Site Suitability Review of the Jensen Landfill

by
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and
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Prepared by the
North Dakota State Water Commission
and the
North Dakota Geological Survey

ND Landfill Site Investigation No. 41

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OF THE
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INTRODUCTION

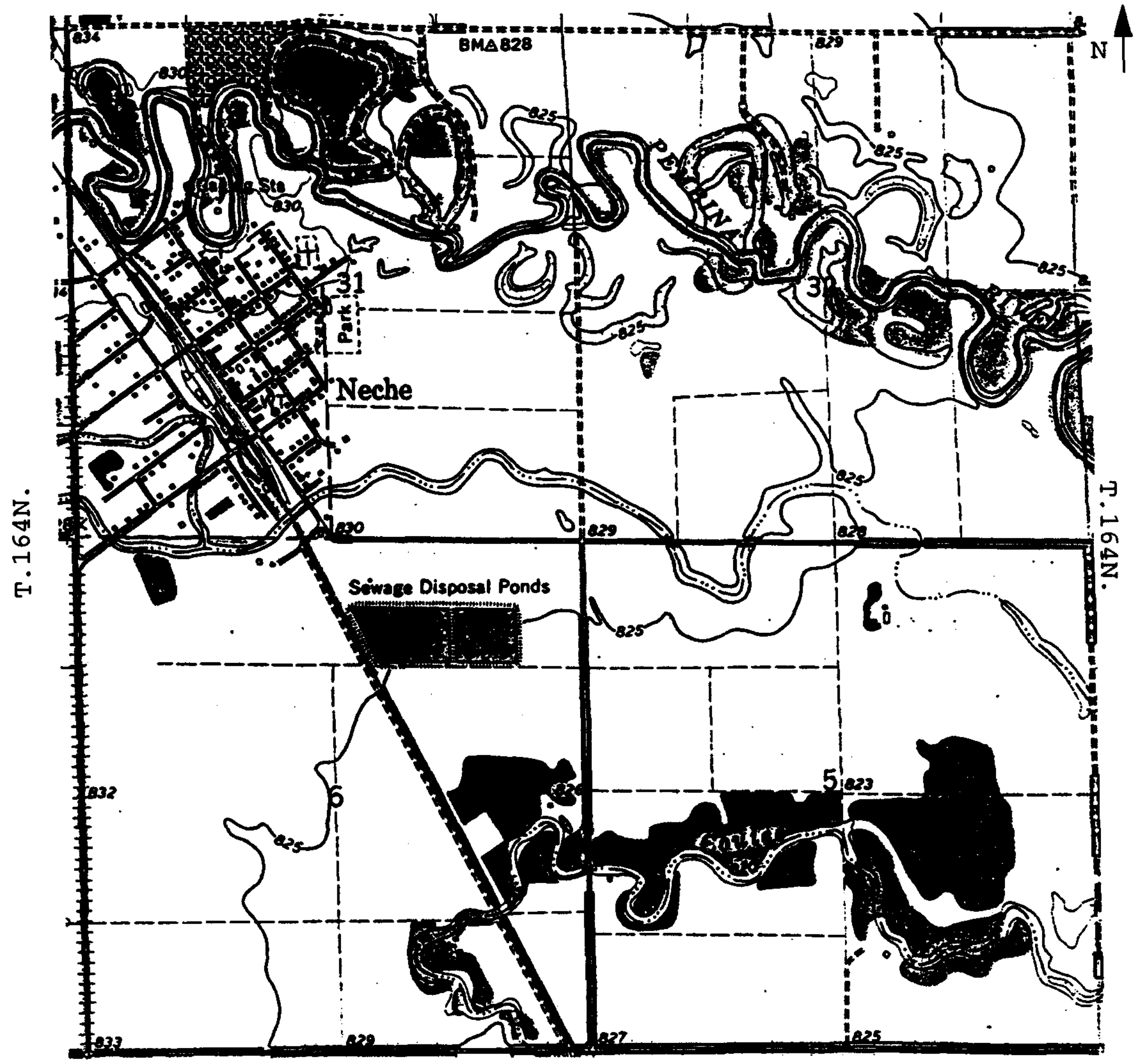
Purpose

The North Dakota State Engineer and the North Dakota State Geologist were instructed by the 52^{nd} State Legislative Assembly to conduct site-suitability reviews of the solid waste landfills in the state of North Dakota. These reviews are to be completed by July 1, 1995 (North Dakota Century Code 23-29-07.7). The purpose of this program is to evaluate site suitability of each landfill for disposal of solid waste based on geologic and hydrologic characteristics. Reports will be provided to the North Dakota State Department of Health and Consolidated Laboratories (NDSDHCL) for use in site improvement, site remediation, or landfill closure. A one time ground-water sampling event was performed at each site, and additional studies may be necessary to meet the requirements of the NDSDHCL for continued operation of solid-waste landfills. The Jensen solid-waste landfill is one of the landfills being evaluated.

Location of the Jensen Landfill

The Jensen solid-waste landfill is located about one-quarter mile north of the city of Neche in Township 164 North, Range 53 West, NW 1/4 Section 31 (Fig. 1) The landfill area encompasses about 10 acres.

R.53W.



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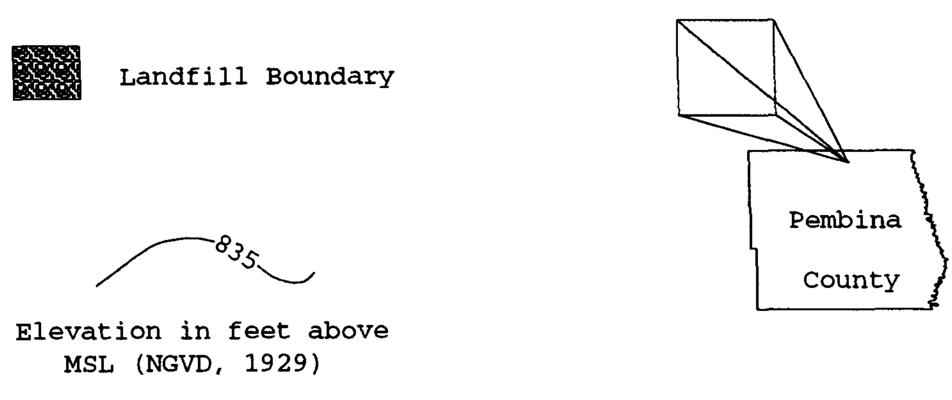

Figure 1. Location of the Jensen landfill in the NW 1/4, Section 31, T.164N., R.53W.

