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Post-it® Fax Note 7671	Date 6/8/04	# of pages ▶ 2
To Jennie Pelczar	From Jerry DeMets	
Co./Dept.	Co.	
Phone #	Phone #	
Fax # 920-424-4404	Fax #	

6-8-2004

REINHART
BOERNER VAN DEUREN s.c.
ATTORNEYS AT LAW

HSI GeoTrans
Milwaukee

May 28, 2004

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

Mr. Bruce G. Urben
Department of Natural Resources
625 County Road Y, Suite 700
Oshkosh, WI 54901-9731

COPY

Dear Mr. Urben:

Re: Responses to April 5, 2004 WDNR Letter regarding FF/NN Landfill

I am enclosing with this letter GeoTrans' responses to certain technical issues raised by the Department's draft cover letter, draft plan modification to the City and related administrative order dated April 5, 2004 (the "Draft"). GeoTrans' responses are being provided in the hope that the Department staff involved in preparing the Draft will withdraw the order portion of the Draft and amend the associated tables in accord with GeoTrans' responses. If the Department rejects GeoTrans' reasoning, then GeoTrans, the City of Ripon, Attorney Ludwig Wurtz and I (the latter two as counsel for the City) urge you to provide not just a statement of your rejection but the reasoning process and data which support such rejection. In my opinion, to do less is not professional.

As counsel for the City on this matter I express my disappointment that the Department has not already addressed the very significant legal issues raised by the letter from Attorney Wurtz and me dated May 6, 2004. In particular, the Department must answer the question: how can the FF/NN Landfill be delisted from the NPL if the Department fails to follow the NCP, as it would fail through the April 5th "Plan Mod." Likewise, the Department must answer whether it now considers the § 144.442 Contract between the FF/NN Landfill PRPs and the Department to be terminated and, if not, why it is proceeding against the City alone.

I look forward to the Department's responses on all these matters.

Thank you for your consideration of the above and for the extension until May 31, 2004 to respond.

Sincerely,

Raymond M. Roder

Madison\127661RMR:JJS

Encs.

cc Mr. Ludwig L. Wurtz (w/encs.)
Mr. Nelson Olavarria (w/encs.)
Mr. Steve Barg (w/encs.)
Mr. Gerald L. DeMers (w/o encs.) ✓

Pelczar, Jennifer S.

From: Jerry DeMers [gdemers@geotransinc.com]
Sent: Tuesday, June 08, 2004 10:04 AM
To: Pelczar, Jennifer S.
Cc: rroder@reinhartlaw.com
Subject: Resposne letter

Attached is the response letter, which you said that you did not receive. I will fax Ray's cover letter to you.

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 28, 2004
(1011.002)

Mr. Raymond Roder
Reinhart Boerner Van Deuren, s.c.
22 East Mifflin Street, Suite 600
P.O. Box 2018
Madison, WI 53701-2018

Re: Response to April 5, 2004 WDNR Letter
FF/NN Landfill, Ripon, WI

Dear Ray:

GeoTrans has prepared this response to the April 5, 2004 letter from Bruce Urben of the Wisconsin Department of Natural Resources (WDNR). In this letter, we address only the eight items that were included in the Conditional Plan of Operation Approval Modification at the end of the letter. While some of issues raised in the WDNR's cover letter are addressed below, we have not attempted to address all of the issues that may have been raised by that letter. The proposed WDNR conditions are provided in italics, and our response follows.

The April 5, 2004 letter is addressed to the City of Ripon, and this response has been prepared on behalf of the City of Ripon. Please note that all of the past work that GeoTrans has done regarding this site has been at the direction of the FF/NN Landfill PRP Group, of which the City of Ripon is one member.

The Department hereby approves the report titled "Revised Ground-Water Monitoring Plan" for the closed Ripon FF/NN Landfill (License #467) subject to the following Conditions:

1. *The City shall submit a Remedial Action Options Report in accordance with ch. NR 722 Wis. Adm. Code within 14 months of the date of this approval.*

As you know, the City of Ripon (the City) has not engaged GeoTrans to prepare a Remedial Action Options Report (RAOR). Should the City engage us we recommend that it consider whether a RAOR will satisfy the requirements of the National Contingency Plan (NCP) in that a RAOR is not a Feasibility Study (FS) and does not follow the same public participation processes that are associated with an FS. As a consequence, substituting a RAOR for an FS may preclude the FF/NN Landfill from being delisted from the National Priorities List (NPL). We are not qualified to answer these questions but think answers are needed before proceeding with a RAOR in lieu of an FS. Nevertheless, preparation of an FS (or RAOR) within 14 months of the final date of approval for a monitoring plan is reasonable. OK

2. *The City shall conduct environmental monitoring in accordance with chs. NR500-520 Wis. Adm. Code the (sic) attached tables (Tables 1, 2, 3 and 4), which are hereby made part of this approval. All monitoring data shall be submitted.....*

The contents of each table are discussed separately below.

WDNR TABLE 1-Sampling Frequency

WDNR Table 1 requires the quarterly sampling of 19 wells, semiannual sampling of 5 wells and annual sampling of 2 wells. This is a substantial increase in monitoring – it is an increase in the amount of sampling by a factor of about three on an annual basis. In large part, this increase requires sampling (often quarterly) at a number of wells that were previously removed from the sampling program because they were consistently below detection or water quality standards.

GeoTrans' Table 1A is attached which lists the following information for all of the wells at the site:

- All sampling dates;
- Whether a VOC was detected on a sampling date;
- If a PAL was exceeded on a sampling date, which substance exceeded its PAL;
- If an ES was exceeded on a sampling date, which substance exceeded its ES;
- The sampling frequency recommended by the WDNR;
- The sampling frequency recommended by GeoTrans; and
- Brief reasons for the sampling frequency recommended by GeoTrans.

The criteria briefly described below were used to determine the "no more frequent" sampling intervals listed below:

Quarterly Sampling will be performed at a well that is

- A private well that is just outside of the known extent of the plume (Baneck, Gaastra and Rohde);
- A monitoring well that is a sentinel well to private wells (MW-3B, P-113B, P-116 (converted Hadel well));
- A regularly monitored well that has significant changes in VOC concentrations in the recent past (MW-112); or
- A newer well where vinyl chloride has been detected and the trend in concentrations in the plume would be valuable information (P-103D, P-111D, P-114).

* Add any shallow GW well that has been dry – MW-

We note that there is not a reason to perform quarterly monitoring at a well that has not had any changes to its historic concentration or trends in concentrations of contaminants. For example, wells such as MW-104 and MW-107 have been proposed for quarterly sampling by the WDNR, but there has not been any change to the contaminant concentrations or trends within the last 10 years to justify increasing the frequency of monitoring from semiannual to quarterly.

Semiannual Sampling will be performed at a well that:

- Was previously sampled on a semi-annual basis and did not meet the criteria set above for quarterly sampling;

- OK

- OK add P102

Suggest Y/4/Y due to GW flow reversal and dry wells for 1 yr. This may or change will impact GW chemistry

- A well that was not previously routinely sampled but from which we have been unable to collect a recent sample (MW-106); or
- A well that was not previously routinely sampled but has had a detection of vinyl chloride (P-102).

Annual Sampling will be performed at:

- Deep wells (layer 4) that are clean (MW-3A, P-113A).

No Sampling will be performed at a well that:

- Was previously removed from the sampling program because there is a history indicating no contaminants were detected (above the water quality limits), and recent samples confirmed that no contaminants are present (i.e., MW-108 and P-108, both of which are side-gradient from the landfill); and
- Wells that were previously removed from the sampling program and have not had any detection of VOCs in several years, including samples collected in the recent past (MW-111 and P-111).
- Wells that were previously removed from the sampling program and have not had any detection of VOCs (above the water quality standards) in several years, including samples collected in the recent past (P-103 and P-104).

The cover letter to the Conditional Approval indicates that the sampling frequency recommended by the WDNR would continue "until it can be shown that stable trends in groundwater chemistry warrant reduced sampling." A review of the groundwater chemistry for all the wells indicates only three wells have not attained a stable trend in groundwater chemistry:

- MW-112, where vinyl chloride concentrations have increased and decreased again in the April 2004 results (and we agree that quarterly monitoring is appropriate);
- P-102, where the reversal in flow direction to the east has apparently resulted in the detection of vinyl chloride in this well where it had not been detected previously (and where we agree with the WDNR's recommended semiannual sampling frequency); and DO NOT – SIC 7-26-04 talked to Jerry DeMers.
- MW-102, where there has not been sufficient water for sampling (and where we recommend semiannual sampling to determine if there are any detections or ES exceedances).

? DNR recommended Quarterly

All other wells have exhibited contaminant concentrations that are consistent with those observed prior to the pumping by Northeast Asphalt. As indicated in the WDNR cover letter, "In October 2003, the shallow monitoring wells that were impacted by the pumping at NE Asphalt gravel pit were no longer dry and indicate that the system may be nearing equilibrium."

As stated in *Applied Hydrogeology* by C.W. Fetter

↑ hydraulicly not chemically

> "Under natural conditions, an aquifer is usually in a state of *dynamic equilibrium* (Theis 1938). A volume of water recharges the aquifer and an equal volume is discharged. The potentiometric surface is steady and the amount of water in storage in the aquifer is a constant."

