Memo

To	**Michelle Kaysen / USEPA**	File no	**377880004.2400**
From	**Russell Johnson**	cc	**Dan Sullivan / NIPSCO**
Date	**June 15, 2015**		

Subject **Response to EPA Comments**
Corrective Measures Study for Area C
Proposed Media Cleanup Standards

In a memo dated July 10, 2014, NIPSCO provided the rationale for Proposed Media Cleanup Standards for Area C. On September 2, 2014 EPA provided review comments on the proposed standards. Each EPA comment is reproduced below, followed by NIPSCO's response. Resulting changes will be incorporated into the Corrective Measures Study (CMS) Report text. Therefore, it is not necessary to revise and re-issue the July 10, 2014 memo. The attached Tables 1 through 6 from the July 10, 2014 memo will be renumbered for use in the CMS Report.

General Comment – The proposed media cleanup standards are one component of EPA's remedial objectives. Remedial objectives include standards, points of compliance, and timeframes.

> Response: The July 10, 2014 memo referred to the numeric Media Cleanup Levels (i.e., concentrations) as Media Cleanup Standards (MCS) to avoid confusion with the more-commonly used acronym for Maximum Contaminant Level (MCL). Maximum Contaminant Levels were sometimes proposed as Media Cleanup Levels, which also has the acronym MCL. To avoid confusion in the CMS Report, Media Cleanup Levels will always be spelled out, and the acronym MCL will be reserved for Maximum Contaminant Level. Points of compliance and timeframes will also be addressed in the CMS Report.

SWMU 15 SOIL

Comment 1a. The Agency concurs with the need for both direct contact and protection of groundwater criteria; however, it's unclear how these two proposed standards will be applied. This section states, "*Post remediation soil samples will be collected from unsaturated soils below the remediated CCR and submitted for SPLP analysis.*"

First, it's unclear if this is a reasonable assumption given the recent SWMU 15 investigation work demonstrated a general lack of unsaturated soils available to sample beneath the ash. Is it assumed that this soil collection effort would occur *during* remediation, at the time at which this soil may be exposed?

> Response: In May and September 2014, direct-push borings were advanced in and around SWMU 15 to further delineate the landfill dimensions and refine the soil lithology. The EVS 3D model was updated with these data and presented to EPA/NPS at the December 10, 2014 meeting. Based on the revised model, a relatively small volume of unsaturated soil is expected to be present below CCR. Therefore, a limited number of post-remediation samples may be collected for SPLP analysis, and only from exposed, unsaturated soil if excavation is

a component of the remedial alternative. Soils will not be exposed for SPLP sample collection for the encapsulation or in situ stabilization and solidification alternatives.

Comment 1b. Second, if the SPLP collection effort is to take place during remediation, is the proposal to remediate the deep, subsurface soil down to the desired SPLP concentration?

Response: Yes, or additional remediation down to the shallow water table.

Comment 1c. Last, the Agency agrees with the use of the more conservative of the MCL (drinking water standards) or the GLI (Great Lakes Initiative standards) and evaluating the soil with a leach test per EPA's Soil Screening Guidance (EPA 1996, 2002), as was done in Area A. However, it's unclear whether the proposed dilution attenuation factor (DAF) for Area C is proposed based on the work done in Area A. If so, the Agency does not concur with this approach. The DAF equation from guidance (equation 11, 1996) incorporates site-specific information that may be different in Area C, compared to Area A. For example, the source area (size) and mixing zone depth are anticipated to be different. Please provide further support for the proposed DAF of 10, or submit a revised DAF based upon the referenced equation.

Response – The DAF for SWMU 15 SPLP samples was recalculated using the EPA, 2002a guidance. As shown in **Table 6**, the DAF is 3. The source length is estimated at 100 feet, representing a conservative estimate of the approximate length of CCR expected to be present overlying unsaturated sand, measured in the direction of groundwater flow. The proposed Media Cleanup Levels for leaching from unsaturated soil have been revised in **Table 2** using the DAF of 3.

Comment 2. Table 2 has the MCL selected for copper; however, it does not appear to be the most conservative criteria. IDEM's human health GLI criteria for copper is 280 ug/L, compared to the MCL of 1300 ug/L.

