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October 31, 2024

Mr. Joshua Fontaine
U.S. Environmental Protection Agency, New England Region
Five Post Office Square
Suite 100
Boston, MA 02109

Re: GE-Pittsfield/Housatonic River Site
Rest of River (GECD850)
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6

Dear Mr. Fontaine:

In accordance with Section II.H.6 of the Revised Final Permit issued by EPA for the Rest of River and Section 4.3.3.1 of the *Final Revised Rest of River Statement of Work*, GE is submitting herewith for EPA's review and approval the *Conceptual Remedial Design/Remedial Action Work Plan for Reach 6*, prepared for GE by Anchor QEA in conjunction with AECOM and Arcadis U.S., Inc. The main text of this work plan and associated tables and figures are being provided by e-mail. The full work plan, including appendices, has been posted to a separate download site.

Please let me know if you have any questions about this work plan.

Sincerely yours,

Robert G. Gibson

Robert G. Gibson
Senior Project Manager

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Public Information Repository at David M. Hunt Library in Falls Village, CT
GE Internal Repository

October 2024
Housatonic River – Rest of River

Conceptual Remedial Design/Remedial Action Work Plan for Reach 6

Prepared for General Electric Company

October 2024
Housatonic River – Rest of River

Conceptual Remedial Design/Remedial Action Work Plan for Reach 6

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APPENDICES

ABBREVIATIONS

AC	activated carbon
ACES	Automated Coastal Engineering System
ADCP	acoustic Doppler current profiler
ARARs	applicable or relevant and appropriate requirements
BBL	Blasland, Bouck & Lee, Inc.
bgs	below ground surface
BMP	best management practice
BRA	Baseline Restoration Assessment
CD	Consent Decree
cfs	cubic foot per second
CLU-IN	Clean-Up Information
CMR	Code of Massachusetts Regulations
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
Conceptual RD/RA Work Plan	*Conceptual Remedial Design/Remedial Action Work Plan for Reach 6*
Conceptual RD/RA Work Plan for Reach 5A	*Conceptual Remedial Design/Remedial Action Work Plan for Reach 5A*
CRA	cultural resources assessment
CRE	CR Environmental, Inc.
CRS	cultural resources survey
cy	cubic yard
D15	15th percentile particle size
D50	median (50th percentile) particle size
D85	85th percentile particle size
EA	Exposure Area
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
Final Revised OSS	*Final Revised Overall Strategy and Schedule for Implementation of the Corrective Measures*
Final Revised SOW	*Final Revised Rest of River Statement of Work*
FOS	factor of safety
fps	foot per second
FUSA	Frequently Used Subarea
GE	General Electric Company
GHG	greenhouse gas

GWP	global warming potential
H:V	horizontal:vertical
HHRA	*Human Health Risk Assessment*
HI	Hazard Index
kg	kilogram
lb	pound
MassDEP	Massachusetts Department of Environmental Protection
MassGIS	Commonwealth of Massachusetts Bureau of Geographic Information
MESA	Massachusetts Endangers Species Act
mg	milligram
MNHESP	Massachusetts Natural Heritage and Endangered Species Program
mph	mile per hour
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyl
pcf	pounds per cubic foot
PDI	pre-design investigation
PDI Summary Report	*Revised Pre-Design Investigation Summary Report for Reach 6*
Phase IB CRS Work Plan	*Phase IB Cultural Resources Survey Work Plan*
QOL	quality of life
QOL Compliance Plan	*Quality of Life Compliance Plan*
RCMS	*Housatonic River – Rest of River, Revised Corrective Measures Study Report*
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
Reach 6 BRA Report	*Baseline Restoration Assessment Report for Reach 6*
Restoration/Remediation Coordination Plan	Restoration/Corrective Measures Coordination Plan
Revised Final Permit	Revised Final Resource Conservation and Recovery Act Permit Modification
Revised Phase IA CRA Report	*Revised Supplemental Phase IA Cultural Resources Assessment Report*
Revised Reach 5B–8 BRA Work Plan	*Revised Baseline Restoration Assessment Work Plan for Reaches 5B Through 8*
Revised Reach 6 PDI Work Plan	*Revised Pre-Design Investigation Work Plan for Reach 6*
Revised T&D Plan	*Revised On-Site and Off-Site Transportation and Disposal Plan*

RME	reasonable maximum exposure
ROR	Rest of River
RU	Remediation Unit
SCAP	*Sustainability and Climate Adaptation Plan*
SDC Work Plan	*Supplemental Data Collection Work Plan*
SEFA	Spreadsheets for Environmental Footprint Analysis
SI	Supplemental Investigation
SIP	Supplemental Information Package
SMU	Sediment Management Unit
Stewart	Stewart Laboratories, Inc.
Subaqueous Capping Guidance	*Guidance for In-Situ Subaqueous Capping of Contaminated Sediments*
SWAC	spatially weighted average concentration
TCLP	toxicity characteristic leaching procedure
TOC	total organic carbon
UDF	Upland Disposal Facility
UDF OMM Plan	*Upland Disposal Facility Operation, Monitoring, and Maintenance Plan*
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WARM	Waste Reduction Model
WWTP	wastewater treatment plant
WWUP	*Revised Water Withdrawal and Uses Plan*

1 Introduction

1.1 Background

On December 16, 2020, pursuant to the 2000 Consent Decree (CD) for the GE Pittsfield/Housatonic River Site (EPA and GE 2000), the U.S. Environmental Protection Agency (EPA) issued to the General Electric Company (GE) a final revised modification of GE's Resource Conservation and Recovery Act (RCRA) Corrective Action Permit (Revised Final Permit) for the Housatonic Rest of River (ROR) (EPA 2020). The Revised Final Permit set forth a Remedial Action selected by EPA to address polychlorinated biphenyls (PCBs) in the ROR.

The Revised Final Permit required GE to develop and submit a Statement of Work specifying the deliverables and activities that GE will conduct to design and implement the ROR Remedial Action. In accordance with that requirement, after receipt of EPA's comments on an earlier version, GE submitted a *Final Revised Rest of River Statement of Work* on September 14, 2021 (Final Revised SOW; Anchor QEA et al. 2021), and EPA approved it on September 16, 2021. The Revised Final Permit also required GE, in Section II.H.2, to develop and submit an Overall Strategy and Schedule document to present its overall strategy for implementing the ROR Remedial Action. In response, GE submitted its *Final Revised Overall Strategy and Schedule for Implementation of the Corrective Measures* on July 5, 2022 (Final Revised OSS; Anchor QEA 2022a), and EPA approved it on July 6, 2022. As described in Section 3.2 of that document, the ROR has been segmented into six separate Remediation Units (RUs) to manage workflow and schedule for the ROR Remedial Action.

Reach 5A will be the first RU to be addressed because it is the most upstream reach in the ROR. GE previously submitted to EPA a *Conceptual Remedial Design/Remedial Action Work Plan for Reach 5A* (Conceptual RD/RA Work Plan for Reach 5A; Anchor QEA et al. 2023) on September 28, 2023, and that work plan is currently under EPA review. The Final Revised OSS states that sediment removal in Reach 6, which includes Woods Pond and is farther downstream, will be conducted in parallel with sediment/soil removal in Reach 5A such that sediment removal in both reaches will be completed at approximately the same time. However, capping in Reach 6 will be delayed until after all sediment and soil removal, backfill/capping, and placement of sediment amendments have been completed in all upstream RUs (i.e., Reaches 5A, 5B, and 5C).

As specified in Section II.B.2.e of the Revised Final Permit, remediation in Woods Pond in Reach 6 will involve removal and engineered capping of sediments in the pond as needed to achieve a post-capping minimum water depth of six feet as measured from the crest of Woods Pond Dam, except in nearshore areas, where the slope from the shore to the six-foot water depth is to be as steep as possible while also being stable. In areas with water depth greater than six feet prior to remediation, sufficient sediment will be removed to allow for the placement of an engineered cap so the final grade is equal to or deeper than the original grade.[1] Remediation in Reach 6 will also include removal of floodplain soils to the extent required by the applicable Performance Standards in the Revised Final Permit. Soil and sediment excavated from the remediation areas will be subject to disposal at an on-site Upland Disposal Facility (UDF) or at an off-site disposal facility, consistent with the requirements specified in Attachment E to the Revised Final Permit.

Section II.H.6 of the Revised Final Permit and Section 4.3.3.1 of the Final Revised SOW require GE to prepare a Conceptual Remedial Design/Remedial Action (RD/RA) Work Plan following completion of pre-design investigation (PDI) activities and related reporting for each RU. The Final Revised OSS established that this *Conceptual Remedial Design/Remedial Action Work Plan for Reach 6* (Conceptual RD/RA Work Plan) would be submitted concurrently with submittal of the last PDI Summary Report for Reach 6.

In accordance with the Final Revised OSS, GE submitted the *Pre-Design Investigation Work Plan for Reach 6* to EPA on November 3, 2022 (Anchor QEA 2022b). EPA conditionally approved that work plan in a letter dated March 2, 2023. As required by that letter, GE submitted a *Revised Pre-Design Investigation Work Plan for Reach 6* (Revised Reach 6 PDI Work Plan; Anchor QEA 2023a) on May 1, 2023, and EPA issued conditional approval on June 20, 2023. After implementation of the field investigation and receipt and validation of associated analytical data, GE has prepared a *Pre-Design Investigation Summary Report for Reach 6* (PDI Summary Report; Anchor QEA 2024a) to summarize the activities and results of the Reach 6 PDI. In addition, GE has prepared a *Baseline Restoration Assessment Report for Reach 6* (Reach 6 BRA Report; AECOM 2024a), which describes current habitat conditions in Reach 6. The PDI Summary Report and Reach 6 BRA Report are being submitted concurrently with this Conceptual RD/RA Work Plan.

In the meantime, on October 15, 2024, GE submitted a *Revised On-Site and Off-Site Transportation and Disposal Plan* (Revised T&D Plan; Arcadis 2024a), which described GE's plans for the transportation and disposal of excavated material from the ROR, including Reach 6.

1.2 Description of Reach 6

Under the CD for the GE Pittsfield/Housatonic River Site, the ROR is defined as the portion of the Housatonic River and its backwaters and floodplain (excluding Actual/Potential Lawns as defined in the CD) located downstream of the confluence of the East and West Branches of the Housatonic River (the Confluence). Reaches 5A through 5C of the ROR begin at the Confluence; Reach 6 begins approximately 10 miles downstream of the Confluence and extends through Woods Pond (in the towns of Lenox and Lee) to Woods Pond Dam, as shown on Figure 1-1. River stations for this stretch

[1] As discussed further below, this remediation requirement does not apply to the headwaters of Woods Pond, which is discussed separately in Section 1.4 and is not covered by the conceptual design presented in this Conceptual RD/RA Work Plan; the design for that area will be provided in a later submittal.

of the river were established during the PDI for Reach 5A sediments and riverbanks (Anchor QEA and AECOM 2024) to provide a locational reference to support the PDI, remedial design, and construction. River stations were established every approximately 100 feet along the approximate centerline of the river. The stationing begins with Station 0+00 at the Confluence and was extended downstream to the Woods Pond Dam at Station 583+00. River stations in the Reach 6 area are shown on Figure 1-2.

Woods Pond is an impounded waterbody formed by the construction of Woods Pond Dam in the late 1800s. Woods Pond proper is approximately 0.2 mile in length and has a surface area of approximately 53.6 acres. Water depths (as measured from the crest of the dam) over much of the pond generally range from one to three feet; however, a deeper portion on the southeastern side of the pond has a maximum depth greater than 14 feet. There is also a relatively pronounced channel through Woods Pond, which provides a primary flow pathway. The water depth in the channel is deeper than the surrounding areas, and water velocity in the channel area is typically greater under average flow conditions than in other areas of Woods Pond. The water in most of Woods Pond is relatively slow moving and contains aquatic habitat characteristics of a standing, shallow-water environment. The pond has dominant macrophyte and periphyton communities during the growing season that have strong influence on the pond system. The banks of the pond provide extensive cover, such as overhanging vegetation, woody debris, rock piles, and submerged macrophytes.

In addition to Woods Pond proper, Reach 6 includes an approximately 12.6-acre portion of the headwaters leading into Woods Pond (referred to in this Conceptual RD/RA Work Plan as the headwaters or transition zone), a 3.7-acre outlet channel leading to the dam, and the associated floodplain extending to the 1 milligram per kilogram (mg/kg) PCB isopleth (Figure 1-2). The existing dam at Woods Pond is a concrete overflow weir dam (constructed in 1989) that consists of a 140-foot-long concrete overflow spillway, a concrete non-overflow gravity section with sloped downstream face at the west abutment, and a concrete and steel sheet pile raceway closure structure at the east abutment (GZA 2019). The spillway has a crest elevation of 948.3 feet National Geodetic Vertical Datum of 1929 (NGVD29), and the top elevation of the west abutment is 954.0 feet NGVD29 (GZA 2019).[2]

Water can bypass the dam via the raceway and discharges back in the Housatonic River approximately 360 feet downstream of the dam over stoplogs that control the water level in the raceway. Stoplogs can be added or removed to raise or lower the water level in the raceway. Just before the stoplogs, the raceway is connected to a pond (known as Valley Mill Pond) via a culvert.

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[2] The vertical datum used for data collection during the PDI is the North American Vertical Datum of 1988 (NAVD88). Using that datum, the Woods Pond Dam spillway crest elevation is 947.7 feet NAVD88.

With no other outlet, the water level in the pond matches the water level in the raceway controlled by the hydraulic connection to the raceway via the culvert.

Encompassed within Reach 6 are a variety of aquatic habitats that are influenced in various ways by the impounded conditions created by Woods Pond Dam. Woods Pond itself has been characterized principally as an impoundment, while the transition zone in the headwaters of Woods Pond and the outlet channel just upstream of the dam have a transitional habitat between the impoundment habitat and riverine habitats upstream and downstream of those areas. The transition zone and outlet channel are part of Reach 6 but are discussed herein separately from the main impoundment that comprises Woods Pond because flow and habitat conditions are different from those of the pond proper.

Within Reaches 5 and 6 (i.e., between the Confluence and Woods Pond Dam), the CD defines the ROR site boundary as the floodplain area extending laterally to the 1 mg/kg PCB isopleth, which corresponds approximately to the 10-year floodplain. The floodplain in Reach 6 is relatively narrow, generally extending no more than 50 to 150 feet from the pond shoreline (see Figure 1-2). EPA's *Human Health Risk Assessment* (HHRA; EPA 2005a) divided the ROR floodplain into 90 Exposure Areas (EAs) for the assessment of direct human contact with floodplain soils.[3] Of the 90 EAs identified in the HHRA, five are located wholly or partially within Reach 6 (EAs 56 through 60), as shown on Figure 1-3. EAs 56 and 57 are located partially within Reach 5C but were fully characterized as part of the Reach 6 PDI. Three of the five EAs in Reach 6 contain subareas based on distinct exposure scenarios; they are EAs 56a, 59a, and 60a. In addition, three of the EAs in this reach (EAs 58, 59, and 60) contain Frequently Used Subareas (FUSAs) identified in the *Housatonic River – Rest of River, Revised Corrective Measures Study Report* (RCMS; Arcadis et al. 2010). Furthermore, as described in the Reach 6 BRA Report, there are two confirmed vernal pools in the Reach 6 area (located in EA 57).

Much of the vegetation in the Reach 6 floodplain consists of hardwood and transitional floodplain forests, with some more limited areas of shrub swamp and emergent marsh habitat (Woodlot 2002). A more detailed description of the existing habitats in Reach 6 is provided in GE's Reach 6 BRA Report and is summarized in Section 3.5 of this Conceptual RD/RA Work Plan.

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[3] Although those EAs were initially defined by EPA starting with property boundaries, the EAs covered by the Revised Reach 6 PDI Work Plan are limited to the portions of the floodplain between the edge of the Housatonic River and the ROR floodplain boundary. Specific non-residential exposure scenarios and receptors were then assigned to each such EA. Several of those EAs contain overlying direct-contact subareas, which are typically characterized by a different and/or more frequent exposure scenario. In addition, in the *Housatonic River – Rest of River, Revised Corrective Measures Study Report* (Arcadis et al. 2010), GE identified "heavily used subareas" within EAs. These heavily used subareas were referred to as "Frequently Used Subareas" in the Revised Final Permit and the Revised Reach 6 PDI Work Plan and continue to be referred to as such herein.

1.3 Purpose and Scope of Reach 6 Conceptual RD/RA Work Plan

This Conceptual RD/RA Work Plan presents preliminary design information for the remediation of sediment and floodplain soil within Reach 6 of the ROR. In accordance with the Final Revised OSS, because cap placement in Reach 6 is anticipated to occur approximately five to six years after the sediment and floodplain soil removal (i.e., after completion of remediation in all upstream RUs [Reaches 5A, 5B, and 5C]), this Conceptual RD/RA Work Plan describes only the design activities required to support sediment and floodplain soil removal components of the remedy in Reach 6. As discussed further below, this Conceptual RD/RA Work Plan will be followed by a Final RD/RA Work Plan for Reach 6 for the same sediment and floodplain soil remediation. Following the performance of additional PDI activities pertinent to capping in the future,[4] an addendum to the Final RD/RA Work Plan will be prepared to address the capping component of the Reach 6 remedy.

The conceptual design provided in this Conceptual RD/RA Work Plan for Reach 6 focuses on Woods Pond proper, the outlet channel, and the Reach 6 floodplain. As described in Section 1.4, sediment removal in the headwaters transition zone portion of Reach 6 will not be conducted concurrently with the sediment removal in other portions of Reach 6. Instead, sediment removal and capping in that transition zone will be conducted concurrently with or after the sediment removal and backfilling for Reach 5C and prior to capping in Woods Pond.

In addition, GE has elected to include Valley Mill Pond as part of the scope of conceptual design for Reach 6. Valley Mill Pond is an approximately 4.6-acre pond located on the eastern side of the river, immediately south of Woods Pond Dam (Figure 1-2). While technically located in Reach 7A, this pond is hydraulically connected to Reach 6 through a diversion channel that bypasses the dam. Given the pond’s location and hydraulic connection to Reach 6, GE has determined that it is appropriate to include this area as part of the Reach 6 RU rather than deferring it to future remediation activities to be performed in the Reach 7 RU. If it is determined that capping will be a component of the remedy in Valley Mill Pond, the design of that cap will be provided in the Final RD/RA Work Plan for Reach 6 (not in the future work plan addendum that will include the cap design for Woods Pond).

This Conceptual RD/RA Work Plan evaluates data collected during the Reach 6 PDI (as well as relevant historical data) and presents preliminary remediation areas for each of those media in accordance with the Performance Standards and other requirements specified in the Revised Final Permit. Details of these evaluations are presented in the remainder of this work plan. It should be noted that Valley Mill Pond was not included in the scope of the Reach 6 PDI. Therefore, the assessment of that pond provided in this Conceptual RD/RA Work Plan is based on historical data

[4] In accordance with the Final Revised OSS, an addendum to the Revised PDI Work Plan for Reach 6 will be submitted approximately two years prior to the anticipated completion of capping in Reach 5C.

collected in that area. Proposed sampling and data collection to be used to support final design is presented in the *Supplemental Data Collection Work Plan for Reach 6* (SDC Work Plan) provided in Appendix F.

This Conceptual RD/RA Work Plan was prepared in accordance with the requirements presented in the Revised Final Permit and in Section 4.3.3.1 of the Final Revised SOW. Specifically, this work plan, including its appendices, presents the following information:

- Description of the characteristics of Reach 6 and a summary of existing data, including the results of pre-design studies/investigations for Reach 6 and historical data used to support the conceptual design;
- Evaluation of the areas and depths subject to remediation in Reach 6 to meet the applicable PCB-related Performance Standards;
- Design assumptions and a preliminary cap design evaluation used to support the conceptual sediment removal depths;
- Sediment stability assessment to evaluate stable sediment removal depth and slopes, including in nearshore areas;
- Preliminary evaluation of the conceptual design to hydraulically dredge and transport sediment to the UDF;
- Evaluation of issues that may affect the type and extent of remediation activities;
- Preliminary remediation plans;
- Summary of preliminary remediation quantities for Reach 6, including estimated sediment and soil removal volumes;
- Description of where the dredged/excavated materials from Reach 6 will be disposed of (i.e., in the UDF versus in off-site disposal facilities) and the volumes of sediment for hydraulic transport to the UDF and the volumes of soil that will need to be transported by truck or truck and rail to the UDF and to off-site disposal facilities (based on the Revised T&D Plan);
- Conceptual description of the waste transport and handling of sediment and soils from Reach 6, including a description of the process and facilities for the hydraulic pumping and dewatering, and (if appropriate) disposal of Reach 6 sediments at the UDF; the process for transport of dewatered sediments not meeting UDF criteria from the UDF to off-site disposal facilities; and transport of soil to the UDF and off-site disposal facilities as necessary;
- Identification of applicable or relevant and appropriate requirements (ARARs) for the remediation and restoration work in Reach 6;

- Overview of the applicable quality of life (QOL) standards, potential QOL impacts on the public, and potential response measures;
- Discussion of sustainability considerations for the Reach 6 remediation;
- Summary of the status of the water withdrawals and uses evaluation for Reach 6;
- Description of supplemental data collection activities to be conducted in Reach 6 prior to final design, including a SDC Work Plan (Appendix F); and
- Schedule for completion of the remedial design for the Reach 6 remediation.

In addition to this Conceptual RD/RA Work Plan, as described in Section 1.1, GE has separately prepared a Reach 6 BRA Report that describes current habitat conditions in Reach 6. Further, GE is developing a *Phase IB Cultural Resources Survey Work Plan* (Phase IB CRS Work Plan) for Reach 6, which will describe GE's plans for investigations to determine whether the remediation and support activities for the areas covered by the Conceptual RD/RA Work Plan will impact any potentially significant cultural resources. That Phase IB CRS Work Plan will be submitted by November 15, 2024, under a revised schedule approved by EPA.

The conceptual design information presented herein is preliminary and represents an approximate 30% design. As such, the estimated removal and disposal quantities presented herein are likewise preliminary and may be adjusted after further evaluation during final design. As described in this Conceptual RD/RA Work Plan, supplemental data collection, additional habitat assessment activities, cultural resources investigations, and additional design evaluations are necessary and will be conducted as part of the final design process. Once these activities are complete, GE will submit a Final RD/RA Work Plan for Reach 6 that includes a detailed description of the design and implementation of the proposed remedial activities for Reach 6 (excluding the headwaters transition zone) along with updated removal and disposal quantity estimates, where applicable.

This Conceptual RD/RA Work Plan does not present design details for the UDF, which were presented in GE's February 2024 UDF Final Design Plan (Arcadis 2024b), which was conditionally approved by EPA on September 12, 2024, and will be revised in response to that conditional approval. A Revised Final Design Plan for the UDF will be submitted to EPA by December 20, 2024, including a revised set of specifications and design drawings and a new addendum that provides details regarding: (a) the conceptual design and location of the on-site UDF leachate treatment system; and (b) the conceptual design and location of the on-site dewatering facility at the UDF.

1.4 Proposed Remediation Approach for the Headwaters Transition Zone

Attachment E to the RCRA Permit states that "EPA agrees to work with GE to design an appropriate transition and hybrid disposal averaging area in the Woods Pond Headwaters area between Reach 5C and Woods Pond."

GE proposes the following remediation approach for that transition zone:

- Sufficient sediment will be removed from the transition zone to allow for placement of an engineered cap so the final grade is generally consistent with the original grade. This is consistent with the remediation approach for Woods Pond where water depths are greater than six feet prior to remediation as well as the engineered cap provisions for other ROR reaches.
- Sediment removal in the transition zone will not be conducted concurrently with the sediment removal in other portions of Reach 6 (i.e., Woods Pond and the outlet channel). Instead, sediment removal and capping in the transition zone will be conducted concurrently with or after the sediment removal and backfilling for Reach 5C and prior to capping in Woods Pond (i.e., the transition zone remediation will be implemented several years after the Woods Pond dredging).
- Disposal of sediment from the transition zone will be in accordance with the requirements listed in Attachment E of the RCRA Permit. GE will segregate and dispose of off-site (out-of-state) any sediment polygons with a length-weighted vertical core average concentration equal to or greater than 100 mg/kg. In addition, GE will segregate and dispose of off-site (out-of-state) any sediments containing high concentrations so the remaining sediment to be disposed of in the UDF averages 25 mg/kg PCBs or less. For the purposes of this calculation, the headwaters transition zone will be included in the averaging area with the remainder of Reach 6 (i.e., Woods Pond and the outlet channel).

This approach was selected based on the following:

- The Revised Final Permit does not contain any specific Performance Standards regarding the headwaters transition zone portion of Reach 6 between Woods Pond proper and Reach 5C. While this transition zone is part of Reach 6, the Revised Final Permit requirement to remove sediment throughout Woods Pond to achieve a post-capping minimum water depth of six feet is not an appropriate remedy for the transition zone given the existing riverine-type conditions present in that area. As such, it is more appropriate to return river elevations in the transition zone to pre-dredge conditions after capping.

- Data collected during the Reach 6 PDI indicate that surficial sediment PCB concentrations in the transition zone are low relative to the much higher PCB concentrations in historical samples collected at depth in that area. Therefore, conducting sediment removal and capping in the transition zone concurrently with remediation to be performed in Reach 5C will reduce the duration where higher PCB concentrations would be exposed (i.e., if dredging in the transition zone was performed at the same time as Woods Pond, higher PCB concentrations in this area would be exposed for several years prior to final cap placement in Reach 6).
- Conducting sediment removal and capping in the transition zone concurrently with or after the Reach 5C remediation will allow the riverine-type conditions in the transition zone to be restored shortly after dredging instead of several years later if the sediment removal was performed concurrent with the Woods Pond dredging.

Because sediment removal in the transition zone will be conducted separately from and several years after the rest of Reach 6 sediment removal, the conceptual design for the transition zone portion of Reach 6 is not presented in this Conceptual RD/RA Work Plan and will not be presented in the Final RD/RA Work Plan for Reach 6. Instead, design details for the sediment removal and capping design for the transition zone will be described in a future addendum to the Final RD/RA Work Plan for Reach 6.[5] GE will coordinate with EPA to develop a schedule for completing the transition zone design and will describe the schedule and associated design submittals in the Final RD/RA Work Plan for Reach 6.

1.5 Work Plan Organization

The remainder of this Conceptual RD/RA Work Plan is organized into the following sections:

- Section 2 presents a summary of the Performance Standards and other requirements applicable to the Reach 6 Remedial Action.
- Section 3 summarizes existing conditions and data applicable to the remediation of Reach 6 based on applicable historical data and pre-design studies/investigations.
- Section 4 presents a summary of the evaluations conducted to determine the preliminary sediment and floodplain remedial areas required to achieve the Performance Standards summarized in Section 2.
- Section 5 presents conceptual design details for the main elements of the Reach 6 design, including hydraulic dredging and pumping of the sediments, floodplain soil remediation, and

[5] This is currently anticipated to be the same addendum to the Final RD/RA Work Plan that will be prepared to address the capping component of the Reach 6 remedy (noted in Section 1.3); however, it could be a separate addendum.

waste transport and disposal at the UDF and off-site disposal facilities (including the anticipated construction of a new rail loading and unloading area near Woods Pond).

- Section 6 presents a discussion of ARARs associated with the remediation of Reach 6 at the conceptual design phase.
- Section 7 presents an overview of the QOL standards to be included in the Revised QOL Compliance Plan that will be submitted in November 2024, summarizes potential measures to address potential impacts on the public, and describes the QOL evaluations that will be completed for the Final RD/RA Work Plan for Reach 6.
- Section 8 presents a preliminary vulnerability assessment for Reach 6 and describes the methodology for how greenhouse gas (GHG) emissions will be evaluated as part of final design.
- Section 9 presents a summary of water withdrawal and uses outreach activities performed to date for Reach 6 and a preliminary evaluation of potential impacts to identified water users.
- Section 10 summarizes the proposed supplemental data collection activities to be conducted prior to final design (with details presented in an attached work plan).
- Section 11 presents a schedule for the remaining design activities for Reach 6.
- Section 12 lists the references cited in this Conceptual RD/RA Work Plan.

The discussions in Sections 2 through 11 are supported by various tables, figures, and appendices included in this Conceptual RD/RA Work Plan.

2 Reach 6 Performance Standards and Corrective Measures

This section summarizes the Performance Standards and Corrective Measures in the Revised Final Permit applicable to the design and construction of remedial activities in Reach 6.

2.1 General Performance Standards

Section II.B.1 of the Revised Final Permit established general Performance Standards applicable to the entire ROR remedy (including Reach 6). The Downstream Transport Performance Standard (Section 2.1.1) and the Biota Performance Standard (Section 2.1.2) include standards that will not be evaluated until several years after the Reach 6 remedial construction (and remediation in other RUs) is complete.

2.1.1 Downstream Transport Performance Standard

Section II.B.1.a of the Revised Final Permit lists the first of three general performance standards—Downstream Transport of PCBs. That standard specifies the future allowable PCB load passing Woods Pond Dam and Rising Pond Dam, as summarized in Table 2-1.

Table 2-1
Downstream Transport Performance Standard

Woods Pond		Rising Pond	
Average Daily Flow at Woods Pond Dam Gage (cfs)[1]	**Average Annual PCB Load (kg/year)**	**Average Daily Flow at Great Barrington USGS Gage (cfs)[1]**	**Average Annual PCB Load (kg/year)**
≤325	2.2	≤485	1.9
>325 to ≤395	2.8	>485 to ≤600	2.4
>395 to ≤1,450	3.3	>600 to ≤2,670	4.0
>1,450	NA	>2,670	NA

Note:
1. The calculated arithmetic average of the average daily flows on days when samples are collected will determine the flow bin for a given year.

An exceedance of this standard would occur if the annual average PCB load exceeds the standard for the corresponding river flow bin at either location in three or more years within any five-year period following completion of the ROR remediation activities. Details regarding measurement of compliance with the Downstream Transport Performance Standards are provided in Sections II.B.1.a.(2)(a) through (g) of the Revised Final Permit.

2.1.2 Biota Performance Standard

Section II.B.1.b of the Revised Final Permit specifies short-term and long-term biota standards as follows:

- The Short-Term Biota Performance Standard is an average total PCB concentration of 1.5 mg/kg wet weight, skin off, in edible fish fillets in each reach of the river and backwaters.[6] This standard is to be achieved within 15 years of completion of construction-related activities for that reach (or, if the reach is subject to monitored natural recovery, upon completion of the closest upstream reach subject to active remediation). An exceedance of this standard would occur in the event that the standard is exceeded in any two consecutive monitoring periods after the 15-year period.
- The Long-Term Biota Monitoring Performance Standard is to continue to monitor (even after the Short-Term Biota Performance Standard has been attained) the expected reduction in biota PCB concentrations and the progress toward achieving average total PCB concentrations of 0.064 mg/kg wet weight, skin off, in fish fillets in each reach of the river and associated backwaters in Massachusetts;[7] 0.00018 mg/kg wet weight, skin off, in fish fillets in each reach of the river in Connecticut;[8] and 0.075 mg/kg in duck breast tissue in all areas along the river.[9]

2.1.3 Restoration of Areas Disturbed by Remediation Activities

As provided in Section II.B.1.c.(1) of the Revised Final Permit, the Performance Standards for restoration of disturbed areas require GE to: (1) implement a comprehensive program of restoration measures to address the impacts of the remediation on affected ecological resources, species, and habitats, including, but not limited to, riverbanks, riverbed, floodplain, wetland habitat, and the occurrence of threatened, endangered, or other state-listed species and their habitats; and (2) return areas disturbed by remediation activities to pre-remediation conditions (e.g., the functions, values, characteristics, vegetation, habitat, species use, and other attributes) to the extent feasible and consistent with the remediation requirements.

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[6] This standard was based on the estimate, in EPA's probabilistic risk assessment of fish consumption by humans, of the PCB concentration corresponding to a non-cancer HI of 1 for the Central Tendency Exposure of adults to PCBs in fish fillets.

[7] This criterion was based on the estimate, in EPA's probabilistic risk assessment of fish consumption by humans, of the PCB concentration associated with an excess cancer risk of 1×10^{-5} for the reasonable maximum exposure (RME) of both young children and adults to PCBs in fish fillets.

[8] This criterion was developed by Connecticut.

[9] This criterion was based on the estimate, in EPA's probabilistic risk assessment of waterfowl consumption by humans, of the PCB concentration associated with an excess cancer risk of 1×10^{-5} for the RME exposure of both young children and adults to PCBs in duck breast consumed.

2.2 Sediment

2.2.1 Woods Pond

Section II.B.2.e of the Revised Final Permit provides that sediment throughout Woods Pond will be removed, and an engineered cap placed, such that the post-capping minimum water depth is six feet, measured from the crest of Woods Pond Dam. An exception applies to nearshore areas, where the slope from the shore to the six-foot water depth will be as steep as possible, while still being able to maintain stability and resist erosion or sloughing. Section II.B.2.e of the Revised Final Permit also provides that, in areas deeper than six feet prior to remediation, sufficient sediment will be removed to allow for the placement of an engineered cap so the final grade is as least as deep as the original grade.

Section II.B.2.e of the Revised Final Permit also provides that, if EPA determines that significant concentrations and depths of PCB-contaminated sediment have accumulated above the engineered cap in Woods Pond during the post-construction monitoring, the accumulated sediment will be removed in a manner that ensures the integrity of the engineered cap.

As noted in Section 1.3, the Revised Final Permit does not contain any specific Performance Standards regarding the headwaters transition zone portion of Reach 6 between Woods Pond proper and Reach 5C. While this transition zone is part of Reach 6, the Revised Final Permit requirement to remove sediment throughout Woods Pond to achieve a post-capping minimum water depth of six feet is not an appropriate remedy for the transition zone given the existing riverine-type conditions present in that area. GE's proposed remediation approach for the transition zone is described in Section 1.4.

2.2.2 Valley Mill Pond

As described in Section 1.3, sediment remediation in Valley Mill Pond is being included in the scope of conceptual design for Reach 6. The Revised Final Permit did not establish specific Performance Standards or other requirements for this area; therefore, GE has elected to evaluate it against the Performance Standards for backwaters given that this area is separate from, but hydraulically connected to, the main river channel.

The Performance Standards for backwaters are specified in Section II.B.2.d of the Revised Final Permit. These Performance Standards have separate requirements for portions of backwaters located within and outside of Core Area 1 Priority Habitat[10] and for surface (top one foot) and subsurface

[10] As defined in the Revised Final Permit, Core Area 1 habitat consists of areas identified by the Massachusetts Division of Fisheries and Wildlife as areas with "the highest quality habitat for species that are most likely to be adversely impacted by PCB remediation activities," most of which species are plants because they are not mobile (Attachment B to Revised Final Permit).

sediments. Valley Mill Pond is not located within Core Area 1 habitat; therefore, the relevant backwater Performance Standards are as follows:

- For surface sediments in areas located outside Core Area 1 habitat, sufficient sediment will be removed, including any sediment in areas with total PCB concentrations greater than or equal to 50 mg/kg, and replaced with a contiguous engineered cap to achieve a spatially weighted average concentration of 1 mg/kg total PCBs in each averaging area. When calculating post-remediation spatially weighted average concentrations, a PCB concentration equal to 1% of the existing average surficial PCB concentration within a given backwater area will be used as the PCB concentration in capped areas.
- For subsurface sediments, additional sediment will be removed as needed to achieve a spatially weighted average concentration of 1 mg/kg total PCBs in each averaging area and depth interval in areas outside the footprint of the engineered cap necessary to meet the requirements for surface sediments described previously. As with surface sediments, when calculating post-remediation spatially weighted average concentrations, a PCB concentration equal to 1% of the existing average surficial PCB concentration within a given backwater area will be used as the PCB concentration in capped areas.
- In lieu of engineered capping for the surface and subsurface sediment remediation described previously, the Revised Final Permit allows for the placement of backfill in areas where sediment was removed; however, the backfill cannot be factored into the spatial weighting calculations.

The Revised Final Permit requires that delineation of remediation areas needed to achieve the concentration criteria for backwaters is to be determined based on Thiessen polygons developed using data collected during pre-design sampling. Valley Mill Pond was not included in the scope of the Reach 6 PDI; therefore, the conceptual design for this area is based on data collected historically. Supplemental PCB data will be collected in this pond consistent with requirements for PDI sampling in backwaters (i.e., 50-foot grid sampling) prior to final design.

2.2.3 Engineered Caps

The Performance Standards for engineered caps are described in Section II.B.2.i of the Revised Final Permit, which states that all engineered caps constructed for the ROR will include the following layers or functions:

- A Mixing Layer to prevent contamination of the overlying chemical isolation layer due to mixing with underlying contaminated sediment during cap placement, taking into account geotechnical considerations, placement techniques, and other factors as appropriate;

- A chemical isolation layer sufficient to minimize (reduce by 99%) the flux of PCB concentrations through the isolation layer;
- An erosion protection layer to prevent erosion in accordance with federal and state requirements and consistent with pertinent EPA or U.S. Army Corps of Engineers (USACE) guidance;
- A Geotechnical Filter Layer, as needed based on the design evaluation, to prevent mixing between the chemical isolation and erosion protection layers;
- A Bioturbation Layer to prevent bioturbation from impacting underlying layers; and
- A Habitat Layer to provide functions and values equivalent to the pre-existing surficial sediment substrate.

Section II.B.2.i.(2) of the Revised Final Permit provides details related to design and construction requirements for each of the cap layers described previously. These requirements are summarized as follows:

- *Mixing Layer:* The composition and thickness of the Mixing Layer will be evaluated and designed to prevent contamination of the overlying chemical isolation layer due to mixing with underlying contaminated sediment during cap placement.
- *Chemical Isolation Layer:* Modeling of the Chemical Isolation Layer will be performed using site-specific data collected during the design process, as appropriate, and in general accordance with the EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (EPA 2005b) and *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments* (Subaqueous Capping Guidance; Palermo et al. 1998). The model will consider the processes of advection, diffusion, sorption, bioturbation, surface water exchange, and sediment deposition, and will be used to determine the thickness and composition (i.e., the amount of activated carbon [AC]/total organic carbon [TOC] or equivalent sorptive amendment) required to reduce the flux of PCB concentrations through the chemical isolation layer by 99%.
- *Erosion Protection Layer:* The design flow event for the erosion protection layer, which is a flow event up to and including the applicable return interval event (e.g., 100-year or 500-year flow event), will be calculated using up-to-date flow data, with additional considerations for the potential impacts of climate change on cap performance and appropriate measures to mitigate them. Site-specific data and modeling will be used to determine design velocities and associated bed shear stresses associated with various flow events. Other potential erosional forces (e.g., bioturbation, wind-generated waves, debris, motorboat wakes, and ice) will also be considered, as appropriate. The stable particle sizes necessary to resist the erosive forces in Reach 6 will be computed in accordance with federal and state requirements and

consistent with pertinent EPA and USACE guidance such as EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (EPA 2005b) and Subaqueous Capping Guidance.

- *Geotechnical Filter Layer:* The use of a Geotechnical Filter Layer between the chemical isolation layer material and erosion protection layer material will be evaluated and may be necessary for those areas requiring cobble or larger-sized material in the erosion protection layer.
- *Bioturbation Layer:* The assemblage of species, bioturbation depth profile, and abundances of dominant organisms will be evaluated to determine the need for and thickness of a bioturbation layer.
- *Habitat Layer:* The Habitat Layer will be designed such that it provides functions and values equivalent to the pre-existing surficial sediment substrate.

The Revised Final Permit also provides that under some circumstances, a single layer of material may serve more than one of the functions listed previously. The design of the engineered cap is also required to consider other factors, such as geotechnical stability and the need for overplacement allowances with additional excavation for each layer. Further, installation of the cap cannot result in a loss of flood storage capacity or an increase in water surface elevations.

The constructed engineered cap is required to be inspected, monitored, and maintained to ensure long-term protectiveness and to ensure that it continues to function as designed.

2.3 Floodplain

2.3.1 Non-Residential Floodplain Exposure Areas

Section II.B.3.a of the Revised Final Permit describes the Performance Standards associated with floodplain soils. For each of the floodplain EAs shown on Figures 3, 3A, and 4 in the Revised Final Permit,[11] the top one foot of soil will be excavated (and backfilled to grade) to achieve either the Primary or Secondary Floodplain Performance Standards applicable to each EA, as listed in Table 1 of the Revised Final Permit.[12] In general, this remediation will be designed to meet the Primary

[11] These EAs consist of the 90 direct-contact EAs that EPA identified in its HHRA, with the modification that, as provided in Section II.O of the Settlement Agreement, EA 10 has been expanded as shown in Figure 3A of the Revised Final Permit.

[12] Table 1 lists the Primary and Secondary Performance Standards for each EA based on exposure scenarios determined by EPA. The Primary Performance Standards are floodplain soil PCB concentrations associated with a residual 1×10^{-5} cancer risk or a non-cancer HI of 1 (as calculated by EPA based on assumed direct contact with soil), whichever is lower. The Secondary Performance Standards are floodplain soil PCB concentrations associated with a residual 1×10^{-4} cancer risk or a non-cancer HI of 1 (as calculated by EPA based on assumed direct contact), whichever is lower.

Floodplain Performance Standards, except that in certain Core Area habitats, the remediation will achieve, at a minimum, the Secondary Floodplain Performance Standards, as discussed further below.

In addition, for each of the FUSAs within the EAs, as shown in Figure 5 of the Revised Final Permit,[13] up to three feet of soil will be excavated (and backfilled to grade) to achieve the relevant Performance Standards for those areas, as listed in Table 2 of the Revised Final Permit.

Excavation in Core Area 1 habitat (other than in FUSAs) will be avoided, except in limited areas where necessary to meet the Secondary Floodplain Performance Standards. Further, GE will minimize impacts from remediation to the extent practicable in Core Areas 2 and 3 habitat shown in Attachment B to the Revised Final Permit); however, at a minimum, Secondary Floodplain Performance Standards will be attained in those areas.

2.3.2 Vernal Pools

Section II.B.3.b of the Revised Final Permit requires that, in addition to any remediation of vernal pools necessary to meet the Floodplain Performance Standards discussed in Section 2.3.1, any such pool that contains sediment/soil exceeding a spatially weighted average PCB concentration of 3.3 mg/kg must be remediated. To implement this requirement, GE is to conduct a pilot study on no more than 10 vernal pools using either traditional excavation and restoration techniques or amendments, such as AC.[14] Based on the results of the pilot study, after an appropriate monitoring period determined by EPA, EPA will determine, and GE will implement, the appropriate remediation of the vernal pools as necessary to meet the Performance Standards specified in Section II.B.3.b.(1) of the Revised Final Permit, which require either achievement of a spatially weighted average total PCB concentration in soil of 3.3 mg/kg in the pool or an equivalent reduction in PCB bioavailability. This can be achieved through removal and replacement of soil or reduction in the bioavailability of PCBs in the pool through placement of amendments.

2.4 Inspection Monitoring and Maintenance Before and During Construction

In accordance with Section II.B.4 of the Revised Final Permit, GE will implement both a baseline and a construction monitoring program. The baseline monitoring program will include collection of PCB data in surface water, sediment, and biota (and other data) prior to the commencement of

[13] FUSAs are portions of the EAs that are more heavily used than other areas. Those subareas were originally defined in GE's RCMS and are generally shown in Figure 5 of the Revised Final Permit but are subject to modification, with EPA approval, based on current conditions pertaining to potential use.

[14] GE is currently conducting the vernal pool pilot study on 10 vernal pools located within Reach 5A pursuant to GE's *Revised Vernal Pool Pilot Study Work Plan* (Anchor QEA and AECOM 2023) approved by EPA on December 5, 2023.

construction activities to serve as a baseline for the evaluation of the potential impacts of the remediation.[15]

The construction monitoring program will include similar types of data collection and will focus on monitoring for potential adverse impacts due to construction activities (e.g., resuspension). It will include the following: (1) measures to assess these impacts (e.g., establishing notification and action levels for PCBs measured in surface water); (2) a monitoring plan to collect these data; and (3) establishment of response actions (e.g., slowdown and evaluation of operations, stop work and modification of operations).

2.5 Disposal of Contaminated Sediment and Soil (Including Upland Disposal Facility and Off-Site Disposal)

As described in Sections II.B.5 and II.B.6 of the Revised Final Permit, the ROR Remedial Action will use a hybrid disposal approach that includes a combination of disposal at a UDF and off-site disposal. This section summarizes the criteria and methods for determining whether material excavated during the ROR Remedial Action may be disposed of in the UDF, as provided in Attachment E to the Revised Final Permit.[16] Those requirements are as follows:

- **Sediments:** Sediments to be disposed of in the UDF must have a volume-weighted average PCB concentration of less than or equal to 25 mg/kg within a reach or subreach (in this case, Reach 6). If the volume-weighted average PCB concentration of sediments to be removed from Reach 6 exceeds 25 mg/kg, sediments with the highest PCB concentrations will be segregated for off-site disposal until the average concentration of the remaining sediments to be removed decreases to less than 25 mg/kg for subsequent disposal at the UDF. In addition, any sediment represented by a three-dimensional polygon associated with a single vertical core that has an average PCB concentration greater than or equal to 100 mg/kg will be segregated for off-site disposal.
- **Floodplain Soils:** Floodplain soil to be disposed of in the UDF must have a volume-weighted average PCB concentration of less than 50 mg/kg for each EA. If the volume-weighted average PCB concentration in the soil to be removed from a given EA equals or exceeds 50 mg/kg, the soils with the highest PCB concentrations in the EA will be segregated for off-site disposal until the average concentration of the remainder of the soil to be removed in the EA decreases to less than 50 mg/kg for subsequent disposal at the UDF.

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[15] GE submitted a *Second Revised Baseline Monitoring Plan* (Anchor QEA 2023b) on January 30, 2023, which was subsequently approved by EPA on February 16, 2023.

[16] The specific design Performance Standards for the UDF are provided in Section II.B.5.a.(2) of the Revised Final Permit and summarized in Section 2.1 of GE's February 2024 UDF Final Design Plan; those requirements are not presented herein.

The UDF will be used only for disposal of sediments and soils that were generated as part of the ROR Remedial Action and only of those sediments and soils that meet the acceptance criteria summarized above. The Revised Final Permit prohibits the disposal of certain types of waste in the UDF—e.g., free liquids, free product, or wastes that meet the federal criteria for RCRA hazardous waste.

In addition, no material from the ROR Remedial Action may be disposed of at any other location in Berkshire County (apart from the UDF), and no material from any portion of the GE Pittsfield/Housatonic River Site other than the ROR or from other response actions under the CD may be disposed of at the UDF.

2.6 Water Withdrawals and Uses

In accordance with Section II.B.8 of the Revised Final Permit, GE will minimize and/or mitigate impacts during implementation of the Remedial Action to withdrawals and/or uses of water from the ROR by any entity. GE will achieve this Performance Standard by doing the following: (1) identifying all industrial, commercial, private, or other withdrawals and/or uses of water from the ROR; (2) identifying requirements associated with these uses (including water quality and quantity) that may be affected by implementation of the Remedial Action; and (3) proposing methods to minimize/mitigate impacts during implementation of the Remedial Action.[17]

[17] GE submitted a *Revised Water Withdrawal and Uses Plan* (WWUP; Anchor QEA 2023d) on April 3, 2023, and it was approved by EPA on May 10, 2023.

3 Reach 6 Characteristics and Existing Data

3.1 Overview

Numerous PDI activities and other studies have been conducted to provide data needed to support remedial design and engineering evaluations for Reach 6. These investigations were performed in accordance with an EPA-approved PDI work plan, and EPA representatives provided oversight during those activities. These activities include, but are not limited to, extensive PCB characterization sampling of sediments and floodplain soils (including non-residential EAs and vernal pools), topographic and bathymetric field surveys, a baseline habitat assessment, initial geotechnical characterization sampling, reconnaissance of shoreline structures and utilities, and a cultural resource assessment (CRA). This information, combined with relevant historical data, has been used to summarize existing data and conditions in Reach 6 provided in this section.

3.2 PCB Data

3.2.1 Sediment

3.2.1.1 Woods Pond, Outlet Channel, and Headwaters Transition Zone[18]

Several investigations have been conducted since the late 1990s to characterize sediment PCB concentrations in Reach 6. These studies include the following:

- Sediment PCB data collected by EPA as part of its Supplemental Investigation (SI) conducted between 1998 and 2002;
- Sediment PCB data collected as part of a partitioning study conducted by EPA and GE in 2001; and
- Sediment PCB data collected by GE during the Reach 6 PDI conducted in 2023.

Between 1998 and 2002, EPA conducted systematic and discrete sediment sampling during its SI to delineate the nature and extent of PCBs in sediment, to facilitate EPA's human health and ecological risk assessments, and to facilitate EPA's modeling study. Specifically, the systematic sampling consisted of the collection of samples at regular intervals and the discrete sampling consisted of "random, judgmental, or focused samples collected at distinct locations" to support specific sampling objectives (Weston 2000). That sampling program resulted in the collection of 628 sediment samples from 107 locations (to a total depth of 14 feet below mudline) within Reach 6. A comprehensive

[18] This section summarizes historical and PDI sediment PCB data collected for all of Reach 6, including Woods Pond, the outlet channel, and the headwaters transition zone. However, as described in Section 1.4, the conceptual remedial design for the transition zone is not covered by this Conceptual RD/RA Work Plan but will be provided in a later addendum to the Final RD/RA Work Plan for Reach 6.

summary of the historical EPA sediment sampling activities and results is provided in GE's *Housatonic River – Rest of River RCRA Facility Investigation Report* (BBL and QEA 2003).

In addition, GE and EPA jointly collected PCB sediment samples as part of a partitioning study conducted for all of Reaches 5 and 6 in 2001. As part of that sampling program, 12 sediment samples were collected from zero to six inches below mudline at 12 core locations in Reach 6.

As part of the Reach 6 PDI conducted in 2023, GE performed sediment sampling in the transition zone, Woods Pond proper, and the outlet channel. The sampling in these areas was designed to support the dredging design process and to evaluate on-site versus off-site disposal requirements for sediments to be removed from Reach 6. Specifically, the PDI sediment sampling within the transition zone and pond was conducted on an approximate 200-foot grid. In addition to the 200-foot grid sampling, sediment sampling was conducted between the 200-foot grid nodes where there were larger data gaps between the historical and PDI grid sampling locations. Within the outlet channel, three sediment core sample locations (left, center, and right of the channel) were established at each of four transects spaced at approximately 250 feet apart. Sediment samples were collected at a total of 102 locations during the PDI. All cores were processed in 12-inch intervals up to or less than a total depth of 10 feet below mudline, resulting in a total of 535 samples for PCB characterization. A comprehensive summary of the PDI sediment sampling activities and results is provided in the PDI Summary Report, which is being submitted concurrently with this Conceptual RD/RA Work Plan.

Sediment sample counts for each of the sampling programs described above (historical and PDI) are summarized in Table 3-1. Figure 3-1 shows the historical and PDI sediment PCB data used for the conceptual design evaluation, which is described in Section 4.2.1.

Table 3-1
Sediment PCB Sample Counts in Reach 6

Program	Lead Entity	Number of Samples
1998–2002 EPA SI	EPA	628
2001 GE Partitioning Study	GE	12
2023 PDI Reach 6	GE	535
	Total	**1,175**

3.2.1.2 Valley Mill Pond

Historical sediment investigations in Valley Mill Pond were conducted in 1980, 1990, and 2000. Samples were collected by Stewart Laboratories, Inc. (Stewart; on behalf of GE); the U.S. Geological Survey (USGS); Blasland, Bouck & Lee, Inc. (BBL; on behalf of GE); and EPA. In total, sediment samples were collected at 11 locations within Valley Mill Pond (Figure 3-2). The cores were processed at varying sample depth intervals up to a total depth of four feet below mudline, resulting in a total of 44 samples for PCB characterization. Sediment location and sample counts for each sampler are summarized in Table 3-2. An evaluation of the historical sediment PCB data for Valley Mill Pond is provided in Section 4.2.2.

Table 3-2
Sediment PCB Sample Counts in Valley Mill Pond

Lead Entity	Years Sampled	Number of Locations	Number of Samples
Stewart (GE)	1980	7	31
USGS	1980	1	3
BBL (GE)	1990	2	8
EPA	2000	1	2
	Total	**11**	**44**

3.2.2 Floodplain Soil

3.2.2.1 Non-Residential Floodplain Exposure Areas

Several floodplain soil PCB investigations have been conducted since the early 1990s to characterize soil PCB concentrations in the non-residential floodplain EAs in Reach 6. These studies include the following:

- Soil PCB data collected historically by GE in 1992 and 1993;
- Soil PCB data collected by EPA as part of its SI conducted between 1998 and 2002; and
- Soil PCB data collected by GE during the Reach 6 PDI conducted in 2023.

As part of the Reach 6 PDI conducted in 2023, GE performed floodplain soil sampling in the non-residential floodplain EAs to further characterize floodplain soil PCB concentrations and better define and confirm the location of the 1 mg/kg PCB isopleth. A total of 566 samples[19] were analyzed for PCBs from core locations within the five non-residential EAs discussed in Section 1.2. Cores were collected at all the locations to a total depth of one foot below ground surface (bgs) and processed into 0.5-foot intervals. Additionally, cores were collected from one to three feet bgs at a subset of locations within the FUSAs (Figure 1-3) and processed into one-foot intervals. A comprehensive summary of the Reach 6 non-residential floodplain soil PDI sampling is provided in GE's PDI Summary Report. Sample counts within the five non-residential floodplain EAs in Reach 6 for

[19] This sample count represents samples collected within the 1 mg/kg PCB isopleth and does not include EPA split samples. Field duplicate samples were not included. As described in the PDI Summary Report, a total of 627 floodplain soil samples (including 593 environmental samples and 34 field duplicates) were collected during the PDI (Anchor QEA 2024a).

each sampling program (historical and PDI) are summarized in Table 3-3. Evaluations of existing floodplain soil PCB conditions in the non-residential floodplain EAs are provided in Section 4.3.

Table 3-3
PCB Sample Counts within the Five Non-Residential Floodplain EAs in Reach 6

Program	Lead Entity	Number of Samples[1]	
		0–1 Foot	1–3 Feet[2]
1992–1993 GE Investigation	GE	9	—
1998–2002 EPA Supplemental Investigation	EPA	101	—
2023 PDI Reach 6 Non-Residential Floodplain EAs	GE	544	22
	Total	**654**	**22**

Notes:
1. Counts represent samples within the 1 mg/kg PCB isopleth. EPA split samples and duplicate samples were excluded from the summary.
2. Only includes samples within the FUSAs.

3.2.2.2 Vernal Pools

As noted in Section 1.2, there are two confirmed vernal pools in the floodplain in the Reach 6 area (Figure 1-3). As part of Reach 6 PDI sampling conducted in 2023 (described in Section 3.2.2.1), GE sampled those vernal pools. Due to the small size of these pools (less than 0.1 acre), only two sampling locations were placed in each pool (i.e., a total of four soil cores). This yielded a total of eight samples in either 0- to 0.5-foot or 0.5- to 1-foot depth intervals. No samples were collected prior to the PDI in these two vernal pools.

3.3 Sediment Characteristics

During the PDI, 122 sediment samples were collected from 89 locations in Reach 6 for analysis of geotechnical index parameters, including 104 samples within Woods Pond, 14 in the transition zone, and 4 in the outlet channel. Testing included moisture content, grain size, and Atterberg limits, with a subset of those samples also analyzed for organic content, dry bulk density, and specific gravity. In-situ vane shear testing was also conducted at 85 locations to assess undrained shear strength. Additionally, eight samples were collected using Shelby tubes at five locations for strength testing, with samples taken from depths between four and 10 feet below the mudline. Fine-grained materials underwent consolidated undrained triaxial shear testing, while coarser materials were tested using direct shear methods.

From the visual-manual characterization of the sediment cores and the laboratory index testing, three primary geotechnical units were identified: (1) organic soils; (2) fine alluvium; and (3) lower alluvium. The organic soils are characterized by dark brown to reddish-brown silts with varying amounts of sand and noticeable plant material. These soils are notable for their strong organic odor, high moisture content, and significant organic content. The fine alluvium is composed of gray to light brown silts and sands, with trace amounts of clay and organic material. Finally, the lower alluvium consists mainly of coarse-grained gray sand with occasional gravel, forming a distinct unit beneath the finer sediments. The thickness of the organic soils varied throughout Reach 6, with the thickest deposits found in the southern portion of Woods Pond, particularly in the southeast, ranging up to at least seven to eight feet (several investigations were advanced to depths between six and eight feet and did not extend through the base of the unit). Elsewhere in the study area, the organic soils were generally thinner, typically only a few feet thick, and were absent in certain channels.

A summary of the sediment sample collection and testing results are presented in the PDI Summary Report. Table 3-4 provides a summary of the results for the index parameter testing.

Table 3-4
Summary of Geotechnical Index Parameter Testing Results by Layer

Geotechnical Analyses		Moisture Content (%)	Organic Content (%)	Dry Bulk Density (pcf)	Specific Gravity	Grain Size (% by weight)		
						Gravel	Sand	Total Fines
Organic Soils	Number of Samples	68	11	11	11	68		
	Minimum	46	10	6	1.0	0	24	18
	Average	358	41	18	1.2	0	53	47
	Maximum	1,090	92	42	1.4	0	83	76
Fine-Grained Alluvium	Number of Samples	50	14	14	14	50		
	Minimum	21	1.7	14	1.3	0	25	16
	Average	61	9	44	1.7	0.1	54	46
	Maximum	197	29	75	2.0	3.8	84	75
Lower Alluvium	Number of Samples	4	1	1	1	4		
	Minimum	14	2.1	57	2.0	0	58	21
	Average	27	2.1	57	2.0	5.8	69	26
	Maximum	39	2.1	57	2.0	20.8	79	31

3.4 Bathymetric and Hydraulic Characteristics

As described in the PDI Summary Report, between December 2021 and November 2023, GE conducted detailed topographic and bathymetric surveys of the riverbed and floodplain over all of Reaches 5 and 6 (i.e., from the Confluence to Woods Pond Dam). These surveys included bathymetric survey of Woods Pond, the transition zone, and the outlet channel conducted using a combination of single-beam sonar and conventional survey methods. Figure 3-3 shows the contiguous digital elevation model of bathymetry in Reach 6 that was developed based on those surveys. Figure 3-4 shows the water depths in Reach 6 based on the current bathymetry, and Table 3-5 summarizes the water depths. These water depths were estimated based on the depth below the Woods Pond Dam crest (elevation 947.7 feet NAVD88).[20]

Table 3-5
Summary of Water Depths in Reach 6

Water Depth Statistic	Transition Zone	Woods Pond Proper	Outlet Channel
Average Water Depth	1.4 feet	2.8 feet	4.4 feet
Maximum Water Depth	8.4 feet	15.0 feet	15.2 feet

Notes:
Water depths were estimated based on the depth below the Woods Pond Dam crest (elevation 947.7 feet NAVD88).

USGS maintains a flow-monitoring station at the downstream end of Reach 6 in the vicinity of Woods Pond Dam (Station 01197145 – Housatonic River at Lenoxdale, Massachusetts). This gage was installed by USGS in September 2022 (in coordination with EPA and GE). This relatively short (two-year) period of record precludes use for evaluation of long-term flow statistics; however, flows over this approximate two-year period ranged from approximately 50 to 2,800 cfs (Figure 3-5). Figure 3-6 summarizes water surface elevations measured in Woods Pond during the Reach 6 PDI.

During the Reach 5A PDI, river-current velocities were measured at a location immediately upstream of the headwaters transition zone (in Reach 5C) using an acoustic Doppler current profiler (ADCP). Water surface elevation and current-velocity profile measurements were collected at that location under three different flow conditions—low, moderate, and high flow. For the purposes of this survey, low, moderate, and high flows were defined as less than 100 cfs, between 100 and 300 cfs, and greater than 300 cfs, respectively, as measured at the USGS Coltsville gage (Station 01197000 – East Branch Housatonic River at Coltsville, Massachusetts). A summary of this survey is presented in the *Revised Pre-Design Investigation Summary Report for Reach 5A Sediment and Riverbanks* (Anchor QEA and AECOM 2024). The ADCP measurements showed a range of current velocities during these events. Under low-flow conditions, current velocities at the cross section closest to the headwaters (Site 6) had a maximum of 0.4 foot per second (fps) with a mean velocity of 0.3 fps. Under moderate-flow conditions, velocities increased to a maximum of approximately 1.0 fps (mean 0.6 fps), and velocities under high-flow conditions increased to a maximum of approximately 1.8 fps (mean 1.2 fps).

3.5 Baseline Restoration Assessment

Section II.B.1.c.(2)(a) of the Revised Final Permit required GE to conduct a Baseline Restoration Assessment (BRA) of areas that will be affected by the ROR Remedial Action. Concurrent with this

[20] Because the water surface elevation in Reach 6 is typically above the dam crest, actual water depths will be greater; the water surface elevation at the dam typically measures approximately 0.5 to 1.5 feet above the dam crest. The *Operation, Monitoring, and Maintenance Plan for Woods Pond Dam* (GZA 2019) indicates that the normal pool elevation is approximately 948.8 feet NGVD29 (or approximately 948.2 feet NAVD88).

Conceptual RD/RA Work Plan, GE has prepared a Reach 6 BRA Report that provides a description and assessment of the pre-remediation conditions, functions, and values of aquatic, floodplain, and vernal pool habitats, as well as the identified habitats of federal or state-listed threatened or endangered species or state-listed species of special concern and any invasive species in the areas affected by the remediation. This assessment was based on data collection performed during 2023 and 2024 pursuant to GE's *Revised Baseline Restoration Assessment Work Plan for Reaches 5B Through 8* (Revised Reach 5B–8 BRA Work Plan; AECOM 2023a), which was approved by EPA on March 8, 2023. The Reach 6 BRA Report also incorporates results from previous investigations that included information on ecological conditions in Reach 6, as well as updated information provided by the Massachusetts Natural Heritage and Endangered Species Program (MNHESP) in the Massachusetts Division of Fisheries and Wildlife on the mapped habitats of state-listed threatened, endangered, and special concern species (referred to collectively herein as rare species). That report also includes a summary of habitat information on three areas that will be used as support areas for the Reach 6 remediation.

Based upon the BRA data collection described above, Reach 6 consists the following habitat types: approximately 70 acres of aquatic habitat comprising the overall Woods Pond impoundment (which includes the 53.6-acre pond proper, 3.7 acres of the outlet channel between the pond proper and Woods Pond Dam, and 12.6 acres of the headwaters transition zone north of the pond proper); and 51 acres of floodplain habitat within the 1 mg/kg PCB isopleth, consisting of 40 acres of floodplain wetland habitat (including two vernal pools) and 11 acres of upland floodplain habitat. Reach 6 also contains potential habitat for eight state-listed rare species. Brief summaries of each of the main habitat types and their characteristics and functions, as well as the rare species in the area, are provided in the following subsections. In addition, a subsection is included on the existing habitat in the three areas that will be used as support areas for the Reach 6 remediation.

3.5.1 Aquatic Habitats

The central feature in Reach 6 is the roughly 70-acre impoundment area encompassing the main body of Woods Pond (53.6 acres), a 3.7-acre linear area of open water between the main pond and the Woods Pond Dam (i.e., the outlet channel), and 12.6 acres of the headwaters transition zone at the upstream end of the main pond. Woods Pond itself has been characterized principally as an impoundment and, therefore, the BRA or ecological characterization of it has implemented the Impoundment Habitat Inventory Procedure described in the Revised Reach 5B–8 BRA Work Plan (Section 3.4 in that work plan). The headwaters area and the outlet channel area just upstream of the dam are somewhat transitional between impoundment and riverine habitats; these areas are therefore described herein separately from the main impoundment that comprises Woods Pond.

Hydrologic and physical parameters strongly influence the characteristics and functions of the aquatic habitat conditions in Reach 6. Woods Pond Dam is the primary feature regulating and determining water stages and flow regimes, and the impounded flow effects of the dam extend upstream throughout the Reach 6 area and likely into the upstream end of Reach 5C. While water depth (which is based on the bathymetry and water surface elevation maintained by the dam) is a primary parameter determining habitat conditions in the Reach 6 impoundment, other parameters combine with and interrelate with water depth to affect habitat conditions; these include water velocity, submerged channel flow (historic and current), flood flows, water circulation, wind/fetch, sediment dynamics and sedimentation patterns, aquatic plant growth, and water quality.

Woods Pond proper is primarily a shallow, eutrophic water body with high productivity reflected in the excessive aquatic macrophyte growth; several invasive aquatic plant species are prevalent in the pond, primarily water chestnut and Eurasian watermilfoil. Distinct zones in the pond offer varying aquatic habitat conditions. These zones include a deeper basin in the southeastern portion of the pond, a submerged channel flow area from northeast to southwest across the central part of the pond, and shallow-water areas (approximately one to three feet deep) across much of the remaining pond. The southeastern basin appears to be the remnants of a former pond located east of the original Housatonic River channel before the Woods Pond Dam created impounded conditions circa 1880 (AECOM 2022). Aquatic plant growth tends to be greatest outside of the submerged channels and the deepest portions of the southeastern basin (i.e., areas with water depth greater than seven feet); however, the invasive water chestnut may have stems extending 15 feet in length from the pond bottom to the floating leaves. In late summer, nearly all (approximately 90%) of Woods Pond is covered with aquatic macrophytes, with approximately 75% covered with floating leaved aquatic plants. The only areas not covered with aquatic plants are where the submerged channel flow occurs and to some extent in the deepest portion of the southeastern basin. Shallow peripheral zones around the pond edges transition into deep marsh habitat, although in places there is a sharper break at the pond edge into wooded habitat, particularly along the southern to southeastern margins where wind fetch appears to be a significant factor.

In the headwaters transition zone, water depths and flow characteristics, and thus aquatic habitat conditions, are distinctly different from those in much of the main Woods Pond impoundment. They reflect a complex history of variable channel flow patterns, differential sediment deposition, and aquatic plant growth, each of which affects the dynamics of the other features. There are two main areas of submerged channel flow through the headwaters area, one in the northeastern portion of the headwaters area that extends to the southwest into and across Woods Pond toward the outlet channel and one along the western side of the headwaters zone. These areas of submerged channel flow support minimal aquatic macrophyte growth, possibly due to prevailing channel flow through the pond proper. Shallow peripheral zones in the headwaters transition into deep marsh habitat, particularly around the marshy floodplain islands.

The outlet channel area also contains deeper channel conditions (i.e., generally greater than seven feet deep) with sufficient flow to limit sedimentation of fine-grained deposits and aquatic plant colonization. Minimal water chestnut occurs in this area, although Eurasian watermilfoil is common.

Despite the disturbed, impounded conditions in the aquatic environment of Reach 6, diverse habitat conditions for aquatic organisms are provided. Due to the range of substrate types, vegetative cover, and depth features, this area provides a range of functional uses for many fish and invertebrate species. Fish found in this reach are primarily warmwater species, including sunfish, various minnow species, and bass. These species forage throughout the river in this reach, taking advantage of complex habitat features to locate food resources and shelter and providing a food source for piscivorous (fish-eating) mammals and birds. A wide range of aquatic invertebrates also utilize this area but are predominantly those associated with a lentic environment.

As described above, Valley Mill Pond is a roughly 4.6-acre ponded area situated along the eastern side of the Housatonic River just downstream (south) of the Woods Pond Dam. The pond is hydraulically connected to the raceway channel that extends off the eastern side of the dam. Just upstream of the structure that regulates the raceway discharge back to the Housatonic River is a culvert that connects the raceway to the northern end of Valley Mill Pond; that culvert appears to be capped at the current time, although it is unclear whether and to what extent water from the raceway is conveyed into Valley Mill Pond under current conditions and operations. There is a constricted outlet at the southern end of the pond that directs waters southwestward, beneath paved areas, and back into the Housatonic River.

Based on a brief visual assessment conducted on October 10, 2024, Valley Mill Pond is characterized as a eutrophic, largely impounded, shallow ponded area that is largely man-made or at least highly modified by man for industrial purposes. While the bathymetry of the pond has not been fully characterized, it appears to be shallow enough to support dense growth of submerged aquatic vegetation throughout much of the basin. Submerged aquatic macrophytes are visible from the shoreline; and based on the peripheral survey, the following species appear to be present: Eurasian watermilfoil, coontail, and Canada waterweed.

3.5.2 Floodplain Wetland and Upland Habitats

Reach 6 includes approximately 51 acres of floodplain habitat, defined by the area between the top-of-bank and the 1 mg/kg PCB isopleth. Most of this area (40 acres) consists of wetland community types (wet meadow, shallow emergent marsh, shrub swamp, and red maple swamp). Shrub swamp is the most prevalent wetland community type present (19.2 acres, or 48% of the wetland area), with red maple swamp also common (14.5 acres, or 36.5% of the wetland area). Upland community types account for 11 acres of the floodplain, mostly along the outer perimeter of the 10-year floodplain; red oak-sugar maple transition forest is the most prevalent upland cover (6.7 acres).

The assessment of floodplain wetland and upland functions indicates that numerous ecological functions are provided by the Reach 6 wetlands, including flood storage, groundwater recharge/discharge, water quality improvement, and wildlife habitat.

As noted in Section 1.2, the Reach 6 floodplain area contains two seasonally wet depressions that meet the MNHESP criteria for certification as vernal pools. These vernal pools consist of depressions that are capable of holding standing water through at least a portion of the amphibian breeding season. These depressions function as vernal pool breeding habitat for obligate vernal pool species, such as wood frog, spotted salamander, and fairy shrimp, as well as breeding, foraging, and rehydration/thermoregulation habitat for other amphibians and reptiles.

3.5.3 Rare Species Habitats

Based on information provided by MNHESP in October 2022, as well as federal IPaC mapping,[21] a total of eight state-listed plant and animal species have mapped habitat areas that encompass the various habitats in Reach 6; these include two plants (bur oak and wapato), one invertebrate (mustard white [a butterfly]), three birds (American bittern, common gallinule, and bald eagle), and two mammals (northern long-eared bat and tricolored bat). The northern long-eared bat is also a federally listed endangered species, and the tricolored bat has been proposed for federal listing. In addition to the species listed above, there is potential habitat for the monarch butterfly, a candidate species for federal listing.

In addition to the species habitat mapping of the foregoing eight species, MNHESP has also identified both Core Area 1 and Core Area 2 habitats within Reach 6 intended to indicate the "habitats and species that might be particularly sensitive to impacts from PCB remediation activities" (MDFW 2012).

3.5.4 Support Area Habitats

As discussed later in this Conceptual RD/RA Work Plan, GE has identified three areas to serve as support areas for the Reach 6 remediation: (1) a shoreline support facility situated on the southern shore of Woods Pond; (2) the route for a temporary hydraulic pipeline for conveying dredged material from the shoreline support facility to the UDF; and (3) a rail spur and rail loading and unloading area, referred to as the Woods Pond Spur, situated along the western side of Woods Pond near the Lenox Railroad Station. The habitat conditions in these support areas are summarized in Section 6 of the Reach 6 BRA Report. In brief, the shoreline support facility area encompasses several

[21] IPaC refers to the U.S. Fish and Wildlife Service online Information, Planning, and Consultation System for identification of federally listed rare species (USFWS 2024).

different wetland and upland community types, the pipeline runs mainly through mature wooded areas, and the proposed rail loading/unloading area consists primarily of previously developed land used for industrial/commercial purposes, with some secondary tree growth. None of these areas contains MNHESP-designated priority habitat for state-listed rare species. The habitat impacts in these support areas are discussed further in Section 5.7.3 below.

3.6 Cultural Resources Assessments

GE submitted a *Revised Supplemental Phase IA Cultural Resources Assessment Report* (Revised Phase IA CRA Report; AECOM 2023b) for the ROR area on March 10, 2023, with a public release version submitted on March 14, 2023. That report was approved by EPA on March 27, 2023. The Revised Phase IA CRA Report described the process and activities that GE conducted to identify potentially affected ROR areas that contain known cultural resources or have a high potential to contain such resources, including Reach 6. That report also described upland areas with known or suspected historic structures that might be indirectly affected by project activities.

The Revised Phase IA CRA Report included mapping of areas within Reach 6 that contain known cultural resources or have a high potential to contain such resources. The floodplain in Reach 6 has areas of high potential for containing both pre-contact and post-contact archaeological sites, and a historic structure on the rail line just west of Woods Pond (the Lenox Railroad Station) has previously been listed on the National Register of Historic Places.

The next step in the process, as provided in Section 4.3.3.2 of the Final Revised SOW, is to conduct a Phase IB Cultural Resources Survey (CRS) of portions of the ROR that will be affected by remediation actions and support activities and contain or have a high potential to contain cultural resources. The Phase IB CRS Work Plan for Reach 6 is discussed further in Section 5.9 and will be submitted separately from this Conceptual RD/RA Work Plan on November 15, 2024.

3.7 Riparian Property Ownership

Figure 3-7 provides an overview of property ownership along Reach 6. In this reach, property ownership can be summarized in four general categories. Properties are owned by (1) the Commonwealth of Massachusetts; (2) GE; (3) private residential owners; and (4) private non-residential owners. The identification of property ownership along the Reach 6 is needed to understand who will be potentially impacted by remediation activities. This is also an important consideration during design when selecting locations for temporary staging/support areas and access roads.

3.8 Infrastructure and Obstructions

The presence of utilities, structures, or other infrastructure/obstructions will need to be considered during remedial design and construction. Overhanging trees, shoreline vegetation, and in-water debris will also need to be addressed to allow the remediation work to be completed.

3.8.1 Utilities and Structures

Utility clearance efforts (using Massachusetts Dig Safe Inc. or 811) conducted prior to PDI sampling activities in Reach 6 and field reconnaissance conducted during the PDI identified the presence of several structures and utilities within the Reach 6 study area. The PDI Summary Report provides information related to observed structures and utilities within or along the in-water remediation areas. In summary, key features, utilities, and structures identified within the Reach 6 study area include the following:

- Seasonal roads (Valley Street and Woodland Road) are located along the southern and western shorelines of Woods Pond.
- Overhead power lines cross the southwestern portion of Woods Pond.
- Multiple rail lines are located along the western shore of Woods Pond and the outlet channel.
- A rock wall and concrete abutment are located along the shore of a residential parcel the southwestern portion of Wood Pond (Lenox Parcel 9-17), and a structure (e.g., a garage or shed) was observed approximately 25 feet from the edge of Woods Pond on the same parcel.
- A footbridge spans the northern end of the outlet channel with stone abutments located on each side of the channel.
- A dock is located along the western shore of the outlet channel immediately south of the footbridge.
- A Town of Lenox wastewater treatment plant (WWTP) outfall is located along the western shore of the outlet channel.
- Woods Pond Dam is located at the southern end of the outlet channel.

Additional field survey and outreach efforts for these features will be conducted as part of the supplemental data collection program described in Section 10.

3.8.2 Aquatic Vegetation, Shoreline Vegetation, and In-Water Debris

As stated in Section 3.5.1, aquatic vegetation is heavy in Woods Pond during part of the year. Specifically, in late summer, virtually all (approximately 90%) of Woods Pond is covered with aquatic macrophytes, with approximately 75% covered with floating leaved aquatic plants (i.e., invasive water chestnut). Plant growth tends to be greatest outside of the deeper channel that traverses Woods Pond and outside the deepest portions of the southeastern basin.

In October/November 2023, side-scan sonar surveys were performed during the BRA in the Reach 6 impoundment after aquatic macrophyte growth had senesced. The goal was to determine the percent of underwater habitat types that are not visible from above. Results showed that about 98% of the aquatic habitat in Reach 6 consists of a silty-mud habitat. The remaining habitat includes patches of fine and coarse woody debris, boulders, cobbles, ledge, and concrete. Woody debris was mainly found in Woods Pond and the headwaters transition zone (25 and 18 observations, respectively), with only one such observation in the outlet channel. In contrast, boulders/cobbles and ledge/concrete were primarily located in the outlet channel (15 locations), with only two such observations in Woods Pond and none in the headwaters transition zone. Maps showing the locations of these features are presented in the Reach 6 BRA Report.

It is expected that surficial and buried debris will be encountered and need to be managed during the Reach 6 dredging project. In addition, shoreline trees or other vegetation extend over water at numerous locations. The debris and overhanging trees/vegetation can limit access, and submerged or buried debris can reduce production efficiencies or affect the ability to achieve sediment removal to target elevations.

3.9 Seasonal and Meteorological Considerations

Seasonal factors, such as rainfall, snow, river flows, wind, and air temperatures, could affect project implementation by restricting the seasonal work schedule, reducing production rates, or necessitating temporary operational shutdown. These factors will need to be considered during remedial design and during construction planning to protect worker safety, construction equipment, and completed work and when developing production rate estimates and project schedules. Due to variable weather and river flow conditions, the actual in-river construction period may vary from year to year. For example, freezing air temperatures cause Woods Pond to freeze during winter months, restricting the seasonal work schedule. In addition, data such as wind speed and direction and air temperature were used in the project design to evaluate potential design of the engineered cap to be placed in Woods Pond (described in Section 5.2).

Local historical meteorological data are available from the National Weather Service for the Pittsfield Municipal Airport.[22] Table 3-6 summarizes monthly air temperature and precipitation data over the last 30 years.

[22] These data are available at: https://www.weather.gov/wrh/Climate?wfo=aly.

Table 3-6
Mean Monthly Air Temperatures and Precipitation at Pittsfield Municipal Airport (1991 to 2020)

Month	Average Monthly Precipitation (inches)	Mean Minimum Temperature (°F)	Mean Average Temperature (°F)	Mean Maximum Temperature (°F)	Average Number of Freezing-Degree Days[1]
January	2.67	13.9	22.0	30.1	25
February	2.52	15.0	24.1	33.1	22
March	3.08	23.1	32.4	41.7	15
April	3.38	33.8	44.5	55.2	2
May	3.79	44.4	55.7	67.0	0
June	4.58	53.1	63.9	74.6	0
July	4.18	58.0	68.7	79.3	0
August	3.82	56.5	67.1	77.6	0
September	4.50	48.9	59.7	70.4	0
October	4.56	38.5	48.4	58.3	1
November	3.52	29.2	37.9	46.6	7
December	3.63	20.9	28.2	35.5	21

Note:
1. Freezing-degree days refers to days when the mean average temperature was 32°F or below.

In addition to temperature data at the project site, the "NOAA National Centers for Environmental Information: Local Climatological Data" page for the Pittsfield Municipal Airport (NOAA 2024) provides 18 years of hourly wind records. Varying wind conditions can generate a wave climate that may affect the final design of the engineered cap and armor stone selection. The fetch, or the length of the water body that wind blows over without obstruction, varies based on the direction of the wind and the shoreline impacted by wind-generated waves. A summary of the wind data is provided in Table 3-7.

Table 3-7
Wind Speeds at Pittsfield Municipal Airport (2006 to 2024) and Woods Pond Fetch Length

Mean Wind Direction (Degrees from North)	Maximum Measured Wind Speed (mph)	100-Year Return Interval Wind Speed (mph)	Woods Pond Fetch Length (Shoreline to Shoreline, Feet)
0	25	27.7	1,675
45	28	31.3	1,500
90	23	25.8	1,750
135	29	34.3	2,075
180	29	31.9	1,675
225	32	34.2	1,500
270	45	49.6	1,750
315	38	41.0	1,925

Note:
1. Wind directions are based on the direction where the wind originates.

4 Preliminary Remediation Area Evaluations

4.1 Overview

This section presents a summary of the evaluations performed to delineate the preliminary sediment and floodplain remediation areas needed to achieve the Performance Standards summarized in Section 2. For each medium, this section summarizes existing conditions, a preliminary remediation plan including remedial footprint and volume, and an evaluation of the segregation of material for on-site versus off-site disposal. The final horizontal and vertical extents of remediation will be determined during the final design process and will be presented in the Final RD/RA Work Plan for Reach 6.

As noted in Section 1.4, GE has elected to defer the conceptual design for the headwaters transition zone portion of Reach 6 to a later submittal. Accordingly, that portion of Reach 6 has not been included in the evaluations presented in this section.

4.2 Sediment Evaluations

4.2.1 Woods Pond and Outlet Channel

4.2.1.1 Data Evaluation (Existing Conditions)

As summarized in Section 3.2.1, extensive sediment sampling was conducted during the Reach 6 PDI, including 494 samples from 84 locations within Woods Pond and the outlet channel. These data were collected to support the dredging design and evaluate on-site versus off-site disposal requirements for sediments to be removed from Reach 6. This assessment also includes the relevant historical data.[23]

Pursuant to Condition No. 3a of EPA's conditional approval letter for the *Pre-Design Investigation Work Plan for Reach 6* (Anchor QEA 2022b), a data usability assessment was conducted to identify which, if any, historical data are not considered appropriate for use in the disposal evaluation. Bathymetric survey data collected by CR Environmental, Inc. (CRE; 1998), were used to estimate the surface elevation at each historical sediment sampling location.[24] That surface elevation was compared to the existing PDI bathymetry at each core location to evaluate changes in elevation over

[23] As provided in Attachment E to the Revised Final Permit, for all reaches except Reaches 5A and 5C, including Reach 6, relevant data from the RCRA Facility Investigation are to be used (in addition to PDI data) to support the evaluation on-site versus off-site disposal requirements.

[24] The 1998 bathymetric survey was based on water depth measurements collected by CRE on December 3, 1998; the survey data were not tied to any survey datum. To support the Reach 6 conceptual design, the Reach 6 water depth surface prepared by CRE was converted to a sediment elevation surface assuming a water surface elevation of 948.2 feet NAVD88 (i.e., the normal pool elevation at Woods Pond Dam, which is 0.5 foot of water above the crest of Woods Pond Dam) at the time of surveying.

time. Based on that evaluation, 11 sample intervals from 10 locations were identified as being entirely above the existing bathymetry. As a result, those samples were excluded from the data evaluations presented in this conceptual design as they are believed to represent sediment that has been disturbed. In addition, 13 samples from 13 locations were identified as being partially above the existing bathymetry. The depth intervals associated with those samples were adjusted as appropriate such that the disposal volume calculations (Section 4.2.1.3) excluded the portion of the sample interval above the existing bathymetry.[25] As a result, historical data collected by EPA and GE from 1998 to 2002 (213 samples from 67 locations) have been included in the sediment evaluations to support the dredging design and evaluate on-site versus off-site disposal requirements for sediments to be removed from Woods Pond proper and the outlet channel (excluding 40 locations from the transition zone). Historical PCB data were processed into one-foot depth-weighted intervals for the conceptual design evaluation, resulting in 213 sample intervals. Figure 3-1 shows the historical and PDI sediment PCB data used for the conceptual design evaluation. Appendix A summarizes the historical data used for the conceptual design evaluation and lists those data that were excluded from the evaluation.

Figures 4-1a and 4-1b show cumulative frequency distributions of the historical (left panel) and PDI (right panel) total PCB concentrations by depth for each one-foot depth interval to a total depth of 15 feet for historical samples and eight feet for PDI samples.[26] Separate figures are provided for sediment data collected from Woods Pond proper (Figure 4-1a) and the outlet channel (Figure 4-1b). Overall, these figures show that PCB concentrations measured historically are generally higher than PCB concentrations measured during the PDI. In the pond, PCB concentrations (both historical and PDI) are highest near the surface and generally decrease with depth within the top four feet. In the top foot, average concentrations are approximately 14 mg/kg (with a maximum of 210 mg/kg) in the historical data set and 2 mg/kg (with a maximum of 63 mg/kg) in the PDI data set. Concentrations at depths below four feet are relatively low and somewhat variable. Within the outlet channel, PCB concentrations measured in the top foot of sediment during the PDI average approximately 3 mg/kg (with a maximum of 12 mg/kg) and generally decrease with depth. Historical data in that area are limited to three surficial samples with an average of 13 mg/kg.

4.2.1.2 Proposed Remediation Plan

As described in Section 2.2.1, the Revised Final Permit provides that sediment throughout Woods Pond will be removed and an engineered cap placed, such that the post-capping minimum water depth is six feet, measured from the crest of Woods Pond Dam (947.7 feet NAVD88). An exception

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[25] The exclusion of historical samples above the existing bathymetry does not impact any conclusions in the sediment disposal evaluation.

[26] As described in the PDI Work Plan for Reach 6, the depth of sediment coring varied by location. In the pond proper, the depth of coring was intended to extend four feet beyond what was needed to characterize sediments that would be removed to achieve the post-remediation six-foot minimum water depth based on the current bathymetry.

applies to nearshore areas, where the slope from the shore to the six-foot water depth will be as steep as possible while still being able to maintain stability and resist erosion or sloughing. The Revised Final Permit also provides that, in areas deeper than six feet prior to remediation, sufficient sediment will be removed to allow for the placement of an engineered cap so the final grade is at least as deep as the original grade.

The extent of the area subject to removal/capping is dependent on mapping of the extent of sediment defined by the edge of the shoreline. The Reach 6 shoreline boundary being used for the conceptual design was established based on a field surveys conducted by Spicer in February 2022 in conjunction with initial Woods Pond bathymetry surveys and is shown on Figure 3-3. This shoreline extent results in an area of approximately 58 acres that will be subject to removal and capping, including approximately 53.6 acres in the pond proper and 3.7 acres in the outlet channel. As described in Section 10, an additional field survey will be conducted prior to final design to better delineate the shoreline around Woods Pond and the outlet channel.

The volume of sediments to be removed from Woods Pond is dependent on several factors, including the current bathymetry elevations (based on 2022 and 2023 survey data), the crest elevation of the Woods Pond Dam (i.e., 947.7 feet NAVD88), the thickness of the engineered cap that will be placed (including assumed cap overplacement allowances), and the depth of dredged material removed from below the target dredge prism (i.e., overdredging).

Because the engineered cap design will not be completed for several years after dredging,[27] a preliminary engineered cap evaluation was conducted as part of the conceptual design to estimate the total engineered cap thickness. As summarized in Section 5.2 and described more fully in Appendix C, the preliminary cap design assumes a minimum cap thickness of 12 inches in Woods Pond and 30 inches in the outlet channel.

Additionally, in accordance with the Revised Final Permit and typical cap design practices, the engineered cap design will need to account for overplacement allowances, with additional sediment removal, for each layer. As described in Section 5.2.4 and summarized in Table 5-1, the sediment removal design assumes cap overplacement allowances of three inches for each six-inch cap layer (i.e., the chemical isolation layer, geotechnical filter layer, and sand or gravel erosion protection layer, where required) and six inches for the 18-inch cobble armor layer (i.e., in the outlet channel).[28]

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[27] As described in Section 1.3, the engineered cap final design will be presented in an addendum to the Final RD/RA Work Plan for Reach 6.

[28] As also discussed in Section 5.2, the Revised Final Permit allows for the fact that a single layer may serve multiple functions. For example, depending on the size of material used to construct an erosion protection layer, the erosion protection layer may also serve as a habitat layer and bioturbation layer. Thus, a single erosion protection layer can serve three functions. That is the approach that has been taken for the Reach 6 caps.

Therefore, the total cap thicknesses assumed for the sediment removal design are 18 inches for Woods Pond and 30 inches for the outlet channel.

In addition to cap overplacement tolerances, the conceptual sediment removal design includes an assumption for overdredging below the target dredge prism. Dredging in submerged conditions require some removal tolerance below the target dredge prism to account for factors such as varying bathymetry, operational control of the dredging equipment, and removal verification. Environmental dredging projects often assume an overdredging allowance of up to six inches below the target dredge cut; however, dredging contractors are typically able to achieve an average overdredging accuracy of approximately four inches or less. Therefore, the estimated sediment removal volume for this conceptual design assumes an average of four inches for overdredging.

Based on the assumptions outlined above, the sediment removal thickness to accommodate placement of a cap for Woods Pond is estimated to be 22 inches. This is based on a six-inch-thick chemical isolation layer (plus three inches for potential cap overplacement), a six-inch-thick sand or gravel erosion protection layer (plus three inches for potential cap overplacement), and an average of four inches for overdredging. For the outlet channel, the sediment removal thickness is estimated at 46 inches.[29] This is based on a six-inch-thick chemical isolation layer (plus three inches for potential cap overplacement), a six-inch-thick sand or geotechnical filter layer (plus three inches for potential cap overplacement), an 18-inch-thick cobble armor layer (plus six inches for potential cap layer overplacement), and an average of four inches for overdredging.

The Revised Final Permit does not contain any specific Performance Standards regarding the outlet channel. The conceptual design assumes that elevations within the outlet channel will be restored to pre-dredging conditions after capping. Therefore, the conceptual design assumes that sufficient sediment will be removed from the outlet channel to allow for placement of an engineered cap, so the final grade is generally consistent with the original grade. This is consistent with the remediation approach for Woods Pond where water depths are greater than six feet prior to remediation, as well as the engineered cap provisions for other ROR reaches. Although not specifically stated in the Revised Reach 6 PDI Work Plan, this approach was the basis for the PDI sediment sampling scheme for the outlet channel.

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[29] Based on the PDI probing and sampling, certain portions of the outlet channel may have less than 46 inches of sediment present. GE will conduct additional investigations as part of the supplemental data collection program (Section 10) to better understand the locations and depths of sediment in the outlet channel. For this conceptual design, the estimated sediment removal volumes assume that 46 inches of sediment can be removed from the outlet channel. This may be subject to change during final design.

Using the assumptions summarized above, a "neat" dredge surface was developed by applying the following removal depths and elevations:

- In areas of Woods Pond where the existing bathymetry is less than six feet below the dam crest elevation of 947.7 feet NAVD88 (i.e., above 941.7 feet NAVD88), the "neat" dredge surface elevation was set at elevation 939.87 feet NAVD88 (i.e., 22 inches below elevation above 941.7 feet NAVD88). This results in variable sediment removal thicknesses below the existing bathymetry.
- In areas of Woods Pond where the existing bathymetry is six feet or more below the dam crest elevation of 947.7 feet NAVD88 (i.e., at or below 941.7 feet NAVD88), the "neat" dredge surface elevations were set to 22 inches (1.83 feet) below the existing bathymetry elevations.
- In the outlet channel, the "neat" dredge surface elevations were set to 46 inches (3.83 feet) below the existing bathymetry elevations.

After generating the "neat" dredge surface, an engineered dredge prism was developed to incorporate stable nearshore slopes and estimate sediment removal volumes for this conceptual design phase. According to Section II.B.2.e of the Revised Final Permit, sediment removal in the nearshore areas of Woods Pond will be sloped to be as steep as possible while also being stable and not subject to erosion or sloughing. In support of the conceptual dredge prism design, a geotechnical slope stability evaluation was performed as described in Section 5.3 and Appendix D. Based on that evaluation, the dredge slopes considered to be stable for this conceptual design include 4 horizontal to 1 vertical (4H:1V) slopes on the eastern side of Woods Pond and 3H:1V slopes on the western side of Woods Pond and outlet channel. These slope configurations were used to develop the conceptual engineered dredge prism for Woods Pond by adjusting the target removal elevations from the shore down to the "neat" dredge surface at these slope angles. In addition, the conceptual engineered dredge prism included a 3H:1V transitional slope from the existing bathymetry elevations at the boundary between the headwater transition zone down to the "neat" dredge surface in Woods Pond proper.

As described in Section 5.4, a shoreline support facility will be constructed along the southern shoreline of Woods Pond to support the dredging operations. The conceptual engineered dredge prism does not include any slope grading for 460 linear feet of shoreline adjacent to the shoreline facility where a sheet pile bulkhead would be constructed to provide water access to the facility.

After the above-referenced adjustments, the resulting conceptual engineered dredge prism is a three-dimensional surface that specifies the horizontal (X and Y) and vertical (Z) extent of sediment estimated for removal. This dredge prism surface was then compared with the existing bathymetry elevations to estimate the volume of sediment to be removed and to serve as the basis for dredging, transport, and dewatering evaluations.

Figure 4-2 (left panel) shows the dredge prism elevations for the conceptual engineered dredge prism, and Figure 4-2 (right panel) shows the estimated sediment removal thicknesses for the dredge prism. Figure 4-3 show cross sections of the dredge prism at select locations within Woods Pond. Table 4-1 summarizes the estimated sediment removal volumes based on the conceptual engineered dredge prism.

Table 4-1
Estimated Sediment Removal Area and Volumes – Woods Pond and Outlet Channel

Zone	Area (acres)	Conceptual Engineered Dredge Prism Volume (cy)
Woods Pond	53.60	461,000[1]
Outlet Channel	3.71	20,000

Note:

1. As described in Section 5.2.1, an additional 5,900 cy of sediment is estimated to be removed from nearshore areas within Woods Pond to facilitate placement of the engineered cap at depths below the wave and ice freezing zone.

For this conceptual design stage, the engineered dredge prism does not include any offsets or setbacks from shoreline structures. In addition, engineering slopes were not applied to the dredge prism for the outlet channel. Additional information will be collected during the supplemental data collection program to support dredge prism development for the outlet channel. These supplemental data collection efforts are summarized in Section 10 and will include upland topographic surveys, additional bathymetric surveys in the outlet channel, and probing to better delineate the depth of sediment in the outlet channel. In addition, the supplemental data collection program will gather information for structures adjacent to the dredge prism to determine if any setbacks or offsets are warranted (e.g., at the footbridge abutments, Town of Lenox WWTP outfall, and rock wall and concrete abutment along the residential parcel shoreline).

4.2.1.3 Disposal Evaluation

As described in Section 2.5, off-site disposal is required for sediment that is represented by a three-dimensional polygon associated with a single vertical core that has an average PCB concentration greater than or equal to 100 mg/kg. This criterion is evaluated as the depth-weighted average PCB concentration for each location, which is calculated using the depth intervals that correspond to the targeted depth of removal associated with each core location. In addition, as described in Section 2.5, the Revised Final Permit states that Reach 6 sediments to be disposed of in the UDF must have a volume-weighted average PCB concentration of less than or equal to 25 mg/kg.

Thiessen polygons were generated for each sampled location and depth interval using the historical and PDI sediment data. The sizes and shapes of the Thiessen polygons vary based on data availability for each sample location and depth interval. Thiessen polygon extents are generated for each depth interval using only locations where data are available at that depth. A series of figures was developed to show the Thiessen polygons and detected PCB concentrations for Woods Pond and the outlet channel for each one-foot removal depth interval (i.e., 0- to 1-foot, 1- to 2-foot, etc., down to 11 feet). These figures are presented as Figures 2a and 2b in Appendix A.

The Thiessen polygons were converted to a one-foot by one-foot raster grid for each depth interval. The target dredge depth, based on the engineered dredge prism, was then used to calculate a depth-weighted average PCB concentration for each grid cell using that raster grid. As summarized in Appendix A, there are no core locations with depth-weighted average PCB concentrations that exceed 100 mg/kg.

The volume-weighted average PCB concentration was calculated using the target dredge depth and depth-weighted average PCB concentration for each grid cell. The estimated volume-weighted average PCB concentration of the sediments targeted for removal is approximately 3.5 mg/kg, which is well below the 25 mg/kg criterion for disposal in the UDF as described in Section 2.5. Based on these evaluations using the historical data and PDI data, all sediment removed from Woods Pond and the outlet channel will be transported to the UDF for disposal.

4.2.2 Valley Mill Pond

As described in Section 2.2.2, sediment remediation in Valley Mill Pond is being included in the scope of conceptual design for Reach 6. The Revised Final Permit did not establish specific Performance Standards or other requirements for this area; therefore, GE has elected to evaluate it against the Performance Standards for backwaters given that this area is separate from, but hydraulically connected to, the main river channel.

Valley Mill Pond was not included in the scope of the Reach 6 PDI; therefore, the conceptual design for this area is based on data collected historically. Supplemental PCB data will be collected in this pond consistent with requirements for PDI sampling in backwaters (i.e., 50-foot grid sampling) prior to final design. The data evaluation presented in this section will be revised during final design after completion of supplemental data collection. Accordingly, the conclusions from this section may change during final design based on the future data evaluation.

4.2.2.1 Data Evaluation (Existing Conditions)

Figure 4-4 shows Thiessen polygons of PCB concentrations for each depth interval based on the available historical data for Valley Mill Pond. Using these polygons, spatially weighted average PCB concentrations were calculated for the surface (0 to 1 foot) and subsurface intervals. The resulting average PCB concentrations are 61 and 0.59 mg/kg for the surface (0 to 1 foot) and subsurface (1 to 4 feet), respectively. A detailed summary of the spatially weighted average PCB concentration calculations is provided in Table 2 in Appendix A. The spatially weighted average PCB concentration in the surface exceeds 1 mg/kg under existing conditions and therefore requires remediation.

4.2.2.2 Proposed Remediation Plan

The preliminary remediation footprint required to achieve a spatially weighted average PCB concentration in the surficial 0- to 1-foot of sediment was delineated through a "hill topping" exercise (i.e., "removal" of Thiessen polygons sequentially from high to low concentration, with the original concentration value replaced with a concentration equal to 1% of the existing average surface sediment PCB concentration) until an average PCB concentration of 1 mg/kg in surface sediments was achieved. Based on this evaluation, removal and capping would be required at all but one historical sampling location (S18S5).

For the subsurface depth interval, the average PCB concentration was calculated by applying a concentration equal to 1% of the existing average surface sediment PCB concentration to subsurface polygons located beneath the surface cap. The resulting post-cap subsurface PCB concentration is 0.59 mg/kg (i.e., below 1 mg/kg). A detailed summary of the post-cap spatially weighted average PCB concentration calculations is provided in Table 2 in Appendix A. In that table, orange-highlighted cells indicate locations where surficial remediation (i.e., removal of the top foot of sediment followed by cap placement) would be required to achieve the 1 mg/kg spatial average criterion based on the historical data. Cells with blue-gray shading indicate the historical sampling location (S18S5) where no surface remediation would be required. The estimated post-remediation surface spatially weighted average PCB concentration is 0.95 mg/kg.

Figure 4-4 shows the preliminary limits of the removal and cap area required to achieve the 1 mg/kg spatial average criteria in surface sediment. A total of 4.2 acres is identified for remediation in Valley Mill Pond, which accounts for 91% of the total area of the pond, including the channel extending north toward Woods Pond Dam. The estimated volume of sediments to be removed from Valley Mill Pond is approximately 6,700 cubic yards (cy), based on a minimum removal depth of one foot. Factoring the same cap overplacement and overdredging assumptions described in Section 4.2.1.2, the total estimated removal thickness would be 22 inches and results in an estimated sediment removal volume of approximately 12,300 cy.

As described in Section 2.2.2, the Revised Final Permit allows for the placement of backfill (in lieu of engineered capping) in areas where sediment was removed, subject to certain constraints. This option will be explored further after supplemental data collection. If capping is ultimately selected for Valley Mill Pond, details for the cap design in this area will be determined during final design after supplemental data collection. Unlike the situation for Woods Pond, where cap placement will be deferred until after completion of remediation in all upstream RUs (Reaches 5A, 5B, and 5C), cap or backfill placement in Valley Mill Pond will occur immediately after sediment removal in this area.

4.2.2.3 Disposal Evaluation

As described in Section 2.5, off-site disposal is required for sediment that is represented by a three-dimensional polygon associated with a single vertical core that has an average PCB concentration greater than or equal to 100 mg/kg. To meet this requirement, the depth-weighted average PCB concentrations for the historical Valley Mill Pond sediment cores were calculated based on a total removal depth of one foot. Two core locations have depth-weighted average PCB concentrations that exceed 100 mg/kg (S18S2 and S18S4). The Theissen polygons associated with these core locations are shown on Figure 4-4 and represent an area of 1.1 acres. The sediments removed from these two locations—which are preliminarily estimated to constitute 3,200 cy based on a total sediment removal thickness of 22 inches—will be subject to off-site disposal.

The Revised Final Permit (Attachment E) also requires that sediments to be disposed of in the UDF have a volume-weighted average PCB concentration of less than or equal to 25 mg/kg. The volume-weighted average of the remaining 9,100 cy of sediments to be removed from Valley Mill Pond is approximately 46 mg/kg, which exceeds the UDF disposal criterion in the Revised Final Permit. As a result, approximately 5,400 cy of additional sediment with the highest PCB concentrations will be segregated for off-site disposal. The remaining 3,700 cy (averaging 22 mg/kg) will be subject to disposal in the UDF. As noted above, the disposal evaluation for this area will be updated based on the results of the proposed supplemental data collection. Table 3 in Appendix A provides a detailed summary of the estimated disposal volumes and volume-weighted average PCB calculations for the sediments to be removed from Valley Mill Pond.

4.3 Non-Residential Floodplain Soil Evaluations

As discussed in Section 1.2, EPA's HHRA divided the ROR floodplain into 90 non-residential EAs for the assessment of human direct contact with floodplain soils. Of those 90 EAs, five are located wholly or partially within Reach 6. Three of those non-residential EAs contain overlying direct contact subareas, which are typically characterized by a different and/or more frequent exposure scenario. This section provides an evaluation of these five non-residential EAs. Specifically, this section summarizes existing PCB conditions for each EA and a summary of proposed removal areas and volumes for each EA having soil PCB concentrations that exceed the applicable Performance Standards described in Section 2.3.1. Details associated with this assessment are provided in Appendix B.

4.3.1 PCB Evaluation (Existing Conditions)

GE provided an evaluation of current exposure point concentrations (EPCs) at each of the five non-residential EAs in the PDI Summary Report, which is being submitted concurrently with this Conceptual RD/RA Work Plan. Details associated with these calculations are also provided for completeness in Appendix B. These EPCs formed the primary basis (along with other relevant factors) for determining the need for soil remediation at these EAs to achieve the Performance Standards described in Section 2.3.1.

Table 4-2 summarizes the floodplain soil EPCs (0 to 1 foot) calculated for each of the five non-residential EAs (and subareas), and Table 4-3 provides 0- to 1-foot and 0- to 3-foot EPCs for each of the three FUSAs.[30] These tables also show the following: (1) whether each EA intersects with Core Area 1 habitat; (2) the exposure scenario and receptors assigned to each EA/subarea in EPA's HHRA; and (3) the corresponding Primary and, where relevant, Secondary Performance Standards that apply to each exposure scenario under Tables 1 and 2 of the Revised Final Permit.[31] EPCs that exceed the applicable Primary Performance Standard are highlighted in gray in Tables 4-2 and 4-3.

Table 4-2
Calculated 0- to 1-Foot EPCs for Reach 6 Non-Residential Exposure Areas and Subareas

EA ID	EA Size (acres)[1]	Includes Core Area 1 Habitat	Exposure Scenario/Receptor	Performance Standards		0- to 1-foot EPC (mg/kg)[2]
				Primary (RME 10^{-5}/ HI = 1)	Secondary (RME 10^{-4}/ HI = 1)	
56	36	Yes	Medium-use general recreation, adult/older child	21	40	2.0
56a	14	Yes	Waterfowl hunting	90	140	18
57	13	No	High-use general recreation, adult/older child	14	N/R	1.2
58	1.3	No	High-use general recreation, adult	14	N/R	15
59	1.9	No	High-use general recreation, adult/older child	14	N/R	11
59a	0.81	No	Bank fishing	26	N/R	22
60	1.1	No	High-use general recreation, adult/older child	14	N/R	1.4
60a	0.17	No	Recreational canoeist	12	N/R	1.8

Notes:
1. Represents the area within the 1 mg/kg PCB isopleth.
2. EPCs that exceed the applicable Primary Performance Standard are highlighted in gray.
N/R: not relevant; the Secondary Performance Standards are relevant only in EAs that contain Core Area 1 habitat.

[30] Based on discussions with EPA relating to the non-residential floodplain evaluations for Reach 5A, GE has evaluated both the 0- to 1-foot and the 0- to 3-foot EPCs in FUSAs (not solely the 0- to 3-foot EPCs).

[31] In accordance with the Revised Final Permit, the Secondary Performance Standards are relevant only in EAs that contain Core Area 1 habitat.

Table 4-3
Calculated 0- to 1-Foot and 0- to 3-Foot EPCs for Reach 6 Frequently Used Subareas

EA ID	FUSA Size (acres)[1]	Includes Core Area 1 Habitat	Exposure Scenario/Receptor	Performance Standards (mg/kg)	0 to 1-Foot EPC (mg/kg)[2]	0- to 3-Foot EPC (mg/kg)[2]
58	0.23	No	High-use general recreation, adult/older child	14	0.58	0.17
59	0.19	No	High-use general recreation, adult/older child	14	45	15
60a	0.0076	No	Recreational canoeist	12	0.21	0.11

Notes:
1. Represents the area of the FUSA within the EA boundary and 1 mg/kg PCB isopleth.
2. EPCs that exceed the applicable Primary Performance Standard are highlighted in gray.

As shown in Table 4-2, current 0- to 1-foot EPCs in the Reach 6 EAs and subareas range from 1.2 mg/kg to 22 mg/kg. All EAs and subareas have 0- to 1-foot EPCs below the applicable Primary Performance Standards except for EA 58, where the 0- to 1-foot EPC of 15 mg/kg is slightly above the Primary Performance Standard of 14 mg/kg. For the three FUSAs in Reach 6, current 0- to 1-foot EPCs range from less than 1 mg/kg to 45 mg/kg while 0- to 3-foot EPCs range from less than 1 mg/kg to 15 mg/kg (Table 4-3). In one such subarea (located in EA 59), the EPCs exceed the Performance Standard in both 0- to 1-foot and 0- to 3-foot depth intervals.

4.3.2 Proposed Remediation Plan

The EPCs provided in Section 4.3.1 form the basis for determining which EAs/subareas required soil remediation to achieve the relevant Performance Standards. As noted, one EA (EA 58) requires remediation in the 0- to 1-foot depth interval to achieve the applicable Performance Standards. One FUSA (located in EA 59 and referred to herein as FUSA 59) requires remediation in the 0- to 1-foot interval to achieve the Performance Standard; in that subarea, the remediation required to achieve the Performance Standard in the 0- to 1-foot interval also results in achieving that same Performance Standard in the 0- to 3-foot interval. A description of the methods for determining the removal areas and volumes was provided previously in Appendix A to GE's Revised Reach 6 PDI Work Plan. Details associated with these methods are also provided for completeness in Appendix B. That appendix also provides a detailed discussion of the evaluation results for these two areas.

A summary of proposed removal areas and volumes for the non-residential floodplain EA and FUSA requiring remediation is provided in Table 4-4. Maps showing 0- to 1-foot soil PCB concentrations and proposed remediation areas for each area are shown on Figures 4-5a and 4-5b. Remediation of the non-residential floodplain EAs results in a total estimated removal volume of approximately 14 cy of soil. None of the proposed remediation is located within any designated core habitat areas. As described in Section 10.2, additional PCB data in EA 58 and FUSA 59 will be collected as part of the supplemental data collection effort to refine the PCB distribution in these areas.

Table 4-4
Removal Area and Volume Estimates and Post-Remediation EPCs for Non-Residential Floodplain EAs and Subareas Requiring Remediation

EA ID	Removal Depth Interval (feet)	Includes Core Area 1 Habitat?	Applicable Performance Standards (mg/kg)	Pre-Remediation EPC (mg/kg)		Post-Remediation EPC (mg/kg)[1]		Removal Area (feet^2)	Estimated Removal Volume (cy)
				0–1 Foot	0–3 Feet	0–1 Foot	0–3 Feet		
EA 58	0–1	No	14	15	—	13.4	—	194	7
FUSA 59	0–1	No	14	45	15	1.1	0.4	194	7
							Total	**398**	**14**

Notes:

1. The post-remediation EPCs are truncated and generally shown one decimal place to demonstrate achievement of the applicable Performance Standards.

—: EPCs not calculated

4.3.3 Disposal Evaluation

As described in Section 2.5, if the volume-weighted average PCB concentration in the soil to be removed from a non-residential EA equals or exceeds 50 mg/kg, the soil with the highest PCB concentrations within the EA will be separated out for off-site disposal until the average concentration of the remaining soil to be removed in the EA decreases to less than 50 mg/kg for subsequent disposal at the UDF. The estimated volumes for disposal in the UDF and off-site disposal are summarized in Table 4-5. As shown, the soil removed from EA 58 will require off-site disposal, while the soil removed from FUSA 59 will be disposed of in the UDF.

Table 4-5
Floodplain Soil – Estimated Disposal Volumes Summary

EA ID	UDF Disposal		Off-Site Disposal		Total Volume (cy)
	Volume-Weighted Average PCB Concentration (mg/kg)	Volume (cy)	Volume-Weighted Average PCB Concentration (mg/kg)	Volume (cy)	
EA 58	—	0	143	7	7
FUSA 59	45	7	—	0	7
	Volume Totals	**7**		**7**	**14**

Note:
—: no concentration provided due to zero volume

4.4 Evaluation of Vernal Pools

Spatially weighted average PCB concentrations were calculated for the 0- to 1-foot depth interval in each of the two vernal pools in Reach 6 (located in EA 57) following the methodology described in Appendix A to GE's approved Second Revised PDI Work Plan for Non-Residential Floodplain EAs. These values are provided in Table 4-6, which are also provided in GE's PDI Summary Report, being submitted concurrently with this Conceptual RD/RA Work Plan. As shown in this table, spatially weighted average PCB concentrations in both vernal pools are less than 1 mg/kg and thus below the vernal pool Performance Standard of 3.3 mg/kg. Therefore, remediation is not required for these two vernal pools.

Table 4-6
Summary of 0- to 1-Foot Spatially Weighted Average PCB Concentrations in Vernal Pools

Exposure Area	Vernal Pool ID	Area (acres)	PCB SWAC (0–1 foot; mg/kg)
57	5C-VP-17	0.081	0.01
	6-VP-1	0.088	0.12

4.5 Summary

Based on the evaluations described in Sections 4.2 through 4.4, preliminary sediment and non-residential floodplain soil remediation areas have been developed for this conceptual design. As described in Section 10, supplemental data collection activities will be performed to further characterize Valley Mill Pond sediment and the non-residential floodplain soil remediation areas. The final horizontal and vertical extents of remediation will be determined during the final design process and will be presented in the Final RD/RA Work Plan for Reach 6.

Table 4-7 provides an overall summary of the conceptual removal area and volume estimates for each media along with preliminary estimated volumes for off-site disposal and disposal in the UDF.

Table 4-7
Summary of Conceptual Design Removal Areas and Estimated Removal Volumes for Reach 6

Media	Remediation Area (acres)	Preliminary Estimated UDF Volume (cy)	Preliminary Estimated Off-Site Volume (cy)	Total Estimated Volume (cy)
Woods Pond Sediment	53.60	461,000	0	461,000
Outlet Channel Sediment	3.71	20,000	0	20,000
Valley Mill Pond Sediment[1]	4.2	3,700	8,600	12,300
Floodplain Soil	0.009	10	10	20
Vernal Pools	0	0	0	0
	Total	**484,710**	**8,610**	**493,320**

Notes:
All quantities are preliminary estimates, are rounded, and may be subject to change during final design. Volumes represent in-place quantities.
As noted in Section 1.4, the conceptual design for the headwaters transition zone portion of Reach 6 will be presented in an addendum to the Final RD/RA Work Plan for Reach 6. Accordingly, estimated remediation volumes for that portion of Reach 6 are not included in this table.

1. Volumes for Valley Mill Pond are estimated based on historical data. Supplemental data collection activities (Section 10) will be performed to collect PCB characterization data that will be used to determine the final remediation extents, depths, and volumes. The final horizontal and vertical extents of remediation will be determined during final design.

5 Remedial Design Process and Considerations

5.1 Overview

This section summarizes completed evaluations that support key aspects of the conceptual design for the Reach 6 remediation. These include evaluations performed to develop preliminary design details for the engineered cap in Reach 6 and evaluations performed to assess the stability of dredging slopes within Reach 6. In addition, this section summarizes the conceptual design approach for various aspects of the Reach 6 remedy, including sediment removal and transport methods, material handling and staging, waste transport and disposal, and restoration of impacted habitats.

5.2 Preliminary Engineered Cap Evaluation

As described in Section 1.3, this Conceptual RD/RA Work Plan describes only the design activities required to support the sediment removal components of the Reach 6 remedy in Woods Pond and the outlet channel because final cap placement in Reach 6 will not occur until after completion of remediation in all upstream RUs (Reaches 5A, 5B, and 5C). Nonetheless, dredge prism elevations for the Woods Pond and the outlet channel are highly dependent on cap thickness. Therefore, this section summarizes a preliminary cap design evaluation to determine potential cap thickness in Woods Pond and the outlet channel, including both chemical isolation and erosion protection.[32] Additional details related to the engineered cap modeling and design evaluations are provided in Appendix C.

As stated in the Revised Final Permit, the engineered caps are required to be designed "to physically isolate contaminated sediments from potential ecological and human receptors, and minimize the transport of PCBs from the sediment beneath the caps to the bioavailable surface layer and the water column" (EPA 2020). The preliminary designs for the engineered caps provided in this section were designed in accordance with guidance set forth in EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (EPA 2005b), Subaqueous Capping Guidance, and *Contaminated Sediments Remediation: Remedy Selection for Contaminated Sediments* (ITRC 2014).

As described in Section 2.2.3, the Performance Standards for engineered caps require that all engineered caps constructed for the ROR include the following layers or functions: a mixing layer, a chemical isolation layer, an erosion protection layer, a geotechnical filter layer, a bioturbation layer, and a habitat layer (left side of Figure 5-1). The Revised Final Permit indicates that a single layer may

[32] The cap design evaluation presented in this section is considered preliminary because the PDI data needed to design the cap have not been collected. Because final cap placement will not occur in Woods Pond for several years, the Revised Reach 6 PDI Work Plan only included the PDI activities and data collection required to support the sediment and floodplain soil removal components of the remedy in Reach 6. An addendum to the Revised Reach 6 PDI Work Plan will be prepared in the future to describe the proposed additional PDI data collection needed to support the engineered cap design in Reach 6.

serve multiple functions, which is consistent with EPA's Subaqueous Capping Guidance. For example, depending on the size of material used to construct an erosion protection layer, the erosion protection layer may also serve as a habitat layer and bioturbation layer. Thus, a single erosion protection layer can serve three functions. That is the approach that has been taken for the Reach 6 caps.

Sections 5.2.1 and 5.2.3 summarize the preliminary design evaluations and modeling performed to evaluate erosion protection and chemical isolation for the Reach 6 caps, respectively. Also included is an evaluation of the need for filtering between those two layers (Section 5.2.2). Details of the preliminary design evaluation and modeling are presented in Appendix C. It should also be noted that a hydrologic analysis and a one-dimensional hydraulic model were developed previously to evaluate flow conditions in Reaches 5 and 6; this analysis and modeling were documented in the Conceptual RD/RA Work Plan for Reach 5A and have also been used to support the preliminary engineered cap design for Reach 6. The Reach 6 cap types and their layers are summarized in Table 5-1 in Section 5.2.5.

5.2.1 Erosion Protection Layer

As described in the Revised Final Permit, the engineered caps will include an erosion protection layer to prevent erosion in accordance with federal and state requirements and consistent with pertinent EPA or USACE guidance. EPA's Subaqueous Capping Guidance states the following:

> The cap component for stabilization/erosion protection has a dual function. On the one hand, this component of the cap is intended to stabilize the contaminated sediments being capped, and prevent them from being resuspended and transported offsite. The other function of this component is to make the cap itself resistant to erosion. These functions may be accomplished by a single component, or may require two separate components in an in-situ cap. (Palermo et al. 1998, p. 31.)

The erosion protection layer (often referred to as an armor layer) will be placed above the chemical isolation layer and will be designed to protect it from erosional processes in the river. In addition to providing erosion protection, this layer will also serve as a habitat layer and bioturbation layer. As stated in Section 5.2 above, the Revised Final Permit allows for a single layer in the cap to serve multiple functions. Thus, a single erosion protection layer can and will serve these three functions for Reach 6.

Because Woods Pond and the outlet channel are generally not used for navigation by motorized watercraft, the river currents and flood flows are typically the dominant factors contributing to potential erosion; effects from vessel wakes and propellor wash, which are often important considerations for cap design, are not relevant in Reach 6. River currents, particularly during high-flow events, can result in elevated current velocities and bed shear stresses and have the potential to erode or resuspend sediment or cap material. As described in the Revised Final Permit, the design flow event for the erosion protection layer is a flow event up to and including the applicable return interval event, which shall be calculated using up-to-date flow data, with additional considerations for the potential impacts of climate change on cap performance and appropriate measures to mitigate them. EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* states the following:

> The design of the erosion protection features of an in-situ cap (i.e., armor layers) should be based on the magnitude and probability of occurrence of relatively extreme erosive forces estimated at the capping site. Generally, in-situ caps should be designed to withstand forces with a probability of 0.01 per year, for example, the 100-year storm. (EPA 2005b, pp. 5–9.)

In addition to river currents, erosional forces acting on the shoreline of Woods Pond are important considerations for the cap design. The erosional forces along the Woods Pond shoreline include wind-generated wave force and ice.

Similar to the conceptual design of the erosion protection layer for Reach 5A, the conceptual design of the erosion protection layer for Reach 6 was developed using a design flow rate with a 200-year return period (16,400 cfs at the Confluence). This flow represents an approximately 23% increase relative to the 100-year return period flow estimate (which is often used a design flow event; EPA 2005b) and was used to account for the potential impacts of climate change.

The stable particle size (e.g., expressed as median diameter [D_{50}]) required to resist the current velocity and related bed shear stress was calculated in accordance with Appendix A to EPA's Subaqueous Capping Guidance. The method is based on USACE's *Hydraulic Design of Flood Control Channels* (USACE 1994). This method uses velocity and flow depth to determine the stable median armor stone size (D_{50}).

Site-specific data and the one-dimensional HEC-RAS model (described in Appendix G to the Conceptual RD/RA Work Plan for Reach 5A) were used to calculate the design velocities associated with various flow events.[33] The model was used to simulate flows with various recurrence intervals, including 1-, 2-, 5-, 10-, 25-, 50-, 100-, and 200-year return periods. Stable particles sizes for each flow event were computed throughout Reach 6 using the hydraulic model output. The results of this evaluation indicate that a sand erosion protection layer would be sufficient to protect the chemical

[33] A one-dimensional model provides valuable information related to water surface elevations and stream velocities that have been used to support this conceptual design. However, as described in the Reach 5A Conceptual RD/RA Work Plan, the one-dimensional HEC-RAS model will be expanded to a two-dimensional model to support the final design for Reach 5A. That same two-dimensional model will be used to support the final design for Reach 6.

isolation layer material from erosive forces throughout most Woods Pond. In the southern portion of Woods Pond near the outlet channel, river-current velocities increase, and gravels are required to protect the chemical isolation layer. In the outlet channel, river velocities are calculated to be higher than Woods Pond because flows are generally confined to the river channel due to higher riverbanks in this area approaching the dam. Therefore, larger materials, such as cobble-sized materials, are required for erosion protection in this area.

Winds blowing across the surface of bodies of water transmit energy to the water, and waves are formed. The size of these wind-generated waves depends on the wind velocity, the length of time the wind is blowing, and the extent of open water over which it blows (i.e., fetch). Because of the sinuosity of the more upstream reaches in the ROR (like Reach 5A), fetch distances are limited; therefore, wind-generated waves are not a significant force relative to river currents. However, in Woods Pond, there are relatively longer fetch distances; therefore, winds may be capable of generating waves that can produce forces capable of causing erosion, particularly in nearshore areas. For the Woods Pond wind-generated wave analysis, a 100-year return period was used for the erosion protection layer evaluation. Wind measurements (speeds and direction) from 2006 to 2024 were obtained from Pittsfield Municipal Airport (located approximately 5.5 miles from Reach 6; summarized in Table 3-7). The methodology used to estimate winds speeds for wave prediction were consistent with that described in Part II – Chapter 2 of the USACE's *Coastal Engineering Manual* (USACE 2006). The wind climate of the site was analyzed using the wind speed and directional data to estimate the 100-year wind speeds.

Along with the computed 100-year wind speeds described above, the fetch distance was used to estimate 100-year wave heights. The USACE Automated Coastal Engineering System (ACES) computer program was used to model wave growth and propagation due to winds (USACE 1992). The ACES program was developed in 1992 by the USACE and is an accepted worldwide reference for modeling water wave mechanics and properties. To compute the 100-year design wave height and periods along the Woods Pond shoreline, the 100-year wind speed was applied along the longest fetch distance at various locations along the pond. The ACES Rubble Mound Revetment Design Module was used to compute the stable particle size to resist the 100-year waves along the shoreline. The results of this evaluation indicate that coarse gravels would be required to protect the chemical isolation layer material along the shoreline from wind-generated waves.

Due to the cold temperatures that occur in western Massachusetts in the winter months, Woods Pond (or a portion thereof) typically freezes over in the winter. As a result, the potential effects of ice on the sediment cap were evaluated as part of the preliminary cap design evaluation. Ice freezing to the bottom of the Woods Pond may occur in shallow-water areas near the shoreline of Woods Pond. In such cases, it is expected that the normal thickening of ice could encounter the bed. GE has not collected ice thickness measurements on Woods Pond and is not aware of any existing ice thickness data. Because Woods Pond is often used for ice fishing, it is estimated that ice thicknesses can be at least three to six inches. Based on estimates of potential ice thickness derived from the modified Stefan equation (based on the degree–day calculation; USACE CRREL 2004), an assumed maximum ice thickness of eight inches was used in the erosion protection layer evaluation. The results of this evaluation indicate that cobbles would be required to protect the chemical isolation layer material from ice erosion along the shoreline.

In lieu of placement of a cobble-armored cap along the Woods Pond perimeter, the final design for the engineered cap will include details to place the engineered cap in nearshore areas at depths below the wave and ice freezing zone to protect the chemical isolation layer of the sediment cap. This approach would include sediment removal immediately prior to cap placement in the nearshore area (which would be conducted several years after initial dredging of Woods Pond). After the dredging and cap placement, the nearshore area will be restored by placing a soil backfill material above the cap to stabilize the shoreline dredge cut. This conceptual design stage assumes that an additional 5,900 cy of sediment would be removed to a depth of three feet along the shoreline in Woods Pond to construct the cap in this manner. Design details for the nearshore sediment removal and cap placement (e.g., removal depths, extents, and methods) will be described in an addendum for the Final RD/RA Work Plan for Reach 6 with the final engineered cap design.

Additional details related to the preliminary erosion protection design analysis are provided in Appendix C. As described in that appendix, the erosion protection layer in Woods Pond will consist of a minimum six-inch-thick layer of sand or gravel, and the erosion protection layer in the outlet channel will consist of a minimum 18-inch-thick layer of cobble. Final details for the erosion protection layer will be determined during final design.

5.2.2 Geotechnical Filter Layer

As described in the Revised Final Permit, "[t]he use of a geotechnical filter layer between the chemical isolation layer material and erosion protection layer material shall be evaluated and may be necessary for those areas requiring cobble or larger-sized material in the erosion protection layer" (EPA 2020).

Where needed, a filter layer provides an interface between the erosion protection layer and the protected material and is an essential element for protecting contaminated sediments (Maynord 1998). The filter prevents migration of one granular material through another (often referred to as "piping"), distributes the weight of overlying armor units to provide more uniform settlement, and permits relief of hydrostatic pressures within the soils. A filter layer is often required when using larger-diameter material for the erosion protection layer of an engineered cap. The same armor-to-filter relationships are used to assess the potential for piping between the filter layer and chemical isolation layer and may be used to evaluate the gradations for the chemical isolation material as well (i.e., to prevent piping of underlying sediment into the chemical isolation layer).

Standard geotechnical filter criteria include recommended particle size ratios between base and overlying materials (e.g., sand chemical isolation and overlying erosion protection materials). The primary filter criteria particle size relationship applicable to subaqueous capping materials is the ratio of D_{15} of the armor stone to D_{85} of the underlying base layer. This relationship relates to the ability of the base layer material (e.g., sand) to pass through the void spaces in the overlying larger material (e.g., erosion protection armor stone). Compliance with the recommended filter criteria minimizes the potential for wash-out of the base material by the creation of internal filters in the armor stone voids. The potential for piping can be minimized by using well-graded gradations for the two materials.

For the conceptual design, it was assumed that a gravel filter will be required for the caps with the cobble-sized erosion protection layers in the outlet channel, but not for the cap in Woods Pond proper. Where required, the gravel filter layer will be placed after the chemical isolation layer and before the erosion protection layer. This conceptual design assumes that the geotechnical filter layer for the outlet channel will consist of a minimum six-inch-thick layer of gravel.

The geotechnical filter layer, including the gradation of the filter layer, will be evaluated and designed for compatibility with the erosion protection layer and the underlying chemical isolation layer of the engineered cap as part of final design.

Additional details on the geotechnical filter layer design evaluation are provided in Appendix C. Final details will be determined during final design.

5.2.3 Chemical Isolation Layer

As described in the Revised Final Permit, the chemical isolation layer will be "sufficient to minimize (reduce by 99%) the flux of PCB concentrations through the isolation layer" (EPA 2020). For the purpose of this preliminary evaluation, a single cap type was evaluated for Woods Pond and the outlet channel.[34] Once additional data are collected as part of the PDI, these areas may be evaluated separately.

To meet the requirements for engineered caps in the Revised Final Permit, the chemical isolation layer in Woods Pond will be designed to achieve 99% reduction in PCB mass flux across the chemical isolation layer throughout a 100-year time frame based on model calculations.

[34] For Valley Mill Pond, since there is no contemporary PDI PCB data, chemical isolation evaluations were not performed.

Similar to the modeling performed to evaluate chemical isolation in Reach 5A (see Appendix A in the Conceptual RD/RA Work Plan for Reach 5A), model simulations were performed using CapSim model (Reible 2017; Shen et al. 2018) to identify the chemical isolation layer thickness and composition (i.e., amendment) needed to meet the Performance Standards. CapSim is a one-dimensional model of chemical transport within sediment caps. The model simulates the transport of contaminants resulting from various transport processes, including groundwater advection, diffusion/dispersion, bioturbation/bioirrigation, and exchange with the overlying surface water, consistent with the requirements of the Revised Final Permit (see Section 2.2.3). The cap model predicts PCB mass flux and concentrations (for both porewater and sorbed phase) throughout the cap over time.

The transport of PCBs was simulated for each of the 10 PCB homolog groups (mono- through decachlorobiphenyl) to account for the differences in mobility among the various homologs. Model-predicted mass flux and concentration for each homolog were summed to calculate the total PCB mass flux throughout the chemical isolation layer and the total PCB concentration within the surface of the cap. PCB mass fluxes predicted by the model at the sediment-cap interface and the interface between the chemical isolation layer and erosion protection layer were used to calculate percent reduction in mass flux across the chemical isolation layer throughout the course of 100-year simulations.

For this preliminary capping evaluation, a cap consisting of a six-inch sand chemical isolation layer overlain by a six-inch gravel/cobble erosion protection layer was evaluated with the model. The model was then run iteratively by adjusting the amendment content and/or thickness of the chemical isolation layer as needed to result in predicted reductions in the PCB mass flux across the chemical isolation layer of 99% throughout the 100-year simulation. For the purposes of this conceptual design, TOC was assumed for the sorptive amendment. Assuming TOC at this stage in the design provides flexibility to select the appropriate amendment(s) during the final design. For example, literature suggests that AC is 10 to 100 times more sorptive than TOC (Arp et al. 2009; Hale et al. 2010; McDonough et al. 2008); therefore, a TOC of 50% by weight determined through the iterative modeling process described above could be achieved using a dose of AC of 5% by weight.

The chemical isolation layer modeling results show that a six-inch chemical isolation layer consisting of sand with 4% TOC (or 0.4% granular AC) is sufficient to meet the applicable Performance Standards (i.e., to reduce the flux of PCB concentrations through that layer by 99%). During future PDI data collection for Woods Pond, additional data will be collected and this preliminary design will be refined. Details related to the chemical isolation layer modeling approach, inputs, development, and results are provided in Appendix C.

5.2.4 Cap Overplacement Allowances

In accordance with the Revised Final Permit, the final design of the engineered caps will consider the need for overplacement allowances, with additional sediment removal, for each layer. Due to challenges in precise placement for underwater construction, an overplacement allowance is usually included in the capping designs. For Reach 6, this extra thickness is expected to range from zero to six inches, averaging about three inches for sand and gravel layers and six inches for cobble layers. This estimate considers the expected cap placement equipment, previous experiences on other projects, and contractor input. Consequently, cap overplacement allowances are assumed for up to three inches for the six-inch-thick chemical isolation layer, up to three inches for the six-inch-thick geotechnical filter layer and gravel erosion protection layers, and up to six inches for cobble armor material. These overplacement allowances are typical for remedial capping projects in underwater construction conditions.

The need for a mixing layer was also considered. At this conceptual design stage, it has been determined that a separate mixing layer is not necessary based on the following:

- Evidence from capping projects shows that modern placement techniques can place cap materials with minimal mixing (e.g., less than one inch) (Anchor Environmental 2007; Shaw et al. 2008). During the Silver Lake Pilot Study (Arcadis BBL 2008), cap material placed through the water column onto very soft sediment resulted in mixing that was limited to the bottom one inch (or less) of the chemical isolation material.
- The capping specifications in the final design will require the contractor to achieve a minimum thickness for the chemical isolation layer and include overplacement allowances. Experience on environmental capping projects shows that contractors consistently place more than the minimum thickness when specifications are written this way. This approach ensures that the chemical isolation layer remains effective even if some mixing occurs.
- Placement techniques can be optimized to minimize the potential for cap materials to mix with the underlying sediment. It is anticipated that such techniques will be included in the final cap placement design.

Final details for the cap overplacement allowances will be determined during final design based on final cap layer design evaluations.

5.2.5 Engineered Cap Types and Thickness

Based on the results of the evaluations presented in Sections 5.2.1 through 5.2.4, the conceptual cap design resulted in the designation of two cap types for Reach 6 as summarized in Table 5-1.

Table 5-1
Conceptual Engineered Cap Types

Cap Type	Conceptual Design
Woods Pond	• Chemical Isolation Layer: Minimum 6-inch-thick layer of sand with a sorptive carbon-based amendment (as needed), plus a 3-inch overplacement allowance • Erosion Protection Layer: Minimum 6-inch-thick layer of sand or gravel, plus a 3-inch overplacement allowance
Outlet Channel	• Chemical Isolation Layer: Minimum 6-inch-thick layer sand with a sorptive carbon-based amendment (as needed), plus a 3-inch overplacement allowance • Geotechnical Filter Layer: Minimum 6-inch-thick layer of gravel, plus a 3-inch overplacement allowance • Erosion Protection Layer: Minimum 18-inch-thick layer of cobble, plus a 6-inch overplacement allowance

The engineered cap evaluation described above did not include a detailed evaluation for Valley Mill Pond. That is because, as stated in Section 4.2.2.2, the option of placing backfill (in lieu of engineered capping) in areas where sediment was removed will be explored further for this pond following supplemental data collection. If capping is ultimately selected as a remedy component for this area, the details for the cap design will be determined during final design. However, it is anticipated that, if capping is employed, the cap layers and thicknesses in Valley Mill Pond would be similar to the cap design listed in Table 5-1 for Woods Pond.

5.3 Dredge Slope Evaluation

Section II.B.2.e of the Revised Final Permit requires that sediment be removed throughout Woods Pond to allow placement of an engineered cap over residual PCBs, resulting in minimum post-capping minimum water depths of six feet (measured from the crest of the dam), except in nearshore areas where the slope from the shore to the six-foot water depth "shall be as steep as possible, while also being stable and not subject to erosion or sloughing" (EPA 2020). In support of the conceptual dredge prism design, including identification of the estimated steepest stable slope configurations, a geotechnical slope stability evaluation was performed. Slope stability analysis was performed using both simplified, closed-form equation-based methods (in a spreadsheet) and using limit equilibrium methods in the software Slide2 (Rocscience 2023). Spreadsheet-based slope evaluations were completed for the three primary surficial and nearsurface units identified in Reach 6 (i.e., organic soils, fine alluvium, and lower alluvium as described in Section 3.3), and a sensitivity analysis was completed to estimate stability for a range of potential slope configurations. Slope stability analysis in Slide2 was completed using interpreted subsurface stratigraphy along four selected cross sections, with dredge and post-cap slope stability evaluated at the shoreline for each cross section (eight locations in total as shown in Appendix D). Similar to the spreadsheet-based slope evaluation, a sensitivity analysis was completed in Slide2 to estimate stability for a range of potential slope configurations.

For the stability evaluations, the slope stability factor of safety (FOS) was computed by dividing the available resisting shear force along a slip surface (resisting force) by the driving force associated with weight of the soil mass and any considered surcharge loading. FOSs were calculated for existing, post-dredge (pre-cap), and post-cap conditions. For engineering design, a target minimum FOS of 1.3 is typically used for the short-term conditions (e.g., post-dredge) and a FOS of 1.5 is typically used for long-term conditions (e.g., post-cap) based on USACE slope stability guidelines (USACE 2003).

The FOS values estimated for the varied slope configurations, ranging from 1.5H:1V to 4H:1V, were plotted relative to the target minimum FOS values for each slope stability cross section and for each material type considered in the simplified spreadsheet analysis. The results of the preliminary slope stability evaluation determined that dredge prism side slopes of approximately 4H:1V were likely the steepest that could be accommodated with the soft organic soils prevalent in the eastern side of the pond, and slope configurations of 3H:1V yielded acceptable FOS values elsewhere in Reach 6. In some locations in and near the outlet channel, existing slopes are steeper than 3H:1V and would likely remain stable at similar configurations following dredging; however, during this conceptual phase of design, it is assumed that a 3H:1V slope configuration would be needed there to promote long-term cap stability. Accordingly, the dredge slopes considered for design were identified as 4H:1V (eastern side of Woods Pond) and 3H:1V (western side of Woods Pond and outlet channel). Figure 5-2 shows the delineation of stable slope configurations based on this evaluation. These slope configurations were used to develop a conceptual dredge prism and calculate estimated removal volumes for Reach 6 as described in Section 5.4.

Further details on the slope stability evaluation, including a discussion of model development and results, are provided in Appendix D.

The design slope configurations presented in this conceptual design have been developed with reference to publicly available mapping and subsurface data collected during the PDI. Uncertainties, such as those associated with adjacent infrastructure (e.g., the footbridge abutment design) and site geotechnical characteristics (e.g., extents of mapped glacial till near the outlet channel), will be addressed as part of the supplemental data collection program described in Section 10. Design slope configurations may be adjusted based on future data collection and analysis, and final details for the design slope configurations will be determined during final design and presented in the Final RD/RA Work Plan for Reach 6.

5.4 Sediment Remediation

As described in Section 4.2, sediment remediation in Reach 6 will include sediment removal in Woods Pond, the outlet channel, and Valley Mill Pond. The estimated sediment remediation extents and preliminary quantity estimates for these areas are summarized in Table 4-7. The remainder of this section provides a description of the sediment remediation and transport methods to be employed for Reach 6, subject to further modification in the final design.

5.4.1 Conceptual Sediment Dredging and Transport Approach

Section II.B.2.e(2) of the Revised Final Permit states that Reach 6 sediments will be removed and "if feasible, conveyed hydraulically to the Upland Disposal Facility location for processing" (EPA 2020). During the conceptual design process, the technical feasibility of hydraulic dredging and transport has been evaluated to satisfy that requirement of the Revised Final Permit.

During preparation of the Revised T&D Plan, a detailed evaluation of the feasibility of hydraulic dredging and hydraulic transport for the sediments in Reach 6 was conducted. That evaluation, including the qualitative rating system and criteria used and the results for Reach 6, were presented in Appendix B to the Revised T&D Plan. For the reasons given in Section 3.4 of that appendix, the current evaluation indicates that hydraulic dredging of Woods Pond and the outlet channel appears feasible and that hydraulic pumping of the sediment to a shoreline support facility on the Woods Pond shoreline and then to the UDF is likewise considered feasible. There is no need to repeat that evaluation here. However, in some areas, sediment removal may require mechanical removal, followed by conveyance to the UDF via hydraulic transport or truck. Further, although it is currently anticipated that hydraulic dredging and pumping will be used for Valley Mill Pond, additional evaluation of the sediment dredging and transport approach for Valley Mill Pond will be conducted after supplemental collection and evaluation of data on the sediments in that pond, and the results of that evaluation will be presented in the Final RD/RA Work Plan for Reach 6.

Overall, based on the conclusions of the above-referenced evaluation, the conceptual design approach for sediment removal in Reach 6 is that the work will generally be performed using hydraulic dredging equipment (potentially supplemented by limited mechanical removal) and transported hydraulically to the UDF property for dewatering.

It is anticipated that hydraulic dredges will operate from within Woods Pond and remove sediment as a pumpable slurry. A dredge head will dislodge the sediment, using a rotating cutterhead mounted on a ladder that can move vertically and horizontally, by sucking the material into a pipeline with a barge-mounted dredge pump. A relatively large amount of water is expected to be entrained into the sediment to create a slurry that can be pumped. The anticipated hydraulic dredging equipment will be equipped with a real-time kinematic positioning differential global positioning system software so that the operator is able to monitor the position and elevation of the dredge and dredge head in real time.

It is anticipated that the sediment hydraulically dredged from Reach 6 that is designated for on-site disposal will be transported by pipeline to the shoreline support facility (Figure 5-3) and then to the

UDF property for dewatering and processing for eventual disposal. The barge-mounted dredge pump will be used in conjunction with the pipeline and a booster pump(s), if needed, to overcome frictional losses and deliver the sediment to the shoreline support facility. A total of approximately 15 feet of elevation change is estimated along the pipeline from Woods Pond to the shoreline support facility. Section 5.6 provides further discussion of how hydraulically dredged sediment will be transported from the shoreline support facility to the UDF property and where the dredged sediment will be dewatered and managed.

As also discussed in Section 5.6 and in the Revised T&D Plan, dredged sediments from this area that ultimately require off-site disposal (which will consist of some of the sediments from Valley Mill Pond) will be transported to and dewatered at the UDF area. Those sediments will subsequently be transported by truck either to an off-site disposal facility or, as recommended in the Revised T&D Plan, to a nearby rail loading area, described in the Revised T&D Plan as the Woods Pond Spur location, for subsequent transport by rail to an off-site disposal facility.[35]

The selected contractor will ultimately be responsible for selection of actual equipment, means, and methods for removal and, therefore, the equipment used by the selected contractor may vary and will be described in the Supplemental Information Package (SIP) for Reach 6.

The conceptual approach to sediment dredging and transport presented herein involves several uncertainties. To support final design, supplemental geotechnical investigations and detailed topographical surveys will be performed to inform decisions about the most suitable location for a shoreline support facility, an associated bulkhead, and the pipeline route. Section 10 summarizes the supplemental data collection program.

5.4.2 Dredging Design Considerations

In EPA's May 25, 2022, conditional approval of GE's initial submittal of the OSS (Anchor QEA 2022c), EPA directed GE to revise that document to show that the goal is to conduct the sediment removal in Reach 6 (Woods Pond) concurrently with the remediation in Reach 5A, such that sediment removal in Reach 6 is completed at approximately the same time as the Reach 5A remediation. Because it is currently estimated that the Reach 5A sediment removal and capping work will require five years to complete and that the Reach 6 dredging will commence one to two years after the start of Reach 5A remediation, the sediment removal in Woods Pond will need to be completed in three to four years. Based on the estimated sediment removal volumes for Woods Ponds, the outlet channel, and Valley Mill Pond (Section 4.2), average dredge production rates between 625 and 830 cy/day would be

[35] As also discussed in the Revised T&D Plan, that Woods Pond Spur rail loading area will also be used for the unloading of material from other RUs that has been transported by rail and is destined for disposal at the UDF.

needed on a 198-day dredge season[36] to complete the Reach 6 dredging in three to four years.[37] Actual production rates will vary based on a variety of factors including, but not limited to, the selected dredging contractor's equipment and methods; operational delays, such as inclement weather or debris; compliance with environmental monitoring and QOL requirements; and the ability to receive and dewater dredged sediments at the UDF. Further evaluation of potential dredging production rates will be presented in the Final RD/RA Work Plan for Reach 6 considering the final design of the on-site dewatering facility at the UDF and the final sediment removal volumes.

During final design, a design dredge prism will be developed to define the required dredge elevations and quantify the final design volume to be removed. The design dredge prism that will be provided to the dredging contractor will be based on the target dredging elevations (it will not include an overdredge allowance as that will be defined in the technical specifications). During construction, the design dredge prism will serve as the basis for determining whether dredging has achieved the required elevations in accordance with specified dredging tolerance requirements by comparing post-construction bathymetric survey data to the design dredge prism. The final dredging limits and contours will be presented in the Final RD/RA Work Plan for Reach 6.

Sediment Management Units (SMUs) will be developed to segregate the targeted sediment removal areas into smaller units that will be used to verify that the required dredge elevations have been achieved. The sizing and layout of SMUs will be determined prior to construction and presented in the Final RD/RA Work Plan or SIP for Reach 6.

The sediment removal and capping operations will be required to comply with specific water quality criteria to be defined in the forthcoming revised Construction Monitoring Plan (Attachment G to the forthcoming revised Project Operations Plan).[38] To achieve this, the remediation contractor(s) will implement operational controls and best management practices (BMPs) during dredging operations to maintain compliance with the water quality requirements. Details on the potential operational controls and BMPs will be described in the Final RD/RA Work Plan for Reach 6 or in the subsequent SIP.

In addition, performance-based technical specifications will be presented in the Final RD/RA Work Plan for Reach 6. The technical specifications will describe the scope of work, post-dredge

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[36] Consistent with the RCMS, the construction season is assumed to be nine months per year and 22 days per month, for a total of 198 working days per year.

[37] Based on the hydraulic dredging production rate presented the RCMS for Alternative SED 9 (which was similar to the final selected remedy), two dredge plants would need to operate for 10 to 12 hours per day or one dredge plant would need to operate for 20 to 24 hours per day (two 10-hour or 12-hour shifts).

[38] The *Project Operations Plan* (Arcadis 2024c) was initially submitted on January 25, 2024, and conditionally approved by EPA on July 22, 2024. As required by EPA's conditional approval, a revised Project Operations Plan will be submitted to EPA by November 22, 2024.

verification requirements, and other requirements for implementing work in accordance with the remedial design, but they will not define the specific methods or equipment that the contractor will use to implement the work, which will be described in the subsequent SIP.

5.4.3 Structures and Utilities

As described in Section 3.8.1, several structures and utilities were identified in Reach 6. The final design will evaluate whether the utilities and structures could impact remedy implementation and whether there are potential risks to the integrity of the utilities and structures themselves. Specific items that will be further evaluated include seasonal roads and rail lines along perimeter of Woods Pond, a footbridge that spans the northern end of the outlet channel, structures along the shore of Woods Pond (i.e., a rock wall, concrete abutment, and residential structure), a dock located along the outlet channel, the Town of Lenox WWTP outfall along the western shore of the outlet channel, and Woods Pond Dam.

The structures and utilities that could affect, or that could be affected by, the remediation will be surveyed. In addition, owners of several utilities and structures (i.e., property owners, local city building departments, utility companies, and county or state transportation agencies) will be contacted to evaluate whether and how the structures and utilities could impact remedy implementation. The additional survey and outreach efforts will be conducted during the supplemental data collection program described in Section 10. The information gathered by these surveys and outreach will determine whether any offsets or setbacks are needed from critical infrastructure or whether alternate remedial methods are needed.

5.4.4 Debris, Invasive Aquatic Species, and Obstructions

Woods Pond and the outlet channel contain a considerable amount of vegetation, such as overhanging shoreline vegetation and aqueous vegetation, and some large debris, such as boulders, driftwood, buried logs, rocks, and, to a lesser extent, consumer debris (i.e., trash). The overhanging and shoreline debris is not expected to significantly impact access because the water will likely be accessed from a singular pre-cleared area (the shoreline support facility); however, the in-water vegetation and submerged or buried debris can have an adverse impact on production rates, cause project standby periods, or affect the ability to achieve sediment removal to required elevations. Hydraulic dredging relies on a continuous fine-grained sediment feed for optimal production rates.

Trees and shoreline vegetation that overhang the sediment removal and capping areas will be pruned to the extent necessary to allow the safe and effective implementation of in-water remediation. Where tree trimming or removal is necessary, the trees will be cut above the trunk, and the root mass will be left in place where possible. Woody debris that contacts sediment will be transported via truck to the UDF for disposal. Woody debris that has not contacted sediment will be segregated for reuse or disposal.

Dense aquatic vegetation will be removed or treated with an herbicide in advance of or in parallel with sediment removal operations. During final design, GE will evaluate the effective methods and timing for vegetation removal. Because Woods Pond contains a significant amount of water chestnut (an invasive species), BMPs will be implemented to manage the potential spread of non-native plant material during the Reach 6 dredging. Details for controlling non-native plants will be developed and presented in the Final RD/RA Work Plan for Reach 6. The control measures may include removal of non-native plants prior to or alongside dredging activities, installation of a barrier to prevent or minimize the spread of non-native plant materials out of Woods Pond, and inspection and elimination of non-native plant materials from vessels and equipment before they leave the work area.

It is anticipated that before initiating dredging, the contractor will perform a debris survey, taking into account its proposed means and methods. Large debris will be removed in advance of or in parallel with sediment removal operations. Smaller debris and remnant aqueous vegetation will be removed with the sediment during the hydraulic dredging operations. To mitigate the potential for vegetation removed with the sediment to cause blockages and/or hinder the dewatering process (particularly if geotextile tubes are utilized for dewatering), a screen may be added to the dredging equipment to separate the sediments (which pass through) from the vegetation.

Separately removed debris will likely be removed mechanically, loaded into haul vehicles, and transported to a nearby support area for handling and appropriate sizing. Large debris (i.e., buried logs/trees) will be cut into manageable sizes before being transported by truck to the UDF. If appropriate, some debris may be decontaminated and beneficially reused; for instance, boulders could be power washed and reused for habitat enhancement structures during restoration.

5.5 Floodplain Remediation and Soil Handling

As described in Section 4.3, floodplain soil removal activities will be performed at two non-residential floodplain EAs in Reach 6. The proposed floodplain remediation areas and preliminary quantities are summarized in Section 4.3 and shown on Figures 4-5a and 4-5b.

The floodplain removal activities will be conducted using standard mechanical excavation equipment or other specialized equipment (e.g., an amphibious excavator) as needed based on field conditions. In general, clearing of existing vegetation within the floodplain will be done only where necessary to access and perform removal activities. In remediation areas where mature trees are present (if any), these trees will be left in place to the extent practicable; and excavation in close proximity to these trees will be performed by hand or using other methods that minimize disturbance to the root system.

During removal activities, field measurements will be made to verify that the target removal depths and elevations have been achieved for each excavation area. Due to the relatively small volume of floodplain soil remediation in Reach 6, it is anticipated that the excavated soils will be directly loaded into haul trucks for transport to the UDF or an off-site disposal facility, as applicable.

Following removal, common backfill/topsoil material will be obtained from an off-site source and will be placed and compacted to re-establish original grade. The imported backfill materials will be transported to the site by truck and will be either temporarily stockpiled at a nearby staging area before placement or, where appropriate, transported directly to the excavation areas for placement. Detailed requirements and technical specifications for the backfill and restoration will be presented in the Final RD/RA Work Plan for Reach 6.

5.6 Waste Transport, Handling, and Disposal

As discussed in Section 4, GE has performed an initial evaluation of the existing PCB data from the sediments and soils subject to removal to assess whether the removed materials can be disposed of on site at the UDF or must be sent to an approved off-site disposal facility under the Revised Final Permit's disposal criteria summarized in Section 2.5. This section provides a conceptual overview of the transportation and disposal of excavated sediments and soils, including the following: (1) hydraulic pumping of sediments to the UDF, with disposal there for sediments meeting UDF criteria; (2) non-hydraulic transport of any dewatered sediments not meeting UDF criteria from the UDF dewatering area to the selected off-site disposal facility(ies) via truck or a combination of rail and truck (rail/truck);[39] (3) transport of soil to the UDF by truck for disposal based on the UDF criteria; and (4) transport of soil via truck or rail/truck to a selected off-site disposal facility.

Additional details regarding waste transport and disposal, including potential transportation routes and procedures and disposal procedures, both for disposal at the UDF and for off-site transport, are provided in the Revised T&D Plan. As provided in the Final Revised SOW, the final methods of transport and transportation routes to the UDF and to the selected off-site disposal facilities will be identified in the Final RD/RA Work Plan or SIP for Reach 6.

5.6.1 Waste Characterization

As described in Section 3.3 of the Reach 5A Conceptual Work Plan, a subset of sediment samples collected during the Reach 5A PDI were analyzed for toxicity characteristic leaching procedure (TCLP) parameters for disposal characterization. Those 10 samples were analyzed for TCLP metals, volatile organic compounds, semivolatile organic compounds, pesticides, and herbicides. These results

[39] As discussed in the Revised T&D Plan, use of rail as a mode of transportation will necessarily include use of trucks to convey material to the railroad and/or from the railroad to the final disposal site and is therefore referred to as a rail/truck transport approach.

indicate that none of the TCLP parameters were detected above the RCRA hazardous waste toxicity characteristic regulatory levels in 40 *Code of Federal Regulations* 261.24.

Based on the waste characterization sampling conducted in Reach 5A, GE does not anticipate that concentrations of TCLP parameters in sediments in Reach 6 will be detected above regulatory levels. Nonetheless, waste characterization sampling, including analysis of sediments by the TCLP, will be conducted as part of the supplemental data collection program for Reach 6 (see Section 10 and Appendix F). In addition, once off-site disposal facilities have been selected, GE may perform additional waste characterization sampling to establish the necessary waste profiles and ensure that the material to be sent to such facilities has been adequately characterized, as required by the selected disposal facilities.

5.6.2 On-Site Transport to and Handling at the UDF

As discussed in Section 5.4.1, sediment hydraulically dredged from Woods Pond will be hydraulically conveyed to a shoreline support facility along the southern shoreline of Woods Pond, which will contain a pump station. From there, slurried sediments will be conveyed approximately 3,000 feet in a pipeline along public roads, undeveloped site areas, and site access roads, up the hill to the UDF property for dewatering. A total of approximately 80 feet of elevation change is expected along the pipeline route from the shoreline support facility to the UDF property. It is anticipated that two booster pumps will be required at approximately 1,500-foot intervals along the pipeline, and intermediate booster pump stations may be installed as needed to overcome frictional losses and maintain the required head pressure. Routing of the pipeline to avoid sudden changes in elevation will be considered during final design. Power requirements will largely depend on flow characteristics and equipment specifications but are preliminarily projected at 110 horsepower per pump, which is achievable with conventional equipment. Additional design considerations for Reach 6 hydraulic dredging and transport are discussed in Appendix E.

Once at the UDF property, dewatering and consolidation of dredged sediments will be achieved through one or more technologies; geotextile tubes, mechanical dewatering (i.e. filter press), or passive dewatering. Water generated during dewatering will be collected for treatment and discharge. As necessary, generated water may instead be intermittently transported to GE's Building 64G Groundwater Treatment Facility in the City of Pittsfield for treatment and discharge.

Sediments that meet the criteria for disposal in the UDF will be fully segregated from sediments that do not meet those criteria during dredging and transport to the UDF and once at the UDF property for dewatering. Dewatered sediments that meet on-site disposal criteria will be disposed of at the UDF after consolidation. Dewatered sediments that do not meet the criteria for disposal in the UDF (which will consist of some sediment from Valley Mill Pond) will be trucked either directly to an off-site disposal facility or, as recommended in the Revised T&D Plan, to the nearby Woods Pond

Spur rail loading area for subsequent transport by rail to an off-site disposal facility, as discussed further in Section 5.6.3.

Details related to the construction and operation of the UDF were presented in the UDF Final Design Plan and Revised *Upland Disposal Facility Operation, Monitoring, and Maintenance Plan* (UDF OMM Plan; Arcadis 2024d), which were both conditionally approved by EPA on September 12, 2024. Based on EPA's conditional approvals, GE will submit revised versions of these plans to EPA by December 20, 2024. In addition, as required by EPA's conditional approval, GE will prepare an addendum to the Revised UDF Final Design Plan that provides details regarding the conceptual design and location of the on-site dewatering and water treatment facilities at the UDF, and the Revised UDF OMM Plan will include also implementation schedules and operation, monitoring, and maintenance activities for these facilities.

Where appropriate, floodplain soils mechanically excavated from Reach 6, as well as any sediments and debris that cannot be hydraulically dredged and pumped, will be transported by truck to the UDF for unloading and dewatering. Over-the-road transport of excavated materials to the UDF is considered on-site transport and is subject to the on-site permit exemption specified in Section 121(e) of the Comprehensive Environmental Response, Compensation, and Liability Act and Paragraph 9.a of the CD for the GE Pittsfield/Housatonic River Site. Additional details regarding transport of materials to the UDF are provided in the Revised T&D Plan.

5.6.3 Off-Site Transport

In accordance with Attachment E of the Revised Final Permit and as summarized in Sections 2.5, any sediment and soil that does not meet the criteria for disposal in the UDF will be transported to an approved off-site disposal facility(ies) outside of Massachusetts. As required by Section II.B.6.a.(2) of the Revised Final Permit, a minimum of 100,000 cy of PCB-impacted sediment, riverbank soils, and/or floodplain soils for the entire ROR Remedial Action project will be sent off site to such an out-of-state facility. The actual quantity of sediment removed from portions of Reach 6 that are transported to an approved off-site disposal facility will be documented to track progress toward achieving this minimum 100,000-cy requirement.

As discussed in Section 5.6.2, sediments that do not meet the UDF disposal criteria (which, as noted, will consist of sediments removed from Valley Mill Pond) will be segregated from sediments for on-site disposal, and will be transported to and dewatered separately at the UDF property. Then, over-the-road transport of those sediments will be required to move material from the dewatering and stockpile areas at the UDF to an off-site disposal facility or, as recommended in the Revised T&D Plan, to the nearby Woods Pond Spur rail loading area for subsequent transport by rail to an off-site disposal facility.[40] Such over-the-road transport will be performed by licensed haulers in accordance with appropriate local, state, and federal regulations. Dump trailers leaving the work area will be lined to prevent spillage during transportation, manifested, and placarded in accordance with federal and state requirements using hazardous waste manifests or bills of lading. Rail transport will be performed in accordance with the applicable requirements specified in the Revised T&D Plan. As noted above, in accordance with the Final Revised SOW, the final methods of transport to the off-site disposal facilities will be described in the Final RD/RA Work Plan or SIP for Reach 6.

5.7 Habitat Impacts and Restoration

The Performance Standards for restoration of disturbed areas in the ROR, as provided in Section II.B.1.c.(1) of the Revised Permit and summarized in Section 2.1.3, require GE to: (1) implement a comprehensive program of restoration measures to address the impacts of the remediation on affected ecological resources, species, and habitats, including, but not limited to, riverbanks, riverbed, floodplain, wetland habitat, and the occurrence of threatened, endangered, or other state-listed species and their habitats; and (2) return areas disturbed by remediation activities to pre-remediation conditions (e.g., the functions, values, characteristics, vegetation, habitat, species use, and other attributes) to the extent feasible and consistent with the remediation requirements.

The Reach 6 BRA Report being submitted concurrently with this Conceptual RD/RA Work Plan (and summarized in Section 3.5) provides a detailed baseline ecological inventory and assessment of pre-remediation conditions and functions of the affected habitats within Reach 6 (as well as support areas) and will serve as the foundation for meeting the restoration Performance Standards set forth in Section II.B.1.c.(1) of the Revised Permit as applicable to this reach.

The following subsections generally describe the potential impacts of the currently anticipated remedial measures to be applied in Reach 6 on the baseline ecological conditions. A key step in the design process will be to incorporate feasible means of minimizing such impacts during all phases of the remediation process; this effort will then reduce the needs for restoration and reduce the time frames needed for recovery of ecological characteristics and functions. In accordance with the Revised Final Permit and the Final Revised SOW, GE will prepare and submit a separate Restoration/Corrective Measures Coordination Plan (Restoration/Remediation Coordination Plan) and a separate Restoration Plan for Reach 6, to be submitted concurrently with the Final RD/RA Work Plan for Reach 6. Those plans will provide details regarding the restoration of impacted habitats in Reach 6.

[40] As noted above, the Woods Pond Spur rail loading area will also be used for the unloading of material from other RUs that has arrived by rail and is destined for disposal at the UDF.

5.7.1 Impoundment Aquatic Habitat Impacts and Restoration

As described above, remediation of the Reach 6 aquatic impoundment habitat for the purposes of this document is limited to the main body of Woods Pond and the outlet channel and will include dredging of the pond bottom followed by placement of a cap (although that cap placement will not occur until several years after remediation in upstream RUs has occurred). Accordingly, this section considers the impacts, management, and restoration of the habitat in the main body of Woods Pond under this first phase of the remediation. Primary impacts related to habitat alterations resulting from those activities include the following:

- Removal of organisms present in the sediments that are subject to dredging;
- Generation of turbidity and downstream movement of suspended sediment;
- Removal of woody debris, rocks, and other structural habitat elements;
- Changed substrate type that may not support some previously resident species of invertebrates, fish, and other wildlife;
- Loss of any state-listed species present in the dredged aquatic habitat; and
- Potential spread and/or colonization by invasive species.

In general, extensive restoration measures within the dredged area of Woods Pond for the initial phase of remediation are not anticipated to be necessary. Removal of the sediments within the pond and creation of a deeper aquatic habitat is anticipated to improve the overall ecology of the pond, primarily by improving water quality and removing the extensive invasive aquatic plant species population in the Pond. Implementation of BMPs during the dredging process and restoration of affected aquatic habitat will include the following steps, which will be coordinated with the various phases of the remediation process, as will be described in the Restoration/Remediation Coordination Plan and the Restoration Plan for Reach 6:

- **Site Preparation Phase:** During this phase, GE will conduct any necessary investigations of state-listed species, such as surveys for state-listed aquatic species with Species Habitat in the Reach 6 area. It will also identify any specific habitat features to be avoided and preserved consistent with the remediation plan, as well as procedures to afford protection of important habitats during clearing activities for construction of the shoreline support facility.
- **Pre-Dredging Phase:** It is anticipated that removal of the aquatic macrophyte biomass will be needed to facilitate the dredging operation. This is particularly true for the water chestnut biomass. Water chestnut is an aggressively invasive, non-native, rooted, floating aquatic plant. It has been declared a noxious weed in Massachusetts and placed on the Massachusetts Prohibited Plant List since January 1, 2006. It is a prolific reproducer, with each plant producing 10 to 15 floating rosettes, each with a nut-like structure (water caltrop) that can

each produce 20 seeds that ripen and drop by mid-August. This prolific expansion has been documented to result in one acre of water chestnut producing enough seeds to cover 100 acres the following year. Further, seeds are viable for up to 12 years within sediments. While successive years of harvesting water chestnut has shown some success at controlling its spread, the best control has been experienced by use of herbicides, and in particular use of imazypyr (or Clearcast). This herbicide has shown effectiveness when used in June or July, prior to viable seeds being produced. Additional evaluation of pre-dredging control options for water chestnut will be provided in the Final RD/RA Work Plan or SIP for Reach 6.

- **Dredging Phase:** During the dredging phase, measures will be implemented to control the dispersal of water chestnut seeds and minimize the potential for this invasive plant to be transported from the Woods Pond area. In addition to the treatment measures described above (i.e., harvesting and/or herbicide treatments), measures such as turbidity curtains or other in-water barriers may be used to confine the dispersal of plant materials (including seeds in the sediments) during dredging.
- **Post-Dredging Interim Phase:** Following completion of dredging and prior to placement of the final caps in Reach 6, an assessment may be required to determine the status of water chestnut growth and expansion in the dredged areas. It is anticipated that the dredging itself will remove most of the water chestnut seeds from the Woods Pond sediments. Also, the deepening of the pond may minimize the potential for re-growth by exceeding the photic zone requirements for plants to readily recolonize the pond.
- **Final Capping Phase:** During this phase, GE will place cap materials (or potentially backfill in Valley Mill Pond) in accordance with design plans, including replacement of large woody debris, boulders, or other structural habitat features (if any) where doing so would not compromise the integrity of the cap and is consistent with the restoration design. It will also install specific habitat features (if any) designed to replace features used by state-listed species.

It is assumed that the aquatic habitat restoration program will not include active planting of native aquatic vegetation, which is predominantly invasive species in Reach 6 currently. Rather, it is assumed that natural recolonization of plants from upstream will occur as suitable substrate conditions develop over time. However, given the extensive presence of invasive species within the watershed, natural recolonization in many vegetated areas may include invasive species that are impracticable to control in flowing water.[41]

[41] Any post-remediation measures to address habitat impacts will be included in the Post-Construction Inspection, Monitoring, and Maintenance Plan for Reach 6.

5.7.2 Floodplain Habitat Impacts and Restoration

Based on the currently proposed remediation footprints in Reach 6 (described in Section 4.3.2), the floodplain remediation is expected to directly impact only approximately 0.009 acre of floodplain habitats, distributed among two cover types: (1) a previously disturbed area (currently a trail) and (2) a shallow marsh. The disturbed trail area (a FUSA) is situated on the eastern side of the footbridge (which crosses the outlet channel of Woods Pond). The trail is devoid of vegetative cover, with a sand and gravel surface, and extends through a small area of upland floodplain hardwood forest (which is not within the remediation footprint). The shallow marsh area is located along the southern shoreline of Woods Pond east of the proposed shoreline support facility; this area consists of several species of herbaceous emergent marsh species such as cattails and arrow arum. The restoration of these areas will be described in the Reach 6 Restoration Plan. It is currently anticipated that the restoration will consist of the actions described in the next two paragraphs.

Following remediation, the trail area will be backfilled with clean sand and gravel similar in composition to the existing and adjoining trail areas. Any areas along the trail where vegetative cover is disturbed will be restored with appropriate floodplain upland plant species, including applying an appropriate seed mixture with erosion control fabric along any affected side-slope areas.

Also following remediation, the shallow marsh area will be backfilled with appropriate organic soil material, anticipated to consist of approximately 20% organic matter and have a soil texture comparable to the existing conditions (e.g., a silty muck histosol). The post-remediation elevation of the marsh area will be carefully graded to restore the existing grades and match the grade of the adjacent undisturbed marsh areas. Subsequent to final grading, a wetland seed mix will be applied with a variety of native marsh herbaceous species. Depending on final design details and specifications, tubers of selected native marsh herbaceous species may be planted to expedite recolonization of marsh cover.

5.7.3 Habitat Impacts and Restoration of Support Areas

This section addresses the habitat conditions, impacts, and restoration of the three support areas associated with the Reach 6 remedial activities: (1) the shoreline support facility; (2) the pipeline route from this shoreline facility to the UDF; and (3) the Woods Pond Spur rail loading/unloading area.

Construction of the shoreline support facility is estimated to impact less than one acre of floodplain habitat (based on the preliminary layout of this area shown on Figure 5-3). This includes impacts to the following cover types: shallow marsh, shrub swamp, red maple swamp, red oak-sugar maple upland floodplain transition forest, and red oak upland non-floodplain forest. A thin fringe of shallow marsh vegetation occurs along the shallow side of the pond itself where the outer bulkhead of the shoreline support facility will be constructed. On the inland side of the emergent marsh fringe, there are two wooded wetland cover types within the footprint of the shoreline support facility: a small area of shrub swamp at the eastern limits of the facility footprint, and red maple swamp extending along much of the remaining limits to the northwest. In addition, floodplain upland forested conditions, in the form of red oak-sugar maple transition forest, covers most of the remainder of the facility area out to the 1 mg/kg isopleth. This upland oak-dominated forest also extends over a small upland knoll outside of the isopleth that remains in the footprint of the shoreline support facility. It is anticipated that the shoreline support facility area will be subject to restoration activities upon completion of the use of this facility (provided that alternative uses such as use for public access to Woods Pond are not agreed upon and approved by EPA for this location). This will be evaluated further and described in the Final RD/RA Work Plan or SIP for Reach 6, as well as in the Reach 6 Restoration Plan.

The proposed pipeline to convey dredged sediment from Woods Pond to the UDF will cross Woodland Road at the shoreline support facility and then extend along the western side of Woodland Road for just over 1,000 feet before turning southwest to cross into and through the UDF area. Most of the habitat along the pipeline route is mature woodland, and has been surveyed in detail and reported on in the *Second Revised Ecological Characterization and Habitat Assessment Report for the UDF Area* (AECOM 2024b). Vegetative cover types along the Woodland Road pipeline route include, in decreasing order of prevalence: northern hardwood forest; eastern white pine forest; and palustrine swamp hardwood forest. The swamp hardwood forest borders the pipeline route for only a short distance at the southern end of the pipeline route as it turns west into the UDF. To the extent practicable, the pipeline corridor will pass along the roadside of Woodland Road and thus will largely border the adjacent woodlands rather than require clearing of the forest. It is anticipated that areas disturbed for the pipeline corridor will be subject to restoration activities upon completion of the use of the pipeline system, as will be described in the Reach 6 Restoration Plan. This is likely to consist of final grading, topsoil restoration, application of an erosion control seed mixture, and, where necessary (e.g., on slopes), an erosion control netting or comparable.

Habitat impacts associated with the Woods Pond Spur rail facility, located on property owned by the Berkshire Scenic Railway Museum, are anticipated to be minor based on the long-term use of this site along the railway and the resulting habitat conditions there. Much of the area of the potential rail loading layout has been previously developed for industrial/commercial uses and currently reflects that past usage in the form of existing building pad and/or gravel surface areas. Several scattered trees exist over the southern half of the site, with secondary growth woodland developing over portions of the northern half of the site. It is anticipated that areas disturbed for the rail spur and loading/unloading operations will be subject to appropriate restoration activities upon final completion of the use of the site, taking into account future use of the area by the Berkshire Scenic Railway Museum. This is likely to consist of final grading, topsoil restoration, and applying an erosion control seed mixture.

5.7.4 *Rare Species Habitat Impacts and Restoration*

As described in Section 3.5.3, MNHESP has mapped portions of Reach 6 as Species Habitat for six state-listed rare species, including two plants, one invertebrate, and three birds. Two other state-listed species (the northern long-eared bat, which is also federally listed, and the tricolored bat, which has been proposed for federal listing) could also utilize the aquatic habitats. These two bat species were not included in MNHESP Species Habitat mapping but are indicated in the IPaC results for the Reach 6 area). Specific occurrences of these rare species within preliminary remediation and support areas have not been determined.[42]

As described in GE's *Revised Restoration Performance Objectives and Evaluation Criteria Report* (Arcadis and AECOM 2024), which was conditionally approved by EPA on July 15, 2024, the restoration evaluation criteria for rare species impacts are that the impacted habitat for those species has been restored to pre-remediation conditions or other conditions that would support such species or that mitigation for such impacts has been provided and that the applicable requirements of the Massachusetts Endangered Species Act (MESA) for state-listed species have been met. Based on current information, it does not appear likely that the remediation and support activities in Reach 6 will have any adverse effects on state-listed rare species such that a mitigation plan for such species under the MESA regulations will be necessary. However, a final evaluation and determination on this issue will be included in the Final RD/RA Work Plan or the Restoration Plan for Reach 6.

5.8 Property Access

Access to certain properties in Reach 6 will be required to facilitate site preparation and remedial construction and restoration activities. Those activities include performing remedial excavation and backfilling activities on private and public properties, constructing support areas, and constructing a pipeline to hydraulically transport dredged material to the UDF. As such, signed property owner access agreements will be needed.

Subsequent to final design and prior to the start of any site work, GE will develop a database of properties that will be affected by remediation and support activities. Property owner contact information, obtained from review of tax mapping and property owner records for the Towns of Lee

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[42]None of the support areas is located within MNHESP-designated priority habitat for state-listed species. The forested habitat, which comprises part of the shoreline support facility, has a limited potential of providing some habitat functions for the two bat species cited above, which inhabit dead trees and trees with loose bark in forested areas for summer roosting sites and small nursery/maternity colonies. However, according to the most recent available mapping (available at: https://mass-eoeea.maps.arcgis.com/apps/Viewer/index.html?appid=de59364ebbb348a9b0de55f6febdfd52), there are no documented hibernacula for these species within seven miles of the site. Further, no known maternity roosts are mapped on or near the support facility site, no observations of these species were made during the Reach 6 field investigations, and no documented observations have been reported on or near to the site. In these circumstances, specific measures to address potential impacts on these bat species are not considered necessary or warranted.

and Lenox, will be included in the database. GE will then contact the private and public floodplain property owners along Reach 6 as needed to notify them of the anticipated work and request that they provide a signed Consent for Access form (based on the form included in the CD) allowing GE and the regulatory agencies, including EPA, access permission to perform and oversee the work.

GE will track the signed access agreements received in the database and will work with property owners to obtain necessary access agreements. In the event that GE is unable to obtain a signed Consent for Access form from a property owner after making several attempts to do so, GE will notify EPA.

5.9 Consideration of Cultural Resources

As discussed in Section 3.6, GE's Revised Phase IA CRA Report stated that the next step in the cultural resource evaluation process is to conduct a Phase IB CRS of portions of Reach 6 that will be affected by remediation activities or support areas in order to evaluate whether those activities will impact any potentially significant cultural resources. The proposed CRS for Reach 6 will be described in GE's Phase IB CRS Work Plan for Reach 6, which will be submitted on November 15, 2024.

6 Applicable or Relevant and Appropriate Requirements

In addition to establishing Performance Standards for the remediation to be conducted in Reach 6 (summarized in Section 2), the Revised Final Permit, in Attachment C, identifies the ARARs for the ROR Remedial Action. The ARARs that are pertinent to and were considered for the remedial design in Reach 6, including support activities, are presented in Table 6-1 (in the same format as Attachment C to the Revised Final Permit). That table also specifies the actions to be taken in the Reach 6 remediation to comply with these ARARs, as well as ARARs that have been waived by EPA.

Section II.E of the Revised Final Permit requires that the technical RD/RA submittals for response actions for the ROR specify additional ARARs not listed in Attachment C, if any, for such response actions. As shown in Table 6-1, one additional guidance document that was not listed in Attachment C—namely, EPA's Subaqueous Capping Guidance—has been identified as a document "to be considered" in the Reach 6 remediation. Pursuant to Section II.B.2.i of the Revised Final Permit and as described in Section 5.2, this guidance was considered during conceptual design of the engineered cap.[43]

[43] In addition to meeting the ARARs, the construction of a new rail spur on property adjacent to Woods Pond will be subject to certain laws and regulations relating specifically to rail spur construction. These will be identified once GE's proposal to construct the Woods Pond Rail Spur has been approved and the design and details relating to that facility are further developed. This will be addressed in a later submittal.

7 Quality-of-Life Considerations

Section II.H.11 of the Revised Final Permit required GE to prepare a QOL Compliance Plan that discusses how several topics will be addressed during remediation, including the following: (1) potential air quality, noise, odor, and light impacts; (2) potential impacts on recreational activities; (3) road use, including restrictions on transportation of waste material through certain residential areas[44] and methods to minimize and mitigate transportation-related impacts to neighborhoods, infrastructure, and the general public; (4) coordination with local governments and affected residents/landowners at or near areas impacted by remediation; and (5) community health and safety. GE prepared a QOL Compliance Plan that was submitted to EPA on December 20, 2023 (Anchor QEA 2023c). EPA conditionally approved that plan in a letter dated July 22, 2024, and required GE to submit a revision that addresses several conditions set forth in that letter. A Revised QOL Compliance Plan will be submitted by November 22, 2024.

The QOL standards presented in the QOL Compliance Plan were established to guide remediation efforts toward an efficient and successful completion while minimizing and mitigating the potential impacts to the community to the extent practicable. Specifically, QOL standards for air quality, noise, odor, and lighting were developed for the ROR, as required by Section II.H.11.a of the Revised Final Permit. Those standards provided in the QOL Compliance Plan will be modified as required by EPA's conditional approval and described in the forthcoming Revised QOL Compliance Plan.

The Reach 6 remediation described in this Conceptual RD/RA Work Plan will consist predominantly of dredging of sediments in Woods Pond, the outlet channel, and Valley Mill Pond, as well as soil removal in limited portions of the floodplain immediately south of Woods Pond (see Section 4). The nearest receptors that may be subject to QOL impacts during construction are the residence along the western shore of Woods Pond (on Housatonic Street), residences and businesses located on Willow Creek Road, and businesses located near Woods Pond Dam on Valley Street and Crystal Street. Specific details regarding potential QOL impacts resulting from the remediation in Reach 6, the approach to monitoring those impacts (including monitoring locations and frequencies), and methods to minimize or mitigate such impacts (consistent with the methods described in the forthcoming Revised QOL Compliance Plan) will be provided in the Final RD/RA Work Plan and/or SIP for Reach 6. The Final RD/RA Work Plan and/or SIP will also include any RU-specific provisions needed to mitigate exceptions to the QOL standards. For example, although the QOL Compliance Plan may list specific work hours for active remediation, it is anticipated that hydraulic dredging and pumping to be performed in Reach 6 may occur during overnight hours to maintain the overall project schedule. It is also anticipated that an adaptive management approach will be implemented with respect to compliance with these QOL standards, such that modifications to control measures

[44] Section II.H.11.c of the Revised Final Permit identifies specific roads where restrictions on transport of waste material through residential areas are required.

and remedial construction activities may be identified as the project proceeds. Details regarding the adaptive management approach to be applied during the ROR Remedial Action were described in GE's *Revised Adaptive Management Plan* submitted to EPA on June 24, 2024 (Anchor QEA 2024b).

The Reach 6 remediation activities will also likely impact recreational use of the Housatonic River and floodplain areas during implementation. For example, use of the canoe launch located adjacent to footbridge at the northern end of the outlet channel will be interrupted by the dredging operations. During the remedial construction, restricted areas will be marked with appropriate signs and/or fencing. In addition, GE will provide notice of affected recreational areas and uses through a community notification program. Also, as will be noted in the QOL Compliance Plan, GE will work cooperatively with the Town of Lee and the Commonwealth of Massachusetts to facilitate their enhancement of recreational activities on properties where remediation or remediation support activities occur in Reach 6.

8 Sustainability Considerations

8.1 Overview

Section II.H.14 of the Revised Final Permit required GE to prepare a sustainability and climate adaptation plan that includes measures to ensure that the remediation activities to be conducted in the ROR are designed and constructed to be resilient to potential impacts from climate change and to incorporate, where practicable and appropriate, methods to minimize GHG emissions. GE's *Sustainability and Climate Adaptation Plan* (SCAP; Anchor QEA 2022d) was submitted to EPA on September 16, 2022, and conditionally approved by EPA on January 27, 2023. EPA's conditional approval letter on the SCAP directed GE to provide design details and measures to be implemented to provide climate resiliency and sustainability in a specific section in the Conceptual and Final RD/RA Work Plans for each RU. Consistent with that directive, this section contains a preliminary vulnerability assessment performed consistent with EPA's 2019 *Climate Resilience Technical Fact Sheet: Contaminated Sediment Sites* (EPA 2019) and a conceptual GHG emissions evaluation. At this conceptual stage of the Reach 6 design, this section provides a summary of the tools that will be used to estimate GHG emissions during final design and a summary of the measures that may be incorporated into the final design to minimize GHG emissions.

8.2 Vulnerability Assessment

A preliminary vulnerability assessment was conducted to define and summarize potential climate change vulnerabilities of the Reach 6 remediation and identify potential resiliency measures to avoid or mitigate such impacts. Results of this assessment are described in the following subsections and summarized in Tables 8-1 and 8-2. This preliminary assessment will be updated, as necessary, during final design as additional details related to remedy implementation are better understood.

As described in the above-referenced EPA Fact Sheet, the following steps were performed as part of the vulnerability assessment: (1) an exposure assessment to identify particular hazards of concern and characterize exposure to those hazards caused by climate change; (2) a sensitivity assessment to evaluate the likelihood for those hazards to reduce the remedy's effectiveness; (3) identification of potential resiliency measures to mitigate high-priority vulnerabilities; and (4) a review of adaptive capacity to adjust to climate variability and extremes caused by climate change. Each of these elements is described further in the following subsections.

Table 8-1 was developed consistent with the EPA's Fact Sheet to summarize potential vulnerabilities of the remedy and remedial construction to extreme weather and to identify potential direct effects, including physical damage, water damage, power interruption, and reduced access.

Table 8-1
Potential Vulnerabilities Associated with Potential Climate Change Impacts

Reach 6 Remedy Components		Potential Vulnerabilities Due to Extreme Weather: Physical Damage[1]	Water Damage[2]	Power Interruption[3]	Reduced Access[4]
Submerged Components	Exposed dredge slopes		●		
Site Operations and Infrastructure	Construction equipment and vehicles	●	●		●
	Hydraulic dredging/transport pumps and pipeline	●	●		●
	Sediment dewatering and water treatment equipment	●			
	Fuel storage units	●	●		●
	Monitoring equipment	●		●	
	Fencing and signs for controlling access or use	●			●
	Field office trailers and other support structures	●	●	●	●
	Work support and staging areas	●	●	●	●

Notes:

1. Physical damage refers to potential harm or destruction that can occur to physical structures or infrastructure due to extreme weather events or hazards (e.g., damage to equipment, buildings, roads, bridges, or utilities).
2. Water damage refers to potential impacts that can be caused by water-related incidents due to extreme weather events (e.g., damage resulting from flooding, high river flows, heavy rainfall, increased stormwater runoff, or winter storms).
3. Power interruption refers to potential impacts that can be caused due to the loss or disruption of electrical power supply resulting from extreme weather events.
4. Reduced access refers to the limitations or restrictions on the ability to reach or use certain areas, resources, or services due to extreme weather events.

Table 8-2
Potential Resiliency Measures to Address High-Priority Vulnerabilities

Potential Points of System Vulnerability		Potential System Disruption Due to Extreme Weather				Potential Resiliency Measures for High-Priority Vulnerabilities
		Physical Damage	Water Damage	Power Interruption	Reduced Access	
Submerged Components	Exposed dredge slopes		●			• Design of stable dredge cuts should consider potential impacts associated with these forces (to be evaluated during final design).
Site Operations and Infrastructure	Construction equipment and vehicles	●	●		◐	• Develop contingency plans, monitor weather forecasts, and relocate equipment to higher ground when there is a potential for flooding (to be included in specifications developed during final design). • Inspect equipment after extreme weather events and repair as necessary.
	Hydraulic dredging/ transport pumps and pipeline	●	●		●	• Locate pumps and piping on stable slopes and outside of areas susceptible to potential damage from scour, wind damage, landslides, or fallen trees resulting from extreme events (to be evaluated during final design). • Inspect pumps and pipeline after extreme weather events and repair as necessary.
	Sediment dewatering and water treatment equipment	●				• Sediment dewatering and water treatment equipment will be located at the UDF, which is outside the 100-year floodplain. • Secure equipment/materials during storm events. • Use wind-resistant covers on sediment stockpiles (to be evaluated during final design). • Inspect equipment and support areas after extreme weather events and repair as necessary.

Potential Points of System Vulnerability		Potential System Disruption Due to Extreme Weather: Physical Damage	Water Damage	Power Interruption	Reduced Access	Potential Resiliency Measures for High-Priority Vulnerabilities
Site Operations and Infrastructure	Fuel storage units	●	●		◐	• Locate outside flood-prone areas, construct wind-resistant housing or anchors, and protect with secondary containment (to be evaluated during final design). • Inspect after extreme weather events and repair as necessary.
	Monitoring equipment	●		○		• Monitor weather forecasts and relocate vulnerable equipment to shelter when extreme storms are forecasted (to be evaluated during final design).
	Fencing and signs for controlling access or use	○			○	• Inspect after extreme weather events and repair as necessary.
	Field office trailers and other support structures	●	◐	○	○	• Use wind-resistant anchors, monitor weather forecasts, and evacuate vulnerable shelters when extreme wind events are forecasted (to be evaluated during final design).
	Work support and staging areas	◐	◐	○	●	• Inspect after extreme weather events and repair as necessary.

Notes:

● = High priority

◐ = Medium priority

○ = Low priority

1. As described in Section 5.1 of the Final Revised SOW, a Post-Construction Inspection, Monitoring, and Maintenance Plan will be submitted concurrently with the Final RD/RA Work Plan for Reach 6.

8.2.1 Exposure Assessment

An exposure assessment was performed to identify potential hazards of concern to the remedy components due to extreme weather events. The identified hazards were then used as part of the sensitivity analysis to assess the likelihood of such hazards (Section 8.2.2) and to identify potential resiliency measures to address the hazards (Section 8.2.3).

As described in Section 4, the Reach 6 remedy components that were developed to meet the Performance Standards include removal of sediments from Woods Pond, the outlet channel, and Valley Mill Pond; excavation and backfill of floodplain soils; and habitat restoration. The exposure assessment related to impacts from extreme weather events included a review of potential hazards to the submerged and upland components of the remedy and to site infrastructure critical to remedy construction, monitoring, and operation. Potential hazards that may arise to the remedy or during remedy construction due to extreme weather events include the following:

- Erosion of dredge cuts that are exposed for several years after the Woods Pond dredging and prior to placement of the engineered cap from high-flow or flooding events;
- Damage to in-progress remedial construction from high winds, flooding, or high river flows;
- Damage to support facilities from high winds and flooding;
- Damage to hydraulic dredging pipelines from downed trees or if located along slopes susceptible scour or instability caused by stormwater runoff;
- Remedial construction delays or unsafe conditions due to unseasonably cold temperatures, high river flows, or ice/snow storms;
- Reduced access to support areas, equipment, or services due to flooding or high winds that down trees; and
- Potential resuspension and transport of sediments during remedial construction due to high river flows.

8.2.2 Sensitivity Assessment

The sensitivity assessment included an evaluation of the likelihood for the climate change hazards of concern to reduce the remedy's effectiveness. While some of the general effects of climate change are universal, regions may experience different levels of effects based on geography and land development pattern. The Commonwealth of Massachusetts has developed the *Massachusetts Climate Change Projections – Statewide and for Major Drainage Basins: Temperature, Precipitation, and Sea Level Rise Projections* (NE CASC 2018). This document indicates that, in Massachusetts, winters may become dominated by rain instead of snow, which would decrease spring-generated snow melts. Rain patterns may change with the result of increases in rain intensity and potential longer periods of drought. If increased rain intensity or more frequent intense storms occur, the likelihood of the potential hazards identified in Section 8.1.2 would increase.

Sensitivity to extreme weather events will differ during construction and after construction. The construction-related hazards identified in Section 8.2.1 have a potential to disrupt or delay remedy implementation for a period of time during any construction season if an extreme weather event occurs. During construction, extreme weather events could cause physical damage to the following:

- Submerged dredge cuts;
- Hydraulic dredging sediment transport piping to the UDF;
- Work support areas;
- Exposed soils or backfill in floodplain remediation areas before adequate soil stabilization is established;
- Construction equipment working in the Reach 6 impoundment or in the floodplain;
- Fuel storage units, if staged within the flood zone;
- Monitoring equipment; and/or
- Power to site.

Post-construction hazards to the remedy may also exist due to extreme weather events. Extreme weather events are typically evaluated during remedial design regardless of whether climate change impacts are expected to occur. With the potential for increased severity or frequency of extreme weather events, the remedial design for Reach 6 includes sensitivity analysis for certain aspects of the remedy to determine if more resilient measures should be incorporated into the final remedial design. The sensitivity analysis described below was performed only in relation to the sediment removal from Reach 6, not the engineered cap.

If remedy components are not designed to be resistant to the potential effects of climate change, indirect impacts that could result include, but are not limited to, the following:

- Contamination of downstream areas due to erosion or loss of engineered cap material;
- Downstream transport of sediment or soil to river or floodplain areas that were previously uncontaminated or remediated; and/or
- Unexpected and additional costs for performing additional dredging or excavation.

8.2.3 Resiliency Measures

In accordance with EPA's Fact Sheet, potential resiliency measures were developed to address the high-priority vulnerabilities identified in Table 8-1. Table 8-2 lists the vulnerabilities identified in

Table 8-1 and provides a priority designation (i.e., low, medium, or high priority) for each identified vulnerability and potential direct impact. Table 8-2 also lists the potential resiliency measures that have been identified for each vulnerability at this stage of the conceptual design. Additional design evaluation and assessment will be conducted during final design; this may include identification of additional vulnerabilities and/or resiliency measures or modifications to those listed in Tables 8-1 and 8-2. Resiliency measures evaluated during the conceptual design phase to address certain vulnerabilities are summarized in the following paragraphs.

As discussed in Section 3.5, river flow conditions can be variable, and stage heights can increase rapidly from runoff from large storms. This is somewhat less of a concern in Reach 6 because water level is largely controlled by Woods Pond Dam. Nonetheless, this was identified as a factor in the review of potential in-river implementation options for Reach 6. As described in Section 5.4.1, hydraulic dredging with direct pumping and treatment at the UDF is the selected primary method for removal and transport of sediments from Reach 6.

Additional potential resiliency measures that will be incorporated into the final design, as appropriate, are listed as follows (and summarized in Table 8-2):

- Contingency plans will be developed to identify response actions associated with potential extreme weather events (e.g., monitoring weather forecasts and relocating equipment and personnel when extreme weather events are forecasted).
- Where possible, sediment processing areas will be located outside the 100-year floodplain, and flood protection measures will be developed for support areas within the floodplain based on the local topography and accessible land.
- Where possible, the hydraulic piping will be located outside the 100-year floodplain and away from trees and other structures that could damage pipelines during extreme events. The piping will be inspected after extreme weather events and repaired as necessary to minimize project delays.
- Fuel storage units will be located outside flood-prone areas, staged in wind-resistant housing or with anchors, and protected with secondary containment.

8.2.4 Adaptive Capacity

Section II.F of the Revised Final Permit requires that an adaptive management approach be incorporated into the design and implementation of the Remedial Action to adapt requirements or activities based on new information and make changes as needed to achieve the expected benefits of the project. This approach is described in GE's *Revised Adaptive Management Plan* (Anchor QEA 2024b). Specifically, that plan describes the adaptive management process that will be implemented to adapt and optimize project activities (i.e., design and construction) to account for lessons learned from work conducted at early stages of the project, new information, and changing conditions. That process will be followed for the Reach 6 remediation.

8.3 Greenhouse Gas Emissions Evaluation

GHGs are gases that trap heat in the atmosphere. The most prominent GHGs contributing to this process are carbon dioxide (CO_2), methane, and nitrous oxide. CO_2 is the primary GHG emitted through human activities (comprising approximately 80% of GHG emissions). However, the carbon dioxide equivalent (CO_2e) consists of the calculated total GHG emissions taking into account the global warming potential (GWP) of each of these components. GWP is the heat absorbed by any GHG in the atmosphere as a multiple of the heat that would be absorbed by the same mass of CO_2. The use of construction equipment and materials are anticipated to generate GHG emissions during the ROR Remedial Action. The potential sources of GHG emissions anticipated during construction and operations will include direct sources (e.g., on- and off-road vehicles and fuel combustion from equipment operation), indirect sources (electricity use), and upstream contributions (e.g., production of materials used for remedial process).

Because many of the details associated with the Reach 6 remedy have yet to be determined, a GHG assessment has not been provided in this Conceptual RD/RA Work Plan. That assessment will be provided in the Final RD/RA Work Plan for Reach 6. Table 8-3 identifies the potential sources of GHG by category and the tools that will be used to estimate GHG for each source as part of final design. Those tools are described in the paragraph following Table 8-3.

Table 8-3
Emission Sources and Quantification Tools

Emission Type	Emission Sources	Evaluation Tools
Direct	Vehicle/equipment fuel combustion	SEFA
	Vegetation decay	WARM
	Tree sequestration changes	i-Tree
Indirect	Electricity use	SEFA
Upstream	Material production/use	SEFA

Notes:
i-Tree: https://planting.itreetools.org/
SEFA: https://www.clu-in.org/greenremediation/SEFA/
WARM: https://www.epa.gov/warm

Spreadsheets for Environmental Footprint Analysis (SEFA) is a Microsoft Excel-based tool developed by EPA and is included in EPA's Clean-Up Information (CLU-IN) website. This tool has been designed to help analyze the environmental footprint of a site cleanup project including GHG emissions. Although SEFA addresses fuel combustion, electricity use, and upstream emissions, it does not account for vegetation decay and carbon sequestration. Vegetation decay can be estimated using emission factors provided in EPA's Waste Reduction Model (WARM), which provides emission factors for composting of material including yard trimmings (which would be a surrogate for mulched trees). For tree sequestration changes, the U.S. Forest Service i-Tree Planting tool will be used. The i-Tree Planting tool quantifies carbon sequestration from tree planting over a project lifetime using species-based biomass equations.

As described in the SCAP, methods to minimize GHG emissions will be incorporated into the design and construction process to the extent practicable. These measures will be evaluated by GHG category, including measures to address direct emissions, indirect emissions, and upstream emissions. Table 8-4 provides minimization measures and details regarding how those measures would reduce GHG emissions. Based on the planned minimization activities, a range of anticipated reductions in the potential CO2e produced during Reach 6 construction activities will be developed and included in the final design.

Sustainable BMPs will be evaluated as part of final design and incorporated into the strategy for continued operation of the remedial activities to minimize GHGs. A summary of the sustainable BMPs will be provided as part of the final design and maintenance of those sustainable BMPs, and GHG mitigation measures will be incorporated into the Post-Construction Inspection, Monitoring, and Maintenance Plan for Reach 6, to be submitted concurrently with the Final RD/RA Work Plan for Reach 6.

Table 8-4
Potential Greenhouse Gas Mitigation Measures

Measure	Reduction	Emission Type		
		Direct	Indirect	Upstream
Incorporate vehicle and equipment BMPs	Measures including use of fuel-efficient on-road vehicles, use of bio-fuels, idling restrictions, use of electric or hybrid vehicles as that market continues to grow, and route planning would reduce fuel use and thereby reduce overall GHG emissions associated with fuel combustion and fuel transport.	✓		✓
Use local sources of construction material where practicable	Use of local sources of construction material would reduce emissions compared to those of longer-distance truck transport to the site.	✓		✓
Employ local staff	Use of local staff to perform site work would limit long-distance commuting to the site.	✓		✓
Use of local suppliers where practicable	Use of local suppliers for equipment and materials to perform site work would limit long-distance delivery routes to the site.	✓		✓

Measure	Reduction	Emission Type		
		Direct	Indirect	Upstream
Use low-impact development methods in temporary construction areas where practicable	Use of low-impact development methods, where practicable, would reduce disturbance to existing habitat and reduce the extent of restoration needed after construction. Such methods include prioritizing temporary construction on previously disturbed areas.	✓		✓
Renewable energy use	Deployment of solar panels or other renewable energy sources to power office trailers or stationary equipment would reduce the need for fuel combustion.		✓	
Electricity use BMPs	BMPs for electricity use, such as use of motion detectors, would reduce electrical use for the project and thereby reduce GHG emissions from electricity generation.		✓	
On-site reuse of material where suitable	Reuse of on-site material would limit the need for transport and disposal of such material and, as such, decrease GHG emissions associated with fuel combustion and processing of virgin material. For example, some debris could be decontaminated and beneficially reused.	✓	✓	✓
Use of recycled material where suitable	Recycled or reused material, such as steel and concrete from recycled content, would reduce life-cycle emissions of GHG compared to use of virgin material.			✓

9 Summary and Preliminary Evaluation of River Water Withdrawals and Uses

9.1 Overview

As described in Section 2.6, the Revised Final Permit establishes a Performance Standard requiring GE to minimize/mitigate impacts during implementation of the Remedial Action to withdrawals and/or uses of water from the ROR by any entity. Section II.H.22 of the Revised Final Permit required GE to prepare a plan that provides details regarding achievement of that Performance Standard and associated requirements of the Revised Final Permit. GE's *Revised Water Withdrawal and Uses Plan* (WWUP; Anchor QEA 2023d) was submitted to EPA on April 3, 2023, and it was approved by EPA on May 10, 2023.

The approved WWUP presented a description of pre-design activities to identify industrial, commercial, and private river water withdrawals and uses from the portions of ROR that will be subject to remediation activities (i.e., Reaches 5 through 8) and gather information for each identified river water user within each RU.[45] That plan also provided a description of the evaluations to be performed to assess potential impacts to identified river water withdrawals and uses during remedial activities and how the information will be used during the design process to minimize/mitigate those potential impacts. It also described the notifications to be made to potentially affected water users during remedial design and Remedial Action activities. GE conducted efforts to identify river water withdrawals and uses in Reach 6. The sections below provide a summary of those efforts and a preliminary evaluation of potential impacts on river water users.

9.2 Summary of Outreach Activities and Information Obtained

This section presents a summary of the water withdrawal and uses outreach activities performed for Reach 6 in accordance with the WWUP and associated findings in that reach. As provided in the WWUP, outreach activities included the following:

- Review of available online records;
- Outreach to Massachusetts Department of Environmental Protection (MassDEP);
- Outreach to local municipalities;
- Outreach to industrial facilities and agricultural operations along the river;
- Outreach to private property owners/lessees;

[45] As described in the WWUP, river water uses are considered activities in which water is physically withdrawn from or discharged to the river for residential, agricultural, industrial, or other uses. They do not include uses of the river for recreational purposes (e.g., boating, swimming, and fishing).

- Identification of permitted discharges to the river (excluding stormwater); and
- Visual observations during the field PDI activities.

9.2.1 Review of Available Online Records

As part of the initial step to identify potential river water users, GE reviewed available online records related to public water supplies, including those maintained by the Commonwealth of Massachusetts Bureau of Geographic Information (MassGIS). Based on a review of those records, no public or private entity was found that withdraws water for potable use along Reach 6. This finding is consistent with 314 Code of Massachusetts Regulations (CMR) 4.06(6)(b), which designates the Housatonic River as a Class B water.[46]

9.2.2 Outreach to MassDEP

GE also contacted MassDEP and requested any available registration and permit documents and information for known uses of water withdrawn from the Housatonic River within Reach 6. As noted in the WWUP, in accordance with 310 CMR 36.00, any person withdrawing an average daily volume of more than 100,000 gallons of water from a surface or groundwater source within Massachusetts must file with the registration program (for uses that began before 1988) or obtain a permit (for new users after 1988), except for some uses that are exempt under 310 CMR 36.05. Based on MassDEP's review, there are no identified water withdrawals within Reach 6.

9.2.3 Outreach to Local Municipalities

As part of the outreach process GE also contacted the Towns of Lee and Lenox and the Berkshire Regional Planning Commission to: (1) gather information regarding any known industrial, commercial, or private withdrawals and users of river water; (2) confirm that no known public water suppliers draw water directly from the Housatonic River; and (3) request any available information on known groundwater extractions and uses within 500 feet of the river. The Town of Lenox referred GE to the Berkshire Regional Planning Commission for the information. The Berkshire Regional Planning Commission notified GE that the information requested would be maintained by MassDEP and the respective municipalities. As of early October 2024, GE is continuing to work with the Town of Lee to obtain the requested Reach 6-specific information for that town. During initial general discussions with the Town of Lee regarding the Housatonic River, the town indicated that some commercial activities may possibly draw from the river in case of fire, but that no one is using the river as a water source and the town has a fire department.

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[46] In accordance with 314 CMR 4.05(3)(b), Class B waters are designated as a habitat for fish, other aquatic life, and wildlife and for primary and secondary contact recreation. Class B waters are suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. They are not designated as suitable as a source of potable water unless they are designated for public water supply as a "Treated Water Supply" under 314 CMR 4.06(1)(d)6 and (6)(b). The Housatonic River does not have the latter designation.

9.2.4 Outreach to Industrial Facilities/Agricultural Operations and Private Property Owners/Lessees Along the River

GE also contacted industrial operations and a private property owner along Reach 6. This initially involved reviewing the MassGIS database records, mapping the parcels located near the Housatonic River in Reach 6, and then identifying parcels that are located within 500 feet of the river. These parcels were then filtered by land use type (e.g., residential, industrial/commercial, and agricultural). The information gathered during this step, as well as information gathered through review of property and aerial mapping and as part of EPA's HHRA, was used to identify industrial/agricultural facilities and private property owners/lessees that needed to be contacted as part of the outreach process.

Five non-GE-owned parcels located within 500 feet of the Housatonic River in Reach 6 (in addition to two parcels owned by GE) are designated as having industrial use. These parcels are 9-10-0 in the Town of Lenox and 150/002.0-0000-0008.0, 150/002.0-0000-0004.B, 150/002.0-0000-0012.0, and 150/002.0-0000-0004.0 in the Town of Lee (shown on Figure 9-1). Survey forms requesting information regarding existing or planned water withdrawal, existing or planned groundwater withdrawal, and permitted discharge details were mailed to the owners of these parcels. As of early October 2024, four of the five survey forms have been completed and returned. The owners of parcels 9-10-0, 150/002.0-0000-0008.0, and 150/002.0-0000-0004.B indicated there are no existing or planned river water or groundwater withdrawals and no permitted discharges to the Housatonic River associated with these parcels. The owner of parcel 150/002.0-0000-0004.0 indicated that its operation included water withdrawal from the river for dust suppression and aggregate washing, groundwater well withdrawal, and stormwater discharge through two outfalls permitted through EPA's 2021 Multi-Sector General Permit. GE is continuing to work with the property owner to collect more detailed information associated with each use/activity to support data evaluation and assessment of mitigation measures described in Section 9.3.

In addition to the Reach 6 industrial-use parcel noted above, the owner of Town of Lee parcel 150/002.0-0000-0001.D, an industrial-use parcel located immediately downstream of the dam in the upper reach of Reach 7A (shown on Figure 9-1), indicated that it used two groundwater wells on site.[47] One well, identified as a domestic well and shown on Figure 9-1, is included in the MassDEP well database for this parcel (Mass EOEEA 2024). As of early October 2024, GE is continuing to work

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[47] In addition to the properties discussed in the prior paragraph, the owners of Town of Lee parcels 150/002.0-0000-0001.D, 150/002.0-0000-0002.0, 150/002.0-0000-0003.0, 150/002.0-0000-0006.B, 150/002.0-0000-0006.A, and 150/002.0-0000-0006.0, as well as Town of Lenox parcels 8-99-0 and 4-65-0, were sent survey forms as part of the Reach 7A outreach. These parcels are located in Reach 7A in close proximity to Woods Pond Dam and Valley Mill Pond (as shown on Figure 9-1) and are designated as having industrial use. As of early October 2024, six of the eight survey forms have been completed and returned. Other than for parcel 150/002.0-0000-0001.D, where two groundwater wells were noted to be on site, responding owners indicated that there are no existing or planned river water or groundwater withdrawals and no permitted discharges to the Housatonic River associated with their parcels.

with the property owner to collect more detailed information associated with each use/activity to support data evaluation and assessment of mitigation measures described in Section 9.3.

A survey form requesting information regarding existing or planned river water or groundwater withdrawals was also sent to one other private property owner/lessee along Reach 6 as part of the outreach for parcels that appeared to have developed land (e.g., properties with structures, dwellings, gardens, or ponds) with some reasonable chance of river water use. This parcel was Town of Lenox parcel 9-17-0 (shown on Figure 9-1). The survey form was completed and returned, indicating that there are no existing or planned river water or groundwater withdrawals on that property.

9.2.5 Identification of Permitted Discharges to the River (Excluding Stormwater)

In addition to the above activities, GE reviewed available online records for active National Pollutant Discharge Elimination System (NPDES) permit holders within Reach 6. The Town of Lenox WWTP is the only active permit holder in Reach 6 based on the available records. The location of the discharge is at the downstream end of Reach 6 along the western shore of the outlet channel upstream of Woods Pond Dam (shown on Figure 9-1).

9.2.6 Visual Observations During the Field PDI Activities

Lastly, to supplement the efforts described above, GE reviewed information and observations gathered during PDI field activities performed within Reach 6 to determine whether there were indications that any property owners/lessees adjacent to the river are withdrawing river water (e.g., pipes extending into the river, intake structures, or pumps located along the shoreline). Specifically, visual observations along the shoreline and other information (i.e., photographs) gathered as part of the Reach 6 PDI field reconnaissance, conducted to document the presence and locations of shoreline structures and utilities along the reach (as described in Section 3.8), were reviewed to identify any potential water withdrawals. Based on results of that review, there were no indications of river water use, except the Town of Lenox WWTP outfall.

