ERR/SF

HYDRO-SEARCH, INC.

A Tetra Tech Company

To: Wisconsin Department of Natural Resources
3911 Fish Hatchery Rd
Fitchburg WI 53711
Attn: Mr Steve Ales

Date: June 2, 1995
Subject: FF/NN Landfill
Ripon, WI
FID# 43104820 0
Job. No. 304733096

We are sending the following: _X_ Herewith ___ Under Separate Cover

# of Copies	Item
3	FF/NN Landfill Feasibility Study Addendum

Comments:

Transmitted by:

- [X] First Class Mail
- [ ] Federal Express
- [ ] Express Mail
- [ ] Messenger
- [ ] Other

CC: Section Chief, WDNR 1 copy
Raymond Roder, 1 copy
Nelson Olavarria, 1 copy
James Kaiser, 1 copy
Rick Kubler, 1 copy

By: Judy Jaussaud

175 N. Corporate Drive, Suite 100, Brookfield, Wisconsin 53045 Telephone (414) 792-1282 Facsimile (414) 792-1310

HYDRO-SEARCH, INC.
A Tetra Tech Company

ADDENDUM
FEASIBILITY STUDY
FF/NN LANDFILL
RIPON, WISCONSIN

June 2, 1995

Prepared For:

FF/NN Landfill PRP Group

Prepared By:

Hydro-Search, Inc.
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

Project No. 304733096

Michael R. Noel, Sr. Vice-President
Manager of Milwaukee Operations

Judy L. Fassbender
Senior Hydrogeologist

WISCONSIN
GERALD LOUIS DEMERS
E-21773
MILWAUKEE, WIS.
PROFESSIONAL ENGINEER

Gerald L. DeMers, P.E.
Senior Engineer

TABLE OF CONTENTS

		Page
1.0	EXECUTIVE SUMMARY	1-1
2.0	INTRODUCTION	2-1
3.0	ADDITIONAL LANDFILL CAP, MONITORING AND GAS ALTERNATIVE	3-1
3.1	Detailed Analysis of Alternative O - Composite Landfill Cap and Passive Gas Venting	3-1
3.1.1	Description	3-1
3.1.2	Overall Protection of Human Health and the Environment	3-2
3.1.3	Compliance with ARARs	3-4
3.1.4	Long-Term Effectiveness and Permanence	3-4
3.1.5	Reduction of Toxicity, Mobility or Volume Through Treatment	3-5
3.1.6	Short-Term Effectiveness	3-5
3.1.7	Implementability	3-6
3.1.8	Cost	3-6
3.2	Comparative Analysis of Alternatives	3-7
3.2.1	Landfill Cap and Monitoring Alternatives	3-7
3.2.1.1	Overall Protection of Human Health and the Environment	3-7
3.2.1.2	Compliance with ARARs	3-8
3.2.1.3	Long-Term Effectiveness and Permanence	3-9
3.2.1.4	Reduction of Toxicity, Mobility or Volume Through Treatment	3-9
3.2.1.5	Short-Term Effectiveness	3-10

TABLE OF CONTENTS (Cont'd)

			Page
	3.2.1.6	Implementability	3-10
	3.2.1.7	Cost	3-11
3.2.2	Landfill Gas Extraction Alternatives		3-12
	3.2.2.1	Overall Protection of Human Health and the Environment	3-12
	3.2.2.2	Compliance with ARARs	3-12
	3.2.2.3	Long-Term Effectiveness and Permanence	3-13
	3.2.2.4	Reduction of Toxicity, Mobility or Volume Through Treatment	3-13
	3.2.2.5	Short-Term Effectiveness	3-13
	3.2.2.6	Implementability	3-14
	3.2.2.7	Cost	3-14
4.0	REFERENCES		4-1

FIGURES

3-1 Passive Landfill Gas Trench Location

3-2 Typical Landfill Gas Trench Cross Section

TABLES

3-1 Potential ARARs for Remedial Actions at the FF/NN Landfill

3-2 Probable Cost for Alternative O

3-3 Landfill Cap and Monitoring Alternatives Summary

3-4 Landfill Gas Extraction Alternatives Summary

1.0 EXECUTIVE SUMMARY

The purpose of the Feasibility Study (FS) is to develop remedial alternatives for a source control operable unit and, if necessary, a ground-water operable unit at the closed FF/NN Landfill site, located near Ripon, Wisconsin. Specifically, the Feasibility Study (FS) for source containment and ground-water remediation is meant to satisfy Tasks 8, 9, and 10 of the Statement of Work (SOW) between the Wisconsin Department of Natural Resources (WDNR) and the Cooperating Parties. The FS includes an evaluation of alternative landfill cap designs, leachate and gas removal and treatment, and ground-water treatment as well as a no action alternative.

This addendum to the December 30, 1994 FS has been prepared in order to consider an additional alternative. Alternative O consists of a composite landfill cap with passive gas venting by way of granular backfilled trenches beneath the clay portion of the cap. This executive summary includes a summary of the information provided in the December 30, 1994 FS.

The remedial alternatives address the following objectives:

- Prevent direct contact with landfill contents;
- Reduce contaminant leaching to ground water;
- Control surface water runon, runoff, and erosion;
- Prevent off-site migration of landfill gas (LFG);
- Restore ground-water quality to ch. NR140 standards; and
- Monitor ground-water quality, landfill gas and leachate for environmental control.

Specifically, the scope of work encompassed by this evaluation includes the following:

- Summary of existing Site Evaluation Report (SER; Simon Hydro-Search, 1992), Technical Memorandum #1 (TM #1; Simon Hydro-Search, 1993), and Recommendations for Additional Well Locations (Simon Hydro-Search, 1994) site data;
- Evaluation of potentially applicable or relevant and appropriate requirements (ARARs);
- Review and screening of available remedial technologies;

- Development and screening of remedial alternatives;
- Development and screening of costs to construct, operate, and maintain the remedial alternatives; and
- Development of a detailed analysis of the alternatives.

Five cap and monitoring alternatives were developed for the site, including no action. Two landfill gas extraction and treatment alternatives, and one shallow ground-water pumping and treatment alternative with four alternatives for discharge have also been developed.

In the event that ground-water impacts from the FF/NN Landfill are detected during ground-water monitoring in private wells near the FF/NN Landfill at concentrations which exceed Wisconsin ch. NR140 Preventive Action Limits (PALs), an alternate water supply would be provided to impacted residences. Water could be supplied to these residences by the extension of the WP&L water system which serves the City of Ripon, or point-of-entry treatment systems could be installed. Other alternatives may also be appropriate depending upon the compounds of concern and number of wells affected.

Landfill Cap and Monitoring Alternatives

Alternative A - No Action

This alternative includes placing restrictions on the property deed, and inspection and maintenance of the existing cap. Fencing with signs will be constructed to restrict access to the landfill. Additionally, ground-water and leachate sampling and analysis, and landfill gas field analysis are included in this alternative.

Alternative B - Regrade Existing Landfill Surface

This alternative consists of regrading the site to eliminate low spots and provide for improved drainage, revegetation of those areas which require such, fencing the landfill, posting signs, and obtaining deed restrictions. The existing passive vents would also be retained. Inspection and maintenance of the site would also be required, as well as ground water, gas, and leachate monitoring.

