Site Suitability Review of the Northwood Landfill

by
Phillip L. Greer
North Dakota Geological Survey
and
Jeffrey Olson
North Dakota State Water Commission

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

ND Landfill Site Investigation No. 46

SITE SUITABILITY REVIEW
OF THE
NORTHWOOD LANDFILL

By Phillip L. Greer, North Dakota Geological Survey,

and Jeffrey M. Olson, North Dakota State Water Commission

North Dakota Landfill Site Investigation 46

Prepared by the NORTH DAKOTA GEOLOGICAL SURVEY
and the NORTH DAKOTA STATE WATER COMMISSION

Bismarck, North Dakota
1995

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

LIST OF FIGURES

INTRODUCTION

Purpose

The North Dakota State Engineer and the North Dakota State Geologist were instructed by the 52nd 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 Northwood solid-waste landfill is one of the landfills being evaluated.

Location of the Northwood Landfill

The Northwood solid waste landfill is located about four miles west of the City of Northwood in the SW 1/4, Section 2, Township 149 North, Range 55 West. The active area of the landfill encompasses approximately 20 acres.

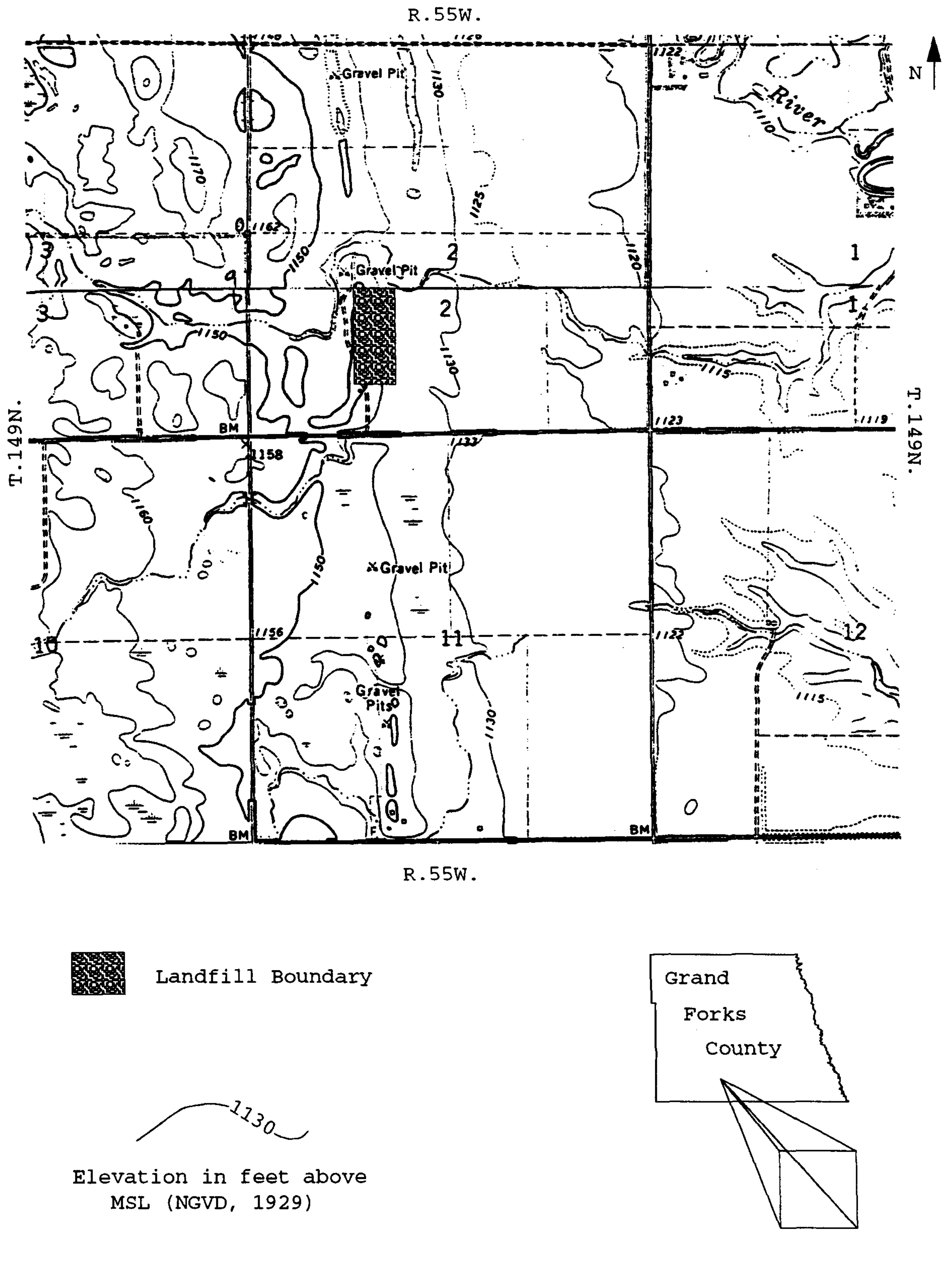

Figure 1. Location of the Northwood municial landfill in the SW 1/4, Section 2, T.149N., R.55W.