9.3 Evaluation of Potential Impacts on River Water Uses

Based on results of the outreach activities conducted to date (described in Section 9.2), two instances of water/groundwater withdrawals within 500 feet were noted for Reach 6. Specifically, as noted, the owner of Town of Lee parcel 150/002.0-0000-0004.0 indicated that its operation includes water withdrawal from the river for dust suppression and aggregate washing and also includes water withdrawal from a groundwater well. Also, the owner of Town of Lee parcel 150/002.0-0000-0001.D, an industrial-use parcel located immediately downstream of Woods Pond Dam in the upper portion of Reach 7A, indicated that it used two groundwater wells on site. As part of the supplemental data collection program, GE will obtain details from these property owners on the frequency and volume of river water and groundwater use and determine whether the sediment remediation work may affect those uses. Based on the outcome of that outreach, further evaluation will be conducted during final design to determine whether temporary suspension of the water withdrawals is possible, if an alternate water source could be used, or if operations BMPs or engineering controls could be implemented during the remediation work to eliminate potential impacts to the water use.

The Town of Lenox WWTP is the only permitted discharge identified in Reach 6, with the discharge point located in the outlet channel just upstream of Woods Pond Dam. The outlet channel will require remediation to achieve the Performance Standards (see Section 4.2.1). The WWTP is permitted to discharge 1.19 million gallons per day, but maximum daily flows have been as high as 2.76 million gallons per day during the last five years, as identified by the WWTP in its annual NPDES monitoring data summary report (EPA 2024). The final design will evaluate whether the WWTP discharge would need to be temporarily diverted during remediation activities in that area. As part of the supplemental data collection program, GE will meet with the Town of Lenox to discuss details associated with the WWTP discharge and potential impacts and mitigative measures to be performed during remediation. During that outreach, GE will determine whether the design for the WWTP discharge specifies the use of any scour protection at the discharge point. Based on the outcome of that outreach, further evaluation will be conducted during final design to determine whether the engineered cap erosion protection layer to be placed near the discharge will require larger stone or an alternate erosion protection design (e.g., concrete matting) to prevent scour from the discharge.

The WWUP also requires that the Conceptual RD/RA Work Plan for each RU in the ROR includes an evaluation to determine whether water withdrawals or uses downstream of that RU could be affected by the remediation in that RU. GE is currently conducting an evaluation of whether the Reach 6 remediation will affect water withdrawals or uses downstream of that reach. That evaluation will be completed during the final design of the Reach 6 remediation.[48] In any case, water quality monitoring will be conducted during Reach 5A remediation to determine (in part) whether any downstream transport is occurring and whether response actions are required.

[48] This evaluation will not consider potential impacts downstream of Reach 8 because GE has determined there will be no impacts in such areas. The downstream end of Reach 6 is approximately 20 river miles from the upstream end of Reach 9, and there are five dams/impoundments located over that reach that will impede transport of solids/PCBs to downstream reaches.

10 Supplemental Data Collection

Section 4.3.3.1 of the Final Revised SOW stated that the Conceptual RD/RA Work Plan for each RU will include a description of supplemental data collection activities to be conducted prior to final design. As described in the preceding sections of this Conceptual RD/RA Work Plan, several supplemental data collection activities are necessary to supplement the existing data and provide additional information to support the remedial design for Reach 6.

This section provides a summary of the proposed supplemental data collection activities. A detailed description of the proposed supplemental investigations and outreach is provided in the SDC Work Plan (Appendix F). As described in that work plan, the proposed supplemental data collection will generally include the following additional activities:

- Sediment probing and sampling to characterize sediment PCB concentrations and depths in Valley Mill Pond to further evaluate the sediment removal, transport, and disposal approach for Valley Mill Pond;
- Supplemental floodplain soil sampling in four EAs (including EA 58 and FUSA 59) to improve PCB characterization and further delineate the extent of the 1 mg/kg isopleth;
- Additional sediment sampling in Woods Pond, the outlet channel, and Valley Mill Pond for TCLP analysis to support waste disposal characterization;
- Additional sediment probing to gather supplemental sediment thickness data in the outlet channel and in nearshore areas of Woods Pond to support sediment removal evaluations;
- Additional geotechnical investigations to provide information and data on the conditions within and/or along Woods Pond, in the outlet channel, and in Valley Mill Pond to support further dredge slope stability evaluations during final design and to evaluate geotechnical properties of the soil in the area where the shoreline support facility is proposed;
- Bathymetric surveys of the outlet channel and Valley Mill Pond to further characterize sediment surface elevations and water depths to support sediment removal design;
- Field surveys to gather detailed topographical data at the remediation areas, at the proposed shoreline support facility area, along nearby roads anticipated for use during construction, along the temporary pipeline route from the shoreline support facility to the UDF, at locations where shoreline structures and utilities have been identified, and at the Woods Pond Spur rail loading/unloading area, as well as in the area surrounding Valley Mill Pond and the inlet channel downstream of the Woods Pond Dam;
- Field surveys to better delineate the shoreline around Woods Pond, the outlet channel, and Valley Mill Pond;

- Visual assessment of the proposed shoreline support facility area and the proposed pipeline route to the UDF, as well as nearby roads, to document existing conditions and assess constructability considerations;
- Surveys to document the locations and elevations of utilities and structures that may impact or be impacted by the Reach 6 remediation and support activities;
- Surface water elevation measurements to assess groundwater seepage for Valley Mill Pond as an initial step to support potential cap design evaluations for the pond;[49] and
- Outreach to utility owners, owners of shoreline structures, and river and groundwater users (i.e., the Town of Lenox WWTP discharge and the two nearby industrial water users) within Reach 6 and immediately downstream in Reach 7A to gather supplemental information to support final design evaluations, evaluate the available electrical power supply at and near the proposed shoreline support facility, facilitate an evaluation of the potential impacts that remediation and support activities may have on nearby structures or utilities, and determine any required setbacks from sensitive structures or utilities.

As described in the SDC Work Plan (Appendix F), the results of the supplemental data collection activities will be presented in a Supplemental Data Collection Summary Report, which will be submitted prior to the Final RD/RA Work Plan for Reach 6.

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[49] If it is determined that a sediment cap will be installed in Valley Mill Pond, additional data will need to be collected in a second supplemental phase to support design of the cap. This additional data collection would include data on porewater PCB concentrations and potentially direct measurements of groundwater seepage rates.

11 Remedial Design Schedule

In accordance with the Final Revised OSS, this Conceptual RD/RA Work Plan is being submitted concurrently with the PDI Summary Report and the Reach 6 BRA Report. The Final Revised OSS also states that GE will submit a Final RD/RA Work Plan for Reach 6 in accordance with the schedule proposed in this Conceptual RD/RA Work Plan and approved by EPA.

The Final Revised OSS presents flow charts (i.e., Figures 5-1 and 5-2 in that report) that detail the sequencing and precedence of deliverables and data collection activities that need to be completed prior to the start of remediation activities in Reach 6. Many of those deliverables will need to be approved by EPA prior to submission of the Final RD/RA Work Plan for Reach 6. Some of those deliverables have already been submitted or are being submitted concurrently with this Conceptual RD/RA Work Plan. Other plans that will present key aspects for the final design will be submitted to EPA in the near future.

The schedule for development of the Final RD/RA Work Plan for Reach 6 is dependent on the following activities and deliverables:

- EPA approval of the PDI Summary Report (submitted concurrently with this Conceptual RD/RA Work Plan);
- EPA approval of this Conceptual RD/RA Work Plan and other work plans provided as appendices to it, including the SDC Work Plan (Appendix F);
- EPA approval of the UDF Final Design Plan addendum that presents conceptual design details for the on-site dewatering facility at the UDF (scheduled for submittal on December 20, 2024);
- EPA approval of the Reach 6 BRA Report (submitted concurrently with this Conceptual RD/RA Work Plan);
- Completion of supplemental data collection activities and EPA approval of the Supplemental Data Collection Summary Report;
- EPA approval of the Phase IB CRS Work Plan for Reach 6 (scheduled for submittal on November 15, 2024) and completion of the associated field surveys;
- EPA approval of the Phase IB CRS Report;
- EPA approval of the Phase II CRA Work Plan (if determined to be necessary) and completion of the associated field activities;
- EPA approval of the Revised T&D Plan (submitted to EPA on October 15, 2024); and
- EPA approval of the Revised QOL Compliance Plan (scheduled for submittal on November 22, 2024).

As described in various sections of this Conceptual RD/RA Work Plan, supplemental data collection activities, the Phase IB CRS, and (if necessary) the Phase II CRA are necessary to support the Reach 6 final design. EPA approval of the work plans for those activities is thus required to proceed with the additional data collection and testing needed to support final design. In addition, because the locations, extents, and depths of remediation areas determine (in part) where supplemental data collection activities will be performed, EPA approval of the conceptual remediation areas presented in Section 4 is necessary to proceed with those activities. As indicated in the Final Revised OSS, the other approvals listed above are also necessary to complete the final design of the Reach 6 remediation.

Accordingly, GE will submit a Final RD/RA Work Plan for Reach 6 within 60 days of the last of the EPA approvals or other activities listed above.

The Final RD/RA Work Plan for Reach 6 will include a detailed description of the design and implementation of the proposed remedial activities in accordance with Section 4.3.3.4 of the Final Revised SOW. It will be accompanied by a Phase II CRA Report (if necessary and not already submitted); a Restoration/Remediation Coordination Plan; a Restoration Plan; and a Post-Construction Inspection, Monitoring, and Maintenance Plan for Reach 6. The Final RD/RA Work Plan for Reach 6 will also include an anticipated schedule for submission of an SIP (containing the relevant contractor plans) and for implementing the remedial activities in Reach 6. The revised Project Operations Plan will also need to be approved prior to the initiation of remediation in Reach 6.

A later addendum or addenda to the Final RD/RA Work Plan, which will present the Reach 6 capping design and the design for remediation of the Woods Pond headwaters area, will be submitted and approved by EPA before those activities are conducted. Those stages of the Reach 6 design will take place at a later date as described in Sections 1.3 and 1.4 and will follow completion of dredging activities in upstream reaches.

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Tables

Table 6-1
Applicable or Relevant and Appropriate Requirements for Reach 6 Remedial Activities[1]

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to Be Taken to Comply with ARARs[2]
Chemical-Specific ARARs				
Federal ARARs				
None				
State ARARs				
Numeric Massachusetts Water Quality Criteria for PCBs—Massachusetts Surface Water Quality Standards	314 CMR 4.05(5)(e)	Freshwater chronic aquatic life criterion (based on protection of mink): 0.014 µg/L. Human health criterion based on human consumption of water and organisms: 0.000064 µg/L.	Relevant and appropriate	Considered by EPA in selecting the remedy and Performance Standards for the Rest of River. The freshwater chronic aquatic life criterion of 0.014 µg/L will be met by the selected remedy. Regarding the human health criterion of 0.000064 µg/L based on human consumption of water and organisms, EPA, in consultation with the Commonwealth, has waived this criterion on the ground that achievement of this ARAR is technically impracticable, given that, based on current data, it is not predicted to be met by the selected remedy or any other sediment remediation alternative in Massachusetts. To be protective of human health and the environment, as specified in the Revised Final Permit, EPA established alternative criteria (that are not ARARs) for this waived criterion.
Numeric Connecticut Water Quality Standards for PCBs	Connecticut Water Quality Standards, Sections 22a-462-1 – 22a-462-9, specifically 22a-462-9(3), Table 3	Freshwater chronic aquatic life criterion (based on protection of mink): 0.014 µg/L. Human health criterion based on human consumption of water and organisms: 0.000064 µg/L.	Relevant and appropriate	Considered by EPA in selecting the remedy and Performance Standards for the Rest of River. EPA has noted that the concentration of 0.000064 µg/L cannot be reliably measured using available analytical techniques. This ARAR does not require any specific actions in Reach 6.
To Be Considered				
Clean Water Act, National Recommended Water Quality Criteria for PCBs	National Recommended Water Quality Criteria: 2002, EPA-822-R-02-047, EPA Office of Water, Office of Science and Technology (November 2002)	Freshwater chronic aquatic life criterion (based on protection of mink): 0.014 µg/L. Human health criterion based on human consumption of water and organisms: 0.000064 µg/L.	To be considered	See the above entry for the Massachusetts Water Quality Standards.
Cancer Slope Factors	EPA Integrated Risk Information System	Guidance values used to evaluate the potential carcinogenic hazard caused by exposure to PCBs.	To be considered	Considered by EPA in selecting the remedy and Performance Standards for Reach 6.
Reference Doses	EPA Integrated Risk Information System	Guidance values used to evaluate the noncancer hazards associated with exposure to PCBs.	To be considered	Considered by EPA in selecting the remedy and Performance Standards for Reach 6.
PCBs: Cancer Dose Response Assessment and Application in Environmental Mixtures (EPA 1996)	EPA/600/P-96/001F (National Center for Environmental Assessment, Office of Research and Development, September 1996)	Guidance describing EPA's reassessment regarding the carcinogenicity of PCBs.	To be considered	Considered by EPA in establishing EPA's Cancer Slope Factors.
Guidelines for Carcinogenic Risk Assessment (EPA 2005)	EPA/630/P-03/001F (EPA Risk Assessment Forum, March 2005)	Framework and guidelines for assessing potential cancer risks from exposure to pollutants and other environmental agents.	To be considered	Considered by EPA in selecting the remedy and Performance Standards for Reach 6.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA/630/R-03/003F (EPA Risk Assessment Forum, March 2005)	Guidance on issues related to assessing cancer risks associated with early-life exposures, including an adjustment for carcinogens acting through a mutagenic mode of action.	To be considered	Considered by EPA in selecting the remedy and Performance Standards for Reach 6.
Massachusetts Fish Consumption Advisory	Massachusetts Department of Public Health, Freshwater Fish Consumption Advisory List (2007)	Advises that the public should not consume any fish from the Housatonic River from Dalton to Sheffield due to PCBs; also includes frogs and turtles.	To be considered	Considered by EPA in adopting the Final Revised Permit requirements relating to biota consumption advisories (Section II.B.7.a) and by GE in its Biota Consumption Advisory Outreach Plan for the Housatonic Rest of River in Massachusetts.
Massachusetts Waterfowl Consumption Advisory	Massachusetts Department of Public Health, Provisional Waterfowl Consumption Advisory (1999)	Advises that the public should avoid eating all mallards and wood ducks from the Housatonic River and its impoundments from Pittsfield to Rising Pond.	To be considered	Considered by EPA in adopting the Final Revised Permit requirements relating to biota consumption advisories (Section II.B.7.a) and by GE in its Biota Consumption Advisory Outreach Plan for the Housatonic Rest of River in Massachusetts.

Table 6-1
Applicable or Relevant and Appropriate Requirements for Reach 6 Remedial Activities[1]

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to Be Taken to Comply with ARARs[2]
Location-Specific ARARs				
Federal ARARs				
Clean Water Act—Section 404 and implementing regulations	33 USC 1344 33 CFR Parts 320-323, 325, and 332 (USACE) 40 CFR Part 230 (EPA)	For the discharge of dredged or fill material into waters of the U.S., including wetlands, there must be no practicable alternative with less adverse effect on the aquatic ecosystem; the discharge cannot cause or contribute, after consideration of disposal site dilution and dispersion, to violation of any applicable water quality standard, violate an applicable toxic effluent standard, jeopardize existence of endangered or threatened species; or contribute to significant degradation of waters of the U.S. The discharger must take appropriate and practicable steps to minimize potential adverse impacts of the discharge on the aquatic ecosystem. Mitigation/restoration is required for unavoidable impacts on resources.	Applicable	Remedial activities that will involve the discharge of dredged or fill material into Woods Pond other waterbodies, and/or wetlands will be conducted in accordance with the substantive provisions of these requirements. EPA has determined that there is no practicable alternative with less adverse effect on the aquatic ecosystem (including wetlands), and that the remedy will not cause or contribute to violation of any applicable water quality standard, violate an applicable toxic effluent standard, jeopardize the existence of endangered or threatened species, or contribute to significant degradation of waters of the U.S. Implementation of the Reach 6 remediation will include appropriate and practicable steps to minimize potential adverse impacts of the discharge on Woods Pond, other waterbodies, and wetlands. In particular, dredging, capping, filling, and grading work, as well as construction of support areas, will be managed in a manner that limits impacts to adjacent site areas and avoids the uncontrolled discharge of stormwater runoff beyond designated areas, and will provide for management of construction-based stormwater. If necessary, mitigation/restoration will be conducted consistent with these regulations. See also Endangered Species Act ARAR below for endangered or threatened species.
Floodplain Management and Protection of Wetlands	44 CFR Part 9	Regulation sets forth policy, procedures, and responsibilities to implement and enforce Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands.	Relevant and appropriate	The Reach 6 remedial activities (i.e., sediment and soil removal, capping, backfilling) will reduce human health and environmental risks in wetlands and the floodplain. Those activities will be conducted in accordance with the policy, procedure, and responsibilities stated in this regulation.
Fish and Wildlife Coordination Act	16 USC 662 et seq.	Sets forth requirements for federal actions that may modify a waterbody, including consultation with federal and state resource agencies.	Applicable to EPA; relevant and appropriate to work in Rest of River waterbodies.	The Reach 6 remedial activities will modify the river and an existing impoundment. As part of the remedy, portions of Reach 6 will be deepened as required by the applicable Performance Standards. The U.S. Fish and Wildlife Service and Massachusetts Division of Fisheries and Wildlife are stakeholders for this project and will be included in the review of the remedial design and remedial action documents.
RCRA requirements for hazardous waste facilities in floodplains	40 CFR 264.1(j)(7) 40 CFR 264.18(b)	Remediation waste management sites must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless procedures are in effect to have waste removed safely before flood waters reach the facility or there will be no adverse effects on human health or the environment if washout occurs.	Potentially relevant and appropriate	The remedy does not include disposal pursuant to these regulations, but will include temporary stockpiling of removed materials at a shoreline support facility and at a rail loading facility (Woods Pond Spur). For such staging areas located in the 100-year floodplain, flood protection measures will be implemented to prevent washout.
NHPA and regulations	54 USC 300101 et seq., including Section 306108 (Section 106 of NHPA) 36 CFR Part 800	A federal agency must take into account the project's effect on properties included or eligible for inclusion in the NRHP.	Applicable to EPA; relevant and appropriate to work that could affect properties included or eligible for inclusion in the NRHP	Pre-design and design activities include a CRA and CRS to determine whether the remediation or support activities would adversely affect any properties that are included or eligible for inclusion in the NRHP. If any such properties are identified, activities will be conducted, in coordination with the relevant federal, state, and tribal authorities, to avoid or mitigate impacts on those properties to the extent required by the substantive provisions of these regulations.
Archaeological and Historic Preservation Act	54 USC 312501 et seq.	When a federal agency finds, or is notified, that its activities in connection with a federal construction project may cause irreparable loss or destruction of significant scientific, prehistorical, historical, or archeological data, such agency shall notify the U.S. Department of the Interior. If the U.S. Department of the Interior determines the data are significant and may be irrevocably lost or destroyed, it is to conduct a survey and other investigation of the affected area and recover and preserve such data as necessary in the public interest.	Applicable to EPA; relevant and appropriate to work in areas where archaeological or historic data may be present	Pre-design and design activities include a CRA and CRS to determine whether the remediation or support activities could cause an irreparable loss or destruction of significant scientific, prehistorical, historical, or archeological data. If so, EPA will make the notification required by this act, and the substantive requirements of this act will be met.
Endangered Species Act and Regulations	16 USC 1536(a)-(d) 50 CFR Part 402, Subparts A&B 50 CFR 17	A federal agency must determine whether a federally authorized project is likely to jeopardize the continued existence of a listed T&E species or result in destruction or adverse modification of its critical habitat. If so, "reasonable and prudent" measures must be taken to avoid and/or minimize such effects.	Applicable to EPA; relevant and appropriate to work that could affect T&E species or their habitat	GE's BRA Report for Reach 6 identified habitat for and the potential presence of one federally listed T&E species within the limits of Reach 6 (the northern long-eared bat, an endangered species), one species that has been proposed for listing (the tricolored bat), and one candidate species for listing (the monarch butterfly). An assessment will be made regarding the impact of the Reach 6 remedy on those species or their habitat. If the remedy will adversely affect a listed T&E species or its habitat, GE will conduct reasonable and prudent measures to avoid or minimize such effects and/or restore the impacted habitat, as will be described in the Restoration Plan for Reach 6.
State ARARs				
Massachusetts Waterways Law and Regulations	MGL Ch. 91 310 CMR 9.00, including 9.40	Regulates construction, placement, excavation, alteration, removal, or use of fill or structures in waterways. Among the requirements is 310 CMR 9.40, Standards for Dredging and Dredged Material Disposal, which includes restrictions on improvement dredging.	Applicable	The Reach 6 remedial activities include construction, placement, excavation, alteration, removal, and use activities in the Housatonic River, including Woods Pond. Except as otherwise provided herein, those activities will meet the substantive environmental standards of these regulations and will limit impacts. The remedy will include sediment removal (dredging) within an ACEC. If the dredging in the ACEC is governed by 310 CMR 9.40, it is permitted as an Ecological Restoration Project. If it is deemed not to be an Ecological Restoration Project, EPA, in consultation with the Commonwealth, has waived, pursuant to CERCLA 121(d)(4)(C), the provision of 310 CMR 9.40 that prohibits dredging in an ACEC.

Table 6-1
Applicable or Relevant and Appropriate Requirements for Reach 6 Remedial Activities[1]

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to Be Taken to Comply with ARARs[2]
Massachusetts Clean Water Act—Water Quality Certification Regulations	314 CMR 9.00 et seq., including 9.06-9.07	For discharge of dredged or fill material to waters of the U.S within Massachusetts, the criteria in Section 9.06 include, without limitation, the following: (a) no discharge is permitted if there is a practicable alternative that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences; (b) no discharge is permitted unless appropriate and practicable steps have been taken to avoid and minimize potential adverse impacts to bordering or isolated vegetated wetlands or land under water; (c) no discharge is permitted for the impoundment or detention of stormwater for purposes of controlling sedimentation or other pollutant attenuation; (d) stormwater is to be controlled with BMPs; and (e) no discharge shall be permitted in rare circumstances where the activity will result in substantial adverse impacts to the physical, chemical, or biological integrity of surface waters. For dredging and dredged material management, the criteria in Section 9.07 include, without limitation, the following: (a) no dredging is allowed if there is a practicable alternative that would have less impact on the aquatic ecosystem; (b) no dredging is permitted unless appropriate and practicable steps have been taken to avoid, minimize or mitigate adverse effects on land under water; (c) no dredging is allowed that will have adverse effect on specified habitat sites of rare species except under certain conditions; (d) dredging and dredged material management must be conducted to ensure protection of human health, public safety, public welfare and the environment,; (e) dredged material shall not be disposed of if a feasible alternative exists that involves the reuse, recycling, or contaminant destruction and/or detoxification; (f) no dredging is permitted in rare circumstances where the activity will result in substantial adverse impacts to the physical, chemical, or biological integrity of waters; (g) dredging must be conducted to meet performance standards in Section 9.07(3) designed to minimize impacts on the aquatic ecosystem and protect human health; and (h) placement of dredged material in an intermediate facility for sediment management (dewatering, processing, etc.) prior to disposal or reuse must meet certain requirements in Section 9.07(4), including requirements governing method of placement/storage of dredged material and siting criteria.	Applicable	The Reach 6 remedial activities that involve discharge of dredged or fill material to waterbodies or wetlands—including dredging, capping, and backfilling—will be conducted in accordance with the substantive provisions of these regulations. In particular, without limitation: • EPA has determined that there is no practicable alternative to the selected remedy that would have less adverse impact on the aquatic ecosystem. • The remedy includes activities to avoid and minimize potential adverse impacts to bordering or isolated vegetated wetlands or land under water. • There will be no discharge of dredged or fill material for impoundment or detention of stormwater for purposes of controlling sedimentation or other pollutant attenuation. • The remedy will use BMPs to control stormwater. • The remedy will not include activities that result in substantial adverse impacts to the physical, chemical, or biological integrity of surface waters. The Reach 6 remedial activities that involve dredging or dredged material management – including dredging of sediments and management of the removed materials – will be conducted in accordance with the substantive provisions of these regulations. In particular, without limitation: • EPA has determined that there is no practicable alternative to the selected remedy that would have less adverse impact on the aquatic ecosystem. • The remedy includes appropriate and practicable steps to avoid, minimize, or mitigate adverse effects on land under water. • Remedial work that may affect the specified habitat of state-listed rare species will be carried out in accordance with the substantive requirements under the MESA. See MESA ARAR listed below. • Dredging and dredged material management will be conducted in a manner that ensures protection of human health, public safety, public welfare, and the environment. • There is no feasible alternative to the disposal of dredged material involving reuse, recycling, or contaminant destruction and/or detoxification. • The dredging will not result in substantial adverse impacts to the physical, chemical, or biological integrity of waters. • The dredging will meet the dredging performance standards in Section 9.07(3) through design and implementation requirements approved by EPA. • The temporary shoreline support facility for removed sediments and soils, as well as the Woods Pond Spur rail loading area, will meet the requirements for an intermediate facility in 314 CMR 9.07(4) except as otherwise approved by EPA. In particular, those temporary staging areas will not have a permanent adverse impact on rare species habitat or the ACEC.
Massachusetts Wetlands Protection Act and Regulations	MGL c. 131, Section 40 310 CMR 10.00, including 10.53	These requirements govern removal, dredging, filling, or altering of "Resource Areas," including riverbanks, Riverfront Areas, inland wetlands, land subject to flooding and certain other areas. Provisions include Section 10.53(3), which authorizes certain projects as "limited projects," including, in 10.53(3)(q), actions responding to a release or threat of release of oil and/or hazardous materials in accordance with the MCP, where (a) there is no practicable alternative consistent with the MCP that would be less damaging to Resource Areas; and (b) steps are taken to avoid or minimize impacts to Resource Areas, including meeting specific standards to the maximum extent practicable. Further, under 310 CMR 10.59, the action must have no adverse effect on estimated habitat of state-listed rare wildlife species.	Applicable	The Reach 6 remedial activities that will affect Resource Areas under this Act will meet the substantive requirements of these regulations. In particular, those activities, as CERCLA response actions and thus considered adequately regulated under the MCP, will constitute limited projects under these regulations and will meet the requirements for such projects. Specifically, EPA has determined that there is no practicable alternative consistent with the MCP that would be less damaging to Resource Areas; and steps will be taken to avoid or minimize impacts to Resource Areas, including meeting the specific standards in the regulations to the maximum extent practicable. Where the remedial activities affect the estimated habitat of state-listed wildlife species, such activities will be carried out in accordance with the substantive provisions of the MESA regulations so as to comply with 310 CMR 10.59.

Table 6-1
Applicable or Relevant and Appropriate Requirements for Reach 6 Remedial Activities[1]

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to Be Taken to Comply with ARARs[2]
Massachusetts Site Suitability Criteria	310 CMR 16.40(3),(4)	Site suitability criteria for solid waste handling facilities, including facility-specific and general site suitability criteria.	Potentially applicable to the temporary management of excavated materials	The Reach 6 remedy will include the temporary management of excavated materials at a temporary shoreline support facility on the Woods Pond shore and at a rail loading area near Woods Pond (Woods Pond Spur) prior to transport for disposal. To the extent that the criteria in Section 16.40 apply to such temporary management of materials during implementation of the remedy and that the materials temporarily managed on-site constitute solid waste under these regulations, the substantive provisions of these criteria will be met except as follows: For any such requirements that would prohibit or restrict such temporary solid waste management locations during implementation of the remedy—including the prohibition on the location of such management facilities within the ACEC (or at locations outside of but adjacent to the ACEC where such locations would fail to protect the outstanding resources of the ACEC) or in a Resource Area or Riverfront Area—EPA, in consultation with the Commonwealth, has waived those requirements pursuant to CERCLA 121(d)(4)(B) on the ground that compliance with them would create a greater risk to human health and the environment than implementation of the selected remedy.
Massachusetts Facility Location Standards	310 CMR 30.700-708	Location standards for hazardous waste management facilities, including temporary storage units for waste defined by the state regulations as hazardous waste. They include, are not limited to, a prohibition on the location of any such facility in the 100-year floodplain or in an ACEC, as well as various other locational requirements for the active portion of the facility. Note that waste containing PCBs at a concentration equal to or greater 50 mg/kg constitutes hazardous waste under the Massachusetts regulations. Note further that these regulations exempt: (a) temporary storage of dredged materials at an intermediate facility when managed under a state water quality certification and under Section 404 of the federal Clean Water Act; or (b) facilities for wastes with a PCB concentration equal to or greater than 50 mg/kg if such facilities comply with EPA's TSCA regulations (40 CFR Part 761) except with respect to a facility located in an ACEC (see 310 CMR 30.501(3)(a)).	Potentially applicable to the temporary management of excavated materials	The Reach 6 remedy will include the temporary management of excavated materials at a temporary shoreline support facility on the Woods Pond shore and at a rail loading area near Woods Pond (Woods Pond Spur) prior to transport for disposal. To the extent that the provisions of these regulations apply to the temporary management of materials during implementation of the remedy, that the materials temporarily managed on site constitute state-designated hazardous waste under these regulations, and that their temporary management is not subject to any regulatory exemption, these substantive location requirements will be met except as follows: For any such requirements that would prohibit or restrict such temporary hazardous waste management locations during implementation of the remedy – including the prohibition on the location of such management facilities within the ACEC (or at the locations outside of but adjacent to or in close proximity to the ACEC where such locations would not be protective of the outstanding resources of the ACEC) – EPA, in consultation with the Commonwealth, has waived those requirements pursuant to CERCLA 121(d)(4)(B) on the ground that compliance with them would create a greater risk to human health and the environment than implementation of the selected remedy. For such support facilities located within the 100-year floodplain, floodproofing will used to prevent floodwaters from coming into contact with hazardous waste (if any).
Massachusetts Historical Commission Act and Regulations	MGL c. 9, Section 27C 950 CMR 71.07	If the MHC determines that a state-authorized project could cause a change in the historical, architectural, archaeological, or cultural qualities of a property on the SRHP, these provisions establish a process for notification, determination of adverse impact, and evaluation of alternatives to avoid, minimize, or mitigate such impacts	Relevant and appropriate	Pre-design and design activities include a CRA and CRS to determine whether the remediation or support activities could cause a change in the historical, architectural, archaeological, or cultural qualities of a property on the SRHP. If any such impacts are identified, the substantive requirements of these regulations will be met in coordination with the MHC, as well as EPA and relevant tribal authorities.
MESA and Regulations	MGL c. 131A 321 CMR 10.00, Parts I, II, and V 321 CMR 10.00, Part IV	Under Parts I, II, and V, a proposed activity in mapped Priority Habitat for a state-listed threatened or endangered species or species of special concern, or other area where such a species has occurred may not result in a "take" of such species, unless it has been authorized by a conservation and management permit. A conservation and management permit may be issued provided that an adequate assessment of alternatives to both temporary and permanent impacts to state-listed species has taken place, an insignificant portion of the local population would be impacted by the project or activity, and the project proponent agrees to carry out a conservation and management plan is carried out that provides a long-term net benefit to the conservation of the state-listed species. Under Part IV, projects that will alter a designated Significant Habitat must be reviewed to ensure that they will not reduce the viability of the habitat to sustain an endangered or threatened species.	Applicable	Some of the Reach 6 remedial activities will take place in mapped Priority Habitats for state-listed species and in Species Habitat mapped by the Massachusetts Natural Heritage and Endangered Species program for such species. The development of Core Habitat Areas, in consultation with the Commonwealth, and implementation of the Revised Final Permit's requirements relating to such Core Habitat Areas will result in the avoidance or minimization of adverse impacts to such species in some areas. To the extent that remediation or support activities have unavoidable impacts that will result in a take of state-listed species, although a conservation and management permit is not required, the substantive provisions of these regulations will be followed, including, if necessary, the development of a conservation and management plan providing for a long-term net benefit to the affected state-listed species. As stated in the Conceptual RD/RA Work Plan for Reach 6, based on current information, it does not appear likely that the remediation and support activities in Reach 6 will have any adverse effects on state-listed species such that a conservation and management plan will be necessary. However, a final determination on this issue will be included in the Final RD/RA Work Plan or the Restoration Plan for Reach 6. There are no designated Significant Habitats in Reach 6. To the extent that a Significant Habitat is designated in that area in the future, this provision will be complied with.
Massachusetts ACEC	301 CMR 12.11(1)(c)	Provides for establishment of ACEC in the state. ACEC designation affects other state laws and regulations.	Relevant and appropriate	The ACEC regulations pertain to state agency actions and are not applicable to the federal EPA action. However, the Reach 6 remedy will comply with the substantive requirements of 301 CMR 12.11(1)(c), which may be relevant and appropriate, by advancing the values of 301 CMR 12.11(1)(c), while avoiding adverse effects on identified values in Section 12.11(1)(c).
Action-Specific ARARs				
Federal ARARs				
TSCA Regulations on Cleanup of PCB Remediation Waste	40 CFR 761.61(c)	Provides for risk-based approval of PCB sampling, cleanup, storage, and disposal methods through an EPA determination that such method(s) will not pose an unreasonable risk of injury to health or the environment	Applicable	Attachment D to the Revised Final Permit contains a risk-based determination by EPA under this provision that the remedy specified in the Revised Final Permit will not pose an unreasonable risk of injury to health or the environment as long as it complies with the conditions set out in that determination, which the Reach 6 remedy will do.

Table 6-1
Applicable or Relevant and Appropriate Requirements for Reach 6 Remedial Activities[1]

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to Be Taken to Comply with ARARs[2]
TSCA Regulations on Storage of PCB Remediation Waste	40 CFR 761.50 40 CFR 761.65 40 CFR 761.61(c)	General and specific requirements for storage of PCB Remediation Waste. Regulations include specific provisions for storage of PCB Remediation Waste in piles at the cleanup site or site of generation for up to 180 days (761.65(c)(9)). Also allows for risk-based approval by EPA of alternate storage method (761.61(c)), based on demonstration that it will not pose an unreasonable risk of injury to health or the environment.	Applicable	The Reach 6 remedy will comply with these provisions. The remedy will include temporary storage of excavated PCB-containing sediments and soils on-site. EPA's risk-based approval contained in Attachment D to the Revised Final Permit covers the storage of such materials in accordance with the requirements of the Revised Final Permit. The temporary storage of PCB-containing sediments and soils excavated in Reach 6 will meet the applicable requirements established in or under the Revised Final Permit for such storage.
TSCA Regulations on Discharge of PCB-containing Water	40 CFR 761.50(a)(3)	Prohibits discharge of water containing PCBs to navigable waters unless PCB concentration is <3 mg/L or discharge is in accordance with NPDES discharge limits.	Applicable	Any discharge to navigable waters will comply with this provision.
TSCA Regulations on Decontamination	40 CFR 761.79	Establishes decontamination standards and procedures for removing PCBs from water, organic liquids, and various types of surfaces.	Applicable	Any decontamination activities conducted as part of the Reach 6 remedy will comply with these requirements.
Clean Water Act and NPDES Regulations	33 USC 1342 40 CFR 122, including, but not limited to, 122.3(d) and 122.44(a) and (e) 40 CFR 125.1-125.3	These standards include that point source discharge must meet technology-based effluent limitations (including those based on best available technology for toxic and non-conventional pollutants and those based on best conventional technology for conventional pollutants) and effluent limitations and conditions necessary to meet state water quality standards, except that discharges in compliance with instructions of the EPA OSC are exempt from these requirements (122.3(d)).	Applicable	The Reach 6 remedy will include dewatering of excavated sediments and wetland soils. Reach 6 remedial activities that include discharge into the river will meet these requirements, including any alternative discharge requirements established by the EPA OSC (such as was done for the remediation of the 1.5 Mile Reach of the Housatonic River).
Clean Water Act—NPDES Regulations (stormwater discharges)	40 CFR 122.26(c)(1)(ii)(C) 40 CFR 122.44(k)	BMPs must be employed to control pollutants in stormwater discharges during construction activities.	Applicable	Erosion and sedimentation control measures and BMPs will be implemented to comply with these stormwater requirements.
RCRA Regulations on Identification of Hazardous Waste	40 CFR 261	Establishes standards for determining whether a waste constitutes hazardous waste under RCRA.	Potentially applicable	Waste characterization sampling of materials subject to removal will be conducted consistent with these requirements to determine whether they constitute hazardous waste under RCRA.
RCRA Regulations for Generators of Hazardous Waste	40 CFR 262.30-33	Pre-transportation requirements for generators of hazardous waste.	Potentially applicable	If RCRA hazardous wastes are identified and these materials are removed from the Area of Contamination but remain on site during Reach 6 remedy implementation, these requirements will be met.
RCRA regulations on Less-than-90-day Accumulation of Hazardous Waste	40 CFR 262.34	Provides for on-site accumulation of hazardous waste in certain circumstances, provided compliance with other specified requirements.	Potentially applicable	If RCRA hazardous wastes are identified and these materials are removed from the Area of Contamination but remain on site during Reach 6 remedy implementation, these requirements will be met.
RCRA Regulations for Hazardous Waste Management Facilities—General	40 CFR 264.1(j)	General requirements for hazardous waste management facilities (waste analysis, security, precautions regarding ignition or reaction of wastes, preventing washout of units)	Potentially applicable	If RCRA hazardous wastes are identified and these materials are removed from the Area of Contamination but remain on site during Reach 6 remedy implementation, these requirements will be met.
State ARARs				
Massachusetts Clean Waters Act—Water Quality Certification Regulations	314 CMR 9.01-9.08	See synopsis of requirements in the location-specific entry for this ARAR.	Applicable	See the location-specific entry for this ARAR.
Massachusetts Clean Water Act and Wetlands Protection Act—Stormwater Management Standards	310 CMR 10.05(6)(k) 314 CMR 9.06(6)(a)	Projects subject to regulation under the Wetlands Protection Act or that involve discharge of dredged or fill material must incorporate stormwater BMPs to attenuate pollutants in stormwater discharges, as well as to provide a setback from receiving waters and wetlands, in accordance with 10 specified stormwater management standards.	Applicable	Erosion and sedimentation control measures and BMPs will be implemented to comply with the substantive requirements of these stormwater regulations.
Massachusetts Hazardous Waste Regulations on Identification and Listing of Hazardous Waste	310 CMR 30.100	Establishes criteria and lists for determining whether a waste is a hazardous waste under state law. Note: Waste containing PCBs at a concentration equal to or greater 50 mg/kg constitutes a listed hazardous waste under the Massachusetts regulations, but the Massachusetts hazardous waste regulations do not apply to facilities for such waste that comply with EPA's TSCA regulations (40 CFR Part 761) except with respect to a facility located in an ACEC (see 310 CMR 30.501(3)(a)).	Applicable	Waste characterization sampling of materials subject to removal will be conducted consistent with these regulations to determine whether they constitute hazardous waste under state law on a basis other than containing PCB concentrations at or above 50 mg/kg. Note: With regard to the waste containing PCB concentrations at or above 50 mg/kg, the facilities for the storage of such waste as part of the Reach 6 remedy will comply with the TSCA regulations (by virtue of EPA's risk-based determination in Attachment D to the Revised Final Permit), and the prohibition on the location of such a facility in an ACEC has been waived by EPA, after consultation with the Commonwealth, pursuant to CERCLA 121(d)(4)(B).
Massachusetts hazardous waste regulations for generators	310 CMR 30.321-324	Pre-transport requirements for generators of hazardous waste	Potentially applicable	To the extent that non-PCB hazardous wastes under state law are identified and these materials are removed from the Area of Contamination but remain on site during Reach 6 remedy implementation, these pre-transport requirements will be met.
Massachusetts hazardous waste management—general requirements	310 CMR 30.513, 514, 524, 560	General requirements for hazardous waste management facilities	Potentially applicable	To the extent that non-PCB hazardous wastes under state law are identified and these materials are removed from the Area of Contamination but remain on site during Reach 6 remedy implementation, these general requirements will be met.

Table 6-1
Applicable or Relevant and Appropriate Requirements for Reach 6 Remedial Activities[1]

Statute/Regulation	Citation	Synopsis of Requirements	Status	Action(s) to Be Taken to Comply with ARARs[2]
Massachusetts hazardous waste regulations—technical requirements for storage	310 CMR 602, 640, 580, 660.	Requirements related to storage of hazardous waste.	Potentially applicable	To the extent that non-PCB hazardous wastes under state law are identified and these materials are removed from the Area of Contamination but remain on site during Reach 6 remedy implementation, the substantive requirements of these regulations will be met.
Massachusetts Air Pollution Control Regulations	310 CMR 7.00, 7.01, 7.06, 7.09, 7.10, and 7.11	These provisions regulate air emissions, dust, odor, and noise, among other things.	Applicable	The Reach 6 remedial activities will comply with the substantive provisions of these regulations. Specifically, those activities will comply with the air emission control and air monitoring requirements set forth in the revised Quality of Life Compliance Plan and in the Ambient Air Monitoring Plan included in the revised Project Operations Plan, and will comply with the noise and odor control and monitoring requirements set forth in the revised Quality of Life Compliance Plan. In addition, control and mitigation of dust emissions will be implemented, as needed, during construction of staging areas and access roads, floodplain excavations, and soil/sediment handling operations.
To Be Considered				
TSCA PCB Spill Cleanup Policy	40 CFR Part 761, Subpart G	Policy used to determine adequacy of cleanup of spills resulting from the release of materials containing PCBs at concentration of 50 mg/kg or greater.	To be considered	Will be considered in the event of any new spill that results from the release of PCBs at a concentration of 50 mg/kg or greater during the Reach 6 remedial construction.
EPA Contaminated Sediment Remediation Guidance	EPA-540-R-05-012 OSWER 9355.0-85 (December 2005)	Provides guidance on remediation of contaminated sediment sites.	To be considered	The guidance was considered by EPA in remedy selection. In addition, in accordance with Section II.B.2.i of the Revised Final Permit, this guidance has been and will continue to be considered during design of the engineered cap for Reach 6 sediments, and it will also be considered in identification of sediment removal methods and for operation and maintenance planning.
EPA Guidance for In-Situ Subaqueous Capping of Contaminated Sediments	EPA 905-B96-004, Great Lakes National Program Office (September 1998)	Provides technical guidance for subaqueous, in-situ capping as a remediation technique for contaminated sediments.	To be considered	In accordance with Section II.B.2.i of the Revised Final Permit, this guidance has been and will continue to be considered during design of the engineered cap for Reach 6 sediments.

Notes:

1. This table has been adapted from Attachment C of the Revised Final Permit with a number of modifications and updates. Note that this table does not include ARARs for the Upland Disposal Facility design, construction, or operation. Those ARARs were presented in the *Upland Disposal Facility Conceptual Design Plan* (Arcadis 2022) submitted to EPA on December 6, 2022.
2. Compliance with ARARs refers to compliance with the substantive requirements, criteria, or limitations of each provision, not any administrative, procedural, or permitting requirements included therein.

µg: microgram
ACEC: Area of Critical Environmental Concern
ARAR: applicable or relevant and appropriate requirement
BMP: best management practice
BRA: Baseline Restoration Assessment
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CFR: Code of Federal Regulations
CMR: Code of Massachusetts Regulations
CRA: Cultural Resource Assessment
CRS: Cultural Resource Survey
EPA: U.S. Environmental Protection Agency
GE: General Electric Company
kg: kilogram
L: liter
MCP: Massachusetts Contingency Plan
MESA: Massachusetts Endangered Species Act
mg: milligram
MGL: Massachusetts General Law
MHC: Massachusetts Historical Commission
NHPA: National Historic Preservation Act
NPDES: National Pollutant Discharge Elimination System
NRHP: National Register of Historic Places
OSC: On-Scene Coordinator
PCB: polychlorinated biphenyl
RCRA: Resource Conservation and Recovery Act
SRHP: State Register of Historic Places
T&E: threatened or endangered
TSCA: Toxic Substances Control Act
USACE: U.S. Army Corps of Engineers
USC: United States Code

Figures

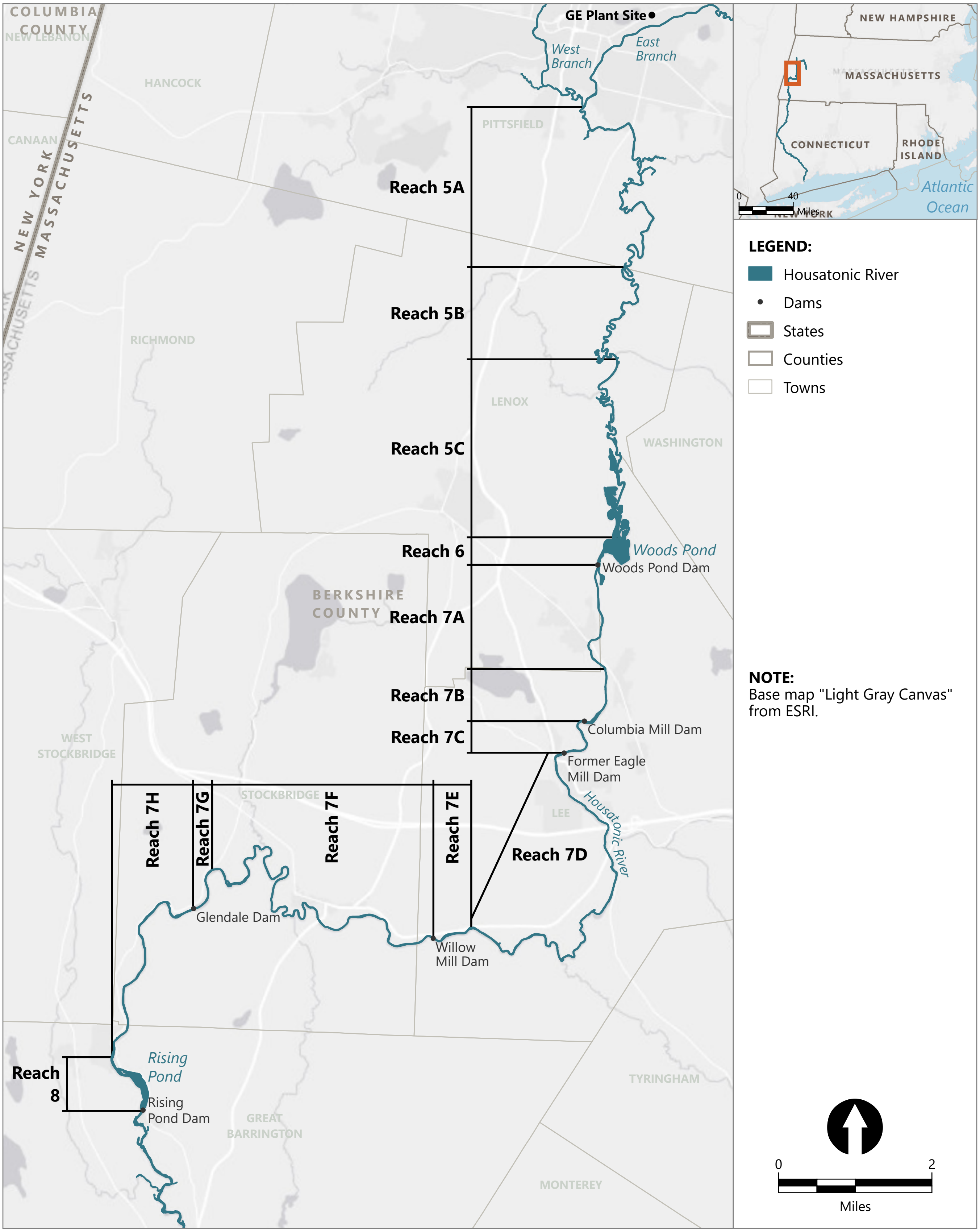

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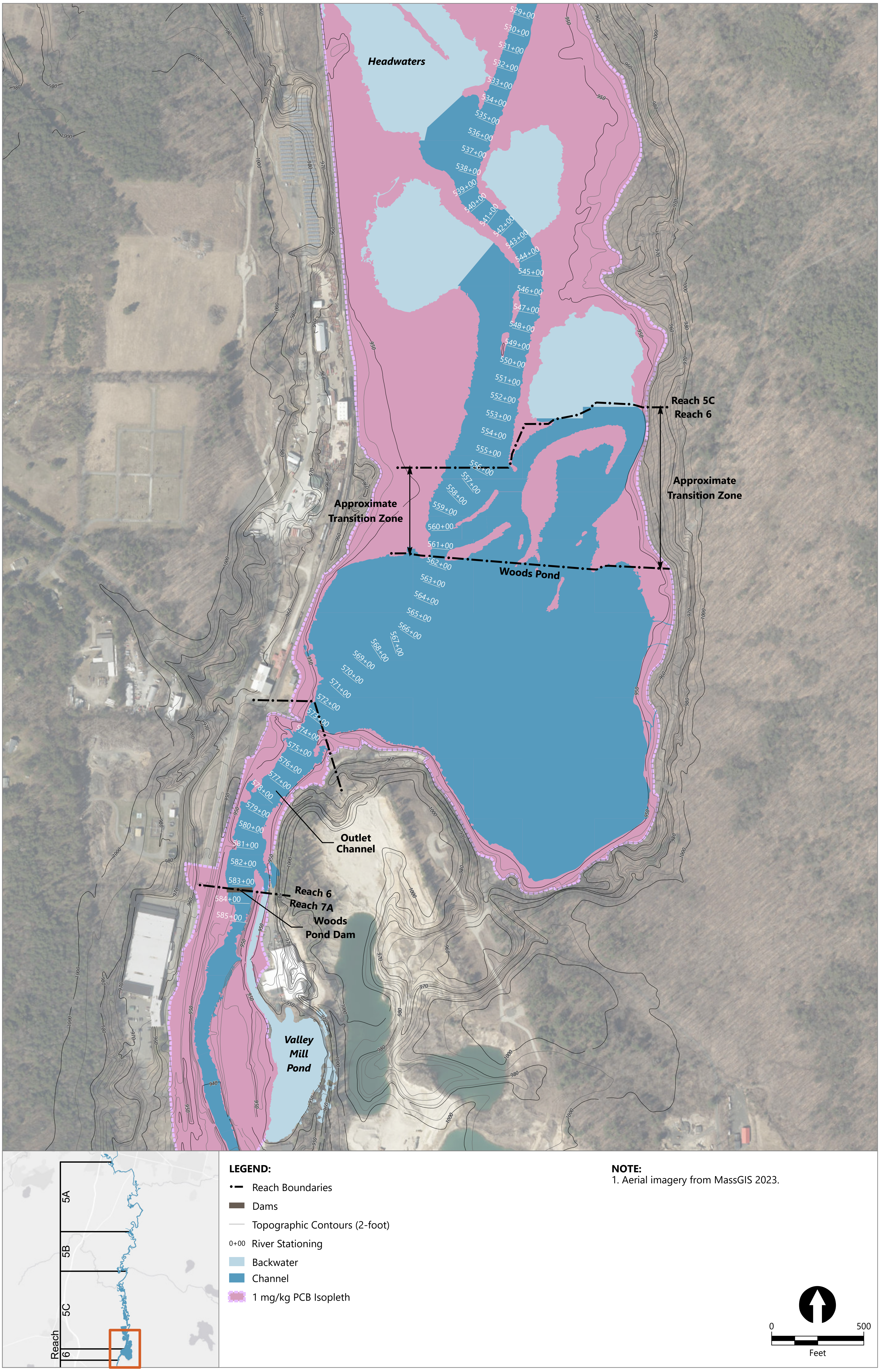
Figure 1-1
Housatonic River Map (Subreaches in Reaches 5 and 7)
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River – Rest of River



LEGEND:

- Reach Boundaries
- Dams
- Topographic Contours (2-foot)
- 0+00 River Stationing
- Backwater
- Channel
- 1 mg/kg PCB Isopleth

NOTE:
1. Aerial imagery from MassGIS 2023.

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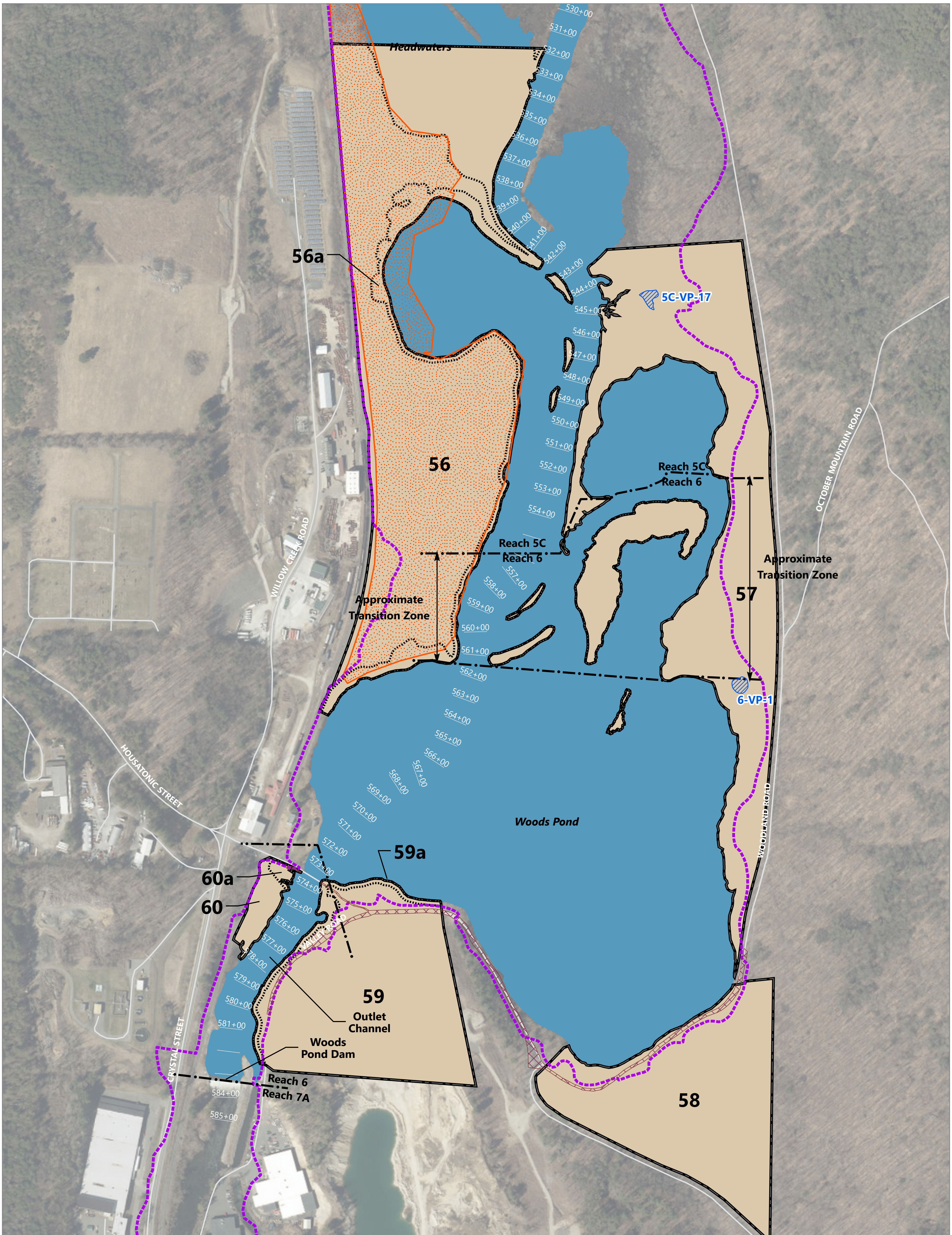
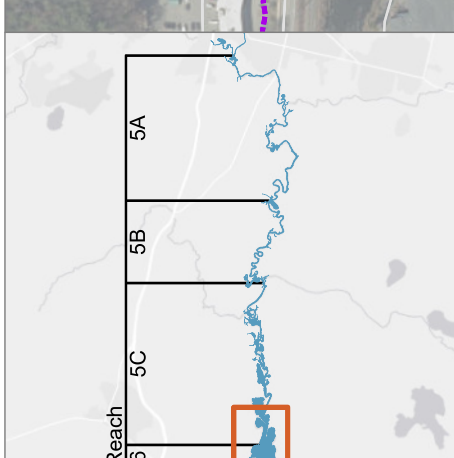
Figure 1-2
Reach 6 Site Map
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River – Rest of River





LEGEND:

- Housatonic River
- 0+00 River Stationing
- Reach Boundaries
- Exposure Area Boundary
- Exposure Subarea Boundary
- 1 mg/kg PCB Isopleth
- Frequently Used Sub-Area (FUSA)
- Vernal Pools (AECOM 2022)
- Core Area 1 Habitat

NOTE:
1. Aerial imagery from MassGIS 2023.

0 400
Feet

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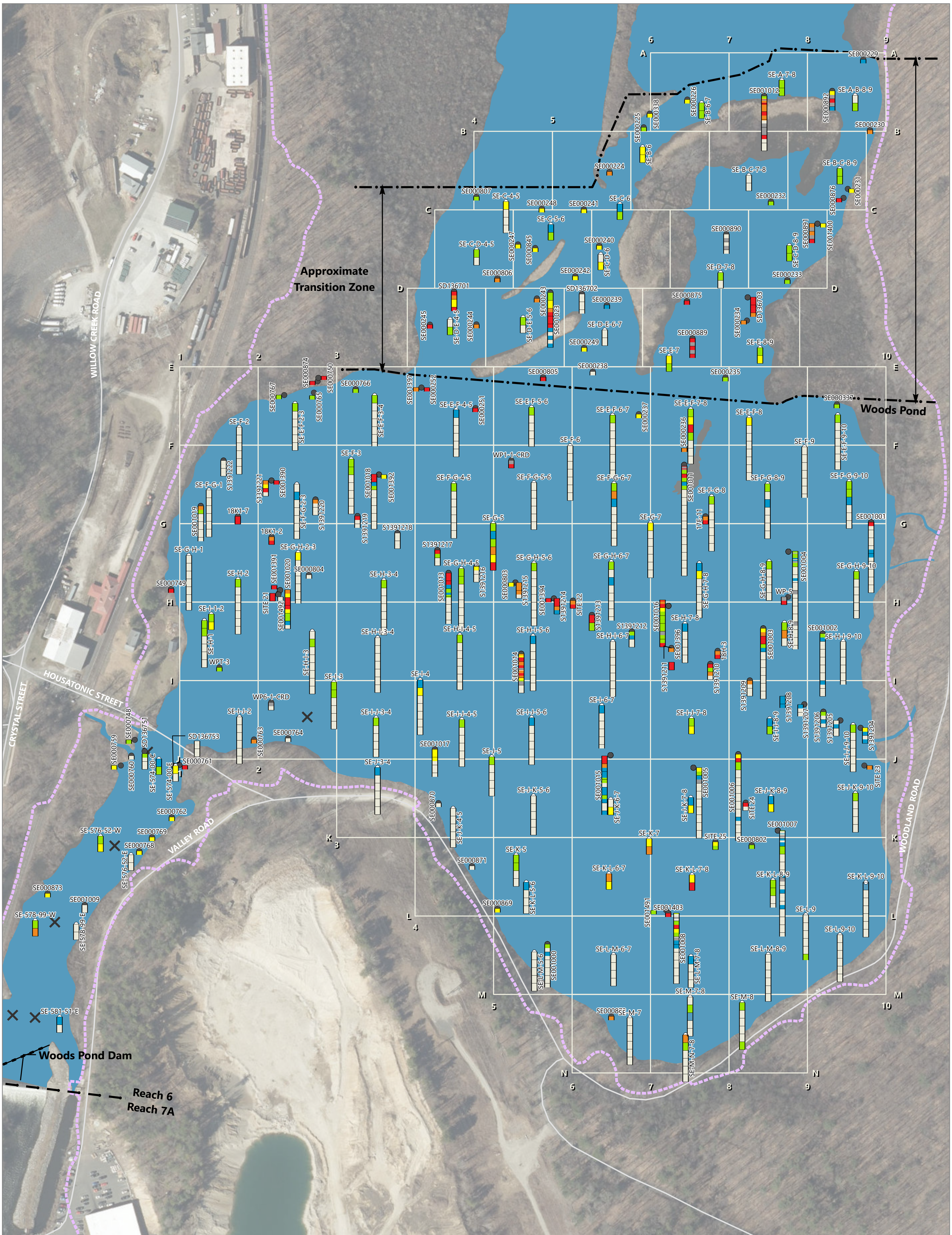
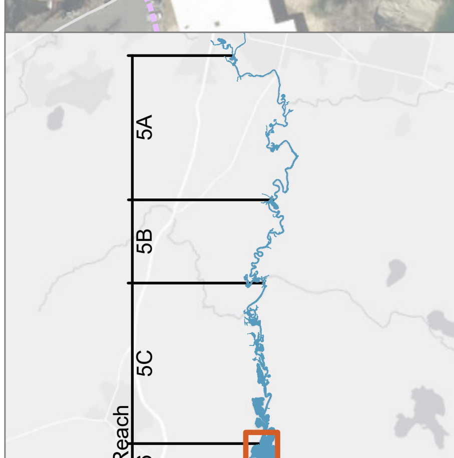
Figure 1-3
Exposure Areas, Subareas, and Frequently Used Subareas in Reach 6





LEGEND:

- Housatonic River
- 1 mg/kg PCB Isopleth
- 200-Foot PDI Sampling Grid
- Dam Safety Cable
- PDI Sediment Core Location
- Historical Sediment Sample Location
- Abandoned Core Location

Total PCBs (mg/kg)

- ≤ 1
- 1.1 - 2
- 2.1 - 10
- 10.1 - 25
- 25.1 - 50
- > 50
- No Data

NOTES:

1. Aerial imagery from MassGIS 2023.
2. mg/kg: milligram per kilogram
3. Sediment PCB data boxes represent 1-foot intervals; partial boxes represent intervals less than 1-foot.

0 300
Feet

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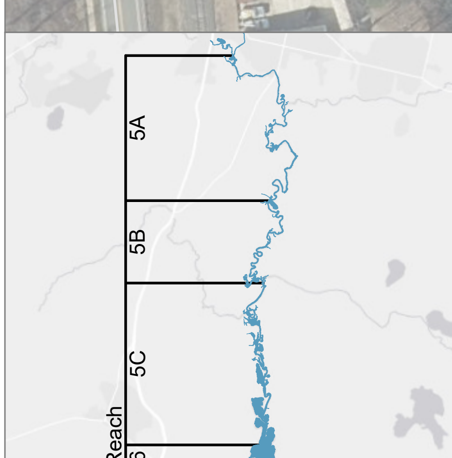
Figure 3-1
Reach 6 Historical and PDI Sediment Sampling Total PCB Results



LEGEND:

- Housatonic River
- Valley Mill Pond
- Dam Safety Cable
- Historical Sediment Sample Location

Total PCBs (mg/kg)

- ≤ 1
- 1.1 - 2
- 2.1 - 10
- 10.1 - 25
- 25.1 - 50
- > 50

NOTES:
1. Aerial imagery from MassGIS 2023.
2. mg/kg: milligram per kilogram
3. Sediment PCB data boxes represent 1-foot intervals; partial boxes represent intervals less than 1-foot.

0 150
Feet

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Figure 3-2
Valley Mill Pond Historical Sediment Sampling Total PCB Results
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River – Rest of River

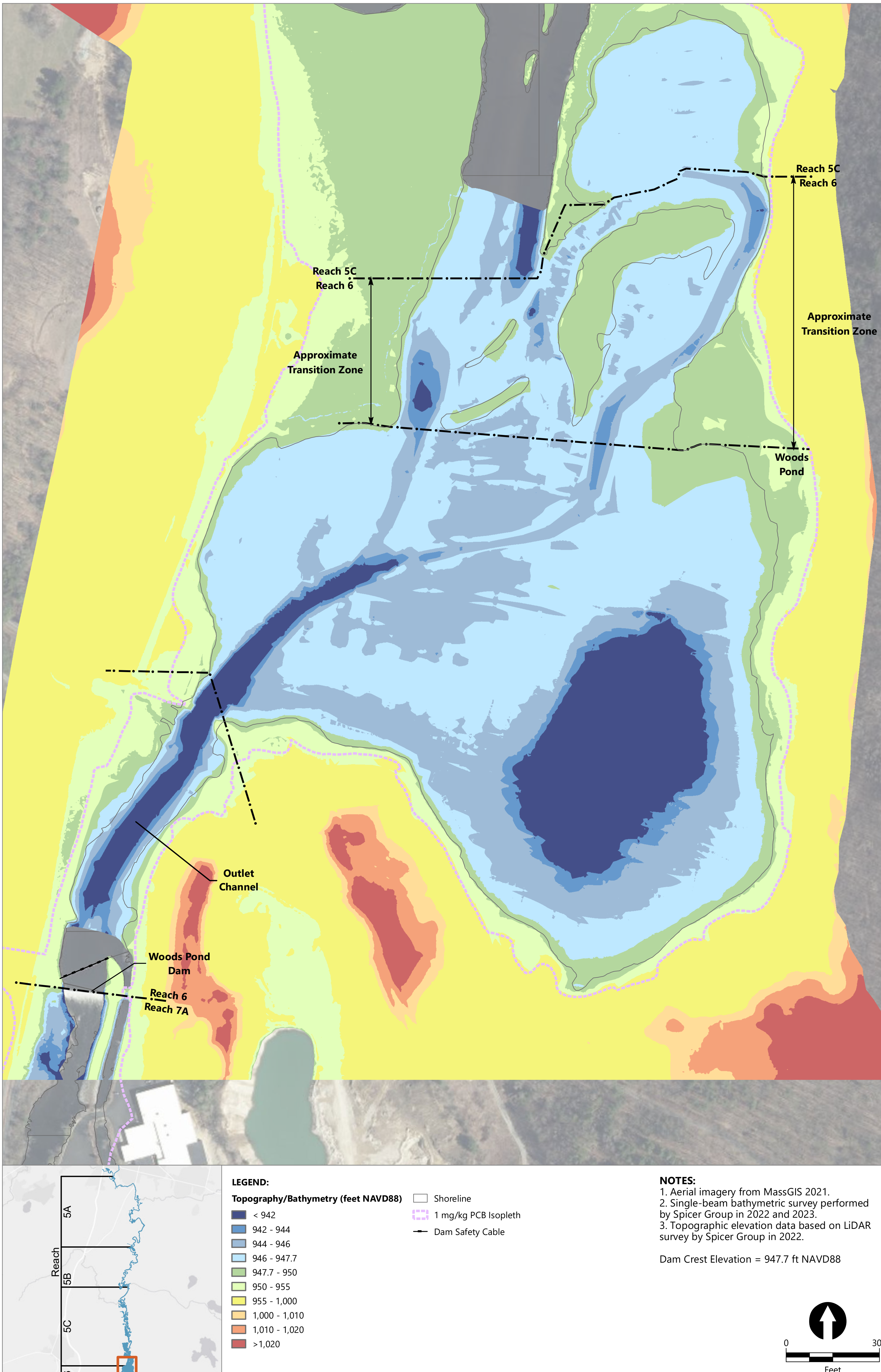

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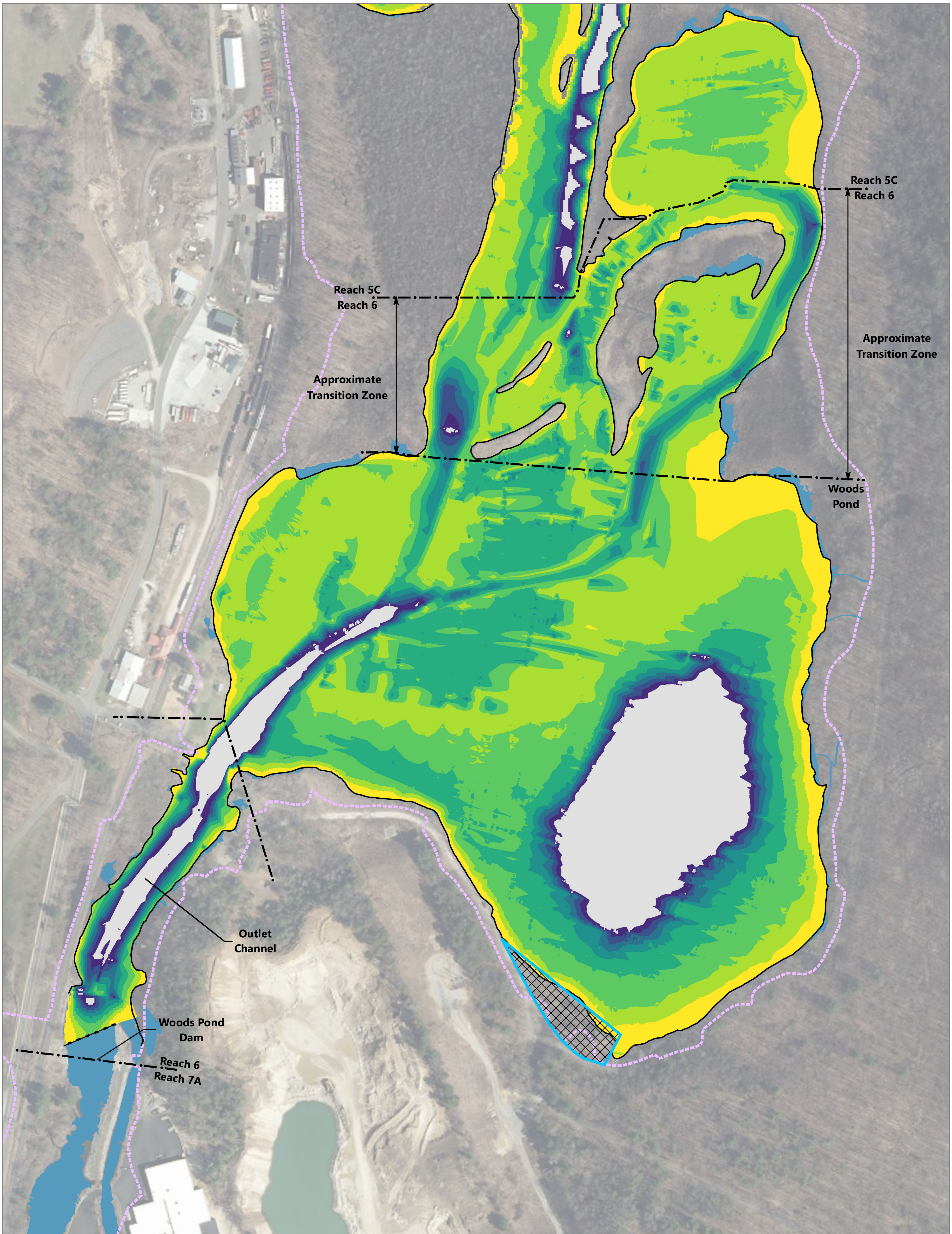
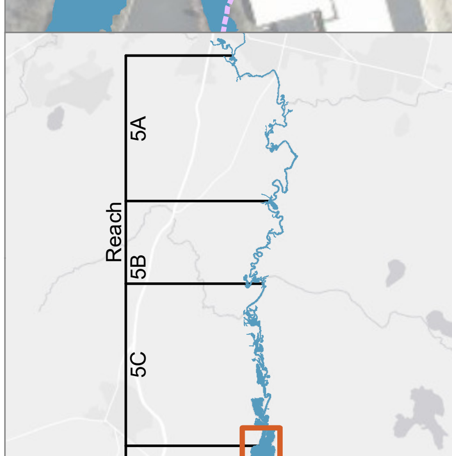
Figure 3-3
Reach 6 Topographic and Bathymetric Survey Data





LEGEND:

- Housatonic River
- 1 mg/kg PCB Isopleth
- Shoreline
- Dam Safety Cable
- Proposed Shoreline Support Facility

Water Depth (feet)

- At or Above Spillway Crest
- ≤ 1 foot Below Crest
- 1.1 - 2
- 2.1 - 3
- 3.1 - 4
- 4.1 - 5
- 5.1 - 6
- 6.1 - 7
- > 7 feet Below Crest

NOTES:

1. Aerial imagery from MassGIS 2021.
2. Bathymetric survey performed by Spicer Group in 2022 and 2023.
3. Water depths calculated below dam crest elevation of 947.7 feet NAVD88 (948.3 feet NGVD29).

0 300
Feet

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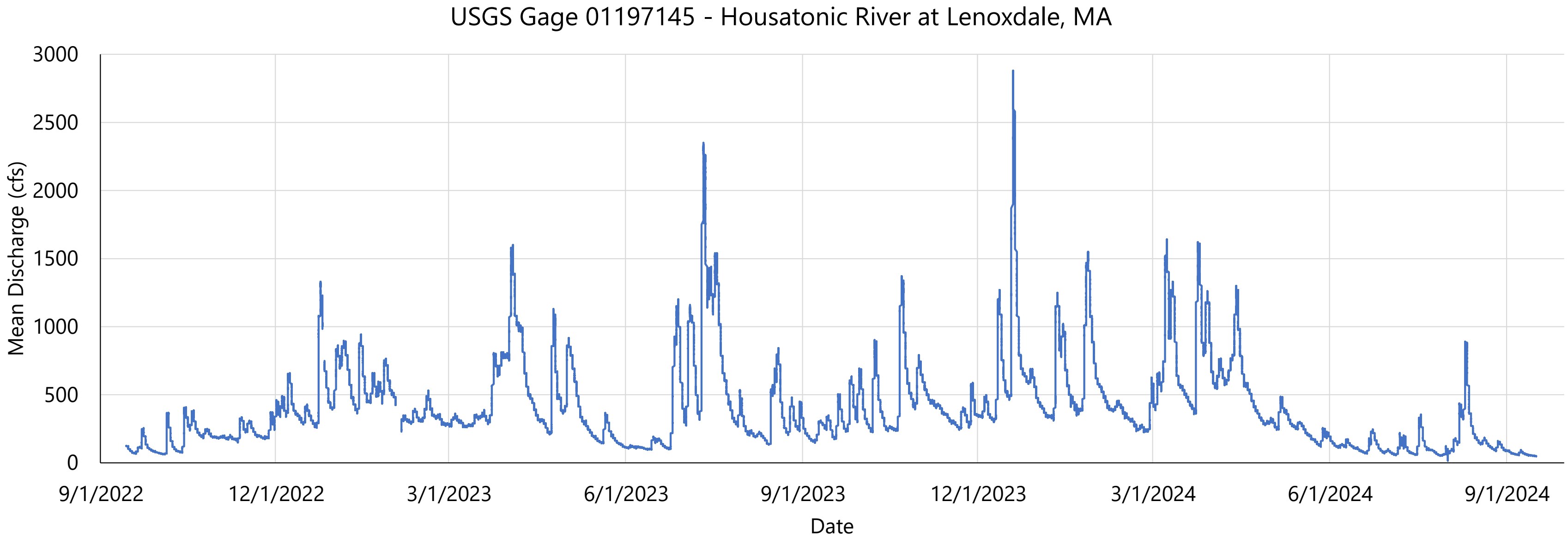
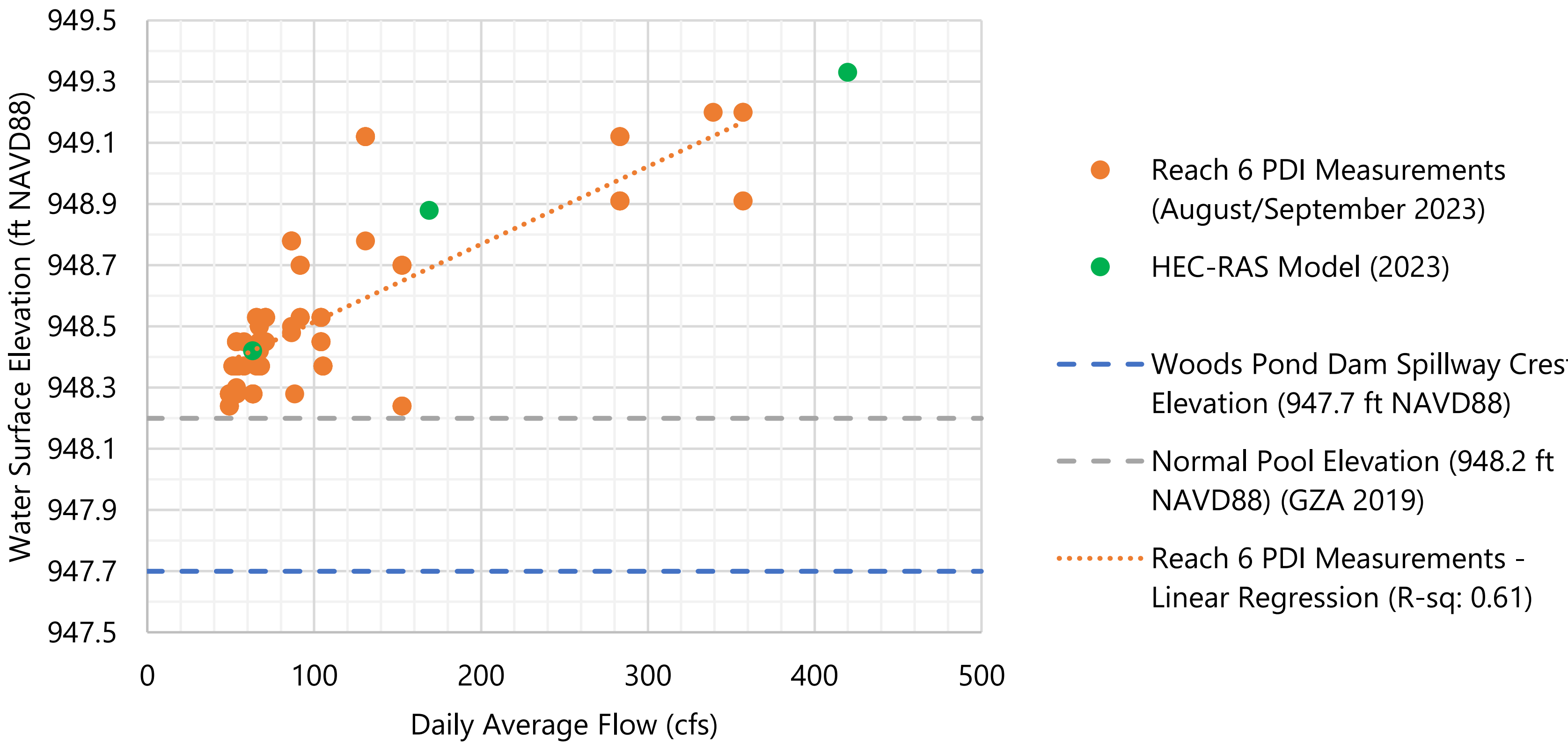
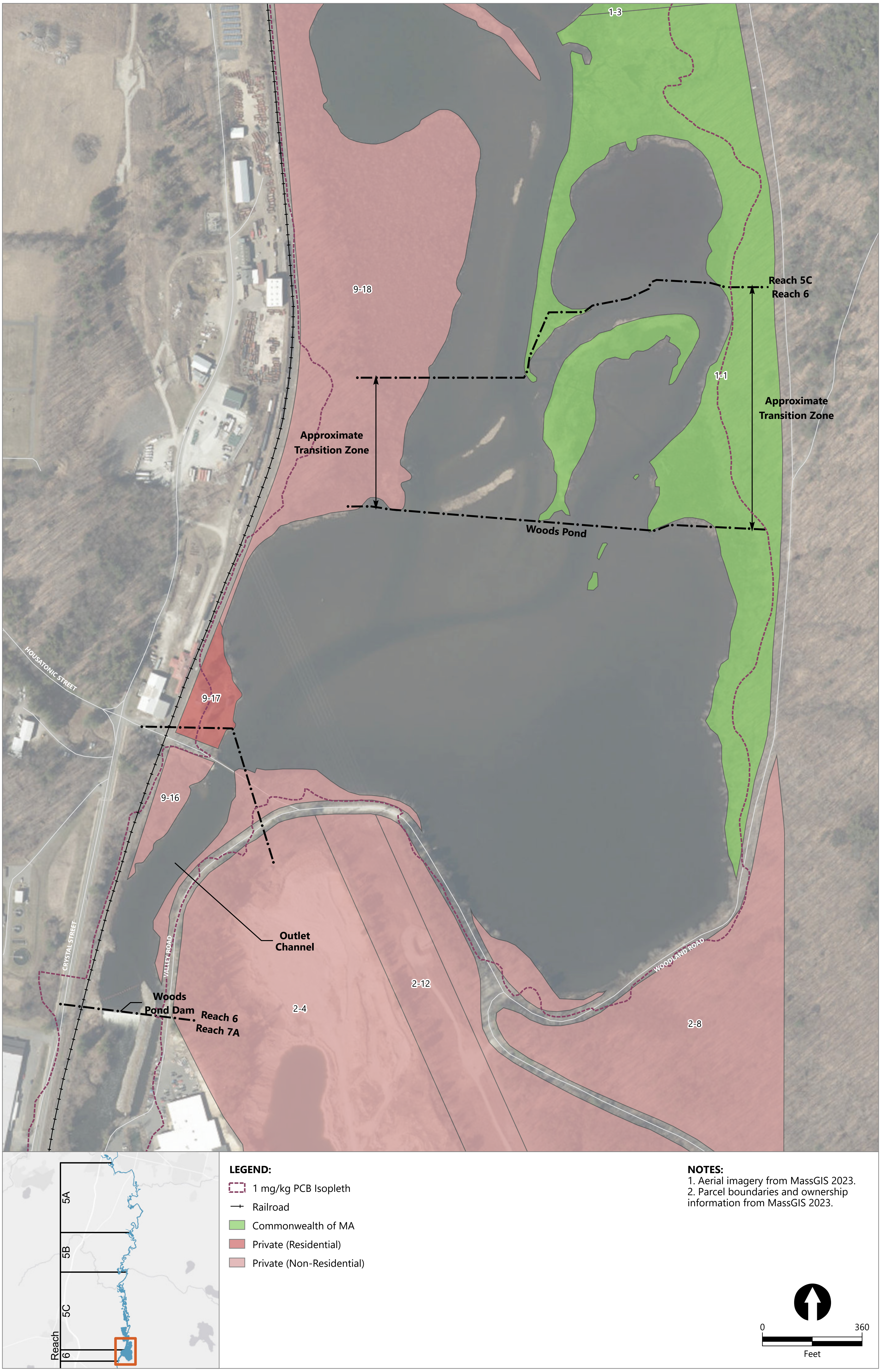
Figure 3-4
Reach 6 Water Depths Below the Woods Pond Dam Crest
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River - Rest of River



Notes:
The Lenoxdale gage (01197145) was installed by USGS in September 2022, in coordination with GE, and is located in Reach 7A, approximately 1,500 feet downstream of the Woods Pond Dam.
cfs: cubic feet per second
USGS: United States Geological Survey



Notes:
ft: feet
GZA 2019: *Operations, Monitoring, and Maintenance Plan for Woods Pond Dam* (GZA 2019)
HEC-RAS: Hydrologic Engineering Center's River Analysis System
NAVD88: North American Vertical Datum of 1988
PDI: Pre-Design Investigation



LEGEND:

- 1 mg/kg PCB Isopleth
- Railroad
- Commonwealth of MA
- Private (Residential)
- Private (Non-Residential)

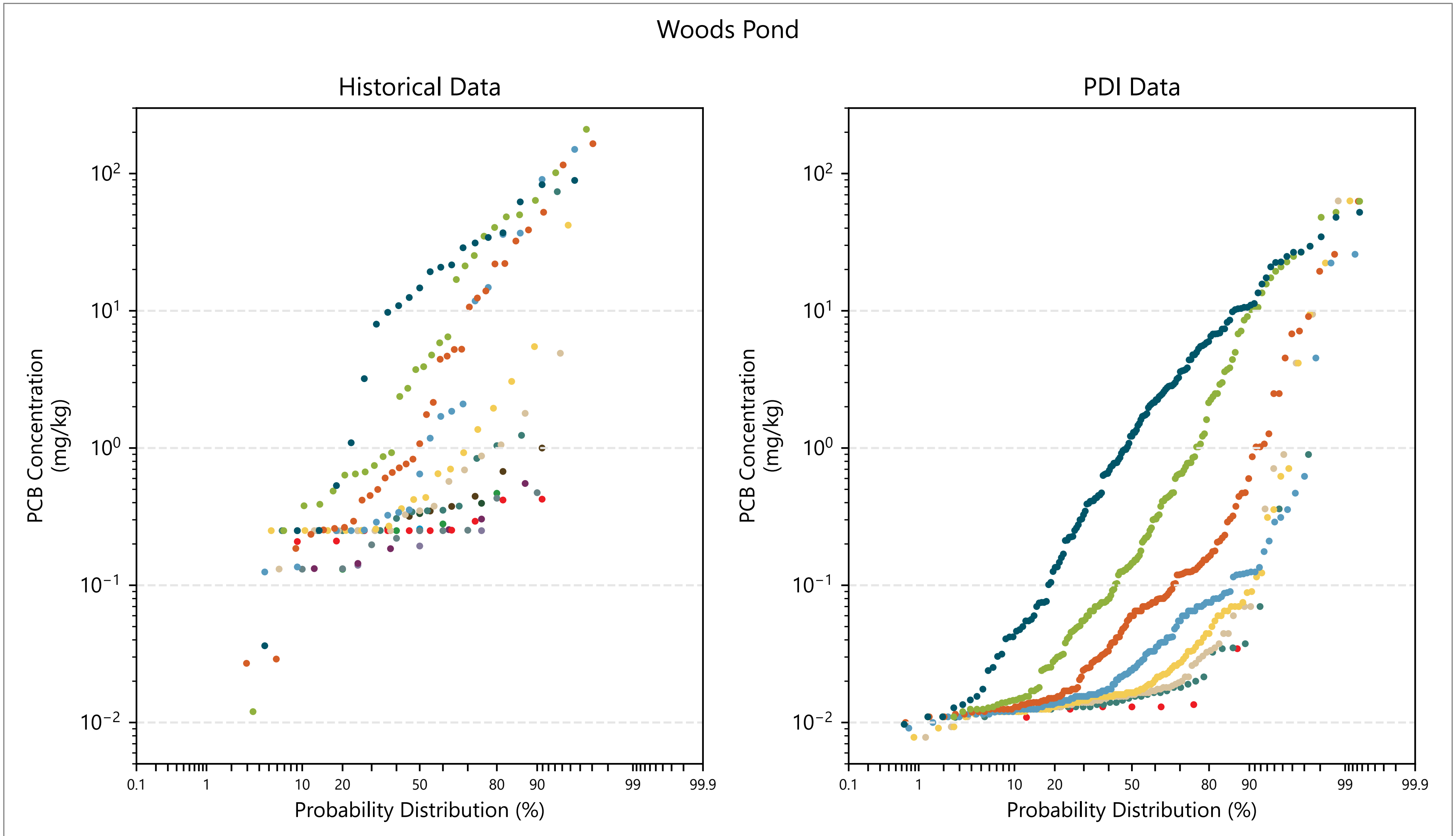
NOTES:
1. Aerial imagery from MassGIS 2023.
2. Parcel boundaries and ownership information from MassGIS 2023.

0 360
Feet

Publish Date: 2024/10/21, 3:41 PM | User: eiverson
Filepath: \\gstfile01\gis\Jobs\GE_0469\HousatonicRiver\Maps\Reports\R6RDWorkPlan\R6DRA_MainReport.aprx\Main Figure 3-7

ANCHOR QEA

Figure 3-7
Riparian Property Ownership in Reach 6
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River – Rest of River



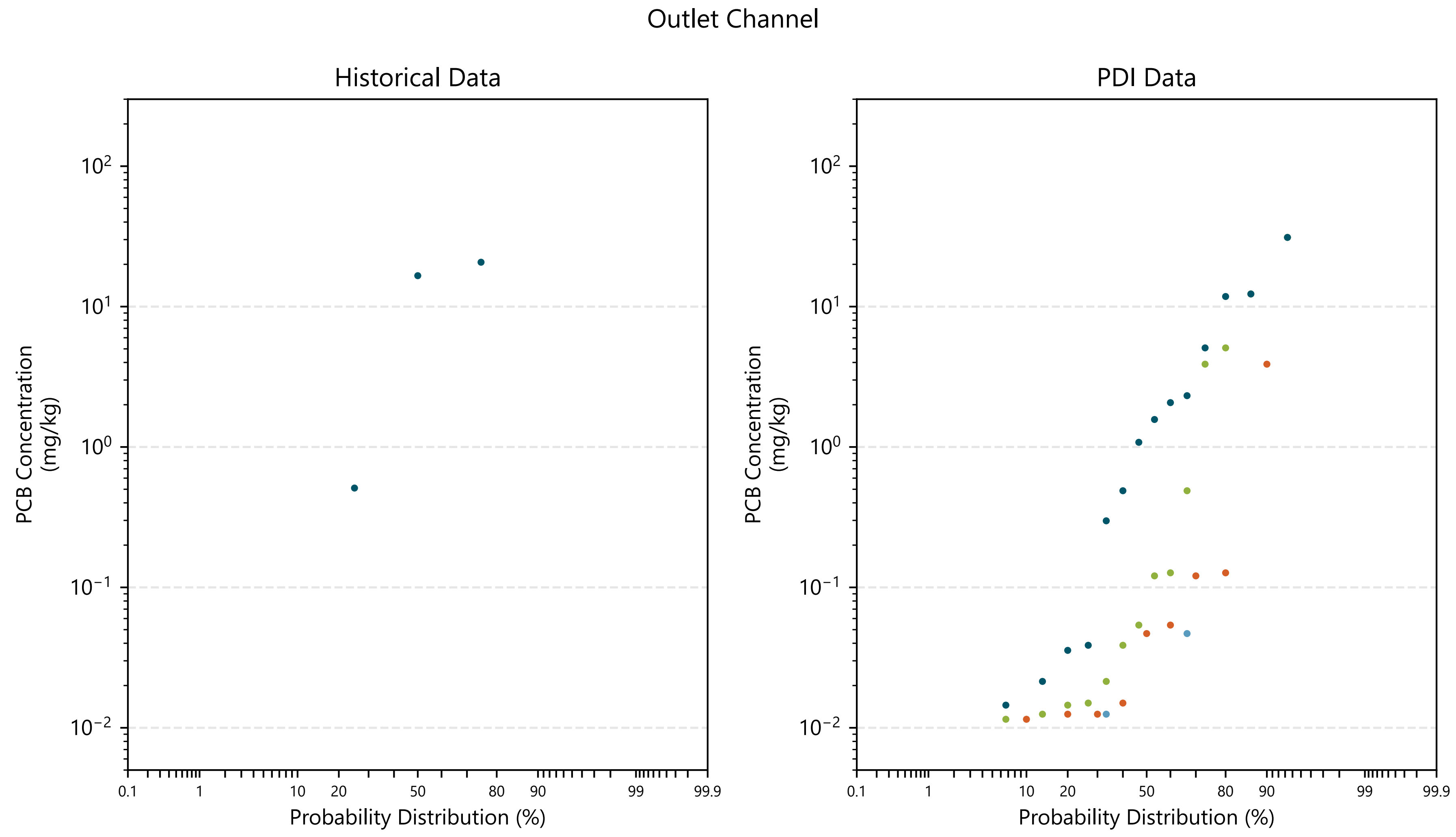
Non-detect values are plotted at half of the reporting detection limit.
Field duplicates are used for quality comparison and are excluded from plots.
Data is separated by start depth of sample. End depths of samples may extend beyond noted interval.
Historical samples with start and end depths that are no longer below the surface after applying bathymetric adjustments are excluded from the plot.
If a sample, after bathymetric adjustment, has any portion of its sampling interval that is still below the sediment surface, it was grouped and plotted based on its end depth.

0-1 feet	5-6 feet	10-11 feet
1-2 feet	6-7 feet	11-12 feet
2-3 feet	7-8 feet	12-13 feet
3-4 feet	8-9 feet	13-14 feet
4-5 feet	9-10 feet	14-15 feet

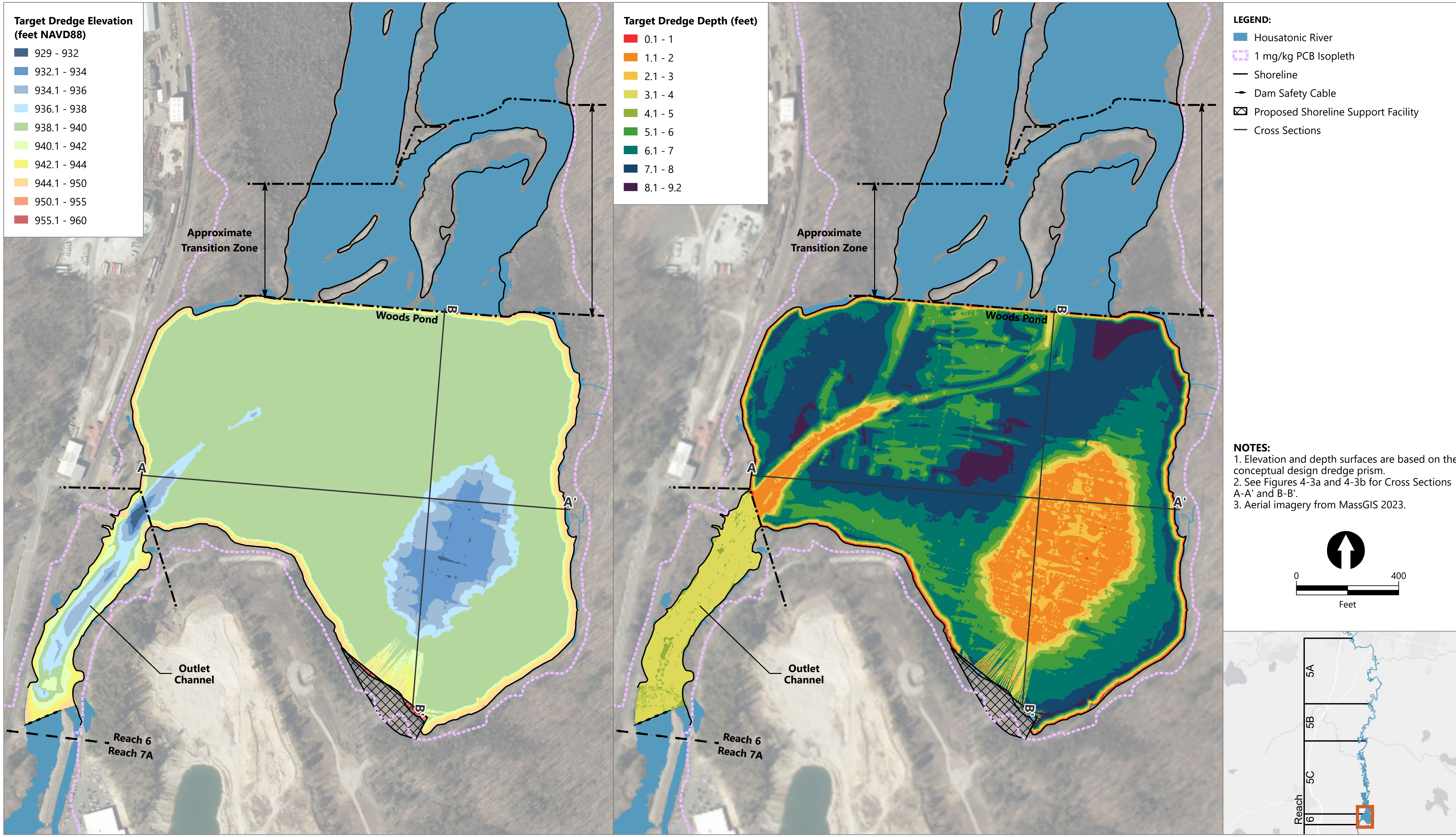
Publish Date: 07/26/2024 14:32 PM | User: SAR-AHER
\\wcl-fs1\Syracuse\Projects\GE\Housatonic_Rest-of-River\Remedial_Design\Reach_6-Woods_Pond\ANALYSIS\Sediment\Python\main.py

ANCHOR QEA

Figure 4-1a
Summary of Historical and PDI Sediment PCB Data in Reach 6
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River - Rest of River



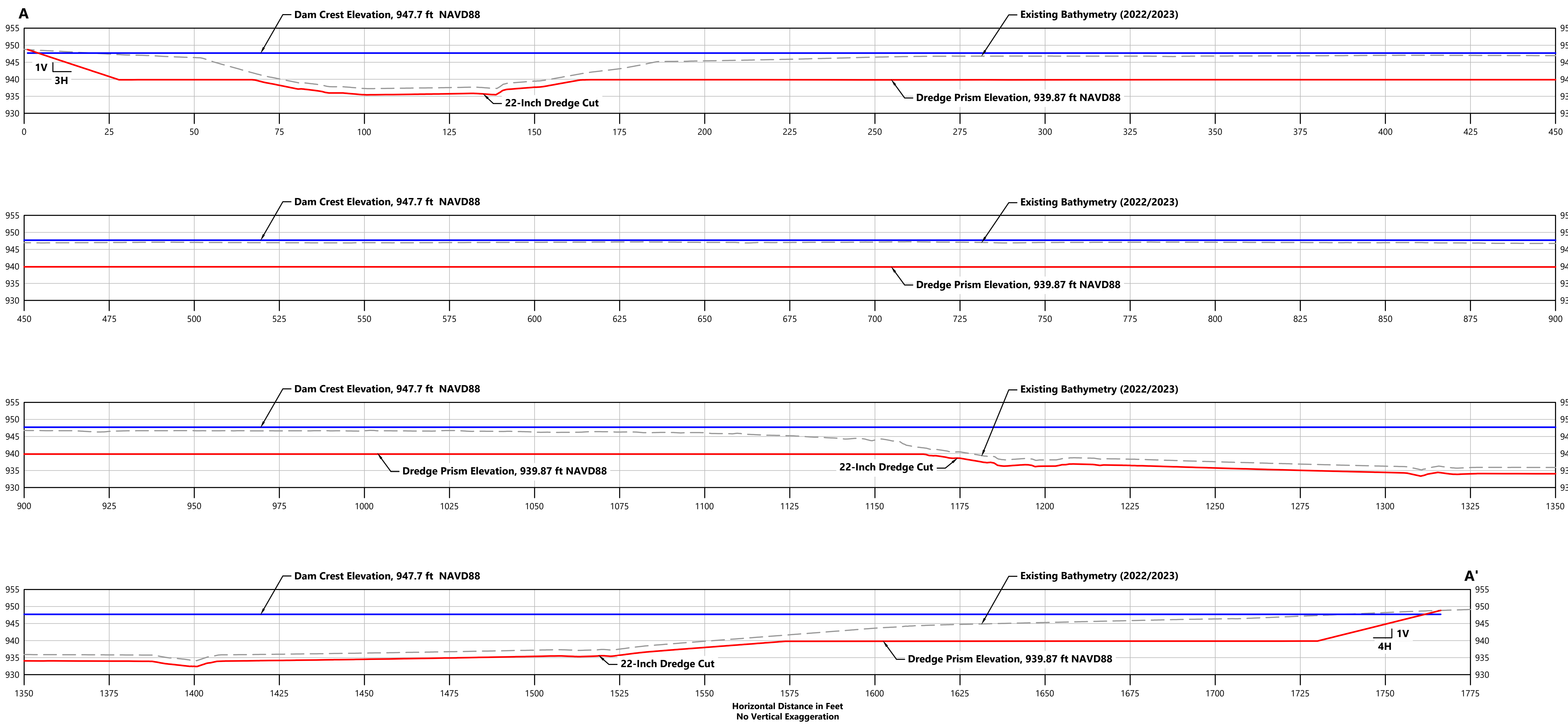
Non-detect values are plotted at half of the reporting detection limit.
Field duplicates are used for quality comparison and are excluded from plots.
Data is separated by start depth of sample. End depths of samples may extend beyond noted interval.
Historical samples with start and end depths that are no longer below the surface after applying bathymetric adjustments are excluded from the plot.
If a sample, after bathymetric adjustment, has any portion of its sampling interval that is still below the sediment surface, it was grouped and plotted based on its end depth.



Publish Date: 2024/10/23, 9:46 AM | User: eiverson
Filepath: \\gstfile01\GIS\Jobs\GE_0469\HousatonicRiver\Maps\Reports\R6RDWorkPlan\R6DRA_MainReport.aprx\Main Figure 4-2

ANCHOR QEA

Figure 4-2
Reach 6 Target Dredge Elevation and Depth
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River – Rest of River



HORIZONTAL DATUM: Massachusetts State Plane, Mainland Zone, NAD83, U.S. feet
VERTICAL DATUM: NAVD88

NOTES:
1. See Figure 4-2 for cross section location.
2. Conceptual dredge prism elevations are preliminary and may be subject to revision during final design. See Section 4.2.1.2 of the Conceptual RD/RA Work Plan for Reach 6.

LEGEND:

Existing Bathymetry (Spicer, 2022/2023)

Conceptual Dredge Prism (Anchor QEA, 2024)

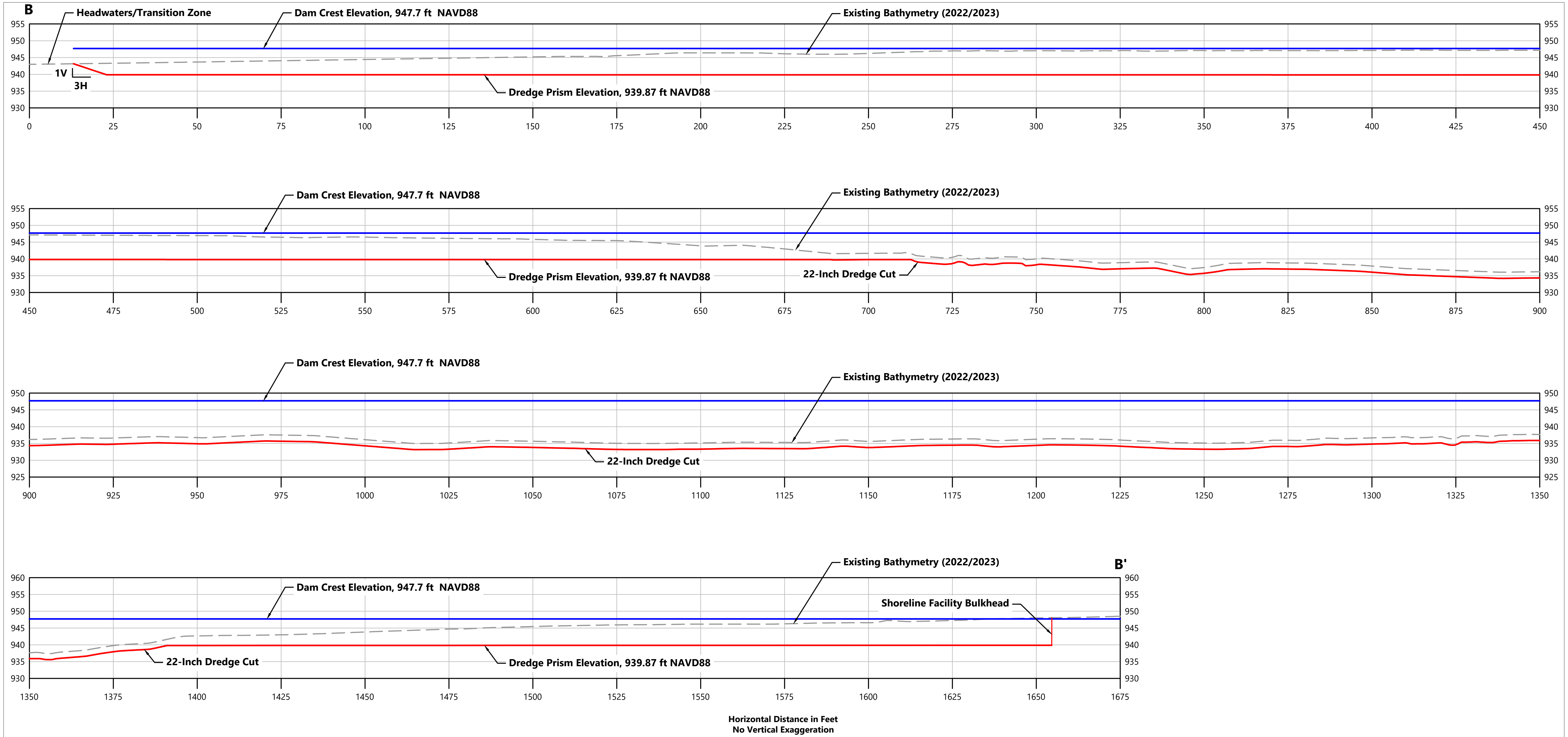
Woods Pond Dam Crest Elevation (947.7 feet NAVD88)

0 30
Feet

Publish Date: 2024/10/03 10:38 AM | User: cyard
Filepath: K:\Projects\0469-General Electric\Housatonic - Woods Pond PDI - Reach 6\0469-RP-044-Cross-Sections-Presentation.dwg Figure 4-3a

ANCHOR QEA

Figure 4-3a
Conceptual Dredge Prism Cross Section A-A'
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River - Rest of River



HORIZONTAL DATUM: Massachusetts State Plane, Mainland Zone, NAD83, U.S. feet
VERTICAL DATUM: NAVD88

NOTES:
1. See Figure 4-2 for cross section location.
2. Conceptual dredge prism elevations are preliminary and may be subject to revision during final design. See Section 4.2.1.2 of the Conceptual RD/RA Work Plan for Reach 6.

LEGEND:

Existing Bathymetry (Spicer, 2022/2023)

Conceptual Dredge Prism (Anchor QEA, 2024)

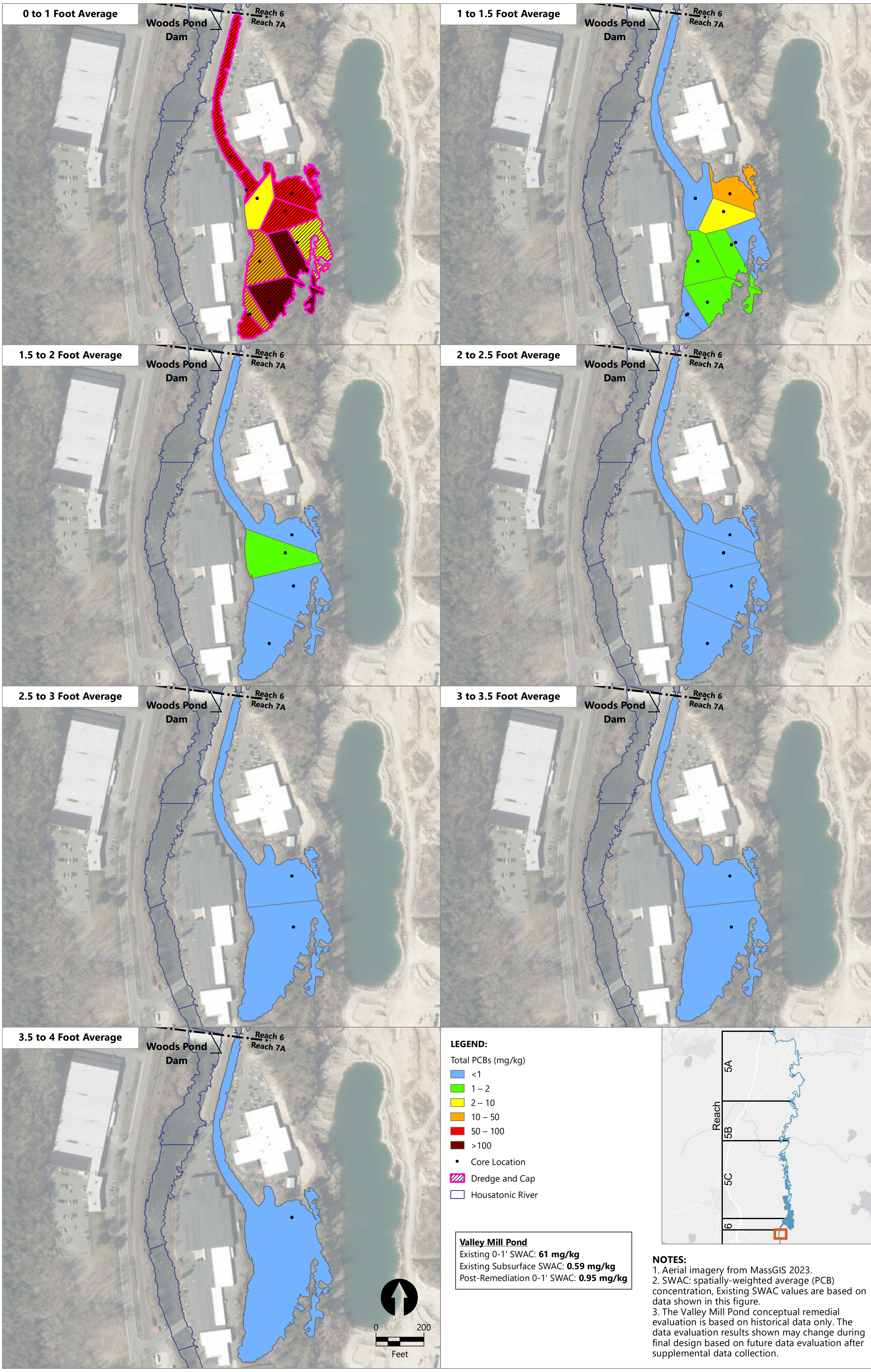
Woods Pond Dam Crest Elevation (947.7 feet NAVD88)

0 30
Feet

Publish Date: 2024/10/03 10:39 AM | User: cyard
Filepath: K:\Projects\0469-General Electric\Housatonic - Woods Pond PDI - Reach 6\0469-RP-044-Cross-Sections-Presentation.dwg Figure 4-3b

ANCHOR QEA

Figure 4-3b
Conceptual Dredge Prism Cross Section B-B'
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River - Rest of River



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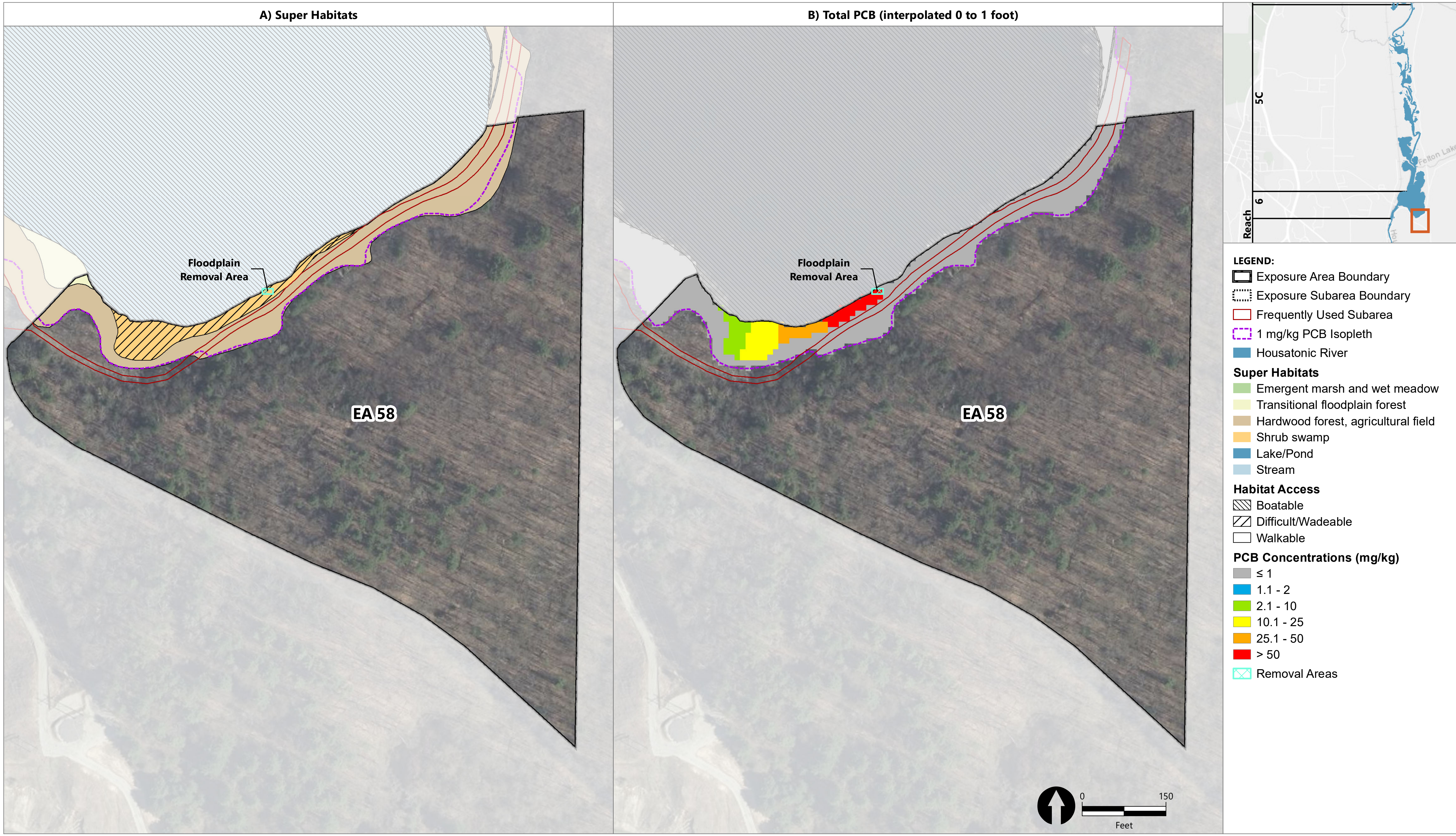
Filepath: \\GSTFile01\gis\Jobs\GE_0469\HousatonicRiver\Maps\Reports\R6RDWorkPlan\AQ_R6RDRA_Fig4-4_ValleyMillPond_TPs.mxd

ANCHOR QEA

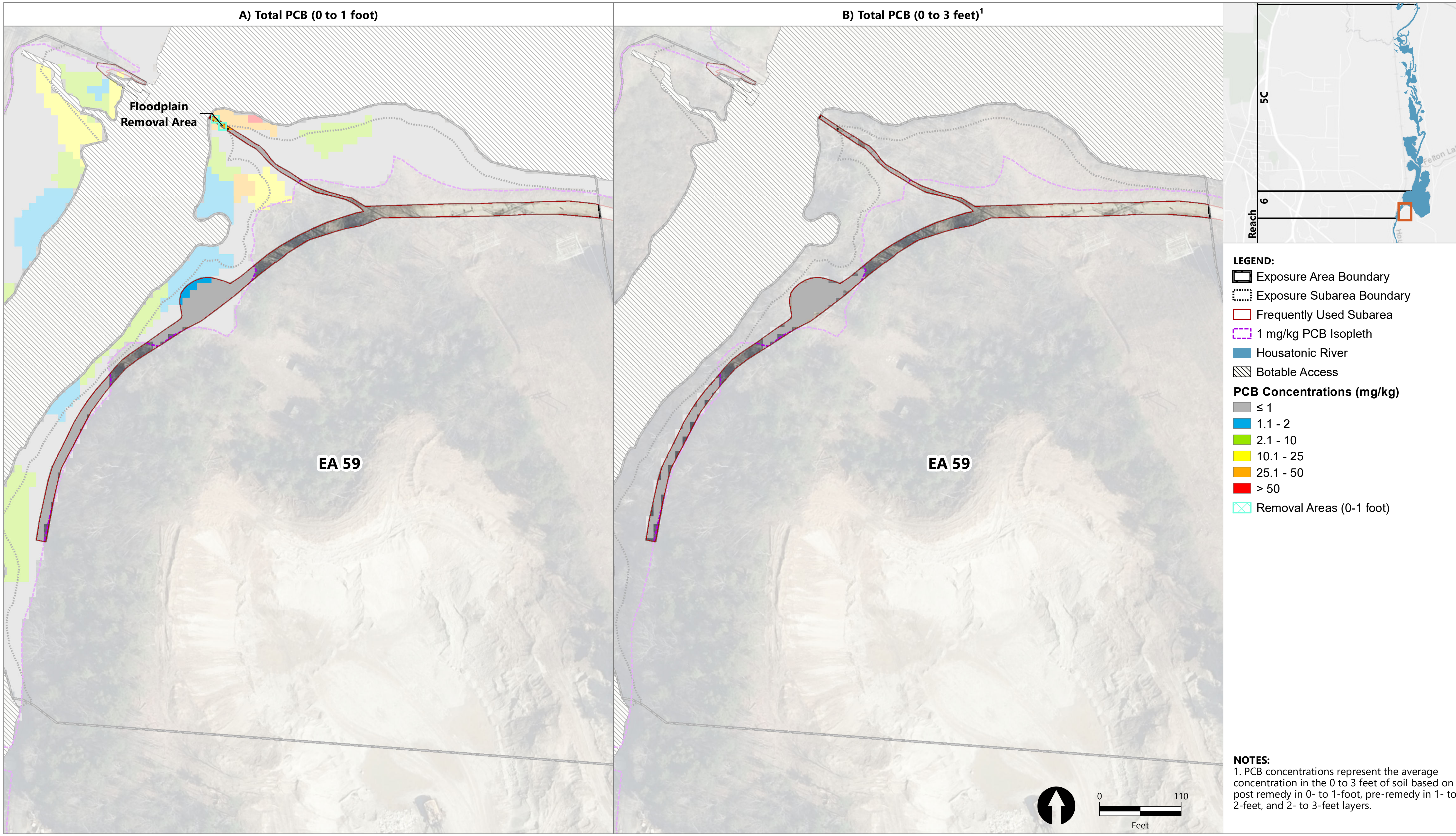
Figure 4-4
Valley Mill Pond Preliminary Remedial Extents and Sediment PCB Concentrations by Depth



Publish Date: 2024/10/21, 11:36 AM | User: mmathew
Filepath: \\gstfile01\gis\Jobs\GE_0469\HousatonicRiver\Maps\Reports\R6RDWorkPlan\NonResidential\R6_WP_Fig4-5a_EA58_wRemovalVolumes.mxd

ANCHOR QEA

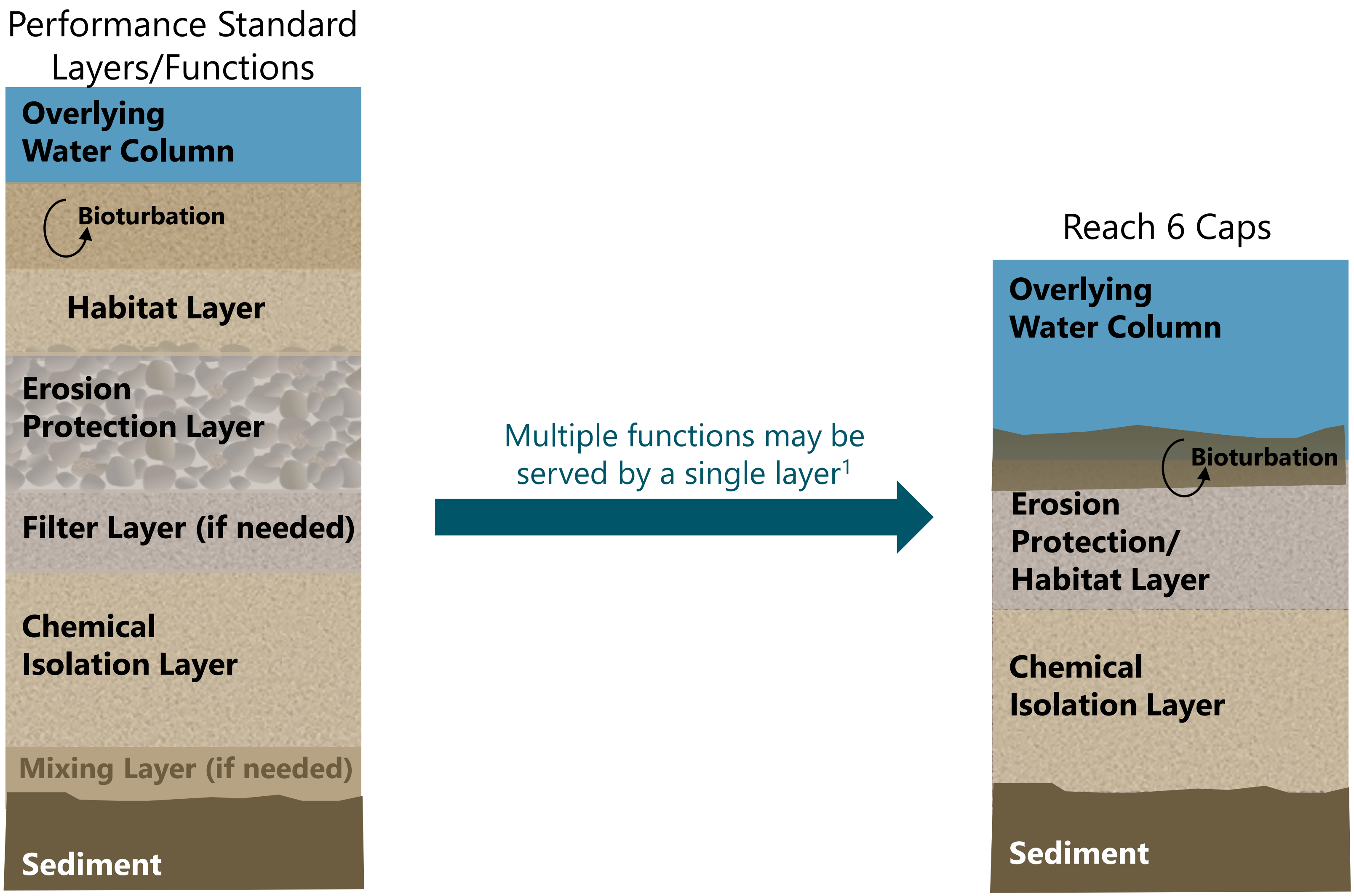
Figure 4-5a
Non-Residential Floodplain Preliminary Remediation Areas (Exposure Area 58)



Publish Date: 2024/10/21, 11:49 AM | User: mmathew
Filepath: \\gstfile01\gis\Jobs\GE_0469\HousatonicRiver\Maps\Reports\R6RDWorkPlan\NonResidential\R6_WP_Fig4-5b_FUSA_wRemovalVolumes.mxd

ANCHOR QEA

Figure 4-5b
Non-Residential Floodplain Preliminary Remediation Areas (Exposure Area 59)

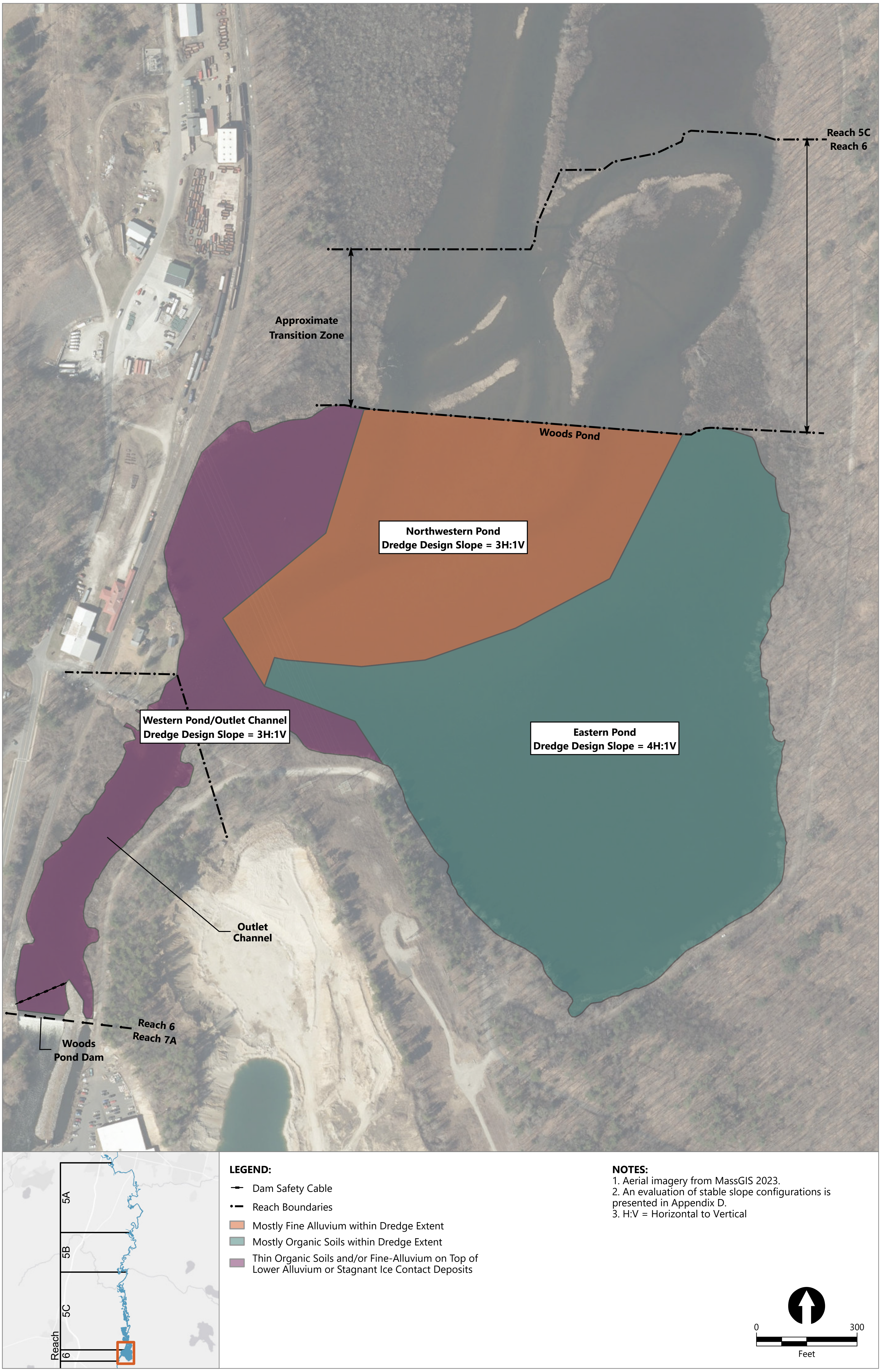


1. The Revised Final Permit indicates that a single layer may serve multiple functions, which is consistent with EPA (1998) guidance on cap design.

Filepath: \\WCL-FS1\Syracuse\Projects\GE\Housatonic_Rest-of-River\Remedial_Design\Reach_6-Woods_Pond\DOCUMENTS\Conceptual_RD_RA\Figures\Figure 5-1 Perf Stand Cap Design.pptx.pptx

ANCHOR QEA

Figure 5-1
Performance Standards and Conceptual Cap Design for Reach 6



NOTES:
1. Aerial imagery from MassGIS 2023.
2. An evaluation of stable slope configurations is presented in Appendix D.
3. H:V = Horizontal to Vertical

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Filepath: \\gstfile01\gis\Jobs\GE_0469\HousatonicRiver\Maps\Reports\R6RDWorkPlan\R6DRA_MainReport.aprx\Main Figure 5-2

ANCHOR QEA

Figure 5-2
Reach 6 Delineation of Stable Slope Configurations
Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Housatonic River – Rest of River

LEGEND:
- Backwater
- Channel
- 1 mg/kg PCB Isopleth
- Reach Boundaries
- Roads
- Proposed Shoreline Support Facility
- Proposed Woods Pond Rail Spur
- Proposed Woods Pond Loading/Unloading Area
- Approximate Limit of UDF Operational Area
- Approximate Limit of UDF Consolidation Area

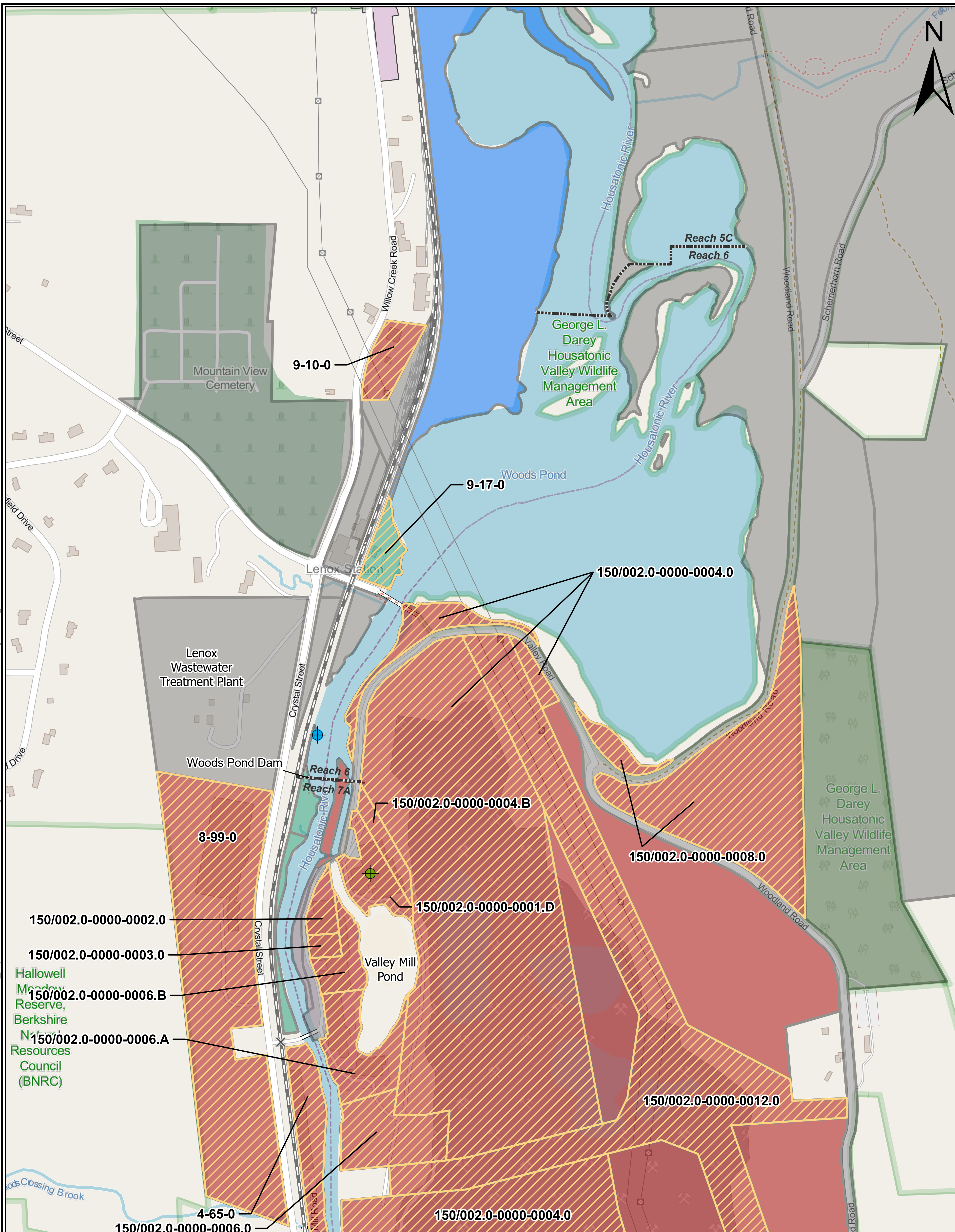
NOTE:
1. Aerial imagery from MassGIS 2023.
2. The potential hydraulic transport pipeline location from Woods Pond to the UDF is shown in Appendix E.
3. UDF: Upland Disposal Facility

0 500
Feet

Publish Date: 2024/10/22, 2:24 PM | User: eiverson
Filepath: \\gstfile01\GIS\Jobs\GE_0469\HousatonicRiver\Maps\Reports\R6RDWorkPlan\R6DRA_MainReport.aprx\Main Figure 5-3

ANCHOR QEA

Figure 5-3
Proposed Shoreline Support Facility, Woods Pond Rail Spur, and UDF Location



LEGEND

- WELL LOCATION
- NPDES DISCHARGE POINT
- REACH BOUNDARY
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- OTHER
- WATER WITHDRAWAL AND USES SURVEY SENT TO PROPERTY OWNER

NOTES:

1. PROJECTION: WGS 1984 WEB MERCATOR AUXILIARY SPHERE. MAP SCALE IS 1:7,680.
2. BASEMAP SOURCE: OPEN STREET MAP, ACCESSED 9/18/2024.
3. TAX PARCEL DATASET OBTAINED FROM MASSGIS AT: HTTPS://WWW.MASS.GOV/INFO-DETAILS/MASSGIS-DATA-PROPERTY-TAX-PARCELS
4. SHADED PARCELS REPRESENT PARCELS THAT ARE LOCATED IN REACHES 6 AND 7A WITHIN 500 FEET OF THE RIVER.

0 700 1,400

GRAPHIC SCALE IN FEET

GENERAL ELECTRIC COMPANY

CONCEPTUAL REMEDIAL DESIGN / REMEDIAL ACTION WORK PLAN FOR REACH 6

OUTREACH TO REACH 6 AND ADJACENT REACH 7A PARCELS WITHIN 500 FEET OF RIVER

ARCADIS

FIGURE **9-1**

Appendix A
PCB Evaluations for Sediment

Appendix A
PCB Evaluations for Sediment

1 Introduction

This appendix documents the polychlorinated biphenyl (PCB) evaluations conducted for the sediments in Reach 6. It covers the sediments in Woods Pond proper and the outlet channel,[1] as well as in Valley Mill Pond.[2] It includes an evaluation of historical data and the evaluation of proposed removal areas and volumes to achieve the applicable Performance Standards. This appendix repeats some of the discussion found in the *Pre-Design Investigation Summary Report for Reach 6* (PDI Summary Report; Anchor QEA 2024) and in the *Conceptual Remedial Design/Remedial Action Work Plan for Reach 6* (Conceptual RD/RA Work Plan) so this appendix can be reviewed as a standalone document.

Several investigations have been conducted since the late 1990s to characterize sediment PCB concentrations in Reach 6. These studies include sediment PCB data collected by the U.S. Environmental Protection Agency (EPA) as part of its Supplemental Investigation (SI) conducted between 1998 and 2002, data collected as part of a partitioning study conducted by EPA and the General Electric Company (GE) in 2001, and data collected by GE during the Reach 6 pre-design investigation (PDI) conducted in 2023. In addition, historical sediment investigations in Valley Mill Pond were conducted in 1980, 1990, and 2000. These data are used to support the dredging design and to evaluate on-site versus off-site disposal requirements for sediments to be removed from Reach 6.[3]

This appendix evaluates the following details related to the removal and disposal of sediments for Woods Pond and Valley Mill Pond:

- Historical and PDI sediment data used for the conceptual design evaluation and those historical data excluded from the evaluation;

[1] As discussed in the Conceptual RD/RA Work Plan (to which this is an appendix), GE has elected to defer the conceptual design for the Woods Pond headwaters portion of Reach 6 to a later addendum to the Final RD/RA Work Plan for Reach 6. Accordingly, that portion of Reach 6 has not been included in the evaluations presented in this appendix.

[2] GE has elected to include Valley Mill Pond in the scope of conceptual design for Reach 6. While technically located in Reach 7A, this pond is hydraulically connected to Reach 6 through a diversion channel that bypasses the dam. Given the pond's location and hydraulic connection to Reach 6, GE has determined that it is appropriate to include this area as part of the Reach 6 Remediation Unit (RU) rather than deferring it to future remediation activities to be performed in the Reach 7 RU.

[3] As provided in Attachment E to the Revised Final Permit (EPA 2020), for all reaches except Reaches 5A and 5C, including Reach 6, relevant data from the Resource Conservation and Recovery Act Facility Investigation (RFI) Report are to be used (in addition to PDI data) to support the evaluation on-site versus off-site disposal requirements.

- The proposed remediation, including the removal of sediment followed by the placement of an engineered cap, as required by the final revised modification of GE's Resource Conservation and Recovery Act Corrective Action Permit (Revised Final Permit) for the Housatonic Rest of River; and
- Methods used to determine the segregation of the dredged sediment that will be subject to disposal at the Upland Disposal Facility (UDF) from those subject to disposal at an off-site disposal facility.

Section 2 discusses the data and proposed remediation plan for Woods Pond and the outlet channel. Section 3 discusses the data and proposed remediation plan for Valley Mill Pond.

2 Woods Pond and Outlet Channel

2.1 Sediment Data

Between 1998 and 2002, EPA conducted systematic and discrete sediment sampling during its SI to delineate the nature and extent of PCBs in sediment, to facilitate EPA's human health and ecological risk assessments, and to facilitate EPA's modeling study. That sampling program resulted in the collection of 628 sediment samples from varying depths up to 14 feet below mudline at 107 locations within Reach 6. In addition, GE and EPA jointly collected PCB sediment samples as part of a partitioning study conducted for Reaches 5 and 6 in 2001. As part of that sampling program, 12 sediment samples were collected from zero to six inches below mudline at 12 core locations in Reach 6.

Pursuant to Condition No. 3a of EPA's conditional approval letter for the *Pre-Design Investigation Work Plan for Reach 6* (Anchor QEA 2022), a data usability assessment was conducted to identify which, if any, historical data are not considered appropriate for use in the disposal evaluation. Bathymetric survey data collected by CR Environmental, Inc. (CRE 1998), were used to estimate the surface elevation at each historical sediment sampling location.[4] Table 1 compares the 1998 surface elevation to the existing PDI bathymetry at each core location to evaluate changes in elevation over time. Based on that evaluation, 11 sample intervals from 10 locations were identified as being entirely above the existing bathymetry. As a result, those samples were excluded from the conceptual design data evaluations as they are believed to represent sediment that has been disturbed. In addition, 13 samples from 13 locations were identified as being partially above the existing bathymetry. The depth intervals associated with those samples were adjusted as appropriate such

[4] The 1998 bathymetric survey was based on water depth measurements collected by CRE on December 3, 1998; the survey data were not tied to any survey datum. To support the Reach 6 conceptual design, the Reach 6 water depth surface prepared by CRE was converted to a sediment elevation surface assuming a water surface elevation of 948.2 feet North American Vertical Datum of 1988 (NAVD88; i.e., the normal pool elevation at Woods Pond Dam, which is 0.5 foot of water above the crest of Woods Pond Dam) at the time of surveying.

that the disposal volume calculations (Section 2.3) excluded the portion of the sample interval above the existing bathymetry. As a result, historical data collected by EPA and GE from 1998 to 2002 (213 samples from 67 locations) have been included in the sediment evaluations to support the dredging design and evaluate on-site versus off-site disposal requirements for sediments to be removed from Woods Pond proper and the outlet channel.

As part of the Reach 6 PDI conducted in 2023, GE performed sediment sampling to support the dredging design process and to evaluate on-site versus off-site disposal requirements for sediments to be removed from Reach 6. A total of 494 samples from 84 locations were collected from Woods Pond and the outlet channel. A comprehensive summary of the PDI sediment sampling activities and results is provided in the PDI Summary Report.

Figure 1 shows the historical and PDI sediment PCB data used for the conceptual design evaluation.

2.2 Proposed Remediation Plan

The Revised Final Permit provides that sediment throughout Woods Pond will be removed and an engineered cap placed such that the post-capping minimum water depth is six feet, measured from the crest of Woods Pond Dam (947.7 feet North American Vertical Datum of 1988 [NAVD88]). An exception applies to nearshore areas, where the slope from the shore to the six-foot water depth will be as steep as possible while still being able to maintain stability and resist erosion or sloughing. The Revised Final Permit also provides that, in areas deeper than six feet prior to remediation, sufficient sediment will be removed to allow for the placement of an engineered cap so the final grade is at least as deep as the original grade. This section summarizes the proposed remediation plan; additional details are provided in Section 4.2.1.2 of the Conceptual RD/RA Work Plan.

The volume of sediments to be removed from Woods Pond is dependent on several factors, including the current bathymetry elevations (based on 2022 and 2023 survey data), the crest elevation of Woods Pond Dam (i.e., 947.7 feet NAVD88), the thickness of the engineered cap that will be placed (including assumed cap overplacement allowances), and the depth of dredged material removed from below the target dredge prism (i.e., overdredging). Because the engineered cap design will not be completed for several years after dredging, a preliminary engineered cap evaluation (Appendix C to the Conceptual RD/RA Work Plan) was conducted as part of the conceptual design to estimate the total engineered cap thickness. In accordance with the Revised Final Permit and typical cap design practices, the engineered cap design will need to account for overplacement allowances, with additional sediment removal, for each layer (i.e., three inches for each six-inch cap layer and six inches for the 18-inch cobble armor layer planned in the outlet channel). The conceptual sediment removal design also assumes an average of four inches for overdredging below the target dredge prism.

Based on the assumptions outlined above, the sediment removal thickness to accommodate placement of a cap for Woods Pond is estimated to be 22 inches. For the outlet channel, the sediment removal thickness is estimated at 46 inches.[5]

Using the assumptions summarized above, a "neat" dredge surface was developed by applying the following removal depths and elevations:

- In areas of Woods Pond where the existing bathymetry is less than six feet below the dam crest elevation of 947.7 feet NAVD88 (i.e., above 941.7 feet NAVD88), the "neat" dredge surface elevation was set at elevation 939.87 feet NAVD88 (i.e., 22 inches below elevation 941.7 feet NAVD88). This results in variable sediment removal thicknesses below the existing bathymetry.
- In areas of Woods Pond where the existing bathymetry is six feet or more below the dam crest elevation of 947.7 feet NAVD88 (i.e., at or below 941.7 feet NAVD88), the "neat" dredge surface elevations were set to 22 inches (1.83 feet) below the existing bathymetry elevations.
- In the outlet channel, the "neat" dredge surface elevations were set to 46 inches (3.83 feet) below the existing bathymetry elevations.

After generating the "neat" dredge surface, an engineered dredge prism was developed to incorporate stable nearshore slopes and estimate sediment removal volumes for this conceptual design phase. According to Section II.B.2.e of the Revised Final Permit, sediment removal in the nearshore areas of Woods Pond will be sloped to be as steep as possible, while also being stable and not subject to erosion or sloughing. Based on a geotechnical slope stability evaluation (Appendix D to the Conceptual RD/RA Work Plan), slope configurations of 4 horizontal to 1 vertical (4H:1V) and 3H:1V slopes were used in the conceptual engineered dredge prism for the eastern and western sides of Woods Pond, respectively. These slope configurations were used to develop the conceptual engineered dredge prism for Woods Pond by adjusting the target removal elevations from the shore down to the "neat" dredge surface at these slope angles. In addition, the conceptual engineered dredge prism includes a 3H:1V transitional slope from the existing bathymetry elevations at the boundary between the headwaters transition zone down to the "neat" dredge surface in Woods Pond proper.

[5] Based on the PDI probing and sampling, certain portions of the outlet channel may have less than 46 inches of sediment present. GE will conduct additional investigations as part of the supplemental data collection program to better understand the locations and depths of sediment in the outlet channel. For this conceptual design, the estimated sediment removal volumes assume that 46 inches of sediment can be removed from the outlet channel. This may be subject to change during final design.

2.3 Disposal Evaluation

Off-site disposal is required for sediment that is represented by a three-dimensional polygon associated with a single vertical core that has an average PCB concentration greater than or equal to 100 milligrams per kilogram (mg/kg). This criterion is evaluated as the depth-weighted average PCB concentration for each location, which is calculated using the depth intervals that correspond to the targeted depth of removal associated with each core location. In addition, the Revised Final Permit states that Reach 6 sediments to be disposed of in the UDF must have a volume-weighted average PCB concentration of less than or equal to 25 mg/kg.

Thiessen polygons were generated for each sampled location and depth interval using the historical and PDI sediment data. Historical PCB data were processed into one-foot depth-weighted intervals to be consistent with the one-foot sampling intervals in the PDI data set. The sizes and shapes of the Thiessen polygons vary based on data availability for each sample location and depth interval. Thiessen polygon extents are generated for each depth interval using only locations where data are available at that depth. A series of figures were prepared showing the Thiessen polygons and PCB concentrations for Woods Pond and the outlet channel for each one-foot removal depth interval (i.e., 0- to 1-foot, 1- to 2-foot, and so forth down to 10 feet). These figures are presented as Figures 2a and 2b.

The Thiessen polygons were converted to a one-foot by one-foot raster grid for each depth interval. The target dredge depth, based on the engineered dredge prism, was then used to calculate a depth-weighted average PCB concentration for each grid cell using that raster grid (Figure 3). As shown on Figure 3, there are no core locations with depth-weighted average PCB concentrations that exceed 100 mg/kg.

The volume-weighted average PCB concentration was calculated using the target dredge depth and depth-weighted average PCB concentration for each grid cell. The estimated volume-weighted average PCB concentration of the sediments targeted for removal is approximately 3.5 mg/kg, which is well below the 25 mg/kg criterion for disposal in the UDF. Based on these evaluations using the historical data and PDI data, all sediment removed from Woods Pond and the outlet channel will be transported to the UDF for disposal.

3 Valley Mill Pond

3.1 Sediment Data

Historical sediment investigations in Valley Mill Pond were conducted in 1980, 1990, and 2000. Sediment samples were collected at 11 locations at varying sample depth intervals up to a total depth of four feet below mudline, resulting in a total of 44 samples for PCB characterization.

Valley Mill Pond was not included in the scope of the Reach 6 PDI; however, supplemental PCB data will be collected in this area consistent with requirements for PDI sampling in backwaters (i.e., 50-foot grid sampling) prior to final design.

3.2 Proposed Remediation Plan

The Revised Final Permit did not establish specific Performance Standards or other requirements for this area; therefore, GE has elected to evaluate it against the Performance Standards for backwaters given that this area is separate from, but hydraulically connected to, the main river channel. The data evaluation presented in this section will be revised during final design after completion of supplemental data collection. Accordingly, the conclusions from this section may change during final design based on the future data evaluation.

The preliminary remediation footprint required to achieve a spatially weighted average PCB concentration in the surficial 0 to 1 foot of sediment was delineated through a "hill topping" exercise (i.e., removal of Thiessen polygons sequentially from high to low concentration, with the original concentration value replaced with a concentration equal to 1% of the existing average surface sediment PCB concentration) until an average PCB concentration of 1 mg/kg in surface sediments was achieved. Based on this evaluation, removal and capping would be required at all but one historical sampling location (S18S5).

For the subsurface depth interval, the average PCB concentration was calculated by applying a concentration equal to 1% of the existing average surface sediment PCB concentration to subsurface polygons located beneath the surface cap. The resulting post-cap subsurface PCB concentration is 0.59 mg/kg (i.e., below 1 mg/kg). A detailed summary of the post-cap spatially weighted average PCB concentration calculations is provided in Table 2. In this table, orange-highlighted cells indicate locations where surficial remediation (i.e., removal of the top foot of sediment followed by cap placement) would be required to achieve the 1 mg/kg spatial average criterion based on the historical data. Cells with blue-gray shading indicate the historical sampling location (S18S5) where no surface remediation would be required. The estimated post-remediation surface spatially weighted average PCB concentration is 0.95 mg/kg.

Figure 4 shows the preliminary limits of the removal and cap area required to achieve the 1 mg/kg spatial average criteria in surface sediment. A total of 4.2 acres is identified for remediation in Valley Mill Pond, which accounts for 91% of the total area of the pond, including the channel extending north toward Woods Pond Dam. The estimated volume of sediments to be removed from Valley Mill Pond is approximately 6,700 cubic yards (cy), based on a minimum removal depth of one foot. Factoring the same cap overplacement and overdredging assumptions described in Section 2.2, the total estimated removal thickness would be 22 inches and results in an estimated sediment removal volume of approximately 12,300 cy.

3.3 Disposal Evaluation

As noted in Section 3.2, off-site disposal is required for sediment that is represented by a three-dimensional polygon associated with a single vertical core that has an average PCB concentration greater than or equal to 100 mg/kg. To meet this requirement, the depth-weighted average PCB concentrations for the historical Valley Mill Pond sediment cores were calculated based on a total removal depth of one foot (Table 3).[6] Two core locations have depth-weighted average PCB concentrations that exceed 100 mg/kg (S18S2 and S18S4). The Theissen polygons associated with these core locations are shown on Figure 4 and represent an area of 1.1 acres. The sediments removed from these two locations—which are preliminarily estimated to constitute 3,200 cy based on a total sediment removal thickness of 22 inches—will be subject to off-site disposal.

Attachment E of the Revised Final Permit also requires that sediments to be disposed of in the UDF have a volume-weighted average PCB concentration of less than or equal to 25 mg/kg. The volume-weighted average of the remaining 9,100 cy of sediments to be removed from Valley Mill Pond is approximately 46 mg/kg, which exceeds the UDF disposal criterion in the Revised Final Permit. As a result, approximately 5,400 cy of additional sediment with the highest PCB concentrations will be segregated for off-site disposal. The remaining 3,700 cy (averaging 22 mg/kg) will be subject to disposal in the UDF. As noted above, the disposal evaluation for this area will be updated based on the results of the proposed supplemental data collection. Table 3 provides a detailed summary of the estimated disposal volumes and volume-weighted average PCB calculations for the sediments to be removed from Valley Mill Pond.

4 References

Anchor QEA, 2022. *Pre-Design Investigation Work Plan for Reach 6*. Housatonic River – Rest of River. Prepared for General Electric Company, Pittsfield, Massachusetts. November 3, 2022.

Anchor QEA, 2024. *Pre-Design Investigation Summary Report for Reach 6*. Housatonic River – Rest of River. Prepared for General Electric Company, Pittsfield, Massachusetts. October 2024.

CRE (CR Environmental, Inc.), 1998. *Housatonic River Supplemental Investigation Sub-Bottom Profiling Woods and Rising Ponds*. Prepare for Roy F. Weston, Inc. December 1998.

EPA, 2020. *Revised Final Permit Modification to the 2016 Reissued RCRA Permit and Selection of CERCLA Remedial Action and Operation & Maintenance for Rest of River*. December 2020.

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[6] The total estimated removal thickness in Valley Mill Pond is 22 inches (including cap overplacement and overdredging assumptions); however, the depth-weighted average PCB concentrations conducted for the disposal evaluation were conservatively based on a total removal depth of one foot due to low data density in the subsurface sediments.

Tables

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
SD136751	Outlet Channel	942.77	941.72	0	1	-1.05	-0.05	1.462	Sample excluded; above PDI bathy
SD136751	Outlet Channel	942.77	941.72	1	2	-0.05	0.95	0.39025	Sample partially excluded; portion of sample is above PDI bathy
SD136753	Outlet Channel	945.15	941.31	0	1	-3.83	-2.83	0.551	Sample excluded; above PDI bathy
SD136753	Outlet Channel	945.15	941.31	1	2	-2.83	-1.83	0.25975	Sample excluded; above PDI bathy
SE000759	Outlet Channel	948.39	948.91	0	1	0.52	1.52	16.6	Sample included in disposal evaluation
SE000760	Outlet Channel	947.25	948.06	0	1	0.81	1.81	0.51	Sample included in disposal evaluation
SE000761	Outlet Channel	947.25	944.13	0	1	-3.12	-2.12	81.45	Sample excluded; above PDI bathy
SE000762	Outlet Channel	947.59	947.67	0	1	0.08	1.08	20.7	Sample included in disposal evaluation
SE000768	Outlet Channel	947.56	946.19	0	1	-1.37	-0.37	10.7	Sample excluded; above PDI bathy
SE000769	Outlet Channel	947.03	946.47	0	1	-0.56	0.44	22.7	Sample partially excluded; Portion of sample is above PDI bathy
SE000873	Outlet Channel	947.04	944.43	0	1	-2.61	-1.61	11.8	Sample excluded; above PDI bathy
SE001009	Outlet Channel	945.72	942.80	0	1	-2.92	-1.92	0.2775	Sample excluded; above PDI bathy
S1391204	Woods Pond	946.15	947.67	0	1	1.53	2.53	6.46	Sample included in disposal evaluation
S1391204	Woods Pond	946.15	947.67	1	2	2.53	3.53	0.4505	Sample included in disposal evaluation
S1391205	Woods Pond	944.72	946.06	0	1	1.34	2.34	0.6475	Sample included in disposal evaluation
S1391205	Woods Pond	944.72	946.06	1	2	2.34	3.34	0.2595	Sample included in disposal evaluation
S1391206	Woods Pond	943.86	945.19	0	1	1.33	2.33	0.925	Sample included in disposal evaluation
S1391206	Woods Pond	943.86	945.19	1	2	2.33	3.33	0.605	Sample included in disposal evaluation
S1391207	Woods Pond	941.95	942.81	0	1	0.86	1.86	0.5325	Sample included in disposal evaluation
S1391207	Woods Pond	941.95	942.81	1	2	1.86	2.86	0.25	Sample included in disposal evaluation
S1391208	Woods Pond	937.86	939.30	0	1	1.43	2.43	0.67	Sample included in disposal evaluation

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
S1391208	Woods Pond	937.86	939.30	1	2	2.43	3.43	0.83	Sample included in disposal evaluation
S1391209	Woods Pond	933.37	936.83	0	1	3.46	4.46	14.795	Sample included in disposal evaluation
S1391209	Woods Pond	933.37	936.83	1	2	4.46	5.46	0.257	Sample included in disposal evaluation
S1391210	Woods Pond	934.60	936.41	0	1	1.81	2.81	25.27	Sample included in disposal evaluation
S1391210	Woods Pond	934.60	936.41	1	2	2.81	3.81	10.6515	Sample included in disposal evaluation
S1391211	Woods Pond	940.09	942.15	0	1	2.06	3.06	165	Sample included in disposal evaluation
S1391212	Woods Pond	945.12	946.57	0	1	1.45	2.45	2.725	Sample included in disposal evaluation
S1391212	Woods Pond	945.12	946.57	1	2	2.45	3.45	0.499	Sample included in disposal evaluation
S1391213	Woods Pond	946.19	947.20	0	1	1.01	2.01	210	Sample included in disposal evaluation
S1391213	Woods Pond	946.19	947.20	1	2	2.01	3.01	5.25	Sample included in disposal evaluation
S1391214	Woods Pond	946.14	945.70	0	1	-0.43	0.57	181.5	Sample partially excluded; portion of sample is above PDI bathy
S1391214	Woods Pond	946.14	945.70	1	2	0.57	1.57	14.675	Sample included in disposal evaluation
S1391215	Woods Pond	946.57	945.83	0	1	-0.74	0.26	38	Sample partially excluded; portion of sample is above PDI bathy
S1391215	Woods Pond	946.57	945.83	1	2	0.26	1.26	19.26	Sample included in disposal evaluation
S1391216	Woods Pond	946.58	945.13	0	1	-1.44	-0.44	6.014	Sample excluded; above PDI bathy
S1391216	Woods Pond	946.58	945.13	1	2	-0.44	0.56	0.0185	Sample partially excluded; portion of sample is above PDI bathy
S1391217	Woods Pond	944.16	945.36	0	1	1.21	2.21	50.05	Sample included in disposal evaluation
S1391217	Woods Pond	944.16	945.36	1	2	2.21	3.21	0.027	Sample included in disposal evaluation
S1391218	Woods Pond	941.63	944.21	0	1	2.58	3.58	0.1855	Sample included in disposal evaluation
S1391218	Woods Pond	941.63	944.21	1	2	3.58	4.58	0.125	Sample included in disposal evaluation

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
S1391219	Woods Pond	946.29	947.01	0	1	0.72	1.72	28.8	Sample included in disposal evaluation
S1391219	Woods Pond	946.29	947.01	1	2	1.72	2.72	0.012	Sample included in disposal evaluation
S1391220	Woods Pond	946.19	945.69	0	1	-0.50	0.50	13.0485	Sample partially excluded; portion of sample is above PDI bathy
S1391220	Woods Pond	946.19	945.69	1	2	0.50	1.50	0.03625	Sample included in disposal evaluation
S1391221	Woods Pond	945.22	947.04	0	1	1.82	2.82	16.9	Sample included in disposal evaluation
S1391221	Woods Pond	945.22	947.04	1	2	2.82	3.82	13.94975	Sample included in disposal evaluation
S1391222	Woods Pond	945.57	946.58	0	1	1.01	2.01	0.389	Sample included in disposal evaluation
S1391222	Woods Pond	945.57	946.58	1	2	2.01	3.01	0.029	Sample included in disposal evaluation
SE000236	Woods Pond	946.62	945.83	0	1	-0.79	0.21	25.4	Sample partially excluded; Portion of sample is above PDI bathy
SE000237	Woods Pond	947.08	947.12	0	1	0.05	1.05	21.6	Sample included in disposal evaluation
SE000251	Woods Pond	946.80	945.03	0	1	-1.77	-0.77	54	Sample excluded; above PDI bathy
SE000252	Woods Pond	946.38	946.73	0	1	0.35	1.35	83	Sample included in disposal evaluation
SE000337	Woods Pond	947.62	948.47	0	1	0.85	1.85	9.74	Sample included in disposal evaluation
SE000763	Woods Pond	946.94	947.21	0	1	0.27	1.27	37	Sample included in disposal evaluation
SE000764	Woods Pond	947.18	947.55	0	1	0.37	1.37	0.25	Sample included in disposal evaluation
SE000765	Woods Pond	946.64	946.80	0	1	0.16	1.16	7.99	Sample included in disposal evaluation
SE000766	Woods Pond	946.79	946.62	0	1	-0.17	0.83	6.04	Sample partially excluded; Portion of sample is above PDI bathy
SE000802	Woods Pond	938.65	939.82	0	1	1.18	2.18	3.73	Sample included in disposal evaluation
SE000803	Woods Pond	946.57	945.83	0	1	-0.74	0.26	16.7	Sample partially excluded; portion of sample is above PDI bathy

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
SE000804	Woods Pond	940.60	944.56	0	1	3.96	4.96	0.2885	Sample included in disposal evaluation
SE000869	Woods Pond	947.91	948.51	0	1	0.60	1.60	10.9	Sample included in disposal evaluation
SE000870	Woods Pond	947.66	947.28	0	1	-0.38	0.62	0.2505	Sample partially excluded; Portion of sample is above PDI bathy
SE000871	Woods Pond	946.79	947.47	0	1	0.68	1.68	0.251	Sample included in disposal evaluation
SE000872	Woods Pond	946.53	947.46	0	1	0.93	1.93	31.2	Sample included in disposal evaluation
SE001000	Woods Pond	944.12	945.80	0	1	1.68	2.68	4.761	Sample included in disposal evaluation
SE001000	Woods Pond	944.12	945.80	1	2	2.68	3.68	1.075	Sample included in disposal evaluation
SE001000	Woods Pond	944.12	945.80	2	3	3.68	4.68	0.25	Sample included in disposal evaluation
SE001000	Woods Pond	944.12	945.80	3	4	4.68	5.68	0.25	Sample included in disposal evaluation
SE001000	Woods Pond	944.12	945.80	4	5	5.68	6.68	0.25	Sample included in disposal evaluation
SE001000	Woods Pond	944.12	945.80	5	6	6.68	7.68	0.25	Sample included in disposal evaluation
SE001001	Woods Pond	946.02	947.70	0	1	1.68	2.68	0.635	Sample included in disposal evaluation
SE001001	Woods Pond	946.02	947.70	1	2	2.68	3.68	0.293	Sample included in disposal evaluation
SE001001	Woods Pond	946.02	947.70	2	3	3.68	4.68	0.25	Sample included in disposal evaluation
SE001001	Woods Pond	946.02	947.70	3	4	4.68	5.68	0.925	Sample included in disposal evaluation
SE001001	Woods Pond	946.02	947.70	4	5	5.68	6.68	0.875	Sample included in disposal evaluation
SE001001	Woods Pond	946.02	947.70	5	6	6.68	7.68	0.349	Sample included in disposal evaluation
SE001001	Woods Pond	946.02	947.70	6	7	7.68	8.68	0.25	Sample included in disposal evaluation
SE001001	Woods Pond	946.02	947.70	7	8	8.68	9.68	0.25	Sample included in disposal evaluation
SE001001	Woods Pond	946.02	947.70	8	9	9.68	10.68	0.22	Sample included in disposal evaluation
SE001002	Woods Pond	944.09	946.63	0	1	2.54	3.54	5.225	Sample included in disposal evaluation

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
SE001002	Woods Pond	944.09	946.63	1	2	3.54	4.54	0.25	Sample included in disposal evaluation
SE001002	Woods Pond	944.09	946.63	2	3	4.54	5.54	0.27	Sample included in disposal evaluation
SE001002	Woods Pond	944.09	946.63	3	4	5.54	6.54	0.25	Sample included in disposal evaluation
SE001002	Woods Pond	944.09	946.63	4	5	6.54	7.54	0.25	Sample included in disposal evaluation
SE001002	Woods Pond	944.09	946.63	5	6	7.54	8.54	0.21	Sample included in disposal evaluation
SE001002	Woods Pond	944.09	946.63	6	7	8.54	9.54	0.675	Sample included in disposal evaluation
SE001002	Woods Pond	944.09	946.63	7	8	9.54	10.54	0.25	Sample included in disposal evaluation
SE001003	Woods Pond	938.65	941.30	0	1	2.65	3.65	22.1	Sample included in disposal evaluation
SE001003	Woods Pond	938.65	941.30	1	2	3.65	4.65	90.6	Sample included in disposal evaluation
SE001003	Woods Pond	938.65	941.30	2	3	4.65	5.65	1.95	Sample included in disposal evaluation
SE001003	Woods Pond	938.65	941.30	3	4	5.65	6.65	0.571	Sample included in disposal evaluation
SE001003	Woods Pond	938.65	941.30	4	5	6.65	7.65	0.25	Sample included in disposal evaluation
SE001003	Woods Pond	938.65	941.30	5	6	7.65	8.65	0.25	Sample included in disposal evaluation
SE001003	Woods Pond	938.65	941.30	6	7	8.65	9.65	0.25	Sample included in disposal evaluation
SE001003	Woods Pond	938.65	941.30	7	8	9.65	10.65	0.132	Sample included in disposal evaluation
SE001003	Woods Pond	938.65	941.30	8	9	10.65	11.65	0.13225	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	0	1	1.77	2.77	3.9151	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	1	2	2.77	3.77	1.753125	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	2	3	3.77	4.77	0.3395	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	3	4	4.77	5.77	0.65	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	4	5	5.77	6.77	0.25	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	5	6	6.77	7.77	0.25	Sample included in disposal evaluation

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
SE001004	Woods Pond	944.61	946.38	6	7	7.77	8.77	0.25	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	7	8	8.77	9.77	0.31775	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	8	9	9.77	10.77	0.25	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	9	10	10.77	11.77	0.25	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	10	11	11.77	12.77	0.25	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	11	12	12.77	13.77	0.25	Sample included in disposal evaluation
SE001004	Woods Pond	944.61	946.38	12	13	13.77	14.77	0.25	Sample included in disposal evaluation
SE001005	Woods Pond	932.38	935.15	0	1	2.77	3.77	12.39	Sample included in disposal evaluation
SE001005	Woods Pond	932.38	935.15	1	2	3.77	4.77	1.7	Sample included in disposal evaluation
SE001005	Woods Pond	932.38	935.15	2	3	4.77	5.77	0.251	Sample included in disposal evaluation
SE001005	Woods Pond	932.38	935.15	3	4	5.77	6.77	0.25	Sample included in disposal evaluation
SE001005	Woods Pond	932.38	935.15	4	5	6.77	7.77	0.307	Sample included in disposal evaluation
SE001005	Woods Pond	932.38	935.15	5	6	7.77	8.77	0.20825	Sample included in disposal evaluation
SE001005	Woods Pond	932.38	935.15	6	7	8.77	9.77	0.25825	Sample included in disposal evaluation
SE001005	Woods Pond	932.38	935.15	7	8	9.77	10.77	0.47275	Sample included in disposal evaluation
SE001005	Woods Pond	932.38	935.15	8	9	10.77	11.77	0.18475	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	0	1	3.17	4.17	36.82	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	1	2	4.17	5.17	3.0575	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	2	3	5.17	6.17	0.25	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	3	4	6.17	7.17	0.3425	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	4	5	7.17	8.17	0.418	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	5	6	8.17	9.17	0.445	Sample included in disposal evaluation

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
SE001006	Woods Pond	932.34	935.51	6	7	9.17	10.17	0.19725	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	7	8	10.17	11.17	0.30375	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	8	9	11.17	12.17	0.46825	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	9	10	12.17	13.17	0.13975	Sample included in disposal evaluation
SE001006	Woods Pond	932.34	935.51	10	11	13.17	14.17	0.33275	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	0	1	1.74	2.74	0.745556	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	1	2	2.74	3.74	0.717375	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	2	3	3.74	4.74	1.852667	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	3	4	4.74	5.74	0.436375	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	4	5	5.74	6.74	0.349	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	5	6	6.74	7.74	0.3775	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	6	7	7.74	8.74	0.25	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	7	8	8.74	9.74	0.3475	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	8	9	9.74	10.74	0.43075	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	9	10	10.74	11.74	0.55175	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	10	11	11.74	12.74	0.27975	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	11	12	12.74	13.74	0.19325	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	12	13	13.74	14.74	0.39575	Sample included in disposal evaluation
SE001007	Woods Pond	939.87	941.62	13	14	14.74	15.74	0.2575	Sample included in disposal evaluation
SE001008	Woods Pond	935.96	938.04	0	1	2.08	3.08	2.150875	Sample included in disposal evaluation
SE001008	Woods Pond	935.96	938.04	1	2	3.08	4.08	36.005	Sample included in disposal evaluation
SE001008	Woods Pond	935.96	938.04	2	3	4.08	5.08	5.4825	Sample included in disposal evaluation

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
SE001008	Woods Pond	935.96	938.04	3	4	5.08	6.08	1.79	Sample included in disposal evaluation
SE001008	Woods Pond	935.96	938.04	4	5	6.08	7.08	1.0405	Sample included in disposal evaluation
SE001008	Woods Pond	935.96	938.04	5	6	7.08	8.08	0.29275	Sample included in disposal evaluation
SE001008	Woods Pond	935.96	938.04	6	7	8.08	9.08	0.3755	Sample included in disposal evaluation
SE001008	Woods Pond	935.96	938.04	7	8	9.08	10.08	0.25175	Sample included in disposal evaluation
SE001008	Woods Pond	935.96	938.04	8	9	10.08	11.08	0.14425	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	0	1	-1.31	-0.31	64.99175	Sample excluded; above PDI bathy
SE001011	Woods Pond	947.10	945.78	1	2	-0.31	0.69	43.36875	Sample partially excluded; portion of sample is above PDI bathy
SE001011	Woods Pond	947.10	945.78	2	3	0.69	1.69	1.0925	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	3	4	1.69	2.69	0.486	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	4	5	2.69	3.69	0.253	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	5	6	3.69	4.69	0.2525	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	6	7	4.69	5.69	0.2505	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	7	8	5.69	6.69	0.13125	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	8	9	6.69	7.69	0.2505	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	9	10	7.69	8.69	0.252	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	10	11	8.69	9.69	0.25075	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	11	12	9.69	10.69	0.131	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	12	13	10.69	11.69	0.25425	Sample included in disposal evaluation
SE001011	Woods Pond	947.10	945.78	13	14	11.69	12.69	0.13075	Sample included in disposal evaluation
SE001013	Woods Pond	946.30	945.16	0	1	-1.15	-0.15	169.575625	Sample excluded; above PDI bathy

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
SE001013	Woods Pond	946.30	945.16	1	2	-0.15	0.85	41.9375	Sample partially excluded; portion of sample is above PDI bathy
SE001013	Woods Pond	946.30	945.16	2	3	0.85	1.85	3.202625	Sample included in disposal evaluation
SE001013	Woods Pond	946.30	945.16	3	4	1.85	2.85	0.3795	Sample included in disposal evaluation
SE001013	Woods Pond	946.30	945.16	4	5	2.85	3.85	0.7655	Sample included in disposal evaluation
SE001013	Woods Pond	946.30	945.16	5	6	3.85	4.85	0.647	Sample included in disposal evaluation
SE001013	Woods Pond	946.30	945.16	6	7	4.85	5.85	0.2505	Sample included in disposal evaluation
SE001014	Woods Pond	946.63	947.15	0	1	0.52	1.52	62.153182	Sample included in disposal evaluation
SE001014	Woods Pond	946.63	947.15	1	2	1.52	2.52	48.3625	Sample included in disposal evaluation
SE001014	Woods Pond	946.63	947.15	2	3	2.52	3.52	38.834167	Sample included in disposal evaluation
SE001014	Woods Pond	946.63	947.15	3	4	3.52	4.52	11.795	Sample included in disposal evaluation
SE001014	Woods Pond	946.63	947.15	4	5	4.52	5.52	0.36175	Sample included in disposal evaluation
SE001015	Woods Pond	937.87	939.36	0	1	1.49	2.49	40.4942	Sample included in disposal evaluation
SE001015	Woods Pond	937.87	939.36	1	2	2.49	3.49	4.673417	Sample included in disposal evaluation
SE001015	Woods Pond	937.87	939.36	2	3	3.49	4.49	1.17975	Sample included in disposal evaluation
SE001015	Woods Pond	937.87	939.36	3	4	4.49	5.49	0.7025	Sample included in disposal evaluation
SE001015	Woods Pond	937.87	939.36	4	5	5.49	6.49	0.6925	Sample included in disposal evaluation
SE001015	Woods Pond	937.87	939.36	5	6	6.49	7.49	0.84	Sample included in disposal evaluation
SE001015	Woods Pond	937.87	939.36	6	7	7.49	8.49	0.424	Sample included in disposal evaluation
SE001015	Woods Pond	937.87	939.36	7	8	8.49	9.49	1	Sample included in disposal evaluation
SE001016	Woods Pond	944.53	946.17	0	1	1.64	2.64	34.959727	Sample included in disposal evaluation
SE001016	Woods Pond	944.53	946.17	1	2	2.64	3.64	4.4355	Sample included in disposal evaluation

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
SE001016	Woods Pond	944.53	946.17	2	3	3.64	4.64	2.09375	Sample included in disposal evaluation
SE001016	Woods Pond	944.53	946.17	3	4	4.64	5.64	1.365	Sample included in disposal evaluation
SE001016	Woods Pond	944.53	946.17	4	5	5.64	6.64	1.055	Sample included in disposal evaluation
SE001016	Woods Pond	944.53	946.17	5	6	6.64	7.64	73.78	Sample included in disposal evaluation
SE001017	Woods Pond	944.74	945.63	0	1	0.89	1.89	12.5	Sample included in disposal evaluation
SE001017	Woods Pond	944.74	945.63	1	2	1.89	2.89	0.866	Sample included in disposal evaluation
SE001017	Woods Pond	944.74	945.63	2	3	2.89	3.89	0.26425	Sample included in disposal evaluation
SE001017	Woods Pond	944.74	945.63	3	4	3.89	4.89	0.3545	Sample included in disposal evaluation
SE001018	Woods Pond	946.26	947.15	0	1	0.89	1.89	89.15	Sample included in disposal evaluation
SE001018	Woods Pond	946.26	947.15	1	2	1.89	2.89	2.375	Sample included in disposal evaluation
SE001018	Woods Pond	946.26	947.15	2	3	2.89	3.89	0.41725	Sample included in disposal evaluation
SE001018	Woods Pond	946.26	947.15	3	4	3.89	4.89	0.32375	Sample included in disposal evaluation
SE001018	Woods Pond	946.26	947.15	4	5	4.89	5.89	0.4215	Sample included in disposal evaluation
SE001018	Woods Pond	946.26	947.15	5	6	5.89	6.89	0.327	Sample included in disposal evaluation
SE001018	Woods Pond	946.26	947.15	6	7	6.89	7.89	0.35225	Sample included in disposal evaluation
SE001019	Woods Pond	945.74	947.02	0	1	1.28	2.28	21.24	Sample included in disposal evaluation
SE001019	Woods Pond	945.74	947.02	1	2	2.28	3.28	0.235	Sample included in disposal evaluation
SE001019	Woods Pond	945.74	947.02	2	3	3.28	4.28	0.136	Sample included in disposal evaluation
SE001019	Woods Pond	945.74	947.02	3	4	4.28	5.28	0.25075	Sample included in disposal evaluation
SE001019	Woods Pond	945.74	947.02	4	5	5.28	6.28	0.377	Sample included in disposal evaluation
SE001020	Woods Pond	941.32	943.84	0	1	2.51	3.51	21.95	Sample included in disposal evaluation
SE001020	Woods Pond	941.32	943.84	1	2	3.51	4.51	150	Sample included in disposal evaluation

Table 1
Historical Data Usability Assessment

Historical Sample Location ID	Zone	Bathy Surface Elevation (ft NAVD88)		Original Sample Depth (ft)		Sample Depth Adjusted to PDI Bathy Surface (ft)		Total PCB (mg/kg)	Sample Usage in Disposal Evaluation
		Historical 1998 Survey[1]	PDI 2022/2023 Surveys[2]	Top of Sample	Bottom of Sample	Top of Sample	Bottom of Sample		
SE001020	Woods Pond	941.32	943.84	2	3	4.51	5.51	42.05	Sample included in disposal evaluation
SE001020	Woods Pond	941.32	943.84	3	4	5.51	6.51	4.905	Sample included in disposal evaluation
SE001020	Woods Pond	941.32	943.84	4	5	6.51	7.51	1.2375	Sample included in disposal evaluation
SE001390	Woods Pond	945.22	947.04	0	1	1.82	2.82	101.3896	Sample included in disposal evaluation
SE001391	Woods Pond	941.32	943.84	0	1	2.51	3.51	115.5253	Sample included in disposal evaluation
SE001392	Woods Pond	946.26	947.15	0	1	0.89	1.89	20.7705	Sample included in disposal evaluation
SE001393	Woods Pond	946.02	947.70	0	1	1.68	2.68	63.7318	Sample included in disposal evaluation
SE001394	Woods Pond	946.14	945.70	0	1	-0.43	0.57	57.5556	Sample partially excluded; portion of sample is above PDI bathy
SE001396	Woods Pond	940.09	942.15	0	1	2.06	3.06	32.238	Sample included in disposal evaluation
SE001397	Woods Pond	946.38	946.73	0	1	0.35	1.35	34.2061	Sample included in disposal evaluation
SE001403	Woods Pond	935.96	938.04	0	1	2.08	3.08	52.2391	Sample included in disposal evaluation
SE001491	Woods Pond	935.47	936.78	0	1	1.31	2.31	5.8439	Sample included in disposal evaluation
SE001492	Woods Pond	940.58	943.23	0	1	2.65	3.65	0.6635	Sample included in disposal evaluation

Notes:

Depth intervals entirely above the existing PDI bathymetry (shaded gray) were excluded from the conceptual design evaluations.

1. The 1998 bathymetric survey was based on water depth measurements collected by CRE on December 3, 1998; the survey data were not tied to any survey datum. To support the Reach 6 conceptual design, the Reach 6 water depth surface prepared by CRE was converted to a sediment elevation surface assuming a water surface elevation of 948.2 feet NAVD88 (i.e., 0.5 foot of water above the crest of Woods Pond Dam) at the time of surveying.
2. PDI single-beam bathymetric survey performed by Spicer Group in 2022 and 2023.

ft: foot
mg/kg: milligram per kilogram
NAVD88: North American Vertical Datum of 1988
PCB: polychlorinated biphenyl
PDI: pre-design investigation

Table 2
Spatially Weighted Average PCB Summary: Valley Mill Pond

Depth (feet)	Location ID	Existing			Post-Cap	
		Total PCB (mg/kg)	Area (square feet)	Total PCB × Area	Total PCB[1] (mg/kg)	Total PCB × Area
0–1	S18S4	118	19,411	2,290,555	0.612	11,882
	S18S2	105.445	27,326	2,881,349	0.612	16,726
	S18S6	88.5	21,578	1,909,640	0.612	13,208
	S18S7	74	24,564	1,817,712	0.612	15,036
	BBS18S3	71.5	7,232	517,082	0.612	4,427
	BBS18S6	57	19,321	1,101,291	0.612	11,827
	SE001379	51	7,212	367,806	0.612	4,414
	S18S3	38.445	24,761	951,919	0.612	15,156
	S18S1	15.01	8,166	122,575	0.612	4,999
	SITE 27	6.56	21,335	139,958	0.612	13,059
	S18S5	4.35	18,052	78,528	4.350	78,528
		Total	198,958	12,178,415	-	189,262
		0–1 feet Average Total PCB (mg/kg)		**61**		**0.95**
1–1.5	S18S6	16	21,651	346,410	0.612	13,253
	BBS18S6	6.9	19,321	133,314	0.612	11,827
	S18S4	1.3	19,411	25,235	0.612	11,882
	S18S2	1.2	27,326	32,791	0.612	16,726
	S18S3	1.2	24,761	29,713	0.612	15,156
	BBS18S3	0.8	7,232	5,786	0.612	4,427
	SITE 27	0.57	21,335	12,161	0.612	13,059
	S18S5	0.05	49,755	2,488	0.050	2,488
	S18S1	0.04	8,166	327	0.612	4,999
		Total	198,958	588,223	-	93,816
		1–1.5 feet Average Total PCB (mg/kg)		**3.0**		**0.47**
1.5–2	BBS18S6	1.1	36,765	40,441	0.612	22,504
	S18S6	0.04	56,714	2,269	0.612	34,715
	S18S4	0.03	52,937	1,588	0.612	32,403
	S18S2	0.02	52,542	1,051	0.612	32,162
		Total	198,958	45,349	-	121,784
		1.5–2 feet Average Total PCB (mg/kg)		**0.23**		**0.61**
2–2.5	S18S6	0.87	56,714	49,341	0.612	34,715
	BBS18S6	0.11	36,765	4,044	0.612	22,504
	S18S2	0.01	52,542	525	0.612	32,162
	S18S4	0.01	52,937	529	0.612	32,403
		Total	198,958	54,440	-	121,784
		2–2.5 feet Average Total PCB (mg/kg)		**0.27**		**0.61**
2.5–3	S18S4	0.05	115,935	5,797	0.612	70,965
	S18S6	0.04	83,022	3,321	0.612	50,819
		Total	198,958	9,118	-	121,784
		2.5-3 feet Average Total PCB (mg/kg)		**0.05**		**0.61**
3–3.5	S18S4	0.02	115,935	2,319	0.612	70,965
	S18S6	0.02	83,022	1,660	0.612	50,819
		Total	198,958	3,979	-	121,784
		3–3.5 feet Average Total PCB (mg/kg)		**0.02**		**0.61**
3.5-4	S18S6	0.01	198,958	1,990	0.612	121,784
		Total	198,958	1,990	-	121,784
		3.5–4 feet Average Total PCB (mg/kg)		**0.01**		**0.61**

Notes:
1. In areas where an engineered cap will be placed, the post-cap surface and subsurface total PCB values assume 1% of the existing average surficial total PCB concentration in accordance with Section II.B.2.d(1)(a) in the Revised Final Permit.
Remedial Approach: Removal of the top 22 inches of sediment followed by engineered cap placement

Exceeds surface remedial criteria; dredge and cap
Below remedial criteria

-: not applicable
cy: cubic yard
mg/kg: milligram per kilogram
PCB: polychlorinated biphenyl

Table 3
Spatially Weighted Average PCB Summary: Valley Mill Pond – Disposal

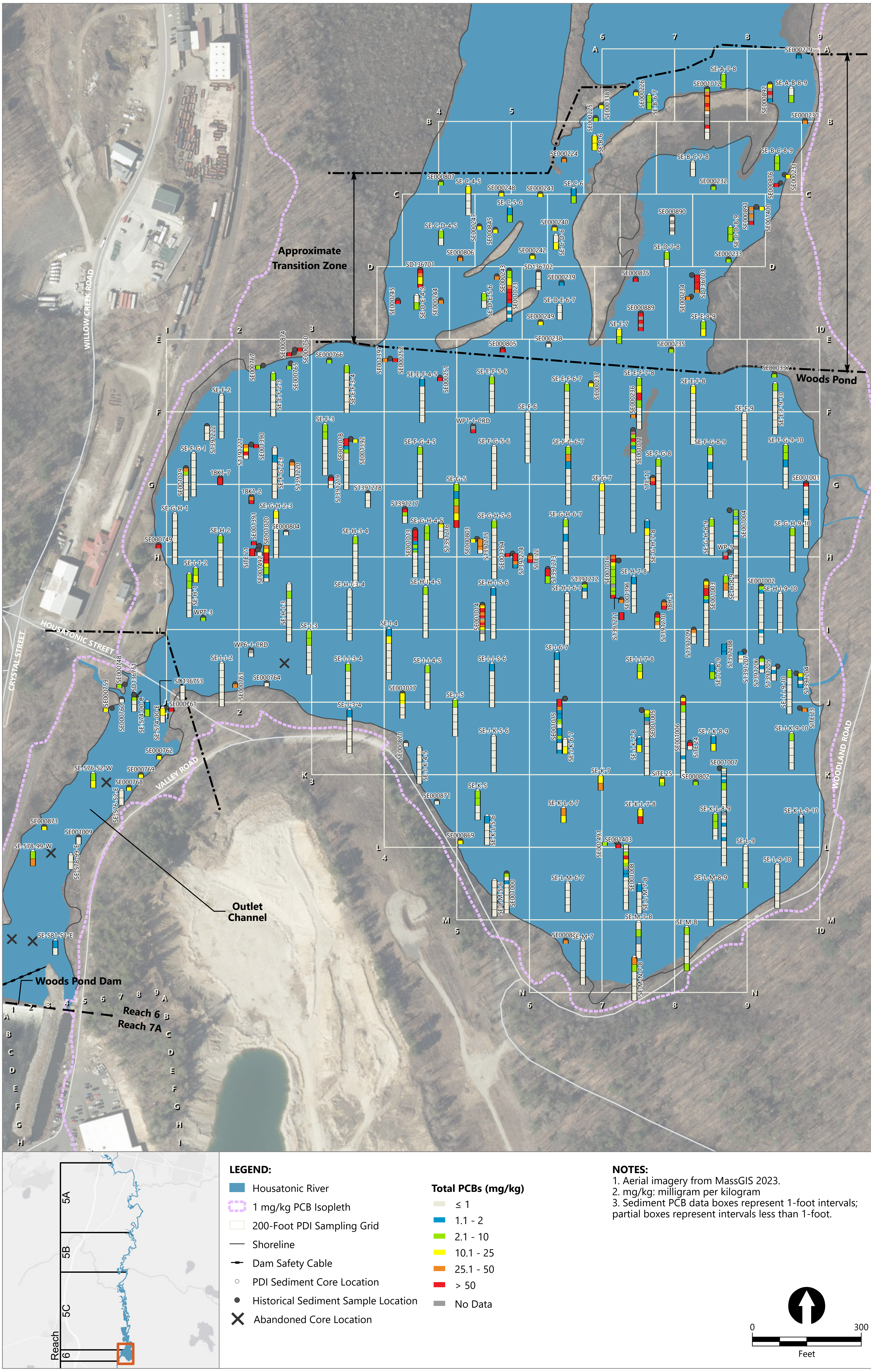
Location ID	Existing 0–1 feet			Top 22 inches Disposal Volume[1] (cy)	
	Area (square feet)	Total PCB (mg/kg)	Total PCB × Area	On-Site (UDF)	Off-Site
S18S4	19,411	118	-	-	1,318
S18S2	27,326	105	-	-	1,855
S18S6	21,578	88.5	-	-	1,465
S18S7	24,564	74	-	-	1,668
BBS18S3	7,232	71.5	-	-	491
BBS18S6	19,321	57	-	-	1,312
SE001379	7,212	51	-	-	490
S18S3	24,761	38.445	951,919	1,681	-
S18S1	8,166	15.01	122,575	554	-
SITE 27	21,335	6.56	139,958	1,449	-
Total [2]	**180,905**	**-**	**1,214,452**	**3,700**	**8,600**
On-Site Volume-Weighted Average PCB (mg/kg)				**22.4**	**-**

Notes:
1. All quantities are preliminary estimates and may be subject to change during final design. Volumes represent in-place quantities and are based on a removal depth of 22 inches.
2. The total volumes (in bold) are rounded.

Off-site disposal is required due to Total PCB concentrations greater than 100 mg/kg
Off-site disposal is required for the sediments to be disposed of in the UDF to have a volume-weighted average PCB concentration of less than or equal to 25 mg/kg

-: not applicable
cy: cubic yard
mg/kg: milligram per kilogram
PCB: polychlorinated biphenyl
UDF: Upland Disposal Facility

Figures



NOTES:
1. Aerial imagery from MassGIS 2023.
2. mg/kg: milligram per kilogram
3. Sediment PCB data boxes represent 1-foot intervals; partial boxes represent intervals less than 1-foot.

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ANCHOR QEA

Figure 1
Reach 6 Historical and PDI Sediment Sampling Total PCB Results
PCB Evaluations for Sediment
Housatonic River – Rest of River

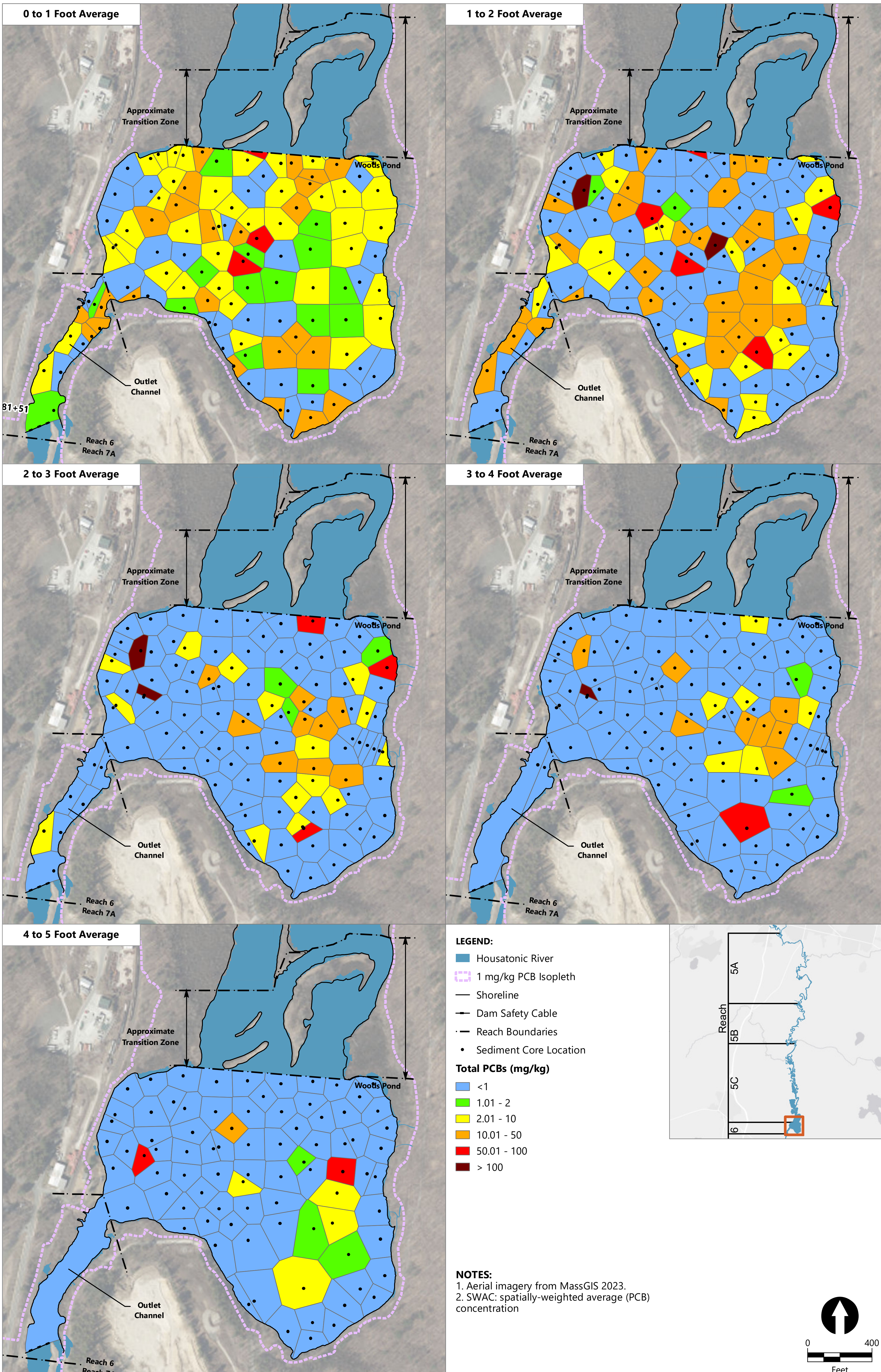

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Figure 2a
Woods Pond and Outlet Channel PCB Concentrations by Depth
PCB Evaluations for Sediment
Housatonic River - Rest of River

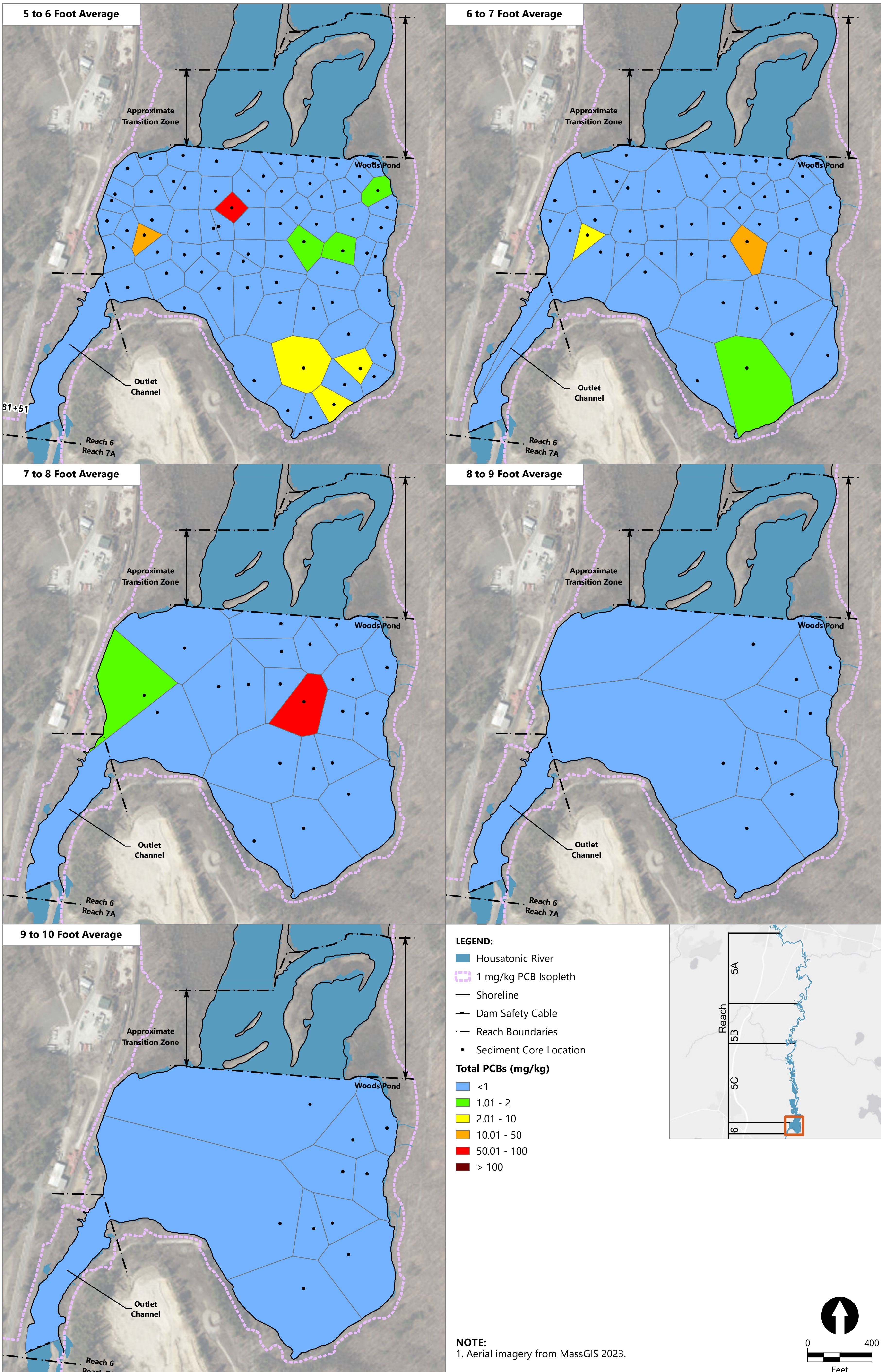

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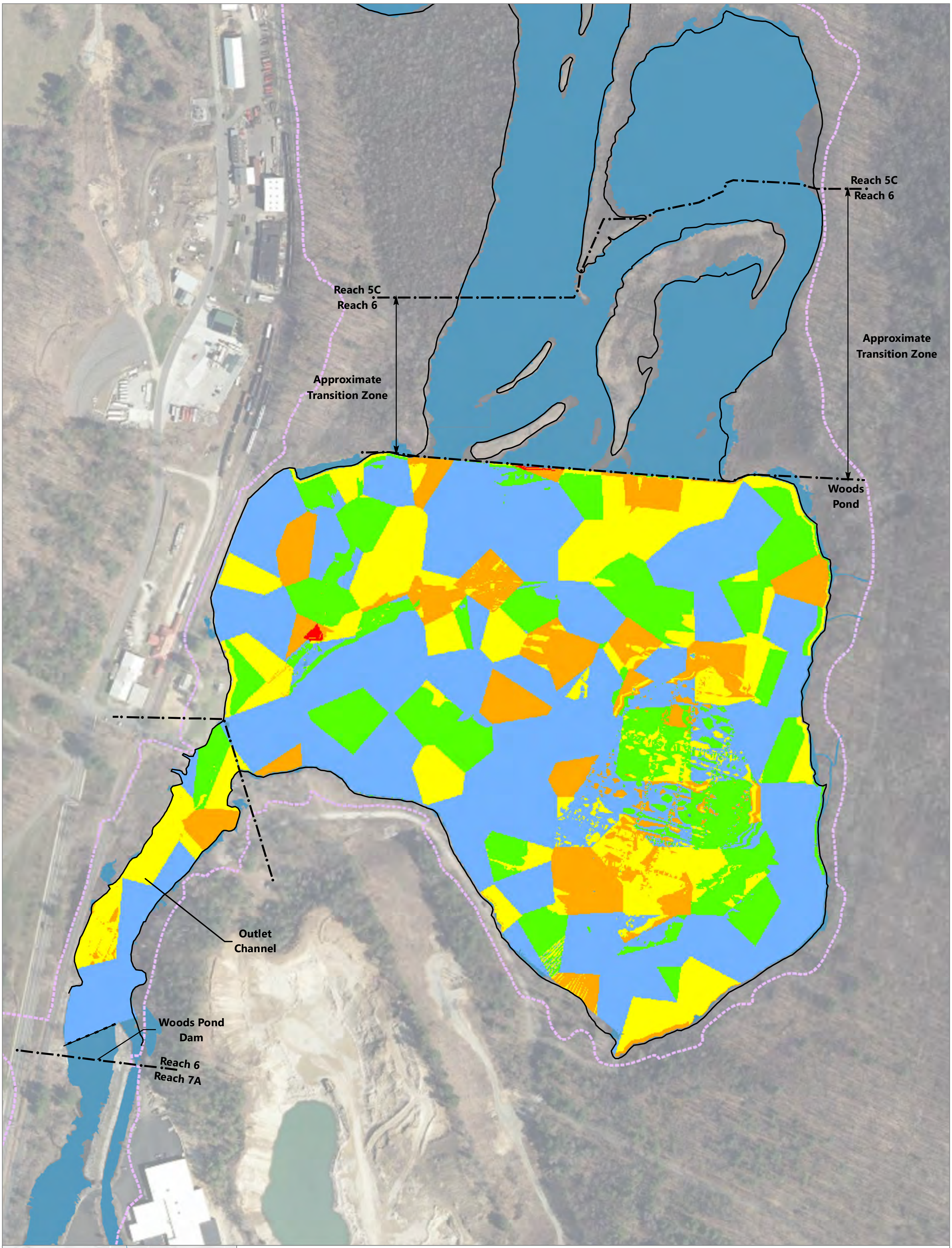
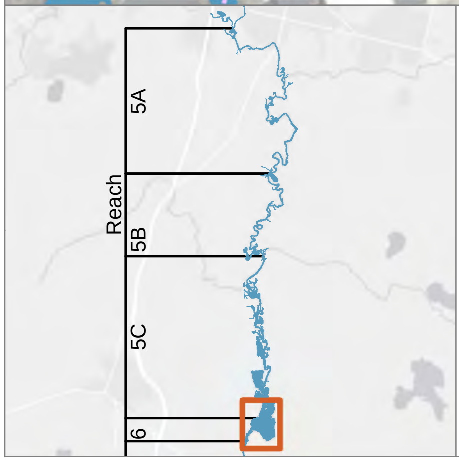
Figure 2b
Woods Pond and Outlet Channel PCB Concentrations by Depth
PCB Evaluations for Sediment
Housatonic River - Rest of River





LEGEND:

- Housatonic River
- 1 mg/kg PCB Isopleth
- Shoreline
- Dam Safety Cable

Depth-Weighted Average Total PCBs (mg/kg)

- <1
- 1.01 - 2
- 2.01 - 10
- 10.01 - 50
- 50.01 - 100

NOTES:
1. Aerial imagery from MassGIS 2021.
2. For the disposal evaluation, Thiessen polygons were converted to a one-foot by one-foot raster grid for each depth interval. The target dredge depth, based on the engineered dredge prism, was then used to calculate a depth-weighted average PCB concentration for each grid cell using that raster grid.

0 300
Feet

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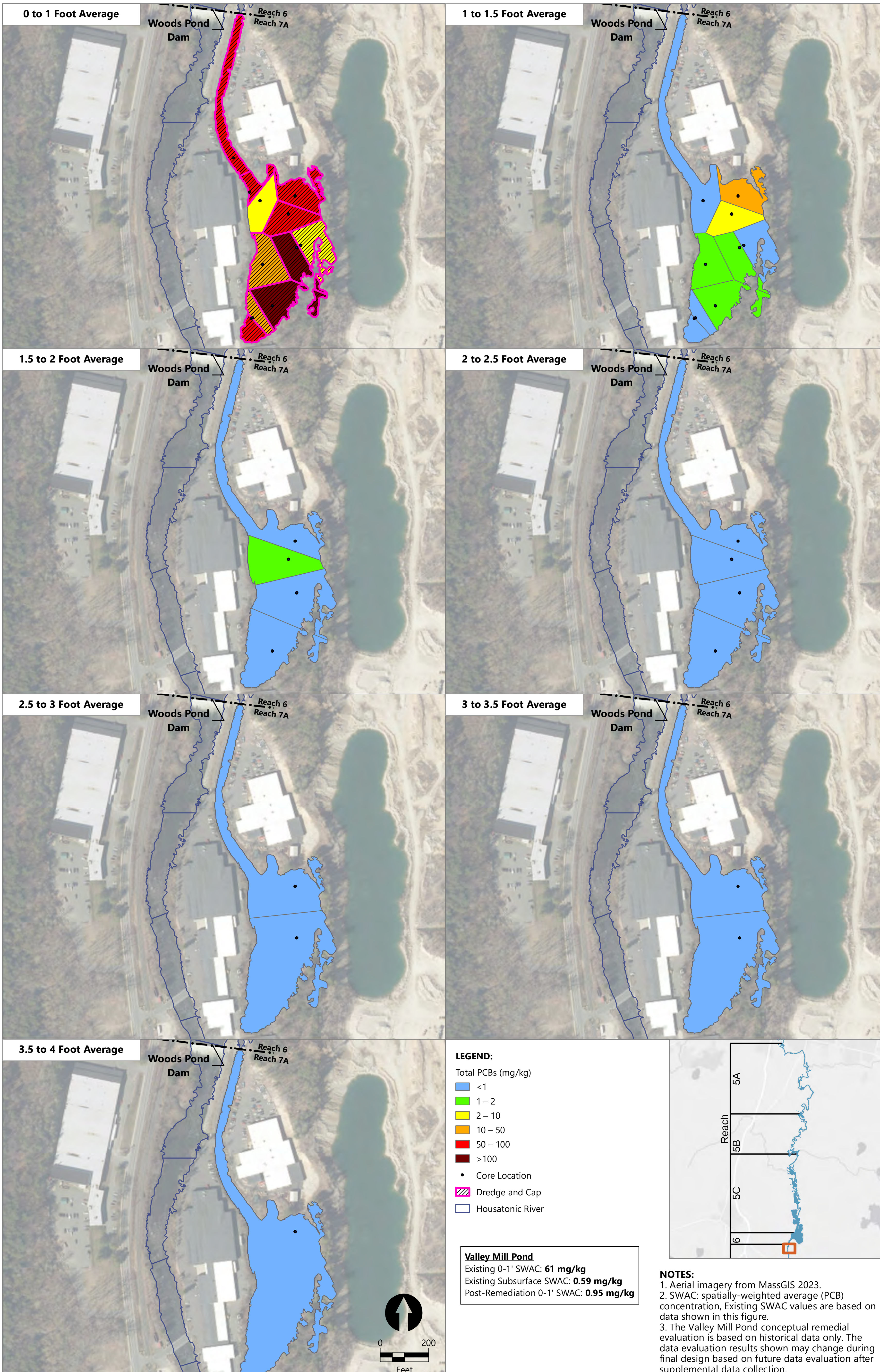
Figure 3
Reach 6 Disposal Sediment Depth-Weighted Average Total PCB
PCB Evaluations for Sediment
Housatonic River - Rest of River



Valley Mill Pond
Existing 0-1' SWAC: **61 mg/kg**
Existing Subsurface SWAC: **0.59 mg/kg**
Post-Remediation 0-1' SWAC: **0.95 mg/kg**

NOTES:
1. Aerial imagery from MassGIS 2023.
2. SWAC: spatially-weighted average (PCB) concentration, Existing SWAC values are based on data shown in this figure.
3. The Valley Mill Pond conceptual remedial evaluation is based on historical data only. The data evaluation results shown may change during final design based on future data evaluation after supplemental data collection.