Alternative C - Construction of a Cover Layer on Landfill

This alternative consists of the construction of a soil cover layer so that the cap meets the performance standards of ch. NR504.07 (1) through (7). This includes removal and stockpiling of the existing topsoil and vegetation, filling the spots which have less than 24 inches of clay with compacted clay, construction of a cover layer, construction of a topsoil layer, revegetation of the landfill, installing signs, fencing the landfill, and obtaining deed restrictions. Inspection and maintenance of the site, as well as ground-water, gas and leachate monitoring would also be required.

Alternative D - Replace Existing Clay Cap on Landfill

This alternative consists of the reconstruction of the cap so that it meets the construction and performance standards ch. NR504.07 (1) through (7). This includes removal of the existing topsoil and available clay from the landfill except for a 6-inch grading layer, replacement and compaction of a clay layer, construction of a cover layer, a vegetative layer, and a topsoil layer. A fence would be constructed with signs to limit access and deed restrictions would be obtained. Ground-water, gas and leachate monitoring, as well as inspection and maintenance would also be required.

Alternative E - Construct a Composite Cap on Landfill

This alternative consists of the construction of a geomembrane and drainage layer over the existing clay cap. Prior to geomembrane placement, topsoil would be stripped for reuse, and additional clay placed to provide a minimum of 24 inches over the site. A drainage layer would be placed on top of the geomembrane, and a cover layer would be placed above the drainage layer. The topsoil would be replaced over the cover layer and a vegetative cover would be reestablished. A fence would be constructed with signs to limit access and deed restrictions would be obtained. Inspection and maintenance of the site, as well as ground-water, gas and leachate monitoring, would also be required.

Landfill Gas Extraction Alternatives

Alternative H - Passive Landfill Gas Venting

This alternative consists of the construction of a passive landfill gas venting system through the landfill cover system at the FF/NN landfill. Forty-nine passive vertical landfill gas vents would be screened into the top of the refuse of the landfill.

Landfill gas would enter through the screen of each vent and would consequently be released to the atmosphere. This alternative could be implemented in conjunction with one of Alternatives C through E.

Alternative I - Active Landfill Gas Collection and Treatment

This alternative consists of the construction of an active landfill gas collection system at the FF/NN landfill. The active landfill gas collection system would be comprised of a blower and subsurface piping connected to each of six active landfill gas extraction wells. Landfill gas withdrawn by the blower system would be piped to an enclosed flare for irreversible thermal destruction. This alternative could be implemented in conjunction with one of Alternatives C through E.

Shallow Ground-Water Extraction and Treatment Alternatives

Alternatives J, K, and M all include the installation of two downgradient extraction wells to intercept the plume in the shallow ground water as it migrates downgradient of the landfill. Ground water would be pumped at a rate of 20 gallons per minute and treated to remove volatile organic compounds (VOCs) by air stripping (except for Alternative M). Each of these alternatives would be implemented in conjunction with one of alternatives B through E. Pumping ground water at 20 gallons per minute will provide hydraulic control for contaminated ground water within one year. However, 50 to 100 years are estimated to be needed to remediate ground water to meet ch. NR140 water quality standards using Alternatives J, K, and M.

Alternative J - Shallow Ground-Water Extraction, Treatment, and Discharge to Surface Waters

Treated ground water would be discharged to one of two surface-water bodies near the site under this alternative. Monthly sampling and analysis of the ground-water influent and treated discharge would be required.

Alternative K - Shallow Ground-Water Extraction, Treatment, and Discharge to an Infiltration Gallery

Treated ground water would be discharged to an infiltration gallery under this alternative. Monthly sampling and analysis of the ground-water influent and treated discharge would be required. The infiltration gallery is likely to clog with precipitated solids over time and require maintenance.

Alternative M - Shallow Ground-Water Extraction and Off-Site Treatment and Disposal at Publicly Owned Treatment Works (POTW)

Extracted ground water would be pumped via a subsurface pipeline to the nearest sewer line of the Ripon POTW. The ground water would be treated and disposed at the POTW. Monthly sampling and analysis of the effluent ground water discharge may be required.

Landfill Cap, Passive Gas Venting, and Monitoring Alternative

Alternative O - Composite Landfill Cap and Passive Gas Venting

Alternative O is a combination of Alternative E, construction of a composite cap, with a passive gas venting system. The passive gas venting system consists of a series of granular backfilled trenches which traverse the landfill and collect gases generated in the landfill to emit them directly to the atmosphere.

2.0 INTRODUCTION

Hydro-Search, Inc. (HSI) was contracted by the FF/NN Landfill Cooperating Parties to complete the Remedial Investigation (RI) and Feasibility Study (FS) for the former FF/NN Landfill, located in the town of Ripon, Fond du Lac County Wisconsin. The purpose of the FS for the FF/NN Landfill is to develop and evaluate alternative remedial actions, based upon the results of the Site Evaluation Report (SER; Simon Hydro-Search, September 11, 1992); Technical Memorandum #1, Source Characterization (TM #1; Simon Hydro-Search, October 19, 1993); and Recommendations for Additional Well Locations (RAWL; Simon Hydro-Search, 1994). The purpose of these alternative remedial actions would be to mitigate potential impacts to human health and welfare and the environment caused by the landfill. The FS, dated December 30, 1994, presented a review of appropriate technologies, developed alternatives, evaluated the alternatives based upon effectiveness, implementability, and cost, and evaluated the alternatives in comparison to the nine criteria identified in the National Contingency Plan (NCP). This work was performed in accordance with the NCP as amended, and RI/FS Guidance.

The WDNR has reviewed the FS prepared for this site and made a determination that an additional alternative be evaluated (WDNR, March 14, 1995). The purpose of this addendum to the FS is to evaluate Alternative O, which includes a composite cap with a passive gas venting system. The passive venting system consists of trenches with granular stone or gravel backfill which traverse the landfill beneath the clay portion of the composite cap.

This addendum to the FS provides a description of Alternative O, a detailed analysis of the alternative using the nine criteria specified in the NCP and a comparative analysis of this alternative with the others developed in the December 30, 1994 FS.

3.0 ADDITIONAL LANDFILL CAP, MONITORING AND GAS ALTERNATIVE

This section provides a description of Alternative O, Composite Landfill Cap and Passive Gas Venting. A detailed analysis of this alternative, and a comparison with the other alternatives is presented. Because Alternative O uses technologies that are discussed and screened in the FS, these technologies are not evaluated again in this addendum.

3.1 Detailed Analysis of Alternative O - Composite Landfill Cap and Passive Gas Venting

3.1.1 Description

This alternative consists of the addition of a geosynthetic cap above the existing clay cap over the entire landfill area. The existing topsoil would be stripped for re-use, and clay added to provide a minimum of 2 feet of clay cover across the site. A 40-mil geoliner (high density polyethylene [HDPE] and a geonet drainage layer would be placed over the clay layer and 18 to 30 inches of cover soil placed over these. For cost estimating purposes, 30 inches of cover soils have been assumed, as with Alternatives C, D, and E. Topsoil would then be replaced.

The passive landfill gas collection system for this alternative will consist of gravel backfilled trenches which traverse the landfill surface beneath the clay cap. For purposes of this analyses, assumptions have been made related to trench spacing and size which would be reviewed during the remedial design. The proposed system is shown in Figure 3-1. Each trench would intercept the waste material and contain a 6-inch perforated PVC pipe to transmit gas. Two to 4 feet of compacted clay would be replaced above the trench, as shown in Figure 3-2. The trenches could cover about 3% of the landfill surface, and no part of the waste disposal area would be more than 75 feet from a collection trench. Fifteen vents would be placed around the perimeter of the landfill to discharge collected gases, as shown on Figure 3-1. Eight gas probes will also be installed outside of the fill for monitoring purposes.

