ExxonMobil Former Buffalo Terminal Operable Unit 3 (BCP Site No. C915201D)

Extension of Containment System at Babcock Street Combined Sewer Overflow Outfall

Remedial Action Work Plan Addendum
(Long Term Corrective Measures Work Plan)

Location:

503 & 625 Elk Street and 1 & 3 Babcock Street
Buffalo, New York

Prepared for:

Elk Street Commerce Park, LLC
4 Centre Drive
Orchard Park, New York

LaBella Project No. 2200012

October 12, 2020 (Revised October 26, 2020)

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1.0 INTRODUCTION

On behalf of Elk Street Commerce Park, LLC (ESCP), LaBella Associates, DPC has prepared this addendum to the Final Remedial Action Work Plan (RAWP) for Operable Unit No. 3 (OU-3) at the ExxonMobil Oil Former Buffalo Terminal Brownfield Cleanup Program (BCP) site (Site No. C915201D), dated December 2017 (Revised May 2018). Figure 1 depicts the configuration of OU-3, which is located at 503 and 625 Elk Street and 1 and 3 Babcock Street, Buffalo, New York. This RAWP addendum addresses the planned extension of the containment system previously constructed in OU-3 to encompass an area of residual petroleum contamination that is present in the vicinity of the Babcock Street Combined Sewer Overflow (CSO) outfall structure located on the site (see Figure 1). This area of residual contamination was documented in the Final Engineering Report (FER) for OU-3, dated December 2019, which details the final remedy that was approved by the New York State Department of Environmental Conservation (NYSDEC) and constructed in 2019. Said remedy allowed the contamination in the area of the CSO outfall structure to remain in place due to the designation of this structure as critical infrastructure that, at the time, could not be disturbed or altered.

The extension of the OU-3 containment system in the area of the CSO outfall structure is planned to remedy a petroleum release to the Buffalo River (NYSDEC No. 2003976) that was observed in August 2020 and has been the subject of ongoing containment and recovery measures. Although the source of the release could not be pinpointed, the historic petroleum contamination remaining in the subsurface in the vicinity of the CSO outfall structure was identified as a potential source. The extended containment system will isolate this area of residual contamination from the Buffalo River while preserving the function of the CSO structure, and will be incorporated as a supplementary component of the previously constructed OU-3 remedy.

2.0 BACKGROUND

ESCP entered into a Brownfield Cleanup Agreement (BCA) with the NYSDEC in October 2017 to investigate and remediate OU-3. The remedy implemented at OU-3 was constructed in accordance with the Final RAWP and is fully described in the FER. The NYSDEC issued a Certificate of Completion (COC) for OU-3 under the BCP in December 2019.

A Buffalo Sewer Authority (BSA) CSO structure is located on the western portion of OU-3 and discharges to the Buffalo River at the southern terminus of Babcock Street. On August 7, 2020, a petroleum release was reported in the Buffalo River in the vicinity of the CSO outfall, which lead to a multi-agency response that included the NYSDEC, United States Coast Guard (USCG) and City of Buffalo Fire Department. The source of the release could not be pinpointed, but historic petroleum contamination remaining in the subsurface in the vicinity of the CSO outfall structure was identified as a potential source.

This historic petroleum contamination was documented in the Laser-Induced Fluorescence (LIF) Survey Data Report submitted to the NYSDEC on October 3, 2019. The LIF survey was performed in accordance with a NYSDEC-approved work plan to investigate the potential occurrence of petroleum impacts below the CSO structure, which, at the time, was deemed critical infrastructure that could not be disturbed or altered. The LIF study concluded that residual hydrocarbons, although present in the vicinity of the CSO outfall, do not occur at concentrations that would allow Liquid Phase Hydrocarbons (LPH) to be mobile. As a result, the NYSDEC approved a remedy that allowed the petroleum-impacted sediment to remain in place and included the installation of a “hanging wall” sheet pile containment system constructed approximately 40-feet north of the river across Babcock Street. The NYSDEC-approved remedy did not include provisions to isolate the petroleum-impacted sediments proximal the CSO outfall from the river.

ESCP voluntarily initiated response and containment measures following the discovery of the release and has continued such operations to date. Said operations are being conducted in accordance with a Discharge Removal and Inspection Plan that was submitted to the USCG pursuant to an Administrative

Order issued by the USCG on August 20, 2020. A Short Term Corrective Measures Work Plan (CMWP) developed on behalf of ESCP was approved by the NYSDEC on September 18, 2020 and describes the ongoing containment and recovery measures that are presently being utilized to effectively mitigate impacts to the river associated with the ongoing petroleum release.

Furthermore, an Interim CMWP describing the additional measures planned for implementation to provide adequate control of continued releases prior to implementation of the long-term remedy was approved by the NYSDEC on October 19, 2020. The Interim CMWP included the preliminary design of an extension of the existing OU-3 containment system in the area of the CSO outfall, as well as several pre-remedial studies intended to investigate current conditions in the subsurface proximal to the CSO structure and in the CSO structure itself. Provisions for the recovery of any product encountered during these investigations as well as the implementation of interim measures to prevent further discharges to the river were including in the Interim CMWP. Implementation of the pre-remedial studies was initiated in mid-October.

The long-term remedy that has been advanced by ESCP in consultation with the NYSDEC, USCG and BSA encompasses three primary components:

1. Isolation of subsurface contamination in the vicinity of the CSO outfall structure from the river via the extension of the existing OU-3 sheet piling containment system to encompass this area;
2. Minimization of communication between the CSO structure and the subsurface within the CSO containment area to prevent the infiltration of contaminants into the structure and the migration of river water from the structure into the containment area; and
3. Hydraulic control of groundwater levels within the containment area coupled with product recovery, if applicable.

The construction of the extended containment system is described in Section 4 and is viewed as a component of the permanent remedy that can be installed prior to the onset of 2020-2021 winter weather conditions (i.e., icing of the river) pending procurement of the required permits and approvals. This component of the final remedy would isolate contaminants within and adjacent to the riverbank from leaching directly into the river. Components nos. 2 and 3 of the permanent remedy are discussed in Sections 5, 6 and 7.

3.0 SITE CONTROL AND MANAGEMENT MEASURES

Site control and management measures to be employed during the implementation of this RAWP addendum shall be in accordance with the Final RAWP and the Site Management Plan (SMP), dated December 2019, for OU-3. This includes, but is not limited to, measures relating to site access and control; erosion and sedimentation control; health and safety; community air monitoring; soils management; recordkeeping and reporting.

4.0 EXTENSION OF CONTAINMENT SYSTEM

4.1 Overview

Part of the permanent remedy previously constructed at OU-3 under the BCP included the installation of a containment system that incorporates a steel bulkhead of sheet piling construction that extends approximately 1,400-feet along the margin of the Buffalo River and ends just east of the CSO outfall. The existing steel bulkhead will be extended westward across the face of the existing concrete headwall of the CSO structure and tied into the previously installed sheet pile containment “hanging” wall that exists inland to the north. The CSO will discharge through an opening to be constructed in the new section of steel bulkhead at the same location as the current CSO outfall. The area of the proposed bulkhead extension is depicted on the attached aerial site map (Figure 2).

4.2 Permits

The following paragraphs identify the status of the required permits and approvals for the extension of the bulkhead.

Excavation & Fill in Navigable Waters (Article 15)/Water Quality Certification (Section 401 of CWA)

Pursuant to guidance provided by the NYSDEC, a request to modify the permit previously issued for construction of the existing steel bulkhead within OU-3 was submitted to the NYSDEC on September 16, 2020. The requested permit modification was granted by the NYSDEC on September 22, 2020 and a copy of this document is provided in Appendix A.

Nationwide Permit #38

As directed by the U.S. Army Corps of Engineers (USACE), a Joint Permit Application was submitted to the USACE on September 15, 2020. A copy of this application was also sent to the NYSDEC. This permit was issued by the USACE on September 28, 2020 and a copy is included in Appendix B.

Marine Work Permit & Floodplain Work Permit

Applications for both a Marine Work Permit and a Floodplain Work Permit were submitted to the City of Buffalo on October 14, 2020.

Real Estate Considerations

ESCP is working collaboratively with the City of Buffalo and BSA to: (1) come to an agreement that transfers ownership of the area along the riverbank on which the sheet pile wall extension will be constructed from the City of Buffalo to ESCP, and (2) establishes the BSA as the owner of the new steel bulkhead and modified CSO outfall structure. This agreement is slated to before the City Common Council on October 27, 2020 for approval.

4.3 Design of Sealed Sheet Pile Wall Extension

LaBella submitted preliminary design plans to the NYSDEC, BSA and USCG on September 27, 2020 and has incorporated comments received from said agencies in the design of the sealed bulkhead extension. Per NYSDEC's request, the revised design plans were submitted to John P. Stopen Engineering, LLP (Stopen) of Syracuse, New York for peer review. The results of the peer review were conveyed in a letter from Stopen that was submitted to the aforementioned agencies on October 21, 2020 along with changes to the design plans that addressed all of Stopen's comments and/or recommendations. The peer review submittal is presented in Appendix C. Said design plans were subsequently approved by the NYSDEC and BSA on October 26, 2020, and the final, certified plans are included in Appendix D.

As reflected by Figure 3, the existing steel bulkhead will be extended approximately 67' to the west, just outboard of the existing concrete headwall and will be connected to the existing bulkhead/sheet pile wall to the east and north using sealed interlocks. The CSO outfall will be extended through the new steel bulkhead at its current location and remain functional during construction. The current void that exists beneath the CSO outfall platform and the riverbank will be grouted with cellular concrete and the space between the new bulkhead and the existing face of the concrete headwall will be backfilled with lightweight concrete. Specifications for both types of concrete to be utilized are provided in Appendix D.

The new bulkhead will consist of PZC-18 sheet piles driven to refusal at an anticipated elevation of ± 530 feet above mean sea level (AMSL). The sheet piles will be delivered as welded pairs with interlock sealant applied to the female interlocks such that the common interlock between the welded pairs will be

hydraulically sealed. The sheet piles installed across the face of the concrete headwall will be anchored to the hanging sheet pile wall located inland to the north using steel tieback rods connected to walers affixed to the sheet pile. The top of the new bulkhead will be set at the same elevation as the asphalt parking lot at the foot of Babcock Street (approx. ± 583.2 feet AMSL). The top of the sheet piling installed in front of the CSO outfall will be set at ± 569.28 feet AMSL, slightly lower than the invert of the existing outfall, and the vertical walls of the outfall extension will be formed using PS-27.5 or AS-500-9.5 straight sheet piles driven approximately 10 feet below the top of the river sediment. The straight sheet piles are to act as form work and supports for the trash rack.

4.4 Construction Dewatering and Product Recovery

As depicted on the design plans in Appendix D, a temporary cofferdam constructed of PZC-18 sheet piles driven to approximately 537 feet AMSL will be installed at the mouth of the CSO outfall and connected to the outboard side of the new steel bulkhead. The top of the cofferdam will be set at an approximate elevation of 575 feet AMSL, several feet above the mean high water level of the river. The temporary cofferdam will be installed after installation of the new sheet pile bulkhead and prior to the placement of concrete under the outfall platform and between the existing headwall and new bulkhead to facilitate dewatering and product recovery.

Water and any accumulating product within the temporary cofferdam and the new steel bulkhead will be pumped into temporary holding tanks staged to the northeast of the work area. Dewatering fluids accumulated in the holding tanks will be batched through the existing Groundwater Treatment Facility (GWTF) for treatment.

During construction, base flow in the CSO will be managed through pumping, as needed, from within the cofferdam. Base flow within the system may also be intercepted at the CSO manhole located approximately 550 feet north of the outfall. Water pumped from this location will also be managed in holding tanks and batched through the existing GWTF.

4.5 Provisions for CSO Activation During Construction

All sheet piles installed in front of the outfall will be continuously driven to the design elevation to avoid obstructing the outfall, which will remain functional throughout the construction period. Furthermore, sheet pile installation will not be performed immediately prior to, or during, precipitation events forecasted to generate 0.77 inches or more of rainfall, which is the threshold above which the CSO activates according to the BSA.

The elevation of the cofferdam has been set below the elevation of the top of the CSO weir located at Prenatt Street to accommodate flows should the CSO activate during construction. Should an activation occur during construction, work within the river and at the CSO headwall that could disrupt the functionality of the CSO will be suspended, and dewatering will be performed as necessary following the procedures described in Section 4.4 after the CSO has de-activated and prior to the resumption of work in this area.