A key word in the above citation is *dynamic*. With eleven years of groundwater elevation data, it is evident that the potentiometric surface has changed through time (i.e. has not remained static). As seen on Table 2, groundwater elevations have fluctuated over the years by as much as nine feet at the site. As these changes occur, the groundwater system adapts to bring about a new dynamic equilibrium. Not only did pumping at Northeast Asphalt affect the water table and potentiometric surface elevations, but the amount of precipitation also affects these levels. According to the Midwestern Regional Climate Center, the historical normal annual rainfall for Ripon is 31.12 inches. In 2002, this station recorded annual precipitation of 28.79 inches while 2003 had annual precipitation of 27.33 inches. Even without the pumping by Northeast Asphalt, lower water table elevations would be expected in the area.

Because of the dynamic nature of the equilibrium, it would be inappropriate to base some future decision regarding sampling all of the wells on whether groundwater elevation in layer 1 monitoring wells reaches a past maximum or some other undefined (and possibly undefinable) elevation purportedly representative of dynamic equilibrium. Because the direction of groundwater flow has returned to pre-pumping conditions, and because contaminant concentrations are consistent with those in the past (except in the three wells noted above), there is no reason to believe that the groundwater system has not achieved dynamic equilibrium at this time. That being said, we concur with the greater sampling frequency at MW-112, MW-102 and P-102 at this time.

WDNR TABLE 1- Indicator Parameters

Field indicator parameters have been collected at all of the groundwater monitoring wells consistently in the past. Laboratory indicators have been analyzed on some occasions in the past. We have presented in past correspondence (letter dated June 28, 2002) and in our September 2003 meeting with WDNR an analysis of laboratory indicator parameters and groundwater quality for contaminants of concern as they relate to this site. An evaluation of indicator parameters in each of the geologic units is also provided as an attachment to this letter. Our main points are briefly summarized here:

- Indicator parameters are only useful as "indicators" of potential contamination. There is no reason to measure the potential for contamination when one is also measuring the actual contamination, i.e., the contaminant of concern. It is not expected that monitoring for VOCs will cease as long as they are present in a well above water quality standards; as a result, there is no reason to monitor indicator parameters when the actual contamination will continue to be monitored.
- Graphs of vinyl chloride (the principal contaminant of concern) versus the laboratory indicator parameters of chloride, hardness and alkalinity concentrations, respectively

are provided on charts that are attached to this letter. The coefficients of determination (R^2) for each of these plots are also given. The coefficient of determination is a measure of goodness of fit of a line with the data, and for these plots it ranges from 0.0045 (chloride) to 0.275 (hardness). A coefficient of determination greater than 0.90 indicates a good correlation. The very low coefficients indicate that at this site there is no correlation between vinyl chloride and the indicator parameters.

For these reasons, and those evaluated in greater depth in the attachment, we do not believe there is a reason for analyzing groundwater monitoring well samples for laboratory indicator parameters, and do not believe that the data generated would be useful at this site.

WDNR TABLE 2

Leachate sampling has been done in accordance with this table with one exception. We have not been analyzing leachate for field conductivity, pH and temperature because of concern with damaging the field instrument, based on recommendations from the equipment manufacturer. These types of meters are manufactured for groundwater with a fairly neutral pH and temperature. Depending on the composition of the leachate, it can harm the plastic casings or other parts in the meter. In addition, the probe must be completely disassembled after each use in leachate and cleaned thoroughly to prevent further damage to the instrument. This is not a typical field procedure. The meters that are used by GeoTrans sell for $1200 and a typical repair bill runs around $500.

Furthermore, we suggest that pH, temperature or conductivity measurements for landfill leachate would not be meaningful in discussions for future remediation or monitoring at the site. We would therefore request that these field parameters not be required for leachate.

WDNR TABLE 3

Field indicator parameters have been collected at the private water supply wells on all occasions in the past. Laboratory indicators have also been analyzed on some occasions in the past.

For the same reasons presented above related to Table 1, we do not believe there is a reason for analyzing private water well samples for indicator parameters, and do not believe that the data generated would be useful at this site.

WDNR TABLE 4

The frequency of gas monitoring is addressed under Condition 7.

3. *The City shall collect and analyze one surface water sample for VOCs from the wetland downgradient of MW-112 (wetland on the R and R Wash property owner by (sic) Roger Washkovick) in July or October of 2004. The data shall be submitted in the quarterly report following the sampling event.*

While the City has not engaged GeoTrans to do any sampling, we note that the PRP Group had already agreed to sample the wetland in July or October 2004, conditioned upon WDNR obtaining permission from the owner. We have not been advised whether the WDNR has obtained the owner's permission.

When was this asked of the Dept?

4. *The City shall submit private well water sampling results to the Department immediately upon receipt of final laboratory documents, as well as in the quarterly report required in condition 6 below.*

In the past, GeoTrans has submitted private well sampling results on behalf of the PRP Group to the WDNR within a few (usually fewer than three) days of receipt. To remove ambiguity, we suggest that "immediately" be replaced with "within three business days." Nonetheless, we note that we have not been engaged by the City to do any sampling.

Under s. NR708.05(4)(f) Wis. Adm. Code, if a private well becomes impacted with compounds emanating from the landfill exceeding the standards contained in Table 1 in ch. NR140, Wis. Adm. Code, the City shall take immediate actions. Immediate actions may include supplying bottled water, installing a treatment unit, or connection of the home to municipal water. Bottled water and a treatment unit are considered temporary alternatives for providing safe water and may not be considered for long term use.

The PRP Group has in the past taken these actions when necessary. Whether the City has the right to allow connection to the water supply system present at Koro Road and Charles Street is not a question that we can answer.

5. *The City shall submit a quarterly report within 90 days of a routine sampling event. The quarterly report shall consist of....*

Reports submitted on behalf of the PRP Group have in the past been provided within 90 days of each sampling event. These reports have contained the information listed in the WDNR draft conditional approval. However, as stated previously, we have not been engaged by the City to conduct any work at or for the site.

6. *The City shall install four s. NR507.11, Wis. Adm. Code compliant gas monitoring wells as proposed in the recent plan dated March 22, 2004 submitted by GeoTrans on the PRP Groups (sic) behalf.*

All four gas probes were installed by the PRP Group as of May 20, 2004 as shown on Figure 1 (attached).

7. *The City shall monitor the gas monitoring points (4 new gas monitoring wells, twelve passive gas vents, three leachate head wells) on a monthly basis for 12 consecutive months starting with the date of this approval.*

To date, gas samples have been collected on behalf of the PRP Group from all of the gas vents on 14 occasions since they were installed in 1996. Gas has been measured at the leachate head wells and monitoring wells on at least 21 occasions in 11 years. These data are portrayed on three charts that are attached. As can be seen from these charts, the concentrations of gas have varied considerably at the various sampling locations, although a general downward trend over time can be observed. Based upon the past data, we expect that monthly sampling of the vents, leachate head wells and gas probes will also show variability similar to that which is shown with the 7 to 10 years of semiannual data. Because more data showing this kind of variation is neither necessary nor useful for remedy selection or design purposes, we recommend that gas sampling be performed no more frequently than quarterly, at the same time as groundwater sampling.

The Department reserves the right to require the submittal of additional information and to modify this approval at any time, if, in the Department's opinion, modifications are necessary. Unless specifically noted, the conditions of this approval do not supercede or replace any previous conditions of approval of the facility.

We anticipate that modifications to the WDNR's conditional approval will raise the same legal issues noted above under item #1. We cannot anticipate what technical issues might also arise.