The gravel backfilled trench of the existing gas venting system will be incorporated as part of the new passive trenches. The existing vent pipes will be removed and properly abandoned.

A detailed gas monitoring plan would be developed during the Remedial Design phase that identifies sampling methods, health and safety issues, and system maintenance requirements. For cost estimating purposes, it is assumed that 2% of the gas system would require repairs each year of an anticipated 30-year period.

The landfill gas emissions from the FF/NN landfill are expected to be below the proposed New Source Performance Standards (NSPS, 40CFR60) for existing landfills, since the FF/NN landfill is expected to be classified as "small" under the proposed rules for existing landfills. Therefore, a landfill gas collection and treatment system at the FF/NN Landfill is not expected to require an air permit.

The site would be fenced, posted with appropriate signs, and restrictions would be placed on the property deed to limit access and restrict future land use. Maintenance of the cap would be required, once it is completed. For cost estimating purposes, it is assumed that 5% of the total landfill surface area would require regrading and revegetation each year. This alternative would be implemented with the gas, leachate, and ground-water monitoring described in Alternative A.

3.1.2 Overall Protection of Human Health and the Environment

This alternative includes, at a minimum, continued repair and maintenance of landfill cover after it has been reconstructed to maintain the required containment of the waste material, correct settlement problems and promote stormwater run-off. Therefore, this alternative would be effective in meeting the Remedial Action Objective (RAO) of control of surface water run-off and erosion. The Alternative O landfill cover also contains the waste material

and would meet the RAO of prevention of direct contact with landfill contents with continued maintenance.

The Alternative O landfill would allow a minimal amount of precipitation to percolate through the landfill cap as shown by the results of the U. S. EPA's HELP model. Under the Alternative O scenario, input parameters for the HELP model included a compacted clay cap with a permeability of 1.3×10^{-8} (the minimum measured permeability of the existing cap). Good vegetative cover was used to reflect the improved grading of the landfill cap in comparison to Alternative A which used fair vegetative cover. The model was run using an average of 2.4 feet of compacted clay with 6 inches of topsoil and 18 inches of root zone in all cases. It was assumed that the 40-mil geomembrane would allow 1% of the percolation to pass through. The HELP model predicts a percolation rate through the Alternative O cap of 0.002 inch per year.

The HELP model run for NR504 conditions (2 feet of compacted clay with a permeability of 1×10^{-7} cm/sec, 18 inches root zone, and 6 inches topsoil) predicts a percolation rate through an NR504 cap of 0.9 inches per year. Therefore, an Alternative O cap would be more effective than an NR504 cap.

Actual leachate percolation to ground water is expected to be minimal since the landfill contains sludge which is hydrophilic and the leachate pump test performed on one of the three existing leachate head wells (LC-2) confirmed that the leachate at the FF/NN Landfill is not practically pumpable. Therefore, this alternative would meet the RAO of prevention of contaminant leaching to ground water. As indicated in section 6.1 of the FS, if ground water in private wells is impacted by the FF/NN Landfill at concentrations above ch. NR140 PALs, municipal water supply will be extended to these residences, or point-of-entry treatment systems provided. This commitment, coupled with regular monitoring of private wells, insures overall protection of human health as ch. NR140 PALs were established to be protective of human health.

Passive landfill gas vents are commonly used to remove gases from municipal landfills since they enhance the vertical migration of landfill gas and thus prevent lateral gas migration. Passive vents are effective in preventing the buildup of gas pressure, and the trench system will prevent the buildup of gas pressure beneath the clay and geosynthetic membrane. The trench system also will not require that vents be placed through the geosynthetic membrane.

The passive gas venting system will meet the RAO of prevention of off-site migration of landfill gas.

3.1.3 Compliance With ARARs

Chapters NR500 through 520 and ch. NR724 have been identified as potentially applicable to the FF/NN Landfill. These administrative codes pertain to all aspects of present day solid waste disposal, and remedial action design, implementation, operation, maintenance, and monitoring, respectively. Alternative O would exceed the landfill cap requirements of ch. NR504.07 by including an impermeable geomembrane above the compacted clay layer. It would also meet the landfill gas control requirements of Ch NR 500-520. Table 3-1 provides a description of the federal and state ARARs for each of the remedial alternatives at the FF/NN Landfill.

3.1.4 Long Term Effectiveness and Permanence

Alternative O would provide long-term effectiveness and permanence by providing maintenance of the composite landfill cap. This would be continued as long as deemed necessary to protect human health and the environment.

The existing passive vents at the FF/NN landfill are removing a portion of the landfill gas from the landfill, as shown by the concentrations of methane greater than 1% at the vents. An additional passive vent system constructed throughout the entire landfill surface would vent gases found at all lateral locations of the landfill and would therefore be effective over

the long term. Additionally, the landfill gas probes constructed around the perimeter of the landfill would provide notification in the event that landfill gases were found to be migrating. In addition, landfill gas generation rates are expected to decrease with time as the organic material in the landfill is degraded and is no longer a source of energy for the anaerobic microorganisms present in the landfill.

The deed restriction would have the same level of long-term effectiveness and permanence, and restrict future use of the property in a similar fashion as Alternative A. The construction of a fence would add additional long-term effectiveness and permanence.

3.1.5 Reduction of Toxicity, Mobility or Volume Through Treatment

Landfill capping and gas venting provide no treatment, and therefore, do not require evaluation under this criterion.

3.1.6 Short-Term Effectiveness

Alternative O would not provide substantially more short-term risks than Alternative A, the No Action alternative. Additional short-term impacts to the community compared to Alternative A would include increased dust and noise from construction and truck traffic since the clay source required under this alternative would be located off-site.

This alternative would also be protective of human health and the environment over the short term since landfill gas would not have the tendency to concentrate or migrate in the subsurface.

3.1.7 Implementability

Technical Feasibility

Alternative O involves construction of a fence around the landfill property and construction of a landfill cover and passive gas venting system which exceeds the requirements of ch. NR504.07(1) through (7). Required materials, services, and equipment are available to construct the fence and construct and maintain the composite landfill cover and gas system. Continued ground water and leachate sampling and analysis, and continued landfill gas field monitoring are required.

Administrative Feasibility

This alternative would be administratively implementable.

3.1.8 Cost

The estimated cost to implement this alternative is developed on Table 3-2. The direct cost for this alternative includes obtaining deed restrictions for the future use of the landfill area, construction of a fence with appropriate signs, and construction of a composite cover and passive gas venting system which exceeds the requirements of ch. NR504.07. The estimated cost is $1,220,000.

The annual O&M costs of this alternative would be $34,000 per year and include the same items as the other cap alternatives, with the addition of maintenance of the passive gas system.

The 30-year present worth using a discount rate of 6% associated with the above costs is estimated to be $1,688,000.

3.2 Comparative Analysis of Alternatives

Section 3.1 provides an analysis of Alternative O with respect to the seven evaluation criteria in the NCP. In this section, a comparative analysis is performed to evaluate the relative performance of this alternative with each of the other alternatives with respect to the seven evaluation criteria so that the WDNR and the U.S. EPA can determine the relative advantages and disadvantages of each alternative. These advantages and disadvantages will be assessed by the WDNR and the U.S. EPA and will serve as the rationale for selecting the preferred alternative(s) and creating a Record of Decision (ROD).