Response: **Table 2** has been revised to reflect the more conservative IDEM human health GLI criteria of 280 ug/L for copper.

GREENBELT AND EASTERN WETLAND BORDERING SWMU 15

Soil

Comment 1. This section states, "*In the case of manganese, the IDNL site-specific background value (i.e., Upper Tolerance Level, or UTL, as described in Section 6.1.1 of the Area C RFI; AMEC, 2011) is proposed as the MCS, which is lower than the Residential DEC but higher than IDEM's Migration to Groundwater standard*." However, Table 4 does not include manganese. Table 4 does not include all of the identified COPCs listed in Table 1 under "Eastern Wetland Soil", please clarify.

Response: **Table 1** lists initial COPECs identified in the Area C BERA. As referenced in the July 10, 2014 memo, manganese was eliminated as a COPEC for Area C soils and sediment along with barium, lead and mercury in the RFI Report for Area C (AMEC, 2011). Therefore standards were not established for those constituents in the July 10, 2014 memo. The text of the July 10, 2014 memo inadvertently references a media cleanup standard for manganese for Greenbelt and Eastern Wetland soil. This sentence will be removed from the memo text prior to its incorporation into the CMS Report.

Comment 2. Table 4 provides proposed cleanup standards for both muck and sand. It's unclear how these two criteria will be applied, where and why a distinction would be made, and how these criteria would be preferentially used over sediment criteria given the ephemeral nature of the water bodies within IDNL.

Response: Criteria for muck were included in **Table 4** of the July 10, 2014 memo because the USDA Web Soil Survey (USDA, 2014) maps Cowles Bog as Adrian muck near SWMU 15 and IDNL-GW13. However, the peat layer that is characteristic of Cowles Bog is not present in the wetland area around IDNL-SD13. Moreover, material collected from below standing water at IDNL-SD13 resembles sediment and the laboratory reports list percent solids contents of approximately 40%. These observations do not agree with the Adrian muck parent material described by the USDA as "herbaceous organic material over sandy outwash." Therefore, the muck category for soil will be removed from **Table 4** for use in the CMS Report. The upland area around IDNL-SD13 is mapped as an Oakville fine sand, with a parent material description of "Eolian sands." Therefore, the criteria for sand will be retained in the CMS Report.

Material sampled as part of the remediation at and near IDNL-SB51/SD13 will be classified as either sediment or sand based on visual appearance and whether or not standing water is present at the sample location at least periodically. **Table 4** will also be revised for use in the CMS Report to include both direct contact and migration to groundwater criteria. Direct contact criteria will be applied to both saturated and unsaturated soil, whereas the migration to groundwater criteria will only be applied to unsaturated soil. Due to the shallow nature of groundwater in the vicinity IDNL-SB51 (approximately one foot at the time of sampling) and periodic standing water at IDNL-SD13, it is anticipated that the SPLP-based criteria will have limited application as remediation criteria for soil.

Sediment

Comment 1. The Memo states that the more stringent of the EPA Region 5 Ecological Screening Levels or the site-specific background value (i.e., UTL) was proposed as the MCS. Table 5 proposes 1.6 mg/kg for cadmium which is the UTL. However, the R5 ESL of 0.99 mg/kg is lower and should be used.

Response: The memo text will be revised as follows in the CMS Report:

Table 5 *[as renumbered in the CMS Report] provides the proposed Media Cleanup Levels for sediment in the area of IDNL-SD13. The proposed Media Cleanup Levels are the higher of the EPA Region 5 Ecological Screening Levels or the site-specific background value (i.e., UTL) as described in Section 6.1.1 of the Area C RFI (AMEC, 2011).*

The proposed Media Cleanup Level will default to the site-specific background value if the Ecological Screening Level is lower than the background value. This procedure is applied in the development of cleanup standards in order to avoid a situation where the Media Cleanup Level is not achievable, as recommended by EPA (EPA, 2002b). In the case of cadmium, the UTL of 1.6 mg/kg was selected since the EPA Region 5 Ecological Screening Level of 0.99 mg/kg is lower than background.