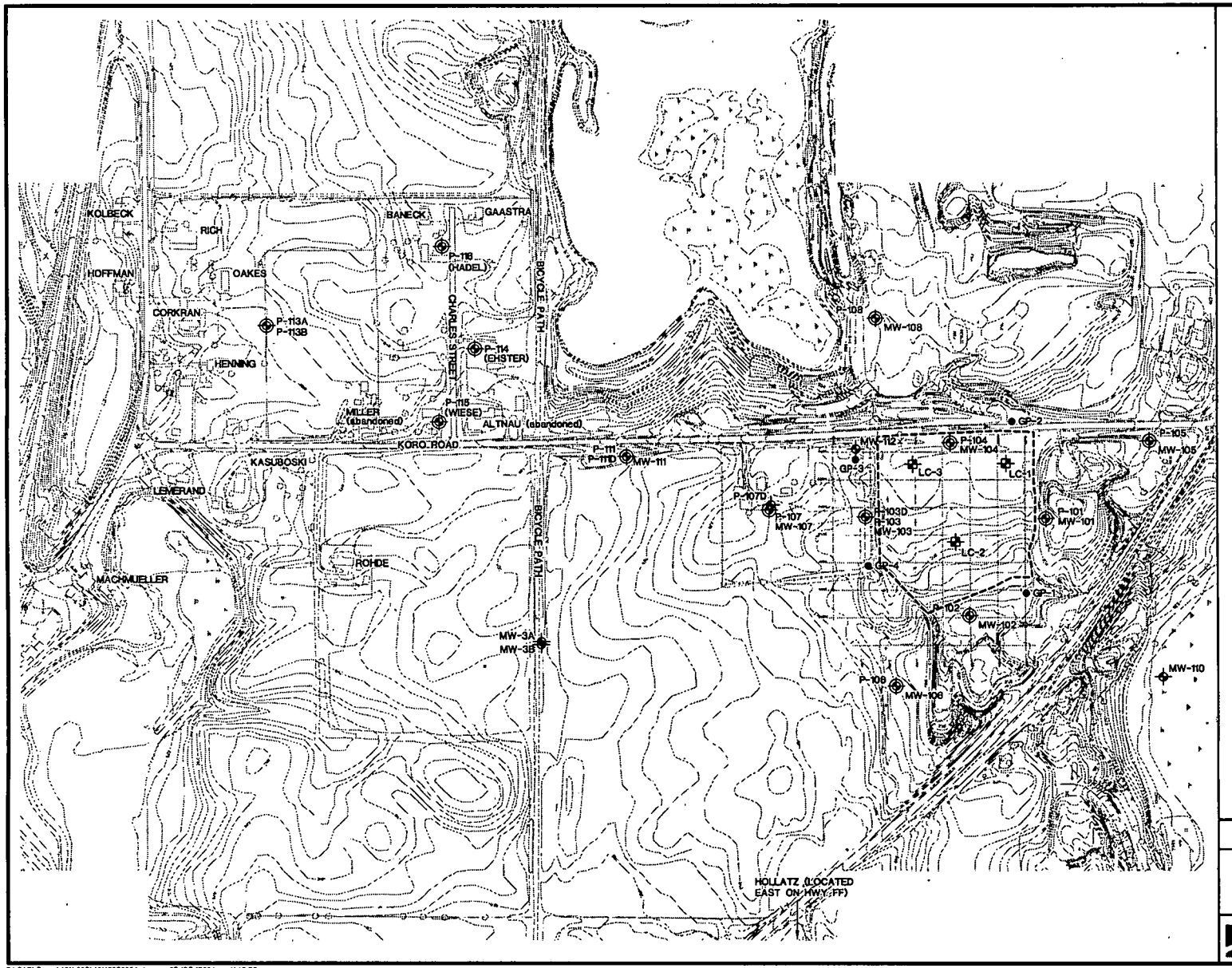
****

We trust this information meets your needs. If you have any questions please give us a call.

Sincerely,

GeoTrans, Inc.

Gerald L. DeMers	Michael R. Noel	Heidi W. Yantz
Senior Engineer, Associate	Principal Hydrogeologist	Project Hydrogeologist



EXPLANATION

- P-104 / MW-104 — MONITOR WELL, PIEZOMETER LOCATION, DESIGNATION
- LC-2 — LEACHATE HEAD WELL LOCATION, DESIGNATION
- OUTLINE OF CLOSED LANDFILL
- GP-1 — GAS PROBE LOCATION AND DESIGNATION

N

SCALE

0 700

Feet

RIPON FF/NN LANDFILL
RIPON, WISCONSIN

WELLS AND GAS PROBES

DATE:	5/27/04
DESIGNED:	GLD
CHECKED:	GLD
APPROVED:	GLD
DRAWN:	HJW
PROJ.:	1011.002

GeoTrans, Inc.

Figure 1

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Table 1A - Evaluation of monitoring wells, results and sampling frequency
FF/NN Landfill, Ripon, WI

Sampling Point:	Collection Date:	VOCs detected (but not necessarily exceeding a standard)	PAL Exceedances	ES Exceedances	WDNR Recommended Sampling Interval	GeoTrans Recommended Sampling Interval	Reasoning
MW-3A	04/04/2002	no			Q	A	Downgradient of P-107D, 1 of 3 wells in this layer; no detections ever
	05/22/2002	no					
	08/20/02	no					
	12/05/02	no					
	04/22/03	no					
	10/22/03	no					
MW-3B	04/04/2002	yes		VC	Q	Q	Sentinel well for Rohde and other S. Koro Road homes
	05/22/2002	no					
	08/20/2002	no					
	12/05/2002	no					
	4/22/03	no					
	10/22/03	no					
MW-101	Oct-93	yes	PCE		Q	SA	Upgradient well with last PAL exceedance in 1999
	Apr-94	yes	PCE				
	May-96	yes	PCE				
	Oct-96	yes	PCE				
	May-97	no					
	Oct-97	yes	PCE				
	4/98*	no					
	Oct-98	no					
	Apr-99	no					
	Oct-99	yes	PCE				
	May-00	yes					
	Oct-00	yes					
	1-May	yes					
	10/11/2001	no					
	2/5/2002	yes					
	05/21/2002 *	insufficient water for sampling					
	8/19/2002 *	insufficient water for sampling					
	12/5/2002 *	insufficient water for sampling					
	4/21/03 *	insufficient water for sampling					
	10/23/2003	no					
P-101	Oct-93	no			Q	None	Upgradient; no historical exceedances; removed from sampling program in 1994
	Apr-94	yes					
	2/5/2002	no					
	5/22/2002	no					
MW-102	10/26/1993	no			Q	SA for one year, then remove from sampling program if no exceedances	No historical PAL exceedances; removed from sampling program in 1998
	4/11/1994	yes					
	5/8/1996	yes					
	10/30/1996	yes					
	5/12/1997	no					
	10/26/1997	no					
	4/13/1998	yes					
	10/11/2001	no					
	5/21/2002 *	insufficient water for sampling					
	8/19/2002 *	insufficient water for sampling					
	12/5/2002 *	insufficient water for sampling					

Table 1A - Evaluation of monitoring wells, results and sampling frequency
FF/NN Landfill, Ripon, WI

Sampling Point:	Collection Date:	VOCs detected (but not necessarily exceeding a standard)	PAL Exceedances	ES Exceedances	WDNR Recommended Sampling Interval	GeoTrans Recommended Sampling Interval	Reasoning
P-102	10/26/1993	no			Q	SA	Need to monitor VC, which is <1 ppb.
	4/11/1994	no					
	10/11/2001	no					
	5/21/2002	yes		VC			
	8/20/2002	yes		VC			
	12/4/2002	yes		VC			
	4/21/2003	yes		VC			
	10/22/2003	yes		VC			
MW-103	10/27/1993	yes		VC, Cis-DCE	Q	SA	Need to monitor exceedances; VOCs have been declining since 1994
	4/11/1994	yes		VC, Cis-DCE			
	May-96	yes		TCE, VC, Cis-			
	Oct-96	yes	TCE	VC, Cis-DCE			
	May-97	yes		TCE, VC, Cis-			
	Oct-97	yes		TCE, VC, Cis-			
	4/98*	yes					
	Oct-98	yes		TCE, VC, Cis-			
	Apr-99	yes	TCE	VC, Cis-DCE			
	Oct-99	yes	TCE	VC, Cis-DCE			
	May-00	yes	TCE	VC, Cis-DCE			
	Oct-00	yes		TCE, VC, Cis-			
	May-01	yes	TCE	VC, Cis-DCE			
	10/11/2001	yes	Cis-DCE	VC			
	2/4/2002	yes	TCE	VC, Cis-DCE			
	5/21/2002*	insufficient water for sampling					
	8/19/2002 *	insufficient water for sampling					
	12/5/2002 *	insufficient water for sampling					
	04/21/2003 *	insufficient water for sampling					
	10/21/2003	yes	TCE	VC			
P-103	10/27/1993	no			SA	None	No exceedances since 1996; removed from monitoring program in 1998
	4/12/1994	no					
	5/9/1996	yes	VC				
	10/31/1996	yes	Chloroethane				
	5/13/1997	no					
	10/27/1997	no					
	4/13/1998	no					
	2/4/2002	no					
	5/21/2002	yes					
P-103D	2/4/2004	yes		VC	None	Q for 1 year, SA thereafter	New well, VC <2ppb; establish data

Table 1A - Evaluation of monitoring wells, results and sampling frequency
FF/NN Landfill, Ripon, WI

Sampling Point:	Collection Date:	VOCs detected (but not necessarily exceeding a standard)	PAL Exceedances	ES Exceedances	WDNR Recommended Sampling Interval	GeoTrans Recommended Sampling Interval	Reasoning
MW-104	10/27/1993	yes			Q	SA	Need to monitor exceedances; VC has varied from 1.1 to 29 ppb since 1993, without a discernable trend
	4/19/1994	yes	TCE, cis-DCE	VC			
	5/9/1996	yes	TCE	VC			
	10/30/1996	yes		VC			
	5/12/1997	yes		VC			
	10/27/1997	yes	Cis-DCE	VC			
	4/13/1998	yes	TCE	VC, Cis-DCE			
	10/13/1998	yes		VC			
	4/7/1999	yes	TCE	VC			
	10/27/1999	yes		VC			
	5/2/2000	yes		VC			
	10/30/2000	yes		VC			
	May-01	yes	TCE	VC			
	10/11/2001	yes	1,1-DCE	VC			
	2/5/2002	yes	TCE	VC			
	5/21/2002*	insufficient water for sampling					
	8/19/2002 *	insufficient water for sampling					
	12/5/2002 *	insufficient water for sampling					
	4/21/2003 *	insufficient water for sampling					
	4/22/2003	yes	Benzene	VC			
	10/23/2003	yes	Benzene	VC			
P-104	10/27/1994	no			Q	None	No exceedances to monitor, and very few detections (chloroethane likely related to sample bottle contamination) Removed from monitoring in 1998
	4/19/1994	no					
	5/9/1996	no					
	10/30/1996	yes					
	5/12/1997	no					
	10/27/1997	no					
	4/13/1998	no					
	10/11/2001	no					
	2/5/2002	yes	Chloroethane				
	5/21/2002	no					
	8/20/2002	no					
MW-106	Oct-93	no			Q	SA for one year, then off the program if no exceedances	No historical exceedances, but we haven't been able to monitor for two years. Was removed from monitoring in 1994.
	Apr-94	yes					
	02/04/02	yes					
	05/21/2002 *	insufficient water for sampling					
	8/19/2002 *	insufficient water for sampling					
	12/5/2002 *	insufficient water for sampling					
	4/21/03 *	insufficient water for sampling					

Table 1A - Evaluation of monitoring wells, results and sampling frequency
FF/NN Landfill, Ripon, WI

