REINHART
BOERNER•VAN DEUREN s.c.
ATTORNEYS AT LAW

May 15, 2003

Raymond M. Roder
Direct Dial: 608-229-2206
rroder@reinhartlaw.com

Jennifer S. Pelczar
Remediation and Redevelopment Program
Wisconsin Department of Natural Resources
Northeast Region Office
625 E. County Road Y, Suite 700
Oshkosh, WI 54901-9731

Dear Ms. Pelczar:

Re: Focused Feasibility Study for Former FF/NN Landfill
BRRTS # 02-20-00915

Enclosed is a copy of a letter to me from GeoTrans dated May 14, 2003. GeoTrans' letter was prepared at my request to respond to the statements in your letter to me dated March 13, 2003. Besides GeoTrans' responses to your letter, I have some responses as well. They are presented below.

First, I am concerned that by the March 13th letter the Department is amending those parts of the Record of Decision ("ROD") for the FF/NN Landfill that the Department no longer likes without either adequate understanding of the relevant data or compliance with the CERCLA process. In consideration of the enclosed GeoTrans' letter, it appears to me that the amendments are based on inadequate technical justification, or in some cases no justification at all. This appears to be the case in regard to matters relating to: the applicable ARARs; the vapor extraction remedial option; the purported presence of dense non-aqueous phase liquid ("DNAPL"); and, the premature request for additional investigation in the wetland.

Second, I think the Department is confusing the purpose and function of source control with the impacts of contaminants in the sandstone aquifer that were released prior to capping the landfill. Because of this confusion many of the Department's requests and demands are based on worst case future conditions that have been assumed. The PRPs are not responsible for assumed conditions.

Third, I believe that many of the unjustified demands (requests) are the result of the Department's continuing failure to understand the hydrogeology downgradient of the FF/NN site. This lack of understanding continues even after our meeting in August 2002 at which Michael Noel and Gerald DeMers of GeoTrans explained how the various strata in the area's geology act to conduct contaminant flow and subsequent reports which evaluate the ground water quality within each stratum. The extent of impacts in each stratum has been defined. It seems to me that we can only overcome this situation if, as GeoTrans suggests, the Department responds in writing to the attached letter and we then hold another face-to-face meeting at which a comprehensive discussion of the hydrogeology associated with the site can occur.

I realize from our conversation on April 23, 2003 that you and other Department personnel may be experiencing expanded workloads due to budget cuts. Nonetheless, I think it will be time well spent by Greg Tilkens, Bruce Urben, Mr. Schorle, if he wishes, and you to listen to our consultants' presentation about the groundwater regime that applies to this site. I also think it will be more efficient if we hold the meeting before the Department completes its written review of GeoTrans' proposed monitoring plan. And, as you know the next groundwater monitoring event is scheduled for July 2003. I therefore think it is preferable that the Department first respond to GeoTrans' May 14th letter and we then hold our meeting, both within the next month.

Please call so that we can select a date, time and location for the meeting.

Thank you for your consideration of the above.

Sincerely,

Raymond M. Roder

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Enc.

cc Heidi Yantz (w/o enc.)
Gerald DeMers (w/o enc.)
Michael Noel (w/o enc.)
Nelson Olavarria (w/enc.)
Steve Barg (w/enc.)
Bernard Schorle (w/enc.)
Greg Tilkens (w/enc.)
Travis Drake (w/enc.)

GeoTrans, Inc.
A TETRA TECH COMPANY

175 N. Corporate Drive
Suite 100
Brookfield, WI 53045

www.geotransinc.com

262-792-1282 FAX 262-792-1310

May 14, 2003
(1011.002)

Mr. Raymond M. Roder, Chairman
FF/NN Landfill PRP Group
Reinhart Boerner Van Deuren S.C.
22 East Mifflin Street, Suite 600
Madison, Wisconsin 53703

Subject: Highway FF/NN Landfill, Town of Ripon, WI, BRRTS #02-20-000915

Dear Mr. Roder:

GeoTrans, Inc. has reviewed the two letters from Jennie Pelczar of the Wisconsin Department of Natural Resources (WDNR), dated March 13, 2003, regarding the proposed Groundwater Monitoring Plan (GMP) and the Focused Feasibility Study Work Plan (FFSWP) for the former FF/NN Landfill in Ripon. At your request, we have prepared the following response to the letters. This response begins with a discussion of three overall issues, and then each of the items raised in the letters is addressed individually.

Issue 1. Is the Landfill a Continuing Source of Groundwater Impacts?

An operative assumption that appears to be made in the March 13 FFSWP letter is that the landfill is a continuing source of significant VOC impacts to groundwater at this site. An underlying assumption of the letter is that groundwater is currently being impacted by VOCs from leachate and by VOCs that are present in landfill gas. However, the data do not support these assumptions.

There are theoretically five basic pathways for VOCs to impact groundwater at any landfill site:

1. Direct contact of wastes with groundwater (i.e., the depth of wastes extends below the water table).
2. Leachate migration from the landfill to groundwater,
3. Direct contact of groundwater with VOC-laden landfill gas,
4. VOC-laden landfill gas contamination of the vadose zone with subsequent infiltration leaching VOCs to groundwater, and
5. Condensation of VOC-laden landfill gas moisture with subsequent percolation to groundwater.