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Figure 4
Valley Mill Pond Preliminary Remedial Extents and Sediment PCB Concentrations by Depth
PCB Evaluations for Sediment
Housatonic River - Rest of River

Appendix B
PCB Evaluations for Floodplain Soil

Appendix B
PCB Evaluations for Floodplain Soil

1 Introduction

As described in the *Conceptual Remedial Design/Remedial Action Work Plan for Reach 6* (Conceptual RD/RA Work Plan), the U.S. Environmental Protection Agency's (EPA's) *Human Health Risk Assessment* (HHRA; EPA 2005) divided the Rest of River (ROR) floodplain into 90 Exposure Areas (EAs) for the assessment of direct human contact with floodplain soils. Of the 90 EAs identified in the HHRA, five are located wholly or partially within Reach 6 (EAs 56 through 60), as shown on Figure 1. EAs 56 and 57 are located partially within Reach 5C but were fully characterized as part of the Reach 6 pre-design investigation (PDI). Thus, EAs 56 and 57 were also evaluated as part of the Reach 6 Conceptual RD/RA Work Plan.

These five EAs within the Reach 6 floodplain are subject to the non-residential Performance Standards for polychlorinated biphenyls (PCBs), described in Section II.B.3.a of the final revised modification of GE's Resource Conservation and Recovery Act Corrective Action Permit (Revised Final Permit; EPA 2020). Those EAs are referred to herein as "non-residential EAs." Three of the five EAs contain subareas, which are typically characterized by a different and/or more frequent exposure scenario; they are EAs 56a, 59a, and 60a. In addition, three of the five EAs (EAs 58, 59, and 60) contain Frequently Used Subareas identified in the *Housatonic River – Rest of River, Revised Corrective Measures Study Report* (RCMS Report; Arcadis et al. 2010). These Frequently Used Subareas are also subject to the Performance Standards in the Revised Final Permit.

As described in the Conceptual RD/RA Work Plan, the floodplain area evaluated for Reach 6 contains two confirmed vernal pools, both located within EA 57 (Figure 1). Under the Revised Final Permit (Section II.B.3.b), vernal pools are subject to a separate numerical Performance Standard of a spatially weighted average PCB concentration of 3.3 milligrams per kilogram (mg/kg). As shown in the Conceptual RD/RA Work Plan, the vernal pools in Reach 6 already meet that standard and therefore are not addressed in this appendix.

GE's *Revised Pre-Design Investigation Work Plan for Reach 6* (Revised Reach 6 PDI Work Plan; Anchor QEA 2023), which was conditionally approved by EPA on June 20, 2023, describes the floodplain soil sampling proposed to be conducted as part of the Reach 6 PDI. GE's *Pre-Design Investigation Summary Report for Reach 6* (Reach 6 PDI Summary Report; Anchor QEA 2024), which is being submitted concurrently with the Conceptual RD/RA Work Plan, summarizes all data collected at the Reach 6 non-residential floodplain EAs under the PDI.

This appendix documents the evaluations conducted for the five non-residential floodplain EAs and subareas in Reach 6. It includes the evaluation of existing PCB concentrations in the EAs and the evaluation of proposed removal areas and volumes to achieve the applicable Performance Standards.

The evaluation follows the approach outlined in Appendix A (*Methods for Calculation of Floodplain Removal Areas and Volume*) to GE's 2023 Revised Reach 6 PDI Work Plan, with several updates documented in the above-referenced PDI Summary Report. This appendix repeats some of the discussion and tables found in the Reach 6 PDI Summary Report and in the Conceptual RD/RA Work Plan so this appendix can be reviewed as a stand-alone document.

This appendix is organized as follows:

- Section 2 describes the methods used to evaluate the existing PCB concentrations for the non-residential EAs, including the generation of PCB coverages and the calculation of exposure point concentrations (EPCs).
- Section 3 describes the methods used to evaluate the removal areas and volumes for the non-residential EAs having EPCs that exceed the applicable Performance Standard.
- Section 4 describes the methods used to determine the segregation of the excavated floodplain soils that will be subject to disposal at the Upland Disposal Facility (UDF) from those subject to disposal at an off-site disposal facility.
- Section 5 documents the detailed evaluation for the EAs identified in Section 3 that require removal to achieve the applicable Performance Standards and the evaluation of disposal locations for the excavated floodplain soils.

2 Evaluation of PCB Concentrations

Calculation of the EPCs for the non-residential EAs requires a continuous coverage of PCB concentrations in the floodplain that require incorporation of several spatially varying features within the floodplain, as detailed in Appendix A to GE's Revised Reach 6 PDI Work Plan (i.e., EA and subarea boundaries, Frequently Used Subarea boundaries, "super habitat" polygons, accessibility weighting factor mapping, vernal pool boundaries, and Core Area 1 habitat boundaries).

A description of the approach to interpolate PCB data spatially and vertically is provided in the following subsections, followed by a summary of the methods used to compute the EPC for each EA and subarea.

2.1 Floodplain Soil PCB Data

The soil PCB data collected as part of the Reach 6 PDI for the non-residential floodplain EAs were combined with other relevant historical data to provide a detailed representation of the spatial distribution of PCB concentrations in the floodplain. The following datasets were used in the PCB evaluations:

- Floodplain soil PCB data collected historically by GE in 1992 and 1993;

- Floodplain soil PCB data collected by EPA as part of its Supplemental Investigation conducted between 1998 and 2002; and
- Soil PCB data collected by GE during the Reach 6 PDI conducted in 2023.

Data treatment for all historical and PDI data was performed as described in Appendix A to GE's Revised Reach 6 PDI Work Plan and was generally consistent with the data treatment used for floodplain soil evaluations in the RCMS Report.

2.2 Interpolation of PCB Concentrations

In accordance with Appendix A to GE's Revised Reach 6 PDI Work Plan, a spatial interpolation method using Thiessen polygons was used to generate a continuous coverage of PCB concentrations over the portions of the floodplain that include the non-residential EAs (referred to hereafter as "the subject floodplain"). For Reach 6, the floodplain is bounded by the 1 mg/kg PCB isopleth.

Consistent with the method used by EPA in the HHRA, generation of Thiessen polygons in the subject floodplain for Reach 6 considers topographic and hydrologic information in the interpolation process. Because PCBs are typically transported onto the floodplain during overbank flow conditions, the PCB distribution in floodplain soils is linked to the topographic and hydrologic features that also influence the distribution of wetland habitats. Six "super habitats"—i.e., grouped habitats having similar characteristics, developed from the Woodlot habitat survey (Woodlot 2002)—were introduced by EPA in the HHRA to guide the spatial interpolation of PCBs in the subject floodplain. Those six super habitats are as follows: (1) hardwood forest/agricultural field; (2) transitional floodplain forest; (3) shrub swamp; (4) emergent marsh/wet meadow; (5) lake/pond; and (6) stream. The super habitat mapping in Reach 6 was subsequently updated based on field surveys of habitat cover types conducted by AECOM between April 20 and June 29, 2023. Further adjustments were made in 2024 as part of the conceptual design phase in some isolated areas where habitat information was missing, mostly areas near the edges of the 1 mg/kg PCB isopleth boundary. For these adjustments, habitat information was reviewed, and the appropriate super habitat polygons were specified in those isolated areas. The updated super habitats within the five floodplain EAs are shown in the upper-left panel on Figures 2a through 2e.

Thiessen polygons were generated separately for the 0- to 0.5-foot and 0.5- to 1-foot depth intervals for each individual super habitat, except for the lake/pond and stream super habitats, which are excluded from the calculation of floodplain EPCs. These polygons were generated using only the data from within that super habitat boundary, including the 2023 PDI data in Reach 6, as well as the historical floodplain soil data. For the 2023 Reach 6 PDI data, any EPA split sample results were averaged with the GE sample results from the same locations. The Thiessen polygons generated for each super habitat were merged to form a single PCB polygon coverage for the subject floodplain for the 0- to 0.5-foot and 0.5- to 1-foot layers. PCB polygons from these two layers were then converted to 3×3-meter grid cells over the entire floodplain area, and each grid cell was vertically averaged to calculate a 0- to 1-foot average PCB concentration. The interpolated PCB concentrations in 0- to 0.5-foot and 0.5- to 1-foot layers, as well as the resulting 0- to 1-foot average PCB concentrations for each EA, are shown on Figures 2a through 2e (see the upper-right, lower-left, and lower-right panels, respectively). On these figures, the polygons are categorized by color based on defined ranges of PCB concentrations.

A similar method was used to interpolate PCB data to the depth of three feet in the Frequently Used Subareas. The 0- to 1-foot average PCB concentrations, discussed in the preceding paragraph, were averaged with interpolated PCB concentrations from the 1- to 2-foot and 2- to 3-foot depth intervals to form 0- to 3-foot average PCB concentrations. Figures 3a through 3c show the 0- to 3-foot average PCB concentrations for the Frequently Used Subareas.

Note that there are six islands located east of EAs 56 and 56a that were inadvertently excluded from EPA's HHRA, as indicated in EPA's conditional approval letters for GE's November 3, 2022 *Pre-Design Investigation Work Plan for Reach 6* (Anchor QEA 2022) and the Revised Reach 6 PDI Work Plan. These islands have been included as part of EAs 56 and 56a in the floodplain evaluations. Furthermore, the boundary for Frequently Used Subarea 60a was modified to exclude the dock area and to exclude an adjacent densely vegetated area that is difficult to access, based on additional field reconnaissance performed in July 2024.

2.3 Calculation of Exposure Point Concentrations

Using the interpolated PCB data set, average soil PCB concentrations were computed for each EA as the 95% Upper Confidence Limit (UCL) on the spatially weighted mean of the data for that EA or subarea. Consistent with the method developed by EPA in the HHRA and used by GE in the RCMS Report, the 95% UCL was calculated using the Modified Halls Bootstrap Method (described in EPA's HHRA, Volume I, Attachment 4). Once the 95% UCL was calculated for a given EA, it was compared to the maximum data value within that area, and the lower of those two values was used as the EPC (i.e., the EPC is not allowed to exceed the maximum interpolated value within a given area).

The method developed by EPA for the 95% UCL calculations also includes application of accessibility weighting factors (hereafter referred to as "use factors") in Reaches 5 and 6. Specifically, the subject floodplain was mapped into four accessibility categories (i.e., walkable, wadable, difficult, and boatable) in the HHRA, corresponding to use factors of 1.0, 0.2, 0.2, and 0.0 for each of these areas, respectively. The areas corresponding to these accessibility categories were also updated consistent with the revised 2023 super habitat mapping in Reach 6. Consistent with the methodology applied by EPA in the HHRA (described in Section 4.4.1.1.1 of the HHRA), these use factors were applied as multipliers on the interpolated PCB concentrations "to account for the variation in accessibility and overall attractiveness of these habitats to children and adults engaged in recreational or residential and other activities." For example, areas considered walkable (with a use factor of 1.0) would be accessed more frequently than areas considered difficult to access or wadable (with a use factor of 0.2). Areas that are considered boatable, including backwaters and other waterbodies, have a use factor of 0.0 and are, therefore, excluded from the EPC calculations. The one exception to the application of these use factors is for the waterfowl hunting exposure scenario for subarea 56a. For that subarea, due to waterfowl hunters' increased contact with wadable and difficult-to-access area (described in Section 4.4.1.1.1. of the HRRA), the weighting factors were set to 1.0 for all accessibility categories. The updated accessibility for the five non-residential floodplain EAs are shown in the upper-left panel on Figures 2a through 2e.

The following is a summary of modifications made to the EPC calculations for remedial design:

- The EPC calculation used the number of PCB sample locations within a given EA (or subarea) to define the "degrees of freedom" for that EA, as directed by EPA during the RCMS. Because the boatable areas were excluded from the evaluation, it was determined that PCB samples within the boatable areas should be excluded from the location counts. This modification had insignificant impact to the resulting EPCs, given the large number of floodplain samples and limited boatable areas within non-residential floodplain EAs.
- EPCs in Frequently Used Subareas were calculated for both the 0- to 1-foot and 0- to 3-foot depth intervals, as discussed with EPA for the Reach 5A floodplain evaluation.[1]

GE's Reach 6 PDI Summary Report provides an updated evaluation of current EPCs at each of the five non-residential EAs. These EPCs form the primary basis, along with other relevant factors (discussed below), for determining the need for and extent of soil remediation at these EAs to achieve the applicable Performance Standards.

Table 1 summarizes the updated floodplain soil EPCs (0- to 1-foot) calculated for each of the five non-residential EAs (and subareas) in Reach 6, and Table 2 provides 0- to 1-foot and 0- to 3-foot EPCs for each of the three Frequently Used Subareas in Reach 6. These tables also show the following: (1) whether each EA intersects with Core Area 1 habitat;[2] (2) the exposure scenario and receptors assigned to each EA and subarea in EPA's HHRA; and (3) the corresponding Primary and, where relevant, Secondary Performance Standards that apply to each exposure scenario under

[1] During discussions with EPA regarding GE's non-residential floodplain evaluations Reach 5A, GE agreed with EPA to evaluate both 0- to 1-foot and 0- to 3-foot EPCs in Frequently Used Subareas (which had been previously evaluated for only 0- to 3-foot EPCs). GE has followed the same approach for the Frequently Used Subareas in the Reach 6 floodplain.

[2] As defined in the Revised Final Permit, Core Area 1 habitat consists of areas identified by the Massachusetts Division of Fisheries and Wildlife (MassDFW) as areas with "the highest quality habitat for species that are most likely to be adversely impacted by PCB remediation activities," most of which species are plants because they are not mobile (Attachment B to Revised Final Permit).

Tables 1 and 2 of the Revised Final Permit.[3] In accordance with the Revised Final Permit, the Secondary Performance Standards are relevant only in EAs that contain Core Area 1 habitat. EPCs that exceed the applicable Primary Performance Standard are highlighted in gray in Tables 1 and 2. As provided in the Revised Final Permit, EAs where the EPC exceeds the Primary Performance Standard will require some amount of remediation to achieve the Performance Standards.

3 Methods for Evaluation of Removal Areas and Volumes

As summarized in Tables 1 and 2, two of the five EAs/subareas have EPCs exceeding the applicable non-residential Performance Standards. Specifically, EA 58 and the Frequently Used Subarea in EA 59 (referred to hereafter as FUSA 59) each have an EPC that exceeds the applicable Performance Standards; therefore, remediation will be required in these two EAs. Methods used to delineate remediation areas in the EA and Frequently Used Subarea are described below.

For each EA/subarea that requires remediation, the approximate areal extent and volume of soil removal were calculated using an iterative process as described in Appendix A to GE's Revised Reach 6 PDI Work Plan. For each EA/subarea with an existing EPC greater than the applicable Primary Performance Standard, the 3×3-meter grid cells with the highest PCB concentrations were flagged for removal and assigned a background replacement soil concentration of 0.021 mg/kg to represent clean backfill material.[4] The EPC was then recalculated (incorporating the area flagged for remediation) and compared again with the Primary Performance Standard. This sequential removal/backfill and recalculation of the EPC was repeated until the amount of remediation was sufficient to reduce the post-remediation EPC to a level that is at or below the applicable Primary Performance Standard for that area.

The remedial evaluations were first performed for subareas (that overlap with larger EAs) prior to evaluating the larger EAs. Any removal required to meet the applicable Performance Standard in a subarea was accounted for during subsequent evaluations to determine whether additional removal was required to achieve the applicable Performance Standard for the larger EA. Accordingly, the evaluation for FUSA 59 was performed first, followed by EA 58.

To facilitate the remedial evaluations, a GIS-based application was developed that employs a raster data model, in which relevant floodplain features (e.g., EA boundaries, super habitats, and use factors) and soil PCB data are translated to 3×3-meter grid cells over the floodplain. This application implements the evaluation process described above in Python code and calculates an optimized

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[3] For Frequently Used Subareas, only one set of Performance Standards is provided in the Revised Final Permit.

[4] A PCB concentration of 0.021 mg/kg was used for the backfill in the Reach 6 floodplain evaluations because that was the average concentration of PCBs in previously sampled backfill sources, as indicated in Table 2 of GE's Proposed Backfill Data Set for CD Sites, dated March 11, 2003.

combination of removal areas and volumes for each EA and subarea that minimizes the removal footprint required to achieve the applicable Performance Standard.

4 Methods for Disposal Evaluation

As described in Sections II.B.5 and II.B.6 of the Revised Final Permit, the ROR Remedial Action will use a hybrid disposal approach that includes a combination of disposal at a UDF and off-site disposal. Attachment E to the Revised Final Permit describes the criteria and methods for determining whether material excavated during the ROR Remedial Action may be disposed of in the UDF. In accordance with Attachment E to the Revised Final Permit, floodplain soil to be disposed of in the UDF must have a volume-weighted average PCB concentration of less than 50 mg/kg for each EA. If the volume-weighted average PCB concentration in the soil to be removed from a given EA equals or exceeds 50 mg/kg, the soils with the highest PCB concentrations in the EA will be segregated for off-site disposal until the average concentration of the remainder of the soil to be removed in the EA decreases to less than 50 mg/kg for subsequent disposal at the UDF.

For EA 58 and FUSA 59, where remediation is required, a volume-weighted average PCB concentration of the soils to be removed was calculated using the interpolated PCB concentrations in 3×3-meter grid cells within the removal footprints and the associated removal areas and depths. If the volume-weighted average PCB concentration for a given EA was below 50 mg/kg, the entire quantity of floodplain soils to be removed from that EA was designated for disposal at the UDF. If the volume-weighted average PCB concentration was 50 mg/kg or greater, the soils with the highest PCB concentrations in the EA were designated for off-site disposal until the average concentration of the remainder of the soil to be removed in the EA decreased to less than 50 mg/kg; the remaining soils were then designated for disposal at the UDF. The resulting disposal locations and volumes for EA 58 and FUSA 59 are discussed in Section 5.

5 Remedial Evaluation Results by Exposure Area

This section summarizes the remedial evaluation results for the two areas requiring remediation (EA 58 and FUSA 59). As described in Section 3, a GIS application was used to perform the remediation assessment. The proposed removal volume was further evaluated to designate soils that would be segregated for disposal in the UDF or off-site disposal, as described in Section 4.

The proposed removal footprints in EA 58 and FUSA 59 are shown on Figures 4 and 5, respectively. For EA 58, the distribution of super habitats and habitat accessibility are presented side-by-side with the 0- to 1-foot PCB concentrations used for the evaluation. For FUSA 59, the interpolated 0- to 1-foot PCB concentrations are presented along with the 0- to 3-foot PCB concentrations. A summary of proposed removal areas and volumes associated with each EA and subarea is presented in Table 3. Table 4 summarizes the estimated disposal volumes for each EA/subarea, including the volumes subject to disposal in the UDF and those subject to off-site disposal. Note that supplemental floodplain soil sampling is proposed for these EAs to better characterize PCB concentrations and to better define the extent of the 1 mg/kg PCB isopleth. The supplemental data will also be used to refine the extent of removal in these areas. Details related to the supplemental floodplain sampling are provided in Appendix F of the Conceptual RD/RA Work Plan.

5.1 Exposure Area 58

EA 58 occupies approximately 1.3 acres and is classified as a high-use general recreation area for adults; it is shown on Figure 4. The Primary Performance Standard for EA 58 is 14 mg/kg. There is no Core Area 1 habitat within this EA, so the Secondary Performance Standard is not relevant. There are also no vernal pools in this EA. The existing (pre-remediation) EPC in EA 58 is 15 mg/kg, which exceeds the Primary Performance Standard; therefore, this EA requires remediation. This EA also contains a Frequently Used Subarea. As shown in Table 2, based on the calculated existing EPCs, the Frequently Used Subarea in EA 58 does not require remediation. Most of EA 58 is considered walkable, with nearly a quarter of the area along the shore is considered difficult to access.

The proposed remedial action for EA 58 includes removal/backfill of approximately 7 cubic yards (cy) of floodplain soils to a depth of one foot below ground surface (bgs), as shown on Figure 4. The total removal area is approximately 194 square feet (0.0045 acre). The target removal is at the area of the highest PCB concentration of 143 mg/kg within the EA.

The proposed remediation will reduce the post-remediation EPC in EA 58 to 13.4 mg/kg (see Table 3), which achieves the Primary Performance Standard of 14 mg/kg for this EA.

As shown in Table 4, the volume-weighted average PCB concentration of soil to be removed from EA 58 is 143 mg/kg that exceeds 50 mg/kg. Therefore, the entire removal volume will be segregated for off-site disposal.

5.2 Frequently Used Subarea in EA 59

FUSA 59 is an approximate 0.19-acre portion of EA 59, as shown on Figure 5. The entire Frequently Used Subarea is considered walkable. None of the area is considered Core Area 1 habitat, and there are no vernal pools in this subarea.

FUSA 59 is classified as high-use general recreation areas for adults and older children. The Performance Standard is 14 mg/kg for both the 0- to 1-foot and 0- to 3-foot soils. This area has pre-remediation EPCs of 45 mg/kg and 15 mg/kg in 0- to 1-foot and 0- to 3-foot soils, respectively,[5] that exceed the Performance Standard; therefore, this subarea requires remediation.

The proposed remedial action includes removal/backfill of approximately 7 cy of floodplain soils to a depth of one foot bgs (Figure 5; left panel). The proposed removal covers approximately 194 square feet (0.0045 acre) of area with a 0- to 1-foot PCB concentration of 45 mg/kg. This reduces the post-remediation EPC to 1.1 mg/kg and thus achieves the Performance Standard for this area (Table 3). Given that the PCB concentrations in 1- to 2-foot and 2- to 3-foot depth intervals are low (Figure 3b), the proposed removal of 0- to 1-foot soil will reduce the 0- to 3-foot EPC to 0.4 mg/kg (Figure 5, right panel), which is below the Performance Standard for this area. Therefore, further removal in the 0- to 3-foot depth increment is not required.

As shown in Table 4, the volume-weighted average PCB concentration to be removed from FUSA 59 is approximately 45 mg/kg; therefore, all soils removed from this Frequently Used Subarea will be subject to disposal in the UDF.

6 References

Anchor QEA, 2022. *Pre-Design Investigation Work Plan for Reach 6*. Housatonic River – Rest of River. Prepared for General Electric Company. November 3, 2022.

Anchor QEA, 2023. *Revised Pre-Design Investigation Work Plan for Reach 6*. Prepared for General Electric Company, Pittsfield, Massachusetts. May 2023.

Anchor QEA, 2024. *Pre-Design Investigation Summary Report for Reach 6*. Prepared for General Electric Company, Pittsfield, Massachusetts. October 2024.

Arcadis, Anchor QEA, and AECOM, 2010. *Housatonic River – Rest of River, Revised Corrective Measures Study Report*. Prepared for General Electric Company, Pittsfield, Massachusetts. October 2010.

EPA (U.S. Environmental Protection Agency), 2005. *Human Health Risk Assessment, GE/Housatonic River Site, Rest of River*. Prepared by Weston Solutions, West Chester, Pennsylvania. February 2005.

EPA, 2020. *Revised Final Permit Modification to the 2016 Reissued RCRA Permit and Selection of CERCLA Remedial Action and Operation & Maintenance for Rest of River*. December 2020.

[5] The pre-remediation EPCs in 0- to 1-foot and 0- to 3-foot soils were set to the maximum PCB concentrations in this Frequently Used Subarea because, in each given layer, the calculated 95% UCL is higher than the maximum concentration due to the large variability in concentrations (concentrations are below 1 mg/kg in remaining areas). Note this high PCB concentration is driven by one historical core in the surficial soil (0- to 1-foot) located outside the subarea.

Woodlot (Woodlot Alternatives, Inc.), 2002. *Ecological Characterization of the Housatonic River*. Prepared for U.S. Environmental Protection Agency Region 1, Boston, Massachusetts. September 2002.

Tables

Table 1
Calculated 0- to 1-Foot EPCs for Reach 6 Non-Residential Exposure Areas and Subareas

EA ID	EA Size (acres)[1]	Includes Core Area 1 Habitat	Exposure Scenario/Receptor	Performance Standards		0 to 1-Foot EPC (mg/kg)[2]
				Primary (RME 10^{-5}/HI = 1)	Secondary (RME 10^{-4}/HI = 1)	
56	36	Yes	Medium-use general recreation, adult/older child	21	40	2.0
56a	14	Yes	Waterfowl hunting	90	140	18
57	13	No	High-use general recreation, adult/older child	14	N/R	1.2
58	1.3	No	High-use general recreation, adult	14	N/R	15
59	1.9	No	High-use general recreation, adult/older child	14	N/R	11
59a	0.81	No	Bank fishing	26	N/R	22
60	1.1	No	High-use general recreation, adult/older child	14	N/R	1.4
60a	0.17	No	Recreational canoeist	12	N/R	1.8

Notes:

1. Represents the area within the 1 mg/kg PCB isopleth.
2. EPCs that exceed the applicable Primary Performance Standard are highlighted in gray.

EA: Exposure Area
EPC: exposure point concentration
HI: Hazard Index
mg/kg: milligram per kilogram
N/R: Not relevant; the Secondary Performance Standards are relevant only in EAs that contain Core Area 1 habitat.
PCB: polychlorinated biphenyl
RME: Reasonable Maximum Exposure

Table 2
Calculated 0- to 1-Foot and 0- to 3-Foot EPCs for Reach 6 Frequently Used Subareas

EA ID	Frequently Used Subarea Size (acres)[1]	Includes Core Area 1 Habitat	Exposure Scenario/Receptor	Performance Standards (mg/kg)	0 to 1-Foot EPC (mg/kg)[2]	0 to 3-Foot EPC (mg/kg)[2]
58	0.23	No	High-use general recreation, adult/older child	14	0.58	0.17
59	0.19	No	High-use general recreation, adult/older child	14	45	15
60a	0.0076	No	Recreational canoeist	12	0.21	0.11

Notes:

1. Represents the area of the Frequently Used Subarea within the EA boundary and 1 mg/kg PCB isopleth.
2. EPCs that exceed the applicable Primary Performance Standard are highlighted in gray.

EA: Exposure Area
EPC: exposure point concentration
mg/kg: milligram per kilogram

Table 3
Removal Areas and Volume Estimates for Non-Residential Floodplain EAs and Subareas Requiring Remediation and Post-Remediation EPCs

ID	Depth Interval (feet)	Includes Core Area 1 Habitat	Applicable Performance Standards (mg/kg)	Pre-Remediation EPC (mg/kg)		Post-Remediation EPC (mg/kg)[1]		Removal Area ($feet^2$)	Removal Volume (cy)
				0-1 Feet	0-3 Feet	0-1 Feet	0-3 Feet		
EA 58	0-1	No	14	15	—	13.4	—	194	7
FUSA 59	0-1	No	14	45	15	1.1	0.4	194	7
							Total	**388**	**14**

Notes:

1. The post-remediation EPCs are truncated and generally shown to one decimal place to demonstrate achievement of the applicable Performance Standards.

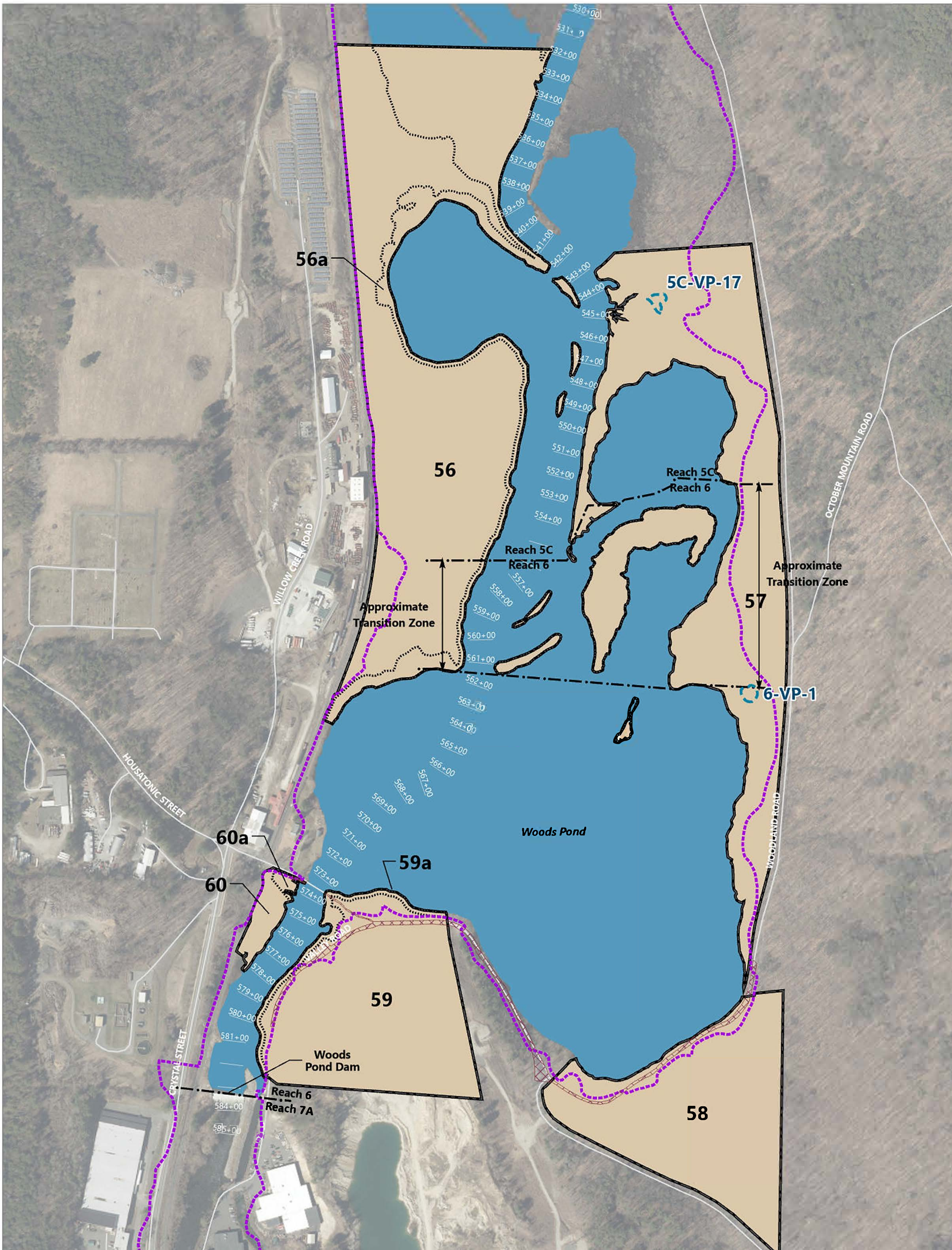
cy: cubic yard
EA: Exposure Area
EPC: exposure point concentration
mg/kg: milligram per kilogram

Table 4
Floodplain Soil—Estimated Disposal Volumes Summary

ID	UDF Disposal		Off-Site Disposal		Total Volume (cy)
	Volume Weighted Average PCB Concentration (mg/kg)	Volume (cy)	Volume Weighted Average PCB Concentration (mg/kg)	Volume (cy)	
EA 58	—	—	143	7	7
FUSA 59	45	7	—	—	7
Volume Totals		**7**		**7**	**14**

Notes:
cy: cubic yard
EA: Exposure Area
FUSA: Frequently Used Subarea
mg/kg: milligram per kilogram
PCB: polychlorinated biphenyl
UDF: Upland Disposal Facility

Figures



LEGEND:
- Housatonic River
- 0+00 River Stationing
- Reach Boundaries
- Exposure Area Boundary
- Exposure Subarea Boundary
- 1 mg/kg PCB Isopleth
- Frequently Used Subarea (FUSA)
- Vernal Pools (AECOM 2023)

NOTE:
1. Aerial imagery from MassGIS 2023.

0 400
Feet

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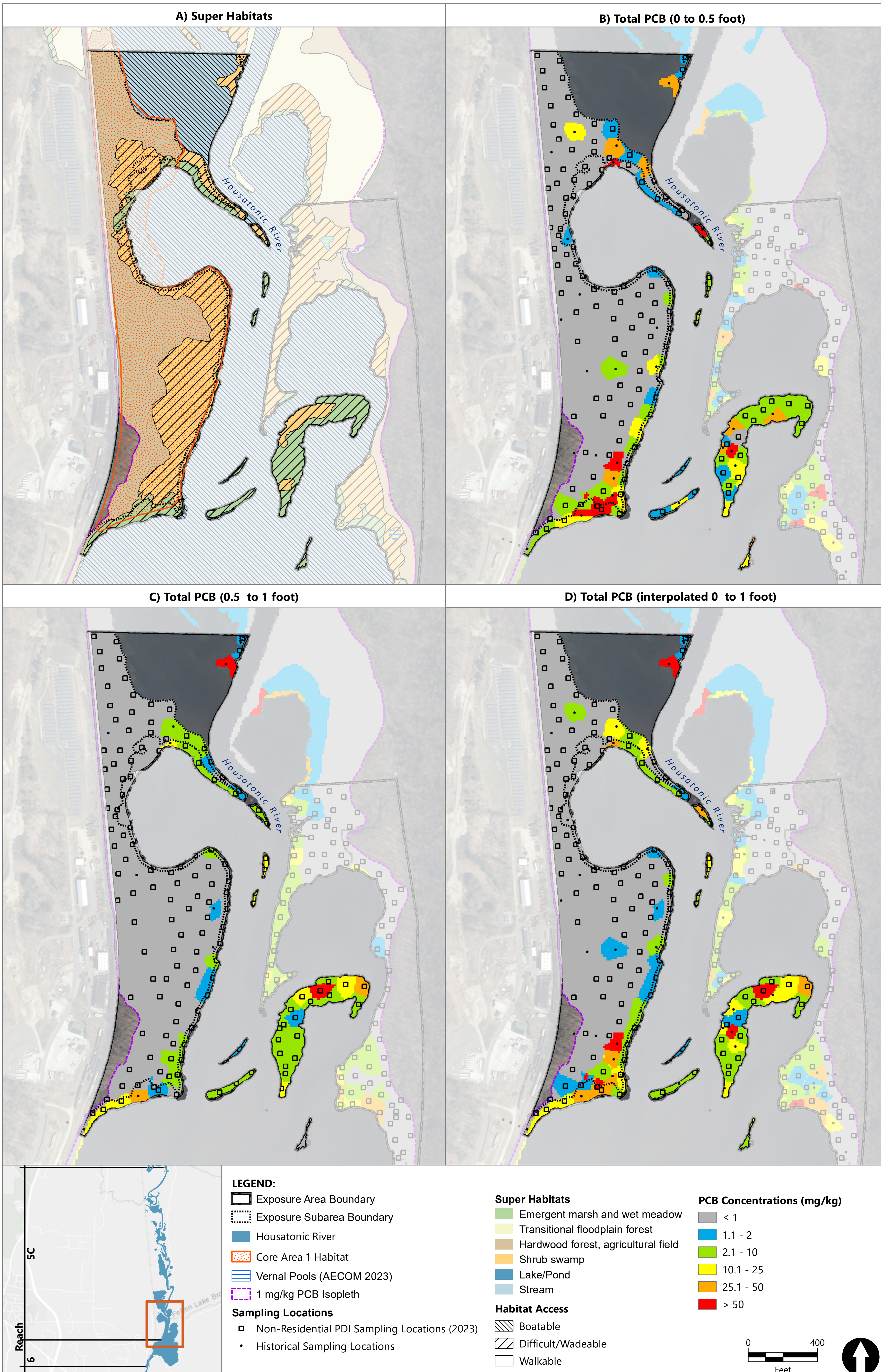
Filepath: \\gstfile01\gis\Jobs\GE_0469\HousatonicRiver\Maps\Reports\R6DSR\R6_DSR.aprx | Figure 1-2 Exposure Areas, FUSAs

ANCHOR QEA

Figure 1
Exposure Areas, Subareas, and Frequently Used Subareas in Reach 6
PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River



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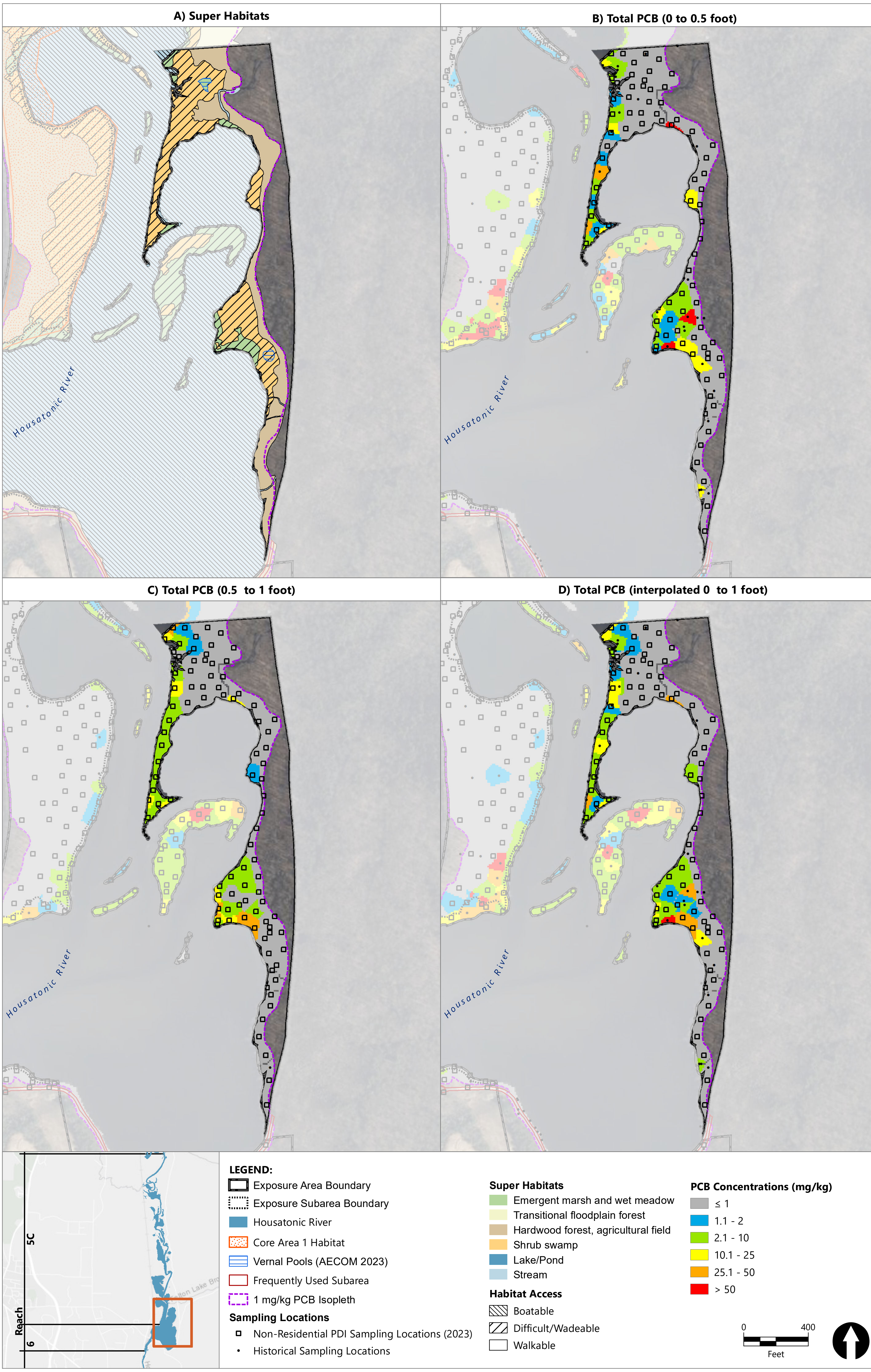
ANCHOR QEA

Figure 2a
Exposure Area 56
PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River



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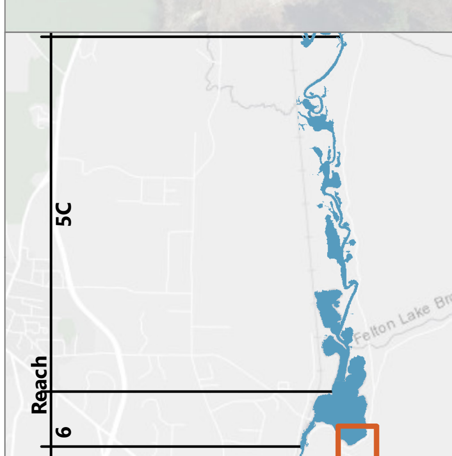
ANCHOR QEA

Figure 2b
Exposure Area 57
PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River



LEGEND:

- Exposure Area Boundary
- Exposure Subarea Boundary
- Housatonic River
- Frequently Used Subarea
- 1 mg/kg PCB Isopleth

Sampling Locations

- Non-Residential PDI Sampling Locations (2023)
- Historical Sampling Locations

Super Habitats

- Emergent marsh and wet meadow
- Transitional floodplain forest
- Hardwood forest, agricultural field
- Shrub swamp
- Lake/Pond
- Stream

Habitat Access

- Boatable
- Difficult/Wadeable
- Walkable

PCB Concentrations (mg/kg)

- ≤ 1
- 1.1 - 2
- 2.1 - 10
- 10.1 - 25
- 25.1 - 50
- > 50

0 200
Feet

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ANCHOR QEA

Figure 2c
Exposure Area 58
PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River

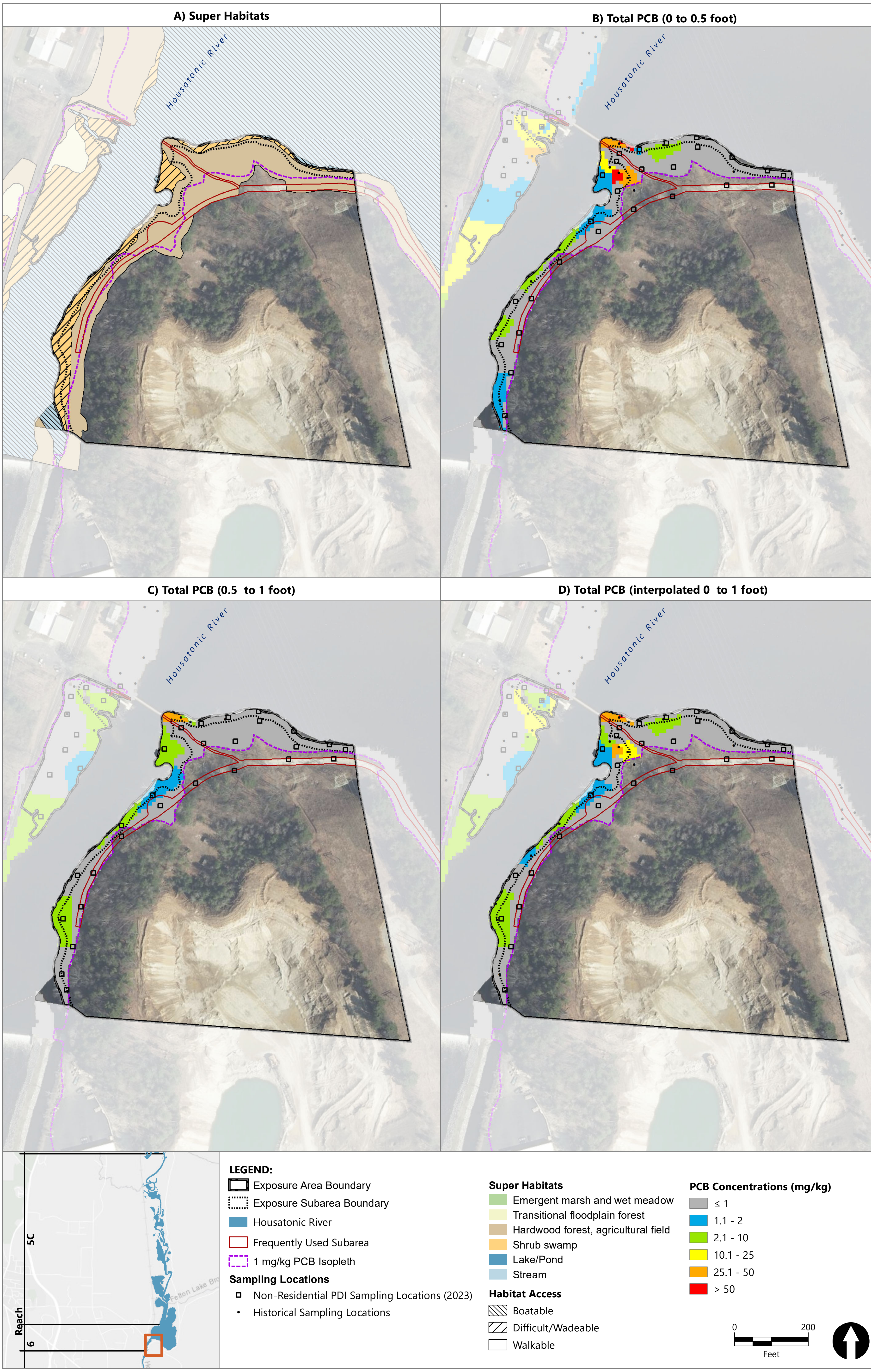

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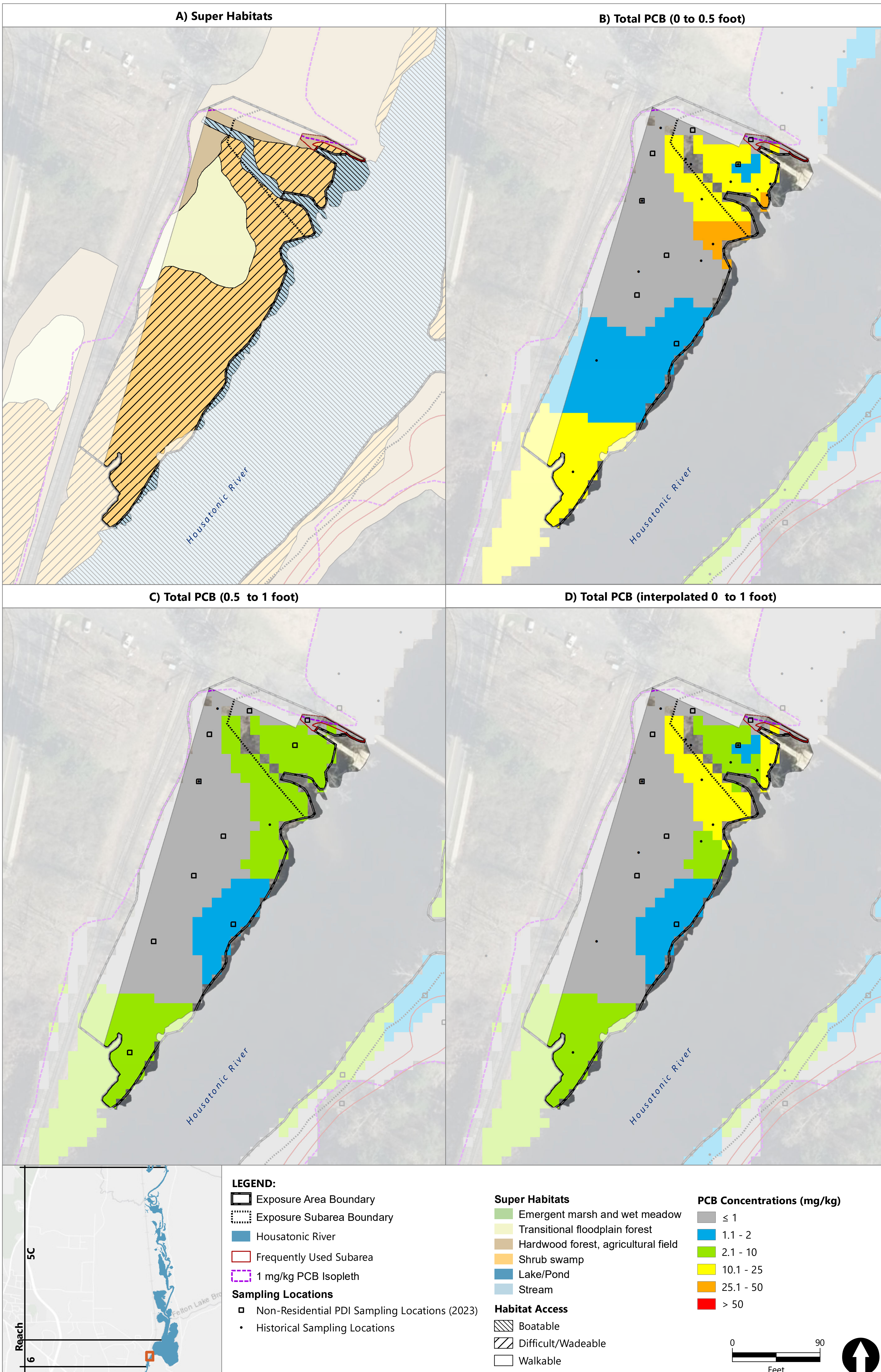
Figure 2d
Exposure Area 59
PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River



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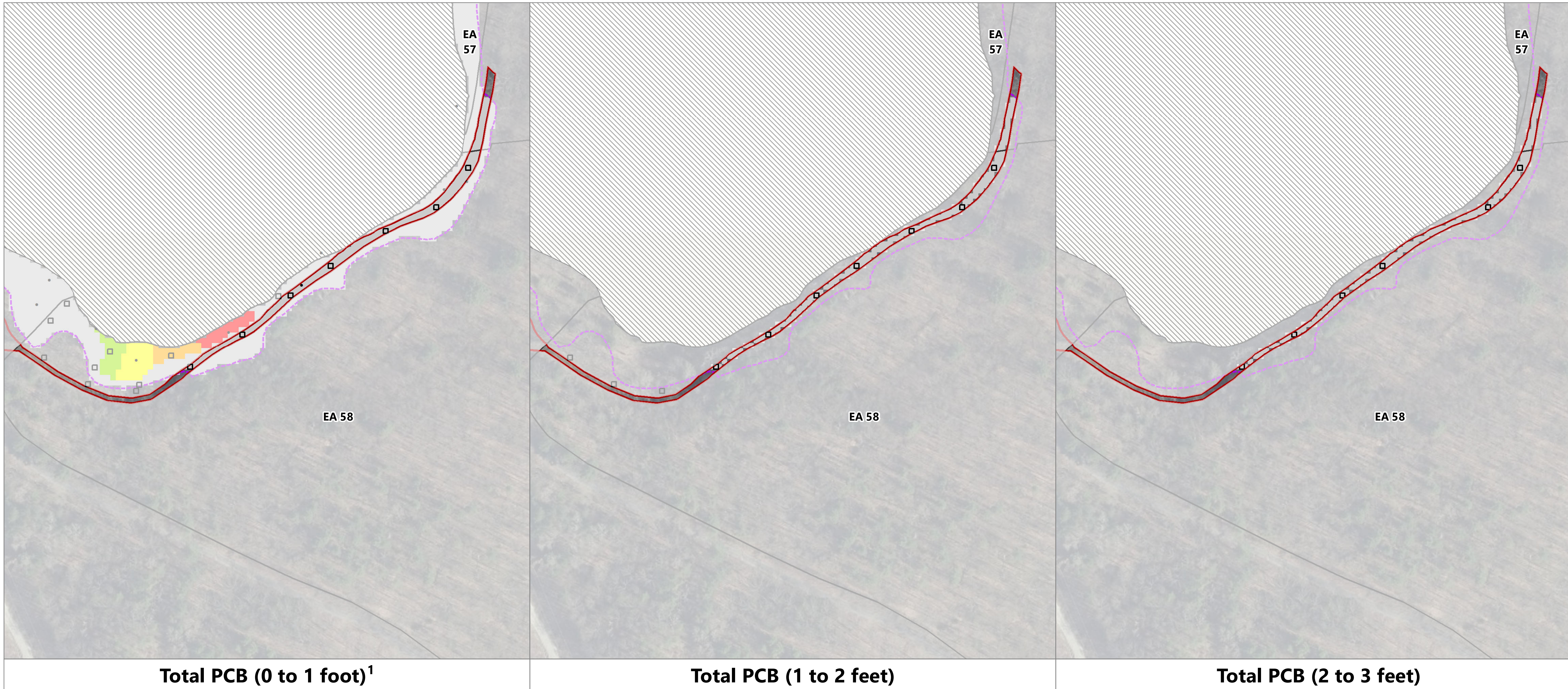
ANCHOR QEA

Figure 2e
Exposure Area 60
PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River



LEGEND:

- Exposure Area Boundary
- Exposure Subarea Boundary
- 1 mg/kg PCB Isopleth
- Frequently Used Subarea
- Botable Access

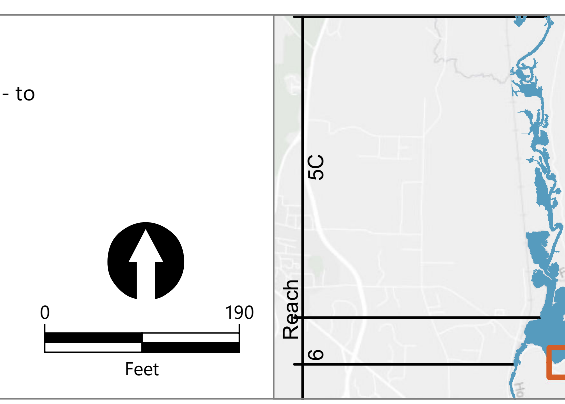
Sampling Locations

- Non-Residential PDI Sampling Locations (2023)
- Historical Sampling Locations

PCB Concentrations (mg/kg)

- ≤ 1
- 1.1 - 2
- 2.1 - 10
- 10.1 - 25
- 25.1 - 50
- > 50

NOTES:
1. PCB concentrations represent the average concentration in the top 0 to 1 foot of soil based on 0- to 0.5-foot and 0.5- to 1-foot layers.
2. Aerial imagery from MassGIS 2021.



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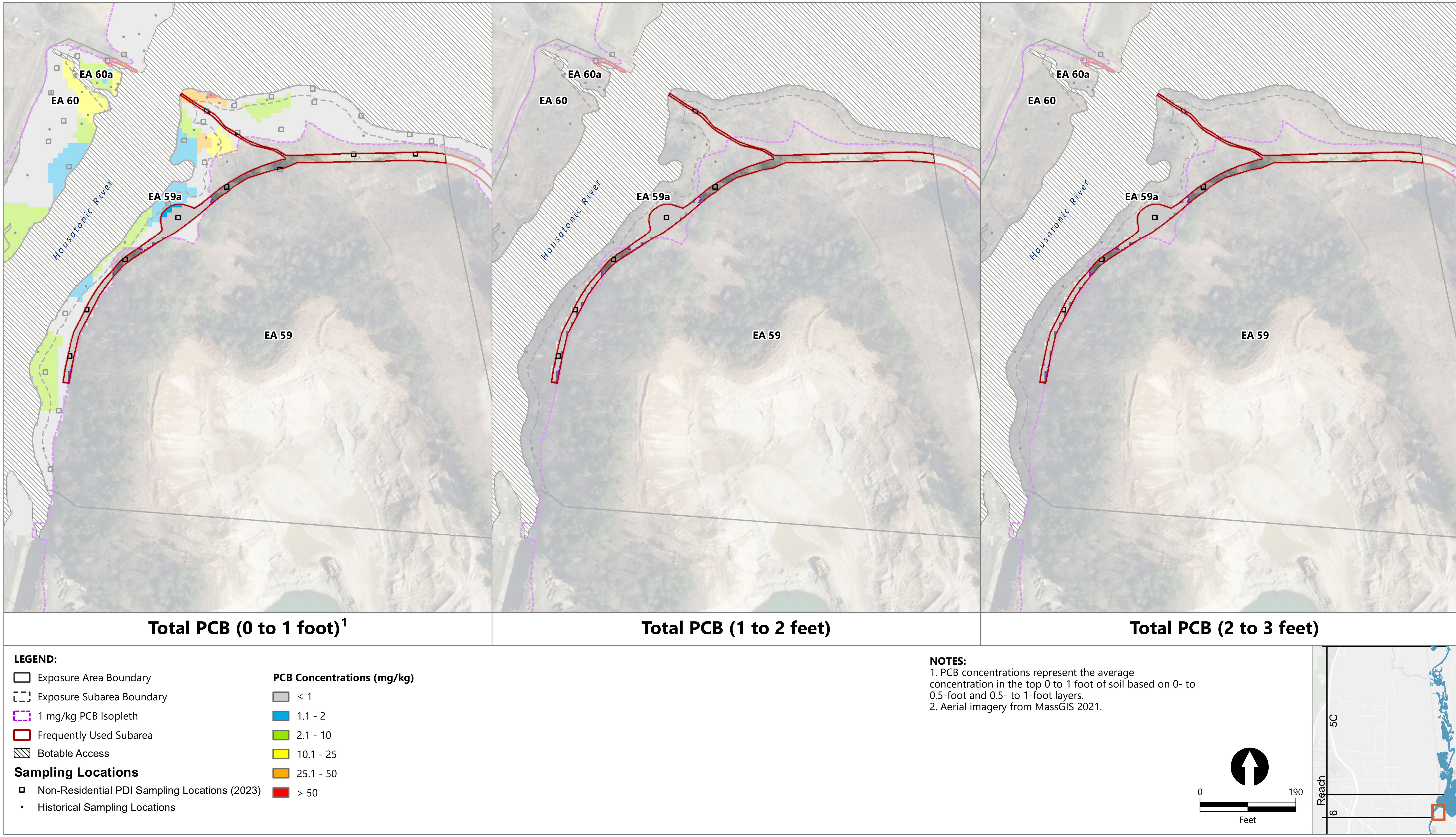
ANCHOR QEA

Figure 3a
Frequently Used Subarea (Exposure Area 58)

PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River



NOTES:
1. PCB concentrations represent the average concentration in the top 0 to 1 foot of soil based on 0- to 0.5-foot and 0.5- to 1-foot layers.
2. Aerial imagery from MassGIS 2021.

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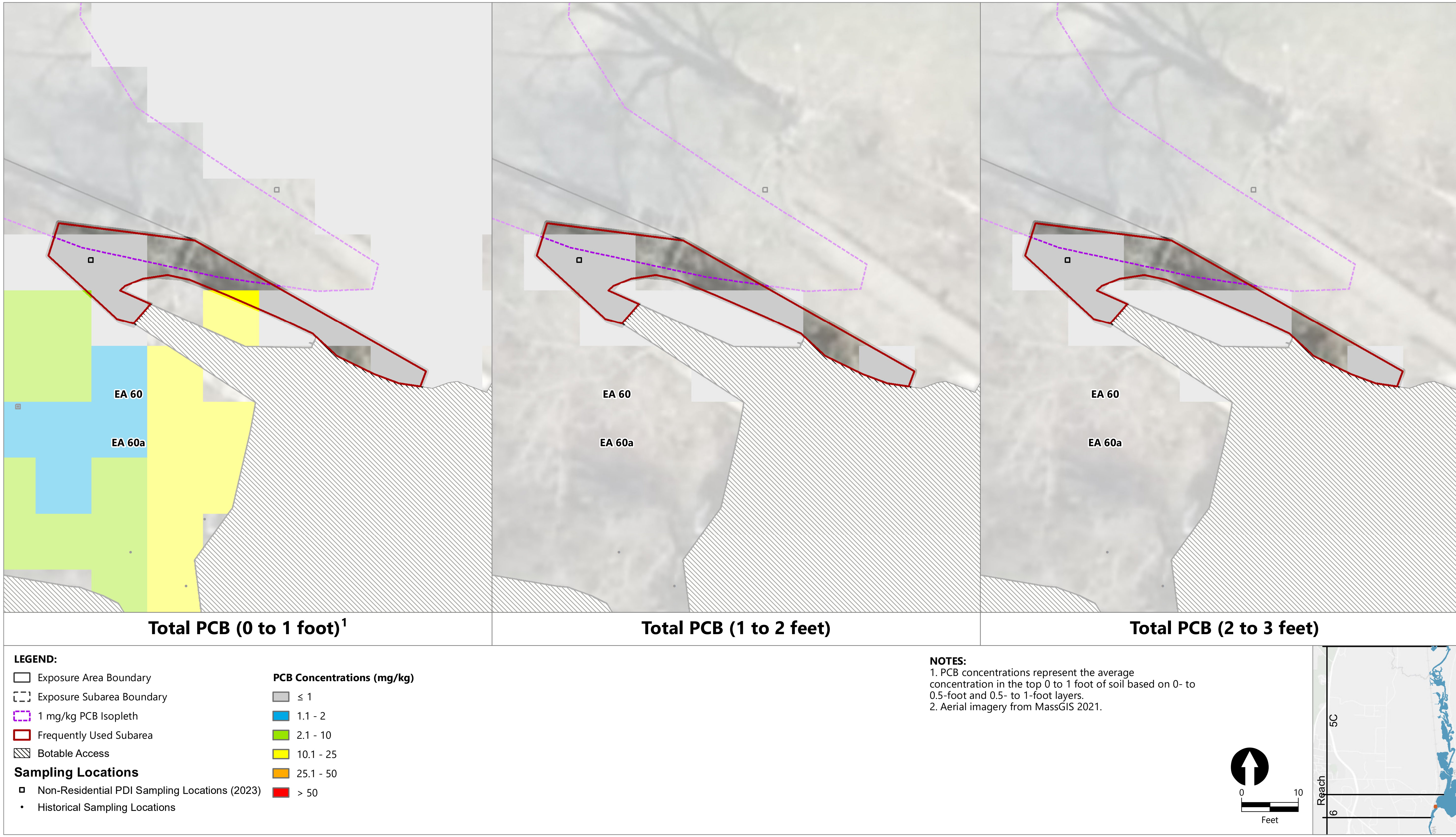
ANCHOR QEA

Figure 3b
Frequently Used Subarea (Exposure Area 59)

PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River



NOTES:
1. PCB concentrations represent the average concentration in the top 0 to 1 foot of soil based on 0- to 0.5-foot and 0.5- to 1-foot layers.
2. Aerial imagery from MassGIS 2021.

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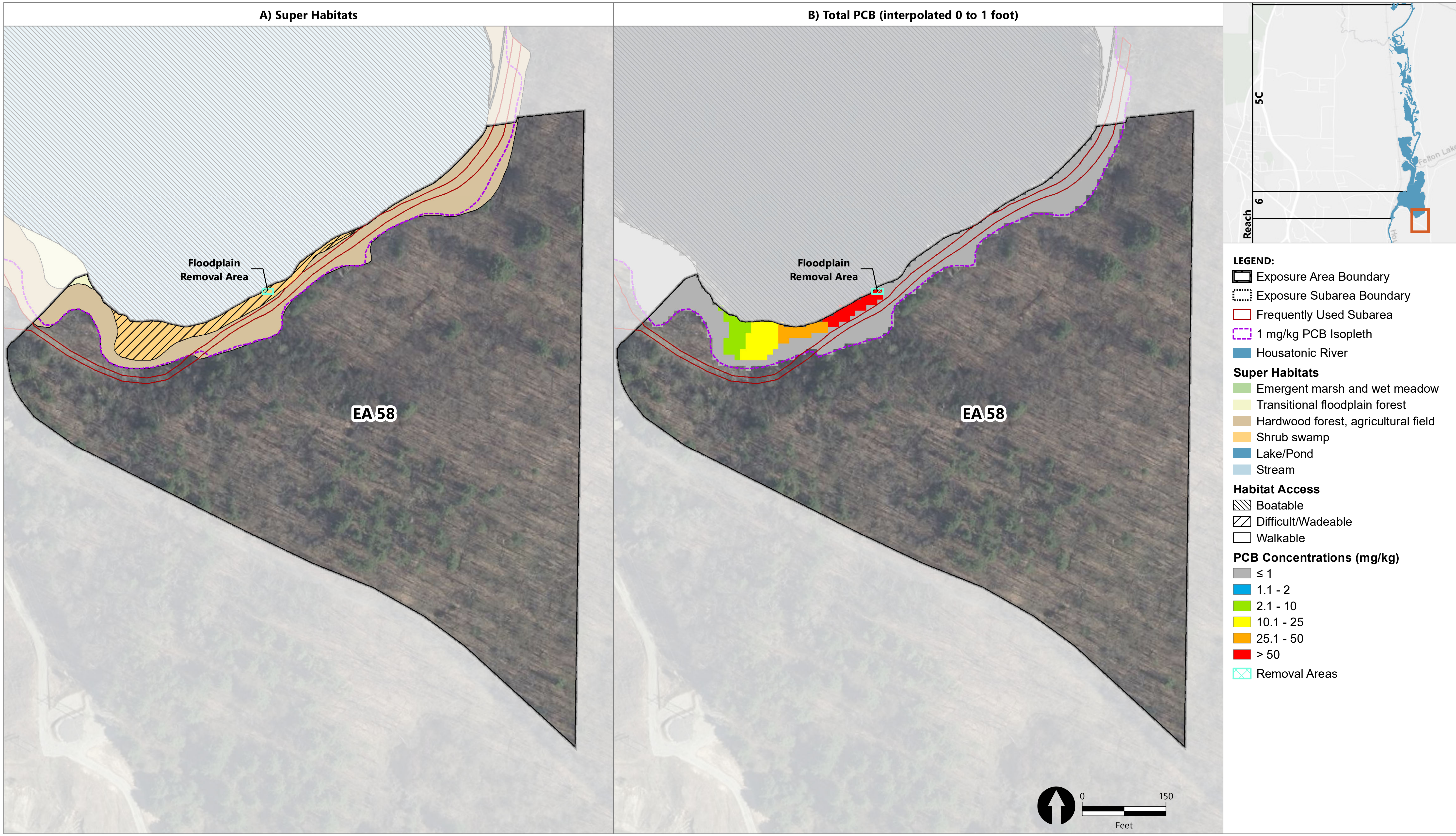
ANCHOR QEA

Figure 3c
Frequently Used Subarea (Exposure Area 60a)
PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River



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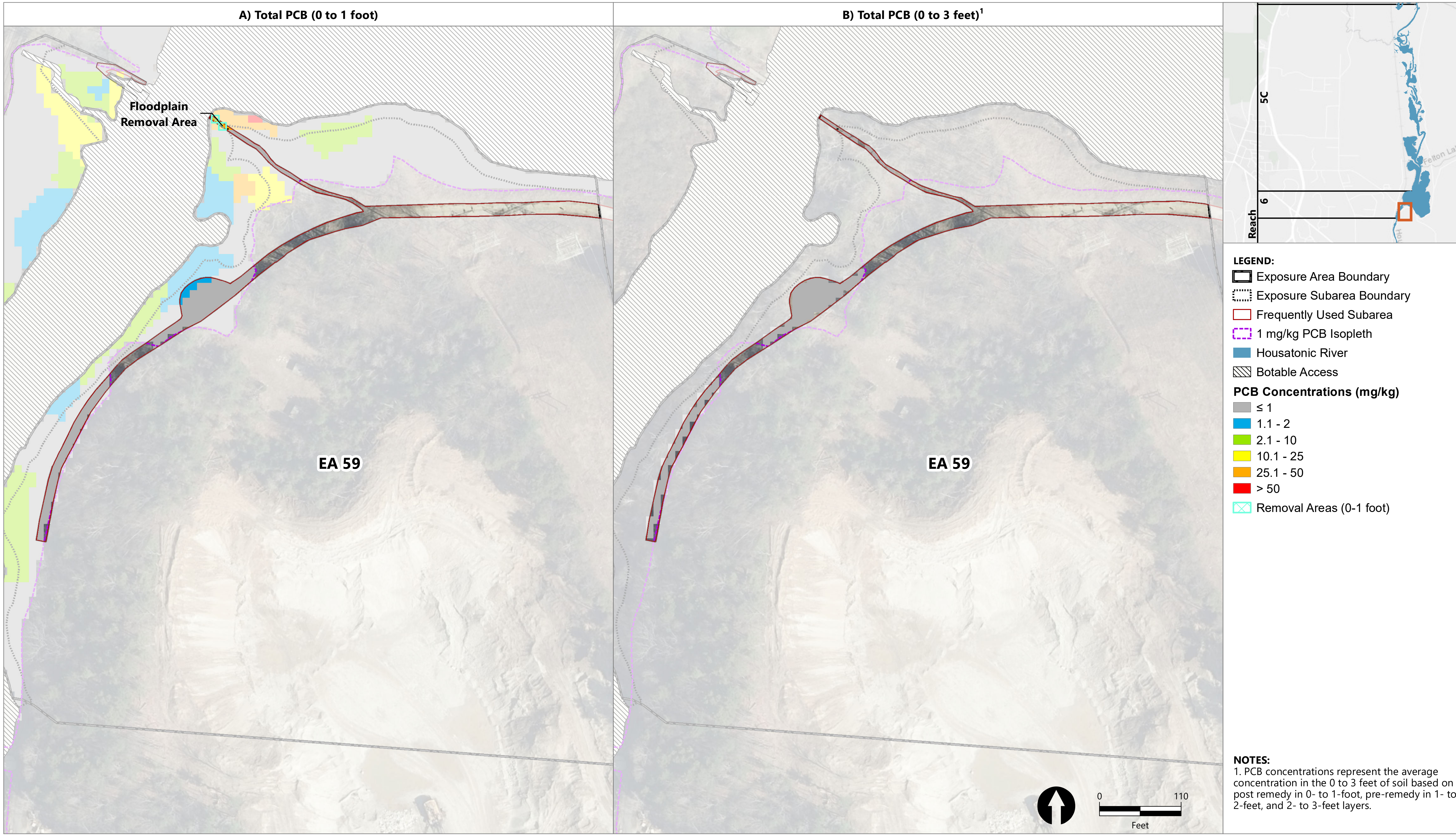
ANCHOR QEA

Figure 4
Non-Residential Floodplain Preliminary Remediation Areas (Exposure Area 58)
PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River



NOTES:
1. PCB concentrations represent the average concentration in the 0 to 3 feet of soil based on post remedy in 0- to 1-foot, pre-remedy in 1- to 2-feet, and 2- to 3-feet layers.

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Filepath: \\gstfile01\gis\Jobs\GE_0469\HousatonicRiver\Maps\Reports\R6RDWorkPlan\NonResidential\AppendixB\R6_WP_FigB-5_FUSA_wRemovalVolumes.mxd

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Figure 5
Non-Residential Floodplain Preliminary Remediation Areas (Exposure Area 59)
PCB Evaluations for Floodplain Soil
Housatonic River - Rest of River

Appendix C
Preliminary Engineered Cap Evaluation

October 2024
Housatonic River – Rest of River

Reach 6 Preliminary Engineered Cap Evaluation

Prepared for General Electric Company

October 2024
Housatonic River – Rest of River

Reach 6 Preliminary Engineered Cap Evaluation

Prepared for
General Electric Company
1 Plastics Avenue
Pittsfield, Massachusetts 01201

Prepared by
Anchor QEA
290 Elwood Davis Road
Liverpool, New York 13088

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ATTACHMENTS

ABBREVIATIONS

µg	microgram
AC	activated carbon
ACES	Automated Coastal Engineering System
AFDD	accumulated freezing degree days
BTZ	bioturbation zone
cfs	cubic feet per second
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
Conceptual RD/RA Work Plan	*Conceptual Remedial Design/Remediation Action Work Plan for Reach 6*
CRREL	Cold Regions Research and Engineering Laboratory
D_{15}	15th percentile particle size
D_{50}	median (50th percentile) particle size
D_{85}	85th percentile particle size
D_{100}	maximum particle diameter
DOC	dissolved organic carbon
EPA	U.S. Environmental Protection Agency
ERDC	Engineer Research and Development Center
FEMA	Federal Emergency Management Agency
FMD	*Final Model Documentation Report*
f_{OC}	fraction organic carbon
g	gram
GE	General Electric Company
H:V	horizontal to vertical
HEC-RAS	Hydrologic Engineering Center—River Analysis System
ITRC	Interstate Technology and Regulatory Council
K_d	partition coefficient
K_{DOC}	dissolved organic carbon partition coefficient
kg	kilogram
K_{OC}	organic carbon partition coefficient
K_{OW}	octanol/water partition coefficient
L	liter
mg	milligram
mph	mile per hour
ng	nanogram

OC	organic carbon
PCB	polychlorinated biphenyl
PDI	pre-design investigation
Revised Final Permit	Revised Final Resource Conservation and Recovery Act Permit Modification
Revised Reach 6 PDI Work Plan	*Revised Pre-Design Investigation Work Plan for Reach 6*
RFI	Resource Conservation and Recovery Act Facility Investigation
RFI Report	*Housatonic River – Rest of River RCRA Facility Investigation Report*
ROR	Rest of River
RU	Remediation Unit
Subaqueous Capping Guidance	*Guidance for In-Situ Subaqueous Capping of Contaminated Sediments*
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
yr^{-1}	per year

1 Introduction

1.1 Background

The final revised modification of the Resource Conservation and Recovery Act Corrective Action Permit (Revised Final Permit) issued by the U.S. Environmental Protection Agency (EPA) to the General Electric Company (GE) for the Housatonic Rest of River (ROR; EPA 2020) requires installation of engineered caps for certain areas within the ROR and sets forth Performance Standards for those caps. Section 4.3.3.1 of GE's *Final Revised Rest of River Statement of Work* (Anchor QEA et al. 2021) submitted under the Revised Final Permit stated that the Conceptual Remedial Design/Remedial Action Work Plan for each ROR remediation area that involves installation of an engineered cap would include preliminary design evaluations for such cap(s).

This appendix of the *Conceptual Remedial Design/Remedial Action Work Plan for Reach 6* (Conceptual RD/RA Work Plan) describes the preliminary engineered cap design evaluations conducted for the sediments of Woods Pond, including the outlet channel (Figure 1-1).[1] As described in Section 5.3 of Conceptual RD/RA Work Plan, that plan only includes the design activities required to support the sediment removal components of the Reach 6 remedy in Woods Pond and the outlet channel because final cap placement in Reach 6 will not occur until after completion of remediation in all upstream remediation units (RUs) (i.e., Reaches 5A, 5B, and 5C). Nonetheless, dredge prism elevations for Woods Pond and the outlet channel are highly dependent on cap thickness. Therefore, a preliminary cap design evaluation was performed to determine potential cap thickness in Woods Pond and the outlet channel, including both chemical isolation and erosion protection.[2]

The cap design evaluation presented in this appendix is considered preliminary because the pre-design investigation (PDI) data needed to design the cap have not been collected. Because final cap placement will not occur in Woods Pond for several years, the *Revised Pre-Design Investigation Work Plan for Reach 6* (Revised Reach 6 PDI Work Plan; Anchor QEA 2023) only included the PDI activities and data collection required to support the sediment and floodplain soil removal components of the remedy in Reach 6. An addendum to the Revised Reach 6 PDI Work Plan will be prepared in the future to describe the proposed additional PDI data collection needed to support the

[1] As discussed in the Conceptual RD/RA Work Plan, GE has elected to defer the conceptual design for the remediation of the Woods Pond headwaters portion of Reach 6 to a later addendum to the Final RD/RA Work Plan for Reach 6. Accordingly, that portion of Reach 6 has not been included in the capping evaluations presented in this appendix. See also Section 1.2.2.

[2] As discussed in the Conceptual RD/RA Work Plan, an engineered cap may also be installed in Valley Mill Pond (i.e., a small impoundment that is hydraulically connected to Woods Pond and is thus being considered in the design for Reach 6). If needed, the engineered cap design for Valley Mill Pond will be developed as part of the final design phase after collection and analysis of supplemental data on the sediments in this pond. It is anticipated that, if capping is employed, the cap in Valley Mill Pond would be similar to the cap design for Woods Pond.

engineered cap design in Reach 6. Likewise, an addendum to the Final RD/RA Work Plan for Reach 6 will be prepared to address the capping component of the Reach 6 remedy.

1.2 Cap Design Evaluation Scope and Requirements

As stated in the Revised Final Permit, the engineered caps are required to be designed "to physically isolate contaminated sediments from potential ecological and human receptors, and minimize the transport of polychlorinated biphenyls (PCBs) from the sediment beneath the caps to the bioavailable surface layer and the water column" (Section II.B.2.i.(2)). The conceptual designs for the engineered caps in Woods Pond and outlet channel were designed in accordance with guidance set forth in EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (EPA 2005), EPA's *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments* (Subaqueous Capping Guidance; Palermo et al. 1998), and the Interstate Technology and Regulatory Council's (ITRC's) *Contaminated Sediments Remediation: Remedy Selection for Contaminated Sediments* (ITRC 2014).

1.2.1 Performance Standards

The Performance Standards set forth in the Revised Final Permit require that an engineered cap be placed over the sediment bed in Woods Pond (Reach 6) after sediment removal to achieve specific post-capping minimum water depths. Specifically, in Woods Pond, sediment will be removed throughout the pond, and an engineered cap will be placed over residual PCBs to result in a post-capping minimum water depth of six feet measured from the crest of Woods Pond Dam, except in nearshore areas where the slope from the shore to the six-foot water depth is to be as steep as possible while also being stable and not subject to erosion or sloughing. In areas deeper than six feet prior to remediation, sufficient sediment will be removed to allow for placement of an engineered cap so the final grade is equal to or deeper than the pre-dredge grade.

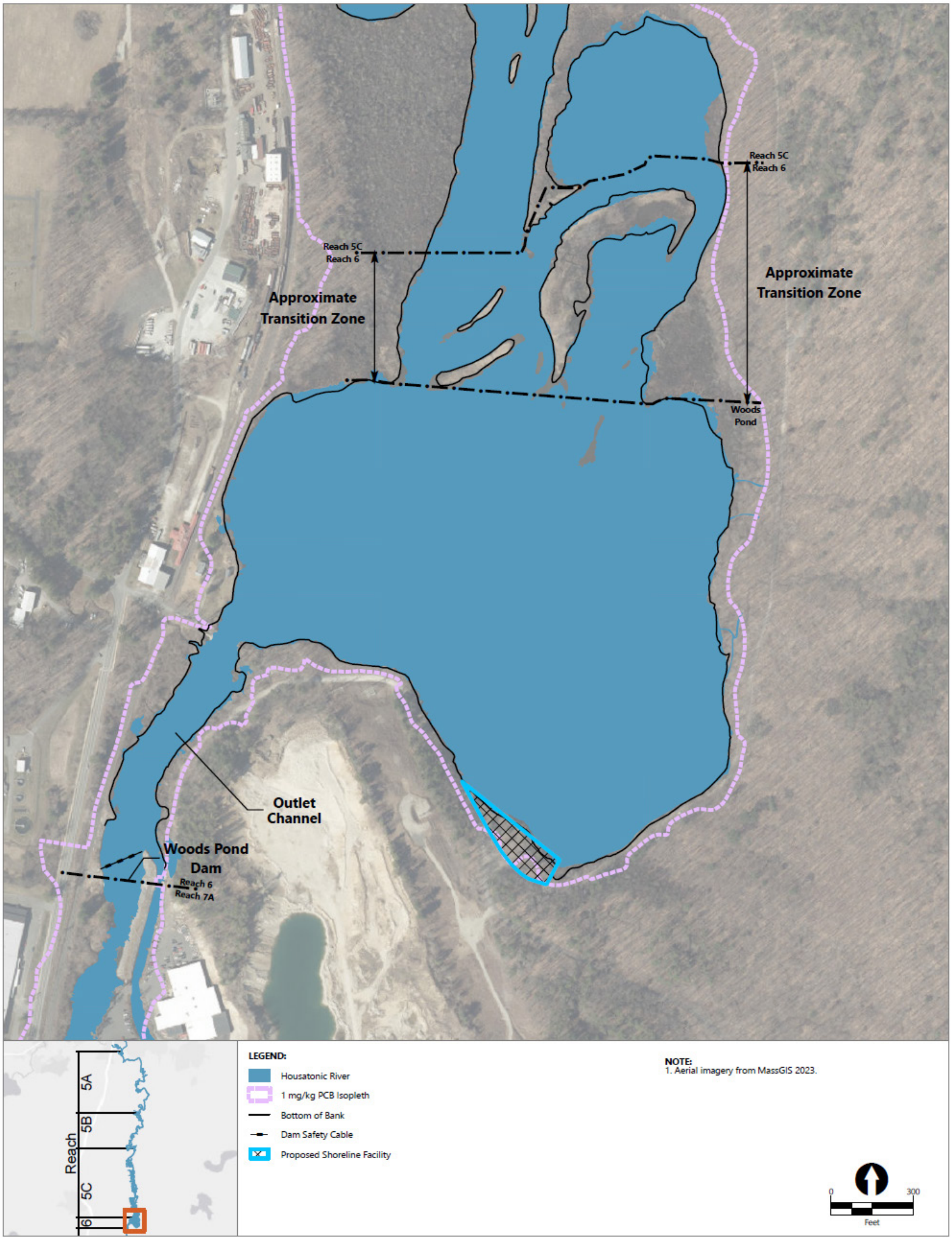
The Revised Final Permit does not contain any specific Performance Standards regarding the outlet channel. The conceptual design assumes that elevations within the outlet channel will be restored to pre-dredge conditions after capping (i.e., consistent with the remediation approach for Woods Pond where water depths are greater than six feet prior to remediation).

1.2.2 Areas to Be Capped

This appendix describes the preliminary engineered cap design evaluations conducted for the sediments of Woods Pond, including the outlet channel (Figure 1-1). As noted above and described in Section 1.4 of the Conceptual RD/RA Work Plan, sediment removal in the headwaters transition zone portion of Reach 6 will be conducted separately from and several years after the rest of Reach 6 sediment removal; therefore, the conceptual design for the transition zone portion of Reach 6 has not been included in the Conceptual RD/RA Work Plan and will not be presented in the Final RD/RA

Work Plan for Reach 6. Instead, design details for the sediment removal and capping design for the transition zone will be described in a future addendum to the Final RD/RA Work Plan for Reach 6.

Figure 1-1
Woods Pond Areas Identified for Capping



1.2.3 Cap Layers and Functions

The Performance Standards for engineered caps set forth in the Revised Final Permit (Section II.B.2.i.(1)(a)) require that engineered caps constructed in the ROR include the following layers or functions: a mixing layer, a chemical isolation layer, an erosion protection layer, a geotechnical filter layer, a bioturbation layer, and a habitat layer. The Revised Final Permit indicates that a single layer can serve multiple functions, which is consistent with EPA's Subaqueous Capping Guidance (Palermo et al. 1998). The specific layers and their need for inclusion in the Woods Pond caps are based on the design evaluations presented in this appendix and discussed in the following subsections.

1.2.3.1 Mixing Layer

The Performance Standards for engineered caps state that the cap shall include a "mixing layer to prevent contamination of the chemical isolation layer due to mixing with underlying contaminated sediment during cap placement, taking into account geotechnical considerations, placement techniques, and other factors as appropriate" (Section II.B.2.i.(1)(a)(i)). The concept of a dedicated mixing layer was included in EPA's Subaqueous Capping Guidance (Palermo et al. 1998) based on experience in constructing caps at that time.

The need for a mixing layer in the Woods Pond caps was considered. At this conceptual design stage, it has been determined that a separate mixing layer will not be necessary, based on the following:

- Experience and observations from multiple completed capping projects show that modern placement techniques can reliably place cap materials with minimal mixing (e.g., less than one inch), even in areas with relatively soft sediment (Anchor Environmental 2007; Shaw et al. 2008). Indeed, during the Silver Lake Pilot Study (Arcadis BBL 2008), cap material placed through the water column onto very soft sediment resulted in mixing that was limited to the bottom one inch (or less) of the chemical isolation material.
- The capping specifications in the final design will require the contractor to achieve a minimum thickness for the chemical isolation layer and will include overplacement allowances. Experience on environmental capping projects shows that contractors consistently place more than the minimum thickness when specifications are written this way. This approach ensures that the chemical isolation layer remains effective even if some mixing occurs.
- Placement techniques can be optimized to minimize the potential for cap materials to mix with the underlying sediment. It is anticipated that such techniques will be included in the final cap placement design.

1.2.3.2 Chemical Isolation Layer

The Performance Standards for engineered caps state that the cap shall include a "chemical isolation layer sufficient to minimize (reduce by 99%) the flux of PCB concentrations through the isolation layer" (Section II.B.2.i.(1)(a)(ii)). Preliminary evaluations conducted to identify the thickness and amendment content required to meet these Performance Standards in the Woods Pond caps are described in Section 3 of this appendix.

1.2.3.3 Erosion Protection Layer

The Performance Standards for engineered caps state that the cap shall include an "erosion protection layer to prevent erosion in accordance with federal and state requirements and consistent with pertinent EPA or U.S. Army Corps of Engineers (USACE) guidance" (Section II.B.2.i.(1)(a)(iii)). Preliminary evaluations conducted to identify the stable particle size and thickness of the erosion protection layer for the Woods Pond caps are described in Section 2 of this appendix.

1.2.3.4 Geotechnical Filter Layer

The Performance Standards for engineered caps state that the cap shall include a "geotechnical filter layer, as needed based on the design evaluation, to prevent mixing between other layers" (Section II.B.2.i.(1)(a)(iv)). Depending on the size of the erosion protection layer material, a geotechnical filter layer will be included in the Woods Pond caps as well. Preliminary evaluations of filter layer requirements are included in Section 2 of this appendix.

1.2.3.5 Bioturbation Layer

The Performance Standards for engineered caps state that the cap shall include a "bioturbation layer to prevent bioturbation from impacting underlying layers" (Section II.B.2.i.(1)(a)(v)). EPA's Subaqueous Capping Guidance (Palermo et al. 1998) discusses bioturbation layers as a separate layer to be included in caps in cases in which the erosion protection layer may consist of a relatively thin layer of finer-grained materials (like sands) to make sure organisms could not burrow down through the chemical isolation layer and come into contact with the underlying sediment, which would result in exposure of the organisms to contaminants and potentially affect the integrity of the cap by providing a means by which contaminants could be transported to the cap surface. However, for the Woods Pond caps, the erosion protection layer is sufficiently thick (see Section 2) such that it is equal to or thicker than the depth of bioturbation for the types of organisms known to be present in Woods Pond based on the ecological characterization performed as part of the site investigations (e.g., as summarized in Appendix B.4 of EPA's *Final Model Documentation Report* [FMD; EPA 2006]).[3] Additionally, as discussed in Section 3 of this appendix, the chemical transport model used to design the chemical isolation layer explicitly represents the contaminant mixing effects of bioturbation at

[3] Table 3 of Appendix B.4 to the FMD indicates that in Woods Pond, the biologically mixed depth interval extends from 0 to 8 centimeters (cm) below the sediment surface and the biologically influenced depth interval extends from 4 to 15 cm below the sediment surface.

the cap's surface. Therefore, the configuration of the erosion protection layer in the Woods Pond caps is such that it addresses the effects of bioturbation without the need for a separate dedicated bioturbation layer.

1.2.3.6 Habitat Layer

The Performance Standards for engineered caps state that the cap shall include a "habitat layer to provide functions and values equivalent to the pre-existing surficial sediment substrate" (Section II.B.2.i.(1)(a)(vi)). As determined by the evaluations discussed in Section 2 of this appendix, a sand-sized material is the predominant erosion protection layer material for the Woods Pond caps, with some areas requiring gravels or cobbles (for the outlet channel). Woods Pond is an impounded waterbody formed by the construction of Woods Pond Dam and is much wider than the upstream riverine conditions in Reaches 5A, 5B, and 5C, resulting in relatively slow-moving water environment. After sediment removal and capping in Woods Pond in accordance with the Revised Final Permit, water depths across the pond will be deeper than current conditions (i.e., minimum depth of six feet), which would further reduce water velocities. Based on the hydraulic conditions within the pond, it is expected that varying thicknesses of sediment will deposit above the erosion protection layer such that the resulting substrate will be similar to the current substrate and will provide equivalent habitat functions and values. Therefore, no separate habitat layer has been included in the design.

1.2.3.7 Summary

The erosion protection layer design developed for Woods Pond caps can effectively provide two other functions—habitat for benthic and aquatic organisms and protection against bioturbation penetrating down into the chemical isolation layer or sediment beneath the cap. In addition, it has been determined that a separate mixing layer is unnecessary due to evidence of minimal mixing during cap placement as part of the Silver Lake Pilot Study, use of placement techniques that minimize mixing, and overplacement of material to thicknesses greater than the minimum thickness. Thus, the engineered cap design for Woods Pond consists of primarily two distinct layers: a chemical isolation layer and an erosion protection layer. Depending on the size of the erosion protection layer material, a geotechnical filter layer will also be included in some areas. Details of the erosion protection layer design evaluations (including evaluations of filter layer requirements) are discussed in Section 2 of this appendix, and a description of the chemical isolation layer design evaluations is provided in Section 3. These evaluations included modeling calculations, consistent with EPA's Subaqueous Capping Guidance (Palermo et al. 1998).

2 Erosion Protection Layer Design Evaluations

As described in the Revised Final Permit, the engineered caps will include an erosion protection layer to prevent erosion in accordance with federal and state requirements and consistent with pertinent EPA or USACE guidance. EPA's Subaqueous Capping Guidance (Palermo et al. 1998) states the following (on page 31):

> "The cap component for stabilization/erosion protection has a dual function. On the one hand, this component of the cap is intended to stabilize the contaminated sediments being capped, and prevent them from being resuspended and transported offsite. The other function of this component is to make the cap itself resistant to erosion. These functions may be accomplished by a single component, or may require two separate components in an in-situ cap."

The erosion protection layer (i.e., often referred to as an armor layer) will be placed above the chemical isolation layer and will be designed to protect it from erosional processes in the river.

River currents, particularly during high-flow events, can result in elevated current velocities and bed shear stresses and have the potential to erode or resuspend sediment or cap material. As described in the Revised Final Permit, the design flow event for the erosion protection layer is a flow event up to and including the applicable return interval event, which is to be calculated using up-to-date flow data, with additional considerations for the potential impacts of climate change on cap performance, and appropriate measures to mitigate them. EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (EPA 2005) states the following (on pages 5 to 9):

> "The design of the erosion protection features of an in-situ cap (i.e., armor layers) should be based on the magnitude and probability of occurrence of relatively extreme erosive forces estimated at the capping site. Generally, in-situ caps should be designed to withstand forces with a probability of 0.01 per year, for example, the 100-year storm."

Like the conceptual design of the erosion protection layer for Reach 5A (Anchor QEA et al. 2023), the conceptual design of the erosion protection layer for Woods Pond and the outlet channel was developed using a design flow rate with a 200-year return period as discussed in Section 2.1.

In addition to river currents, erosional forces acting on the shoreline of Woods Pond are important considerations for the cap design. The erosional forces along the Woods Pond shoreline include wind-generated wave force and ice. Evaluation of each of these erosional forces is discussed in the following subsections.

2.1 River Currents

The stable particle size (e.g., expressed as median diameter [D_{50}]) required to resist a design current velocity was estimated in accordance with Appendix A to EPA's Subaqueous Capping Guidance (Maynord 1998). The method shown in Equation 2-1 is based on the USACE's *Hydraulic Design of Flood Control Channels* (USACE 1994). This method uses velocity and flow depth to determine the stable median armor particle size (D_{50}).

Equation 2-1

$$D_{50} = S_f C_s C_v C_T C_G d \left[\left(\frac{\gamma_w}{\gamma_s - \gamma_w} \right)^{\frac{1}{2}} \frac{V}{\sqrt{K_1 g d}} \right]^{2.5} \text{ where:}$$

D_{50}	=	median particle size in feet
Sf	=	safety factor = 1.5 (minimum 1.1)
Cs	=	stability coefficient for incipient failure = 0.30 for angular rock
C_V	=	velocity distribution coefficient
	=	1.0 for straight channels
	=	1.283-.2log(R/W) for outside of bends (1 for R/W > 26), where R is the centerline radius of bend and W is the water surface width
C_T	=	blanket thickness coefficient = 1.0 for flood flows
C_G	=	gradation coefficient = $(D85/D15)^{1/3}$
D_{85}/D_{15}	=	gradation uniformity coefficient = 3.5 (typical range = 1.8 to 3.5)
d	=	water depth in feet
γ_s	=	unit weight of stone = 165 pounds per cubic foot
γ_w	=	unit weight of water = 62.4 pounds per cubic foot
V	=	depth-averaged velocity in feet per second
K_1	=	side slope correction factor = 1 (for a flat slope)
g	=	acceleration due to gravity = 32.2 feet per second squared

To obtain the current velocity and flow depth under a range of flow conditions, the calibrated one-dimensional Hydrologic Engineering Center—River Analysis System (HEC-RAS) hydraulic model was developed during the conceptual remedial design phase for Reach 5A, as described in the Conceptual RD/RA Work Plan for that reach (Anchor QEA et al. 2023).[4] The one-dimensional HEC-RAS model was developed to represent Reaches 5 and 6 of the ROR and calibrated based on

[4] A one-dimensional model provides valuable information related to water surface elevations and stream velocities that have been used to support this conceptual design. However, as described in the Conceptual RD/RA Work Plan for Reach 5A, the one-dimensional HEC-RAS model will be expanded to a two-dimensional model to support the final design for Reach 5A. That same two-dimensional model will be used to support the final design for Reach 6.

in-river current velocity and water surface elevation data collected over a range of flows. The HEC-RAS model was used to simulate flows associated with various recurrence intervals, including 1-, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year return periods. Outputs from these model simulations, including water surface elevations, water depths, and current velocities, were used in the design of the erosion protection layer. Details regarding the hydrologic analysis and hydraulic model development and calibration are provided in Appendix G (Hydrologic/Hydraulic Analysis and Modeling of Reaches 5 and 6) to the Conceptual RD/RA Work Plan for Reach 5A.

The median armor material size (D_{50}) was computed at each HEC-RAS transect in Woods Pond and the outlet channel for each of the flow events simulated. The conceptual design of the erosion protection layer was initially developed using a design flow rate with a 100-year return period based on up-to-date flow information (i.e., through 2022) from the U.S. Geological Survey (USGS) Coltsville gage. Although the 100-year return period flow is often used a design flow event (EPA 2005), a wide range of flows was evaluated to understand velocities in the river channel under various conditions, including lower flows during which a greater proportion of the flow remains in-channel and higher flows that were evaluated to assess the potential impacts of climate change on cap performance. Because the updated 100-year return period flow (i.e., 13,390 cubic feet per second [cfs]) at the Confluence has increased by 8.1% from the value calculated by the Federal Emergency Management Agency (FEMA) in 1987,[5] a flow of 16,400 cfs at the Confluence was used to account for the potential impacts of climate change. This flow represents an approximately 23% increase relative to the current 100-year return period flow estimate and is approximately equal to the current 200-year return period flow.

The model was, therefore, used to simulate flows with various recurrence intervals, including 1-, 2-, 5-, 10-, 25-, 50-, 100-, and 200-year return periods. Stable particles sizes for each flow event were computed throughout Woods Pond and the outlet channel based on the hydraulic model output and using Equation 2-1. The conceptual design of the erosion protection layer for Woods Pond and the outlet channel was developed using a design flow rate with a 200-year return period. Attachment 1 presents the HEC-RAS model results and computed D_{50} for each flow event and HEC-RAS transect. Figure 2-1 shows a comparison of the calculated stable particle size (D_{50}) at each of the HEC-RAS model transects (Figure 2-7) in Reach 6 for flows up to and including the 200-year return period.

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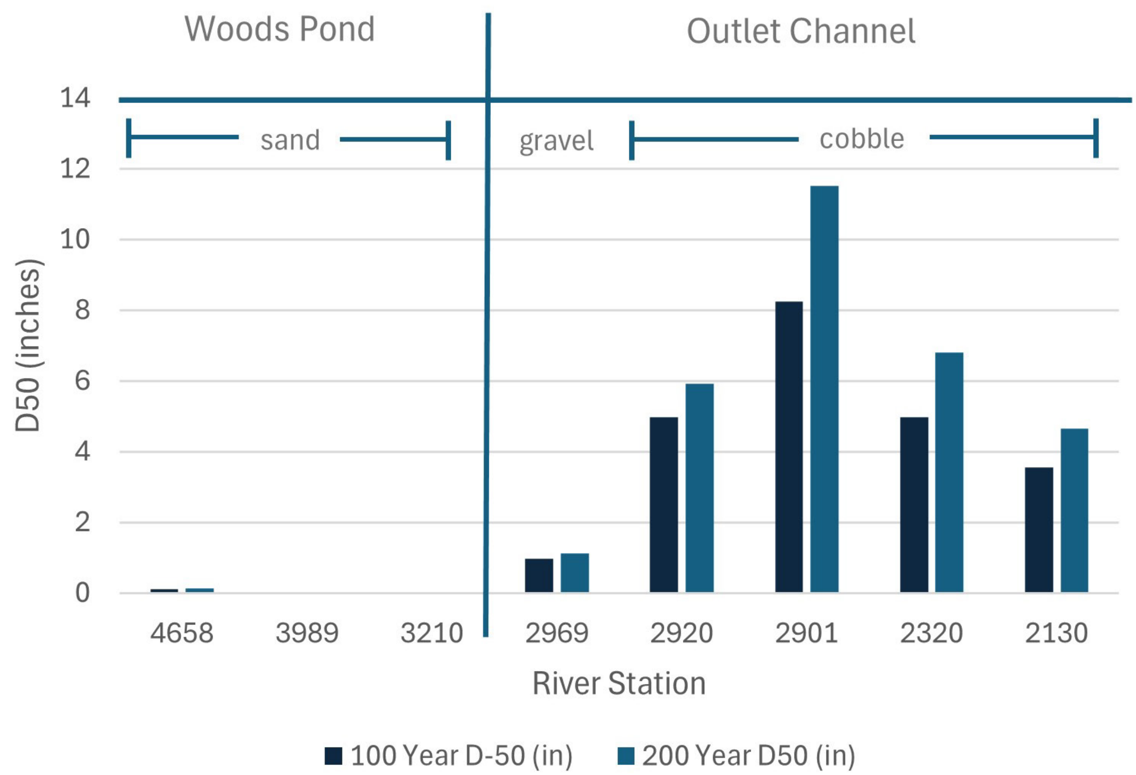
[5] The 1987 100-year flow value (12,386 cfs) is from FEMA's Flood Insurance Study report (FEMA 1987), and the updated value (13,390 cfs) is based on return period analysis of long-term data from the USGS Coltsville gage using USACE Hydrologic Engineering Center's Statistical Software Package (HEC-SSP) (Bartles et al. 2022; England et al. 2019) and the flow increment values presented in Appendix G to the Conceptual RD/RA Work Plan for Reach 5A.

Figure 2-1
Calculated Stable Particle Sizes at Each HEC-RAS Transect for Woods Pond



The results of this evaluation indicate that a sand erosion protection layer would be sufficient to protect the chemical isolation layer material from erosive forces throughout Woods Pond. At the entrance to the outlet channel, river-current velocities increase where the river flows constrict, and gravels are required to protect the chemical isolation layer. In the outlet channel, river velocities are higher than Woods Pond because flows are generally confined to the channel due to higher banks in the area approaching the dam. Therefore, larger materials, such as cobble-sized materials, are required for erosion protection in this area. Section 2.3 summarizes the extents of each type of erosion protection layer for Woods Pond and the outlet channel.

2.2 Other Erosional Forces

In addition to river currents, other erosional forces acting on the shoreline of Woods Pond are important considerations for the cap design. These other erosional forces along the Woods Pond shoreline include wind-generated wave force and ice. Analyses of these forces are presented in the following subsections.

Because the ROR is not a navigable waterway, the river currents and flood flows are the dominant factors contributing to potential erosion; effects from vessel wakes and propellor wash, which are often important considerations for cap design, are not relevant in Reach 6.

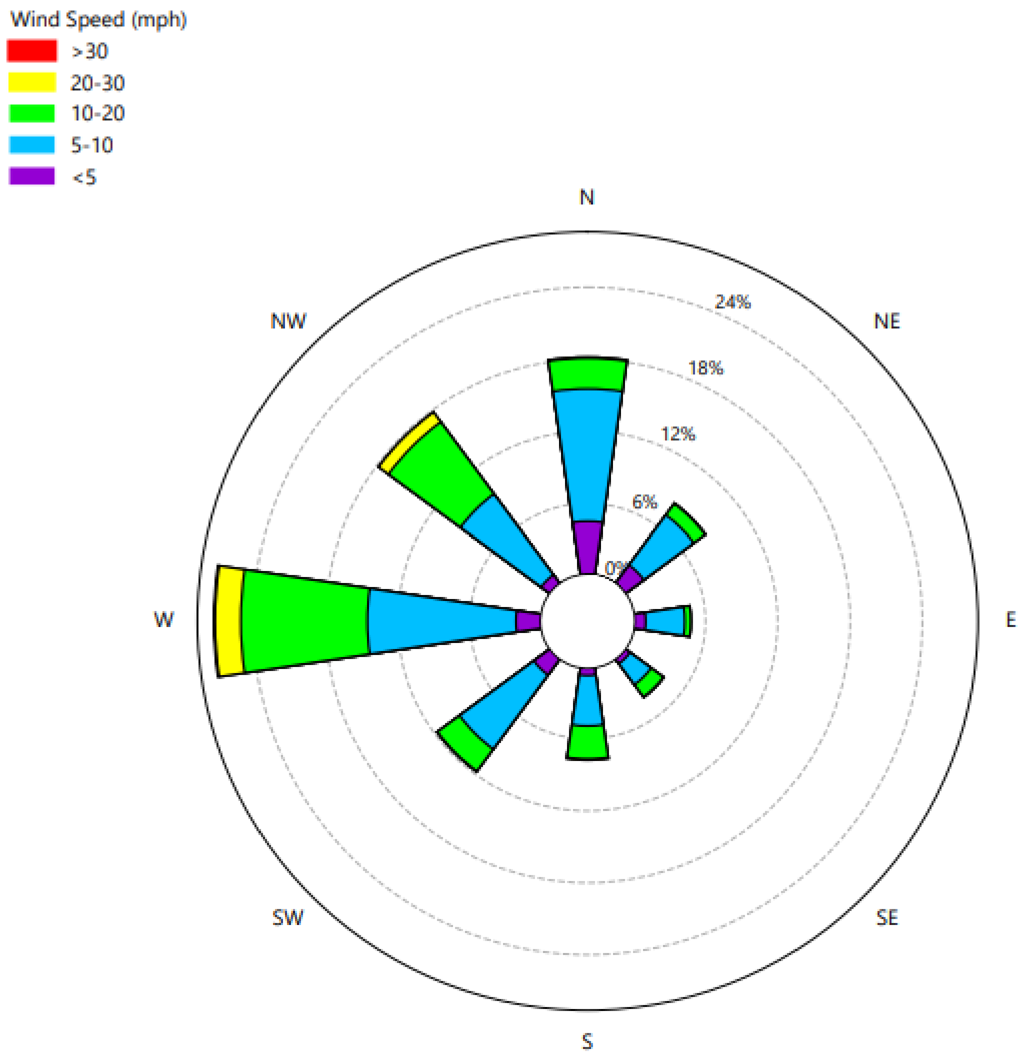
2.2.1 Wind-Generated Waves

Winds blowing across the surface of bodies of water transmit energy to the water, and waves are formed. The size of these wind-generated waves depends on the wind velocity, the length of time the wind is blowing, and the length of open water over which it blows (referred to as fetch). Because of the sinuosity of the more upstream reaches in the ROR (like Reach 5A), fetch distances are limited; therefore, wind-generated waves are not a significant force relative to river currents in these areas. However, in Woods Pond, there are relatively longer fetch distances such that winds may be capable of generating waves that can produce forces capable of causing erosion, particularly in nearshore areas.

For the Woods Pond wind-generated wave analysis, a 100-year return period was used for the erosion protection layer evaluation. Wind measurements (speeds and direction) from 2006 to 2024 were obtained from Pittsfield Municipal Airport (located approximately 5.5 miles from Reach 6). The methodology used to estimate winds speeds for wave prediction were consistent with that described in Part II, Chapter 2, of the USACE's *Coastal Engineering Manual* (USACE 2006). The wind climate of the site was analyzed using the wind speed and directional data to estimate the 100-year wind speeds.

Figure 2-2 shows the wind rose for the Pittsfield Municipal Airport. The wind data were obtained from the National Oceanic and Atmospheric Administration "National Centers for Environmental Information: Local Climatological Data" page for the Pittsfield Municipal Airport (NOAA 2024). This climatological station provides 18 years of wind observations for evaluation.

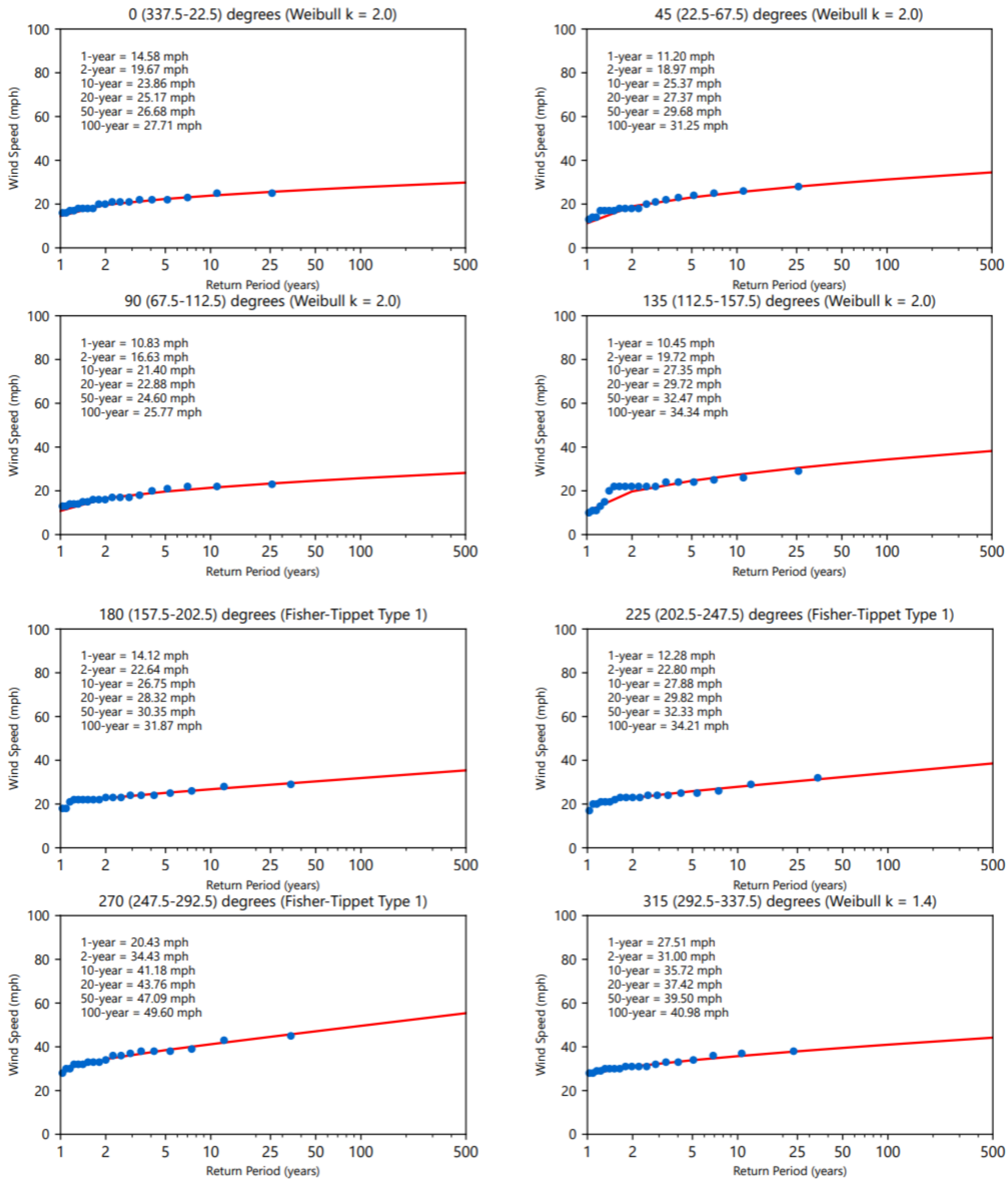
Figure 2-2
Pittsfield Municipal Airport Wind Rose



Notes:
1. Hourly wind data were obtained from Pittsfield Municipal Airport, Pittsfield, Massachusetts, for years 2006 through 2024.
2. Calm and Variable Winds: 30.5%
3. Maximum Recorded Wind Speed: 45 mph
4. Wind directions are based on the direction where the wind originates.

To compute the return period wind speeds, the maximum yearly wind speed in each directional bin (for this evaluation 45-degree increments encompassing directions of interest) were computed for the data record. These maximums for each direction were then input to a statistical analysis in which five probability distribution functions (Fisher-Tippet Type 1 and Weibull distributions with exponent k varying from 0.75 to 2) were fitted and best fit was determined. Results from this analysis are shown on Figures 2-3 and summarized in Table 2-1.

Figure 2-3
Pittsfield Municipal Wind Return Periods



Notes:
Curve fitting was performed using Fisher-Tippet Type I and Weibull Models. Directional bin, selected model, and fitting parameter are listed in parenthesis above each plot. Model selection criteria is the smallest curve fitting correlation coefficient.

Table 2-1
Wind Speeds at Pittsfield Municipal Airport (2006 to 2024) and Woods Pond Fetch Length

Mean Wind Direction (Degrees from North)	Maximum Measured Wind Speed (mph)	100-Year Return Interval Wind Speed (mph)	Woods Pond Fetch Length (Shoreline to Shoreline [feet])
0	25	27.7	1,675
45	28	31.3	1,500
90	23	25.8	1,750
135	29	34.3	2,075
180	29	31.9	1,675
225	32	34.2	1,500
270	45	49.6	1,750
315	38	41.0	1,925

Note:
Wind directions are based on the direction where the wind originates.

Along with the computed 100-year wind speeds listed in Table 2-1, the corresponding fetch distance for each direction was used to estimate the 100-year wave heights. The USACE Automated Coastal Engineering System (ACES) computer program was used to model the wave growth and propagation due to winds (USACE 1992). The ACES program was developed in 1992 by the USACE and is an accepted worldwide reference for modeling water wave mechanics and properties. To compute the 100-year design wave height for each area of the shoreline along Woods Pond, the 100-year wind speed was applied along the longest fetch distance at various locations along the pond. The ACES Rubble Mound Revetment Design Module was used to compute the stable particle size to resist the 100-year waves along the shoreline. This stable particle size calculation was performed for both 3 horizontal (H): 1 vertical (V) and 5H:1V restored slopes. The results of the ACES evaluation are summarized in Table 2-2. The results of this evaluation indicate that coarse gravels would be required to protect the chemical isolation layer material along the shoreline from wind-generated waves.

Table 2-2
Wave and Structural Results from 100-year Wind Results (2006 to 2024)

Shoreline Area	Restored Slope	100-Year Wave Height (feet)	Peak Wave Period (seconds)	Particle Size (D_{50}, inches)
Western Shore	3H:1V	0.56	1.35	1.9
	5H:1V			1.3
Southern Shore	3H:1V	0.43	1.19	1.1
	5H:1V			1.4
Southeastern Shore	3H:1V	0.65	1.44	2.2
	5H:1V			1.6
Eastern Shore	3H:1V	0.75	1.53	2.5
	5H:1V			1.8

Note:
Wind directions are based on the direction where the wind originates.

2.2.2 Ice Forces

Due to the cold temperatures that occur in western Massachusetts in the winter months, Woods Pond (or a portion thereof) typically freezes over in the winter. As a result, the potential effects of ice on the sediment cap were evaluated as part of the preliminary cap design evaluation. Ice freezing to the bottom of the Woods Pond may occur in shallow water areas near the shoreline, and the normal thickening of ice could encounter the bed. GE has not collected ice thickness measurements on Woods Pond and is not aware of any existing ice thickness data. Because Woods Pond is often used for ice fishing, it is estimated that ice thicknesses can be at least three to six inches.

The primary ice forcing of concern for Woods Pond is ice cover growth resulting from heat transfer. The thickness of ice cover can be determined through the evaluation of temperature records and the calculation of the accumulated freezing degree days (AFDD). Because ice jams are not the most critical concern in the area, the more important factor is pre-breakup ice thickness. Winter ice thickness was calculated for the 2006 to 2024 period from daily average air temperature data from Pittsfield, Massachusetts (collected at Pittsfield Municipal Airport). The modified Stefan equation was used to calculate the winter ice thickness in inches (t_i) for each year of record from the AFDD (Equation 2-2).

Equation 2-2

$$t_i = C * \sqrt{AFDD}$$

and

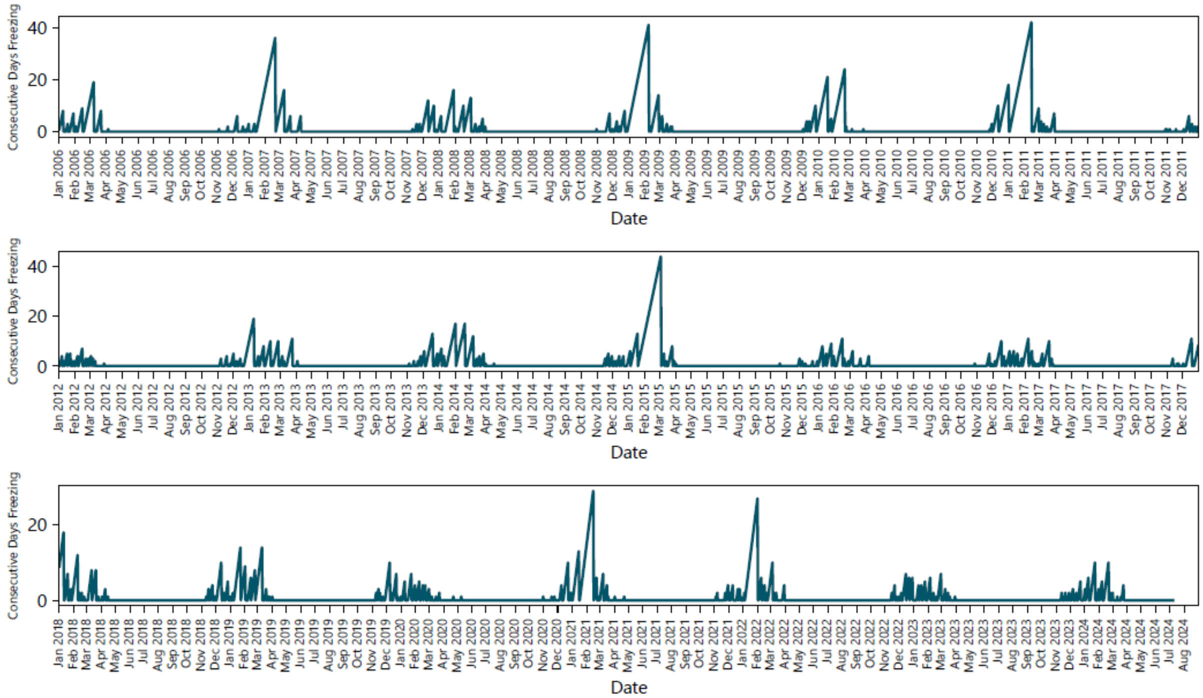
$$AFDD = \sum (32 - T_a)$$

where:

C	=	condition coefficient
T_a	=	average daily temperature in Fahrenheit
AFDD	=	accumulated freezing degree days
t_i	=	ice cover thickness in inches

By identifying the winter months, the timeline for the ice thickening and thinning process can be isolated to complete the thickness analysis. To determine which months are to be considered "winter" for the ice thickness evaluation, consecutive days below freezing can be plotted or the first instance extracted to initialize the winter time frame. Within each winter season the freezing degree days are calculated based on the daily average temperature. The AFDD are then determined by a running sum of the freezing degree days. The computed consecutive days count below freezing at Pittsfield Municipal Airport can be seen in Figure 2-4.

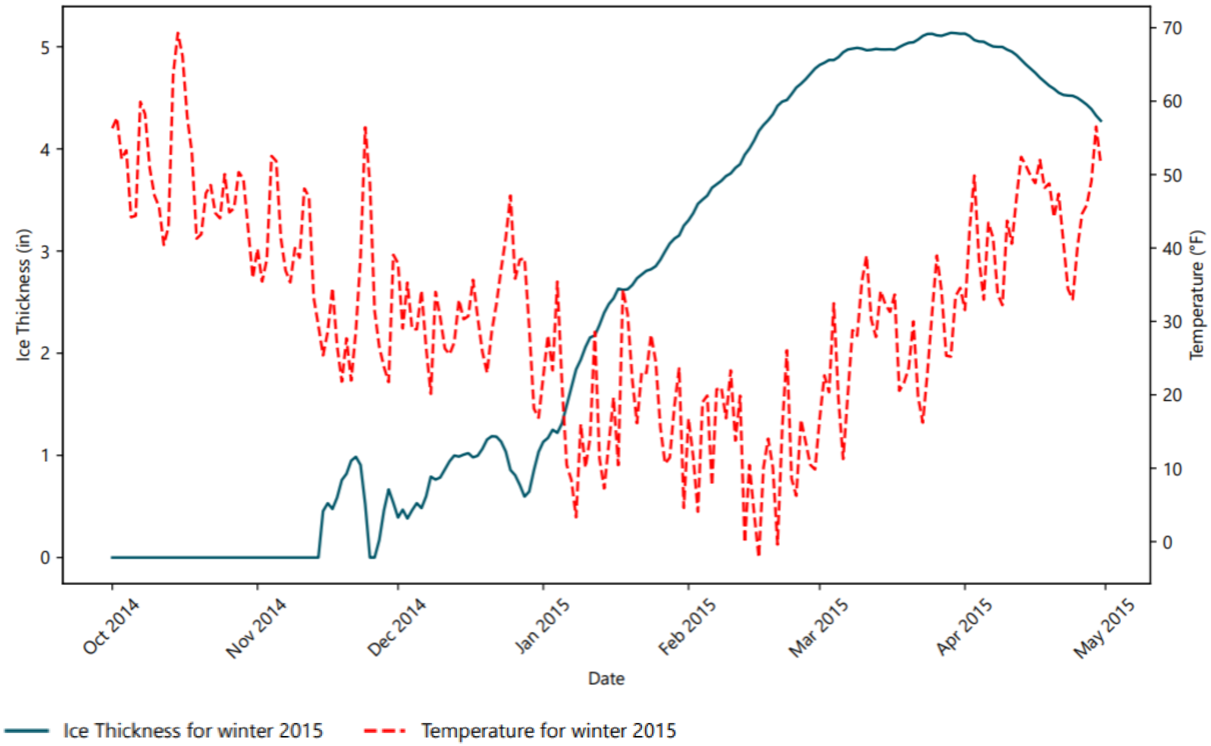
Figure 2-4
Consecutive Days at or Below Freezing Temperatures



Note:
Winter is determined to be generally the November through April months.

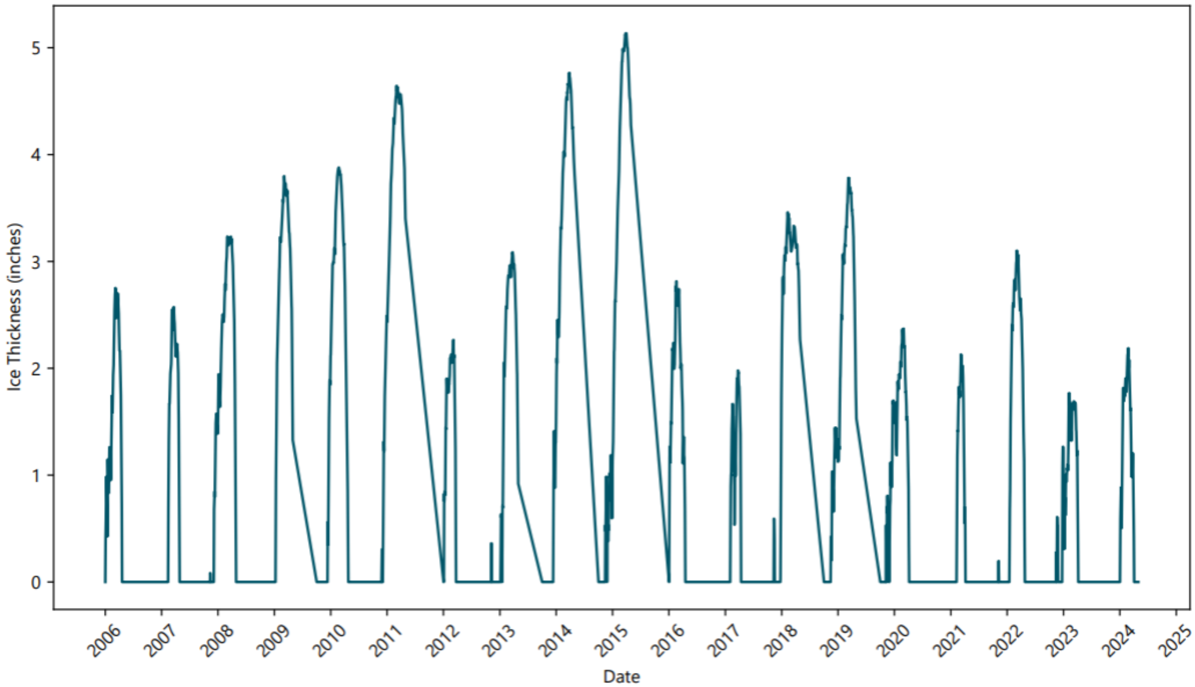
The *C* value in the modified Stefan equation is a coefficient representing the type of waterbody and condition in which the icing is taking place (USACE CRREL 2004). A C value ranging between 0.12 and 0.15 is recommended for an average river with snow. A C value of 0.15 was used in this analysis for the Housatonic River as a conservative upper bound for this condition. The maximum ice thickness calculated under the average river with snow condition was 5.1 inches (occurring on March 29). An example of the relationship between air temperatures and calculated ice thickness, as well as the before mentioned maximum thickness, can be seen in Figure 2-5. The peak and general trend of ice thickness on Woods Pond is shown in the Ice Thickness Timeseries for the full temperature dataset in Figure 2-6.

Figure 2-5
Ice Thickness and Temperature for Winter of 2015 (Maximum Ice Thickness)



Notes:
Coefficient for use in modified Stefan equation: 0.15, average river with snow
Ice thickness calculations were completed using the USACE Engineer Research and Development Center (ERDC) ice thickness guidance available at: https://erdc-library.erdc.dren.mil/server/api/core/bitstreams/81b728f8-711f-4ef8-e053-411ac80adeb3/content.

Figure 2-6
Ice Thickness Timeseries



Notes:
Coefficient for use in modified Stefan equation: 0.15, average river with snow
Ice thickness calculations were completed using the USACE ERDC ice thickness guidance available at: https://erdc-library.erdc.dren.mil/server/api/core/bitstreams/81b728f8-711f-4ef8-e053-411ac80adeb3/content.

Based on this analysis, an assumed maximum ice thickness of eight inches was used in the erosion protection layer evaluation.

A series of physical model tests performed by USACE Cold Regions Research and Engineering Laboratory (CRREL) concluded that, to avoid riprap damage, the maximum stone size (D_{100}) needed to be at least as large as the ice thickness (Sodhi et al. 1996; Sodhi et al. 1997; Sodhi and Donnelly 1999). It should be noted that in these tests, the rocks were randomly placed and the ice was riding up directly on the embankment rather than shearing horizontally as in a river ice run. In a subsequent series of scale model tests, Daly et al. (2008) found that, for rocks of similar diameter and selectively placed, the average rock size could be about equal the ice thickness without experiencing damage. As a result, this evaluation indicates that cobbles would be required to protect the chemical isolation layer material from ice erosion along the shoreline.

2.3 Erosion Protection Layer Thickness

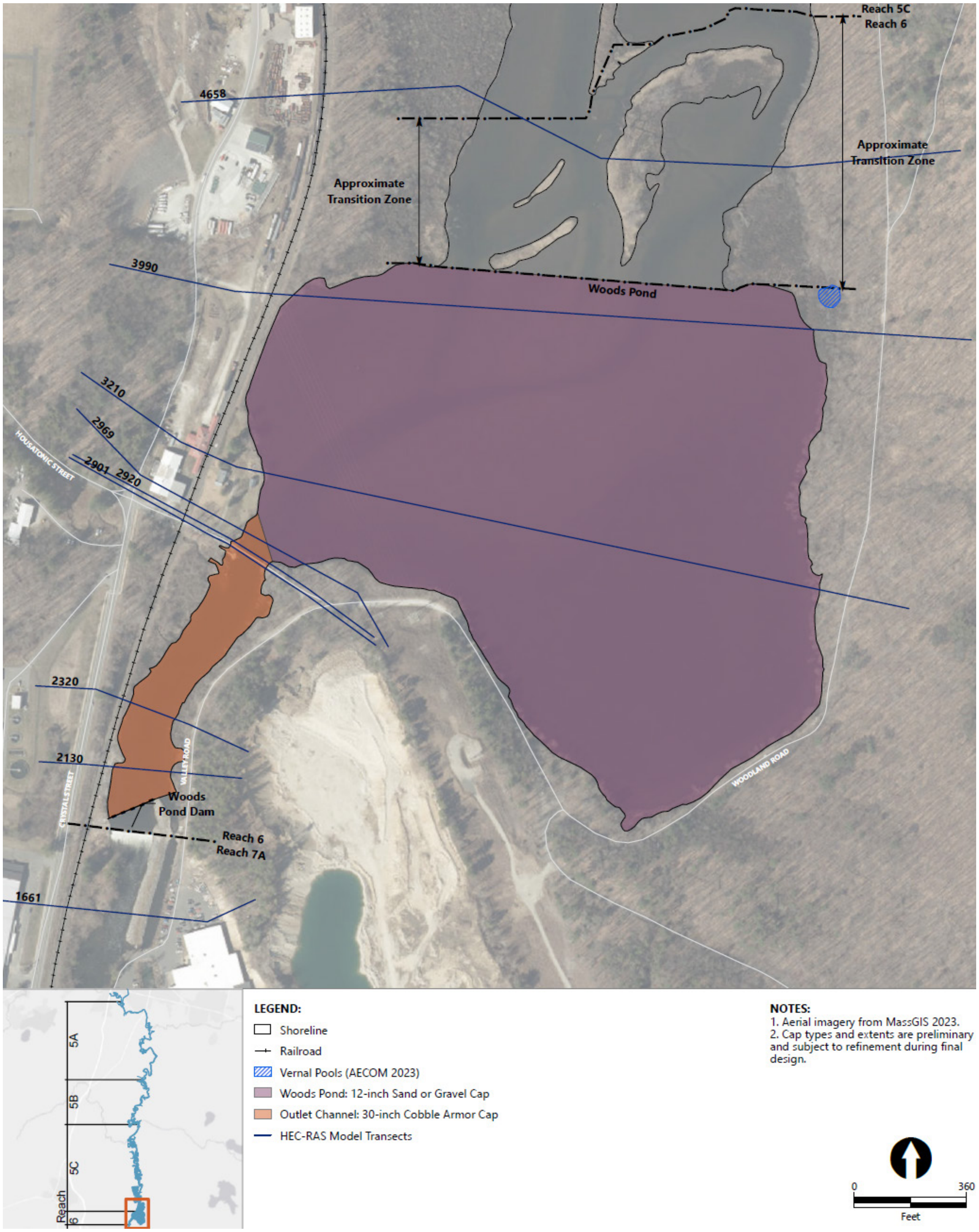
In lieu of placement of a gravel- or cobble-armored cap along the Woods Pond perimeter (based on the wind and ice analyses in Sections 2.2.1 and 2.2.2, respectively), the final design for the engineered cap will include details to place the engineered cap in nearshore areas at depths below the wave and ice freezing zone to protect the chemical isolation layer of the sediment cap. This approach will include additional sediment removal immediately prior to cap placement in the nearshore area (i.e., this additional removal will be conducted several years after initial dredging of Woods Pond). After the dredging and cap placement, the nearshore area will be restored by placing a soil backfill material above the cap to stabilize the shoreline dredge cut. It is currently assumed that sediment would be removed to a depth of three feet along the shoreline in Woods Pond to construct the cap in this manner. Design details for the nearshore sediment removal and cap placement (e.g., removal depths, extents, and methods) will be described in the Final RD/RA Work Plan for Reach 6 addendum that presents the final engineered cap design.

Maynord (1998) recommends that the thickness of the erosion protection layer be twice the median particle diameter (i.e., $2 \times D_{50}$) or 1.5 times the maximum particle diameter (i.e., $1.5 \times D_{100}$), whichever is greater. The D_{100} is the maximum particle size of the erosion protection layer material gradation and will be determined during final design. For the conceptual design, the minimum erosion protection layer thickness is based on twice the D_{50}. As a result, the minimum thicknesses of the erosion protection layer for Woods Pond and the outlet channel are summarized below.

- Woods Pond – Erosion Protection Layer: Minimum six-inch-thick layer of sand or gravel
- Outlet Channel – Erosion Protection Layer: Minimum 18-inch-thick layer of cobble

Table 4-1 in Section 4 summarizes the overall assumed cap layer thickness that includes the chemical isolation layer and cap placement tolerances. Figure 2-7 shows the extents of erosion protection layer design for Woods Pond and the outlet channel.

Figure 2-7
Erosion Protection Layer Extents



2.4 Geotechnical Filter Considerations

As described in the Revised Final Permit, "the use of a geotechnical filter layer between the chemical isolation layer material and erosion protection layer material shall be evaluated and may be necessary for those areas requiring cobble or larger sized material in the erosion protection layer" (Section II.B.2.i.(2)(d)).

Where needed, a filter layer provides an interface between the erosion protection layer and the protected material and is an essential element for protecting contaminated sediments (Maynord 1998). The filter prevents migration of one granular material through the voids of another (often referred to as "piping"), distributes the weight of overlying armor units to provide more uniform settlement, and permits relief of hydrostatic pressures within the soils. A filter layer is often required when a larger-diameter material for the erosion protection layer needs to be placed above a much smaller diameter chemical isolation layer.

Standard geotechnical filter criteria include recommended particle size ratios between base and overlying materials (e.g., sand chemical isolation layer and overlying erosion protection layer materials). The primary filter criteria particle size relationship applicable to subaqueous capping materials is the ratio of D_{15} of the erosion protection material to D_{85} of the underlying base layer. D_{15} is the 15th percentile particle size (15% of the particles are smaller than this size), and D_{85} is the 85th percentile particle size (85% of the particles are smaller than this size). This relationship relates to the ability of the base layer material (i.e., the chemical isolation layer sand) to pass through the void spaces in the overlying larger material (i.e., the erosion protection layer armor stone consisting of gravel- or cobble-sized material). Meeting the recommended filter criteria minimizes the potential for the loss of the base material by the creation of internal filters in the armor stone voids. The potential for piping (the loss of material) can be minimized by using well-graded gradations for the two materials.

For the conceptual design, the design evaluations for the erosion protection and chemical isolation layers indicate that a gravel filter will be required for the outlet channel caps that have cobble-sized erosion protection layers. Where required, the gravel filter layer will be placed between the erosion protection layer and chemical isolation layer. This conceptual design assumes that the geotechnical filter layer for the outlet channel will be a minimum six-inch-thick layer of gravel.

Where needed, the geotechnical filter layer, including its gradation, will be evaluated and designed for compatibility with the erosion protection layer material and the underlying chemical isolation layer material of the engineered cap as part of final design.

3 Preliminary Chemical Isolation Layer Design Evaluations

3.1 Chemical Transport Modeling Approach

The preliminary design evaluations presented in this section were conducted in a similar manner to those conducted for Reach 5A, as presented in the Conceptual RD/RA Work Plan for that reach. The evaluations were based on numerical modeling, the primary purpose of which was to simulate the transport of dissolved-phase PCBs within a candidate cap design so as to identify the cap configuration (thickness and composition) needed to meet the chemical isolation capping Performance Standards, which are defined in Section 3.1.1. Similar to the modeling conducted for Reach 5A, individual PCB homologs were simulated using the cap model to account for the range in mobility of the PCB congeners that make up the total PCB concentration. The modeling documented in this appendix was performed in accordance with industry standard cap design guidance set forth by EPA (EPA 2005; Palermo et al. 1998) and the ITRC (2014, 2023).

For this preliminary evaluation, a single cap type was evaluated for Woods Pond and the outlet channel. Once additional data are collected as part of the PDI, these areas may be evaluated separately.[6]

3.1.1 Chemical Isolation Cap Performance Standards

As described in the Revised Final Permit, the chemical isolation layer will be "sufficient to minimize (reduce by 99%) the flux of PCB concentrations through the isolation layer" (Section II.B.2.i.(1)(a)(ii)). To meet the requirements for engineered caps in the Revised Final Permit, the chemical isolation layer in Woods Pond will be designed to achieve a 99% reduction in PCB mass flux across the chemical isolation layer throughout a 100-year timeframe based on model calculations.

3.1.2 Model Framework

CapSim (version 4.2), a one-dimensional model of chemical transport in sediment and cap systems, was used for this evaluation. This model simulates the time-variable fate and transport of chemicals (dissolved and sorbed phases, including partitioning between these phases) under the processes of advection, diffusion and dispersion, biodegradation, bioturbation and bioirrigation, and exchange with the overlying surface water, consistent with the requirements of the Revised Final Permit. The cap model predicts contaminant mass flux and concentrations (for both porewater and sorbed phase) vertically throughout the simulated cap profile over time. Details on the model structure,

[6] Chemical isolation evaluations were not performed for Valley Mill Pond because there are no contemporary PDI PCB data. An evaluation of the engineered cap for Valley Mill Pond (if applicable) will be conducted as part of the final design phase after collection and analysis of supplemental data in that area.

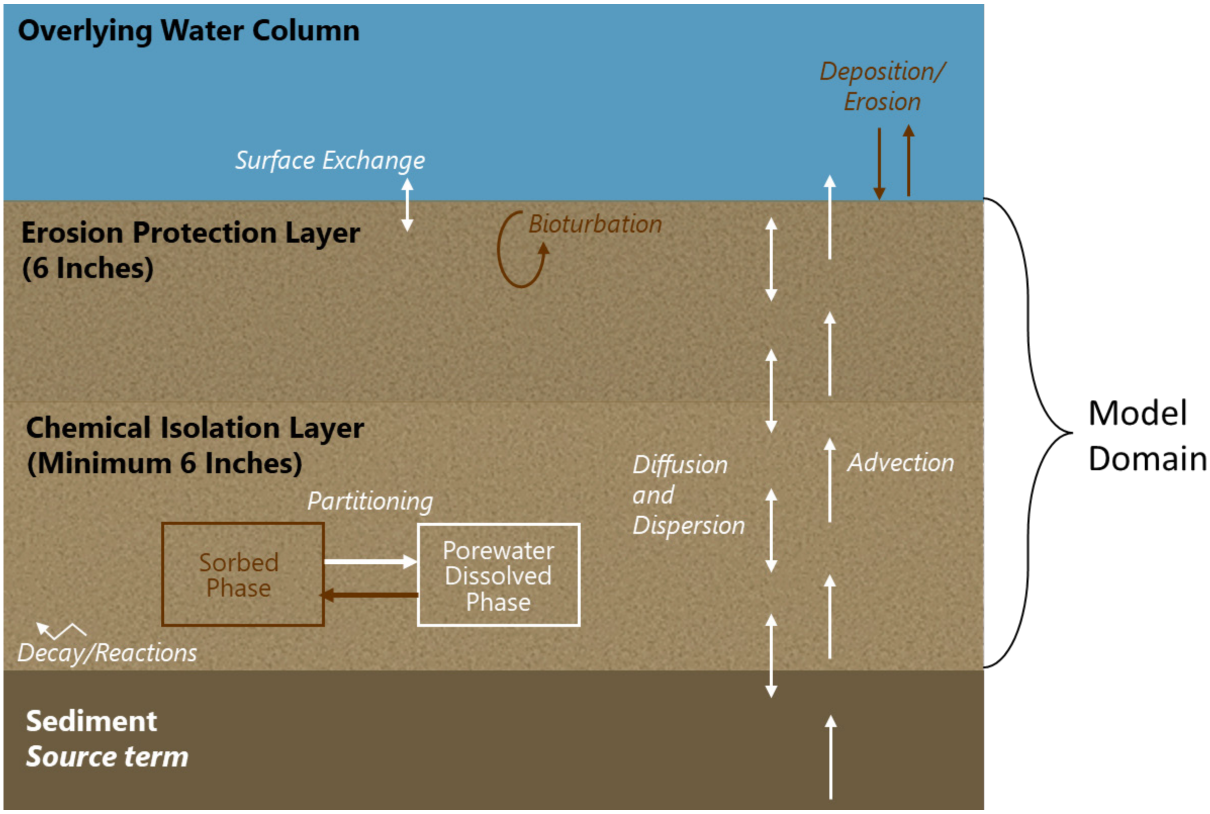
underlying theory, and governing equations are provided in the model's associated literature (Shen et al. 2018; Go et al. 2009; Lampert and Reible 2009).

3.1.3 Model Domain and Layers

The model evaluations were conducted to support the design of the chemical isolation layer for the Woods Pond caps. As described in Sections 1 and 2, the cap design for Woods Pond consists of two distinct layers, a chemical isolation layer and an erosion protection layer, with a geotechnical filter layer being included between them for the outlet channel as described in Section 2.4.[7] Consistent with the modeling for Reach 5A, the model was initially set up to simulate PCB transport through a six-inch layer of sand chemical isolation material. That layer was simulated to be overlain by at least six inches of erosion protection material (erosion protection layer evaluations are presented in Section 2 of this appendix). The erosion protection layer varies across Woods Pond and consists of six inches of sand to gravel-sized material in Woods Pond, with larger sized materials placed in the outlet channel where there will be an 18-inch-thick layer of cobble-sized material. Simulating the erosion protection layer as six inches thick is conservative for areas where more than six inches of material is required. The model simulates bioturbation (mixing of particles by biological activity) at the top of the erosion protection layer over a specified thickness; this thickness is referred to hereinafter as the bioturbation zone (BTZ). A schematic showing the cap layers represented in the model and the processes simulated by the model is provided on Figure 3-1.

[7] As discussed in Section 1 of this appendix, the Revised Final Permit requires consideration of layers for mixing, habitat, and bioturbation. These engineered cap design evaluations considered these functions and determined that dedicated layers are not needed for these functions because they can be effectively met by the two primary layers.

Figure 3-1
Model Domain and Processes Simulated by the Model



Note:
Decay/reactions and deposition/erosion were not included in the modeling of Woods Pond caps.

The underlying sediment was not included as part of the model domain in this modeling evaluation (i.e., the sediment was not simulated explicitly). Rather, the porewater PCB concentrations in the sediment beneath the cap were conservatively represented as an infinite source (i.e., constant concentration boundary condition). This approach is conservative because it assumes that no attenuation or loss of PCB mass occurs in the sediments beneath the cap over time. The model similarly does not simulate the water column, but rather uses its concentration as a boundary condition.

3.2 Model Inputs

The model uses several input parameters that describe chemical-specific properties, cap and sediment material properties, and chemical mass transfer rates. These input parameters were developed based on site-specific data, previous site-specific modeling conducted by EPA, information from literature, and experience with cap design at other similar sites. To the extent possible (and appropriate), input parameters were consistent with Reach 5A cap modeling documented in Conceptual RD/RA Work Plan for Reach 5A and the PCB fate and transport model that EPA developed and calibrated to simulate PCBs in the Housatonic River surface water and sediment, as documented in the FMD. A listing of model input parameters, the values used for this preliminary modeling evaluation, and the source(s) from which they were derived are provided in Table 3-1. More details describing the key model inputs (i.e., those to which the model is most sensitive) and chemical-specific properties are provided in Sections 3.2.1 through 3.2.3.

During future PDI activities for Woods Pond, additional pre-design data will be collected; thus, certain cap model inputs and the preliminary design presented herein will be refined.[8]

Table 3-1
Input Parameter Values for the Chemical Isolation Cap Model

Model Input Parameter	Value	Data Source
Chemical-Specific Properties		
Porewater PCB concentration (µg/L) (boundary condition for bottom of model domain)	See Table 3-3	Values based on sediment sample PCB concentrations from the PDI (2023) and historical sampling programs (1998, 1999, 2001, and 2002) converted to porewater concentrations for individual PCB homologs using site-specific partition coefficients and data on PCB homolog composition. See Section 3.2.2 for details.
OC partition coefficient Log K_{OC} (Log L/kg)	See Table 3-2	Consistent with values used for Reach 5A cap modeling documented in the Conceptual RD/RA Work Plan for Reach 5A. See Section 3.2.1 for details.
DOC partition coefficient Log K_{DOC} (Log L/kg)	See Table 3-2	Consistent with values used for Reach 5A cap modeling documented in the Conceptual RD/RA Work Plan for Reach 5A. See Section 3.2.1 for details.
Molecular diffusivity (cm^2/second)	Homolog-specific, increasing from 3.3E-6 for mono-PCBs to 6.5E-6 for deca-PCB	Values based on empirical relationship with PCB homolog molecular weight (Schwarzenbach et al. 1993). The model calculates the effective diffusion coefficient by multiplying the input molecular diffusivity value by a tortuosity factor that is a function of the material porosity (Lampert and Reible 2009).
Chemical first-order chemical biodegradation rate (yr^{-1})	0	Assumed no biodegradation.

[8] In accordance with the *Final Revised Overall Strategy and Schedule for Implementation of the Corrective Measures* (Anchor QEA 2022), the Revised PDI Work Plan addendum that will propose data collection for capping design in Reach 6 will be submitted approximately two years prior to the anticipated completion of capping in Reach 5C.

Model Input Parameter	Value	Data Source
Surface water PCB concentration (μg/L) (boundary condition for top of model domain)	See Table 3-4	Consistent with values used in Reach 5A documented in the Conceptual RD/RA Work Plan for Reach 5A, based on concentrations measured at Pomeroy Avenue Bridge and South Street Bridge collected from March to November 2022 (Anchor QEA and Arcadis 2023).
Erosion Protection Layer Properties		
Erosion protection layer thickness (cm)	15	Conservatively represented as a 15 cm (six-inch) layer of gravel or cobble that has infilled, as discussed in Section 3.1.3.
Total porosity	0.35	Typical value for range of gravel-sized materials (e.g., Domenico and Schwartz 1990) and taken to be representative of larger sized materials, considering that cobble-sized material is expected to be infilled by deposition of sediments over time and recognizing that the armor materials often have a gradation that may include sand and gravel-sized materials.
Dry bulk density (g/cm^3)	1.69	Calculated based on typical particle density of 2.6 g/cm^3 for inorganic minerals and representative porosity (see previous row).
Fraction organic carbon within the BTZ f_{OC} (%)	7.8%	Location-specific f_{OC} in the BTZ (top 15 cm) considering that over time, the materials in the BTZ will equilibrate to the f_{OC} of depositing solids. Dataset used to calculate the average f_{OC} was from the RFI Report (BBL and QEA 2003).
Porewater DOC concentration (mg/L)	16	Based on average porewater DOC concentration measured in Reaches 5 and 6 during EPA's partitioning study. Note, the study concluded that there was no spatial trend in DOC between Reaches 5 and 6.
Chemical Isolation Layer Properties		
Chemical isolation layer thickness (cm)	15	Design variable. Started with a thickness of six inches (15 cm) and increased based on iterative model simulations as needed to meet Performance Standards. See Section 3.3 for details.
Total porosity	0.4	Typical value for sand (e.g., Domenico and Schwartz 1990).
Dry bulk density (g/cm^3)	1.56	Calculated based on typical particle density of 2.6 g/cm^3 for inorganic minerals and representative porosity (see previous row).
f_{OC} (%)	Design variable	This input was used to represent sorptive amendment content for the chemical isolation layer. Started with a sand-only chemical isolation layer, assuming a nominal f_{OC} of 0.1%. Iteratively increased f_{OC} as necessary to meet Performance Standards.

Model Input Parameter	Value	Data Source
Porewater DOC concentration (mg/L)	16	Based on average porewater DOC concentration measured in Reaches 5 and 6 during EPA's partitioning study. Note, the study concluded that there was no spatial trend in DOC between Reaches 5 and 6.
Chemical-Independent Mass Transport Properties		
Boundary layer mass transfer coefficient (cm/hour)	0.04	Appendix B-10 of the FMD developed a site-specific value of 1 to 2 cm/day for use in EPA's PCB fate and transport model. The lower end of this range was used in the cap modeling to account for the fact that groundwater seepage is explicitly simulated in the cap model but was not in EPA's PCB fate and transport model.
Groundwater seepage rate (cm/day)	1	Seepage rates were not measured in Woods Pond. Value used in this preliminary modeling is based on a mid-range value measured in Reach 5A, as documented in the Conceptual RD/RA Work Plan for Reach 5A. This assumed value is likely conservative, because the presence of the dam likely decreases or even reverses the natural hydraulic gradient between the groundwater and river. This parameter will be revisited when future PDI to support final cap design is conducted.
Tortuosity factor for molecular diffusion	Varies with porosity	Model uses an empirical relationship with porosity to calculate a tortuosity factor that is multiplied by the chemical-specific molecular diffusivity to result in an effective diffusion coefficient associated with porous media flow. The Millington and Quirk (1961) relationship was used, because this is applicable to granular material (Lampert and Reible 2009).
Net sedimentation rate (cm/year)	0	Conservatively, no net sedimentation was assumed in the model. It is expected that a transient zone of new native sandy sediment will develop atop the cap to some thickness (and fill in space between large armor stone) and that this zone will likely be in dynamic equilibrium. That is, although no net sedimentation is assumed, it does not mean there is no (gross) sedimentation.
Dispersion length (cm)	1	Dispersion length was calculated from the relationship developed by Neuman (1990), which relates dispersion to model domain length, which resulted in a value that is less than 1 cm. Based on recommendations from Reible (Lampert and Reible 2009), dispersion length was set to 1 cm.

Model Input Parameter	Value	Data Source
Bioturbation depth (cm) (equals BTZ thickness)	15	The literature review presented in Appendix B4 of the FMD conceptualizes the BTZ as a biologically mixed interval (0 to 8 cm in Woods Pond) and a biologically influenced interval (0 to 15 cm in Woods Pond; EPA 2006). The biologically influenced depth of 15 cm was used for the bioturbation depth in the model.
Particle biodiffusion coefficient (cm^2/year)	1	The FMD states that in the softer sediments of Reach 6, bioturbation is expected to be three times faster than in the river channel of Reach 5A (EPA 2006). Based on Thibodeaux and Mackay (2011), 0.3 cm^2/year is a typical value representing riverine environments, such as Reach 5A. Therefore, in the Reach 6, a value of 1 cm^2/year (i.e., approximately three times greater than the value in a riverine environment) was used.
Porewater biodiffusion coefficient (cm^2/year)	100	Parameter represents bioturbation rate applied to dissolved-phase PCBs. This value is 10 times higher than the particle biodiffusion coefficient based on literature (Reible 2012; Thibodeaux and Mackay 2011).
Consolidation thickness (cm) and time (years) to reach 90% consolidation for underlying sediment	None	Because sediments will be removed to increase water depths, the volume of sediment removed is greater than the volume of the cap material proposed to be placed, therefore, the effects of consolidation, which can result in an additional upward flux of porewater, are expected to be negligible. This assumption will be re-evaluated during final design.

3.2.1 Partitioning Coefficients

Partitioning of chemicals between the dissolved and sorbed phases is described in the CapSim model by the chemical-specific equilibrium partition coefficient (K_d). For organic chemicals, such as PCBs, K_d is represented by the OC partition coefficient (K_{OC}) times the fraction OC (f_{OC}), consistent with the formulations used in EPA's PCB fate and transport model documented in the FMD. Site-specific partition coefficients were used in the cap design modeling in the following two ways: (1) to estimate the porewater chemical concentrations beneath the cap based on measured sediment concentrations; and (2) to simulate sorption of PCBs to the various layers of cap materials represented in the model (see Section 3.1.3 and Table 3-1). As stated previously, individual PCB homologs were simulated by the cap model to account for the range in mobility of the PCB congeners that make up the total PCB concentration. Partition coefficients developed for each of the 10 PCB homologs based on Reach 5A evaluations were used in this evaluation (Table 3-2). For more details on the development of these partition coefficients, see the Conceptual RD/RA Work Plan for

Reach 5A. These coefficients will be subject to refinement during the final cap design after future PDI activities for Woods Pond.

Table 3-2
Chemical-Specific Partition Coefficients

Chemical Name	Log K_{OC} (log L/kg)	Log K_{DOC} (log L/kg)	Log K_{OW} (log L/kg)
PCB-mono	5.3	4.0	5.0
PCB-di	5.5	4.5	5.5
PCB-tri	5.7	4.9	5.9
PCB-tetra	5.9	5.4	6.4
PCB-penta	6.2	5.8	6.8
PCB-hexa	6.4	6.2	7.2
PCB-hepta	6.7	6.6	7.6
PCB-octa	6.9	6.9	7.9
PCB-nona	7.1	7.2	8.3
PCB-deca	7.4	7.6	8.6

3.2.2 Porewater PCB Concentrations

The porewater concentration input defines the source term in the cap model and corresponds to the contaminant concentrations present in the porewater immediately beneath the cap. Site-specific partition coefficients (as presented in Section 3.2.1), were used to convert the Reach 6 bulk sediment PCB dataset collected historically (1998, 1999, 2001, and 2002) and under the PDI (2023, as described in Section 3.2.1 of the Conceptual RD/RA Work Plan) to corresponding porewater PCB concentrations to fully characterize sediment porewater PCB concentrations for use in cap design model evaluations. The conversion from sediment Aroclor-based PCB concentrations to PCB homolog porewater concentrations in this approach was a multi-step process that is described in the remainder of this section.

Step 1: Calculate Sediment PCB Concentration Statistics for Each Sub-Area for Selected Depth Intervals of Interest

Although sediment will be removed from these areas prior to capping, the sediment concentrations from all depths were considered reflective of the PCB concentrations that would be present beneath the engineered caps and, therefore, used for the capping evaluations for the purpose of defining concentrations beneath the cap. These concentrations are shown on an OC-normalized basis because the conversion to porewater concentration is based on dividing the OC-normalized sediment concentration by the K_{OC}. Summary statistics for the sediment total PCB concentrations (OC-normalized) in Woods Pond, including transition zone and outlet channel, are as follows:[9]

- Sample Count: 762
- Minimum PCB Concentration: 0.123 mg/kg OC
- Mean PCB Concentration: 200 mg/kg OC
- 95% UCL on the Mean PCB Concentration: 253 mg/kg OC
- 50th Percentile PCB Concentration: 7.33 mg/kg OC
- 75th Percentile PCB Concentration: 67.2 mg/kg OC
- 95th Percentile PCB Concentration: 748 mg/kg OC
- Maximum PCB Concentration: 15,300 mg/kg OC

Because the goal of the remedy is to reduce PCB flux to the water column and PCB uptake from biota, a statistic that represents an area-wide average is appropriate. Conservatively, simulations were conducted using the 95% upper confidence limit (UCL) on the mean of PCB concentrations, which was calculated using the EPA ProUCL software (version 5.1; Singh and Singh 2015). As shown in bulleted list above, the 95% UCL on the mean is greater than the 75th percentile PCB concentration, which illustrates that this represents an upper-bound concentration relative to the full data distribution.

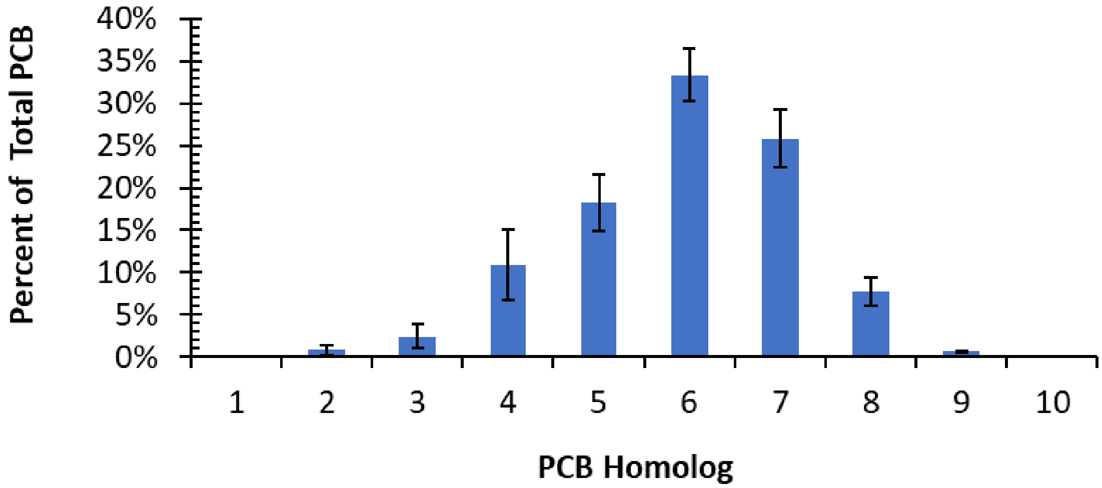
Step 2: Calculate PCB Homolog Concentrations from Total PCB Concentrations

As stated previously, individual PCB homologs were simulated by the cap model to account for the range in mobility of the PCB congeners that make up the total. Therefore, consistent with the approach used for Reach 5A in the Conceptual RD/RA Work Plan, the reported PCB concentrations in sediment were first converted to individual PCB homolog concentrations using the average homolog distribution from the 20 sediment samples collected as part of the Reach 5A PDI porewater partitioning study that were analyzed for congener-specific-PCBs (see Figure 3-2).[10]

[9] Concentrations are reported to three significant figures.

[10] No porewater samples were collected in Woods Pond as part of the Reach 6 PDI. This is anticipated to be an element of a future PDI effort to be conducted in Reach 6 prior to final design of the cap.

Figure 3-2
Average Homolog Distribution of PDI Sediment Samples Analyzed for Congener-Specific PCBs



Notes:
Error bars represent +/- 2 standard errors of the mean
Samples collected from Reach 5A during PDI for Reach 5A.

Although the distribution in Figure 3-2 is based on samples collected from Reach 5A, the average homolog distribution shown on Figure 3-2 is generally consistent with that measured in historical sampling (as documented in Figure 4-28 of the *Housatonic River – Rest of River RCRA Facility Investigation Report* [RFI Report; BBL and QEA 2003]) and is consistent with an Aroclor 1260-dominated signature, which is what has consistently been reported for this site, as noted in the RFI Report. Thus, this homolog distribution was applied to the samples collected from Woods Pond.

Step 3: Apply Aroclor to Congener Conversion Factor

Because the larger sediment PCB data set was analyzed for PCBs using an Aroclor-based method (consistent with nearly all of the historical sampling conducted for the RFI, risk assessments, and the Corrective Measures Study) and the partitioning coefficients were developed using congener-specific PCB data, the evaluation explicitly considered differences in these two methods when converting from sediment Aroclor PCB data to PCB homolog concentrations. The data collected as part of the Reach 5A PDI partitioning study indicated that congener-based total PCB concentrations in sediment samples are generally higher than those measured by the Aroclor method. The central tendency value of the ratio of paired congener-based to Aroclor-based PCB concentrations from this study is approximately 1.7, when calculated using both log-transformed and untransformed data. Thus, the Aroclor-based PCB sediment concentration data were multiplied by a factor of 1.7 for converting to sediment PCB homolog concentrations.

Step 4: Use K_{OC} to Convert to Porewater PCB Homolog Concentrations

The calculated sediment PCB homolog concentrations were lastly converted to porewater PCB homolog concentrations using the site-specific log K_{OC} values listed in Table 3-2. Calculated porewater PCB homolog concentrations based on the 95% UCL of the mean sediment concentrations (OC-normalized) are listed in Table 3-3.

Table 3-3
Freely Dissolved Porewater Concentrations

Chemical Name	95% UCL of the Mean Freely Dissolved Porewater Concentration in Woods Pond (µg/L)
PCB-mono	8.9E-04
PCB-di	1.6E-02
PCB-tri	3.1E-02
PCB-tetra	8.1E-02
PCB-penta	6.3E-02
PCB-hexa	7.1E-02
PCB-hepta	3.1E-02
PCB-octa	5.4E-03
PCB-nona	2.8E-04
PCB-deca	7.4E-06
Total PCB[a]	3.0E-01

Note:

a. Total PCBs are included for reference only; total PCBs were not simulated with the model. PCBs were simulated by homolog group, and results were summed to calculate total PCB flux and concentration for comparison to the Performance Standards.

3.2.3 Surface Water PCB Concentrations

Surface water concentrations represent the boundary condition at the top of the cap in the model and are used in the cap model to compute the surface exchange flux between porewater and surface water at the cap/surface water interface. These concentrations were based on the average concentrations measured at the Pomeroy Avenue Bridge (East Branch) and South Street Bridge (West Branch) locations from samples collected between March and November 2022 as part of the interim baseline sampling program. Surface water concentrations will be subject to refinement during the final cap design after future PDI activities for Woods Pond. As discussed in the Conceptual RD/RA Work Plan for Reach 5A, surface water PCB concentrations were measured from whole water samples and were converted to freely dissolved surface water concentrations on a homolog-specific basis. The calculated freely dissolved surface water PCB concentrations used in the cap model are listed in Table 3-4.

Table 3-4
Surface Water PCB Concentrations Used in Cap Model

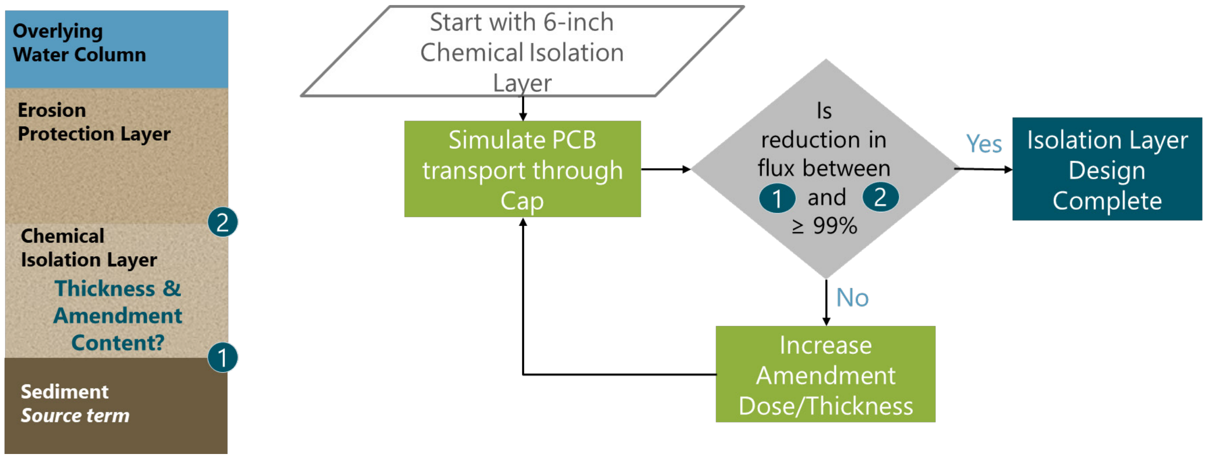
Chemical Name	Freely Dissolved Surface Water Concentration (ng/L)
PCB-mono	0.093
PCB-di	5.6
PCB-tri	1.6
PCB-tetra	0.92
PCB-penta	0.12
PCB-hexa	0.29
PCB-hepta	0.092
PCB-octa	0.0058
PCB-nona	0.0011
PCB-deca	0.00039
Total PCB[a]	8.7

Note:
a. Total PCB is included for reference only; total PCB was not simulated with the model. PCBs were simulated by homolog group.

3.3 Simulation Setup and Iterative Approach

As described in Section 3.1.3, a six-inch sand chemical isolation layer was initially evaluated with the model (represented by f_{OC} of 0.1%). The transport of PCBs was simulated for each of the 10 PCB homolog groups (mono- through decachlorobiphenyl) for a 100-year period. Model-predicted PCB mass fluxes and PCB concentrations for each homolog were summed to calculate the total PCB mass flux across the chemical isolation layer (i.e., by comparing predicted values at the bottom and top of that layer in the model) and the total PCB concentration within the BTZ. PCB mass fluxes predicted by the model at the sediment-cap interface and the interface between the chemical isolation layer and erosion protection layer were used to calculate percent reduction in total PCB mass flux across the chemical isolation layer throughout the course of the 100-year simulations. The total PCB concentration within the BTZ and the calculated percent reduction in total PCB mass flux were then compared to the Performance Standards summarized in Section 3.1.1. The model was then run iteratively by adjusting the amendment content and/or thickness of the chemical isolation layer, as needed, to achieve predicted reductions of 99% in the PCB mass flux across the chemical isolation layer throughout the simulation, as illustrated on Figure 3-3.

Figure 3-3
Iterative Process of Simulation Approach



For the purposes of this conceptual design, f_{OC} was represented in the model as a generic carbon-based sorptive amendment for PCBs. Using f_{OC} at this stage in the design provides flexibility in selecting the appropriate amendment(s) during the final design. For example, literature suggests that activated carbon (AC) is 10 to 100 times more sorptive than natural total OC (Arp et al. 2009; Hale et al. 2009; McDonough et al. 2008). As such, a f_{OC} of 10% could be achieved using a dose of AC of 1% by weight or less.

3.4 Model Results

Model results indicated that for Woods Pond, the Performance Standards would not be attained with a sand-only chemical isolation layer. Therefore, the model was run iteratively, increasing the specified f_{OC} of the chemical isolation layer until the Performance Standards were predicted to be met. The model results indicate that 4% f_{OC} is required to meet the Performance Standards in Woods Pond.

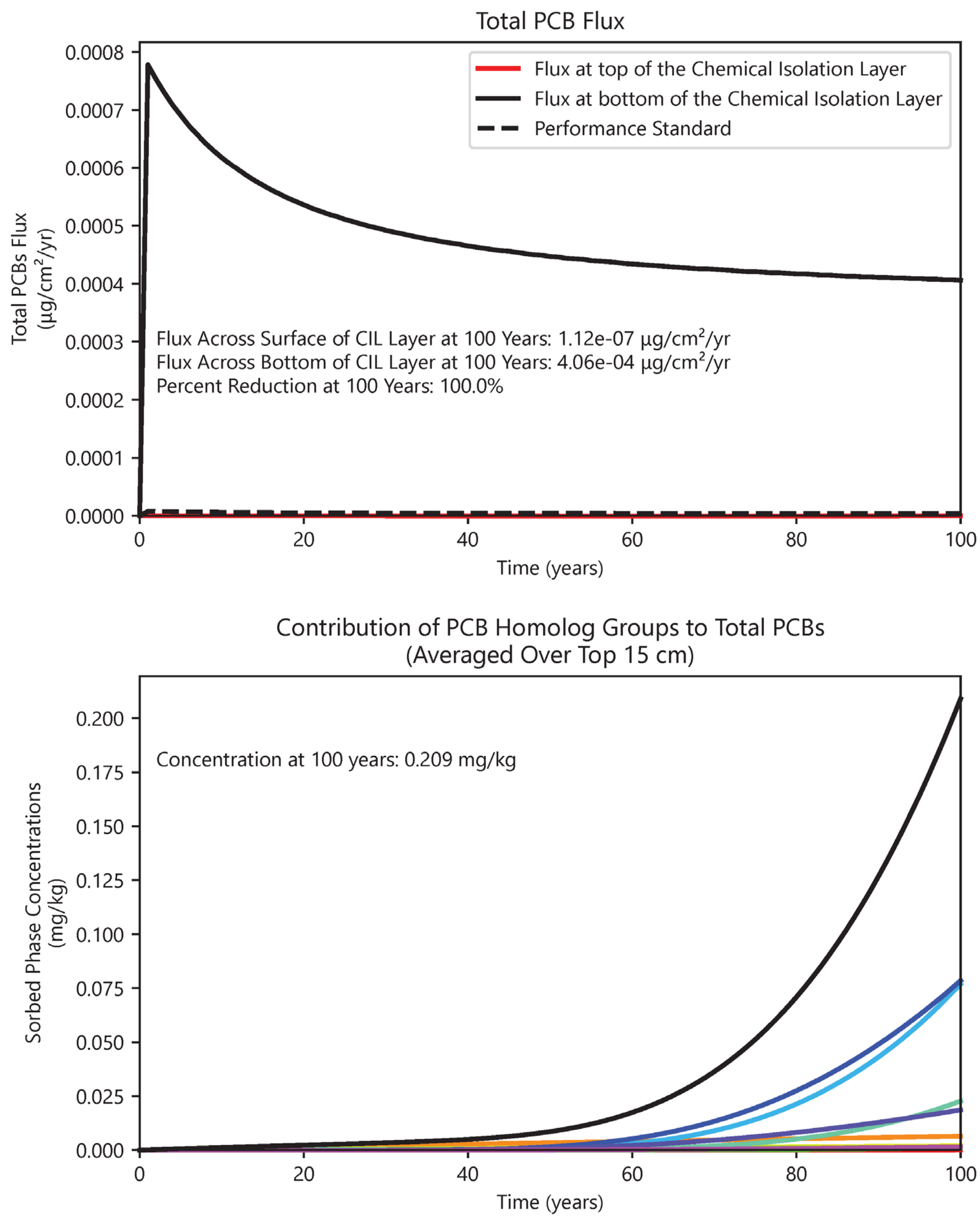
Time series of model-predicted total PCB mass flux at the bottom and top of the chemical isolation layer and total PCB concentrations within the BTZ are shown on Figure 3-4. The top panel in this figure compares the model-predicted total PCB mass fluxes at the bottom and top of the chemical isolation layer, which were used to calculate the percent reduction in total PCB mass flux across the layer.[11] The model initiates with a zero PCB mass flux at the start of the model-simulation. Due to the very large initial concentration gradient between the boundary condition (constant porewater concentration beneath the cap) and the initial zero concentration within the bottom of the cap,

[11] This is a conservative approach because it compares flux at the top of the chemical isolation layer to the top of capped sediments. Reductions are even greater if the predicted flux at the top of the chemical isolation layer is compared to the current PCB mass flux from uncapped sediments because the additional transport associated with porewater exchange from surface sediment that occurs for uncapped conditions is absent when the contaminated sediments are a foot or more below the cap/surface water interface.

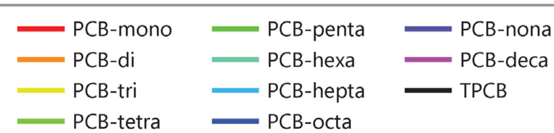
diffusion- and dispersion-dominated flux causes the total PCB mass flux to increase to a relatively high value and peak very early in the simulation. As concentrations begin to build within the bottom of the cap just above the sediment interface, the concentration gradients are reduced; and as a result, the model-predicted flux decreases until it eventually comes to a steady-state value that is dominated by the advection flux driven by groundwater seepage. The model-predicted fluxes at the top of the chemical isolation layer increase more gradually over the course of the model-simulation. Figure 3-4 shows that the reduction in total PCB mass flux across the chemical isolation layer remains greater than 99% throughout the 100-year simulations for the f_{OC} contents determined during this iterative cap design modeling evaluation. The bottom panel in this figure shows the PCB concentrations for each PCB homolog group and the corresponding total PCB concentrations predicted by the model within the BTZ (as a vertical average) over the course of the 100-year simulation.

As stated in Section 3.3, for the purposes of this conceptual design, f_{OC} was represented in the model as a generic carbon-based sorptive amendment for PCBs, which has been shown to be 10 to 100 times more sorptive than AC. Thus, a f_{OC} of 4% by weight determined through the iterative modeling process described herein could be achieved using a dose of AC of 0.4% by weight or less. This amendment dose is considered preliminary at this conceptual design stage and will be subject to refinement during final design after PDI data collection and subsequent modeling evaluations.

Figure 3-4
Model-Predicted PCB Flux and Concentration Compared to Performance Standards: Woods Pond



Notes:
The dotted black line represents the performance standard.
Surface of the chemical isolation layer is at a depth of 15 cm from the surface of the cap.
Bottom of the chemical isolation layer is at a depth of 30 cm from the surface of the cap.
Chemical isolation layer contains 4.0% by weight f_{OC}.



3.5 Recommended Chemical Isolation Layer Configuration

The chemical isolation layer modeling results from this preliminary evaluation show that a six-inch chemical isolation layer consisting of sand with a carbon-based sorptive amendment of 4% by weight f_{OC} is sufficient to meet the Performance Standards—i.e., reduce total PCB mass flux through the chemical isolation layer by 99% in Woods Pond. As additional data become available during the PDI for Woods Pond and the design is refined, the final recommended amendment type(s) and dosage(s) will be developed during final design. In addition, an evaluation of carbon-based sorptive amendment types and doses to be used for the chemical isolation layer will be conducted as part of the treatability studies described in Appendix H to the Conceptual RD/RA Work Plan for Reach 5A (the Treatability Study Work Plan for Reach 5A).

4 Conceptual Cap Design Summary

Based on the results of the erosion protection and chemical isolation evaluations presented in Sections 2 and 3, respectively, the conceptual cap design resulted in the designation of two cap types—one for Woods Pond and one for the outlet channel.

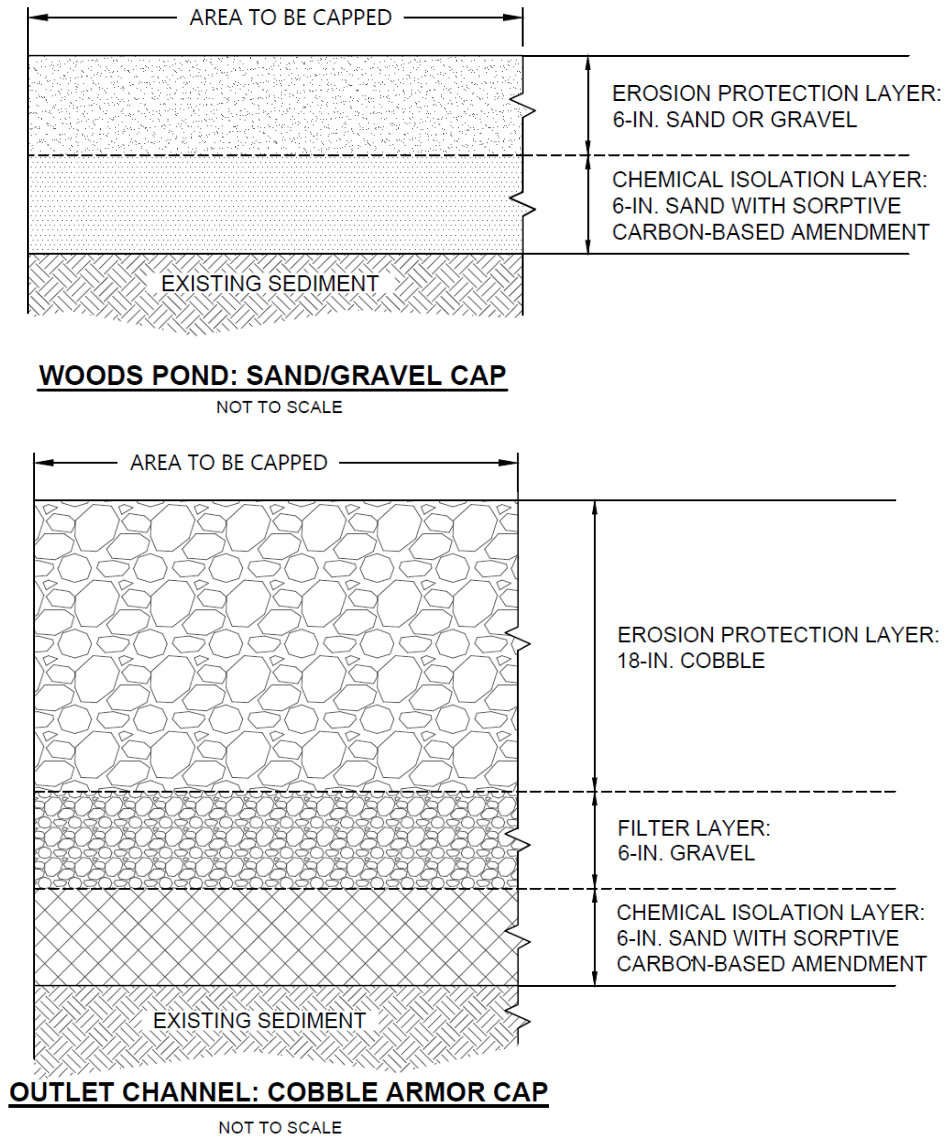
In accordance with the Revised Final Permit, the final design of the engineered caps will consider the need for overplacement allowances, with additional sediment removal, for each layer. Due to challenges in precise placement for underwater construction, an overplacement allowance is usually included in the capping designs. For Reach 6, this extra thickness is expected to range from zero to six inches, averaging about three inches for sand and gravel layers and six inches for cobble layers. This estimate considers the expected cap placement equipment, previous experiences on other projects, and contractor input. Consequently, cap overplacement allowances are assumed for up to three inches for the six-inch-thick chemical isolation layer, up to three inches for the six-inch-thick geotechnical filter layer and gravel erosion protection layers, and up to six inches for cobble armor material. These overplacement allowances are typical for remedial capping projects in underwater construction conditions.

Table 4-1 summarizes the cap types for Woods Pond and the outlet channel at this conceptual design stage. Figure 2-7 (presented in Section 2.3) shows the extents of where the different cap types would be applied in Woods Pond and the outlet channel. Figure 4-1 shows schematic cross-sections of each cap type. The capping addendum to the Final RD/RA Work Plan for Reach 6 will present updated evaluations and final cap details, including final material and placement specifications and cross sections.

Table 4-1
Conceptual Engineered Cap Types

Cap Type	Conceptual Design
Woods Pond	• Chemical Isolation Layer: Minimum six-inch-thick layer of sand with a sorptive carbon-based amendment (as needed), plus a three-inch overplacement allowance • Erosion Protection Layer: Minimum six-inch-thick layer of sand or gravel, plus a three-inch overplacement allowance
Outlet Channel	• Chemical Isolation Layer: Minimum six-inch-thick layer sand with a sorptive carbon-based amendment (as needed), plus a three-inch overplacement allowance • Geotechnical Filter Layer: Minimum six-inch-thick layer of gravel, plus a three-inch overplacement allowance • Erosion Protection Layer: Minimum 18-inch-thick layer of cobble, plus a six-inch overplacement allowance

Figure 4-1
Conceptual Engineered Cap Types



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Attachment 1
HEC-RAS Model Results and Stable Particle Size Calculation

Table 1

HEC-RAS Model Results and Stable Particle Size Calculation: Low Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	2.31	0.17	402.64	NA	1.00	0.00	0.0
Reach 6	3989	NA	1.72	0.09	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	4.94	0.03	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	6.29	0.18	218.74	0.94	1.29	0.00	0.0
Reach 6	2920	218.74	11.24	0.22	93.4	2.34	1.21	0.00	0.0
Reach 6	2901	198.75	11.18	0.23	93.2	2.13	1.21	0.00	0.0
Reach 6	2320	262.69	5.73	0.28	151.6	1.73	1.23	0.00	0.0
Reach 6	2130	NA	3.04	0.44	182.39	NA	1.00	0.00	0.0

Note:

NA: Not Applicable for a straight channel

Table 2
HEC-RAS Model Results and Stable Particle Size Calculation: Moderate Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	2.74	0.38	408	NA	1.00	0.00	0.0
Reach 6	3989	NA	2.18	0.19	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	5.4	0.08	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	6.71	0.53	221.68	0.93	1.29	0.00	0.0
Reach 6	2920	218.74	11.7	0.69	93.4	2.34	1.21	0.00	0.0
Reach 6	2901	198.75	11.64	0.72	93.2	2.13	1.21	0.00	0.0
Reach 6	2320	262.69	6.18	0.84	151.6	1.73	1.23	0.00	0.0
Reach 6	2130	NA	3.45	1.17	184.3	NA	1.00	0.00	0.1

Note:
NA: Not Applicable for a straight channel

Table 3
HEC-RAS Model Results and Stable Particle Size Calculation: High Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	3.19	0.38	408	NA	1.00	0.00	0.0
Reach 6	3989	NA	2.63	0.19	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	5.85	0.08	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	7.11	0.53	220.23	0.93	1.29	0.00	0.0
Reach 6	2920	218.74	12.14	0.69	93.4	2.34	1.21	0.00	0.0
Reach 6	2901	198.75	12.08	0.72	93.2	2.13	1.21	0.00	0.0
Reach 6	2320	262.69	6.62	0.84	151.6	1.73	1.23	0.00	0.0
Reach 6	2130	NA	3.88	1.17	184.3	NA	1.00	0.01	0.1

Note:
NA: Not Applicable for a straight channel

Table 4
HEC-RAS Model Results and Stable Particle Size Calculation: 1-Year Return Interval Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	3.91	0.51	408	NA	1.00	0.00	0.0
Reach 6	3989	NA	3.35	0.26	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	6.57	0.12	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	7.77	0.83	223	0.92	1.29	0.00	0.0
Reach 6	2920	218.74	12.84	1.11	93.4	2.34	1.21	0.00	0.0
Reach 6	2901	198.75	12.78	1.16	93.2	2.13	1.21	0.00	0.1
Reach 6	2320	262.69	7.31	1.29	151.6	1.73	1.23	0.01	0.1
Reach 6	2130	NA	4.55	1.7	184.3	NA	1.00	0.01	0.1

Note:
NA: Not Applicable for a straight channel

Table 5
HEC-RAS Model Results and Stable Particle Size Calculation: 2-Year Return Interval Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	6.4	0.82	408	NA	1.00	0.00	0.0
Reach 6	3989	NA	5.84	0.43	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	9.06	0.26	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	10.22	1.82	223	0.92	1.29	0.02	0.2
Reach 6	2920	218.74	15.22	2.68	93.4	2.34	1.21	0.03	0.4
Reach 6	2901	198.75	15.14	2.85	93.2	2.13	1.21	0.04	0.5
Reach 6	2320	262.69	9.63	2.78	151.6	1.73	1.23	0.04	0.5
Reach 6	2130	NA	6.83	3.12	184.3	NA	1.00	0.05	0.6

Note:
NA: Not Applicable for a straight channel

Table 6
HEC-RAS Model Results and Stable Particle Size Calculation: 5-Year Return Interval Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	8.15	1.01	408	NA	1.00	0.00	0.0
Reach 6	3989	NA	7.59	0.53	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	10.81	0.35	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	11.93	2.38	223	0.92	1.29	0.03	0.3
Reach 6	2920	218.74	16.83	3.88	93.4	2.34	1.21	0.08	1.0
Reach 6	2901	198.75	16.72	4.13	93.2	2.13	1.21	0.10	1.2
Reach 6	2320	262.69	11.2	3.73	151.6	1.73	1.23	0.09	1.0
Reach 6	2130	NA	8.4	3.88	184.3	NA	1.00	0.08	1.0

Note:
NA: Not Applicable for a straight channel

Table 7
HEC-RAS Model Results and Stable Particle Size Calculation: 10-Year Return Interval Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	9.15	1.16	408	NA	1.00	0.00	0.0
Reach 6	3989	NA	8.59	0.62	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	11.8	0.42	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	12.9	2.79	223	0.92	1.29	0.04	0.5
Reach 6	2920	218.74	17.69	4.91	93.4	2.34	1.21	0.15	1.8
Reach 6	2901	198.75	17.55	5.13	93.2	2.13	1.21	0.17	2.0
Reach 6	2320	262.69	12.02	4.49	151.6	1.73	1.23	0.14	1.6
Reach 6	2130	NA	9.22	4.51	184.3	NA	1.00	0.12	1.4

Note:
NA: Not Applicable for a straight channel

Table 8
HEC-RAS Model Results and Stable Particle Size Calculation: 25-Year Return Interval Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	10.12	1.31	408	NA	1.00	0.01	0.1
Reach 6	3989	NA	9.56	0.7	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	12.77	0.49	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	13.83	3.14	223	0.92	1.29	0.06	0.7
Reach 6	2920	218.74	18.53	5.7	93.4	2.34	1.21	0.22	2.6
Reach 6	2901	198.75	18.31	6.17	93.2	2.13	1.21	0.27	3.2
Reach 6	2320	262.69	12.77	5.25	151.6	1.73	1.23	0.20	2.4
Reach 6	2130	NA	9.98	5.15	184.3	NA	1.00	0.16	1.9

Note:
NA: Not Applicable for a straight channel

Table 9
HEC-RAS Model Results and Stable Particle Size Calculation: 50-Year Return Interval Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	11.49	1.50	408	NA	1.00	0.01	0.1
Reach 6	3989	NA	10.93	0.80	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	14.14	0.58	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	15.18	3.46	223	0.92	1.29	0.07	0.8
Reach 6	2920	218.74	19.72	6.81	93.4	2.34	1.21	0.33	4.0
Reach 6	2901	198.75	19.28	7.88	93.2	2.13	1.21	0.48	5.8
Reach 6	2320	262.69	13.75	6.31	151.6	1.73	1.23	0.31	3.7
Reach 6	2130	NA	10.96	6.00	184.3	NA	1.00	0.23	2.8

Note:
NA: Not Applicable for a straight channel

Table 10

HEC-RAS Model Results and Stable Particle Size Calculation: 100-Year Return Interval Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	12.49	1.65	408	NA	1.00	0.01	0.1
Reach 6	3989	NA	11.93	0.88	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	15.14	0.65	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	16.15	3.71	223	0.92	1.29	0.08	1.0
Reach 6	2920	218.74	20.61	7.48	93.4	2.34	1.21	0.41	5.0
Reach 6	2901	198.75	19.94	9.1	93.2	2.13	1.21	0.69	8.2
Reach 6	2320	262.69	14.49	7.16	151.6	1.73	1.23	0.41	5.0
Reach 6	2130	NA	11.7	6.67	184.3	NA	1.00	0.30	3.6

Note:
NA: Not Applicable for a straight channel

Table 11
HEC-RAS Model Results and Stable Particle Size Calculation: 200-Year Return Interval Flow

Reach	HEC-RAS Transect Number	Radius Curvature (R, feet)	Hydraulic Depth (feet)	Channel Velocity (feet per second)	Channel Width (W, feet)	R/W	Velocity Distribution Coefficent, Cv (1.0 for Straight Channels)	Computed Stable Particle Size (feet)	Computed Stable Particle Size (inches)
Reach 6	4658	NA	13.74	1.81	408	NA	1.00	0.01	0.1
Reach 6	3989	NA	13.19	0.97	1669.9	NA	1.00	0.00	0.0
Reach 6	3210	NA	16.39	0.74	1822.6	NA	1.00	0.00	0.0
Reach 6	2969	205.87	17.38	3.94	223	0.92	1.29	0.09	1.1
Reach 6	2920	218.74	21.79	8.07	93.4	2.34	1.21	0.49	5.9
Reach 6	2901	198.75	20.75	10.45	93.2	2.13	1.21	0.96	11.5
Reach 6	2320	262.69	15.31	8.16	151.6	1.73	1.23	0.57	6.8
Reach 6	2130	NA	12.94	7.49	184.3	NA	1.00	0.39	4.6

Note:
NA: Not Applicable for a straight channel

Appendix D
Dredge Slope Stability Evaluation

October 2024
Housatonic River – Rest of River

Reach 6 Dredge Slope Stability Evaluation

Prepared for General Electric Company

October 2024
Housatonic River – Rest of River

Reach 6 Dredge Slope Stability Evaluation

Prepared for
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ATTACHMENTS

ABBREVIATIONS

ASTM	ASTM International
Conceptual RD/RA Work Plan	*Conceptual Remedial Design/Remediation Action Work Plan for Reach 6*
EPA	U.S. Environmental Protection Agency
FOS	factor of safety
GE	General Electric Company
H:V	horizontal:vertical
ML	inorganic silts
ML-CL	inorganic silts and low-plasticity clayey silts
mm	millimeter
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
OH	organic silts and high-plasticity clays
OL	organic silts and clays of low plasticity
PCB	polychlorinated biphenyl
PDI	pre-design investigation
PDI Summary Report	*Revised Pre-Design Investigation Summary Report for Reach 6*
psf	pound per square foot
Revised Final Permit	Revised Final Resource Conservation and Recovery Act Permit Modification
ROR	Rest of River
SM	silty sands
USCS	Unified Soil Classification System

1 Introduction

1.1 Background

The final revised modification of the Resource Conservation and Recovery Act Corrective Action Permit (Revised Final Permit) issued by the U.S. Environmental Protection Agency (EPA) to the General Electric Company (GE) for the Housatonic Rest of River (ROR) (EPA 2020) requires and sets forth Performance Standards for sediment removal and installation of an engineered cap in Woods Pond as part of the Reach 6 remediation. The ROR is the portion of the Housatonic River and its backwaters and floodplain downstream of the confluence of the East and West Branches of the Housatonic River (the Confluence). Reach 6 begins approximately 10 miles downstream of the Confluence and contains Woods Pond, which is an impounded waterbody formed by the construction of Woods Pond Dam in the late 1800s, and its associated floodplain. Woods Pond is approximately 0.2 mile in length and has a surface area of approximately 53.6 acres.

Section II.B.2.e of the Revised Final Permit sets forth the Performance Standards for remediation of sediment in the Woods Pond portion of Reach 6. Specifically, Section II.B.2.e.(1)(a) requires that sediment be removed throughout the pond and an engineered cap be placed over any residual polychlorinated biphenyls (PCBs) such that there is a post-capping minimum water depth of six feet measured from the crest of Woods Pond Dam,[1] with the exception that, in nearshore areas, the slope from the shore to the six-foot water depth needs to be as steep as possible but also stable and not subject to erosion or sloughing. In areas with water depth greater than six feet prior to remediation, sufficient sediment needs to be removed to allow for the placement of an engineered cap so the final grade is equal to or deeper than the original grade.

1.2 Slope Stability Analysis Objectives and Scope

This report describes the evaluations conducted to assess the dredge slope stability and to identify preliminary dredge slope configurations to be used as part of the dredge design in nearshore areas within Woods Pond. The evaluations presented herein were performed to support the conceptual design stage; additional evaluations will be conducted during final design after additional data collection and the results of those additional evaluations could vary from those presented herein.

[1] The post-capping minimum water depth is applicable to Woods Pond proper and does not apply to the headwaters of the pond (i.e., the 12.6-acre portion of Reach 6 between the downstream end of Reach 5C and Woods Pond proper). As described in the Conceptual RD/RA Work Plan (to which this document is an appendix), the Revised Final Permit does not contain any specific Performance Standards regarding the headwaters transition zone portion of Reach 6. While this transition zone is part of Reach 6, the Revised Final Permit requirement to remove sediment throughout Woods Pond to achieve a post-capping minimum water depth of six feet is not an appropriate remedy for the transition zone given the existing riverine-type conditions present in that area. As also discussed in the Conceptual RD/RA Work Plan, the conceptual design for the remediation of this headwaters transition zone is not included in that work plan, but will be presented in a later addendum.

This report is being submitted as an appendix to the *Conceptual Remedial Design/Remedial Action Work Plan for Reach 6* (Conceptual RD/RA Work Plan) in support of the remedial design for Woods Pond. This report includes summaries of the interpreted site geotechnical conditions used to inform the development of the slope stability modeling; the modeling approach, assumptions made to facilitate modeling, and the results of the modeling; preliminary dredge slope design recommendations; and uncertainties and data gaps that are planned to be addressed in the Supplemental Data Collection program.

2 Geotechnical Conditions

2.1 Bathymetry and Topography

Woods Pond is located within the Housatonic River Valley in Berkshire County, Massachusetts, and is an impounded waterbody formed by the construction of Woods Pond Dam in the late 1800s. In addition to Woods Pond proper, Reach 6 includes an approximately 12.6-acre portion of the headwaters leading into Woods Pond (herein referred to as the headwaters or transition zone), an outlet channel leading to the dam, and the associated floodplain. The dam includes a spillway crest elevation of 948.3 feet National Geodetic Vertical Datum of 1929 (NGVD29; GZA 2019).[2] Water depths (as measured from the crest of the dam) over much of the pond generally range from one to three feet; however, a deeper portion on the southeastern side of the pond has a maximum depth greater than 14 feet. There is also a relatively pronounced channel through Woods Pond, which provides a primary flow pathway. Water can bypass the dam via a raceway, and a portion of that bypass enters a downstream pond area, known as Valley Mill Pond, via a culvert.

Woods Pond is surrounded by higher terrain to the east, south, and west. To the east of Woods Pond are densely vegetated slopes rising to elevations of about 1,800 to 2,000 feet North American Vertical Datum of 1988 (NAVD88), which lead to a broad plateau with gently undulating terrain indicative of historical glaciation. South and west of Woods Pond the terrain also features gentle undulations and is broadly absent of significant topographic highs, with typical elevations ranging between about 1,100 and 1,200 feet NAVD88.

2.2 Geology

The site is located within a historically glaciated alluvial channel and floodplain environment, with deposits characteristic of glacial advance and retreat, channel migration, and episodic flooding. Geologic mapping efforts completed by Holmes (1967) and later updated by Stone et al. (2018) were both reviewed to identify regionally mapped geologic units present at the site as well as origin and description data to compare with geotechnical investigation data collected as part of the pre-design investigation (PDI) for Reach 6 (Section 2.3). Geologic units mapped at the site and immediately surrounding vicinity are shown on Figure 2-1 and are listed and described below (descriptions per Stone et al. 2018).

Swamp deposits [*Qs*]: Swamp deposits are characterized as organic muck and peat with trace amounts of sand, silt, and clay. They may be present in poorly drained depressions overlying glacial

[2] The vertical datum used for the project is NAVD88. Using that datum, the Woods Pond Dam spillway crest elevation is 947.7 feet NAVD88.

till and are typically less than 10 feet thick. These are mapped on the northwestern side of Reach 6; however, they may be present below mapped waterbodies (e.g., Woods Pond).

Alluvium [*Qal*]: Alluvial deposits, including floodplain alluvium (per Stone et al. 2018), are characterized as consisting of sand, gravel, silt, and trace organics and are extensively present along the Housatonic River. This unit typically overlies glacially stratified deposits and often includes reworked or transported glacial deposits. This unit is mapped throughout Reach 6.

Alluvial-fan deposits [*Qaf*]: Alluvial-fan deposits locally consist of coarse gravel and sand deposited at the base of steep slopes where high-energy streams enter relatively flat valleys. These deposits are mapped at the northeast side of Reach 6.

Ice-contact deposits [*Qcd*]: Stagnant ice-contact deposits consist primarily of gravel and sand and contain scattered large surface boulders and interlayered beds of silt and clay. Historical mapping by Holmes (1967) indicates several quarries sourcing material from this unit were present south of Woods Pond. The two quarries closest to Woods Pond were identified as producing "bouldery gravel" material, while others slightly further south produced "cobble sand" and "pebble sand." Ice-contact deposits are mapped within the valley south of Reach 6 and appear to extend through the south and west sides of the site, potentially underlying much of Woods Pond.

Till [*Qt*]: Glacial till, locally differentiated by thickness in geologic maps, is broadly present around and beneath Reach 6. Till is regionally characterized as consisting of nonsorted, nonstratified sand with trace silt and clay and may contain pebble, cobble, and boulder clasts near the surface of the unit. Lower till typically consists of more fine-grained materials (e.g., silt) and is very compact.

2.3 Geotechnical Data Collection

GE initiated Reach 6 PDI field activities in August 2023 and substantially completed those activities by November 2023. Geotechnical and sediment data were collected during the PDI via a combination of sample collection (sediment cores and Shelby tube samples), in-situ testing (vane shear testing), and laboratory testing (index and strength testing). Brief summaries of the PDI geotechnical field and laboratory testing procedures, and their respective results, are provided in the following subsections. A detailed summary of PDI activities and results are presented in the *Pre-Design Investigation Summary Report for Reach 6* (PDI Summary Report; Anchor QEA 2024) which is being submitted concurrently with the Conceptual RD/RA Work Plan.

2.3.1 Pre-Design Investigation Geotechnical Field Data

Field data collected as part of the PDI phase included visual characterization of sediment samples collected from Woods Pond, the headwaters transition zone, and the outlet channel as well as in-situ vane shear testing to estimate the undrained shear strength of site soils. A map displaying the testing locations for sediment sample collection and vane shear can be found on Figure 2-2 (reproduced from Figure 2-7 of the PDI Summary Report). Field sample collection logs were prepared for all sampling locations and included visual observations and data, such as sample collection date, probing depth, recovery length, and sample description. In addition, limited field data, such as sampler advance and recovery characteristics, were recorded for a total of eight relatively undisturbed samples collected using Shelby tubes at five nearshore locations, as shown on Figure 2-2.

Vane shear testing was conducted in-field for sediment analysis at 85 different sediment sampling locations. Tests utilized three different vane sizes of 25.4-millimeter (mm), 32 mm, and 64 mm diameter. These tests provided data pertaining to in-situ undrained shear strength of the identified geotechnical soil units (see Section 2.4 for descriptions of the geotechnical soil units).

2.3.2 Pre-Design Investigation Geotechnical Analytical Results

A total of 122 sediment samples from 89 different locations distributed throughout the Reach 6 study area were submitted for laboratory testing of index properties. Samples submitted were tested for a variety of indexing parameters, including moisture content (by ASTM International [ASTM] D2216), organic content (by ASTM D2974), specific gravity (by ASTM D854), Atterberg limits (by ASTM D4318), particle size (by ASTM D6913), and dry bulk density (by ASTM D7263). These results were then used to develop a preliminary interpretation of the subsurface units encountered, as described in Section 2.4.

In addition to index testing, geotechnical strength testing was conducted on eight samples collected using Shelby tubes from the nearshore areas, as described in Section 2.3.1. Five samples consisting of primarily fine material were submitted for consolidated undrained triaxial shear strength (by ASTM D4767), and three samples consisting of primarily coarser material were submitted for direct shear testing (by ASTM D3080). In addition to strength data recorded, physical properties of the tested soils were also included, such as moisture content and unit weight.

2.4 Primary Geotechnical Units

The following subsections describe the primary geotechnical units identified for Reach 6 relevant to the slope stability evaluation. These units were identified as primary given their prevalence and their importance in both understanding the site geological conditions as well as the engineering characteristics for dredging and capping. Descriptions are provided for each geotechnical unit's interpreted site distribution, physical characteristics, and engineering behavior.

2.4.1 Organic Soils

The organic soils encountered at the site consist of dark-brown to reddish-brown silt with noticeable plant material and varying amounts of sand. This layer is characterized by an organic odor and very high moisture and organic content. The typical Unified Soil Classification System (USCS) classifications for this layer are primarily OL (organic silts and clays of low plasticity), OH (organic silts and high-plasticity clays), and ML (inorganic silts). While primarily non-plastic, the organic soils may exhibit some plasticity, as indicated by Atterberg limit testing results.

This unit is primarily found within the southern portion of Woods Pond, with thicknesses ranging to eight feet or more.[3] In other areas of Reach 6, this layer is generally thinner—typically only a few feet thick—and locally one foot or less in some locations.

These soils exhibit complex behavior due to their high organic and moisture content. In undrained conditions, their strength is primarily derived from apparent cohesion due to both the fine-grained soils as well as the mesh-like structure of the organic matter. In drained conditions, test results indicate very low friction angles, indicating low strength when allowing for excess pore pressures to dissipate under loading. These soils may accommodate significant deformations prior to failing in a purely plastic/brittle fashion. This unit may exhibit limited loadbearing capacity and be prone to instability, particularly in shallow depths or when subjected to rapid loading. These soils will require further evaluation during final design to evaluate their ability to support cap placement where coarse materials may be required due to hydrodynamic loads or ice forces.

2.4.2 Fine Alluvium

The fine alluvium layer is characterized by a mix of gray and light brown to brown silt and sand, with trace amounts of clay and organics. The USCS classifications for samples in this layer included SM (silty sands), ML, and ML-CL (inorganic silts and low-plasticity clayey silts). This unit has a lower moisture content compared to the organic soils.

Geologic mapping and PDI investigations identified layers of fine alluvium throughout the Reach 6 study area, with these deposits being present at the surface in the headwaters north of the pond and along the main channels identified in the site bathymetry (Stone et al. 2018) as well as locally between the overlying organic soils (see Section 2.4.2) and underlying lower alluvium/ice-contact deposits (see Section 2.4.3).

Laboratory tests indicate that this layer has a higher drained strength compared to the organic soils and will typically behave as a drained unit under loading associated with cap placement. However, its behavior during dredging and under capping loads will be influenced by drainage conditions and the rate of loading where fines content is greater within the unit (e.g., ML-CL). Additionally, the low-to-absent cohesion within this unit may lead to transport of the unit, even on very flat slopes.

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[3] Several sediment cores did not extend through the organic soil layer despite advancing to depths ranging from six feet to eight feet below the mudline. Accordingly, the total thickness of the layer at those locations was not able to be identified. Where cores extended through the organic soil layer, materials consistent with the fine alluvium and lower alluvium/ice-contact deposits were encountered.

2.4.3 Lower Alluvium/Ice-Contact Deposits[4]

The lower alluvium layer, which was typically encountered beneath the finer sediments and directly under the organic soils in the southern portion of Woods Pond, consists of predominantly coarse-grained gray sand with occasional gravel. The samples from this layer generally fall under the SM USCS classification.

This layer, being coarser and denser, provides increased strength and greater stability than the organic soils or the fine alluvium.

2.4.4 Glacial Till

Glacial till was not encountered in any of the samples collected during the PDI efforts, but it is characterized regionally and is mapped at the site, potentially within or below the Reach 6 dredge extent on the west side of Woods Pond and the outlet channel. Till generally consists of sand, trace silt, and trace clay, and may contain pebble, cobble, and boulder clasts at the shallower subsurface, as described in Section 2.2.

Due to the density or consistency of the unit, glacial till demonstrates high strength and will provide for stable slopes upon excavation; however, the unit would be much more difficult to excavate or dredge than the other geotechnical units encountered at the site.

2.5 Secondary Geotechnical Units

The following subsections describe the secondary geotechnical units identified in the Reach 6 study area. These units were identified as secondary given their limited prevalence at the site and their limited impact on the geotechnical slope stability analysis.

2.5.1 Artificial Fill

While the extents of fill materials were not determined, it is anticipated that some amount of artificial fill is likely present at or immediately adjacent to Reach 6, such as along the rail line, at the residential property on the west side of the pond, along the gravel roads south and east of the pond, and at the footbridge abutments at the northern end of the outlet channel. General fill may be derived from local sources and consist of reworked silt, sand, and gravel, with variable consistency and strength. Fill along the rail alignment (e.g., ballast), gravel roads, and the bridge abutments may consist of

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[4] Local geologic mapping indicates that Woods Pond is bounded and underlain by glacial till (mapped to the east and west) and stagnant-ice deposits (mapped to the south) (Stone et al. 2018). Glacial till was not encountered in any of the investigations completed as part of the PDI. The lower alluvium appears to be similar to available descriptions of the stagnant-ice-contact deposits; however, it may also locally consist of reworked stagnant-ice-contact deposits within and adjacent to older alluvial channels or simply alluvial deposits derived from upstream sources. Accordingly, the characterization of the lower alluvium may be revised based on additional data collection at the site.

engineered materials, such as processed aggregate, and have been placed and compacted to established requirements for those projects.

2.5.2 Colluvium/Alluvial-Fan Deposits

Alluvial-fan deposits, as described in Section 2.2, are present locally on the northeast side of the Reach 6 study area and may locally overlie colluvium. Colluvium is an assemblage of slope debris derived from weathering and erosion of the upslope till, and it is interpreted to likely be present along the east side of Woods Pond. Materials associated with these units were not encountered during the PDI; however, they may be encountered in the easternmost dredge extents of the project.