Sampling Point:	Collection Date:	VOCs detected (but not necessarily exceeding a standard)	PAL Exceedances	ES Exceedances	WDNR Recommended Sampling Interval	GeoTrans Recommended Sampling Interval	Reasoning
P-106	Oct-93	yes	TCE		SA	SA	Need to monitor exceedances; all TCE detections since 1993 have been less than 1 ppb and have stayed relatively constant
	Apr-94	yes	TCE				
	May-96	yes	TCE				
	Oct-96	yes	Chloromethane,				
	May-97	yes	TCE				
	Oct-97	yes	TCE				
	Apr-98	yes	TCE				
	Oct-98	yes	TCE				
	Apr-99	yes	TCE				
	Oct-99	yes	TCE				
	May-00	yes	TCE				
	Oct-00	yes	TCE				
	May-01	yes	TCE				
	10/11/2001	yes	TCE				
	2/5/2002	yes	TCE				
	5/22/2002	yes	TCE				
	8/20/2002	yes	TCE				
	12/4/2002	yes	TCE				
	4/22/2003	yes	TCE				
	10/21/2003	yes	TCE				
MW-107	10/27/1993	yes	TCE		Q	SA	Need to monitor exceedances; all TCE detections since 1993 have been less than 3 ppb, and there has been no trend in detections. SA sampling would be consistent with other wells in the nest.
	4/12/1994	yes	TCE				
	5/9/1996	yes	TCE				
	10/21/1996	yes	TCE,				
	5/13/1997	yes	TCE				
	10/27/1997	yes	TCE				
	4/14/1998	yes	TCE				
	10/13/98*	insufficient water for sampling					
	4/6/1999	yes	TCE				
	10/27/1999	yes	TCE				
	5/2/2000	yes	TCE				
	10/31/2000	yes	TCE				
	5/31/2001	yes	TCE				
	10/11/2001	yes	TCE				
	2/4/2002	yes	TCE				
	05/21/2002*	insufficient water for sampling					
	8/19/2002 *	insufficient water for sampling					
	12/5/2002 *	insufficient water for sampling					
	4/21/2003	yes	TCE				
	10/21/2003	yes	TCE				

Table 1A - Evaluation of monitoring wells, results and sampling frequency
FF/NN Landfill, Ripon, WI

Sampling Point:	Collection Date:	VOCs detected (but not necessarily exceeding a standard)	PAL Exceedances	ES Exceedances	WDNR Recommended Sampling Interval	GeoTrans Recommended Sampling Interval	Reasoning
P-107	10/27/1993	yes		VC	SA	SA	Need to monitor exceedances; VC has slowly declined from 3 ppb in 1994 to about 1 ppb
	4/12/1994	yes		VC			
	5/9/1996	yes		VC			
	10/23/1996	yes	Chloromethane	VC			
	5/14/1997	yes		VC			
	10/27/1997	yes		VC			
	4/14/1998	yes		VC			
	10/14/1998	yes		VC			
	4/6/1999	yes		VC			
	10/27/1999	yes					
	5/2/2000	yes		VC			
	10/31/2000	yes					
	5/9/2001	yes	TCE	VC			
	10/11/2001	yes		VC			
	2/4/2002	yes		VC			
	5/21/2002	yes		VC			
	8/20/2002	yes		VC			
	12/4/2002	yes		VC			
	4/21/2003	yes		VC			
	10/21/2003	yes		VC			
P-107D	10/27/1993	yes		VC	SA	SA	Need to monitor exceedances; VC has ranged from 0.6 to 10 ppb since 1993 without a clear trend
	4/13/1994	yes					
	5/9/1996	yes	Chloromethane	VC			
	10/23/1996	yes	Chloromethane	VC			
	5/14/1997	yes		VC			
	10/27/1997	yes		VC			
	4/14/1998	yes		VC			
	10/14/1998	yes		VC			
	4/6/1999	yes		VC			
	10/27/1999	yes		VC			
	5/2/2000	yes		VC			
	10/31/2000	yes					
	01/05/2001	yes		VC			
	10/11/2001	yes		VC			
	2/4/2002	yes		VC			
	5/21/2002	yes		VC			
	8/20/2002	yes		VC			
	12/4/2002	yes		VC			
	4/21/2003	yes		VC			
	10/21/2003	yes					
MW-108	10/18/1993	yes			Q	None	Cross-gradient; was removed from monitoring in 1998; no detections since 1997. 2002 sample confirmed no impacts
	4/13/1994	yes					
	5/8/1996	yes					
	10/23/1996	yes	Chloromethane				
	5/12/1997	no					
	10/27/1997	no					
	4/14/1998	no					
	10/11/2001	no					
	05/21/2002*	insufficient water for sampling					
	8/19/2002 *	insufficient water for sampling					
	12/5/2002	no					

Table 1A - Evaluation of monitoring wells, results and sampling frequency
FF/NN Landfill, Ripon, WI

Sampling Point:	Collection Date:	VOCs detected (but not necessarily exceeding a standard)	PAL Exceedances	ES Exceedances	WDNR Recommended Sampling Interval	GeoTrans Recommended Sampling Interval	Reasoning
P-108	10/25/1993	no			SA	None	Cross-gradient; was removed from monitoring in 1994; no detections ever
	4/13/1994	no					
	10/11/2001	no					
	2/5/2002	no					
	5/21/2002	no					
MW-111	4/19/1994	no			A	None	No detections ever; removed from monitoring in 1994
	10/11/2001	no					
	05/21/2002*	insufficient water for sampling					
	8/19/2002	no					
	12/5/2002	no					
P-111	4/19/1994	no			A	None	No detections ever; removed from monitoring in 1994
	10/11/2001	no					
	2/5/2002	no					
	5/22/2002	no					
	8/19/2002	no					
	12/5/2002	no					
	4/22/2003	no					
	10/22/2003	no					
P-111D	4/4/2002	yes		VC	Q	Q	Relativley new well; monitor trend, VC is 9 to 15 ppb
	5/22/2002	yes		VC			
	8/19/2002	yes		VC			
	12/5/2002	yes		VC			
	4/23/2003	yes		VC			
	10/23/2003	yes		VC			
MW-112	11/27/1996	yes	TCE, cis-DCE,	VC	Q	Q	Need to monitor exceedances; VC concentrations increased after pumping by Northeast Asphalt
	5/12/1997	yes	benzene	VC			
	10/26/1997	yes	benzene				
	4/13/1998	yes	TCE, cis-DCE,	VC			
	10/13/1998	yes	TCE, benzene	VC			
	4/6/1999	yes	TCE, cis-DCE,	VC			
	10/27/1999	yes	TCE, cis-DCE				
	5/2/2000	yes					
	10/30/2000	yes					
	5/9/2001	yes		VC			
	10/11/2001	yes	TCE, cis-DCE	VC			
	2/4/2002	yes					
	05/21/2002*	insufficient water for sampling					
	8/19/2002 *	insufficient water for sampling					
	12/4/2002	yes	TCE	VC, Cis-DCE			
	4/22/2003	yes	benzene	TCE, VC, Cis-			
	10/22/2003	yes	TCE, cis-DCE,	VC			
P-113A	9/12/2002	yes			Q	A	1 of 3 wells in this layer
	12/3/2002	no					
	4/23/2003	yes					
	10/22/2003	no					
P-113B	9/11/2002	yes			Q	Q	Sentinel well for downgradient private wells
	12/3/2002	no					
	4/23/2003	no					
	7/30/2003	no					
	10/22/2003	no					
	2/4/2004	no					

Table 1A - Evaluation of monitoring wells, results and sampling frequency
FF/NN Landfill, Ripon, WI

Sampling Point:	Collection Date:	VOCs detected (but not necessarily exceeding a standard)	PAL Exceedances	ES Exceedances	WDNR Recommended Sampling Interval	GeoTrans Recommended Sampling Interval	Reasoning
P-114 (former Ehster well)	11/19/2001	yes		VC	Q	Q	Need to monitor exceedances; VC ranges from 3.3 to 9.2 ppb
	2/5/2002	yes		VC			
	5/22/2002	yes		VC			
	8/21/2002	yes		VC			
	12/3/2002	yes		VC			
	4/23/2003	yes		VC			
	10/23/2003	yes		VC			
P-115 (former Wiese well)	10/9/2001	no			Q	SA	Sentinel Well for leading edge of plume
	11/19/2001	no					
	2/5/2002	no					
	5/22/2002	no					
	8/19/2002	yes					
	12/3/2002	no					
	4/22/2003	yes					
	7/30/2003	no					
	10/22/2003	no					
	2/4/2004	no					
P-116 (former Hadel well)	10/9/2001	no			Q	Q	Sentinel Well for centerline of leading edge of plume
	11/19/2001	no					
	2/5/2002	no					
	5/22/2002	no					
	8/19/2002	no					
	12/3/2002	no					
	4/22/2003	no					
	7/30/2003	no					
	10/22/2003	no					
	2/4/2004	yes					
Baneck	5/9/2001	no			Q	Q	Private Well
	11/19/2001	no					
	2/5/2002	no					
	5/22/2002	no					
	8/19/2002	no					
	12/3/2002	no					
	4/22/2003	no					
	10/22/2003	no					
Gaastra	5/9/2001	no			Q	Q	Private Well
	11/19/2001 [2]	no					
	2/5/2002	no					
	5/22/2002	no					
	8/19/2002	yes					
	12/3/2002	no					
	4/22/2003	no					
	10/22/2003	no					
	10/22/2003	no					

Table 1A - Evaluation of monitoring wells, results and sampling frequency
FF/NN Landfill, Ripon, WI

Sampling Point:	Collection Date:	VOCs detected (but not necessarily exceeding a standard)	PAL Exceedances	ES Exceedances	WDNR Recommended Sampling Interval	GeoTrans Recommended Sampling Interval	Reasoning
Rohde	10/9/2001	no			Q	Q	Private Well
	11/19/2001 [2]	no					
	2/4/2002	no					
	5/22/2002	no					
	8/20/2002	no					
	4/22/2003	no					
	10/23/2003	no					
	10/23/2003	no					

VC: vinyl chloride
TCE: trichloroethylene
cis-DCE: cis-1,2-dichloroethene

		Tally of wells:			
Q=	Quarterly		22	10	Agree on 9
SA=	Semi-annually		5	11	Agree on 3
A=	Annually		2	2	Agree on 0
	No Monitoring		1	7	Agree on 0

Evaluation of Indicator Parameters

Evaluation of Indicator Parameters

In our meeting with Bruce Urban and Jennie Pelczar of the WDNR on August 19, 2002, the testing of indicator parameters was briefly discussed. Bruce Urban suggested that the sampling results for indicator parameters for wells outside of the contaminant plume be compared to the results for wells inside of the plume, and close to the landfill. Once the extent of the plume was fully defined, and when a remedy for the site is realized, then indicator parameters are no longer needed. At this time, the vertical and horizontal extent of the contaminant plume has been defined.

