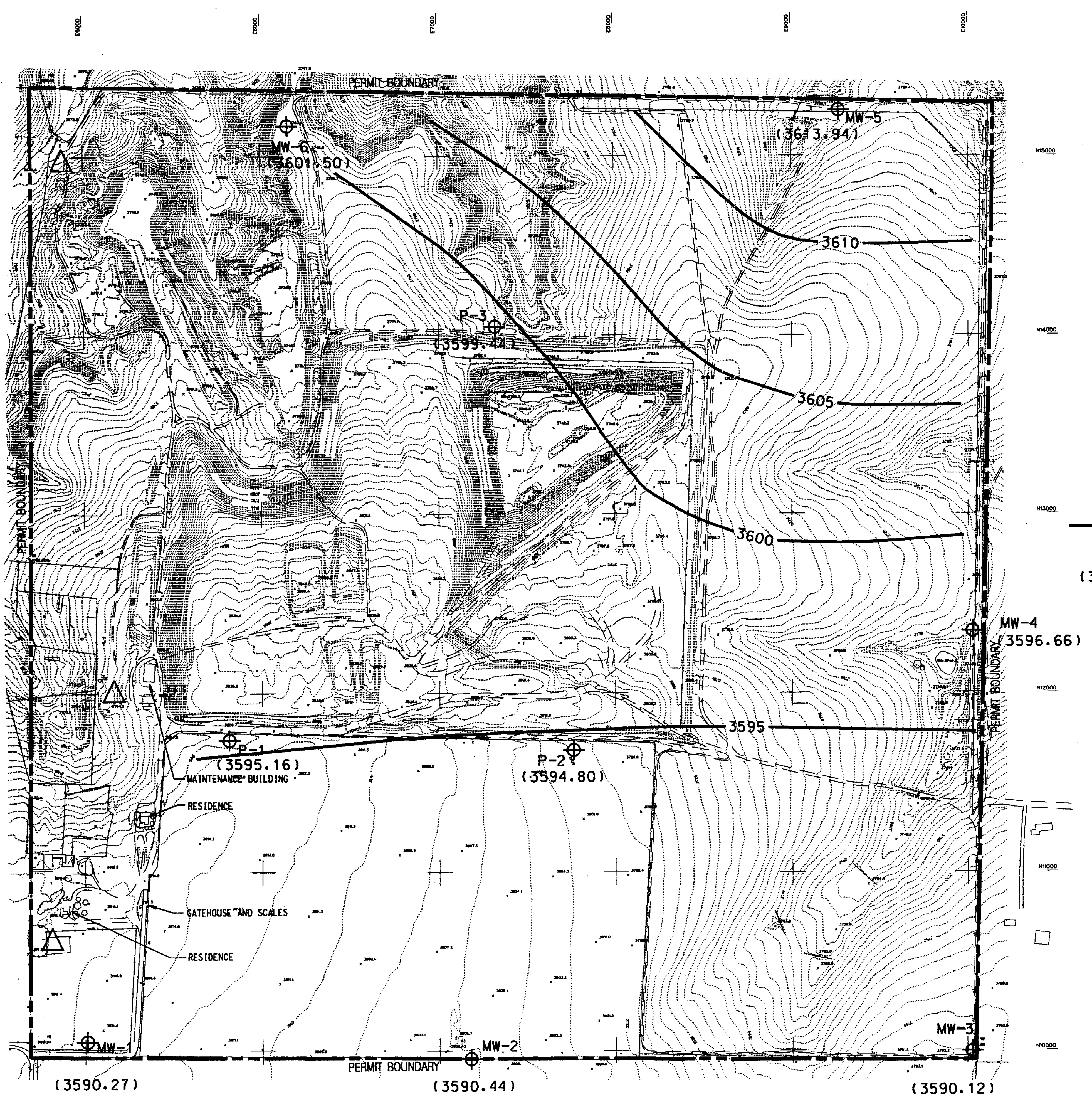
GROUNDWATER CONTOUR MAP OCT. 12, 1994

Project Manager
T. HOTCHKISS
Designed
HDR
Drafted
HDR
Checked

Project Number
06625-015-037
Date
DECEMBER, 1994
NOVEMBER, 1994

NOT FOR CONSTRUCTION

Drawing Number
Figure Number
16



N

0 300 600
SCALE IN FEET

LEGEND

△	EXISTING WATER WELLS
⊕	MONITOR WELL LOCATION
━━━━	PERMIT BOUNDARY
—3600—	GROUNDWATER ELEVATION CONTOUR IN FEET, MSL
(3595.69)	GROUNDWATER ELEVATION IN WELL, MEASURED ON OCTOBER 26, 1994

NOTES

1. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY UNITED AERIAL MAPPING, SAN ANTONIO, TEXAS FROM AERIAL PHOTOGRAPHY DATED MARCH 9,1993. VERTICAL DATUM BASED ON MEAN SEA LEVEL. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO, COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.
2. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.

HDR
HDR Engineering, Inc.

CITY OF AMARILLO
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

GROUNDWATER CONTOUR MAP OCT. 26, 1994

Project Manager
T. HOTCHKISS

Designed
HDR

Drafted
HDR

Checked

Project Number
06625-015-037

Date
DECEMBER, 1994
~~NOVEMBER, 1994~~

NOT FOR CONSTRUCTION

Drawing Number
Figure Number
17

FILE: e:\amarillo\subdmods\amgw1026.dgn
DATE: 1-Dec-94 16:52

APPENDIX A

DATA FROM AREA WELL SURVEY

James W. Sansom, Jr.
Consulting Geologist
Certified Professional Geologist
AIPG No. 2406

9506 Queenswood Drive
Austin, Texas 78748
512/282-1598
FAX 512/280-1761

October 29, 1994

Mr. Brad McCardell
HDR Engineering, Inc.
12700 Hillcrest Road
Suite 125
Dallas, Texas 75230-2096

Dear Brad,

In reference to your telephone call on October 26, 1994, about my supplementing the ground water inventory that I did for Troy Hotchkiss west of Amarillo, Texas in May, 1993, the following information is enclosed:

1. I reviewed the locations and data for the wells within the radius that Troy requested in 1993. I did not find pump test data for any of the wells. Two of the wells were found to have water quality analyses: 06-49-101 and 07-56-307
2. Logs and maps are provided for well numbers 07-56-3E and 07-56-3J since you are interested in the wells on site. Please note that two logs for well number 3J are included.
3. Three new wells were found; 07-56-3, 06-49-1, and a unnumbered well drilled in 1993.

The two 3J well logs look like duplicates because they are almost exactly the same in all aspects (TD, water level, etc.). Upon close examination the wells were completed two days apart. As to the three new wells, well data is continuously added to the files, and often it is a very slow process from the time the log is received until it is placed in the Central Records File.

I hope this will be of some benefit to you.

Sincerely,

James W. Sansom, Jr., CPG

Texas Water Development Board
Well Schedule

State Well No. 07 56 307 Previous Well No. ☐ County Potter 375

River Basin Red River 02 Zone 1 Region ☐ Lat. 35 13 07 Long. 102 01 37 Source of Coord. 1

Owner's Well No. ______ Location NW 1/4, NW 1.4, Section 127, Block B-9, Survey BS&F

Owner CAROLINE B. EMENY

Driller BUD GIBBONS

Address P.O. Box 1230, Amarillo Tx Tenant/Oper. VICTOR PLUNK Rt 1, Bx 544 Amar

Date Drilled 03 08 1974 Depth 295 Source of Depth Datum D Altitude 3815 Source of Alt. Datum

Aquifer OGALLALA 121OG44 Well Type W User

Well Construction Const. Method Rotary R Casing Material Steel S

Completion Perforated P Screen Material Steel S

Lift Data Pump Mfr. NONE Type ______ ☐ No. Stages ______

Bowls Diam. ______ in. Setting ______ ft. Column Diam. ______ in.

Motor Mfr. NONE Fuel or Power ______ ☐ Horsepower ☐☐☐.☐☐

Yield Flow ______ GPM Pump ______ GPM Meas., Rept., Est. ______ Date ______

Performance Test Date ______ Length of Test ______ Production ______ GPM

Static Level ____ ft. Pumping Level ____ ft. Drawdown ____ ft. Sp.Cap. ______ GPM/ft.

Quality (Remarks ______

Water Use Primary UNUSED U Secondary ______ ☐ Tertiary ______ ☐

Other Data Available Water Level C Water Quality ☐ Logs ☐☐☐☐☐☐ Other Data ☐☐☐☐☐

Water Levels

Date 01 DC 1993 Meas. 226.59 Below LSD.

Date ☐☐ ☐☐ ☐☐☐☐ Meas. ☐☐☐.☐☐ ______

Date ☐☐ ☐☐ ☐☐☐☐ Meas. ☐☐☐.☐☐ ______

Casing or Blank Pipe (C)
Well Screen or Slotted Zone (S)
Open Hole (O)
Cemented from ___ to ___

		Diam. (in.)	Setting (feet) From	To
1	C	14	0	19
2	S	14	197	29
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

Recorded By DAN SEALE Date Record Collected or Updated 07 25 1994 (20 max) Reporting Agency

Remarks
1 ID PLATE INTACT ON WEST SIDE OF
2 STAND PIPE APPROX. 3FT ABOVE G.L.
3
4
5 MP-HOLE IN TOP OF PUMP BASE COVERING
6 CASING =+1.00ft

Aquifer OGA

Well No. 07-56

NTY Potter

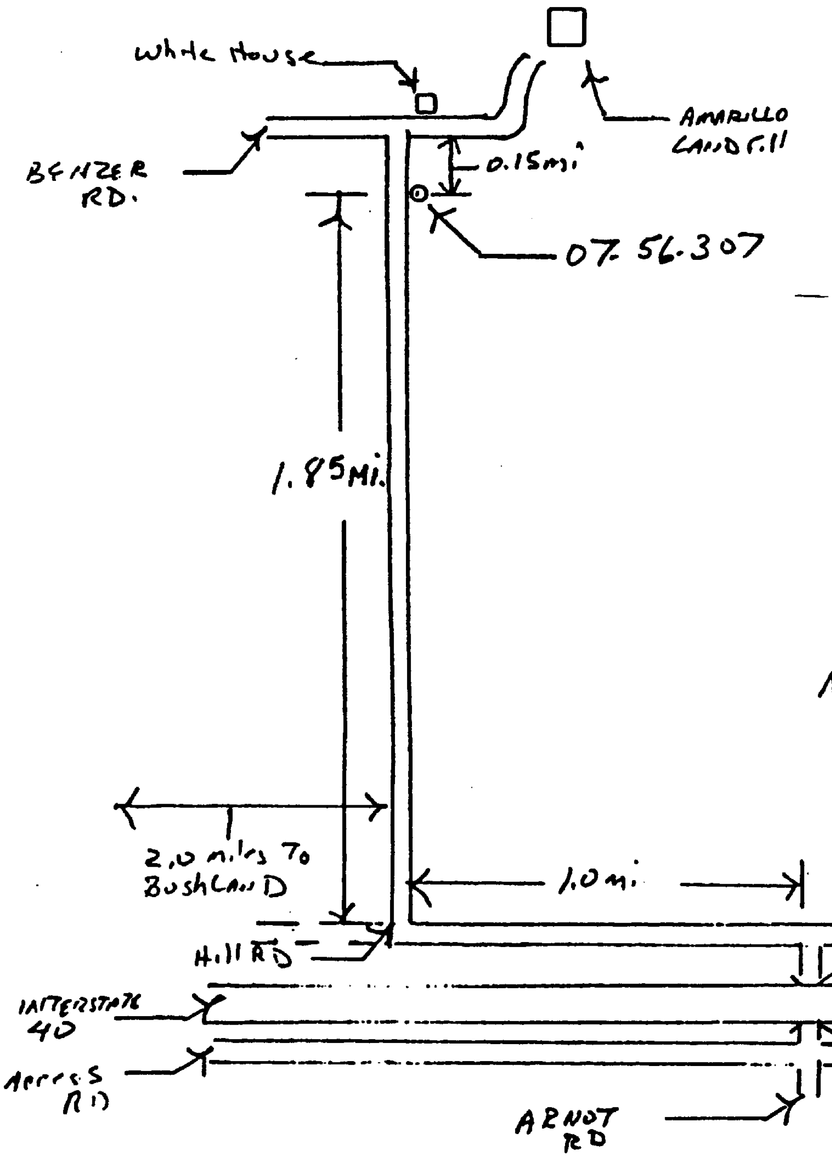
NO. 07-56-307

LOCATION SKETCH
BY DAN SEA
DATE 9-13-76

PHOTOGRAPHS
BY DAN SEALE
DATE 7-21-94

MP-ID VIEW LOOKING E.

LOCATION VIEW LOOKING N.



NO. 07-56-307

Send original copy by
certified mail to the
Texas Water Development Board
P. O. Box 13087
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 07-5
Located on map
Received; 74

1) OWNER:
Person having well drilled Caroline B. Emney (Name) Address Box 1230 (Street or RFD) Amarillo (City) Texa (St

Landowner Same (Name) Address Same (Street or RFD) (City) (St

2) LOCATION OF WELL:
County Potter 3/4-N & 2-E miles in NE (N.E., S.W., etc.) direction from Bushland, Texas (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*

North

(Use reverse side if necessary)

or

Give legal location with distances and directions from adjacent sections or survey lines.

Labor
League
Block 9
Survey BS & F
Abstract No.
(NW ~~xxxxxxxxxx~~) of Section 127

3) TYPE OF WORK (Check):
New Well XX Deepening
Reconditioning Plugging

4) PROPOSED USE (Check):
Domestic Industrial Municipal
Irrigation XX Test Well Other

5) TYPE OF WELL (Check):
Rotary XX Driven Dug
Cable Jetted Bored

6) WELL LOG:
Diameter of hole 12" in. Depth drilled 295' ft. Depth of completed well ______ ft. Date drilled 3-8-
All measurements made from ______ ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
00	4	Top Soil
4	82	Caliche Clay
82	153	Clay Sand Rock & Sand
153	259	Clay and Layers Sand
259	279	Fine sand
279	289	Course Sand
289	295	Blue Clay and Red Bed

(Use reverse side if necessary)

9) Casing:
Type: Old New XX Steel XX Plastic Other
Cemented from ______ ft. to ______

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gag
14"OD.	0	295	.188

(197' - 2 95' - 4 row Perforation

10) SCREEN:
Type
Perforated Slotted

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slo Siz

7) COMPLETION (Check):
Straight wall XX Gravel packed Other
Under reamed Open Hole

8) WATER LEVEL:
Static level ______ ft. below land surface Date ______
Artesian pressure ______ lbs. per square inch Date ______
Depth to pump bowls, cylinder, jet, etc., ______ ft. below land surface.

11) WELL TESTS:
Was a pump test made? Yes No XX If yes, by w
Yield: ______ gpm with ______ ft. drawdown after
Bailer test ______ gpm with ______ ft. drawdown after
Artesian flow ______ gpm
Temperature of water ______

12) WATER QUALITY:
Was a chemical analysis made? Yes No
Did any strata contain undesirable water? Yes
Type of water? ______ depth of strata ______

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Bud Gibbons (Type or Print)
Water Well Drillers Registration No. 299

ADDRESS 1004 E. 5th. P.O.Box 1972 (Street or RFD) Plainview (City) Texas (State)

(Signed) Bud Gibbons (Water Well Driller)
Bud Gibbons Drilling Contractor (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available. UU 07-56-30

*Additional instructions on reverse side.

TWDB-WD-8

GW 1

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

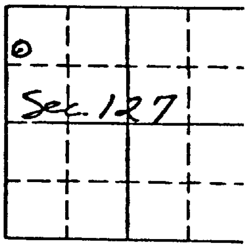
Aquifer Ogallala

Field No. Perm.# 276

Owner's Well No.

State Well No. 07-56-307

County Potter



1. Location: NW1/4, NW1/4 Sec. 127, Block B-9 Survey B.S. & F

2. Owner: Caroline B. Emery Address: Box 1230, Amarillo, Tx.

Tenant: Victor Plunk Address: Rt1, Box 544, Amarillo, Tx.

Driller: Bud Gibbons Address: Plainview Tx

3. Elevation of is 3814 ft. above msl, determined by

4. Drilled: 3-8 1974; Dug, Cable Tool [✓ Rotary,]

5. Depth: Rept. 295 ft. Meas. ft. Red Bed Reported @ 2875ft

6. Completion: Open Hole [✓ Straight Wall,] Underreamed, Gravel Packed

7. Pump: Mfgr. Johnston p.b., Amarillo Co. Type Turbine

No. Stages 7, Bowls Diam. 10 in., Setting 280 ft.

Column Diam. 6 in., Length Tailpipe 10 ft.

8. Motor: Fuel NAT. GAS Make & Model M.M. 6cyl. HP.

9. Yield: Flow gpm, Pump 400 gpm, Meas., [✓ Rept.,] Est. Driller

10. Performance Test: Date Length of Test Made by

Static Level ft. Pumping Level ft. Drawdown ft.

Production gpm Specific Capacity gpm/ft.

CASING & BLANK PIPE

Cemented From ft. to ft.

Diam. (in.)	Type	Setting, ft.	
		from	to
14	Steel	Surface	295

11. Water Level: 227.98 ft. ~~rept.~~ meas. 9/13 1976 ~~above~~ below See MP Below which is +0.50 ft. above ~~below~~

ft. rept. meas. 19 above below which is ft. above below ce.

ft. rept. meas. 19 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

12. Use: Dom., Stock, Public Supply, Ind. [✓ Irr.] Waterflooding, [✓ Observation,] Not Used,

13. Quality: (Remarks on taste, odor, color, etc.)

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

14. Other data available as circled: [✓ Driller's Log,] Radioactivity Log, Electric Log, Formation Samples, Pumping Test,

15. Record by: DAN SEALE Date 9/13 1976

Source of Data Field & HPUWCD #1 Records

16. Remarks: Permission from Mr. F. G Collard III, manager to enter this well into the program

WELL SCREEN

Screen Openings

Diam. (in.)	Type	Setting, ft.	
		from	to
14	Perforated	197	295
Casing perforated with 3/8" slots 4 row pattern.			

Obs Well

3814
289
3525

M.P. - Edge of Airline hole inside pump port S. side = +0.50 ft

(Sketch)

07-56-307

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ______ Lab No. ☐☐

Work No. ______

CHEMICAL WATER ANALYSIS REPORT

S. R. S.

SEP 19 1980

County 188 Potter

State Well No. 07-56-397

Well No. 276

Date Collected 08-01-80

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location NW/4, NW1/4, Sec. 127, Blk B-9, BS+F Survey Sample No. ☐ By HPUWCD#1 B

Source (type of well) turbine Owner Caroline Embry

Date Drilled 3-8-74 Depth 295 ft. WBF Ogallala

Producing intervals ______ Water level ______ ft. Sample depth ☐☐☐☐ ft.

Sampled after pumping cont hrs. Yield ______ GPM meas. est. Temperature ☐☐☐ °F ☐☐☐ °C

Point of collection faucet on discharge Appearance ☑ clear ☐ turbid ☐ colored ☐ other

Use Irr. Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

Laboratory No. CO15975

Date Received AUG 18 1980

Date Reported SEP 17 '8

		MG/L	ME/L
Silica	00955	57	
Calcium	00915	47	2.36
Magnesium	00925	26	2.11
Sodium	00929	29	1.26
		Total	5.73
☐ Potassium	00937	.	
[3] ☐ Manganese	01055	.	
☐ Boron	01022	.	
[3] ☐ Total Iron	01045	.	

%Na ______

SAR ______

RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) 00095 480

Diluted Conductance (micromhos/cm^3) 4 x 144
576

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	. —
Bicarbonate 144	00440	293	4.80
Sulfate	00945	30	0.62
Chloride	00940	7	0.20
Fluoride	00951	2.4	0.13
Nitrate	71850	2.9	.
pH	00403	8.2	Total 5.75

[1] Dissolved Solids (residue at 180°C)	70300	350
Phenolphthalein Alkalinity as CaCO$_3$	00415	0
Total Alkalinity as CaCO$_3$ (4.80)	00410	240
Total Hardness as CaCO$_3$ (4.47)	00900	224

[2] Nitrogen Cycle

Ammonia - N	00610	.
Nitrite - N	00615	.
Nitrate - N	00620	.
Organic Nitrogen	00605	.

RE...

JUL 25 1981

CR...

Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

TEXAS WATER DEVELOPMENT BOA

WELL SCHEDULE

State Well No. 06 49 101 Previous Well No. County Potter 37

River Basin Canadian 01 Zone 2 Lat. 35 13 05 Long. 101 59 59

Owner's Well No. Location NW 1/4, NE 1/4, Section 112, Block 9, Survey B.S.&F.

Owner Marshall Cutwright, Jr. Driller Whitaker Well Service

Address P.O. Box 3176, Amarillo, Tx. 79116 Address Amarillo, Tx.

Tenant Address

Date Drilled Depth Source of Depth Datum Altitude 3764 Source of Alt. Datum

Aquifer Ogallala 121OGLL Well Type W User

Well Construction Const. Method Casing Material steel S

Screen Material Steel S Completion

Casing or Blank Pipe (C)
Well Screen or Slotted Zone (S)
Open Hole (O)
Cemented from ____ to ____
Diam. (in.) Setting (feet) From To

Lift Data Pump Mfr. Type submersible S No. Stages

Bowls Diam. ____ in. Setting ____ ft. Column Diam. ____ in. Length Tailpipe ____ ft.

Motor Mfr. Fuel or Power electric E Horsepower

Yield Flow ____ GPM Pump ____ GPM Meas., Rept., Est. ____ Date ____

Performance Test Date ____ Length of Test ____ Production ____ GPM

Static Level ____ ft. Pumping Level ____ ft. Drawdown ____ ft. Sp. Cap. ____ GPM/ft.

Quality (Remarks on Taste, Odor, Color, Etc.)

Water Use Primary Use Domestic H Secondary Use ☐ Tertiary Use ☐

Other Data Available Water Level N Water Quality ☐ Logs ☐ ☐ ☐ ☐ ☐ ☐ Other Data ☐ ☐ ☐ ☐ ☐

Water Levels Date ____ Meas. ____ ft. (+) Above (-) Below Landsurface

Date ____ Meas. ____ ft. (+) Above (-) Below Landsurface

Recorded By Keith Whitworth Date Record Collected or Updated 08 04 1988 Reporting Agency 05

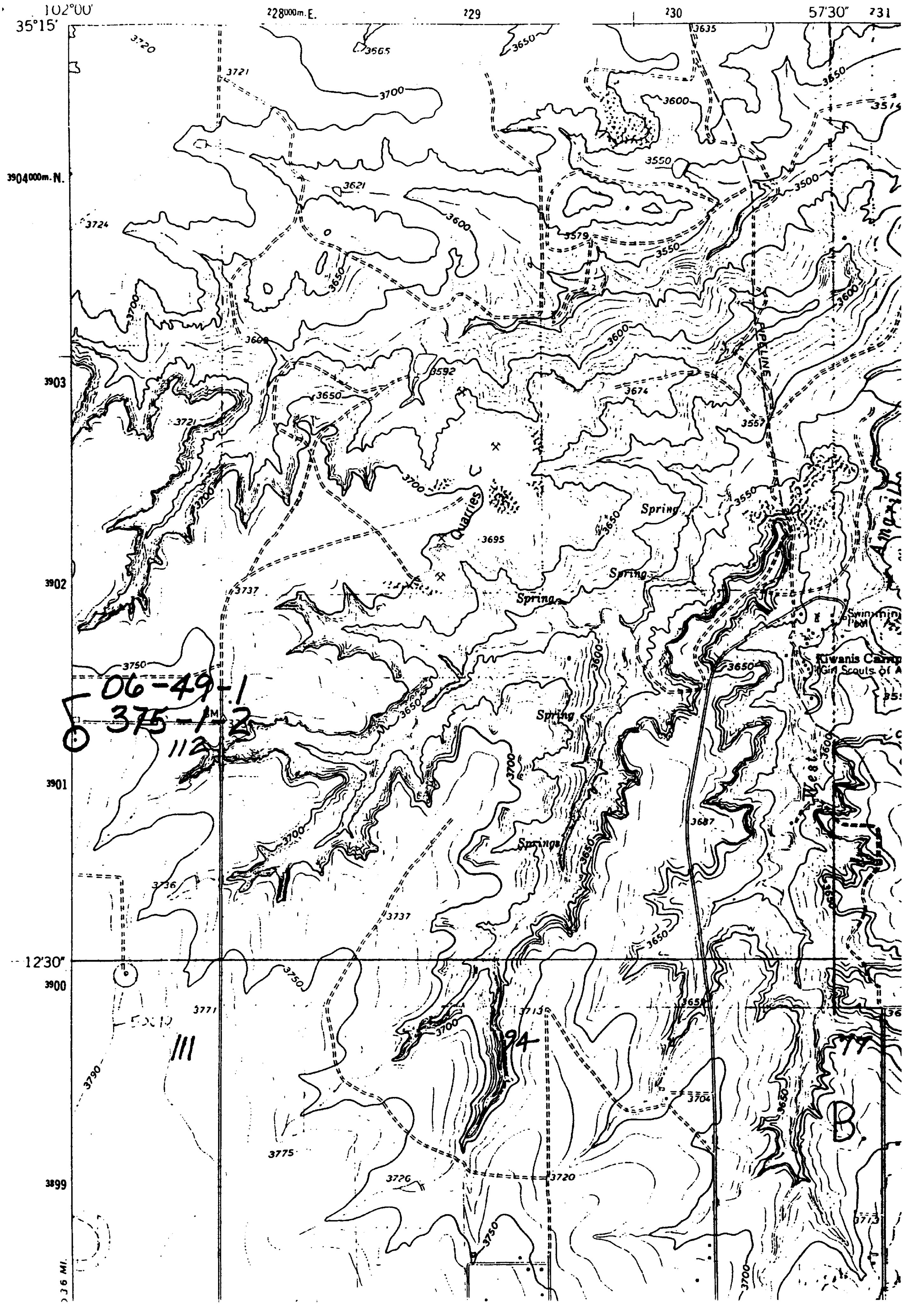
Remarks

Well Schedule In TWDB File Y

TWDB-0409 (02-26-88) 375-1-2

Aquifer Ogallala

Well No. 06-49-101


102°00'
35°15'
228000m. E.
229
230
57'30"
231
3904000m. N.
3903
3902
3901
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3899
12'30"
3720
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3609
3592
3674
3557
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3650
3700
Quarries
3695
Spring
Spring
Spring
3737
3750
3650
3600
Swimming Pool
Kiwanis Camp
Girl Scouts of A
Spring
3700
3687
Springs
3650
3736
3737
3750
3771
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3704
3775
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PIPELINE
West
BM
06-49-1
375-1-2
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111
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0.36 MI.

TEXAS WATER DEVELOPMENT BOARD

CHEMICAL WATER ANALYSIS REPORT
DW3900 FORM 1/DG#5

Send Reply To:
Water Availability Data
and Studies Section
Texas Water Development Board
Stephen F. Austin Building
1700 Congress Avenue
Austin, Texas 78711

TWDB ONLY
Organization No. 375-1-2
Work No.

Attn: Phil Nordstrom Room:

Laboratory Code 0 1 (10 11)

County Potter

State Well No. 0 6 4 9 1 0 1 (13 20)

Date Collected 0 8 0 4 1 9 8 8 (22 29)

Sample No. 1 (31)

Time 1 4 : 4 3 (33 34 36 37)

By HPUWCD #1 D.S. + C.G.

Code for Sample Collecting Agency 0 7 (39 40)

Temperature 1 8 °C (42 43)

Analysis Reliability Remark (45 46)

Chemical Constituent Remark (48 49)

If Different From Completed Well

Aquifer	Producing Interval	
51 58	60 63 Top	65 68 Bottom

Remarks (10 39)

Owner Marshall Cutwright, Jr. Send copy to owner

Address P.O. Box 3176, Amarillo, Tx. 79116

Date Drilled — Depth — ft. WBF 121066L Point of collection faucet

Sampled after pumping .75 hrs. Yield GPM megs. est. Use domestic

CHEMICAL ANALYSIS

EB9-13 Date Received SEP 07 '88 Date Reported OCT 17 '88

KEY PUNCHED

Laboratory No. EB9-135	Date Received 090888		Date Reported 101088	
		ME/L	Flag	MG/L
Silica	00955			49
Calcium	00915	2.14		42.00
Magnesium	00925	2.22		27.00
Sodium	00930	.91		21
Potassium	00935	.13		5.0
T.Cations(+)		5.4		
Carbonate	00445	.12		3.0
Bicarbonate	00440	4.7		287.0
Sulfate	00946	.46		22
Chloride	00940	.11		4
Fluoride	00950	.09		1.7
Nitrate as NO3	71851	.06		3.46
Total Anions(-)		5.54		
pH		00403		8.6
Dissolved Solids (Sum)		70301		321
P.Alk asCaCO3		00415		3
T.Alk as CaCO3		00410		241
T.Hardness as CaCO3		00900		218
Specific Conductance (umhos @ 25 C)		00095		548

Phenol Alk as $CaCO_3$	00415	25	27 32
Total Alk as $CaCO_3$	00410	34	36 41
Total Hardness as $CaCO_3$	00900	43	45 50
Specific Conductance (umhos at 25C)	00095	52	54 59

Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 07-56-3E
Located on map yes
Received: C.F.S.

NER John Porter (Name) Address Box 162 (Street or RFD) Cactus (City) Texas (State) 79013 (Zip)

CATION OF WELL:
County Potter 5 miles in NW (N.E., S.W., etc.) direction from Amarillo, Tex. (Town)

Well Location Bishop Hills Estate

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ____ Block No. ____ Township ____
Abstract No. ____ Survey Name ____
Distance and direction from two intersecting section or survey lines ____

☒ See attached map.

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ____

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ____

6) WELL LOG:

Date drilled March 19,1981

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4	Surface	350

From (ft.)	To (ft.)	Description and color of formation material
0	28	Topsoil & Caliche
28	48	Caliche & rock
48	92	Rock & Clay
92	136	White Clay & Sand
136	180	Sand & Gravel
180	202	Sand & Gray clay
202	246	Gray & white clay
246	268	White, gray, & red clay
268	290	Gray & red clay
290	312	Red clay & gravel
	334	Red clay
	350	Red clay
	350	TD

(Use reverse side if necessary)

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other ____
If Gravel Packed give interval . . . from 0 ft. to 350 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.)		Gage Casing Screen
			From	To	
6	New	Steel, Perf.	250	350	

CEMENTING DATA

Cemented from ____ ft. to ____ ft.
Method used ____
Cemented by ____ (Company or Individual)

9) WATER LEVEL:
Static level 250 ft. below land surface Date 3-19-81
Artesian flow ____ gpm. Date ____

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ____
Depth to pump bowls, cylinder, jet, etc., 315 ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimated
Yield: 23 gpm with 25 ft. drawdown after 3 hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

Jimmy McCaskill (Type or Print) Water Well Drillers Registration No. 1771

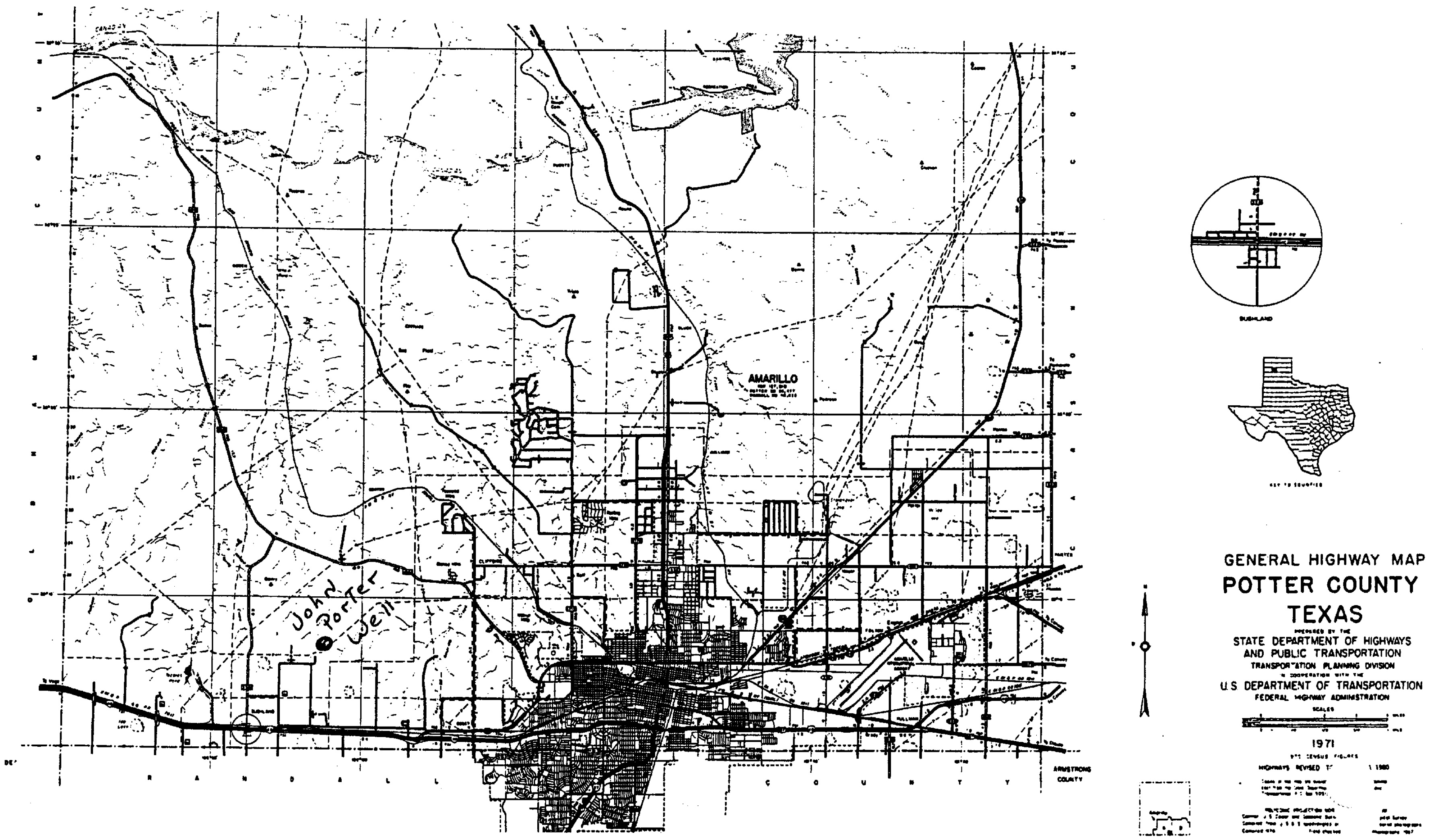
ADDRESS 8018 River Road (Street or RFD) Amarillo (City) Texas (State) 79108 (Zip)

(Signed) Jimmy McCaskill (Water Well Driller) A & A Drilling Company (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

DWR-0392 (Rev. 1-12-79)

DEPARTMENT OF WATER RESOURCES COPY


GENERAL HIGHWAY MAP
POTTER COUNTY
TEXAS
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALES
1971
AMARILLO
BUSHLAND
KEY TO COUNTIES
ARMSTRONG COUNTY
R A N D A L L C O U N T Y
John Porter Well

Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

ER DAY and Company (Name) Address 6309 S. Indiana (Street or RFD) Lubbock (City) TX. (State) 79413 (Zip)

2) ATION OF WELL: County Potter 6 miles in W.N.W. (N.E., S.W., etc.) direction from Amarillo (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:

Section No. ______ Block No. ______ Township ______

Abstract No. ______ Survey Name ______

Distance and direction from two intersecting section or survey lines ______

☒ See attached map. map on 07-56-3J

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 3/14/85

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4"	Surface	300'

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from 10 ft. to 300 ft.

From (ft.) To (ft.)	Description and color of formation material
-15	Topsoil w/sandy caliche
5-60	caliche + caliche rock
0-75	caliche w/sandy clay
5-105	med. to coarse sand w/sandstone
20	fine sand w/cemented sand
20-135	fine sand
35-240	fine to med. sand w/stk cemented sand
40-255	fine to med. sand w/fine gravel
55-270	gray sandy clay w/sand strips
70-285	Red + gray clay w/sandstone & Cemented sand
85-300	Red + gray clay w/sandstone & Cemented sand
00'	Red clay

(Use reverse side if necessary)

RECEIVED
APR - 8 1985
DEPT. OF
WATER RESOURCES

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.)		Gage Casing Screen
			From	To	
4½	N	Plastic	0	180'	
4½"	N	P.V.C. Perforated	180'	300'	

CEMENTING DATA

Cemented from 0 ft. to 10' ft.
Method used ______
Cemented by A-1 Pump + Well Service (Company or Individual)

9) WATER LEVEL:
Static level 170' ft. below land surface Date 3/15/85
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 240' ft.

3) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Fresh Depth of strata 130' ft
Was a chemical analysis made? ☐ Yes ☒ No

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: 12 gpm with 60' ft. drawdown after 2 hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME A-1 Pump + Well Service (Type or Print) Water Well Driller's License No. 2119

DDRESS Rt 2 Box 54-G (Street or RFD) Amarillo (City) TX. (State) 79101 (Zip)

igned) ______ (Licensed Water Well Driller) (Signed) Ricky G. ______ (Registered Driller Trainee)

OWP

For TDWR use only
Well No. 07-56-3J
Located on map yes C.F.S.

ease attach electric log, chemical analysis, and other pertinent information, if available.

DEPARTMENT OF WATER RESOURCES COPY

Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers B
P. O. Box 13087
Austin, Texas 78711

1) OWNER DAY and Company (Name) Address 6309 B. Indiana (Street or RFD) Lubbock (City) Tx. (State) (Zip

2) LOCATION OF WELL: County Potter 6 miles in W.N.W (N.E., S.W., etc.) direction from Amarillo (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 3/12/85

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4"	Surface	300'

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from 10 ft. to 300

From (ft.) | To (ft.) | Description and color of formation material

0-15 Top soil w/sandy caliche
15-60 Caliche + caliche rock
60-75 Caliche w/sandy clay
75-105 Med. to coarse sand w/sandstone
105-120 Fine sand w/cemented sand
120-135 Fine sand
135-240 Fine to med. sand w/stks. cemented Sand
240-255 Fine to med. sand w/fine gravel
255-270 Gray sandy clay w/sand strips
270-285 Red + gray clay w/Sandstone + Cemented Sand
285-300 Red + gray clay w/Sandstone + Cemented Sand
300' Red clay

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	To
4 1/2"	N	Plastic	0	180'
4 1/2"	N	P.V.C. Perforated	180'	300'

CEMENTING DATA
Cemented from 0 ft. to 10
Method used ______
Cemented by A-1 Pump + Well Servic (Company or Individual)

9) WATER LEVEL:
Static level 170' ft. below land surface Date 3/14/8
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth

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APR - 8 1985
DEPT. OF
WATER RESOURCES

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 240' ft.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Fresh Depth of strata 130' ft.
Was a chemical analysis made? ☐ Yes ☒ No

12) WELL TESTS:
☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimate
Yield: 12 gpm with 60' ft. drawdown after 2 hr

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

COMPANY NAME A-1 Pump + Well service (Type or Print) Water Well Driller's License No. 2119

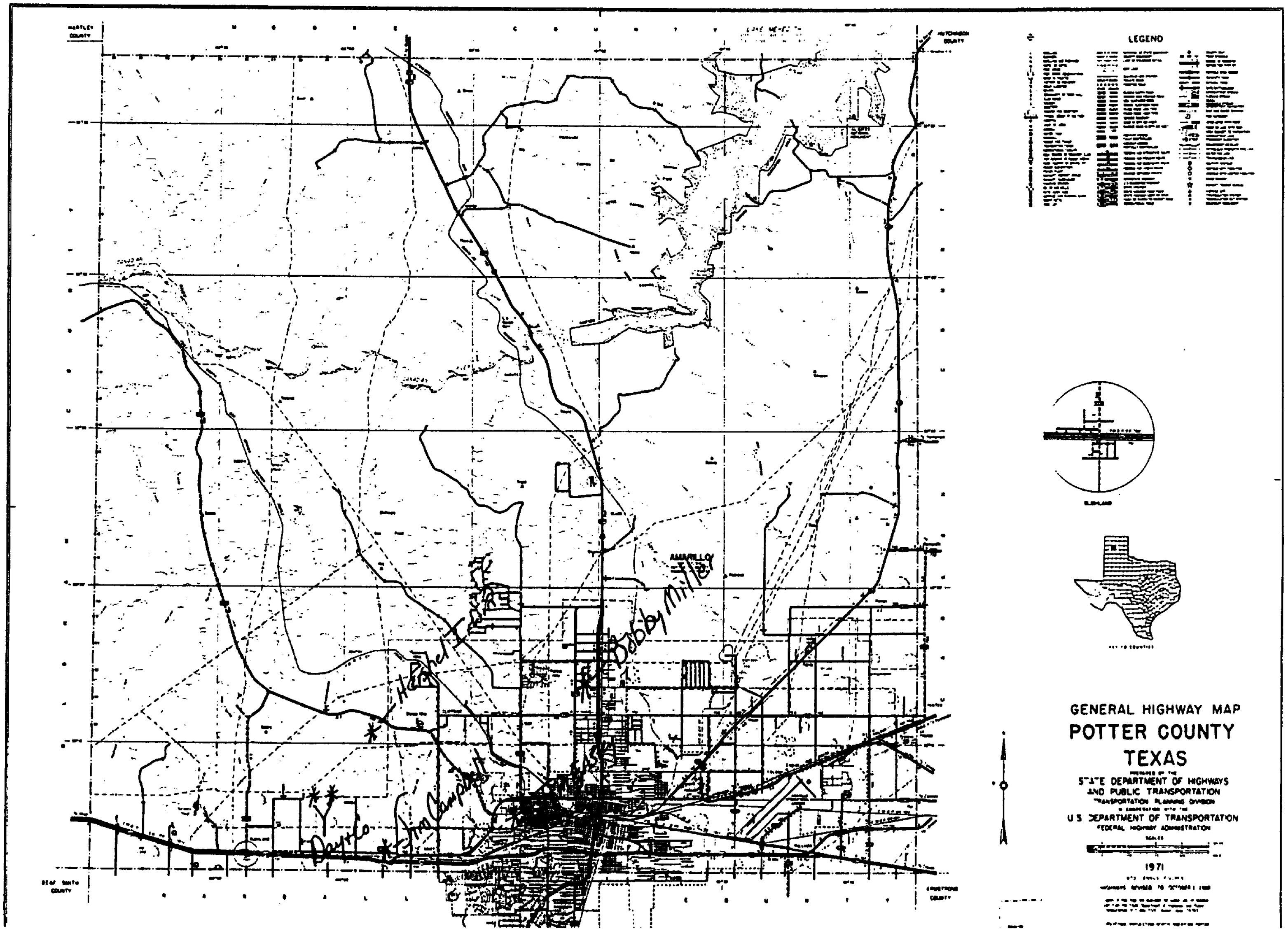
ADDRESS Rt. 2 Box 54-G (Street or RFD) Amarillo (City) Tx. (State) 79101 (Zip)

(Signed) Ricky D Bostick (Licensed Water Well Driller) (Signed) Ricky G. [illegible] (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 07-56-31
Located on map Yes c.f

TDWR 0392 (Rev. 5-27-82)



GENERAL HIGHWAY MAP
POTTER COUNTY
TEXAS

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION

U S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

1971

Please use black ink.
Send original copy by certified mail to the
Texas Water Commission
P.O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT
ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Boar
P. O. Box 13087
Austin, Texas 78711

1) OWNER Robert Young (Name) Address Estates & Big Sky (Street or RFD) Amarillo, (City) Tex (State)

2) LOCATION OF WELL:
County Potter 10 miles in Northwest (N.E., S.W., etc.) direction from Amarillo (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ See attached map.

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Injection ☐ Other ______

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Drive ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:
Date Drilling:
Started 1-14-88 19__
Completed ______ 19__

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
9	Surface	460

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from 17 ft. to 460

From (ft.)	To (ft.)	Description and color of formation material
0	25	Topsoil, caliche, caprock.
25	50	Caliche, lt. brown sandy clay.
50	72	Lt. brown sandy clay.
72	94	Lt. brown sandy clay w/strks. sandstone.
94	116	Fine tight sand and sandstone, gravel @ 105'.
116	138	Gravel-hard, red clay & shale at 120'.
138	160	Red clay & shale.
160	182	Red clay & shale w/strks. gray clay.
182	204	Red clay & shale " " ".
204	226	Grey & red clay w/strks. fine tight sandstone.
226	248	Grey & red clay w/strks. fine tight sandstone.
248	270	Red and grey clay & shale.
270	292	Red and grey clay & shale.
292	314	Red and grey shale, yellow clay & shale.
314	336	Yellow clay & shale.
336	358	Yellow clay & shale, red clay.
358	380	Red clay w/ shale strks.
380	402	Red clay w/ shale strks.
402	424	Red clay w/ shale strks.
424	446	Red clay w/strks. fine tight sand.

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.)	
			From	To
9	N	PVC	0	260
		.050 Perforations	260	460

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 17 ft. to 2 ft. No. of Sacks
______ ft. to ______ ft. No. of Sacks
Method used Mixed
Cemented by Mark Randall

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 319.44(c)]
☒ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 240 ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) PACKERS: Type Depth

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APR 05 1988
TEXAS WATER COMMISSION

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME K-Ran Drilling, Inc, (Type or Print) Water Well Driller's License No. 2848-W

ADDRESS Rt. 6, Box 106 (Street or RFD) Amarillo, Texas (City) (State) 79106 (Zip)

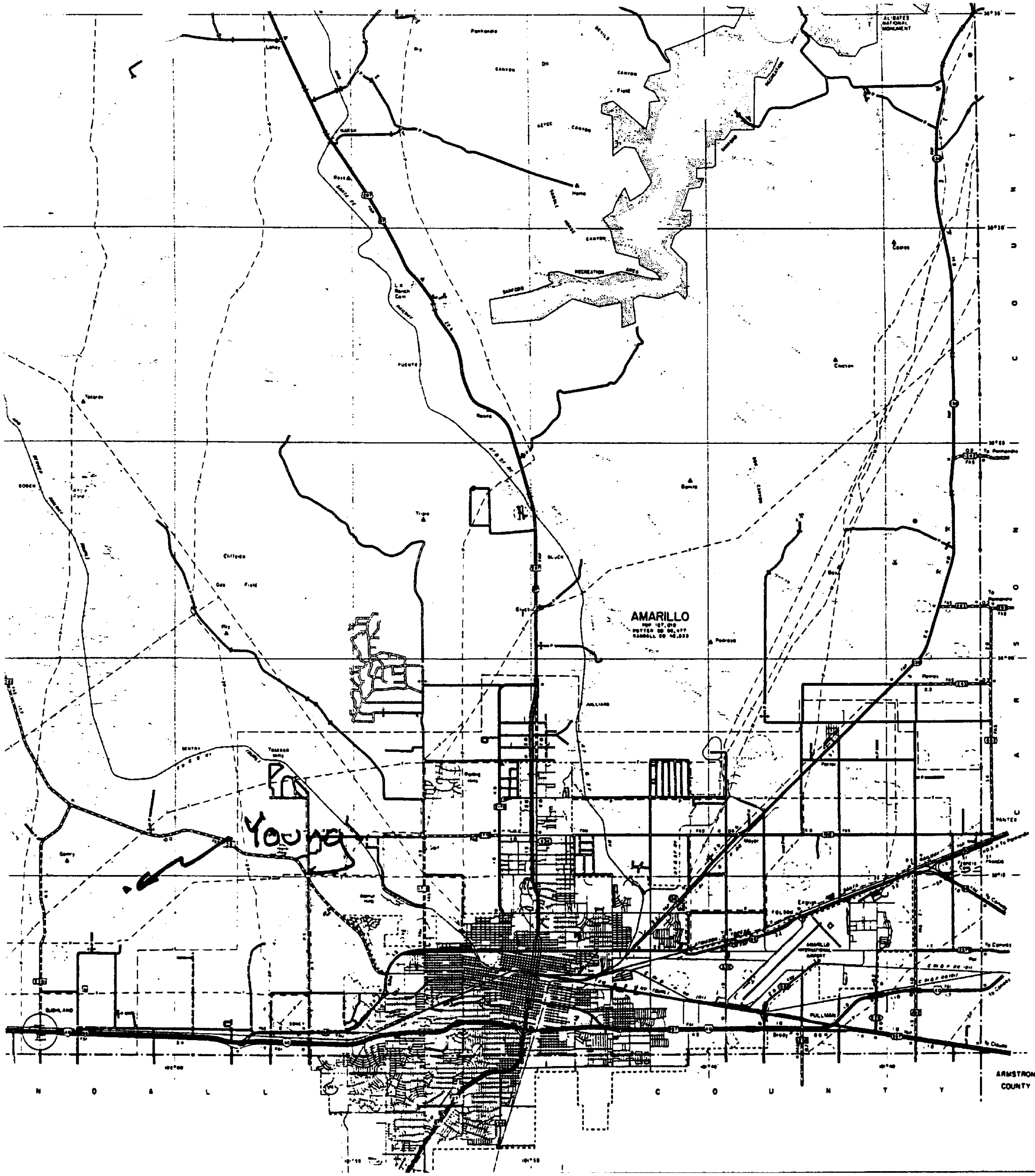
(Signed) ______ (Licensed Water Well Driller) (Signed) ______ (Registered Driller Trainee)

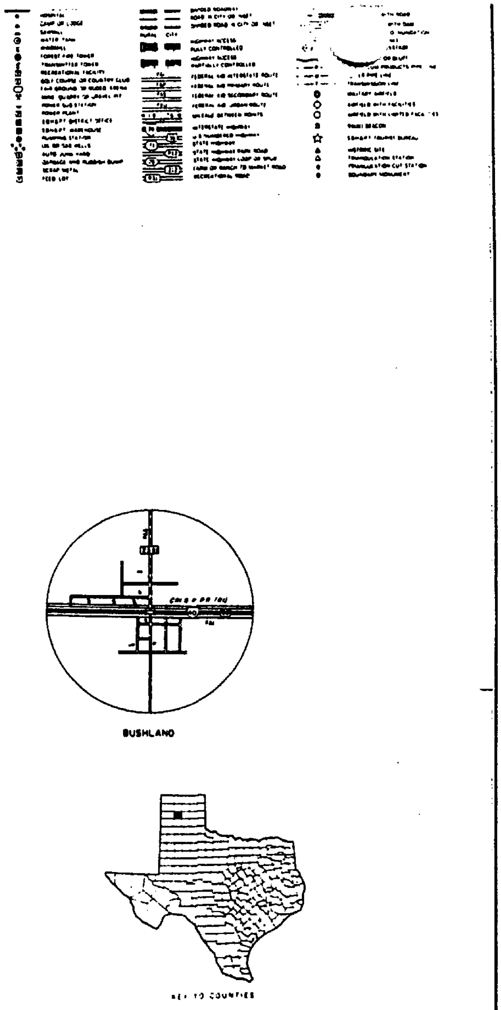
Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only
Well No. 07-56-3
Located on map ______

TWC-0392 (Rev. 06-10-85)

TEXAS WATER COMMISSION COPY





GENERAL HIGHWAY MAP
POTTER COUNTY
TEXAS

PREPARED BY THE
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION
IN COOPERATION WITH THE
U.S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALES

1971

1970 CENSUS FIGURES

HIGHWAYS REVISED TO OCTOBER 1 1980

POLYCONIC PROJECTION NORTH AMERICAN DATUM
Control: U.S. Coast and Geodetic Survey and U.S. Geological Survey
Compiled from U.S.G.S. quadrangles and updated with aerial photographs

KEY TO SUPPLEMENTARY SHEETS

end original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) **OWNER** Steve Shamlin (Name) **ADDRESS** Eagletree (Street or RFD) Amarillo, (City) Texas (State) (Zi

2) **LOCATION OF WELL:** County Potter , 10 miles in West (NE, SW, etc.) direction from Amarillo (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ **LEGAL DESCRIPTION:**

Section No. ______ Block No. ______ Township ______ Abstract No. ______ Survey Name ______

Distance and direction from two intersecting section or survey lines ______

☒ **SEE ATTACHED MAP**

3) **TYPE OF WORK (Check):** ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) **DRILLING METHOD (Check):** ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) **WELL LOG:**

Date Drilling:

Started 12-13 1993

Completed ______ 19 __

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
9	Surface	355

7) **BOREHOLE COMPLETION:**

☐ Open Hole ☐ Straight Wall ☐ Underreamed

☒ Gravel Packed ☐ Other ______

If Gravel Packed give interval . . . from 17 ft. to 355 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	15	Topsoil, caprock.
15	70	Caliche.
70	110	Green sandstone, conglomerate.
10	150	Red clay, shale.
50	185	Brn and gray clay, w/sandstone strks.
35	270	Red & white clay & shale w/ sandstone strks.
70	320	Reddish brn clay w/sand strks.
20	345	Red clay w/strks sand loose-fast drilling.

(Use reverse side if necessary)

MAR 25 1994

TEXAS WATER COMMISSION

8) **CASING, BLANK PIPE, AND WELL SCREEN DATA:**

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
5	N	Sch 40 PVC	0	225	
		.030 Perforations	225	345	
		10' blank on bottom			

9) **CEMENTING DATA** [Rule 287.44(1)]

Cemented from 2 ft. to 17 ft. No. of Sacks Used 4

______ ft. to ______ ft. No. of Sacks Used ______

Method used Cement

Cemented by Mixed

10) **SURFACE COMPLETION**

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☒ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) **WATER LEVEL:**

Static level 110 ft. below land surface Date ______

Artesian flow ______ gpm. Date ______

12) **PACKERS:** Type Depth

13) **TYPE PUMP:**

☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder

☐ Other ______

Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) **WELL TESTS:**

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) **WATER QUALITY:**

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? ______ Depth of strata ______

Was a chemical analysis made? ☐ Yes ☐ No

ereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand t failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

MPANY NAME K-Ran Drilling, Inc. (Type or print) WELL DRILLER'S LICENSE NO. 2848-WI

DRESS Rt. 6, Box 106 (Street or RFD) Amarillo, (City) Texas (State) 79124-9502 (Zip)

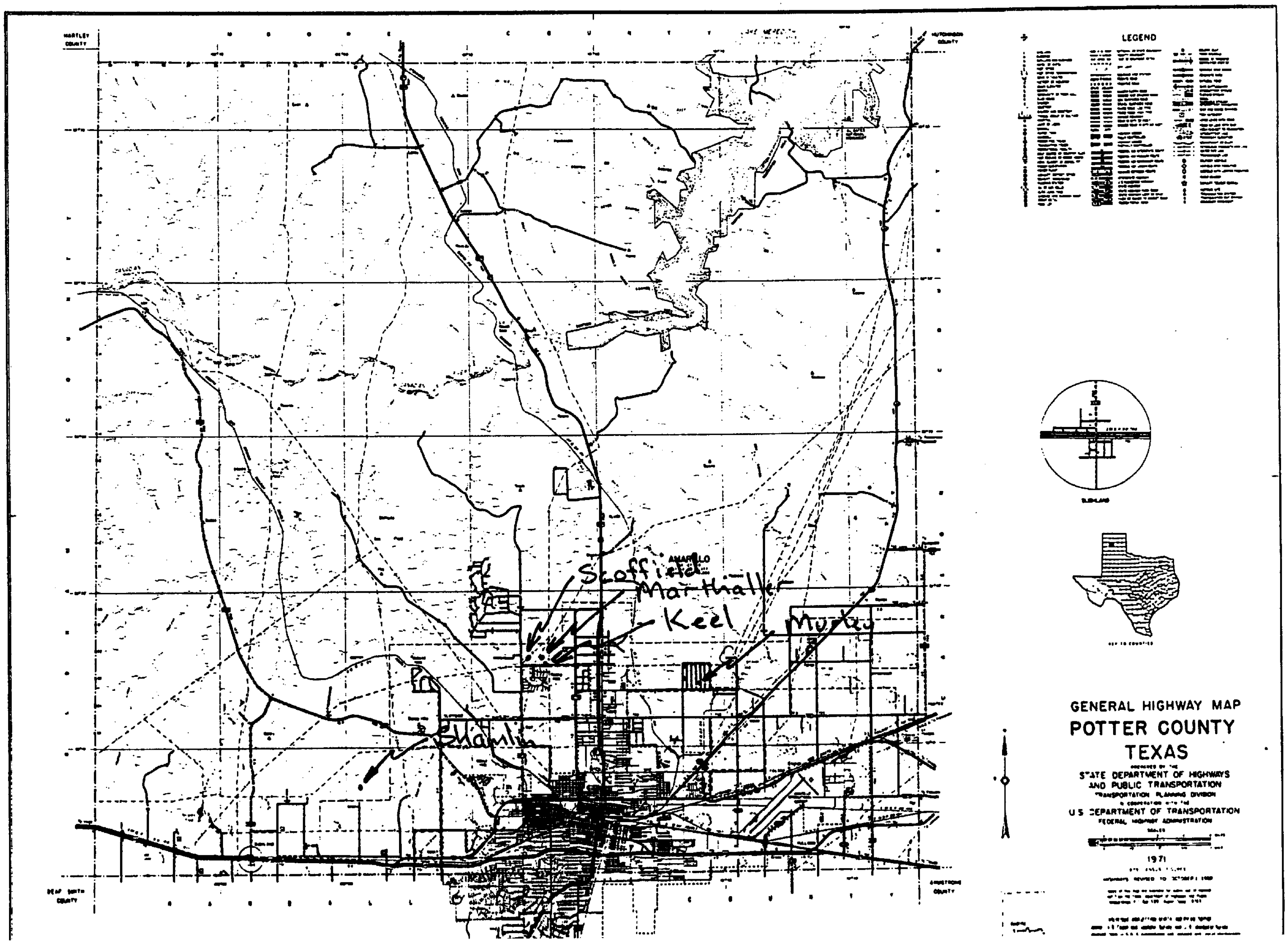
gned) ______ (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

ase attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. ______ Located on map ______

VD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY



GENERAL HIGHWAY MAP
POTTER COUNTY
TEXAS

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

1971

lease use black ink.
end original copy by
ertified mail to the
exas Department of Water Resources
. O. Box 13087
ustin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

) **OWNER** Harold Knight (Name) Address 8112 Coronado (Street or RFD) Amarillo, (City) Texas (State) 79110 (Zip)

LOCATION OF WELL:
County Potter ____ miles in I-40 West (N.E., S.W., etc.) direction from Amarillo,Turn North (Town)
n Dowell Rd 2 miles, 1/4 back west

riller must complete the legal description to the right ith distance and direction from two intersecting secon or survey lines, or he must locate and identify the ell on an official Quarter- or Half-Scale Texas County eneral Highway Map and attach the map to this form.

☐ Legal description:
Section No. ____ Block No. ____ Township ____
Abstract No. ____ Survey Name ____
Distance and direction from two intersecting section or survey lines ____

☒ See attached map.

) **TYPE OF WORK** (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) **PROPOSED USE** (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ____

5) **DRILLING METHOD** (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ____

) **WELL LOG:**

. Date drilled 4-8- 1989

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4	Surface	555

7) **BOREHOLE COMPLETION:**
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other ____
If Gravel Packed give interval . . . from 15 ft. to 555 ft.

From (ft.)	To (ft.)	Description and color of formation material
	1	Soil
	44	Brown Sandy Clay
4	62	White Sandy Clay & Soft Rock
2	105	Brown Sandy Clay
05	135	Brown Sandy Clay & Soft Rock
5	154	White & Brown Rock
4	168	Red Clay
8	260	Red Clay & Blue Clay Streaks
0	281	Gray Clay & Soft Rock
1	285	Brown Clay & Soft Rock
5	342	Red & Gray Clay
2	398	Brown Clay & Soft Rock
8	405	Red with White Clay & Soft Rock
5	428	Red Clay & Soft Rock(loose)
8	436	Red & White Clay & Soft Rock
36	476	Red Clay
6	505	Red & Gray Clay & Soft Rock
05	520	Yellow, Red & Gray Clay & Rock
0	524	CBrown Sandy Clay & course Sand
4	545	Red,Yellow, Brown Clay & Rock
45	550	Course Sand
0	555	Red Bed

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DEC 20 1989
TEXAS WATER

(Use reverse side if necessary)

8) **CASING, BLANK PIPE, AND WELL SCREEN DATA:**

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
5	N	160 PVC	0	555	.020
		Perf 130 Ft			
		325-345/365- 385			
		405-425/445-465			
		485-505/525-555			

9) **CEMENTING DATA** [Rule 319.44(b)]
Cemented from 0 ft. to 15 ft.
____ ft. to ____ ft.
Method used Hand Mixed
Cemented by Don DeHay

10) **SURFACE COMPLETION**
☐ Specified Surface Slab Installed [Rule 319.44(c)]
☒ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) **WATER LEVEL:**
Static level 140 ft. below land surface Date 10-8-89
Artesian flow ____ gpm. Date ____

12) **PACKERS:** Type Depth
None None

13) **TYPE PUMP:**
☐ Turbine ☐ Jet ☑ Submersible ☐ Cylinder
☐ Other ____
Depth to pump bowls, cylinder, jet, etc., 540 ft.

) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ____ Depth of strata 520
Was a chemical analysis made? ☐ Yes ☒ No

14) **WELL TESTS:**
Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 15 gpm with 4.4 ft. drawdown after ____ hrs.

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

)MPANY NAME D. & L. Drilling (Type or Print) Water Well Driller's License No. 2558

DDRESS 5606 McCormick Rd (Street or RFD) Amarillo, (City) Texas (State) 79118 (Zip)

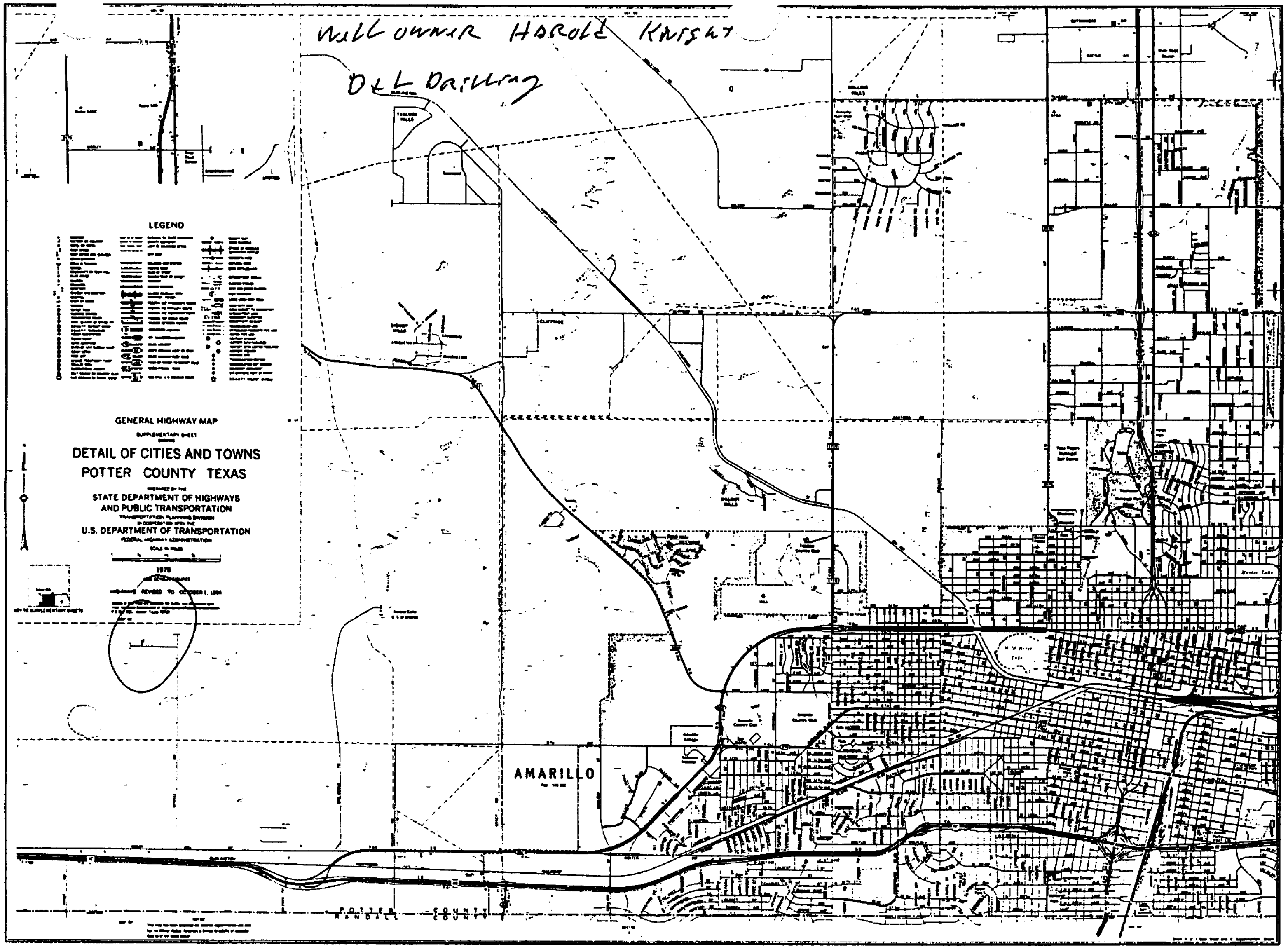
igned) Don DeHay (Licensed Water Well Driller) (Signed) ____ (Registered Driller Trainee)

ease attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 06-49-1
Located on map ____

DEPARTMENT OF WATER RESOURCES COPY

VR-0392 (12/29/83)



Well owner Harold Knight

D&L Drilling

TEXAS WATER DEVELOPMENT BOARD

Charles W. Jenness, *Chairman*
William B. Madden, *Member*
Diane E. Umstead, *Member*

Craig D. Pedersen,
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Telecommunications Cover Page
Fax Number
(512) 445-1488

DATE: 10/18/93

TO: Todd Lee
PERSON TO CONTACT

FROM: Phil Nordstrom
PERSON SENDING FAX

HDR
COMPANY NAME

TWDB
COMPANY NAME

OWN STATE

TOWN STATE

214 960 4471
TELEFAX NUMBER

512 445 1488
TELEFAX NUMBER

COMMENTS: Requested data on located wells

Total Number of Pages Transmitting (including this cover page) 3

For Verification of telecommunications transmission, please contact the operator at (512) 445-1488.

IE:

OPERATOR:

TEXAS WATER DEVELOPMENT BOARD
WATER LEVEL OBSERVATION WELL REPORT

STATE WELL NUMBER: 0756307
PREVIOUS WELL NUMBER: P276
WELL LOCATION: LAT: 35 13 07
LONG: 102 01 37
WELL USE: I

CURRENT DATE: Oct 18 1993
YEAR RECORD BEGINS: 1976
ELEVATION OF LAND SURFACE: 3814
DEPTH OF WELL: 295

DATE OF CURRENT MEASUREMENT MO DAY YEAR	CURRENT DEPTH TO WATER FROM LAND SURFACE	CHANGE IN LEVEL SINCE LAST STATIC MEASUREMENT	MEASUREMENT NUMBER	ELEVATION OF WATER LEVEL	MEASURING AGENCY	MEASUREMENT METHOD	REMARKS
09/13/1976	-227.48		01	3587	06	1	
01/03/1977	-232.87		01	3581	06	1	04
01/05/1978	-222.92	4.56	01	3591	06	1	
01/19/1979	-223.88	-0.96	01	3590	06	1	
12/05/1979	-225.07	-1.19	01	3589	06	1	
01/06/1981	-225.77	-0.70	01	3588	06	1	
01/19/1982	-224.64	1.13	01	3589	06	1	
02/22/1983	-223.77	0.87	01	3590	06	1	
01/03/1984	-224.45	-0.68	01	3590	06	1	
01/24/1985	-224.52	-0.07	01	3589	06	1	
'02/1986	-224.78	-0.26	01	3589	06	1	
/07/1987	-225.22	-0.44	01	3589	06	1	
02/10/1988	-224.53	0.69	01	3589	06	1	
01/03/1989	-224.88	-0.35	01	3589	06	1	
01/04/1990	-224.41	0.47	01	3590	06	1	
01/28/1991	-225.56	-1.15	01	3588	06	1	
01/20/1992	-226.23	-0.67	01	3588	06	1	
01/06/1993	-226.59	-0.36	01	3587	06	1	

AQUIFER: OGALLALA FORMATION
BASIN : Red River
COUNTY : Potter

WELL CLASS AND NUMBER: CURRENT 0756307

SWN	USE	WQ	GPM YIELD	
0649101	Domestic	Y 319 TDS	— —	
0756301	Irr	N	- -	
302	Irr	N	560	
303	Irr	N	800	
304	Irr	N	500	
305	Irr	N	- -	
306	Irr	N	600	
*307	Irr	Y 350 TDS	400	Current Ob
602	Irr	N	700	
603	Irr	N	550	
604	Irv	N	500	
611	Irr	N	— —	

Yield reported by driller during pump test.

0649101 Sampled in 1988 TDS = 320
0756307 Sampled in 1980 TDS = 350

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Lonnie Eaves (Name) ADDRESS ______ (Street or RFD) ______ (City) ______ (State) ______ (Zip)

2) LOCATION OF WELL: County Potter , 9 miles in W (NE, SW, etc.) direction from Amarillo (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. ______ Block No. ______ Township ______ Abstract No. ______ Survey Name ______

Distance and direction from two intersecting section or survey lines ______

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other ______

6) WELL LOG:

Date Drilling: Started 6-19-92 19__

Completed ______ 19__

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
9	Surface	336

7) BOREHOLE COMPLETION:

☐ Open Hole ☐ Straight Wall ☐ Underreamed

☒ Gravel Packed ☐ Other ______

If Gravel Packed give interval ... from 17 ft. to 336 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	25	Topsoil, brn dirty sand w/ caliche layers.
25	50	Brn clean med sand, large broken gravel & cong @ 40'.
50	72	Conglamerate to 57', red clay.
2	94	Red clay w/shale strks.
94	116	" " " "
116	138	" " " "
138	160	" " " "
160	182	" " " "

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
5	N	PVC	0	154	
		.050 Perforations	154	314	
		10' blank on			
		bottom			

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 2 ft. to 17 ft. No. of Sacks Used 4

______ ft. to ______ ft. No. of Sacks Used ______

Method used Mixed

Cemented by Mark Randall

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☒ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level 65' ft. below land surface Date ______

Artesian flow ______ gpm. Date ______

12) PACKERS: Type Depth

13) TYPE PUMP:

☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder

☐ Other ______

Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? ______ Depth of strata ______

Was a chemical analysis made? ☐ Yes ☐ No

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JUL 14 1992
TEXAS WATER COMMISSION

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME K-Ran Drilling, Inc. (Type or print) WELL DRILLER'S LICENSE NO. 2848-W

ADDRESS Rt. 6, Box 106 (Street or RFD) Amarillo, Texas (City) 79124-9502 (State) (Zip)

(Signed) ______ (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. ______ Located on map ______

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) **OWNER** Charlene Barnard (Name) **ADDRESS** Eagle Tree (Street or RFD) Amarillo, Texas (City) (State, (Zip)

2) **LOCATION OF WELL:** County Potter, 10 miles in West (NE, SW, etc.) direction from Amarillo (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ **LEGAL DESCRIPTION:**

Section No. ______ Block No. ______ Township ______ Abstract No. ______ Survey Name ______

Distance and direction from two intersecting section or survey lines ______

☒ **SEE ATTACHED MAP**

3) **TYPE OF WORK (Check):** ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** ☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) **DRILLING METHOD (Check):** ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bor ☐ Air Rotary ☐ Cable Tool ☐ Other ______ ☐ Driv

6) **WELL LOG:**

Date Drilling: Started 8-22 1990

Completed ______ 19__

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4	Surface	338

7) **BOREHOLE COMPLETION:**

☐ Open Hole ☐ Straight Wall ☐ Underreamed

☒ Gravel Packed ☐ Other ______

If Gravel Packed give interval . . . from 17 ft. to 338 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	25	Topsoil, caliche, med. gravel.
25	50	Med gravel, red clay.
50	72	Red & grey clay.
72	94	Red & grey clay w/strks. of shale.
94	116	Red & grey clay w/strks. sandstone.
116	138	Red & grey clay w/strks. sandstone.
138	160	Red & grey clay w/strsk. sandstone.

(Use reverse side if necessary)

8) **CASING, BLANK PIPE, AND WELL SCREEN DATA:**

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Castin Scree
			From	To	
5	N	PVC	0	178	
		.050 Perforations	178	338	

9) **CEMENTING DATA** [Rule 287.44(1)]

Cemented from 2 ft. to 17 ft. No. of Sacks Used 4

______ ft. to ______ ft. No. of Sacks Used ______

Method used Mixed

Cemented by Mark Randall

13) **TYPE PUMP:**

☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder

☐ Other ______

Depth to pump bowls, cylinder, jet, etc., ______

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APR 03 1992
TEXAS WATER COMMISSION

10) **SURFACE COMPLETION**

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☒ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

14) **WELL TESTS:**

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

11) **WATER LEVEL:**

Static level 125 ft. below land surface Date ______

Artesian flow ______ gpm. Date ______

15) **WATER QUALITY:**

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? ______ Depth of strata ______

Was a chemical analysis made? ☐ Yes ☐ No

12) **PACKERS:** Type Depth

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME K-Ran Drilling, Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** 2848-W

ADDRESS Rt. 6, Box 106 (Street or RFD) Amarillo, Texas (City) (State) 79124-950 (Zip)

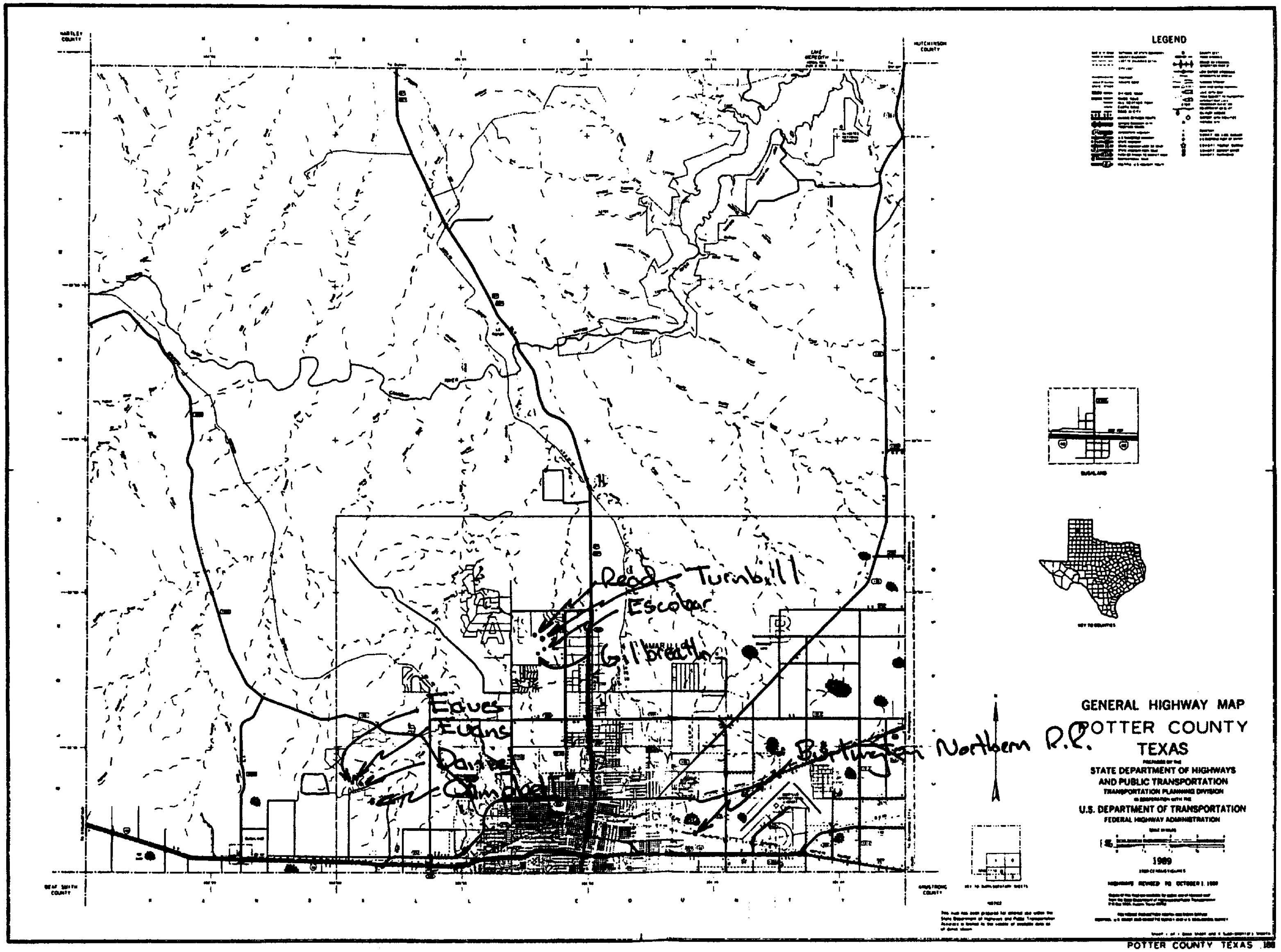
(Signed) ______ (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. ______ Located on map ______

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY



GENERAL HIGHWAY MAP

POTTER COUNTY

TEXAS

STATE DEPARTMENT OF HIGHWAYS

AND PUBLIC TRANSPORTATION

TRANSPORTATION PLANNING DIVISION

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

1989

POTTER COUNTY TEXAS

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) **OWNER** Evan Evans (Name) **ADDRESS** Eagle Tree (Street or RFD) (City) (State)

2) **LOCATION OF WELL:**
County Potter , 9 miles in W (NE, SW, etc.) direction from Amarillo (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ **LEGAL DESCRIPTION:**

Section No. ______ Block No. ______ Township ______ Abstract No. ______ Survey Name ______

Distance and direction from two intersecting section or survey lines ______

☒ **SEE ATTACHED MAP**

3) **TYPE OF WORK (Check):**
☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):**
☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) **DRILLING METHOD (Check):**
☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Driven ☐ Air Rotary ☐ Cable Tool ☐ Other ☐ Bored

6) **WELL LOG:**
Date Drilling:
Started 6-17-92 19__
Completed ______ 19__

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
9	Surface	370

7) **BOREHOLE COMPLETION:**
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from 17 ft. to 370 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	25	Topsoil, fine brn sand.
25	50	Fine brn sand, coarse sand & gravel @ 40'.
50	72	Red & grey clay @ 51'.
72	94	Red clay, grn shale & s/s @ 82
94	116	Red clay w/shale strks.
116	138	" " " "
138	160	" " " "
160	182	Red clay w/sand strks.
182	204	Blue shale cemented brn sand.

(Use reverse side if necessary)

8) **CASING, BLANK PIPE, AND WELL SCREEN DATA:**

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
5	N	PVC	0	162	
		PVC	302	342	
.		.050 Perforations	162	302	
		.050 Perforations	342	362	

9) **CEMENTING DATA** [Rule 287.44(1)]
Cemented from 2 ft. to 17 ft. No. of Sacks Used 4
______ ft. to ______ ft. No. of Sacks Used ______
Method used Mixed
Cemented by Mark Randall

10) **SURFACE COMPLETION**
☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☒ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

11) **WATER LEVEL:**
Static level 60' ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

12) **PACKERS:** Type Depth

13) **TYPE PUMP:**
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.

14) **WELL TESTS:**
Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.

RECEIVED
JUL 14 1992
TEXAS WATER COMMISSION

15) **WATER QUALITY:**
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME K-Ran Drilling, Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** 2848-W

ADDRESS Rt. 6, Box 106 (Street or RFD) Amarillo, Texas (City) (State) 79124-9502 (Zip)

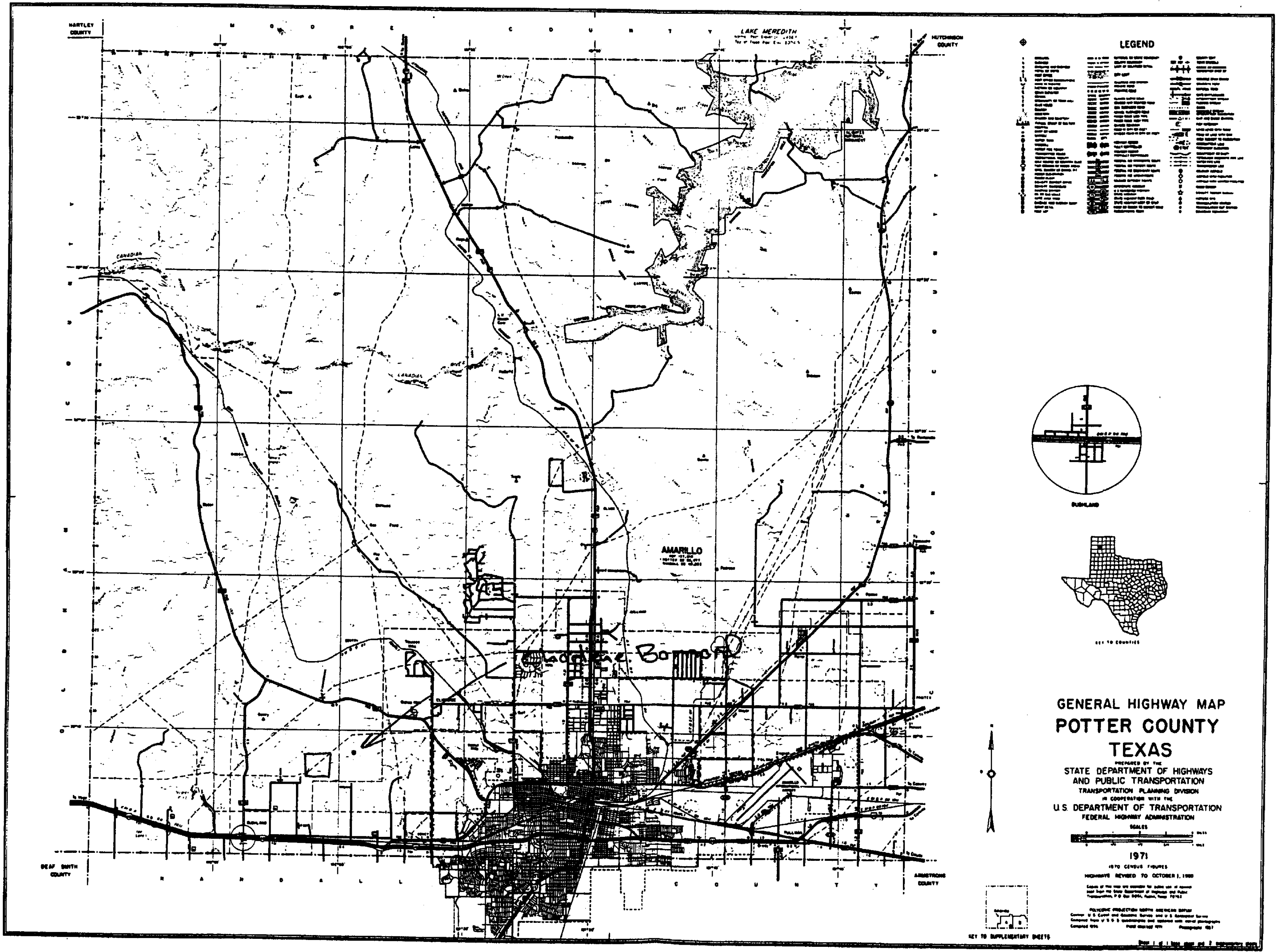
(Signed) ______ (Licensed Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. ______ Located on map ______

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY



GENERAL HIGHWAY MAP

POTTER COUNTY

TEXAS

PREPARED BY THE

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION

IN COOPERATION WITH THE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

1971

1970 CENSUS FIGURES

POTTER COUNTY TEXAS 188

7-56-3(A-J)

GW 1

end original copy by
ertified mail to the
exas Water Development Board
. O. Box 123P6
ustin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 07-56-3A
Located on map yes
Received: 1-11
Form GW 8
Form GW 9

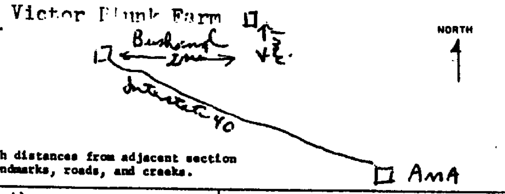
1) OWNER:
Person having well drilled Bush Estate (Name) Address Box 1230 Amarillo, Texas (Street or RFD) (City) (State)

Landowner Same (Name) Address Same (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Potter Labor League Abstract No.

NW¼ NE¼ SW¼ SE¼ of Section 127 Block No. 9 Survey
(Circle as many as are known)

miles in W (NE, SW, etc.) direction from Amarillo (Town).



Sketch map of well location with distances from adjacent section or survey lines, and to landmarks, roads, and creeks.

3) TYPE OF WORK (Check):
New Well ☒ Deepening ☐
Reconditioning ☐ Plugging ☐

4) PROPOSED USE (Check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

5) TYPE OF WELL (Check):
Rotary ☐ Driven ☐ Dug ☐
Cable ☒ Jetted ☐ Bored ☐

6) WELL LOG:
Diameter of hole 9 in. Depth drilled 290 ft. Depth of completed well 290 ft. Date drilled Dec. 68

All measurements made from 0 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	2	Blk. clay topsoil
2	80	Yellow clay
80	120	sandy caliche
120	140	sand, sandstone stringers
140	170	soft sand
170	218	sandstone
218	225	rock
225	275	Ogallala sand

From (ft.)	To (ft.)	Description and color of formation material
275	278	red clay
278	285	sand & gravel
285	290	red bed clay

(Use reverse side if necessary)

7) COMPLETION (Check):
Straight wall ☒ Gravel packed ☐ Other ☐
Under reamed ☐ Open hole ☐

8) WATER LEVEL:
Static level 190 ft. below land surface Date Dec. 68
Artesian pressure ____ lbs. per square inch Date

9) CASING:
Type: old ☒ New ☐ Steel ☒ Plastic ☐ Other ☐
Cemented from ____ ft. to 5 ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
6 5/8	0	290	.156

10) SCREEN:
Type Torch cut casing
Perforated ☐ Slotted ☐

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot size
6 5/8	265	290	1/16

11) WELL TESTS:
Was a pump test made? ☐ Yes ☒ No If yes by whom?

Yield: ____ gpm with ____ ft. drawdown after ____ hrs
Bailer test 30 gpm with 1 ft. drawdown after 7 hrs
Artesian flow ____ gpm Date
Temperature of water
Was a chemical analysis made? ☐ Yes ☒ No
Did any strata contain undesirable water? ☐ Yes ☒ No
Type of water? Potable depth of strata 190-287

12) PUMP DATA:
Manufacturer's Name Aermotor
Type Submersible H.P. 1
Designed pumping rate 10 gpm ☒ gph ☐
Type power unit Electric
Depth to bowls, cylinder, jet, etc., ____ ft. below land surface.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME C. A. Biggers (Type or Print) Water Well Drillers Registration No. 286

Address 700 Valley Ave (Street or RFD) Amarillo, Texas 79108 (City) (State)

Signed) (Driller) C. A. Biggers, Water Well Service (Company Name)

[redacted]

d original copy by
tified mail to the
as Water Development Board
O. Box 12386
tin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 07-56-3C
Located on map 1C
Received: 67

OWNER:
Person having well drilled WmH Bush Est (Name) Address AMARILLo (Street or RFD) Tex (City) (State)

Landowner SAMe AS ABove (Name) Address (Street or RFD) (City) (State)

LOCATION OF WELL:
County Potter, NW'n 22 miles in ____ (N.E., S.W., etc.) direction from BUSHLAND (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*

North

(Use reverse side if necessary)

or Give legal location with distances and directions from adjacent sections or survey lines.
Sec 127 League ____
Block 9 Survey BS+F
Abstract No. ____
(NW¼ NE¼ SW¼ SE¼) of Section ____

TYPE OF WORK (Check): [✓ New Well] Deepening Reconditioning Plugging

4) PROPOSED USE (Check): Domestic Industrial Municipal [✓ Irrigation] Test Well Other

5) TYPE OF WELL (Check): [✓ Rotary] Driven Dug Cable Jetted Bored

WELL LOG:
Diameter of hole 18" in. Depth drilled 356 ft. Depth of completed well 356 ft. Date drilled 4-30-67

All measurements made from ____ ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	14	SoiL + CALICHe
4	60	SANDY CLAY
0	85	SHALe + CLAY
5	95	CAPROCK
5	130	TIGHT SAND + SHALe
30	275	FINe SAND
75	305	COARSe SAND
05	345	ROCK + SAND STKS
5	356	ReD BeD

(Use reverse side if necessary)

9) Casing:
Type: Old [✓ New Steel] Plastic Other
Cemented from ____ ft. to ____ ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
16"	0	356	250

10) SCREEN:
Type ____
Perforated [✓ Slotted]

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size
16	250	356	3/16 x 10

COMPLETION (Check):
[✓ Straight wall] Gravel packed Other
Under reamed Open Hole

WATER LEVEL:
Static level ____ ft. below land surface Date ____
Artesian pressure ____ lbs. per square inch Date ____
Depth to pump bowls, cylinder, jet, etc., ____ ft.
below land surface.

11) WELL TESTS:
Was a pump test made? [✓ Yes] No If yes, by whom? Peerless Pump Co Plainview
Yield: ____ gpm with ____ ft. drawdown after ____ hrs.
Bailer test ____ gpm with ____ ft. drawdown after ____ hrs.
Artesian flow ____ gpm
Temperature of water ____

12) WATER QUALITY:
Was a chemical analysis made? Yes No
Did any strata contain undesirable water? Yes No
Type of water? ____ depth of strata ____

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME W.G. Goyne (Type or Print) Water Well Drillers Registration No. 306

ADDRESS 1306 HOLIDAY DR (Street or RFD) PLAINVIEW (City) Tex (State)

(Signed) W.G. Goyne (Water Well Driller) Goyne Drilling Co (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

ertified mail to the
exas Water Development Board
. O. Box 12386
ustin, Texas 78711

State of Texas

WATER WELL REPORT

DEPT. OF WATER RESOURCES

For TWDB use only
Well No. 07-56-3C
Located on map yes
Received: 79 jac
Form GW 8
Form GW 9

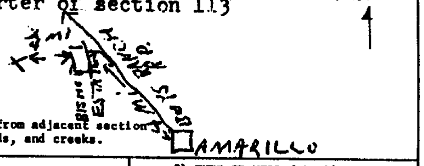
1) OWNER:
Person having well drilled W. H. Bush Estate (Name) Address Box 1230, Ama. Texas, 79105 (Street or RFD) (City) (State)

Landowner Same (Name) Address Same (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Potter Labor League Abstract No.
NW¼ NE¼ SW¼ SE¼ of Section 113 Block No. 9 Survey BS&F
(Circle as many as are known)
6 miles in NW (NE, SW, etc.) direction from Amarillo, Texas. (Town)

In Northeast corner of the S.W. quarter of section 113

3760
246
3520



Sketch map of well location with distances from adjacent section or survey lines, and to landmarks, roads, and creeks.

3) TYPE OF WORK (Check):
New Well ☒ Deepening ☐
Reconditioning ☐ Plugging ☐

4) PROPOSED USE (Check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☒ stock

5) TYPE OF WELL (Check):
Rotary ☐ Driven ☐ Dug ☐
Cable ☒ Jetted ☐ Bored ☐

6) WELL LOG:
Diameter of hole 9" in. Depth drilled 350' ft. Depth of completed well 350' ft. Date drilled Sept. 78
All measurements made from 0 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	3	sandy brwn. top soil
3	40	yellow sandy clay
40	70	limestone w caliche & sandst.
70	140	sandy clay w sandstone st.
140	162	gravel
162	220	hard & soft str. red & grey shale
220	225	grey sandy shale w sandstone str.

From (ft.)	To (ft.)	Description and color of formation material
225	230	sandy red shale
230	240	grey shale w cem. sandst. str.
240	264	red, blue & white shale str.
264	320	red & brown shale
320	342	soft white sandst. w blue shale str. (water bearing)
342	350	Hard brn. shale

(Use reverse side if necessary)

7) COMPLETION (Check):
Straight wall ☒ Gravel packed ☐ Other ☐
Under reamed ☐ Open hole ☐

8) WATER LEVEL:
Static level 210 ft. below land surface Date Sept. 78
Artesian pressure lbs. per square inch Date

9) CASING:
Type: old ☐ New ☒ Steel ☒ Plastic ☐ Other ☐
Cemented from 0 ft. to 5 ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
6 5/8	2' above	350	.188

10) SCREEN:
Type Torch cut perforation
Perforated ☐ Slotted ☒

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot size
6 5/8	305	350	1/16

11) WELL TESTS:
Was a pump test made? ☐ Yes ☒ No If yes by whom?
Yield: gpm with ft. drawdown after hrs
Bailer test 4 gpm with 100 ft. drawdown after 7 hrs
Artesian flow gpm Date Sept. 78
Temperature of water
Was a chemical analysis made? ☐ Yes ☒ No
Did any strata contain undesirable water? ☐ Yes ☒ No
Type of water? Potable sweet Depth of strata 320-342

12) PUMP DATA:
Manufacturer's Name Aermotor windmill
Type 10 Ft H.P.
Designed pumping rate 3 gpm ☐ gph ☐
Type power unit
Depth to bowls, cylinder, jet, etc., 343 ft. below land surface.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

Name C. A. Biggers (Type or Print) Water Well Drillers Registration No. 286
Address 700 Valley Ave. (Street or RFD) Amarillo (City) Texas (State)
Signed) Clifford Biggers (Well Driller) C. A. Biggers, Drilling & Repair Serv. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

rtified mail to the
xas Department of Water Resou
O. Box 13087
stin, Texas 78711

WATER WELL REPORT

TENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Well No. 07-56-3D
Located on map YES
Received: TH

OWNER Robert Jackson (Name) Address (Street or RFD) (City) (State) (Zip)

LOCATION OF WELL:
County Potter 7 miles in N.W. (N.E., S.W., etc.) direction from Amarillo (Town)

iller must complete the legal description to the right th distance and direction from two intersecting sec- n or survey lines, or he must locate and identify the ll on an official Quarter- or Half-Scale Texas County neral Highway Map and attach the map to this form.

☐ Legal description:
Section No. 114 Block No. 9 Township
Abstract No. Survey Name Jimmy Nail (Bishop Estates)
Distance and direction from two intersecting section or survey lines B.S.+F.

☐ See attached map.

TYPE OF WORK (Check):
☐ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☑ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other

WELL LOG:

Date drilled 3-15-80

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4	Surface	230

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☑ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from 0 ft. to 230 ft.

From (ft.)	To (ft.)	Description and color of formation material
	140	Surface Red Clay
0	160	Sandstone W/ Clay Strips
60	180	Hard Sandstone & Red Clay
80	200	Red & Brown Clay
00	220	Red & Blue Clay W/ Sandstone Strips
20	230	Red Clay

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.)		Gage Casing Screen
			From	To	
5	N	Plastic	0	230	.050
		Perf.	120	220	

CEMENTING DATA

Cemented from ft. to ft.
Method used
Cemented by (Company or Individual)

9) WATER LEVEL:
Static level ft. below land surface Date 3-15-80
Artesian flow gpm. Date

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☐ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 3 gpm with ft. drawdown after hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

ME Lester J. Taylor (Type or Print) Water Well Drillers Registration No. 1849

DRESS Box 784 (Street or RFD) Sunray (City) Texas (State) 79086 (Zip)

gned) (Water Well Driller) Les Taylor Drilling Co. (Company Name)

Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 07-56-3D
Located on map YES
Received: TH

1) OWNER Martin Birken Field (Name) Address 3841 A Washington (Street or RFD) Amarillo (City) Texas (State) 79101 (Zip)

2) LOCATION OF WELL:
County Potter 7 miles in N. W. (N.E., S.W., etc.) direction from Amarillo (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. 114 Block No. 9 Township
Abstract No. Survey Name Jimmy Nail B.S.+F
Distance and direction from two intersecting section or survey lines

☐ See attached map.

3) TYPE OF WORK (Check):
☐ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other

6) WELL LOG:

Date drilled 3-11 80

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4	Surface	180

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from 0 ' ft. to 180 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	100	Surface Red & Blue Clay W/ Sand & stone
100	120	Sandstone W/ Blue Clay Strip
120	140	Sandstone W/ Red & Blue Clay Strips
140	160	Red & Blue Shale W/ sand & sandstone strips
160	180	Red & Yellow Clay

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.)		Gage Casing Screen
			From	To	
5	N	Plastic	0	180	.050
		Perf.	90	170	

CEMENTING DATA

Cemented from ft. to ft.
Method used
Cemented by (Company or Individual)

9) WATER LEVEL:
Static level 98 ft. below land surface Date 3-11-80
Artesian flow gpm. Date

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: 12 gpm with ft. drawdown after hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Lester J. Taylor (Type or Print) Water Well Drillers Registration No. 1849

ADDRESS Box (Street o.) Sunray (City) Texas (State) 79086 (Zip)

(Signed) Lester Taylor Les Taylor Drilling Co.

ıııı original copy by
ertified mail to the
exas Department of Water Resc
. O. Box 13087
ustin, Texas 78711

State of Texas

WATER WELL REPORT

JAN 1 (1979
DEPT. OF
WATER RESOURCES

For TDWR use only
Well No. 07-56-3D
Located on map yes
Received: 79 SHC

1) OWNER GARY ALEXANDER (Name) Address BOX 3502 (Street or RFD) AMARILLO (City) TEX (State) 79106 (Zip)

2) LOCATION OF WELL:
County POTTER, 5 miles in N. W (N.E., S.W., etc.) direction from AMARILLO (Town)

riller must complete the legal description to the right ith distance and direction from two intersecting secon or survey lines, or he must locate and identify the ell on an official Quarter- or Half-Scale Texas County eneral Highway Map and attach the map to this form.

☐ Legal description:
Section No. 814 Block No. 9 Township
Abstract No. Survey Name JIMMY NAIL
Distance and direction from two intersecting section or survey lines

☐ See attached map. BISHOP ESTATES.

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other

6) WELL LOG:

Date drilled 12-7-78

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8"	Surface	177'

From (ft.)	To (ft.)	Description and color of formation material
0	100	SURFACE, CLAY
100	120	RED CLAY + SANDSTONE
120	140	RED CLAY + SANDSTONE
140	160	RED CLAY + SANDSTONE
160	177	RED CLAY

(Use reverse side if necessary)

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from 0 ft. to 177 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
3	N	PLASTIC	0	177	
5"	N	PLASTIC .50 SLOTS	100	170	

CEMENTING DATA

Cemented from ft. to ft.
Method used
Cemented by (Company or Individual)

9) WATER LEVEL:
Static level 95' ft. below land surface Date
Artesian flow gpm. Date

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbin ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: 15 gpm with ft. drawdown after hrs.

) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

AME LESTER J TAYLOR (Type or Print) Water Well Drillers Registration No. 1849

DDRESS BOX 784 (Street or RFD) SUNRAY (City) TEX. (State) 79086 (Zip)

gned) Les J. Taylor (Water Well Driller) Les Taylor Drilling Co. (Company Name)

ase attach electric log, chemical analysis and other pertinent information

end original copy by
ertified mail to the
exas Department of Water Resources
. O. Box 13087
ustin, Texas 78711

State of Texas

WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 07-56-30
Located on map yes
Received: C.K.S.

OWNER William A. Bowers (Name) Address 2 Cambridge (Street or RFD) Amarillo, Tx. (City) (State) 79106 (Zip)

LOCATION OF WELL:
County Potter 10 miles in W (N.E., S.W., etc.) direction from Amarillo (Town)

riller must complete the legal description to the right ith distance and direction from two intersecting section or survey lines, or he must locate and identify the ell on an official Quarter- or Half-Scale Texas County eneral Highway Map and attach the map to this form.

☐ Legal description:
Section No. $114 Block No. 9 Township
Abstract No. Survey Name BS&F
Distance and direction from two intersecting section or survey lines
Unit 1 Track 80, Bishop Estates
☐ See attached map.

TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other

WELL LOG:

Date drilled 6/22/80

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
	Surface	
10	0	352

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from top ft. to bottom ft.

From (ft.)	To (ft.)	Description and color of formation material
0	3	top soil
3	64	Caliche
64	80	Clay & hard rock
80	187	Red clay
187	190	Blue clay
190	196	Sandy clay & sandstone
196	210	Blue clay
210	231	Speckled caly w/ sandstone
231	253	Hard gray rock
253	318	Hard gray rock & clay
318	332	Red clay & rock
332	352	Sand & sandstone
352		Yellow clay & rock

OCT 07 1981
TDWR

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
5	N	Plastic	-2	352	190
		\			
		Perfs 120 ft. on bottom			
		232-352 ?			

CEMENTING DATA
Cemented from ft. to ft.
Method used
Cemented by (Company or Individual)

9) WATER LEVEL:
Static level 217 ft. below land surface Date 6/22/80
Artesian flow gpm. Date

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., 320 ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimated
Yield: 12 gpm with 0 ft. drawdown after 3 hrs.

3) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

AME Charles Hooley (Type or Print) Water Well Drillers Registration No. 674

DDRESS Box 17 (Street or Miami (City) Tx. (State) 79059 (Zip)

igned) Miami Water Well Service

ıxas Department of Water Reso
O. Box 13087
ıstin, Texas 78711

WATER WELL REPORT

TTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Well No. 01-36-3E
Located on map yes
Received: C.F.S

OWNER John Porter (Name) Address Box 162 (Street or RFD) Cactus (City) Texas (State) 79013 (Zip)

LOCATION OF WELL:
County Potter 5 miles in NW (N.E., S.W., etc.) direction from Amarillo, Tex. (Town)
Well Location Bishop Hills Estate

iller must complete the legal description to the right th distance and direction from two intersecting secon or survey lines, or he must locate and identify the ll on an official Quarter- or Half-Scale Texas County neral Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ See attached map.

TYPE OF WORK (Check): ☐ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

WELL LOG:

Date drilled March 19,1981

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4	Surface	350

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from 0 ft. to 350 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	28	Topsoil & Caliche
28	48	Caliche & rock
48	92	Rock & Clay
92	136	White Clay & Sand
136	180	Sand & Gravel
180	202	Sand & Gray clay
202	246	Gray & white clay
246	268	White, gray, & red clay
268	290	Gray & red clay
290	312	Red clay & gravel
312	334	Red clay
334	350	Red clay
	350	TD

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
6	New	Steel, Perf.	250	350	

CEMENTING DATA

Cemented from ______ ft. to ______ ft.
Method used ______
Cemented by ______ (Company or Individual)

9) WATER LEVEL:
Static level 250 ft. below land surface Date 3-19-81
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 315 ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimated
Yield: 23 gpm with 25 ft. drawdown after 3 hrs.

3) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

AME Jimmy McCaskill (Type or Print) Water Well Drillers Registration No. 1771

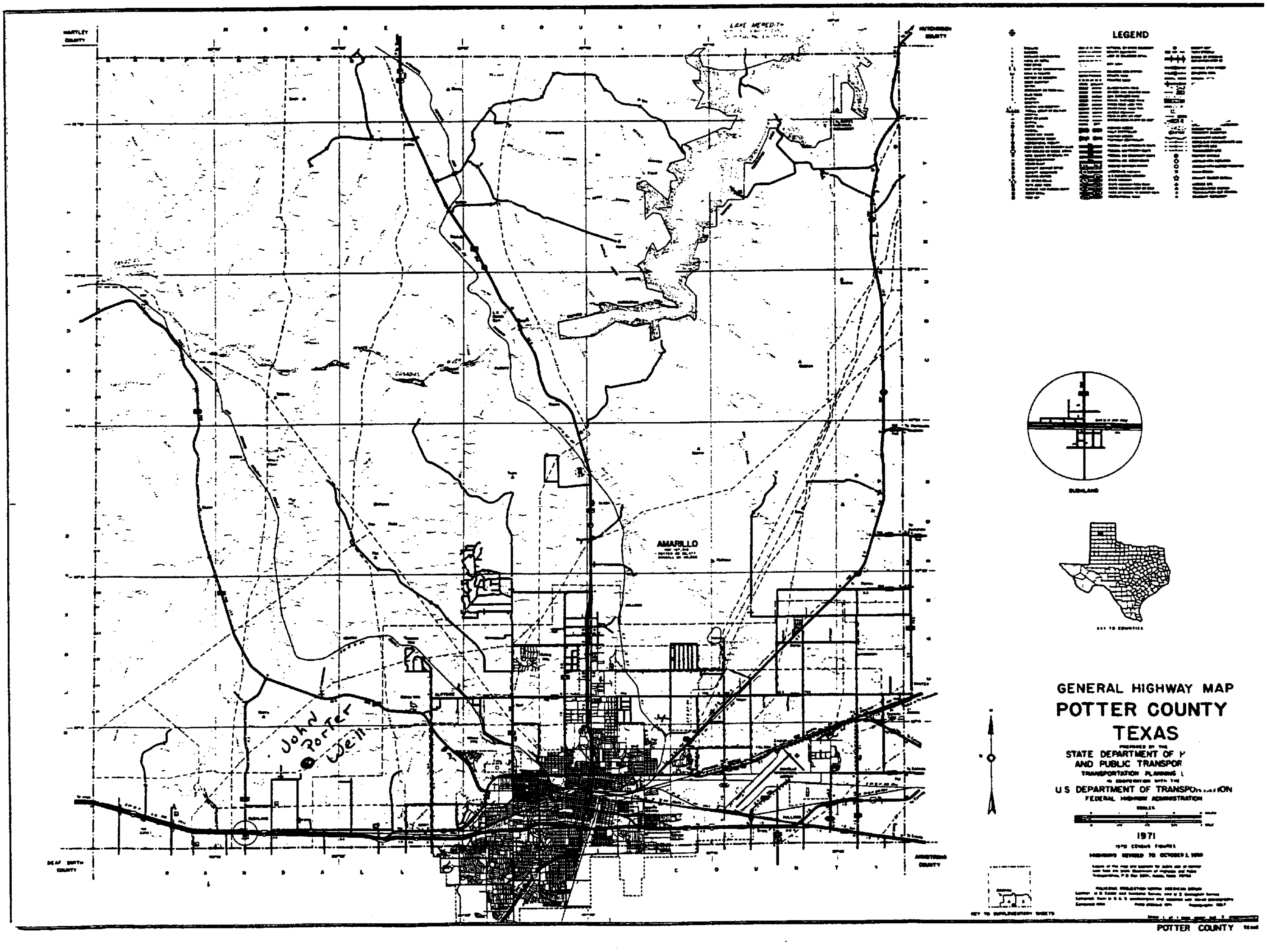
DDRESS 8018 River Road (Street or RFD) Amarillo (City) Texas (State) 79108 (Zip)

igned) Jimmy McCaskill (Water Well Driller) A & A Drilling Company (Company Name)

~~(806) 935-4453~~

~~Dumas~~

John Porter's Well



ertified mail to the
Texas Department of Water Res
P. O. Box 13087
Austin, Texas 78711

WATER WELL REPORT

TTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Well No. 07-56-3F
Located on map yes
Received: KLW

) OWNER J. W. Bragg (Name) Address 3534 Barclay (Street or RFD) Amarillo (City) Texas (State) 79109 (Zip)

) LOCATION OF WELL:
County Potter 10 miles in N.W. (N.E., S.W., etc.) direction from Amarillo (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ____ Block No. ____ Township ____
Abstract No. ____ Survey Name ____
Distance and direction from two intersecting section or survey lines ____

☒ See attached map. Map on 06-41-7D

) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ____

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ____

) WELL LOG:

Date drilled 4-14-81

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4	Surface	345

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from Surface ft. to 350 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	15	Top soil + Caliche + Rock
5	30	Caliche + Rock
30	45	Red clay + Rock
15	60	" " "
0	75	" " "
15	90	Red clay + stks Blue shale
10	105	" " " " "
05	120	" " " " "
20	135	Red clay + Rock
35	150	" " "
50	165	Red + Blue clay + stks Rock
5	180	" " " stks Lime stone
80	195	Blue shale + stks Lime stone
75	210	" " " " "
10	225	" " " " "
25	240	Red + Blue shale + stks Limestone
40	255	" " " " "
55	270	" " " + stks yellow clay
70	285	yellow clay
85	300	" "
00	315	" "
15	330	" "
30	345	yellow clay

SEP 16 1982

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
5	N	P.V.C.	Surface	350	40
		200 ft of Perf			
		~~Entire Well Perforated~~			

CEMENTING DATA

Cemented from ____ ft. to ____ ft.
Method used ____
Cemented by ____ (Company or Individual)

9) WATER LEVEL:
Static level 135 ft. below land surface Date 4-14-81
Artesian flow ____ gpm. Date ____

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ____
Depth to pump bowls, cylinder, jet, etc., ____ ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimated
Yield: 6 gpm with 90 ft. drawdown after 2 hrs.

3) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

AME Joe Allen (Type or Print) Water Well Drillers Registration No. 2053

DDRESS Rt 5 Box 22 E (Street or RFD) Amarillo (City) Texas (State) 79118 (Zip)

igned) Joe Allen (Water Well Driller) T & A Drilling Co. (Company Name)

certified mail to the
Texas Department of Water R   s
P. O. Box 13087
Austin, Texas 78711

WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

P. O. Box 13087
Austin, Texas 78711

1) OWNER LEWIS ANCHETTIN (Name) Address 103 RATON (Street or RFD) AMARILLO (City) TX (State) (Zip)

2) LOCATION OF WELL:
County POTTER 6 miles in N.W. (N.E., S.W., etc.) direction from AMARILLO (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ See attached map. 07-56-3G

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☐ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check):
☐ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 12-11-84

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8¾"	Surface	290

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from 10 ft. to 290 ft.

From (ft.) To (ft.)	Description and color of formation material
0-15	TOP SOIL + CALICHE
5-30	CALICHE W/BROWN SHALE + SANDY CLAY
30-60	BROWN SHALE + SANDY CLAY
60-120	SANDY CLAY W/RED + GRAY SHALE
20-150	RED + GRAY SHALE W/ROCK + GRAVEL
50-195	FINE SAND W/RED + GRAY SHALE
95-290	FINE SAND W/RED + GRAY SHALE W/STKS. RED CLAY

(Use reverse side if necessary)

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8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4½	N	PVC PLASTIC	0	190	
4½	N	PVC PERFORATED	190	290	

CEMENTING DATA
Cemented from 0 ft. to 10 ft.
Method used ______
Cemented by A-1 PUMP + WELL SERVICE (Company or Individual)

9) WATER LEVEL:
Static level 130 ft. below land surface Date 12-13-84
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 260 ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimated
Yield: 12 gpm with 200 ft. drawdown after 2 hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? FRESH Depth of strata 160 ft.
Was a chemical analysis made? ☐ Yes ☐ No

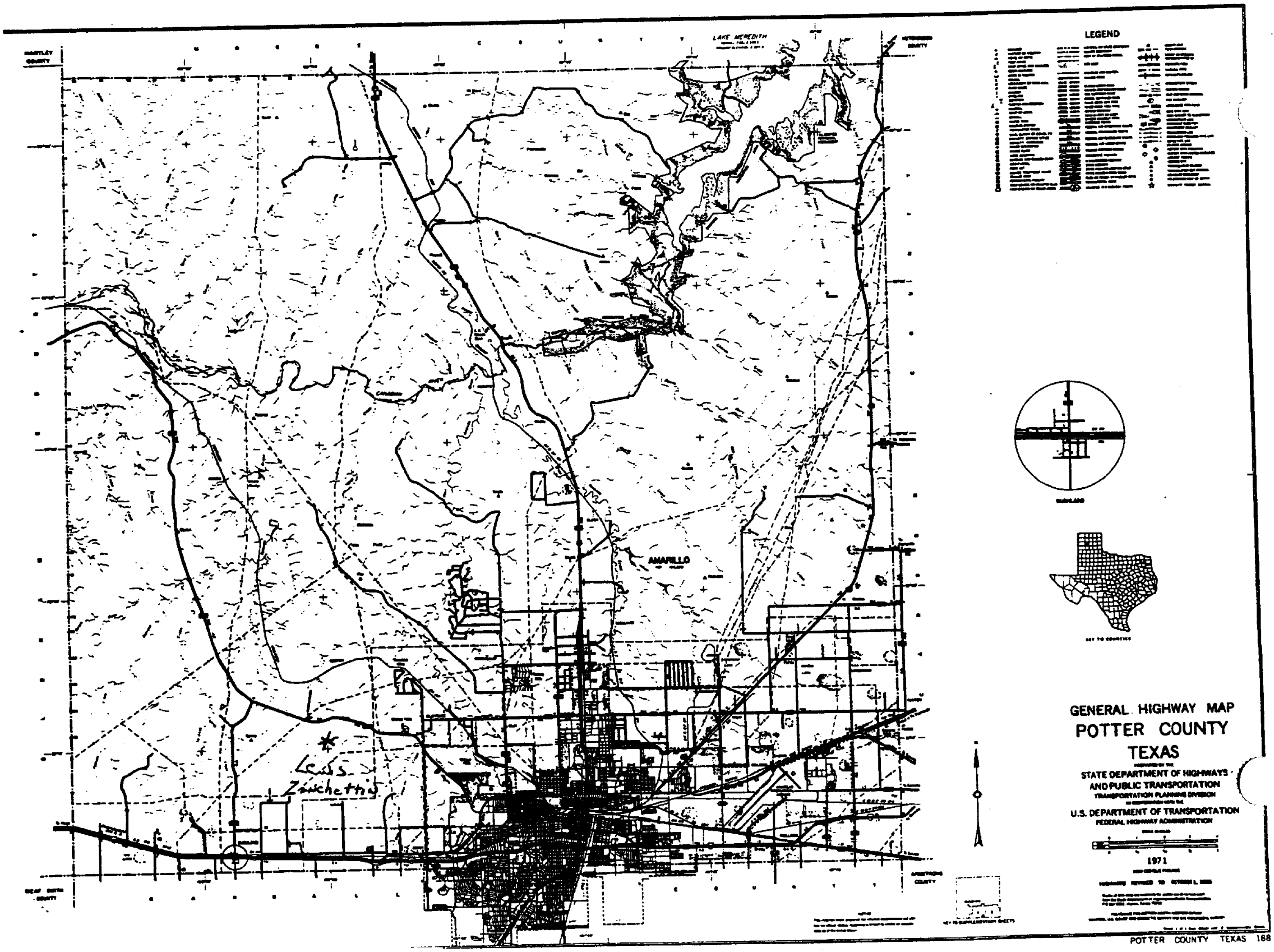
I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

COMPANY NAME A-1 PUMP + WELL SERV. (Type or Print) Water Well Driller's License No. 2119

ADDRESS RT. 2 BOX 54-G (Street or RFD) AMARILLO (City) TX (State) 79101 (Zip)

Signed) (Licensed Water Well Driller) (Signed) (Registered Driller Trainee)

For TDWR use only
Well No. 07-56-3G



GENERAL HIGHWAY MAP
POTTER COUNTY
TEXAS

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

1971

POTTER COUNTY TEXAS 188

Texas Department of Water [illegible]ources
P. O. Box 13087
Austin, Texas 78711

WATER WELL REPORT

Austin, Texas 78711

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

1) OWNER Chuck [illegible]sley (Name) Address 2507 S Spring (Street or RFD) Amarillo (City) TX (State) 7910. (Zip)

2) LOCATION OF WELL: County Potter 6 miles in N.W. (N.E., S.W., etc.) direction from Amarillo (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 11-2-84

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
8¾"	Surface	350

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from 0 ft. to 350 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	15	Top soil + caliche
15	30	Sandy Clay w/caliche + fine sand
30	60	fine sand w/cemented sand + sandstone
60	105	fine to med sand w/cemented sand + sandstone
105	165	Med. to coarse sand w/stks. sandstone
165	210	Med. to coarse sand w/stks. sandstone + red shale
210	285	Red shale w/stks. sandstone + Red clay
285	350	Red shale w/stks sandstone + Red + Gray clay

(Use reverse side if necessary)

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[illegible] 1984
DEPT. OF
WATER RESOURCES

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.)		Gage Casing Screen
			From	To	
4½"	N	Plastic	0	150	
4½"	N	P.V.C. Perforated	150	350	

CEMENTING DATA
Cemented from 0 ft. to 10' ft.
Method used ______
Cemented by A-1 Pump + Well Service (Company or Individual)

9) WATER LEVEL:
Static level 150' ft. below land surface Date 11/4/84
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 340' ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimated
Yield: 10 gpm with 140 ft. drawdown after 2 hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Fresh Depth of strata 200' ft
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

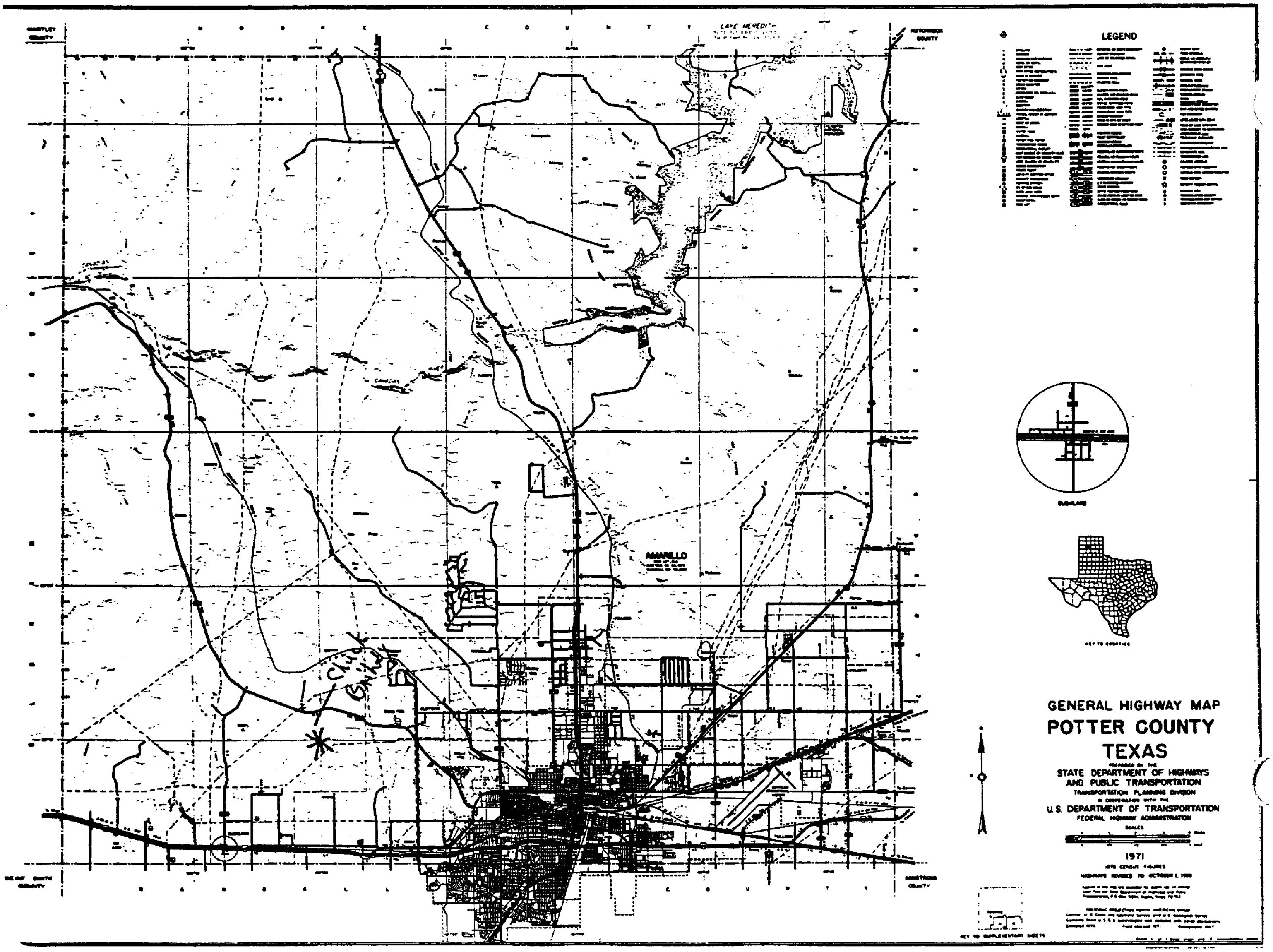
COMPANY NAME A-1 Pump + Well Service (Type or Print) Water Well Driller's License No. 2119

ADDRESS Rt. 2 Box 54-G (Street or RFD) Amarillo (City) Tx. (State) 79101 (Zip)

(Signed) Ricky D Bostick (Licensed Water Well Driller) (Signed) Rick (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 0756-3G
Located on map Yes TXS


HARTLEY COUNTY
MOORE COUNTY
LAKE MEREDITH
HUTCHINSON COUNTY
LEGEND
CANADIAN RIVER
AMARILLO
BUSHLAND
KEY TO COUNTIES
DEAF SMITH COUNTY
RANDALL COUNTY
ARMSTRONG COUNTY
KEY TO SUPPLEMENTARY SHEETS
GENERAL HIGHWAY MAP
POTTER COUNTY
TEXAS
PREPARED BY THE
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALES
1971
1970 CENSUS FIGURES

xas Department of Water Re
O. Box 13087
ustin, Texas 78711

Austin, Texas 78711

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

OWNER DAY & CO. (Name) Address 6309 E. Indiana Lubbock, Texas 79413 (Street or RFD) (City) (State) (Zip)

LOCATION OF WELL:
County Potter 8 miles in N. W. (N.E., S.W., etc.) direction from Amarillo (Town)

iller must complete the legal description to the right th distance and direction from two intersecting section or survey lines, or he must locate and identify the ell on an official Quarter- or Half-Scale Texas County eneral Highway Map and attach the map to this form.

☐ Legal description:
Section No. 113 Block No. 90 Township
Abstract No. Survey Name B S & F
Distance and direction from two intersecting section or survey lines

☐ See attached map.

TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other

WELL LOG:

Date drilled 1-6-85

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8 3/4	Surface	295

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other
If Gravel Packed give interval . . . from 15 ft. to 295 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	115	SURFACE CALICHE CLAY & SAND
115	155	Sand & gravel
155	195	Red clay
195	235	Red clay w/ sandstone strips
235	275	Red & green clay w/ sandstone strips
275	295	Blue clay

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
5	N	Plastic Perf	115	285	.050

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from Plus 1 ft. to 15 ft.
ft. to ft.
Method used Hand Mixed
Cemented by Les Taylor Drilling

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☒ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level ft. below land surface Date
Artesian flow gpm. Date

12) PACKERS: Type Depth

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DEPT. OF
WATER RESOURCES

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc., ft.

) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☐ No

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: 2-5 gpm with ft. drawdown after hrs.

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

OMPANY NAME LES TAYLOR DRILLING (Type or Print) Water Well Driller's License No. 2366

DDRESS P. O. Box 784 Sunray, Texas 79086 (Street or RFD) (City) (State) (Zip)

igned) Randy Taylor (Licensed Water Well Driller) (Signed) (Registered Driller Trainee)

lease attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 07-5603H

.O. Box 13087
ustin, Texas 78711

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

) OWNER DAY and Company (Name) Address 6309 S. Indiana (Street or RFD) Lubbock (City) TX (State) 79413 (Zip)

) LOCATION OF WELL: County Potter 6 miles in W.N.W. (N.E., S.W., etc.) direction from Amarillo (Town)

riller must complete the legal description to the right ith distance and direction from two intersecting secon or survey lines, or he must locate and identify the ell on an official Quarter- or Half-Scale Texas County eneral Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ See attached map. map on 07-56-3J

) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

) WELL LOG:

Date drilled 3/14/85

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8¾"	Surface	300'

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from 10 ft. to 300 ft.

From (ft.)	To (ft.)	Description and color of formation material
-15		Topsail w/sandy caliche
5-60		caliche + caliche rock
0-75		caliche w/sandy clay
5-105		med. to coarse sand w/sandstone
05-120		fine sand w/cemented sand
0-135		fine sand
35-240		fine to med. sand w/stk cemented sand
40-255		fine to med. sand w/fine gravel
55-270		gray sandy clay w/sand strips
70-285		Red + gray clay w/Sandstone & (Cemented Sand
85-300		Red + gray clay w/Sandstone & (Cemented Sand
00'		Red clay

(Use reverse side if necessary)

RECEIVED
APR - 8 1985
DEPT. OF
WATER RESOURC

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4½	N	Plastic	0	180'	
4½"	N	PVC. Perforated	180'	300'	

CEMENTING DATA

Cemented from 0 ft. to 10' ft.
Method used ______
Cemented by A-1 Pump + Well Service (Company or Individual)

9) WATER LEVEL:
Static level 170' ft. below land surface Date 3/15/85
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 240' ft.

3) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Fresh Depth of strata 130' ft
Was a chemical analysis made? ☐ Yes ☒ No

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: 12 gpm with 60' ft. drawdown after 2 hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

OMPANY NAME A-1 Pump + Well Service (Type or Print) Water Well Driller's License No. 2119

DDRESS Rt. 2 Box 54-G (Street or RFD) Amarillo (City) TX. (State) 79101 (Zip)

igned) Ricky D. Bostick (Water Well Driller) (Signed) Ricky G. Jacks (Registered Driller Trainee)

ease attach electric log, chem. analysis, and other pertinent information, if available.

For TDWR use only
Well No. 07-56-3J
Located on map yes C.F.S.

DWP

Karen
(806) 622-0852

P. O. Box 13087
Austin, Texas 78711

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

1) OWNER DAY c ompany (Name) Address 6309 B.Indiana (Street or RFD) Lubbock (City) Tx. (State) 79413 (Zip)

2) LOCATION OF WELL: County Potter 6 miles in W.N.W (N.E., S.W., etc.) direction from Amarillo (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 3/12/85

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
8¾"	Surface	300'

From (ft.)	To (ft.)	Description and color of formation material
0	15	Top soil w/sandy caliche
5	60	Caliche + caliche rock
0	75	caliche w/sandy clay
5	105	Med. to coarse sand w/sandstone
05	120	Fine sand w/cemented sand
20	135	Fine sand
35	240	Fine to med. sand w/stks. cemented sand
40	255	Fine to med. sand w/fine gravel
55	270	Gray sandy clay w/sand strips
70	285	Red + gray clay w/Sandstone + Cemented Sand
85	300	Red + gray clay w/Sandstone + Cemented Sand
00'		Red clay

(Use reverse side if necessary)

ECEIVE
APR - 8 1985
DEPT. OF
WATER RESOURCES

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from 10 ft. to 300 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4½"	N	Plastic	0	180'	
4½"	N	P.V.C. Perforated	180'	300'	

CEMENTING DATA

Cemented from 0 ft. to 10 ft.
Method used ______
Cemented by A-1 Pump + Well Service (Company or Individual)

9) WATER LEVEL:
Static level 170' ft. below land surface Date 3/14/85
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 240' ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimated
Yield: 12 gpm with 60' ft. drawdown after 2 hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Fresh Depth of strata 130'ft.
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

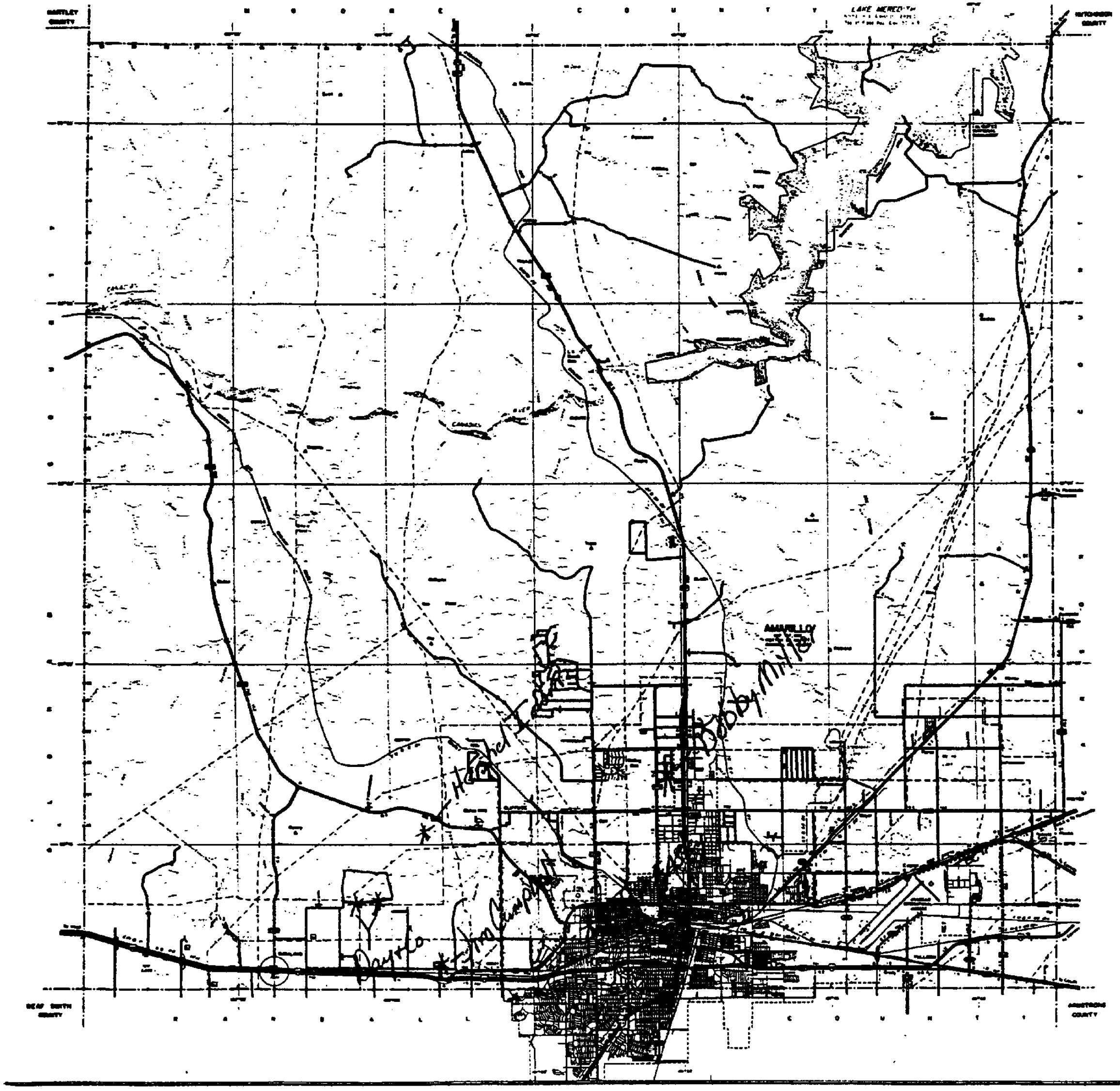
COMPANY NAME A-1 Pump+Well Service (Type or Print) Water Well Driller's License No. 2119

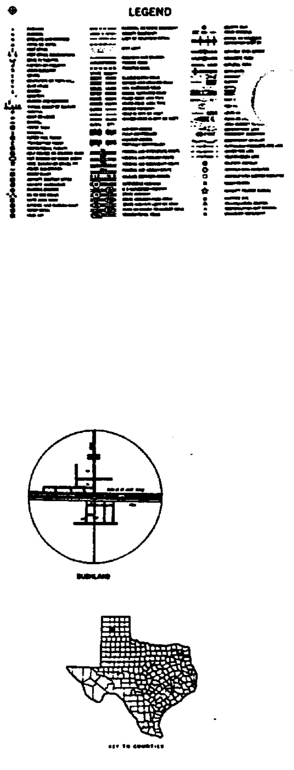
ADDRESS Rt. 2 Box 54-G (Street or RFD) Amarillo (City) Tx. (State) 79101 (Zip)

(Signed) ______ (Licensed Water Well Driller) (Signed) ______ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 07-56-31
Located on map YES C.F.S.





GENERAL HIGHWAY MAP
POTTER COUNTY
TEXAS

STATE DEPARTMENT OF HIGHW
AND PUBLIC TRANSPORTATI
TRANSPORTATION PLANNING DIVISIO
U.S. DEPARTMENT OF TRANSPORTATIO
FEDERAL HIGHWAY ADMINISTRATION

1971

POTTER COUNTY TEXAS

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer________ Field No.________ State Well No. UU 07-56 301

Owner's Well No.________ County Potter

1. Location: SW 1/4, SW 1/4 Sec. 126, Block 9 Survey BS & F.
2. Owner: J.W. Hill Address:________

   Tenant:________ Address:________

   Driller:________ Address:________
3. Elevation of LSD is 3816 ft. above msl, determined by 7½ min. topo
4. Drilled:________ 19___; Dug, Cable Tool, Rotary,________
5. Depth: Rept._____ ft. Meas._____ ft.
6. Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed________
7. Pump: Mfgr. Pomona Type Turbine

   No. Stages___, Bowls Diam.___ in., Setting_____ ft.

   Column Diam. 6 in., Length Tailpipe_____ ft.
8. Motor: Fuel Elec. Make & Model________ HP. 50GH
9. Yield: Flow____ gpm, Pump____ gpm, Meas., Rept., Est.________
10. Performance Test: Date______ Length of Test_____ Made by______

    Static Level____ ft. Pumping Level____ ft. Drawdown____ ft.

    Production_____ gpm Specific Capacity_____ gpm/ft.
11. Water Level:_____ ft. rept. meas. _____ 19__ above below ________ which is____ ft. above below surface.

    _____ ft. rept. meas. _____ 19__ above below ________ which is____ ft. above below surface.

    _____ ft. rept. meas. _____ 19__ above below ________ which is____ ft. above below surface.

    _____ ft. rept. meas. _____ 19__ above below ________ which is____ ft. above below surface.
12. Use: Dom., Stock, Public Supply, Ind., [✓ Irr.] Waterflooding, Observation, Not Used,________
13. Quality: (Remarks on taste, odor, color, etc.)________

    Temp.___ °F, Date sampled for analysis______ Laboratory______

    Temp.___ °F, Date sampled for analysis______ Laboratory______

    Temp.___ °F, Date sampled for analysis______ Laboratory______
14. Other data available as circled: Driller's Log, Radioactivity Log, Electric Log,

    Formation Samples, Pumping Test,
15. Record by: D. Müller Date 3-7-1972

    Source of Data Obs
16. Remarks: Access E-side pump base

CASING & BLANK PIPE

Cemented From______ ft. to______ ft.

Diam. (in.)	Type	Setting, ft.	
		from	to

WELL SCREEN

Screen Openings________

Diam. (in.)	Type	Setting, ft	
		from	

TWDBE-GW-49

(Sketch)

WATER WELL LOCATION SKETCH
TEXAS WATER DEVELOPMENT BOARD
GROUND WATER DIVISION

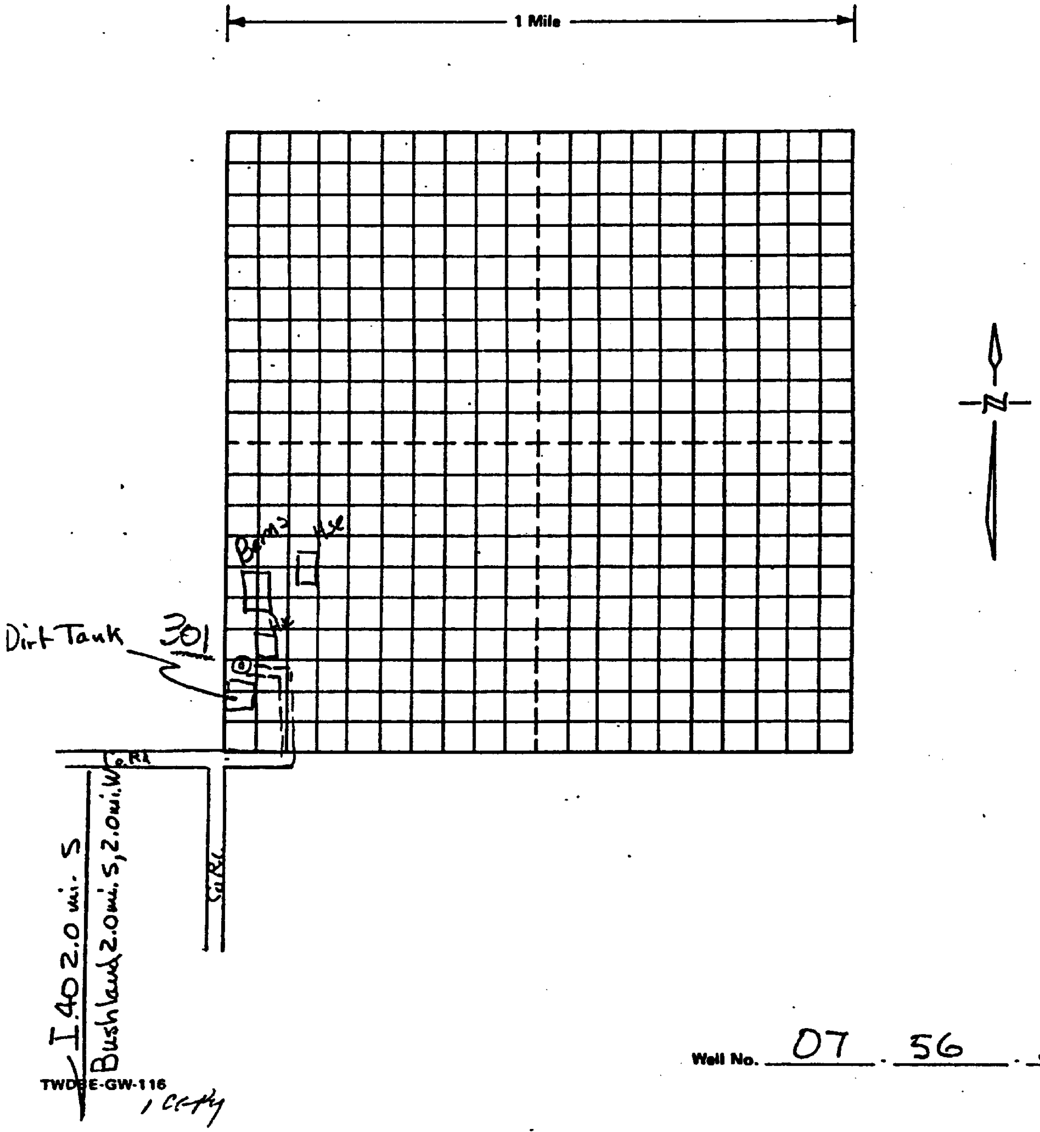
Section 126 in Block 9

Potter County

2½-minute Quadrangle 3 in

7½-minute Quadrangle 56

Sketch by D. Müller Date 3-7-72



Well No. 07 - 56 - 301

TWDBE-GW-116

1 copy

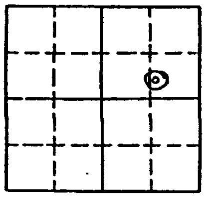
TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer______ Field No. Permit No. 252 State Well No. UU 07-56-302

Owner's Well No. ______ County Potter

1. Location: SE 1/4, NE 1/4 Sec. 127, Block 9 Survey BS & F



2. Owner: Caroline B. Emery Address:
   Tenant: Address:
   Driller: W. G. Gayne Address: Plainview, Texas
3. Elevation of LSD is 3801 ft. above msl, determined by 7½ min topo.
4. Drilled: 5-15-1969; Dug, Cable Tool, [✓ Rotary],
5. Depth: Rept. 317 ft. Meas. ____ ft.
6. Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed
7. Pump: Mfgr. Peerless Type Turbine
   No. Stages 7, Bowls Diam. 10 in., Setting 270 ft.
   Column Diam. 6 in., Length Tailpipe ____ ft.
8. Motor: Fuel NG Make & Model Minn - Moline HP. 40 GH
9. Yield: Flow ____ gpm, Pump 560 gpm, Meas. [✓ Rept.], Est.
10. Performance Test: Date 5-15-69 Length of Test ____ Made by DRILLER
    Static Level 190 ft. Pumping Level 255 ft. Drawdown ____ ft.
    Production 560 gpm Specific Capacity ____ gpm/ft.
11. Water Level: 190 ft. [✓ rept.] meas. 5-15-1969 above below ____ which is ____ ft. above below surface.
    ____ ft. rept. meas. 19__ above below ____ which is ____ ft. above below surface.
    ____ ft. rept. meas. 19__ above below ____ which is ____ ft. above below surface.
    ____ ft. rept. meas. 19__ above below ____ which is ____ ft. above below surface.
12. Use: Dom., Stock, Public Supply, Ind. [✓ Irr.] Waterflooding, Observation, Not Used,
13. Quality: (Remarks on taste, odor, color, etc.)
    Temp. ___ °F, Date sampled for analysis ____ Laboratory ____
    Temp. ___ °F, Date sampled for analysis ____ Laboratory ____
    Temp. ___ °F, Date sampled for analysis ____ Laboratory ____
14. Other data available as circled: [✓ Driller's Log], Radioactivity Log, Electric Log, Formation Samples, Pumping Test,
15. Record by: D. Muller Date 3-8-1972
    Source of Data DL, tenant
16. Remarks: Access W-side pump base
    Base of Ogallala 280' (Ln)

CASING & BLANK PIPE

Cemented From ____ ft. to ____ ft.

Diam. (in.)	Type	Setting, ft.	
		from	to
16		0	317

WELL SCREEN

Screen Openings ____

Diam. (in.)	Type	Setting, ft.	
		from	to
16	Perf.	290	317

TWDBE-GW-49 (Sketch)

FORM NO. 389R-LW

Quadruplicate—Applicant's Copy

High Plains Underground Water Conservation District No. 1

REGISTRATION and LOG OF WELL

INSTRUCTIONS: Fill out in quadruplet. Submit all copies to County Committee for recommendation. (PLEASE TYPE OR PRINT)

FOR USE OF COMMITTEEMEN

Field Well No. 253

Date Received 4-29-69

Permit Size of Pump 6 in Maximum Yield 600 GPM

1. Land Owner Caroline B Finney Address P.O. Box 1220 Amarillo, Texas
2. Well located 1 miles N, ______ miles S, 2 miles E, ______ miles W of town of Bushland
3. County Potter Labor ______ League ______ Abstract No. ______
4. NW¼ [✓ NE¼] SW¼ SE¼ Section 127 Block 9 Survey BS & F

MARK OUT THOSE THAT DO NOT APPLY

670 N
400 E

DRILLER'S LOG OF WELL

Method of Drilling: Rotary ______ ~~Spudder~~ ______ Diameter of Well: 18 inches.

MARK OUT ONE THAT DOES NOT APPLY

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL	FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	12	Soil & caliche			
12	60	Sdy Cly			
60	90	Red Cly			670 5-90
90	98	Cap Rk			2010 2090
95	150	Fn Sd (Tight)			
150	170	Brkn Rk			
170	225	Tight Sd & Rk Strks			
225	265	Fn Sd			
265	280	Coarse Sd.			
280	317	Red Bed			

REMARKS:

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein are true to the best of my knowledge and belief.

Driller W.G. Geyne Address Plainview, Texas Date Drilled 5-15-1969

DESCRIPTION OF WELL AND PRODUCTION EQUIPMENT

(This Does Not Mean Testing or Development Pump)

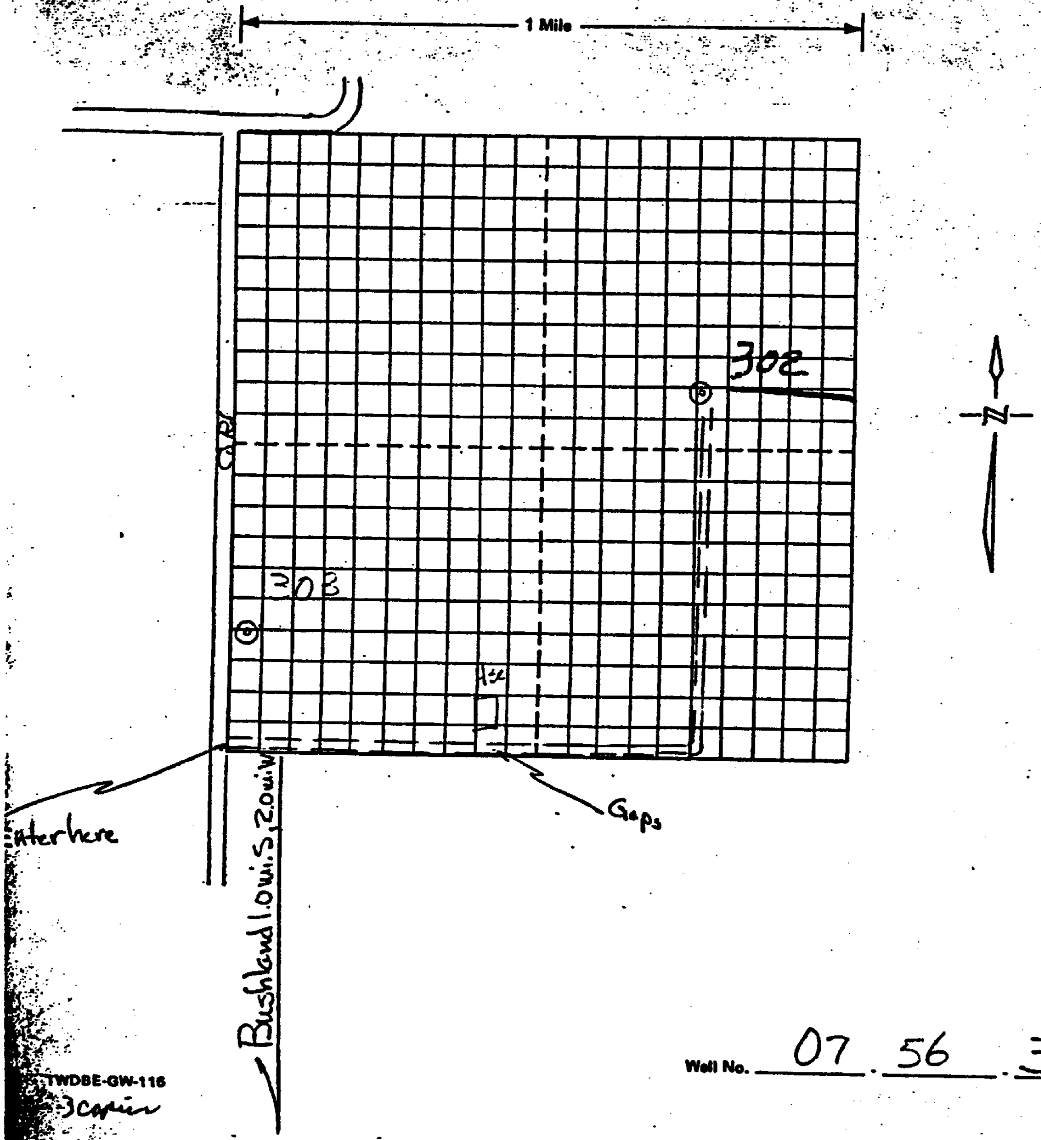
6. Casing: [✓ new], used, gas line, or shop made. Diameter 16 in Total casing length 288 ft.
7. Casing perforations: from 280 ft. to 317 ft. Size 3/16 X 10" Number of rows 6
8. Pump Column: Size 6 in. Column, shaft length 270 ft. Suction pipe size 6 in. Suction pipe length 3 ft.
9. Pump bowls: Size 10 Number of stages 7 Pump discharge pipe: Size 6 in.
10. Depth to water level 190 ft. Pump yield 560 GPM. Pumping level: 255 ft.
11. Power Unit: Electrical, [✓ Natural Gas], Butane, Other ______ Horsepower 60

Signature ______
LANDOWNER OR AGENT TITLE ADDRESS

[redacted]-07-56-30

WATER WELL LOCATION SKETCH
TEXAS WATER DEVELOPMENT BOARD
GROUND WATER DIVISION

Section 127 **in Block** 9
Potter **County**
2½-minute Quadrangle 3 : 6 **in**
7½-minute Quadrangle 56
Sketch by D. Muller **Date** 3-7-72



Well No. 07 . 56 . 302

TWDBE-GW-116
3 copies

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer

Field No. Permit No. 242

Owner's Well No.

State Well No. UU 07-56-303

County Potter

1. Location: SW 1/4, SW 1/4 Sec. 127, Block 9 Survey B.S. & F

2. Owner: Caroline B. Emery Address:

Tenant: Address:

Driller: Dirks Drlg Co. Address: Hereford, Texas

3. Elevation of LSD is 3804 ft. above msl, determined by 7½ min. topo

4. Drilled: 5-25-1966; Dug, Cable Tool, [✓ Rotary]

5. Depth: Rept. 305 ft. Meas. ft.

6. Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed

7. Pump: Mfgr. Deming Type Turbine

No. Stages 6, Bowls Diam. 12 in., Setting 290 ft.

Column Diam. 8 in., Length Tailpipe ft.

8. Motor: Fuel NG Make & Model Minn-Moline HP. —

9. Yield: Flow gpm, Pump 800 gpm, Meas. [✓ Rept.], Est.

10. Performance Test: Date 5-25-66 Length of Test Made by DRILLER

Static Level 181 ft. Pumping Level 262 ft. Drawdown ft.

Production 800 gpm Specific Capacity gpm/ft.

11. Water Level: 181 ft. [✓ rept.] meas. 5-25-1966 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

12. Use: Dom., Stock, Public Supply, Ind., [✓ Irr.] Waterflooding, Observation, Not Used,

13. Quality: (Remarks on taste, odor, color, etc.)

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

14. Other data available as circled: [✓ Driller's Log], Radioactivity Log, Electric Log, Formation Samples, Pumping Test,

15. Record by: D. Müller Date 3-7-1972

Source of Data Obs., DL

16. Remarks: No access

Base of Ogallala 295' (LW)

CASING & BLANK PIPE

Cemented From ft. to ft.

Diam. (in.)	Type	Setting, ft.	
		from	to
16		0	305

WELL SCREEN

Screen Openings

Diam. (in.)	Type	Setting, ft.	
		from	to
16	Perf	210	305

3804
295
3509

TWDBE-GW-49

(Sketch)

FORM NO. 359R-LW

Triplicate---County Co[illegible]itteeman

High Plains Underground Water Conservation District No. 1

REGISTRATION and LOG OF WELL

INSTRUCTIONS: Fill out in quadruplet. Submit all copies to County Committee for recommendation. (PLEASE TYPE OR PRINT)

FOR USE OF COMMITTEEMEN

Field Well No. [illegible]

Date Received

Permit Size of Pump 8 Maximum in Yield [illegible] GPM

1. Land Owner Bush Estate Address Amarillo, Texas

2. Well located 1¼ miles N, ____ miles S, 2 miles E, ____ miles W of town of Bushland, Texas

3. County Potter Labor ____ League ____ Abstract No. ____

4. NW¼ NE¼ [✓ SW¼] SE¼ Section 127 Block 9 Survey B.S.&F.
MARK OUT THOSE THAT DO NOT APPLY

360 S
10 W

DRILLER'S LOG OF WELL

Method of Drilling: Rotary ____ ~~Spudder~~ ____ Diameter of Well: ____ inches.
MARK OUT ONE THAT DOES NOT APPLY

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL	FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	4	Top Soil	218	220	Hd wh sd rk
4	86	Caliche and cly	220	224	Sd rk
86	89	Hd caliche rk	224	295	Med. course Lt. Br. sd c̄ sd rk layers
89	105	Soft caliche rk	295	305	Red Bed
105	122	Sd rk, cly and caliche			
122	145	Sd, sd rk and caliche			
145	147	Hd sd rk			
147	158	Sd and sd rk			
158	181	Fn Lt. Br. sd.			
181	218				

REMARKS:

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein are true to the best of my knowledge and belief.

Driller Dirks Drlg Co. Address Hereford, Texas Date Drilled 5-25-1966

DESCRIPTION OF WELL AND PRODUCTION EQUIPMENT

(This Does Not Mean Testing or Development Pump)

6. Casing: [✓ new, used] gas line, or shop made. Diameter 16 in Total casing length 305 ft.

7. Casing perforations: from 210 ft. to 305 ft. Size 1/4-3/8 Number of rows 12-8

8. Pump Column: Size 8 in. Column, shaft length 250 ft. Suction pipe size 8 in. Suction pipe length 1 ft.

9. Pump bowls: Size 12 Number of stages 6 Pump discharge pipe: Size 8 in.

10. Depth to water level 131 ft. Pump yield 800 GPM. Pumping level: 262 ft.

11. Power Unit: Electrical, [✓ Natural Gas,] Butane, Other ____ Horsepower ____

Signature ____
LANDOWNER OR AGENT TITLE ADDRESS

07-56-303

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer

Field No. Permit No. 241

Owner's Well No.

State Well No. UU 07-56-304

County Potter

1. **Location:** NW 1/4, NE 1/4 Sec. 146, Block 9 Survey B.S. & F.

		⊙	

2. **Owner:** R. D. Durrett Address:

Tenant: Leo Begner Address:

Driller: Dirks Drlg. Co Address: Hereford, Texas

3. **Elevation of** LSD is 3821 ft. above msl, determined by 7½ min. topo.

4. **Drilled:** 4-6-1966; Dug, Cable Tool, [✓ Rotary]

5. **Depth:** Rept. 286 ft. Meas. ft.

6. **Completion:** Open Hole, Straight Wall, Underreamed, Gravel Packed

7. **Pump:** Mfgr. U.S. Pumps Type Turbine

No. Stages 7, Bowls Diam. 10 in., Setting 280 ft.

Column Diam. 5 in., Length Tailpipe ft.

8. **Motor:** Fuel NG Make & Model Minn. Moline HP. 50 GH

9. **Yield:** Flow gpm, Pump 500 gpm, Meas., [✓ Rept.], Est.

10. **Performance Test:** Date 4-6-66 Length of Test Made by DRILLER

Static Level 200 ft. Pumping Level 256 ft. Drawdown 56 ft.

Production 500 gpm Specific Capacity gpm/ft.

11. **Water Level:** 200 ft. [✓ rept.] meas. 4-6-1966 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

12. **Use:** Dom., Stock, Public Supply, Ind., [✓ Irr.], Waterflooding, Observation, Not Used.

13. **Quality:** (Remarks on taste, odor, color, etc.)

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

14. **Other data available as circled:** [✓ Driller's Log] Radioactivity Log, Electric Log, Formation Samples, Pumping Test,

15. **Record by:** D. Müller Date 2-7-1972

Source of Data Obs., DL

16. **Remarks:** Access top conc N-side

Base of Ogallala 284' (Lw)

CASING & BLANK PIPE

Cemented From ft. to ft.

Diam. (in.)	Type	Setting, ft.	
		from	to
16		0	286

WELL SCREEN

Screen Openings

Diam. (in.)	Type	Setting, ft.	
		from	to
16	Perf.	206	286

3821
284
3537

TWDBE-GW-49

(Sketch)

FORM NO. 359R-LW

Original---District Offic[illegible]opy

High Plains Underground Water Conservation District No. 1

REGISTRATION and LOG OF WELL

INSTRUCTIONS: Fill out in quadruplet. Submit all copies to County Committee for recommendation. (PLEASE TYPE OR PRINT)

FOR USE OF COMMITTEEMEN

Field Well No. [illegible]

Date Received 5-10-66

Permit Size of Pump 6 Maximum in Yield 600 GPM

1. Land Owner Delmar Durrett Address Amarillo
2. Well located 2 miles N, ____ miles S, 1½ miles E, ____ miles W of town of Bushland
3. County Potter Labor ____ League ____ Abstract No. ____
4. NW¼ [✓ NE¼] SW¼ SE¼ Section 146 Block 9 Survey BS & F

MARK OUT THOSE THAT DO NOT APPLY

324 N

626 W

DRILLER'S LOG OF WELL

Method of Drilling: Rotary ____ ~~Spudder~~ ____ Diameter of Well: 19 inches.

MARK OUT ONE THAT DOES NOT APPLY

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL	FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	4	Top Soil			
4	91	Caliche & cly			
91	93	Caliche rk			
93	103	Caliche, cly & caliche rk			
103	121	Med course lt br sd.			
121	225	Med course sd w caliche & sd rk			
225	280	Med & fine Br sd w sd rk layers			
280	284	Coarse sd & gravel			
284	286	Red Bed			

REMARKS:

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein are true to the best of my knowledge and belief.

Driller Dirks Drilling Co Address Hereford Date Drilled 4-6-1966

DESCRIPTION OF WELL AND PRODUCTION EQUIPMENT

(This Does Not Mean Testing or Development Pump)

6. Casing: new, used, gas line, or shop made. Diameter 16 in Total casing length 286 ft.
7. Casing perforations: from 206 ft. to 286 ft. Size 1/4-3/16 Number of rows 8-10
8. Pump Column: Size 6 in. Column, shaft length 280 ft. Suction pipe size 6 in. Suction pipe length 1 ft.
9. Pump bowls: Size 10 Number of stages 7 Pump discharge pipe: Size 6 in.
10. Depth to water level 200 ft. Pump yield 500 GPM. Pumping level: 256 ft.
11. Power Unit: Electrical, [✓ Natural Gas], Butane, Other ____ Horsepower 70

Signature ____

LANDOWNER OR AGENT TITLE ADDRESS

WATER WELL LOCATION SKETCH

TEXAS WATER DEVELOPMENT BOARD

GROUND WATER DIVISION

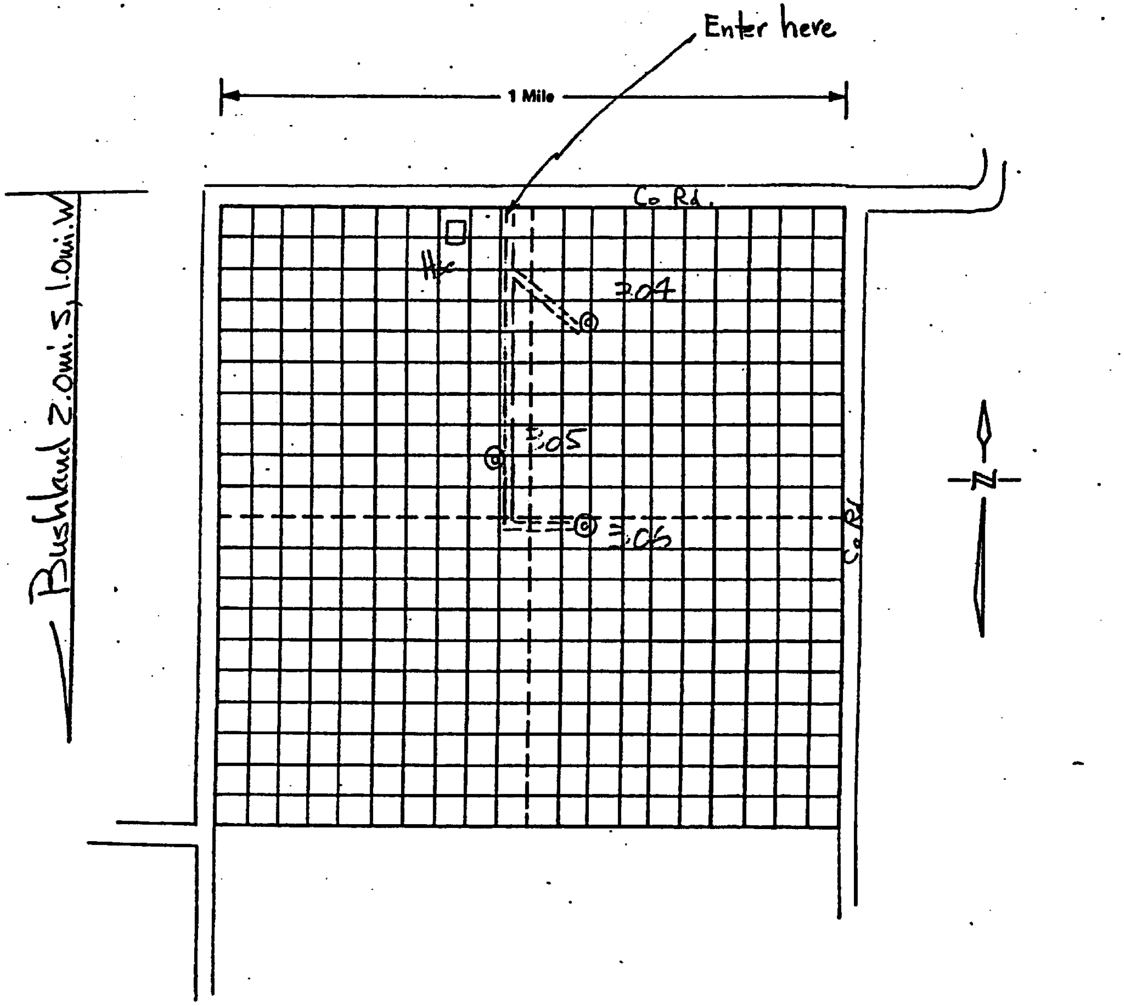
Section 146 in Block 9

Potter County

2½-minute Quadrangle 2,3,5,6 in

7½-minute Quadrangle 56

Sketch by D. Müller Date 3-7-72



Well No. 07 . 56 . 304

TWDBE-GW-116
5 copies

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Permit No. 246

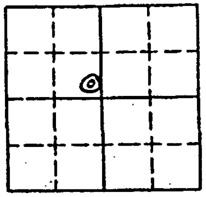
Aquifer ____________

Field No. ____________

Owner's Well No. ____________

State Well No. llll 07-56-305

County Potter



1. **Location:** SE 1/4 NW 1/4 Sec. 146, Block 9 Survey B.S.&F

2. **Owner:** Leo Bezner Address: ____________

Tenant: ____________ Address: ____________

Driller: ____________ Address: ____________

3. **Elevation** of LSD is 3815 ft. above msl, determined by 7½ min. topo

4. **Drilled:** ________ 19___; Dug, Cable Tool, Rotary, ________

5. **Depth:** Rept. ______ ft. Meas. ______ ft.

6. **Completion:** Open Hole, Straight Wall, Underreamed, Gravel Packed ________

7. **Pump:** Mfgr. Wintroath Type Turbine

No. Stages ____, Bowls Diam. ____ in., Setting ______ ft.

Column Diam. 6 in., Length Tailpipe ______ ft.

8. **Motor:** Fuel NG Make & Model Minn.-Moline HP. 75GH

9. **Yield:** Flow ____ gpm, Pump ____ gpm, Meas., Rept., Est. ________

10. **Performance Test:** Date ______ Length of Test ______ Made by ________

Static Level ____ ft. Pumping Level ____ ft. Drawdown ____ ft.

Production ______ gpm Specific Capacity ______ gpm/ft.

CASING & BLANK PIPE			
Cemented From ______ ft. to ______ ft.			
Diam. (in.)	Type	Setting, ft.	
		from	to

11. **Water Level:** ______ ft. rept. meas. ______ 19___ above below ________ which is ____ ft. above below surface.

______ ft. rept. meas. ______ 19___ above below ________ which is ____ ft. above below surface.

______ ft. rept. meas. ______ 19___ above below ________ which is ____ ft. above below surface.

______ ft. rept. meas. ______ 19___ above below ________ which is ____ ft. above below surface.

12. **Use:** Dom., Stock, Public Supply, Ind., [✓ Irr.] Waterflooding, Observation, Not Used, ________

13. **Quality:** (Remarks on taste, odor, color, etc.) ________

Temp. ___ °F, Date sampled for analysis ________ Laboratory ________

Temp. ___ °F, Date sampled for analysis ________ Laboratory ________

Temp. ___ °F, Date sampled for analysis ________ Laboratory ________

14. **Other data available as circled:** Driller's Log, Radioactivity Log, Electric Log, Formation Samples, Pumping Test, ________

15. **Record by:** D. Müller Date 3-7-1972

Source of Data Obs., DL

16. **Remarks:** Access top of same blk

WELL SCREEN			
Screen Openings ________			
Diam. (in.)	Type	Setting, ft.	
		from	

TWDBE-GW-49

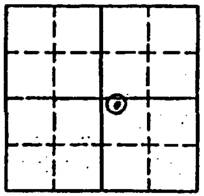
(Sketch)

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer________ Field No. Permit No. 207 State Well No. UU 07-56-306

Owner's Well No. ✓ County Potter



1. **Location:** NW 1/4, SE 1/4 Sec. 146, Block 9 Survey B.S. & F

2. **Owner:** R.D. Durrett Address:

   Tenant: Leo Bezner Address:

   Driller: J.H. Fish Address: Hereford, Texas

3. **Elevation** of LSD is 3814 ft. above msl, determined by 7½ min. topo.

4. **Drilled:** 11-9-1954; Dug, Cable Tool, [✓ Rotary]

5. **Depth:** Rept. 305 ft. Meas. ___ ft.

6. **Completion:** Open Hole, Straight Wall, Underreamed, Gravel Packed

7. **Pump:** Mfgr. Pomona Type Turbine

   No. Stages 6, Bowls Diam. 12 in., Setting 270 ft.

   Column Diam. 6 in., Length Tailpipe ___ ft.

8. **Motor:** Fuel NG Make & Model Minn-Moline HP. 75GH.

9. **Yield:** Flow ___ gpm, Pump 600 gpm, Meas. [✓ Rept], Est.

10. **Performance Test:** Date 11-9-54 Length of Test ___ Made by DRILLER

    Static Level 185 ft. Pumping Level 250 ft. Drawdown ___ ft.

    Production 600 gpm Specific Capacity ___ gpm/ft.

11. **Water Level:** 185 ft. [✓ rept.] meas. 11-9-1954 above below ___ which is ___ ft. above below surface.

    ___ ft. rept. meas. ___ 19__ above below ___ which is ___ ft. above below surface.

    ___ ft. rept. meas. ___ 19__ above below ___ which is ___ ft. above below surface.

    ___ ft. rept. meas. ___ 19__ above below ___ which is ___ ft. above below surface.

12. **Use:** Dom., Stock, Public Supply, Ind., [✓ Irr.] Waterflooding, Observation, Not Used,

13. **Quality:** (Remarks on taste, odor, color, etc.)

    Temp.___ °F, Date sampled for analysis ___ Laboratory ___

    Temp.___ °F, Date sampled for analysis ___ Laboratory ___

    Temp.___ °F, Date sampled for analysis ___ Laboratory ___

14. **Other data available as circled:** [✓ Driller's Log], Radioactivity Log, Electric Log, Formation Samples, Pumping Test,

15. **Record by:** D. Muller Date 3-7-1972

    Source of Data Obs., DL

16. **Remarks:** Access N-side pump base

    Base of Ogallala 302' (Lw)

CASING & BLANK PIPE

Cemented From ___ ft. to ___ ft.

Diam. (in.)	Type	Setting, ft.	
		from	to
16		0	305

WELL SCREEN

Screen Openings ___

Diam. (in.)	Type	Setting, ft.	
		from	to
16	Perf.	215	305

TWDBE-GW-49

(Sketch)

Quadruplicate—Applica[illegible]'s Copy

Field Well No.	207
Date Received	1-11-55
Permit Size of Pump	6 in
Maximum Yield	700 GPM

High Plains Undergroun[illegible]ater Conservation District No. 1

REGISTRATION and LOG OF WELL

INSTRUCTIONS: Fill out in quadruplet. Submit all copies to County Committee for recommendation. (PLEASE TYPE OR PRINT)

1. Land Owner Delmar Durett Address Amarillo

2. Well located 1½ miles N, ______ miles S, 1½ miles E, ______ miles W of town of Bushland

3. County Potter Labor ______ League ______ Abstract No. ______

4. NW¼ [✓ NE¼] SW¼ SE¼ Section 146 Block 9 Survey BS&F

MARK OUT THOSE THAT DO NOT APPLY

880 N
740 E

DRILLER'S LOG OF WELL

Method of Drilling: Rotary ✓ Spudder ______ Diameter of Well: ______ Inches.

MARK OUT ONE THAT DOES NOT APPLY

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL	FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	4	Caliche			
4	60	Clay			
60	160	Sd & cly			
160	161	RK			
161	220	Cly			
220	267	Fn sd			
267	302	Sd & gravel			
302	305	Red Bed			

REMARKS:

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein are true to the best of my knowledge and belief.

Driller J.H. Fish Address Hereford Date Drilled 11-9- 1954

DESCRIPTION OF WELL AND PRODUCTION EQUIPMENT

(This Does Not Mean Testing or Development Pump)

6. Casing: new, used, gas line, or shop made. Diameter 16 in Total casing length ______ ft.

7. Casing perforations: from 215 ft. to 305 ft. Size 1/4 X 12 Number of rows 8

8. Pump Column: Size 6 in. Column, shaft length 270 ft. Suction pipe size 6 in. Suction pipe length 10 ft.

9. Pump bowls: Size 12 Number of stages 6 Pump discharge pipe: Size 6 in.

10. Depth to water level 185 ft. Pump yield 600 GPM. Pumping level: 250 ft.

11. Power Unit: Electrical, Natural Gas, [✓ Butane] Other ______ Horsepower 75

Signature ______
LANDOWNER OR AGENT TITLE ADDRESS

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer Ogallala
Field No. Perm. # 276
Owner's Well No.
State Well No. 07-56-307
County Potter

1. Location: NW1/4, NW1/4 Sec. 127, Block B-9 Survey B.S. & F

Sec 127

2. Owner: Caroline B. Emery Address: Box 1230, Amarillo, Tx.
Tenant: Victor Plunk Address: Rt 1, Box 544, Amarillo, Tx
Driller: Bud Gibbons Address: Plainview TX
3. Elevation of is 3814 ft. above msl, determined by
4. Drilled: 3-8 1974; Dug, Cable Tool [✓ Rotary],
5. Depth: Rept. 295 ft. Meas. ft. Red Bed Reported @ 287 5ft
6. Completion: Open Hole [✓ Straight Wall], Underreamed, Gravel Packed
7. Pump: Mfgr. Johnston p.b., Amarillo Co. Type Turbine
No. Stages 7, Bowls Diam. 10 in., Setting 280 ft.
Column Diam. 6 in., Length Tailpipe 10 ft.
8. Motor: Fuel NAT. GAS Make & Model M.M. 6cyl. HP.
9. Yield: Flow gpm, Pump 400 gpm, Meas. [✓ Rept.] Est. Driller
10. Performance Test: Date Length of Test Made by
Static Level ft. Pumping Level ft. Drawdown ft.
Production gpm Specific Capacity gpm/ft.
11. Water Level: 227.98 ft. below meas. 9/13 1976 above below See MP Below which is +0.50 ft. above surface.
ft. rept. meas. 19 above below which is ft. above below surface.
ft. rept. meas. 19 above below which is ft. above below surface.
ft. rept. meas. 19 above below which is ft. above below surface.
12. Use: Dom., Stock, Public Supply, Ind. [✓ Irr.] Waterflooding, [✓ Observation] Not Used.
13. Quality: (Remarks on taste, odor, color, etc.)
Temp. °F, Date sampled for analysis Laboratory
Temp. °F, Date sampled for analysis Laboratory
Temp. °F, Date sampled for analysis Laboratory
14. Other data available as circled: [✓ Driller's Log] Radioactivity Log, Electric Log, Formation Samples, Pumping Test,
15. Record by: DAN SEALE Date 9/13 1976
Source of Data Field & HPUWCD #1 Records
16. Remarks: Permission from Mr. F. G. Collard III, manager to enter this well into the program

CASING & BLANK PIPE

Cemented From ft. to ft.

Diam. (in.)	Type	Setting, ft.	
		from	to
14	Steel	Surface	295

WELL SCREEN

Screen Openings

Diam. (in.)	Type	Setting, ft.	
		from	to
14	Perforated	197	295
Casing	Perforated with	3/8"	Sluts
4 row pattern.			

Obs Well

3814
289
3525

MP - Edge of Airline hole
inside pump port
S. side = +0.50 ft

(Sketch)

07-56-307

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY
Organization No. ________ Lab No. ☐☐
Work No. ________

CHEMICAL WATER ANALYSIS REPORT

S. R. S.

SEP 19 1980

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

County 188 Potter
State Well No. 07-56-397
Well No. 276
Date Collected 08-01-80

Location NW/4, NW1/4, Sec. 127, Blk B-9, BS+F Survey Sample No. ☐ By HPAWCD #1 BB
Source (type of well) turbine Owner Caroline Embry
Date Drilled 3-8-74 Depth 295 ft. WBF Ogallala
Producing intervals ________ Water level ________ ft. Sample depth ________ ft.
Sampled after pumping cont. hrs. Yield ________ GPM meas. est. Temperature ________ °F ________ °C
Point of collection faucet on discharge Appearance ☑ clear ☐ turbid ☐ colored ☐ other
Use Irr. Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

Laboratory No. CO15975
Date Received AUG 18 1980
Date Reported SEP 17 '80

		MG/L	ME/L
Silica	00955	57	
Calcium	00915	47	2.36
Magnesium	00925	26	2.11
Sodium	00929	29	1.26
Total			5.73
☐ Potassium	00937	.	
[3] ☐ Manganese	01055	.	
☐ Boron	01022	.	
[3] ☐ Total Iron	01045	.	

%Na ________
SAR ________
RSC ________

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm³) 00095 480
Diluted Conductance (micromhos/cm³) 4 x 144
576

"☐" Items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	. —
Bicarbonate 144	00440	293	4.80
Sulfate	00945	30	0.62
Chloride	00940	7	0.20
Fluoride	00951	2.4	0.
Nitrate	71850	2.9	.
pH	00403	8.2	
Total			5.75

[1] Dissolved Solids (residue at 180°C)	70300	350
Phenolphthalein Alkalinity as CaCO₃	00415	0
Total Alkalinity as CaCO₃ (4.80)	00410	240
Total Hardness as CaCO₃ (4.47)	00900	224
[2] Nitrogen Cycle		
Ammonia - N	00610	.
Nitrite - N	00615	.
Nitrate - N	00620	.
Organic Nitrogen	00605	.

REC... JUL 25 1981 CRIDW...

Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

Send original copy by
certified mail to the
Texas Water Development Board
P. O. Box 13087
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 07-56-
Located on map yes
Received: 74
dlr

1) OWNER:
Person having well drilled Caroline B. Emney (Name) Address Box 1230 (Street or RFD) Amarillo (City) Texas (State)

Landowner Same (Name) Address (Street or RFD) Same (City) (State)

2) LOCATION OF WELL:
County Potter 3/4-N & 2-E miles in NE (N.E., S.W., etc.) direction from Bushland, Texas (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*

North ↑

(Use reverse side if necessary)

or

Give legal location with distances and directions from adjacent sections or survey lines.

Labor ______ League ______
Block 9 Survey BS & F
Abstract No. ______
([illegible]) of Section 127

3) TYPE OF WORK (Check):
New Well XX Deepening
Reconditioning Plugging

4) PROPOSED USE (Check):
Domestic Industrial Municipal
Irrigation XX Test Well Other

5) TYPE OF WELL (Check):
Rotary XX Driven Dug
Cable Jetted Bored

6) WELL LOG:
Diameter of hole 18" in. Depth drilled 295' ft. Depth of completed well ______ ft. Date drilled 3-8-74
All measurements made from ______ ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
00	4	Top Soil
4	82	Caliche Clay
82	153	Clay Sand Rock & Sand
153	259	Clay and Layers Sand
259	279	Fine sand
279	289	Course Sand
289	295	Blue Clay and Red Bed

(Use reverse side if necessary)

9) Casing:
Type: Old New XX Steel XX Plastic Other
Cemented from ______ ft. to ______

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
14" OD.	0	295	.188 Wal

(197' - 2 95' - 4 row Perforation

10) SCREEN:
Type ______
Perforated Slotted

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size

7) COMPLETION (Check):
Straight wall XX Gravel packed Other
Under reamed Open Hole

8) WATER LEVEL:
Static level ______ ft. below land surface Date ______
Artesian pressure ______ lbs. per square inch Date ______
Depth to pump bowls, cylinder, jet, etc., ______ ft.
below land surface.

11) WELL TESTS:
Was a pump test made? Yes No XX If yes, by whom
Yield: ______ gpm with ______ ft. drawdown after ______
Bailer test ______ gpm with ______ ft. drawdown after ______
Artesian flow ______ gpm
Temperature of water ______

12) WATER QUALITY:
Was a chemical analysis made? Yes No XX
Did any strata contain undesirable water? Yes No
Type of water? ______ depth of strata ______

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Bud Gibbons (Type or Print) Water Well Drillers Registration No. 299

ADDRESS 1004 E. 5th. P.O.Box 1972 (Street or RFD) Plainview (City) Texas (State)

(Signed) Bud Gibbons (Water Well Driller) Bud Gibbons Drilling Contractor (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available. UU07-56-30

*Additional instructions on reverse side.

TWDB-WD-2

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer

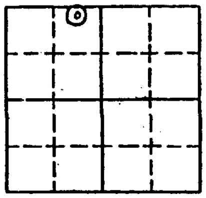
Field No. Permit No. 248

Owner's Well No.

State Well No. UY 07-56-603

County Potter

1. Location: NE 1/4, NW 1/4 Sec. 128, Block 9 Survey B.S. & F.



2. Owner: Fritz Menke Address:

Tenant: Address:

Driller: Bud Gibbons Address: Plainview, Texas

3. Elevation of LSD is 3797 ft. above msl, determined by 7½ min. topo.

4. Drilled: 4-5-1969; Dug, Cable Tool, [✓ Rotary]

5. Depth: Rept. 314 ft. Meas. ft.

6. Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed

7. Pump: Mfgr. Western Type Turbine

No. Stages 7, Bowls Diam. 10 in., Setting ft.

Column Diam. 6 in., Length Tailpipe ft.

8. Motor: Fuel NG Make & Model Chrysler Ind. HP. 50GH

9. Yield: Flow gpm, Pump 550 gpm, Meas. [✓ Rept], Est.

10. Performance Test: Date 4-5-69 Length of Test Made by DRILLER

Static Level 200 ft. Pumping Level 250 ft. Drawdown 50 ft.

Production 550 gpm Specific Capacity gpm/ft.

11. Water Level: 200 ft. [✓ rept.] meas. 4-5-1969 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

12. Use: Dom., Stock, Public Supply, Ind., [✓ Irr.] Waterflooding, Observation, Not Used,

13. Quality: (Remarks on taste, odor, color, etc.)

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

14. Other data available as circled: [✓ Driller's Log], Radioactivity Log, Electric Log, Formation Samples, Pumping Test,

15. Record by: D. Müller Date 3-7-1972

Source of Data Obs., DL

16. Remarks: Access S-side pump base
Base of Ogallala 306' (DL)

CASING & BLANK PIPE

Cemented From ft. to ft.

Diam. (in.)	Type	Setting, ft.	
		from	to
16		0	314

WELL SCREEN

Screen Openings

Diam. (in.)	Type	Setting, ft.	
		from	to
16	Perf.	250	305

TWDBE-GW-49

(Sketch)

FORM NO. 359R-LW

Triplicate—County Co[illegible]tteeman

High Plains Underground Water Conservation District No. 1

REGISTRATION and LOG OF WELL

INSTRUCTIONS: Fill out in quadruplet. Submit all copies to County Committee for recommendation. (PLEASE TYPE OR PRINT)

FOR USE OF COMMITTEEMEN

Field Well No. 248

Date Received

Permit Size of Pump 6 in Maximum Yield 560 GPM

1. Land Owner Fritz Menke Address Amarillo

2. Well located ____ miles N, 1 miles S, ____ miles E, 2 3/4 miles W of town of Bushland

3. County Potter Labor ____ League ____ Abstract No. ____

4. [✓ NW¼] NE¼ SW¼ SE¼ Section 128 Block 9 Survey BS&F

MARK OUT THOSE THAT DO NOT APPLY

10 N

530 W

DRILLER'S LOG OF WELL

Method of Drilling: Rotary ____ ~~Spudder~~ ____ Diameter of Well: 18 inches.

MARK OUT ONE THAT DOES NOT APPLY

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL	FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	4	Top Soil	295	306	Ss
4	12	Caliche	306	314	Red bed
12	70	Sdy Cly			
70	85	Rk			
85	220	Ss			
220	228	Rk			
228	240	Ss			
240	255	Sd			
255	258	Rk			
258	295	Sd Gravel			

REMARKS:

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein are true to the best of my knowledge and belief.

Driller Bud Gibbons Address Plainview, Texas Date Drilled 4-5- 1969

DESCRIPTION OF WELL AND PRODUCTION EQUIPMENT

(This Does Not Mean Testing or Development Pump)

6. Casing: new, [✓ used] [✓ gas line] or shop made. Diameter 16 in Total casing length 314 ft.

7. Casing perforations: from 250 ft. to 305 ft. Size 1/4 Number of rows 6

8. Pump Column: Size 6 in. Column, shaft length 2 ft. Suction pipe size ____ in. Suction pipe length ____ ft.

9. Pump bowls: Size 10 Number of stages 7 Pump discharge pipe: Size 6 in.

10. Depth to water level 200 ft. Pump yield 550 GPM. Pumping level: 250 ft.

11. Power Unit: Electrical, [✓ Natural Gas], Butane, Other ____ Horsepower 55

Signature ____

LANDOWNER OR AGENT TITLE ADDRESS

07-56-603

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer

Field No. Permit No. 224

Owner's Well No.

State Well No. UU 07-56-602

County Potter

1. **Location:** NW 1/4, NW 1/4 Sec. 128, Block 9 Survey B.S. & F.

⊙			

2. **Owner:** Fritz Menke Address:

Tenant: Address:

Driller: Charlie McCaskill Address: Amarillo, Texas

3. **Elevation** of LSD is 3803 ft. above msl, determined by 7½ min. topo

4. **Drilled:** 4-10-1963; Dug, Cable Tool, Rotary,

5. **Depth:** Rept. ft. Meas. ft.

6. **Completion:** Open Hole, Straight Wall, Underreamed, Gravel Packed

7. **Pump:** Mfgr. Western Type Turbine

No. Stages 5, Bowls Diam. 12 in., Setting 280 ft.

Column Diam. 6 in., Length Tailpipe ft.

8. **Motor:** Fuel NG Make & Model Chrysler Ind. HP. 50GH.

9. **Yield:** Flow gpm, Pump 700 gpm, Meas. [✓ Rept.] Est.

10. **Performance Test:** Date 4-10-63 Length of Test Made by DRILLER

Static Level 190 ft. Pumping Level 280 ft. Drawdown 90 ft.

Production 200 gpm Specific Capacity gpm/ft.

11. **Water Level:** 190 ft. [✓ rept.] meas. 4-10-1963 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

ft. rept. meas. 19 above below which is ft. above below surface.

12. **Use:** Dom., Stock, Public Supply, Ind., [✓ Irr.], Waterflooding, Observation, Not Used,

13. **Quality:** (Remarks on taste, odor, color, etc.)

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

Temp. °F, Date sampled for analysis Laboratory

14. **Other data available as circled:** [✓ Driller's Log], Radioactivity Log, Electric Log, Formation Samples, Pumping Test,

15. **Record by:** D. Müller Date 3-7-1972

Source of Data Obs, DL

16. **Remarks:** Access S-side pump base.
Base of Ogallala 300' (Lw)

CASING & BLANK PIPE

Cemented From ft. to ft.

Diam. (in.)	Type	Setting, ft.	
		from	to

WELL SCREEN

Screen Openings

Diam. (in.)	Type	Setting, ft.	
		from	to

TWDBE-GW-49

(Sketch)

FORM NO. 388R-LW

Quadruplicate—Applicant's Copy 07-56-60

FOR USE OF COMMITTEEMEN
Field Well No. 229
Date Received 7-20-63
Permit Size of Pump 6 in Maximum Yield 65 GPM

High Plains Underground Water Conservation District No. 1

REGISTRATION and LOG OF WELL

INSTRUCTIONS: Fill out in quadruplet. Submit all copies to County Committee for recommendation. (PLEASE TYPE OR PRINT)

1. Land Owner Fritz Menke Address Amarillo

2. Well located 1 miles N, ____ miles S, ____ miles E, 2 miles W of town of Bushland

3. County Potter Labor ____ League ____ Abstract No. ____

4. [✓ NW¼] NE¼ SW¼ SE¼ Section 128 Block 9 Survey BS&F

MARK OUT THOSE THAT DO NOT APPLY

10 N
200 W

DRILLER'S LOG OF WELL

Method of Drilling: Rotary ____ Spudder ____ Diameter of Well: ____ inches.

MARK OUT ONE THAT DOES NOT APPLY

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL	FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	5	Top Soil	267	285	Coarse Sd
5	85	Caliche	285	300	Sd & Gravel
85	115	Sd & Clay	300	305	Red Bed
115	119	Wh Rk			
119	145	Sd & Cly			
145	180	Coarse Sd			
180	240	Sd & Cly			
240	243	Hd Rk			
243	265	Coarse Sd			
265	267	Hd Rk			

REMARKS:

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein are true to the best of my knowledge and belief.

Driller Charlie McCaskill Address Amarillo Date Drilled 4-10-1963

DESCRIPTION OF WELL AND PRODUCTION EQUIPMENT

(This Does Not Mean Testing or Development Pump)

6. Casing: [✓ new] used, gas line, or shop made. Diameter 16 in Total casing length 305 ft.

7. Casing perforations: from 202 ft. to 305 ft. Size 1/8 Number of rows 14

8. Pump Column: Size 6 in. Column, shaft length 280 ft. Suction pipe size ____ in. Suction pipe length ____ ft.

9. Pump bowls: Size 12 Number of stages 5 Pump discharge pipe: Size 6 in.

10. Depth to water level 190 ft. Pump yield 700 GPM. Pumping level: 280 ft.

11. Power Unit: Electrical, [✓ Natural Gas], Butane, Other ____ Horsepower ____

Signature ____
LANDOWNER OR AGENT TITLE ADDRESS

07-56-602

WATER WELL LOCATION SKETCH
TEXAS WATER DEVELOPMENT BOARD
GROUND WATER DIVISION

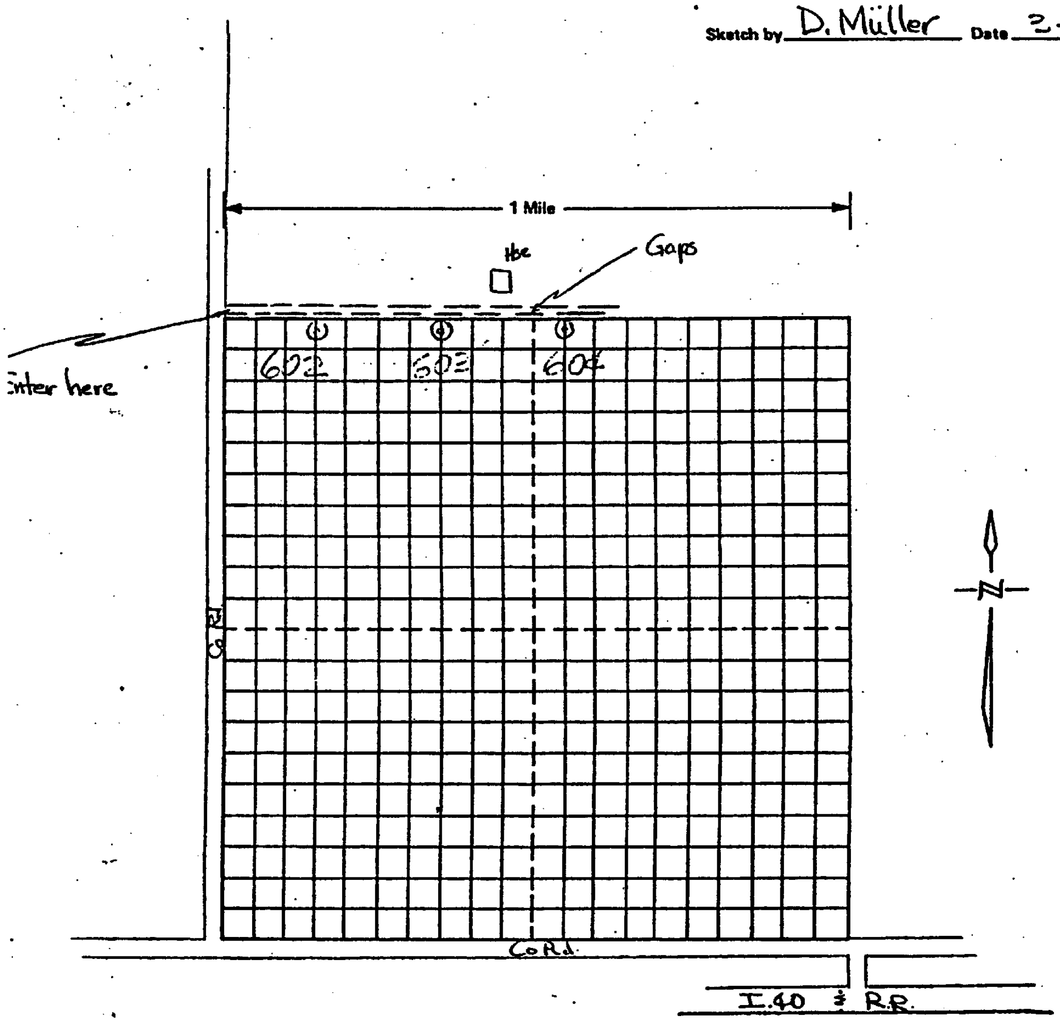
Section 128 in Block 9

Potter County

2½-minute Quadrangle 6 in

7½-minute Quadrangle 56

Sketch by D. Müller Date 2-7-72



Well No. 07 . 56 . 602

TWDBE-GW-116

S tepan

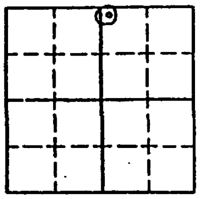
TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer________________ Field No. Permit No. 247 State Well No. UU 07-56-604

Owner's Well No. ________________ County Potter

Location: NW 1/4, NE 1/4 Sec. 128, Block 9 Survey B.S. & F.



Owner: Fritz Menke Address: Amarillo, Texas

Tenant: ________________ Address: ________________

Driller: Bud Gibbons Address: Plainview, Texas

Elevation of LSD is 3791 ft. above msl, determined by 7½ min. topo.

Drilled: 4-3-1969; Dug, Cable Tool [✓ Rotary,]

Depth: Rept. ________ ft. Meas. ________ ft.

Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed

Pump: Mfgr. A & C Type Turbine

No. Stages 7, Bowls Diam. 10 in., Setting 284 ft.

Column Diam. 6 in., Length Tailpipe ________ ft.

Motor: Fuel NG Make & Model Chrysler Ind HP. 50GH

Yield: Flow ____ gpm, Pump 500 gpm, Meas., [✓ Rept.], Est.

0. **Performance Test**: Date 4-3-69 Length of Test ____ Made by DRILLER

Static Level 200 ft. Pumping Level 265 ft. Drawdown 65 ft.

Production 500 gpm Specific Capacity ______ gpm/ft.

CASING & BLANK PIPE			
Cemented From ________ ft. to ________ ft.			
Diam. (in.)	Type	Setting, ft.	
		from	to
16		0	312

1. **Water Level**: 200 ft. [✓ rept.] meas. 4-3-1969 above below ________ which is ____ ft. above below surface.

________ ft. rept. meas. ____ 19__ above below ________ which is ____ ft. above below surface.

________ ft. rept. meas. ____ 19__ above below ________ which is ____ ft. above below surface.

________ ft. rept. meas. ____ 19__ above below ________ which is ____ ft. above below surface.

2. **Use**: Dom., Stock, Public Supply, Ind., [✓ Irr.,] Waterflooding, Observation, Not Used,

3. **Quality**: (Remarks on taste, odor, color, etc.)

Temp.___ °F, Date sampled for analysis ________ Laboratory ________

Temp.___ °F, Date sampled for analysis ________ Laboratory ________

Temp.___ °F, Date sampled for analysis ________ Laboratory ________

4. **Other data available as circled**: [✓ Driller's Log], Radioactivity Log, Electric Log, Formation Samples, Pumping Test,

5. **Record by**: D. Müller Date 3-8-1972

Source of Data Obs., DL

6. **Remarks**: Access S-side pump base

Base of Ogallala 305' (Lw)

WELL SCREEN			
Screen Openings ________			
Diam. (in.)	Type	Setting, ft.	
		from	to
16	Perf.	250	305

TWDBE-GW-49 (Sketch)

FORM NO. 359R-LW

Duplicate--File Copy

07-56-60

High Plains Underground Water Conservation District No. 1

REGISTRATION and LOG OF WELL

INSTRUCTIONS: Fill out in quadruplet. Submit all copies to County Committee for recommendation. (PLEASE TYPE OR PRINT)

FOR USE OF COMMITTEEMEN
Field Well No. 247
Date Received
Permit Size of Pump 6 Maximum in Yield 560 GPM

1. Land Owner Fritz Menke Address Rt. Amarillo Texas
2. Well located ____ miles N, 1 miles S, ____ miles E, 2½ miles W of town of Bushland
3. County Potter Labor ____ League ____ Abstract No. ____
4. NW¼ [✓ NE¼] SW¼ SE¼ Section 128 Block 9 Survey BS&F

MARK OUT THOSE THAT DO NOT APPLY

18 N
870 W

DRILLER'S LOG OF WELL

Method of Drilling: Rotary ____ ~~Spudder~~ ____ Diameter of Well: 18 inches.

MARK OUT ONE THAT DOES NOT APPLY

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL	FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	4	Top Soil			
4	15	Caliche			
15	90	Sdy Cly			
90	220	Ss			
220	250	Rk			
250	295	Sd Gravel			
295	305	Ss			
305	313	Red Bed			

REMARKS:

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein are true to the best of my knowledge and belief.

Driller Bud Gibbons Address Plainview Texas Date Drilled 4-3-1969

DESCRIPTION OF WELL AND PRODUCTION EQUIPMENT

(This Does Not Mean Testing or Development Pump)

6. Casing: new, [✓ used,] [✓ gas line] or shop made. Diameter 16 in Total casing length 313 ft.
7. Casing perforations: from 250 ft. to 305 ft. Size 1/4 Number of rows 6
8. Pump Column: Size 6 in. Column, shaft length 234 ft. Suction pipe size 6 in. Suction pipe length 2 ft.
9. Pump bowls: Size 10" Number of stages 7 Pump discharge pipe: Size 6" in.
10. Depth to water level 200 ft. Pump yield 500 GPM. Pumping level: 265 ft.
11. Power Unit: Electrical, [✓ Natural Gas,] Butane, Other ____ Horsepower 56

Signature ____
LANDOWNER OR AGENT TITLE ADDRESS

07-56-604

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer________ Field No.________ State Well No. UU 07-56-611

Owner's Well No. ________ County Potter

1. **Location:** NE 1/4 NE 1/4 Sec. 145, Block 9 Survey B.S. & F

			○

2. **Owner:** Georgianne Menke Address: Amarillo, Texas

Tenant: ________ Address: ________

Driller: ________ Address: ________

3. **Elevation** of LSD is 3805 ft. above msl, determined by 7 1/2 min. topo

4. **Drilled:** ________ 19___; Dug, Cable Tool, Rotary, ________

5. **Depth:** Rept.______ ft. Meas.______ ft.

6. **Completion:** Open Hole, Straight Wall, Underreamed, Gravel Packed ________

7. **Pump:** Mfgr. Wintroath Type Turbine

No: Stages____, Bowls Diam.____ in., Setting______ ft.

Column Diam. 6 in., Length Tailpipe______ ft.

8. **Motor:** Fuel NG Make & Model Chrysler Ind. HP. 70 GH

9. **Yield:** Flow____ gpm, Pump____ gpm, Meas., Rept., Est.________

10. **Performance Test:**. Date______ Length of Test______ Made by________

Static Level____ ft. Pumping Level____ ft. Drawdown____ ft.

Production______ gpm Specific Capacity______ gpm/ft.

CASING & BLANK PIPE

Cemented From______ ft. to______ ft.

Diam. (in.)	Type	Setting, ft.	
		from	to

11. **Water Level:** ______ ft. rept. meas. ______ 19___ above below ________ which is____ ft. above below surface.

______ ft. rept. meas. ______ 19___ above below ________ which is____ ft. above below surface.

______ ft. rept. meas. ______ 19___ above below ________ which is____ ft. above below surface.

______ ft. rept. meas. ______ 19___ above below ________ which is____ ft. above below surface.

12. **Use:** Dom., Stock, Public Supply, Ind. [✓ Irr.] Waterflooding, Observation, Not Used, ________

13. **Quality:** (Remarks on taste, odor, color, etc.) ________

Temp.___ °F, Date sampled for analysis______ Laboratory______

Temp.___ °F, Date sampled for analysis______ Laboratory______

Temp.___ °F, Date sampled for analysis______ Laboratory______

WELL SCREEN

Screen Openings________

Diam. (in.)	Type	Setting, ft.	
		from	to

14. **Other data available as circled:** Driller's Log, Radioactivity Log, Electric Log, Formation Samples, Pumping Test, ________

15. **Record by:** D. Müller Date 3-7-1972

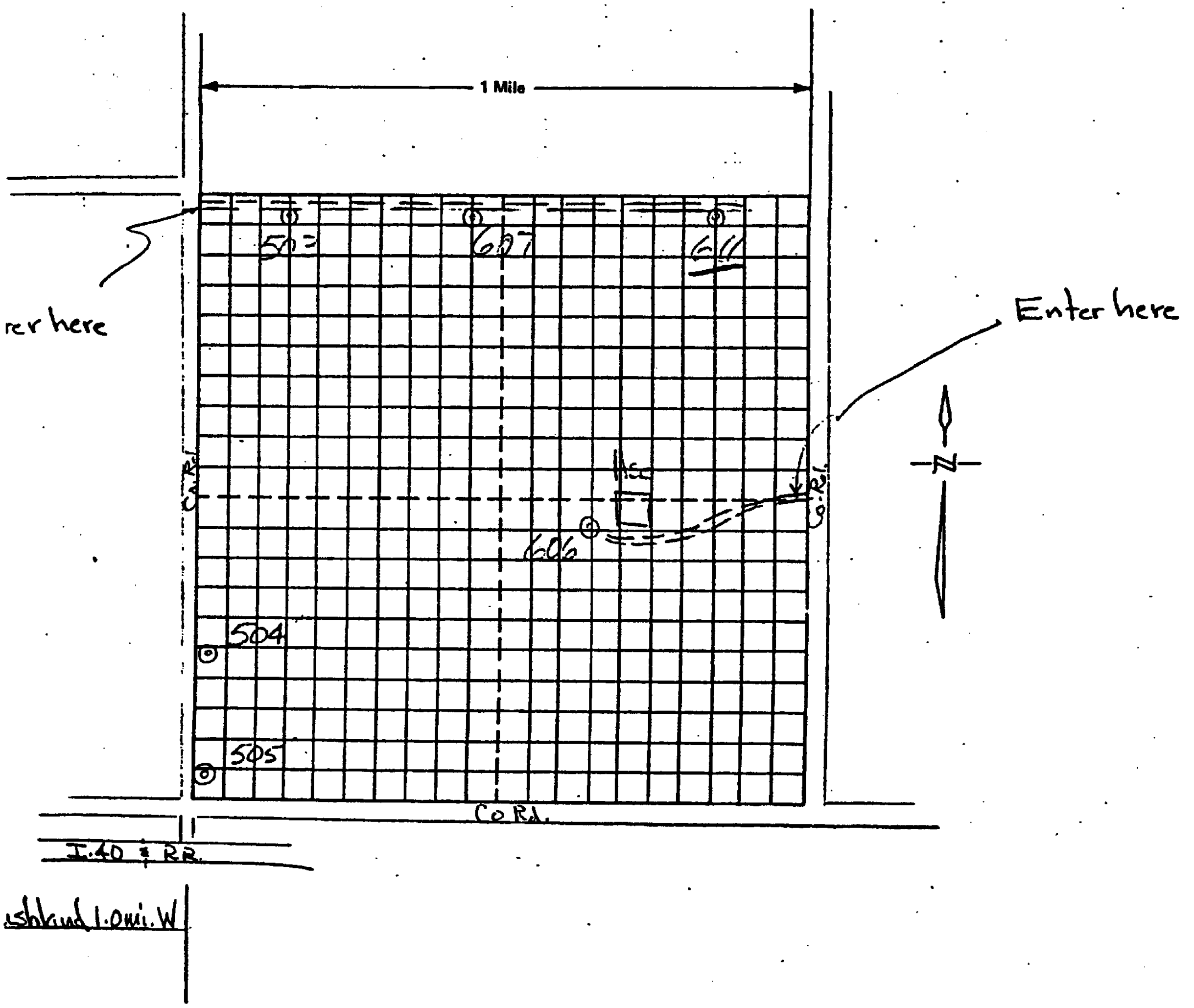
Source of Data Obs

16. **Remarks:** Access W-side top cons. blk

(Sketch)

WATER WELL LOCATION SKETCH
TEXAS WATER DEVELOPMENT BOARD
GROUND WATER DIVISION

Section 145 in Block 9
Potter County
2½-minute Quadrangle 5 & 6 in
7½-minute Quadrangle 56
Sketch by D. Müller Date 3-7-72



Well No. 07 . 56 . 611

TWDBE-GW-116
11 Copies

APPENDIX B

SLUG TESTING DATA AND CALCULATIONS

Job No. 06615-015-037 No.

HDR Engineering, Inc.

Project City of Amarillo MSWLF
Computed BAm Date 10/19.
Subject In-Situ Permeability Calculation
Checked Date
Task Summary
Sheet 1 Of 1

	B÷R	Hvorslev	Equilibrium Well E
MW-2	6.58×10^{-4} cm/sec	1.32×10^{-3} cm/sec	3.34×10^{-3} cm
MW-3	7.24×10^{-4} cm/sec	1.80×10^{-4} cm/sec	4.4×10^{-4} cm/s
MW-6	1.35×10^{-3} cm/sec	1.33×10^{-3} cm/sec	3.3×10^{-3} cm/se
P-1	1.47×10^{-3} cm/sec	3.77×10^{-2} cm/sec	--
P-2	1.25×10^{-3} cm/sec	1.03×10^{-3} cm/sec	--
P-3	1.09×10^{-3} cm/sec	4.28×10^{-3} cm/sec	3.77×10^{-3} cm/

Average of B÷R and Hvorslev

MW-2	9.89×10^{-4} cm/sec
MW-3	4.52×10^{-4} cm/sec
MW-6	1.34×10^{-3} cm/sec
P-1	1.96×10^{-2} cm/sec
P-2	1.14×10^{-3} cm/sec
P-3	2.69×10^{-3} cm/sec

Job No. 06625-015-037 No.

HDR Engineering, Inc.

Project City of Amarillo MSWLF
Computed BAm
Date 10/19/99
Subject In-situ Permeability Calculations
Checked
Date
Task Bouwer and Rice Method
Sheet 1
Of 2

Static W.L. 219.

MW-2

$$K = \frac{r_c^2 \ln (Re/Rw)}{2Lt} \ln \frac{y_o}{y_t}$$

K = hydraulic Conductivity, cm/sec
r_c = radius of well Casing, cm
Re = effective radius of influence
Rw = radius of Boring, cm
L = length of Screen or saturated thickness if entire screen is not Saturated, cm
t = Selected time from time/drawdown Semi-log plot
y_o = initial drawdown at time t = 0, sec
y_t = drawdown at time t, sec

Rw = 5-inches = ~~0.417~~ 12.7 cm/sec
r_c = 5-inches = ~~0.417~~ 12.7 cm/sec
L = 40ft = 1219.2 cm
y_o - 4.90 ft =
y_t 4.95 ft =
t = 60 sec

$$\ln \, {}^{Re}/_{rw} = \left[\frac{1.1}{\ln (H/r_w)} + \frac{C}{L/r_w} \right]^{-1}$$

$$\left[\frac{1.1}{\ln(26/\underset{12.7}{0.417})} + \frac{3.9}{\underset{1219.2}{40}/\underset{\substack{12.7\\-1}}{0.417}}\right]^{-1}$$

$$= \underset{1.535}{0.266} + 0.041$$

$$= 3.26$$

NO. 340-L310 DIETZGEN GRAPH PAPER
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3 CYCLES X 10 DIVISIONS PER INCH

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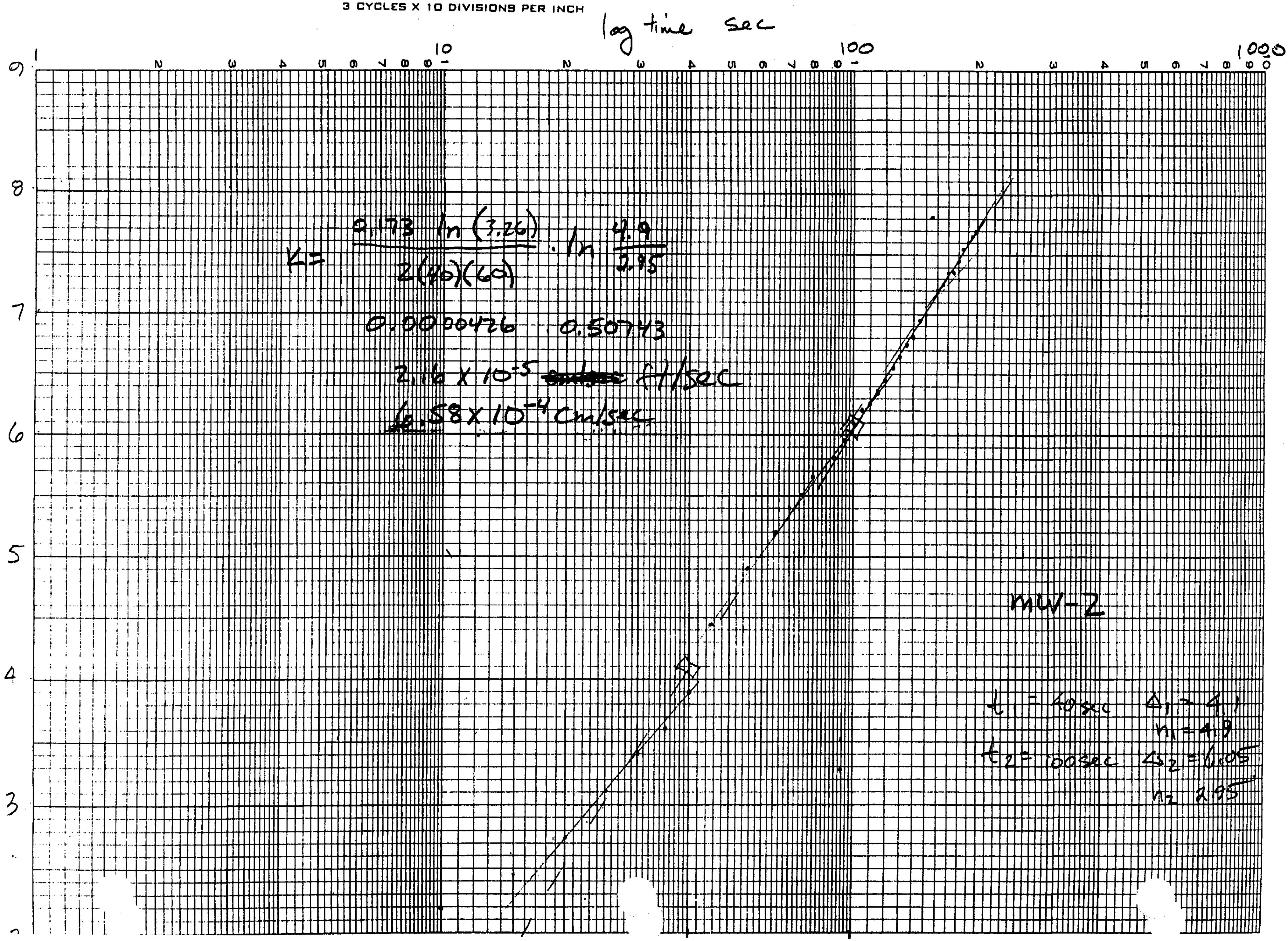

$$K = \frac{2.173 \ln(3.26)}{2(40)(60)} \cdot \ln \frac{4.9}{2.95}$$

0.0000426 0.50743

2.16×10^{-5} ~~[illegible]~~ ft/sec

6.58×10^{-4} cm/sec

MW-2

t_1 = 40sec Δ_1 = 4.1
h_1 = 4.9
t_2 = 100sec Δ_2 = 6.05
h_2 2.95

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL, FT	H/Ho	WATER ELEV.,FT	TIME SEC	WATER LEVEL, FT	H/Ho	WATER ELEV.,FT
			217.15						
MW-2	3590.64	0	228.00		3581.89	215	220.20	7.80	3589.69
		5	226.20	1.80	3583.69	220	220.15	7.85	3589.74
		10	225.80	2.20	3584.09	225	220.15	7.85	3589.74
		15	225.55	2.45	3584.34	230	220.10	7.90	3589.79
		20	225.25	2.75	3584.64	235	220.05	7.95	3589.84
		25	224.90	3.10	3584.99	240	220.00	8.00	3589.89
		30	224.60	3.40	3585.29	245	220.00	8.00	3589.89
		35	224.40	3.60	3585.49	250	219.95	8.05	3589.94
		40	224.10	3.90	3585.79	255	219.95	8.05	3589.94
		45	223.55	4.45	3586.34	260	219.90	8.10	3589.99
		55	223.30	4.70	3586.59	265	219.90	8.10	3589.99
		60	223.10	4.90	3586.79	270	219.85	8.15	3590.04
		65	223.00	5.00	3586.89	275	219.80	8.20	3590.09
		70	222.80	5.20	3587.09	280	219.80	8.20	3590.09
		75	222.60	5.40	3587.29	285	219.80	8.20	3590.09
		80	222.50	5.50	3587.39	290	219.80	8.20	3590.09
		85	222.35	5.65	3587.54	295	219.80	8.20	3590.09
		90	222.20	5.80	3587.69	300	219.75	8.25	3590.14
		95	222.05	5.95	3587.84	305	219.75	8.25	3590.14
		100	221.90	6.10	3587.99	310	219.70	8.30	3590.19
		105	221.80	6.20	3588.09	315	219.70	8.30	3590.19
		110	221.75	6.25	3588.14	320	219.70	8.30	3590.19
		115	221.65	6.35	3588.24	325	219.70	8.30	3590.19
		120	221.55	6.45	3588.34	330	219.65	8.35	3590.24
		125	221.45	6.55	3588.44	335	219.65	8.35	3590.24
		130	221.35	6.65	3588.54	340	219.65	8.35	3590.24
		135	221.25	6.75	3588.64	345	219.65	8.35	3590.24
		140	221.20	6.80	3588.69	350	219.60	8.40	3590.29
		145	221.05	6.95	3588.84	355	219.60	8.40	3590.29
		150	221.00	7.00	3588.89	360	219.60	8.40	3590.29
		155	220.19	7.81	3589.7	365	219.60	8.40	3590.29
		160	220.80	7.20	3589.09	370	219.60	8.40	3590.29
		165	220.75	7.25	3589.14	375	219.55	8.45	3590.34
		170	220.65	7.35	3589.24	380	219.55	8.45	3590.34
		175	220.65	7.35	3589.24	385	219.55	8.45	3590.34
		180	220.55	7.45	3589.34	390	219.55	8.45	3590.34
		185	220.45	7.55	3589.44	395	219.55	8.45	3590.34
		190	220.40	7.60	3589.49	400	219.55	8.45	3590.34
		195	220.35	7.65	3589.54	405	219.55	8.45	3590.34
		200	220.30	7.70	3589.59	410	219.55	8.45	3590.34
		205	220.30	7.70	3589.59	415	219.55	8.45	3590.34
		210	220.20	7.80	3589.69	420	219.55	8.45	3590.34

Job No. 0660W-45-031
No.