3.2.1 Landfill Cap and Monitoring Alternatives

3.2.1.1 Overall Protection of Human Health and the Environment

The No Action Alternative includes grading of the landfill surface to correct settlement problems and promote stormwater runoff; all other alternatives include grading or reconstruction of the landfill cap. Therefore, all landfill cap alternatives would be effective in meeting the RAO of controlling surface water runoff and erosion.

All of the landfill cap alternatives include maintenance of the landfill cover specified in the particular landfill cap alternative. Since the No Action Alternative effectively contains the waste material, then all of the landfill cover alternatives meet the RAO of prevention of direct contact with landfill contents.

Modeling of expected percolation rates through each of the landfill cover alternatives has been conducted using the HELP model. The HELP model indicates the following expected percolation rates for each landfill cap alternative:

Alternative A - 1 inch per year;
Alternative B - 1 inch per year
Alternative C - 0.1 inch per year;
Alternative D - 0.1 inch per year;
Alternative E - 0.002 inch per year, and
Alternative O - 0.002 inch per year.

As shown by the HELP modeling, Alternatives E and O provide for the lowest infiltration rate, followed by Alternatives C and D, and finally, Alternatives B and A.

Based on the results of the HELP modeling, Alternatives C, D, E, and O would be more effective than the landfill cover specified in ch. NR504. Alternatives A and B are expected to have similar levels of performance as the ch. NR504 landfill cover.

3.2.1.2 Compliance with ARARs

Chapters NR500 through 520 and ch. NR724 have been identified as potentially applicable to the capping alternatives for the FF/NN Landfill. These administrative codes pertain to all aspects of present day solid waste disposal, and remedial action design, implementation, operation, maintenance, and monitoring.

The No Action Alternative and Alternative B fail to comply with the following ARAR:

NR504.07, Wisconsin Administrative Code

Administrative Code that specifies landfill cover specifications for the landfill. The No Action landfill cover would not meet this requirement because no cover layer/root zone is present at the landfill and approximately 3 acres of the site has less than the required 2-foot thickness of compacted clay.

However, since both the No Action Alternative and Alternative B would meet the performance standards of ch. NR504 as indicated by the results of the HELP modeling, then a waiver from the ch. NR504 requirement under CERCLA Section 121(d)(4)(D) could be sought.

Alternative C may also be considered to fail to conform with the same ARAR that specifies landfill cover specifications for the landfill. The Alternative C landfill cover does not strictly meet this requirement because the 2-foot thick compacted clay layer was not constructed with 6-inch lifts of compacted clay. However, the Alternative C cover would meet the performance standards for permeability of ch. NR504 as indicated by the results of clay layer testing and the HELP modeling, so a waiver from the ch. NR504 requirement under CERCLA Section 121(d)(4)(D) could be sought.

The Alternative D landfill cover would be constructed in strict conformance with ch. NR504.07 and the landfill cover under Alternatives E and O would include a geosynthetic layer which would exceed the requirements of ch. NR500 through 520 landfill cap design requirements.

3.2.1.3 Long-Term Effectiveness and Permanence

All of the landfill cover alternatives would provide long-term effectiveness and permanence by maintaining or improving the existing landfill cap and by restricting the future use of the landfill area with a deed restriction and fencing. The maintenance of the landfill cover would be continued as long as deemed necessary to protect human health and the environment.

3.2.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Landfill capping provides no treatment and, therefore, does not require evaluation under this criterion.

3.2.1.5 Short-Term Effectiveness

Implementation of Alternatives A, B, C, D, E, or O would generally not result in risks to human health and the environment since the clay cap would remain in-place and in good repair under these alternatives and, therefore, there should be no direct contact with landfill wastes.

With any of landfill cap alternatives B, C, D, E, or O as with any construction project, physical risks would be present. These risks would be minimized with good construction practices and would not significantly affect the protection of human health and the environment. Implementation of Alternatives B, C, D, E, and O would increase short-term risks associated with dust and noise from construction and truck traffic, since the materials required under these alternatives would be located off-site.

3.2.1.6 Implementability

Technical Feasibility

Required materials, services, and equipment are available to construct the fence, reconstruct and maintain the landfill cap, continue ground-water and leachate sampling and analysis, and continue landfill gas field monitoring under each of the landfill cap alternatives.

Administrative Feasibility

Each of the landfill cap alternatives would have the same level of administrative burden in complying with ch. NR500 through 520 and ch. NR700 through 736.

3.2.1.7 Cost

The annual O&M costs for each of the landfill cap alternatives are estimated to be $33,000 per year. These costs include the landfill cap maintenance and the monitoring.

The direct costs for each of the landfill cap alternatives are estimated to be as follows:

Alternative A: $ 1,000
Alternative B: $ 60,000
Alternative C: $ 631,000
Alternative D: $ 850,000
Alternative E: $1,171,000
Alternative O: $1,220,000 (including $49,000 for the gas system)

The present worth for each of the landfill cap alternatives are estimated to be as follows:

Alternative A: $ 455,000
Alternative B: $ 514,000
Alternative C: $1,085,000
Alternative D: $1,304,000
Alternative E: $1,625,000
Alternative O: $1,688,000 (including $63,000 for the gas system)

Table 3-3 provides a summary of the detailed analysis described above.

3.2.2 Landfill Gas Extraction Alternatives

3.2.2.1 Overall Protection of Human Health and the Environment

The No Action Alternative includes maintenance of the existing passive vents on the landfill surface and semi-annual field monitoring of the landfill gas from the existing vents and leachate wells. Since the property located directly south of the landfill is owned by the City of Ripon which is a member of the FF/NN Landfill Group, and no landfill gas has been detected beyond the boundary of either the landfill property or the above-mentioned property south of the landfill, then No Action would meet the RAO of prevention of off-site migration of landfill gas.

Alternatives H, I, and O would also meet the RAO of prevention of the migration of landfill gas since they include the construction, operation, and maintenance of engineering controls which are not in place under the No Action Alternative. Alternative I would be the most protective since it involves the most efficient gas extraction method and irreversibly destroys the gas rather than venting it to the atmosphere as under Alternatives H and O.

Therefore, the No Action Alternative and Alternatives H, I and O all meet the RAO of preventing off-site migration of landfill gas. Alternative I is slightly more protective than Alternatives H, and O and these are more protective than A.

3.2.2.2 Compliance with ARARs

Chapters NR500 through 520, ch. NR445, and ch. NR724 have been identified as potentially applicable to the FF/NN Landfill. These administrative codes pertain to all aspects of present day solid waste disposal, emission of hazardous air pollutants, and remedial action design, implementation, operation, maintenance, and monitoring, respectively.

As discussed in Section 3.1, Alternatives A, H, I and O would be constructed and implemented in accordance with all ARARs with regard to landfill gas.

3.2.2.3 Long-Term Effectiveness and Permanence

All of the landfill gas alternatives would provide long-term effectiveness and permanence since, under the No Action Alternative, no landfill gas has been detected outside of either the landfill boundary or the adjacent property south of the landfill which is owned by the City of Ripon.

Alternatives H and O would provide additional long-term effectiveness and permanence since there would be less risk of gas buildup over the long-term. Alternative I would be slightly more effective over the long term; and with proper treatment would remove most of the long-term risk associated with the landfill gas.

Landfill gas generation rates would decrease over the long-term, regardless of the landfill gas alternative selected.

3.2.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Landfill gas collection does not require treatment and, therefore, does not require evaluation under this criterion.

The flare included in Alternative I would reduce the toxicity and volume of landfill gas as compared to Alternatives A, H, and O.

