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Memorandum

To	Ms. Kathleen M. McDaniel Manitowoc City Attorney	Page	1of 5
CC	Mr. Edward B. Witte, Godfrey & Kahn, S.C.		
Subject	Former Town of Newton Gravel Pit Response to Manitowoc Company RAOR Comments		
From	Dave Henderson, AECOM Jeff Maletzke, AECOM		
Date	May 5, 2017		

This memorandum provides responses to comments on the draft Remedial Action Options Report (RAOR) for the former Town of Newton Gravel Pit project received from Ms. Jodi Arndt Labs, Conway, Olejniczak & Jerry, S.C., on behalf of The Manitowoc Company, Inc. (Manitowoc Company) dated April 12, 2017.

As you know, the Manitowoc Company retained the services of Ms. Arndt Labs and GEI Consultants (GEI) to review the RAOR. GEI provided their review comments in a memo dated April 10, 2017. Presented below are each of GEI's review comments followed by a corresponding response.

Please note that AECOM will take into account the written comments received when we revise the RAOR. We do anticipate that our response to comments provided below will be satisfactory to the Manitowoc Company, Ms. Arndt Labs, and to GEI.

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1. Source Remediation

   a. We agree with the concept of reducing the contaminant mass representing a continuous source of groundwater contamination. In our opinion, mass reduction is the most critical component of site remediation, resulting in the greatest impact on environmental remediation. Proposed plans for vapor extraction, light non-aqueous phase liquid (LNAPL) recovery and capping appear to be a reasonable approach.

      Is there an estimate of the mass reduction that can be attained by implementing the recommended source remediation?

      <u>Response:</u> Contaminant mass estimates are difficult to quantify and typically include an uncertainty of minus 50% to plus 100%.The total contaminant mass in the Western Source Area was estimated in the LNAPL Characterization and Contaminant Mass Analysis Technical Memorandum (AECOM, August 1, 2016) at approximately 199,300 lbs. Generally speaking, mass reduction utilizing an active engineered system (in this case, SVE and LNAPL recovery) can be expected to

recover between approximately 20% and 50% of both residual hydrocarbons and recoverable free product.

b. The August 1, 2016 Technical Memorandum on Characterization of Contaminant Mass estimates the contaminant mass currently present in the source area including the vadose zone and LNAPL zone.

Based on LNAPL transmissivity, how much LNAPL will remain following practical recovery through the proposed skimmer pumps?

Response: Transmissivity modeling was not conducted due to the limited applicability of the results based on the LNAPL specific gravity and the effects of viscosity. Additionally, we plan on enhanced recovery efforts through the application of SVE and local, down-well, heating to improve effective transmissivity and LNAPL viscosity effects. In general, recoverable free product typically represents 20-50 % of the total mass.

What is the estimated time for operating the LNAPL and SVE systems and the corresponding operation and monitoring costs?

Response: As noted in Section 4.2.2 of the RAOR, the estimated operating time is 5 years. The estimated corresponding budget level operation and monitoring costs over this period are approximately $96,000.

What is the estimated contaminant mass remaining following completion of the proposed LNAPL and VES recovery?

Response: See response to comment 1a above.

c. We concur that excavation and off-site disposal, while effective, will be costly due to the anticipated regulation under the toxic substances control act (TSCA).

Should the excavation alternative be re-visited following completion of the LNAPL recovery? Will the excavated material still be considered a TSCA waste (or RCRA- TSCA waste) at that time and what further contaminant mass reduction will be gained?

Response: As noted in previous responses, mass reduction utilizing SVE and LNAPL recovery will result in an irretrievable residual contaminant mass within the Western Source Area. This residual contaminant mass will result in continued consideration of excavated material as TSCA waste. Therefore, it is anticipated that the excavation alternative will remain too costly and will not be revisited following completion of the LNAPL recovery.

d. The schedule submitted with the RAOR indicates source remediation may be initiated following a 5-year groundwater monitoring period. In our opinion the LNAPL source area should be mitigated as an initial corrective action to reduce the contaminant mass, control further degradation of downgradient groundwater quality and limit long-term monitoring costs. This opinion is based on the assumption that the proposed LNAPL recovery and VES system will effectively remove a significant quantity of the contaminant mass.

What is the criteria, including conditions and schedule, for determining when to implement source remediation and contaminant mass reduction?

