RUST Rust Environment & Infrastructure Inc.

A Rust International Company
4738 North 40th Street
Sheboygan, WI 53083-1883
P.O. Box 1067
Sheboygan, WI 53082-1067
Phone 414.458.8711
Fax 414.458.0537

MEMORANDUM

October 6, 1997

To: Mark Gottlieb, P.E.
Public Works Committee

From: Joan Underwood

Subject: Proposed Work Plan Scope
REI Project No. 101688

I. PROJECT DESCRIPTION AND GOALS

A Scoping Meeting for the Lime Kiln Landfill site was held in Sheboygan on September 11, 1997. Based on this scoping meeting, a proposed scope of work was developed and a Work Plan is being prepared for submittal to DNR. This memorandum summarizes the proposed scope of work.

The purpose of the Work Plan is to identify the data needs associated with the initial site characterization of the Lime Kiln Landfill along with potential remedial measures and the procedures necessary to collect the data.

II. SITE CONCEPTUAL MODEL

Primary Sources

The site conceptual model consists of several potential primary sources including the Lime Kiln landfill, other area industries, UST, and LUST sites. The three potential primary contaminant sources from the landfill include leachate, gas, and waste/soil.

Primary Release Mechanisms

As water infiltrates through the landfill, contaminants may be released from the waste/soil and carried downward to the groundwater table. Waste that is below the water table could also release constituents directly to the water table. To determine the importance of these release mechanisms, the hydrogeology of the site and leachate head conditions within the landfill will need to be determined.

Quality through teamwork

Landfill gas generated during the natural decomposition of organic mater may transport VOCs. VOCs will also naturally volatilize from the leachate and waste. Compounds that are not highly water soluble and that are more volatile are most likely to be released in the gas according to Henry's Law. Gas can then migrate and constituents can be transported through the soils and into the groundwater and air. Gas and leachate composition will be investigated along with gas pressure conditions in the landfill to evaluate this release mechanism.

Pathways

Pathways of exposure include surface water, groundwater, and air.

1. Surface Water

We do not expect surface water to be impacted, but if it is, it would be primarily impacted from groundwater seepage into the river.

2. Groundwater

Groundwater is the most important pathway of concern because it can be impacted by all the primary sources. There may be preferential pathways for groundwater flow in a reef structure known to occur in the area. The numerous existing private wells in the area also serve to provide preferential pathways within the groundwater flow system because all the wells are constructed with long (up to about 100 feet) open boreholes within the rock. This allows constituents that enter the groundwater system to be mixed throughout the aquifer to at least the depth of the wells because groundwater flow can move freely both up and down the boreholes. Downward migration of constituents would be limited by an aquitard found at a depth of approximately 500 feet.

Fractures in the bedrock may also play a role in contaminant transport, however: 1) Tecumseh, working on a nearby project, found no strong correlation between fracture occurrence and contaminant concentrations; and 2) there are two scientific opinions on the importance of fracture flow in the area. One opinion believes it has a very strong influence, and the other opinion is that other factors, especially bulk permeability, will be a much more dominant influence on flow.

3. Air

Because the landfill is old and concentrations by contaminants are not high in groundwater, it is not likely that there is an air pathway risk.

A site conceptual drawing is attached.

III. CLEANUP OBJECTIVES BY MEDIA

We discussed the goals and objectives of any cleanup activities. Regulatory drivers are NR 700 codes and not NR 500 because the site was never a permitted landfill. We also need to consider NR 140 groundwater quality regulations which include the standards for groundwater quality - PALs and ESs.

IV. PRELIMINARY IDENTIFICATION OF ALTERNATIVES

The Preliminary Alternatives table (attached) was used to identify preliminary response actions that might be feasible at and around the site. These potential response actions then control what data we will need to collect in order to determine the appropriate response action. It allows us to focus on the outcome for the site and save costs by not collecting data that is not necessary to finding a solution. Appropriate media-specific actions are summarized below, and the preliminary response action table should be referred to for specific data needs.

Surface water - It is usually difficult to clearly relate site contaminants to contaminants detected in a river. However, we will investigate potential impacts to the Milwaukee River in case risk from surface water needs to be addressed by taking samples upgradient, adjacent to, and downgradient of the site. We will also collect river water level information and correlate it to groundwater levels to evaluate whether groundwater flows into or out of the river adjacent to the site, and to evaluate the magnitude of groundwater flow (if any) from the site compared to stream flow.

Gas - Several remedies could be appropriate to control the effects of gas migration, such as a gas recovery system or a gas venting system.

Soil/waste material - Soil/waste material can be addressed by containment, treatment in-place, removal, removal with treatment, and replacement. Removal has been preliminarily determined to be not feasible because of implementability problems and the costs associated with it.

Leachate/groundwater - Leachate generation can be minimized with a low permeability cover system as long as the waste is not within the groundwater. If the waste is below the water table, leachate removal with disposal to a sanitary sewer or on-site treatment with discharge to the river may be necessary. We would consider leachate extraction through wells within or just below the waste. There is no sanitary sewer to the park at this time.

