8212-01

ADDENDUM B

US EPA RECORDS CENTER REGION 5
491589

SUBSURFACE INVESTIGATION
SANITARY LANDFILL
W. G. KRUMMRICH PLANT
MONSANTO COMPANY
SAUGET, ILLINOIS

1.0 INTRODUCTION

In May 1977, E. D'Appolonia Consulting Engineers, Inc. (D'Appolonia) issued a report describing a preliminary assessment of the sanitary landfill operated by Monsanto at the W. G. Krummrich plant site. This assessment was based on published information from various state and federal agencies and data supplied by Monsanto. The report considered the environmental impact of the landfill, the effect of shutdown of the adjacent Ranney well, and the alternatives available for closing the landfill.

Following Monsanto's review of the preliminary assessment, D'Appolonia was authorized to proceed with a detailed subsurface investigation to determine actual soil conditions at the site and the extent of leachate movement from the landfill. These data were to provide the basis for more rigorous evaluation of the alternatives for closing, securing, and monitoring the landfill.

2.0 GEOLOGY

2.1 TOPOGRAPHY

The W. G. Krummrich plant sanitary landfill is located in Sauget, St. Clair County, Illinois, across the Mississippi River from St. Louis, Missouri (Figure 1). The landfill site is located at the edge of the Mississippi River on a broad, flat flood plain, locally called the American Bottoms. The flood plain is approximately six miles wide at the site and is at approximately Elevation 400 to 410. The slope of the plain is about 0.5 foot per mile down river. The flood plain is almost featureless topographically, although meander scars, ox-bow lakes, and

swamps have been formed by channel migration and flooding. Six miles to the east, the flood plain is abruptly bordered by an upland whose boundary with the flood plain is marked by 150-foot-high, loess-covered bluffs. The noticeable features on the flood plain near the river are industrial sites, storage areas, and railroad yards. Urban areas are present farther away from the river edge and cropland is dominant toward the bluff line.

The topography of the landfill area has been modified between the western boundary and the river by an earth and ash dike and beyond the east boundary by a government levee (Figure 2). The area of the Krummrich landfill itself, however, had apparently been unaltered before the placement of wastes began. The original surface was relatively flat with a maximum relief of 5 feet.

2.2 SOILS OF THE AMERICAN BOTTOMS

The American Bottoms at the Krummrich site has approximately 100 to 120 feet of unconsolidated valley fill over bedrock (limestone) of Mississippian age. There are two main soil units. The upper unit consists of clayey silt with fine sand and is recent alluvium (Cahokia Alluvium); the lower unit consists of medium coarse sand and gravel and is glacial outwash (Henry Formation). Although there is a considerable intertonguing of alluvium and outwash as well as lentils of more or less clayey material in the outwash, the alluvium generally comprises the upper 15 to 30 feet of the valley fill. The soils below 30 feet are better sorted than the alluvium above and comprise the major aquifer of the region.

Surface Soils (Aquitard)

The surface soils in the St. Clair County flood plain have been mapped by the University of Illinois Agricultural Experiment Station, and their soils units reflect, in general, the grain-size analysis, slope and drainage characteristics of the soils in the upper 80 inches of the profile. The U.S. Soil Conservation Service is in the process of updating the soils mapping, but their report is not yet published. The 1938 soils

map indicates that areas of silty and clayey soils predominate on the American Bottoms, although relatively sandy soils are present in a narrow strip along the Mississippi River and near Sauget, Cahokia, and Centreville. Logs of previous borings at the site provided by Monsanto (Figure 2) and others published by the Illinois State Geological Survey indicate that soils in the upper 5 to 10 feet of the profile are relatively clayey.

Subsurface Soils (Aquifer)

The better sorted (more poorly graded) soils of the subsurface consist of sand and gravel from the base of the alluvium (10 to 30 feet deep) to the bedrock surface at 100 to 120 feet deep. These sediments were deposited by glacial meltwaters under much higher river flows than those that exist today. The high energy regime of sedimentation produced a coarser, better sorted deposit (outwash) than the alluvium of the present-day channel. Ice-contact deposits were mixed in with the outwash and show up as poorly sorted lenses or lentils of clayey and silty sediment. These ice-contact deposits are rare, however, and do not detract from the high permeability/transmissibility of the aquifer.

3.0 SUBSURFACE INVESTIGATION

During the period from October 31 to December 1, 1977, 20 test borings were drilled by Layne-Western Drilling Company, Inc., of Kirkwood, Missouri, under the full-time supervision of D'Appolonia. In addition to the test borings, eight auger borings were drilled for the purpose of installing piezometer standpipes. The locations of these borings are shown in Figure 3. During this investigation, a total of 1295 lineal feet of soil sampling and drilling was completed and 1005.5 lineal feet of piezometer pipe installed. The borings were drilled using two truck-mounted CME 55s and a CME 750. During the drilling, Standard Penetration Tests (SPT) were conducted while obtaining split-barrel samples of the soil. Continuous samples were obtained in the top 30 feet and samples were taken at 5-foot intervals below 30 feet. In addition, 11 three-inch-diameter undisturbed Shelby tube samples of the fine-grained soil materials underlying the site were obtained.

The subsurface profiles shown in Figures 3 and 4 were generalized from and interpolated between the test borings. The nature of the upper soil unit (alluvium) is so variable from boring to boring that the sections are somewhat speculative. The alluvium has been shown as sand and silty sand containing lenses of silty clay. The boring log data could also be interpreted as indicating silty clay containing sand and silty sand lenses. However, because of the apparent movement of leachate through the alluvium, the continuity of the less permeable silty clay seems less likely than the continuity of the silty sand.

The detailed boring logs are shown in Figures 5 through 10. Each boring log indicates the locations of the samples, the soil profile description, appropriate Unified Soil Classification System (USCS) classification of each sample, and the results of the penetration resistance tests.

In general, the borings indicate that the subsurface strata consist of three different sequences: miscellaneous fill; interbedded layers of fine sand, silt and clay; and a clean, medium to coarse sand sequence.

The fill consists of 5 to 20 feet of fly ash, cinders, silty clay, sand and gravel, as well as miscellaneous material such as glass, scrap metal, and unidentified waste.

The alluvium, interbedded fine sand, silt and clay underlying the fill, ranges from 15 to 50 feet in total thickness. The alluvium is indicative of changing river channels with the fine-grained materials intertonguing. The leachate which has been carried down is usually concentrated just above the contacts between a silty sand layer overlying a silty clay layer. The thickness of these various layers is usually thin, on the order of a few feet.

Underlying the alluvium is a thick sequence of medium to coarse sand. Although none of the borings drilled for this study extended to bedrock, this sand layer is expected to continue to bedrock. Cobbles and boulders were encountered in the deeper portions of the borings.

4.0 GROUNDWATER

Groundwater levels were observed by the installation and monitoring of standpipe piezometers during the subsurface investigation. Nineteen wellpoints were installed and the depths of the wellpoints and the recorded water levels are shown in Figures 3 and 4. The groundwater levels were measured each day during the investigation. The changes in water levels in the deep piezometers corresponded closely with the change in the Mississippi River level measured at the Eads Bridge gage north of the site. This direct connection between the river and the principal groundwater at the site would be expected due to the clean medium sand layer. The shallower piezometers in the alluvium indicate the presence of localized perched groundwater as would be expected in the interbedded sands, silts, and clays.

The exact direction and rate of flow of the groundwater in the aquifer has not been determined because precise elevations of the piezometers have not been measured. Based on the piezometer data available, piezometric levels across the site are very flat. Under normal conditions, groundwater flow in the aquifer would be expected to be downriver with a component toward the river. Using estimated "normal" piezometric levels and permeability of the aquifer, average flow velocities in the aquifer probably are in the range of 10 to 100 feet per month.

4.1 HYDROLOGIC PROPERTIES

Four, falling-head field permeability tests were conducted to evaluate the alluvial materials. Two additional tests were attempted, but the materials were so permeable that no measurements could be made. The results of these field tests are presented in Table 1.

The results of these field tests, field observations, and laboratory measured permeability show that the alluvium is very permeable. This supports the conclusion that the silty sand is the continuous material in the alluvium and also explains the apparent movement of leachate from the landfill downward to the aquifer.

TABLE 1

FIELD PERMEABILITY TEST RESULTS
W. G. KRUMMRICH LANDFILL
MONSANTO COMPANY
SAUGET, ILLINOIS

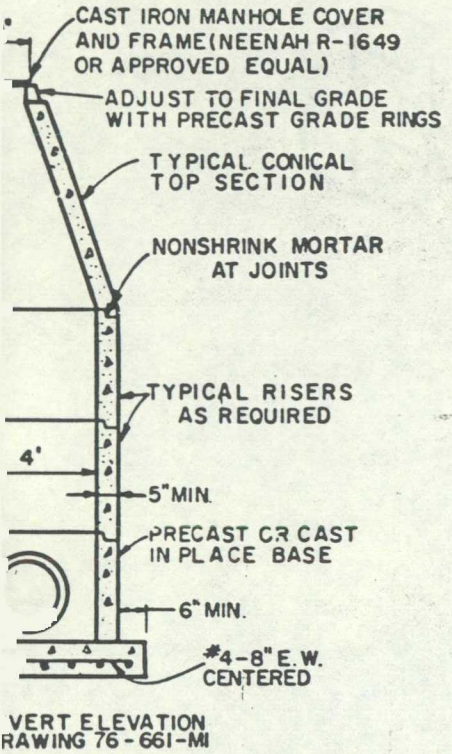
BORING NO.	DEPTH (FT)	MATERIAL	PERMEABILITY (CM/SEC)
B-1	10.5	Silty Clay	1.8×10^{-4}
B-10	35.5	Silty Clay	6.0×10^{-3}
B-11	25.5	Sandy Silt	2.0×10^{-3}
B-15	45.5	Silty Clay	1.4×10^{-3}

TABLE 2

LABORATORY PERMEABILITY TEST RESULTS
W. G. KRUMMRICH LANDFILL
MONSANTO COMPANY
SAUGET, ILLINOIS

BORING NO.	SAMPLE NO.	DEPTH (FT)	PERMEABILITY (CM/SEC)	SAMPLE DESCRIPTION
2	ST-15	23.0-25.5	1.7×10^{-7}	Interbedded silty clay, silty fine sand, and clayey silt
11	ST-15	21.0-23.5	4.1×10^{-4}	Fine sand, some silt
14	ST-5	15.5-18.0	1.2×10^{-6}	Sandy silt to silty sand, trace of clay
20	ST-13	18.0-20.5	5.2×10^{-7}	Interbedded silty clay, clayey silt, silty sand

-C)



IL 6

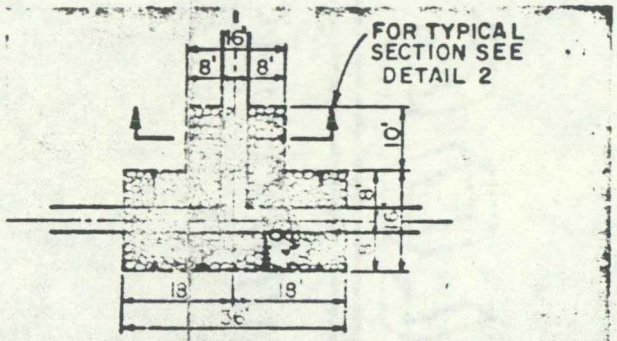
ST MANHOLE

M C-478 REQUIREMENTS)

S.