HDR Engineering, Inc.

Project City of Amarillo MSWLF
Computed BAM
Date 10/1

Subject In-Situ Permeability Calculations
Checked
Date

Task Bouwer and Rice Method
Sheet 1
Of 3

MW-3

$$K = \frac{r_c^2 \ln (Re/Rw)}{2Lt} \ln \frac{Y_o}{Y_t}$$

$Rw = 0.417$
$r_c = 0.417$
$L = 40$ ft
$Y_o = 11.10$ ft
$Y_t = 4.70$ ft
$t = 100.$ sec

$$\ln {}^{Re}/_{r_w} = \left[\frac{1.1}{\ln(H/r_w)} + \frac{C}{L/r_w}\right]^{-1}$$

$$\frac{1.1}{\ln (43.35/0.417)} + \frac{3.9}{40/0.417}^{-1}$$

$$= 0.237 + 0.041^{-1}$$

$$= 3.59$$

NO. 340-L310 DIETZGEN GRAPH PAPER
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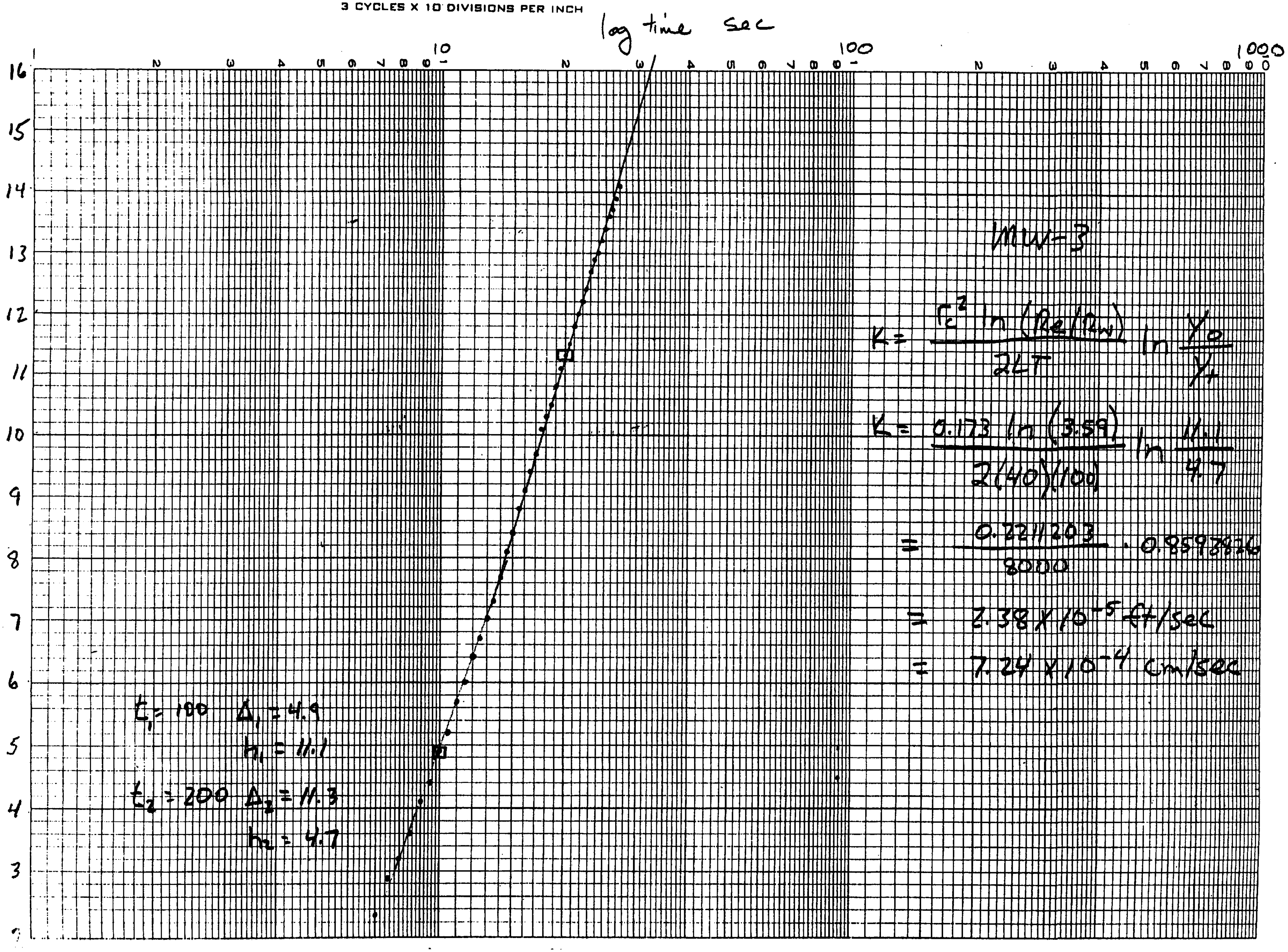


MW-3

$$K = \frac{r_c^2 \ln (Re/Rw)}{2LT} \ln \frac{Y_o}{Y_t}$$

$$K = \frac{0.173 \ln (3.59)}{2(40)(100)} \ln \frac{11.1}{4.7}$$

$$= \frac{0.221203}{8000} \cdot 0.8593826$$

$$= 2.38 \times 10^{-5} \text{ ft/sec}$$

$$= 7.24 \times 10^{-4} \text{ cm/sec}$$

$t_1 = 100$ $\Delta_1 = 4.9$

$h_1 = 11.1$

$t_2 = 200$ $\Delta_2 = 11.3$

$h_2 = 4.7$

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL, FT	H/Ho	WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT
MW-3	3589.16	0				245	212.1	13.20	3580.71
		5	225.3		3567.51	250	211.9	13.40	3580.91
		10	224.8	0.50	3568.01	255	211.7	13.60	3581.11
		15	224.8	0.50	3568.01	260	211.6	13.70	3581.21
		20	226.4	-1.10	3566.41	265	211.4	13.90	3581.41
		25	226.4	-1.10	3566.41	270	211.2	14.10	3581.61
		30	226.0	-0.70	3566.81	275	211.1	14.20	3581.71
		35	225.6	-0.30	3567.21	280	210.8	14.50	3582.01
		40	225.2	0.10	3567.61	285	210.7	14.60	3582.11
		45	225.0	0.30	3567.81	290	210.6	14.70	3582.21
		55	224.5	0.80	3568.31	300	210.4	14.90	3582.41
		60	224.1	1.20	3568.71	310	210.1	15.20	3582.71
		65	223.5	1.80	3569.31	320	209.9	15.40	3582.91
		70	223.0	2.30	3569.81	330	209.7	15.60	3583.11
		75	222.4	2.90	3570.41	340	209.4	15.90	3583.41
		80	222.1	3.20	3570.71	350	209.2	16.10	3583.61
		85	221.7	3.60	3571.11	360	208.9	16.40	3583.91
		90	221.2	4.10	3571.61	370	208.8	16.50	3584.01
		95	220.9	4.40	3571.91	380	208.5	16.80	3584.31
		100	220.4	4.90	3572.41	390	208.4	16.90	3584.41
		105	220.1	5.20	3572.71	400	208.1	17.20	3584.71
		110	219.6	5.70	3573.21	410	207.9	17.40	3584.91
		115	219.3	6.00	3573.51	420	207.8	17.50	3585.01
		120	218.9	6.40	3573.91	430	207.4	17.90	3585.41
		125	218.6	6.70	3574.21	440	207.3	18.00	3585.51
		130	218.3	7.00	3574.51	450	207.2	18.10	3585.61
		135	218.0	7.30	3574.81	460	207.0	18.30	3585.81
		140	217.6	7.70	3575.21	470	206.8	18.50	3586.01
		145	217.2	8.10	3575.61	480	206.6	18.70	3586.21
		150	216.9	8.40	3575.91	490	206.5	18.80	3586.31
		155	216.5	8.80	3576.31	500	206.3	19.00	3586.51
		160	216.2	9.10	3576.61	510	206.2	19.10	3586.61
		165	215.9	9.40	3576.91	520	206.1	19.20	3586.71
		170	215.6	9.70	3577.21	530	205.9	19.40	3586.91
		175	215.2	10.10	3577.61	540	205.8	19.50	3587.01
		180	215.0	10.30	3577.81	550	205.7	19.60	3587.11
		185	214.8	10.50	3578.01	560	205.6	19.70	3587.21
		190	214.5	10.80	3578.31	570	205.5	19.80	3587.31
		195	214.2	11.10	3578.61	580	205.4	19.90	3587.41
		200	214.0	11.30	3578.81	590	205.3	20.00	3587.51
		205	213.8	11.50	3579.01	600	205.2	20.10	3587.61
		210	213.5	11.80	3579.31	610	205.1	20.20	3587.71
		215	213.3	12.00	3579.51	620	205.1	20.20	3587.71
		220	213.1	12.20	3579.71	630	205.0	20.30	3587.81
		225	212.9	12.40	3579.91	640	204.9	20.40	3587.91
		230	212.6	12.70	3580.21	650	204.8	20.50	3588.01
		235	212.4	12.90	3580.41	660	204.8	20.50	3588.01
		240	212.3	13.00	3580.51	670	204.7	20.60	3588.11

Job No. 06625-015-037 No.

HDR Engineering, Inc.

HDR

Project City of Amarillo MSWLF
Computed BAm
Date 10/19/94
Subject In-Situ Permeability Calculations
Checked
Date
Task Bouwer and Rice Method
Sheet 1
Of 3

MW-6

$$K = \frac{r_c^2 \ln(Re/Rw)}{2LT} \ln\frac{Y_0}{Y_t}$$

$Rw = 0.417$
$r_c = 0.417$
$L = 40$
$Y_0 = 4.2$
$Y_t = 1.5$
$t = 60$

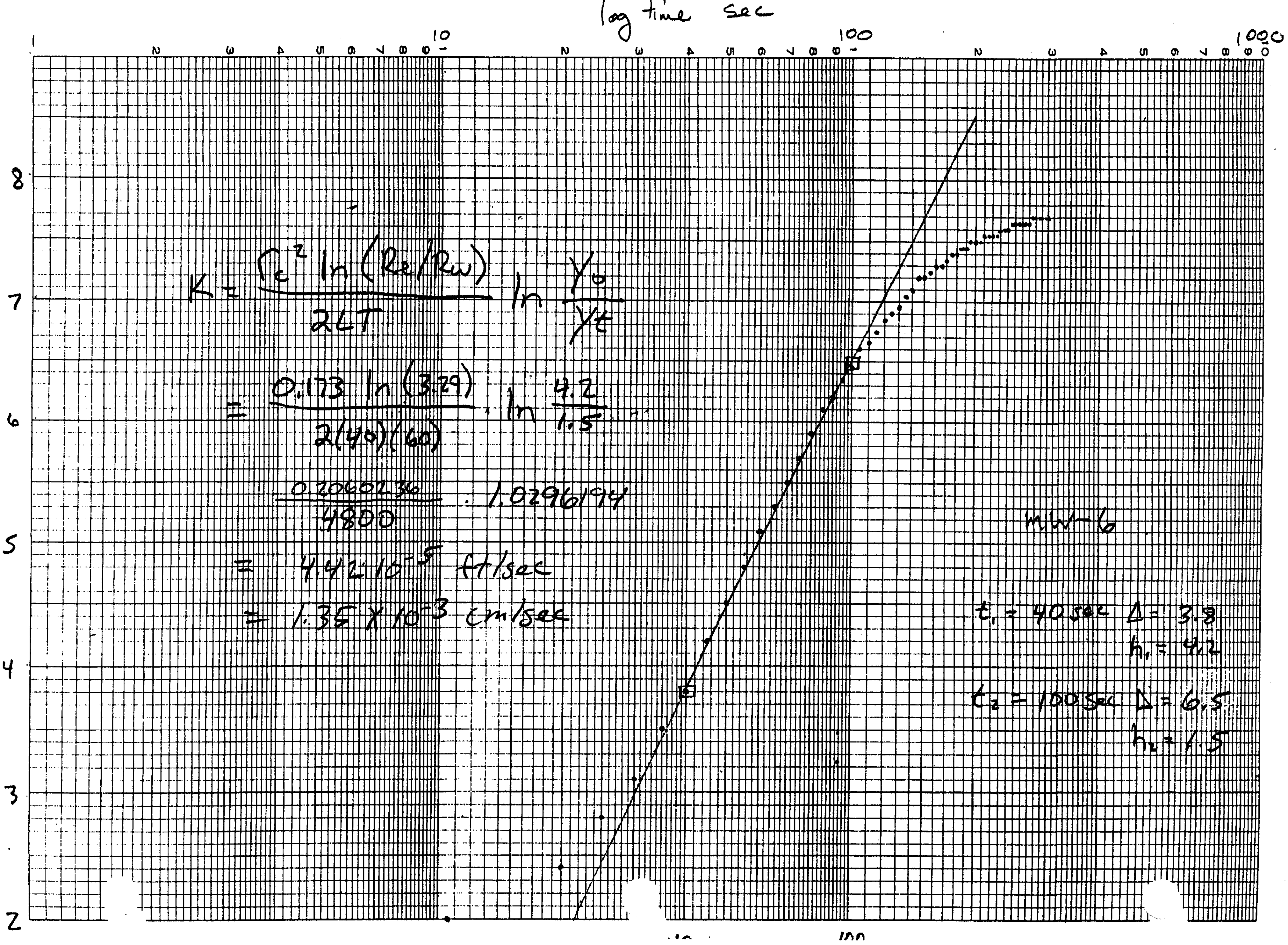
$$\ln Re/Rw = \left[\frac{1.1}{\ln(27.15/0.417)} + \frac{3.9}{40/0.417}\right]^{-1}$$

$$= 0.263 + 0.041$$

$$= 3.29$$

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



$$K = \frac{r_c^2 \ln (Re/Rw)}{2LT} \ln \frac{Y_0}{Y_t}$$

$$= \frac{0.173 \ln (3.29)}{2(40)(60)} \cdot \ln \frac{4.2}{1.5}$$

$$\frac{0.2060236}{4800} \cdot 1.0296194$$

$= 4.42 10^{-5}$ ft/sec

$= 1.35 \times 10^{-3}$ cm/sec

mw-6

$t_1 = 40$ sec $\Delta = 3.8$
$h_1 = 4.2$

$t_2 = 100$ sec $\Delta = 6.5$
$h_2 = 1.5$

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT
MW-6	3601.52	5	157.00		3593.72	155	149.75	7.25	3600.97
		10	156.90	0.10	3593.82	160	149.70	7.30	3601.02
		15	155.00	2.00	3595.72	165	149.70	7.30	3601.02
		20	154.60	2.40	3596.12	170	149.65	7.35	3601.07
		25	154.20	2.80	3596.52	175	149.60	7.40	3601.12
		30	153.90	3.10	3596.82	180	149.60	7.40	3601.12
		35	153.50	3.50	3597.22	185	149.55	7.45	3601.17
		40	153.20	3.80	3597.52	190	149.55	7.45	3601.17
		45	152.80	4.20	3597.92	195	149.50	7.50	3601.22
		50	152.50	4.50	3598.22	200	149.50	7.50	3601.22
		55	152.20	4.80	3598.52	205	149.50	7.50	3601.22
		60	151.90	5.10	3598.82	210	149.45	7.55	3601.27
		65	151.70	5.30	3599.02	215	149.45	7.55	3601.27
		70	151.50	5.50	3599.22	220	149.45	7.55	3601.27
		75	151.30	5.70	3599.42	225	149.45	7.55	3601.27
		80	151.10	5.90	3599.62	230	149.40	7.60	3601.32
		85	150.90	6.10	3599.82	235	149.40	7.60	3601.32
		90	150.80	6.20	3599.92	240	149.40	7.60	3601.32
		95	150.65	6.35	3600.07	245	149.35	7.65	3601.37
		100	150.55	6.45	3600.17	250	149.35	7.65	3601.37
		105	150.40	6.60	3600.32	255	149.35	7.65	3601.37
		110	150.35	6.65	3600.37	260	149.35	7.65	3601.37
		115	150.25	6.75	3600.47	265	149.35	7.65	3601.37
		120	150.15	6.85	3600.57	270	149.35	7.65	3601.37
		125	150.10	6.90	3600.62	275	149.30	7.70	3601.42
		130	150.05	6.95	3600.67	280	149.30	7.70	3601.42
		135	149.95	7.05	3600.77	285	149.30	7.70	3601.42
		140	149.90	7.10	3600.82	290	149.30	7.70	3601.42
		145	149.80	7.20	3600.92	295	149.30	7.70	3601.42
		150	149.80	7.20	3600.92	300	149.30	7.70	3601.42

Job No.

No.

Computation

HDR

Project City OF Amarillo MSWLF.

Computed BAm

Date

Subject In-Situ Permeability Calculation

Checked

Date

Task Bouwer and Rice Method

Sheet 1

Of 1

P-1

$$K = \frac{r_c^2 \ln(Re/Rw)}{2LT} \ln \frac{Y_o}{Y_t}$$

$Rw = 0.417$ ft

$r_c = 0.417$ ft

$L = 40$ ft

$Y_o = 2.9$

$Y_t = 1.0$

$$\ln Re/rw = \left[\frac{1.1}{\ln(H/rw)} + \frac{C}{L/r_w}\right]^{-1}$$

$$= \frac{1.1}{\ln(37.23/0.417)} + \frac{3.90}{40/0.417}^{-1}$$

$$= 0.2448916 + 0.0406575^{-1}$$

$$= 3.50$$

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EUGENE DIETZGEN CO.
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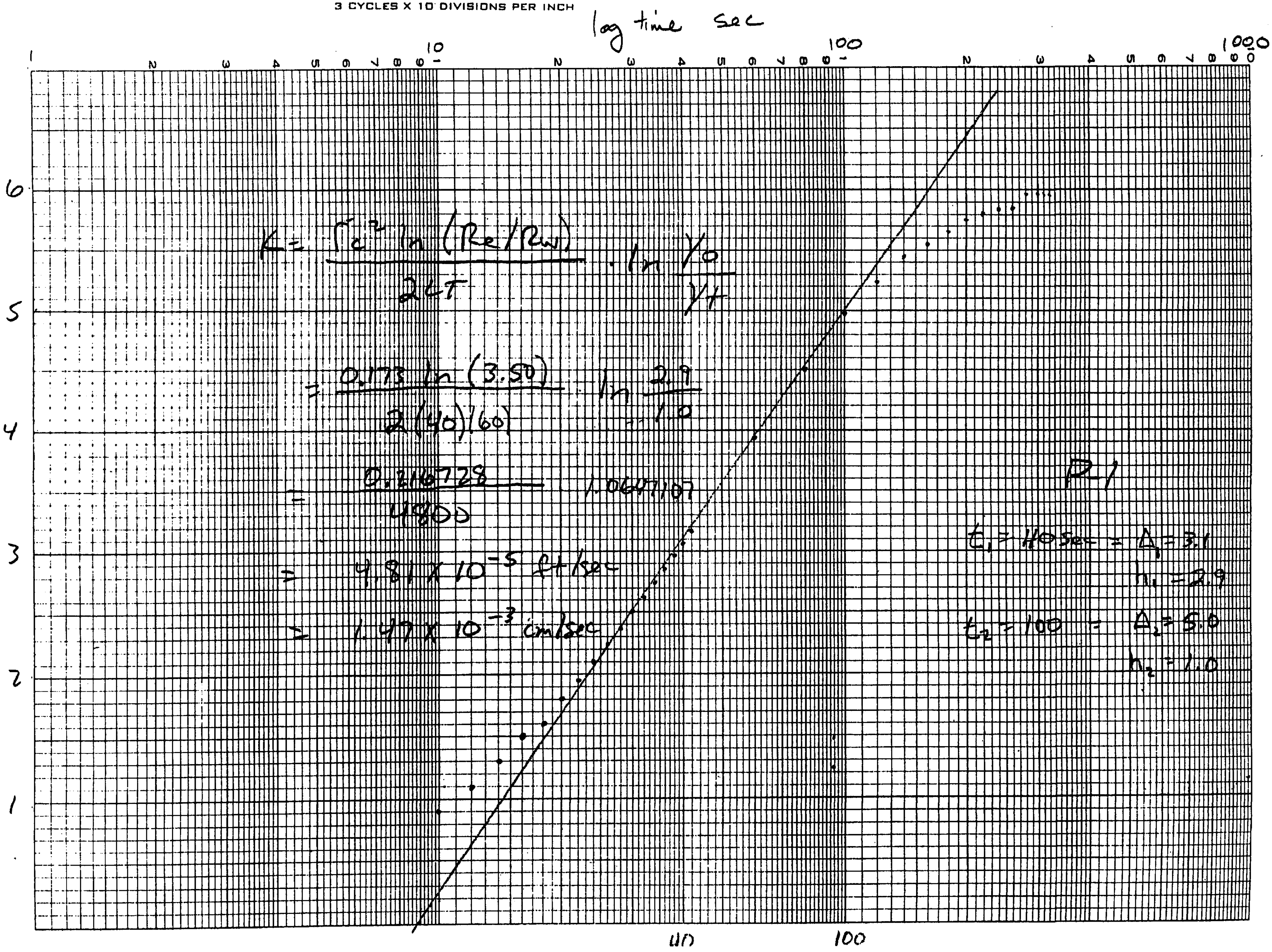

P-1

$t_1 = 40 \text{ sec} = \Delta_1 = 3.1$

$h_1 = 2.9$

$t_2 = 100 = \Delta_2 = 5.0$

$h_2 = 1.0$

$$K = \frac{r_c^2 \ln(Re/Rw)}{2LT} \cdot \ln \frac{Y_0}{Y_t}$$

$$= \frac{0.173 \ln(3.50)}{2(40)(60)} \ln \frac{2.9}{1.0}$$

$$= \frac{0.216728}{4800} \; 1.0647107$$

$= 4.81 \times 10^{-5}$ ft/sec

$= 1.47 \times 10^{-3}$ cm/sec

SE2000
Environmental Logger
10/07 10:11

Unit# 9600 Test 4

Static W.L =. 997.240

Setups:	INPUT 1
Type	Level (F)
Mode	TOC
I.D.	P1

Reference	1000.00	2,000
SG	1.000	
Linearity	0.011	
Scale factor	10.095	
Offset	0.030	
Delay mSEC	50.000	

Step 0 09/21 18:02:37

Elapsed Time		INPUT 1	W.L.	H/Ho
0.0000		1003.16	996.84	
0.0333	2	1003.17	996.83	0.01
0.0666	4	1002.90	997.10	0.26
0.1000	6	1002.66	997.34	0.50
0.1333	8	1002.45	997.55	0.71
0.1666	10	1002.26	997.74	0.90
0.2000	12	1002.05	997.95	1.11
0.2333	14	1001.86	998.14	1.30
0.2666	16	1001.68	99832	1.48
0.3000	18	1001.52	998.42	1.58
0.3333	20	1001.36	998.64	1.80
0.3666	22	1001.21	998.79	1.95
0.4000	24	1001.06	998.94	2.10
0.4333	26	1000.92	999.08	2.24
0.4666	28	1000.79	999.21	2.37
0.5000	30	1000.66	999.34	2.50
0.5333	32	1000.54	999.46	2.62
0.5666	34	1000.41	999.59	2.75
0.6000	36	1000.30	999.70	2.86
0.6333	38	1000.19	999.81	2.97
0.6666	40	1000.08	99992	3.08

0.7000	42	999.980	1000.02	3.18
0.7333	44	999.875		
0.7666	46	999.783		
0.8000	48	999.691		
0.8333	50	999.605		
0.8666	52	999.516		
0.9000	54	999.443		
0.9333	56	999.373		
0.9666	58	999.296		
1.0000	60	999.226	1000.774	3.934
1.0333	62	999.153		
1.0666	64	999.089		
1.1000	66	999.038		
1.1333	68	998.972		
1.1666	70	998.911		
1.2000	72	998.854		
1.2333	74	998.797		
1.2666	76	998.749		
1.3000	78	998.692		
1.3333	80	998.644	1001.356	4.516
1.3666	82	998.596		
1.4000	84	998.552		
1.4333	86	998.507		
1.4666	88	998.469		
1.5000	90	998.421		
1.5333	92	998.386		
1.5666	94	998.341		
1.6000	96	998.306		
1.6333	98	998.271		
1.6666	100	998.233	1001.767	4.927
1.7000	102	998.198		
1.7333	104	998.166		
1.7666	106	998.135		
1.8000	108	998.106		
1.8333	110	998.074		
1.8666	112	998.046		
1.9000	114	998.020		
1.9333	116	997.995		
1.9666	118	997.966		
2.0000	120	997.940	1002.06	5.22
2.0333	122	997.921		
2.0666	124	997.899		
2.1000	126	997.877		
2.1333	128	997.848		
2.1666	130	997.820		

2.2000	132	997.797		
2.2333	134	997.781		
2.2666	136	997.759		
2.3000	138	997.743		
2.3333	140	997.718	1002.282	5.442
2.3666	142	997.708		
2.4000	144	997.692		
2.4333	146	997.673		
2.4666	148	997.657		
2.5000	150	997.644		
2.5333	152	997.629		
2.5666	154	997.616		
2.6000	156	997.603		
2.6333	158	997.594		
2.6666	160	997.574	1002.426	5.586
2.7000	162	997.562		
2.7333	164	997.552		
2.7666	166	997.543		
2.8000	168	997.530		
2.8333	170	997.520		
2.8666	172	997.508		
2.9000	174	997.498		
2.9333	176	997.489		
2.9666	178	997.482		
3.0000	180	997.473	1002.527	5.687
3.0333	182	997.463		
3.0666	184	997.457		
3.1000	186	997.447		
3.1333	188	997.441		
3.1666	190	997.434		
3.2000	192	997.425		
3.2333	194	997.415		
3.2666	196	997.412		
3.3000	198	997.406		
3.3333	200	997.399	1002.601	5.761
3.3666	202	997.393		
3.4000	204	997.390		
3.4333	206	997.380		
3.4666	208	997.374		
3.5000	210	997.371		
3.5333	212	997.364		
3.5666	214	997.358		
3.6000	216	997.355		
3.6333	218	997.352		
3.6666	220	997.342	1002.658	5.819

3.7000	222	997.336		
3.7333	224	997.336		
3.7666	226	997.329		
3.8000	228	997.326		
3.8333	230	997.323		
3.8666	232	997.320		
3.9000	234	997.313		
3.9333	236	997.310		
3.9666	238	997.307		
4.0000	240	997.304	1002.696	5.856
4.0333	242	997.301		
4.0666	244	997.298		
4.1000	246	997.294		
4.1333	248	997.291		
4.1666	250	997.288		
4.2000	252	997.285		
4.2333	254	997.282		
4.2666	256	997.282		
4.3000	258	997.275		
4.3333	260	997.275	1002.725	5.885
4.3666	262	997.272		
4.4000	264	997.269		
4.4333	266	997.266		
4.4666	268	997.266		
4.5000	270	997.263		
4.5333	272	997.263		
4.5666	274	997.256		
4.6000	276	997.259		
4.6333	278	997.256		
4.6666	280	997.253	1002.747	5.907
4.7000	282	997.253		
4.7333	284	997.250		
4.7666	286	997.247		
4.8000	288	997.247		
4.8333	290	997.247		
4.8666	292	997.247		
4.9000	294	997.243		
4.9333	296	997.243		
4.9666	298	997.240		
5.0000	300	997.240	1002.76	5.92
5.0333		997.237		
5.0666		997.237		
5.1000		997.237		
5.1333		997.234		
5.1666		997.234		

5.2000		997.234		
5.2333		997.231		
5.2666		997.231		
5.3000		997.231		
5.3333	320	997.228-	1002.772	5.932
5.3666		997.228		
5.4000		997.224		
5.4333		997.224		
5.4666		997.224		
5.5000		997.221		
5.5333		997.221		
5.5666		997.224		
5.6000		997.221		
5.6333		997.221		
5.6666	340	997.221	1002.779	5.939
5.7000		997.221		
5.7333		997.218		
5.7666		997.218		
5.8000		997.218		
5.8333		997.215		
5.8666		997.215		
5.9000		997.215		
5.9333		997.215		
5.9666		997.215		
6.0000	360	997.212	1002.788	5.948
6.0333		997.208		
6.0666		997.212		
6.1000		997.212		
6.1333		997.212		
6.1666		997.212		
6.2000		997.208		
6.2333		997.208		
6.2666		997.205		
6.3000		997.205		
6.3333	380	997.205	1002.795	5.955
6.3666		997.208		
6.4000		997.205		
6.4333		997.205		
6.4666		997.205		
6.5000		997.205		
6.5333		997.205		
6.5666		997.202		
6.6000		997.205		
6.6333		997.199		
6.6666	400	997.202	1002.798	5.958

6.7000		997.205		
6.7333		997.202		
6.7666		997.199		
6.8000		997.202		
6.8333		997.199		
6.8666		997.199		
6.9000		997.199		
6.9333		997.196		
6.9666		997.193		
7.0000	420	997.193	1002.807	5.967
7.0333		997.202		
7.0666		997.196		
7.1000		997.199		
7.1333		997.196		
7.1666		997.196		
7.2000		997.196		
7.2333		997.196		
7.2666		997.196		
7.3000		997.193		
7.3333		997.196		
7.3666		997.196		
7.4000		997.196		
7.4333		997.193		
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7.6000		997.196		
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7.7000		997.196		
7.7333		997.196		
7.7666		997.196		
7.8000		997.193		
7.8333		997.193		
7.8666		997.193		
7.9000		997.193		
7.9333		997.189		
7.9666		997.193		
8.0000		997.193		
8.0333		997.193		
8.0666		997.196		
8.1000		997.193		
8.1333		997.193		
8.1666		997.193		

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 8.2000        997.193
 8.2333        997.193
 8.2666        997.193
 8.3000        997.193
 8.3333        997.193
 8.3666        997.193
 8.4000        997.189
 8.4333        997.193
 8.4666        997.196
 8.5000        997.193
 8.5333        997.193
 8.5666        997.189
 8.6000        997.183
 8.6333        997.193
 8.6666        997.193
 8.7000        997.193
 8.7333        997.189
 8.7666        997.193
 8.8000        997.193
 8.8333        997.193
 8.8666        997.193
 8.9000        997.193
 8.9333        997.193
 8.9666        997.193
 9.0000        997.193
 9.0333        997.193
 9.0666        997.193
 9.1000        997.193
 9.1333        997.193
 9.1666        997.193
 9.2000        997.193
 9.2333        997.193
 9.2666        997.193
 9.3000        997.193
 9.3333        997.193
 9.3666        997.189
 9.4000        997.193
 9.4333        997.193
 9.4666        997.193
 9.5000        997.193
 9.5333        997.196
 9.5666        997.193
 9.6000        997.193
 9.6333        997.193
 9.6666        997.193
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     9.7000        997.193
     9.7333        997.193
     9.7666        997.193
     9.8000        997.193
     9.8333        997.193
     9.8666        997.193
     9.9000        997.193
     9.9333        997.193
     9.9666        997.193
    10.0000        997.193
    10.0333        997.193
```

Job No. [illegible] | No.

HDR Engineering, Inc.

HDR

Project City of Amarillo MSWLF | Computed BAm | Date 10/1/91
Subject In-situ Permeability Calculations | Checked | Date
Task Bouwer and Rice Method | Sheet 1 | Of 3

P-2

$$K = \frac{r_c^2 \ln(Re/Rw)}{2LT} \cdot \ln \frac{Y_o}{Y_t}$$

$Rw = 0.417$
$r_c = 0.417$
$L = 40'$
$Y_o = 1.95$
$Y_t = 0.75$
$t = 60$

$$\ln Re/Rw = \left[\frac{1.1}{\ln(27.15/.417)} + \frac{3.9}{40/0.417} \right]^{-1}$$

$$= 0.263 + 0.041^{-1}$$

$$= 3.28$$

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EUGENE DIETZGEN CO.
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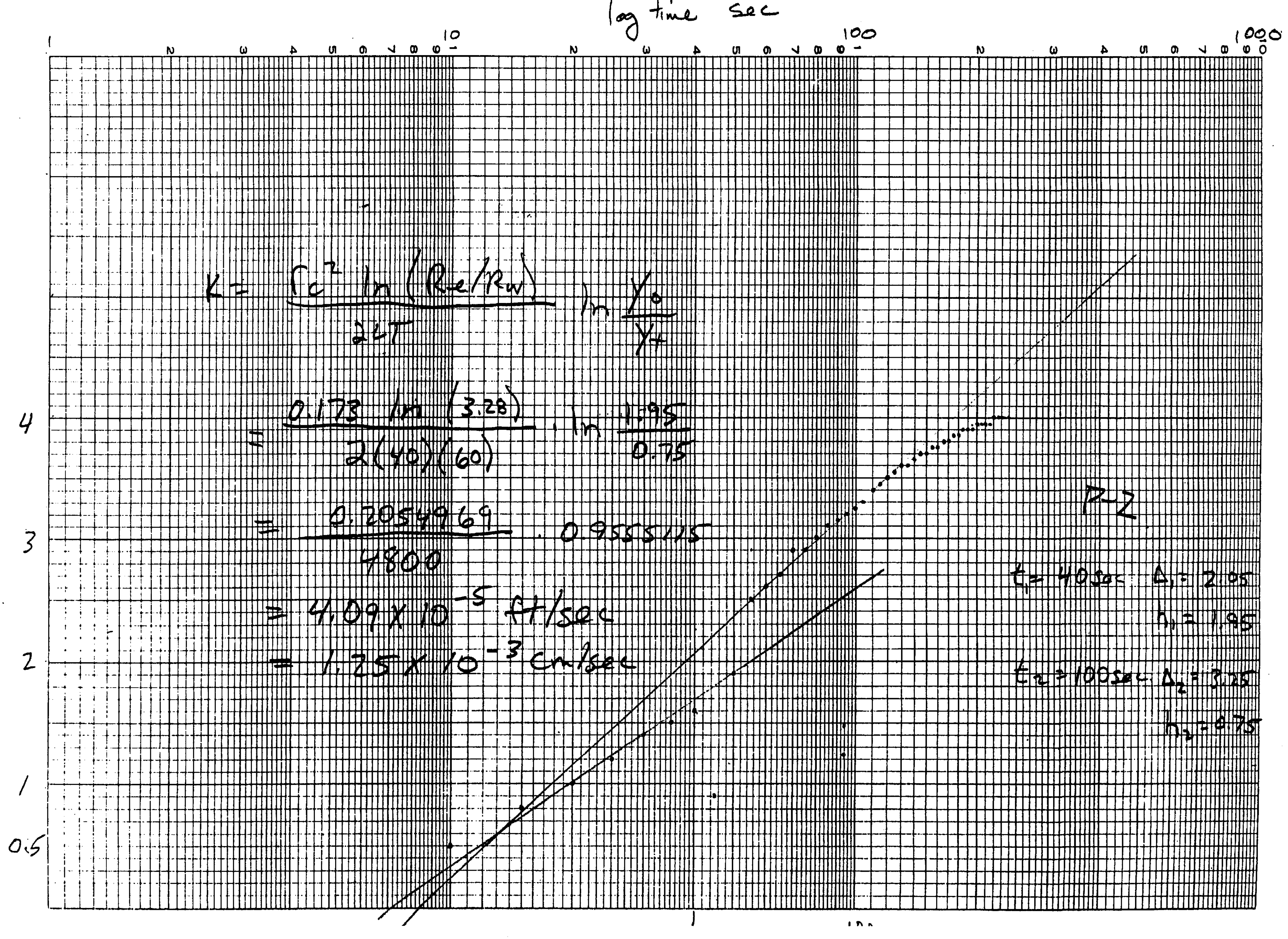


P-2

$$K = \frac{r_c^2 \ln(R_e/R_w)}{2LT} \ln\frac{Y_0}{Y_t}$$

$$= \frac{0.173 \ln(3.28)}{2(40)(60)} \cdot \ln\frac{1.95}{0.75}$$

$$= \frac{0.2054969}{4800} \cdot 0.9555115$$

$= 4.09 \times 10^{-5}$ ft/sec

$= 1.25 \times 10^{-3}$ cm/sec

$t_1 = 40$ sec $\Delta_1 = 2.05$

$h_1 = 1.95$

$t_2 = 100$ sec $\Delta_2 = 3.25$

$h_2 = 0.75$

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT
P-2	3595.17	0							
		5	207.40		3590.87	125	203.85	3.55	3594.42
		10	206.90	0.50	3591.37	130	203.80	3.60	3594.47
		15	206.60	0.80	3591.67	135	203.80	3.60	3594.47
		20	206.40	1.00	3591.87	140	203.75	3.65	3594.52
		25	206.20	1.20	3592.07	145	203.70	3.70	3594.57
		30	206.00	1.40	3592.27	150	203.70	3.70	3594.57
		35	205.90	1.50	3592.37	155	203.65	3.75	3594.62
		40	205.80	1.60	3592.47	160	203.65	3.75	3594.62
		45	206.50	0.90	3591.77	165	203.60	3.80	3594.67
		50	205.50	1.90	3592.77	170	203.60	3.80	3594.67
		55	204.90	2.50	3593.37	175	203.55	3.85	3594.72
		60	204.80	2.60	3593.47	180	203.55	3.85	3594.72
		65	204.70	2.70	3593.57	185	203.50	3.90	3594.77
		70	204.50	2.90	3593.77	190	203.50	3.90	3594.77
		75	204.50	2.90	3593.77	195	203.50	3.90	3594.77
		80	204.40	3.00	3593.87	200	203.45	3.95	3594.82
		85	204.30	3.10	3593.97	205	203.45	3.95	3594.82
		90	204.25	3.15	3594.02	210	203.45	3.95	3594.82
		95	204.20	3.20	3594.07	215	203.45	3.95	3594.82
		100	204.15	3.25	3594.12	220	203.40	4.00	3594.87
		105	204.10	3.30	3594.17	225	203.40	4.00	3594.87
		110	204.00	3.40	3594.27	230	203.40	4.00	3594.87
		115	203.95	3.45	3594.32	235	203.40	4.00	3594.87
		120	203.90	3.50	3594.37	240	203.40	4.00	3594.87

Job No. 06025-015-037 | No.

HDR Engineering, Inc.

Project City of Amarillo MSWLF
Computed BAM
Date 10/19/94
Subject In-situ Permeability Calculations
Checked
Date
Task Bouwer and Rice Method
Sheet 1
Of 3

P-3

$R_w = 0.417$
$r_c = 0.417$
$L = 40$ ft
$Y_o = 5$ ft
$Y_t = 2.2$ ft
$t = 60$ sec

$$K = \frac{r_c^2 \ln (R_e / R_w)}{2LT} \cdot \ln \frac{Y_o}{Y_t}$$

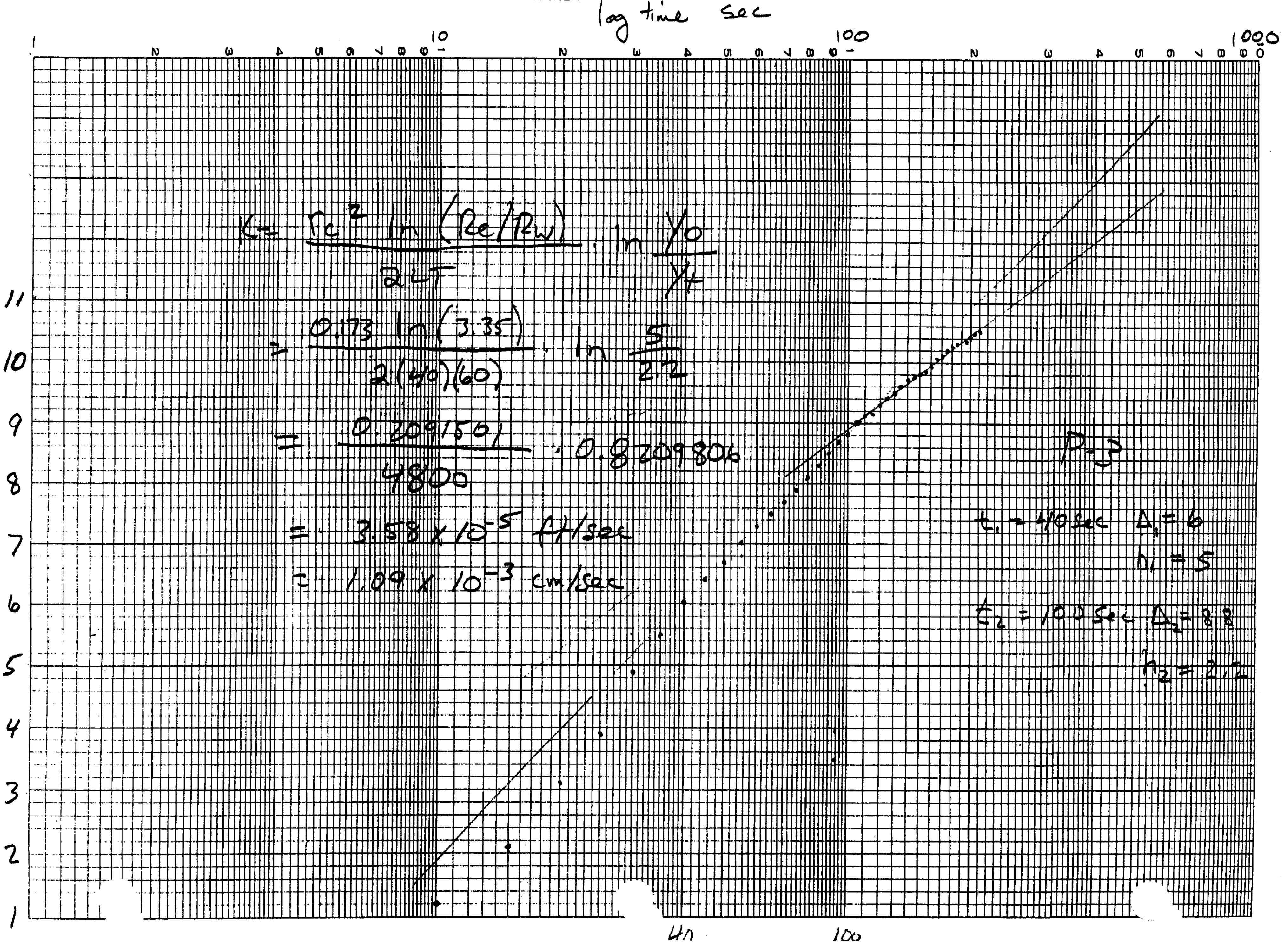
$$\ln R_e/R_w \left[\frac{1.1}{\ln(29.90/.417)} + \frac{3.9}{40/0.417} \right]^{-1}$$

$$= 0.257 + 0.041$$

$$= 3.35$$

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



$$K = \frac{r_c^2 \ln(Re/Rw)}{2LT} \cdot \ln \frac{Y_0}{Y_t}$$

$$= \frac{0.173 \ln(3.35)}{2(40)(60)} \cdot \ln \frac{5}{2.2}$$

$$= \frac{0.209156}{4800} \cdot 0.8209806$$

$$= 3.58 \times 10^{-5} \text{ ft/sec}$$

$$= 1.09 \times 10^{-3} \text{ cm/sec}$$

P-3

$t_1 = 40$ sec $\Delta_1 = 6$

$h_1 = 5$

$t_2 = 100$ sec $\Delta_2 = 8.8$

$h_2 = 2.2$

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT
P-3	3599.61	0							
		5	158.10		3588.56	215	147.60	10.50	3599.06
		✓10	156.90	1.20	3589.76	220	147.55	10.55	3599.11
		✓15	156.00	2.10	3590.66	225	147.50	10.60	3599.16
		20	155.00	3.10	3591.66	230	147.50	10.60	3599.16
		25	154.20	3.90	3592.46	235	147.50	10.60	3599.16
		30	153.20	4.90	3593.46	240	147.45	10.65	3599.21
		35	152.60	5.50	3594.06	245	147.40	10.70	3599.26
		40	152.10	6.00	3594.56	250	147.40	10.70	3599.26
		45	151.70	6.40	3594.96	255	147.40	10.70	3599.26
		50	151.40	6.70	3595.26	260	147.40	10.70	3599.26
		55	151.10	7.00	3595.56	265	147.40	10.70	3599.26
		60	150.80	7.30	3595.86	270	147.35	10.75	3599.31
		65	150.60	7.50	3596.06	275	147.35	10.75	3599.31
		70	150.40	7.70	3596.26	280	147.35	10.75	3599.31
		75	150.20	7.90	3596.46	285	147.30	10.80	3599.36
		80	150.00	8.10	3596.66	290	147.30	10.80	3599.36
		85	149.80	8.30	3596.86	295	147.30	10.80	3599.36
		90	149.60	8.50	3597.06	300	147.25	10.85	3599.41
		95	149.40	8.70	3597.26	305	147.25	10.85	3599.41
		100	149.30	8.80	3597.36	310	147.25	10.85	3599.41
		105	149.10	9.00	3597.56	315	147.25	10.85	3599.41
		110	149.00	9.10	3597.66	320	147.25	10.85	3599.41
		115	148.95	9.15	3597.71	325	147.25	10.85	3599.41
		120	148.80	9.30	3597.86	330	147.20	10.90	3599.46
		125	148.70	9.40	3597.96	335	147.20	10.90	3599.46
		130	148.60	9.50	3598.06	340	147.20	10.90	3599.46
		135	148.50	9.60	3598.16	345	147.20	10.90	3599.46
		140	148.40	9.70	3598.26	350	147.20	10.90	3599.46
		145	148.35	9.75	3598.31	355	147.20	10.90	3599.46
		150	148.30	9.80	3598.36	360	147.20	10.90	3599.46
		155	148.25	9.85	3598.41	365	147.20	10.90	3599.46
		160	148.15	9.95	3598.51	370	147.20	10.90	3599.46
		165	148.05	10.05	3598.61	375	147.20	10.90	3599.46
		170	148.00	10.10	3598.66	380	147.15	10.95	3599.51
		175	147.90	10.20	3598.76	385	147.15	10.95	3599.51
		180	147.85	10.25	3598.81	390	147.15	10.95	3599.51
		185	147.80	10.30	3598.86	395	147.15	10.95	3599.51
		190	147.75	10.35	3598.91	400	147.15	10.95	3599.51
		195	147.75	10.35	3598.91	405	147.15	10.95	3599.51
		200	147.70	10.40	3598.96	410	147.15	10.95	3599.51
		205	147.65	10.45	3599.01	415	147.15	10.95	3599.51
		210	147.60	10.50	3599.06	420	147.15	10.95	3599.51

Job No.

No.

HDR Engineering, Inc.

HDR

Project City of Amarillo MSWLF

Computed BAm

Date 10/18

Subject In-situ Field Permeability Calculations

Checked

Date

Task Hvorslev Method G

Sheet 1

Of 3

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T} \cdot \ln \frac{H_L}{H_2}$$

K_h = horizontal Hydraulic Conductivity, cm/sec

d = diameter of standpipe, cm

m = Transformation Ratio

L = Length of intake area, cm

D = Diameter of intake area, cm

T = Time Lag, sec

MW-2

Screen (BGS) 205-245 4" 40'

Filter Pack (BGS) 200-245

Static Water Level 219.00 (9/20/94)

Parameters

m = 3

d = 10.16 cm

D = 10.16 cm

L = 1219.20 cm

H_1 = Drawdown t_1

H_2 = Drawdown t_2

$$K_h = \frac{(10.16)^2 \cdot \ln\left(\frac{2(3)(1219.2)}{10.16}\right)}{8(1219.2)(10)} \cdot \ln \frac{9}{6.8}$$

t_1 = 228.0

t_2 = 225.80

$$= \frac{103.23\,(6.58)}{97536} \cdot 0.280$$

$$= 1.95 \times 10^{-3} \text{ cm/sec}$$

t_1 = 228

t_2 = 224.60

$$K_h = \frac{679.2534}{8(1219.2)(30)} \cdot \ln \frac{9}{5.6}$$

$$\frac{679.2534}{292608} \cdot 0.474458$$

$$= 1.10 \times 10^{-3} \text{ cm/sec}$$

Job No. | No.

HDR Engineering, Inc.

Project City of Amarillo MSWLF | Computed BAm | Date 10/18/94
Subject In-situ Field Permeability Calculations | Checked | Date
Task Hvorslev Method G | Sheet 2 | Of 3

mw-2 Cont

$t_1 = 228.$
$t_2 = 223.10$

$$Kh = \frac{629.2534}{9753.6(60\ )} \cdot \ln \frac{9}{4.1}$$

$$= 0.0011607 \cdot 0.7862376$$

$$= 9.13 \times 10^{-4}$$

$$\text{Ave } Kh = 1.32 \times 10^{-3} \text{ cm/sec}$$

<u>MW-3</u>

Screen 207-247'(BGS) 4" 40'
Filter Pack 200-247 (BGS)
Static Water Level 203.65' BGS

Parameters
$m = 3$
$d = 10.16$ cm
$D = 10.16$ cm
$L = 1291.20$
H_1 = drawdown t_1
H_2 = drawdown t_2

$t_1 = 226.4$
$t_2 = 224.5$

$$Kh = \frac{103.23(6.58\ )}{(9753.6)(240\ )} \cdot \ln \frac{22.75}{20.85}$$

$$= 0.0002902 \cdot 0.0872112$$

$$= 2.53 \times 10^{-5} \text{ cm/sec}$$

$t_1 = 224.5$
$t_2 = 221.7$

$$Kh = \frac{103.23(6.58)}{(9753.6)(160\ )} \cdot \ln \frac{20.85}{18.05}$$

$$= 0.0004353 \cdot 0.1442083$$

$$= 6.28 \times 10^{-5} \text{ cm/sec}$$

Job No.

No.

HDR Engineering, Inc.

Project City of Amarillo MSWLF

Computed BAm

Date 10/18

Subject In-situ Field Permeability Calculations

Checked

Date

Task

Sheet 3

Of 3

MW-3 Cont.

$t_1 = 220.4$

$t_2 = 214.0$

$$K_h = \frac{103.23(6.58)}{9753.6(100)} \cdot \ln \frac{16.75}{10.35}$$

$$0.0006964 \cdot 0.4814117$$

$$3.35 \times 10^{-4} \text{ cm/sec}$$

$t_1 = 214$

$t_2 = 210.4$

$$Kh = \frac{103.23(6.58)}{9753.6(100)} \cdot \ln \frac{10.35}{6.75}$$

$$= 0.0006964 \cdot 0.427444$$

$$= 2.97 \times 10^{-4} \text{ cm/sec}$$

Average $Kh = 1.80 \times 10^{-4}$ cm/sec

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL, FT	H/Ho	WATER ELEV.,FT
MW-2	3590.64	0	228.00		3581.89
		5	226.20	1.80	3583.69
		10	225.80	2.20	3584.09
		15	225.55	2.45	3584.34
		20	225.25	2.75	3584.64
		25	224.90	3.10	3584.99
		30	224.60	3.40	3585.29
		35	224.40	3.60	3585.49
		40	224.10	3.90	3585.79
		45	223.55	4.45	3586.34
		55	223.30	4.70	3586.59
		60	223.10	4.90	3586.79
		65	223.00	5.00	3586.89
		70	222.80	5.20	3587.09
		75	222.60	5.40	3587.29
		80	222.50	5.50	3587.39
		85	222.35	5.65	3587.54
		90	222.20	5.80	3587.69
		95	222.05	5.95	3587.84
		100	221.90	6.10	3587.99
		105	221.80	6.20	3588.09
		110	221.75	6.25	3588.14
		115	221.65	6.35	3588.24
		120	221.55	6.45	3588.34
		125	221.45	6.55	3588.44
		130	221.35	6.65	3588.54
		135	221.25	6.75	3588.64
		140	221.20	6.80	3588.69
		145	221.05	6.95	3588.84
		150	221.00	7.00	3588.89
		155	220.19	7.81	3589.7
		160	220.80	7.20	3589.09
		165	220.75	7.25	3589.14
		170	220.65	7.35	3589.24
		175	220.65	7.35	3589.24
		180	220.55	7.45	3589.34
		185	220.45	7.55	3589.44
		190	220.40	7.60	3589.49
		195	220.35	7.65	3589.54
		200	220.30	7.70	3589.59
		205	220.30	7.70	3589.59
		210	220.20	7.80	3589.69
		215	220.20	7.80	3589.69
		220	220.15	7.85	3589.74
		225	220.15	7.85	3589.74
		230	220.10	7.90	3589.79
		235	220.05	7.95	3589.84
		240	220.00	8.00	3589.89
		245	220.00	8.00	3589.89
		250	219.95	8.05	3589.94
		255	219.95	8.05	3589.94
		260	219.90	8.10	3589.99
		265	219.90	8.10	3589.99
		270	219.85	8.15	3590.04
		275	219.80	8.20	3590.09
		280	219.80	8.20	3590.09
		285	219.80	8.20	3590.09
		290	219.80	8.20	3590.09
		295	219.80	8.20	3590.09
		300	219.75	8.25	3590.14
		305	219.75	8.25	3590.14
		310	219.70	8.30	3590.19
		315	219.70	8.30	3590.19
		320	219.70	8.30	3590.19
		325	219.70	8.30	3590.19
		330	219.65	8.35	3590.24
		335	219.65	8.35	3590.24
		340	219.65	8.35	3590.24
		345	219.65	8.35	3590.24
		350	219.60	8.40	3590.29
		355	219.60	8.40	3590.29
		360	219.60	8.40	3590.29
		365	219.60	8.40	3590.29
		370	219.60	8.40	3590.29
		375	219.55	8.45	3590.34
		380	219.55	8.45	3590.34
		385	219.55	8.45	3590.34
		390	219.55	8.45	3590.34
		395	219.55	8.45	3590.34
		400	219.55	8.45	3590.34
		405	219.55	8.45	3590.34
		410	219.55	8.45	3590.34
		415	219.55	8.45	3590.34
		420	219.55	8.45	3590.34

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL, FT	H/Ho	WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT
MW-3	3589.16	0				245	212.1	13.20	3580.71
		5	225.3		3567.51	250	211.9	13.40	3580.91
		10	224.8	0.50	3568.01	255	211.7	13.60	3581.11
		15	224.8	0.50	3568.01	260	211.6	13.70	3581.21
		20	226.4	-1.10	3566.41	265	211.4	13.90	3581.41
		25	226.4	-1.10	3566.41	270	211.2	14.10	3581.61
		30	226.0	-0.70	3566.81	275	211.1	14.20	3581.71
		35	225.6	-0.30	3567.21	280	210.8	14.50	3582.01
		40	225.2	0.10	3567.61	285	210.7	14.60	3582.11
		45	225.0	0.30	3567.81	290	210.6	14.70	3582.21
		55	224.5	0.80	3568.31	300	210.4	14.90	3582.41
		60	224.1	1.20	3568.71	310	210.1	15.20	3582.71
		65	223.5	1.80	3569.31	320	209.9	15.40	3582.91
		70	223.0	2.30	3569.81	330	209.7	15.60	3583.11
		75	222.4	2.90	3570.41	340	209.4	15.90	3583.41
		80	222.1	3.20	3570.71	350	209.2	16.10	3583.61
		85	221.7	3.60	3571.11	360	208.9	16.40	3583.91
		90	221.2	4.10	3571.61	370	208.8	16.50	3584.01
		95	220.9	4.40	3571.91	380	208.5	16.80	3584.31
		100	220.4	4.90	3572.41	390	208.4	16.90	3584.41
		105	220.1	5.20	3572.71	400	208.1	17.20	3584.71
		110	219.6	5.70	3573.21	410	207.9	17.40	3584.91
		115	219.3	6.00	3573.51	420	207.8	17.50	3585.01
		120	218.9	6.40	3573.91	430	207.4	17.90	3585.41
		125	218.6	6.70	3574.21	440	207.3	18.00	3585.51
		130	218.3	7.00	3574.51	450	207.2	18.10	3585.61
		135	218.0	7.30	3574.81	460	207.0	18.30	3585.81
		140	217.6	7.70	3575.21	470	206.8	18.50	3586.01
		145	217.2	8.10	3575.61	480	206.6	18.70	3586.21
		150	216.9	8.40	3575.91	490	206.5	18.80	3586.31
		155	216.5	8.80	3576.31	500	206.3	19.00	3586.51
		160	216.2	9.10	3576.61	510	206.2	19.10	3586.61
		165	215.9	9.40	3576.91	520	206.1	19.20	3586.71
		170	215.6	9.70	3577.21	530	205.9	19.40	3586.91
		175	215.2	10.10	3577.61	540	205.8	19.50	3587.01
		180	215.0	10.30	3577.81	550	205.7	19.60	3587.11
		185	214.8	10.50	3578.01	560	205.6	19.70	3587.21
		190	214.5	10.80	3578.31	570	205.5	19.80	3587.31
		195	214.2	11.10	3578.61	580	205.4	19.90	3587.41
		200	214.0	11.30	3578.81	590	205.3	20.00	3587.51
		205	213.8	11.50	3579.01	600	205.2	20.10	3587.61
		210	213.5	11.80	3579.31	610	205.1	20.20	3587.71
		215	213.3	12.00	3579.51	620	205.1	20.20	3587.71
		220	213.1	12.20	3579.71	630	205.0	20.30	3587.81
		225	212.9	12.40	3579.91	640	204.9	20.40	3587.91
		230	212.6	12.70	3580.21	650	204.8	20.50	3588.01
		235	212.4	12.90	3580.41	660	204.8	20.50	3588.01
		240	212.3	13.00	3580.51	670	204.7	20.60	3588.11

Job No.

No.

HDR Engineering, Inc.

HDR

Project City of Amarillo MSWLF

Computed BAM

Date 10/19/94

Subject In-situ Permeability Calculations

Checked

Date

Task Hvorslev Method G

Sheet 1

Of 1

Static W.L = 149.2

MW-6

157.00 = H_1

152.20 = H_2

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T} \cdot \ln\frac{H_1}{H_2}$$

$$= \frac{(10.16)^2 \cdot \ln\left(\frac{2(3)(1219.20)}{10.16}\right)}{8(1219.20)(50)} \cdot \ln\frac{7.8}{3.0}$$

$$= \frac{103.23 \cdot 6.58}{487680} \cdot -0.841$$

$$= 0.0013928 \cdot 0.9555115$$

$K_h = 1.33 \times 10^{-3}$ cm/sec

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT
MW-6	3601.52	5	157.00		3593.72	155	149.75	7.25	3600.97
		10	156.90	0.10	3593.82	160	149.70	7.30	3601.02
		15	155.00	2.00	3595.72	165	149.70	7.30	3601.02
		20	154.60	2.40	3596.12	170	149.65	7.35	3601.07
		25	154.20	2.80	3596.52	175	149.60	7.40	3601.12
		30	153.90	3.10	3596.82	180	149.60	7.40	3601.12
		35	153.50	3.50	3597.22	185	149.55	7.45	3601.17
		40	153.20	3.80	3597.52	190	149.55	7.45	3601.17
		45	152.80	4.20	3597.92	195	149.50	7.50	3601.22
		50	152.50	4.50	3598.22	200	149.50	7.50	3601.22
		55	152.20	4.80	3598.52	205	149.50	7.50	3601.22
		60	151.90	5.10	3598.82	210	149.45	7.55	3601.27
		65	151.70	5.30	3599.02	215	149.45	7.55	3601.27
		70	151.50	5.50	3599.22	220	149.45	7.55	3601.27
		75	151.30	5.70	3599.42	225	149.45	7.55	3601.27
		80	151.10	5.90	3599.62	230	149.40	7.60	3601.32
		85	150.90	6.10	3599.82	235	149.40	7.60	3601.32
		90	150.80	6.20	3599.92	240	149.40	7.60	3601.32
		95	150.65	6.35	3600.07	245	149.35	7.65	3601.37
		100	150.55	6.45	3600.17	250	149.35	7.65	3601.37
		105	150.40	6.60	3600.32	255	149.35	7.65	3601.37
		110	150.35	6.65	3600.37	260	149.35	7.65	3601.37
		115	150.25	6.75	3600.47	265	149.35	7.65	3601.37
		120	150.15	6.85	3600.57	270	149.35	7.65	3601.37
		125	150.10	6.90	3600.62	275	149.30	7.70	3601.42
		130	150.05	6.95	3600.67	280	149.30	7.70	3601.42
		135	149.95	7.05	3600.77	285	149.30	7.70	3601.42
		140	149.90	7.10	3600.82	290	149.30	7.70	3601.42
		145	149.80	7.20	3600.92	295	149.30	7.70	3601.42
		150	149.80	7.20	3600.92	300	149.30	7.70	3601.42

Job No.

No.

Computation

Project City of Amarillo MSWLF

Computed BAm

Date

Subject In-Situ Permeability Calculations

Checked

Date

Task Hvorslev Method G

Sheet 1

Of 1

P-1

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T} \cdot \ln\frac{H_1}{H_2}$$

$$= \frac{(10.16)^2 \cdot \ln\left(\frac{(2)(3)(1219.2)}{10.16}\right)}{8(40)(60)} \cdot \ln\frac{2.9}{1.0}$$

$$= \frac{679.14715}{19200} \cdot 1.0647107$$

$$= 3.77 \times 10^{-2} \text{ cm/sec}$$

Job No.

No.

HDR Engineering, Inc.

Project City OF Amarillo MSWLF

Computed BAm

Date 10/1, ,7

Subject In-Situ Permeability Calculations

Checked

Date

Task Hvorslev Method G

Sheet 1

Of 2

Static W.L. = 203.1

P-2

$$K_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T} \cdot \ln \frac{H_1}{H_2}$$

H_1 = 207.40

H_2 = 203.90

$$= \frac{(10.16)^2 \cdot \ln\left(\frac{2(3)(1219.20)}{10.16}\right)}{8(1219.2)(120)} \cdot \ln \frac{4.3}{0.8}$$

$$= \frac{679.1761}{1170432} \cdot 1.6817586$$

$$= 9.76 \times 10^{-4} \text{ cm/sec}$$

H_1 = 207.40

H_2 = 204.80

$$K_h = \frac{679.1761}{8(1219.2)(60)} \cdot \ln \frac{4.3}{1.7}$$

$$= 0.0011606 \cdot 0.9279868$$

$$= 1.08 \times 10^{-3} \text{ cm/sec}$$

$$\text{Average} = 1.03 \times 10^{-3} \text{ cm/sec}$$

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT
P-2	3595.17	0			
		5	207.40		3590.87
		10	206.90	0.50	3591.37
		15	206.60	0.80	3591.67
		20	206.40	1.00	3591.87
		25	206.20	1.20	3592.07
		30	206.00	1.40	3592.27
		35	205.90	1.50	3592.37
		40	205.80	1.60	3592.47
		45	206.50	0.90	3591.77
		50	205.50	1.90	3592.77
		55	204.90	2.50	3593.37
		60	204.80	2.60	3593.47
		65	204.70	2.70	3593.57
		70	204.50	2.90	3593.77
		75	204.50	2.90	3593.77
		80	204.40	3.00	3593.87
		85	204.30	3.10	3593.97
		90	204.25	3.15	3594.02
		95	204.20	3.20	3594.07
		100	204.15	3.25	3594.12
		105	204.10	3.30	3594.17
		110	204.00	3.40	3594.27
		115	203.95	3.45	3594.32
		120	203.90	3.50	3594.37
		125	203.85	3.55	3594.42
		130	203.80	3.60	3594.47
		135	203.80	3.60	3594.47
		140	203.75	3.65	3594.52
		145	203.70	3.70	3594.57
		150	203.70	3.70	3594.57
		155	203.65	3.75	3594.62
		160	203.65	3.75	3594.62
		165	203.60	3.80	3594.67
		170	203.60	3.80	3594.67
		175	203.55	3.85	3594.72
		180	203.55	3.85	3594.72
		185	203.50	3.90	3594.77
		190	203.50	3.90	3594.77
		195	203.50	3.90	3594.77
		200	203.45	3.95	3594.82
		205	203.45	3.95	3594.82
		210	203.45	3.95	3594.82
		215	203.45	3.95	3594.82
		220	203.40	4.00	3594.87
		225	203.40	4.00	3594.87
		230	203.40	4.00	3594.87
		235	203.40	4.00	3594.87
		240	203.40	4.00	3594.87

Job No.
No.

HDR Engineering, Inc.

HDR

Project City of Amarillo MSWLF
Computed BAm
Date 10/1/91
Subject In-Situ Permeability Calculations
Checked
Date
Task Hvorslev Method G
Sheet 1
Of 1

Static W.L.=147.0

P-3

$$Kh = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T} \cdot \ln \frac{H_1}{H_2}$$

$H_1 = 158.10$
$H_2 = 148.80$

$$= \frac{679.1761}{2(1219.2)(120)} \cdot \ln \frac{11.05}{1.75}$$

$$= 0.0023211 \cdot 1.8428146$$

$$= 4.28 \times 10^{-3} \text{ cm/sec}$$

CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL
PERMIT NO. 73

SLUG TEST
RECOVERY

WELL NO.	STATIC WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT	TIME SEC	WATER LEVEL,FT	H/Ho	WATER ELEV.,FT
P-3	3599.61	0							
		5	158.10		3588.56	215	147.60	10.50	3599.06
		10	156.90	1.20	3589.76	220	147.55	10.55	3599.11
		15	156.00	2.10	3590.66	225	147.50	10.60	3599.16
		20	155.00	3.10	3591.66	230	147.50	10.60	3599.16
		25	154.20	3.90	3592.46	235	147.50	10.60	3599.16
		30	153.20	4.90	3593.46	240	147.45	10.65	3599.21
		35	152.60	5.50	3594.06	245	147.40	10.70	3599.26
		40	152.10	6.00	3594.56	250	147.40	10.70	3599.26
		45	151.70	6.40	3594.96	255	147.40	10.70	3599.26
		50	151.40	6.70	3595.26	260	147.40	10.70	3599.26
		55	151.10	7.00	3595.56	265	147.40	10.70	3599.26
		60	150.80	7.30	3595.86	270	147.35	10.75	3599.31
		65	150.60	7.50	3596.06	275	147.35	10.75	3599.31
		70	150.40	7.70	3596.26	280	147.35	10.75	3599.31
		75	150.20	7.90	3596.46	285	147.30	10.80	3599.36
		80	150.00	8.10	3596.66	290	147.30	10.80	3599.36
		85	149.80	8.30	3596.86	295	147.30	10.80	3599.36
		90	149.60	8.50	3597.06	300	147.25	10.85	3599.41
		95	149.40	8.70	3597.26	305	147.25	10.85	3599.41
		100	149.30	8.80	3597.36	310	147.25	10.85	3599.41
		105	149.10	9.00	3597.56	315	147.25	10.85	3599.41
		110	149.00	9.10	3597.66	320	147.25	10.85	3599.41
		115	148.95	9.15	3597.71	325	147.25	10.85	3599.41
		120	148.80	9.30	3597.86	330	147.20	10.90	3599.46
		125	148.70	9.40	3597.96	335	147.20	10.90	3599.46
		130	148.60	9.50	3598.06	340	147.20	10.90	3599.46
		135	148.50	9.60	3598.16	345	147.20	10.90	3599.46
		140	148.40	9.70	3598.26	350	147.20	10.90	3599.46
		145	148.35	9.75	3598.31	355	147.20	10.90	3599.46
		150	148.30	9.80	3598.36	360	147.20	10.90	3599.46
		155	148.25	9.85	3598.41	365	147.20	10.90	3599.46
		160	148.15	9.95	3598.51	370	147.20	10.90	3599.46
		165	148.05	10.05	3598.61	375	147.20	10.90	3599.46
		170	148.00	10.10	3598.66	380	147.15	10.95	3599.51
		175	147.90	10.20	3598.76	385	147.15	10.95	3599.51
		180	147.85	10.25	3598.81	390	147.15	10.95	3599.51
		185	147.80	10.30	3598.86	395	147.15	10.95	3599.51
		190	147.75	10.35	3598.91	400	147.15	10.95	3599.51
		195	147.75	10.35	3598.91	405	147.15	10.95	3599.51
		200	147.70	10.40	3598.96	410	147.15	10.95	3599.51
		205	147.65	10.45	3599.01	415	147.15	10.95	3599.51
		210	147.60	10.50	3599.06	420	147.15	10.95	3599.51

Job No. 06625-015-027 No.

HDR Engineering, Inc. HDR

Project City of Amarillo MSWLF
Computed BAm
Date 10/25/07
Subject Equilibrium Well Equation
Checked
Date
Task Estimate Hydraulic Conductivity
Sheet 1
Of 3

$$Q = \frac{K(H^2 - h^2)}{1{,}055 \log R/r}$$

Driscoll, p. 213

Q = pumping rate, gpm
K = hydraulic Conductivity of Formation, gpd/ft²
H = Static head measured from bottom of aquifer, ft
h = depth of water in well while pumping, ft
R = radius of the cone of depression, ft.
r = radius of the well, ft

<u>MW-2</u>

$$K = \frac{Q\, 1{,}055 \log R/r}{H^2 - h^2}$$

$$= \frac{10\,(1{,}055 \log 10/0.167)}{25.75^2 - 18.8^2}$$

$$= \frac{18750.34}{663.06 - 353.44}$$

$$= \frac{18750.34}{309.62}$$

$$= 60.56 \text{ gpd/ft}^2$$

$$= 2.86 \times 10^{-3} \text{ cm/sec}$$

Q = 10 gpm
H = 25.75
h = 18.8
R = 10' (assumed)
r = 0.167

Job No. 06625-015 027 | No.

Project City of Amarillo MSWLF | Computed BAm | Date 10/25/97

Subject Equilibrium Well Equation | Checked | Date

Task Estimate Hydraulic Conductivity | Sheet 2 | Of 3

MW-2 Cont.

R= 20'

$$K = \frac{10\,(1{,}055)\log 20/.167)}{25.75^2 - 18.8^2}$$

$$= \frac{21926.21}{663.06 - 353.44}$$

$$= 70.82\ gpd/ft^2$$

$$= 3.34 \times 10^{-3}\ cm/sec$$

MW-3

$$K = \frac{6\,(1{,}055)\log 20/.167}{43.35^2 - 21.70^2}$$

$$= \frac{13155.73}{1879.22 - 470.89}$$

$$= 9.34\ gpd/ft^2$$

$$= 4.4 \times 10^{-4}\ cm/sec$$

Q = 6 gpm
H = 43.35
h = 21.70
R = 20
r = 0.167

Job No. 06625-95-037
No.

HDR Engineering, Inc.

Project City of Amarillo MSWLF
Subject Equilibrium Well Equation
Task Estimate Hydraulic Conductivity
Computed DAM
Date 10/2[illegible]
Checked
Date
Sheet 3
Of 3

MW-6

$$K = \frac{12(1{,}055)\log 20/0.167}{27.15^2 - 19^2}$$

$$= \frac{26311.45}{737.12 - 361}$$

$$= 69.95 \text{ gpd/ft}^2$$

$$= 3.3 \times 10^{-3} \text{ cm/sec}$$

Q = 12 gpm
H = 27.15
h = 19
R = 20'
r = 0.167

P-3

$$K = \frac{10(1{,}055)\log 20/(0.167)}{17.95^2 - 6.9^2}$$

$$= \frac{4926.21}{322.20 - 47.61}$$

$$= 79 \text{ gpd/ft}^2$$

$$= 3.77 \times 10^{-3} \text{ cm/sec}$$

Q = 10
H = 17.95
h = 6.9
R = 20
r = 0.167

Job No.
No.

HDR Engineering, Inc.

Project City of Amarillo MSWLF
Computed BAm
Date 10/26/9
Subject Estimate Radius of Influence
Checked
Date
Task
Sheet 1
Of 1

$$r_0^2 = \frac{0.3Tt}{S}$$

S = Coefficient of Storage
T = Transmissivity, gpd/ft
t = time since pumping started, days
r_0 = intercept of extended straight line at zero drawdown, ft

$$r_0^2 = \frac{0.3(6600)(0.042)}{0.2}$$

$$= \sqrt{415.8}$$

$$= 20.39$$

Using average of Transmissivities Computed for wells in Randal County, TWDB Report 98, Compilation of Results of Aquifer Tests in Texas

APPENDIX C
HELP MODEL RUNS

AMR1LFTB

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******************************************************************************
******************************************************************************

  Amarillo - Year One - GCL/FML (LF=0.01) - 10-2 SAND DRAIN, 2%, 840' -o
  One lift of waste with daily cover (SC) - LAI=0.0 - RO=0.0
  NOVEMBER 29, 1994

******************************************************************************
******************************************************************************




                                 LAYER  1
                                 --------

                       VERTICAL PERCOLATION LAYER
    THICKNESS                            =      6.00 INCHES
    POROSITY                             =      0.3980 VOL/VOL
    FIELD CAPACITY                       =      0.2443 VOL/VOL
    WILTING POINT                        =      0.1361 VOL/VOL
    INITIAL SOIL WATER CONTENT           =      0.2443 VOL/VOL
    SATURATED HYDRAULIC CONDUCTIVITY     =      0.000119999997 CM/SEC



                                 LAYER  2
                                 --------

                       VERTICAL PERCOLATION LAYER
    THICKNESS                            =    120.00 INCHES
    POROSITY                             =      0.5200 VOL/VOL
    FIELD CAPACITY                       =      0.2942 VOL/VOL
    WILTING POINT                        =      0.1400 VOL/VOL
    INITIAL SOIL WATER CONTENT           =      0.2000 VOL/VOL
    SATURATED HYDRAULIC CONDUCTIVITY     =      0.000099999997 CM/SEC



                                 LAYER  3
                                 --------

                       VERTICAL PERCOLATION LAYER
    THICKNESS                            =     12.00 INCHES
    POROSITY                             =      0.3980 VOL/VOL
    FIELD CAPACITY                       =      0.2443 VOL/VOL
    WILTING POINT                        =      0.1361 VOL/VOL
    INITIAL SOIL WATER CONTENT           =      0.2443 VOL/VOL
    SATURATED HYDRAULIC CONDUCTIVITY     =      0.000099999997 CM/SEC



                                 LAYER  4
                                 --------
```

```
                     LATERAL DRAINAGE LAYER
 THICKNESS                        =     12.00 INCHES
 POROSITY                         =      0.4170 VOL/VOL
 FIELD CAPACITY                   =      0.0454 VOL/VOL
 WILTING POINT                    =      0.0200 VOL/VOL
 INITIAL SOIL WATER CONTENT       =      0.0454 VOL/VOL
 SATURATED HYDRAULIC CONDUCTIVITY =      0.009999999776 CM/SEC
 SLOPE                            =      2.00 PERCENT
 DRAINAGE LENGTH                  =    840.0 FEET


                          LAYER  5
                          --------

           BARRIER SOIL LINER WITH FLEXIBLE MEMBRANE LINER
 THICKNESS                        =      0.30 INCHES
 POROSITY                         =      0.4000 VOL/VOL
 FIELD CAPACITY                   =      0.3560 VOL/VOL
 WILTING POINT                    =      0.2899 VOL/VOL
 INITIAL SOIL WATER CONTENT       =      0.4000 VOL/VOL
 SATURATED HYDRAULIC CONDUCTIVITY =      0.000000005000 CM/SEC
 LINER LEAKAGE FRACTION           =      0.01000000


                     GENERAL SIMULATION DATA
                     -----------------------

 SCS RUNOFF CURVE NUMBER          =      70.00
 TOTAL AREA OF COVER              =       1. SQ FT
 EVAPORATIVE ZONE DEPTH           =      10.00 INCHES
 POTENTIAL RUNOFF FRACTION        =       0.000000
 UPPER LIMIT VEG. STORAGE         =       4.4680 INCHES
 INITIAL VEG. STORAGE             =       2.2658 INCHES
 INITIAL SNOW WATER CONTENT       =       0.0000 INCHES
 INITIAL TOTAL WATER STORAGE IN
   SOIL AND WASTE LAYERS          =      29.0622 INCHES

            SOIL WATER CONTENT INITIALIZED BY USER.


                      CLIMATOLOGICAL DATA
                      -------------------

 SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
 SOLAR RADIATION FOR      AMARILLO            TEXAS


 MAXIMUM LEAF AREA INDEX                 = 0.00
 START OF GROWING SEASON (JULIAN DATE)   =  104
 END OF GROWING SEASON (JULIAN DATE)     =  302


         NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
-------     -------     -------     -------     -------     -------

 35.10       39.20       47.10       56.80       65.40       74.10
 78.60       76.50       69.10       58.50       46.00       36.90
```

```
*******************************************************************************

                   MONTHLY TOTALS FOR YEAR   10
-------------------------------------------------------------------------------

                        JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                        ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)    0.82    1.75    0.32    1.43    0.88    2.98
                          3.10    3.14    1.25    2.55    1.01    0.54

RUNOFF (INCHES)          0.000   0.000   0.000   0.000   0.000   0.000
                         0.000   0.000   0.000   0.000   0.000   0.000

EVAPOTRANSPIRATION       1.617   0.904   1.257   0.736   1.538   2.762
     (INCHES)            1.108   4.106   0.759   2.797   1.078   0.416

LATERAL DRAINAGE FROM   0.0036  0.0081  0.0124  0.0142  0.0163  0.0166
  LAYER  4 (INCHES)     0.0177  0.0179  0.0173  0.0177  0.0168  0.0170

PERCOLATION FROM        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER  5 (INCHES)     0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

-------------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------------


  . DAILY HEAD ON          0.09    0.21    0.30    0.35    0.39    0.41
 AYER  5 (INCHES)          0.42    0.43    0.43    0.42    0.41    0.41

STD. DEV. OF DAILY HEAD    0.05    0.03    0.02    0.01    0.01    0.00
  ON LAYER  5 (INCHES)     0.00    0.00    0.00    0.00    0.00    0.00

*******************************************************************************


*******************************************************************************

                    ANNUAL TOTALS FOR YEAR   10
-------------------------------------------------------------------------------
                                  (INCHES)     (CU. FT.)     PERCENT
                                  --------     ---------     -------
  PRECIPITATION                    19.77             2.      100.00

  RUNOFF                            0.000            0.        0.00

  EVAPOTRANSPIRATION               19.078            2.       96.50

  LATERAL DRAINAGE FROM LAYER  4    0.1755           0.        0.89

  PERCOLATION FROM LAYER  5         0.0014           0.        0.01

  CHANGE IN WATER STORAGE           0.515            0.        2.61

  OIL WATER AT START OF YEAR       29.06             2.

  SOIL WATER AT END OF YEAR        29.58             2.

  SNOW WATER AT START OF YEAR       0.00             0.
```

```
   SNOW WATER AT END OF YEAR              0.00            0.

   ANNUAL WATER BUDGET BALANCE            0.00            0.      0.00

******************************************************************************




******************************************************************************

      AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    10 THROUGH    10
------------------------------------------------------------------------------

                        JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                        ------- ------- ------- ------- ------- -------
  PRECIPITATION
  -------------
    TOTALS                0.82    1.75    0.32    1.43    0.88    2.98
                          3.10    3.14    1.25    2.55    1.01    0.54

    STD. DEVIATIONS       0.00    0.00    0.00    0.00    0.00    0.00
                          0.00    0.00    0.00    0.00    0.00    0.00

  RUNOFF
  ------
    TOTALS               0.000   0.000   0.000   0.000   0.000   0.000
                         0.000   0.000   0.000   0.000   0.000   0.000

    STD. DEVIATIONS      0.000   0.000   0.000   0.000   0.000   0.000
                         0.000   0.000   0.000   0.000   0.000   0.000

  EVAPOTRANSPIRATION
  ------------------
    TOTALS               1.617   0.904   1.257   0.736   1.538   2.762
                         1.108   4.106   0.759   2.797   1.078   0.416

    STD. DEVIATIONS      0.000   0.000   0.000   0.000   0.000   0.000
                         0.000   0.000   0.000   0.000   0.000   0.000

  LATERAL DRAINAGE FROM LAYER  4
  ------------------------------
    TOTALS              0.0036  0.0081  0.0124  0.0142  0.0163  0.0166
                        0.0177  0.0179  0.0173  0.0177  0.0168  0.0170

    STD. DEVIATIONS     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
                        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

  PERCOLATION FROM LAYER  5
  -------------------------
    TOTALS              0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
                        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

    STD. DEVIATIONS     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
                        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

******************************************************************************



******************************************************************************

  AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    10 THROUGH    10
------------------------------------------------------------------------------
```

```
                                 (INCHES)         (CU. FT.)    PERCENT
                              ---------------   -----------   -------
  PRECIPITATION               19.77    ( 0.000)          2.     100.00

  RUNOFF                       0.000   ( 0.000)          0.       0.00

  EVAPOTRANSPIRATION          19.078   ( 0.000)          2.      96.50

  LATERAL DRAINAGE FROM        0.1755 ( 0.0000)          0.       0.89
     LAYER  4

  PERCOLATION FROM LAYER  5    0.0014 ( 0.0000)          0.       0.01

  CHANGE IN WATER STORAGE      0.515   ( 0.000)          0.       2.61

******************************************************************************


******************************************************************************

           PEAK DAILY VALUES FOR YEARS   10 THROUGH   10
     ------------------------------------------------------------------
                                                (INCHES)    (CU. FT.)
                                                --------    ---------
       PRECIPITATION                              1.05          0.1

       RUNOFF                                     0.000         0.0

       LATERAL DRAINAGE FROM LAYER  4             0.0006        0.0

       PERCOLATION FROM LAYER  5                  0.0000        0.0

       HEAD ON LAYER  5                           0.4

       SNOW WATER                                 0.06          0.0


       MAXIMUM VEG. SOIL WATER (VOL/VOL)              0.3792

       MINIMUM VEG. SOIL WATER (VOL/VOL)              0.1355

******************************************************************************



******************************************************************************

              FINAL WATER STORAGE AT END OF YEAR    10
     ------------------------------------------------------------------
                LAYER        (INCHES)        (VOL/VOL)
                -----        --------        ---------
                  1            0.92           0.1535

                  2           25.23           0.2102

                  3            2.62           0.2180

                  4            0.69           0.0578

                  5            0.12           0.4000

              SNOW WATER       0.00
```

AMR2LFTA

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******************************************************************************
******************************************************************************


 Amarillo - Year two - only one year
 two lifts of waste with daily cover
 NOVEMEBER 29, 1994


******************************************************************************
******************************************************************************




                              LAYER  1
                              --------

                     VERTICAL PERCOLATION LAYER
   THICKNESS                          =       6.00 INCHES
   POROSITY                           =       0.3980 VOL/VOL
   FIELD CAPACITY                     =       0.2443 VOL/VOL
   WILTING POINT                      =       0.1361 VOL/VOL
   INITIAL SOIL WATER CONTENT         =       0.2443 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY   =       0.000119999997 CM/SEC



                              LAYER  2
                              --------

                     VERTICAL PERCOLATION LAYER
   THICKNESS                          =     120.00 INCHES
   POROSITY                           =       0.5200 VOL/VOL
   FIELD CAPACITY                     =       0.2942 VOL/VOL
   WILTING POINT                      =       0.1400 VOL/VOL
   INITIAL SOIL WATER CONTENT         =       0.2000 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY   =       0.000099999997 CM/SEC



                              LAYER  3
                              --------

                     VERTICAL PERCOLATION LAYER
   THICKNESS                          =     120.00 INCHES
   POROSITY                           =       0.5200 VOL/VOL
   FIELD CAPACITY                     =       0.2942 VOL/VOL
   WILTING POINT                      =       0.1400 VOL/VOL
   INITIAL SOIL WATER CONTENT         =       0.2102 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY   =       0.000099999997 CM/SEC



                              LAYER  4
                              --------
```

```
                  VERTICAL PERCOLATION LAYER
 THICKNESS                           =     12.00 INCHES
 POROSITY                            =      0.3980 VOL/VOL
 FIELD CAPACITY                      =      0.2443 VOL/VOL
 WILTING POINT                       =      0.1361 VOL/VOL
 INITIAL SOIL WATER CONTENT          =      0.2108 VOL/VOL
 SATURATED HYDRAULIC CONDUCTIVITY    =      0.000119999997 CM/SEC



                         LAYER  5
                         --------

                   LATERAL DRAINAGE LAYER
 THICKNESS                           =     12.00 INCHES
 POROSITY                            =      0.4170 VOL/VOL
 FIELD CAPACITY                      =      0.0454 VOL/VOL
 WILTING POINT                       =      0.0200 VOL/VOL
 INITIAL SOIL WATER CONTENT          =      0.0578 VOL/VOL
 SATURATED HYDRAULIC CONDUCTIVITY    =      0.009999999776 CM/SEC
 SLOPE                               =      2.00 PERCENT
 DRAINAGE LENGTH                     =    840.0 FEET



                         LAYER  6
                         --------

           BARRIER SOIL LINER WITH FLEXIBLE MEMBRANE LINER
 THICKNESS                           =      0.30 INCHES
 POROSITY                            =      0.4000 VOL/VOL
 FIELD CAPACITY                      =      0.3560 VOL/VOL
 WILTING POINT                       =      0.2899 VOL/VOL
 INITIAL SOIL WATER CONTENT          =      0.4000 VOL/VOL
 SATURATED HYDRAULIC CONDUCTIVITY    =      0.000000005000 CM/SEC
 LINER LEAKAGE FRACTION              =      0.01000000



                   GENERAL SIMULATION DATA
                   ----------------------

 SCS RUNOFF CURVE NUMBER             =      70.00
 TOTAL AREA OF COVER                 =       1. SQ FT
 EVAPORATIVE ZONE DEPTH              =      10.00 INCHES
 POTENTIAL RUNOFF FRACTION           =       0.000000
 UPPER LIMIT VEG. STORAGE            =       4.4680 INCHES
 INITIAL VEG. STORAGE                =       2.2658 INCHES
 INITIAL SNOW WATER CONTENT          =       0.0000 INCHES
 INITIAL TOTAL WATER STORAGE IN
   SOIL AND WASTE LAYERS             =      54.0330 INCHES

            SOIL WATER CONTENT INITIALIZED BY USER.



                    CLIMATOLOGICAL DATA
                    ------------------

 SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
 SOLAR RADIATION FOR      AMARILLO           TEXAS
```

```
   MAXIMUM LEAF AREA INDEX                   = 0.00
   START OF GROWING SEASON (JULIAN DATE)     =  104
   END OF GROWING SEASON (JULIAN DATE)       =  302


          NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

   JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
   -------     -------     -------     -------     -------     -------

    35.10       39.20       47.10       56.80       65.40       74.10
    78.60       76.50       69.10       58.50       46.00       36.90


*******************************************************************************

                      MONTHLY TOTALS FOR YEAR   10
-------------------------------------------------------------------------------

                            JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                            ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)       0.82    1.75    0.32    1.43    0.88    2.98
                             3.10    3.14    1.25    2.55    1.01    0.54

RUNOFF (INCHES)              0.000   0.000   0.000   0.000   0.000   0.000
                             0.000   0.000   0.000   0.000   0.000   0.000

EVAPOTRANSPIRATION           1.617   0.904   1.257   0.736   1.538   2.762
     (INCHES)                1.108   4.106   0.759   2.797   1.078   0.416

LATERAL DRAINAGE FROM        0.0162  0.0140  0.0148  0.0136  0.0133  0.0123
  LAYER  5 (INCHES)          0.0121  0.0115  0.0106  0.0104  0.0096  0.0095

PERCOLATION FROM             0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER  6 (INCHES)          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

-------------------------------------------------------------------------------
                     MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------------


AVG. DAILY HEAD ON            0.39    0.37    0.35    0.33    0.32    0.30
  LAYER  6 (INCHES)           0.29    0.27    0.26    0.25    0.24    0.23

STD. DEV. OF DAILY HEAD       0.01    0.01    0.01    0.00    0.00    0.00
  ON LAYER  6 (INCHES)        0.00    0.00    0.00    0.00    0.00    0.00

*******************************************************************************


*******************************************************************************

                      ANNUAL TOTALS FOR YEAR   10
-------------------------------------------------------------------------------
                                        (INCHES)    (CU. FT.)    PERCENT
                                        --------    ---------    -------

  PRECIPITATION                           19.77            2.     100.00

  RUNOFF                                  0.000            0.       0.00
```

```
   EVAPOTRANSPIRATION                 19.078            2.     96.50

   LATERAL DRAINAGE FROM LAYER  5      0.1478           0.      0.75

   PERCOLATION FROM LAYER  6           0.0012           0.      0.01

   CHANGE IN WATER STORAGE             0.543            0.      2.75

   SOIL WATER AT START OF YEAR        54.03             5.

   SOIL WATER AT END OF YEAR          54.58             5.

   SNOW WATER AT START OF YEAR         0.00             0.

   SNOW WATER AT END OF YEAR           0.00             0.

   ANNUAL WATER BUDGET BALANCE         0.00             0.      0.00

***************************************************************************




***************************************************************************

     AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    10 THROUGH    10
---------------------------------------------------------------------------

                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------
 PRECIPITATION
 -------------
   TOTALS                  0.82    1.75    0.32    1.43    0.88    2.98
                           3.10    3.14    1.25    2.55    1.01    0.54

   STD. DEVIATIONS         0.00    0.00    0.00    0.00    0.00    0.00
                           0.00    0.00    0.00    0.00    0.00    0.00

 RUNOFF
 ------
   TOTALS                 0.000   0.000   0.000   0.000   0.000   0.000
                          0.000   0.000   0.000   0.000   0.000   0.000

   STD. DEVIATIONS        0.000   0.000   0.000   0.000   0.000   0.000
                          0.000   0.000   0.000   0.000   0.000   0.000

 EVAPOTRANSPIRATION
 ------------------
   TOTALS                 1.617   0.904   1.257   0.736   1.538   2.762
                          1.108   4.106   0.759   2.797   1.078   0.416

   STD. DEVIATIONS        0.000   0.000   0.000   0.000   0.000   0.000
                          0.000   0.000   0.000   0.000   0.000   0.000

 LATERAL DRAINAGE FROM LAYER  5
 ------------------------------
   TOTALS                0.0162  0.0140  0.0148  0.0136  0.0133  0.0123
                         0.0121  0.0115  0.0106  0.0104  0.0096  0.0095

   STD. DEVIATIONS       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
                         0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

 PERCOLATION FROM LAYER  6
 -------------------------
```

```
    TOTALS              0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
                        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

    STD. DEVIATIONS     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
                        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

***************************************************************************


***************************************************************************

  AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS   10 THROUGH   10
---------------------------------------------------------------------------
                                     (INCHES)        (CU. FT.)    PERCENT
                                  ---------------   -----------   -------
   PRECIPITATION                  19.77   ( 0.000)          2.    100.00

   RUNOFF                          0.000  ( 0.000)          0.      0.00

   EVAPOTRANSPIRATION             19.078  ( 0.000)          2.     96.50

   LATERAL DRAINAGE FROM           0.1478 ( 0.0000)         0.      0.75
      LAYER  5

   PERCOLATION FROM LAYER  6       0.0012 ( 0.0000)         0.      0.01

   CHANGE IN WATER STORAGE         0.543  ( 0.000)          0.      2.75

***************************************************************************



***************************************************************************

             PEAK DAILY VALUES FOR YEARS   10 THROUGH   10
      ----------------------------------------------------------------
                                              (INCHES)    (CU. FT.)
                                              --------    ---------
        PRECIPITATION                           1.05          0.1

        RUNOFF                                  0.000         0.0

        LATERAL DRAINAGE FROM LAYER  5          0.0005        0.0

        PERCOLATION FROM LAYER  6               0.0000        0.0

        HEAD ON LAYER  6                        0.4

        SNOW WATER                              0.06          0.0


        MAXIMUM VEG. SOIL WATER (VOL/VOL)           0.3792

        MINIMUM VEG. SOIL WATER (VOL/VOL)           0.1355

***************************************************************************



***************************************************************************

                 FINAL WATER STORAGE AT END OF YEAR   10
```

```
        ----------------------------------------------------------------------------

                      LAYER          (INCHES)        (VOL/VOL)
                      -----          --------        ---------
                        1              0.92           0.1535

                        2             25.23           0.2102

                        3             25.22           0.2102

                        4              2.46           0.2050

                        5              0.63           0.0523

                        6              0.12           0.4000

                    SNOW WATER         0.00

   ******************************************************************************
   ******************************************************************************
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AMR3LFTA

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******************************************************************************


 Amarillo - Year three - only one year
 three lifts of waste with daily cover
 NOVEMBER 29, 1994


******************************************************************************
******************************************************************************




                              LAYER  1
                              --------

                    VERTICAL PERCOLATION LAYER
   THICKNESS                              =      6.00 INCHES
   POROSITY                               =      0.3980 VOL/VOL
   FIELD CAPACITY                         =      0.2443 VOL/VOL
   WILTING POINT                          =      0.1361 VOL/VOL
   INITIAL SOIL WATER CONTENT             =      0.2443 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY       =      0.000119999997 CM/SEC



                              LAYER  2
                              --------

                    VERTICAL PERCOLATION LAYER
   THICKNESS                              =    120.00 INCHES
   POROSITY                               =      0.5200 VOL/VOL
   FIELD CAPACITY                         =      0.2942 VOL/VOL
   WILTING POINT                          =      0.1400 VOL/VOL
   INITIAL SOIL WATER CONTENT             =      0.2000 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY       =      0.000099999997 CM/SEC



                              LAYER  3
                              --------

                    VERTICAL PERCOLATION LAYER
   THICKNESS                              =    120.00 INCHES
   POROSITY                               =      0.5200 VOL/VOL
   FIELD CAPACITY                         =      0.2942 VOL/VOL
   WILTING POINT                          =      0.1400 VOL/VOL
   INITIAL SOIL WATER CONTENT             =      0.2102 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY       =      0.000099999997 CM/SEC



                              LAYER  4
                              --------
```

```
                VERTICAL PERCOLATION LAYER
THICKNESS                        =      120.00 INCHES
POROSITY                         =        0.5200 VOL/VOL
FIELD CAPACITY                   =        0.2942 VOL/VOL
WILTING POINT                    =        0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT       =        0.2102 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY =        0.000099999997 CM/SEC



                           LAYER  5
                           --------

                VERTICAL PERCOLATION LAYER
THICKNESS                        =       12.00 INCHES
POROSITY                         =        0.3980 VOL/VOL
FIELD CAPACITY                   =        0.2443 VOL/VOL
WILTING POINT                    =        0.1361 VOL/VOL
INITIAL SOIL WATER CONTENT       =        0.2050 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY =        0.000119999997 CM/SEC



                           LAYER  6
                           --------

                  LATERAL DRAINAGE LAYER
THICKNESS                        =       12.00 INCHES
POROSITY                         =        0.4170 VOL/VOL
FIELD CAPACITY                   =        0.0454 VOL/VOL
WILTING POINT                    =        0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT       =        0.0523 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY =        0.009999999776 CM/SEC
SLOPE                            =        2.00 PERCENT
DRAINAGE LENGTH                  =      840.0 FEET



                           LAYER  7
                           --------

        BARRIER SOIL LINER WITH FLEXIBLE MEMBRANE LINER
THICKNESS                        =        0.30 INCHES
POROSITY                         =        0.4000 VOL/VOL
FIELD CAPACITY                   =        0.3560 VOL/VOL
WILTING POINT                    =        0.2899 VOL/VOL
INITIAL SOIL WATER CONTENT       =        0.4000 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY =        0.000000005000 CM/SEC
LINER LEAKAGE FRACTION           =        0.01000000



                  GENERAL SIMULATION DATA
                  -----------------------

SCS RUNOFF CURVE NUMBER          =        70.00
TOTAL AREA OF COVER              =         1. SQ FT
EVAPORATIVE ZONE DEPTH           =        10.00 INCHES
POTENTIAL RUNOFF FRACTION        =         0.000000
UPPER LIMIT VEG. STORAGE         =         4.4680 INCHES
```

```
INITIAL VEG. STORAGE                =        2.2658 INCHES
INITIAL SNOW WATER CONTENT          =        0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN
  SOIL AND WASTE LAYERS             =       79.1214 INCHES

          SOIL WATER CONTENT INITIALIZED BY USER.