4.6 Sediment and Erosion Control

Construction stormwater management and erosion control measures will be installed as prescribed in the Final RAWP for OU-3 and will include the installation and maintenance of a turbidity curtain in the river and silt fence/sock along the western and southern perimeter of the work area. Additionally, active stormwater drains proximal to the construction area will be protected.

4.7 Product/Sheen Containment and Recovery

Current containment and recovery measures required by USCG and NYSDEC will continue to the extent practical during construction for pollution control purposes. These procedures are described in the NYSDEC-approved Short Term Corrective Measures Work Plan dated September 18, 2020.

4.8 Future Dredging Considerations

Consistent with the design of the existing steel bulkhead that extends approximately 1,400 feet along the southern boundary of OU-3, the sheet pile wall extension has been designed to accommodate a dredge depth of 560 feet AMSL. As noted in the Final RAWP for OU-3, dredging of river sediments outboard of the OU-3 bulkhead will be possible, however, site-specific dredging activities will require evaluation prior to performing the dredging work. Should the planned dredging depth extend below 560 feet AMSL, slot dredging and backfilling or other suitable dredging methods may be necessary to minimize wall deflection.

Considering the age, condition and construction of the existing CSO headwall, which is supported by aged timber piles, it is likely that similar, if not more extensive measures would be required to dredge adjacent to the current structure. Therefore, no adverse impacts to the feasibility of future dredging projects proximal the extended steel bulkhead have been identified in connection with this installation.

4.9 Schedule

Pending the receipt of all required permits and approvals, ESCP has targeted November-December 2020 for the construction of the extended containment wall and anticipates that it will require 3-4 weeks to fabricate the interlocks and another 3-4 weeks to construct the wall.

5.0 BABCOCK STREET CSO ISOLATION

5.1 Overview

Inspection of the CSO structure and associated headwall as described in the Interim CMWP was conducted on October 19-20, 2020, following approval of the BIDCO Marine Group, Inc. (BIDCO) site specific Dive Safety Plan submitted to NYSDEC, BSA and USCG on October 9, 2020.

BIDCO visually inspected and video-record the interior condition of the structure from the Buffalo River outfall to the overflow weir located approximately 550 feet to the north at former Prenatt Street. The purpose of this inspection was to investigate the potential presence and physical extent of petroleum sheen and/or LPH within the structure, as well as identify potential contaminant sources (i.e., staining, seepage, etc.) that could be indicative of contaminant migration into the structure.

As part of the investigation, BIDCO also performed an underwater investigation of the CSO headwall and outlet structure itself, including the void between the bottom of the CSO platform and the interior bank of the river. During this inspection, BIDCO attempted to identify any potential sources of sheen and/or LPH in and around the structure, including the presumed slag tunnel bedding. This included manually probing the bank and sediment in this area to evaluate the degree to which contaminants were present and discharging from these materials.

Real-time video monitoring of the inspection occurred during the work. During the week of October 26, 2020, BIDCO will provide digital video captured during the inspection and a written report summarizing key findings and recommendations. These findings will be evaluated by ESCP and LaBella to define potential opportunities to implement remedial measures addressing any point sources and/or discharges discovered within or around the structure. Subsequent recommendations will be made to BSA and NYSDEC for further evaluation and review.

5.2 Potential Interim Measures

Should the BIDCO inspection result in the identification of a potential source of the petroleum sheen and/or LPH observed discharging to the river, ESCP will identify and evaluate potential interim measures available to address the ongoing discharge. The results of this evaluation and any ensuing plan for corrective actions will be shared with NYSDEC, BSA, and USCG, prior to implementation.

5.3 Potential Long Term Remedies

The mechanism for release of the petroleum product and sheen to the Buffalo River is suspected to be the leaching of contaminants directly from petroleum-contaminated sediments located in the subsurface proximal the CSO structure into the river in connection with fluctuations in the river stage. This is supported by the fact that the most significant discharges observed have occurred during documented low river stage events.

The pre-remedial investigations of the CSO structure and the subsurface surrounding this structure described in the Interim CMWP are intended to confirm this interpretation and guide the further development of the permanent remedy. This includes the remedial components that may be required relative to both hydraulic control within the CSO containment system and any actions that may be required to minimize communication between the CSO structure and the subsurface within the CSO containment area.

Should these investigations indicate the need to physically isolate the CSO from the subsurface to prevent the infiltration of contaminants into the structure and/or the migration of river water from the structure into the containment area, ESCP will interface with the BSA regarding the development of a long-term solution. However, until the condition of the CSO structure is characterized, it is premature to speculate on the need or scope of any repairs or modifications to the structure.

6.0 GROUNDWATER MONITORING

6.1 Overview

It is understood and acknowledged that construction of the extended containment system proximal the CSO outfall may cause a mounding effect on the existing water table in this area and may influence current groundwater flow patterns within and up-gradient of this area. As described in the Interim CMWP, three new groundwater wells are slated for installation proximal the CSO outfall structure and south of the hanging sheet pile wall where no wells currently exist. The planned location of these wells is depicted on Figure 4 and they are hereinafter referred to as “CSO series wells”. These wells are planned to be utilized for interim product recovery prior to and during construction should LPH be detected in this area. These wells will also be used for monitoring of groundwater levels before and after construction of the extended containment system. Additionally, the design of the CSO series wells will facilitate the use of these wells as groundwater extraction points for hydraulic control, should the mounding of groundwater be observed within or up-gradient of the containment system post-construction.

The three existing wells located to the north of the hanging sheet pile wall (MW-3, SB-37 and SB-11/LB-1) will also be supplemented by the installation of two additional monitoring wells along the western perimeter of OU-3 (see Figure 5). Collectively, these five monitoring wells will be utilized to monitor potential impacts to groundwater flow conditions up-gradient of the hanging sheet pile wall following construction of the bulkhead extension.

The following subsections describe the pre- and post-construction groundwater monitoring that will be performed using this expanded monitoring network. The monitoring data will be utilized to determine the need for active hydraulic control within the extended containment system. Should groundwater mounding or the potential for off-site contaminant migration be observed and necessitate active hydraulic control within this area, the preliminary plan for groundwater extraction and treatment is discussed in Section 7.

6.2 Groundwater Monitoring

The drilling and installation of the western boundary wells (ESCP-MW-7 and ESCP-MW-8) was completed between October 21-23, 2020. The new CSO series wells are slated for installation during the week of October 26, 2020. Well design, drilling, installation and development will be in accordance with the Interim CMWP. Monitoring prior to and after construction of the sealed sheet pile containment wall will be conducted as described below.

Pre-Construction Monitoring

Weekly static water level measurements will be collected and recorded at the following locations immediately following the installation of the new CSO series and western boundary wells.

- ESCP-CSO-MW-1
- ESCP-CSO-MW-2
- ESCP-CSO-MW-3
- SB-11/LB-1
- SB-37
- MW-3
- ESCP-MW-7
- ESCP-MW-8
- Buffalo River

An interface probe will be utilized to gauge the level of LPH, if any, and/or water at each location, and the resulting data will be recorded on a field log and subsequently entered in a spreadsheet to allow the statistical and graphical evaluation of fluctuations over time.

Based upon the anticipated schedule for construction of the sheet pile containment system, it is estimated that 6-8 weeks of pre-construction monitoring data will be compiled. These data, along with historical water level data from SB-11/LB-1, SB-37 and MW-3 will be utilized to establish baseline groundwater elevations for use in assessing potential changes associated with containment system construction.

Post-Construction Monitoring

Following the completion of containment wall construction, weekly monitoring of static water levels at the following locations will be performed for a period of six months and the data recorded as described above:

- ESCP-CSO-MW-1
- ESCP-CSO-MW-2
- ESCP-CSO-MW-3
- SB-11/LB-1
- SB-37
- MW-3
- ESCP-MW-7
- ESCP-MW-8
- Buffalo River

Product Recovery and Management

Should recoverable LPH be encountered in the wells during pre- and post-construction monitoring, product recovery measures will be implemented. The frequency and method of product recovery will be based upon the characteristics and thickness of the product that is encountered. Methods to be utilized may include the bailing and removal of product from the wells, placement and removal of adsorbent socks within the wells or a combination of these methods.

Recovered product/water and spent adsorbent materials will be contained in sealed 55-gallon drums that will be temporarily staged at the existing GWTF. Drums of recovered water/product mixture will be transported to and discharged into the existing GWTF on a daily basis and the volume of fluids discharged to the GWTF is recorded. The water and product mixture will be pumped into the GWTF oil water separator and treated by the system. Accumulated product will be stored in the existing GWTF 1,000-gallon product aboveground storage tank with secondary containment for periodic removal and recycling or disposal at a permitted facility. Treated effluent from the system is discharged to the Buffalo Sewer Authority (BSA) under an existing permit per authorization from BSA.

The disposal of drums containing spent adsorbent materials will occur within 90 days of the accumulation date at an appropriately permitted off-site disposal facility.

Data Evaluation and Reporting

The resulting post-construction monitoring data will be compared with the historical and pre-construction baseline elevations on a monthly basis to identify potential changes in groundwater elevations that could be indicative of changes in groundwater flow patterns and/or groundwater mounding within the CSO containment area. This review will focus on the identification of changes to the elevation of the water table and gradient within and up-gradient of the CSO containment area, with particular attention on potential changes in groundwater flow patterns along the western boundary of OU-3 that are indicative of increased groundwater flow off-site.

In addition to the identification of significant changes in groundwater levels and/or flow patterns, the appearance of LPH in wells in which it was not previously observed will be a focal point of post-construction monitoring. No product has been observed in existing wells SB-11/LB-1, SB-37 and MW-3 located north of the hanging wall during weekly monitoring conducted in 2020. As noted above, monitoring of the new CSO series and western boundary wells for LPH will be conducted during the pre-construction phase and product recovery measures will be implemented as necessary. Specific attention will be placed on identifying the initial appearance or increase in LPH in these wells during the post-construction phase. Such occurrences will be reported to the NYSDEC within two hours of discovery and will be mitigated through the application of product recovery measures as appropriate.

The pre- and post-construction data will be submitted to the NYSDEC with a potentiometric surface map and interpretation of groundwater conditions in and up-gradient of the CSO containment area on a quarterly basis. During the post-construction period, each quarterly report will verify the appropriateness of continued monitoring or identify other measures necessary to properly manage site conditions, such as active hydraulic control.

7.0 HYDRAULIC CONTROL

Should post-construction monitoring identify the need for active hydraulic control within the CSO containment area, the design of the CSO series wells will facilitate the use of these wells as groundwater extraction points. Depending on the drawdown required to maintain an inward gradient within the CSO containment area, one or more of the CSO wells will be converted to groundwater extractions wells. Under this scenario, the size of the pump(s) and required pumping rate will be determined based upon a pump test to be completed on the well(s). Prior to performing the pump test, a pump test work plan will be developed and submitted to the NYSDEC for review and approval.

Using the results of the pump test, an extraction system will be constructed within the CSO containment area. Groundwater will be pumped from the extraction wells and conveyed to the existing Groundwater Treatment Facility (GWTF) for treatment.

8.0 LONG TERM REMEDIAL MEASURES TIMETABLE

Subject to the procurement of all required permits and approvals, the following sequence and timetable is envisioned for the implementation of the remedy described herein:

1. CSO Structure/Headwall Inspection: October 19-20, 2020
2. Installation of CSO Series and Western Boundary Wells: October 21-28, 2020
3. Pre-Construction Monitoring: October 29, 2020 – December 31, 2020
4. Fabrication of Sheet Pile Interlocks: November 2-25, 2020
5. Construction of Sheet Pile Extension: November 30, 2020 – December 31, 2020
6. Post-Construction Monitoring: January 1, 2021 – June 30, 2021

Other remedial measures that may be identified as a result of the CSO inspection and/or supplemental subsurface investigation will be scheduled for implementation as soon as practical.

9.0 CONSTRUCTION COMPLETION REPORT

A Construction Completion Report summarizing and documenting the construction of the sealed sheet pile wall extension and associated remedial components will be prepared for submittal to the NYSDEC to supplement the FER. This report will describe the remedial construction activities performed; document compliance with the EWP and CAMP; and identify remaining contamination within the extended containment system. As-built drawings will also be included in the Construction Completion Report, which will be finalized to address any comments received from the NYSDEC.

10.0 SITE MANAGEMENT PLAN REVISIONS

The SMP shall be revised to reflect changes to the OU-3 remedy, as well as modifications to the site boundary; easement; and operations, monitoring and maintenance program for OU-3. Said revisions will be submitted to the NYSDEC and New York State Department of Health (NYSDOH) for review, and shall be finalized once agency comments have been addressed.