NOTES

1. SHORING DETAILS FOR THE CULVERT TRENCH EXCAVATIONS SHALL BE DETERMINED BY THE CONTRACTOR.
2. RIPRAP SHALL BE PLACED ACCORDING TO THE REQUIREMENTS OF ILLINOIS STATE HIGHWAY DEPARTMENT SPECIFICATIONS. STONE SHALL BE CONSOLIDATED DEPOSITS OF ROCK REASONABLY FREE OF SHALE OR SHALY DEPOSITS.



DETAIL 7

INTERCEPTOR DITCH

INTERSECTION DETAIL

1/2" = 1'-0"

SECTION D-D

3/16" = 1'-0"

REV.	LOCATION	DESCRIPTION	BY	CKD.	DATE
1		RAISED FILL 1 FOOT IN SECTION A-A	G. J. G.	ATKINS	6-28-78

TYPICAL LANDFILL SECTIONS AND DETAILS

W. G. KRUMMRICH PLANT
MONSANTO COMPANY
ST. LOUIS, MISSOURI

Monsanto

CORPORATE ENGINEERING DEPARTMENT	C.E.A. No.	PLANT	SIZE	ZONE	TYPE	NUMBER	REVISION
	8250	03	D	63.0	C	2	1

D'APPOLONIA

REDUCED SIZE PRINT

A B C D

22

J B-B)

-0"
-1/2" DOWN)

8" 3000 PSI CONCRETE
8" COMPACTED ROCK

ACTED
CT
FILL

SE
EGATE

OR 30" DIA.
S III RCP
S X
RETE

ACTED
CT
FILL

SE
EGATE

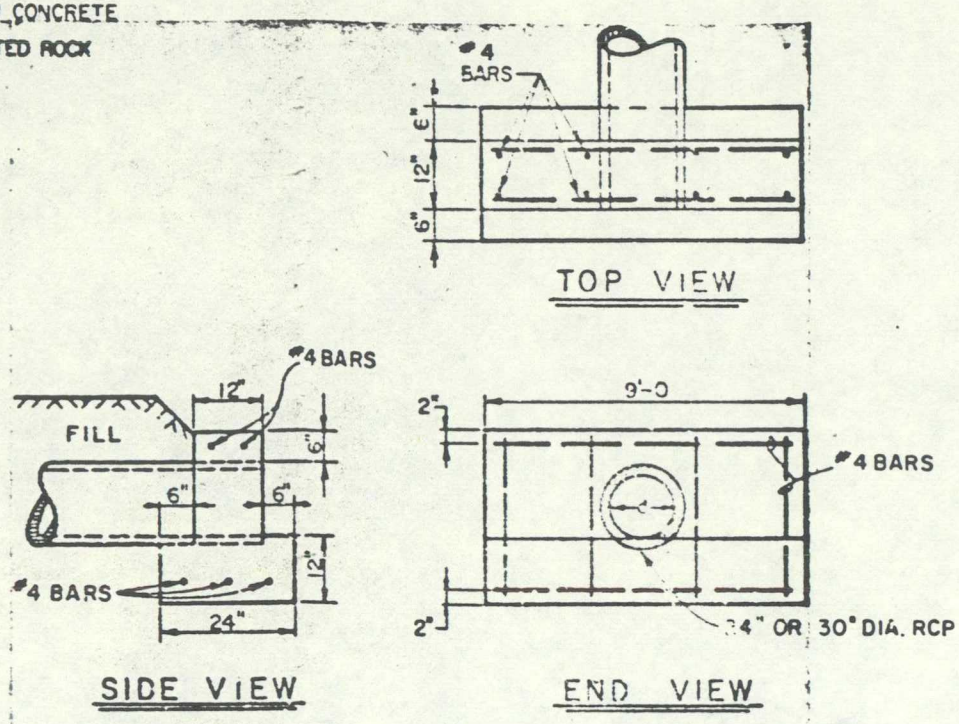
OR 30" DIA.
S I RCP

N SHAPED

G DETAIL

(SECTION C-C)

3/16" = 1'-0"

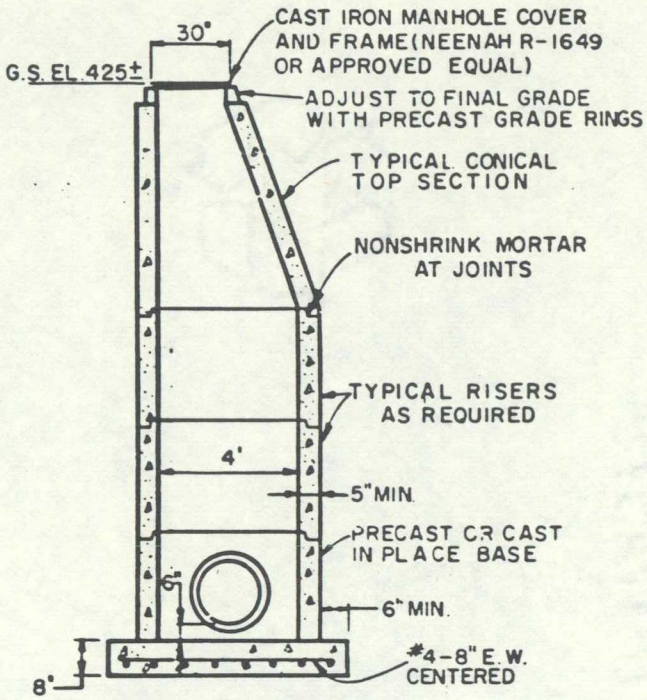


DETAIL 5

CULVERT HEADWALL

(ALL END WALLS ARE CLASS A CONCRETE.
ILLINOIS STATE HWY. SPECIFICATIONS)

N.T.S.



NOTE: FOR INVERT ELEVATION SEE DRAWING 76-661-MI

DETAIL 6

TYPICAL PRECAST MANHOLE

(MANHOLE TO MEET ASTM C-478 REQUIREMENTS)

N.T.S.

NO

1

2

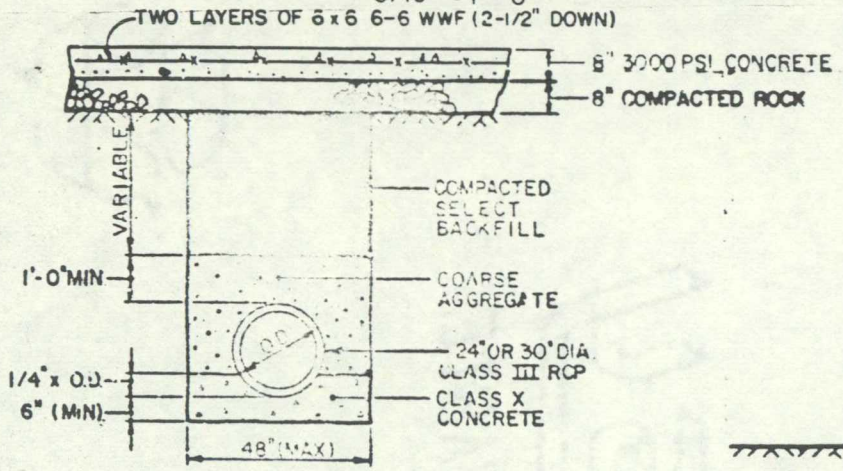
INTER

REDUCED

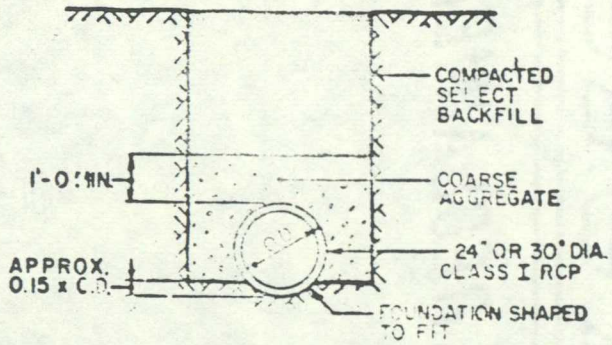
A

TYPICAL INTERCEPTOR DITCH
(SECTION B-B)

3/16" = 1'-0"



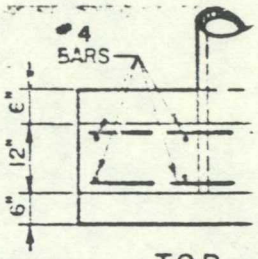
DETAIL 4a
(AT ROAD CROSSINGS)
(SEE NOTE 1)



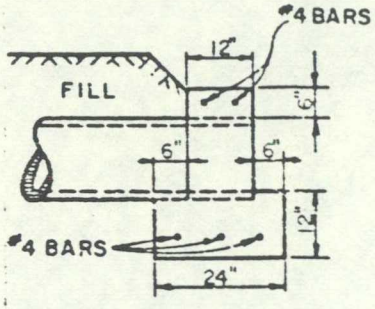
DETAIL 4b
(OTHER LOCATIONS)
(SEE NOTE 1)

CULVERT DITCH & BEDDING DETAIL

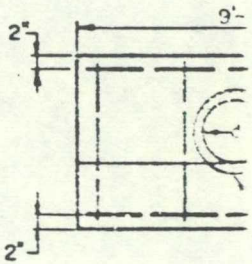
SCALE 3/8" = 1'-0"



TOP



SIDE VIEW



END

DETAIL 5
CULVERT HEADWAL

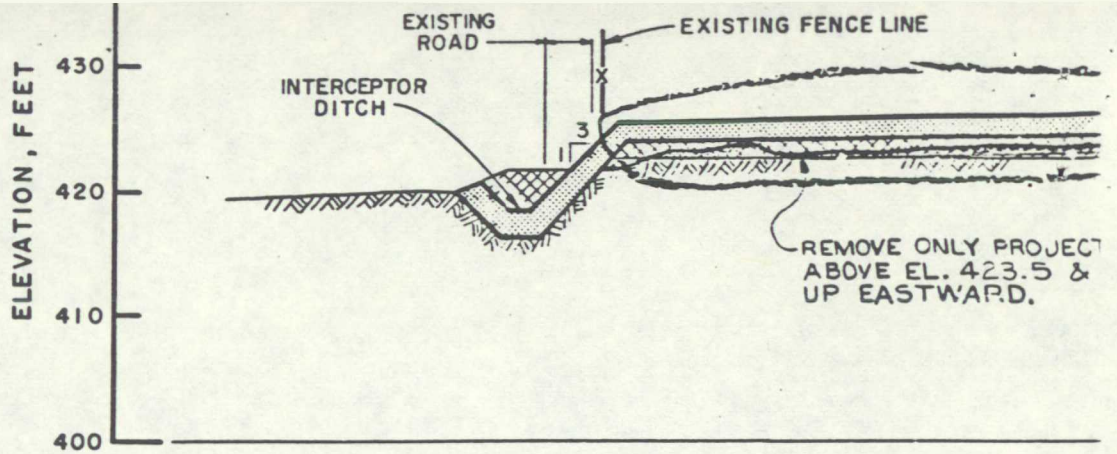
(ALL END WALLS ARE CLASS A CONCF
ILLINOIS STATE HWY SPECIFICATIO
N.T.S.

