



Stantec Consulting Services Inc.

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July 18, 2017

File: 193704196

Attention: John Feeney

Wisconsin Department of Natural Resources
2300 North Martin Luther King Drive
Milwaukee, Wisconsin 53212

Dear Mr. Feeney:

Reference: Five Year Landfill Monitoring Plan – Denow Landfill, Grafton, Wisconsin (WDNR License No. 01133; WDNR Facility No. 246048000; BRRTS No. 02-46-000735

This letter presents the five-year landfill monitoring plan (the Plan) for the Denow Landfill (the Landfill) located south of Cedar Sauk Road in the Town of Grafton (the Town). The Landfill is located in the southeast quarter of the northwest quarter of Section 1, Township 10 North, Range 21 East, Ozaukee County, Wisconsin as shown on Figure 1. The Wisconsin Department of Natural Resources (WDNR) issued an operating license for the Landfill in 1971. The Landfill operated until 1989, when it was closed and capped. During 1998, vinyl chloride was detected in private water supply wells downgradient of the Landfill. Between 1998 and 2009, site investigation activities included installation of 28 groundwater monitoring wells, conversion of 4 private water supply wells (i.e. private wells) to groundwater monitoring wells, and collection of groundwater samples from numerous private wells near the Landfill. The site investigation identified tetrachloroethene (PCE) and trichloroethene (TCE) as the primary contaminants, with the detected cis 1,2-dichloroethene and vinyl chloride likely to be TCE-daughter products. Groundwater monitoring well and private well locations are illustrated in Figure 2.

Periodic groundwater monitoring continued from 2009 through 2012. During 2012, ENVIRON (now Ramboll-Environ) prepared a Remedial Design Report (RDR) outlining a long-term groundwater monitoring plan that included a specific five-year groundwater monitoring plan and semi-annual landfill cap maintenance (ENVIRON, 2012). ENVIRON submitted the RDR to the WDNR in November 2012, who subsequently approved the plan during June 2013.

Stantec completed the final tasks outlined in the five-year groundwater monitoring plan during March 2016; the results of which are summarized in Stantec's report dated May 9, 2016 (Stantec, 2016). To guide future groundwater monitoring and maintenance activities associated with the Landfill, Stantec (in consultation with Ramboll-Environ) prepared a new five-year Landfill monitoring plan (herein referred to as "the Plan") to guide these activities for the next five years. The Plan is intended to be a continuation of the recently completed five-year plan prepared by ENVIRON and is outlined below.

FIVE YEAR LANDFILL MONITORING PLAN

Stantec prepared this long-term Landfill monitoring plan to meet the requirements of Wisconsin Administrative Code (WAC) Chapters NR 724 and NR 507 and WDNR-specific requirements for the Landfill. The Plan includes the following tasks:

- Task 1: Landfill Cap Inspection and Maintenance
- Task 2: Groundwater Monitoring Well Sampling
- Task 3: In-Use Private Water Supply Well Sampling
- Task 4: Data Evaluation and Reporting to the WDNR
- Task 5: Private Water Supply Well Evaluation and Reporting

Each task is described in detail below.



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Task 1 - Landfill Cap Inspection and Maintenance

To maintain the integrity of the landfill cap, the Landfill will be inspected twice per year (Spring and Fall) for the following:

- Vegetation growth and overall health;
- Evidence of stressed vegetation;
- Bare spots from erosion, washout, die-offs, etc.; and
- Need for reseeding.

In addition, the landfill cover and adjacent land will be inspected to determine if any of the following occurred:

- Erosion resulting in rills, gullies, or bare soil;
- Settlement resulting in loss of grade and/or water standing on the landfill cover;
- Presence of seeps on the perimeter of the landfill;
- Presence of overgrown or woody vegetation; and
- Slumping or sloughing of the cover resulting in cracking or failure of cover surface.

The landfill cap will be mowed in the Spring and Fall to control vegetation. If the cap inspections identify any of the conditions listed above, appropriate actions will be taken to restore the integrity of the cap. If damage to the cap is significant enough to expose underlying waste material, the damaged area will be repaired as soon as possible to meet or exceed current landfill cap construction specifications. The landfill inspection and maintenance log provided in Attachment A will be completed after each inspection. Copies of the logs will be provided in annual reports for submittal to the WDNR.