                       CLIMATOLOGICAL DATA
                       -------------------


   SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
   SOLAR RADIATION FOR      AMARILLO           TEXAS


   MAXIMUM LEAF AREA INDEX                 = 0.00
   START OF GROWING SEASON (JULIAN DATE)  =  104
   END OF GROWING SEASON (JULIAN DATE)    =  302


         NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

   JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
   -------     -------     -------     -------     -------     -------

    35.10       39.20       47.10       56.80       65.40       74.10
    78.60       76.50       69.10       58.50       46.00       36.90


***********************************************************************

                    MONTHLY TOTALS FOR YEAR   10
-----------------------------------------------------------------------

                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)     0.82    1.75    0.32    1.43    0.88    2.98
                           3.10    3.14    1.25    2.55    1.01    0.54

RUNOFF (INCHES)           0.000   0.000   0.000   0.000   0.000   0.000
                          0.000   0.000   0.000   0.000   0.000   0.000

EVAPOTRANSPIRATION        1.617   0.904   1.257   0.736   1.538   2.762
    (INCHES)              1.108   4.106   0.759   2.797   1.078   0.416

LATERAL DRAINAGE FROM    0.0090  0.0079  0.0084  0.0078  0.0077  0.0072
  LAYER  6 (INCHES)      0.0071  0.0069  0.0064  0.0064  0.0060  0.0060

PERCOLATION FROM         0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER  7 (INCHES)      0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

-----------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS
-----------------------------------------------------------------------


G. DAILY HEAD ON            0.22    0.21    0.20    0.19    0.18    0.18
  LAYER  7 (INCHES)         0.17    0.16    0.16    0.15    0.15    0.14

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  7 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00
```

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*******************************************************************************


*******************************************************************************

                     ANNUAL TOTALS FOR YEAR   10
-------------------------------------------------------------------------------
                                        (INCHES)     (CU. FT.)     PERCENT
                                        --------     ---------     -------
  PRECIPITATION                          19.77              2.     100.00

  RUNOFF                                  0.000             0.       0.00

  EVAPOTRANSPIRATION                     19.078             2.      96.50

  LATERAL DRAINAGE FROM LAYER  6          0.0868            0.       0.44

  PERCOLATION FROM LAYER  7               0.0010            0.       0.00

  CHANGE IN WATER STORAGE                 0.604             0.       3.06

  SOIL WATER AT START OF YEAR            79.12              7.

  SOIL WATER AT END OF YEAR              79.73              7.

  SNOW WATER AT START OF YEAR             0.00              0.

  SNOW WATER AT END OF YEAR               0.00              0.

  ANNUAL WATER BUDGET BALANCE             0.00              0.       0.00

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     AVERAGE MONTHLY VALUES IN INCHES FOR YEARS   10 THROUGH   10
-------------------------------------------------------------------------------

                          JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                          ------- ------- ------- ------- ------- -------
 PRECIPITATION
 -------------
   TOTALS                   0.82    1.75    0.32    1.43    0.88    2.98
                            3.10    3.14    1.25    2.55    1.01    0.54

   STD. DEVIATIONS          0.00    0.00    0.00    0.00    0.00    0.00
                            0.00    0.00    0.00    0.00    0.00    0.00

 RUNOFF
 ------
   TOTALS                  0.000   0.000   0.000   0.000   0.000   0.000
                           0.000   0.000   0.000   0.000   0.000   0.000

   STD. DEVIATIONS         0.000   0.000   0.000   0.000   0.000   0.000
                           0.000   0.000   0.000   0.000   0.000   0.000

 EVAPOTRANSPIRATION
 ------------------
   TOTALS                  1.617   0.904   1.257   0.736   1.538   2.762
                           1.108   4.106   0.759   2.797   1.078   0.416
```

```
   STD. DEVIATIONS     0.000   0.000   0.000   0.000   0.000   0.000
                       0.000   0.000   0.000   0.000   0.000   0.000

 LATERAL DRAINAGE FROM LAYER  6
 ------------------------------
   TOTALS              0.0090  0.0079  0.0084  0.0078  0.0077  0.0072
                       0.0071  0.0069  0.0064  0.0064  0.0060  0.0060

   STD. DEVIATIONS     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
                       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

 PERCOLATION FROM LAYER  7
 -------------------------
   TOTALS              0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
                       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

   STD. DEVIATIONS     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
                       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

***********************************************************************


***********************************************************************

 AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS   10 THROUGH   10
-----------------------------------------------------------------------
                                   (INCHES)        (CU. FT.)    PERCENT
                               ---------------  -----------   -------
 PRECIPITATION                 19.77   ( 0.000)          2.    100.00

 RUNOFF                         0.000  ( 0.000)          0.      0.00

 EVAPOTRANSPIRATION            19.078  ( 0.000)          2.     96.50

 LATERAL DRAINAGE FROM          0.0868 ( 0.0000)         0.      0.44
    LAYER  6

 PERCOLATION FROM LAYER  7      0.0010 ( 0.0000)         0.      0.00

 CHANGE IN WATER STORAGE        0.604  ( 0.000)          0.      3.06

***********************************************************************



***********************************************************************

          PEAK DAILY VALUES FOR YEARS   10 THROUGH   10
   ---------------------------------------------------------------
                                              (INCHES)   (CU. FT.)
                                              --------   ---------
      PRECIPITATION                             1.05        0.1

      RUNOFF                                    0.000       0.0

      LATERAL DRAINAGE FROM LAYER  6            0.0003      0.0

      PERCOLATION FROM LAYER  7                 0.0000      0.0

      HEAD ON LAYER  7                          0.2

      SNOW WATER                                0.06        0.0
```

```
      MAXIMUM VEG. SOIL WATER (VOL/VOL)        0.3792

      MINIMUM VEG. SOIL WATER (VOL/VOL)        0.1355

****************************************************************************




****************************************************************************

             FINAL WATER STORAGE AT END OF YEAR   10
    -------------------------------------------------------------------
              LAYER        (INCHES)       (VOL/VOL)
              -----        --------       ---------
                1             0.92          0.1535

                2            25.23          0.2102

                3            25.22          0.2102

                4            25.22          0.2102

                5             2.42          0.2013

                6             0.60          0.0497

                7             0.12          0.4000

             SNOW WATER       0.00

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AM5LF5YR

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******************************************************************************

 Amarillo - Year FIVE - FIVE years    EVAP DEPTH=18" LAI=2.0
 five lifts of waste with INTERMEDIATE cover  RO=1.0
 November 29, 1994

******************************************************************************
******************************************************************************




                                  LAYER  1
                                  --------

                         VERTICAL PERCOLATION LAYER
   THICKNESS                              =     12.00 INCHES
   POROSITY                               =      0.3980 VOL/VOL
   FIELD CAPACITY                         =      0.2443 VOL/VOL
   WILTING POINT                          =      0.1361 VOL/VOL
   INITIAL SOIL WATER CONTENT             =      0.2443 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY       =      0.000119999997 CM/SEC


                                  LAYER  2
                                  --------

                         VERTICAL PERCOLATION LAYER
   THICKNESS                              =    240.00 INCHES
   POROSITY                               =      0.5200 VOL/VOL
   FIELD CAPACITY                         =      0.2942 VOL/VOL
   WILTING POINT                          =      0.1400 VOL/VOL
   INITIAL SOIL WATER CONTENT             =      0.2000 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY       =      0.000099999997 CM/SEC


                                  LAYER  3
                                  --------

                         VERTICAL PERCOLATION LAYER
   THICKNESS                              =    120.00 INCHES
   POROSITY                               =      0.5200 VOL/VOL
   FIELD CAPACITY                         =      0.2942 VOL/VOL
   WILTING POINT                          =      0.1400 VOL/VOL
   INITIAL SOIL WATER CONTENT             =      0.2102 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY       =      0.000099999997 CM/SEC


                                  LAYER  4
                                  --------
```

```
                 VERTICAL PERCOLATION LAYER
THICKNESS                          =    120.00 INCHES
POROSITY                           =      0.5200 VOL/VOL
FIELD CAPACITY                     =      0.2942 VOL/VOL
WILTING POINT                      =      0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT         =      0.2102 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY   =      0.000099999997 CM/SEC


                         LAYER  5
                         --------

                 VERTICAL PERCOLATION LAYER
THICKNESS                          =    120.00 INCHES
POROSITY                           =      0.5200 VOL/VOL
FIELD CAPACITY                     =      0.2942 VOL/VOL
WILTING POINT                      =      0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT         =      0.2102 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY   =      0.000099999997 CM/SEC


                         LAYER  6
                         --------

                 VERTICAL PERCOLATION LAYER
THICKNESS                          =     12.00 INCHES
POROSITY                           =      0.3980 VOL/VOL
FIELD CAPACITY                     =      0.2443 VOL/VOL
WILTING POINT                      =      0.1361 VOL/VOL
INITIAL SOIL WATER CONTENT         =      0.2013 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY   =      0.000119999997 CM/SEC


                         LAYER  7
                         --------

                  LATERAL DRAINAGE LAYER
THICKNESS                          =     12.00 INCHES
POROSITY                           =      0.4170 VOL/VOL
FIELD CAPACITY                     =      0.0454 VOL/VOL
WILTING POINT                      =      0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT         =      0.0497 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY   =      0.009999999776 CM/SEC
SLOPE                              =      2.00 PERCENT
DRAINAGE LENGTH                    =    840.0 FEET


                         LAYER  8
                         --------

         BARRIER SOIL LINER WITH FLEXIBLE MEMBRANE LINER
THICKNESS                          =      0.30 INCHES
POROSITY                           =      0.4000 VOL/VOL
FIELD CAPACITY                     =      0.3560 VOL/VOL
WILTING POINT                      =      0.2899 VOL/VOL
INITIAL SOIL WATER CONTENT         =      0.4000 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY   =      0.000000005000 CM/SEC
```

```
   LINER LEAKAGE FRACTION                =      0.01000000




                     GENERAL SIMULATION DATA
                     -----------------------

   SCS RUNOFF CURVE NUMBER               =      70.00
   TOTAL AREA OF COVER                   =       1. SQ FT
   EVAPORATIVE ZONE DEPTH                =      18.00 INCHES
   POTENTIAL RUNOFF FRACTION             =       1.000000
   UPPER LIMIT VEG. STORAGE              =       7.8960 INCHES
   INITIAL VEG. STORAGE                  =       4.1316 INCHES
   INITIAL SNOW WATER CONTENT            =       0.0000 INCHES
   INITIAL TOTAL WATER STORAGE IN
     SOIL AND WASTE LAYERS               =     129.7356 INCHES

             SOIL WATER CONTENT INITIALIZED BY USER.



                       CLIMATOLOGICAL DATA
                       -------------------

   SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
   SOLAR RADIATION FOR      AMARILLO           TEXAS


   MAXIMUM LEAF AREA INDEX                = 2.00
   START OF GROWING SEASON (JULIAN DATE)  =  104
   END OF GROWING SEASON (JULIAN DATE)    =  302


          NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

  JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
  -------     -------     -------     -------     -------     -------

   35.10       39.20       47.10       56.80       65.40       74.10
   78.60       76.50       69.10       58.50       46.00       36.90


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                     MONTHLY TOTALS FOR YEAR    1
-------------------------------------------------------------------------------

                          JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                          ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)     0.40    0.35    1.70    0.04    0.15    1.54
                           3.01    3.57    0.80    1.86    1.14    0.85

RUNOFF (INCHES)            0.000   0.000   0.000   0.000   0.000   0.000
                           0.000   0.000   0.000   0.000   0.025   0.000

EVAPOTRANSPIRATION         1.775   0.604   1.410   0.358   0.099   0.619
   (INCHES)                3.555   3.997   0.724   1.936   1.149   0.390

LATERAL DRAINAGE FROM      0.0057  0.0050  0.0054  0.0051  0.0051  0.0048
  LAYER  7 (INCHES)        0.0048  0.0047  0.0044  0.0044  0.0042  0.0042

PERCOLATION FROM           0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
```

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  LAYER  8 (INCHES)      0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


------------------------------------------------------------------------
                    MONTHLY SUMMARIES FOR DAILY HEADS
------------------------------------------------------------------------


AVG. DAILY HEAD ON         0.14    0.13    0.13    0.13    0.12    0.12
  LAYER  8 (INCHES)        0.11    0.11    0.11    0.11    0.10    0.10

STD. DEV. OF DAILY HEAD    0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  8 (INCHES)     0.00    0.00    0.00    0.00    0.00    0.00

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                       ANNUAL TOTALS FOR YEAR    1
------------------------------------------------------------------------
                                         (INCHES)   (CU. FT.)   PERCENT
                                         --------   ---------   -------
  PRECIPITATION                           15.41           1.     100.00

  RUNOFF                                   0.025          0.       0.16

  EVAPOTRANSPIRATION                      16.617          1.     107.84

  LATERAL DRAINAGE FROM LAYER  7           0.0578         0.       0.38

  PERCOLATION FROM LAYER  8                0.0009         0.       0.01

  CHANGE IN WATER STORAGE                 -1.291          0.      -8.38

  SOIL WATER AT START OF YEAR            129.74          11.

  SOIL WATER AT END OF YEAR              128.44          11.

  SNOW WATER AT START OF YEAR              0.00           0.

  SNOW WATER AT END OF YEAR                0.00           0.

  ANNUAL WATER BUDGET BALANCE              0.00           0.       0.00

************************************************************************





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                       MONTHLY TOTALS FOR YEAR    2
------------------------------------------------------------------------

                        JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                        ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)   0.14    1.00    0.46    1.33    0.41    1.07
                         1.38    6.03    3.63    0.68    0.05    0.44

RUNOFF (INCHES)          0.000   0.000   0.000   0.000   0.000   0.000
                         0.000   0.000   0.410   0.000   0.000   0.000
```

```
EVAPOTRANSPIRATION        0.382   0.394   0.375   1.355   1.258   1.024
    (INCHES)              1.409   6.047   3.080   0.645   0.225   0.085

 LATERAL DRAINAGE FROM    0.0041  0.0037  0.0040  0.0038  0.0038  0.0036
  LAYER  7 (INCHES)       0.0037  0.0036  0.0034  0.0035  0.0033  0.0033

PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER  8 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-------------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------


AVG. DAILY HEAD ON          0.10    0.10    0.09    0.09    0.09    0.09
  LAYER  8 (INCHES)         0.09    0.09    0.08    0.08    0.08    0.08

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  8 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

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                      ANNUAL TOTALS FOR YEAR    2
-------------------------------------------------------------------------
                                       (INCHES)    (CU. FT.)    PERCENT
                                       --------    ---------    -------
  PRECIPITATION                         16.62            1.     100.00

  RUNOFF                                 0.410           0.       2.47

  EVAPOTRANSPIRATION                    16.280           1.      97.95

  LATERAL DRAINAGE FROM LAYER  7         0.0437          0.       0.26

  PERCOLATION FROM LAYER  8              0.0008          0.       0.00

  CHANGE IN WATER STORAGE               -0.114           0.      -0.69

  SOIL WATER AT START OF YEAR          128.44           11.

  SOIL WATER AT END OF YEAR            128.33           11.

  SNOW WATER AT START OF YEAR            0.00            0.

  SNOW WATER AT END OF YEAR              0.00            0.

  ANNUAL WATER BUDGET BALANCE            0.00            0.       0.00

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                   MONTHLY TOTALS FOR YEAR    3
-------------------------------------------------------------------------
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                     JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                     ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)  0.33    0.17    0.92    1.20    0.21    6.80
                        1.71    2.54    4.79    2.21    1.00    0.86

RUNOFF (INCHES)         0.000   0.000   0.000   0.000   0.000   0.864
                        0.000   0.000   0.000   0.000   0.000   0.000

EVAPOTRANSPIRATION      0.308   0.267   0.448   1.811   0.314   5.351
    (INCHES)            1.794   2.535   3.120   2.549   1.043   1.186

LATERAL DRAINAGE FROM   0.0033  0.0029  0.0032  0.0030  0.0031  0.0029
  LAYER  7 (INCHES)     0.0030  0.0030  0.0028  0.0029  0.0027  0.0028

PERCOLATION FROM        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER  8 (INCHES)     0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------


AVG. DAILY HEAD ON        0.08    0.08    0.08    0.07    0.07    0.07
  LAYER  8 (INCHES)       0.07    0.07    0.07    0.07    0.07    0.07

STD. DEV. OF DAILY HEAD   0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  8 (INCHES)    0.00    0.00    0.00    0.00    0.00    0.00

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                  ANNUAL TOTALS FOR YEAR    3
-------------------------------------------------------------------------
                                      (INCHES)    (CU. FT.)    PERCENT
                                      --------    ---------    -------
 PRECIPITATION                         22.74            2.     100.00

 RUNOFF                                 0.864           0.       3.80

 EVAPOTRANSPIRATION                    20.727           2.      91.15

 LATERAL DRAINAGE FROM LAYER  7         0.0357          0.       0.16

 PERCOLATION FROM LAYER  8              0.0008          0.       0.00

 CHANGE IN WATER STORAGE                1.113           0.       4.89

 SOIL WATER AT START OF YEAR          128.33           11.

 SOIL WATER AT END OF YEAR            129.44           11.

 SNOW WATER AT START OF YEAR            0.00            0.

 SNOW WATER AT END OF YEAR              0.00            0.

 ANNUAL WATER BUDGET BALANCE            0.00            0.       0.00

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                    MONTHLY TOTALS FOR YEAR    4
-------------------------------------------------------------------------------

                        JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                        ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)    0.04    0.26    0.82    0.03    1.27    2.57
                          0.77    2.00    3.69    0.00    0.26    0.00

RUNOFF (INCHES)           0.000   0.000   0.000   0.000   0.000   0.023
                          0.000   0.027   0.358   0.000   0.000   0.000

EVAPOTRANSPIRATION        0.747   0.288   0.372   0.344   1.381   2.522
     (INCHES)             0.864   1.108   2.518   1.710   0.225   0.000

LATERAL DRAINAGE FROM     0.0028  0.0026  0.0027  0.0026  0.0026  0.0025
  LAYER  7 (INCHES)       0.0026  0.0025  0.0024  0.0025  0.0024  0.0024

PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER  8 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

-------------------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------------


'G. DAILY HEAD ON            0.07    0.07    0.06    0.06    0.06    0.06
  LAYER  8 (INCHES)          0.06    0.06    0.06    0.06    0.06    0.06

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  8 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

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                    ANNUAL TOTALS FOR YEAR    4
-------------------------------------------------------------------------------
                                       (INCHES)     (CU. FT.)    PERCENT
                                       --------     ---------    -------

  PRECIPITATION                         11.71              1.    100.00

  RUNOFF                                 0.409             0.      3.49

  EVAPOTRANSPIRATION                    12.081             1.    103.16

  LATERAL DRAINAGE FROM LAYER  7         0.0307            0.      0.26

  PERCOLATION FROM LAYER  8              0.0008            0.      0.01

  CHANGE IN WATER STORAGE               -0.811             0.     -6.93

  SOIL WATER AT START OF YEAR          129.44             11.

  SOIL WATER AT END OF YEAR            128.63             11.

  SNOW WATER AT START OF YEAR            0.00              0.
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  SNOW WATER AT END OF YEAR            0.00           0.

  ANNUAL WATER BUDGET BALANCE          0.00           0.       0.00

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                    MONTHLY TOTALS FOR YEAR     5
---------------------------------------------------------------------------

                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)    0.45    0.87    0.67    0.21    1.08    4.53
                          2.81    2.34    1.26    0.59    0.83    0.75

RUNOFF (INCHES)           0.000   0.000   0.000   0.000   0.000   0.106
                          0.000   0.000   0.000   0.000   0.000   0.000

EVAPOTRANSPIRATION        0.168   0.367   0.310   0.300   1.434   5.127
     (INCHES)             2.810   2.300   1.304   0.586   0.423   0.519

LATERAL DRAINAGE FROM     0.0024  0.0022  0.0024  0.0023  0.0023  0.0022
  LAYER  7 (INCHES)       0.0023  0.0023  0.0022  0.0022  0.0021  0.0022

PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER  8 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

---------------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS
---------------------------------------------------------------------------


AVG. DAILY HEAD ON          0.06    0.06    0.06    0.06    0.06    0.06
  LAYER  8 (INCHES)         0.05    0.05    0.05    0.05    0.05    0.05

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  8 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

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                      ANNUAL TOTALS FOR YEAR     5
---------------------------------------------------------------------------
                                      (INCHES)    (CU. FT.)    PERCENT
                                      --------    ---------    -------
  PRECIPITATION                        16.39            1.     100.00

  RUNOFF                                0.106           0.       0.64

  EVAPOTRANSPIRATION                   15.647           1.      95.47

  LATERAL DRAINAGE FROM LAYER  7        0.0271          0.       0.17

  PERCOLATION FROM LAYER  8             0.0007          0.       0.00
```

```
CHANGE IN WATER STORAGE            0.610           0.      3.72

SOIL WATER AT START OF YEAR      128.63           11.

SOIL WATER AT END OF YEAR        129.24           11.

SNOW WATER AT START OF YEAR        0.00            0.

SNOW WATER AT END OF YEAR          0.00            0.

ANNUAL WATER BUDGET BALANCE        0.00            0.      0.00

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    AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    1 THROUGH    5
-----------------------------------------------------------------------

                      JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                      ------- ------- ------- ------- ------- -------
 PRECIPITATION
 -------------
   TOTALS              0.27    0.53    0.91    0.56    0.62    3.30
                       1.94    3.30    2.83    1.07    0.66    0.58

   STD. DEVIATIONS     0.18    0.38    0.47    0.65    0.52    2.36
                       0.95    1.64    1.72    0.93    0.48    0.37

 RUNOFF
 ------
   TOTALS              0.000   0.000   0.000   0.000   0.000   0.199
                       0.000   0.005   0.154   0.000   0.005   0.000

   STD. DEVIATIONS     0.000   0.000   0.000   0.000   0.000   0.374
                       0.000   0.012   0.211   0.000   0.011   0.000

 EVAPOTRANSPIRATION
 ------------------
   TOTALS              0.676   0.384   0.583   0.834   0.897   2.928
                       2.086   3.198   2.149   1.485   0.613   0.436

   STD. DEVIATIONS     0.651   0.134   0.465   0.703   0.638   2.226
                       1.086   1.895   1.083   0.851   0.450   0.471

 LATERAL DRAINAGE FROM LAYER  7
 ------------------------------
   TOTALS              0.0037  0.0033  0.0035  0.0033  0.0034  0.0032
                       0.0033  0.0032  0.0031  0.0031  0.0030  0.0030

   STD. DEVIATIONS     0.0013  0.0011  0.0012  0.0011  0.0011  0.0010
                       0.0010  0.0010  0.0009  0.0009  0.0008  0.0008

 PERCOLATION FROM LAYER  8
 -------------------------
   TOTALS              0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
                       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

   STD. DEVIATIONS     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
                       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

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 AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH    5
---------------------------------------------------------------------------
                                   (INCHES)          (CU. FT.)    PERCENT
                               ----------------    -----------   -------
  PRECIPITATION                16.57   ( 3.971)            1.    100.00

  RUNOFF                        0.363  ( 0.330)            0.      2.19

  EVAPOTRANSPIRATION           16.270  ( 3.079)            1.     98.17

  LATERAL DRAINAGE FROM         0.0390 ( 0.0122)           0.      0.24
     LAYER  7

  PERCOLATION FROM LAYER  8     0.0008 ( 0.0001)           0.      0.00

  CHANGE IN WATER STORAGE      -0.099  ( 0.987)            0.     -0.60
***************************************************************************



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            PEAK DAILY VALUES FOR YEARS     1 THROUGH     5
    -----------------------------------------------------------------
                                             (INCHES)     (CU. FT.)
                                             --------     ---------
      PRECIPITATION                            2.82           0.2

      RUNOFF                                   0.544          0.0

      LATERAL DRAINAGE FROM LAYER  7           0.0002         0.0

      PERCOLATION FROM LAYER  8                0.0000         0.0

      HEAD ON LAYER  8                         0.1

      SNOW WATER                               0.03           0.0


      MAXIMUM VEG. SOIL WATER (VOL/VOL)            0.3201

      MINIMUM VEG. SOIL WATER (VOL/VOL)            0.1355
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              FINAL WATER STORAGE AT END OF YEAR     5
    -----------------------------------------------------------------
                LAYER        (INCHES)       (VOL/VOL)
                -----        --------       ---------
                  1            2.27          0.1892

                  2           48.33          0.2014
```

```
              3           25.19          0.2100

              4           25.22          0.2102

              5           25.22          0.2102

              6            2.32          0.1930

              7            0.56          0.0470

              8            0.12          0.4000

         SNOW WATER        0.00

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AMR7FNL

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 Amarillo - 20 years, CN=90, RoC=1.0
 seven lifts of waste with final cover (24" SC & 12 " CCL)
 NOVEMBER 29, 1994

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******************************************************************************




                                  LAYER  1
                                  --------

                        VERTICAL PERCOLATION LAYER
   THICKNESS                            =      24.00 INCHES
   POROSITY                             =       0.4640 VOL/VOL
   FIELD CAPACITY                       =       0.3104 VOL/VOL
   WILTING POINT                        =       0.1875 VOL/VOL
   INITIAL SOIL WATER CONTENT           =       0.1892 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY     =       0.000010000000 CM/SEC


                                  LAYER  2
                                  --------

                            BARRIER SOIL LINER
   THICKNESS                            =      12.00 INCHES
   POROSITY                             =       0.4224 VOL/VOL
   FIELD CAPACITY                       =       0.3495 VOL/VOL
   WILTING POINT                        =       0.2648 VOL/VOL
   INITIAL SOIL WATER CONTENT           =       0.2648 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY     =       0.000010000000 CM/SEC


                                  LAYER  3
                                  --------

                        VERTICAL PERCOLATION LAYER
   THICKNESS                            =     240.00 INCHES
   POROSITY                             =       0.5200 VOL/VOL
   FIELD CAPACITY                       =       0.2942 VOL/VOL
   WILTING POINT                        =       0.1400 VOL/VOL
   INITIAL SOIL WATER CONTENT           =       0.2000 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY     =       0.000099999997 CM/SEC


                                  LAYER  4
                                  --------
```

```
                   VERTICAL PERCOLATION LAYER
THICKNESS                            =    240.00 INCHES
POROSITY                             =      0.5200 VOL/VOL
FIELD CAPACITY                       =      0.2942 VOL/VOL
WILTING POINT                        =      0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT           =      0.2014 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY     =      0.000099999997 CM/SEC


                          LAYER  5
                          --------

                   VERTICAL PERCOLATION LAYER
THICKNESS                            =    120.00 INCHES
POROSITY                             =      0.5200 VOL/VOL
FIELD CAPACITY                       =      0.2942 VOL/VOL
WILTING POINT                        =      0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT           =      0.2100 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY     =      0.000099999997 CM/SEC


                          LAYER  6
                          --------

                   VERTICAL PERCOLATION LAYER
THICKNESS                            =    120.00 INCHES
POROSITY                             =      0.5200 VOL/VOL
FIELD CAPACITY                       =      0.2942 VOL/VOL
WILTING POINT                        =      0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT           =      0.2102 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY     =      0.000099999997 CM/SEC


                          LAYER  7
                          --------

                   VERTICAL PERCOLATION LAYER
THICKNESS                            =    120.00 INCHES
POROSITY                             =      0.5200 VOL/VOL
FIELD CAPACITY                       =      0.2942 VOL/VOL
WILTING POINT                        =      0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT           =      0.2102 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY     =      0.000099999997 CM/SEC


                          LAYER  8
                          --------

                   VERTICAL PERCOLATION LAYER
THICKNESS                            =     12.00 INCHES
POROSITY                             =      0.3980 VOL/VOL
FIELD CAPACITY                       =      0.2443 VOL/VOL
WILTING POINT                        =      0.1361 VOL/VOL
INITIAL SOIL WATER CONTENT           =      0.1930 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY     =      0.000119999997 CM/SEC
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                              LAYER  9
                              --------

                    LATERAL DRAINAGE LAYER
   THICKNESS                          =     12.00 INCHES
   POROSITY                           =      0.4170 VOL/VOL
   FIELD CAPACITY                     =      0.0454 VOL/VOL
   WILTING POINT                      =      0.0200 VOL/VOL
   INITIAL SOIL WATER CONTENT         =      0.0470 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY   =      0.009999999776 CM/SEC
   SLOPE                              =      2.00 PERCENT
   DRAINAGE LENGTH                    =    840.0 FEET



                              LAYER 10
                              --------

          BARRIER SOIL LINER WITH FLEXIBLE MEMBRANE LINER
   THICKNESS                          =      0.30 INCHES
   POROSITY                           =      0.4000 VOL/VOL
   FIELD CAPACITY                     =      0.3560 VOL/VOL
   WILTING POINT                      =      0.2899 VOL/VOL
   INITIAL SOIL WATER CONTENT         =      0.4000 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY   =      0.000000005000 CM/SEC
   LINER LEAKAGE FRACTION             =      0.01000000



                        GENERAL SIMULATION DATA
                        -----------------------

   SCS RUNOFF CURVE NUMBER            =      90.00
   TOTAL AREA OF COVER                =       1. SQ FT
   EVAPORATIVE ZONE DEPTH             =      22.00 INCHES
   POTENTIAL RUNOFF FRACTION          =       1.000000
   UPPER LIMIT VEG. STORAGE           =      10.2080 INCHES
   INITIAL VEG. STORAGE               =       4.1624 INCHES
   INITIAL SNOW WATER CONTENT         =       0.0000 INCHES
   INITIAL TOTAL WATER STORAGE IN
     SOIL AND WASTE LAYERS            =     182.7024 INCHES

              SOIL WATER CONTENT INITIALIZED BY USER.



                         CLIMATOLOGICAL DATA
                         -------------------

   SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
   SOLAR RADIATION FOR      AMARILLO            TEXAS


   MAXIMUM LEAF AREA INDEX                 = 3.30
   START OF GROWING SEASON (JULIAN DATE)   =  104
   END OF GROWING SEASON (JULIAN DATE)     =  302


          NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

  JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
```

```
   -------      -------      -------      -------      -------      -------

    35.10        39.20        47.10        56.80        65.40        74.10
    78.60        76.50        69.10        58.50        46.00        36.90


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                      MONTHLY TOTALS FOR YEAR     1
-------------------------------------------------------------------------------

                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)         0.40    0.35    1.70    0.04    0.15    1.54
                               3.01    3.57    0.80    1.86    1.14    0.85

RUNOFF (INCHES)                0.000   0.011   0.281   0.000   0.000   0.109
                               0.706   0.695   0.013   0.440   0.592   0.000

EVAPOTRANSPIRATION             0.149   0.487   1.475   0.120   0.100   1.133
    (INCHES)                   2.495   3.036   0.702   1.505   0.548   0.398

PERCOLATION FROM               0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)            0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM          0.0021  0.0019  0.0021  0.0020  0.0021  0.0020
  LAYER  9 (INCHES)            0.0021  0.0021  0.0020  0.0020  0.0020  0.0020

PERCOLATION FROM               0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)            0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

-------------------------------------------------------------------------------
                     MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------------


AVG. DAILY HEAD ON               0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)              0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD          0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)           0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON               0.05    0.05    0.05    0.05    0.05    0.05
  LAYER 10 (INCHES)              0.05    0.05    0.05    0.05    0.05    0.05

STD. DEV. OF DAILY HEAD          0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)           0.00    0.00    0.00    0.00    0.00    0.00

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                        ANNUAL TOTALS FOR YEAR     1
-------------------------------------------------------------------------------
                                         (INCHES)     (CU. FT.)     PERCENT
                                         --------     ---------     -------

  PRECIPITATION                            15.41             1.     100.00

  RUNOFF                                    2.847            0.      18.47

  EVAPOTRANSPIRATION                       12.149            1.      78.84
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   PERCOLATION FROM LAYER  2              0.0000          0.       0.00

   LATERAL DRAINAGE FROM LAYER  9         0.0244          0.       0.16

   PERCOLATION FROM LAYER 10              0.0007          0.       0.00

   CHANGE IN WATER STORAGE                0.389           0.       2.52

   SOIL WATER AT START OF YEAR          182.70           15.

   SOIL WATER AT END OF YEAR            183.09           15.

   SNOW WATER AT START OF YEAR            0.00            0.

   SNOW WATER AT END OF YEAR              0.00            0.

   ANNUAL WATER BUDGET BALANCE            0.00            0.       0.00

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                   MONTHLY TOTALS FOR YEAR    2
-----------------------------------------------------------------------

                       JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                       ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)   0.14    1.00    0.46    1.33    0.41    1.07
                         1.38    6.03    3.63    0.68    0.05    0.44

RUNOFF (INCHES)          0.000   0.068   0.000   0.007   0.000   0.054
                         0.000   2.513   1.890   0.053   0.000   0.016

EVAPOTRANSPIRATION       0.330   0.372   0.565   1.582   0.840   1.001
     (INCHES)            1.417   3.521   1.579   0.601   0.237   0.084

PERCOLATION FROM        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM   0.0020  0.0018  0.0020  0.0019  0.0019  0.0019
  LAYER  9 (INCHES)     0.0019  0.0019  0.0018  0.0019  0.0018  0.0019

PERCOLATION FROM        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)     0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

-----------------------------------------------------------------------
                 MONTHLY SUMMARIES FOR DAILY HEADS
-----------------------------------------------------------------------


AVG. DAILY HEAD ON        0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD   0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)    0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON        0.05    0.05    0.05    0.05    0.05    0.05
  LAYER 10 (INCHES)       0.05    0.05    0.05    0.04    0.04    0.04
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STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

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                     ANNUAL TOTALS FOR YEAR    2
-----------------------------------------------------------------------
                                       (INCHES)    (CU. FT.)   PERCENT
                                       --------    ---------   -------

  PRECIPITATION                         16.62            1.    100.00

  RUNOFF                                 4.602           0.     27.69

  EVAPOTRANSPIRATION                    12.130           1.     72.99

  PERCOLATION FROM LAYER  2              0.0000          0.      0.00

  LATERAL DRAINAGE FROM LAYER  9         0.0226          0.      0.14

  PERCOLATION FROM LAYER 10              0.0007          0.      0.00

  CHANGE IN WATER STORAGE               -0.135           0.     -0.81

  SOIL WATER AT START OF YEAR          183.09           15.

  SOIL WATER AT END OF YEAR            182.96           15.

  SNOW WATER AT START OF YEAR            0.00            0.

  SNOW WATER AT END OF YEAR              0.00            0.

  ANNUAL WATER BUDGET BALANCE            0.00            0.      0.00

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                    MONTHLY TOTALS FOR YEAR    3
-----------------------------------------------------------------------

                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)          0.33    0.17    0.92    1.20    0.21    6.80
                                1.71    2.54    4.79    2.21    1.00    0.86

RUNOFF (INCHES)                 0.000   0.000   0.058   0.288   0.000   4.576
                                0.166   0.772   1.463   0.228   0.264   0.004

 APOTRANSPIRATION               0.259   0.232   1.142   0.989   0.162   2.271
    (INCHES)                    1.539   1.765   2.674   2.479   0.406   1.225

PERCOLATION FROM                0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)             0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM           0.0018  0.0017  0.0018  0.0018  0.0018  0.0017
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  LAYER  9 (INCHES)       0.0018  0.0018  0.0017  0.0018  0.0017  0.0017

PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------


AVG. DAILY HEAD ON          0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)         0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON          0.04    0.04    0.04    0.04    0.04    0.04
  LAYER 10 (INCHES)         0.04    0.04    0.04    0.04    0.04    0.04

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

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                      ANNUAL TOTALS FOR YEAR    3
-------------------------------------------------------------------------
                                      (INCHES)    (CU. FT.)    PERCENT
                                      --------    ---------    -------
  PRECIPITATION                         22.74            2.    100.00

  RUNOFF                                 7.819           1.     34.38

  EVAPOTRANSPIRATION                    15.144           1.     66.60

  PERCOLATION FROM LAYER  2              0.0000          0.      0.00

  LATERAL DRAINAGE FROM LAYER  9         0.0211          0.      0.09

  PERCOLATION FROM LAYER 10              0.0007          0.      0.00

  CHANGE IN WATER STORAGE               -0.244           0.     -1.07

  SOIL WATER AT START OF YEAR          182.96           15.

  SOIL WATER AT END OF YEAR            182.71           15.

  SNOW WATER AT START OF YEAR            0.00            0.

  SNOW WATER AT END OF YEAR              0.00            0.

  ANNUAL WATER BUDGET BALANCE            0.00            0.      0.00

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                       MONTHLY TOTALS FOR YEAR    4
-------------------------------------------------------------------------

                           JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                           ------- ------- ------- ------- ------- -------

 PRECIPITATION (INCHES)      0.04    0.26    0.82    0.03    1.27    2.57
                             0.77    2.00    3.69    0.00    0.26    0.00

 RUNOFF (INCHES)             0.000   0.000   0.006   0.000   0.413   0.715
                             0.019   0.621   2.107   0.000   0.000   0.000

 EVAPOTRANSPIRATION          0.157   0.214   0.451   0.307   0.988   1.763
      (INCHES)               0.844   1.037   1.531   0.393   0.260   0.000

 PERCOLATION FROM            0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   LAYER  2 (INCHES)         0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

 LATERAL DRAINAGE FROM       0.0017  0.0016  0.0017  0.0017  0.0017  0.0016
   LAYER  9 (INCHES)         0.0017  0.0017  0.0016  0.0017  0.0016  0.0016

 PERCOLATION FROM            0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
   LAYER 10 (INCHES)         0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-------------------------------------------------------------------------
                       MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------


 AVG. DAILY HEAD ON            0.00    0.00    0.00    0.00    0.00    0.00
   LAYER  2 (INCHES)           0.00    0.00    0.00    0.00    0.00    0.00

 STD. DEV. OF DAILY HEAD       0.00    0.00    0.00    0.00    0.00    0.00
   ON LAYER  2 (INCHES)        0.00    0.00    0.00    0.00    0.00    0.00

 AVG. DAILY HEAD ON            0.04    0.04    0.04    0.04    0.04    0.04
   LAYER 10 (INCHES)           0.04    0.04    0.04    0.04    0.04    0.04

 STD. DEV. OF DAILY HEAD       0.00    0.00    0.00    0.00    0.00    0.00
   ON LAYER 10 (INCHES)        0.00    0.00    0.00    0.00    0.00    0.00

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                       ANNUAL TOTALS FOR YEAR    4
---------------------------------------------------------------------------
                                       (INCHES)    (CU. FT.)    PERCENT
                                       --------    ---------    -------
  PRECIPITATION                          11.71            1.    100.00

  RUNOFF                                 3.880            0.     33.14

  EVAPOTRANSPIRATION                     7.947            1.     67.86

  PERCOLATION FROM LAYER  2             0.0000            0.      0.00

  LATERAL DRAINAGE FROM LAYER  9        0.0200            0.      0.17

  PERCOLATION FROM LAYER 10             0.0007            0.      0.01

  CHANGE IN WATER STORAGE               -0.138            0.     -1.18
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   SOIL WATER AT START OF YEAR          182.71           15.

   SOIL WATER AT END OF YEAR            182.57           15.

   SNOW WATER AT START OF YEAR            0.00            0.

   SNOW WATER AT END OF YEAR              0.00            0.

   ANNUAL WATER BUDGET BALANCE            0.00            0.       0.00

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                    MONTHLY TOTALS FOR YEAR    5
-----------------------------------------------------------------------

                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------

 PRECIPITATION (INCHES)    0.45    0.87    0.67    0.21    1.08    4.53
                           2.81    2.34    1.26    0.59    0.83    0.75

 RUNOFF (INCHES)           0.076   0.262   0.011   0.000   0.207   1.643
                           0.772   0.572   0.158   0.172   0.114   0.000

 EVAPOTRANSPIRATION        0.146   0.384   0.316   0.296   1.580   2.887
      (INCHES)             2.038   1.656   1.215   0.418   0.420   0.498

 PERCOLATION FROM          0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   LAYER  2 (INCHES)       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

 LATERAL DRAINAGE FROM     0.0016  0.0015  0.0016  0.0016  0.0016  0.0016
   LAYER  9 (INCHES)       0.0016  0.0016  0.0015  0.0016  0.0015  0.0016

 PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
   LAYER 10 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-----------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS
-----------------------------------------------------------------------


 AVG. DAILY HEAD ON          0.00    0.00    0.00    0.00    0.00    0.00
   LAYER  2 (INCHES)         0.00    0.00    0.00    0.00    0.00    0.00

 STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
   ON LAYER  2 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

 AVG. DAILY HEAD ON          0.04    0.04    0.04    0.04    0.04    0.04
   LAYER 10 (INCHES)         0.04    0.04    0.04    0.04    0.04    0.04

 STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
   ON LAYER 10 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

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                    ANNUAL  TOTALS FOR YEAR    5
-------------------------------------------------------------------------
                                      (INCHES)    (CU. FT.)    PERCENT
                                      --------    ---------    -------
  PRECIPITATION                        16.39            1.     100.00

  RUNOFF                                3.987           0.      24.33

  EVAPOTRANSPIRATION                   11.855           1.      72.33

  PERCOLATION FROM LAYER  2             0.0000          0.       0.00

  LATERAL DRAINAGE FROM LAYER  9        0.0189          0.       0.12

  PERCOLATION FROM LAYER 10             0.0007          0.       0.00

  CHANGE IN WATER STORAGE               0.528           0.       3.22

  SOIL WATER AT START OF YEAR         182.57           15.

  SOIL WATER AT END OF YEAR           183.10           15.

  SNOW WATER AT START OF YEAR           0.00            0.

  SNOW WATER AT END OF YEAR             0.00            0.

  ANNUAL WATER BUDGET BALANCE           0.00            0.       0.00

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                    MONTHLY TOTALS FOR YEAR    6
-------------------------------------------------------------------------

                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)    0.59    1.56    2.31    0.22    2.72    6.74
                          2.28    1.59    2.13    2.39    0.04    1.40

RUNOFF (INCHES)           0.012   0.000   0.159   0.000   0.359   3.026
                          0.330   0.291   0.451   0.617   0.000   0.118

EVAPOTRANSPIRATION        0.375   0.996   2.167   1.519   2.362   2.712
     (INCHES)             2.441   1.809   1.202   1.665   0.625   0.744

PERCOLATION FROM          0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM     0.0016  0.0014  0.0016  0.0015  0.0015  0.0015
  LAYER  9 (INCHES)       0.0015  0.0015  0.0015  0.0015  0.0015  0.0015

  RCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

-------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS
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AVG. DAILY HEAD ON          0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)         0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON          0.04    0.04    0.04    0.04    0.04    0.04
  LAYER 10 (INCHES)         0.04    0.04    0.04    0.04    0.04    0.04

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

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                    ANNUAL TOTALS FOR YEAR    6
-----------------------------------------------------------------------
                                      (INCHES)    (CU. FT.)    PERCENT
                                      --------    ---------    -------
 PRECIPITATION                          23.97            2.     100.00

 RUNOFF                                  5.364           0.      22.38

 EVAPOTRANSPIRATION                     18.616           2.      77.66

 PERCOLATION FROM LAYER  2               0.0000          0.       0.00

 LATERAL DRAINAGE FROM LAYER  9          0.0181          0.       0.08

 PERCOLATION FROM LAYER 10               0.0007          0.       0.00

 CHANGE IN WATER STORAGE                -0.029           0.      -0.12

 SOIL WATER AT START OF YEAR           183.10           15.

 SOIL WATER AT END OF YEAR             183.07           15.

 SNOW WATER AT START OF YEAR             0.00            0.

 SNOW WATER AT END OF YEAR               0.00            0.

 ANNUAL WATER BUDGET BALANCE             0.00            0.       0.00

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                  MONTHLY TOTALS FOR YEAR    7
-----------------------------------------------------------------------

                           JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                           ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)      0.29    0.04    0.35    2.49    2.82    2.65
                            1.37    2.08    0.08    2.19    1.96    0.51
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RUNOFF (INCHES)            0.000   0.000   0.000   0.555   0.730   0.814
                           0.217   0.413   0.000   0.883   0.200   0.001

EVAPOTRANSPIRATION         0.828   0.040   0.290   1.967   2.120   1.709
    (INCHES)               1.072   1.874   0.080   0.968   1.586   0.925

PERCOLATION FROM           0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM      0.0015  0.0014  0.0015  0.0014  0.0015  0.0014
  LAYER  9 (INCHES)        0.0015  0.0015  0.0014  0.0015  0.0014  0.0015

PERCOLATION FROM           0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-----------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS
-----------------------------------------------------------------------


AVG. DAILY HEAD ON           0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)          0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON           0.04    0.04    0.04    0.04    0.04    0.04
  LAYER 10 (INCHES)          0.04    0.04    0.04    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

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                       ANNUAL TOTALS FOR YEAR   7
-----------------------------------------------------------------------
                                      (INCHES)    (CU. FT.)    PERCENT
                                      --------    ---------    -------
  PRECIPITATION                         16.83           1.     100.00

  RUNOFF                                3.814           0.      22.66

  EVAPOTRANSPIRATION                   13.457           1.      79.96

  PERCOLATION FROM LAYER  2             0.0000          0.       0.00

  LATERAL DRAINAGE FROM LAYER  9        0.0174          0.       0.10

  PERCOLATION FROM LAYER 10             0.0007          0.       0.00

  CHANGE IN WATER STORAGE              -0.459           0.      -2.73

  SOIL WATER AT START OF YEAR          183.07          15.

  SOIL WATER AT END OF YEAR            182.61          15.

  SNOW WATER AT START OF YEAR            0.00           0.

  SNOW WATER AT END OF YEAR              0.00           0.

  ANNUAL WATER BUDGET BALANCE            0.00           0.       0.00
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                      MONTHLY TOTALS FOR YEAR    8
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                          JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                          ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)     0.59    0.54    1.32    2.18    5.74    7.26
                           0.37    3.58    3.05    2.41    0.00    0.95

RUNOFF (INCHES)            0.001   0.000   0.289   0.794   2.192   3.822
                           0.000   2.158   0.668   0.342   0.000   0.326

EVAPOTRANSPIRATION         0.685   0.470   0.857   1.630   3.089   3.492
     (INCHES)              0.775   1.422   2.137   1.474   0.840   0.624

PERCOLATION FROM           0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM      0.0014  0.0014  0.0014  0.0014  0.0014  0.0014
  LAYER  9 (INCHES)        0.0014  0.0014  0.0014  0.0014  0.0014  0.0014

PERCOLATION FROM           0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-------------------------------------------------------------------------------
                    MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------------


AVG. DAILY HEAD ON           0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)          0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON           0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)          0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

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                       ANNUAL TOTALS FOR YEAR    8
-------------------------------------------------------------------------------
                                        (INCHES)    (CU. FT.)    PERCENT
                                        --------    ---------    -------
 PRECIPITATION                           27.99            2.     100.00

 RUNOFF                                  10.592           1.      37.84
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 EVAPOTRANSPIRATION              17.494         1.     62.50

 PERCOLATION FROM LAYER  2        0.0000        0.      0.00

 LATERAL DRAINAGE FROM LAYER  9   0.0168        0.      0.06

 PERCOLATION FROM LAYER 10        0.0007        0.      0.00

 CHANGE IN WATER STORAGE         -0.114         0.     -0.41

 SOIL WATER AT START OF YEAR    182.61         15.

 SOIL WATER AT END OF YEAR      182.50         15.

 SNOW WATER AT START OF YEAR      0.00          0.

 SNOW WATER AT END OF YEAR        0.00          0.

 ANNUAL WATER BUDGET BALANCE      0.00          0.      0.00

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                     MONTHLY TOTALS FOR YEAR    9
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                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)     0.63    0.57    2.43    0.60    2.60    1.15
                           1.35    7.16    1.12    0.13    0.10    0.05

RUNOFF (INCHES)            0.144   0.000   0.379   0.131   0.472   0.196
                           0.284   4.189   0.270   0.000   0.000   0.000

EVAPOTRANSPIRATION         0.155   0.516   1.714   1.051   2.268   0.954
    (INCHES)               1.066   2.122   1.700   0.130   0.100   0.040

PERCOLATION FROM           0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM      0.0014  0.0013  0.0014  0.0013  0.0014  0.0013
  LAYER  9 (INCHES)        0.0014  0.0014  0.0013  0.0014  0.0013  0.0014

PERCOLATION FROM           0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

------------------------------------------------------------------------------
                    MONTHLY SUMMARIES FOR DAILY HEADS
------------------------------------------------------------------------------


'G. DAILY HEAD ON           0.00    0.00    0.00    0.00    0.00    0.00
.AYER  2 (INCHES)           0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
 ON LAYER  2 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON          0.03    0.03    0.03    0.03    0.03    0.03
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```
  LAYER 10 (INCHES)        0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD    0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)     0.00    0.00    0.00    0.00    0.00    0.00

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                      ANNUAL TOTALS FOR YEAR    9
-----------------------------------------------------------------------
                                    (INCHES)    (CU. FT.)    PERCENT
                                    --------    ---------    -------
  PRECIPITATION                      17.89             1.    100.00

  RUNOFF                              6.064            1.     33.90

  EVAPOTRANSPIRATION                 11.816            1.     66.05

  PERCOLATION FROM LAYER  2           0.0000           0.      0.00

  LATERAL DRAINAGE FROM LAYER  9      0.0163           0.      0.09

  PERCOLATION FROM LAYER 10           0.0007           0.      0.00

  CHANGE IN WATER STORAGE            -0.007            0.     -0.04

  SOIL WATER AT START OF YEAR       182.50            15.

  SOIL WATER AT END OF YEAR         182.49            15.

  SNOW WATER AT START OF YEAR         0.00             0.

  SNOW WATER AT END OF YEAR           0.00             0.

  ANNUAL WATER BUDGET BALANCE         0.00             0.      0.00

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                    MONTHLY TOTALS FOR YEAR   10
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                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)    0.82    1.75    0.32    1.43    0.88    2.98
                          3.10    3.14    1.25    2.55    1.01    0.54

RUNOFF (INCHES)           0.142   0.078   0.000   0.117   0.232   0.649
                          0.924   1.148   0.014   0.714   0.446   0.032

EVAPOTRANSPIRATION        0.441   0.636   0.982   1.109   1.472   2.274
     (INCHES)             1.151   2.999   1.032   1.875   0.805   0.508

PERCOLATION FROM          0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
LATERAL DRAINAGE FROM     0.0014  0.0012  0.0014  0.0013  0.0014  0.0013
  LAYER  9 (INCHES)       0.0013  0.0013  0.0013  0.0013  0.0013  0.0013

PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

-------------------------------------------------------------------------
                 MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------


AVG. DAILY HEAD ON          0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)         0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON          0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)         0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

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                    ANNUAL TOTALS FOR YEAR   10
-------------------------------------------------------------------------
                                     (INCHES)   (CU. FT.)    PERCENT
                                     --------   ---------    -------
  PRECIPITATION                       19.77           2.     100.00

  RUNOFF                               4.495          0.      22.73

  EVAPOTRANSPIRATION                  15.285          1.      77.31

  PERCOLATION FROM LAYER  2            0.0000         0.       0.00

  LATERAL DRAINAGE FROM LAYER  9       0.0159         0.       0.08

  PERCOLATION FROM LAYER 10            0.0007         0.       0.00

  CHANGE IN WATER STORAGE             -0.026          0.      -0.13

  SOIL WATER AT START OF YEAR        182.49          15.

  SOIL WATER AT END OF YEAR          182.47          15.

  SNOW WATER AT START OF YEAR          0.00           0.

  SNOW WATER AT END OF YEAR            0.00           0.

  ANNUAL WATER BUDGET BALANCE          0.00           0.       0.00

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                  MONTHLY TOTALS FOR YEAR   11
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                        JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                        ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)    0.61    0.53    1.23    0.30    2.15    4.71
                          2.81    2.03    2.67    0.00    0.49    0.41

RUNOFF (INCHES)          0.002   0.006   0.178   0.012   0.456   1.544
                         0.756   0.402   1.367   0.000   0.011   0.000

EVAPOTRANSPIRATION       0.608   0.401   0.691   0.773   1.681   2.954
    (INCHES)             2.257   1.650   1.303   0.000   0.069   0.378

PERCOLATION FROM        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM   0.0013  0.0012  0.0013  0.0013  0.0013  0.0013
  LAYER  9 (INCHES)     0.0013  0.0013  0.0013  0.0013  0.0013  0.0013

PERCOLATION FROM        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)     0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-------------------------------------------------------------------
                 MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------


AVG. DAILY HEAD ON        0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD   0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)    0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON        0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)       0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD   0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)    0.00    0.00    0.00    0.00    0.00    0.00

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                   ANNUAL TOTALS FOR YEAR   11
-------------------------------------------------------------------
                                    (INCHES)    (CU. FT.)   PERCENT
                                    --------    ---------   -------
  PRECIPITATION                      17.94             1.    100.00

  RUNOFF                              4.733            0.     26.38

  EVAPOTRANSPIRATION                 12.766            1.     71.16

  PERCOLATION FROM LAYER  2           0.0000           0.      0.00

  LATERAL DRAINAGE FROM LAYER  9      0.0155           0.      0.09

  PERCOLATION FROM LAYER 10           0.0007           0.      0.00

  CHANGE IN WATER STORAGE             0.425            0.      2.37
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   SOIL WATER AT START OF YEAR         182.47          15.

   SOIL WATER AT END OF YEAR           182.89          15.

   SNOW WATER AT START OF YEAR           0.00           0.

   SNOW WATER AT END OF YEAR             0.00           0.

   ANNUAL WATER BUDGET BALANCE           0.00           0.       0.00

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                     MONTHLY TOTALS FOR YEAR   12
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                          JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                          ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)     0.59    0.61    0.00    0.00    3.81    6.37
                           2.22    6.97    1.39    0.17    0.25    0.20

RUNOFF (INCHES)            0.012   0.089   0.000   0.000   2.057   3.486
                           0.309   4.781   0.267   0.000   0.000   0.000

VAPOTRANSPIRATION          0.370   0.319   0.210   0.260   1.960   2.926
    (INCHES)               1.969   1.826   1.238   0.493   0.250   0.089

PERCOLATION FROM           0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM      0.0013  0.0012  0.0013  0.0013  0.0013  0.0012
  LAYER  9 (INCHES)        0.0013  0.0013  0.0012  0.0013  0.0012  0.0013

PERCOLATION FROM           0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

------------------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS
------------------------------------------------------------------------------


AVG. DAILY HEAD ON           0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)          0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON           0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)          0.03    0.03    0.03    0.03    0.03    0.03

TD. DEV. OF DAILY HEAD       0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

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                        ANNUAL TOTALS FOR YEAR   12
-------------------------------------------------------------------------------
                                     (INCHES)   (CU. FT.)   PERCENT
                                     --------   ---------   -------
  PRECIPITATION                        22.58           2.    100.00

  RUNOFF                               11.001          1.     48.72

  EVAPOTRANSPIRATION                   11.910          1.     52.75

  PERCOLATION FROM LAYER  2             0.0000         0.      0.00

  LATERAL DRAINAGE FROM LAYER  9        0.0152         0.      0.07

  PERCOLATION FROM LAYER 10             0.0007         0.      0.00

  CHANGE IN WATER STORAGE              -0.347          0.     -1.53

  SOIL WATER AT START OF YEAR         182.89          15.

  SOIL WATER AT END OF YEAR           182.54          15.

  SNOW WATER AT START OF YEAR           0.00           0.

  SNOW WATER AT END OF YEAR             0.00           0.

  ANNUAL WATER BUDGET BALANCE           0.00           0.      0.00

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                      MONTHLY TOTALS FOR YEAR   13
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                          JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                          ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)     0.26    0.15    0.32    2.47    2.39    2.69
                           1.08    4.26    0.64    0.21    0.00    0.48

RUNOFF (INCHES)            0.000   0.000   0.013   1.482   0.844   1.124
                           0.012   1.363   0.051   0.000   0.000   0.007

EVAPOTRANSPIRATION         0.310   0.180   0.120   0.610   2.056   1.652
     (INCHES)              1.038   2.927   0.589   0.136   0.074   0.210

PERCOLATION FROM           0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM      0.0013  0.0011  0.0013  0.0012  0.0013  0.0012
  LAYER  9 (INCHES)        0.0013  0.0013  0.0012  0.0013  0.0012  0.0013

PERCOLATION FROM           0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-------------------------------------------------------------------------------
                     MONTHLY SUMMARIES FOR DAILY HEADS
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AVG. DAILY HEAD ON           0.00     0.00     0.00     0.00     0.00     0.00
  LAYER  2 (INCHES)          0.00     0.00     0.00     0.00     0.00     0.00

STD. DEV. OF DAILY HEAD      0.00     0.00     0.00     0.00     0.00     0.00
  ON LAYER  2 (INCHES)       0.00     0.00     0.00     0.00     0.00     0.00

AVG. DAILY HEAD ON           0.03     0.03     0.03     0.03     0.03     0.03
  LAYER 10 (INCHES)          0.03     0.03     0.03     0.03     0.03     0.03

STD. DEV. OF DAILY HEAD      0.00     0.00     0.00     0.00     0.00     0.00
  ON LAYER 10 (INCHES)       0.00     0.00     0.00     0.00     0.00     0.00

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                     ANNUAL TOTALS FOR YEAR   13
-------------------------------------------------------------------------
                                       (INCHES)    (CU. FT.)   PERCENT
                                       --------    ---------   -------
  PRECIPITATION                         14.95             1.   100.00

  RUNOFF                                 4.896            0.    32.75

  EVAPOTRANSPIRATION                     9.902            1.    66.23

  PERCOLATION FROM LAYER  2              0.0000           0.     0.00

  LATERAL DRAINAGE FROM LAYER  9         0.0149           0.     0.10

  PERCOLATION FROM LAYER 10              0.0007           0.     0.00

  CHANGE IN WATER STORAGE                0.137            0.     0.91

  SOIL WATER AT START OF YEAR          182.54            15.

  SOIL WATER AT END OF YEAR            182.68            15.

  SNOW WATER AT START OF YEAR            0.00             0.

  SNOW WATER AT END OF YEAR              0.00             0.

  ANNUAL WATER BUDGET BALANCE            0.00             0.     0.00

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                   MONTHLY TOTALS FOR YEAR   14
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                          JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                          ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)     0.46    0.18    0.89    0.70    1.70    3.63
                           1.83    1.83    1.14    2.81    0.79    0.61
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RUNOFF (INCHES)            0.013   0.000   0.000   0.014   0.168   2.150
                           0.159   0.266   0.412   1.645   0.240   0.000

EVAPOTRANSPIRATION         0.289   0.365   0.478   0.312   2.516   1.231
    (INCHES)               1.745   1.777   0.728   0.895   0.701   0.565

PERCOLATION FROM           0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM      0.0013  0.0011  0.0012  0.0012  0.0012  0.0012
  LAYER  9 (INCHES)        0.0012  0.0012  0.0012  0.0012  0.0012  0.0012

PERCOLATION FROM           0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-----------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS
-----------------------------------------------------------------------


AVG. DAILY HEAD ON           0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)          0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON           0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)          0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

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                    ANNUAL TOTALS FOR YEAR   14
-----------------------------------------------------------------------
                                  (INCHES)    (CU. FT.)    PERCENT
                                  --------    ---------    -------
  PRECIPITATION                    16.57            1.     100.00

  RUNOFF                            5.068           0.      30.58

  EVAPOTRANSPIRATION               11.601           1.      70.01

  PERCOLATION FROM LAYER  2         0.0000          0.       0.00

  LATERAL DRAINAGE FROM LAYER  9    0.0146          0.       0.09

  PERCOLATION FROM LAYER 10         0.0007          0.       0.00

  CHANGE IN WATER STORAGE          -0.115           0.      -0.69

  SOIL WATER AT START OF YEAR     182.68           15.

  SOIL WATER AT END OF YEAR       182.57           15.

  SNOW WATER AT START OF YEAR       0.00            0.

  SNOW WATER AT END OF YEAR         0.00            0.
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 ANNUAL WATER BUDGET BALANCE           0.00              0.       0.00

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                    MONTHLY TOTALS FOR YEAR   15
-----------------------------------------------------------------------

                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)          0.65    0.08    1.91    0.52    0.68    1.85
                                1.30    4.08    0.39    1.22    0.99    0.79

RUNOFF (INCHES)                0.111   0.000   0.580   0.000   0.113   0.676
                               0.000   1.264   0.000   0.200   0.310   0.104

EVAPOTRANSPIRATION             0.359   0.424   1.044   0.772   0.324   1.295
     (INCHES)                  1.455   2.696   0.491   0.760   0.425   0.492

PERCOLATION FROM              0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)           0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM         0.0012  0.0011  0.0012  0.0012  0.0012  0.0012
  LAYER  9 (INCHES)           0.0012  0.0012  0.0012  0.0012  0.0012  0.0012

  RCOLATION FROM              0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)           0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-----------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS
-----------------------------------------------------------------------


AVG. DAILY HEAD ON               0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)              0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD          0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)           0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON               0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)              0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD          0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)           0.00    0.00    0.00    0.00    0.00    0.00

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                     ANNUAL TOTALS FOR YEAR   15
-----------------------------------------------------------------------
                                    (INCHES)    (CU. FT.)    PERCENT
                                    --------    ---------    -------

  PRECIPITATION                       14.46           1.     100.00

  RUNOFF                              3.359           0.      23.23
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   EVAPOTRANSPIRATION                 10.538           1.     72.88

   PERCOLATION FROM LAYER  2           0.0000          0.      0.00

   LATERAL DRAINAGE FROM LAYER  9      0.0144          0.      0.10

   PERCOLATION FROM LAYER 10           0.0007          0.      0.00

   CHANGE IN WATER STORAGE             0.548           0.      3.79

   SOIL WATER AT START OF YEAR       182.57           15.

   SOIL WATER AT END OF YEAR         183.12           15.

   SNOW WATER AT START OF YEAR         0.00            0.

   SNOW WATER AT END OF YEAR           0.00            0.

   ANNUAL WATER BUDGET BALANCE         0.00            0.      0.00

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                     MONTHLY TOTALS FOR YEAR   16
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                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)    1.00    0.07    0.88    0.76    1.47    3.61
                          2.05    1.96    1.22    2.20    0.12    0.17

RUNOFF (INCHES)           0.330   0.000   0.074   0.124   0.291   0.869
                          0.141   0.671   0.561   0.812   0.000   0.000

EVAPOTRANSPIRATION        0.542   0.647   1.029   0.692   0.755   2.276
     (INCHES)             2.799   0.964   0.985   0.822   0.488   0.333

PERCOLATION FROM          0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM     0.0012  0.0011  0.0012  0.0012  0.0012  0.0012
  LAYER  9 (INCHES)       0.0012  0.0012  0.0012  0.0012  0.0012  0.0012

PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


 ---------------------------------------------------------------------------
                    MONTHLY SUMMARIES FOR DAILY HEADS
 ---------------------------------------------------------------------------


AVG. DAILY HEAD ON          0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)         0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00
```

```
AVG. DAILY HEAD ON          0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)         0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

***********************************************************************


***********************************************************************

                      ANNUAL TOTALS FOR YEAR   16
-----------------------------------------------------------------------
                                        (INCHES)    (CU. FT.)    PERCENT
                                        --------    ---------    -------
  PRECIPITATION                          15.51            1.     100.00

  RUNOFF                                  3.871           0.      24.96

  EVAPOTRANSPIRATION                     12.331           1.      79.50

  PERCOLATION FROM LAYER  2               0.0000          0.       0.00

  LATERAL DRAINAGE FROM LAYER  9          0.0143          0.       0.09

  PERCOLATION FROM LAYER 10               0.0007          0.       0.00

  CHANGE IN WATER STORAGE                -0.706           0.      -4.56

  SOIL WATER AT START OF YEAR           183.12           15.

  SOIL WATER AT END OF YEAR             182.41           15.

  SNOW WATER AT START OF YEAR             0.00            0.

  SNOW WATER AT END OF YEAR               0.00            0.

  ANNUAL WATER BUDGET BALANCE             0.00            0.       0.00

***********************************************************************




***********************************************************************

                       MONTHLY TOTALS FOR YEAR   17
-----------------------------------------------------------------------

                            JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                            ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)       0.28    0.44    0.93    0.47    3.13    0.00
                             2.54    2.66    0.07    0.38    0.15    0.00

RUNOFF (INCHES)              0.000   0.001   0.049   0.000   1.014   0.000
                             0.676   0.588   0.000   0.008   0.000   0.000

EVAPOTRANSPIRATION           0.209   0.545   0.489   0.545   2.433   0.000
     (INCHES)                1.584   2.352   0.070   0.240   0.282   0.000

PERCOLATION FROM             0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)          0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
LATERAL DRAINAGE FROM     0.0012  0.0011  0.0012  0.0012  0.0012  0.0012
  LAYER  9 (INCHES)       0.0012  0.0012  0.0012  0.0012  0.0011  0.0012

PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-----------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS
-----------------------------------------------------------------------


AVG. DAILY HEAD ON          0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)         0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON          0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)         0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

***********************************************************************


***********************************************************************

                     ANNUAL TOTALS FOR YEAR   17
-----------------------------------------------------------------------
                                    (INCHES)    (CU. FT.)    PERCENT
                                    --------    ---------    -------
 PRECIPITATION                        11.05            1.     100.00

 RUNOFF                               2.335            0.      21.13

 EVAPOTRANSPIRATION                   8.750            1.      79.19

 PERCOLATION FROM LAYER  2           0.0000            0.       0.00

 LATERAL DRAINAGE FROM LAYER  9      0.0140            0.       0.13

 PERCOLATION FROM LAYER 10           0.0007            0.       0.01

 CHANGE IN WATER STORAGE             -0.050            0.      -0.45

 SOIL WATER AT START OF YEAR        182.41            15.

 SOIL WATER AT END OF YEAR          182.36            15.

 SNOW WATER AT START OF YEAR          0.00             0.

 SNOW WATER AT END OF YEAR            0.00             0.

 ANNUAL WATER BUDGET BALANCE          0.00             0.       0.00

***********************************************************************
```

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*******************************************************************************

                    MONTHLY TOTALS FOR YEAR   18
-------------------------------------------------------------------------------

                          JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                          ------- ------- ------- ------- ------- -------

 PRECIPITATION (INCHES)    0.00    0.43    1.28    0.33    1.51    1.17
                           2.00    2.76    4.61    0.60    0.00    0.11

 RUNOFF (INCHES)           0.000   0.000   0.194   0.000   0.234   0.096
                           0.486   0.848   1.465   0.155   0.000   0.000

 EVAPOTRANSPIRATION        0.000   0.248   0.388   0.370   2.076   1.114
     (INCHES)              1.514   1.796   2.683   0.686   0.338   0.110

 PERCOLATION FROM          0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   LAYER  2 (INCHES)       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

 LATERAL DRAINAGE FROM     0.0012  0.0011  0.0012  0.0011  0.0012  0.0011
   LAYER  9 (INCHES)       0.0012  0.0012  0.0011  0.0012  0.0011  0.0012

 PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
   LAYER 10 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


-------------------------------------------------------------------------------
                    MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------------


   G. DAILY HEAD ON          0.00    0.00    0.00    0.00    0.00    0.00
   LAYER  2 (INCHES)         0.00    0.00    0.00    0.00    0.00    0.00

 STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
   ON LAYER  2 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

 AVG. DAILY HEAD ON          0.03    0.03    0.03    0.03    0.03    0.03
   LAYER 10 (INCHES)         0.03    0.03    0.03    0.03    0.03    0.03

 STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
   ON LAYER 10 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

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                    ANNUAL TOTALS FOR YEAR   18
-------------------------------------------------------------------------------
                                      (INCHES)     (CU. FT.)     PERCENT
                                      --------     ---------     -------
  PRECIPITATION                        14.80              1.     100.00

  RUNOFF                                3.478             0.      23.50

  EVAPOTRANSPIRATION                   11.322             1.      76.50

  ERCOLATION FROM LAYER  2              0.0000            0.       0.00

  LATERAL DRAINAGE FROM LAYER  9        0.0139            0.       0.09

  PERCOLATION FROM LAYER 10             0.0007            0.       0.00
```

```
  CHANGE IN WATER STORAGE              -0.015          0.      -0.10

  SOIL WATER AT START OF YEAR          182.36          15.

  SOIL WATER AT END OF YEAR            182.34          15.

  SNOW WATER AT START OF YEAR            0.00          0.

  SNOW WATER AT END OF YEAR              0.00          0.

  ANNUAL WATER BUDGET BALANCE            0.00          0.       0.00

******************************************************************************




******************************************************************************

                      MONTHLY TOTALS FOR YEAR   19
------------------------------------------------------------------------------

                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)     0.08    0.72    1.00    0.54    4.04    2.16
                           0.23    0.28    2.41    0.89    0.00    0.49

RUNOFF (INCHES)            0.000   0.019   0.005   0.010   1.837   0.218
                           0.000   0.003   0.619   0.275   0.000   0.003

EVAPOTRANSPIRATION         0.038   0.533   0.880   0.855   1.459   2.481
     (INCHES)              0.434   0.277   1.129   0.724   0.439   0.258

PERCOLATION FROM           0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)        0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM      0.0012  0.0011  0.0012  0.0011  0.0012  0.0011
  LAYER  9 (INCHES)        0.0012  0.0012  0.0011  0.0012  0.0011  0.0012

PERCOLATION FROM           0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)        0.0001  0.0001  0.0001  0.0001  0.0001  0.0001


------------------------------------------------------------------------------
                    MONTHLY SUMMARIES FOR DAILY HEADS
------------------------------------------------------------------------------


AVG. DAILY HEAD ON           0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)          0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON           0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)          0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD      0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)       0.00    0.00    0.00    0.00    0.00    0.00

******************************************************************************
```

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*************************************************************************

                    ANNUAL TOTALS FOR YEAR  19
-------------------------------------------------------------------------
                                        (INCHES)    (CU. FT.)    PERCENT
                                        --------    ---------    -------
  PRECIPITATION                           12.84             1.    100.00

  RUNOFF                                  2.989             0.     23.28

  EVAPOTRANSPIRATION                      9.508             1.     74.05

  PERCOLATION FROM LAYER  2              0.0000             0.      0.00

  LATERAL DRAINAGE FROM LAYER  9         0.0138             0.      0.11

  PERCOLATION FROM LAYER 10              0.0007             0.      0.01

  CHANGE IN WATER STORAGE                 0.329             0.      2.56

  SOIL WATER AT START OF YEAR           182.34             15.

  SOIL WATER AT END OF YEAR             182.67             15.

  SNOW WATER AT START OF YEAR             0.00              0.

  SNOW WATER AT END OF YEAR               0.00              0.

  ANNUAL WATER BUDGET BALANCE             0.00              0.      0.00

*************************************************************************



*************************************************************************

                    MONTHLY TOTALS FOR YEAR  20
-------------------------------------------------------------------------

                         JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                         ------- ------- ------- ------- ------- -------

PRECIPITATION (INCHES)    1.46    0.16    0.48    2.01    2.40    2.88
                          3.10    5.36    2.46    0.99    0.25    0.24

RUNOFF (INCHES)           0.000   0.000   0.031   0.873   0.927   0.926
                          1.253   2.660   0.993   0.362   0.012   0.000

EVAPOTRANSPIRATION        0.473   0.494   0.795   1.083   2.177   1.670
     (INCHES)             1.883   2.792   0.877   0.691   0.373   0.321

PERCOLATION FROM          0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  LAYER  2 (INCHES)       0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

LATERAL DRAINAGE FROM     0.0012  0.0011  0.0012  0.0011  0.0012  0.0011
  LAYER  9 (INCHES)       0.0012  0.0012  0.0011  0.0012  0.0011  0.0012

PERCOLATION FROM          0.0001  0.0001  0.0001  0.0001  0.0001  0.0001
  LAYER 10 (INCHES)       0.0001  0.0001  0.0001  0.0001  0.0001  0.0001

-------------------------------------------------------------------------
```

```
                     MONTHLY SUMMARIES FOR DAILY HEADS
-------------------------------------------------------------------------


AVG. DAILY HEAD ON          0.00    0.00    0.00    0.00    0.00    0.00
  LAYER  2 (INCHES)         0.00    0.00    0.00    0.00    0.00    0.00

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER  2 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

AVG. DAILY HEAD ON          0.03    0.03    0.03    0.03    0.03    0.03
  LAYER 10 (INCHES)         0.03    0.03    0.03    0.03    0.03    0.03

STD. DEV. OF DAILY HEAD     0.00    0.00    0.00    0.00    0.00    0.00
  ON LAYER 10 (INCHES)      0.00    0.00    0.00    0.00    0.00    0.00

*************************************************************************


*************************************************************************

                        ANNUAL TOTALS FOR YEAR   20
-------------------------------------------------------------------------
                                       (INCHES)   (CU. FT.)   PERCENT
                                       --------   ---------   -------
  PRECIPITATION                          21.79          2.    100.00

  RUNOFF                                  8.038         1.     36.89

  EVAPOTRANSPIRATION                     13.629         1.     62.55

  PERCOLATION FROM LAYER  2               0.0000        0.      0.00

  LATERAL DRAINAGE FROM LAYER  9          0.0137        0.      0.06

  PERCOLATION FROM LAYER 10               0.0007        0.      0.00

  CHANGE IN WATER STORAGE                 0.108         0.      0.50

  SOIL WATER AT START OF YEAR           182.67         15.

  SOIL WATER AT END OF YEAR             182.78         15.

  SNOW WATER AT START OF YEAR             0.00          0.

  SNOW WATER AT END OF YEAR               0.00          0.

  ANNUAL WATER BUDGET BALANCE             0.00          0.      0.00

*************************************************************************




*************************************************************************

     AVERAGE MONTHLY VALUES IN INCHES FOR YEARS     1 THROUGH   20
-------------------------------------------------------------------------

                     JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                     ------- ------- ------- ------- ------- -------
 PRECIPITATION
 -------------
```

```
   TOTALS             0.48     0.52     1.01     0.89     2.06     3.32
                      1.87     3.31     1.94     1.22     0.47     0.49

   STD. DEVIATIONS    0.35     0.47     0.66     0.83     1.43     2.13
                      0.88     1.85     1.43     0.99     0.54     0.37

 RUNOFF
 ------
   TOTALS             0.042    0.027    0.115    0.220    0.627    1.335
                      0.360    1.311    0.638    0.345    0.109    0.031

   STD. DEVIATIONS    0.084    0.062    0.160    0.401    0.676    1.376
                      0.369    1.311    0.676    0.418    0.176    0.077

 EVAPOTRANSPIRATION
 ------------------
   TOTALS             0.336    0.425    0.804    0.842    1.621    1.890
                      1.576    2.015    1.197    0.848    0.463    0.390

   STD. DEVIATIONS    0.215    0.206    0.528    0.524    0.846    0.876
                      0.630    0.803    0.719    0.648    0.344    0.323

 PERCOLATION FROM LAYER  2
 -------------------------
   TOTALS             0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

   STD. DEVIATIONS    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

 LATERAL DRAINAGE FROM LAYER  9
 ------------------------------
   TOTALS             0.0014   0.0013   0.0014   0.0014   0.0014   0.0014
                      0.0014   0.0014   0.0014   0.0014   0.0014   0.0014

   STD. DEVIATIONS    0.0003   0.0003   0.0003   0.0003   0.0003   0.0003
                      0.0003   0.0003   0.0003   0.0003   0.0002   0.0002

 PERCOLATION FROM LAYER 10
 -------------------------
   TOTALS             0.0001   0.0001   0.0001   0.0001   0.0001   0.0001
                      0.0001   0.0001   0.0001   0.0001   0.0001   0.0001

   STD. DEVIATIONS    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

***********************************************************************


***********************************************************************

 AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   20
-----------------------------------------------------------------------
                                  (INCHES)         (CU. FT.)    PERCENT
                              ---------------     -----------   -------
  PRECIPITATION              17.59   ( 4.355)             1.    100.00

  RUNOFF                      5.162  ( 2.422)             0.     29.34

  EVAPOTRANSPIRATION         12.408  ( 2.688)             1.     70.54

  PERCOLATION FROM LAYER  2   0.0000 ( 0.0000)            0.      0.00

  LATERAL DRAINAGE FROM       0.0168 ( 0.0032)            0.      0.10
     LAYER  9
```

```
  PERCOLATION FROM LAYER 10     0.0007 ( 0.0000)          0.       0.00

  CHANGE IN WATER STORAGE       0.004  ( 0.325)           0.       0.02

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          PEAK DAILY VALUES FOR YEARS    1 THROUGH   20
   ----------------------------------------------------------------
                                          (INCHES)     (CU. FT.)
                                          --------     ---------
      PRECIPITATION                         3.82           0.3

      RUNOFF                                3.286          0.3

      PERCOLATION FROM LAYER  2             0.0000         0.0

      HEAD ON LAYER  2                      0.0

      LATERAL DRAINAGE FROM LAYER  9        0.0001         0.0

      PERCOLATION FROM LAYER 10             0.0000         0.0

      HEAD ON LAYER 10                      0.1

      SNOW WATER                            0.68           0.1


      MAXIMUM VEG. SOIL WATER (VOL/VOL)         0.2643

      MINIMUM VEG. SOIL WATER (VOL/VOL)         0.1871

*******************************************************************************



*******************************************************************************

            FINAL WATER STORAGE AT END OF YEAR   20
   ----------------------------------------------------------------
               LAYER       (INCHES)       (VOL/VOL)
               -----       --------       ---------
                 1            4.97          0.2071

                 2            3.18          0.2648

                 3           47.87          0.1995

                 4           48.32          0.2013

                 5           25.09          0.2091

                 6           25.21          0.2101

                 7           25.22          0.2102

                 8            2.24          0.1867

                 9            0.56          0.0463
```

```
                  10              0.12            0.4000

               SNOW WATER         0.00

****************************************************************************
****************************************************************************
```

APPENDIX D
MULTIMED MODEL RUNS

AMRBASE

```
1
















                         U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                         E X P O S U R E   A S S E S S M E N T

                                              M U L T I M E D I A   M O D E L

                                          MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage


 BASE MODEL - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                        Saturated and unsaturated zone models
 Run was                              DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
         - Total number of nodal points             240
 NMAT    - Number of different porous materials       1
 KPROP   - Van Genuchten or Brooks and Corey          1
 IMSHGN  - Spatial discretization option              1
 NVFLAYR - Number of layers in flow model             1
```

```
 OPTIONS CHOSEN
 ------- ------
 Van Genuchten functional coefficients
 User defined coordinate system
1


 Layer information
 -----------------
 LAYER NO.    LAYER THICKNESS    MATERIAL PROPERTY
 ---------    ---------------    -----------------
     1                31.80              1

                                          DATA FOR MATERIAL  1
                                          ---- --- --------
                                       VADOSE ZONE MATERIAL VARIABLES


            ------------------------------------------------------------------------------------------------------------------
                     VARIABLE NAME                 UNITS      DISTRIBUTION         PARAMETERS               LIMITS
                                                                                MEAN      STD DEV      MIN          MAX
            ------------------------------------------------------------------------------------------------------------------
            Saturated hydraulic conductivity        cm/hr       CONSTANT        0.360       -999.      0.100E-10  0.100E+05
            Unsaturated zone porosity                --         CONSTANT        0.430       -999.      0.100E-08  0.990
            Air entry pressure head                  m          CONSTANT        0.000E+00 -999.        0.000E+00  -999.
            Depth of the unsaturated zone            m          CONSTANT         31.8       -999.      0.100E-08  -999.

                                          DATA FOR MATERIAL  1
                                          ---- --- --------
                                       VADOSE ZONE FUNCTION VARIABLES


            ------------------------------------------------------------------------------------------------------------------
                     VARIABLE NAME                 UNITS      DISTRIBUTION         PARAMETERS               LIMITS
                                                                                MEAN      STD DEV      MIN          MAX
            ------------------------------------------------------------------------------------------------------------------
            Residual water content                   --         CONSTANT        0.700E-01 -999.        0.100E-08    1.00
            Brook and Corey exponent,EN              --         CONSTANT        0.000E+00 -999.        0.000E+00    10.0
            ALFA coefficient                        1/cm        CONSTANT        0.500E-02 -999.        0.000E+00    1.00
            Van Genuchten exponent, ENN              --         CONSTANT         1.09      -999.        1.00         5.00
1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY   - Number of different layers used               1
NTSTPS - Number of time values concentration calc     40
DUMMY  - Not presently used                            1
ISOL   - Type of scheme used in unsaturated zone       1
N      - Stehfest terms or number of increments       18
NTEL   - Points in Lagrangian interpolation            3
NGPTS  - Number of Gauss points                      104
NIT    - Convolution integral segments                 2
IBOUND - Type of boundary condition                    2
ITSGEN - Time values generated or input                1
TMAX   - Max simulation time              --           0.0
WTFUN  - Weighting factor                 --           1.2


OPTIONS CHOSEN
------- ------
Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations
```

```
1
                              DATA FOR LAYER   1
                              ---- --- -----
                              VADOSE TRANSPORT VARIABLES


 -----------------------------------------------------------------------------------------
          VARIABLE NAME                 UNITS    DISTRIBUTION        PARAMETERS              LIMITS
                                                                  MEAN      STD DEV      MIN          MAX
 -----------------------------------------------------------------------------------------
 Thickness of layer                       m        CONSTANT       31.8      -999.      0.100E-08  -999.
 Longitudinal dispersivity of layer       m        DERIVED       -999.      -999.      0.100E-02  0.100E+05
 Percent organic matter                   --       CONSTANT       1.00      -999.      0.000E+00   100.
 Bulk density of soil for layer          g/cc      CONSTANT       1.60      -999.      0.100E-01   5.00
 Biological decay coefficient            1/yr      CONSTANT      0.000E+00 -999.       0.000E+00  -999.
1
                             CHEMICAL SPECIFIC VARIABLES


 -----------------------------------------------------------------------------------------
          VARIABLE NAME                 UNITS    DISTRIBUTION        PARAMETERS              LIMITS
                                                                  MEAN      STD DEV      MIN          MAX
 -----------------------------------------------------------------------------------------
 Solid phase decay coefficient           1/yr      DERIVED       -999.      -999.      0.000E+00  0.100E+11
 Dissolved phase decay coefficient       1/yr      DERIVED       -999.      -999.      0.000E+00  0.100E+11
 Overall chemical decay coefficient      1/yr      DERIVED       -999.      -999.      0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate          l/M-yr    CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Neutral hydrolysis rate constant        1/yr      CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Base catalyzed hydrolysis rate          l/M-yr    CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Reference temperature                   C         CONSTANT       25.0      -999.      0.000E+00   100.
 Normalized distribution coefficient     ml/g      CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Distribution coefficient                 --       DERIVED       -999.      -999.      0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone)  1/yr      CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Air diffusion coefficient               cm2/s     CONSTANT      0.000E+00 -999.       0.000E+00   10.0
 Reference temperature for air diffusion C         CONSTANT       25.0      -999.      0.000E+00   100.
 Molecular weight                        g/M       CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Mole fraction of solute                  --       CONSTANT      0.000E+00 -999.       0.100E-08   1.00
 Vapor pressure of solute                mm Hg     CONSTANT      0.000E+00 -999.       0.000E+00   100.
 Henry's law constant                  atm-m^3/M   CONSTANT      0.000E+00 -999.       0.100E-09   1.00
 Overall 1st order decay sat. zone       1/yr      DERIVED       0.000E+00 0.000E+00   0.000E+00   1.00
 Not currently used                                CONSTANT      -999.      -999.      0.000E+00   1.00
 Not currently used                                CONSTANT      -999.      -999.      0.000E+00   1.00
1
                              SOURCE SPECIFIC VARIABLES


 -----------------------------------------------------------------------------------------
          VARIABLE NAME                 UNITS    DISTRIBUTION        PARAMETERS              LIMITS
                                                                  MEAN      STD DEV      MIN          MAX
 -----------------------------------------------------------------------------------------
 Infiltration rate                       m/yr      CONSTANT      0.273E-04 -999.       0.100E-09  0.100E+11
 Area of waste disposal unit             m^2       CONSTANT      0.197E+07 -999.       0.100E-01  -999.
 Duration of pulse                       yr        CONSTANT       200.      -999.      0.100E-08  -999.
 Spread of contaminant source            m         DERIVED       -999.      -999.      0.100E-08  0.100E+11
 Recharge rate                           m/yr      CONSTANT      0.000E+00 -999.       0.000E+00  0.100E+11
 Source decay constant                   1/yr      CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Initial concentration at landfill       mg/l      CONSTANT       1.00      -999.      0.000E+00  -999.
 Length scale of facility                m         DERIVED       -999.      -999.      0.100E-08  0.100E+11
 Width scale of facility                 m         DERIVED       -999.      -999.      0.100E-08  0.100E+11
 Near field dilution                               DERIVED        1.00     0.000E+00   0.000E+00   1.00
1
                              AQUIFER SPECIFIC VARIABLES
```

```
-------------------------------------------------------------------------------------------------------
          VARIABLE NAME                     UNITS     DISTRIBUTION         PARAMETERS             LIMITS
                                                                        MEAN      STD DEV      MIN         MAX
-------------------------------------------------------------------------------------------------------
Particle diameter                           cm         CONSTANT       0.100E-03  -999.      0.100E-08   100.
Aquifer porosity                            --         CONSTANT       0.200      -999.      0.100E-08   0.990
Bulk density                                g/cc       CONSTANT        1.50      -999.      0.100E-01   5.00
Aquifer thickness                           m          CONSTANT        12.2      -999.      0.100E-08   0.100E+06
Source thickness (mixing zone depth)        m          DERIVED        -999.      -999.      0.100E-08   0.100E+06
Conductivity (hydraulic)                    m/yr       CONSTANT        100.      -999.      0.100E-06   0.100E+09
Gradient (hydraulic)                                   CONSTANT       0.500E-02  -999.      0.100E-07   -999.
Groundwater seepage velocity                m/yr       DERIVED        -999.      -999.      0.100E-09   0.100E+09
Retardation coefficient                     --         DERIVED        -999.      -999.       1.00       0.100E+09
Longitudinal dispersivity                   m          FUNCTION OF X  -999.      -999.      -999.       -999.
Transverse dispersivity                     m          FUNCTION OF X  -999.      -999.      -999.       -999.
Vertical dispersivity                       m          FUNCTION OF X  -999.      -999.      -999.       -999.
Temperature of aquifer                      C          CONSTANT        28.0      -999.      0.000E+00   100.
pH                                          --         CONSTANT        7.50      -999.      0.300       14.0
Organic carbon content (fraction)                      CONSTANT       0.100E-02  -999.      0.100E-05   1.00
Well distance from site                     m          CONSTANT        15.0      -999.       1.00       -999.
Angle off center                          degree       CONSTANT       0.000E+00  -999.      0.000E+00   360.
Well vertical distance                      m          CONSTANT       0.000E+00  -999.      0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1052E-04
```

AMRDURTH

```
1
















                   U. S.   ENVIRONMENTAL   PROTECTION   AGENCY

                           EXPOSURE   ASSESSMENT

                             MULTIMEDIA   MODEL

                         MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage



 duration sensitivity - WHOLE SITE, AVG LEAKAGE 20-year duration
 Chemical simulated is DEFAULT CHEMICAL



 Option Chosen                      Saturated and unsaturated zone models
 Run was                            DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
  (input parameter description and value)
         - Total number of nodal points            240
 NMAT    - Number of different porous materials      1
 KPROP   - Van Genuchten or Brooks and Corey         1
 IMSHGN  - Spatial discretization option            1
 NVFLAYR - Number of layers in flow model            1
```

```
 OPTIONS CHOSEN
 ------- ------
 Van Genuchten functional coefficients
 User defined coordinate system
1


 Layer information
 -----------------
 LAYER NO.    LAYER THICKNESS    MATERIAL PROPERTY
 ---------    ---------------    -----------------
     1                  31.80             1

                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                     VADOSE ZONE MATERIAL VARIABLES


          ---------------------------------------------------------------------------------------------------
                   VARIABLE NAME                UNITS     DISTRIBUTION         PARAMETERS            LIMITS
                                                                             MEAN     STD DEV     MIN        MAX
          ---------------------------------------------------------------------------------------------------
          Saturated hydraulic conductivity      cm/hr       CONSTANT        0.360      -999.     0.100E-10  0.100E+05
          Unsaturated zone porosity              --         CONSTANT        0.430      -999.     0.100E-08  0.990
          Air entry pressure head                m          CONSTANT        0.000E+00 -999.      0.000E+00  -999.
          Depth of the unsaturated zone          m          CONSTANT         31.8      -999.     0.100E-08  -999.

                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                     VADOSE ZONE FUNCTION VARIABLES


          ---------------------------------------------------------------------------------------------------
                   VARIABLE NAME                UNITS     DISTRIBUTION         PARAMETERS            LIMITS
                                                                             MEAN     STD DEV     MIN        MAX
          ---------------------------------------------------------------------------------------------------
          Residual water content                 --         CONSTANT        0.700E-01 -999.      0.100E-08   1.00
          Brook and Corey exponent,EN            --         CONSTANT        0.000E+00 -999.      0.000E+00   10.0
          ALFA coefficient                      1/cm        CONSTANT        0.500E-02 -999.      0.000E+00   1.00
          Van Genuchten exponent, ENN            --         CONSTANT         1.09      -999.      1.00       5.00
1

 UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

 NLAY   - Number of different layers used              1
 NTSTPS - Number of time values concentration calc    40
 DUMMY  - Not presently used                           1
 ISOL   - Type of scheme used in unsaturated zone      1
 N      - Stehfest terms or number of increments      18
 NTEL   - Points in Lagrangian interpolation           3
 NGPTS  - Number of Gauss points                     104
 NIT    - Convolution integral segments                2
 IBOUND - Type of boundary condition                   2
 ITSGEN - Time values generated or input               1
 TMAX   - Max simulation time               --       0.0
 WTFUN  - Weighting factor                  --       1.2


 OPTIONS CHOSEN
 ------- ------
 Stehfest numerical inversion algorithm
 Nondecaying pulse source
 Computer generated times for computing concentrations
```

```
1
                                     DATA FOR LAYER   1
                                     ---- --- -----
                                     VADOSE TRANSPORT VARIABLES


 ------------------------------------------------------------------------------------------------
             VARIABLE NAME                 UNITS     DISTRIBUTION       PARAMETERS          LIMITS
                                                                     MEAN     STD DEV     MIN        MAX
 ------------------------------------------------------------------------------------------------
 Thickness of layer                          m         CONSTANT      31.8      -999.    0.100E-08  -999.
 Longitudinal dispersivity of layer          m         DERIVED      -999.      -999.    0.100E-02  0.100E+05
 Percent organic matter                      --        CONSTANT      1.00      -999.    0.000E+00   100.
 Bulk density of soil for layer             g/cc       CONSTANT      1.60      -999.    0.100E-01   5.00
 Biological decay coefficient               1/yr       CONSTANT    0.000E+00   -999.    0.000E+00  -999.
1
                                     CHEMICAL SPECIFIC VARIABLES


 ------------------------------------------------------------------------------------------------
             VARIABLE NAME                 UNITS     DISTRIBUTION       PARAMETERS          LIMITS
                                                                     MEAN     STD DEV     MIN        MAX
 ------------------------------------------------------------------------------------------------
 Solid phase decay coefficient              1/yr       DERIVED      -999.      -999.     0.000E+00  0.100E+11
 Dissolved phase decay coefficient          1/yr       DERIVED      -999.      -999.     0.000E+00  0.100E+11
 Overall chemical decay coefficient         1/yr       DERIVED      -999.      -999.     0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate            l/M-yr      CONSTANT    0.000E+00   -999.     0.000E+00  -999.
 Neutral hydrolysis rate constant           1/yr       CONSTANT    0.000E+00   -999.     0.000E+00  -999.
 Base catalyzed hydrolysis rate            l/M-yr      CONSTANT    0.000E+00   -999.     0.000E+00  -999.
 Reference temperature                       C         CONSTANT     25.0       -999.     0.000E+00   100.
 Normalized distribution coefficient        ml/g       CONSTANT    0.000E+00   -999.     0.000E+00  -999.
 Distribution coefficient                    --        DERIVED      -999.      -999.     0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone)     1/yr       CONSTANT    0.000E+00   -999.     0.000E+00  -999.
 Air diffusion coefficient                 cm2/s       CONSTANT    0.000E+00   -999.     0.000E+00   10.0
 Reference temperature for air diffusion     C         CONSTANT     25.0       -999.     0.000E+00   100.
 Molecular weight                           g/M        CONSTANT    0.000E+00   -999.     0.000E+00  -999.
 Mole fraction of solute                     --        CONSTANT    0.000E+00   -999.     0.100E-08   1.00
 Vapor pressure of solute                  mm Hg       CONSTANT    0.000E+00   -999.     0.000E+00   100.
 Henry's law constant                    atm-m^3/M     CONSTANT    0.000E+00   -999.     0.100E-09   1.00
 Overall 1st order decay sat. zone          1/yr       DERIVED     0.000E+00 0.000E+00   0.000E+00   1.00
 Not currently used                                    CONSTANT     -999.      -999.     0.000E+00   1.00
 Not currently used                                    CONSTANT     -999.      -999.     0.000E+00   1.00
1
                                     SOURCE SPECIFIC VARIABLES


 ------------------------------------------------------------------------------------------------
             VARIABLE NAME                 UNITS     DISTRIBUTION       PARAMETERS          LIMITS
                                                                     MEAN     STD DEV     MIN        MAX
 ------------------------------------------------------------------------------------------------
 Infiltration rate                          m/yr       CONSTANT    0.273E-04   -999.     0.100E-09  0.100E+11
 Area of waste disposal unit                m^2        CONSTANT    0.197E+07   -999.     0.100E-01  -999.
 Duration of pulse                           yr        CONSTANT     20.0       -999.     0.100E-08  -999.
 Spread of contaminant source                m         DERIVED      -999.      -999.     0.100E-08  0.100E+11
 Recharge rate                              m/yr       CONSTANT    0.000E+00   -999.     0.000E+00  0.100E+11
 Source decay constant                      1/yr       CONSTANT    0.000E+00   -999.     0.000E+00  -999.
 Initial concentration at landfill          mg/l       CONSTANT     1.00       -999.     0.000E+00  -999.
 Length scale of facility                    m         DERIVED      -999.      -999.     0.100E-08  0.100E+11
 Width scale of facility                     m         DERIVED      -999.      -999.     0.100E-08  0.100E+11
 Near field dilution                                   DERIVED      1.00     0.000E+00   0.000E+00   1.00
1
                                     AQUIFER SPECIFIC VARIABLES
```

```
-----------------------------------------------------------------------------------------------------------
            VARIABLE NAME                    UNITS     DISTRIBUTION          PARAMETERS             LIMITS
                                                                         MEAN       STD DEV     MIN         MAX
-----------------------------------------------------------------------------------------------------------
Particle diameter                            cm        CONSTANT        0.100E-03  -999.     0.100E-08   100.
Aquifer porosity                             --        CONSTANT        0.200      -999.     0.100E-08   0.990
Bulk density                                 g/cc      CONSTANT         1.50      -999.     0.100E-01   5.00
Aquifer thickness                            m         CONSTANT         12.2      -999.     0.100E-08   0.100E+06
Source thickness (mixing zone depth)         m         DERIVED         -999.      -999.     0.100E-08   0.100E+06
Conductivity (hydraulic)                     m/yr      CONSTANT         100.      -999.     0.100E-06   0.100E+09
Gradient (hydraulic)                                   CONSTANT        0.500E-02  -999.     0.100E-07   -999.
Groundwater seepage velocity                 m/yr      DERIVED         -999.      -999.     0.100E-09   0.100E+09
Retardation coefficient                      --        DERIVED         -999.      -999.      1.00       0.100E+09
Longitudinal dispersivity                    m         FUNCTION OF X   -999.      -999.     -999.       -999.
Transverse dispersivity                      m         FUNCTION OF X   -999.      -999.     -999.       -999.
Vertical dispersivity                        m         FUNCTION OF X   -999.      -999.     -999.       -999.
Temperature of aquifer                       C         CONSTANT         28.0      -999.     0.000E+00   100.
pH                                           --        CONSTANT         7.50      -999.     0.300       14.0
Organic carbon content (fraction)                      CONSTANT        0.100E-02  -999.     0.100E-05   1.00
Well distance from site                      m         CONSTANT         15.0      -999.      1.00       -999.
Angle off center                             degree    CONSTANT        0.000E+00  -999.     0.000E+00   360.
Well vertical distance                       m         CONSTANT        0.000E+00  -999.     0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1051E-05
```

AM DURTN2

```
1





                    U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                     E X P O S U R E   A S S E S S M E N T

                                         M U L T I M E D I A   M O D E L

                                        MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage



 duration sensitivity - WHOLE SITE, AVG LEAKAGE 2000-year duration
 Chemical simulated is DEFAULT CHEMICAL



 Option Chosen                          Saturated and unsaturated zone models
 Run was                                DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
         - Total number of nodal points              240
 NMAT    - Number of different porous materials        1
 KPROP   - Van Genuchten or Brooks and Corey           1
 IMSHGN  - Spatial discretization option               1
 NVFLAYR - Number of layers in flow model              1
```

```
 OPTIONS CHOSEN
 ------- ------
 Van Genuchten functional coefficients
 User defined coordinate system
1


 Layer information
 -----------------
 LAYER NO.    LAYER THICKNESS    MATERIAL PROPERTY
 ---------    ---------------    -----------------
     1              31.80                1


                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                     VADOSE ZONE MATERIAL VARIABLES


          -------------------------------------------------------------------------------------------
                  VARIABLE NAME               UNITS     DISTRIBUTION       PARAMETERS         LIMITS
                                                                        MEAN     STD DEV    MIN       MAX
          -------------------------------------------------------------------------------------------
          Saturated hydraulic conductivity    cm/hr     CONSTANT       0.360     -999.   0.100E-10 0.100E+05
          Unsaturated zone porosity           --        CONSTANT       0.430     -999.   0.100E-08 0.990
          Air entry pressure head             m         CONSTANT       0.000E+00 -999.   0.000E+00 -999.
          Depth of the unsaturated zone       m         CONSTANT        31.8     -999.   0.100E-08 -999.