The following is a brief review of the indicator parameter information that has been collected at the FF\NN Landfill site. The data are summarized on Tables 3 and 4.

The concentrations of chloride, hardness and alkalinity versus vinyl chloride concentration are plotted on the attached charts. In addition, the concentration of chloride versus vinyl chloride has been plotted for the four geologic units. As can be seen from the plots, there does not appear to be a correlation between any of these indicator parameters and vinyl chloride. The very low correlation coefficients (the highest is 0.29) also confirm that there is no statistical correlation between the indicators and vinyl chloride.

Indicator parameters (alkalinity, Chemical Oxygen Demand (COD), chlorides and hardness) in groundwater are all constituents that are highly dependent on the characteristics of the soil or rock matrix in which they are present. Therefore, it is most appropriate to compare results within each of the geologic units, rather than between units. Each of the four geologic units is discussed below.

Water Table Wells

The water table wells include nine wells near the landfill. Because all these wells were dry in May 2002 and only one well could be sampled in August 2002, the only complete round of indicator parameter data is from February 2002. In comparing the limited data from the wells with VOC impacts (MW-103, MW-104, MW-107 and MW-112) to those wells without VOC impacts (MW101, MW-106 and MW-111), it can generally be said that the impacted wells typically had higher alkalinity, COD, hardness and chlorides than did the non-impacted wells. However, there is a significant overlap in the measured concentrations between the impacted and non-impacted wells. Also, impacted wells exhibited the lowest concentrations of COD and chlorides.

The extent of the groundwater contaminant plume in the water table wells was defined at the time the RI/FS by 1994. Since that time, the extent of impacts, as measured by directly analyzing VOCs, has not increased, and has probably decreased due to decreasing concentrations in the existing wells. Because 1) VOCs are already being analyzed in these wells, 2) the extent of impacts for this geologic unit has been defined and is decreasing, and 3) there is a significant overlap in the data when comparing

impacted with non-impacted wells, it is recommended that indicator parameters not be analyzed for the water table wells.

Deeper Unconsolidated Wells

The deeper unconsolidated wells include eight wells, all fairly close to the landfill. These include two impacted wells (P-106 and P-107), one recently impacted well due to pumping at Northeast Asphalt (P-102), and five wells that are not impacted by VOCs (P-101, P-103, P-104, P-108 and P-111).

There seems to be no correlation when comparing impacted and non-impacted wells for the indicator parameters. For alkalinity, the concentrations are very similar, although the highest alkalinity concentrations are in the non-impacted wells. Results are similar for chlorides and hardness. The only discernable trend is that the COD is more likely non-detectable in non-impacted wells than in VOC impacted wells. However, even impacted wells contain non-detectable concentrations of COD, so it is not a good indicator of VOC impacts.

The extent of impacts in the deeper unconsolidated wells was defined as a part of the RI/FS in 1994. Other than the recent detections of vinyl chloride in P-102 (at less than 1 ppb), the extent of impacts in this geologic unit is stable (P-106) to decreasing (P-107).

For the same reasons as for the water table wells, it is not recommended that indicator parameters be analyzed in the deeper unconsolidated wells.

Upper Sandstone Wells

The upper sandstone wells include P-111D, which is impacted with VOCs, MW-3B and P-113B, which are not impacted, and all of the private water supply wells.

The most direct evaluation of the usefulness of the indicator parameters is to compare the results for the impacted private wells (Altnau and Ehster) to all of the other private water supply wells (see Table 3). The results, particularly for alkalinity and hardness, fall within a relatively small range, and the results for the Altnau and Ehster wells fall at the upper end of that range. The results from the impacted wells for chlorides and COD are generally greater than those for the non-impacted wells. The indicator parameters do not offer any indication of other impacts.

With the installation of P-113B, as well as the conversion of the Weise and Hadel wells to monitor wells, the extent of VOC impacts in the upper sandstone wells has been defined.

As with the other two geologic units, analysis for indicator parameters is not recommended for the upper sandstone wells because actual contaminants, rather than proxies for those contaminants are being analyzed.

Basal Sandstone/Granite Wells

There are now three wells completed in the basal sandstone: P-107D, which is impacted, and MW-3A and P-113A, which have no VOC impacts. The limited indicator parameter results indicate that the impacted and non-impacted wells have nearly identical results for alkalinity, hardness and COD. Chlorides were non-detectable in the non-impacted wells, but were detectable at low concentrations in P-107D, which is impacted. However, the chloride concentrations in P-107D are significantly lower than any of the shallower wells at the site.

The extent of VOC impacts in the basal sandstone/granite wells has been defined as a result of the installation of P-113A.

For the same reasons given above, analysis of indicator parameter is not recommended for the wells in the basal sandstone/granite unit.

Summary of Conclusions for Indicator Parameters

The following is a summary of reasons why the analysis of indicator parameters is not recommended for the FF/NN landfill:

- A comparison of the indicator parameter results for each of the geologic units indicates that there is a significant overlap in the results from impacted and non-impacted wells. As a result, the indicator parameters cannot be used to determine the expansion of the contaminant plume, and they are not a useful indicator of whether a well has actually been impacted.

- If indicator parameters were able to identify an increase in the size of the contaminant plume at this site, then the resulting action would be to analyze future samples from the well for VOCs. Because VOCs are already being analyzed at each of the wells in the monitoring program for the site, the indicator parameters don't provide any early warning to implement a more aggressive monitoring program.

- The results from analyses for indicator parameters can naturally vary significantly in time or location, and this variation is not a valid predictor of other contaminants at this site. The use of indicator parameters to identify the expansion of a plume of groundwater contamination requires much time, interpretation and judgment, and cannot result in a definitive answer as to whether significant contamination exists.

- For the home owners downgradient of the landfill, the use of indicator parameters as a proxy for analysis of VOCs would cause a significant erosion in the credibility of the results, and would be viewed negatively.

- The additional cost to sample and analysis these indicator parameters is about $60 per well per sampling period. Because there are currently about 30 wells in the sampling program, this amounts to a cost of up to $1,800 per sampling period. This is a significant cost for data that is redundant at best, and is not expected to be useful in the future. While the FF/NN Landfill PRP Group has spent a significant amount of money at this site, it has done so in order to fulfill clear objectives—defining the extent of impacts and providing drinking water to residences. There is no apparent benefit to analyzing samples from this site for indicator parameters.

As a result, we recommend that indicator parameters not be analyzed at this site in the future.

Table 3 - Groundwater Sampling Results for Private Drinking Water Wells
FF/NN Landfill, Ripon, WI

		Parameters										
		VOC's							Inorganic			
Private Well ID	**Sampling Date**	**Carbon disulfide ***	**Methyl ethyl ketone ***	**Chloromethane**	**cis-1,2-Dichloroethene**	**Napthalene**	**Toluene**	**Vinyl Chloride**	**Alkalinity**	**COD**	**Chloride**	**Hardness**
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L	mg/L
Regularly Monitored Wells												
Altnau [1]	10/9/2001	NA	NA					**0.96**	NA	NA	NA	NA
	2/5/2002	NA	NA					**0.48**	270	2.8	18	320
	5/22/2002	NA	NA					**0.97**	280		13	300
	08/21/2002-influent	NA						**1.2**	300	ND	15	320
	08/21/2002-post filter	0.97							NR	NR	NR	NR
	November 2002	Home connected to public water supply. Well abandoned.										
Baneck [1]	5/9/2001	NA	NA						NA	NA	NA	NA
	11/19/2001 [2]	NA	NA						NA	NA	NA	NA
	2/5/2002	NA	NA						280	3.2		280
	5/22/2002	NA	NA						300			290
	5/22/2002 Dup	NA	NA						300			290
	8/19/2002								300	[3.0]	ND	290
	12/3/2002								NA	NA	NA	NA
	4/22/2003								NA	NA	NA	NA
Ehster	11/19/2001 [2]	NA	NA		0.93			7	NA	NA	NA	NA
	2/5/2002	NA	NA		0.85			**5.5**	300	3.7	24	340
	5/22/2002	NA	NA		1.2			**6.2**	320		22	330
	08/21/2002-influent [4]	NA			0.93			**5.4**	NA	NA	NA	NA
	08/21/2002-post strip	NA	[2.1]			[0.65]			NR	NR	NR	NR
	08/21/2002-post filter								NR	NR	NR	NR
	12/3/2002				1.3		[0.40]	**6.3**	NA	NA	NA	NA
	converted to piezometer - January 2003								NA	NA	NA	NA
Gaastra [1]	5/9/2001	NA	NA						NA	NA	NA	NA
	11/19/2001 [2]	NA	NA						NA	NA	NA	NA
	2/5/2002	NA	NA						290			280
	5/22/2002	NA	NA						290			270
	8/19/2002			[0.24]					300	ND	ND	280
	12/3/2002								NA	NA	NA	NA
	4/22/2003								NA	NA	NA	NA

