REGION 5
CHICAGO, IL 60604
March 5, 2025

Michael Gerdenich
BASF Corporation
1609 Biddle Avenue
Wyandotte, Michigan 48192-3729

Re: Comprehensive Interim Measure Remedy Additional Information on Clay Layer and Soil Properties, EPA ID: MID064197742

Dear Mr. Gerdenich:

Following the issuance of EPA's November 8, 2024, letter, BASF and EPA held several discussions regarding the scope of EPA's comments and the required deliverables related to BASF's March 4, 2025, 60% Basis of Design (60% Design) for the Comprehensive Interim Measure Remedy. One of the requirements in EPA's November 2024 letter was for BASF to submit a pre-trenching and/or predrilling program aimed at addressing data gaps identified in EPA's review of the 60% Design. On December 13, 2024, BASF provided EPA additional information in a PowerPoint presentation on the depth of the clay layer for EPA's consideration prior to moving forward with a pre-trenching or predrilling program.

After review of the slides and presented information, EPA is requiring BASF to (1) develop a draft section for the 95% Design ("Perimeter Barrier Report") that provides a detailed presentation of all datasets used to determine the design depth of the sheet pile wall (along the northern perimeter, southern perimeter and rip-rap shoreline) into the clay layer that is critical in acting as ground water aquitard; and (2) conduct a limited investigation along the Southern Proposed Perimeter Section C along James DeSana Drive (see Attachment B) for delineation for the historical ship slip area. Each of these requests are outlined in detail below.

Perimeter Barrier Report:

BASF must prepare a draft section of the 95% Design that captures the perimeter barrier location, depth, and current datasets presented to EPA on December 13, 2024, with the geophysics results from the 60% Design. This Perimeter Barrier Report should take the information presented and provide a more in-depth depiction of the perimeter barriers, broken down into sections, and a description of the datasets involved.

The report or draft section must provide a narrative from both a geological and engineering standpoint that:

- Hydraulic Properties: Describes the hydraulic properties of the clay layer and a rationale for the 3-foot embedment depth as it pertains to containment of groundwater. Specifically, that the clay layer identified in the cross sections is the same interval that had a low hydraulic conductivity and thus would inhibit groundwater migration off-site from the Hydraulic Profiling Tool (HPT) dataset, soil boring, and geophysical information.
- Cross sections and Figures: Updates figures to show the 3-foot embedment depth from the December 13, 2024, PowerPoint slides. Retains the same number of segments displayed in the cross sections as the PowerPoint slides depicted. Ensures the cross-sections show the established elevation of the clay layer into which the sheet piles are to be driven.

Limited Investigation:

EPA is also requiring BASF to collect soil borings within Section C (Attachment B). The soil boring locations must address the area near SB-112-24 to provide additional delineation for the historical ship slip area. Other areas along this section with larger discrepancies between the datasets may also require this additional investigation. The limited soil investigation workplan must be submitted to EPA for review and approval.

The soil borings should also have testing completed to provide geotechnical information on the properties of the clay layer. The following should be performed on the sheet pile wall embedment clay profile:

i. Pocket penetrometer testing on the in-situ clay during drilling, along with the Standard Penetration Test (SPT) blow counts.
ii. Index testing for the clay including moisture content (ASTM D2216), sieve analysis with hydrometer (ASTM D422), and Atterberg Limits (ASTM D 4318).
iii. Flexible-wall permeability testing (ASTM D 5084) of the in-situ clay to further demonstrate that the clay meets the barrier requirements noted in Section 4.3.1.1. Specimens of the in-situ clay (e.g., soils sampled using Shelby tubes) should be used for analysis by falling head test based on the low permeability of the clay layer.
iv. Additional strength and consolidation testing on the in-situ clay to determine if the clay profile meets the requirements of the sheet pile wall design for embedment and to account for potential clay settlement after the wall is installed.

Please submit the Perimeter Barrier Report as a draft section of the 95% Design by June 30, 2025. For the Limited Investigation work plan, please submit a copy for EPA review by April 4, 2025. If changes to the deadlines are needed, BASF must submit a written request for an extension to EPA.