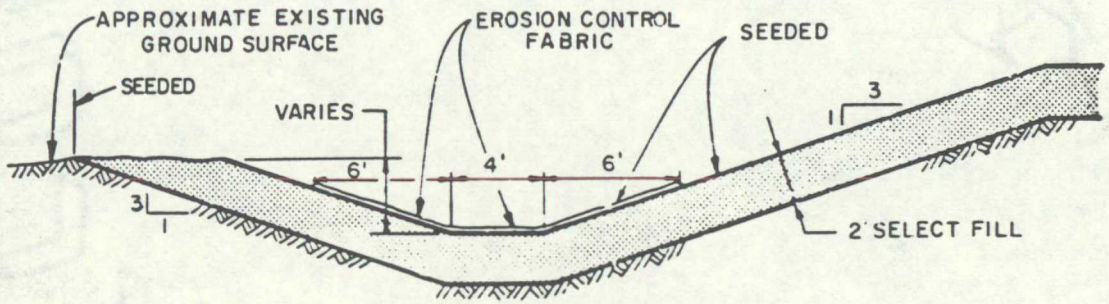
D

D

22

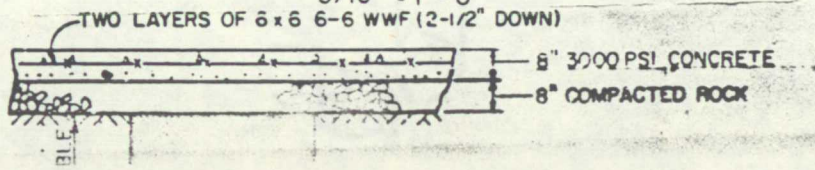
DRAWN BY	D.W. 4-21-78	CHECKED BY	BE	DRAWING NUMBER	77-661
	c/b	APPROVED BY		4/22/78	

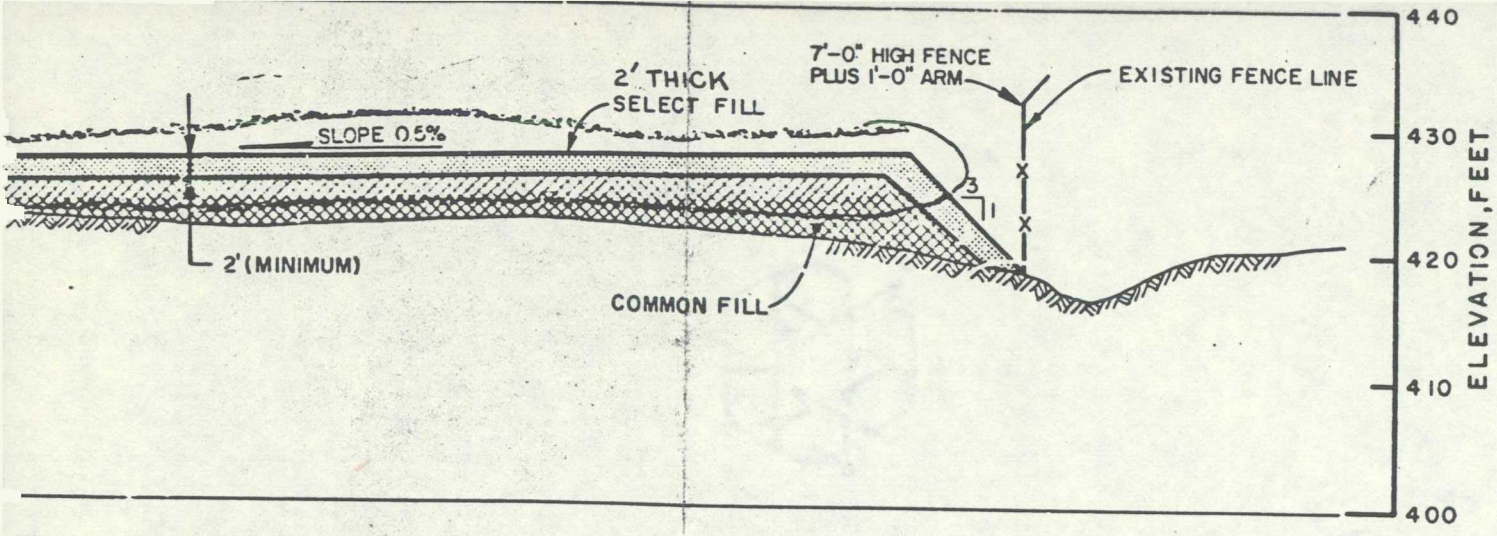




DETAIL 1
TYPICAL INTERCEPTOR DITCH
(SECTION B-B)

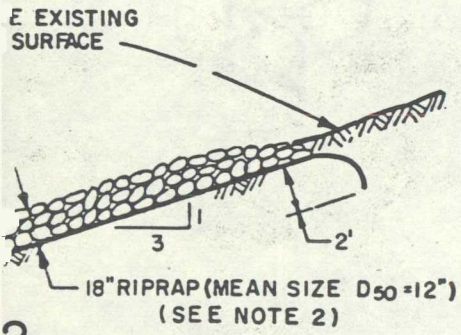
3/16" = 1'-0"



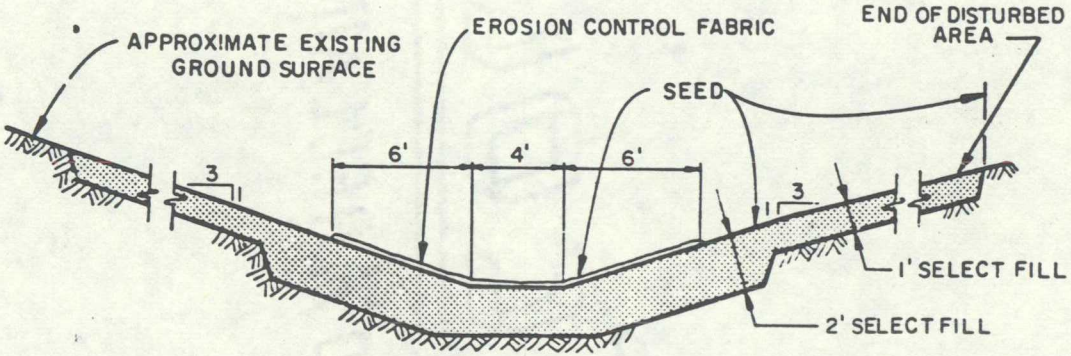


FILL SECTION
A-A)

VERTICAL SCALE
0 10 20 30 FEET



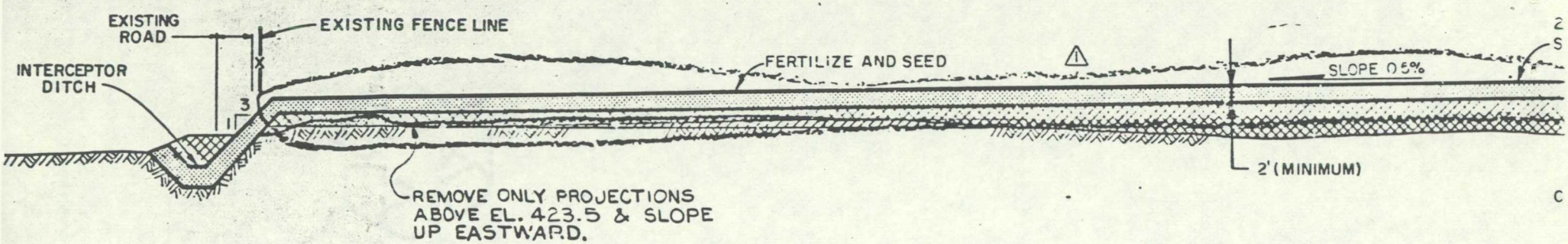
2
ED DITCH
- C)



DETAIL 3
TYPICAL DISCHARGE DITCH DETAIL
SECTION D-D
3/16" = 1'-0"

CAST IRON MANHOLE COVER
AND FRAME (NEENAH R-1649

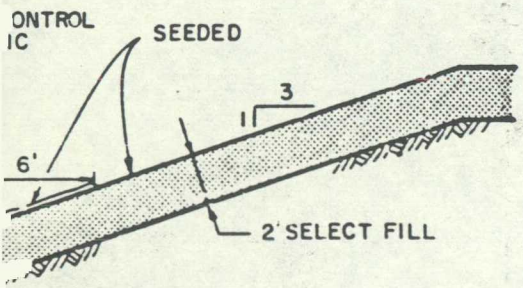
NOTES



TYPICAL LANDFILL SECTION
(SECTION A-A)

HORIZONTAL SCALE: 0 30 60 90 FEET

VERTICAL SCALE: 0 10 20 30 FEET

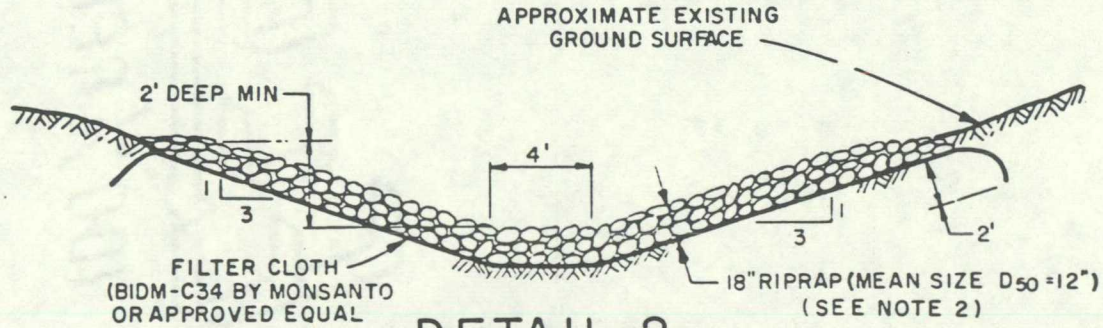


L 1

EPTOR DITCH

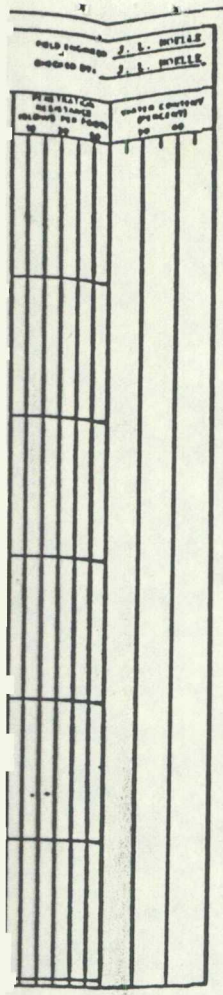
B-B)

