DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environnemental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater under Control

Facility Name:	**Bway Corporation**
Facility Address:	**8200 Broadwell Road, Cincinnati, Ohio**
Facility EPA ID #:	**OHD 004 253 225**

1. *Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?*

X If yes - check here and continue with #2 below.

____ If no - re-evaluate existing data, or

____ If data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Bway currently operates a metal container manufacturing facility located at 8200 Broadwell Road, Cincinnati, Ohio. The Facility is located near the Little Miami River in a mixed industrial, commercial and residential area. Bway began manufacturing metal containers from sheets of steel since October 1996. The facility is comprised of two parcels totaling 77 acres. The primary features of the facility include, the main manufacturing building and warehouse with connected offices, a treated sanitary wastewater storage pond, a sanitary biological treatment plant and land-application spray field, three gravel pit ponds and three railroad spurs. (Figure 1)

Bway was directed in the September 2007 Administrative Order to complete activities necessary in identifying and characterizing releases of hazardous waste and or hazardous waste constituents to the environment. Historically, a total of 23 Solid Waste Management Units (SWMUs) and one Area of Concern (AOC) were initially evaluated for further investigation stemming from the 1989 Preliminary Assessment/Visual Site Inspection. Upon conducting and completing the "2007 Current Conditions Report" an additional eight areas of interest (AOIs) and two SWMUs were added to the list for the purpose of documenting the current environmental conditions at the Facility. These evaluations resulted in further characterization of ten SWMUs, one AOC and eight Areas of Interest (AOIs) as part of the RFI. (Figure 2)

Groundwater characterization data has been collected from on-site monitoring wells and off-site pore water piezometer locations since 1990. All groundwater data, have been evaluated in accordance with Sampling and Analysis Work Plans submitted between 2008 and 2014 as well as from the following documents and reports to conduct this CA 750 analysis.: September 2007 Administrative Order on Consent; Current Conditions Report, December, 2007; Quality Assurance and Project Plan (QAPP), September, 2008; RCRA CA 725 Environmental Indicator Report, March 2016; RCRA CA 750

Environmental Indicator Report, March 2016; RCRA CA Ecological Risk Assessment Report, September 2009; Ecological Risk Assessment Revised. March 2016; Corrective Measures Proposal, September 2009; Quarterly Progress Reports, 2014- 2015; 1989 PA/VSI. (See Figure 3 for RFI Sampling Locations)

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

X If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The facility is located in the Lower Little Miami River watershed which flows in a west/southwest direction to the Ohio River. The uppermost aquifer that underlies the Facility consists of outwash and alluvium deposits along the Little Miami River buried valley. The outwash deposits consist of predominantly sand and/or gravel with discontinuous interbedded layers of finer-grained silt and clay and scattered cobbles and boulders. In the vicinity of the plant, the unconsolidated material consists of 70 feet of sand and gravel underlain by about 30 feet of clay followed by a six foot sand and gravel lens on top of shale bedrock encountered at 102 ft. bgs.

Groundwater characterization data has been collected from nine on-site monitoring wells and six off-site pore water piezometer locations. Monitoring wells are screened across the water table within unconsolidated sand and gravel deposits at 50 feet below ground surface (bgs), and at the sand/till interface 80 feet bgs (Figure 2). OW-1, OW-2, and OW-3 were installed in 1990 and have been periodically sampled since. OW-4, OW-5, OW-6, OW-6D, OW-7, and OW-7D were installed in 2014 and have been sampled quarterly. OW-3, located in the NE corner of the site, *and adjacent to Senco Products, Inc.*, is considered a background well. Groundwater has consistently been measured moving to the Northwest at 1-10 feet per day towards a closed quarry pond.

A total of seven constituents have exceeded National Primary Drinking Water Regulations Maximum Contaminant Levels (Federal MCL's) at on-site groundwater monitoring well locations. The constituents include Arsenic, Chromium (total), Lead, Iron, Manganese, Thallium, and Trichloroethene (TCE). As the Bway Corporation obtains its potable water from the City of Cincinnati public water supply, there are no present on-site users of groundwater. There are no present groundwater use restrictions for the property and based upon present knowledge there are no groundwater use restrictions for properties surrounding the site. Hence, federal maximum contaminant levels (MCL's), State of Ohio (MCL's) and or *Region 9 Tap Water Ingestion Values (TWIs) where no MCLs existed* are appropriate applicable promulgated standards for on-site groundwater

A site map, depicting locations of SWMUs and AOCs identified in the 1989 PA/VSI and 2007 Current Conditions Report, is provided in Figure 2.

Quarterly groundwater samples collected in monitoring wells and pore water piezometers from 2007-2010 and 2014-2015 that exceed applicable promulgated standards are identified in Table 1. Table 2 illustrates the maximum detected concentrations in groundwater exceeding appropriate screening level criteria and date of occurrence.

Figure 4 shows groundwater sampling data collected in all monitoring wells since 2007. Data are compared to State of Ohio Maximum Contaminant Levels (MCLs), Federal MCLs, or the USEPA Regional Screening Levels Resident Tapwater criteria for a Noncancer Hazard Index of 1. Quarterly groundwater samples collected in monitoring wells and pore water piezometers from 2007-2010 and 2014-2015 that exceeded one of more of the screening criteria are identified in Table 1. According to Table 1, COCs remaining above criteria in the 2014-2015 sampling events still include TCE, Manganese, Iron, Arsenic, and Chromium (total). TCE, Mn, and Fe are present above criteria in OW-3, Arsenic is found in OW-6D, and Chromium is found in OW-4. (See Table 3)

Table 2

Maximum Detected Constituent Concentrations in Groundwater Exceeding Screening Level Criteria

Well Location	Sample Date	Constituent	Maximum Concentration	Drinking Water Criteria
OW-3	8/15/2007	Iron	26,400	11,000
OW-2	8/15/2007	Chromium	329	100
OW-6D	3/9/2015	Arsenic	13	10
OW-3	8/15/2007	Lead	16.2	15*
OW-3	3/4/2014	Manganese	3200	880
OW-3	6/16/2008	Thallium	16.2	2
OW-3	3/4/2014	TCE	46	5

concentration units ug/L; *Action level concentration given for lead (Pb) as no MCL available for Pb. Action level is based on a Treatment Technique that requires public water systems to control the corrosiveness of their water. Action level is not based on groundwater potability.