Previous Site Investigations

No previous hydrogeologic investigations have been performed at the Northwood landfill.

Methods of Investigation

The Northwood 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 was based on the site's geology and depth to ground water, as determined by the preliminary site evaluation. A hollow-stem auger was used at the Northwood landfill because the depth to ground water was expected to be relatively shallow. The lithologic descriptions were determined from the drill cuttings. The water used with the rig was obtained from municipal water supplies.

Monitoring Well Construction and Development

Four test holes were drilled at the Northwood landfill, and a monitoring well was installed in each test hole. The number of wells installed at the 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 around the active area 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 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

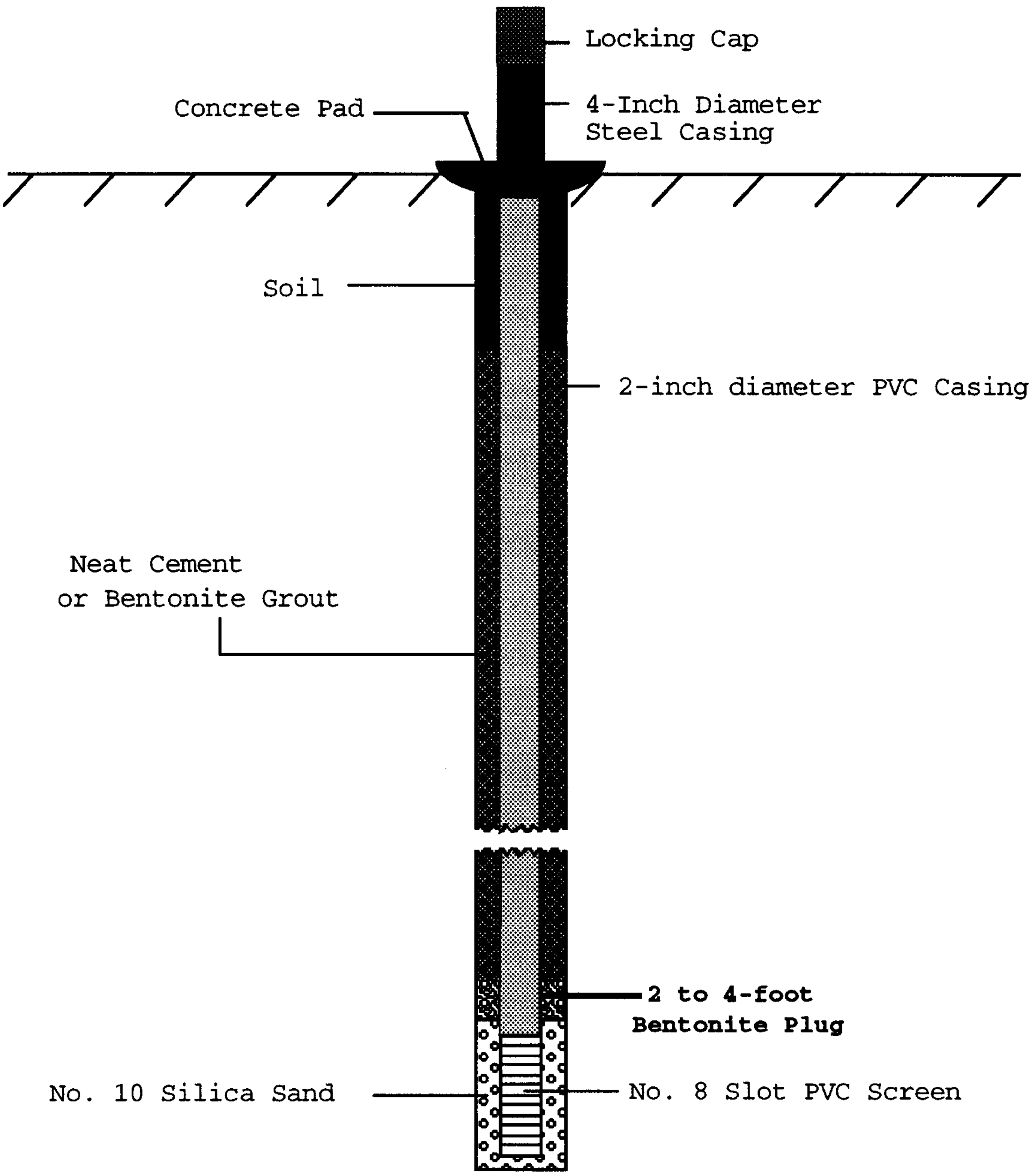

Figure 2. Construction design used for monitoring wells installed at the Northwood landfill.

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 the underlying ground-water system. 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 Water Commission (NDSWC) Laboratory and VOC analyses were performed by the NDSDHCL.

---

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

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 149-055-02CAB would be located in the NW1/4, NE1/4, SW1/4, Section 2, Township 149 North, Range 55 West. Consecutive numbers are added following the three letters if more than one well is located in a 10-acre tract, e.g. 149-055-02CAB1 and 149-055-02CAB2.

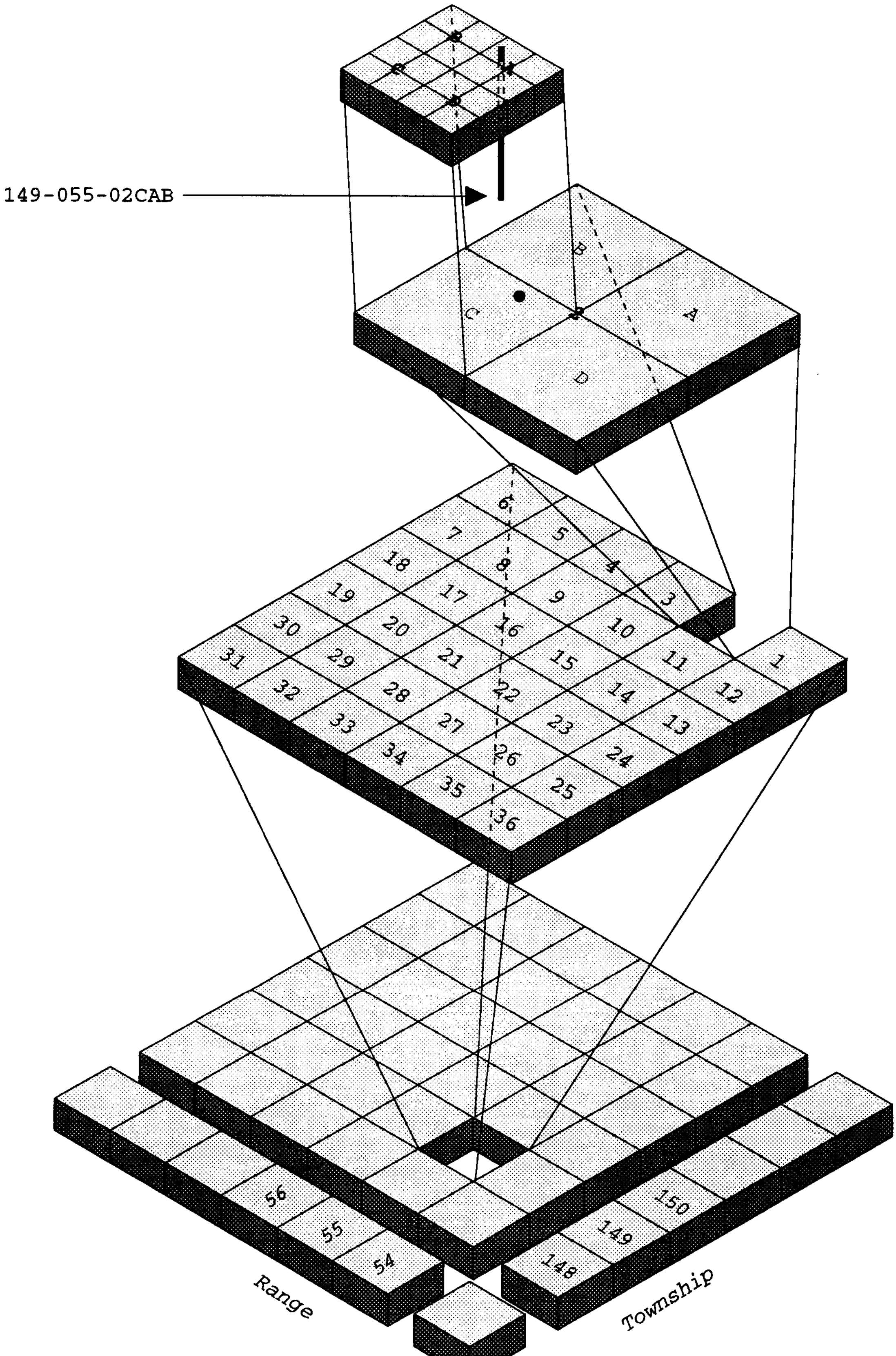

Figure 3. Location-numbering system.