FIGURES

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NOT TO SCALE

Figure 1
Site Map

ExxonMobil Former Buffalo Terminal OU-3
Remedial Action Work Plan Addendum

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NOT TO SCALE

Figure 2
Existing and Extended Bulkhead

ExxonMobil Former Buffalo Terminal OU-3
Remedial Action Work Plan Addendum

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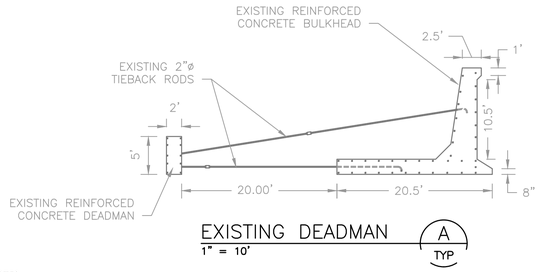
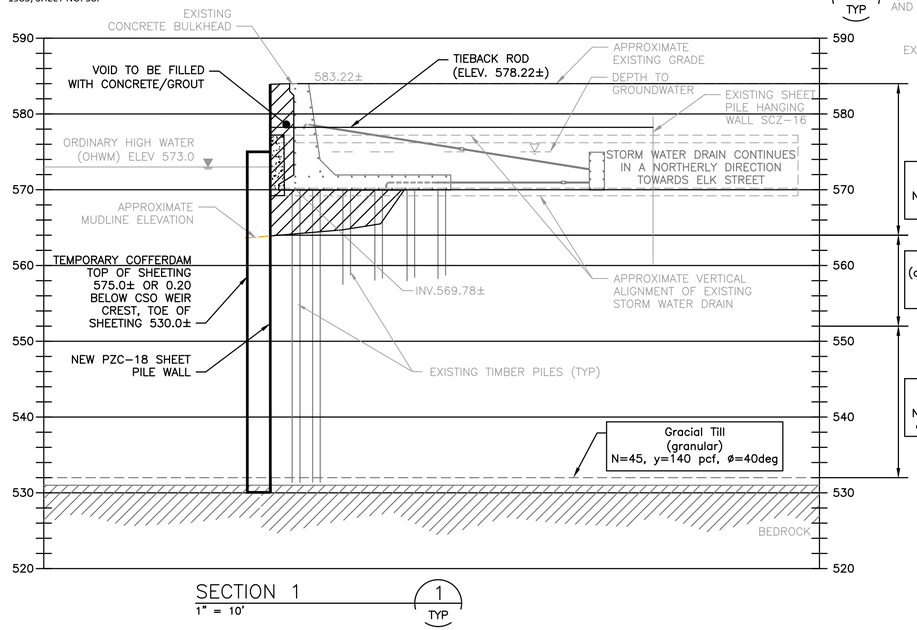


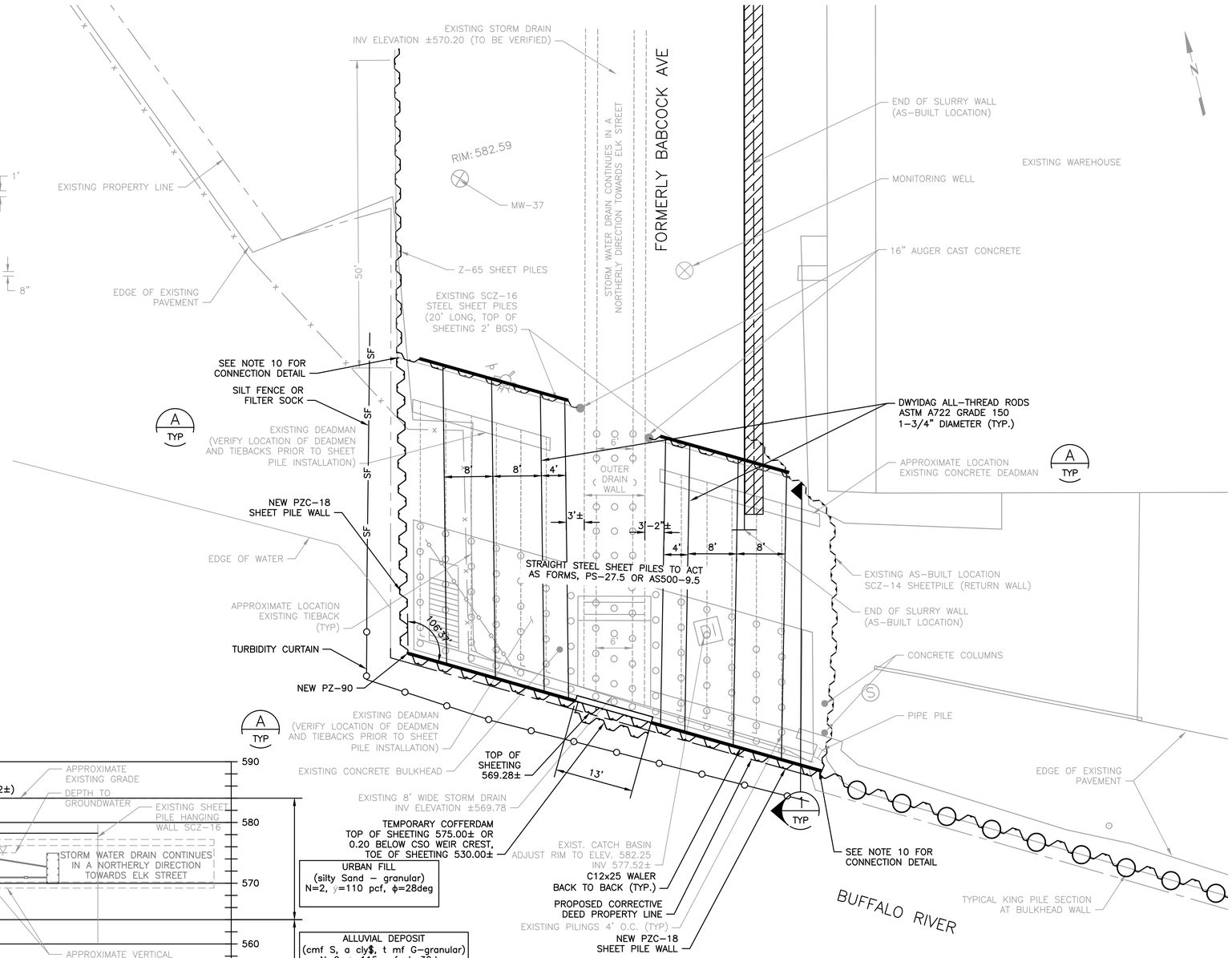
EXISTING DEADMAN
1" = 10'
A TYP

GENERAL NOTES:

1. ANY AND ALL EXCAVATION WORK SHALL BE CONDUCTED IN ACCORDANCE WITH THE EXCAVATION WORK PLAN THAT IS INCLUDED IN THE SITE MANAGEMENT PLAN.
2. THE BASE PLAN AND SECTION FIGURES WERE OBTAINED FROM A DRAWING PREPARED BY: AMEC FOSTER WHEELER ENVIRONMENT & INFRASTRUCTURE, INC.; TITLED: SITE PLAN WEST, OU3 SEEP REMEDY; PROJECT NO.: 3617-16-7397; DWG NO.: FIGURE 1; DATED: 8/31/20.
3. THE CONTRACTOR IS OBLIGATED TO CONTACT THE LOCAL ONE-CALL SYSTEM TO HAVE UTILITIES MARKED OUT.
4. BABCOCK CSO SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.
5. STEEL SHEET PILES ARE ANTICIPATED TO BE 60-FEET LONG AND SHALL BE INSTALLED TO REFUSAL (ANTICIPATED TO BE TOP OF BEDROCK). STEEL SHEET PILES SHALL BE HOT ROLLED SECTIONS, COLD ROLLED SECTIONS SHALL NOT BE USED.
6. COMMON INTERLOCKS SHALL BE WELDED, THE LEADING INTERLOCK SHALL HAVE A SWELL SEAL APPLIED PRIOR TO DRIVING.
7. NELSON STUDS SHALL BE WELDED TO THE SHEET PILES TO FORM A PERMANENT BOND BETWEEN THE CONCRETE/GROUT AND THE NEW SHEETING.
8. CELLULAR CONCRETE SHALL BE TREMIE PUMPED BENEATH THE EXISTING OUTFALL HEADWALL. LIGHTWEIGHT CONCRETE SHALL BE TREMIE PUMPED BETWEEN THE EXISTING HEADWALL STRUCTURE AND NEW SHEET PILE BULKHEAD WALL.
9. NEW BULKHEAD STRUCTURE TO BE TIED BACK TO THE EXISTING HANGING WALL SHEETING. WALERS SHALL CONSIST OF HOT ROLLED CHANNEL SECTIONS, COLD ROLLED SECTIONS SHALL NOT BE USED. TIEBACK RODS SHALL BE PRESTRESSED STEEL.
10. WHERE THE NEW SHEET PILE WALL SHALL BE JOINED TO EXISTING SHEETING, A SECTION OF THE EXISTING SHEETING SHALL BE WITHDRAWN, AN INTERLOCK OR NEW SHEET SHALL BE WELDED TO THE EXISTING SHEET AND THE MODIFIED SHEET SHALL BE REINSTALLED.
11. ELEVATIONS PROVIDED ARE FROM A PLAN TITLED "PLAN AND PROFILE" PREPARED BY C&S CONSULTING ENGINEERS FOR THE BUFFALO SEWER AUTHORITY BACK WATER PROTECTION IMPROVEMENTS - CONTRACT NO. 1A-SITE NO 80A; FILE NO. 140.009.001; DATED MARCH 21, 1983; SHEET NO. 58.



SECTION 1
1" = 10'
1 TYP



SECTION 1 GENERAL NOTES:

1. THIS SECTION PROVIDES GENERAL LAYOUT INFORMATION REGARDING THE LOCATION OF THE NEW STEEL SHEET PILE BULKHEAD, TEMPORARY COFFERDAM, TIEBACK ANCHOR ROD, AND GENERAL SOIL PROFILE. THIS SECTION DOES NOT DEPICT THE IMPROVEMENTS MADE TO THE CONCRETE HEADWALL IN 1983.
2. GENERAL SOIL STRATIGRAPHY OBTAINED FROM A DRAWING PREPARED BY AMEC FOSTER WHEELER ENVIRONMENT & INFRASTRUCTURE, INC.; TITLED: SUBSURFACE PROFILE SLURRY WALL WEST; PROJECT NUMBER: 3617-16-7397; DWG: C-203; SHEET: 13 OF 28; DATED: JANUARY 2017.
3. STANDARD PENETRATION TEST N-VALUES OBTAINED FROM THE DRAWING REFERENCED IN NOTE 1, TEST BORING: PDI-SB-013.
4. REFER TO THE PROFILE DETAIL FOR ADDITIONAL INFORMATION.