The EPA appreciates BASF's cooperation on the Comprehensive Groundwater Interim Measure to address concerns and comments on the 60% Basis of Design. The EPA response to BASF's comment tracking table that were also part of the discussions on December 13, 2024, and December 19, 2024, are provided in Attachment A. In addition to these responses to comments, please note that EPA may require additional revision to the 95% Design or to these comments on the 60% Design, if needed.

Sincerely,

SHILPA PATEL

Digitally signed by SHILPA PATEL
Date: 2025.03.05 09:27:43 -06'00'

Shilpa Patel
Acting Branch Manager, Remediation Branch
Land, Chemicals, and Redevelopment Division

ENCLOSURES
Attachment A: Comment Tracking Table on 60% Basis of Design
Attachment B: 2024-12-13 PreDrilling and PreTrenching Meeting Slides, Arcadis

cc:
Doug Lam, US EPA LCRD RB Project Manager
Valerie Voisin, US EPA LCRD RB Project Manager
Elizabeth Garver, Michigan EGLE Environmental Manager
Kimberly Tyson, Michigan EGLE Hazardous Waste Section Manager
Marc Messina, Michigan EGLE Geologist
Christina Herbert, Michigan EGLE

Attachment A: Comment Tracking Table on 60% Basis of Design

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
Section 2 Site Description and Background				
1	Section 2.3, PDF Page 14, First Bullet: The text refers to the BASF North Works Geotechnical Data Report (Arcadis 2021a). This report contains data used for the design. a. BASF Action Item: In the 95% Design, attach the BASF North Works Geotechnical Data Report to Appendix F.	12/19/2024	The BASF North Works Geotechnical Data Report (Arcadis 2021a) will be added to Appendix F - SPT Soil Boring Logs, in the 95% Design submittal this Appendix will be renamed Geotechnical Data.	EPA finds the response to this comment acceptable.
2	Section 2.3, PDF Page 16, Last Paragraph: The soil-cement slurry barrier wall type is no longer proposed, additional freeze-thaw evaluations of the soil-cement design mix are no longer needed; instead, all subsurface barriers are proposed as steel sheet pile. a. BASF Action Item: In the 95% Design, add a short discussion to support the proposed decision to use steel sheet piling rather than soil-cement slurry.	12/19/2024	This discussion was included in Section 4.2.1 of the 60% Design: *An ex-situ mixed borrow soil-cement wall was proposed in the Preliminary (30%) BOD Report for this portion of the barrier network due in part to the high potential for encountering obstructions in the fill layer. Upon review of recent geophysical studies conducted in this area, it was determined that the potential for encountering obstructions is not as great as originally anticipated and that, with certain construction measures in place, a driven sheet pile wall would be an appropriate technology to implement along the rip rap shoreline (Figure 4, Appendix G, and Appendix I).* *Additionally, in comparison to the soil-cement wall option, a driven sheet pile wall will be less disruptive and result in a smaller footprint during construction that could impact sensitive adjacent properties.*	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
			Section 4.3.1 includes additional detail on the Intermediate (60%) Design basis for this wall design and the construction measures that will be taken during implementation.	
Section 3 Perimeter Barrier Remedy Basis				
3	Section 3.2, PDF Page 17 Proposed Remedy Description: This section indicates a funnel and gate system may be considered in the future if site conditions change. Please note that EPA's April 24, 2018, letter cited several components of BASF's prior funnel and gate proposal to be problematic. Any major design change, such as funnel and gate, from the current proposal described in the 60% Design must be submitted to EPA for review and approval. a. BASF Action Item: In the 95% Design, remove references to funnel and gate system or reference EPA's April 24, 2018 letter.	12/19/2024	The April 24, 2018 letter was in response to the proposed Engineered Discharge Zone (EDZ) remedy which is not the same remedy as the funnel and gate (F&G) system proposed as a potential remedy option in the May 2019 Remedial Design Work Plan. The EDZ is a passive barrier remedy whereas the F&G system would consistent of a physical barrier with passive treatment gates. The F&G remedy option was conditionally approved, as part of the Remedial Design Work Plan, by EPA via email on October 23, 2019. However, based on current site conditions, the technical feasibility and cost benefit of a F&G system are not apparent, and the F&G option was not carried forward as part of the perimeter barrier remedy. References to the F&G system will be removed from the 95% Design BODR to avoid confusion but a F&G system may still be considered in the future if site conditions change. If and when BASF would like to propose converting the system from a pump and treat system to a F&G system, a revised	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
			design proposal would be submitted to EPA for review and approval.	