IDNL GROUNDWATER

Comment 1. This section states, "…*compliance with the MCS for aluminum will focus on the downgradient border of SWMU 15 and will consider the influence of pH on the solubility of naturally-occurring aluminum*." EPA requests clarification on what this will mean in terms of meeting the MCS.

Response: As documented in the RFI Report for Area C (AMEC, 2011), exceedances of the aluminum background concentration of 140 ug/L result from naturally-occurring variations in pH that affect the solubility of aluminum. **Figure 6-5** and **Figure 6-42** from the Area C RFI have been reproduced as attachments to this response to comment memo. Aluminum concentrations downgradient of SWMU 15 are expected to be at or below background as indicated by the results from IDNL-GW13 shown on **Figure 6-5**. Note also that the pH at IDNL-GW13 ranges from 6.27 to 6.90, where aluminum is least soluble. Aluminum concentrations measured during post-remediation compliance monitoring will be evaluated by plotting the result with existing historic data represented in **Figure 6-42** from the Area C RFI (AMEC, 2011). Anomalous concentrations will be further evaluated. For example, the outlier indicated on **Figure 6-42** from monitoring well MW-101 in October 2005 has a pH of 8.01 and an aluminum concentration of 1200 ug/L. Since October 2005, sixteen additional pH measurements have been obtained for groundwater from well MW-101, ranging from 10.69 to 11.90 with an average of 11.49. Assuming the October 2005 pH value of 8.01 is inaccurate and assigning the average value for that well results in a more reasonable pH-dependent, naturally-occurring concentration.

Anomalous pH results measured during the corrective measures process will be similarly evaluated before concluding a Media Cleanup Level exceedance. For wells located downgradient of SWMU 15, repeat exceedances of the background value for aluminum in association with pH values in the range of 6.5 to 7.5 will be considered an exceedance.

REFERENCES

AMEC, 2011. RCRA Facility Investigation (RFI) Report for Area C. NIPSCO Bailly Generating Station, Chesterton, Indiana. April 2011.

Hanson, R.L. 1991. Evaporation and droughts. p. 99–104. In R.W. Paulson et al. (compilers) National water summary 1988–89—Hydrologic events and floods and droughts. U.S. Geological Survey water-supply paper 2375. U.S. Gov. Print. Office, Washington, DC.

USDA, 2014. Web Soil Survey Website: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed May 2015.

U.S. Environmental Protection Agency, 2002a. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Peer Review Draft. Office of Emergency and Remedial Response. OSWER 9355.4-24, December 2002.

U.S. Environmental Protection Agency, 2002b. Role of Background in the CERCLA Cleanup Program. Office of Solid Waste and Emergency Response. OSWER 9285.6-07P, April 26, 2002.

Table 1. Contaminants of Potential Ecological Concern
Area C Corrective Measures Study
Bailly Generating Station
Chesterton, IN

SWMU 15		
Soil	**Sediment**	**Groundwater**
Arsenic	Not Applicable	Aluminum
Boron		Arsenic
Cadmium		Boron
Chromium		Molybdenum
Copper		Selenium
Lead		
Manganese		
Molybdenum		
Selenium		
Eastern Wetland		
Soil [1]	**Sediment [1]**	**Groundwater**
Arsenic	Arsenic	Aluminum
Barium [2]	Barium	Boron
Boron	Boron	
Cadmium	Cadmium	
Chromium	Chromium	
Copper	Copper	
Lead [2]	Lead	
Manganese [2]	Manganese	
Mercury [2]	Mercury	
Molybdenum	Molybdenum	
Selenium	Selenium	
Central Blag Slough		
Soil	**Sediment**	**Groundwater**
Not Applicable	pH	Aluminum
		Manganese
Northwest Blag Slough		
Soil	**Sediment**	**Groundwater**
Not Applicable	Not Required	Aluminum
Little Lake		
Soil	**Sediment**	**Groundwater**
Not Applicable	Not Required	Aluminum
		Manganese
Other Wetlands		
Soil	**Sediment**	**Groundwater**
Not Applicable	Not Required	Aluminum
		Manganese

SWMU - Solid Waste Management Unit
Not Applicable - soil or sediment not present in sub-area.
Not Required - sediment in this sub-area does not require remediation.
[1] Only applies in Greenbelt at toe of SWMU 15 and potentially extending into the IDNL near IDNL-GW13.
[2] These constituents were so infrequently detected above screening values that they were not disccused further after the initial presentation of statistics in the Area C RFI, and therefore no media cleanup standards were developed.

