DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater

Facility Name: Northern Indiana Public Service Company – Bailly Generating Station
Facility Address: 246 Bailly Station Road, Chesterton, IN 46304
Facility EPA ID #: IND 000 718 114

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

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 NIPSCO facility is an "L"-shaped property located along the southern shore of Lake Michigan. Referring to Figure 1, the top of the "L" borders the lake and the stern and the bottom of the "L" borders the Cowles Bog sector of the Indiana Dunes National Lakeshore (IDNL) which is part of the National Park Service system and is dominated by beach, lakeshore and a globally rare dune and swale ecosystem. The facility is located within the Calumet Lacustrine Plain, characterized by three post-glacial dune-beach complexes. Much of the NIPSCO facility was built on fill and is elevated above the surrounding land. The land surface elevation ranges from approximately 578 feet above mean sea level (amsl) along the shore of Lake Michigan to approximately 620 ft amsl within the facility.

The regional aquifer is underlain by unconsolidated glacial, lacustrine and eolian sediments. The unconsolidated sediments surrounding the facility consist of three major aquifers: basal, subtill and surficial. The most relevant aquifer in the area of the facility, the surficial aquifer, is approximately 50 ft thick with a saturated thickness ranging from 20 to 40 ft. The surficial aquifer is comprised of coastal sand with minor gravel, clay, calcareous mud, and peat. The horizontal hydraulic gradient indicates that the groundwater flow direction within the shallow aquifer is to the north, towards Lake Michigan.

Site-wide groundwater monitoring at the site is performed as part of a RCRA Facility Investigation (RFI) and began in July 2005. Sampling is being or has been conducted within the NIPSCO Bailly Generating Station facility, on the Lake Michigan beach, and on the downgradient IDNL property. For the preliminary evaluation, the sampling results were screened preferentially against Federal Maximum Contaminant Levels (MCLs) and, in the absence of an MCL, against the National Secondary Drinking Water Regulations (NSDWRs) or other health-based criteria. Later in this document, more site-specific screening criteria are used to evaluate the groundwater.

Groundwater is contaminated in two distinct locations: 1. The western groundwater plume is entirely on-site. The contamination originates from the former fly ash staging area in the southwest portion of the site (SWMU 18), also known as "Area A", and migrates north under the facility towards Lake Michigan. 2. The eastern groundwater plume originates on-site from the historic ash landfills (SWMUs 14 and 15) and migrates off-site through the IDNL property (also known as "Area C").

Table 1, reports the maximum concentrations of site-related constituents found since 2008 during the investigation by monitoring well and general location above MCLs or NSDWRs (or the appropriate criteria cited below).

Maximum Groundwater Concentrations in Exceedence of MCLs

Chemical Name	Maximum (mg/L)	MCL (mg/L)	NSDWR (mg/L)	Location of Maximum Detection	Onsite Or Offsite
Aluminum	2.86		0.2	IDNL-GW12	OFF
Arsenic	0.728	0.01		MW-119	ON
Boron	38.2		5.0*	MW-119	ON
Manganese	2.02		0.3**	IDNL GW15	OFF
Molybdenum	7.05		0.04***	MW-119	ON
Selenium	0.056	0.05		MW-125	ON

*An EPA Lifetime Health Advisory (LHA) level of 5.0 mg/L has been established for boron based upon a lifetime exposure to a 67-kg pregnant adult woman (EPA 2008).
**An EPA Lifetime Health Advisory (LHA) level of 0.3 mg/L has been established for manganese based upon a lifetime exposure to a 70-kg adult consuming 2 liters of water per day (EPA 2006). Based on staining and taste, EPA has set a secondary level for manganese at 0.05 mg/L which is below the level that may present a health concern (EPA 2003).

***An EPA Lifetime Health Advisory (LHA) level of 0.04 mg/L has been established for molybdenum (EPA 2006).

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 MCLs or NSDWRs. MCLs can be found at: http://www.epa.gov/safewater/contaminants/index.html

USGS (1992) Shedlock et al., Hydrologeology and Hydrochemistry of Dunes and Wetlands Along the Southern Shore of Lake Michigan, Indiana, U.S. Geological Survey Open-File Report 92-139, 86pp.

Cohen, D.A., T.K. Greeman, and P.M. Buszka, 2002. Surface-water and ground-water hydrology and contaminant detections in ground water for a Natural Resource Damage Assessment of the Indiana Harbor Canal and nearshore Lake Michigan watersheds, Northwest Indiana. U.S. Geological Survey, Administrative Report, Indianapolis, Indiana.

EPA, Drinking Water Health Advisory for Boron, 2008. EPA 822-R-08-013
http://www.epa.gov/safewater/ccl/pdfs/reg_determine2/healthadvisory_ccl2-reg2_boron.pdf

EPA, 2006 Edition of the Drinking Water Standards and Health Advisories. EPA 822-R-06-013

EPA, Health Effects Support Document for Manganese, 2003.
www.epa.gov/safewater/ccl/pdf/manganese.pdf

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):

The migration of contaminated groundwater in the western plume, originating from the former on-site fly ash staging area, is stabilized. Delineation of this plume was completed in late 2009 on the Lake Michigan beach immediately north of the facility (see Figure of Sitewide Overview). The on-site monitoring wells MW-108, MW-109, and MW-110 have concentrations of metals in exceedence of screening values (see Cross Section for well locations relative to the lake). These wells are located on a bluff at the northern edge of the facility, approximately 30 feet above the beach. To determine whether constituents were entering the lake, five groundwater samples were collected from both the shallow and deep aquifers (at intervals of 5-7' and 15'-19' below ground surface, bgs) approximately 500 feet inland from the water, spanning the width of the facility. To ensure complete delineation, five groundwater samples were also taken from the shallow and deep aquifers (at intervals of 0-2', 8-10', and 15-18' bgs) at the shoreline, or 500' down gradient from the first row of samples. The shallow groundwater discharging into the lake meets conservative screening values developed for the protection of the piping plover, an endangered species. The shallow groundwater discharging to the lake also meets Great Lakes Initiative (GLI) screening criteria that are protective of the Great Lakes. At two sampling locations, 500' inland from the lake, there are GLI exceedences in the deeper groundwater (>15'bgs). However, those constituents (boron,