Previous Site Investigations

One soil boring was drilled by Peterson Well Company on January 10, 1986. This boring was drilled to a depth of 53 feet and lacustrine clay was the only lithology encountered. A water level was measured at 15.5 feet below land surface.

Methods of Investigation

The Jensen study was accomplished by means of: 1) drilling test holes; 2) constructing and developing monitoring wells; 3) collecting and analyzing water samples; and 4) measuring water levels.

Test-Drilling Procedure

The drilling method at the Jensen landfill was based on the site's geology and depth to ground water, as determined by the preliminary evaluation. A hollow-stem auger was used at the Jensen landfill because the sediments were poorly consolidated and because the depth to the water table was expected to be less than 70 feet. The lithologic descriptions were determined from the drill cuttings.

Monitoring Well Construction and Development

Five test holes were drilled at the Jensen landfill, and monitoring wells were installed in all five test holes. The number of wells installed at the Jensen landfill was based on the geologic and topographic characteristics of the site. The depth and intake interval of each well was selected to monitor the water level at the top of the uppermost aquifer. The wells were located within boundaries of the landfill.

Wells were constructed following a standard design (Fig. 2) intended to comply with the construction regulations of the NDSDHCL and the North Dakota Board of Water Well Contractors (North Dakota Department of Health, 1986). The wells were constructed using a 2-inch diameter, SDR21, polyvinyl chloride (PVC) well casing and a PVC screen, either 5 or 10 feet long, with a slot-opening size of 0.012 or 0.013 inches. The screen was fastened to the casing with stainless steel screws (no solvent weld cement was used). After the casing and screen were installed into the drill hole, the annulus around the screen was filled with No. 10 (grain-size diameter) silica sand to a height of two feet above the top of the screen. A two to three-foot bentonite plug was placed above the sand pack using medium-size bentonite chips. High-solids bentonite grout and/or neat cement was placed above the bentonite plug to seal the annulus to approximately five feet below land surface. The remaining annulus was filled

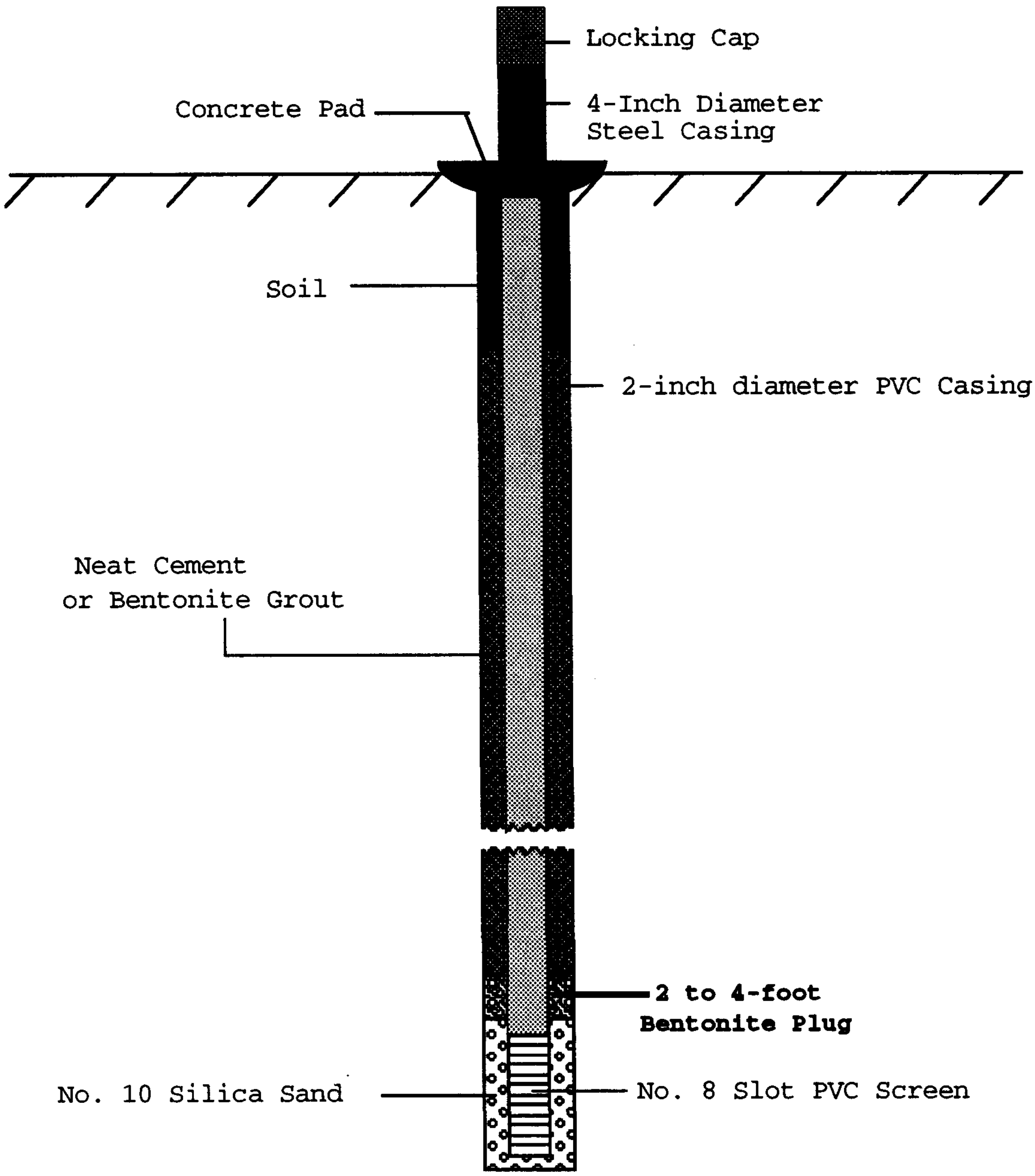

Figure 2. Construction design used for monitoring wells installed at the Jensen landfill.

with drill cuttings. The permanent wells were secured with a protective steel casing and a locking cover protected by a two-foot-square concrete pad.