Table 2. Proposed Media Cleanup Standards
SWMU 15 Soil
Area C Corrective Measures Study
Bailly Generating Station
Chesterton, IN

Analyte	Direct Contact (mg/kg)	Leaching from Unstaurated Soil (ug/L)	Groundwater MCS (ug/L)
ARSENIC	24 [1]	30	10 [3]
BORON	100,000 [2]	4,800	1,600 [4]
CADMIUM	800 [1]	15	5 [3]
CHROMIUM	100,000 [1]	300	100 [3]
COPPER	41,000 [1]	840	280 [4]
LEAD	800 [1]	45	15 [3]
MANGANESE	23,000 [2]	2,982 - 7,053	994 - 2,351 [5]
MOLYBDENUM	5,100 [2]	2,400	800 [4]
SELENIUM	5,100 [1]	13.8	4.61 [4]

Notes:

[1] IDEM RISC Industrial Soil Default Closure Level

http://www.in.gov/idem/files/risc_screening_table_2014_explanatory.pdf

[2] EPA Industrial Soil Regional Screening Level

[3] MCL - Maximum Contaminant Level

[4] GLI - Great Lakes Initiative

[5] GLI hardness-adjusted range with background established as lower limit.

GLI values derived from Criteria and Values for Selected Substances Calculated Using the Great Lakes Basin Methodologies (IDEM, 2002); boron value from IDEM Water Quality Standards Tier II 2004 update.

The proposed MCS for unsaturated soil is derived by multiplying the proposed MCS for groundwater by a factor of 3. The MCS for soil is measured using the Synthetic Precipitation Leaching Procedure (SPLP).

MCS - Media Cleanup Standard

Table 3. Proposed Media Cleanup Standards for Groundwater Area C Corrective Measures Study Bailly Generating Station Chesterton, IN

Analyte	Proposed MCS (ug/L)	COPECs	
		SWMU 15	IDNL
Aluminum	140 [1]	X	X
Arsenic	10 [2]	X	X
Boron [a]	1600 [3]	X	X
Manganese [a]	994 - 2351 [4]		X
Molybdenum [a]	800 [3]	X	
Selenium [a]	4.61 [3]	X	

Notes:

Analytes include those identified as an Area C BERA COPEC

BERA - Baseline Ecological Risk Assessment

COPEC - Contaminant of potential ecological concern

MCS - Media Cleanup Standard

ug/L - microgram per liter

[1] UTL - Upper Tolerence Limit (background)

[2] MCL - Maximum Contaminant Level

[3] GLI - Great Lakes Initiative

[4] GLI hardness-adjusted range with background established as lower limit.

[a] GLI values derived from Criteria and Values for Selected Substances Calculated Using the Great Lakes Basin Methodologies (IDEM, 2002); boron value from IDEM Water Quality Standards Tier II 2004 update.

Table 4. Proposed Media Cleanup Standards
Soil Near IDNL-GW13
Area C Corrective Measures Study
Bailly Generating Station
Chesterton, IN

Analyte	Sand (mg/kg)	
	Residental Direct Contact	Migration to Groundwater
Arsenic	8.5	5.9
Boron	22,000	200
Cadmium	98	7.5
Chromium	100,000	1,000,000
Copper	4,300	920
Molybdenum	550	32
Selenium	550	5.3

Notes:
Criteria from IDEM, 2014
http://www.in.gov/idem/files/risc_screening_table_2014_explanatory.pdf

Table 5. Proposed Media Cleanup Standards
Sediment Near IDNL-GW13
Area C Corrective Measures Study
Bailly Generating Station
Chesterton, IN

Analyte	Sediment (mg/kg)
ARSENIC	9.8 [1]
BORON	8.5 [2]
CADMIUM	1.6 [2]
CHROMIUM	43 [1]
COPPER	32 [1]
MOLYBDENUM	8.6 [2]
SELENIUM	19 [2]

Notes:
mg/kg = milligram per kilogram
[1] EPA Region 5 Ecological Screening Level
[2] UTL - Upper tolerance level (i.e., background). See Section 6.1 of the Area C RFI Report (AMEC 2011) for discussion of tolerance interval method for determining background concentrations.

