

**From:** Ziegelbauer, Heather/MKE <Heather.Ziegelbauer@jacobs.com>  
**Sent:** Friday, May 24, 2019 4:16 PM  
**To:** Neal, Conor; Carey, Angela J - DNR; Fassbender, Judy L - DNR  
**Cc:** Jeffrey Howard Danko; Joseph Janeczek; Ryan Suennen; Finney, David/BOS; Mitchell, David/BOS  
**Subject:** [WARNING: ATTACHMENT(S) MAY CONTAIN MALWARE]Tyco May 13 Project Status Meeting - Presentation Materials, Meeting Notes and Proposed Schedule  
**Attachments:** TycoProjectStatusMeetingPresentation\_20190513-PoreWater WP-Final.pdf; TycoProjectStatusMeetingPresentation\_20190513-FYR-RTC-Final.pdf; TycoProjectStatusMeetingPresentation\_20190513-AddendumRTC-Final.pdf; TycoProjectStatusMeetingPresentation\_20190513-Other-Misc-Final.pdf; TycoProjectStatusMeetingMay13Notes-20190524.pdf  
**Follow Up Flag:** Follow up  
**Flag Status:** Flagged  
**Categories:** Green category, Reference

All,  
 Per your request during our meeting on May 13, 2019, attached are the presentation materials for your reference as follows:

- Review of Sediment Conditions and Migration Pathways Work Plan (Pore Water Work Plan) Presentation
- Five-Year Technical Review Report–EPA and WDNR Comments and Responses Presentation
- Addendum to 2015 Barrier Wall Groundwater Monitoring Plan Update –Responses to EPA and WDNR Comments Presentation
- Other/Miscellaneous Items Presentation

Also attached are meeting notes to document major discussion points and decisions during the meeting for your review.

In addition, below is our proposed schedule for follow up response items:

Document	To Agencies	Response from Agencies	Field Work*
Pore Water Work Plan	June 21	July 12	August 5
BWGMPU Addendum	June 21	30-60 days**	Well installation June Semi-annual event –following well install VBW inspection - ~July when water clarity is good
Five Year Review	60 days, July 12	30-60 days	No field work specific to document
Vapor Intrusion Analysis	90 days, August 11	30-60 days	Additional VOC GW sampling in during semi-annual event to replace old VOC data
Stormwater CCR	90 days, August 11	30-60 days	TBD

Notes:

- \* All field dates subject to subcontractor/field staff availability (and weather/site conditions)
- \*\*Tyco is moving forward with all field aspects per discussions with agencies during 5/13/19 meeting

Please let us know if you have any questions.

Thanks,

Heather Ziegelbauer, PE\*

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**Subject** Status Meeting Notes from May 13, 2019, for the Tyco Stanton Street Facility RCRA Project

**Attendees** Conor Neal/EPA  
Dave Franc/TetraTech (via phone)  
Heather Ziegelbauer/Jacobs  
Dave Finney/Jacobs  
Dave Mitchell/Jacobs  
Angela Carey/WDNR  
Judy Fassbender/WDNR  
Jeff Danko/Tyco-JCI  
Ryan Suennen/Tyco-Tyco Fire Protection  
Joe Janeczek/Tyco-JCI

**Meeting Date** May 13, 2019

**Location** Milwaukee, Wisconsin

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### Status Update Meeting Notes

The meeting started at 10:30 a.m. Central time.

#### 1. Introductions

Representatives from the U.S. Environmental Protection Agency (EPA), Wisconsin Department of Natural Resources (WDNR), Jacobs Engineering Group Inc. (Jacobs), and Tyco-JCI (Tyco) attended the meeting in person or via phone.

#### 2. Review of Sediment Conditions and Migration Pathways Work Plan (Pore Water Work Plan Presentation)

Jacobs reviewed the presentation slides regarding the sediment conditions and migration pathways work plan. There was limited discussion during the presentation. The following summarizes the major discussion points, mainly at the end of the presentation.

EPA asked if an upwelling study was considered. Jacobs indicated it was considered but determined that it would be technically difficult to complete an upwelling study (need at least 1 inch of sediment for temperature differential/fiber optics, Trident probe cannot be inserted into till, etc.). The work plan focused on areas in the Turning Basin where glacial till was a concern and other locations based on 2018 analytical results to better understand migration pathways. Draft surface-weighted average concentration (SWAC) calculations also were completed that showed only the Turning Basin exceeded 20 milligrams per kilogram (mg/kg), and the overall SWAC was less than 20 mg/kg.

EPA asked about trying to collect groundwater from bedrock. If arsenic was identified in bedrock, the project team would need to consider mitigation measure options. EPA indicated that even getting to bedrock and not getting a sample is good information. WDNR indicated that the proposed approach for the work plan was a good start; however, WDNR agreed with EPA and believed it would be good to have a complete data set versus completing as a separate evaluation at a different time. WDNR indicated that depending on what the data collected indicate, Tyco may need to follow up with bedrock sampling. Tyco indicated it has been known that bedrock could not be addressed as part of the remedy, and mentioned frustration about bringing up bedrock as a "new" issue. Tyco did not agree to include bedrock groundwater sampling into the work plan.

Near the end of the meeting, CAPSIM model and post-remediation conceptual site model slides were reviewed as supplemental information and are included at the end of pre-station slide-deck. WDNR indicated they are interested in knowing how long until 20 mg/kg is reached in a worst-case scenario, which will allow them to understand potential future management approaches.

EPA wanted to revisit Comment 4, Bullet 2 on sampling in the dredge footprint. The team indicated that to better address this comment, Tyco should provide available data, sources of this data, SWAC maps, and SWAC calculation processes as part of the work plan. Tyco agreed to include the information in the work plan. EPA requested that a discussion of data points in excess of 20 mg/kg should be provided.

**Path Forward**

Tyco agreed to provide a proposed schedule for the work plan to the agencies.

**3. Addendum to 2015 Barrier Wall Groundwater Monitoring Plan Update – Response to EPA and WDNR Comments (Addendum Response to Comments Presentation)**

Jacobs reviewed presentation slides regarding response to agency comments on the Addendum to the 2015 Barrier Wall Groundwater Monitoring Plan Update (Addendum). The following summarizes the major discussion points during the presentation.

**General Comments**

- WDNR indicated that head differential (inward gradient) is WDNR’s primary way to evaluate the effectiveness of barrier walls. This site is difficult because that is not required in some areas.
- Tyco/Jacobs indicated that WDNR’s general comment was similar to EPA’s comment; however, based on the additional language, it appeared WDNR was not in agreement with the path forward EPA, WDNR, and Tyco had agreed upon. WDNR indicated they are on board with this approach but cannot say it is “final/final” since it is not in place yet and has not shown its effectiveness yet.

**Visual Underwater Inspection**

- EPA Comment 2 – EPA indicated that narration/spreadsheets documenting what divers are seeing during inspections are valuable. EPA indicated they are satisfied with Tyco’s proposed approach for videoing several representative sections where the wall is intact and all locations where deficiencies are observed.
- EPA Comment 3 – EPA referenced U.S. Army Corp of Engineers Engineering Manuals, particularly the inspection frequency for hydraulic barriers not to exceed 5 years. Jacobs mentioned American Society of Civil Engineers Engineering Manuals were reviewed and had similar recommendations of 5 to 6 years. Tyco agreed to update language that inspections would be conducted in 2019, and then at least every 5 years before the five-year review (next one in 2023), unless the inspection and wall condition indicate a more frequent inspection would be needed. The group discussed adding to the Addendum that, based on the inspection results, there could be more frequent inspections of a smaller specific area, if needed, instead of inspecting the entire wall.
- EPA Comment 13 – The group discussed using WDNR’s fresh water acute and aquatic criteria as part of evaluating what size leak represents “significant” (that is, requires immediate response). Information from the dye testing mixing zone calculations may be valuable to help make these calculations. Jacobs will look at incorporating this into the Addendum.
- WDNR Comment 5 – Jacobs indicated that other technologies (for example, DGTs, temperature sensing, and surface water sampling) were evaluated and presented at previous meetings and did not identify better technologies to add/use at this time. WDNR’s comment was made to emphasize that options should be left open for future/new technologies that may come available, especially if a diver goes out and cannot “see” anything or the underwater visual inspection is ineffective. Technologies can be added and reviewed as part of the five-year review.

#### SeriesSEE and Enhanced Monitoring Well Network

- EPA Comment 4, on well spacing – EPA indicated they are satisfied with moving forward as proposed. Before the meeting, EPA and Tyco had discussed going forward with the proposed well spacing.
- EPA Comment 7, SeriesSEE data set – EPA was satisfied with this approach.
- EPA Comment 8 – EPA was interested in root-mean square error and using and evaluating it annually to identify changes/outliers (Figure 2-4 had a bubble that seems like it is time to start quantifying this).

#### Groundwater Contour Maps/Network

- EPA Comment 6 – TetraTech indicated they do not see what the groundwater contour maps/network looks like with those wells included; more data are usually better. Jacobs indicated they would be updating Table 2-1 to include the rationale for each well location.
- EPA Comment 10 and WDNR Comments 6 and 13 – WDNR still wants to see the big picture and would like contour maps included, but the new approach needs to show its effectiveness before removing anything. Tyco agreed but would still like this language included and will evaluate what is useful/effective as part of the annual and five-year review reports and make any recommendations for changes.
- EPA Comment 12 – EPA did not realize that the well monitoring frequency was updated to reflect what was allowed in the 2015 Barrier Wall Groundwater Monitoring Plan Update and will need to take a closer look at that. Jacobs also will review the frequency and clearly indicate in the text and tables why the updates were made.
- WDNR Comment 4 – WDNR did not realize that going from semiannual to annual sampling was offered during the October 22, 2018 meeting.

#### Path Forward

Tyco/Jacobs will update and submit a finalized Addendum that incorporates comments as discussed during the meeting. A formal response to comments (RTC) document is not needed, and the presentation slides will help close out the RTCs.

#### 4. Five-Year Technical Review Report – EPA WDNR Comments and Responses (Five-Year Review Response to Comments Presentation)

Jacobs reviewed the presentation slides regarding responses to agency comments on the five-year review report (FYR). The following summarizes the major discussion points during the presentation.

- RTC Approach – Tyco proposed submitting an attachment to the FYR and documenting next steps instead of incorporating changes to the FYR. The next steps/work plans would be identified as outcomes of the FYR and not formal attachments to the FYR. EPA was satisfied with separating next steps/work plans as long as it was documented as a next step in the FYR response/updates; however, EPA needed to confirm and look at FYR guidance to see if Tyco can have an attachment to respond to FYR comments. EPA believes the FYR document may need to be updated so it is an all-inclusive document; EPA will check into this and let the group know the results after the meeting. WDNR indicated that the FYR needs to identify what next steps and the process for developing them is so that expectations are memorialized.
- EPA Comment 1 and WDNR Comment 2 – EPA indicated that for the outfall investigation, there was not a lot of analysis in the FYR, and it did not include recommended next steps. The path forward is to include a discussion of what will be included in the construction completion report and the next steps will be in the FYR. The construction completion report would be included as a standalone document.

- EPA Comment 2, first part – EPA does not agree that there are no changes or corrective actions as documented in the FYR. They acknowledged that there are changes going forward, and often, an FYR is a standalone document.
  - EPA Comment 2, second part – No major discussion.
  - EPA Comment 5 (Ecological Risk) –
    - EPA indicated the data were provided to an EPA ecological risk assessor, which is another component of the FYR that EPA believed would be evaluated in more detail.
    - EPA stated it is probably okay to look only at the Turning Basin for ecological risk.
    - Jacobs indicated in agreements that there is an acknowledged period of monitored natural recovery (MNR), and we should not be surprised by results where sediments are in excess in glacial till areas. Conducting a risk assessment now is inconsistent with the current project phase (post-remedy monitoring).
    - WDNR indicated that many sites rely on accumulation of sediments to achieve cleanup goals. It appears sediment rates are less than anticipated, and WDNR agrees we may need more time for MNR processes to act. WDNR wants an opportunity to evaluate risk in the future, but for now, they prefer to allow additional time for MNR processes, while leaving the option to use a risk assessment to evaluate whether conditions are protective of health and the environment. WDNR’s process is to document an acceptable path forward.
    - EPA ultimately agreed and indicated that in 2023, Tyco would need to consider a risk assessment if the site is not meeting the cleanup criteria and would have one of three options/paths forward
      - Criteria have been met.
      - Criteria are not yet met but will be met in a reasonable timeframe
      - Criteria are not met, are unlikely to be met in a reasonable timeframe, and potential alternatives need to be evaluated.

This is the time at which risk should be evaluated and understood to determine whether risk is acceptable or not and whether a different remedy is needed.
  - EPA noted that November 2023 is when MNR is due, and the FYR is due at end of that same year. The team may need to evaluate the timing for these activities and submittal.
  - The group agreed that evaluation of ecological risk, if needed, should be done in 2022 or 2023 to help make decisions in the 2023 FYR.
- EPA Comment 6 and WDNR Comment 1 – WDNR indicated they were satisfied with the proposed approach; however, the team needs to make sure all details for the steps evaluated in the approach are included. Tyco asked about the lessee and releases attributable to them and how would WDNR react in this case. WDNR indicated that ChemDesign has open releases with the state, and WDNR would look to ChemDesign to respond to potential vapor intrusion concerns from these releases. WDNR recommends that Tyco still conduct a desktop evaluation, though.
- EPA Comment 8 – During the meeting, the group had no additional comments on the proposed total dissolved solids well locations.
- EPA Comment 13 – EPA indicated that the major concern with volatile organic compounds in groundwater at the site is the potential for vapor intrusion and how volatile organic compounds in groundwater can be redistributed within the barrier walls and migrate toward buildings.
- EPA Comment 16, MW003S/MW003M – No additional comments were made during the meeting on proposal to continue monitoring this location.
- WDNR Comment 3 – WDNR indicated it was interested in other technologies that Bruce Manning (Jacobs) had discussed at previous meetings. Tyco indicated that conveyance system construction has been postponed because of uncertainty with Wisconsin Pollutant Discharge Elimination System permit approval. Tyco will continue to conduct the pump down program using the temporary system. Installation of additional extraction wells also is postponed, as they are linked to a conveyance

project. WDNR asked if they should expect similar pumping performance as in 2018, and Jacobs indicated similar performance is likely. Tyco pointed out that, even if not at target elevation, the system has maintained an inward gradient.

- WDNR Comment 4 – WDNR indicated it needs to see stable arsenic concentration data sets with less fluctuation to be satisfied with dropping arsenic sampling locations or frequency. WDNR is concerned about increasing concentrations, even inside the wall, and would like to see more detail in analyzing reasons for arsenic concentration trends/fluctuations (such as, near a phyto plot may be reason for seasonal variation or changes in redox condition).

#### **Path Forward**

EPA will confirm the format required for the FYR RTC submittal. Once confirmation is received, Tyco/Jacobs will provide a proposed schedule for the updated report to the agencies and update and submit an FYR response that incorporates comments as discussed during the meeting.

## **5. Other/Miscellaneous Items (Other-Misc Presentation)**

Jacobs briefly reviewed presentation slides regarding other/miscellaneous items. Many of these items were partly discussed during the other presentations.

#### **Pump Down Program Status**

- The temporary system is operational. The target elevation was met in the former Eighth Street Slip through the winter; the former Salt Vault did not meet the target elevation but has generally been below the river elevation through the winter and into spring.

#### **Wisconsin Pollutant Discharge Elimination System Variance Permit Status**

- Tyco needs time to further evaluate the approach for Outfall 001 (industrial outfall) and understand the full impacts of the approach.
- The final approach on Outfall 001 could change the approach for Outfall 003 (groundwater collection and treatment system outfall).
- Tyco has postponed the start of conveyance work while the Outfall 001 approach is evaluated. The temporary system will be operational.

#### **Proposed ChemDesign Building**

- Tyco/Jacobs will submit a memorandum detailing the impacts and recommendations for addressing affected Resource Conservation and Recovery Act (RCRA) remedy components. The memorandum also will include stormwater and waste management details.
- WDNR indicated that the NR 718 exemption would be needed for soils planned to be moved around and reused onsite. This requires WDNR approval through a form, and a guidance document also is available. Jacobs will identify these requirements and see how they apply to this site.

## **6. Action Items**

- Tyco/Jacobs will provide a pore water work plan that includes components discussed during this meeting and provide a proposed work plan schedule to the agencies.
- Tyco/Jacobs will update and submit a finalized Addendum that incorporates comments as discussed during this meeting. An RTC document is not needed, as the presentation slides will help to close out the RTCs. Tyco/Jacobs also will provide a proposed work plan schedule to the agencies.
- Tyco/Jacobs will update and submit an FYR response that incorporates comments as discussed during this meeting and provide a proposed schedule for the updated report to the agencies after EPA confirms the format required for the submittal.

- Tyco/Jacobs will provide follow-on/next step documents and proposed schedules for the following:
  - Vapor intrusion analysis
  - Stormwater construction completion report
- Tyco/Jacobs will provide agencies with a memorandum for the ChemDesign new building components.
- EPA will check on FYR response format requirements. Conor Neal sent an email on May 14, 2019 indicating, “Tyco should re-submit a Five Year Review document with the changes we discussed yesterday, including identification of issues and recommendations and follow-up actions within the report; a Response to Comments attached to the FYR would not be appropriate.”
- Tyco/Jacobs will email presentation materials to attendees.
- The next face-to-face meeting date is to be determined.





# Fire Suppression Products

**Tyco Fire Product LP – Marinette, WI**

*Project Status Meeting*

*May 13, 2019*

**tyco**  
*Fire Protection  
Products*

# Addendum to 2015 Barrier Wall Groundwater Monitoring Plan Update – Responses to EPA and WDNR comments

USEPA, WDNR and Tyco Teleconference  
May 13, 2019



# Barrier Wall Monitoring Program Addendum Response to Comments Agenda

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- Background
- Objectives
- EPA/WDNR Comments on Addendum to 2015 Barrier Wall Groundwater Monitoring Program Update with Responses
- Questions or clarification on comments
- Discussion/Next Steps

# Background

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## June 26, 2018 Teleconference with Agencies

- Enhance existing monitoring well network to establish a final permanent monitoring system in the Main Plant area to monitor changes in river/groundwater interactions over time
- Define the “finish line”

## August 1, 2018 Teleconference with Agencies

- Presented Groundwater Flow Model Simulations
- Proposed Enhanced Monitoring Well Network (Through-Wall)
  - Proposed 5 additional shallow MWs, so well within 100' of any potential leak
- EPA/WDNR Provided Comments/Questions on September 4

## October 22, 2018 Meeting with Agencies

- Presented response to agency comments on groundwater flow model runs, transducer data analysis methods (SeriesSEE) and additional bedrock monitoring wells

# Background

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## October 22, 2018 Meeting with Agencies, Cont.