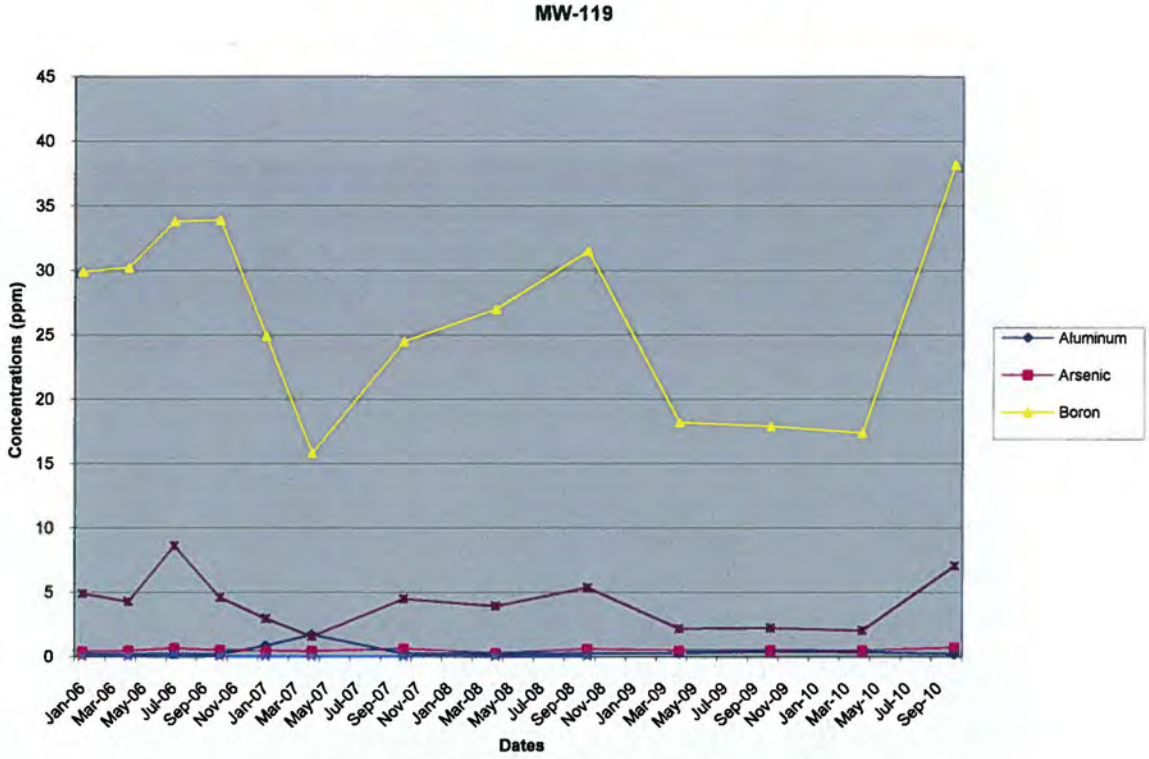
magnesium, and selenium) are not detected at any depth downgradient (closer to the lake). Furthermore, the inland beach samples demonstrate that there is a 5-fold decrease of constituent concentration from the on-site groundwater wells to the beach groundwater wells. Concentrations of constituents in the western groundwater plume are stabilized relative to conservative GLI screening criteria (see Figure of Lake Michigan Beach samples).

Some remediation has been completed in the northwest and central portions of the site to address sources. Within the northwest portion of the facility, several source control measures have taken place in the way of soil excavation since 2005. Additional source control measures are scheduled to take place at SWMU 18. Regarding the central portion of the facility, in 1976, the National Park Service notified NIPSCO that an estimated 1 million gallons of water per day were infiltrating from NIPSCO's unlined fly ash surface impoundments into IDNL. In February 1978, NIPSCO agreed to line the ponds in order to terminate seepage from the impoundments into the Indiana Dunes property, located immediately downgradient to the north of the ponds. Construction was completed in 1980 and included reconfiguring and sealing the ponds with a foot of low permeability natural clay liner, a membrane liner, and sand and buffer materials. Although the fly ash pond sources appear to be controlled, their legacy includes elevated concentrations of metals in groundwater and soils with lowered pH within the IDNL.