<u>Response:</u> Please note that, due to feedback from the Wisconsin Department of Natural Resource (WDNR), the RAOR will be revised to acknowledge that source remediation and contaminant mass removal will occur and not be dependent on the data obtained during an initial 5-year groundwater monitoring period. Based upon construction schedules and budget periods, the SVE and LNAPL recovery systems are expected to be installed during 2018.

Discussions with the WDNR and the City of Manitowoc (City) have identified that reducing the toxicity and volume of impacted groundwater moving down gradient of the source and limiting off-site migration of residual groundwater impacts are the priorities for the initial corrective action. Mass removal at the Western Source Area is a WDNR requirement, however, it is anticipated that source control measures will ultimately leave residual contamination that can still impact groundwater. As noted in the RAOR, a surface cap will be installed at the Western Source Area in conjunction with constructing the engineered pond. The cap will mitigate infiltration and percolation of surface water through the impacted soil. The engineered pond will intercept and treat the groundwater plume directly down gradient of the Western Source Area.

2. Potable Well Target Zone

   a. It is our understanding that remedial action objectives do not include further corrective action aimed at addressing the water supply wells and no additional remedial action is proposed within the potable well target zone.

   b. Source remediation will improve conditions in the potable well target zone over time and natural attenuation is the final remedy.

      <u>Response:</u> Other than continued potable well monitoring and providing safe drinking water where and when applicable, that is correct.

3. Groundwater Treatment Area

   a. Proposed corrective action consists of excavating the soil to create a pond with approximate dimensions of 500 feet long, 160 feet wide and 30 feet deep (20 feet below apparent water table). In general, groundwater will flow into the pond and be discharged to Silver Creek via a weir controlled discharge structure. While we anticipate that once groundwater enters the pond, contaminant concentrations will decrease and surface water discharge standards will be achieved, it is our opinion the presence of the pond will have limited influence on improving groundwater quality beyond that achieved through effective source reduction.

      i. Are there examples of the use of groundwater treatment ponds for similar conditions?

      <u>Response:</u> Proposing no active remediation in the Groundwater Treatment Zone fails to recognize the anticipated on-going groundwater quality impacts from residual (irreducible) contamination in the source area.

      As noted in Section 5.2.1 of the RAOR;

"During a project specific Technical Information meeting[1] between the City, WDNR and AECOM; Dave Johnson, Hydrogeologist with the WDNR Division of Environmental Management, Drinking and Groundwater Section, suggested that the Former Newton Pit site presents a unique combination of contaminant compounds, subsurface conditions, and a topographic profile that might make it a good candidate for the installation of a groundwater treatment pond."

A summary of specific research and additional field investigation activities completed to evaluate the use of groundwater treatment ponds has been previously submitted to the WDNR in a Groundwater Treatment Area Feasibility Study Technical Memorandum[2] and in the RAOR. Additionally, constructed wetlands, of which the treatment pond qualifies, is an industry proven technical solution for the treatment of volatile organic compound (VOC) impacted water.

ii. If the pond is 30 feet deep and 160 feet wide, this suggests about a 2.5 (vertical): 1 (horizontal) side slope. Has the constructability of the pond been evaluated including stability of the base and slope under saturated conditions?

Response: The pond is anticipated to be 20 feet deep and with safety shelfs and floor width, about 140 feet wide at the normal water level of 685 ft mean sea level (msl). The pond side slopes are designed at approximately 3:1 (h:v). The stability of the pond under these conditions has been reviewed and determined to be constructible.

iii. How will the presence of the pond influence long-term monitoring costs and time to achieve environmental closure? What is the anticipated economic benefit, or return on construction cost, for building the pond?

Response: The pond addresses VOC impacts within the Groundwater Treatment Area, to reduce the groundwater contaminant mass migrating down gradient towards the Potable Well Target Zone. If the aquifer response to the engineered treatment Pond results in groundwater data indicating steady state or declining contaminant levels, the long-term monitoring costs and time to achieve environmental closure may be reduced. As stated in the RAOR, an initial 5 year groundwater monitoring period is estimated and the final surface water discharge monitoring period will be determined by the conditions of the Wisconsin Pollutant Discharge Elimination System permit.