3 Slope Stability Analysis

3.1 Slope Stability Analysis Approach

Preliminary slope stability analysis was completed for Reach 6 to support the design of dredge slopes within Woods Pond.[5] As discussed in Section 1.1, sediment will be removed throughout the pond, and an engineered cap be placed over any residual PCBs such that there is a post-capping minimum water depth of six feet measured from the crest of Woods Pond Dam, with the exception that, in nearshore areas, the slope from the shore to the six-foot water depth needs to be as steep as possible but also stable and not subject to erosion or sloughing. In order to assess a potential range of dredge slope configurations extending through the primary geotechnical units described in Section 2.4, slope stability analysis was performed using both limit-equilibrium methods (i.e., using geotechnical modeling software Slide2 [Rocscience 2024]) and an infinite slope method (i.e., simplified, closed-form, equation-based methods in a spreadsheet). Descriptions of the modeling approach taken for each of these two methods are provided in the following subsections.

3.1.1 Simplified Evaluation (Infinite Slope Method)

A simplified slope stability evaluation, using the infinite slope method, was performed utilizing the following equation (Duncan and Wright 2005):

Equation 1

$$FS = \frac{c'}{(\gamma - \gamma w)z} * \frac{2}{sin(2\beta)} + [cot\beta]tan\emptyset'$$

where:

FS	=	factor of safety
c	=	average drained cohesion of the soil (psf)
γ	=	total unit weight (pcf)
γ_w	=	unit weight of water (pcf)
z	=	slope height (feet)
β	=	existing slope angle (degrees)
$\emptyset'$	=	drained friction angle (degrees)

This method of evaluation assumes a simplified geometry with a fixed slope angle, with neither sloping ground nor vehicle surcharge loading above/below the slope. Furthermore, it should be

[5] Slope stability analysis was not performed to evaluate potential dredge slopes within the headwaters/transition zone at the upstream end of Reach 6, since, as noted above, the conceptual design for the remediation of that area is not included in the Conceptual RD/RA Work Plan, but will be presented in a later addendum.

noted that it assumes a single soil unit, with no variation of the properties within said unit. Thus, the infinite slope method can be considered a simplified screening tool that is useful where its assumptions can approximate site conditions. This simplified calculation was performed for a range of dredge slopes cut through three primary geotechnical units at the site: organic soils, fine alluvium, and lower alluvium/ice-contact deposits. These results were then compared with the more rigorous modeling completed using limit-equilibrium methods, as described in the following subsection.

3.1.2 Limit-Equilibrium Methods

Representative cross-sections of the pond were selected to analyze slope stability for various dredge and cap scenarios. Five cross-sections were selected to facilitate development of geologic profiles, as shown on Figures 1-1 through 1-6 in Attachment 1. Four of the cross-sections were utilized for direct incorporation in limit-equilibrium slope stability analysis. One cross-section (2-2’) was selected to identify the subsurface stratigraphy along the west side of Reach 6, facilitating development of the other sections; however, it did not intersect dredge slopes directly and was not used for slope stability analysis. All slope stability modeling was performed with Rocscience Slide2 version 9.03 (Rocscience 2024) software, which uses limit-equilibrium methods of analysis to calculate the factor of safety (FOS) for the evaluated slip surface. For each of the four cross-sections utilized, two models were generated of the existing slope at each end (totaling eight), and five different dredge scenarios were created for each dredge and cap model (totaling 40 scenarios). The selected range of dredge cuts were evaluated to estimate the steepest dredge slope configuration that would meet the minimum FOS requirements, and the results for each location modeled were then compared with other locations at which dredging would extend through similar subsurface conditions (e.g., organic soils on the east side of Woods Pond). Where conditions were interpreted to be similar, the flattest governing slope angle in the results would be taken as the controlling and representative slope condition for dredging. Modeling included vehicle surcharge loading and variation of subsurface stratigraphy.

The target FOS values for these models consider the site’s intended use, consequences of slope failure, and any limitations surrounding knowledge of the subsurface lithology. For this site, based upon recommended U.S. Army Corps of Engineers slope stability guidelines, target FOS values of 1.3 for short-term (undrained) conditions and 1.5 for long-term (drained) conditions were considered feasible and appropriate (USACE 2003).

3.2 Assumptions

3.2.1 Dredge and Cap Approach

The preliminary cap thickness assumed for slope stability modeling was 1.5 feet. Accordingly, the target dredge depth was taken as the lower of 7.5 feet below the dam crest (6 feet plus 1.5 feet overdredge for cap placement) or 1.5 feet below the existing mudline. Modeling assumed that capping materials would likely consist of sand; however, it should be noted that cap design requirements for hydrodynamic or ice forces are pending further development and have not been considered in the modeling analysis.

3.2.2 Subsurface Stratigraphy

Subsurface stratigraphy profiles were developed using a combination of PDI data, geologic mapping, and local topography and bathymetry. Sediment core logs and geotechnical laboratory test data provided insights into the depositional sequences, physical properties, and classification of soil layers. Strength data from vane shear, triaxial compression, and direct shear tests were used to further characterize these layers based on their geotechnical properties. Geologic mapping helped delineate historical soil unit boundaries, while topography and bathymetry data revealed sediment deposition and erosion patterns.

Based on the above framework, seven geotechnical soil units were identified, as described in Sections 2.4 and 2.5, and represented within the slope stability models. The stratigraphic interpretations for each of the evaluated locations are provided in the slope stability analysis outputs in Attachment 2.

3.2.3 Material Properties

Material properties for primary soil units were generally determined with reference to in-situ test and laboratory test results, and properties for secondary soil units were estimated using available data from historical projects completed regionally. Because glacial till was not encountered during the PDI, regional information was used to estimate the engineering properties for the unit, similar to the secondary soil units.

The properties for the organic soils varied across the site and across data acquisition methods, including typically higher strength estimation from laboratory tests as compared to in-situ tests. Accordingly, slope stability analysis included a sensitivity evaluation to assess the stability of both dredge and cap slopes when considering different strength and in-situ stress relationships. Two strength relationships were taken to be independent of in-situ confining stresses and increase with depth at rates of 10 pounds per square foot (psf)/foot and 15 psf/foot, respectively. These represent conservative strength estimates that represent the low range of the vane shear test results (10 psf/foot) and the low bound of the laboratory test results (15 psf/foot), each conservatively independent of confinement and pre-dredge depth. The third strength model related the undrained shear strength to the in-situ stress regime using a vertical stress ratio of 0.65, which approximates the low bound of the laboratory test results and accounts for the confining stresses within the slopes. The FOS values for all analyzed scenarios were then assessed and compared with target dredge configurations. Table 3-1 summarizes the material properties of relevant soil units.

Table 3-1
Geotechnical Engineering Soil Properties for Slope Stability Analysis

Material	Total Unit Weight (γ) (pcf)	Undrained Parameters		Drained Parameters	
		Cohesion (Top) (psf)	Cohesion Change with Depth	Effective Cohesion (c′) (psf)	Friction Angle (φ′) (degrees)
Fill	120	—	—	0	34
Organic Soils[1]	75	0	10 psf/foot; 15 psf/foot; 0.65 x σ'_v	—	—
Fine Alluvium	95	—	—	0	30
Lower Alluvium Ice-Contact Deposits	120	—	—	0	36
Glacial Till	130	—	—	0	40

Note:
1. See discussion of sensitivity analysis using three different strength profile interpretations in Section 3.2.3.

3.3 Results and Recommendations

3.3.1 Method of Interpretation

The results of all temporary (dredge) and long-term (cap) analysis were reviewed with reference to the associated target minimum FOS values. To visualize the FOS results for each scenario evaluated, plots were generated to compare the calculated FOS values. Individual plots were created for each dredge slope configuration, in addition to the range of material strengths considered under the sensitivity analysis, in comparison with the target minimum FOS. Developed plots were then reviewed with the range of subsurface conditions from collected PDI data, which allowed for the development of preliminary recommended dredge slope configurations for identified sections of Woods Pond. These plots are included in Attachment 2 as Figures 2-1 and 2-2. The following subsections discuss the evaluation results and their application to the dredge slope design.

3.3.2 Summary of Findings

The results of the slope stability analysis completed indicate that a dredge slope configured at 4 horizontal to 1 vertical (4H:1V) is anticipated to satisfy the minimum short-term target FOS of 1.3 for all of Reach 6, except in a few locations at potentially very shallow depth *if* locally the strength of the organic soils are as low as the lowest readings from the vane shear tests. Using estimated parameters for the organic soils that are consistent with both the vane shear test results and also the low bound of the laboratory tests, FOS values exceed 1.3 throughout all of Reach 6 for dredge slopes at a 4H:1V configuration.

To refine potential dredge slopes to be steeper where stratigraphy and loading conditions would allow, Woods Pond (including its outlet channel) was divided into two subareas of similar subsurface characteristics: the western pond/outlet channel and the eastern pond.[6] The results for available analysis for each subarea were then grouped and reviewed. Within the eastern pond, it was found that while some FOS values would achieve at least 1.3 for the dredge case with a 3H:1V slope, they typically did not meet the minimum long-term target FOS of 1.5. Accordingly, a 4H:1V slope was taken as the steepest stable slope within the eastern pond where organic soils are most prevalent because the minimum long-term target FOS of 1.5 was achieved with this slope configuration. Within the western pond/outlet channel, target short-term and long-term minimum FOS values were achieved with a 3H:1V slope configuration. The analysis indicated that a 2H:1V slope configuration may be geotechnically stable in some areas, including within sections of the western pond/outlet channel; however, due to uncertainties in subsurface stratigraphy and considerations for cap stability, the steepest slopes considered for design were maintained as 3H:1V.

Table 3-2 includes a summary of the results for both the infinite slope model and the limit-equilibrium analysis for the assumed organic soil strength profile increasing at 15 psf/foot. Plots and tabular summaries of analysis, along with slope stability modeling printouts, are provided in Attachment 2.

Table 3-2
Dredge Slope Stability Analysis Results

Location	Analysis Type and Section	Slope Configuration and FOS[1,2]				
		Existing	1.5H:1V	2H:1V	3H:1V	4H:1V
Western Pond/ Outlet Channel	Infinite Slope Method	NA	1.09	1.45	2.18	2.91
	Limit-Equilibrium Method: Section 1-1' West	1.45	0.93	1.17	1.31	1.36
	Limit-Equilibrium Method: Section 1-1' East	1.85	1.18	1.47	1.71	NA
	Limit-Equilibrium Method: Section 3-3' West	1.16	1.25	1.29	1.29	1.30
Eastern Pond	Infinite Slope Method	NA	0.9	1.04	1.39	1.77
	Limit-Equilibrium Method: Section 3-3' East	1.27	1.27	1.40	1.58	1.67
	Limit-Equilibrium Method: Section 4-4' West	2.41	1.21	1.37	1.82	2.11
	Limit-Equilibrium Method: Section 4-4' East	3.22	1.07	1.39	1.33	1.52
	Limit-Equilibrium Method: Section 5-5' South	2.06	2.14	2.19	2.06	2.06

Notes:
1. Reported FOS values are for the assumed organic soil strength profile increasing at 15 psf/foot. See discussion of sensitivity analysis using three different strength profile interpretations in Section 3.2.3.
2. Gray-highlighted values satisfy the short-term FOS value (1.3).

[6] As noted above, this analysis did not include the headwaters/transition zone.

3.3.3 Preliminary Design Recommendations

As indicated in Section 3.3.2, the slope stability analysis conducted with reference to the PDI data indicates that 4H:1V slopes appear to be geotechnically stable for both post-dredge and cap conditions throughout Reach 6 and that slopes of 3H:1V appear to be stable through the western side of Woods Pond and south through the outlet channel. The recommended steepest dredge slopes to be used for preliminary design have been identified for the two Woods Pond subdivisions based on interpreted subsurface stratigraphy and dredge depth requirements. Table 3-3 summarizes the recommended dredge slopes. Figure 3-1 shows the delineation of stable slope configurations based on this evaluation.

Table 3-3
Recommended Design Dredge Slopes for Reach 6 Subsections

Reach 6 Subsection	Primary Geotechnical Unit	Design Dredge Slope[1]
Western Pond, Outlet Channel	Lower Alluvium and Ice-Contact Deposits	3H:1V
Eastern Pond	Organic Soils	4H:1V

Note:

1. 2H:1V may be feasible in some locations, but cap placement and local site use (i.e., rail line and buildings) would require a slope of at least 3H:1V.

4 Uncertainties and Data Gaps

All geotechnical analyses require acknowledgement that uncertainties are inherent to geomaterial characterization and modeling simplifications, and the level of uncertainty should generally diminish with the increasing design development and/or risk. For Reach 6, assumptions were required where uncertainties were identified, whether pertaining to material type and characteristics, potential design configurations, or existing infrastructure. Data gaps associated with these uncertainties have been identified, and, where possible, desktop and in-situ investigations are planned to reduce uncertainties. Planned investigations are discussed in detail within the *Supplemental Data Collection Work Plan for Reach 6* (Appendix F to the Conceptual RD/RA Work Plan). A brief summary of these investigation efforts is provided as follows:

- **Footbridge Structure and Foundation As-Built Drawings:** Available as-built or design drawings for the footbridge and its foundation, as well as supporting geotechnical investigation records (if any), will be obtained.
- **Publicly Available Geotechnical Data:** Outreach to the Towns of Lenox and Lee, Berkshire County, and the Massachusetts Department of Transportation will be conducted to gather available geotechnical investigation, reporting, and design records for residential development, utility, rail, and roadway projects near Reach 6 (if any).
- **Supplemental Field Investigation:** A supplemental geotechnical investigation will be performed to gather geotechnical data within and around Woods Pond to inform subsurface geologic conditions to support additional evaluation of dredge slope stability, shoreline protection design, and design of temporary support area structures for the final design. Planned in-water investigations include additional sediment probing, undisturbed sample collection, and in-situ vane shear testing. Planned upland investigations include geotechnical borings and dynamic cone penetrometer testing.

Additionally, it should be noted that the slope stability evaluation was performed with reference to static water conditions and did not specifically account for hydrodynamic loading, erosional forces, or ice loading. The results of such analyses in the future may lead to general design modifications as well as necessary modifications to the dredge slope configurations. Accordingly, supplemental geotechnical slope stability evaluations will be performed to support the final remedial design phase based on the findings of the desktop review, supplemental subsurface data collection, and design modifications. The results of the supplemental geotechnical slope stability evaluations will be presented in the Final RD/RA Work Plan for Reach 6.

5 References

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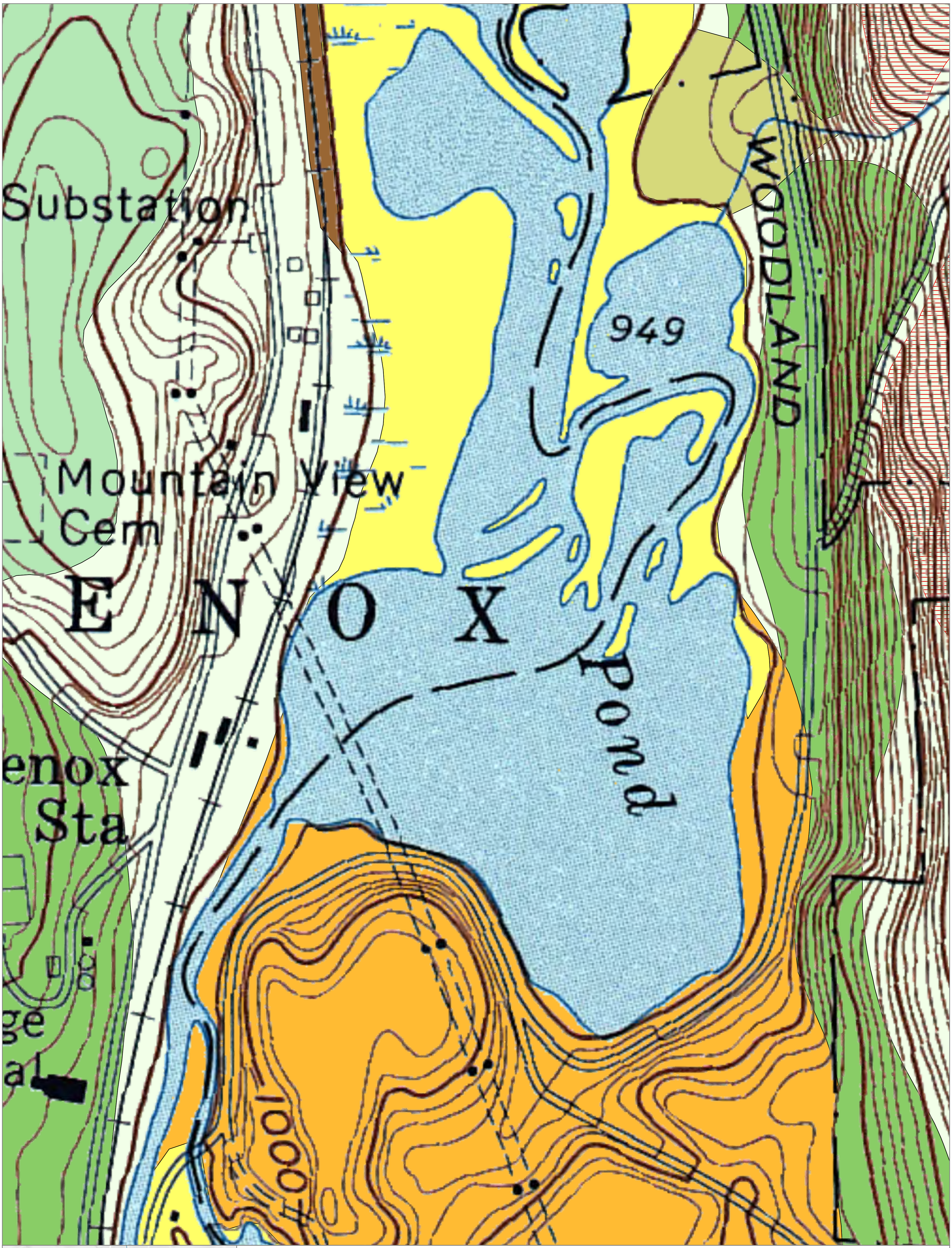
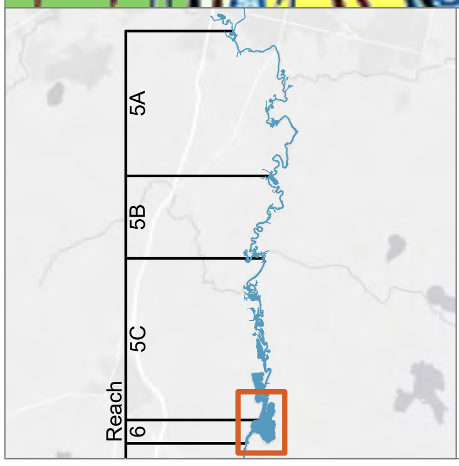
Figures





LEGEND:

Surficial Geology

- Areas of Abundant Outcrop or Shallow Bedrock
- Artificial Fill
- Flood-plain Alluvium
- Alluvial-fan Deposits
- Stagnant-ice Deposits
- Thick Till
- Thick Valley Till and Fine Deposits
- Thin Till

NOTES:

1. Geological surfaces basemap from MassGIS 2024.
2. Unit descriptions per: Stone, J.R., B.D. Stone, M.L. DiGiacomo Cohen, and S.B.Mabee, cartographers. Index Map of 7.5 Minute Quadrangles in Massachusetts Showing Distribution of Surficial Materials. Prepared for the U.S. Geological Survey.

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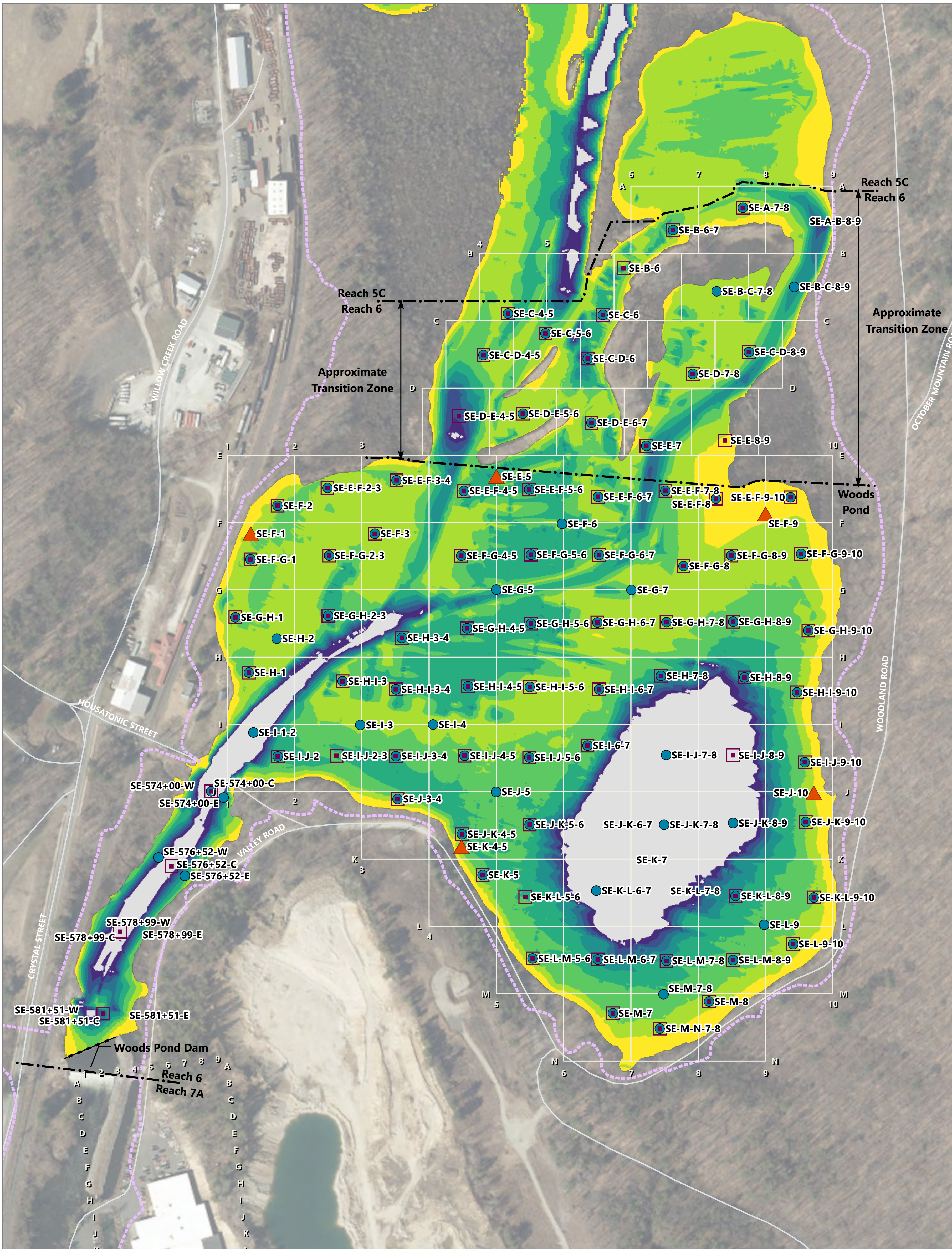
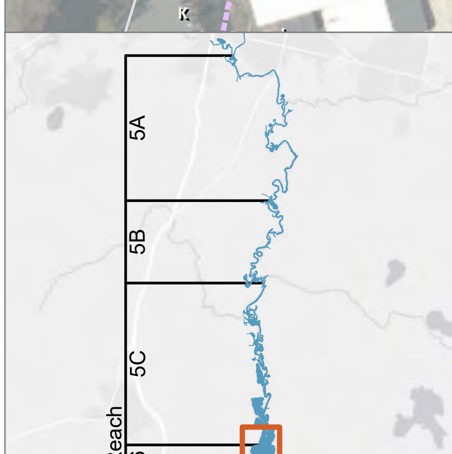
ANCHOR QEA

Figure 2-1
Woods Pond Geological Map
Reach 6 Dredge Slope Stability Evaluation
Housatonic River – Rest of River





LEGEND:

- 1 mg/kg PCB Isopleth
- 200-Foot Sampling Grid
- Dam Safety Cable
- Vane Shear Test Location
- Triaxial Testing Location
- Index Parameter Test Location

Water Depth (feet)

- At or Above Spillway Crest
- ≤ 1 foot Below Crest
- 1.1 - 2
- 2.1 - 3
- 3.1 - 4
- 4.1 - 5
- 5.1 - 6
- 6.1 - 7
- > 7 feet Below Crest

NOTES:
1. Aerial imagery from MassGIS 2023.
2. Single-beam bathymetric survey performed by Spicer Group in 2022 and 2023.
3. Water depths calculated below dam spillway elevation of 947.7 feet NAVD88 (948.3 feet NGVD29).

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Feet

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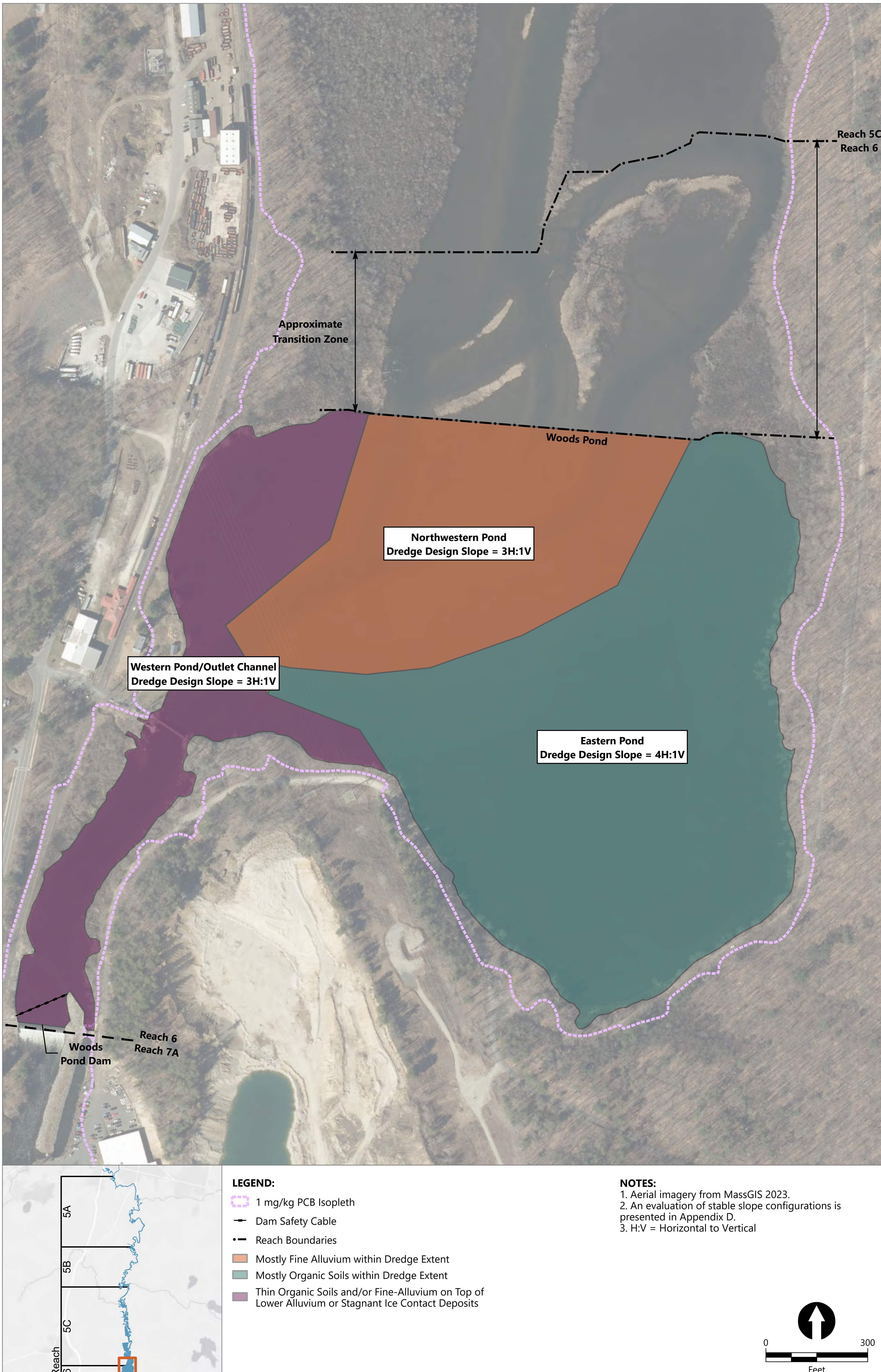
ANCHOR QEA

Figure 2-2
PDI Sampling Grid/Locations for Geotechnical Evaluation
Reach 6 Dredge Slope Stability Evaluation
Housatonic River – Rest of River



LEGEND:

- 1 mg/kg PCB Isopleth
- Dam Safety Cable
- Reach Boundaries
- Mostly Fine Alluvium within Dredge Extent
- Mostly Organic Soils within Dredge Extent
- Thin Organic Soils and/or Fine-Alluvium on Top of Lower Alluvium or Stagnant Ice Contact Deposits

NOTES:
1. Aerial imagery from MassGIS 2023.
2. An evaluation of stable slope configurations is presented in Appendix D.
3. H:V = Horizontal to Vertical

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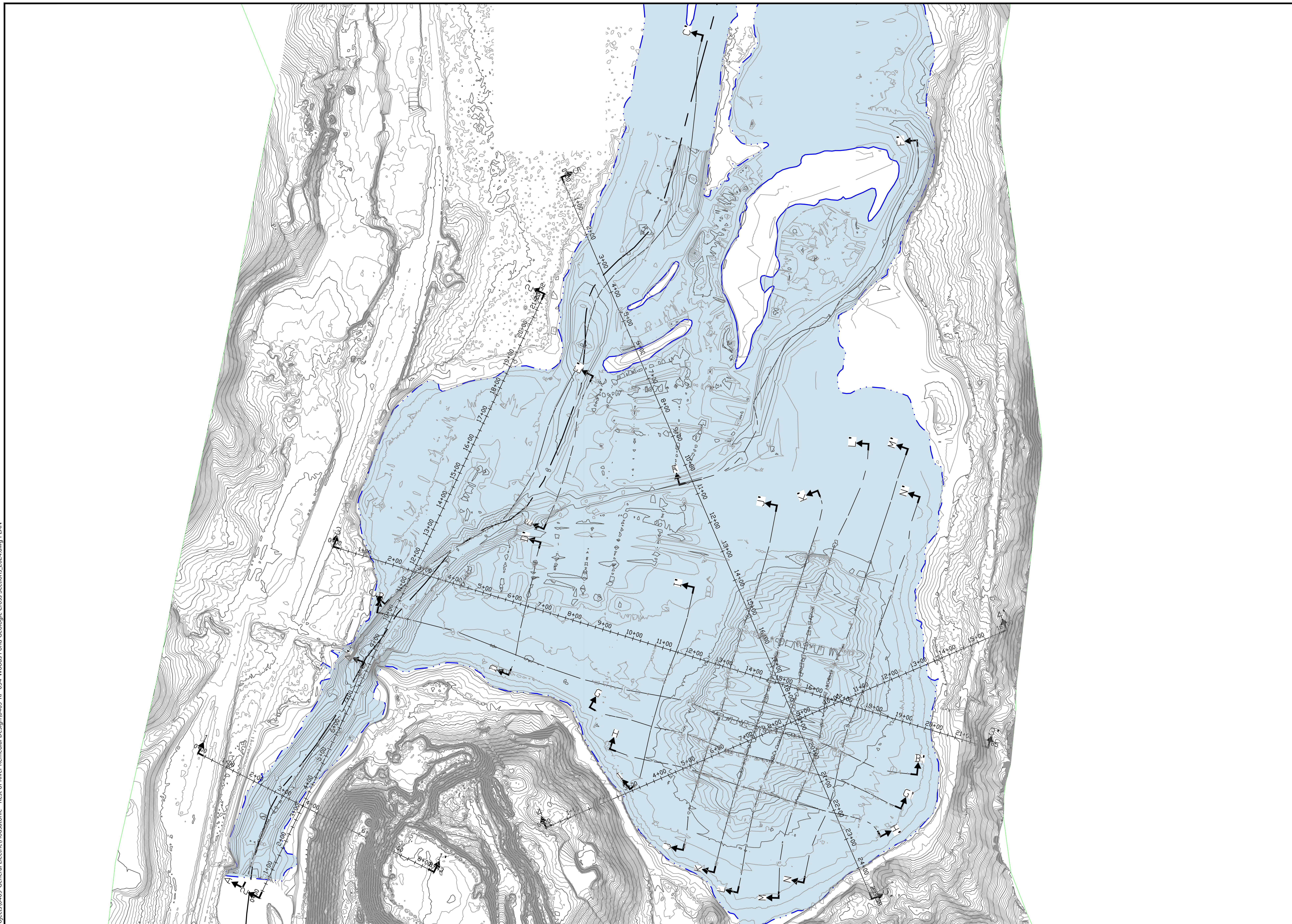
ANCHOR QEA

Figure 3-1
Stable Slope Design Configurations
Reach 6 Dredge Slope Stability Evaluation
Housatonic River – Rest of River

Attachment 1

Plan and Profile Inputs



NORTH

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04-06-2023 PROGRESS SURVEY BY SPICER GROUP, INC.
HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE MAINLAND, NAD83, U.S. FEET.
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

DRAFT-NOT FOR CONSTRUCTION

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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ANCHOR QEA

REVISIONS				
REV	DATE	BY	APP'D	DESCRIPTION

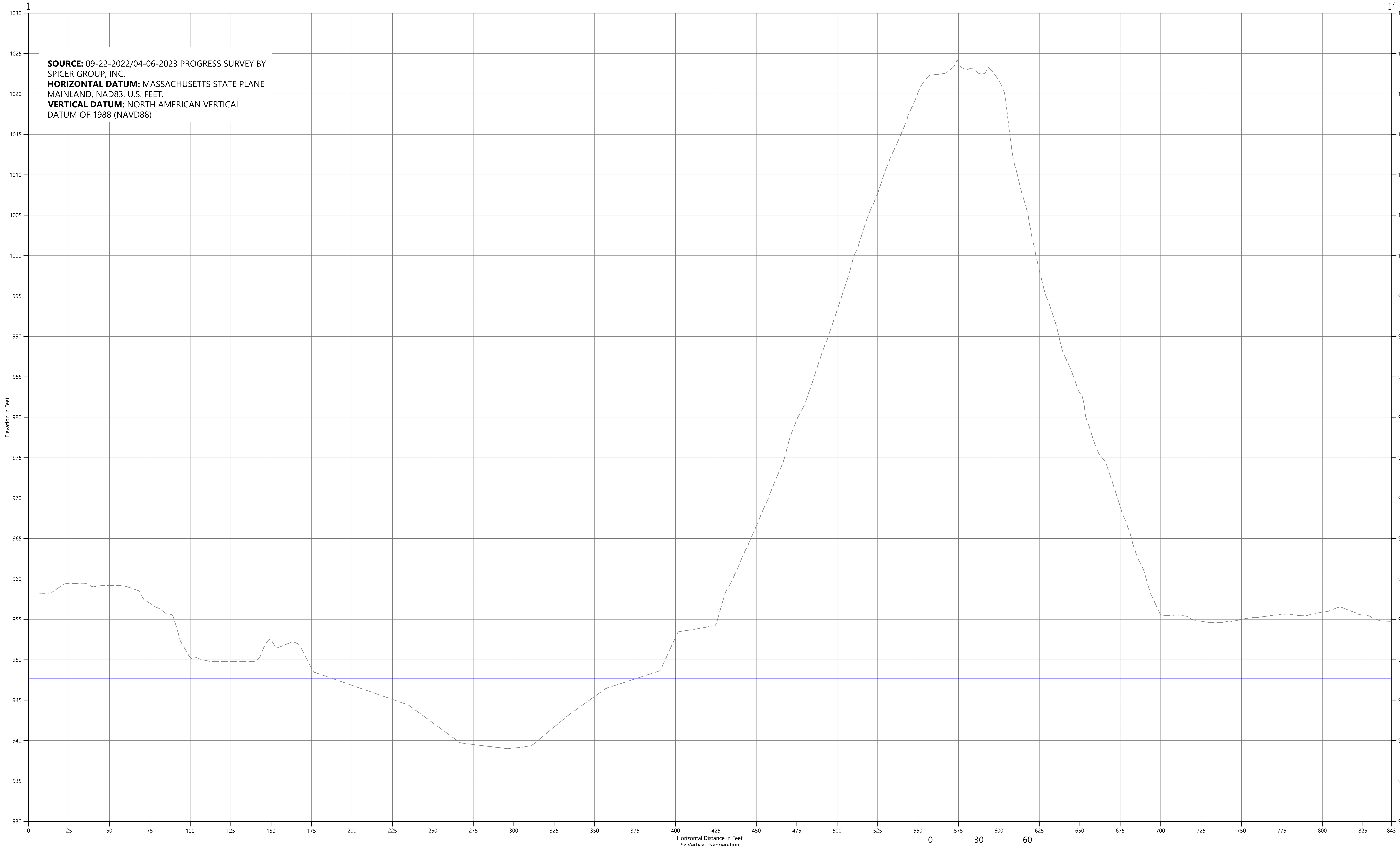
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:
SCALE: AS NOTED
DATE: JULY 2024

HOUSATONIC RIVER - WOODS POND
GENERAL ELECTRIC COMPANY, PITTSFIELD, MA

GEOLOGIC SECTION LOCATIONS

FIG 1-1

SHEET # 1 OF 6



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LEGEND:

- 09/22/2022_04/06/2023 SPICER EXIST BATHYMETRY SURVEY
- WOODS POND DAM CREST ELEVATION (947.7 FEET NAVD88)
- ELEVATION 941.7 FEET NAVD88 - 6-FEET BELOW WOODS POND DAM CREST

5H 1V
5H 1V
3H 1V
3H 1V

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

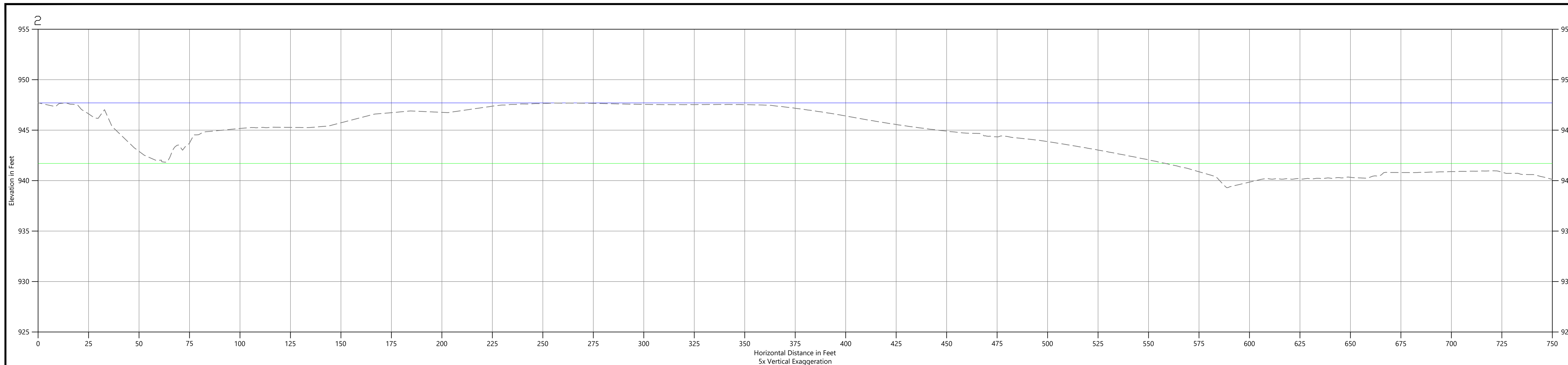
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:
SCALE: AS NOTED
DATE: JULY 2024

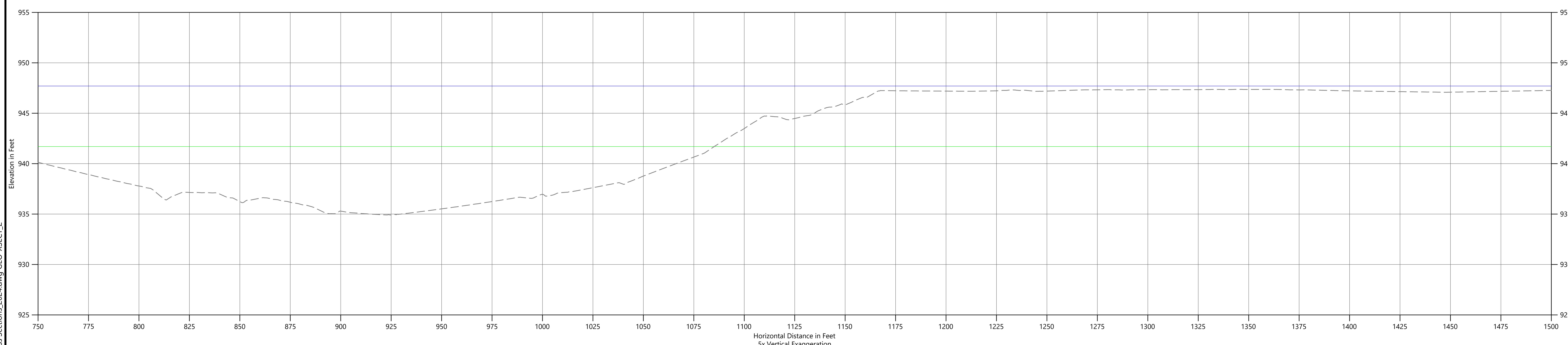
HOUSATONIC RIVER - WOODS POND
GENERAL ELECTRIC COMPANY, PITTSFIELD, MA

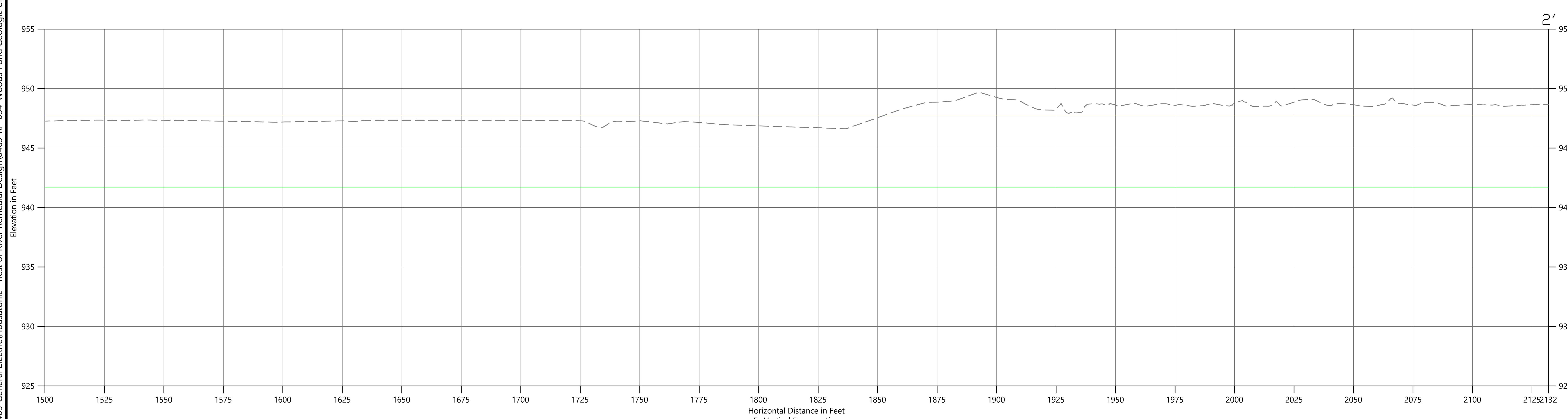
SECTION 1-1'

FIG 1-2

SHEET # 2 OF 6







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VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

DRAFT-NOT FOR CONSTRUCTION

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

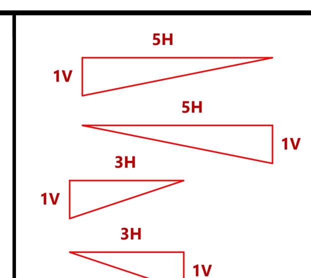
K:\Projects\0469-General Electric\Housatonic Rest of River Remedial Design\0469-RP-034-Woods Pond Geologic Cross Sections_2024.dwg GEO-XSECT_2

Jul 08, 2024 10:54am cyand

ANCHOR QEA

LEGEND:

09/22/2022_04/06/2023 SPICER EXIST BATHYMETRY SURVEY
WOODS POND DAM CREST ELEVATION (947.7 FEET NAVD88)
ELEVATION 941.7 FEET NAVD88 - 6-FEET BELOW WOODS POND DAM CREST



REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

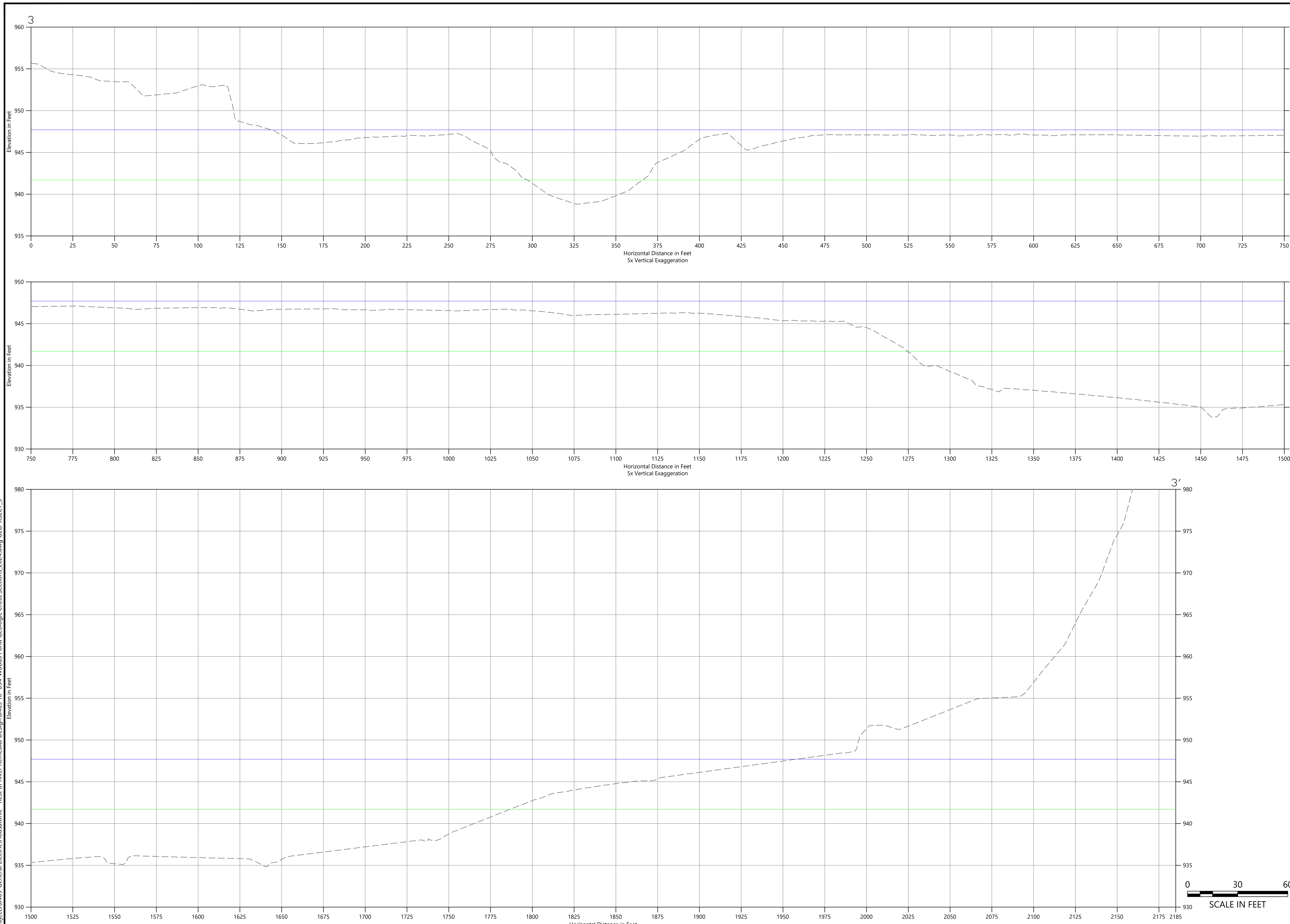
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:
SCALE: AS NOTED
DATE: JULY 2024

HOUSATONIC RIVER - WOODS POND
GENERAL ELECTRIC COMPANY, PITTSFIELD, MA

SECTION 2-2'

FIG 1-3

SHEET # 3 OF 6



0 30 60
SCALE IN FEET

SOURCE: 09-22-2022/04-06-2023 PROGRESS SURVEY BY SPICER GROUP, INC.
HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE MAINLAND, NAD83, U.S. FEET.
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

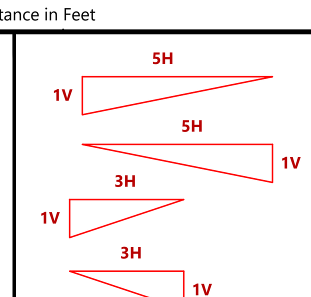
PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

ANCHOR QEA

LEGEND:
- 09/22/2022_04/06/2023 SPICER EXIST BATHYMETRY SURVEY
- WOODS POND DAM CREST ELEVATION (947.7 FEET NAVD88)
- ELEVATION 941.7 FEET NAVD88 - 6-FEET BELOW WOODS POND DAM CREST



REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:
SCALE: AS NOTED
DATE: JULY 2024

HOUSATONIC RIVER - WOODS POND
GENERAL ELECTRIC COMPANY, PITTSFIELD, MA

SECTION 3-3'

FIG 1-4

SHEET # 4 OF 6

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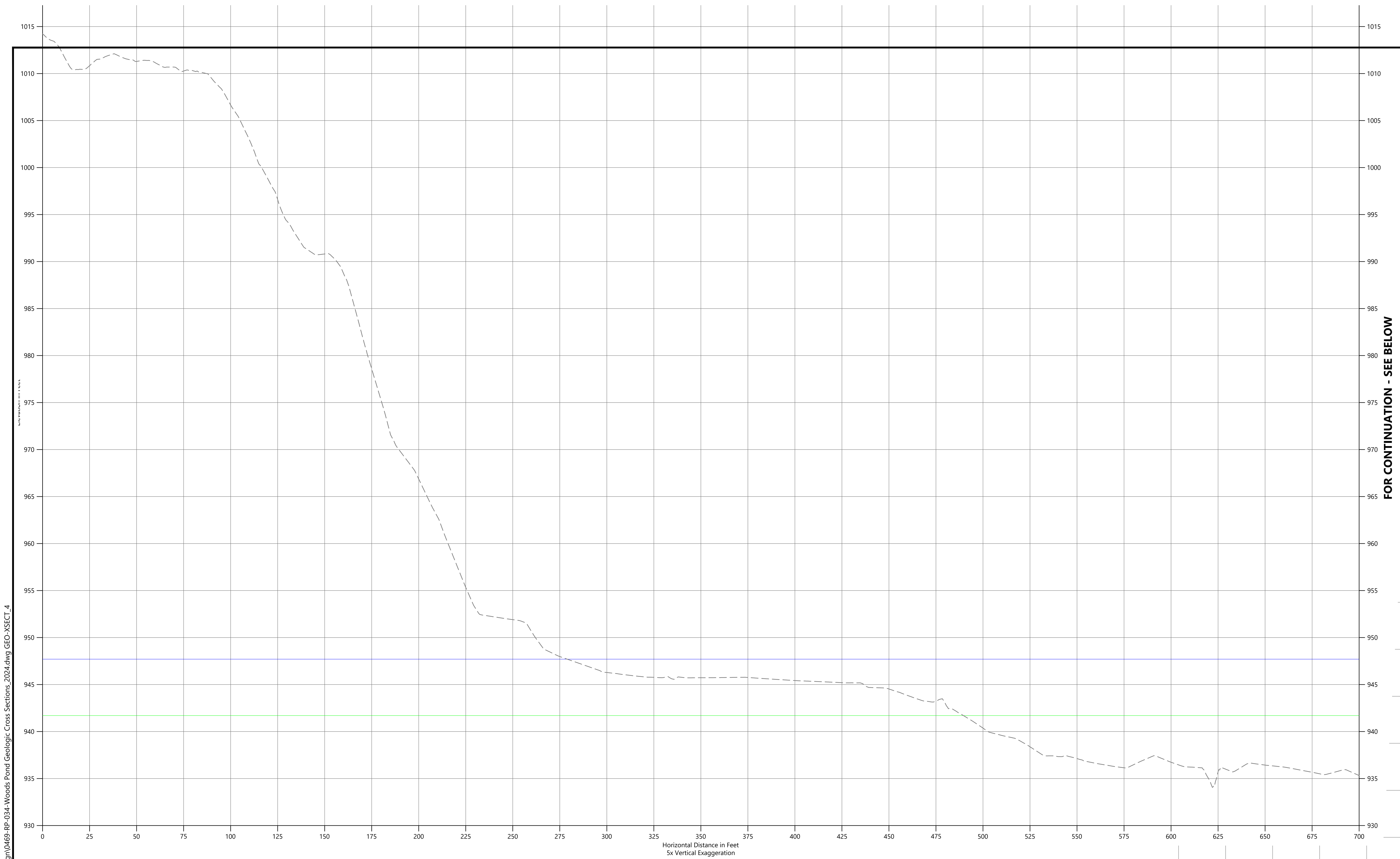

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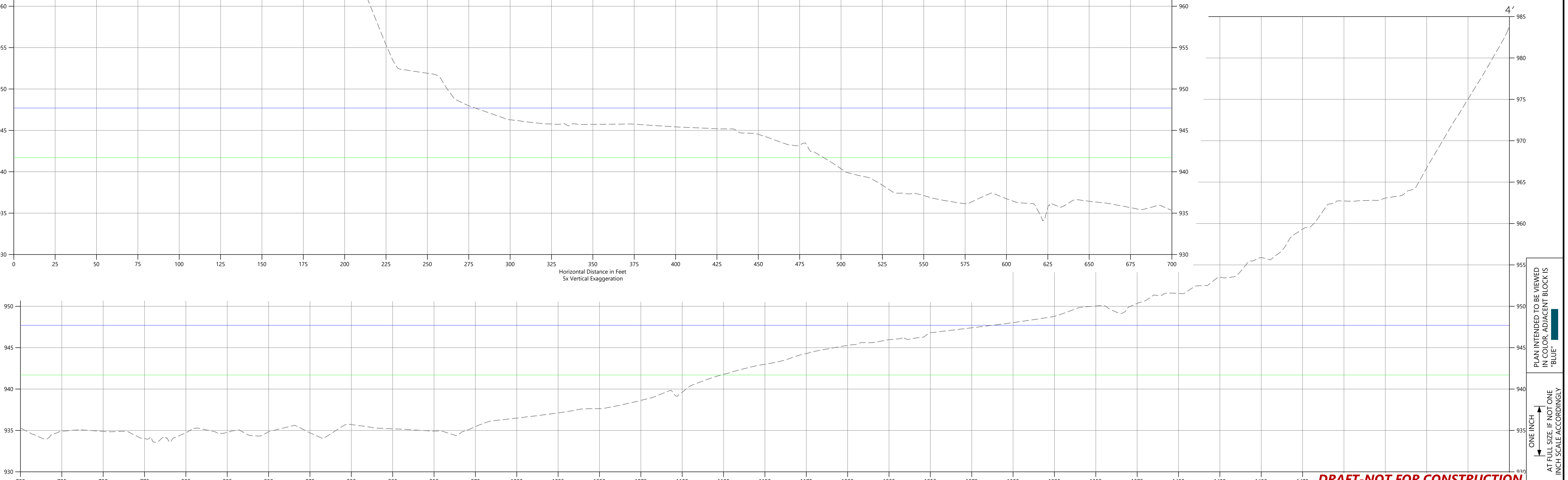
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

0 30 60
SCALE IN FEET



PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

K:\Projects\0469-General Electric\Housatonic Rest of River Remedial Design\0469-RP-034-Woods Pond Geologic Cross Sections_2024.dwg GEO-XSECT_4

Jul 08, 2024 10:55am cyard

ANCHOR QEA

LEGEND:
- 09/22/2022_04/06/2023 SPICER EXIST BATHYMETRY SURVEY
- WOODS POND DAM CREST ELEVATION (947.7 FEET NAVD88)
- ELEVATION 941.7 FEET NAVD88 - 6-FEET BELOW WOODS POND DAM CREST

5H 1V; 5H 1V; 3H 1V; 3H 1V

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

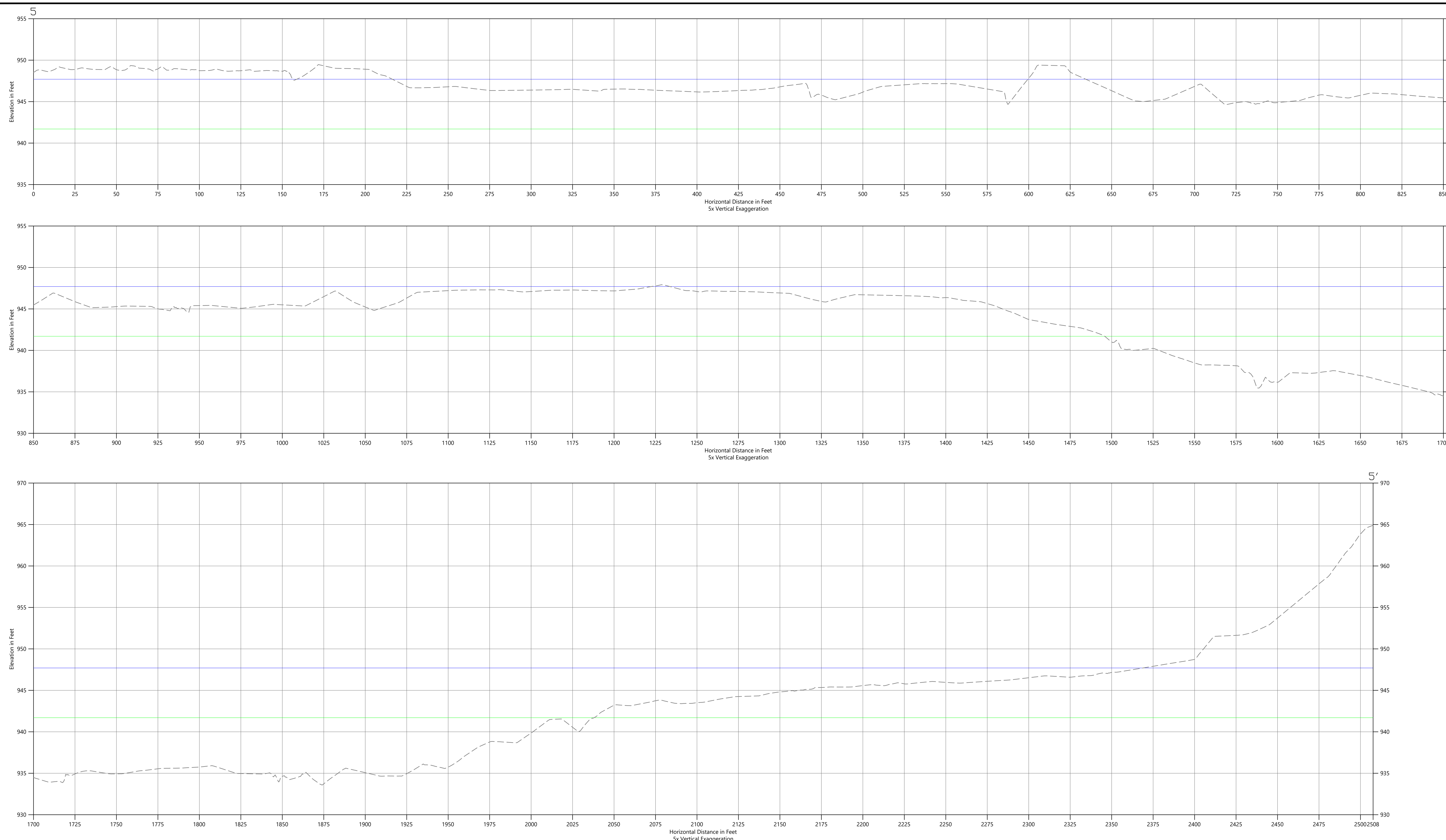
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:
SCALE: AS NOTED
DATE: JULY 2024

HOUSATONIC RIVER - WOODS POND
GENERAL ELECTRIC COMPANY, PITTSFIELD, MA

SECTION 4-4'

FIG 1-5

SHEET # 5 OF 6



SOURCE: 09-22-2022/04-06-2023 PROGRESS SURVEY BY SPICER GROUP, INC.
HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE MAINLAND, NAD83, U.S. FEET.
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

0 30 60
SCALE IN FEET

DRAFT-NOT FOR CONSTRUCTION

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

K:\Projects\0469-General Electric\Housatonic_Rest of River Remedial Design\0469-RP-034-Woods Pond Geologic Cross Sections_2024.dwg GEO-XSECT_5

Jul 08, 2024 10:55am cyand

ANCHOR QEA

LEGEND:

- 09/22/2022_04/06/2023 SPICER EXIST BATHYMETRY SURVEY
- WOODS POND DAM CREST ELEVATION (947.7 FEET NAVD88)
- ELEVATION 941.7 FEET NAVD88 - 6-FEET BELOW WOODS POND DAM CREST

5H 1V
5H 1V
3H 1V
3H 1V

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:
SCALE: AS NOTED
DATE: JULY 2024

HOUSATONIC RIVER - WOODS POND
GENERAL ELECTRIC COMPANY, PITTSFIELD, MA

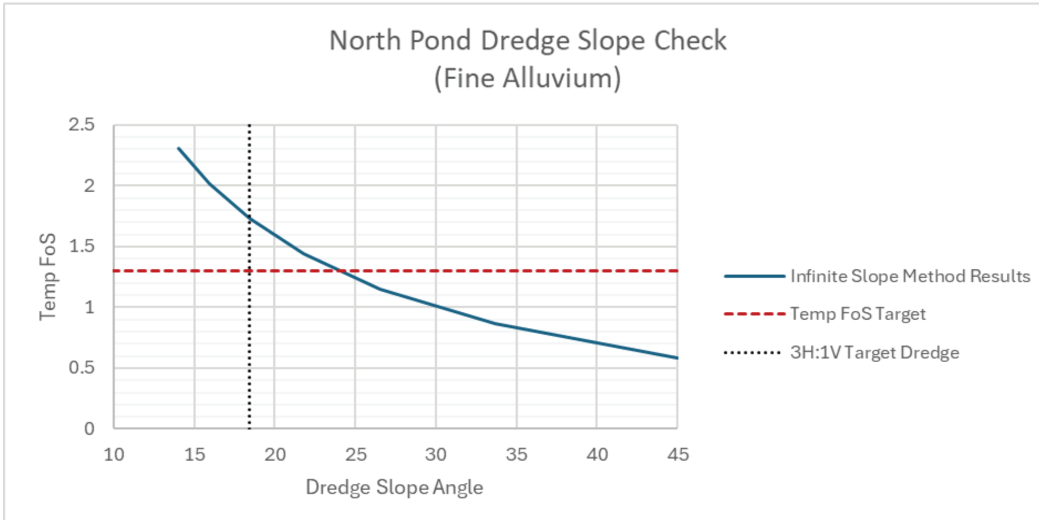
SECTION 5-5'

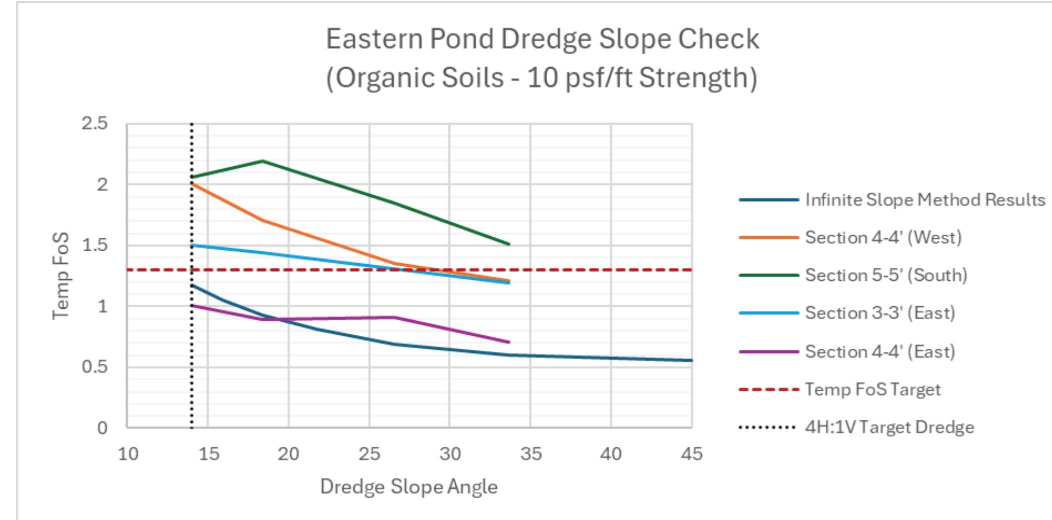
FIG 1-6

SHEET # 6 OF 6

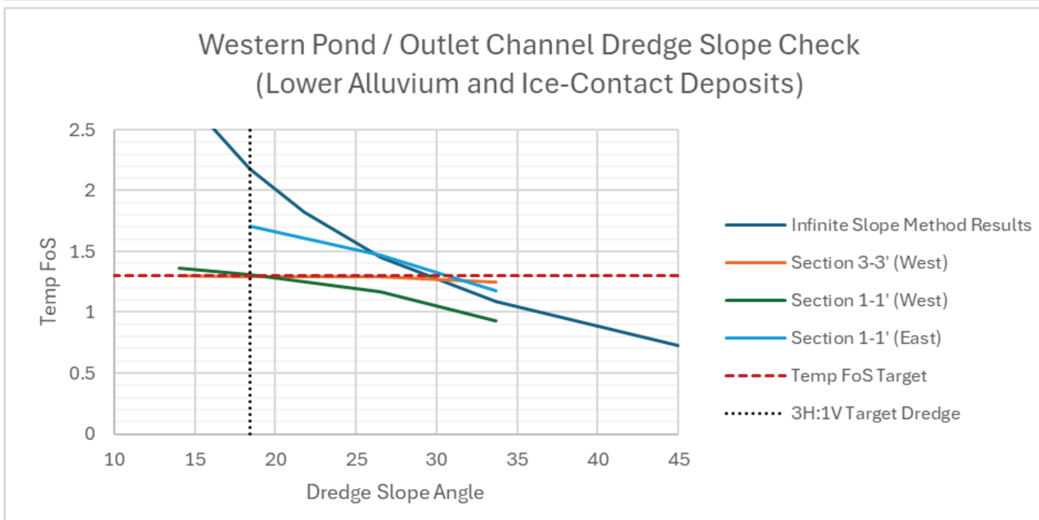
Attachment 2

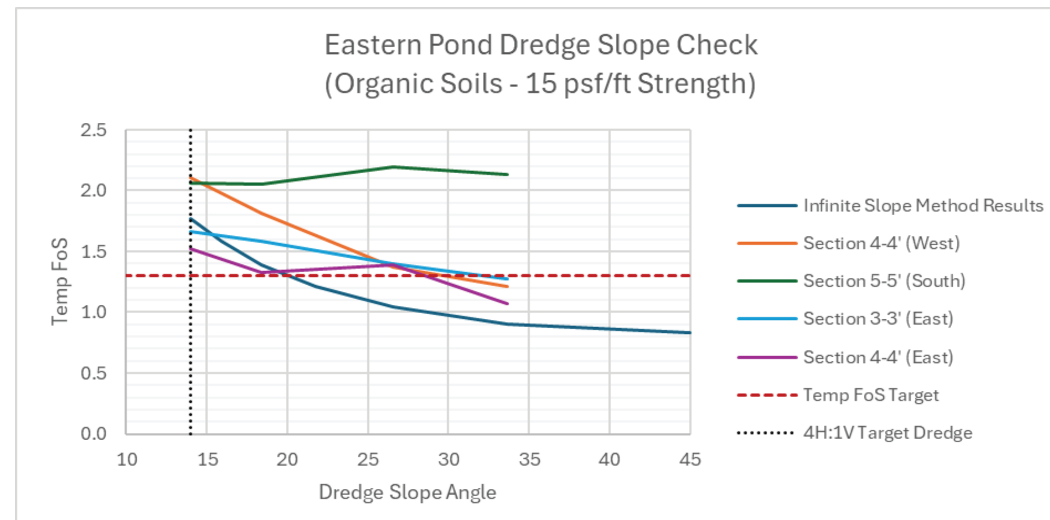
Slope Stability Modeling Results





Low Strength Envelope (*VST Only, No In-Situ Stress Regime Considered*)

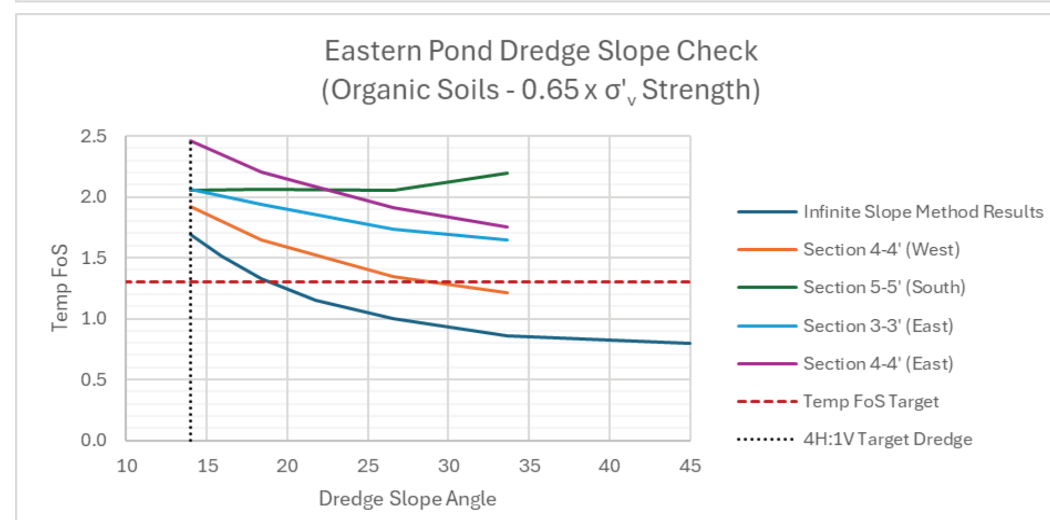




Low Bound of Lab Test Results (*No In-Situ Stress Regime Considered*)

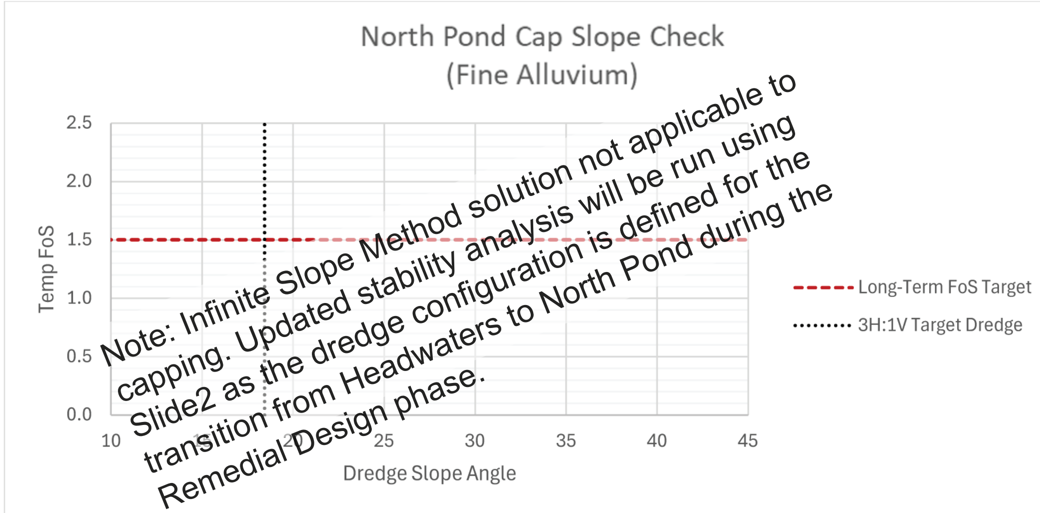
Dredge Slope Stability Analysis Results *(Strength = Low Bound of Lab Test Results)*

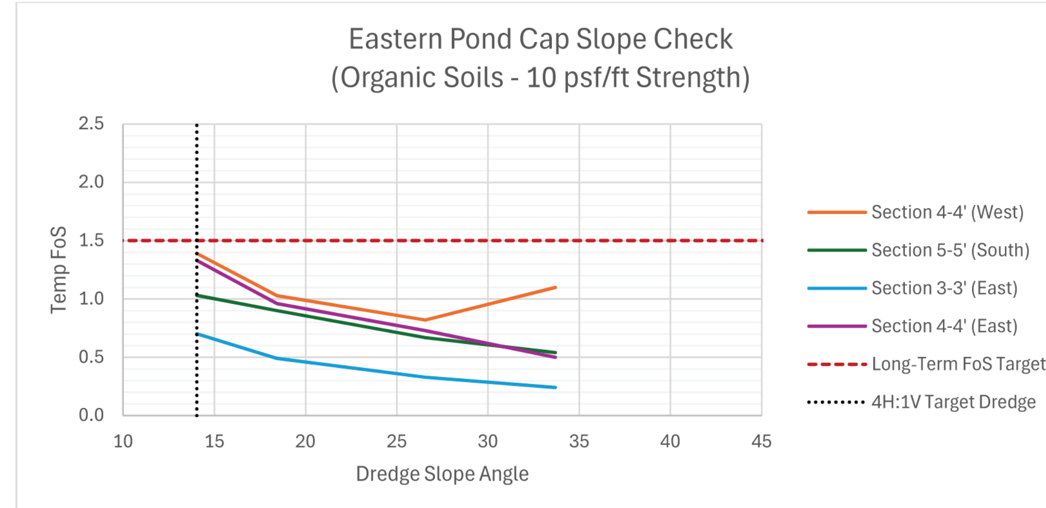
	Slope Configuration →	Existing	1.5H:1V	2H:1V	3H:1V	4H:1V
North Pond	Infinite Slope Method	NA	0.87	1.15	1.73	2.31
Western Pond / Outlet Channel	Infinite Slope Method	NA	1.09	1.45	2.18	2.91
	1-1' West	1.45	0.93	1.17	1.31	1.36
	1-1' East	1.85	1.18	1.47	1.71	NA
	3-3' West	1.16	1.25	1.29	1.29	1.30
Eastern Pond	Infinite Slope Method	NA	0.9	1.04	1.39	1.77
	3-3' East	1.27	1.27	1.40	1.58	1.67
	4-4' West	2.41	1.21	1.37	1.82	2.11
	4-4' East	3.22	1.07	1.39	1.33	1.52
	5-5' South	2.06	2.14	2.19	2.06	2.06



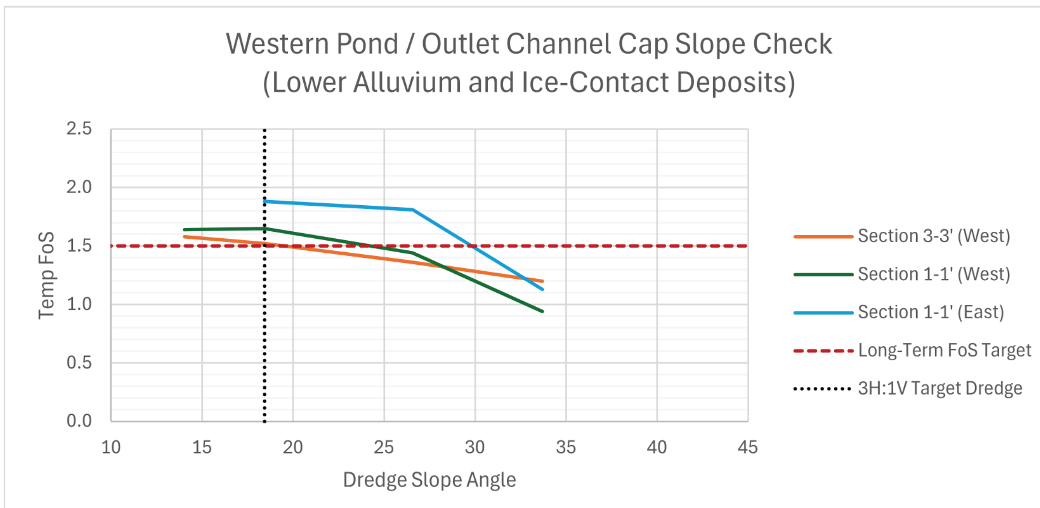
Low Strength Envelope (*In-Situ Stress Considered*)

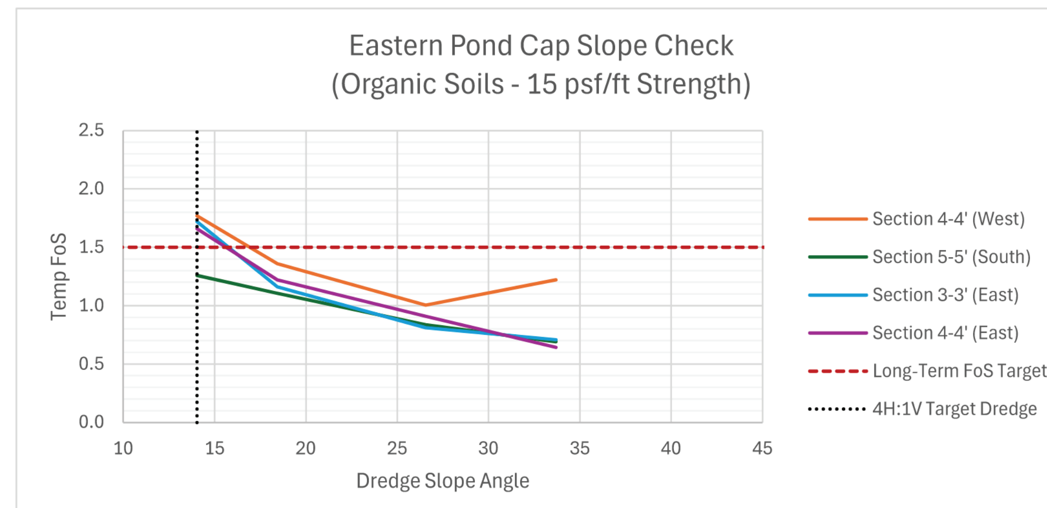
NOTE: Factor of Safety Targets per United States Army Corps of Engineers (USACE) *Slope Stability* Engineering Manual, 2003. See References.





Low Strength Envelope (*VST Only, No In-Situ Stress Regime Considered*)

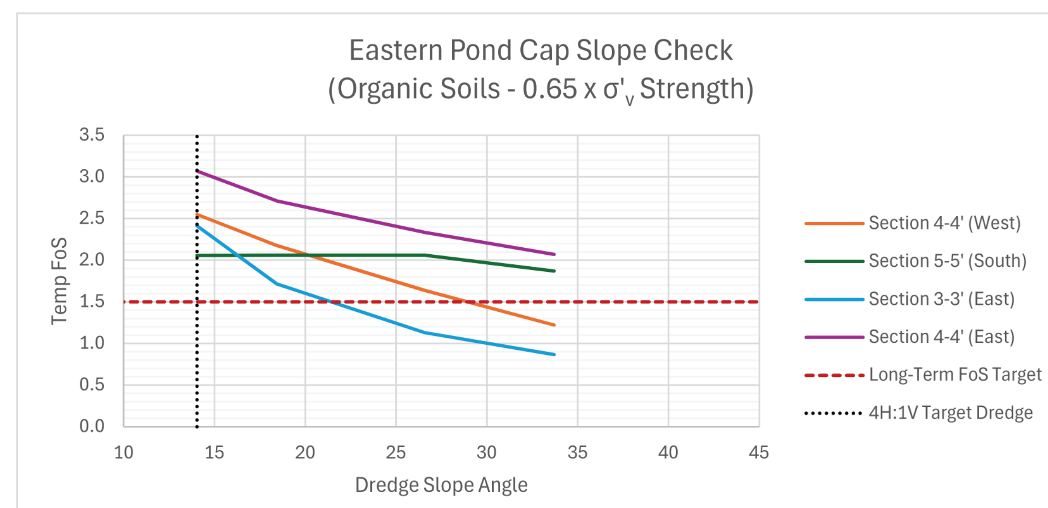




Low Bound of Lab Test Results (*No In-Situ Stress Regime Considered*)

Cap Slope Stability Analysis Results *(Strength = Low Bound of Lab Test Results)*

	Slope Configuration →	Existing	1.5H:1V	2H:1V	3H:1V	4H:1V
North Pond	Infinite Slope Model	NA	NA	NA	NA	NA
Western Pond / Outlet Channel	Infinite Slope Model	NA	NA	NA	NA	NA
	1-1' West	1.45	0.94	1.44	1.65	1.64
	1-1' East	1.85	1.13	1.81	1.88	NA
	3-3' West	1.16	1.20	1.36	1.52	1.58
Eastern Pond	Infinite Slope Model	NA	NA	NA	NA	NA
	3-3' East	1.42	0.71	0.81	1.16	1.72
	4-4' West	2.41	1.22	1.01	1.36	1.77
	4-4' East	3.22	0.64	0.91	1.22	1.66
	5-5' South	2.06	0.69	0.84	1.11	1.26



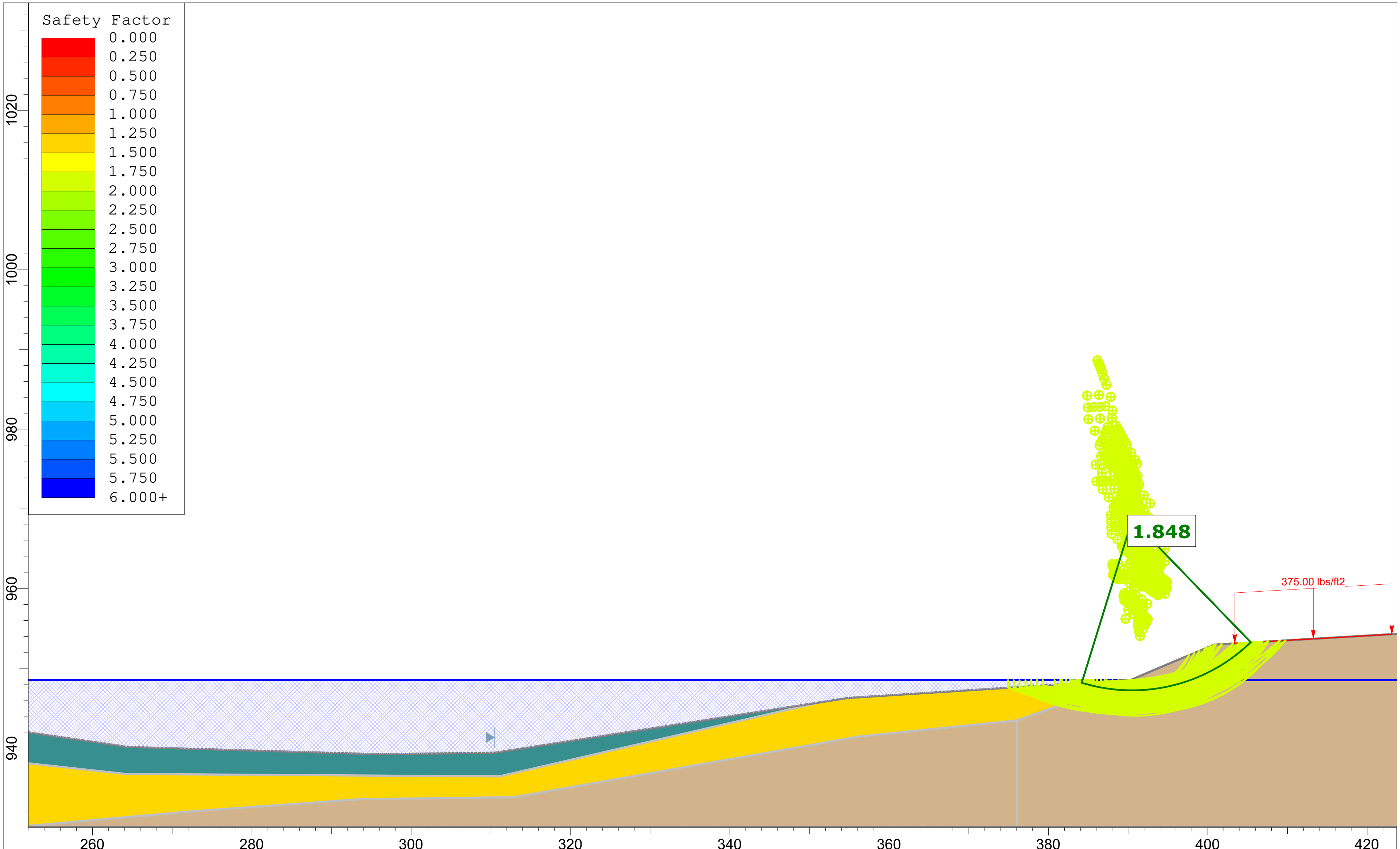
Low Strength Envelope (*In-Situ Stress Considered*)

NOTE: Factor of Safety Targets per United States Army Corps of Engineers (USACE) *Slope Stability* Engineering Manual, 2003. See References.

ANCHOR QEA

Figure 2-2
Slope Stability Results - Cap Scenario
Slope Stability Modeling Results
Housatonic River – Rest of River

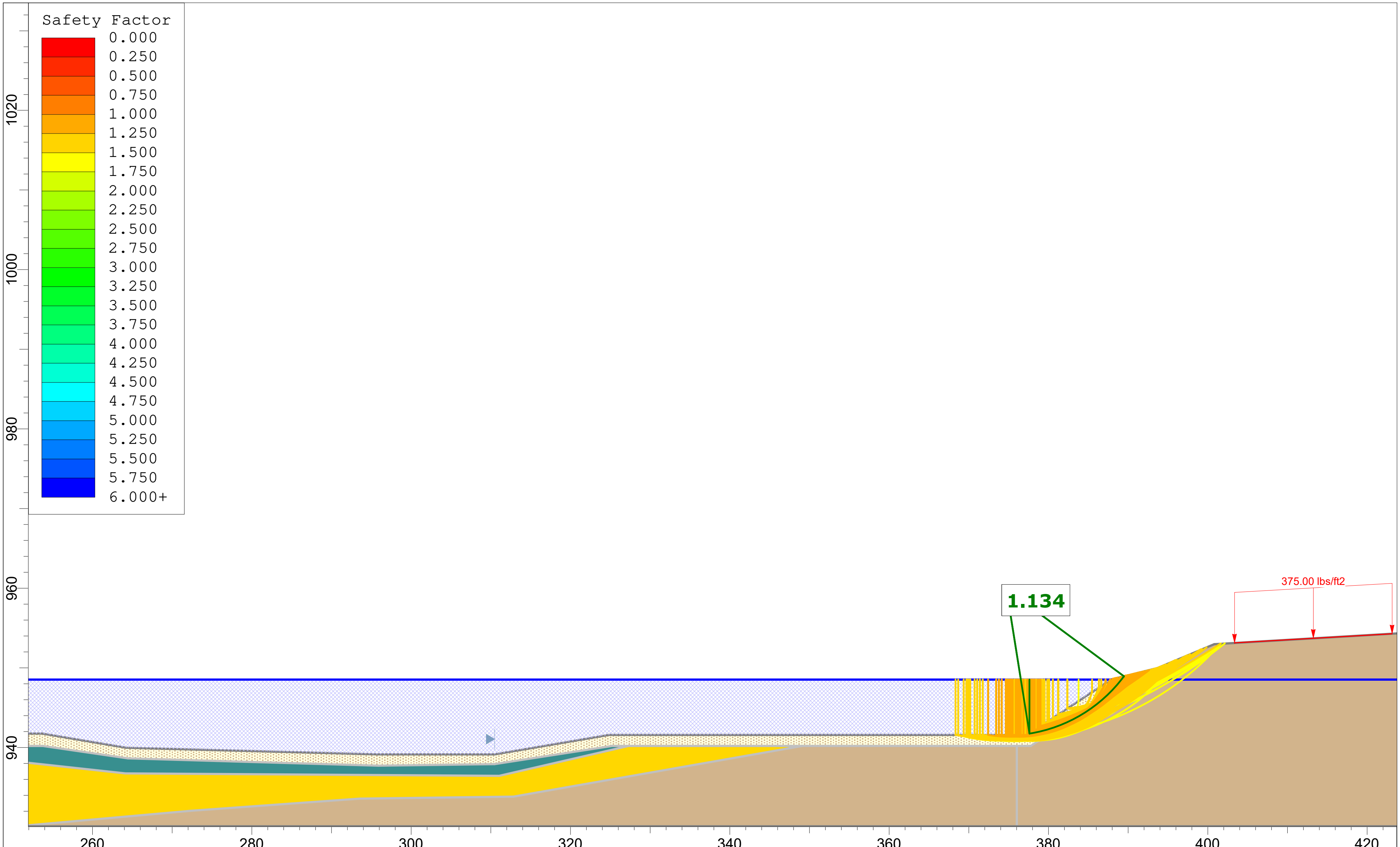
Slope Stability Modeling Scenario Outputs



rocscience

SLIDEINTERPRET 9.034

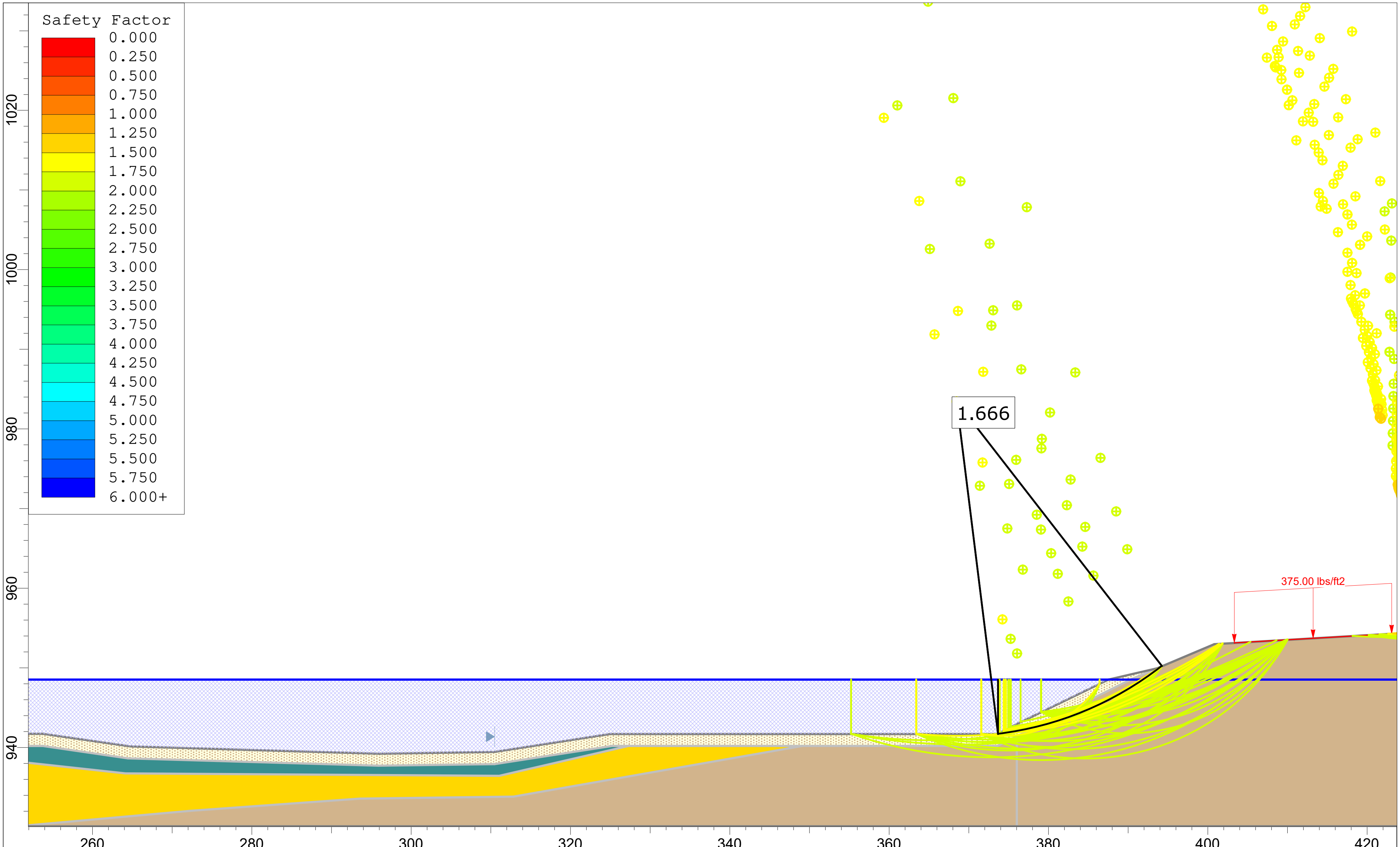
Project	Woods Pond (Housatonic Reach 6)		
Group	East - Right to Left	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_10psf-cap.slmd



rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	East - 1.5:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1_10psf-cap.slmd

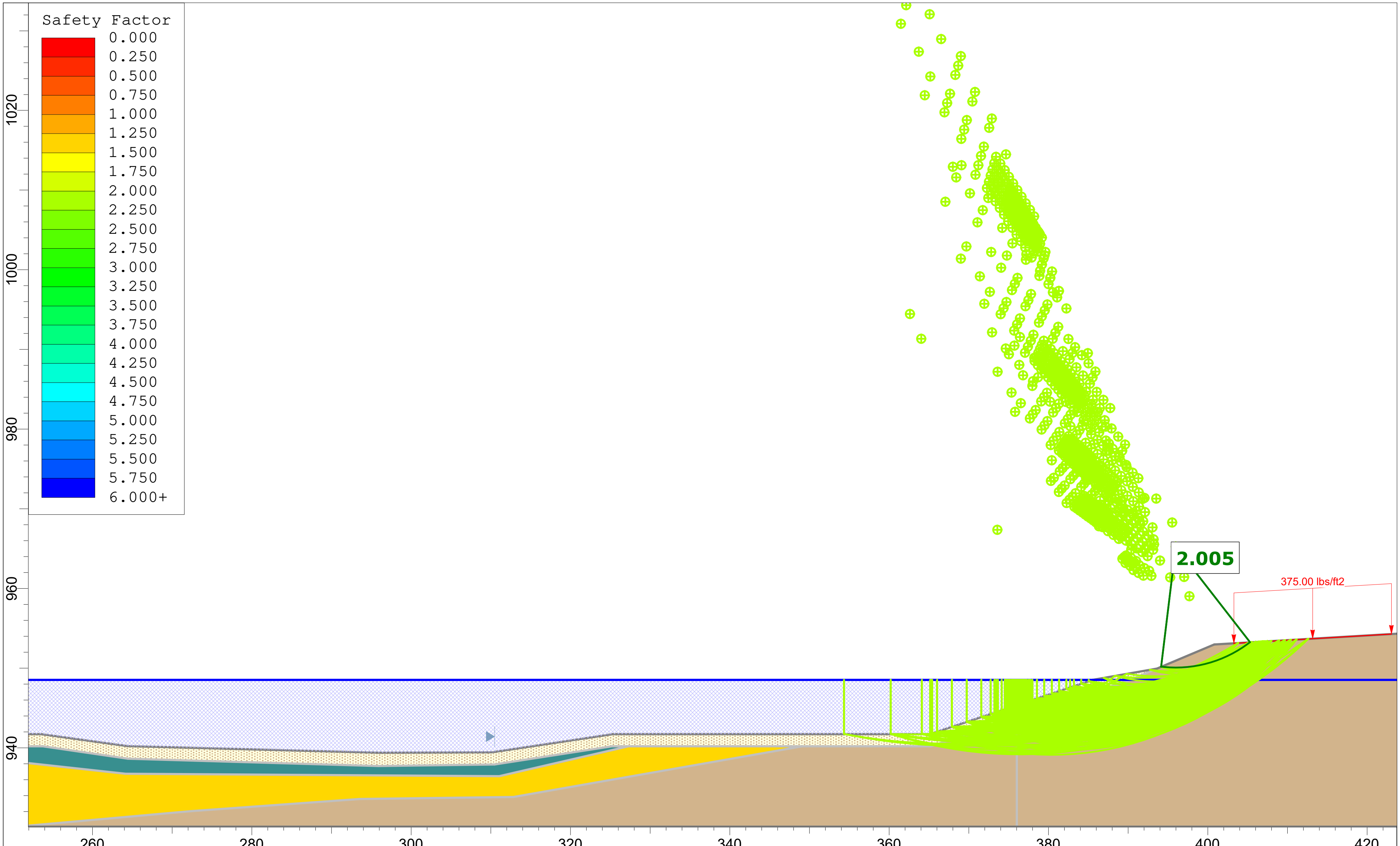
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	East - 2:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1_10psf-cap.slmd



Project	Woods Pond (Housatonic Reach 6)		
Group	East - 3:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1_10psf-cap.slmd

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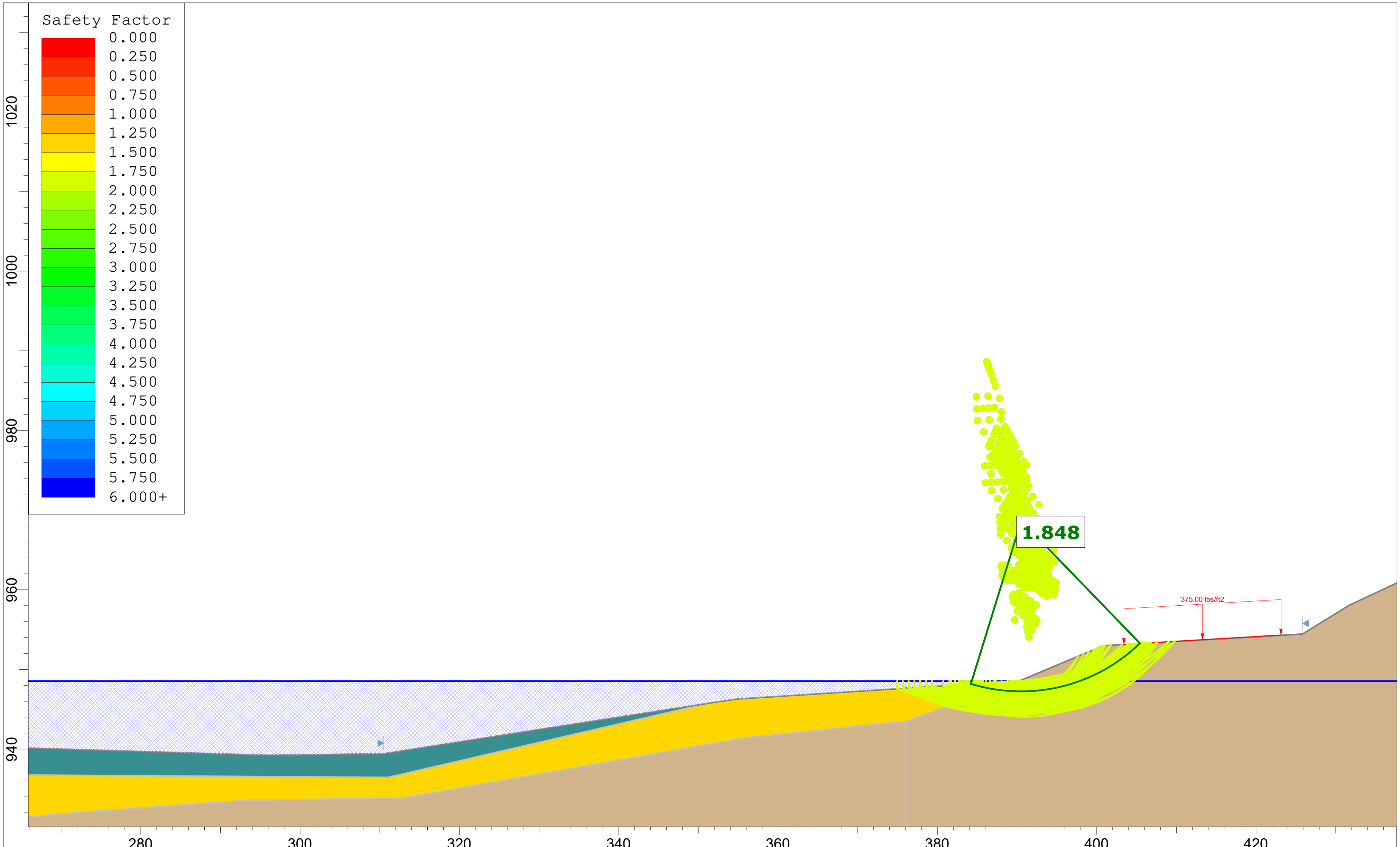

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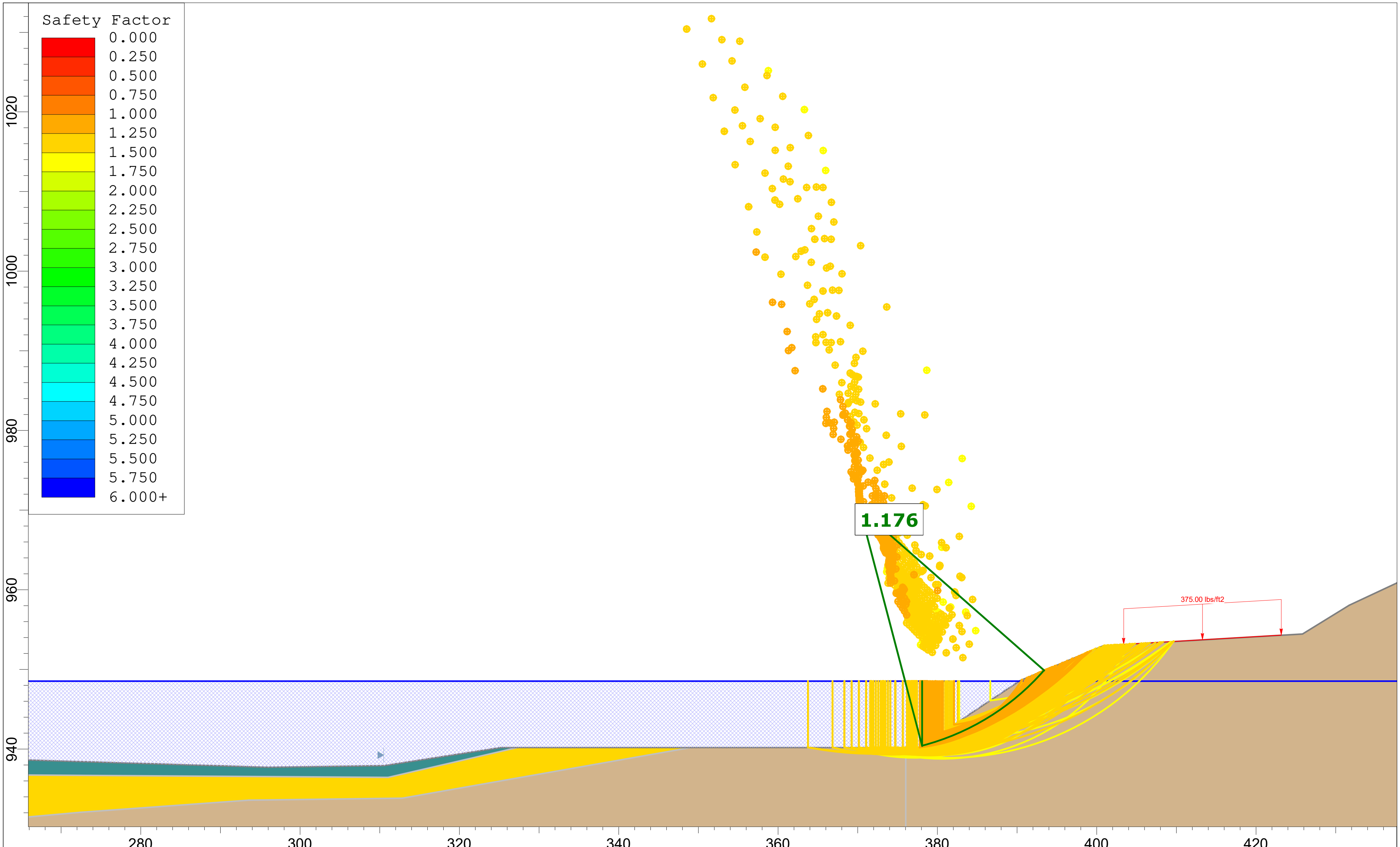
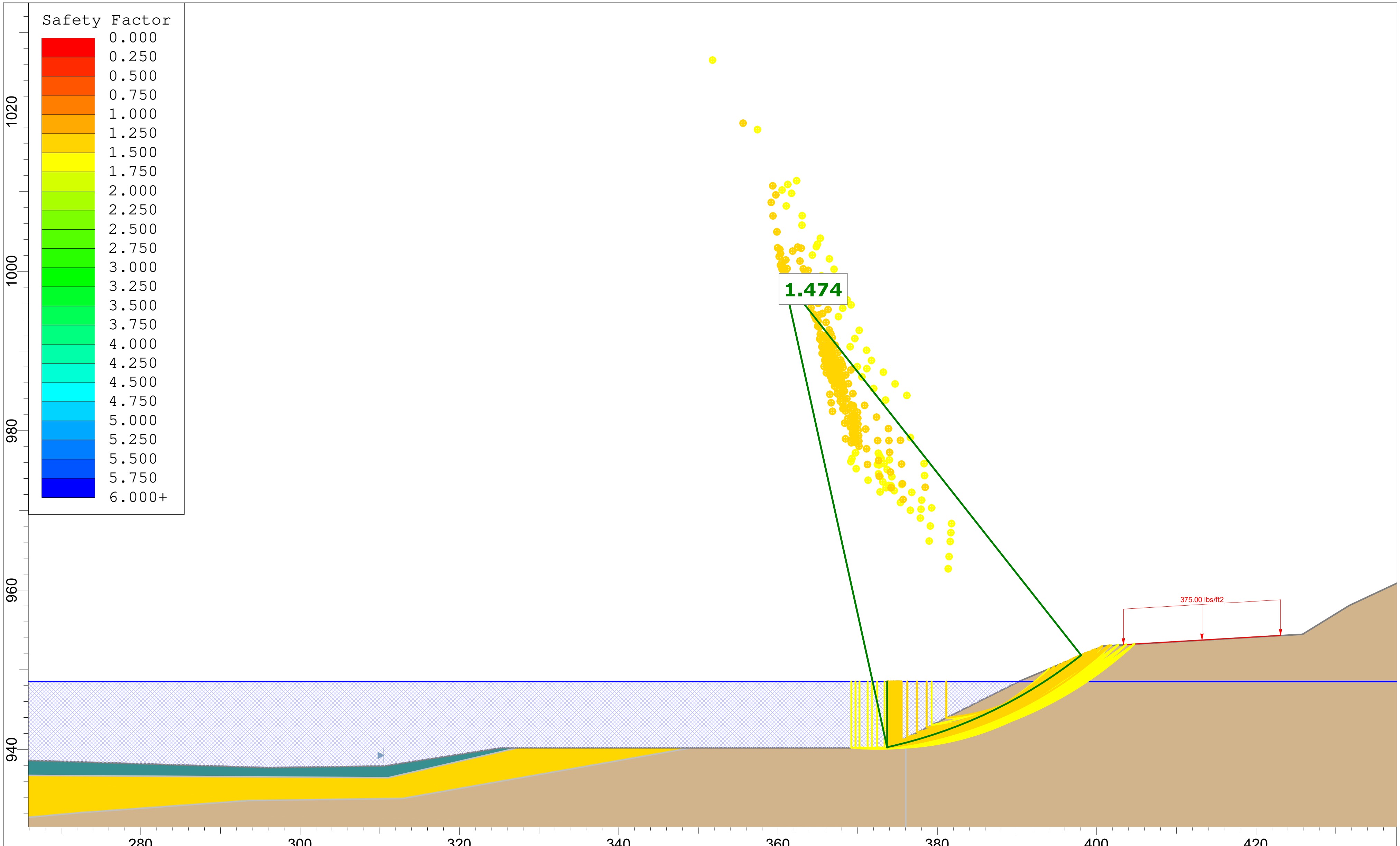
SLIDEINTERPRET 9.034

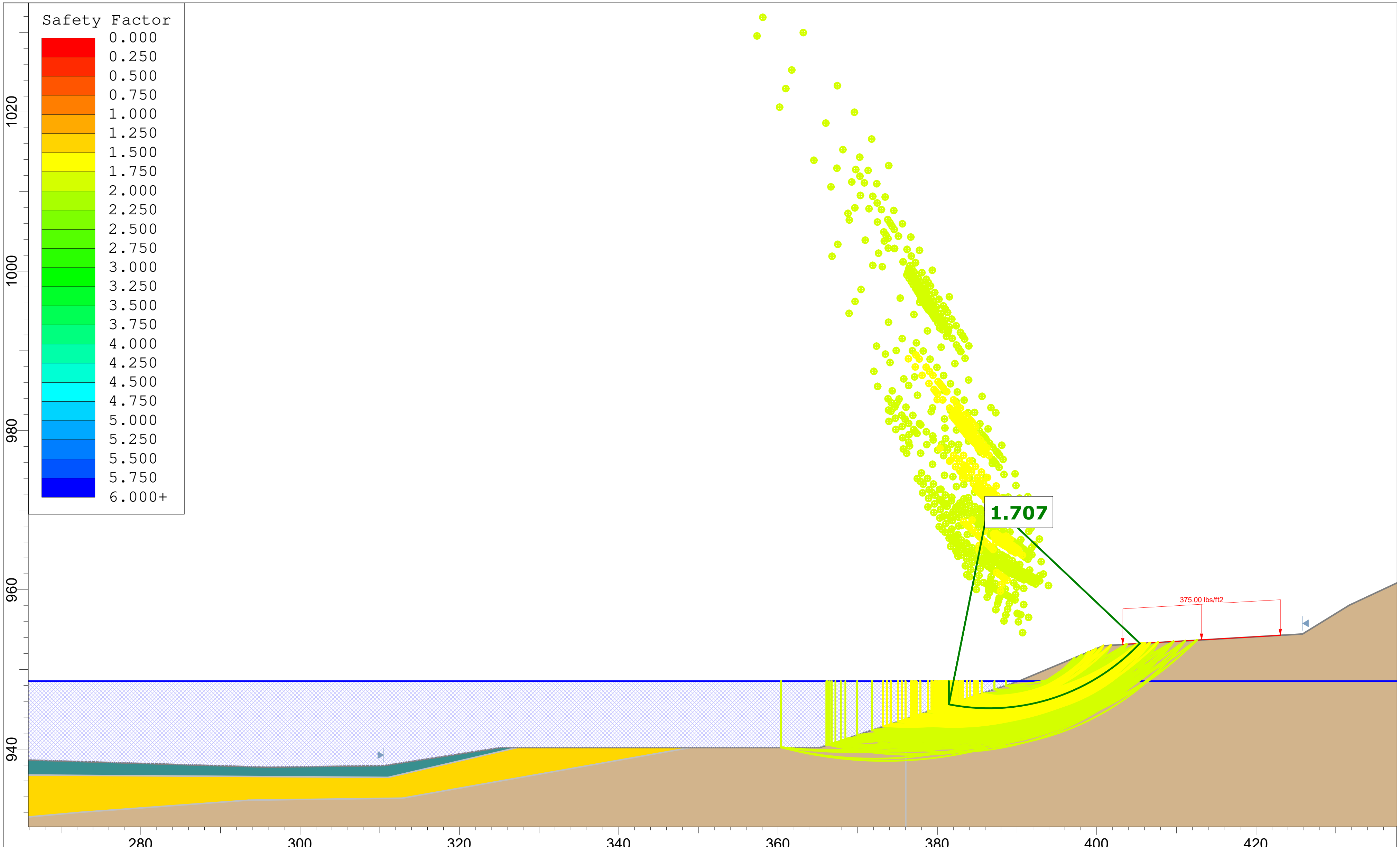
Project	Woods Pond (Housatonic Reach 6)		
Group	East - Right to Left	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_10psf.slmd



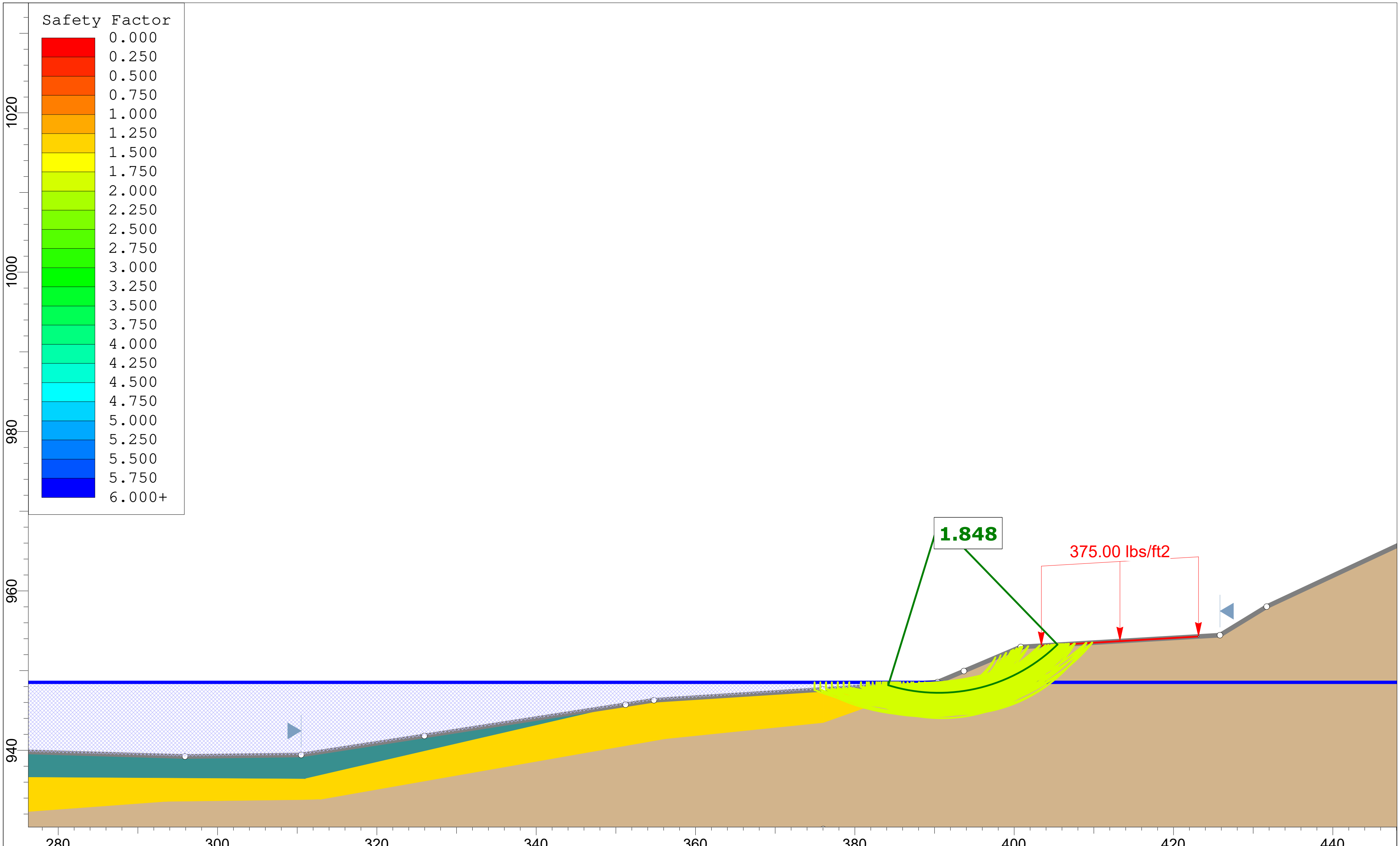
rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group East - 1.5:1	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 1-1_10psf.slmd	



rocscience	Project	Woods Pond (Housatonic Reach 6)	
	Group: East - 2:1	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 1-1_10psf.slmd	



rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group East - 3:1	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 1-1_10psf.slmd	

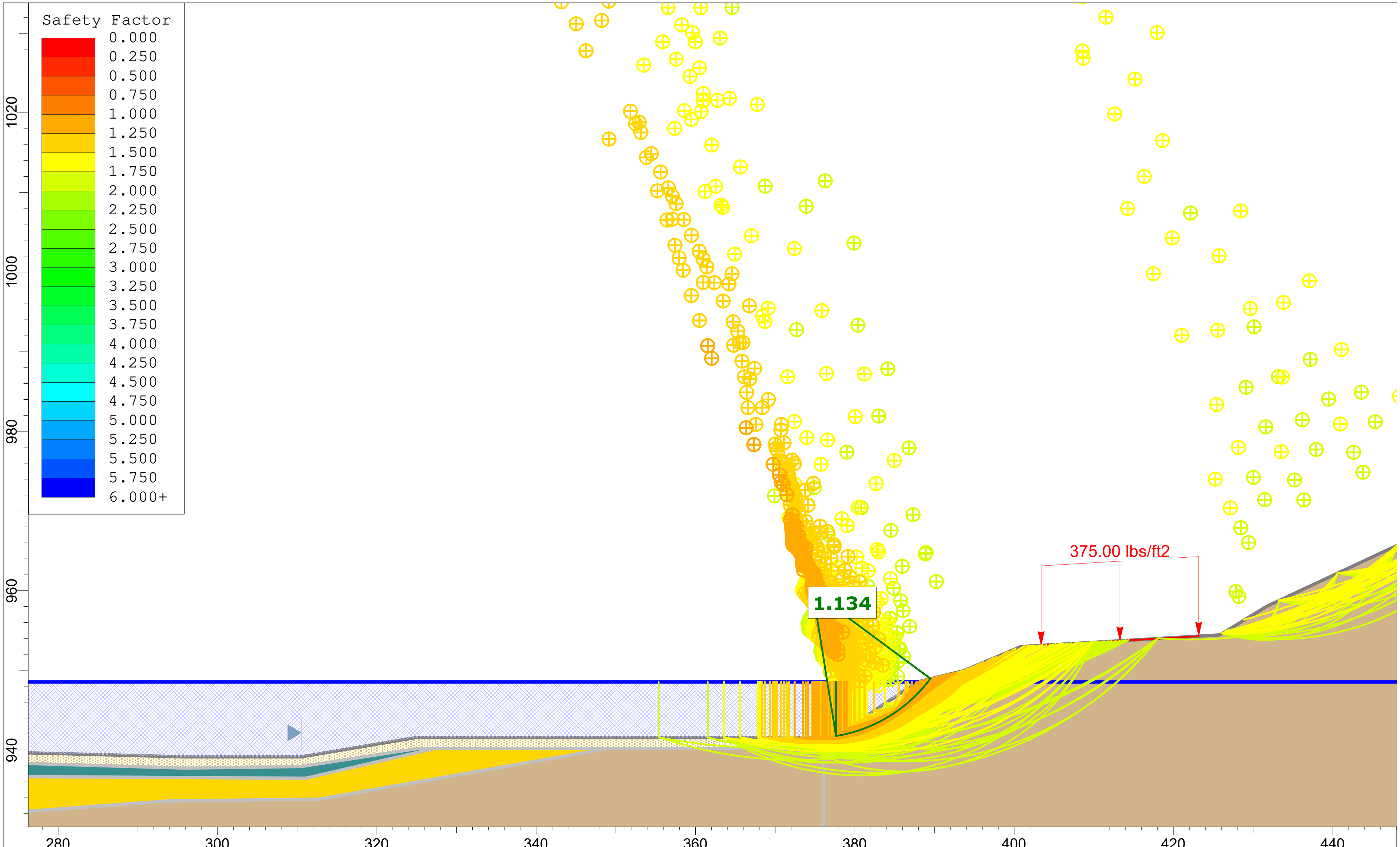


rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)

Group	East - Right to Left	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1-15psf-Cap.slmd



Project	Woods Pond (Housatonic Reach 6)		
Group	East - 1.5:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1-15psf-Cap.slmd

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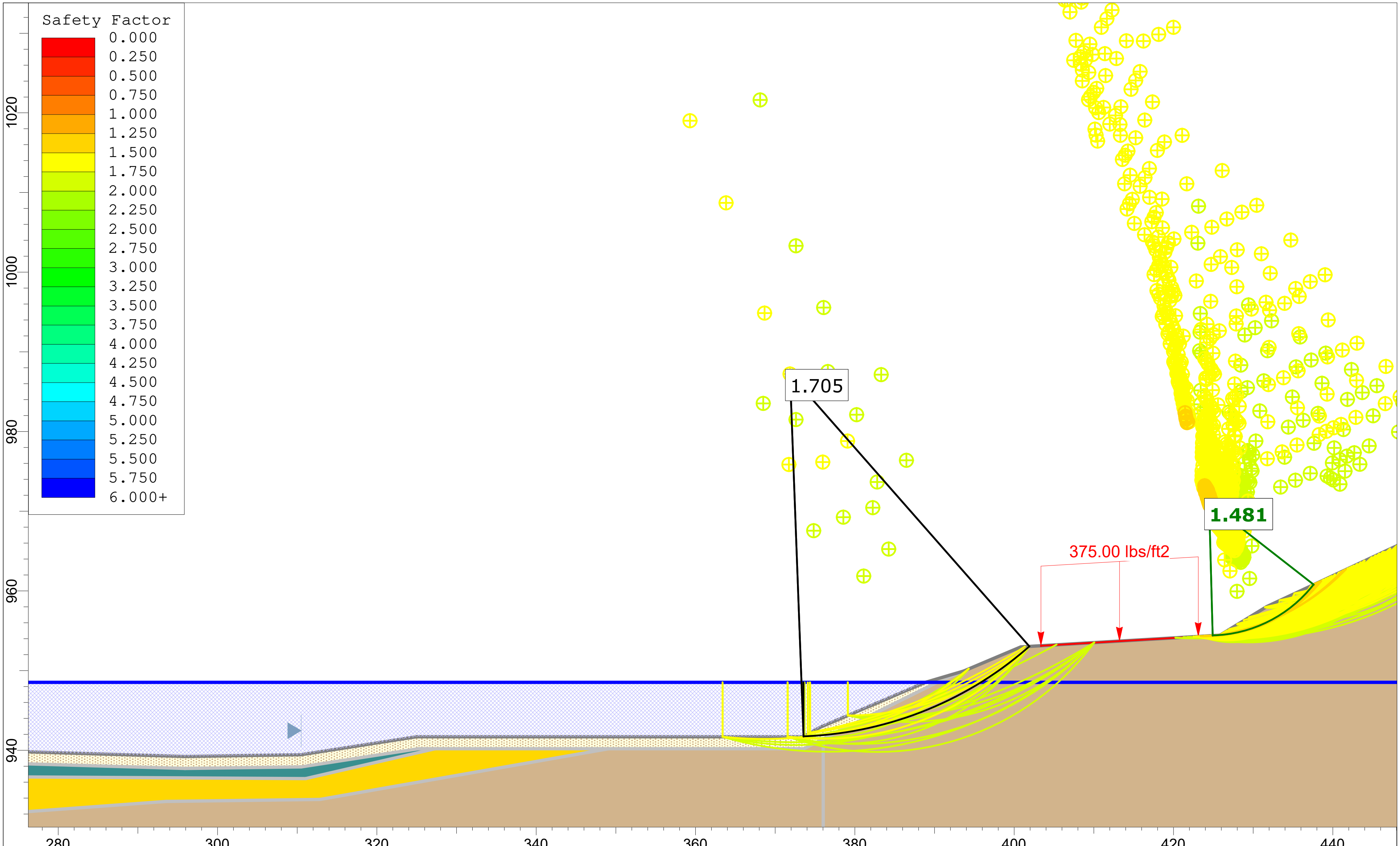

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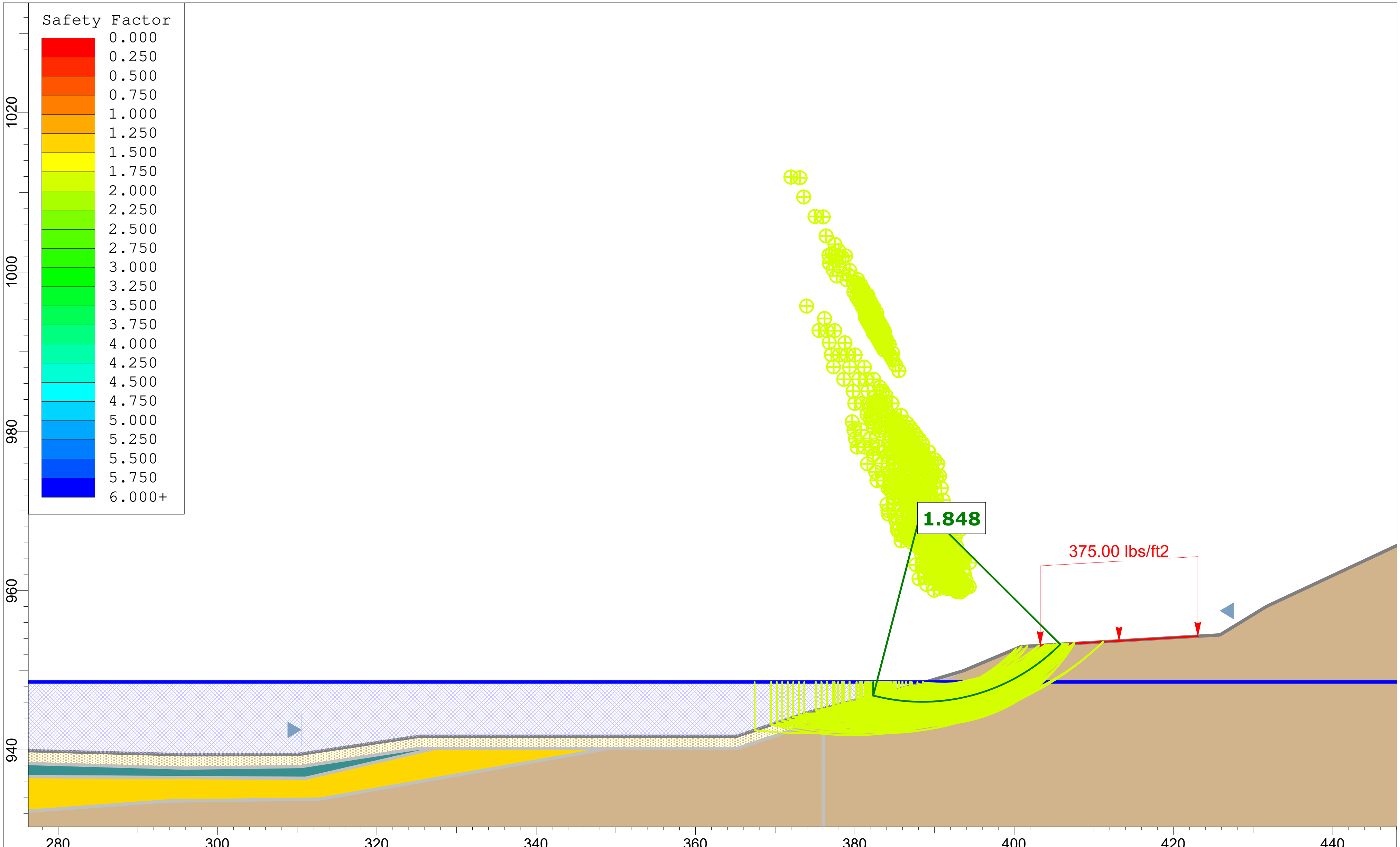
Project	Woods Pond (Housatonic Reach 6)		
Group	East - 2:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1-15psf-Cap.slmd

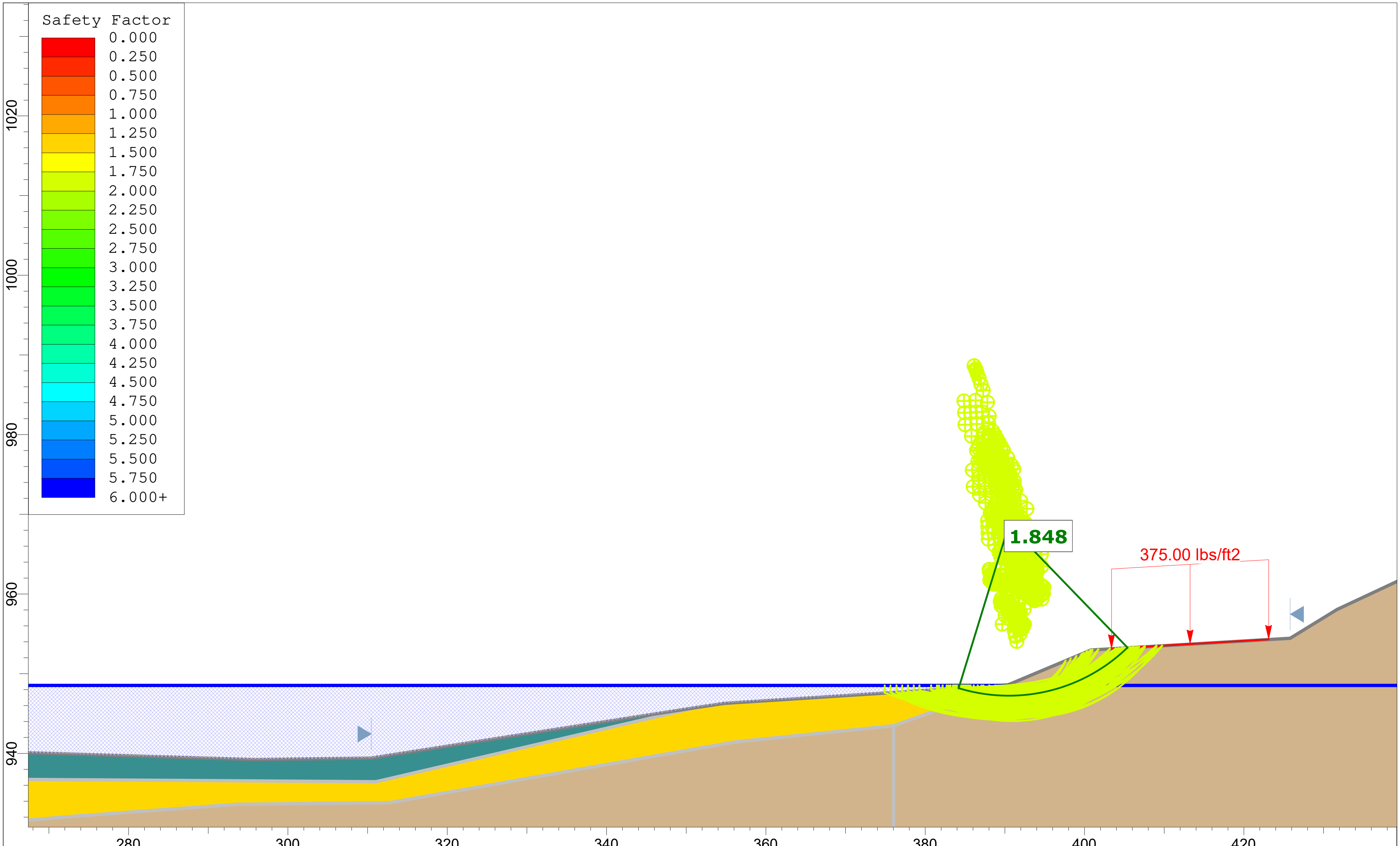
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	East - 3:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1-15psf-Cap.slmd



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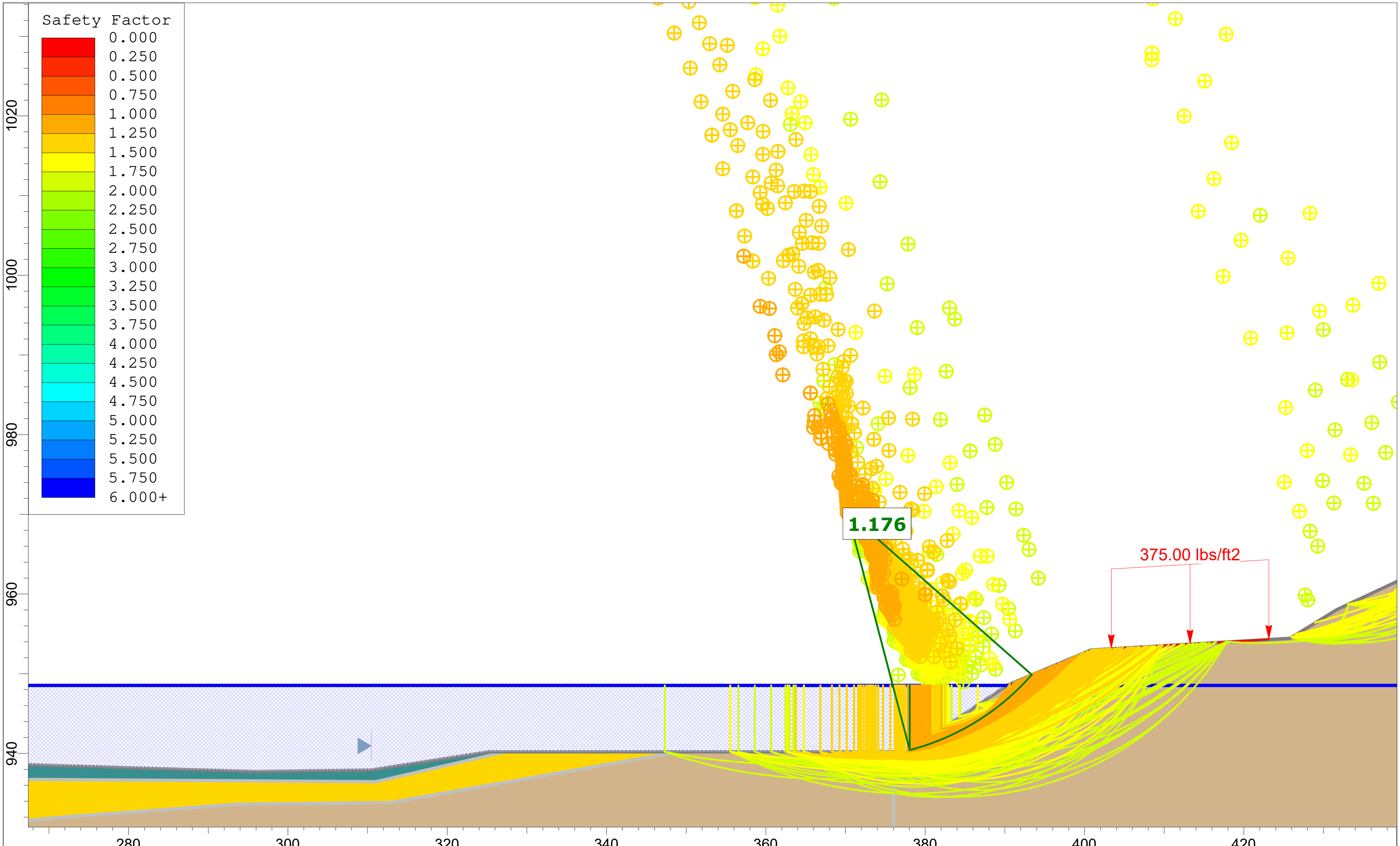
SLIDEINTERPRET 9.034

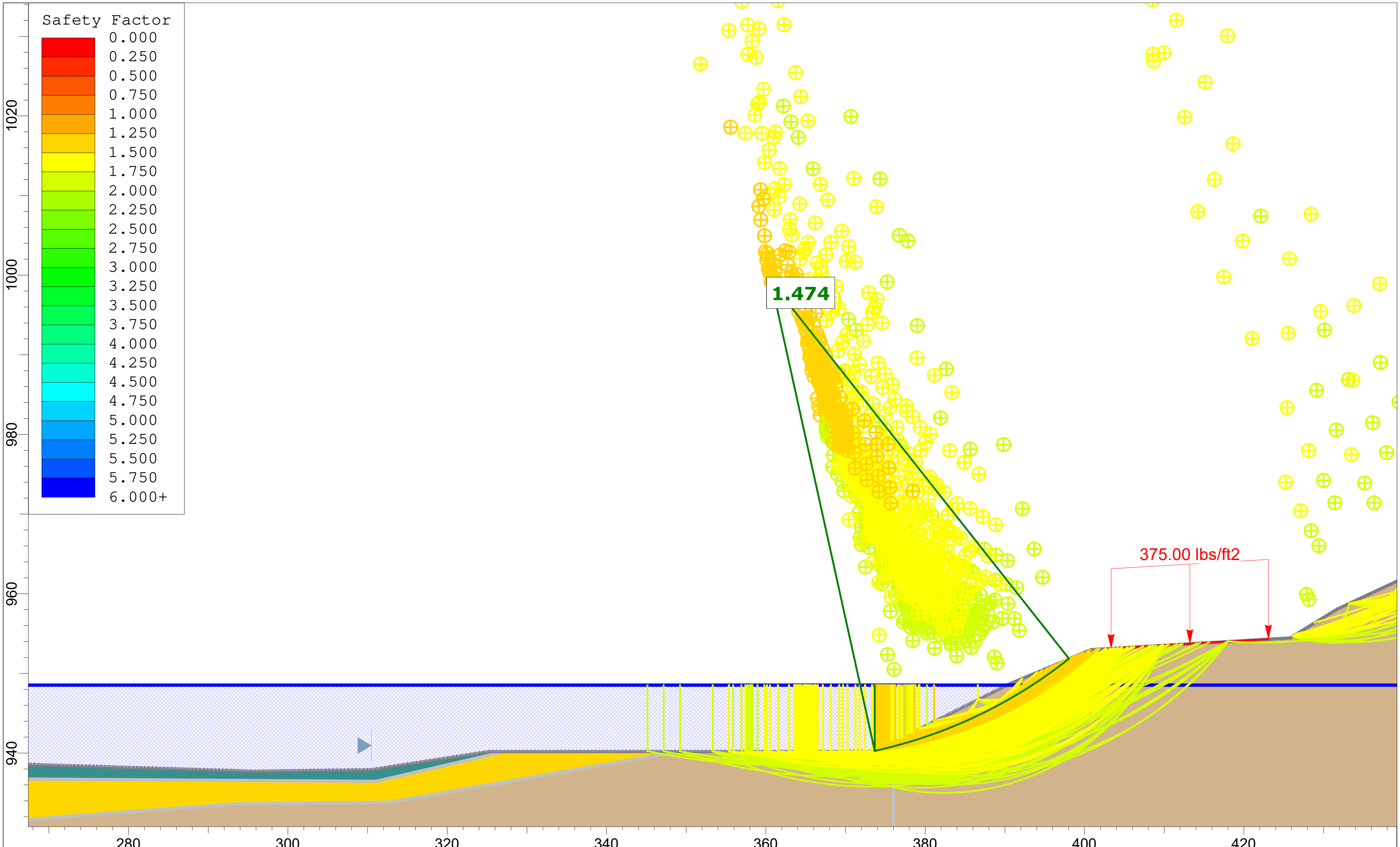
Project	Woods Pond (Housatonic Reach 6)		
Group	East - Right to Left	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1-15psf.slmd



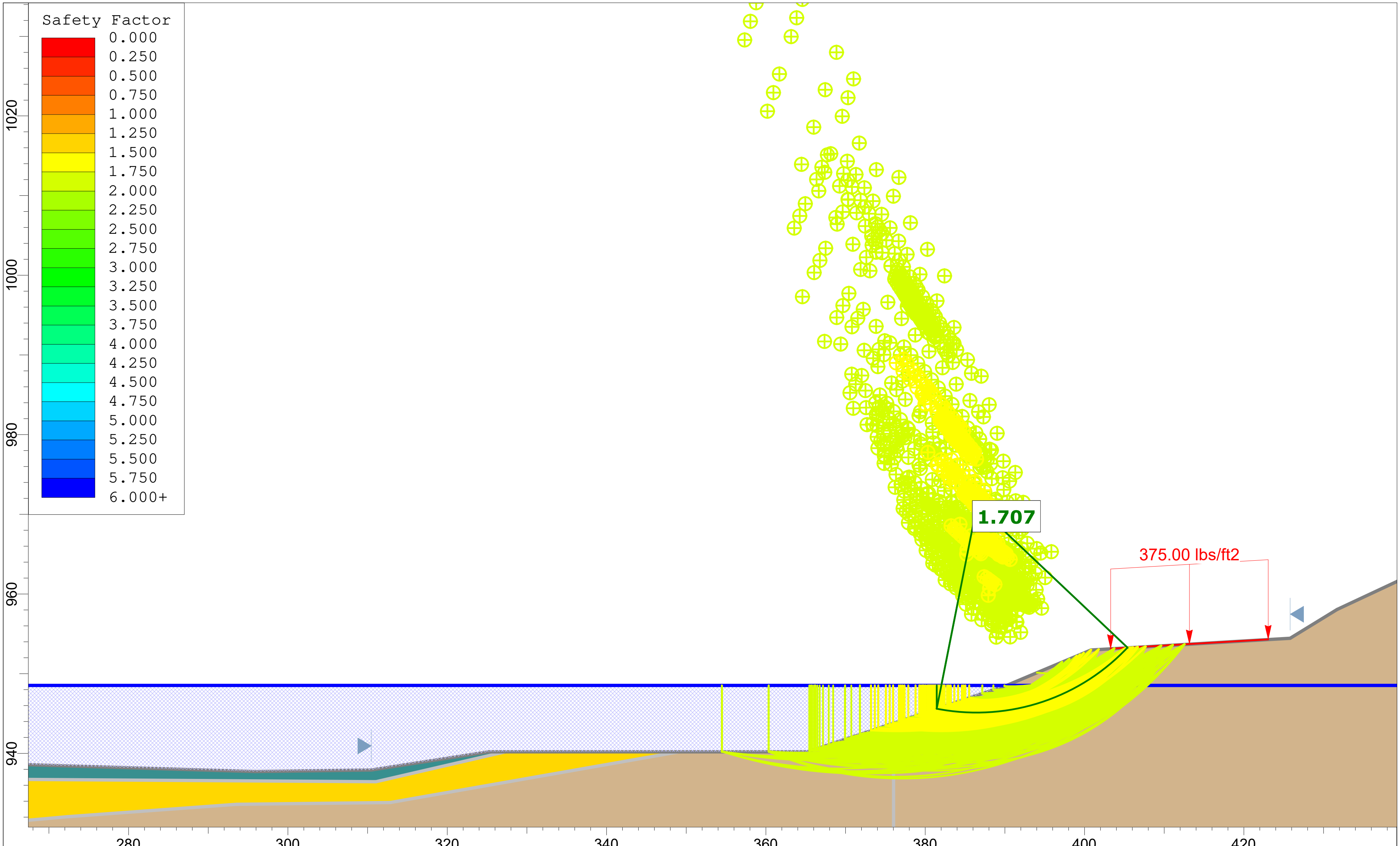
rocscience

SLIDEINTERPRET 9.034

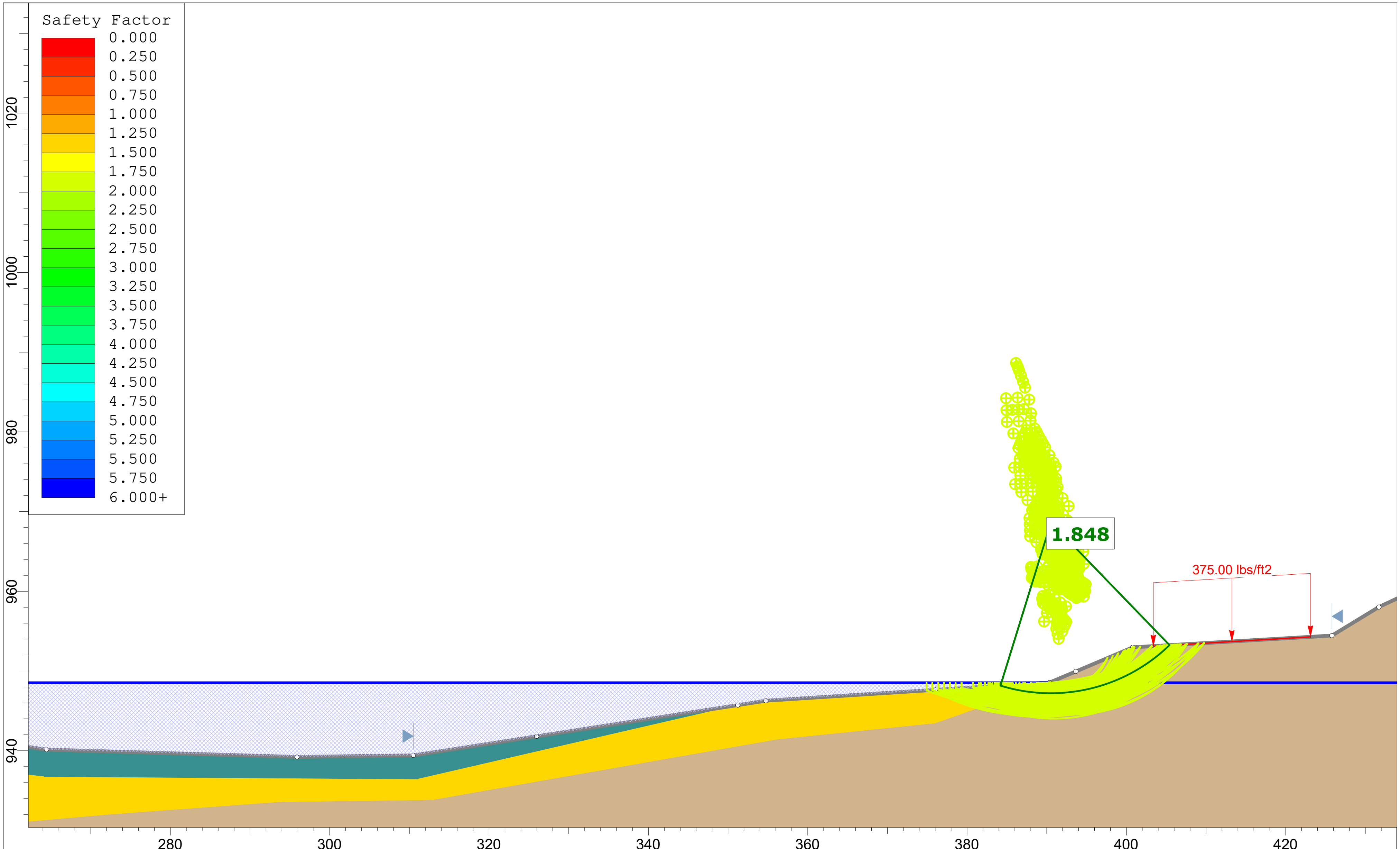
Project	Woods Pond (Housatonic Reach 6)		
Group	East - 1.5:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1-15psf.slmd



rocscience	Project: Woods Pond (Housatonic Reach 6)		
	Group: East - 2:1	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 1-1-15psf.slmd	



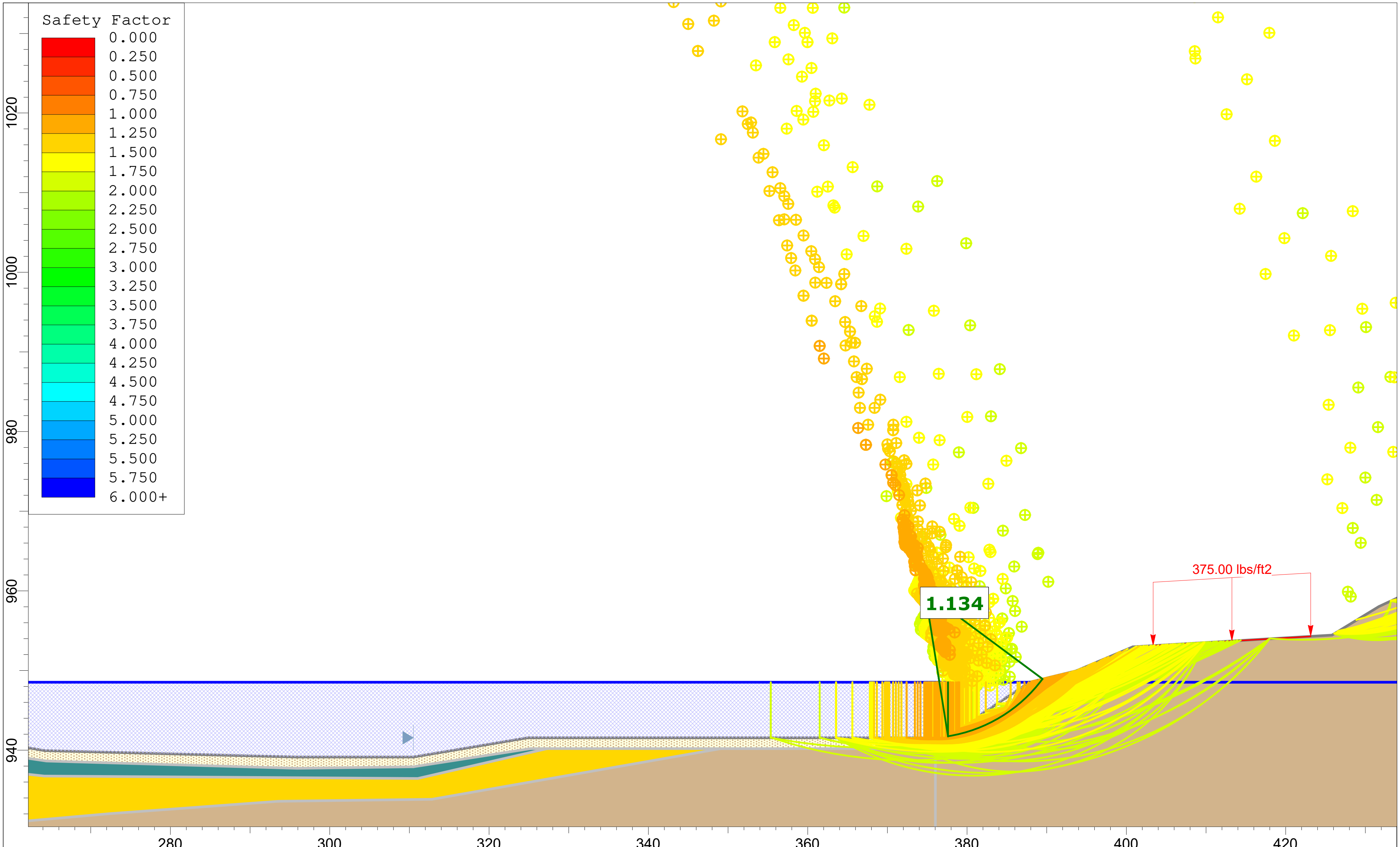
rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group East - 3:1	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 1-1-15psf.slmd	



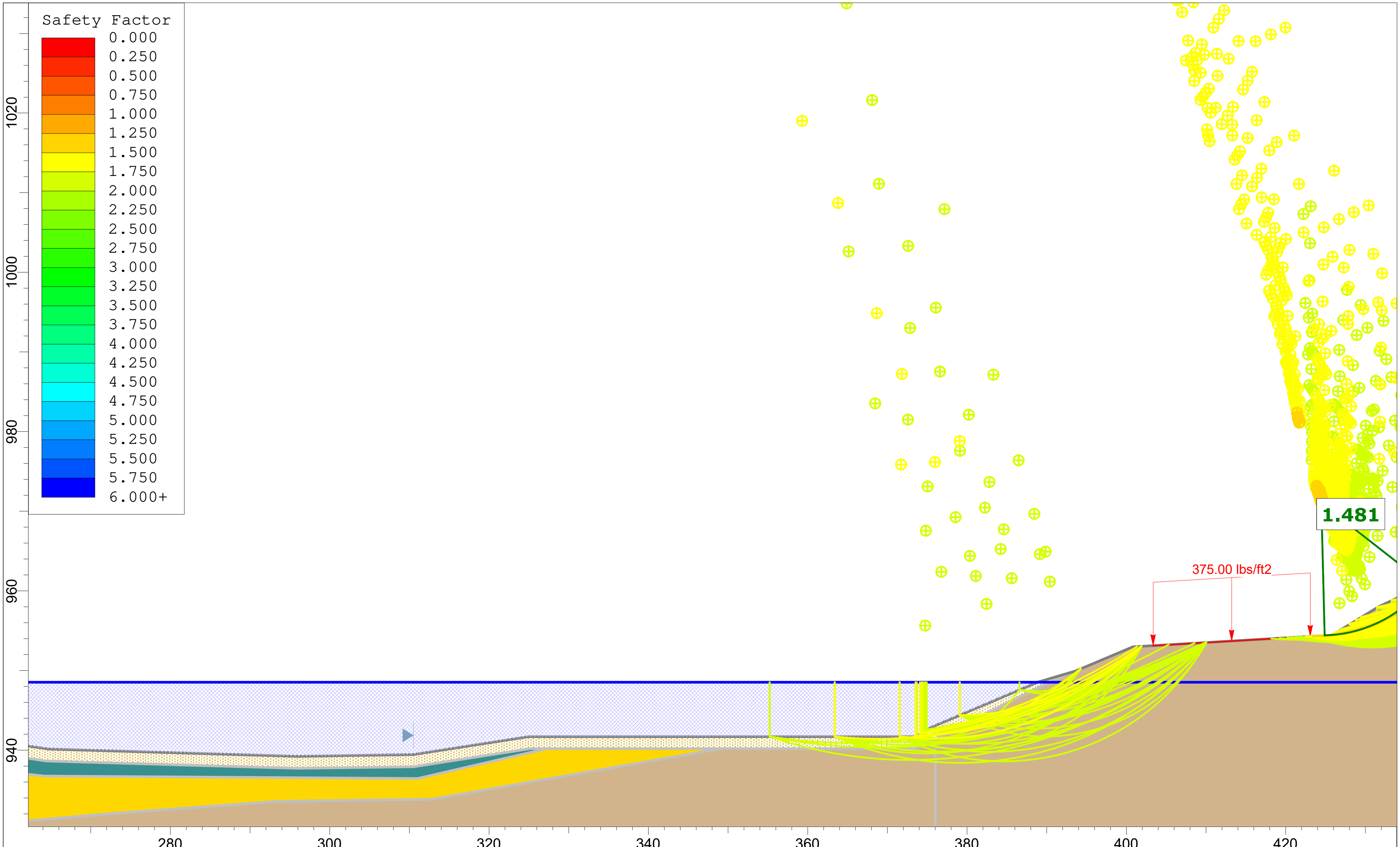
rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	East - Right to Left	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio-Cap.slmd



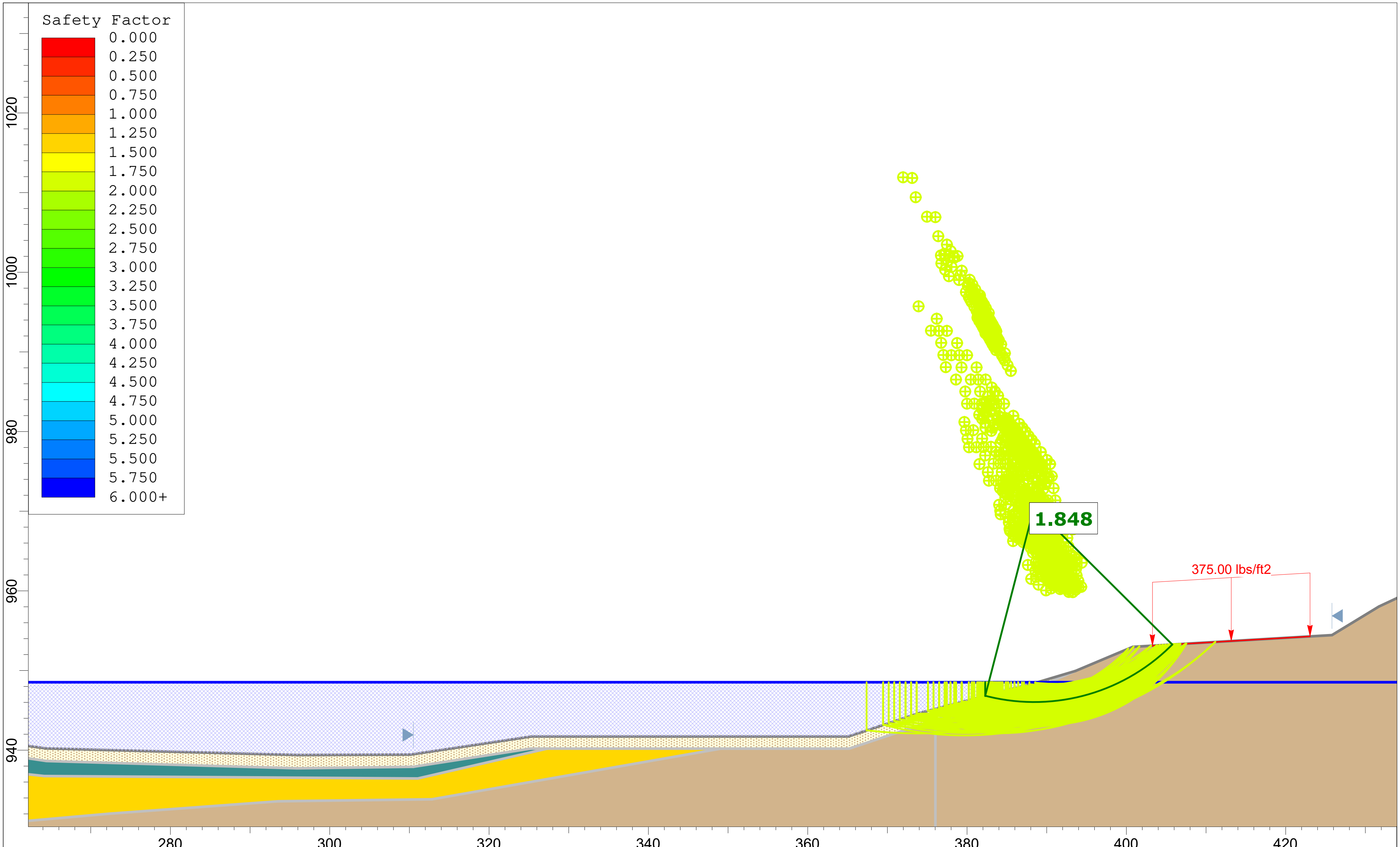
rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group East - 1.5:1	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 1-1_065ratio-Cap.slmd	



rocscience

SLIDEINTERPRET 9.034

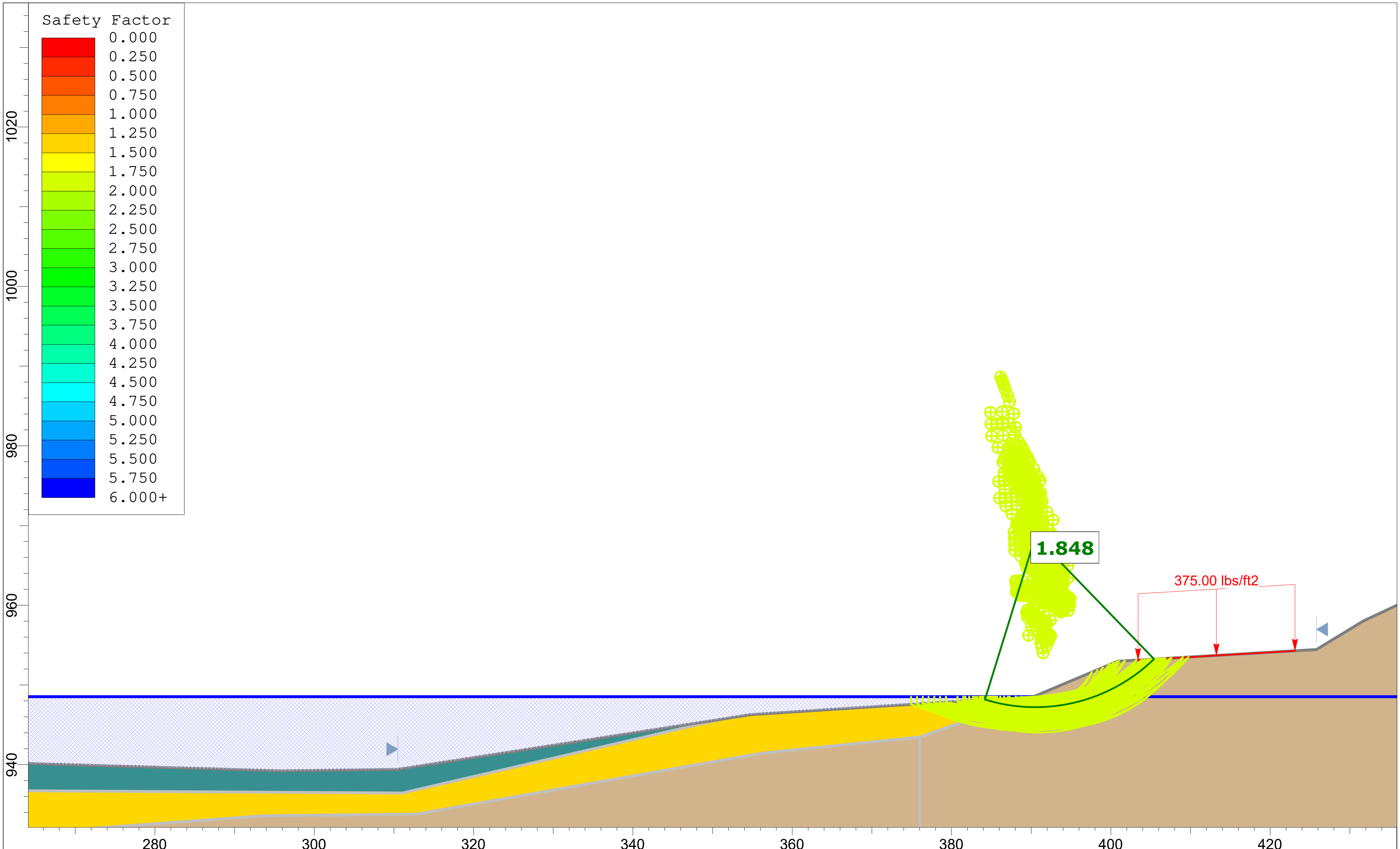
Project	Woods Pond (Housatonic Reach 6)		
Group	East - 2:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio-Cap.slmd



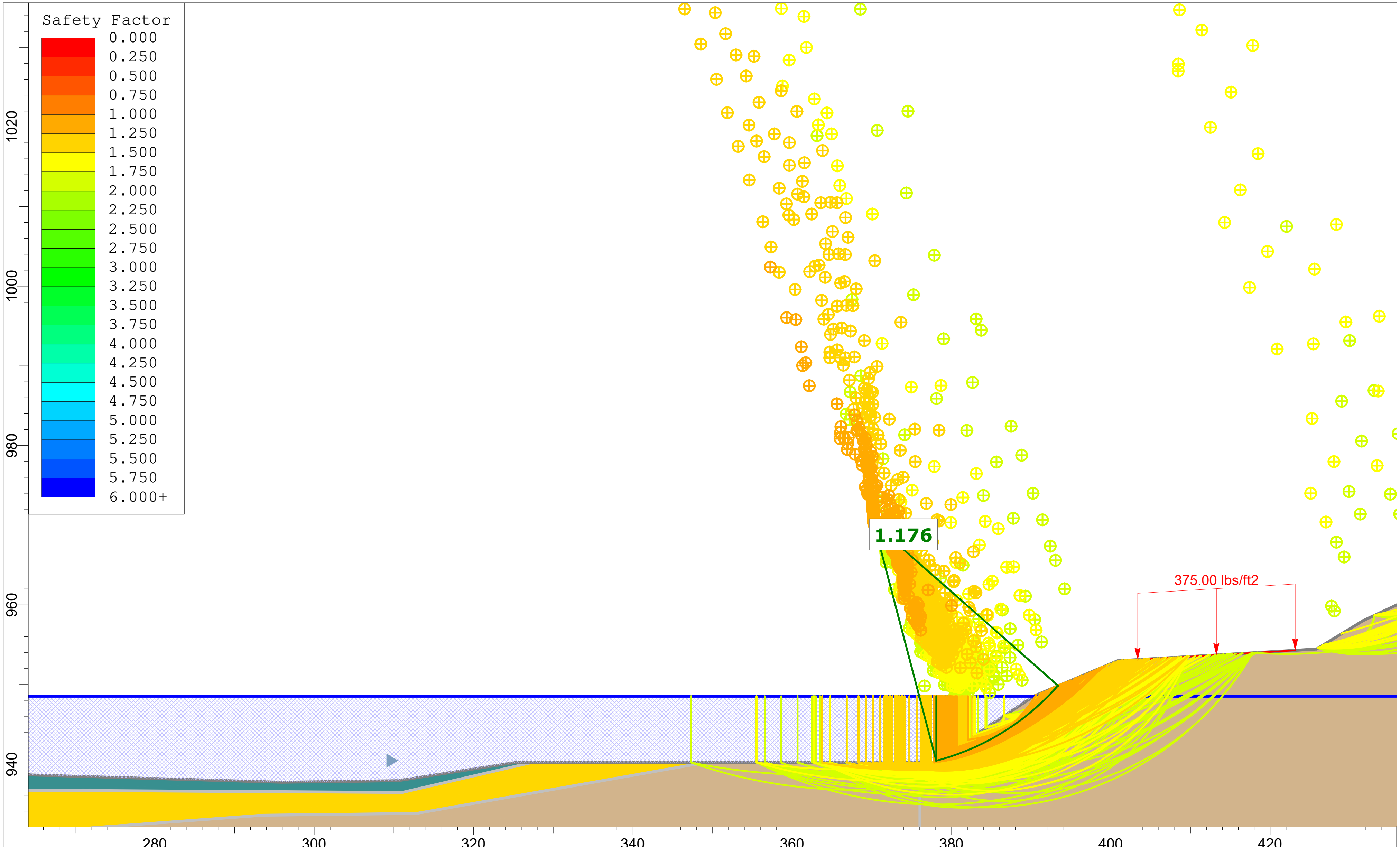
rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	East - 3:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio-Cap.slmd



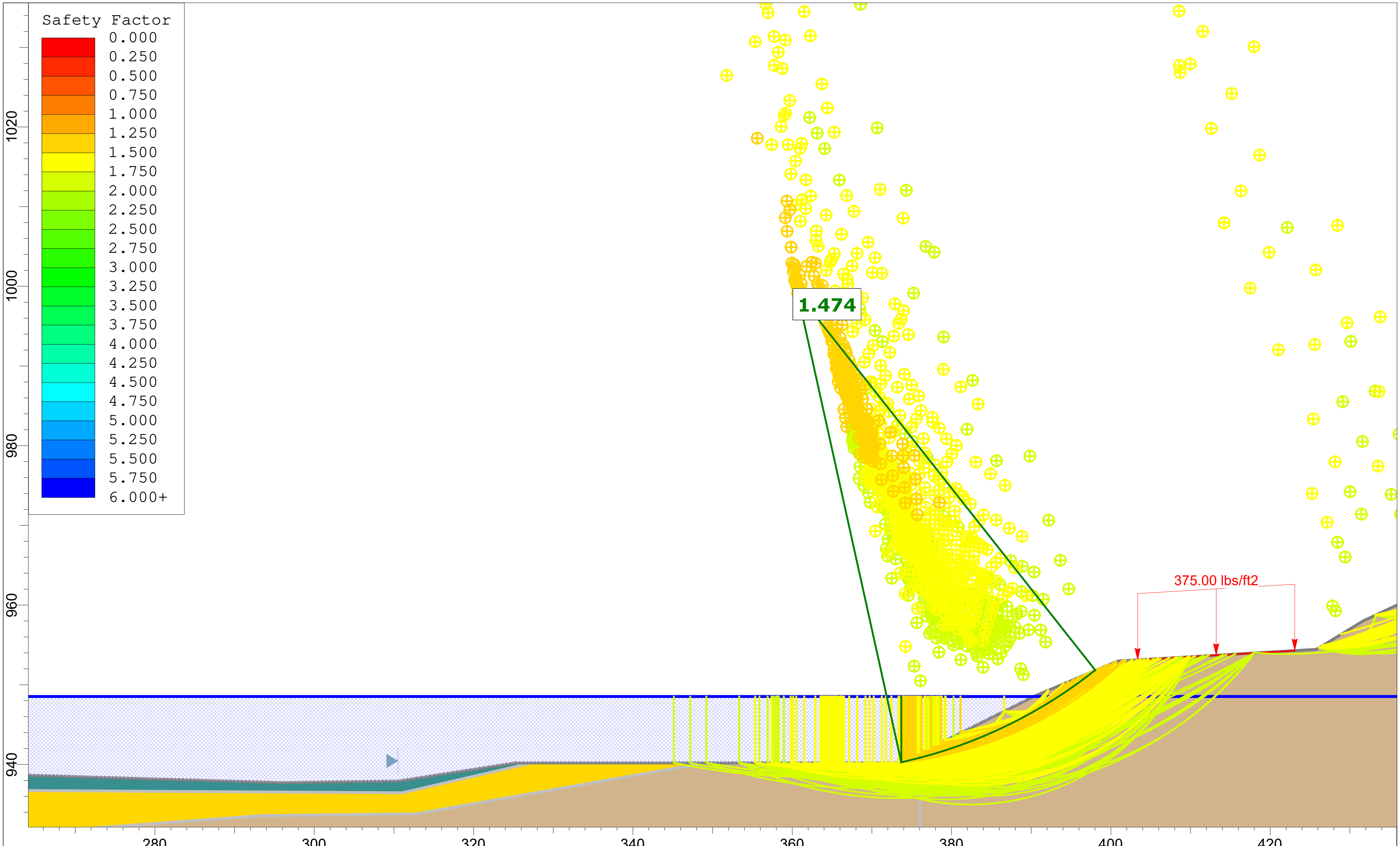
rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group East - Right to Left	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 1-1_065ratio.slmd	



rocscience

SLIDEINTERPRET 9.034

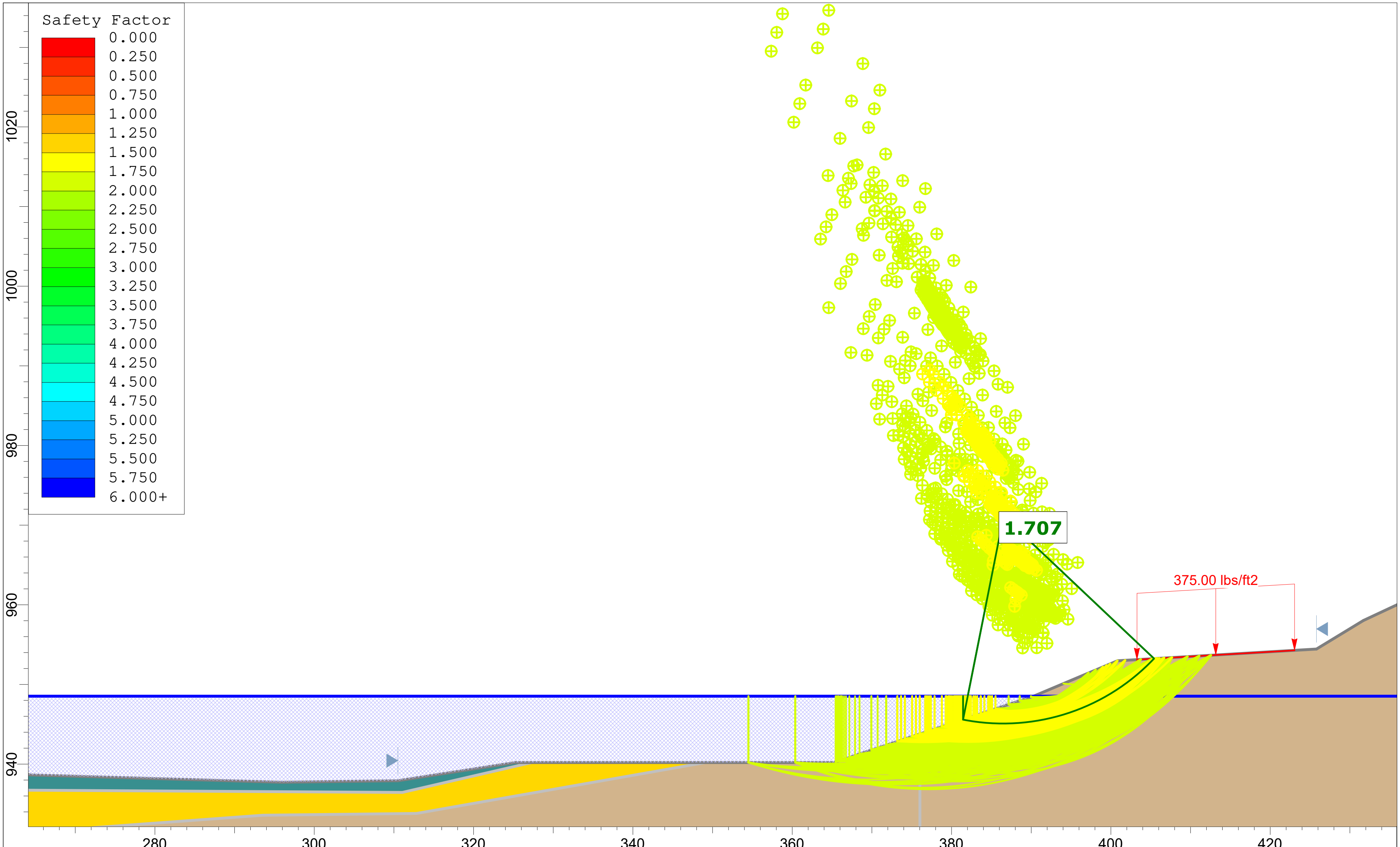
Project	Woods Pond (Housatonic Reach 6)		
Group	East - 1.5:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio.slmd



rocscience

SLIDEINTERPRET 9.034

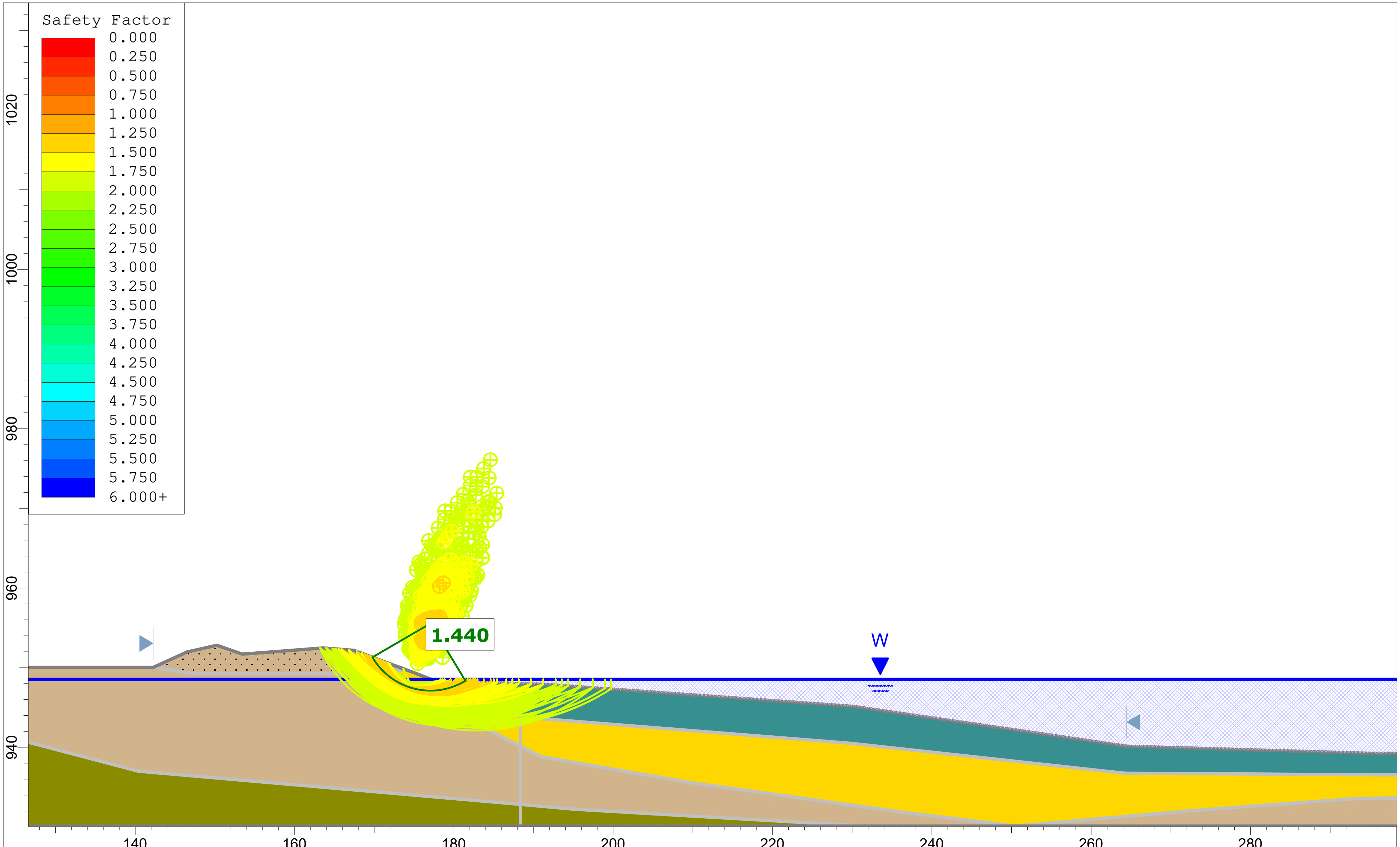
Project	Woods Pond (Housatonic Reach 6)		
Group	East - 2:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio.slmd



Project	Woods Pond (Housatonic Reach 6)		
Group	East - 3:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1_065ratio.slmd

rocscience

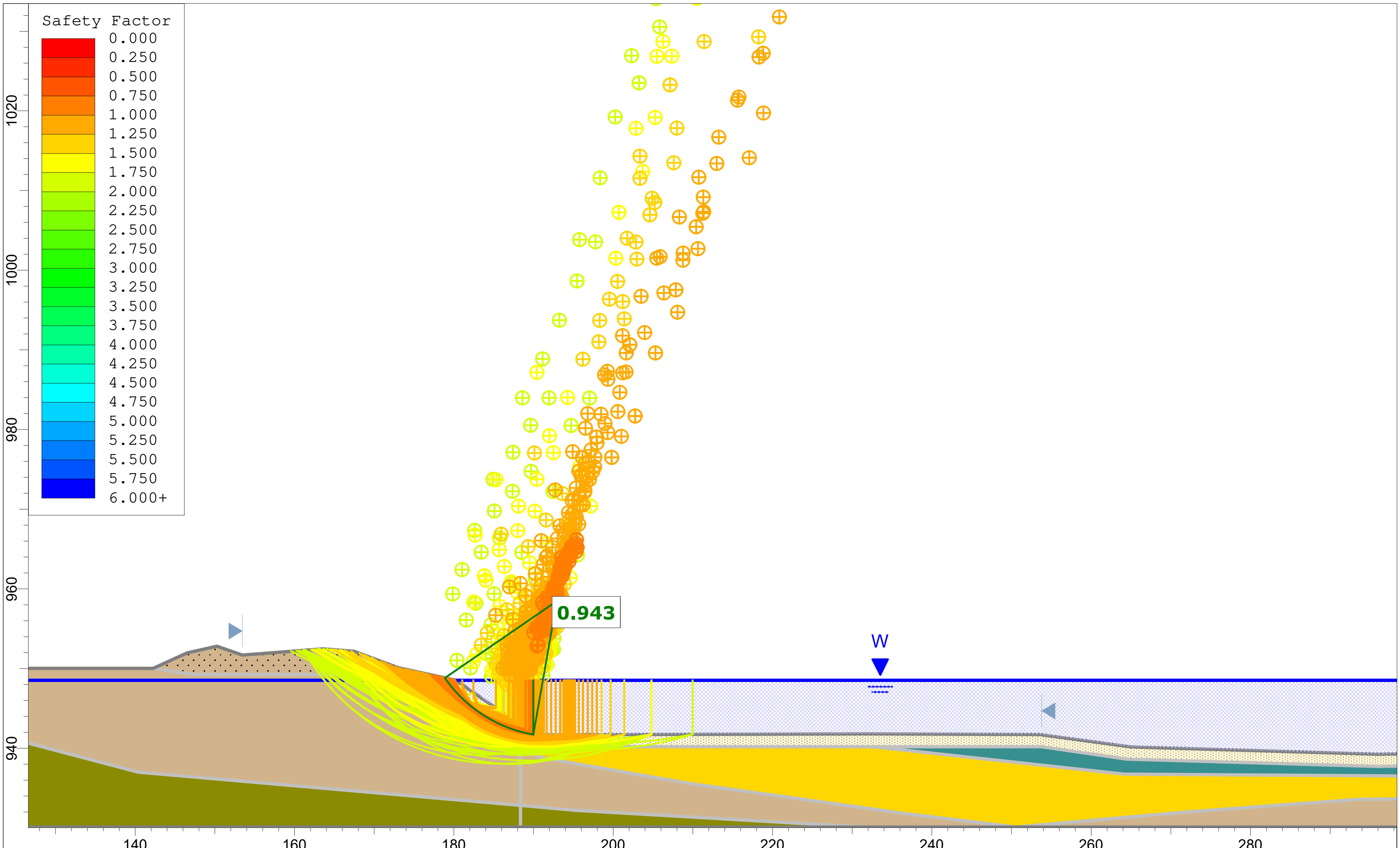
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

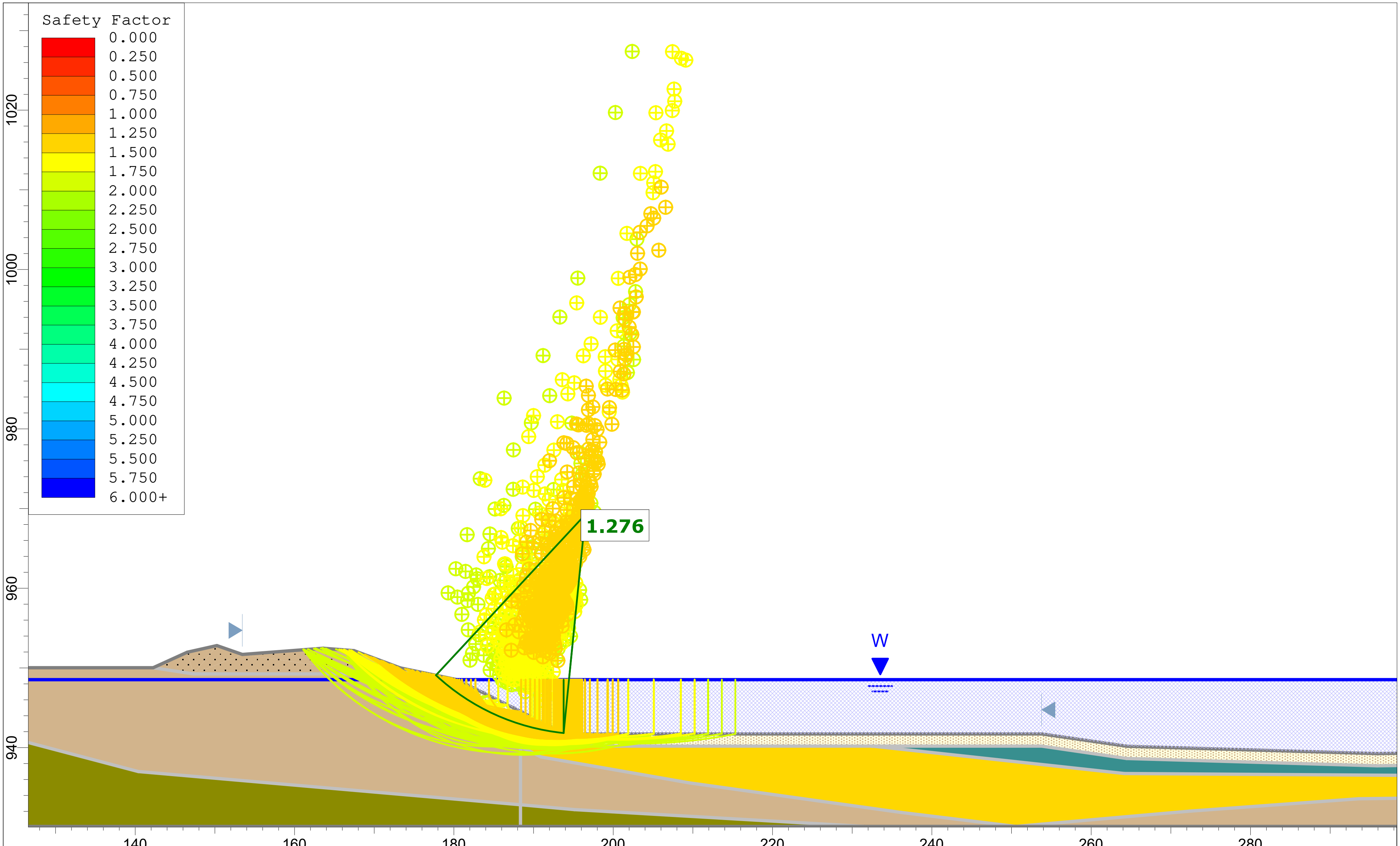
Project	Woods Pond (Housatonic Reach 6)		
Group	West - Left to Right	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_10psf-cap.slmd



rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 1.5:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_10psf-cap.slmd

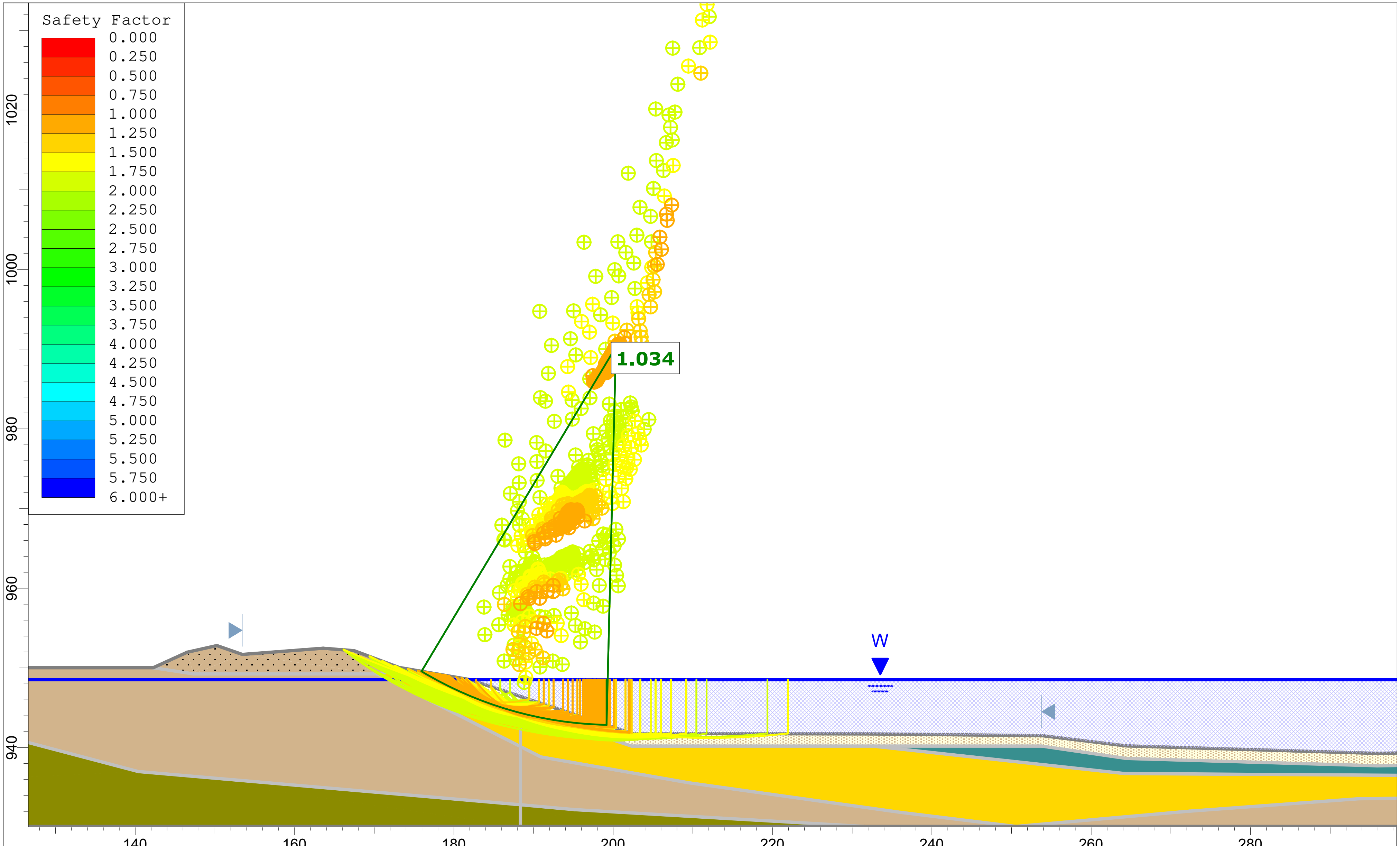
SLIDEINTERPRET 9.034



rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 2:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1_10psf-cap.slmd

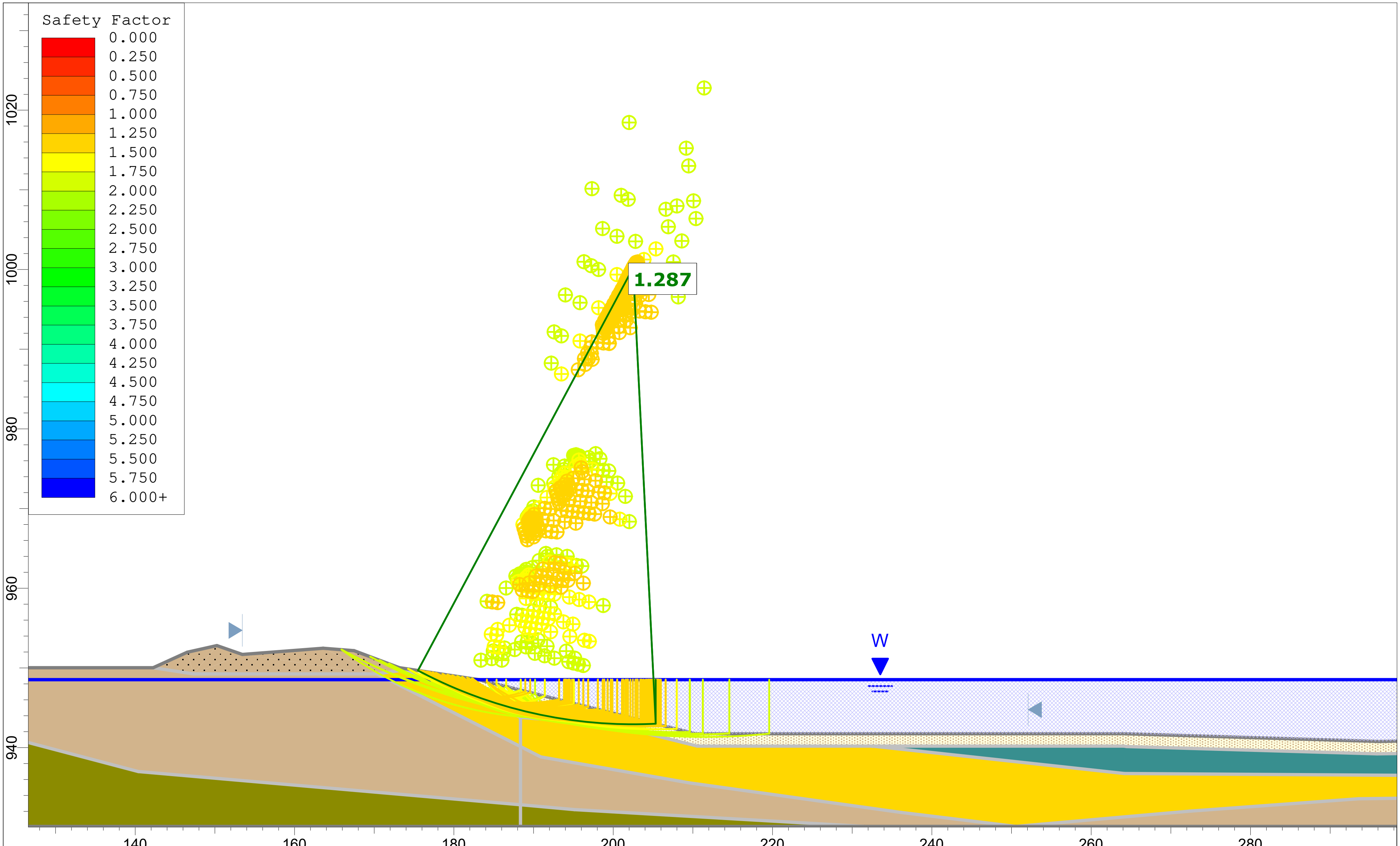
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 3:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1_10psf-cap.slmd



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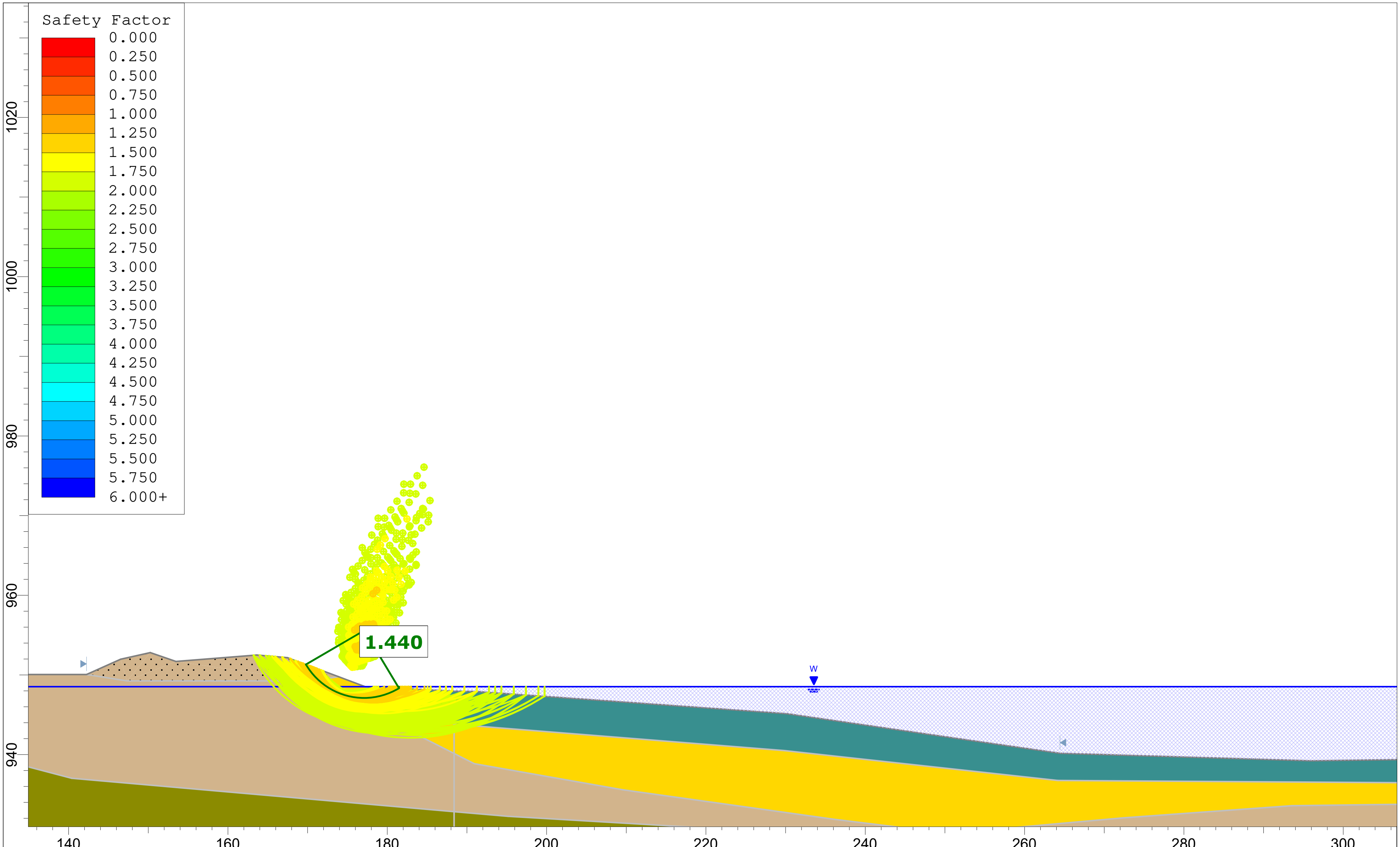
SLIDEINTERPRET 9.034