0 5 10 20
SCALE IN FEET

LaBella
Powered by partnership.
300 Pearl Street, Suite 130
Buffalo, NY 14202
716-551-6281
labellapc.com

NOT FOR CONSTRUCTION

ELK STREET COMMERCE PARK LLC
4 CENTRE DRIVE
ORCHARD PARK, NY 14127

ExxonMobil Former Buffalo Terminal OU-3 Remedial Action Work Plan Addendum

NO:	DATE:	DESCRIPTION:
--	--	--

REVISIONS

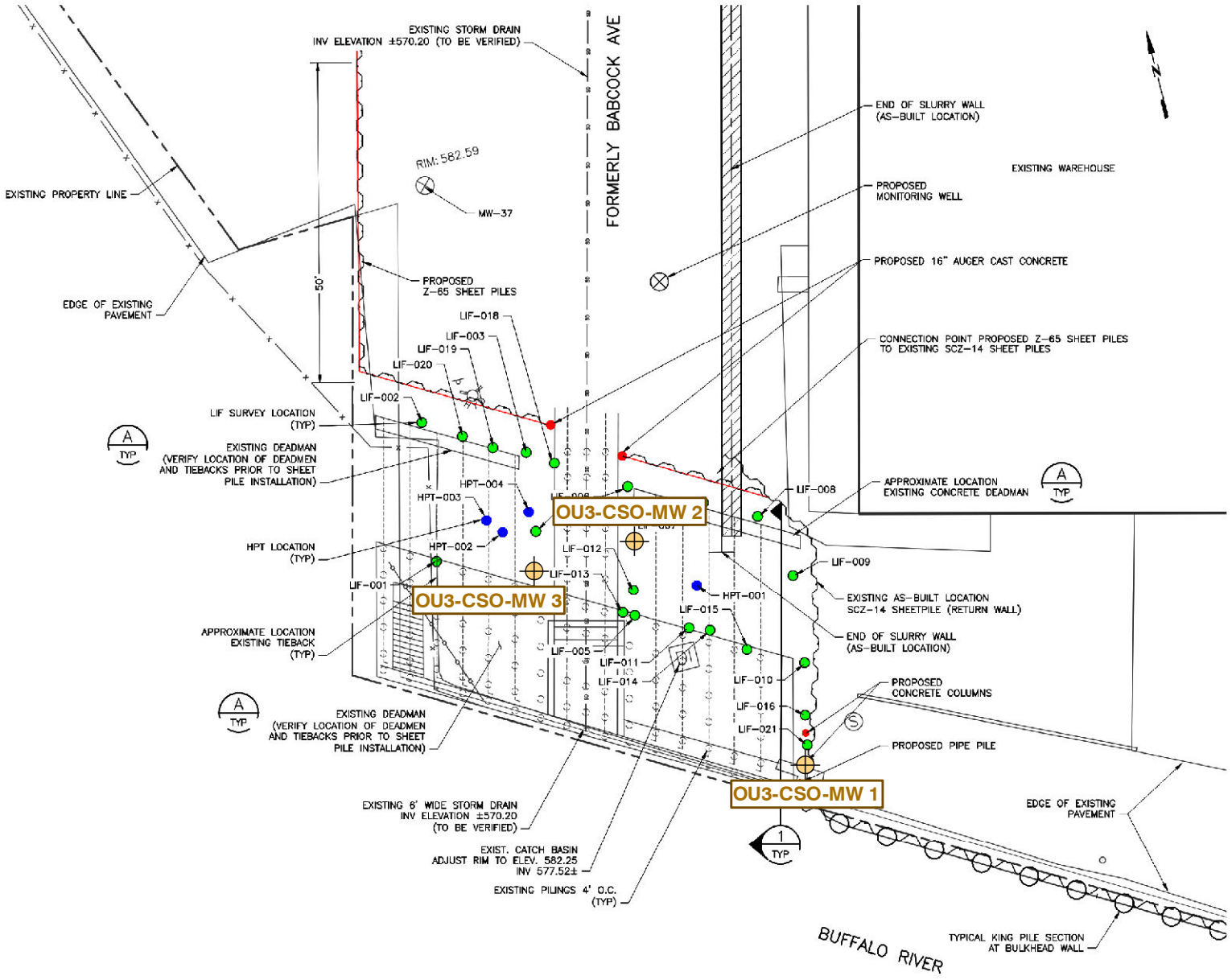
PROJECT NUMBER: 2200012
DRAWN BY: TAP
REVIEWED BY: CTB
ISSUED FOR:
DATE: OCTOBER 23, 2020
DRAWING NAME:

Figure 3

Extended Containment System Design

C201

Date & Time: 10/23/2020 1:59 PM By: Petranchuk, Tim
Path: I:\Elk Street Commerce Park\2200012 - OM&M Elk St Commerce\Babcock Drain Remedy\Drawings from Wood\Fig-1 OU3 Seep Remedy LaBella.dwg



Path: I:\Elk Street Commerce Park\2200012 - OM&M Elk St Commerce\GIS\MXD\2020_10_11\Figure 4 CSO Series Well Locations.mxd GRC

LaBella
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ExxonMobil Former Buffalo Terminal OU-3 Remedial Action Work Plan Addendum

N

LaBella Project No: 2200012
Date: October 2020

CSO Series Well Locations

Figure 4

LaBella
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ExxonMobil Former Buffalo Terminal OU-3 Remedial Action Work Plan Addendum

N

0 50 100 Feet

Legend

- Additional Monitoring Wells
- Existing Well / Piezometer

LaBella Project No: 2200012
Date: October 2020

Additional Western Boundary Well Locations

Figure 5

Path: I:\Elk Street Commerce Park\2200012 - OM&M Elk St Commerce\GIS\MXD\2020_10_11\Figure 5 - Additional Western Boundary Well Locations.mxd GRC

APPENDIX A

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Permits, Region 9
270 Michigan Avenue, Buffalo, NY 14203-2915
P: (716) 851-7165 | F: (716) 851-7168
www.dec.ny.gov

September 22, 2020

Mr. Paul Neureuter
Elk Street Commerce Park LLC
4 Centre Drive
Orchard Park, New York 14127

Dear Mr. Neureuter:

PERMIT TRANSMITTAL LETTER
DEC PERMIT No. 9-1402-00977

Enclosed is your permit which was issued in accordance with applicable provisions of the Environmental Conservation Law. The permit is valid for only that project, activity or operation expressly authorized.

The DEC permit number and Program ID number, if applicable, should be retained for your records and should be referenced on all future correspondence and applications related to the permit. If modifications are desired after permit issuance, you must submit the proposed revisions and receive written approval from the Permit Administrator prior to initiating any change. If the Department determines that the modification represents a material change in the scope of the authorized project, activity, operation or permit conditions, you will be required to submit a new application for permit.

Please note the expiration date of the permit. Applications for permit renewal should be made well in advance of the expiration date (minimum of 30 days) and submitted to the Regional Permit Administrator at the above address. For SPDES, Solid Waste and Hazardous Waste Permits, renewals must be made at least 180 days prior to the expiration date.

Please review all permit conditions carefully. In particular, identify your initial responsibilities under this permit in order to assure timely action if required. Since failure to comply precisely with permit conditions may be treated as a violation of the environmental conservation law, you are requested to provide a copy of the permit to the project contractor, facility operator, and other persons directly responsible for permit implementation (if any).

If you have any questions, please contact this office at the above address.

Respectfully,

David S. Denk
Regional Permit Administrator

DSD/slr
Enclosure

ec: Acting Captain Liza Bobseine, Division of Law Enforcement, NYSDEC Region 9
Mr. Mike Todd, Division of Fish and Wildlife, NYSDEC Region 9
Mr. Gene Melnyk, Division of Environmental Remediation, NYSDEC Region 9
Mr. Steve Metivier, U.S. Army Corps of Engineers, Buffalo District
Mr. Rob Napieralski, LaBella PC

PERMIT

Under the Environmental Conservation Law (ECL)

Permittee and Facility Information

Permit Issued To:
Elk Street Commerce Park LLC

4 Centre Dr
ORCHARD PARK, NY 14127

EXXONMOBIL OIL CORP
3225 GALLOWS RD
FAIRFAX, VA 22037
(703) 846-3000

Facility:
FORMER EXXON MOBIL BUFFALO TERMINAL
625 ELK ST
BUFFALO, NY 14210

Facility Location: in BUFFALO in ERIE COUNTY
Facility Principal Reference Point: NYTM-E: 186.961 NYTM-N: 4752.841
Latitude: 42°51'50.5" Longitude: 78°49'54.9"

Authorized Activity: The installation of approximately 1,400 feet of metal sheet pile down to bedrock in front of the existing bulkhead along the bank of the Buffalo River at the Former Buffalo Terminal in the City of Buffalo. As part of the September 22, 2020 modification the metal sheet pile wall will be extended approximately 65 linear feet in the vicinity of Babcock Street CSO outfall to isolate soil contamination. The purpose of this project is to aid in containment and recovery of migrating contaminants from impacted groundwater to the Buffalo River and to remove direct contact hazards from impacted soils, thus reducing the impact from the site on the Buffalo River.

Permit Authorizations

Excavation & Fill in Navigable Waters - Under Article 15, Title 5
Permit ID 9-1402-00977/00004

New Permit	Effective Date: 3/2/2018	Expiration Date: 3/1/2021
Modification # 1	Effective Date: 9/22/2020	Expiration Date: 3/1/2021

Water Quality Certification - Under Section 401 - Clean Water Act
Permit ID 9-1402-00977/00006

Modification # 0	Effective Date: 9/22/2020	Expiration Date: 3/1/2021

NYSDEC Approval

By acceptance of this permit, the permittee agrees that the permit is contingent upon strict compliance with the ECL, all applicable regulations, and all conditions included as part of this permit.

Permit Administrator: DAVID S DENK, Regional Permit Administrator
Address: NYSDEC Region 9 Headquarters
270 Michigan Ave
Buffalo, NY 14203 -2915

Authorized Signature: David S. Denk Digitally signed by David S. Denk DN: cn=David S. Denk, o=NYS DEC, ou=Div. of Env. Permits, email=david.denk@dec.ny.gov, c=US Date: 2020.09.22 13:38:15 -04'00' Date ___/___/____

Distribution List

Law Enforcement
MICHAEL TODD
US ARMY CORPS OF ENGINEERS - BUFFALO DISTRICT
EUGENE W MELNYK
Robert Napieralski

Permit Components

NATURAL RESOURCE PERMIT CONDITIONS

WATER QUALITY CERTIFICATION SPECIFIC CONDITION

GENERAL CONDITIONS, APPLY TO ALL AUTHORIZED PERMITS

NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

NATURAL RESOURCE PERMIT CONDITIONS - Apply to the Following Permits: EXCAVATION & FILL IN NAVIGABLE WATERS; WATER QUALITY CERTIFICATION

1. **Conformance With Plans** All activities authorized by this permit must be in strict conformance with the approved plans submitted by the applicant or applicant's agent as part of the permit application. Such approved plans were prepared by Amec Foster Wheeler titled Bulkhead isolation project Exxon Mobil former Buffalo Terminal and dated October 2017. Modified plans were prepared by LaBella Associates and dated September 16, 2020..

2. **Work Prohibition Period** Construction activities in the Buffalo River are prohibited during the period April 1st through June 30th.

3. **Notice of Intent to Commence Work** The permittee shall submit a Notice of Intent to Commence Work to DEP.R9@dec.ny.gov at least 48 hours in advance of the time of commencement and shall also notify her promptly in writing of the completion of work.

4. **Siltation Prevention Measures** Siltation prevention measures, such as silt fencing, sediment traps or settling basins, shall be installed and maintained during the project, to prevent movement of silt and turbid waters from the project site into any watercourse, stream, water body or wetland.

5. **Concrete Leachate** During construction, no wet or fresh concrete or leachate shall be allowed to escape into any wetlands or waters of New York State, nor shall washings from ready-mixed concrete trucks, mixers, or other devices be allowed to enter any wetland or waters. Only watertight or waterproof forms shall be used. Wet concrete shall not be poured to displace water within the forms.

6. **No Work During High Water and Waves** No work shall occur in the Buffalo River during periods of high water and wave conditions. No work shall occur during or immediately after a storm, which may cause high water conditions or flooding.

7. **Isolate Work Area** The in-water and surrounding work area shall be isolated with a combination of soil erosion and sedimentation controls.

8. **Seed, Mulch Disturbed Areas** All areas of soil disturbance that are a result of this project shall be seeded with an erosion control seed mix and mulched with straw or hydro-mulch immediately upon completion of the project, within two days of final grading, or by the expiration date of the permit, whichever is first. Mulch shall be maintained until suitable vegetative cover is established to the department's satisfaction.

9. **No Interference With Navigation** There shall be no unreasonable interference with navigation by the work herein authorized.

10. **Precautions Against Contamination of Waters** All necessary precautions shall be taken to preclude contamination of any wetland or waterway by suspended solids, sediments, fuels, solvents, lubricants, epoxy coatings, paints, concrete, leachate or any other environmentally deleterious materials associated with the project.

11. **State Not Liable for Damage** The State of New York shall in no case be liable for any damage or injury to the structure or work herein authorized which may be caused by or result from future operations undertaken by the State for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.

12. **State May Order Removal or Alteration of Work** If future operations by the State of New York require an alteration in the position of the structure or work herein authorized, or if, in the opinion of the Department of Environmental Conservation it shall cause unreasonable obstruction to the free navigation of said waters or flood flows or endanger the health, safety or welfare of the people of the State, or cause loss or destruction of the natural resources of the State, the owner may be ordered by the Department to remove or alter the structural work, obstructions, or hazards caused thereby without expense to the State, and if, upon the expiration or revocation of this permit, the structure, fill, excavation, or other modification of the watercourse hereby authorized shall not be completed, the owners, shall, without expense to the State, and to such extent and in such time and manner as the Department of Environmental Conservation may require, remove all or any portion of the uncompleted structure or fill and restore to its former condition the navigable and flood capacity of the watercourse. No claim shall be made against the State of New York on account of any such removal or alteration.