The base of the landfill is located approximately 20 feet above the water table. As a result, there is not now, nor has there been in the past, direct contact between the contents of the landfill and groundwater at the site. Therefore, the first pathway is not possible at this site.

Regarding the second potential pathway, since the time the composite cap was constructed on the landfill in 1996, the levels of leachate in the leachate wells have fallen by 3 to 8 feet. This is consistent with the fact that the composite cap allows a negligible quantity of precipitation to enter the top of the landfill to produce leachate. In fact, two of the three leachate head wells, and specifically those in the thickest portion of the landfill, have been dry for years. The construction logs for these wells indicate that they actually extend beneath the bottom of the wastes in the landfill, which indicates that there is no leachate in the landfill at these locations. Furthermore, the one leachate head well that does contain liquid, LC-2, has been sampled and analyzed, and it contains no chlorinated solvents, which are the contaminants of concern in the groundwater. In fact, this leachate head well contains significant concentrations of xylenes and ethylbenzene. If leachate from the vicinity of LC-2 is contaminating groundwater, then these contaminants would be observed in groundwater monitoring wells at the site. In ten years of monitoring, xylenes and ethylbenzene have never been detected in groundwater monitoring wells downgradient of the site. Therefore, the second potential pathway is not significant at this site.

With regard to the third potential pathway, the physical characteristics of the site indicate that direct contact between the gas and groundwater at the site is highly unlikely. Landfill gas is lighter than air and therefore rises whereas the base of the landfill is located approximately 20 feet above the water table. While the composite cap serves to confine gases within the landfill, the passive gas vent system serves to alleviate gas pressures from building up within the landfill. Equally important, the landfill was a former gravel pit, and the soils surrounding the site are granular in nature, which allow gases to easily dissipate should they leave through the sides of the landfill. (There has never been any evidence of stressed vegetation from landfill gas at the site, and methane has only been detected intermittently at one location 30 feet beyond the edge of wastes.) Given this, there is no physical mechanism for VOCs, which are alleged to be present in the landfill gas, to be transmitted at least 20 feet downward to the groundwater. Therefore, the third potential pathway is highly unlikely at this site.

Regarding the fourth potential pathway, the physical characteristics of the site will significantly limit the amount of contaminants from landfill gas that could be leached from the vadose zone outside of the landfill. Because of the granular soils outside of the landfill, gas outside the waste area dissipates readily, and provides little opportunity for leaching of contaminants. (Migration of landfill gas outside of the fill area is further discussed later in this letter). The fourth potential pathway is therefore unlikely at this site.

The theoretical formation of landfill gas condensate in the soil outside of the landfill is generally negligible for landfills. Condensation is driven by the difference in the temperature inside of the landfill (warm, due to biodegradation) and the surrounding soils. While this route is always minor, the potential quantities decrease over time as biological activity slows in a closed landfill.

If the landfill were a continuing source of contaminants to groundwater, then this would be observable in sustained concentrations of chlorinated compounds in groundwater monitoring wells. MW-103 is the well with the historically highest concentrations of chlorinated

compounds present. The total VOCs in this well have steadily declined from over 1500 ppb in 1994 to approximately 120 ppb the last time MW-103 was sampled in February 2002.

The predominant contaminants found in groundwater adjacent to the site are cis-1,2-dichloroethylene (1,2-DCE) and vinyl chloride. In wells farther from the landfill, vinyl chloride is the only contaminant present. Vinyl chloride is present only because it is a breakdown product of other chlorinated compounds; the same may be true of 1,2-DCE at this site. The presence of vinyl chloride in groundwater is indicative of a source that has undergone reductive dechlorination. Because of the physical characteristics of vinyl chloride (it is a gas unless it is contained under pressure), vinyl chloride is not present as a waste within the landfill.

In summary, there is no evidence to suggest that the landfill is a continuing source of significant VOCs to groundwater. The source control measures, which include the composite cap and gas venting system, are working as intended and as designed. There is absolutely no evidence to suggest otherwise.

Issue 2. Is Groundwater Plume Migration an Indication of Inadequate Source Control?

Another assumption made in the March 13 FFSWP letter is that the detection of VOCs in the private wells indicates that source control measures (landfill cap) are inadequate. While a landfill cap can prevent continued leaching of contaminants into the groundwater, as is the case at this site (as demonstrated above), the cap cannot control the migration of contaminants that were already present in the groundwater before the cap was installed or released during cap construction. When a source of contamination is eliminated, a groundwater plume can still migrate downgradient as a slug. A landfill cap serves no purpose in controlling the movement of that slug.

The downgradient migration of contaminants with the groundwater occurs through and is a function of advection, dispersion and diffusion processes. Advection occurs when dissolved constituents are carried along with the ground water. Normally, advection is the primary mechanism for the bulk movement of contaminants in groundwater, and it operates on a macroscopic level. Dispersion occurs on a much smaller scale when the arrangement of pore spaces and grains along a flow path can cause velocities to differ, causing a mixing effect. Diffusion occurs on a microscopic level when a solute in water moves from an area of greater concentration toward an area of lesser concentration. These processes, along with retardation (sorption) and biodegradation, control the movement of the contaminant in the aquifer.