Table 3

Maximum Detected Exceedances between 2014 – 2015 Groundwater Sampling Events
(Date of sampling event in brackets)

Well Location	Max Conc Detected Exceedance 2014 – 2015 (ug/L)	Most Recent Exceedance (ug/L)	Drinking Water Criteria (ug/L)
OW-3	Fe - 20,000 (9/17/14) Mn – 3200 (3/4/14) TCE – 46 3/4/14	Fe - 12,000 (3/9/15) Mn - 890 (3/9/15) TCE - 20 (5/9/15)	Fe - 11,000 Mn - 880 TCE - 5
OW-4	Cr – 110 (5/19/15)	Cr – 110 (5/19/15)	Cr - 100
OW-6D	As – 13 (3/9/15)	As – 13 (3/9/15)	As - 10

References:

1. Preliminary Assessment Visual Site Investigation, August 1989
2. Current Conditions Report, December 2007
3. Quality Assurance and Project Plan (QAPP), September 2008
4. RCRA CA 725 Environmental Indicator Report, March 2016
5. RCRA CA 750 Environmental Indicator Report, March 2016
6. RCRA CA Ecological Risk Assessment Report, September 2009
7. Corrective Measures Proposal, September 2009
8. Quarterly Progress Reports, 2014- 2015
9. RCRA CA Ecological Risk Assessment Revised, March 2016

Footnotes:

[1]"Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Geological cross-sections, groundwater contour maps, and groundwater quality data were used to assess groundwater flow and transport conditions and potential groundwater contaminant migration/stabilization. Groundwater with concentrations that exceed Federal MCLs, State of Ohio MCLs and or Region 9 Tapwater Ingestion Values (TWIs) have been characterized and delineated and is expected to remain within the currently affected areas. Though TCE and manganese are the only constituents that have been consistently detected above applicable screening standards and more specifically at OW-3, groundwater monitoring activities performed in 2014-2015 indicate that areas of contaminated groundwater on-site are now limited to OW-3 (See Table 3 above for constituent concentrations) OW-4, and OW-6D. OW-3 is considered a background well location. Groundwater contour maps illustrate that ground water flow direction is towards the northwest. Review of available information from an adjacent industrial facility appear to be show that the contamination of the TCE and Manganese at OW-3 may have originated from an upgradient off-site source. Results of groundwater sampling conducted downgradient of the Site have not demonstrated that TCE and manganese have migrated downgradient of the Site. Additionally, any migration would effectively be intercepted by the quarry pond directly west of the site.

Further evidence of the migration of groundwater having been stabilized is evidenced by the following:

1) A reduction of the constituent concentrations detected in the aquifer:

a) Lead (Pb) detected at OW-3 at a concentration of 16.2 ug/L, in 8/15/2007 exceeding the risk based concentration of 15, but has not been detected at a concentration equal to or greater than 15ug/L at any other well locations. The most recent detected Pb concentration at OW-3 was 4.59 ug/L on 5/2015.

b) Maximum concentration of Chromium (Cr) of 329 ug/L detected on 8/15/2007 at on-site monitoring well location OW-2. The most recent groundwater sampling event on 5/19/2015 detected Cr at 110 ug/L at OW-4. Groundwater flow maps show that OW-4 is slightly upgradinet of OW-2. No other exceedances of Cr have been observed at any other well locations.

c) Maximum exceedance of Iron (Fe) occurred on 8/15/2007 where 26,400 ug/L Fe was detected at OW-3. The 3/9/2015 sampling event detected a Fe concentration of 12,000 ug/L exceeding the 11,000 ug/L drinking water criteria. There has not been any other observances of exceedances at any other well locations

d) Thallium having the widest spatial plume geometric shape of any contaminant, as it occurred at four monitoring locations: OW-1, OW-2, OW-3 and PW06 all occurring between June and September 2008, with concentrations ranging from 5.4 ug/L (OW-2) to 16.2 ug/L (OW-3).

Piezometer, PW06 is considered a downgradient monitoring location as it is closest to the quarry pond, had a concentration of 5.7 ug/L; Drinking water criteria is 2 ug/L. There have been no further detections of thallium above the drinking water criteria of 2ug/L since 2008. Additionally, with the exception of thallium detected at PW-06, there have been no exceedances of the drinking water criteria identified in any downgradient piezometers

e) TCE had the most detections with concentrations ranging from 7.2 ug/L to 46 ug/L all occurring at OW-3 3/4/2014. The most recent sampling event 5/9/2015 detected TCE at 20 ug/L at OW-3. TCE have not been detected above applicable standards at any other well locations and or downgradient well locations.

2) The groundwater flow conceptual model for the study area is comprised primarily of groundwater flowing towards and discharging to the Closed Quarry Pond. Shallow groundwater from uplands east and northeast of the Closed Quarry Pond flows toward the Closed Quarry Pond located on the northwest of the site boundary. The Closed Quarry Pond is a local groundwater discharge area that functions as a natural hydraulic barrier preventing the northwesterly migration of contaminants beyond the local discharge area. (See Figure 5 for Geological Cross Section)

[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

X If yes - continue after identifying potentially affected surface water bodies.

____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Groundwater flow has consistently been shown to flow to the Northwest towards the closed quarry pond (see Figure 4). A pore water sample collected in the quarry pond (PW-06) on 9/25/2008 had a detection for Thallium exceeding State MCLs.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

X If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

As sampling data collected from the ground water in the aquifer beneath the Facility did not reveal any constituent concentrations that were greater than ten times the MCL, it is not necessary to compute a resulting mixing zone calculation of constituent concentrations entering a surface water body. Discharge of contaminants is expected to be insignificant to surface water, sediments, and the ecosystem. However, according to Table 3, groundwater concentrations of TCE, manganese, and iron were present above drinking water criteria in well OW-3 during the 2014-2015 quarterly sampling events. TCE was measured at a maximum concentration of 46 ug/L (5.8 times the MCL), manganese was measured at a maximum concentration of 3,200 ug/L (6.67 times the USEPA Region 9 Tap Water Ingestion Value), and iron was measured at a maximum concentration of 20,000 ug/L (1.8 times the USEPA Region 9 Tap Water Ingestion Value). Arsenic was measured in OW-6D at a maximum concentration of 13 ug/L (1.3 times the MCL). Chromium was measured in OW-4 at 110 ug/L (1.1 times the MCL). On-going monitoring will be recommended to ensure that constituent concentrations of TCE, Mn, Fe, As, and Cr at these wells or any other well location showing exceedances of applicable screening criteria do not increase with time.

Additionally, though groundwater from the unconfined aquifer discharges into the closed quarry pond, the quarry pond is not used as a drinking water source or for recreational purposes such as swimming, therefore, comparison of Mn, Fe, As, and Cr to drinking water or water quality standards is conservative. National or Ohio Surface Water Quality Standards are more appropriate for values screening comparison based upon current groundwater use at the site. (See table 5 below).