GEOLOGY

Regional Geology

The Northwood landfill lies at the western edge of the Red River Valley in an area where a variety of depositional environments are represented. The landfill is located on the Herman Beach complex, which marks the maximum westward extent of glacial Lake Agassiz. The Herman Beach shoreline deposits are low, long narrow ridges of wave-washed sand and gravel (Hansen and Kume, 1970).

The Herman Beach ridges overlie collapsed glacial sediments that were deposited during several earlier glacial advances. These glacial sediments range from 50 to 150 feet thick and consist of till with scattered beach deposits. The uppermost bedrock in the area is Cretaceous shale of the Carlile Formation (Hansen and Kume, 1970, Plate 3).

The Elk Valley delta plain a short distance east of the landfill contains outwash and deltaic deposits consisting of well-sorted clay, silt, sand, and gravel. At an outcrop along the Goose River west of Northwood (NW 1/4, Section 7, T149N, R54W) the deltaic sediments consist of interbedded silt, clay, and fine sand (Hansen and Kume, 1970). This outcrop is 1 1/2 miles east of the Northwood landfill.

The delta plain had an extremely low-relief surface which has since been modified by water and wind erosion. A veneer of Holocene alluvium and windblown sediments overlies the deltaic deposits.

Local Geology

The landfill is located on a small ridge (Fig. 4) which has about 10 feet of relief and is part of the Herman Beach ridge complex. A fine to medium-grained sand occurring at the surface around the landfill is a remnant of the beach ridge. This sand has a maximum measured thickness of 6 feet in test hole 149-055-02CCD (Fig. 5, lithologic logs in Appendix C). The surficial sand is absent at test hole 149-055-02CDD, which is located east of the beach ridge.

The beach sand is underlain by successive layers of till, sand, and till. The uppermost till ranges from 11 feet to 23 feet thick. A layer of fine-grained sand beneath the till has a maximum thickness of 21 feet. Although a few zones consist of relatively uniform sand, most of the unit is composed of poorly sorted sand containing significant percentages of clay, silt, or gravel. This sand is probably an outwash deposit. The sand is underlain by a second layer of till of unknown thickness.

HYDROLOGY

Surface-Water Hydrology

The Goose River is located about 0.75 miles northeast of the landfill. The Goose River appears to be the main point