3.2.2.5 Short-Term Effectiveness

Implementation of Alternatives A, H, I, or O would not result in risks to human health and the environment since the landfill gas has not migrated beyond the landfill property or the

vacant property to the south of the landfill which is owned by the City of Ripon. Continued gas monitoring would provide advance warning of migrating gases.

3.2.2.6 Implementability

Technical Feasibility

Required materials, services, and equipment are available to construct and maintain any of the gas alternatives. Alternative A would be the easiest to implement since it involves no new construction. Alternatives H, I, and O would be moderately easy to implement since construction of gas vents/wells has been done at a number of landfills.

Administrative Feasibility

Each of the gas alternatives are expected to have the same level of administrative burden in complying with ch. NR500 through 520, ch. NR445, and ch. NR700 through 736.

3.2.2.7 Cost

The direct costs for each of the gas alternatives are estimated to be as follows:

Alternative A: $ 1,000
Alternative H: $161,000
Alternative I: $165,000
Alternative O: $ 49,000 for just the gas system portion of the alternative

The annual O&M costs for each of the LFG alternatives are estimated to be as follows:

Alternative A: $33,000
Alternative H: $ 3,000

Alternative I: $19,000

Alternative O: $ 1,000 for just the gas system portion of the alternative

The present worth for each of the LFG alternatives are estimated to be as follows:

Alternative A: $455,000

Alternative H: $202,000

Alternative I: $427,000.

Alternative O: $ 63,000 for just the gas system portion of the alternative.

It should be noted that costs for Alternative A include ground-water monitoring which is not included in Alternatives H, I, and O. The O&M costs for the gas monitoring in Alternative A are less than those of Alternatives H, I, or O.

Table 3-4 provides a summary of the detailed analysis provided above.

4.0 REFERENCES

Hydro-Search, Inc., Feasibility Study, FF/NN Landfill, Ripon, Wisconsin, December 30, 1994.

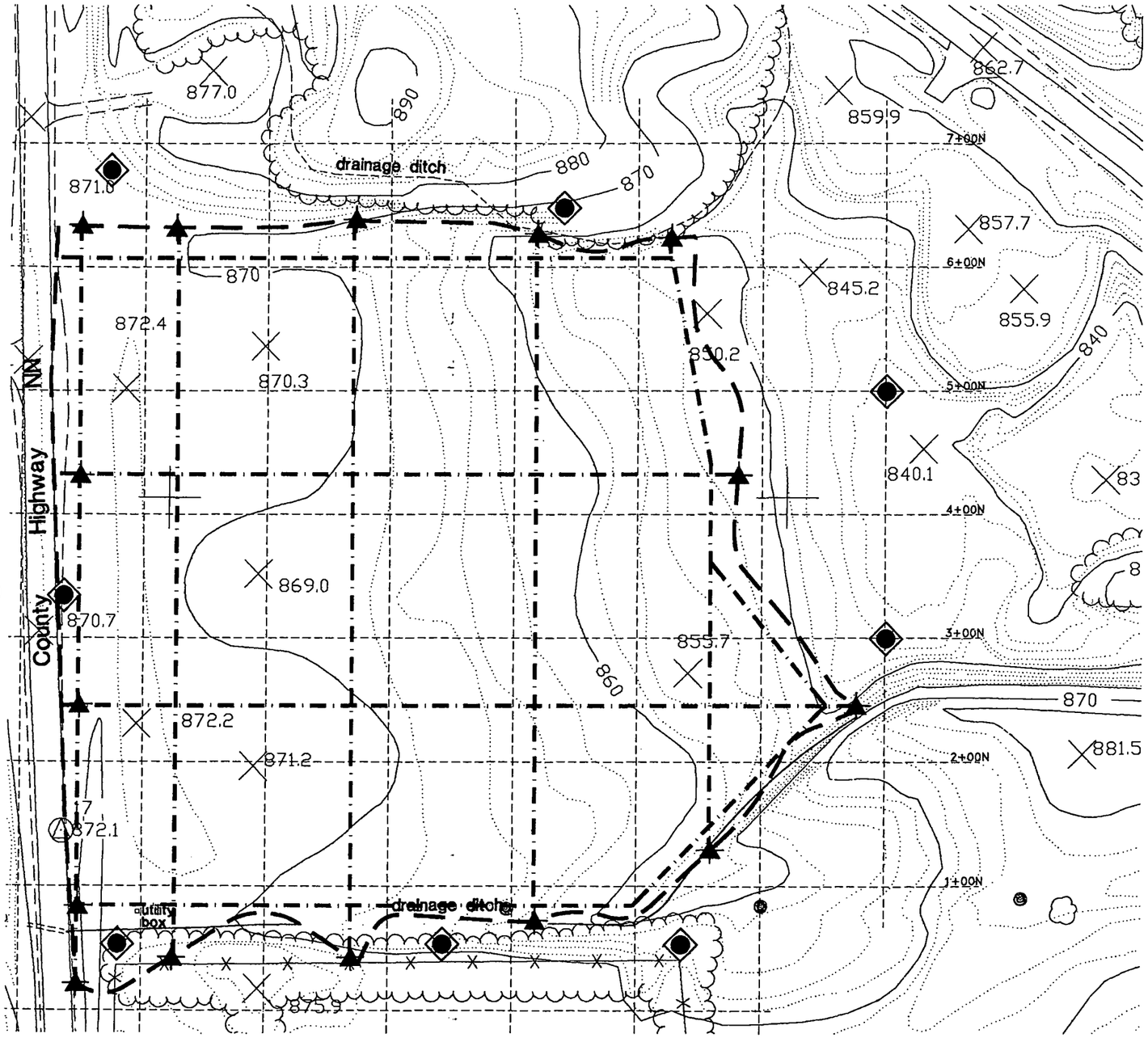
Hydro-Search, Inc., Remedial Investigation Report, FF/NN Landfill, Ripon, Wisconsin, August 26, 1994.

Means, 1991, Site Work and Landscape Cost Data (1992), 11th Annual Edition, R. S. Means Company, Inc., Kingston, Massachusetts.

Peyton, L. and Schroeder, P., Verification of the Hydrologic Evaluation of Landfill Performance (HELP) Model Using Field Data, Documentation Report for the HELP Model, Colorado School of Mines, 1986.

Simon Hydro-Search, 1992, Task 1, Site Evaluation Report Remedial Investigation/ Feasibility Study, Ripon FF/NN Landfill, Ripon, Wisconsin.

Simon Hydro-Search, 1994, Recommendations for Additional Well Locations, Ripon FF/NN Landfill, Ripon, Wisconsin.