- Agreed to provide an update to the barrier wall monitoring plan; a memorandum/document that would serve as an addendum to the plan that includes the following:
  - Which wells are proposed for the USGS SeriesSEE evaluation
  - Procedure for evaluation using USGS SeriesSEE tool
  - Different lines of evidence including the new below water visual survey
  - Procedures for evaluation if a leak is indicated – first steps USEPA believed might be more prescriptive, but later steps could more general (e.g., providing language around the preparation of a work plan to further address specific issues as identified)

## Draft Document and EPA/WDNR Comments

- February 20, 2019 Draft-Addendum to 2015 Barrier Wall Groundwater Monitoring Plan Update submitted
- March 25, 2019 EPA/WDNR comments received; responses/revisions requested within 60 days
- April 5, 2019, EPA email indicates responses/revisions submittal date to be determined at May 13 meeting

# Objectives

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- Discuss EPA/WDNR comments (re-organized by topic)
  - General Comments
  - Visual Underwater Inspection
  - SeriesSEE Analysis and MW Network
  - Groundwater Contour Maps
  - Other Comments
- Finalize approach/path forward/schedule to finalize Addendum

# General Comments



# EPA/WDNR General Comments

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## General Comments – EPA

- The EPA currently believes the methods proposed in the Addendum are the best available methods for detecting structural issues with visible portions of the Main Plant barrier wall or groundwater leaks through the wall. However, as with all remedy selections and operations and maintenance methods at the Site, a regular review of their effectiveness is required.

Response: Tyco agrees

## General Comments - WDNR

- The Department of Natural Resources is not convinced that the revised monitoring program and groundwater model will provide adequate information to ensure protection of human health and the environment from arsenic contaminated groundwater contained within the barrier wall system.

Response:

- Tyco believed the Agencies were amenable to development of the proposed monitoring program
- Monitoring program includes multiple lines of investigation both in uplands and river
- Tyco does not want to proceed with installation of new wells/installation of transducers unless the Agencies agree to the approach
- Assuming the program proves to be effective and demonstrates no unacceptable risk to human health and the environment, Tyco anticipates no additional monitoring components required.





# EPA/WDNR General Comments (Cont'd)

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## General Comments – WDNR (Continued)

- Tyco's draft addendum to the 2015 BWGMPU emphasizes the finality of this approach in the determination of the effectiveness of the barrier wall containment system. The efficacy of this program has yet to be demonstrated. Any direction to limit monitoring frequency and locations at this point is premature.
- The barrier wall system will require inspection and maintenance as long as it remains in place and the soil and groundwater inside the system is contaminated. Both the above water and below water visual inspections are an important part of this program and any discussion of limiting the scope and frequency of these activities is premature.
- After the effectiveness of this program is established and it is accepted as one of multiple supporting lines of evidence in the evaluation of the protectiveness of the containment system, the scope, frequency and term of its components should be revisited on a regular basis.

Response: Based on past project meetings and discussions, Tyco believed the Agencies were amenable to developing a monitoring program to find an end game/finish line. Tyco agrees that the program should be regularly reviewed and will provide evaluation of effectiveness and recommendations for optimization in Annual Reports.

# Visual Underwater Inspection



# EPA Comments 1 and 2 and Responses

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## EPA 1. Section 2, Barrier Wall Inspection Enhancements (Update to BWGMPU Section 2.1), P. 3

- The initial visual inspection should include close physical contact with the steel sheet pile bulkhead and cleaning of areas with potential cracks or leaks.
- A follow-up inspection should not be necessary to clean the bulkhead.

Response: Tyco agrees. Cleaning inspections would be concurrent with the initial inspection, but only in areas where needed.

## EPA 2. Section 2, Barrier Wall Inspection Enhancements (Update to BWGMPU Section 2.1), P. 3

The diver's visual inspection from the mudline to the waterline must be videotaped, not photographed. The videotape will be sent to EPA with the inspection report for review.

Response:

- Tyco is not planning to video the entire wall inspection.
- Photographs will be taken using a clearwater box.
- Video in representative sections and where deficiencies are identified, if visibility allows.
- Photographs and video may not be high quality due to low visibility.

# EPA Comment 3 and Response

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## EPA 3. Section 2, Barrier Wall Inspection Enhancements (Update to BWGMPU Section 2.1), P. 3

- It is unclear what general industry practice is referenced for underwater surveys or why general industry practices would be applicable at this Site.
- Given the arsenic concentrations and the human health and ecological risks associated with a damaged or breached VBW, more frequent underwater surveys should be performed.

### Response:

- 5 to 6 years frequency is typical
- Inspection frequency based on condition
- Tyco will update language in the Addendum to indicate 5 year intervals (2019, prior to 2023 FYR)
- Frequency re-assessed after each inspection

# EPA Comment 13 and Response

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## EPA 13. Comment on Figure 2-3

Specify what conditions would need to be observed to indicate the potential for significant leakage. List all possible conditions and include them in this addendum.

### Response:

- Recent groundwater flow modelling (presented at previous meetings) indicated that a 9 inch gap along 18 feet of seam (13.5 square feet) would result in a leak of about 1.6 gpm, while a 4.5 inch gap (6.75 square feet) would result in a leak of about 1.0 gpm.
- Conditions that indicate the potential for significant leakage include:
  - Observed leakage above the waterline at a rate greater than 1 gpm
  - Observed defect (such as separation of seams) in the VBW affecting an entire seam
  - Observed single defect in the VBW (such as a hole or breach) greater than 6 square feet
- Minor leakage will still be evaluated and repaired as needed.

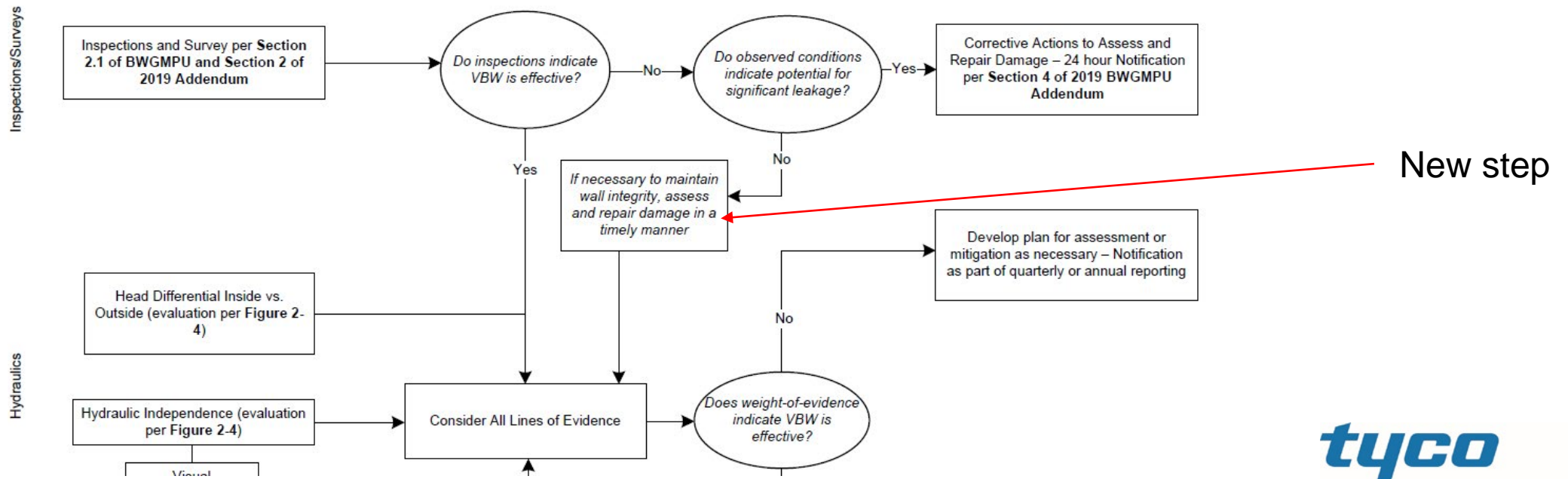
# EPA Comment 14 and Response

## EPA 14. Figure 2-3

An additional step in this flowchart should be added. If observed conditions do not indicate the potential for significant leakage, the condition that led to the conclusion that the VBW is not effective should be identified and rectified as soon as possible to prevent significant leakage in the future.

### Response:

This condition has been added to Figure 2-3 to assess and repair damage in a timely manner.



# WDNR Comment 5 and Response

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## WDNR 5. Page 3, Barrier Wall Inspection Enhancements, paragraph 2:

The DNR is not convinced that an underwater inspection by a diver alone will provide the information necessary to monitor the long-term condition of the wall between the mud line and surface, and recommends that other technologies continue to be considered.

### Response:

- Other wall monitoring technologies were discussed at previous meetings and Agencies and Tyco agreed to pursue enhanced monitoring network
- Other technologies have been and will be considered in future reports if visual underwater inspection not deemed effective
- Imaging was considered but the resolution that can be achieved is inferior to up-close visual inspections
- All lines of evidence will be reviewed and their continued use and frequency proposed in future annual reports

# SeriesSEE and Enhanced Monitoring Well Network





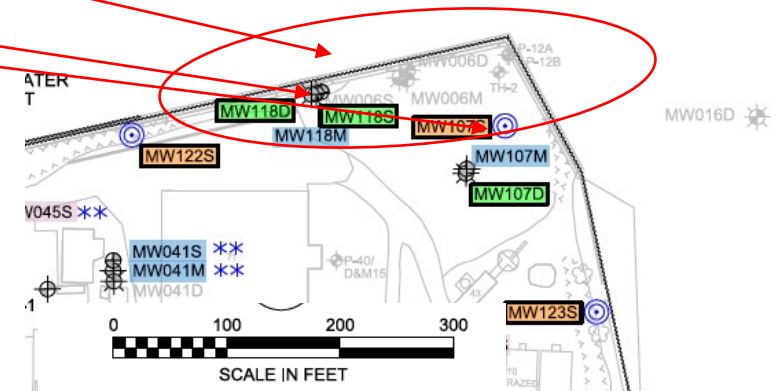
# EPA Comment 4 and Response

## EPA 4. Section 3.1, New Monitoring Well Installation, Page 3

- Proposed monitoring wells should be located as closely as possible (within reason to maintain necessary spacing) to VBW areas with previously identified leaks (such as loose bolts and seams id'ed in FYR)

### Response:

- Loose bolts and the seam were in the area of the former Coal Dock.
- Monitoring wells MW118S and proposed well MW107S in the area.
- Location of potential future leaks is not known, and may not be in areas of recently observed and repaired leaks; want to maintain 200' spacing as much as possible



# EPA Comment 7 and Response

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## EPA 7. Section 3.3.1 SeriesSEE Data Set Selection, Page 6

- Tyco should complete SeriesSEE analyses on datasets with varying characteristics (e.g. no precipitation for previous 2 days, while snow is on the ground, etc.) to evaluate how the results differ.
- This data may be useful for comparison during wetter years, when extended periods of no precipitation do not occur.

### Response:

- Objective: Minimize known factors that can influence water levels
  - When snow is on the ground, the effect of the snowcover on recharge is unknown and likely to vary.
  - Not including periods of snowcover allows SeriesSEE to focus on evaluation of potential river influences from barometric pressure and river level changes
- 1991 to 2019 precipitation data indicates data will be available each year
  - At least 7 data sets each year with 3 days no precipitation
  - At least 1 data set each year with 7 consecutive days of no precipitation
- Recommend analyzing different dry weather conditions (no rain for 1 day, 3 days, and 7 days, at one inside and one outside well) to assess their effect on SeriesSEE results.

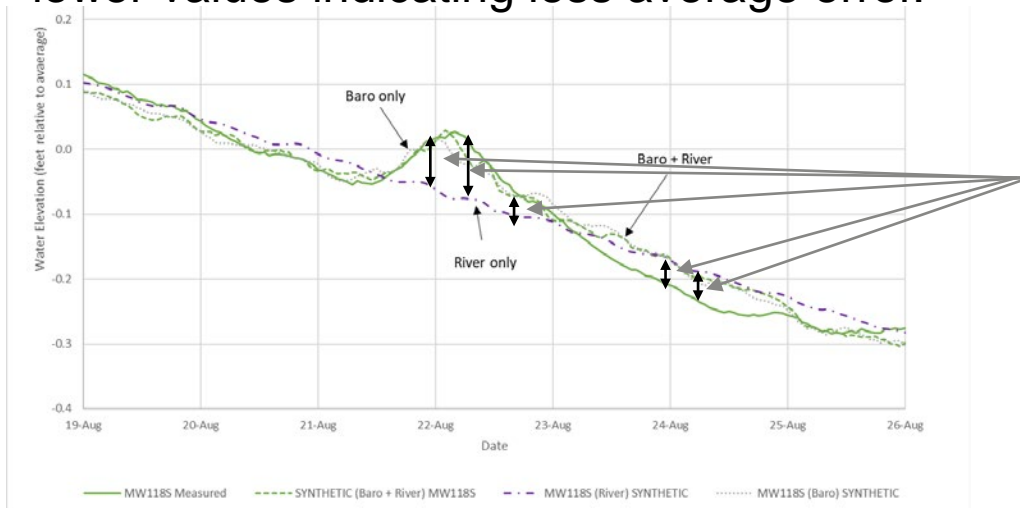
# EPA Comment 8 and Response

## EPA 8. Section 3.3.2, SeriesSEE Analysis Steps, Page 7

- Discuss root-mean square (RMS) and river amplitude criteria used to assess the degree of hydraulic connection to the river.
- Provide the range of RMS values indicative of acceptable best-fit of water levels and the range or increase from baseline of river amplitude factor that will be used to determine whether further analysis of data is required.

### Response:

- RMS provides a measure of the absolute value of the average error observed across the time-series, with lower values indicating less average error.



1. Calculate difference between actual and predicted hydrograph for each time step
2. Square each error
3. Sum squares, take square root

# Response to EPA Comment 8 (Cont'd)

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## RMS Error

### Inside Wall (August 2017)

- Barometric-pressure only RMS errors averaged 0.026 ft (0.017 to 0.035 ft range)
- Barometric-pressure only RMS errors always lower than river-only RMS errors

### Outside Wall (August 2017)

- River only RMS errors always lower than barometric pressure-only RMS values
- River+Baro RMS errors averaged 0.021 ft (0.012 to 0.049 ft range)
  
- Ideally RMS errors < 0.03 ft (0.36 inches)
- Higher RMS errors may indicate other influences affecting hydrograph

# Response to EPA Comment 8 (Cont'd)

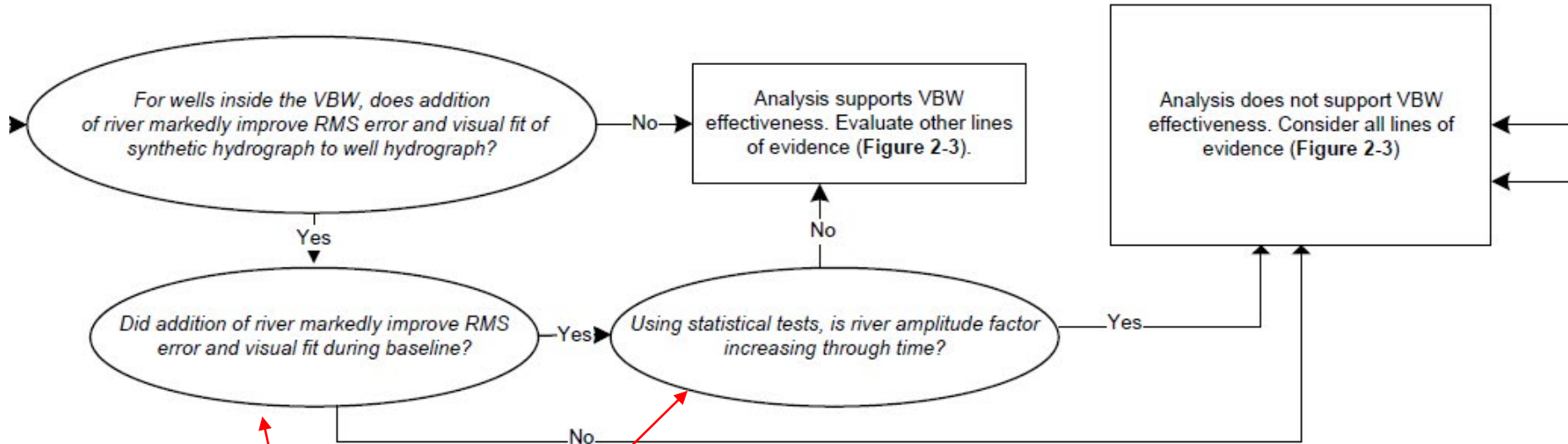
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## Amplitude Factors

- If influence from the river found additional time series will be analyzed to see if consistent connection
- If newly detected hydraulic connection to the river (that is, the baseline/previous analyses did not show a connection), then it would be concluded that the hydraulic connection has increased, regardless of amplitude.
- If hydraulic connection indicated previously, then statistical tests for increasing amplitude
  - Mann-Kendall (or similar) analysis (trend through time)
  - Wilcoxon Rank sum (or similar) (are means/medians of two populations same or different)

# Response to EPA Comment 8 (Cont'd)

Updated Figure 2-4



New additions to Figure 2-4

# WDNR Comment 10 and Response

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## WDNR 10. Page 6, Section 3 .3.1 SeriesSEE Data Set Selection, 1st paragraph

Please explain why, during the time period necessary to establish a baseline, every available time series interval of data that meets the conditions stated for each well will not be evaluated to establish the best fit, amplitude factor, etc. and in turn, the baseline hydraulic response.