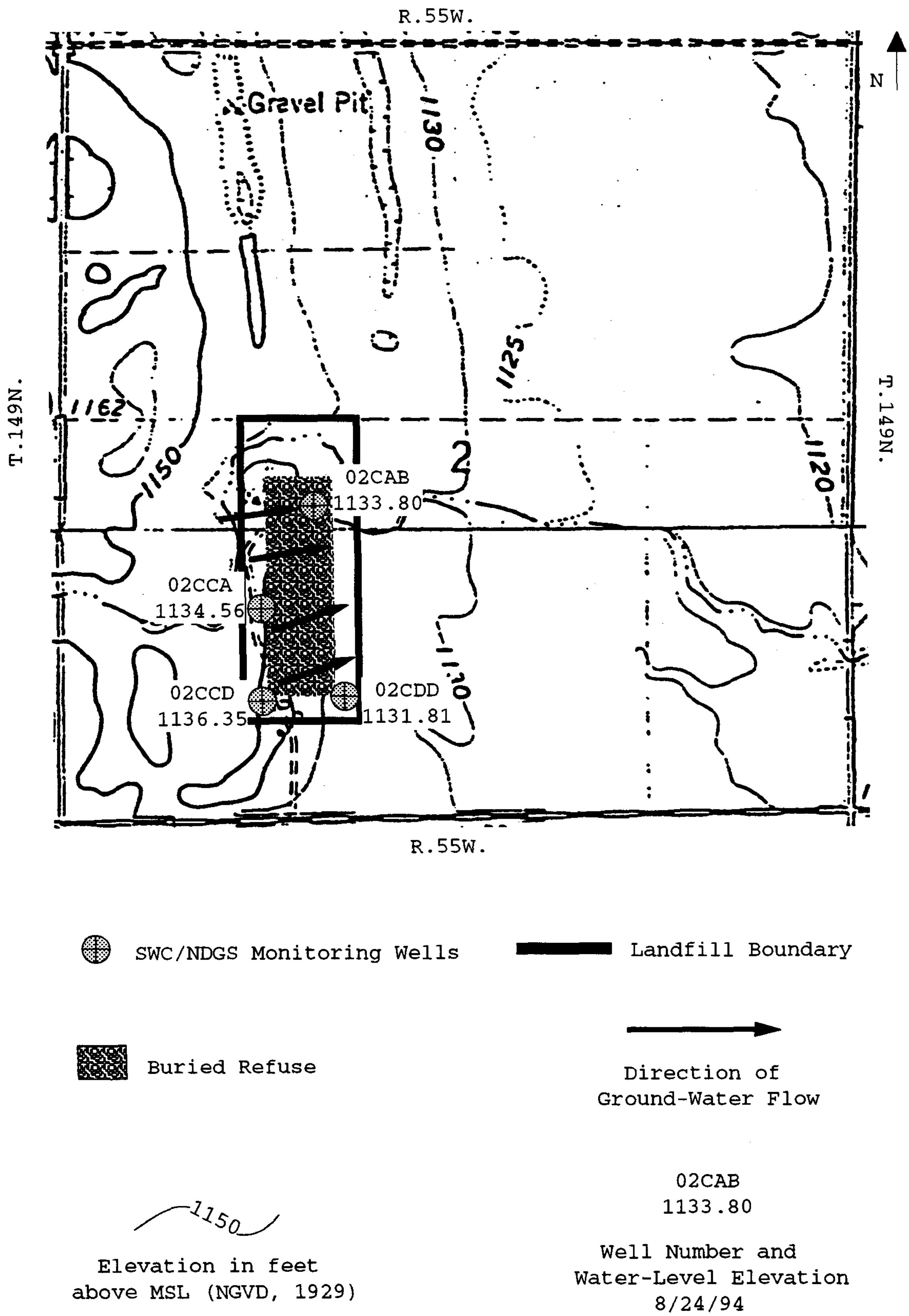

Figure 4. Location of monitoring wells and the direction of ground-water flow.