11	Section 4.3.1.3, PDF Page 37, 2nd Paragraph: This paragraph states that based on findings from subsurface investigations along the alignments, the pile depths for the northern alignment of the sheet pile wall will vary from approximately 12 feet below proposed grade at the western end to 25 feet at the connection to the existing sheet pile bulkhead. For the southern alignment, the pile depths will range from approximately 17 to 57 feet below proposed grade. These are large ranges in depth. It doesn't appear to be a consistent clay layer, and additional confirmation soil borings to determine the horizontal and vertical extent of the clay layer are required. a. BASF Action Item: Add a figure showing profile view of both alignments including borings with top of clay elevation in the 95% Design. Additionally, please see EPA comments on Appendix D for further detail.	12/13/2024	Drawing Numbers 0154-SITE-C2-79746 to 0154-SITE-C2-79751 in the 60% design submittal include both plan views and profiles of the proposed subsurface barrier wall alignments. These profile views included the estimated top of clay surface based on findings from subsurface investigations along the proposed alignment. For the 95% design submittal, the locations of the soil borings, HPT borings, MASW, and composite design top of clay surface will be included on both the plan view and profile figures associated with the subsurface barrier wall alignments.	EPA finds the slides from 12/13/2024 useful for the purposes of reviewing already available information on the differencing barrier depths. Please see the letter for additional requirements pertaining to this comment.
12	Section 4.3.1.3 Pile Depths and Appendix J, Design Calculations – Please see EPA comments on Appendix D for further detail.	12/13/2024	It is assumed that both items a and b of this comment refer to the subsurface barrier wall portion of the groundwater remedy. a. This comment refers to expected clay	Please see the letter for additional requirements pertaining to this comment.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	a. In general, BASF needs to provide more clarity on the actual top and bottom of clay elevations along the sheet pile wall anchoring alignments and provide more detail on the clay's geotechnical properties along the depth of the clay. Based on the geotechnical logs provided, there are potentially two strength profiles of clay, one with higher Standard Penetration Test (SPT) blow counts (~5 to 10) and one with lower SPT blow counts (~0 to 4). i. BASF Action Item: BASF needs to determine if the minimum clay strength parameters needed to anchor the sheet pile wall are present within the in-situ clay profiles to the embedment depths required. b. This section speaks to that "In areas of the alignment where the clay profile is variable, the contractor will be required to conduct a pre- drilling program to refine the clay surface and provide additional information on potential for encountering subsurface debris during installation. It is anticipated that the pre-drilling program will consist of soil borings spaced at 25-foot intervals, advanced to the top of the clay layer, with visual confirmation of the clay surface		strengths along the alignment and the potential variation of strengths based on the SPT blow count data collected from the soil borings. For design of structural walls (i.e., walls that support applied loads) it is important to understand and design to the estimated strength of a bearing layer. For non-structural walls, such as for a subsurface groundwater barrier, the wall is not designed to support loads and the soil strength properties at the bottom of the wall are not essential for wall design. While it is important to understand the soil properties at the bottom of the wall for hydraulic cutoff purposes (soil type, permeability), knowing the strength properties is important for installation of the wall and what consistency (soft, hard, dense) the contractor should expect to encounter during wall installation. Evaluations will be provided that demonstrate that the soil frictional resistance against the piles will provide sufficient resistance such that the self-weight of the embedded pile will be supported. b. A summary of the evaluations completed to support the basis that a pre-drilling and geotechnical testing program for the subsurface barrier wall is not warranted is included in the slide	

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	via sampling. Limits of the pre-drilling program will be provided in the Pre-final (95%) Design for the barrier remedy." i. BASF Action Item: BASF must conduct the pre-drilling program prior to the 95% Design submittal and include results of a pre-drilling program as a separate submittal as noted in the letter above. This data will provide more clarity for the sheet pile wall design prior to installation of the wall. After reviewing the 60% Design and the BASF North Works, Geotechnical Data Report, Barrier Wall Pre-Design Investigation, prepared by Arcadis, June 28, 2021, the following BASF Action Items for the geotechnical testing should be performed on the sheet pile wall embedment clay profile during the pre-drilling program to supplement the geotechnical information already gathered for the site: i. Pocket penetrometer testing on the in-situ clay during drilling, along with the SPT blow counts; ii. Index testing for the clay including moisture content (ASTM D2216),		deck from the December 13, 2024 meeting.	