The inspection schedule will be re-evaluated regularly after performing routine maintenance activities described above. If more frequent maintenance is required due to performance issues (ponding of water, exposure of waste material, seeps, growth of woody vegetation, etc.), a modified inspection and/or maintenance schedule will be submitted to the WDNR for approval.

If a disturbance to the cap is proposed (i.e., utility installation, road construction, cap repair, etc.), the following actions will be taken:

1. Notify the WDNR in advance for approval of any proposed disturbance or change to the cap;
2. Provide cap maintenance requirements to all private and public utilities installing or upgrading utilities and all contractors and/or on-site employees conducting construction, utility installation, or cap repair activities around the Landfill cap;
3. Monitor any excavation of subsurface soil in the areas adjacent to the Landfill cap (within 25 feet of the landfill) by conducting field observations as appropriate;
4. Restore the cap to specifications matching or exceeding the current construction;
5. Record the cap disturbance, management of materials, and the cap restoration activities on a maintenance log (provided in Attachment A); and
6. Provide the WDNR with documentation regarding changes and/or repairs made to the cap as a result of the planned disturbance.



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Task 2 - Groundwater Monitoring Plan

In general, the groundwater monitoring plan will include a groundwater monitoring event in the Spring and Fall each year. During the Spring event groundwater samples will be collected from 12 groundwater monitoring wells and 3 private water supply wells. During the Fall event groundwater samples will be collected from 24 groundwater monitoring wells and up to 8 private water supply wells. Groundwater sampling locations and frequency are summarized in Table 1.

The groundwater monitoring wells selected for semi-annual sampling are located along the axis of the contaminant plume and will continue providing data regarding contaminant concentration trends and horizontal and vertical extent. The additional groundwater monitoring wells selected for annual sampling include hydraulically down-, up-, and side-gradient wells.

Since vinyl chloride concentrations in groundwater exceeding the NR 140 enforcement standard (ES) have been detected twice in private wells located at 2246, 2252, and 2258 Edgewater Drive, these wells have been selected for semi-annual sampling. The private wells located at 2165, 2217, and 2225 Green Bay Road have been selected for annual sampling. These wells are located directly down-gradient of the Landfill.

Four additional private wells near the landfill were selected to be sampled once during the five-year monitoring period. These private wells were chosen based on location relative to the Landfill and groundwater plume. Three private wells (2206, 2216, and 2236 Edgewater Drive) are located adjacent to the private wells where vinyl chloride was most recently detected. The fourth private well (1965 Tamarack Drive) is located up-gradient of the Landfill and historically has contained detectable concentrations of volatile organic compounds (VOCs) (not believed to be related to the Landfill).

Task 3 - Groundwater Monitoring Methods

During each groundwater monitoring event, water levels will be measured in all monitoring wells to evaluate groundwater flow conditions in each of the three hydro-stratigraphic units. Wells with expandable caps will be opened and allowed to equilibrate prior to taking measurements. Measurements will be made using an electronic water level sensor (accuracy 0.01 feet). The water level depth, as well as the total well depth will be recorded in a bound field notebook.

Prior to sampling, each groundwater monitoring well will be purged using either a new disposable polyethylene bailer or a Grundfos™ submersible pump by removing a minimum of three well casing volumes of water from each well. If the Grundfos™ pump is used, it will be lowered no greater than five feet below the water level to ensure that stagnant water is removed from the well. All non-disposable groundwater sampling equipment (i.e. Grundfos™ pump and tubing) will be thoroughly decontaminated between each sampling location using an Alconox© solution and rinsed in deionized water.

After well purging, groundwater samples will be collected from the monitoring wells by lowering a new polyethylene bailer into the water column within the well in a manner such that disturbance to the water column is minimized. The bailer will then be raised to the surface and the water discharged directly into laboratory-supplied sample containers and preserved as appropriate. Field measurements for dissolved oxygen, oxidation-reduction potential, temperature, pH, and specific conductance will be recorded from select wells using a down hole YSI™ water quality sonde, after well purging and groundwater samples are collected.