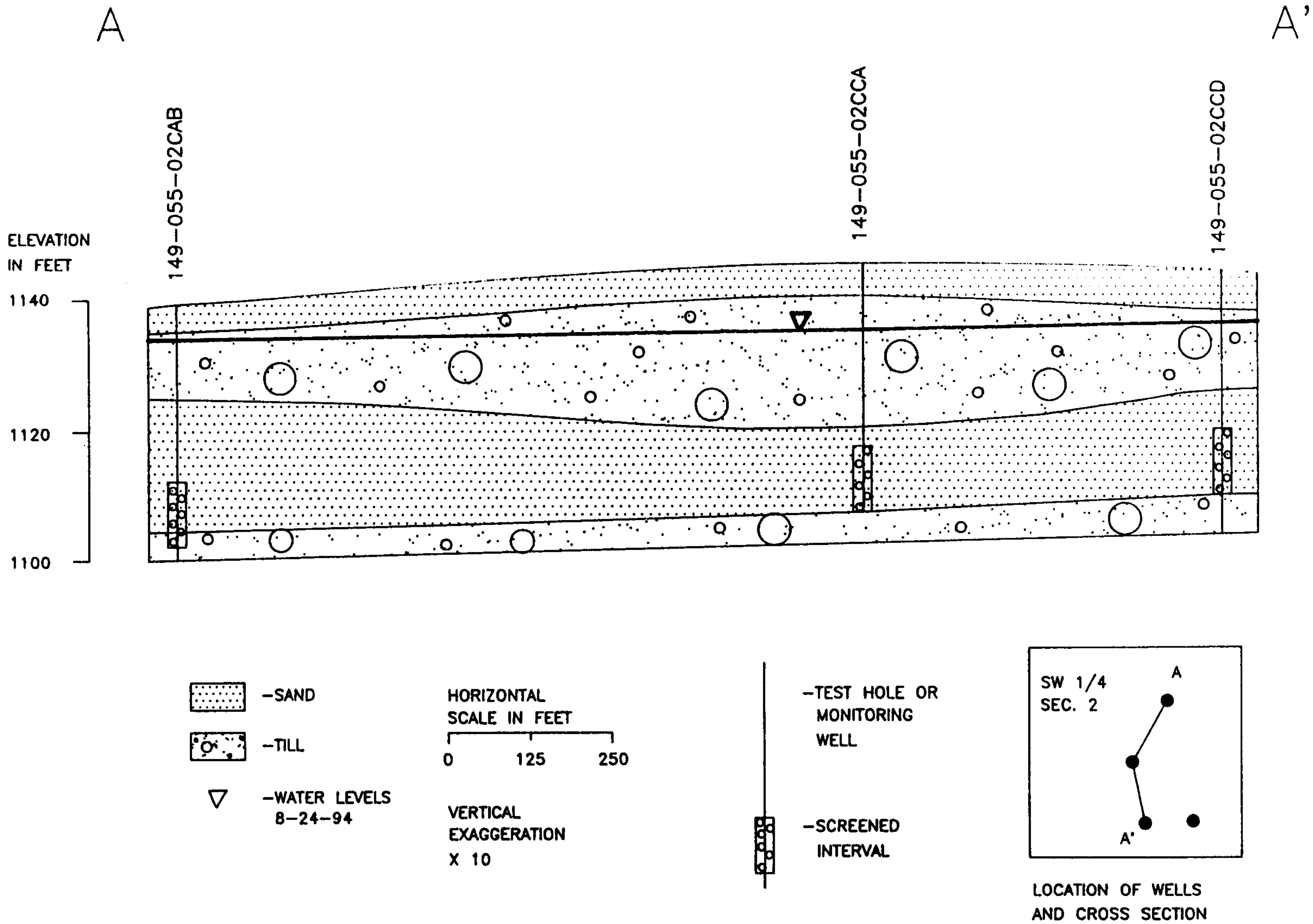

Figure 5: Geohydrologic section A–A' in the Northwood landfill.

of discharge for the area near the Northwood landfill. An intermittent stream occurs along the north boundary of the landfill and drains into the Goose River. Some surface runoff at the Northwood landfill may flow into this stream. The Goose River should not be affected by significant contaminant migration due to its distance from the landfill.

Regional Ground-Water Hydrology

Regional aquifers near the Northwood landfill consist of bedrock and glacial lithologies. The Dakota aquifer is located about 500 feet below land surface and directly underlies the glacial till (Kelly and Paulson, 1970). The Dakota aquifer is characterized by a sodium-chloride type water. The Dakota aquifer should not be susceptible to contaminant migration from the landfill due to its depth and the occurrence of intervening clays characterized by low transmitting capacity.

The western boundary of the Elk Valley aquifer, as mapped by Kelly and Paulson (1970), is about one-half mile from the Northwood landfill. Available data indicates the western boundary of the aquifer may extend farther west than originally mapped. The Elk Valley aquifer is unconfined and generally less than 50 feet below land surface near the landfill. The Elk Valley aquifer consists of fine grained sand and is characterized by a calcium-bicarbonate type water. This aquifer may be susceptible to contaminant migration if the western boundary extends beneath the landfill.

Undifferentiated glacial aquifers are present in isolated sand and gravel deposits. These aquifers are generally small in size and contain small amounts of water. The ground-water chemistry in these aquifers is variable. It is not known if any undifferentiated aquifers exist near the Northwood landfill.

Local Ground-Water Hydrology

Four test holes were drilled at the Northwood landfill and monitoring wells were installed at each site (Fig 4). Four water-level measurements were taken over an eight-week period (Appendix D). All monitoring wells were screened within a layer of fine-grained sand. Two separate sand aquifers were encountered at the Northwood landfill. A surficial, unconfined aquifer, encountered at well 2CDD, is separated from a deeper sand aquifer by a 5- to 10-foot thick layer of clay. The other three monitoring wells are screened in the deeper, confined sand aquifer. The deeper, confined sand aquifer appears to be located at the same elevation as the Elk Valley aquifer and it is not known if these aquifers are hydraulically connected. The direction of ground-water flow is to the east-northeast toward the Little Goose River.

Water Quality

Chemical analyses of water samples are shown in Appendix E. Well 2CAB detected an iron concentration of 0.37 mg/L which is slightly above the SMCL of 0.3 mg/L set by the Environmental Protection Agency (EPA). The source of the increased iron concentration was not determined. The major ion concentrations are not above SMCL.

The trace element analyses detected an elevated concentration of selenium (7 µg/L) in well 02CCD. This concentration is below the MCL of 10 µg/L but higher than concentrations in the other wells. The source of the selenium was not determined in this study.