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	sieve analysis with hydrometer (ASTM D422), and Atterberg Limits (ASTM D 4318); iii. Flex-wall permeability testing (ASTM D 5084) of the in-situ clay to further demonstrate that the clay meets the barrier requirements noted in Section 4.3.1.1.; and iv. Additional strength and consolidation testing on the in-situ clay to determine if the clay profile meets the requirements of the sheet pile wall design for embedment and to account for potential clay settlement after the wall is installed.			
15	Section 4.3.2.1.3, PDF Page 38, Paragraph 3: Appendix J includes a summary of the 2020 soil data collected for the bulkhead design. This summary includes an analysis of the SPT and CPT borings, geotechnical laboratory testing, and in-situ field vane testing in support of selection of the design soil profiles and soil parameters used in this Intermediate (60%) Design. The summary of soil conditions assumed soil parameters, and soil profiles should be presented in the body of the report text, not in an attachment in an appendix of the report.	12/13/2024	A summary of the soil conditions will be included in the calculation summary text for the bulkhead design. Elevation range for top of clay and range of permeability values will be added to this paragraph.	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	a. BASF Action Item: Provide the summary of soil conditions within the body of Appendix J. Comment to be addressed following the additional soil-boring collection in the pre-drilling program and no later than March 30, 2025.			
Section 4 Perimeter Containment Barrier				
16	Section 4.3.2.1.3, PDF Page 39, 3rd bullet: This bullet speaks to that a soft to medium stiff layer of lacustrine clay was encountered ranging in thickness from approximately 25 to 43.5 feet in the upland area and from approximately 15 to 25 feet in the river. a. BASF Action Item: Add top of clay layer elevation range and permeability of clay sample test results to this bullet. Comment to be addressed following the additional soil-boring collection in the pre-drilling program.	12/13/2024	Elevation range for top of clay and range of permeability values will be added to this paragraph.	EPA finds the response to this comment acceptable.
17	Section 4.3.2.2.1, PDF Page 39 1st Paragraph: This paragraph states that the steel bulkhead structure will consist of an anchored steel sheet pile wall. a. BASF Action Item: Please reference the Comprehensive Interim Measure Remedy Selection correspondence dated May 25, 2023 in the 95% Design.	12/19/2024	A reference to the Comprehensive Interim Measure Remedy Selection correspondence dated May 25, 2023 will be added to the 95% Design.	EPA finds the response to this comment acceptable.
18	Section 4.3.2.2.2, PDF Page 40 a. BASF Action Item:	12/13/2024	A table will be included that summarizes the assumed soil parameters for the bulkhead design.	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	b. Add a table in the 95% Design section presenting the assumed soil profile parameters for each SSP design cross section. Comment to be addressed following the additional soil-boring collection in the future pre-drilling program and no later than March 30, 2025.			
19	Section 4.3.2.2.2, PDF Page 41, 1st bullet: Restating this bullet that in consideration of the proposed compliance gradient requirement of 0.5 ft inward gradient, it was therefore conservatively assumed that the water levels on either side of the bulkhead were the same (i.e., no water level differential) and the net hydrostatic pressure on the wall was zero. a. BASF Action Item: The 95% Design should describe and evaluate the hydrostatic pressure on the wall when the groundwater extraction system fails and groundwater rises to typical surfaces while the river level is at lowest water depth.	12/19/2024	The 95% Design will describe and evaluate the hydrostatic pressure on the wall when the groundwater extraction system fails and groundwater rises to ground surface/flooding levels while the river level is at historical low level of 569.54 ft. IGLD 85.	EPA finds the response to this comment acceptable.
20	Section 4.3.2.2.2, PDF Page 41, Design Criteria and Assumptions: Hydrostatic loads: This section speaks to the seiche events and its impact on the 0.5 ft inward gradient of the groundwater collection and treatment system. However, the impacts of pressure on the perimeter barriers during seiche	12/19/2024	The 95% Design will include an evaluation of increased pressure on the perimeter barriers during seiche events (historical high water level) and the estimated impacts on the perimeter barriers while the groundwater extraction system is operating normally.	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	events were not included in the discussion. a. BASF Action Item: In the 95% Design, add an evaluation of increased pressure on the perimeter barriers during seiche events and the estimated impacts on the perimeter barriers.			
22	Section 4.3.2.2.2, PDF Page 41, 4th Paragraph: This paragraph speaks to the assumptions on the bulkhead design criteria are listed in Appendix J. a. BASF Action Item: In the 95% Design, add the assumptions in Appendix J to the relevant text in the design document.	12/19/2024	The assumptions in Appendix J (Design Calculations) will be added to the relevant text in the 95% Design BODR.	EPA finds the response to this comment acceptable.
23	Section 4.3, PDF Page 42, Table 8: Steel Tie Rods a. BASF Action Item: In the 95% Design, add the proposed spacing of the tie rods and H pile anchors to the table (currently table 8 in the 60% Design).	12/19/2024	The proposed spacing of the tie rods and H pile anchors will be added to the table in the 95% Design (currently table 8 in the 60% Design).	EPA finds the response to this comment acceptable.
24	Section 4.3.2.2.3, PDF Page 42, Results of the Intermediate (60%) Design Calculations: This first bullet on this page references king piles; however, king piles are not discussed in Appendix J (Design Calculations). As such, it is not clear if king piles are still a design option.	12/19/2024	The reference to king piles in Section 4.3.2.2.2 was included to define what a combination wall would be constructed of: "Wall type: regular sheet pile wall or combination wall (i.e., king piles and intermediate sheet pile or similar system)". King piles are not proposed as a wall option. This bullet will be revised to "Wall type" in the 95% Design for clarity.	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	a. BASF Action Item: In the 95% Design, revise this section and Appendix J to address this discrepancy.			
26	Section 4.3.2.4.3, PDF Page 45, Buttressing to Increase Passive Resistance: This section indicates the finished grade in front of the wall will be higher from placement of the buttress material and the localized stability of the buttress would need further review. However, it is not clear if this review will be done as part of the 95% Design. a. BASF Action Item: Include the information on buttresses described above in the 95% Design.	12/19/2024	If the buttressing alternative is incorporated into the design for increasing passive resistance for the bulkhead, the buttress information and design calculations will be included in the 95% Design.	EPA finds the response to this comment acceptable.
28	Section 4.3.2.3.1, PDF Page 43, 4th Paragraph: This paragraph speaks to that a sealant will be applied to the sheet pile interlocks prior to sheet pile installation. Various interlock sealants are commercially available and are routinely applied by contractors or fabricators. Sealant material and any installation requirements specific to the project must be included in the specifications. Add this detail to the 95% Design.	12/19/2024	Interlock sealant material and installation requirements are included Draft Specification Section 31 62 16.13 - Steel Sheet Piling of the 60% design. The specifications for the interlock sealant will be reviewed and adjusted as the barrier design is advanced to the 95% design. From the 60% Spec Section 31 62 16.13 - Steel Sheet Piling: 2.2 Related Materials A. Hydrophilic Waterstop Sealant: 1. Material shall be single-component, gun-grade, polyurethane sealant. Sealant shall be expandable by not less than 200 percent of dry volume when in the presence of water to form water-tight joint seal.	EPA finds the response to this comment acceptable.