The groundwater impacts in the downgradient private wells (in the upper sandstone unit) most likely originated from the landfill when active waste disposal was occurring, from 1970 to 1983. During these years, the landfill was accepting new waste, there was no cap over the existing wastes, leachate generation was the greatest and the potential for leachate entering groundwater was also at its highest. The contamination seen today at the downgradient private wells left the landfill during this period. Therefore, the contaminants detected in the private wells beginning in 2001 originated at the landfill at least 18 years ago and possibly as long as 30 years ago. This time lag also indicates that the reduced leaching of contaminants to groundwater due to the

construction of the composite landfill cap in 1996 has not yet affected groundwater quality at the leading edge of the contaminant plume.

Based on this empirical evidence, there is no reason to believe that any action taken at the landfill at this time would affect groundwater quality at the location of the private wells until a comparable period of time has passed (even though the source control action taken at this site has reduced contaminant release). Therefore, dialogue on source control actions is irrelevant when discussing management of the contaminant plume.

Issue 3. Remedial Investigation Activities versus Feasibility Study Activities

CERCLA defines a Remedial Investigation (RI) as a process to "determine the nature and extent of the problem presented by the release" at a site. A Feasibility Study (FS) uses the data developed in the RI to evaluate remedial alternatives for remediating a site. As a result, the investigation of a site must be completed before remedial alternatives are evaluated. In other words, if the "problem" has not been fully defined, then it is premature to evaluate methods to "fix the problem"

The FF/NN PRP Group prepared a FFS Work Plan because the WDNR had requested that the PRP Group evaluate remedial alternatives for the FF/NN Landfill site. The purpose of the Work Plan was to identify the media of concern (the "Operable Unit") and the remedial technologies to be evaluated for dealing with contamination in groundwater.

The March 13, 2003 letter regarding the FFS Work Plan identifies a number of issues related to investigation of the site. These include the migration of landfill gas, defining the extent of groundwater impacts, and the investigation of the wetland downgradient of MW-112. While the PRP Group does not agree that all of these topics are worthy of additional investigation (as discussed above and below), it is not appropriate to be evaluating alternatives to remediate problems if there has been no agreement on what the problems are that are to be remediated.

The issue that "changed" at the site, and that precipitated numerous additional investigations, actions and expenditures by the PRP Group was that vinyl chloride was detected in drinking water wells downgradient of the site. We are not aware of any other issues that would necessitate the overturning of the existing ROD for the site. The items that must be remediated at this site, and specific reasons why these must be remediated now must be agreed upon prior to completion of the FFS for this site.

Letter Regarding the Revised Groundwater Monitoring Plan

The Groundwater Monitoring Plan proposed in January 2003 for the site includes all of the sampling requirements found in the 1996 Plan Modification with its 1998 revision except that VOC analysis for samples from MW-101 had not been proposed. In order to be in strict compliance with the existing Plan Modifications, we have added this analysis to those that will be performed in April 2003. As discussed with the WDNR, the groundwater samples will be

collected during the week of April 21, 2003. We do not anticipate receiving WDNR review comments regarding the Groundwater Monitoring Plan prior to that time.

Letter Regarding the Focused Feasibility Study Work Plan

Italicized text in the remainder of the document denotes the verbage taken from the WDNR letter dated March 13, 2003, regarding the Focused Feasibility Study Work Plan (FFSWP).

Item 1. Please note that one of the potential responsible party (PRP) groups (sic) response objectives under ch. NR140.24 (2) Wis. Adm. Code is to "...prevent any new releases of the substance from traveling beyond the design management zone or other applicable points of standards application....and restored (sic) contaminated groundwater within a reasonable period of time...". This is an (sic) ch. NR140 Wis. Adm. Code requirement and the remedy that is selected must satisfy it.

These were also objectives of the previous FS, and we presume considered by the WDNR and USEPA in the ROD at that time. It was determined by the WDNR and the USEPA that the ROD for this site did fulfill those objectives based upon what was known at that time, and upon the Remedial Actions to be taken.

The change that has occurred since the ROD was issued is the detection of vinyl chloride in private wells located downgradient of the site. As a result of those impacts, additional hydrogeologic investigations of the site were performed, and there is now a greater understanding of groundwater flow in both the sandstone and unconsolidated glacial material aquifers.

The proposed FFS addresses what has changed regarding our understanding of the site since the ROD. The current Work Plan is titled and considered a "Focused FS", concerning the issue of vinyl chloride in drinking water downgradient of the landfill. We do not believe that there is any reason to overturn previous decisions made about the site that were based on facts regarding the site which have not changed.

Item 2. The GeoTrans report states that the objective of this focused feasibility study is to address the vinyl chloride impacted groundwater in the "sandstone aquifer" to meet the ch. NR140 Wis. Adm. Code groundwater standards. The Department does not agree that the feasibility study can only address the sandstone aquifer. The feasibility study must cover all impacted aquifers, not just the sandstone aquifer, and it must consider source control.

As noted above, the only thing that has changed since the ROD was issued for this site is our understanding of contaminant flow in the sandstone aquifer downgradient of the site. The extent of impacts in groundwater at the water table, as well as the groundwater 25 feet deeper than the water table, were defined as a result of the 1994 RI for the site. The contaminant concentrations in both water table monitoring wells and shallow piezometers have decreased significantly since

the No Further Action ROD was issued in relation to the shallow groundwater units in 1996. Therefore, there is no reason or justification for overturning that ROD with respect to shallow groundwater. As a result, there is no reason to evaluate all groundwater at the site as a part of the Focused FS.