Before collecting groundwater samples from a private well, a spigot or tap will be run for at least five minutes to allow potentially stagnant water to be purged from the system. If accessible, each sample will be collected at a spigot located inside the residence, before the pressure tank, per WDNR



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guidelines (WDNR, 1996). If the spigot nearest the well is not accessible, the next nearest spigot or faucet will be used to collect the sample. Only cold water spigots or faucets will be used.

The groundwater samples will be placed on ice and submitted to a Wisconsin-certified laboratory for analysis, following standard practice for chain-of-custody procedures. The groundwater samples will be analyzed for VOCs using United States Environmental Protection Agency (EPA) Method 8260B. For quality control purposes, one trip blank and one duplicate sample per 15 wells sampled will be analyzed for VOCs during each sampling event.

Task 4- Data Evaluation and Reporting to the WDNR

Within 60 days after receipt of the laboratory analytical data from each scheduled sampling event, the results will be tabulated and a brief letter report will be prepared for submittal to the WDNR. The letter report will include sufficient tables and figures to summarize landfill cap and groundwater conditions and a discussion of the cause and significance of any increasing VOC concentrations in groundwater. Groundwater plume stability will also be assessed following each event. Graphs used to analyze contaminant trends will also be updated after each sampling event.

An annual report will be prepared that provides in-depth analysis of groundwater conditions and evaluates effectiveness of natural attenuation as the final remedial alternative for the Landfill. The report will include contour maps and figures illustrating the distribution in groundwater for the contaminants of interest. In addition, a discussion in the annual report will assess if monitored natural attenuation is meeting remedial goals (i.e. stable/reducing plume conditions, lack of landfill-impacts to private water supply wells) and if a WDNR case closure request is warranted. The final closure mechanism for this Landfill will likely include the use of institutional controls (e.g. WDNR Geographic Information System [GIS] Registry for soil and/or groundwater).

Semi-annual sampling results will also be submitted to the WDNR within 60 days of collection on a compact disk using a format acceptable to the Bureau of Waste and Materials Management program. A brief memorandum accompanying the monitoring well and potable well sample results will be included that provides a preliminary cause and significance for groundwater results that exceed WAC NR140 standards.

Task 5 - Private Water Supply Well Evaluation and Reporting

Individual private well analytical results will be provided to private well owners within 10 days of receipt of the data after each sampling event in conformance with WAC NR 716.14. If impacts to private wells are reported, the report will evaluate and propose an appropriate response based on the provisions set out in WAC NR 140.24 and NR 140.26. If Landfill impacts to private well(s) are reported, additional water samples will be collected from the impacted private well as detailed below.

If Landfill impacts above WAC NR 140 preventive action limit (PAL) values (but not ES values) are detected at a private well, the well will be re-sampled within a 180-day timeframe. For private wells on an annual sampling schedule, if subsequent semi-annual groundwater samples do not indicate impacts above WAC NR 140 PAL values for two consecutive sampling events, the sampling schedule would revert to an annual basis for the affected well.

If Landfill impacts above WAC NR 140 ES values are detected at a potable well, the potable well(s) will be re-sampled within a 30-day timeframe. If Landfill impacts do not exceed WAC NR 140 ESs in the re-sampling of the potable well, the sampling schedule will remain semi-annual. For private wells on an annual sampling schedule, if subsequent semi-annual groundwater samples do not indicate



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impacts above WAC NR 140 ES and PAL values for two consecutive sampling events, then annual sampling will resume for the affected well.

If Landfill impacts above WAC NR 140 ES values are confirmed based on the results of the private well re-sampling within the 30-day timeframe, then the user of the impacted private well will be supplied with bottled potable water within 30 days of the date of the re-sampling event and the private well will be sampled on a quarterly basis. If three consecutive rounds (two samples collected within a 30-day timeframe and the third quarterly sample) indicate Landfill impacts above WAC NR 140 ES values, then an evaluation of additional remedial actions will be completed within 90 days thereafter. Additional remedial actions could include an evaluation of corrective measures such as alternate water supply or active groundwater remedial options.