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			2. Product and Manufacturer: Provide one of the following: a. De Neef Swellseal WA by GCP Applied Technologies, Inc. b. Ultraseal P-201 by Adeka Corporation. c. Or equal. 3.2 Preparation E. Pile Preparation: 4. Interlock Preparation: Seal all pile interlocks with hydrophilic waterstop sealant. CONTRACTOR shall be responsible for all delays, repairs, additional Work, and expenses resulting from improper sealing of pile interlocks. a. Clean interlock surfaces immediately before installing sealant. Remove dirt, weakly-adhering coatings, moisture, and other substances that would interfere with bonds of sealant compound as recommended in sealant manufacturer's written instructions. Blow out interlocks with oil-free compressed air. b. Remove rough or sharp edges on leading (male) interlock and install sacrificial plug at bottom of interlock to prevent entrance of dirt and debris during driving. c. Apply hydrophilic waterstop sealant to lagging (female) interlock after cleaning. Locate sealant as near as possible to center of interlock. Sealant shall be continuous along entire length of interlock. Comply with sealant manufacturer's written instructions.	
33	Section 4.4, PDF Page 46, Paragraph 1: The existing bulkhead portion of the barrier system is approximately 3,243	12/19/2024	Figures showing the extent of each wall section of the existing bulkhead alignment will be added to the 95% Design.	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	feet and is typically described by sections that reference the historical facility feature, namely the Light Dock, Heavy Dock, and North Central Shoreline. a. BASF Action Item: Add a figure showing the extent of each wall section alignment to the 95% Design.			
34	Section 4.4.1.1.2, PDF Page 47, Findings from Visual Inspections and Diver Survey: This section notes that other than a number of open lift holes and leakage observed at three waler bolt locations, no other openings, holes, or gaps were noted from the diver survey. However, photograph 85, in Appendix C (Diver Inspection Summary) identifies stations 32+52 – 32+64, as one large problem area that runs an average distance of 3 feet, 6 inches down from the cap, and there are several holes visible. While the visible holes in this photograph are above the water line, this section of the text needs to clarify the findings of the diver survey assessment. Similarly, for photograph 104. Further, photograph 95 notes holes around the 10-inch pipe at station 32+75. a. BASF Action Item: In the 95% Design, revise this section to address the above	12/19/2024	These stations are all along the Perry Place bulkhead, which is owned and maintained by the City not BASF, and is not included as part of the barrier for the site. The observations noted by the divers in this area are the reason this bulkhead was excluded from the barrier design going from 30% to 60%. The BODR text will be modified to "other than a number of open lift holes and leakage observed at three waler bolt locations, no other openings, holes, or gaps were noted from the diver survey along the existing BASF bulkhead that will be included as part of the perimeter barrier " for clarification. Arcadis will also add text and call outs within the cover letter, figures, and photo log included in Appendix C indicating that the Perry Place Bulkhead is City owned and not part of the BASF barrier remedy.	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	noted findings from Appendix C and the diver survey.			
36	Section 4.4.1.2.1, PDF Page 48, Paragraph 2: A typical cross section for the Heavy Dock section is shown on the Design Drawings (Appendix G). a. BASF Action Item: In the 95% Design, please reference the specific sheet number.	12/19/2024	The specific sheet number for the Heavy Dock typical cross section (0154-SITE-C2-79774) will be added to the 95% design.	EPA finds the response to this comment acceptable. Please also update the Heavy Dock cross sections with the recent boring information collected in 2024. Please also break the cross sections into similar scale as the ones in the 12/13/2024 slides.
Appendix A – Draft Perimeter Conceptual Site Model				
47	Appendix A, PDF Page 115, Draft Perimeter Conceptual Site Model, Section 3, Updated Perimeter Conceptual Site Model: This section notes that the sheet pile creates a hydraulic barrier with the Detroit River that acts as a no-flow boundary during pumping tests. a. BASF Action Item: Indicate the source for the pumping test data/results that support this statement in the written response to comments and provide these details in the 95% Design. b. BASF Action Item: In the 95% Design, revise this section and reference the relevant reports to substantiate these statements.	12/19/2024	a. The pumping test that supports this statement was conducted in 2021 and showed the existing bulkhead wall was a barrier to flow. The data/results of this test were included in the DRAFT Hydraulic Pre-Design Investigation Report, submitted August 27, 2021. b. This report will be referenced in the 95% Design to substantiate this statement.	EPA finds the response to this comment acceptable.
Appendix D – Geophysical Survey Results Report				
64	Appendix D, PDF Page 2142, Draft Geophysical Survey Results Report, Section 1, Background and Objectives, 3rd Paragraph, 1st Sentence: This	12/19/2024	The phrase “tested and collected” will be changed to “collected and evaluated” in the 95% Design.	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	sentence states, “To address the noted data gaps, Arcadis tested and collected several types of geophysical data between August 14 and September 22, 2023, and performed test pit observations of select geophysical anomalies between October 23 and October 30, 2023.” However, several types of geophysical data were evaluated but not tested. a. BASF Action Item: In the 95% Design, change the phrase “tested and collected” to “collected and evaluated” for clarification.			
65	Appendix D, PDF Page 2143, Draft Geophysical Survey Results Report, Section 1, Background and Objectives, 6th Paragraph, 1st Sentence: This sentence states, “GPR technology was selected for testing to potentially obtain several types of pertinent information including: ….” However, the technology was not selected for testing because the methods have already been tested when it was developed. a. BASF Action Item: In the 95% Design, change the word “testing” to “evaluation” for clarity and readability.	12/19/2024	The word “testing” will be changed to “evaluation” in the 95% Design.	EPA finds the response to this comment acceptable.
70	Appendix D, PDF Page 2145, Draft Geophysical Survey Results Report, Section 3, Geophysical Methods, Data Collection, and Data Processing, 4th Paragraph, 8th Sentence: The text	12/19/2024	This description will be revised to state that the geophones, which are evenly spacing on the surface, record the direct, refracted and reflected body waves and slower moving surface waves used in the	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	states, “A line of evenly spaced highly sensitive geophones oscillate as the surface waves travel outward from the hammer blow.” However, the springs with the geophones oscillate but not the geophones themselves. a. BASF Action Item: In the 95% Design, revise this description to state that the geophones, which are evenly spacing on the surface, record the direct, refracted, and reflected waves.		MASW data analysis that trail behind the body waves.	
72	Appendix D, PDF Page 2150, Draft Geophysical Survey Results Report, Section 5.1.1, Aboveground Anomalies from Known Objects: Features known or observed at the surface are not anomalies by definition since the source the of elevated response associated with the surface feature is known. a. BASF Action Item: In the 95% Design, change "Anomalies" to "Features" in the title of this section.	12/19/2024	"Anomalies" will be changed to "Features" in the title of this section.	EPA finds the response to this comment acceptable.
73	Appendix D, PDF Page 2154, Draft Geophysical Survey Results Report, Table 2, Known Underground Utilities Crossed by Proposed Design Features: Some of the details on the underground utilities need further clarification. a. BASF Action Item: In the 95% Design, provide two numbers past the decimal for each easting and northing listed for	12/19/2024	Two numbers past the decimal for each easting and northing will be provided in the 95% Design.	EPA finds the response to this comment acceptable.