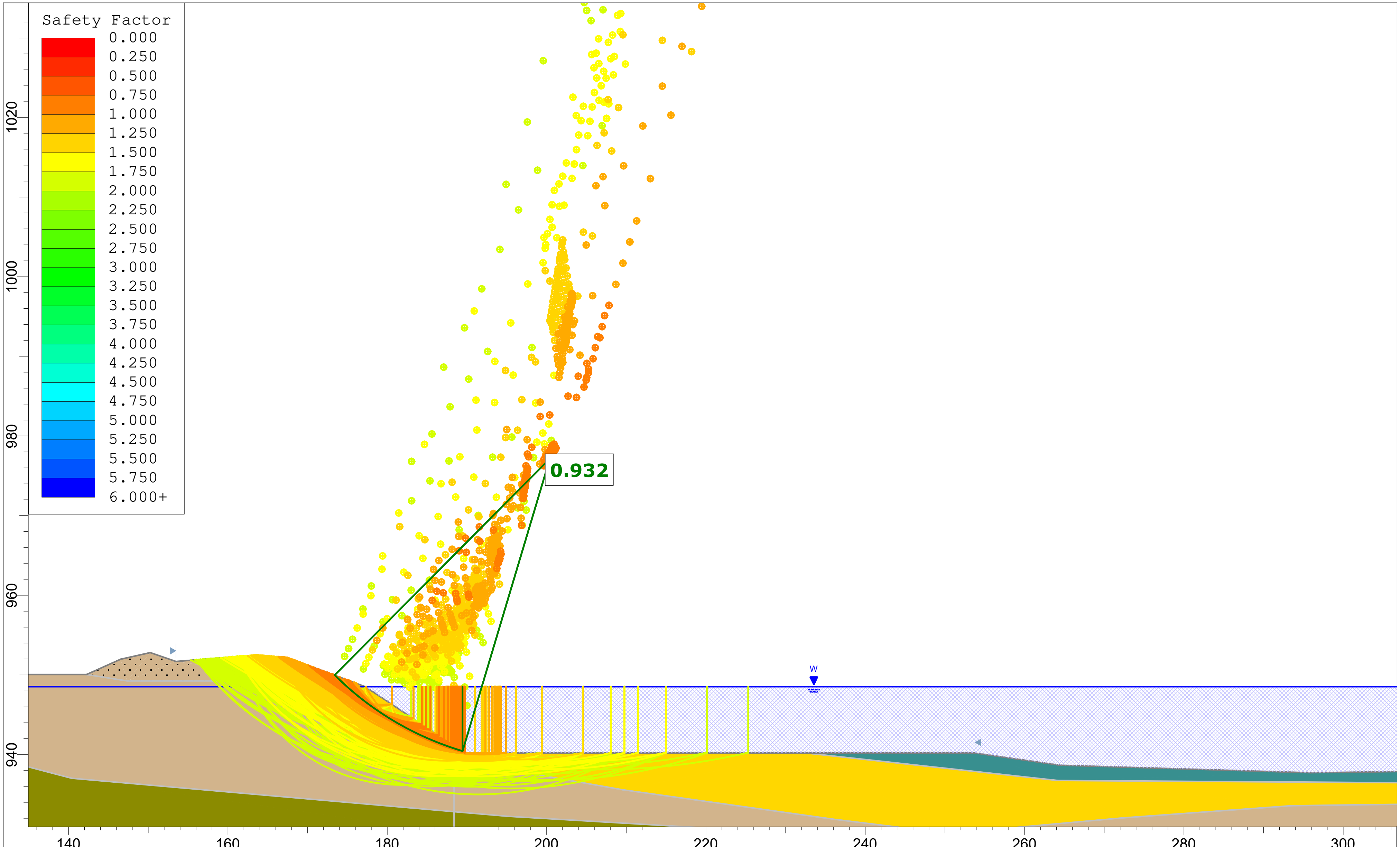
Project	Woods Pond (Housatonic Reach 6)		
Group	West - 4H:1V	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_10psf-cap.slmd



rocscience

SLIDEINTERPRET 9.034

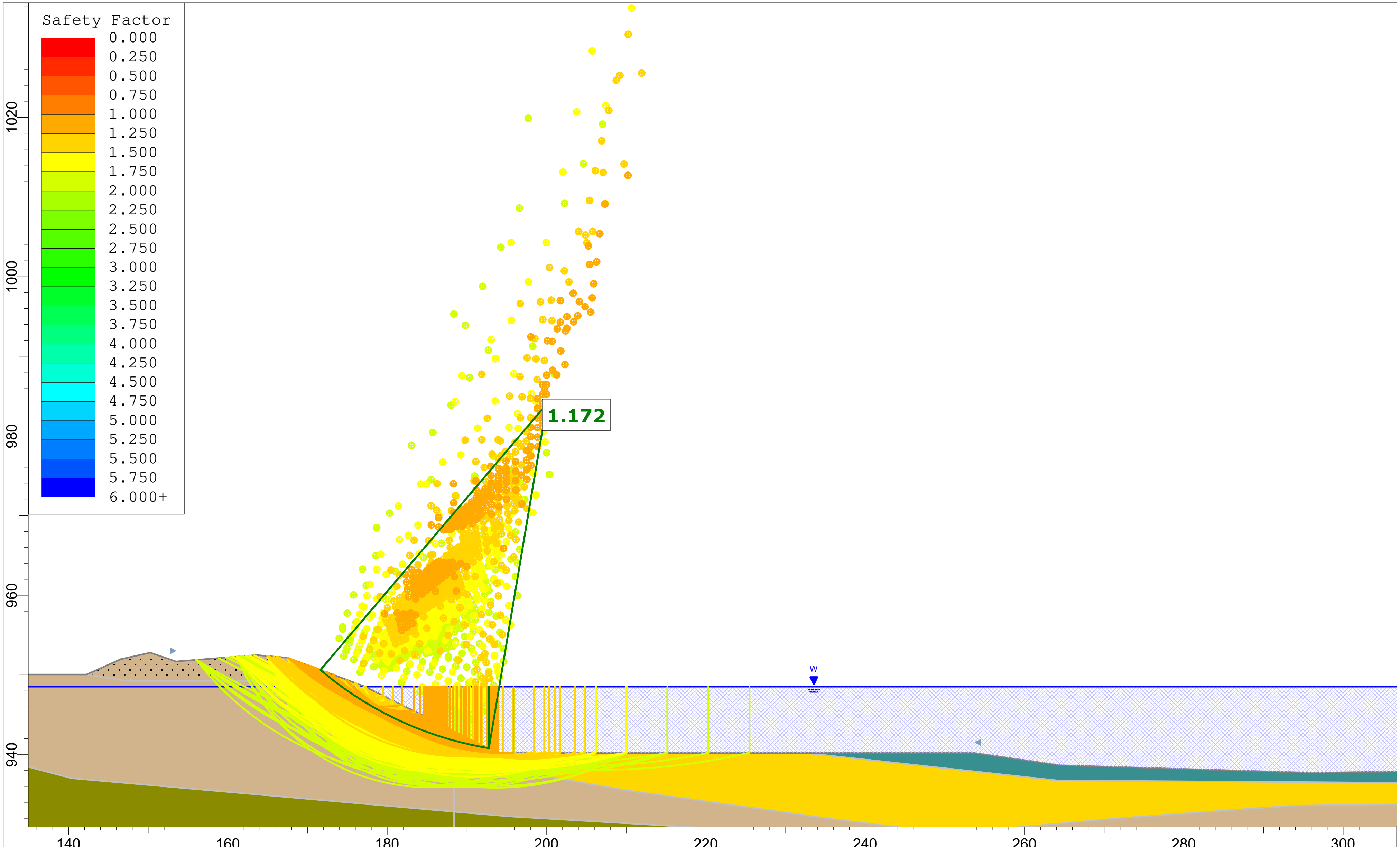
Project	Woods Pond (Housatonic Reach 6)		
Group	West - Left to Right	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_10psf.slmd



rocscience

SLIDEINTERPRET 9.034

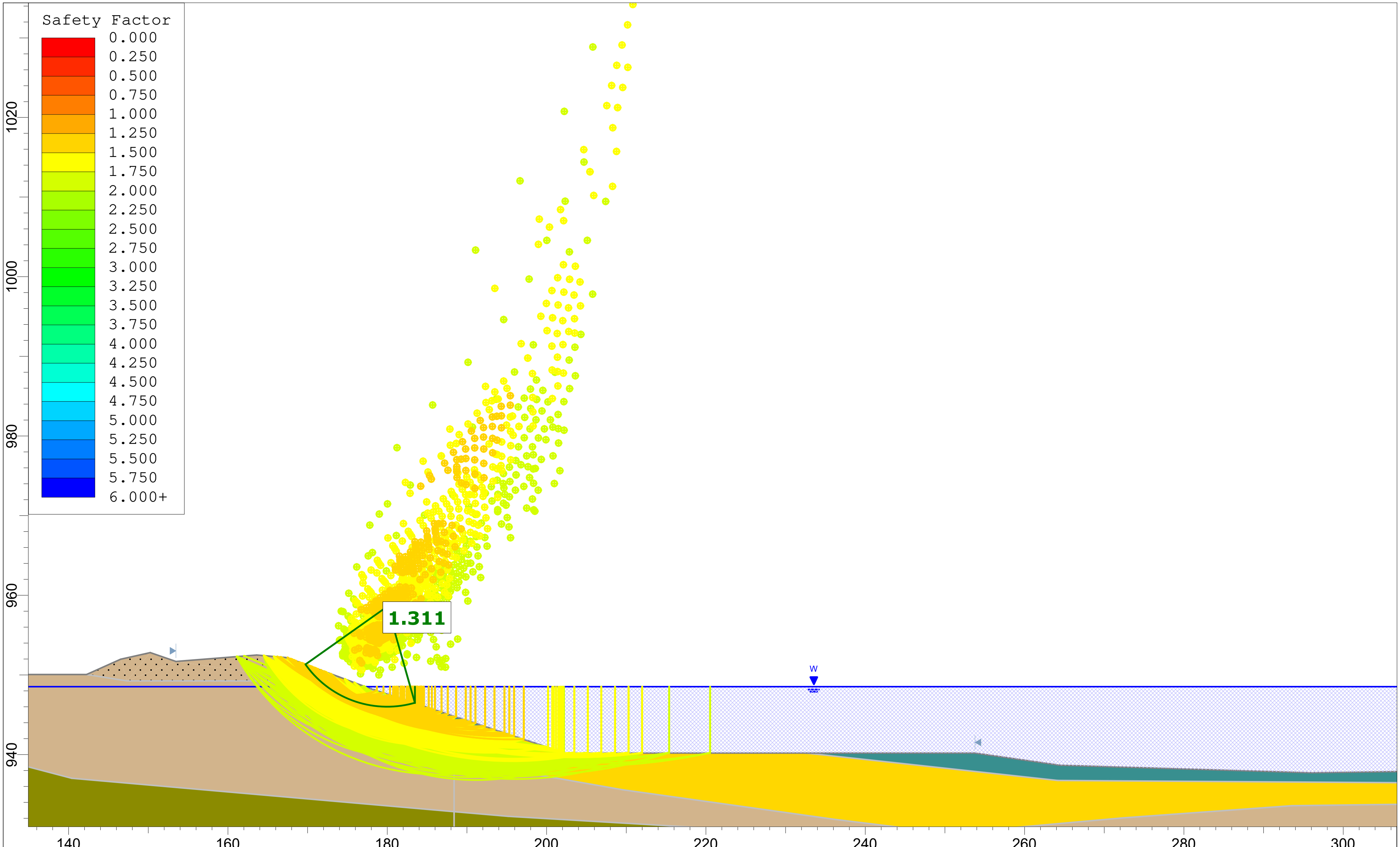
Project	Woods Pond (Housatonic Reach 6)		
Group	West - 1.5:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_10psf.slmd



rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 2:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1_10psf.slmd

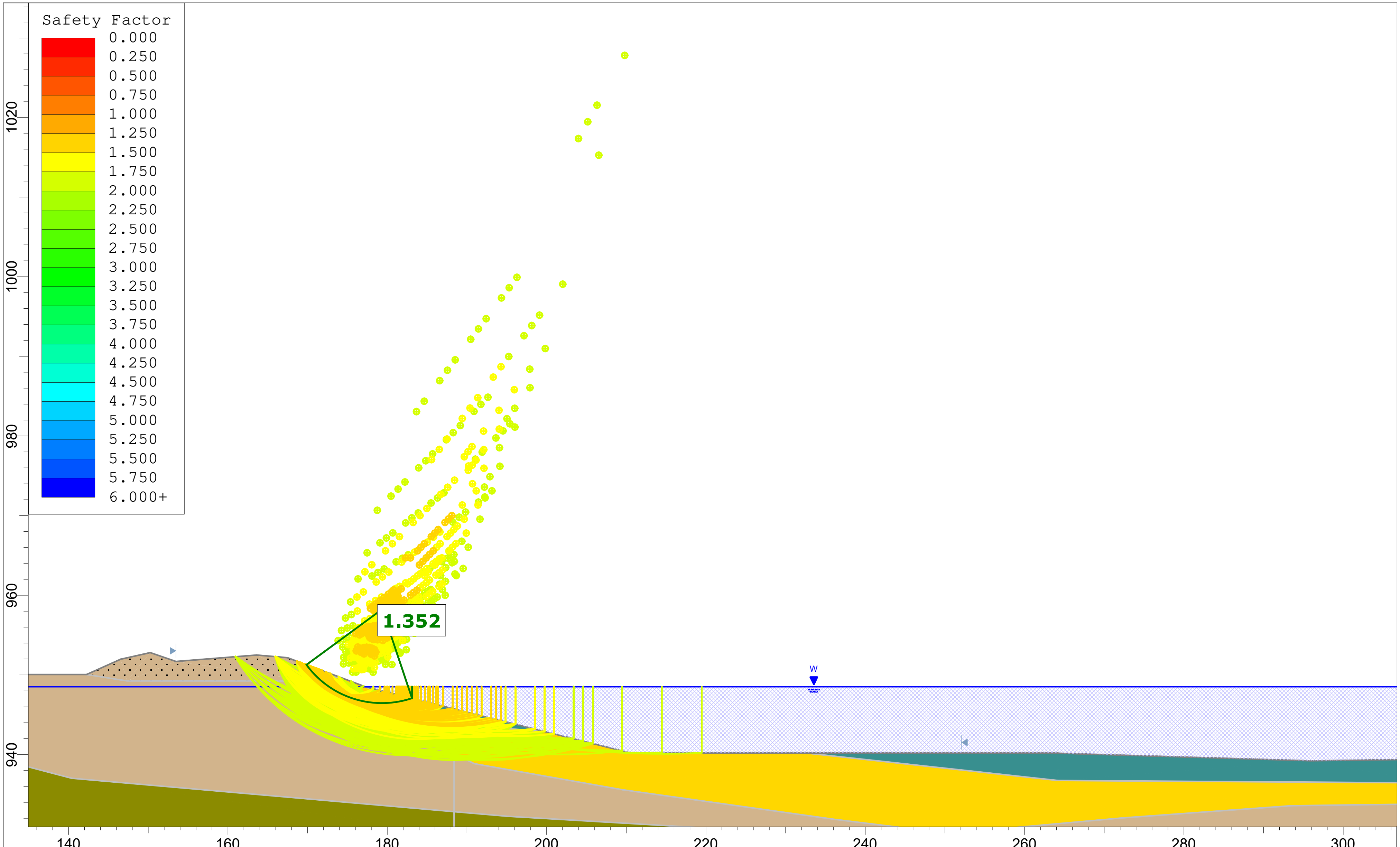
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 3:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_10psf.slmd



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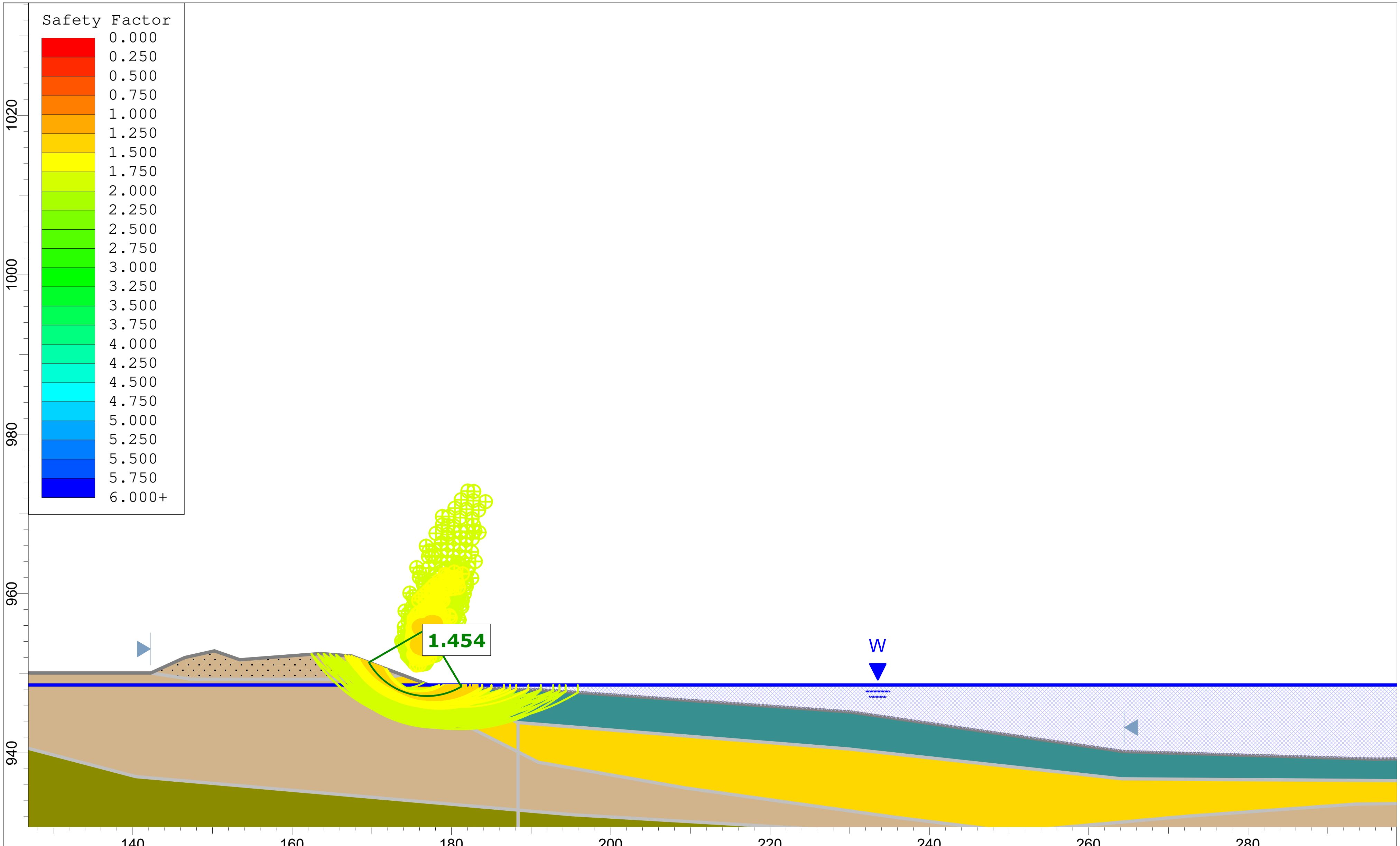
SLIDEINTERPRET 9.034

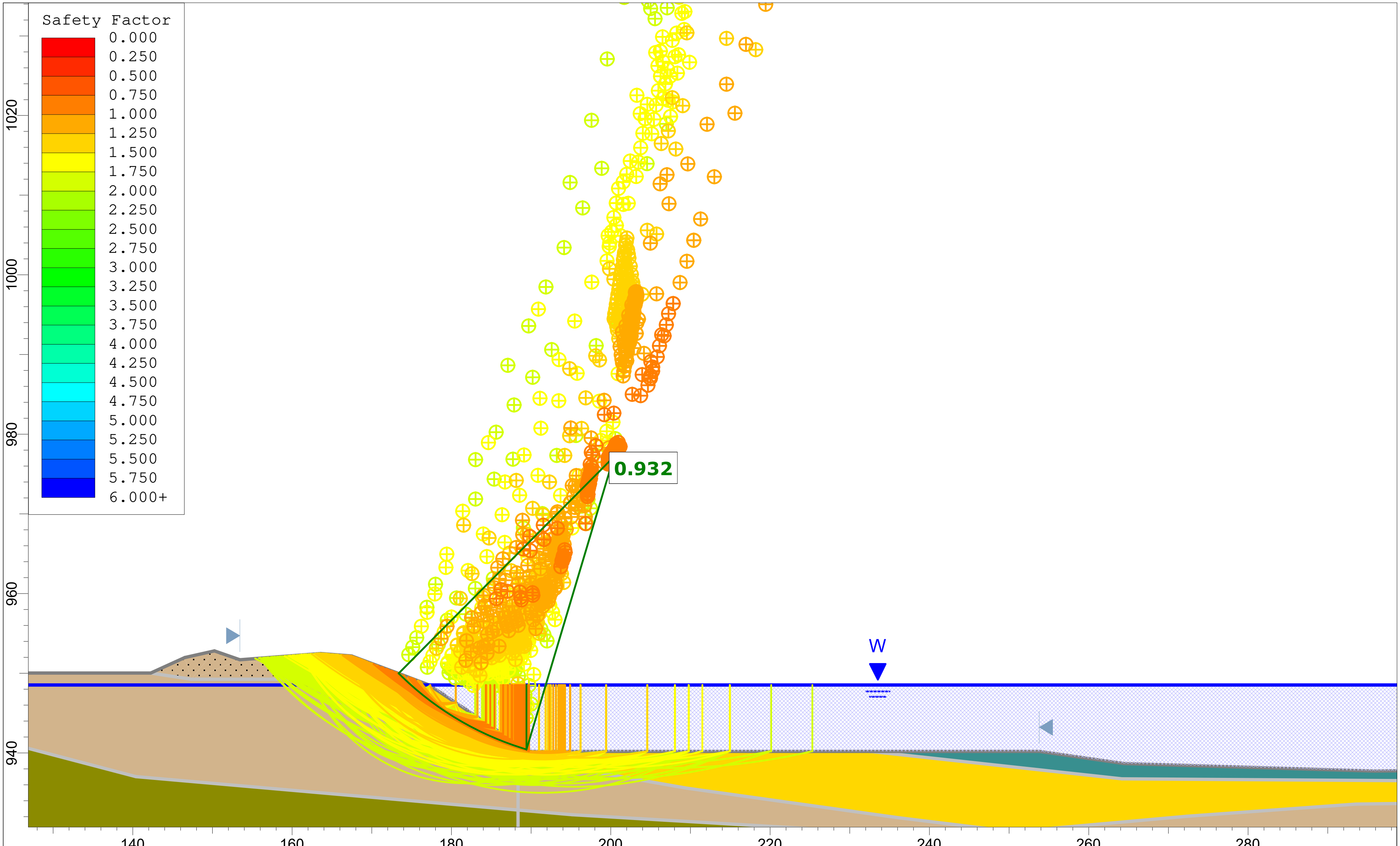
Project	Woods Pond (Housatonic Reach 6)		
Group	West - 4H:1V	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_10psf.slmd



rocscience

SLIDEINTERPRET 9.034

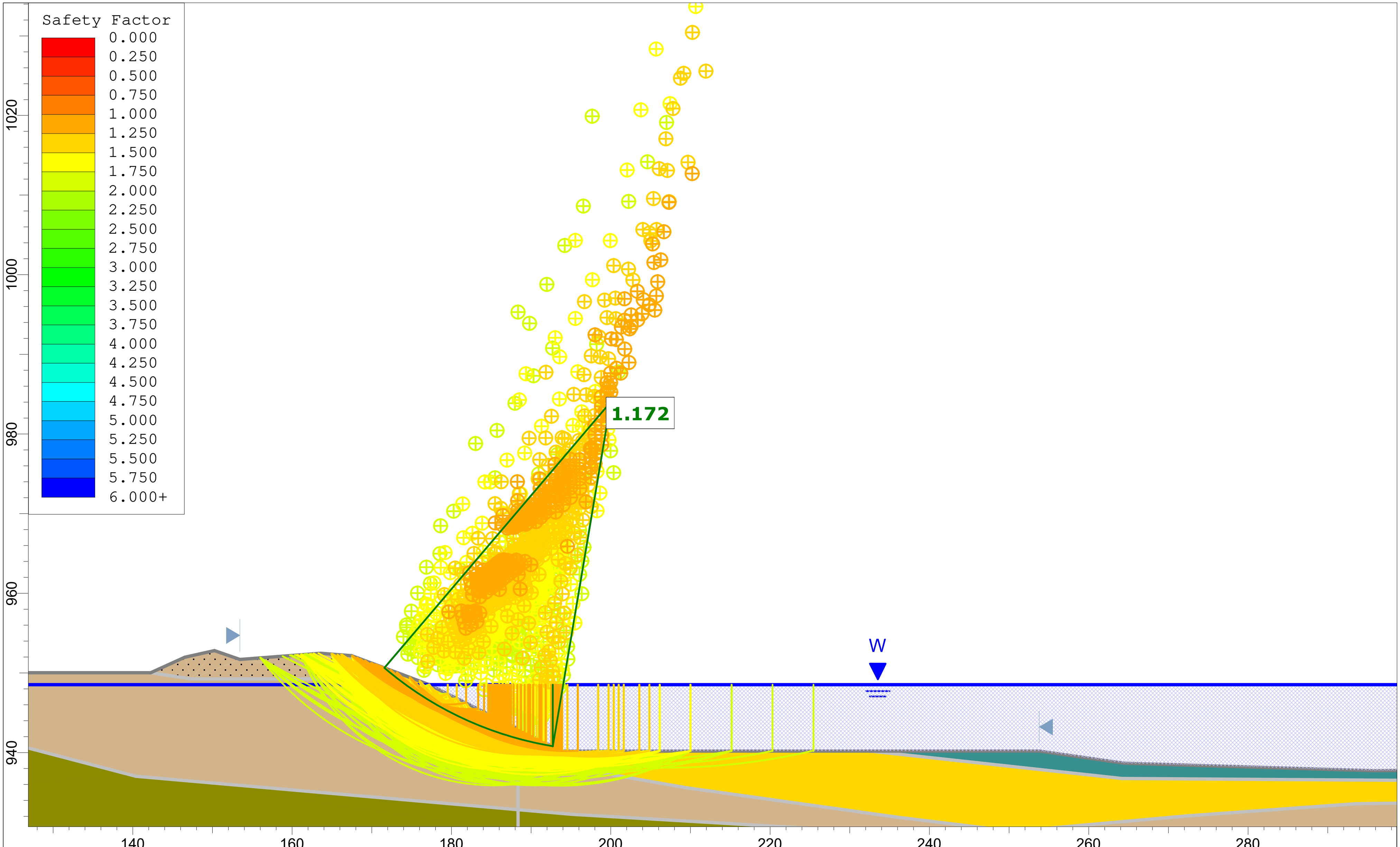
Project	Woods Pond (Housatonic Reach 6)		
Group	West - Left to Right	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1-15psf.slmd



rocscience

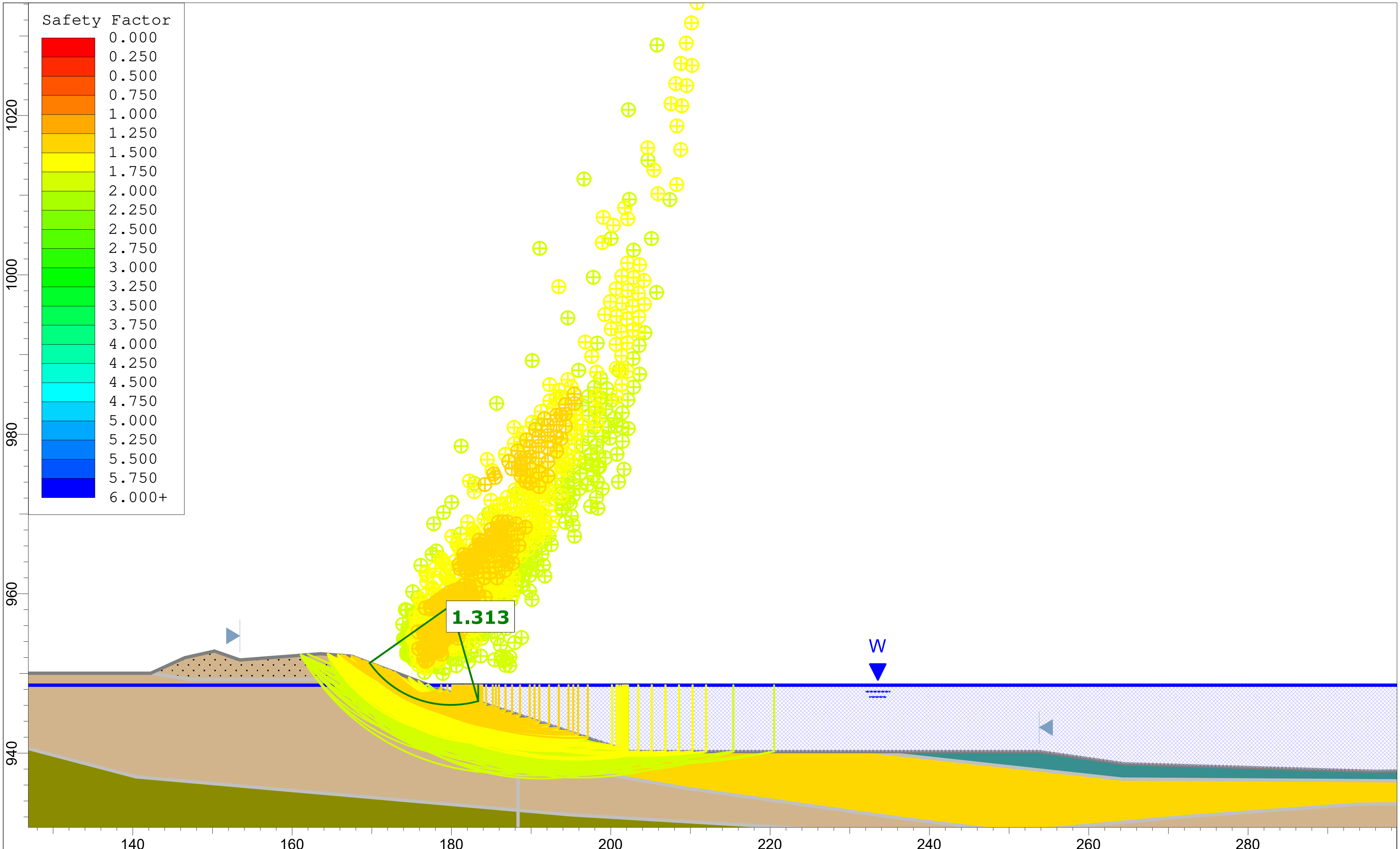
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 1.5:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1-15psf.slmd



Project	Woods Pond (Housatonic Reach 6)		
Group	West - 2:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1-15psf.slmd

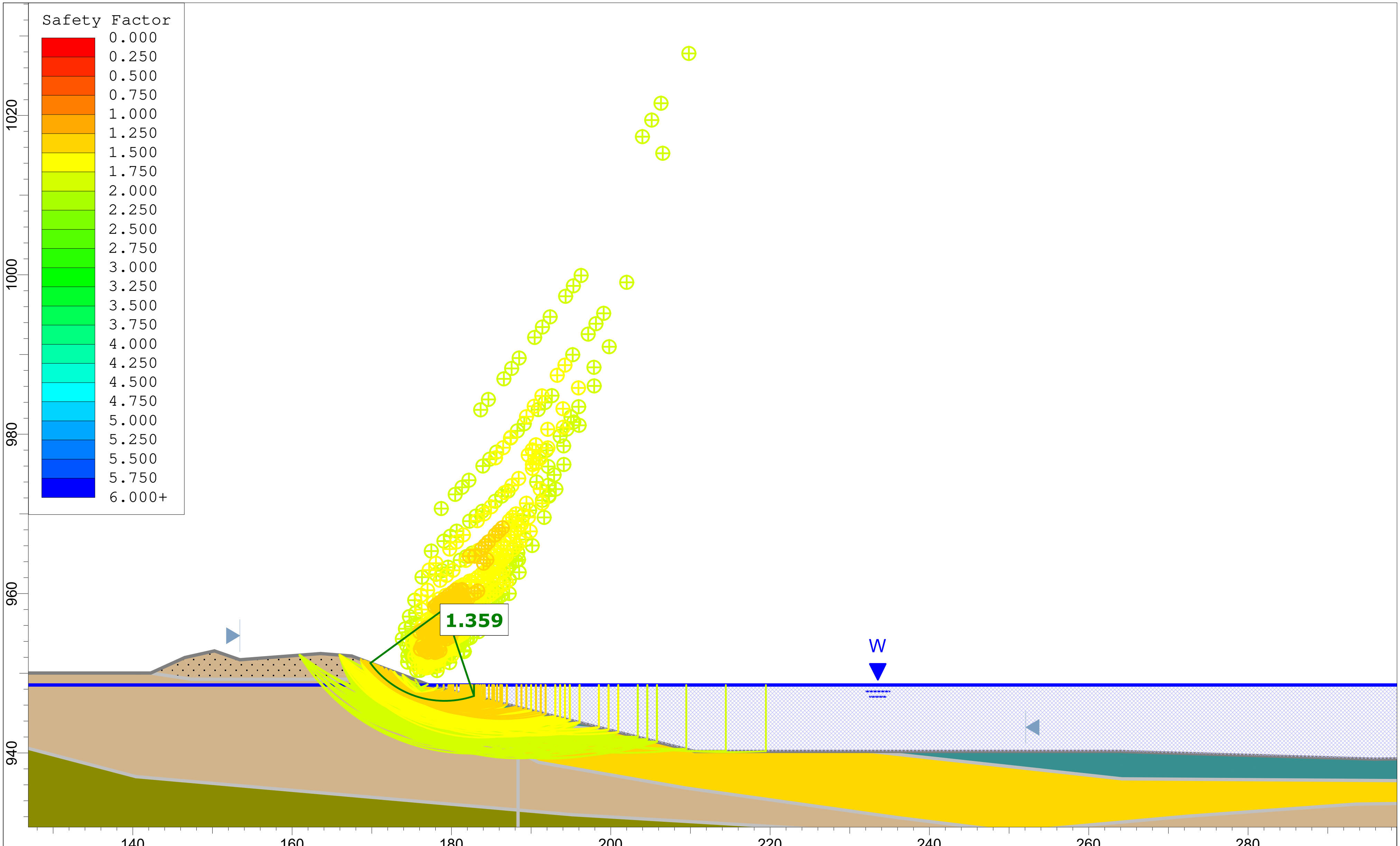
SLIDEINTERPRET 9.034



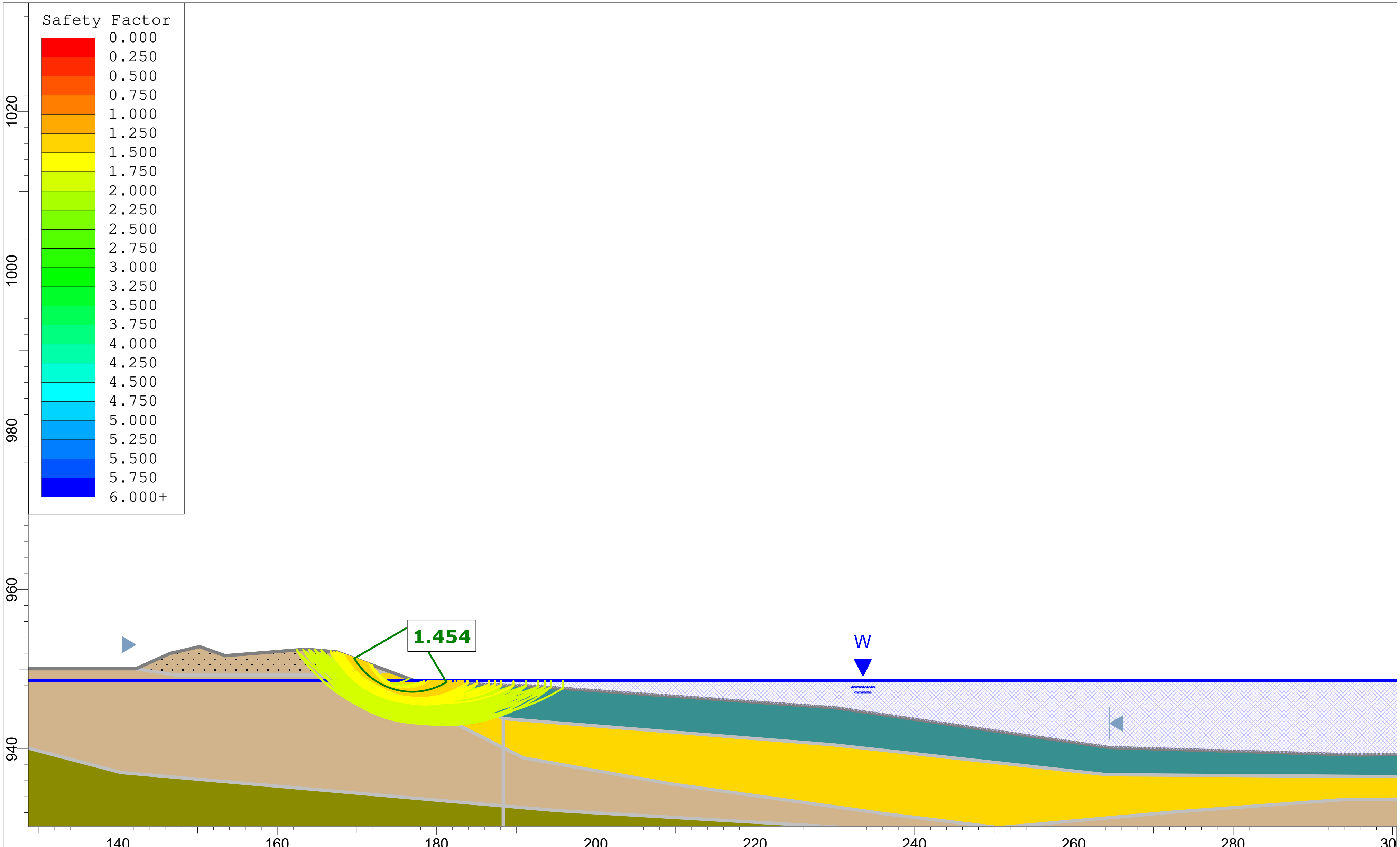
rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 3:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1-15psf.slmd

SLIDEINTERPRET 9.034



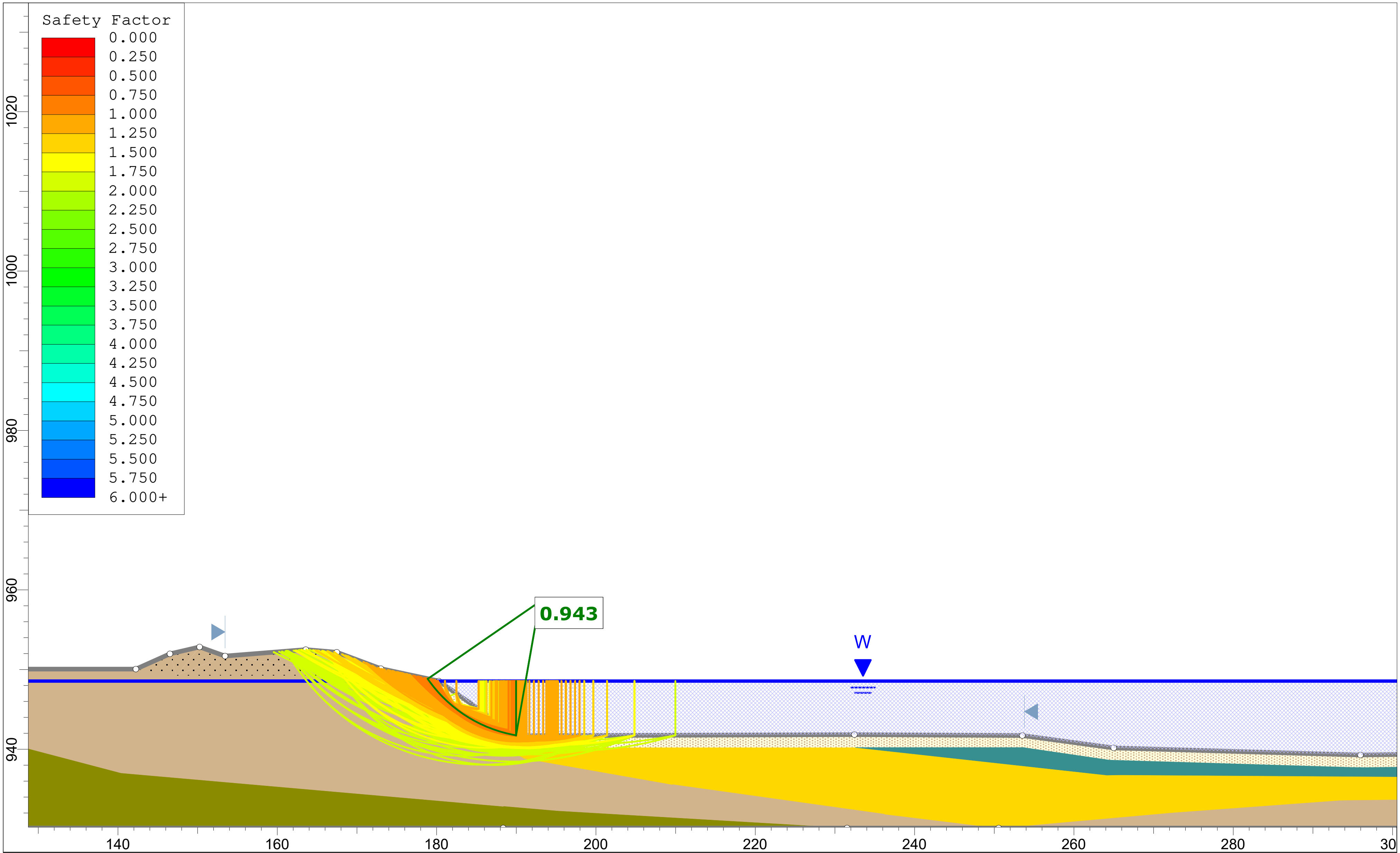
rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group West - 4H:1V	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 1-1-15psf.slmd	



rocscience

SLIDEINTERPRET 9.034

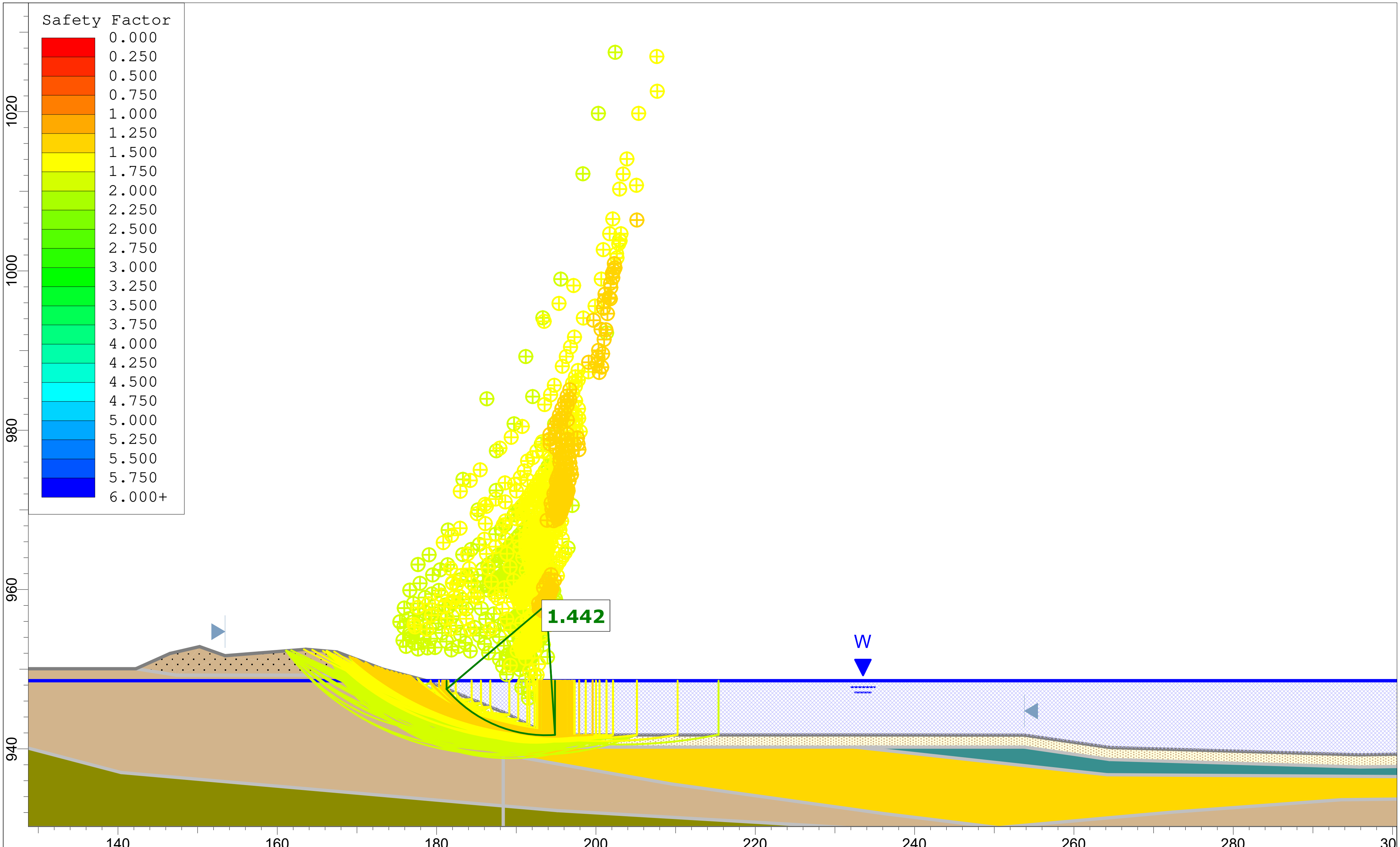
Project	Woods Pond (Housatonic Reach 6)		
Group	West - Left to Right	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1-15psf-Cap.slmd



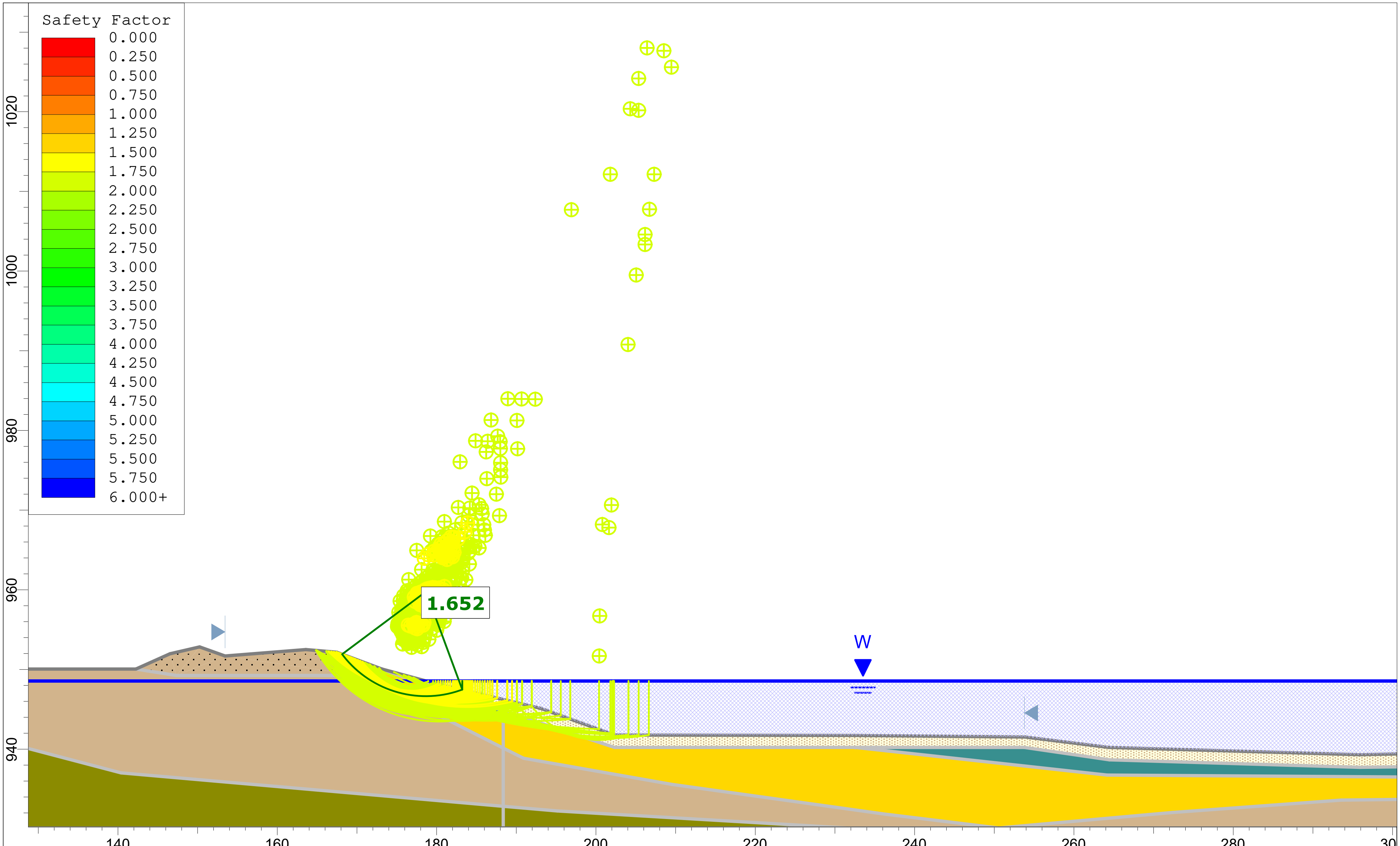
rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 1.5:1	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1-15psf-Cap.slmd

SLIDEINTERPRET 9.034



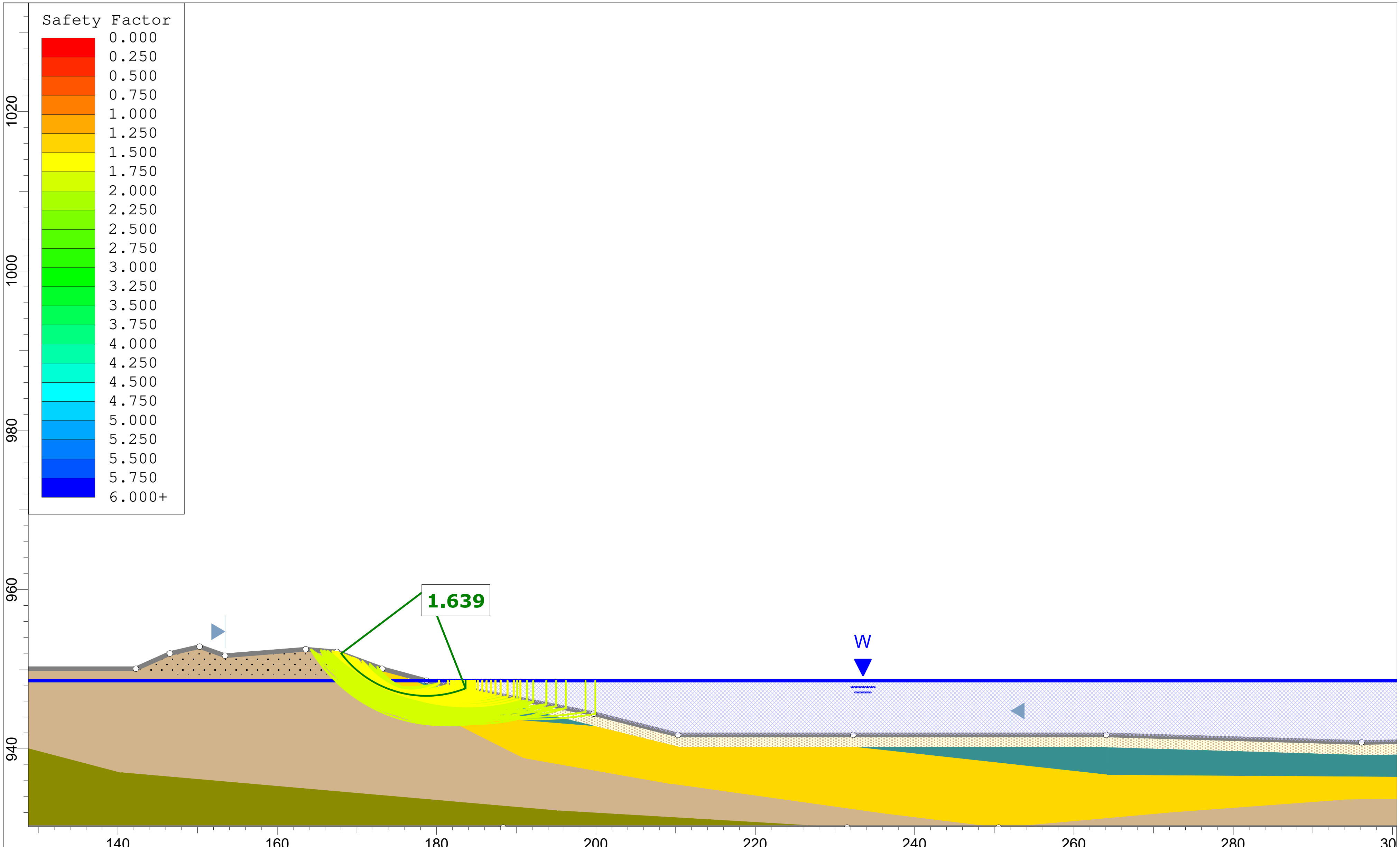
rocscience	Project	Woods Pond (Housatonic Reach 6)	
	Group: West - 2:1	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 1-1-15psf-Cap.slmd	



rocscience

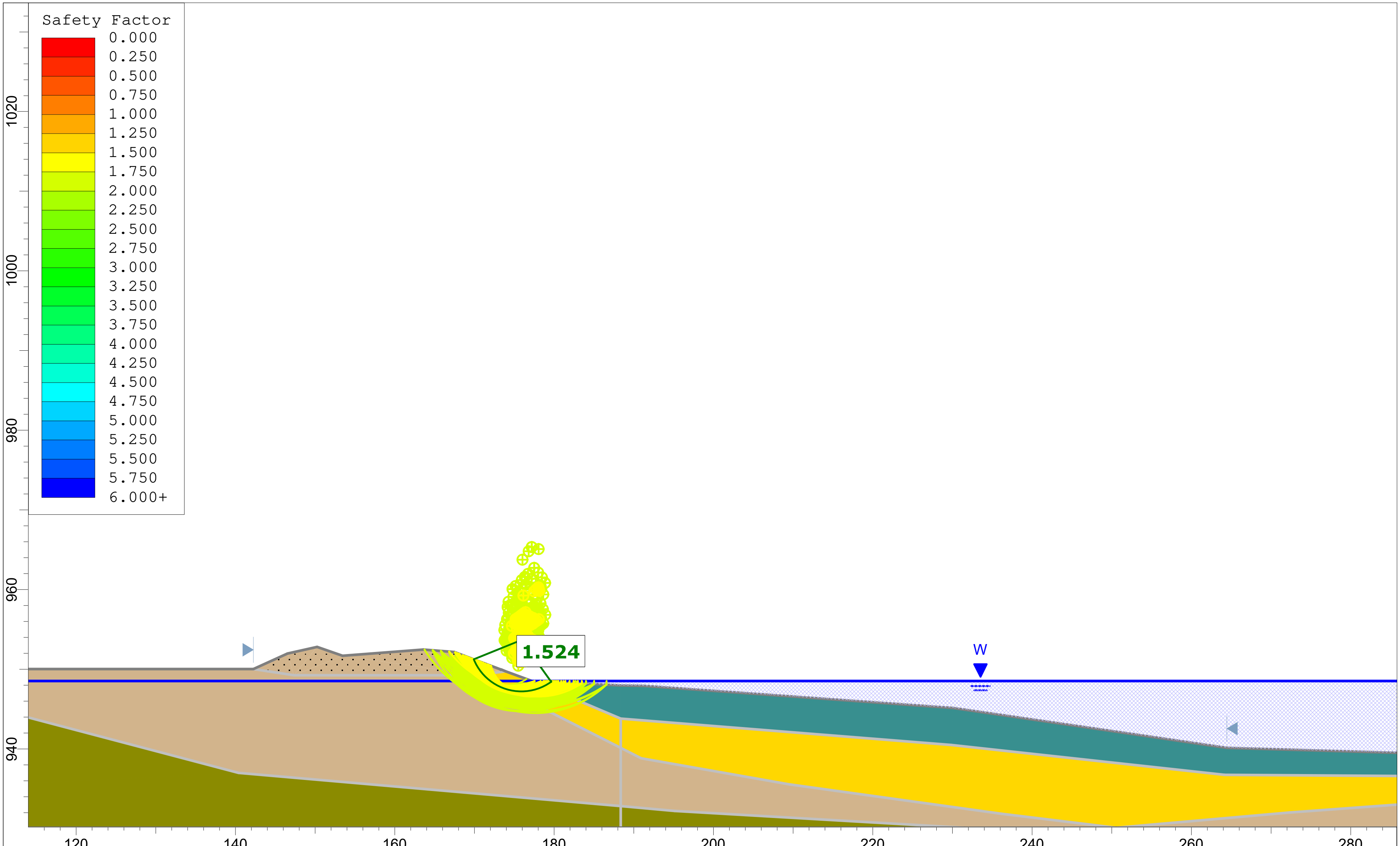
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 3:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1-15psf-Cap.slmd

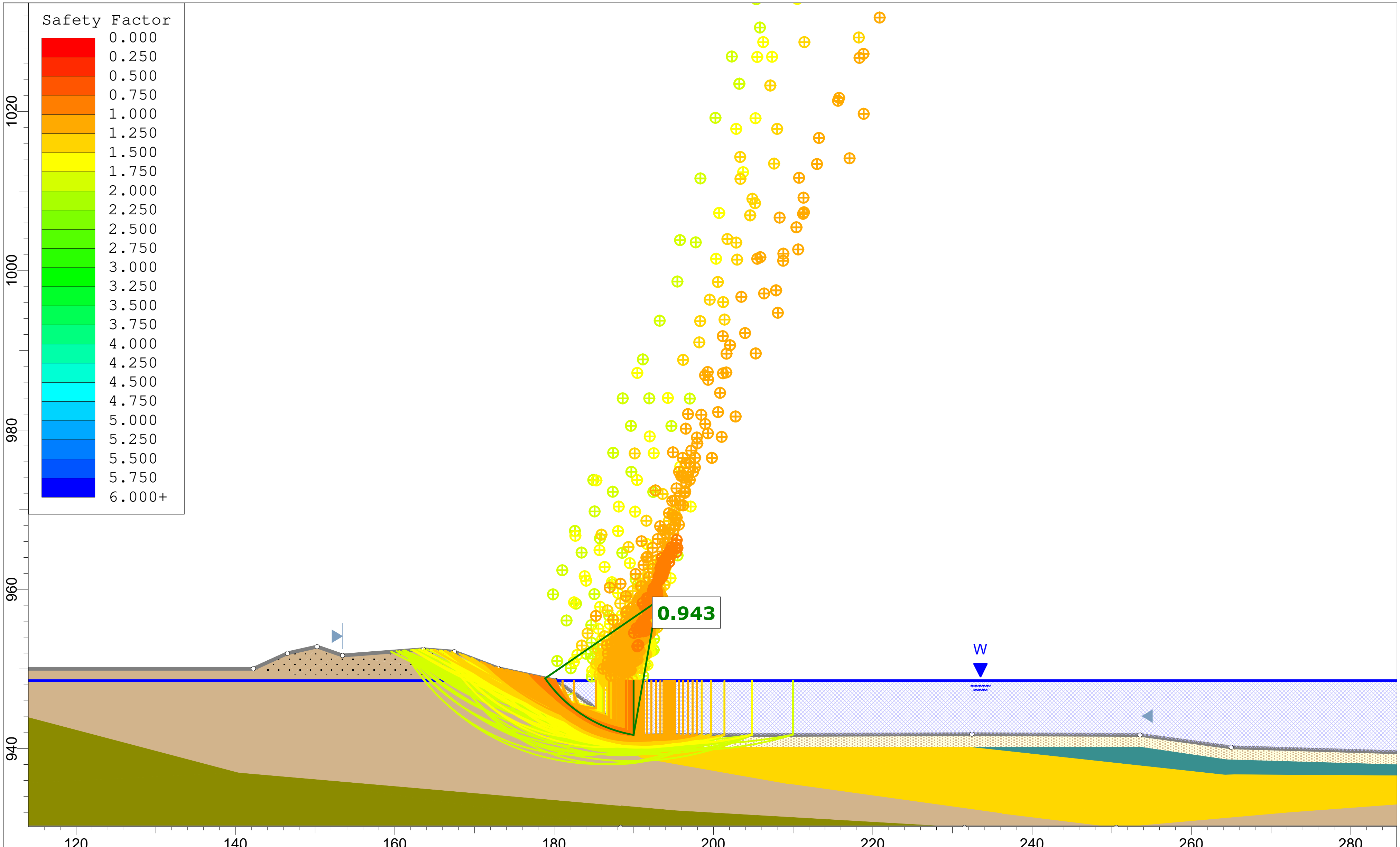


Project	Woods Pond (Housatonic Reach 6)		
Group	West - 4H:1V	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 1-1-15psf-Cap.slmd

SLIDEINTERPRET 9.034



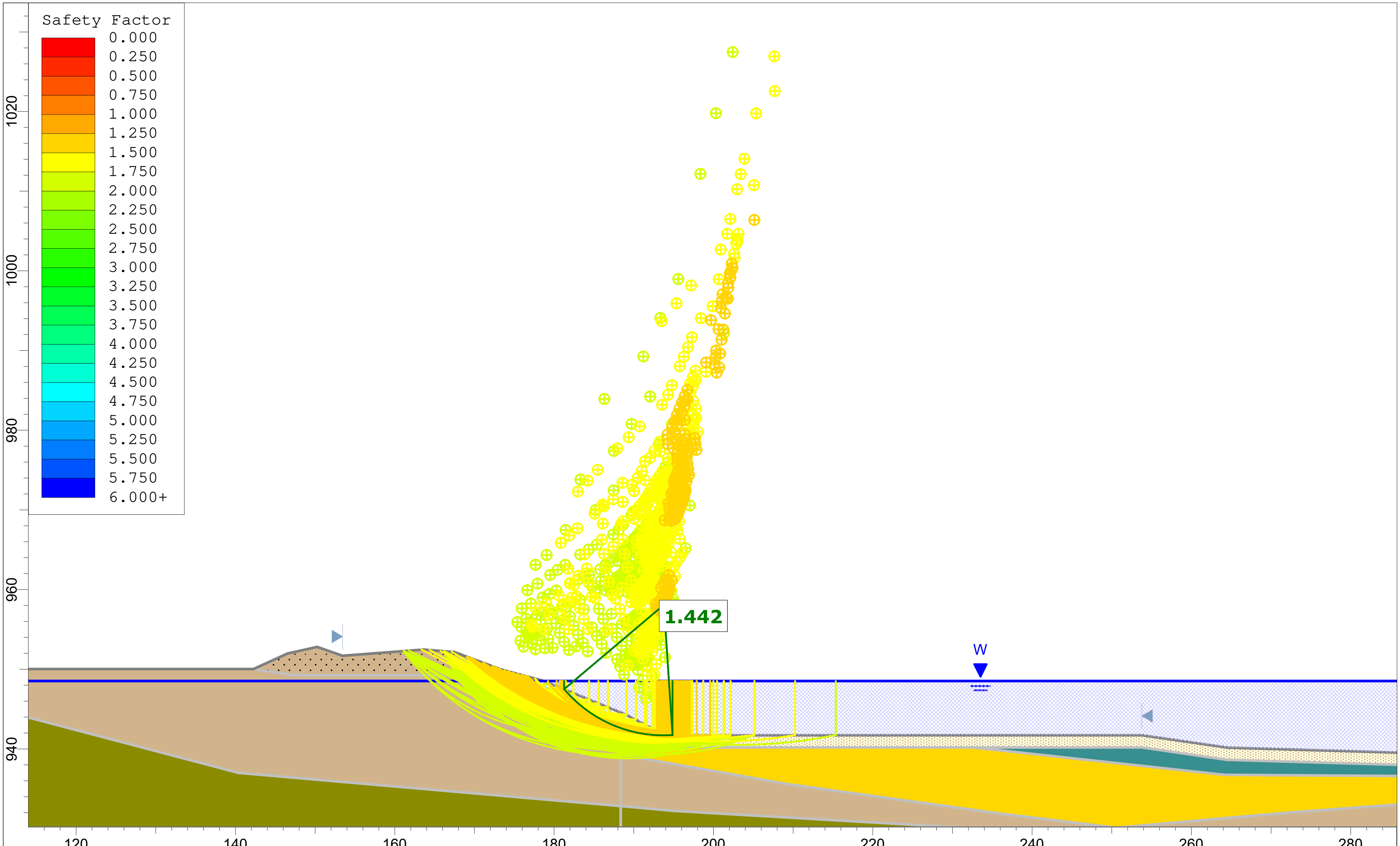
rocscience	Project	Woods Pond (Housatonic Reach 6)	
	Group: West - Left to Right	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 1-1_065ratio-Cap.slmd	



rocscience

SLIDEINTERPRET 9.034

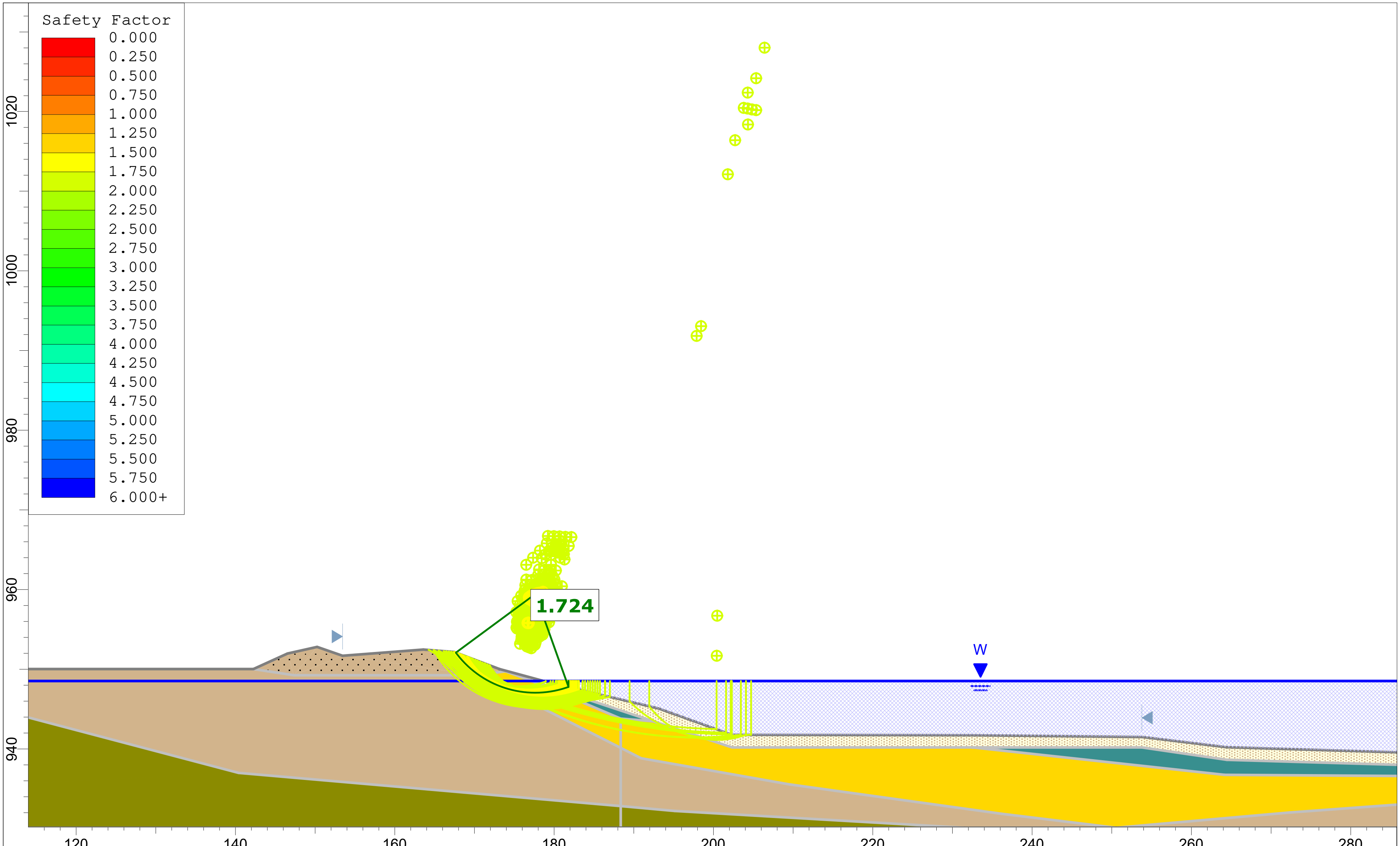
Project	Woods Pond (Housatonic Reach 6)		
Group	West - 1.5:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

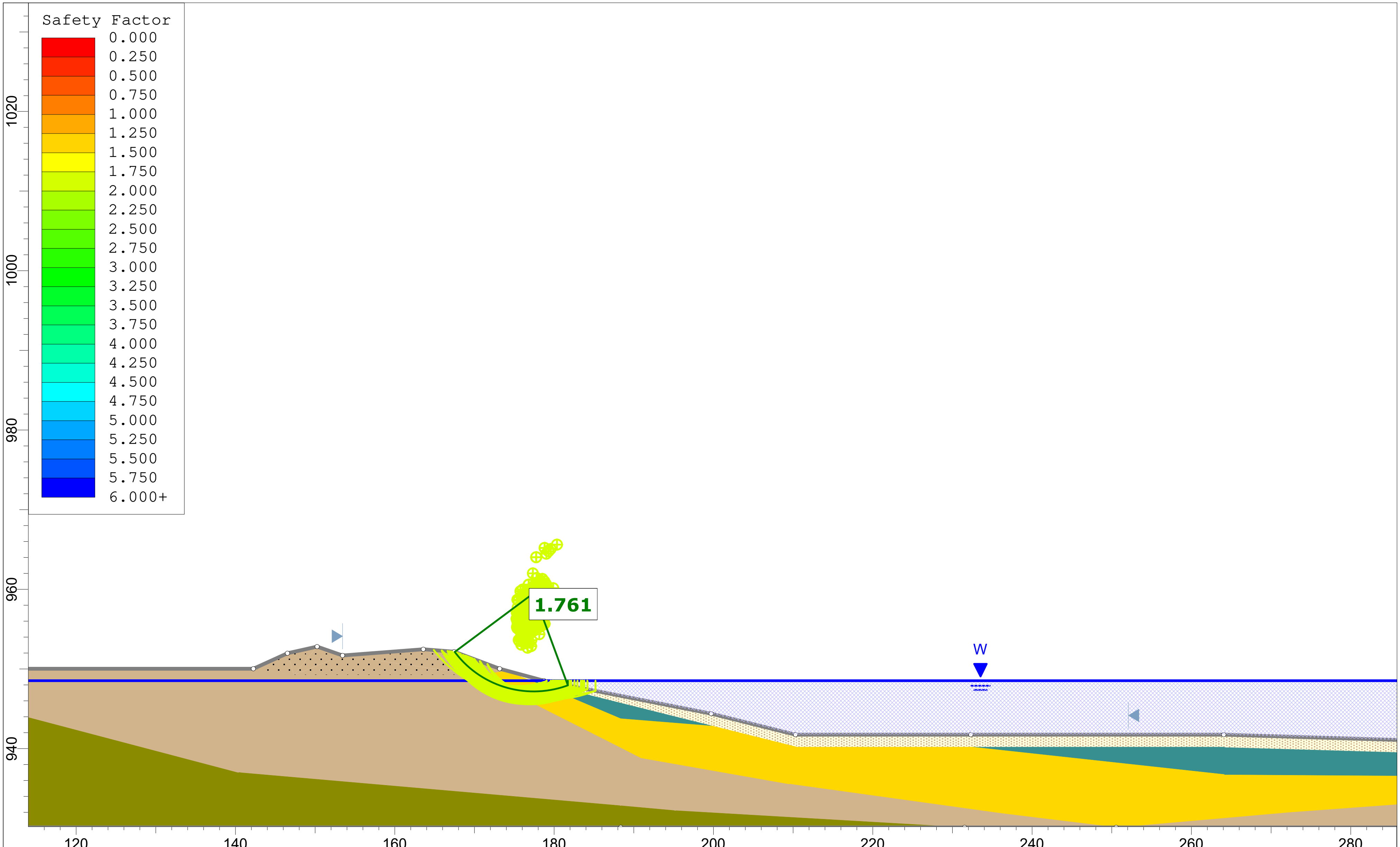
Project	Woods Pond (Housatonic Reach 6)		
Group	West - 2:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio-Cap.slmd



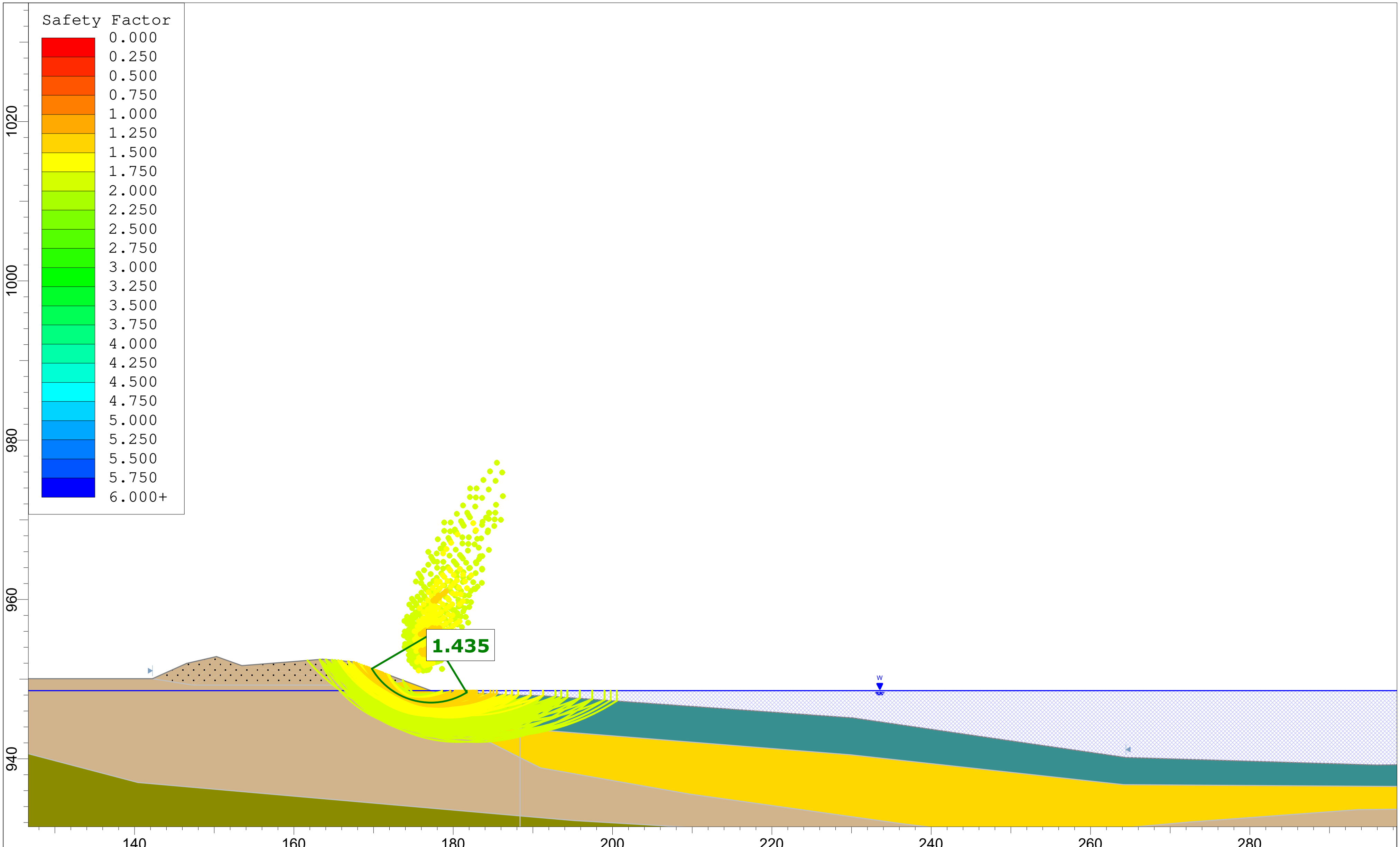
rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	West - 3:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio-Cap.slmd



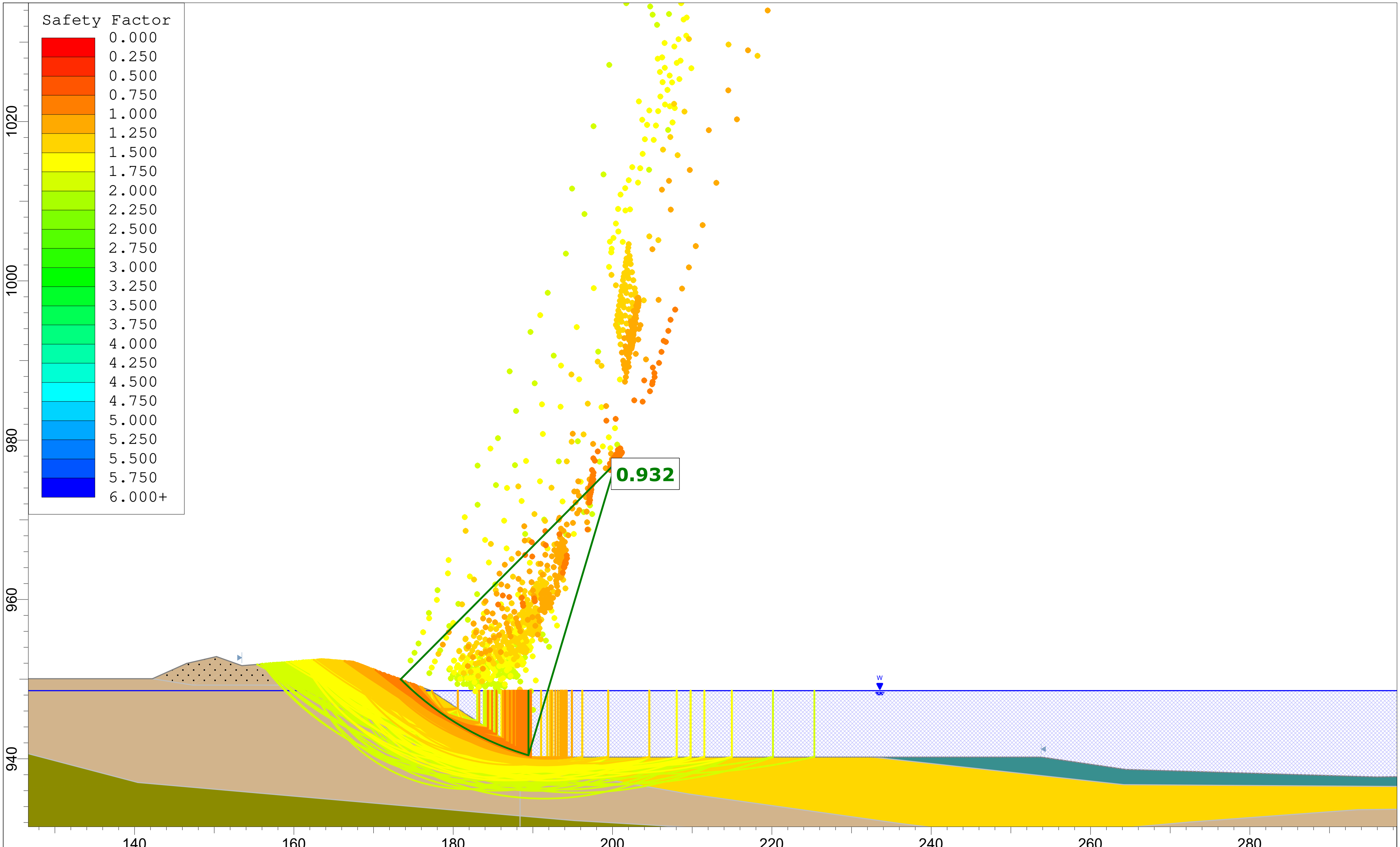
rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group West - 4H:1V	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 1-1_065ratio-Cap.slmd	



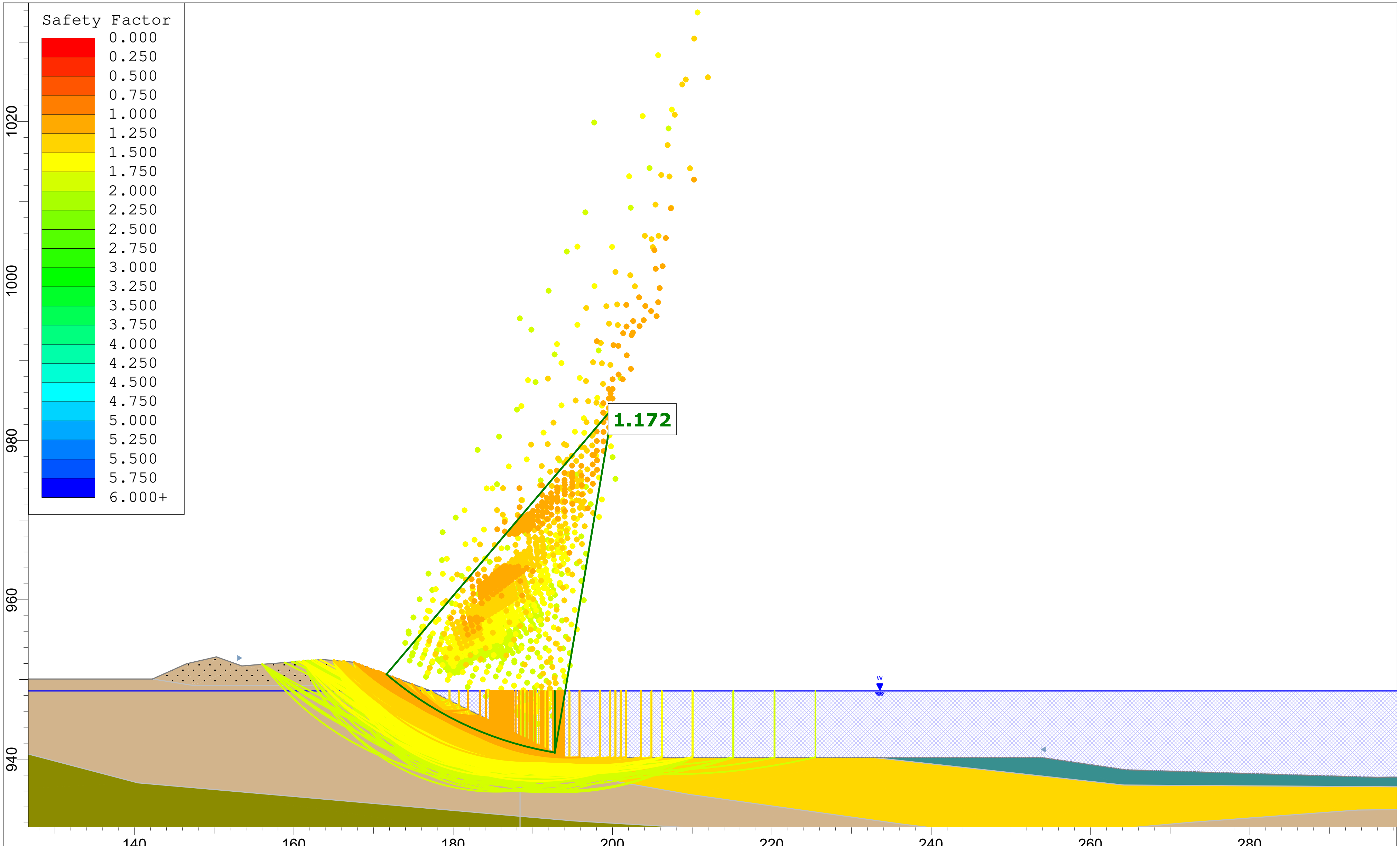
rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	West - Left to Right	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio.slmd



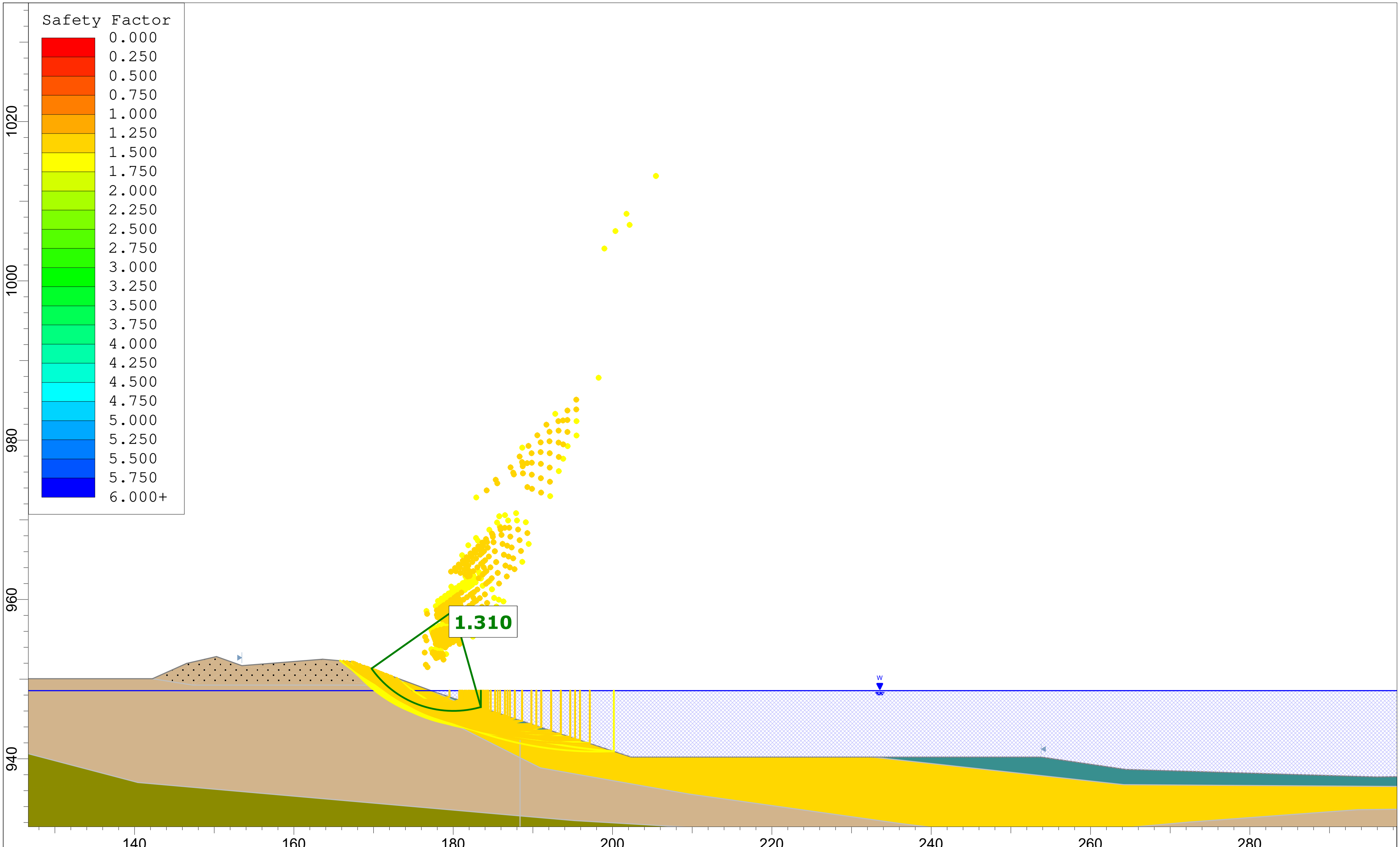
rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group West - 1.5:1	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 1-1_065ratio.slmd	



rocscience

SLIDEINTERPRET 9.034

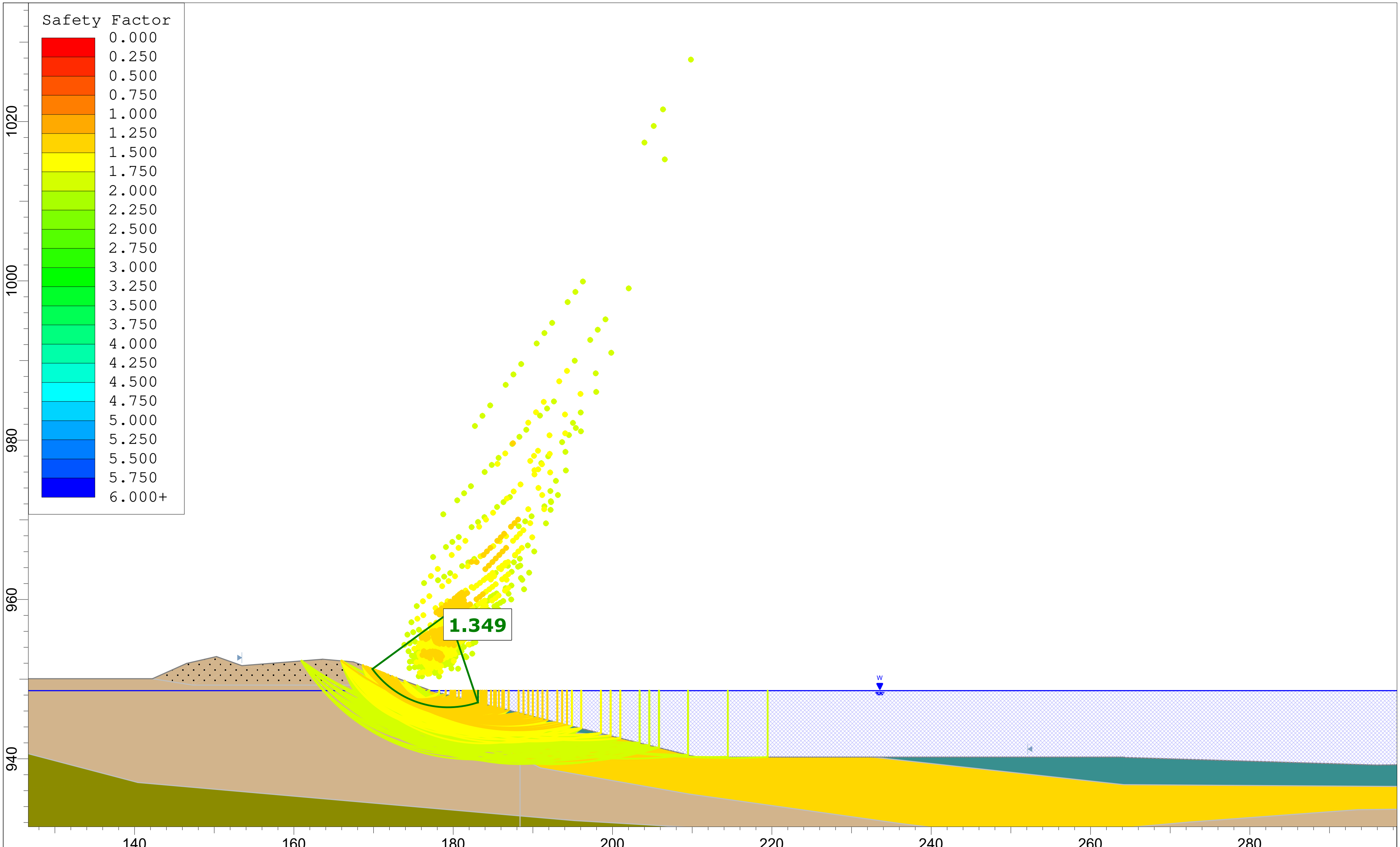
Project	Woods Pond (Housatonic Reach 6)		
Group	West - 2:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio.slmd



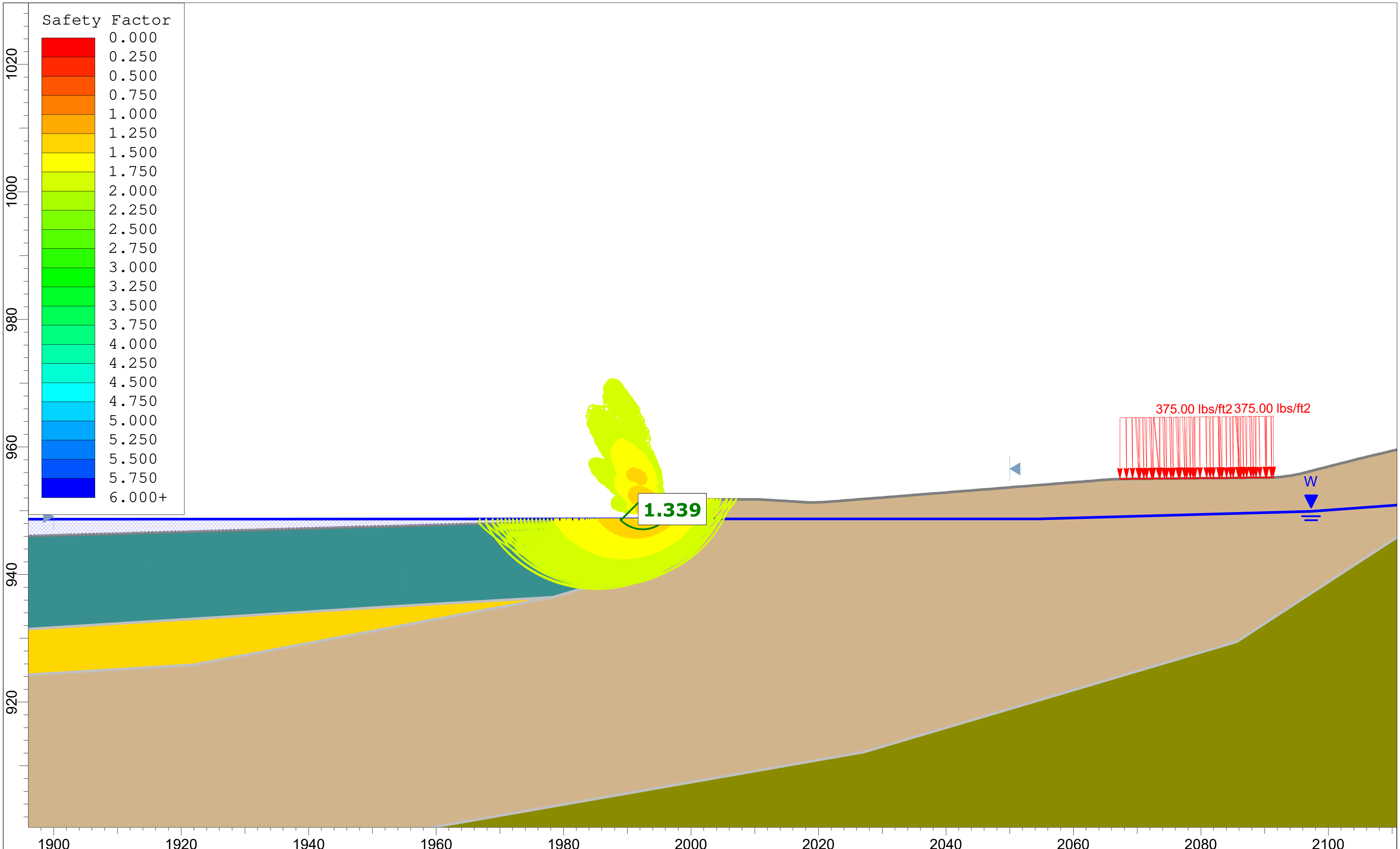
rocscience

SLIDEINTERPRET 9.034

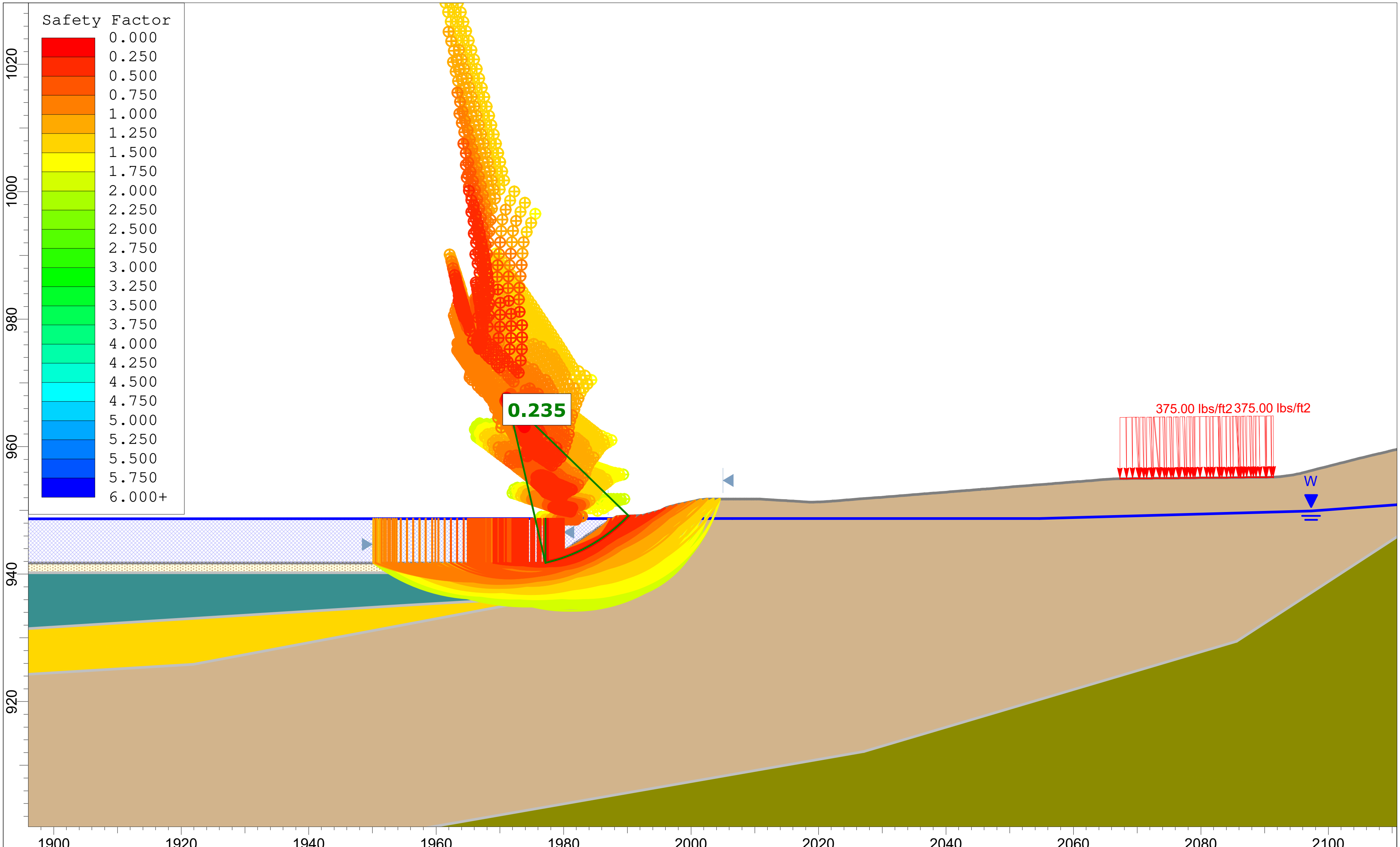
Project	Woods Pond (Housatonic Reach 6)		
Group	West - 3:1	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 1-1_065ratio.slmd



rocscience	Project	Woods Pond (Housatonic Reach 6)	
	Group: West - 4H:1V	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 1-1_065ratio.slmd	



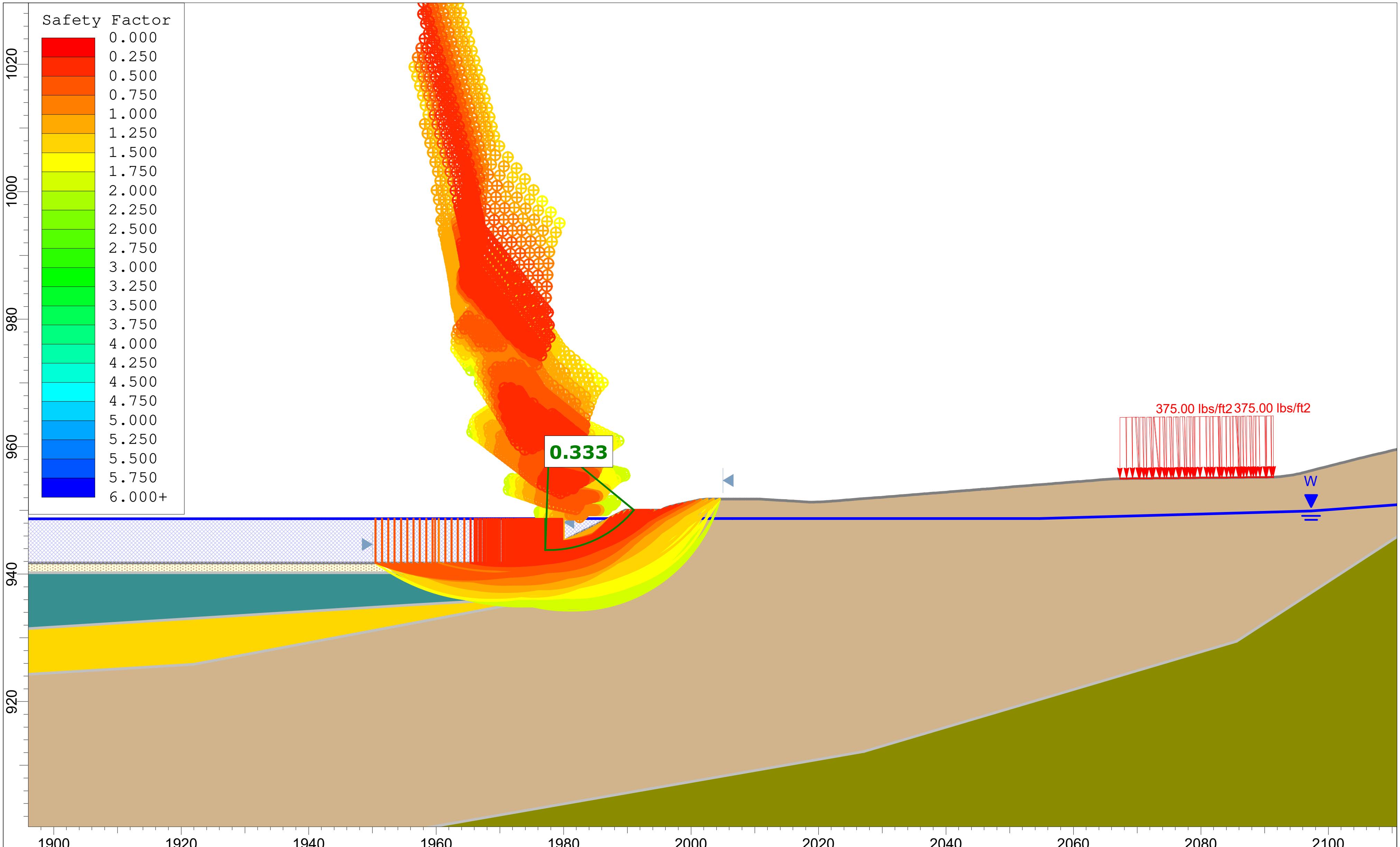
rocscience	*Project*	Woods Pond (Housatonic Reach 6)	
	Group Existing Conditions	*Scenario* Existing Conditions	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 3-3 East_10psf-cap.slmd	



rocscience

SLIDEINTERPRET 9.034

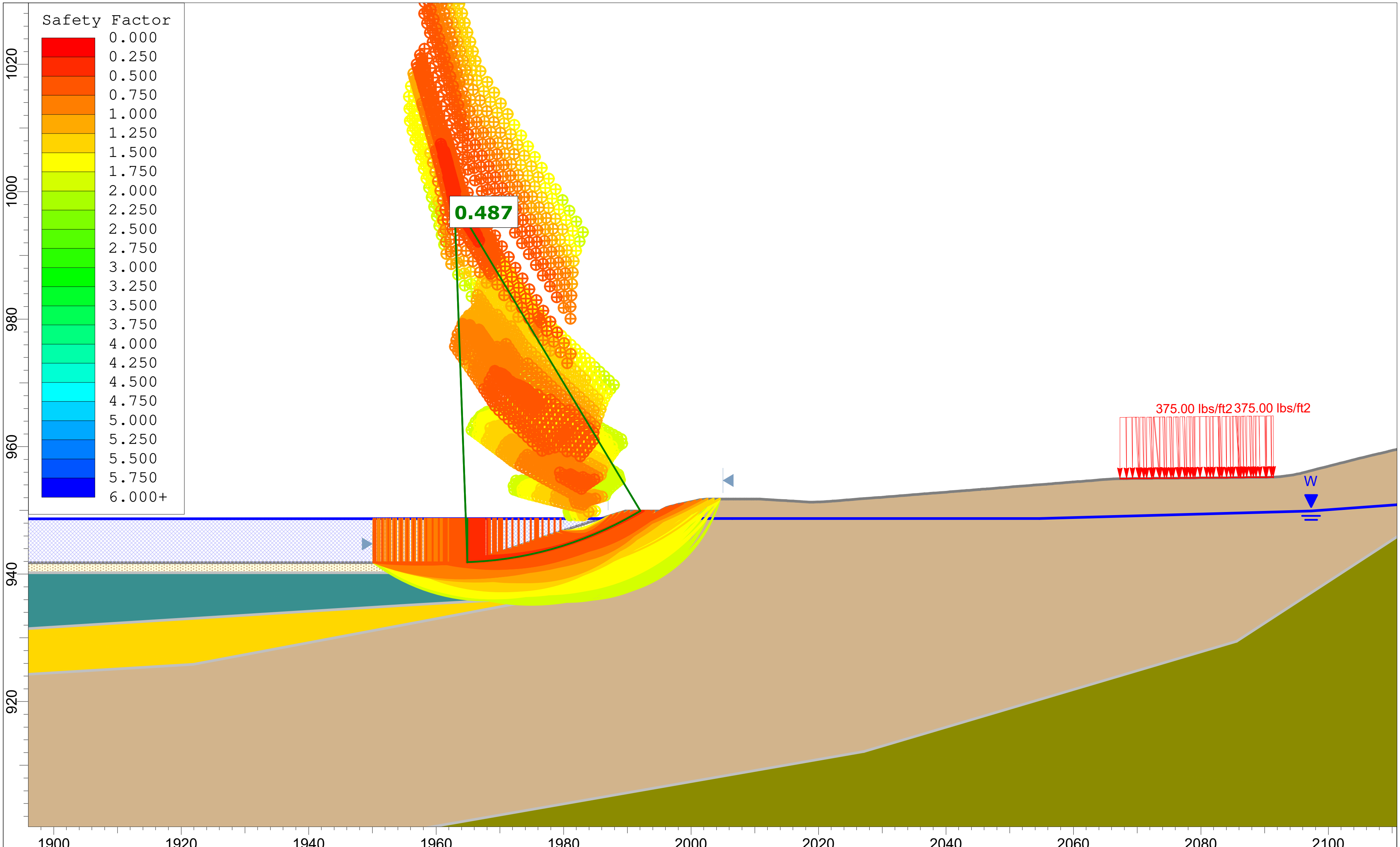
Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	*Scenario*	1.5H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_10psf-cap.slmd



rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	*Scenario*	2H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_10psf-cap.slmd



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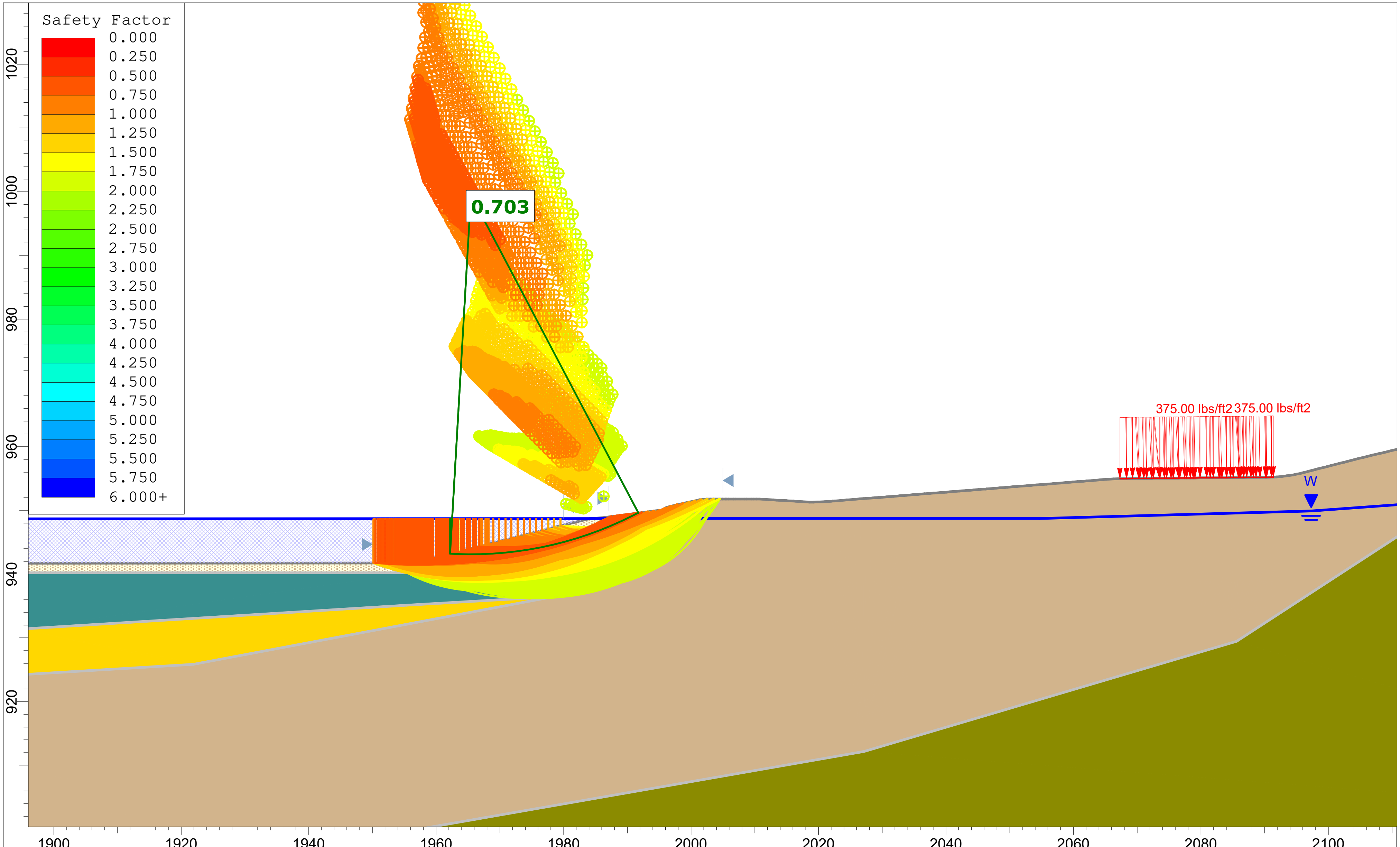
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	3H:1V Dredge	*Scenario*	3H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_10psf-cap.slmd



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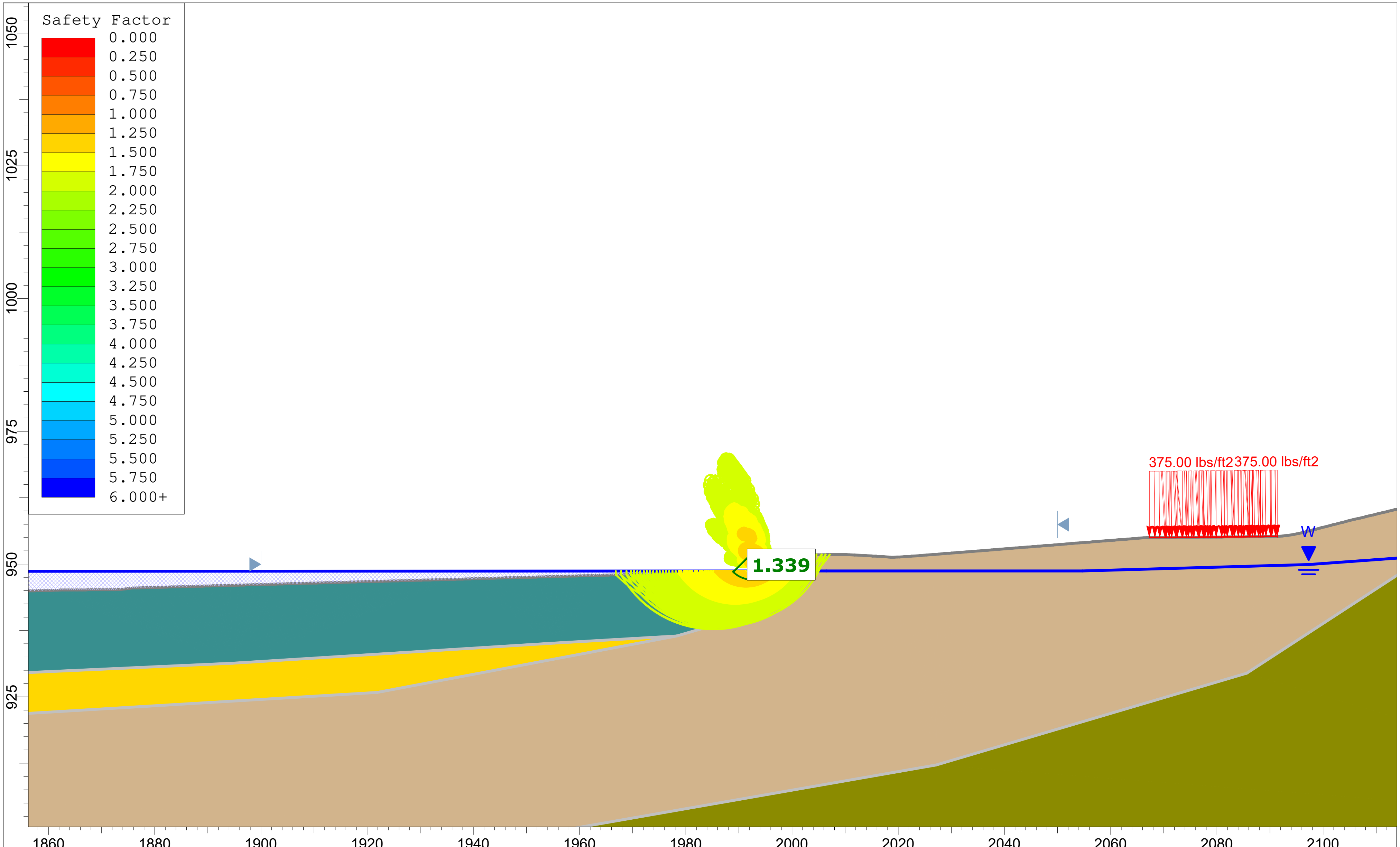
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	4H:1V Dredge	*Scenario*	4H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_10psf-cap.slmd



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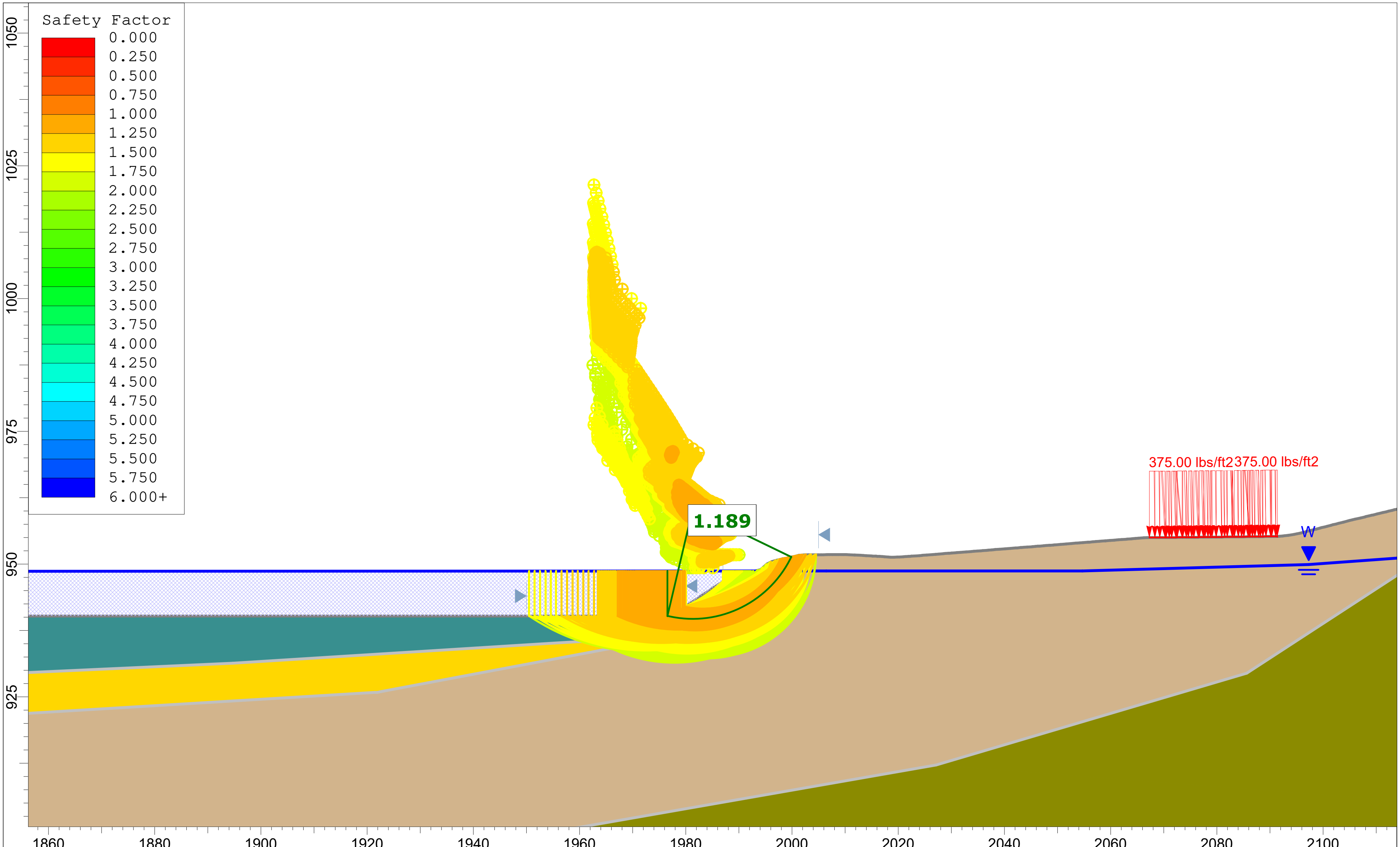
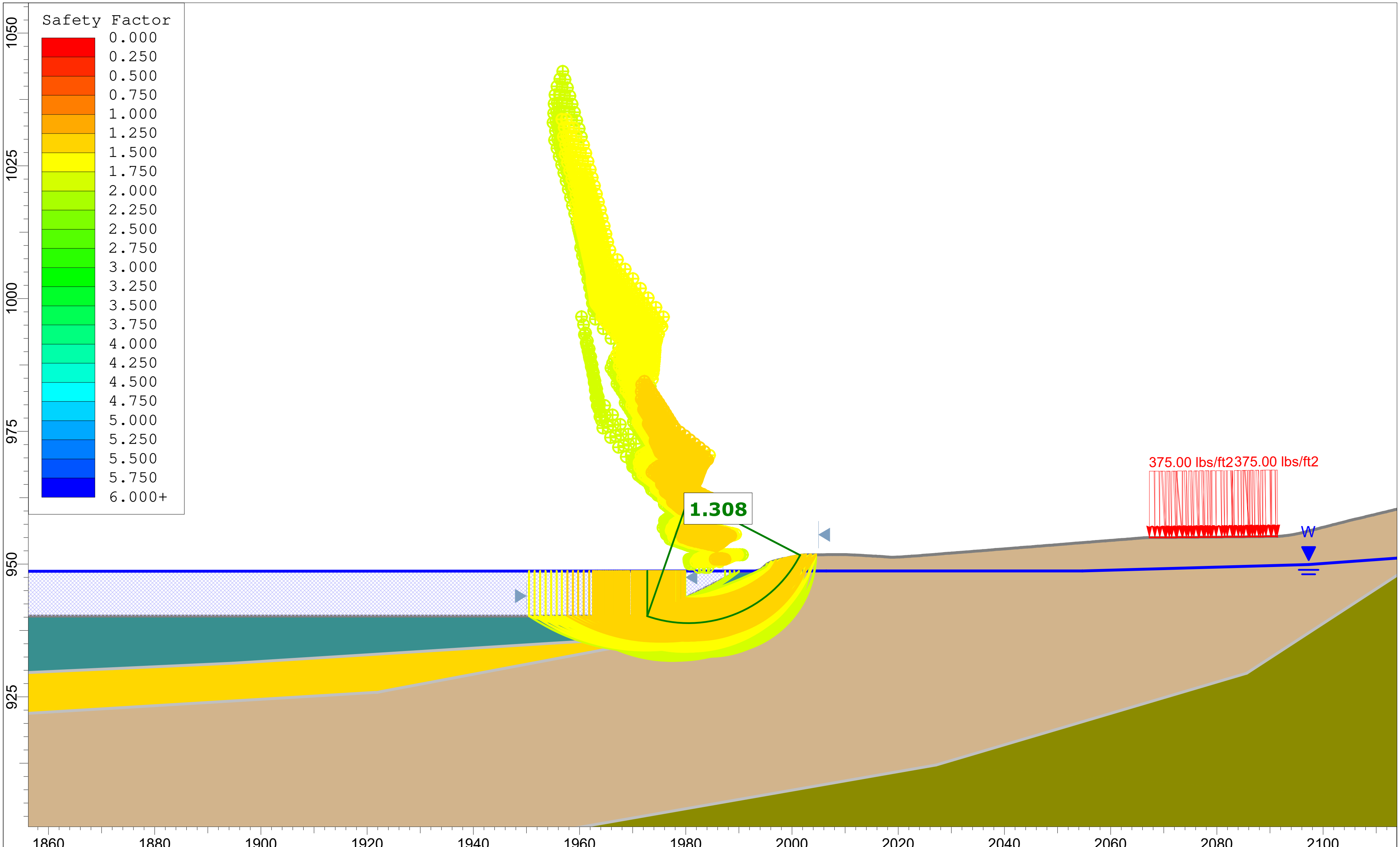
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	Existing Conditions	*Scenario*	Existing Conditions
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_10psf.slmd



Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	Scenario	1.5H:1V Dredge
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 3-3 East_10psf.slmd

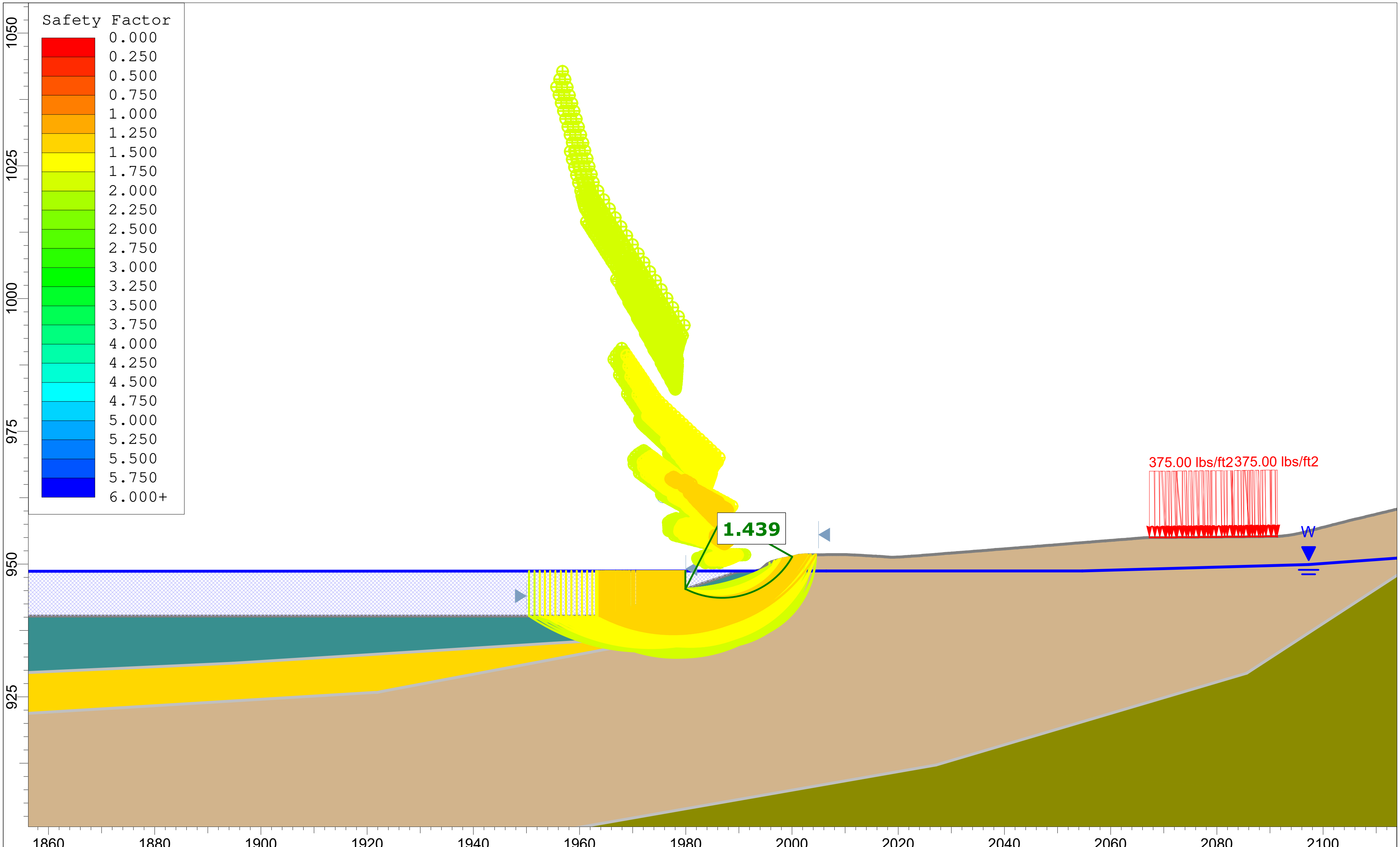
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

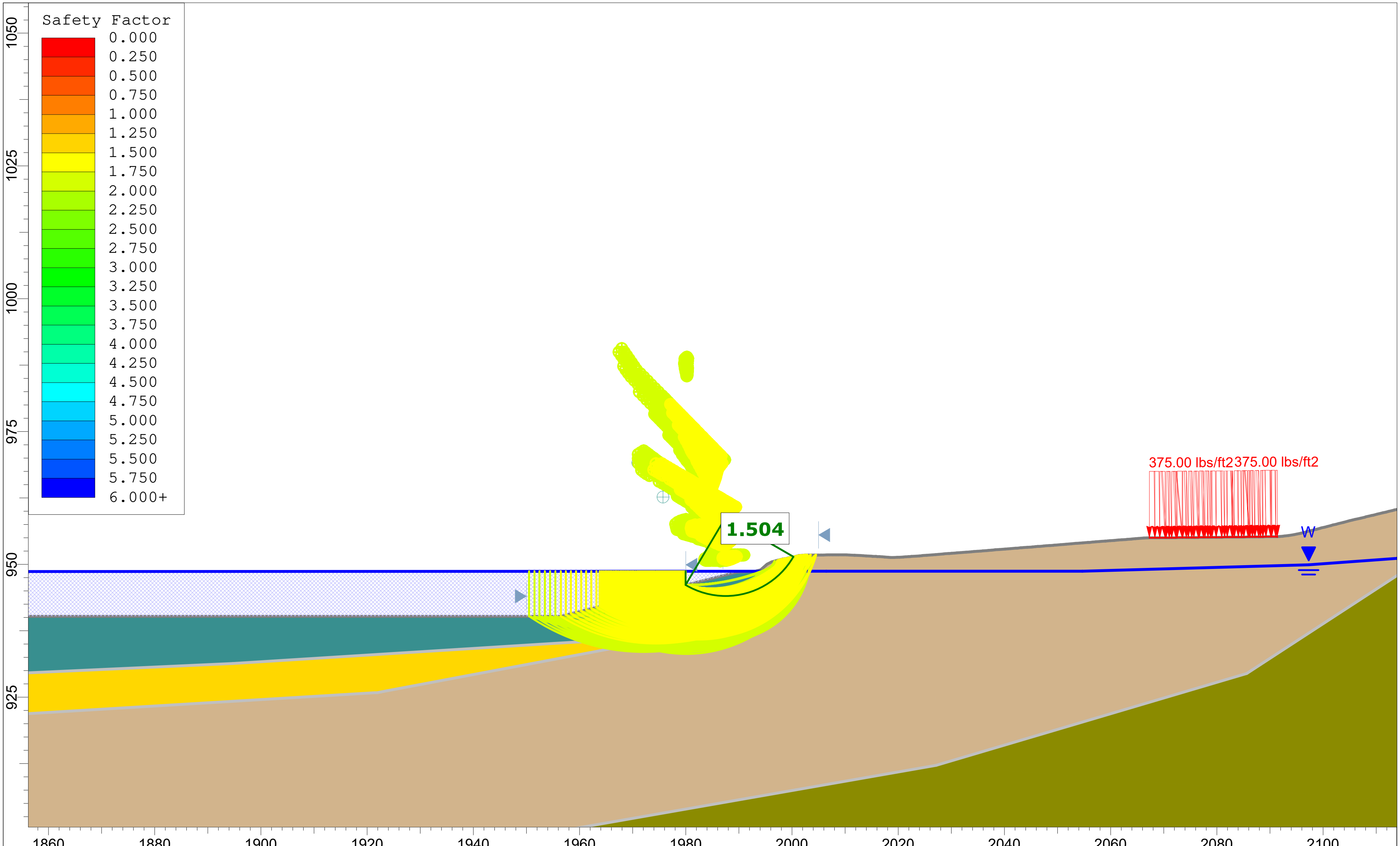
Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	*Scenario*	2H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_10psf.slmd



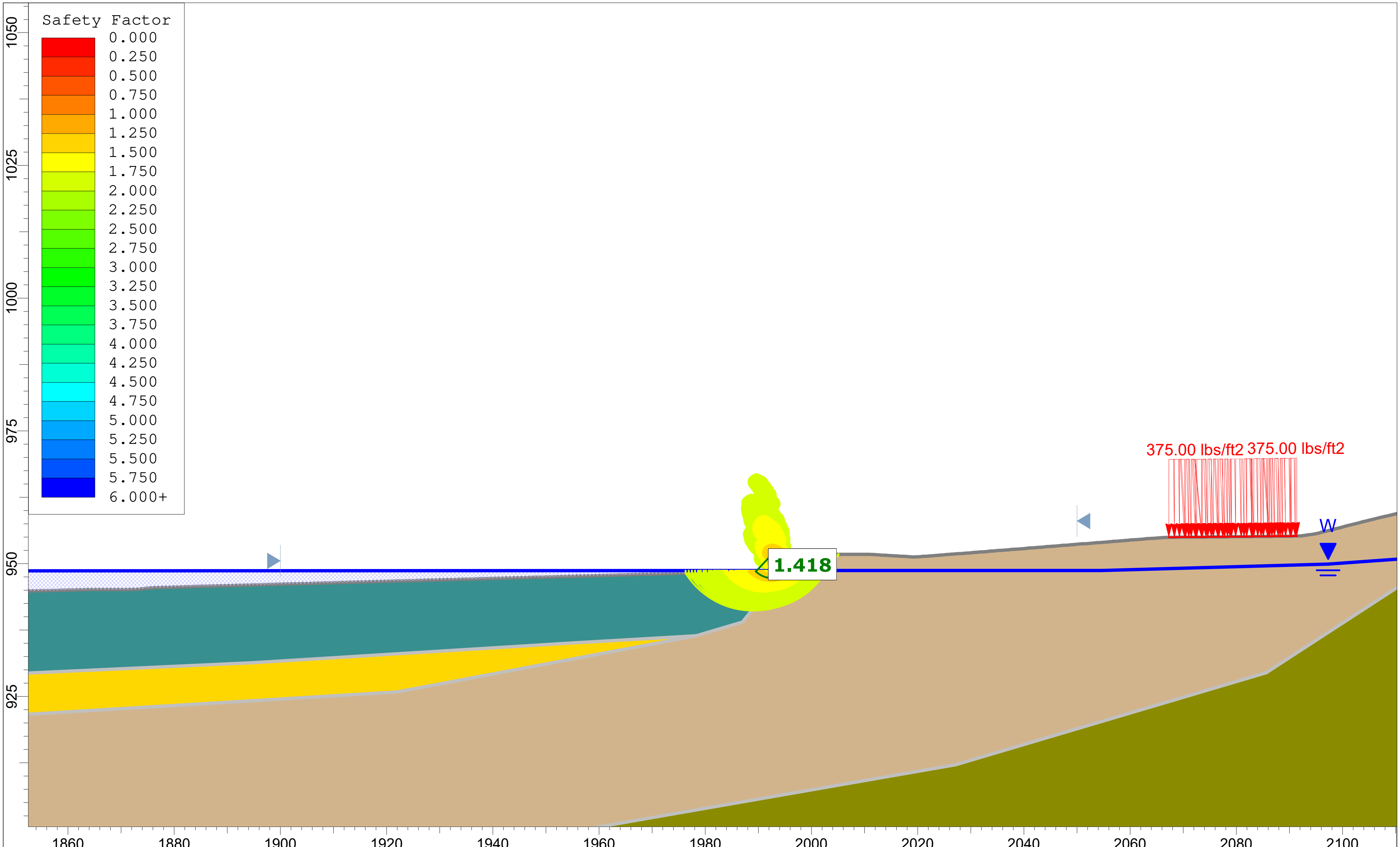
rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	3H:1V Dredge	*Scenario*	3H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_10psf.slmd



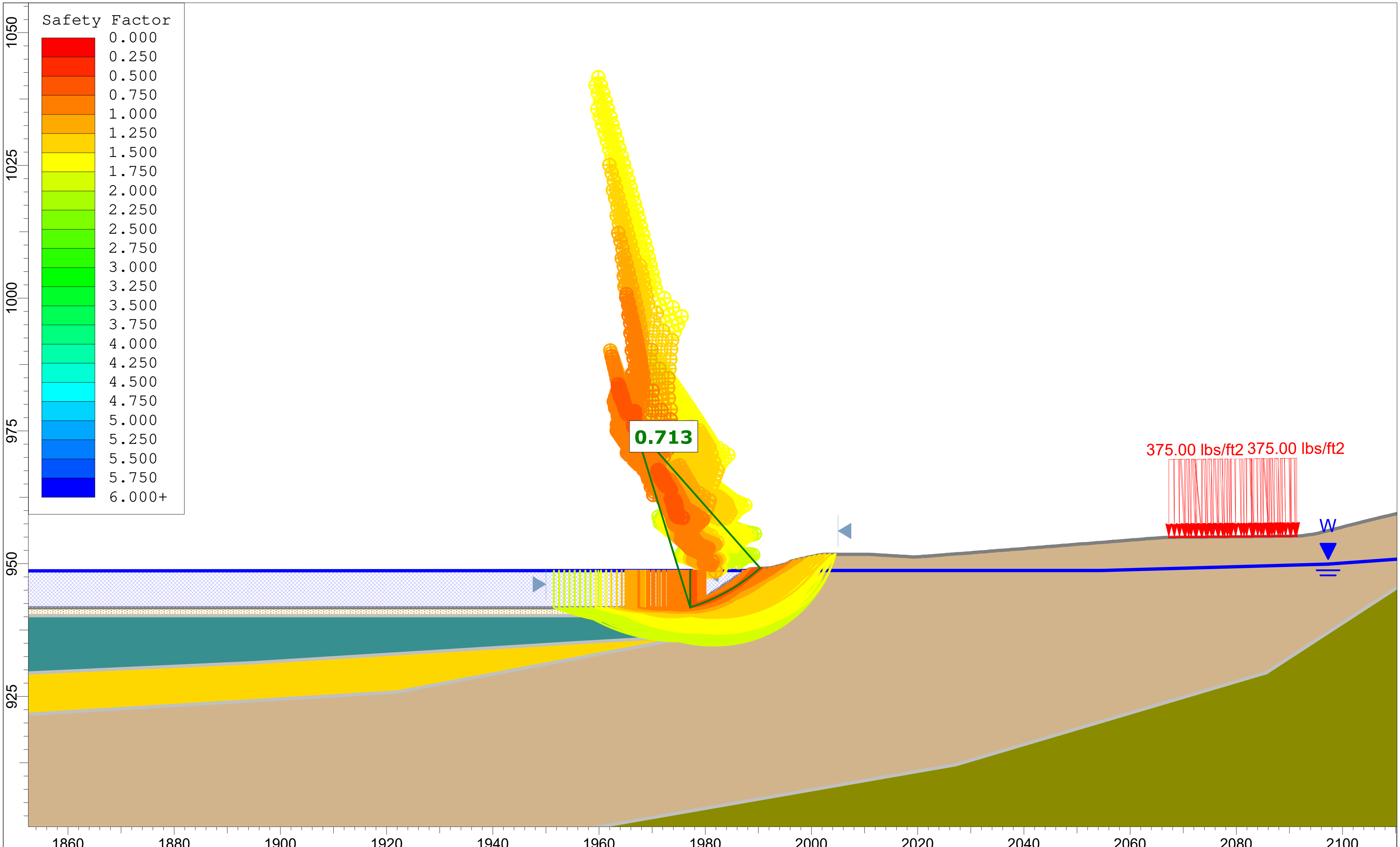
rocscience	Project: Woods Pond (Housatonic Reach 6)	
	Group: 4H:1V Dredge	Scenario: 4H:1V Dredge
	Drawn By: C. Bales	Company: Anchor QEA
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 3-3 East_10psf.slmd



rocscience

SLIDEINTERPRET 9.034

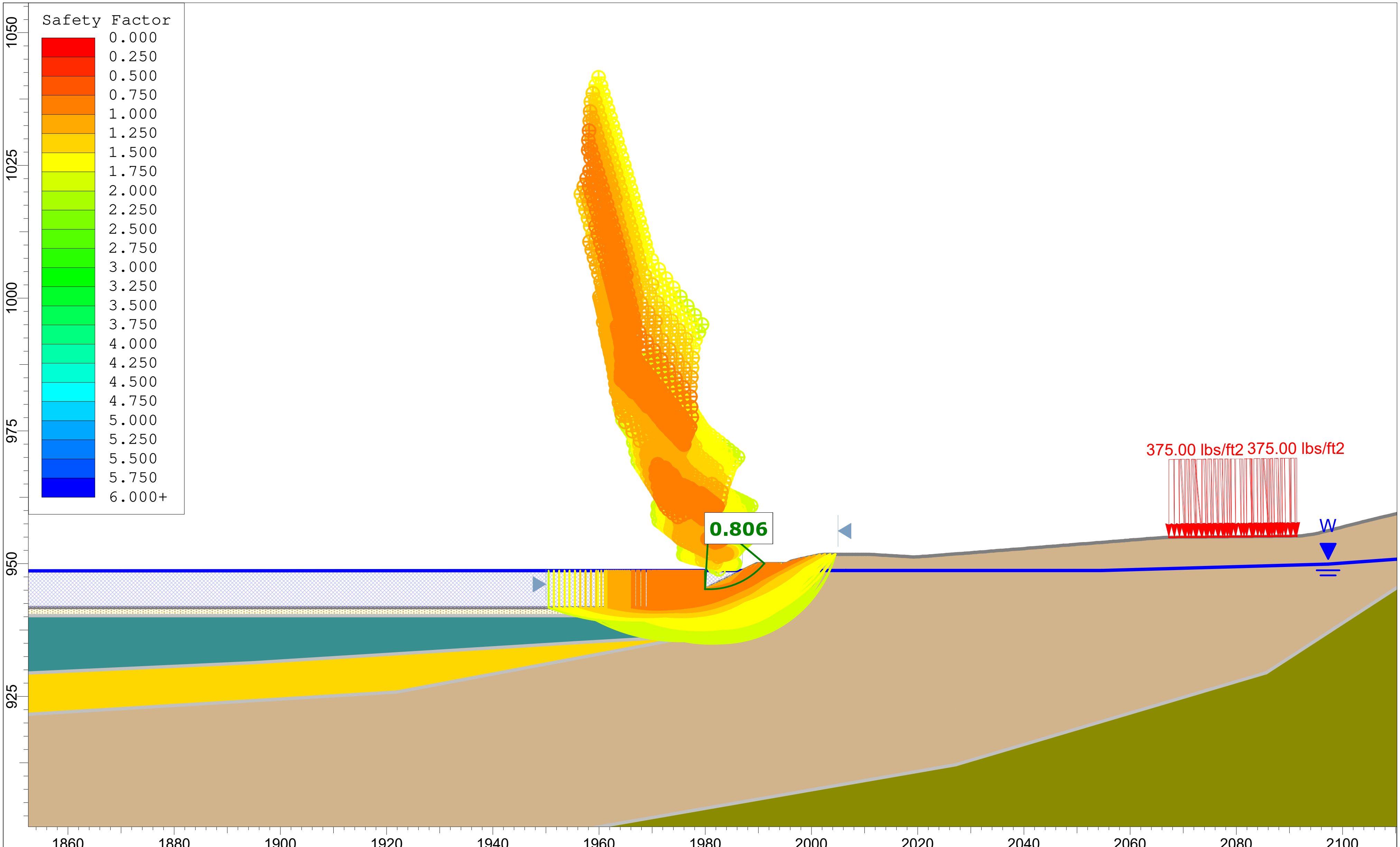
Project	Woods Pond (Housatonic Reach 6)		
Group	Existing Conditions	*Scenario*	Existing Conditions
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_15psf-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

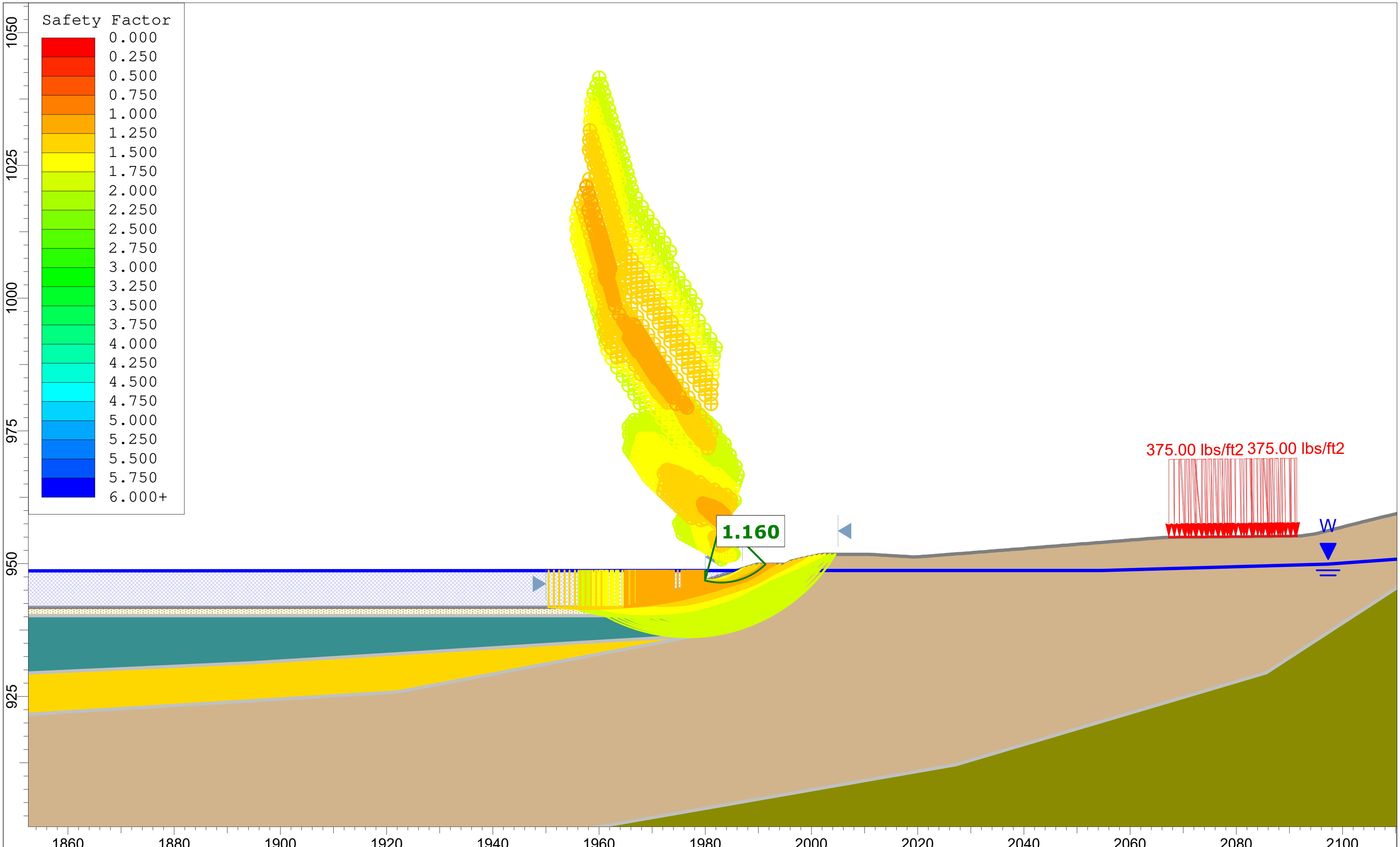
Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	*Scenario*	1.5H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_15psf-Cap.slmd



rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	*Scenario*	2H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_15psf-Cap.slmd

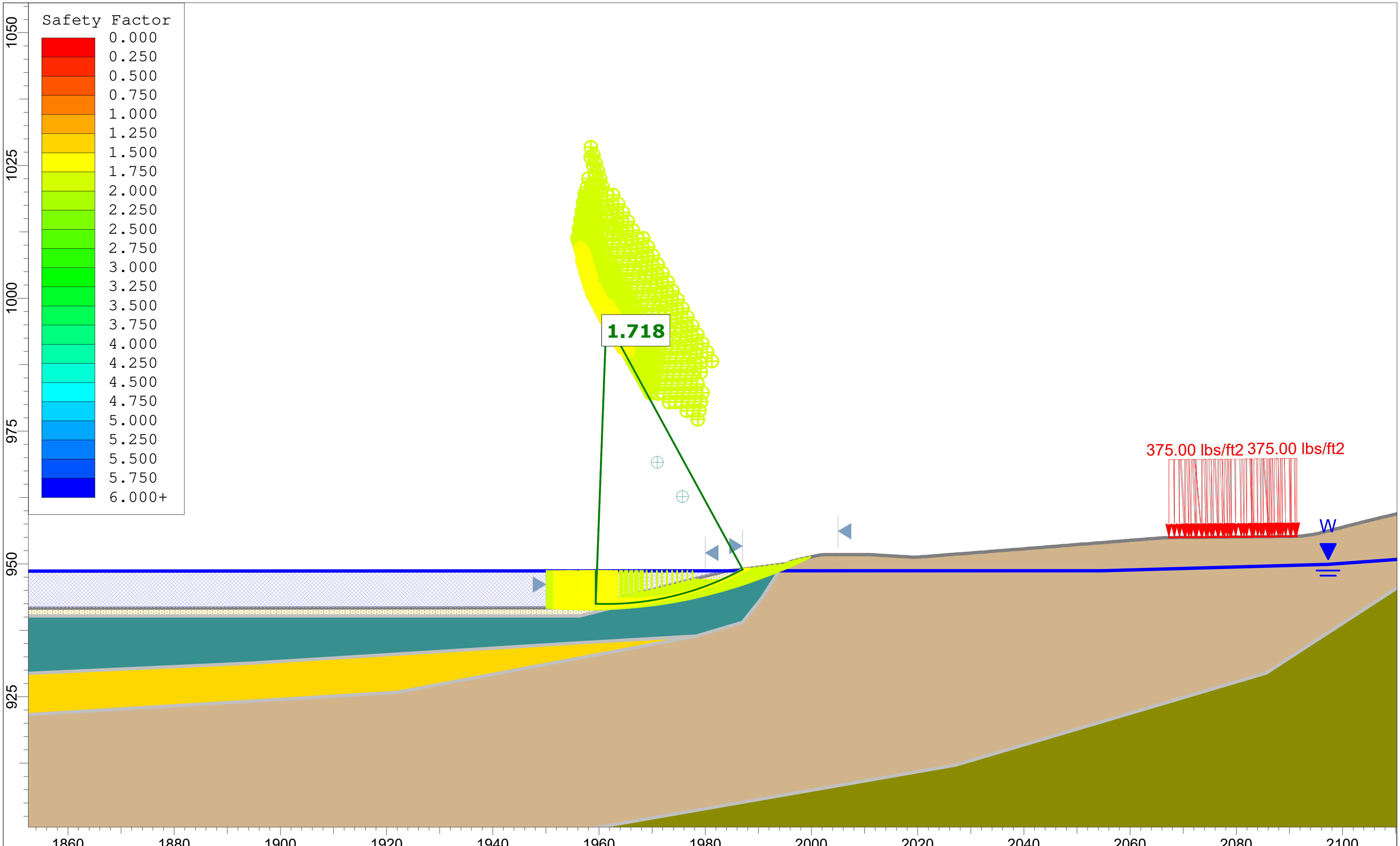
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

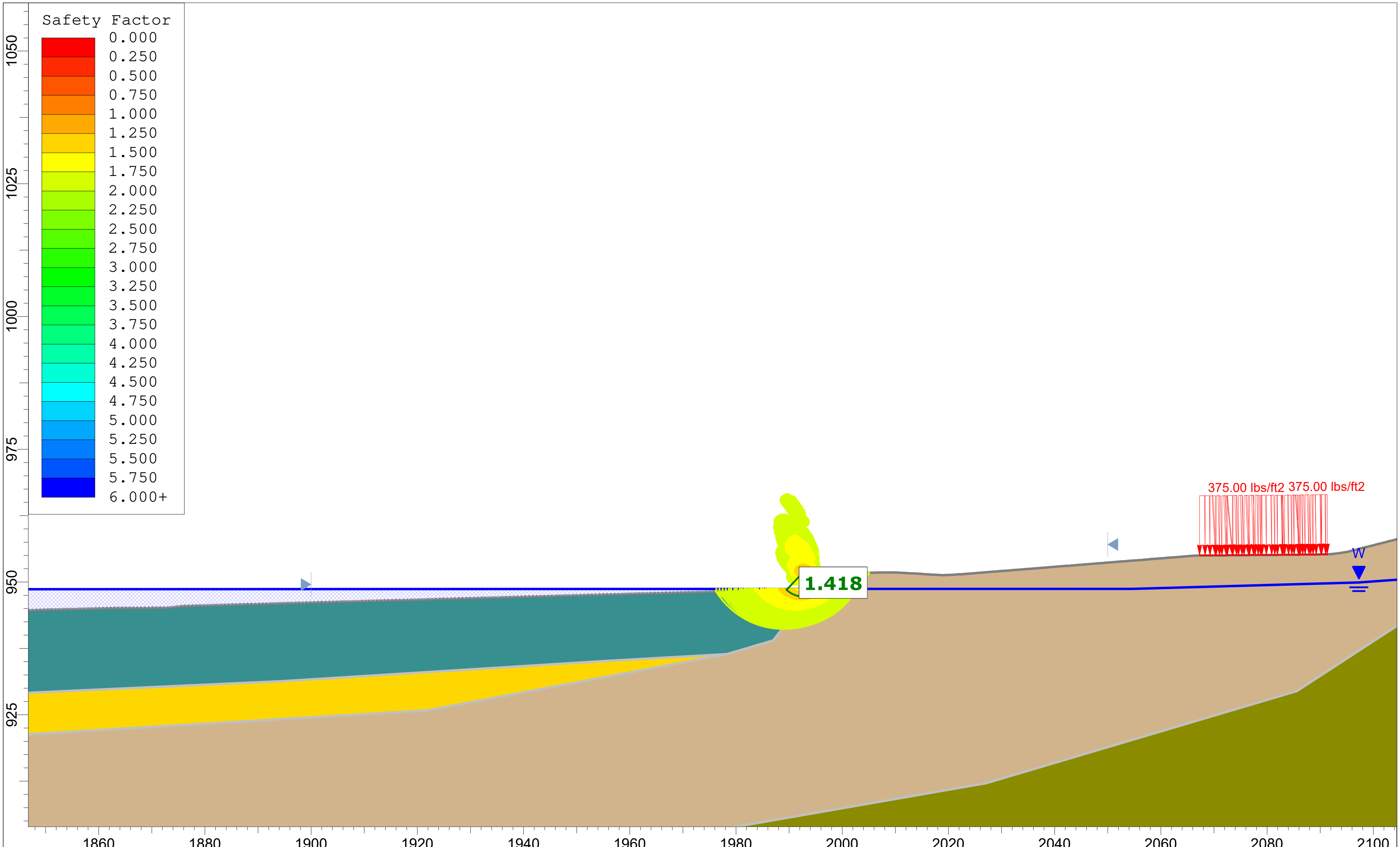
Project	Woods Pond (Housatonic Reach 6)		
Group	3H:1V Dredge	*Scenario*	3H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_15psf-Cap.slmd



rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	4H:1V Dredge	*Scenario*	4H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_15psf-Cap.slmd

SLIDEINTERPRET 9.034



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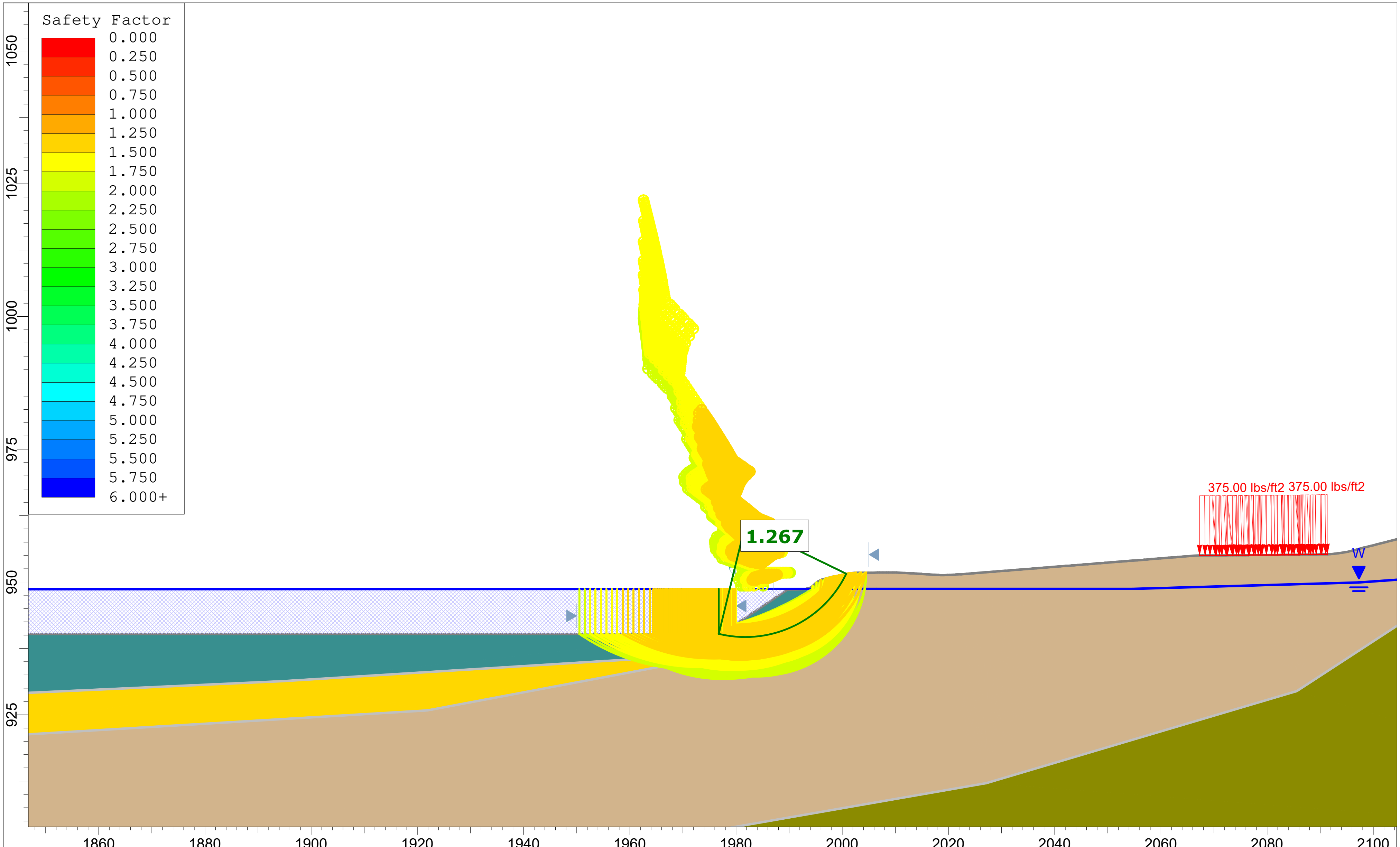
SLIDEINTERPRET 9.034

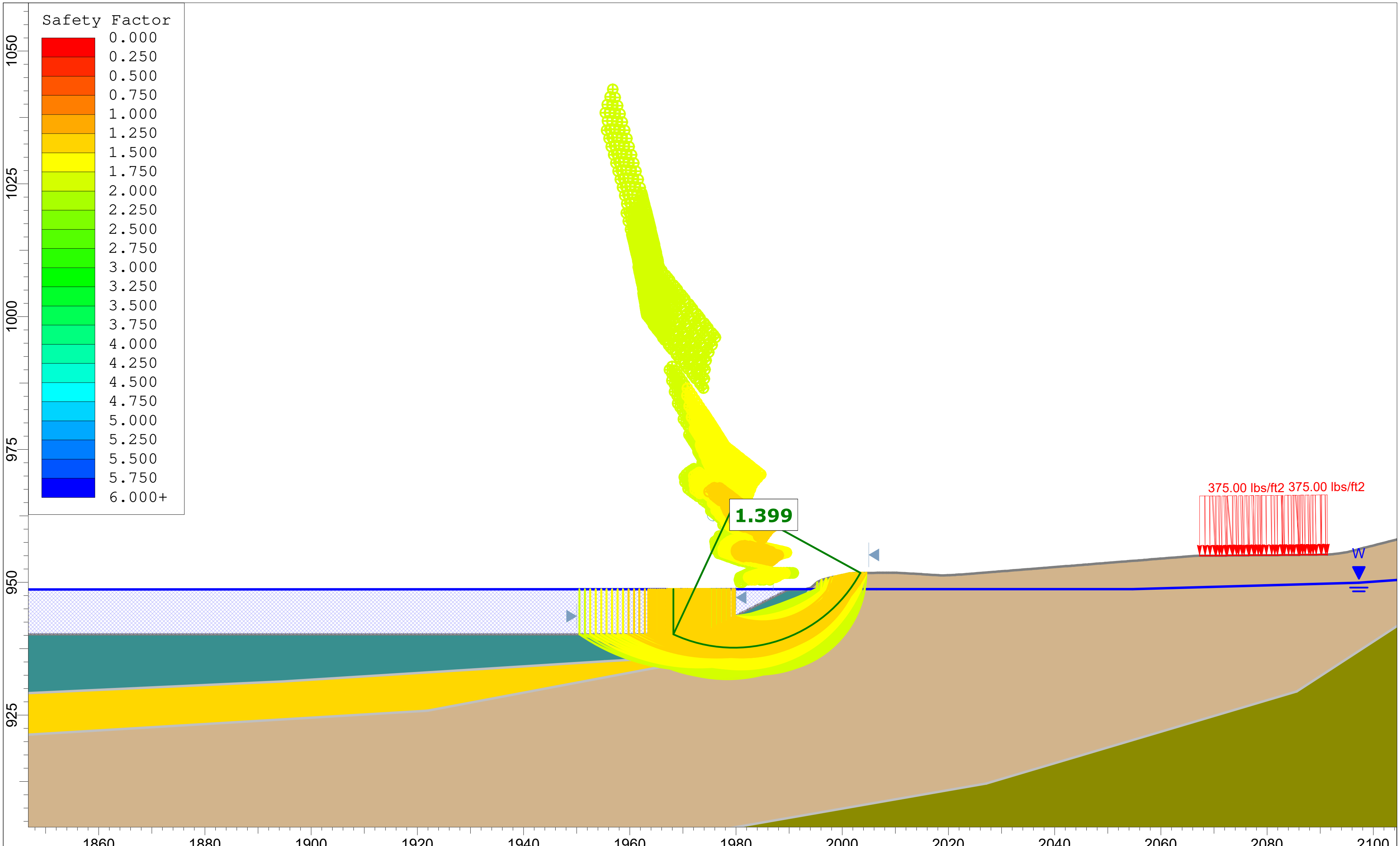
Project	Woods Pond (Housatonic Reach 6)		
Group	Existing Conditions	*Scenario*	Existing Conditions
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_15psf.slmd



rocscience

SLIDEINTERPRET 9.034

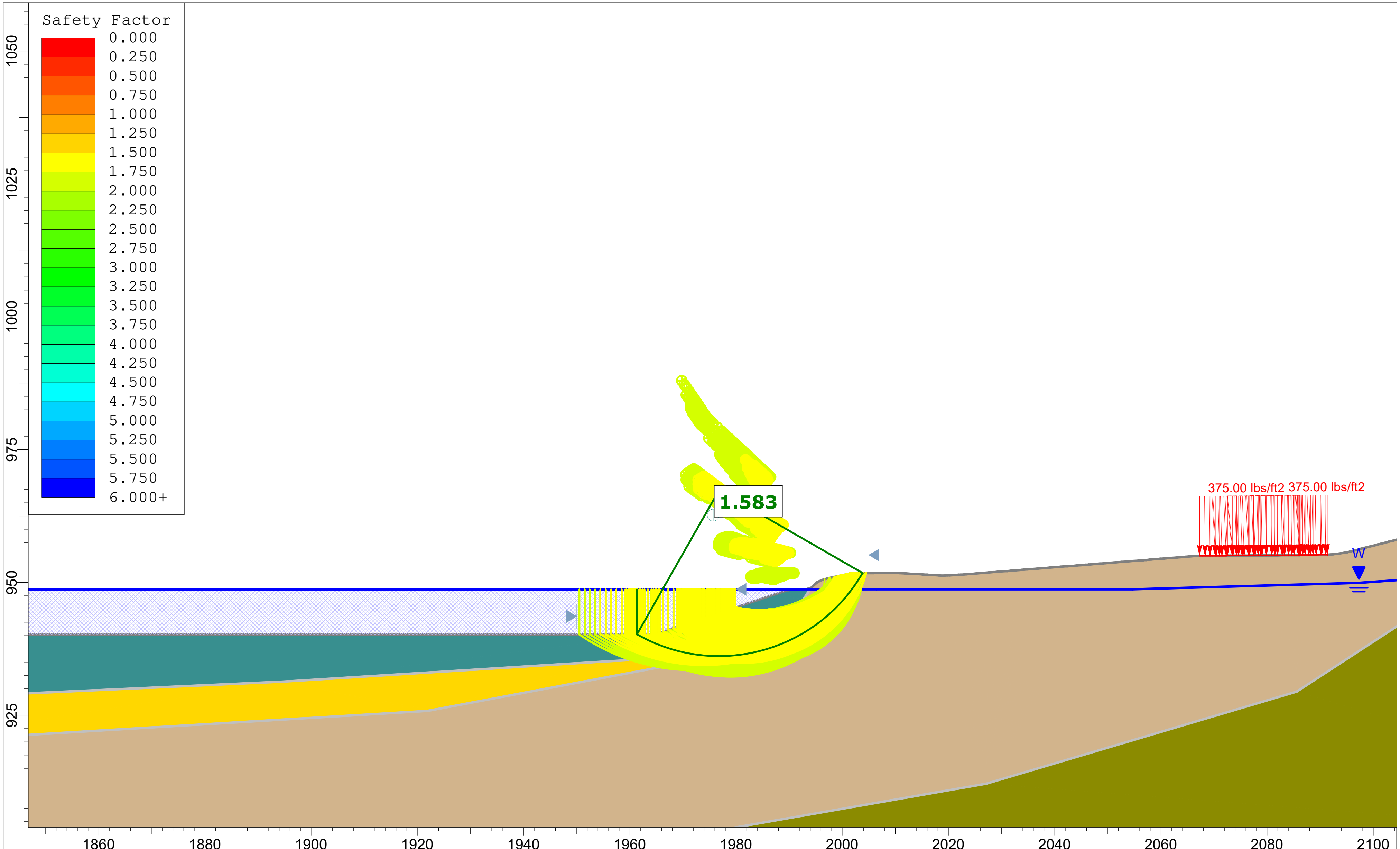
Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	*Scenario*	1.5H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_15psf.slmd



rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	*Scenario*	2H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_15psf.slmd



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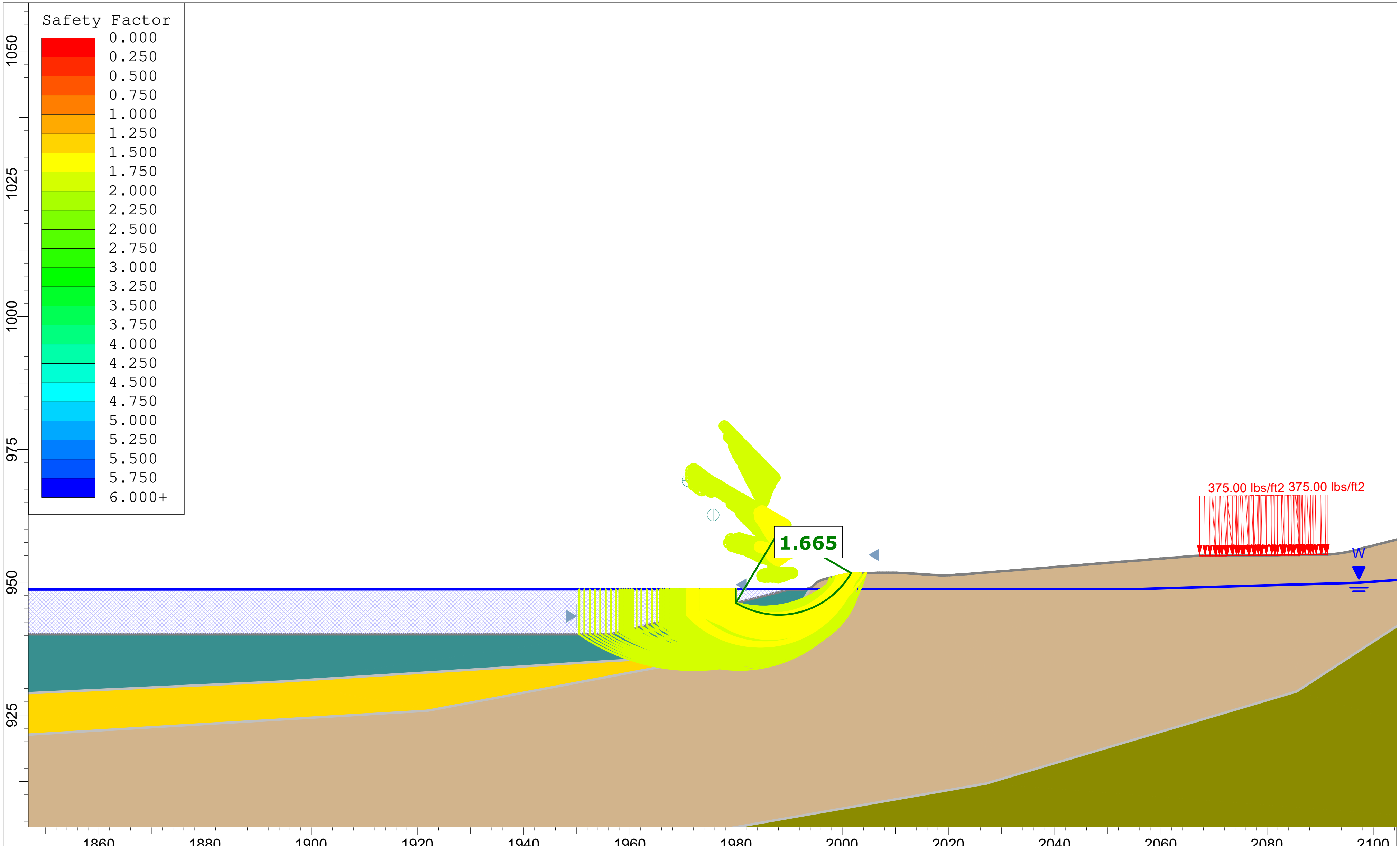
Project	Woods Pond (Housatonic Reach 6)		
Group	3H:1V Dredge	Scenario	3H:1V Dredge
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 3-3 East_15psf.slmd

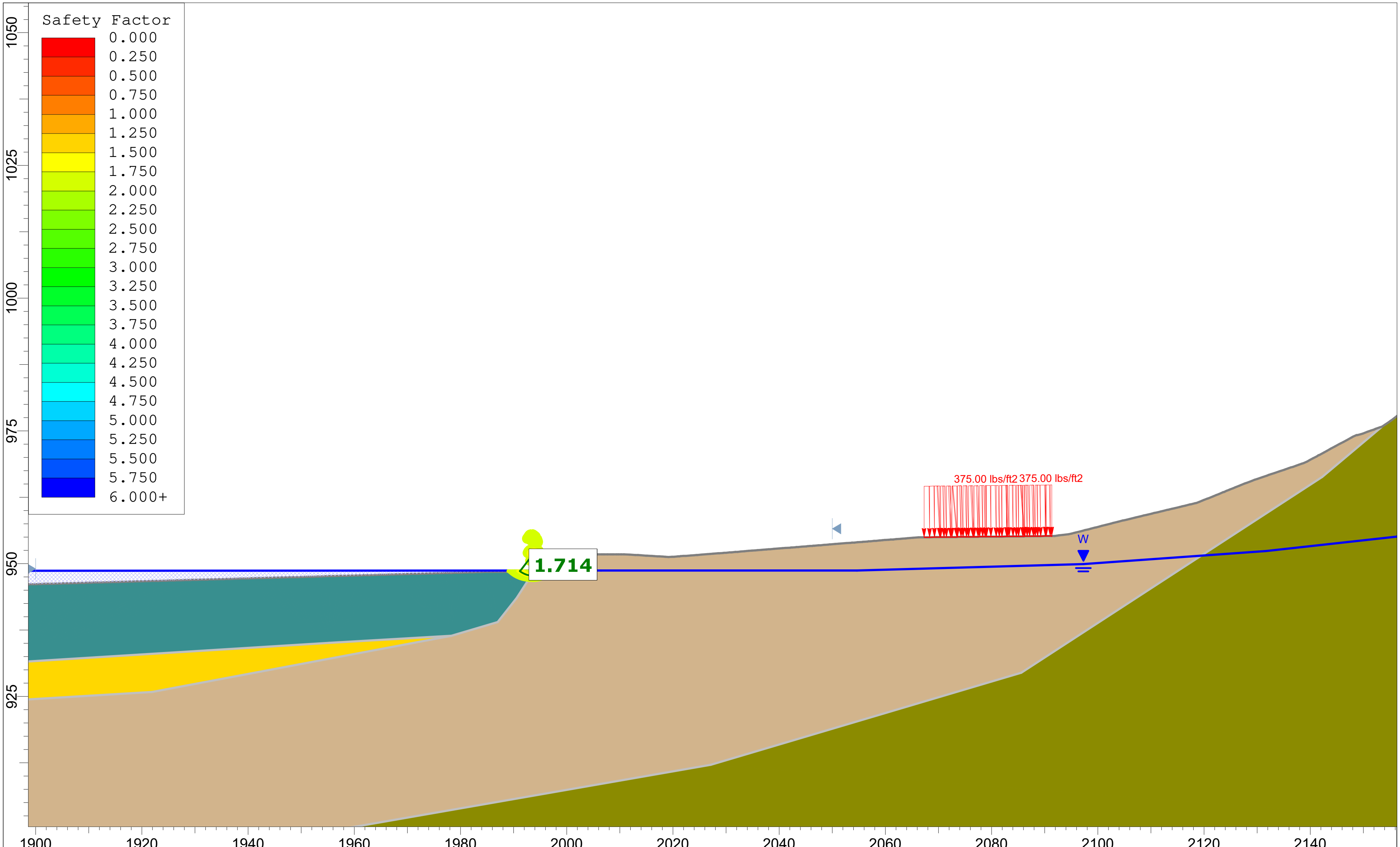
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	4H:1V Dredge	*Scenario*	4H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_15psf.slmd



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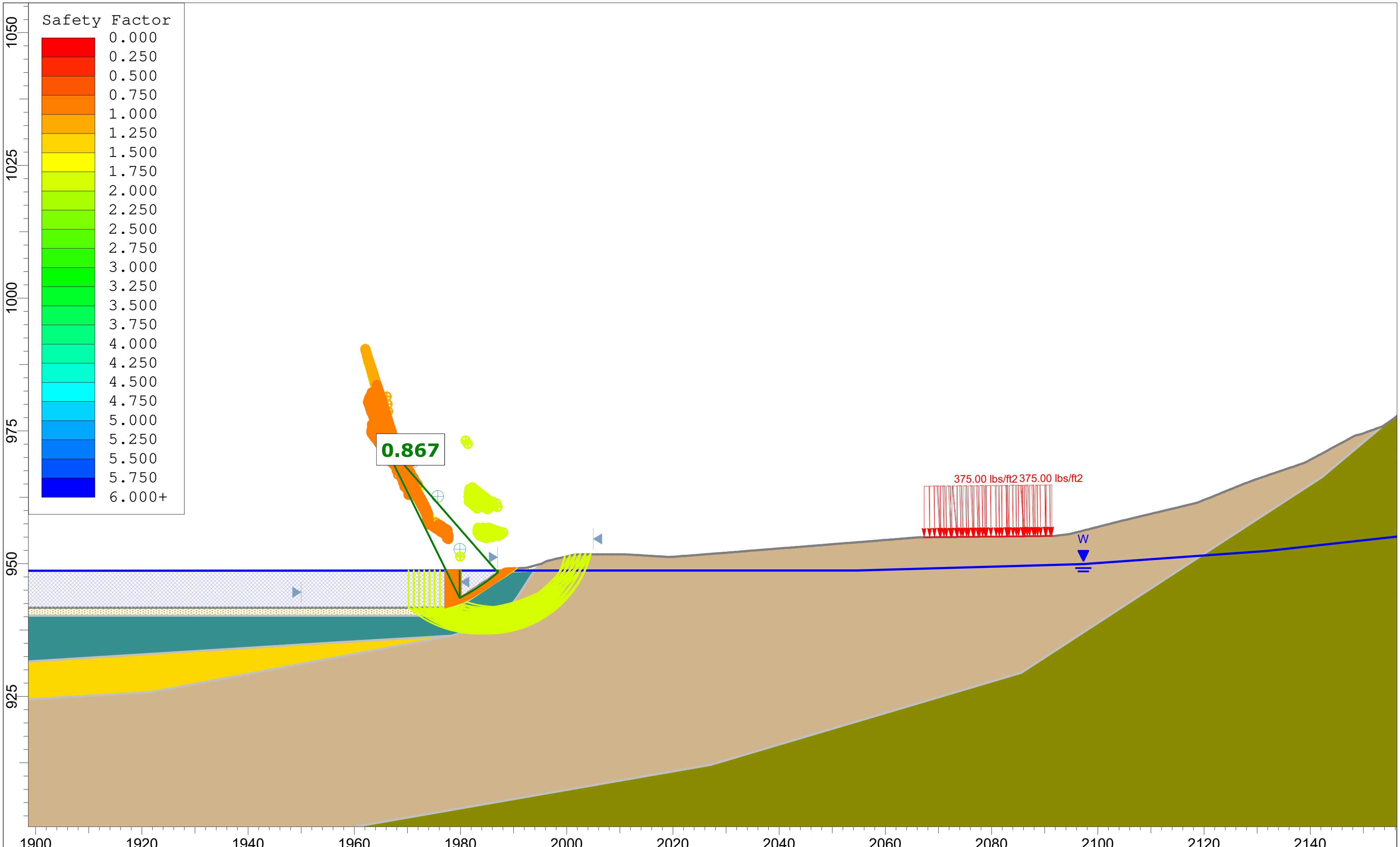
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	Existing Conditions	*Scenario*	Existing Conditions
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_065ratio-Cap.slmd



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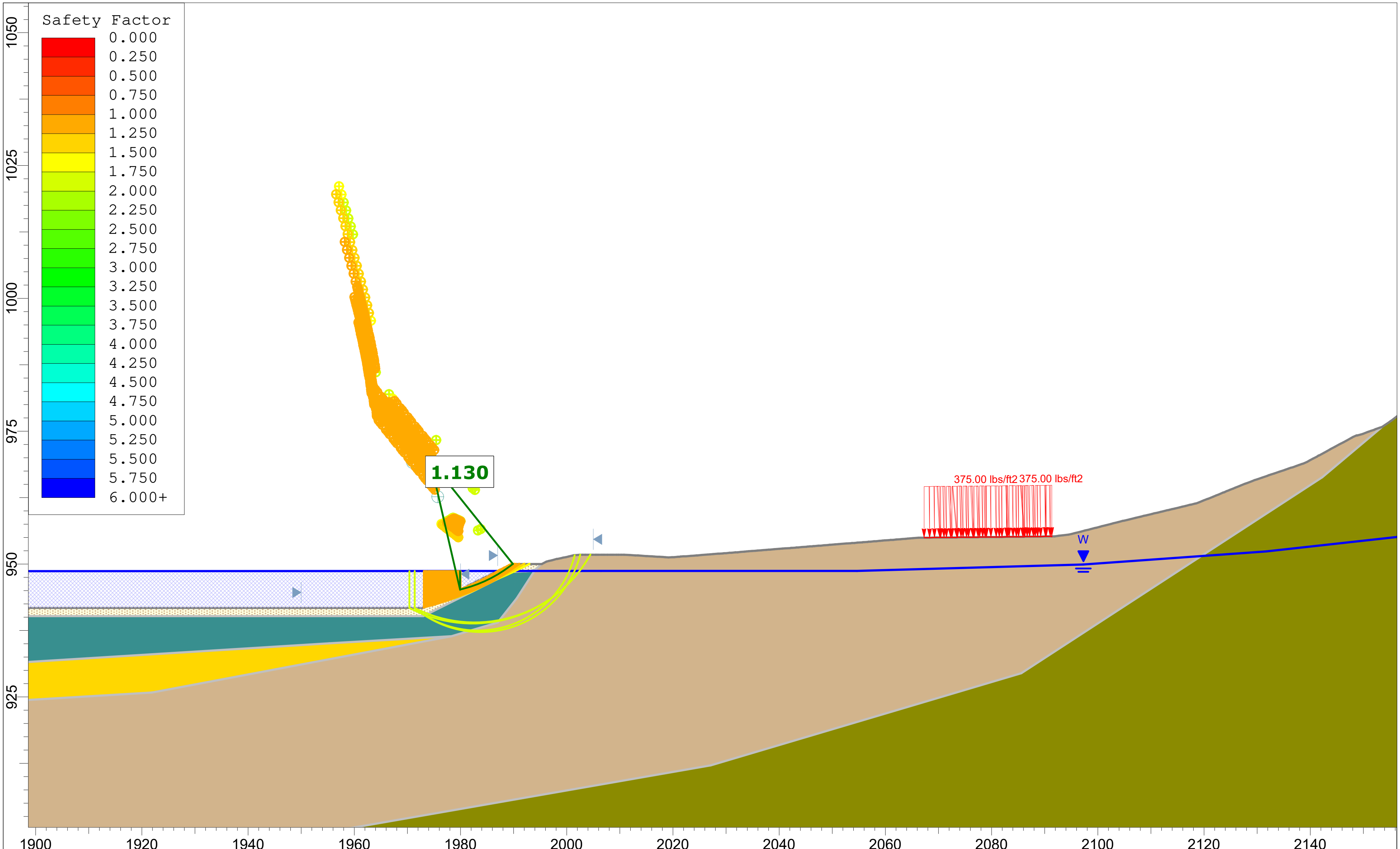
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	*Scenario*	1.5H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_065ratio-Cap.slmd



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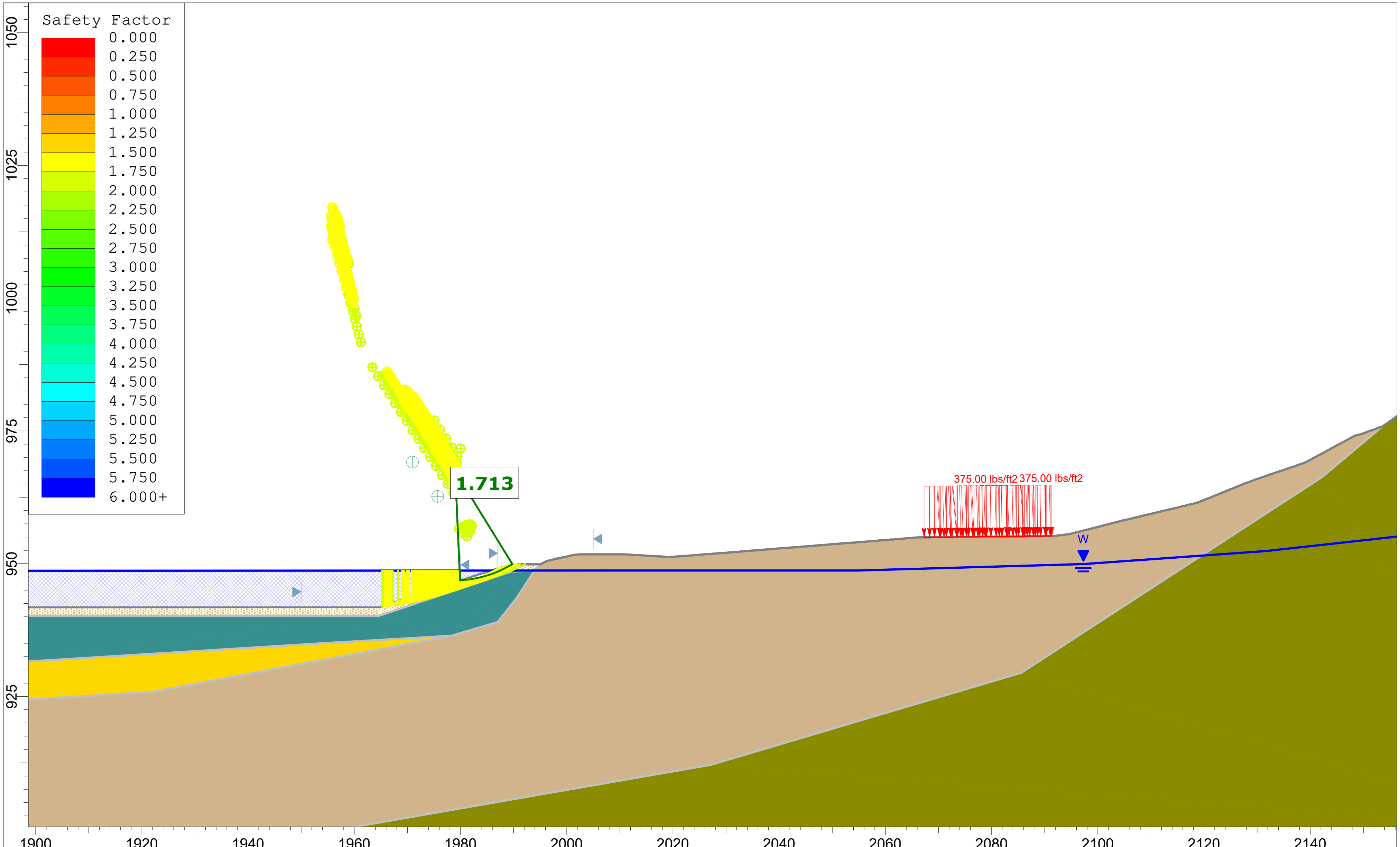
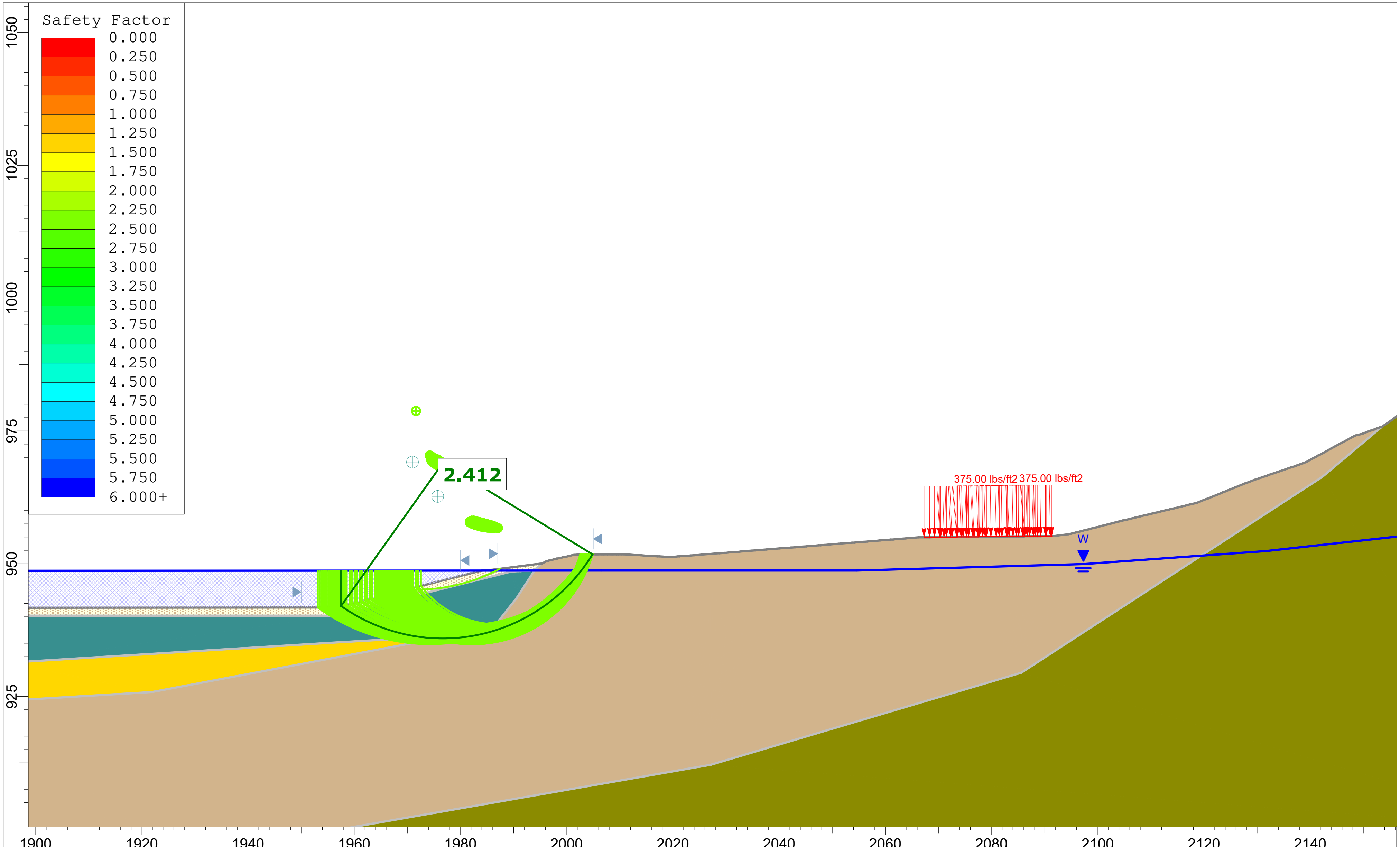
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	Scenario	2H:1V Dredge
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 3-3 East_065ratio-Cap.slmd



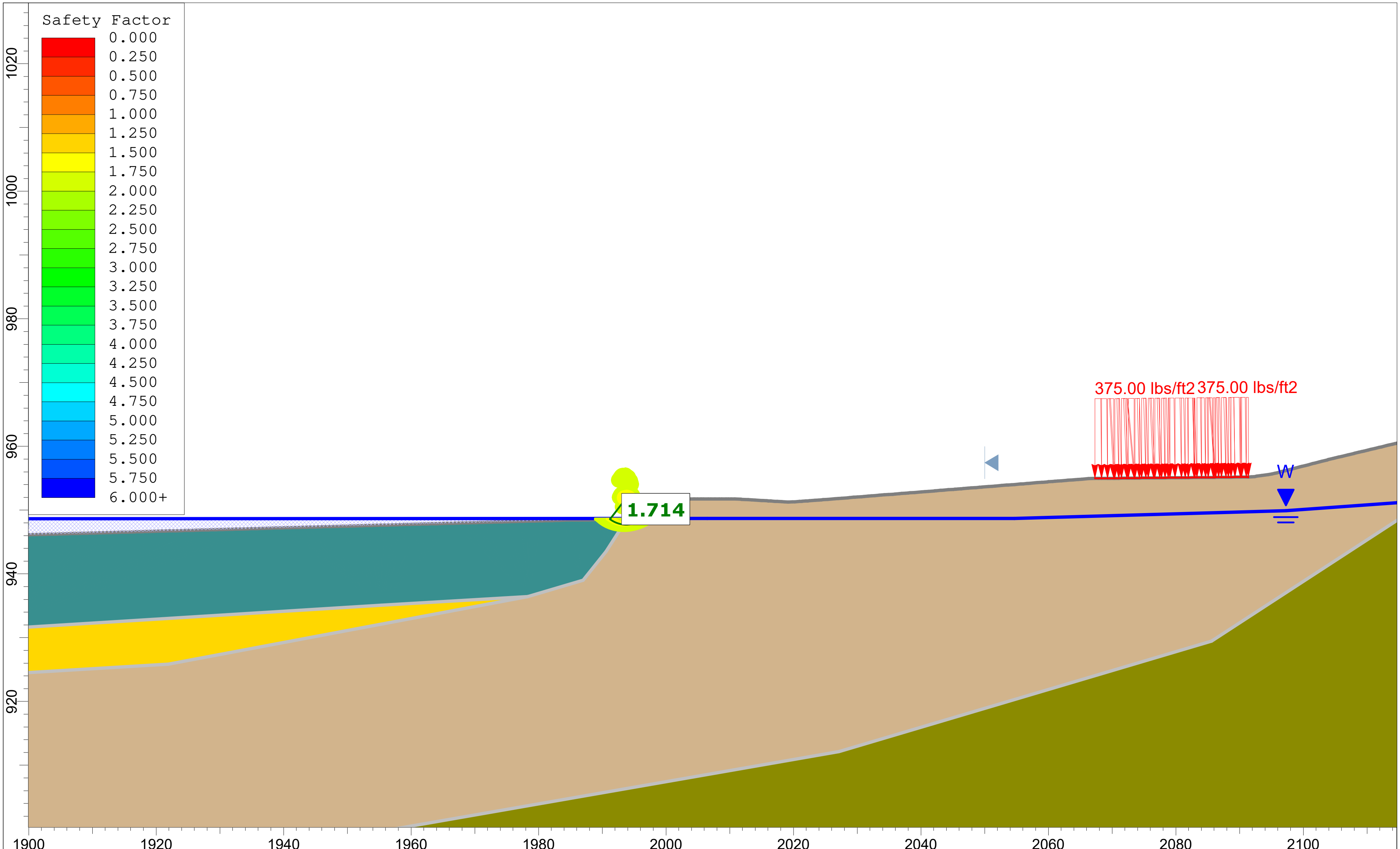
rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group 3H:1V Dredge	*Scenario* 3H:1V Dredge	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 3-3 East_065ratio-Cap.slmd	



rocscience

SLIDEINTERPRET 9.034

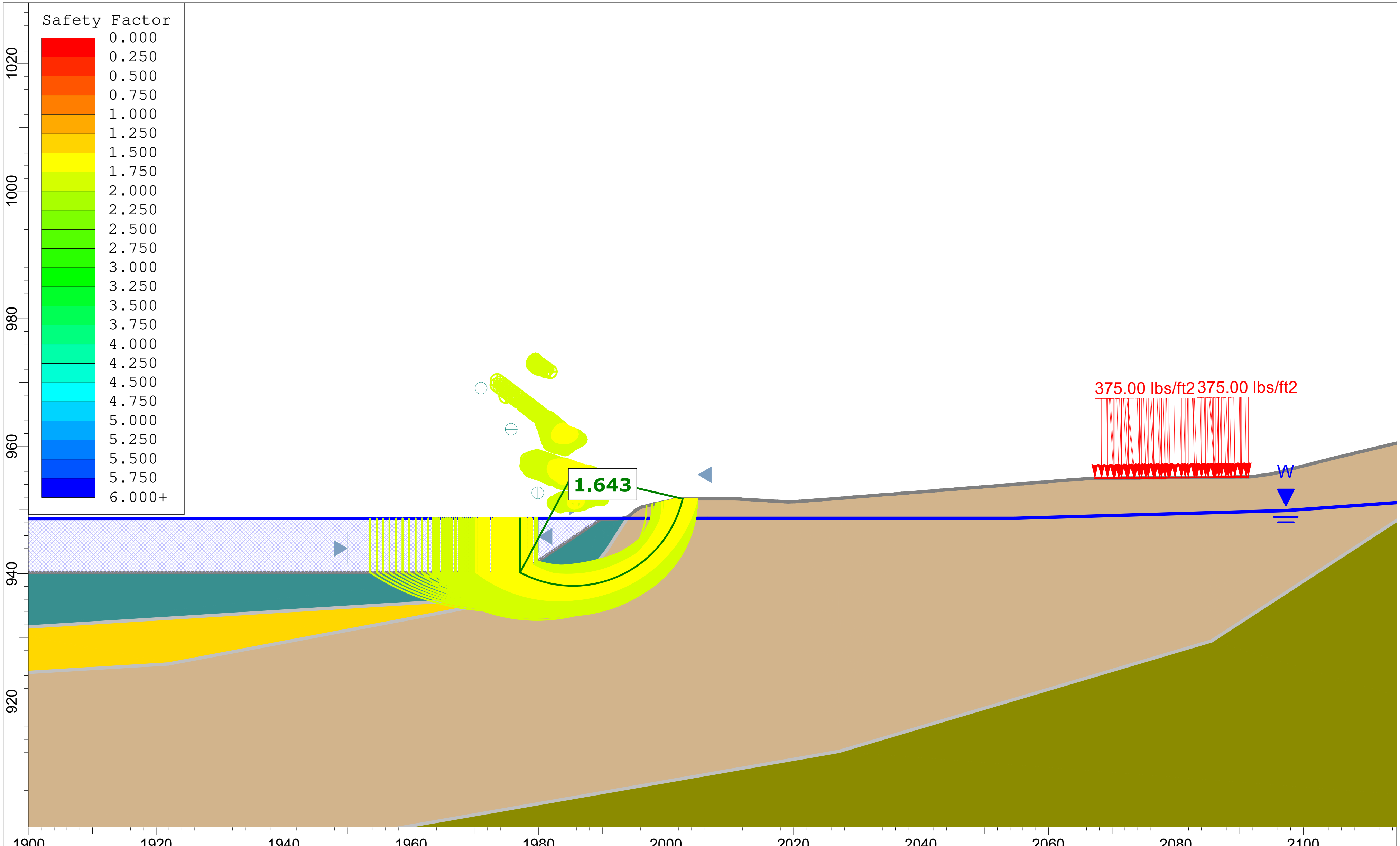
Project	Woods Pond (Housatonic Reach 6)		
Group	4H:1V Dredge	*Scenario*	4H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_065ratio-Cap.slmd



rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	Existing Conditions	*Scenario*	Existing Conditions
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_065ratio.slmd

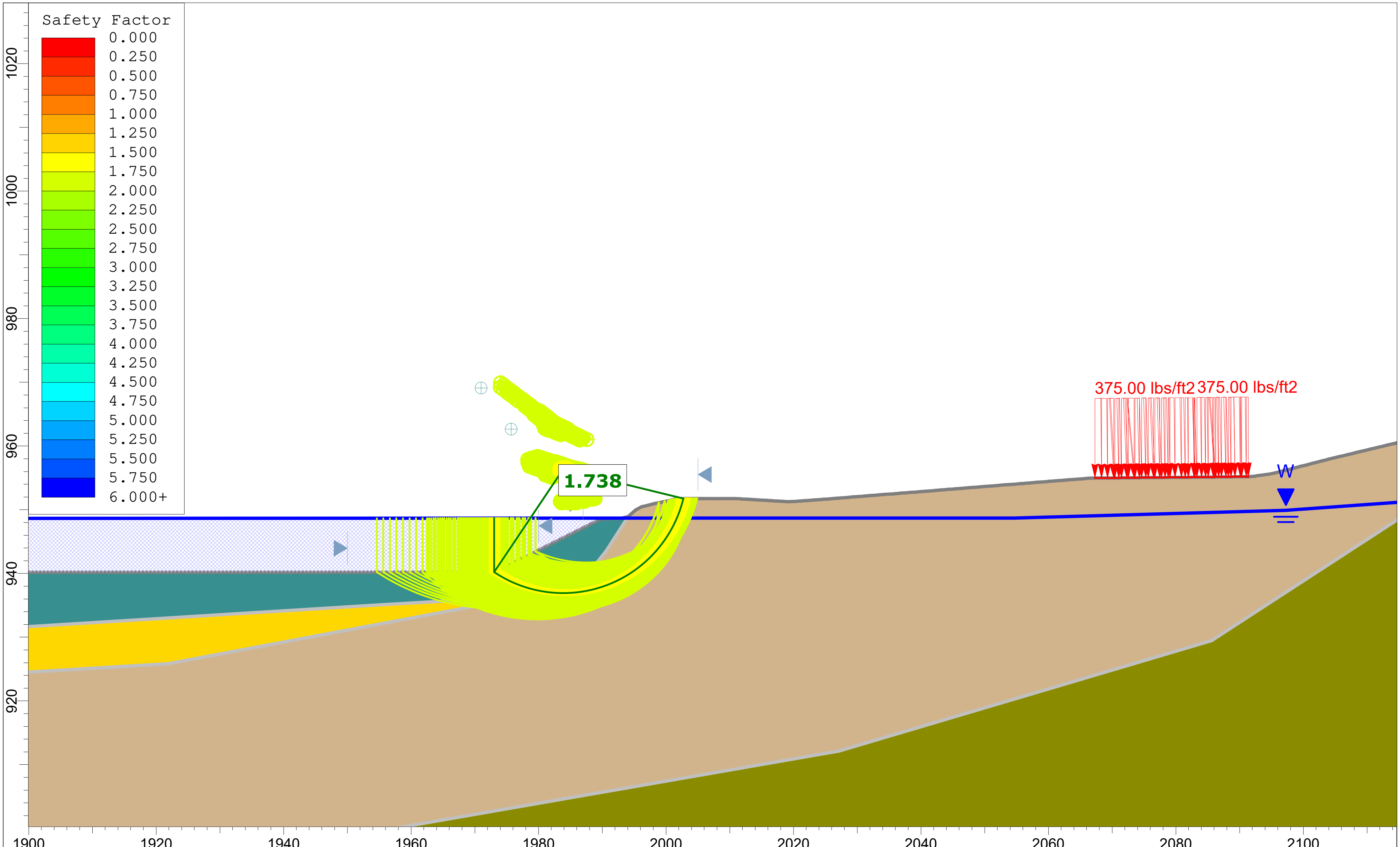
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