Deed restrictions are a potential option to avoid active groundwater remediation. It would prevent disturbance of the waste at the Park and prevent groundwater usage. This is a possibility where the Village has the jurisdiction, but would not work outside the Village limits unless other governmental agencies became involved. Providing an alternative drinking water source is also a common solution to problems such as this and needs to be considered as a potential remedial option for the existing groundwater problem. Each resident would pay for the water usage once they are hooked up to the system. This is important from a long-term cost evaluation standpoint.

V. DATA NEEDS

We discussed data needs for each media by evaluating the media with the Preliminary Identification of Data Needs According to Response Action/Remedial Technology table. The table provides a guideline for determining data needs and was marked-up according to potential conditions at the site (attached). The Village will provide us with electronic files of area topography, property lines, utilities, etc.

In general, we need to know the following:

- Is the landfill a source of the constituents detected in the private wells near the site?
- Is the landfill the only source?
- Is the Tecumseh groundwater problem part of this problem?
- Is the plume stable? Is the situation getting better over time (i.e., constituent concentrations decreasing, plume size stable or shrinking) which could indicate natural attenuation? We will need to look at the times samples were taken in the past and consider timing, contaminant type, and distribution when collecting data in the future.
- The nature and extent of contamination around or from the site.
- If the contamination is widespread, and what are the potential risks (now and future) associated with the contamination?
- Is natural attenuation occurring?

VI. SPECIFIC FIELD APPROACH AND ACTIVITIES BY MEDIA

The data to be collected is shown on the attached table. Methods to collect the data are listed below by media.

Surface water

1. Surface water effects:

- Install a marker on the abutment in the river to determine elevation of river. This will be used to evaluate flow with respect to groundwater elevations and whether groundwater flows into or out of the river adjacent to the site.
- Potential impacts to the Milwaukee River will be addressed by taking samples upgradient, adjacent to, and downgradient of the site.

- Historical water level information will be collected and correlated to groundwater levels to evaluate groundwater/surface water interaction and the magnitude of groundwater flow (if any) from the site compared to stream flow.

Soil/waste material

1. Aerial and vertical extent of waste will be determined through:

- Aerial photos will be used to plot the potential waste area(s) on a site topographic map.
- An electromagnetic (EM) geophysical survey will be used to estimate the limits of waste both in Quarries 1 and 3. If information prior to field work is found concerning disposal in Quarry 3, this area may be eliminated from the EM survey.
- Shallow soil borings via a geoprobe will be used to confirm EM survey results, both inside and outside the limits of waste in both Quarries 1 and 3. If an EM survey is not conducted in Quarry 3, several geoprobe holes will be completed in Quarry 3 to confirm the absence of waste.

2. Upgradient potential sources:

- Talk to Winter Hess on other potential sources in the vicinity of Lime Kiln Park.
- Determine the need to investigate additional areas based on information provided by Winter Hess.

3. Gas migration:

- Methane concentrations, gas pressure (and, therefore, gas quantity), and gas quality will be investigated through installation of gas/leachate extraction wells. Wells will be constructed to be able to collect samples and pressure readings.

4. Cover thickness:

- Geoprobe borings used to confirm EM survey waste location will also be used for evaluating existing cover thickness and type.

Leachate/groundwater

1. Upgradient/background groundwater quality:

- At least one upgradient well will be located near the intersection near the southwest corner of the site. Coring of the monitoring well hole is recommended, however, we will provide costs for both coring and non-coring. Coring would be helpful for evaluating the site stratigraphy and correlating the information collected from the private wells with the geologic information collected from the core. The borehole will be geophysically logged for natural gamma, caliper, and resistivity prior to well installation. Packer testing of select intervals will be used to evaluate the permeability of various stratigraphic horizons and will also be used to collect select samples at different depth intervals (minimum shallow and deep sampling), depending on stratigraphy found in private wells and during drilling. The well depth will be determined based on the core, geophysical logging results, and borehole sampling results from the corehole. If additional wells are necessary based on sampling results, up to two additional wells will be installed in the same corehole using multi-level well construction equipment.

Groundwater samples will be analyzed for VOCs, SVOCs, metals, herbicides/pesticides, PCBs, and natural attenuation and indicator parameters.

2. Residential well investigations:

- A well search will be conducted by looking at private well logs located west of the site, checking with the Village, and potentially making a door-to-door call to determine if any wells still exist upgradient of the site.
- Existing private wells in the Manchester subdivision and wells which may potentially exist within the Village limits may provide information on stratigraphy, groundwater flow direction, and water quality.
- Select private wells both upgradient (if any are found) and within the Manchester Subdivision will be geophysically logged for caliper, natural gamma, and resistivity. We would also complete at least one round of water levels in the residential wells that are being geophysically logged. This will provide a baseline for conditions just after the homes are switched to Village water and a qualitative groundwater flow direction. Based on these results, selected intervals may be packer tested for information on hydraulic conductivity, and possibly sampled for select parameters to evaluate the presence of preferential flow zones. Borehole logs will be correlated with the corehole completed for the upgradient well (if it is cored). Upgradient private wells will be sampled for VOCs, SVOCs, metals, herbicides/pesticides, PCBs, and natural attenuation and indicator parameters. Manchester Subdivision well sampling will be for the same parameters, but wells to be sampled will be determined later based on results of the borehole logging and packer testing.
- Map the bottom elevation and open screen intervals of residential wells so that we can compare the open screen intervals and contaminant levels in the wells to determine if there is a correlation.