The anticipated economic benefit is provided by the lower cost relative to other remedial alternatives, such as a permeable reactive barrier, for the Groundwater Treatment Area.

b. The phased approach presented in the RAOR consists of constructing the pond, then evaluating conditions for 5 years before determining whether to implement source remediation. Capital costs presented for pond construction are $675,000 relative to estimated

[1] *Manitowoc City/Former Newton TN Gravel Pit Technical Information Meeting Minutes*, April 1, 2015, Oshkosh DNR Service Center.
[2] *2015 Task 31; Groundwater Treatment Area Feasibility Study Technical Memorandum*, AECOM Technical Services, Inc., dated April 4, 2016.

capital cost for source remediation of $350,000. We recognize the operating cost for source remediation will exceed operating costs for the pond.

i. What is the total cost (capital, operation and monitoring) per estimated mass removed for the following scenarios:

1. Proposed source remediation without the pond?

2. Proposed pond construction without source remediation?

3. Proposed source remediation with pond construction?

Response: Calculation of such a "cost of removal factor" is of little practical value as it relates to the chosen remedial options for this project. The regulatory requirements to conduct groundwater and source area remediation to reduce contaminant mass and decrease possible impacts to human health are the overall driving factors. In addition, the uncertainty inherent in quantifying the total contaminant mass and in predicting mass removal creates a "removal factor" with little or no accuracy.

ii. Can the performance of proposed source remediation be evaluated prior to constructing the pond? We recognize the fill required for the capping component was being generated by the pond construction. Perhaps the proposed cap could be reconfigured to reduce the quantity of imported fill required for cap construction.

Response: Please see the response to comment 1d. Regardless of the "success" of the source remediation, residual contaminant mass will continue to impact groundwater down gradient of the source area. The WDNR and City have prioritized active remediation in the Groundwater Treatment Zone in order to begin limiting the impacts to off-site potable wells. Please note construction of the pond is proposed concurrent with installation of the surface cap at the Western Source Area.

c. We concur with the proposed use of available funding for phytoremediation efforts.

i. Can the proposed phytoremediation proceed independent of the pond construction?

Response: The phytoremediation work is proceeding independent of the pond construction. The phyto work is being conducted in conjunction with the US Department of Agriculture (USDA), Forest Service, under an EPA Great Lakes Restoration Initiative Action Plan II grant. As a sole technical approach to groundwater treatment, the phytoremediation alone cannot provide hydraulic gradient influence as deep into the groundwater plume as the proposed pond. In addition, it takes 3 to 4 years for the trees to establish root systems and provide significant water uptake (i.e. to provide additional hydraulic gradient control).

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CC	Mr. Edward B. Witte, Godfrey & Kahn, S.C.	
Subject	Former Town of Newton Gravel Pit Response to Gould Electronics RAOR Comments	
From	Dave Henderson, AECOM Jeff Maletzke, AECOM	
Date	May 5, 2017	

This memorandum provides responses to comments on the draft Remedial Action Options Report (RAOR) for the former Town of Newton Gravel Pit project received from Mr. Tom Rich on behalf of Gould Electronics Inc. (GEI) dated April 14, 2017. Presented below are each of GEI's review comments followed by a corresponding response.

Please note that AECOM will take into account the written comments received when we revise the RAOR. We do anticipate that our response to comments provided below will be satisfactory to Mr. Rich and GEI.

Generally:

A. The materials provided do not include a response letter to WDNR's comments in Mr. Begg's email from September 2016, and the RAP does not address all such comments. The City should provide GEI with its specific response to each of WDNR's September 2016 comments.

Response: AECOM, on the behalf of the City of Manitowoc (City) will be providing the Wisconsin Department of Natural Resources (WDNR) a revised RAOR that addresses all of Mr. Beggs' comments. Once submitted, the revised RAOR will be available from the WDNR on their Bureau of Remediation and Redevelopment (BRRTS) website. http://dnr.wi.gov/botw/GetActivityDetail.do?detailSeqNo=33760

B. The RAP does not provide sufficient information to support the stated characterizations of the carbon footprint of each remedial action option.

Response: The Former Town of Newton Gravel Pit project is regulated by the WDNR under the Wisconsin Administrative Code (WAC) Chapter NR 700 rule series. The information presented in the RAOR along with the qualitative characterization of the project's sustainability meets the requirements of NR 700.

C. The RAP does not provide sufficient information to support the cost estimates for each remedial action option in Section 4. At a minimum, details should be provided regarding the direct capital, indirect capital, and operation and maintenance costs. This should include associated unit costs, quantities, durations and underlying assumptions.