EXPLANATION

PROPOSED PASSIVE LANDFILL GAS VENT LOCATION (15 Total)

PROPOSED GAS MONITORING PROBE LOCATION (8 Total)

APPROXIMATE EXTENT OF REFUSE

PASSIVE LANDFILL GAS TRENCH LOCATIONS

N

SCALE

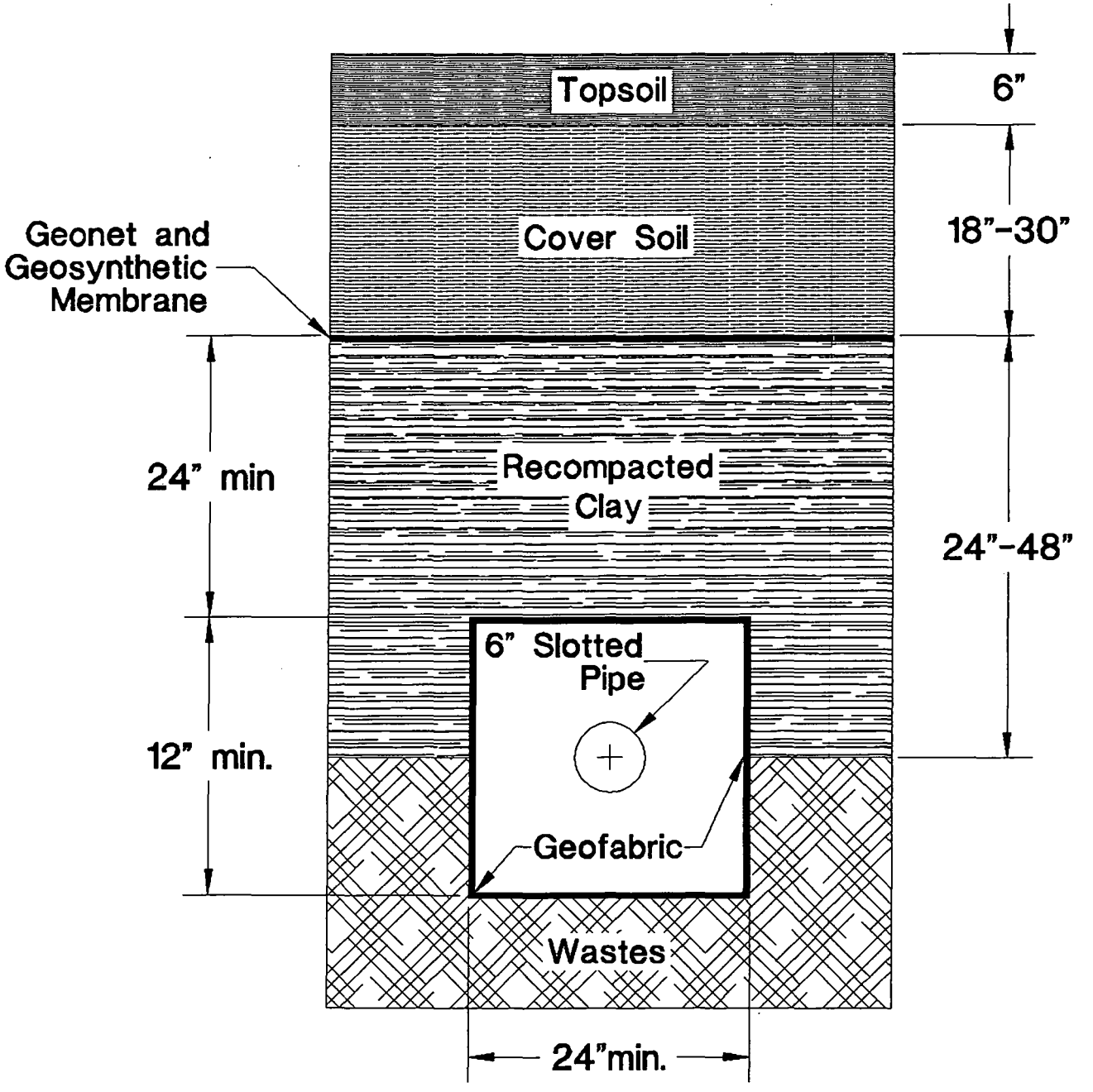
0 200

Feet

Base map from Ayres Associates, 1991 for the City of Ripon

RIPON FF/NN LANDFILL RIPON, WISCONSIN	DATE: 05/01/95
	DESIGNED: MCL
PASSIVE LANDFILL GAS TRENCH LOCATIONS	CHECKED: GLD
	APPROVED: GLD
	DRAWN: MCL
	PROJ.: 304733096
HYDRO-SEARCH INC A Tetra Tech Company	Figure 3-1

/hsl/473/3096/3096-b16a



NOT TO SCALE

RIPON FF/NN LANDFILL RIPON, WISCONSIN	DATE: 05/01/95
TYPICAL LANDFILL GAS TRENCH CROSS SECTION	DESIGNED: GLD CHECKED: GLD APPROVED: GLD DRAWN: MCL PROJ.: 304833098
HYDRO-SEARCH, INC A Tetra Tech Company	Figure 3-2

/hsi/473/3096/3096-a3

FS Addendum Table 3-1. Potential ARARs for Remedial Actions at the FF/NN Landfill (Page 1 of 4)

Regulation, Policy, or Law	Description	Alternatives										
		A	B	C	D	E	H	I	J	K	M	O
FEDERAL REGULATIONS												
Clean Air Act (CAA) and National Ambient Air Quality Standards (NAAQS)	Regulates site air emissions	X	X	X	X	X	X	X	X	X	X	X
40 CFR 52	Regional air quality plan for remedial activities. Federal Prevention of Significant Deterioration Program						X	X	X	X	X	X
40 CFR 50	Air quality standards for remedial activities						X	X	X	X	X	X
40 CFR 257	Criteria for classification of solid waste disposal facilities and practices	X	X	X	X	X						X
40 CFR 261	Identification of hazardous waste						X	X	X	X	X	X
40 CFR 262	Regulations for hazardous waste generators						X	X	X	X	X	X
40 CFR 263	Regulations for transport of hazardous waste								X	X	X	
40 CFR 264.310(a)	Requirements for final cover design and closure/post closure use of the property					*						*
40 CFR 264.117(c)	Requirements for post closure use of the property	X	X	X	X	X						X
40 CFR 264.228(b), 310(b)	Requirements to prevent run-on and run-off from damaging the cover	X	X	X	X	X						X
40 CFR 264.310(b)	Requirements for protection and maintenance of any surveyed benchmarks used to locate waste cells	X	X	X	X	X						X
Department of Transportation Hazardous Materials Transportation Act	Off-site transport of hazardous waste						X	X	X	X	X	X
Occupational Safety and Health Administration (OSHA)	Regulates worker safety	X	X	X	X	X	X	X	X	X	X	X
Fish and Wildlife Coordination Act	Regulates flow modification of Silver Creek								X			
Endangered Species Act	Protects endangered species and habitats. No endangered species are known to exist at the site.	X	X	X	X	X	X	X	X	X	X	X
OSWER Directive 9355.0-28	Control of air emissions from superfund air strippers at superfund ground-water sites (emissions threshold for air strippers is set at 3 lbs/hr or 15 lbs/day or a potential rate of 10 tons/yr of total VOCs								X	X		
40 CFR Part 264, AA	Requires total organic emissions from air strippers be reduced below 1.4 kg/hr and 2.8 megagrams/yrs/ or by 95% by weight								X	X		
Executive Order 11988 and 11990; 40 CFR 6, Subpart A	Requirements for remedial actions impacting floodplains or wetlands								X			

Notes: X = ARAR
* = Alternative would meet this standard. However, this standard is not an ARAR.