3. Leachate:

- Two leachate/gas wells will be constructed at the bottom of waste if it is saturated or just below the waste at the water table. Leachate/groundwater samples will be collected and analyzed for VOCs, SVOCs, PCBs, herbicides/pesticides, metals, and natural attenuation and indicator parameters. Two noncomposite samples (1 from each well) will be collected and analyzed. Well construction will be done with a larger diameter casing so that the wells could be used for pumping, if that is determined necessary. This would be more cost-effective in the long run.

4. Park Well (No. 36):

- We will check the depth of the Park well (Well No. 36) to check the appropriateness of this for an upgradient background sampling point. The laboratory analysis for Well No. 36 will be reviewed and checked for indicator parameter results to see if normal landfill indicators are at elevated concentrations. (Village information on water quality would be for bacteria). Summary lab results from the DNR have no VOC detections. We may need to install another upgradient well in place of this one if it is determined that Well No. 36 is not adequate for monitoring purposes.

5. Groundwater/surface water interaction:

- One shallow well, approximately 15 feet deep, will be installed on the west side of the river. This well will be sampled for the same parameters as the leachate/groundwater to help determine if the landfill is impacting the river. This well will be used for water level data and the evaluation of whether the river is a gaining or losing stream.

6. Groundwater modeling:

- We will complete some simple (1 or 2-dimensional) modeling or calculations of what changes to the groundwater levels and groundwater flow direction could be expected because of discontinued use of the private wells. We will vary site conditions (similar to a model sensitivity analysis) so we can estimate what kind of impact pumping of residential wells may have on groundwater flow.

Project Phasing

Work for the investigation will be completed in a phased approach. This will allow us to first characterize the waste and determine if there are a suite of constituents representative of contaminants that could be coming from the landfill. This will also allow us to target certain analytical parameters when completing future sampling to help minimize costs.

Phase I will consist of source characterization (i.e., landfill extent, leachate/gas sampling), including upgradient analysis, and some additional geological analysis, including geophysical logging of residential wells. Phase II will include extent and final plume definition.

The upgradient groundwater quality will also be determined during Phase I so we have an indication of other potential contaminant sources and constituents associated with these other sources. This will help separate potential effects from the landfill vs. other sources. Initial work on the residential wells will include the geophysical logging, water level information, and if necessary, select packer testing.

Based on the Phase I results, we will develop the final Phase II sampling plan for the private wells and additional sampling of monitoring wells so that we can estimate the rate and extent of a plume.

Data validation will not be done, but a data review will be conducted, and a memorandum describing this review will be prepared.

Rust Environment & Infrastructure

CALCULATION SHEET

PAGE 1 OF 1

PROJECT NO.

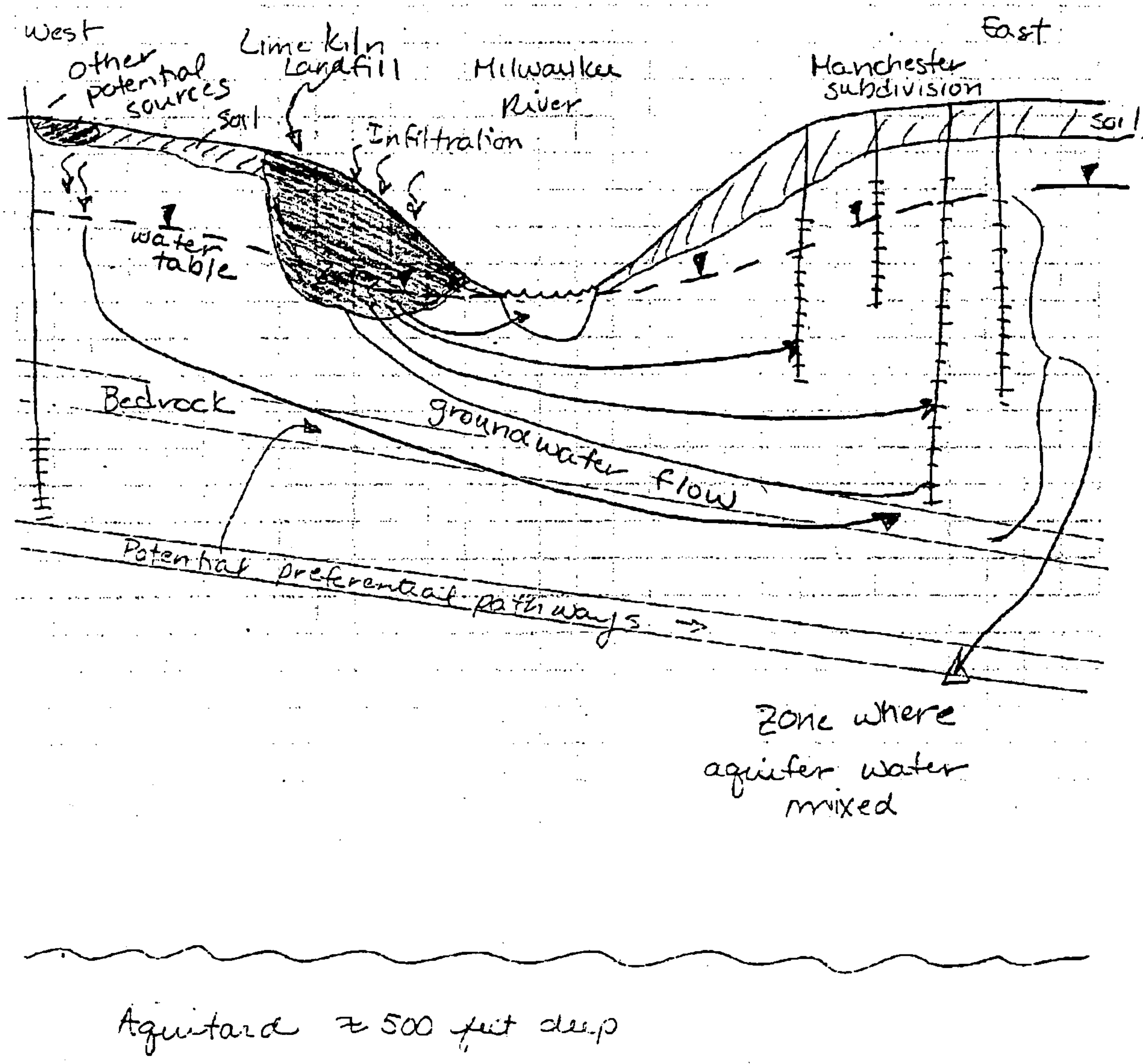
CLIENT Grafton SUBJECT Conceptual Sketch