Item 3. The applicable or relevant and appropriate requirement (ARARs) in the February 26, 1996 Record of Decision (ROD) are no longer frozen as of the date of the ROD. It is necessary to consider other ARARs that may need to be met. This focused feasibility study must not focus on only one state requirement – groundwater quality standards. The Department agrees that the groundwater impacts to the private wells is (sic) the most immediate issue, however other requirements may be applicable or relevant and appropriate and must not be overlooked.

Prior to submitting the Work Plan for the FFS, we requested the WDNR to provide us with an updated list of Applicable, Relevant and Appropriate Requirements (ARARs) contained in their 1991 memo (which was included as an appendix in the 1994 FS for this site). No revised list of ARARs has apparently been prepared by the WDNR. Since the date of that FS, GeoTrans is aware of the following significant changes to ARARS:

* The NR 700 series was added to the Wisconsin Administrative Code
* Guidance documents by the WDNR that give new interpretations to the existing ARARs, including Monitored Natural Attenuation, closure with groundwater contamination left in place that is greater than an ES, etc..

The listing of ARARs that was prepared for the 1994 FS has been amended to include these items, and this amended listing is attached to this letter.

The only reason that additional work has been done at this site is because vinyl chloride was found in private water supply wells. There is no other issue at this site that necessitates the preparation of another FS, and there is no indication that the ROD for the site should be overturned rather than amended.

Item 4. Within the FSWP, GeoTrans references the 1988 EPA guidance on remedial investigation/feasibility study (RI/FS) at CERCLA sites. Please consider also referencing "Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites" (EPA, 1991). This is the most up to date EPA reference for CERCLA landfills.

The additional reference will be used; it was used in the previous FS for this site.

Item 5. Currently, the landfill cap does not appear to have adequately controlled the migration of the groundwater plume and has not improved the groundwater quality. The plume has expanded to the residential area on Charles Street. Vinyl chloride was detected in two private wells in October 2001. These private wells have been monitored for many years. The detection of Volatile Organic Compounds (VOCs) in these downgradient wells proves that the groundwater plume has expanded downgradient. In addition, landfill gas has been detected outside the waste mass above the lower explosion limit (LEL) for methane over the years since

the cap was installed. Using groundwater monitoring wells for sampling landfill gases is not acceptable under ch. NR500 Wis. Adm. Code. Proper landfill gas probes should be installed. Please submit a plan to address this issue with the feasibility study report.

Source control cannot affect the leading edge of a groundwater contaminant plume, and that is why groundwater is a separate Operable Unit from source control at this site. The issues of source control, as well as its effect on the leading edge of the contaminant plume, were discussed above.

The pertinent requirement for landfill gas is that methane concentrations greater than its Lower Explosive Limit (LEL, or 5%) should not occur outside the limits of the wastes. MW-101, MW-102 and MW-103 are the three gas monitoring points located outside of the limits of the wastes. For these three locations, the only one where the concentration of methane has ever exceeded the LEL is at MW-103. A summary of the gas concentrations in MW-103 is given below:

Date	Methane Concentration (%)	Date	Methane Concentration (%)
6/93	1.8	10/98	11.6
5/94	0	10/99	4.3
9/94	9	5/00	0
11/94	7.2 and 11	10/00	11.4
5/96	17	5/01	0
5/97	0	10/01	0
10/97	4.6	5/02	0
4/98	10.6	12/02	1.5

As can be seen from these data, the concentration of methane has exceeded the LEL 6 times out of the 16 times that gas has been measured. It has only exceeded an LEL once in the past 4 years, and the LEL has not been exceeded since the rotating ventilators were installed on the vents at the site.

We are unclear as to why, at this time, the WDNR has indicated that groundwater-monitoring wells cannot be used for gas sampling at the site. The WDNR approved this method for this site as a part of the CERCLA Sampling and Analysis Plan over 10 years ago, and it was apparently compliant with the Administrative Code at that time. The WDNR in the southeast district and the USEPA have approved this practice at several other sites at which we work, including the North College Avenue Landfill and the Hartung Quarry Landfill in Milwaukee. Using groundwater monitoring wells for gas sampling has also been acceptable to regulators in other states.

NR 507.11 requires that gas monitoring probes be constructed in the same way as groundwater monitoring wells, except that they are to be provided with a shut-off valve to prevent the escape of gas while sampling. If necessary, the groundwater monitoring wells at the site could likely be provided with gas collection shutoff valves, as long as this is compatible with the QED sampling equipment. Gas sampling would be performed prior to groundwater sampling. The gas vents,

which are also sampled on a regular basis for methane, would not be outfitted with valves as this would be contrary to their use as vents.

NR507.11(3)(b) requires that the gas monitoring probes be located within 150 feet of the waste boundary. The monitor well which has had methane gas in it is only about 30 feet from the edge of wastes. If new gas monitoring probes are constructed at the site, they would be located significantly farther from the waste boundary, (i.e. 150 feet away). Given the relatively low concentration of gas that is intermittently present in a monitoring well 30 feet from the edge of wastes, it is highly unlikely that any gas would be present 150 feet from the edge of wastes. We note that the City of Ripon owns the entire property south of the landfill, and there are absolutely no potential receptors within at least 500 feet of the solid waste boundary.