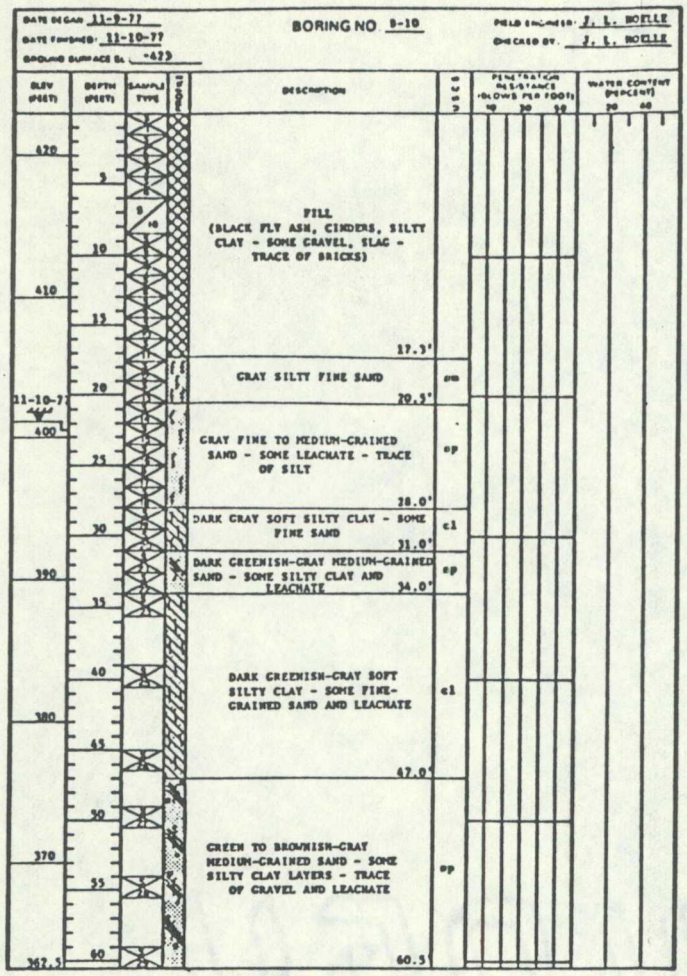
0"
/2" DOWN)

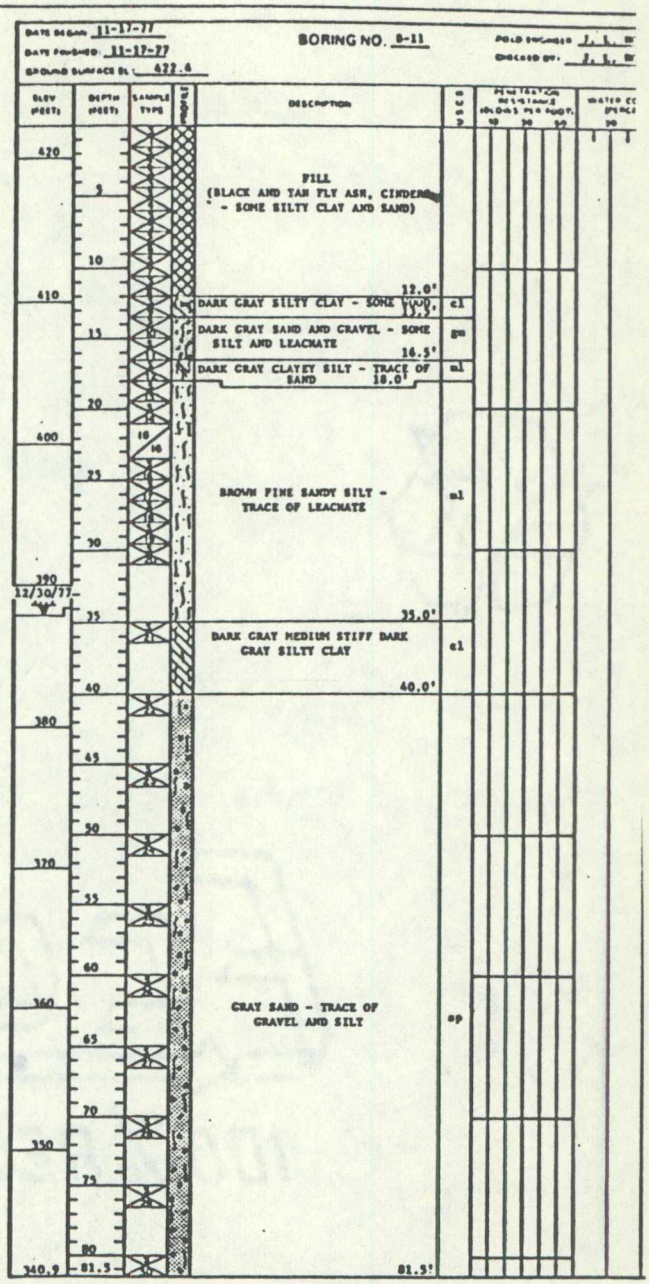


DETAIL 2
TYPICAL RIPRAPPED DITCH
(SECTION C-C)

3/16" = 1'-0"







NOTES:

1. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 362.2.
2. WELLPOINT INSTALLED IN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 388.3.

FIGURE 7

BORING LOGS B-8 THROUGH B
SUBSURFACE INVESTIGATIO

W.G. KRUMMRICH PLANT
SAUGET, ILLINOIS

PREPARED FOR

MONSANTO COMPANY
ST. LOUIS, MISSOURI

THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS AND DATES INDICATED SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING LOCATIONS ALSO THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE BORING LOCATIONS

NOTES

1. FOR PLAN AND LOCATION OF BORINGS SEE FIGURE 3.
2. FOR GENERAL NOTES AND LEGEND SEE FIGURE 10.

D'APPOLONI

DRAWING NUMBER 77-661-E5

CHECKED BY JLH 3-10-78

APPROVED BY [illegible] 9-10-78

DRAWN BY TRS & MEL 12-13-77

DATE BEGAN: 11-22-77
DATE FINISHED: 11-22-77
GROUND SURFACE EL: -419.2

BORING NO. B-8

FIELD ENGINEER: J. L. NOELLE
CHECKED BY: J. L. NOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 30	WATER CONTENT (PERCENT) 20 40
410	5, 10, 15		FILL (BLACKISH-GRAY FLY ASH WITH A TRACE OF SILTY CLAY AND ROOTS) 17.5'			
400	20		LIGHT BROWN SILTY FINE TO MEDIUM SAND 22.0'	sp		
	25		GRAY MEDIUM STIFF GRAY SILTY CLAY TO CLAYEY SILT - SOME SAND 25.0'	cl-ml		
390, 380	30, 35, 40		DARK GRAY SILTY SAND TO SANDY SILT - TRACE OF CLAY 40.0'	sm		
377.7	41.5		DARK GRAY SILTY CLAY- SOME SAND 41.5'	cl		

BOTTOM OF BORING
41.5'

DATE BEGAN: 11-22-77
DATE FINISHED: 11-22-77
GROUND SURFACE EL: -420

BORING NO. B-9

FIELD ENGINEER: J. L. NOELLE
CHECKED BY: J. L. NOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 30	WATER CONTENT (PERCENT) 20 40
410	5, 10		FILL (DARK GRAY FLY ASH - SOME CINDERS - TRACE OF SAND AND ROOTS) 11.0'			
	15		FILL (DARK BROWN CINDERS - SOME SILTY CLAY, SAND AND GRAVEL) 15.5'			
400	20, 25		BROWN AND GRAY SOFT TO MEDIUM STIFF SILTY CLAY - SOME TO A TRACE OF SAND - TRACE OF LEACHATE 26.0'	cl		
390 12/30/77	30, 35		DARK GRAY SILTY SAND - SOME CLAY AND LEACHATE 38.0'	sm		
380	40		DARK GRAY SANDY CLAY - TRACE OF LEACHATE 44.0'	cl		
370, 360	45, 50, 55		DARK GRAY SILTY FINE SAND - TRACE OF FINE GRAVEL, CLAY AND LEACHATE 59.0'	sm		
359.5	60		GRAY MEDIUM SAND 60.5'	sp		

BOTTOM OF BORING
60.5'

NOTES:

1. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 361.0.
2. WELLPOINT INSTALLED IN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 380.3.

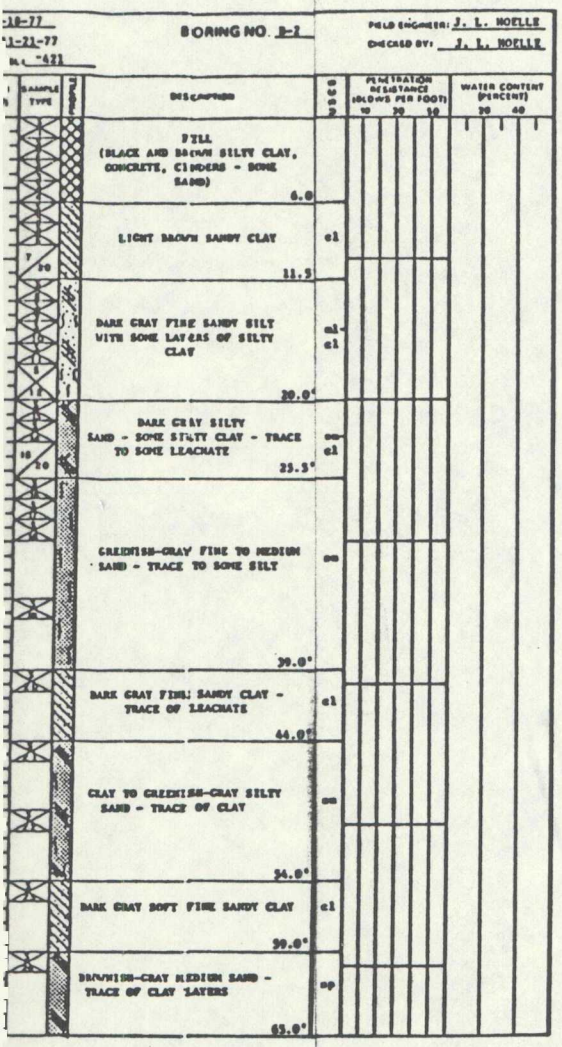
-18-77
-1-21-77
EL: -421

BORING NO. B-2

FIELD ENGINEER: J. L. HOELLE
CHECKED BY: J. L. HOELLE

SAMPLE TYPE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 30	WATER CONTENT (PERCENT) 20 40
	FILL (BLACK AND BROWN SILTY CLAY, CONCRETE, CINDERS - SOME SAND) 6.0			
7 / 10	LIGHT BROWN SANDY CLAY 11.5	cl		
	DARK GRAY FINE SANDY SILT WITH SOME LAYERS OF SILTY CLAY 20.0'	ml-cl		
18 / 20	DARK GRAY SILTY SAND - SOME SILTY CLAY - TRACE TO SOME LEACHATE 25.5'	sm-cl		
	GREENISH-GRAY FINE TO MEDIUM SAND - TRACE TO SOME SILT 39.0'	sm		
	DARK GRAY FINE SANDY CLAY - TRACE OF LEACHATE 44.0'	cl		
	CLAY TO GREENISH-GRAY SILTY SAND - TRACE OF CLAY 54.0'	sm		
	DARK GRAY SOFT FINE SANDY CLAY 59.0'	cl		
	BROWNISH-GRAY MEDIUM SAND - TRACE OF CLAY LAYERS 65.0'	sp		

BOTTOM OF BORING
65.0'



NOTES:

1. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 357.5.
2. WELLPOINT INSTALLED IN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 374.