### Response:

- Similar to conducting numerous successive aquifer tests
- Results should be similar and won't provide additional value
- Tyco will confirm (run analyses on multiple data sets) at one well inside wall and one well outside wall in 2019 to confirm
- See response to EPA Comment 7

# EPA Comment 9 and WDNR Comments 3, 9, and 11

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## EPA 9. Section 3.3.2, SeriesSEE Analysis Steps, Page 7

Comment: The EPA agrees that the 2019 SeriesSEE analysis can be used as a baseline, as long as the 2019 visual survey does not identify structural issues or leaks in the bulkhead.

## WDNR 3. Page 2, 1st bullet after 2nd paragraph:

Comment: Tyco states that the agreed upon approach included "Performing a below water visual survey to evaluate VBW condition and serve as a baseline for USGS SeriesSEE analyses (updates to BWGMPU, Section 2.1)." The below water visual survey will serve to establish a baseline of the condition of the visible portion of the wall. Future visual inspections of the accessible portions of the wall may serve to provide supporting information related to changes in hydraulic head and potentially in model results. It is important to note that the entire wall is not accessible for visual inspection and the limited portion that is should not serve as a baseline alone.

## WDNR 9. Page 6, 1<sup>st</sup> paragraph:

Comment: Therefore the goal of the SeriesSEE analysis is to correlate the magnitude of any observed hydraulic response to the VBW conditions (Section 2 of this addendum) and monitor any changes in these responses going forward." The DNR does not agree with this statement. The visual underwater survey will only be performed on the accessible portion of the wall and cannot be expected to support conclusions on the condition of the entire wall.

## WDNR 11. Page 6, 1st Footnote #7: "Groundwater flow model indicates ...

Comment: Again, the DNR does not agree with this statement. The visual underwater survey is not a complete and thorough inspection of the condition of the wall and represents one line of evidence in the determination of its condition.





# Response to EPA Comment 9 and WDNR Comments 3, 9, and 11

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## Response:

- Wall in place for nine years - no way to go back to fully evaluate prior conditions
- 2019 below water survey and SeriesSEE evaluation will serve as a baseline no matter the wall conditions
- If issues in the wall are identified during the underwater survey, these will be taken into consideration and incorporated as part of the baseline review (that is, SeriesSEE analysis and other lines of evidence).
- Data will be evaluated before and after any repairs to document and track any changes
- Leakage through wall below mudline expected to be minimal due to low-permeability till and pore water work plan will evaluate groundwater upwelling pathway

# Groundwater Contour Maps/Network



# EPA Comments 5 and 6 and Responses

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## EPA 5. Section 3.1, New Monitoring Well Installation, Page 3

Which monitoring well was abandoned and will be replaced in 2019.

### Response

- MW118D will be replaced with MW118D-R; MW-118S and MW-118M will be repaired at the same time (damaged by snowplow this past winter)

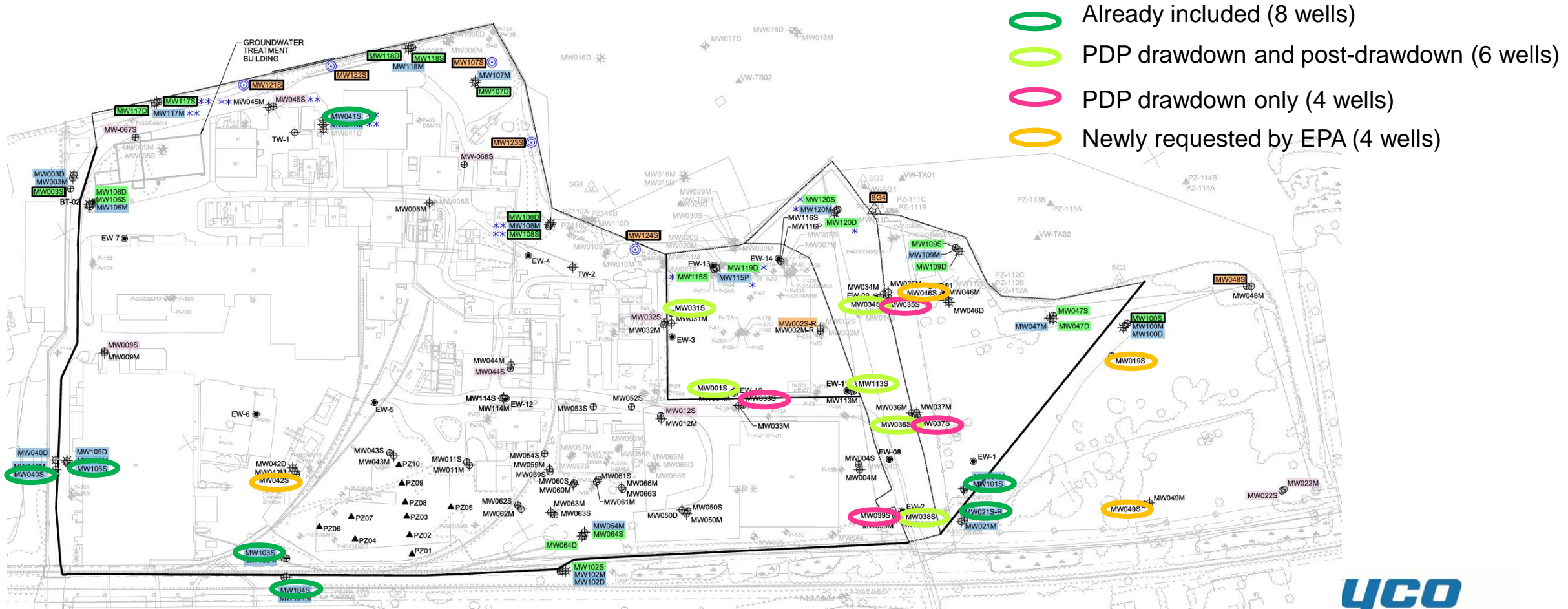
## EPA 6. Section 3.2, Updated Hydraulic Monitoring Network, Page 5

EPA recommends 22 wells be added to manual groundwater elevation measurement events

### Response:

- Well network selected as part of 2015 BWGMPU with EPA input
- Tyco added 4 wells as part of Addendum to provide better coverage
- Of the EPA recommended 22 wells:
  - 8 wells already included
  - 6 wells in pump down program (PDP) drawdown and post-drawdown phase events
  - 4 wells in PDP drawdown phase only (measurements to be discontinued when target elevation is met)
  - 4 wells proposed by EPA not included (see next slide)
- What is rationale for EPA suggested additions?

# Response to EPA Comment 6 (Cont'd)



# EPA Comment 10 and WDNR Comments 6 and 13 and Response

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## EPA 10. Section 3.4, Main Plant Groundwater Elevation Assessment, Page 8:

- Future contour maps for shallow and deep wells should be developed, regardless of success of SeriesSEE evaluation.
- Groundwater flow determination across the Main Plant portion of the site is a necessary component in understanding where the greatest concern for a breach in the VBW may occur and provides additional evidence of VBW effectiveness.

## WDNR 6. Page 3, Barrier Wall Inspection Enhancements, paragraph 3:

- Underwater surveys are one of several sources of information which would be used to determine the integrity and protectiveness of the containment system. Suggesting the elimination of other components of the monitoring program is premature.

## WDNR 13. Page 8, Section 3.4 Main Plant Groundwater Elevation Assessment:

- The DNR does not support the elimination of the production of contour maps in the near future.

## Response:

- During October 22, 2018 meeting, the possibility of removing the contour maps, depending on the success of the SeriesSEE evaluations, was discussed (memorialized in November 1, 2018 meeting notes).
- EPA emailed on November 7, 2018 further clarifying the entry with the following: “In Section 2, on page 2, third paragraph, I’d like to clarify that the SeriesSEE analysis may allow for cessation of the synoptic water level surveys and contour map generation once we have had a chance to evaluate it in practice, but not immediately.”
- Report language was consistent with previous understanding. Propose no changes to language.
- Tyco will evaluate regularly the effectiveness of all lines of evidence and propose updates.



# Other Comments



# EPA Comment 12 and Response

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## EPA 12. Table 2-1

Changes to sampling frequency were made in the "UNCONSOLIDATED Total Arsenic Concentration Trend Monitoring" that are outside of the scope of this addendum and were not discussed in previous meetings or in the addendum. It is not clear why those changes were made. Tyco should reverse those changes or clarify the purpose of the changes.

### Response:

- Only changes made to the sampling frequency to date were those allowed for the former Salt Vault and Eighth Street Slip monitoring wells.
- Per the approved 2015 BWGMPU, wells in these areas had annual sampling in 2016, 2017 and 2018 and are to be sampled every 5 years (prior to the FYR), beginning in 2023.
- Tyco has indicated in the notes of Table 2-1 that the frequency for the overall monitoring program be semi-annual in 2019 and that the frequency will be re-evaluated in annual reports.

# WDNR Comment 12 and Responses

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## WDNR 12. Page 7. Section 3.3.2 SeriesSEE Analysis Steps

Comment: Please confirm that the requests made in the September 4, 2018 email from the US EPA to Tyco, titled "Tyco Sheet Pile Wall Monitoring" will be included in the modeling steps.

Response:

- September 4, 2018 email requested:
  - Discussion of methods or criteria to detect a leak
  - How Tyco will reduce transducer noise in its evaluation
  - What steps will be undertaken if leak detected
- These requests are discussed during October 22, 2018 meeting and in Addendum Section 3.3
- Additional detail on leak confirmation and contingency plans have been added to the Addendum.



# WDNR Comment 8 and Response

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## WDNR 8. Page 5, Section 3.3, 1<sup>st</sup> paragraph:

Remove “will confirm” and revise with “may confirm” to say “Evidence of independent systems may confirm the VBW is effectively containing site groundwater.”

Response: Tyco proposes to revise the text “will confirm” with “will serve as a line of evidence” to read as follows.

“Evidence of independent systems will serve as a line of evidence that the VBW is effectively containing site groundwater.”

# EPA Comment 11 and Response

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## EPA 11. Table 2-1

Two notes require editing to match the text. Both notes start "Continuous hydraulic monitoring ... " and state that pressure transducers will" ... be downloaded quarterly three times a year ... " Please change the text.

Response: Addendum text will be updated.

# WDNR Comments 1, 2, and 4 and Responses

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## WDNR 1. Page 1, 1st paragraph, last sentence:

Remove "final" and replace with "revised" to say " ...it was agreed that the monitoring program would be enhanced to provide a revised barrier wall effectiveness monitoring approach."

## WDNR 2. Page 2, 2nd paragraph, 1st sentence:

Remove "final, permanent" and replace with "appropriate" so that the sentence reads "A June 26, 2018 conference call was conducted to confirm the objective of establishing an appropriate monitoring system to monitor changes in river/groundwater interactions over time."

Response to Comments 1 and 2: Tyco proposes to leave text as is.

## WDNR 4. Page 3, Barrier Wall Inspection Enhancements, paragraph 1:

The DNR does not currently support a reduction of the frequency of the above-waterline inspections to annual.

Response: During the October 22, 2018 meeting, EPA offered to allow annual inspections versus semi-annual for the existing visual wall inspections if Tyco added the newly proposed underwater diver inspection as indicated in the meeting notes (Section 2, page 2, third paragraph). Tyco is proposing to leave the above-waterline inspections as annual.

# WDNR Comment 7 and Response

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WDNR 7. Page 4, #3.2 Updated Hydraulic Monitoring Network, paragraph beginning with ‘The monitoring well network...’:

The focus of an evaluation should first be to determine if it is designed and working to provide the information necessary to ensure protection. This could result in the addition or deletion of wells in the program, once its efficacy has been established.

Response: Tyco proposes a revision of text as follows:

“The monitoring well network will be evaluated as part of the annual reports to determine if it is serving as an effective means with which to evaluate the performance of the remedy.”

# WDNR Comment 14 and Responses

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## WDNR 14. Is there a Figure 2-2?

Response: As indicated on Page 2 in the last sentence, the other figures (1-1, 1-2, 1-3, 1-4, 2-2, 3-1, 4-1, and 5-1) and tables (4-1 and 5-1) in the BWGMPU have not been updated for this addendum. Therefore Figure 2-2 (Well Condition Evaluation Chart) was not included and can be found in the original 2015 BWGMPU.

# Discussion/ Next Steps

USEPA, WDNR and Tyco Project Status Meeting  
May 13, 2019



# The End

USEPA, WDNR and Tyco Project Status Meeting  
May 13, 2019





# Fire Suppression Products

**Tyco Fire Product LP – Marinette, WI**

*Project Status Meeting*

*May 13, 2019*

**tyco**  
*Fire Protection  
Products*



# Five-Year Technical Review report– EPA and WDNR Comments and Responses

USEPA, WDNR and Tyco Project Status Meeting  
May 13, 2019



# Five-Year Technical Review (FYR) report - Response to Comments(RTC) Agenda

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- Proposed RTC Approach
- EPA/WDNR Comments on FYR with Jacobs/ Tyco Responses
- Will also discuss:
  - Questions or clarification needed on comments
  - Status of comment response/ report revision
- Discussion/Next Steps

# RTC Approach

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- Based on the comments received, components of the FYR report were to be revised and work plans included as attachments to the FYR
- Propose to:
  - Update FYR with a FYR Attachment to address FYR specific comments
  - Other requested documents (such as work plans) complete as separate follow-on documents, not attached to FYR
- Rationale
  - Minimal changes to FYR, can be addressed in letter/FYR Attachment to
  - Follow-on actions or work products do not need to be tied to the FYR report; they can be recommend outcomes as part of the FYR report and incorporated through the comment responses
  - Will allow close out the FYR report while moving forward on follow-on documents
  - Tyco will work with USEPA and WDNR to finalize the path forward for the follow-on work/documents.



# EPA Comment 1 and WDNR Comment 2

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EPA 1. Section 2.3 Outfall Investigation Stormwater Sampling and Upgrades

WDNR 2. Section 4.11 Stormwater Outfall Investigation

- Data from the stormwater sampling event in 2018 are presented without an analysis of the results
- Identify possible infiltration points of the arsenic into the sewers
- Provide post-repair video and information on the piping size and construction material
- Submit information as an addendum to the Five-Year Review (FYR), provide an analysis of the sewer arsenic data, and propose corrective actions

## Response/ Status:

- Currently working on the construction completion report and will include an analysis of the sewer arsenic data and proposed actions (such as additional sampling, if needed) as requested
- Propose that the report be submitted as a separate document (not as part of the FYR Attachment)
- We've reviewed some of the post-repair video, but not all videos/information have been provided to date and working with contractor to get remaining videos

## EPA Comment 2 – Section 3.2 Hydraulic Conditions

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- EPA does not agree with Tyco's conclusion that no changes or corrective actions are needed as part of the barrier wall groundwater monitoring
- EPA will provide comments to the Draft Addendum under separate cover
- Changes to the 2015 Barrier Wall Groundwater Monitoring Plan Update must be made within 60 days after finalization and approval of the Draft Addendum

Response: Components of Comment 2 listed above were discussed as part of Addendum review

# EPA Comment 2 on FYR report (cont.)

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## 2. Section 3.2 Hydraulic Conditions (cont.)

- Outward gradient towards the River often exists
- MW117S and MW118S hydraulic trends indicate that potential leaks in the barrier wall are present in these areas
- Concerns with high concentrations and observed leakage at bolts/seams during O&M inspection

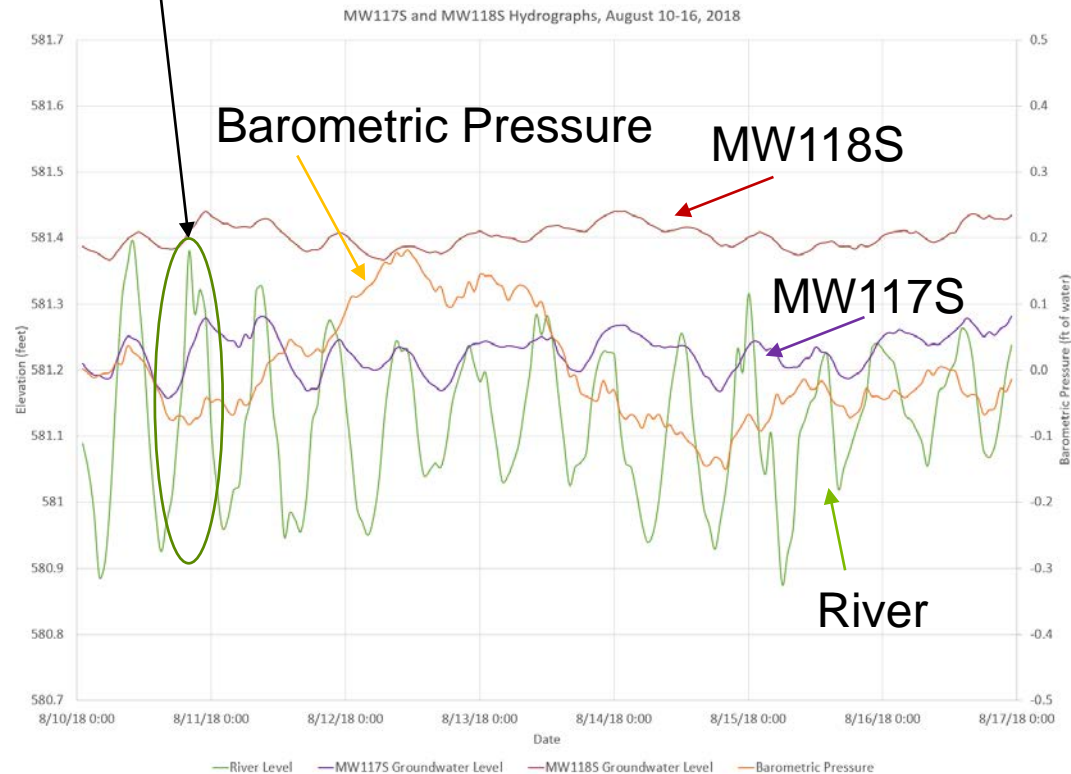
### Response:

- As presented in August and October 2018, some hydraulic connection may be present even when the barrier wall is acting as designed
- Groundwater flow model simulations indicated that even under a “no breach” scenario, fluctuations in groundwater elevations inside the barrier wall system could occur

Leak Scenario	River Level Change (ft)	GW Change (ft)
No Breach	0.63	0.04
1 gpm	0.63	0.05 to 0.09
1.6 gpm	0.63	0.06 to 0.12
2.8 gpm	0.63	0.09 to 0.20