Item 6. The Department has talked with Jerry DeMers at GeoTrans preliminarily about the work plan. The Department does not have a problem with the technologies that were suggested. However, we believe several of the technologies will not stop the plume from expanding. Options 3.1, 3.2, 3.3, and 3.4 will not stop the plume. Therefore, the Department does not consider these options as a final remedy but they may be implemented with a combination of the other viable options.

According to the March 13 letter, the following are the four alternatives that "will not stop the plume from expanding:"

No Further Action
Institutional Controls
Extension of the Municipal Water Supply
Monitored Natural Attenuation

No Further Action
The No Action alternative is required under CERCLA, and that is why it has been included.

Institutional Controls
The use of Institutional Controls is a valid means of limiting risk associated with contaminated drinking water, and it is one of the alternatives recommended for consideration in the USEPA Guidance Document, "Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites." In fact, institutional controls are required where contamination remains on a property or properties at the time that closure is sought from the WDNR. While the PRP Group is not seeking closure for this site at this time, it would be contrary to the relevant ARARs to preclude the PRPs from this at some time in the future.

Extension of the Municipal Water Supply
The extension of the municipal water is considered by the USEPA to be a Final Remedy:

> "Remedy or remedial action means those actions consistent with permanent remedy... The term includes, but is not limited to...provisions of alternative water supplies..." (National Contingency Plan, Federal Register, page 8818, March 8, 1990).

It is unclear to us why the extension of municipal water to replace a contaminated water supply would not be considered a final remedy, whether one uses the definitions presented in CERCLA, or from the common usage of the term "final remedy." A distinction must be made between a "final" remedy and a "sole" remedy.

Monitored Natural Attenuation

The WDNR has issued a draft Guidance Document, "Understanding Chlorinated Hydrocarbon Behavior in Groundwater: Investigation, Assessment and Limitations of Monitored Natural Attenuation." This document states "Natural attenuation refers to any naturally occurring process that degrades contaminants or *limits their movement in the subsurface.* (emphasis added)" This document presents a methodology to evaluate a site contaminated by chlorinated compounds to determine whether monitored natural attenuation is an effective remedy at a site. The proposed revised groundwater monitoring plan submitted by the PRP Group will provide the mechanism to show whether or not natural attenuation of the contaminant plume is an effective remedy for this site.

Item 7. The Department has suggested another option be considered; this option is vapor extraction at the landfill (the source). It is generally accepted within the landfill remediation community that vapor extraction has great potential to reduce VOCs within groundwater, by removing them before they become part of the groundwater problem. One thing to keep in mind when putting this FS together is that the goal of the FS is to identify remedies that will stop the groundwater plume from expanding.

The remedial alternative that the WDNR suggests that we add to our evaluation, Active Gas Collection, cannot stop the plume from expanding. It is a source control measure, and as discussed above, landfill gas cannot be a source of significant concentrations of VOCs in groundwater for this site, nor could source control have any effect on the leading edge of the plume.

In prior correspondence, Ms. Pelczar provided a 1991 paper entitled "The Role of Active Gas Extraction Systems In Capturing VOCs from Municipal Landfill Waste and Leachate: A Preliminary Assessment." This study evaluated the VOCs found in leachate at two landfills and in groundwater at two landfills not constructed with a clay or membrane liner. Each of these sites was a recently closed landfill cell. The study of the two landfills with VOCs in groundwater did find that VOC concentrations in groundwater did decrease with the implementation of an active gas extraction system. However, the initial concentrations of VOCs in the groundwater at these two sites were between ten and twenty times the highest concentrations that are now observed at the Ripon site. The VOC concentrations in groundwater at these sites after implementation of active gas collection were still similar (i.e. about 50 ppb) as what is now seen at the FF/NN landfill. Clearly, there is an effect of scale—if high concentrations of VOCs are present in a recently closed landfill that is generating significant

quantities of landfill gas, then an active gas collection system will remove a significant portion of those VOCs and reduce the potential impacts to groundwater. But if there are only low concentrations of VOCs in groundwater and limited amounts of gas, the same conclusion cannot be made.

At the time of the ROD for the Ripon landfill, Steve Ales of the WDNR used his experience at a similar CERCLA site in Sauk County to determine whether active gas collection should be required at the FF/NN landfill. That site was of similar age to the FF/NN Landfill, and an active gas collection system was required in its ROD, primarily for the reason of reducing the continued transmission of VOCs to groundwater. Because of the age of the fill, the Sauk County landfill produced only a limited amount of gas—so limited that a flare could not be sustained from just the gas from this landfill. (Gas from an adjoining, active site was able to sustain combustion). The most immediate result of installing the active gas collection at this site was that concentrations of VOCs in groundwater monitoring wells immediately downgradient of the site jumped substantially (i.e. from about 20 ppb to 112 ppb) because the installation of the wells had penetrated the existing cap, allowing precipitation to enter the landfill and generate leachate. The VOC concentrations declined over a 3-year period following construction, and returned to levels similar to those prior to the construction of the gas system. The concentrations of VOCs in groundwater adjacent to that site are now only slightly less than prior to construction of the gas system in 1994.

There is too little gas present at the FF/NN landfill to sustain a flare. Thirty percent methane content is necessary and only a few of the vents occasionally have that much methane. In fact, in December 2002, only 5 of the 12 vents had concentrations of gas exceeding its LEL of 5%.