Table 3 - Groundwater Sampling Results for Private Drinking Water Wells
FF/NN Landfill, Ripon, WI

		Parameters										
		VOC's							Inorganic			
Private Well ID	Sampling Date	Carbon disulfide *	Methyl ethyl ketone *	Chloromethane	cis-1,2-Dichloroethene	Napthalene	Toluene	Vinyl Chloride	Alkalinity	COD	Chloride	Hardness
Hadel [1]	10/9/2001	NA	NA						NA	NA	NA	NA
	11/19/2001 [2,3]	NA	NA						NA	NA	NA	NA
	2/5/2002	NA	NA						290			280
	5/22/2002	NA	NA						300			280
	8/19/2002	[0.24]							290	ND	ND	280
	08/19/2002 Dup								290	ND	ND	290
	12/3/2002								NA	NA	NA	NA
	12/03/2002 Dup								NA	NA	NA	NA
	4/22/2003								NA	NA	NA	NA
Miller [1]	5/9/2001	NA	NA						NA	NA	NA	NA
	05/09/01 Dup	NA	NA						NA	NA	NA	NA
	11/19/2001 [2]	NA	NA						NA	NA	NA	NA
	11/19/2001 Dup	NA	NA						NA	NA	NA	NA
	2/5/2002	NA	NA						280	3.7	5.2	290
	5/22/2002	NA	NA						290			290
	8/20/2002								290			290
	November 2002	Home connected to public water supply. Well abandoned.										
Rohde [1]	10/9/2001	NA	NA						NA	NA	NA	NA
	11/19/2001 [2]	NA	NA						NA	NA	NA	NA
	2/4/2002	NA	NA						290			300
	5/22/2002	NA	NA						290			290
	8/20/2002								300			290
	4/22/2003								NA	NA	NA	NA
Weiss [1]	10/9/2001	NA	NA						NA	NA	NA	NA
	10/09/01 Dup	NA	NA						NA	NA	NA	NA
	11/19/2001 [2]	NA	NA						NA	NA	NA	NA
	2/5/2002	NA	NA						280	4.6		270
	5/22/2002	NA	NA						290			280
	8/19/2002			[0.20]					290			280
	12/3/2002								NA	NA	NA	NA
	04/22/2003 [5]								NA	NA	NA	NA

Wells Not on Regular Monitoring Schedule

Fude	2/5/2002	NA	NA						240			
Hoffman	2/5/2002	NA	NA						290			290
Hollatz	2/5/2002	NA	NA						290			300
Henning	2/5/2002	NA	NA						280		10	350

Table 3 - Groundwater Sampling Results for Private Drinking Water Wells
FF/NN Landfill, Ripon, WI

		Parameters										
		VOC's							Inorganic			
Private Well ID	Sampling Date	Carbon disulfide *	Methyl ethyl ketone *	Chloromethane	cis-1,2-Dichloroethene	Napthalene	Toluene	Vinyl Chloride	Alkalinity	COD	Chloride	Hardness
Kasuboski	2/5/2002	NA	NA						290		8.4	330
	5/22/2002	NA	NA						310		8.5	340
Kolbeck	2/5/2002	NA	NA						280		5.7	320
Lemerand	2/5/2002	NA	NA						300		13	370
	5/22/2002	NA	NA						300		12	370
Machmueller	2/5/2002	NA	NA						300	2.8	23	350
	5/23/2002	NA	NA						290		19	330
	05/23/2002 Dup	NA	NA						300		18	340
Oakes	2/5/2002	NA	NA						300			310
	5/23/2002	NA	NA						300			310
	5/23/2002 Dup	NA	NA									
	8/20/2002		[0.70]						300			320
Rich	2/5/2002	NA	NA						290	3.2		2.5
Sauer	2/5/2002	NA	NA						250	2.8		260
Vossekuil	2/5/2002	NA	NA						300	3.2	41	360
	5/22/2002	NA	NA						330		46	370
	8/21/2002			[0.19]					310			360
WDNR NR140	PAL	200	90	0.3	7	8		0.02	NS	NS	125	NS
	ES	1000	460	3	70	40		0.2	NS	NS	250	NS

Blank = not detected
NA = not analyzed
NR = not required to analyze
PAL = Preventive Action Limit
ES = Enforcement Standard
[ ] = detected at less than quantitation limit

Underline values indicate PAL exceedance
Bold values indicate ES exceedance

* Began analyzing using method 542.2 with August 2002 event

[1] Monitoring began in 1993. See prior report submittals to WDNR for results prior to 2001.

[2] Methylene Chloride was detected in 11/19/01 samples and is assumed to be a laboratory artifact

[3] 1,1,1-Trichloroethane was detected at 0.18 ppb in Hadel well on 11-19-01

[4] Lab didn't analyze indicator parameter samples before hold time expired.

Table 4 - Inorganic Sampling Results for Groundwater
FF/NN Landfill
Ripon, Wisconsin

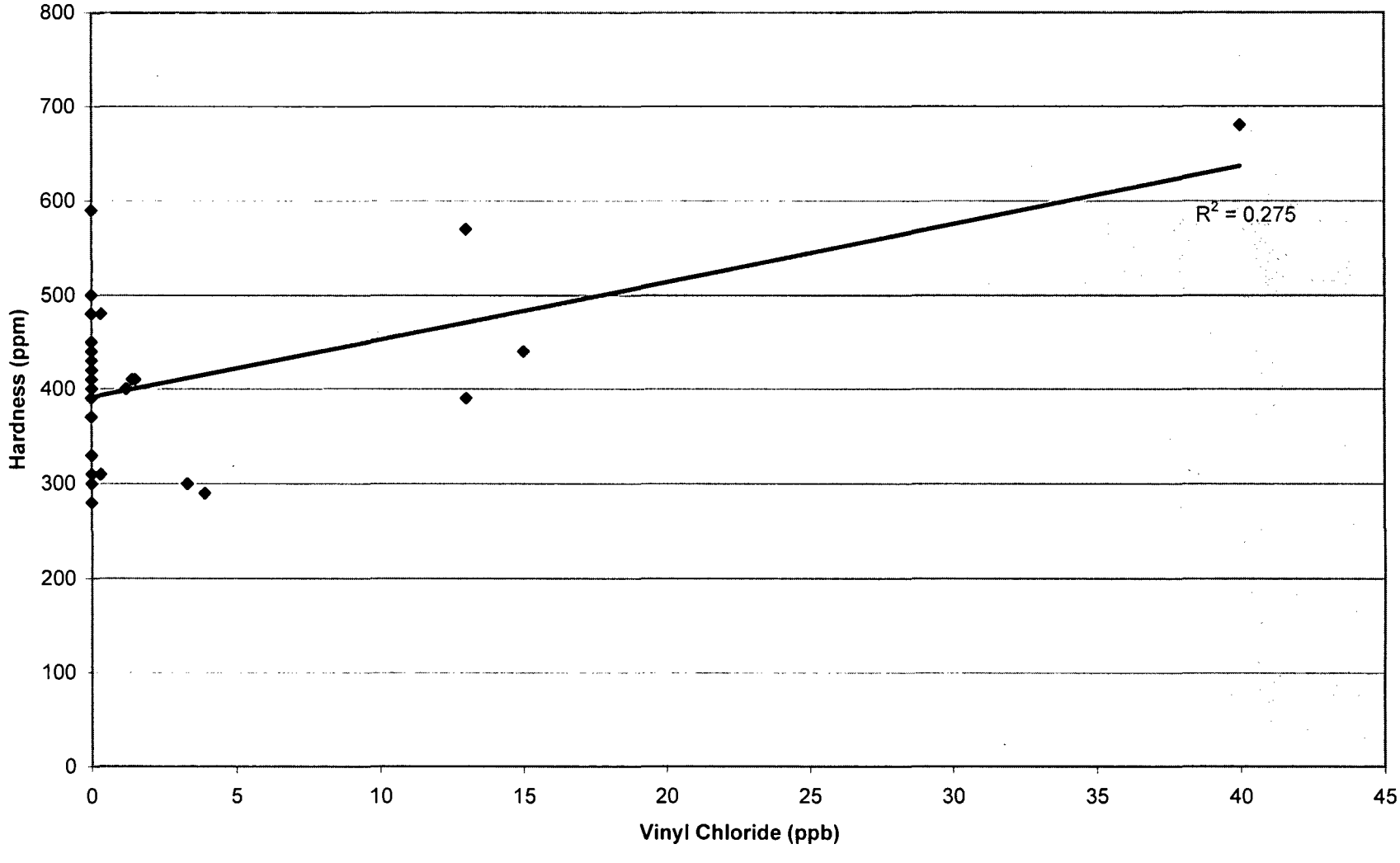
Sampling Point:	Collection Date:	Parameters			
		Alkalinity	COD	Chloride	Hardness
		mg/L	mg/L	mg/L	mg/L
MW-3A	04/04/200	300	ND	ND	280
	5/22/2002	310	ND	ND	300
	8/20/2002	310	[5.9]	ND	290
MW-3B	04/04/200	290	3.4	12	310
	5/22/2002	310	ND	10	330
	8/20/2002	290	ND	13	330
MW-101	2/5/2002	520	ND	38	590
	05/21/2002*	NA	NA	NA	NA
	8/19/2002 *	NA	NA	NA	NA
P-101	2/5/2002	330	ND	31	390
	5/21/2002	670	ND	34	400
MW-102	05/21/2002*	NA	NA	NA	NA
	8/19/2002 *	NA	NA	NA	NA
P-102	5/21/2002	440	73	35	480
	8/20/2002	540	[7.4]	37	470
MW-103	2/4/2002	680	12	27	680
	05/21/2002*	NA	NA	NA	NA
	8/19/2002 *	NA	NA	NA	NA
P-103	2/4/2002	400	ND	40	440
	5/21/2002	470	[3.2]	40	440
MW-104	2/5/2002	780	16	66	570
	05/21/2002*	NA	NA	NA	NA
	8/19/2002 *	NA	NA	NA	NA
P-104	2/5/2002	380	ND	39	430
	5/21/2002	460	[3.6]	46	500
	8/20/2002	610	[4.4]	45	580
MW-106	2/5/2002	290	ND	18	310
	05/21/2002*	NA	NA	NA	NA
	8/19/2002 *	NA	NA	NA	NA
P-106	2/5/2002	340	ND	62	440
	02/05/02Dup	330	ND	64	440
	5/22/2002	340	ND	36	410
	5/22/02Dup	350	[2.7]	38	420
	8/20/2002	360	[5.9]	41	630
MW-107	2/4/2002	670	ND	11	450
	05/21/2002*	NA	NA	NA	NA
	8/19/2002 *	NA	NA	NA	NA
P-107	2/4/2002	340	ND	26	400
	5/21/2002	350	[8.7]	27	410
	05/21/2002Dup	360	[3.2]	26	410
	8/20/2002	320	[5.4]	18	360