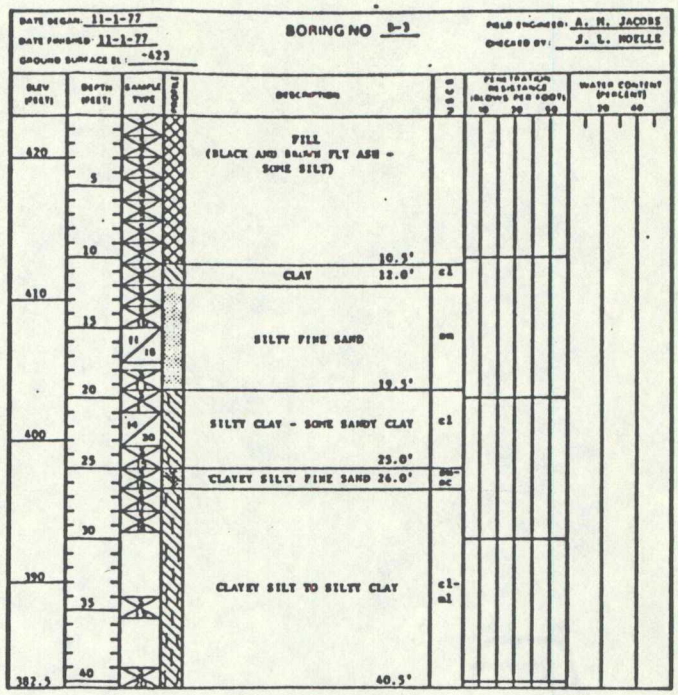
DATE BEGAN: 11-1-77
DATE FINISHED: 11-1-77
GROUND SURFACE EL: -423

BORING NO B-3

FIELD ENGINEER: A. M. JACOBS
CHECKED BY: J. L. HOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 30	WATER CONTENT (PERCENT) 20 40
420	5		FILL (BLACK AND BROWN FLY ASH - SOME SILT) 10.5'			
	10		CLAY 12.0'	cl		
410	15	11 / 18	SILTY FINE SAND 19.5'	sm		
400	20	14 / 30	SILTY CLAY - SOME SANDY CLAY 25.0'	cl		
	25		CLAYEY SILTY FINE SAND 26.0'	sm-sc		
390	30		CLAYEY SILT TO SILTY CLAY 40.5'	cl-ml		
382.5	35					
	40					

BOTTOM OF BORING
40.5'



THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS AND DATES INDICATED SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING LOCATIONS ALSO THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE BORING LOCATIONS

NOTES

1. FOR PLAN AND LOCATION OF BORINGS SEE FIGURE 3.
2. FOR GENERAL NOTES AND LEGEND SEE FIGURE 10.

FIGURE 5

BORING LOGS B-1 THROUGH B-
SUBSURFACE INVESTIGATION

W.G. KRUMMRICH PLANT
SAUGET, ILLINOIS
PREPARED FOR
MONSANTO COMPANY
ST. LOUIS, MISSOURI

D'APPOLONIA

DRAWING NUMBER 77-661-E3

DRAWN BY TRS & MEL 12-13-77 | CHECKED BY JLH | APPROVED BY [illegible] | 3.10.78 | [illegible]

DATE BEGAN: 11-18-77
DATE FINISHED: 11-21-77
GROUND SURFACE EL: ~421

BORING NO. B-1

FIELD ENGINEER: J. L. HOELLE
CHECKED BY: J. L. HOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 30	WATER CONTENT (PERCENT) 20 40
420	5		FILL (BLACK FLY ASH, CINDERS) 6.0'			
410	10, 15		LIGHT BROWN TO BLACK SOFT TO STIFF SILTY CLAY TO CLAYEY SILT - TRACE TO SOME FINE SAND - TRACE OF GRAVEL 17.5'	cl-ml		
	20		DARK BROWN FINE SANDY SILT - TRACE OF LEACHATE 20.5'	ml		
400	25		DARK BROWN TO DARK GRAY SOFT FINE SANDY CLAY - SOME SILT 26.0'	cl-ml		
390 12/30/77	30, 35, 40		DARK GRAY FINE SANDY SILT - TRACE TO SOME CLAY - TRACE OF LEACHATE 40.0'	ml-cl		
380, 370, 360, 350, 340	45, 50, 55, 60, 65, 70, 75, 80		GRAY TO BROWNISH-GRAY MEDIUM-GRAINED SAND - TRACE OF SILT AND GRAVEL 81.5'	sp		
339.5	81.5					

BOTTOM OF BORING
81.5'

NOTES:

1. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 341.5.
2. OBSTRUCTION ENCOUNTERED AT 30.0 FEET. OFFSET BORING AND RESUMED SAMPLING AT 25.0 FEET. SAMPLES OBTAINED FROM OFFSET BORING INDICATED BY LETTER "A".

DATE BEGAN: 11-18-77
DATE FINISHED: 11-21-77
GROUND SURFACE EL: ~421

BORING NO. B-2

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION
420	5		FILL (BLACK AND BROWN SILTY CLAY, CONCRETE, CINDERS - SOME SAND) 6.0
410	10	7 20	LIGHT BROWN SANDY CLAY 11.5
	15		DARK GRAY FINE SANDY SILT WITH SOME LAYERS OF SILTY CLAY 20.0'
400	20, 25	18 20	DARK GRAY SILTY SAND - SOME SILTY CLAY - TRACE TO SOME LEACHATE 25.5'
390 12/30/77	30, 35		GREENISH-GRAY FINE TO MEDIUM SAND - TRACE TO SOME SILT 39.0'
380	40		DARK GRAY FINE SANDY CLAY - TRACE OF LEACHATE 44.0'
370	45, 50		GRAY TO GREENISH-GRAY SILTY SAND - TRACE OF CLAY 54.0'
	55		DARK GRAY SOFT FINE SANDY CLAY 59.0'
360	60		BROWNISH-GRAY MEDIUM SAND - TRACE OF CLAY LAYERS 65.0'
356.0	65.0		

BOTTOM OF BORING
65.0'

NOTES:

1. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 357.5.
2. WELLPOINT INSTALLED IN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 374.

BORING NO. B-17

FIELD ENGINEER: J. L. HOELLE
CHECKED BY: J. L. HOELLE

DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 30	WATER CONTENT (PERCENT) 20 40
FILL (LACE SAND AND GRAVEL, SILTY CLAY AND CINDERS - SOME CONCRETE, ROCK FRAGMENTS AND COAL) 15.0'			
ME MEDIUM STIFF SILTY CLAY 18.0'	cl		
ME FINE-GRAINED SANDY SILT 21.0'	ml		
GHT BROWN MEDIUM-GRAINED SAND - SOME LEACHATE 30.0'	sp		
Y CLAYEY SILT TO SILTY CLAY A FEW THIN SAND SEAMS - SOME LEACHATE 33.5'	cl		
GRAY MEDIUM DENSE MEDIUM TO COARSE-GRAINED SAND - TRACE OF GRAVEL AND SILT 80.5'	sp		

BOTTOM OF BORING
80.5'

WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 398.0.

WELLPOINT INSTALLED IN AN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 388.0.

WELLPOINT TIPS 1 OBTAINED IN OFFSET BORING AT PREDETERMINED DEPTH.

BORING NO. B-18

DATE BEGAN: 11-28-77
DATE FINISHED: 11-28-77
GROUND SURFACE EL: ~421.5

FIELD ENGINEER: J. L. HOELLE
CHECKED BY: J. L. HOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 30	WATER CONTENT (PERCENT) 20 40
420	5, 10		FILL (BLACK CINDERS, SILTY CLAY - SOME BRICKS, ROCK FRAGMENTS AND LEACHATE) 10.5'			
410	15		BROWN AND BLACK SILTY SAND - SOME LEACHATE - TRACE OF ROCK FRAGMENTS 18.0'	sm		
	20		BROWN SOFT TO MEDIUM STIFF SILTY CLAY - SOME LEACHATE 21.0'	cl		
400	25		LIGHT BROWN MEDIUM FINE SAND - TRACE OF SILT AND LEACHATE 25.5'	sp		
			BROWN SILTY CLAY - TRACE OF FINE-GRAINED SAND 27.5'	cl		
390	30, 35		BROWN SILTY SAND	sm		
380.0	40, 41.5		41.5'			

BOTTOM OF BORING
41.5'

THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS AND DATES INDICATED. SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING LOCATIONS. ALSO THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE BORING LOCATIONS.

NOTES
1. FOR PLAN AND LOCATION OF BORINGS SEE FIGURE 3.
2. FOR GENERAL NOTES AND LEGEND SEE FIGURE 10.

FIGURE 9

BORING LOGS B-16 THROUGH B-18
SUBSURFACE INVESTIGATION

W.G. KRUMMRICH PLANT
SAUGET, ILLINOIS

PREPARED FOR

MONSANTO COMPANY
ST. LOUIS, MISSOURI

D'APPOLONIA

DRAWN BY TRS & MEL 12-13-77 | CHECKED BY | APPROVED BY | DRAWING NUMBER 77-661-E 7

DATE BEGAN: 11-23-77
DATE FINISHED: 11-23-77
GROUND SURFACE EL. -422.7

BORING NO. B-16

FIELD ENGINEER: J. L. HOELLE
CHECKED BY: J. L. HOELLE

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
420	5		FILL (CINDERS, FLY ASH, SILTY CLAY - SOME SAND - TRACE OF FIBROUS MATERIAL, LEACHATE)			
410	10					
	15					
			18.0'			
	20		BROWN FINE SANDY SILT TO SILTY SAND	ml sm		
400			24.0'			
11-23-77	25		BROWN FINE TO MEDIUM-GRAINED SAND - TRACE OF SILT	sp		
			28.5'			
	30		DARK GREENISH-GRAY MEDIUM STIFF SILTY TO FINE-GRAINED SANDY CLAY - SOME LEACHATE	cl		
390	35					
	40		40.0'			
381.2	41.5		DARK BROWN SILTY SAND - SOME LEACHATE 41.5'	sm		

BOTTOM OF BORING - 41.5'

DATE BEGAN: 11-16-77
DATE FINISHED: 11-17-77
GROUND SURFACE EL. 422.6

BORING NO.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION
420	5		FILL (BLACK SAND AND GRAVEL, CLAY AND CINDERS - SOM CONCRETE, ROCK FRAGMEN AND COAL)
410	10		
	15		BROWN MEDIUM STIFF SILTY
	20		BROWN FINE-GRAINED SANDY
400	25		LIGHT BROWN MEDIUM-GRAIN SAND - SOME LEACHATE
	30		GRAY CLAYEY SILT TO SILTY WITH A FEW THIN SAND SEAMS SOME LEACHATE
390 12/30/77	35		
	40		
380	45		
	50		
370	55		GRAY MEDIUM DENSE MEDIU TO COARSE-GRAINED SAND - TRACE OF GRAVEL AND SILT
	60		
360	65		
	70		
350	75		
342.1	80		

BOTTOM OF BORING 80.5'

NOTES:

1. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 384.0.
2. WELLPOINT INSTALLED IN AN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 388.0.
3. SHELBY TUBE 1 OBTAINED IN OFFSET BORING AT PREDETERMINED DEPTH.