Table 4

Locations of Maximum Concentrations in Groundwater as compared to Ten Times the Appropriate Drinking Water Criteria

Well Location	Constituent	Maximum Concentration ug/L	Date of Max Concentration	Drinking Water Value ug/L	Is Max Concentration > 10X Criteria ug/L	Most Recent Concentration and (Date) ug/L
OW-3	TCE	46	3/4/2014	5 - MCL	No	20 (5/9/15)
OW-3	Manganese	3200	3/4/2014	880 - USEPA Region 9 Tapwater Ingestion Value	No	890 (3/9/15)
OW-3	Iron	26,400	8/15/2007	11,000 - USEPA Region 9 Tapwater Ingestion Value	No	8400 (5/19/15)
OW-2 OW-4	Chromium	329 110	8/15/2007 5/19/15	100 MCL	No	1.60 (5/19/15) 110 (5/19/15)
OW-6D	Arsenic	13	3/9/15	10 MCL	No	13 (3/9/15)

Table 5
Constituents Detected in Groundwater between 2014 – 2015 Exceeding Drinking Water Criteria Compared Against Surface Water Quality Criteria

Constituent (Pollutant)	Surface Water Quality Criteria (ug/L	Maximum Concentration (2014 - 2015) (ug/L)
Arsenic	340 - NAQWC* (acute) 150 - NAWQC (chronic)c	13
Chromium III	570 - NAWQC (acute) 74 - NAQQC (chronic)	110
Chromium, IV	16 - NAWQC (acute) 11 - NAWQC chronic)	110
Iron	1000 - NAWQC (chronic)	20,000
Manganese		3,200
TCE	200 - Ohio EPA	46

*NAWQC – National Ambient Water Quality Criteria

A thorough assessment of the ecological risks associated with manganese, iron, arsenic, and chromium determined that although several constituents were found to exceed ecological screening values it was determined that those constituents did not pose an unacceptable risk to ecological receptors.

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic zone).

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

If yes - continue after either:

1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site=s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR

2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full

If no - (the discharge of "contaminated" groundwater cannot be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

X If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

____ If no - enter "NO" status code in #8.

____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

Monitoring well OW-3 continues to detect iron, manganese, and TCE at levels exceeding various criterion, as does OW-6D with respect to arsenic, and OW-4 with Chromium. These three wells should continue to be monitored to verify that the extent of contamination is stable.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

X YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the (FACILITY NAME, EPA ID #, LOCATION). Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

____ IN - More information is needed to make a determination.

Completed by: (signature) Date 9/15/2016

(print) Juan Thomas

(title) Environmental Scientist

Supervisor: (signature) Date 10/6/16

(print) Gregory Rudloff

(title) Acting Section Chief

EPA Region 5

Locations where References may be found:

U.S EPA Region 5
7th Floor Records Center
77 W Jackson Blvd
Chicago, IL 60604

Contact telephone and e-mail numbers

(name) Juan Thomas

(phone #) 312-886-6010

(e-mail) thomas.juan@epa.gov

Table 1 - Groundwater Samples Exceeding Screening Criteria

Table 1: Groundwater Samples Exceeding Screening Criteria

On/Off site	Location	Sample Date	Chem Group	Chemical	Meas Basis	Conc (ug/L)	Qual	Water Criteria (ug/L)	Ratio of Conc to Drinking Water Criteria	Criterion
on	OW-2	8/15/2007	INORG	Chormium (total)	T	329.0		100	3.29	SM
on	OW-3	8/15/2007	VOC	Trichlorothene	T	33.0		5	6.60	SM
on	OW-3	8/15/2007	INORG	Arsenic	T	13.4		10	1.34	SM
on	OW-3	8/15/2007	INORG	Iron	T	26,400.0		11,000	2.40	NC
on	OW-3	8/15/2007	INORG	Lead	T	16.2		15	1.08	SM
on	OW-3	8/15/2007	INORG	Manganese	T	1,230.0		480	2.56	NC
on	OW-3	12/21/2007	VOC	Trichlorothene	T	34.0		5	6.80	SM
on	OW-3	3/17/2008	VOC	Trichlorothene	T	20.0		5	4.00	SM
on	OW-2	6/16/2008	INORG	Thallium	T	5.4	B J	2	2.70	SM
on	OW-1	6/16/2008	INORG	Arsenic	T	10.9		10	1.09	SM
on	OW-1	6/16/2008	INORG	Thallium	T	6.4	B J	2	3.20	SM
on	OW-1	6/16/2008	INORG	Thallium	T	7.7	B J	2	3.85	SM
on	OW-3	6/16/2008	VOC	Trichlorothene	T	17.0		5	3.40	SM
on	OW-3	6/16/2008	INORG	Thallium	T	16.2	J	2	8.10	SM
on	OW-3	9/11/2008	VOC	Trichlorothene	T	24.0		5	4.80	SM
off	PW-06	9/24/2008	INORG	Thallium	D	5.7	B	2	2.85	SM
on	OW-3	12/15/2008	VOC	Trichlorothene	T	14.0		5	2.80	SM
on	OW-3	3/13/2009	VOC	Trichlorothene	T	29.0		5	5.80	SM
on	OW-3	6/16/2009	VOC	Trichlorothene	T	27.0		5	5.40	SM
on	OW-3	9/14/2009	VOC	Trichlorothene	T	7.2		5	1.44	SM
on	OW-3	11/17/2009	VOC	Trichlorothene	T	15.0		5	3.00	SM
on	OW-3	2/8/2010	VOC	Trichlorothene	T	17.0		5	3.40	SM
on	OW-3	5/17/2010	VOC	Trichlorothene	T	23.0		5	4.60	SM
on	OW-3	5/17/2010	INORG	Manganese	T	622.0	J	480	1.30	NC
on	OW-3	3/4/2014	INORG	Manganese	T	3,200.0		480	6.67	NC
on	OW-3	3/4/2014	INORG	Manganese	D	510.0		480	1.06	NC
on	OW-3	3/4/2014	VOC	Trichlorothene	T	46.0		5	9.20	SM
on	OW-3	3/4/2014	INORG	Iron	T	18,000.0	B	11,000	1.64	SM
on	OW-3	6/27/2014	VOC	Trichlorothene	T	24.0		5	4.80	SM
on	OW-3	6/27/2014	INORG	Manganese	T	530.0	B	480	1.10	NC
on	OW-3	9/17/2014	INORG	Iron	T	20,000.0		11,000	1.82	SM
on	OW-3	9/17/2014	INORG	Manganese	T	1,200.0		480	2.50	NC
on	OW-6D	9/17/2014	INORG	Arsenic	T	13.0		10	1.30	SM
on	OW-3	9/17/2014	VOC	Trichlorothene	T	29.0		5	5.80	SM
on	OW-3	12/16/2014	INORG	Iron	T	12,000.0	B	11,000	1.09	SM
on	OW-3	12/16/2014	VOC	Trichlorothene	T	11.0		5	2.20	SM
on	OW-3	12/16/2014	INORG	Manganese	T	1,400.0		480	2.92	NC
on	OW-3	12/16/2014	INORG	Manganese	D	510.0	B	480	1.06	NC
on	OW-3	3/9/2015	INORG	Iron	T	12,000.0		11,000	1.09	SM
on	OW-6D	3/9/2015	INORG	Arsenic	T	13.0	B	10	1.30	SM
on	OW-3	3/9/2015	VOC	Trichlorothene	T	11.0		5	2.20	SM
on	OW-3	3/9/2015	INORG	Manganese	T	890.0		480	1.85	NC
on	OW-3	3/9/2015	INORG	Manganese	D	550.0		480	1.15	NC
on	OW-3	5/19/2015	INORG	Manganese	T	820.0		480	1.71	NC
on	OW-3	5/19/2015	VOC	Trichlorothene	T	20.0		5	4.00	SM
on	OW-4	5/19/2015	INORG	Chromium (total)	T	110.0	B	100	1.10	SM