PROJECT Lime Kiln

Prepared By Jlu Date 9/30/97

Reviewed By Date

Approved By Date



PRELIMINARY IDENTIFICATION OF DATA NEEDS ACCORDING TO RESPONSE ACTION/REMEDIAL TECHNOLOGY

LIME KILN LANDFILL
GRAFTON, WISCONSIN

	CONSTRUCTION RELATED ACTIVITIES				DIVERSION/COLLECTION				
DATA NEEDS	DUST CONTROL	EXCAVATION/ REMOVAL	NO ACTION	INSTITUTIONAL CONTROLS	DIKES AND BERMS	GROUNDWATER EXTRACTION WELLS	GRADING	SILT FENCES	REVEGETATION
SITE CHARACTERISTICS									
- STORAGE TIME									
- ACCESSIBILITY		X			X			X	X
- LAND USE	X		X	X	X			X	X
- ECOLOGICAL AREAS		X	X	X	X		X	X	X
- VEGETATION		X	X	X	X			X	
- TOPOGRAPHY		X			X	X	X	X	X
- DRAINAGE		X	X	X	X		X	X	X
- LOCATION/PERFORMANCE OF RCRA TREATMENT/DISPOSAL FACILITY									
- LOCATION AND NEEDS OF FACILITY OR USER QUALITY, VOLUME	X	X	X	X	X	X	X	X	X
CLIMATE									
- PRECIPITATION	X	X			X	X	X	X	X
- TEMPERATURE									X
- EVAPORATION									X
- WIND SPEED DIRECTION	X								
HYDROGEOLOGY									
- DEPTH TO IMPERMEABLE STRATA			X	X		X			
- SEISMIC HISTORY									
- SUBSURFACE CHARACTERIZATION		X	X	X		X			
- TRANSMISSIVITY, STORATIVITY			X	X		X			
- DEPTH TO GROUNDWATER/LEACHATE						X			X
- RATE & DIRECTION OF FLOW			X	X		X			
- HYDRAULIC CONDUCTIVITY			X	X		X			
- PUMPING RATE TO CONTAIN PLUME									
- LOCATIONS OF WELLS						X			
- WELL INTERFERENCE						X			
SOIL/WASTE CHARACTERISTICS									
- AVAILABILITY OF COVER MATERIAL									X
- GRAIN SIZE	X	X			X	X	X	X	X
- ATTERBERG LIMITS	X	X			X	X	X	X	X
- % MOISTURE		X							X
- PROCTOR COMPACTION	X				X			X	
- PERMEABILITY					X			X	X
- TRIAXIAL & DIRECT SHEAR TEST (STRENGTH)									
- % ORGANIC MATTER	X	X	X	X			X		X
- MICROBIOLOGY CELL ENUMERATIONS									
- DEPTH, TYPE, THICKNESS OF BOTTOM LINER, AND FINAL COVER									
- RECHARGE RATE						X			
CONTAMINANT CHARACTERISTICS									
- VOLATILITY	X		X	X					
- SORPTION, PARTITION COEFFICIENTS	X		X	X					
- EFFECTIVENESS OF DUST SUPPRESSION	X								
- BIODEGRADATION			X	X					
- SOLUBILITY			X	X		X			
- DENSITY			X	X		X			
- COMPATABILITY									
- TOXICITY		X	X	X					
WASTE CHARACTERIZATION									
- VOLUME	X	X	X	X		X			
- EXTENT OF CONTAMINATION	X	X	X	X		X			X
- CONCENTRATIONS AND TYPE		X	X	X		X			
- AIR	X		X	X					
- SOILS	X		X	X					X
- GROUNDWATER			X	X		X			
- LIQUID WASTE									
- SEDIMENTS			X	X	X			X	
- SLUDGE									
- OTHER			X	X	X			X	
- AERIAL PHOTO INTERPRETATION				X					
- DRUMS									
- LOWER LIMIT OF WASTE									
- LEACHATE/GAS COLLECTION/VENTING INFORMATION									
- OTHER									
CHEMICAL/PHYSICAL ANALYSIS									
- ORGANIC COMPOUNDS									X
- METALS		X							X
- TSS									
- TDS									
- TS									X
- TOC									
- COD									
- BOD									X
- TEMPERATURE									
- DISSOLVED OXYGEN									
- NUTRIENTS									X
- pH									X
- Na									X
- OIL AND GREASE									
- HEAT CONTENT									
- ASH CONTENT									
- VISCOSITY									
- CHLORINE CONTENT									
- Fe Mn									
- HARDNESS									
- ALKALINITY									
- SULFATES									
- CHLORIDE									
- NITROGEN, AMMONIA			X						
- NITORGEN, NITRATE & NITRITE			X						
- NITROGEN, KJELDAHL			X						
- PHOSPHATE, ORTHO			X						
- ELECTRICAL CONDUCTIVITY			X						
- OXIDATION - REDUCTION			X						
SURFACE WATER CHARACTERISTICS									
- WATER DEPTH									
- GAUGE MEASUREMENTS			X	X					
- STREAM CHANNEL MORPHOLOGY		X	X	X					
- 100 YEAR FLOODPLAIN			X	X	X			X	X
SEDIMENT CHARACTERISTICS									
- BOTTOM SEDIMENTS CHARACTERISTIC		X	X	X					
- DREDGABLE VOLUME	X	X	X	X					
- ARARS		X	X	X	X	X	X	X	
WATER SUPPLY INFORMATION									
- WATER QUALITY OF NEW SOURCE									
- LOCATION OF NEW SOURCE									
- DISTANCE TO NEW SOURCE									
- REQUIRED TREATMENT									
- EXPECTED DURATION OF NEED									
- INSTALLATION REQUIREMENTS									
- CURRENT AND PROJECTED WATER USE AND LOCATIONS									