All monitoring wells were developed using a stainless steel bladder pump or a teflon bailer. Any drilling fluid and fine materials present near the well were removed to insure movement of formation water through the screen.

The Mean Sea Level (MSL) elevation was established for each well by differential leveling to Third Order accuracy. The surveys established the MSL elevation at the top of the casing and the elevation of the land surface next to each well.

Collecting and Analyzing Water Samples

Water-quality analyses were used to determine if leachate is migrating from the landfill into underlying aquifers. Selected field parameters, major ions, and trace elements were measured for each water sample. These field parameters and analytes are listed in Appendix A with their Maximum Contaminant Levels (MCL). MCLs are enforceable drinking water standards that represent the maximum permissible level of a contaminant as stipulated by the U.S. Environmental Protection Agency (EPA).

Water samples were collected using a bladder pump constructed of stainless steel with a teflon bladder. A teflon bailer was used in monitoring wells with limited transmitting capacity. Before sample collection, three to four well volumes were extracted to insure that unadulterated formation water was sampled. Four samples from each well were collected in high-density polyethylene plastic bottles as follows:

1) Raw (500 ml)

2) Filtered (500 ml)

3) Filtered and acidified (500 ml)

4) Filtered and double acidified (500 ml)

The following parameters were determined for each sample: Specific conductance, pH, bicarbonate, and carbonate were analyzed using the raw sample. Sulfate, chloride, nitrate*, and dissolved solids were analyzed using the filtered sample. Calcium, magnesium, sodium, potassium, iron, and manganese were analyzed from the filtered, acidified sample. Cadmium, lead, arsenic, and mercury were analyzed using the filtered double-acidified samples.

One well was sampled for Volatile Organic Compounds (VOC) analysis. This sample was collected at a different time than the standard water-quality sample. The procedure used for collecting the VOC sample is described in Appendix B. Each sample was collected with a plastic throw-away bailer and kept chilled. These samples were analyzed within the permitted 14-day holding period. The standard water-quality analyses were performed at the North Dakota State

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* No special preservative techniques were applied to nitrate samples and as a result reported nitrate concentrations may be lower than actual.

Water Commission (NDSWC) Laboratory and VOC analyses were performed by the NDSDHCL.

Water-Level Measurements

Water-level measurements were taken at least three times at a minimum of two-week intervals. The measurements were taken using a chalked-steel tape or an electronic (Solnist 10078) water-level indicator. These measurements were used to determine the shape and configuration of the water table.

Location-Numbering System

The system for denoting the location of a test hole or observation well is based on the federal system of rectangular surveys of public land. The first and second numbers indicate Township north and Range west of the 5th Principle Meridian and baseline (Fig. 3). The third number indicates the section. The letters A, B, C, and D designate, respectively, the northeast, northwest, southwest, and southeast quarter section (160-acre tract), quarter-quarter section (40-acre tract), and quarter-quarter-quarter section (10-acre tract). Therefore, a well denoted by 164-053-31BAD would be located in the SE1/4, NE1/4, NW1/4, Section 31, Township 164 North, Range 53 West. Consecutive numbers are added following the three letters if more than one well is