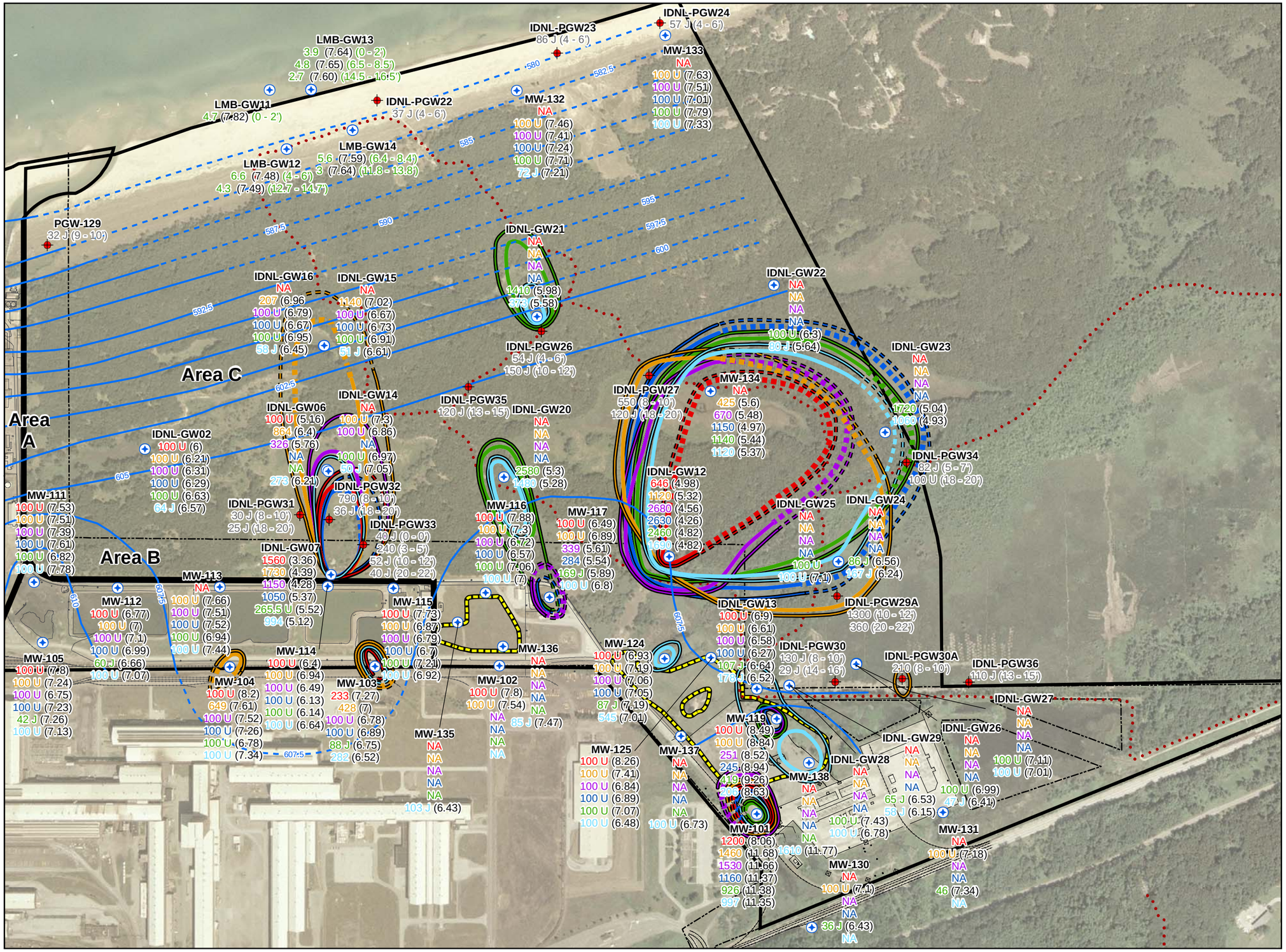
Table 6. Dilution Attenuation Factor Calculations
Proposed Media Cleanup Standards
Bailly Generating Station