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	consistency and to reflect the accuracy of the coordinates.			
75	Appendix D, GENERAL – Electromagnetic Metal Detection (EM-61) Survey: a. It would have been prudent to have established a base station for this device since there are many potential sources of interference from ferrous and non-ferrous metals across the study area. While not required, it is good practice to establish a base station for calibration and independent quality control of data throughout the data gathering process in the field. Utilization of a base station was not discussed in the Report. (This comment was partially answered in the June 7, 2024 supplemental letter discussing geophysical survey techniques. Two areas outside of the survey zones were identified as locations for checking null response on the EM-61 platform prior to and during survey transects. While helpful, a prove out area to check null and repeatability over known responses is part of a more robust QA/QC protocol on larger surveys.) b. The East-West running lines that are associated with the Northern Perimeter/ Perry Place in the north and James DeSana Drive in the south contain a number of overhead electrical	12/13/2024	a. As discussed in the June 7, 2024 supplement letter daily nulling daily nulling was performed at a designated location. In addition, daily data review was performed to identify potential latency in the data by scrutinizing patterns in the data where linear objects were crossed at high angles in passes of the instrument that were alternately south-to-north and then north-to-south. Characteristic zig-zag patterns were observed and a y-axis shift correction was applied to the data to remove this effect. In addition, data review was performed where data overlap occurred to assure that signal levels were comparable over time. Should any additional EM-61 surveys be conducted as part of the barrier remedy design QA/QC procedures will be discussed and agreed upon with EPA prior to executing the work. b. New figures scaled in a size format that includes references to anomalies and features were provided in the slide deck from the December 13, 2024 meeting. c. The EM-61 subsurface anomalies, as	Please see the letter for additional requirements pertaining to this comment.