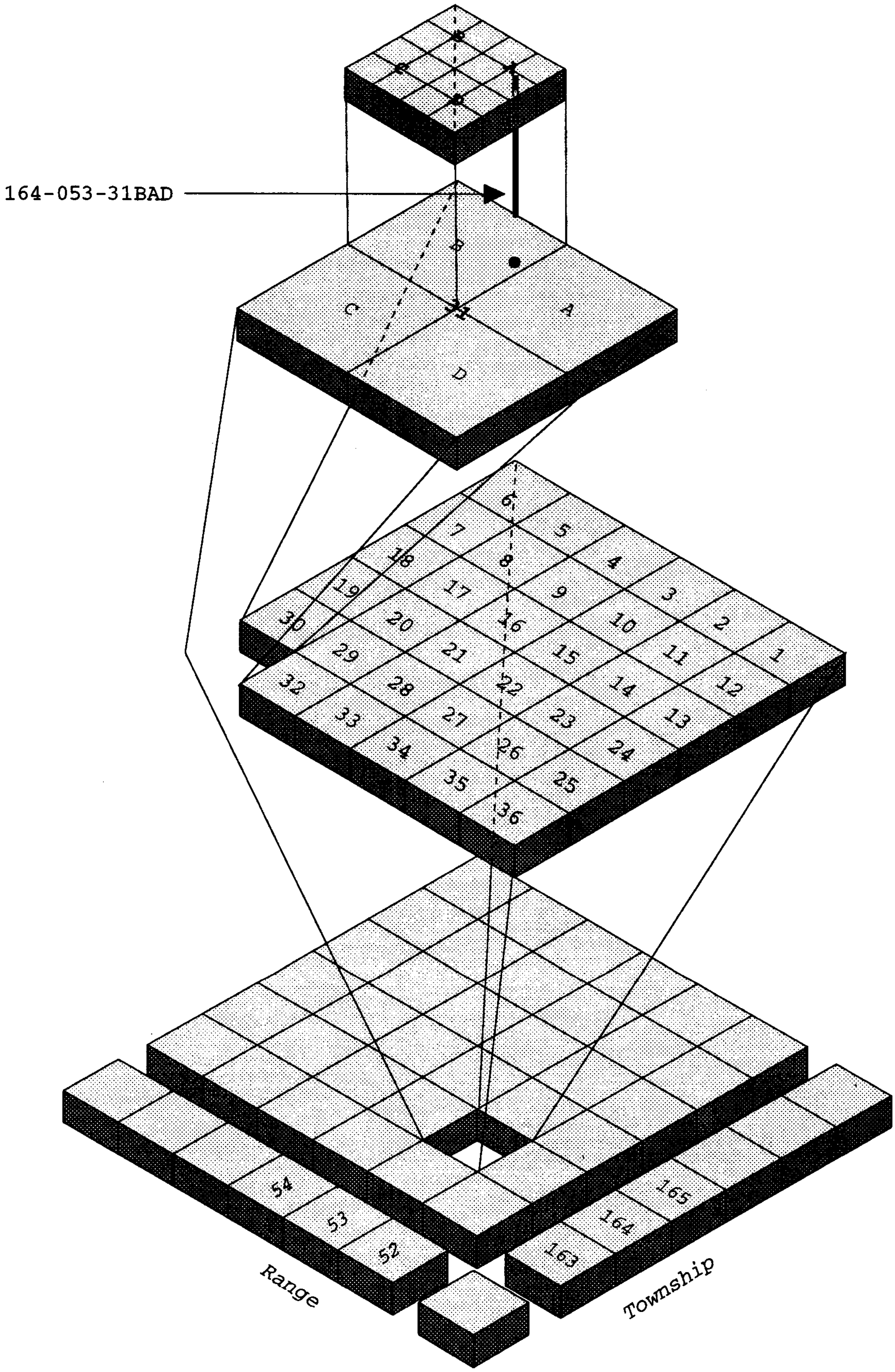

Figure 3. Location-numbering system.

located in a 10-acre tract, e.g. 164-053-31BAD1 and 164-053-31BAD2.

GEOLOGY

Regional Geology

The Jensen landfill lies within the Red River Valley physiographic region, a flat plain that was formerly the basin of glacial Lake Agassiz. The landfill is near the Pembina River. Surficial deposits in the area consist of alluvium and offshore lake sediment (Arndt, 1975).

A deep test hole drilled less than a mile from the landfill illustrates the subsurface stratigraphy of the area. Test hole 164-054-25DAA2 was drilled by the North Dakota Geological Survey in 1966. This hole penetrated lacustrine clay and silt from the surface to 145 feet followed by glacial till from 145 feet to 201 feet. A sequence of bedrock shale believed to be Triassic or Jurassic in age was observed from 201 feet to 383 feet. Limestone from the Ordovician-Silurian Stonewall Formation was encountered from 383 feet to the bottom of the hole at 400 feet (Hutchinson, 1973).

Local Geology

The Jensen landfill is located on the north side of the Pembina River (Fig. 4). The active area of the landfill is bounded on the south and east by abandoned oxbows. The oxbow to the south has been nearly filled with sediment. The surface elevation of the active area of the landfill is between 830 feet and 835 feet, compared with an elevation of approximately 820 feet for the Pembina River.

Test hole 164-053-31BBA is located within the oxbow south of the active area of the landfill. Test hole 164-053-31BAC is on the bank of the present Pembina River channel. Test hole 164-053-31BAD is at the intersection of the oxbow with the river channel. Each of these test holes encountered an interval of sandy clay and silty clay underlain by a layer of medium-grained sand (Fig. 5, lithologic logs in Appendix C). These sediments are interpreted as alluvial deposits based on their topographic position and lithology. The sand is probably a channel deposit, whereas much of the overlying clay may represent overbank deposits.

Test hole 164-053-31BAB on the north side of the landfill encountered clay and silt with lenses of orange silt and very fine sand toward the base of the boring. These sediments are probably lake deposits. Test hole 164-053-31BAA is located near the other oxbow at the east side of the landfill. This test hole encountered fill and garbage at the