                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                     VADOSE ZONE FUNCTION VARIABLES


          -------------------------------------------------------------------------------------------
                  VARIABLE NAME               UNITS     DISTRIBUTION       PARAMETERS         LIMITS
                                                                        MEAN     STD DEV    MIN       MAX
          -------------------------------------------------------------------------------------------
          Residual water content              --        CONSTANT       0.700E-01 -999.   0.100E-08  1.00
          Brook and Corey exponent,EN         --        CONSTANT       0.000E+00 -999.   0.000E+00  10.0
          ALFA coefficient                    1/cm      CONSTANT       0.500E-02 -999.   0.000E+00  1.00
          Van Genuchten exponent, ENN         --        CONSTANT        1.09     -999.    1.00      5.00
1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY    - Number of different layers used              1
NTSTPS  - Number of time values concentration calc    40
DUMMY   - Not presently used                           1
ISOL    - Type of scheme used in unsaturated zone      1
N       - Stehfest terms or number of increments      18
NTEL    - Points in Lagrangian interpolation           3
NGPTS   - Number of Gauss points                     104
NIT     - Convolution integral segments                2
IBOUND  - Type of boundary condition                   2
ITSGEN  - Time values generated or input               1
TMAX    - Max simulation time              --        0.0
WTFUN   - Weighting factor                 --        1.2


OPTIONS CHOSEN
------- ------
Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations
```

```
1
                                        DATA FOR LAYER   1
                                        ---- --- -----
                                        VADOSE TRANSPORT VARIABLES


 ---------------------------------------------------------------------------------------------------------------------
          VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                     MEAN      STD DEV      MIN          MAX
 ---------------------------------------------------------------------------------------------------------------------
 Thickness of layer                        m          CONSTANT        31.8      -999.       0.100E-08   -999.
 Longitudinal dispersivity of layer        m          DERIVED        -999.      -999.       0.100E-02   0.100E+05
 Percent organic matter                    --         CONSTANT        1.00      -999.       0.000E+00    100.
 Bulk density of soil for layer           g/cc        CONSTANT        1.60      -999.       0.100E-01    5.00
 Biological decay coefficient             1/yr        CONSTANT       0.000E+00  -999.       0.000E+00   -999.
1
                                        CHEMICAL SPECIFIC VARIABLES


 ---------------------------------------------------------------------------------------------------------------------
          VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                     MEAN      STD DEV      MIN          MAX
 ---------------------------------------------------------------------------------------------------------------------
 Solid phase decay coefficient            1/yr        DERIVED        -999.      -999.       0.000E+00   0.100E+11
 Dissolved phase decay coefficient        1/yr        DERIVED        -999.      -999.       0.000E+00   0.100E+11
 Overall chemical decay coefficient       1/yr        DERIVED        -999.      -999.       0.000E+00   0.100E+11
 Acid catalyzed hydrolysis rate           l/M-yr      CONSTANT       0.000E+00  -999.       0.000E+00   -999.
 Neutral hydrolysis rate constant         1/yr        CONSTANT       0.000E+00  -999.       0.000E+00   -999.
 Base catalyzed hydrolysis rate           l/M-yr      CONSTANT       0.000E+00  -999.       0.000E+00   -999.
 Reference temperature                    C           CONSTANT        25.0      -999.       0.000E+00    100.
 Normalized distribution coefficient      ml/g        CONSTANT       0.000E+00  -999.       0.000E+00   -999.
 Distribution coefficient                  --         DERIVED        -999.      -999.       0.000E+00   0.100E+11
 Biodegradation coefficient (sat. zone)   1/yr        CONSTANT       0.000E+00  -999.       0.000E+00   -999.
 Air diffusion coefficient                cm2/s       CONSTANT       0.000E+00  -999.       0.000E+00    10.0
 Reference temperature for air diffusion  C           CONSTANT        25.0      -999.       0.000E+00    100.
 Molecular weight                         g/M         CONSTANT       0.000E+00  -999.       0.000E+00   -999.
 Mole fraction of solute                  --          CONSTANT       0.000E+00  -999.       0.100E-08    1.00
 Vapor pressure of solute                 mm Hg       CONSTANT       0.000E+00  -999.       0.000E+00    100.
 Henry's law constant                   atm-m^3/M     CONSTANT       0.000E+00  -999.       0.100E-09    1.00
 Overall 1st order decay sat. zone        1/yr        DERIVED        0.000E+00 0.000E+00    0.000E+00    1.00
 Not currently used                                   CONSTANT       -999.      -999.       0.000E+00    1.00
 Not currently used                                   CONSTANT       -999.      -999.       0.000E+00    1.00
1
                                        SOURCE SPECIFIC VARIABLES


 ---------------------------------------------------------------------------------------------------------------------
          VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                     MEAN      STD DEV      MIN          MAX
 ---------------------------------------------------------------------------------------------------------------------
 Infiltration rate                        m/yr        CONSTANT       0.273E-04  -999.       0.100E-09   0.100E+11
 Area of waste disposal unit              m^2         CONSTANT       0.197E+07  -999.       0.100E-01   -999.
 Duration of pulse                        yr          CONSTANT       0.200E+04  -999.       0.100E-08   -999.
 Spread of contaminant source             m           DERIVED        -999.      -999.       0.100E-08   0.100E+11
 Recharge rate                            m/yr        CONSTANT       0.000E+00  -999.       0.000E+00   0.100E+11
 Source decay constant                    1/yr        CONSTANT       0.000E+00  -999.       0.000E+00   -999.
 Initial concentration at landfill        mg/l        CONSTANT        1.00      -999.       0.000E+00   -999.
 Length scale of facility                 m           DERIVED        -999.      -999.       0.100E-08   0.100E+11
 Width scale of facility                  m           DERIVED        -999.      -999.       0.100E-08   0.100E+11
 Near field dilution                                  DERIVED         1.00     0.000E+00    0.000E+00    1.00
1
                                        AQUIFER SPECIFIC VARIABLES
```

```
---------------------------------------------------------------------------------------------------
          VARIABLE NAME                  UNITS     DISTRIBUTION        PARAMETERS            LIMITS
                                                                     MEAN     STD DEV     MIN         MAX
---------------------------------------------------------------------------------------------------
 Particle diameter                        cm        CONSTANT        0.100E-03 -999.     0.100E-08   100.
 Aquifer porosity                         --        CONSTANT        0.200     -999.     0.100E-08  0.990
 Bulk density                             g/cc      CONSTANT         1.50     -999.     0.100E-01   5.00
 Aquifer thickness                        m         CONSTANT         12.2     -999.     0.100E-08  0.100E+06
 Source thickness (mixing zone depth)     m         DERIVED         -999.     -999.     0.100E-08  0.100E+06
 Conductivity (hydraulic)                 m/yr      CONSTANT         100.     -999.     0.100E-06  0.100E+09
 Gradient (hydraulic)                               CONSTANT        0.500E-02 -999.     0.100E-07  -999.
 Groundwater seepage velocity             m/yr      DERIVED         -999.     -999.     0.100E-09  0.100E+09
 Retardation coefficient                  --        DERIVED         -999.     -999.      1.00      0.100E+09
 Longitudinal dispersivity                m         FUNCTION OF X   -999.     -999.     -999.      -999.
 Transverse dispersivity                  m         FUNCTION OF X   -999.     -999.     -999.      -999.
 Vertical dispersivity                    m         FUNCTION OF X   -999.     -999.     -999.      -999.
 Temperature of aquifer                   C         CONSTANT         28.0     -999.     0.000E+00   100.
 pH                                       --        CONSTANT         7.50     -999.     0.300       14.0
 Organic carbon content (fraction)                  CONSTANT        0.100E-02 -999.     0.100E-05   1.00
 Well distance from site                  m         CONSTANT         15.0     -999.      1.00      -999.
 Angle off center                       degree      CONSTANT        0.000E+00 -999.     0.000E+00   360.
 Well vertical distance                   m         CONSTANT        0.000E+00 -999.     0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1063E-03
```

AMR INFIL

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1





                    U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                      E X P O S U R E   A S S E S S M E N T

                                          M U L T I M E D I A   M O D E L

                                      MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage


 infiltration sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                         Saturated and unsaturated zone models
 Run was                               DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
  (input parameter description and value)
         - Total number of nodal points             240
 NMAT    - Number of different porous materials       1
 KPROP   - Van Genuchten or Brooks and Corey          1
 IMSHGN  - Spatial discretization option              1
 NVFLAYR - Number of layers in flow model             1
```

```
 OPTIONS CHOSEN
 ------- ------
 Van Genuchten functional coefficients
 User defined coordinate system
1


 Layer information
 -----------------
 LAYER NO.    LAYER THICKNESS     MATERIAL PROPERTY
 ---------    ---------------     -----------------
     1                 44.20               1


                                           DATA FOR MATERIAL  1
                                           ---- --- --------
                                        VADOSE ZONE MATERIAL VARIABLES


          ----------------------------------------------------------------------------------------------------
                   VARIABLE NAME                UNITS      DISTRIBUTION        PARAMETERS           LIMITS
                                                                             MEAN     STD DEV     MIN         MAX
          ----------------------------------------------------------------------------------------------------
          Saturated hydraulic conductivity      cm/hr        CONSTANT      0.360     -999.     0.100E-10  0.100E+05
          Unsaturated zone porosity              --          CONSTANT      0.430     -999.     0.100E-08  0.990
          Air entry pressure head                m           CONSTANT      0.000E+00 -999.     0.000E+00  -999.
          Depth of the unsaturated zone          m           CONSTANT       44.2     -999.     0.100E-08  -999.

                                           DATA FOR MATERIAL  1
                                           ---- --- --------
                                        VADOSE ZONE FUNCTION VARIABLES


          ----------------------------------------------------------------------------------------------------
                   VARIABLE NAME                UNITS      DISTRIBUTION        PARAMETERS           LIMITS
                                                                             MEAN     STD DEV     MIN         MAX
          ----------------------------------------------------------------------------------------------------
          Residual water content                 --          CONSTANT      0.700E-01 -999.     0.100E-08   1.00
          Brook and Corey exponent,EN            --          CONSTANT      0.000E+00 -999.     0.000E+00   10.0
          ALFA coefficient                      1/cm         CONSTANT      0.500E-02 -999.     0.000E+00   1.00
          Van Genuchten exponent, ENN            --          CONSTANT       1.09     -999.      1.00       5.00
1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY   - Number of different layers used            1
NTSTPS - Number of time values concentration calc  40
DUMMY  - Not presently used                         1
ISOL   - Type of scheme used in unsaturated zone    1
N      - Stehfest terms or number of increments    18
NTEL   - Points in Lagrangian interpolation         3
NGPTS  - Number of Gauss points                   104
NIT    - Convolution integral segments              2
IBOUND - Type of boundary condition                 2
ITSGEN - Time values generated or input             1
TMAX   - Max simulation time            --        0.0
WTFUN  - Weighting factor               --        1.2


OPTIONS CHOSEN
------- ------
Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations
```

```
1

                                      DATA FOR LAYER    1
                                      ---- --- -----
                                      VADOSE TRANSPORT VARIABLES


 -----------------------------------------------------------------------------------------------------------------
          VARIABLE NAME                     UNITS      DISTRIBUTION        PARAMETERS               LIMITS
                                                                        MEAN      STD DEV      MIN          MAX
 -----------------------------------------------------------------------------------------------------------------
 Thickness of layer                          m          CONSTANT        44.2       -999.      0.100E-08  -999.
 Longitudinal dispersivity of layer          m          DERIVED        -999.       -999.      0.100E-02  0.100E+05
 Percent organic matter                      --         CONSTANT        1.00       -999.      0.000E+00   100.
 Bulk density of soil for layer             g/cc        CONSTANT        1.60       -999.      0.100E-01   5.00
 Biological decay coefficient               1/yr        CONSTANT       0.000E+00  -999.      0.000E+00  -999.
1
                                      CHEMICAL SPECIFIC VARIABLES


 -----------------------------------------------------------------------------------------------------------------
          VARIABLE NAME                     UNITS      DISTRIBUTION        PARAMETERS               LIMITS
                                                                        MEAN      STD DEV      MIN          MAX
 -----------------------------------------------------------------------------------------------------------------
 Solid phase decay coefficient              1/yr        DERIVED        -999.       -999.      0.000E+00  0.100E+11
 Dissolved phase decay coefficient          1/yr        DERIVED        -999.       -999.      0.000E+00  0.100E+11
 Overall chemical decay coefficient         1/yr        DERIVED        -999.       -999.      0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate             l/M-yr      CONSTANT       0.000E+00  -999.      0.000E+00  -999.
 Neutral hydrolysis rate constant           1/yr        CONSTANT       0.000E+00  -999.      0.000E+00  -999.
 Base catalyzed hydrolysis rate             l/M-yr      CONSTANT       0.000E+00  -999.      0.000E+00  -999.
 Reference temperature                      C           CONSTANT        25.0       -999.      0.000E+00   100.
 Normalized distribution coefficient        ml/g        CONSTANT       0.000E+00  -999.      0.000E+00  -999.
 Distribution coefficient                    --         DERIVED        -999.       -999.      0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone)     1/yr        CONSTANT       0.000E+00  -999.      0.000E+00  -999.
 Air diffusion coefficient                  cm2/s       CONSTANT       0.000E+00  -999.      0.000E+00   10.0
 Reference temperature for air diffusion    C           CONSTANT        25.0       -999.      0.000E+00   100.
 Molecular weight                           g/M         CONSTANT       0.000E+00  -999.      0.000E+00  -999.
 Mole fraction of solute                     --         CONSTANT       0.000E+00  -999.      0.100E-08   1.00
 Vapor pressure of solute                   mm Hg       CONSTANT       0.000E+00  -999.      0.000E+00   100.
 Henry's law constant                     atm-m^3/M     CONSTANT       0.000E+00  -999.      0.100E-09   1.00
 Overall 1st order decay sat. zone          1/yr        DERIVED        0.000E+00 0.000E+00   0.000E+00   1.00
 Not currently used                                     CONSTANT       -999.       -999.      0.000E+00   1.00
 Not currently used                                     CONSTANT       -999.       -999.      0.000E+00   1.00
1
                                      SOURCE SPECIFIC VARIABLES


 -----------------------------------------------------------------------------------------------------------------
          VARIABLE NAME                     UNITS      DISTRIBUTION        PARAMETERS               LIMITS
                                                                        MEAN      STD DEV      MIN          MAX
 -----------------------------------------------------------------------------------------------------------------
 Infiltration rate                          m/yr        CONSTANT       0.273E-04  -999.      0.100E-09  0.100E+11
 Area of waste disposal unit                m^2         CONSTANT       0.197E+07  -999.      0.100E-01  -999.
 Duration of pulse                          yr          CONSTANT        200.       -999.      0.100E-08  -999.
 Spread of contaminant source               m           DERIVED        -999.       -999.      0.100E-08  0.100E+11
 Recharge rate                              m/yr        CONSTANT       0.000E+00  -999.      0.000E+00  0.100E+11
 Source decay constant                      1/yr        CONSTANT       0.000E+00  -999.      0.000E+00  -999.
 Initial concentration at landfill          mg/l        CONSTANT       -1.00       -999.      0.000E+00  -999..
 Length scale of facility                   m           DERIVED        -999.       -999.      0.100E-08  0.100E+11
 Width scale of facility                    m           DERIVED        -999.       -999.      0.100E-08  0.100E+11
 Near field dilution                                    DERIVED         1.00      0.000E+00  0.000E+00   1.00
1
                                      AQUIFER SPECIFIC VARIABLES
```

```
1

                                   DATA FOR LAYER   1
                                   ---- --- -----
                                   VADOSE TRANSPORT VARIABLES


 ------------------------------------------------------------------------------------------------------
           VARIABLE NAME               UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                   MEAN      STD DEV     MIN           MAX
 ------------------------------------------------------------------------------------------------------
 Thickness of layer                      m          CONSTANT       31.8      -999.      0.100E-08  -999.
 Longitudinal dispersivity of layer      m          DERIVED       -999.      -999.      0.100E-02  0.100E+05
 Percent organic matter                  --         CONSTANT       1.00      -999.      0.000E+00   100.
 Bulk density of soil for layer         g/cc        CONSTANT       1.60      -999.      0.100E-01   5.00
 Biological decay coefficient          1/yr         CONSTANT      0.000E+00 -999.       0.000E+00  -999.
1
                                  CHEMICAL SPECIFIC VARIABLES


 ------------------------------------------------------------------------------------------------------
           VARIABLE NAME               UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                   MEAN      STD DEV     MIN           MAX
 ------------------------------------------------------------------------------------------------------
 Solid phase decay coefficient          1/yr        DERIVED       -999.      -999.      0.000E+00  0.100E+11
 Dissolved phase decay coefficient      1/yr        DERIVED       -999.      -999.      0.000E+00  0.100E+11
 Overall chemical decay coefficient     1/yr        DERIVED       -999.      -999.      0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate         l/M-yr      CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Neutral hydrolysis rate constant       1/yr        CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Base catalyzed hydrolysis rate         l/M-yr      CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Reference temperature                  C           CONSTANT       25.0      -999.      0.000E+00   100.
 Normalized distribution coefficient    ml/g        CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Distribution coefficient                --         DERIVED       -999.      -999.      0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone) 1/yr        CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Air diffusion coefficient              cm2/s       CONSTANT      0.000E+00 -999.       0.000E+00   10.0
 Reference temperature for air diffusion C          CONSTANT       25.0      -999.      0.000E+00   100.
 Molecular weight                       g/M         CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Mole fraction of solute                 --         CONSTANT      0.000E+00 -999.       0.100E-08   1.00
 Vapor pressure of solute               mm Hg       CONSTANT      0.000E+00 -999.       0.000E+00   100.
 Henry's law constant                 atm-m^3/M     CONSTANT      0.000E+00 -999.       0.100E-09   1.00
 Overall 1st order decay sat. zone      1/yr        DERIVED       0.000E+00 0.000E+00   0.000E+00   1.00
 Not currently used                                 CONSTANT      -999.      -999.      0.000E+00   1.00
 Not currently used                                 CONSTANT      -999.      -999.      0.000E+00   1.00
1
                                   SOURCE SPECIFIC VARIABLES


 ------------------------------------------------------------------------------------------------------
           VARIABLE NAME               UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                   MEAN      STD DEV     MIN           MAX
 ------------------------------------------------------------------------------------------------------
 Infiltration rate                      m/yr        CONSTANT      0.273E-04 -999.       0.100E-09  0.100E+11
 Area of waste disposal unit            m^2         CONSTANT      0.197E+07 -999.       0.100E-01  -999.
 Duration of pulse                      yr          CONSTANT       200.      -999.      0.100E-08  -999.
 Spread of contaminant source           m           DERIVED       -999.      -999.      0.100E-08  0.100E+11
 Recharge rate                          m/yr        CONSTANT      0.000E+00 -999.       0.000E+00  0.100E+11
 Source decay constant                  1/yr        CONSTANT      0.000E+00 -999.       0.000E+00  -999.
 Initial concentration at landfill      mg/l        CONSTANT       1.00      -999.      0.000E+00  -999.
 Length scale of facility               m           DERIVED       -999.      -999.      0.100E-08  0.100E+11
 Width scale of facility                m           DERIVED       -999.      -999.      0.100E-08  0.100E+1
 Near field dilution                                DERIVED        1.00     0.000E+00   0.000E+00   1.00
1
                                  AQUIFER SPECIFIC VARIABLES
```

```
---------------------------------------------------------------------------------------------------------
          VARIABLE NAME                  UNITS     DISTRIBUTION        PARAMETERS                LIMITS
                                                                     MEAN      STD DEV       MIN         MAX
---------------------------------------------------------------------------------------------------------
Particle diameter                         cm        CONSTANT       0.100E-03 -999.        0.100E-08   100.
Aquifer porosity                          --        CONSTANT       0.200      -999.       0.100E-08  0.990
Bulk density                              g/cc      CONSTANT        1.50      -999.       0.100E-01   5.00
Aquifer thickness                         m         CONSTANT        12.2      -999.       0.100E-08  0.100E+06
Source thickness (mixing zone depth)      m         DERIVED        -999.      -999.       0.100E-08  0.100E+06
Conductivity (hydraulic)                  m/yr      CONSTANT        100.      -999.       0.100E-06  0.100E+09
Gradient (hydraulic)                                CONSTANT       0.500E-02 -999.        0.100E-07  -999.
Groundwater seepage velocity              m/yr      DERIVED        -999.      -999.       0.100E-09  0.100E+09
Retardation coefficient                   --        DERIVED        -999.      -999.        1.00      0.100E+09
Longitudinal dispersivity                 m         FUNCTION OF X  -999.      -999.       -999.      -999.
Transverse dispersivity                   m         FUNCTION OF X  -999.      -999.       -999.      -999.
Vertical dispersivity                     m         FUNCTION OF X  -999.      -999.       -999.      -999.
Temperature of aquifer                    C         CONSTANT        28.0      -999.       0.000E+00   100.
pH                                        --        CONSTANT        7.50      -999.       0.300       14.0
Organic carbon content (fraction)                   CONSTANT       0.100E-02 -999.        0.100E-05   1.00
Well distance from site                   m         CONSTANT        15.0      -999.        1.00      -999.
Angle off center                         degree     CONSTANT       0.000E+00 -999.        0.000E+00   360.
Well vertical distance                    m         CONSTANT       0.000E+00 -999.        0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1158E-04
```

AM INFIL Z

```
1

















                      U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                   E X P O S U R E   A S S E S S M E N T

                                        M U L T I M E D I A   M O D E L

                                     MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage


 infiltration sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                          Saturated and unsaturated zone models
 Run was                                DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
 NP      - Total number of nodal points               240
 NMAT    - Number of different porous materials         1
 KPROP   - Van Genuchten or Brooks and Corey            1
 IMSHGN  - Spatial discretization option                1
 NVFLAYR - Number of layers in flow model               1
```

```
OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
User defined coordinate system



Layer information
-----------------
LAYER NO.    LAYER THICKNESS     MATERIAL PROPERTY
---------    ---------------     -----------------
    1                 31.80              1

                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                     VADOSE ZONE MATERIAL VARIABLES


          ------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                           MEAN      STD DEV      MIN         MAX
          ------------------------------------------------------------------------------------------------------
          Saturated hydraulic conductivity     cm/hr       CONSTANT       0.360      -999.      0.100E-10  0.100E+05
          Unsaturated zone porosity             --         CONSTANT       0.430      -999.      0.100E-08  0.990
          Air entry pressure head               m          CONSTANT       0.000E+00 -999.       0.000E+00  -999.
          Depth of the unsaturated zone         m          CONSTANT        31.8      -999.      0.100E-08  -999.

                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                     VADOSE ZONE FUNCTION VARIABLES


          ------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                           MEAN      STD DEV      MIN         MAX
          ------------------------------------------------------------------------------------------------------
          Residual water content                --         CONSTANT       0.700E-01 -999.       0.100E-08   1.00
          Brook and Corey exponent,EN           --         CONSTANT       0.000E+00 -999.       0.000E+00   10.0
          ALFA coefficient                     1/cm        CONSTANT       0.270E-01 -999.       0.000E+00   1.00
          Van Genuchten exponent, ENN           --         CONSTANT        1.09      -999.       1.00        5.00
1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY   - Number of different layers used              1
NTSTPS - Number of time values concentration calc    40
DUMMY  - Not presently used                           1
ISOL   - Type of scheme used in unsaturated zone      1
N      - Stehfest terms or number of increments      18
NTEL   - Points in Lagrangian interpolation           3
NGPTS  - Number of Gauss points                     104
NIT    - Convolution integral segments                2
IBOUND - Type of boundary condition                   2
ITSGEN - Time values generated or input               1
TMAX   - Max simulation time            --          0.0
WTFUN  - Weighting factor               --          1.2


OPTIONS CHOSEN
------- ------
Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations
```

```
----------------------------------------------------------------------------------------------------
            VARIABLE NAME                 UNITS     DISTRIBUTION        PARAMETERS           LIMITS
                                                                      MEAN     STD DEV     MIN        MAX
----------------------------------------------------------------------------------------------------
Particle diameter                          cm         CONSTANT      0.100E-03 -999.    0.100E-08   100.
Aquifer porosity                           --         CONSTANT      0.200     -999.    0.100E-08  0.990
Bulk density                               g/cc       CONSTANT       1.50     -999.    0.100E-01   5.00
Aquifer thickness                          m          CONSTANT       12.2     -999.    0.100E-08  0.100E+06
Source thickness (mixing zone depth)       m          DERIVED       -999.     -999.    0.100E-08  0.100E+06
Conductivity (hydraulic)                   m/yr       CONSTANT       100.     -999.    0.100E-06  0.100E+09
Gradient (hydraulic)                                  CONSTANT      0.500E-02 -999.    0.100E-07  -999.
Groundwater seepage velocity               m/yr       DERIVED       -999.     -999.    0.100E-09  0.100E+09
Retardation coefficient                    --         DERIVED       -999.     -999.     1.00      0.100E+09
Longitudinal dispersivity                  m          FUNCTION OF X -999.     -999.    -999.      -999.
Transverse dispersivity                    m          FUNCTION OF X -999.     -999.    -999.      -999.
Vertical dispersivity                      m          FUNCTION OF X -999.     -999.    -999.      -999.
Temperature of aquifer                     C          CONSTANT       28.0     -999.    0.000E+00   100.
pH                                         --         CONSTANT       7.50     -999.    0.300       14.0
Organic carbon content (fraction)                     CONSTANT      0.100E-02 -999.    0.100E-05   1.00
Well distance from site                    m          CONSTANT       15.0     -999.     1.00      -999.
Angle off center                         degree       CONSTANT      0.000E+00 -999.    0.000E+00   360.
Well vertical distance                     m          CONSTANT      0.000E+00 -999.    0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1052E-06
```

AMR DEPTH

```
1









                 U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                  E X P O S U R E   A S S E S S M E N T

                                       M U L T I M E D I A   M O D E L

                                     MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage


 vadose depth sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                        Saturated and unsaturated zone models
 Run was                              DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
  (input parameter description and value)
          - Total number of nodal points             240
 NMAT     - Number of different porous materials        1
 KPROP    - Van Genuchten or Brooks and Corey           1
 IMSHGN   - Spatial discretization option               1
 NVFLAYR  - Number of layers in flow model              1
```

```
 OPTIONS CHOSEN
 ------- ------
 Van Genuchten functional coefficients
 User defined coordinate system
1


 Layer information
 -----------------
 LAYER NO.    LAYER THICKNESS    MATERIAL PROPERTY
 ---------    ---------------    -----------------
     1             21.00                1


                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                    VADOSE ZONE MATERIAL VARIABLES


          ------------------------------------------------------------------------------------------------
                   VARIABLE NAME                  UNITS     DISTRIBUTION        PARAMETERS            LIMITS
                                                                             MEAN      STD DEV    MIN        MAX
          ------------------------------------------------------------------------------------------------
          Saturated hydraulic conductivity        cm/hr       CONSTANT       0.360      -999.     0.100E-10  0.100E+05
          Unsaturated zone porosity                --         CONSTANT       0.430      -999.     0.100E-08  0.990
          Air entry pressure head                  m          CONSTANT       0.000E+00 -999.      0.000E+00  -999.
          Depth of the unsaturated zone            m          CONSTANT        21.0      -999.     0.100E-08  -999.

                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                    VADOSE ZONE FUNCTION VARIABLES


          ------------------------------------------------------------------------------------------------
                   VARIABLE NAME                  UNITS     DISTRIBUTION        PARAMETERS            LIMITS
                                                                             MEAN      STD DEV    MIN        MAX
          ------------------------------------------------------------------------------------------------
          Residual water content                   --         CONSTANT       0.700E-01 -999.      0.100E-08   1.00
          Brook and Corey exponent,EN              --         CONSTANT       0.000E+00 -999.      0.000E+00   10.0
          ALFA coefficient                        1/cm        CONSTANT       0.500E-02 -999.      0.000E+00   1.00
          Van Genuchten exponent, ENN              --         CONSTANT        1.09      -999.      1.00       5.00
1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY    - Number of different layers used              1
NTSTPS  - Number of time values concentration calc    40
DUMMY   - Not presently used                           1
ISOL    - Type of scheme used in unsaturated zone      1
N       - Stehfest terms or number of increments      18
NTEL    - Points in Lagrangian interpolation           3
NGPTS   - Number of Gauss points                     104
NIT     - Convolution integral segments                2
IBOUND  - Type of boundary condition                   2
ITSGEN  - Time values generated or input               1
TMAX    - Max simulation time              --          0.0
WTFUN   - Weighting factor                 --          1.2


OPTIONS CHOSEN
------- ------
Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations
```

```
1


                                    DATA FOR LAYER   1
                                    ---- --- -----
                                    VADOSE TRANSPORT VARIABLES


 ------------------------------------------------------------------------------------------------------------
        VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                    MEAN     STD DEV      MIN          MAX
 ------------------------------------------------------------------------------------------------------------
 Thickness of layer                      m          CONSTANT        21.0      -999.       0.100E-08  -999.
 Longitudinal dispersivity of layer      m          DERIVED        -999.      -999.       0.100E-02  0.100E+05
 Percent organic matter                  --         CONSTANT        1.00      -999.       0.000E+00   100.
 Bulk density of soil for layer         g/cc        CONSTANT        1.60      -999.       0.100E-01   5.00
 Biological decay coefficient           1/yr        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
1
                                    CHEMICAL SPECIFIC VARIABLES


 ------------------------------------------------------------------------------------------------------------
        VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                    MEAN     STD DEV      MIN          MAX
 ------------------------------------------------------------------------------------------------------------
 Solid phase decay coefficient          1/yr        DERIVED        -999.      -999.       0.000E+00  0.100E+11
 Dissolved phase decay coefficient      1/yr        DERIVED        -999.      -999.       0.000E+00  0.100E+11
 Overall chemical decay coefficient     1/yr        DERIVED        -999.      -999.       0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate         l/M-yr      CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Neutral hydrolysis rate constant       1/yr        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Base catalyzed hydrolysis rate         l/M-yr      CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Reference temperature                  C           CONSTANT        25.0      -999.       0.000E+00   100.
 Normalized distribution coefficient    ml/g        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Distribution coefficient                --         DERIVED        -999.      -999.       0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone) 1/yr        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Air diffusion coefficient              cm2/s       CONSTANT       0.000E+00 -999.        0.000E+00   10.0
 Reference temperature for air diffusion C          CONSTANT        25.0      -999.       0.000E+00   100.
 Molecular weight                       g/M         CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Mole fraction of solute                 --         CONSTANT       0.000E+00 -999.        0.100E-08   1.00
 Vapor pressure of solute               mm Hg       CONSTANT       0.000E+00 -999.        0.000E+00   100.
 Henry's law constant                 atm-m^3/M     CONSTANT       0.000E+00 -999.        0.100E-09   1.00
 Overall 1st order decay sat. zone      1/yr        DERIVED        0.000E+00 0.000E+00    0.000E+00   1.00
 Not currently used                                 CONSTANT       -999.      -999.       0.000E+00   1.00
 Not currently used                                 CONSTANT       -999.      -999.       0.000E+00   1.00
1
                                    SOURCE SPECIFIC VARIABLES


 ------------------------------------------------------------------------------------------------------------
        VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                    MEAN     STD DEV      MIN          MAX
 ------------------------------------------------------------------------------------------------------------
 Infiltration rate                      m/yr        CONSTANT       0.273E-04 -999.        0.100E-09  0.100E+11
 Area of waste disposal unit            m^2         CONSTANT       0.197E+07 -999.        0.100E-01  -999.
 Duration of pulse                      yr          CONSTANT        200.      -999.       0.100E-08  -999.
 Spread of contaminant source           m           DERIVED        -999.      -999.       0.100E-08  0.100E+11
 Recharge rate                          m/yr        CONSTANT       0.000E+00 -999.        0.000E+00  0.100E+11
 Source decay constant                  1/yr        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Initial concentration at landfill      mg/l        CONSTANT        1.00      -999.       0.000E+00  -999.
 Length scale of facility               m           DERIVED        -999.      -999.       0.100E-08  0.100E+11
 Width scale of facility                m           DERIVED        -999.      -999.       0.100E-08  0.100E+11
 Near field dilution                                DERIVED         1.00     0.000E+00    0.000E+00   1.00
1
                                    AQUIFER SPECIFIC VARIABLES
```

```
-------------------------------------------------------------------------------------------------------------
          VARIABLE NAME                    UNITS    DISTRIBUTION       PARAMETERS             LIMITS
                                                                    MEAN       STD DEV     MIN         MAX
-------------------------------------------------------------------------------------------------------------
Particle diameter                          cm       CONSTANT      0.100E-03  -999.      0.100E-08   100.
Aquifer porosity                           --       CONSTANT      0.200      -999.      0.100E-08  0.990
Bulk density                               g/cc     CONSTANT       1.50      -999.      0.100E-01   5.00
Aquifer thickness                          m        CONSTANT       12.2      -999.      0.100E-08  0.100E+06
Source thickness (mixing zone depth)       m        DERIVED       -999.      -999.      0.100E-08  0.100E+06
Conductivity (hydraulic)                   m/yr     CONSTANT       100.      -999.      0.100E-06  0.100E+09
Gradient (hydraulic)                                CONSTANT      0.500E-02  -999.      0.100E-07  -999.
Groundwater seepage velocity               m/yr     DERIVED       -999.      -999.      0.100E-09  0.100E+09
Retardation coefficient                    --       DERIVED       -999.      -999.       1.00      0.100E+09
Longitudinal dispersivity                  m        FUNCTION OF X -999.      -999.      -999.      -999.
Transverse dispersivity                    m        FUNCTION OF X -999.      -999.      -999.      -999.
Vertical dispersivity                      m        FUNCTION OF X -999.      -999.      -999.      -999.
Temperature of aquifer                     C        CONSTANT       28.0      -999.      0.000E+00   100.
pH                                         --       CONSTANT       7.50      -999.      0.300       14.0
Organic carbon content (fraction)                   CONSTANT      0.100E-02  -999.      0.100E-05   1.00
Well distance from site                    m        CONSTANT       15.0      -999.       1.00      -999.
Angle off center                          degree    CONSTANT      0.000E+00  -999.      0.000E+00   360.
Well vertical distance                     m        CONSTANT      0.000E+00  -999.      0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1555E-04
```

AMDEPTH2

```
1




                  U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                 E X P O S U R E   A S S E S S M E N T

                                      M U L T I M E D I A   M O D E L

                                  MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage



 vadose depth sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL



 Option Chosen                          Saturated and unsaturated zone models
 Run was                                DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
          - Total number of nodal points                240
    AT    - Number of different porous materials          1
 KPROP    - Van Genuchten or Brooks and Corey             1
 IMSHGN   - Spatial discretization option                 1
 NVFLAYR  - Number of layers in flow model                1
```

```
 OPTIONS CHOSEN
 ------- ------
 Van Genuchten functional coefficients
 User defined coordinate system
1


 Layer information
 -----------------
 LAYER NO.    LAYER THICKNESS     MATERIAL PROPERTY
 ---------    ---------------     -----------------
     1                 31.80              1


                                               DATA FOR MATERIAL  1
                                               ---- --- --------
                                            VADOSE ZONE MATERIAL VARIABLES


          ------------------------------------------------------------------------------------------------------
                    VARIABLE NAME                UNITS      DISTRIBUTION        PARAMETERS            LIMITS
                                                                              MEAN      STD DEV     MIN         MAX
          ------------------------------------------------------------------------------------------------------
          Saturated hydraulic conductivity       cm/hr        CONSTANT       0.360      -999.      0.100E-10  0.100E+05
          Unsaturated zone porosity              --           CONSTANT       0.430      -999.      0.100E-08  0.990
          Air entry pressure head                m            CONSTANT       0.000E+00 -999.       0.000E+00  -999.
          Depth of the unsaturated zone          m            CONSTANT        31.8      -999.      0.100E-08  -999.

                                               DATA FOR MATERIAL  1
                                               ---- --- --------
                                            VADOSE ZONE FUNCTION VARIABLES


          ------------------------------------------------------------------------------------------------------
                    VARIABLE NAME                UNITS      DISTRIBUTION        PARAMETERS            LIMITS
                                                                              MEAN      STD DEV     MIN         MAX
          ------------------------------------------------------------------------------------------------------
          Residual water content                 --           CONSTANT       0.700E-01 -999.       0.100E-08   1.00
          Brook and Corey exponent,EN            --           CONSTANT       0.000E+00 -999.       0.000E+00   10.0
          ALFA coefficient                       1/cm         CONSTANT       0.500E-02 -999.       0.000E+00   1.00
          Van Genuchten exponent, ENN            --           CONSTANT        1.09      -999.       1.00        5.00
1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY   - Number of different layers used              1
NTSTPS - Number of time values concentration calc    40
DUMMY  - Not presently used                           1
ISOL   - Type of scheme used in unsaturated zone      1
N      - Stehfest terms or number of increments      18
NTEL   - Points in Lagrangian interpolation           3
NGPTS  - Number of Gauss points                     104
NIT    - Convolution integral segments                2
IBOUND - Type of boundary condition                   2
ITSGEN - Time values generated or input               1
TMAX   - Max simulation time            --          0.0
WTFUN  - Weighting factor               --          1.2


OPTIONS CHOSEN
------- ------
Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations
```

```
1

                                   DATA FOR LAYER   1
                                   ---- --- -----
                                   VADOSE TRANSPORT VARIABLES


 ------------------------------------------------------------------------------------------------------
          VARIABLE NAME                UNITS      DISTRIBUTION       PARAMETERS              LIMITS
                                                                  MEAN     STD DEV     MIN          MAX
 ------------------------------------------------------------------------------------------------------
 Thickness of layer                      m          CONSTANT      31.8       -999.      0.100E-08  -999.
 Longitudinal dispersivity of layer      m          DERIVED      -999.       -999.      0.100E-02  0.100E+05
 Percent organic matter                  --         CONSTANT      1.00       -999.      0.000E+00   100.
 Bulk density of soil for layer         g/cc        CONSTANT      1.60       -999.      0.100E-01   5.00
 Biological decay coefficient           1/yr        CONSTANT     0.000E+00 -999.      0.000E+00  -999.
1
                                   CHEMICAL SPECIFIC VARIABLES


 ------------------------------------------------------------------------------------------------------
          VARIABLE NAME                UNITS      DISTRIBUTION       PARAMETERS              LIMITS
                                                                  MEAN     STD DEV     MIN          MAX
 ------------------------------------------------------------------------------------------------------
 Solid phase decay coefficient          1/yr        DERIVED      -999.       -999.      0.000E+00  0.100E+11
 Dissolved phase decay coefficient      1/yr        DERIVED      -999.       -999.      0.000E+00  0.100E+11
 Overall chemical decay coefficient     1/yr        DERIVED      -999.       -999.      0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate         l/M-yr      CONSTANT     0.000E+00 -999.      0.000E+00  -999.
 Neutral hydrolysis rate constant       1/yr        CONSTANT     0.000E+00 -999.      0.000E+00  -999.
 Base catalyzed hydrolysis rate         l/M-yr      CONSTANT     0.000E+00 -999.      0.000E+00  -999.
 Reference temperature                  C           CONSTANT      25.0       -999.      0.000E+00   100.
 Normalized distribution coefficient    ml/g        CONSTANT     0.000E+00 -999.      0.000E+00  -999.
 Distribution coefficient                --         DERIVED      -999.       -999.      0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone) 1/yr        CONSTANT     0.000E+00 -999.      0.000E+00  -999.
 Air diffusion coefficient              cm2/s       CONSTANT     0.000E+00 -999.      0.000E+00   10.0
 Reference temperature for air diffusion C          CONSTANT      25.0       -999.      0.000E+00   100.
 Molecular weight                       g/M         CONSTANT     0.000E+00 -999.      0.000E+00  -999.
 Mole fraction of solute                 --         CONSTANT     0.000E+00 -999.      0.100E-08   1.00
 Vapor pressure of solute               mm Hg       CONSTANT     0.000E+00 -999.      0.000E+00   100.
 Henry's law constant                 atm-m^3/M     CONSTANT     0.000E+00 -999.      0.100E-09   1.00
 Overall 1st order decay sat. zone      1/yr        DERIVED      0.000E+00 0.000E+00  0.000E+00   1.00
 Not currently used                                 CONSTANT     -999.       -999.      0.000E+00   1.00
 Not currently used                                 CONSTANT     -999.       -999.      0.000E+00   1.00
1
                                   SOURCE SPECIFIC VARIABLES


 ------------------------------------------------------------------------------------------------------
          VARIABLE NAME                UNITS      DISTRIBUTION       PARAMETERS              LIMITS
                                                                  MEAN     STD DEV     MIN          MAX
 ------------------------------------------------------------------------------------------------------
 Infiltration rate                      m/yr        CONSTANT     0.273E-05 -999.      0.100E-09  0.100E+11
 Area of waste disposal unit            m^2         CONSTANT     0.197E+07 -999.      0.100E-01  -999.
 Duration of pulse                      yr          CONSTANT      200.       -999.      0.100E-08  -999.
 Spread of contaminant source           m           DERIVED      -999.       -999.      0.100E-08  0.100E+11
 Recharge rate                          m/yr        CONSTANT     0.000E+00 -999.      0.000E+00  0.100E+11
 Source decay constant                  1/yr        CONSTANT     0.000E+00 -999.      0.000E+00  -999.
 Initial concentration at landfill      mg/l        CONSTANT      1.00       -999.      0.000E+00  -999.
 Length scale of facility               m           DERIVED      -999.       -999.      0.100E-08  0.100E+11
 Width scale of facility                m           DERIVED      -999.       -999.      0.100E-08  0.100E+11
 Near field dilution                                DERIVED       1.00     0.000E+00  0.000E+00   1.00
1
                                   AQUIFER SPECIFIC VARIABLES
```

```
-------------------------------------------------------------------------------------------------------
         VARIABLE NAME                  UNITS     DISTRIBUTION       PARAMETERS            LIMITS
                                                                  MEAN     STD DEV      MIN         MAX
-------------------------------------------------------------------------------------------------------
Particle diameter                       cm        CONSTANT        0.100E-03 -999.       0.100E-08   100.
Aquifer porosity                        --        CONSTANT        0.200     -999.       0.100E-08  0.990
Bulk density                            g/cc      CONSTANT         1.50     -999.       0.100E-01   5.00
Aquifer thickness                       m         CONSTANT         12.2     -999.       0.100E-08  0.100E+06
Source thickness (mixing zone depth)    m         DERIVED         -999.     -999.       0.100E-08  0.100E+06
Conductivity (hydraulic)                m/yr      CONSTANT         100.     -999.       0.100E-06  0.100E+09
Gradient (hydraulic)                              CONSTANT        0.500E-02 -999.       0.100E-07  -999.
Groundwater seepage velocity            m/yr      DERIVED         -999.     -999.       0.100E-09  0.100E+09
Retardation coefficient                 --        DERIVED         -999.     -999.        1.00      0.100E+09
Longitudinal dispersivity               m         FUNCTION OF X   -999.     -999.       -999.      -999.
Transverse dispersivity                 m         FUNCTION OF X   -999.     -999.       -999.      -999.
Vertical dispersivity                   m         FUNCTION OF X   -999.     -999.       -999.      -999.
Temperature of aquifer                  C         CONSTANT         28.0     -999.       0.000E+00   100.
pH                                      --        CONSTANT         7.50     -999.       0.300       14.0
Organic carbon content (fraction)                 CONSTANT        0.100E-02 -999.       0.100E-05   1.00
Well distance from site                 m         CONSTANT         15.0     -999.        1.00      -999.
Angle off center                      degree      CONSTANT        0.000E+00 -999.       0.000E+00   360.
Well vertical distance                  m         CONSTANT        0.000E+00 -999.       0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.7725E-05
```

AMR ALPHA

```
1





                    U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                      E X P O S U R E   A S S E S S M E N T

                                           M U L T I M E D I A   M O D E L

                                         MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage


 alpha VG sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                        Saturated and unsaturated zone models
 Run was                              DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (Input parameter description and value)
         - Total number of nodal points              240
 NMAT    - Number of different porous materials        1
 KPROP   - Van Genuchten or Brooks and Corey           1
 IMSHGN  - Spatial discretization option               1
 NVFLAYR - Number of layers in flow model              1
```

```
 OPTIONS CHOSEN
 ------- ------
 Van Genuchten functional coefficients
 User defined coordinate system
1


 Layer information
 -----------------
 LAYER NO.   LAYER THICKNESS    MATERIAL PROPERTY
 ---------   ---------------    -----------------
     1              31.80               1

                                          DATA FOR MATERIAL  1
                                          ---- --- --------
                                       VADOSE ZONE MATERIAL VARIABLES


         ----------------------------------------------------------------------------------------------------
                    VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS           LIMITS
                                                                             MEAN     STD DEV      MIN         MAX
         ----------------------------------------------------------------------------------------------------
         Saturated hydraulic conductivity         cm/hr       CONSTANT      0.360     -999.      0.100E-10  0.100E+05
         Unsaturated zone porosity                 --         CONSTANT      0.430     -999.      0.100E-08  0.990
         Air entry pressure head                   m          CONSTANT      0.000E+00 -999.      0.000E+00  -999.
         Depth of the unsaturated zone             m          CONSTANT       31.8     -999.      0.100E-08  -999.

                                          DATA FOR MATERIAL  1
                                          ---- --- --------
                                       VADOSE ZONE FUNCTION VARIABLES


         ----------------------------------------------------------------------------------------------------
                    VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS           LIMITS
                                                                             MEAN     STD DEV      MIN         MAX
         ----------------------------------------------------------------------------------------------------
         Residual water content                    --         CONSTANT      0.700E-01 -999.      0.100E-08   1.00
         Brook and Corey exponent,EN               --         CONSTANT      0.000E+00 -999.      0.000E+00   10.0
         ALFA coefficient                         1/cm        CONSTANT      0.500E-02 -999.      0.000E+00   1.00
         Van Genuchten exponent, ENN               --         CONSTANT       1.09     -999.       1.00       5.00
1

 UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

 NLAY   - Number of different layers used               1
 NTSTPS - Number of time values concentration calc     40
 DUMMY  - Not presently used                            1
 ISOL   - Type of scheme used in unsaturated zone       1
 N      - Stehfest terms or number of increments       18
 NTEL   - Points in Lagrangian interpolation            3
 NGPTS  - Number of Gauss points                      104
 NIT    - Convolution integral segments                 2
 IBOUND - Type of boundary condition                    2
 ITSGEN - Time values generated or input                1
 TMAX   - Max simulation time              --          0.0
 WTFUN  - Weighting factor                 --          1.2


 OPTIONS CHOSEN
 ------- ------
 Stehfest numerical inversion algorithm
 Nondecaying pulse source
 Computer generated times for computing concentrations
```

```
1

                              DATA FOR LAYER   1
                              ---- --- -----
                              VADOSE TRANSPORT VARIABLES


 -------------------------------------------------------------------------------------------
       VARIABLE NAME                  UNITS     DISTRIBUTION       PARAMETERS          LIMITS
                                                                MEAN     STD DEV     MIN        MAX
 -------------------------------------------------------------------------------------------
 Thickness of layer                    m         CONSTANT       31.8      -999.     0.100E-08  -999.
 Longitudinal dispersivity of layer    m         DERIVED        -999.     -999.     0.100E-02  0.100E+05
 Percent organic matter                --        CONSTANT       1.00      -999.     0.000E+00   100.
 Bulk density of soil for layer        g/cc      CONSTANT       1.60      -999.     0.100E-01   5.00
 Biological decay coefficient          1/yr      CONSTANT     0.000E+00 -999.       0.000E+00  -999.
1
                              CHEMICAL SPECIFIC VARIABLES


 -------------------------------------------------------------------------------------------
       VARIABLE NAME                  UNITS     DISTRIBUTION       PARAMETERS          LIMITS
                                                                MEAN     STD DEV     MIN        MAX
 -------------------------------------------------------------------------------------------
 Solid phase decay coefficient         1/yr      DERIVED        -999.     -999.     0.000E+00  0.100E+11
 Dissolved phase decay coefficient     1/yr      DERIVED        -999.     -999.     0.000E+00  0.100E+11
 Overall chemical decay coefficient    1/yr      DERIVED        -999.     -999.     0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate        l/M-yr    CONSTANT     0.000E+00 -999.       0.000E+00  -999.
 Neutral hydrolysis rate constant      1/yr      CONSTANT     0.000E+00 -999.       0.000E+00  -999.
 Base catalyzed hydrolysis rate        l/M-yr    CONSTANT     0.000E+00 -999.       0.000E+00  -999.
 Reference temperature                 C         CONSTANT       25.0      -999.     0.000E+00   100.
 Normalized distribution coefficient   ml/g      CONSTANT     0.000E+00 -999.       0.000E+00  -999.
 Distribution coefficient               --       DERIVED        -999.     -999.     0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone) 1/yr     CONSTANT     0.000E+00 -999.       0.000E+00  -999.
 Air diffusion coefficient             cm2/s     CONSTANT     0.000E+00 -999.       0.000E+00   10.0
 Reference temperature for air diffusion C       CONSTANT       25.0      -999.     0.000E+00   100.
 Molecular weight                      g/M       CONSTANT     0.000E+00 -999.       0.000E+00  -999.
 Mole fraction of solute               --        CONSTANT     0.000E+00 -999.       0.100E-08   1.00
 Vapor pressure of solute              mm Hg     CONSTANT     0.000E+00 -999.       0.000E+00   100.
 Henry's law constant               atm-m^3/M    CONSTANT     0.000E+00 -999.       0.100E-09   1.00
 Overall 1st order decay sat. zone     1/yr      DERIVED      0.000E+00 0.000E+00   0.000E+00   1.00
 Not currently used                              CONSTANT       -999.     -999.     0.000E+00   1.00
 Not currently used                              CONSTANT       -999.     -999.     0.000E+00   1.00
1
                              SOURCE SPECIFIC VARIABLES


 -------------------------------------------------------------------------------------------
       VARIABLE NAME                  UNITS     DISTRIBUTION       PARAMETERS          LIMITS
                                                                MEAN     STD DEV     MIN        MAX
 -------------------------------------------------------------------------------------------
 Infiltration rate                     m/yr      CONSTANT     0.273E-03 -999.       0.100E-09  0.100E+11
 Area of waste disposal unit           m^2       CONSTANT     0.197E+07 -999.       0.100E-01  -999.
 Duration of pulse                     yr        CONSTANT       200.      -999.     0.100E-08  -999.
 Spread of contaminant source          m         DERIVED        -999.     -999.     0.100E-08  0.100E+11
 Recharge rate                         m/yr      CONSTANT     0.000E+00 -999.       0.000E+00  0.100E+11
 Source decay constant                 1/yr      CONSTANT     0.000E+00 -999.       0.000E+00  -999.
 Initial concentration at landfill     mg/l      CONSTANT       1.00      -999.     0.000E+00  -999.
 Length scale of facility              m         DERIVED        -999.     -999.     0.100E-08  0.100E+11
 Width scale of facility               m         DERIVED        -999.     -999.     0.100E-08  0.100E+11
 Near field dilution                             DERIVED        1.00    0.000E+00   0.000E+00   1.00
1
                              AQUIFER SPECIFIC VARIABLES
```

```
-------------------------------------------------------------------------------------------------------------
          VARIABLE NAME                  UNITS     DISTRIBUTION         PARAMETERS             LIMITS
                                                                     MEAN      STD DEV      MIN         MAX
-------------------------------------------------------------------------------------------------------------
 Particle diameter                        cm        CONSTANT       0.100E-03  -999.      0.100E-08    100.
 Aquifer porosity                         --        CONSTANT       0.200      -999.      0.100E-08   0.990
 Bulk density                             g/cc      CONSTANT        1.50      -999.      0.100E-01    5.00
 Aquifer thickness                        m         CONSTANT        12.2      -999.      0.100E-08   0.100E+06
 Source thickness (mixing zone depth)     m         DERIVED        -999.      -999.      0.100E-08   0.100E+06
 Conductivity (hydraulic)                 m/yr      CONSTANT        100.      -999.      0.100E-06   0.100E+09
 Gradient (hydraulic)                               CONSTANT       0.500E-02  -999.      0.100E-07   -999.
 Groundwater seepage velocity             m/yr      DERIVED        -999.      -999.      0.100E-09   0.100E+09
 Retardation coefficient                  --        DERIVED        -999.      -999.       1.00       0.100E+09
 Longitudinal dispersivity                m         FUNCTION OF X  -999.      -999.      -999.       -999.
 Transverse dispersivity                  m         FUNCTION OF X  -999.      -999.      -999.       -999.
 Vertical dispersivity                    m         FUNCTION OF X  -999.      -999.      -999.       -999.
 Temperature of aquifer                   C         CONSTANT        28.0      -999.      0.000E+00    100.
 pH                                       --        CONSTANT        7.50      -999.      0.300        14.0
 Organic carbon content (fraction)                  CONSTANT       0.100E-02  -999.      0.100E-05    1.00
 Well distance from site                  m         CONSTANT        15.0      -999.       1.00       -999.
 Angle off center                       degree      CONSTANT       0.000E+00  -999.      0.000E+00    360.
 Well vertical distance                   m         CONSTANT       0.000E+00  -999.      0.000E+00    1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1059E-02
```

AM ALPHAZ

```
1

                       U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                      E X P O S U R E   A S S E S S M E N T

                                         M U L T I M E D I A   M O D E L

                                        MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------


 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage


 alpha VG sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                      Saturated and unsaturated zone models
 Run was                            DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
         - Total number of nodal points            240
 NMAT    - Number of different porous materials      1
 KPROP   - Van Genuchten or Brooks and Corey         1
 IMSHGN  - Spatial discretization option             1
 NVFLAYR - Number of layers in flow model            1
```

```
 OPTIONS CHOSEN
 ------- ------
 Van Genuchten functional coefficients
 User defined coordinate system
1


 Layer information
 -----------------
 LAYER NO.    LAYER THICKNESS    MATERIAL PROPERTY
 ---------    ---------------    -----------------
     1                31.80              1


                                          DATA FOR MATERIAL  1
                                          ---- --- --------
                                       VADOSE ZONE MATERIAL VARIABLES


           ------------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                UNITS      DISTRIBUTION         PARAMETERS              LIMITS
                                                                            MEAN      STD DEV      MIN          MAX
           ------------------------------------------------------------------------------------------------------------
           Saturated hydraulic conductivity    cm/hr        CONSTANT        0.360      -999.       0.100E-10  0.100E+05
           Unsaturated zone porosity            --          CONSTANT        0.430      -999.       0.100E-08  0.990
           Air entry pressure head              m           CONSTANT        0.000E+00 -999.        0.000E+00  -999.
           Depth of the unsaturated zone        m           CONSTANT         31.8      -999.       0.100E-08  -999.

                                          DATA FOR MATERIAL  1
                                          ---- --- --------
                                       VADOSE ZONE FUNCTION VARIABLES


           ------------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                UNITS      DISTRIBUTION         PARAMETERS              LIMITS
                                                                            MEAN      STD DEV      MIN          MAX
           ------------------------------------------------------------------------------------------------------------
           Residual water content               --          CONSTANT        0.700E-01 -999.        0.100E-08   1.00
           Brook and Corey exponent,EN          --          CONSTANT        0.000E+00 -999.        0.000E+00   10.0
           ALFA coefficient                    1/cm         CONSTANT        0.145      -999.       0.000E+00   1.00
           Van Genuchten exponent, ENN          --          CONSTANT         1.09      -999.        1.00       5.00
1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY    - Number of different layers used                1
NTSTPS  - Number of time values concentration calc      40
DUMMY   - Not presently used                             1
ISOL    - Type of scheme used in unsaturated zone        1
N       - Stehfest terms or number of increments        18
NTEL    - Points in Lagrangian interpolation             3
NGPTS   - Number of Gauss points                       104
NIT     - Convolution integral segments                  2
IBOUND  - Type of boundary condition                     2
ITSGEN  - Time values generated or input                 1
TMAX    - Max simulation time              --          0.0
WTFUN   - Weighting factor                 --          1.2


OPTIONS CHOSEN
------- ------
Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations
```

```
------------------------------------------------------------------------------------------------------------------
         VARIABLE NAME                      UNITS     DISTRIBUTION        PARAMETERS               LIMITS
                                                                      MEAN      STD DEV       MIN          MAX
------------------------------------------------------------------------------------------------------------------
Particle diameter                            cm        CONSTANT      0.100E-03  -999.      0.100E-08    100.
Aquifer porosity                             --        CONSTANT      0.200      -999.      0.100E-08    0.990
Bulk density                                 g/cc      CONSTANT       1.50      -999.      0.100E-01     5.00
Aquifer thickness                            m         CONSTANT       12.2      -999.      0.100E-08    0.100E+06
Source thickness (mixing zone depth)         m         DERIVED       -999.      -999.      0.100E-08    0.100E+06
Conductivity (hydraulic)                     m/yr      CONSTANT       100.      -999.      0.100E-06    0.100E+09
Gradient (hydraulic)                                   CONSTANT      0.500E-02  -999.      0.100E-07   -999.
Groundwater seepage velocity                 m/yr      DERIVED       -999.      -999.      0.100E-09    0.100E+09
Retardation coefficient                      --        DERIVED       -999.      -999.       1.00        0.100E+09
Longitudinal dispersivity                    m         FUNCTION OF X -999.      -999.      -999.        -999.
Transverse dispersivity                      m         FUNCTION OF X -999.      -999.      -999.        -999.
Vertical dispersivity                        m         FUNCTION OF X -999.      -999.      -999.        -999.
Temperature of aquifer                       C         CONSTANT       28.0      -999.      0.000E+00     100.
pH                                           --        CONSTANT       7.50      -999.      0.300         14.0
Organic carbon content (fraction)                      CONSTANT      0.100E-02  -999.      0.100E-05     1.00
Well distance from site                      m         CONSTANT       15.0      -999.       1.00        -999.
Angle off center                           degree      CONSTANT      0.000E+00  -999.      0.000E+00     360.
Well vertical distance                       m         CONSTANT      0.000E+00  -999.      0.000E+00     1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1208E-04
```

AMR BETA

```
1





























                       U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                        E X P O S U R E   A S S E S S M E N T

                                          M U L T I M E D I A   M O D E L

                                         MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------




 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage



 Betaa VG sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL



 Option Chosen                          Saturated and unsaturated zone models
 Run was                                DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
 NP      - Total number of nodal points            240
 NMAT    - Number of different porous materials      1
 KPROP   - Van Genuchten or Brooks and Corey         1
 IMSHGN  - Spatial discretization option             1
 NVFLAYR - Number of layers in flow model            1
```

```
OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
  r defined coordinate system



Layer information
-----------------
LAYER NO.    LAYER THICKNESS    MATERIAL PROPERTY
---------    ---------------    -----------------
    1                31.80               1

                                            DATA FOR MATERIAL  1
                                            ---- --- --------
                                         VADOSE ZONE MATERIAL VARIABLES


          ------------------------------------------------------------------------------------------------
                   VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS           LIMITS
                                                                              MEAN     STD DEV     MIN         MAX
          ------------------------------------------------------------------------------------------------
          Saturated hydraulic conductivity      cm/hr        CONSTANT       0.360      -999.     0.100E-10  0.100E+05
          Unsaturated zone porosity              --          CONSTANT       0.430      -999.     0.100E-08  0.990
          Air entry pressure head                m           CONSTANT       0.000E+00 -999.      0.000E+00  -999.
          Depth of the unsaturated zone          m           CONSTANT        31.8      -999.     0.100E-08  -999.

                                            DATA FOR MATERIAL  1
                                            ---- --- --------
                                         VADOSE ZONE FUNCTION VARIABLES


          ------------------------------------------------------------------------------------------------
                   VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS           LIMITS
                                                                              MEAN     STD DEV     MIN         MAX
          ------------------------------------------------------------------------------------------------
          Residual water content                 --          CONSTANT       0.700E-01 -999.      0.100E-08   1.00
          Brook and Corey exponent,EN            --          CONSTANT       0.000E+00 -999.      0.000E+00   10.0
          ALFA coefficient                      1/cm         CONSTANT       0.500E-02 -999.      0.000E+00   1.00
          Van Genuchten exponent, ENN            --          CONSTANT        1.23      -999.       1.00        5.00
1

 UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

 NLAY   - Number of different layers used              1
 NTSTPS - Number of time values concentration calc    40
 DUMMY  - Not presently used                           1
 ISOL   - Type of scheme used in unsaturated zone      1
 N      - Stehfest terms or number of increments      18
 NTEL   - Points in Lagrangian interpolation           3
 NGPTS  - Number of Gauss points                     104
 NIT    - Convolution integral segments                2
 IBOUND - Type of boundary condition                   2
 ITSGEN - Time values generated or input               1
 TMAX   - Max simulation time               --       0.0
 WTFUN  - Weighting factor                  --       1.2


   IONS CHOSEN
 ------- ------
 Stehfest numerical inversion algorithm
 Nondecaying pulse source
 Computer generated times for computing concentrations
```

```
1

                                      DATA FOR LAYER    1
                                      ---- --- -----
                                      VADOSE TRANSPORT VARIABLES


          ----------------------------------------------------------------------------------------------------
                   VARIABLE NAME              UNITS      DISTRIBUTION         PARAMETERS            LIMITS
                                                                            MEAN     STD DEV      MIN         MAX
          ----------------------------------------------------------------------------------------------------
          Thickness of layer                    m          CONSTANT         31.8       -999.      0.100E-08  -999.
          Longitudinal dispersivity of layer    m          DERIVED         -999.       -999.      0.100E-02  0.100E+05
          Percent organic matter                --         CONSTANT         1.00       -999.      0.000E+00   100.
          Bulk density of soil for layer       g/cc        CONSTANT         1.60       -999.      0.100E-01   5.00
          Biological decay coefficient        1/yr         CONSTANT        0.000E+00 -999.        0.000E+00  -999.
1
                                     CHEMICAL SPECIFIC VARIABLES


          ----------------------------------------------------------------------------------------------------
                   VARIABLE NAME              UNITS      DISTRIBUTION         PARAMETERS            LIMITS
                                                                            MEAN     STD DEV      MIN         MAX
          ----------------------------------------------------------------------------------------------------
          Solid phase decay coefficient        1/yr        DERIVED         -999.       -999.      0.000E+00  0.100E+11
          Dissolved phase decay coefficient    1/yr        DERIVED         -999.       -999.      0.000E+00  0.100E+11
          Overall chemical decay coefficient   1/yr        DERIVED         -999.       -999.      0.000E+00  0.100E+11
          Acid catalyzed hydrolysis rate       l/M-yr      CONSTANT        0.000E+00 -999.        0.000E+00  -999.
          Neutral hydrolysis rate constant     1/yr        CONSTANT        0.000E+00 -999.        0.000E+00  -999.
          Base catalyzed hydrolysis rate       l/M-yr      CONSTANT        0.000E+00 -999.        0.000E+00  -999.
          Reference temperature                C           CONSTANT         25.0       -999.      0.000E+00   100.
          Normalized distribution coefficient  ml/g        CONSTANT        0.000E+00 -999.        0.000E+00  -999.
          Distribution coefficient              --         DERIVED         -999.       -999.      0.000E+00  0.100E+11
          Biodegradation coefficient (sat. zone)  1/yr     CONSTANT        0.000E+00 -999.        0.000E+00  -999.
          Air diffusion coefficient            cm2/s       CONSTANT        0.000E+00 -999.        0.000E+00   10.0
          Reference temperature for air diffusion  C       CONSTANT         25.0       -999.      0.000E+00   100.
          Molecular weight                     g/M         CONSTANT        0.000E+00 -999.        0.000E+00  -999.
          Mole fraction of solute               --         CONSTANT        0.000E+00 -999.        0.100E-08   1.00
          Vapor pressure of solute             mm Hg       CONSTANT        0.000E+00 -999.        0.000E+00   100.
          Henry's law constant               atm-m^3/M     CONSTANT        0.000E+00 -999.        0.100E-09   1.00
          Overall 1st order decay sat. zone    1/yr        DERIVED         0.000E+00 0.000E+00    0.000E+00   1.00
          Not currently used                               CONSTANT        -999.       -999.      0.000E+00   1.00
          Not currently used                               CONSTANT        -999.       -999.      0.000E+00   1.00
1
                                       SOURCE SPECIFIC VARIABLES


          ----------------------------------------------------------------------------------------------------
                   VARIABLE NAME              UNITS      DISTRIBUTION         PARAMETERS            LIMITS
                                                                            MEAN     STD DEV      MIN         MAX
          ----------------------------------------------------------------------------------------------------
          Infiltration rate                    m/yr        CONSTANT        0.273E-04 -999.        0.100E-09  0.100E+11
          Area of waste disposal unit          m^2         CONSTANT        0.197E+07 -999.        0.100E-01  -999.
          Duration of pulse                    yr          CONSTANT         200.       -999.      0.100E-08  -999.
          Spread of contaminant source         m           DERIVED         -999.       -999.      0.100E-08  0.100E+11
          Recharge rate                        m/yr        CONSTANT        0.000E+00 -999.        0.000E+00  0.100E+11
          Source decay constant                1/yr        CONSTANT        0.000E+00 -999.        0.000E+00  -999.
          Initial concentration at landfill    mg/l        CONSTANT         1.00       -999.      0.000E+00  -999.
          Length scale of facility             m           DERIVED         -999.       -999.      0.100E-08  0.100E+11
          Width scale of facility              m           DERIVED         -999.       -999.      0.100E-08  0.100E+11
          Near field dilution                              DERIVED          1.00     0.000E+00    0.000E+00   1.00
1
                                      AQUIFER SPECIFIC VARIABLES
```

```
-----------------------------------------------------------------------------------------------
           VARIABLE NAME                 UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                    MEAN      STD DEV      MIN        MAX
-----------------------------------------------------------------------------------------------
Particle diameter                        cm        CONSTANT        0.100E-03 -999.      0.100E-08   100.
Aquifer porosity                         --        CONSTANT        0.200     -999.      0.100E-08  0.990
Bulk density                             g/cc      CONSTANT         1.50     -999.      0.100E-01   5.00
Aquifer thickness                        m         CONSTANT         12.2     -999.      0.100E-08  0.100E+06
Source thickness (mixing zone depth)     m         DERIVED         -999.     -999.      0.100E-08  0.100E+06
Conductivity (hydraulic)                 m/yr      CONSTANT         100.     -999.      0.100E-06  0.100E+09
Gradient (hydraulic)                               CONSTANT        0.500E-02 -999.      0.100E-07  -999.
Groundwater seepage velocity             m/yr      DERIVED         -999.     -999.      0.100E-09  0.100E+09
Retardation coefficient                  --        DERIVED         -999.     -999.       1.00      0.100E+09
Longitudinal dispersivity                m         FUNCTION OF X   -999.     -999.      -999.      -999.
Transverse dispersivity                  m         FUNCTION OF X   -999.     -999.      -999.      -999.
Vertical dispersivity                    m         FUNCTION OF X   -999.     -999.      -999.      -999.
Temperature of aquifer                   C         CONSTANT         28.0     -999.      0.000E+00   100.
pH                                       --        CONSTANT         7.50     -999.      0.300       14.0
Organic carbon content (fraction)                  CONSTANT        0.100E-02 -999.      0.100E-05   1.00
Well distance from site                  m         CONSTANT         15.0     -999.       1.00      -999.
Angle off center                       degree      CONSTANT        0.000E+00 -999.      0.000E+00   360.
Well vertical distance                   m         CONSTANT        0.000E+00 -999.      0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1285E-04
```

AMR BETA 2

```
1

                                      U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                                 E X P O S U R E   A S S E S S M E N T

                                                    M U L T I M E D I A   M O D E L

                                                 MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage



 Betaa VG sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL



 Option Chosen                       Saturated and unsaturated zone models
 Run was                             DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
 NP      - Total number of nodal points              240
 NMAT    - Number of different porous materials        1
 KPROP   - Van Genuchten or Brooks and Corey           1
 IMSHGN  - Spatial discretization option               1
 NVFLAYR - Number of layers in flow model              1
```

```
OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
  r defined coordinate system



Layer information
-----------------
LAYER NO.   LAYER THICKNESS    MATERIAL PROPERTY
---------   ---------------    -----------------
    1              31.80               1


                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                     VADOSE ZONE MATERIAL VARIABLES


     ---------------------------------------------------------------------------------------------------
               VARIABLE NAME                UNITS     DISTRIBUTION       PARAMETERS           LIMITS
                                                                       MEAN     STD DEV     MIN        MAX
     ---------------------------------------------------------------------------------------------------
     Saturated hydraulic conductivity      cm/hr       CONSTANT       0.360      -999.     0.100E-10  0.100E+05
     Unsaturated zone porosity              --         CONSTANT       0.430      -999.     0.100E-08  0.990
     Air entry pressure head                m          CONSTANT       0.000E+00 -999.      0.000E+00  -999.
     Depth of the unsaturated zone          m          CONSTANT        31.8      -999.     0.100E-08  -999.

                                        DATA FOR MATERIAL  1
                                        ---- --- --------
                                     VADOSE ZONE FUNCTION VARIABLES


     ---------------------------------------------------------------------------------------------------
               VARIABLE NAME                UNITS     DISTRIBUTION       PARAMETERS           LIMITS
                                                                       MEAN     STD DEV     MIN        MAX
     ---------------------------------------------------------------------------------------------------
     Residual water content                 --         CONSTANT       0.700E-01 -999.      0.100E-08   1.00
     Brook and Corey exponent,EN            --         CONSTANT       0.000E+00 -999.      0.000E+00   10.0
     ALFA coefficient                      1/cm        CONSTANT       0.500E-02 -999.      0.000E+00   1.00
     Van Genuchten exponent, ENN            --         CONSTANT        2.68      -999.       1.00       5.00
1

 UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

 NLAY   - Number of different layers used               1
 NTSTPS - Number of time values concentration calc     40
 DUMMY  - Not presently used                            1
 ISOL   - Type of scheme used in unsaturated zone       1
 N      - Stehfest terms or number of increments       18
 NTEL   - Points in Lagrangian interpolation            3
 NGPTS  - Number of Gauss points                      104
 NIT    - Convolution integral segments                 2
 IBOUND - Type of boundary condition                    2
 ITSGEN - Time values generated or input                1
 TMAX   - Max simulation time            --           0.0
 WTFUN  - Weighting factor               --           1.2


  TIONS CHOSEN
 ------- ------
 Stehfest numerical inversion algorithm
 Nondecaying pulse source
 Computer generated times for computing concentrations
```

```
1
                                      DATA FOR LAYER   1
                                      ---- --- -----
                                      VADOSE TRANSPORT VARIABLES


 ---------------------------------------------------------------------------------------------------
          VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS             LIMITS
                                                                     MEAN     STD DEV     MIN         MAX
 ---------------------------------------------------------------------------------------------------
 Thickness of layer                        m          CONSTANT        31.8      -999.      0.100E-08  -999.
 Longitudinal dispersivity of layer        m          DERIVED        -999.      -999.      0.100E-02  0.100E+05
 Percent organic matter                    --         CONSTANT        1.00      -999.      0.000E+00   100.
 Bulk density of soil for layer            g/cc       CONSTANT        1.60      -999.      0.100E-01   5.00
 Biological decay coefficient             1/yr        CONSTANT       0.000E+00 -999.      0.000E+00  -999.
1
                                     CHEMICAL SPECIFIC VARIABLES


 ---------------------------------------------------------------------------------------------------
          VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS             LIMITS
                                                                     MEAN     STD DEV     MIN         MAX
 ---------------------------------------------------------------------------------------------------
 Solid phase decay coefficient             1/yr       DERIVED        -999.      -999.      0.000E+00  0.100E+11
 Dissolved phase decay coefficient         1/yr       DERIVED        -999.      -999.      0.000E+00  0.100E+11
 Overall chemical decay coefficient        1/yr       DERIVED        -999.      -999.      0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate            l/M-yr     CONSTANT       0.000E+00 -999.      0.000E+00  -999.
 Neutral hydrolysis rate constant          1/yr       CONSTANT       0.000E+00 -999.      0.000E+00  -999.
 Base catalyzed hydrolysis rate            l/M-yr     CONSTANT       0.000E+00 -999.      0.000E+00  -999.
 Reference temperature                     C          CONSTANT        25.0      -999.      0.000E+00   100.
 Normalized distribution coefficient       ml/g       CONSTANT       0.000E+00 -999.      0.000E+00  -999.
 Distribution coefficient                   --        DERIVED        -999.      -999.      0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone)    1/yr       CONSTANT       0.000E+00 -999.      0.000E+00  -999.
 Air diffusion coefficient                 cm2/s      CONSTANT       0.000E+00 -999.      0.000E+00   10.0
 Reference temperature for air diffusion   C          CONSTANT        25.0      -999.      0.000E+00   100.
 Molecular weight                          g/M        CONSTANT       0.000E+00 -999.      0.000E+00  -999.
 Mole fraction of solute                    --        CONSTANT       0.000E+00 -999.      0.100E-08   1.00
 Vapor pressure of solute                  mm Hg      CONSTANT       0.000E+00 -999.      0.000E+00   100.
 Henry's law constant                    atm-m^3/M    CONSTANT       0.000E+00 -999.      0.100E-09   1.00
 Overall 1st order decay sat. zone         1/yr       DERIVED        0.000E+00 0.000E+00  0.000E+00   1.00
 Not currently used                                   CONSTANT       -999.      -999.      0.000E+00   1.00
 Not currently used                                   CONSTANT       -999.      -999.      0.000E+00   1.00
1
                                      SOURCE SPECIFIC VARIABLES


 ---------------------------------------------------------------------------------------------------
          VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS             LIMITS
                                                                     MEAN     STD DEV     MIN         MAX
 ---------------------------------------------------------------------------------------------------
 Infiltration rate                         m/yr       CONSTANT       0.273E-04 -999.      0.100E-09  0.100E+11
 Area of waste disposal unit               m^2        CONSTANT       0.197E+07 -999.      0.100E-01  -999.
 Duration of pulse                         yr         CONSTANT        200.      -999.      0.100E-08  -999.
 Spread of contaminant source              m          DERIVED        -999.      -999.      0.100E-08  0.100E+11
 Recharge rate                             m/yr       CONSTANT       0.000E+00 -999.      0.000E+00  0.100E+11
 Source decay constant                     1/yr       CONSTANT       0.000E+00 -999.      0.000E+00  -999.
 Initial concentration at landfill         mg/l       CONSTANT        1.00      -999.      0.000E+00  -999.
 Length scale of facility                  m          DERIVED        -999.      -999.      0.100E-08  0.100E+11
 Width scale of facility                   m          DERIVED        -999.      -999.      0.100E-08  0.100E+11
 Near field dilution                                  DERIVED         1.00     0.000E+00  0.000E+00   1.00
1
                                     AQUIFER SPECIFIC VARIABLES
```

```
------------------------------------------------------------------------------------------------------------------
             VARIABLE NAME                      UNITS      DISTRIBUTION         PARAMETERS               LIMITS
                                                                             MEAN      STD DEV       MIN         MAX
------------------------------------------------------------------------------------------------------------------
Particle diameter                                cm          CONSTANT      0.100E-03  -999.       0.100E-08    100.
Aquifer porosity                                 --          CONSTANT      0.200      -999.       0.100E-08   0.990
Bulk density                                     g/cc        CONSTANT       1.50      -999.       0.100E-01    5.00
Aquifer thickness                                m           CONSTANT       12.2      -999.       0.100E-08   0.100E+06
Source thickness (mixing zone depth)             m           DERIVED       -999.      -999.       0.100E-08   0.100E+06
Conductivity (hydraulic)                         m/yr        CONSTANT       100.      -999.       0.100E-06   0.100E+09
Gradient (hydraulic)                                         CONSTANT      0.500E-02  -999.       0.100E-07   -999.
Groundwater seepage velocity                     m/yr        DERIVED       -999.      -999.       0.100E-09   0.100E+09
Retardation coefficient                          --          DERIVED       -999.      -999.        1.00       0.100E+09
Longitudinal dispersivity                        m           FUNCTION OF X -999.      -999.       -999.       -999.
Transverse dispersivity                          m           FUNCTION OF X -999.      -999.       -999.       -999.
Vertical dispersivity                            m           FUNCTION OF X -999.      -999.       -999.       -999.
Temperature of aquifer                           C           CONSTANT       28.0      -999.       0.000E+00    100.
pH                                               --          CONSTANT       7.50      -999.       0.300        14.0
Organic carbon content (fraction)                            CONSTANT      0.100E-02  -999.       0.100E-05    1.00
Well distance from site                          m           CONSTANT       15.0      -999.        1.00       -999.
Angle off center                               degree        CONSTANT      0.000E+00  -999.       0.000E+00    360.
Well vertical distance                           m           CONSTANT      0.000E+00  -999.       0.000E+00    1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.3240E-04
```

AM BOTH VG

```
1





























                    U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                      E X P O S U R E   A S S E S S M E N T

                                           M U L T I M E D I A   M O D E L

                                         MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage


 Dual VG sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                      Saturated and unsaturated zone models
 Run was                            DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
 NP      - Total number of nodal points               240
 NMAT    - Number of different porous materials          1
 KPROP   - Van Genuchten or Brooks and Corey             1
 IMSHGN  - Spatial discretization option                 1
 NVFLAYR - Number of layers in flow model                1
```

```
OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
  er defined coordinate system



Layer information
-----------------
LAYER NO.   LAYER THICKNESS    MATERIAL PROPERTY
---------   ---------------    -----------------
    1                 31.80               1


                                                  DATA FOR MATERIAL  1
                                                  ---- --- --------
                                              VADOSE ZONE MATERIAL VARIABLES


            -----------------------------------------------------------------------------------------------------
                      VARIABLE NAME                 UNITS      DISTRIBUTION         PARAMETERS           LIMITS
                                                                                  MEAN     STD DEV     MIN         MAX
            -----------------------------------------------------------------------------------------------------
            Saturated hydraulic conductivity        cm/hr        CONSTANT        0.360      -999.      0.100E-10  0.100E+05
            Unsaturated zone porosity                --          CONSTANT        0.430      -999.      0.100E-08  0.990
            Air entry pressure head                  m           CONSTANT        0.000E+00 -999.       0.000E+00  -999.
            Depth of the unsaturated zone            m           CONSTANT         31.8      -999.      0.100E-08  -999.

                                                  DATA FOR MATERIAL  1
                                                  ---- --- --------
                                              VADOSE ZONE FUNCTION VARIABLES


            -----------------------------------------------------------------------------------------------------
                      VARIABLE NAME                 UNITS      DISTRIBUTION         PARAMETERS           LIMITS
                                                                                  MEAN     STD DEV     MIN         MAX
            -----------------------------------------------------------------------------------------------------
            Residual water content                   --          CONSTANT        0.700E-01 -999.       0.100E-08   1.00
            Brook and Corey exponent,EN              --          CONSTANT        0.000E+00 -999.       0.000E+00   10.0
            ALFA coefficient                        1/cm         CONSTANT        0.145      -999.      0.000E+00   1.00
            Van Genuchten exponent, ENN              --          CONSTANT         2.68      -999.       1.00       5.00
1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY   - Number of different layers used              1
NTSTPS - Number of time values concentration calc    40
DUMMY  - Not presently used                           1
ISOL   - Type of scheme used in unsaturated zone      1
N      - Stehfest terms or number of increments      18
NTEL   - Points in Lagrangian interpolation           3
NGPTS  - Number of Gauss points                     104
NIT    - Convolution integral segments                2
IBOUND - Type of boundary condition                   2
ITSGEN - Time values generated or input               1
TMAX   - Max simulation time            --          0.0
WTFUN  - Weighting factor               --          1.2


  TIONS CHOSEN
------- ------
Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations
```

```
1

                                             DATA FOR LAYER   1
                                             ---- --- -----
                                             VADOSE TRANSPORT VARIABLES


 -----------------------------------------------------------------------------------------------------------
            VARIABLE NAME                   UNITS      DISTRIBUTION         PARAMETERS             LIMITS
                                                                          MEAN     STD DEV      MIN          MAX
 -----------------------------------------------------------------------------------------------------------
 Thickness of layer                          m          CONSTANT          31.8      -999.       0.100E-08   -999.
 Longitudinal dispersivity of layer          m          DERIVED          -999.      -999.       0.100E-02   0.100E+05
 Percent organic matter                      --         CONSTANT          1.00      -999.       0.000E+00    100.
 Bulk density of soil for layer             g/cc        CONSTANT          1.60      -999.       0.100E-01    5.00
 Biological decay coefficient               1/yr        CONSTANT         0.000E+00 -999.        0.000E+00   -999.
1
                                            CHEMICAL SPECIFIC VARIABLES


 -----------------------------------------------------------------------------------------------------------
            VARIABLE NAME                   UNITS      DISTRIBUTION         PARAMETERS             LIMITS
                                                                          MEAN     STD DEV      MIN          MAX
 -----------------------------------------------------------------------------------------------------------
 Solid phase decay coefficient              1/yr        DERIVED          -999.      -999.       0.000E+00   0.100E+11
 Dissolved phase decay coefficient          1/yr        DERIVED          -999.      -999.       0.000E+00   0.100E+11
 Overall chemical decay coefficient         1/yr        DERIVED          -999.      -999.       0.000E+00   0.100E+11
 Acid catalyzed hydrolysis rate             l/M-yr      CONSTANT         0.000E+00 -999.        0.000E+00   -999.
 Neutral hydrolysis rate constant           1/yr        CONSTANT         0.000E+00 -999.        0.000E+00   -999.
 Base catalyzed hydrolysis rate             l/M-yr      CONSTANT         0.000E+00 -999.        0.000E+00   -999.
 Reference temperature                      C           CONSTANT          25.0      -999.       0.000E+00    100.
 Normalized distribution coefficient        ml/g        CONSTANT         0.000E+00 -999.        0.000E+00   -999.
 Distribution coefficient                    --         DERIVED          -999.      -999.       0.000E+00   0.100E+11
 Biodegradation coefficient (sat. zone)     1/yr        CONSTANT         0.000E+00 -999.        0.000E+00   -999.
 Air diffusion coefficient                  cm2/s       CONSTANT         0.000E+00 -999.        0.000E+00    10.0
 Reference temperature for air diffusion    C           CONSTANT          25.0      -999.       0.000E+00    100.
 Molecular weight                           g/M         CONSTANT         0.000E+00 -999.        0.000E+00   -999.
 Mole fraction of solute                     --         CONSTANT         0.000E+00 -999.        0.100E-08    1.00
 Vapor pressure of solute                   mm Hg       CONSTANT         0.000E+00 -999.        0.000E+00    100.
 Henry's law constant                     atm-m^3/M     CONSTANT         0.000E+00 -999.        0.100E-09    1.00
 Overall 1st order decay sat. zone          1/yr        DERIVED          0.000E+00 0.000E+00    0.000E+00    1.00
 Not currently used                                     CONSTANT         -999.      -999.       0.000E+00    1.00
 Not currently used                                     CONSTANT         -999.      -999.       0.000E+00    1.00
1
                                             SOURCE SPECIFIC VARIABLES


 -----------------------------------------------------------------------------------------------------------
            VARIABLE NAME                   UNITS      DISTRIBUTION         PARAMETERS             LIMITS
                                                                          MEAN     STD DEV      MIN          MAX
 -----------------------------------------------------------------------------------------------------------
 Infiltration rate                          m/yr        CONSTANT         0.273E-04 -999.        0.100E-09   0.100E+11
 Area of waste disposal unit                m^2         CONSTANT         0.197E+07 -999.        0.100E-01   -999.
 Duration of pulse                          yr          CONSTANT          200.      -999.       0.100E-08   -999.
 Spread of contaminant source               m           DERIVED          -999.      -999.       0.100E-08   0.100E+11
 Recharge rate                              m/yr        CONSTANT         0.000E+00 -999.        0.000E+00   0.100E+11
 Source decay constant                      1/yr        CONSTANT         0.000E+00 -999.        0.000E+00   -999.
 Initial concentration at landfill          mg/l        CONSTANT          1.00      -999.       0.000E+00   -999.
 Length scale of facility                   m           DERIVED          -999.      -999.       0.100E-08   0.100E+11
 Width scale of facility                    m           DERIVED          -999.      -999.       0.100E-08   0.100E+11
 Near field dilution                                    DERIVED           1.00     0.000E+00    0.000E+00    1.00
1
                                            AQUIFER SPECIFIC VARIABLES
```

```
------------------------------------------------------------------------------------------------------
        VARIABLE NAME                     UNITS    DISTRIBUTION        PARAMETERS           LIMITS
                                                                   MEAN      STD DEV      MIN        MAX
------------------------------------------------------------------------------------------------------
Particle diameter                          cm       CONSTANT     0.100E-03 -999.      0.100E-08   100.
Aquifer porosity                           --       CONSTANT     0.200     -999.      0.100E-08  0.990
Bulk density                               g/cc     CONSTANT      1.50     -999.      0.100E-01   5.00
Aquifer thickness                          m        CONSTANT      12.2     -999.      0.100E-08  0.100E+06
Source thickness (mixing zone depth)       m        DERIVED      -999.     -999.      0.100E-08  0.100E+06
Conductivity (hydraulic)                   m/yr     CONSTANT      100.     -999.      0.100E-06  0.100E+09
Gradient (hydraulic)                                CONSTANT     0.500E-02 -999.      0.100E-07  -999.
Groundwater seepage velocity               m/yr     DERIVED      -999.     -999.      0.100E-09  0.100E+09
Retardation coefficient                    --       DERIVED      -999.     -999.       1.00      0.100E+09
Longitudinal dispersivity                  m        FUNCTION OF X -999.    -999.      -999.      -999.
Transverse dispersivity                    m        FUNCTION OF X -999.    -999.      -999.      -999.
Vertical dispersivity                      m        FUNCTION OF X -999.    -999.      -999.      -999.
Temperature of aquifer                     C        CONSTANT      28.0     -999.      0.000E+00   100.
pH                                         --       CONSTANT      7.50     -999.      0.300       14.0
Organic carbon content (fraction)                   CONSTANT     0.100E-02 -999.      0.100E-05   1.00
Well distance from site                    m        CONSTANT      15.0     -999.       1.00      -999.
Angle off center                         degree     CONSTANT     0.000E+00 -999.      0.000E+00   360.
Well vertical distance                     m        CONSTANT     0.000E+00 -999.      0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.4639E-04
```

AM AQPOR

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1









                    U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                   E X P O S U R E   A S S E S S M E N T

                                     M U L T I M E D I A   M O D E L

                                   MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage


 aquifer porosity sensitivity - WHOLE SITE, AVG LEAKAGE 200-year duration
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                          Saturated and unsaturated zone models
 Run was                                DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
 NP      - Total number of nodal points              240
 NMAT    - Number of different porous materials        1
 KPROP   - Van Genuchten or Brooks and Corey           1
 IMSHGN  - Spatial discretization option               1
 NVFLAYR - Number of layers in flow model              1
```

```
OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
   r defined coordinate system



Layer information
-----------------
LAYER NO.    LAYER THICKNESS     MATERIAL PROPERTY
---------    ---------------     -----------------
    1                  31.80              1

                                            DATA FOR MATERIAL  1
                                            ---- --- --------
                                        VADOSE ZONE MATERIAL VARIABLES


        ----------------------------------------------------------------------------------------------------
                   VARIABLE NAME                 UNITS      DISTRIBUTION          PARAMETERS              LIMITS
                                                                               MEAN      STD DEV      MIN          MAX
        ----------------------------------------------------------------------------------------------------
        Saturated hydraulic conductivity          cm/hr       CONSTANT        0.360       -999.       0.100E-10  0.100E+05
        Unsaturated zone porosity                 --          CONSTANT        0.430       -999.       0.100E-08  0.990
        Air entry pressure head                   m           CONSTANT        0.000E+00 -999.         0.000E+00  -999.
        Depth of the unsaturated zone             m           CONSTANT         31.8       -999.       0.100E-08  -999.

                                            DATA FOR MATERIAL  1
                                            ---- --- --------
                                        VADOSE ZONE FUNCTION VARIABLES


        ----------------------------------------------------------------------------------------------------
                   VARIABLE NAME                 UNITS      DISTRIBUTION          PARAMETERS              LIMITS
                                                                               MEAN      STD DEV      MIN          MAX
        ----------------------------------------------------------------------------------------------------
        Residual water content                    --          CONSTANT        0.700E-01 -999.         0.100E-08   1.00
        Brook and Corey exponent,EN               --          CONSTANT        0.000E+00 -999.         0.000E+00   10.0
        ALFA coefficient                          1/cm        CONSTANT        0.500E-02 -999.         0.000E+00   1.00
        Van Genuchten exponent, ENN               --          CONSTANT         1.09      -999.         1.00        5.00
1

 UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

 NLAY   - Number of different layers used              1
 NTSTPS - Number of time values concentration calc    40
 DUMMY  - Not presently used                           1
 ISOL   - Type of scheme used in unsaturated zone      1
 N      - Stehfest terms or number of increments      18
 NTEL   - Points in Lagrangian interpolation           3
 NGPTS  - Number of Gauss points                     104
 NIT    - Convolution integral segments                2
 IBOUND - Type of boundary condition                   2
 ITSGEN - Time values generated or input               1
 TMAX   - Max simulation time              --          0.0
 WTFUN  - Weighting factor                 --          1.2


   TIONS CHOSEN
 ------- ------
 Stehfest numerical inversion algorithm
 Nondecaying pulse source
 Computer generated times for computing concentrations
```

```
1


                                             DATA FOR LAYER   1
                                             ---- --- -----
                                             VADOSE TRANSPORT VARIABLES


            -----------------------------------------------------------------------------------------------------
                      VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                                MEAN     STD DEV      MIN          MAX
            -----------------------------------------------------------------------------------------------------

            Thickness of layer                        m          CONSTANT        31.8      -999.      0.100E-08  -999.
            Longitudinal dispersivity of layer        m          DERIVED        -999.      -999.      0.100E-02  0.100E+05
            Percent organic matter                    --         CONSTANT        1.00      -999.      0.000E+00   100.
            Bulk density of soil for layer           g/cc        CONSTANT        1.60      -999.      0.100E-01   5.00
            Biological decay coefficient            1/yr         CONSTANT       0.000E+00 -999.       0.000E+00  -999.
1
                                            CHEMICAL SPECIFIC VARIABLES


            -----------------------------------------------------------------------------------------------------
                      VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                                MEAN     STD DEV      MIN          MAX
            -----------------------------------------------------------------------------------------------------

            Solid phase decay coefficient            1/yr        DERIVED        -999.      -999.      0.000E+00  0.100E+11
            Dissolved phase decay coefficient        1/yr        DERIVED        -999.      -999.      0.000E+00  0.100E+11
            Overall chemical decay coefficient       1/yr        DERIVED        -999.      -999.      0.000E+00  0.100E+11
            Acid catalyzed hydrolysis rate           l/M-yr      CONSTANT       0.000E+00 -999.       0.000E+00  -999.
            Neutral hydrolysis rate constant         1/yr        CONSTANT       0.000E+00 -999.       0.000E+00  -999.
            Base catalyzed hydrolysis rate           l/M-yr      CONSTANT       0.000E+00 -999.       0.000E+00  -999.
            Reference temperature                    C           CONSTANT        25.0      -999.      0.000E+00   100.
            Normalized distribution coefficient      ml/g        CONSTANT       0.000E+00 -999.       0.000E+00  -999.
            Distribution coefficient                  --         DERIVED        -999.      -999.      0.000E+00  0.100E+11
            Biodegradation coefficient (sat. zone)   1/yr        CONSTANT       0.000E+00 -999.       0.000E+00  -999.
            Air diffusion coefficient                cm2/s       CONSTANT       0.000E+00 -999.       0.000E+00   10.0
            Reference temperature for air diffusion  C           CONSTANT        25.0      -999.      0.000E+00   100.
            Molecular weight                         g/M         CONSTANT       0.000E+00 -999.       0.000E+00  -999.
            Mole fraction of solute                   --         CONSTANT       0.000E+00 -999.       0.100E-08   1.00
            Vapor pressure of solute                 mm Hg       CONSTANT       0.000E+00 -999.       0.000E+00   100.
            Henry's law constant                   atm-m^3/M     CONSTANT       0.000E+00 -999.       0.100E-09   1.00
            Overall 1st order decay sat. zone        1/yr        DERIVED        0.000E+00 0.000E+00   0.000E+00   1.00
            Not currently used                                   CONSTANT       -999.      -999.      0.000E+00   1.00
            Not currently used                                   CONSTANT       -999.      -999.      0.000E+00   1.00
1
                                              SOURCE SPECIFIC VARIABLES


            -----------------------------------------------------------------------------------------------------
                      VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                                MEAN     STD DEV      MIN          MAX
            -----------------------------------------------------------------------------------------------------

            Infiltration rate                        m/yr        CONSTANT       0.273E-04 -999.       0.100E-09  0.100E+11
            Area of waste disposal unit              m^2         CONSTANT       0.197E+07 -999.       0.100E-01  -999.
            Duration of pulse                        yr          CONSTANT        200.      -999.      0.100E-08  -999.
            Spread of contaminant source             m           DERIVED        -999.      -999.      0.100E-08  0.100E+11
            Recharge rate                            m/yr        CONSTANT       0.000E+00 -999.       0.000E+00  0.100E+11
            Source decay constant                    1/yr        CONSTANT       0.000E+00 -999.       0.000E+00  -999.
            Initial concentration at landfill        mg/l        CONSTANT        1.00      -999.      0.000E+00  -999.
            Length scale of facility                 m           DERIVED        -999.      -999.      0.100E-08  0.100E+11
            Width scale of facility                  m           DERIVED        -999.      -999.      0.100E-08  0.100E+11
            Near field dilution                                  DERIVED         1.00     0.000E+00   0.000E+00   1.00
1
                                             AQUIFER SPECIFIC VARIABLES
```

```
---------------------------------------------------------------------------------------------------------
          VARIABLE NAME                 UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                   MEAN      STD DEV      MIN         MAX
---------------------------------------------------------------------------------------------------------
 Particle diameter                       cm       CONSTANT       0.100E-03  -999.     0.100E-08   100.
 Aquifer porosity                        --       CONSTANT       0.400      -999.     0.100E-08  0.990
 Bulk density                           g/cc      CONSTANT        1.50      -999.     0.100E-01   5.00
 Aquifer thickness                       m        CONSTANT        12.2      -999.     0.100E-08  0.100E+06
 Source thickness (mixing zone depth)    m        DERIVED        -999.      -999.     0.100E-08  0.100E+06
 Conductivity (hydraulic)               m/yr      CONSTANT        100.      -999.     0.100E-06  0.100E+09
 Gradient (hydraulic)                             CONSTANT       0.500E-02  -999.     0.100E-07  -999.
 Groundwater seepage velocity           m/yr      DERIVED        -999.      -999.     0.100E-09  0.100E+09
 Retardation coefficient                 --       DERIVED        -999.      -999.      1.00      0.100E+09
 Longitudinal dispersivity               m        FUNCTION OF X  -999.      -999.     -999.      -999.
 Transverse dispersivity                 m        FUNCTION OF X  -999.      -999.     -999.      -999.
 Vertical dispersivity                   m        FUNCTION OF X  -999.      -999.     -999.      -999.
 Temperature of aquifer                  C        CONSTANT        28.0      -999.     0.000E+00   100.
 pH                                      --       CONSTANT        7.50      -999.     0.300       14.0
 Organic carbon content (fraction)                CONSTANT       0.100E-02  -999.     0.100E-05   1.00
 Well distance from site                 m        CONSTANT        15.0      -999.      1.00      -999.
 Angle off center                      degree     CONSTANT       0.000E+00  -999.     0.000E+00   360.
 Well vertical distance                  m        CONSTANT       0.000E+00  -999.     0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1052E-04
```

AM HYDCON

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1














                    U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                   E X P O S U R E   A S S E S S M E N T

                                        M U L T I M E D I A   M O D E L

                                      MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - transient leakage


 Aquifer hydraulic conductivity sensitivity - WHOLE SITE, AVG LEAKAGE 200-year du
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                        Saturated and unsaturated zone models
 Run was                              DETERMIN
 Infiltration input by user
 Run was transient
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
 UNSATURATED ZONE FLOW MODEL PARAMETERS
 (input parameter description and value)
 NP      - Total number of nodal points             240
 NMAT    - Number of different porous materials       1
 KPROP   - Van Genuchten or Brooks and Corey          1
 IMSHGN  - Spatial discretization option              1
 NVFLAYR - Number of layers in flow model             1
```

```
OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
   r defined coordinate system



Layer information
-----------------
LAYER NO.    LAYER THICKNESS     MATERIAL PROPERTY
---------    ---------------     -----------------
    1                 31.80              1

                                                      DATA FOR MATERIAL  1
                                                      ---- --- --------
                                                  VADOSE ZONE MATERIAL VARIABLES


               ------------------------------------------------------------------------------------------------------------------------
                          VARIABLE NAME                   UNITS       DISTRIBUTION         PARAMETERS              LIMITS
                                                                                         MEAN      STD DEV     MIN          MAX
               ------------------------------------------------------------------------------------------------------------------------
               Saturated hydraulic conductivity           cm/hr         CONSTANT        0.360      -999.      0.100E-10  0.100E+05
               Unsaturated zone porosity                   --           CONSTANT        0.430      -999.      0.100E-08  0.990
               Air entry pressure head                     m            CONSTANT        0.000E+00 -999.       0.000E+00  -999.
               Depth of the unsaturated zone               m            CONSTANT         31.8      -999.      0.100E-08  -999.

                                                      DATA FOR MATERIAL  1
                                                      ---- --- --------
                                                  VADOSE ZONE FUNCTION VARIABLES


               ------------------------------------------------------------------------------------------------------------------------
                          VARIABLE NAME                   UNITS       DISTRIBUTION         PARAMETERS              LIMITS
                                                                                         MEAN      STD DEV     MIN          MAX
               ------------------------------------------------------------------------------------------------------------------------
               Residual water content                      --           CONSTANT        0.700E-01 -999.       0.100E-08   1.00
               Brook and Corey exponent,EN                 --           CONSTANT        0.000E+00 -999.       0.000E+00   10.0
               ALFA coefficient                           1/cm          CONSTANT        0.500E-02 -999.       0.000E+00   1.00
               Van Genuchten exponent, ENN                 --           CONSTANT         1.09      -999.       1.00        5.00
1

 UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

 NLAY    - Number of different layers used                 1
 NTSTPS  - Number of time values concentration calc       40
 DUMMY   - Not presently used                              1
 ISOL    - Type of scheme used in unsaturated zone         1
 N       - Stehfest terms or number of increments         18
 NTEL    - Points in Lagrangian interpolation              3
 NGPTS   - Number of Gauss points                        104
 NIT     - Convolution integral segments                   2
 IBOUND  - Type of boundary condition                      2
 ITSGEN  - Time values generated or input                  1
 TMAX    - Max simulation time                 --          0.0
 WTFUN   - Weighting factor                    --          1.2


   TIONS CHOSEN
 ------- ------
 Stehfest numerical inversion algorithm
 Nondecaying pulse source
 Computer generated times for computing concentrations
```

```
1
                                          DATA FOR LAYER    1
                                          ---- --- -----
                                          VADOSE TRANSPORT VARIABLES


         ------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                  UNITS       DISTRIBUTION        PARAMETERS               LIMITS
                                                                               MEAN     STD DEV      MIN          MAX
         ------------------------------------------------------------------------------------------------------
         Thickness of layer                         m           CONSTANT       31.8       -999.      0.100E-08  -999.
         Longitudinal dispersivity of layer         m           DERIVED       -999.       -999.      0.100E-02  0.100E+05
         Percent organic matter                     --          CONSTANT       1.00       -999.      0.000E+00   100.
         Bulk density of soil for layer           g/cc          CONSTANT       1.60       -999.      0.100E-01   5.00
         Biological decay coefficient             1/yr          CONSTANT      0.000E+00 -999.        0.000E+00  -999.
1
                                         CHEMICAL SPECIFIC VARIABLES


         ------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                  UNITS       DISTRIBUTION        PARAMETERS               LIMITS
                                                                               MEAN     STD DEV      MIN          MAX
         ------------------------------------------------------------------------------------------------------
         Solid phase decay coefficient             1/yr         DERIVED       -999.       -999.      0.000E+00  0.100E+11
         Dissolved phase decay coefficient         1/yr         DERIVED       -999.       -999.      0.000E+00  0.100E+11
         Overall chemical decay coefficient        1/yr         DERIVED       -999.       -999.      0.000E+00  0.100E+11
         Acid catalyzed hydrolysis rate           l/M-yr        CONSTANT      0.000E+00 -999.        0.000E+00  -999.
         Neutral hydrolysis rate constant          1/yr         CONSTANT      0.000E+00 -999.        0.000E+00  -999.
         Base catalyzed hydrolysis rate           l/M-yr        CONSTANT      0.000E+00 -999.        0.000E+00  -999.
         Reference temperature                     C            CONSTANT       25.0       -999.      0.000E+00   100.
         Normalized distribution coefficient       ml/g         CONSTANT      0.000E+00 -999.        0.000E+00  -999.
         Distribution coefficient                   --          DERIVED       -999.       -999.      0.000E+00  0.100E+11
         Biodegradation coefficient (sat. zone)    1/yr         CONSTANT      0.000E+00 -999.        0.000E+00  -999.
         Air diffusion coefficient                 cm2/s        CONSTANT      0.000E+00 -999.        0.000E+00   10.0
         Reference temperature for air diffusion   C            CONSTANT       25.0       -999.      0.000E+00   100.
         Molecular weight                          g/M          CONSTANT      0.000E+00 -999.        0.000E+00  -999.
         Mole fraction of solute                   --           CONSTANT      0.000E+00 -999.        0.100E-08   1.00
         Vapor pressure of solute                  mm Hg        CONSTANT      0.000E+00 -999.        0.000E+00   100.
         Henry's law constant                    atm-m^3/M      CONSTANT      0.000E+00 -999.        0.100E-09   1.00
         Overall 1st order decay sat. zone         1/yr         DERIVED       0.000E+00 0.000E+00    0.000E+00   1.00
         Not currently used                                     CONSTANT      -999.       -999.      0.000E+00   1.00
         Not currently used                                     CONSTANT      -999.       -999.      0.000E+00   1.00
1
                                          SOURCE SPECIFIC VARIABLES


         ------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                  UNITS       DISTRIBUTION        PARAMETERS               LIMITS
                                                                               MEAN     STD DEV      MIN          MAX
         ------------------------------------------------------------------------------------------------------
         Infiltration rate                         m/yr         CONSTANT      0.273E-04 -999.        0.100E-09  0.100E+11
         Area of waste disposal unit               m^2          CONSTANT      0.197E+07 -999.        0.100E-01  -999.
         Duration of pulse                         yr           CONSTANT       200.       -999.      0.100E-08  -999.
         Spread of contaminant source              m            DERIVED       -999.       -999.      0.100E-08  0.100E+11
         Recharge rate                             m/yr         CONSTANT      0.000E+00 -999.        0.000E+00  0.100E+11
         Source decay constant                     1/yr         CONSTANT      0.000E+00 -999.        0.000E+00  -999.
         Initial concentration at landfill         mg/l         CONSTANT       1.00       -999.      0.000E+00  -999.
         Length scale of facility                  m            DERIVED       -999.       -999.      0.100E-08  0.100E+11
         Width scale of facility                   m            DERIVED       -999.       -999.      0.100E-08  0.100E+11
         Near field dilution                                    DERIVED        1.00     0.000E+00    0.000E+00   1.00
1
                                          AQUIFER SPECIFIC VARIABLES
```

```
-----------------------------------------------------------------------------------------------------
          VARIABLE NAME               UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                 MEAN     STD DEV       MIN        MAX
-----------------------------------------------------------------------------------------------------
Particle diameter                       cm        CONSTANT      0.100E-03 -999.       0.100E-08   100.
Aquifer porosity                        --        CONSTANT      0.200     -999.       0.100E-08  0.990
Bulk density                            g/cc      CONSTANT       1.50     -999.       0.100E-01   5.00
Aquifer thickness                       m         CONSTANT       12.2     -999.       0.100E-08  0.100E+06
Source thickness (mixing zone depth)    m         DERIVED       -999.     -999.       0.100E-08  0.100E+06
Conductivity (hydraulic)                m/yr      CONSTANT      0.100E+04 -999.       0.100E-06  0.100E+09
Gradient (hydraulic)                              CONSTANT      0.500E-02 -999.       0.100E-07  -999.
Groundwater seepage velocity            m/yr      DERIVED       -999.     -999.       0.100E-09  0.100E+09
Retardation coefficient                 --        DERIVED       -999.     -999.        1.00      0.100E+09
Longitudinal dispersivity               m         FUNCTION OF X -999.     -999.       -999.      -999.
Transverse dispersivity                 m         FUNCTION OF X -999.     -999.       -999.      -999.
Vertical dispersivity                   m         FUNCTION OF X -999.     -999.       -999.      -999.
Temperature of aquifer                  C         CONSTANT       28.0     -999.       0.000E+00   100.
pH                                      --        CONSTANT       7.50     -999.       0.300       14.0
Organic carbon content (fraction)                 CONSTANT      0.100E-02 -999.       0.100E-05   1.00
Well distance from site                 m         CONSTANT       15.0     -999.        1.00      -999.
Angle off center                      degree      CONSTANT      0.000E+00 -999.       0.000E+00   360.
Well vertical distance                  m         CONSTANT      0.000E+00 -999.       0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1052E-05
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STEDYBAS

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1
















                  U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                   E X P O S U R E   A S S E S S M E N T

                                      M U L T I M E D I A   M O D E L

                                     MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 BASE MODEL - 20 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                       Saturated zone model
 Run was                             DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                              CHEMICAL SPECIFIC VARIABLES


         ------------------------------------------------------------------------------------------------------
                   VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                               MEAN     STD DEV       MIN          MAX
         -------------------------------------------------------------------------------------------------------------
         Solid phase decay coefficient             1/yr         DERIVED        -999.     -999.     0.000E+00  0.100E+11
```

```
     Dissolved phase decay coefficient        1/yr       DERIVED        -999.      -999.        0.000E+00  0.100E+11
     Overall chemical decay coefficient       1/yr       DERIVED        -999.      -999.        0.000E+00  0.100E+11
     Acid catalyzed hydrolysis rate           l/M-yr     CONSTANT       0.000E+00 -999.         0.000E+00  -999.
     Neutral hydrolysis rate constant         1/yr       CONSTANT       0.000E+00 -999.         0.000E+00  -999.
     Base catalyzed hydrolysis rate           l/M-yr     CONSTANT       0.000E+00 -999.         0.000E+00  -999.
     Reference temperature                    C          CONSTANT        25.0      -999.        0.000E+00   100.
     Normalized distribution coefficient      ml/g       CONSTANT       0.000E+00 -999.         0.000E+00  -999.
     Distribution coefficient                  --        DERIVED        -999.      -999.        0.000E+00  0.100E+11
     Biodegradation coefficient (sat. zone)   1/yr       CONSTANT       0.000E+00 -999.         0.000E+00  -999.
     Air diffusion coefficient                cm2/s      CONSTANT       0.000E+00 -999.         0.000E+00   10.0
     Reference temperature for air diffusion  C          CONSTANT        25.0      -999.        0.000E+00   100.
     Molecular weight                         g/M        CONSTANT       0.000E+00 -999.         0.000E+00  -999.
     Mole fraction of solute                  --         CONSTANT       0.000E+00 -999.         0.100E-08   1.00
     Vapor pressure of solute                 mm Hg      CONSTANT       0.000E+00 -999.         0.000E+00   100.
     Henry's law constant                   atm-m^3/M    CONSTANT       0.000E+00 -999.         0.100E-09   1.00
     Overall 1st order decay sat. zone        1/yr       DERIVED        0.000E+00 0.000E+00     0.000E+00   1.00
     Not currently used                                  CONSTANT       -999.      -999.        0.000E+00   1.00
     Not currently used                                  CONSTANT       -999.      -999.        0.000E+00   1.00
1
                                               SOURCE SPECIFIC VARIABLES


     -------------------------------------------------------------------------------------------------------------
                VARIABLE NAME                 UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                         MEAN      STD DEV       MIN         MAX
     -------------------------------------------------------------------------------------------------------------

     Infiltration rate                        m/yr       CONSTANT       0.273E-04 -999.         0.100E-09  0.100E+11
     Area of waste disposal unit              m^2        CONSTANT       0.810E+05 -999.         0.100E-01  -999.
     Duration of pulse                        yr         CONSTANT        200.      -999.        0.100E-08  -999.
     Spread of contaminant source             m          DERIVED        -999.      -999.        0.100E-08  0.100E+11
     Recharge rate                            m/yr       CONSTANT       0.000E+00 -999.         0.000E+00  0.100E+11
     Source decay constant                    1/yr       CONSTANT       0.000E+00 -999.         0.000E+00  -999.
     Initial concentration at landfill        mg/l       CONSTANT        1.00      -999.        0.000E+00  -999.
     Length scale of facility                 m          DERIVED        -999.      -999.        0.100E-08  0.100E+11
     Width scale of facility                  m          DERIVED        -999.      -999.        0.100E-08  0.100E+11
     Near field dilution                                 DERIVED         1.00      0.000E+00    0.000E+00   1.00
1
                                              AQUIFER SPECIFIC VARIABLES


     -------------------------------------------------------------------------------------------------------------
                VARIABLE NAME                 UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                         MEAN      STD DEV       MIN         MAX
     -------------------------------------------------------------------------------------------------------------

     Particle diameter                        cm         CONSTANT       0.100E-03 -999.         0.100E-08   100.
     Aquifer porosity                         --         CONSTANT       0.400      -999.        0.100E-08  0.990
     Bulk density                             g/cc       CONSTANT        1.50      -999.        0.100E-01   5.00
     Aquifer thickness                        m          CONSTANT        12.2      -999.        0.100E-08  0.100E+06
     Source thickness (mixing zone depth)     m          DERIVED        -999.      -999.        0.100E-08  0.100E+06
     Conductivity (hydraulic)                 m/yr       CONSTANT       100.       -999.        0.100E-06  0.100E+09
     Gradient (hydraulic)                                CONSTANT       0.500E-02 -999.         0.100E-07  -999.
     Groundwater seepage velocity             m/yr       DERIVED        -999.      -999.        0.100E-09  0.100E+09
     Retardation coefficient                  --         DERIVED        -999.      -999.         1.00      0.100E+09
     Longitudinal dispersivity                m          FUNCTION OF X  -999.      -999.        -999.      -999.
     Transverse dispersivity                  m          FUNCTION OF X  -999.      -999.        -999.      -999.
     Vertical dispersivity                    m          FUNCTION OF X  -999.      -999.        -999.      -999.
     Temperature of aquifer                   C          CONSTANT        28.0      -999.        0.000E+00   100.
     pH                                       --         CONSTANT        7.50      -999.        0.300       14.0
     Organic carbon content (fraction)                   CONSTANT       0.100E-02 -999.         0.100E-05   1.00
     Well distance from site                  m          CONSTANT        30.0      -999.         1.00      -999.
     Angle off center                       degree       CONSTANT       0.000E+00 -999.         0.000E+00   360.
     Well vertical distance                   m          CONSTANT       0.000E+00 -999.         0.000E+00   1.00


 CONCENTRATION AFTER SATURATED ZONE MODEL 0.3009E-02
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AMSSFIAR

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1

                  U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                   E X P O S U R E   A S S E S S M E N T

                                     M U L T I M E D I A   M O D E L

                                   MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 BASE MODEL - 20 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                         Saturated zone model
 Run was                               DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                                   CHEMICAL SPECIFIC VARIABLES


              -----------------------------------------------------------------------------------------------------------
                        VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS               LIMITS
                                                                                   MEAN      STD DEV       MIN          MAX
              ------------------------------------------------------------------------------------------------------------
              Solid phase decay coefficient            1/yr         DERIVED        -999.      -999.      0.000E+00  0.100E+11
```

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      Dissolved phase decay coefficient      1/yr      DERIVED       -999.      -999.       0.000E+00  0.100E+11
      Overall chemical decay coefficient     1/yr      DERIVED       -999.      -999.       0.000E+00  0.100E+11
      Acid catalyzed hydrolysis rate         l/M-yr    CONSTANT      0.000E+00 -999.        0.000E+00  -999.
      Neutral hydrolysis rate constant       1/yr      CONSTANT      0.000E+00 -999.        0.000E+00  -999.
      Base catalyzed hydrolysis rate         l/M-yr    CONSTANT      0.000E+00 -999.        0.000E+00  -999.
      Reference temperature                  C         CONSTANT       25.0      -999.       0.000E+00   100.
      Normalized distribution coefficient    ml/g      CONSTANT      0.000E+00 -999.        0.000E+00  -999.
      Distribution coefficient                --       DERIVED       -999.      -999.       0.000E+00  0.100E+11
      Biodegradation coefficient (sat. zone) 1/yr      CONSTANT      0.000E+00 -999.        0.000E+00  -999.
      Air diffusion coefficient              cm2/s     CONSTANT      0.000E+00 -999.        0.000E+00   10.0
      Reference temperature for air diffusion C        CONSTANT       25.0      -999.       0.000E+00   100.
      Molecular weight                       g/M       CONSTANT      0.000E+00 -999.        0.000E+00  -999.
      Mole fraction of solute                 --       CONSTANT      0.000E+00 -999.        0.100E-08   1.00
      Vapor pressure of solute               mm Hg     CONSTANT      0.000E+00 -999.        0.000E+00   100.
      Henry's law constant                 atm-m^3/M   CONSTANT      0.000E+00 -999.        0.100E-09   1.00
      Overall 1st order decay sat. zone      1/yr      DERIVED       0.000E+00 0.000E+00    0.000E+00   1.00
      Not currently used                               CONSTANT      -999.      -999.       0.000E+00   1.00
      Not currently used                               CONSTANT      -999.      -999.       0.000E+00   1.00
1
                                             SOURCE SPECIFIC VARIABLES


      ------------------------------------------------------------------------------------------------------------
                 VARIABLE NAME               UNITS     DISTRIBUTION       PARAMETERS             LIMITS
                                                                       MEAN      STD DEV      MIN         MAX
      ------------------------------------------------------------------------------------------------------------
      Infiltration rate                      m/yr      CONSTANT      0.273E-04 -999.        0.100E-09  0.100E+11
      Area of waste disposal unit            m^2       CONSTANT      0.810E+05 -999.        0.100E-01  -999.
      Duration of pulse                      yr        CONSTANT       200.      -999.       0.100E-08  -999.
      Spread of contaminant source           m         DERIVED       -999.      -999.       0.100E-08  0.100E+11
      Recharge rate                          m/yr      CONSTANT      0.000E+00 -999.        0.000E+00  0.100E+11
      Source decay constant                  1/yr      CONSTANT      0.000E+00 -999.        0.000E+00  -999.
      Initial concentration at landfill      mg/l      CONSTANT       1.00      -999.       0.000E+00  -999.
      Length scale of facility               m         DERIVED       -999.      -999.       0.100E-08  0.100E+11
      Width scale of facility                m         DERIVED       -999.      -999.       0.100E-08  0.100E+11
      Near field dilution                              DERIVED        1.00      0.000E+00   0.000E+00   1.00
1
                                             AQUIFER SPECIFIC VARIABLES