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	lines and transformers as well as numerous adjacent steel buildings. Section 5.1.1 and Table 4 on page 16 of Appendix D partially address these concerns; however, the number of power lines, transformers, and industrial equipment might induce too much noise into the data for effective filtering. The interpretation of the data sets on the included figures does not provide enough detail to show the features that were easily identified on the surface or of known subsurface interference. The scale of the figures is such that fine details and responses are too small to be seen and identified. Provide new figures scaled in a size format that can include more references to anomalies and features that would allow for use in picking drilling/excavation sites for ground truthing or removal along the proposed barrier. c. The plan for barrier wall construction includes excavation of a trench prior to installation (see Section 4.3.x and comments above). However, EM-61 subsurface anomalies should be investigated and removed prior to the 95% Design submittal to increase confidence that the proposed layout is viable.		identified in Appendix D, fall into one of two categories: historical infrastructure or debris. The historical infrastructure is well understood based on Site figures, maps, historical imagery and drawings that have been closely reviewed. The debris is generally small in nature and removable based on findings during geophysical test pitting (i.e. rebar, abandoned metal piping, etc.). Contractors will be provided information related to historical infrastructure and debris to be prepared during remedy construction. Pre-trenching known debris will not provide any additional value or reduce risk therefore BASF is not recommending pre-trenching/clearing debris prior to the 95% Design. d. Based on the discussion/responses above pre-trenching is not recommended prior to construction.	