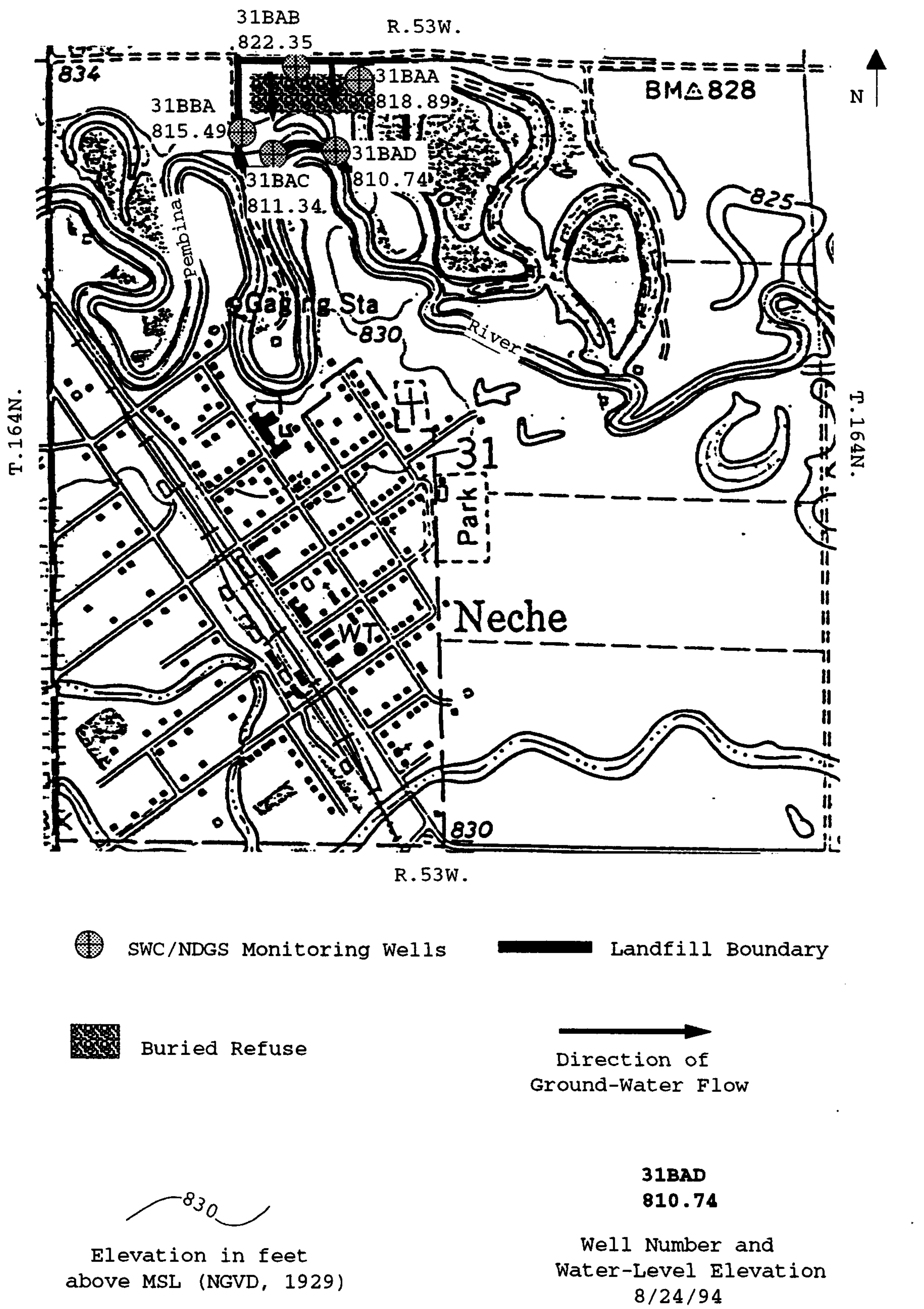

Figure 4. Location of monitoring wells and the direction of ground-water flow.

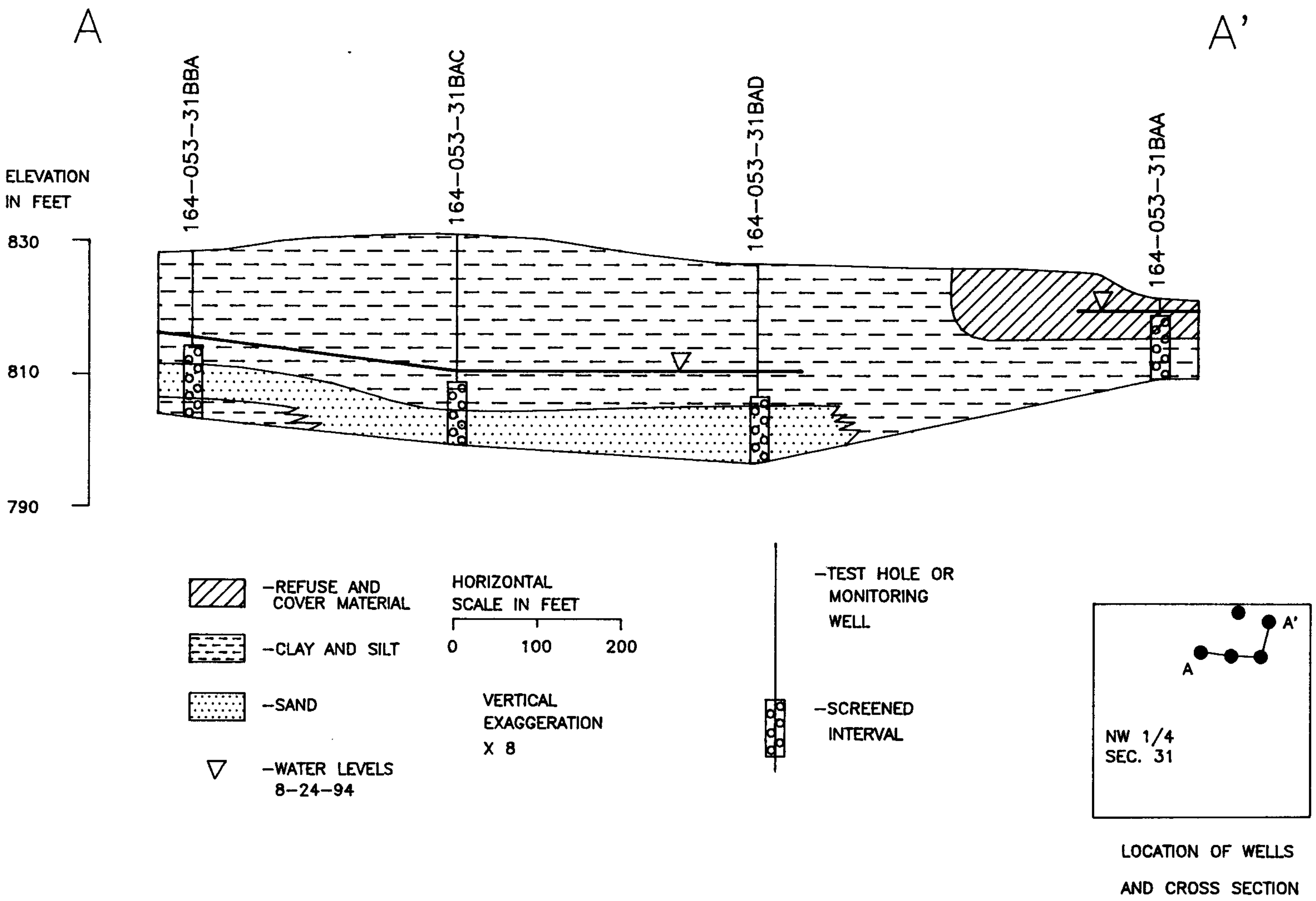

Figure 5. Geohydrologic section A–A' in the Jensen landfill.

surface overlying orange clay with silt and very fine sand similar to the basal part of 31BAB.

HYDROLOGY

Surface-Water Hydrology

The Pembina River forms the southern boundary of the Jensen landfill. The Pembina River is a slow meandering river that flows toward the east and discharges into the Red River. During periods of high precipitation or high snow melt the Pembina River may overflow its banks and flood ancestral meanders and oxbows. One old meander exists within 100 feet of the buried refuse. The City of Neche obtains its municipal water supply from the Pembina River (Hutchinson, 1977). The Pembina River may be susceptible to contaminant migration from the landfill due to its location.