## EPA Comment 2 on FYR report (cont.)

- Visually, it does appear that there is some hydraulic connection, especially at MW117S, however does not account for other factors that SeriesSEE can evaluate
- MW117S max water level change of 0.12 feet near time of 0.46 feet river rise; other responses lower
- MW118S max water level change of 0.06 feet in near time of 0.46 feet river rise; other responses lower

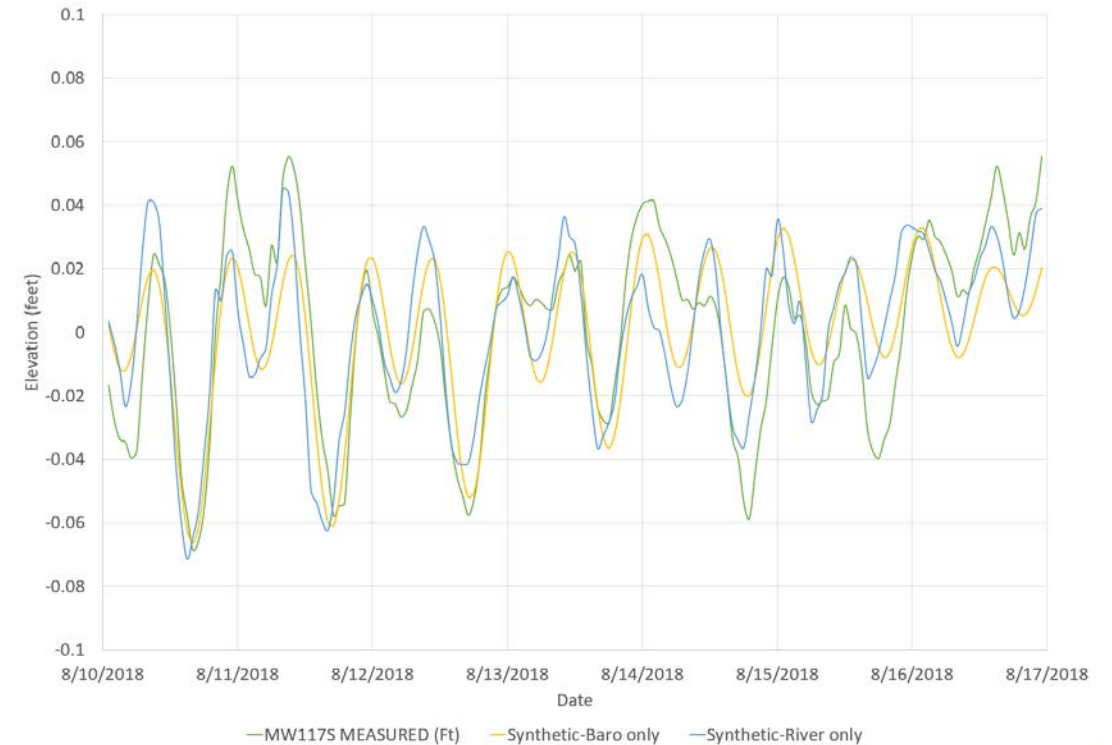


# EPA Comment 2 on FYR report (cont.)

- SeriesSEE analysis conducted
  - Fit did not improve from barometric pressure-only analysis when river considered (similar to 2016-2018)
  - River amplitude factors of 0.14 (MW117S) and 0.08 (MW118S); similar to previous amplitude factors
- SeriesSEE does not indicate hydraulic connection
- Area will be inspected (above and below wall) and SeriesSEE analysis conducted in 2019
- Note that concentrations at MW117 and MW118 well nests are 3 order magnitude lower than the max concentrations noted by EPA

	RMS Errors		
Well	Baro Only	River Only	Baro + River
MW117S	<b>0.0188</b>	0.0202	0.0201
MW118S	<b>0.0154</b>	0.0162	0.0172

MW117S SeriesSEE Synthetics August 10-16, 2018





# EPA Comments 3 and 4

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3. Section 3.2 Hydraulic Conditions

4. Section 4.9 and Appendix E, Sediment Sampling 2018

Response to 3 and 4: Discussed as part of Pore Water Work Plan review

# EPA Comment 5 – Section 4.9 and Appendix E, Sediment Sampling 2018

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- Risks associated with the arsenic (As) concentrations measured in sediments was not evaluated in FYR
- Clean up goal of 20 ppm in sediment is essentially the mean of the two threshold screening criteria used to evaluate potential risk to ecological receptors from exposure to As in sediments
- Threshold effects concentration (TEC) is 9.8 ppm, probable effects concentration (PEC) is 33 ppm
- Frequency and concentrations of As in sediments are most likely causing adverse biological effects on sediment dwelling organisms
- Effects of As in sediments on the sediment dwelling organisms and further up the food chain are currently unknown
- Tyco to model the food chain effects using the site-specific detected concentrations, along with EPA approved food chain model assumptions and toxicity reference values to predict what the effects might be to upper tropic level receptors
- Study completed after Tyco analyzes sediment samples from the rest of the dredge footprint, and no later than March 1, 2020, and must include data from within the impacted area (currently known to be the Turning Basin, but may possibly include the Transition Areas, 6th St Slip, and South Channel)

# EPA Comment 5 Response

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- General assessment of ecological risk has been conducted and will be included in FYR Attachment
- Baseline Risk Assessment (URS 2003) identified no acceptable risk to benthic or upper trophic receptors under pre-dredge conditions
- Sediment removal action has resulted in significant reduction in arsenic concentrations
- Assessments of risk should include agreed upon averaging approach as allowed by AOC
  - 2018 sediment sampling results incorporated with all post-dredging surface sediment provide comprehensive picture
  - Preliminary draft evaluations using SWAC approach shows:
    - Sitewide SWAC 15.7 mg/kg
    - Only subarea SWAC > 20 mg/kg is Turning Basin at 42.4 mg/kg - Driven primarily by max concentration at SD-09 (exposed till) – if removed SWAC <20 mg/kg
- Given prior risk work, current conditions, and stage of project (post-remedial monitoring), Tyco does not believe further risk evaluations are warranted or appropriate

# EPA Comment 6 and WDNR Comment 1

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## EPA 6. Section 6

### WDNR 1: Section 3.4 – VOCs

- Conduct Vapor Intrusion Evaluation – initial analysis and work plan, if needed
- Submit updated conceptual model table for human exposure pathways associated with contained source and migration pathways
- Construction Worker Trench Exposure Evaluation
- Worker and Resident Surface Soil Exposure Evaluation

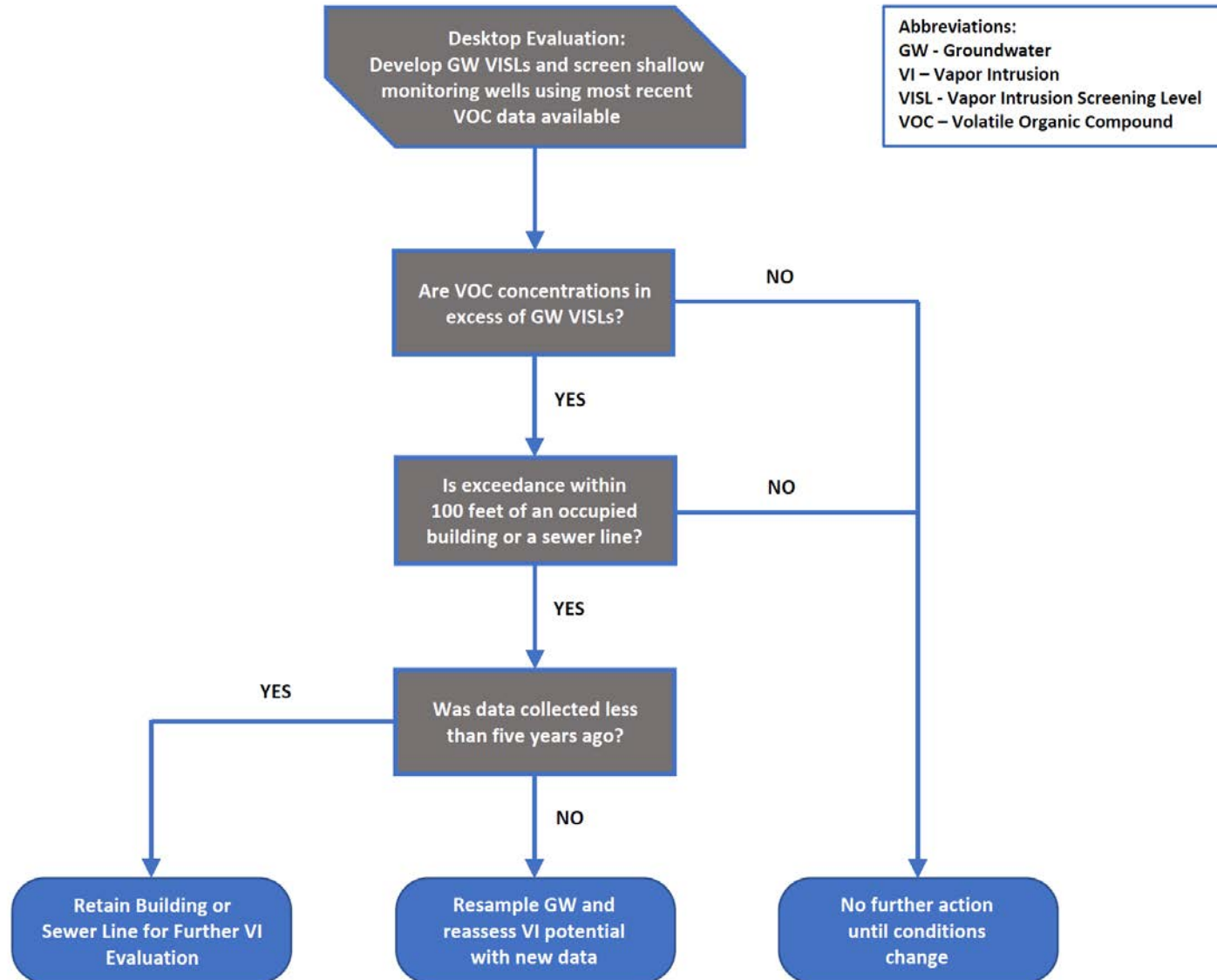
# EPA Comment 6 and WDNR Comment 1 – Vapor Intrusion Response

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## ■ Vapor Intrusion

- Conducting initial analysis using WDNR Vapor Intrusion Guidance (RR-800)
- Will include most recent VOC data available for each monitoring well (from 2000 to more recent 2009 to 2018 data)
- Vapor intrusions screening levels (VISLs) will be used and calculated using adjustments allowed by WDNR Guidance

# Vapor Intrusion Assessment Approach



# EPA Comment 6 and WDNR Comment 1 – Vapor Intrusion Response

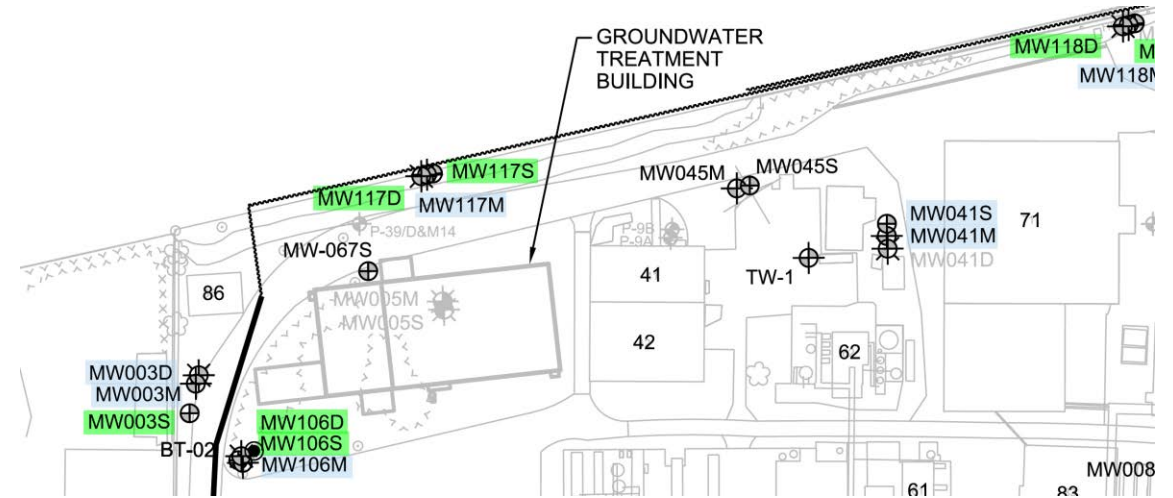
## ■ Vapor Intrusion Cont.

■ Area of main concern is in NW corner of the site near MW045

■ Some of the VOCs detected attributable to ChemDesign

■ Tyco proposes to start with approach described

■ Recommend the analysis and work plan, if needed, be separate from the FYR Attachment



## EPA Comment 6 – Human Health Evaluation Responses

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- **HH Exposure pathways Table** – An updated conceptual model table for human exposure pathways associated with contained source and migration pathways will be included in the FYR Attachment
- **Construction Worker Trench Exposure Evaluation** – Tyco is evaluating the CW trench exposure evaluation and will be included in the FYR Attachment
- **Worker and Resident Surface Soil Exposure Evaluation** – Tyco is preparing and will add an exposure scenario and evaluate this as a risk in the FYR Attachment



## EPA Comment 8 (note no comment 7)

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Section 2.1.2, Equivalent Freshwater Head Corrections, Page 2-1: Total dissolved solids (TDS) concentrations should be obtained through laboratory analysis to provide more accurate correction factors

Response: TDS will be added to a subset of wells sampled during the spring 2019 BWGMPU sampling event that had hydraulic correction factors greater than 1 and are located in the Main Plant area or Wetlands area:

- All 17 M-series monitoring wells scheduled for sampling in spring 2019
- Four D-series wells that had correction factors  $> 1$  (MW040D, MW105D, MW107D, and MW108D)
- Six S-series wells that had correction factors  $> 1$  (MW003S, MW106S, MW107S, MW108S, and MW117S)

## EPA Comment 9

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Section 2.2, Monitoring Network Effectiveness, Page 2-3 : Photographic documentation of issues and resolutions regarding the monitoring well network should be included as part of the FYR

- No photos were taken of the monitoring well network issues or resolutions during the FYR period
- Future monitoring well network issues and resolutions will be documented and photos included as part of the annual report or FYR.

## EPA Comment 10 Section 3.2.1, Groundwater Flow, Page 3-2:

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Groundwater elevations should be provided for all monitoring wells where continuous or manual measurements are made in the FYR or a discussion regarding the selection of monitoring well locations used for groundwater flow determination should be provided

- Requirements included in Table 2 and Figure 2 in the FYR (taken from Table 2 and Figure 2-1 in the 2015 BWGMPU and updated with any agreed agency approved changes during the FYR reporting period)
- List of wells to include evaluated and discussed in detail with the Agencies during the development of the 2015 BWGMPU – selected to provide coverage across all areas of the site so that the general flow patterns in the shallow, medium and deep (bedrock) units could be inferred
- With the exception of the 4 wells that were not accessible, all wells as specified in the 2015 BWGMPU were included in the events associated with this reporting period
- The rationale for each well used for continuous or manual measurements will be included in an updated Table 2 provided in the FYR Attachment

# EPA Comment 11

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## 11. Section 3.2.2.1, Horizontal Gradients, Page 3-3:

Table 6 or text should clarify that elevations used to calculate head differences were collected within a 24-hour period

- Where water level could not be collected at the start of the sitewide gauging event, well was gauged at or near the end of the event if it became accessible
- Therefore, not all calculated head differences were collected from wells within a 24-hour period and the notes in Table 6 are correct
- Results were included for comparison as there appeared to be no significant changes in water levels during the event

## EPA Comments 12

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### 12. Section 3.3.2, Arsenic Trend Analysis, Page 3-8, Last bullet:

Discussion regarding the increasing trend at MW064D is unnecessary and bullet should be removed

Tyco proposes to keep the bullet included

# EPA Comment 13 – Section 3.4, Volatile Organic Compounds, Pages 3-8:

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Although the VOC dataset is limited, additional evaluation of the VOC data and a discussion of those findings is warranted

- Tyco will include additional evaluation of the VOC data and discussion of those findings in the FYR Attachment
- Former Lanxess data was identified from 2010 through 2014 and will allow Mann-Kendall analysis on 6 wells (8+ data points) and will also be included in the evaluation
- Some of the VOCs detected are attributable to releases by ChemDesign
  - ChemDesign's 2014 Status report – 1,2-dichlorobenzene, methylene chloride, toluene, and xylene detections at some of the wells can be attributed to historic spills by ChemDesign
  - Chlorobenzene is a degradation product of 1,2-dichlorobenzene, Tyco believes that the chlorobenzene detections are also related to ChemDesign releases.

## EPA Comments 14 and 15

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### 14. Section 3.6, 2018 BWGMPU Conclusions, Page 3-10, Second Bullet

Comment: The statement "The presence of a downward gradient does not indicate flow is occurring" should be revised. The presence of a downward gradient alone does not indicate flow is occurring from the unconsolidated deposits to the bedrock.

### 15. Section 3.6, 2018 BWGMPU Conclusions, Page 3-11, Last Bullet

Comment: Based on the deflections of two survey point locations at tolerances greater than expected, this statement should be revised to indicate that "the majority of the barrier wall structural integrity remains intact."

#### Response to 14 and 15:

- Tyco proposes to keep the sentences as written
- Tyco does not propose to revisit the FYR document to make these minor changes, and will focus on providing a FYR Attachment with updated components, as described in the Approach slide



## EPA Comment 16 – Figures 8a and 8b:

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Evaluate MW003S/MW003M impacts of groundwater discharging to surface water on surface water quality and propose corrective actions, if necessary, to prevent degradation of surface water quality.