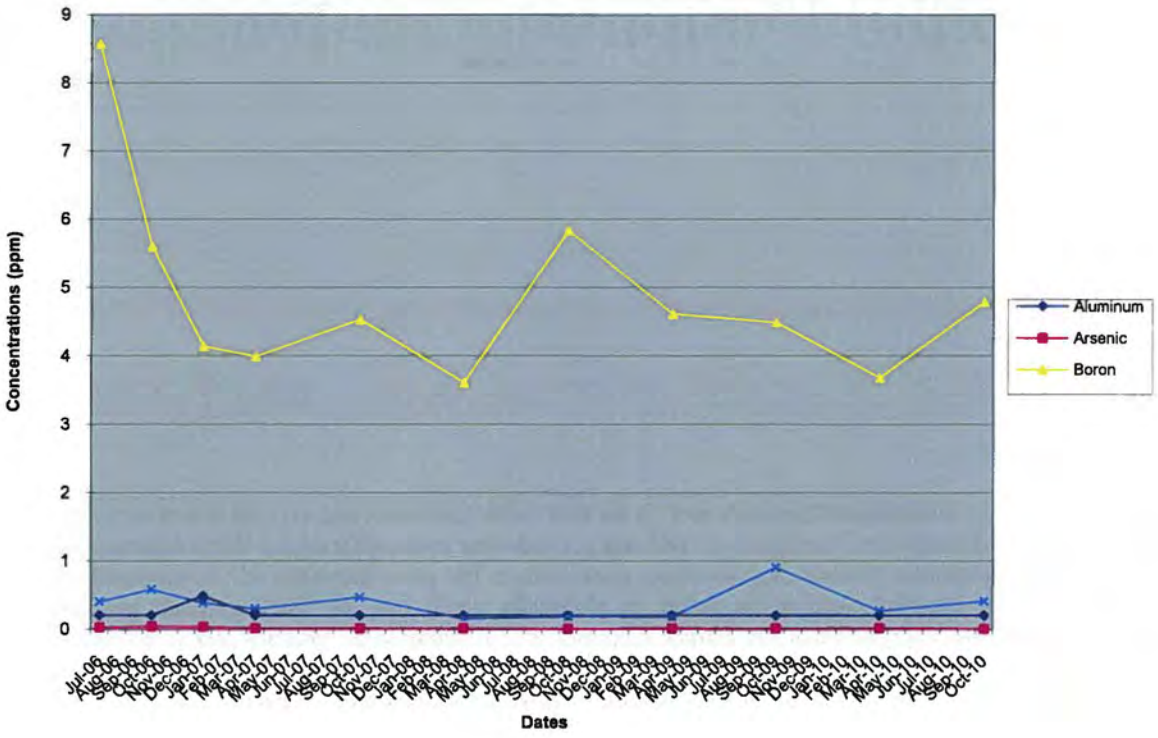
The eastern groundwater contamination plume, originating from the former on-site ash landfills (SWMUs 14 and 15), appears to exhibit an upward concentration trend at the source itself but stabilizes off-site. The graph of MW-119, below, illustrates the groundwater at the source continues to increase in concentrations of metals. Therefore, it is reasonable to conclude that, in the absence of source control, the source material in the landfills (fly and bottom ash) may continue to have an impact on groundwater flowing through the landfills and into the IDNL property into the foreseeable future. The graph of IDNL-GW13 below, illustrates that although concentrations off-site, in the IDNL area, exceed screening values in several locations, concentration trends are generally stable. Within the interior of the park, at MW-134, concentrations of certain metals (such as aluminum) appear to be stabilizing after increasing for some time, while concentrations of other metals (such as boron) appear to be increasing, see graph below.

Migration of contaminated groundwater appears to be stabilized such that it is expected to remain within the existing area of contaminated groundwater. However, as discussed in the following question there is a vertical component to groundwater migration within IDNL where groundwater discharges to surface water. The migration of contaminated groundwater is laterally stabilized while the vertical component represents a migration pathway within the existing area of contaminated groundwater. Consequently, the potential migration from groundwater to surface water is addressed in the next question.

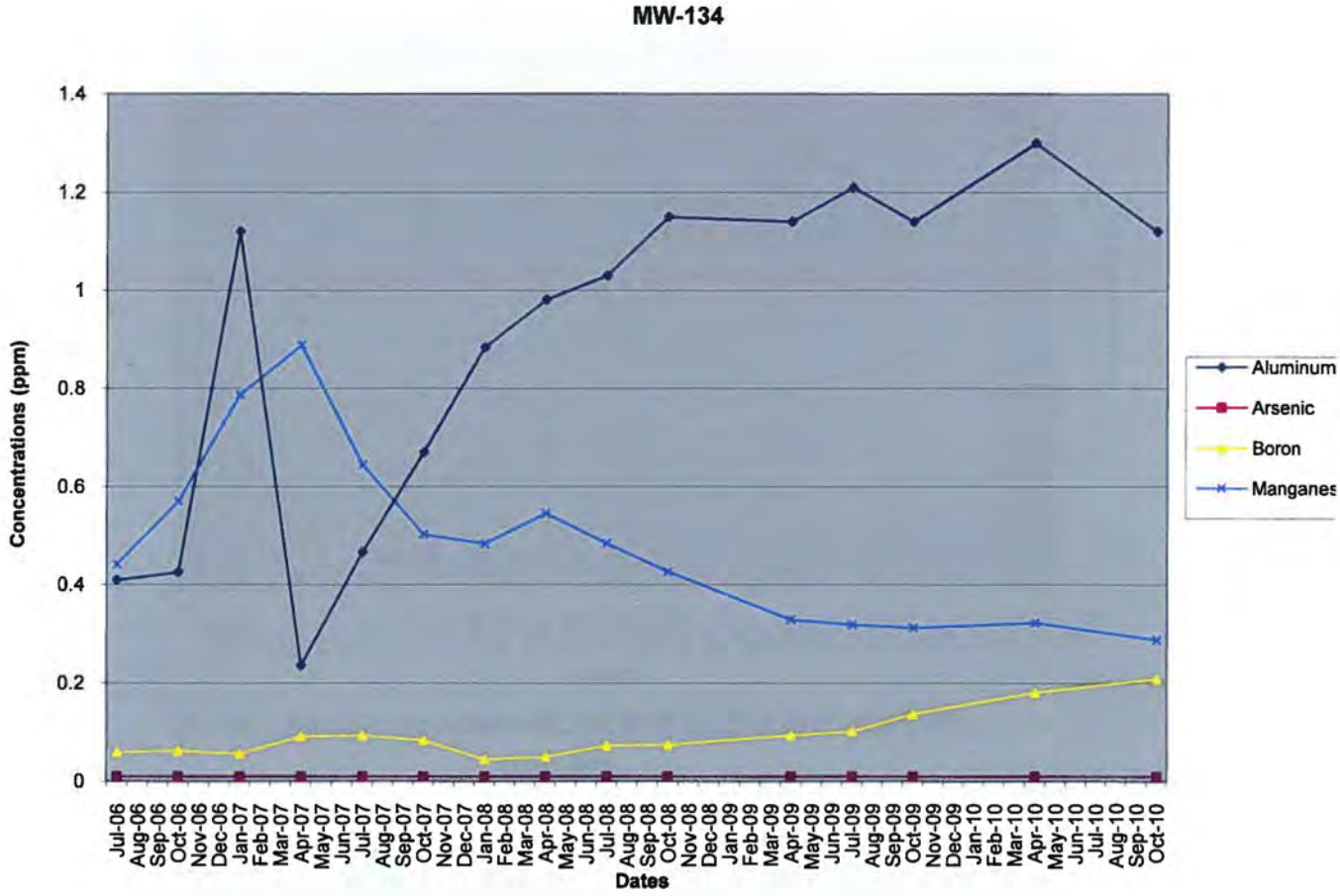
Monitoring Well 119: On-Site, SWMU 15



Monitoring Well IDNL-GW13: Off-Site, Downgradient from MW-119



Monitoring Well MW-134: Off-Site, IDNL



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[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):

The groundwater flow direction is northward towards the lake; there are two specific groundwater migration pathways of significance. At the northern end of the property, groundwater discharges directly to Lake Michigan (western plume). Within the IDNL, groundwater flows towards the Lake and discharges in low-lying interdunal ponds, creating a variety of wetland types such as fens and bogs, and otherwise saturates soils (eastern plume).