Regional Ground-Water Hydrology

The main aquifer in the region is the Pembina River aquifer. The Pembina River aquifer is the most productive glacial aquifer in Pembina County (Hutchinson, 1977). The aquifer material consists of sand and gravel with increasing silt in the area of the Jensen landfill (Hutchinson, 1977). This aquifer has an average thickness of about 20 feet. The Pembina River aquifer is underlain by lake deposits consisting of clay and silt and overlain by a sequence of fluvial clay and silt (Hutchinson, 1977). Locally the aquifer is confined. Recharge to this aquifer is mainly by precipitation and from the Pembina River during periods of high stream flow. The Pembina River aquifer discharges into the Pembina River during periods of low or normal flow. This discharge establishes the base flow of the Pembina River. The Pembina River aquifer is characterized by a sodium-bicarbonate type water in the area of the Jensen landfill (Hutchinson, 1977). This aquifer may be susceptible to contaminant migration due to its shallow depth.

Undifferentiated aquifers are present in isolated sand and gravel deposits. These aquifers are generally limited in areal extent and contain small amounts of water. The ground-water chemistry in these aquifers is variable. It is not known if any undifferentiated aquifers are present near the Jensen landfill. No bedrock aquifers are present near the Jensen landfill.

Local Ground-Water Hydrology

Five test holes were drilled at the Jensen landfill and monitoring wells were installed at each site (Fig. 4). The well screens were placed near the top of the uppermost aquifer. Four water-level measurements were taken over an eight-week period (Appendix D). Wells 164-053-31BAD and 31BAC were placed along the bank of the Pembina River on the southern boundary of the landfill and are down-gradient from the landfill. Well 31BAB is located along the northern boundary and is up-gradient of the landfill. Wells 31BAA and 31BBA are located within old meander scars of the Pembina River, on the east and west sides respectively. Monitoring wells along the southern and western boundaries of the landfill are screened in a sand layer that was probably deposited during an older stage of the Pembina River (Fig. 5). Wells 31BAA and 31BAB are screened in lacustrine clay and silt. The local direction of ground-water flow is to the south toward the Pembina River (Fig. 4).

Water Quality

Chemical analyses of water samples are shown in Appendix E. Elevated chloride concentrations were detected in monitoring wells 31BAB (250 mg/L) and 31BBA (100 mg/L). These concentrations are near the SMCL and significantly higher than the other wells. Well 31BAB is located about 100 feet up-gradient of the buried refuse. It is possible that ground-water mounding beneath the cell may have reversed the direction of local ground-water flow thereby affecting the water chemistry in well 31BAB. Well 31BBA is located in an old meander scar west of the buried refuse. The elevated chloride concentration may be partially attributed to contaminant migration from the landfill.

The trace element analyses indicated a selenium concentration of 7 µg/L in wells 31BAB and 31BBA which is close to the selenium MCL of 10 µg/L. The source of this concentration was not determined. Well 31BAA detected a selenium concentration of 138 µg/L, which is about fourteen times higher than the MCL. The high selenium concentration in well 31BAA may be influenced by the buried refuse. The water level at well 31BAA is above the base of the buried refuse (Fig. 5).

The results of the VOC analysis, from well 31BAD, are shown in Appendix F. The VOC results detected concentrations of chloroform (4.53 µg/L) and dichloromethane (3.94 µg/L). It is inconclusive as to whether the source of this VOC compound is the result of laboratory contamination[†] or migration from the landfill.

CONCLUSIONS

The Jensen landfill is located within the Red River Valley physiographic region. The surficial deposits at the landfill consist of alluvium and offshore lake sediment underlain by glacial till.

The landfill is within 200 feet of the Pembina River, which flows eastward and discharges into the Red River. The active area of the landfill is bounded on the south and the

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[†] Beginning in September, 1994 the NDSDHCL changed their analytical procedures that lowered detection limits for VOC concentrations by one to two orders of magnitude.

east by abandoned oxbows of the Pembina River. The oxbow to the south contains a layer of medium-grained sand. During periods of high precipitation and snow melt the Pembina River may overflow its banks and flood the ancestral meanders and oxbows.

The Pembina aquifer is the most productive glacial aquifer in Pembina County. This aquifer is located beneath the Pembina River and consists of sand and gravel with increasing silt in the area of the Jensen landfill. Recharge to this aquifer is mainly by precipitation and infiltration from the Pembina River. This aquifer may be susceptible to contaminant migration from the landfill because of its shallow depth.

The sand aquifer beneath the landfill is associated with ancestral oxbows of the Pembina River. This aquifer may be hydraulically connected to the Pembina River aquifer. The direction of ground-water flow is to the south toward the Pembina River.

Water-quality analyses detected elevated chloride concentrations in monitoring wells 31BAB and 31BBA. These concentrations are at or near the SMCL and are significantly higher than the other wells. The elevated chloride concentrations may be due to contaminant migration from the landfill.

The trace element analyses from wells 31BAB and 31BBA detected elevated selenium concentrations approaching the MCL. Well 31BAA detected a selenium concentration that was fourteen times higher than the MCL. Monitoring well 31BAA is screened in an ancestral oxbow that contains buried refuse. The selenium may be derived from the buried refuse, which is below the water table.

The VOC analyses detected concentrations of chloroform and dichloromethane. It is inconclusive as to whether the source of this VOC compound is the result of laboratory contamination or migration from the landfill.

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APPENDIX A

WATER QUALITY STANDARDS
AND
CONTAMINANT LEVELS

Water Quality Standards
and
Contaminant Levels

Field Parameters	
appearance	color/odor
pH	6-9(optimum)
specific conductance	-----
temperature	-----

Constituent	**MCL (µg/L)**
Arsenic	50
Cadmium	10
Lead	50
Molybdenum	100
Mercury	2
Selenium	10
Strontium	*

*EPA has not set an MCL for strontium. The median concentration for most U.S. water supplies is 100 µg/L (Hem, 1989).