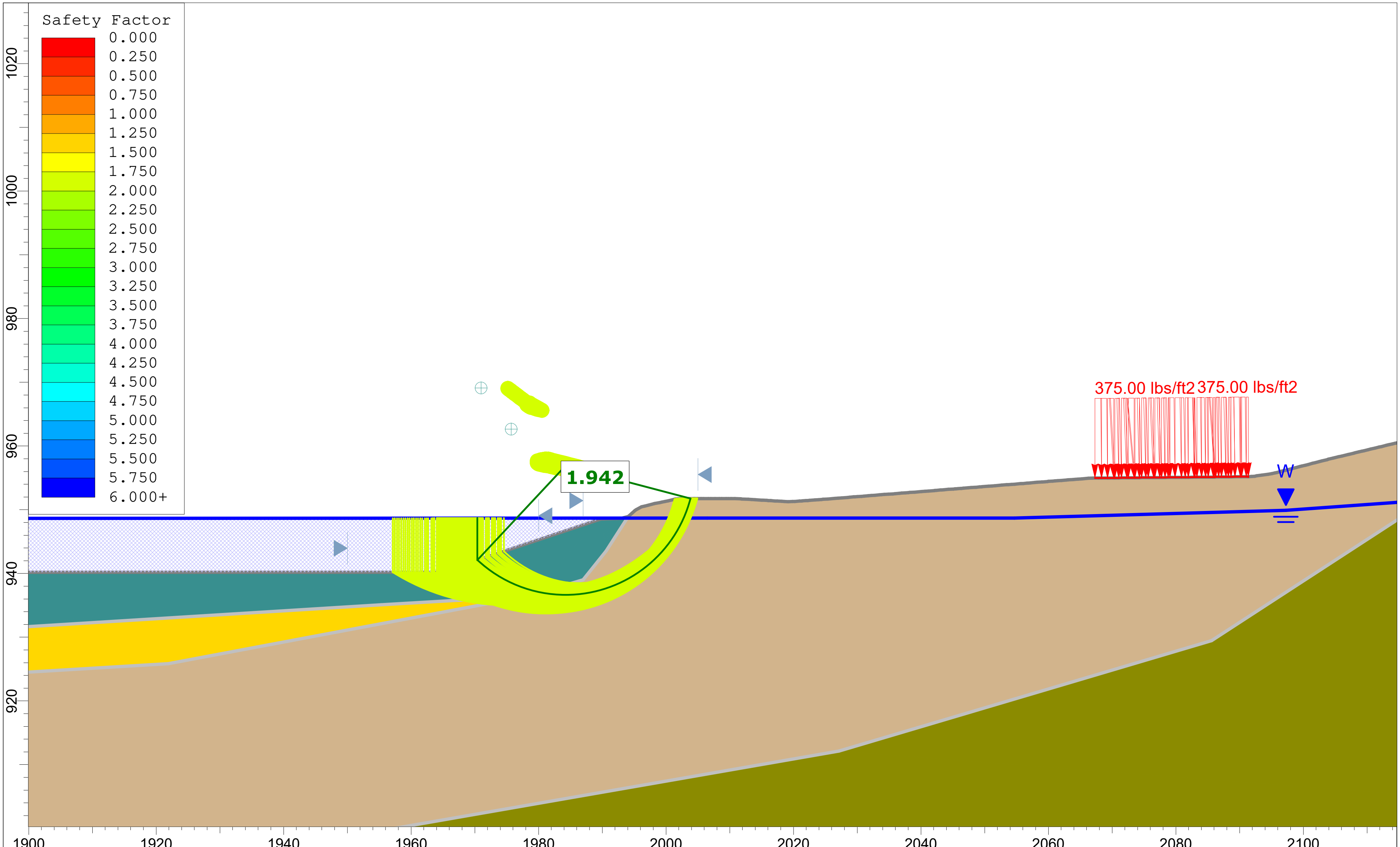
Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	*Scenario*	1.5H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_065ratio.slmd



rocscience

SLIDEINTERPRET 9.034

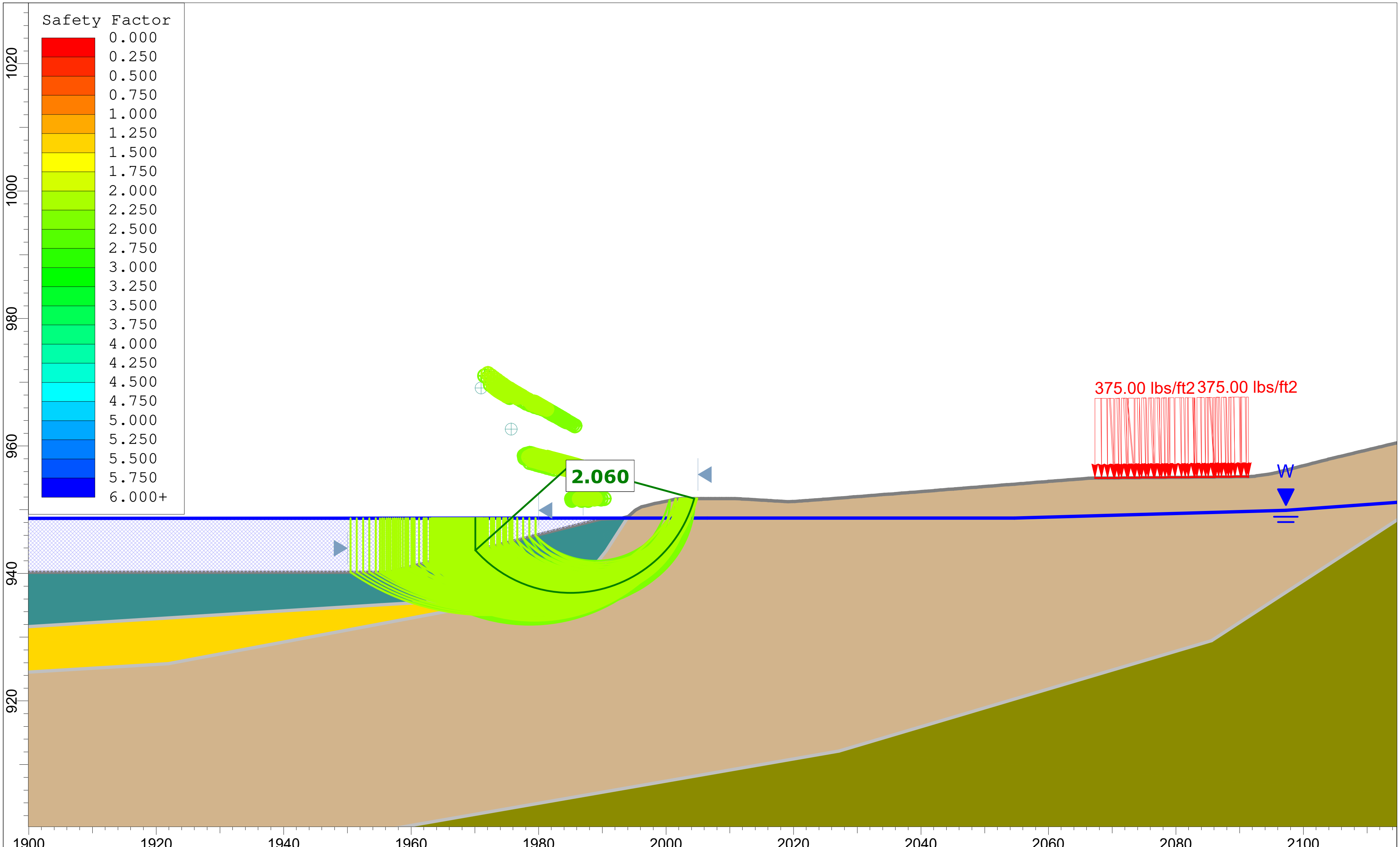
Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	*Scenario*	2H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_065ratio.slmd



rocscience

SLIDEINTERPRET 9.034

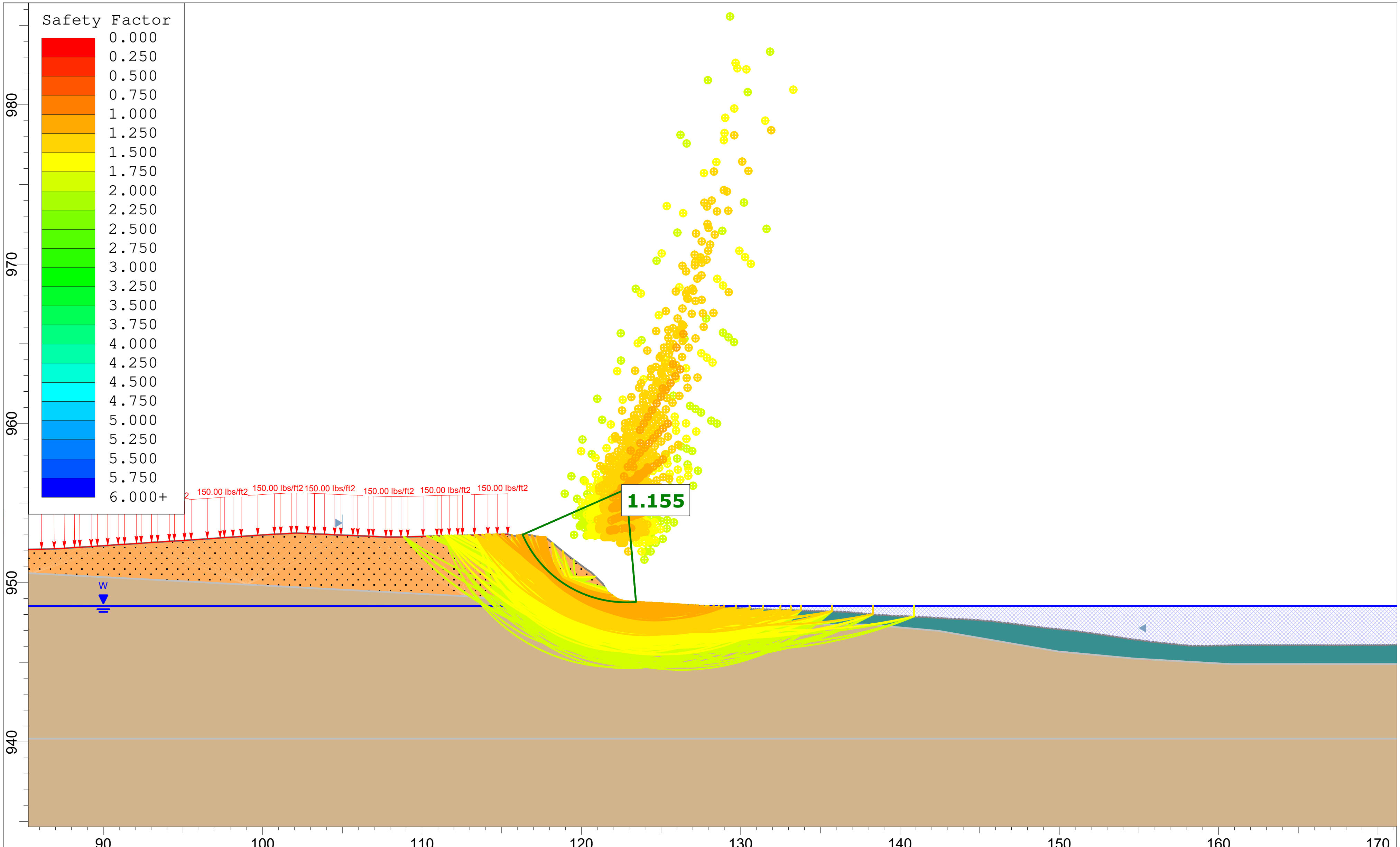
Project	Woods Pond (Housatonic Reach 6)		
Group	3H:1V Dredge	*Scenario*	3H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_065ratio.slmd



rocscience

SLIDEINTERPRET 9.034

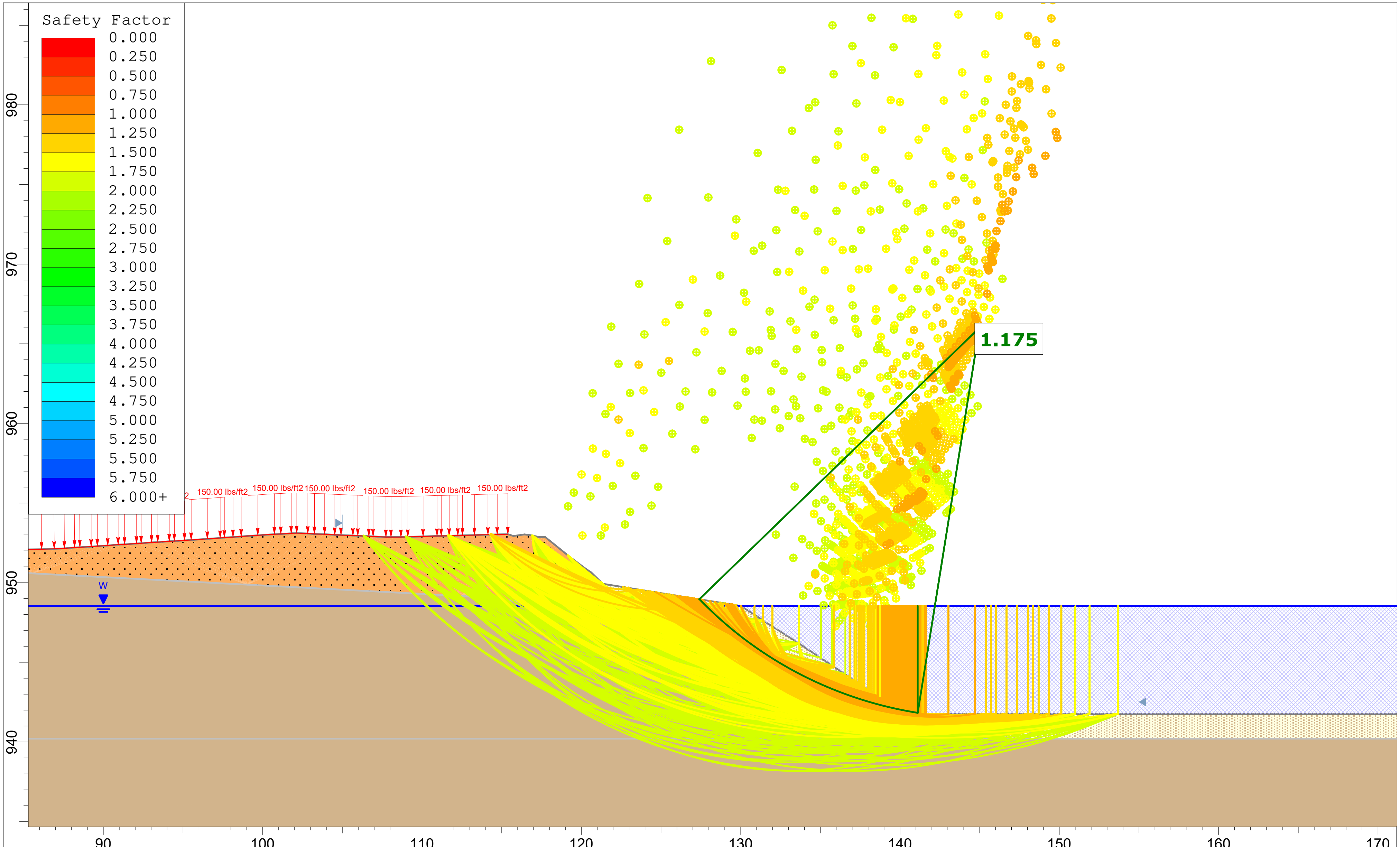
Project	Woods Pond (Housatonic Reach 6)		
Group	4H:1V Dredge	*Scenario*	4H:1V Dredge
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3 East_065ratio.slmd



rocscience

SLIDEINTERPRET 9.034

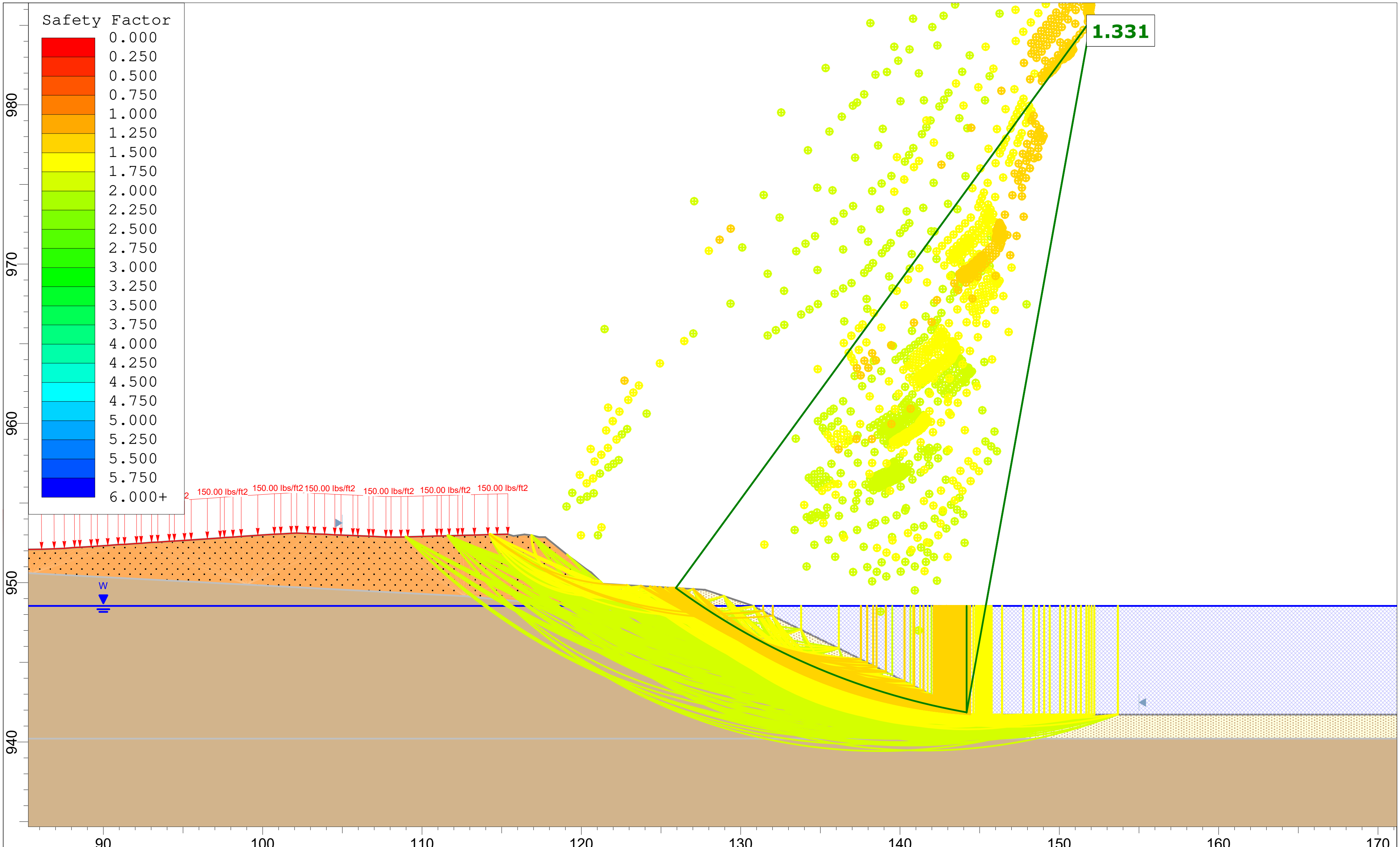
Project	Woods Pond (Housatonic Reach 6)		
Group	Existing Conditions	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_10psf-cap.slmd



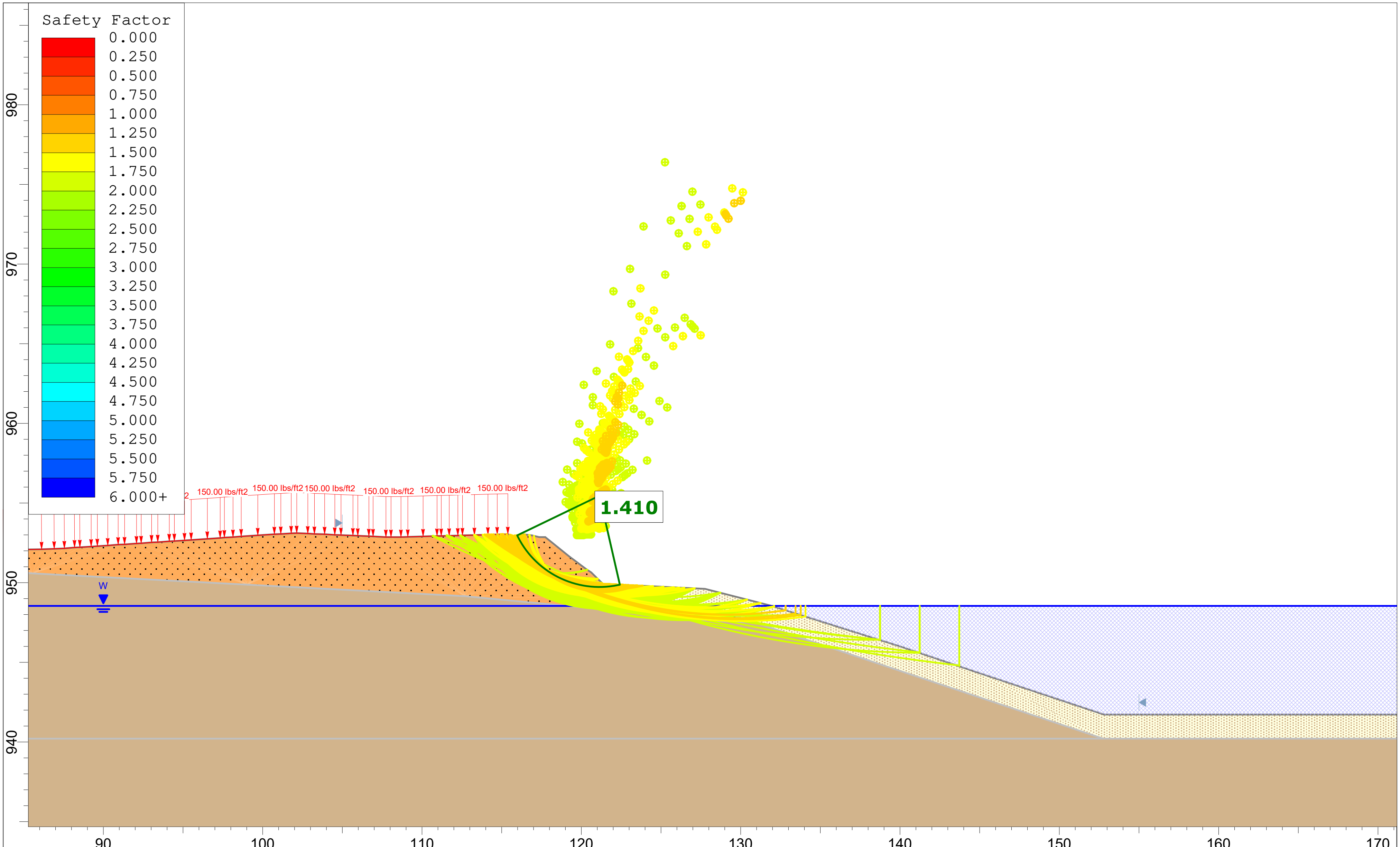
rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_10psf-cap.slmd



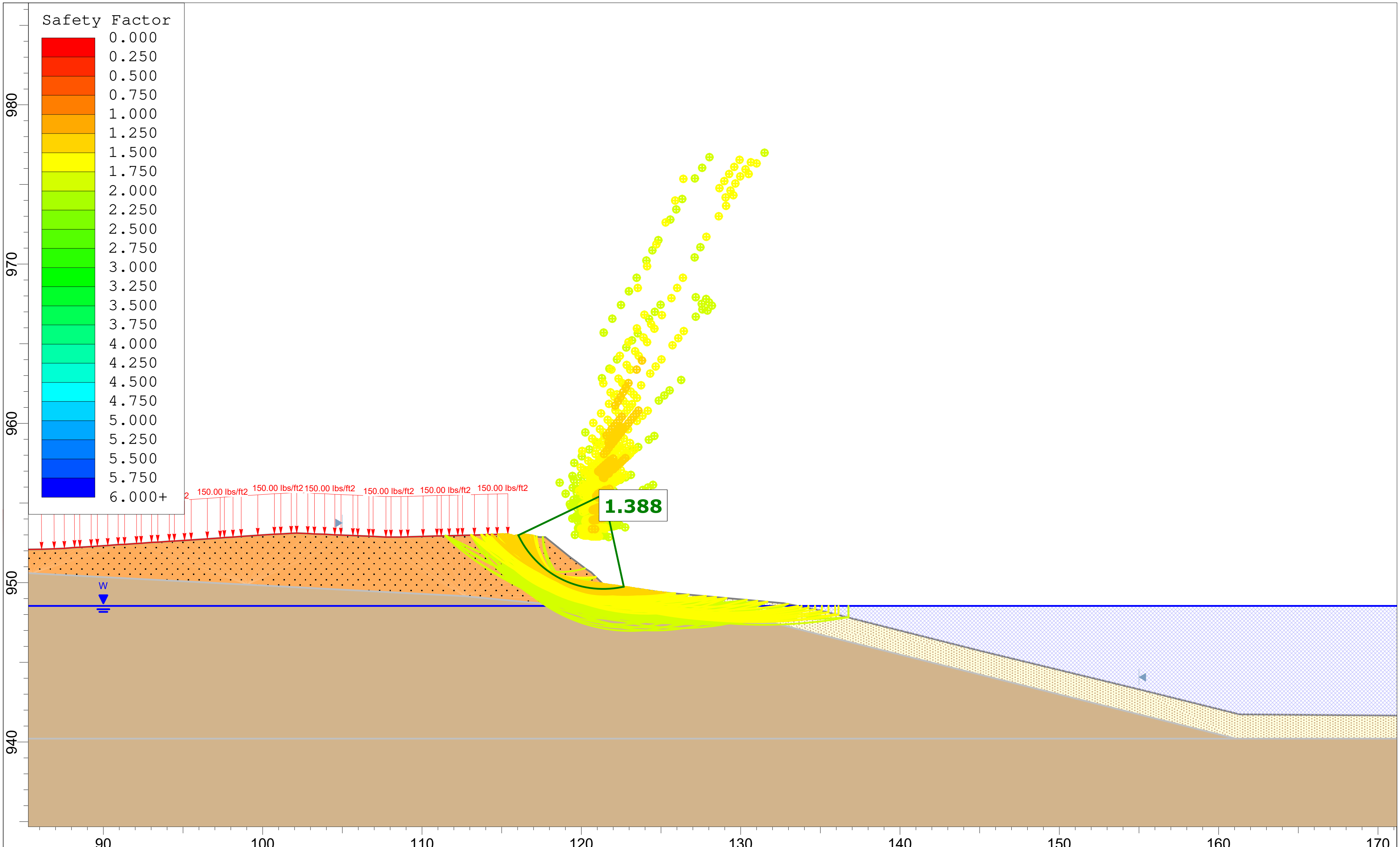
rocscience	*Project*	Woods Pond (Housatonic Reach 6)	
	Group 2H:1V Dredge	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 3-3_West_10psf-cap.slmd	



rocscience

SLIDEINTERPRET 9.034

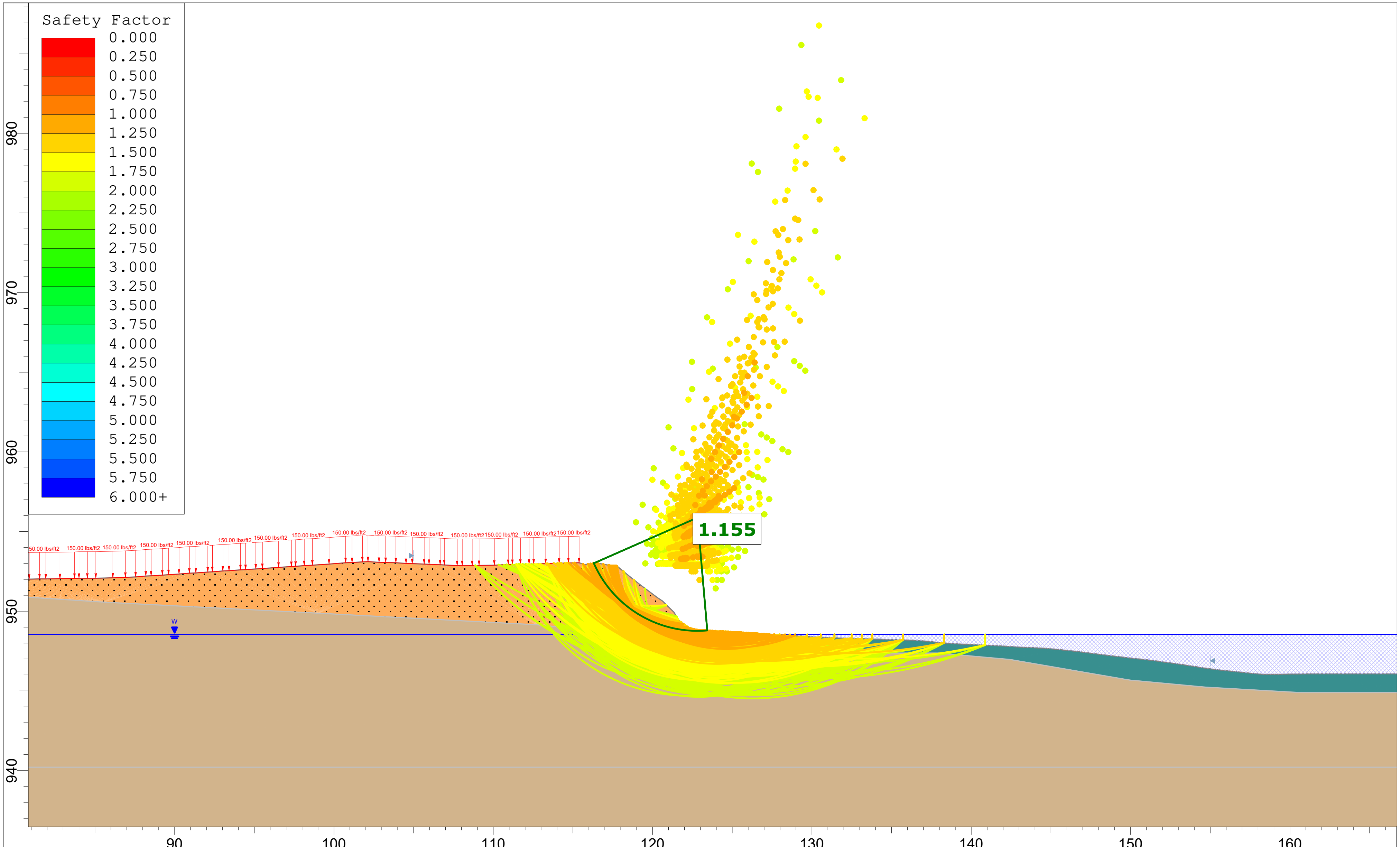
Project	Woods Pond (Housatonic Reach 6)		
Group	3H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_10psf-cap.slmd



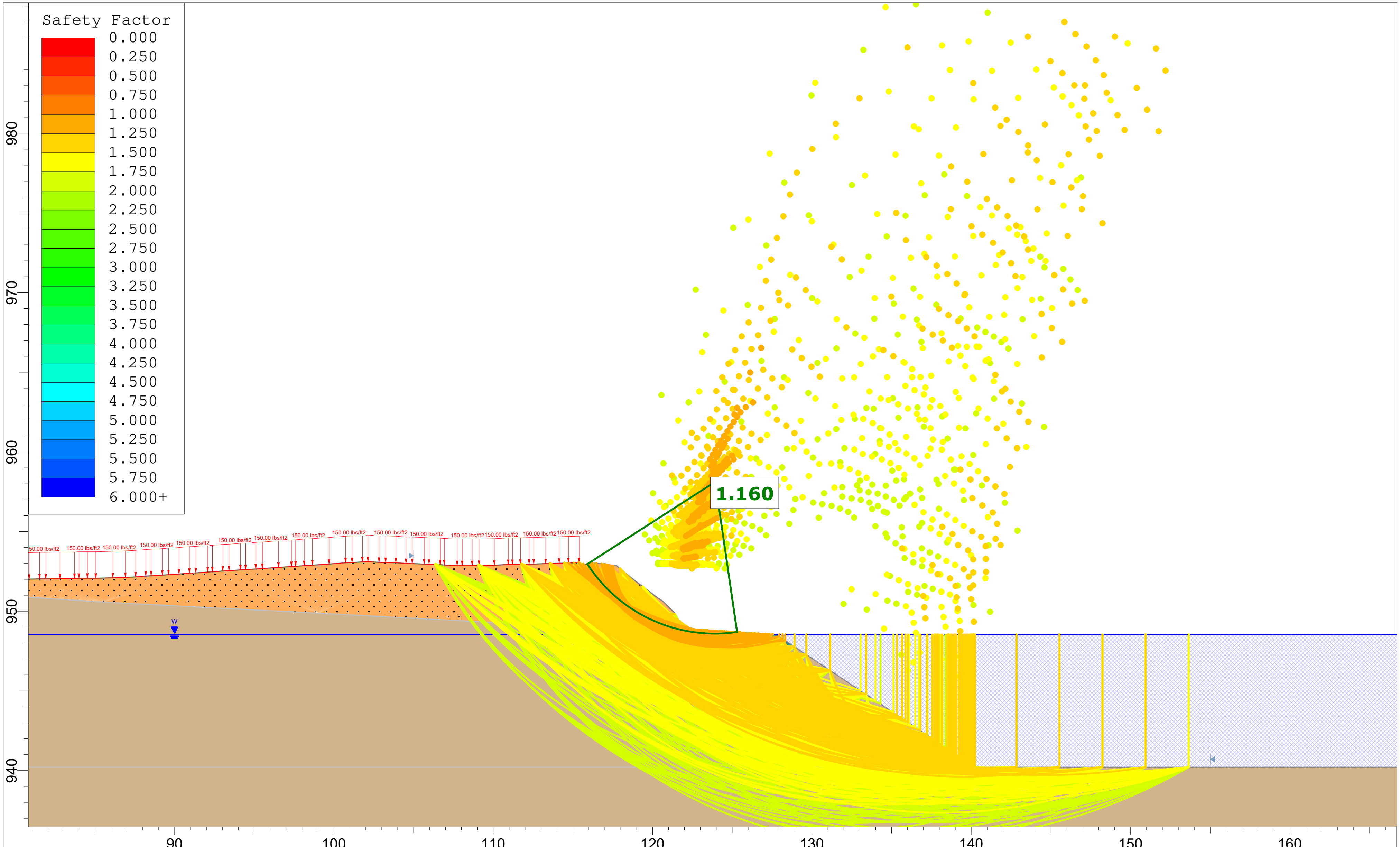
rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	4H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_10psf-cap.slmd

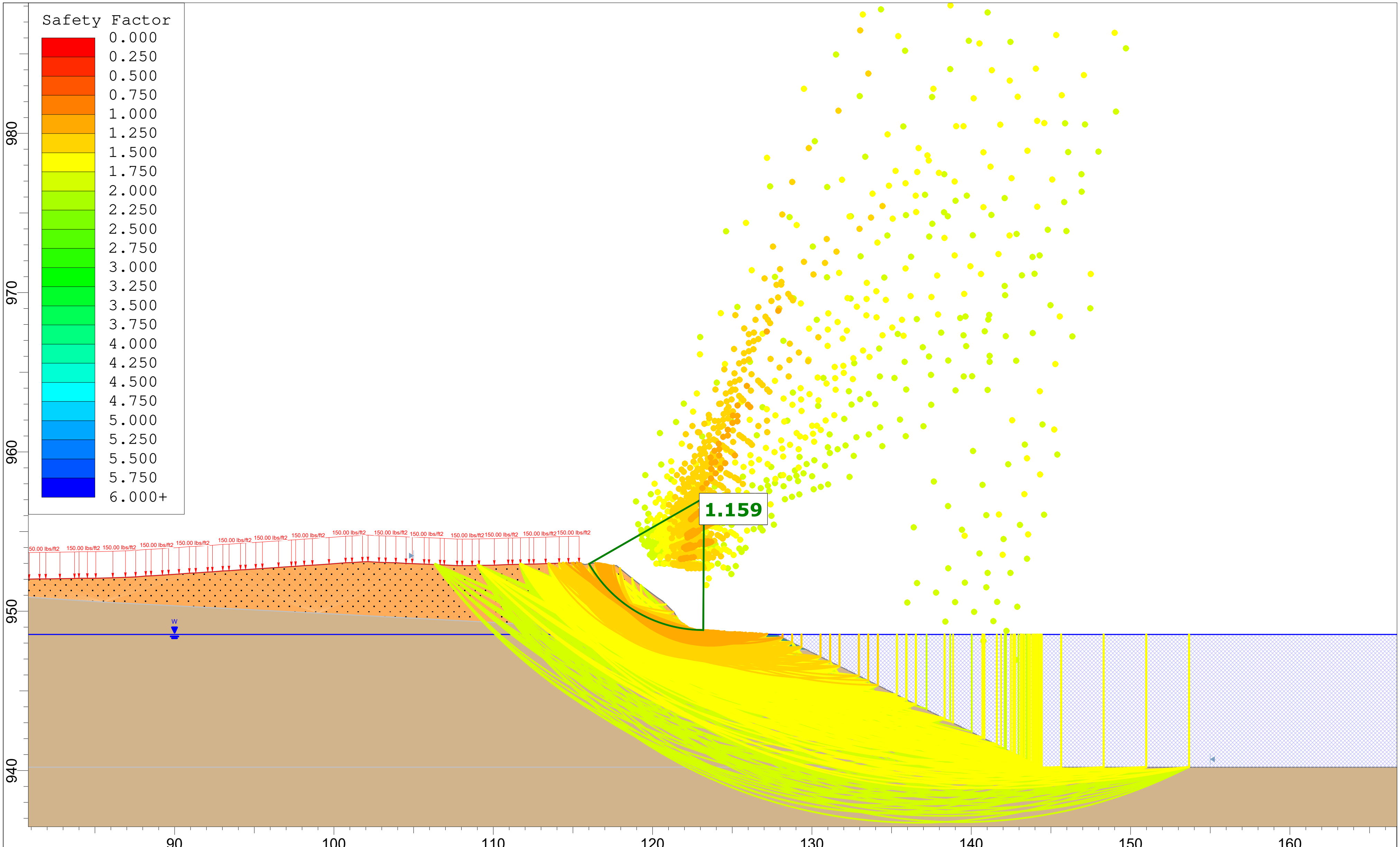


SLIDEINTERPRET 9.034	*Project* Woods Pond (Housatonic Reach 6)		
	Group Existing Conditions	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
	Date August 19, 2024	*File Name* Section 3-3_West_10psf.slmd	



SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_10psf.slmd



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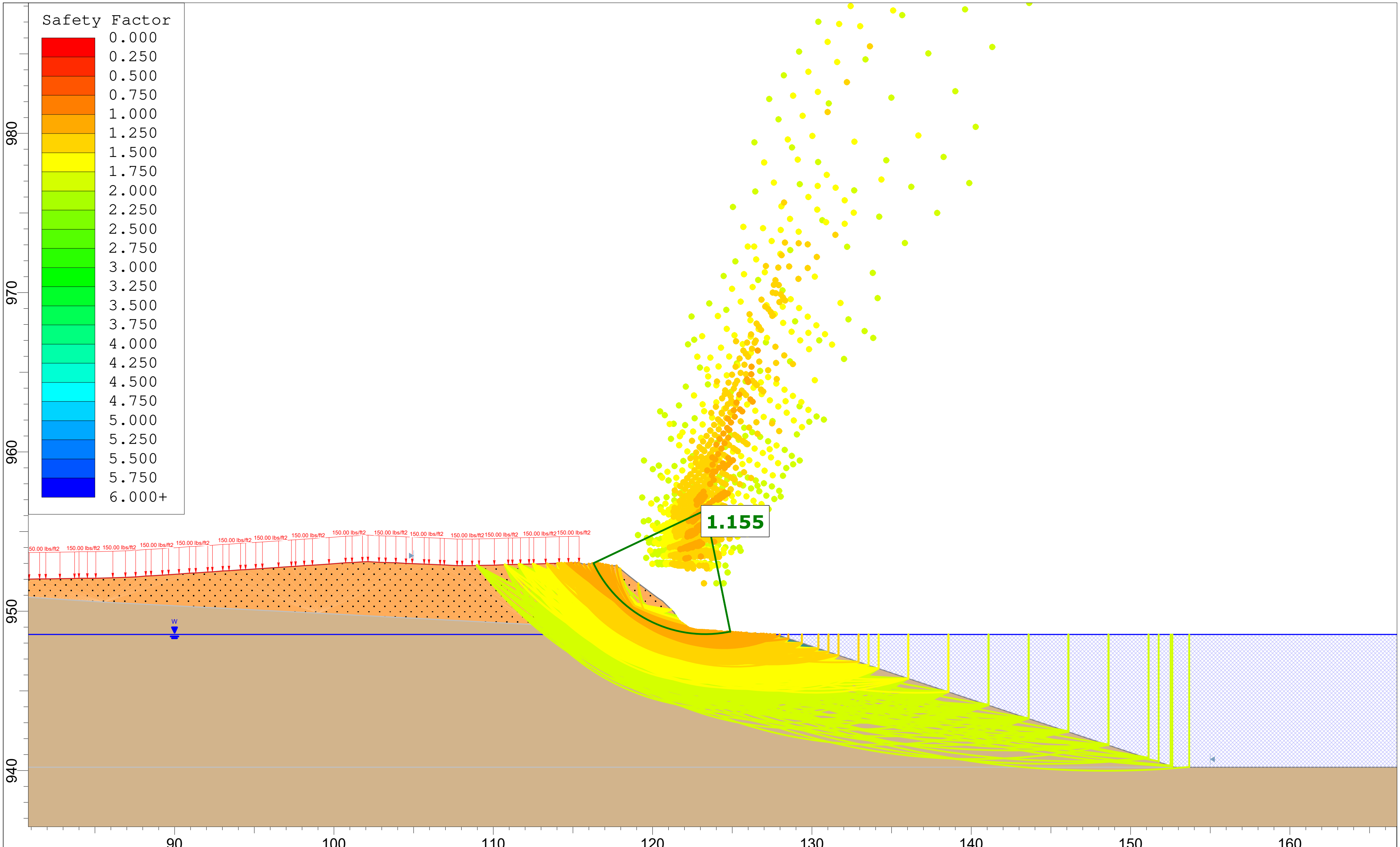
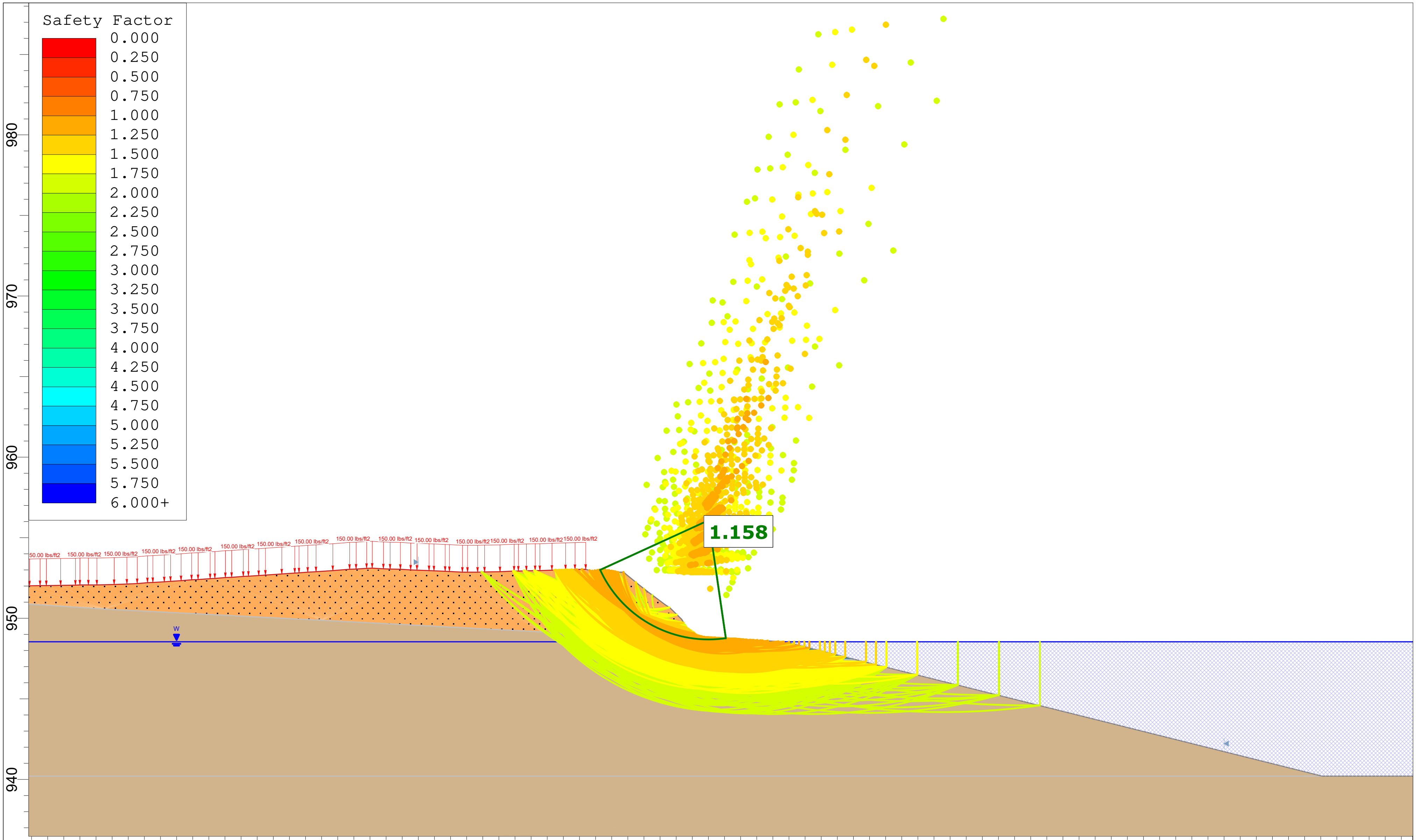
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_10psf.slmd



rocscience	Project	Woods Pond (Housatonic Reach 6)	
	Group: 3H:1V Dredge	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 3-3_West_10psf.slmd	



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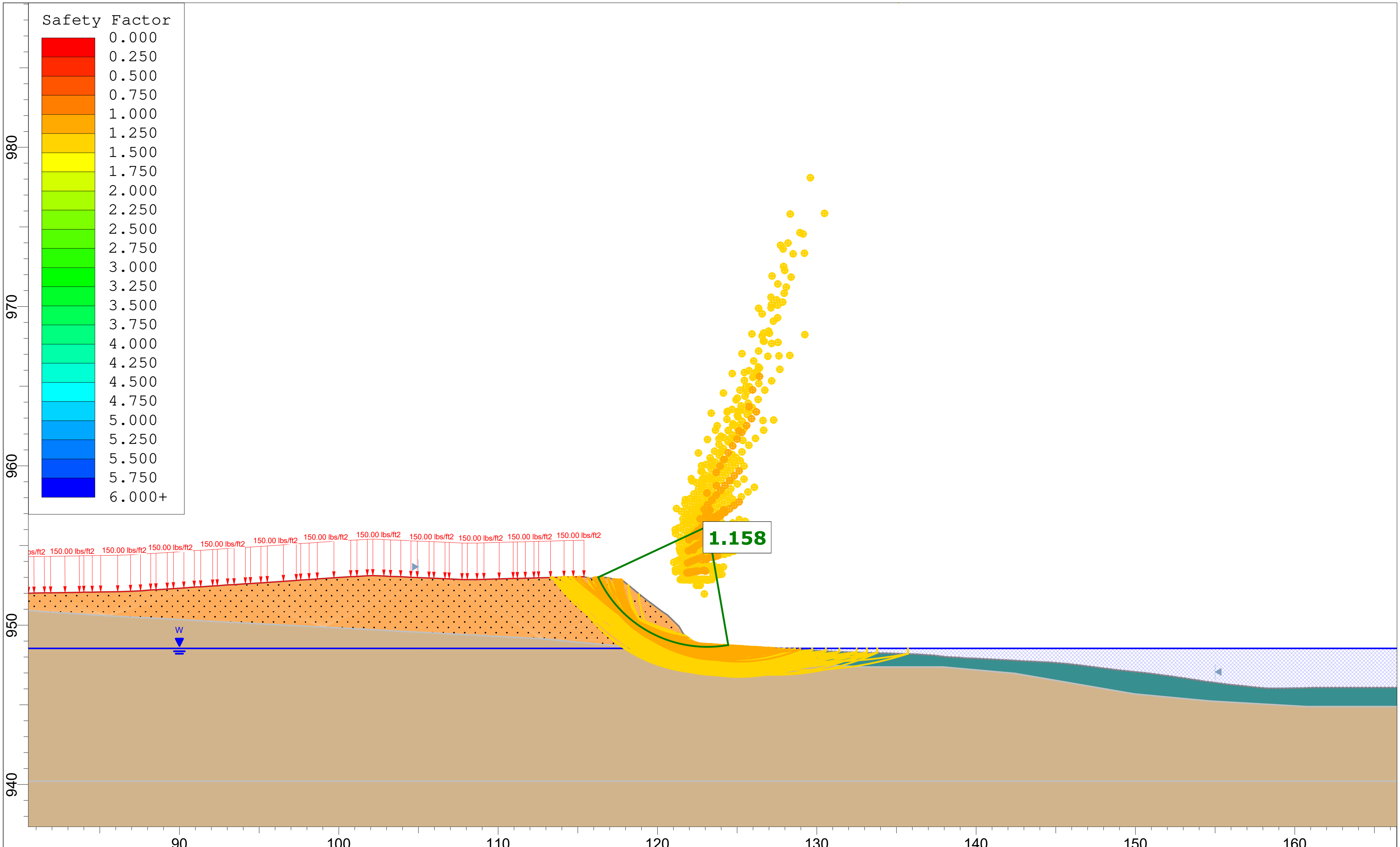
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	4H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_10psf.slmd



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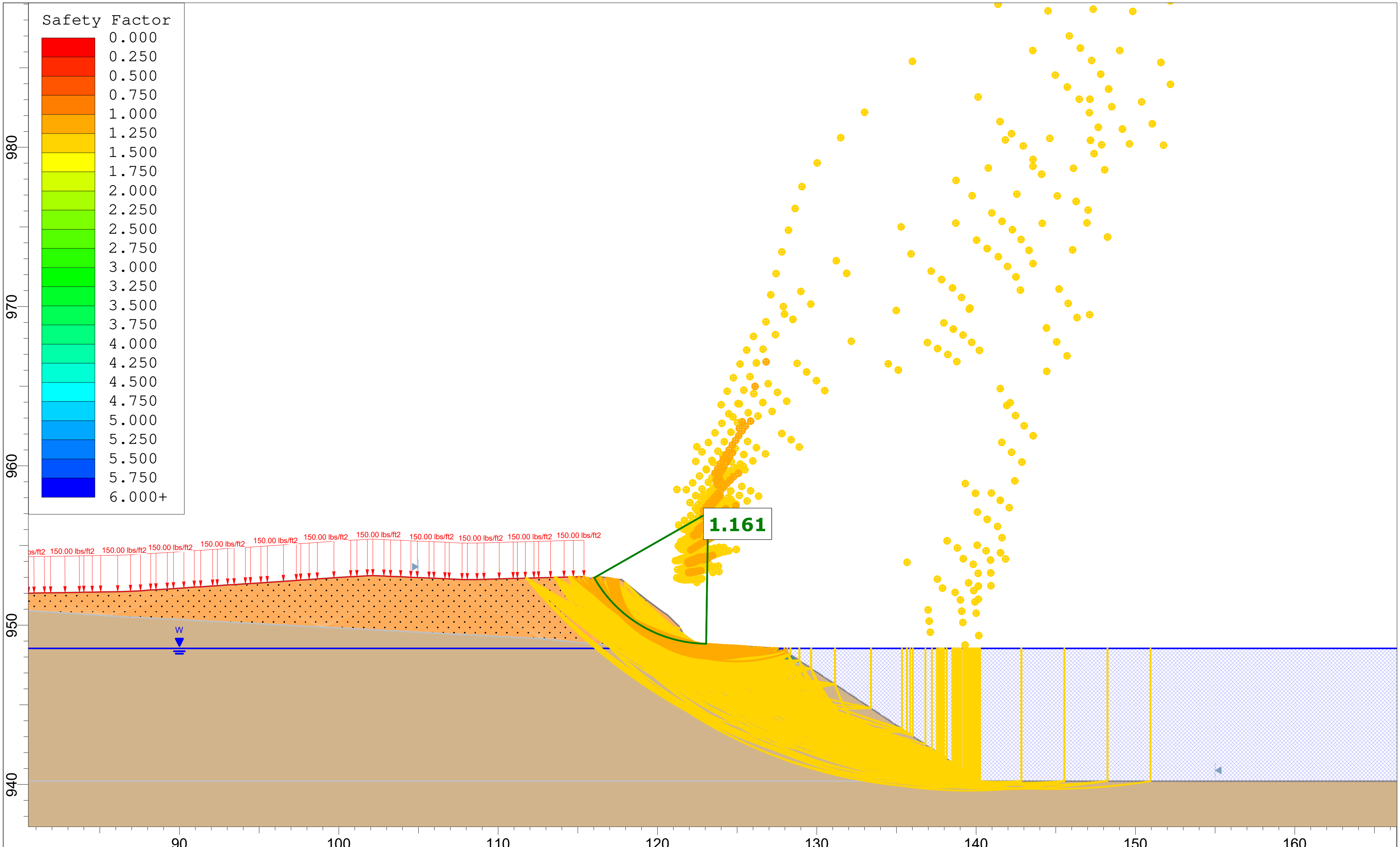
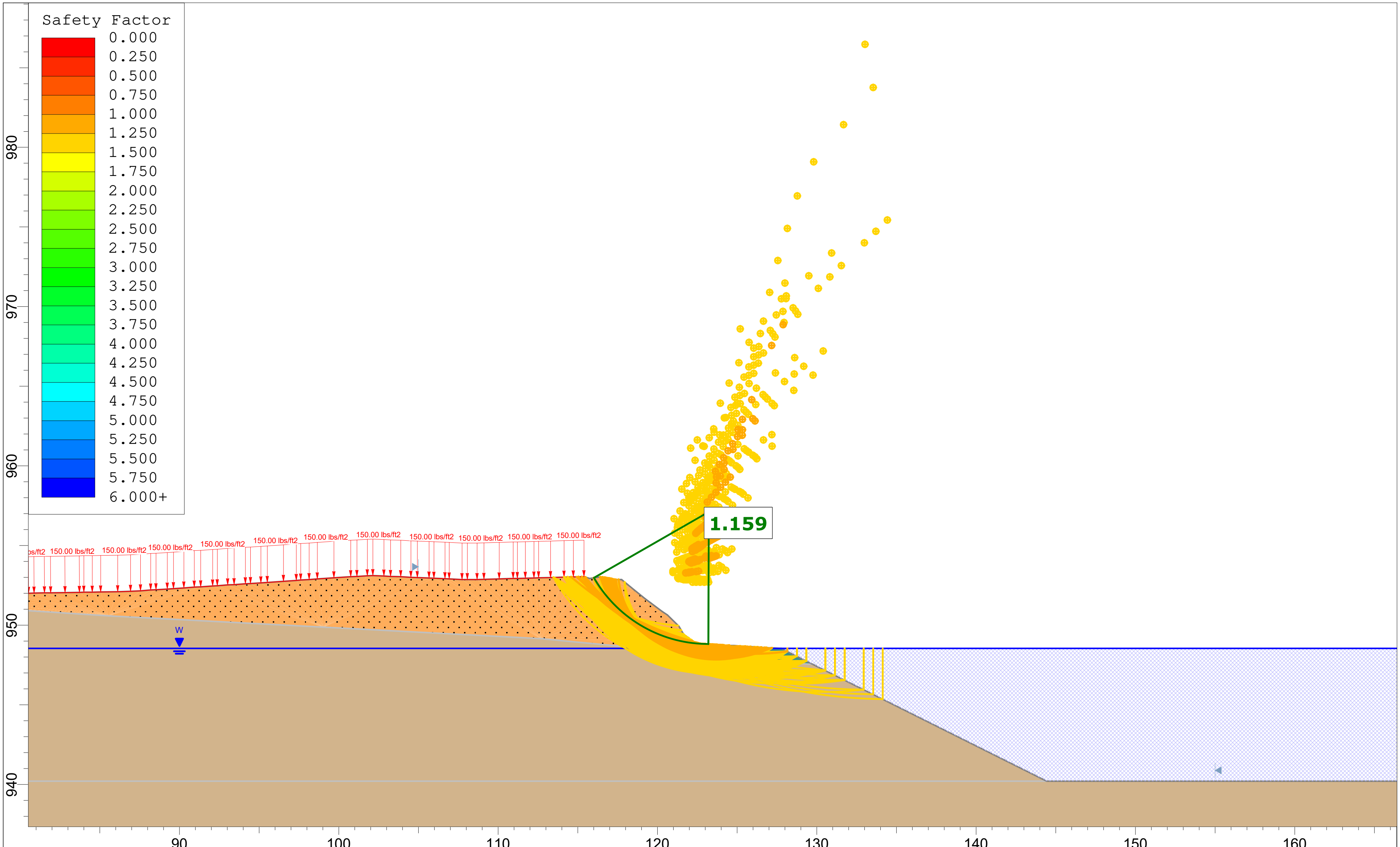
Project	Woods Pond (Housatonic Reach 6)		
Group	Existing Conditions	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 3-3_West_15psf.slmd

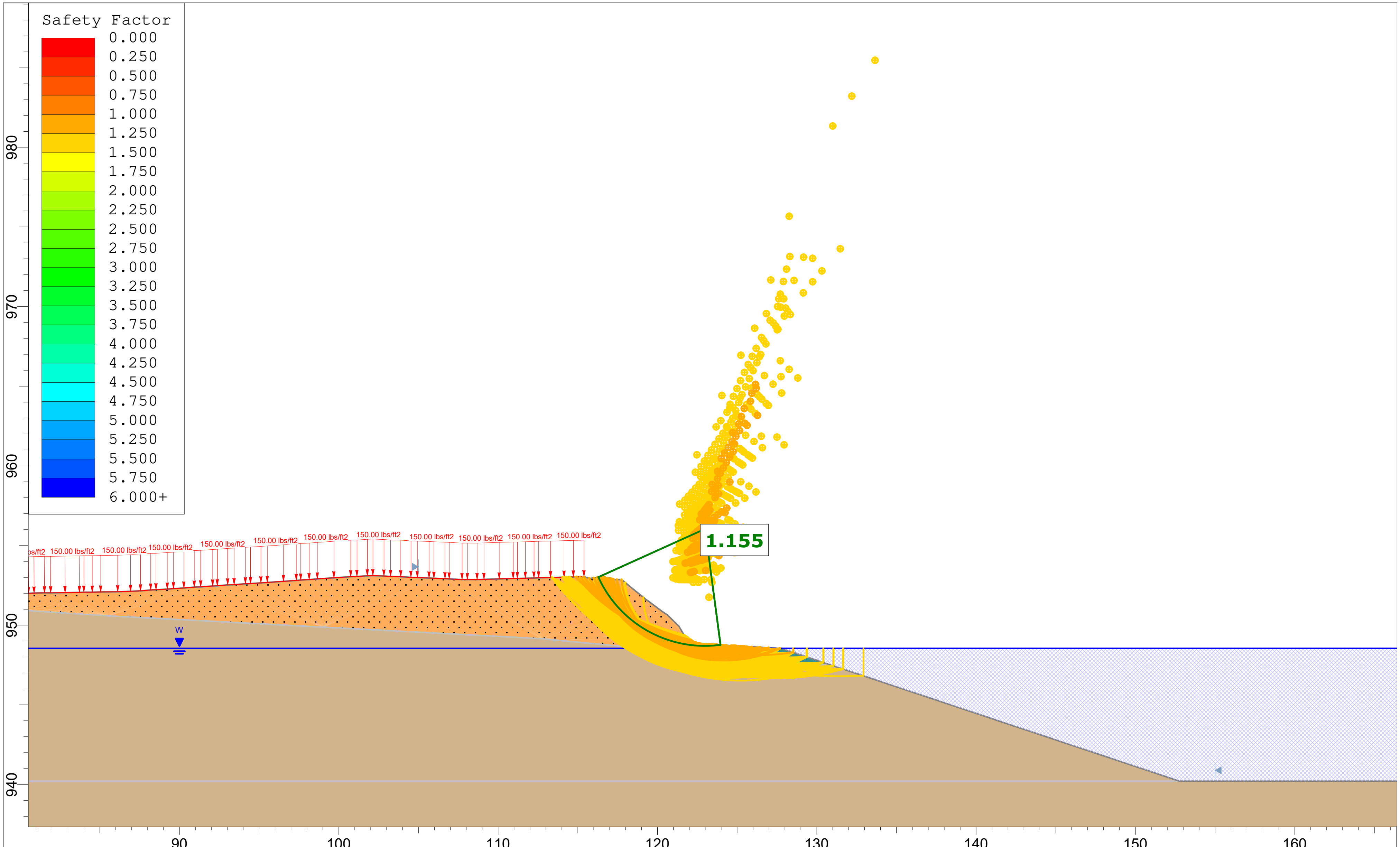
SLIDEINTERPRET 9.034



rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group 1.5H:1V Dredge	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 3-3_West_15psf.slmd	



rocscience	Project	Woods Pond (Housatonic Reach 6)	
	Group: 2H:1V Dredge	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 3-3_West_15psf.slmd	



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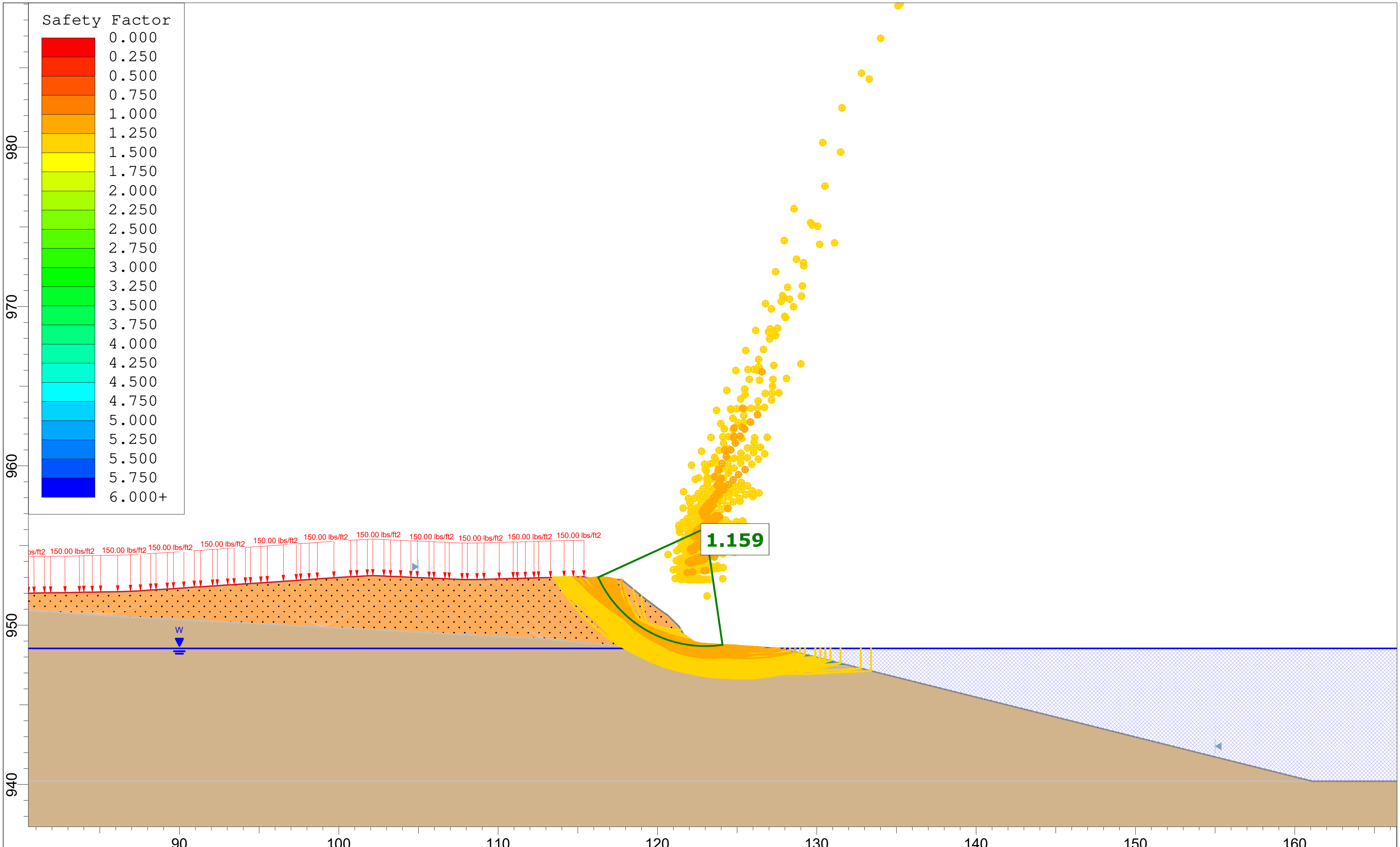
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	3H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_15psf.slmd



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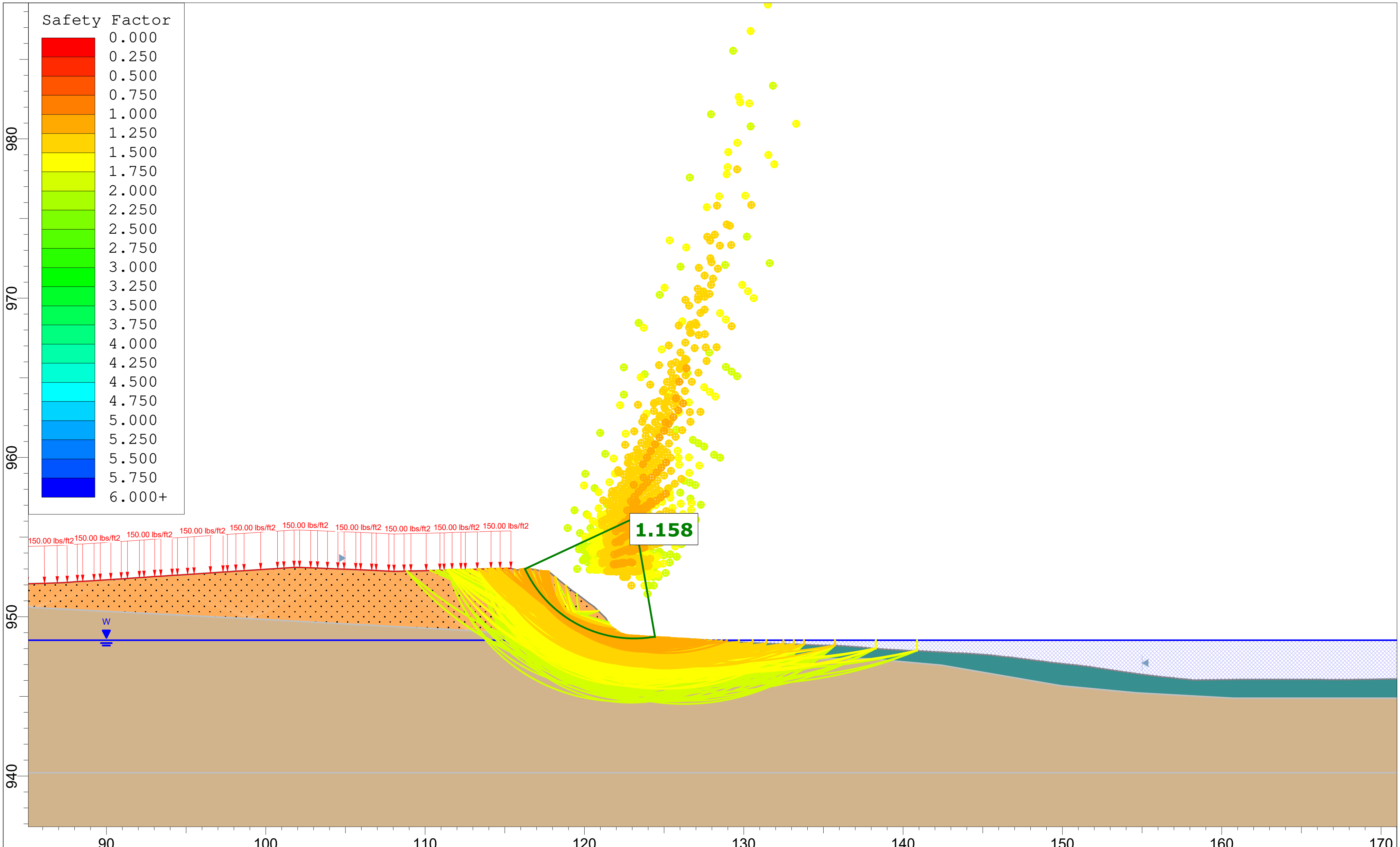
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)

Group	4H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_15psf.slmd

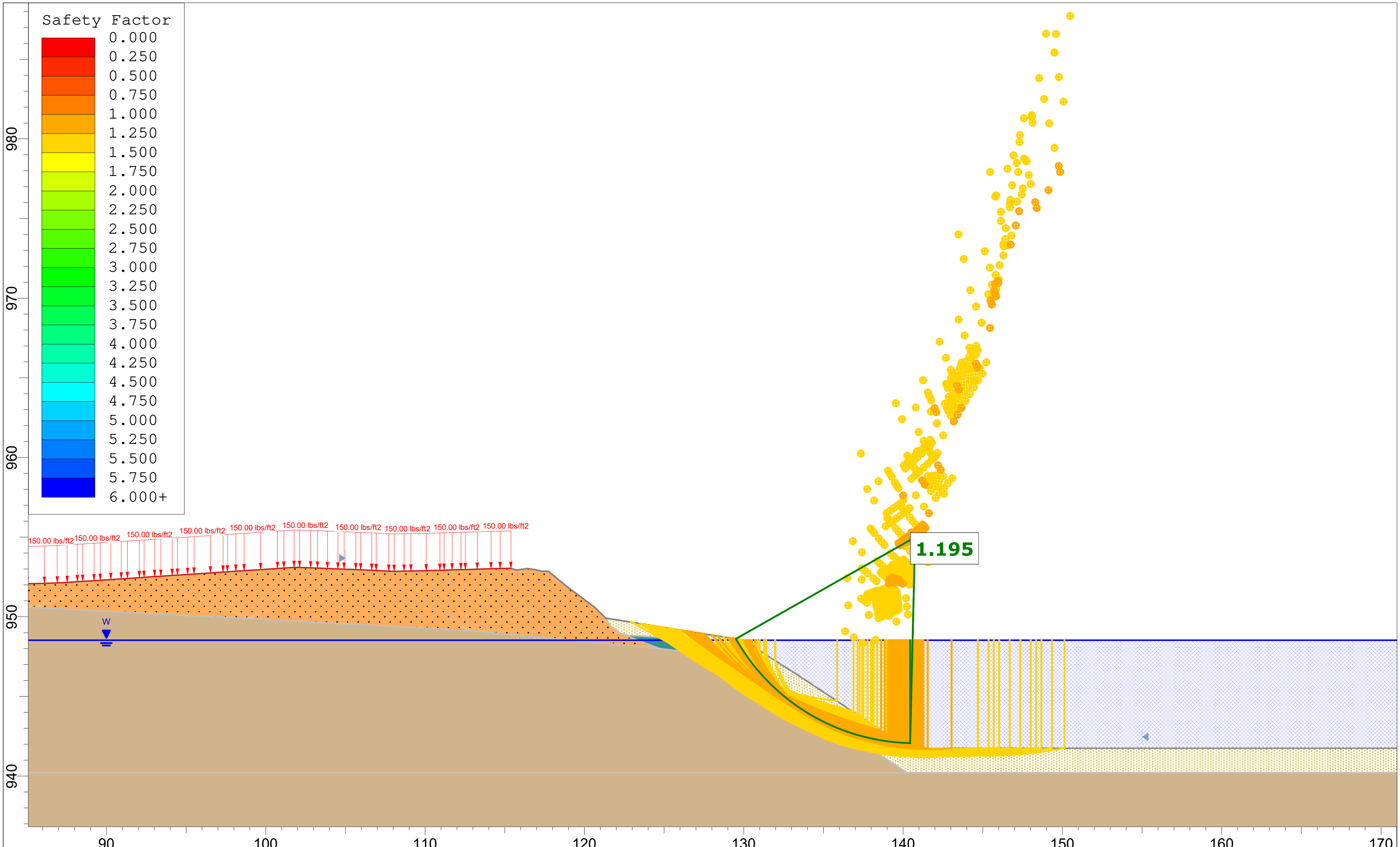


rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)

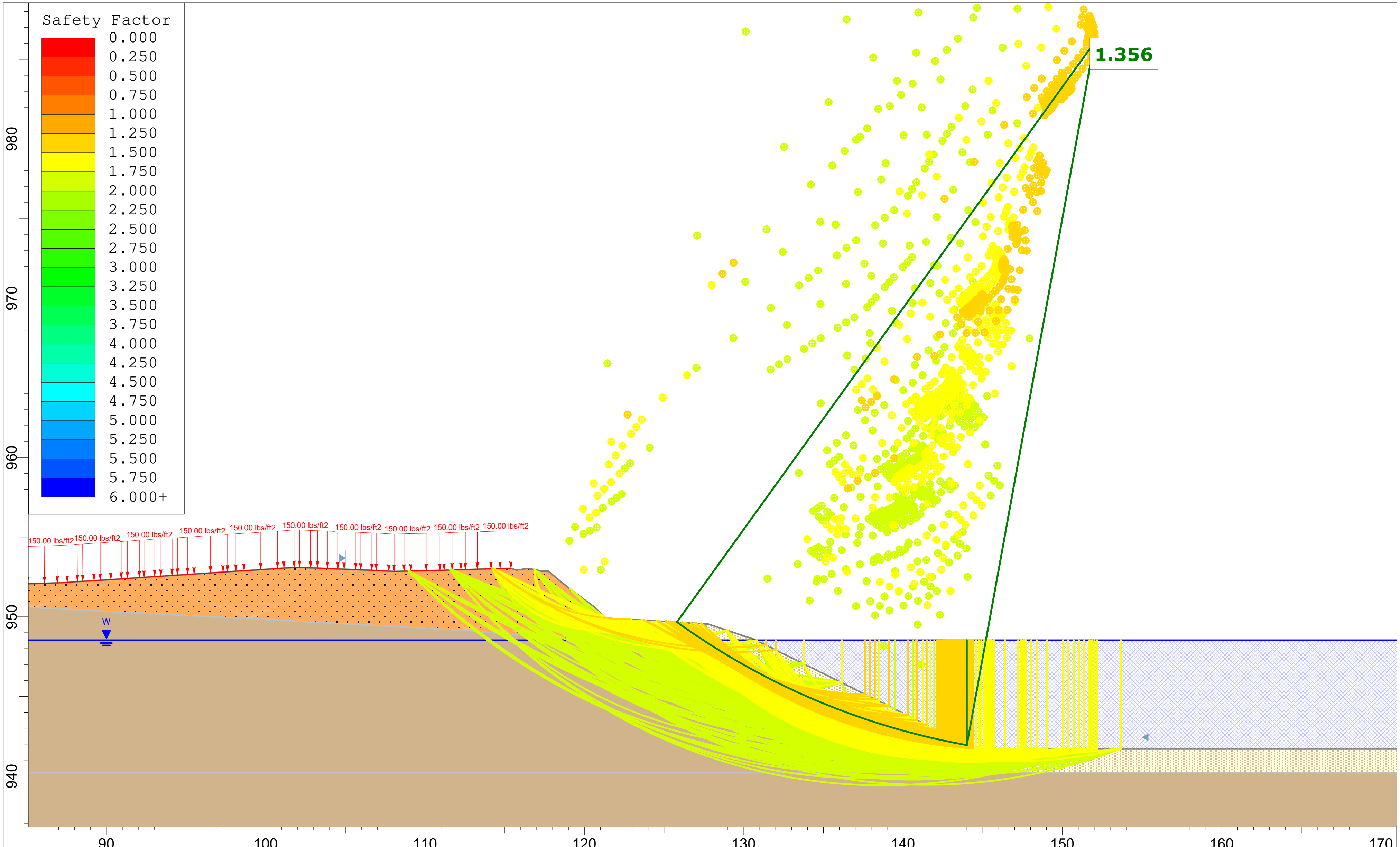
Group	Existing Conditions	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 3-3_West_15psf-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

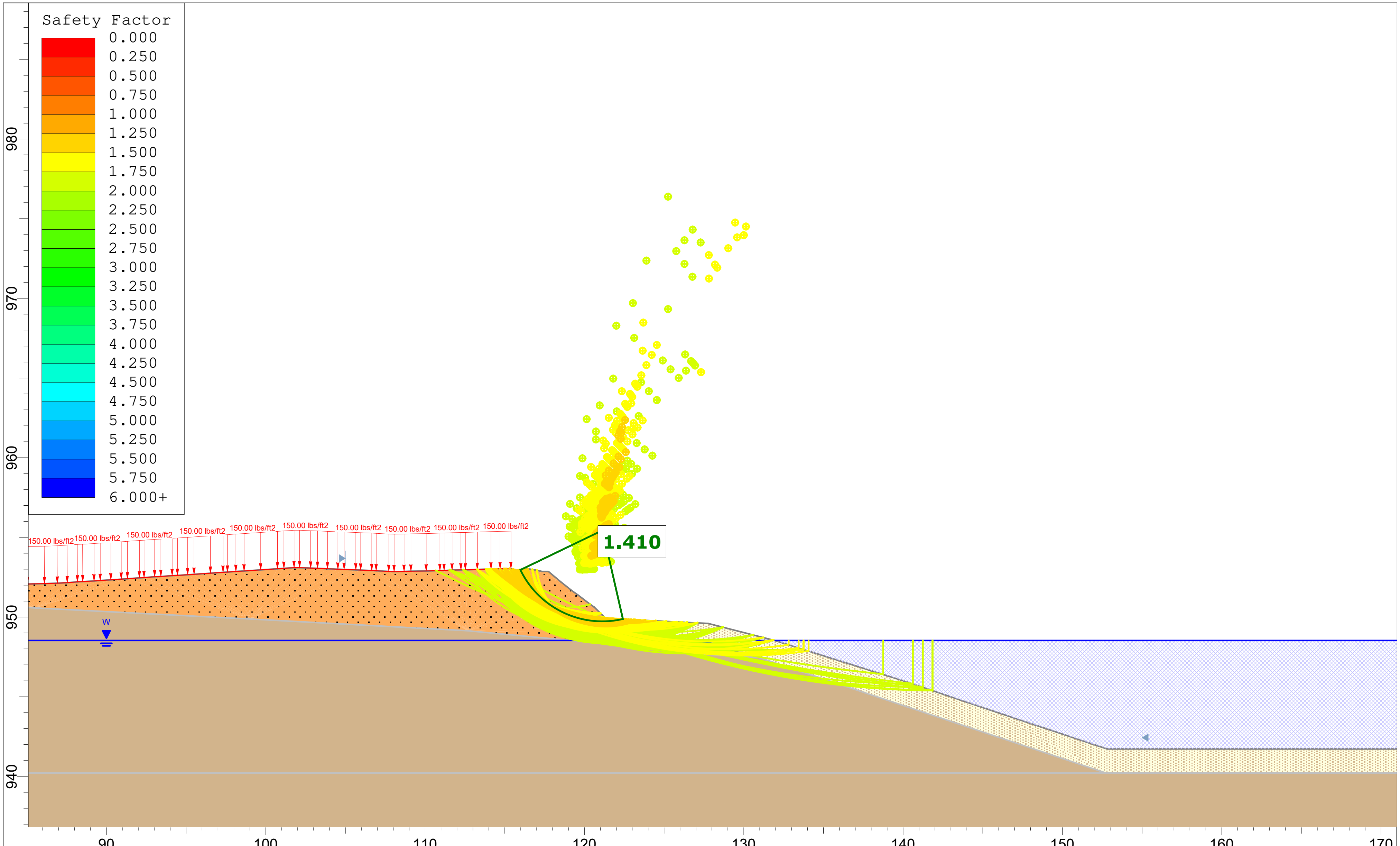
Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_15psf-Cap.slmd



rocscience

Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 3-3_West_15psf-Cap.slmd

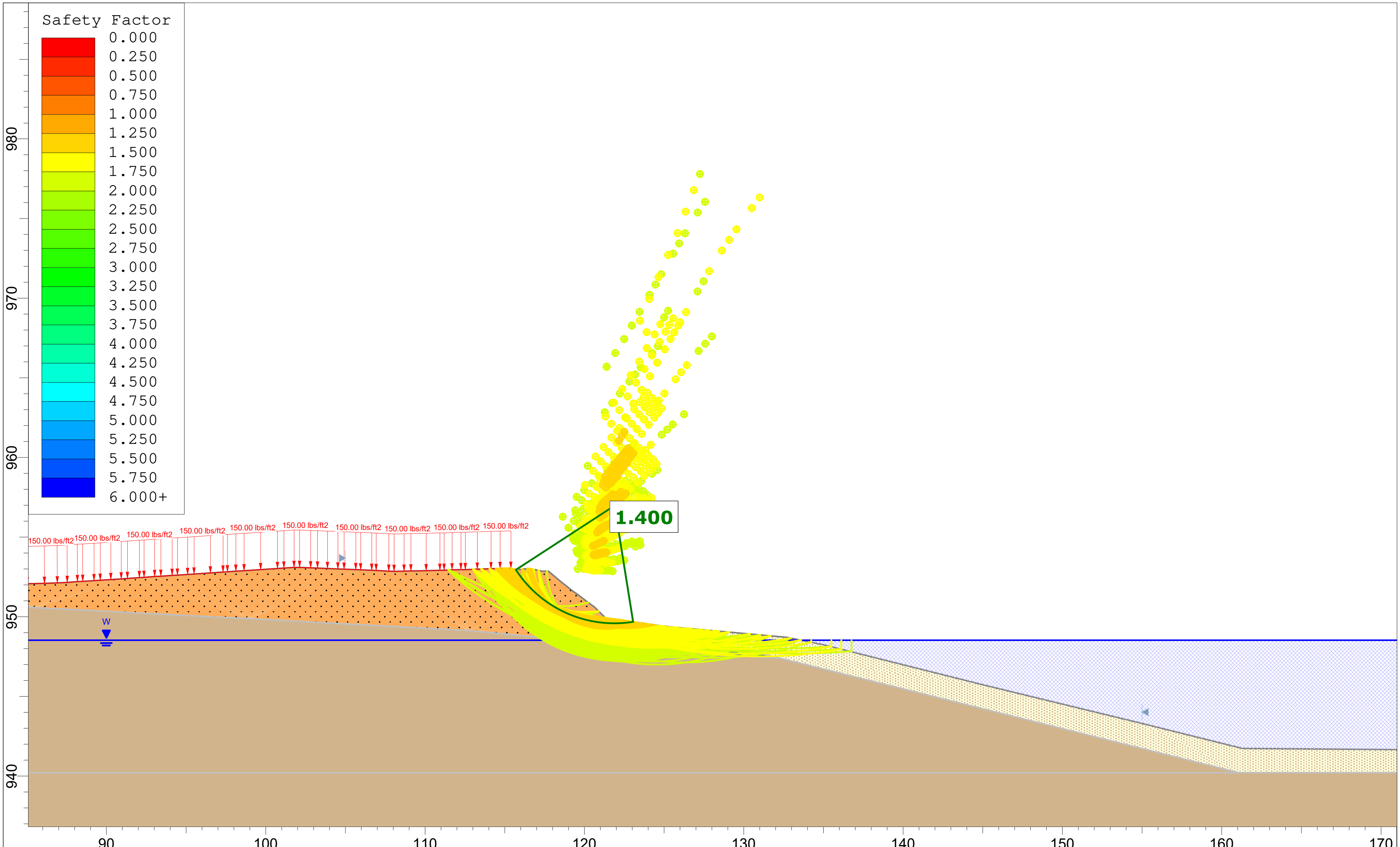
SLIDEINTERPRET 9.034



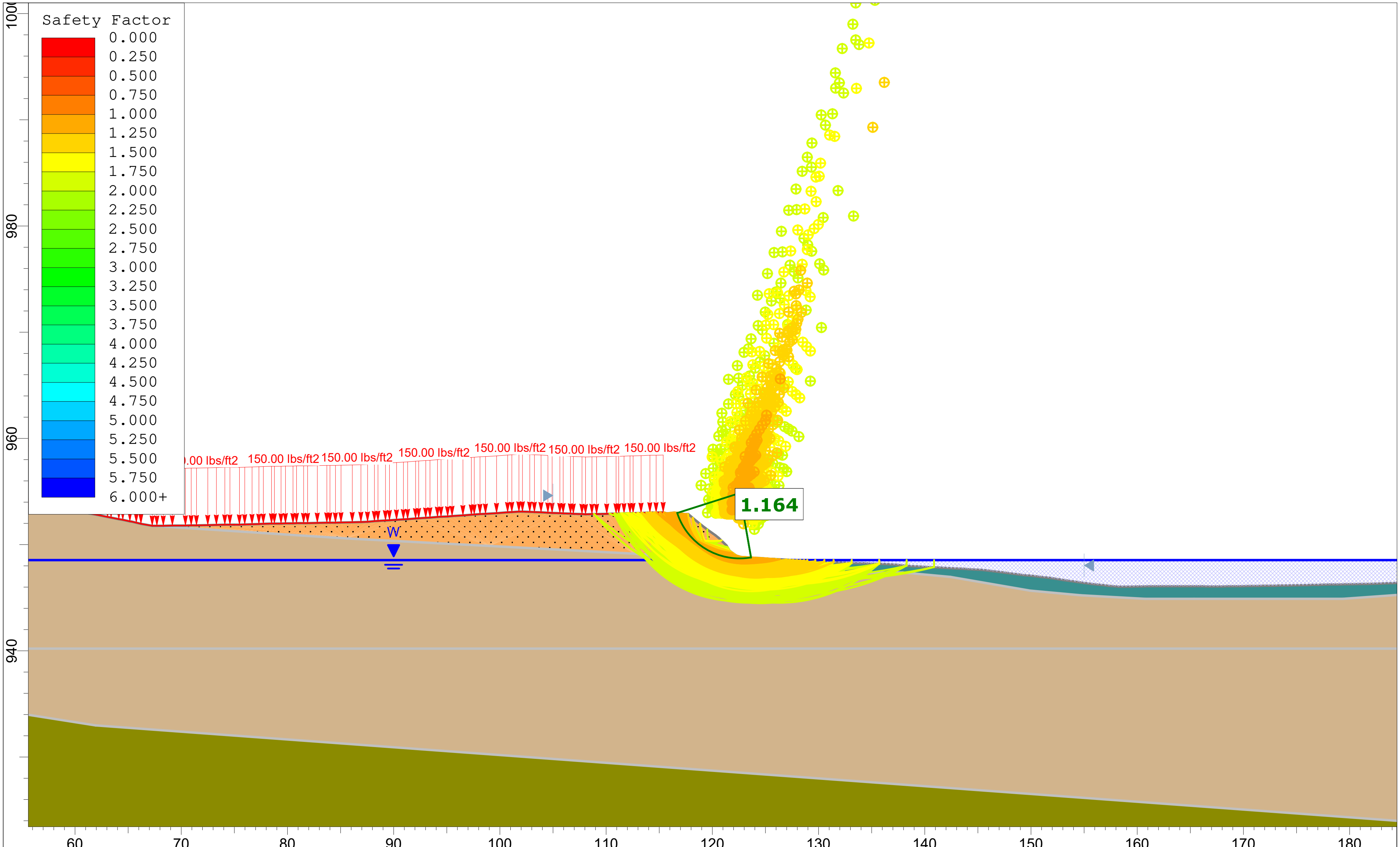
rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	3H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_15psf-Cap.slmd



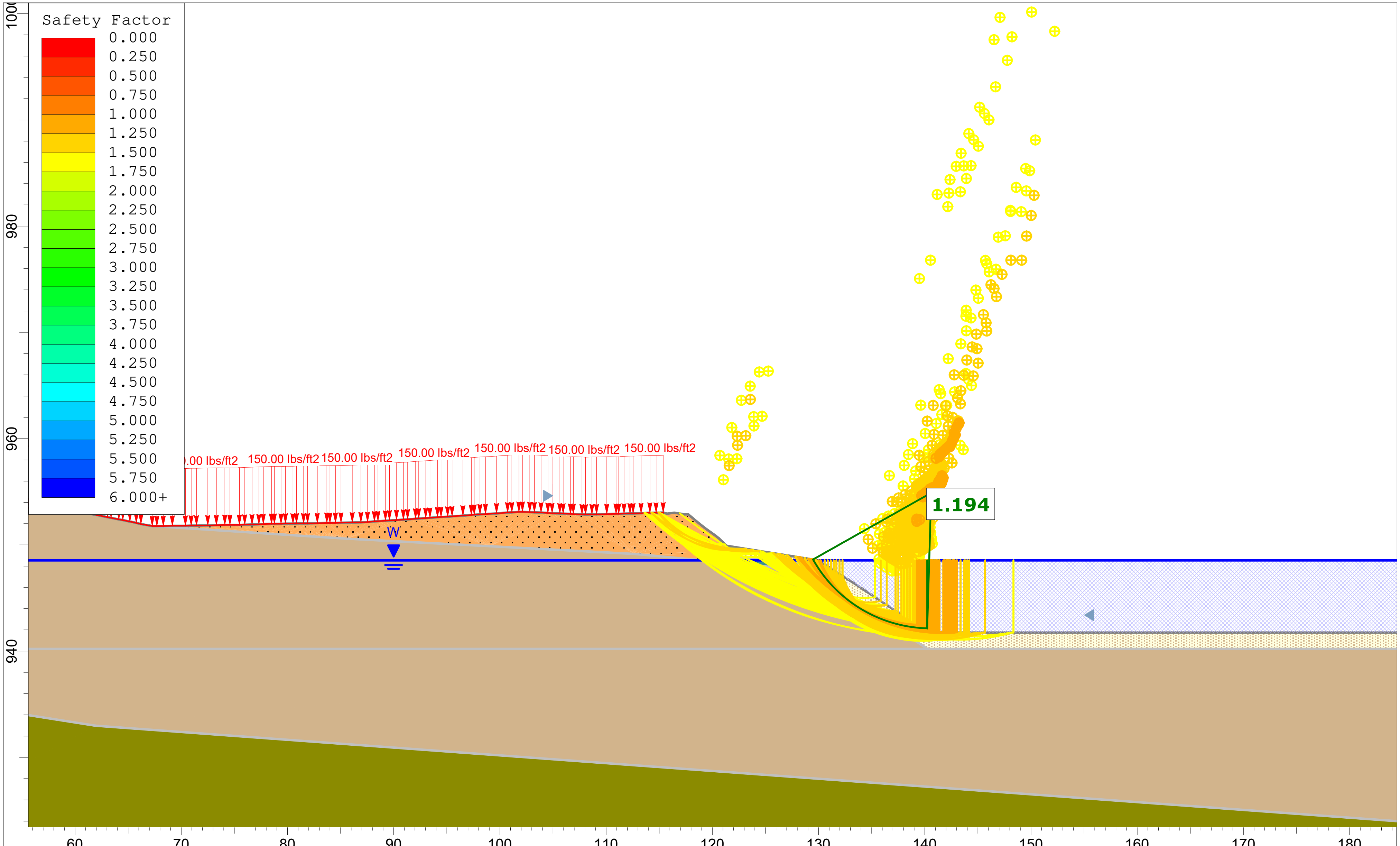
rocscience	Project: Woods Pond (Housatonic Reach 6)		
	Group: 4H:1V Dredge	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 3-3_West_15psf-Cap.slmd	



rocscience

SLIDEINTERPRET 9.034

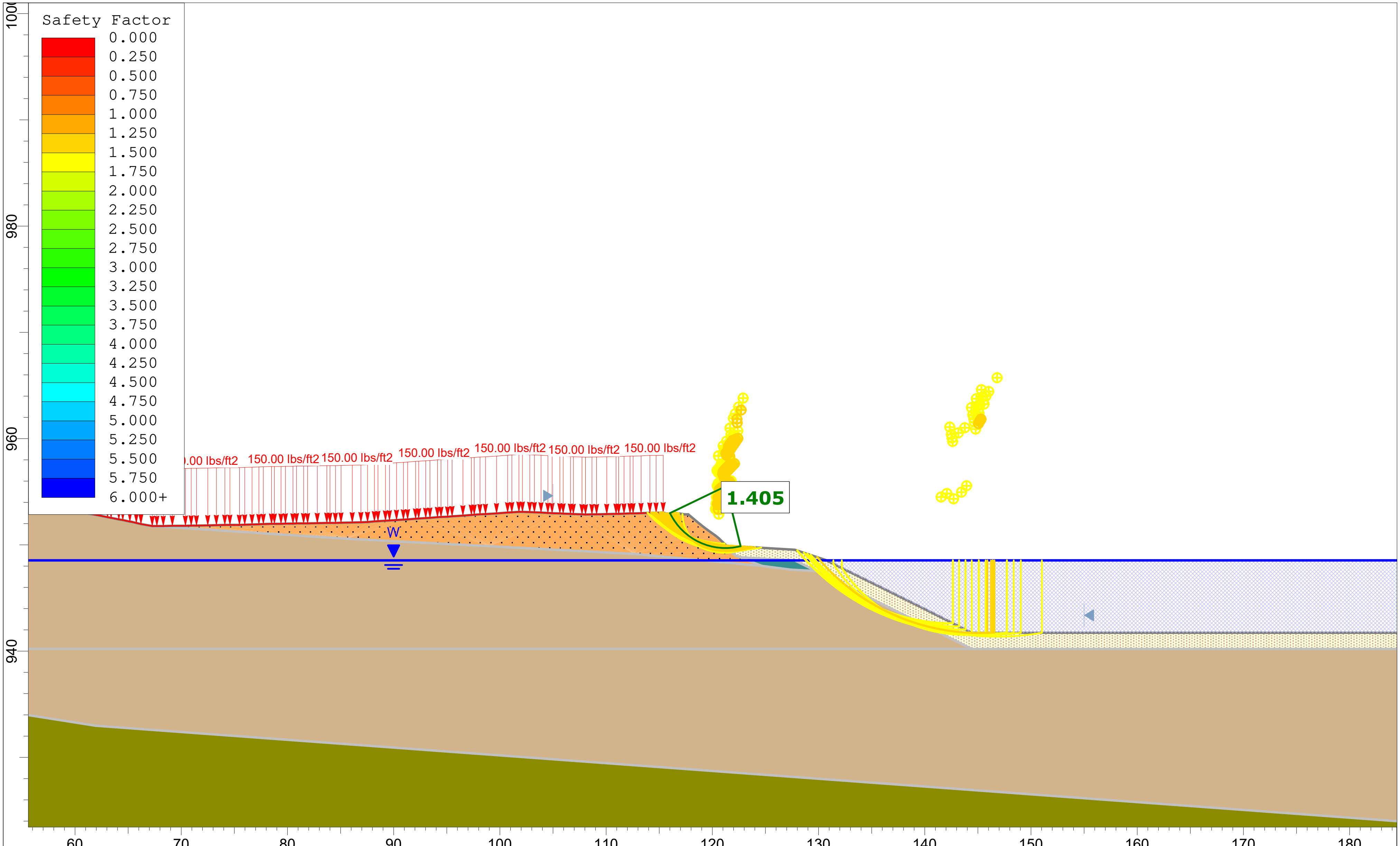
Project Woods Pond (Housatonic Reach 6)	
Group Existing Conditions	*Scenario* Master Scenario
Drawn By C. Bales	*Company* Anchor QEA
Date August 19, 2024	*File Name* Section 3-3_West_065ratio-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

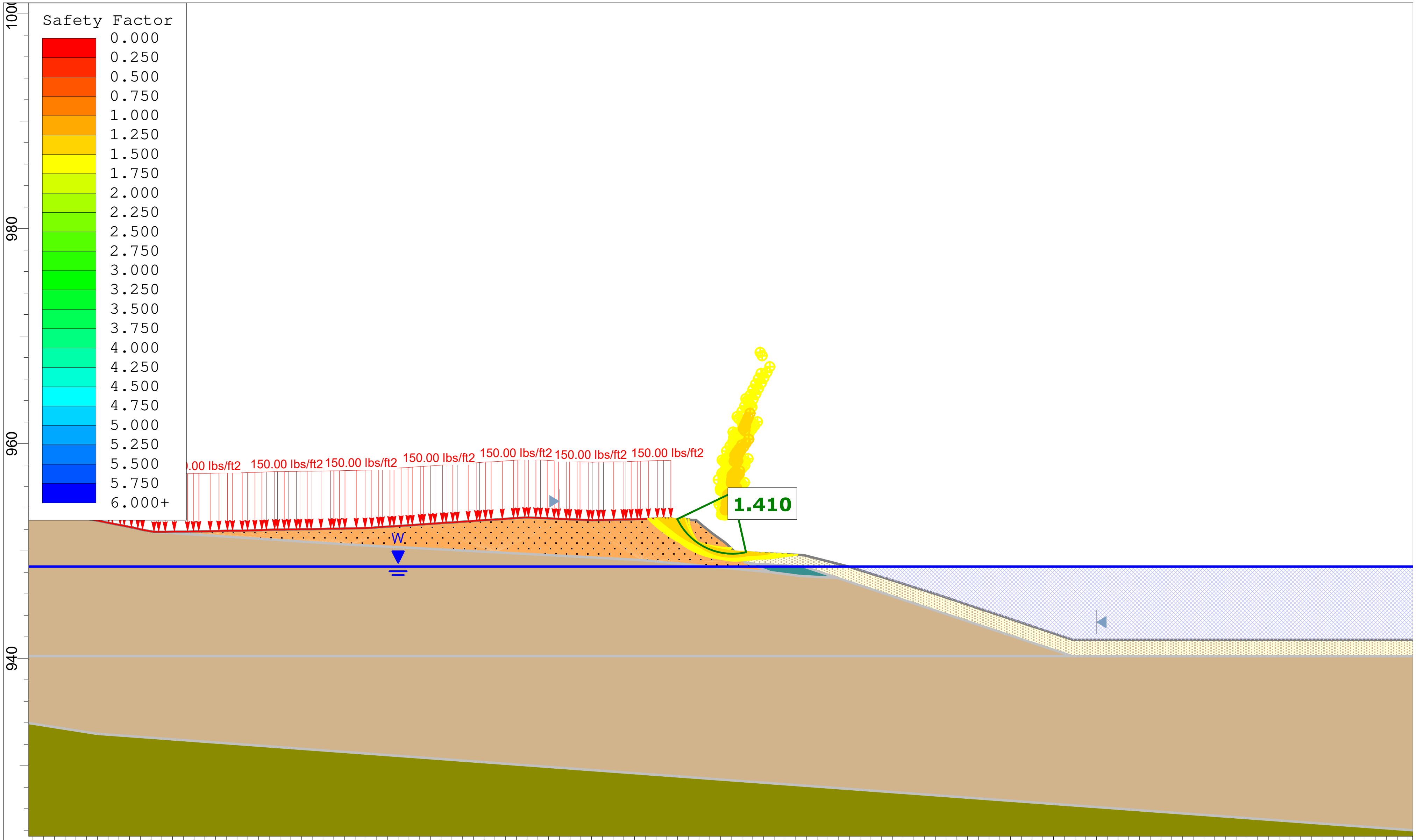
Project	Woods Pond (Housatonic Reach 6)		
Group	1.5H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_065ratio-Cap.slmd



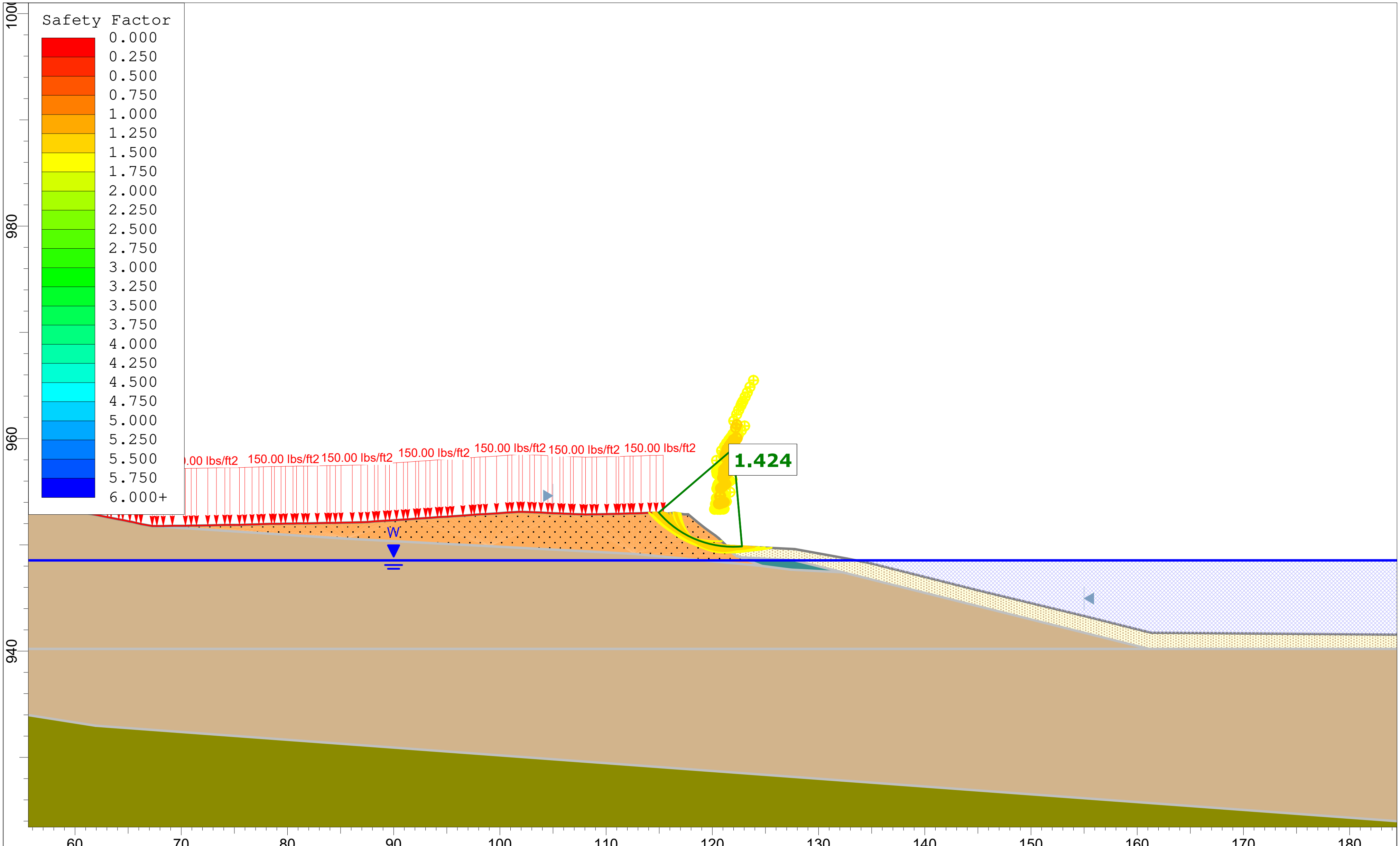
rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	Scenario	Master Scenario
Drawn By	C. Bales	Company	Anchor QEA
Date	August 19, 2024	File Name	Section 3-3_West_065ratio-Cap.slmd



rocscience	Project	Woods Pond (Housatonic Reach 6)	
	Group: 3H:1V Dredge	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 3-3_West_065ratio-Cap.slmd	

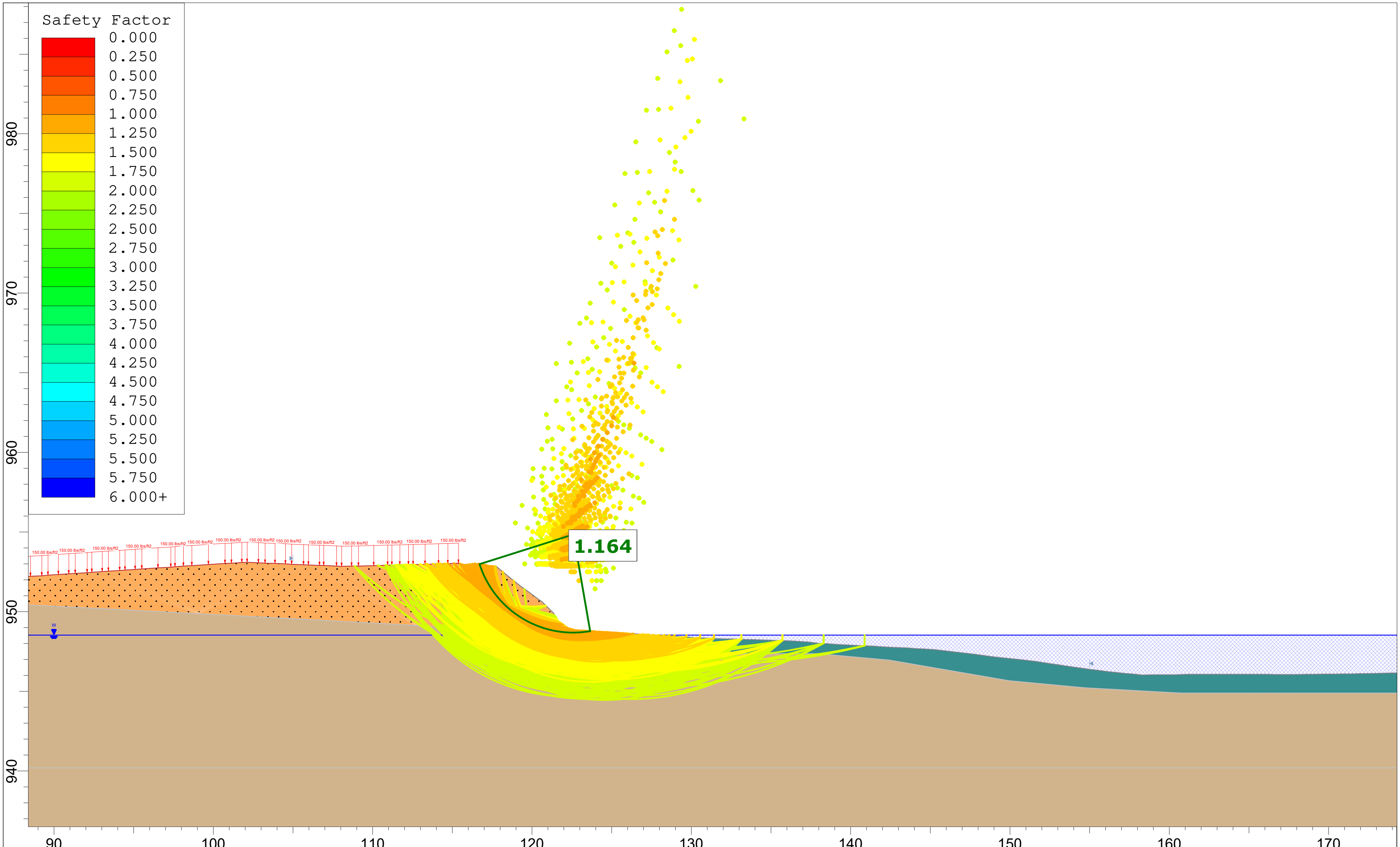


rocscience

SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)

Group	4H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_065ratio-Cap.slmd



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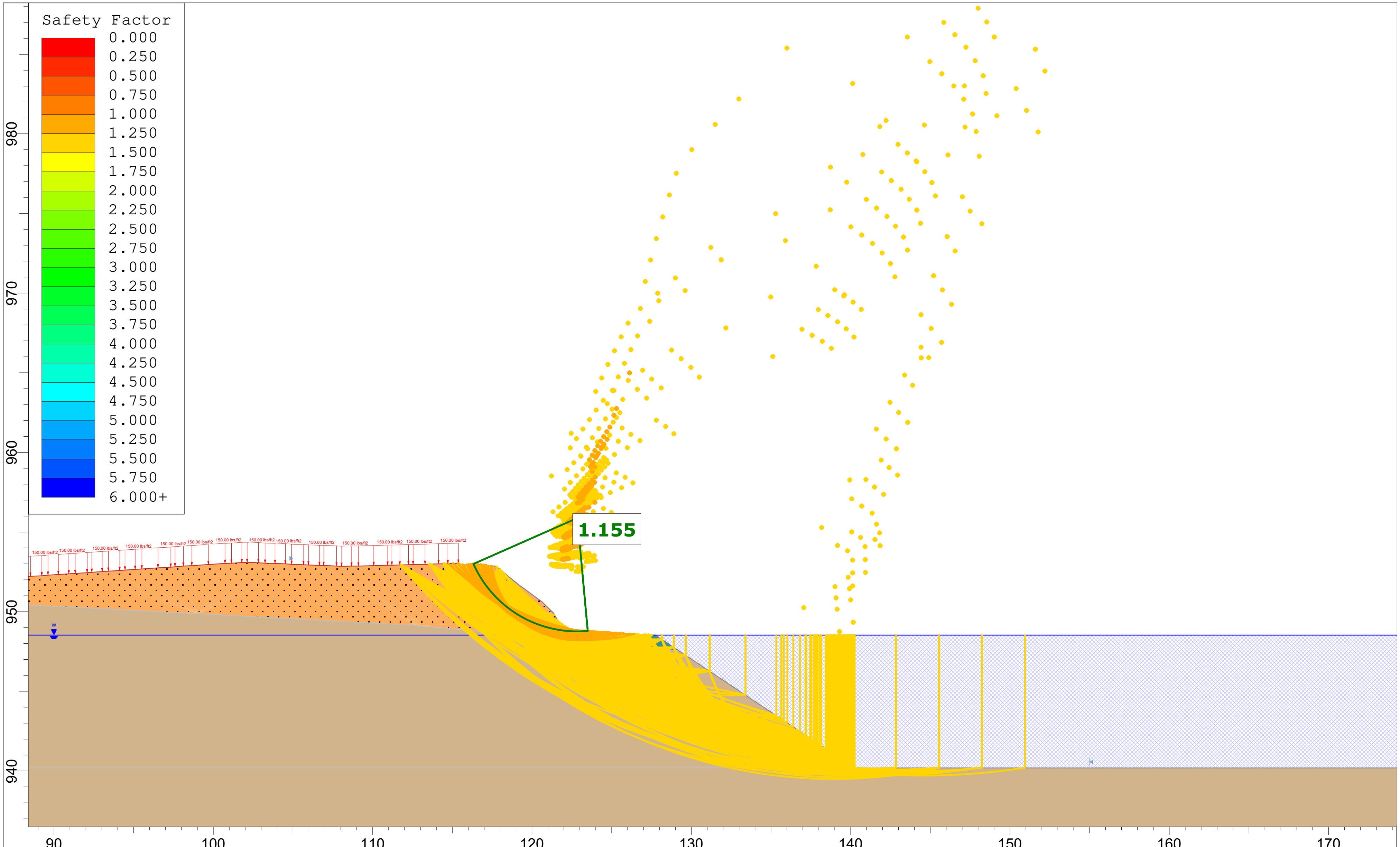
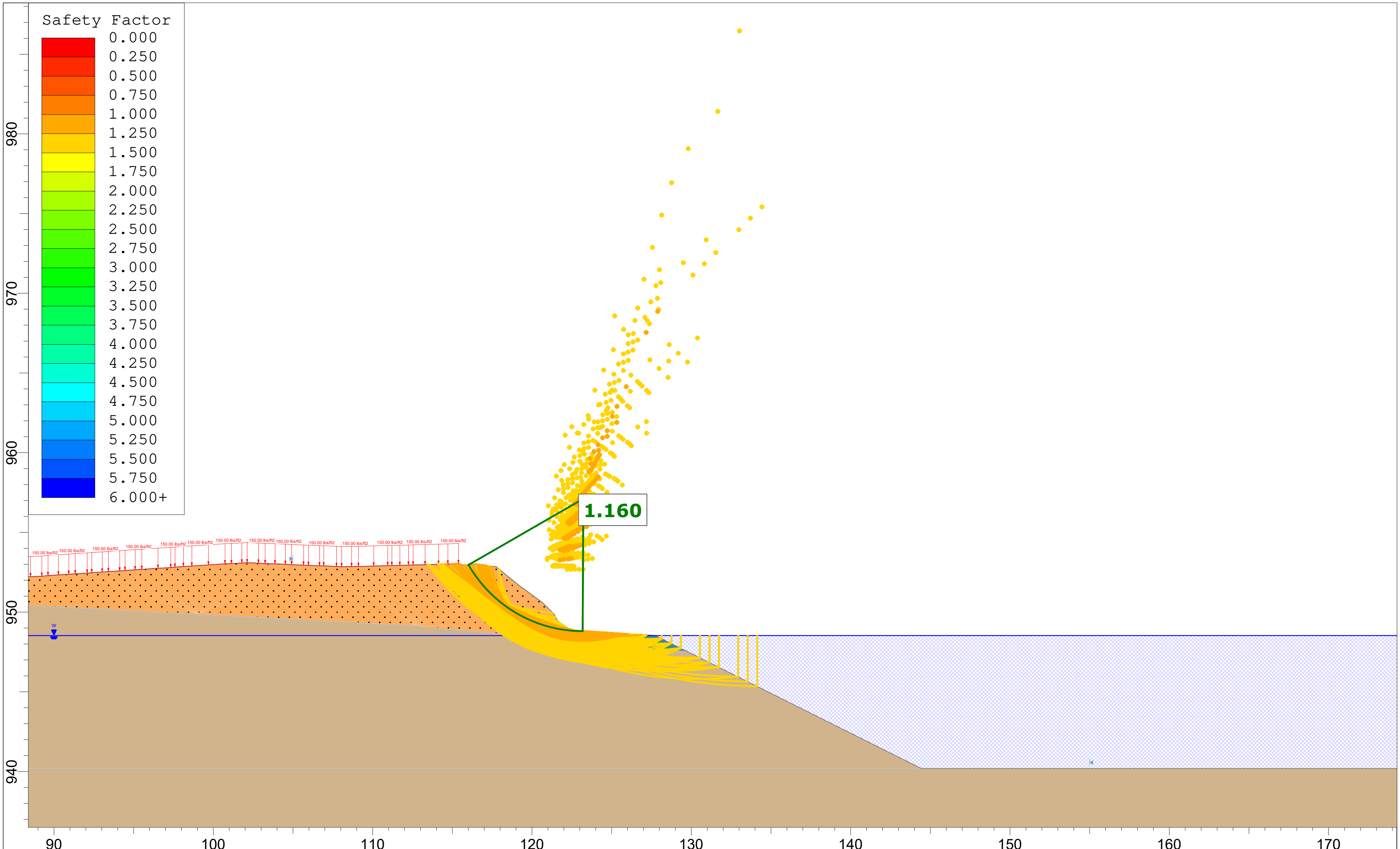
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	Existing Conditions	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_065ratio.slmd

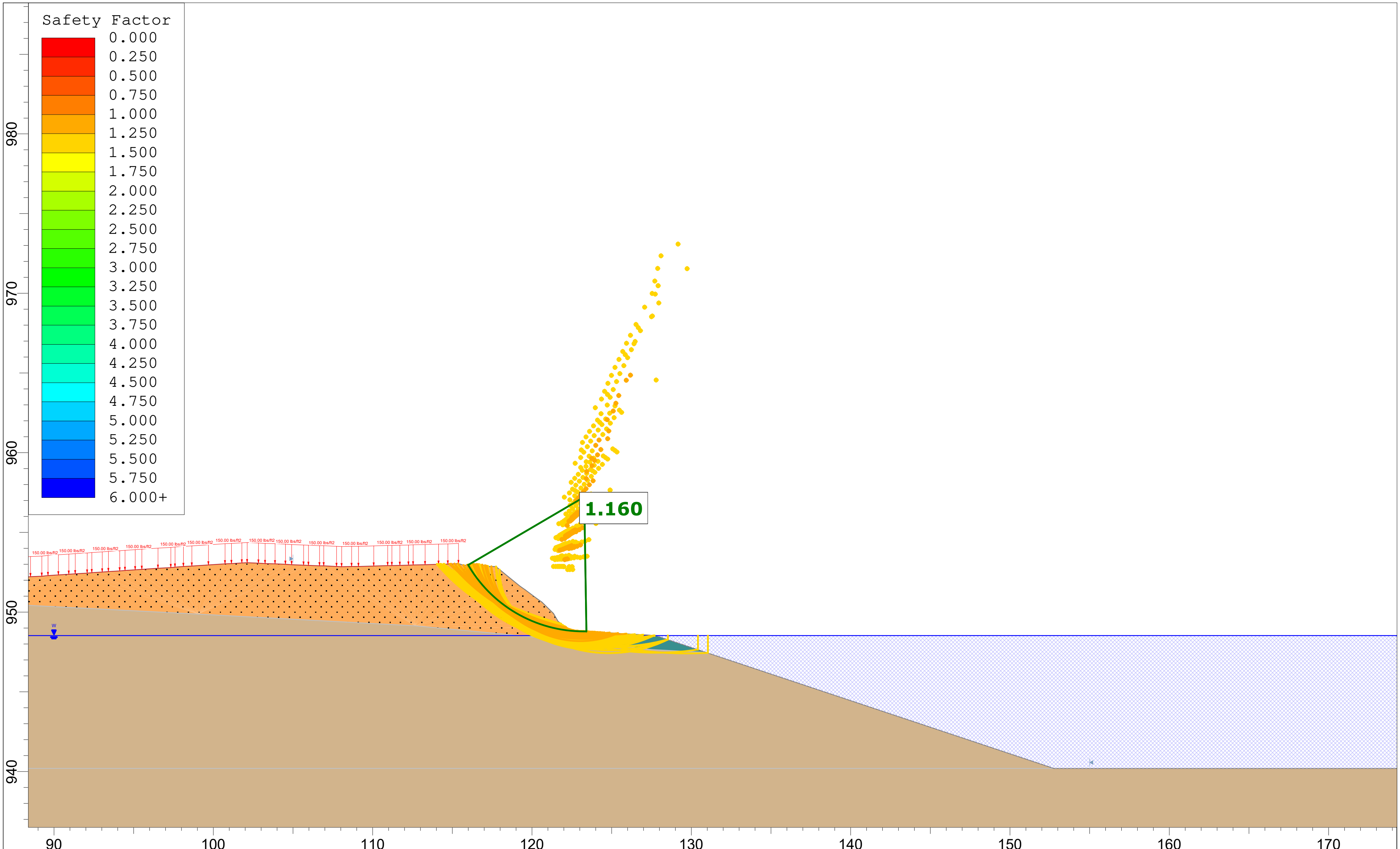


rocscience	*Project* Woods Pond (Housatonic Reach 6)		
	Group 1.5H:1V Dredge	*Scenario* Master Scenario	
	Drawn By C. Bales	*Company* Anchor QEA	
SLIDEINTERPRET 9.034	*Date* August 19, 2024	*File Name* Section 3-3_West_065ratio.slmd	



Project	Woods Pond (Housatonic Reach 6)		
Group	2H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_065ratio.slmd

SLIDEINTERPRET 9.034



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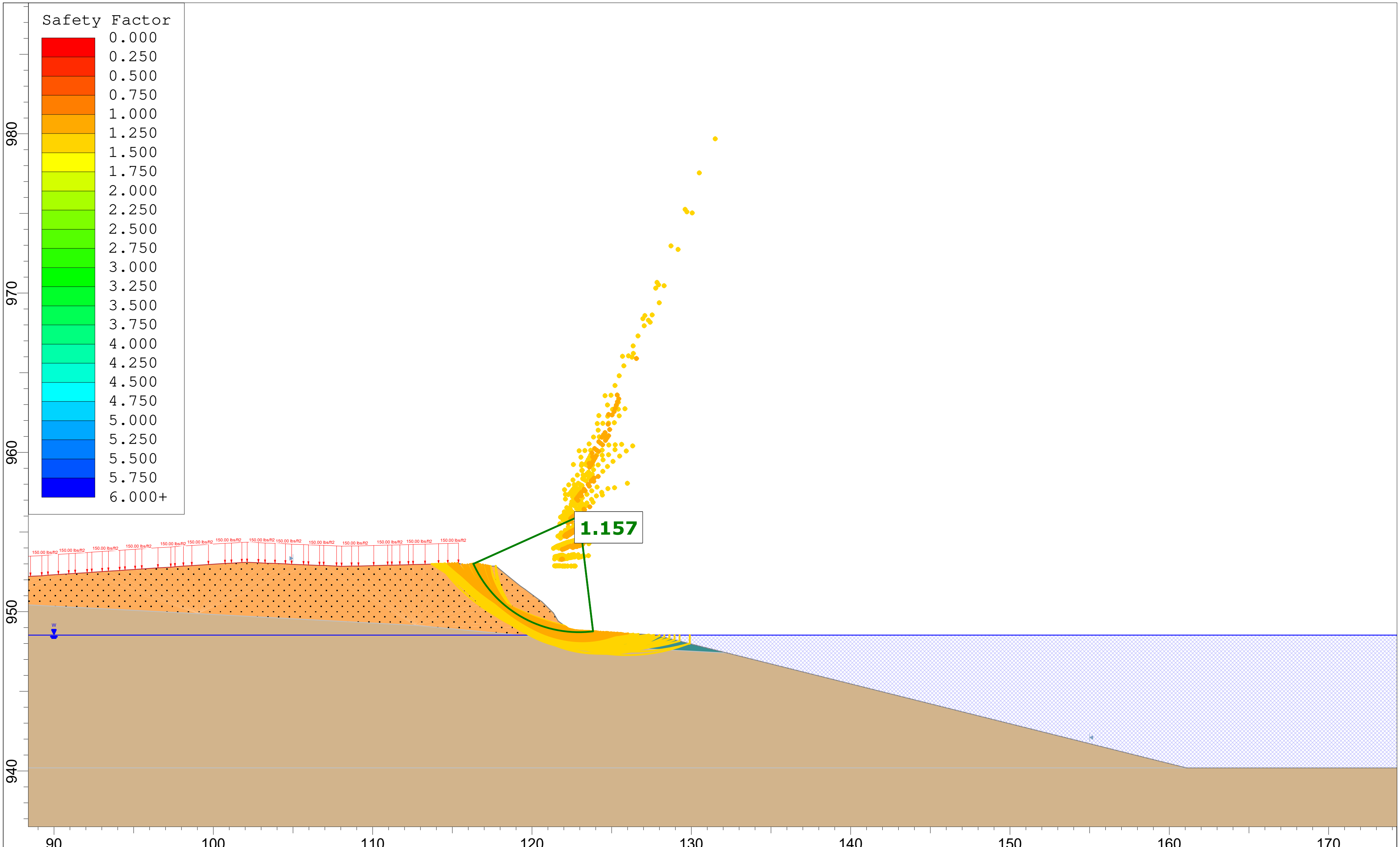
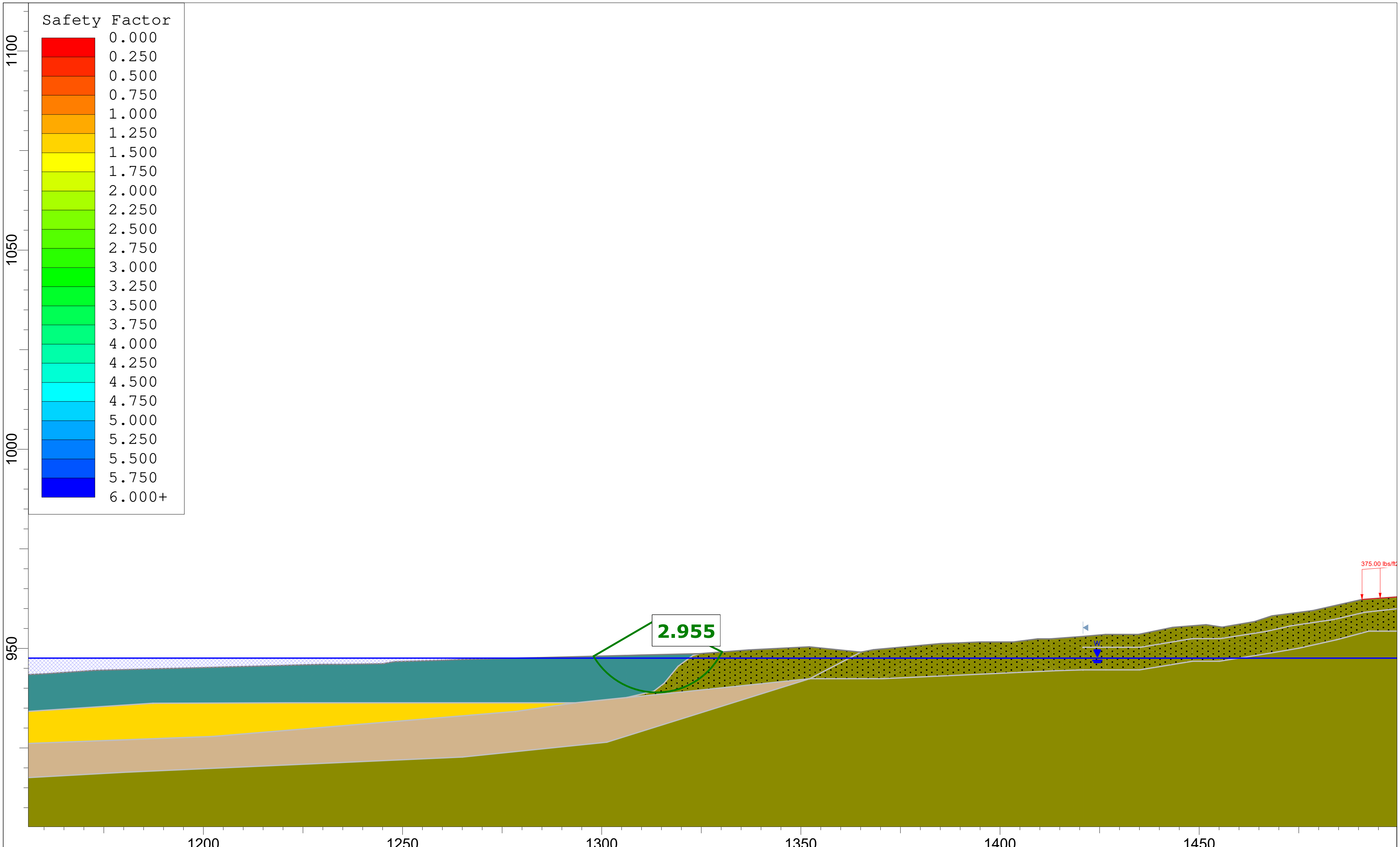
SLIDEINTERPRET 9.034

Project	Woods Pond (Housatonic Reach 6)		
Group	3H:1V Dredge	*Scenario*	Master Scenario
Drawn By	C. Bales	*Company*	Anchor QEA
Date	August 19, 2024	*File Name*	Section 3-3_West_065ratio.slmd



rocscience			
	Project	Woods Pond (Housatonic Reach 6)	
	Group: 4H:1V Dredge	Scenario: Master Scenario	
	Drawn By: C. Bales	Company: Anchor QEA	
SLIDEINTERPRET 9.034	Date: August 19, 2024	File Name: Section 3-3_West_065ratio.slmd	

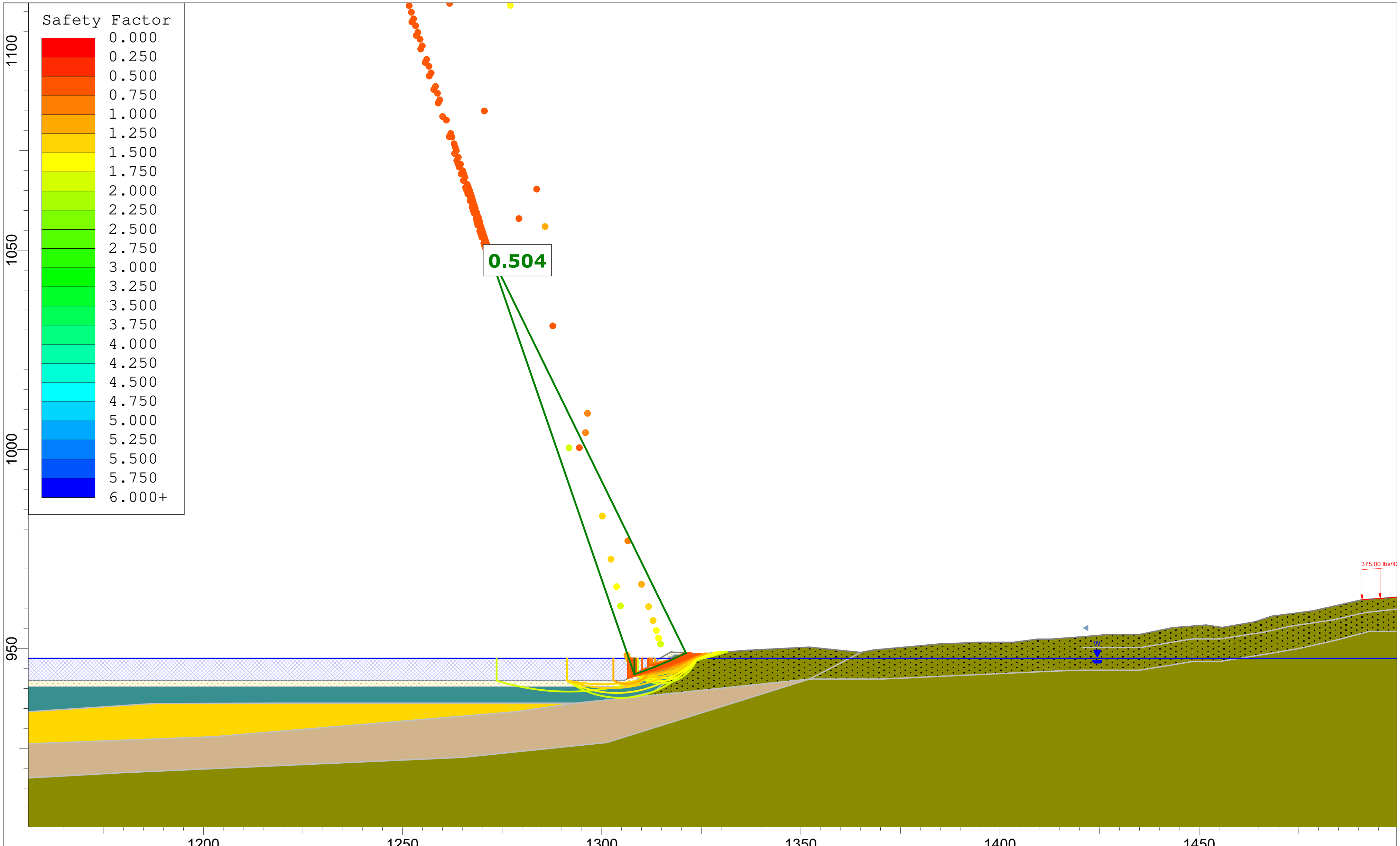


rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program

Group	4 East - Existing	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_10psf-cap.slmd



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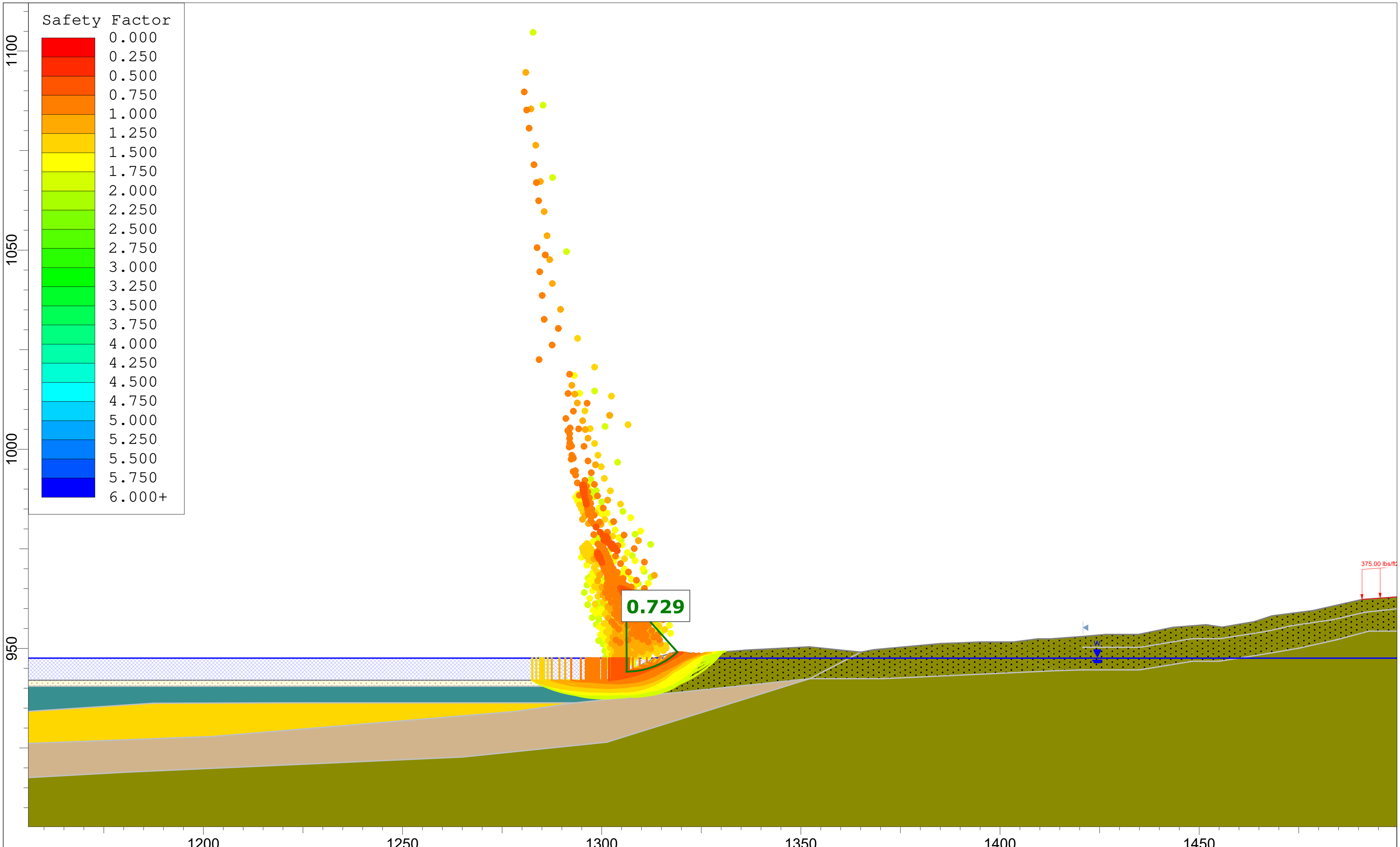
SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 1.5H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_10psf-cap.slmd



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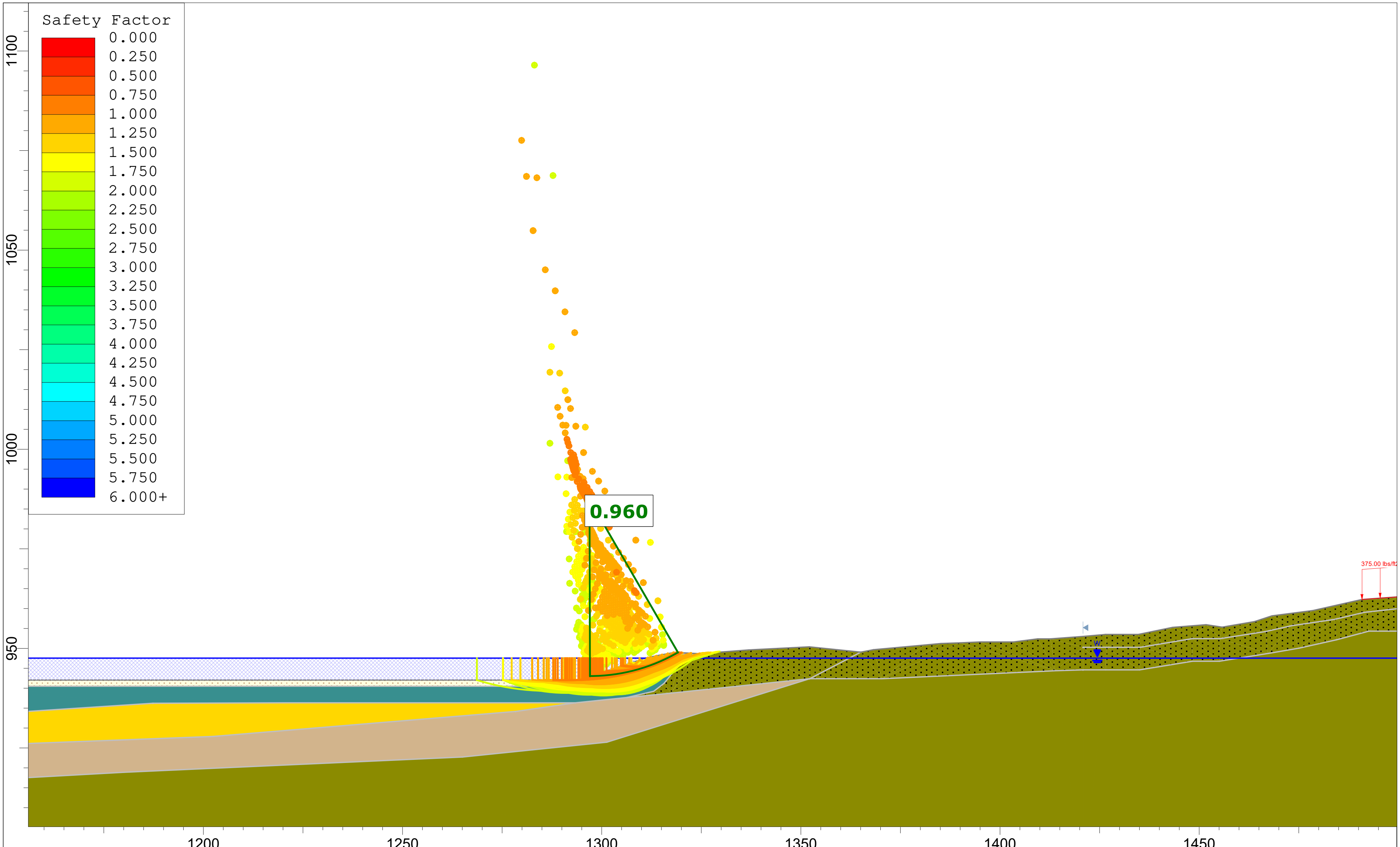
SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 2H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_10psf-cap.slmd



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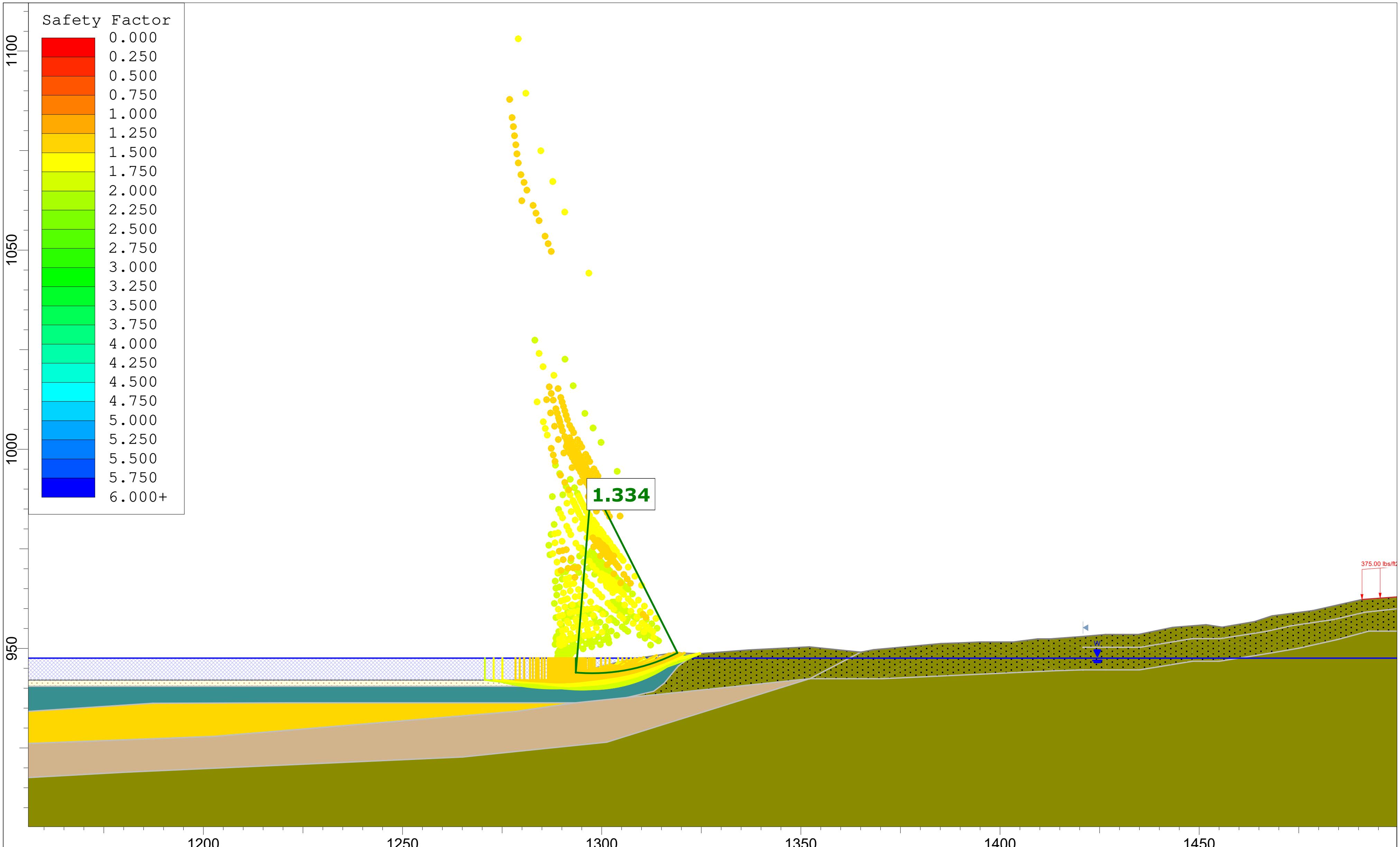
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 3H:1V	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 1:24:07 PM	File Name	Section 4-4 East_10psf-cap.slmd

SLIDEINTERPRET 9.034



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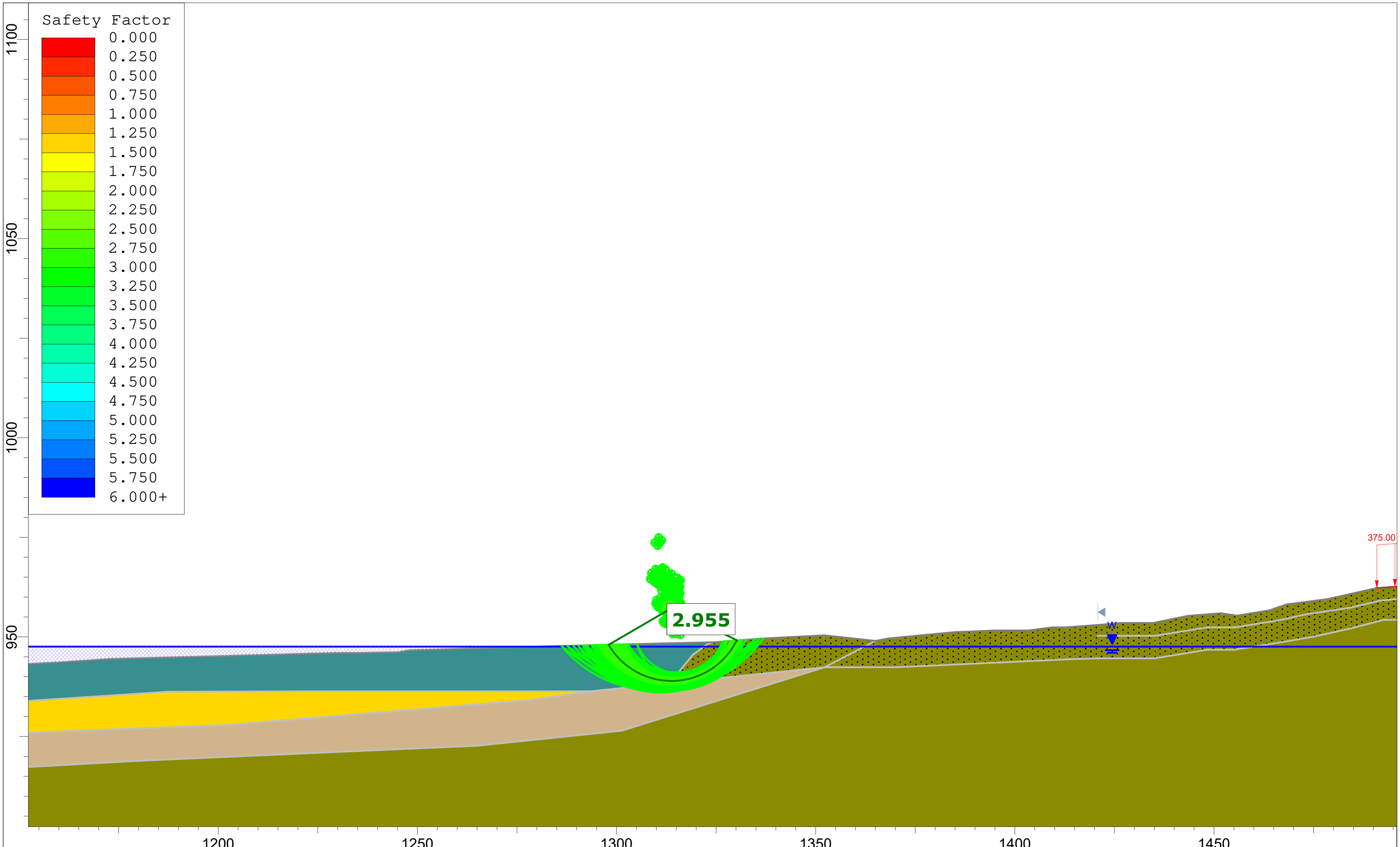
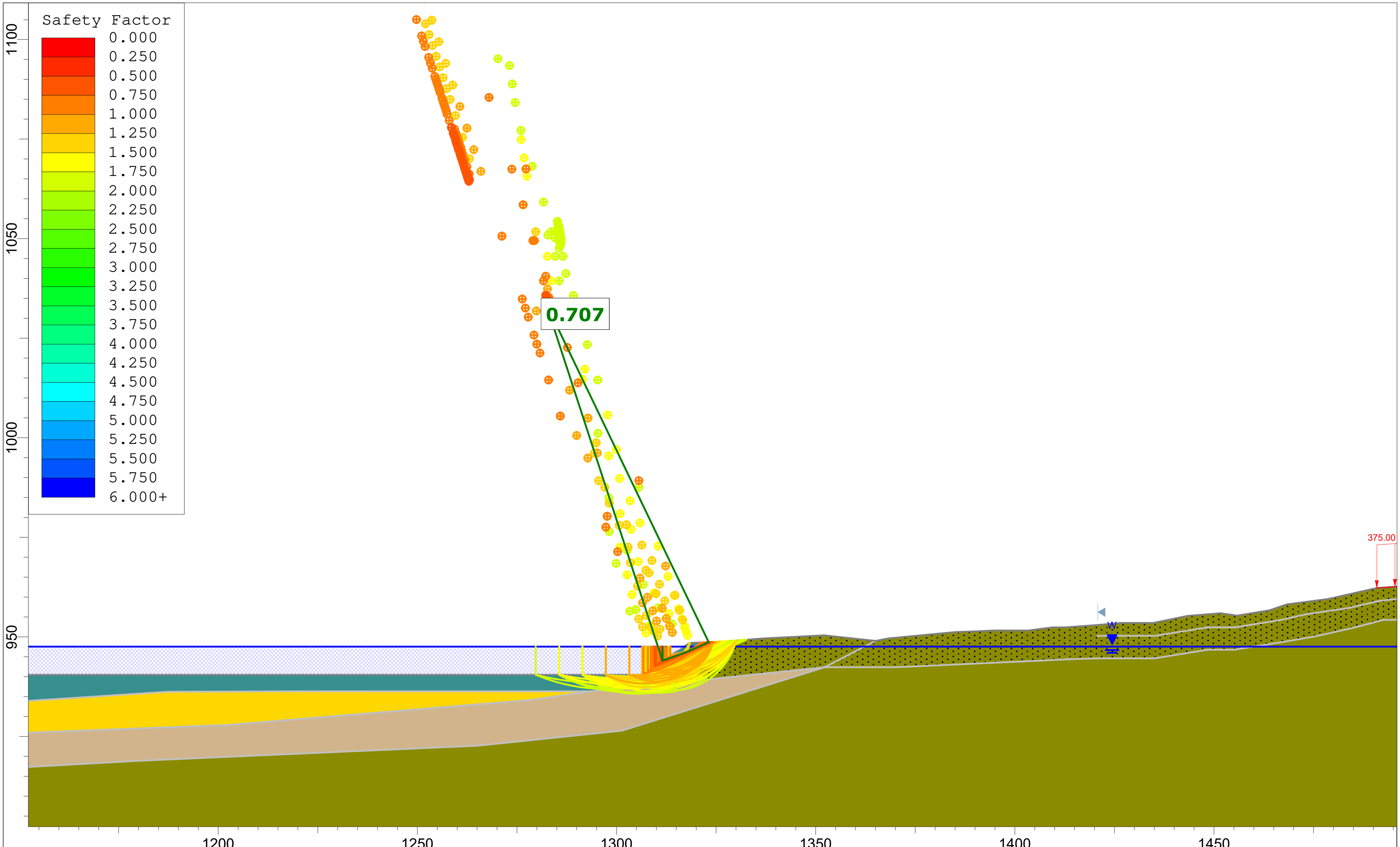
SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 4H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_10psf-cap.slmd



rocscience	Project	Slide2 - An Interactive Slope Stability Program	
	Group: 4 East - Existing		Scenario: Master Scenario
	Drawn By		Company
SLIDEINTERPRET 9.034	Date: 7/18/2024, 1:24:07 PM		File Name: Section 4-4 East_10psf.slmd



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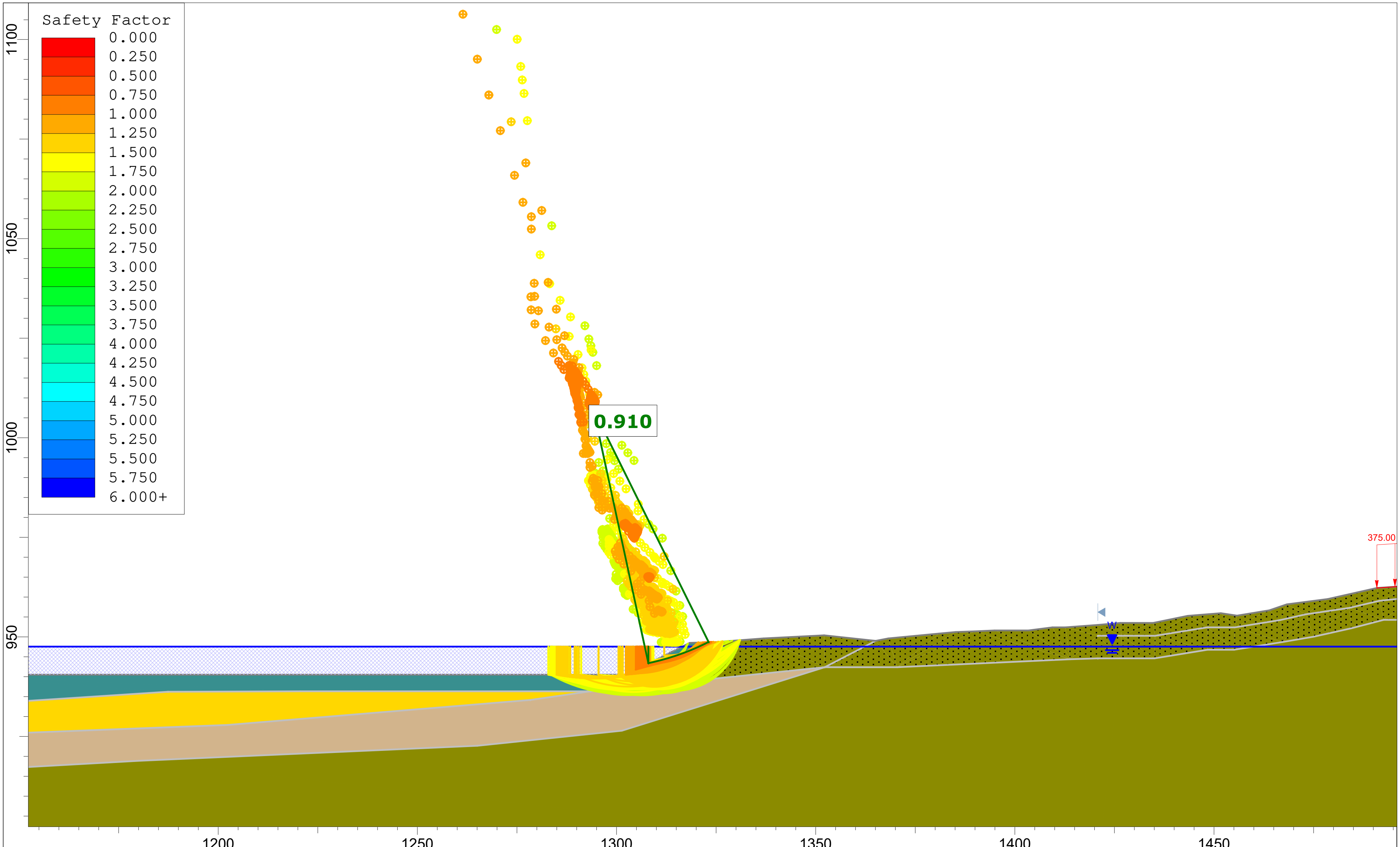
SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 1.5H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_10psf.slmd



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Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 2H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
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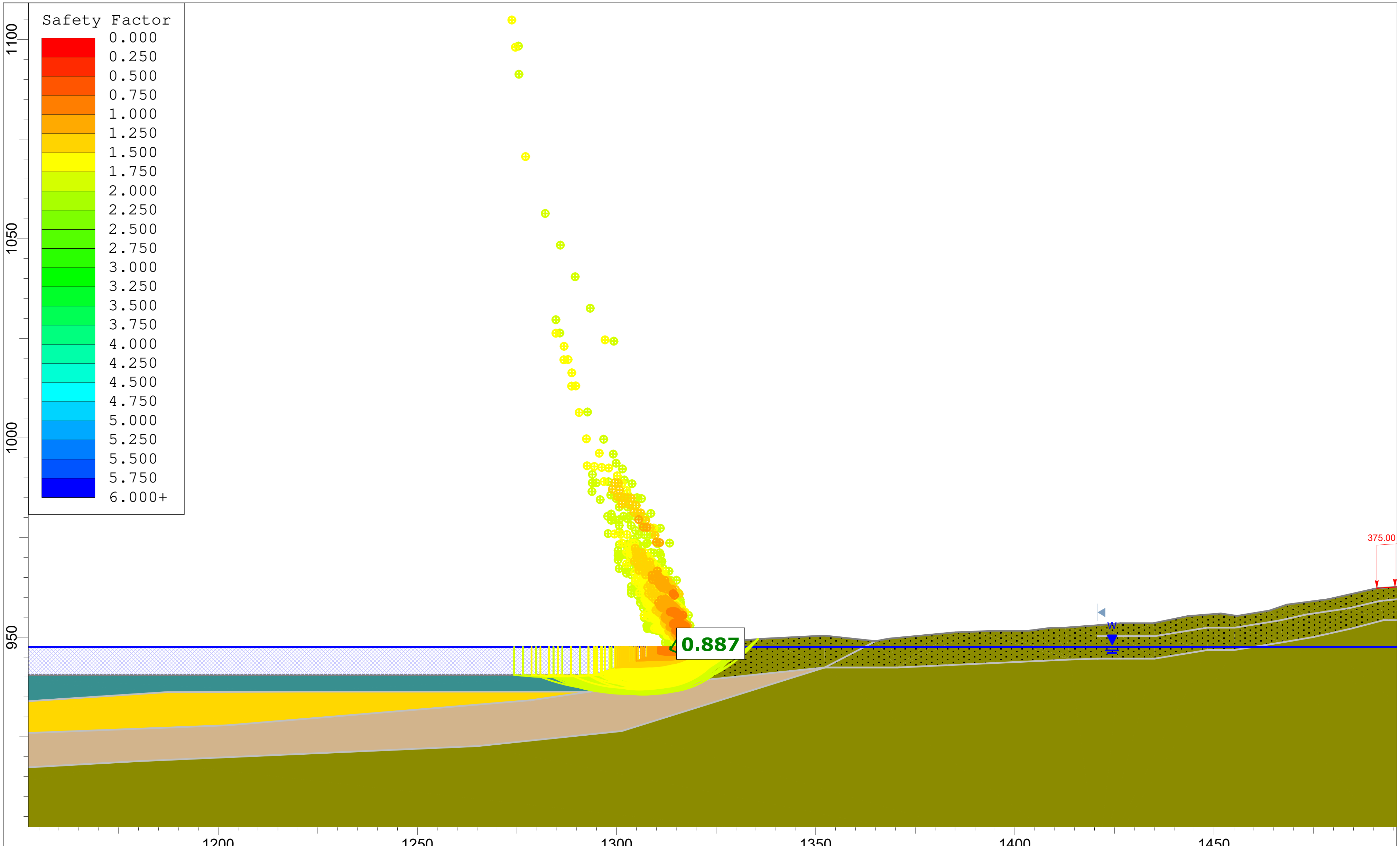
SLIDEINTERPRET 9.034



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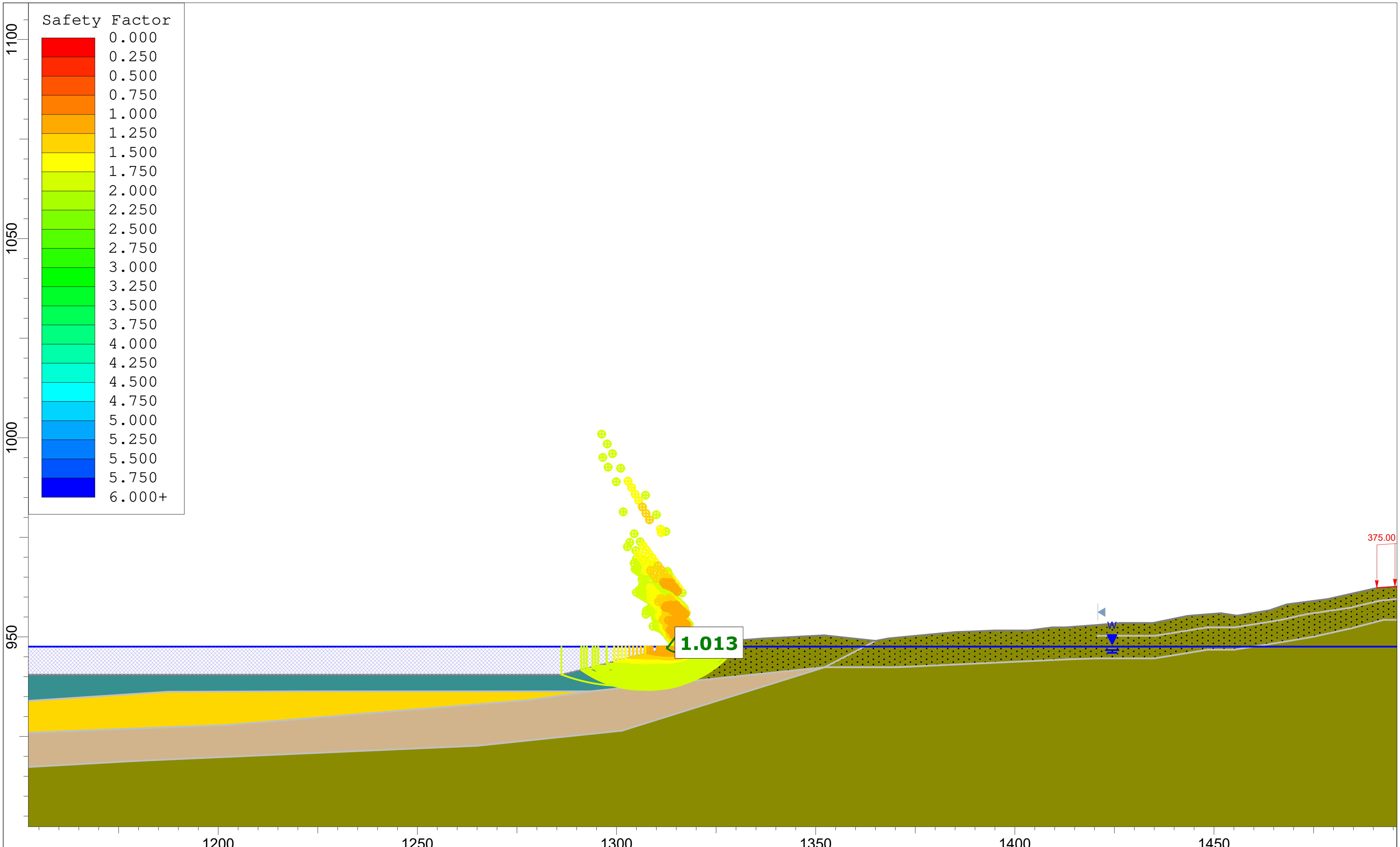
SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 3H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_10psf.slmd



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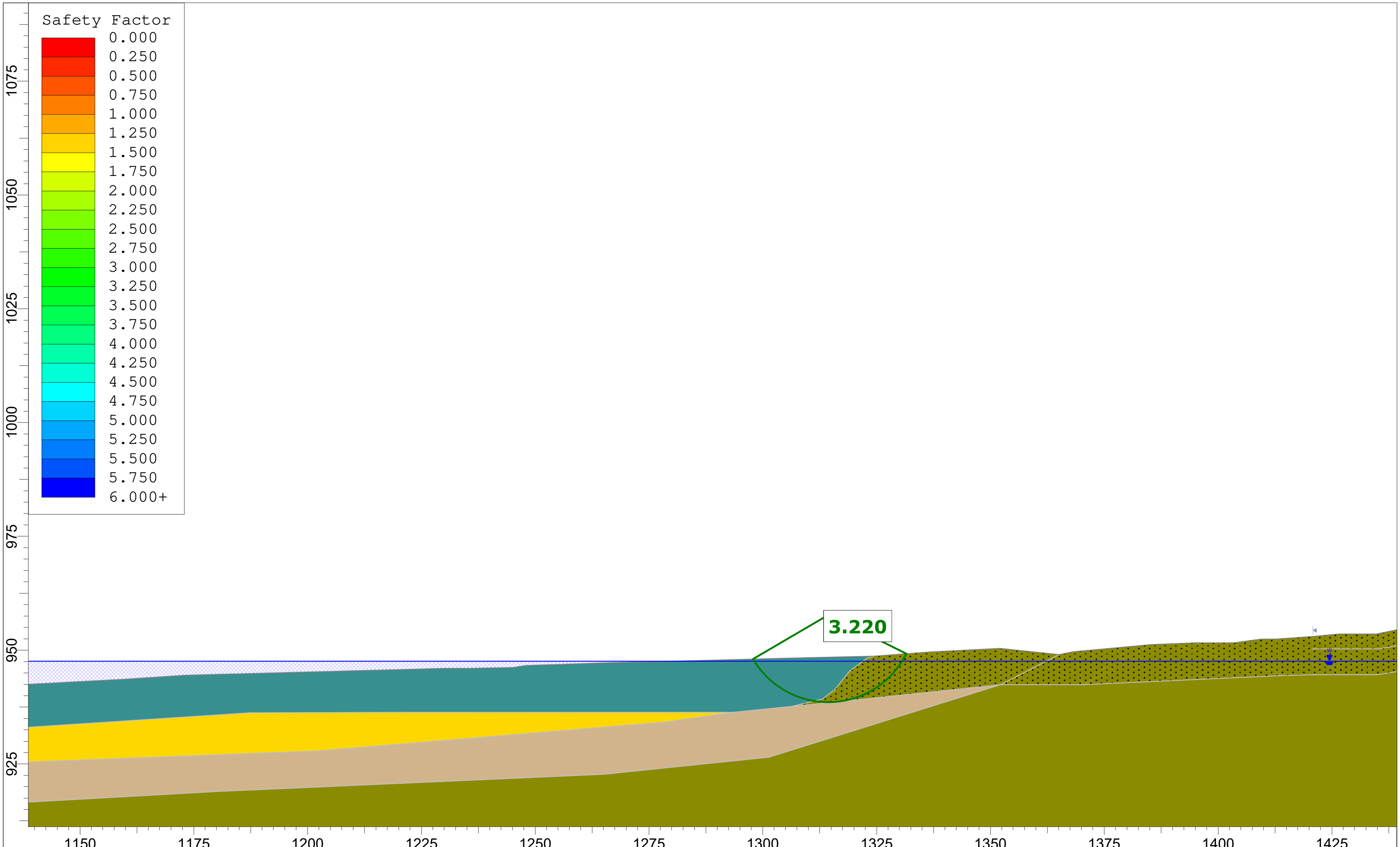
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 4H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_10psf.slmd

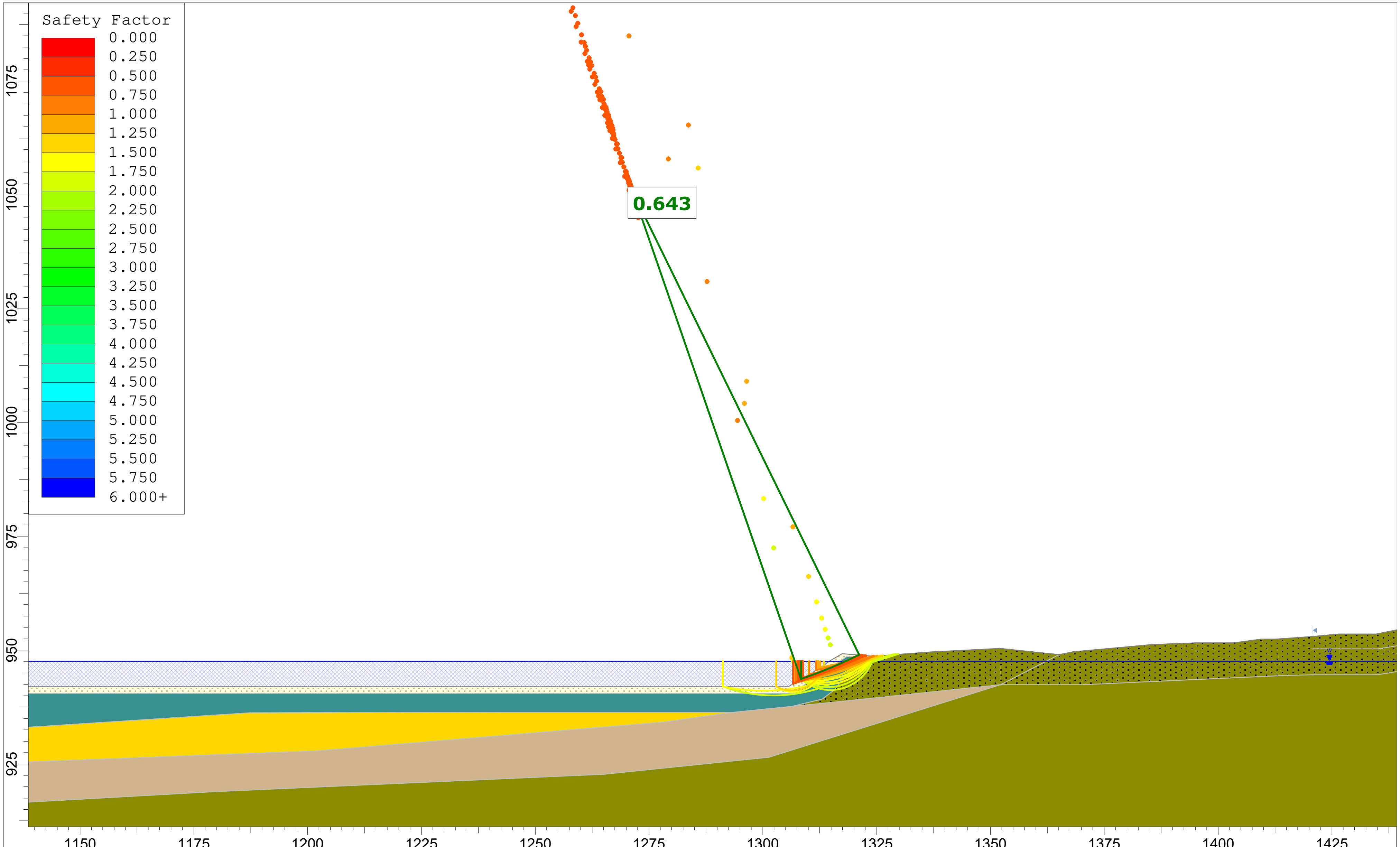
SLIDEINTERPRET 9.034



rocscience

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - Existing	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 1:24:07 PM	File Name	Section 4-4 East_15psf-Cap.slmd

SLIDEINTERPRET 9.034



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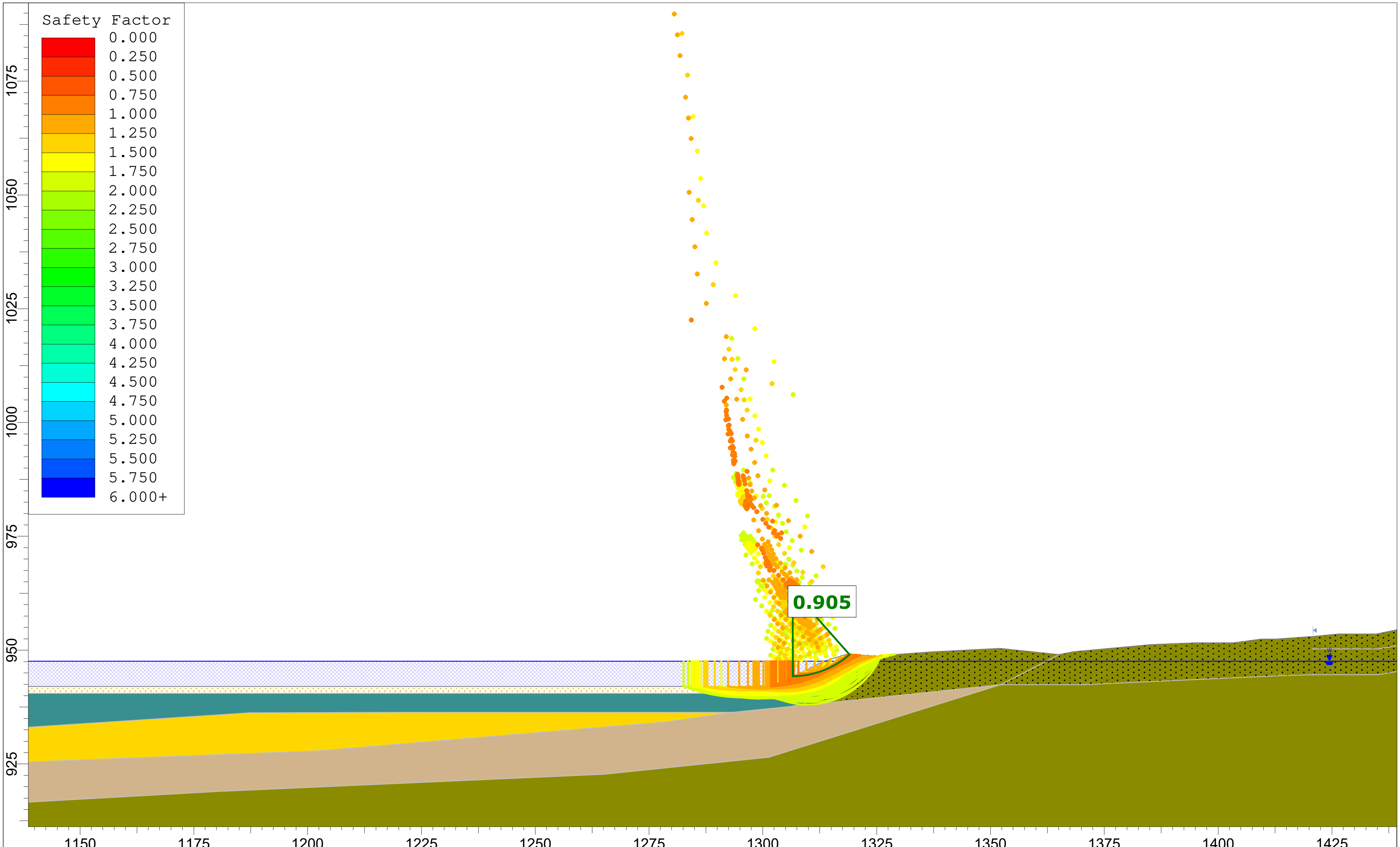
SLIDEINTERPRET 9.034

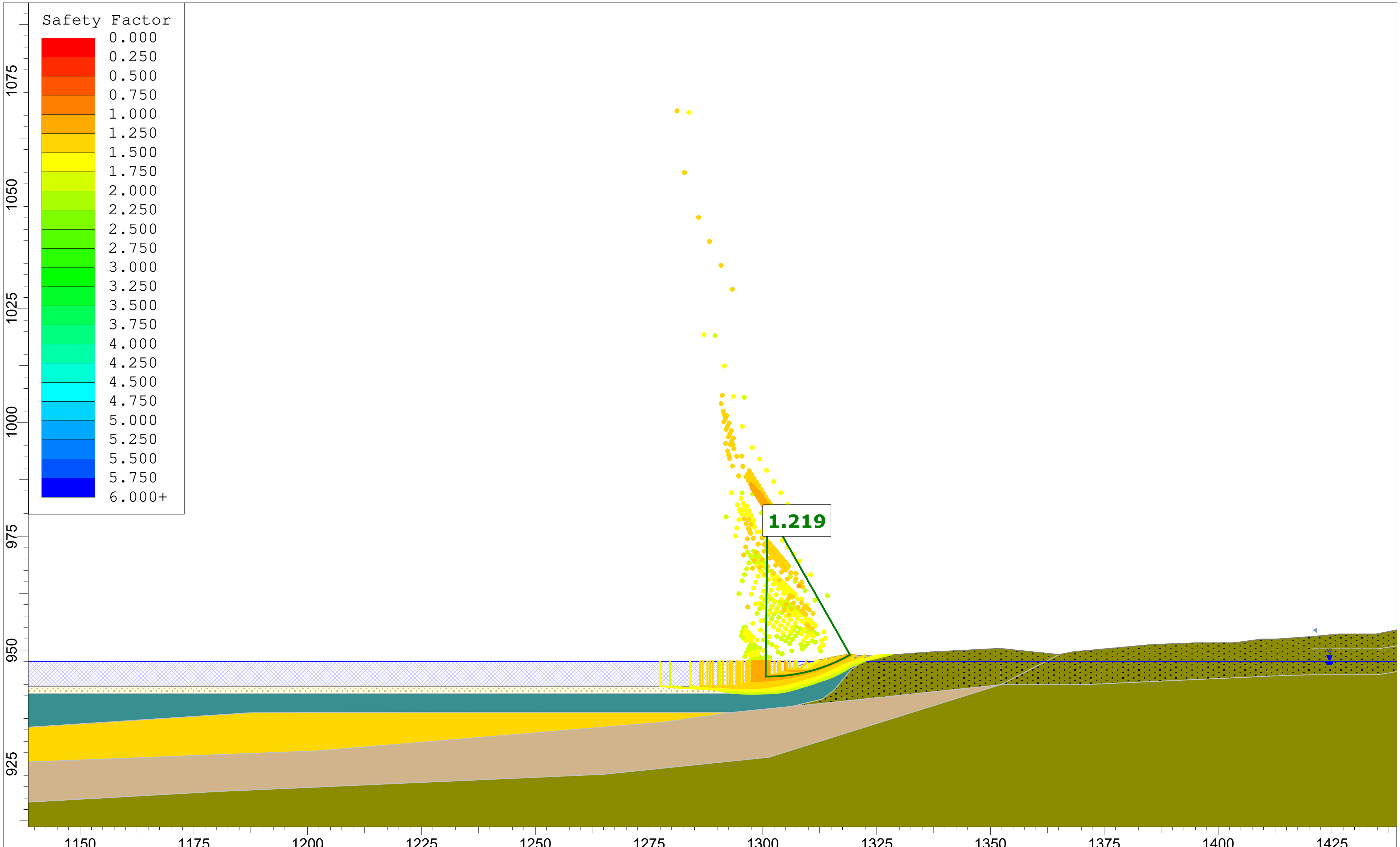
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 1.5H:1V	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 1:24:07 PM	File Name	Section 4-4 East_15psf-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

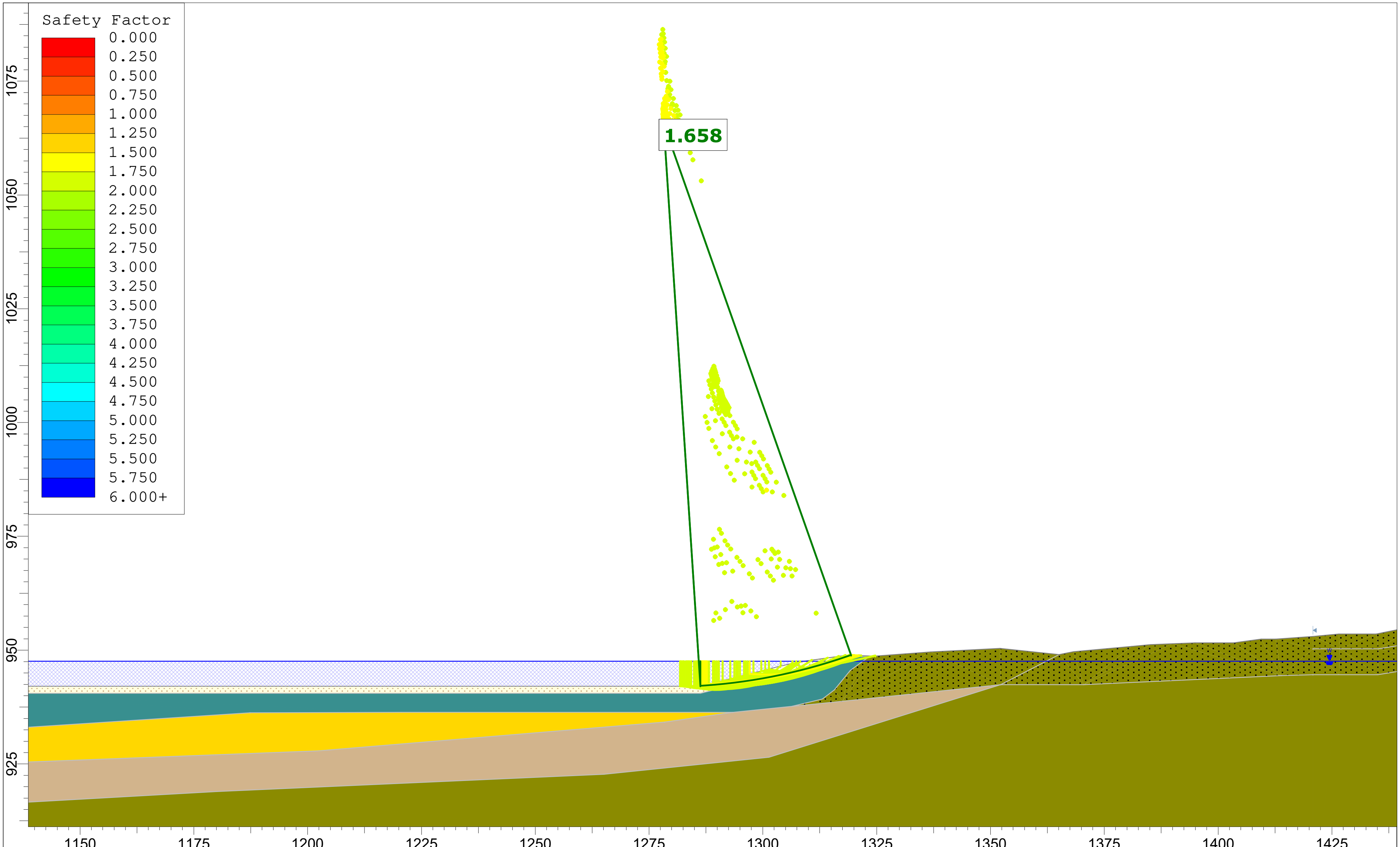
Project Slide2 - An Interactive Slope Stability Program	
Group 4 East - 2H:1V	*Scenario* Master Scenario
Drawn By	*Company*
Date 7/18/2024, 1:24:07 PM	*File Name* Section 4-4 East_15psf-Cap.slmd



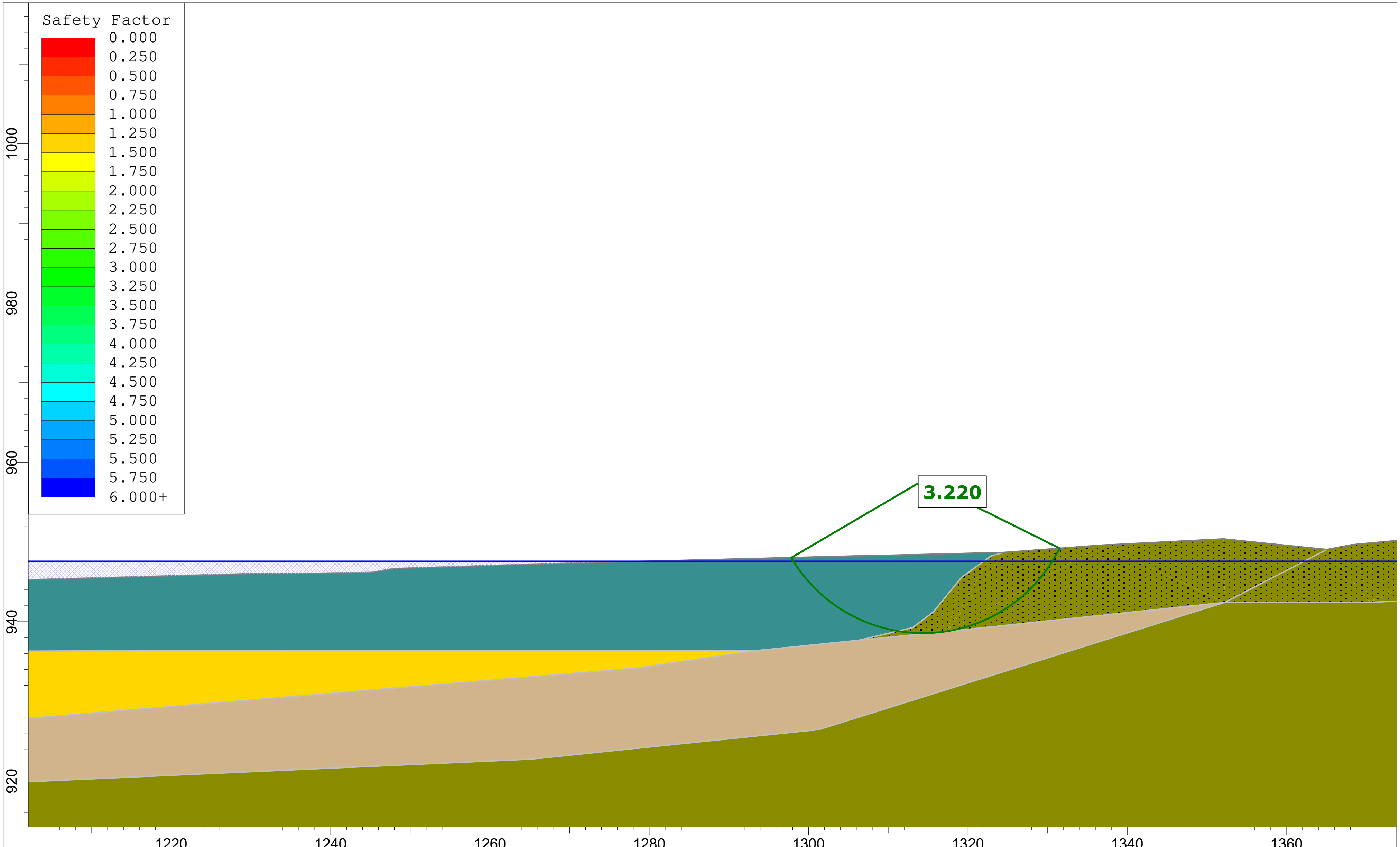
rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 3H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_15psf-Cap.slmd



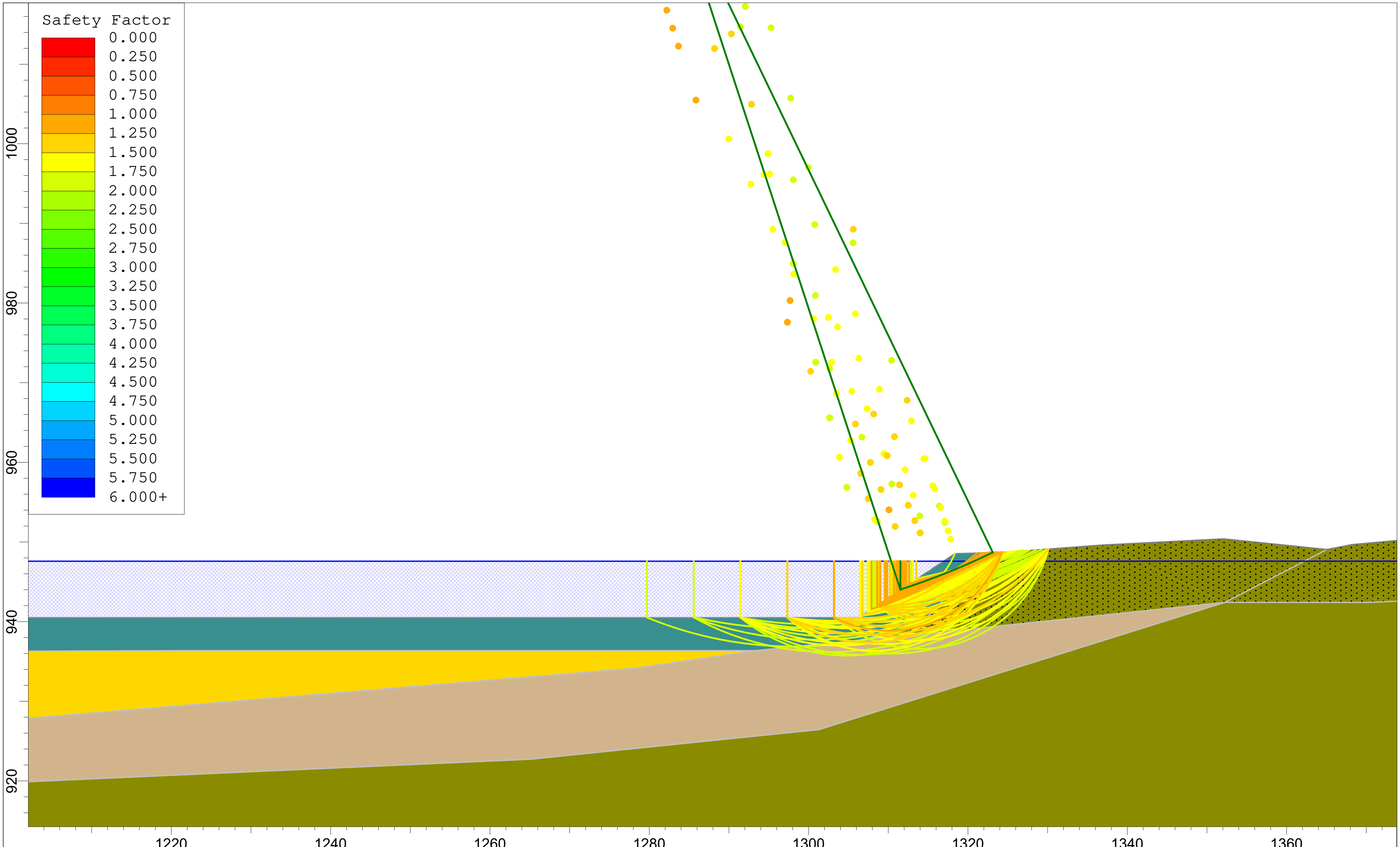
rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 East - 4H:1V	*Scenario* Master Scenario	
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 1:24:07 PM	*File Name* Section 4-4 East_15psf-Cap.slmd	



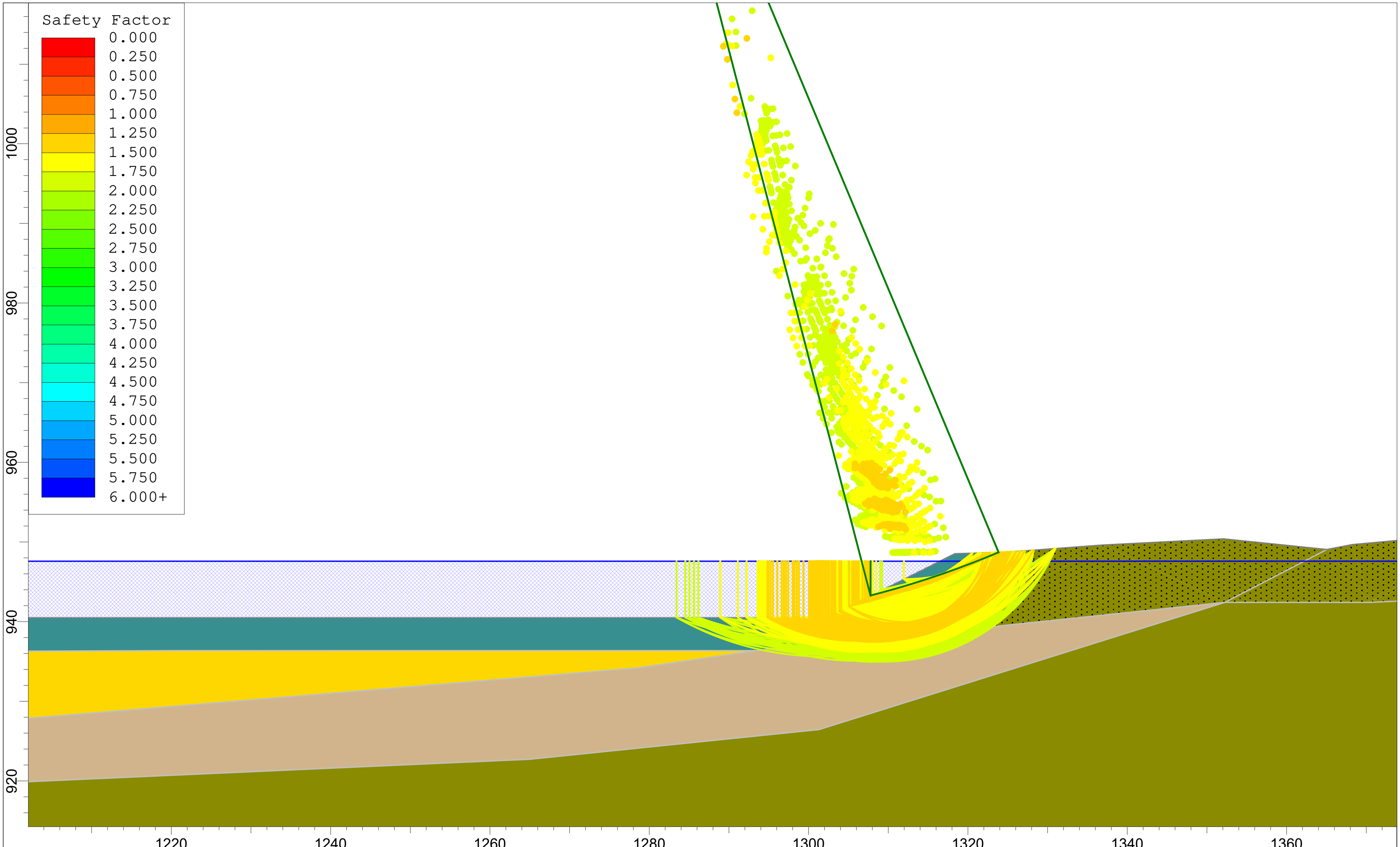
rocscience

SLIDEINTERPRET 9.034

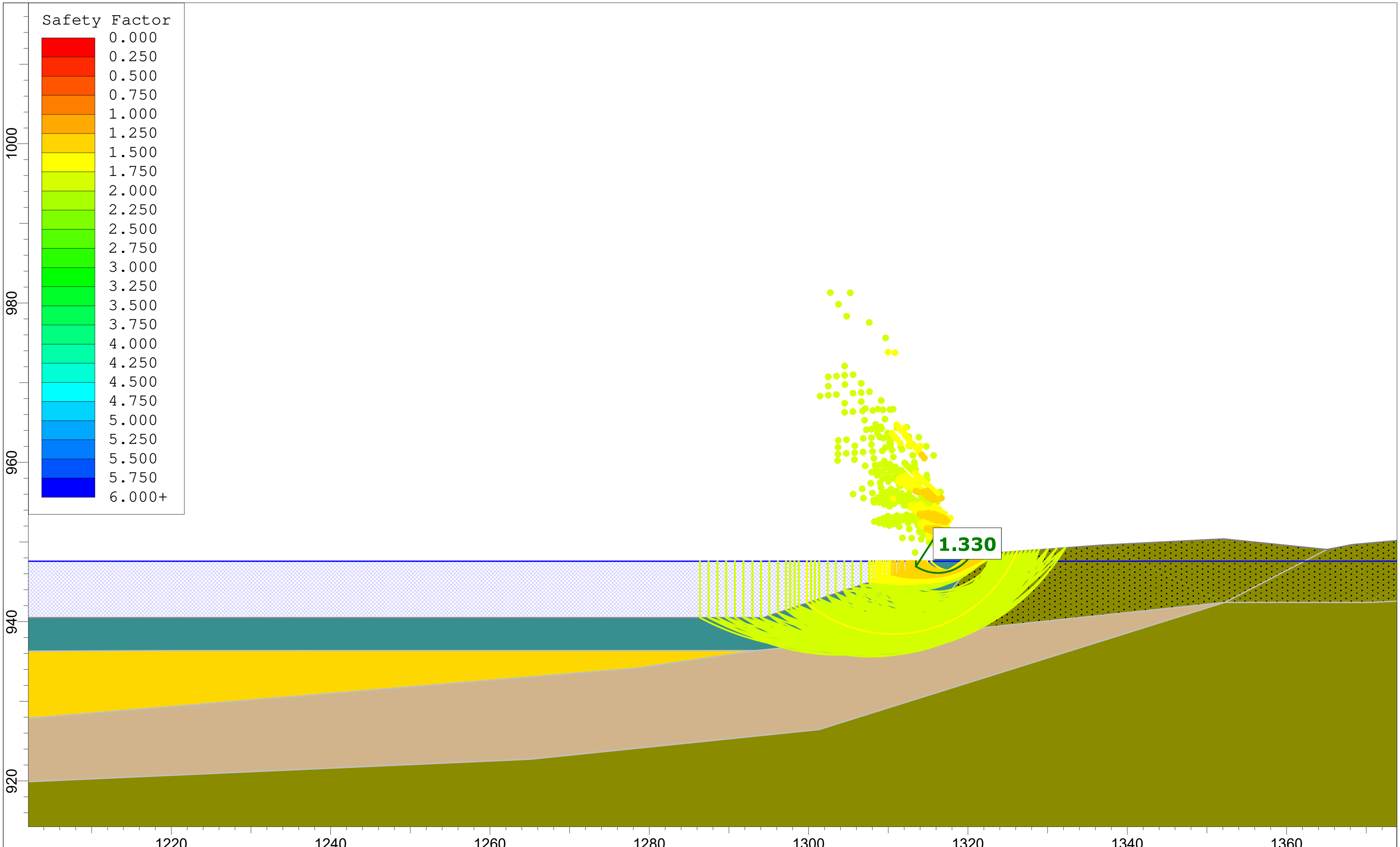
Project Slide2 - An Interactive Slope Stability Program	
Group 4 East - Existing	*Scenario* Master Scenario
Drawn By	*Company*
Date 7/18/2024, 1:24:07 PM	*File Name* Section 4-4 East_15psf.slmd



rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 East - 1.5H:1V	*Scenario* Master Scenario	
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 1:24:07 PM	*File Name* Section 4-4 East_15psf.slmd	



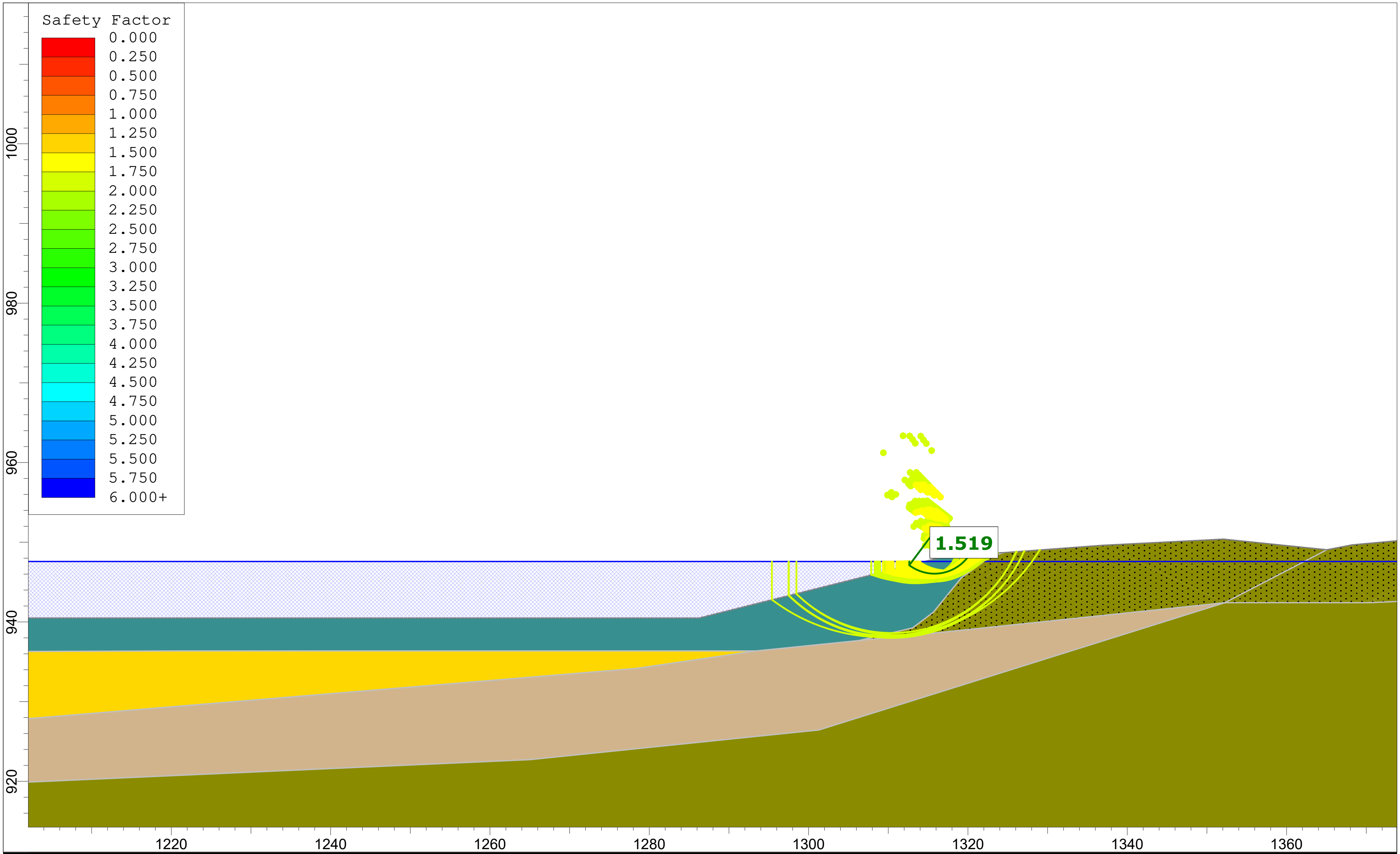
rocscience	Project: Slide2 - An Interactive Slope Stability Program		
	Group: 4 East - 2H:1V	Scenario: Master Scenario	
	Drawn By:	Company:	
SLIDEINTERPRET 9.034	Date: 7/18/2024, 1:24:07 PM	File Name: Section 4-4 East_15psf.slmd	



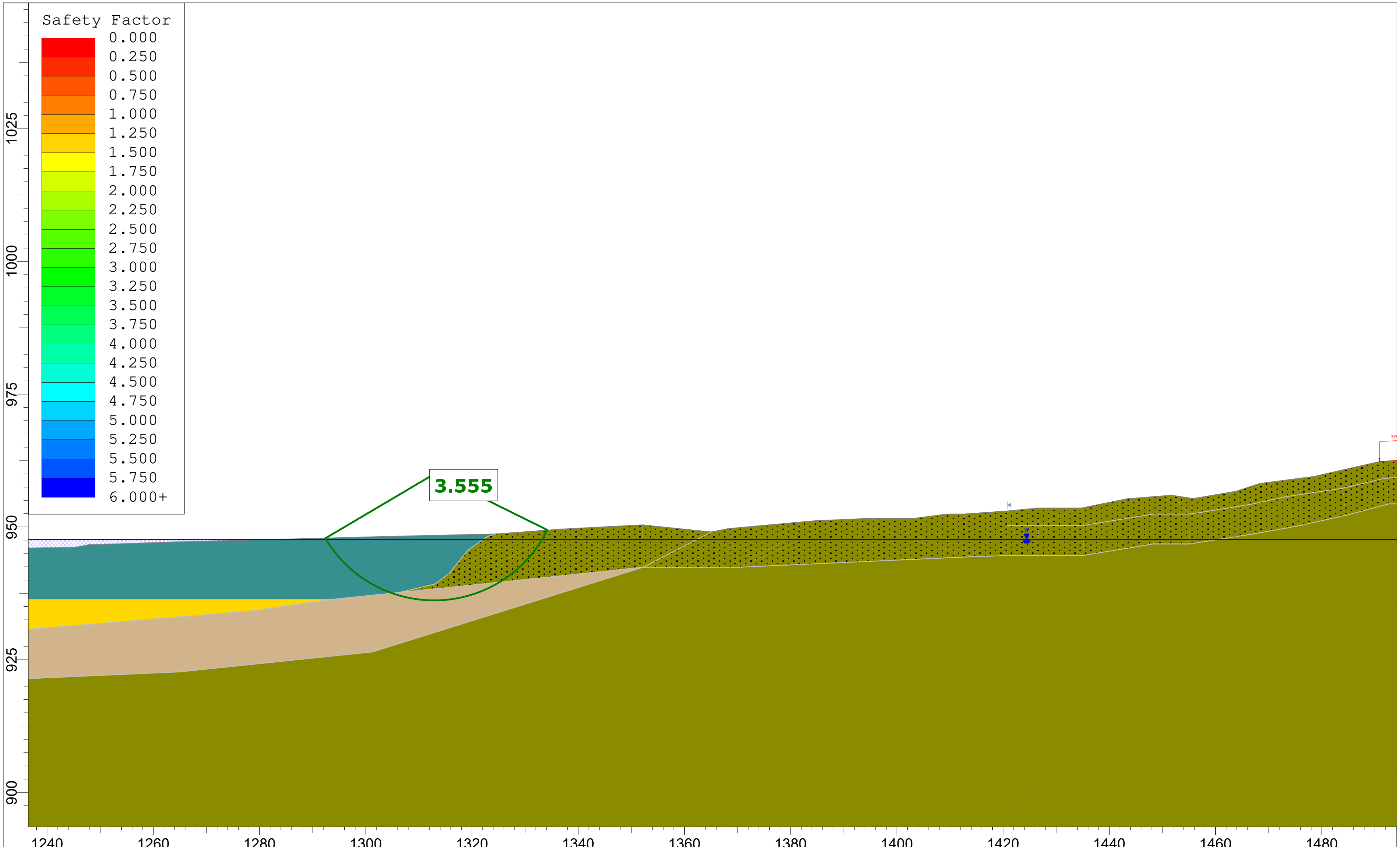
rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 3H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_15psf.slmd