The western groundwater plume does not discharge to surface water with contaminants in exceedence of GLI criteria.

The eastern groundwater plume does discharge to surface water with contaminants in exceedence of screening criteria. As the groundwater contamination, which originates at the on-site landfills, migrates towards Lake Michigan it saturates the low-lying soils of IDNL and discharges to the surface waters of ephemeral wetlands.

Groundwater from the central and eastern portions of the facility generally flows into the downgradient IDNL property discharging to inter-dunal ephemeral and permanent ponds and otherwise saturates soils. The discharge occurs in topographically low areas during periods of seasonal high water tables*. Based on a comparison of groundwater and surface water elevations, groundwater likely discharged to surface water near groundwater monitoring points IDNL-GW12 and IDNL-GW13 in April 2006 (Quarterly Progress Report 06-02, AMEC 2006). In addition to ephemeral surface water discharge such as this, per IDNL staff one of the inter-dunal ponds, "Little Lake," generally has year-round open water as does the Southeast Pond. Since the beginning of the investigations, seasonal water levels have varied with exceptionally high levels the past couple of years.

**Note that even during periods when the ephemeral ponds decline, groundwater is frequently at the surface saturating the soil. The effect of this discharge to plants and other receptors has been addressed in the ecological risk assessment, which is currently under review.*

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentrations 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)?

____ 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 judgment/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.

__X__ 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 referenced in question two, Maximum Contaminant Levels (MCLs) were used as preliminary screening values. At one location in IDNL where groundwater discharges to surface water, IDNL-GW12, aluminum concentrations in the groundwater exceed 10x the NSDWR.

Constituent	Maximum (mg/L)	10 x MCL (mg/L)	10 x NSDWR (mg/L)	Location of Maximum	Waters Affected
Aluminum	2.86		2.0	IDNL-GW12	IDNL

However, as considered in the question above, other conditions that significantly increase the potential for unacceptable impacts to surface waters, sediments, or ecosystems do exist at this site. The MCLs for this portion of the site may not be an appropriate criteria to address ecosystems. Consequently, additional screening criteria specifically designed to address waters within the Great Lakes System were considered and are described below.

The Great Lakes Water Quality Initiative (GLI) was established in order to develop a consistent level of environmental protection for the Great Lakes ecosystem [60 Fed Reg 15366-15425]. Part of the intent behind the GLI program was to reduce disparities between water quality programs such that Great Lakes-specific criteria and methodologies to protect aquatic life, wildlife and human health were developed. The GLI methodologies were developed with the sensitivity of the Great Lakes resources in mind, including the lakes themselves, their connecting channels and "all of the streams, rivers, lakes and other bodies of water that are within the drainage basin of the Lakes" [60 Fed Reg 15367].

The Indiana portion of Lake Michigan waters and all waters incorporated in the Indiana Dunes National Lakeshore are designated Outstanding State Resource Waters within the Great Lakes Basin [327 IAC 2-1.5-19]. In determining the "significance" of contaminated groundwater to surface water, it is important to note that Indiana's water quality standards for all waters within the Great Lakes system states, ". . . all high quality waters designated under section 19(b) of this rule as an outstanding state resource water shall be maintained and protected in their present high quality without degradation" [327 IAC 2-1.5-4(c)]. Although 327 IAC 5-2-11.7 provides a framework in which to implement the referenced antidegration standard and primarily focuses on point source discharge from a NPDES permit, it is reasonable to believe that the IDNL wetlands would be provided the type of protection described under the antidegradation standard. As a federal park with wetlands, which has been designated an Outstanding State Resource, IDNL's groundwater aquifer is classified as a Class I aquifer afforded the greatest level of protection from degradation.

How the Applicable Water Quality Standard was Selected
The contaminant discharge has been preferentially compared to the appropriate Great Lakes Initiative (GLI) screening criteria based on the following considerations:

1) The site is entirely within the Lake Michigan Basin and all groundwater within the watershed discharges to the Great Lakes

2) Lake Michigan and IDNL waters are listed as Outstanding State Resource Waters within a Class I groundwater aquifer
3) The IDNL is public land containing special aquatic sites, globally rare dune and swale ecosystem, and several rare plant and animal species
4) The Great Lakes Water Quality Initiative began with the purpose to establish a consistent and conservative level of environmental protection for the Great Lakes ecosystem

GSI within IDNL

For groundwater plumes within the IDNL maximum concentrations were compared to the GLI aquatic chronic life or wildlife screening criteria. Groundwater wells were preferentially screened at locations in areas of IDNL where groundwater is known to discharge to surface water during times of high water levels. At such times and as reported throughout the investigation, groundwater discharges to surface water at areas such as the Blag Slough, Little Lake and the eastern wetland area.

Within IDNL, dilution does not appear to be appropriate, as the waters can be considered "waters of the Great Lakes system with no appreciable flow relative to their volumes" [327 IAC 5-2-11.4(b)(2)(B)]. For those areas where groundwater concentrations exceed GLI criteria and groundwater is discharging to IDNL, site-specific dilution or mixing does not appear to be appropriate. Whereas dilution inevitably occurs at the point of groundwater discharge to the lake, no such process exists within the ephemeral wetlands of IDNL. Since no such groundwater dilution process occurs in these surface waters, metals from the groundwater concentrate in the surface water and soils/sediments. It is important to note that the language of question #5 takes into account the environmental setting of the groundwater discharge. The corrective action ecological risk assessment and final remedy decision will evaluate this ecosystem further.

