February 12, 2020 Project No. 20141048

TECHNICAL MEMORANDUM

Mr. Kent A. Walters, Geologist
Materials Management Division
Grand Rapids District Office
Department of Environment, Great Lakes, and Energy
State Office Building
350 Ottawa Avenue, NW, Unit 10
Grand Rapids, Michigan 49503

UNIT 3 IMPOUNDMENTS ALTERNATE SOURCE DEMONSTRATION RESPONSE
GRAND HAVEN BOARD OF LIGHT AND POWER - JB SIMS POWER GENERATING STATION

Dear Mr. Walters,

Golder Associates Inc. (Golder) has prepared this memorandum (memo) in response to the Department of Environment, Great Lakes, and Energy (EGLE) letter dated January 28, 2021 to the Grand Haven Board of Light and Power (GHBLP) regarding the Alternate Source Demonstration prepared by Golder dated December 28, 2020. Comments received from EGLE are included below in bold with Golder's responses directly following the comment.

EGLE: Grand Haven Board of Light and Power (GHBLP) submitted a Unit 3 impoundment ASD on December 28, 2020, stating that the groundwater impact immediately adjacent to Unit 3A/3B is from another source. Michigan Admin Code, R 299.4440(9) governs requests for ASD and states:

> ***The owner and operator may demonstrate to the director that a source other than a landfill unit caused the contamination or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation or from natural variation in groundwater quality. A report that documents the demonstration shall be certified by a qualified groundwater scientist, be submitted to the director within 30 days of the determination specified in subrule (8) of this rule, and be placed in the operating record. If the director determines that the alternate source demonstration prepared pursuant to this subrule has not been successfully provided, the deficiencies shall be specified to the petitioner in writing and the petitioner granted 15 days to address those deficiencies identified by the director.***

Rule 299.4440(8), referenced by Rule 299.4440(9), in turn relates to when an owner or operator determines "that there is a statistically significant increase over background for one or more of the constituents at any monitoring well at the solid waste boundary or at other monitoring locations required by the

Golder Associates Inc.
27200 Haggerty Road, Suite B-12 Farmington Hills, Michigan, USA 48331-5719 T: +1 248 295-0135 +1 248 295-0133

director." GHBLP indicated statistical exceedances above groundwater protection standards in its 2018 annual groundwater monitoring report submitted January 2019. A timely ASD would have been submitted no later than March of 2019, and thus this ASD submittal is well beyond the 30-day deadline as required by R 299.4440.

Golder Response: For ease of reference, Golder has included the Part 115 references as well as the Federal CCR Rule. Following the PA 640 Section, 11511a(3)(c), Rule 440(9), similarly 40 CFR 257.94(2) follows detection monitoring and indicates that while in detection monitoring if an SSI is identified the owner/operator has 30 days to submit an ASD or Assessment Monitoring will be triggered. On April 2, 2018 GHBLP initiated assessment monitoring following the 40 CFR 257.95 and has conducted an assessment monitoring program to include the additional constituents identified in PA 640 Section 11511a(3)(c) and 11519b(2). GHBLP had initiated assessment monitoring prior to enactment of PA 640. Following Rule 4441(8) and similarly 40 CFR 257.95(g)(3)(ii) while in assessment monitoring, the owner/operator may demonstrate that a source other than the CCR unit caused the contamination. Specifically,

> *An owner and operator may demonstrate that a source other than a type II landfill unit or other source at the facility caused the contamination or that the statistically significant increase resulted from error in sampling, analysis, or statistical evaluation or from natural variation in groundwater quality. A report that documents the demonstration shall be certified by a qualified groundwater scientist, approved by the director, and placed in the operating record. Until a successful demonstration is made, the owner and operator shall comply with subrules (6) and (7) of this rule….*

Contrary to Rule 4440(9), the rule does not specify a timeline for which an ASD must be submitted while in assessment monitoring. As more data becomes available during the investigation, an alternate source may present itself as is the case for the former 3A/B Impoundments at JB Sims.

EGLE: Although the ASD was submitted almost two years past its required submittal date, EGLE will comment on the information provided in the ASD.

Golder Response: As stated above, GHBLP has conducted both detection and assessment monitoring over the past two years. Also, under Rule 4441(8), there is no required submittal date for an ASD. While performing assessment monitoring, GHBLP has conducted additional site evaluations in determining the nature and extent of groundwater impacts. GHBLP has collected additional site data and completed studies to determine imminent risk to human health and the environment and has diligently communicated with and responded to EGLE concerns over the boundary of the inactive 1/2 Impoundment and the monitoring well network. EGLE's statement above is incorrect in suggesting that an ASD must have been submitted prior to March 2019 in order to be considered as an ASD is specifically allowable under Rule 4441(8) at any time during assessment monitoring. This should provide adequate clarification and documentation that the timing of the ASD submittal is appropriate.