The results of the VOC analyses, from well 149-055-02CAB, are shown in Appendix F. The VOC analyses detected a concentration of dichloromethane (1.02 µg/L). It is inconclusive whether the source of this VOC compound is the result of laboratory contamination[†] or migration from the landfill.

CONCLUSIONS

The Northwood landfill is located on the Herman Beach ridge complex near the western edge of the Elk Valley delta

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

plain. A layer of fine-grained to medium-grained beach sand at the ground surface has a maximum measured thickness of 6 feet. The beach sand is underlain by a layer of till, a layer of fine-grained sand, and another layer of till.

The deeper sand ranges from 11 feet to 21 feet thick. Water-level measurements indicate that the deeper sand aquifer is confined. The direction of ground-water flow is east-northeast, toward the Goose River.

It is not known whether the deeper sand is a small, isolated aquifer or whether it is hydraulically connected to the extensive blanket of outwash sand which makes up the Elk Valley aquifer. Previous studies have mapped the western boundary of the Elk Valley aquifer to within a mile east of the landfill. However, the aquifer boundaries are approximate because of limited well data in the area.

Chemical analyses of water samples revealed an iron concentration slightly above the SMCL in well 02CAB. The source of the elevated iron concentration was not determined.

The trace element analyses detected an elevated concentration of selenium in well 02CCD. This concentration is below the MCL of 10 μg/L but higher than concentrations in the other wells. The source of the selenium was not determined in this study.

The VOC analysis, from well 02CAB, detected a trace of dichloromethane. It is inconclusive whether the source of this VOC compound is the result of laboratory contamination or migration from the landfill.

REFERENCES

Hansen, D.E., and Kume, J., 1970, Geology and ground water resources of Grand Forks County, part I, geology: North Dakota Geological Survey, Bulletin 53, North Dakota State Water Commission, County Ground Water Studies 13, 76 p.

Hem, J.D., 1989, Study and interpretation of the chemical characteristics of natural water: United States Geological Survey, Water-Supply Paper 2254, 263 p.

Kelly, T.E., and Paulson, Q.F., 1970, Geology and ground water resources of Grand Forks County, part III, ground water resources: North Dakota Geological Survey, Bulletin 53, North Dakota State Water Commission, County Ground Water Studies 13, 58 p.

North Dakota Department of Health, 1986, Water well construction and water well pump installation: Article 33-18 of the North Dakota Administrative Code, 42 p.

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

149-055-02CAB

NDSWC

Date Completed:	6/21/94	Purpose:	Observation Well
L.S. Elevation (ft):	1138.64	Well Type:	2" PVC
Depth Drilled (ft):	37	Aquifer:	Undefined
Screened Interval (ft):	26-36	Source:	
		Owner:	NORTHWOOD

Lithologic Log

Unit	Description	Depth (ft)
Topsoil		0-1
Sand	Fine to medium grain.	1-3
Clay	Trace of sand and gravel,yellowish-brown with moderate red mottles, till.	3-12
Clay	Sandy, silty, yellowish-brown.	12-14
Sand	Clayey, yellowish-brown.	14-18
Sand	Clayey wih a trace of gravel, bluish-gray, damp.	18-22
Sand	Very fine grained, gray, damp.	22-25
Sand	Fine grained, trace of gravel, gray.	25-35
Clay	Trace of sand and gravel, greenish-gray.	35-37

149-055-02CCA
NDSWC

Date Completed:	6/21/94	Purpose:	Observation Well
L.S. Elevation (ft):	1145.19	Well Type:	2" PVC
Depth Drilled (ft):	38	Aquifer:	Undefined
Screened Interval (ft):	27-37	Source:	
		Owner:	NORTHWOOD

Lithologic Log

Unit	Description	Depth (ft)
Topsoil		0-1
Sand	Fine to medium grain with a trace of gravel.	1-4
Clay	Trace of sand and gravel, yellowish-brown, till.	4-16
Clay	Sandy, gravelly, yellowish-brown.	16-22
Clay	Sandy, gravelly, gray.	22-27
Sand	Clayey, gray.	27-38

149-055-02CCD
NDSWC

Date Completed:	6/21/94	Purpose:	Observation Well
L.S. Elevation (ft):	1143.45	Well Type:	2" PVC
Depth Drilled (ft):	37	Aquifer:	Undefined
Screened Interval (ft):	25-35	Source:	
		Owner:	NORTHWOOD