- A desktop evaluation of MW003S and MW003M will be included in the FYR
  - Conservative estimates of potential shoreline discharge would not be expected to effect surface water concentrations
  - Nearby surface water results from 2012-2014 all non-detect
  - Adjacent sediment data show soft sediment concentrations < 10 mg/kg
  - The arsenic concentrations in MW003S were below the Acute Criterion in 2 of the last 4 events and appears to demonstrate seasonal variations, with the highest concentrations in fall
- No corrective actions or additional investigation are recommended, continue to monitor



# Groundwater Evaluation in Vicinity of MW003

SD-564 – Sediment Sampling

Top (ft bss)	Bottom (ft bss)	Material	As Conc (mg/kg)
0.0	0.5	Soft Sed	9.7
0.5	1.0	Subsoil	6.6
4.0	5.0	Subsoil	5.5
5.0	5.7	Till	14.7

Upstream -1

Surface Water Samples	As (ug/L)
6/29/12	< 4.7
7/10/12	< 4.7
4/25/13	< 2.4
9/6/14	< 2.6

Marinette Marine Wall

0.0009 lb/day  
 ~140 ft  
 282-933 ug/L @ 0.12 gpm

MW003S

Date	Concentration (ug/L)
6/22/2011	1,110
6/5/2012	1,280
5/15/2013	620
5/21/2014	1,100
7/2/2015	720
12/10/2015	1,600
5/3/2016	570
10/19/2016	1,800
4/26/2017	310
10/16/2017	1,300
5/2/2018	200 JB
9/14/2018	1,300

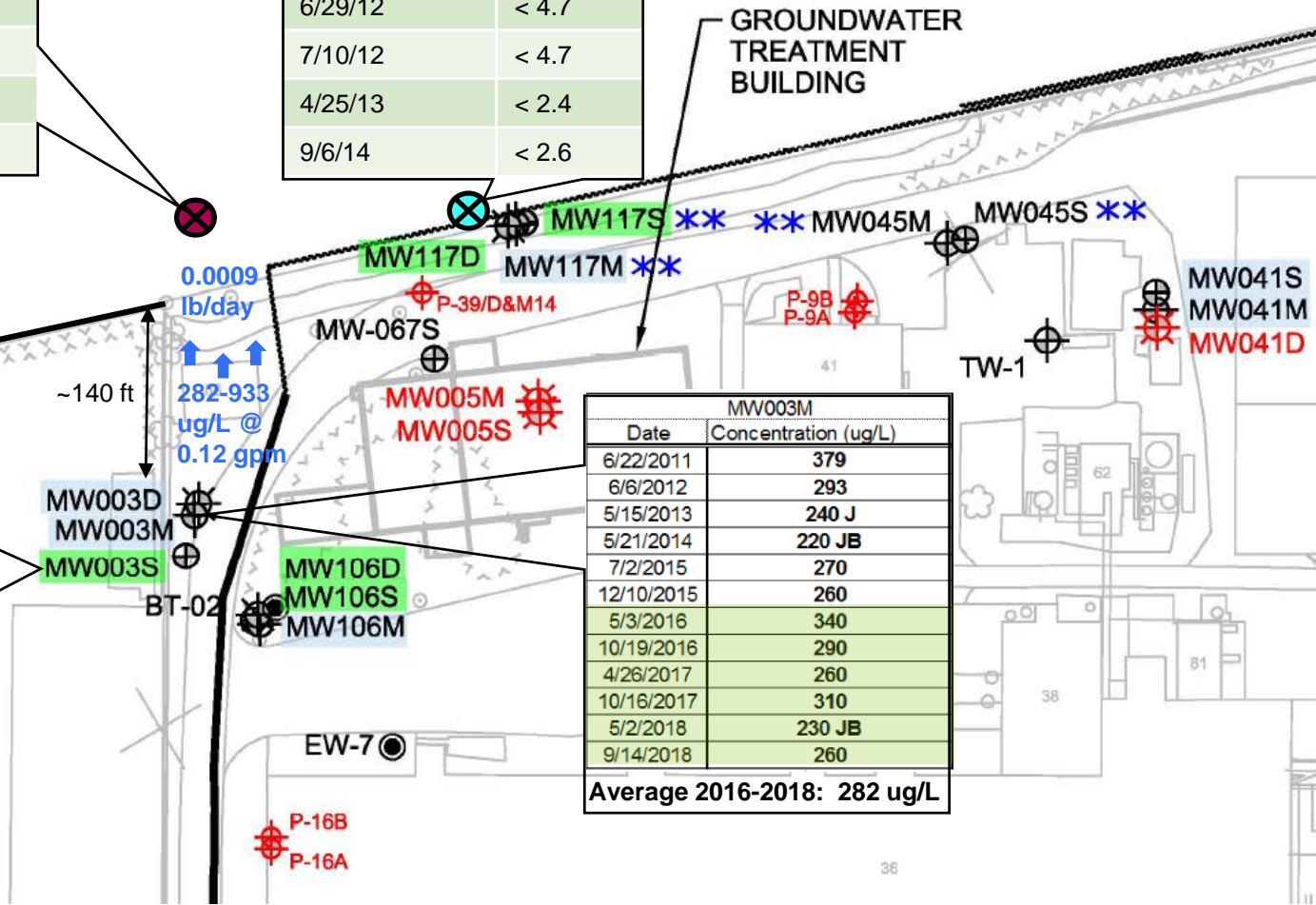
Average 2016-2018: 933 ug/L

MW003M

Date	Concentration (ug/L)
6/22/2011	379
6/6/2012	293
5/15/2013	240 J
5/21/2014	220 JB
7/2/2015	270
12/10/2015	260
5/3/2016	340
10/19/2016	290
4/26/2017	260
10/16/2017	310
5/2/2018	230 JB
9/14/2018	260

Average 2016-2018: 282 ug/L

GROUNDWATER TREATMENT BUILDING



# WDNR Comment 3 – Section 4.5 and 4.6 - On Site Groundwater Management - GWCTS and the PDP

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Tyco has not been successful in maintaining the target groundwater elevations in the former Salt Vault and 8th Street Slip. If a treatment technology exists that can address a portion of the groundwater produced through the PDP, it should be pursued while efforts continue to address extraction issues in the Sault Vault.

- There are no treatment technologies that exist that can better address portions of the PDP groundwater, other than what has already been discussed and tentatively planned as part of the WPDES variance process and will likely be implemented after WPDES variance approval
- To the extent practicable, Tyco continues to pursue the integration of these treatment technologies despite the uncertainty around the pending decision on the WPDES variance
- Extraction issues in the former Salt Vault will be addressed by adding 2 additional extraction wells

# WDNR Comment 4 – Groundwater Monitoring – Total Arsenic and Monitoring Well Head Differences

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- MW102/MW064 and MW103/MW104 have demonstrated an increasing trend in arsenic in the shallow wells
- Located on the southern portion of the barrier wall, where shallow groundwater flow outside the wall mounds and is deflected to the east and west
- The DNR would not support decreasing the frequency of monitoring in the near future
- FYR indicates there is not an outward hydraulic gradient present across the barrier wall in these locations
- Per the FYR, 2019 sampling will be semi-annual and then the frequency for future events be evaluated as part of the 2019 annual report
- Tyco will continue to evaluate updates to the program and frequency as part of each annual report and propose any changes based on the results

# Discussion/ Next Steps

USEPA, WDNR and Tyco Project Status Meeting  
May 13, 2019



# The End

USEPA, WDNR and Tyco Project Status Meeting  
May 13, 2019





# Fire Suppression Products

**Tyco Fire Product LP – Marinette, WI**

*Project Status Meeting*

*May 13, 2019*

**tyco**  
*Fire Protection  
Products*

# Other/Miscellaneous

USEPA, WDNR and Tyco Teleconference  
May 13, 2019



## Other/Miscellaneous Agenda

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- Pump Down Program Status
- WPDES Permit Status
- ChemDesign New Building
- Other



## 2019 Pump Down Program Operations

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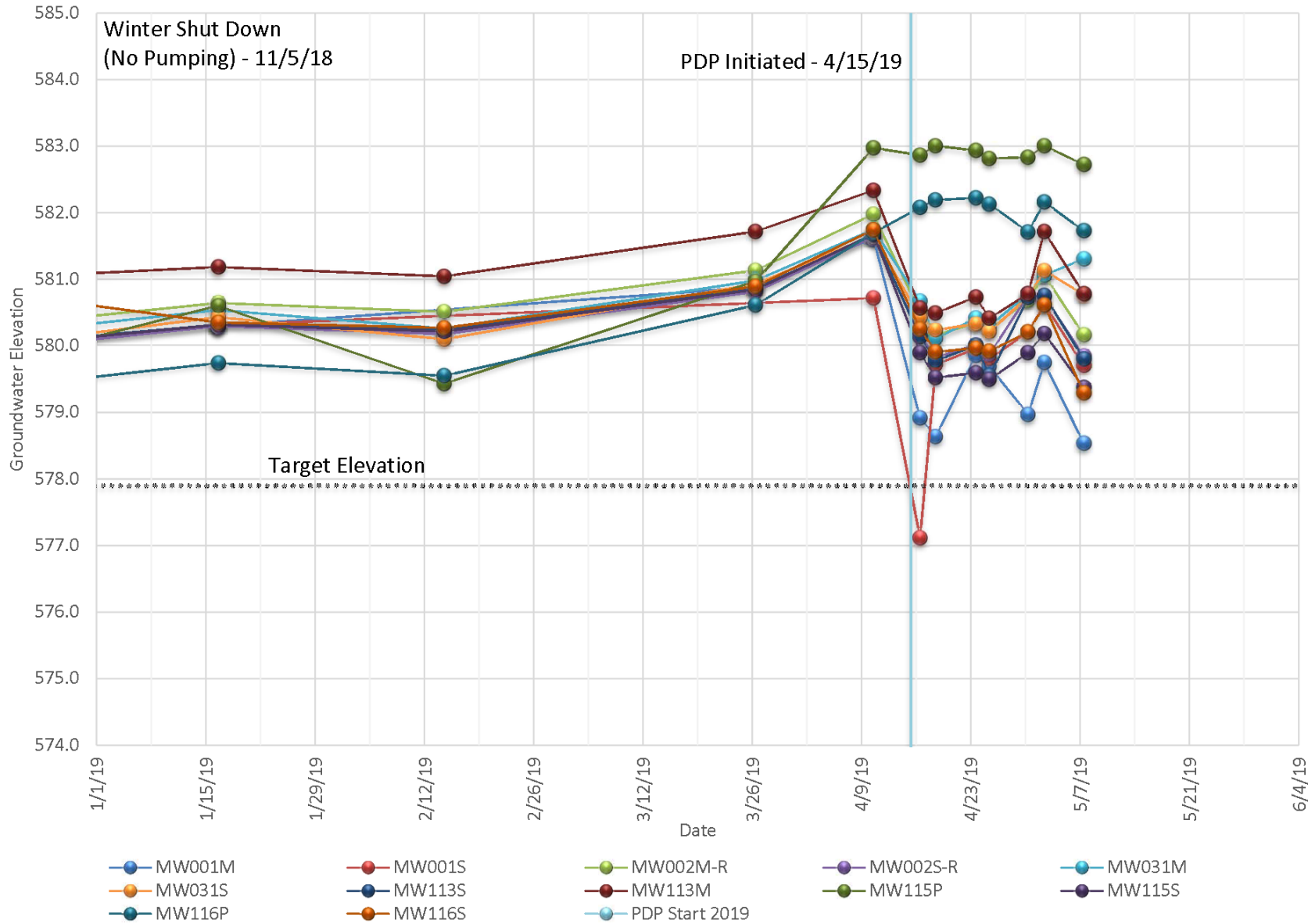
- Commenced system re-installation on April 9, 2019, completed on April 12, 2019
- Pump down operations re-commenced on April 15, 2019
- System extraction operations currently 5 days per week
- Recovered water being transported off-site to Vickery
  - Estimated total volume transported – 74,467 gallons (through May 7, 2019)
  - Vickery only accepting water Monday-Friday.
  - Currently 1-2 trucks/per day (approximately 5,000-10,000 gallons)
- Approximate volume recovered (through May 7, 2018)
  - Total Estimated Volume – 95,000 gallons

# 2019 Pump Down Program Operations

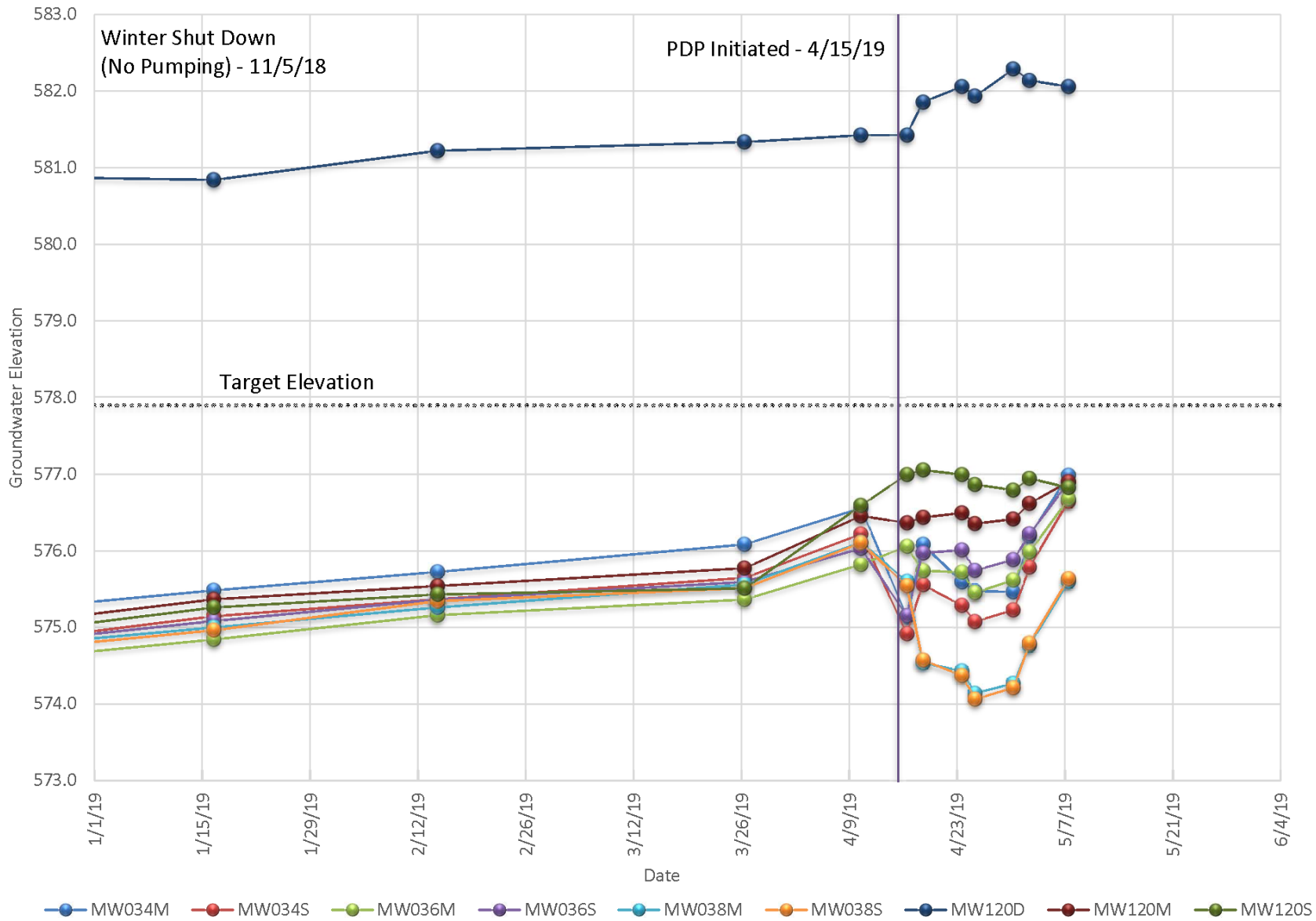
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- Approximate current recovery rates per area (based on operation time – April 30, 2018)
  - Former Salt Vault – ~5 gpm
  - Former 8<sup>th</sup> Street Slip – ~7 gpm, was already below target elevation at start, only intermittent operation to maintain needed volume for disposal
  - Focus has been on keeping Sault Vault wells running
- Average groundwater elevations per area (May 7, 2019)
  - Former Salt Vault – 579.96 feet, 2.06 feet above target level
  - Former 8<sup>th</sup> Street Slip – 576.52 feet, 1.38 feet below target level
- 2019 Water Level Graphs follow

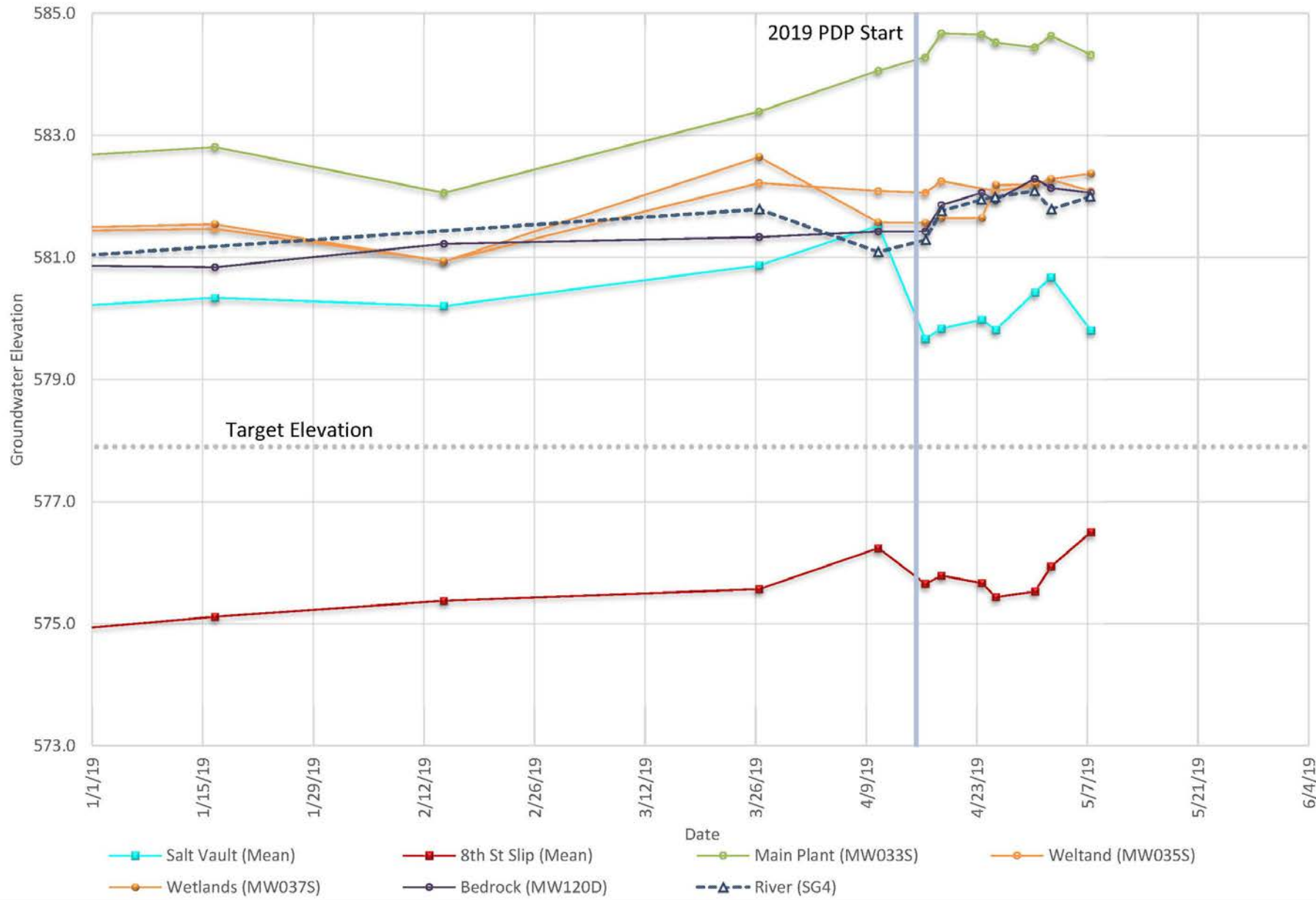
# 2019 Pump Down Program Hydrographs for Former Salt Vault Monitoring Wells