Mixing Zone Depth (d)				
Term		**Units**	**Value**	**Source**
Source length	L	ft	100	Approximate length of SWMU 15 with sand in unsaturated zone below CCR, measured parallel to groundwater flow (in line with MW-101 and MW-119)
Infiltration rate	I	ft/yr	0.83	Average annual precipitation (40 inches, Indiana State Climate Office) minus average estimated Indiana evapotranspiration (30 inches) (Hanson, 1991)
Hydraulic conductivity	k	ft/yr	3292	Geometric mean of hydraulic conductivity values from four nested well triples (IDNL-GW30/31/32, MW-142)
Hydraulic gradient	i	ft/ft	0.002169	Hydraulic gradient from MW-142S to IDNL-GW30S in March 2015
Aquifer thickness	da	ft	31.5	From cross section A-A'
		d=	**20**	Equation 4-12 from EPA, 2002
Dilution Attenuation Factor (DAF)				
Term		**Units**	**Value**	**Source**
Hydraulic conductivity	k	ft/yr	3292	Geometric mean of hydraulic conductivity values from four nested well triples (IDNL-GW30/31/32, MW-142)
Hydraulic gradient	i	ft/ft	0.002169	Hydraulic gradient from MW-142S to IDNL-GW30S in March 2015
Mixing zone depth	d	ft	20	From mixing zone depth calculation above
Iinfiltration rate	I	ft/yr	0.83	Average annual precipitation (40 inches, Indiana State Climate Office) minus average estimated Indiana evapotranspiration (30 inches) (Hanson, 1991)
Source length	L	ft	100	Approximate length of SWMU 15 with sand in unsaturated zone below CCR, measured parallel to groundwater flow (in line with MW-101 and MW-119)
		DAF=	**3**	Equation 4-11 from EPA, 2002

Notes:

EPA, 2002 Equation 4-12: d = ((0.0112 x L^2)^0.5) + da x (1-EXP((-L x I) / (K x i x da)))

EPA, 2002 Equation 4-11: DAF = 1 + (k x i x d) / (I x L)



Area C Aluminum Groundwater Results

Northern Indiana Public Service Company

Bailly Generating Station
Chesterton, Indiana

Legend

Monitoring Well Sample Result (µg/L) (pH result)

100 U (7.72)	October 2005	100 U (7.72)	October 2008
100 U (7.72)	October 2006	100 U (7.72)	September/October 2009
100 U (7.72)	October 2007	100 U (7.72)	October 2010

29 (14-16') — May and June 2006 screening sample result (µg/L) and depth (ft bgs)

Groundwater Monitoring Wells

Direct Push Groundwater Sample Location

Known Groundwater Contour (ft)

Inferred Groundwater Contour (ft)

Area Boundary

Trail

Coal Combustion Residual Fill Area

For each respective sampling date (based on color) area of Aluminum concentrations above background limit of 140 µg/L (Boundary dashed where inferred)

For each respective sampling date (based on color) area of Aluminum concentrations above plant screening benchmark of 300 µg/L for groundwater (Boundary dashed where inferred)

Location of Site

Notes and Sources

FIGURE 6-5

Aerial Photo: March 2003, Courtesy of Indiana Spatial Data Portal
- All concentrations are in ug/L.
- U = Analyte not detected.
- J = Estimated value.
- Wells without results for a given round were not sampled and are shown as NA (not analyzed).
- If both total and dissolved results were available, the dissolved result was used.
- See Section 6.0 for summary of upper tolerance limits for background groundwater, water screening values, and plant screening benchmarks.
- If both normal and duplicate results were available, the maximum value of the two samples was used.
- For non-detect results, values are shown as half of the detection limit.
- Groundwater contours from October 2010.