PRELIMINARY IDENTIFICATION OF DATA NEEDS ACCORDING TO RESPONSE ACTION/REMEDIAL TECHNOLOGY

LIME KILN LANDFILL
GRAFTON, WISCONSIN

DATA NEEDS	PHYSICAL/CHEMICAL TREATMENT												
	PRECIPITATION	PHOTOLYSIS/OXIDATION ULTRAVIOLET/ PEROXIDE, OZONE	CHEMICAL OXIDATION/ REDUCTION	CARBON ADSORPTION	AIR STRIPPING	DEHALOGENATION	SOLVENT EXTRACTION	SOIL WASHING	STABILIZATION BY ION EXCHANGE RESINS	STEAM STRIPPING	DEWATERING	LOW TEMPERATURE THERMAL DESORPTION	ION EXCHANGE
SITE CHARACTERISTICS													
- STORAGE TIME	X		X			X							
- ACCESSIBILITY		X											
- LAND USE			X										
- ECOLOGICAL AREAS													
- VEGETATION													
- TOPOGRAPHY									X				
- DRAINAGE			X										
- LOCATION/PERFORMANCE OF RCRA TREATMENT/DISPOSAL FACILITY													
- LOCATION AND NEEDS OF FACILITY OR USER QUALITY, VOLUME	X	X	X	X	X	X	X		X	X	X	X	X
CLIMATE													
- PRECIPITATION													
- TEMPERATURE		X											
- EVAPORATION													
- WIND SPEED DIRECTION													
HYDROGEOLOGY													
- DEPTH TO IMPERMEABLE STRATA													
- SEISMIC HISTORY													
- SUBSURFACE CHARACIERIZATION													
- TRANSMISSIVITY, STORATIVITY													
- DEPTH TO GROUNDWATER/LEACHATE													
- RATE & DIRECTION OF FLOW													
- HYDRAULIC CONDUCTIVITY													
- PUMPING RATE TO CONTAIN PLUME													
- LOCATIONS OF WELLS													
- WELL INTERFERENCE													
SOIL/WASTE CHARACTERISTICS													
- AVAILABILITY OF COVER MATERIAL													
- GRAIN SIZE							X	X			X	X	
- ATTERBERG LIMITS											X	X	
- % MOISTURE											X	X	
- PROCTOR COMPACTION							X	X			X	X	
- PERMEABILITY							X	X					
- TRIAXIAL & DIRECT SHEAR TEST (STRENGTH)													
- % ORGANIC MATTER							X	X	X				
- MICROBIOLOGY CELL ENUMERATIONS				X									
- DEPTH, TYPE, THICKNESS OF BOTTOM LINER, AND FINAL COVER													
- RECHARGE RATE													
CONTAMINANT CHARACTERISTICS													
- VOLATILITY	X		X		X	X	X	X		X		X	
- SORPTION, PARTITION COEFFICIENTS					X		X	X		X		X	
- EFFECTIVENESS OF DUST SUPPRESSION													
- BIODEGRADATION													
- SOLUBILITY	X		X										
- DENSITY													
- COMPATABILITY			X										
- TOXICITY			X										
WASTE CHARACTERIZATION													
- VOLUME	X	X	X	X	X		X	X	X	X	X	X	X
- EXTENT OF CONTAMINATION	X	X	X	X	X		X	X	X	X		X	X
- CONCENTRATIONS AND TYPE	X	X	X	X	X		X	X	X	X		X	X
- AIR													
- SOILS													
- GROUNDWATER	X	X	X	X	X					X			X
- LIQUID WASTE													
- SEDIMENTS						X	X	X	X		X	X	
- SLUDGE													
- OTHER					X					X			X
- AERIAL PHOTO INTERPRETATION													
- DRUMS													
- LOWER LIMIT OF WASTE													
- LEACHATE/GAS COLLECTION/VENTING INFORMATION													
CHEMICAL/PHYSICAL ANALYSIS													
- ORGANIC COMPOUNDS	X	X	X	X	X		X	X	X	X			X
- METALS	X	X	X	X	X		X	X	X	X			X
- TSS	X	X		X	X								X
- TDS				X									X
- TS	X												
- TOC	X	X					X	X					
- COD													
- BOD							X	X					
- TEMPERATURE		X											
- DISSOLVED OXYGEN					X								
- NUTRIENTS			X										
- pH	X	X	X				X	X	X	X			
- Na					X								X
- OIL AND GREASE				X			X	X					
- HEAT CONTENT													
- ASH CONTENT													
- VISCOSITY													
- CHLORINE CONTENT													
- Fe Mn				X									X
- HARDNESS													
- ALKALINITY													
- SULFATES													
- CHLORIDE													
- NITROGEN, AMMONIA													
- NITORGEN, NITRATE & NITRITE													
- NITROGEN, KJELDAHL													
- PHOSPHATE, ORTHO													
- ELECTRICAL CONDUCTIVITY													
- OXIDATION - REDUCTION													
SURFACE WATER CHARACTERISTICS													
- WATER DEPTH													
- GAUGE MEASUREMENTS													
- STREAM CHANNEL MORPHOLOGY													
- 100 YEAR FLOODPLAIN													
SEDIMENT CHARACTERISTICS													
- BOTTOM SEDIMENTS CHARACTERISTIC													
- DREDGABLE VOLUME													
- ARARS	X	X	X	X	X		X		X	X			X
WATER SUPPLY INFORMATION													
- WATER QUALITY OF NEW SOURCE													
- LOCATION OF NEW SOURCE													
- DISTANCE TO NEW SOURCE													
- REQUIRED TREATMENT													
- EXPECTED DURATION OF NEED													
- INSTALLATION REQUIREMENTS													
- CURRENT AND PROJECTED WATER USE AND LOCATIONS													