# 2019 Pump Down Program Hydrographs for Former 8th Street Slip Monitoring Wells



# 2019 Pump Down Program Hydrograph



# WPDES Variance Permit Status

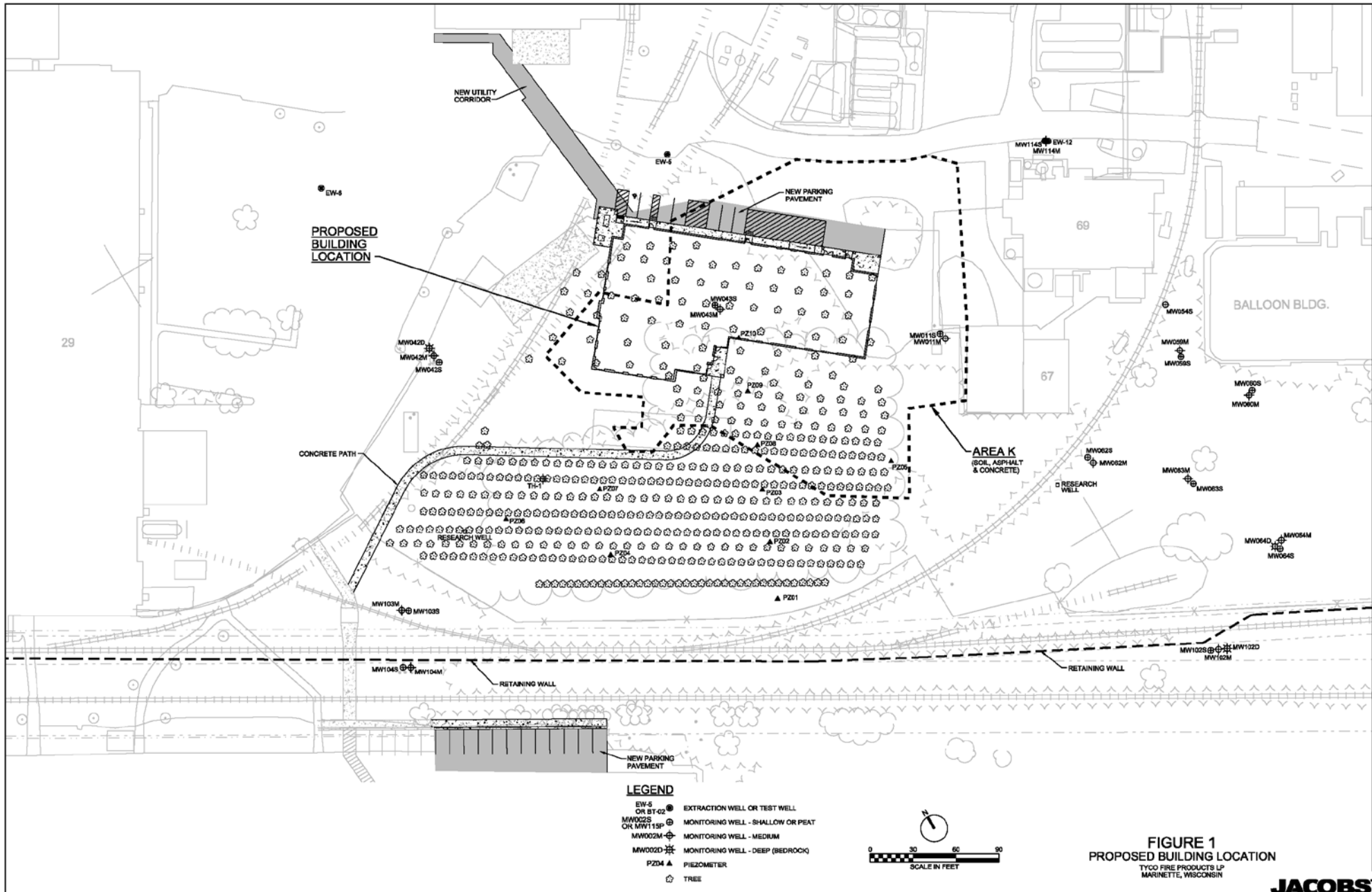
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- October 22, 2018 – Meeting to discuss draft additional information requested by the agencies and provided to EPA and WDNR following the meeting on October 23
- November 29, 2018 – WDNR provided comments on the draft information
- February 18, 2019 – Document provided to agencies with “Response to Additional Information Request for Tyco Arsenic Variance Package”
- April 17, 2019 – Meeting with WDNR requesting more information and followed up with email documenting the details the same day
- May 8, 2019 – Tyco later discussed path forward with WDNR for Outfall 001 and Tyco has to:
  - Decide on a final approach for Outfall 001 to get a variance OR
  - Issue a variance for Outfall 003 and agree to a compliance schedule for Outfall 001 (need to meet 0.2 ug/L criteria within a certain timeframe, could consider background concentrations)
- Tyco needs time needs time to evaluate further the approach for Outfall 001 and understand full impacts of approach
- Final approach on Outfall 001 could change Outfall 003 (GWCTS outfall) approach

# Proposed ChemDesign Building

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- New building in area that will intersect
  - 2 monitoring wells and 1 piezometer (MW043S, MW043M, PZ10)
  - Cover Area K
  - ~90 trees in the phyto plot (Zone 1)
- Building designed to limit amount of excavation
- Tyco to provide memo with impacts and recommendations for addressing affected Resource Conservation and Recovery Act (RCRA) remedy components
- Memo to also include stormwater and waste management details
- Schedule
  - ChemDesign looking to start construction in July 2019
  - Tyco to submit memo shortly after meeting



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**JACOBS**





# Other?

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# Questions

USEPA, WDNR and Tyco Project Status Meeting  
May 13, 2019



# The End

USEPA, WDNR and Tyco Project Status Meeting  
May 13, 2019





# Fire Suppression Products

**Tyco Fire Product LP – Marinette, WI**

*Project Status Meeting*

*May 13, 2019*

**tyco**  
*Fire Protection  
Products*

# Review of Sediment Conditions and Migration Pathways Work Plan

USEPA, WDNR and Tyco Project Meeting  
May 13, 2019



# Arsenic Migration Pathways Work Plan Agenda

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- AOC Requirements and Compliance Timeline
- Current Sediment Conditions
- EPA Five Year Review Comments 3 and 4
- Work Plan Objectives
- Proposed Approach
- Proposed Analyses
- Discussion/Next Steps

# AOC Requirements Timeline

	2009 AOC	2013 Dredge	2013 Legacy Act Conceptual Agreement	2014/2015 Dredging and Sand Cover	2018 FYR Sediment Sampling	2019 Pore Water Invest.
Remedial Approach	<ul style="list-style-type: none"> <li>• 11.d Dredge Soft Seds and SCM to 50 mg/kg</li> <li>• No till dredge</li> </ul>	<ul style="list-style-type: none"> <li>• SCM and Soft Seds dredged to 50 mg/kg</li> <li>• DMU approach</li> </ul>	<ul style="list-style-type: none"> <li>• Dredge SCM and Soft Seds to 20 mg/kg</li> <li>• Place sand cover on till where possible</li> <li>• 11.d met upon CCR approval</li> </ul>	<ul style="list-style-type: none"> <li>• Soft Seds and SCM dredged to 20 mg/kg</li> <li>• Sand cover on till where feasible</li> <li>• DMU approach</li> <li>• CCR approved (11.d obligations met)</li> </ul>		
Evaluation Approach		<ul style="list-style-type: none"> <li>• Concentration &lt; 50 mg/kg in DMU or till exposed</li> </ul>		<ul style="list-style-type: none"> <li>• Concentration &lt; 20 mg/kg in DMU or till exposed (and covered)</li> </ul>	<ul style="list-style-type: none"> <li>• 18 Sample Locations, mostly in Turning Basin</li> <li>• Initial SWAC results on next slides</li> </ul>	<ul style="list-style-type: none"> <li>• Submit SWAC calculation proposal</li> <li>• Evaluate migration pathways to inform future concentrations</li> </ul>
Attainment of Cleanup Goal Approach	<ul style="list-style-type: none"> <li>• 11.e MNR within 10 years to 20 mg/kg</li> <li>• Averaging method to be submitted and approved</li> </ul>	<ul style="list-style-type: none"> <li>• Draft MNR Plan includes point-by-point and SWAC comparisons</li> <li>• CAPSIM indicates most locations will reach 20 mg/kg within 10 years, but exposed till may take 20-30 years</li> </ul>	<ul style="list-style-type: none"> <li>• 11.e met by sand cover placement, provided FYR demonstrates 20 mg/kg cleanup goal has been achieved</li> </ul>		<ul style="list-style-type: none"> <li>• Point-by-point comparison</li> </ul>	<ul style="list-style-type: none"> <li>• Compare SWAC to 20 mg/kg</li> <li>• CAPSIM modelling (if necessary) to predict future concentrations</li> </ul>



# Sediment Sampling Approach

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## BWGMPU Approach

- Collect soft sediment in 0.5 ft increments
- Analyze 0-0.5 ft increment and 0.5 ft interval collect 1 ft above base of accumulating sediment
- If <1 foot sediment, analyze both samples
- Archive remaining intervals
  - If interval > 20 ppm, analyze next deeper sample
- If soft sediment samples cannot be retrieved, will move to a second location within 70 ft

## 2018 Sampling

- EPA collected/analyzed samples from sand cover and deeper native materials/dredge residuals

Upper 6 inches considered the biologically active zone (BAZ) for ecological risk, focus for previous modeling



# Key Points

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- 2009 AOC/Statement of Basis anticipated use of an averaging method to evaluate cleanup goal

## AOC Attachment 1

18. Section 4.3, 1<sup>st</sup> paragraph: The SB states: "average residual concentration of 20 mg/kg of arsenic would be protective of life in the river". It should be noted that the 20 mg/kg is based on a surface weighted average concentration or SWAC, and not an arithmetic average.

We do not see a need to make this change. Ansul is required to submit an averaging proposal which may include a SWAC method for review and approval by the Agencies. The Statement of Basis is clear and allows Ansul to submit a plan for averaging.

## Statement of Basis

WDNR used independent lines of ecological and toxicological evidence to identify a site specific clean-up level (WDNR, 2005, WDNR, 2006). The WDNR analysis determined that an average residual concentration of 20 mg/kg of arsenic would be protective of life in the river, particularly the survival, growth, and reproduction of organisms that live in the sediment and are at the bottom of the food chain. An analysis of risks to human

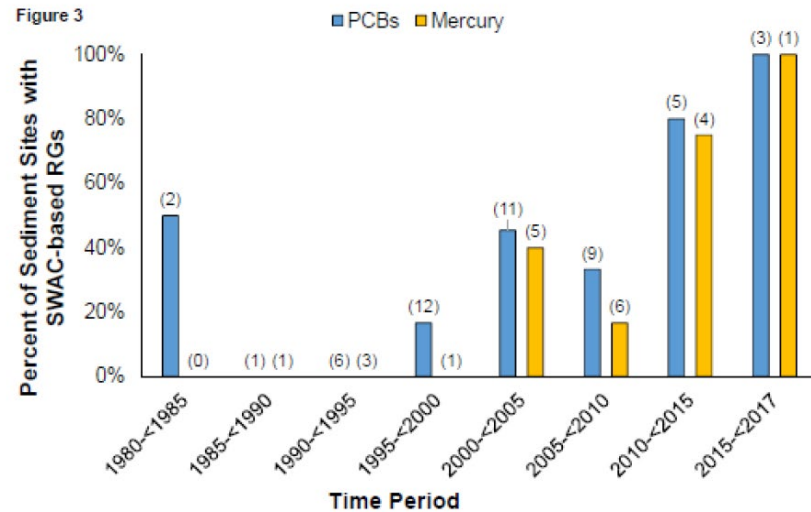
- EPA cognizant of likely reasons for cleanup goal exceedances (Comments on Draft MNR Plan)

arsenic either in the glacial till or the dredged residual. The remaining significant source after dredging is completed is expected to be from residual arsenic in the glacial till and/or the dredged residual concentration. Based on the available data, there is significant residual arsenic contamination in the glacial till over the remedial action objective of 50 mg/kg, with 10 data points exceeding that standard, ranging from 95 to 310 mg/kg. There is also significant residual

- Exposed glacial till > 20 mg/kg primarily in Turning Basin

# Key Points (Cont'd)

- SWACs commonly used at sediment sites
  - 21 of 77 CERCLA sites reviewed by Pelletier et al. (2019) had SWACs
  - SWACs increasingly used (Figure 3 from Pelletier et al. (2019))

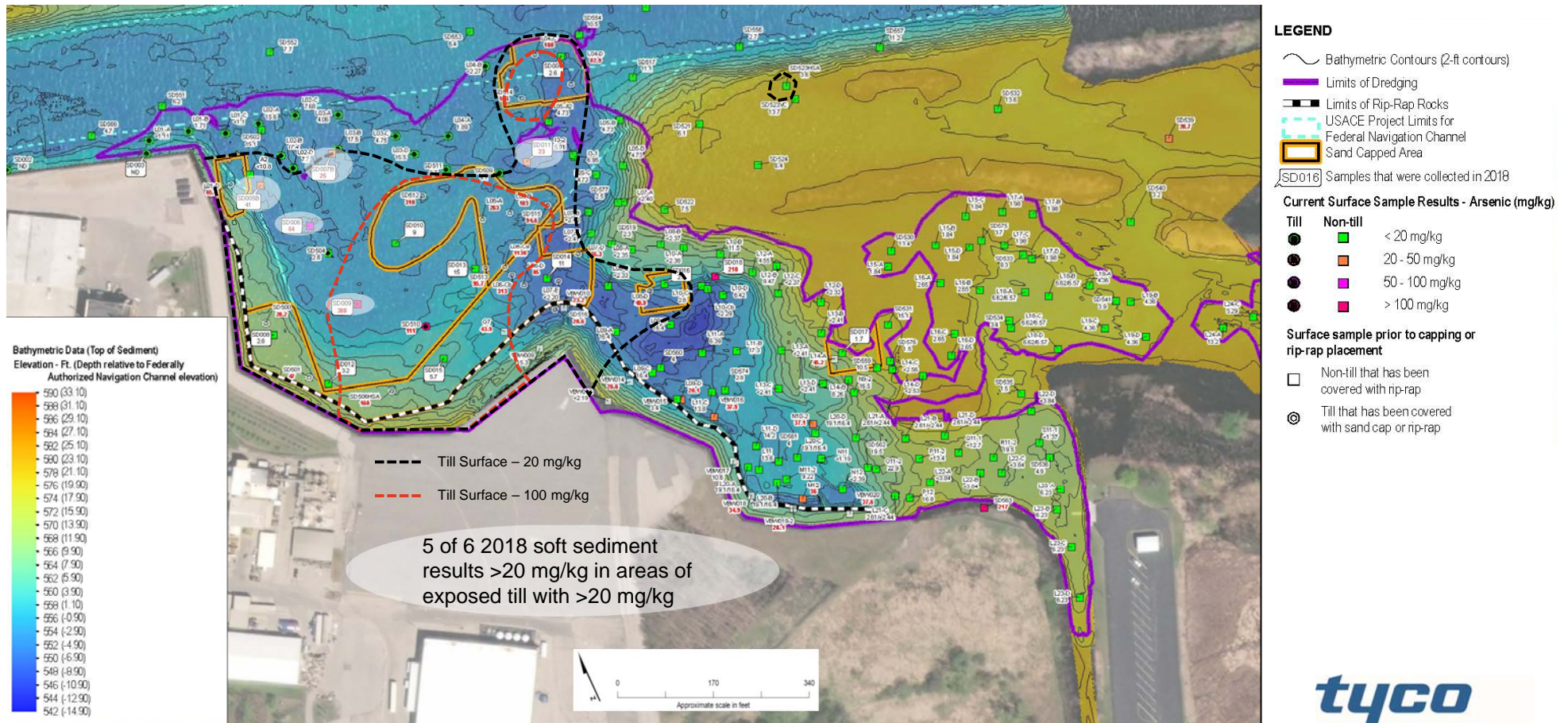


Pelletier, D., Sacks, V.P, Sorensen, M, Magar, V. 2019. Review of Remediation Goals at Contaminated Sediment Sites in the United States. *Integrated Environmental Assessment Management*. Apr 26.