Notes:

The drinking water criteria are based on the following hierarchy: State MCL, Federal MCL, USEPA Region 9 Tap Water Ingestion value at the lower of the criteria calculated at either the target cancer risk of 1E-5 or target hazard quotient of 1*.

*United States Environmental Protection Agency (USEPA). 2014. Region 9 Preliminary Remediation Goals. October.

The criteria for Chromium (total) are the criteria provided by the EPA for Chromium VI.

SM – The criterion is the State MCL.

NC - The criterion is based on noncancer effects at a hazard quotient of 1.

Chem Group - Chemical group

Meas Basis - measured basis; T = Total, D = Dissolved

Qualifiers - B = Estimated result, result is less than the reporting limit; J = Method blank contamination, associated method blank contains the target analyte at a reportable level.

Figure 1 - Facility Layout and Features

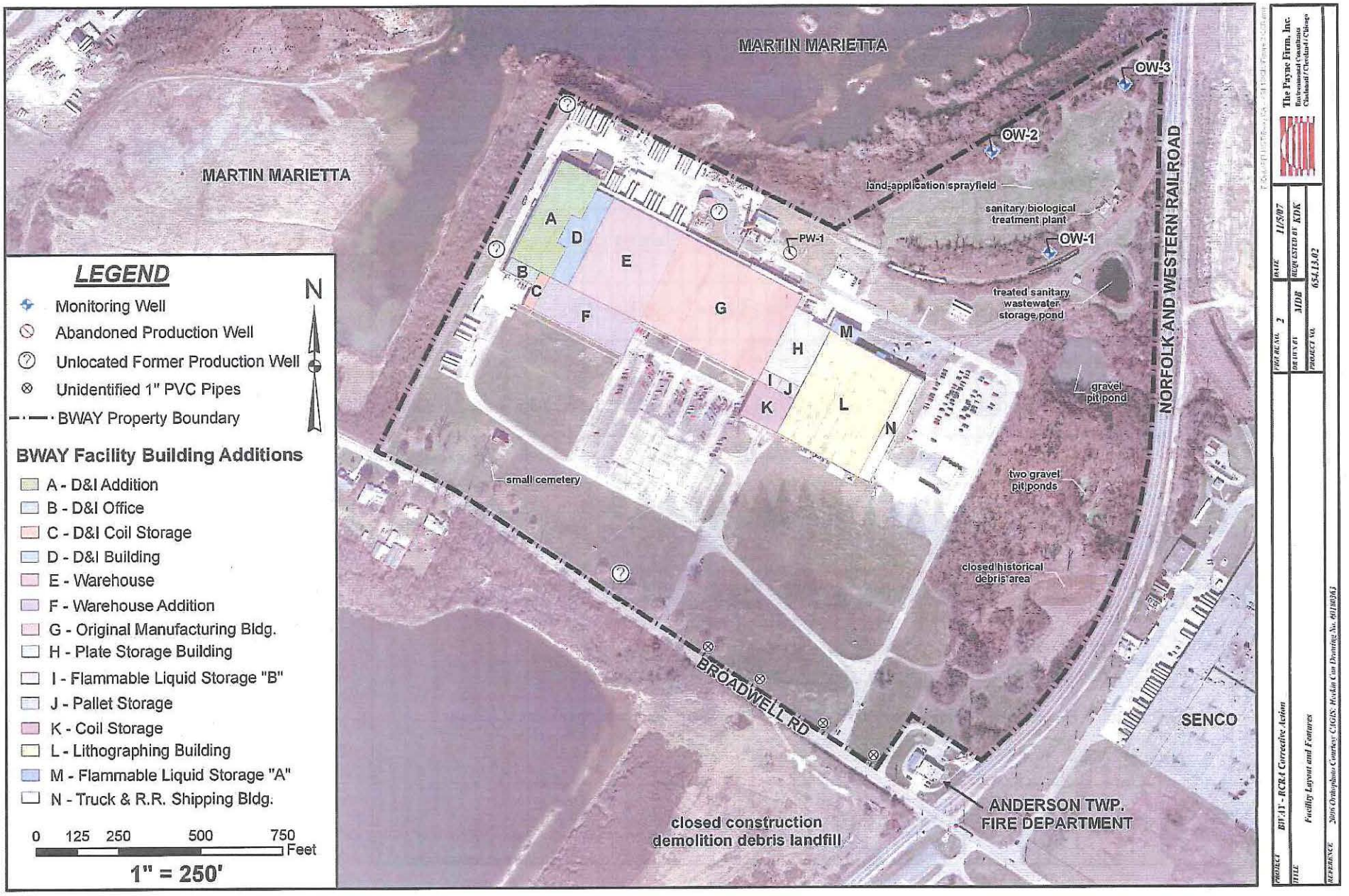


Figure 2 - Locations of SWMUs, AOCs, & AOIs

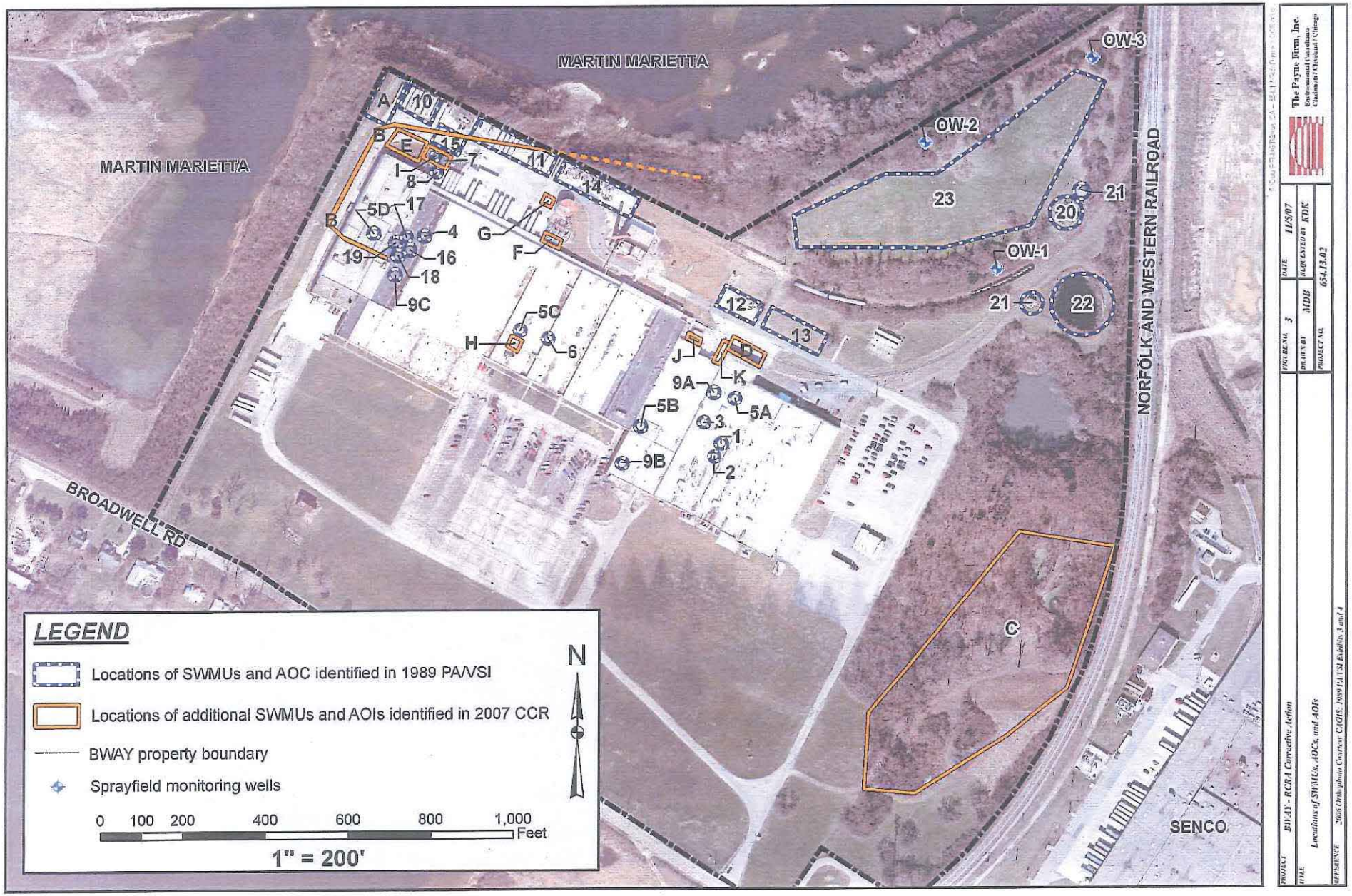


Figure 3- RFI Sampling Locations and Groundwater Locations (Pre - 2014)