There is a major operational problem if a landfill gas extraction system is considered a "vapor extraction system." A landfill gas extraction system must be operated to optimize the production of methane gas from a landfill. As such, areas that are generating little or no gas are "throttled back" so that little or no vapors are extracted from these areas. (At this time, that would be over half of the landfill site). This is because placing a significant vacuum on areas not producing gas will result in drawing air from outside of the landfill into the waste mass. This outside air is rich in oxygen—and its presence in the landfill would result in substantial risk of starting an underground landfill fire. Proper operation of a landfill gas extraction system requires that oxygen concentrations be maintained at less than 1%. The lowest concentration of oxygen measured in any gas vent in December 2002 was 13.1%. Since the construction of the cap in 1996, gas has been sampled eleven times at 19 locations each time (vents, adjacent monitoring wells, leachate head wells); only 6% of these measurements exhibited oxygen concentrations less than 1%.

In summary, landfill gas is not a potential source of impacts to groundwater, and even if it were, an active gas collection system could not affect the leading edge of the plume. Little gas is generated at the landfill, and operating an active gas collection system as a vapor extraction system would result in a significant risk of a landfill fire. Implementing an active gas collection system could actually result in a short-term deterioration in groundwater quality at the site, and experience at other sites does not indicate that any significant reduction in VOC concentrations

in groundwater would result. An active gas collection system at the FF/NN Landfill is not a viable alternative for this site.

Item 8. Additional monitoring wells have been installed to aid in determining the degree and extent of the groundwater plume downgradient. However, the groundwater contaminant plume has not been fully defined to date. This needs to be addressed. The PRP group also needs to address the possible presence of a dense non-aqueous phase liquid (DNAPL).

The extent of impacts in groundwater has been defined. This was discussed in the meeting with the WDNR last August, when the location of the last wells to define the extent of impacts in the deep sandstone was the topic of discussion. Figures within the groundwater monitoring plan submitted in January 2003 also show the extent of groundwater impacts in each of the four stratigraphic units. The extent of impacts has been defined both horizontally and vertically. The extent of impacts in the unconsolidated glacial materials was defined in 1994; an FS would not have been performed, nor a ROD issued, if the extent of impacts in these units had not been defined at that time. Since the ROD was issued, there have been no substantial changes in the upper two stratigraphic units (water table and deeper unconsolidated). Any changes in the sandstone units have been fully delineated.

Appendix A of "Understanding Chlorinated Hydrocarbon Behavior in Groundwater: Investigation, Assessment and Limitations of Monitored Attenuation" (WDNR, December 2002) discusses the methods to assess for the presence of DNAPLs in the subsurface. Specifically, soil and groundwater samples have been analyzed for contaminants of concern in the RI and subsequent groundwater sampling. The document indicates that DNAPL identification methods include:

> Estimating the presence of DNAPL from aqueous concentrations in monitoring wells. Rules of thumb (e.g., 1% or 10% of saturated aqueous concentration, adjusted for mole percent of the compound in the DNAPL) can be applied. However, concentrations less than this do not preclude the possibility of NAPL.

In order for DNAPL to be present at a site, high concentrations of the suspected DNAPL must be present in soil and groundwater near the source area. As the DNAPL material passes through the soil and/or bedrock matrix, residual levels of the contaminant will remain. The concentrations of contaminants left in the matrix would be at levels similar to the saturation limit for that material in soil. It is not likely for DNAPL to be present at depth without significant concentrations remaining along its downward pathway. As groundwater passes through this contaminated matrix, it will dissolve high concentrations of these contaminants. DNAPL would also be indicated by even higher concentrations at depth where the liquid collects. None of these attributes of a DNAPL site has been observed at the FF/NN Landfill.

At this site, the theoretically possible contaminants present as DNAPL are perchloroethylene (PCE), trichloroethylene (TCE), and possibly 1,2 DCE. It should be noted that these compounds would only behave as a DNAPL (i.e., would continue to migrate downward upon reaching the water table surface) in the free –product phase; in the dissolved phase, they would travel in

groundwater and be subject to the accompanying advection, dispersion and retardation forces. Vinyl chloride is not a potential DNAPL at the site; it has a specific gravity of 0.9121, making it less dense than water. In addition, vinyl chloride as a product exists as a gas at standard temperature and pressure, so it is unlikely to be in liquid phase in groundwater.

The chemical characteristics of the three possible compounds and where they have been detected in groundwater at the site are summarized below.

	PCE	TCE	Cis-1,2 DCE	Trans-1,2-DCE
Highest concentration ever measured at the site, ug/l	0.70J MW-101, 1996	11J MW-103, 1996	1,100 MW-103, 1994	10J MW-103, 1996
Highest concentration measured at the site in 2001 or 2002, ug/l	0.32J MW-101, 2002	4.5 MW-103, 2001	94 MW-103, 2001	5.5 MW-103, 2002
Solubility of compound, ug/l	150,000	1,100,000	3,500,000	600,000
1% of solubility of compound, ug/l	1,500	11,000	35,000	6,000

Note that a "J" indicates that the detection of the compound is below the quantitation limit of the analytical instruments, and that the concentration is an estimated value.