- SWACs used at Fox River, Sheboygan Harbor/River sites in Wisconsin
- SWACs consistent with AOC/Statement of Basis averaging cleanup goal approach

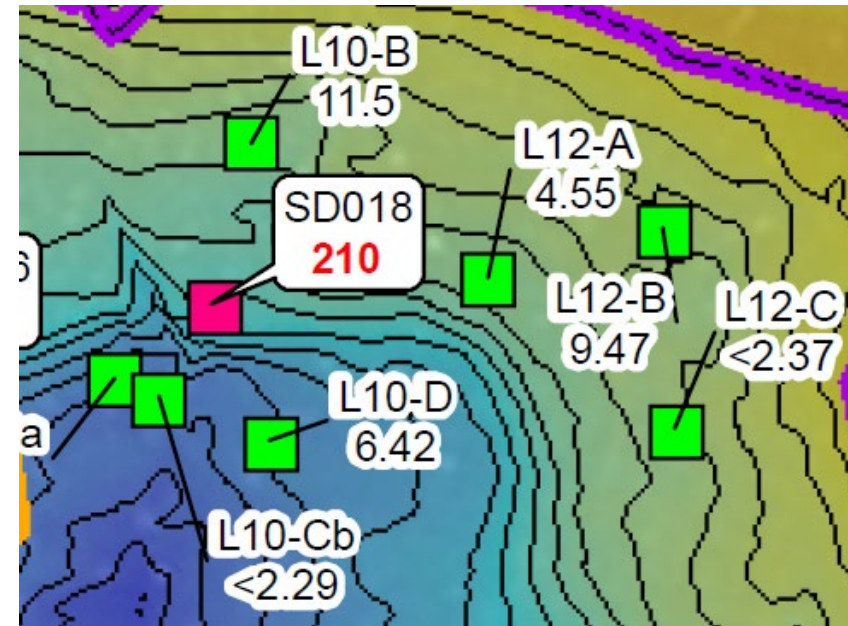


# Turning Basin and Transition Areas – Current Surface Sediment Conditions



# SD018 Mechanisms

- Along steep slope (~20%)
  - Sediment sloughing
- Challenging area during remediation 30+ feet
  - Area to south dredged deep
  - Confirmation sampling (DMU approach) indicated < 20 mg/kg
- Beyond remnant till impacts (in area of SCM)
- Likely isolated area of dredge residual > 20 mg/kg (~0.04 acres or 1,767 ft<sup>2</sup>)

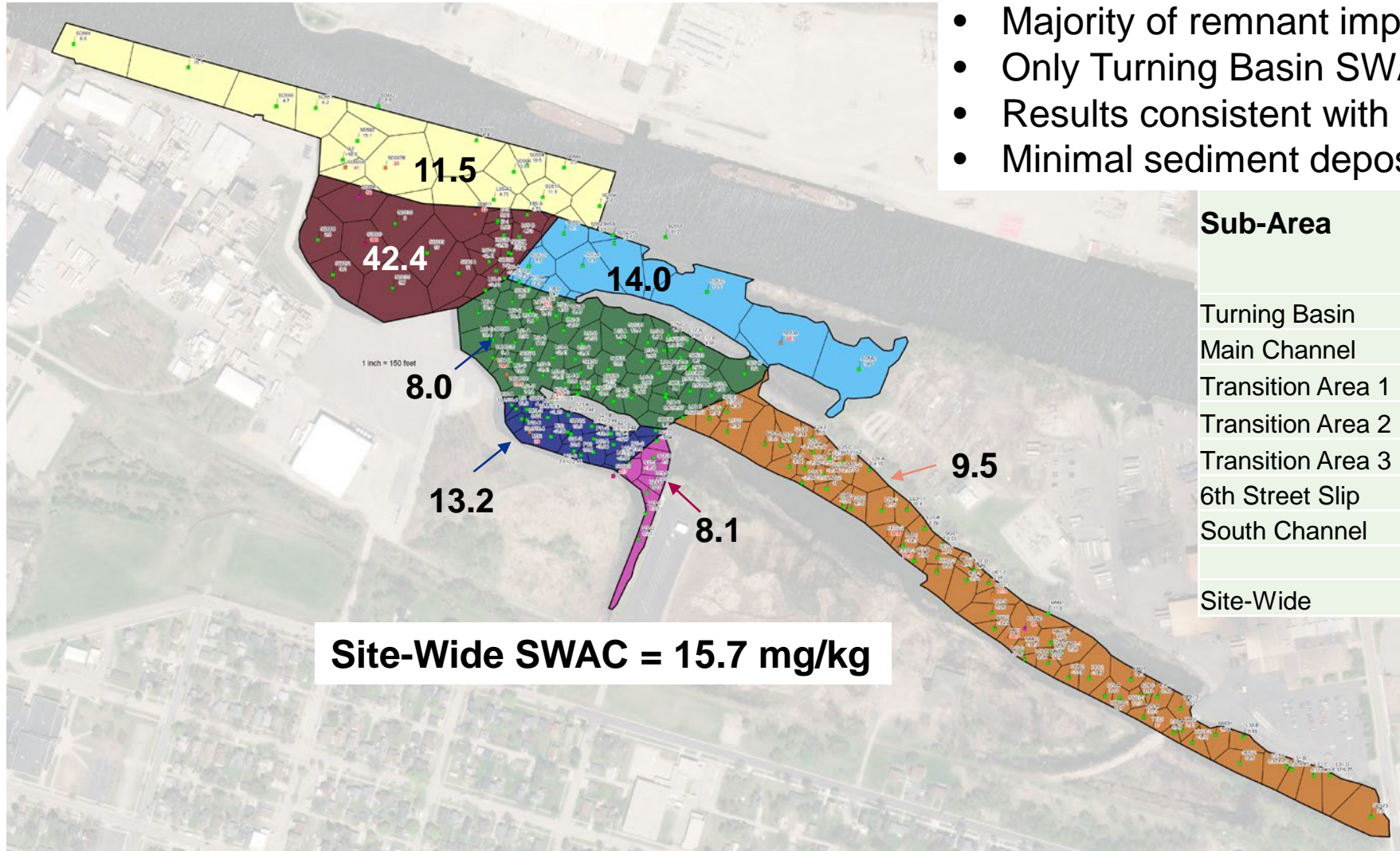


0 85  
Scale in feet

# Evaluation of Post-Dredging Conditions

■ Site-Wide SWAC (15.7 mg/kg) using post-dredging data is below cleanup goal

- Majority of remnant impacts are in the Turning Basin
- Only Turning Basin SWAC exceeds 20 mg/kg
- Results consistent with previous site understanding
- Minimal sediment deposition



Sub-Area	Area (ft <sup>2</sup> )	Surface Sediment SWAC (mg/kg)
Turning Basin	275,349	42.4
Main Channel	369,155	11.5
Transition Area 1	246,817	14.0
Transition Area 2	303,183	8.0
Transition Area 3	71,346	13.2
6th Street Slip	35,286	8.1
South Channel	434,683	9.5
Site-Wide	1,735,819	15.7



# EPA Comments 3 and 4 on Five Year Review

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## EPA Comment 3

- *EPA expects Tyco will submit a pore water sampling work plan to assess, if, and where, groundwater is upwelling through the riverbed and potentially contributing arsenic to re-contaminate sediments*
- *Submit as an addendum to FYR within 60 days of receipt of comments*
- *Tyco may alternatively choose to submit this work plan along with the work plan required in general comment 4*

## EPA Comment 4

- *EPA directs Tyco to submit a work plan and work schedule as an addendum to the FYR to monitor potential arsenic migration mechanisms within 60 days of receipt of this letter.*
- *The monitoring activities must be completed by December 31, 2019 and must be designed to:*
  - *Determine the cause of arsenic concentrations above 20 ppm in sediments, sand cover, and native materials, including whether previously contaminated sediments are redistributing and redepositing, or whether they are being re-contaminated by other means;*
  - *Determine if the rest of the 2012-2014 dredge footprint not included in the 2018 sampling event have arsenic concentrations above 20 ppm. This includes the Transition areas, 6<sup>th</sup> Street Slip, and South Channel; and*
  - *Propose methods for predicting if arsenic concentrations will decrease to the final RAO by November 1, 2023 after additional data collection is complete;*
- *Tyco may alternatively propose to implement a contingency remedy to remove sediment with greater than 20 ppm arsenic.*

# Responses to EPA Comments 3 and 4 on Five Year Review

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- Tyco will submit a work plan that covers requirements in Comments 3 (Pore Water Work Plan) and 4 (Arsenic Migration Pathways Evaluation)
- Primary mechanisms identified in FYR for potential arsenic recontamination
  - Advective groundwater transport (upwelling)
  - Diffusion
  - Dredge residuals (materials left behind or redistributed)
  - Sedimentation
- Previous CAPSIM modeling provided to EPA indicated sediments deposited on exposed glacial till (310 mg/kg) would take 22-30 years to attain 20 mg/kg
- Focus primarily on Turning Basin
  - Historically highest arsenic impacts
  - Highest surficial glacial till concentrations without sand cover
  - Other areas had more post-dredging confirmation sampling; no soft sediment accumulation
- Work Plan will be submitted to evaluate arsenic migration pathways
  - Groundwater/surface water, soil/sediment vertical profiling
  - Evaluation of vertical groundwater migration rate
  - Proposed averaging approach per AOC (e.g. Surface-Weighted Average Concentrations)

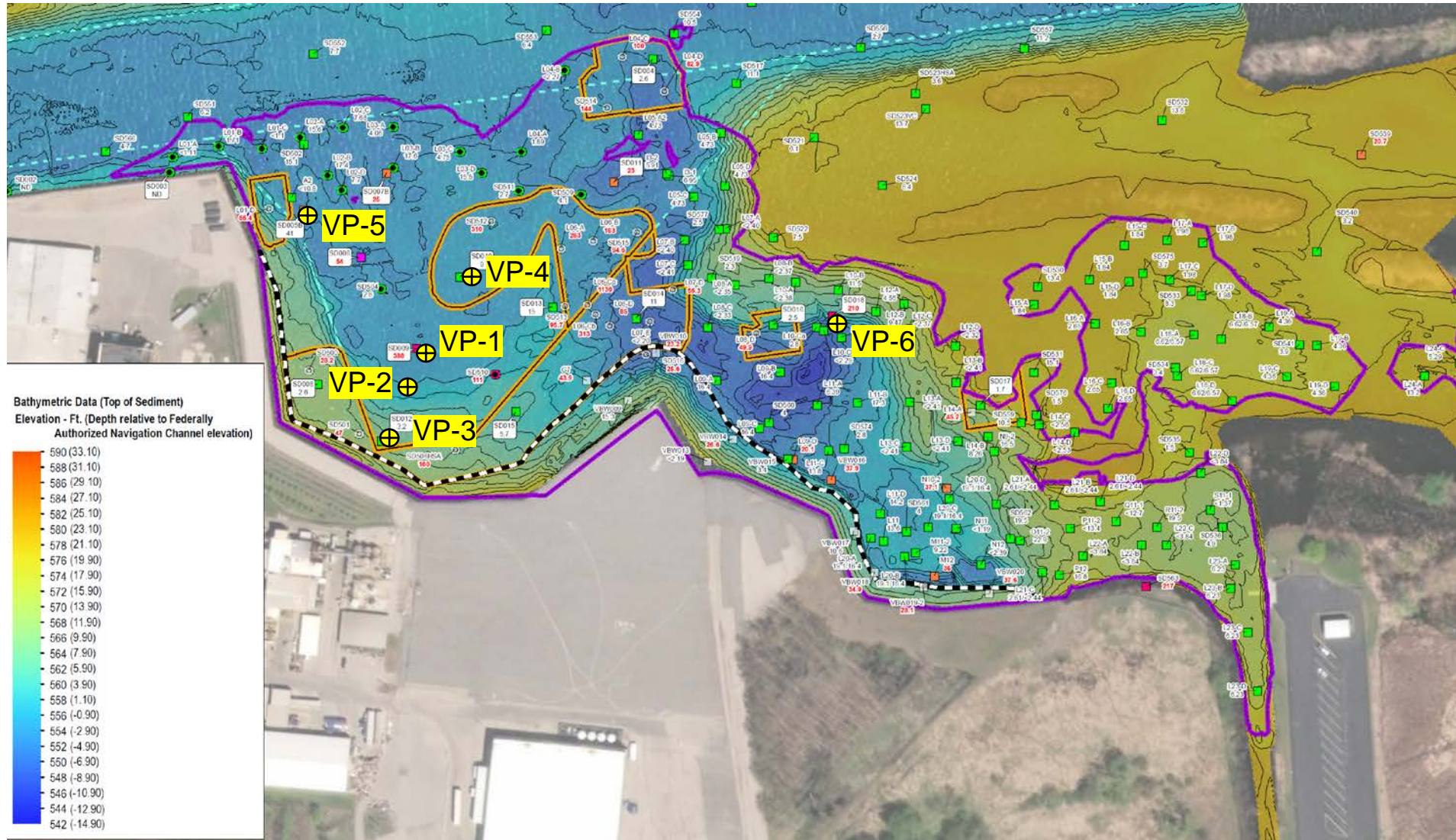
# Work Plan Objectives

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- Develop averaging method, consistent with AOC, for evaluating compliance with 20 mg/kg cleanup goal
- Improve understanding of relative importance of different potential arsenic migration pathways
  - Groundwater upwelling
  - Dredge residual presence
  - Diffusion from underlying impacted glacial tills



# Proposed Vertical Profiling Locations



**LEGEND**

- Bathymetric Contours (2-ft contours)
- Limits of Dredging
- Limits of Rip-Rap Rocks
- USACE Project Limits for Federal Navigation Channel Sand Capped Area
- SD018 Samples that were collected in 2018

**Current Surface Sample Results - Arsenic (mg/kg)**

Till	Non-till	Result
●	■	< 20 mg/kg
●	■	20 - 50 mg/kg
●	■	50 - 100 mg/kg
●	■	> 100 mg/kg

**Surface sample prior to capping or rip-rap placement**

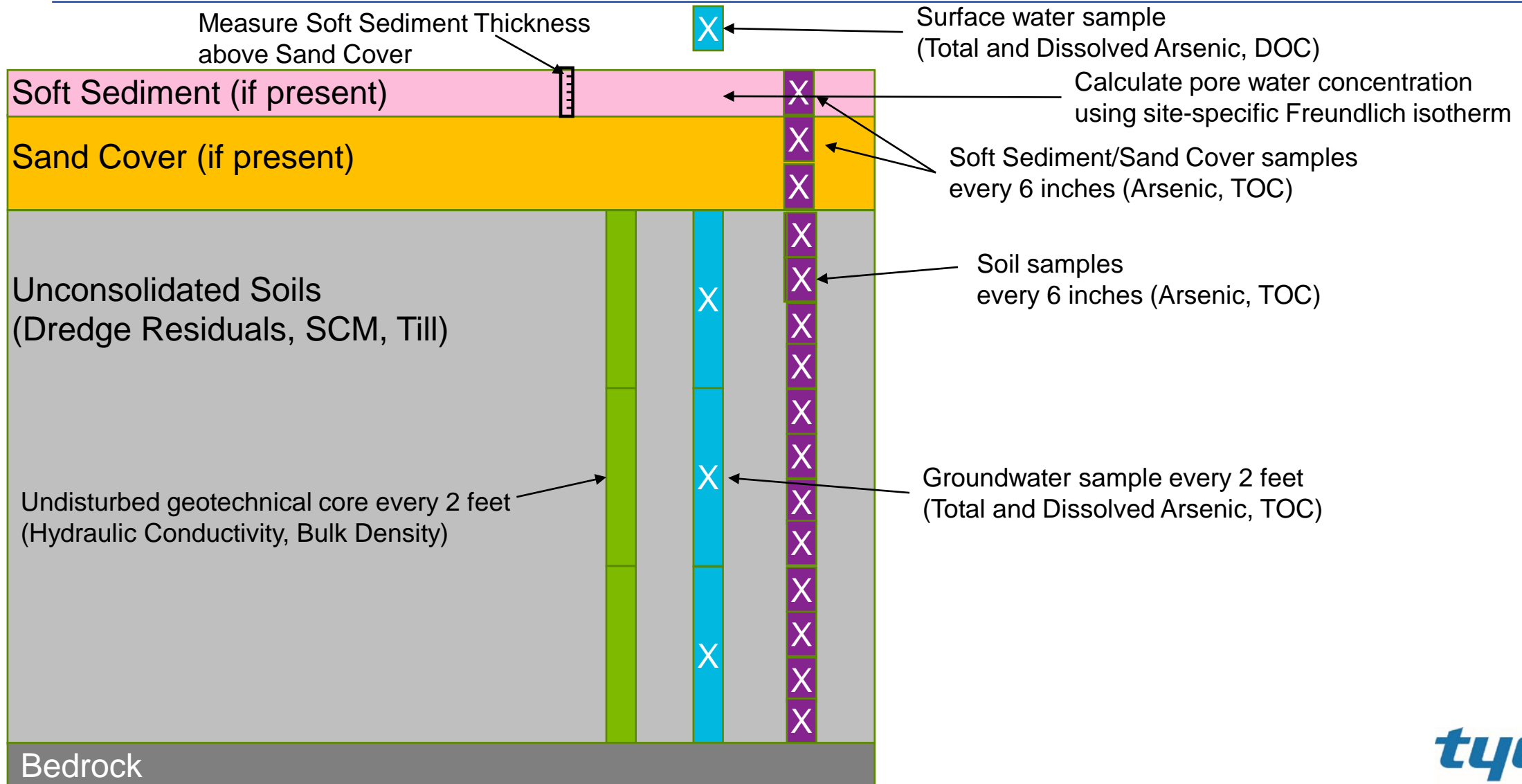
- Non-till that has been covered with rip-rap
- ⊙ Till that has been covered with sand cap or rip-rap