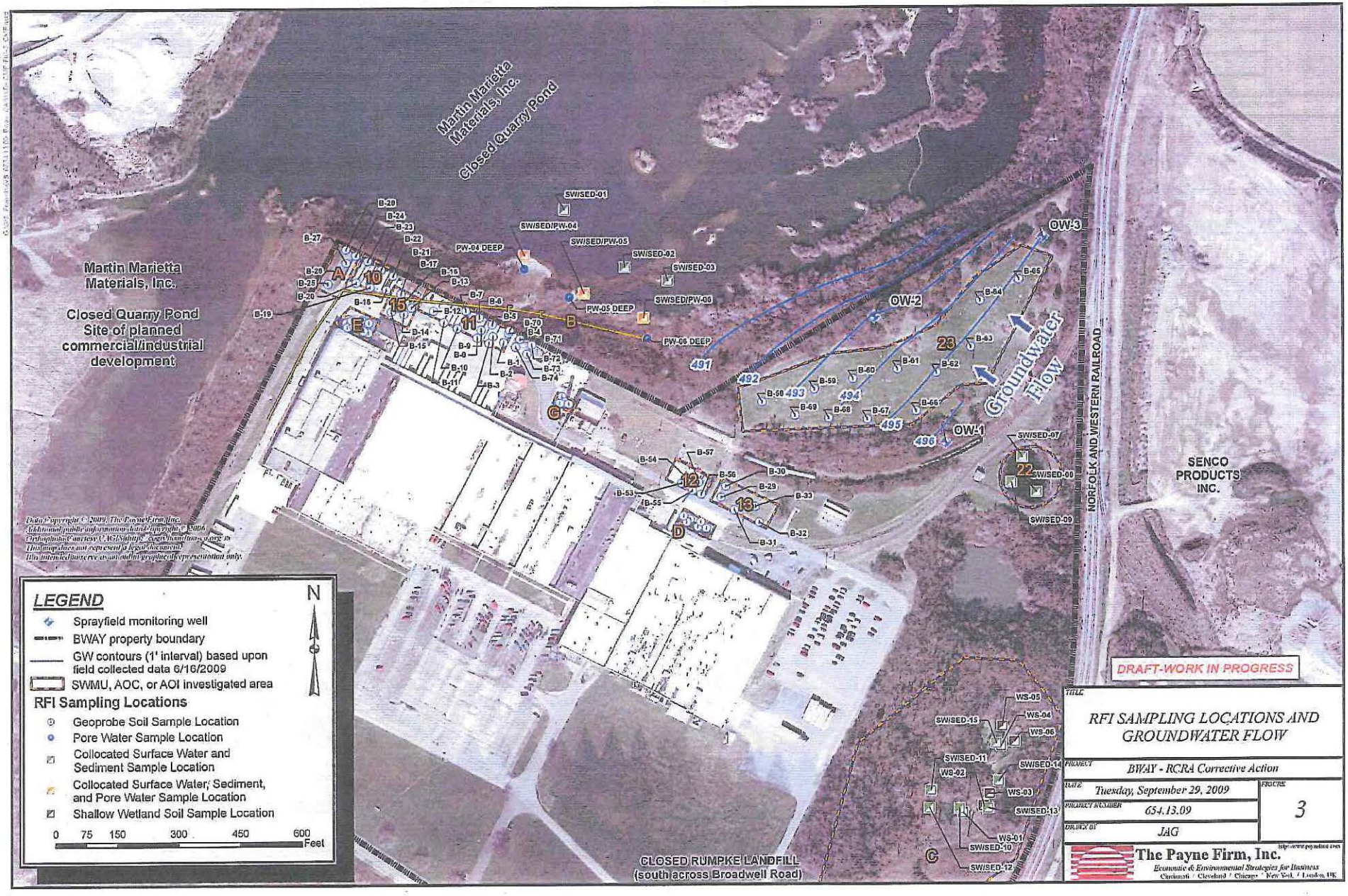


Figure 4 - Groundwater Sampling Locations Since September 2014

OW-6										
DATE	T/D	AS	CR	FE	PB	MN	TL	PCE	TCE	VC
9/17/2014	T	1.4 J	18	1100	0.91 JB	44	0.12 JB	1.2	< 1 U	< 1 U
9/17/2014	D	0.84 JB	< 2 U	< 50 U	< 1 U	8	< 1 U	N/A	N/A	N/A
12/16/2014	T	1 J	15 Bj	310 Bu	0.27 JBj	13	< 1 U	1.8	0.15 J	< 1 U
12/16/2014	D	0.91 JB	1.3 JB	< 50 Uu	< 1 Uj	6 B	< 1 U	N/A	N/A	N/A
3/9/2015	T	<1.4 JBu	13 B	1000	0.84 JBu	34	< 1 U	1.8	< 1 U	< 1 U
3/9/2015	D	0.69 J	<1.4 JBu	< 50 U	< 1 U	5.1	< 1 U	N/A	N/A	N/A
5/19/2015		2.4 JB	19 B	2100	1.8	64	< 1 U	2	< 1 U	< 1 U
5/19/2015	D	1.2 JB	1.5 JB	< 50 U	0.17 JB	2 J	< 1 U	N/A	N/A	N/A

OW-6D									
DATE	T/D	AS	CR	FE	PB	MN	TL	TCE	VC
9/17/2014	T	13	35	3500	0.55 JB	240	0.12 JB	< 1 U	< 1 U
9/17/2014	D	7.2 B	30	2200	0.32 J	240	< 1 U	N/A	N/A
12/16/2014	T	9.1	44 B	2900 B	<0.33 JBu	240	< 1 U	< 1 U	< 1 U
12/16/2014	D	5.1 B	1.3 JBj	< 50 U	< 1 U	230 B	< 1 U	N/A	N/A
3/9/2015	T	13 B	45 B	4000	< 1 Bu	300	< 1 U	< 1 U	< 1 U
3/9/2015	D	6.4	<1.2 JBu	< 50 U	< 1 U	250	< 1 U	N/A	N/A
5/19/2015	T	8.1 B	2 B	1900	0.13 J	230	< 1 U	< 1 U	< 1 U
5/19/2015	D	5 B	2.6 B	140 B	0.17 JB	230	< 1 U	N/A	N/A

OW-7									
DATE	T/D	AS	CR	FE	PB	MN	TL	TCE	VC
9/17/2014	T	0.63 J	2.1	290	0.19 JB	47	0.11 JB	< 1 U	< 1 U
9/17/2014	D	0.57 JB	< 2 U	< 50 U	< 1 U	37	< 1 U	N/A	N/A
12/16/2014	T	1 J	9.1 Bj	320 Bu	0.27 JBj	24	< 1 U	< 1 U	< 1 U