Response: The budgets presented in the RAOR for the purposes of comparing the remedial alternatives are based on estimated engineering and construction costs. Operation & maintenance (O&M) costs are reviewed as they relate to each option and provided to the client for budgeting discussions. The budget information provided is in accordance with NR700. For the Newton Pit site the following estimated costs were considered:

Western Source Area:

- *Monitored Natural Attenuation, typically $40,000 to $100,000 per year.*
- *Engineered Treatment System, $330,000 to $350,000*
  - *Cap Construction Costs, $129,000*
  - *SVE & LNAPL Construction Costs, $211,397*
  - *O&M costs, $96,000 over five years*
- *Excavation with off-site disposal, $3,800,000 to $5,100,000*

Groundwater Treatment Area:

- *Monitored Natural Attenuation, typically $40,000 to $100,000 per year.*
- *Permeable Reactive Barrier, $1,100,000 to $2,300,000.*
- *Engineered Treatment Pond, $488,000 to $675,000*
  - *O&M costs, dependent on negotiated WPDES sampling frequencies.*

Source Area Remediation:

A. The RAP also does not describe the performance standards that will apply to the SVE and LNAPL components, and doesn't provide any analysis supporting the assumption that they will only need to operate for five years.

Response: The technical basis for the SVE system design is presented in the Soil Vapor Extraction Pilot Study Technical Memorandum[1]. The tech memo presents the results of the SVE pilot test conducted in September 2015 along with a discussion of the system design parameters. Similarly for the LNAPL removal, indications from field testing, along with the aquifer characteristics (e.g. sandy soils) suggest that LNAPL recovery is a feasible remedial method to reduce LNAPL mass. The five year operation estimate is based on a combination of professional judgement and vetting/review by the WDNR. Actual operational periods will be dependent on field operational data.

B. The RAP does not provide sufficient information to support the stated volume assumptions for waste characterization for the soil excavation remedial action option.

[1] 2015 Task 32; Soil Vapor Extraction Pilot Study Technical memorandum, AECOM Technical Services, Inc., dated August 1, 2016.

<u>Response:</u> The stated volumes provide an estimate only. The overall volume of excavated soil is coincident with the extent of the Western Source Area as determined from field investigations. The volume of soil assumed impacted above TSCA limits is coincident with extent of free product within the source area. The volume of soil for off-site disposal at a Subtitle C landfill was assumed at 20% of the soil surrounding the defined extent of free product. The assumed volume of non-impacted soil is simply the remaining balance of the overall excavation area.

Shallow Groundwater Remediation:

A. The RAP does not discuss the expected NPDES discharge limits for the engineered pond, or provide any basis for the City's assumption that the pond will meet, or be able to meet those limits solely through aeration.

<u>Response:</u> The background technical basis for the engineered pond design is presented in a Groundwater Treatment Area Feasibility Study Technical Memorandum[2]. This discussion is augmented by the RAOR and by our Wisconsin Pollutant Discharge Elimination System (WPDES) Contaminated Groundwater From Remedial Action Operations (Permit No. WI-0046566) general permit application.

B. The RAP also does not provide any analysis to support the assumption that VOC emissions from the pond will be deemed *de* minimis and unregulated.

<u>Response:</u> The RAOR states "Due to the parts-per-billion levels of COCs in the groundwater the emissions created by volatilization of VOCs from the groundwater are considered negligible." This statement takes into account the transmissivity of the aquifer, the groundwater contaminant concentrations, the application of WAC Chapter NR 419.07 4 (b) limits and WAC Chapter NR 445.07 Table A values and the concurrence from WDNR air permit staff.

C. The RAP does not explain what will happen with the excess 75,000 cubic yards of soil that will be generated from the engineered pond construction.

<u>Response:</u> As described in Section 5.2.1 of the RAOR the estimated 82,000 cubic yards of soil excavated to create the pond and channel will be managed as follows:

• Material excavated from above the water table will be considered clean material not impacted with VOC compounds. AECOM proposes that these clean materials can be used without limitation. They can be relocated on the property for use as fill or they can be transported off-site for use as fill on any commercial project.

• Material excavated from below the water table will be considered impacted by VOC compounds. AECOM proposes that these VOC-impacted materials can be used on-site as fill within the formally delineated VOC groundwater plume area. If these materials are tested and found to have no-detectable levels of VOCs (as defined by the laboratory method detection limit for VOCs) – these materials may be used without limitation.

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[2] 2015 Task 32; Groundwater Treatment Area Feasibility Study Technical memorandum, AECOM Technical Services, Inc., dated April 4, 2016.