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PRELIMINARY IDENTIFICATION OF DATA NEEDS ACCORDING TO RESPONSE ACTION/REMEDIAL TECHNOLOGY

LIME KILN LANDFILL
GRAFTON, WISCONSIN

DATA NEEDS	STABILIZATION/ SOLIDIFICATION	THERMAL DESTRUCTION/ INCINERATION				LANDFILL DISPOSAL	EFFLUENT DISCHARGE							
	VITRIFICATION	ROTARY KILN INCINERATION	ENERGY INFRARED THERMAL TREATMENT	CIRCULATING FLUIDIZED BED COMBUSTION	PYROLYSIS	OFF-SITE LANDFILL	AGRICULTRIAL/ INDUSTRIAL USE	TEMPORARY STORAGE	REINJECTION	PUBLICALLY OWNED TREATMENT WORK	SEEPAGE BASIN	SUBSURFACE DRAINS	SURFACE WATER DISCHARGE	CITY WATER SUPPLY/ NEW COMMUNITY WELL
SITE CHARACTERISTICS														
- STORAGE TIME								X						X
- ACCESSIBILITY						X				X	X	X	X	
- LAND USE						X					X	X		
- ECOLOGICAL AREAS						X					X	X		
- VEGETATION						X					X	X		
- TOPOGRAPHY						X		X			X	X		
- DRAINAGE						X		X			X	X		
- LOCATION/PERFORMANCE OF RCRA TREATMENT/DISPOSAL FACILITY						X								X
- LOCATION AND NEEDS OF FACILITY OR USER QUALITY, VOLUME	X	X	X	X	X	X								
CLIMATE														
- PRECIPITATION	X										X	X		
- TEMPERATURE	X													
- EVAPORATION														
- WIND SPEED DIRECTION														
HYDROGEOLOGY														
- DEPTH TO IMPERMEABLE STRATA												X		
- SEISMIC HISTORY														
- SUBSURFACE CHARACTERIZATION						X			X		X	X		
- TRANSMISSIVITY, STORATIVITY						X			X		X	X		
- DEPTH TO GROUNDWATER/LEACHATE						X			X		X	X		
- RATE & DIRECTION OF FLOW						X								
- HYDRAULIC CONDUCTIVITY											X	X		
- PUMPING RATE TO CONTAIN PLUME														
- LOCATIONS OF WELLS									X					
- WELL INTERFERENCE											X	X		
SOIL/WASTE CHARACTERISTICS														
- AVAILABILITY OF COVER MATERIAL						X								
- GRAIN SIZE	X	X	X	X	X	X					X	X		
- ATTERBERG LIMITS	X					X					X	X		
- % MOISTURE	X	X	X	X	X	X					X	X		
- PROCTOR COMPACTION						X					X	X		
- PERMEABILITY											X	X		
- TRIAXIAL & DIRECT SHEAR TEST (STRENGTH)						X					X	X		
- % ORGANIC MATTER	X	X	X	X	X	X					X	X		
- MICROBIOLOGY CELL ENUMERATIONS														
- DEPTH, TYPE, THICKNESS OF BOTTOM LINER, AND FINAL COVER						X								
- RECHARGE RATE											X	X		
CONTAMINANT CHARACTERISTICS														
- VOLATILITY	X	X	X	X	X									
- SORPTION, PARTITION COEFFICIENTS														
- EFFECTIVENESS OF DUST SUPPRESSION														
- BIODEGRADATION														
- SOLUBILITY														
- DENSITY														