From the above table, the following conclusions can be made:

- PCE has never been detected above 1 part per billion. As a result, it was probably not dumped in the site as product. The highest concentration is less than one one-thousandth of the rule-of-thumb concentration that would indicate the possible presence of PCE as DNAPL. It is highly unlikely that DNAPL PCE is present.
- The highest concentration of TCE present is only one one-thousandth of the rule-of-thumb concentration that would indicate the possible presence of TCE as DNAPL. It is highly unlikely that DNAPL TCE is present.
- 1,2-DCE product is usually sold as a mixture of the cis- and trans- isomers. Because the trans- isomer has been detected in only one well, and at much lower concentrations than the cis- isomer, it is likely that the 1,2-DCE present in the groundwater at the site is a result of TCE breaking down, rather than from spent 1,2-DCE solvent disposal in the landfill. If the 1,2-DCE concentrations are the result of breakdown, then 1,2-DCE is unlikely to be present as a DNAPL.
- Cis-1,2 DCE is present in groundwater at about one-thirtieth of the rule-of-thumb concentration that would indicate the possible presence of DCE as DNAPL. Therefore, it is unlikely that DNAPL cis-1,2 DCE is present.
- Trans-1,2 DCE is present in groundwater at about one five-hundredth of the rule-of-thumb concentration that would indicate the possible presence of DCE as DNAPL. Therefore, it is highly unlikely that DNAPL trans-1,2-DCE is present.

In summary, given the guidance document guidelines and the existing data, it would be difficult to find any evidence suggesting that DNAPL exists at this site. If DNAPL were present at this site, there would be evidence of it in the results of the RI or from the existing monitoring well network.. On the contrary, all of the evidence indicates that DNAPL is highly unlikely to be present.

Item 9. Please provide hydraulic conductivity measurements and average groundwater flow velocities for each of the aquifers, as this will aid in determining how fast the plume is moving forward. Conductivities from the newly installed wells should be used.

The January 2003 Groundwater Monitoring Plan proposed that the hydraulic conductivities of two of the new wells (P-111D and P-113B, both at the top of the bedrock surface) would be determined. The velocity of groundwater in the sandstone aquifer will be important in the evaluation of monitored natural attenuation.

Item 10. Current data shows (sic) that the groundwater quality in MW-112 has changed significantly. The water in this well was black in color and the vinyl chloride levels have increased significantly. With this noted, the Department is requesting that additional investigation of the downgradient wetland area be investigated.

The variation in vinyl chloride concentrations in MW-112 is certainly affected by the unstable water levels due to last year's pumping at the gravel pit. There was only 3 inches of water in the well when it was sampled in December 2002; 3.9 feet of water was present in the well when it was sampled on April 22, 2003. (A report on the sampling results for April 2003 is currently being prepared. The results for MW-112 for April 2003 were similar to those in December 2002; vinyl chloride was detected at 45 ug/l, and cis-1,2-DCE was detected at 220 ug/l) The water table elevation in this well needs to rise at least 1.1 feet for it to reach the minimum elevation experienced between 1993 and February 2002. The water table has clearly not attained steady-state conditions that existed prior to pumping at the gravel pit.

The black sediment may be indicative of the oxidation of manganese, as has been observed in the water supply systems in many of the area homes Prior to sampling the well in April 2003, the well was redeveloped in order to remove the black sediment. Because of the limited amount of water in the well, only a portion of the screened area could be redeveloped. We recommend that the well be redeveloped again once the water levels have achieved steady-state conditions.Fluctuations in the water table are likely causing contaminants sorbed to the soil matrix to be released to the groundwater. The need for any additional investigation of the wetland area downgradient of MW-112 can only be determined after a representative sample is collected from MW-112 and analyzed for VOCs. A representative sample of groundwater can only be collected once the water table has returned to steady-state conditions.

Item 11. The 1996 ROD has two operable units 1) source control and 2) groundwater. The source control measures required may not have been adequate. The problem with the groundwater is much greater than what was acknowledged in the 1996 ROD and consequently "no action" for this operable unit is no longer appropriate. Greg Tilkens from the waste

program at the Department will be assisting in the modification of the plans for this landfill and his hours for this involvement will be billed back to the PRP group. The 1996 ROD will be amended once an additional remedial action is determined for the site, after a Proposed Plan has been issued to present the proposed additional remedy to the public.

As indicated above, there is no evidence that the source control actions were inadequate at this site. The landfill cap has prevented infiltration of precipitation and hence generation of leachate. This is exactly what it was supposed to do. Additional comments regarding source control are addressed at the beginning of this letter.

GeoTrans recommends that these comments be provided to the WDNR for their review, followed by a meeting to discuss these concerns. Because of the significance of the issues involved, as well as the need for a written record to justify any future action at this CERCLA site, we urge that any rebuttal to these points by the WDNR be presented in writing.

We trust that this information meets your needs. If you should have any questions, feel free to contact us.