	SMCL (mg/L)
Chloride	250
Iron	>0.3
Nitrate	50
Sodium	20-170
Sulfate	300-1000
Total Dissolved Solids	>1000

	Recommended Concentration Limits (mg/L)
Bicarbonate	150-200
Calcium	25-50
Carbonate	150-200
Magnesium	25-50
Hardness	>121 (hard to very hard)

APPENDIX B

SAMPLING PROCEDURE FOR
VOLATILE ORGANIC COMPOUNDS

SAMPLING PROCEDURE FOR 40ML AMBER BOTTLES

Sample Collection for Volatile Organic Compounds

by
North Dakota Department of Health
and Consolidated Laboratories

1. Three samples must be collected in the 40ml bottles that are provided by the lab. One is the sample and the others are duplicates.

2. A blank will be sent along. Do Not open this blank and turn it in with the other three samples.

3. Adjust the flow so that no air bubbles pass through the sample as the bottle is being filled. No air should be trapped in the sample when the bottle is sealed. Make sure that you do not wash the ascorbic acid out of the bottle when taking the sample.

4. The meniscus of the water is the curved upper surface of the liquid. The meniscus should be convex (as shown) so that when the cover to the bottle is put on, no air bubbles will be allowed in the sample.

convex meniscus

5. Add the small vial of concentrated HCL to the bottle.

6. Screw the cover on with the white Teflon side down. Shake vigorously, turn the bottle upside down, and tap gently to check if air bubbles are in the sample.

7. If air bubbles are present, take the cover off the bottle and add more water. Continue this process until there are no air bubbles in the sample.

8. The sample must be iced after collection and delivered to the laboratory as soon as possible.

9. The 40 ml bottles contain ascorbic acid as a preservative and care must be taken not to wash it out of the bottles. The concentrated acid must be added after collection as an additional preservative.

APPENDIX C

LITHOLOGIC LOGS
OF WELLS AND TEST HOLES

164-053-31BAA
NDSWC

Date Completed:	6/7/94	Purpose:	Observation Well
L.S. Elevation (ft):	821.52	Well Type:	2" PVC
Depth Drilled (ft):	13	Aquifer:	Undefined
Screened Interval (ft):	3-13	Source:	
		Owner:	Harold Jensen

Lithologic Log

Unit	Description	Depth (ft)
FILL		0-3
FILL	REFUSE	3-6
CLAY	MEDIUM GRAY, LAKE SEDIMENT	6-10
CLAY	SILTY, GRAY WITH LENSES OF YELLOWISH-ORANGE SANDY CLAY TOTAL DEPTH 13 FEET.	10-13

164-053-31BAB
NDSWC

Date Completed:	6/7/94	Purpose:	Observation Well
L.S. Elevation (ft):	830.19	Well Type:	2" PVC
Depth Drilled (ft):	29	Aquifer:	Undefined
Screened Interval (ft):	19-29	Source:	
		Owner:	HAROLD JENSEN

Lithologic Log

Unit	Description	Depth (ft)
TOPSOIL		0-2
CLAY	BROWN, LAKE SEDIMENT	2-6
SILT	BROWN, DAMP	6-8
CLAY	SILTY, BROWN	8-12
CLAY	OLIVE-GRAY	12-18
CLAY	MEDIUM GRAY	18-22
CLAY	MEDIUM GRAY, LENSES OFG ORNAGE SILT WITH VERY FINE SAND, WET AT 23 FEET. TOTAL DEPTH 29 FEET.	22-29

164-053-31BAC
NDSWC

Date Completed:	6/7/94	Purpose:	Observation Well
L.S. Elevation (ft):	831.08	Well Type:	2" PVC
Depth Drilled (ft):	32	Aquifer:	Undefined
Screened Interval (ft):	22-32	Source:	
		Owner:	HAROLD JENSEN

Lithologic Log

Unit	Description	Depth (ft)
SAND	FINE GRAINED, SILTY, BROWN,ALUVIUM	0-4
CLAY	SANDY, BROWN	4-27
SAND	MEDIUM GRAINED, BROWN TOTAL DEPTH 32 FEET.	27-32

164-053-31BAD
NDSWC

Date Completed:	6/7/94	Purpose:	Observation Well
L.S. Elevation (ft):	826.16	Well Type:	2" PVC
Depth Drilled (ft):	29	Aquifer:	Undefined
Screened Interval (ft):	18-28	Source:	
		Owner:	HAROLD JENSEN

Lithologic Log

Unit	Description	Depth (ft)
CLAY	SANDY, BROWN, ALLUVIUM	0-6
CLAY	SILTY, BROWN	6-14
CLAY	SILTY, OLIVE-GRAY	14-17
CLAY	SANDY, DARK GRAY	17-21
SAND	MEDIUM GRAINED, MEDIUM GRAY TOTAL DEPTH 29 FEET.	21-29

164-053-31BBA
NDSWC

Date Completed:	6/7/94	Purpose:	Observation Well
L.S. Elevation (ft):	827.94	Well Type:	2" PVC
Depth Drilled (ft):	24	Aquifer:	Undefined
Screened Interval (ft):	14-24	Source:	
		Owner:	HAROLD JENSEN

Lithologic Log

Unit	Description	Depth (ft)
TOP SOIL		0-1
CLAY	SANDY, BROWN	1-5
CLAY	SILTY, BROWN	5-17
SAND	MEDIUM GRAINED, BROWN	17-22
CLAY	OLIVE-GRAY TOTAL DEPTH 24 FEET.	22-24

APPENDIX D

WATER-LEVEL TABLES

Jensen Landfill Water Levels
7/26/94 to 9/8/94

164-053-31BAA MP Elev (msl,ft)=822.71

Undefined Aquifer SI (ft.)=3-13

Date	Depth to Water (ft)	WL Elev (msl, ft)	Date	Depth to Water (ft)	WL Elev (msl, ft)
07/26/94	3.38	819.33	08/24/94	3.82	818.89
08/11/94	3.65	819.06	09/08/94	3.96	818.75

164-053-31BAB MP Elev (msl,ft)=831.45

Undefined Aquifer SI (ft.)=19-29

Date	Depth to Water (ft)	WL Elev (msl, ft)	Date	Depth to Water (ft)	WL Elev (msl, ft)
07/26/94	8.81	822.64	08/24/94	9.10	822.35
08/11/94	8.94	822.51	09/08/94	9.31	822.14