EGLE Comment:

1) **EGLE previously notified GHBLP that their groundwater monitoring network around Unit 3A/3B is inadequate to properly monitor groundwater downgradient of the unit. Since the addition of new groundwater monitoring points, a more consistent flow pattern appears to be emerging. Michigan coal ash rules require the number, spacing and depths of monitoring wells shall be based upon site**

specific information including seasonal and temporal fluctuations in groundwater flow (R299.4906(7)).

GHBLP does not meet this requirement as the ASD groundwater flow maps show there are no downgradient monitoring wells of Unit 3A/3B. GHBLP is therefore unable to assess if groundwater has been impacted from the units and has not properly assessed downgradient groundwater conditions to be able to submit an ASD.

Golder Response: Golder is currently evaluating expansion of the groundwater monitoring well network. However additional wells at the boundary of the former 3A/B Impoundments does not impact the demonstration. Golder disagrees that a more consistent flow pattern appears to be emerging. With the additional monitoring data, refinement of the groundwater flow pattern is presented. The flow pattern is understood. JB Sims is on an island in the Grand River. Groundwater within the island rises and falls in response to the elevation of the Grand River. Additionally, the potentiometric surface of unit being monitored is within 15 feet of ground surface. This uppermost aquifer consists of varying types of fill material and therefore, is NOT homogenous and NON isotropic (e.g., flow rate and flow direction are not consistent across the site). So, to state a more consistent flow pattern is emerging based on the depth and materials is inaccurate. For EGLE to state that there are no downgradient monitoring wells is also inaccurate.

Regionally, groundwater flow is toward the west and Lake Michigan. Locally, surrounding the former 3A/B Impoundments and around the inactive 1/2 impoundment, we observe radially outward flow patterns at different times throughout the year. Golder assumes EGLE is referring to a well north and south of the former 3A/B Impoundments being necessary as the deficiency comment is incomplete. Under this assumption, Golder ascertains that the three (3) detection monitoring wells MW-2, MW-3, and MW-4 as well as assessment monitoring well MW-9 are sufficient to monitoring the downgradient edge of the unit as regional flow direction is toward the west. Further, based on knowledge of the site, any well installed at the former waste boundary of the former 3A/B Impoundments either north or south would be installed in historical ash used as beneficial fill prior to the construction of Unit 3 and/or municipal solid waste and therefore would not provide for detection of a release from the former 3A/B Impoundments.

EGLE Comment:

2) GHBLP utilizes trend charts as a line of evidence to determine if the units have caused groundwater impact. EGLE recognizes that Units 3A/3B have been actively accepting wastes since the early 80s and provides the following comments:

a) GHBLP states that if Unit 3 was the source of groundwater impact, then closure of the units should produce decreasing trends in the groundwater. EGLE does not disagree with this statement, however GHBLP ceased accepting waste into Unit 3A/3B on July 30, 2020 and has had only one sampling event on September 25, 2020 after the units ceased waste acceptance. Furthermore, GHBLP photologs show coal ash wastes being removed well into October 2020. Using trend charts as an ASD is inappropriate in this circumstance because there has not been enough time, post waste removal, to monitor potential groundwater quality improvement.

b) Unit 3A/3B's National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Report (DMR) indicates a daily fluctuating discharge and likely fluctuating hydraulic loading within the impoundments. The inconsistent hydraulic loading of the ponds can produce inconsistent

analytical trends in the groundwater, therefore rendering analytical trends unreliable when used to track groundwater quality.

Golder Response: Golder has presented trend charts and the lack of either an increasing or decreasing trend as one of many lines of evidence that the source of groundwater impacts is not the former 3A/B Impoundments. The lack of either an increasing or decreasing trend simply substantiates that the source of the impacts is stable and longstanding (i.e., ash fill and comingled waste). This is consistent with Golder's observation that the bottom and sidewalls of the impoundment were intact and when upper layers of clay were removed, the lower levels showed no indication of penetration such as discoloration or mottling. Additional monitoring data available from November 2020 following removal of ash from former 3A/B Impoundments confirms the lack of trends in groundwater monitoring data which further supports the demonstration that former 3A/B Impoundments are not the source of groundwater impacts.