FS Addendum Table 3-1. Potential ARARs for Remedial Actions at the FF/NN Landfill (Page 2 of 4)

Regulation, Policy, or Law	Description	Alternatives										
		A	B	C	D	E	H	I	J	K	M	O
Resource Conservation and Recovery Act (RCRA), Subtitle D	Regulates solid waste	X	X	X	X	X						X
RCRA, Subtitle C	Regulates hazardous waste. Water treatment residuals may be hazardous waste						X	X	X	X		X
Clean Water Act (CWA)	Regulates surface water quality								X			
40 CFR 264.18(b) (RCRA)	Requirements for design, construction, operation and maintenance of remedial actions at RCRA hazardous waste sites located in floodplain								X			
National Pollutant Discharge Elimination System (NPDES)	Regulates discharge into Silver Creek								X			
Pretreatment Requirements 40 CFR, Part 403.5	Pretreatment standards for discharge to POTW.										X	
Fresh Water Quality Criteria (FWQC)	Surface water quality standards								X			
Executive Order for Wetlands and Floodplains	Regulates actions in wetlands or floodplains								X	X	X	
Response in a Floodplain or Wetlands; 40 CFR Part 6, Appen. A	Construction in flood hazard areas								X	X	X	
STATE OF WISCONSIN REGULATIONS												
NR 102 - Water Quality Standards for Wisconsin Surface Waters	Specifies water quality standards for use classifications. Dissolved oxygen must not be lowered below 5 mg/l and pH must be maintained within 6 to 9 units. See NR 102 for additional standards								X			
NR 103 - Water Quality Standards for Wetlands	Regulates water discharges to wetlands								X	X	X	
NR 104 - Intrastate Water uses and Designated Standards	Designates use classifications for surface waters.								X			
NR 105 - Surface Water Quality Criteria for Toxic and Organoleptic Substances	Specifies water quality criteria for toxic and organoleptic substances for protection of human health and welfare and aquatic life.								X			
NR 106 - Procedures for Calculating Water Quality based Effluent Limitations for Toxic and Organoleptic Substances Discharged to Surface Waters	Specifies procedures for how effluent limitations are to be calculated for toxic and organoleptic substances.								X			

Notes: X = ARAR
* = Alternative would meet this standard. However, this standard is not an ARAR.

FS Addendum Table 3-1. Potential ARARs for Remedial Actions at the FF/NN Landfill (Page 3 of 4)

Regulation, Policy, or Law	Description	Alternatives										
		A	B	C	D	E	H	I	J	K	M	O
NR 108 - Requirement for Plans and Specifications - Submittal for Reviewable Projects and Operations of Community Water Systems, Sewerage Systems, and Industrial Waste Facilities	Sets guidelines for plans and specifications for actions which propose a discharge to ground water								X	X		
NR 112 - Well Construction and Pump Installation	Specifies construction standards for well and pump installations and abandonment of wells.								X	X	X	
NR 116 - Wisconsin's Flood Plain Management Program	Requires and establishes standards for municipal flood plain zoning ordinances. Relevant and appropriate to construction of remediation facilities.	X	X	X	X	X	X	X	X	X	X	X
NR 140 - Ground-Water Quality	Specifies ground-water quality preventative action limits and enforcement standards. Notification requirements and potential response actions when standards are exceeded are listed.	X							X	X	X	
NR 181 - Hazardous Waste Management	Establishes requirements for the identification of hazardous waste and standards for the storage, transport, and disposal of hazardous waste. Generally parallels RCRA part 264 requirements (see Federal ARARs table).						X	X	X	X	X	X
NR 200 - Application for Discharge Permit	Discharge permit is required for discharges to surface waters and to land areas where water may percolate to ground water.								X	X		
NR 207 - Water Quality Antidegradation	Sets procedures for proposed new or increased discharge to ORWs or ERWs								X			
NR 211 - General Pretreatment Requirements	Prohibits discharges to POTWs which pass through or interfere with the operation or performance of the POTW and thereby cause a POTW to violate its WPDES permit.										X	
NR 214 - Land Application and Disposal of Liquid Industrial Wastes and Byproducts	Requires land disposal systems to meet design and construction criteria and requires plans and specification to be approved by WDNR. Effluent limitations and ground-water monitoring requirements are also specified.								X	X		
NR 219 - Analytical Test Methods and Procedures	Sets procedures applicable to effluent limitations for discharges from point sources								X			
NR 220 - Categories and Classes of Point Sources and Effluent Limitations	Requires WDNR to establish effluent limits for uncategorized point sources and to base those limits on best practicable control technology currently available or best available control technology economically achievable.								X			

Notes: X = ARAR
* = Alternative would meet this standard. However, this standard is not an ARAR.

FS Addendum Table 3-1. Potential ARARs for Remedial Actions at the FF/NN Landfill (Page 4 of 4)

Regulation, Policy, or Law	Description	Alternatives										
		A	B	C	D	E	H	I	J	K	M	O
CH147.Stats - Pollution Discharge Elimination	Requires point source discharges to obtain a permit from WDNR								X			
NR 445 - Control of Hazardous Pollutants	Specifies emission limits and control requirements for air contaminant sources emitting hazardous pollutants	X					X	X	X	X	X	X
NR 445-04 - Emission Limits for New or Modified Sources	Specifies air concentrations not to be exceeded off the source's property in terms of 24-hour and 1-hour averages. Requires lowest achievable control technology for air contaminants without acceptable ambient concentrations.	X					X	X	X	X	X	X
NR 500-520 - Solid Waste Management Regulations	These codes are for all aspects of solid waste disposal in Wisconsin.	X	X	X	X	X	X	X				X
NR 504 - Landfill Location, Performance, and Design Criteria	Specifies locational criteria, performance standards, and minimum design requirements for solid waste disposal facilities	X	X	X	X	X						X
NR 506.08 - Landfill Operational Criteria - Closure Requirements	Specific closure requirements for landfills including notification, establishment of 2 feet of soil cover and revegetation and hazardous air contaminant control for facilities over 500,000 CY.	X	X	X	X	X						X
NR 508 - Landfill Monitoring, Remedial Actions and In-field Conditions Reports	Specifies monitoring requirements for ground water, vadose zone, leachate, gas, surface water and air. Also specifies the design management zone as 300 feet from the waste boundary.	X	X	X	X	X	X	X	X	X	X	X
NR 700 - 736 - Investigation and Remediation of Environmental Contamination	Specifies standards and procedures pertaining to the identification, investigation, and remediation of sites.	X	X	X	X	X	X	X	X	X	X	X

Notes: X = ARAR
* = Alternative would meet this standard. However, this standard is not an ARAR.

Table 3-2. FF/NN LANDFILL Alternative O - Construct Composite Cap with Passive Gas Venting

COST ESTIMATE

CAPITAL COSTS

	Quantity	Units	Unit Cost	Total Cost
Place Restriction on Deed	1	each	$1,000	$1,000
Strip, Disc & Stockpile Existing Vegetation and Topsoil	5,500	cubic yds	$5	$28,000
Excavate Gas Trenches	1,400	cubic yds	$2	$3,000
Place Geofabric in Gas Trenches	3,200	Sq. yds	$1.50	$5,000
Provide and Place Pipe in Gas Trenches	4,700	linear ft.	$2	$9,000
Provide/Place Gravel Backfill in Gas Trench	350	cubic yds	$22	$8,000
Replace Wastes in Landfill	200	cubic yds	$5	$1,000
Import Clay as Necessary	5,000	cubic yds	$9	$45,000
Place & Grade Imported Clay	6,200	cubic yds	$5	$31,000
Import and Place Geoliner and Geonet	36,000	Sq. yds	$11	$396,000
Import Cover Layer Soil	20,000	cubic yds	$9	$180,000
Place & Grade Cover Layer Soil	20,000	cubic yds	$3	$60,000
Import Additional Topsoil	500	cubic yds	$8	$4,000
Place & Grade Imported and Stockpiled Topsoil	6,000	cubic yds	$3	$18,000
Revegetate Landfill	36,000	Sq. Yd.	$0.30	$11,000
Provide and Install Passive Gas Vents	15	ea.	$1,000.00	$15,000
Provide and Install Gas Probes	8	ea.	$2,000.00	$16,000
Eight-foot high Chain Link Fence	2,400	Linear Ft	$15	$36,000
Mobilization/Demobilization	10% of Capital Costs			$87,000
	TOTAL CAPITAL COST =			$954,000