DATE BEGAN: 11-9-77
DATE FINISHED: 11-11-77
GROUND SURFACE EL: 421.9

BORING NO. B-14

FIELD ENGINEER: J. L. HOELLE
CHECKED BY: J. L. HOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS
420	5		FILL (BLACK FLY ASH, CINDERS, CONCRETE - SOME SILTY CLAY - TRACE OF WOOD - SOME LEACHATE) 14.0'	
410	10, 15	8, 24, 9	DARK GRAY VERY STIFF SILTY CLAY - SOME LEACHATE 20.5'	cl
400	20		GREENISH-GRAY SILTY FINE SAND - SOME SILTY CLAY LAYERS - SOME LEACHATE 24.0'	sp
390	25, 30, 35		DARK GREENISH-GRAY MEDIUM STIFF TO SOFT SILTY CLAY, A FEW SAND LAYERS - SOME LEACHATE 35.0'	cl
	40		DARK GREENISH-GRAY SILTY SAND - SOME LEACHATE 40.0'	sm
380	45, 50, 55		DARK GREENISH-GRAY TO BROWNISH-GRAY MEDIUM-GRAINED SAND - SOME LEACHATE 40.0' TO 45.0' 60.0'	sp
370	60, 65, 70		GRAY MEDIUM TO COARSE-GRAINED SAND 75.0'	sp
360	75, 80, 85, 90, 95		GRAY COARSE-GRAINED SAND - TRACE OF LEACHATE 85.0' TO 86.5', BOULDERS 95.0' TO 100.5'	sp
350				
340				
330				
321.4	100	S-26		

PENETRATION RESISTANCE (BLOWS PER FOOT): 10 20 30
WATER CONTENT (PERCENT): 20 40

BOTTOM OF BORING
100.5'

THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS AND DATES INDICATED SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING LOCATIONS ALSO THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE BORING LOCATIONS

NOTES
1. FOR PLAN AND LOCATION OF BORINGS SEE FIGURE 3
2. FOR GENERAL NOTES AND LEGEND SEE FIGURE 10

DATE BEGAN: 11-28-77
DATE FINISHED: 11-29-77
GROUND SURFACE EL: ~421

BORING NO. B-15

FIELD ENGINEER: J. L. HOELLE
CHECKED BY: J. L. HOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS
420	5		FILL (BLACK FLY ASH, CINDERS - SOME ROCK FRAGMENTS) 6.0'	
			BROWN SILTY SAND TO SANDY SILT 9.0'	sm
410	10		LIGHT BROWN MEDIUM-GRAINED SAND - TRACE OF CLAY 12.0'	sp
	15		BROWN LAYERED SILTY CLAY AND SAND 15.0'	cl-sp
400	20		GRAY TO BROWN SANDY SILT TO SILTY SAND 21.0'	sm
	25		DARK BROWN SILTY TO SANDY CLAY - SOME LEACHATE 24.0'	cl-ml
390	30, 35, 40		GRAY TO BLACK SANDY SILT TO SILTY SAND - SOME LEACHATE 44.0'	sm
12/30/77				
380	45		DARK GRAY SOFT SILTY CLAY - SOME COAL FRAGMENTS 49.0'	cl
370	50		DARK GRAY FINE-GRAINED SANDY SILT 54.0'	ml
	55		GRAY MEDIUM-GRAINED SAND AND GRAVEL - TRACE OF SILT 60.5'	sw
360.5	60			

PENETRATION RESISTANCE (BLOWS PER FOOT): 10 20 30
WATER CONTENT (PERCENT): 20 40

BOTTOM OF BORING
60.5'

NOTES:
1. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 363.3.
2. WELLPOINT INSTALLED IN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 380.8.

FIGURE 8

BORING LOGS B-12 THROUGH B-15
SUBSURFACE INVESTIGATION

W.G. KRUMMRICH PLANT
SAUGET, ILLINOIS

PREPARED FOR

MONSANTO COMPANY
ST. LOUIS, MISSOURI

D'APPOLONIA

DRAWING NUMBER 77-661-E 6

DRAWN BY TRS & MEL 12-13-77

CHECKED BY [illegible] 3-10-78

APPROVED BY [illegible] 7-10-78

DATE BEGAN: 11-4-77
DATE FINISHED: 11-4-77
GROUND SURFACE EL: -422

BORING NO. B-12

FIELD ENGINEER: A. M. JACOBS
CHECKED BY: J. L. HOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 50	WATER CONTENT (PERCENT) 20 40
420	5			FILL (BLACK FLY ASH - SOME SILTY CLAY, SAND AND GRAVEL AND LEACHATE)			
410	10						
	15			15.0'			
400	20			SILTY FINE TO MEDIUM-GRAINED SAND, LEACHATE 23.0' TO 25.0'	sp		
	25						
390	30						
	35			39.0'			
380	40			MEDIUM-GRAINED SAND - SOME LEACHATE	sp		
	45			49.0'			
370	50			SILTY MEDIUM-GRAINED SAND	sm		
	55			54.0'			
361.5	60			COARSE-GRAINED SAND	sp		
				60.5'			

BOTTOM OF BORING
60.5'

DATE BEGAN: 11-11-77
DATE FINISHED: 11-14-77
GROUND SURFACE EL: -419

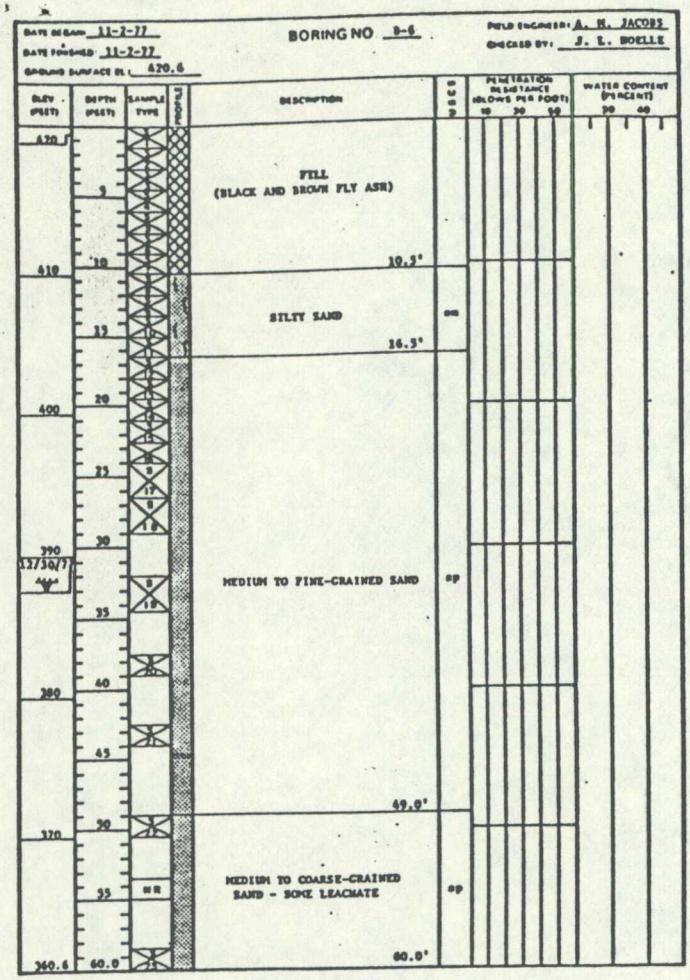
BORING NO. B-13

FIELD ENGINEER: J. L. HOELLE
CHECKED BY: J. L. HOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 50	WATER CONTENT (PERCENT) 20 40
410	5			FILL (BLACK FLY ASH, CINDERS - SOME SAND AND GRAVEL FIBROUS MATERIAL AND LEACHATE)			
	10			12.0'			
	15			FILL (BLACK CINDERS)			
400				15.0'			
				GRAY AND BROWN INTERBEDDED MEDIUM-GRAINED SAND AND SOFT SILTY CLAY	sp-cl		
	20			19.5'			
				GRAY SILT AND FINE-GRAINED SANDY SILT	ml		
	25			24.0'			
390 12/30/77	30			DARK GRAY SOFT SILTY CLAY - SOME FINE-GRAINED SAND - SOME LEACHATE	cl		
	35			34.0'			
380	40			DARK GRAY MEDIUM DENSE MEDIUM TO COARSE-GRAINED SAND - COBBLES 59.0' TO 60.5'	sp		
	45						
370	50						
	55						
360 358.5	60			60.5'			

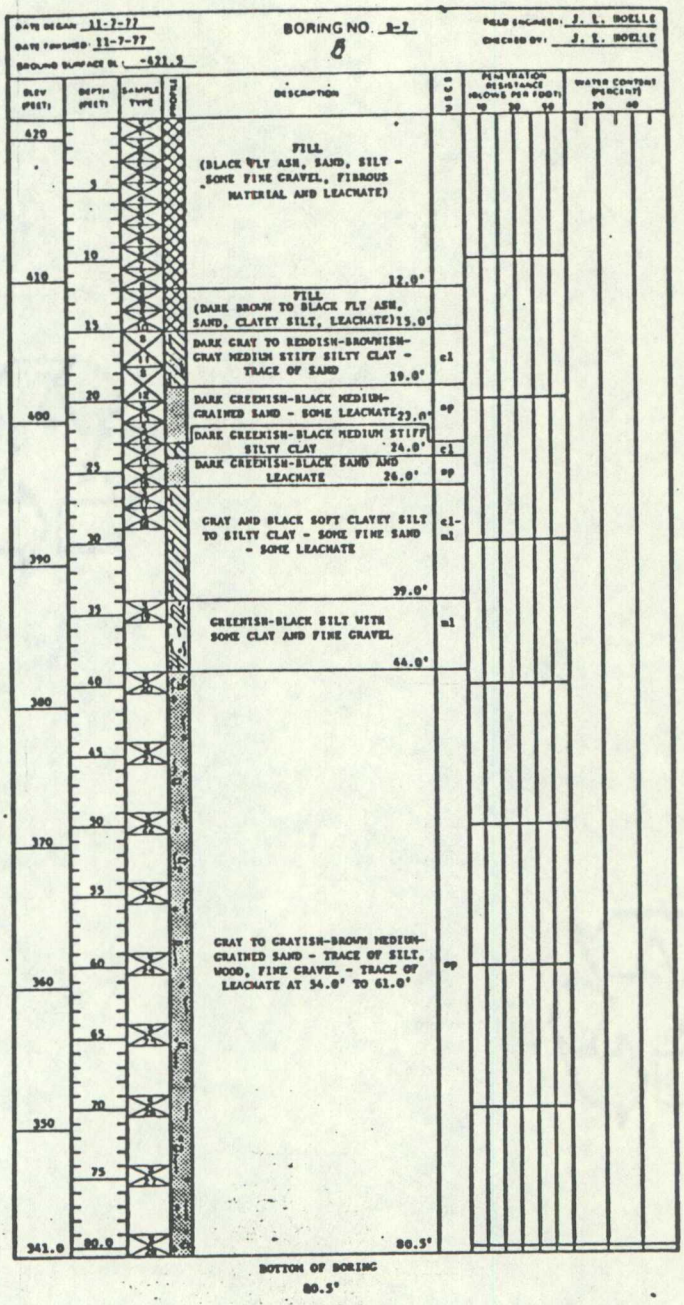
BOTTOM OF BORING
60.5'

NOTE: WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 361.6.