Groundwater constituent values discharging to IDNL ephemeral inter-dunal ponds exceeding the GLI chronic aquatic criteria.

Groundwater Exceedences at Locations where Groundwater Discharges to Surface Water

Constituent	GLI criteria for the Surface Water/GW interface (mg/L)	Conc. Max. (mg/L)	Location and Date of Maximum Detection
Aluminum	0.087*	2.86 1.3	IDNL-GW12 April 2008 MW-134 April 2010
Boron	1.6	8.57	IDNL-GW13 July 2006
Cadmium	0.00325	0.0276	IDNL-GW07 July 2006
Manganese	0.867	2.02	IDNL-GW15 April 2009

*Currently No Aluminum GLI Value Available: National Recommended Water Quality Criteria for Freshwater Chronic. Background concentration is 0.140.

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[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 MCLs or FDWGs. MCLs and FDWG can be found at: http://www.epa.gov/safewater/mcl.html#mcls
GLI numbers can be found at: http://www.state.in.us/idem/owm/planbr/wqs/criteria/crdown.html

[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 assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

__X__ If no - (the discharge of "contaminated" groundwater can not 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:

The discharge of contaminated groundwater into surface water within the IDNL cannot be shown to be acceptable. Continued impacts to the surface water, sediment or ecosystems should not be allowed to continue until a final remedy decision. Groundwater constituents are found in IDNL surface waters above the GLI screening criteria at two locations, presented below.

Surface Water Exceedences of the GLI screening criteria in IDNL

Constituent	GLI criteria for the Surface Water (mg/L)	Conc. Max. (mg/L)	Location of Maximum Detection
Boron	1.6	4.97	IDNL-SW13; downgradient from SWMU 15
Manganese	0.676	4.24	IDNL-SW08; in Central Blag Slough

Stressed vegetation, manifesting as yellowing and burnt plant tips, has been observed by the National Park Service at the "southwestern terminus of the Cowles Bog Wetland complex, downgradient from SWMUs 14 and 15. There is a complicated hydrogeologic cycle between the groundwater, surface water and sediment pertaining to the bioavailability of certain metals dependent upon physical, chemical parameters in the environment. The most chronically exposed receptors are the plants within the park. Concentrations of site constituents have been found in plant tissue. The risk of these concentrations are being evaluated in the Baseline Ecological Risk Assessment currently under review. The table below presents the sediment concentrations within those areas for constituents that exceed the soil screening criteria (EPA Eco-SSLs).

Sediment Exceedences of the Eco-SSLs within Areas of IDNL where Groundwater Discharges to Surface Water

Constituent	Sediment/Soil Screening Value (µg/kg)	Conc. Max. (µg/kg)	Location of Maximum Detection
Aluminum	8,350,000	13,700,000	IDNL-SD11, 0-3"
Arsenic	9,790	214,000	IDNL-SD13, 0-3"
Boron	8,500	153,000	IDNL-SD13, 0-3"
Cadmium	990	97,700	IDNL-SD35, 0-3"
Chromium	43,400	44,400	IDNL-SD13, 0-3"

At this time the groundwater discharge to surface water, and associated impacts to sediment, within the IDNL is not acceptable. On-site source control of the historic landfills should be implemented in the meantime to prevent further impacts to the National Park's land.

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[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?"

__ 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.

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).

__ __ 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, EPA ID # IND 000 718 114, located at 246 Bailly Station Road, Chesterton, IN 46304. 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.

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

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

Completed by (signature) Michelle Kaysen Date 7-15-11
(print) MICHELLE KAYSEN
(title) ENVIRONMENTAL SCIENTIST

Supervisor (signature) George J. Hamper Date 7-15-11
(print) George J. Hamper
(title) Chief, Corrective Action Section #2
(EPA Region or State) 5

Locations where References may be found:

Contact telephone and e-mail numbers
(name) Michelle Kaysen
(phone #) (312) 886-4253
(e-mail) kaysen.michelle@epa.gov

Sitewide Overview and Site Features

Northern Indiana Public Service Company

Bailly Generating Station
Chesterton, Indiana

Legend

- Bailly Generating Station Property Line
- Approximate Slurry Wall Location
- Railroad
- Area A
- Area B
- Area C

Location of Site

Notes and Sources

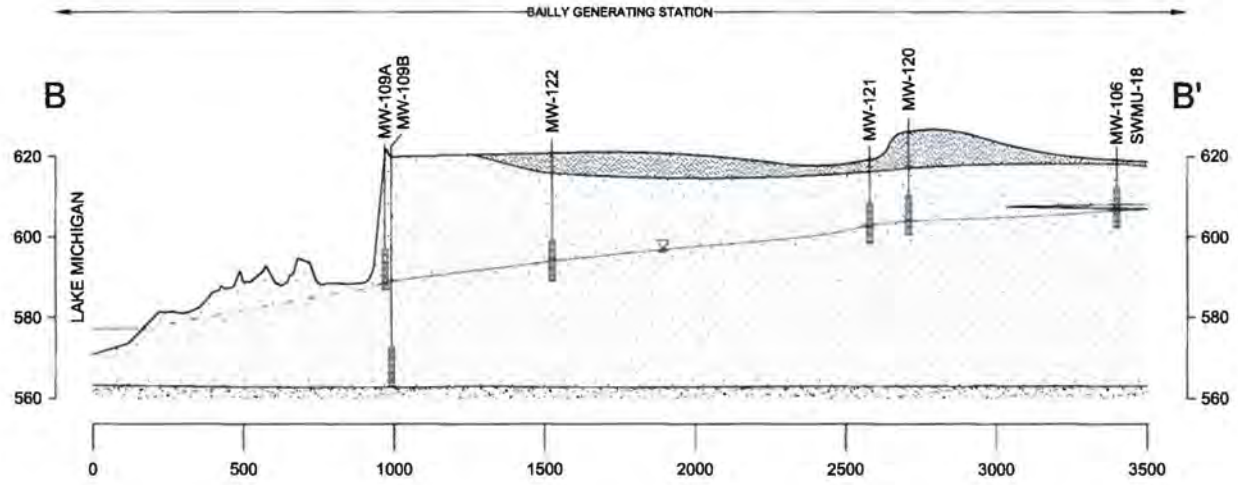
FIGURE 1

Aerial Photo: March 2003
Courtesy of Indiana Spatial Data Portal

0 750 1,500 Feet

AMEC Earth & Environmental, Inc.
2 Robbins Road
Westford, MA 01886
(978) 692-9090