12/16/2014	D	0.85 JBj	2 Bj	< 50 U	< 1 U	11 Bj	< 1 U	N/A	N/A
3/9/2015	T	<2.2 JBu	33 B	2200	1.4 B	120	< 1 U	< 1 U	< 1 U
3/9/2015	D	0.88 J	< 3.2 Bu	< 50 U	< 1 U	6.2	< 1 U	N/A	N/A
5/19/2015	T	2.3 JB	41 B	2100	1.2	96	< 1 U	< 1 U	< 1 U
5/19/2015	D	1.1 JB	1.4 JB	< 50 U	0.16 JB	6.5	< 1 U	N/A	N/A

OW-7D									
DATE	T/D	AS	CR	FE	PB	MN	TL	TCE	VC
9/17/2014	T	4.8 J	13	6600	0.19 JB	53	0.077 JB	< 1 U	< 1 U
9/17/2014	D	1.9 JB	< 2 U	380	< 1 U	46	< 1 U	N/A	N/A
12/16/2014	T	6.4	50 B	7200 B	0.83 JBj	71	< 1 U	< 1 U	< 1 U
12/16/2014	D	2.2 JBj	1.2 JBj	62 Bu	< 1 U	40 B	< 1 U	N/A	N/A
3/9/2015	T	7.7 B	26 B	7200	<0.33 JBu	57	< 1 U	< 1 U	< 1 U
3/9/2015	D	3.2 J	<1.3 JBu	270	< 1 U	46	< 1 U	N/A	N/A
5/19/2015	T	8.5 B	2.9 B	7200	0.63 J	71	< 1 U	< 1 U	< 1 U
5/19/2015	D	2.9 JB	1.6 JB	< 50 U	0.13 JB	44	< 1 U	N/A	N/A

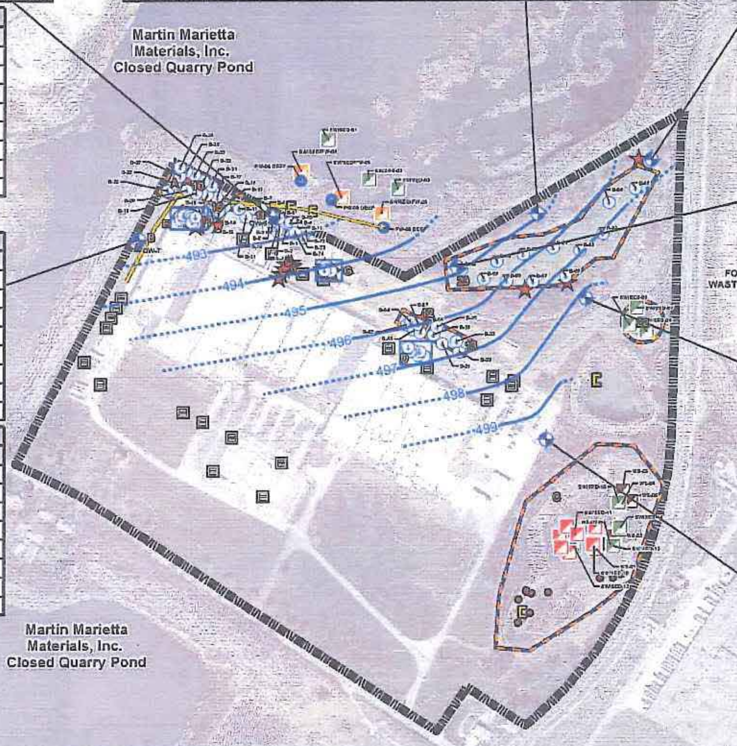
OW-2									
DATE	T/D	AS	CR	FE	PB	MN	TL	TCE	VC
9/17/2014	T	2.3 J	2.7	1500	2.8 B	72	1.5 B	< 1 U	< 1 U
9/17/2014	D	0.57 JB	< 2 U	< 50 U	< 1 U	< 5 U	< 1 U	N/A	N/A
12/16/2014	T	2.3 J	5.2 Bj	3200 B	5.6 B	160	0.28 J	< 1 U	< 1 U
12/16/2014	D	0.65 JBj	1.2 J Bj	< 50 U	< 1 U	< 5 U	< 1 U	N/A	N/A
3/9/2015	T	4.2 JB	< 6.2 Bu	7100	6.1 B	390	0.088 J	< 1 U	< 1 U
3/9/2015	D	0.76 J	<1.4 JBu	< 50 U	0.26 J	1.3 J	0.3 J	N/A	N/A
5/19/2015	T	1.8 JB	2.6 B	2000 J	1.7	61	< 1 U	< 1 U	< 1 U
5/19/2015	D	1.9 JB	1.6 JB	17 JB	0.42 JB	< 5 U	0.35 JB	N/A	N/A