- COMPATABILITY												X		
- TOXICITY							X	X	X	X			X	
WASTE CHARACTERIZATION														
- VOLUME	X	X	X	X	X	X	X	X	X	X	X	X	X	X
- EXTENT OF CONTAMINATION	X	X	X	X	X	X	X		X	X	X	X	X	
- CONCENTRATIONS AND TYPE	X	X	X	X	X	X	X		X	X	X	X	X	
- AIR														
- SOILS														
- GROUNDWATER														
- LIQUID WASTE								X	X	X	X	X	X	
- SEDIMENTS	X	X	X	X	X	X	X							
- SLUDGE														
- OTHER														
- AERIAL PHOTO INTERPRETATION										X				
- DRUMS														
- LOWER LIMIT OF WASTE														
- LEACHATE/GAS COLLECTION/VENTING INFORMATION														
CHEMICAL/PHYSICAL ANALYSIS														
- ORGANIC COMPOUNDS	X	X	X	X	X	X	X	X	X	X	X	X	X	X
- METALS	X	X	X	X	X	X	X	X	X	X	X	X	X	
- TSS		X					X	X	X	X	X	X	X	
- TDS							X		X	X	X	X	X	
- TS							X		X	X	X	X	X	
- TOC	X						X		X	X	X	X	X	
- COD							X		X	X	X	X	X	
- BOD									X	X	X	X	X	
- TEMPERATURE														
- DISSOLVED OXYGEN														
- NUTRIENTS														
- pH	X						X		X	X	X	X	X	
- Na							X		X	X	X	X	X	
- OIL AND GREASE							X		X	X	X	X	X	
- HEAT CONTENT		X	X	X	X		X		X	X	X	X	X	
- ASH CONTENT		X	X	X	X									
- VISCOSITY		X	X	X	X									
- CHLORINE CONTENT		X	X	X	X									
- Fe Mn							X		X	X	X	X		
- HARDNESS							X		X	X	X	X		
- ALKALINITY														
- SULFATES	X	X												
- CHLORIDE							X		X	X	X	X		
- NITROGEN, AMMONIA														
- NITORGEN, NITRATE & NITRITE														
- NITROGEN, KJELDAHL														
- PHOSPHATE, ORTHO														
- ELECTRICAL CONDUCTIVITY														
- OXIDATION - REDUCTION														
SURFACE WATER CHARACTERISTICS														
- WATER DEPTH														
- GAUGE MEASUREMENTS														
- STREAM CHANNEL MORPHOLOGY														
- 100 YEAR FLOODPLAIN												X		
SEDIMENT CHARACTERISTICS														
- BOTTOM SEDIMENTS CHARACTERISTIC	X	X	X	X	X	X								
- DREDGABLE VOLUME	X	X	X	X	X	X								
- ARARS	X					X	X	X	X	X	X	X	X	
WATER SUPPLY INFORMATION														
- WATER QUALITY OF NEW SOURCE														X
- LOCATION OF NEW SOURCE														X
- DISTANCE TO NEW SOURCE														X
- REQUIRED TREATMENT														X
- EXPECTED DURATION OF NEED							X	X	X	X	X	X	X	X
- INSTALLATION REQUIREMENTS							X	X	X	X	X	X		X
- CURRENT AND PROJECTED WATER USE AND LOCATIONS							X	X	X	X	X	X	X	X

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PRELIMINARY IDENTIFICATION OF DATA NEEDS ACCORDING TO RESPONSE ACTION/REMEDIAL TECHNOLOGY