H:\NiSource\BaillyGenerating\Task85\MXD\Fig1_SitewideOverview.mxd H:\NiSource\BaillyGenerating\Task85\MXD\Fig1_SitewideOverview.pdf February 21, 2011 DWN: JDP APC CHKD: AKN



NOTES:

1. WATER LEVELS MEASURED BY AMEC PERSONNEL FROM OCTOBER 12 THROUGH OCTOBER 23, 2009.
2. LAKE MICHIGAN WATER LEVEL IS AVERAGE FROM OCTOBER 12 THROUGH OCTOBER 23, 2009 AS MEASURED AT CALUMET HARBOR, LAKE MICHIGAN, IL.
3. 20 X VERTICAL EXAGGERATION.

LEGEND:

- DUNE-BEACH AND LACUSTRINE SAND
- GROUNDWATER FLOW DIRECTION
- WATER TABLE (INFERRED)
- WATER TABLE (KNOWN)
- FILL
- PEAT
- TILL AND GLACIAL-LACUSTRINE CLAY AND SILT

HORIZONTAL SCALE: 1" = 400'

0 400' 800'

0 20' 40'

VERTICAL SCALE: 1" = 20'

CLIENT: NORTHERN INDIANA PUBLIC SERVICE COMPANY

AMEC Earth & Environmental, Inc.
2 ROBBINS ROAD
WESTFORD, MASSACHUSETTS 01886
(978) 692-9090

DRAWN BY:	M. YAU
CHECKED BY:	J. RAGUCCI
DATUM:	N/A
PROJECTION:	N/A
SCALE:	AS SHOWN

PROJECT: Northern Indiana Public Service Company
Bailly Generating Station
Chesterton, Indiana

TITLE: Geologic Cross Section B-B'

DATE:	18 FEBRUARY 2011
PROJECT NO:	3-7788-0004
REV. NO.:	A
FIGURE No.	3

P:\NiSource\BaillyGeneratingStation\CAD\2011-02-18\Figure 1.dwg — Layout1 — Feb. 18, 2011 3:32pm — dana.dempsey

Lake Michigan Beach Groundwater Sampling Locations

Northern Indiana Public Service Company
Bailly Generating Station
Chesterton, Indiana

Legend

- Bailly Generating Station Property Line
- Groundwater Sampling Points

Location of Site

Notes and Sources

FIGURE 4

Aerial Photo: TerraServer, 8/17/2008.

N

0 300 Feet

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Westford, MA 01886
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Source\BaillyGenerating\Task85\MXD\Fig4_Lake_Mich_Plover_noSW.mxd H:\WiSource\BaillyGenerating\Task85\MXD\Fig4_Lake_Mich_Plover_noSW.pdf February 22, 2011 DWN: JDP APC CHKD: AKN

Lake Michigan Beach Groundwater Compared to GLI Criteria and Background Groundwater

Northern Indiana Public Service Company
Bailly Generating Station
Chesterton, Indiana

LMB-GW03

Analyte	Background Groundwater	GLI Criteria	6.0-7.0 ft
ALUMINUM [1]	0.140	0.2	0.0079
ARSENIC	0.0032	0.15	0.00084
BARIUM	0.019	0.63	0.019
BORON	0.12	1.6	0.037
CADMIUM	0.00100	0.0030	0.0004 U
CHROMIUM	0.00100	0.098	0.00074
COPPER	0.00227843	0.012	0.00094
LEAD	0.00170	0.0073	0.0004 U
MAGNESIUM [2]	22	82	12
MANGANESE	1.00	0.71	0.0004 U
MERCURY	0.000115	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.0025
SELENIUM	0.00100	0.0046	0.00023 J
SILVER [1]	0.001	0.1	0.0004 U
HARDNESS	NA	NA	140

LMB-GW05

Analyte	Background Groundwater	GLI Criteria	5.0-7.0 ft	GLI Criteria	7.5-10.5 ft	GLI Criteria	12.5-14.5 ft
ALUMINUM [1]	0.140	0.2	0.0089	0.2	0.0035	0.2	0.0021
ARSENIC	0.0032	0.15	0.0007	0.15	0.00028 J	0.15	0.026
BARIUM	0.019	0.63	0.019	0.67	0.0098	3.78	0.068
BORON	0.12	1.6	0.09	1.6	0.064	1.6	0.88
CADMIUM	0.00100	0.0030	0.0004 U	0.0031	0.0004 U	0.011	0.0004 U
CHROMIUM	0.00100	0.098	0.00072	0.10	0.0002 J	0.39	0.0024
COPPER	0.00227843	0.012	0.00088	0.013	0.00054	0.051	0.0008
LEAD	0.00170	0.0073	0.0004 U	0.0079	0.0004 U	0.042	0.0004 U
MAGNESIUM [2]	22	82	12	82	7.8	82	58
MANGANESE	1.00	0.71	0.00029 J	0.76	0.033 J	3.14	1.6 J
MERCURY	0.000115	0.00077	0.00023 U	0.00077	0.00023 U	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.0021	0.8	0.0021 J	0.8	0.0024 J
SELENIUM	0.00100	0.0046	0.00028 J	0.0046	0.0002 U	0.0046	0.0027 J
SILVER [1]	0.001	0.1	0.0004 U	0.0001	0.0004 U	0.1	0.0004 U
HARDNESS	NA	NA	140	NA	150	NA	780