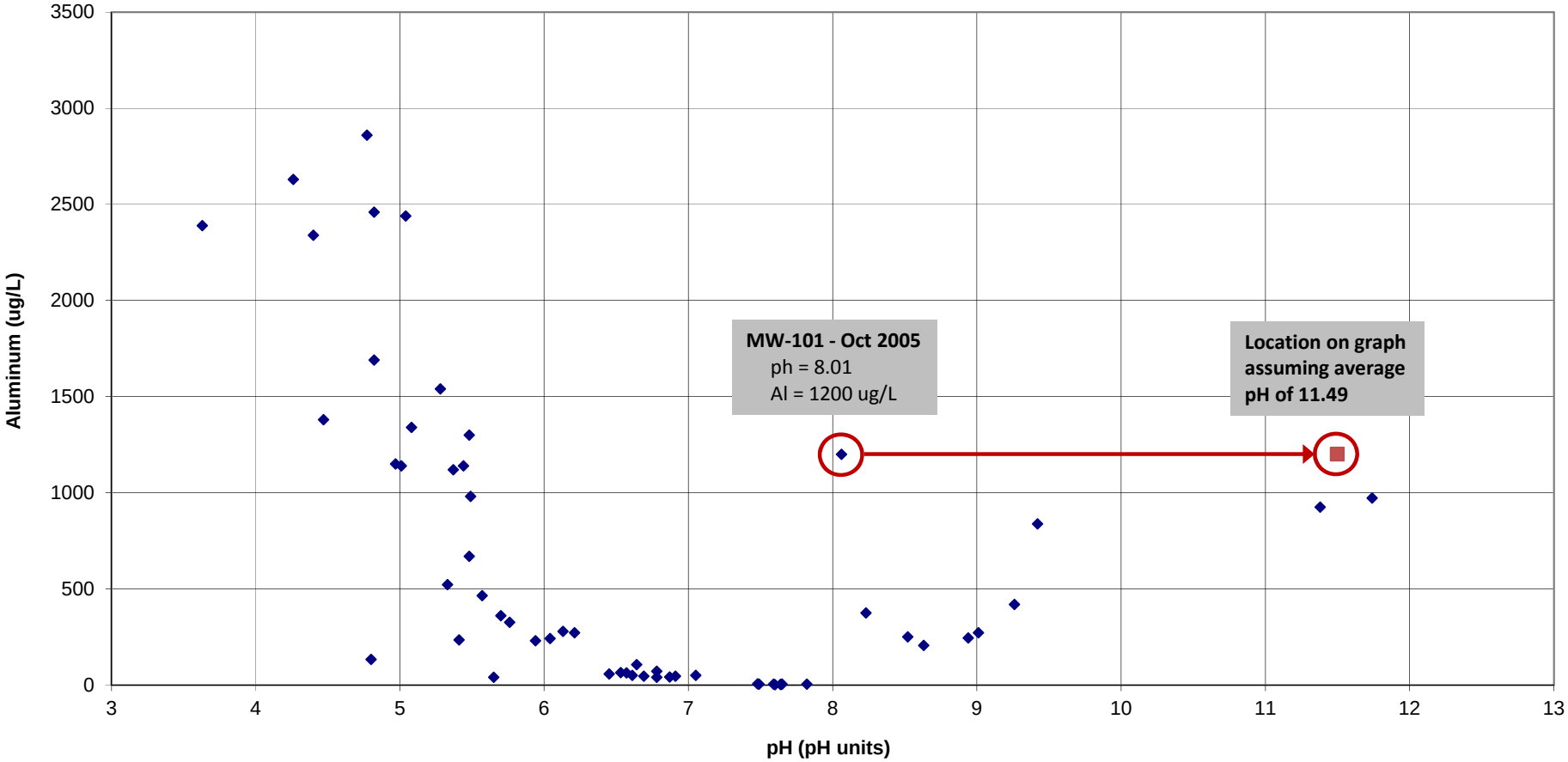
N

0 700 Feet

amec

H:\NiSource\BaillyGenerating\Task81\MXD\Fig6-5_Area_C_ AluminumPlume.mxd March 3, 2011 DWN: APC CHKD: JR

Figure 6-42
NIPSCO Bailly Generating Station
pH vs Aluminum in Area C Groundwater



Note: only dissolved results are shown.