IMPLEMENTATION SCHEDULE

Assuming receipt of WDNR's authorization to proceed, implementation of the selected Five Year Landfill Monitoring Plan will commence according to the following schedule:

1. Spring event completed during March or April each year and
2. Fall event completed during September or October each year.

After WDNR approval of this Plan the groundwater and private water supply well monitoring, landfill cap maintenance, and annual reporting activities will be performed for five years. The natural attenuation monitoring program will be re-evaluated at the end of the 5-year landfill monitoring period. If increasing groundwater contaminant concentrations, or impacts to private wells are reported, a revised plan may be required. Recommendations for a modified plan (if necessary) will be submitted to the WDNR in the annual groundwater monitoring report after completion of the 5-year monitoring period.

I trust this information meets your needs. If you have any questions or comments, please contact me.

Regards,

STANTEC CONSULTING SERVICES INC.

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Enclosures

- c. Lester Bartell, Town of Grafton
Mike Carlton, von Briesen & Roper, S.C.
Sara MacCarthy, Hall, Render, Heath & Lyman, P.C.
Jeanne Tarvin, Ramboll-Environ



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"I, Christopher C. Hatfield, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, am registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code, or licensed in accordance with the requirements of ch. GHSS 3, Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in ch. NR 700 to 726, Wis. Adm. Code."

Christopher C. Hatfield, PG No. 1247-013

July 18, 2017
Date

REFERENCES

ENVIRON International Corporation, "Revised Remedial Design Report – Denow Landfill Site, Grafton, Wisconsin," November 2012.

Stantec Consulting Services, Inc., "March 2016 Groundwater Monitoring Results – Denow Landfill, Town of Grafton, Wisconsin," May 9, 2016.

Wisconsin Department of Natural Resources, "Environmental Monitoring for Landfills," *Wisconsin Administrative Code*, Chapter NR 507, July 2015.

Wisconsin Department of Natural Resources, "Groundwater Quality," *Wisconsin Administrative Code*, Chapter NR 140, July 2015.

Wisconsin Department of Natural Resources, "Remedial and Interim Action Design, Implementation, Operation, Maintenance, and Monitoring Requirements," *Wisconsin Administrative Code*, Chapter NR 724, October 2013.

Wisconsin Department of Natural Resources, "Sample results notification requirements," *Wisconsin Administrative Code*, s NR 716.14, November 2013.

Wisconsin Department of Natural Resources, "Groundwater Sampling Field Manual," PUBL-DG-038 96, September 1996.

Wisconsin Department of Natural Resources, "Remedial and Interim Action Design, Implementation, Operation, Maintenance, and Monitoring Requirements," *Wisconsin Administrative Code*, Chapter NR 724, October 2013.



SCALE IN FEET

1" = 2000'



CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929



QUADRANGLE LOCATION

BASE MAP SOURCE: USGS 7.5 MINUTE QUADRANGLE, CEDARBURG, WISCONSIN, 1994 (NATIONAL GEOGRAPHIC HOLDINGS, INC.)



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LANDFILL LOCATION & LOCAL TOPOGRAPHY