LMB-GW07

Analyte	Background Groundwater	GLI Criteria	6.0-7.0 ft
ALUMINUM [1]	0.140	0.2	0.01
ARSENIC	0.0032	0.15	0.00076
BARIUM	0.019	0.63	0.02
BORON	0.12	1.6	0.27
CADMIUM	0.00100	0.0030	0.0004 U
CHROMIUM	0.00100	0.098	0.00078
COPPER	0.00227843	0.012	0.0015
LEAD	0.00170	0.0073	0.0004 U
MAGNESIUM [2]	22	82	12
MANGANESE	1.00	0.71	0.0018 J
MERCURY	0.000115	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.0041 J
SELENIUM	0.00100	0.0046	0.00056 U
SILVER [1]	0.001	0.1	0.0004 U
HARDNESS	NA	NA	140

LMB-GW01

Analyte	Background Groundwater	GLI Criteria	5.0-7.0 ft	GLI Criteria	DUP 5.0-7.0 ft	GLI Criteria	8.5-10.5 ft	GLI Criteria	15.5-17.5 ft
ALUMINUM [1]	0.140	0.2	0.0065	0.2	0.0068	0.2	0.0025	0.2	0.0013
ARSENIC	0.0032	0.15	0.00082	0.15	0.00061	0.15	0.00058	0.15	0.032
BARIUM	0.019	0.67	0.02	0.67	0.02	1.26	0.03	2.78	0.19
BORON	0.12	1.6	0.08	1.6	0.067	1.6	0.036	1.6	0.56
CADMIUM	0.00100	0.0030	0.0004 U	0.0031	0.0004 U	0.0049	0.0004 U	0.0089	0.0004 U
CHROMIUM	0.00100	0.10	0.00077	0.10	0.00074	0.17	0.0011	0.31	0.00099
COPPER	0.00227843	0.013	0.00097	0.013	0.0012	0.021	0.0005	0.040	0.00048
LEAD	0.00170	0.0079	0.0004 U	0.0079	0.0004 U	0.015	0.0004 U	0.032	0.0004 U
MAGNESIUM [2]	22	82	12	82	12	82	17	82	44
MANGANESE	1.00	0.76	0.0004 U	0.76	0.00023 J	1.37	0.035	2.44	1.6
MERCURY	0.000115	0.00077	0.00023 U	0.00077	0.00023 U	0.00077	0.00023 U	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.002	0.8	0.0018	0.8	0.0048	0.8	0.0042
SELENIUM	0.00100	0.0046	0.0004 U	0.0048	0.00048	0.0046	0.0004 U	0.0048	0.00074
SILVER [1]	0.001	0.1	0.00012 J	0.1	0.00013 J	0.1	0.0004 U	0.1	0.0004 U
HARDNESS	NA	NA	150	NA	150	NA	270	NA	570

LMB-GW09

Analyte	Background Groundwater	GLI Criteria	6.0-7.0 ft	GLI Criteria	7.5-8.5 ft	GLI Criteria	15.0-17.0 ft
ALUMINUM [1]	0.140	0.2	0.0092	0.2	0.004	0.2	0.0021
ARSENIC	0.0032	0.15	0.00097	0.15	0.00043	0.15	0.016
BARIUM	0.019	0.63	0.018	0.62	0.018	0.91	0.064
BORON	0.12	1.6	0.056	1.6	0.062	1.6	0.075
CADMIUM	0.00100	0.0030	0.0004 U	0.0036	0.0004 U	0.0039	0.0004 U
CHROMIUM	0.00100	0.098	0.00065	0.12	0.00043	0.13	0.00036 J
COPPER	0.00227843	0.012	0.0013	0.015	0.00052	0.018	0.0004 U
LEAD	0.00170	0.0073	0.0004 U	0.0086	0.0004 U	0.011	0.0004 U
MAGNESIUM [2]	22	82	12	82	12	82	14
MANGANESE	1.00	0.71	0.00025 J	0.89	0.09	0.97	0.48
MERCURY	0.000115	0.00077	0.00023 U	0.00077	0.00023 U	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.0026	0.8	0.0025	0.8	0.003
SELENIUM	0.00100	0.0046	0.00028 J	0.0046	0.0004 U	0.0046	0.0004 U
SILVER [1]	0.001	0.1	0.0004 U	0.1	0.0004 U	0.1	0.0004 U
HARDNESS	NA	NA	140	NA	180	NA	350

LMB-GW02

Analyte	Background Groundwater	GLI Criteria	4.7-6.7 ft	GLI Criteria	14.0-16.0 ft	GLI Criteria	(DUP) 14.0-16.0 ft
ALUMINUM [1]	0.140	0.2	0.009 J	0.2	0.0018 J	0.2	0.039 J
ARSENIC	0.0032	0.15	0.0005	0.15	0.031	0.15	0.027
BARIUM	0.019	0.67	0.014	4.90	0.062	4.74	0.056
BORON	0.12	1.6	0.026	1.6	1.2 J	1.8	1.2
CADMIUM	0.00100	0.0039	0.0004 U	0.014	0.0004 U	0.013	0.0004 U
CHROMIUM	0.00100	0.13	0.00054	0.48	0.0027	0.46	0.0027
COPPER	0.00227843	0.015	0.00085	0.052	0.0009	0.051	0.00076
LEAD	0.00170	0.010	0.0004 U	0.053	0.00012 J	0.052	0.0004 U
MAGNESIUM [2]	22	82	13	82	72	82	73
MANGANESE	1.00	0.93	0.034	3.89	1.4 J	3.79	1.4 J
MERCURY	0.000115	0.00077	0.00023 U	0.00077	0.00023 U	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.0038	0.8	0.0038 J	0.8	0.0019 J
SELENIUM	0.00100	0.0046	0.0004	0.0046	0.002 J	0.0046	0.0016 J
SILVER [1]	0.001	0.1	0.00015 J	0.1	0.0004 U	0.1	0.0004 U
HARDNESS	NA	NA	190	NA	570	NA	940