164-053-31BAC MP Elev (msl,ft)=832.88

Undefined Aquifer SI (ft.)=22-32

Date	Depth to Water (ft)	WL Elev (msl, ft)	Date	Depth to Water (ft)	WL Elev (msl, ft)
07/26/94	21.07	811.81	08/24/94	21.54	811.34
08/11/94	21.55	811.33	09/08/94	21.22	811.66

164-053-31BAD MP Elev (msl,ft)=827.72

Undefined Aquifer SI (ft.)=18-28

Date	Depth to Water (ft)	WL Elev (msl, ft)	Date	Depth to Water (ft)	WL Elev (msl, ft)
07/26/94	16.38	811.34	08/24/94	16.98	810.74
08/11/94	17.02	810.70	09/08/94	16.18	811.54

164-053-31BBA MP Elev (msl,ft)=829.62

Undefined Aquifer SI (ft.)=14-24

Date	Depth to Water (ft)	WL Elev (msl, ft)	Date	Depth to Water (ft)	WL Elev (msl, ft)
07/26/94	13.62	816.00	08/24/94	14.13	815.49
08/11/94	13.95	815.67	09/08/94	14.15	815.47

APPENDIX E

MAJOR ION AND TRACE-ELEMENT CONCENTRATIONS

Jensen Landfill Water Quality
Major Ions

Location	Screened Interval (ft)	Date Sampled	SiO_2	Fe	Mn	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	B	TDS	Hardness as $CaCO_3$	NCH	% Na	SAR	Spec Cond (µmho)	Temp (∞C)	pH
			(milligrams per liter)																					
164-053-31BAA	3-13	07/26/94	27	0.02	0.54	170	37	13	2.1	478	0	190	3.8	0.8	24	0.12	703	580	180	5	0.2	1280	8	7.5
164-053-31BAB	19-29	07/21/94	27	0.07	0.31	140	34	34	4.6	311	0	210	250	1.1	18	0.12	882	460	210	14	0.7	1303	8	
164-053-31BAC	22-32	07/19/94	21	0.02	0.86	68	15	58	20	117	0	270	22	0.9	0	0.09	534	230	140	33	1.7	910	11	
164-053-31BAD	18-28	07/26/94	25	1.2	4.4	210	54	62	13	396	0	520	25	0.5	1.5	0.12	1110	750	420	15	1	1804	8	7.51
164-053-31BBA	14-24	07/20/94	26	0.02	2	120	25	24	5	400	0	100	100	0.8	0.2	0.11	600	400	75	11	0.5	964	10	

Trace Element Analyses

Location	Date Sampled	Selenium	Lead	Cadmium	Mercury	Arsenic	Molybdenum	Strontium
		(micrograms per liter)						
164-053-31BAB	7/21/94	7	0	0	0	1	45	620
164-053-31BAA	7/21/94	138	0	0	0	2	14	730
164-053-31BAD	7/21/94	1	0	0	0	2	22	870
164-053-31BAC	7/21/94	3	0	0	0	2	93	160
164-053-31BBA	7/21/94	7	0	0	0	2	12	210

APPENDIX F

VOLATILE ORGANIC COMPOUNDS
FOR WELL 164-053-31BAD

Volatile Organic Compounds
and
Minimum Concentrations

Concentrations are based only on detection limits. Anything over the detection limit indicates possible contamination.

Constituent	Chemical Analysis µg/L
Benzene	<0.5
Vinyl Chloride	<0.5
Carbon Tetrachloride	<0.5
1,2-Dichlorethane	<0.5
Trichloroethylene	<0.5
1,1-Dichloroethylene	<0.5
1,1,1-Trichloroethane	<0.5
para-Dichlorobenzene	<0.5
Acetone	<50
2-Butanone (MEK)	<50
2-Hexanone	<50
4-Methyl-2-pentanone	<50
Chloroform	4.53*
Bromodichloromethane	<0.5
Chlorodibromomethane	<0.5
Bromoform	<0.5
trans1,2-Dichloroethylene	<0.5
Chlorobenzene	<0.5
m-Dichlorobenzene	<0.5
Dichloromethane	3.94*
cis-1,2-Dichloroethylene	<0.5
o-Dichlorobenzene	<0.5
Dibromomethane	<0.5
1,1-Dichloropropene	<0.5
Tetrachlorethylene	<0.5
Toluene	<0.5
Xylene(s)	<0.5
1,1-Dichloroethane	<0.5
1,2-Dichloropropane	<0.5
1,1,2,2-Tetrachloroethane	<0.5
Ethyl Benzene	<0.5
1,3-Dichloropropane	<0.5
Styrene	<0.5
Chloromethane	<0.5
Bromomethane	<0.5
1,2,3-Trichloropropane	<0.5
1,1,1,2-Tetrachloroethane	<0.5
Chloroethane	<0.5
1,1,2-Trichloroethane	<0.5

* Constituent Detection

VOC Constituents cont.

2,2-Dichloropropane	<0.5
o-Chloroluene	<0.5
p-Chlorotoluene	<0.5
Bromobenzene	<0.5
1,3-Dichloropropene	<0.5
1,2,4-Trimethylbenzene	<0.5
1,2,4-Trichlorobenzene	<0.5
1,2,3-Trichlorobenzene	<0.5
n-Propylbenzene	<0.5
n-Butylbenzene	<0.5
Naphthalene	<0.5
Hexachlorobutadiene	<0.5
1,3,5-Trimethylbenzene	<0.5
p-Isopropyltoluene	<0.5
Isopropylbenzene	<0.5
Tert-butylbenzene	<0.5
Sec-butylbenzene	<0.5
Fluorotrichloromethane	<0.5
Dichlorodifluoromethane	<5
Bromochloromethane	<0.5
Allylchloride	<5
2,3-Dichloro-1-propane	<5
Tetrahydrofuran	<50
Pentachloroethane	<5
Trichlorotrifluoroethane	<5
Carbondisufide	<5
Ether	<5
trans-1,3-Dichloropropene	<0.5

* Constituent Detection