OW-3									
DATE	T/D	AS	CR	FE	PB	MN	TL	TCE	VC
9/17/2014	T	7.6	7.3	20000	11 B	1200	0.44 JB	29	< 1 U
9/17/2014	D	0.5 JB	< 2 U	< 50 U	< 1 U	320	< 1 U	N/A	N/A
12/16/2014	T	4.7 J	6.1 Bj	12000 B	6 B J	1400	0.12 J	11	< 1 U
12/16/2014	D	0.61 JBj	1.1 JBj	< 50 U	< 1 U	510 B	< 1 U	N/A	N/A
3/9/2015	T	4.5 JB	< 5.6 Bu	12000	6.5 B	890	0.096 J	11	< 1 U
3/9/2015	D	0.62 J	<1.3 JBu	< 50 U	0.13 J	550	0.11 J	N/A	N/A
5/19/2015	T	3.3 JB	4.7 B	8400	4.6	820	< 1 U	20	< 1 U
5/19/2015	D	1.1 JB	1.4 JB	< 50 U	0.25 JB	220	0.15 JB	N/A	N/A

OW-4									
DATE	T/D	AS	CR	FE	PB	MN	TL	TCE	VC
9/17/2014	T	2 J	2.7	630	0.47 JB	64	0.29 JB	< 1 U	< 1 U
9/17/2014	D	1.5 JB	< 2 U	< 50 U	< 1 U	21	< 1 U	N/A	N/A
12/16/2014	T	2.3 J	61 B	1200 B	0.9 JBj	98	0.085 J	< 1 U	< 1 U
12/16/2014	D	1.6 JBj	1.1 JBj	< 50 U	< 1 U	10 B j	< 1 U	N/A	N/A
3/9/2015	T	<1.8 JBu	< 2.7 Bu	160	<0.19 JBu	15	< 1 U	< 1 U	< 1 U
3/9/2015	D	1.6 J	<1.2 JBu	< 50 U	< 1 U	3.3 J	0.092 J	N/A	N/A
5/19/2015	T	3.9 JB	110 B	3800	2.3	320	0.09 J	< 1 U	< 1 U
5/19/2015	D	1.5 JB	1.5 JB	< 50 U	0.21 JB	31	0.13 JB	N/A	N/A

OW-1									
DATE	T/D	AS	CR	FE	PB	MN	TL	TCE	VC
9/17/2014	T	2.7 J	16	260	0.73 JB	9.2	0.99 JB	< 1 U	< 1 U
9/17/2014	D	2.1 JB	0.4 J	< 50 U	0.12 J	3.6 J	0.11 J	N/A	N/A
12/16/2014	T	2.4 J	1.5 JBj	180 Bu	0.29 JBj	8.1	< 1 U	< 1 U	< 1 U
12/16/2014	D	2.3 J	1.4 JBj	< 50 U	0.17 J	< 5 U	0.23 J	N/A	N/A
3/9/2015	T	2.6 JB	< 2.2 Bu	240	<0.44 JBu	10	0.19 J	< 1 U	< 1 U
3/9/2015	D	2.2 J	<1.4 JBu	< 50 U	0.16 J	< 5 U	0.21 J	N/A	N/A
5/19/2015	T	2.6 JB	9.4 B	170	0.28 J	10	0.091 J	< 1 U	< 1 U
5/19/2015	D	3.1 JB	1.6 JB	22 JB	0.34 JB	< 5 U	0.23 JB	N/A	N/A

OW-5									
DATE	T/D	AS	CR	FE	PB	MN	TL	TCE	VC
9/17/2014	T	3.2 J	35	3000	1.8 B	270	0.26 JB	< 1 U	0.43 J
9/17/2014	D	1.3 JB	< 2 U	< 50 U	< 1 U	220	< 1 U	N/A	N/A
12/16/2014	T	1.5 J	2.5 B	550 B	0.33 JB	33	0.087 J	< 1 U	< 1 U
12/16/2014	D	0.94 JBj	1.1 JBj	< 50 U	< 1 U	15 Bj	< 1 U	N/A	N/A
3/9/2015	T	9.2 B	22 B	9900	4.9 B	370	0.2 J	< 1 U	< 1 U
3/9/2015	D	1 J	<1.2 JBu	< 50 U	< 1 U	20	< 1 U	N/A	N/A
5/19/2015	T	1.9 JB	3 B	940	0.6 J	23	< 1 U	< 1 U	< 1 U
5/19/2015	D	1.4 JB	1.4 JB	< 50 U	0.22 JB	1.2 J	0.14 JB	N/A	N/A



LEGEND

- Groundwater Observation Well
- Groundwater Contours (5/19/2015)
- Groundwater Contours (extrapolated)
- BWAY Property Boundary
- 2 FT Ground Surface Contours
- SWMU, AOC, or AOI investigated area

RFI Sampling Locations

- Geoprobe Soil Sample Location
- Pore Water Sample Location
- Collocated Surface Water and Sediment Sample Location
- Collocated Surface Water, Sediment, and Pore Water Sample Location
- Shallow Wetland Soil Sample Location

N

0 200 400 Feet

Notes
All samples reported in UG/L (micrograms per liter); QA/QC Duplicate samples not shown on figure.
AS = Arsenic; CR = Chromium; FE = Iron; PB = Lead; MN = Manganese; TL = Thallium; TCE = Trichloroethene; VC = Vinyl Chloride; PCE = Tetrachlorethene
RSL: USEPA Regional Screening Levels, November 2015 (Iron RSL = 15,000) (Manganese RSL = 480)
MCL: Maximum Contaminant Level enforceable standard of National Primary Drinking Water Regulations under Safe Drinking Water Act
(Arsenic MCL = 10) (Chromium MCL = 100) (Lead MCL = 15) (Thallium MCL = 2) (TCE MCL = 5) (Vinyl Chloride MCL = 2)
T/D: measured basis (metals only); T = total, D = dissolved
N/A: Not Analyzed
U: Test America Lab Qualifier. Nondetect.
J: Test America Lab Qualifier. Method blank contamination. The associated method blank contains the target analyte at a reportable level.
B: Test America Lab Qualifier. Estimated result. Result is less than the reporting limit.
j: TRC Qualifier. The analyte was not detected above the reporting sample quantitation limit. However, the reported quantitation limit is approx. and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
u: TRC Qualifier. The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