Golder disagrees with EGLE's further argument that the fluctuating hydraulic loading within the impoundments rendering unreliable utilization of trend analyses. Since the former 3A/B Impoundments were clay lined, it is not accurate to directly connect the inconsistent hydraulic loading of the impoundment to the groundwater quality. Any fluctuation of the hydraulic loading within the impoundments would be of negligible or very minimal impact compared to the fluctuating groundwater elevations and resulting gradients observed.

Regardless, the lack of increasing or decreasing trends in groundwater quality as it relates to the source of groundwater impacts is simply one of multiple lines of evidence that substantiates that the source of groundwater impacts are not from the former 3A/B Impoundment.

EGLE Comment:

3) **GHBLP compared major cations and ions from the source area and the surrounding groundwater near the source. GHBLP states that Unit 3A/3B have not leaked because the concentrations of major cations and ions in the groundwater are not like the wastewater contained within the impoundments and that data does not plot on a mixing line. EGLE does not agree that this is an appropriate method for determining alternate sources at the site for the following reasons:**

   a) **GHBLP uses groundwater, surface water and wastewater data spanning a 4-year period. Major cation and ion data should be compared from the same sample monitoring points collected during the same sampling events as source signatures can change over time.**

   b) **GHBLP has only collected one data point from Unit 3A/3B in 2017. The units were actively used since the early 80s disposing of coal ash wastes along with other waste streams including but not limited to Grand River chlorinated water, scrubber sump discharge, demineralizer water and coal pile runoff stormwater. It is likely that major cations and ions have changed over time, dependent on which and how much of a given waste stream is added into the impoundments during a given day/month. Using one single data point to characterize the Unit 3A/3B wastewater is not sufficient.**

   c) **The Unit 3A/3B wastewater may geochemically change due to differing pH levels and reactions occurring during migration through substrate. Based on site conditions at Unit 3A/3B, it is not appropriate to compare geochemical signatures from the source as the signature could change as the wastewater migrates into and reacts with the groundwater.**

Golder Response: The use of geochemical modeling tools (i.e., Stiff and Piper diagrams) has been used at multiple CCR and solid waste sites across the country. This modeling was presented to EGLE as early as November 2019. If EGLE disagrees with this evaluation tool and approach to assessing groundwater quality, why has EGLE not brought up the concerns prior to this letter. Golder disagrees with EGLE's comment regarding the utilization of geochemical modeling as an appropriate method to evaluate groundwater quality compared to the likely source of groundwater impacts.

Utilizing geochemical modeling techniques to determine whether or not a release has occurred from a CCR unit, or to delineate the extent of groundwater impacts if a release has occurred is recommended by the Electric Power Research Institute (EPRI) and has been well documented (Hem, 1985)[1]. Dating back to 1944, Piper diagrams have been used to interpret water analyses.[2] Discussion of Piper diagrams can be found in most hydrogeology textbooks and Wikipedia[3]. Piper diagrams are used to assess groundwater mixing (i.e., mixing of background and source water) and are prescribed by USGS[4].

The reasons provided by EGLE to discount the use of geochemical modeling to evaluate the groundwater quality and assess the source of groundwater impacts are not substantiated. Specifically, Golder has addressed each sub bullet separately.

a) EGLE suggests that because source data and groundwater quality data is collected over a period of time, it should not be used for comparison. Ideally, data would have been collected from all points at the same time. Multiple samples were collected from groundwater monitoring wells and no trend toward or away from the "source" was observed, therefore a single representative data point was used to plot results. We are using conservative tracers to plot this data. Simply because the data is collected over a period of time should not be a reason to discount this line of evidence.

   Further, a single source sample from the Unit 3 impoundments was used for the mixing analyses presented in the Piper diagrams. However, the data available has been substantiated by comparing published results to multiple published similar sources from other coal ash impoundments and documented by EPRI.

   The opinion that "major cation and ion data must be compared from the same sample monitoring points collected during the same sampling events as source signatures can change over time" is not accurate. Major ion data can be evaluated by comparing data from multiple sample monitoring points collected during the same sampling events as well as multiple sample points collected over multiple sampling events. We agree that source signatures can change over time; only viewing one specific sampling event is not looking at the whole picture. Golder has included the available data which includes multiple dates over a period of time.

[1] Hem, J.D., 1985. *Study and interpretation of the chemical characteristics of natural water* (Vol. 2254). Department of the Interior, US Geological Survey.

[2] Piper, 1944. A graphic procedure in the geochemical interpretation of water-analyses - Piper - 1944 - Eos, Transactions American Geophysical Union - Wiley Online Library

[3] Piper diagram - Wikipedia

[4] USGS, June 26, 2020. GW_Chart: A Program for Creating Specialized Graphs Used in Groundwater Studies (usgs.gov).