NOTES:

1. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 364.6.
2. WELLPOINT INSTALLED IN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 386.8.



THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS AND DATES INDICATED SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING LOCATIONS ALSO THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE BORING LOCATIONS

NOTES

1. FOR PLAN AND LOCATION OF BORINGS SEE FIGURE 3.
2. FOR GENERAL NOTES AND LEGEND SEE FIGURE 10.

FIGURE 6

BORING LOGS B-4 THROUGH B-7 SUBSURFACE INVESTIGATION

W.G. KRUMMRICH PLANT
SAUGET, ILLINOIS

PREPARED FOR

MONSANTO COMPANY
ST. LOUIS, MISSOURI

D'APPOLONIA

DRAWING NUMBER	77-661-E4
DRAWN BY	TRS & MEL 12-13-77
CHECKED BY	JLM 3-10-78
APPROVED BY	2-10-78

DATE BEGAN: 11-3-77
DATE FINISHED: 11-7-77
GROUND SURFACE EL.: ~422.9

BORING NO. B-4

FIELD ENGINEER: A. N. JACOBS
CHECKED BY: J. L. NOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS
420	5, 10		FILL (BLACK AND BROWN FLY ASH, CINDERS - SOME SILT AND GRAVEL)	
			23.0'	
410	15, 20		FINE TO COARSE SAND - SOME SILT - TRACE TO SOME LEACHATE	sm
400	25			
			29.0'	
390	30, 35 (12/30/77)		CLAYEY SILT TO SILTY CLAY	cl-ml
380	40, 45			
			45.0'	
			SILTY FINE SAND	sm
	50		51.5'	
370	55, 60		GRAY TO GRAYISH-BROWN MEDIUM-GRAINED SAND - TRACE OF WOOD, GRAVEL AND LEACHATE	sp
360	65, 70			
350	75, 80			
340	85, 90			
			90.0'	
330	95, 100		BROWNISH-GRAY MEDIUM TO COARSE-GRAINED SAND - TRACE OF GRAVEL	sp
320	105, 110			
311.4	111.5		111.5'	

PENETRATION RESISTANCE (BLOWS PER FOOT): 10, 20, 30
WATER CONTENT (PERCENT): 20, 40

BOTTOM OF BORING
111.5'

DATE BEGAN: 10-31-77
DATE FINISHED: 10-31-77
GROUND SURFACE EL.: 421.9

BORING NO. B-9

FIELD ENGINEER: A. N. JACOBS
CHECKED BY: J. L. NOELLE

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	USCS
420	5, 10		FILL (BLACK AND BROWN FLY ASH, SAND AND GRAVEL)	
			10.5'	
410	15	9 / 14	SANDY SILTY CLAY	cl
			16.0'	
10-31-77	20		SILTY FINE SAND WITH SOME LAYERS OF FINE TO MEDIUM-GRAINED SAND	sm
400	25		25.0'	
			SILTY CLAY 26.5'	cl
390	30, 35		SILTY SAND WITH SOME MEDIUM-GRAINED SAND LAYERS	sm
			38.0'	
382.4	39.5		MEDIUM GRAINED SAND 39.5'	sp

PENETRATION RESISTANCE (BLOWS PER FOOT): 10, 20, 30
WATER CONTENT (PERCENT): 20, 40

BOTTOM OF BORING
39.5'

NOTES:

1. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 357.9.
2. WELLPOINT INSTALLED IN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 390.5.

BORING NO. B-20

FIELD ENGINEER: J. L. McELLE
CHECKED BY: J. L. McELLE

DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 20 30	WATER CONTENT (PERCENT) 20 40
FILL (GRAY AND BROWN SILT, CLAY - SOME SAND, GRAVEL AND CINDERS) 6.0'			
BROWN MEDIUM-GRAINED SAND WITH A FEW SILTY CLAY LAYERS 13.5'	sp		
DARK BROWN SILTY CLAY WITH A FEW SILTY SAND LAYERS 20.5'	cl		
GRAY TO GRAYISH-BROWN SAND - TRACE OF SILT 39.0'	sp		
DARK GRAY MEDIUM DENSE SAND - SOME GRAVEL 49.0'	sp		
DARK GRAY SAND - TRACE OF GRAVEL 60.5'	sp		

BOTTOM OF BORING
60.5'

WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 352.0.

P INDICATES PITCHER BARREL SAMPLER

2" O.D. SPLIT BARREL SAMPLE NUMBER

75/0.5' PENETRATION REFUSAL RESISTANCE AND FRACTIONAL INCREMENT DRIVEN IN FEET

12-10-75 GROUND WATER LEVEL AND DATE

U.S.C.S. UNIFIED SOIL CLASSIFICATION SYSTEM (CAPITAL LETTERS INDICATE LAB TEST CLASSIFICATION, LOWER CASE LETTERS INDICATE VISUAL FIELD CLASSIFICATION)

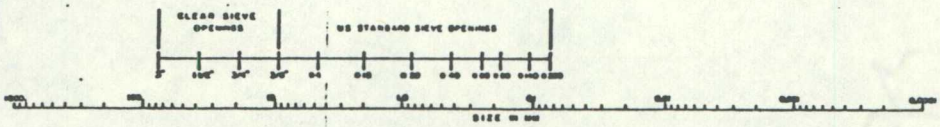
SAMPLE NUMBER
3" UNDISTURBED SAMPLE (SHELBY TUBE)
RECOVERY INCHES

PLASTIC LIMIT (PL)
ATTERBERG LIMITS
LIQUID LIMIT (LL)

ROD (ROCK QUALITY DESIGNATION - PERCENT)
(LENGTH OF NUMBER OF PIECES GREATER THAN 4 INCHES DIVIDED BY THE LENGTH OF THE CORE RUN)
(60)
90
INDICATES PERCENT OF CORE RECOVERED (LENGTH OF CORE RECOVERED DIVIDED BY LENGTH OF CORE RUN)

DRILLING FLUID LOSS ____%

DRILLING FLUID REGAINED ____%



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

USCS CLASSIFICATION FOR SOILS

BOULDER	COBBLE	PEBBLE	GRANULE	VERY COARSE SAND	COARSE SAND	MEDIUM SAND	FINE SAND	VERY FINE SAND	SILT	CLAY	INDIVIDUAL PARTICLES
BOULDER CONGLOMERATE	COBBLE CONGLOMERATE	PEBBLE CONGLOMERATE	SANDSTONE						SILTSTONE	CLAYSTONE AND SHALE	CONSOLIDATED ROCK

WENTWORTH SCALE FOR ROCK

TERMS USED TO DESCRIBE THE RELATIVE DEGREES OF ROCK CORE HARDNESS

DESCRIPTIVE TERMS	DEFINING CHARACTERISTICS
VERY SOFT	CRUSHES UNDER PRESSURE OF FINGERS AND/OR THUMB
SOFT	CRUSHES UNDER PRESSURE OF PRESSED HAMMER
MEDIUM HARD	BREAKS EASILY UNDER SINGLE HAMMER BLOW BUT WITH CRUMBLY EDGES
HARD	BREAKS UNDER ONE OR TWO STRONG HAMMER BLOWS BUT WITH RESISTANT SHARP EDGES
VERY HARD	BREAKS UNDER SEVERAL STRONG HAMMER BLOWS BUT WITH VERY RESISTANT SHARP EDGES AND MAY SPALL LEAVING CONCHOIDAL FRACTURES

THE SPACING OF THE DISCONTINUITIES IN THE ROCK MAY BE DESCRIBED BY ONE OF THE FOLLOWING TERMS

DESCRIPTIVE TERMS	SPACING
VERY BROKEN	LESS THAN 1 IN
BROKEN	1 IN. TO 3 IN
SLIGHTLY BROKEN	3 IN TO 6 IN
MASSIVE	6 IN. AND GREATER

TERMS USED TO DESCRIBE BEDDING THICKNESS

VERY THICKLY BEDDED	THICKER THAN 1 m
THICKLY BEDDED	30-100 cm
MEDIUM BEDDED	10-30 cm
THINLY BEDDED	3-10 cm
VERY THINLY BEDDED	1-3 cm
THICKLY LAMINATED	0.3-1 cm
THINLY LAMINATED	THINNER THAN 0.3 cm

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH TONS PER SQUARE FOOT
VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
MEDIUM STIFF	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DESIGNATION	BLOWS PER FOOT
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM DENSE	11-30
DENSE	31-50
VERY DENSE	OVER 50

STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2 INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140 POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER WAS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6 INCH INTERVAL. THE RESISTANCE TO PENETRATION IS INDICATED ON THE DRAWING AS BLOWS PER FOOT.

THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS AND DATES INDICATED SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING LOCATIONS ALSO THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE BORING LOCATIONS

NOTES

1. FOR PLAN AND LOCATION OF BORINGS SEE FIGURE 3

FIGURE 10
BORING LOGS B-19 AND B-20
GENERAL NOTES AND LEGEND
SUBSURFACE INVESTIGATION

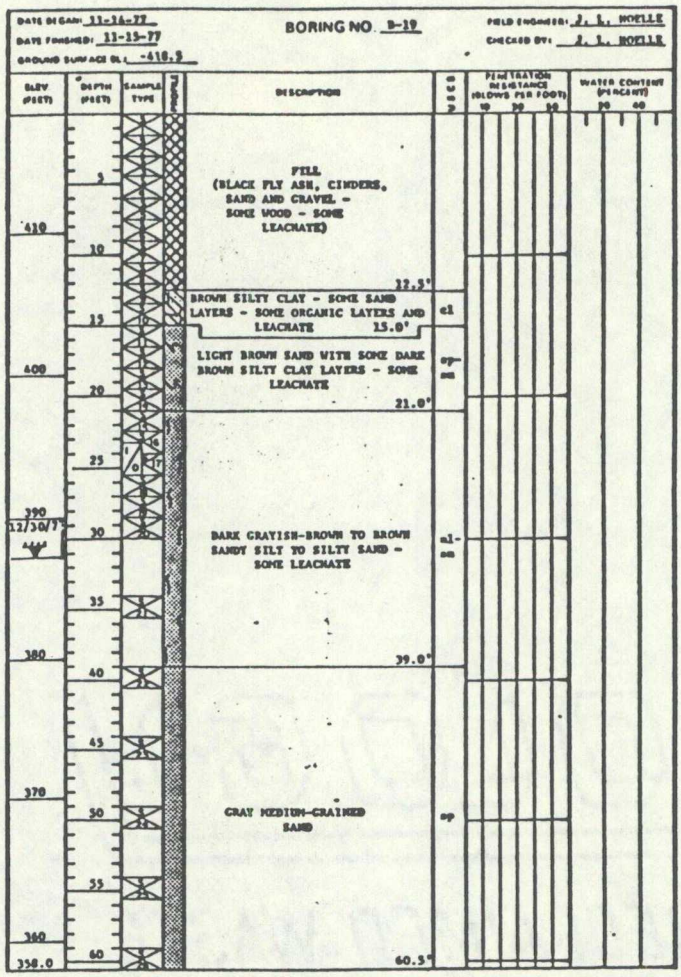
W.G. KRUMMRICH PLANT
SAUGET, ILLINOIS

PREPARED FOR

MONSANTO COMPANY
ST. LOUIS, MISSOURI

D'APPOLONIA

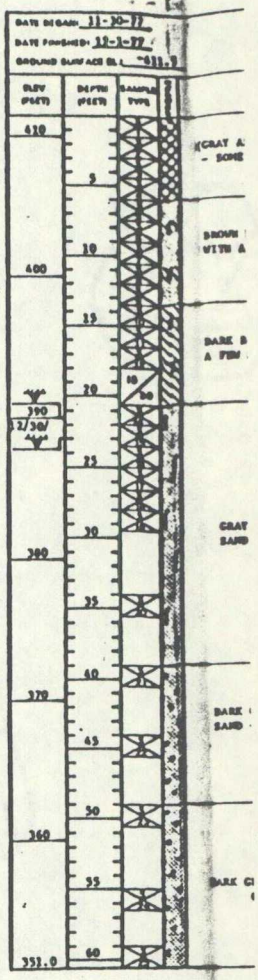
DRAWN BY	TRS & MEL	CHECKED BY		DRAWING NUMBER 77-661-E8
	12-13-77	APPROVED BY		



BOTTOM OF BORING
60.5'

NOTES:

1. SHELBY TUBE 1 OBTAINED IN AN OFFSET BORING AT A PREDETERMINED DEPTH.
2. WELLPOINT INSTALLED AT COMPLETION OF BORING WITH TIP AT APPROXIMATELY ELEVATION 361.5.
3. WELLPOINT INSTALLED IN AN OFFSET BORING WITH TIP AT APPROXIMATELY ELEVATION 384.7.