Additionally, in accordance with Mr. Beggs' September 2016 comments on the RAOR, AECOM will be providing a NR 718 tech memo and revisions to the RAOR that will further delineate the use of the excavated material from the pond. Once submitted, the tech memo and revised RAOR will be available on the BRRTS website.

D. Due to the innovative nature of the engineered pond approach, detailed bench- scale and possibly pilot-scale testing should be performed as part of any final design.

Response: A summary of specific research and additional field investigation activities completed to evaluate the use of a groundwater treatment pond has been previously submitted to the WDNR in a Groundwater Treatment Area Feasibility Study Technical Memorandum[3] and in the RAOR. Additionally, constructed wetlands, of which the treatment pond qualifies, is an industry proven technical solution for the treatment of volatile organic compound (VOC) impacted water.

In addition, GEI believes that the City has not justified its selection of an engineered pond over a permeable reactive barrier.

A. For example, the RAP rejects the reactive barrier partly on the grounds that some water may flow beneath it, but doesn't apply the same criticism to the engineered pond. Such barriers, which are a proven technology for the types of COCs and hydrogeology at the Site, are frequently installed to a depth of 35 to 50 feet using long-stick trackhoes or one-pass trenching systems.

Response: The RAOR does not recommend the permeable reactive barrier (PRB) for several reasons including;

- *the hanging wall design, without other hydraulic control efforts, may allow contaminated groundwater to flow beneath or around it,*
- *questions about the long-term effectiveness of this alternative as inorganic constituents in the groundwater may form mineral precipitates on the iron surface and clog the PRB, reducing its effectiveness over time, and,*
- *on the basis of cost. The PRB is anticipated to cost more than the groundwater treatment pond.*

B. The proposed pond will also allow groundwater to flow below and, because it's only 400 feet wide at the base, will allow water to flow around the sides too. Unlike a reactive permeable barrier, that could intercept the entire plume if desired, the proposed pond will intersect 2/3 or less of the complete horizontal and vertical limits of the impacted groundwater.

Response: The proposed design of the pond will directly intersect two-thirds of the vertical extent and the entire width of the horizontal extent of the plume at the groundwater table. As explained in Section 5.2.1 of the RAOR, hydraulic control due

[3] *2015 Task 31; Groundwater Treatment Area Feasibility Study Technical Memorandum*, AECOM Technical Services, Inc., dated April 4, 2016.

to evaporation and discharge to Silver Creek will create a groundwater capture zone around and beneath the pond thereby effectively increasing the size of the pond and its influence on the groundwater plume.

C. Under the evaluation criteria, the fact that the reactive barrier destroys VOCs, while the pond merely transfers them from water to air, also favors the barrier.

Response: As noted in Section 5.2.1 of the RAOR, the treatment process of VOCs anticipated to occur within the pond include volatilization, phytoremediation, aerobic-bioremediation, and solar (i.e. UV radiation) oxidation. Volatilization is anticipated to be the main remedial process with phytoremediation, aerobic-bioremediation, and solar oxidation providing minimal benefits that will vary according to the season.

One of the reasons volatilization of VOCs is effective is because VOCs are actively oxidized and destroyed once they are transferred to the atmosphere.

D. A reactive barrier could be installed in a much shorter time frame than the engineered pond and phytoremediation remedies. One-pass trenching systems can achieve 200 to 400 linear feet per day at the depths assumed at this site.

Response: The RAOR does not discount the permeable reactive barrier on the basis of installation/construction time, but rather on the basis of, hydraulic control, long term effectiveness, and cost. The lower end of the estimated cost for the permeable reactive barrier exceeds the cost for the recommended remedial alternative (treatment system in the Western Source Area and the engineered pond in the Groundwater Treatment Area).

E. Finally, a reactive barrier would not require special attention to deal with freezing conditions during Wisconsin winters, the way a pond would. If the pond freezes, it will stop intercepting and treating groundwater. The RAP does not include enough design detail to determine how much of a risk this is.

Response: The pond was designed taking into account groundwater transmissivity and horizontal flow velocity, which means that even in winter the pond will intercept and treat groundwater. Additionally, as mentioned in Sections 4.3.3 and 5.2.1 of the RAOR, circulation equipment would be used to provide physical mixing and aeration to augment the pond operation during the winter months.

Overall, based on the information the City has provided, a permeable reactive barrier should be the preferred remedy, as it would be less expensive, easier to install, operate and maintain, and would intercept more of the plume than the engineered pond.

Response: *See responses A & D above.*