      ------------------------------------------------------------------------------------------------------------
                 VARIABLE NAME               UNITS     DISTRIBUTION       PARAMETERS             LIMITS
                                                                       MEAN      STD DEV      MIN         MAX
      ------------------------------------------------------------------------------------------------------------
      Particle diameter                      cm        CONSTANT      0.100E-03 -999.        0.100E-08   100.
      Aquifer porosity                        --       CONSTANT      0.400      -999.       0.100E-08  0.990
      Bulk density                           g/cc      CONSTANT       1.50      -999.       0.100E-01   5.00
      Aquifer thickness                      m         CONSTANT       12.2      -999.       0.100E-08  0.100E+06
      Source thickness (mixing zone depth)   m         DERIVED       -999.      -999.       0.100E-08  0.100E+06
      Conductivity (hydraulic)               m/yr      CONSTANT       100.      -999.       0.100E-06  0.100E+09
      Gradient (hydraulic)                             CONSTANT      0.500E-02 -999.        0.100E-07  -999.
      Groundwater seepage velocity           m/yr      DERIVED       -999.      -999.       0.100E-09  0.100E+09
      Retardation coefficient                 --       DERIVED       -999.      -999.        1.00      0.100E+09
      Longitudinal dispersivity              m         FUNCTION OF X -999.      -999.       -999.       -999.
      Transverse dispersivity                m         FUNCTION OF X -999.      -999.       -999.       -999.
      Vertical dispersivity                  m         FUNCTION OF X -999.      -999.       -999.       -999.
      Temperature of aquifer                 C         CONSTANT       28.0      -999.       0.000E+00   100.
      pH                                      --       CONSTANT       7.50      -999.       0.300       14.0
      Organic carbon content (fraction)                CONSTANT      0.100E-02 -999.        0.100E-05   1.00
      Well distance from site                m         CONSTANT       470.      -999.        1.00       -999.
      Angle off center                     degree      CONSTANT      0.000E+00 -999.        0.000E+00   360.
      Well vertical distance                 m         CONSTANT      0.000E+00 -999.        0.000E+00   1.00


  CONCENTRATION AFTER SATURATED ZONE MODEL 0.1167E-02
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AMSSHYCN

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                 U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                  E X P O S U R E   A S S E S S M E N T

                                     M U L T I M E D I A   M O D E L

                                  MULTIMED  (Version 1.01, June 1991)
1
 Run options
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 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 aquifer hydraulic conductivity - 20 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                       Saturated zone model
 Run was                             DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                                CHEMICAL SPECIFIC VARIABLES


         ------------------------------------------------------------------------------------------------------------
                   VARIABLE NAME                 UNITS      DISTRIBUTION           PARAMETERS                LIMITS
                                                                               MEAN      STD DEV      MIN          MAX
         ------------------------------------------------------------------------------------------------------------
         Solid phase decay coefficient            1/yr        DERIVED          -999.     -999.      0.000E+00  0.100E+11
```

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    Dissolved phase decay coefficient        1/yr        DERIVED        -999.      -999.       0.000E+00  0.100E+11
    Overall chemical decay coefficient       1/yr        DERIVED        -999.      -999.       0.000E+00  0.100E+11
    Acid catalyzed hydrolysis rate           l/M-yr      CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Neutral hydrolysis rate constant         1/yr        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Base catalyzed hydrolysis rate           l/M-yr      CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Reference temperature                    C           CONSTANT        25.0      -999.       0.000E+00   100.
    Normalized distribution coefficient      ml/g        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Distribution coefficient                  --         DERIVED        -999.      -999.       0.000E+00  0.100E+11
    Biodegradation coefficient (sat. zone)   1/yr        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Air diffusion coefficient                cm2/s       CONSTANT       0.000E+00 -999.        0.000E+00   10.0
    Reference temperature for air diffusion  C           CONSTANT        25.0      -999.       0.000E+00   100.
    Molecular weight                         g/M         CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Mole fraction of solute                  --          CONSTANT       0.000E+00 -999.        0.100E-08   1.00
    Vapor pressure of solute                 mm Hg       CONSTANT       0.000E+00 -999.        0.000E+00   100.
    Henry's law constant                   atm-m^3/M     CONSTANT       0.000E+00 -999.        0.100E-09   1.00
    Overall 1st order decay sat. zone        1/yr        DERIVED        0.000E+00 0.000E+00    0.000E+00   1.00
    Not currently used                                   CONSTANT       -999.      -999.       0.000E+00   1.00
    Not currently used                                   CONSTANT       -999.      -999.       0.000E+00   1.00
1
                                                 SOURCE SPECIFIC VARIABLES


    ---------------------------------------------------------------------------------------------------------------
                 VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                            MEAN      STD DEV      MIN          MAX
    ---------------------------------------------------------------------------------------------------------------
    Infiltration rate                        m/yr        CONSTANT       0.273E-04 -999.        0.100E-09  0.100E+11
    Area of waste disposal unit              m^2         CONSTANT       0.810E+05 -999.        0.100E-01  -999.
    Duration of pulse                        yr          CONSTANT        200.      -999.       0.100E-08  -999.
    Spread of contaminant source             m           DERIVED        -999.      -999.       0.100E-08  0.100E+11
    Recharge rate                            m/yr        CONSTANT       0.000E+00 -999.        0.000E+00  0.100E+11
    Source decay constant                    1/yr        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Initial concentration at landfill        mg/l        CONSTANT        1.00      -999.       0.000E+00  -999.
    Length scale of facility                 m           DERIVED        -999.      -999.       0.100E-08  0.100E+11
    Width scale of facility                  m           DERIVED        -999.      -999.       0.100E-08  0.100E+11
    Near field dilution                                  DERIVED         1.00     0.000E+00    0.000E+00   1.00
1
                                                 AQUIFER SPECIFIC VARIABLES


    ---------------------------------------------------------------------------------------------------------------
                 VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                            MEAN      STD DEV      MIN          MAX
    ---------------------------------------------------------------------------------------------------------------
    Particle diameter                        cm          CONSTANT       0.100E-03 -999.        0.100E-08   100.
    Aquifer porosity                         --          CONSTANT       0.400      -999.       0.100E-08  0.990
    Bulk density                             g/cc        CONSTANT        1.50      -999.       0.100E-01   5.00
    Aquifer thickness                        m           CONSTANT        12.2      -999.       0.100E-08  0.100E+06
    Source thickness (mixing zone depth)     m           DERIVED        -999.      -999.       0.100E-08  0.100E+06
    Conductivity (hydraulic)                 m/yr        CONSTANT       0.100E+04 -999.        0.100E-06  0.100E+09
    Gradient (hydraulic)                                 CONSTANT       0.500E-02 -999.        0.100E-07  -999.
    Groundwater seepage velocity             m/yr        DERIVED        -999.      -999.       0.100E-09  0.100E+09
    Retardation coefficient                  --          DERIVED        -999.      -999.        1.00      0.100E+09
    Longitudinal dispersivity                m           FUNCTION OF X  -999.      -999.       -999.      -999.
    Transverse dispersivity                  m           FUNCTION OF X  -999.      -999.       -999.      -999.
    Vertical dispersivity                    m           FUNCTION OF X  -999.      -999.       -999.      -999.
    Temperature of aquifer                   C           CONSTANT        28.0      -999.       0.000E+00   100.
    pH                                       --          CONSTANT        7.50      -999.       0.300       14.0
    Organic carbon content (fraction)                    CONSTANT       0.100E-02 -999.        0.100E-05   1.00
    Well distance from site                  m           CONSTANT        30.0      -999.        1.00      -999.
    Angle off center                       degree        CONSTANT       0.000E+00 -999.        0.000E+00   360.
    Well vertical distance                   m           CONSTANT       0.000E+00 -999.        0.000E+00   1.00


 CONCENTRATION AFTER SATURATED ZONE MODEL 0.3009E-03
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AMSSGRAD

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                          U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                           E X P O S U R E   A S S E S S M E N T

                                              M U L T I M E D I A   M O D E L

                                             MULTIMED  (Version 1.01, June 1991)
1
 Run options
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 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 Htdraulic Gradient - 20 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                          Saturated zone model
 Run was                                DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                                     CHEMICAL SPECIFIC VARIABLES


          --------------------------------------------------------------------------------------------------
                    VARIABLE NAME                 UNITS       DISTRIBUTION          PARAMETERS               LIMITS
                                                                                  MEAN      STD DEV       MIN          MAX
          --------------------------------------------------------------------------------------------------------
          Solid phase decay coefficient            1/yr         DERIVED           -999.      -999.      0.000E+00  0.100E+11
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      Dissolved phase decay coefficient       1/yr       DERIVED        -999.       -999.        0.000E+00  0.100E+11
      Overall chemical decay coefficient      1/yr       DERIVED        -999.       -999.        0.000E+00  0.100E+11
      Acid catalyzed hydrolysis rate          l/M-yr     CONSTANT       0.000E+00 -999.        0.000E+00  -999.
      Neutral hydrolysis rate constant        1/yr       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
      Base catalyzed hydrolysis rate          l/M-yr     CONSTANT       0.000E+00 -999.        0.000E+00  -999.
      Reference temperature                   C          CONSTANT        25.0      -999.       0.000E+00   100.
      Normalized distribution coefficient     ml/g       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
      Distribution coefficient                 --        DERIVED        -999.      -999.       0.000E+00  0.100E+11
      Biodegradation coefficient (sat. zone)  1/yr       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
      Air diffusion coefficient               cm2/s      CONSTANT       0.000E+00 -999.        0.000E+00   10.0
      Reference temperature for air diffusion C          CONSTANT        25.0      -999.       0.000E+00   100.
      Molecular weight                        g/M        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
      Mole fraction of solute                 --         CONSTANT       0.000E+00 -999.        0.100E-08   1.00
      Vapor pressure of solute                mm Hg      CONSTANT       0.000E+00 -999.        0.000E+00   100.
      Henry's law constant                  atm-m^3/M    CONSTANT       0.000E+00 -999.        0.100E-09   1.00
      Overall 1st order decay sat. zone       1/yr       DERIVED        0.000E+00 0.000E+00    0.000E+00   1.00
      Not currently used                                 CONSTANT       -999.      -999.       0.000E+00   1.00
      Not currently used                                 CONSTANT       -999.      -999.       0.000E+00   1.00
1
                                               SOURCE SPECIFIC VARIABLES


      -----------------------------------------------------------------------------------------------------------
                  VARIABLE NAME               UNITS      DISTRIBUTION       PARAMETERS              LIMITS
                                                                          MEAN      STD DEV      MIN         MAX
      -----------------------------------------------------------------------------------------------------------

      Infiltration rate                       m/yr       CONSTANT       0.273E-04 -999.        0.100E-09  0.100E+11
      Area of waste disposal unit             m^2        CONSTANT       0.810E+05 -999.        0.100E-01  -999.
      Duration of pulse                       yr         CONSTANT        200.      -999.       0.100E-08  -999.
      Spread of contaminant source            m          DERIVED        -999.      -999.       0.100E-08  0.100E+11
      Recharge rate                           m/yr       CONSTANT       0.000E+00 -999.        0.000E+00  0.100E+11
      Source decay constant                   1/yr       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
      Initial concentration at landfill       mg/l       CONSTANT        1.00      -999.       0.000E+00  -999.
      Length scale of facility                m          DERIVED        -999.      -999.       0.100E-08  0.100E+11
      Width scale of facility                 m          DERIVED        -999.      -999.       0.100E-08  0.100E+11
      Near field dilution                                DERIVED         1.00      0.000E+00   0.000E+00   1.00
1
                                              AQUIFER SPECIFIC VARIABLES


      -----------------------------------------------------------------------------------------------------------
                  VARIABLE NAME               UNITS      DISTRIBUTION       PARAMETERS              LIMITS
                                                                          MEAN      STD DEV      MIN         MAX
      -----------------------------------------------------------------------------------------------------------

      Particle diameter                       cm         CONSTANT       0.100E-03 -999.        0.100E-08   100.
      Aquifer porosity                        --         CONSTANT       0.400      -999.       0.100E-08  0.990
      Bulk density                            g/cc       CONSTANT        1.50      -999.       0.100E-01   5.00
      Aquifer thickness                       m          CONSTANT        12.2      -999.       0.100E-08  0.100E+06
      Source thickness (mixing zone depth)    m          DERIVED        -999.      -999.       0.100E-08  0.100E+06
      Conductivity (hydraulic)                m/yr       CONSTANT        100.      -999.       0.100E-06  0.100E+09
      Gradient (hydraulic)                               CONSTANT       0.700E-02 -999.        0.100E-07  -999.
      Groundwater seepage velocity            m/yr       DERIVED        -999.      -999.       0.100E-09  0.100E+09
      Retardation coefficient                 --         DERIVED        -999.      -999.        1.00      0.100E+09
      Longitudinal dispersivity               m          FUNCTION OF X  -999.      -999.       -999.      -999.
      Transverse dispersivity                 m          FUNCTION OF X  -999.      -999.       -999.      -999.
      Vertical dispersivity                   m          FUNCTION OF X  -999.      -999.       -999.      -999.
      Temperature of aquifer                  C          CONSTANT        28.0      -999.       0.000E+00   100.
      pH                                      --         CONSTANT        7.50      -999.       0.300       14.0
      Organic carbon content (fraction)                  CONSTANT       0.100E-02 -999.        0.100E-05   1.00
      Well distance from site                 m          CONSTANT        30.0      -999.        1.00      -999.
      Angle off center                      degree       CONSTANT       0.000E+00 -999.        0.000E+00   360.
      Well vertical distance                  m          CONSTANT       0.000E+00 -999.        0.000E+00   1.00


 CONCENTRATION AFTER SATURATED ZONE MODEL 0.2149E-02
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AMSSMIX

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1

















                 U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                  E X P O S U R E   A S S E S S M E N T

                                     M U L T I M E D I A   M O D E L

                                   MULTIMED  (Version 1.01, June 1991)
1
 Run options
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 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 12.2m mixing zone - 20 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                         Saturated zone model
 Run was                               DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                         CHEMICAL SPECIFIC VARIABLES


          -------------------------------------------------------------------------------------------
                   VARIABLE NAME                 UNITS     DISTRIBUTION        PARAMETERS            LIMITS
                                                                             MEAN      STD DEV     MIN        MAX
          ------------------------------------------------------------------------------------------------
          Solid phase decay coefficient          1/yr        DERIVED        -999.     -999.     0.000E+00  0.100E+11
```

```
      Dissolved phase decay coefficient         1/yr        DERIVED       -999.      -999.        0.000E+00  0.100E+11
      Overall chemical decay coefficient        1/yr        DERIVED       -999.      -999.        0.000E+00  0.100E+11
      Acid catalyzed hydrolysis rate            l/M-yr      CONSTANT      0.000E+00 -999.         0.000E+00  -999.
      Neutral hydrolysis rate constant          1/yr        CONSTANT      0.000E+00 -999.         0.000E+00  -999.
      Base catalyzed hydrolysis rate            l/M-yr      CONSTANT      0.000E+00 -999.         0.000E+00  -999.
      Reference temperature                     C           CONSTANT       25.0     -999.         0.000E+00   100.
      Normalized distribution coefficient       ml/g        CONSTANT      0.000E+00 -999.         0.000E+00  -999.
      Distribution coefficient                   --         DERIVED       -999.      -999.        0.000E+00  0.100E+11
      Biodegradation coefficient (sat. zone)    1/yr        CONSTANT      0.000E+00 -999.         0.000E+00  -999.
      Air diffusion coefficient                 cm2/s       CONSTANT      0.000E+00 -999.         0.000E+00   10.0
      Reference temperature for air diffusion   C           CONSTANT       25.0     -999.         0.000E+00   100.
      Molecular weight                          g/M         CONSTANT      0.000E+00 -999.         0.000E+00  -999.
      Mole fraction of solute                    --         CONSTANT      0.000E+00 -999.         0.100E-08   1.00
      Vapor pressure of solute                  mm Hg       CONSTANT      0.000E+00 -999.         0.000E+00   100.
      Henry's law constant                    atm-m^3/M     CONSTANT      0.000E+00 -999.         0.100E-09   1.00
      Overall 1st order decay sat. zone         1/yr        DERIVED       0.000E+00 0.000E+00     0.000E+00   1.00
      Not currently used                                    CONSTANT      -999.      -999.        0.000E+00   1.00
      Not currently used                                    CONSTANT      -999.      -999.        0.000E+00   1.00
1
                                           SOURCE SPECIFIC VARIABLES


      ------------------------------------------------------------------------------------------------------------
                VARIABLE NAME                   UNITS     DISTRIBUTION         PARAMETERS              LIMITS
                                                                             MEAN      STD DEV      MIN         MAX
      ------------------------------------------------------------------------------------------------------------
      Infiltration rate                         m/yr        CONSTANT      0.273E-04 -999.         0.100E-09  0.100E+11
      Area of waste disposal unit               m^2         CONSTANT      0.810E+05 -999.         0.100E-01  -999.
      Duration of pulse                         yr          CONSTANT       200.     -999.         0.100E-08  -999.
      Spread of contaminant source              m           DERIVED       -999.      -999.        0.100E-08  0.100E+11
      Recharge rate                             m/yr        CONSTANT      0.000E+00 -999.         0.000E+00  0.100E+11
      Source decay constant                     1/yr        CONSTANT      0.000E+00 -999.         0.000E+00  -999.
      Initial concentration at landfill         mg/l        CONSTANT       1.00     -999.         0.000E+00  -999.
      Length scale of facility                  m           DERIVED       -999.      -999.        0.100E-08  0.100E+11
      Width scale of facility                   m           DERIVED       -999.      -999.        0.100E-08  0.100E+11
      Near field dilution                                   DERIVED        1.00     0.000E+00     0.000E+00   1.00
1
                                           AQUIFER SPECIFIC VARIABLES


      ------------------------------------------------------------------------------------------------------------
                VARIABLE NAME                   UNITS     DISTRIBUTION         PARAMETERS              LIMITS
                                                                             MEAN      STD DEV      MIN         MAX
      ------------------------------------------------------------------------------------------------------------
      Particle diameter                         cm          CONSTANT      0.100E-03 -999.         0.100E-08   100.
      Aquifer porosity                           --         CONSTANT      0.400     -999.         0.100E-08  0.990
      Bulk density                              g/cc        CONSTANT       1.50     -999.         0.100E-01   5.00
      Aquifer thickness                         m           CONSTANT       12.2     -999.         0.100E-08  0.100E+06
      Source thickness (mixing zone depth)      m           CONSTANT       12.2     -999.         0.100E-08  0.100E+06
      Conductivity (hydraulic)                  m/yr        CONSTANT       100.     -999.         0.100E-06  0.100E+09
      Gradient (hydraulic)                                  CONSTANT      0.500E-02 -999.         0.100E-07  -999.
      Groundwater seepage velocity              m/yr        DERIVED       -999.      -999.        0.100E-09  0.100E+09
      Retardation coefficient                    --         DERIVED       -999.      -999.         1.00      0.100E+09
      Longitudinal dispersivity                 m           FUNCTION OF X -999.      -999.        -999.      -999.
      Transverse dispersivity                   m           FUNCTION OF X -999.      -999.        -999.      -999.
      Vertical dispersivity                     m           FUNCTION OF X -999.      -999.        -999.      -999.
      Temperature of aquifer                    C           CONSTANT       28.0     -999.         0.000E+00   100.
      pH                                         --         CONSTANT       7.50     -999.         0.300       14.0
      Organic carbon content (fraction)                     CONSTANT      0.100E-02 -999.         0.100E-05   1.00
      Well distance from site                   m           CONSTANT       30.0     -999.          1.00      -999.
      Angle off center                        degree        CONSTANT      0.000E+00 -999.         0.000E+00   360.
      Well vertical distance                    m           CONSTANT      0.000E+00 -999.         0.000E+00   1.00



  CONCENTRATION AFTER SATURATED ZONE MODEL 0.3009E-02
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AMSSPOR2

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1

                     U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                     E X P O S U R E   A S S E S S M E N T

                                          M U L T I M E D I A   M O D E L

                                     MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 Porosity = 0.2 - 20 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                            Saturated zone model
 Run was                                  DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                                       CHEMICAL SPECIFIC VARIABLES


          ------------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                 UNITS      DISTRIBUTION          PARAMETERS                LIMITS
                                                                             MEAN      STD DEV        MIN          MAX
          ------------------------------------------------------------------------------------------------------------
          Solid phase decay coefficient          1/yr        DERIVED         -999.      -999.       0.000E+00   0.100E+11
```

```
 Dissolved phase decay coefficient       1/yr      DERIVED       -999.      -999.       0.000E+00  0.100E+11
 Overall chemical decay coefficient      1/yr      DERIVED       -999.      -999.       0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate          l/M-yr    CONSTANT      0.000E+00 -999.        0.000E+00  -999.
 Neutral hydrolysis rate constant        1/yr      CONSTANT      0.000E+00 -999.        0.000E+00  -999.
 Base catalyzed hydrolysis rate          l/M-yr    CONSTANT      0.000E+00 -999.        0.000E+00  -999.
 Reference temperature                   C         CONSTANT       25.0      -999.       0.000E+00   100.
 Normalized distribution coefficient     ml/g      CONSTANT      0.000E+00 -999.        0.000E+00  -999.
 Distribution coefficient                 --       DERIVED       -999.      -999.       0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone)  1/yr      CONSTANT      0.000E+00 -999.        0.000E+00  -999.
 Air diffusion coefficient               cm2/s     CONSTANT      0.000E+00 -999.        0.000E+00   10.0
 Reference temperature for air diffusion C         CONSTANT       25.0      -999.       0.000E+00   100.
 Molecular weight                        g/M       CONSTANT      0.000E+00 -999.        0.000E+00  -999.
 Mole fraction of solute                 --        CONSTANT      0.000E+00 -999.        0.100E-08   1.00
 Vapor pressure of solute                mm Hg     CONSTANT      0.000E+00 -999.        0.000E+00   100.
 Henry's law constant                  atm-m^3/M   CONSTANT      0.000E+00 -999.        0.100E-09   1.00
 Overall 1st order decay sat. zone       1/yr      DERIVED       0.000E+00 0.000E+00    0.000E+00   1.00
 Not currently used                                CONSTANT      -999.      -999.       0.000E+00   1.00
 Not currently used                                CONSTANT      -999.      -999.       0.000E+00   1.00
1
                                          SOURCE SPECIFIC VARIABLES


 ----------------------------------------------------------------------------------------------------------
             VARIABLE NAME               UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                     MEAN      STD DEV      MIN        MAX
 ----------------------------------------------------------------------------------------------------------
 Infiltration rate                       m/yr      CONSTANT      0.273E-04 -999.        0.100E-09  0.100E+11
 Area of waste disposal unit             m^2       CONSTANT      0.810E+05 -999.        0.100E-01  -999.
 Duration of pulse                       yr        CONSTANT       200.      -999.       0.100E-08  -999.
 Spread of contaminant source            m         DERIVED       -999.      -999.       0.100E-08  0.100E+11
 Recharge rate                           m/yr      CONSTANT      0.000E+00 -999.        0.000E+00  0.100E+11
 Source decay constant                   1/yr      CONSTANT      0.000E+00 -999.        0.000E+00  -999.
 Initial concentration at landfill       mg/l      CONSTANT       1.00      -999.       0.000E+00  -999.
 Length scale of facility                m         DERIVED       -999.      -999.       0.100E-08  0.100E+11
 Width scale of facility                 m         DERIVED       -999.      -999.       0.100E-08  0.100E+11
 Near field dilution                               DERIVED        1.00      0.000E+00   0.000E+00   1.00
1
                                          AQUIFER SPECIFIC VARIABLES


 ----------------------------------------------------------------------------------------------------------
             VARIABLE NAME               UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                     MEAN      STD DEV      MIN        MAX
 ----------------------------------------------------------------------------------------------------------
 Particle diameter                       cm        CONSTANT      0.100E-03 -999.        0.100E-08   100.
 Aquifer porosity                        --        CONSTANT      0.200      -999.       0.100E-08  0.990
 Bulk density                            g/cc      CONSTANT       1.50      -999.       0.100E-01   5.00
 Aquifer thickness                       m         CONSTANT       12.2      -999.       0.100E-08  0.100E+06
 Source thickness (mixing zone depth)    m         DERIVED       -999.      -999.       0.100E-08  0.100E+06
 Conductivity (hydraulic)                m/yr      CONSTANT      100.       -999.       0.100E-06  0.100E+09
 Gradient (hydraulic)                              CONSTANT      0.500E-02 -999.        0.100E-07  -999.
 Groundwater seepage velocity            m/yr      DERIVED       -999.      -999.       0.100E-09  0.100E+09
 Retardation coefficient                 --        DERIVED       -999.      -999.        1.00      0.100E+09
 Longitudinal dispersivity               m         FUNCTION OF X -999.      -999.       -999.      -999.
 Transverse dispersivity                 m         FUNCTION OF X -999.      -999.       -999.      -999.
 Vertical dispersivity                   m         FUNCTION OF X -999.      -999.       -999.      -999.
 Temperature of aquifer                  C         CONSTANT       28.0      -999.       0.000E+00   100.
 pH                                      --        CONSTANT       7.50      -999.       0.300       14.0
 Organic carbon content (fraction)                 CONSTANT      0.100E-02 -999.        0.100E-05   1.00
 Well distance from site                 m         CONSTANT       30.0      -999.        1.00      -999.
 Angle off center                      degree      CONSTANT      0.000E+00 -999.        0.000E+00   360.
 Well vertical distance                  m         CONSTANT      0.000E+00 -999.        0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.3009E-02
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AMSS FAR 2

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1




                     U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                     E X P O S U R E   A S S E S S M E N T

                                       M U L T I M E D I A   M O D E L

                                      MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------



 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 300m to POC - 20 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                        Saturated zone model
 Run was                              DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                              CHEMICAL SPECIFIC VARIABLES


         ---------------------------------------------------------------------------------------------
                  VARIABLE NAME                 UNITS     DISTRIBUTION       PARAMETERS           LIMITS
                                                                          MEAN     STD DEV     MIN        MAX
         ----------------------------------------------------------------------------------------------------
         Solid phase decay coefficient           1/yr       DERIVED       -999.     -999.     0.000E+00  0.100E+11
```

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      Dissolved phase decay coefficient        1/yr         DERIVED         -999.     -999.        0.000E+00  0.100E+11
      Overall chemical decay coefficient       1/yr         DERIVED         -999.     -999.        0.000E+00  0.100E+11
      Acid catalyzed hydrolysis rate           l/M-yr       CONSTANT        0.000E+00 -999.        0.000E+00  -999.
      Neutral hydrolysis rate constant         1/yr         CONSTANT        0.000E+00 -999.        0.000E+00  -999.
      Base catalyzed hydrolysis rate           l/M-yr       CONSTANT        0.000E+00 -999.        0.000E+00  -999.
      Reference temperature                    C            CONSTANT         25.0     -999.        0.000E+00   100.
      Normalized distribution coefficient      ml/g         CONSTANT        0.000E+00 -999.        0.000E+00  -999.
      Distribution coefficient                  --          DERIVED         -999.     -999.        0.000E+00  0.100E+11
      Biodegradation coefficient (sat. zone)   1/yr         CONSTANT        0.000E+00 -999.        0.000E+00  -999.
      Air diffusion coefficient                cm2/s        CONSTANT        0.000E+00 -999.        0.000E+00   10.0
      Reference temperature for air diffusion  C            CONSTANT         25.0     -999.        0.000E+00   100.
      Molecular weight                         g/M          CONSTANT        0.000E+00 -999.        0.000E+00  -999.
      Mole fraction of solute                  --           CONSTANT        0.000E+00 -999.        0.100E-08   1.00
      Vapor pressure of solute                 mm Hg        CONSTANT        0.000E+00 -999.        0.000E+00   100.
      Henry's law constant                   atm-m^3/M      CONSTANT        0.000E+00 -999.        0.100E-09   1.00
      Overall 1st order decay sat. zone        1/yr         DERIVED         0.000E+00 0.000E+00    0.000E+00   1.00
      Not currently used                                    CONSTANT        -999.     -999.        0.000E+00   1.00
      Not currently used                                    CONSTANT        -999.     -999.        0.000E+00   1.00
1
                                                SOURCE SPECIFIC VARIABLES


      ----------------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                UNITS      DISTRIBUTION        PARAMETERS               LIMITS
                                                                            MEAN     STD DEV       MIN          MAX
      ----------------------------------------------------------------------------------------------------------------

      Infiltration rate                        m/yr         CONSTANT        0.273E-04 -999.        0.100E-09  0.100E+11
      Area of waste disposal unit              m^2          CONSTANT        0.810E+05 -999.        0.100E-01  -999.
      Duration of pulse                        yr           CONSTANT         200.     -999.        0.100E-08  -999.
      Spread of contaminant source             m            DERIVED         -999.     -999.        0.100E-08  0.100E+11
      Recharge rate                            m/yr         CONSTANT        0.000E+00 -999.        0.000E+00  0.100E+11
      Source decay constant                    1/yr         CONSTANT        0.000E+00 -999.        0.000E+00  -999.
      Initial concentration at landfill        mg/l         CONSTANT         1.00     -999.        0.000E+00  -999.
      Length scale of facility                 m            DERIVED         -999.     -999.        0.100E-08  0.100E+11
      Width scale of facility                  m            DERIVED         -999.     -999.        0.100E-08  0.100E+11
      Near field dilution                                   DERIVED          1.00     0.000E+00    0.000E+00   1.00
1
                                                AQUIFER SPECIFIC VARIABLES


      ----------------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                UNITS      DISTRIBUTION        PARAMETERS               LIMITS
                                                                            MEAN     STD DEV       MIN          MAX
      ----------------------------------------------------------------------------------------------------------------

      Particle diameter                        cm           CONSTANT        0.100E-03 -999.        0.100E-08   100.
      Aquifer porosity                         --           CONSTANT        0.400     -999.        0.100E-08  0.990
      Bulk density                             g/cc         CONSTANT         1.50     -999.        0.100E-01   5.00
      Aquifer thickness                        m            CONSTANT         12.2     -999.        0.100E-08  0.100E+06
      Source thickness (mixing zone depth)     m            DERIVED         -999.     -999.        0.100E-08  0.100E+06
      Conductivity (hydraulic)                 m/yr         CONSTANT         100.     -999.        0.100E-06  0.100E+09
      Gradient (hydraulic)                                  CONSTANT        0.500E-02 -999.        0.100E-07  -999.
      Groundwater seepage velocity             m/yr         DERIVED         -999.     -999.        0.100E-09  0.100E+09
      Retardation coefficient                  --           DERIVED         -999.     -999.         1.00      0.100E+09
      Longitudinal dispersivity                m            FUNCTION OF X   -999.     -999.        -999.      -999.
      Transverse dispersivity                  m            FUNCTION OF X   -999.     -999.        -999.      -999.
      Vertical dispersivity                    m            FUNCTION OF X   -999.     -999.        -999.      -999.
      Temperature of aquifer                   C            CONSTANT         28.0     -999.        0.000E+00   100.
      pH                                       --           CONSTANT         7.50     -999.        0.300       14.0
      Organic carbon content (fraction)                     CONSTANT        0.100E-02 -999.        0.100E-05   1.00
      Well distance from site                  m            CONSTANT         300.     -999.         1.00      -999.
      Angle off center                       degree         CONSTANT        0.000E+00 -999.        0.000E+00   360.
      Well vertical distance                   m            CONSTANT        0.000E+00 -999.        0.000E+00   1.00


  CONCENTRATION AFTER SATURATED ZONE MODEL 0.1648E-02
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AMSSBIG

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1

                    U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                   E X P O S U R E   A S S E S S M E N T

                                     M U L T I M E D I A   M O D E L

                                   MULTIMED  (Version 1.01, June 1991)
1
 Run options
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 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 BASE MODEL - 487 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                          Saturated zone model
 Run was                                DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                                 CHEMICAL SPECIFIC VARIABLES


         --------------------------------------------------------------------------------------------------
                   VARIABLE NAME                UNITS     DISTRIBUTION          PARAMETERS            LIMITS
                                                                              MEAN     STD DEV     MIN          MAX
         -----------------------------------------------------------------------------------------------------------
         Solid phase decay coefficient           1/yr       DERIVED          -999.      -999.     0.000E+00  0.100E+11
```

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     Dissolved phase decay coefficient       1/yr        DERIVED        -999.       -999.          0.000E+00  0.100E+11
     Overall chemical decay coefficient      1/yr        DERIVED        -999.       -999.          0.000E+00  0.100E+11
     Acid catalyzed hydrolysis rate          l/M-yr      CONSTANT       0.000E+00 -999.            0.000E+00  -999.
     Neutral hydrolysis rate constant        1/yr        CONSTANT       0.000E+00 -999.            0.000E+00  -999.
     Base catalyzed hydrolysis rate          l/M-yr      CONSTANT       0.000E+00 -999.            0.000E+00  -999.
     Reference temperature                   C           CONSTANT        25.0       -999.          0.000E+00   100.
     Normalized distribution coefficient     ml/g        CONSTANT       0.000E+00 -999.            0.000E+00  -999.
     Distribution coefficient                 --         DERIVED        -999.       -999.          0.000E+00  0.100E+11
     Biodegradation coefficient (sat. zone)  1/yr        CONSTANT       0.000E+00 -999.            0.000E+00  -999.
     Air diffusion coefficient               cm2/s       CONSTANT       0.000E+00 -999.            0.000E+00   10.0
     Reference temperature for air diffusion C           CONSTANT        25.0       -999.          0.000E+00   100.
     Molecular weight                        g/M         CONSTANT       0.000E+00 -999.            0.000E+00  -999.
     Mole fraction of solute                 --          CONSTANT       0.000E+00 -999.            0.100E-08   1.00
     Vapor pressure of solute                mm Hg       CONSTANT       0.000E+00 -999.            0.000E+00   100.
     Henry's law constant                  atm-m^3/M     CONSTANT       0.000E+00 -999.            0.100E-09   1.00
     Overall 1st order decay sat. zone       1/yr        DERIVED        0.000E+00 0.000E+00        0.000E+00   1.00
     Not currently used                                  CONSTANT       -999.       -999.          0.000E+00   1.00
     Not currently used                                  CONSTANT       -999.       -999.          0.000E+00   1.00
1
                                               SOURCE SPECIFIC VARIABLES


     ----------------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                UNITS      DISTRIBUTION         PARAMETERS               LIMITS
                                                                             MEAN      STD DEV      MIN          MAX
     ----------------------------------------------------------------------------------------------------------------
     Infiltration rate                       m/yr        CONSTANT       0.273E-04 -999.            0.100E-09  0.100E+11
     Area of waste disposal unit             m^2         CONSTANT       0.197E+07 -999.            0.100E-01  -999.
     Duration of pulse                       yr          CONSTANT        200.       -999.          0.100E-08  -999.
     Spread of contaminant source            m           DERIVED        -999.       -999.          0.100E-08  0.100E+11
     Recharge rate                           m/yr        CONSTANT       0.000E+00 -999.            0.000E+00  0.100E+11
     Source decay constant                   1/yr        CONSTANT       0.000E+00 -999.            0.000E+00  -999.
     Initial concentration at landfill       mg/l        CONSTANT        1.00       -999.          0.000E+00  -999.
     Length scale of facility                m           DERIVED        -999.       -999.          0.100E-08  0.100E+11
     Width scale of facility                 m           DERIVED        -999.       -999.          0.100E-08  0.100E+11
     Near field dilution                                 DERIVED         1.00      0.000E+00       0.000E+00   1.00
1
                                               AQUIFER SPECIFIC VARIABLES


     ----------------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                UNITS      DISTRIBUTION         PARAMETERS               LIMITS
                                                                             MEAN      STD DEV      MIN          MAX
     ----------------------------------------------------------------------------------------------------------------
     Particle diameter                       cm          CONSTANT       0.100E-03 -999.            0.100E-08   100.
     Aquifer porosity                        --          CONSTANT       0.400       -999.          0.100E-08  0.990
     Bulk density                            g/cc        CONSTANT        1.50       -999.          0.100E-01   5.00
     Aquifer thickness                       m           CONSTANT        12.2       -999.          0.100E-08  0.100E+06
     Source thickness (mixing zone depth)    m           DERIVED        -999.       -999.          0.100E-08  0.100E+06
     Conductivity (hydraulic)                m/yr        CONSTANT        100.       -999.          0.100E-06  0.100E+09
     Gradient (hydraulic)                                CONSTANT       0.500E-02 -999.            0.100E-07  -999.
     Groundwater seepage velocity            m/yr        DERIVED        -999.       -999.          0.100E-09  0.100E+09
     Retardation coefficient                 --          DERIVED        -999.       -999.           1.00      0.100E+09
     Longitudinal dispersivity               m           FUNCTION OF X  -999.       -999.          -999.      -999.
     Transverse dispersivity                 m           FUNCTION OF X  -999.       -999.          -999.      -999.
     Vertical dispersivity                   m           FUNCTION OF X  -999.       -999.          -999.      -999.
     Temperature of aquifer                  C           CONSTANT        28.0       -999.          0.000E+00   100.
     pH                                      --          CONSTANT        7.50       -999.          0.300       14.0
     Organic carbon content (fraction)                   CONSTANT       0.100E-02 -999.            0.100E-05   1.00
     Well distance from site                 m           CONSTANT        30.0       -999.           1.00      -999.
     Angle off center                      degree        CONSTANT       0.000E+00 -999.            0.000E+00   360.
     Well vertical distance                  m           CONSTANT       0.000E+00 -999.            0.000E+00   1.00


 CONCENTRATION AFTER SATURATED ZONE MODEL 0.1503E-01
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AMSS PRST

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1

















                  U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                         E X P O S U R E   A S S E S S M E N T

                                           M U L T I M E D I A   M O D E L

                                         MULTIMED  (Version 1.01, June 1991)
1
 Run options
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 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 porosity - 487 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                          Saturated zone model
 Run was                                DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                                   CHEMICAL SPECIFIC VARIABLES


          ----------------------------------------------------------------------------------------------------
                    VARIABLE NAME                  UNITS      DISTRIBUTION         PARAMETERS              LIMITS
                                                                                 MEAN      STD DEV      MIN          MAX
          -----------------------------------------------------------------------------------------------------------
          Solid phase decay coefficient             1/yr        DERIVED          -999.      -999.      0.000E+00  0.100E+11
```

```
    Dissolved phase decay coefficient       1/yr       DERIVED      -999.       -999.        0.000E+00  0.100E+11
    Overall chemical decay coefficient      1/yr       DERIVED      -999.       -999.        0.000E+00  0.100E+11
    Acid catalyzed hydrolysis rate          l/M-yr     CONSTANT     0.000E+00 -999.          0.000E+00  -999.
    Neutral hydrolysis rate constant        1/yr       CONSTANT     0.000E+00 -999.          0.000E+00  -999.
    Base catalyzed hydrolysis rate          l/M-yr     CONSTANT     0.000E+00 -999.          0.000E+00  -999.
    Reference temperature                   C          CONSTANT      25.0       -999.        0.000E+00   100.
    Normalized distribution coefficient     ml/g       CONSTANT     0.000E+00 -999.          0.000E+00  -999.
    Distribution coefficient                 --        DERIVED      -999.       -999.        0.000E+00  0.100E+11
    Biodegradation coefficient (sat. zone)  1/yr       CONSTANT     0.000E+00 -999.          0.000E+00  -999.
    Air diffusion coefficient               cm2/s      CONSTANT     0.000E+00 -999.          0.000E+00   10.0
    Reference temperature for air diffusion C          CONSTANT      25.0       -999.        0.000E+00   100.
    Molecular weight                        g/M        CONSTANT     0.000E+00 -999.          0.000E+00  -999.
    Mole fraction of solute                 --         CONSTANT     0.000E+00 -999.          0.100E-08   1.00
    Vapor pressure of solute                mm Hg      CONSTANT     0.000E+00 -999.          0.000E+00   100.
    Henry's law constant                  atm-m^3/M    CONSTANT     0.000E+00 -999.          0.100E-09   1.00
    Overall 1st order decay sat. zone       1/yr       DERIVED      0.000E+00 0.000E+00      0.000E+00   1.00
    Not currently used                                 CONSTANT     -999.       -999.        0.000E+00   1.00
    Not currently used                                 CONSTANT     -999.       -999.        0.000E+00   1.00
1
                                                  SOURCE SPECIFIC VARIABLES


    ------------------------------------------------------------------------------------------------------------
                VARIABLE NAME                UNITS     DISTRIBUTION      PARAMETERS             LIMITS
                                                                       MEAN     STD DEV      MIN          MAX
    ------------------------------------------------------------------------------------------------------------
    Infiltration rate                       m/yr       CONSTANT     0.273E-04 -999.          0.100E-09  0.100E+11
    Area of waste disposal unit             m^2        CONSTANT     0.197E+07 -999.          0.100E-01  -999.
    Duration of pulse                       yr         CONSTANT      200.      -999.         0.100E-08  -999.
    Spread of contaminant source            m          DERIVED      -999.       -999.        0.100E-08  0.100E+11
    Recharge rate                           m/yr       CONSTANT     0.000E+00 -999.          0.000E+00  0.100E+11
    Source decay constant                   1/yr       CONSTANT     0.000E+00 -999.          0.000E+00  -999.
    Initial concentration at landfill       mg/l       CONSTANT      1.00       -999.        0.000E+00  -999.
    Length scale of facility                m          DERIVED      -999.       -999.        0.100E-08  0.100E+11
    Width scale of facility                 m          DERIVED      -999.       -999.        0.100E-08  0.100E+11
    Near field dilution                                DERIVED       1.00     0.000E+00      0.000E+00   1.00
1
                                                  AQUIFER SPECIFIC VARIABLES


    ------------------------------------------------------------------------------------------------------------
                VARIABLE NAME                UNITS     DISTRIBUTION      PARAMETERS             LIMITS
                                                                       MEAN     STD DEV      MIN          MAX
    ------------------------------------------------------------------------------------------------------------
    Particle diameter                       cm         CONSTANT     0.100E-03 -999.          0.100E-08   100.
    Aquifer porosity                        --         CONSTANT     0.200      -999.         0.100E-08  0.990
    Bulk density                            g/cc       CONSTANT      1.50      -999.         0.100E-01   5.00
    Aquifer thickness                       m          CONSTANT      12.2      -999.         0.100E-08  0.100E+06
    Source thickness (mixing zone depth)    m          DERIVED      -999.      -999.         0.100E-08  0.100E+06
    Conductivity (hydraulic)                m/yr       CONSTANT      100.      -999.         0.100E-06  0.100E+09
    Gradient (hydraulic)                               CONSTANT     0.500E-02 -999.          0.100E-07  -999.
    Groundwater seepage velocity            m/yr       DERIVED      -999.      -999.         0.100E-09  0.100E+09
    Retardation coefficient                 --         DERIVED      -999.      -999.          1.00      0.100E+09
    Longitudinal dispersivity               m          FUNCTION OF X -999.     -999.         -999.       -999.
    Transverse dispersivity                 m          FUNCTION OF X -999.     -999.         -999.       -999.
    Vertical dispersivity                   m          FUNCTION OF X -999.     -999.         -999.       -999.
    Temperature of aquifer                  C          CONSTANT      28.0      -999.         0.000E+00   100.
    pH                                      --         CONSTANT      7.50      -999.         0.300       14.0
    Organic carbon content (fraction)                  CONSTANT     0.100E-02 -999.          0.100E-05   1.00
    Well distance from site                 m          CONSTANT      30.0      -999.          1.00      -999.
    Angle off center                      degree       CONSTANT     0.000E+00 -999.          0.000E+00   360.
    Well vertical distance                  m          CONSTANT     0.000E+00 -999.          0.000E+00   1.00


 CONCENTRATION AFTER SATURATED ZONE MODEL 0.1503E-01
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AMBIGGRD

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1

                    U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                   E X P O S U R E   A S S E S S M E N T

                                        M U L T I M E D I A   M O D E L

                                   MULTIMED  (Version 1.01, June 1991)
1
 Run options
 --- -------


 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


 gradient - 487 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL


 Option Chosen                        Saturated zone model
 Run was                              DETERMIN
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                             CHEMICAL SPECIFIC VARIABLES

             -------------------------------------------------------------------------------------------
                      VARIABLE NAME                   UNITS     DISTRIBUTION        PARAMETERS            LIMITS
                                                                                  MEAN     STD DEV      MIN          MAX
             ------------------------------------------------------------------------------------------------
             Solid phase decay coefficient            1/yr        DERIVED        -999.     -999.      0.000E+00  0.100E+11
```

```
    Dissolved phase decay coefficient       1/yr      DERIVED      -999.      -999.        0.000E+00  0.100E+11
    Overall chemical decay coefficient      1/yr      DERIVED      -999.      -999.        0.000E+00  0.100E+11
    Acid catalyzed hydrolysis rate          l/M-yr    CONSTANT     0.000E+00 -999.         0.000E+00  -999.
    Neutral hydrolysis rate constant        1/yr      CONSTANT     0.000E+00 -999.         0.000E+00  -999.
    Base catalyzed hydrolysis rate          l/M-yr    CONSTANT     0.000E+00 -999.         0.000E+00  -999.
    Reference temperature                   C         CONSTANT      25.0      -999.        0.000E+00   100.
    Normalized distribution coefficient     ml/g      CONSTANT     0.000E+00 -999.         0.000E+00  -999.
    Distribution coefficient                 --       DERIVED      -999.      -999.        0.000E+00  0.100E+11
    Biodegradation coefficient (sat. zone)  1/yr      CONSTANT     0.000E+00 -999.         0.000E+00  -999.
    Air diffusion coefficient               cm2/s     CONSTANT     0.000E+00 -999.         0.000E+00   10.0
    Reference temperature for air diffusion C         CONSTANT      25.0      -999.        0.000E+00   100.
    Molecular weight                        g/M       CONSTANT     0.000E+00 -999.         0.000E+00  -999.
    Mole fraction of solute                 --        CONSTANT     0.000E+00 -999.         0.100E-08   1.00
    Vapor pressure of solute                mm Hg     CONSTANT     0.000E+00 -999.         0.000E+00   100.
    Henry's law constant                  atm-m^3/M   CONSTANT     0.000E+00 -999.         0.100E-09   1.00
    Overall 1st order decay sat. zone       1/yr      DERIVED      0.000E+00 0.000E+00     0.000E+00   1.00
    Not currently used                                CONSTANT     -999.      -999.        0.000E+00   1.00
    Not currently used                                CONSTANT     -999.      -999.        0.000E+00   1.00
1
                                             SOURCE SPECIFIC VARIABLES


    ----------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS             LIMITS
                                                                           MEAN      STD DEV      MIN         MAX
    ----------------------------------------------------------------------------------------------------------
    Infiltration rate                           m/yr       CONSTANT      0.273E-04 -999.        0.100E-09  0.100E+11
    Area of waste disposal unit                 m^2        CONSTANT      0.197E+07 -999.        0.100E-01  -999.
    Duration of pulse                           yr         CONSTANT       200.      -999.       0.100E-08  -999.
    Spread of contaminant source                m          DERIVED       -999.      -999.       0.100E-08  0.100E+11
    Recharge rate                               m/yr       CONSTANT      0.000E+00 -999.        0.000E+00  0.100E+11
    Source decay constant                       1/yr       CONSTANT      0.000E+00 -999.        0.000E+00  -999.
    Initial concentration at landfill           mg/l       CONSTANT       1.00      -999.       0.000E+00  -999.
    Length scale of facility                    m          DERIVED       -999.      -999.       0.100E-08  0.100E+11
    Width scale of facility                     m          DERIVED       -999.      -999.       0.100E-08  0.100E+11
    Near field dilution                                    DERIVED        1.00      0.000E+00   0.000E+00   1.00
1
                                             AQUIFER SPECIFIC VARIABLES


    ----------------------------------------------------------------------------------------------------------
                  VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS             LIMITS
                                                                           MEAN      STD DEV      MIN         MAX
    ----------------------------------------------------------------------------------------------------------
    Particle diameter                           cm         CONSTANT      0.100E-03 -999.        0.100E-08   100.
    Aquifer porosity                            --         CONSTANT      0.400      -999.       0.100E-08  0.990
    Bulk density                                g/cc       CONSTANT       1.50      -999.       0.100E-01   5.00
    Aquifer thickness                           m          CONSTANT       12.2      -999.       0.100E-08  0.100E+06
    Source thickness (mixing zone depth)        m          DERIVED       -999.      -999.       0.100E-08  0.100E+06
    Conductivity (hydraulic)                    m/yr       CONSTANT       100.      -999.       0.100E-06  0.100E+09
    Gradient (hydraulic)                                   CONSTANT      0.700E-02 -999.        0.100E-07  -999.
    Groundwater seepage velocity                m/yr       DERIVED       -999.      -999.       0.100E-09  0.100E+09
    Retardation coefficient                     --         DERIVED       -999.      -999.        1.00      0.100E+09
    Longitudinal dispersivity                   m          FUNCTION OF X -999.      -999.       -999.      -999.
    Transverse dispersivity                     m          FUNCTION OF X -999.      -999.       -999.      -999.
    Vertical dispersivity                       m          FUNCTION OF X -999.      -999.       -999.      -999.
    Temperature of aquifer                      C          CONSTANT       28.0      -999.       0.000E+00   100.
    pH                                          --         CONSTANT       7.50      -999.       0.300       14.0
    Organic carbon content (fraction)                      CONSTANT      0.100E-02 -999.        0.100E-05   1.00
    Well distance from site                     m          CONSTANT       30.0      -999.        1.00      -999.
    Angle off center                          degree       CONSTANT      0.000E+00 -999.        0.000E+00   360.
    Well vertical distance                      m          CONSTANT      0.000E+00 -999.        0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1073E-01
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AMBIGHYC

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                    U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                   E X P O S U R E   A S S E S S M E N T

                                     M U L T I M E D I A   M O D E L

                                   MULTIMED  (Version 1.01, June 1991)
1
 Run options
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AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


hydrualic conductivity - 487 ACRES, AVG LEAKAGE
Chemical simulated is DEFAULT CHEMICAL


Option Chosen                         Saturated zone model
Run was                               DETERMIN
Infiltration input by user
Run was steady-state
Reject runs if Y coordinate outside plume
Do not reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model
1
1
                                               CHEMICAL SPECIFIC VARIABLES

          ------------------------------------------------------------------------------------------------------
                    VARIABLE NAME               UNITS     DISTRIBUTION         PARAMETERS             LIMITS
                                                                             MEAN      STD DEV      MIN         MAX
          ------------------------------------------------------------------------------------------------------
          Solid phase decay coefficient          1/yr       DERIVED          -999.     -999.     0.000E+00   0.100E+11
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 Dissolved phase decay coefficient         1/yr         DERIVED        -999.      -999.        0.000E+00  0.100E+11
 Overall chemical decay coefficient        1/yr         DERIVED        -999.      -999.        0.000E+00  0.100E+11
 Acid catalyzed hydrolysis rate            l/M-yr       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Neutral hydrolysis rate constant          1/yr         CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Base catalyzed hydrolysis rate            l/M-yr       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Reference temperature                     C            CONSTANT        25.0      -999.        0.000E+00   100.
 Normalized distribution coefficient       ml/g         CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Distribution coefficient                   --          DERIVED        -999.      -999.        0.000E+00  0.100E+11
 Biodegradation coefficient (sat. zone)    1/yr         CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Air diffusion coefficient                 cm2/s        CONSTANT       0.000E+00 -999.        0.000E+00   10.0
 Reference temperature for air diffusion   C            CONSTANT        25.0      -999.        0.000E+00   100.
 Molecular weight                          g/M          CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Mole fraction of solute                   --           CONSTANT       0.000E+00 -999.        0.100E-08   1.00
 Vapor pressure of solute                  mm Hg        CONSTANT       0.000E+00 -999.        0.000E+00   100.
 Henry's law constant                    atm-m^3/M      CONSTANT       0.000E+00 -999.        0.100E-09   1.00
 Overall 1st order decay sat. zone         1/yr         DERIVED        0.000E+00 0.000E+00    0.000E+00   1.00
 Not currently used                                     CONSTANT       -999.      -999.        0.000E+00   1.00
 Not currently used                                     CONSTANT       -999.      -999.        0.000E+00   1.00
1
                                              SOURCE SPECIFIC VARIABLES


 ----------------------------------------------------------------------------------------------------------------
             VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                        MEAN      STD DEV      MIN          MAX
 ----------------------------------------------------------------------------------------------------------------
 Infiltration rate                          m/yr        CONSTANT       0.273E-04 -999.        0.100E-09  0.100E+11
 Area of waste disposal unit                m^2         CONSTANT       0.197E+07 -999.        0.100E-01  -999.
 Duration of pulse                          yr          CONSTANT        200.      -999.        0.100E-08  -999.
 Spread of contaminant source               m           DERIVED        -999.      -999.        0.100E-08  0.100E+11
 Recharge rate                              m/yr        CONSTANT       0.000E+00 -999.        0.000E+00  0.100E+11
 Source decay constant                      1/yr        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
 Initial concentration at landfill          mg/l        CONSTANT        1.00      -999.        0.000E+00  -999.
 Length scale of facility                   m           DERIVED        -999.      -999.        0.100E-08  0.100E+11
 Width scale of facility                    m           DERIVED        -999.      -999.        0.100E-08  0.100E+11
 Near field dilution                                    DERIVED         1.00      0.000E+00    0.000E+00   1.00
1
                                              AQUIFER SPECIFIC VARIABLES


 ----------------------------------------------------------------------------------------------------------------
             VARIABLE NAME                  UNITS      DISTRIBUTION        PARAMETERS              LIMITS
                                                                        MEAN      STD DEV      MIN          MAX
 ----------------------------------------------------------------------------------------------------------------
 Particle diameter                          cm          CONSTANT       0.100E-03 -999.        0.100E-08   100.
 Aquifer porosity                           --          CONSTANT       0.400      -999.        0.100E-08  0.990
 Bulk density                               g/cc        CONSTANT        1.50      -999.        0.100E-01   5.00
 Aquifer thickness                          m           CONSTANT        12.2      -999.        0.100E-08  0.100E+06
 Source thickness (mixing zone depth)       m           DERIVED        -999.      -999.        0.100E-08  0.100E+06
 Conductivity (hydraulic)                   m/yr        CONSTANT       0.100E+04 -999.        0.100E-06  0.100E+09
 Gradient (hydraulic)                                   CONSTANT       0.500E-02 -999.        0.100E-07  -999.
 Groundwater seepage velocity               m/yr        DERIVED        -999.      -999.        0.100E-09  0.100E+09
 Retardation coefficient                    --          DERIVED        -999.      -999.         1.00      0.100E+09
 Longitudinal dispersivity                  m           FUNCTION OF X  -999.      -999.       -999.       -999.
 Transverse dispersivity                    m           FUNCTION OF X  -999.      -999.       -999.       -999.
 Vertical dispersivity                      m           FUNCTION OF X  -999.      -999.       -999.       -999.
 Temperature of aquifer                     C           CONSTANT        28.0      -999.        0.000E+00   100.
 pH                                         --          CONSTANT        7.50      -999.        0.300       14.0
 Organic carbon content (fraction)                      CONSTANT       0.100E-02 -999.        0.100E-05   1.00
 Well distance from site                    m           CONSTANT        30.0      -999.         1.00      -999.
 Angle off center                         degree        CONSTANT       0.000E+00 -999.        0.000E+00   360.
 Well vertical distance                     m           CONSTANT       0.000E+00 -999.        0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1503E-02
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AWSSFAR3

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                 U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                  E X P O S U R E   A S S E S S M E N T

                                      M U L T I M E D I A   M O D E L

                                    MULTIMED  (Version 1.01, June 1991)
1
 Run options
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AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL


300m to POC - 487 ACRES, AVG LEAKAGE
Chemical simulated is DEFAULT CHEMICAL


Option Chosen                        Saturated zone model
Run was                              DETERMIN
Infiltration input by user
Run was steady-state
Reject runs if Y coordinate outside plume
Do not reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model
1
1
                                            CHEMICAL SPECIFIC VARIABLES


         --------------------------------------------------------------------------------------------
                  VARIABLE NAME               UNITS      DISTRIBUTION       PARAMETERS            LIMITS
                                                                          MEAN     STD DEV     MIN        MAX
         ------------------------------------------------------------------------------------------------
         Solid phase decay coefficient         1/yr       DERIVED        -999.     -999.    0.000E+00  0.100E+11
```

```
    Dissolved phase decay coefficient       1/yr       DERIVED        -999.      -999.       0.000E+00  0.100E+11
    Overall chemical decay coefficient      1/yr       DERIVED        -999.      -999.       0.000E+00  0.100E+11
    Acid catalyzed hydrolysis rate          l/M-yr     CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Neutral hydrolysis rate constant        1/yr       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Base catalyzed hydrolysis rate          l/M-yr     CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Reference temperature                   C          CONSTANT        25.0      -999.       0.000E+00   100.
    Normalized distribution coefficient     ml/g       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Distribution coefficient                 --        DERIVED        -999.      -999.       0.000E+00  0.100E+11
    Biodegradation coefficient (sat. zone)  1/yr       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Air diffusion coefficient               cm2/s      CONSTANT       0.000E+00 -999.        0.000E+00   10.0
    Reference temperature for air diffusion C          CONSTANT        25.0      -999.       0.000E+00   100.
    Molecular weight                        g/M        CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Mole fraction of solute                 --         CONSTANT       0.000E+00 -999.        0.100E-08   1.00
    Vapor pressure of solute                mm Hg      CONSTANT       0.000E+00 -999.        0.000E+00   100.
    Henry's law constant                 atm-m^3/M     CONSTANT       0.000E+00 -999.        0.100E-09   1.00
    Overall 1st order decay sat. zone       1/yr       DERIVED        0.000E+00 0.000E+00    0.000E+00   1.00
    Not currently used                                 CONSTANT       -999.      -999.       0.000E+00   1.00
    Not currently used                                 CONSTANT       -999.      -999.       0.000E+00   1.00
1
                                             SOURCE SPECIFIC VARIABLES


    ----------------------------------------------------------------------------------------------------------
              VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS               LIMITS
                                                                       MEAN      STD DEV      MIN         MAX
    ----------------------------------------------------------------------------------------------------------

    Infiltration rate                       m/yr       CONSTANT       0.273E-04 -999.        0.100E-09  0.100E+11
    Area of waste disposal unit             m^2        CONSTANT       0.197E+07 -999.        0.100E-01  -999.
    Duration of pulse                       yr         CONSTANT        200.      -999.       0.100E-08  -999.
    Spread of contaminant source            m          DERIVED        -999.      -999.       0.100E-08  0.100E+11
    Recharge rate                           m/yr       CONSTANT       0.000E+00 -999.        0.000E+00  0.100E+11
    Source decay constant                   1/yr       CONSTANT       0.000E+00 -999.        0.000E+00  -999.
    Initial concentration at landfill       mg/l       CONSTANT        1.00      -999.       0.000E+00  -999.
    Length scale of facility                m          DERIVED        -999.      -999.       0.100E-08  0.100E+11
    Width scale of facility                 m          DERIVED        -999.      -999.       0.100E-08  0.100E+11
    Near field dilution                                DERIVED         1.00     0.000E+00    0.000E+00   1.00
1
                                             AQUIFER SPECIFIC VARIABLES


    ----------------------------------------------------------------------------------------------------------
              VARIABLE NAME                 UNITS      DISTRIBUTION        PARAMETERS               LIMITS
                                                                       MEAN      STD DEV      MIN         MAX
    ----------------------------------------------------------------------------------------------------------

    Particle diameter                       cm         CONSTANT       0.100E-03 -999.        0.100E-08   100.
    Aquifer porosity                        --         CONSTANT       0.400      -999.       0.100E-08  0.990
    Bulk density                            g/cc       CONSTANT        1.50      -999.       0.100E-01   5.00
    Aquifer thickness                       m          CONSTANT        12.2      -999.       0.100E-08  0.100E+06
    Source thickness (mixing zone depth)    m          DERIVED        -999.      -999.       0.100E-08  0.100E+06
    Conductivity (hydraulic)                m/yr       CONSTANT        100.      -999.       0.100E-06  0.100E+09
    Gradient (hydraulic)                               CONSTANT       0.500E-02 -999.        0.100E-07  -999.
    Groundwater seepage velocity            m/yr       DERIVED        -999.      -999.       0.100E-09  0.100E+09
    Retardation coefficient                 --         DERIVED        -999.      -999.        1.00      0.100E+09
    Longitudinal dispersivity               m          FUNCTION OF X  -999.      -999.       -999.      -999.
    Transverse dispersivity                 m          FUNCTION OF X  -999.      -999.       -999.      -999.
    Vertical dispersivity                   m          FUNCTION OF X  -999.      -999.       -999.      -999.
    Temperature of aquifer                  C          CONSTANT        28.0      -999.       0.000E+00   100.
    pH                                      --         CONSTANT        7.50      -999.       0.300       14.0
    Organic carbon content (fraction)                  CONSTANT       0.100E-02 -999.        0.100E-05   1.00
    Well distance from site                 m          CONSTANT        300.      -999.        1.00      -999.
    Angle off center                      degree       CONSTANT       0.000E+00 -999.        0.000E+00   360.
    Well vertical distance                  m          CONSTANT       0.000E+00 -999.        0.000E+00   1.00


 CONCENTRATION AFTER SATURATED ZONE MODEL 0.1428E-01
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AMSSDPTH1

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1

                  U. S.   E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

                                  E X P O S U R E   A S S E S S M E N T

                                       M U L T I M E D I A   M O D E L

                                    MULTIMED  (Version 1.01, June 1991)
1
 Run options
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 AMARILLO ALTERNATE LINER DEMONSTRATION - STEADY STATE MODEL

 12m mixing zone - 487 ACRES, AVG LEAKAGE
 Chemical simulated is DEFAULT CHEMICAL

 Option Chosen                           Saturated zone model
 Run was                                 DETERMIN.
 Infiltration input by user
 Run was steady-state
 Reject runs if Y coordinate outside plume
 Do not reject runs if Z coordinate outside plume
 Gaussian source used in saturated zone model
1
1
                                                    CHEMICAL SPECIFIC VARIABLES

         -----------------------------------------------------------------------------------------------------
                  VARIABLE NAME                 UNITS     DISTRIBUTION        PARAMETERS              LIMITS
                                                                           MEAN     STD DEV       MIN         MAX
         -----------------------------------------------------------------------------------------------------------
         Solid phase decay coefficient           1/yr       DERIVED        -999.     -999.     0.000E+00  0.100E+11
```

```
    Dissolved phase decay coefficient        1/yr       DERIVED        -999.      -999.        0.000E+00  0.100E+11
    Overall chemical decay coefficient       1/yr       DERIVED        -999.      -999.        0.000E+00  0.100E+11
    Acid catalyzed hydrolysis rate           l/M-yr     CONSTANT       0.000E+00 -999.         0.000E+00  -999.
    Neutral hydrolysis rate constant         1/yr       CONSTANT       0.000E+00 -999.         0.000E+00  -999.
    Base catalyzed hydrolysis rate           l/M-yr     CONSTANT       0.000E+00 -999.         0.000E+00  -999.
    Reference temperature                    C          CONSTANT        25.0      -999.        0.000E+00   100.
    Normalized distribution coefficient      ml/g       CONSTANT       0.000E+00 -999.         0.000E+00  -999.
    Distribution coefficient                  --        DERIVED        -999.      -999.        0.000E+00  0.100E+11
    Biodegradation coefficient (sat. zone)   1/yr       CONSTANT       0.000E+00 -999.         0.000E+00  -999.
    Air diffusion coefficient                cm2/s      CONSTANT       0.000E+00 -999.         0.000E+00   10.0
    Reference temperature for air diffusion  C          CONSTANT        25.0      -999.        0.000E+00   100.
    Molecular weight                         g/M        CONSTANT       0.000E+00 -999.         0.000E+00  -999.
    Mole fraction of solute                  --         CONSTANT       0.000E+00 -999.         0.100E-08   1.00
    Vapor pressure of solute                 mm Hg      CONSTANT       0.000E+00 -999.         0.000E+00   100.
    Henry's law constant                   atm-m^3/M    CONSTANT       0.000E+00 -999.         0.100E-09   1.00
    Overall 1st order decay sat. zone        1/yr       DERIVED        0.000E+00 0.000E+00     0.000E+00   1.00
    Not currently used                                  CONSTANT       -999.      -999.        0.000E+00   1.00
    Not currently used                                  CONSTANT       -999.      -999.        0.000E+00   1.00
1
                                          SOURCE SPECIFIC VARIABLES


    ------------------------------------------------------------------------------------------------------------
               VARIABLE NAME                UNITS       DISTRIBUTION        PARAMETERS              LIMITS
                                                                         MEAN      STD DEV      MIN         MAX
    ------------------------------------------------------------------------------------------------------------
    Infiltration rate                        m/yr       CONSTANT       0.273E-04 -999.         0.100E-09  0.100E+11
    Area of waste disposal unit              m^2        CONSTANT       0.197E+07 -999.         0.100E-01  -999.
    Duration of pulse                        yr         CONSTANT        200.      -999.        0.100E-08  -999.
    Spread of contaminant source             m          DERIVED        -999.      -999.        0.100E-08  0.100E+11
    Recharge rate                            m/yr       CONSTANT       0.000E+00 -999.         0.000E+00  0.100E+11
    Source decay constant                    1/yr       CONSTANT       0.000E+00 -999.         0.000E+00  -999.
    Initial concentration at landfill        mg/l       CONSTANT        1.00      -999.        0.000E+00  -999.
    Length scale of facility                 m          DERIVED        -999.      -999.        0.100E-08  0.100E+11
    Width scale of facility                  m          DERIVED        -999.      -999.        0.100E-08  0.100E+11
    Near field dilution                                 DERIVED         1.00     0.000E+00     0.000E+00   1.00
1
                                          AQUIFER SPECIFIC VARIABLES


    ------------------------------------------------------------------------------------------------------------
               VARIABLE NAME                UNITS       DISTRIBUTION        PARAMETERS              LIMITS
                                                                         MEAN      STD DEV      MIN         MAX
    ------------------------------------------------------------------------------------------------------------
    Particle diameter                        cm         CONSTANT       0.100E-03 -999.         0.100E-08   100.
    Aquifer porosity                         --         CONSTANT       0.400      -999.        0.100E-08  0.990
    Bulk density                             g/cc       CONSTANT        1.50      -999.        0.100E-01   5.00
    Aquifer thickness                        m          CONSTANT        12.2      -999.        0.100E-08  0.100E+06
    Source thickness (mixing zone depth)     m          CONSTANT        12.2      -999.        0.100E-08  0.100E+06
    Conductivity (hydraulic)                 m/yr       CONSTANT        100.      -999.        0.100E-06  0.100E+09
    Gradient (hydraulic)                                CONSTANT       0.500E-02 -999.         0.100E-07  -999.
    Groundwater seepage velocity             m/yr       DERIVED        -999.      -999.        0.100E-09  0.100E+09
    Retardation coefficient                  --         DERIVED        -999.      -999.         1.00      0.100E+09
    Longitudinal dispersivity                m          FUNCTION OF X  -999.      -999.        -999.      -999.
    Transverse dispersivity                  m          FUNCTION OF X  -999.      -999.        -999.      -999.
    Vertical dispersivity                    m          FUNCTION OF X  -999.      -999.        -999.      -999.
    Temperature of aquifer                   C          CONSTANT        28.0      -999.        0.000E+00   100.
    pH                                       --         CONSTANT        7.50      -999.        0.300       14.0
    Organic carbon content (fraction)                   CONSTANT       0.100E-02 -999.         0.100E-05   1.00
    Well distance from site                  m          CONSTANT        30.0      -999.         1.00      -999.
    Angle off center                       degree       CONSTANT       0.000E+00 -999.         0.000E+00   360.
    Well vertical distance                   m          CONSTANT       0.000E+00 -999.         0.000E+00   1.00


CONCENTRATION AFTER SATURATED ZONE MODEL 0.1503E-01
```

APPENDIX 4B

2005 Updated Slope Stability Analysis and Liner System Design
Monitoring Well Groundwater Elevation Summary

City of Amarillo Landfill
Potter County, Texas
Slope Stability Analysis

Determine that the landfill slopes are theoretically stable with an acceptable factor of safety.

Procedures:

1. Verify slope stability for landfill excavation.
2. Verify liner system design by determining tensile stresses in the liner elements, verify liner system stability using infinite slope analysis, and verify anchor trench design.
3. Determine factor of safety for the interim fill slope.
4. Using a critical slope configuration for the final slope, calculate the final slope stability factor of safety.

The landfill excavation slope was analyzed in the previous permit documents. The previous analysis remains valid, and no technical issues have varied since that determination. Excavation slopes within the natural soils have been made and are stable during construction and subsequent landfill operations.

City of Amarillo Landfill
Potter County, Texas
Interim Slope Stability Analysis

Procedure:

The interim solid waste fill slope has been analyzed using the computer code PCSTABL, University of Wisconsin-Madison and Purdue University. The computer modeling has utilized a wedge type failure that calculates slippage along the surface of the liner system as waste is placed and compacted within the landfill. The critical failure mode during waste deposition occurs along one of the liner elements where the interim waste fill can be limited to maintain an acceptable interim slope stability factor of safety.

The soil strength and properties used for the analysis are as follows:

Material	Unit Weight, pcf	Cohesion, psf	Friction Angle, degrees
Waste(1)	70	400	20
Liner(2)	125	100	10
Natural Soil	125	1000	30

(1) Solid waste shear strength selected to be conservative.

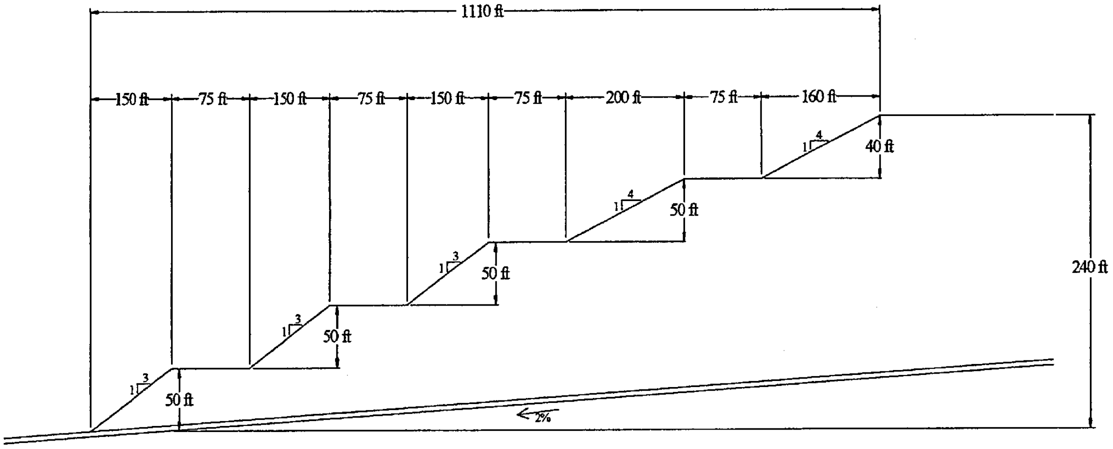
(2) The critical interface layer within the liner system is between the geomembrane and geosynthetic clay layers. This critical interface provides the lower strength values of the liner system for the stability analysis. Bottom membrane to be textured 60 mil HDPE and the selected liner shear values as modeled are considered to be conservative, that is, interface values are probably greater than values modeled.

The interim slope stability calculations have utilized waste slopes on five benches within the 240-foot waste height. Each bench is 75 feet wide. The following figure shows the cross section of the interim slope used in calculations.

Prepared By: PRW
Date: 12/15/05

Checked By: MWS
Date: 12-15-05

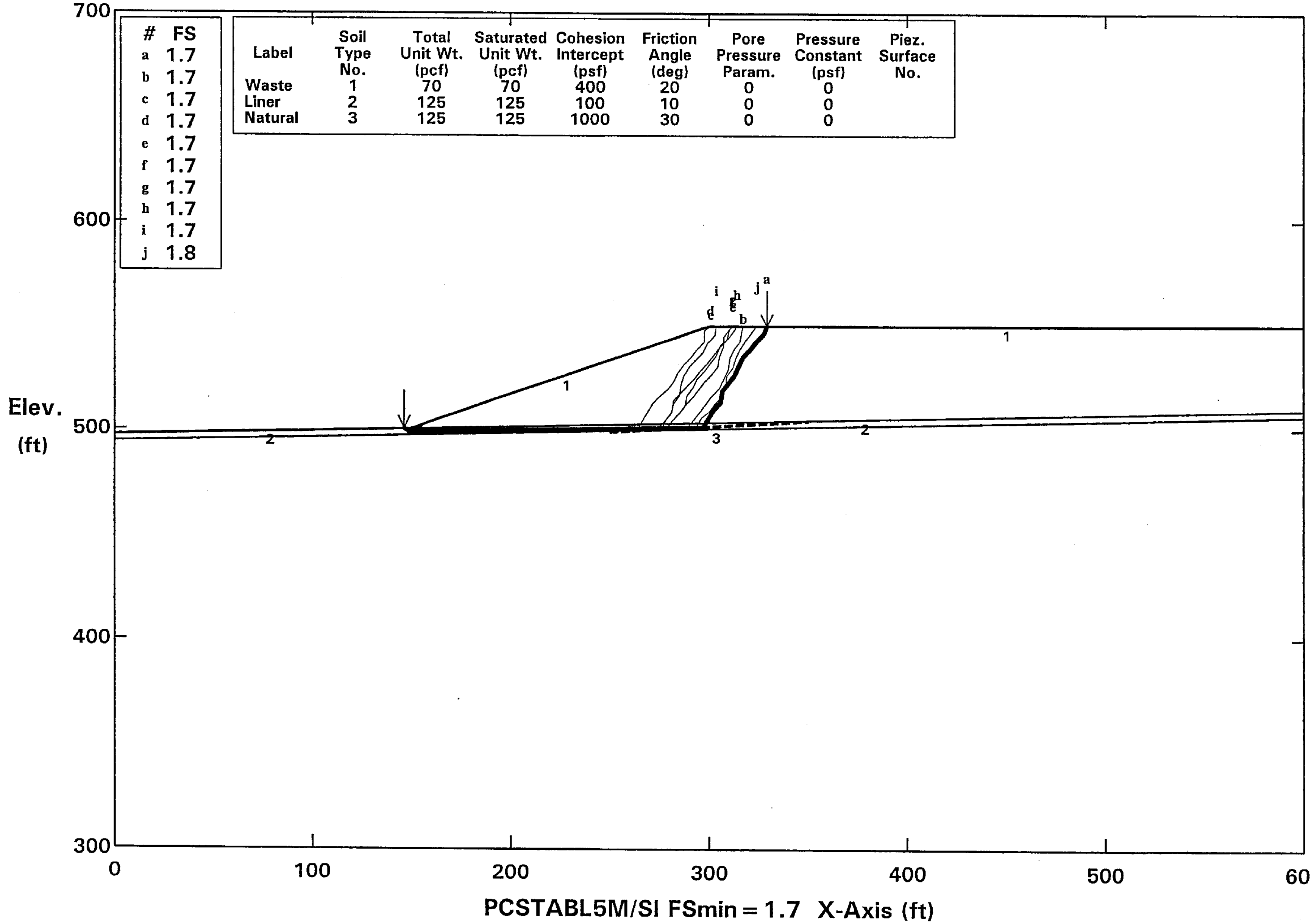
Interim Slope
Not to Scale



Utilizing the above cross section and the above stated strength values, a minimum factor of safety of 1.5 was calculated by the Modified Janbu Method. The critical failure mode is a sliding block failure along the interface of the waste and the liner system. The interim slope stability calculations are presented on the following pages.

57815-City of Amarillo Landfill, Interim Slope with 50' Height

Ten Most Critical. U:INT50.PLT By: PRW 07-01-05 2:36pm



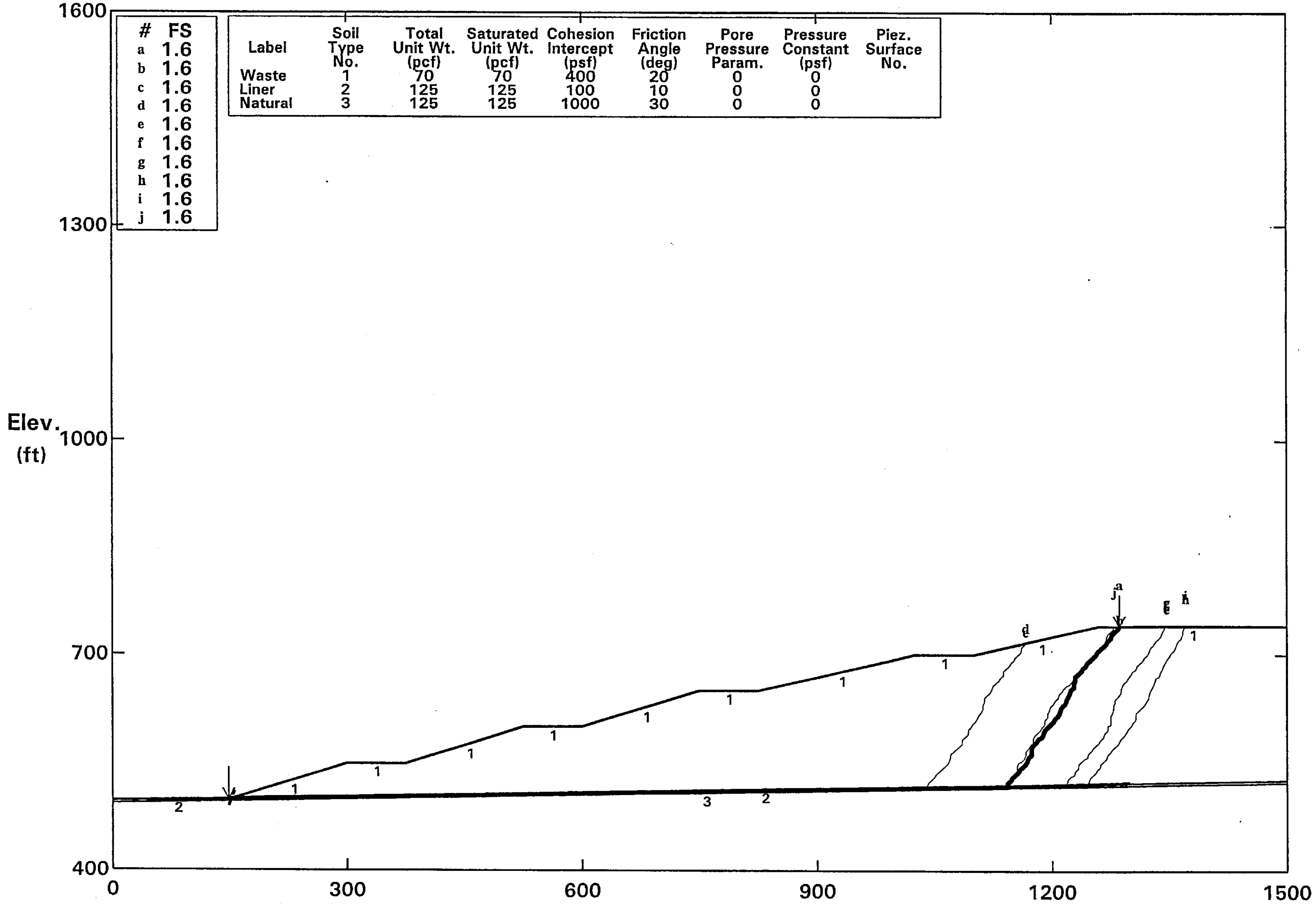
#	FS
a	1.7
b	1.7
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.8

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Waste	1	70	70	400	20	0	0	
Liner	2	125	125	100	10	0	0	
Natural	3	125	125	1000	30	0	0	

Factors Of Safety Calculated By The Modified Janbu Method

57815-City of Amarillo Landfill, Interim Slope, Benched

Ten Most Critical. U:INTERIM.PLT By: PRW 07-13-05 3:26pm



#	FS
a	1.6
b	1.6
c	1.6
d	1.6
e	1.6
f	1.6
g	1.6
h	1.6
i	1.6
j	1.6

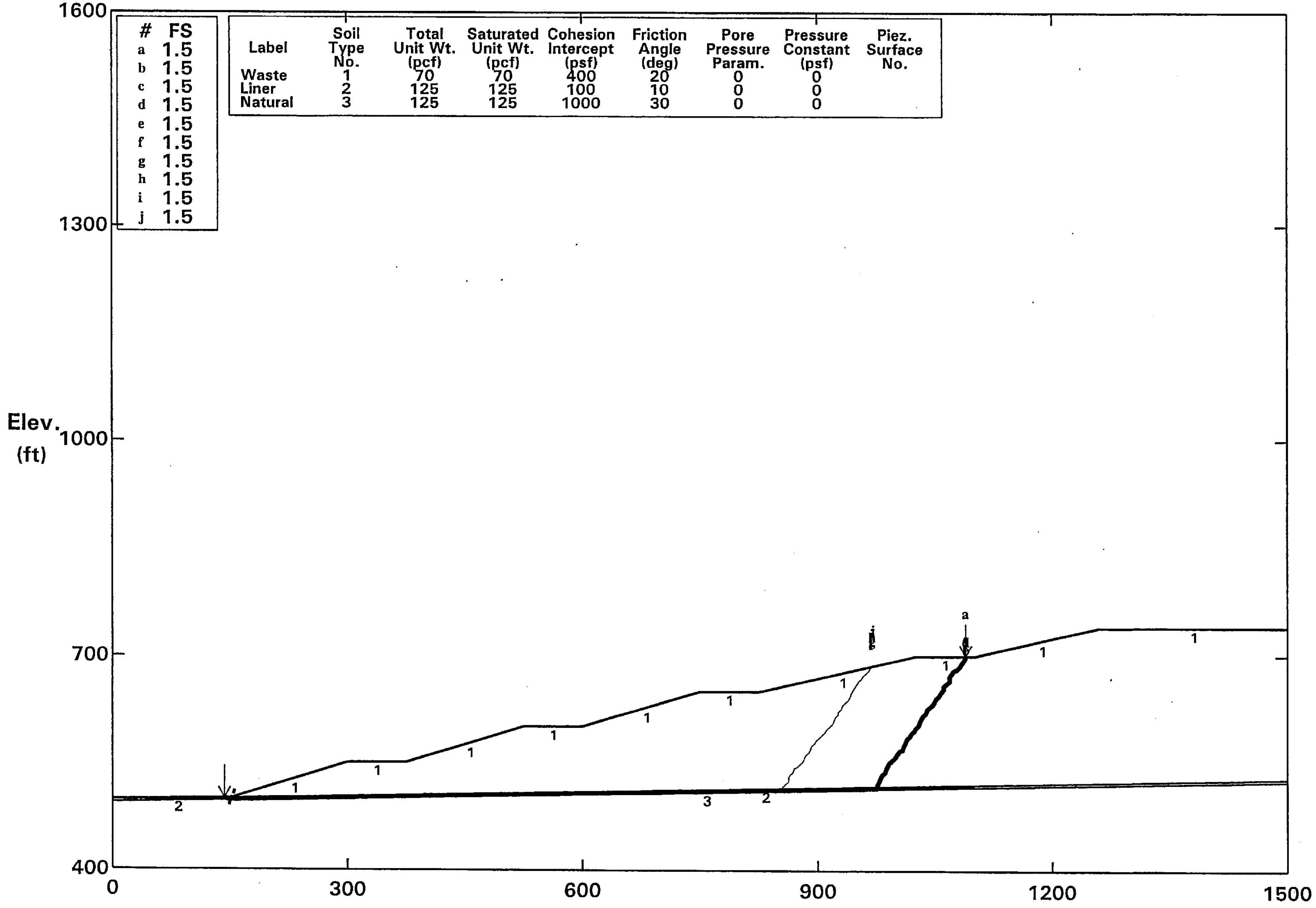
Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Waste	1	70	70	400	20	0	0	
Liner	2	125	125	100	10	0	0	
Natural	3	125	125	1000	30	0	0	

PCSTABL5M/SI FSmin = 1.6 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

57815-City of Amarillo Landfill, Interim Slope, Benched

Ten Most Critical. U:INTERIM2.PLT By: PRW 07-13-05 3:30pm



#	FS
a	1.5
b	1.5
c	1.5
d	1.5
e	1.5
f	1.5
g	1.5
h	1.5
i	1.5
j	1.5

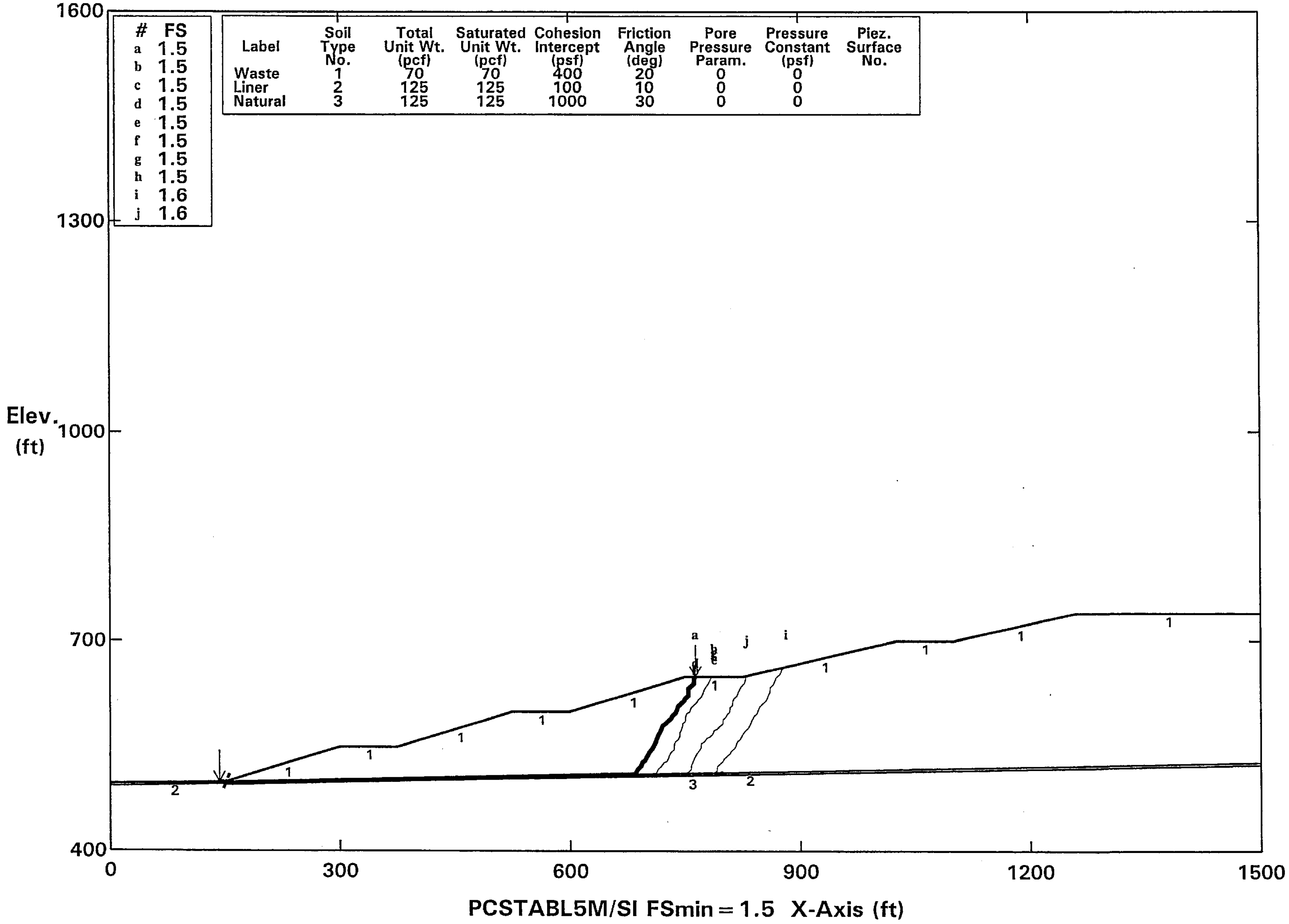
Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Waste	1	70	70	400	20	0	0	
Liner	2	125	125	100	10	0	0	
Natural	3	125	125	1000	30	0	0	

PCSTABL5M/SI FSmin = 1.5 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

57815-City of Amarillo Landfill, Interim Slope, Benched

Ten Most Critical. U:INTERIM3.PLT By: PRW 07-13-05 3:42pm



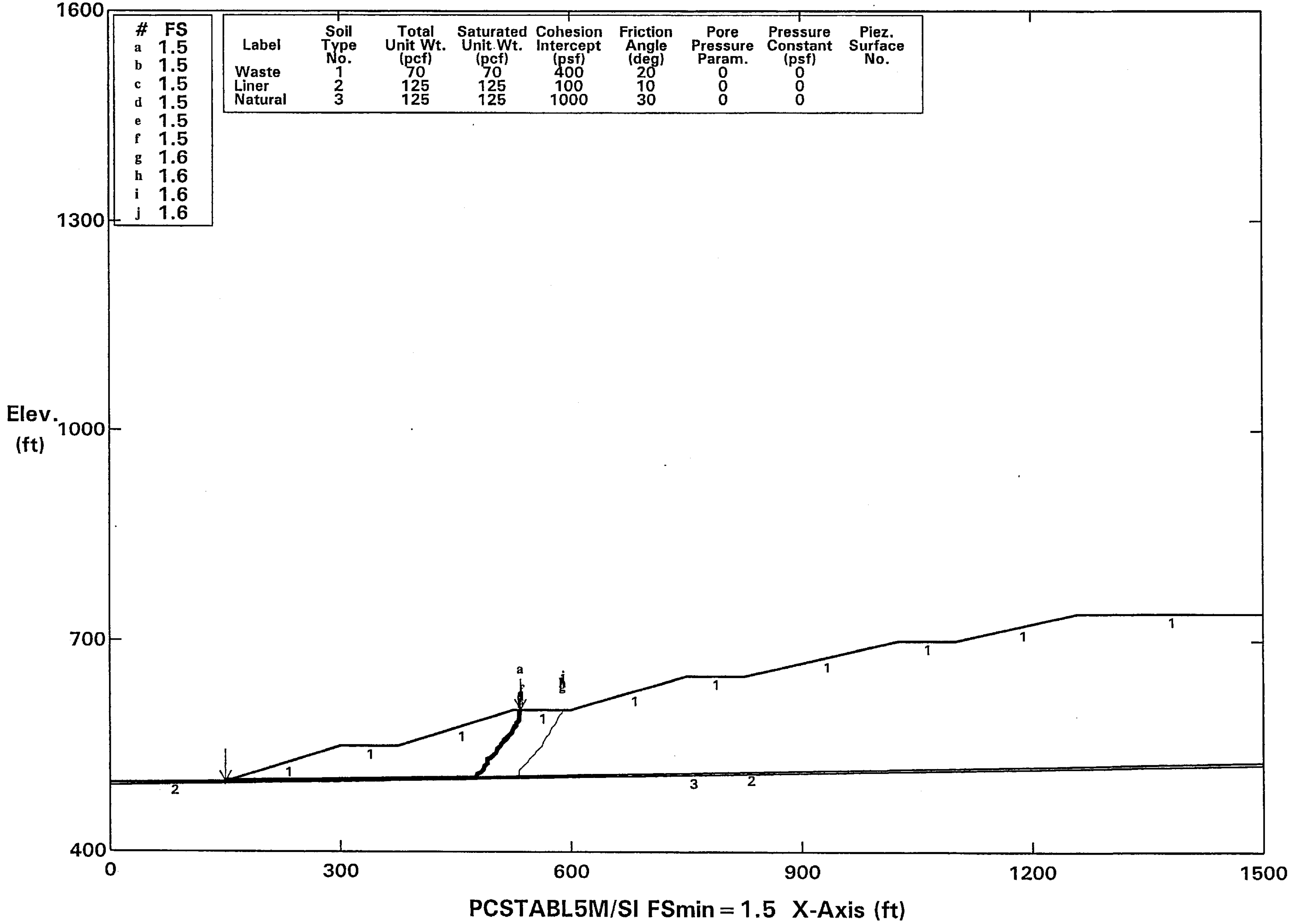
#	FS
a	1.5
b	1.5
c	1.5
d	1.5
e	1.5
f	1.5
g	1.5
h	1.5
i	1.6
j	1.6

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Waste	1	70	70	400	20	0	0	
Liner	2	125	125	100	10	0	0	
Natural	3	125	125	1000	30	0	0	

Factors Of Safety Calculated By The Modified Janbu Method

57815-City of Amarillo Landfill, Interim Slope, Benched

Ten Most Critical. U:INTERIM4.PLT By: PRW 07-13-05 3:43pm



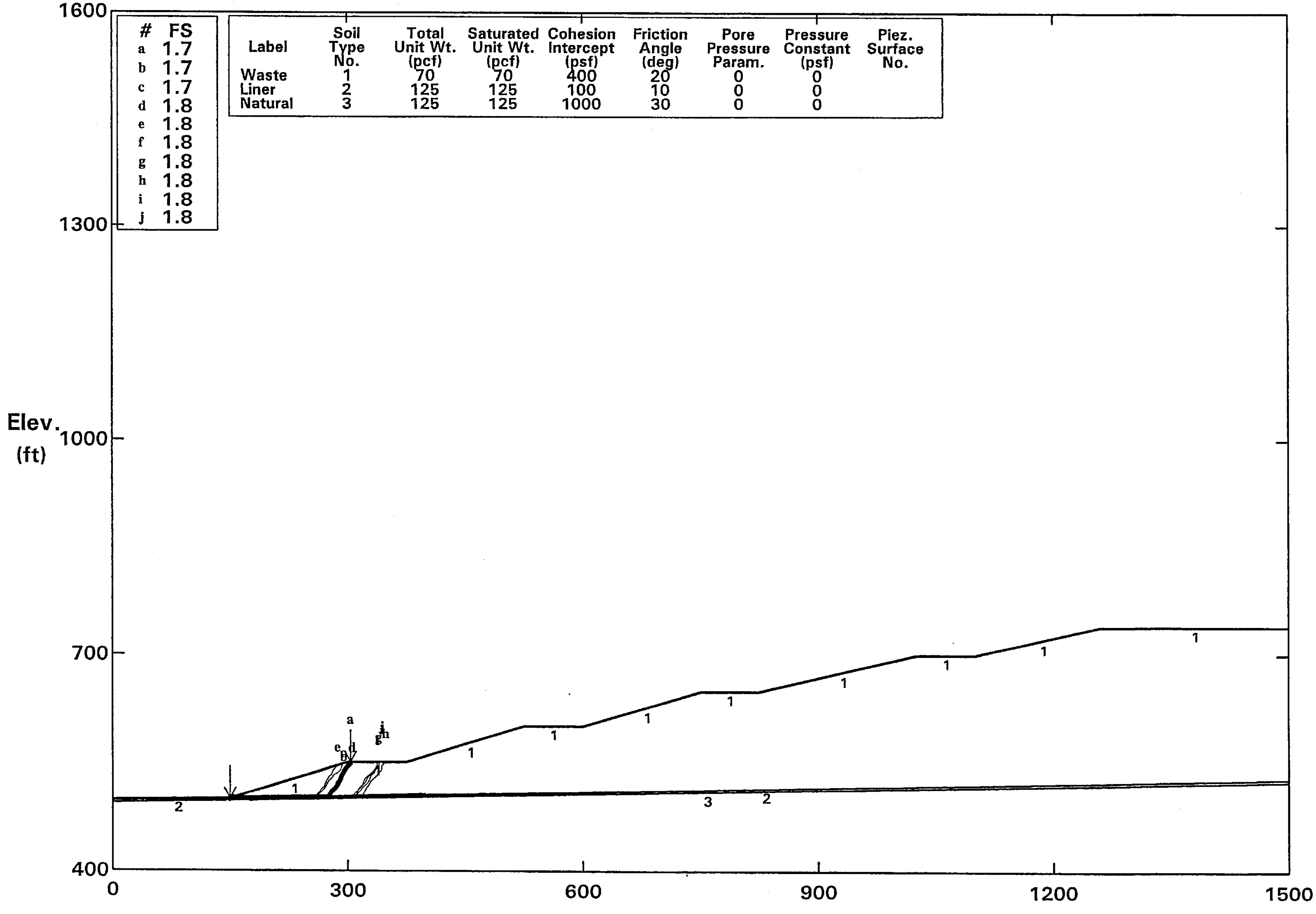
#	FS
a	1.5
b	1.5
c	1.5
d	1.5
e	1.5
f	1.5
g	1.6
h	1.6
i	1.6
j	1.6

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Waste	1	70	70	400	20	0	0	
Liner	2	125	125	100	10	0	0	
Natural	3	125	125	1000	30	0	0	

Factors Of Safety Calculated By The Modified Janbu Method

57815-City of Amarillo Landfill, Interim Slope, Benched

Ten Most Critical. U:INTERIM5.PLT By: PRW 07-13-05 3:44pm



#	FS
a	1.7
b	1.7
c	1.7
d	1.8
e	1.8
f	1.8
g	1.8
h	1.8
i	1.8
j	1.8

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Waste	1	70	70	400	20	0	0	
Liner	2	125	125	100	10	0	0	
Natural	3	125	125	1000	30	0	0	

PCSTABL5M/SI FSmin = 1.7 X-Axis (ft)

Factors Of Safety Calculated By The Modified Janbu Method

City of Amarillo Landfill
Potter County, Texas
Final Slope Stability Analysis

Procedure:

The critical or the highest slope will occur along the western edge of the landfill. The waste will be filled to the top of the excavated area, which is about 70 feet deep, then will be placed on a 4H:1V slope up to the crest for a total waste thickness of 240 feet on the western side of the landfill.

The soil strength and properties used for the analysis are as follows:

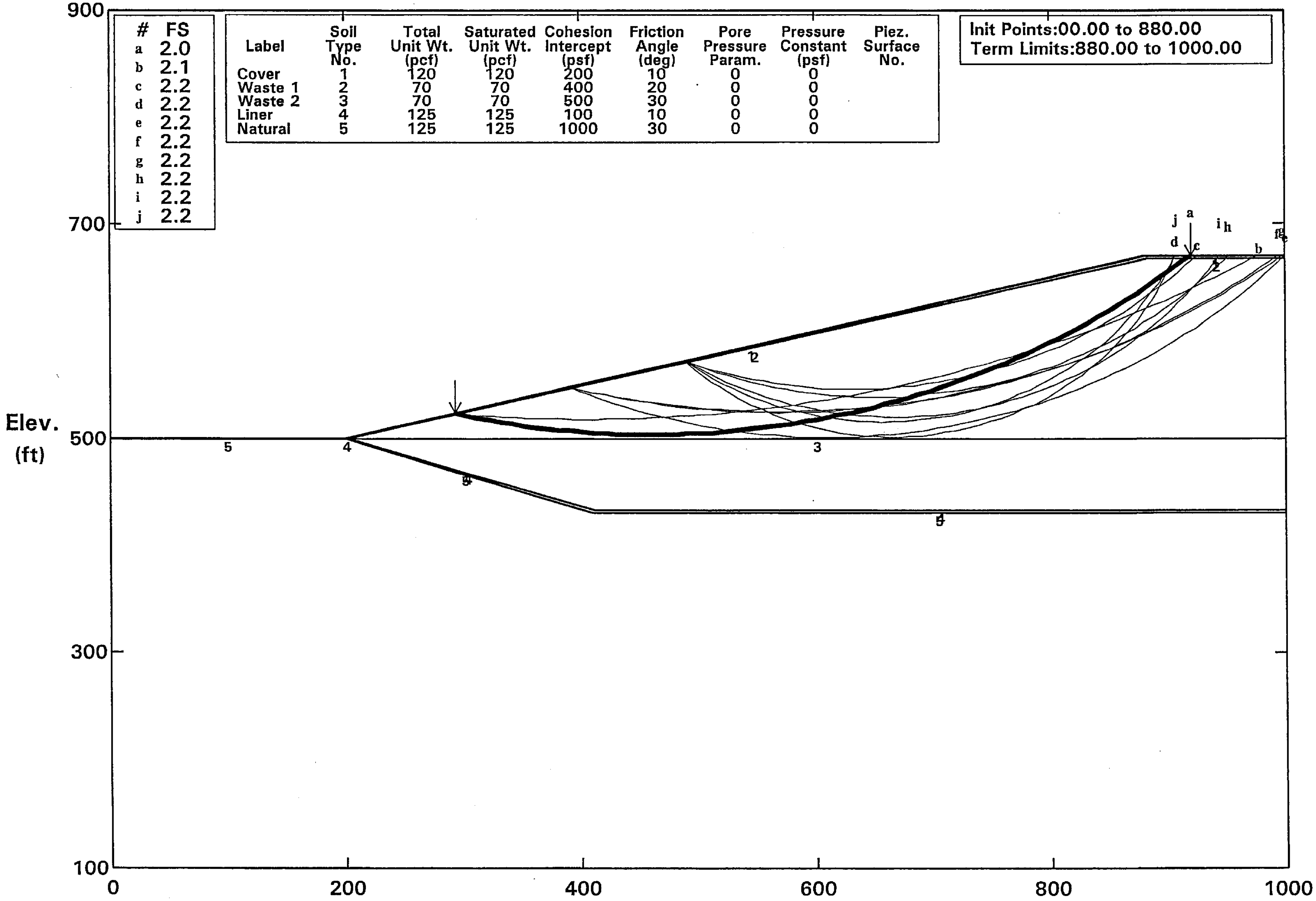
Material	Unit Weight, pcf	Cohesion, psf	Friction Angle, degrees
Final Cover	120	200	10
Solid Waste, upper	70	400	20
Solid Waste, lower	70	500	30
Liner	125	100	10
Natural Soil	125	1000	30

For the solid waste placed first (Cells 1-3), at elevations below the top of the excavated area (natural grade), the waste will have gained additional strength due to the length of time the waste has been in place and the weight of the overlying waste having continued to compress the underlying waste layer. This strengthening influence has been modeled by slightly increasing the strength of the solid waste in the lower lifts as shown in the table, above.

A circular failure surface has been calculated. Based on the calculation, the resulting final slope factor of safety meets or exceeds acceptable values. The following plate shows the calculated factor of safety.