13. **State May Require Site Restoration** If upon the expiration or revocation of this permit, the project hereby authorized has not been completed, the applicant shall, without expense to the State, and to such extent and in such time and manner as the Department of Environmental Conservation may lawfully require, remove all or any portion of the uncompleted structure or fill and restore the site to its former condition. No claim shall be made against the State of New York on account of any such removal or alteration.

WATER QUALITY CERTIFICATION SPECIFIC CONDITIONS

1. **Water Quality Certification** The authorized project, as conditioned pursuant to the Certificate, complies with Section 301, 302, 303, 306, and 307 of the Federal Water Pollution Control Act, as amended and as implemented by the limitations, standards, and criteria of state statutory and regulatory requirements set forth in 6 NYCRR Section 608.9(a). The authorized project, as conditioned, will also comply with applicable New York State water quality standards, including but not limited to effluent limitations, best usages and thermal discharge criteria, as applicable, as set forth in 6 NYCRR Parts 701, 702, 703, and 704.

GENERAL CONDITIONS - Apply to ALL Authorized Permits:

1. **Facility Inspection by The Department** The permitted site or facility, including relevant records, is subject to inspection at reasonable hours and intervals by an authorized representative of the Department of Environmental Conservation (the Department) to determine whether the permittee is complying with this permit and the ECL. Such representative may order the work suspended pursuant to ECL 71- 0301 and SAPA 401(3).

The permittee shall provide a person to accompany the Department's representative during an inspection to the permit area when requested by the Department.

A copy of this permit, including all referenced maps, drawings and special conditions, must be available for inspection by the Department at all times at the project site or facility. Failure to produce a copy of

the permit upon request by a Department representative is a violation of this permit.

2. **Relationship of this Permit to Other Department Orders and Determinations** Unless expressly provided for by the Department, issuance of this permit does not modify, supersede or rescind any order or determination previously issued by the Department or any of the terms, conditions or requirements contained in such order or determination.

3. **Applications For Permit Renewals, Modifications or Transfers** The permittee must submit a separate written application to the Department for permit renewal, modification or transfer of this permit. Such application must include any forms or supplemental information the Department requires. Any renewal, modification or transfer granted by the Department must be in writing. Submission of applications for permit renewal, modification or transfer are to be submitted to:

Regional Permit Administrator
NYSDEC Region 9 Headquarters
270 Michigan Ave
Buffalo, NY14203 -2915

4. **Submission of Renewal Application** The permittee must submit a renewal application at least 30 days before permit expiration for the following permit authorizations: Excavation & Fill in Navigable Waters, Water Quality Certification.

5. **Permit Modifications, Suspensions and Revocations by the Department** The Department reserves the right to exercise all available authority to modify, suspend or revoke this permit. The grounds for modification, suspension or revocation include:

a. materially false or inaccurate statements in the permit application or supporting papers;

b. failure by the permittee to comply with any terms or conditions of the permit;

c. exceeding the scope of the project as described in the permit application;

d. newly discovered material information or a material change in environmental conditions, relevant technology or applicable law or regulations since the issuance of the existing permit;

e. noncompliance with previously issued permit conditions, orders of the commissioner, any provisions of the Environmental Conservation Law or regulations of the Department related to the permitted activity.

6. **Permit Transfer** Permits are transferrable unless specifically prohibited by statute, regulation or another permit condition. Applications for permit transfer should be submitted prior to actual transfer of ownership.

NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

Item A: Permittee Accepts Legal Responsibility and Agrees to Indemnification
The permittee, excepting state or federal agencies, expressly agrees to indemnify and hold harmless the Department of Environmental Conservation of the State of New York, its representatives, employees, and agents ("DEC") for all claims, suits, actions, and damages, to the extent attributable to the permittee's acts or omissions in connection with the permittee's undertaking of activities in connection with, or operation and maintenance of, the facility or facilities authorized by the permit whether in compliance or not in compliance with the terms and conditions of the permit. This indemnification does not extend to any claims, suits, actions, or damages to the extent attributable to DEC's own negligent or intentional acts or omissions, or to any claims, suits, or actions naming the DEC and arising under Article 78 of the New York Civil Practice Laws and Rules or any citizen suit or civil rights provision under federal or state laws.

Item B: Permittee's Contractors to Comply with Permit
The permittee is responsible for informing its independent contractors, employees, agents and assigns of their responsibility to comply with this permit, including all special conditions while acting as the permittee's agent with respect to the permitted activities, and such persons shall be subject to the same sanctions for violations of the Environmental Conservation Law as those prescribed for the permittee.

Item C: Permittee Responsible for Obtaining Other Required Permits
The permittee is responsible for obtaining any other permits, approvals, lands, easements and rights-of-way that may be required to carry out the activities that are authorized by this permit.

Item D: No Right to Trespass or Interfere with Riparian Rights
This permit does not convey to the permittee any right to trespass upon the lands or interfere with the riparian rights of others in order to perform the permitted work nor does it authorize the impairment of any rights, title, or interest in real or personal property held or vested in a person not a party to the permit.

APPENDIX B

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, BUFFALO DISTRICT
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207-3199

September 28, 2020

Regulatory Branch

SUBJECT: Department of the Army No. LRB-2020-01268, Nationwide Permit No. 38, Cleanup of Hazardous and Toxic Waste, as Published in the Federal Register, Volume 82, No. 4, on Friday, January 6, 2017

Mr. Paul Neureuter
Co-Manager
Elk Street Commerce Park, LLC
4 Centre Drive
Orchard Park, New York 14127

Dear Mr. Neureuter:

This pertains to your proposal to install a steel sheet piling bulkhead refacing directly in front of an existing concrete bulkhead, for a length of about 67 feet, in the river, in order to prevent the leaching of petroleum into the waterway, in the Buffalo River, located at 1 Babcock Street, in the City of Buffalo, Erie County, New York.

I have evaluated the impacts associated with your proposal and have concluded that they are authorized by the enclosed Nationwide Permit (NWP) provided that the attached conditions are satisfied.

Verification of the applicability of this NWP is valid until March 18, 2022, unless the NWP is modified, suspended, revoked, or the activity complies with any subsequent permit modification. Please note in accordance with 33 CFR part 330.6(b), that if you commence or are under contract to commence an activity in reliance of the permit prior to the date this NWP expires, is suspended or revoked, or is modified such that the activity no longer complies with the terms and conditions, you have twelve months from the date of permit modification, expiration, or revocation to complete the activity under the present terms and conditions of the permit, unless the permit has been subject to the provisions of discretionary authority.

It is your responsibility to remain informed of changes to the NWP program. A public notice announcing any changes will be issued when they occur and will be available for viewing at our website: http://www.lrb.usace.army.mil/Missions/Regulatory.aspx. Finally, note that if your activity is not undertaken within the defined period or the project specifications have changed, you must immediately notify this office to determine the need for further approval or reverification.

During our review we considered all applicable Federal requirements as well as state Water Quality Certification (WQC) conditions. We have made every effort to ensure that your project

SUBJECT: Application No. LRB-2020-01268, Nationwide No. 38, Cleanup of Hazardous and Toxic Waste, as Published in the Federal Register, Volume 82, No. 4, on Friday, January 6, 2017

complies with these requirements. However, we have neither the resources nor the statutory authority to conclusively determine whether your project complies with ALL New York State WQC conditions. In this regard, I strongly suggest that you closely review the WQC conditions attached at the end of this document. If you are certain that you will remain in compliance with ALL conditions attached to this Permit no further coordination is required. However, if you have any doubt about your ability to comply with the state WQC conditions you must resolve those issues with the appropriate Department of Environmental Conservation (DEC) Regional office before you commence work. If the state determines that you need to obtain a project specific WQC you should forward to this office a copy of their final decision at the conclusion of the process. Direct your WQC inquiries to:

Regional Permit Administrator
New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

Your initiation of work as authorized by the enclosed NWP acknowledges your acceptance of the general and special conditions contained therein. This affirmation is limited to the attached NWP and associated WQC and does not obviate the need to obtain any other project specific Federal, state, or local authorization. Specifically, you may need to obtain Article 15 (Protection of Water), Article 24 (Freshwater Wetland), and/or Article 34 (Coastal Erosion Management) authorization from the New York State DEC.

Questions pertaining to this matter should be directed to me at (716) 879-4307, by writing to the following address: U.S. Army Corps of Engineers Regulatory Branch, 1776 Niagara Street, Buffalo, New York 14207, or by e-mail at: Mel.R.Schroeder@usace.army.mil.

Sincerely,

Mel R. Schroeder

Mel Schroeder
Environmental Engineer

Enclosures
cc: Robert Napieralski (LaBella Associates)

COMPLETION FORM / COMPLIANCE CERTIFICATION

Each permittee who receives a Nationwide Permit (NWP) verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and any compensatory mitigation.

APPLICANT:
Mr. Paul Neureuter
Elk Street Redevelopment, LLC
4 Centre Drive
Orchard Park, NY 14127

POINT OF CONTACT:
Mr. Paul Neureuter
Elk Street Redevelopment, LLC
4 Centre Drive
Orchard Park, NY 14127

File No.: LRB-2020-01268
File Closed: September 28, 2020
NWP No.: 38

Upon completion of the activity authorized by this permit and any required compensatory mitigation sign this certification and return it to the address listed below within 30 days of project completion.

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, revocation, and/or assessment of administrative penalties.

The permittee shall certify the completion of the authorized work and mitigation:

a. The authorized work was done in accordance with the NWP authorization, including any general, regional, or activity specific conditions.

b. The implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, this certification must include the documentation required by 33 CFR 332.3(1)(3) to confirm that the permittee secured the appropriate number and resource type of credits.

_____ _____
Paul Neureuter Date

Permittee Telephone Number: _____

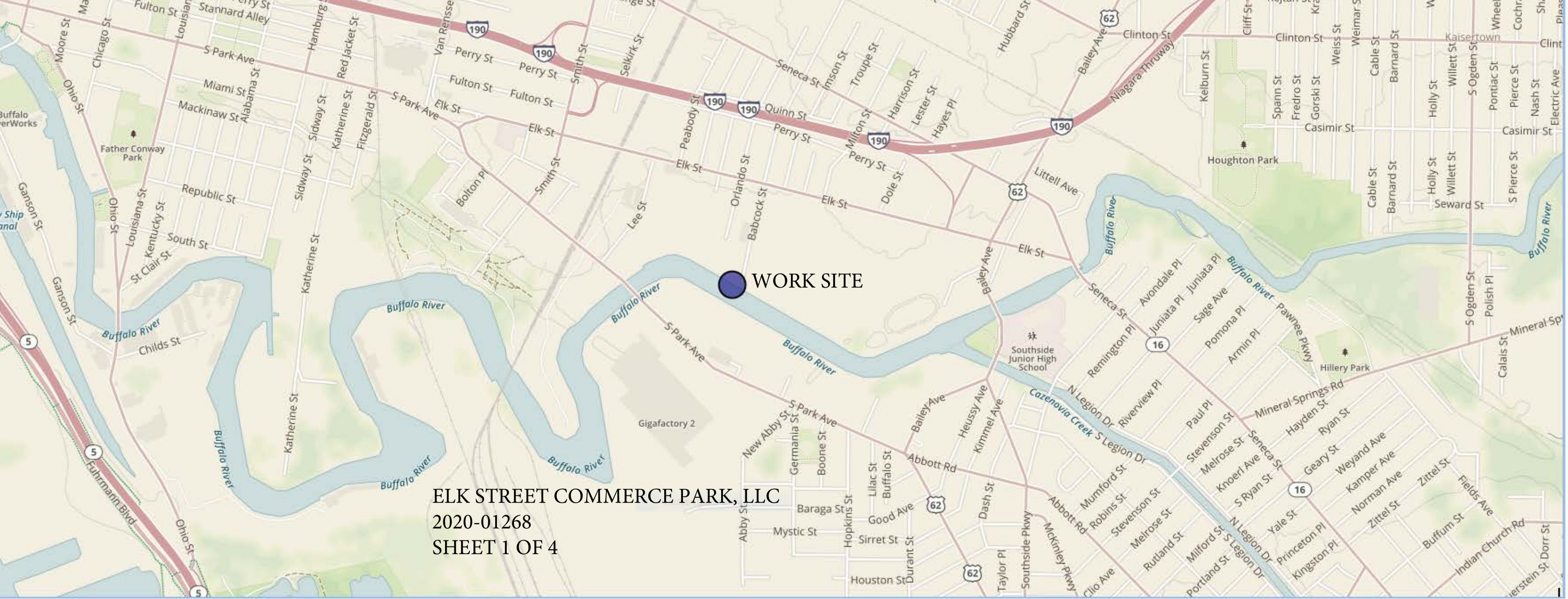
Project location:

Project Description: install a steel sheet piling bulkhead refacing directly in front of an existing concrete bulkhead, for a length of about 67 feet, in the river, in order to prevent the leaching of petroleum into the waterway

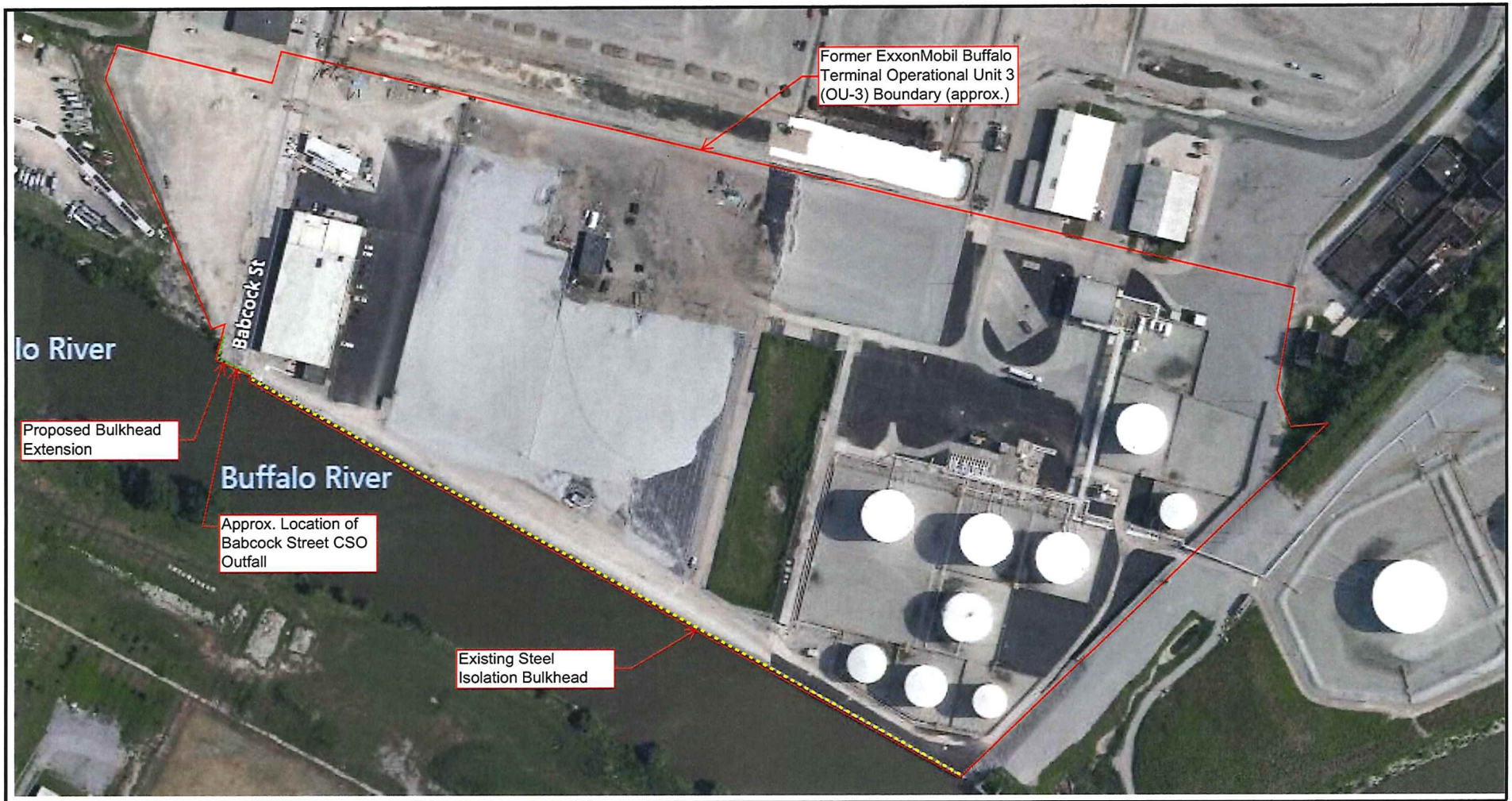
Authorized Impacts (Waters of the U.S. Impacted by Project): 67 feet

Waterway and/or Project Setting: The Buffalo River

Return completed form to:
Mr. David Leput
Regulatory Branch
U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207



ELK STREET COMMERCE PARK, LLC
2020-01268
SHEET 1 OF 4



N

NOT TO SCALE

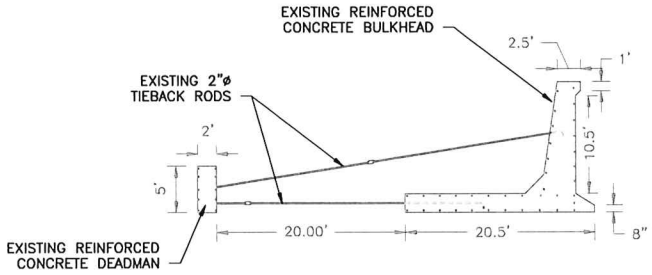
SITE AERIAL

Elk Street Commerce Park
Buffalo, New York

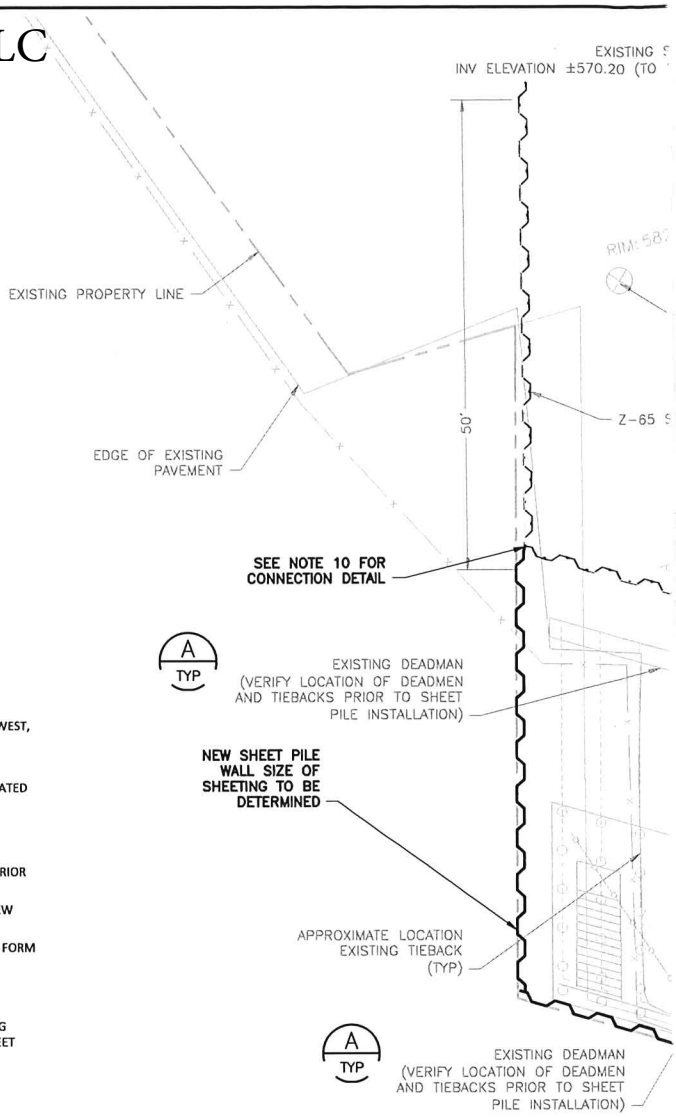
LaBella
Powered by partnership

ELK STREET COMMERCE PARK, LLC
2020-01268
SHEET 2 OF 4

ELK STREET COMMERCE PARK, LLC
2020-01268
SHEET 3 OF 4

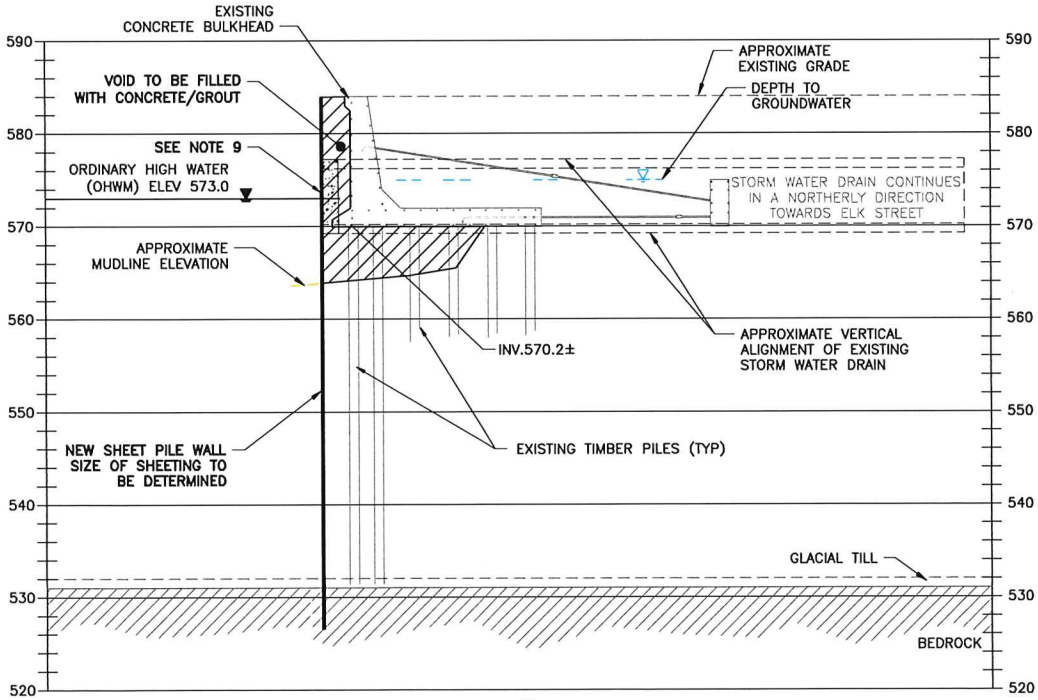


EXISTING DEADMAN
1" = 10'
A TYP

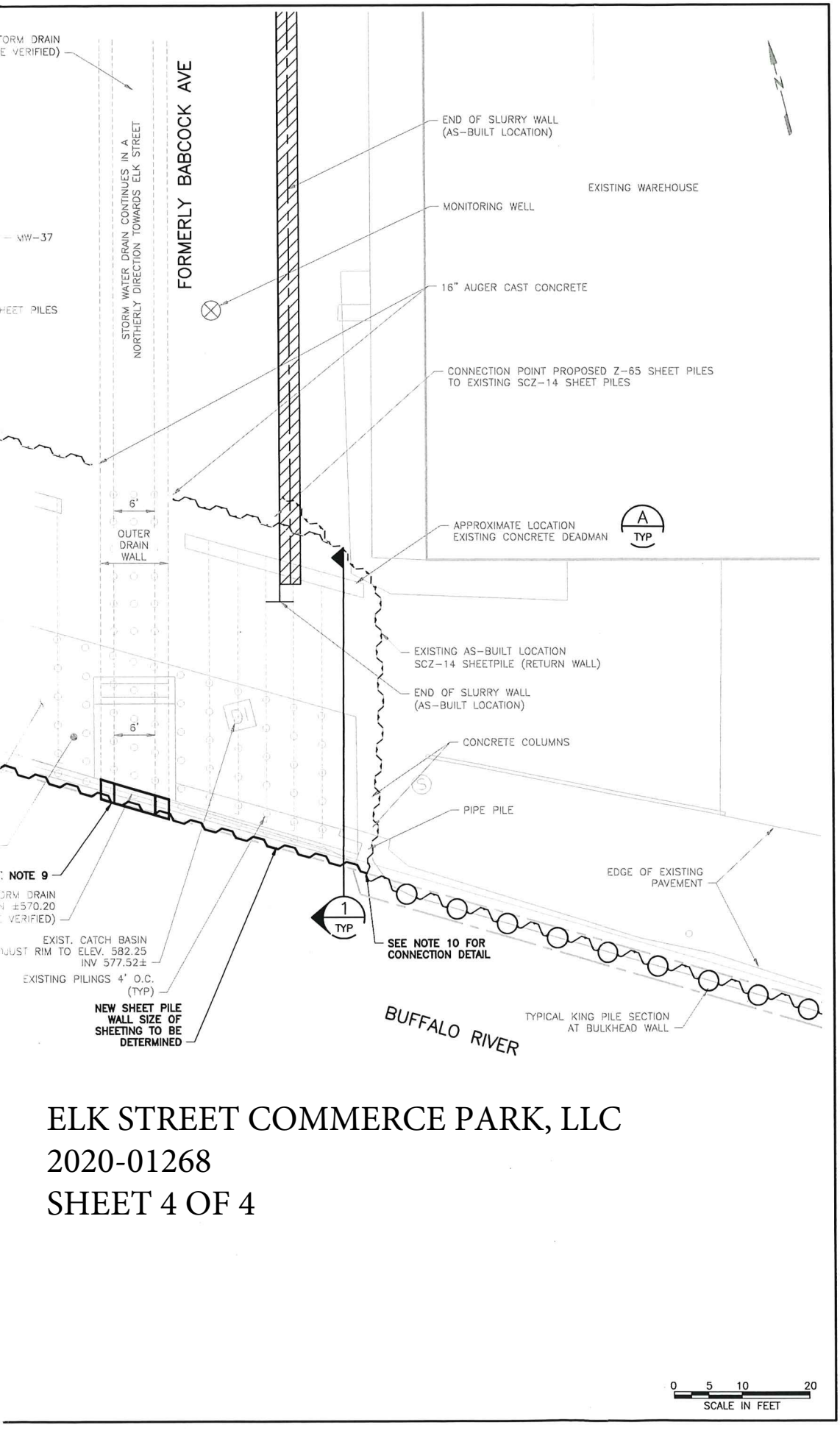


GENERAL NOTES:

1) THE BASE FIGURES WERE OBTAINED FROM A DRAWING PREPARED BY: AMEC, E&E, PC; TITLED: SITE PLAN WEST, OU3 SEEP REMEDY; DATED: 8/31/20; PROJECT NO.: 3617-16-7397; DRAWING NO.: FIGURE 1.
2) BABCOCK DRAIN SHALL BE OPERATIONAL DURING CONSTRUCTION.
3) STEEL SHEET PILES ARE ANTICIPATED TO BE 65-FEET LONG AND SHALL BE INSTALLED TO REFUSAL (ANTICIPATED TO BE TOP OF BEDROCK)
4) STEEL SHEET PILES SHALL BE HOT ROLLED SECTIONS, COLD ROLLED SECTIONS SHALL NOT BE USED.
5) SIZE OF STEEL SHEET PILES SHALL BE DETERMINED DURING DESIGN.
6) COMMON INTERLOCKS SHALL BE WELDED, THE LEADING INTERLOCK SHALL HAVE A SWELL SEAL APPLIED PRIOR TO DRIVING.
7) CONCRETE OR GROUT SHALL BE TREMIE PUMPED BENEATH THE EXISTING OUTFALL AND BETWEEN THE NEW SHEET PILE WALL AND EXISTING OUTFALL STRUCTURE.
8) NELSON STUDS SHALL BE WELDED TO THE SHEET PILES (SPACING TO BE DETERMINED DURING DESIGN) TO FORM A PERMANENT BOND BETWEEN THE CONCRETE/GROUT AND THE NEW SHEETING.
9) A STEEL CHANNEL SHALL BE USED AROUND THE EXISTING OUTFALL OPENING TO "EXTEND" THE OUTFALL THROUGH THE NEW SHEETPILE WALL AND CONCRETE/GROUT.
10) WHERE THE NEW SHEET PILE WALL SHALL BE JOINED TO EXISTING SHEETING, A SECTION OF THE EXISTING SHEETING SHALL BE WITHDRAWN, AN INTERLOCK OR NEW SHEET SHALL BE WELDED TO THE EXISTING SHEET AND THE MODIFIED SHEET SHALL BE REINSTALLED.
11) THIS FIGURE IS NOT INTENDED FOR CONSTRUCTION, ESTIMATING OR LAYOUT PURPOSES.



SECTION 1
1" = 10'
1 TYP



ELK STREET COMMERCE PARK, LLC
2020-01268
SHEET 4 OF 4

LaBella
Powered by partnership.
300 Pearl Street, Suite 130
Buffalo, NY 14202
716-551-6281
labellapc.com

NOT FOR CONSTRUCTION

ELK STREET COMMERCE PARK LLC
4 CENTRE DRIVE
ORCHARD PARK, NY 14127

ELK STREET COMMERCE PARK
625 ELK STREET
BUFFALO, NEW YORK

--	--	--
NO.	DATE:	DESCRIPTION:
REVISIONS		

PROJECT NUMBER: 2200012
DRAWN BY: TAP
REVIEWED BY: CTB
ISSUED FOR:
DATE: SEPTEMBER 15, 2020
DRAWING NAME:

SITE PLAN WEST

DRAWING NUMBER:

FIGURE 1

APPENDIX C

October 21, 2020

Mr. Eugene Melnyk, PE
Remediation Engineer
NYSDEC Region 9
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, New York 14203-2915

RE: ExxonMobil Former Buffalo Terminal OU-3 – Design of Sealed Sheet Pile Wall Extension
503 & 625 Elk Street and 1 & 3 Babcock Street, Buffalo, NY (BCP Site No. C915201D)
LaBella Project #2200012

Dear Mr. Melnyk:

Design plans for the extension of the sealed bulkhead located on the above referenced site in the vicinity of the Babcock Street Combined Sewer Overflow (CSO) outfall were included in the Remedial Action Work Plan addendum submitted to the New York State Department of Environmental Conservation (NYSDEC), Buffalo Sewer Authority (BSA) and United States Coast Guard (USCG) on October 12, 2020. As requested by the NYSDEC, said design plans and supporting calculations were submitted for independent peer review by a NYSDEC-endorsed professional engineering consultant, John P. Stopen Engineering, LLP (Stopen).

The results of the peer review are summarized in a letter from Stopen dated October 21, 2020, which is included as Attachment 1. Individual responses to each of the comments and recommendations issued in the Stopen letter are provided below, and all Stopen comments and recommendations have been addressed in the revised plans included as Attachment 2.

Comment # 1
No quantitative strength information was available so use of conservative soil strengths would be appropriate for design.

Response # 1
Conservative soil values were used for designing the sheet pile bulkhead system.

Comment # 2
Temporary cofferdam sheeting should be extended to rock to achieve adequate safety for cantilevered sheeting. Otherwise sheeting could be braced against concrete head wall.

Response # 2
Cofferdam sheeting now extends to rock as shown on the plans.

Comment # 3
For main sheeting analysis, we would not consider the concrete as part of the soil profile for calculating earth pressure. The Revised Soil Profile would not include modeling of the concrete.

Response # 3
Modeling the concrete as soil is a more conservative approach as it places additional lateral loading on the sheeting, resulting in additional loads transferred to the tieback and waler. A more conservative tie rod and waler design load has been utilized based on the Stopen modeling.

Comment # 4
Consequently, the tie rod design load would increase to about 7 kips per foot.

Response # 4
The tie rod and waler design load utilized was 7 kips per foot.

Comment # 5
PZC-18 sheet piles have adequate structural strength for the Revised Soil Profile.

Response # 5
PZC-18 sheet piles have been specified in LaBella's design as shown on the plans.

Comment #6
PZC-18 sheet piles have adequate toe penetration for SF=1.5 (safety factor of 1.5) if driven to rock and tied back at the tie rod level for the Revised Soil Profile.

Response #6
Per the design, PZC-18 sheet piles will be driven to rock and a tie-rod and waler system designed for a lateral loading of 7 kips per foot will be installed.

Comment # 7
Tie rod design force of about 7 kips per ft. at 8-ft c-c spacing (56 kips) would be met with1.5-inch-diameter grade 75 Thread Bar (or 1.375-inch diameter grade 150 Thread Bar) with an allowance for corrosion. Bar diameter could be increased or coated to provide additional corrosion allowance. Critical corrosion allowance should be considered at the exposed threaded connections.

Response # 7
A 1-3/4-inch diameter grade 150 thread bar has been specified to provide additional corrosion protection. To provide for critical corrosion protection at each end of the tie-rods, the tie-rod and waler shall be embedded in concrete.

Comment # 8
The SZC-16 Sheeting Piling in the hanging wall is adequate for use as the deadman anchor as shown by your red annotations on Sheet C-201, but will require a wale beam to distribute load.

Response # 8
A waler system has been designed for the Sheet Pile Bulkhead Wall and for the Deadman Anchor Wall (Existing Hanging Sheet Pile Wall) using:

- *7 kips/ft. loading;*
- *Tie-Rod spacing of 8 ft. on center; and*
- *An allowable deflection of 3/16".*

The resulting waler system consists of a pair of channels C12x25 grade 50 steel placed back to back with an 8"x8" x1" thick grade 50 steel 502 steel bearing plate resulting in a safety factor of 1.52.

The revised plans included in Attachment 2 also address comments received from the BSA via e-mail dated October 19, 2020. Lastly, the design calculations submitted to Stopen have been provided in Attachment 3.

Elk Street Commerce Park, LLC (ESCP) respectfully requests that the NYSDEC expedite the review of the revised design plans to enable the shoring contractor to proceed with material acquisition, fabrication and construction per the schedule outlined in the Interim Corrective Measures Work Plan. Please do not hesitate to contact me should you have any questions concerning this submittal.

Respectfully submitted,

LaBella Associates, DPC

Craig T. Bruening, PE
Sr. Geotechnical Engineer

Robert Napieralski, CPG
Vice President/ Buffalo Regional Manager

cc: C. Staniszewski (NYSDEC)
A. Caprio (NYSDEC)
CDR. W. McKinstrey (USCG)
LT. J. Hoffman (USCG)
R. Nogle (BSA)
R. Harris (BSA)
P. Neureuter (ESCP)
B. Genes (ESCP)
A. Cubins (ESCP)
A. Janik (LaBella)

ATTACHMENT 1

JOHN P. STOPEN ENGINEERING, LLP

PRINCIPALS: JAMES F. KAPLAN, P.E. / JAMES P. STEWART, PH.D., P.E. / ROBERT J. COSSELMAN, P.E. / MATTHEW W. MCKEE, P.E., S.E. / JASON P. THORPE, P.E.
ASSOCIATE: ERIK A. NELSON, P.E.

October 21, 2020

via email to cbruening@labellapc.com
LaBella Associates
300 Pearl Street, Suite 130
Buffalo, NY 14202

ATTN: Mr. Craig Bruening, P.E.

RE: Peer Review, Rev. 1
Permanent Sheet Piling Design
Elk Street Commerce Park
#220225.00

Dear Mr. Bruening:

At your request, we reviewed these documents:

1. Sheetpile Calculations by CT- SHORING dated 10-12-2020 4:20 pm

2. Deadman, Tieback Waler Calculations dated 10-8-2020

3. General Boring Location Plan dated January 2017

4. Subsurface Profile Slurry Wall West by AMEC Foster Wheeler dated 10-26-2017

5. CSO Plan Sketch 20201009.pdf dated 9-25-2020 Sheet C201 with red and blue annotations.

We independently checked calculations and overall design judgment and have these comments:

1. No quantitative strength information was available so use of conservative soil strengths would be appropriate for design.

2. Temporary cofferdam sheeting should be extended to rock to achieve adequate safety for cantilevered sheeting. Otherwise sheeting could be braced against concrete head wall.

3. For main sheeting analysis, we would not consider the concrete as part of the soil profile for calculating earth pressure. The Revised Soil Profile would not include modeling of the concrete.

4. Consequently, the tie-rod design load would increase to about 7 kips per foot.

5. PZC-18 sheet piles have adequate structural strength for the Revised Soil Profile.

6. PZC-18 sheet piles have adequate toe penetration for SF=1.5 if driven to rock and tied back at the tie rod level for the Revised Soil Profile.

7. Tie rod design force of about 7 kips per ft at 8-ft c-c spacing (56 kips) would be met with 1.5-inch-diameter grade 75 Thread Bar (or 1.375-inch-diameter grade 150 Thread Bar) with an allowance for corrosion. Bar diameter could be increased or coated to provide additional corrosion allowance. Critical corrosion allowance should be considered at the exposed threaded connections.

8. The SZC-16 Sheeting Piling in the hanging wall is adequate for use as the deadman anchor as shown by your red annotations on Sheet C-201, but will require a wale beam to distribute load.

Please contact us if you have any questions about our review.