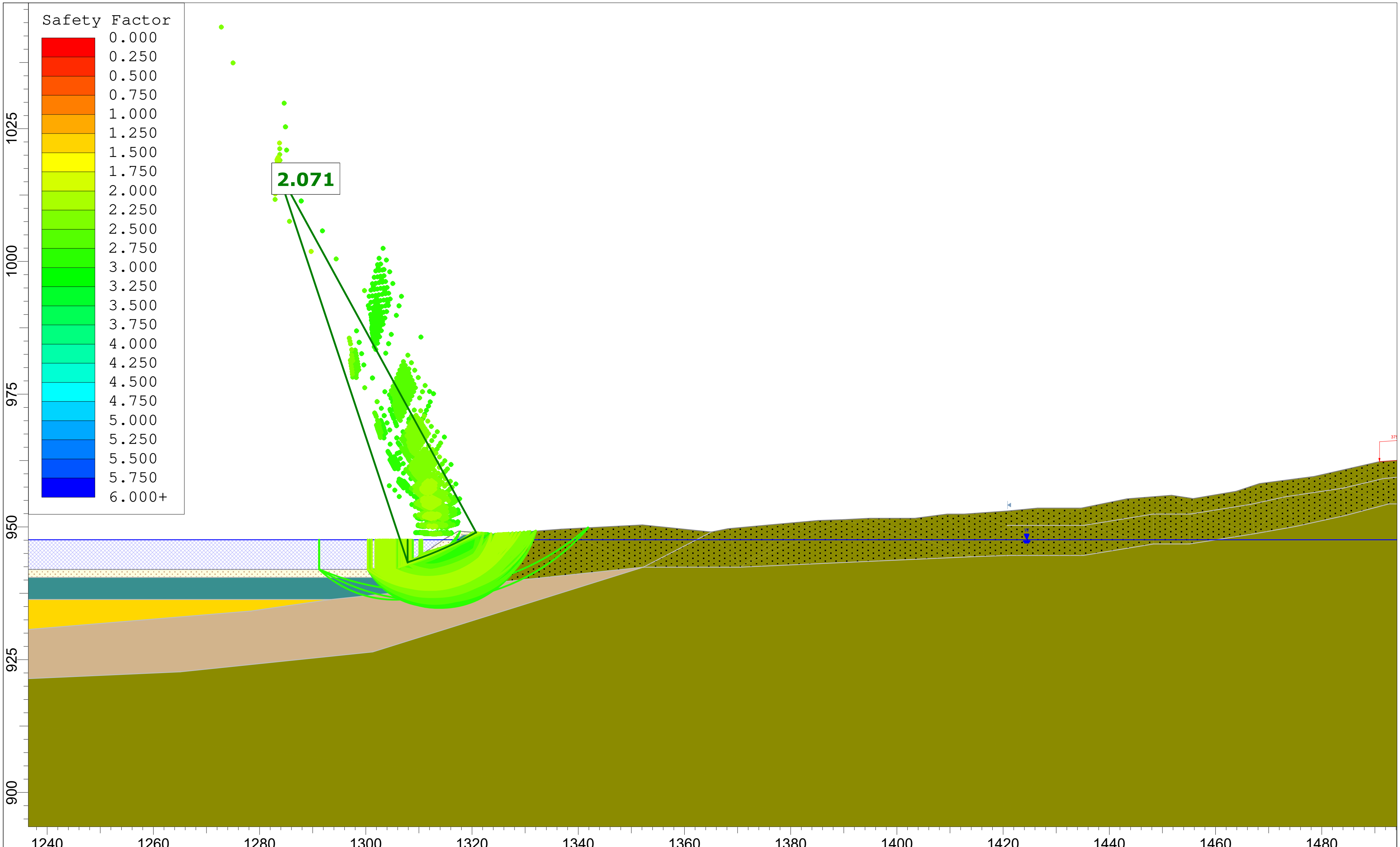
rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 East - 4H:1V	*Scenario* Master Scenario	
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 1:24:07 PM	*File Name* Section 4-4 East_15psf.slmd	



rocscience

SLIDEINTERPRET 9.034

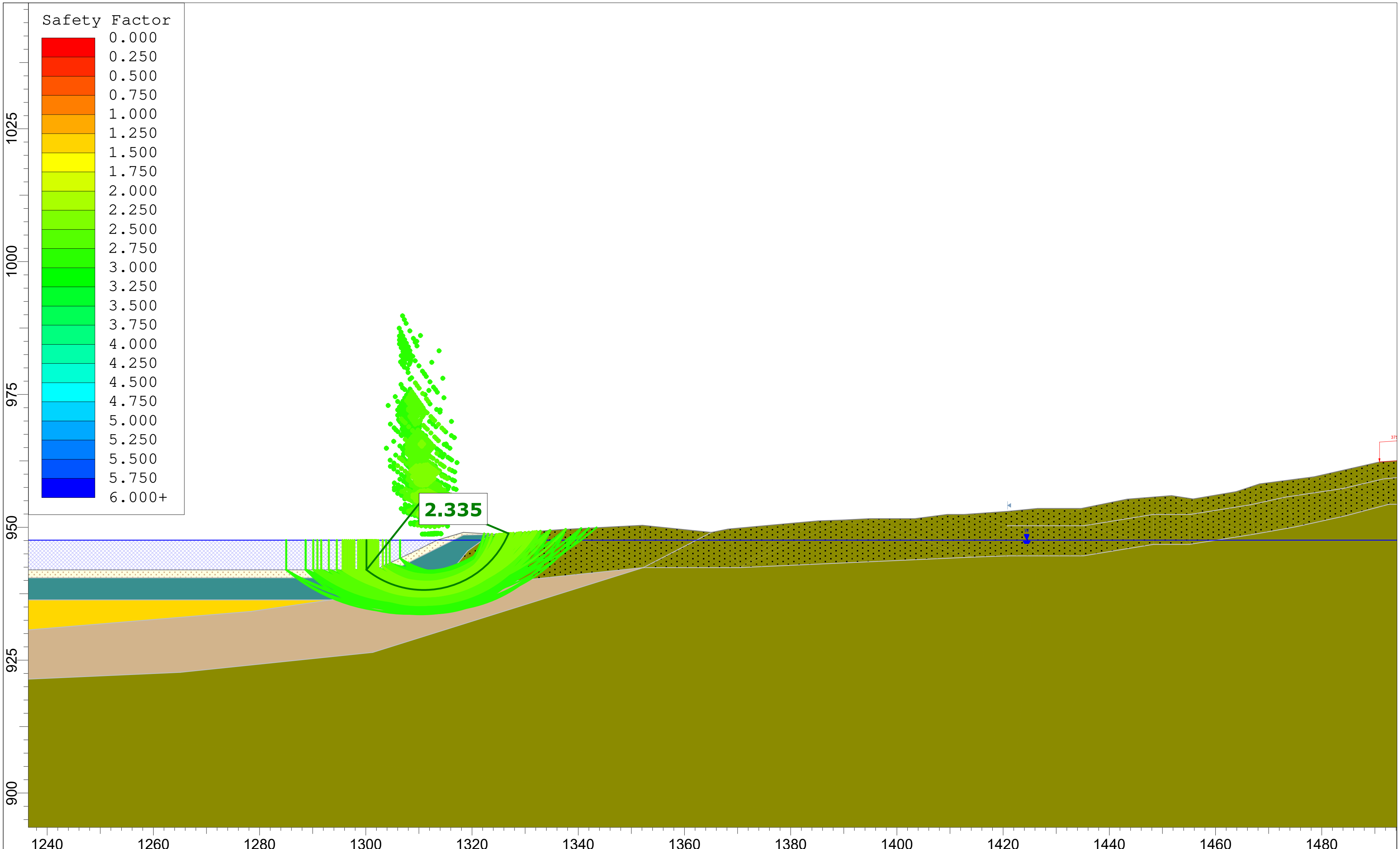
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - Existing	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_065ratio-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 1.5H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_065ratio-Cap.slmd



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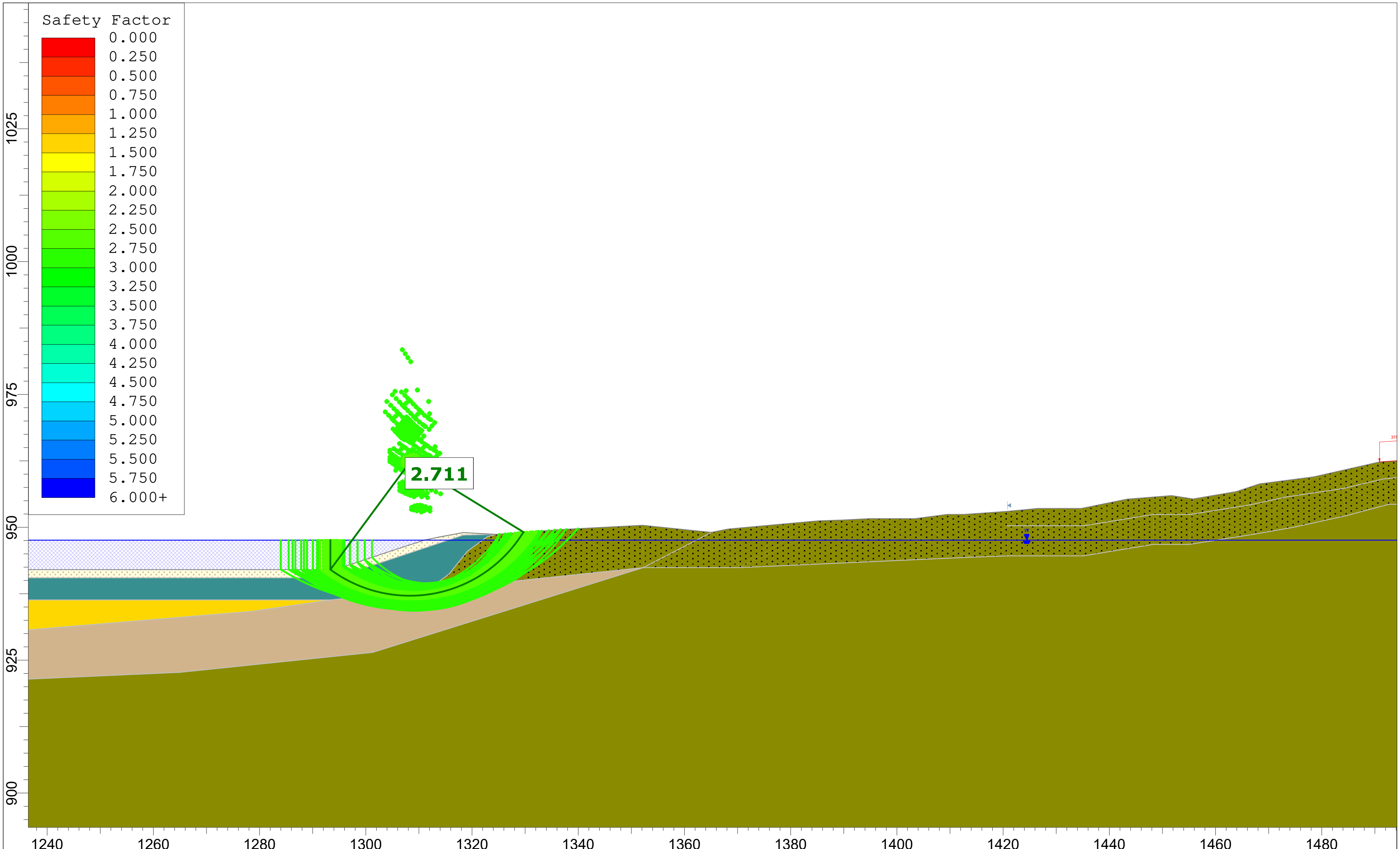
SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 2H:1V	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 1:24:07 PM	File Name	Section 4-4 East_065ratio-Cap.slmd



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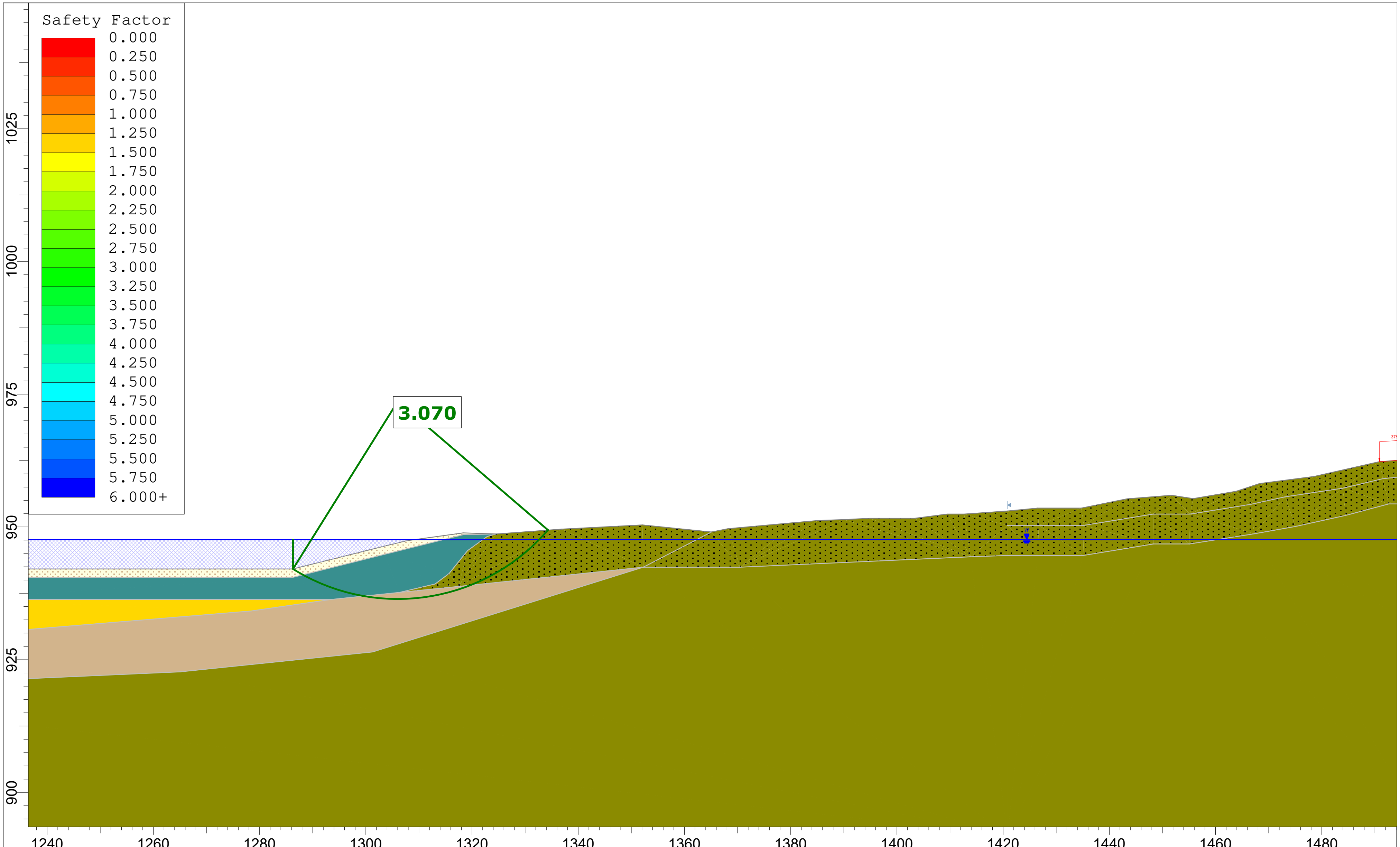
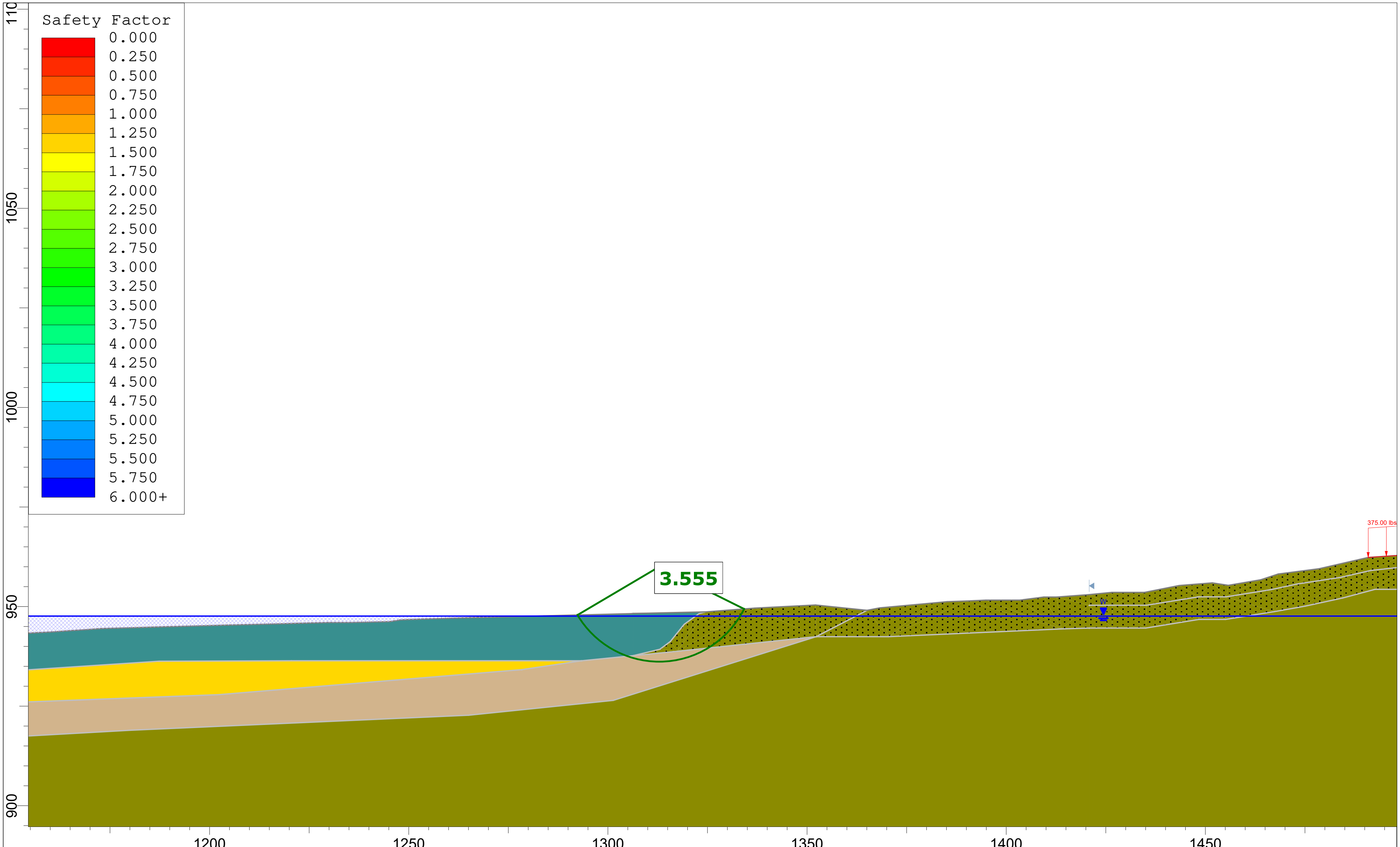
SLIDEINTERPRET 9.034

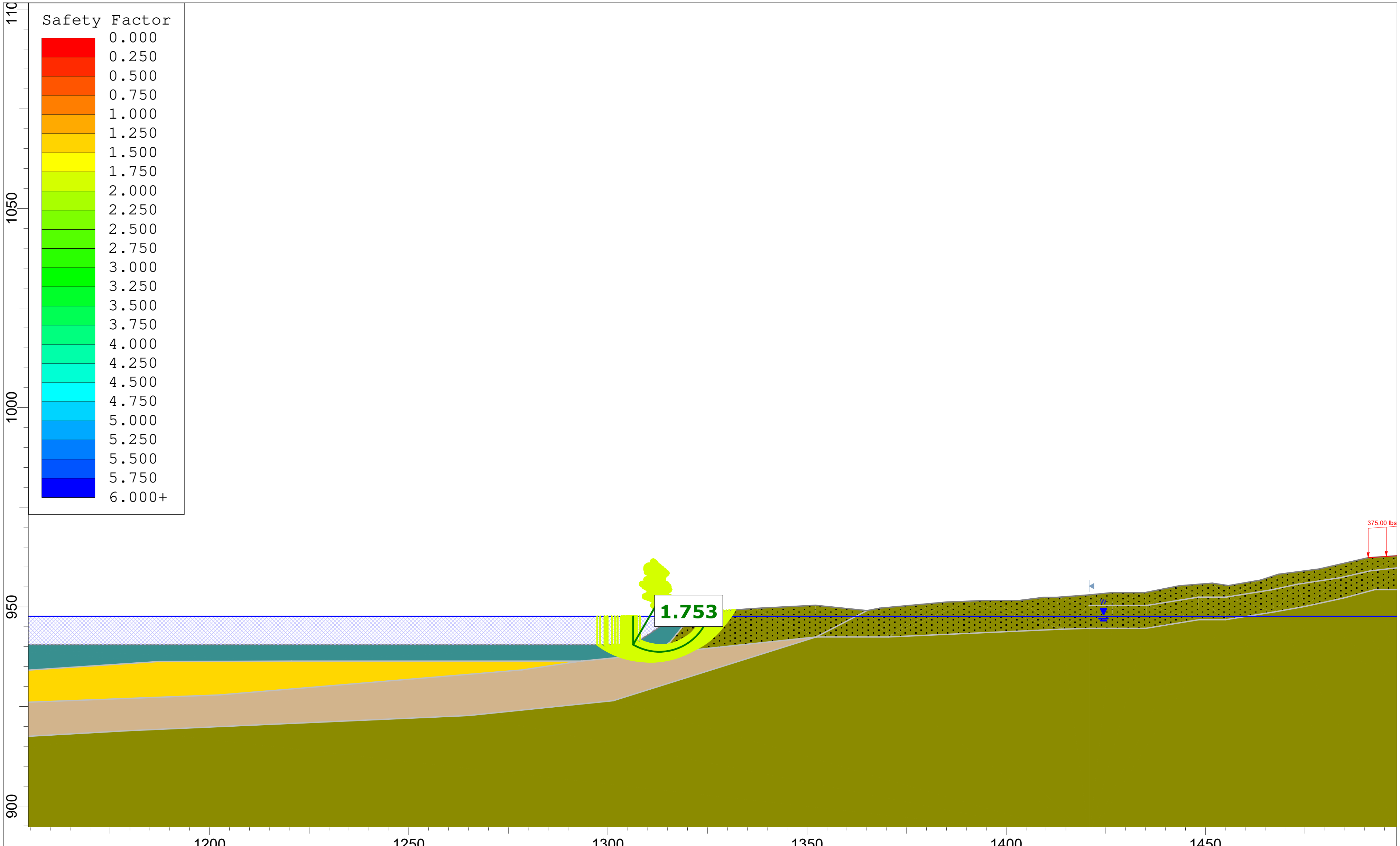
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 3H:1V	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 1:24:07 PM	File Name	Section 4-4 East_065ratio-Cap.slmd



rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 East - 4H:1V	*Scenario* Master Scenario	
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 1:24:07 PM	*File Name* Section 4-4 East_065ratio-Cap.slmd	



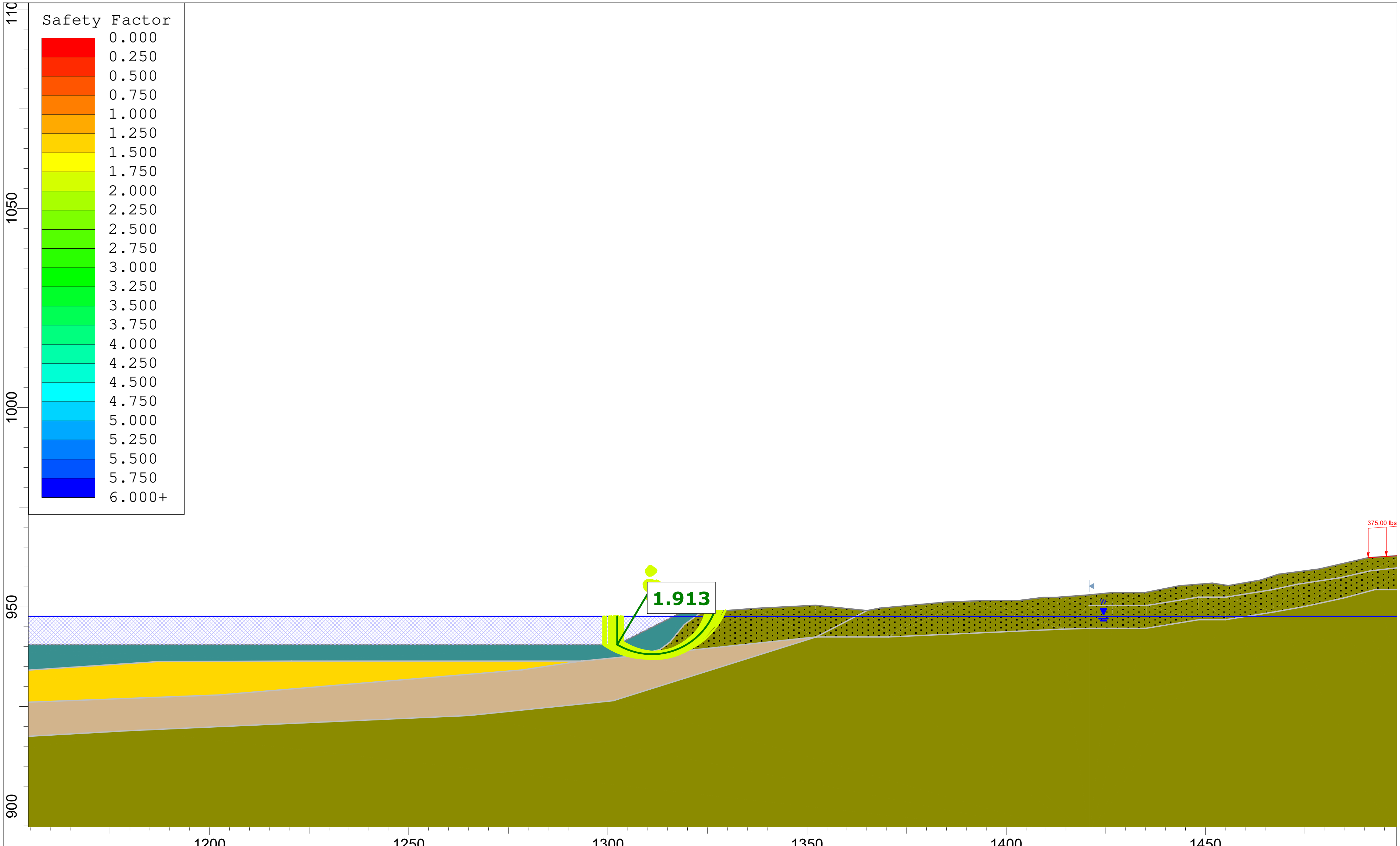
rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 East - Existing	*Scenario* Master Scenario	
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 1:24:07 PM	*File Name* Section 4-4 East_065ratio.slmd	



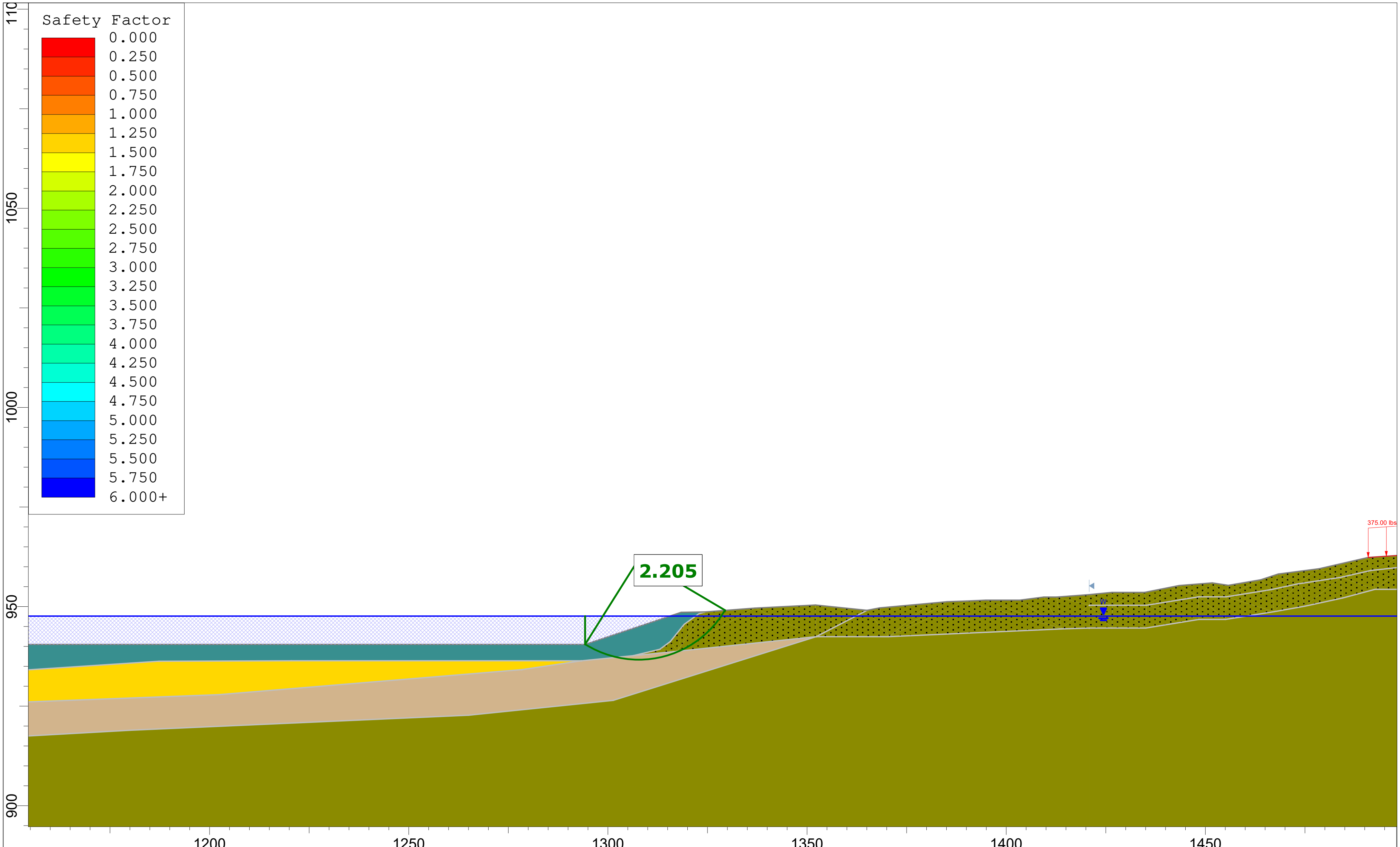
rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 1.5H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_065ratio.slmd



rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 East - 2H:1V	*Scenario* Master Scenario	
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 1:24:07 PM	*File Name* Section 4-4 East_065ratio.slmd	



rocscience

SLIDEINTERPRET 9.034

Project Slide2 - An Interactive Slope Stability Program

Group 4 East - 3H:1V

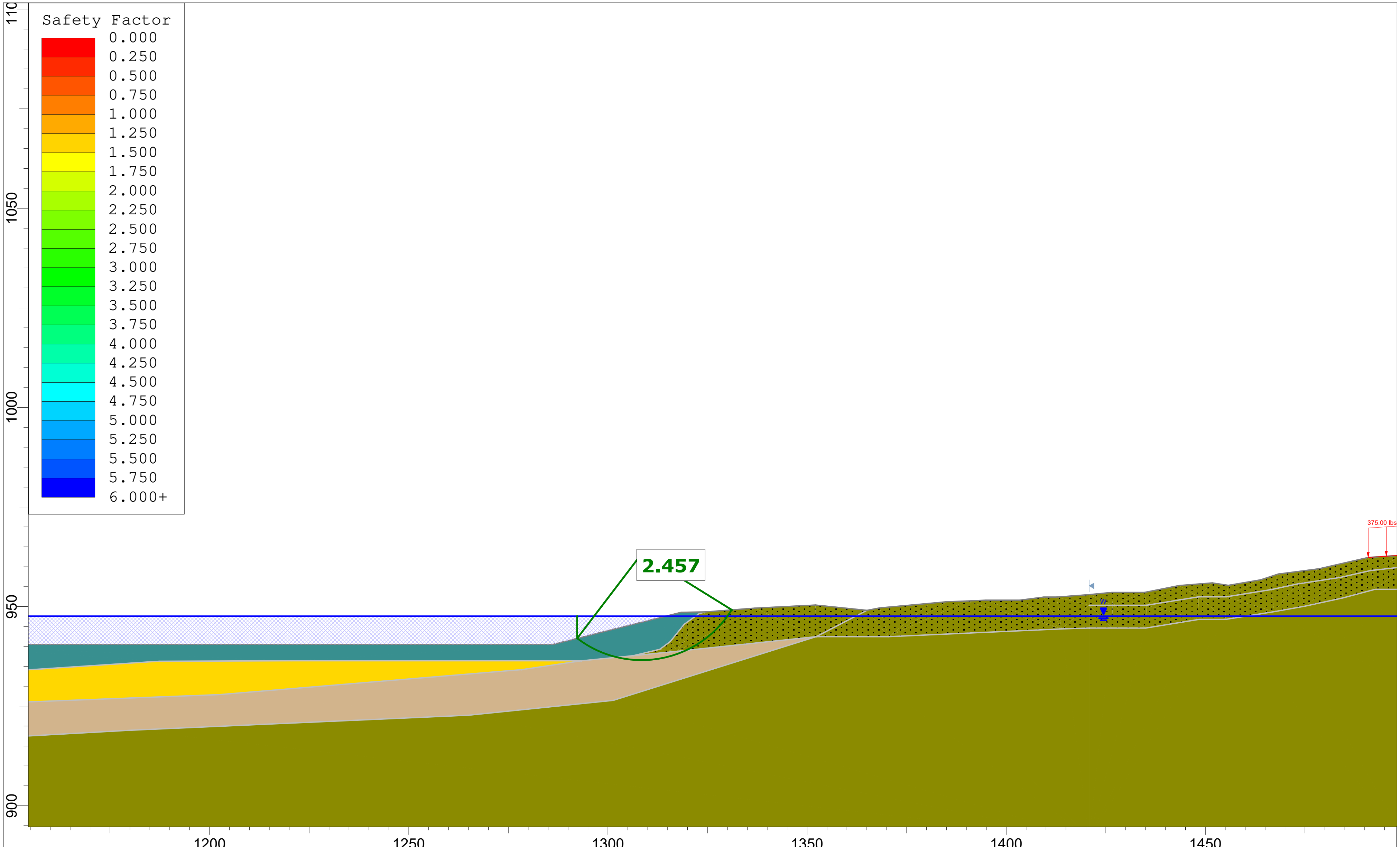
Scenario Master Scenario

Drawn By

Company

Date 7/18/2024, 1:24:07 PM

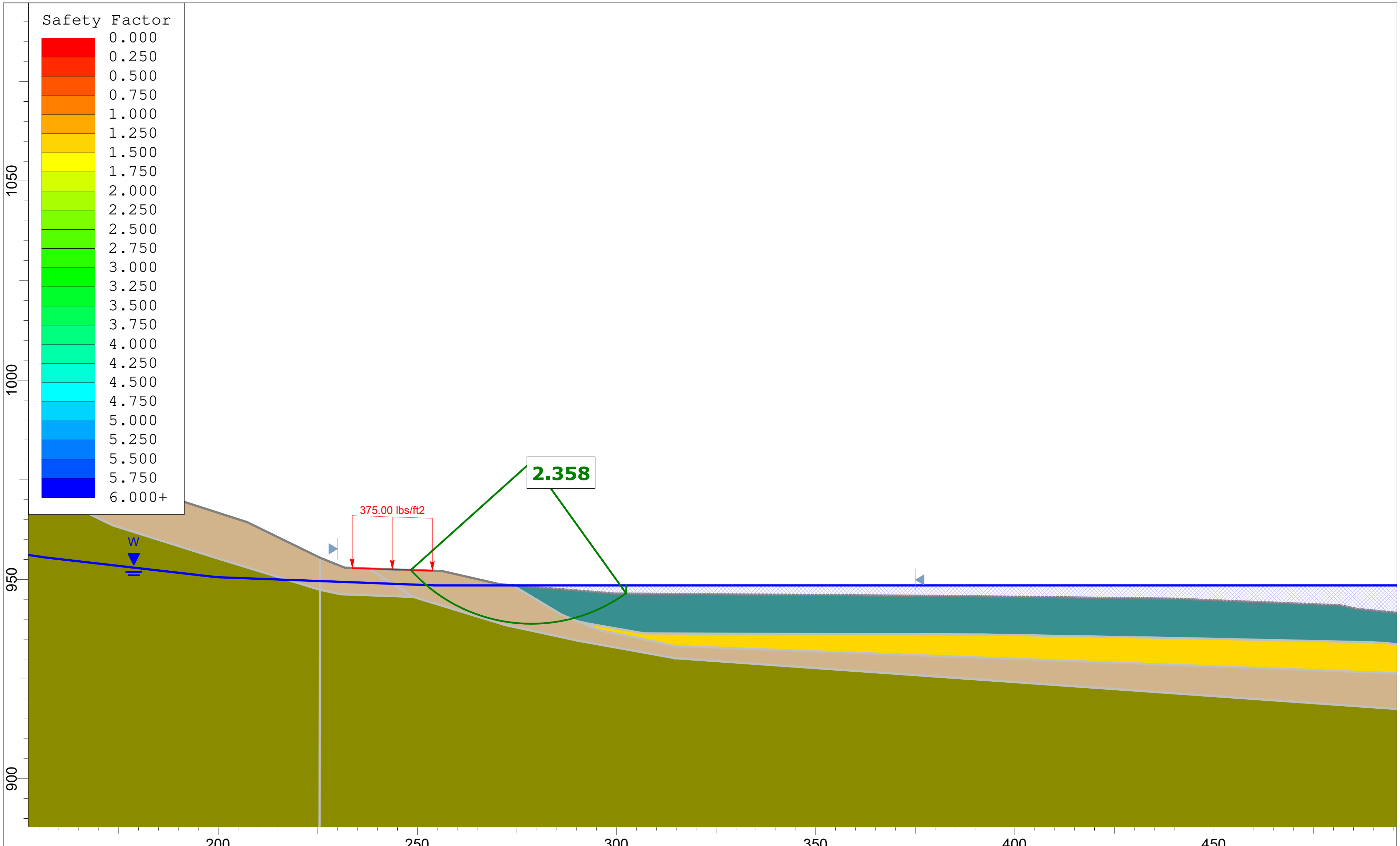
File Name Section 4-4 East_065ratio.slmd



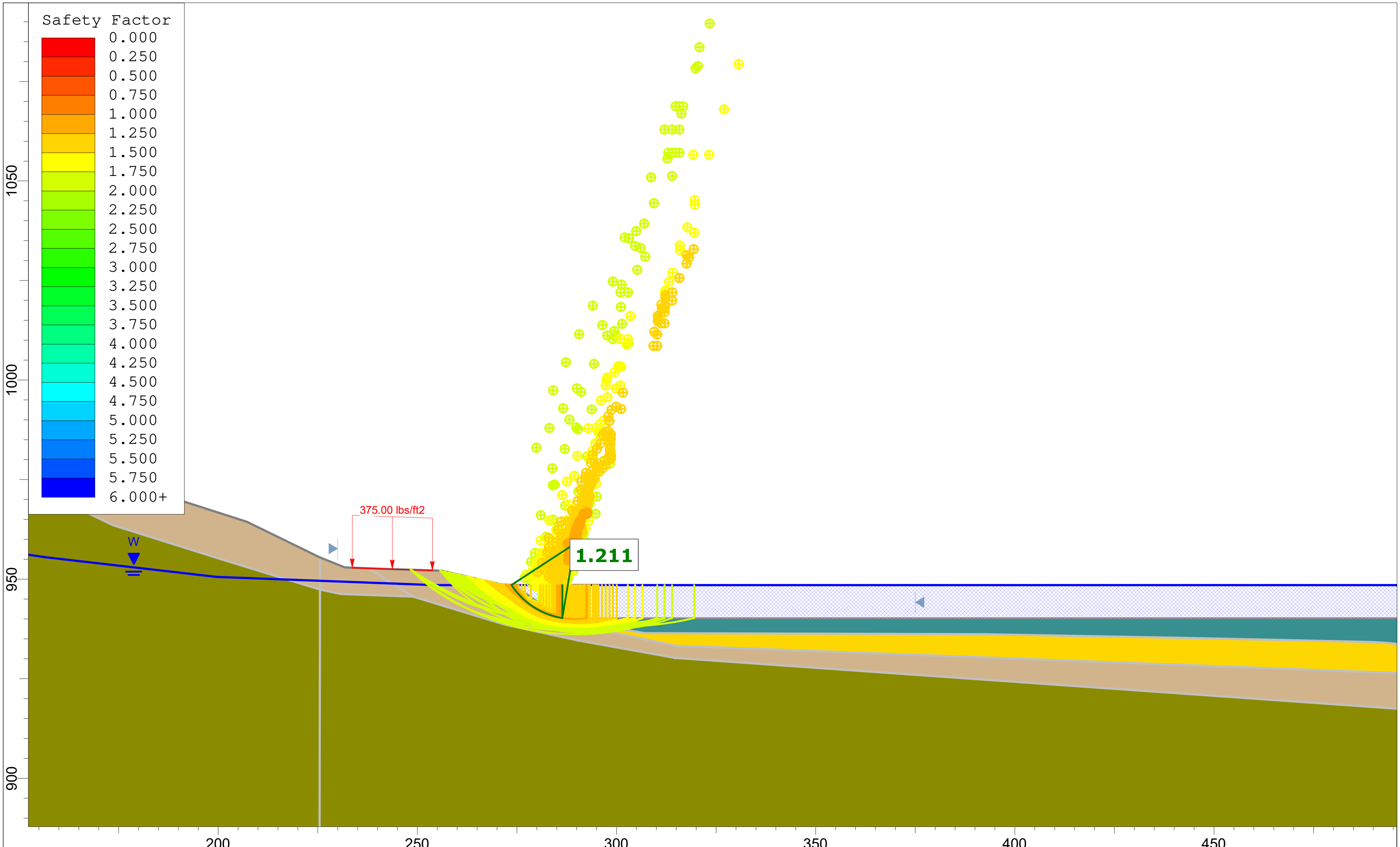
rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 East - 4H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 1:24:07 PM	*File Name*	Section 4-4 East_065ratio.slmd



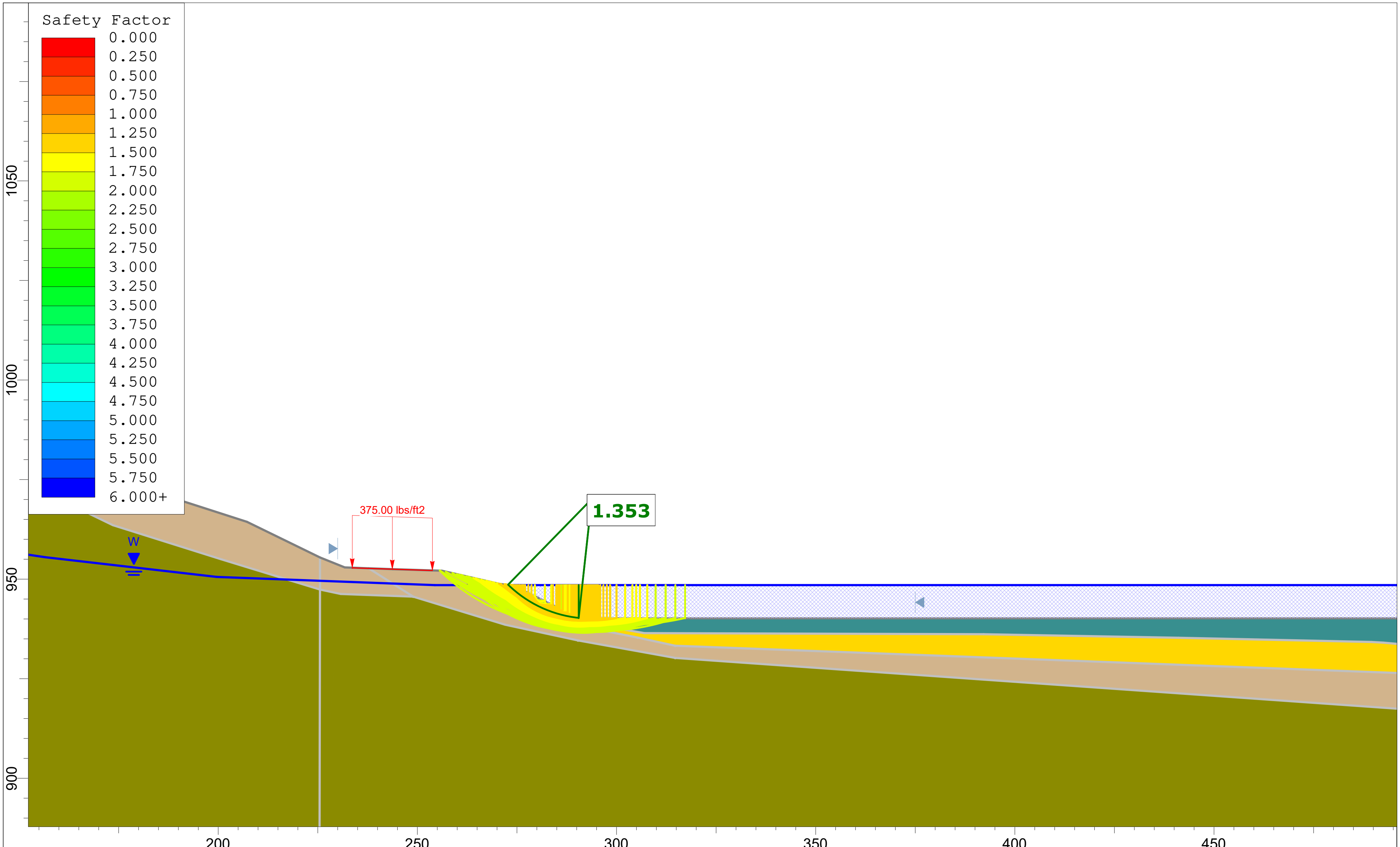
rocscience	Project	Slide2 - An Interactive Slope Stability Program	
	Group: 4 West - Existing	Scenario: Master Scenario	
	Drawn By	Company	
SLIDEINTERPRET 9.034	Date: 7/18/2024, 2:24:33 PM	File Name: Section 4-4 West_10psf.slmd	



rocscience

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 1.5H:1V	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 2:24:33 PM	File Name	Section 4-4 West_10psf.slmd

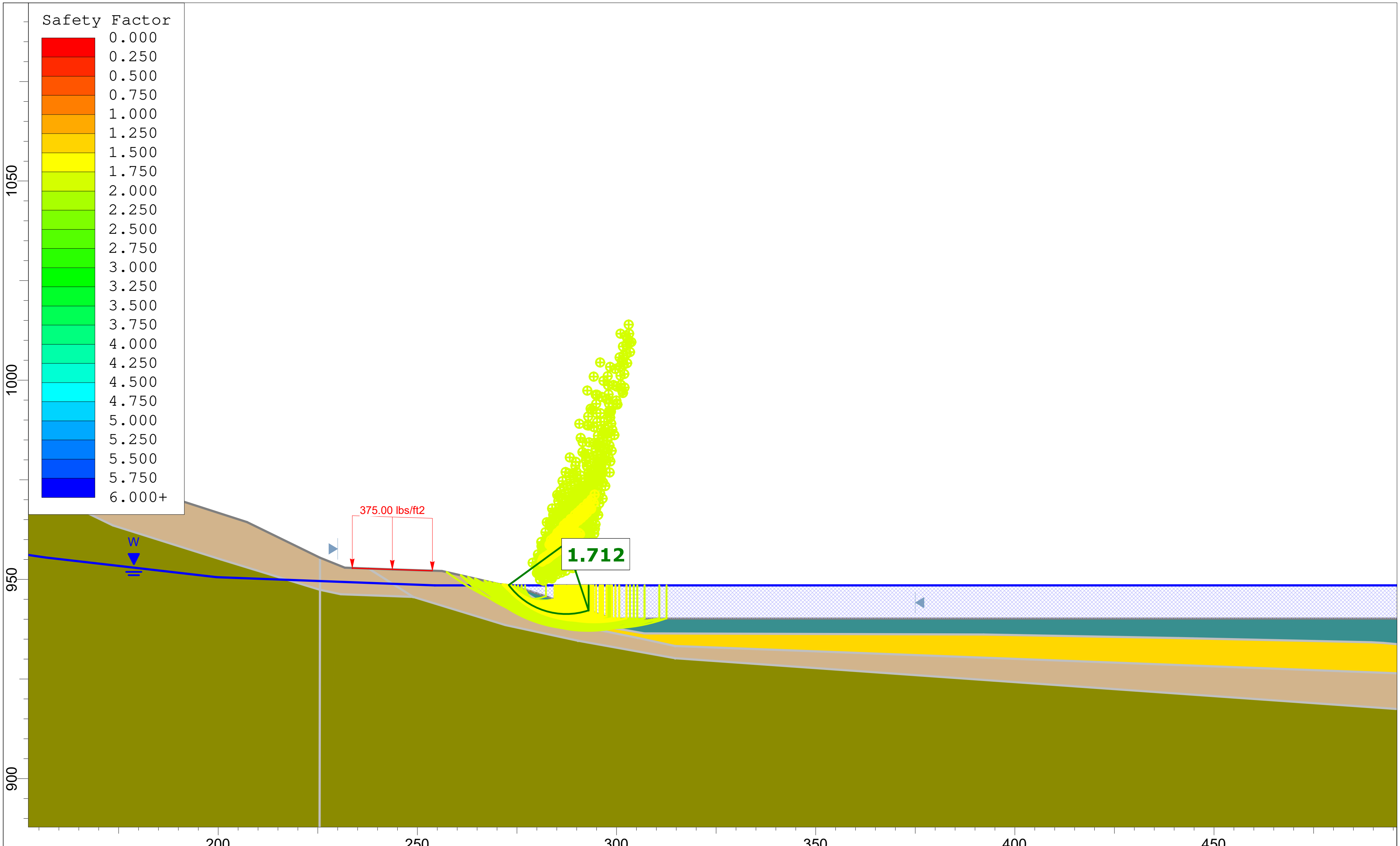
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

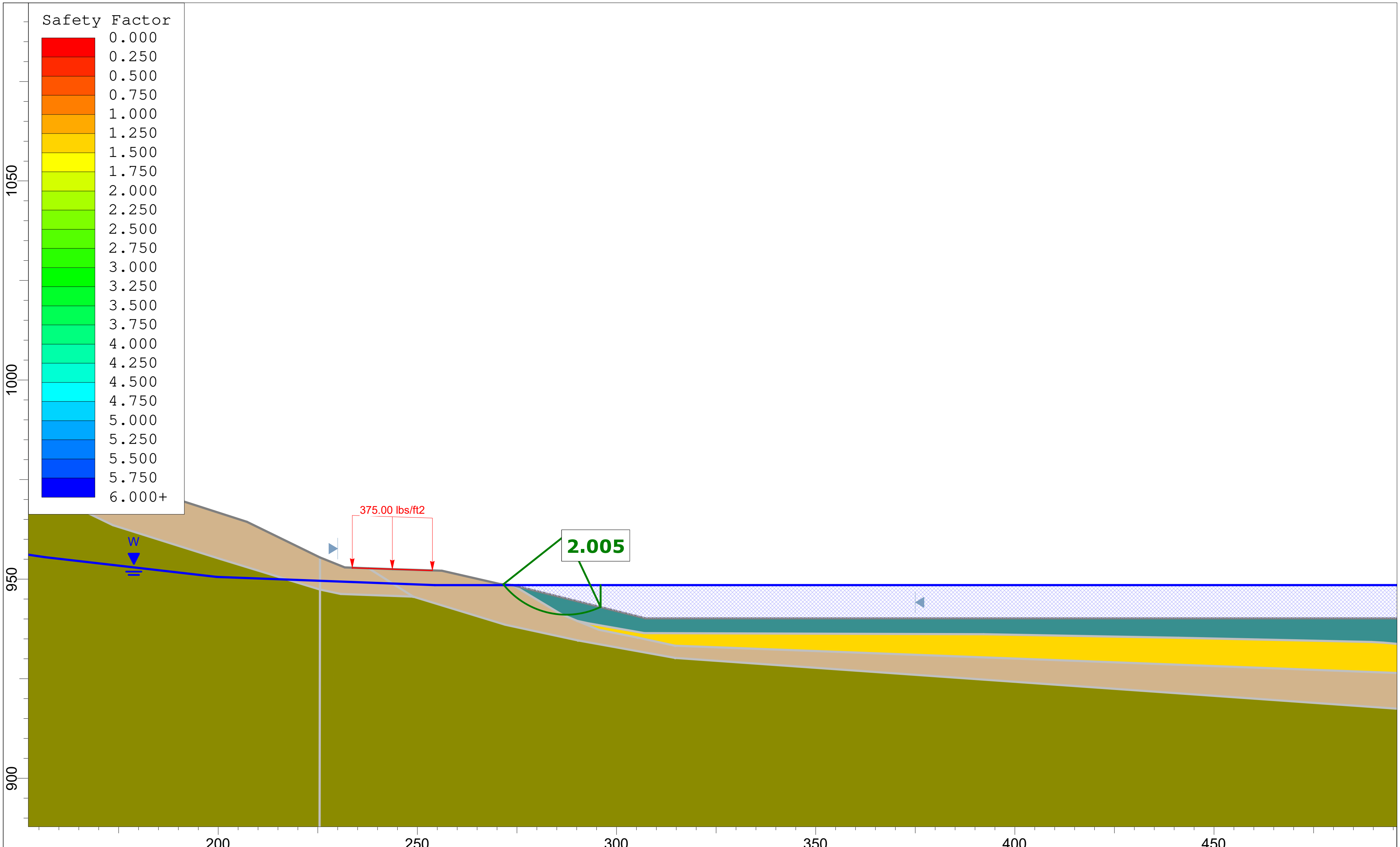
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 2H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_10psf.slmd



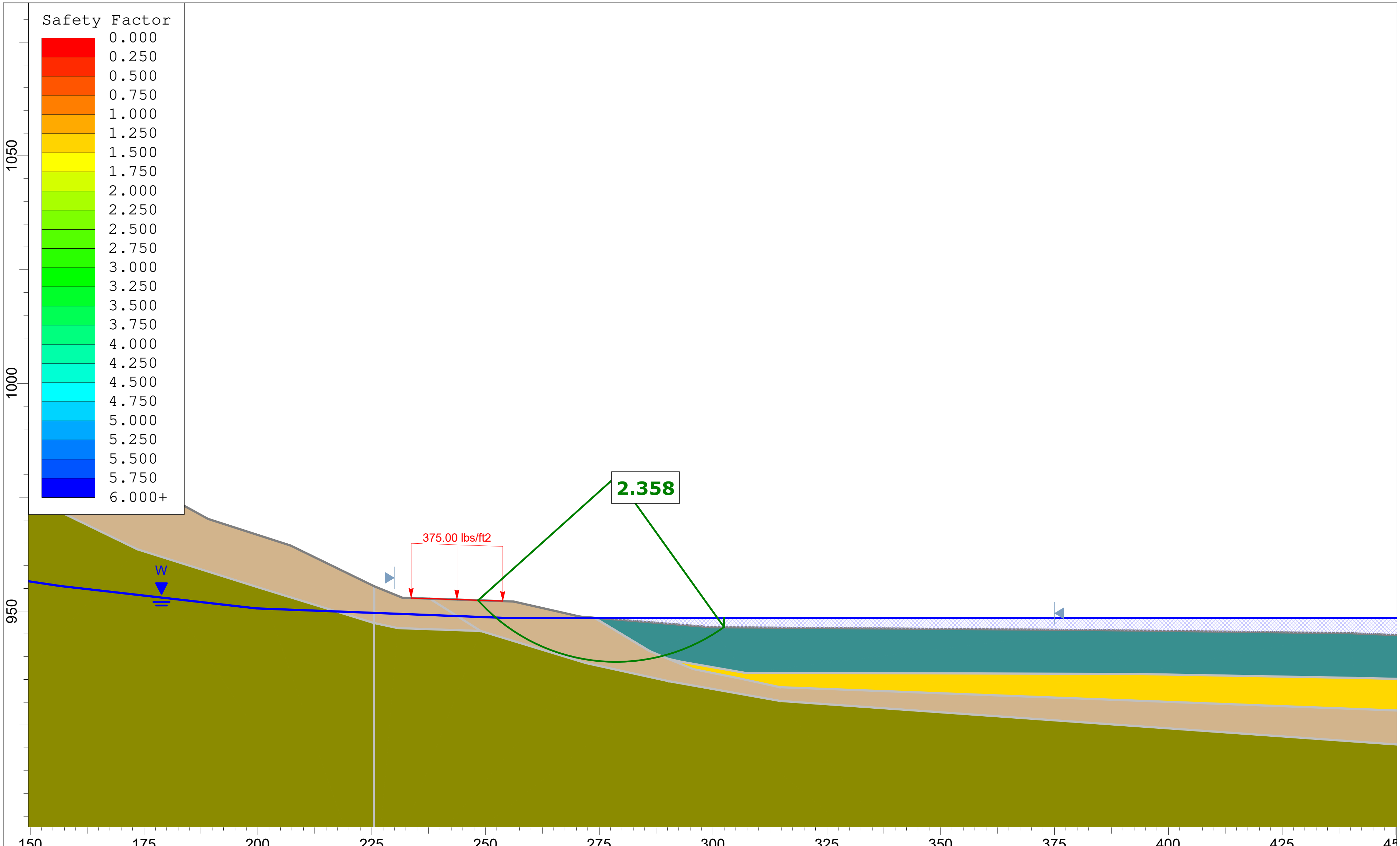
rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 3H:1V	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 2:24:33 PM	File Name	Section 4-4 West_10psf.slmd



rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 West - 4H:1V	*Scenario* Master Scenario	
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 2:24:33 PM	*File Name* Section 4-4 West_10psf.slmd	



rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
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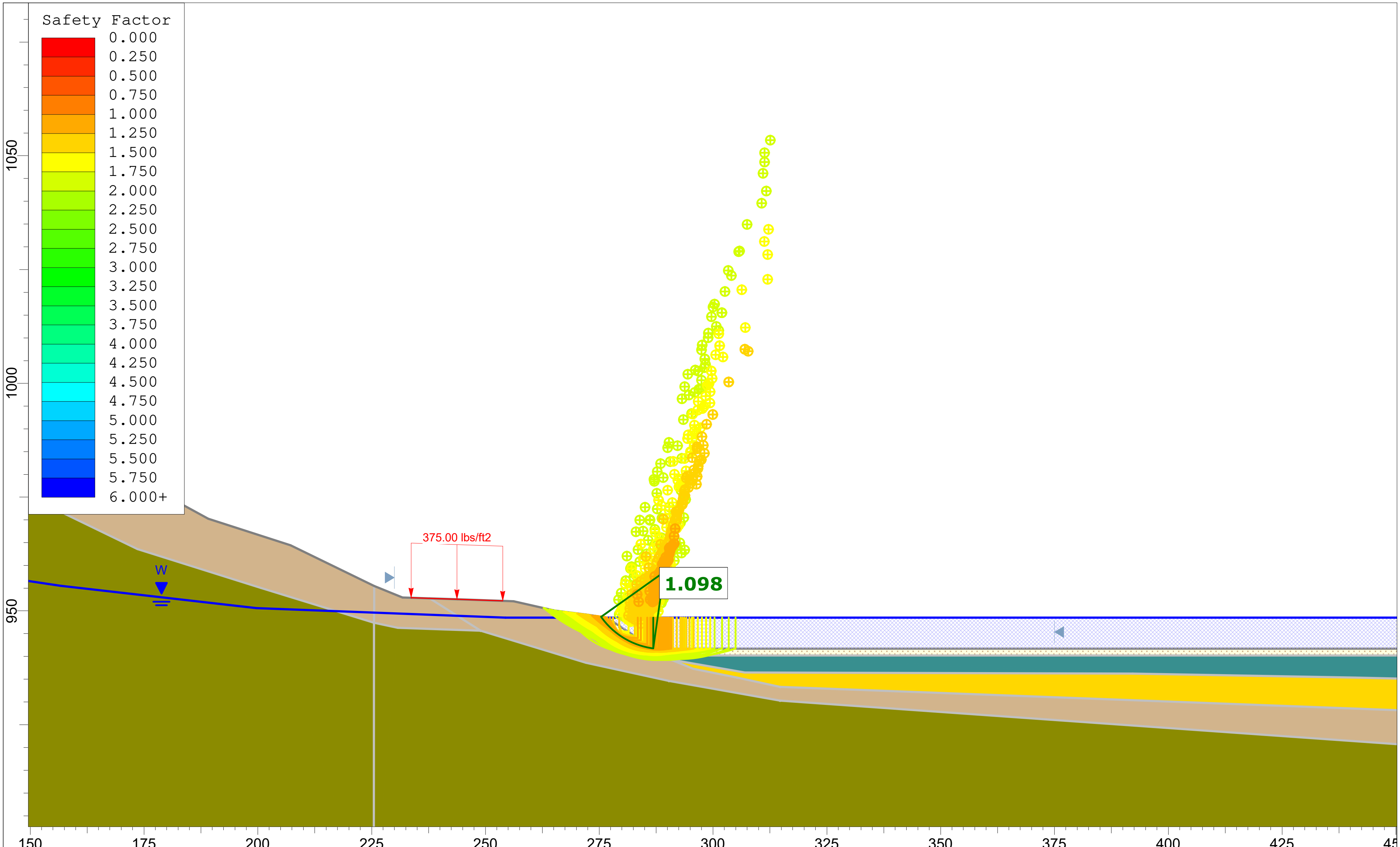
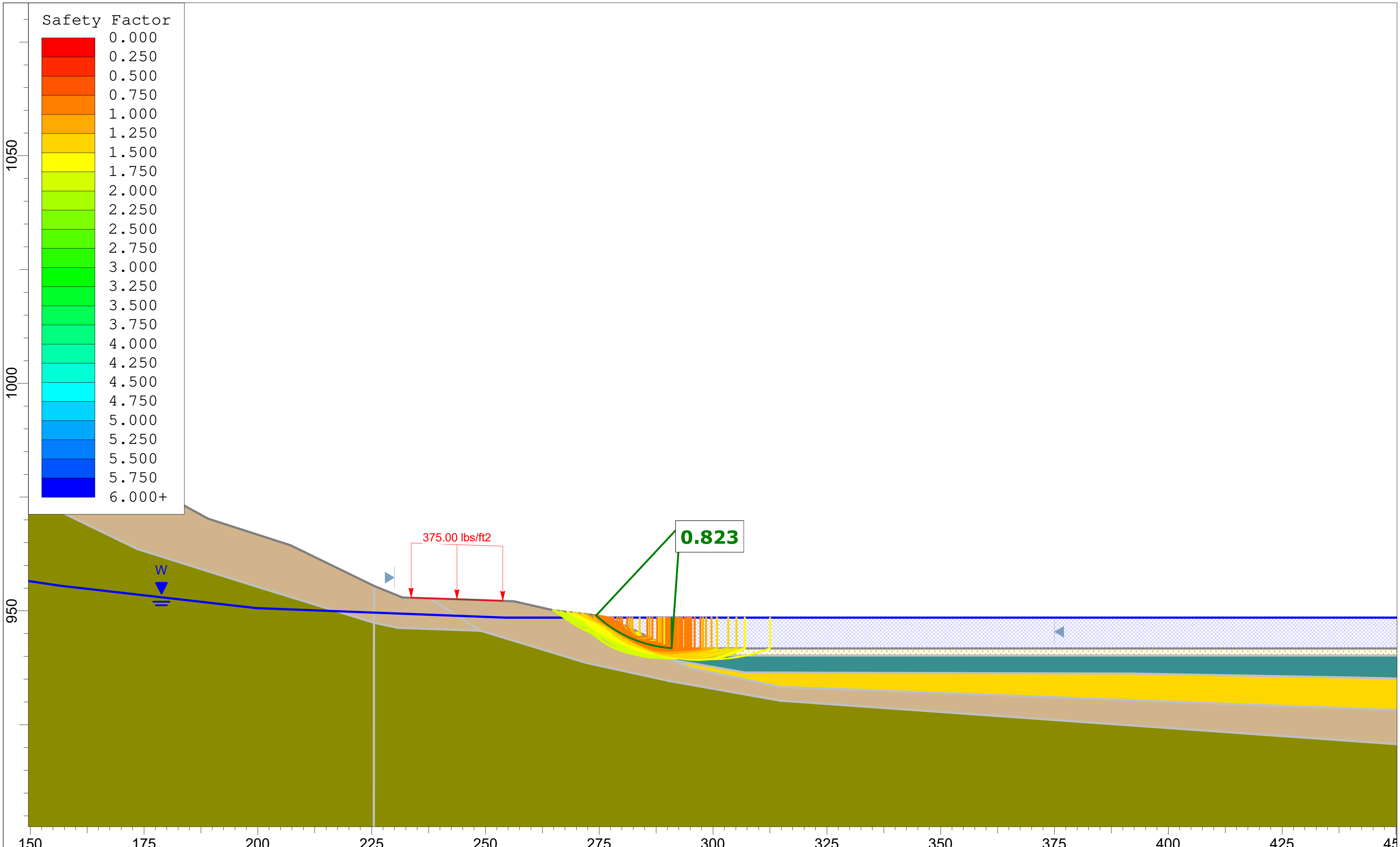
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 2:24:33 PM	*File Name* Section 4-4 West_10psf-cap.slmd	



rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 1.5H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_10psf-cap.slmd



rocscience	Project	Slide2 - An Interactive Slope Stability Program	
	Group: 4 West - 2H:1V	Scenario: Master Scenario	
	Drawn By:	Company:	
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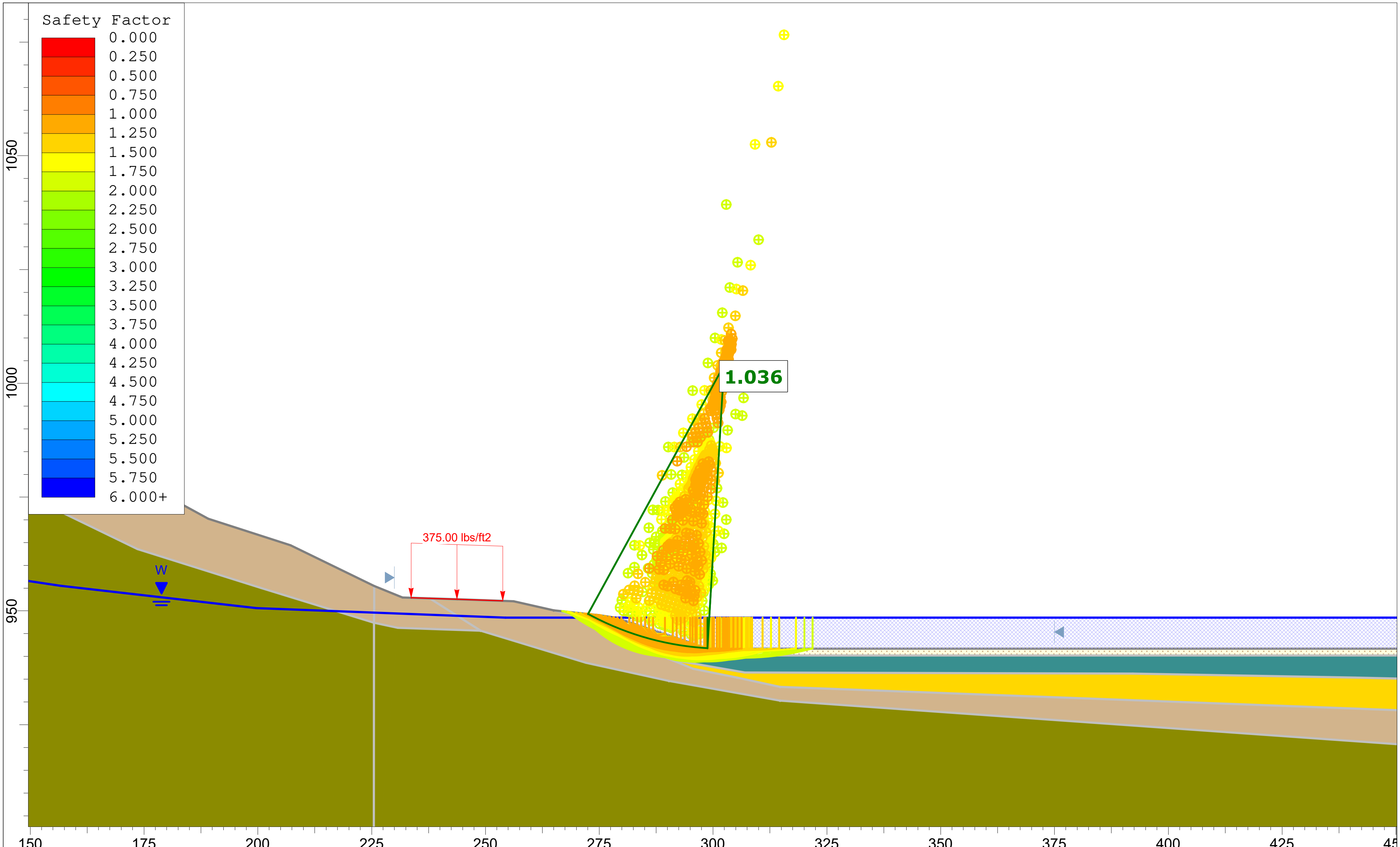
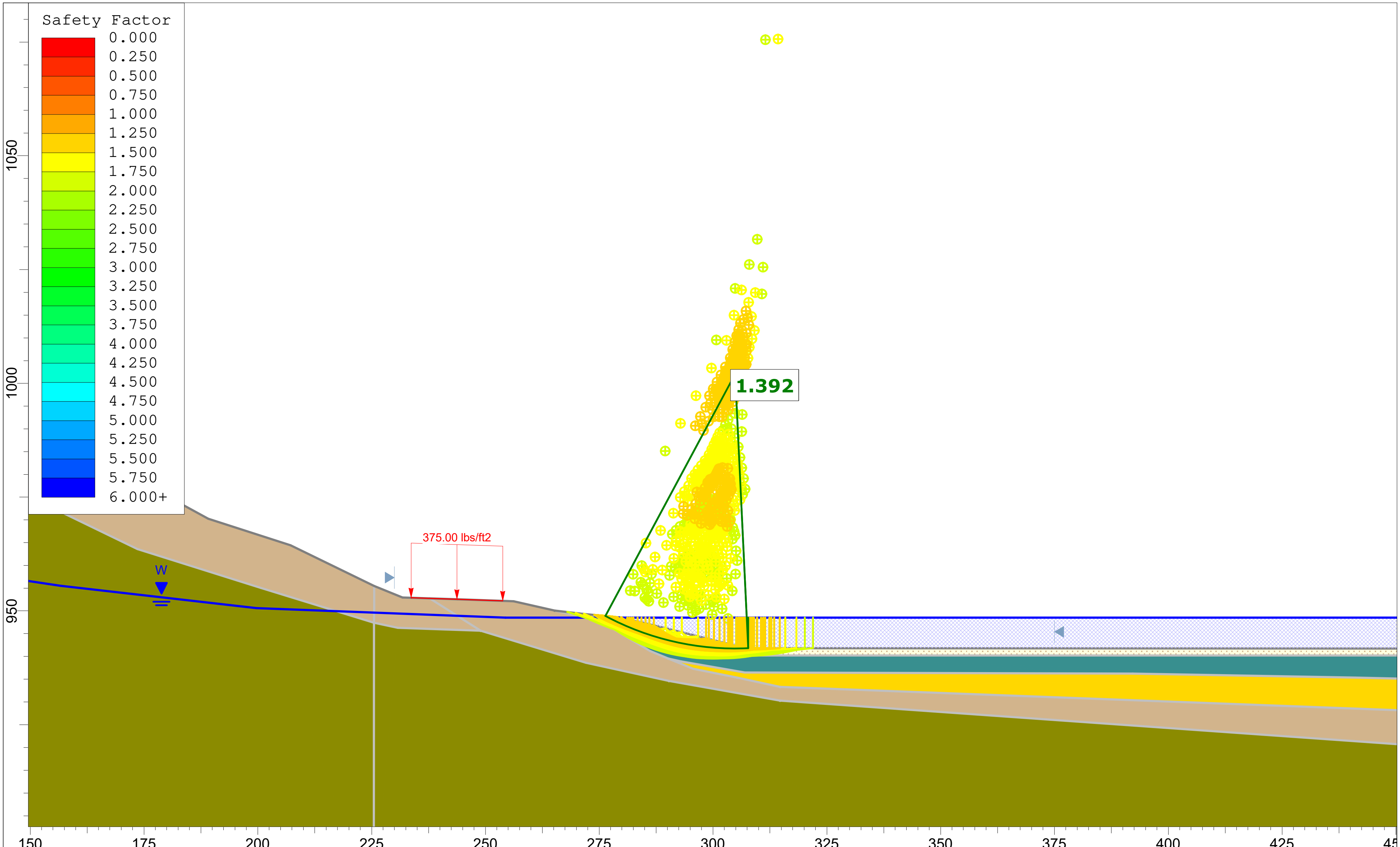


rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 3H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_10psf-cap.slmd



rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 West - 4H:1V	*Scenario* Master Scenario	
	Drawn By	*Company*	
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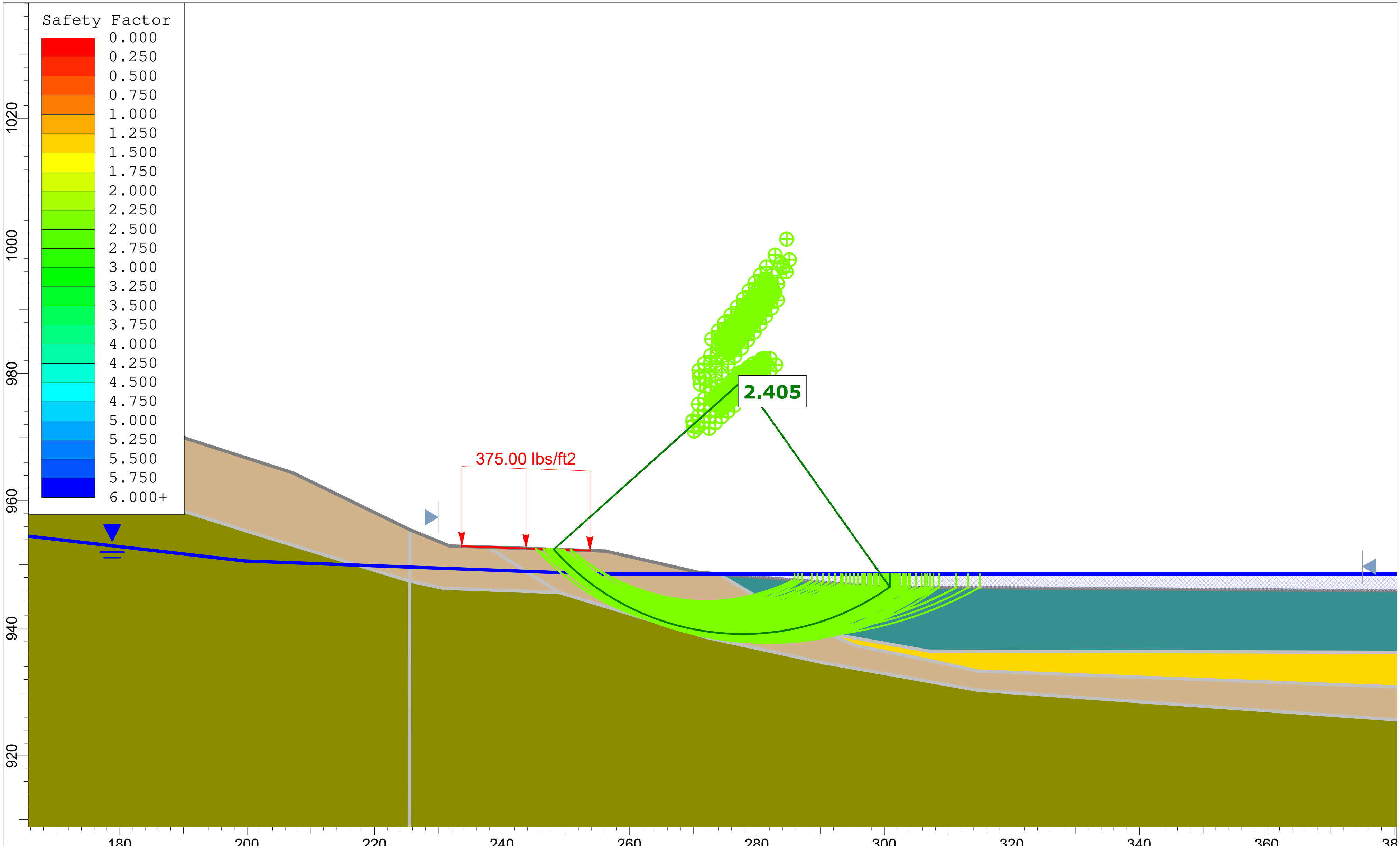
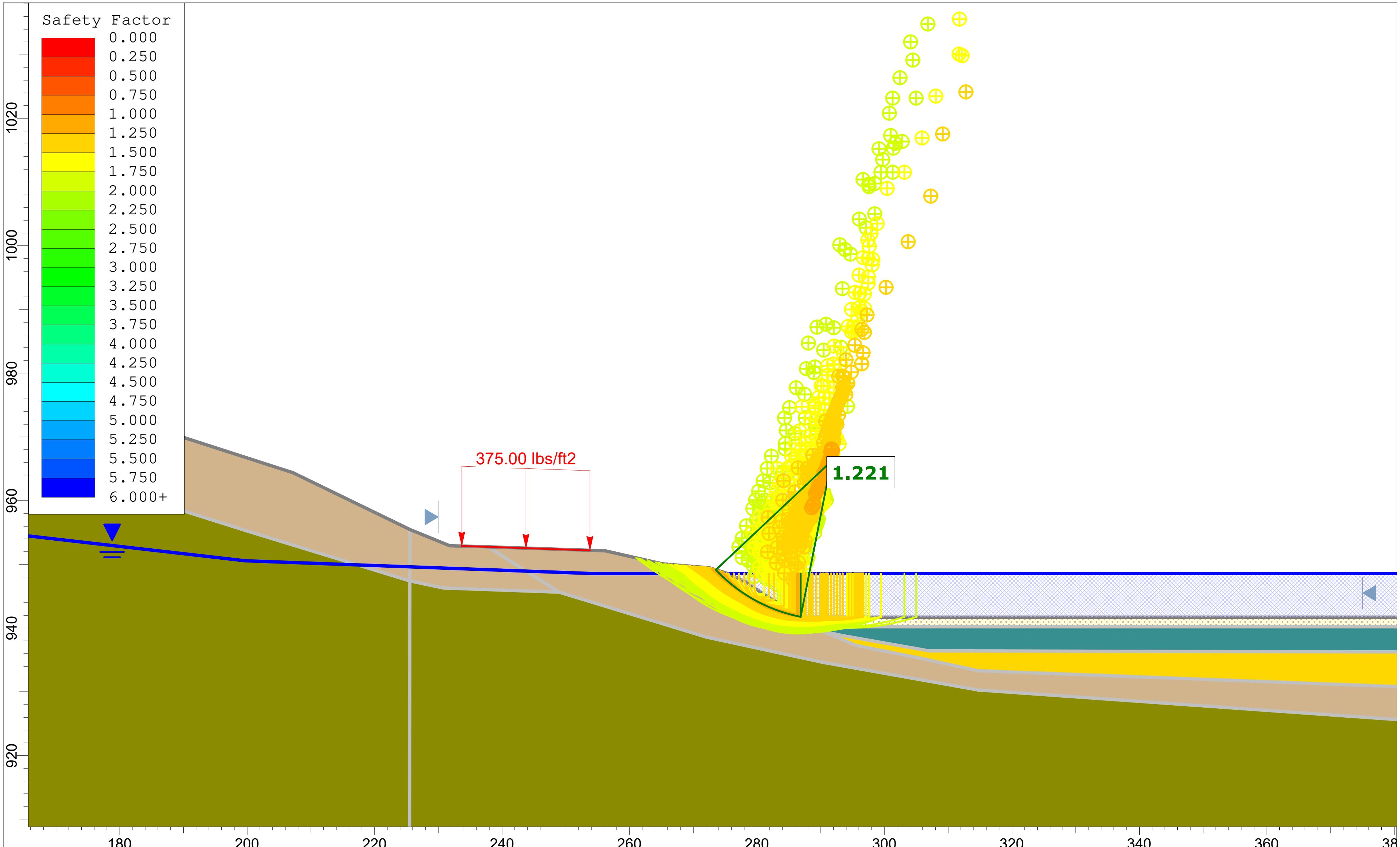


rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - Existing	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 2:24:33 PM	File Name	Section 4-4 West_psf15-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 1.5H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
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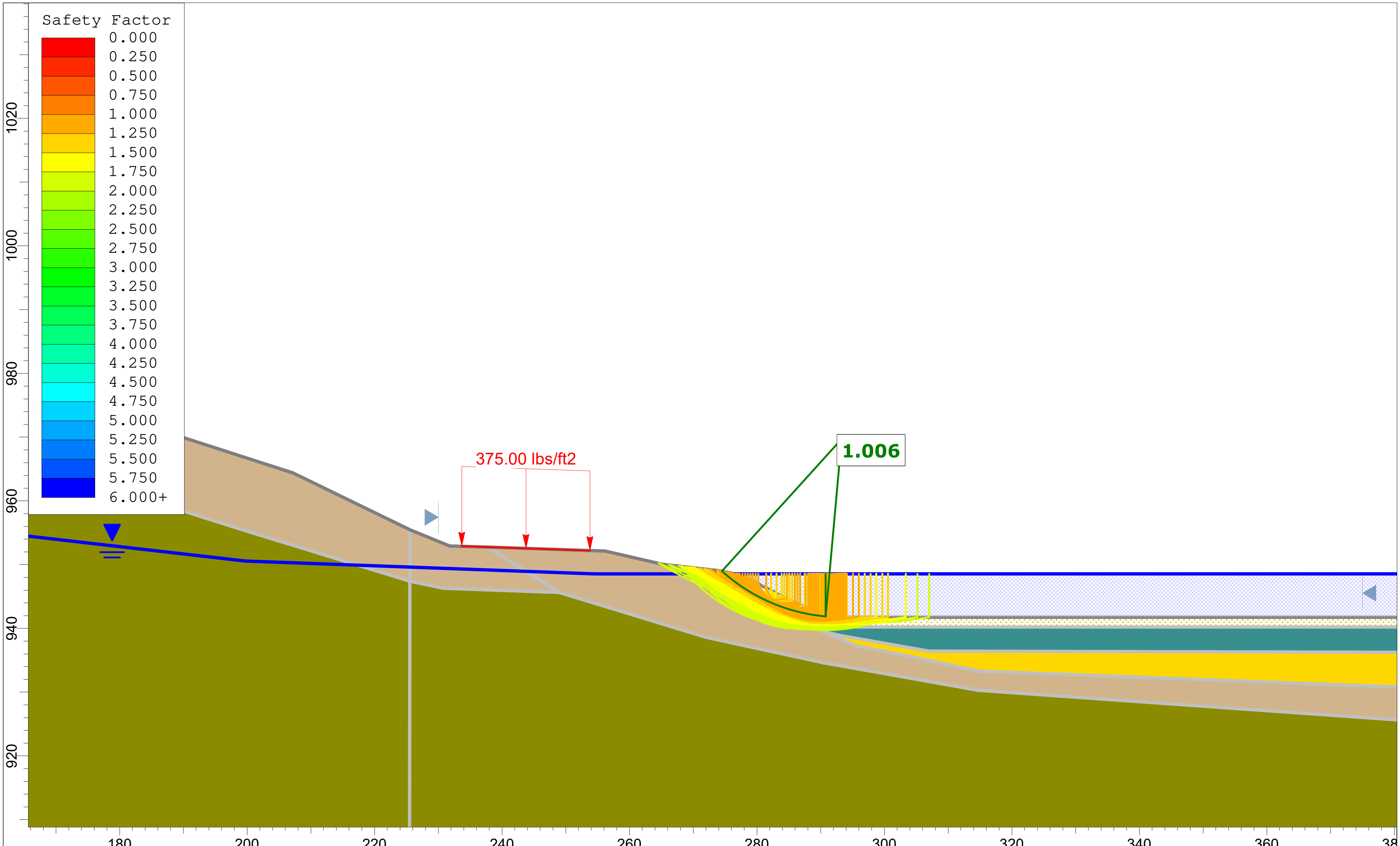

rocscience	Project	Slide2 - An Interactive Slope Stability Program	
	Group: 4 West - 2H:1V	Scenario: Master Scenario	
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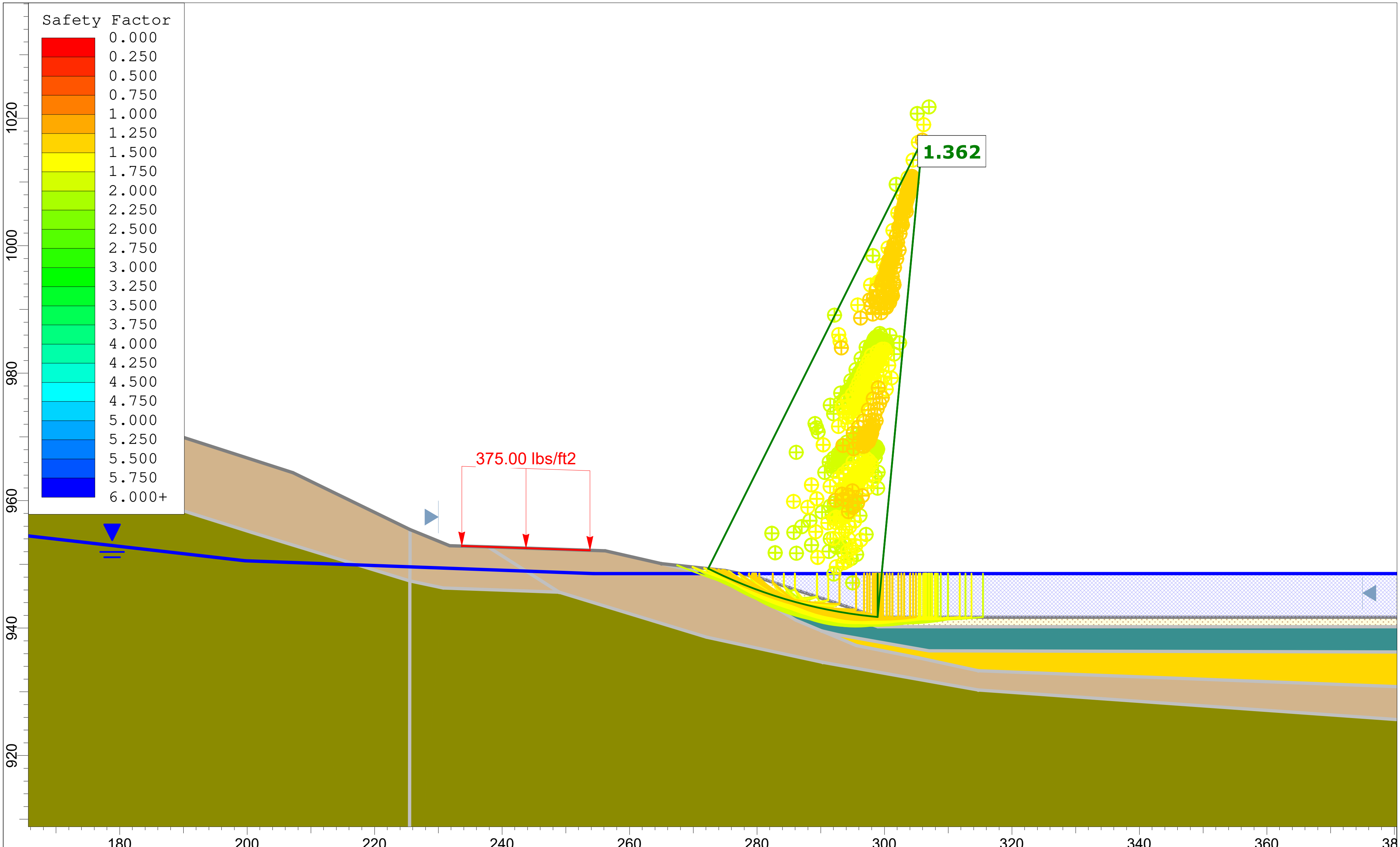

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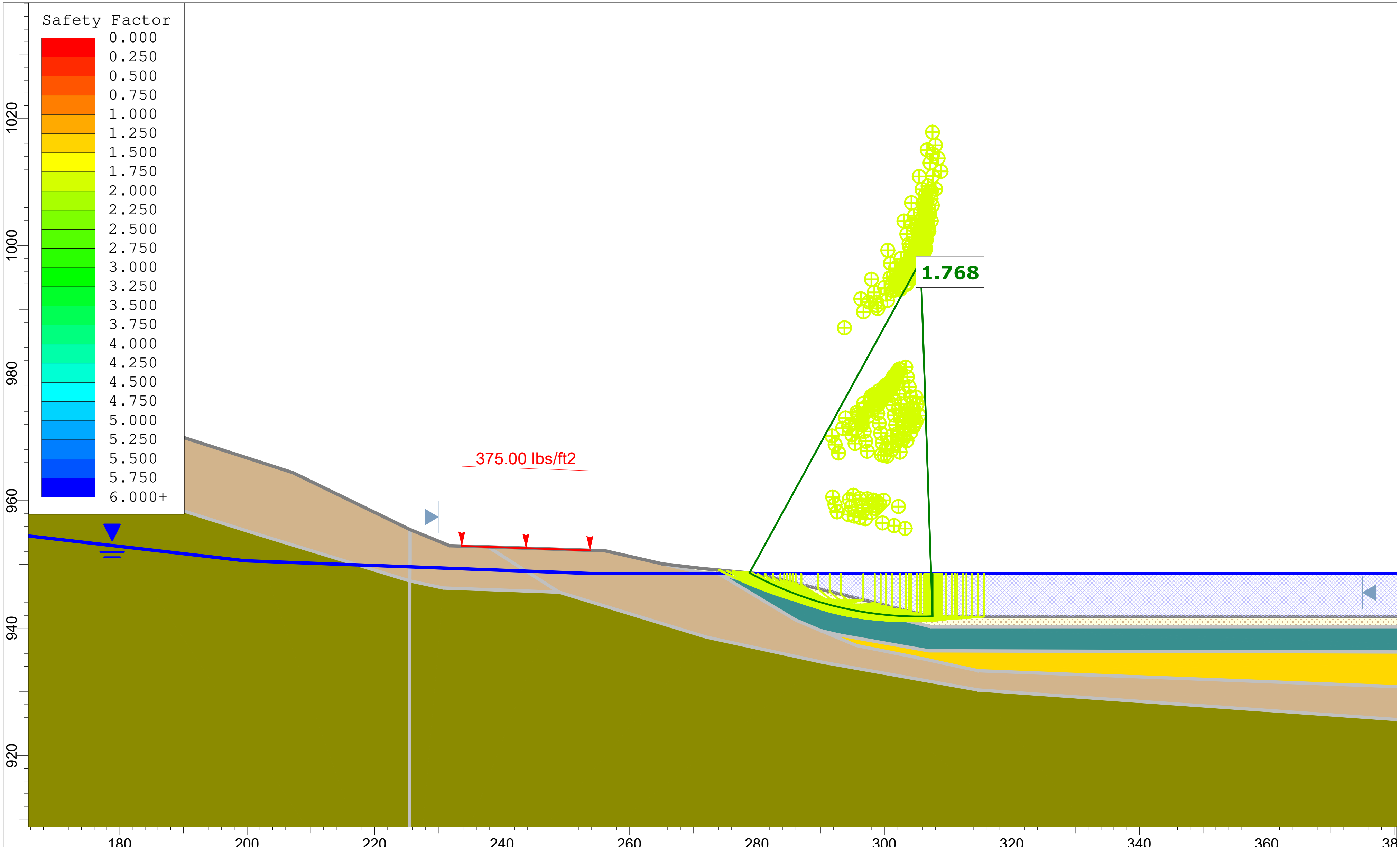
SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 3H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_psf15-Cap.slmd



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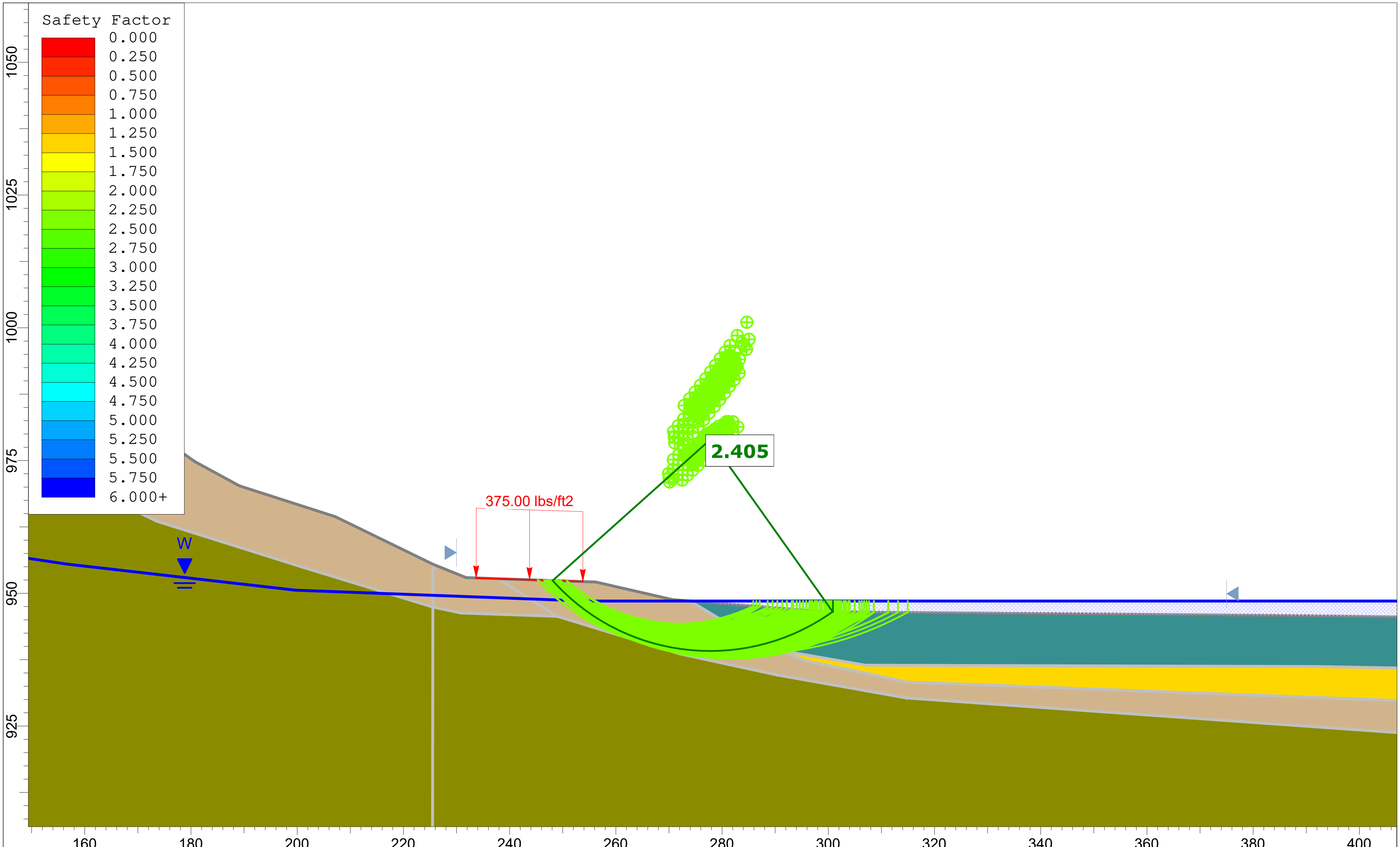
SLIDEINTERPRET 9.034

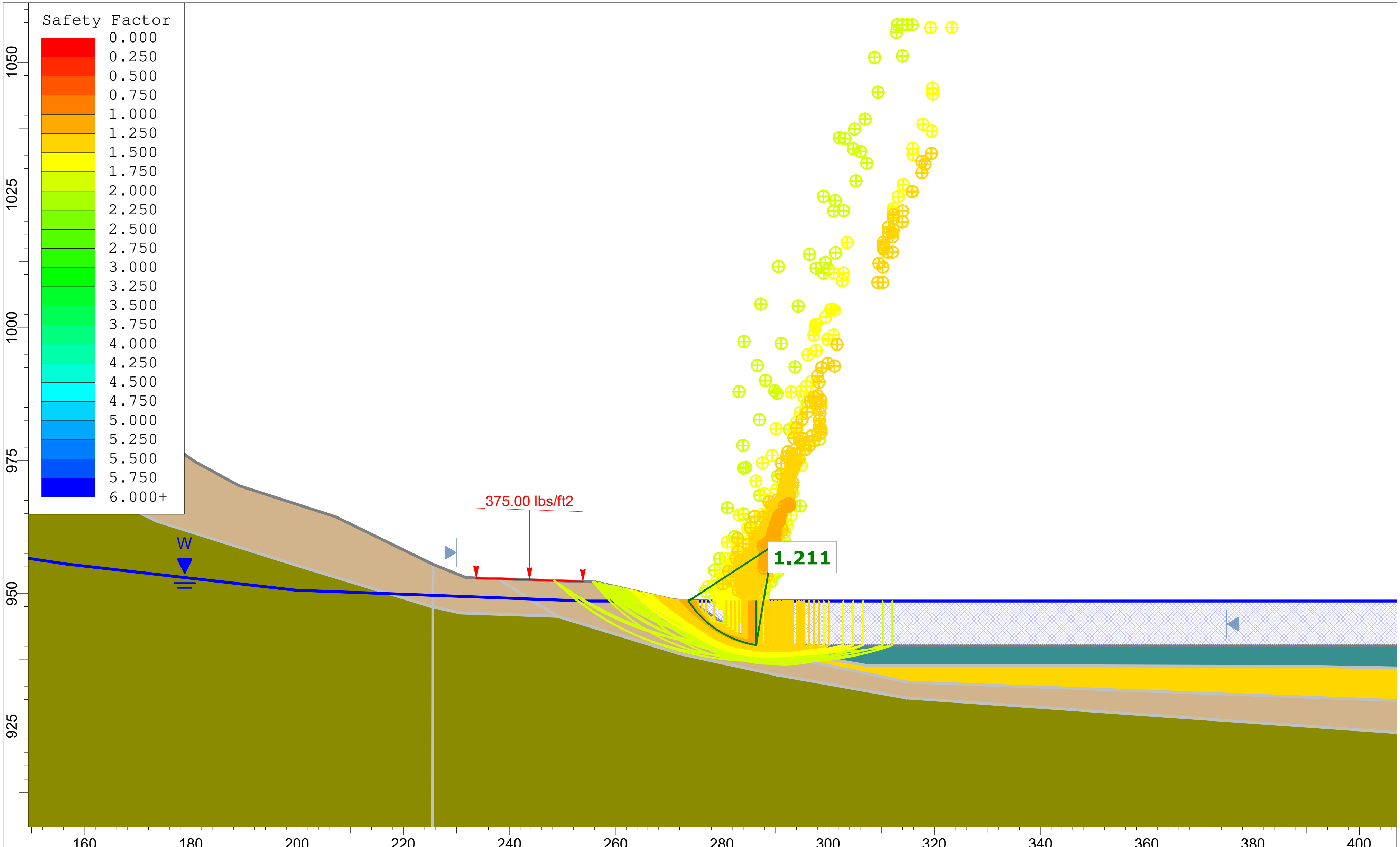
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 4H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_psf15-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - Existing	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_psf15.slmd



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SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 1.5H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
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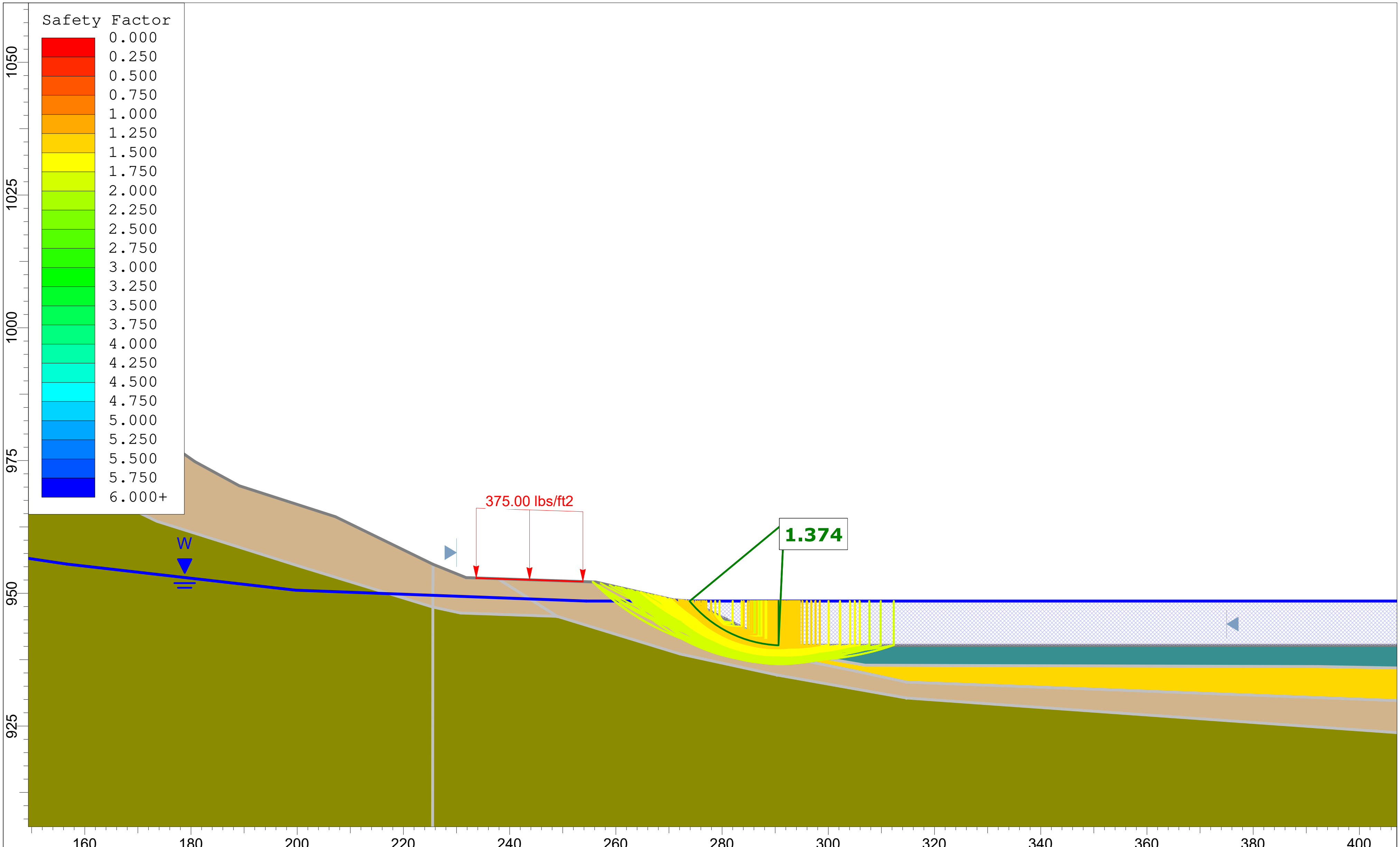

rocscience	Project	Slide2 - An Interactive Slope Stability Program	
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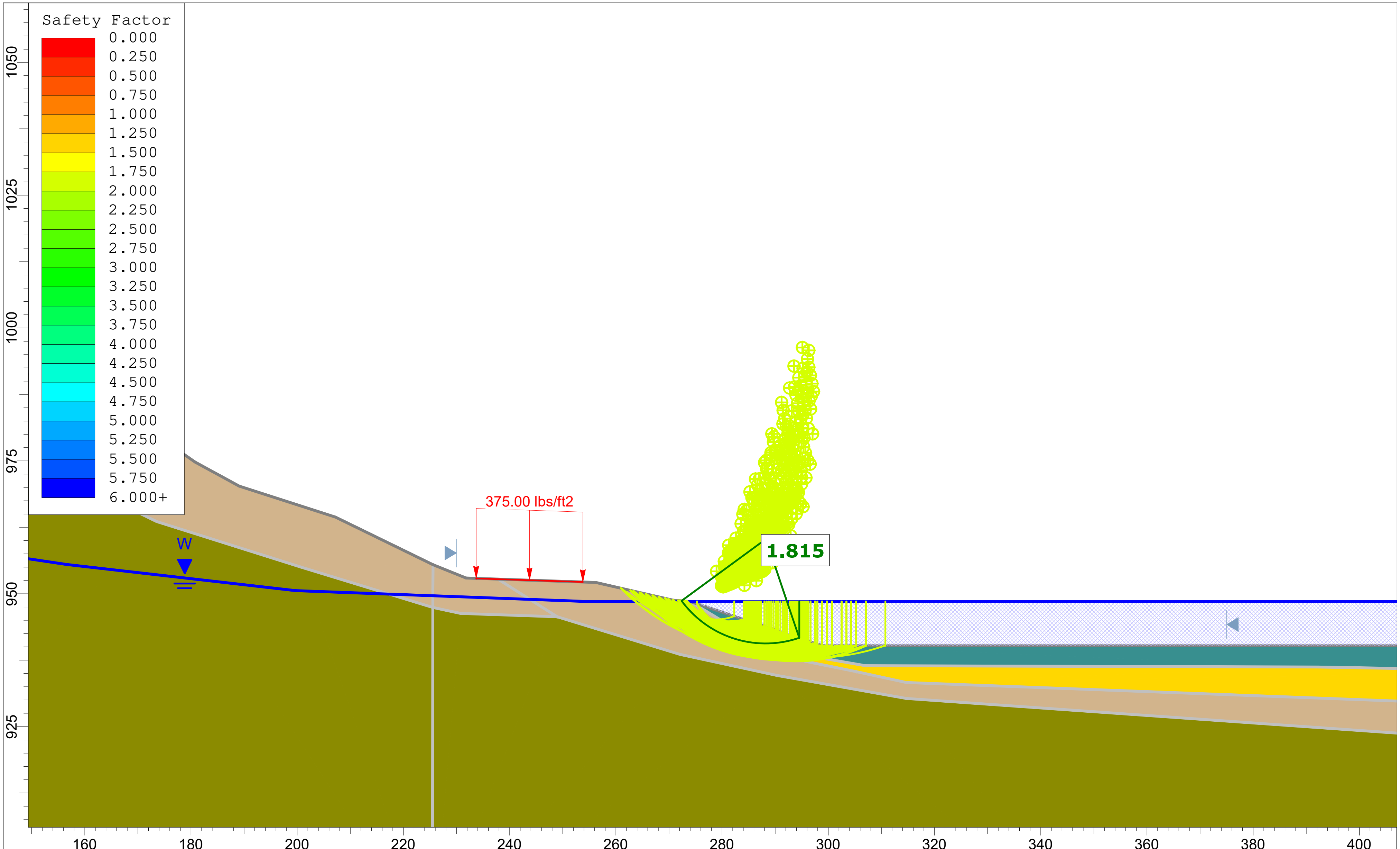

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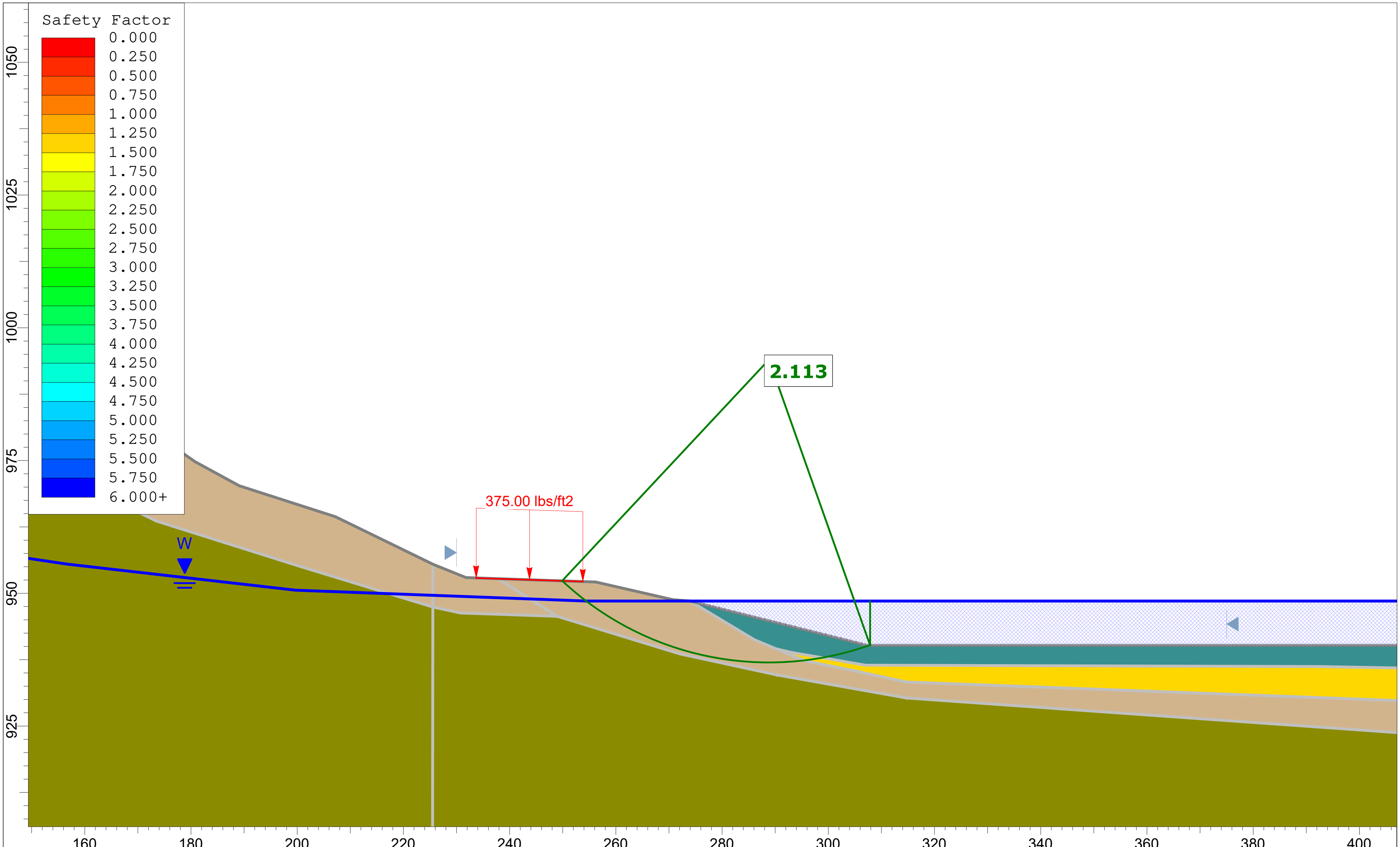
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 3H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_psf15.slmd

SLIDEINTERPRET 9.034



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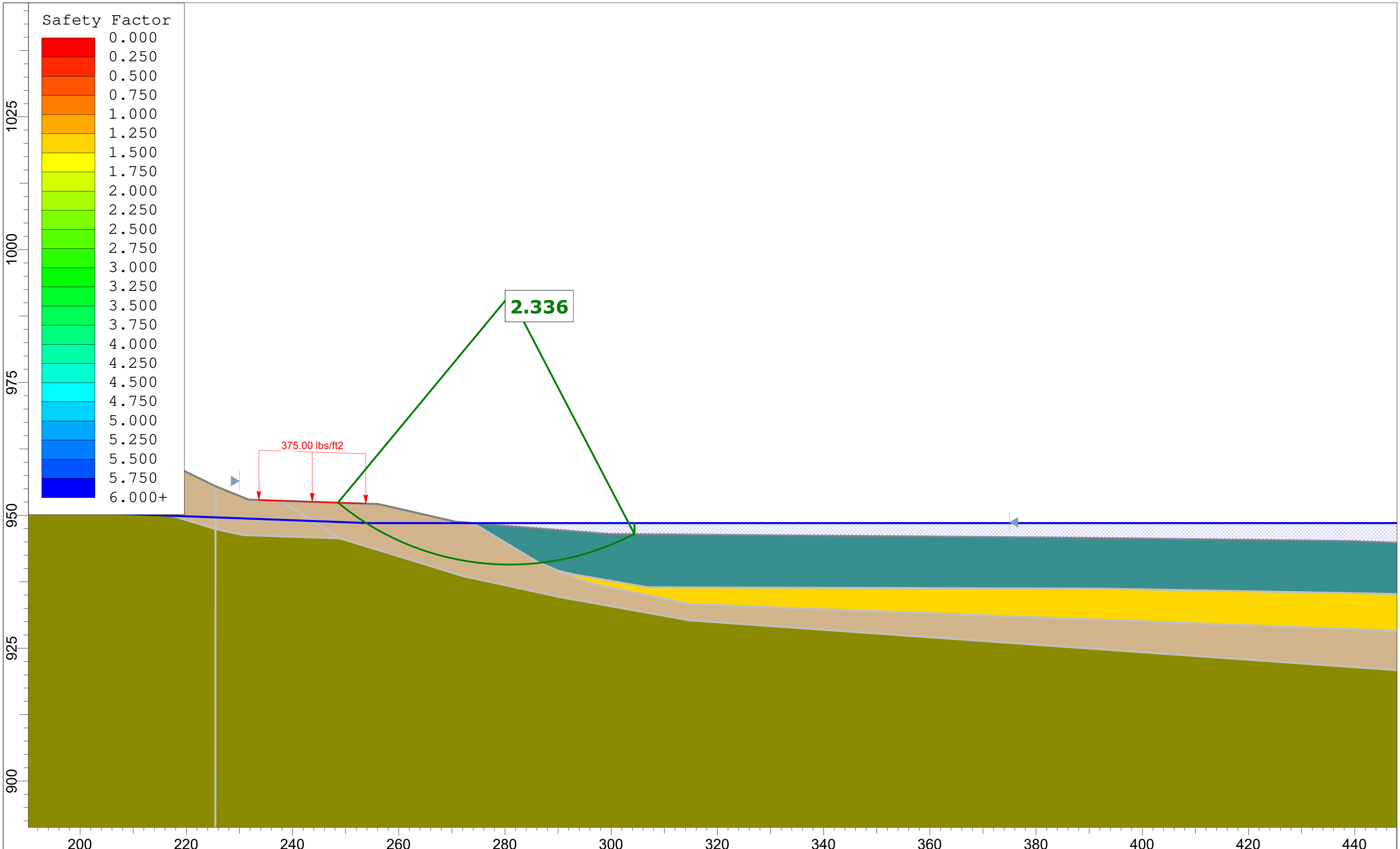
SLIDEINTERPRET 9.034

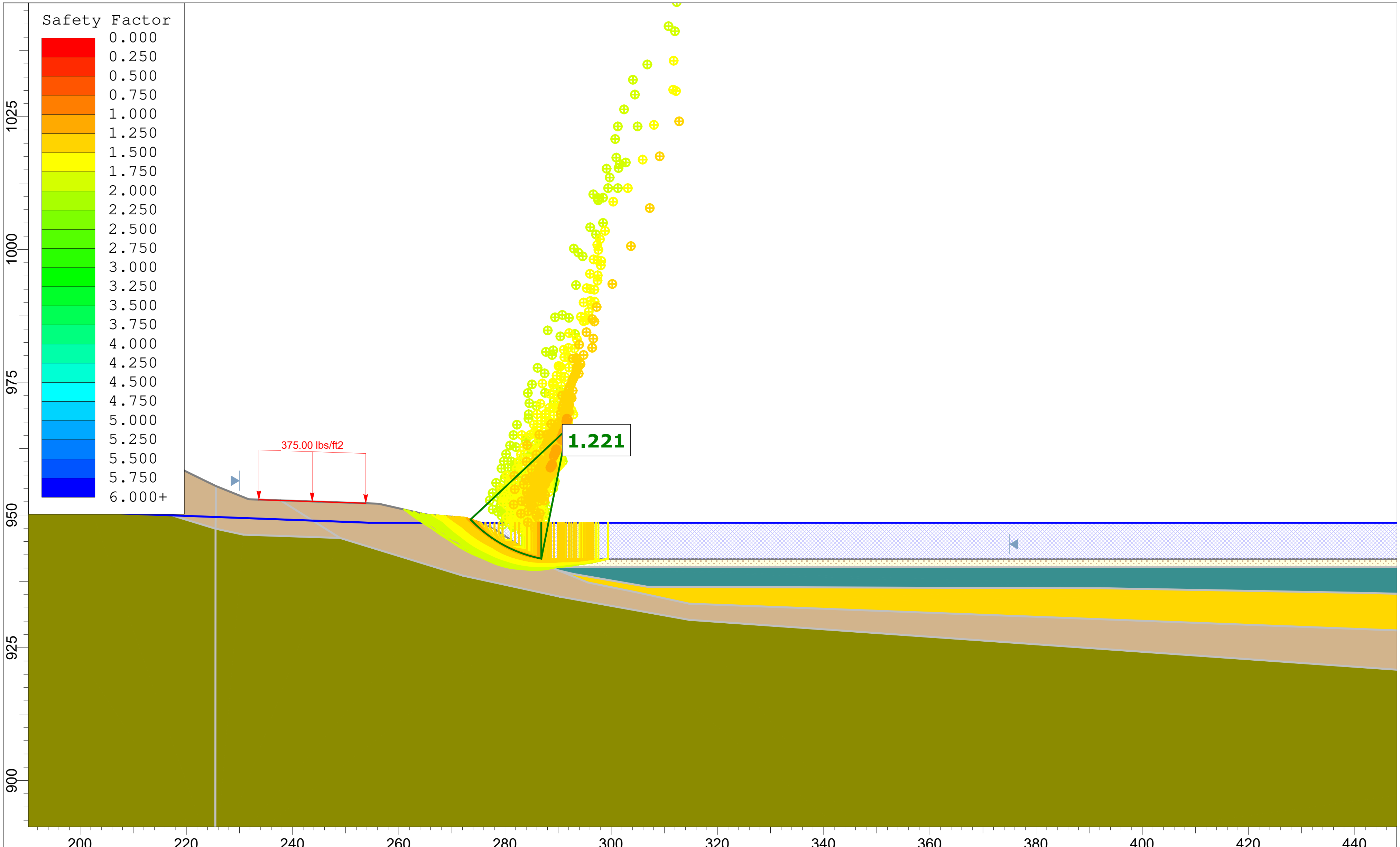
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 4H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_psf15.slmd



rocscience

SLIDEINTERPRET 9.034

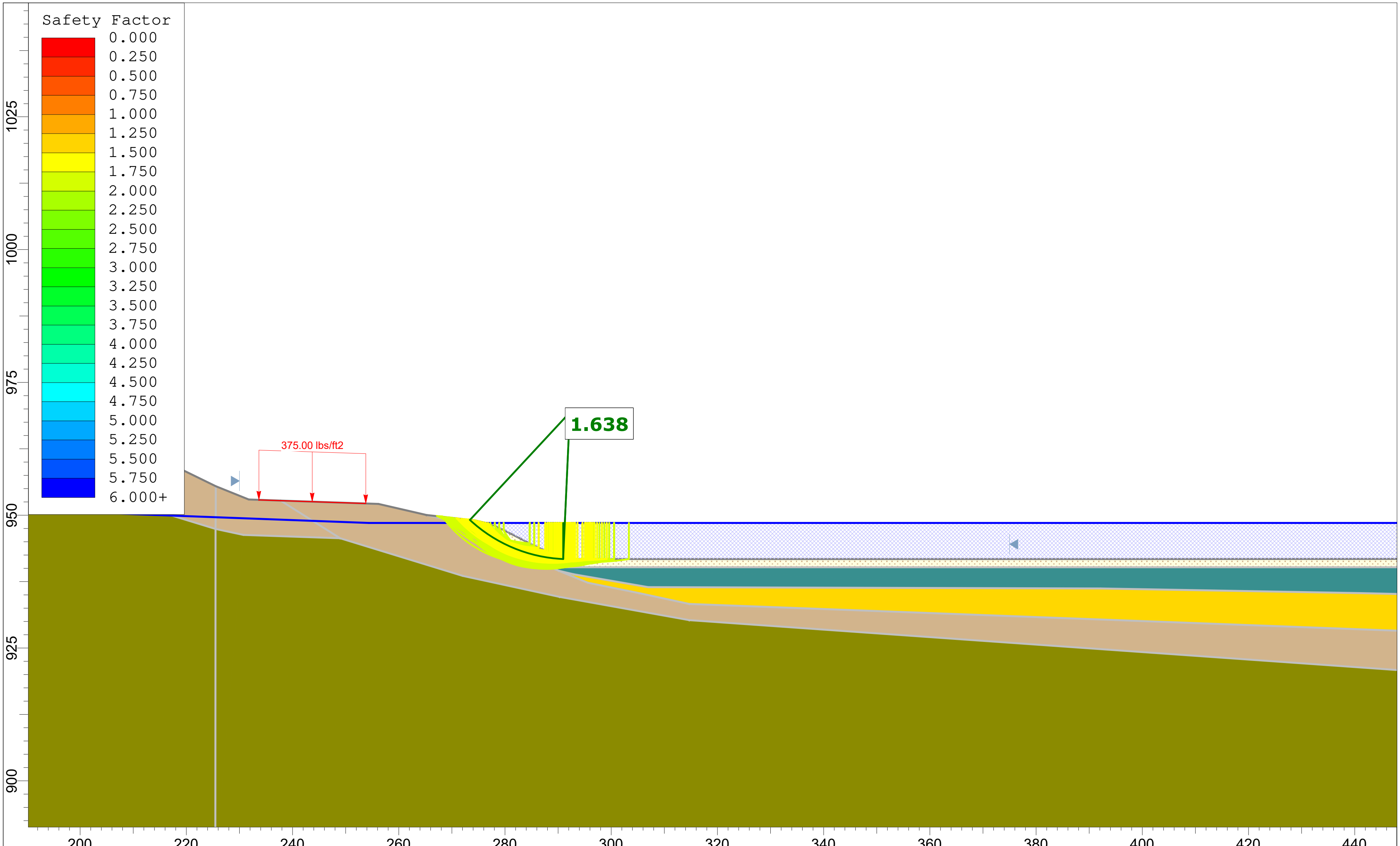
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - Existing	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_065ratio-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

Project Slide2 - An Interactive Slope Stability Program	
Group 4 West - 1.5H:1V	*Scenario* Master Scenario
Drawn By	*Company*
Date 7/18/2024, 2:24:33 PM	*File Name* Section 4-4 West_065ratio-Cap.slmd



rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 West - 2H:1V	*Scenario* Master Scenario	
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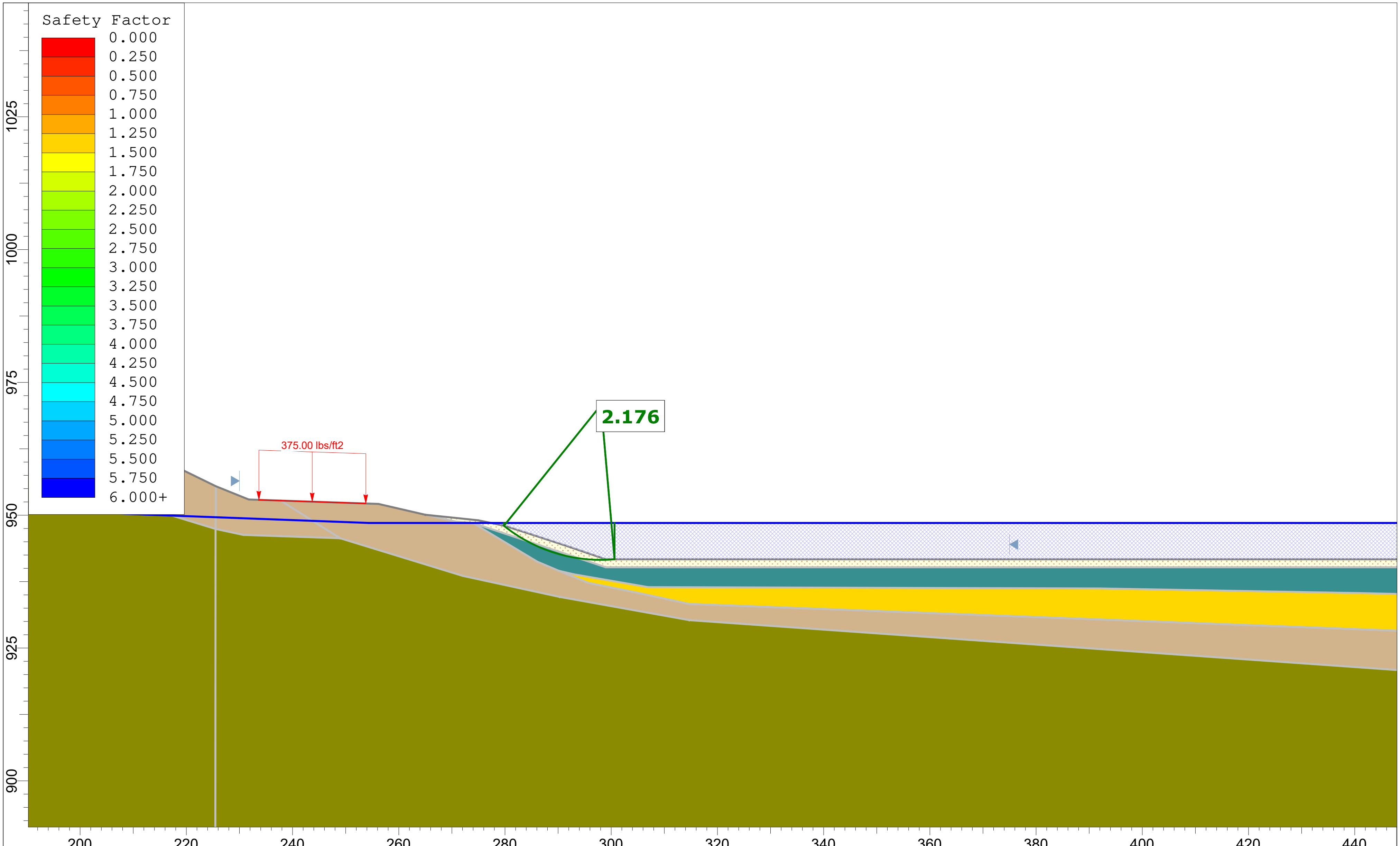
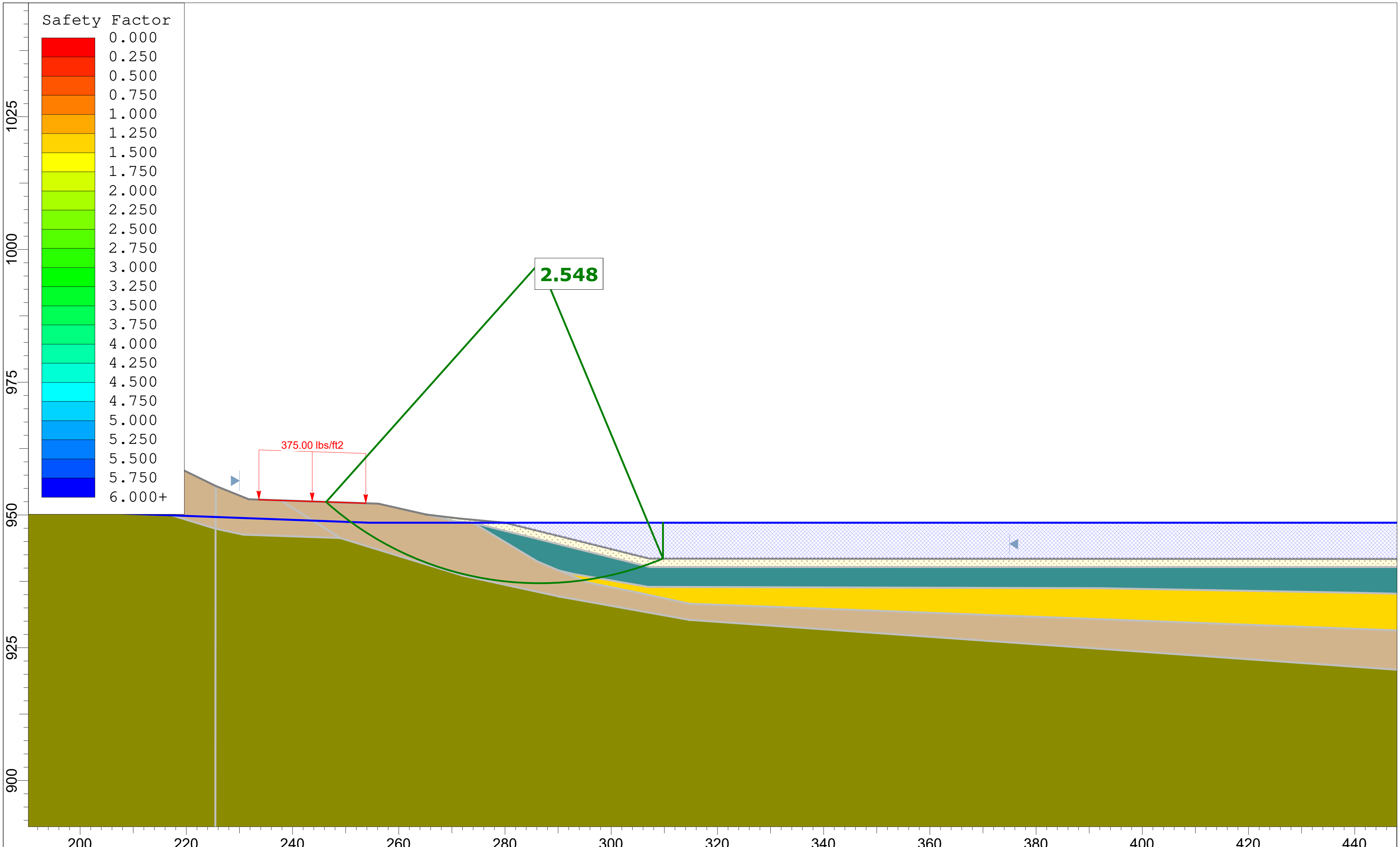
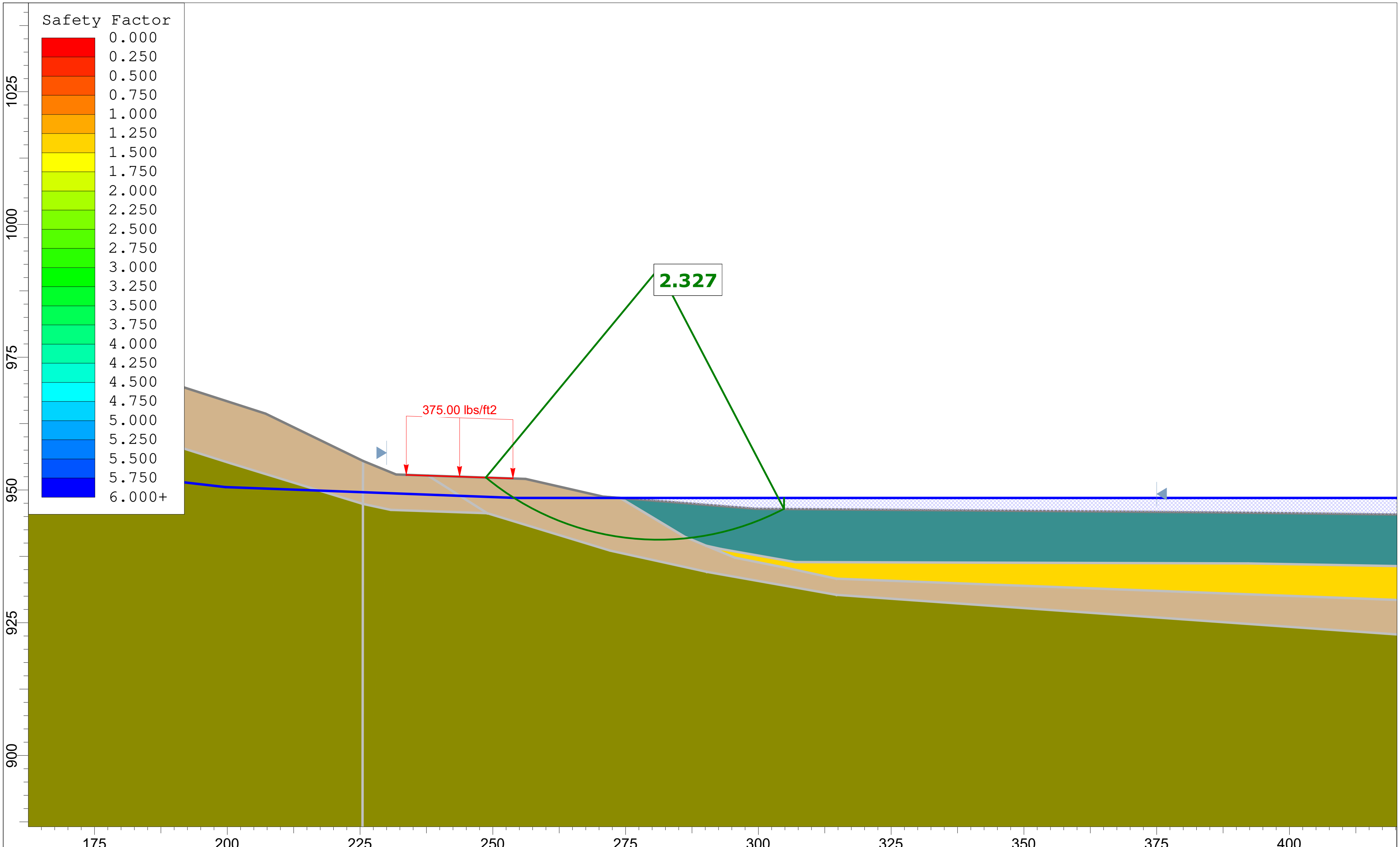


rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 4 West - 3H:1V	*Scenario* Master Scenario	
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 2:24:33 PM	*File Name* Section 4-4 West_065ratio-Cap.slmd	



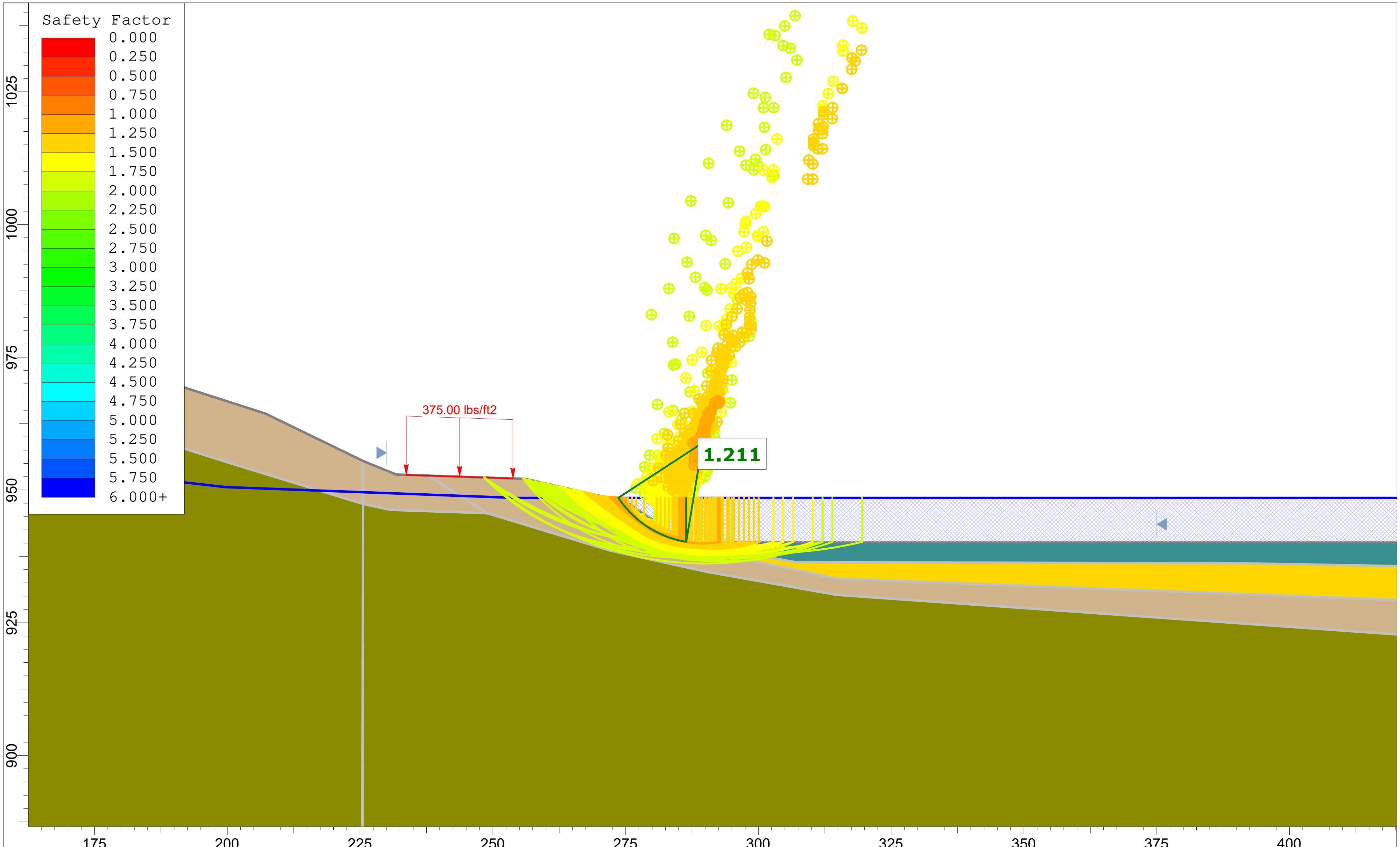
rocscience	Project	Slide2 - An Interactive Slope Stability Program	
	Group	4 West - 4H:1V	Scenario: Master Scenario
	Drawn By		Company:
SLIDEINTERPRET 9.034	Date	7/18/2024, 2:24:33 PM	File Name: Section 4-4 West_065ratio-Cap.slmd



rocscience

SLIDEINTERPRET 9.034

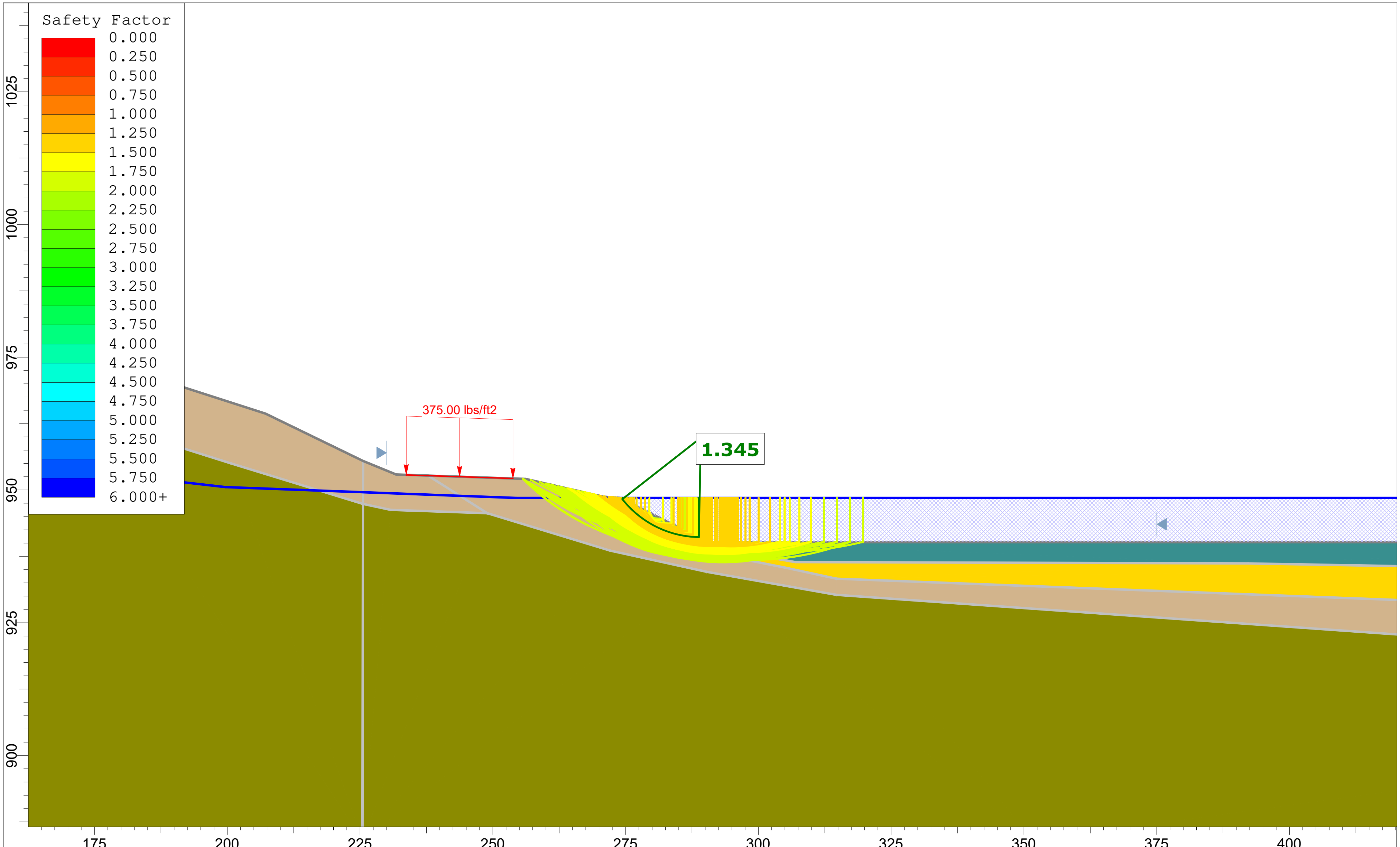
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - Existing	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 2:24:33 PM	File Name	Section 4-4 West_065ratio.slmd



rocscience

SLIDEINTERPRET 9.034

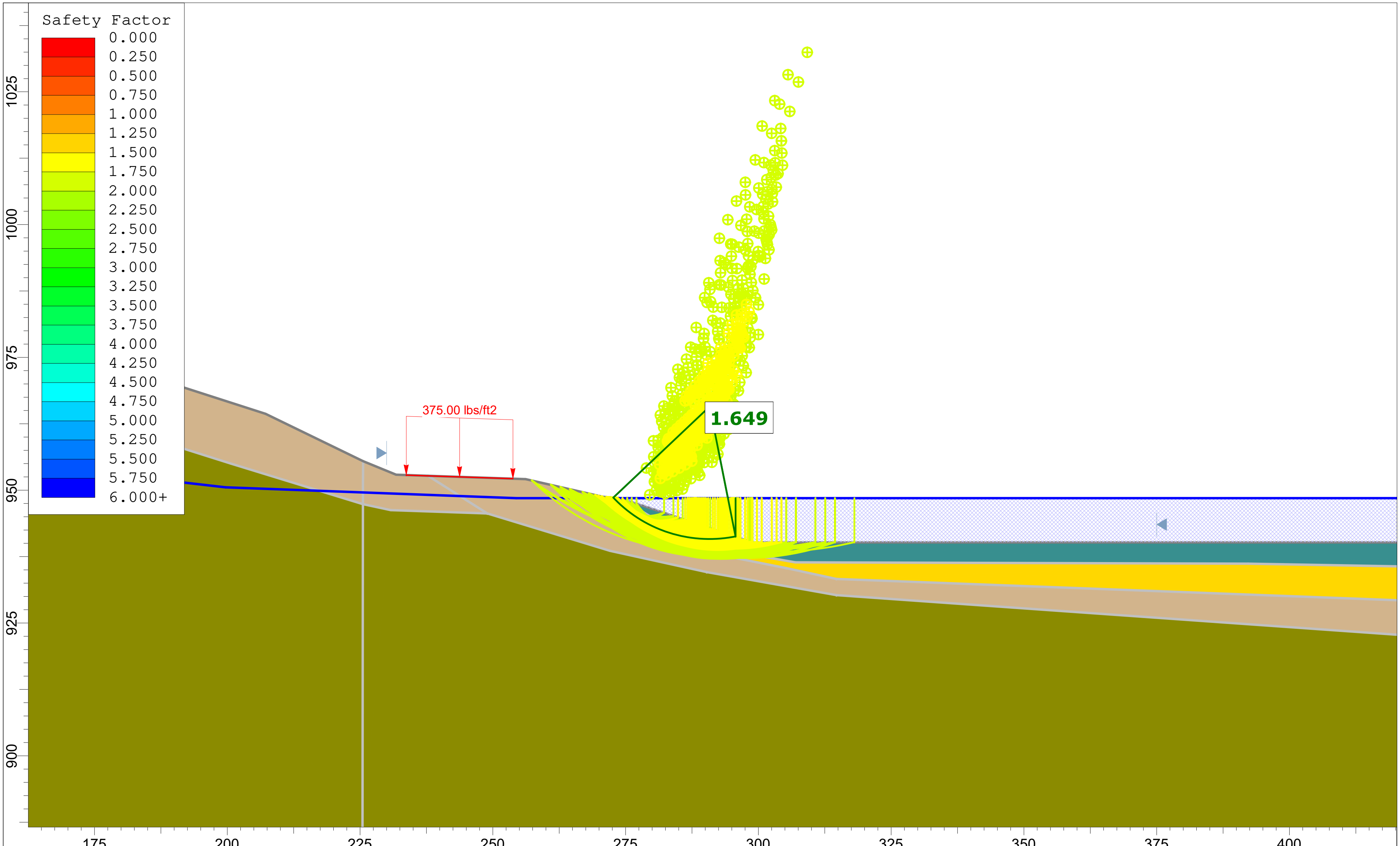
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 1.5H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_065ratio.slmd



rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 2H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_065ratio.slmd

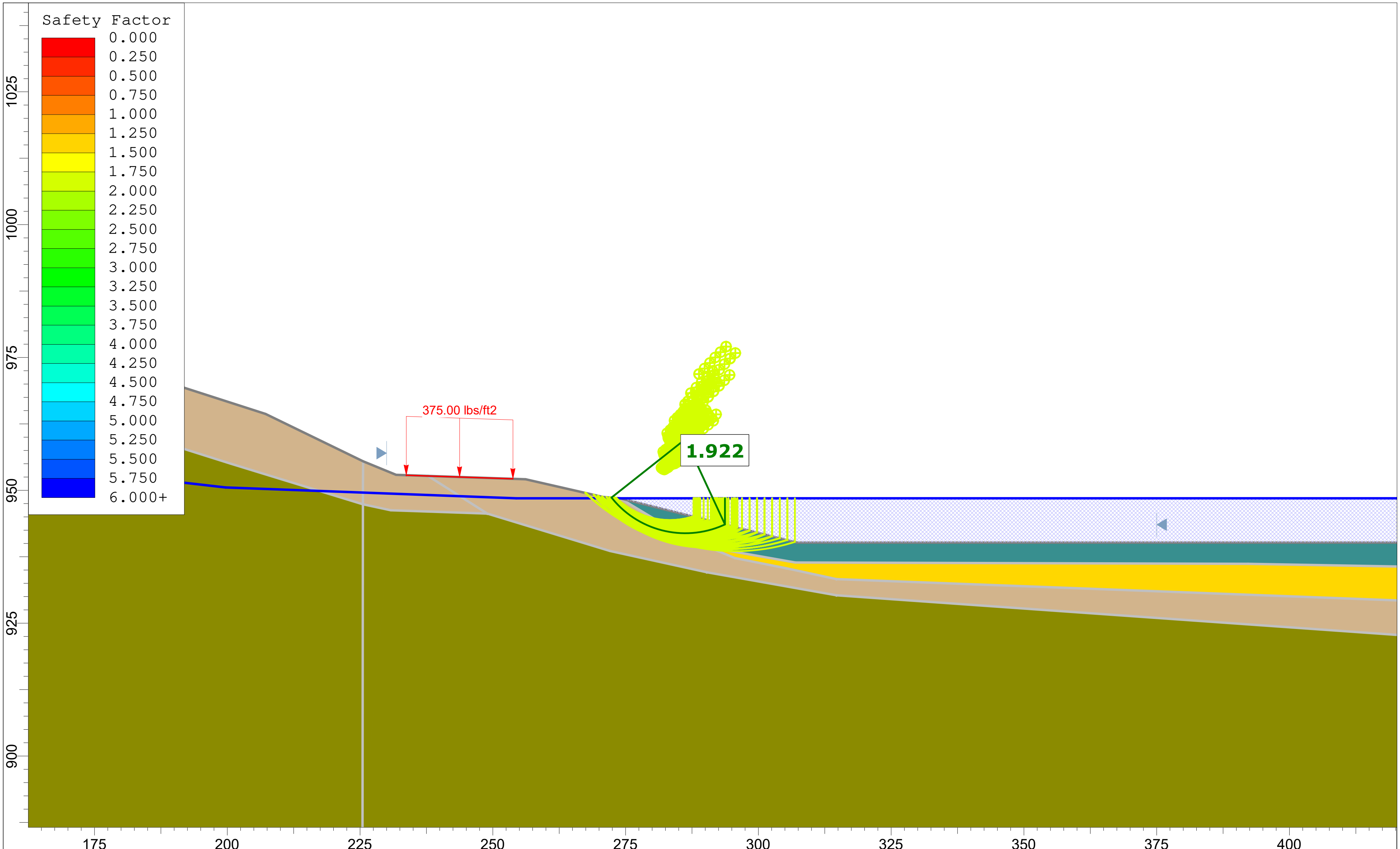


rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program

Group	4 West - 3H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_065ratio.slmd



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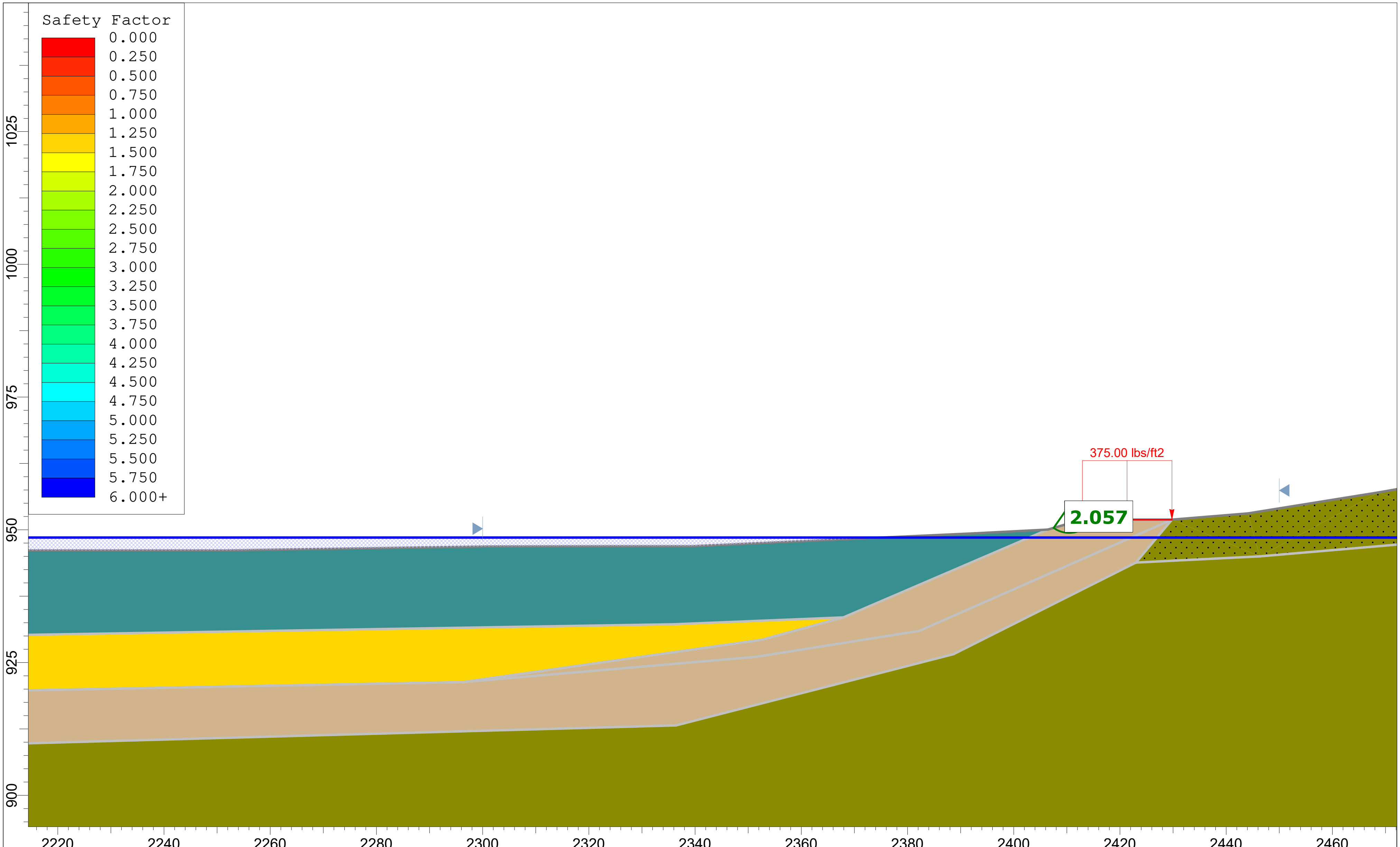
SLIDEINTERPRET 9.034

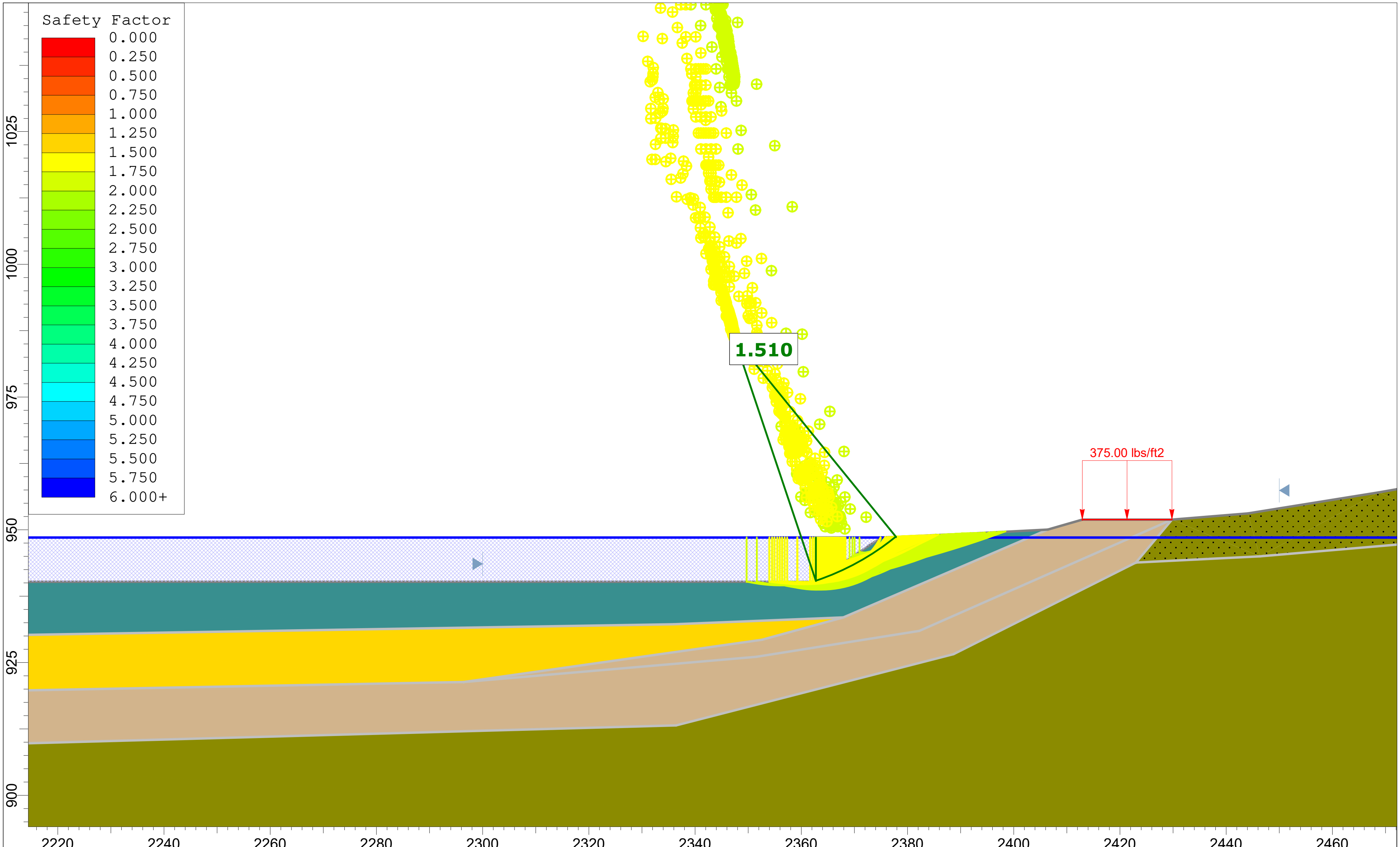
Project	Slide2 - An Interactive Slope Stability Program		
Group	4 West - 4H:1V	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:24:33 PM	*File Name*	Section 4-4 West_065ratio.slmd



rocscience

SLIDEINTERPRET 9.034

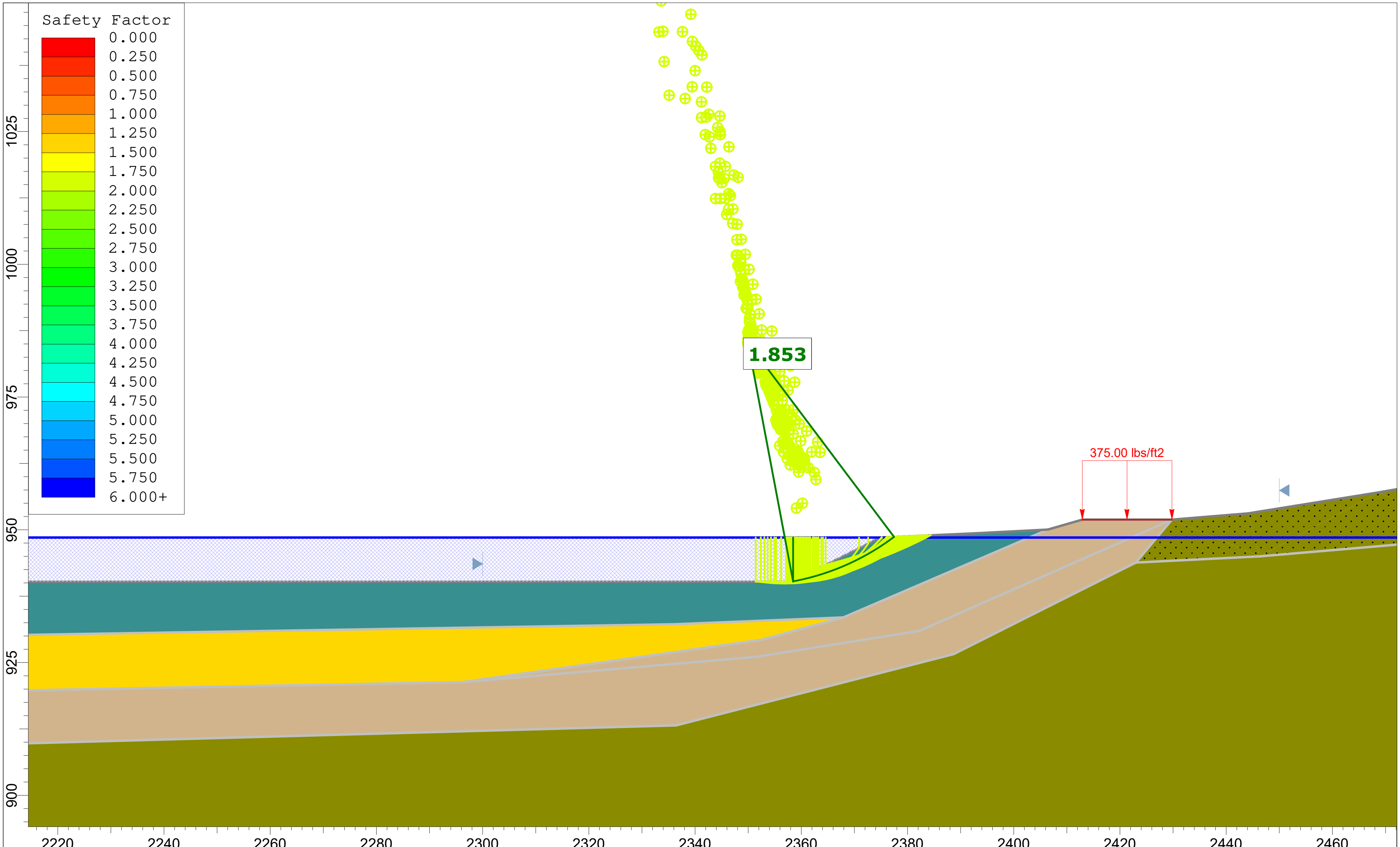
Project	Slide2 - An Interactive Slope Stability Program		
Group	5 South - Existing	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:41:59 PM	*File Name*	Section 5-5 South_10psf.slmd



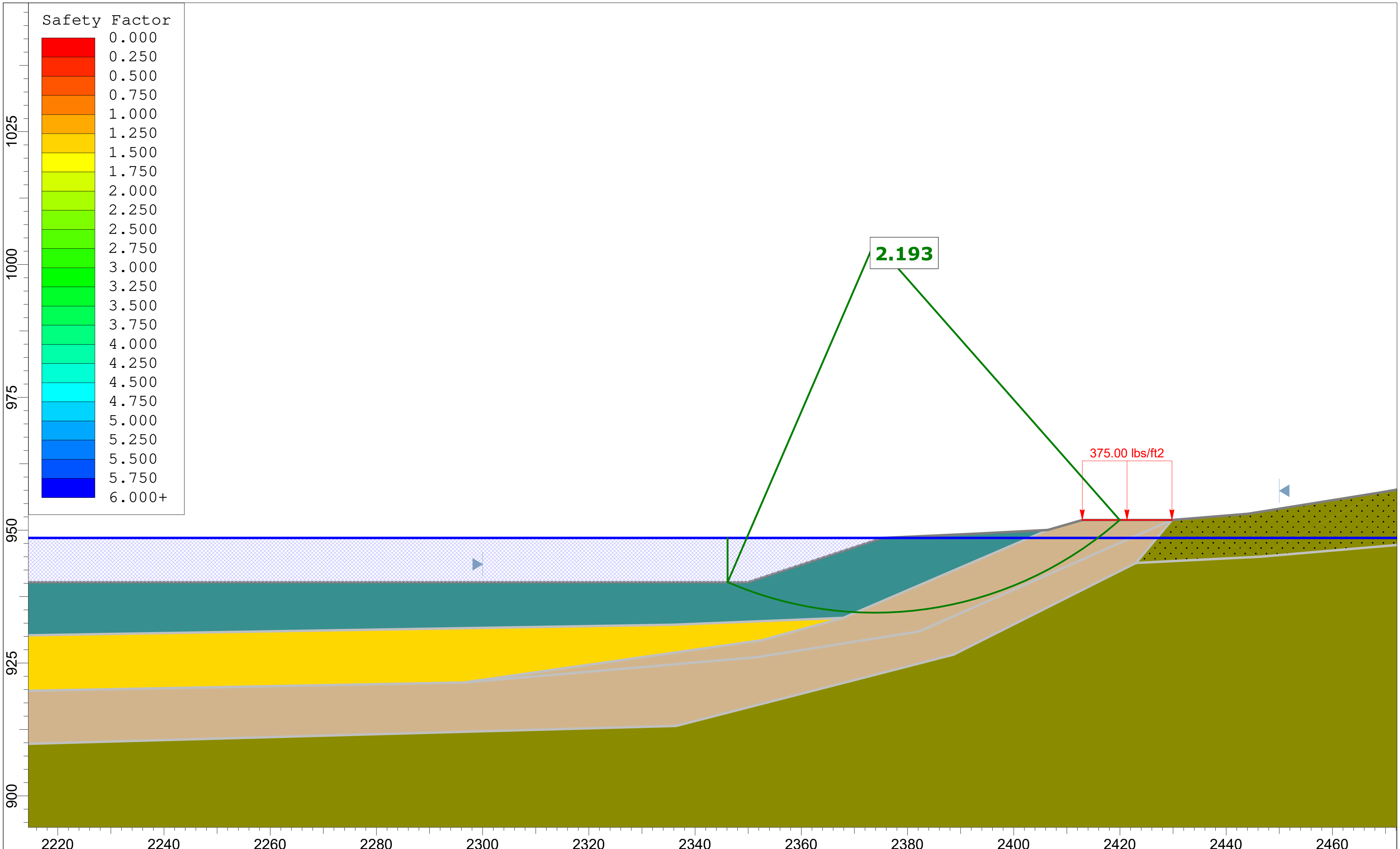
rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program
Group 5 South - 1.5:1	*Scenario* Master Scenario
Drawn By	*Company*
Date 7/18/2024, 2:41:59 PM	*File Name* Section 5-5 South_10psf.slmd

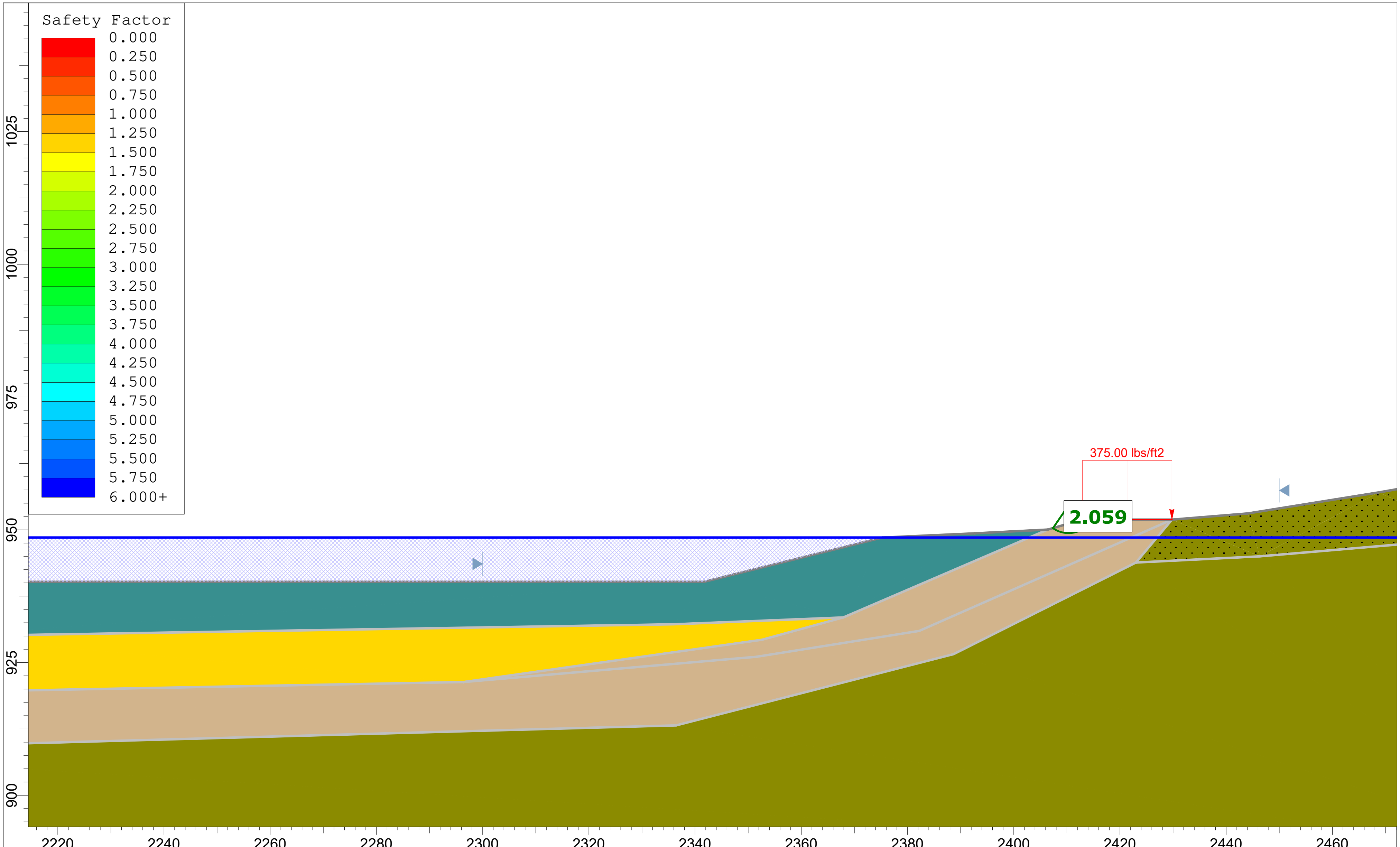


rocscience	*Project* Slide2 - An Interactive Slope Stability Program		
	Group 5 South - 2:1	*Scenario* Master Scenario	
	Drawn By	*Company*	
SLIDEINTERPRET 9.034	*Date* 7/18/2024, 2:41:59 PM	*File Name* Section 5-5 South_10psf.slmd	



Project	Slide2 - An Interactive Slope Stability Program		
Group	5 South - 3:1	Scenario	Master Scenario
Drawn By		Company	
Date	7/18/2024, 2:41:59 PM	File Name	Section 5-5 South_10psf.slmd

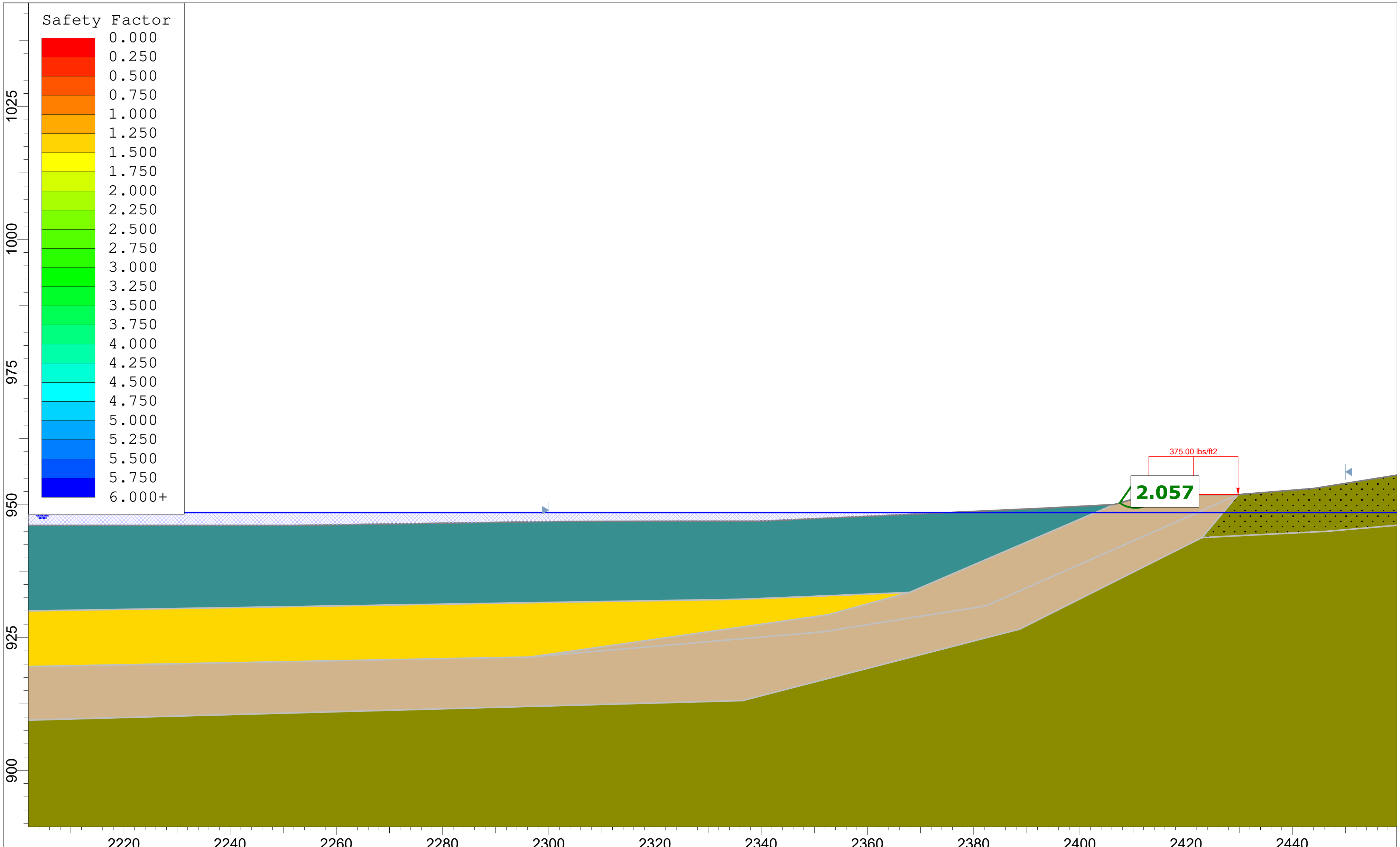
SLIDEINTERPRET 9.034



rocscience

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	5 South - 4:1	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	7/18/2024, 2:41:59 PM	*File Name*	Section 5-5 South_10psf.slmd



rocscience	Project	Slide2 - An Interactive Slope Stability Program	
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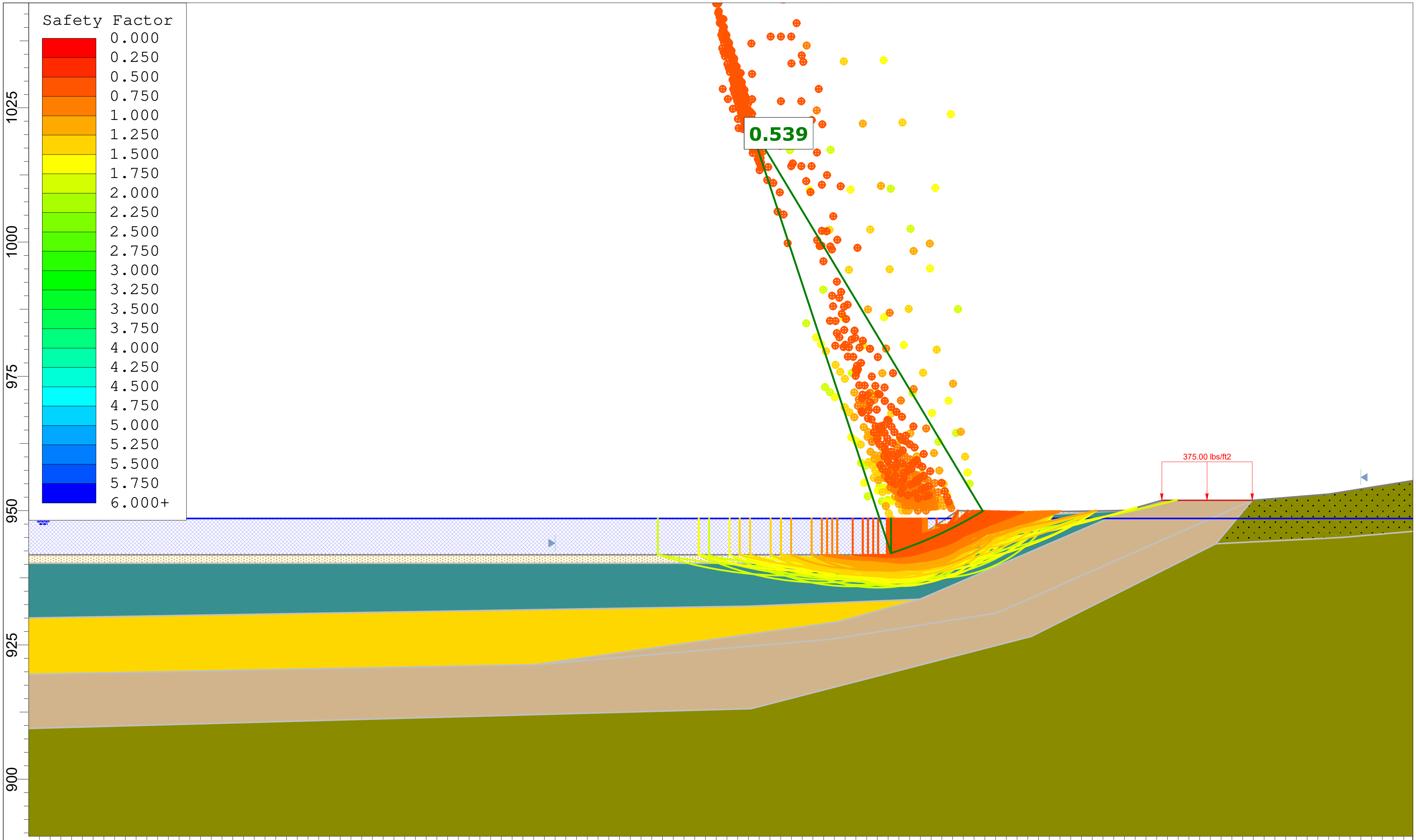

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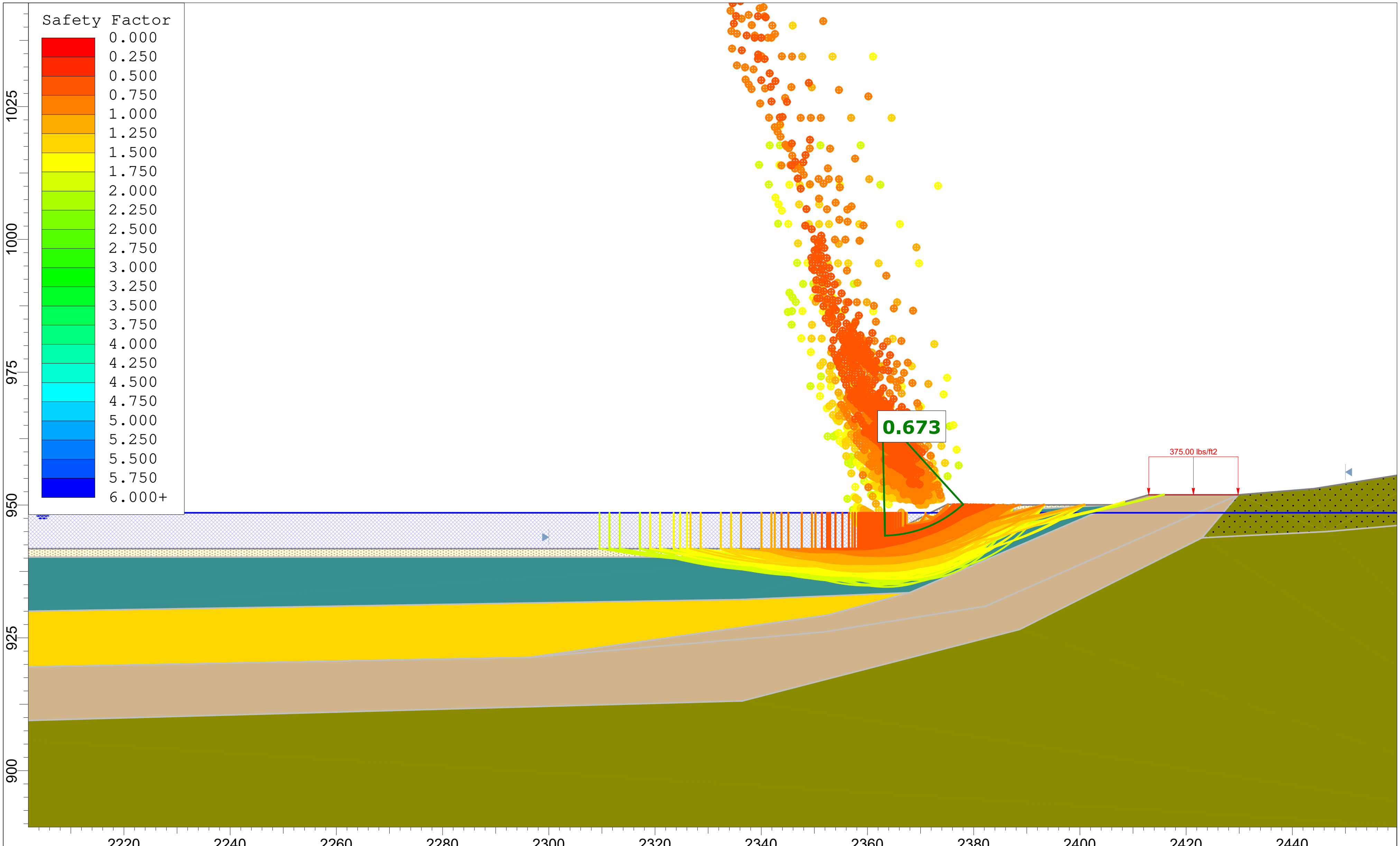

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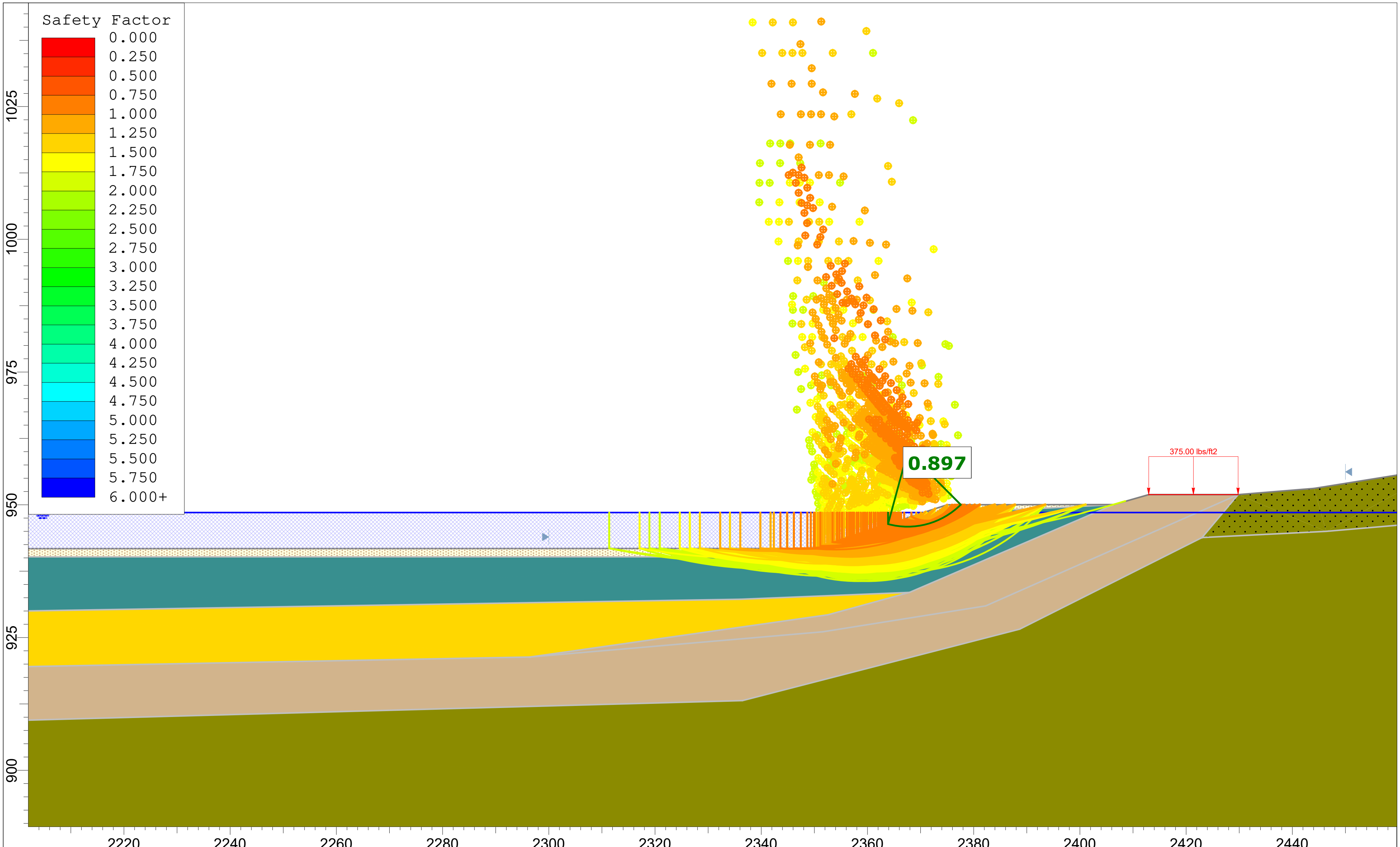

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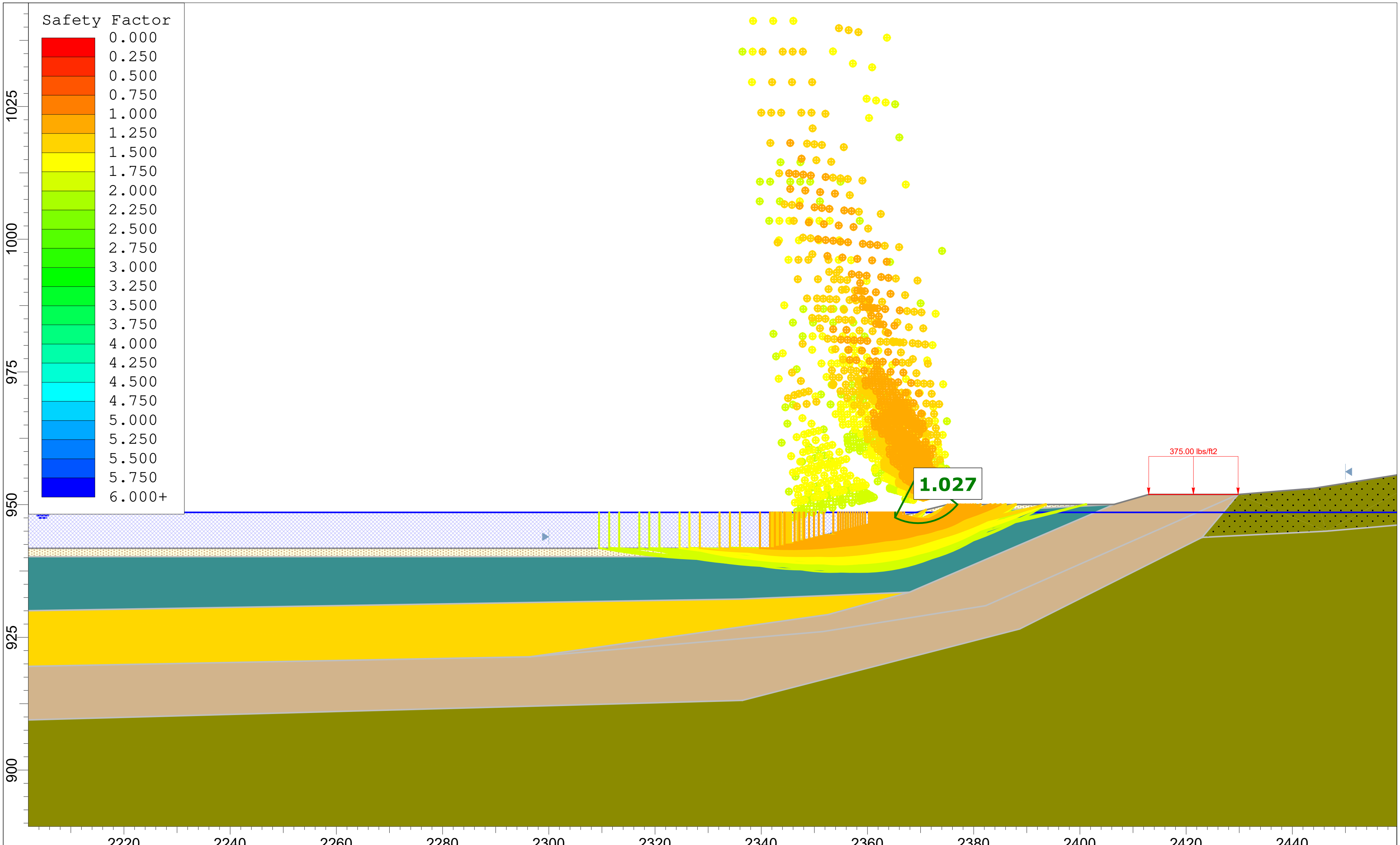

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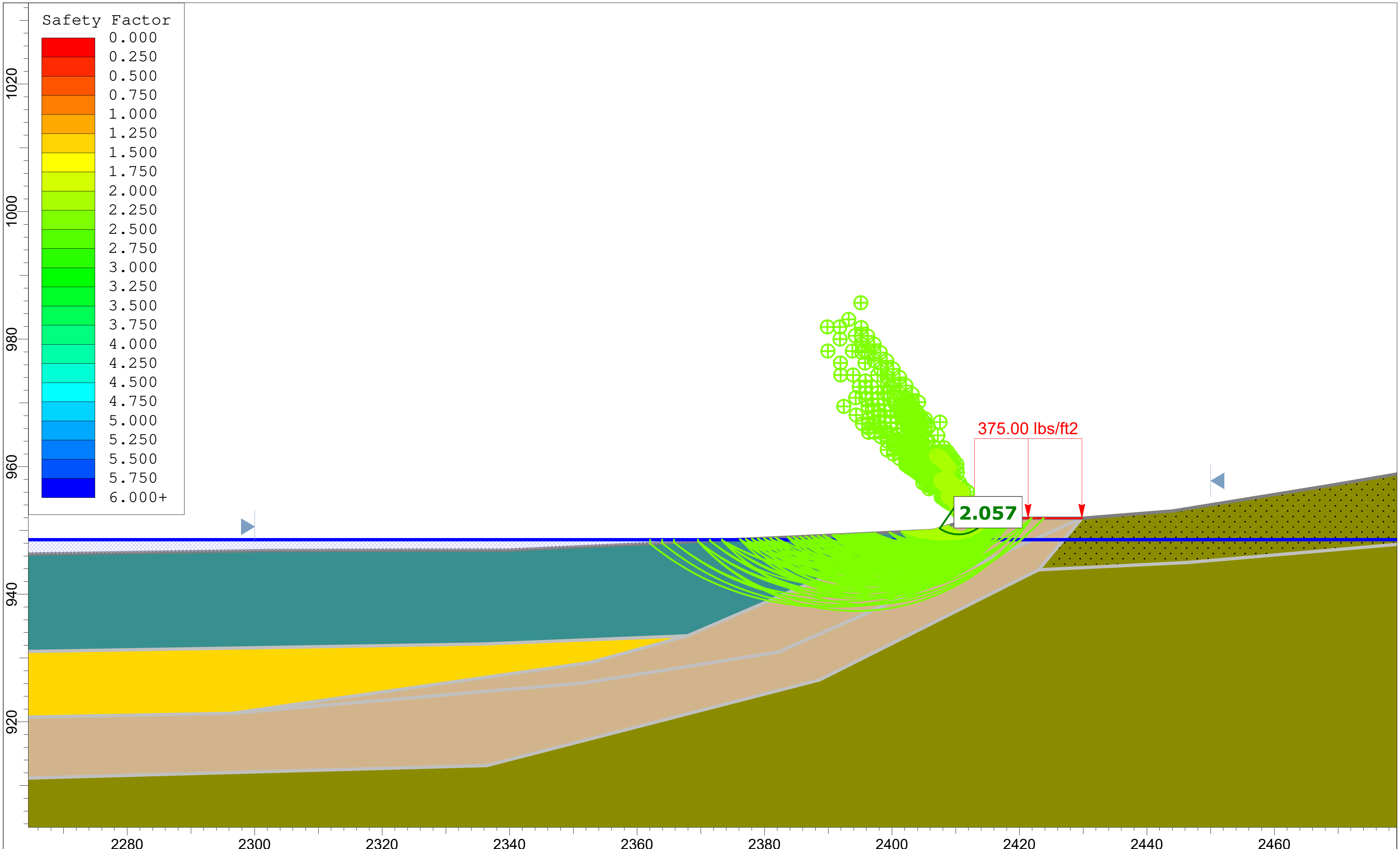

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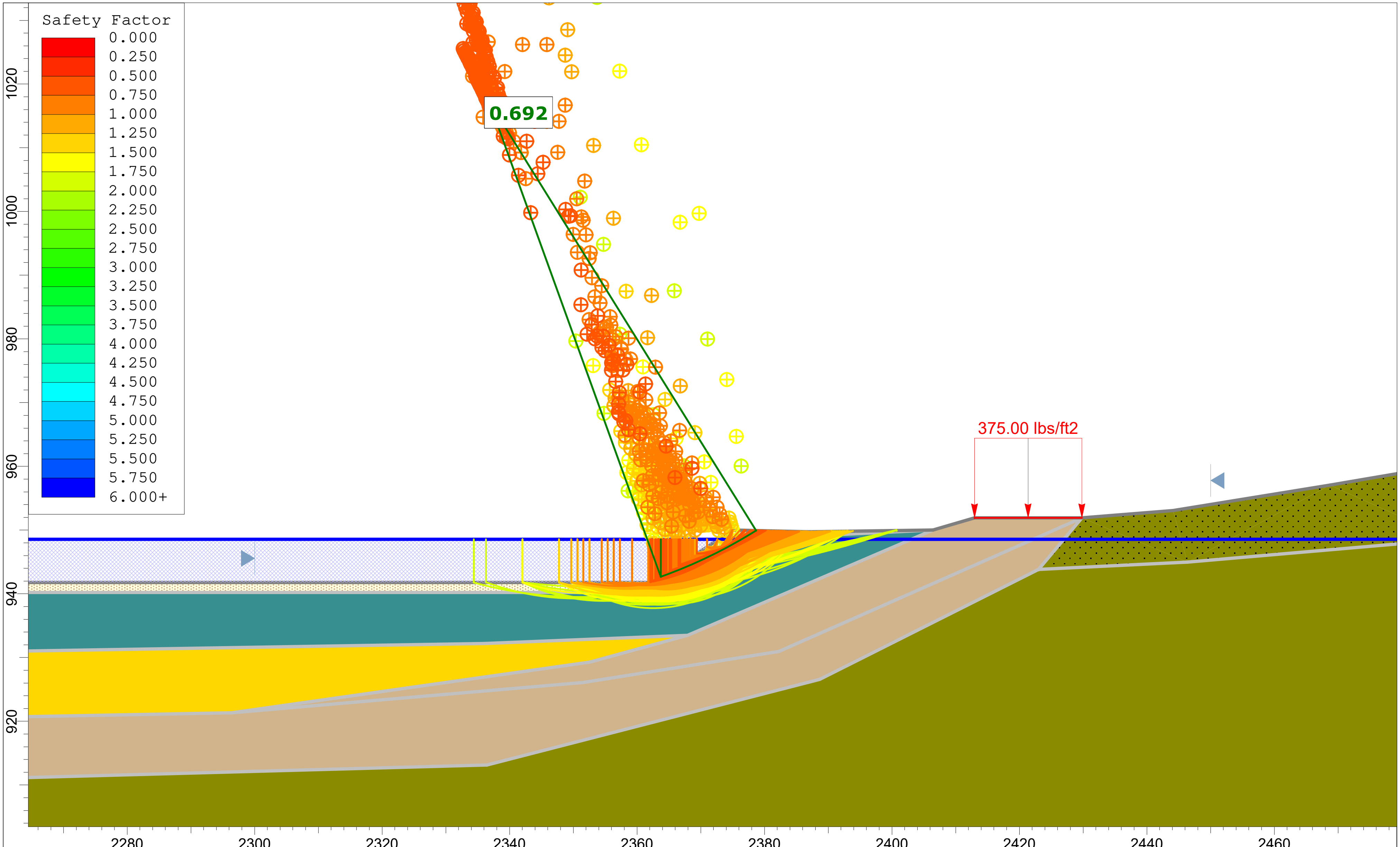

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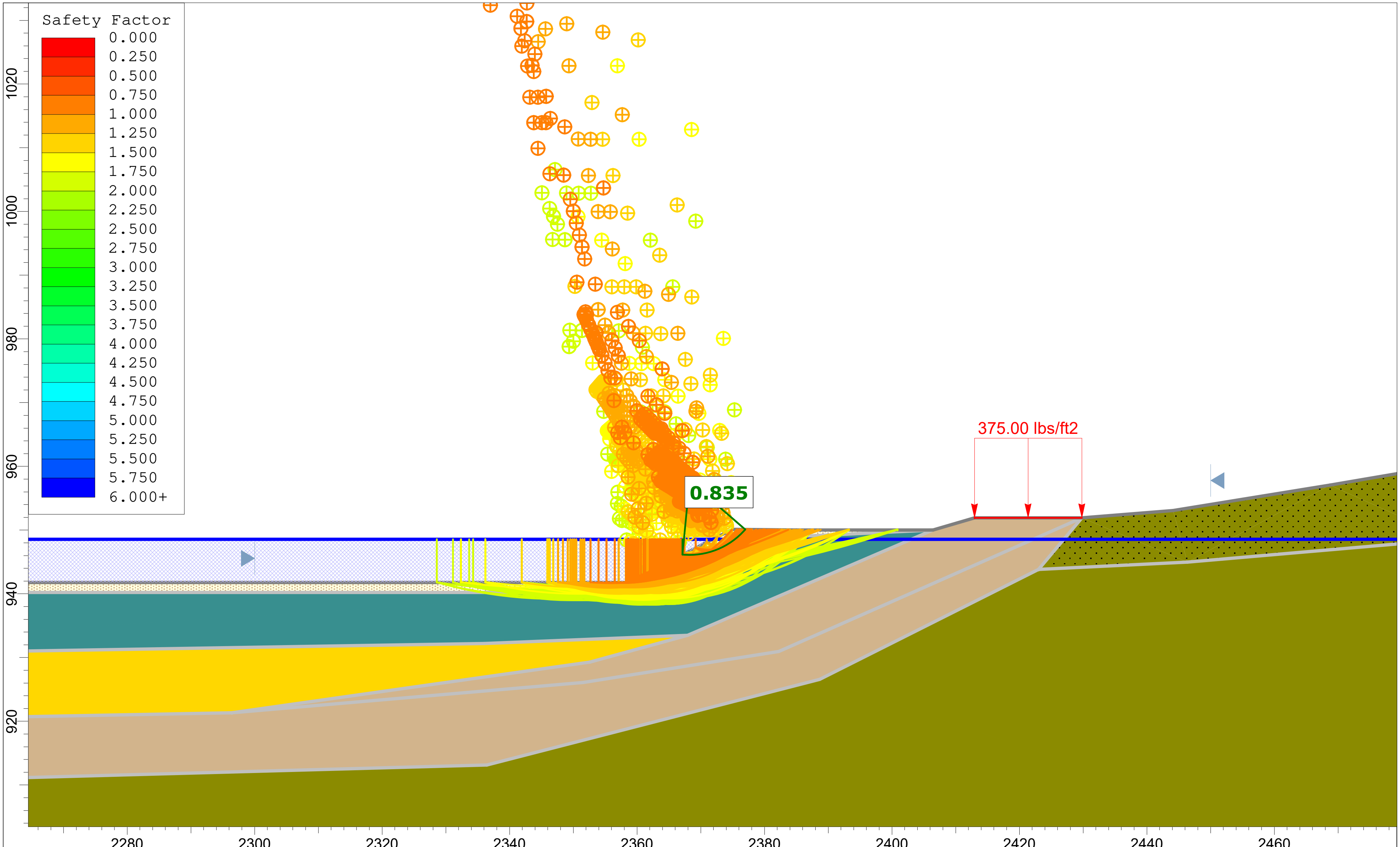