Table 4 - Inorganic Sampling Results for Groundwater
FF/NN Landfill
Ripon, Wisconsin

Sampling Point:	Collection Date:	Parameters			
		Alkalinity	COD	Chloride	Hardness
		mg/L	mg/L	mg/L	mg/L
P-107D	2/5/2002	290	ND	6.4	290
	02/05/02Dup	300	ND	6.4	290
	5/21/2002	320	ND	5.8	300
	8/20/2002	310	ND	7.5	290
MW-108	05/21/2002*	NA	NA	NA	NA
	8/19/2002 *	NA	NA	NA	NA
P-108	2/5/2002	340	ND	34	410
	5/21/2002	350	ND	26	390
MW-111	05/21/2002*	NA	NA	NA	NA
	8/19/2002	350	[4.0]	24	390
P-111	2/5/2002	290	ND	12	310
	5/22/2002	320	ND	18	370
	8/19/2002	310	[4.0]	17	350
	08/19/2002 Dup	320	[3.0]	17	350
P-111D	4/4/2002	350	6.8	34	390
	5/22/2002	390	[2.7]	38	440
	8/19/2002	380	[5.4]	34	420
MW-112	2/4/2002	460	3.2	61	480
	5/21/2002*	NA	NA	NA	NA
	8/19/2002 *	NA	NA	NA	NA
P-113A	9/12/2002	480	[3.52]	ND	270
P-113B	9/11/2002	330	[3.5]	ND	300
LC-2	5/22/2002	2300	440	470	1000

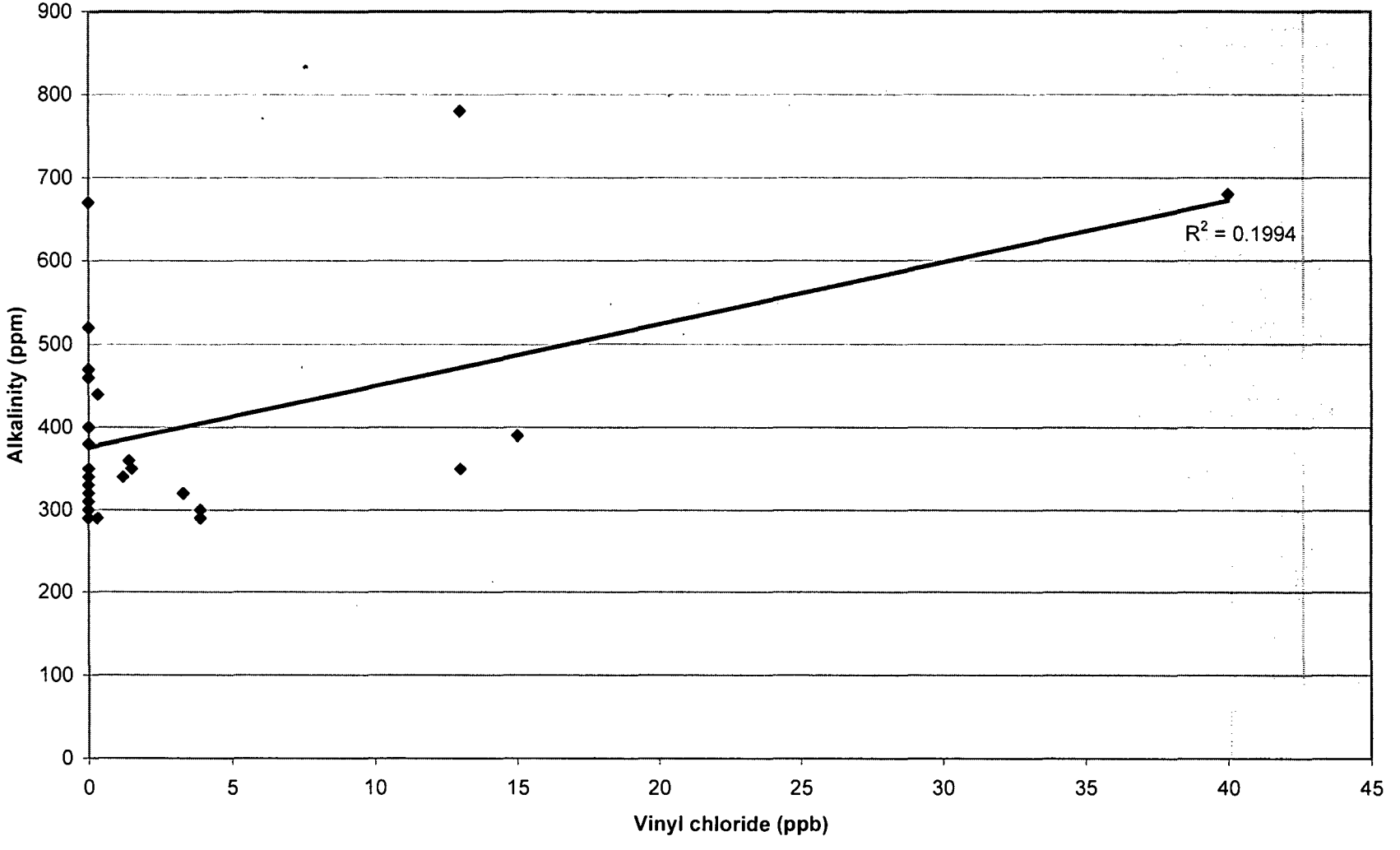
* Not sampled due to insufficient water for collection
[ ] indicates concentrations below limit of quantitation

Vinyl Chloride versus Hardness, FF/NN Landfill



P:\Ripon_Landfill\Tables\GW Indicator Charts2.xls

Vinyl Chloride versus Alkalinity, FF/NN Landfill



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Vinyl Chloride versus Chloride, FF/NN Landfill