TITLE: *GROUNDWATER SAMPLE LOCATIONS & RESULTS SINCE SEPTEMBER 2014*

PROJECT: *BWAY RCRA CORRECTIVE ACTION (RCRA-05-2007-0011)*

DATE: *Tuesday, March 22, 2016*

FIGURE: *1*

PROJECT NUMBER: *214114*

DRAWN BY: *GIS*

TRC
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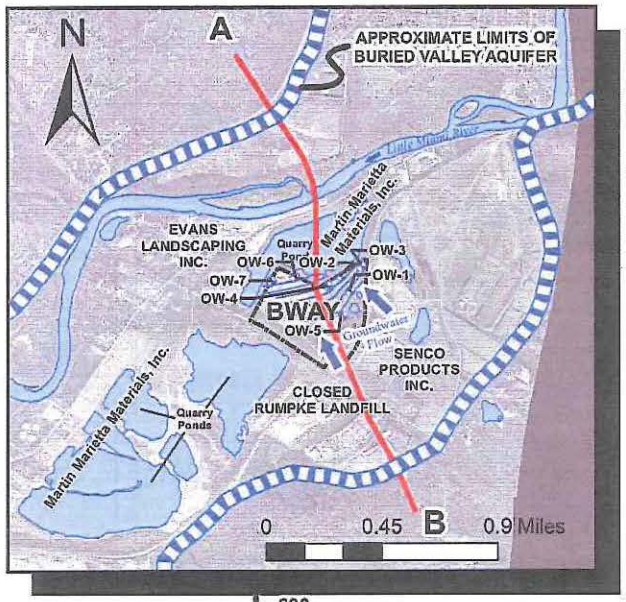
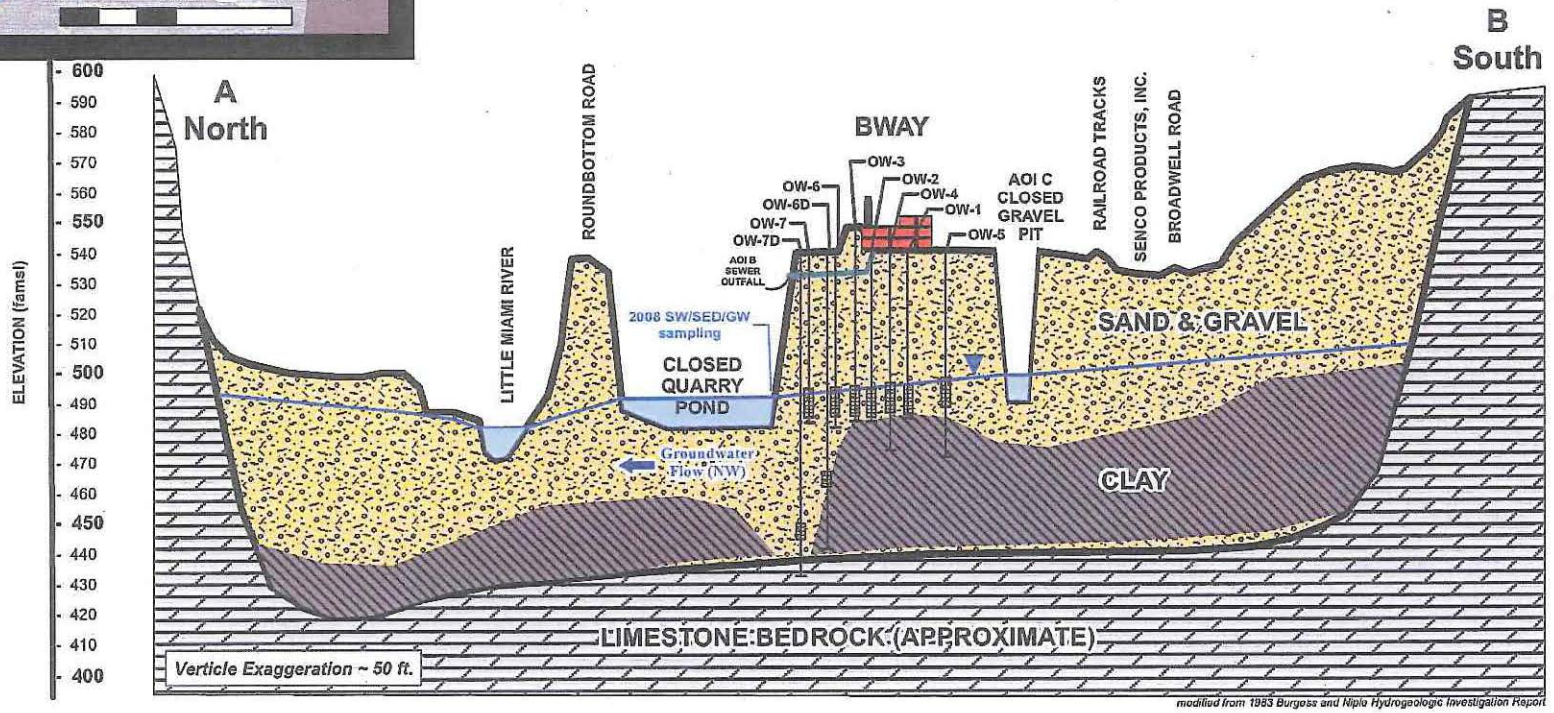
Cincinnati, Ohio 45242
513-489-2255
http://www.trcsolutions.com/

Figure 5 - Geological Cross-Section



HYDROGEOLOGIC SUMMARY

- The site is underlain by the Little Miami River Buried Valley Aquifer and sits within the Little Miami River Watershed. The Little Miami River flows southwest of the site. Based on maps published by the Ohio EPA, the Facility is not located within a well field protection district.
- The Facility is located over a buried valley which is approximately 100 feet thick and 1 mile wide assigned to a portion of the U.S. EPA designated Greater Miami Sole Source Aquifer system.
- The unconsolidated deposits beneath the facility and in the vicinity of the Property generally consist of about 80 feet of sand and gravel deposits overlying about 30 feet of fine-grained, very-low permeability, glacial tills on top of bedrock.
- The underlying bedrock is composed of interbedded layers of shale and limestone belonging to the Kope Formation of Ordovician Age. The bedrock typically yields less than 5 gallons per minute to drilled wells and is not considered to be a significant aquifer.



modified from 1983 Burgess and Niple Hydrogeologic Investigation Report

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FIGURE No.	2
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PROJECT No.	214114.0000
DATE	11/18/14
REQUESTED BY	KDK

PROJECT: BWAT - RCRA Corrective Action

TITLE: Geologic cross-section A to B (updated 2014)

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