Symbols to be used for designation of subsurface materials on all boring logs and subsurface sections

OVERBURDEN:

- Glacial Till
- Gravel
- Sand
- Silt
- Clay
- Organic Material

SEDIMENTARY ROCKS

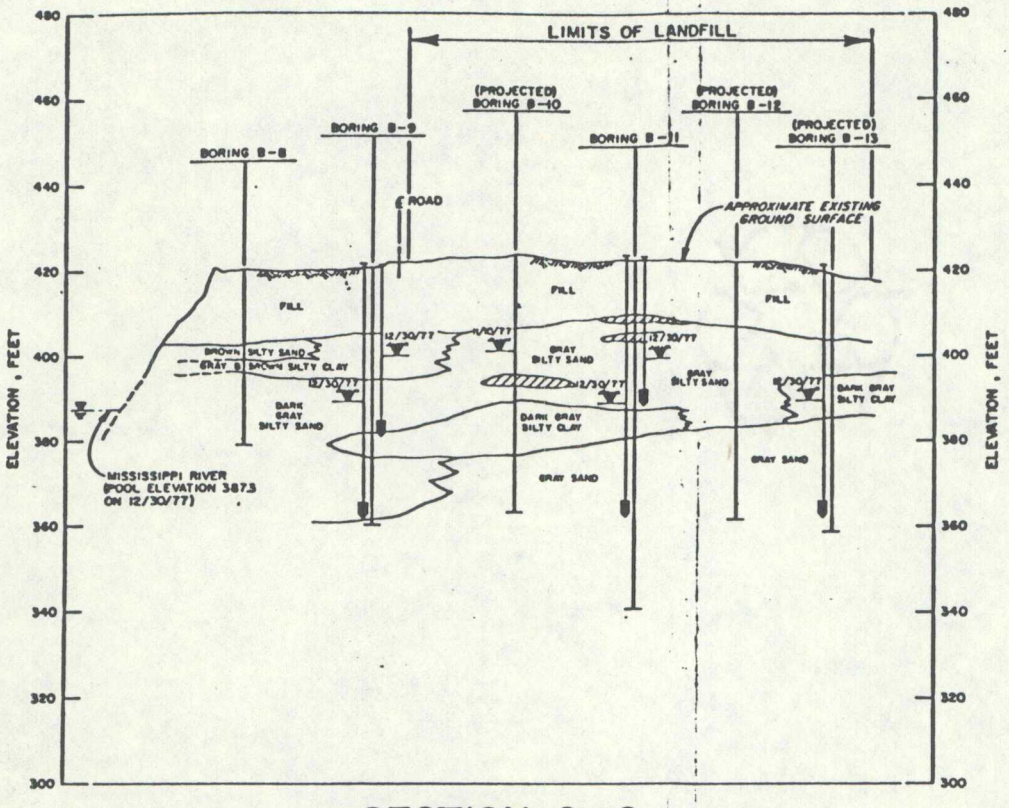
- Limestone
- Siltstone
- Sandstone
- Mesaive Mudstone or Claystone
- Shale
- Coal
- Dolomite
- Conglomerate
- Breccia
- Crystalline Limestone
- Bedded Chert
- Marble
- Chalk
- Gypsum
- Salt
- Anhydrite
- Limestone Containing Nodules Of Chert Or Flint

METAMORPHIC & IGNEOUS ROCKS:

- Schistose Or Gneissoid Granite
- Granite
- Gneiss
- Quartzite
- Schist
- Basic Lava Flows
- Bedded Tuff

MISCELLANEOUS

- Slag
- Fill
- Concrete
- Void (Indicate Size of Void)
- Water
- Approximate Existing Ground Surface
- Approximate Top Of Rock



SECTION C-C

(LOOKING NORTH)

LEGEND:

12/1/77 — DATE OF OBSERVATION

— WATER LEVEL IN BORING

PIEZOMETER SENSING ZONE

NOTES:

1. FOR PLAN AND LOCATION OF BORINGS AND SECTIONS, SEE FIGURE 3.
2. FOR GENERAL NOTES AND LEGEND, SEE FIGURE 10.
3. FOR DETAILED DESCRIPTION OF BORINGS, SEE FIGURES 5 THROUGH 10.

HORIZONTAL SCALE

100 0 100 200 FEET

VERTICAL SCALE

20 0 20 40 FEET

THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS AND DATES INDICATED. SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING LOCATIONS. ALSO THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE BORING LOCATIONS.

THE DEPTH AND THICKNESS OF THE SUBSURFACE STRATA INDICATED ON THE SECTIONS WERE GENERALIZED FROM AND INTERPOLATED BETWEEN THE TEST BORINGS. INFORMATION ON ACTUAL SUBSURFACE CONDITIONS EXISTS ONLY AT THE LOCATION OF THE TEST BORINGS AND IT IS POSSIBLE THAT SUBSURFACE CONDITIONS BETWEEN THE TEST BORINGS MAY VARY FROM THOSE INDICATED.

FIGURE 4

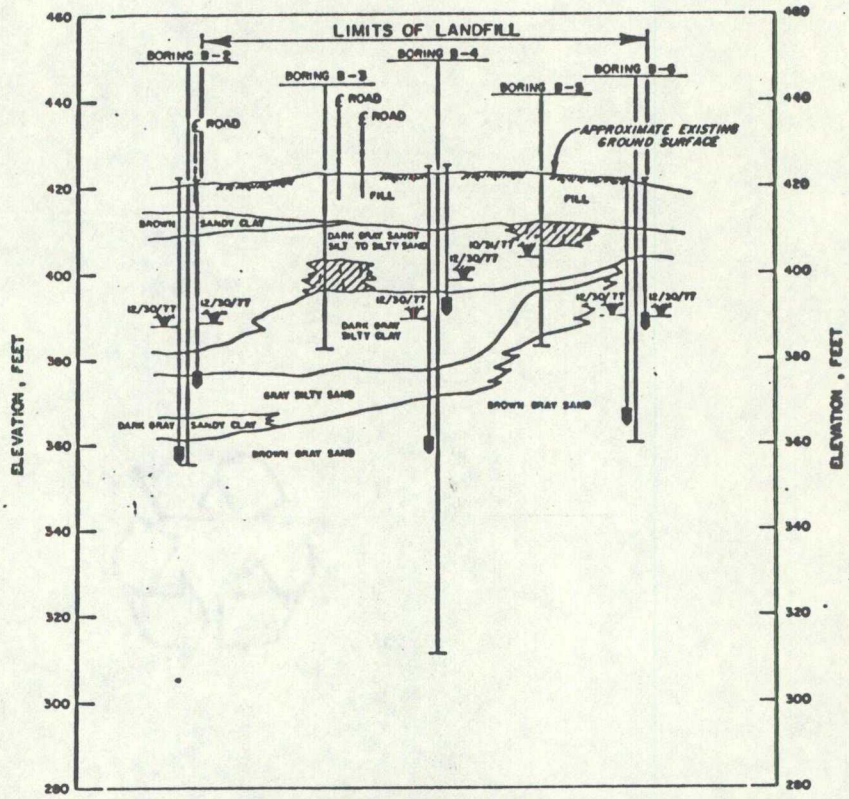
SECTIONS B-B, C-C AND D-D
SANITARY LANDFILL
W. G. KRUMMRICH PLANT
SAUGET, ILLINOIS

PREPARED FOR

MONSANTO COMPANY
ST. LOUIS, MISSOURI

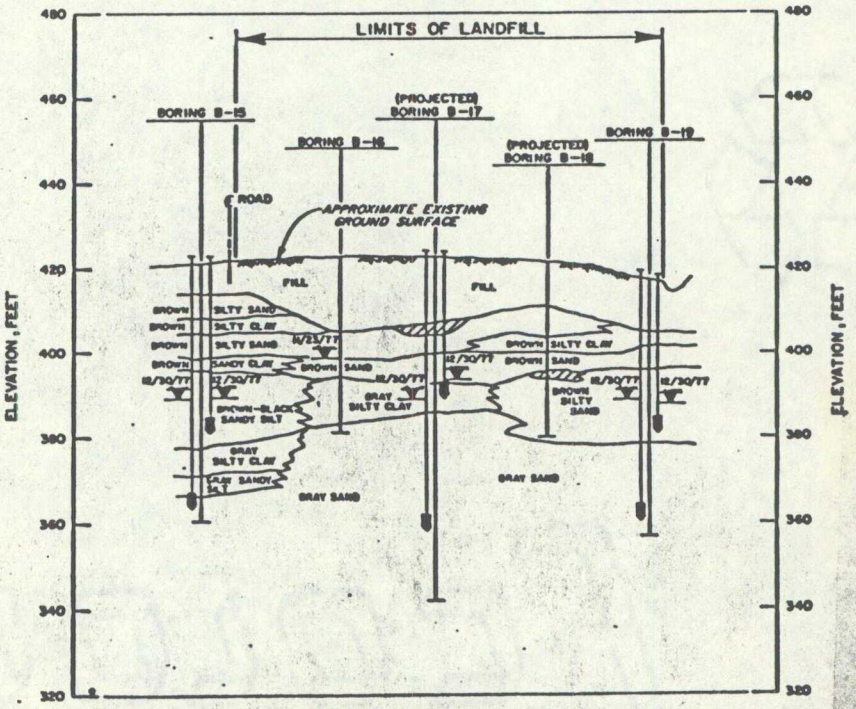
D'APPOLONIA

DRAWN BY	J.G.S.	CHECKED BY		3-16-78	DRAWING NUMBER 77-661-E9
	12·5·77	APPROVED BY		3-16-78	



SECTION B-B

(LOOKING NORTH)



SECTION D-D

(LOOKING NORTH)