## Vertical Profiling Location Rationales

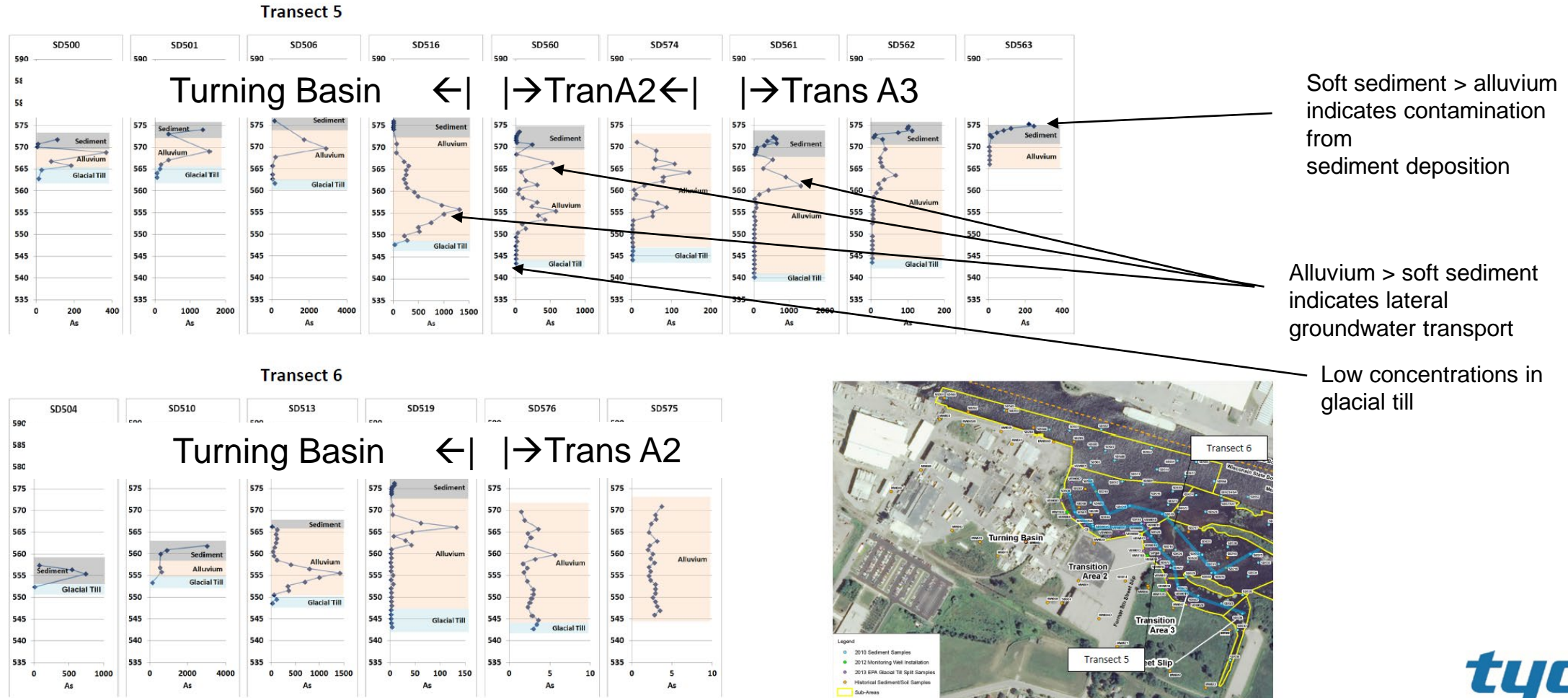
ID	Nearest 2018 Location (Soft Sed conc.)	Groundwater Upwelling?	Diffusion?	Dredge Residual Presence?	Sediment Down Slope?	Sand Cover Effective?	Note
VP-1	SD-09 (380 mg/kg)	X	X	X			3,900 mg/kg in underlying soil
VP-2	SD-09 (380 mg/kg)	X	X	X			3,900 mg/kg in underlying soil
VP-3	SD-12 (3.2 mg/kg)	X	X		X	X	Near wall
VP-4	SD-10 (9.0 mg/kg)	X	X			X	Sand cover
VP-5	SD-05B (41 to 85 mg/kg)	X	X	X	X		Near wall
VP-6	SD-18 (210 mg/kg)	X	X	X	X		Suspected dredge residuals

# Proposed Field Approach



# Pre-Remedy Sediment/Soil Profiles (2010)

- Vertical profiles indicate groundwater upwelling not an important migration process



# Proposed Evaluations

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- Dredge residuals/redeposited sediments presence
  - Evaluate lithology and compaction of sediments in cores
- Where and at what rate is groundwater upwelling
  - Evaluate vertical profiles for upwelling signature
  - Calculate vertical upwelling rate using Darcy's Law
- Compare surface water concentrations to Wisconsin acute and chronic criteria for arsenic
- Compare sediment concentrations (point-by-point, and using SWAC) to cleanup goal
- Estimate pore water concentration from soft sediment concentrations and site-specific isotherm
- Evaluate vertical profiles and lithological information to assess migration pathways
- If necessary, CAPSIM or similar modelling to evaluate migration pathways and future concentrations

# Discussion Points

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- Study goals, approach, and locations
- Sediment goals and averaging approach

# Proposed Schedule

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- Work Plan Submittal – Summer 2019
- Field Work – Summer/Fall 2019
- Analysis – Winter 2019/2020

# Discussion/ Next Steps

USEPA, WDNR and Tyco Meeting

May 13, 2019





# The End

USEPA, WDNR and Tyco Meeting  
May 13, 2019



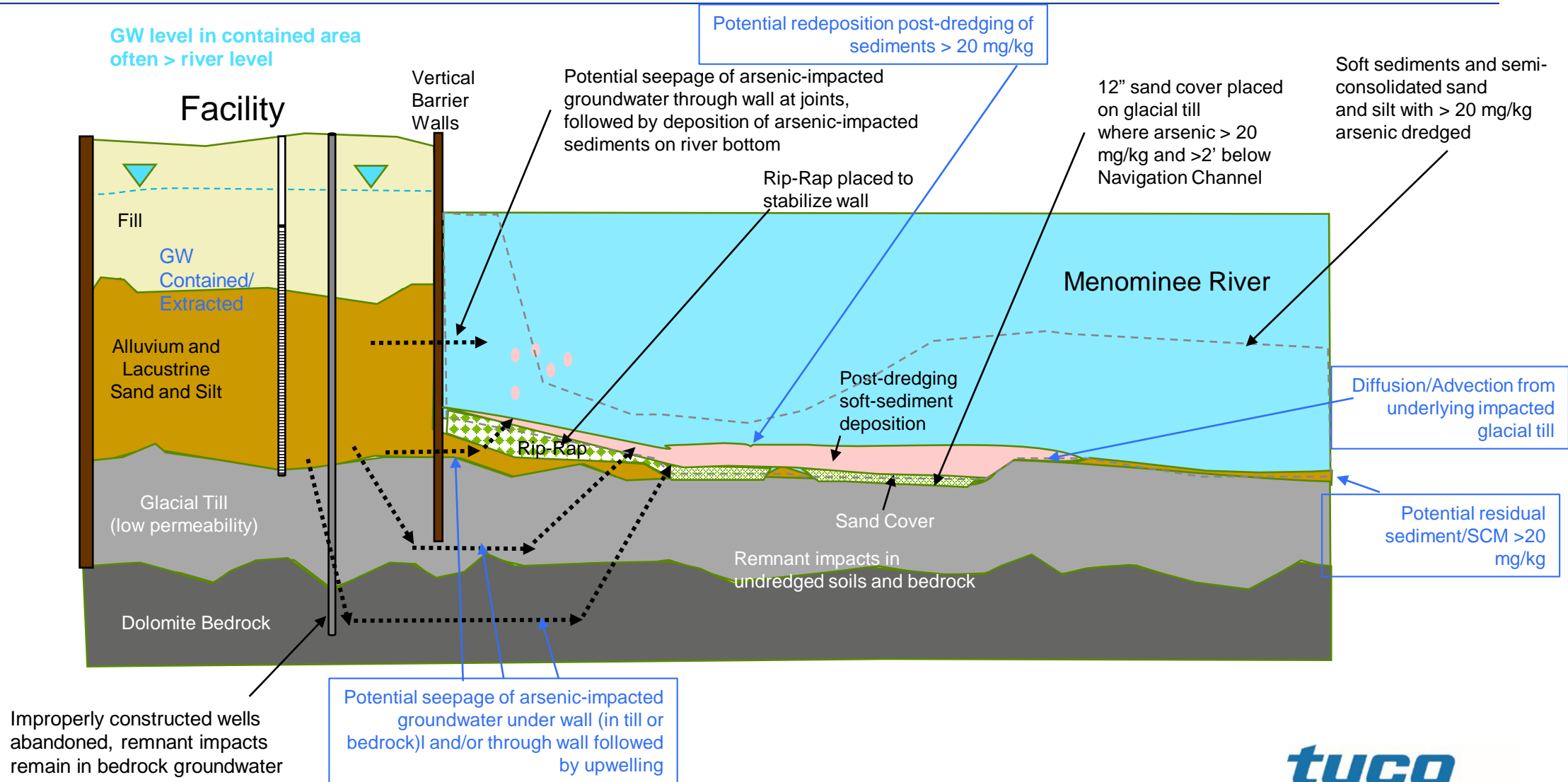
# Conceptual Site Model Slide

USEPA, WDNR and Tyco Meeting

May 13, 2019



# Post-Remediation Conceptual Site Model



# CAPSIM Model Slides

USEPA, WDNR and Tyco Meeting

May 13, 2019



# Previous Sediment Modeling at Site

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CAPSIM Model – Developed by Dr. Danny Reible, University of Texas-Austin

-Transient, 1D model with five compartments

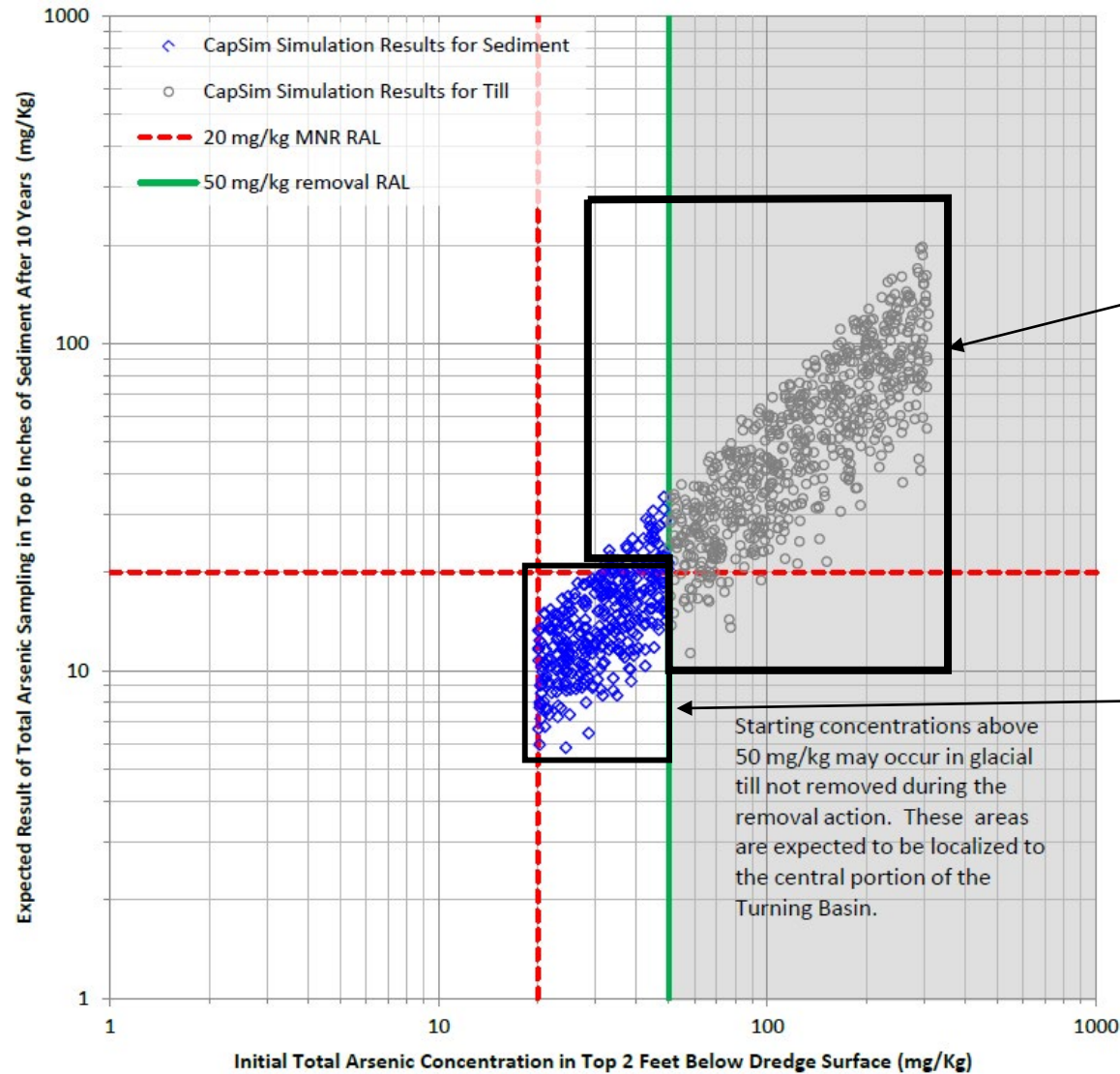
- Overlying water column
  - Sediment-water interface layer
  - Chemical isolation layer (if present)
  - Bioturbation layer
  - Riverbed sediment
- Simulates groundwater upwelling through sediment (advection, diffusion, sorption), deposition of new sediment, mixing of shallow sediment with river water by benthic organisms
- Outputs predicted pore water and sediment concentrations at multiple depths/times
- Capable of Monte Carlo simulations (multiple runs of model, varying various inputs within reasonable ranges)
- Key inputs
- Starting arsenic concentration
  - Sediment deposition rates
  - Site-specific sediment-porewater partitioning relationship
  - Groundwater upwelling velocities

# Previous Sediment Modeling Key Conclusions

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- Where exposed glacial till > 50 mg/kg remains, achieving arsenic concentration < 20 mg/kg takes > 10 years in most model runs
- Worst-case exposed glacial till concentration of 310 mg/kg, 50% of simulations achieve 20 mg/kg within 23 years and 67% achieve 20 mg/kg within 30 years
- One foot sand cover (without sorbing material) sufficient to attain pore water goal (equivalent to 20 mg/kg sediment goal) within 4 years
  - 3.5 cm/yr sediment deposition
  - 6 cm/yr groundwater upwelling rate
  - Target porewater concentration of 0.25 mg/L attained in first year and 0 mg/L within 4 years
- 15 to 20 cm of sediment thickness over residual sand cover will maintain long term arsenic containment
- Key parameters affecting CAPSIM model
  - Deposition Rate (assumed based on historic soft sediment thicknesses)
  - Partitioning
  - Groundwater upwelling rates

# Expected Sediment Concentrations After 10 years – Turning Basin



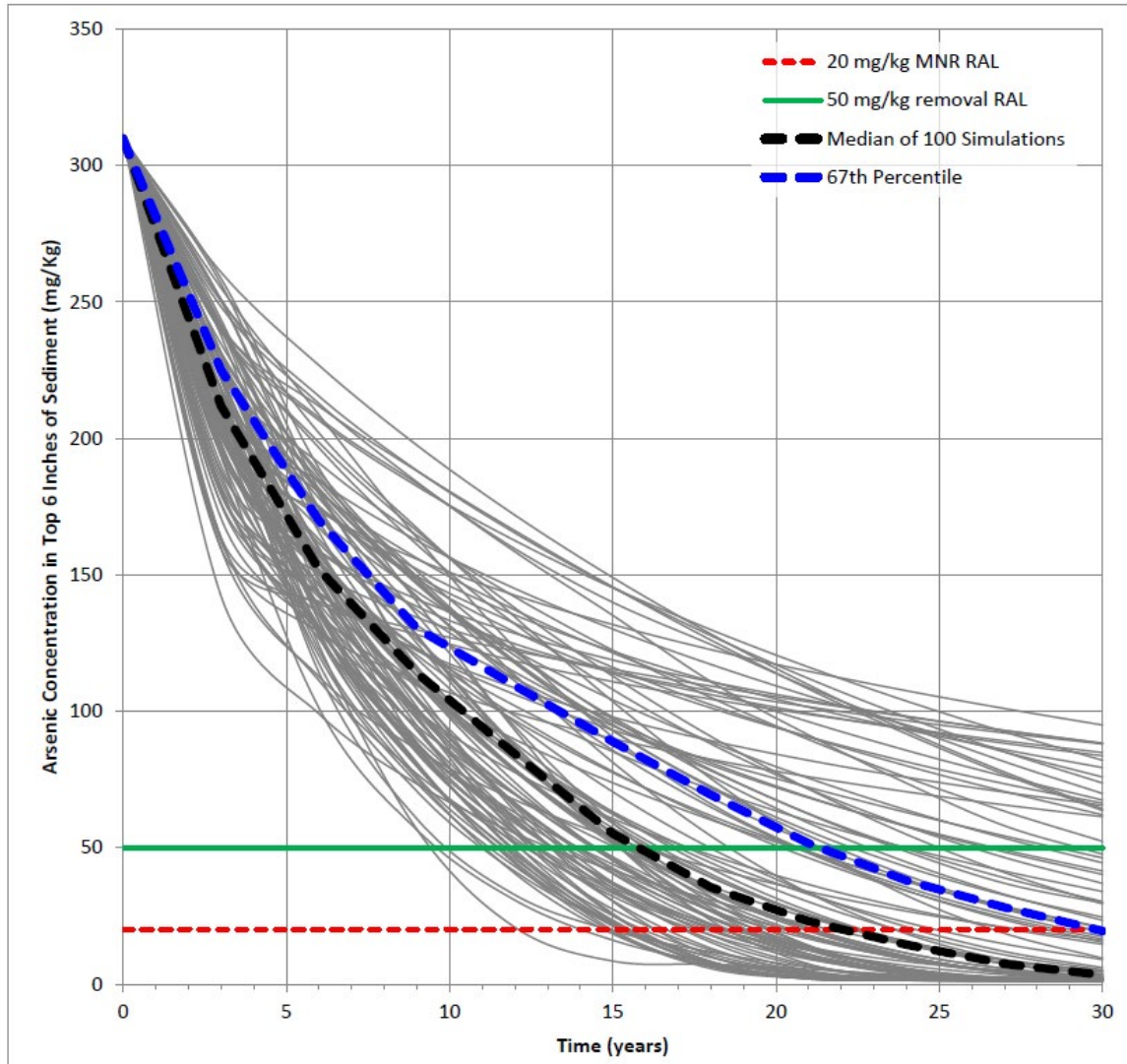
Model assumes dredging SCM to 50 mg/kg

Do not attain 20 mg/kg within 10 years

Attain 20 mg/kg within 10 years

Starting concentrations above 50 mg/kg may occur in glacial till not removed during the removal action. These areas are expected to be localized to the central portion of the Turning Basin.

# CAPSIM Model for 310 mg/kg Exposed Glacial Till



1000 Monte Carlo Simulations (varying inputs)  
Starting Glacial Till concentration of 310 mg/kg

67<sup>th</sup> percentile line – 67 percent of simulations  
reach 20 mg/kg within 30 years

Median percentile line – 50 percent of simulations  
reach 20 mg/kg within 22 years