Sincerely,

Gerald L. DeMers, P.E.
Associate and Senior Engineer

Heidi W Yantz
Project Hydrogeologist

Michael R. Noel
Vice President

Cc: Nelson Olavarria, Cooper Industries
Steve Barg, City of Ripon
Travis Drake, City of Ripon

Table 1 Potential ARARs for Remedial Actions at the FF/NN Landfill
Ripon, Wisconsin
Focused Feasibility Study, 2003

Regulation, Policy or Law	Description	Groundwater Extraction, To Surface Water	Groundwater Extraction, To Infiltration Gallery	Groundwater Extraction, To Ripon POTW	Active Gas Extract	Extension of Municipal Water	In-Situ Remedial Alts	No Action, Institutional Controls
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.	✔	✔	✔	✔			
NR 507 - Monitoring for Landfills	Specifies monitoring requirements for ground water, leachate and gas.	✔	✔	✔	✔	✔	✔	✔
NR 508 - Responses when a groundwater standard is exceeded	Specifies procedures for responding to groundwater exceeding a standard.	✔	✔	✔	✔	✔	✔	✔
NR 600-620 - 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).	✔	✔	✔	✔	✔	✔	✔
NR 700-754 - Investigation and Remediation of Environmental Contamination	Specifies standards and procedures pertaining to the identification, investigation and remediation of sites.	✔	✔	✔	✔	✔	✔	✔
NR 809 Safe Drinking Water	Establishes minimum standards for safe drinking water					✔		✔
NR 811 Requirements for the Operation and Design of Community Water Systems	Establishes design and operation standards for community water systems					✔		
NR 812 Well Construction and Pump Installation	Establishes standards for extracting groundwater	✔	✔	✔		✔	✔	

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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.	✔	✔					
NR 207 - Water Quality Antidegradation	Sets procedures for proposed new or increased discharge to ORWs or ERWs	✔						
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.			✔				
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.	✔	✔					
NR 218 - Sampling	Establishes sampling methods	✔						
NR 219 - Analytical Test Methods and Procedures	Sets procedures applicable to effluent limitations for discharges from point sources	✔						
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	✔						
Ch 147.Stats - Pollution Discharge Elimination	Requires point source discharges to obtain a permit from WDNR	✔						
NR 445 - Control of Hazardous Pollutants	Specifies emission limits and control requirements for air contaminant sources emitting hazardous pollutants	✔	✔	✔	✔			

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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.	✔						
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.	✔						
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 or community sewerage systems	✔	✔	✔				
NR 112 - Well Construction and Pump Installation	Specifies construction standards for well and pump installations and abandonment of wells	✔	✔	✔				
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	✔	✔	✔				
NR140 - Groundwater Quality	Specifies groundwater quality preventive action limits and enforcement standards. Notification requirements and potential response actions when standards are exceeded are listed	✔	✔	✔		✔	✔	✔
NR 149 Lab Certification	Sets analytical standards for lab certification	✔	✔	✔	✔	✔	✔	✔

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Executive Order 11988 and 11990; 40 CFR 6, Subpart A	Requirements for remedial actions impacting floodplains or wetlands	✔					✔	
RCRA, Subtitle C	Regulates hazardous waste. Water treatment residuals may be hazardous waste	✔	✔		✔		✔	
Clean Water Act (CWA)	Regulates surface water quality	✔						
40 CFR 264.18(b) (RCRA)	Requirements for design, construction, operation and maintenance of remedial actions at RCRA hazardous waste sites located in floodplain	✔						
National Pollutant Discharge Elimination System (NPDES)	Regulates discharge into Silver Creek	✔						
Pretreatment Requirements 40 CFR, Part 403.5	Pretreatment standards for discharge to POTW			✔				
Fresh Water Quality Criteria (FWQC)	Surface water quality standards	✔						
Executive Order for Wetlands and Floodplains	Regulates actions in wetlands or floodplains	✔	✔	✔				
Response in a Floodplain or Wetlands; 40 CFR Part 6, Append. A	Construction in flood hazard areas	✔	✔	✔				
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	✔						
NR 103 - Water Quality Standards for Wetlands	Regulates water discharges to wetlands	✔	✔	✔				
NR 104 - Intrastate Water Uses and Designated Standards	Designates use classifications for surface waters.	✔						

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FEDERAL REGULATIONS								
Clean Air Act (CAA) and National Ambient Air Quality Standards (NAAQS)	Regulates site air emissions	✔	✔	✔	✔	✔	✔	✔
40 CFR 52	Regional air quality plan for remedial activities. Federal Prevention of Significant Deterioration Program	✔	✔	✔	✔			
40 CFR 50	Air quality standards for remedial activities	✔	✔	✔	✔		✔	
40 CFR 257	Criteria for classification of solid waste disposal facilities and practices	✔	✔	✔	✔	✔	✔	✔
40 CFR 261	Identification of hazardous waste	✔	✔	✔	✔	✔	✔	✔
40 CFR 262	Regulations for hazardous waste generators	✔	✔	✔	✔	✔	✔	✔
40 CFR 263	Regulations for transport of hazardous waste	✔	✔	✔	✔	✔	✔	✔
Department of Transportation Hazardous Materials Transportation Act	Off-site transport of hazardous waste	✔	✔	✔	✔	✔		
Occupational Safety and Health Administration (OSHA)	Regulates worker safety	✔	✔	✔	✔	✔	✔	✔
Fish and Wildlife Coordination Act	Regulates flow modification of Silver Creek	✔						
Endangered Species Act	Protects endangered species and habitats. No endangered species are known to exist at the site.	✔	✔	✔	✔	✔	✔	✔
OSWER Directive 9355.0-28	Control of air emissions from Superfund air strippers at Superfund groundwater 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)	✔	✔					
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	✔	✔					