Lithologic Log

Unit	Description	Depth (ft)
Topsoil		0-1
Sand	Medium grain, yellowish-brown.	1-6
Clay	Sandy with a trace of gravel, yellowish-brown.	6-18
Sand	Fine grain, gray.	18-21
Sand	Clayey, trace of gravel, gray.	21-35
Clay	Sandy, gray.	35-37

149-055-02CDD

NDSWC

Date Completed:	6/21/94	Purpose:	Observation Well
L.S. Elevation (ft):	1139.49	Well Type:	2" PVC
Depth Drilled (ft):	25	Aquifer:	Undefined
Screened Interval (ft):	15-25	Source:	
		Owner:	NORTHWOOD

Lithologic Log

Unit	Description	Depth (ft)
Topsoil		0-1
Clay	Trace of sand and gravel, yellowish-brown, till	1-17
Sand	Fine to medium grain, yellowish-brown, wet.	17-20
Clay	Sandy with a trace of gravel, yellowish-brown.	20-25

APPENDIX D

WATER-LEVEL TABLES

Northwood Water Levels
7/26/94 to 9/8/94

149-055-02CAB MP Elev (msl,ft)=1140.4
Undefined Aquifer SI (ft.)=26-36

Date	Depth to Water (ft)	WL Elev (msl, ft)	Date	Depth to Water (ft)	WL Elev (msl, ft)
07/26/94	7.82	1132.58	08/24/94	6.60	1133.80
08/11/94	7.07	1133.33	09/08/94	6.84	1133.56

149-055-02CCA MP Elev (msl,ft)=1147.14
Undefined Aquifer SI (ft.)=27-37

Date	Depth to Water (ft)	WL Elev (msl, ft)	Date	Depth to Water (ft)	WL Elev (msl, ft)
07/26/94	13.82	1133.32	08/24/94	12.58	1134.56
08/11/94	12.98	1134.16	09/08/94	12.81	1134.33

149-055-02CCD MP Elev (msl,ft)=1145.29
Undefined Aquifer SI (ft.)=25-35

Date	Depth to Water (ft)	WL Elev (msl, ft)	Date	Depth to Water (ft)	WL Elev (msl, ft)
07/26/94	10.05	1135.24	08/24/94	8.94	1136.35
08/11/94	9.16	1136.13	09/08/94	9.19	1136.10

149-055-02CDD MP Elev (msl,ft)=1141.04
Undefined Aquifer SI (ft.)=15-25

Date	Depth to Water (ft)	WL Elev (msl, ft)	Date	Depth to Water (ft)	WL Elev (msl, ft)
07/26/94	10.36	1130.68	08/24/94	9.23	1131.81
08/11/94	9.21	1131.83	09/08/94	9.42	1131.62

APPENDIX E

MAJOR ION AND TRACE-ELEMENT CONCENTRATIONS

Northwood 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 $CaCO_3$	as NCH	% Na	SAR	Spec Cond (µmho)	Temp (∞C)	pH
			(milligrams per liter)																					
149-055-02CAB	26-36	07/18/94	28	0.37	0.59	100	31	26	5.6	423	0	79	3.7	0.3	0.4	0.12	483	380	31	13	0.6	872	11	
149-055-02CCA	27-37	07/18/94	7.1	0.06	0.01	28	9.5	68	17	94	26	170	12	1.2	0	0.11	385	110	0	53	2.8	702	12	
149-055-02CCD	25-35	07/18/94	28	0.13	0.16	89	110	15	2.4	293	0	170	4.2	0.2	0	0.07	563	680	430	5	0.3	932	12	
149-055-02CDD	15-25	07/19/94	26	0.06	0.39	78	36	36	4.7	307	0	160	2.8	0.3	4.2	0.07	500	340	91	18	0.8	848	13	

Trace Element Analyses

Location	Date Sampled	Selenium	Lead	Cadmium	Mercury	Arsenic	Molybdenum	Strontium
		(micrograms per liter)						
149-055-02CAB	07/19/94	0	0	0	0	6	4	220
149-055-02CCA	07/19/94	0	0	0	0	1	8	120
149-055-02CCD	07/19/94	7	1	0	0	2	10	150
149-055-02CDD	07/19/94	0	0	0	0.1	2	13	110

APPENDIX F

VOLATILE ORGANIC COMPOUNDS
FOR WELL 149-055-02CAB

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	<0.5
Bromodichloromethane	<0.5
Chlorodibromomethane	<0.5
Bromoform	<0.5
trans1,2-Dichloroethylene	<0.5
Chlorobenzene	<0.5
m-Dichlorobenzene	<0.5
Dichloromethane	1.02*
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