Comment Number	EPA Comment	Date(s) Discussed with EPA	BASF Response to Comment	EPA Response to Comment
	d. BASF Action Item: The general issues noted above need to be addressed following the completion of the predrilling program described in the letter above. A written response to comments is due on or before March 30, 2025.			
Appendix F – SPT Soil Boring Logs				
76	Appendix F: General Comment, SPT Soil Boring Logs: The SPT soil boring logs need additional detail provided in the design document. a. BASF Action Item: In the 95% Design, add laboratory test results of soil samples collected in the soil borings. Add soil profiles along the north and south sections. Add a discussion for findings: top of the clay layer; subsurface data for installation of barrier components; and calibration of the geophysical survey results. Add all pertinent historical soil boring and well logs used in the design.	12/13/2024	No laboratory test were collected from the recent Nov. '23 and January '24 SPT soil borings. A discussion of the findings and development of the clay surface profile will be included in the 95% BODR.	EPA finds this response acceptable
77	Appendix I: PDF Page 2655, Subsurface Barrier Options Summary Table: A table should be added for the bulkhead wall comparison of sheet pile with tiebacks vs. king pile/SSP wall option (unless this was already presented in the 30% design documents). a. BASF Action Item: EPA recommends performing a Value Engineering study	12/19/2024	Value Engineering will continue to be performed as the 95% design progresses. Results of the VE will be included in the 95% Design along with a summary table attachment of the bulkhead wall options similar to what was presented in the 60% design for the subsurface barrier wall options.	EPA finds this response acceptable.

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	to determine most cost-effective remedies.			
80	Appendix J, PDF Page 2673, Hydrostatic Assume., note 4: This note speaks to "It was assumed that there is no water level differential and the net hydrostatic pressure on the wall will be zero." a. BASF Action Item: Check this scenario in the 95% Design for when the groundwater treatment system fails, landside water level rises, and river level is in a low seiche condition or Low Water Datum.	12/19/2024	This scenario/assumption will be checked and verified after evaluating the hydrostatic pressure loads identified in comments 19 and 20.	EPA finds this response acceptable.
81	Appendix J, PDF Page 2684, Attach. 3 – Soil Analysis for Design Parameters, page 1/6: The subsurface conditions at the South Dock area of the Site, along with physical characteristics of the geologic units are provided in the geotechnical data report for the Site (Arcadis 2021). a. BASF Action Item: The GDR should be attached to the 95% Design. A summary of the results should be presented in this Appendix.	12/19/2024	The BASF North Works Geotechnical Data Report (Arcadis 2021a) will be added to the 95% Design. A summary of the results from this report has been incorporated into the calculation summary for the bulkhead (Appendix J).	EPA finds this response acceptable
82	Comment 82 was the BASF Action Item for EPA comment 81.	12/19/2024	N/A	N/A

Attachment B: 2024-12-13 PreDrilling and PreTrenching Meeting Slides, Arcadis

WORKING DRAFT – SUBJECT TO REVISION

Southern Subsurface Sheet Pile Alignment

ARCADIS