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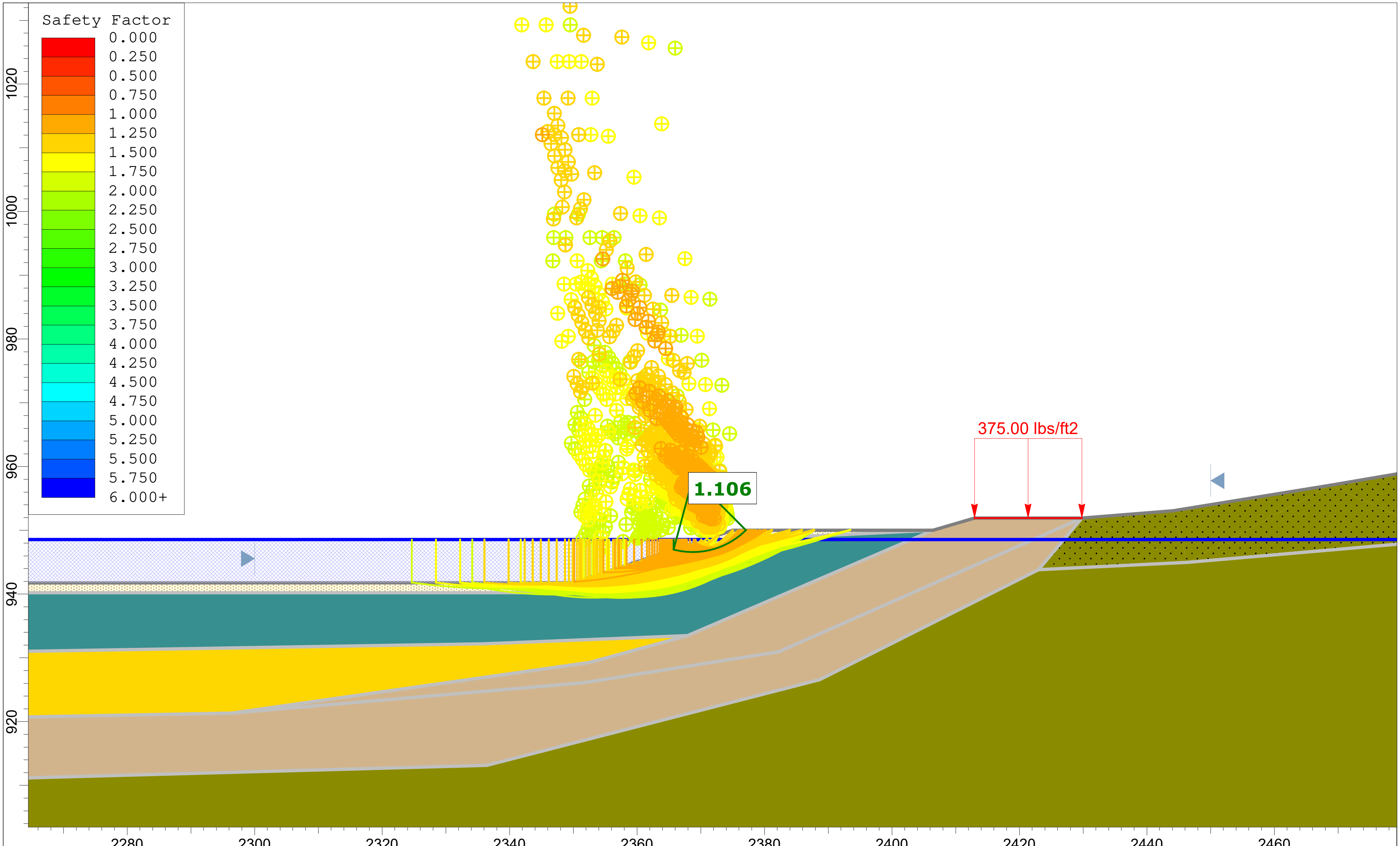

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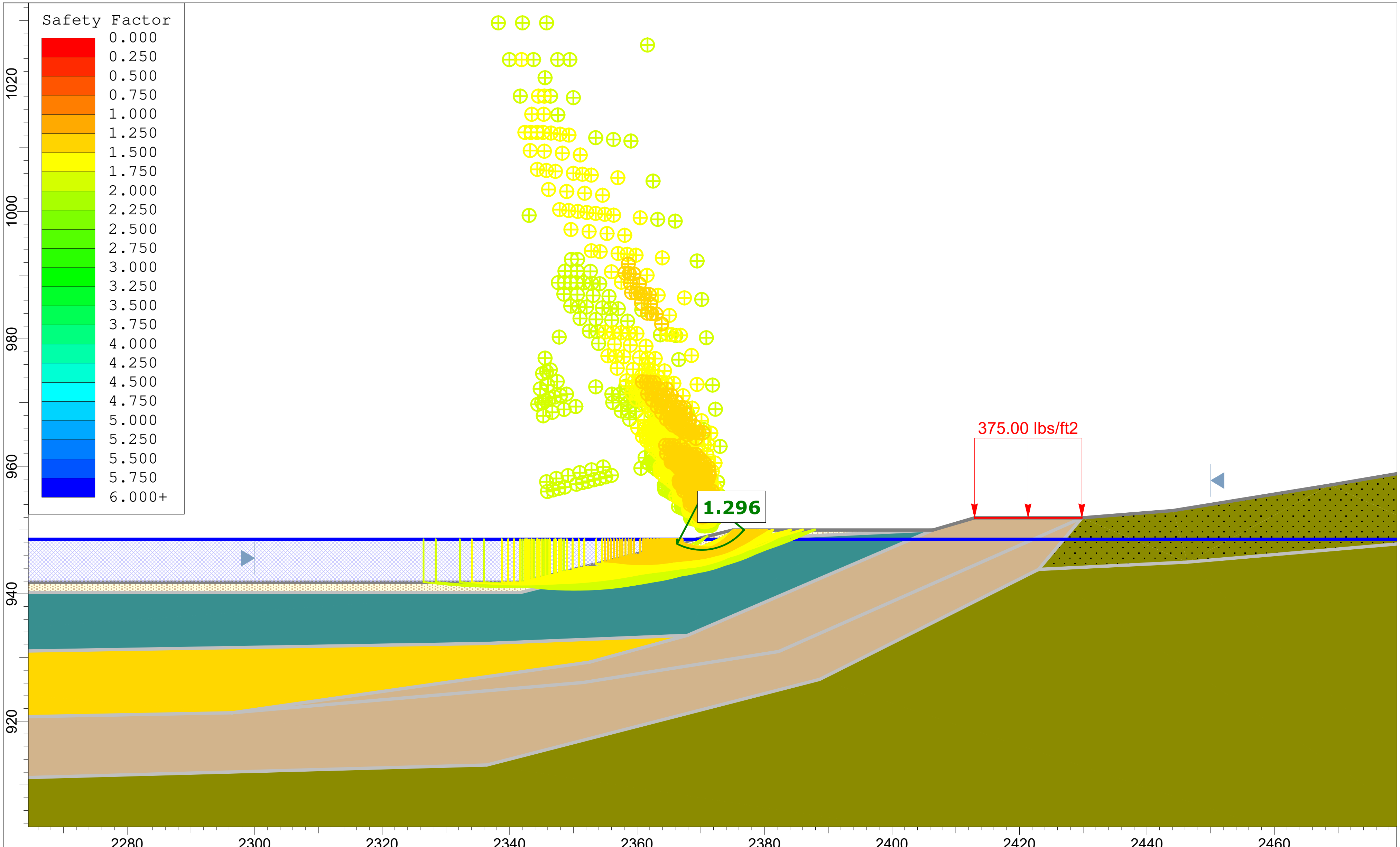

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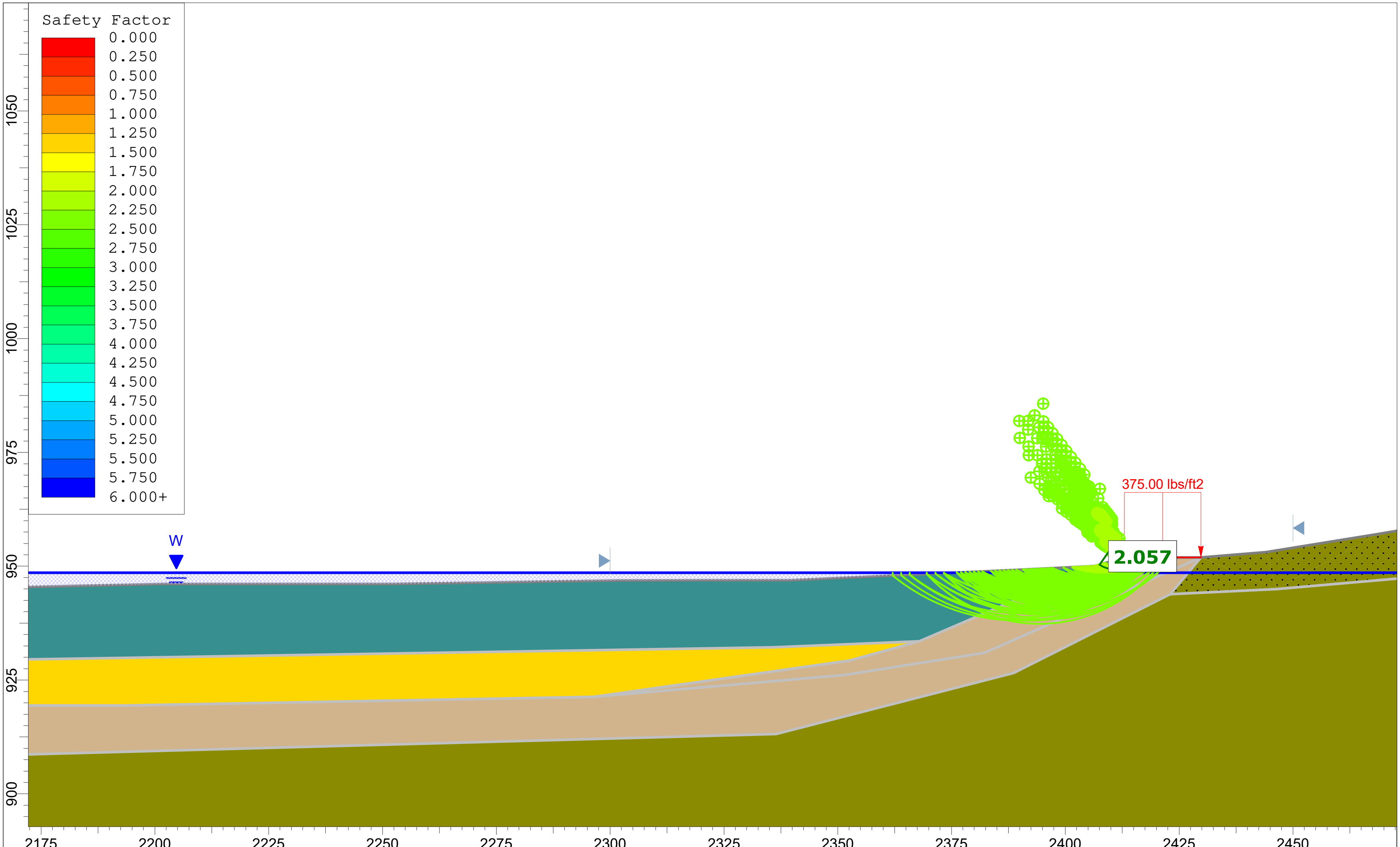

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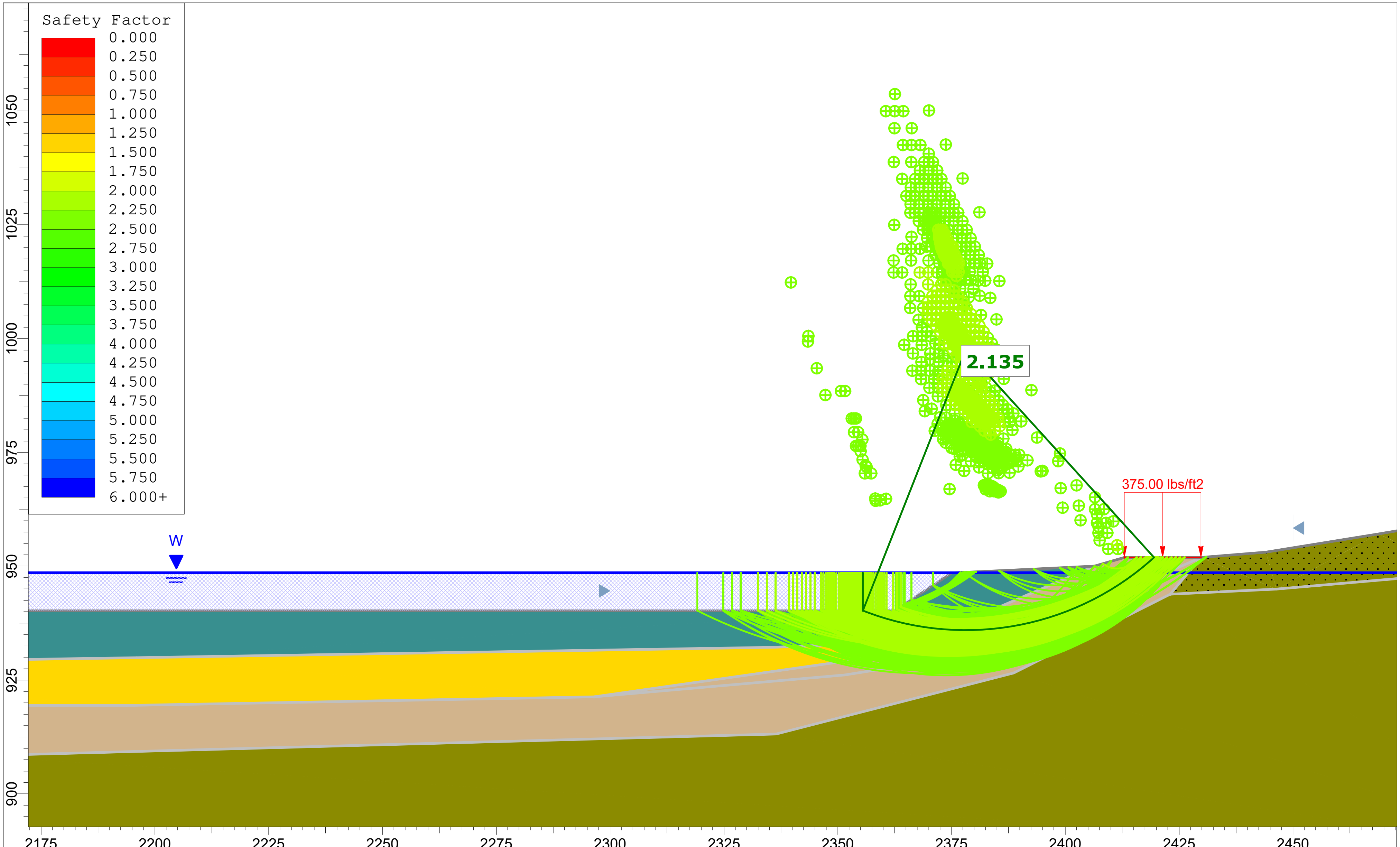

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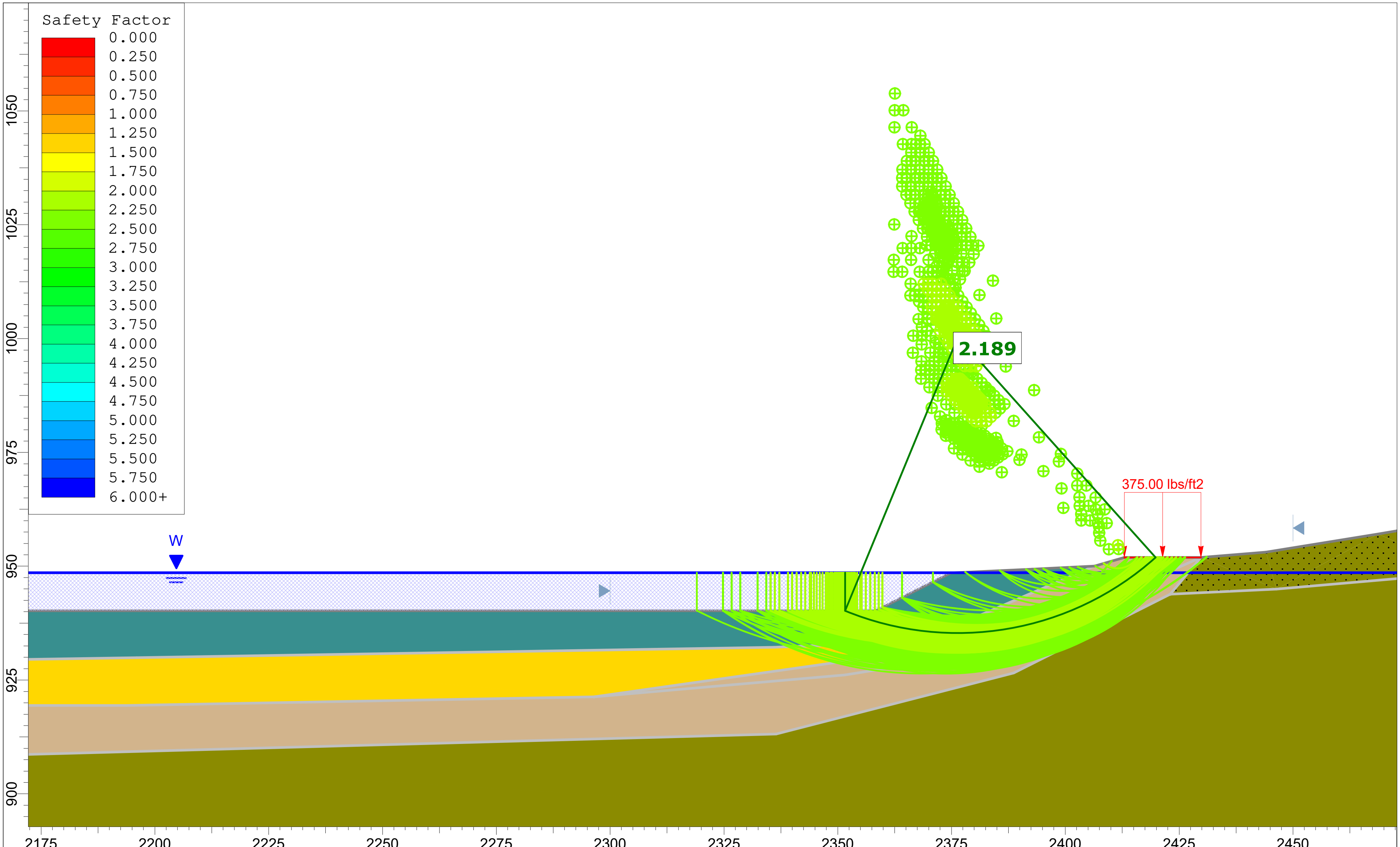

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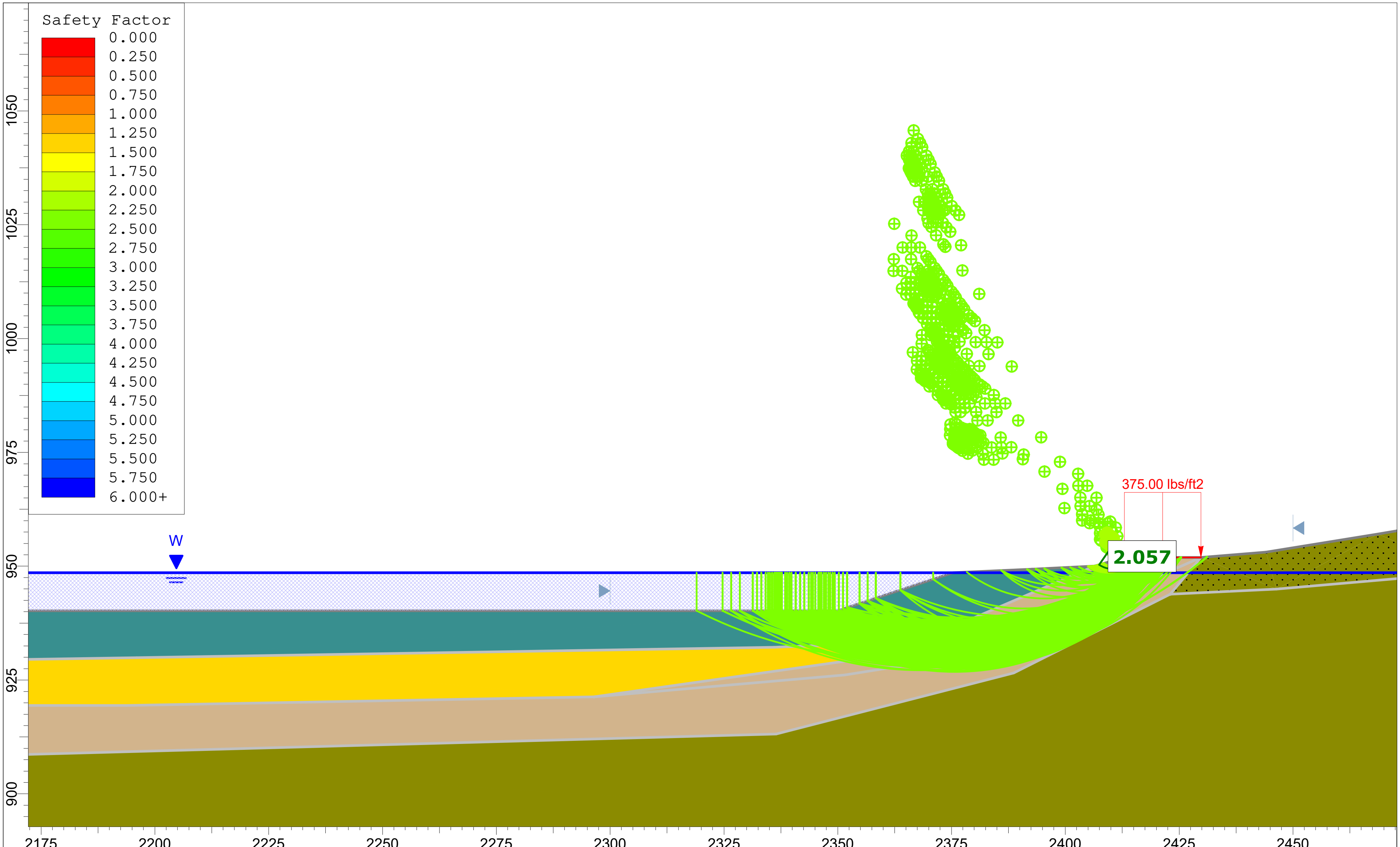

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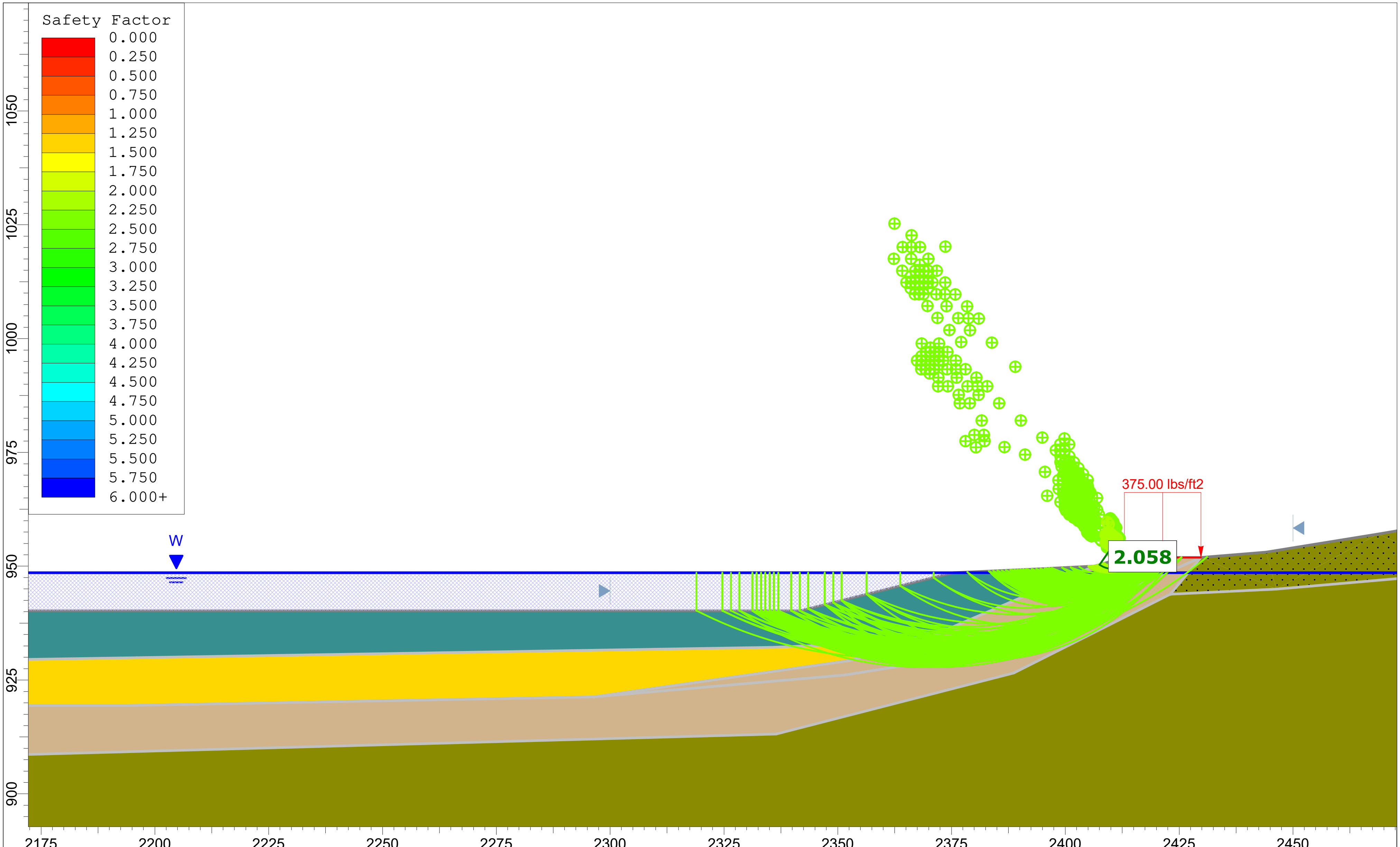

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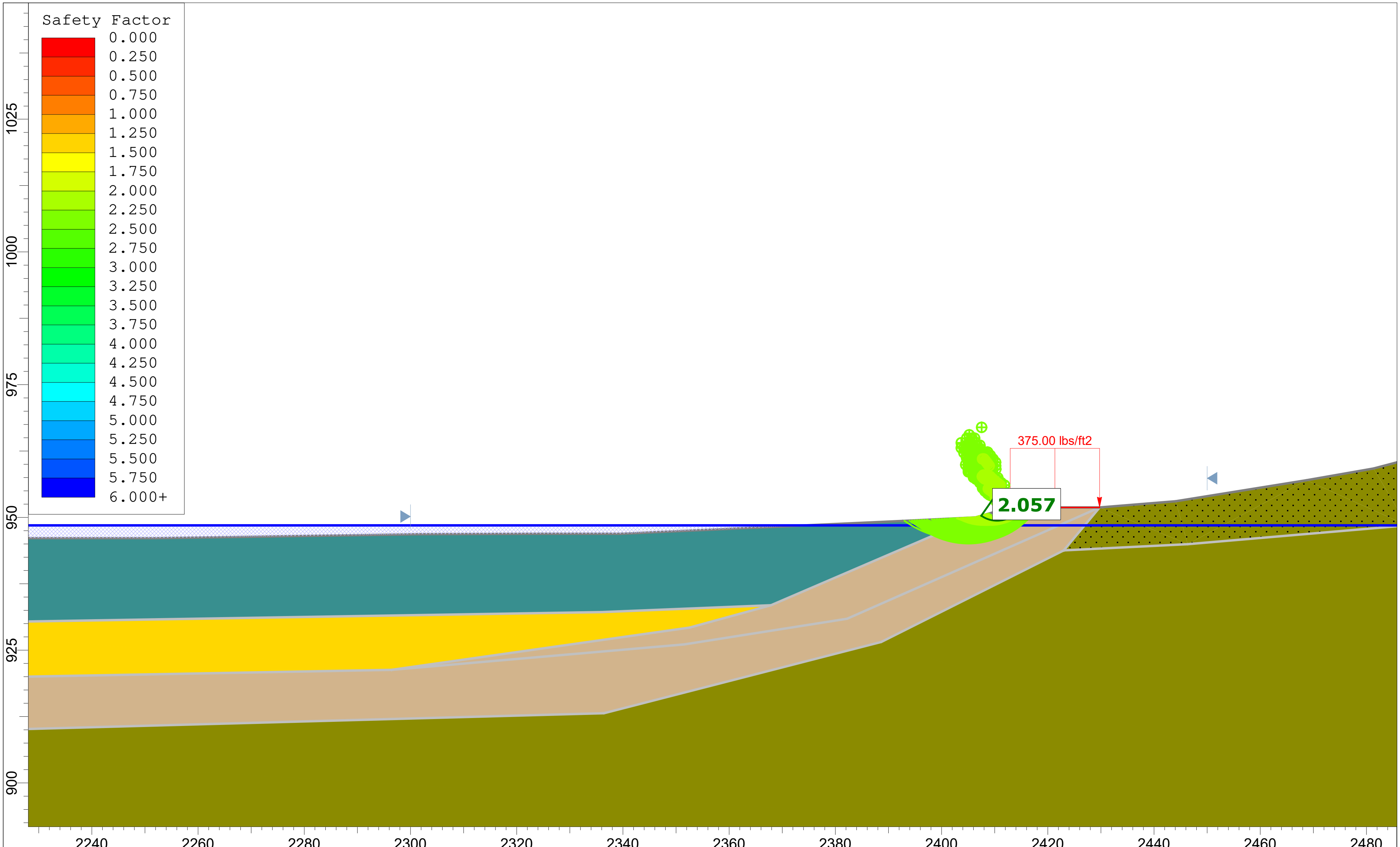

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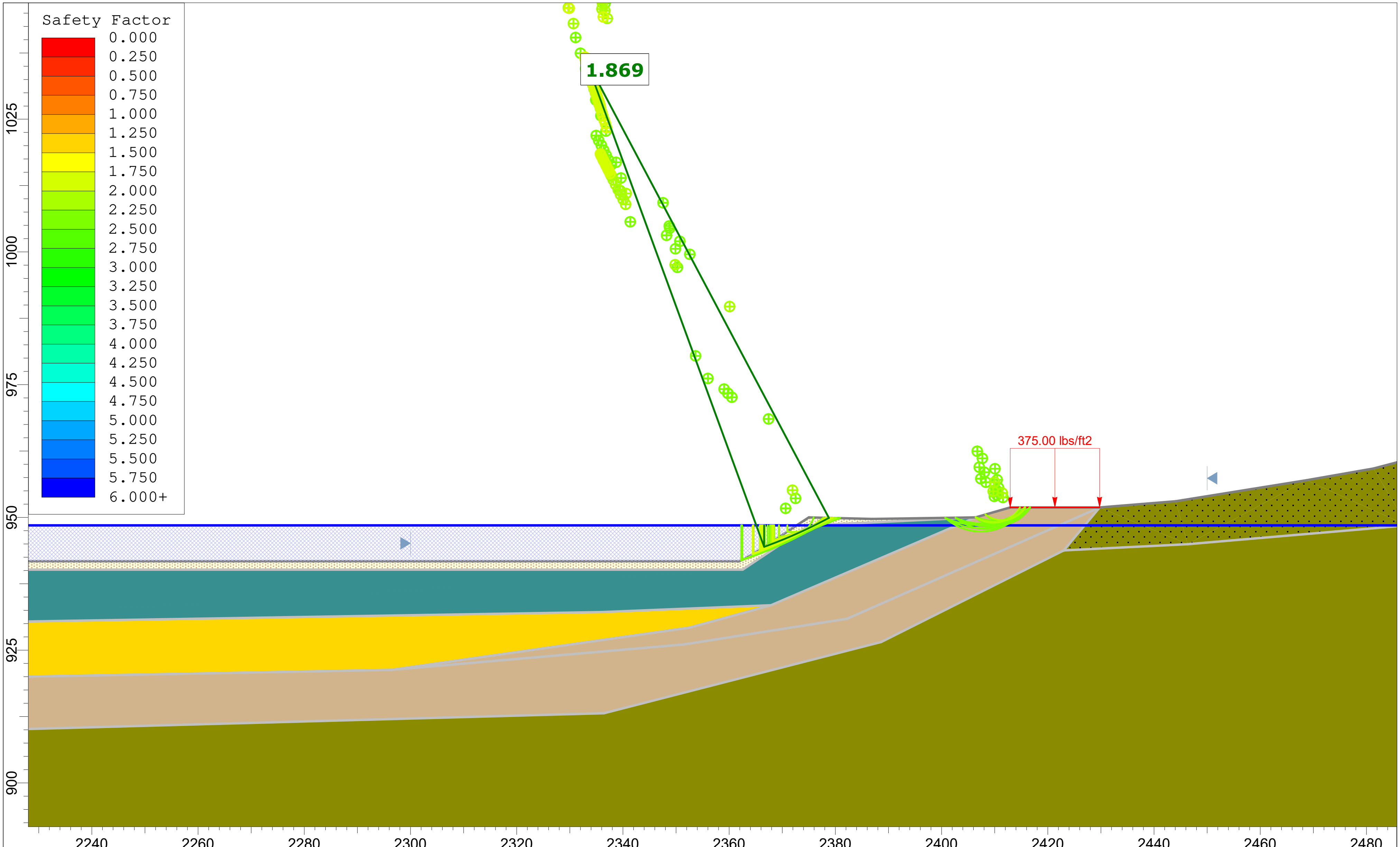

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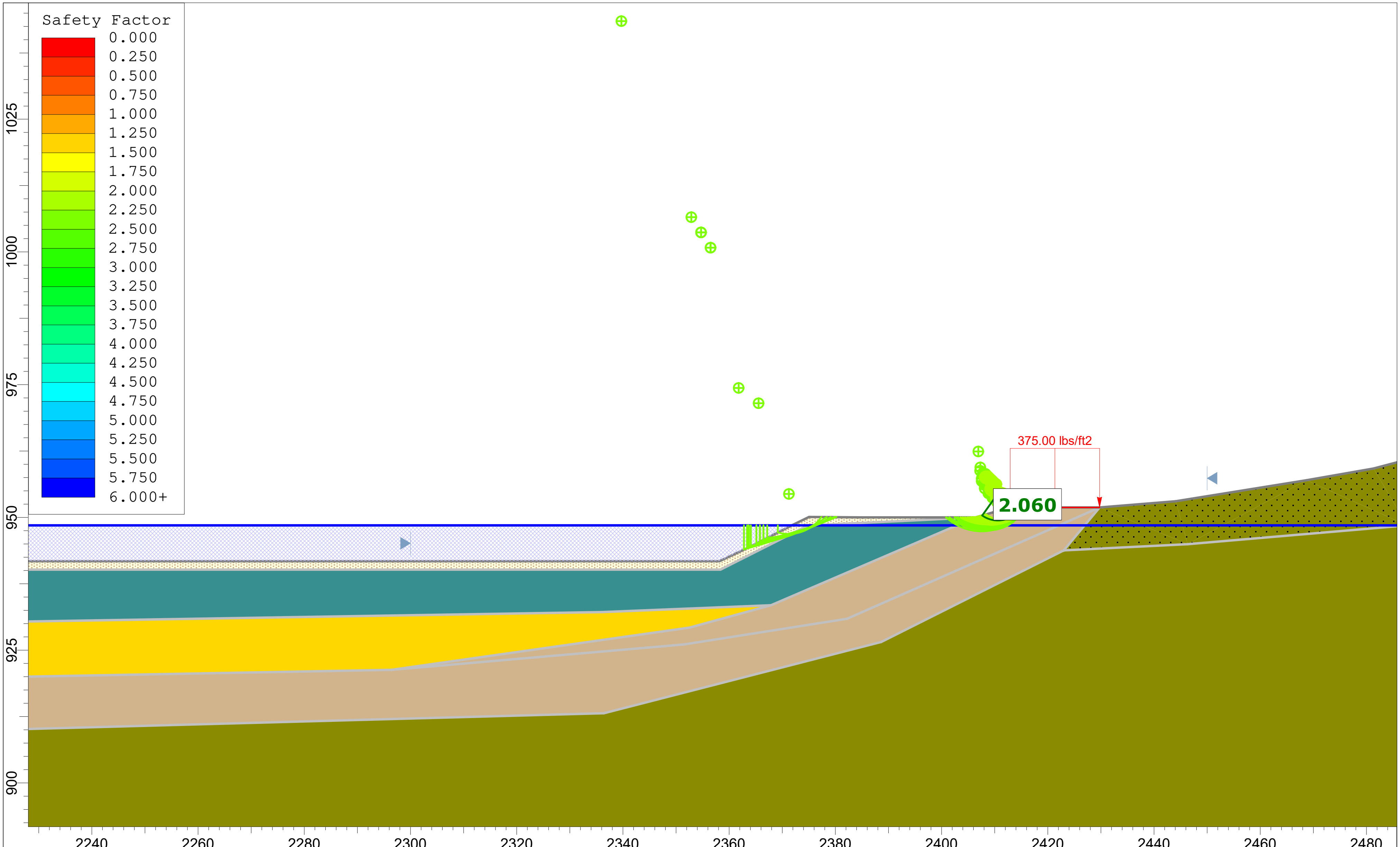

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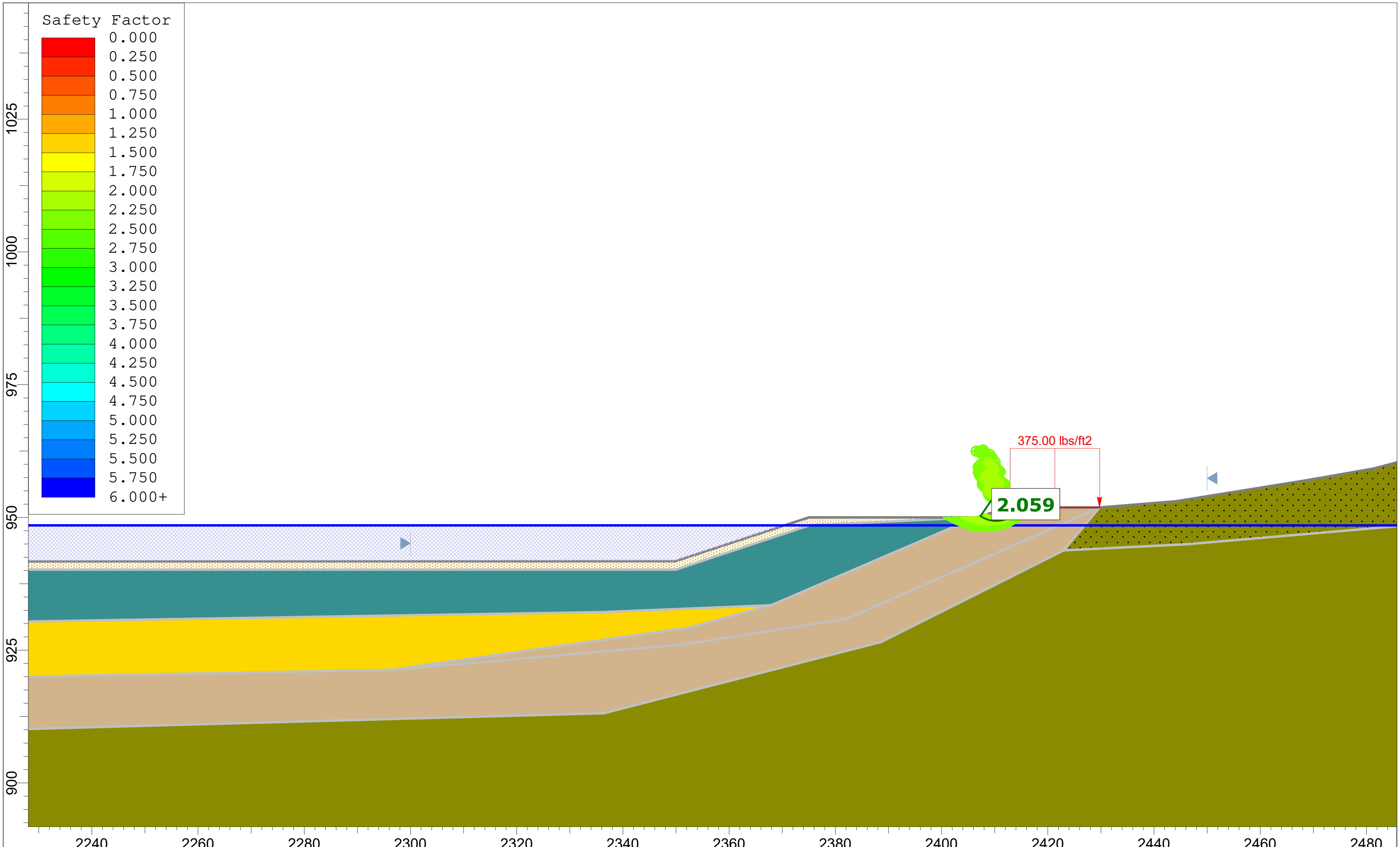

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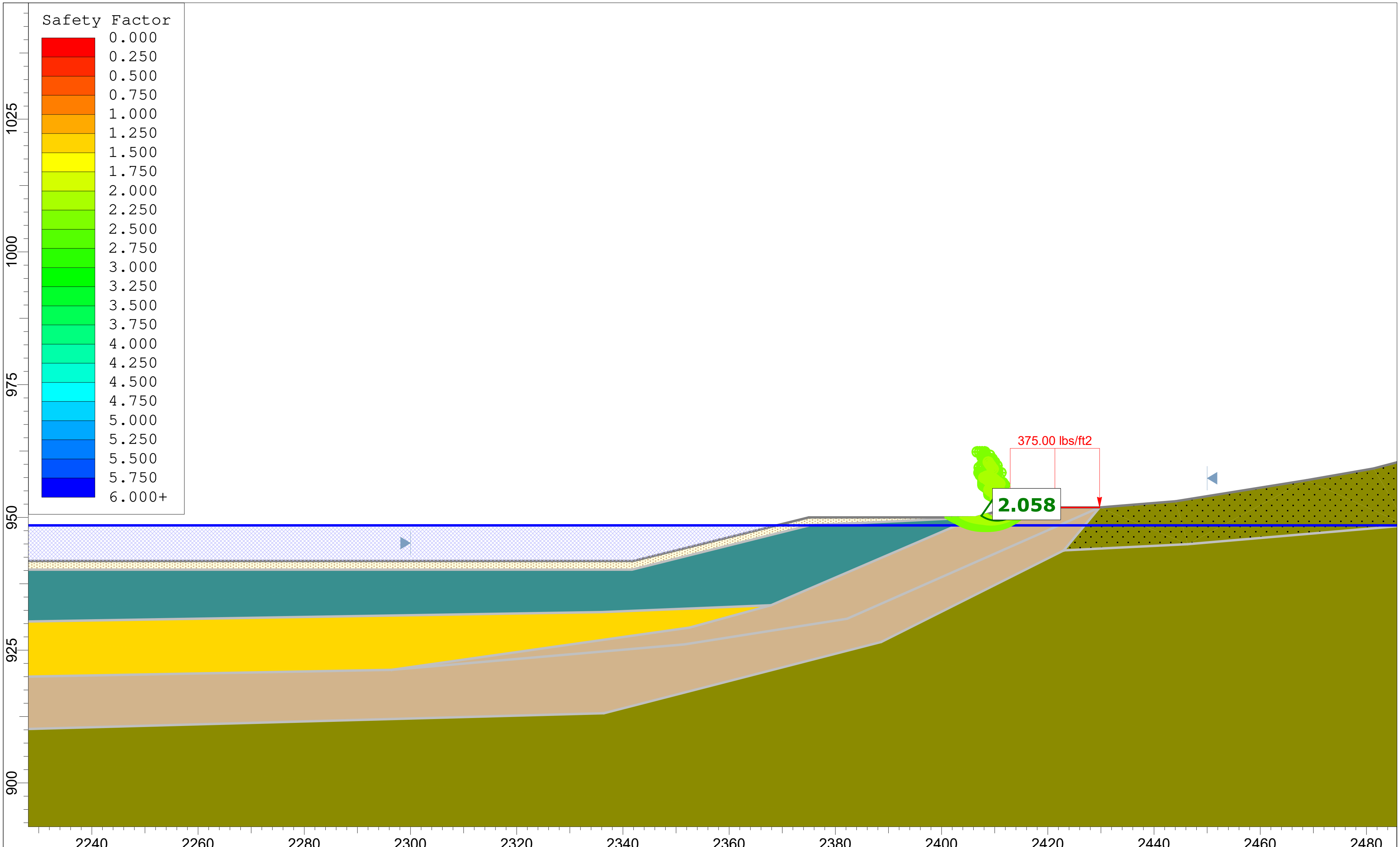

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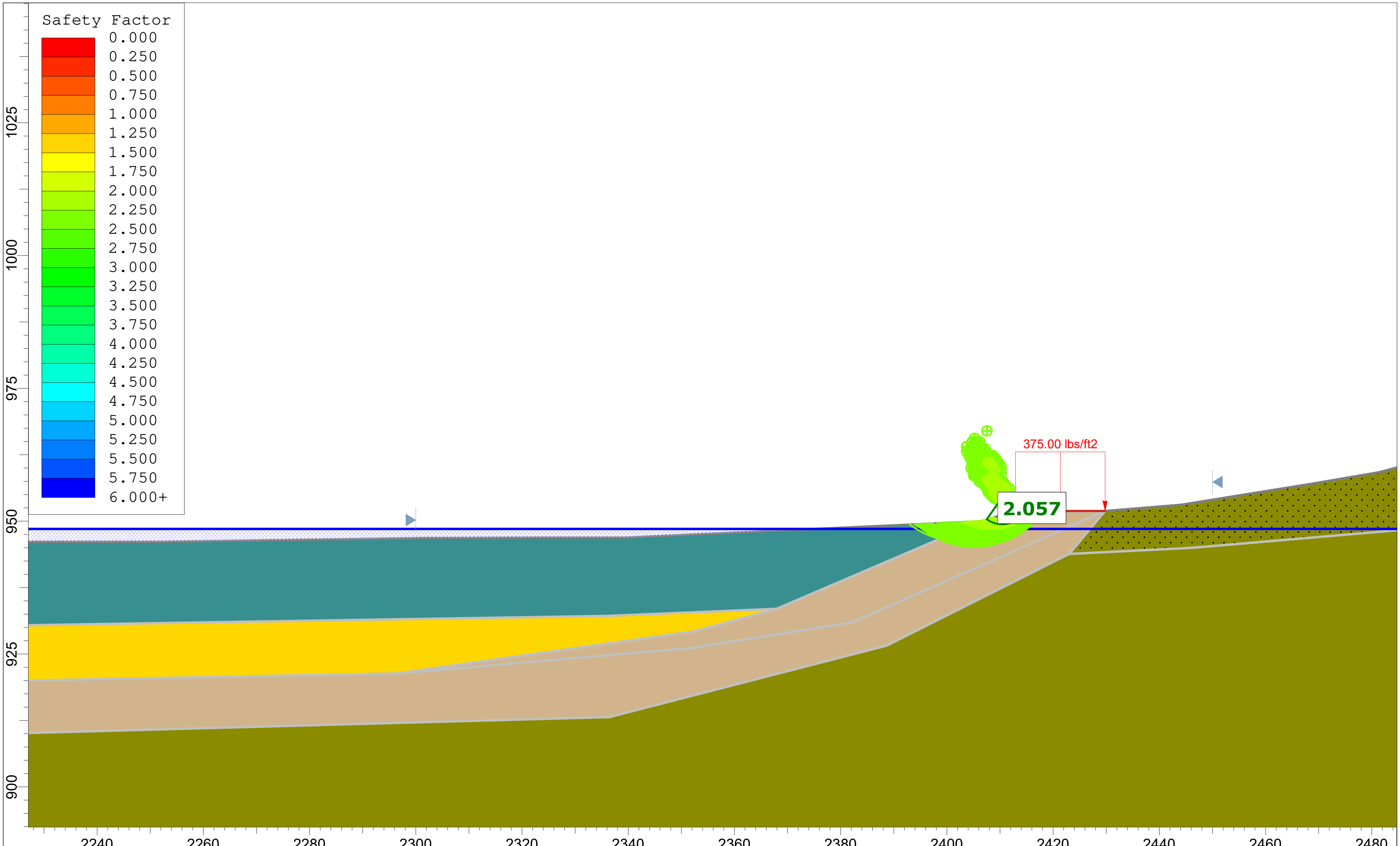

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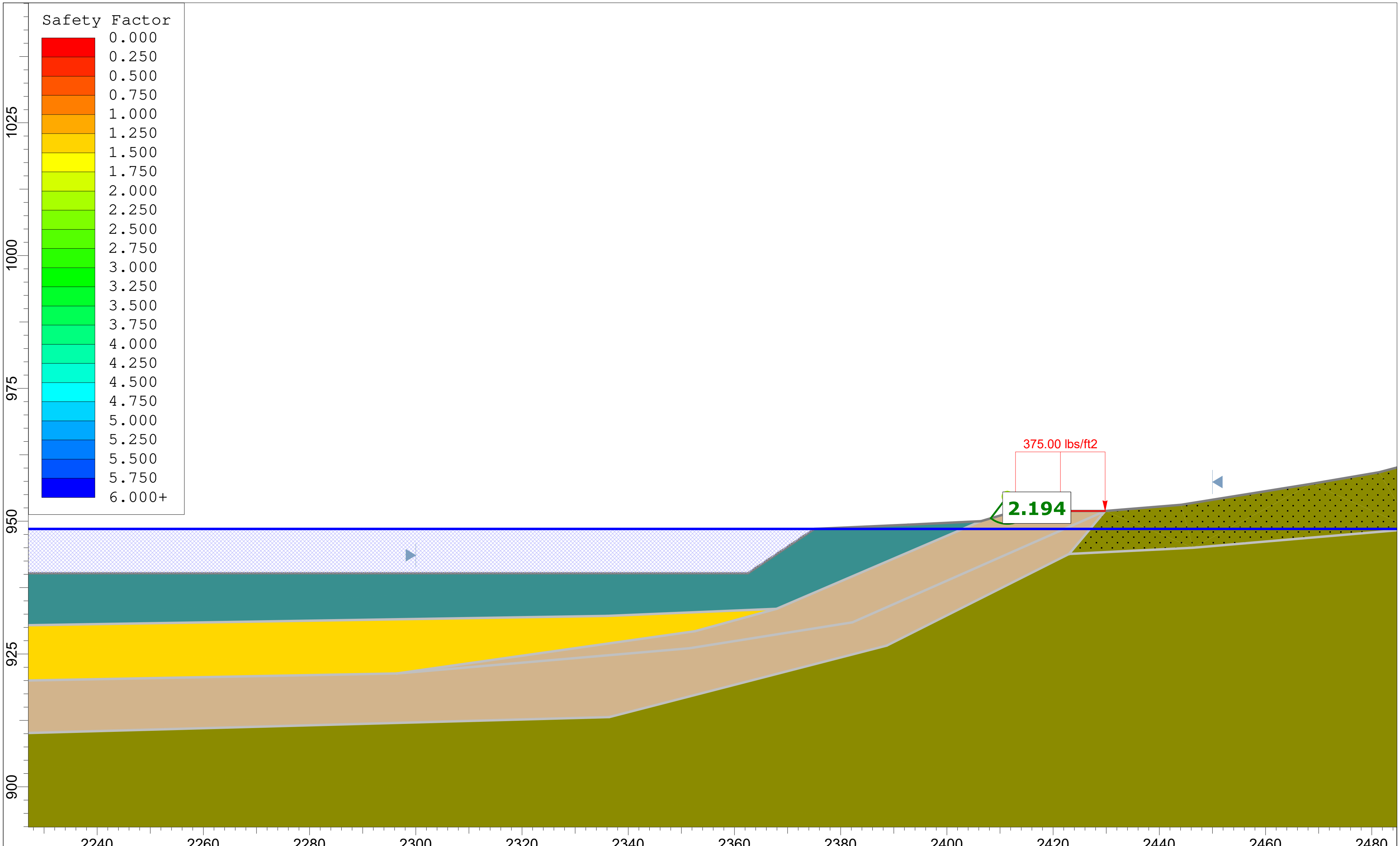

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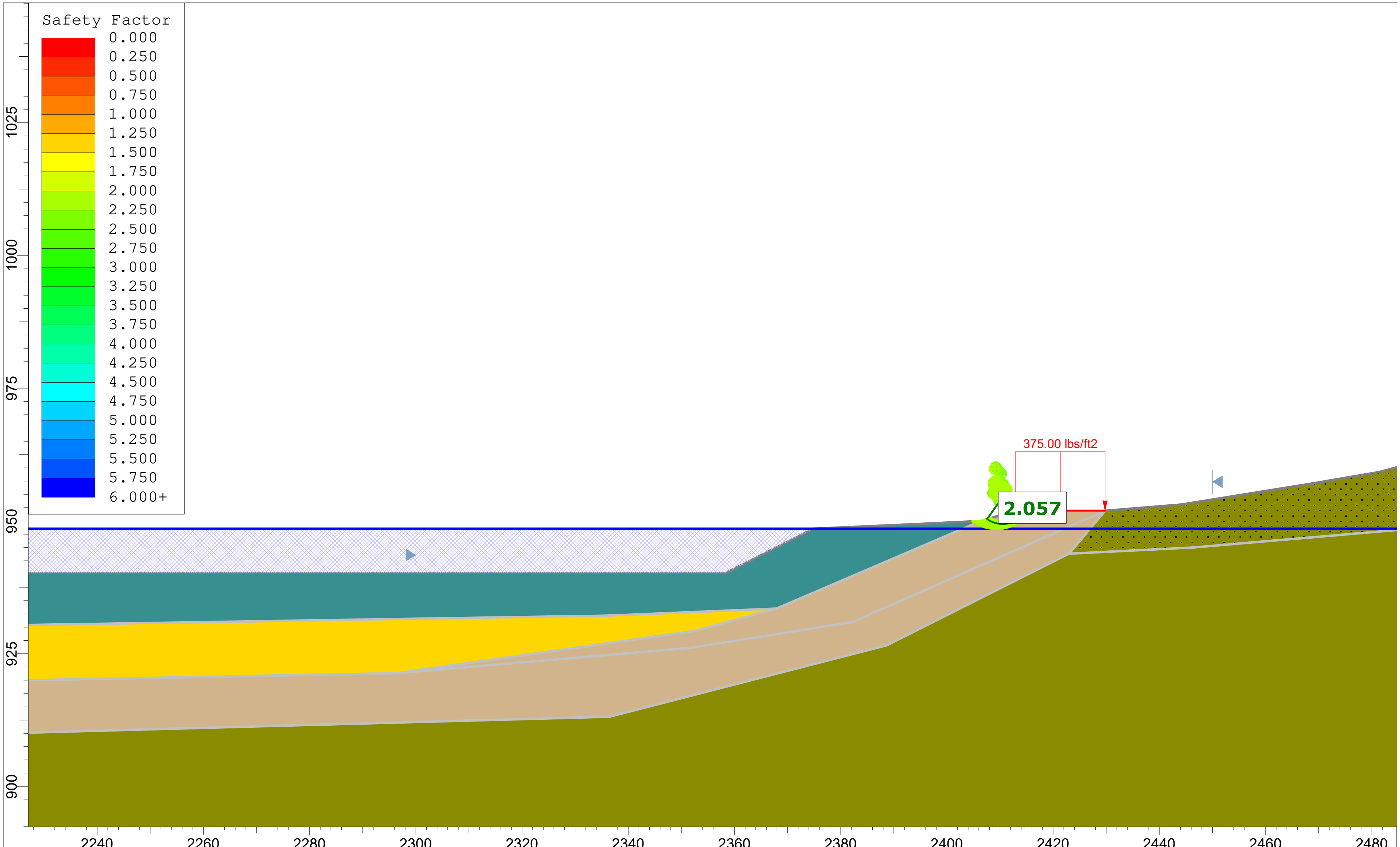

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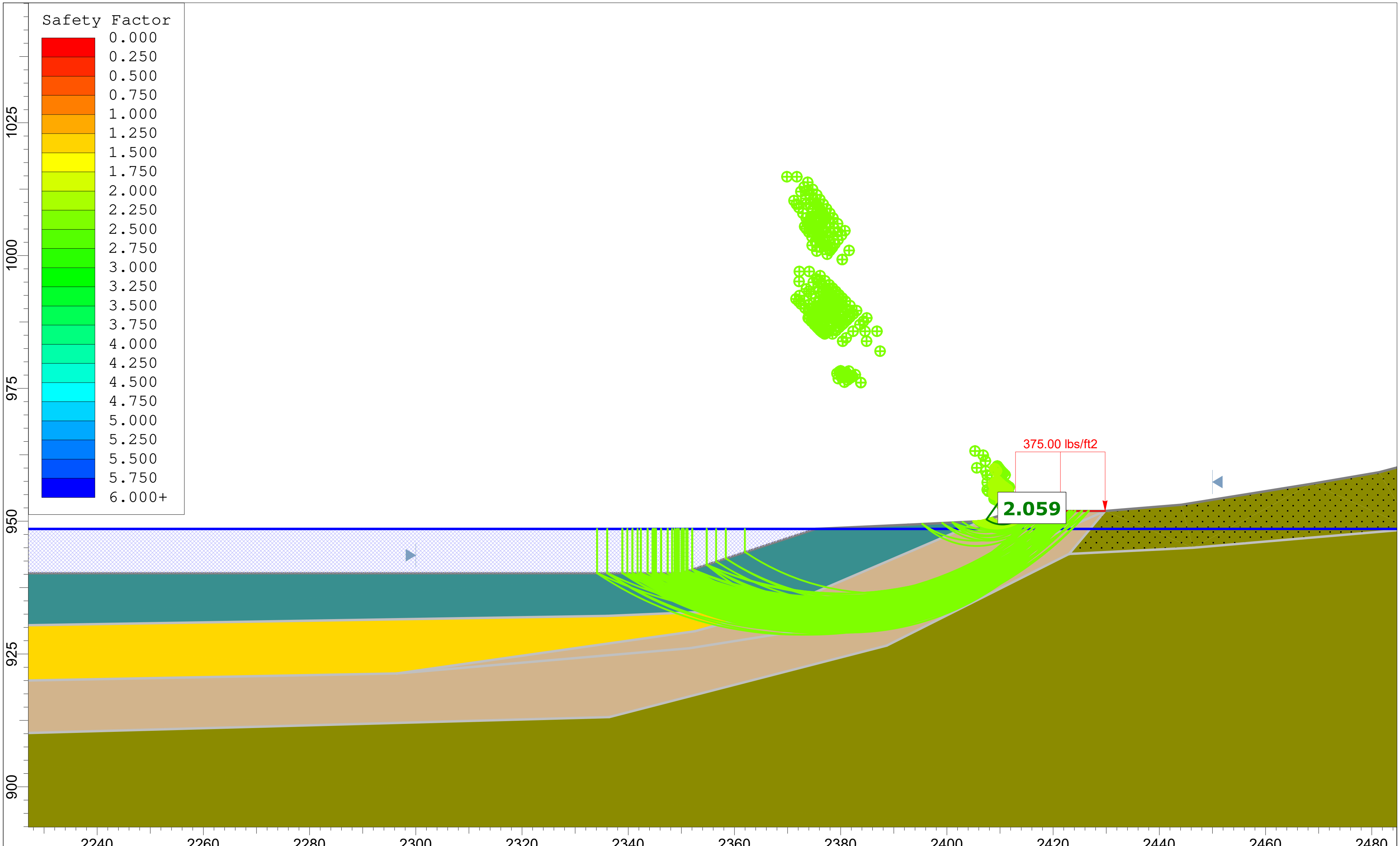

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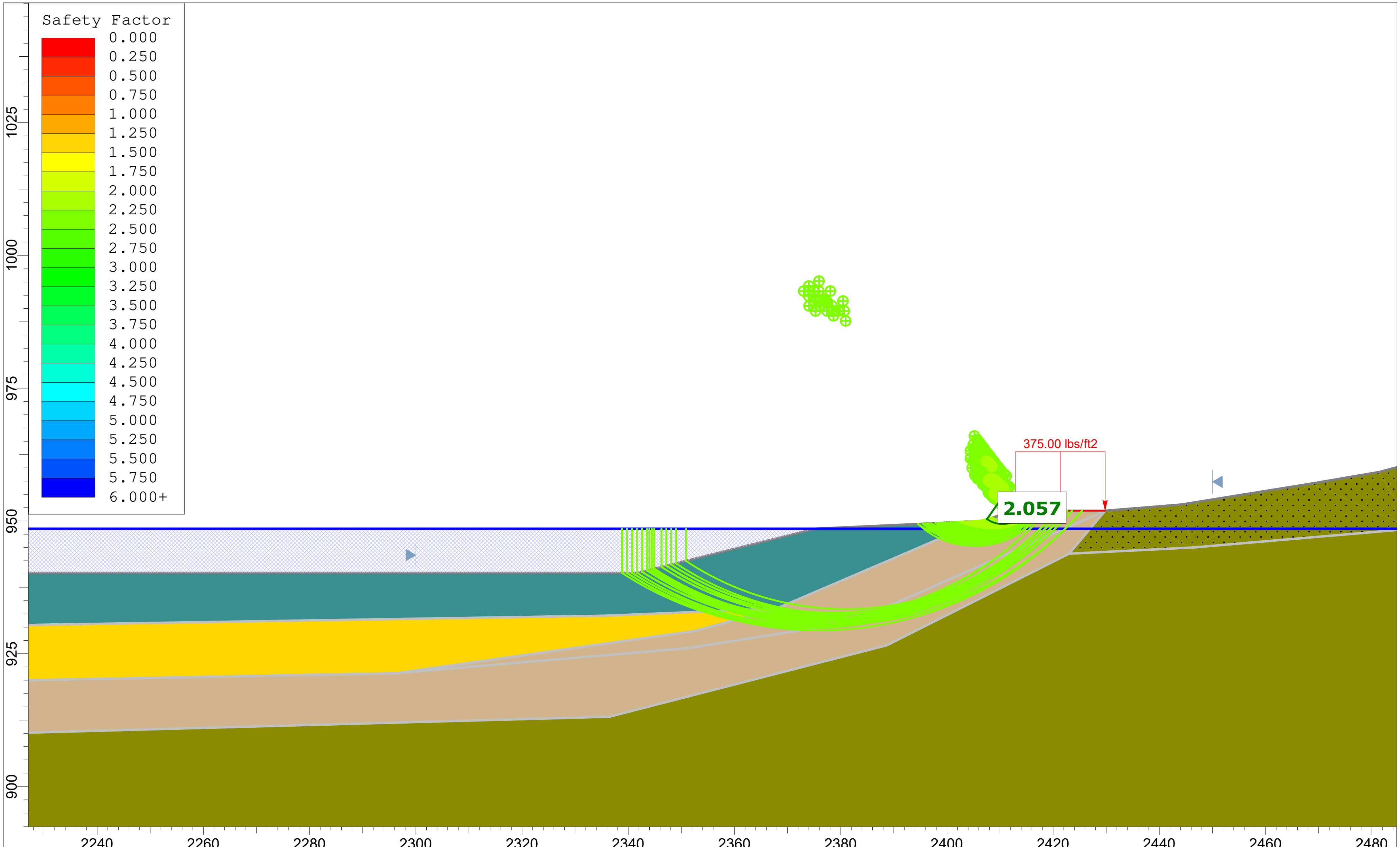

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Appendix E
Hydraulic Transport Evaluation for Reach 6

General Electric Company

Appendix E: Hydraulic Transport Evaluation for Reach 6

Housatonic River – Rest of River
Pittsfield, Massachusetts

October 2024

Appendix E:
Hydraulic Transport Evaluation for Reach 6

Housatonic River – Rest of River
Pittsfield, Massachusetts

October 2024

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Pittsfield, Massachusetts

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Abbreviations

Arcadis	Arcadis U.S., Inc.
AST	above-ground storage tank
EPA	United States Environmental Protection Agency
cy	cubic yards
cy/day	cubic yards per day
FEMA	Federal Emergency Management Agency
GE	General Electric Company
HDPE	high-density polyethylene
LiDAR	Light detection and ranging
NAVD88	North American Vertical Datum of 1988
Reach 6 Conceptual Work Plan	Conceptual Remedial Design/Remedial Action Work Plan for Reach 6
Revised Final Permit	Revised Final Resource Conservation and Recovery Act Permit Modification
ROR	Rest of River
UDF	Upland Disposal Facility
UDF OMM Plan	Upland Disposal Facility Operation, Monitoring, and Maintenance Plan

1 Introduction

The Rest of River (ROR) is that portion of the Housatonic River and its backwaters and floodplain (excluding Actual/Potential Lawns as defined in the 2000 Consent Decree) located downstream of the confluence of the East and West Branches of the Housatonic River, in Pittsfield, Massachusetts. The ROR has been segmented into six separate remediation units (RUs) to manage workflow and schedule for the ROR Remedial Action.

Reach 5A was the first RU to be addressed because it is the most upstream reach in the ROR. The *Conceptual Remedial Design/Remedial Action Work Plan for Reach 5A* (Anchor QEA et al. 2023) was submitted to EPA on September 28, 2023, and is currently under EPA review. Reach 6, which includes Woods Pond, is the second RU to be addressed. This Hydraulic Dredging and Transport Evaluation for Reach 6 is an appendix to the *Conceptual Remedial Design/Remedial Action Work Plan for Reach 6* (Conceptual Work Plan).

As described in the Conceptual Work Plan, the remedial action proposed for Reach 6 includes removal of sediments from Woods Pond and other aquatic portions of Reach 6 and disposal of such removed sediments at an on-site Upland Disposal Facility (UDF) or at an off-site disposal facility, consistent with the requirements specified in Attachment E to the Revised Final Resource Conservation and Recovery Act Corrective Action Permit (Revised Final Permit) issued by EPA to GE for the ROR (EPA 2020). On October 15, 2024, GE submitted a Revised On-Site and Off-Site Transportation and Disposal Plan (Arcadis 2024a), which described GE's plans for the transportation and disposal of excavated material from the ROR, including from Reach 6. That plan stated that GE would implement hydraulic dredging and pumping for the sediments in Reach 6.

This document outlines the conceptual hydraulic dredging and transport activities planned for Reach 6, specifically for on-site transport to the UDF. As described below, details regarding sediment dewatering and associated water treatment processes at the UDF will be addressed in a separate document, which will be included as part of the UDF design submittal.

2 Conceptual Sediment Dredging and Transport Approach

As discussed in Section 5.4.2 of the Conceptual Work Plan, it is anticipated for this conceptual design that the sediment hydraulically dredged from Reach 6 that is designated for on-site disposal will be transported by temporary pipeline to a shoreline support facility on the southern shoreline of Woods Pond and then to the UDF property for dewatering and processing for eventual disposal (Figure 2-1).[1] Section 3 of the Conceptual Work Plan includes a summary of sediment characteristics and existing data considered as part of the hydraulic dredging and transport evaluation presented herein. In general, significant variability was observed in the dry bulk density, moisture content, and grain size distribution of the sediment samples collected from Reach 6. The variability in geotechnical index parameter results reflects the heterogenous nature of the sediment at various depth intervals and locations in Reach 6.

Table 4-7 of the Conceptual Work Plan includes a summary of the conceptual design removal areas and volumes for Reach 6. As discussed there, that work plan covers the sediments in Woods Pond itself plus those in the outlet channel from Woods Pond and in Valley Mill Pond (located on the eastern side of the river south of Woods Pond

[1] As noted in the Conceptual Work Plan, it is possible that, in some shoreline areas, sediment removal may require mechanical removal, followed by conveyance to the UDF via hydraulic transport or truck.

Dam and hydraulically connected to Reach 6). As presented there, approximately 493,300 cubic yards (cy) of sediment are estimated for removal from those areas, including approximately 488,400 cy for disposal in the UDF and approximately 4,900 cy for disposal at an off-site facility.[2] Based on these estimated removal volumes for Reach 6, and as stated in Section 5.4.2 of the Conceptual Work Plan, average dredge production rates between 625 and 830 cubic yards per day (cy/day) would be needed to complete the Reach 6 dredging within the target schedule of three to four years.

Based on the hydraulic dredging production rate presented the GE's Revised Corrective Measures Study Report (Arcadis et al. 2010) for Alternative SED 9 (which was similar to the subsequently selected ROR remedy), two dredge plants would need to operate for 10 to 12 hours per day or one dredge plant would need to operate for 20 to 24 hours per day (two 10-hour or 12-hour shifts) to achieve these average production rates. The final production rate and schedule will be determined during the final remedial design based on a variety of factors, including the ability to receive and dewater dredged sediments at the UDF. Further evaluation of potential dredging production rates will be presented in the Final RD/RA Work Plan for Reach 6 in consideration of the final design of the on-site dewatering facility at the UDF and the final sediment removal volumes. The production rates considered for the Reach 6 hydraulic dredging and transport evaluation are summarized in Table 2-1.

Table 2-1. Assumed Reach 6 Production Rates Considered in Evaluation

Design Parameter	Conceptual Assumption
Active Dredge Crews	2 crews
Daily Operation Time	10 to 12 hours
Hydraulic Dredging Production Rate	625 and 830 cy/day

It is anticipated that sediments designated for off-site disposal, which are estimated to consist of sediments from Valley Mill Pond, will be removed separately from hydraulic dredging of the sediments designated for disposal in the UDF. Under the conceptual design, these sediments would be hydraulically dredged and then pumped to and segregated at the UDF (see Section 5.6.2 of the Reach 6 Conceptual Work Plan). However, additional evaluation of the sediment dredging and transport approach for Valley Mill Pond will be conducted after supplemental data are collected on the sediments in that pond. In any case, large debris and/or dense aquatic vegetation may require removal by mechanical means separately from and prior to initiating hydraulic dredging.

3 Transportation of Hydraulically Dredged Materials

As noted above, dredged sediment from Reach 6 will be conveyed to a shoreline support facility, which will contain a pump station. From there, material will be conveyed to the UDF for dewatering and further processing, as needed, for eventual disposal. This section describes the shoreline support facility and how hydraulically dredged sediment will be transported from the shoreline support facility to the UDF property.

Details related to the construction and operation of the UDF were presented in the UDF Final Design Plan (Arcadis 2024b) and Revised *Upland Disposal Facility Operation, Monitoring, and Maintenance Plan* (UDF OMM

[2] As described in the Conceptual Work Plan, the design presented in that Work Plan does not include remediation of the headwaters of Woods Pond (i.e., the portion of Reach 6 between the downstream end of Reach 5C and Woods Pond proper), which will be addressed in a later addendum to the Final RD/RA Work Plan for Reach 6.

Plan; Arcadis 2024c), which were both conditionally approved by EPA on September 12, 2024. Based on EPA's conditional approvals, GE will submit revised versions of these plans to EPA by December 20, 2024. In addition, as required by EPA's conditional approval, GE will prepare an addendum to the Revised UDF Final Design Plan that provides details regarding the conceptual design and location of the on-site dewatering and water treatment facilities at the UDF, and the Revised UDF OMM Plan will include also implementation schedules and operation, monitoring, and maintenance activities for these facilities.

The conceptual approach to hydraulic dredging and transport presented herein involves several uncertainties. To support final design, supplemental investigations will be performed to inform decisions about the progression of the remedial design, including the final location for the shoreline support facility, an associated bulkhead, and the pipeline route. (See Section 5 for the proposed supplemental data collection program.) During the remediation activities, best management practices will be implemented to reduce potential impacts of ROR remedial activities on the local community, including potential noise and light impacts and impacts on existing infrastructure due to additional traffic related to the ROR remedial activities.

3.1 Shoreline Support Facility

A shoreline support facility will be the primary location for access to Reach 6 and will provide general support for the initial sediment removal operations for Reach 6 and transport of the removed material to the UDF, as well as likely support for discharge of treated water back to the Housatonic River (to be discussed in an addendum to the Revised UDF Final Design Plan). In addition, the shoreline support facility will likely support future backfilling and capping in Reach 6 as well as sediment removal, backfilling, and capping in Reach 5C, both of which will occur several years after initial sediment removal operations for Reach 6. This section describes expected existing conditions, design elements, and development necessary to provide adequate support of proposed work activities.

3.1.1 Location

Given the topography and existing infrastructure (e.g., roads, utilities) between Woods Pond and the UDF, few options are available for the location for the shoreline support facility. The two primary areas evaluated included the space between Woodland Road and Woods Pond and the space south of and across the street from that location, on the inside of the sharp curve in Woodland Road (Figure 3-1). The preferred location identified for the shoreline support facility is on the southern shoreline of Woods Pond, within a parcel currently owned by Eurovia Atlantic Coast, LLC (see Figure 3-1). This location was selected based on the following criteria:

- Likely availability of land with simple egress via public roads;
- Proximity to the UDF and dredging operations;
- Adequate shoreline length to facilitate dredging and final restoration operations (e.g., barge docking, equipment and material loading);
- Minimization of disturbance to residential and other private properties; and
- General regularity of terrain (compared to nearby steep hillsides).

Because the preferred property for the shoreline support facility is not owned by GE, access and use will require coordination with the current owner.

Current survey information for the shoreline support facility area is partially based on light detection and ranging (LiDAR) data previously procured via aerial methods. As noted above, supplemental investigations will be performed to complete the shoreline support facility design (including its final location). Those supplemental investigations are described in Section 5 and are also included in Supplemental Data Collection Work Plan for Reach 6, which is Appendix F to the Conceptual Work Plan. Based on those investigations or other relevant information, the final design location and layout of the shoreline support facility may be modified or expanded, considering equipment needs, assessment of ecological impacts, coordination with the property owner, dredging means and methods, and space required for materials handling and storage.

3.1.2 Site Access

Vehicular access to the shoreline support facility most likely will be via Woodland Road from the southeast. Improvements to Woodland Road (e.g., widening, drainage improvements, pavement enhancements) will likely be required prior to construction equipment mobilization. In addition, clearing adjacent to Woodland Road may be necessary for the above-ground installation of the sediment pipeline.

An alternate route to the shoreline support facility is available via Valley Street from the southwest. Use of Valley Street would require coordination and access agreements with property owners along Valley Street as a portion of the road itself is owned by private entities. Current operations of local businesses along Valley Street involve a significant amount of daily truck traffic, which may impede use of this route for additional routine daily truck traffic. In addition, the use of this route would require reconditioning of the seasonal-use portion of Valley Street and, depending on the weight rating of the existing culvert bridge over the spillway immediately east of the river, potential reconstruction of that bridge to support construction-related truck traffic. Additionally, use of the route along Valley Street would not provide direct access to the UDF.

3.1.3 Existing Shoreline Conditions

Most of Reach 6 is characterized by shallow, slow-moving water. The shoreline of Woods Pond primarily consists of overhanging vegetation, woody debris, and rock piles. Vegetation near the proposed shoreline support facility primarily consists of hardwood and transitional floodplain forest. Pond depth near the proposed shoreline support facility is shallow, ranging between zero and four feet deep within 150 feet of the shoreline. Beyond approximately 150 feet from shore, the pond bottom drops more precipitously to a maximum depth of nearly 15 feet. Aquatic growth peaks during the summer months, with aquatic vegetation covering most of Woods Pond much of the growing season.

3.1.4 Site Development Activities

Development for the shoreline support facility will require careful planning to optimize available space and limit disturbance to the extent practicable. This section outlines the general considerations for shoreline support facility development that will be defined with greater detail in subsequent design phases.

3.1.4.1 Flood Control

As shown on Figure 3-1, the property most suitable for the shoreline support facility is located entirely within a Federal Emergency Management Agency (FEMA) 100-year flood hazard zone (FEMA 1982). For protection of the public, infrastructure constructed for the shoreline support facility will generally comply with the substantive requirements of Chapter 108 – *Floodplain Management* of the Lee, Massachusetts Administrative Code (Town of Lee 1974) in that the layout and construction of the shoreline support facility, including ancillary facilities discussed in Section 3.1.4.2, will consider the following:

- Preventing flotation, collapse, and/or lateral movement of structures and materials in the event of flooding;
- Utilizing flood-resistant construction materials and equipment;
- Employing temporary dikes and drainage features to minimize flooding potential and to divert water away from the shoreline support facility;
- Importing fill materials to construct the shoreline support facility above the 100-year base flood elevation;
- Situating certain sources of potential contamination (e.g., equipment maintenance areas, portable toilet facilities, longer-term parking/laydown areas, chemical storage areas) at higher elevations above the flood impact zone (or potentially at an area outside of the 100-year base flood elevation, such as the space south of and across the street from the preferred location for the shoreline support facility [Figure 3-1]);
- Elevating equipment or materials that cannot be easily relocated to be above the 100-year base flood elevation; and
- Preparing an evacuation plan for relocation of equipment subject to damage and/or with the potential to damage downstream resources and/or infrastructure during a flood.

The effective FEMA flood insurance rate map for Reach 6 indicates a 100-year base flood elevation of approximately 956 feet (National Geodetic Vertical Datum of 1929), or approximately 955.4 feet in the project-specific vertical datum (i.e., North American Vertical Datum of 1988 [NAVD88]). Because the shoreline support facility is intended to be a temporary structure, it is not necessary to ensure that all development is above the 100-year base flood elevation. However, preventive measures for the maintenance and protection of the shoreline support facility during flooding should be considered for all infrastructure and equipment below an elevation of 955.4 feet above sea level (NAVD88).

3.1.4.2 Ancillary Facilities

The following components will likely be required at the shoreline support facility:

- **Contractor support areas.** As needed, support facilities such as office space, small tools/consumables storage areas, support vessels, chemical storage areas, and lavatories may be included at the shoreline support facility for use by the remediation contractor.
- **Security and lighting.** Site security is anticipated to be required at the shoreline support facility and may include perimeter fencing, gates, lighting, and signage. Security guards, video surveillance, or other security measures will likely not be necessary, but will be considered during development of the remedial design.
- **Bulkhead(s).** Bulkhead(s) will be required to provide adequate draft for vessels working within Woods Pond and to support development of the operational area at the shoreline support facility.
- **Docks/berthing areas.** Docking areas will likely be required to berth barges and support vessels and for equipment/material loading and off-loading if such activities cannot be performed directly from the bulkhead(s).

- **Above-ground storage tank (AST).** An AST may be needed to serve as a slurry receiving facility from the hydraulic dredging operations to attenuate potential inconsistent flows from dredging operations while maintaining consistent flows through the slurry transport pipeline to the sediment dewatering facility. If needed, an AST would include a mixer(s) to provide sufficient agitation and sediment suspension, level sensors to control the pump system and send alarms for high water warning, and influent and effluent connection points complete with isolation valves. The AST would be sized based on the volume of the flows from the dredging operations and the required flows to the UDF.
- **Inlet pump station.** A pump station at the inlet of the sediment transport pipeline will be required to convey sediment-laden water (slurry) from the lower elevation at the shoreline support facility to a higher elevation at the UDF. The requirements for this inlet pump station are provided in Section 3.2.2.1.

The location and elevation of ancillary facilities will take into account the 100-year base flood elevation, as discussed in Section 3.1.4.1. As appropriate, equipment will be fit with control measures to minimize noise impacts during implementation of the remediation activities. Such control measures may include using shrouds, barriers, or other sound-attenuating walls around stationary equipment (e.g., generators and booster pumps) or between noise sources and receptors.

Consistent power is necessary to prevent power surges and/or inadequate flow of power during normal operations and to prevent inconsistencies in the operation of the equipment at the shoreline support facility. As noted above and further described in Section 5, to support final design, supplemental investigations will be performed to inform decisions about the available electrical power supply at and near the proposed shoreline support facility.

3.1.4.3 Earthwork

Construction of the shoreline support facility will require the regrading of native earthen materials as well as the placement of imported fill to construct building and equipment pads, laydown areas, and workspaces. Clearing and grubbing will be the first step of site development and will include removing vegetation to facilitate subsequent construction activities.

Since the remediation of Reaches 5C and 6 is a multi-year project, the minimum elevation of the developed shoreline support facility areas will be primarily dictated by the required elevation for flooding protection (discussed in Section 3.1.4.1). The construction of the bulkhead(s) via filling and associated slope grading adjacent to the shoreline support facility are not included in the conceptual engineered dredge prism (see Section 4.2.1 of the Conceptual Work Plan), but will be further considered during the final remedial design. Earthen materials will be subject to material testing prior to import and use to determine adequacy for use as fill.

As noted above and further described in Section 5, to support final design, supplemental investigations will be performed to inform decisions about the most suitable location for a bulkhead and the required earthwork to develop the shoreline support facility.

3.1.4.4 Stormwater Management and Stabilization

Development of the shoreline support facility will require the implementation of stormwater management infrastructure and stabilization measures to limit site flooding, surface degradation (e.g., erosion, rutting), and impacts to downstream aquatic resources. Because the shoreline support facility is intended to be temporary, and the developed area will be restored following remediation in Reaches 5C and 6 (unless the area will have a permanent public use) (see Section 4 below), permanent practices for stormwater management are not anticipated. However, the following temporary stormwater management measures will be included in the design of the shoreline support facility:

- **Stormwater Diversions and Conveyance:** Under existing conditions, water from adjacent upland areas (including water collected by nearby roadside swales) is directed towards the shoreline support facility (see Figure 2-1). Conveyances such as swales, catch basins, and culverts will be used to collect stormwater run-off and divert water around the shoreline support facility to discharge points (e.g., stabilized outlet structures) at Woods Pond. Open channels will be lined (e.g., with riprap, erosion control blanket, and concrete matting) according to expected flow velocities and shear stresses. Point discharge locations (e.g., channels or culverts discharging to Woods Pond) will be stabilized (e.g., with riprap aprons or concrete mats) to limit erosion.
- **Work Area Stabilization:** Work areas and roadways will be stabilized (e.g., using compacted gravel, temporary pavement, and/or other similar surface treatments) to inhibit erosion and degradation (e.g., rutting). Regraded areas that will not be used as part of dredging operations will be amended (e.g., with topsoil and fertilizer) and seeded to establish a stand of stabilizing vegetation. Cut slopes will be stabilized (e.g., using erosion control blankets) in addition to soil amendment and seed application.
- **Material Storage:** Dredged material will be conveyed to the UDF via slurry piping, eliminating the need for staging at the shoreline support facility. However, other materials that may be staged at the shoreline support facility (e.g., removed debris, removed vegetation, dredge backfill and cover), as space allows, will be stockpiled within perimeter controls to inhibit erosion and downgradient sedimentation.
- **Shoreline Protection:** Disturbed shorelines will be stabilized (e.g., with riprap, concrete mats) based on design parameters, including shoreline slope, run-on from upgradient areas, wave action, debris impact, and ice jamming.

3.2 Pipeline Routing and Design

This section describes the pipeline routing and design for conveying the dredged sediment from the shoreline support facility to the UDF. Although the final locations of the dewatering area and water treatment area are yet to be determined and will be presented in a forthcoming addendum to the Revised UDF Final Design Plan, a conceptual location for the dewatering area is shown on Figure 2-1 for the purposes of this transport evaluation.

3.2.1 Routing

Figure 2-1 shows the conceptual Reach 6 sediment transport layout plan, including the preferred routing for the temporary sediment pipeline. The proposed pipeline route has been selected to minimize environmental impacts, promote safety, and optimize pumping efficiency for the slurry pipeline (e.g., minimizing elevation change). During subsequent phases of design, the slurry characteristics (e.g., specific gravity, variability of the solids concentration) will be further evaluated and additional optimizations will be considered to promote consistent flow and to avoid solids deposition within the slurry pipeline (e.g., by maintaining appropriate pipeline scouring velocities).

The pipeline route will generally follow public and site access roads to facilitate access for inspection and maintenance, while avoiding areas prone to erosion, landslides, and flooding. In addition, the pipelines likely will be installed above grade unless otherwise required (e.g., at road crossings). The route shown on Figure 2-1 will consist of ±80 feet of elevation gain and ±3,500 linear feet for the sediment pipeline.

The proposed pipeline routes are primarily within the Woodland Road right-of-way and property owned by GE. Parcel boundaries are shown on Figure 2-1. The existing and proposed finished grades are shown on Figure 3-2 for the sediment pipeline.

It is anticipated that the pipeline alignment will require clearing. Removal of vegetation may be limited to existing grade in areas where the piping is placed above ground, which is expected to be the case for most of the route, except at road crossings. The vegetation removed will likely be chipped and spread within the pipeline corridor. Should portions of the pipeline require burying, additional sub-surface grubbing may be required to remove roots. Vegetation and/or soil moved to bury the pipeline will be used to cover the buried pipeline portions.

Current survey information for the pipeline routing is partially based on prior LiDAR data procured via aerial methods. Supplemental investigations, including field and topographic surveys, will be performed to complete the pipeline routing and transport design, as described in Section 5. Based on those investigations or other relevant information, the final design location and layout of the pipeline route may be modified or expanded, considering equipment needs, assessment of ecological impacts, coordination with the property owner, and dredging means and methods.

3.2.2 Sediment Pipeline

This section describes the facilities necessary to carry the dredged slurry from the shoreline support facility to the UDF and the assessments required for design purposes. Project life expectancy will need to be considered during selection of equipment to determine the projected abrasion to the pipeline, pumping systems, and other appurtenances. Abrasion is expected regardless of life expectancy; however, more abrasion over longer periods of time will significantly increase the friction coefficient of the pipeline and ultimately change the head pressure and life expectancy of the system.

3.2.2.1 Ancillary Facilities

A pump station at the inlet of the sediment transport pipeline will include several key components designed to move sediment-laden water or slurry from a lower elevation at the shoreline support facility to a higher elevation at the UDF while maintaining sufficient turbulence and velocity to prevent deposition of the entrained solids. The following components will be required at the inlet pump station:

- **Influent header piping.** An influent pump header will be constructed with appropriate fittings and isolation valves with connection from the AST (discussed in Section 3.1.4.2) to the pump(s). Piping material will be selected based on the friction coefficient of the material, the pressure rating of the system, and structural integrity to prevent deflection in the pipeline from the weight of valve configurations and other appurtenances.
- **Pumps.** To convey material from the shoreline support facility to the UDF, one primary pump will likely be needed at the shoreline facility and two additional, inline booster pumps at roughly 1,500-foot intervals will likely be needed to overcome the anticipated 80 feet of positive elevation change while maintaining the critical carrying velocity as defined by Durand’s formula. These pumps will be selected to accommodate the abrasive properties of the dredged slurry, system head conditions, and rate of flow required by the process treatment facility. Isolation valves will be provided upstream and downstream of each pump to allow for isolation if necessary. Check valves will be provided downstream of each pump to prevent backflow through the pump.

The number and size of pumps required will be determined based on final anticipated removal volume and anticipated production rates. Intermediate booster pump stations may be installed as needed to maintain the required head pressure and maintain required flow rates. Further evaluation of the properties of the slurry (e.g., specific gravity, variability of the solids concentration) and typical operating conditions will be required to properly size and position the booster pumps. A hydraulic grade line will be developed and analyzed to determine the locations and quantity of booster pump stations.

- **Effluent header piping.** An effluent header with appropriate fittings will be installed to direct flow to the sediment pipeline. Piping material will be selected based on the friction coefficient of the material, the pressure rating of the system, and structural integrity to prevent deflection in the pipeline from the weight of the valve configurations and other appurtenances.
- **Pipe supports.** Pipe supports may be required at the shoreline support facility to suspend the pipeline at the influent and effluent header of the pump. Pipe support design will be considered based on constructability. Current pipe support options include timber-constructed, skid-mounted and floor-mounted pipe stanchion of either galvanized steel or 304 stainless steel material with neoprene rubber cushion. Pipe supports will be installed only where necessary to suspend the pipeline (i.e., at the influent and effluent header) and are not expected to be used on the main pipelines.
- **Pipe guide support.** Significant movement of the pipeline is expected as a result of thermal expansion of the pipeline and the potential for water hammer during pump system startups and shutdowns. A pipe guide support system will be designed to restrict this movement for a pipe run on grade. The support system will restrict lateral movement while allowing for controlled axial expansion if needed. The support system may include a cast-in-place concrete pier with vertical support posts flanking the pipe and timber piles.
- **Power supply.** A power supply will be necessary to provide electrical power to the pump station and booster pumps not powered by a generator. Further investigation will be needed to determine the availability of sufficient power supply from the existing power utility in the area. A backup generator of either natural gas or diesel fuel may be necessary for redundant power generation.
- **Air/vacuum relief valves.** Air/vacuum relief valves may be required at high points along the sediment pipeline. Air/vacuum relief valves will release entrained air and prevent siphoning to minimize the potential for damage to the pipeline. Locations and sizing will be determined through further hydraulic assessment.

As appropriate, equipment will be fit with control measures to minimize noise impacts during implementation of the remediation activities. Such control measures may include using shrouds, barriers, or other sound-attenuating walls around stationary equipment (e.g., generators and booster pumps) or between noise sources and receptors.

3.2.2.2 Hydraulic Evaluation

Two scenarios were considered in the hydraulic evaluation of the design capacity based on the low and high anticipated flow conditions of the dredging operation (i.e., 625 and 830 cy/day; see Section 2). Critical carrying velocity, defined by Durand’s formula, is the primary controlling factor to ensure that the sediment remains entrained during hydraulic transport. If the slurry velocity decreases below the critical carrying velocity, material can settle out of the slurry, decreasing the efficiency of the pumps and changing the hydraulic conditions of the system. Critical carrying velocity depends on pipe size, pumping rate, solids concentration, and properties of the slurry. To properly design the sediment pipeline, an analysis of typical operational conditions and further investigation into the properties of the slurry (e.g., specific gravity, variability of the solids concentration) will be required. To accommodate a range of flows from one to two dredges in operation, multiple sediment pipelines that can be isolated or used in parallel will be required to maintain critical velocity without creating excessive head losses due to high velocities. The pump motor will be sized based on the anticipated gain in elevation of 80 feet from the shoreline support facility to the UDF, slurry pumping flow rates capable of handling one or two hydraulic dredges in operation, and slurry fluid properties; preliminary estimates indicate an approximate head loss of five feet per 100 feet of linear pipeline. A safety factor is not included in these conceptual calculations. Laboratory testing for fluid properties, verification of typical flow operation, and consideration of contractor input will be required to further the design.

3.2.2.3 Pipe Material Specification

It will be crucial to select pipe material that will resist abrasion from the sediment and provide a minimal amount of friction head loss within the system. The pipeline will be installed above grade unless noted otherwise; for this reason, above-ground pipe supports designed to guide pipeline movement during normal pumping operations will be necessary. Multiple options are available for use, including high-density polyethylene (HDPE) and ductile iron. HDPE piping provides flexibility, strong abrasion resistance, and low friction head loss and is currently the preferred material. Further evaluation of fluid properties and verification of typical flow operation will be necessary to determine the appropriate pipe class(s).

Because of the abrasive nature of the dredge materials (i.e., particularly sands and gravels), erosion of the pipe wall is a significant concern and will be considered further during the final design. Properties of pipe material may result in significant thermal expansion across the pipeline. The pipeline will be designed to withstand year-round weather conditions regardless of typical operations. Several expansion loops will be required to prevent stress to the pipeline from thermal expansion and contraction. These properties will be considered in more detail during the final design.

3.2.2.4 System Flushing

Should sediments be allowed to settle and remain within the sediment pipeline for an extended period of time, the material can consolidate and become difficult to resuspend. To avoid the need to store large volumes of dredged material, the sediment transport system will be designed to operate for the operation of the dredging crews. Flushing of the pumps, piping headers, and sediment pipeline with sediment-free water will be required when the pumping operation ceases for the day. A significant source of clean flushing water will be required to provide flushing at shutdown and during emergency situations. A typical approach is to connect a clean water source at the suction header of the slurry pumps and use the pumps to flush the pipeline to the UDF. Two potential flushing water sources are treated water from the treatment facility (which will be described in an addendum to the Revised UDF Final Design Plan) and surface water withdrawn from the Housatonic River.

3.2.2.5 Winterization Requirements

The system will be winterized prior to the occurrence of freezing temperatures in each construction season.

4 Restoration of Shoreline Support Facility and Pipeline Route

As described above, the shoreline support facility and pipeline route will likely be in use through completion of capping and restoration of Reaches 5C and 6, several years after initiation of sediment removal operations for Reach 6. Following completion of use, the shoreline support facility areas and temporary pipeline route will be restored unless an alternative use such as permanent use of the shoreline support area as a public access area for Woods Pond is agreed upon and approved by EPA for this location. If these areas are restored, the restoration will be in accordance with the Performance Standards for restoration of disturbed areas in the ROR, as provided in Section II.B.1.c.(1) of the Revised Final Permit and based on the program outlined in Section 5.7 of the Conceptual Work Plan. Typical activities to be completed during site restoration include:

- Removal of all material and demobilization of equipment used in support of remedial activities;
- Removal of temporary facilities (e.g., storage containers, toilet facilities);
- Removal of waterfront infrastructure and facilities (e.g., temporary docks);
- Removal of temporary flood control measures, fills, and bulkheads;
- Stabilization of shoreline and restoration of native riparian areas;
- Restoration of site topography at the shoreline support facility and the pipeline route; and
- Removal of signage and other pedestrian and/or traffic control devices.

A more detailed discussion of the restoration of the shoreline support facility area and the pipeline route will be included in the Restoration Plan for Reach 6, to be submitted concurrently with the Final RD/RA Work Plan for Reach 6.

5 Additional Data Needs

The following items have been identified as requiring further investigation or evaluation to continue the shoreline support facility design and pipeline routing and transport design beyond the conceptual stage:

- **Geotechnical Investigations:** Subsurface geotechnical investigations (e.g., borings) will be conducted to evaluate geotechnical properties of the soil in the area where the shoreline support facility is proposed in order to facilitate infrastructure design (e.g., foundations, pads, bulkhead walls, dock piers).
- **Visual Assessment and Field Survey:** A ground-based visual assessment and field surveys will be conducted along nearby roads anticipated for use during construction, at the proposed shoreline support facility area, and along the proposed pipeline route from the shoreline support facility to the UDF to document existing conditions and facilitate design of the shoreline support facility and the pipeline route.
- **Outreach Regarding Power Supply:** Outreach activities will be performed to evaluate the available electrical power supply at and near the proposed shoreline support facility so as to facilitate design of the equipment requirements at that facility.

These data needs are included in the investigations identified in Section 10 of the Conceptual Work Plan and described in the Supplemental Data Collection Work Plan for Reach 6, which is Appendix F to the Conceptual Work Plan.

6 References

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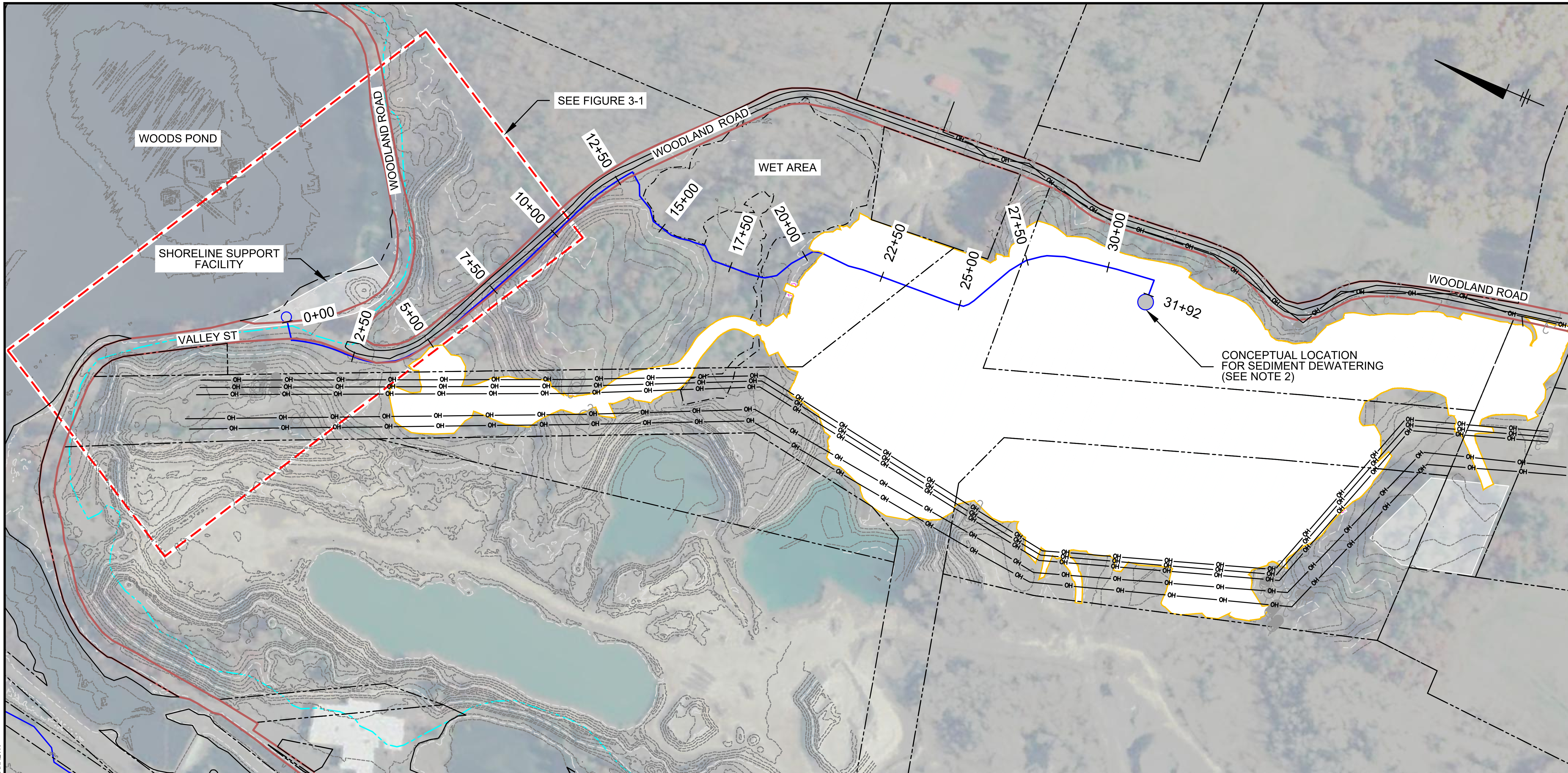
Figures



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EXISTING FEATURES LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- ELEVATION CONTOUR (25-FOOT INTERVAL)
- ELEVATION CONTOUR (5-FOOT INTERVAL)
- EDGE OF ROAD
- OH — OVERHEAD WIRES
- FEMA 100-YEAR-DESIGNATED FLOOD BOUNDARY (APPROXIMATE)
- WET AREA

DESIGN FEATURES LEGEND

- APPROXIMATE LIMIT OF UDF GRADING (SEE NOTE 3)
- CONCEPTUAL SEDIMENT PIPELINE ROUTE

NOTES:

1. AERIAL IMAGERY FROM BING MAPS © 2023 MICROSOFT CORPORATION © 2023 MAXAR © CNES (2023) DISTRIBUTION AIRBUS DS.
2. LOCATION FOR SEDIMENT DEWATERING IS CONCEPTUAL ONLY FOR THE PURPOSES OF ILLUSTRATING A POTENTIAL PIPELINE ROUTE. DESIGN DETAILS RELATED TO SEDIMENT DEWATERING WILL BE PRESENTED IN A SEPARATE DOCUMENT.
3. LIMIT OF UDF GRADING IS BASED ON INFORMATION INCLUDED IN THE FEBRUARY 28, 2024 *UPLAND DISPOSAL FACILITY FINAL DESIGN PLAN* AND ARE SUBJECT TO MODIFICATION IN THE FORTHCOMING REVISED UPLAND DISPOSAL FACILITY FINAL DESIGN PLAN.

0 300' 600'

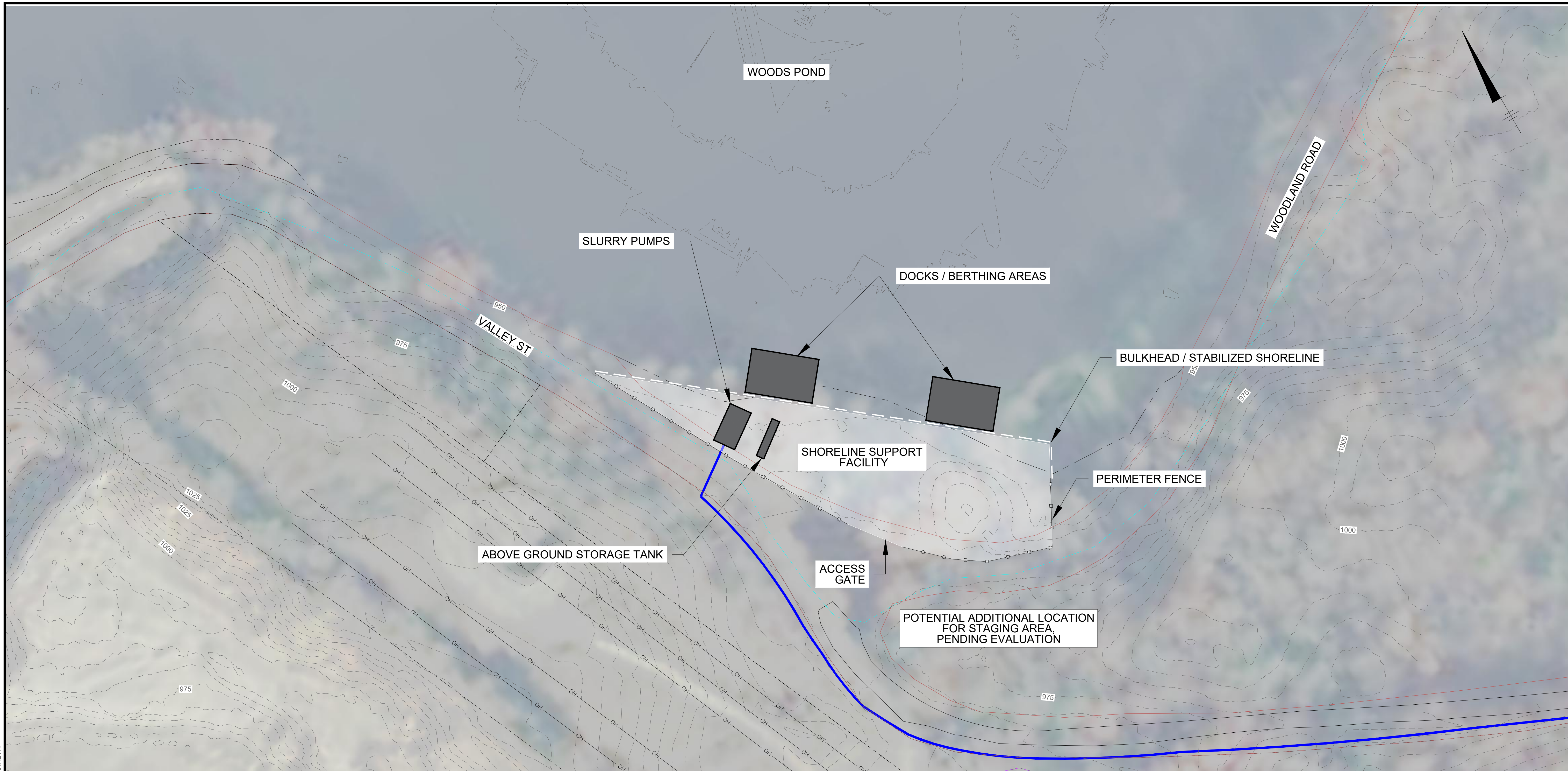
GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
HYDRAULIC TRANSPORT EVALUATION FOR REACH 6

CONCEPTUAL SEDIMENT TRANSPORT LAYOUT PLAN

ARCADIS

FIGURE
2-1



0 100' 200'
GRAPHIC SCALE

EXISTING FEATURES LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- ELEVATION CONTOUR (5-FOOT INTERVAL)
- EDGE OF ROAD
- OH OVERHEAD WIRES
- FEMA 100-YEAR-DESIGNATED FLOOD BOUNDARY (APPROXIMATE)

DESIGN FEATURES LEGEND

- CONCEPTUAL SEDIMENT PIPELINE ROUTE

NOTES:

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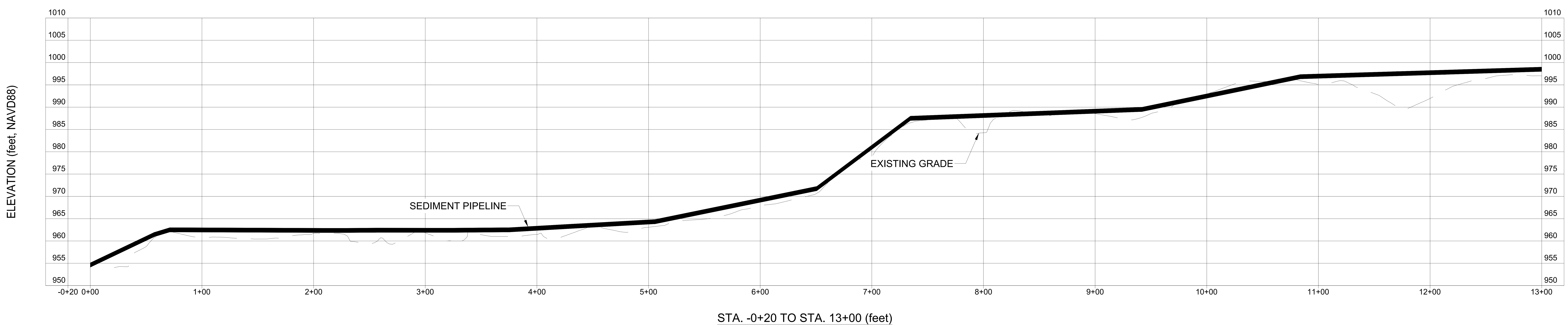
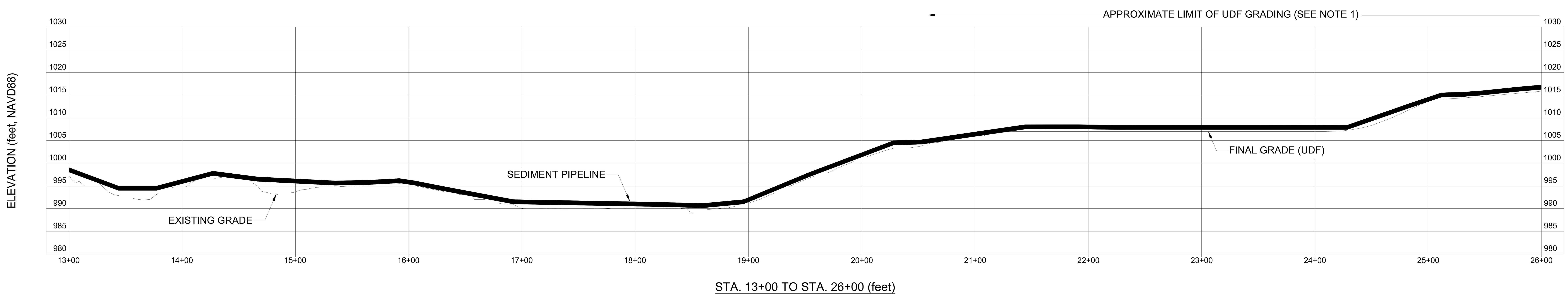
GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
HYDRAULIC TRANSPORT EVALUATION FOR REACH 6

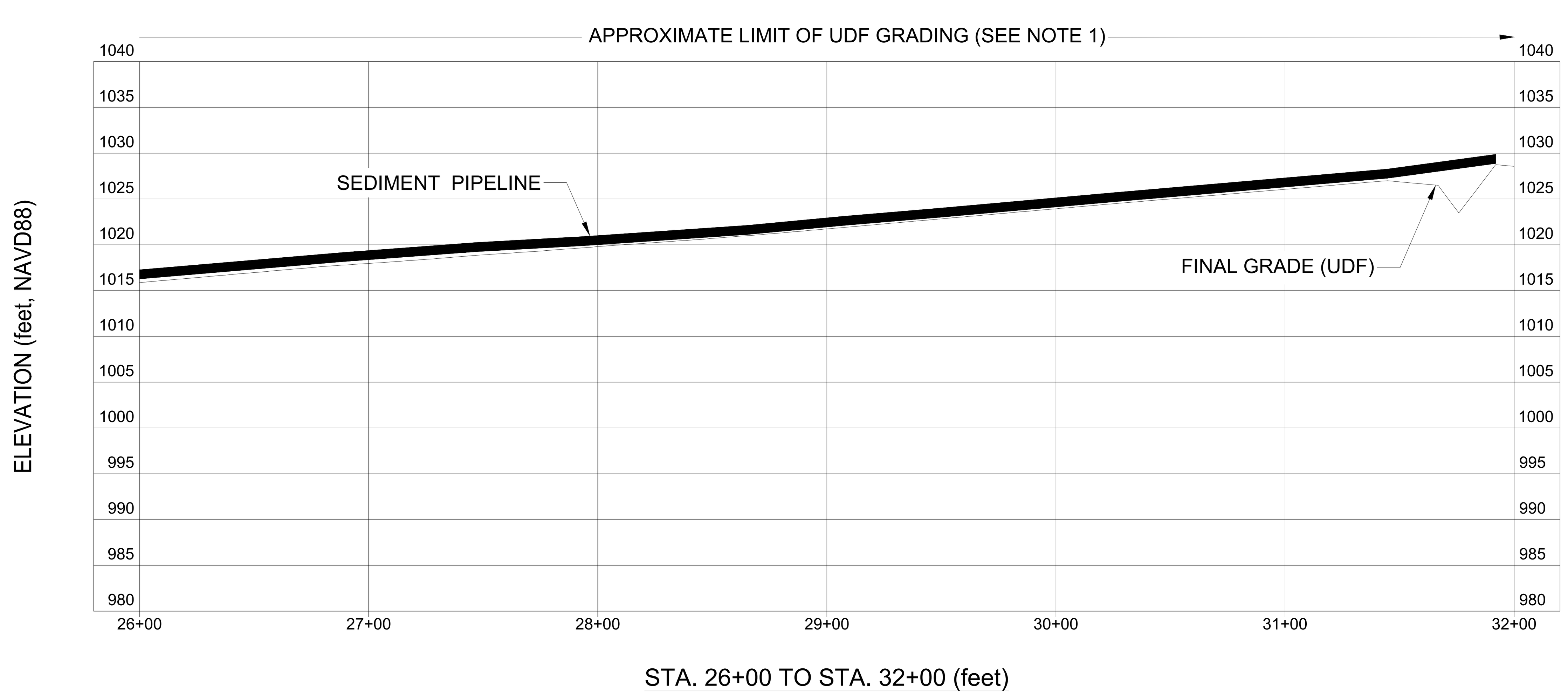
CONCEPTUAL SHORELINE SUPPORT FACILITY LAYOUT PLAN

ARCADIS

FIGURE
3-1

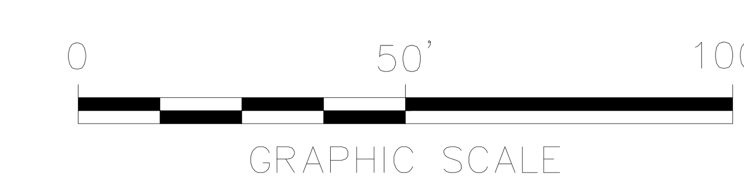






NOTE:

1. LIMIT AND ELEVATION OF UDF GRADING IS BASED ON INFORMATION INCLUDED IN THE FEBRUARY 28, 2024 UPLAND DISPOSAL FACILITY FINAL DESIGN PLAN AND ARE SUBJECT TO MODIFICATION IN THE FORTHCOMING REVISED UPLAND DISPOSAL FACILITY FINAL DESIGN PLAN.



GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
HYDRAULIC TRANSPORT EVALUATION FOR REACH 6

CONCEPTUAL SEDIMENT PIPELINE ROUTE PROFILE

ARCADIS

FIGURE
3-2

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Appendix F
Supplemental Data Collection Work Plan for Reach 6

October 2024
Housatonic River – Rest of River

Supplemental Data Collection Work Plan for Reach 6

Prepared for General Electric Company

October 2024
Housatonic River – Rest of River

Supplemental Data Collection Work Plan for Reach 6

Prepared for
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TABLE OF CONTENTS

FIGURES

ABBREVIATIONS

ASTM	ASTM International
BRA	Baseline Restoration Assessment
CD	Consent Decree
Conceptual RD/RA Work Plan	*Conceptual Remedial Design/Remedial Action Work Plan for Reach 6*
DGPS	differential global positioning system
DQO	data quality objective
EA	Exposure Area
EPA	U.S. Environmental Protection Agency
Final Revised SOW	*Final Revised Rest of River Statement of Work*
FSP/QAPP	*Revised Field Sampling Plan/Quality Assurance Project Plan*
FUSA	Frequently Used Subarea
GE	General Electric Company
HHRA	*Human Health Risk Assessment*
kg	kilogram
mg	milligram
NAVD88	North American Vertical Datum of 1988
PCB	polychlorinated biphenyl
PDI	pre-design investigation
RCRA	Resource Conservation and Recovery Act
Reach 6 BRA Report	*Baseline Restoration Assessment Report for Reach 6*
Reach 6 PDI Summary Report	*Pre-Design Investigation Summary Report for Reach 6*
Revised Final Permit	Revised Final Resource Conservation and Recovery Act Permit Modification
RFI	RCRA Facility Investigation
ROR	Rest of River
SDC Work Plan	*Supplemental Data Collection Work Plan for Reach 6*
SOP	standard operating procedure
SPT	standard penetration testing
TCLP	toxicity characteristic leaching procedure
TOC	total organic carbon
UDF	Upland Disposal Facility
WWTP	Wastewater Treatment Plant

1 Introduction

1.1 Background

In accordance with the final revised modification of the Resource Conservation and Recovery Act Corrective Action Permit (Revised Final Permit) issued by the U.S. Environmental Protection Agency (EPA) to the General Electric Company (GE) for the Housatonic Rest of River (ROR) (EPA 2020) and GE's *Final Revised Rest of River Statement of Work* (Final Revised SOW; Anchor QEA et al. 2021) under the Revised Final Permit, GE conducted a pre-design investigation (PDI) of Reach 6 of the ROR between August 2023 and November 2023. After implementation of the field investigations and receipt and validation of associated analytical data, GE has prepared and is submitting a *Pre-Design Investigation Summary Report for Reach 6* (Reach 6 PDI Summary Report; Anchor QEA 2024). In addition, as required by the Revised Final Permit and Final Revised SOW, GE has prepared a *Conceptual Remedial Design/Remedial Action Work Plan for Reach 6* (Conceptual RD/RA Work Plan).

Section 4.2.3.1 of the Final Revised SOW states that if the findings or results of the PDI activities indicate that additional sampling is necessary to further supplement the available data, or if additional data needs are identified during development of the Conceptual RD/RA Work Plan for a given remediation area, a supplemental data collection work plan will be submitted to EPA for review and approval prior to implementing such supplemental investigations. GE has determined that supplemental data collection is necessary to support the remedial design for Reach 6. This *Supplemental Data Collection Work Plan for Reach 6* (SDC Work Plan) presents GE's proposal for those supplemental investigations and is provided as an appendix to the Conceptual RD/RA Work Plan.

1.2 Description of Reach 6

Under the Consent Decree (CD) for the GE-Pittsfield/Housatonic River Site (EPA and GE 2000), the ROR is defined as the portion of the Housatonic River and its backwaters and floodplain (excluding Actual/Potential Lawns as defined in the CD) located downstream of the confluence of the East and West Branches of the Housatonic River (the Confluence). Reaches 5A through 5C of the ROR begin at the Confluence, and Reach 6 begins approximately 10 miles downstream of the Confluence and extends through Woods Pond to Woods Pond Dam.

Woods Pond is an impounded waterbody formed by the construction of Woods Pond Dam in the late 1800s. Woods Pond is approximately 0.2 mile in length and has a surface area of approximately 53.6 acres. In addition to Woods Pond proper, Reach 6 includes an approximately 12.6-acre portion of the headwaters leading into Woods Pond (referred to in this work plan as the headwaters or transition zone), a 3.7-acre outlet channel leading to the dam, and the associated floodplain extending to the 1 milligram per kilogram (mg/kg) PCB isopleth (Figure 1-1).[1]

Water can bypass the dam via the raceway and discharges back in the Housatonic River approximately 360 feet downstream of the dam over stoplogs that control the water level in the raceway. Stoplogs can be added or removed to raise or lower the water level in the raceway. Just before the stoplogs, the raceway is connected to a pond (known as Valley Mill Pond) via a culvert (Figure 1-1). While technically located in Reach 7A, Valley Mill Pond (approximately 4.6 acres) is hydraulically connected to Reach 6; therefore, as described in the Conceptual RD/RA Work Plan, GE has elected to include Valley Mill Pond as part of the scope of conceptual design for Reach 6.

Within Reaches 5 and 6 (i.e., between the Confluence and Woods Pond Dam), the CD defines the ROR site boundary as the floodplain area extending laterally to the 1 mg/kg PCB isopleth, which corresponds approximately to the 10-year floodplain. The floodplain in Reach 6 is relatively narrow, generally extending no more than 50 to 150 feet from the pond shoreline (see Figure 1-2). EPA's *Human Health Risk Assessment* (HHRA; EPA 2005) divided the ROR floodplain into 90 Exposure Areas (EAs) for the assessment of direct human contact with floodplain soils.[2] Of the 90 EAs identified in the HHRA, five are located wholly or partially within Reach 6 (EAs 56 through 60), as shown on Figure 1-2. EAs 56 and 57 are located partially within Reach 5C but were fully characterized as part of the Reach 6 PDI. Three of the five EAs in Reach 6 contain subareas based on distinct exposure scenarios; they are EAs 56a, 59a, and 60a. In addition, three of the EAs in this reach (EAs 58, 59, and 60) contain Frequently Used Subareas (FUSAs) identified in the *Housatonic River – Rest of River, Revised Corrective Measures Study Report* (Arcadis et al. 2010). Finally, there are two vernal pools in the area (located in EA 57).

1.3 Reach 6 Remedial Action Overview

Remediation in Reach 6 will include removal and capping of sediments in Woods Pond, the outlet channel, and Valley Mill Pond and removal of floodplain soils to the extent required by the applicable Performance Standards in the Revised Final Permit. Soil and sediment excavated from the Reach 6 remediation areas will be subject to disposal at an on-site Upland Disposal Facility (UDF) or at an off-site disposal facility in accordance with the requirements specified in Attachment E to the Revised Final Permit.

[1] As discussed in the Conceptual RD/RA Work Plan, that work plan covers Woods Pond, the outlet channel, and the associated floodplain, but does not include design details for the headwaters transition zone, which will be addressed in a later addendum to the Final RD/RA Work Plan for Reach 6.

[2] Although those EAs were initially defined by EPA starting with property boundaries, the EAs covered by the Revised Reach 6 PDI Work Plan are limited to the portions of the floodplain between the edge of the Housatonic River and the ROR floodplain boundary (i.e., the 1 mg/kg isopleth).

The Conceptual RD/RA Work Plan provides a description of the conceptual approach for performing the sediment dredging, floodplain soil remediation, and material handling activities for Reach 6. It explains that the sediments in Reach 6 will be hydraulically dredged and pumped from a shoreline support facility on the Woods Pond shoreline to the UDF for disposal there or, where necessary, transferred from the UDF to a rail loading area near Woods Pond (referred to as the Woods Pond Spur) for off-site transport and disposal. That work plan does not include the subsequent sediment capping components of the remedy, which will be addressed in a future addendum to the Final RD/RA Work Plan following the completion of upstream sediment removal.

For the remediation activities described in the Conceptual RD/RA Work Plan, supplemental data collection (the subject of this work plan), cultural resources investigations, and additional design evaluations are necessary and will be conducted as part of the final design process. As noted in the Conceptual RD/RA Work Plan, once those activities have been completed and the associated reports have been submitted and approved, GE will submit a Final RD/RA Work Plan that includes a detailed description of the design and implementation of the remedial activities for Reach 6.[3]

1.4 Summary of Completed PDI and Related Activities

In accordance with the Revised Final Permit, GE was required to prepare a PDI work plan for the collection of pre-design data to be used to support the remedial activities in the ROR. In Reach 6, the PDI activities to be conducted were presented in the *Revised Pre-Design Investigation Work Plan for Reach 6* (Revised Reach 6 PDI Work Plan; Anchor QEA 2023a). PDI activities included bathymetric surveys, a shoreline structures and utility survey, sediment sampling and analysis in Reach 6 aquatic areas, and soil sampling and analysis in the floodplain EAs.[4] The PDI scope did not include any data collection in Valley Mill Pond. The activities and results of the Reach 6 PDI are described in the Reach 6 PDI Summary Report, which is being submitted concurrently with the Conceptual RD/RA Work Plan.

In addition to the PDI activities, in accordance with GE's *Revised Baseline Restoration Assessment Work Plan for Rest of River Reaches 5B Through 8* (AECOM 2023a), GE has conducted a baseline restoration assessment (BRA) of Reach 6. The results of that assessment are presented in a *Baseline Restoration Assessment Report for Reach 6* (Reach 6 BRA Report; AECOM 2024), which is also being submitted concurrently with the Conceptual RD/RA Work Plan. The Reach 6 BRA Report includes a description of the pre-remediation conditions and functions of the Woods Pond bottom habitat, the aquatic habitat in the headwaters transition zone and outlet channel, and the floodplain and vernal

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[3] As noted above, a later addendum or addenda to the Final RD/RA Work Plan will present the Reach 6 capping design and the design for remediation of the Woods Pond headwaters area.

[4] Following submission of the Revised Reach 6 PDI Work Plan, adjustments and additions were made to the proposed floodplain soil PCB sampling locations to account for updated mapping of "super habitats" (i.e., grouped habitats that have similar characteristics). The updated super habitat mapping and revised floodplain soil sampling locations were submitted to EPA for review and approval on July 31, 2023 (Anchor QEA 2023b). EPA approved those revisions on August 28, 2023.

pool habitats in Reach 6, as well as the habitat in Valley Mill Pond. It includes the identified occurrence of federal- or state-listed threatened or endangered species or other state-listed species and any invasive species in the areas affected by the Reach 6 remediation. The Reach 6 BRA Report includes an assessment of the habitat in three support areas—the anticipated shoreline support facility area, the temporary hydraulic pipeline route from there to the UDF, and the Woods Pond Spur rail loading/unloading area.

Further, in accordance with the Revised Final Permit and Final Revised SOW, GE has conducted an initial assessment of archaeological and historic resources in the overall ROR, including Reach 6, and the potential for those areas to contain such resources. The results of that assessment are provided in the *Revised Supplemental Phase IA Cultural Resources Assessment Report for the Housatonic Rest of River* (AECOM 2023b), which was submitted to and approved by EPA in March 2023. GE is developing a *Phase IB Cultural Resources Survey Work Plan for Reach 6*, which will describe GE's plans for investigations to determine whether the remediation and support activities described in the Conceptual RD/RA Work Plan will impact any potentially significant cultural resources. That work plan will be submitted by November 15, 2024, under a revised schedule approved by EPA.

1.5 Supplemental Data Collection Work Plan Objectives and Scope

The objective of this SDC Work Plan is to describe proposed data collection activities necessary to supplement the existing data and provide additional information to support the final design for Reach 6 (excluding the capping components and the headwaters transition zone). As described in the remainder of this work plan, the scope of the supplemental data collection will generally include the following additional activities:

- Sediment probing and sampling to characterize sediment depth and PCB concentrations in Valley Mill Pond to further evaluate the sediment removal, transport, and disposal approach for Valley Mill Pond;
- Supplemental floodplain soil sampling in four EAs to improve PCB characterization and further delineate the extent of the 1 mg/kg isopleth;
- Additional sediment sampling in Woods Pond, the outlet channel, and Valley Mill Pond for analysis by the toxicity characteristic leaching procedure (TCLP) to support waste disposal characterization;
- Additional sediment probing to gather supplemental sediment thickness data in the outlet channel and in nearshore areas of Woods Pond to support sediment removal evaluations;
- Additional geotechnical investigations to provide information and data on the conditions within and along Woods Pond, in the outlet channel, and in Valley Mill Pond to support further dredge slope stability evaluations during final design and to evaluate geotechnical properties of the soil in the area where the shoreline support facility is proposed;

- Bathymetric surveys of the outlet channel and Valley Mill Pond to further characterize sediment surface elevations and water depths to support the sediment removal design;
- Field surveys to gather topographical data at remediation areas, at the proposed shoreline support facility area, along nearby roads anticipated for use during construction, along the temporary pipeline route from the shoreline support facility to the UDF, at locations where shoreline structures and utilities have been identified, and at the Woods Pond Spur rail loading/unloading area, as well as in the area surrounding Valley Mill Pond and the inlet channel downstream of the Woods Pond Dam;
- Field surveys to better delineate the shoreline around Woods Pond, the outlet channel, and Valley Mill Pond;
- Visual assessment of the proposed shoreline support facility area and the proposed pipeline route to the UDF, as well as nearby roads, to document existing conditions and assess constructability considerations;
- Surveys to document the locations and elevations of utilities and structures that may impact or be impacted by the Reach 6 remediation and support activities;
- Surface water elevation measurements to assess groundwater seepage for Valley Mill Pond as an initial step to support potential cap design evaluations for the pond;[5] and
- Outreach to utility owners, owners of shoreline structures, and river and groundwater users within Reach 6 and immediately downstream in Reach 7A to gather supplemental information to support final design evaluations, evaluate the available electrical power supply at and near the proposed shoreline support facility, facilitate an evaluation of the potential impacts that remediation and support activities may have on nearby structures or utilities, and determine any required setbacks from sensitive structures or utilities.

1.6 Plan Organization

The remainder of this SDC Work Plan is organized into the following sections:

- Section 2 presents the data quality objectives (DQOs) for the supplemental data collection activities.
- Sections 3 through 7 describe the supplemental data collection activities organized by topic.
- Section 8 describes the schedule and reporting for the supplemental data collection activities.
- Section 9 lists the references cited in this document.

[5] If it is determined that a sediment cap will be installed in Valley Mill Pond, additional data will need to be collected in a second supplemental phase to support design of the cap. This additional data collection would include data on porewater PCB concentrations and potentially direct measurements of groundwater seepage rates for use in estimating dissolved-phase PCB mass flux from sediments. See Section 6.

2 Data Quality Objectives

Specific DQOs for the Reach 6 supplemental data collection program are as follows:

DQO 1. Characterize sediment PCB concentrations and obtain sediment thickness data within Valley Mill Pond to evaluate the sediment dredging, transport, and disposal design.

DQO 2. Refine PCB characterization in the preliminary remediation footprint for EA 58 and the FUSA portion of EA 59.

DQO 3. Refine the 1 mg/kg PCB isopleth boundary at specific locations for EAs 56, 58, and 59 where PCBs were detected during the Reach 6 PDI above 1 mg/kg at the existing 1 mg/kg isopleth.

DQO 4. Provide additional data to characterize PCBs in the FUSA portion of EA 60a.

DQO 5. Characterize sediment TCLP constituent concentrations to determine whether materials designated for disposal at the UDF constitute characteristic RCRA hazardous waste.

DQO 6. Obtain supplemental sediment thickness data in the outlet channel and in nearshore areas of Woods Pond to support sediment removal evaluations.

DQO 7. Obtain geotechnical information in Woods Pond and the outlet channel and in upland areas to support dredge slope stability assessments and design of the shoreline support facility.

DQO 8. Obtain data on geotechnical properties of sediment within Valley Mill Pond to support the sediment removal and handling design evaluations.

DQO 9. Obtain supplemental bathymetric survey data in the outlet channel and bathymetric data in Valley Mill Pond.

DQO 10. Obtain topographical data for the preliminary floodplain remediation areas, at the proposed shoreline support facility area, along nearby roads anticipated for use during construction, along the temporary pipeline route from the shoreline support facility to the UDF, and at the Woods Pond Spur rail loading/unloading area, as well as in the area surrounding Valley Mill Pond and the inlet channel downstream of the Woods Pond Dam.

DQO 11. Obtain survey data to delineate the shoreline around Woods Pond, the outlet channel, and Valley Mill Pond that will be used to define the limits of the sediment remediation polygon and the edge of the floodplain.

DQO 12. Provide a visual assessment of the proposed shoreline support facility area and the proposed pipeline route, as well as nearby roads, to document existing conditions and assess constructability considerations.

DQO 13. Map and define the locations and footprints of existing shoreline structures and utilities that could impact or be impacted by the Reach 6 remediation and support activities.

DQO 14. Obtain surface water elevation data to assess groundwater seepage for Valley Mill Pond as an initial step to support potential cap design evaluations for that pond.

DQO 15. Gather information from utility owners, owners of shoreline structures, and river and groundwater users (i.e., the Town of Lenox Wastewater Treatment Plant [WWTP] discharge and the two nearby industrial water users) within Reach 6 and immediately downstream in Reach 7A to support final design evaluations, evaluate the available electrical power supply at and near the shoreline support facility, facilitate an evaluation of the potential impacts that remediation and support activities may have on these nearby structures/utilities, and determine any required setbacks from sensitive structures or utilities.

3 Supplemental Characterization Sampling

This section describes proposed supplemental sediment and soil characterization activities to support the final design for Reach 6, which will include the following: (1) sediment sampling within Valley Mill Pond, which was not characterized as part of the Reach 6 PDI (DQO 1); (2) soil sampling in certain floodplain EAs where PCBs were detected during the Reach 6 PDI above 1 mg/kg at the existing 1 mg/kg isopleth and where additional PCB characterization is needed to support the remedial design (DQO 2, DQO 3, and DQO 4); (3) waste characterization sampling for non-PCB constituents (DQO 5); and (4) sediment probing in Woods Pond and the outlet channel to gather sediment thickness data (DQO 6).

3.1 Sediment and Floodplain PCB Characterization Sampling

Comprehensive characterization of sediment PCBs in Woods Pond was completed in accordance with the Revised Reach 6 PDI Work Plan. No additional sediment PCB characterization in Woods Pond is necessary. However, PCB characterization of sediment in Valley Mill Pond and supplemental floodplain PCB characterization are proposed as detailed in the following subsections. Results from the existing and proposed Reach 6 PCB characterization will also be used for waste characterization purposes.

3.1.1 Valley Mill Pond Sediment

GE has elected to include Valley Mill Pond as part of the scope of conceptual design for Reach 6. The decision to include this area as part of the Reach 6 Remediation Unit was made after completion of the Reach 6 PDI; therefore, no contemporary sediment PCB concentration data exist for this area. As stated in Section 2.2.2 of the Conceptual RD/RA Work Plan, the Revised Final Permit did not establish specific Performance Standards or other requirements for Valley Mill Pond; therefore, GE has elected to evaluate it against the Performance Standards for backwaters given that this area is separate from, but hydraulically connected to, the main river channel. Accordingly, to address DQO 1, sediment samples will be collected in accordance with Section II.B.2 of the Revised Final Permit, which requires collection of backwater sediment PCB samples on a 50-foot grid. This results in PCB sampling at a total of 65 locations in Valley Mill Pond, as shown on Figure 3-1. At each location, sediment cores will be collected to a total depth of five feet, and each core will be segmented into a 0- to 1-foot depth interval (65 samples) (since the Performance Standards for surface sediments in backwaters apply to the top one foot) and six-inch intervals between one and five feet (520 samples), resulting in a total of 585 samples. Samples within the top three feet of each such core will be analyzed initially for PCBs (325 samples), and samples collected from lower depths will be held for potential future analysis if necessary based on the results from the top three feet.

Sediment sampling and processing in Valley Mill Pond will be performed following the sediment sample collection methodology detailed in Appendix C2 (SOP for Sediment Probing, Coring, and

Sample Collection) of GE's December 2023 *Revised Field Sampling Plan/Quality Assurance Project Plan* (FSP/QAPP) (Arcadis 2023). Samples will be analyzed for PCB as Aroclors using EPA Method 8082 and total organic carbon (TOC) by the Lloyd Kahn Method. PCB analytical detection and reporting limits are presented in Table 6A of the FSP/QAPP. The sampling crew will locate proposed sediment sampling locations using a differential global positioning system (DGPS). It may be necessary to make small adjustments to some of the target sampling locations based on conditions encountered in the field. In the event that any more significant adjustments to target sampling locations are necessary, they will be discussed with and approved by the EPA field representative.

3.1.2 Floodplain Soil

Supplemental floodplain soil sampling is proposed in Reach 6 as described below.

Based on the floodplain soil PCB characterization completed as part of the Reach 6 PDI, as documented in the Reach 6 PDI Summary Report and Conceptual RD/RA Work Plan, the only exposure point concentrations in the identified EAs that exceed the Primary Performance Standard are those in EA 58 and the FUSA portion of EA 59. Floodplain soil sampling is proposed to further refine the extent of soil remediation required in these two areas (DQO 2). Elevated PCBs were measured in the 0- to 1-foot interval in the western portion of EA 58, with a sharp concentration gradient from the maximum PCB concentration (143 mg/kg) in the samples east and west of it. Two supplemental cores will be collected from the top foot to better characterize PCBs in this area, as shown on Figure 3-2b. Elevated PCB concentrations were also measured in a historical sample in the northwestern corner of EA 59. Two supplemental cores will be collected from the top foot in this area, one on either side of the trail, to better characterize PCBs in this area, as shown on Figure 3-2c.

Floodplain soil sampling will also be conducted to further delineate the extent of the 1 mg/kg PCB isopleth at specific locations for EAs 56, 58, and 59 (DQO 3), as shown on Figures 3-2a through 3-2c. This supplemental sampling will include the collection of one core in EA 56, two cores in EA 58, and one core in EA 59. Each core will be collected from the top foot.

In addition, supplemental floodplain soil sampling will be conducted to improve PCB characterization in the FUSA in EA 60a (DQO 4). As described in Section 2.3.1 of the PDI Summary Report, there is only one PDI sample location available to characterize PCBs in that FUSA; a second location that was proposed in the Revised Reach 6 PDI Work Plan was in a heavily wooded area and was not able to be collected. Therefore, one additional core location will be collected to a depth of three feet at the eastern end of this area, as shown on Figure 3-2d.

The soil samples will be collected in 0.5-foot intervals to a depth of one foot below ground surface and in one-foot intervals from one to three feet below ground surface for the core in the EA 60a FUSA, in accordance with the protocols established in Appendix D1 of the FSP/QAPP (SOP for Soil

Coring and Sample Collection). Samples will be analyzed for PCB as Aroclors using EPA Method 8082 with analytical detection and reporting limits presented in Table 6A of the FSP/QAPP.

3.2 Sediment Waste Characterization Sampling

As described in Section 5.6.1 of the Conceptual RD/RA Work Plan, none of the sediment samples collected during the Reach 6 PDI were analyzed for TCLP parameters for disposal characterization. A determination as to the need for this characterization was deferred until after completion of the conceptual design for Reach 6. As summarized in Section 4.5 of the Conceptual RD/RA Work Plan, the sediments to be removed from Woods Pond and the outlet channel and some of the sediments to be removed from Valley Mill Pond will be disposed of in the UDF. Attachment E to the Revised Final Permit provides that, for the purposes of determining whether materials designated for the UDF constitute characteristic RCRA hazardous waste, GE may use existing relevant ROR data from GE's RCRA Facility Investigation (RFI) and apply the "20 times rule."[6] GE has conducted screening of existing ROR sediment and floodplain soil data, including RFI data located in Reach 6, using the "20 times rule" for non-PCB constituents to evaluate whether sediments and soils designated for removal may be considered RCRA hazardous waste. This screening indicated that characteristic RCRA hazardous waste would not be expected in the ROR, including Reach 6. Nonetheless, to confirm that conclusion for Reach 6, GE has elected to collect additional sediment samples within the Reach 6 dredge area for analysis by the TCLP (DQO 5).

One full-depth composite sediment sample will be collected at each of 12 locations distributed throughout Woods Pond and the outlet channel. Specifically, a single sediment core will be collected at each location to the depth of the conceptual dredge prism at that location. Sediment core locations are shown on Figure 3-3. In addition, one sediment core will be collected at each of two locations from within Valley Mill Pond (shown on Figure 3-1) from the top three feet of sediment for TCLP analysis. At each of the 14 sample locations, a single composite sediment sample will be generated as a full-depth composite using the sediment compositing procedures described in Appendix C1 of the FSP/QAPP (SOP for Surface Sediment Probing and Sample Collection). Samples will be submitted for TCLP analysis of metals (by SW846 6010D/7470A), semivolatile organic compounds (by SW846 8270E), pesticides (by SW846 8081B), volatile organic compounds (by SW846 8260D), and herbicides (by SW846 8151A).

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[6] Under this rule, the in-situ sample results for constituents that could cause materials to be hazardous waste (expressed as mg/kg or parts per million) are divided by 20, changing the reporting units from milligrams per kilogram to micrograms per liter, and the converted results are compared to the allowable extract toxicity characteristic concentration limits in 40 Code of Federal Regulations § 261.24. Materials that are determined through this screening evaluation to have concentrations within those allowable regulatory limits will not be considered RCRA hazardous waste (so long as there is no basis for believing that the material would constitute hazardous waste on other grounds).

3.3 Sediment Probing

Supplemental probing in Woods Pond and the outlet channel and comprehensive probing in Valley Mill Pond will be conducted to delineate contact between soft sediments and underlying, more competent strata, as described below. All probing will be performed in accordance with the procedures specified in Appendix C1 of the FSP/QAPP (SOP for Surface Sediment Probing and Sample Collection). In summary, sediment probing will be conducted from a shallow draft vessel (where possible) or by wading in shallow-water areas. Probing will be performed utilizing a small-diameter (less than 0.5-inch) steel rod advanced manually through the sediment to refusal. Probing will be performed at a minimum of three locations within each grid cell to evaluate whether the refusal is a function of the soil substrate or is caused by buried debris. Additional rod lengths will be available to accommodate deep water and/or thick sediment deposits. A standard survey rod (approximately two inches in diameter) will be used to measure water depth and identify the sediment-water interface. During all probing activities, the horizontal coordinates of the probing location, water depth, sediment thickness, sediment type (e.g., sand, silt, gravel), date, time, and any pertinent visual observations will be recorded. Horizontal position data will be collected with a DGPS capable of sub-foot accuracy.

3.3.1 Outlet Channel and Woods Pond Nearshore Areas

Sediment probing in Woods Pond was completed during the PDI in accordance with the Revised Reach 6 PDI Work Plan and is described in the Reach 6 PDI Summary Report. However, it was determined that additional probing is needed in the outlet channel to further evaluate the presence and thickness of sediment in that area (DQO 6). Probing in the outlet channel will be conducted at least every 15 feet across the channel along transects spaced 100 feet apart, as shown on Figure 3-4.

In addition, supplemental probing is proposed in radial probing arrays within Woods Pond along the perimeter of the northern, southern, and eastern sides of the pond in the anticipated areas of the dredge slopes to better define the thickness of soft (organic) sediment and depth to glacial soil contact (DQO 6). Probing will be conducted at least every 25 feet along selected transects, as shown on Figure 3-4. The probing in Woods Pond will be conducted concurrently with vane shear testing as described in Section 4.1.1.

3.3.2 Valley Mill Pond

Sediment probing in Valley Mill Pond will be conducted to gain a general understanding of sediment thickness and sediment texture (DQO 1). Sediment probing will be conducted at the same sediment PCB sampling grid locations described in Section 3.1.1. Probing will be performed at a minimum of three locations near each sediment sampling location. This probing will be used initially to map the approximate sediment thickness at various locations throughout Valley Mill Pond, to evaluate the likelihood of obtaining the desired sediment sample collection depth at the target sampling locations described in Section 3.1.1, and to determine whether any modifications to the sampling approach or equipment are necessary. Sediment probing will be conducted in advance of sediment sample collection; however, the probing information will not be used to eliminate any of the proposed target sampling locations or depths in advance. Subsequent to sampling, the sediment probing data collected will be used in conjunction with data gathered during the sediment core collection described in Section 3.1.1 to determine the sediment thickness in support of the remedial design.

Probing will also be completed within the bypass channel between Woods Pond Dam and the culvert and in the channel south of the culvert leading to Valley Mill Pond. Probing will be completed at intervals across the channel along transects spaced 50 feet apart to evaluate the depth of sediment in these areas.

4 Supplemental Geotechnical Characterization

4.1 Sediment Geotechnical Characterization

4.1.1 Woods Pond

As part of the Reach 6 PDI, a subset of sediment samples collected in the headwaters transition zone, Woods Pond proper, and the outlet channel were analyzed for geotechnical index parameters, including moisture content, organic content, specific gravity, Atterberg limits, particle size, and dry bulk density. In addition to samples collected for index testing, eight relatively undisturbed samples were collected for laboratory strength testing to augment in-situ strength data collected during vane shear testing. To better define the transition between soft sediment and the underlying more competent substrate at planned dredge slopes around the northern, southern, and eastern sides of Woods Pond, supplemental data collection will include additional in-situ vane shear testing (DQO 7). In-situ vane shear testing locations will be conducted concurrently with the supplemental probing in nearshore portions of Woods Pond (described in Section 3.3.1). Vane shear testing will be conducted at a minimum of three locations along each transect shown on Figure 3-4. The vane shear testing will be performed in one-foot increments using a hand-held vane shear test apparatus. Vane shear testing will be conducted in general accordance with ASTM International (ASTM) D2573/D2573M and the standard operating procedure provided in Appendix M of FSP/QAPP (SOP for Vane Shear Testing).

4.1.2 Valley Mill Pond

To support geotechnical evaluations associated with the Valley Mill Pond (DQO 8), geotechnical data will be collected as detailed below. All sampling and analysis will be completed in accordance with the procedures specified in the FSP/QAPP.

4.1.2.1 Soil/Sediment Properties

A subset of the sediment samples collected in Valley Mill Pond, as described in Section 3.1.1, will be analyzed for geotechnical index parameters. Specifically, 25 surface sediment samples and 25 subsurface sediment samples will be selected and submitted for analysis for the following geotechnical parameters:

- Moisture content (using ASTM D2216/D2974A);
- Organic content (using ASTM D2974);
- Particle size analysis (using ASTM D6913/D7928);
- Atterberg limits for fine-grained materials (using ASTM D4318);
- Bulk density analysis (using ASTM D7263); and

- Specific gravity analysis (using ASTM D854).

The geotechnical samples will be collected from the same core locations targeted for PCB sampling, as described in Section 3.1.1. The geotechnical samples will be collected from the full thickness of continuous geologic material types in a particular core. For example, if there is a continuous sand layer from 12 to 30 inches, the sample will be collected over that full thickness, rather than limiting the sample to a 12-inch section. Samples will not be composited from multiple core locations.

The specific samples to be subject to geotechnical analyses will be selected in the field to provide data that are spatially representative of Valley Mill Pond. Samples will also be selected to provide data for each unique geologic material type and from various sampling depths, including sediment targeted for removal and sediment that may remain after dredging. The geotechnical data will provide information regarding the sediment type and particle size distribution that will be used to evaluate sediment handling and transport methods during the remedial design.

4.1.2.2 In-Situ Vane Shear Testing

In-situ vane shear testing will be conducted within Valley Mill Pond to measure the undrained shear strength of the relatively soft, fine-grained sediments (clays and silts). The vane shear testing will be performed using a hand-held vane shear test apparatus. The vane shear testing locations will be co-located with the PCB characterization samples collected on a 50-foot sampling grid described in Section 3.1 (Figure 3-1).

The vane shear testing in Valley Mill Pond will be conducted in one-foot increments starting one foot below the existing mudline and advancing to refusal. The actual testing locations may be adjusted in the field based on observations of the material types encountered during the PCB characterization sampling. The test method is not applicable to coarse-grained sediment (i.e., sand), so it will not be performed in locations (if any) where that material type is encountered. Vane shear testing will be conducted in general accordance with ASTM D2573/D2573M and the standard operating procedure provided in Appendix M of FSP/QAPP (SOP for Vane Shear Testing).

4.2 Upland Geotechnical Characterization

Geotechnical borings will be advanced at selected upland areas to provide a general understanding of the subsurface stratigraphy and to support design evaluations (DQO 7). Approximate locations for the geotechnical locations are shown on Figure 3-4.

Geotechnical borings will be located within the proposed shoreline support facility area on the southern shore of Woods Pond to evaluate geotechnical properties of the soil in that area in support of future bulkhead design. Four geotechnical borings will be conducted at a spacing of approximately one boring every 100 feet to support the design of the shoreline support facility and the associated bulkhead. The resulting data will also be considered as part of final dredge slope stability evaluations. Additional boring locations may be added if materials are observed to be significantly different between the initial investigation locations.

In addition, two geotechnical borings will be located adjacent to the Woods Pond outlet channel to gather subsurface geotechnical data that will be evaluated to characterize the subsurface stratigraphy and to support slope stability analysis (DQO 7). Additional geotechnical borings may also be advanced depending on subsurface condition information gathered as part of the outreach activities discussed in Section 7, such as near the footbridge abutments or the railroad tracks. The geotechnical borings and related sampling and analysis will be conducted in accordance with the protocols established in the FSP/QAPP.

The geotechnical boring work at each location will follow similar procedures and will be conducted in general accordance with relevant ASTM methods for drilling, soil sampling, visual classification (using the Unified Soil Classification System), and geotechnical laboratory testing. In summary, geotechnical borings will be advanced using the appropriate drilling method for each investigation area. Standard penetration testing (SPT) will be performed in each boring starting at the ground surface and proceeding continuously in the upper 10 feet and then at five-foot intervals until the termination of the boring. SPTs will be performed using split-spoon samplers to collect disturbed soil samples for index testing. Blow counts will be recorded for each six-inch interval of the advance. In some instances, modified California samplers with six-inch brass tube liners or one-inch brass ring liners may be used to facilitate recovery of gravelly soils and to collect samples for bulk density testing. Additionally, layers of soft, fine-grained soils may be targeted for relatively undisturbed sample collection via Shelby tube or piston (Osterberg) samplers that are advanced using direct-push methods. Each boring will be advanced until refusal is encountered or as directed by the field geologist based on material conditions encountered to a maximum depth of 15 feet into till or 50 feet below ground surface, whichever is shallower. Subsurface soil samples collected from the borings will be submitted for laboratory testing.

Representative samples collected from each material type encountered during completion of the geotechnical borings will be selected for laboratory index testing for classification purposes. At least one set of index tests per soil type encountered will be performed for each boring. The index tests and their corresponding ASTM test number designations are as follows:

- Moisture content (using ASTM D2216/D2974A);
- Specific gravity (using ASTM D854);
- Bulk density (using ASTM D7263);
- Particle size analysis (using ASTM D6913);
- Atterberg limits for fine-grained soils (using ASTM D4318);
- Compaction characteristics (using ASTM D698); and

- Organic content (using ASTM D2974).

Samples will be selected for strength, seepage, and compressibility characteristics from among the relatively undisturbed samples collected using Shelby tubes. Samples deemed representative of site conditions will be utilized for testing. Tests requiring relatively undisturbed samples to inform geotechnical evaluations (e.g., slope stability, foundation design, settlement potential) are as follows:

- Unconsolidated, undrained triaxial shear strength (using ASTM D2850);
- Consolidated, undrained triaxial shear strength (using ASTM D4767);
- Consolidated, drained direct shear strength (using ASTM D3080);
- One-dimensional consolidation (using ASTM D2435); and
- Permeability (using ASTM D2434).

The actual boring locations may be adjusted based on field conditions and accessibility considerations. Coordinates of the actual geotechnical boring locations will be recorded using a DGPS.

5 Supplemental Field Surveys

This section describes the additional field surveys that will be conducted to support the final design for Reach 6. The supplemental field surveys will include the following (DQOs 9 to 13):

- A supplemental bathymetric survey of the outlet channel;
- A bathymetric survey of Valley Mill Pond;
- Topographic surveys of the preliminary floodplain remediation areas, the shoreline support facility area, along roads anticipated for use during construction, along the temporary pipeline route, and at the Woods Pond Spur rail loading/unloading area, as well as in the area surrounding Valley Mill Pond and the inlet channel downstream of Woods Pond Dam;
- Surveys to delineate the shoreline of Woods Pond, the outlet channel, and Valley Mill Pond;
- A ground-based visual assessment of support areas and nearby roads; and
- Surveys of utilities and structures that may impact or be impacted by implementation of the remediation and support activities.

All survey coordinates will be gathered and recorded using the following horizontal and vertical datums, respectively: Massachusetts State Plane, Mainland Zone; North American Datum of 1983, U.S. feet; and North American Vertical Datum of 1988 (NAVD88), U.S. feet.

5.1 Bathymetric Surveys

As described in Section 2.4 of the Revised Reach 6 PDI Work Plan, between December 2021 and May 2022, GE conducted topographic and bathymetric surveys of the riverbed and floodplain over all of Reaches 5 and 6 (i.e., from the Confluence to Woods Pond Dam), extending laterally to include the approximate 100-year floodplain and including nearby infrastructure (e.g., roads). These surveys included a single-beam bathymetric survey of Woods Pond and the outlet channel. Supplemental Woods Pond bathymetry data was collected as part of the Reach 6 PDI as described in the Reach 6 PDI Summary Report.

To augment existing bathymetry data, a supplemental bathymetric survey will be conducted along the outlet channel to provide improved resolution in that area (DQO 9). The bathymetric survey within the outlet channel will include a multibeam bathymetric survey (where water depths allow) or additional single-beam transects to reduce reliance on interpolation of the existing single-beam data between previous survey transects.

A bathymetric survey will also be conducted in Valley Mill Pond (DQO 9), including the bypass channel between Woods Pond Dam and the culvert and the channel south of the culvert leading to Valley Mill Pond. Bathymetric survey data will be collected either using single-beam sonar during higher water elevations when water depths are approximately three feet or greater, or using conventional survey methods from a shallow draft vessel. A combination of methods may be required.

5.2 Upland Topographic Surveys

Topographic surveys of the proposed floodplain remediation areas, the proposed shoreline support facility area, along roads anticipated for use during construction, along the temporary pipeline route from the shoreline support facility to the UDF, and at the Woods Pond Spur rail loading/unloading area will be conducted to document property boundaries, existing elevations, grades, and site features in support of the final design (DQO 10). These topographic surveys will be conducted by a Professional Land Surveyor licensed in the Commonwealth of Massachusetts. The locations of the proposed remediation areas, shoreline support facility, and Woods Pond Spur rail loading/unloading area are shown on figures included in the Conceptual RD/RA Work Plan. The location of the proposed temporary pipeline route from Woods Pond to the UDF is shown in Appendix E to the Conceptual RD/RA Work Plan. Topographic surveying will also be conducted in the area surrounding Valley Mill Pond and the inlet channel downstream of the Woods Pond Dam (including the culvert north of the Valley Mill Pond). The topographic surveys will document the locations of notable site features (e.g., aboveground utilities and support structures, curbs, and existing trails or pathways).

5.3 Shoreline Delineation Surveys

The Reach 6 shoreline boundary shown in the Conceptual RD/RA Work Plan was established based on field surveys conducted by Spicer Group during the Reach 6 PDI. Specifically, that boundary varies in elevation and was based on the observed water surface at the time of the PDI bathymetric surveys.

To support the final design, a topographic survey will be conducted to establish the shoreline boundary that will be used to establish the sediment remediation limits for Woods Pond, the outlet channel, and Valley Mill Pond (DQO 11). The shoreline definition will be established based on the normal pool elevation at the Woods Pond Dam, which is approximately 948.8 feet National Geodetic Vertical Datum of 1929 (or approximately 948.2 feet NAVD88) as described in the *Operation, Monitoring, and Maintenance Plan for Woods Pond Dam* (GZA 2019) and is 0.5 foot above the Woods Pond Dam spillway crest elevation of 947.7 feet NAVD88. The shoreline survey will be conducted by a Professional Land Surveyor licensed in the Commonwealth of Massachusetts to define the 948.2 feet NAVD88 contour around the perimeters of Woods Pond, the outlet channel, and Valley Mill Pond.

5.4 Visual Assessment of Proposed Support Areas and Nearby Roads

A ground-based visual assessment will be conducted at the proposed shoreline support facility location and along the proposed pipeline route to confirm the accuracy of existing topographic data, to facilitate detailed design of the shoreline support facility, and to verify constructability of the pipeline route (e.g., to rule out unforeseen conditions that may require an alteration in the pipeline route) (DQO 12). The visual assessment will also include nearby roads anticipated for use to confirm whether improvement is required before use. During the visual assessment, field documentation (e.g., photographs, video) will be gathered at the proposed shoreline facility location, along the proposed pipeline route, and along nearby roads to document existing conditions and assess constructability considerations.

5.5 Shoreline Structure and Utility Surveys

In addition to the topographic surveys described in Section 5.2, surveys will be conducted to document the locations and elevations of other known aboveground utilities and structures that may impact or be impacted by the implementation of the Reach 6 remedial action (DQO 13).

5.5.1 Woods Pond

As summarized in the Conceptual RD/RA Work Plan and the Reach 6 PDI Summary Report, several aboveground structures and utilities were identified along Woods Pond and the outlet channel. During remedial design, it will be necessary to conduct additional outreach to owners of some of these structures and utilities to evaluate whether and how the structures and utilities could impact or be impacted by the remediation or support activities, as discussed in Section 7. Additional surveys will also be conducted for some of these structures and utilities. Specifically, the footprints of the following structures and utilities identified during the Reach 6 PDI will be surveyed:

- A concrete wall (possibly old foundation) at pond's edge along the western shoreline of Woods Pond;
- A stone wall at pond's edge and building adjacent to the western shoreline of Woods Pond;
- The gravel boat ramp extending from Valley Street along the southern shoreline of Woods Pond;
- Overhead power lines traversing the western portion of Woods Pond in a northwest-southeast direction;[7]
- Seasonal roads (Valley Street and Woodland Road) located along the southern and western shorelines of Woods Pond;
- The footbridge that spans the northern end of the outlet channel and its stone abutments located on each side of the channel;
- The public access dock and boat launch area along the western shoreline of the outlet channel immediately south of the footbridge;
- The Town of Lenox WWTP outfall located along the western shore of the outlet channel; and

[7] Clearances to overhead utility power lines depend on the sag in the lines, which is influenced by air temperature; therefore, the air temperature at the time of the survey will be documented.

- A concrete wall extending from the wing wall of the dam.

Surveys will be conducted by a Professional Land Surveyor licensed in the Commonwealth of Massachusetts.

5.5.2 Valley Mill Pond

The presence and locations of observed shoreline structures and utilities will be documented during field reconnaissance activities conducted concurrently with the sediment sampling program. Survey data will be collected for any structures or utilities that are observed and could affect the remediation of Valley Mill Pond.

6 Valley Mill Pond Cap Design Data

The depth of impacted sediment in Valley Mill Pond is uncertain. Therefore, it is uncertain whether the preferred remedial approach will be complete removal (and backfill) of impacted sediment or a combination of removal and capping. A determination will be made based on the results of the PCB characterization sampling described in Section 3.1.1.

At the present time, as an initial step to support potential cap design evaluations for Valley Mill Pond, an evaluation of groundwater seepage will be made using surface water elevation measurements. Valley Mill Pond is at a higher elevation than the adjacent Housatonic River (west of Valley Mill Pond) and the nearby pond on the quarry property (east of Valley Mill Pond). This setting indicates that groundwater flow is likely in a direction away from Valley Mill Pond, following the expected hydraulic gradient in this area. As an initial step in the evaluation of groundwater seepage, surface water elevation measurements will be collected from Valley Mill Pond and the adjacent pond on the quarry property during the supplemental data collection program (DQO 14). Stage height data from the U.S. Geological Survey Lenoxdale gage located in the river just downstream of the dam will also be accessed for river elevation data.

If it is subsequently determined that the preferred remedial approach will include a sediment cap, additional data will be required in a second phase of supplemental data collection to support design of the cap, including data needed to support estimation of the dissolved-phase PCB mass flux from sediments through the cap. It is anticipated that this data collection would include data associated with porewater PCB concentrations and potentially direct measurements of groundwater seepage rates, as detailed below.

Porewater PCB concentrations would be estimated based primarily on PCB sediment data and partitioning theory. To support this, all Valley Mill Pond sediment samples analyzed for PCBs will also be analyzed for TOC, as described in Section 3.1.1. Additional data may be required to verify the relationship between PCB concentrations in sediment and those in porewater (i.e., to support site-specific partitioning relationships) as a supplement to the paired sediment and porewater PCB data collected by GE in Reach 5A. This would entail collection of supplemental samples from Valley Mill Pond for analysis of paired sediment and porewater PCBs. The need for these supplemental data will be determined following determination of the preferred remedial approach. If determined to be necessary, porewater PCB characterization in Valley Mill Pond would be performed consistent with the methods used for porewater characterization in Reach 5A (see Anchor QEA and AECOM 2022, 2024).

Further, in addition to the groundwater seepage estimates from the surface water elevation measurements described above, direct measurements of groundwater seepage rates using piezometers and/or seepage meters may be warranted, as were used extensively in Reach 5A to evaluate groundwater seepage rates in that reach. A determination as to the need for such direct measurement of groundwater seepage (via piezometers or seepage meters) will be made after the initial evaluation of whether a cap will be installed in Valley Mill Pond.

7 Utility, Structure, and Water Users Outreach

As part of the supplemental data collection program, GE will conduct outreach to obtain additional details regarding utilities and structures that have the potential to affect the Reach 6 remedial design and construction (DQO 15).

These outreach efforts will include the following activities:

- GE will identify and contact owners of property and structures adjacent to Woods Pond and Valley Mill Pond to discuss the remediation extents and potential impacts. These will include the owner(s) of the concrete wall (possibly old foundation) at the edge of Woods Pond along the western shoreline and the stone wall at the pond's edge and building adjacent to the western shoreline of Woods Pond.
- GE will identify and contact the owner of the footbridge to request record drawings and any available subsurface geotechnical information and to determine whether setbacks are necessary from the footbridge abutments.
- GE will coordinate with Eversource (formerly Western Massachusetts Electric Company) to determine the electric power supply availability at and near the proposed shoreline support facility and to determine whether sufficient power supply is available to support remediation.
- GE will contact the Housatonic Railroad Company to request record drawings and any available subsurface geotechnical information for local portions of the rail line immediately west of Woods Pond (including the anticipated Woods Pond Spur rail loading/unloading area) and the outlet channel and determine whether any setbacks or other provisions are needed.
- GE will contact local public entities to request record drawings and any available subsurface geotechnical information for local portions of Housatonic Street, Valley Street, Woodland Road, and the gravel boat ramp on Valley Street along southern shore of Woods Pond to determine whether any setbacks are needed.
- GE will contact the owner of the dock and boat launch along the outlet channel to coordinate the remediation activities and determine whether any setbacks are needed.
- GE will contact the Town of Lenox to discuss the WWTP discharge located on the western side of the outlet channel—specifically, to obtain additional details regarding the treatment plant discharge that is not in its National Pollutant Discharge Elimination System permit, understand utility depths, and determine any offset requirements.
- GE will meet with nearby river and groundwater users within Reach 6 and immediately downstream in Reach 7A (i.e., those described in Section 9 of the Conceptual RD/RA Work Plan) to gather details on the frequency and volume of river water and groundwater use and determine whether the sediment remediation work may affect those uses.

8 Schedule and Reporting

After EPA approval of this SDC Work Plan, GE will initiate the supplemental data collection activities. GE anticipates that the supplemental data collection activities described in this work plan will be conducted during 2025 after the necessary EPA approvals and subject to weather constraints. The results of the supplemental data collection activities will be summarized in a Supplemental Data Collection Report for Reach 6, which will be submitted to EPA 60 days after completion of data collection, receipt of data, and validation of the data where necessary.

9 References

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AECOM, 2023b. *Revised Supplemental Phase IA Cultural Resource Assessment Report for the Housatonic Rest of River*. Prepared for the General Electric Company, Pittsfield, Massachusetts. March 2023.

AECOM, 2024. *Baseline Restoration Assessment Report for Reach 6*. Prepared for General Electric Company. October 2024.

Anchor QEA, 2023a. *Revised Pre-Design Investigation Work Plan for Reach 6*. Housatonic River – Rest of River. Prepared for General Electric Company. May 2023.

Anchor QEA, 2023b. Regarding: Revised Reach 6 Habitat, Accessibility, and Floodplain PCB Sample Locations. Email from: Michael Werth (Anchor QEA). Email to: Joshua Fontaine (U.S. Environmental Protection Agency). July 31, 2023.

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Anchor QEA and AECOM, 2022. *Revised Pre-Design Investigation Work Plan for Reach 5A Sediment and Riverbanks*. Housatonic River – Rest of River. Prepared for General Electric Company, Pittsfield, Massachusetts. May 2, 2022.

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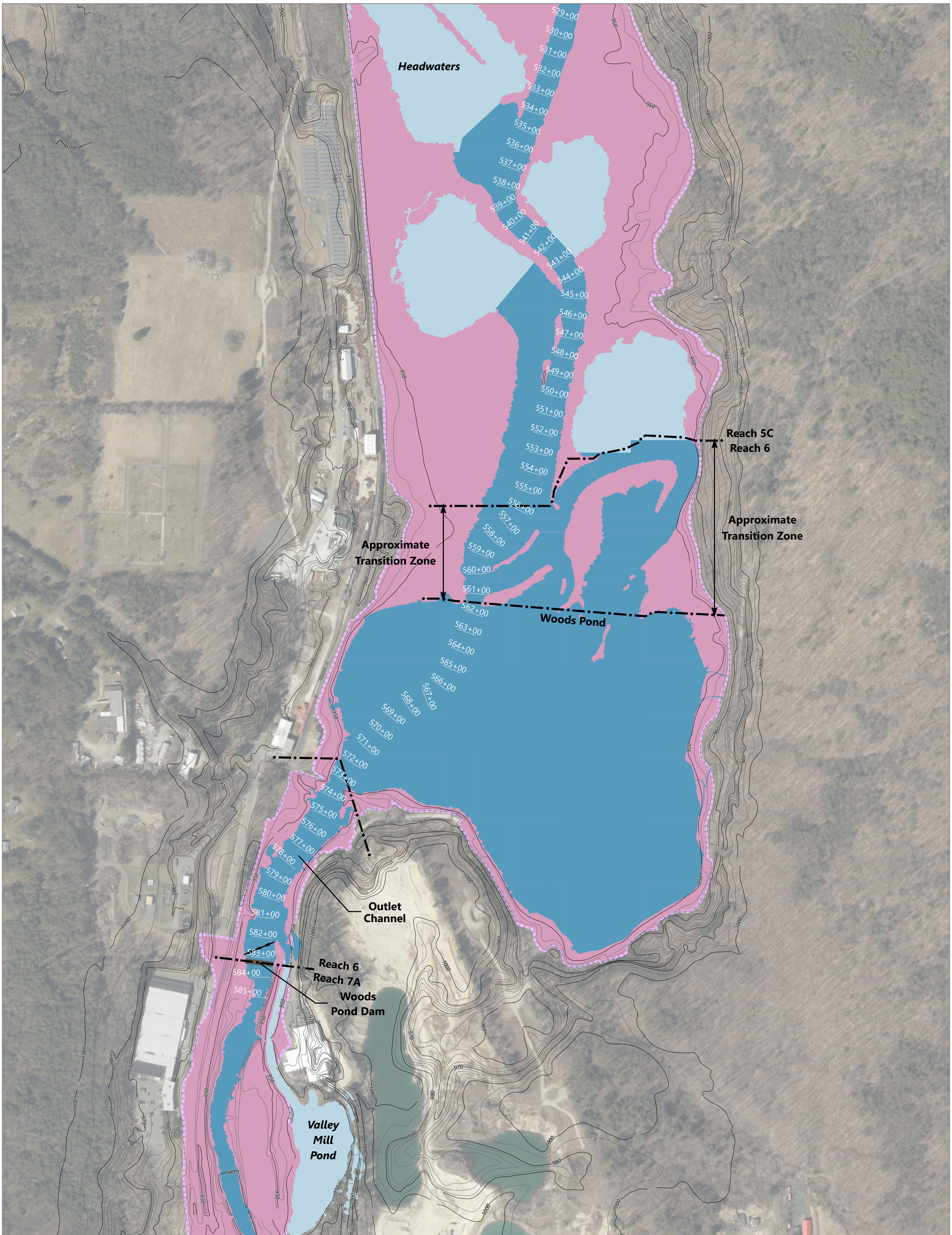
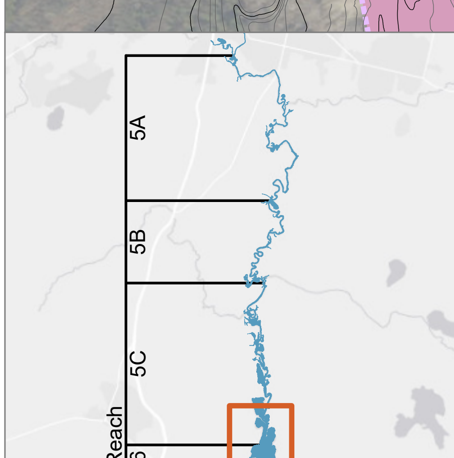
GZA (GZA GeoEnvironmental, Inc.). 2019. *Operations, Monitoring, and Maintenance Plan Woods Pond Dam – MA 00250*. Prepared for General Electric Company. June 2019.

Figures





LEGEND:

- Reach Boundaries
- Topographic Contours (2-foot)
- 0+00 River Stationing
- Backwater
- Channel
- 1 mg/kg PCB Isopleth

NOTE:
1. Aerial imagery from MassGIS 2023.

0 500
Feet

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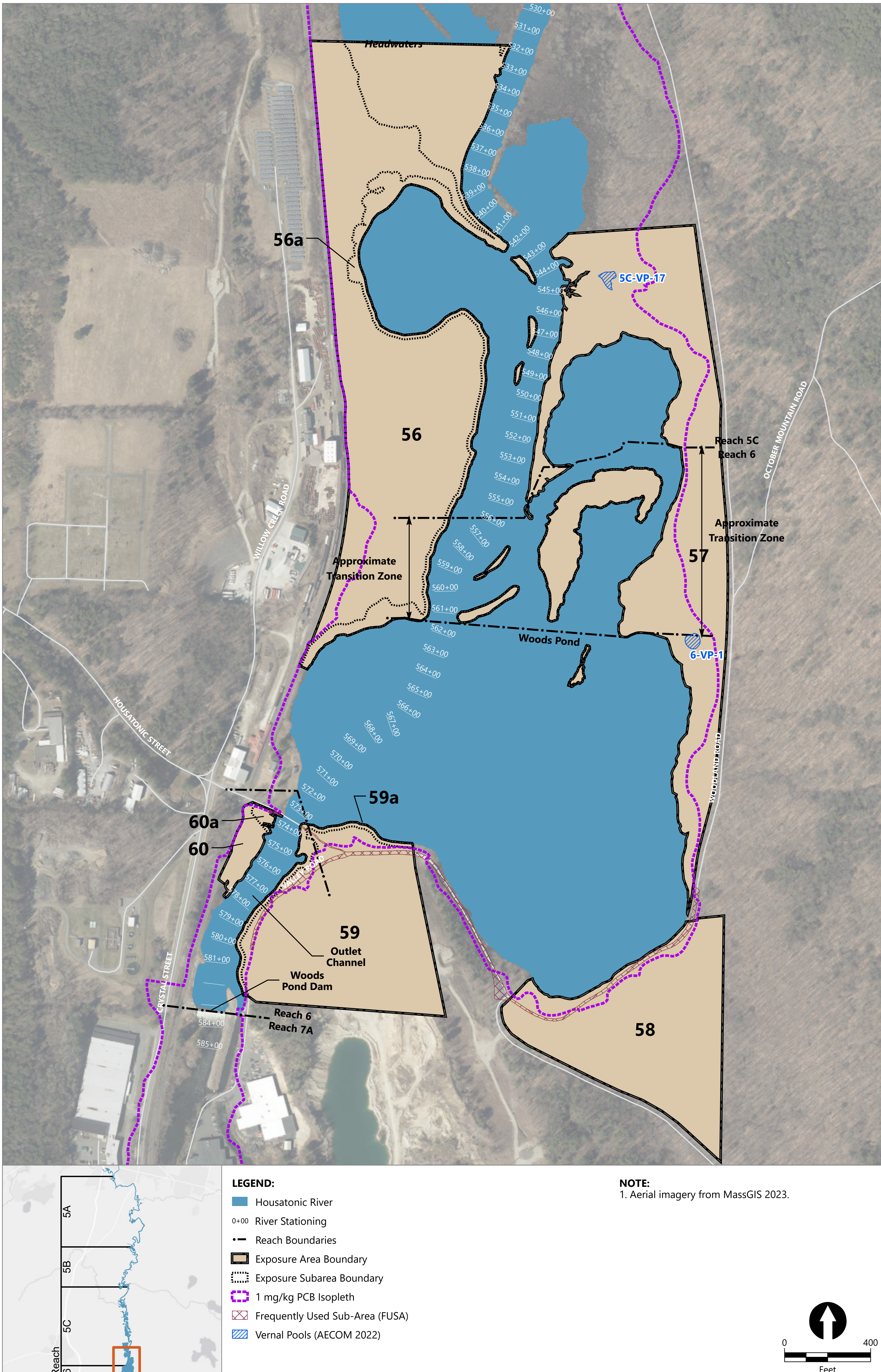
ANCHOR QEA

Figure 1-1
Reach 6 Site Map
Supplemental Data Collection Work Plan for Reach 6
Housatonic River – Rest of River



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ANCHOR QEA

Figure 1-2
Exposure Areas, Subareas, and Frequently Used Subareas in Reach 6
Supplemental Data Collection Work Plan for Reach 6
Housatonic River – Rest of River

LEGEND:
- Housatonic River
- Reach Boundaries
- Dam Safety Cable
- Sampling Grid (50-feet)
- Proposed Sediment Probing Transects
- Proposed Sediment Sampling Locations
- Proposed Waste Characterization Sampling Locations

NOTES:
1. Aerial imagery from MassGIS 2023.
2. Probing will be completed every 10 feet across the channel along transects spaced 50 feet apart.

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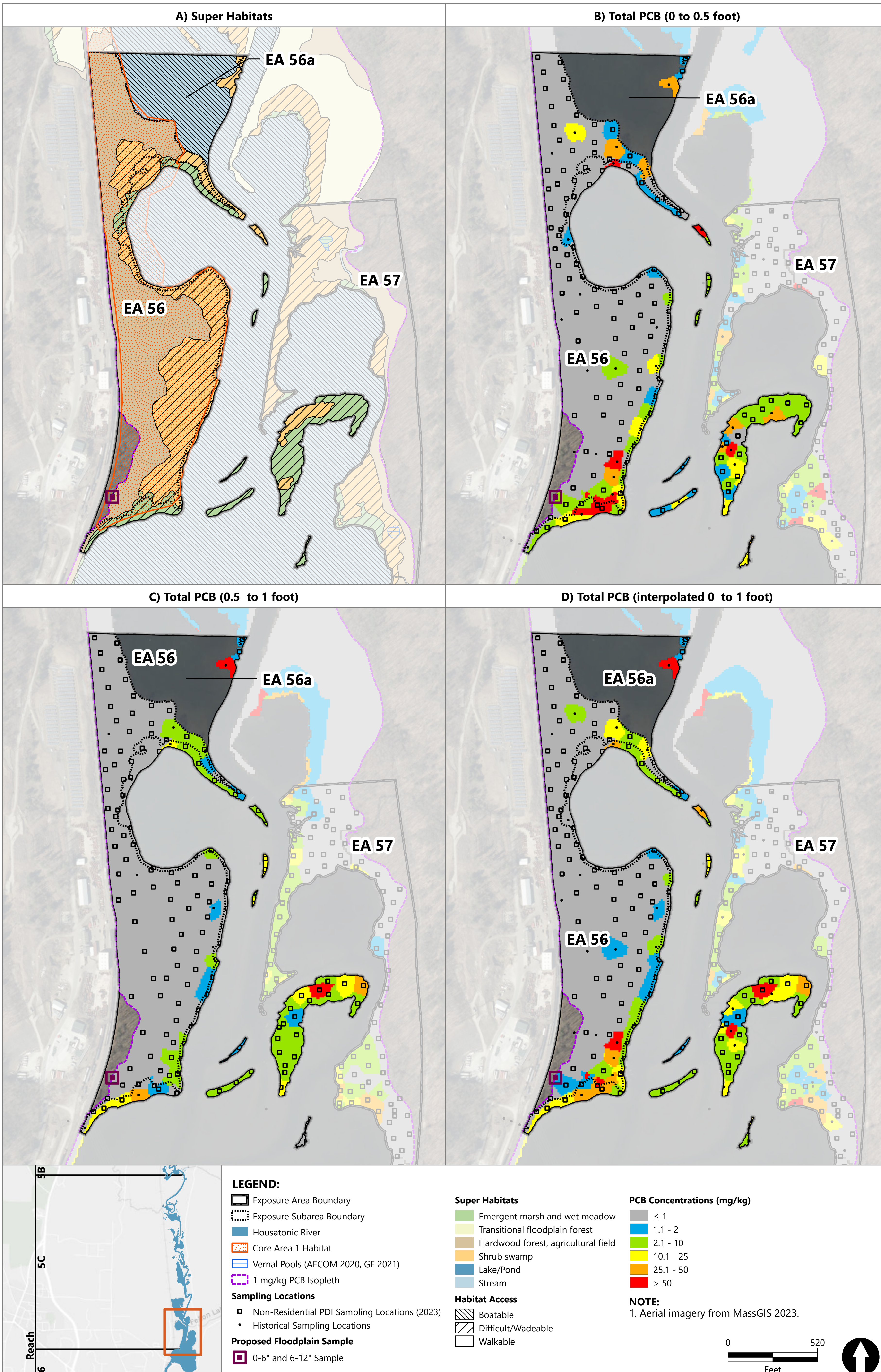
ANCHOR QEA

Figure 3-1
Proposed Valley Mill Pond Sediment Sampling and Inlet Channel Probing Locations
Supplemental Data Collection Work Plan for Reach 6
Housatonic River – Rest of River



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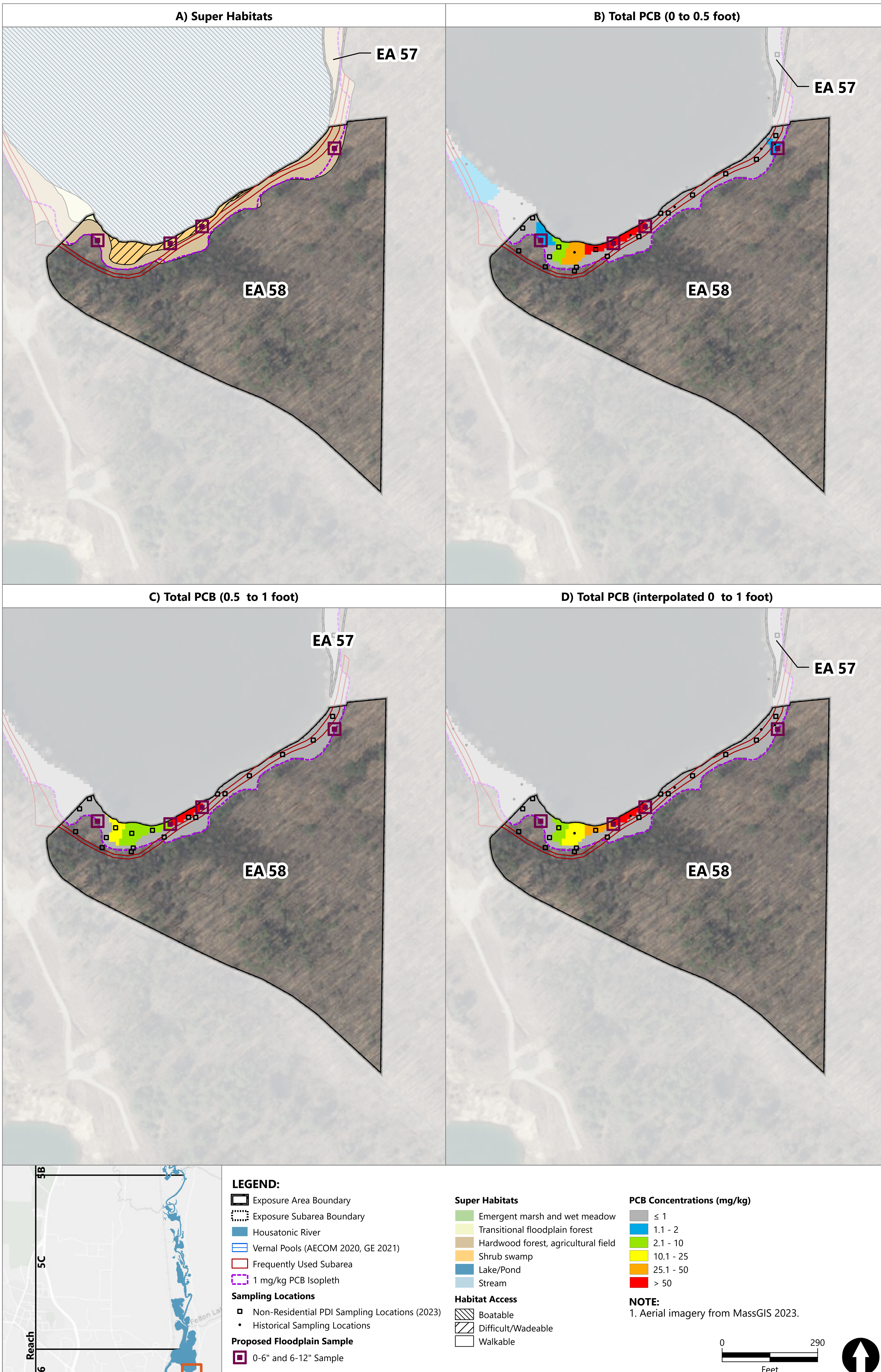
ANCHOR QEA

Figure 3-2a
Proposed Supplemental Sampling Locations for Non-Residential Floodplain Areas: Exposure Area 56
Supplemental Data Collection Work Plan for Reach 6
Housatonic River – Rest of River



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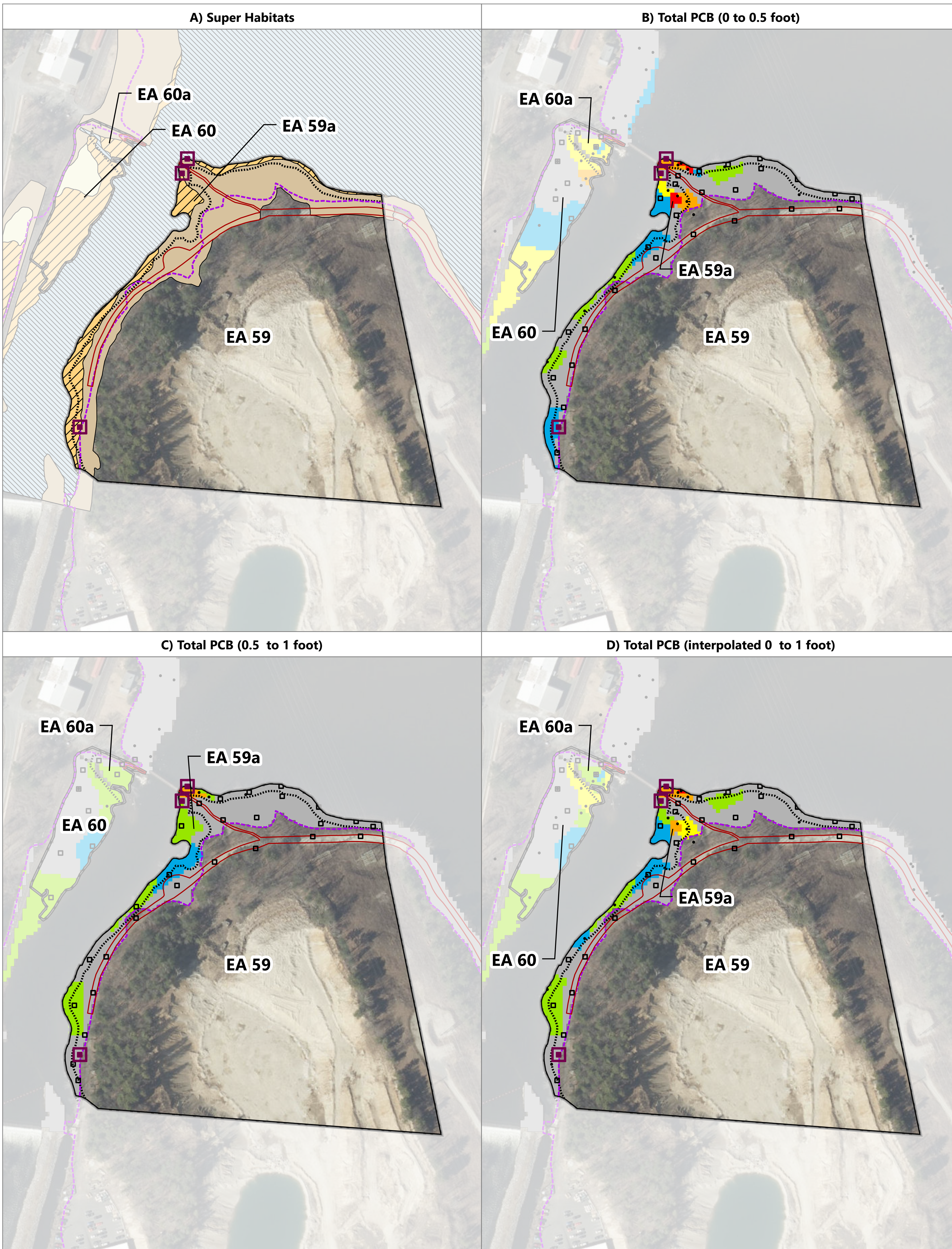
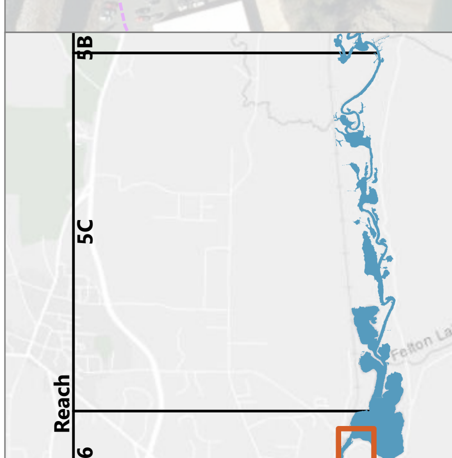
ANCHOR QEA

Figure 3-2b
Proposed Supplemental Sampling Locations for Non-Residential Floodplain Areas: Exposure Area 58





LEGEND:

- Exposure Area Boundary
- Exposure Subarea Boundary
- Housatonic River
- Vernal Pools (AECOM 2020, GE 2021)
- Frequently Used Subarea
- 1 mg/kg PCB Isopleth

Sampling Locations

- Non-Residential PDI Sampling Locations (2023)
- Historical Sampling Locations

Proposed Floodplain Sample

- 0-6" and 6-12" Sample

Super Habitats

- Emergent marsh and wet meadow
- Transitional floodplain forest
- Hardwood forest, agricultural field
- Shrub swamp
- Lake/Pond
- Stream

Habitat Access

- Boatable
- Difficult/Wadeable
- Walkable

PCB Concentrations (mg/kg)

- ≤ 1
- 1.1 - 2
- 2.1 - 10
- 10.1 - 25
- 25.1 - 50
- > 50

NOTE:
1. Aerial imagery from MassGIS 2023.

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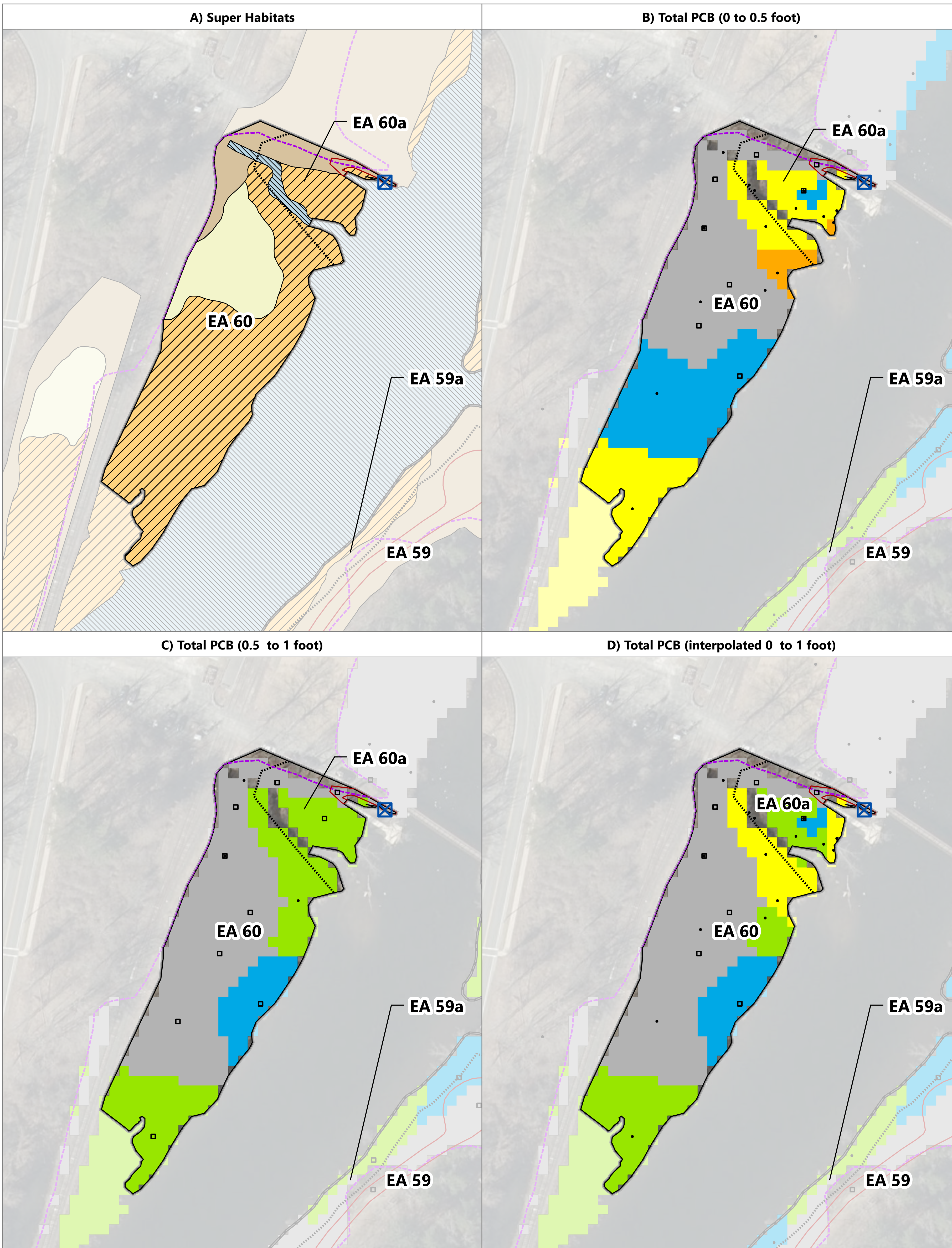
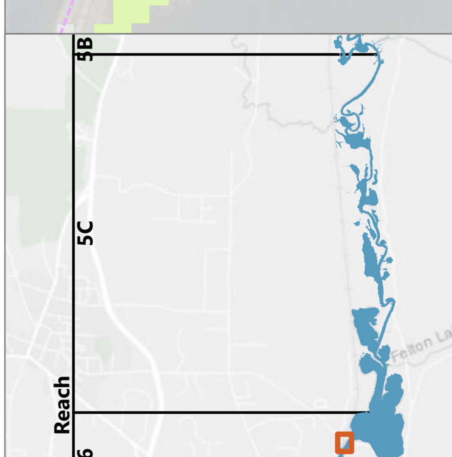
ANCHOR QEA

Figure 3-2c
Proposed Supplemental Sampling Locations for Non-Residential Floodplain Areas: Exposure Area 59
Supplemental Data Collection Work Plan for Reach 6
Housatonic River – Rest of River





LEGEND:

- Exposure Area Boundary
- Exposure Subarea Boundary
- Housatonic River
- Vernal Pools (AECOM 2020, GE 2021)
- Frequently Used Subarea
- 1 mg/kg PCB Isopleth

Sampling Locations

- Non-Residential PDI Sampling Locations (2023)
- Historical Sampling Locations

Proposed Floodplain Sample

- 36" Sample

Super Habitats

- Emergent marsh and wet meadow
- Transitional floodplain forest
- Hardwood forest, agricultural field
- Shrub swamp
- Lake/Pond
- Stream

Habitat Access

- Boatable
- Difficult/Wadeable
- Walkable

PCB Concentrations (mg/kg)

- ≤ 1
- 1.1 - 2
- 2.1 - 10
- 10.1 - 25
- 25.1 - 50
- > 50

NOTE:
1. Aerial imagery from MassGIS 2023.

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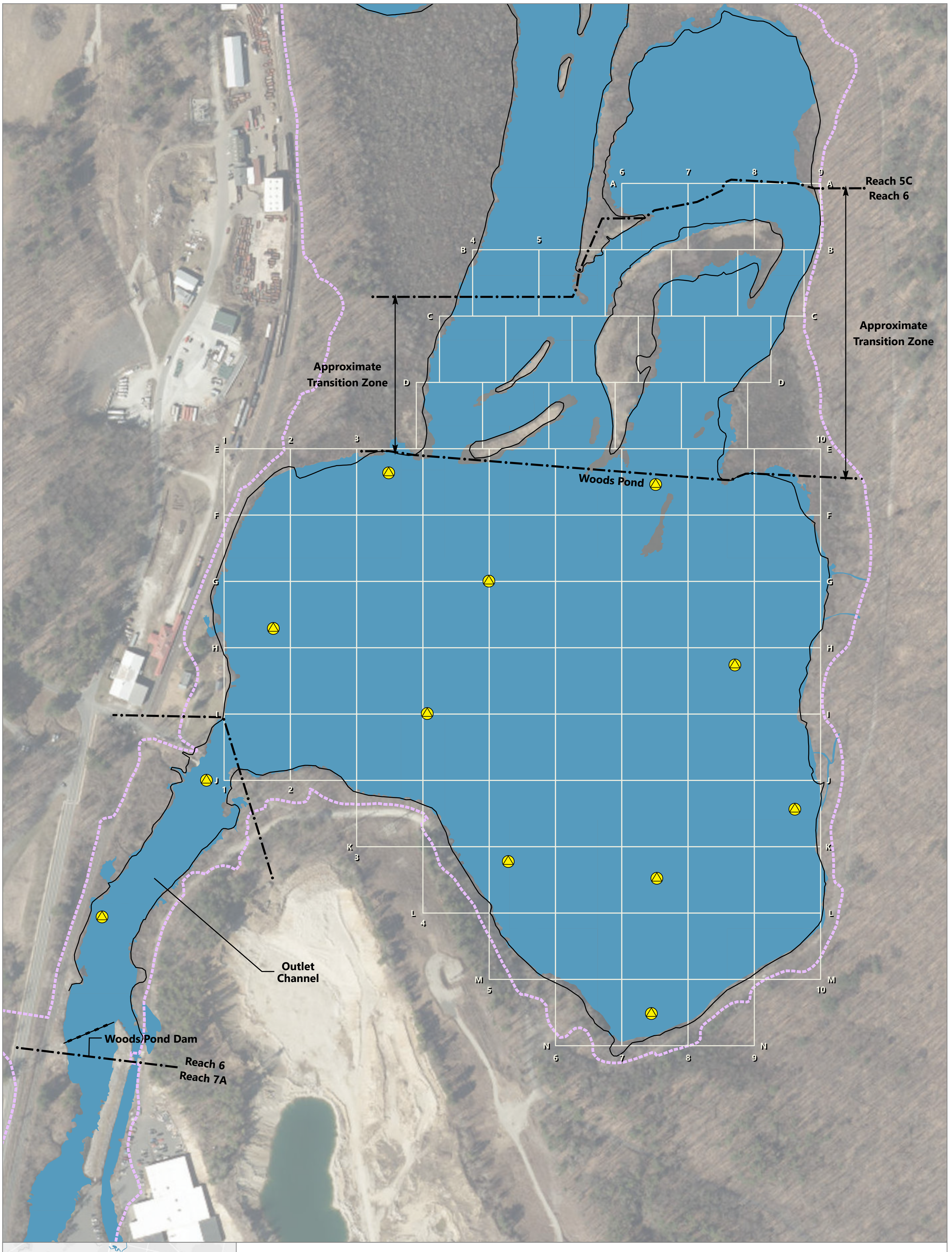
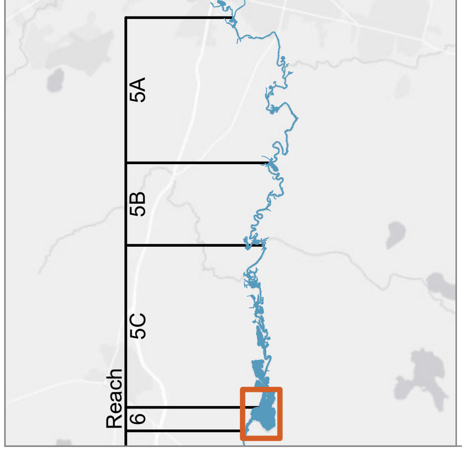
ANCHOR QEA

Figure 3-2d
Proposed Supplemental Sampling Locations for Non-Residential Floodplain Areas: Exposure Area 60
Supplemental Data Collection Work Plan for Reach 6
Housatonic River – Rest of River





LEGEND:

- Housatonic River
- 1 mg/kg PCB Isopleth
- Shoreline
- Dam Safety Cable
- 200-Foot Sampling Grid
- Proposed Sediment Waste Characterization Sampling Locations

NOTES:

1. Aerial imagery from MassGIS 2023.
2. Bathymetric survey performed by Spicer Group in 2022 and 2023.

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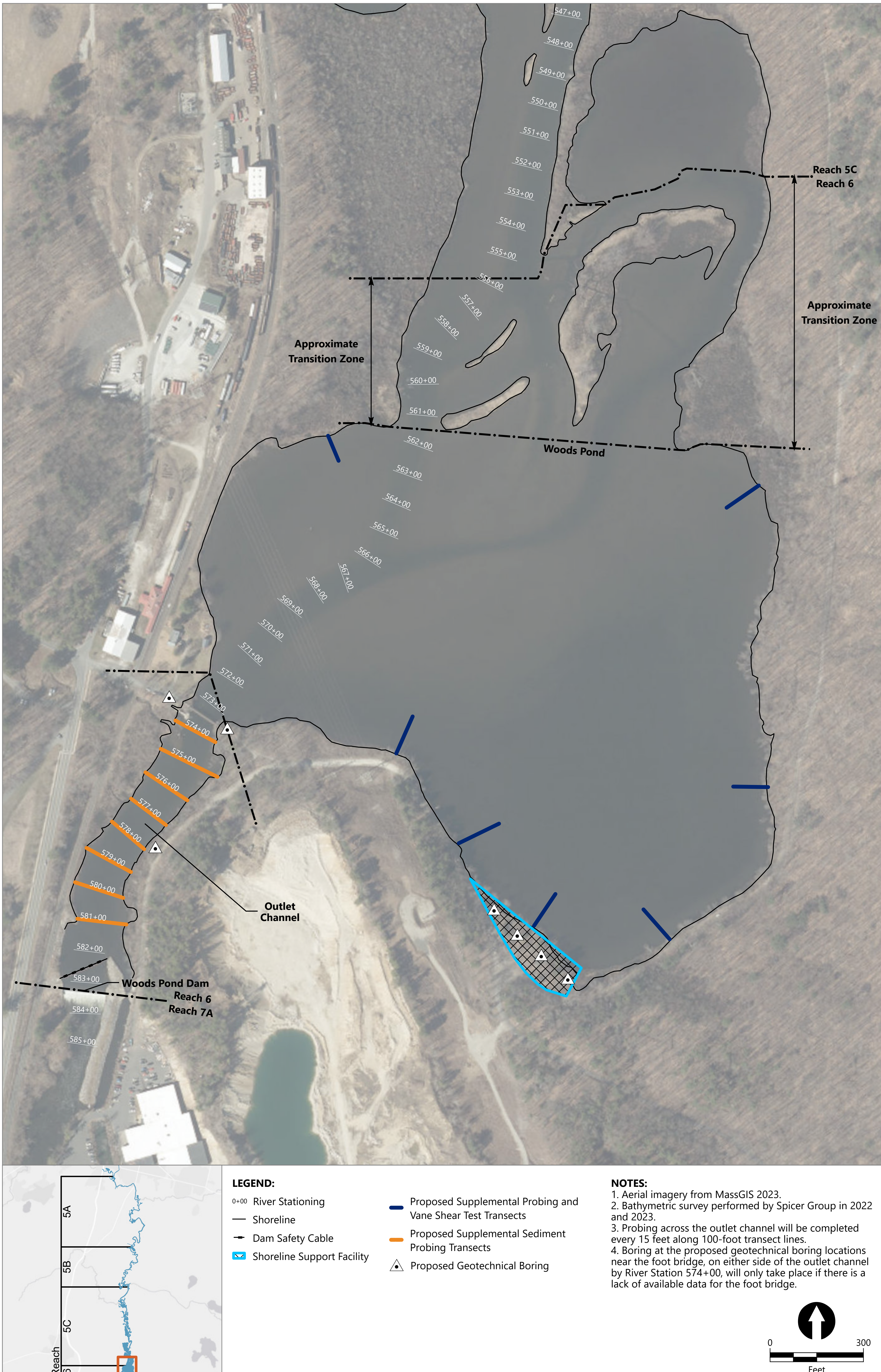
ANCHOR QEA

Figure 3-3
Proposed Woods Pond Sediment Waste Characterization Sampling Locations
Supplemental Data Collection Work Plan for Reach 6
Housatonic River – Rest of River



LEGEND:

- 0+00 River Stationing
- Shoreline
- Dam Safety Cable
- Shoreline Support Facility
- Proposed Supplemental Probing and Vane Shear Test Transects
- Proposed Supplemental Sediment Probing Transects
- Proposed Geotechnical Boring

NOTES:

1. Aerial imagery from MassGIS 2023.
2. Bathymetric survey performed by Spicer Group in 2022 and 2023.
3. Probing across the outlet channel will be completed every 15 feet along 100-foot transect lines.
4. Boring at the proposed geotechnical boring locations near the foot bridge, on either side of the outlet channel by River Station 574+00, will only take place if there is a lack of available data for the foot bridge.

0 300
Feet

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Figure 3-4
Proposed Supplemental Woods Pond Probing and Geotechnical Investigation Locations

Supplemental Data Collection Work Plan for Reach 6
Housatonic River – Rest of River