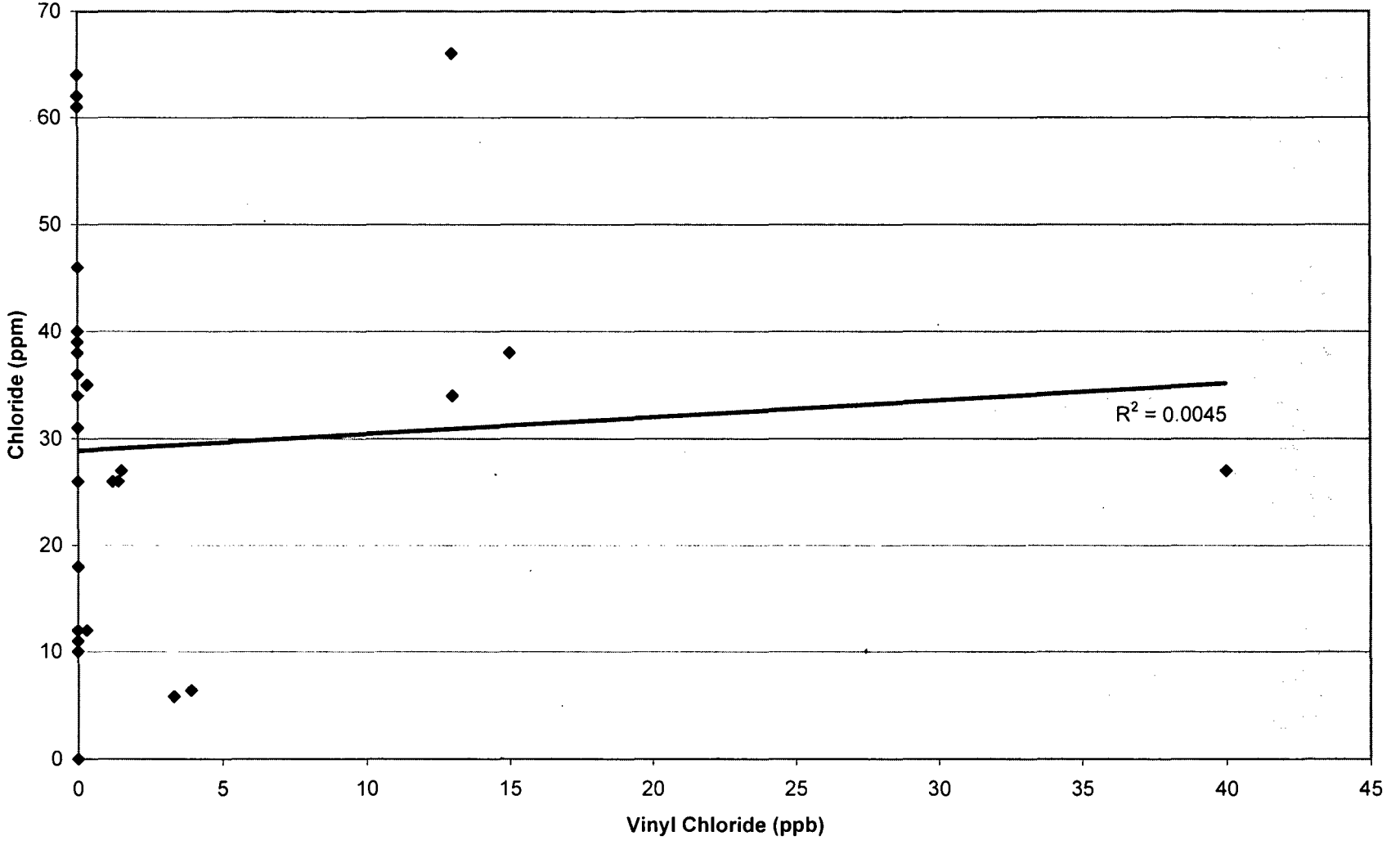

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Chart 4-13. Methane Percentage in Leachate Wells

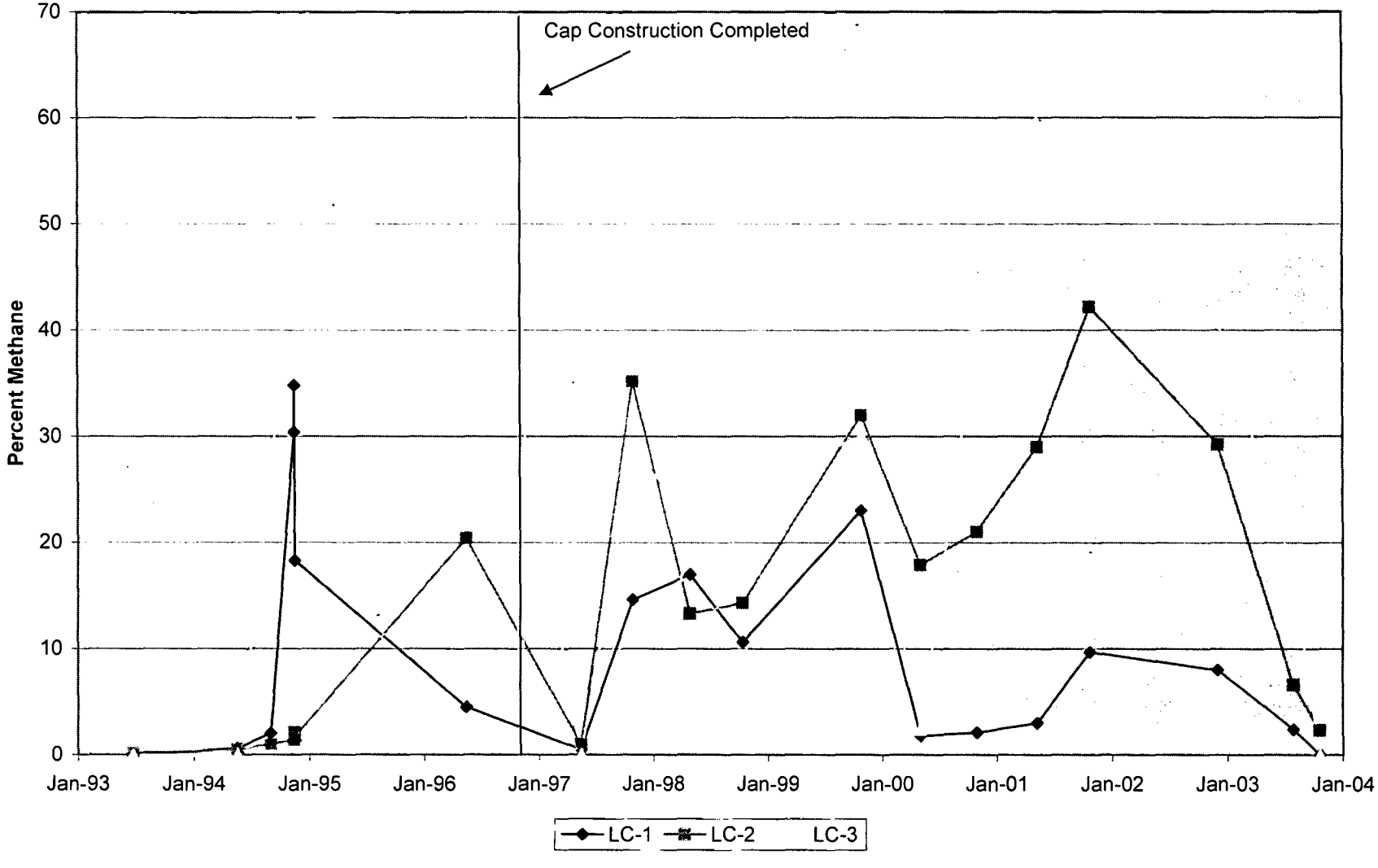

Chart 4-12. Methane Percentage in Gas Vents

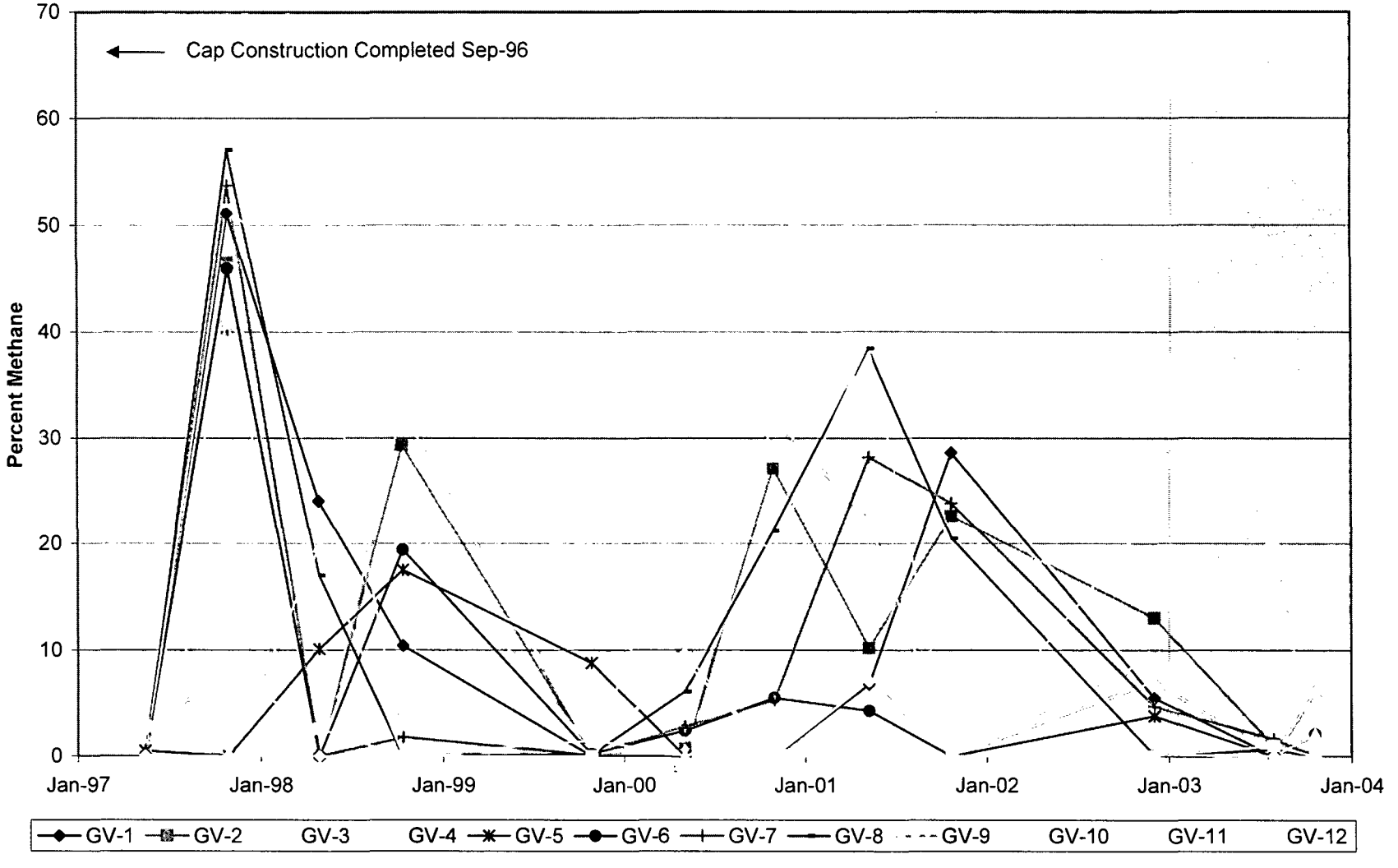

Chart 4-14. Methane Percentage in Monitor Wells