57815-Amarillo Landfill Final Slope

Ten Most Critical. U:FINAL1.PLT By: PRW 07-01-05 2:57pm



#	FS
a	2.0
b	2.1
c	2.2
d	2.2
e	2.2
f	2.2
g	2.2
h	2.2
i	2.2
j	2.2

Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Cover	1	120	120	200	10	0	0	
Waste 1	2	70	70	400	20	0	0	
Waste 2	3	70	70	500	30	0	0	
Liner	4	125	125	100	10	0	0	
Natural	5	125	125	1000	30	0	0	

Init Points:00.00 to 880.00
Term Limits:880.00 to 1000.00

PCSTABL5M/SI FSmin = 2.0 X-Axis (ft)
Factors Of Safety Calculated By The Modified Janbu Method

Prepared By: PRW
Date: 12/15/05

City of Amarillo Landfill
Excavation Slope Stability Analysis

Checked By:
Date: 12-15-05

City of Amarillo Landfill
Potter County, Texas
Excavation Slope Stability Analysis

Procedure:

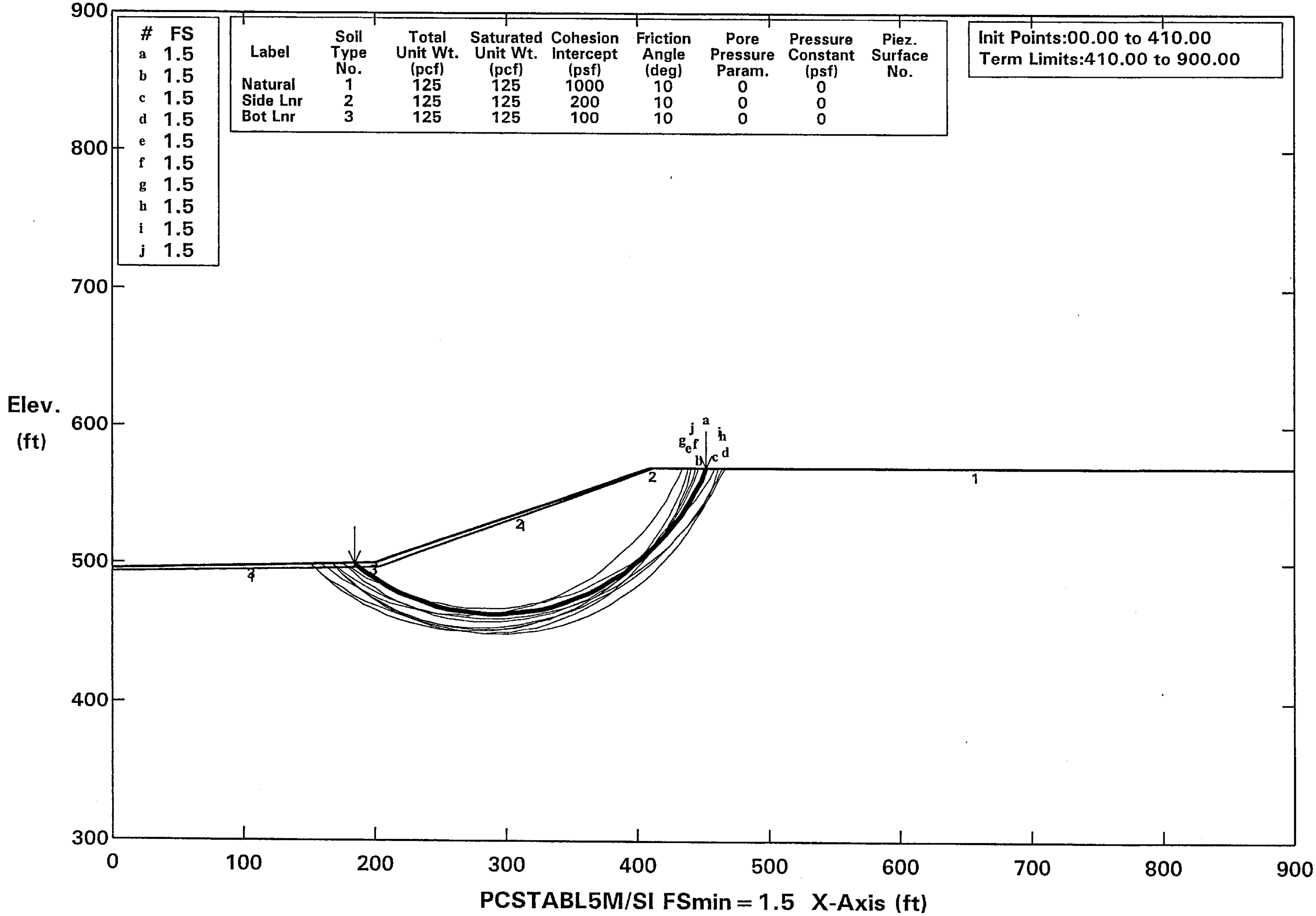
The excavated area is 70 feet deep with side slopes of 3H:1V. A slope stability analysis was completed for the 1994 permit modifications. Since the excavation has been opened, the soils may have changed shear strength values due to drying. Typically, the apparent cohesion decreases and the apparent friction angle increases with time for an effective stress analysis. The excavation slope has been reviewed with slightly altered shear strength values as a check on effective stress. The soil strength and properties used for this analysis are as follows:

Material	Unit Weight, pcf	Cohesion, psf	Friction Angle, degrees
Natural Soil	125	1000	10
Side Slope Liner	125	200	10
Bottom Liner	125	100	10

A circular failure surface has been calculated. Based on the calculation, the resulting excavation slope factor of safety is 1.5. The following plate shows the calculated factor of safety.

57815-Excavation Slope

Ten Most Critical. U:EXCSLP.PLT By: PRW 07-13-05 3:48pm



Factors Of Safety Calculated By The Modified Janbu Method

City of Amarillo Landfill
Potter County, Texas
Liner System Design

Procedure:

1. Verify tensile stresses in the liner system with geocomposite (geonet/geotextile), over textured 60 mil HDPE geomembrane, over geosynthetic clay liner (GCL) by calculating shear forces in the liner system.
2. Verify liner system stability using infinite slope stability analysis. (Ref. 1, 3, and 4)
3. Verify final cover system using infinite slope stability.
4. Verify anchor trench design for pull-out of liner system components. (Ref 2, 3, and 4)

Calculations:

1. Tensile Forces of Liner System

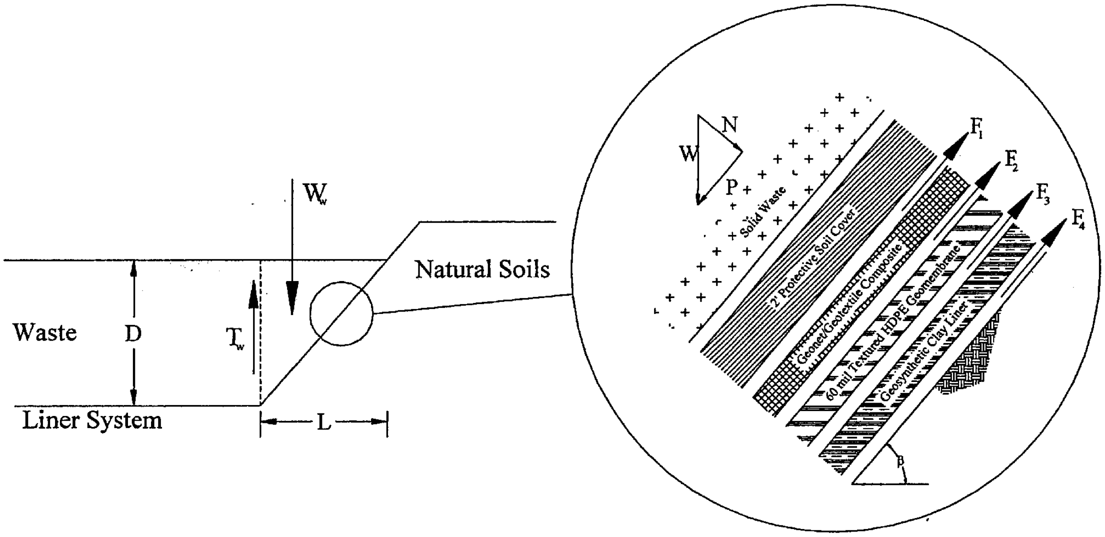


Figure 1

Definitions of terms and variables:

W_w = Weight of solid waste
T_w = Friction force on edge of waste
β = Slope angle
W = Net force of waste on liner system
N = $W\cos\beta$ = Normal force on liner system
P = $W\sin\beta$ = Shearing force on liner system

$F_1 = N\tan A_1 + C_1(L/\cos\beta)$
$F_2 = N\tan A_2 + C_2(L/\cos\beta)$
$F_3 = N\tan A_3 + C_3(L/\cos\beta)$
$F_4 = N\tan A_4 + C_4(L/\cos\beta)$

A_1 = Interface friction angle between protective soil cover and geonet/geotextile composite

C_1 = Cohesion/adhesion intercept between protective soil cover and geonet/geotextile composite

A_2 = Interface friction angle between geonet/geotextile composite and 60-mil HDPE geomembrane (textured)

C_2 = Cohesion/adhesion intercept between geonet/geotextile composite and 60 mil HDPE geomembrane (textured)

A_3 = Interface friction angle between 60 mil HDPE geomembrane (textured) and geosynthetic clay liner

C_3 = Cohesion/adhesion intercept between 60 mil HDPE geomembrane (textured) and geosynthetic clay liner

A_4 = Interface friction angle between geosynthetic clay liner and natural ground

C_4 = Cohesion/adhesion intercept between geosynthetic clay liner and natural subgrade

D = Individual waste lift height

L = Horizontal length of solid waste lift along slope

γ_{waste} = Unit weight of solid waste

ϕ_{waste} = Internal friction angle of solid waste

Parameters:

$A_1 = 10^\circ$
$C_1 = 200$ psf
$A_2 = 15^\circ$
$C_2 = 200$ psf

$A_3 = 12^\circ$
$C_3 = 200$ psf
$A_4 = 20^\circ$
$C_4 = 150$ psf

$D = 20$ ft
$\beta = 18.43^\circ$ (3:1 slope)
$L = 60$ feet (3:1 slope)
$\gamma_{waste} = \frac{(40_i + 70_f)}{2} = 55$ pcf
$\phi_{waste} = 20^\circ$
$c_{waste} = 400$ psf

Calculate:

Weight of solid waste for 20-foot lift placed along a 3:1 slope

$$W_w = \frac{DL\gamma_{waste}}{2}$$ (See Figure 1)

$$W_w = \frac{(20')(60')(55pcf)}{2}$$

$$W_w = 33{,}000 \text{ lb/ft}$$

Friction force on edge of waste

$$T_w = k_o \sigma_v \tan\phi_{waste} D$$ (See Figure 1)

where $k_o = 1 - \sin\phi_{waste} = 0.66$

$$\sigma_v = \frac{D\gamma_{waste}}{2} = \frac{(20')(55pcf)}{2} = 550psf$$

$$T_w = (0.66)(550psf)(\tan 20^\circ)(20')$$

$$T_w = 2{,}642 \text{ lb/ft}$$

Net force of waste on liner system

$$W = W_w - T_w$$

$$W = 33{,}000 - 2{,}642 = 30{,}358 \; lb/ft$$

$$N = W\cos\beta = 30{,}358 \cos 18.43^\circ = 28{,}800 \; lb/ft$$

$$P = W\sin\beta = 30{,}358 \sin 18.43^\circ = 9{,}598 \text{ lb/ft}$$

Resistance of protective soil cover and geonet/geotextile composite interface

$$F_1 = N \tan A_1 + C_1\left(\frac{L}{\cos\beta}\right)$$

$$F_1 = 28{,}800\left(\tan 10^o\right) + 200\left(\frac{60}{\cos 18.43^o}\right)$$

$F_1 = 5{,}078 + 12{,}648$
$F_1 = 17{,}726$ lb/ft

$P < F_1$, therefore the protective soil cover is stable on the geocomposite

Resistance of geocomposite and 60 mil HDPE (textured) geomembrane interface

$$F_2 = N \tan A_2 + C_2\left(\frac{L}{\cos\beta}\right)$$

$$F_2 = 28{,}800\left(\tan 15^o\right) + 200\left(\frac{60}{\cos 18.43^o}\right)$$

$F_2 = 7{,}716 + 12{,}649$
$F_2 = 20{,}365$ lb/ft

$P < F_2$, therefore the geocomposite is stable on the geomembrane

Resistance of 60-mil HDPE (textured) geomembrane and geosynthetic clay liner (GCL) interface

$$F_3 = N \tan A_3 + C_3\left(\frac{L}{\cos\beta}\right)$$

$$F_3 = 28{,}800\left(\tan 12^o\right) + 200\left(\frac{60}{\cos 18.43^o}\right)$$

$F_3 = 6{,}121 + 12{,}649$
$F_3 = 18{,}700$ lb/ft

$P < F_3$, therefore the geomembrane is stable on the GCL

Resistance of GCL and natural subgrade interface

$$F_4 = N \tan A_4 + C_4 \left(\frac{L}{\cos \beta} \right)$$

$$F_4 = 28{,}800 (\tan 20^o) + 150 \left(\frac{60}{\cos 18.43^o} \right)$$

$$F_4 = 10{,}482 + 9{,}486$$

$$F_4 = 19{,}968 \text{ lb/ft}$$

$P < F_4$, therefore the GCL is stable on the natural subgrade

Therefore, the individual liner components are not subjected to any external forces caused by the shearing of the waste placed over the liner system.

Normal Stress on Liner (bottom liner system)

$$\sigma_n = \gamma_{waste} H_{waste}$$

Where:

H_{waste} = 240 feet (maximum depth)

γ_{waste} = 70 pcf

$$\sigma_n = (70 pcf)(240 ft)$$

$$\sigma_n = 16{,}800 \, psf$$

The geocomposite layer is the critical layer because water must flow through the geocomposite to the leachate collection system.

Geocomposite normal pressure = 20,000+ *psf*

$$FS = \frac{20{,}000}{16{,}800} = 1.2$$

- Cohesion neglected along waste thickness (D) for conservative calculation.
- The maximum uncompacted waste lift depth placed against the sidewall liner is 20 feet. The liner calculations have considered as much as 20 feet of waste placed and compacted along the sloping liner system, resulting in a severe loading condition and conservative FS calculations for the liner components.
- Factors used in the calculations have been made from referenced publications and previous experience.

2. Infinite Slope Analysis of Liner System

$$FS = A\frac{\tan\phi}{\tan\beta} + B\frac{c}{\gamma H} \qquad \text{(Ref. 3)}$$

Protective soil cover and geocomposite interface

ϕ = 10°
c = 200 psf
β = 18.43°
A = 0.45 (see attached charts, Ref. 3)
B = 3.3 (see attached charts, Ref. 3)
γ = 120 pcf
H = 2 feet

$$FS = 0.45\left(\frac{\tan 10^o}{\tan 18.43^o}\right) + 3.3\left[\frac{200}{(120)(2)}\right]$$

$$FS = 2.9$$

Geocomposite and 60-mil HDPE geomembrane (textured) interface

ϕ = 15°
c = 200 psf
β = 18.43°
A = 0.45 (see attached charts, Ref. 3)
B = 3.3 (see attached charts, Ref. 3)
γ = 120 pcf
H = 2 feet

$$FS = 0.45\left(\frac{\tan 15^o}{\tan 18.43^o}\right) + 3.3\left[\frac{200}{(120)(2)}\right]$$

$$FS = 3.1$$

60 mil HDPE geomembrane (textured) and GCL interface

ϕ = 12°
c = 200 psf
β = 18.43°
A = 0.45 (see attached charts, Ref. 3)
B = 3.3 (see attached charts, Ref. 3)
γ = 120 pcf
H = 2 feet

$$FS = 0.45\left(\frac{\tan 12^o}{\tan 18.43^o}\right) + 3.3\left[\frac{200}{(120)(2)}\right]$$

$$FS = 3.0$$

GCL and natural soil interface

ϕ = 20°
c = 150 psf
β = 18.43°
A = 0.45 (see attached charts, Ref. 3)
B = 3.3 (see attached charts, Ref. 3)
γ = 120 pcf
H = 2 feet

$$FS = 0.45\left(\frac{\tan 20^o}{\tan 18.43^o}\right) + 3.3\left[\frac{150}{(120)(2)}\right]$$

$$FS = 2.5$$

The GCL and natural soil interface should provide the lowest interface factor of safety for the liner system. A factor of safety of at least 1.5 is considered acceptable for short and long-term stability. Therefore the liner system is stable as designed. Interface testing of the liner system components should be conducted prior to construction to verify that the liner system will be stable for site-specific conditions.

3. Infinite Slope Analysis of Cover System

The critical cover system will occur on the 4H:1V side slope.

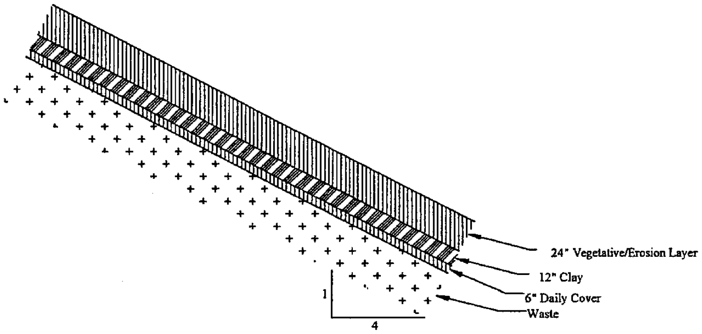


Figure 2.

Erosion layer and clay interface

ϕ = 10°
c = 200 psf
β = 14.04°
A = 1 (see attached charts, Ref. 3)
B = 4.2 (see attached charts, Ref. 3)
γ = 120 pcf
H = 2 feet

$$FS = 1\left(\frac{\tan 10^o}{\tan 14.04^o}\right) + 4.2\left[\frac{200}{(120)(2)}\right]$$

$$FS = 4.2$$

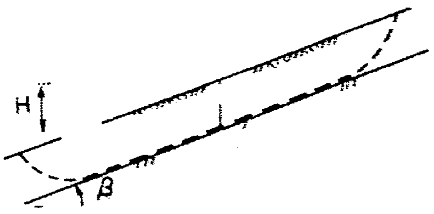
Clay and daily cover interface

ϕ = 10°
c = 200 psf
β = 14.04°
A = 0.85 (see attached charts, Ref. 3)
B = 4.2 (see attached charts, Ref. 3)
γ = 120 pcf
H = 3 feet

$$FS = 0.85\left(\frac{\tan 10^{o}}{\tan 14.04^{o}}\right) + 4.2\left[\frac{200}{(120)(3)}\right]$$

$$FS = 2.9$$

The final cover system will be stable as designed. The clay and daily cover interface has the lowest factor of safety. Interface testing should be conducted prior to construction to verify that the liner system will be stable for site-specific conditions.



γ = total unit weight of soil

γ_w = unit weight of water

c' = cohesion intercept } Effective Stress

ϕ' = friction angle } Effective Stress

r_u = pore pressure ratio = $\frac{u}{\gamma H}$

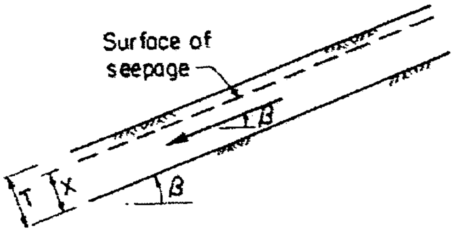
u = pore pressure at depth H

Steps:

① Determine r_u from measured pore pressures or formulas at right

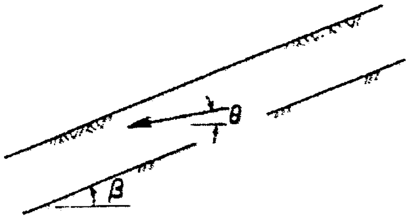
② Determine A and B from charts below

③ Calculate $F = A \frac{\tan\phi'}{\tan\beta} + B \frac{c'}{\gamma H}$



Seepage parallel to slope

$$r_u = \frac{X}{T} \frac{\gamma_w}{\gamma} \cos^2\beta$$



Seepage emerging from slope

$$r_u = \frac{\gamma_w}{\gamma} \frac{1}{1 + \tan\beta \tan\theta}$$

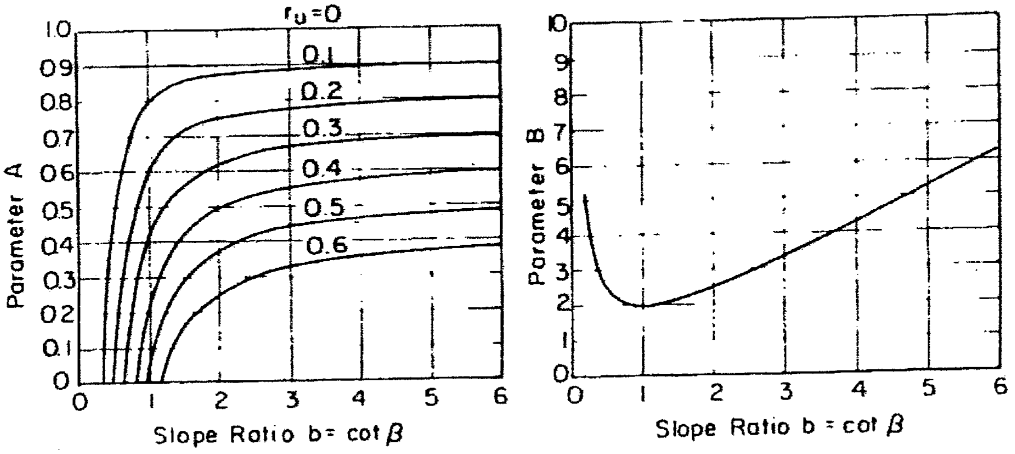
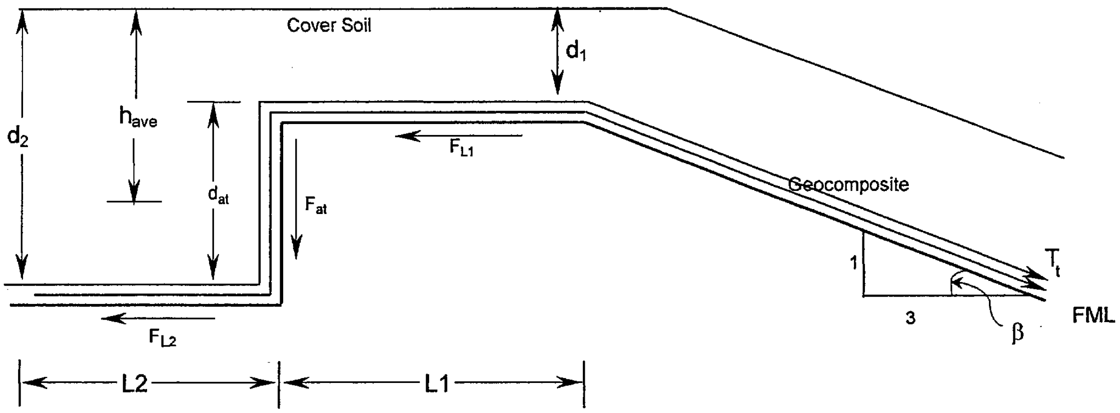


Fig.10 STABILITY CHARTS FOR INFINITE SLOPES.

4. Anchor Trench Design



$T_t = F_{L1} + F_{at} + F_{L2}$

$F_{L1} = (q_1 \tan A_1)L_1 + CL_1$

$F_{at} = (V \tan A_2)d_{at} + Cd_{at}$

$F_{L2} = (q_2 \tan A_3)L_2 + CL_2$

T_t = Force required for pull-out of FML

$q_1 = d_1\gamma_{soil}$ = Surcharge pressure, psf

d_1 = Depth of cover soil, ft.

γ_{soil} = Unit weight of soil, pcf

A = Interface friction angle between liner components

L_1 = Length of runout, ft.

L_2 = Length of trench bottom

C = Cohesion/adhesion intercept between liner components

$V = k_o y$ = Average horizontal stress

k_o = $1 - \sin\phi$

ϕ = Internal friction angle of cover soil

y = $\gamma_{soil}\, h_{ave}$

h_{ave} = Average depth of trench with cover soil

d_{at} = Depth of trench

Parameters:

Cover / Geocomposite $A_1 = 10^\circ$, $C_1 = 200\,psf$

Geocomposite / Geomembrane $A_2 = 15^\circ$, $C_2 = 200\,psf$

Geomembrane / GCL $A_3 = 12^\circ$, $C_3 = 200\,psf$

GCL / Natural Soil $A_4 = 20^\circ$, $C_4 = 120\,psf$

$\gamma_{soil} = 120\,psf$
$\phi = 15^\circ$
$d_1 = 2\,ft$
$d_2 = 4\,ft$
$d_{at} = 2\,ft$
$h_{ave} = 3\,ft$
$L_1 = 2\,ft$
$L_2 = 2\,ft$

Calculate:

$$q_1 = d_1\gamma_{soil} = (2)(120) = 240\,psf$$
$$V = k_o y$$
$$V = (1 - \sin 15^o)(120)(3) = 266.8\,psf$$
$$q_2 = d_2\gamma_{soil} = (4)(120) = 480\,psf$$

T_t for Cover / Geocomposite

$$F_{L_1} = (240)\tan 10^o(2) + 200(2)$$
$$= 485 \text{ lb/ft width}$$

$$F_{at} = (266.8)\tan 10^o(2) + 200(2)$$
$$= 494 \text{ lb/ft width}$$

$$F_{L_2} = (480)\tan 10^o(2) + 200(2)$$
$$= 569 \text{ lb/ft width}$$

$$T_t = 485 + 494 + 569 = 1{,}548 \text{ lb/ft width}$$

T_t for Geocomposite / Geomembrane (textured)

$$\begin{aligned} F_{L_1} &= (240)\tan 15^{o}(2) + 200(2) \\ &= 529\ \mathit{lb/ft\ width} \end{aligned}$$

$$\begin{aligned} F_{L_1} &= (266.8)\tan 15^{o}(2) + 200(2) \\ &= 543\ \mathit{lb/ft\ width} \end{aligned}$$

$$\begin{aligned} F_{L_2} &= (480)\tan 15^{o}(2) + 200(2) \\ &= 657\ \mathit{lb/ft\ width} \end{aligned}$$

$$T_t = 529 + 543 + 657 = 1{,}729\ \mathit{lb/ft\ width}$$

T_t for Geomembrane (textured) / GCL

$$\begin{aligned} F_{L_1} &= (240)\tan 12^{o}(2) + 200(2) \\ &= 502\ \mathit{lb/ft\ width} \end{aligned}$$

$$\begin{aligned} F_{L_1} &= (266.8)\tan 12^{o}(2) + 200(2) \\ &= 513\ \mathit{lb/ft\ width} \end{aligned}$$

$$\begin{aligned} F_{L_2} &= (480)\tan 12^{o}(2) + 200(2) \\ &= 604\ \mathit{lb/ft\ width} \end{aligned}$$

$$T_t = 502 + 513 + 604 = 1{,}619\ \mathit{lb/ft\ width}$$

T_t for GCL / Natural soil

$$\begin{aligned} F_{L_1} &= (240)\tan 20^{o}(2) + 150(2) \\ &= 475\ \mathit{lb/ft\ width} \end{aligned}$$

$$\begin{aligned} F_{L_1} &= (266.8)\tan 20^{o}(2) + 150(2) \\ &= 494\ \mathit{lb/ft\ width} \end{aligned}$$

$$\begin{aligned} F_{L_1} &= (480)\tan 20^{o}(2) + 150(2) \\ &= 649\ \mathit{lb/ft\ width} \end{aligned}$$

$$T_t = 475 + 494 + 649 = 1{,}618\ \mathit{lb/ft\ width}$$

The lowest resistance is from the cover / geocomposite interface. Therefore, additional strength gained from anchor trench is 1,548 pounds per foot of width.

For 60 mil HDPE textured geomembrane:

Yield Strength	= 126 *lb/in.*	(Ref. 7)
Break Strength	= 90 *lb/in.*	(Ref. 7)

$$\text{Break Strength, } T = 90\frac{lb}{in.}\left(\frac{1 sheet}{0.060 in.}\right) = 1{,}500 psi$$

$$\sigma_{all} = \frac{T}{FS} = \frac{1{,}500}{3} = 500 psi \qquad FS = 3$$

$$\sigma_{all} = \frac{T}{FS} = \frac{1{,}500}{2} = 750 psi \qquad FS = 2$$

To calculate anchorage resistance value:

σ_{all} = allowable mobilized stress

$$\sigma_{all} = 500 psi\left(144\frac{in.^2}{ft^2}\right)\left(\frac{0.06 in.}{12 in/ft}\right)$$

$\sigma_{all} = 360$ *lb/ft*

$\sigma_{all}\cos\beta = 360 \cos 18.43^{\circ} = 341$ *lb/ft (horizontal)*

$\sigma_{Break} = 1{,}023$ *lb/ft (horizontal component)*
$\sigma_{Yield} = 1{,}435$ *lb/ft (horizontal component)*

T_t = Resistance from anchor trench = 1,548 *lbs* for weakest interface

For current dimension and run out length, anchor trench will secure geomembrane, with geomembrane failure at yield and break strengths before anchor trench pull-out.

Prepared By: PRW
Date: 12/15/05

Checked By: MWG
Date: 12-15-05

Liner System Design Summary

Calculations for the liner system shear forces indicate the individual liner components are not subject to external forces when loaded with 20 feet of solid waste. The infinite slope analysis further indicates that the liner system is stable along the slope prior to waste deposition.

Anchor trench design will provide additional strength to liner system for resisting pull-out or liner slippage down the slope, should it occur.

Interface testing between the liner system components should be conducted prior to construction to verify that the liner system will be stable for site-specific conditions.

Prepared By: PRW
Date: 12/15/05

Checked By: MMS
Date: 12-15-05

City of Amarillo Landfill
Potter County, Texas
Foundation Settlement Analysis

Determine settlement of the subsurface strata when landfill has maximum load.

Procedure:

Generalize subsurface strata as one layer of clayey sand, based on information gathered from previous borings and four additional borings drilled by Kleinfelder.

Conduct a consolidation test on a sample from Boring 201 at a depth of 35 to 36½ feet below the existing ground surface (results presented on Plate 37, discussion located in text).

Use results of the consolidation test to determine parameters for settlement calculation.

The foundation settlement can be calculated using the equation:

$$S_c = \frac{C_r H_c}{1+e_o} \log \frac{p_c}{p_o} + \frac{C_c H_c}{1+e_o} \log \frac{p_o + \Delta p}{p_c}$$

Where: S_c = Settlement (*ft*)
H_c = Height of Soil Layer (*ft*)
e_o = Initial void ratio
C_r = Recompression Index
C_c = Compression Index
p_o = Present Overburden Pressure (*psf*)
p_c = Preconsolidation Pressure (*psf*)
Δp = Change in Overburden Pressure (*psf*)

The unit weights of soil and solid waste used for the settlement calculation are 125 and 70 *pcf*, respectively.

The maximum depth of solid waste is 240 feet. This includes a 70-foot excavation below natural grade and 170 feet of fill above natural grade.

Solution:

1. Calculate the present overburden pressure at the midpoint of the subgrade layer.

$$p_o = \gamma_{soil} \frac{H_c}{2}$$

$$p_o = (125\,pcf)\frac{50\,ft}{2}$$

$$p_o = 3125\,psf$$

2. Calculate the change in overburden pressure.

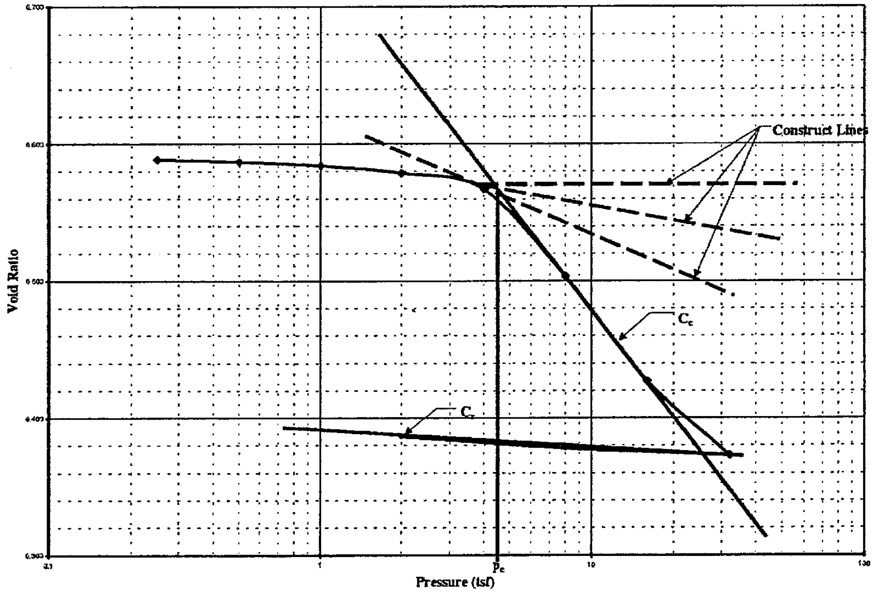
$$\Delta p = \text{Pressure of Solid Waste} - \text{Pressure of Excavated Material}$$

$$\Delta p = (70\,pcf)(240\,ft) - (125\,pcf)(70\,ft)$$

$$\Delta p = 8050\,psf$$

3. From the consolidation test results:

Using Casagrande's construct, determine p_c



$$p_c \approx 4.4\,tsf = 8800\,psf$$

The Compression Index is the slope of the straight-line portion of the consolidation curve.

$$C_c = \frac{e_1 - e_2}{\log\left(\frac{p_2}{p_1}\right)}$$

Where (e_1,p_1) and (e_2,p_2) are points along the straight/line portion of the consolidation curve.

$$C_c \approx 0.25$$

The Recompression Index is the slope of the straight-line portion of the rebound curve.

$$C_r = \frac{e_3 - e_4}{\log\left(\frac{p_4}{p_3}\right)}$$

Where (e_3,p_3) and (e_4,p_4) are points along the straight/line portion of the consolidation curve.

$$C_r \approx 0.01$$

The initial void ratio determined from the consolidation test is:

$$e_o = 0.598$$

4. Substituting into the settlement equation:

$$S_c = \frac{0.01 \cdot 50ft}{1+0.598}\log\frac{8800psf}{3125psf} + \frac{0.25 \cdot 50ft}{1+0.598}\log\frac{3125psf + 8050psf}{8800psf}$$
$$S_c = 0.141ft + 0.812ft$$
$$S_c = 0.952ft$$
$$S_c = 11.4\ in.$$

Conclusion:

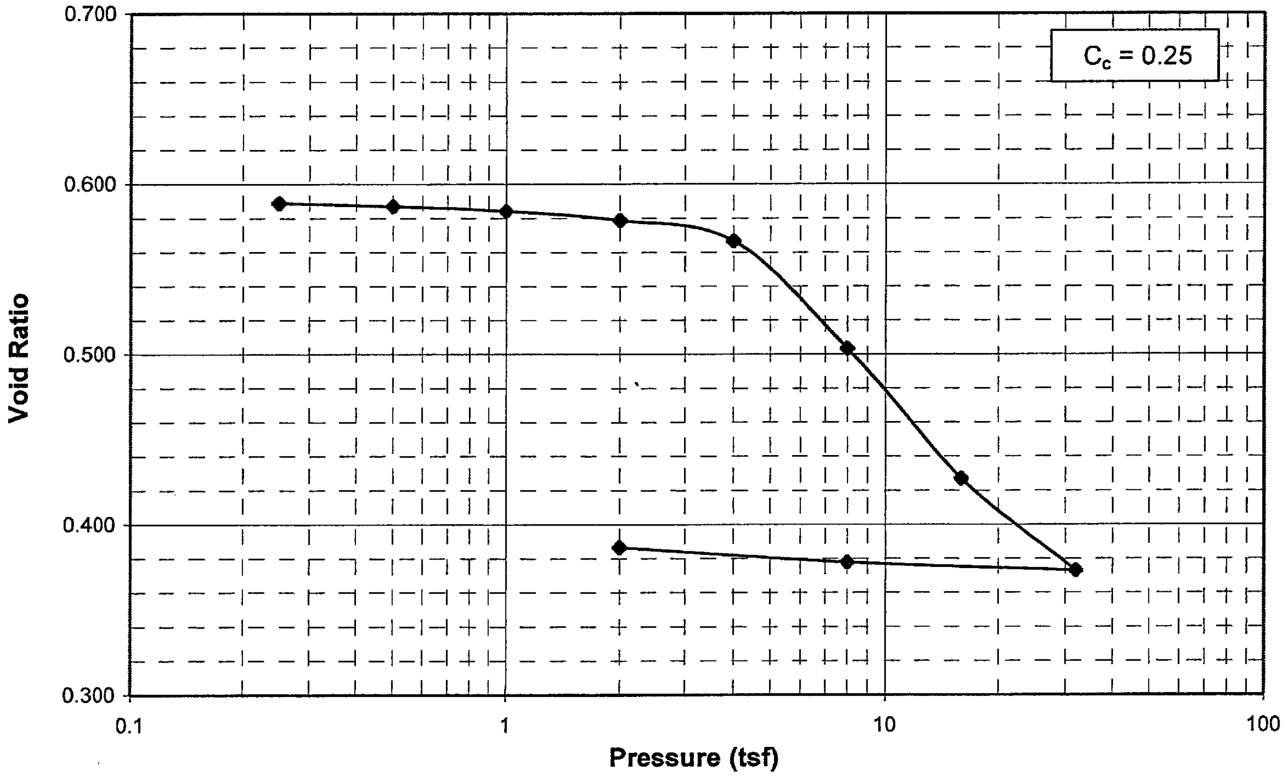
The foundation settlement is estimated to be about 1 foot, based on the results of the consolidation test. The estimated settlement should be conservative since only a portion of the landfill will have the 240-foot waste thickness expected. Most of the site will have less waste thickness.

KLEINFELDER
Geotechnical Engineering, Environmental Services, and
Construction Materials Engineering and Testing

One-Dimensional Consolidation Test Results

Project Name: Amarillo Landfill
Location: Amarillo , Texas
Material Description: CLAYEY SAND, silty, light brown
Project No.: 57815
Boring No.: B-201
Sample Depth (ft.): 35 to 36.5
Sample Type: Undisturbed
Tested By: D. Green
Date Tested: 6/21/2005
Consolidometer ID: G
Assumed Specific Gravity: 2.65

	Initial	**Final**
Void Ratio =	0.598	0.373
Moisture Content (%) =	7.2	21.2
Wet Unit Weight (pcf) =	111.0	129.2
Dry Unit Weight (pcf) =	103.5	106.6
Saturation (%) =	32.0	100.0



Test method generally based on ASTM D 2435.

City of Amarillo Landfill
Potter County, Texas
Solid Waste Settlement Analysis

Estimate total settlement in the Type I solid waste due to primary (short-term) and secondary (long-term decomposition) settlement.

Procedure:

1. Calculate total settlement
2. Determine the change in final cover grades due to differential settlement calculations.

Settlement of Type 1 waste can be modeled using consolidation theory for clay soils. Settlement can be calculated using the following equation:

$$S = \frac{H_o \Delta e}{1 + e_o}$$

Where: S = Settlement (ft)
H_o = Initial waste height (ft) or thickness of waste layer being currently evaluated
e_o = Initial void ratio
Δe = Change in void ratio

Primary and secondary consolidation of the waste is then computed by substituting in appropriate expressions for the change in void ratio.

Solution:

1. Primary settlement of solid waste:

Solid waste will undergo primary compression due to its own weight, weight of waste placed above it, final cover, and equipment. Primary compression occurs quickly, generally within the first month after loading. Primary compression occurs due to the weight of the waste lift above the waste layer being evaluated. Primary compression is calculated using soil consolidation theory.

$$\Delta e = C_c\left(\log\frac{\sigma'_o+\Delta\sigma}{\sigma'_o}\right)$$

Where: C_c = Compression index
= $0.15e_o$ for fills low in organic content
= $0.55e_o$ for fills high in organic content
$\Delta\sigma$ = Change in loading (psf)
σ'_o = Effective stress at mid-height of waste (psf)

Height of solids in waste:

$$H_s = \frac{W_s}{AS_G\gamma_w}$$

Where: H_s = Height of solids (ft)
W_s = Weight of solids = 37 lbs.
$\gamma_{waste,i}$ and moisture content of 10% (Ref. 9)
A = Area = 1 ft^2
S_G = Specific gravity of waste = 1.8 (Ref. 9)
γ_w = Unit weight of water = 62.4 lbs./ft^3

H_s = 0.33 ft

The total height of 1 ft^3 of material is 1 ft.

H_T = 1.00 ft

Height of voids:

$$H_v = H_T - H_s$$

Where: H_v = Height of voids (ft)
H_T = Total height of material = 1.00 ft
H_s = Height of solids = 0.33 ft

H_v = 0.67 ft

Initial void ratio:

$$e_o = \frac{V_v}{V_s} = \frac{H_v A}{H_s A} = \frac{H_v}{H_s}$$

H_v = 0.67 ft
H_s = 0.33 ft

e_o = 2.04 (typical of well compacted waste, Ref. 9)

For this site assume:

C_c = $0.35e_o = 0.71$ (fill with a moderate quantity of organic content, Ref. 8)

Substituting the equation for Δe into the settlement equation and solving for settlement:

$$S_P = \frac{H_o C_c}{1 + e_o}\left(\log \frac{\sigma'_o + \Delta\sigma}{\sigma'_o}\right)$$

Where:
S_P = Primary settlement (ft)
σ'_o = [0.5 (layer thickness being evaluated) + (overlying waste thickness)] x γ_s
$\Delta\sigma$ = γ_{waste} x (waste thickness above waste layer being evaluated)

2. Secondary settlement of solid waste

Secondary settlement continues for periods of time well beyond primary compression. Secondary settlement is a combination of secondary compression, physio-chemical action, and biochemical decay. The settlement-log time relationship is similar to secondary compression of soils and can be expressed by the following equation:

$$\Delta e = \alpha\left(\log \frac{t_2}{t_1}\right) \qquad \text{Ref. 9}$$

Where: α = Secondary compression factor
= 0.03 e_o for conditions unfavorable to decay of inert materials
= 0.09 e_o for conditions favorable to decay of inert materials
t_1 = Initial time of current interval
t_2 = Time at which settlement is determined (year)

Secondary settlement is calculated as follows:

$$S_C = \frac{H_o}{1+e_o}\left(\alpha \log \frac{t_2}{t_1}\right)$$

Where: S_C = Secondary settlement (ft)

Variables: e_o = 2.04
α = $0.06e_o = 0.12$
$\frac{\alpha}{1+e_o}$ = 0.04 (range between 0.02 and 0.07, Ref. 8 & 10)

The following tables show the calculations for waste settlement. Table 1 shows the settlement for a portion of the landfill that is filled to 70 feet and then left until there is little or no settlement occurring, and then the additional 170 feet of waste is placed to achieve the total 240 feet of solid waste thickness. Table 2 shows the settlement for a portion of the landfill that is filled to 240 feet with solid waste. The difference between the two settlements calculated in Tables 1 and 2 represent the greatest amount of differential solid waste settlement the landfill should experience. Due to filling techniques and other operational parameters, the actual differential settlement will be less than calculated.

Table 1
Settlement at Crown
240 ft Waste Thickness (70 ft + 170 ft)

Waste Lift	Variables	EOY 2	EOY 4	EOY 6	EOY 8	EOY 10	EOY 12	EOY 14	EOY 16	EOY 18	EOY 20	EOY 22	EOY 24	EOY 26
1	H_o	20.00	18.89	17.61	16.79	16.19	16.12	16.06	16.01	15.97	15.93	15.89	15.86	15.84
	S_p	0.00	1.04	0.68	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	1.11	0.24	0.14	0.09	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.03
	H_f	18.89	17.61	16.79	16.19	16.12	16.06	16.01	15.97	15.93	15.89	15.86	15.84	15.81
2	H_o		21.11	19.94	18.61	17.75	17.65	17.57	17.51	17.46	17.41	17.37	17.34	17.30
	S_p		0.00	1.08	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c		1.17	0.25	0.14	0.10	0.08	0.06	0.05	0.05	0.04	0.04	0.03	0.03
	H_f		19.94	18.61	17.75	17.65	17.57	17.51	17.46	17.41	17.37	17.34	17.30	17.27
3	H_o			22.45	21.20	19.83	19.68	19.57	19.49	19.42	19.36	19.31	19.27	19.23
	S_p			0.00	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c			1.25	0.27	0.15	0.11	0.08	0.07	0.06	0.05	0.04	0.04	0.04
	H_f			21.20	19.83	19.68	19.57	19.49	19.42	19.36	19.31	19.27	19.23	19.19
4	H_o				23.40	22.10	21.82	21.66	21.54	21.46	21.38	21.32	21.27	21.22
	S_p				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c				1.30	0.28	0.16	0.11	0.09	0.07	0.06	0.05	0.05	0.04
	H_f				22.10	21.82	21.66	21.54	21.46	21.38	21.32	21.27	21.22	21.18
5	H_o													
	S_p													
	S_c													
	H_f													
6	H_o													
	S_p													
	S_c													
	H_f													
7	H_o													
	S_p													
	S_c													
	H_f													
8	H_o													
	S_p													
	S_c													
	H_f													
9	H_o													
	S_p													
	S_c													
	H_f													
10	H_o													
	S_p													
	S_c													
	H_f													
11	H_o													
	S_p													
	S_c													
	H_f													
12	H_o													
	S_p													
	S_c													
	H_f													
Total Theoretical Height, ft		20.00	40.00	60.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00
Total Height at EOY, ft		18.89	37.55	56.60	75.87	75.27	74.86	74.55	74.30	74.09	73.90	73.74	73.59	73.46
Interval Settlement, ft		1.11	2.45	3.40	4.13	4.73	5.14	5.45	5.70	5.91	6.10	6.26	6.41	6.54
Total Settlement, ft		1.11	3.56	6.96	11.09	15.81	16.22	16.53	16.79	17.00	17.19	17.35	17.50	17.63

Waste Lift	Variables	EOY 28	EOY 30	EOY 32	EOY 34	EOY 36	EOY 38	EOY 40	EOY 42	EOY 44	EOY 46	EOY 48	EOY 50	EOY 52
1	H_o	15.81	15.79	15.76	15.74	15.72	15.70	15.69	15.67	15.66	15.64	15.63	15.61	15.60
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
	H_f	15.79	15.76	15.74	15.72	15.70	15.69	15.67	15.66	15.64	15.63	15.61	15.60	15.59
2	H_o	17.27	17.25	17.22	17.20	17.17	17.15	17.13	17.11	17.10	17.08	17.06	17.05	17.03
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01
	H_f	17.25	17.22	17.20	17.17	17.15	17.13	17.11	17.10	17.08	17.06	17.05	17.03	17.02
3	H_o	19.19	19.16	19.13	19.10	19.08	19.05	19.03	19.01	18.99	18.97	18.95	18.94	18.92
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	H_f	19.16	19.13	19.10	19.08	19.05	19.03	19.01	18.99	18.97	18.95	18.94	18.92	18.90
4	H_o	21.18	21.14	21.11	21.08	21.05	21.02	21.00	20.97	20.95	20.93	20.91	20.89	20.87
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	H_f	21.14	21.11	21.08	21.05	21.02	21.00	20.97	20.95	20.93	20.91	20.89	20.87	20.85
5	H_o													
	S_p													
	S_c													
	H_f													
6	H_o													
	S_p													
	S_c													
	H_f													
7	H_o													
	S_p													
	S_c													
	H_f													
8	H_o													
	S_p													
	S_c													
	H_f													
9	H_o													
	S_p													
	S_c													
	H_f													
10	H_o													
	S_p													
	S_c													
	H_f													
11	H_o													
	S_p													
	S_c													
	H_f													
12	H_o													
	S_p													
	S_c													
	H_f													
Total Theoretical Height, ft		80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00
Total Height at EOY, ft		73.33	73.22	73.12	73.02	72.93	72.85	72.77	72.69	72.62	72.55	72.49	72.42	72.36
Interval Settlement, ft		6.67	6.78	6.88	6.98	7.07	7.15	7.23	7.31	7.38	7.45	7.51	7.58	7.64
Total Settlement, ft		17.75	17.86	17.97	18.06	18.15	18.24	18.32	18.39	18.47	18.53	18.60	18.66	18.72

Waste Lift	Variables	EOY 54	EOY 56	EOY 58	EOY 60	EOY 62	EOY 64	EOY 66	EOY 68	EOY 70	EOY 72	EOY 74	EOY 76	EOY 78
1	H_o	15.59	15.57	15.56	15.55	15.54	15.53	15.52	15.51	15.50	15.97	15.04	14.69	14.41
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.34	0.28	0.24
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.49	0.01	0.01	0.01
	H_f	15.57	15.56	15.55	15.54	15.53	15.52	15.51	15.50	15.49	15.04	14.69	14.41	14.16
2	H_o	17.02	17.01	16.99	16.98	16.97	16.96	16.95	16.94	16.93	17.46	16.34	15.90	15.56
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.42	0.33	0.29
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.56	0.01	0.01	0.01
	H_f	17.01	16.99	16.98	16.97	16.96	16.95	16.94	16.93	16.92	16.34	15.90	15.56	15.26
3	H_o	18.90	18.89	18.87	18.86	18.85	18.83	18.82	18.81	18.80	19.42	18.01	17.45	17.02
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.55	0.42	0.35
	S_c	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.65	0.01	0.01	0.01
	H_f	18.89	18.87	18.86	18.85	18.83	18.82	18.81	18.80	18.79	18.01	17.45	17.02	16.66
4	H_o	20.85	20.84	20.82	20.80	20.79	20.77	20.76	20.75	20.73	21.46	19.62	18.89	18.35
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.09	0.72	0.52	0.43
	S_c	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.75	0.01	0.01	0.01
	H_f	20.84	20.82	20.80	20.79	20.77	20.76	20.75	20.73	20.72	19.62	18.89	18.35	17.91
5	H_o										28.08	26.52	25.00	24.01
	S_p										0.00	1.18	0.80	0.63
	S_c										1.56	0.33	0.19	0.13
	H_f										26.52	25.00	24.01	23.25
6	H_o											26.86	25.37	24.02
	S_p											0.00	1.03	0.75
	S_c											1.49	0.32	0.18
	H_f											25.37	24.02	23.09
7	H_o												25.08	23.69
	S_p												0.00	0.92
	S_c												1.39	0.30
	H_f												23.69	22.47
8	H_o													25.32
	S_p													0.00
	S_c													1.41
	H_f													23.91
9	H_o													
	S_p													
	S_c													
	H_f													
10	H_o													
	S_p													
	S_c													
	H_f													
11	H_o													
	S_p													
	S_c													
	H_f													
12	H_o													
	S_p													
	S_c													
	H_f													
Total Theoretical Height, ft		80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	80.00	100.00	120.00	140.00	160.00
Total Height at EOY, ft		72.31	72.25	72.20	72.15	72.10	72.05	72.00	71.96	71.92	95.52	117.30	137.06	156.71
Interval Settlement, ft		7.69	7.75	7.80	7.85	7.90	7.95	8.00	8.04	8.08	4.48	2.70	2.94	3.29
Total Settlement, ft		18.78	18.83	18.89	18.94	18.99	19.03	19.08	19.13	19.17	21.26	23.96	26.90	30.19

Notes:
1) EOY is abbreviation of End Of Year
2) Primary compression for each interval is assumed to be completed at EOY
3) Soil cover during waste placement not included in the analysis
4) Soil cover placed after last waste lift not included in the analysis

Table 1 (continued)

Settlement at Crown

240 ft Waste Thickness (70 ft + 170 ft)

Waste Lift	Variables	EOY 80	EOY 82	EOY 84	EOY 86	EOY 88	EOY 90	EOY 92	EOY 94	EOY 96	EOY 98	EOY 100	EOY 110	EOY 120	EOY 122	EOY 124	EOY 126	EOY 128	EOY 130	EOY 132	EOY 134	EOY 136	EOY 138	EOY 140	EOY 142	EOY 144	EOY 146	EOY 148	EOY 150
1	H_o	14.16	13.93	13.73	13.54	13.37	13.36	13.36	13.35	13.34	13.34	13.33	13.32	13.30	13.27	13.26	13.26	13.26	13.25	13.25	13.24	13.24	13.23	13.23	13.22	13.22	13.22	13.21	13.21
	S_p	0.22	0.20	0.18	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	H_f	13.93	13.73	13.54	13.37	13.36	13.36	13.35	13.34	13.34	13.33	13.32	13.30	13.27	13.26	13.26	13.26	13.25	13.25	13.24	13.24	13.23	13.23	13.22	13.22	13.22	13.21	13.21	13.20
2	H_o	15.26	15.00	14.76	14.55	14.35	14.35	14.34	14.33	14.33	14.32	14.31	14.30	14.27	14.25	14.24	14.24	14.23	14.22	14.22	14.21	14.21	14.21	14.20	14.20	14.19	14.19	14.18	14.18
	S_p	0.25	0.23	0.21	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	H_f	15.00	14.76	14.55	14.35	14.35	14.34	14.33	14.33	14.32	14.31	14.30	14.27	14.25	14.24	14.24	14.23	14.22	14.22	14.21	14.21	14.21	14.20	14.20	14.19	14.19	14.18	14.18	14.17
3	H_o	16.66	16.35	16.07	15.82	15.59	15.39	15.20	15.01	14.82	14.64	14.45	14.27	14.07	13.87	13.70	13.53	13.36	13.19	13.02	12.86	12.70	12.53	12.37	12.21	12.06	11.90	11.74	11.59
	S_p	0.31	0.27	0.24	0.22	0.19	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	H_f	16.35	16.07	15.82	15.59	15.39	15.20	15.01	14.82	14.64	14.45	14.27	14.07	13.87	13.70	13.53	13.36	13.19	13.02	12.86	12.70	12.53	12.37	12.21	12.06	11.90	11.74	11.59	11.44
4	H_o	17.91	17.54	17.21	16.92	16.66	16.65	16.64	16.64	16.63	16.62	16.61	16.60	16.57	16.53	16.53	16.52	16.52	16.51	16.50	16.50	16.49	16.49	16.48	16.48	16.47	16.47	16.46	16.46
	S_p	0.36	0.32	0.28	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	17.54	17.21	16.92	16.66	16.65	16.64	16.64	16.63	16.62	16.61	16.60	16.57	16.53	16.53	16.52	16.52	16.51	16.50	16.50	16.49	16.49	16.48	16.48	16.47	16.47	16.46	16.46	16.45
5	H_o	23.25	22.62	22.10	21.65	21.25	21.20	21.15	21.11	21.07	21.03	21.00	20.97	20.84	20.75	20.73	20.71	20.70	20.68	20.67	20.65	20.64	20.62	20.61	20.60	20.59	20.57	20.56	20.55
	S_p	0.52	0.44	0.38	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.10	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.13	0.10	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	22.62	22.10	21.65	21.25	21.20	21.15	21.11	21.07	21.03	21.00	20.97	20.84	20.75	20.73	20.71	20.70	20.68	20.67	20.65	20.64	20.62	20.61	20.60	20.59	20.57	20.56	20.55	20.54
6	H_o	23.09	22.37	21.78	21.28	20.85	20.79	20.74	20.70	20.66	20.62	20.59	20.56	20.42	20.33	20.31	20.29	20.28	20.26	20.25	20.23	20.22	20.20	20.19	20.18	20.17	20.15	20.14	20.13
	S_p	0.59	0.49	0.42	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.13	0.10	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.13	0.10	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	22.37	21.78	21.28	20.85	20.79	20.74	20.70	20.66	20.62	20.59	20.56	20.42	20.33	20.31	20.29	20.28	20.26	20.25	20.23	20.22	20.20	20.19	20.18	20.17	20.15	20.14	20.13	20.12
7	H_o	22.47	21.61	20.95	20.41	19.95	19.89	19.83	19.78	19.74	19.70	19.67	19.64	19.51	19.41	19.39	19.37	19.36	19.34	19.33	19.31	19.30	19.29	19.28	19.26	19.25	19.24	19.23	19.22
	S_p	0.68	0.54	0.45	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.17	0.12	0.09	0.07	0.06	0.05	0.05	0.04	0.04	0.04	0.03	0.13	0.10	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	21.61	20.95	20.41	19.95	19.89	19.83	19.78	19.74	19.70	19.67	19.64	19.51	19.41	19.39	19.37	19.36	19.34	19.33	19.31	19.30	19.29	19.28	19.26	19.25	19.24	19.23	19.22	19.21
8	H_o	23.91	22.71	21.87	21.21	20.67	20.60	20.53	20.48	20.43	20.39	20.35	20.31	20.17	20.06	20.05	20.03	20.01	20.00	19.98	19.97	19.95	19.94	19.92	19.91	19.90	19.89	19.88	19.86
	S_p	0.90	0.67	0.54	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.30	0.17	0.12	0.09	0.08	0.06	0.05	0.05	0.04	0.04	0.04	0.14	0.11	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	22.71	21.87	21.21	20.67	20.60	20.53	20.48	20.43	20.39	20.35	20.31	20.17	20.06	20.05	20.03	20.01	20.00	19.98	19.97	19.95	19.94	19.92	19.91	19.90	19.89	19.88	19.86	19.85
9	H_o	25.68	24.25	23.07	22.23	21.57	21.48	21.40	21.34	21.28	21.23	21.19	21.15	20.99	20.88	20.86	20.84	20.82	20.80	20.79	20.77	20.76	20.74	20.73	20.71	20.70	20.69	20.68	20.66
	S_p	0.00	0.88	0.66	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	1.43	0.31	0.18	0.12	0.09	0.08	0.06	0.06	0.05	0.04	0.04	0.16	0.11	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	24.25	23.07	22.23	21.57	21.48	21.40	21.34	21.28	21.23	21.19	21.15	20.99	20.88	20.86	20.84	20.82	20.80	20.79	20.77	20.76	20.74	20.73	20.71	20.70	20.69	20.68	20.66	20.65
10	H_o		26.00	24.56	23.40	22.57	22.44	22.35	22.27	22.20	22.15	22.09	22.05	21.88	21.75	21.73	21.71	21.69	21.67	21.66	21.64	21.62	21.61	21.59	21.58	21.57	21.55	21.54	21.53
	S_p		0.00	0.85	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c		1.45	0.31	0.18	0.12	0.10	0.08	0.07	0.06	0.05	0.05	0.17	0.12	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f		24.56	23.40	22.57	22.44	22.35	22.27	22.20	22.15	22.09	22.05	21.88	21.75	21.73	21.71	21.69	21.67	21.66	21.64	21.62	21.61	21.59	21.58	21.57	21.55	21.54	21.53	21.51
11	H_o			26.30	24.83	23.69	23.51	23.39	23.29	23.21	23.14	23.08	23.03	22.84	22.70	22.68	22.66	22.64	22.62	22.60	22.58	22.56	22.55	22.53	22.52	22.50	22.49	22.47	22.46
	S_p			0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c			1.46	0.31	0.18	0.13	0.10	0.08	0.07	0.06	0.05	0.19	0.13	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
	H_f			24.83	23.69	23.51	23.39	23.29	23.21	23.14	23.08	23.03	22.84	22.70	22.68	22.66	22.64	22.62	22.60	22.58	22.56	22.55	22.53	22.52	22.50	22.49	22.47	22.46	22.45
12	H_o				26.55	25.07	24.76	24.57	24.44	24.34	24.26	24.19	24.13	23.91	23.77	23.74	23.72	23.70	23.68	23.66	23.64	23.62	23.60	23.59	23.57	23.55	23.54	23.53	23.51
	S_p				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c				1.48	0.32	0.18	0.13	0.10	0.08	0.07	0.06	0.22	0.15	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01
	H_f				25.07	24.76	24.57	24.44	24.34	24.26	24.19	24.13	23.91	23.77	23.74	23.72	23.70	23.68	23.66	23.64	23.62	23.60	23.59	23.57	23.55	23.54	23.53	23.51	23.50
	Total Theoretical Height, ft	180.00	200.00	220.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00
	Total Height at EOY, ft	176.38	196.09	215.83	235.61	234.43	233.51	232.74	232.06	231.44	230.87	230.34	228.77	227.56	227.22	226.88	226.55	226.23	225.92	225.61	225.31	225.02	224.73	224.44	224.16	223.89	223.62	223.35	223.09
	Interval Settlement, ft	3.62	3.91	4.17	4.39	5.57	6.49	7.26	7.94	8.56	9.13	9.66	11.23	12.44	12.78	13.12	13.45	13.77	14.08	14.39	14.69	14.98	15.27	15.56	15.84	16.11	16.38	16.65	16.91
	Total Settlement, ft	33.81	37.73	41.89	46.28	51.85	52.77	53.54	54.22	54.84	55.41	55.94	57.52	58.72	59.06	59.40	59.73	60.05	60.36	60.67	60.97	61.26	61.55	61.84	62.12	62.39	62.66	62.93	63.19

Notes: 1) EOY is abbreviation of End Of Year
2) Primary compression for each interval is a:
3) Soil cover during waste placement not incl
4) Soil cover placed after last waste lift not in

Prepared By: PRW
Date: 12/15/05

Checked By:
Date: 12/15/05

Table 2
Settlement at Crown
240 ft Waste Thickness

Waste Lift	Variables	EOY 2	EOY 4	EOY 6	EOY 8	EOY 10	EOY 12	EOY 14	EOY 16	EOY 18	EOY 20	EOY 22	EOY 24	EOY 26	EOY 28	EOY 30	EOY 32	EOY 34	EOY 36	EOY 38	EOY 40	EOY 42	EOY 44	EOY 46	EOY 48	EOY 50	EOY 52	EOY 54	EOY 56	EOY 58	EOY 60	EOY 62	EOY 64	EOY 66	EOY 68	EOY 70	EOY 72	EOY 74	EOY 76	EOY 78	EOY 80	EOY 82
1	H_o	20.00	18.89	17.61	16.79	16.19	15.71	15.32	14.98	14.69	14.44	14.21	14.00	13.82	13.79	13.77	13.75	13.73	13.71	13.70	13.68	13.66	13.65	13.63	13.62	13.61	13.60	13.58	13.57	13.56	13.55	13.54	13.53	13.52	13.51	13.50	13.49	13.49	13.48	13.47	13.46	13.45
	S_p	0.00	1.04	0.68	0.51	0.41	0.34	0.29	0.25	0.22	0.20	0.18	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	1.11	0.24	0.14	0.09	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	18.89	17.61	16.79	16.19	15.71	15.32	14.98	14.69	14.44	14.21	14.00	13.82	13.79	13.77	13.75	13.73	13.71	13.70	13.68	13.66	13.65	13.63	13.62	13.61	13.60	13.58	13.57	13.56	13.55	13.54	13.53	13.52	13.51	13.50	13.49	13.49	13.48	13.47	13.46	13.45	13.45
2	H_o		21.11	19.94	18.61	17.75	17.12	16.63	16.22	15.87	15.57	15.30	15.07	14.85	14.83	14.80	14.78	14.75	14.73	14.71	14.69	14.68	14.66	14.64	14.63	14.62	14.60	14.59	14.58	14.56	14.55	14.54	14.53	14.52	14.51	14.50	14.49	14.48	14.47	14.46	14.45	14.45
	S_p		0.00	1.08	0.71	0.53	0.42	0.35	0.30	0.26	0.23	0.20	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c		1.17	0.25	0.14	0.10	0.08	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f		19.94	18.61	17.75	17.12	16.63	16.22	15.87	15.57	15.30	15.07	14.85	14.83	14.80	14.78	14.75	14.73	14.71	14.69	14.68	14.66	14.64	14.63	14.62	14.60	14.59	14.58	14.56	14.55	14.54	14.53	14.52	14.51	14.50	14.49	14.48	14.47	14.46	14.45	14.45	14.44
3	H_o			22.45	21.20	19.83	18.95	18.30	17.78	17.35	16.99	16.67	16.40	16.15	16.11	16.08	16.06	16.03	16.01	15.98	15.96	15.94	15.93	15.91	15.89	15.87	15.86	15.84	15.83	15.82	15.80	15.79	15.78	15.77	15.76	15.75	15.73	15.72	15.71	15.70	15.70	15.69
	S_p			0.00	1.10	0.73	0.55	0.44	0.36	0.31	0.27	0.24	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c			1.25	0.27	0.15	0.11	0.08	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f			21.20	19.83	18.95	18.30	17.78	17.35	16.99	16.67	16.40	16.15	16.11	16.08	16.06	16.03	16.01	15.98	15.96	15.94	15.93	15.91	15.89	15.87	15.86	15.84	15.83	15.82	15.80	15.79	15.78	15.77	15.76	15.75	15.73	15.72	15.71	15.70	15.70	15.69	15.68
4	H_o				23.40	22.10	20.74	19.85	19.19	18.66	18.23	17.86	17.53	17.25	17.21	17.17	17.14	17.11	17.09	17.06	17.04	17.02	16.99	16.98	16.96	16.94	16.92	16.91	16.89	16.88	16.86	16.85	16.83	16.82	16.81	16.80	16.79	16.77	16.76	16.75	16.74	16.73
	S_p				0.00	1.08	0.73	0.55	0.44	0.37	0.31	0.27	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c				1.30	0.28	0.16	0.11	0.09	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f				22.10	20.74	19.85	19.19	18.66	18.23	17.86	17.53	17.25	17.21	17.17	17.14	17.11	17.09	17.06	17.04	17.02	16.99	16.98	16.96	16.94	16.92	16.91	16.89	16.88	16.86	16.85	16.83	16.82	16.81	16.80	16.79	16.77	16.76	16.75	16.74	16.73	16.72
5	H_o					24.13	22.79	21.46	20.58	19.91	19.39	18.95	18.57	18.25	18.20	18.16	18.12	18.09	18.06	18.03	18.01	17.98	17.96	17.94	17.92	17.90	17.88	17.86	17.84	17.83	17.81	17.80	17.78	17.77	17.76	17.74	17.73	17.72	17.71	17.70	17.69	17.67
	S_p					0.00	1.04	0.72	0.55	0.44	0.37	0.32	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c					1.34	0.29	0.16	0.11	0.09	0.07	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f					22.79	21.46	20.58	19.91	19.39	18.95	18.57	18.25	18.20	18.16	18.12	18.09	18.06	18.03	18.01	17.98	17.96	17.94	17.92	17.90	17.88	17.86	17.84	17.83	17.81	17.80	17.78	17.77	17.76	17.74	17.73	17.72	17.71	17.70	17.69	17.67	17.66
6	H_o						24.69	23.32	22.03	21.17	20.51	19.99	19.55	19.17	19.12	19.07	19.03	18.99	18.96	18.93	18.90	18.87	18.85	18.82	18.80	18.78	18.76	18.74	18.72	18.70	18.69	18.67	18.66	18.64	18.63	18.61	18.60	18.59	18.58	18.56	18.55	18.54
	S_p						0.00	0.99	0.70	0.54	0.44	0.37	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c						1.37	0.29	0.17	0.12	0.09	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f						23.32	22.03	21.17	20.51	19.99	19.55	19.17	19.12	19.07	19.03	18.99	18.96	18.93	18.90	18.87	18.85	18.82	18.80	18.78	18.76	18.74	18.72	18.70	18.69	18.67	18.66	18.64	18.63	18.61	18.60	18.59	18.58	18.56	18.55	18.54	18.53
7	H_o							25.13	23.74	22.50	21.65	21.01	20.49	20.05	19.99	19.94	19.89	19.85	19.81	19.77	19.74	19.71	19.68	19.66	19.63	19.61	19.59	19.57	19.55	19.53	19.51	19.49	19.48	19.46	19.45	19.43	19.42	19.40	19.39	19.38	19.37	19.35
	S_p							0.00	0.94	0.67	0.52	0.43	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c							1.40	0.30	0.17	0.12	0.09	0.07	0.06	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f							23.74	22.50	21.65	21.01	20.49	20.05	19.99	19.94	19.89	19.85	19.81	19.77	19.74	19.71	19.68	19.66	19.63	19.61	19.59	19.57	19.55	19.53	19.51	19.49	19.48	19.46	19.45	19.43	19.42	19.40	19.39	19.38	19.37	19.35	19.34
8	H_o								25.48	24.07	22.88	22.06	21.43	20.92	20.84	20.78	20.72	20.67	20.63	20.59	20.55	20.52	20.49	20.46	20.43	20.41	20.39	20.36	20.34	20.32	20.30	20.29	20.27	20.25	20.24	20.22	20.20	20.19	20.18	20.16	20.15	20.14
	S_p								0.00	0.88	0.65	0.51	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c								1.42	0.30	0.17	0.12	0.09	0.08	0.06	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f								24.07	22.88	22.06	21.43	20.92	20.84	20.78	20.72	20.67	20.63	20.59	20.55	20.52	20.49	20.46	20.43	20.41	20.39	20.36	20.34	20.32	20.30	20.29	20.27	20.25	20.24	20.22	20.20	20.19	20.18	20.16	20.15	20.14	20.13
9	H_o									25.77	24.34	23.20	22.40	21.79	21.69	21.61	21.55	21.49	21.44	21.40	21.36	21.32	21.29	21.26	21.23	21.20	21.17	21.15	21.13	21.11	21.09	21.07	21.05	21.03	21.01	21.00	20.98	20.96	20.95	20.94	20.92	20.91
	S_p									0.00	0.83	0.62	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c									1.43	0.31	0.18	0.12	0.09	0.08	0.07	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
	H_f									24.34	23.20	22.40	21.79	21.69	21.61	21.55	21.49	21.44	21.40	21.36	21.32	21.29	21.26	21.23	21.20	21.17	21.15	21.13	21.11	21.09	21.07	21.05	21.03	21.01	21.00	20.98	20.96	20.95	20.94	20.92	20.91	20.90
10	H_o										26.00	24.56	23.46	22.69	22.57	22.47	22.39	22.33	22.27	22.22	22.17	22.13	22.10	22.06	22.03	22.00	21.97	21.95	21.92	21.90	21.88	21.86	21.84	21.82	21.80	21.78	21.76	21.75	21.73	21.72	21.70	21.69
	S_p										0.00	0.79	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c										1.45	0.31	0.18	0.12	0.10	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
	H_f										24.56	23.46	22.69	22.57	22.47	22.39	22.33	22.27	22.22	22.17	22.13	22.10	22.06	22.03	22.00	21.97	21.95	21.92	21.90	21.88	21.86	21.84	21.82	21.80	21.78	21.76	21.75	21.73	21.72	21.70	21.69	21.68
11	H_o											26.20	24.74	23.69	23.52	23.39	23.29	23.21	23.14	23.08	23.03	22.99	22.94	22.91	22.87	22.84	22.81	22.78	22.75	22.73	22.71	22.68	22.66	22.64	22.62	22.60	22.59	22.57	22.55	22.54	22.52	22.51
	S_p											0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c											1.46	0.31	0.18	0.13	0.10	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01
	H_f											24.74	23.69	23.52	23.39	23.29	23.21	23.14	23.08	23.03	22.99	22.94	22.91	22.87	22.84	22.81	22.78	22.75	22.73	22.71	22.68	22.66	22.64	22.62	22.60	22.59	22.57	22.55	22.54	22.52	22.51	22.49
12	H_o												26.16	24.70	24.39	24.21	24.08	23.98	23.90	23.83	23.77	23.72	23.68	23.63	23.59	23.56	23.53	23.50	23.47	23.44	23.42	23.39	23.37	23.35	23.33	23.31	23.29	23.27	23.25	23.24	23.22	23.21
	S_p												0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c												1.45	0.31	0.18	0.13	0.10	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01
	H_f												24.70	24.39	24.21	24.08	23.98	23.90	23.83	23.77	23.72	23.68	23.63	23.59	23.56	23.53	23.50	23.47	23.44	23.42	23.39	23.37	23.35	23.33	23.31	23.29	23.27	23.25	23.24	23.22	23.21	23.19
Total Theoretical Height, ft		20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00
Total Height at EOY, ft		18.89	37.55	56.60	75.87	95.31	114.87	134.52	154.23	174.00	193.80	213.64	233.33	232.26	231.46	230.81	230.25	229.75	229.31	228.91	228.55	228.21	227.90	227.60	227.33	227.07	226.83	226.60	226.38	226.17	225.97	225.77	225.59	225.41	225.24	225.08	224.92	224.77	224.62	224.48	224.34	224.20
Interval Settlement, ft		1.11	2.45	3.40	4.13	4.69	5.13	5.48	5.77	6.00	6.20	6.36	6.67	7.74	8.54	9.19	9.75	10.25	10.69	11.09	11.45	11.79	12.10	12.40	12.67	12.93	13.17	13.40	13.62	13.83	14.03	14.23	14.41	14.59	14.76	14.92	15.08	15.23	15.38	15.52	15.66	15.80
Total Settlement, ft		1.11	3.56	6.96	11.09	15.77	20.91	26.39	32.16	38.17	44.36	50.73	57.39	65.13	65.93	66.59	67.15	67.64	68.08	68.48	68.85	69.18	69.50	69.79	70.06	70.32	70.56	70.80	71.02	71.23	71.43	71.62	71.80	71.98	72.15	72.31	72.47	72.62	72.77	72.92	73.06	73.19

Notes: 1) EOY is abbreviation of End Of Year
2) Primary compression for each interval is assumed to be completed at EOY
3) Soil cover during waste placement not included in the analysis
4) Soil cover placed after last waste lift not included in the analysis

Table 2 (continued)

Settlement at Crown
240 ft Waste Thickness

Waste Lift	Variables	EOY 84	EOY 86	EOY 88	EOY 90	EOY 92	EOY 94	EOY 96	EOY 98	EOY 100	EOY 102	EOY 104	EOY 106	EOY 108	EOY 110	EOY 112	EOY 114	EOY 116
1	H_o	13.45	13.44	13.43	13.42	13.42	13.41	13.41	13.40	13.39	13.39	13.38	13.37	13.37	13.36	13.36	13.35	13.35
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	13.44	13.43	13.42	13.42	13.41	13.41	13.40	13.39	13.39	13.38	13.37	13.37	13.36	13.36	13.35	13.35	13.34
2	H_o	14.44	14.43	14.42	14.41	14.41	14.40	14.39	14.39	14.38	14.37	14.37	14.36	14.35	14.35	14.34	14.34	14.33
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	14.43	14.42	14.41	14.41	14.40	14.39	14.39	14.38	14.37	14.37	14.36	14.35	14.35	14.34	14.34	14.33	14.32
3	H_o	15.68	15.67	15.66	15.65	15.64	15.64	15.63	15.62	15.61	15.61	15.60	15.59	15.58	15.58	15.57	15.57	15.56
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	15.67	15.66	15.65	15.64	15.64	15.63	15.62	15.61	15.61	15.60	15.59	15.58	15.58	15.57	15.57	15.56	15.55
4	H_o	16.72	16.71	16.71	16.70	16.69	16.68	16.67	16.66	16.65	16.65	16.64	16.63	16.62	16.62	16.61	16.60	16.60
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	16.71	16.71	16.70	16.69	16.68	16.67	16.66	16.65	16.65	16.64	16.63	16.62	16.62	16.61	16.60	16.60	16.59
5	H_o	17.66	17.65	17.64	17.64	17.63	17.62	17.61	17.60	17.59	17.58	17.57	17.57	17.56	17.55	17.54	17.54	17.53
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	17.65	17.64	17.64	17.63	17.62	17.61	17.60	17.59	17.58	17.57	17.57	17.56	17.55	17.54	17.54	17.53	17.52
6	H_o	18.53	18.52	18.51	18.50	18.49	18.48	18.47	18.46	18.45	18.44	18.43	18.43	18.42	18.41	18.40	18.39	18.39
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	18.52	18.51	18.50	18.49	18.48	18.47	18.46	18.45	18.44	18.43	18.43	18.42	18.41	18.40	18.39	18.39	18.38
7	H_o	19.34	19.33	19.32	19.31	19.30	19.29	19.28	19.27	19.26	19.25	19.24	19.23	19.23	19.22	19.21	19.20	19.19
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	19.33	19.32	19.31	19.30	19.29	19.28	19.27	19.26	19.25	19.24	19.23	19.23	19.22	19.21	19.20	19.19	19.19
8	H_o	20.13	20.11	20.10	20.09	20.08	20.07	20.06	20.05	20.04	20.03	20.02	20.01	20.00	19.99	19.98	19.98	19.97
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	20.11	20.10	20.09	20.08	20.07	20.06	20.05	20.04	20.03	20.02	20.01	20.00	19.99	19.98	19.98	19.97	19.96
9	H_o	20.90	20.88	20.87	20.86	20.85	20.84	20.83	20.82	20.80	20.79	20.78	20.78	20.77	20.76	20.75	20.74	20.73
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	20.88	20.87	20.86	20.85	20.84	20.83	20.82	20.80	20.79	20.78	20.78	20.77	20.76	20.75	20.74	20.73	20.72
10	H_o	21.68	21.66	21.65	21.64	21.63	21.61	21.60	21.59	21.58	21.57	21.56	21.55	21.54	21.53	21.52	21.51	21.50
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	21.66	21.65	21.64	21.63	21.61	21.60	21.59	21.58	21.57	21.56	21.55	21.54	21.53	21.52	21.51	21.50	21.49
11	H_o	22.49	22.48	22.46	22.45	22.44	22.43	22.42	22.40	22.39	22.38	22.37	22.36	22.35	22.34	22.33	22.32	22.31
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	22.48	22.46	22.45	22.44	22.43	22.42	22.40	22.39	22.38	22.37	22.36	22.35	22.34	22.33	22.32	22.31	22.30
12	H_o	23.19	23.18	23.16	23.15	23.14	23.12	23.11	23.10	23.09	23.08	23.07	23.05	23.04	23.03	23.02	23.01	23.00
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	23.18	23.16	23.15	23.14	23.12	23.11	23.10	23.09	23.08	23.07	23.05	23.04	23.03	23.02	23.01	23.00	22.99
	Total Theoretical Height, ft	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00
	Total Height at EOY, ft	224.07	223.94	223.82	223.70	223.58	223.47	223.36	223.25	223.14	223.04	222.93	222.84	222.74	222.64	222.55	222.46	222.37
	Interval Settlement, ft	15.93	16.06	16.18	16.30	16.42	16.53	16.64	16.75	16.86	16.96	17.07	17.16	17.26	17.36	17.45	17.54	17.63
	Total Settlement, ft	73.32	73.45	73.57	73.69	73.81	73.92	74.04	74.14	74.25	74.36	74.46	74.56	74.65	74.75	74.84	74.93	75.02

Waste Lift	Variables	EOY 118	EOY 120	EOY 122	EOY 124	EOY 126	EOY 128	EOY 130	EOY 132	EOY 134	EOY 136	EOY 138	EOY 140	EOY 142	EOY 144	EOY 146	EOY 148	EOY 150
1	H_o	13.34	13.34	13.33	13.33	13.32	13.32	13.31	13.31	13.30	13.30	13.29	13.29	13.29	13.28	13.28	13.27	13.27
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	H_f	13.34	13.33	13.33	13.32	13.32	13.31	13.31	13.30	13.30	13.29	13.29	13.29	13.28	13.28	13.27	13.27	13.26
2	H_o	14.32	14.32	14.31	14.31	14.30	14.30	14.29	14.29	14.28	14.28	14.27	14.27	14.26	14.26	14.25	14.25	14.25
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	H_f	14.32	14.31	14.31	14.30	14.30	14.29	14.29	14.28	14.28	14.27	14.27	14.26	14.26	14.25	14.25	14.25	14.24
3	H_o	15.55	15.55	15.54	15.53	15.53	15.52	15.52	15.51	15.51	15.50	15.50	15.49	15.49	15.48	15.48	15.47	15.47
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	H_f	15.55	15.54	15.53	15.53	15.52	15.52	15.51	15.51	15.50	15.50	15.49	15.49	15.48	15.48	15.47	15.47	15.46
4	H_o	16.59	16.58	16.58	16.57	16.56	16.56	16.55	16.55	16.54	16.54	16.53	16.52	16.52	16.51	16.51	16.50	16.50
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	16.58	16.58	16.57	16.56	16.56	16.55	16.55	16.54	16.54	16.53	16.52	16.52	16.51	16.51	16.50	16.50	16.49
5	H_o	17.52	17.52	17.51	17.50	17.50	17.49	17.48	17.48	17.47	17.46	17.46	17.45	17.45	17.44	17.44	17.43	17.43
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	17.52	17.51	17.50	17.50	17.49	17.48	17.48	17.47	17.46	17.46	17.45	17.45	17.44	17.44	17.43	17.43	17.42
6	H_o	18.38	18.37	18.37	18.36	18.35	18.34	18.34	18.33	18.33	18.32	18.31	18.31	18.30	18.29	18.29	18.28	18.28
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	18.37	18.37	18.36	18.35	18.34	18.34	18.33	18.33	18.32	18.31	18.31	18.30	18.29	18.29	18.28	18.28	18.27
7	H_o	19.19	19.18	19.17	19.16	19.16	19.15	19.14	19.13	19.13	19.12	19.11	19.11	19.10	19.10	19.09	19.08	19.08
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	19.18	19.17	19.16	19.16	19.15	19.14	19.13	19.13	19.12	19.11	19.11	19.10	19.10	19.09	19.08	19.08	19.07
8	H_o	19.96	19.95	19.94	19.94	19.93	19.92	19.91	19.91	19.90	19.89	19.89	19.88	19.87	19.87	19.86	19.85	19.85
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	19.95	19.94	19.94	19.93	19.92	19.91	19.91	19.90	19.89	19.89	19.88	19.87	19.87	19.86	19.85	19.85	19.84
9	H_o	20.72	20.71	20.71	20.70	20.69	20.68	20.67	20.67	20.66	20.65	20.65	20.64	20.63	20.63	20.62	20.61	20.61
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	20.71	20.71	20.70	20.69	20.68	20.67	20.67	20.66	20.65	20.65	20.64	20.63	20.63	20.62	20.61	20.61	20.60
10	H_o	21.49	21.49	21.48	21.47	21.46	21.45	21.45	21.44	21.43	21.42	21.42	21.41	21.40	21.39	21.39	21.38	21.37
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	21.49	21.48	21.47	21.46	21.45	21.45	21.44	21.43	21.42	21.42	21.41	21.40	21.39	21.39	21.38	21.37	21.37
11	H_o	22.30	22.29	22.28	22.28	22.27	22.26	22.25	22.24	22.24	22.23	22.22	22.21	22.21	22.20	22.19	22.18	22.18
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	22.29	22.28	22.28	22.27	22.26	22.25	22.24	22.24	22.23	22.22	22.21	22.21	22.20	22.19	22.18	22.18	22.17
12	H_o	22.99	22.99	22.98	22.97	22.96	22.95	22.94	22.93	22.93	22.92	22.91	22.90	22.90	22.89	22.88	22.87	22.87
	S_p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S_c	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	H_f	22.99	22.98	22.97	22.96	22.95	22.94	22.93	22.93	22.92	22.91	22.90	22.90	22.89	22.88	22.87	22.87	22.86
	Total Theoretical Height, ft	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00
	Total Height at EOY, ft	222.28	222.19	222.11	222.03	221.94	221.86	221.79	221.71	221.63	221.56	221.48	221.41	221.34	221.27	221.20	221.13	221.06
	Interval Settlement, ft	17.72	17.81	17.89	17.97	18.06	18.14	18.21	18.29	18.37	18.44	18.52	18.59	18.66	18.73	18.80	18.87	18.94
	Total Settlement, ft	75.11	75.20	75.28	75.37	75.45	75.53	75.61	75.68	75.76	75.83	75.91	75.98	76.05	76.12	76.19	76.26	76.33

Notes: 1) EOY is abbreviation of End Of Year
2) Primary compression for each interval i
3) Soil cover during waste placement not i
4) Soil cover placed after last waste lift no

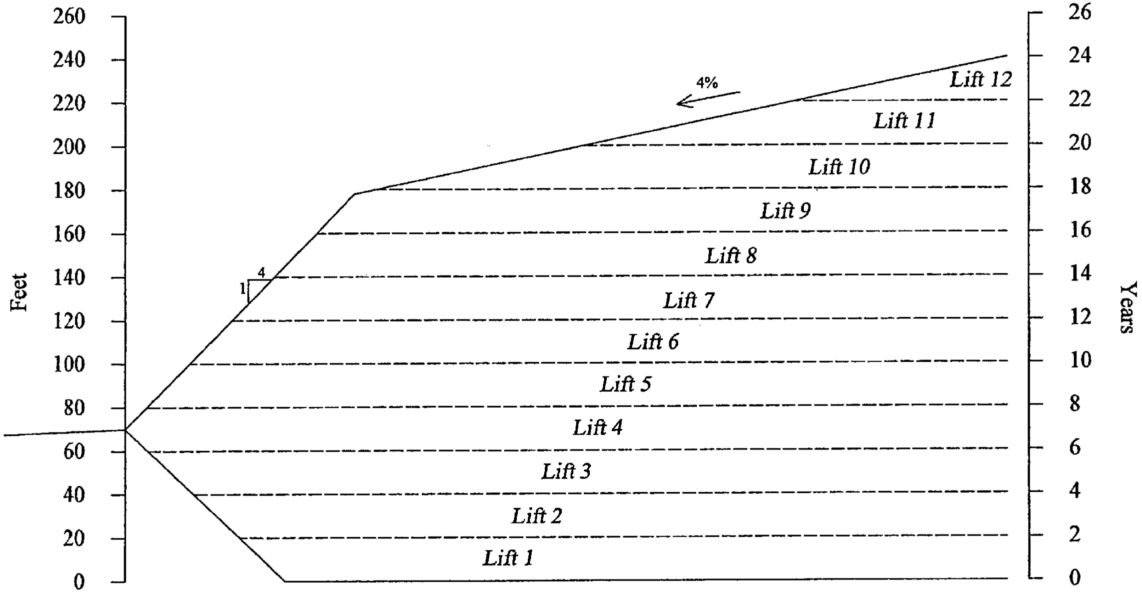
The waste settlement calculations have assumed:

1. The depth of solid waste can achieve 240 feet in thickness
2. The cell will be filled to capacity in about 24 years once waste placement begins

These assumptions are conservative and will result in waste settlement magnitudes that over estimate waste settlement since,

- Daily compaction operations will likely result in more dense waste that is less susceptible to long-term settlement.
- If waste deposition takes longer than the settlement calculations account for, more settlement will have occurred prior to placement of final cover.

Landfill Layers and Time Intervals
Used in Waste Settlement Calculations



City of Amarillo Landfill
Potter County, Texas
Potential Final Cover Differential Settlement Analysis

Procedure:

1. Assume entire area of Cells 1, 2, and 3 have been filled to a waste depth of 70 feet, prior to waste placement in other cells.
2. Waste thickness in Cells 1, 2 and 3 is not increased for 70 years.
3. Entire waste column of 240 feet is placed next to previously deposited Cells 1, 2, and 3, while aerial fill is placed over Cells 1, 2, and 3.
4. Differential cover settlement is determined.
5. Tensile strain calculated in cover system.

Calculations:

From Table 1:

Settlement at 8 years = 11.09 feet total

Settlement at 70 years = 19.17 feet total

Assume areal fill is placed starting at EOY 70, up to maximum waste thickness of 240 feet, until EOY 86 when maximum thickness is achieved.

Settlement at EOY 86 = 46.28 feet total

Cover System placed

Settlement at EOY 150= 63.19 feet total

Differential settlement potential over Cell 1, 2, or 3 is

63.19 feet – 46.28feet = 16.91 feet total

At EOY 62 in Table 1, Solid Waste deposition begins in adjacent cell, to provide waste fill depth of 70 – 80 feet in 8 years as indicated in Table 2 to coincide with EOY without Settlement from Table 1. Fill continues up to maximum waste thickness of 240 feet. EOY 16 in Table 2, corresponds to EOY 86, Table 1.

Therefore Table 2,

Settlement at EOY 24 = 57.39 feet total
and cover system is placed corresponding to cover
system placement at EOY 86, Table 1.

Settlement at EOY 88 = 73.32 feet total
corresponding to EOY 150, Table 1.

73.32 feet – 57.39 feet = 15.93 feet total,
settlement of cover system corresponding with Table 1.

Potential differential settlement of cover systems between Tables 1 and 2.

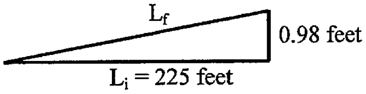
16.9 feet – 15.93 feet = 0.98 feet total

To calculate tensile strain on cover system, that is, strain induced by differential settlement

$$\varepsilon = (L_f - L_i)/ L_i$$

Where L_f and L_i = horizontal distance between two points after settlement and prior to settlement, respectively (See Section 7.0 REFERENCE No. 11)

Assume settlement occurs over 225 feet, which is the horizontal length over 3:1 slope, 50 feet high or 150 feet horizontal plus a 75-foot horizontal bench for 225 feet.



$$L_f = ((225)^2 + (0.98)^2)^{1/2}$$

$$L_f = 225.002 \text{ feet}$$

$$\varepsilon = 9.9 \times 10^{-4}\% \text{ -} \quad \text{negligible, ok}$$

Typical strain at failure for compacted clay 0.1 – 4% (See Section 7.0 REFERENCE No. 10)

Compute potential worst-case situation for final cover strain for consecutive points at the surface.

Assume fill up to 240 in 24 years (Table 2)

Waste in place for 10 years, EOY 34, cover system is placed

Settlement at EOY 34 = 67.64 feet total
Settlement at EOY 150 = <u>76.33 feet total</u>
8.69 feet differential

Settlement over 225 feet (conservative)

L_f = 225.17 feet
ε = 0.075% okay

If settlement occurs over 75 feet (length of bench)

ε = 0.67% > 0.1%,
which places tensile strain in lower end of failure stain range.

Assume fill to 240 feet at:

EOY 24, Table 2 S = 57.39 feet
EOY 150, Table 2 S = <u>76.33 feet</u>
18.94 feet differential

Settlement over 225 feet (conservative)

L_f = 225.17 feet
ε = 0.35% lower and of failure strain range

Note: Foundation settlement neglected in these calculation since it is a minor amount, distributed on a wide area and will be negligible to these calculations made over a discreet, horizontal distance.

Conclusions:

Settlement within the final cover system will occur and potential tensile strain will depend upon waste placement, compaction, and time that waste is in place prior to landfill cover placement and closure. It is more likely that settlement within the solid waste will occur over longer distances than calculated for these estimates. These distance assumptions for L_i imply that solid waste composition would have completely different material properties within short horizontal distances, which is very unlikely. The landfill cover system must be maintained in accordance with the Post-Closure Maintenance Plan since fill settlement will occur. Actual tensile strain failure of the clay final cover is unlikely, so long as the post-closure maintenance is implemented.

CITY OF AMARILLO MUNICIPAL SOLID WASTE LANDFILL

PERMIT NO. 73

Groundwater Elevation Analysis

1994-2005

Date	MW 1	MW 2	MW 3	MW 4	MW 5	MW 6	MW 7	MW 8	MW 9	MW 10	MW 11	MW 12	MW 13	B 203	B 204
09/20/94	3590.24	3590.44	3588.90	3596.26	3613.78	3601.55	3595.12	3594.75	3599.57	N/A	N/A	N/A	N/A	N/A	N/A
09/28/94	3588.65	3587.34	3588.98	3595.69	3613.03	3601.06	3594.51	3594.11	3599.24	N/A	N/A	N/A	N/A	N/A	N/A
10/05/94	3590.32	3590.44	3590.12	3596.51	3613.84	3601.55	3595.20	3594.80	3597.59	N/A	N/A	N/A	N/A	N/A	N/A
10/12/94	3590.27	3590.44	3590.07	3596.56	3613.89	3601.55	3595.01	3594.75	3597.54	N/A	N/A	N/A	N/A	N/A	N/A
10/19/94	3590.32	3590.44	3590.12	3596.51	3613.84	3601.55	3595.11	3594.75	3599.59	N/A	N/A	N/A	N/A	N/A	N/A
10/26/94	3590.27	3590.44	3590.12	3596.66	3613.94	3601.50	3595.16	3594.80	3599.54	N/A	N/A	N/A	N/A	N/A	N/A
10/31/94	3590.22	3590.39	3589.97	3596.66	3613.99	3601.50	3594.96	3594.65	3599.44	N/A	N/A	N/A	N/A	N/A	N/A
11/09/94	3590.17	3590.39	3589.97	3596.76	3614.09	3601.50	3595.01	3594.65	3599.44	N/A	N/A	N/A	N/A	N/A	N/A
11/16/94	3590.22	3590.39	3590.02	3596.81	3614.24	3601.45	3595.06	3594.75	3599.44	N/A	N/A	N/A	N/A	N/A	N/A
11/23/94	3590.22	3590.34	3590.02	3596.91	3614.34	3601.45	3595.11	3594.75	3599.49	N/A	N/A	N/A	N/A	N/A	N/A
11/30/94	3590.92	3590.34	3590.02	3597.06	3614.39	3601.45	3595.01	3594.75	3599.44	N/A	N/A	N/A	N/A	N/A	N/A
12/07/94	3590.12	3590.24	3590.02	3597.06	3614.39	3601.40	3594.65	3594.65	3599.39	N/A	N/A	N/A	N/A	N/A	N/A
12/14/94	3589.87	3590.34	3590.02	3597.11	3614.39	3601.40	3595.01	3594.75	3599.44	N/A	N/A	N/A	N/A	N/A	N/A
02/20/95	3590.65	3590.25	3589.00	3596.65	3614.10	3601.40	3595.02	3594.65	3599.34	N/A	N/A	N/A	N/A	N/A	N/A
03/14/95	3590.22	3590.74	3588.87	3595.86	3614.16	3601.45	3595.21	3595.00	3598.64	N/A	N/A	N/A	N/A	N/A	N/A
04/14/95	3589.82	3590.69	3589.82	3596.56	3614.19	3601.55	3595.11	3594.85	3599.64	N/A	N/A	N/A	N/A	N/A	N/A
05/14/95	3589.77	3590.64	3590.64	3596.36	3614.09	3601.55	3594.61	3594.85	3599.59	N/A	N/A	N/A	N/A	N/A	N/A
06/14/95	3589.82	3590.29	3590.29	3597.01	3614.39	3601.45	3595.11	3594.70	3599.54	N/A	N/A	N/A	N/A	N/A	N/A
07/14/95	3589.82	3590.69	3590.69	3596.46	3614.09	3601.50	3595.11	3594.90	3599.59	N/A	N/A	N/A	N/A	N/A	N/A
08/14/95	3589.67	3590.49	3589.77	3596.31	3614.19	3601.45	3595.06	3594.80	3599.54	N/A	N/A	N/A	N/A	N/A	N/A
09/14/95	3589.67	3590.54	3589.72	3597.46	3614.69	3601.40	3594.91	3594.80	3599.64	N/A	N/A	N/A	N/A	N/A	N/A
10/16/95	3589.65	3589.85	3588.70	3597.25	3614.30	3602.10	3594.67	3594.15	3599.14	N/A	N/A	N/A	N/A	N/A	N/A
11/16/95	3589.55	3589.75	3588.70	3597.40	3614.35	3600.95	3594.52	3594.55	3599.14	N/A	N/A	N/A	N/A	N/A	N/A
12/14/95	3589.65	3589.75	3588.75	3597.40	3614.30	3601.10	3594.57	3594.65	3599.14	N/A	N/A	N/A	N/A	N/A	N/A
01/15/96	3589.70	3589.85	3588.80	3597.45	3614.30	3601.15	3594.62	3594.70	3599.14	N/A	N/A	N/A	N/A	N/A	N/A
02/15/96	3589.45	3589.55	3588.65	3597.10	3614.10	3600.90	3594.42	3594.45	3599.04	N/A	N/A	N/A	N/A	N/A	N/A
04/16/96	3589.35	3589.74	3588.67	3596.63	3613.94	3600.94	3594.60	3594.65	3599.14	N/A	N/A	N/A	N/A	N/A	N/A
05/15/96	3588.45	3589.55	3588.80	3596.30	3613.80	3600.85	3594.32	3594.40	3599.04	N/A	N/A	N/A	N/A	N/A	N/A
06/15/96	3588.36	3589.60	3588.52	3596.15	3613.78	3600.75	3594.80	3594.38	3599.04	N/A	N/A	N/A	N/A	N/A	N/A
07/16/96	3588.10	3589.55	3588.50	3595.95	3613.94	3600.67	3594.72	3594.35	3598.94	N/A	N/A	N/A	N/A	N/A	N/A
08/15/96	3588.00	3589.43	3588.38	3596.10	3613.70	3600.73	3594.47	3594.30	3598.89	N/A	N/A	N/A	N/A	N/A	N/A
09/15/96	3587.88	3589.12	3588.30	3596.05	3613.30	3600.62	3594.17	3594.40	3598.84	N/A	N/A	N/A	N/A	N/A	N/A
10/16/96	3587.78	3588.85	3588.26	3596.00	3614.89	3600.40	3593.97	3594.21	3598.83	N/A	N/A	N/A	N/A	N/A	N/A
11/20/96	3586.92	3588.99	3588.35	3596.13	3614.20	3600.80	3594.07	3594.37	3598.89	N/A	N/A	N/A	N/A	N/A	N/A
12/20/96	3587.45	3589.10	3588.10	3595.75	3614.65	3600.80	3593.87	3594.42	3599.04	N/A	N/A	N/A	N/A	N/A	N/A

CITY OF AMARILLO MUNICIPAL SOLID WASTE LANDFILL

PERMIT NO. 73

Groundwater Elevation Analysis

1994-2005

Date	MW 1	MW 2	MW 3	MW 4	MW 5	MW 6	MW 7	MW 8	MW 9	MW 10	MW 11	MW 12	MW 13	B 203	B 204
01/15/97	3588.18	3588.30	3587.22	3595.21	3614.06	3600.24	3593.51	3594.16	3598.49	N/A	N/A	N/A	N/A	N/A	N/A
02/15/97	3588.31	3588.28	3587.20	3595.14	3613.86	3600.21	3593.54	3594.21	3598.43	N/A	N/A	N/A	N/A	N/A	N/A
03/15/97	3588.32	3588.24	3587.18	3595.08	3613.72	3600.15	3593.52	3594.15	3598.38	N/A	N/A	N/A	N/A	N/A	N/A
04/15/97	3588.28	3588.20	3587.13	3595.00	3613.62	3600.15	3593.56	3594.18	3598.36	N/A	N/A	N/A	N/A	N/A	N/A
05/16/97	3588.28	3588.14	3587.10	3594.90	3613.52	3600.24	3593.49	3594.05	3598.75	N/A	N/A	N/A	N/A	N/A	N/A
06/18/97	3588.27	3588.11	3587.07	3594.85	3613.43	3600.50	3593.46	3594.00	3599.22	N/A	N/A	N/A	N/A	N/A	N/A
10/14/97	3587.45	3587.90	3586.89	3594.55	3614.12	3600.40	3593.31	3593.80	3598.79	N/A	N/A	N/A	N/A	N/A	N/A
11/20/97	3588.18	3587.86	3586.84	3594.45	3614.00	3600.21	3593.23	3593.75	3598.56	N/A	N/A	N/A	N/A	N/A	N/A
04/14/98	3588.30	3587.72	3586.76	3594.23	3613.43	3599.95	3593.21	3593.51	3598.18	N/A	N/A	N/A	N/A	N/A	N/A
10/14/98	3587.29	3587.64	3586.45	3593.77	3613.40	3599.69	3593.09	3593.28	3597.87	N/A	N/A	N/A	N/A	N/A	N/A
04/19/99	3587.68	3587.33	3586.19	3593.41	3613.94	3599.48	3592.57	3592.90	3597.65	N/A	N/A	N/A	N/A	N/A	N/A
10/11/99	3588.02	3587.23	3585.95	3593.26	3614.53	3599.50	3592.63	3592.68	3597.74	N/A	N/A	N/A	N/A	N/A	N/A
04/17/00	3587.91	3587.09	3585.76	3593.00	3613.45	3599.19	3592.53	3592.56	3597.34	3590.68	3590.70	3590.74	3590.76	N/A	N/A
10/16/00	3587.57	3586.95	3585.51	3592.71	3613.25	3598.93	3592.30	3592.40	3596.99	3590.35	3590.47	3590.50	3590.48	N/A	N/A
04/16/01	3587.21	3586.74	3585.26	3592.41	3613.12	3598.66	3592.10	3592.02	3596.69	3590.41	3590.27	3590.32	3590.20	N/A	N/A
10/16/01	3586.37	3586.62	3585.09	3592.29	3613.25	3598.49	3591.78	3591.93	3596.49	3589.52	3590.02	3590.16	3590.06	N/A	N/A
04/15/02	3587.22	3586.50	3584.88	3591.95	3613.07	3598.20	3591.70	3591.71	3596.19	3589.89	3589.98	3590.00	3589.86	N/A	N/A
10/14/02	3587.32	3586.41	3584.73	3591.63	3613.12	3598.02	3591.54	3591.53	3596.09	3589.79	3589.83	3589.88	3589.67	N/A	N/A
04/14/03	3587.85	3586.16	3584.44	3591.30	3613.08	3597.75	3591.32	3591.19	3595.73	3589.72	3589.10	3589.54	3589.43	N/A	N/A
10/14/03	3586.75	3586.04	3584.24	3591.08	3609.34	3597.53	3591.10	3591.02	3595.46	3589.40	3589.45	3589.43	3589.28	N/A	N/A
04/14/04	3586.77	3585.91	3584.08	3590.82	3613.25	3597.34	3591.01	3590.88	3595.23	3589.31	3589.30	3589.21	3589.07	N/A	N/A
10/18/04	3586.76	3585.63	3583.77	3590.59	3613.99	3597.30	3590.75	3590.57	3595.61	3589.16	3589.04	3588.90	3588.92	N/A	N/A
10/18/04	3586.77	3585.63	3583.77	3590.59	3613.99	3597.30	3590.75	3590.57	3595.61	3589.16	3589.04	3588.90	3588.92	N/A	N/A
04/19/05	3586.28	3585.59	3583.69	3590.55	3614.31	3597.51	3590.67	3590.61	3595.76	3588.88	3589.00	3588.98	3588.92	N/A	N/A
09/16/05	3586.17	3585.59	3583.63	3590.47	3614.77	3597.38	3590.58	3590.45	3595.56	3588.86	3588.90	3588.86	3588.80	3592.11	3597.41
10/17/05	3586.09	3585.52	3583.53	3590.41	3614.58	3597.20	3590.51	3590.40	3595.34	3588.69	3588.84	3588.79	3588.68	N/A	N/A
11/18/05	3586.23	3585.48	3585.49	3590.34	3614.36	3597.11	3590.44	3590.31	3595.19	3588.76	3588.79	3588.73	3588.68	3591.91	3597.22
11/29/05	3586.37	3585.43	3583.44	3590.33	3614.25	3597.10	3590.39	3590.31	3595.12	3588.76	3588.72	3588.64	3588.90	3591.89	3597.22

APPENDIX 4C

Site Plan with Boring Locations

Key to Logs of Borings

2005 Logs of Borings B-201 through B-204

1999 Logs of Borings PP-8 through PP-12

1999 Monitoring Wells MW-10 through MW-13

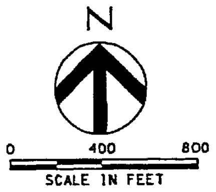
1994 Logs of Borings TB-1 through TB-2

1994 Monitoring Well MW-1 through MW-6

1994 Logs of Borings PZ-1 through PZ-3 (MW 7 – MW-9)

1979 Logs of Borings No. 1 through No. 4

1975 Logs of Borings No. 1 through No. 15



LEGEND

▬ ▬	PERMIT BOUNDARY
MW-1 ◈	MONITORING WELL LOCATIONS
B-07 △	1975 BORING LOCATIONS
UV-1 ⊕	UTILITY VENT LOCATIONS
TB-1 △	1994 BORING LOCATIONS
B-202 ⏃	2005 BORING LOCATIONS
PP-11 ☒	PERIMETER PROBE LOCATIONS

Michael W. Shiplett

SHIPLETT

For Borings 201, 202, 203 + 204 only

NOTES:

1. THE PROPOSED GRADES REPRESENT THE FINAL CONTOURS.
2. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY STEWART GEO TECHNOLOGIES, SAN ANTONIO, TEXAS FROM AERIAL PHOTOGRAPHY DATED APRIL 15, 2004. VERTICAL DATUM BASED ON NGVD 29. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO, COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.
3. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.
4. LOCATIONS OF 1979 BORINGS UNKNOWN.

DATE:12/15/2005
TIME: 10:03:31 AM

:od\V7N6E6:\mdavison\
FILE: \AMIII04.01.DGN

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

BORING LOCATION MAP

0 1" 2"

FILENAME	...\AMIII04.01.DGN
SCALE	

SHEET
PLATE 1, APP 4C

2005 – Kleinfelder

Key to Logs of Borings

Logs of Borings B-201 through B-204

KEY TO LOGS OF BORINGS

DRILLING AND SAMPLING SYMBOLS AND TERMS:

▩ Thin-Walled Tube Sample

◩ Auger Sample/Drilling

☒ Split Spoon Sample and Standard Penetration Test

◫ Continuous Core Sample

☑ TxDOT Cone Penetrometer Test

🅱 Bag Sample

▽ Water Level Initial Measurement

▼ Water Level Subsequent Measurement

Hand Penetrometer : An indicator of fine-grained soils consistency. Reported as tons per square foot, tsf.

Penetration : An indicator of soil and rock density and consistency, and correlates to the soil strength. Reported as N = blows/6 inches unless otherwise indicated.

Core Recovered : Length of rock core recovered as a percent of the total continuous core sample length.

RQD : Rock Quality Designation. A measure of the integrity of the continuous core sample recovered. Reported as the percentage of core recovered in pieces greater than 4 inches in length.