DENOW LANDFILL
GRAFTON, WISCONSIN

DATE: 01/15/13	DRAWN BY: AJ5	REVISED: .	PROJECT NUMBER: 193701498	FIGURE 1
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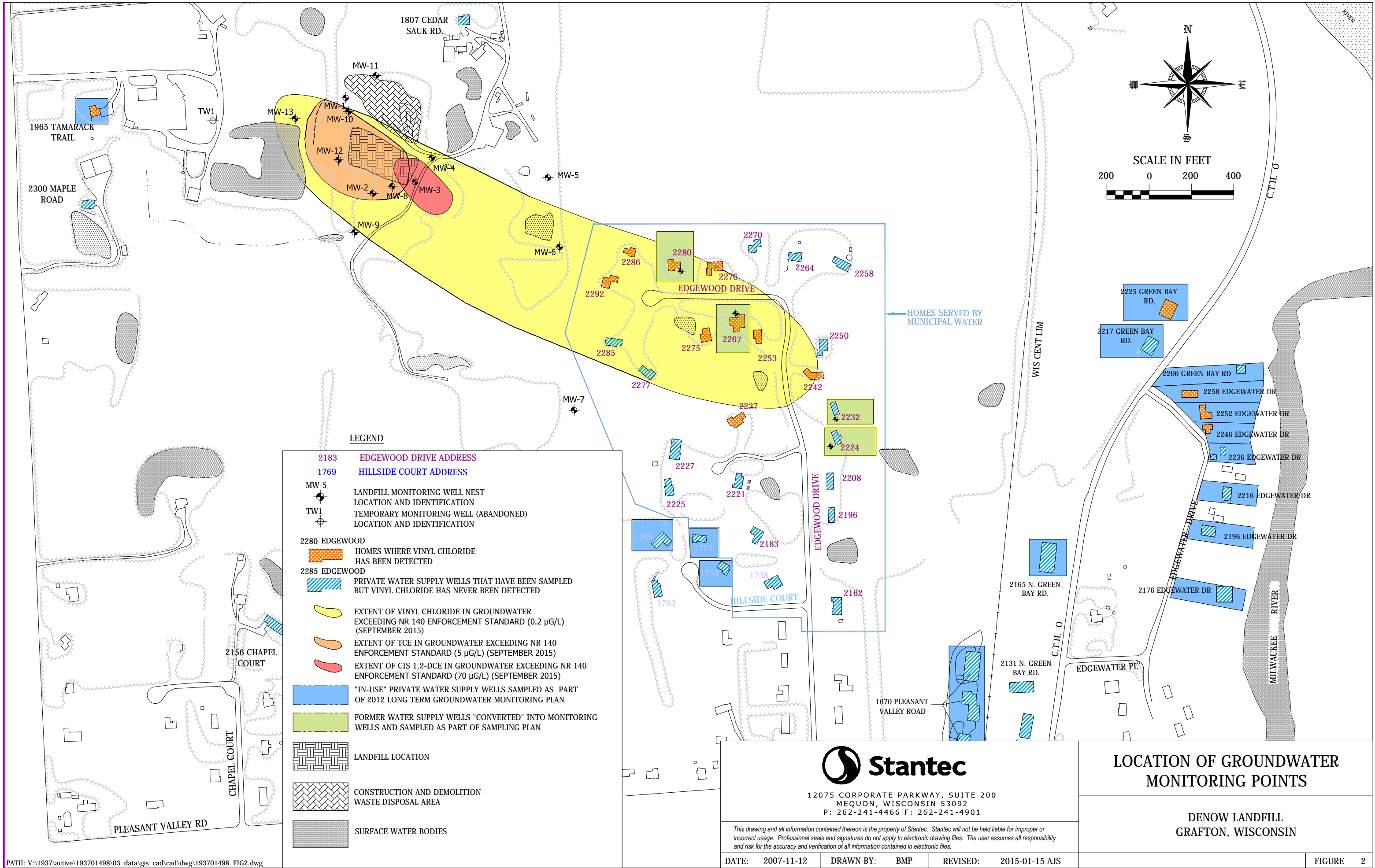


Table 1: Proposed Longterm Groundwater Monitoring Plan - Denow Landfill, Grafton, WI (WDNR License #01133, WDNR FID #246048000, BRRTS #02-46-000735)