LIME KILN LANDFILL
GRAFTON, WISCONSIN

DATA NEEDS	CONTAINMENT				GAS COLLECTION/ RECOVERY		BIOLOGICAL TREATMENT				
	DUST CONTROL	CAPPING/ SURFACE SEALING	SLURRY WALLS	GROUNDWATER PUMPING	PASSIVE SUBSURFACE GAS CONTROL	ACTIVE SUBSURFACE GAS CONTROL	AEROBIC	ANAEROBIC	LAND APPLICATION	IN-SITU BIOLOGICAL TREATMENT	PACT SYSTEM
SITE CHARACTERISTICS											
- STORAGE TIME					X	X					
- ACCESSIBILITY		X	X	X					X	X	
- LAND USE	X	X				X			X	X	
- ECOLOGICAL AREAS									X		
- VEGETATION			X						X	X	
- TOPOGRAPHY			X	X	X				X		
- DRAINAGE			X		X				X	X	
- LOCATION/PERFORMANCE OF RCRA TREATMENT/DISPOSAL FACILITY											
- LOCATION AND NEEDS OF FACILITY OR USER-QUALITY, VOLUME	X			X	X	X				X	
CLIMATE											
- PRECIPITATION	X			X	X	X	X	X	X		X
- TEMPERATURE		X			X	X	X	X		X	X
- EVAPORATION									X		
- WIND SPEED DIRECTION	X										
HYDROGEOLOGY											
- DEPTH TO IMPERMEABLE STRATA			X	X	X	X					
- SEISMIC HISTORY			X								
- SUBSURFACE CHARACTERIZATION			X	X	X	X			X	X	
- TRANSMISSIVITY, STORATIVITY				X		X			X	X	
- DEPTH TO GROUNDWATER/LEACHATE		X	X	X	X	X			X	X	
- RATE & DIRECTION OF FLOW			X	X		X			X	X	
- HYDRAULIC CONDUCTIVITY			X	X					X	X	
- PUMPING RATE TO CONTAIN PLUME				X							
- LOCATIONS OF WELLS				X		X					
- WELL INTERFERENCE				X		X					
SOIL/WASTE CHARACTERISTICS											
- AVAILABILITY OF COVER MATERIAL		X			X						
- GRAIN SIZE	X	X	X	X	X	X			X		
- ATTERBERG LIMITS	X	X	X	X	X	X			X		
- % MOISTURE		X			X	X			X		
- PROCTOR COMPACTION	X	X			X	X					
- PERMEABILITY		X	X		X	X			X	X	
- TRIAXIAL & DIRECT SHEAR TEST (STRENGTH)		X									
- % ORGANIC MATTER	X	X								X	
- MICROBIOLOGY CELL ENUMERATIONS					X					X	
- DEPTH, TYPE, THICKNESS OF BOTTOM LINER, AND FINAL COVER											
RECHARGE RATE			X								
CONTAMINANT CHARACTERISTICS											
- VOLATILITY	X				X	X	X	X	X		X
- SORPTION, PARTITION COEFFICIENTS	X		X		X	X			X		X
- EFFECTIVENESS OF DUST SUPPRESSION	X										
- BIODEGRADATION					X		X	X	X	X	X
- SOLUBILITY				X					X		
- DENSITY				X							
- COMPATABILITY			X								
- TOXICITY				X			X	X	X	X	X
WASTE CHARACTERIZATION											
- VOLUME	X	X			X	X	X	X	X		X
- EXTENT OF CONTAMINATION	X	X	X		X	X	X	X		X	X
- CONCENTRATIONS AND TYPE		X		X	X	X	X	X	X	X	X
- AIR	X								X	X	
- SOILS	X	X			X	X			X	X	
- GROUNDWATER			X	X			X	X	X	X	X
- LIQUID WASTE											
- SEDIMENTS							X	X	X		
- SLUDGE											
- OTHER					X	X	X	X	X	X	X
- AERIAL PHOTO INTERPRETATION		X					X	X	X	X	X
- DRUMS											
- LOWER LIMIT OF WASTE											
- LEACHATE/GAS COLLECTION/VENTING INFORMATION					X	X					
CHEMICAL/PHYSICAL ANALYSIS											
- ORGANIC COMPOUNDS			X		X	X	X	X	X	X	X
- METALS			X		X	X	X	X	X	X	X
- TSS							X	X	X	X	X
- TDS							X	X	X	X	X
- TS							X	X	X	X	X
- TOC					X		X	X	X	X	X
- COD			X		X	X	X	X	X	X	X
- BOD					X		X	X	X	X	X
- TEMPERATURE							X	X	X	X	X
- DISSOLVED OXYGEN							X	X		X	X
- NUTRIENTS					X		X	X	X	X	X
- pH			X				X	X	X	X	X
- Na			X				X	X	X	X	X
- OIL AND GREASE											
- HEAT CONTENT											
- ASH CONTENT											
- VISCOSITY											
- CHLORINE CONTENT							X	X	X		X
- Fe Mn											
- HARDNESS			X								
- ALKALINITY											
- SULFATES							X	X	X		X
- CHLORIDE											
- NITROGEN, AMMONIA											
- NITORGEN, NITRATE & NITRITE											
- NITROGEN, KJELDAHL											
- PHOSPHATE, ORTHO											
- ELECTRICAL CONDUCTIVITY											
- OXIDATION - REDUCTION											
SURFACE WATER CHARACTERISTICS											
- WATER DEPTH											
- GAUGE MEASUREMENTS											
- STREAM CHANNEL MORPHOLOGY											
- 100 YEAR FLOODPLAIN		X									
SEDIMENT CHARACTERISTICS											
- BOTTOM SEDIMENTS CHARACTERISTIC							X	X	X	X	X
- DREDGABLE VOLUME							X	X	X	X	X
- ARARS	X	X	X	X			X	X	X	X	X
WATER SUPPLY INFORMATION											
- WATER QUALITY OF NEW SOURCE											
- LOCATION OF NEW SOURCE											
- DISTANCE TO NEW SOURCE											
- REQUIRED TREATMENT											
- EXPECTED DURATION OF NEED											
- INSTALLATION REQUIREMENTS											
- CURRENT AND PROJECTED WATER USE AND LOCATIONS											

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