RELATIVE DENSITY OF COARSE-GRAINED SOILS:		CONSISTENCY OF FINE-GRAINED SOILS:	
Penetration Resistance Blows/foot	**Relative Density**	**Hand Penetrometer Readings, tsf**	**Consistency**
0-4	Very Loose	<1	Soft
4-10	Loose	1-2	Firm
10-30	Medium Dense	2-3	Stiff
30-50	Dense	3-4	Very Stiff
over 50	Very Dense	>4.0	Hard

TERMS CHARACTERIZING SOIL STRUCTURE:

Slickensided : Having inclined planes of weakness that are slick and glossy in appearance.

Fissured : Containing shrinkage cracks; usually more or less vertical

Laminated : Composed of thin layers of varying color and texture.

Interbedded : Composed of alternate layers of different soil types.

Calcareous : Containing appreciable quantities of calcium carbonate.

Well graded : Having wide range in grain sizes and substantial amounts of all intermediate particle sizes.

Poorly graded : Predominantly one grain size, or having some intermediate size missing.

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths because of planes of weakness or cracks in the soil. The consistency rating of such soils are based on penetrometer readings.

DEGREE OF WEATHERING:

Unweathered : Rock in its natural state before being exposed to weathering agents.

Slightly weathered : Noted predominantly by color change with no disintegrated zones.

Weathered : Complete color change with zones of slightly decomposed rock.

Severely weathered : Complete color change with consistency, texture, and general appearance approaching soil.

SUBSURFACE CONDITIONS:

Soil and rock descriptions on the boring logs are a compilation from field data as well as from laboratory test results. The stratification lines represent the approximate boundary between materials and the actual transition can be gradual.

Water level observations have been made in the borings at the times indicated. Note that fluctuations in groundwater level(s) may occur due to variations in rainfall, hydraulic conductivity of soil strata, construction activity, and other factors.

LOG OF BORING NO. B-201

Project Description:	**Amarillo Municipal Landfill - Potter County, Texas**
Location:	See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation:	3724'

Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
								SILTY CLAYEY GRAVEL, light red-brown, dense, fragmented caliche, moderately cemented, with caliche (FILL) El 3720.8; 3.5	17	15	2	30	8			
				33	50/ 5½"			CEMENTED SAND, calcareous, red-brown and light red-brown, very hard, moderately cemented, jointed, shaly, with dissolution cavities El 3717.8; 6.5								
5						5.0	20									
								SILTY CLAY, light red-brown El 3716.8; 7.5								
								CALICHE, very light brown, dense El 3715.8; 8.5								
								CLAYEY SILT, light red-brown, stiff El 3712.8; 11.5								
10				50/ 3"	50/ 2"	5.0	0									
								CALICHE, very light red-brown, silt with sand, weakly to moderately cemented El 3710.8; 13.5								
								CEMENTED SAND, light red-brown, hard, highly cemented, vuggy, with dense silty sand seams El 3708.3; 16.0								
15				50/ 4¾"					25	25	NP	4	12			
						5.0	22	CLAYEY SAND, silty, light red-brown, very dense, with weakly cemented vuggy sandstone seams, fine to medium, subrounded to subangular, frosted								
20						5.0	18									
25				32	46											
						3.5	3									
30				49	50/ 4½"							15	10			
						3.5	51	- weakly cemented for approximately 1 foot for every 5 feet								
35																
						3.5	0									
40												5	2			

continued on next page

Completion Depth:	76.5 ft.
Date Boring Started:	6/7/05
Date Boring Completed:	6/8/05
Logged by:	D. James
Project No.:	57815

Remarks: Boring advanced using air as drilling circulation medium. Boring dry upon completion. Boring backfilled with hydrated bentonite upon completion of the drilling and sampling.

KLEINFELDER

LOG OF BORING NO. B-201 (cont'd)

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3724'

Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
						3.5	29	- increasing weakly cemented sandstone, vuggy, with moderately cemented caliche accretions El. 3679.3; 45.0'								
45		☒		50/ 4¾"				CEMENTED SAND, light red-brown, moderately hard, moderately cemented, calcareous, with moderately dense sand infilled cavities, intercalated with uncemented sand layers, with caliche accretions, fine to medium, frosted, subangular to subrounded								
						3.5	69									
50		☒		50/ 5"												
						4.0	48									
55						5.0	46						12	113	13.6	1.1
								- with clayey sand partings and seams								
60						5.0	36									
65		▨										3	12			
						4.0	18						13	114	33.7	1.1
								- with clayey sand seams								
70						5.0	40	- less cemented below 70 feet								
75		☒		41	47											
								El. 3647.8; 76.5'								

Completion Depth: 76.5 ft.
Date Boring Started: 6/7/05
Date Boring Completed: 6/8/05
Logged by: D. James
Project No.: 57815

Remarks: Boring advanced using air as drilling circulation medium. Boring dry upon completion. Boring backfilled with hydrated bentonite upon completion of the drilling and sampling.

KLEINFELDER

Stratification lines represent approximate strata boundaries, as in-situ the transitions may be gradual. This Log of Boring is not intended for bidding or estimating purposes. Boring log(s) should not be reproduced separately from the engineering report unless said report is specifically included by reference.

LOG OF BORING NO. B-202

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3728'

Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
		▨	3.1					SANDY CLAY, light red-brown, very stiff, calcareous, with calcareous accretions, with magnesium oxide stains, with root filament holes, silty								
		▨	3.0						33	14	19	52	12			
								El. 3724.4; 4.0'								
		☒		50/ 1½"				CEMENTED SAND, calcareous, light red-brown and light brown, very hard, moderately cemented								
5						5.0	36	El. 3722.9; 5.5'					5	118	12.5	1.8
								SILTY CALICHE with sand, very light brown, very hard, moderately cemented								
								El. 3721.4; 7.0'								
								CEMENTED SAND, very light brown to light red-brown, moderately hard, highly cemented, with caliche, fine to medium, subangular to subrounded, frosted, silty								
10						5.0	44									
15		☒		50/ 3"		4.5	62						7	108	23.1	0.7
								- less cemented below 20½ feet								
20						5.0	2	El. 3707.9; 20.5'								
								CLAYEY SAND, silty, light red-brown with very light brown, very dense to dense, fine to medium, well graded, subangular to subrounded, frosted								
25		☒		37	41							20	6			
						3.5	31	- weakly cemented with caliche form 27 to 29 feet								
30		▨														
						3.5	0									
35		☒		18	21			- dense				32	13			
						3.5	0									
								- weakly cemented at 38 feet								
40		☒		24	50/ 5"			- very dense below 41 feet								
								El. 3687.1: 41.3'								

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Completion Depth: 81.5 ft.
Date Boring Started: 6/8/05
Date Boring Completed: 6/9/05
Logged by: D. James
Project No.: 57815

Remarks: Boring advanced using air as drilling circulation medium. Boring dry upon completion. Boring backfilled with hydrated bentonite upon completion of the drilling and sampling.

KLEINFELDER

LOG OF BORING NO. B-202 (cont'd)

Project Description:	**Amarillo Municipal Landfill - Potter County, Texas**
Location:	See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation:	3728'

Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
						3.5	43	CEMENTED SAND, very light red-brown and red-brown, hard, moderately cemented, with caliche, intercalated with very dense sand seams, calcareous, with dense sand infilled cavities, vuggy								
45				50/ 4½"								18	7			
						4.0	0									
50				50/ 4"												
						4.5	0									
55				50/ 4½"				EL 3672.4: 56.0'								
						4.0	0	SAND with clay, silty, light red-brown, very dense, with occasional weakly cemented sand seams and layers, calcareous accretions, fine to medium, with weakly to moderately cemented calcareous accretions, with occasional clay content								
60				45	48							7	9			
65																
70				47	50/ 5"											
75				50/ 5½"												
80				46	50/ 4½			EL 3646.9: 81.5'				10	14			

Completion Depth: 81.5 ft.
Date Boring Started: 6/8/05
Date Boring Completed: 6/9/05
Logged by: D. James
Project No.: 57815

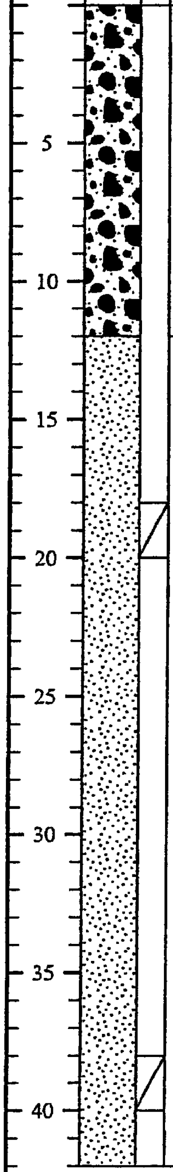
Remarks: Boring advanced using air as drilling circulation medium. Boring dry upon completion. Boring backfilled with hydrated bentonite upon completion of the drilling and sampling.

KLEINFELDER

Stratification lines represent approximate strata boundaries, as in-situ the transitions may be gradual. This Log of Boring is not intended for bidding or estimating purposes. Boring log(s) should not be reproduced separately from the engineering report unless said report is specifically included by reference.

LOG OF BORING NO. B-203

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3763'



Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
								CALICHE, very light red-brown, hard, jointed, moderate to highly cemented El. 3751.1; 12.0'								
								CLAYEY SAND, silty, light red-brown and very light brown, dense, with calcareous accretions and occasional caliche cemented sandstone seams and layers								

continued on next page

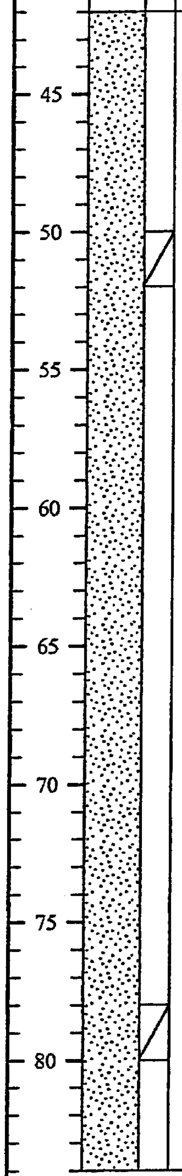
Completion Depth: 220 ft.
Date Boring Started: 9/7/05
Date Boring Completed: 9/7/05
Logged by: D. James
Project No.: 57815

Remarks: Boring dry upon completion. Water at 169.1 feet, 20 hours after completion of drilling and sampling.

KLEINFELDER

LOG OF BORING NO. B-203 (cont'd)

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3763'



Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
					CLAYEY SAND, silty, light red-brown and very light brown, dense, with calcareous accretions and occasional caliche cemented sandstone seams and layers								
						25	21	4	13	20			

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Completion Depth: 220 ft.
Date Boring Started: 9/7/05
Date Boring Completed: 9/7/05
Logged by: D. James
Project No.: 57815

Remarks: Boring dry upon completion. Water at 169.1 feet, 20 hours after completion of drilling and sampling.

KLEINFELDER

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LOG OF BORING NO. B-203 (cont'd)

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3763'

Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
85								CLAYEY SAND, silty, light red-brown and very light brown, dense, with calcareous accretions and occasional caliche cemented sandstone seams and layers								
90																
95																
												16	38			
100																
105																
110																
115																
120																
125																

continued on next page

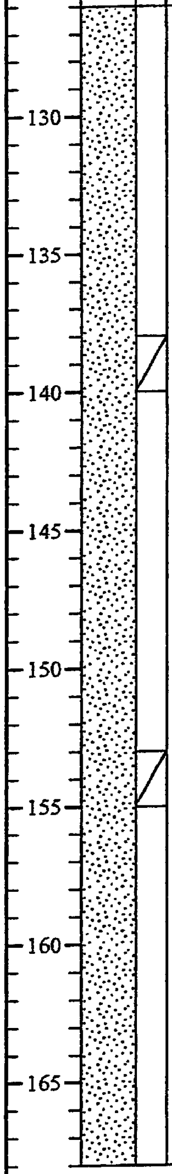
Completion Depth: 220 ft.
Date Boring Started: 9/7/05
Date Boring Completed: 9/7/05
Logged by: D. James
Project No.: 57815

Remarks: Boring dry upon completion. Water at 169.1 feet, 20 hours after completion of drilling and sampling.

KLEINFELDER

LOG OF BORING NO. B-203 (cont'd)

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3763'



Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
								CLAYEY SAND, silty, light red-brown and very light brown, dense, with calcareous accretions and occasional caliche cemented sandstone seams and layers								
								- moderate to highly cemented from 155 to 162 feet								
								- coarse to medium, subrounded, frosted, gap graded to well graded, yellow-brown, less cemented to non-cemented below 162 feet								

continued on next page

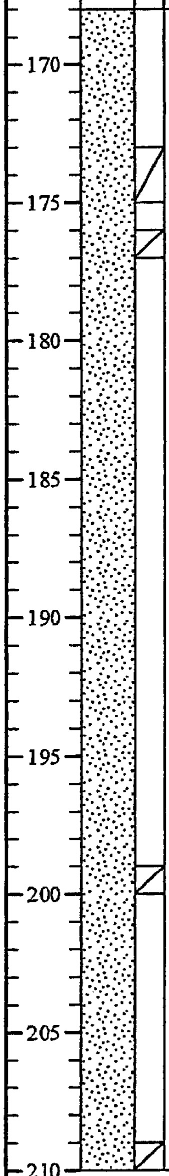
Completion Depth:	220 ft.
Date Boring Started:	9/7/05
Date Boring Completed:	9/7/05
Logged by:	D. James
Project No.:	57815

Remarks: Boring dry upon completion. Water at 169.1 feet, 20 hours after completion of drilling and sampling.

KLEINFELDER

LOG OF BORING NO. B-203 (cont'd)

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3763'



Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
								CLAYEY SAND, silty, light red-brown and ▼ very light brown, dense, with calcareous accretions and occasional caliche cemented sandstone seams and layers - with occasional fine rounded gravel below 212 feet								

continued on next page

Completion Depth: 220 ft.
Date Boring Started: 9/7/05
Date Boring Completed: 9/7/05
Logged by: D. James
Project No.: 57815

Remarks: Boring dry upon completion. Water at 169.1 feet, 20 hours after completion of drilling and sampling.

KLEINFELDER

LOG OF BORING NO. B-203 (cont'd)

Project Description:	**Amarillo Municipal Landfill - Potter County, Texas**
Location:	See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation:	3763'

Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
								CLAYEY SAND, silty, light red-brown and very light brown, dense, with calcareous accretions and occasional caliche cemented sandstone seams and layers El. 3549.1; 214.0'								
215								SHALE, red-brown and light green-gray, very stiff to hard, weathered El. 3543.1; 220.0'								
220																

Completion Depth:	220 ft.
Date Boring Started:	9/7/05
Date Boring Completed:	9/7/05
Logged by:	D. James
Project No.:	57815

Remarks: Boring dry upon completion. Water at 169.1 feet, 20 hours after completion of drilling and sampling.

KLEINFELDER

Stratification lines represent approximate strata boundaries, as in-situ the transitions may be gradual. This Log of Boring is not intended for bidding or estimating purposes. Boring log(s) should not be reproduced separately from the engineering report unless said report is specifically included by reference.

LOG OF BORING NO. B-204

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3680'

Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
								SAND with gravel, silty, light red-brown and yellow-brown, calcareous accretions and caliche fragments, fine to medium, gap to well graded								
5																
10																
15																
20								- with occasional weakly to moderately cemented calcareous sandstone seams and layers below 18 feet	22	16	6	9	12			
25																
30																
35								El. 3644.8; 35.0' SAND, yellow-brown, dense, fine to medium, gap to well graded, frosted, subrounded, with occasional caliche seams								
40																

continued on next page

Completion Depth:	135 ft.
Date Boring Started:	9/8/05
Date Boring Completed:	9/8/05
Logged by:	D. James
Project No.:	57815

Remarks: Boring dry upon completion. Water at 81.6 feet, 1 hour after completion of drilling and sampling.

LOG OF BORING NO. B-204 (cont'd)

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3680'

Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
								SAND, yellow-brown, dense, fine to medium, gap to well graded, frosted, subrounded, with occasional caliche seams								
45																
50																
55																
												4	22			
60																
65																
70																
								- moderately cemented sandstone from 74 to 75 feet								
75																
80								- with trace clay								
							▼									

continued on next page

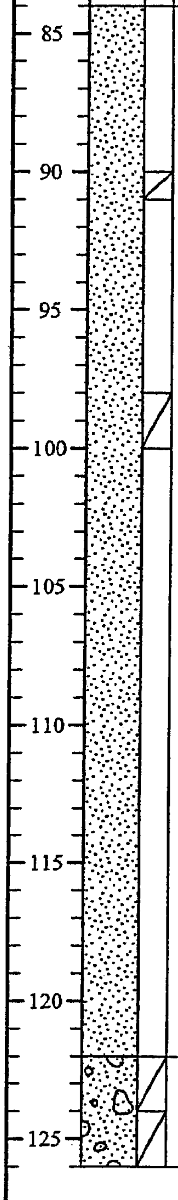
Completion Depth:	135 ft.
Date Boring Started:	9/8/05
Date Boring Completed:	9/8/05
Logged by:	D. James
Project No.:	57815

Remarks: Boring dry upon completion. Water at 81.6 feet, 1 hour after completion of drilling and sampling.

KLEINFELDER

LOG OF BORING NO. B-204 (cont'd)

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3680'



Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
85								SAND, yellow-brown, dense, fine to medium, gap to well graded, frosted, subrounded, with occasional caliche seams								
105								- with occasional fine gravel below 105 feet								
								El 3557.8; 122.0'								
								GRAVELLY SAND, variegated, dense								

continued on next page

Completion Depth: 135 ft.
Date Boring Started: 9/8/05
Date Boring Completed: 9/8/05
Logged by: D. James
Project No.: 57815

Remarks: Boring dry upon completion. Water at 81.6 feet, 1 hour after completion of drilling and sampling.

KLEINFELDER

LOG OF BORING NO. B-204 (cont'd)

Project Description: **Amarillo Municipal Landfill - Potter County, Texas**
Location: See Plan of Borings, Plate 1 Appendix 4C
Approx. Surface Elevation: 3680'

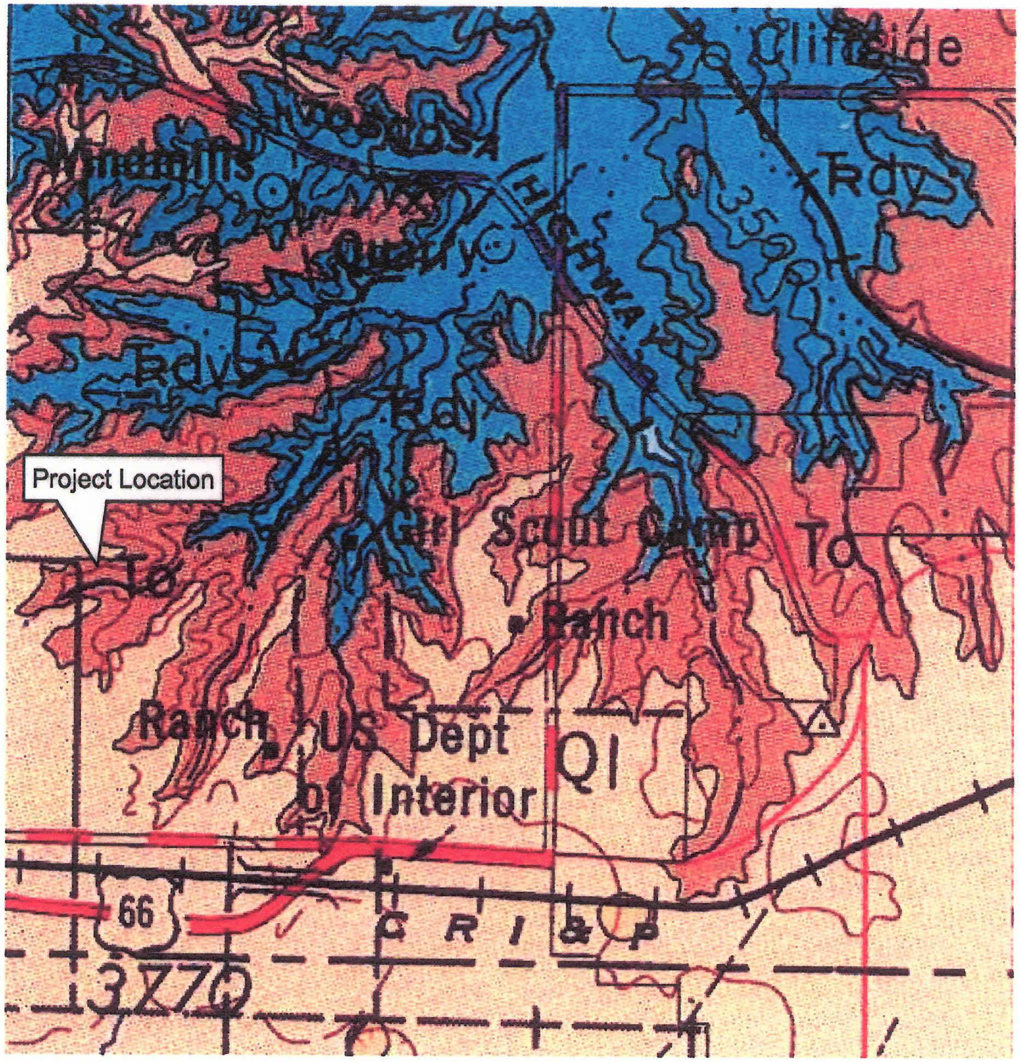
Depth	Symbol/USCS	Samples	Hand Penetrometer, tsf	Penetration (1st Drive)	Penetration (2nd Drive)	Core Drilled, ft.	Core Recovered, %	MATERIAL DESCRIPTION	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Moisture Content, %	Unit Dry Weight, pcf	Unc. Compressive Strength, tsf	Strain at Failure, %
								GRAVELLY SAND, variegated, dense El. 3552.8; 127.0'								
130								SHALE, red-brown, and light green-gray, very stiff to hard								
135								El. 3544.8; 135.0'								

Completion Depth: 135 ft.
Date Boring Started: 9/8/05
Date Boring Completed: 9/8/05
Logged by: D. James
Project No.: 57815

Remarks: Boring dry upon completion. Water at 81.6 feet, 1 hour after completion of drilling and sampling.

KLEINFELDER

Stratification lines represent approximate strata boundaries, as in-situ the transitions may be gradual. This Log of Boring is not intended for bidding or estimating purposes. Boring log(s) should not be reproduced separately from the engineering report unless said report is specifically included by reference.



Ql
Loess

Windblown silt

To

Ogallala Formation

Sand, silt, clay, gravel, and caliche. Sand, fine to coarse-grained quartz, silty in part, caliche nodules locally, cemented locally by calcite and by silica, locally cross-bedded, various shades of gray, brown, and red. Minor silt and clay with caliche nodules, sandy in places, massive, white, gray, olive-green, brown, red, and maroon. Gravel, not everywhere present, composed of pebbles and cobbles of quartz, quartzite, minor chert, igneous rock, metamorphic rock, limestone, clay balls in lower part, and abraded Gryphaea *in intraformational channel deposits and in basal conglomerate. Caliche, not everywhere present, sandy, pisolitic, white, gray, pink, comprises four or five beds up to 12 feet thick in upper part, forms ledges and caprock. Maximum thickness-550 feet, thins westward. (Locally includes Ogallala sand which has moved downslope covering older formations)*

TRd
TRdj
TRdv

Dockum Group undivided and
Trujillo and Tecovas Formations

Dockum Group undivided, TRd, *in Palo Duro Canyon. Thickness 250 feet. (Elsewhere Dockum is divided into Trujillo and Tecovas Formations.)*

Trujillo Formation, TRdj, *conglomerate, sandstone, and shale. Conglomerate, sandy, composed of granules and pebbles of quartz, limestone, sandstone, siltstone, minor chert, and fragments of petrified wood, massive, gray, brown. Sandstone, conglomeratic, fine to coarse grains of quartz and limestone, micaceous, calcareous locally, cross-bedded to massive, gray, greenish gray, and brown. Shale, micaceous, occurs as thin interbeds, gray and red. Forms scarp. Thickness 30 feet, truncated locally*

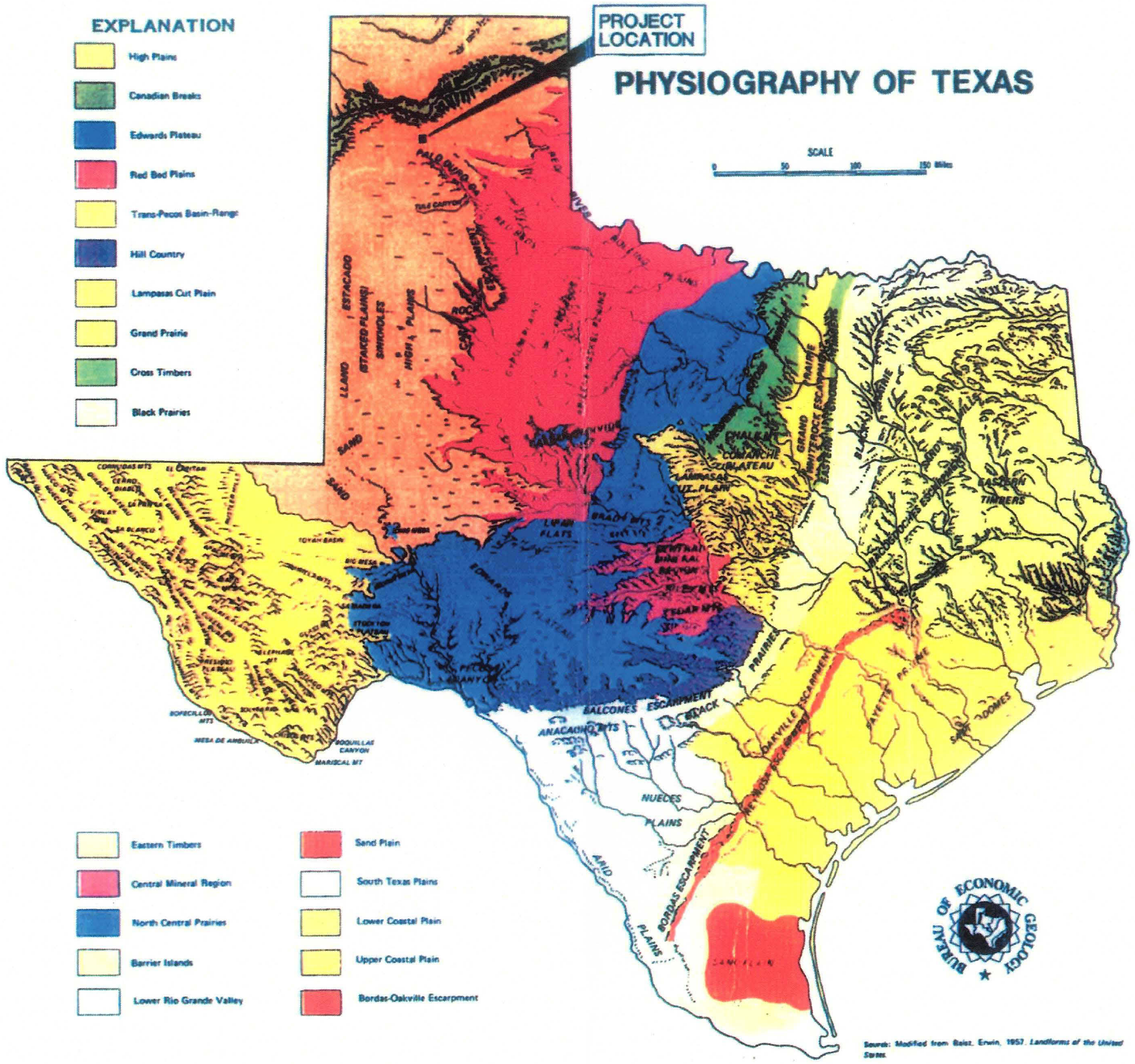
Tecovas Formation, TRdv, *shale, clay, siltstone, and sand. Shale, clay, and siltstone, sandy in places, micaceous, calcareous locally, reddish brown, various shades of red, maroon, gray, greenish gray, yellow, and purple. Sand, fine to medium-grained quartz, locally large petrified logs, unconsolidated, massive, lenticular, white, and light gray. Thickness 275 feet, truncated eastward*

KLEINFELDER

Not to scale

GEOLOGICAL MAP
City of Amarillo Landfill
MSW Permit No. 73
Potter County, Texas
Project 57815 April 2006

PHYSIOGRAPHY OF TEXAS



Source: Modified from Raisz, Erwin, 1957. *Landforms of the United States.*

HDR
HDR Engineering, Inc.

CITY OF AMARILLO
MUNICIPAL LANDFILL

PHYSIOGRAPHIC
MAP

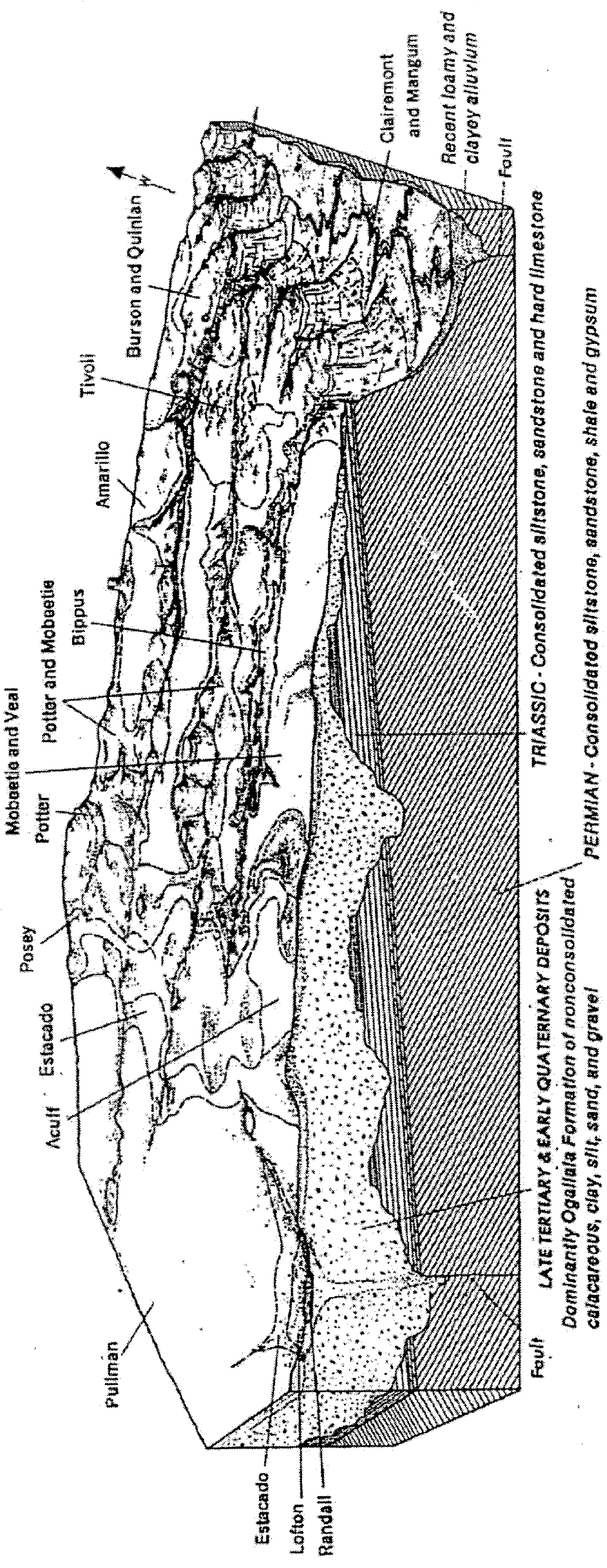
Project Manager
T. HOTCHKISS
Designed
HDR
Drafted
HDR
Checked

Project Number
06625-015-037
Date
NOVEMBER, 1994
Issue

Figure Number
3

FILE = [illegible]
DATE 1-Dec-94 18:54

Plate 7b, App. 4C



Pattern of soils in Potter County.

MAP SOURCE:
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY OF POTTER COUNTY, FEBRUARY, 1980

FILENAME: AMASOIL

HDR

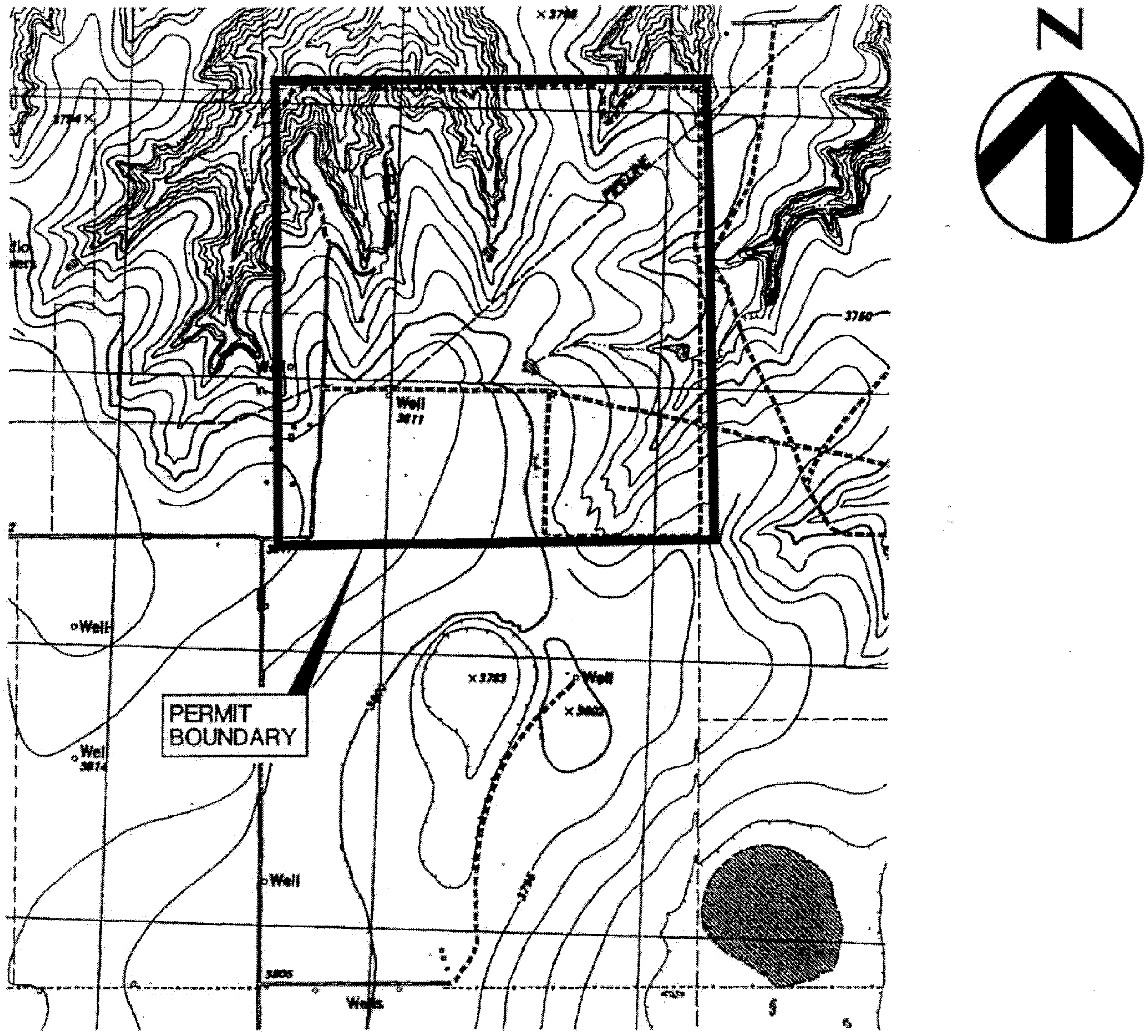
HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

DISTRIBUTION OF SOIL TYPES

Date
11/94

Figure
4



MAP SOURCE:
USGS 7.5 MINUTE QUADRANGLE, BUSHLAND, TEXAS, 1984

0 2000 4000
SCALE IN FEET

HDR

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CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

TOPOGRAPHIC MAP

Date
11/94

Figure
5

FILENAME: E:\AMARILLO\DWG\AMATOPO

Plate 7d, App. 4C

FILENAME. .MAGNST

System	Series	Formation or Group	Thickness (feet)	Lithologic Description	Water Supply
Quaternary	Recent		0–15	Chiefly Windblown sand and silt.	Yields no water to wells. Sandy areas form excellent recharge facilities.
	Pleistocene		0–144	Sand, clay, diatomaceous earth, volcanic ash, limestone.	Mostly above water table. Does not yield large supplies.
Tertiary	Pliocene	Ogallala Formation	0–500	Fine to coarse sand and gravel; clay, silt, and caliche.	Yields large supplies of water throughout the Southern High Plains
Cretaceous		Not present in Amarillo area.	Unconformity		
Triassic		Dockum Group Tecovas Formation Santa Rosa sandstone Chinle Formation equivalent	150–1800+	Varicolored shale and sandy shale, gray or brown crossbedded sandstone and conglomerate.	Probably capable of yielding small to moderate supplies of water; most of the water is at least slightly saline.
Permian		Not present in Amarillo area.			

REFERENCE:
SENI, S.J.
SAND-BODY GEOMETRY AND
DEPOSITIONAL SYSTEMS,*
OGALLALA FORMATION, TEXAS
REPORT NO. 105, 1980

HDR

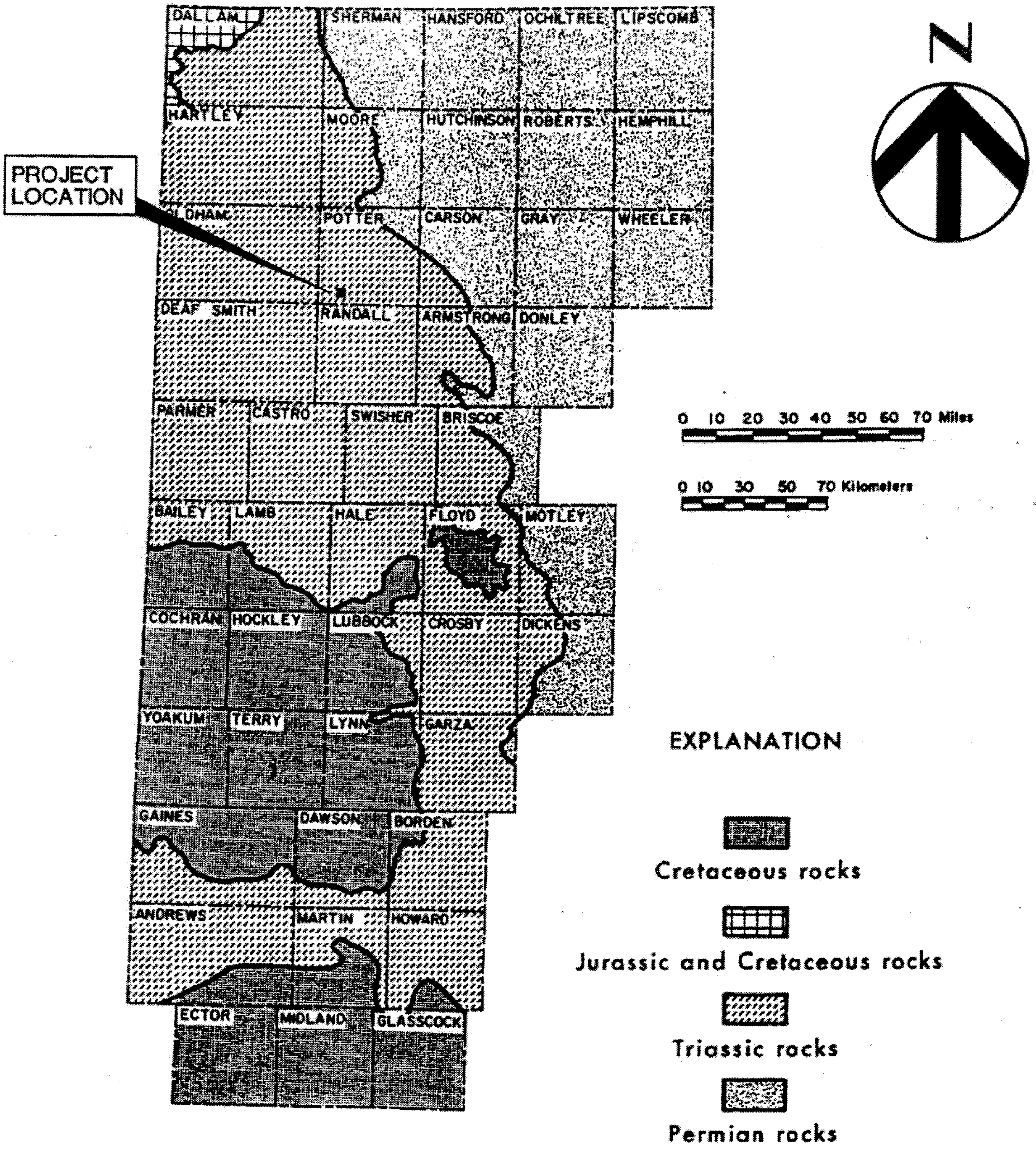
HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

GENERALIZED STRATIGRAPHY

Date 11/94

Figure 7



MAP SOURCE:
EVALUATING THE GROUNDWATER RESOURCES OF THE HIGH PLAINS OF TEXAS,
REPORT 288, VOL. I, MAY, 1984.
TEXAS DEPARTMENT OF WATER RESOURCES

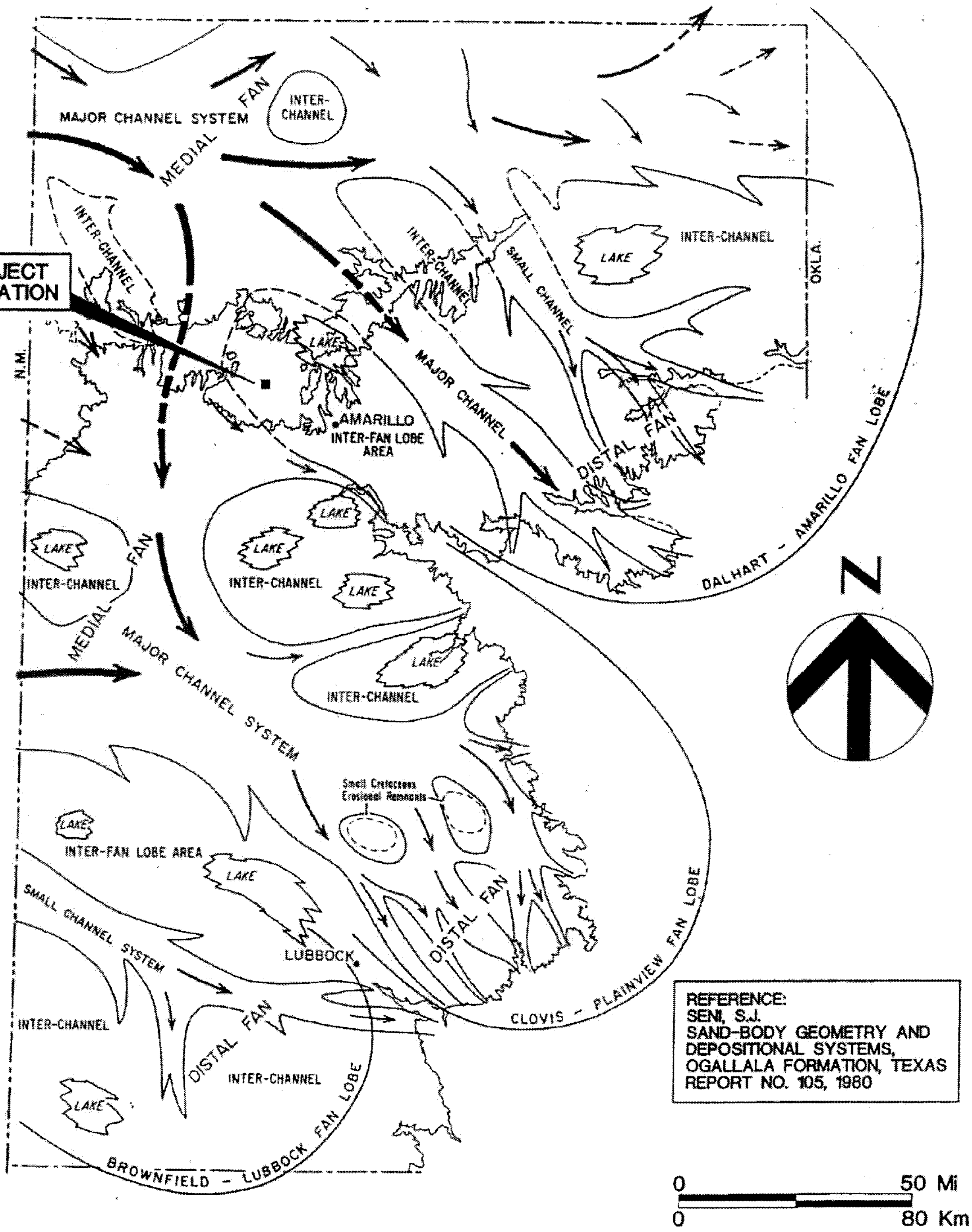
HDR
HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
GEOLOGIC UNITS UNDERLYING
THE OGALLALA FORMATION

Date
11/94

Figure
8

FILENAME: E:\AMARILLO\DWG\AMAFIG2



REFERENCE:
SENI, S.J.
SAND-BODY GEOMETRY AND DEPOSITIONAL SYSTEMS, OGALLALA FORMATION, TEXAS
REPORT NO. 105, 1980

HDR

HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

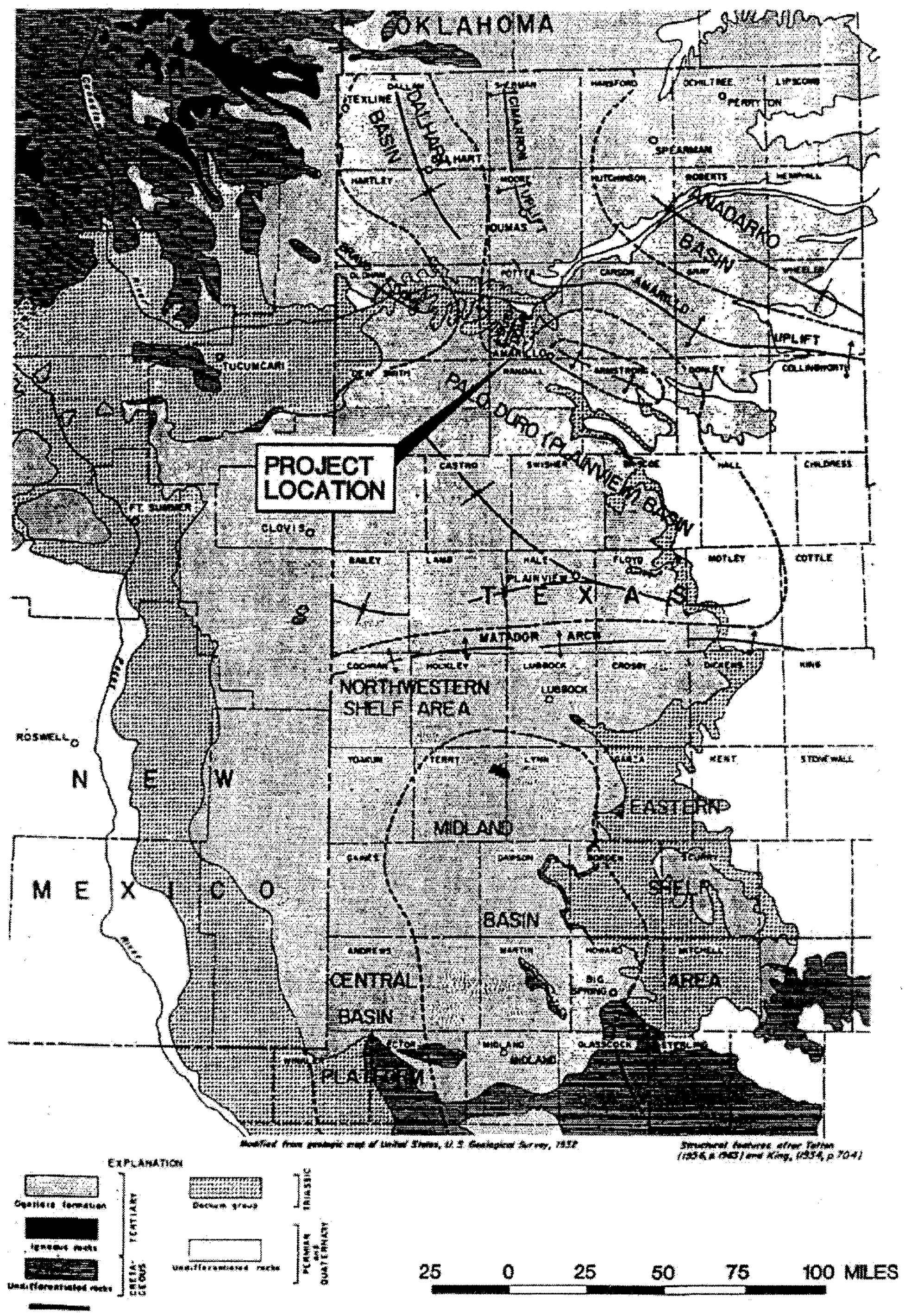
DEPOSITIONAL FACIES MAP

Date
11/94

Figure
9

FILENAME \AMARILLO\DWG\AMADPFAC

Plate 7g, App. 4C



Modified from geologic map of United States, U. S. Geological Survey, 1932

Structural features after Totten (1956, & 1963) and King, (1934, p 704)

REFERENCE: CRONIN, J.G.
A SUMMARY OF THE OCCURRENCE AND DEVELOPMENT
OF GROUNDWATER IN THE SOUTHERN HIGH PLAINS
OF TEXAS, TEXAS BOARD OF WATER ENGINEERS,
BULLETIN 6107, 1971.

HDR

HDR Engineering, Inc.

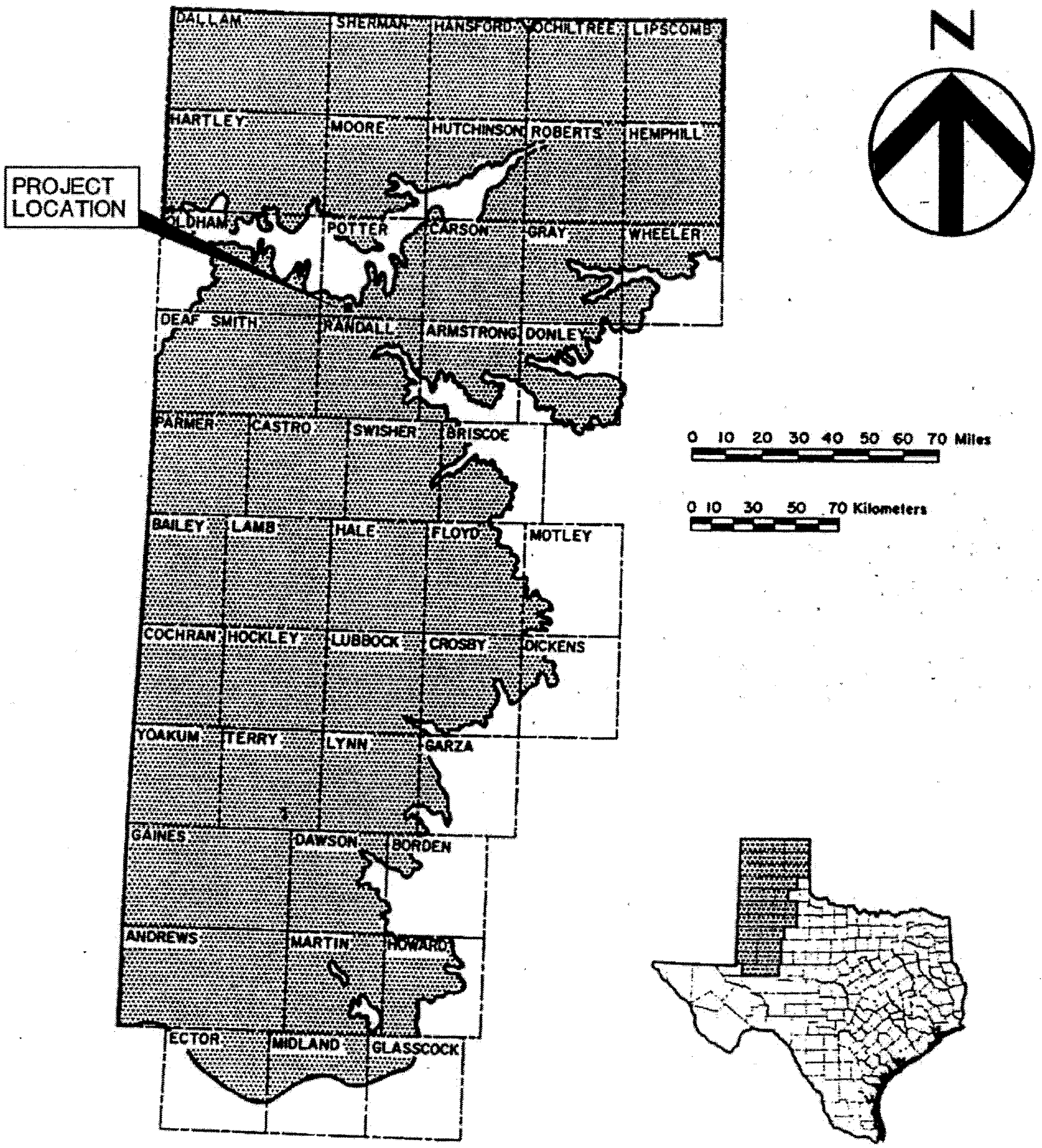
CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

REGIONAL STRUCTURE MAP

Date
11/94

Figure
10

FILENAME: .MARGSTC



MAP SOURCE:
EVALUATING THE GROUNDWATER RESOURCES OF THE HIGH PLAINS OF TEXAS,
FINAL REPORT, VOL. I, AUGUST, 1982.
TEXAS DEPARTMENT OF WATER RESOURCES

FILENAME: E:\AMARILLO\DWG\AMAFIG1

HDR

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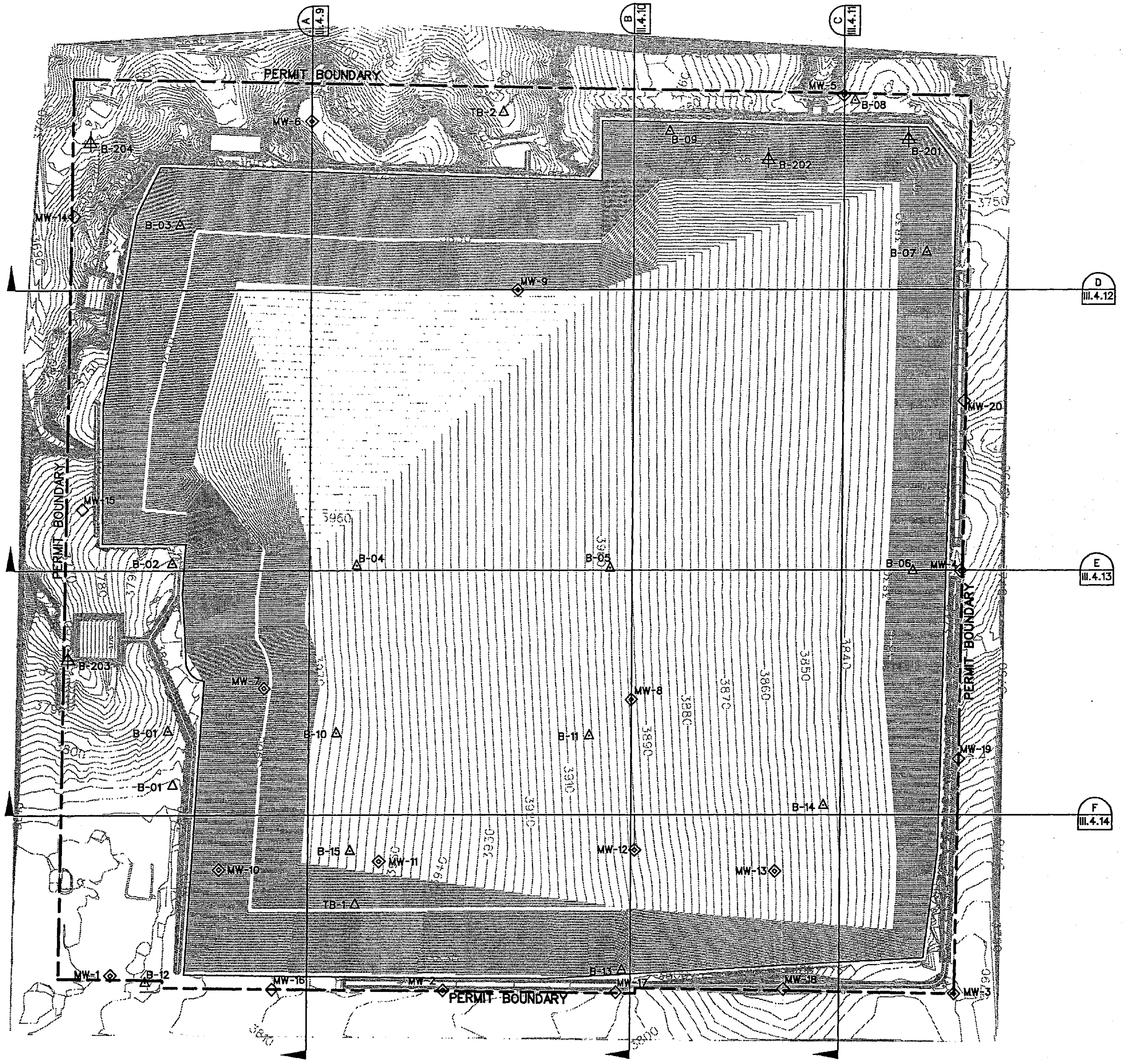
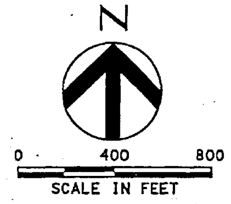
CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

HIGH PLAINS AQUIFER

Date
11/94

Figure
11





LEGEND

— — —	PERMIT BOUNDARY
MW-1◈	MONITORING WELL LOCATIONS
B-07△	1975 BORING LOCATIONS
B-201⏃	2005 BORING LOCATIONS
TB-2△	1994 BORING LOCATIONS
MW-15◇	PROPOSED MONITORING WELL

NOTES:

1. THE PROPOSED GRADES REPRESENT THE FINAL CONTOURS (TOP OF FINAL COVER).
2. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.

HDR

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

CROSS-SECTION LOCATION MAP

0 1" 2"

FILENAME	...\AMIII04.08.DGN
SCALE	

SHEET
Plate 8
App. 4C

USER: mdavison
FILE: ..\AMIII04.08.DGN
DATE: 5/9/2006
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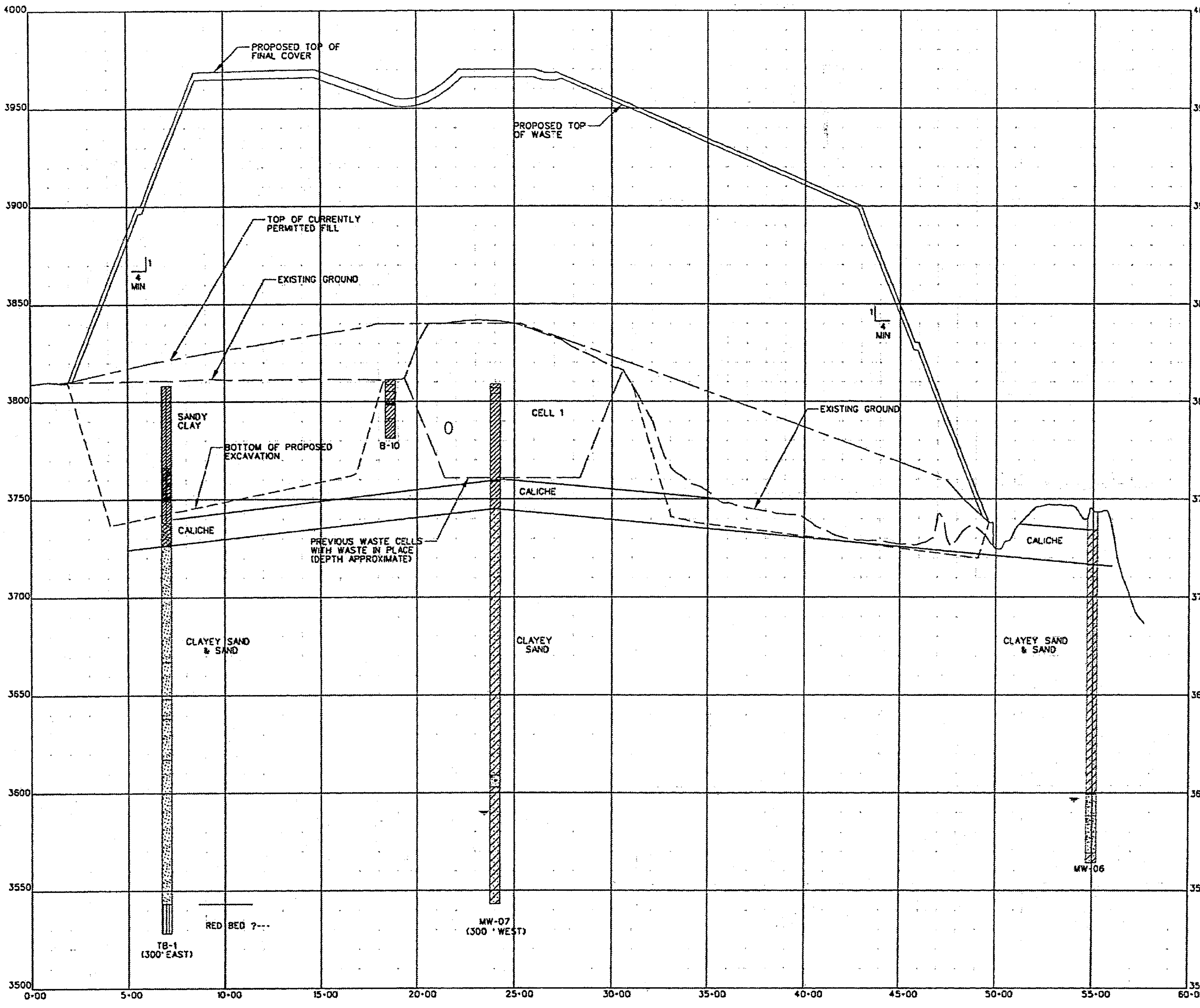


SECTION A / III.4.8

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

Michael M Shiflett
- for subsurface information only

M. M. SHIFLETT 43763

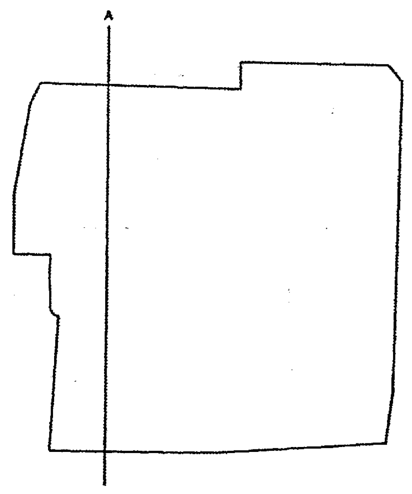
BORING LEGEND

- ▨ CLAY
- ▨ SANDY CLAY
- ▨ TOP SOIL
- ▨ SAND
- ▨ CALICHE

NOTE

THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



HDR
HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION A-A

0 1" 2"

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SCALE

SHEET
Plate 9
App. 4C

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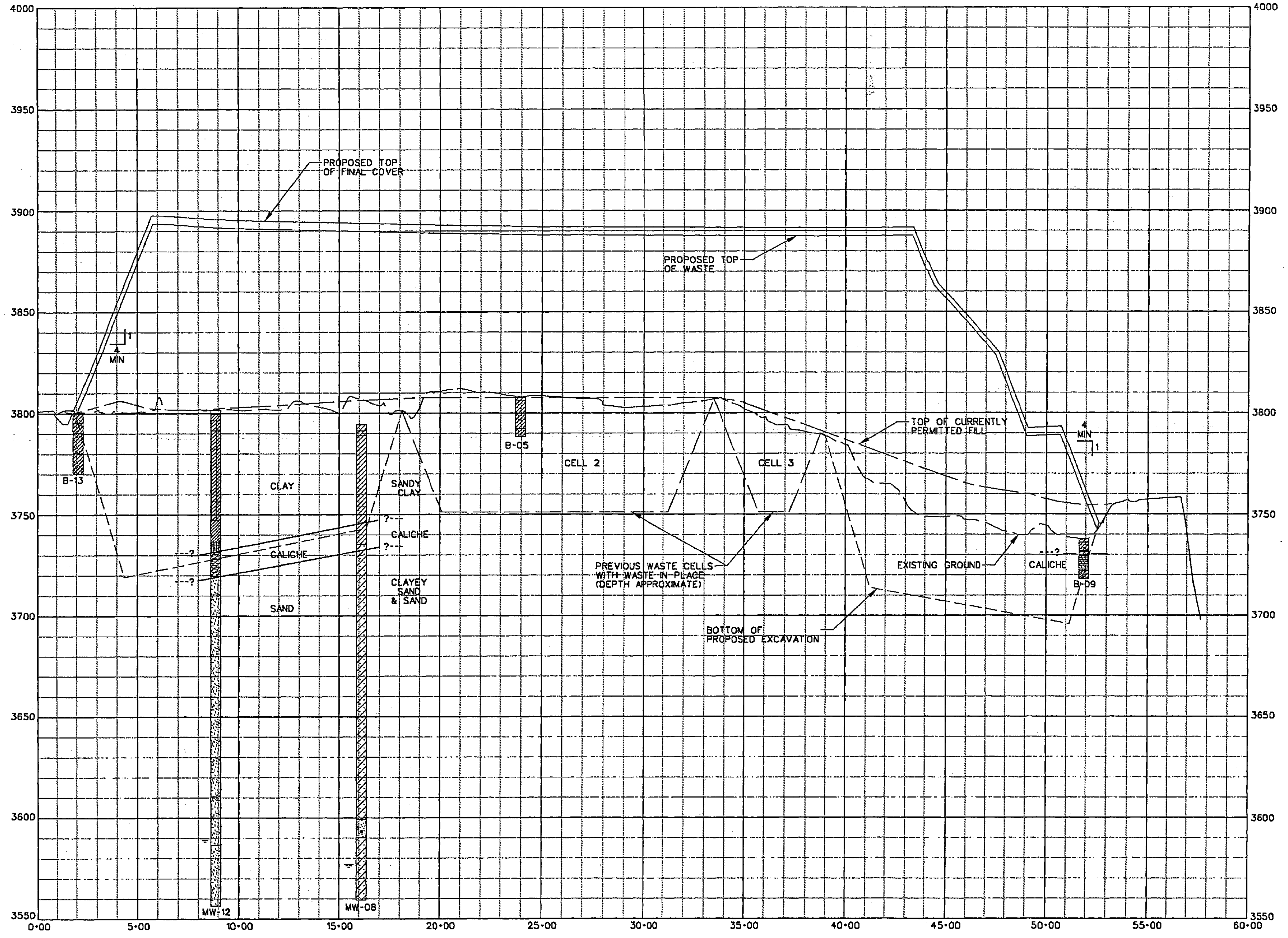
FILE: $$FILE$$
DATE: $$DATE$$
TIME: $$TIME$$



SECTION B / III.4.8

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

M. M. SHIFLETT

For subsurface information only.

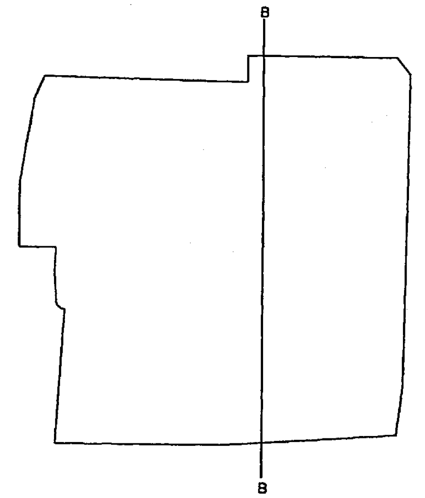
BORING LEGEND

- ▨ CLAY
- ▨ SANDY CLAY
- ▩ TOP SOIL
- ▩ CEMENTED CALICHE
- ▤ CEMENTED LIMESTONE WITH CALICHE
- ▥ SILTY CLAY
- ▦ CALICHE
- ░ SAND
- ▿ STATIC WATER LEVEL

NOTE:

1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



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HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION B-B

0 1" 2"

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SCALE

SHEET
Plate 10
App. 4C

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DATE: $$DATE$$
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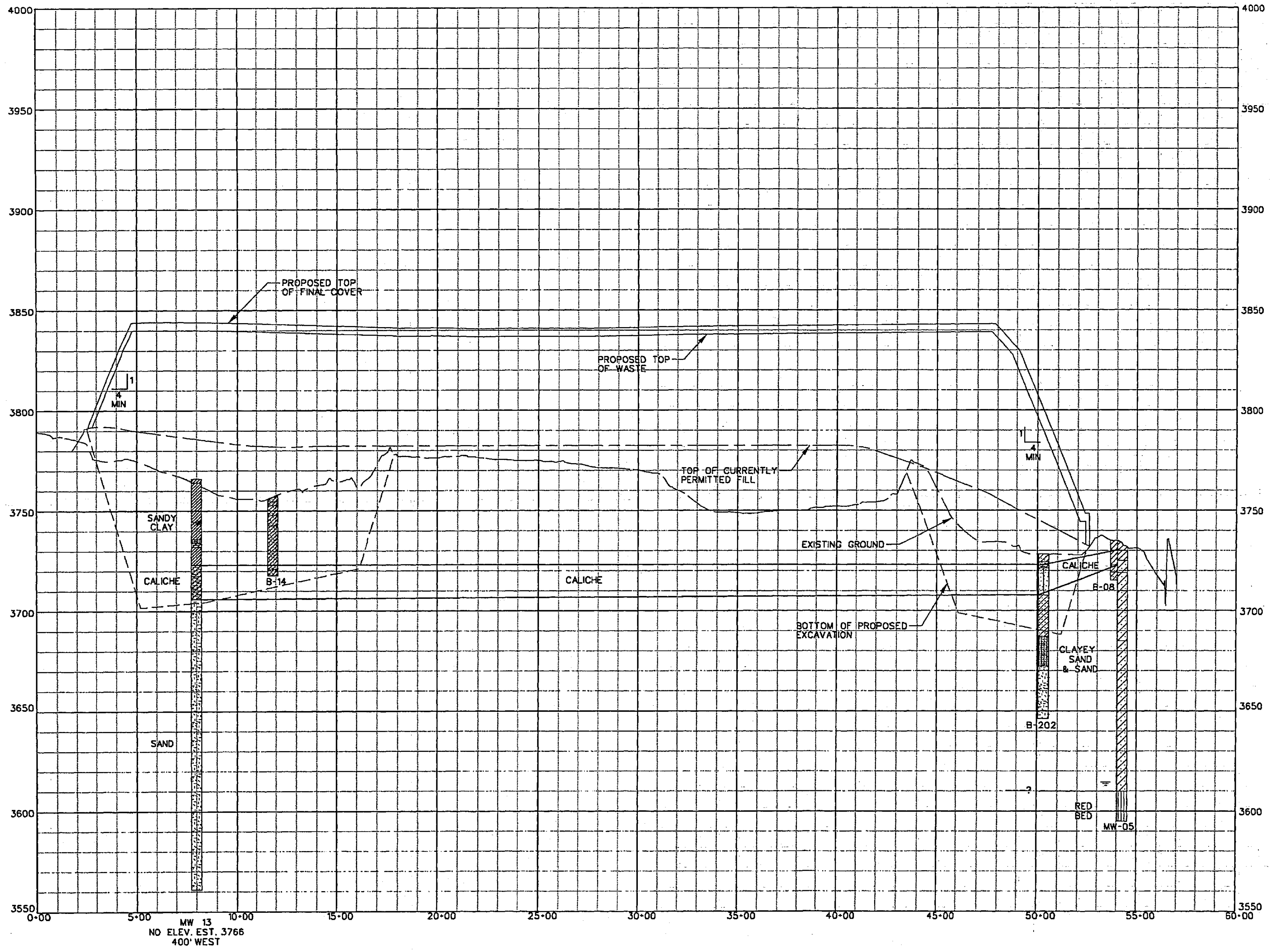


SECTION C
III.4.8

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

M. SHIFLETT
43763

For subsurface information only

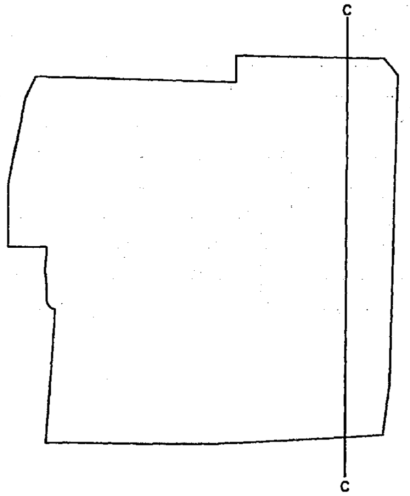
BORING LEGEND

▨	CLAY
▨	SANDY CLAY
▥	SILTY CLAY
▥	SILTY SANDSTONE
▩	SAND
▩	CALICHE

NOTE:

1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



HDR
HDR Engineering, Inc.

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

ISSUE	DATE	DESCRIPTION

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

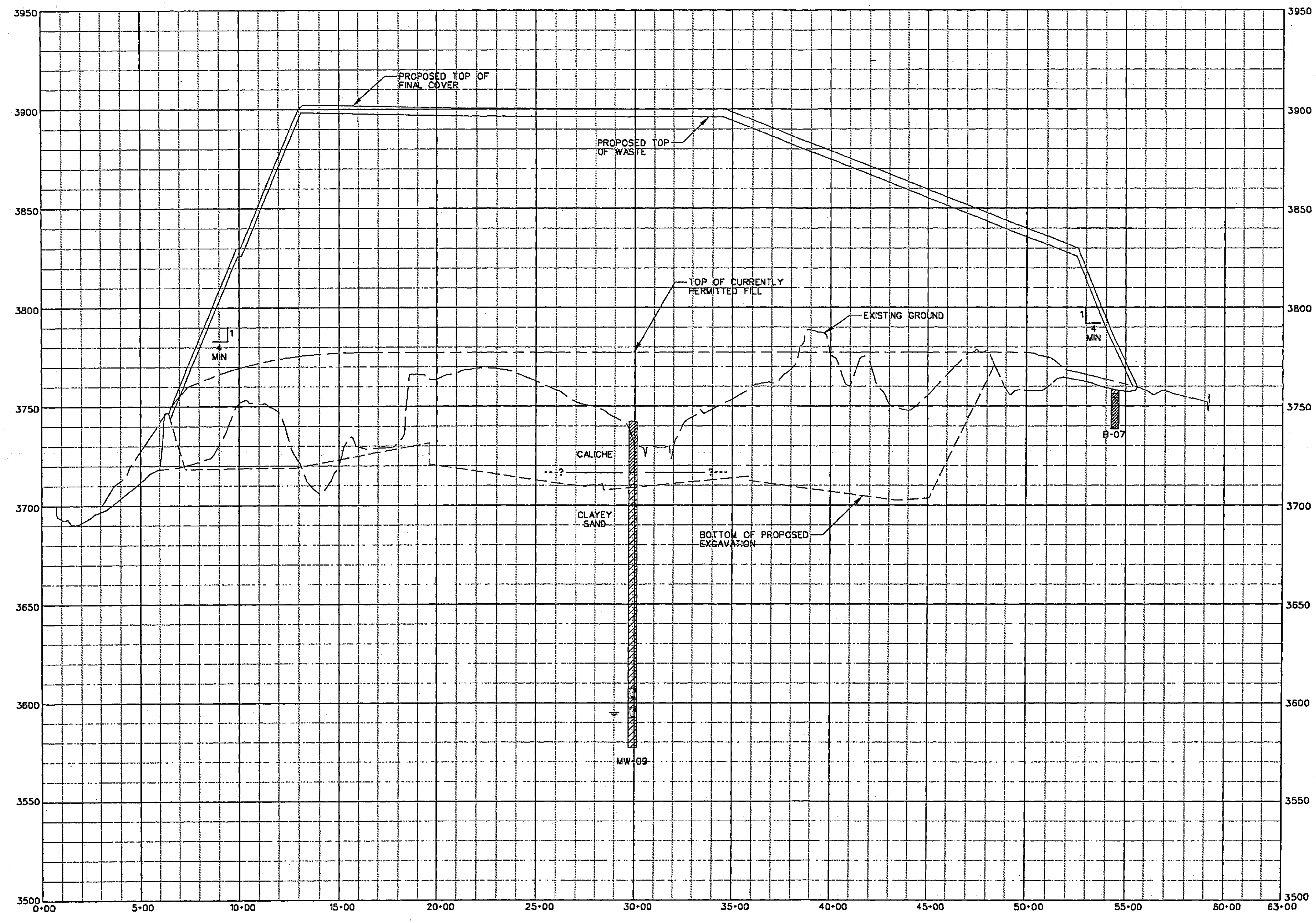
SECTION C-C

0 1" 2"

FILENAME $$FILE$$
SCALE

SHEET
Plate 11
App. 4C

USER: $$USER$$
FILE: $$FILE$$
DATE: $$DATE$$
TIME: $$TIME$$



SECTION D
III.4.8

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

M. M. SHIFLETT
43763

For subsurface information only

BORING LEGEND

▨ CLAY

▨ SANDY CLAY

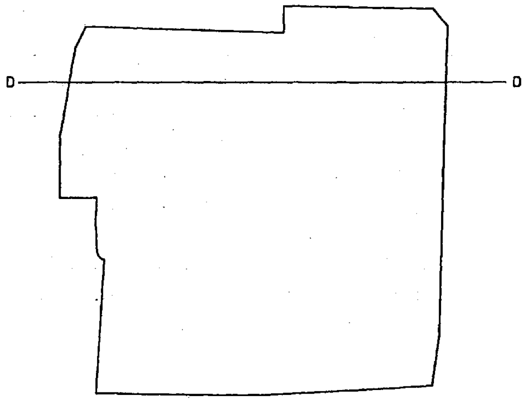
▩ TOP SOIL

▦ CALICHE

NOTE:

1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION D-D

0 1" 2"

FILENAME $$FILE$$
SCALE

SHEET
Plate 12
App. 4C

USER: $$USER$$
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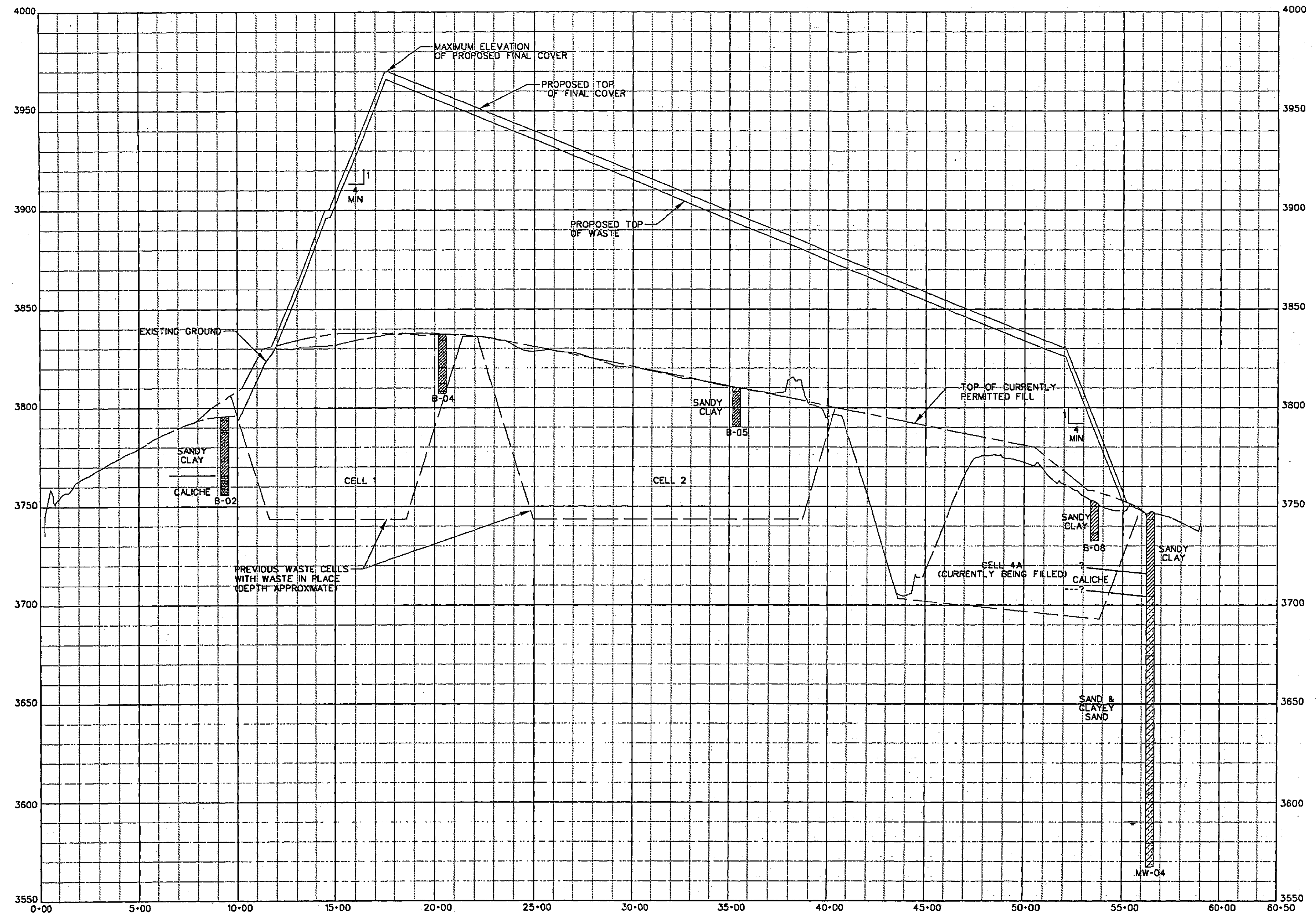
TIME: $$TIME$$



SECTION E
III.4.8

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

M M Shiflett
M. M. SHIFLETT
43766
5-8-06

For Subsurface information only

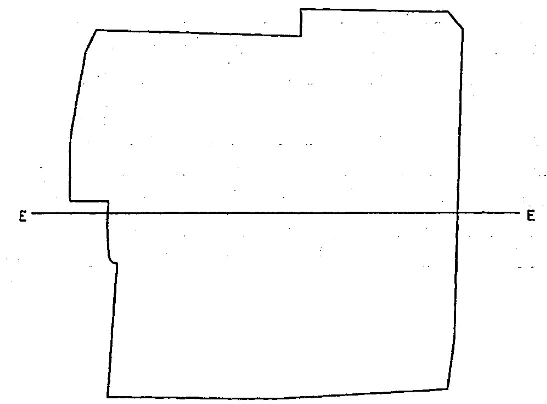
BORING LEGEND

- ▨ CLAY
- ▨ SANDY CLAY
- ▨ TOP SOIL
- ▤ CEMENTED LIMESTONE WITH CALICHE
- ▩ CALICHE

NOTE:

1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



C
B
A

USER: $$USER$$
FILE: $$FILE$$
DATE: $$DATE$$
TIME: $$TIME$$

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

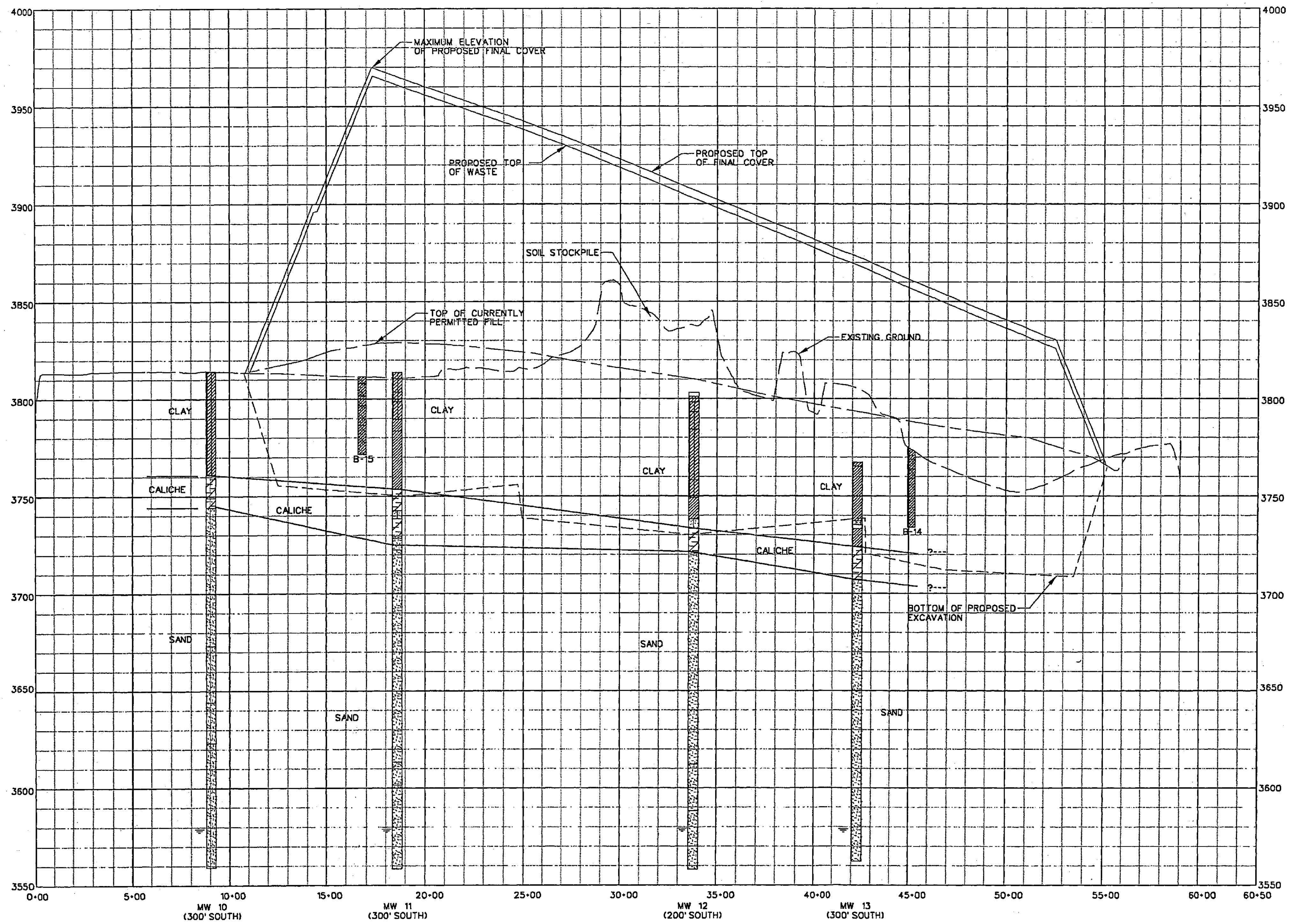
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION E-E

0 1" 2"

FILENAME	$$FILE$$
SCALE	

SHEET
Plate 13
App. 4C



SECTION F / III.4.8

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

M. M. SHIFLETT
43766

For Subsurface information only

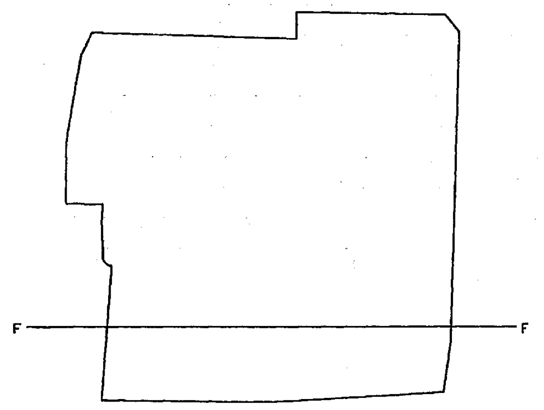
BORING LEGEND

▨	CLAY
▨	SANDY CLAY
▦	TOP SOIL
▦	SILTY CLAY
▒	SAND
▨	CALICHE

NOTE:

1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



HDR

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION F-F

0 1" 2"

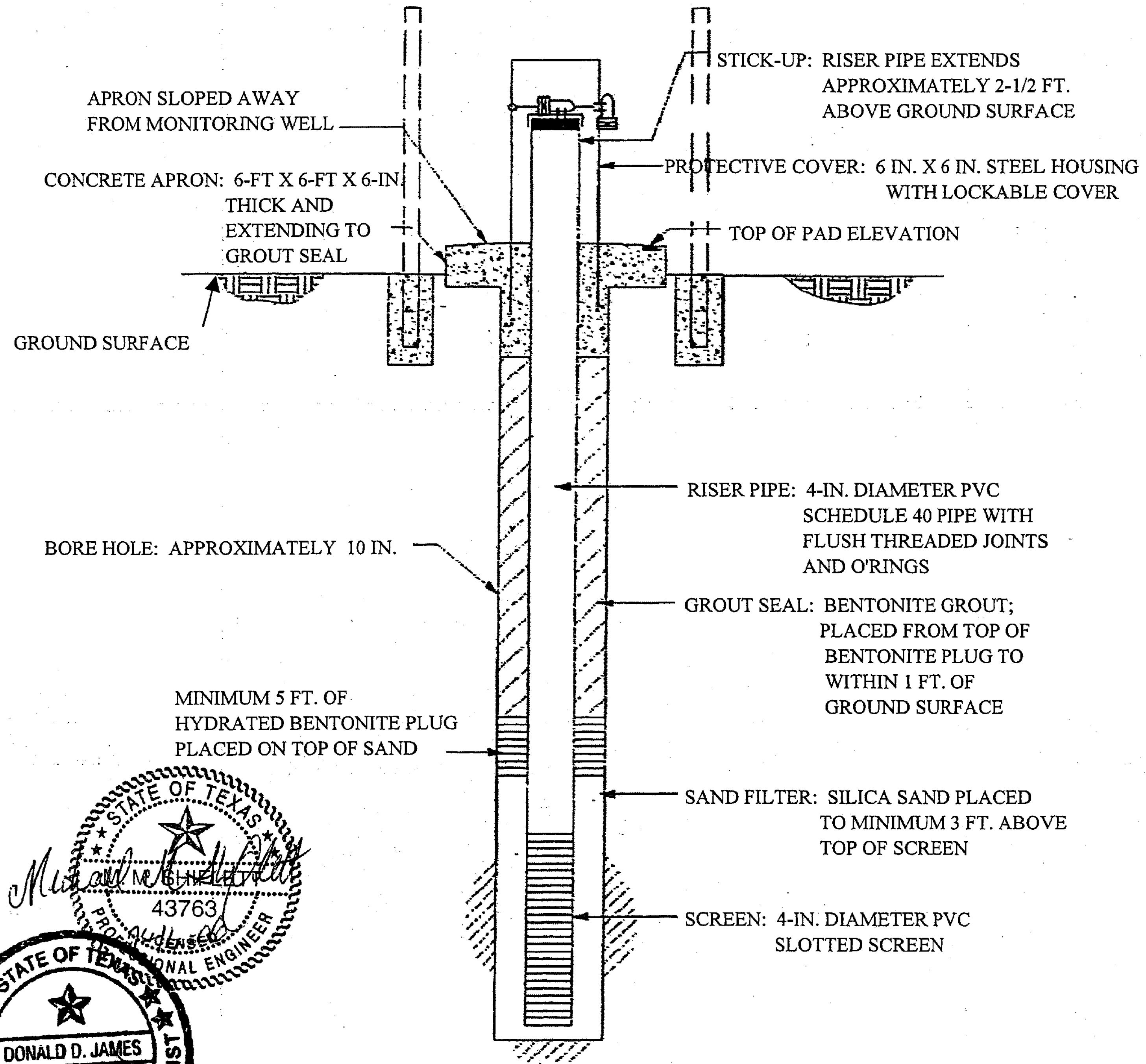
FILENAME $$FILE$$

SCALE

SHEET Plate 14 App. 4C

USER: $$USER$$ FILE: $$FILE$$ DATE: $$DATE$$ TIME: $$TIME$$

TYPICAL MONITORING WELL DETAIL



M. SHIFLETT
43763

DONALD D. JAMES
GEOLOGY
360

7-11-06

Notes:

1. Typical Monitoring Well Detail as provided in the 1994 document. Table has been updated with current information.
2. Actual monitoring depths to be confimed at time of well installation with pilot borings.
3. Monitoring Well locations as presented on this plate will provide the groundwater monitoring well system.

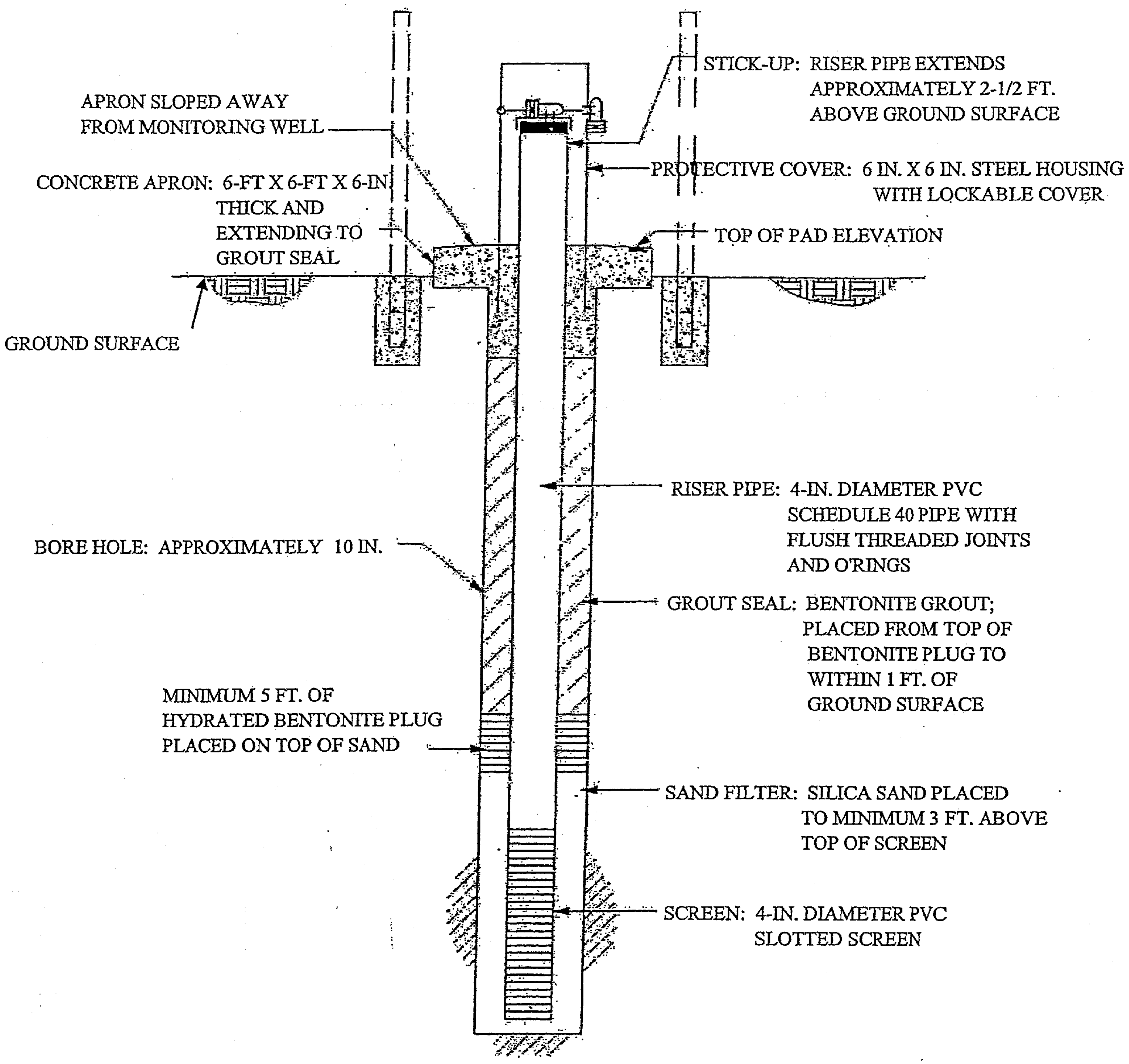
EXISTING MONITORING WELL NETWORK
City of Amarillo Landfill, 2005

Monitoring Well No.	Ground Elevation	Bottom Elevation	Screened Interval		Top of Filter Pack Elevation	Top of Bentonite Seal Elevation
			From	To		
Upgradient Monitoring Wells						
MW-5	3736.64	3596.64	3651.64	3596.64	3656.64	3661.64
MW-6	3746.38	3570.38	3610.38	3570.38	3617.38	3622.38
Downgradient Monitoring Wells						
MW-1	3814.85	3561.65	3601.85	3561.65	3606.85	3611.85
MW-2	3805.39	3560.39	3600.39	3560.39	3605.39	3610.39
MW-3	3789.57	3542.57	3582.57	3542.57	3589.57	3594.57
MW-4	3746.88	3564.88	3604.88	3564.88	3610.88	3615.88

ADDITIONAL MONITORING WELLS
City of Amarillo Landfill, 2005 (See Note 2)

Monitoring Well No.	Estimated Ground Elevation	Bottom Elevation	Screened Interval		Top of Filter Pack Elevation	Top of Bentonite Seal Elevation
			From	To		
Upgradient Monitoring Wells						
MW-14	3705	3550	3588	3552	3591	3596
MW-15	3775	3549	3585	3549	3588	3593
Downgradient Monitoring Wells						
MW-16	3810	3540	3577	3540	3580	3585
MW-17	3800	3540	3577	3540	3580	3585
MW-18	3780	3540	3577	3540	3580	3585
MW-19	3766	3540	3580	3540	3585	3588
MW-20	3752	3540	3589	3550	3592	3597

TYPICAL MONITORING WELL DETAIL



Notes:

1. Typical Monitoring Well Detail as provided in the 1994 document. Table has been updated with current information.
2. Actual monitoring depths to be confimed at time of well installation with pilot borings.

EXISTING MONITORING WELL NETWORK
City of Amarillo Landfill, 2005

Monitoring Well No.	Ground Elevation	Bottom Elevation	Screened Interval		Top of Filter Pack Elevation	Top of Bentonite Seal Elevation
			From	To		
Upgradient Monitoring Wells						
MW-5	3736.64	3596.64	3651.64	3596.64	3656.64	3661.64
MW-6	3746.38	3570.38	3610.38	3570.38	3617.38	3622.38
Downgradient Monitoring Wells						
MW-1	3814.85	3561.65	3601.85	3561.65	3606.85	3611.85
MW-2	3805.39	3560.39	3600.39	3560.39	3605.39	3610.39
MW-3	3789.57	3542.57	3582.57	3542.57	3589.57	3594.57
MW-4	3746.88	3564.88	3604.88	3564.88	3610.88	3615.88

ADDITIONAL MONITORING WELLS
City of Amarillo Landfill, 2005 (See Note 2)

Monitoring Well No.	Estimated Ground Elevation	Bottom Elevation	Screened Interval		Top of Filter Pack Elevation	Top of Bentonite Seal Elevation
			From	To		
Upgradient Monitoring Wells						
MW-14	3705	3550	3588	3552	3591	3596
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MW-16	3810	3540	3577	3540	3580	3585
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MW-18	3780	3540	3577	3540	3580	3585
MW-19	3766	3540	3580	3540	3585	3588
MW-20	3752	3540	3589	3550	3592	3597

1999 – Dyess – Peterson Testing Laboratory, Inc.

Logs of Borings PP-8 through PP-12

BORING NO. PP - 8

Dyess-Peterson Testing Laboratory, Inc.

PROJECT: City of Amarillo Landfill #73
CLIENT: City of Amarillo
DRILLED DATE: 10/25/99
DRILLING METHOD: Gardner Denver Drilling Unit

LOCATION: Amarillo, Texas
LOGGED BY: M. Todd
DRILLED BY: G. Perez
ELEVATION: Existing

Depth Depth Feet	Sample	Soil Log	Description	SPT Blows/Ft	Moisture Percent	Dry Density pcf	LL	PL	PI	Unconfined Compressive Strength TSF	Passing 200 Sieve
0			Silty Clay, Dry, Light Brown 6 / 4 / 7.5YR								
5 10			Silty Clay, Grainy, Crumbly, Brown 5 / 4 / 7.5YR								
			Silty Clay Caliche, Soft, Pink 7 / 3 / 7.5YR								
20			Clay, Soft, Slightly Moist, Light Brown, Slight Plasticity 6 / 4 / 7.5YR								
			Clay, Strong Brown, Moist, Slightly Plastic 5 / 6 / 7.5YR								
25 30 35 40			Clay, Light Brown, Slightly Moist 6 / 4 / 7.5YR								

BORING NO. PP - 8

Dyess-Peterson Testing Laboratory, Inc.

PROJECT: City of Amarillo Landfill #73
CLIENT: City of Amarillo
DRILLED DATE: 10/25/99
DRILLING METHOD: Gardner Denver Drilling Unit

LOCATION: Amarillo, Texas
LOGGED BY: M. Todd
DRILLED BY: G. Perez
ELEVATION: Existing

Depth Depth Feet	Sample	Soil Log	Description	SPT Blows/Ft	Moisture Percent	Dry Density pcf	LL	PL	PI	Unconfined Compressive Strength TSF	Passing 200 Sieve
45			Clay, Brown, Slightly Moist 5 / 4 / 7.5YR								
50			Silty Clay, Light Brown, Dry, Crumbly 6 / 4 / 7.5YR								
55			Silty Clay Caliche, Some Hard Consolidated Fragments, Pinkish White, Became Soft 8 / 2 / 7.5YR								
			Caliche, Hard Caliche Lithfield, Angular Fragments, Light Gray 7 / 1 / 7.5YR (Some Layers of Caliche Clay 8 / 2 / 7.5YR)								
60											
65											
			Sand, Unconsolidated, Very Fine Grain, Pinkish Gray (Easy Drilling) 6 / 1 / 7.5YR								
70											
75			* T.D. - 75' *								
80											

BORING NO. PP - 9

Dyess-Peterson Testing Laboratory, Inc.

PROJECT: City of Amarillo Landfill #73
CLIENT: City of Amarillo
DRILLED DATE: 10/25/99
DRILLING METHOD: Gardner Denver Drilling Unit

LOCATION: Amarillo, Texas
LOGGED BY: M. Todd
DRILLED BY: G. Perez
ELEVATION: Existing

Depth Depth Feet	Sample	Soil Log	Description	SPT Blows/Ft	Moisture Percent	Dry Density pcf	LL	PL	PI	Unconfined Compressive Strength TSF	Passing 200 Sieve
0			Fill, Silty Clay Fill Material								
			Clay, Loamy, Dark Brown 5 / 4 / 7.5YR								
5											
10			Clay								
20											
25											
			Silty Clay, Caliche, Pink 7 / 3 / 7.5YR								
30											
			Clay, Soft, Slightly Moist, Slight Plasticity, Light Brown 6 / 4 / 7.5YR								
35											
40											

BORING NO. PP - 9

Dyess-Peterson Testing Laboratory, Inc.

PROJECT: City of Amarillo Landfill #73
CLIENT: City of Amarillo
DRILLED DATE: 10/25/99
DRILLING METHOD: Gardner Denver Drilling Unit

LOCATION: Amarillo, Texas
LOGGED BY: M. Todd
DRILLED BY: G. Perez
ELEVATION: Existing

Depth Depth Feet	Sample	Soil Log	Description	SPT Blows/Ft	Moisture Percent	Dry Density pcf	LL	PL	PI	Unconfined Compressive Strength TSF	Passing 200 Sieve
45			Clay, Soft, Slightly Moist, Slight Plasticity. Light Brown 6 / 4 / 7.5YR								
50											
55											
60											
65											
			Caliche, Hard, Lithifield, Angular Fragments, Dry 7 / 1 / 7.5YR								
70											
75			* T.D. - 75' *								
80											