LMB-GW10

Analyte	Background Groundwater	GLI Criteria	6.0-8.0 ft	GLI Criteria	17.0-19.0 ft
ALUMINUM [1]	0.140	0.2	0.012 J	0.2	0.011 J
ARSENIC	0.0032	0.15	0.00085	0.15	0.0015
BARIUM	0.019	1.81	0.048	1.98	0.12
BORON	0.12	1.6	1.2	1.8	0.85
CADMIUM	0.00100	0.0057	0.0004 U	0.0069	0.0004 U
CHROMIUM	0.00100	0.19	0.00037 J	0.24	0.00013 J
COPPER	0.00227843	0.024	0.0013	0.030	0.00073
LEAD	0.00170	0.016	0.00022 J	0.023	0.0004 U
MAGNESIUM [2]	22	82	21	82	32
MANGANESE	1.00	1.47	0.045	1.83	0.98
MERCURY	0.000115	0.00077	0.00023 U	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.0048	0.8	0.0036
SELENIUM	0.00100	0.0046	0.004	0.0046	0.0018
SILVER [1]	0.001	0.1	0.0004 U	0.1	0.0004 U
HARDNESS	NA	NA	320	NA	410

LMB-GW04

Analyte	Background Groundwater	GLI Criteria	7.5-8.5 ft	GLI Criteria	15.0-16.5 ft
ALUMINUM [1]	0.140	0.2	0.0095 J	0.2	0.0091 J
ARSENIC	0.0032	0.15	0.00043	0.15	0.012
BARIUM	0.019	1.01	0.019	3.15	0.053
BORON	0.12	1.6	0.025	1.6	0.83
CADMIUM	0.00100	0.0042	0.0004 U	0.0067	0.0004 U
CHROMIUM	0.00100	0.14	0.00022 J	0.34	0.0004 U
COPPER	0.00227843	0.018	0.00086	0.044	0.00071
LEAD	0.00170	0.012	0.0004 U	0.035	0.0004 U
MAGNESIUM [2]	22	82	13	82	42
MANGANESE	1.00	1.08	0.029	2.70	0.93
MERCURY	0.000115	0.00077	0.00023 U	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.0038	0.8	0.0065
SELENIUM	0.00100	0.0046	0.00015 J	0.0046	0.0014
SILVER [1]	0.001	0.1	0.0004 U	0.1	0.0004 U
HARDNESS	NA	NA	220	NA	640

LMB-GW06

Analyte	Background Groundwater	GLI Criteria	5.7-7.7 ft	GLI Criteria	15.5-17.5 ft
ALUMINUM [1]	0.140	0.2	0.018 J	0.2	0.1 U
ARSENIC	0.0032	0.15	0.00044	0.15	0.0088
BARIUM	0.019	0.91	0.019	7.24	0.054
BORON	0.12	1.6	0.035	1.6	1.8
CADMIUM	0.00100	0.0039	0.0004 U	0.018	0.002 U
CHROMIUM	0.00100	0.13	0.00048	0.64	0.0006 J
COPPER	0.00227843	0.018	0.001	0.085	0.0024
LEAD	0.00170	0.011	0.0004 U	0.075	0.002 U
MAGNESIUM [2]	22	82	12	82	110
MANGANESE	1.00	0.97	0.02	5.37	2.4
MERCURY	0.000115	0.00077	0.00023 U	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.0048	0.8	0.003
SELENIUM	0.00100	0.0046	0.00036 J	0.0046	0.0058
SILVER [1]	0.001	0.1	0.0004 U	0.1	0.002 U
HARDNESS	NA	NA	200	NA	1400

LMB-GW08

Analyte	Background Groundwater	GLI Criteria	5.7-7.7 ft	GLI Criteria	(DUP) 5.7-7.7 ft	GLI Criteria	15.0-15.5 ft
ALUMINUM [1]	0.140	0.2	0.0075 J	0.2	0.012 J	0.2	0.1 U
ARSENIC	0.0032	0.15	0.00055	0.15	0.00052	0.15	0.015
BARIUM	0.019	1.21	0.029 J	1.21	0.029 J	4.68	0.036 J
BORON	0.12	1.6	0.09	1.6	0.089	1.6	2.2
CADMIUM	0.00100	0.0048	0.0004 U	0.0048	0.0004 U	0.013	0.002 U
CHROMIUM	0.00100	0.15	0.00034 J	0.16	0.00037 J	0.46	0.002 U
COPPER	0.00227843	0.029	0.0011	0.028	0.0012	0.060	0.0019 J
LEAD	0.00170	0.014	0.0004 U	0.014	0.0004 U	6.051	0.002 U
MAGNESIUM [2]	22	82	17	82	17	82	74
MANGANESE	1.00	1.22	0.027	1.22	0.029	3.75	1.3
MERCURY	0.000115	0.00077	0.00023 U	0.00077	0.00023 U	0.00077	0.00023 U
MOLYBDENUM	0.0100	0.8	0.0023	0.8	0.0025	0.8	0.003
SELENIUM	0.00100	0.0046	0.0015	0.0046	0.0013	0.0046	0.0045
SILVER [1]	0.001	0.1	0.0004 U	0.1	0.0004 U	0.1	0.002 U
HARDNESS	NA	NA	260	NA	260	NA	930

Legend

Sampling ID
Analyte | Depth or Criteria
Result (mg/L)

B - Analyte was detected in the associated Method Blank
J - Estimated value
U - Analyte not detected above laboratory method detection limits

Bailly Generating Station Property Line

Groundwater Sampling Points

Location of Site

Notes and Sources

FIGURE 1

Aerial Photo: TerraServer, 8/17/2008.

-Results in red are above GLI Criteria and Background Groundwater.
-All results shown are from samples filtered with a 0.45 µm filter prior to field preservation.
-Hardness-adjusted GLI Criteria calculated using hardness values from individual wells.
-Background groundwater concentrations were calculated using the Upper Tolerance Interval method following the Interim Final Guidance (EPA 1989).
-Non-detect results are indicated with a "U" qualifier and are not highlighted.

1. Aluminum and silver screening values are National Secondary Drinking Water Criteria
2. Magnesium screening value is from Suter, G.W. II, and Tsao, C.L. 1996

N

0 300 Feet

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December 9, 2009 DWN: JDP APC CHKD: AKN