OTHER DIRECT COSTS

Permitting and Design (10% of Total Capital Costs)	$95,000
Construction Oversight (8% of Total Capital Costs)	$76,000
Contingency (10% of Total Capital Costs)	$95,000
TOTAL DIRECT COSTS =	$1,220,000

OPERATION & MAINTENANCE COSTS

Annual Discount Rate = 6.0%
Life of Project = 30 years

	Quantity	Unit Cost	Annual Cost	Present Worth
Annual Inspection and Maintenance of Landfill Cap	1	$5,000	$5,000	$69,000
Semiannual Ground Water and LFG Sampling and Analysis	2	$12,000	$24,000	$330,000
Annual Leachate Sampling and Analysis	1	$4,000	$4,000	$55,000
Gas System Maintenance and Repairs	2 % of Capital Cost	$1,000	$1,000	$14,000
	ANNUAL O&M COSTS =		$34,000	
	PRESENT WORTH O&M COSTS =			$468,000

TOTAL DIRECT COSTS =	$1,220,000
PRESENT WORTH O&M COSTS =	$468,000
TOTAL PRESENT WORTH COSTS =	$1,688,000

FS Addendum Table 3-3. Landfill Cap and Monitoring Alternatives Summary (Page 1 of 2)

Criteria	Alternative A No Action	Alternative B Regrade Existing Landfill Surface	Alternative C Construction of a Cover Layer on Landfill	Alternative D Replace Existing Clay Cap on Landfill	Alternatives E and O Construct a Composite Cap on Landfill*
Overall Protection of Human Health and the Environment					
♦ Control Surface Water Runoff and Erosion	♦ Provides protection by grading of the landfill surface to correct settlement problems and promote storm water runoff.	♦ Same as Alternative A	♦ Provides protection by reconstructing and grading of the surface to correct settlement problems and promote storm water runoff.	♦ Same as Alternative C	♦ Same as Alternative C
♦ Prevention of Direct Contact with Landfill Contents	♦ Provides protection by maintaining the existing landfill cover which effectively contains the waste material.	♦ Same as Alternative A	♦ Provides protection by maintaining the improved landfill cover.	♦ Same as Alternative C	♦ Same as Alternative C
♦ Prevention of Contaminant Leaching to Ground Water	♦ Expected percolation rate through the Alternative A landfill cover is 1 inch/year. Leachate is not pumpable.	♦ Expected percolation rate through the Alternative B cover is 1 inch/year. Leachate is not pumpable	♦ Expected percolation rate through the Alternative C landfill cover is 0.1 inches/year. Leachate under this alternative is not pumpable.	♦ Expected percolation rate through the Alternative D landfill cover is 0.1 inches/year. Leachate under this alternative is not pumpable.	♦ Expected percolation rate through the composite landfill cover is 0.002 inches/year. Leachate under this alternative is not pumpable.
Compliance with ARARs	This alternative would not meet the landfill cap specifications of NR504.07 since no cover layer would be present at the landfill and approximately 3 acres of the site would have approximately 1.5 feet of compacted clay. However, this alternative would meet the performance standards for permeability of ch. NR504.07.	Same as Alternative A.	This alternative can comply with all of the identified ARARs except the construction specifications of NR504.07. However, this alternative would exceed the performance standards for permeability of NR504.07.	This alternative can comply with all of the identified ARARs.	These alternatives would comply with all of the identified ARARs and would exceed the requirements of NR500-520 by including a geosynthetic layer.

FS Addendum Table 3-3. Landfill Cap and Monitoring Alternatives Summary (Page 2 of 2)

Criteria	Alternative A No Action	Alternative B Regrade Existing Landfill Surface	Alternative C Construction of a Cover Layer on Landfill	Alternative D Replace Existing Clay Cap on Landfill	Alternatives E and O Construct a Composite Cap on Landfill*
Long-term Effectiveness and Permanence	This alternative would provide long-term effectiveness by maintaining the existing landfill cap.	Same as Alternative A	This alternative would provide long-term effectiveness by maintaining the upgraded landfill cap.	Same as Alternative C	Same as Alternative C
Reduction of Toxicity, Mobility, or Volume through Treatment	Landfill capping requires no treatment and, therefore, does not require evaluation under this criterion.	Same as Alternative A	Same as Alternative A	Same as Alternative A	Same as Alternative A
Short-Term Effectiveness	No significant risk to the community or the environment.	Same as Alternative A	No significant risk to the community or the environment. Increased short-term risks due to increased dust and noise from construction.	Same as Alternative C	Same as Alternative C
Implementability	Maintenance of landfill cap and continued monitoring are readily implementable.	Same as Alternative A	Construction and maintenance of landfill cap and continued monitoring are readily implementable.	Same as Alternative C	Same as Alternative C
Cost	Direct cost is $1,000 O&M cost is $33,000/year Present worth is $455,000	Direct cost is $60,000 O&M cost is $33,000/year Present worth is $514,000	Direct cost is $631,000 O&M cost is $33,000/year Present worth is $1,085,000	Direct cost is $850,000 O&M cost is $33,000/year Present worth is $1,304,000	Direct cost is $1,171,000 O&M cost is $33,000/year Present worth is $1,625,000

* Does not include cost of passive gas system.

FS Addendum Table 3-4. Landfill Gas Extraction Alternatives Summary

Criteria	Alternative A No Action	Alternatives H and O Passive LFG Venting	Alternative I Active LFG Extraction and Treatment
Overall Protection of Human Health and the Environment	LFG monitoring has not shown that off-site migration of LFG has occurred.	More protective than Alternative A since it would include construction, operation, and maintenance of engineering controls which are not in place under Alternative A.	Involves the most efficient LFG extraction method and irreversible destruction of LFG.
Compliance with ARARs	This alternative could comply with all ARARs.	Same as Alternative A.	Same as Alternative A.
Long-Term Effectiveness and Permanence	This alternative would provide long-term effectiveness and permanence by providing continued monitoring of the LFG. LFG has not migrated off-site.	This alternative would provide additional long-term effectiveness and permanence compared to Alternative A by reducing the potential for gas build-up over time.	This alternative would provide additional long-term effectiveness and permanence compared to Alternative G by actively removing the treating LFG over the long term.
Reduction of Toxicity, Mobility, or Volume through Treatment	LFG extraction alternatives do not require treatment and, therefore, do not require evaluation under this criterion.	Same as Alternative A.	The flare would considerably reduce the volume of LFG.
Short-Term Effectiveness	LFG has not migrated and, therefore, there should be no significant risk to the community or the environment.	Same as Alternative A.	Same as Alternative A.
Implementability	Alternative A involves no construction and has already been implemented.	Construction and maintenance of passive vents are readily implementable.	Construction, operation, and maintenance of an active gas extraction system and flare are readily implementable.
Cost Note: The cost of the No Action Alternative would be added to Alternatives H and I	Direct cost is $1,000. Annual O&M cost is $33,000/year. Present worth is $455,000.	<u>Alternative H</u> Direct cost is $161,000. Annual O&M is $3,000/year. Present worth is $202,000. <u>Alternative O</u> Direct cost is $49,000 Annual O&M is $3,000/year Present worth is $63,000 These costs are for the gas system only and must be added to the cap cost in Table 3-3	Direct cost is $165,000. Annual O&M cost is $19,000/year. Present worth is $427,000.