Well Information			Well Location Relative to Groundwater Flow	Groundwater Sampling Events ^{1,2}						Water Levels	MNA Parameters ³
Unique Well ID #	WDNR Point ID #	Well ID		Semi-Annual Events (Years 1 through 5)	Year 1 - Annual Event	Year 2 - Annual Event	Year 3 - Annual Event	Year 4 - Annual Event	Year 5 - Annual Event	Semi-Annual	Semi-Annual
JW878	101	MW-1S	upgradient		X	X	X	X	X	X	
JW877	102	MW-1D	upgradient		X	X	X	X	X	X	
JX182	116	MW-1B	upgradient		X	X	X	X	X	X	
JW883	103	MW-2S	downgradient	X	X	X	X	X	X	X	
JW232	104	MW-2D	sidegradient	X	X	X	X	X	X	X	
JW881	105	MW-3S	sidegradient	X	X	X	X	X	X	X	X
JX231	106	MW-3D	downgradient - nearest landfill	X	X	X	X	X	X	X	X
VW691	125	MW-3B1	downgradient - nearest landfill	X	X	X	X	X	X	X	X
VW690	126	MW-3B2	downgradient - nearest landfill	X	X	X	X	X	X	X	X
JW882	107	MW-4S	upgradient							X	
JW884	108	MW-4D	upgradient		X	X	X	X	X	X	
JW886	109	MW-5S	sidegradient							X	
JW888	110	MW-5D	sidegradient/downgradient						X	X	
JW885	111	MW-6S	sidegradient						X	X	
JW887	112	MW-6D	downgradient	X	X	X	X	X	X	X	X
JX183	117	MW-6B	downgradient	X	X	X	X	X	X	X	X
JW879	113	MW-7S	sidegradient						X	X	
JW880	114	MW-7D	sidegradient/downgradient						X	X	
JX181	115	MW-8S	downgradient - nearest landfill	X	X	X	X	X	X	X	X
JX184	118	MW-8B	downgradient	X	X	X	X	X	X	X	X
VW693	119	MW-9S	downgradient		X	X	X	X	X	X	
VW692	120	MW-9B	sidegradient		X	X	X	X	X	X	
VW694	121	MW-10S	upgradient		X	X	X	X	X	X	
VW695	122	MW-11S	upgradient							X	
VW651	123	MW-12S	upgradient		X	X	X	X	X	X	
VW650	124	MW-12B	upgradient		X	X	X	X	X	X	
VT836	127	MW-13S	upgradient		X	X	X	X	X	X	
VT837	128	MW-13B	upgradient		X	X	X	X	X	X	
Former Residential Water Supply Wells Converted Into Groundwater Moitoring Wells											
JX268	204	2224 Edgewood Dr.	downgradient						X	X	
JX267	203	2232 Edgewood Dr.	downgradient		X	X	X	X	X	X	
JX266	202	2267 Edgewood Dr.	downgradient	X	X	X	X	X	X	X	
JX265	201	2280 Edgewood Dr.	downgradient	X	X	X	X	X	X	X	
In-Use Residential Water Supply Wells ⁴											
IZ596	304	2165 Green Bay Rd.			X	X	X	X	X		
IZ595	305	2217 Green Bay Rd.			X	X	X	X	X		
PU743	307	1965 Tamarack Tr.					X				
JF817	308	2206 Green Bay Rd				X					
PU744	309	2225 Green Bay Rd			X	X	X	X	X		
PU746	312	2216 Edgewater Dr				X					
PU474	313	2236 Edgewater Dr						X			
PU748	314	2246 Edgewater Dr		X	X	X	X	X	X		
PU749	315	2252 Edgewater Dr		X	X	X	X	X	X		
PU750	316	2258 Edgewater Dr		X	X	X	X	X	X		

Notes:

1 - laboratory analysis for VOCs using EPA Test Method 8260B.

2 - This sampling plan may be modified based on the data collected.

3 - field parameters (specifc conductance, dissolved oxygen, oxygen reduction potential, pH, and temperature).

4 - In-Use Water Supply well sample analysis for only VOCs using Test Method 8260B

= most recent groundwater sample contained VOC concentrations exceeding NR 140 Preventive Action Limit

= most recent groundwater sample contained VOC concentrations exceeding NR 140 Enforcement Standard

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>
Fall Event (September/October)	1	3	5	7	9
Spring Event (March/April)	2	4	6	8	10



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ATTACHMENT A

Landfill Inspection and Maintenance Log

Landfill Cap Maintenance Inspection Log

Denow Landfill Site

Grafton, Wisconsin

WDNR BRRTS #02-46-000735

[illegible]