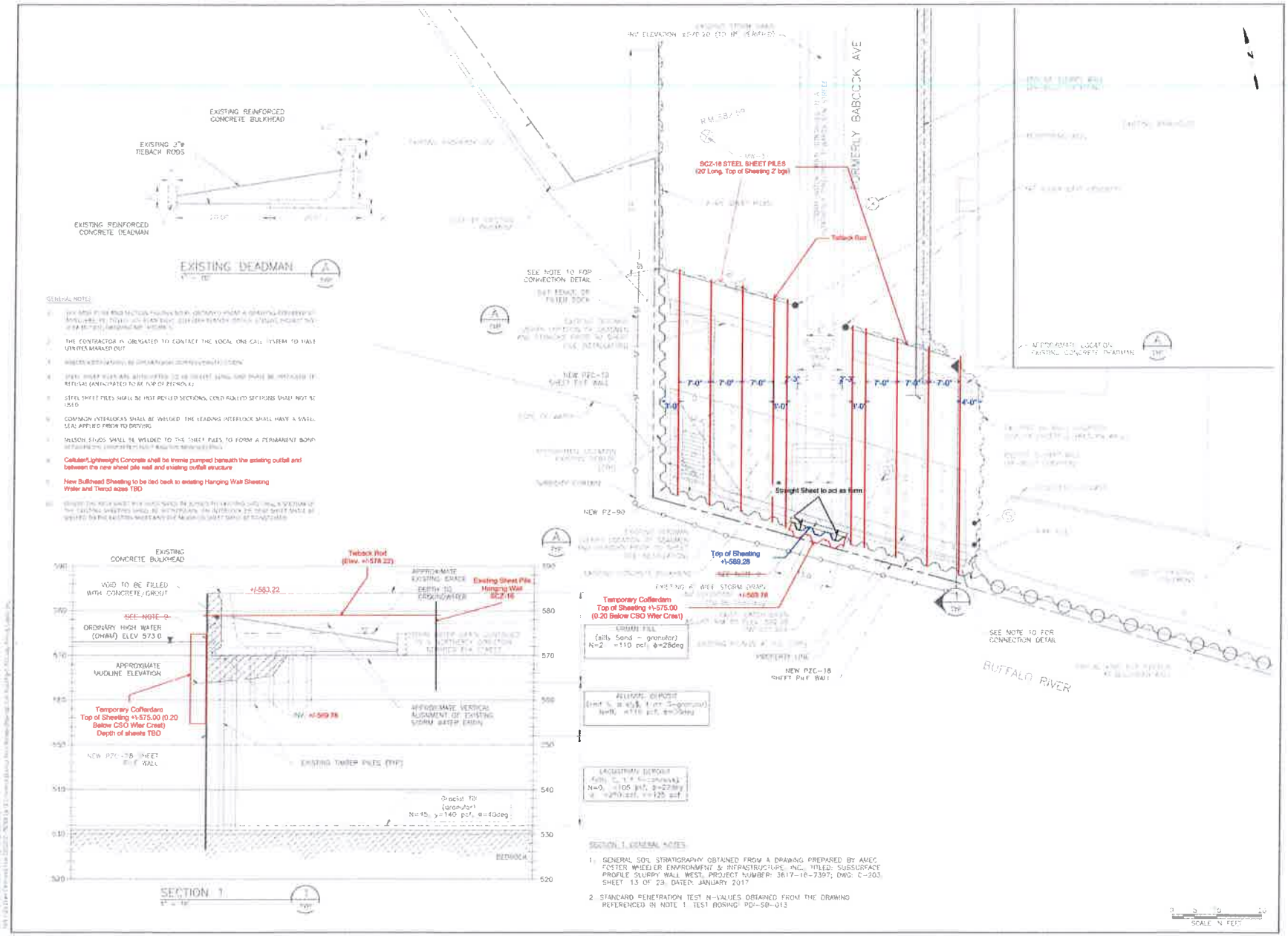
Sincerely,

JOHN P. STOPEN ENGINEERING, LLP

JAMES P. STEWART, Ph.D., P.E.
Partner, Geotechnical Engineer

JPS/jlw

Attachment



GENERAL NOTES

1. [illegible]
2. THE CONTRACTOR IS OBLIGATED TO CONTACT THE LOCAL ONE CALL SYSTEM TO HAVE UTILITIES MARKED OUT.
3. [illegible]
4. [illegible]
5. STEEL SHEET PILES SHALL BE HOT ROLLED SECTIONS, COLD ROLLED SECTIONS SHALL NOT BE USED.
6. COMMON INTERLOCKS SHALL BE WELDED. THE LEADING INTERLOCK SHALL HAVE A SWEEL SEAL APPLIED PRIOR TO DRIVING.
7. NELSON STUDS SHALL BE WELDED TO THE SHEET PILES TO FORM A PERMANENT BOND.
8. Cellular/Lightweight Concrete shall be tremie pumped beneath the existing outfall and between the new sheet pile wall and existing outfall structure
9. New Bulkhead Sheeting to be tied back to existing Hanging Wall Sheeting Waler and Tierod sizes TBD
10. [illegible]

LaBella
Powered by partnership.
300 Pearl Street, Suite 130
Buffalo, NY 14202
716.551.6281
labellapc.com

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ELK STREET COMMERCE PARK LLC
4 CENTRE DRIVE
ORCHARD PARK, NY 14127

ELK STREET COMMERCE PARK
625 ELK STREET
BUFFALO, NEW YORK

2200012
DRAWN: TAP
CHECKED: CTB

SEPTEMBER 25, 2020

SITE PLAN WEST

C201

ATTACHMENT 2

PLANS SUPERSEDED BY FINAL PLANS CONTAINED IN APPENDIX D OF RAWP ADDENDUM REV #1 & INTENTIONALLY OMITTED

ATTACHMENT 3

ExxonMobil Former Buffalo Terminal OU-3
Babcock CSO Sheeting Bulkhead Notes

The soil profile used to design the sheet pile bulkhead wall was developed from information provided on a drawing prepared by AMEC Foster Wheeler Environmental & Infrastructure, Inc.; titled: SUBSURFACE PROFILE SLURRY WALL WEST; project number: 3617-16-7397; dwg: C-203; sheet: 13 OF 28; dated: January 2017. Standard Penetration Test (SPT) N-values were obtained from this drawing utilizing the information associated with test boring PDI-SB-013. Since geotechnical strength parameters were not available, conservative soil properties were assigned to each subsurface soil strata and use to model the subsurface. The design values are provide with Section 1 on Sheet C201.

The design of the sheet pile wall was conducted using a computer program titled *Shoring Suite* by CivilTech Software, Inc. After a computer model is developed within the software, different types of earth retaining structures (e.g., sheet piles, soldier beam and lagging wall, secant walls, etc.) can be added to the model that can account for lateral soil loading to design the earth retaining structure.

The soil design values, as shown on Section 1 were used to create a digital model. The steel sheet pile selected for this project was a PZC-18 Grade 50 steel (f_y = 50 ksi) with a single row of soil anchors spaced at 8-foot intervals. The *Shoring Suite* computer program first calculates an embedment of the sheeting based on force equilibrium and then checks moment equilibrium. The user can then specify a factor of safety (FOS) to increase the embedment. For this project the minimum targeted FOS for embedment is 1.5. The Shoring Suite computer model indicates that the minimum embedment is approximately 17.03-feet; therefore the minimum design embedment with an FOS of 1.5 is 26.45-feet. For this project the bulkhead sheeting will be advanced to refusal (i.e., bedrock) having a design embedment of approximately 30-feet with an FOS of approximately 1.76. Refer to the attached Shoring Suite output for additional information.

Stopen Engineering conducted a review of LaBella's calculations and modeled the subsurface slightly different and concurred that by advancing the sheeting to refusal (i.e., bedrock) there is sufficient embedment and a PCZ-18 has sufficient structural capacity. One item Stopen Engineering identified is that the horizontal force on the tie-rod located 5-feet below the top of the sheet pile wall increased to nearly 7.0 kips/ft. This value was subsequently used to redesign the tie-rod and waler system. Refer to Stopen Engineering's letter for additional information.

The design of the tie-rod and waler system was conducted by modeling the waler as a simply supported beam with a concentrated load of 56 kips (7 kips/ft x 8 ft span) with an allowable deflection of 3/16-inch. This yielded a waler size of two C12x25 channel sections grade 50 (f_y = 50 ksi) oriented back-to-back. This configuration yields a factor of safety of 1.52. The tie-rod modeled with a tensile force of 56 kips using a 1-3/8-inch diameter grade 150 thread bar provides a factor of safety of approximately 4.0 for tension. To provide additional corrosion protection, the tie-rod was increased to 1-3/4-inch diameter, which yields a factor of safety of approximately 7.0 for tension. Refer to the calculation sheet for additional information.

Bulkhead Sheeting Calculations

****

EARTH PRESSURE ANALYSIS SUMMARY
<EarthPres>

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****

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Date: 10/9/2020 File: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Bulkhead Shoring\Bulkhead Wall.ep8

Title 1: Elk Street Commerce Park - New Bulkhead Wall
Title 2: Design River Bottom 23.22' below top of sheets

Input data: **********

Wall Height = 23.22
Depth of Ground at Active Side = 0.00
Depth of Ground at Passive Side = 23.22
Apparent Pressure Envelope: 1.* Actual Pressures (All walls, All soils)
Pressure Type: 1.* Active, Ka
Earthquake Loading Apply to: 1. No Earthq. Loads
Earthquake Horizontal Acceleration, Kh = 0
Earthquake Vertical Acceleration, Kv = 0
Calculation Methods: 1.* Numerical Solution (Wedge Analysis)
Wall Friction Options: 1.* No wall friction
Wall Batter Angle = 0
Apparent Pressure Conversion: 1.* Default (Terzaghi and Peck)*
Water Density = 62.4
Water Pressure: 1.* No seepage at wall tip
User's Settings
Ignore Passive from Depth = 0
Multiplier of Active Pressure = 1
Multiplier of Passive Pressure = 1
Multiplier of Water Pressure = 1
Multiplier of Earthq. Pressure = 1
Estimated Embedment: Shallow: 3H
Program's Settings
Max. Height, Hmax = 232.20
Analysis Segment, dz = 0.58
No. of Active Segment at H, nz0 = 7
No. of Active Segment at Hmax, nz = 11
No. of Passive Segment, nzp = 4
Active Depth at H, Zh = 23.22
Active Depth at Hmax, Z = 232.20
Passive Depth at Hmax, Zp = 232.20
Max. Pressure = 184.97

Total Soil Types= 8

Soil	Weight	W(S)	Phi	Cohesion	Nspt	Type	Description
1	110.0	121.0	28	0	2	5	Gravel
2	115.0	125.0	30	0	9	4	cmf S, a cly
3	105.0	115.0	27	0.125	0	2	silty C, t f

4	140.0	154.0	40	0	45	5	Glacial TILL
5	150.0	155.0	55	0	60	4	BEDROCK
6	150.0	155.0	55	0	60	4	Conc-Normal
7	100.0	105.0	55	0	60	4	Conc-Light
8	70.0	75.0	55	0	60	4	Conc-Cell

Soil Type: 1 Equivalent Clay; 2 Clay; 3 Silt; 4 Sand; 5 Gravel

Ground Surface at Active Side:

Line	Z1	Xa1	Z2	Xa2	Soil No.
1	0.0	0.0	0.0	800.0	1
2	0.1	0.0	0.1	2.9	6
3	0.1	2.9	0.1	13.2	6
4	0.1	13.2	12.0	13.2	6
5	12.0	13.2	12.0	27.9	6
6	12.0	27.9	14.0	27.9	6
7	14.0	27.9	14.0	800.0	6
8	0.1	0.0	0.1	2.9	7
9	0.1	2.9	14.0	2.9	7
10	14.0	2.9	14.0	800.0	7
11	14.0	0.0	14.0	800.0	8
12	18.9	0.0	18.0	12.0	1
13	18.0	12.0	14.0	14.0	1
14	14.0	14.0	14.0	800.0	1
15	19.0	0.0	19.0	800.0	2
16	31.0	0.0	31.0	800.0	3
17	51.0	0.0	51.0	800.0	4
18	52.0	0.0	52.0	800.0	5

Water Table at Active Side:

Point	Z-water	X-water
1	10.0	0.0
2	10.0	800.0

Ground Surface at Passive Side:

Line	Z1	Xp1	Z2	Xp2	Soil No.
1	23.2	0.0	23.2	800.0	2
2	31.0	0.0	31.0	800.0	3
3	51.0	0.0	51.0	800.0	4
4	52.0	0.0	52.0	800.0	5

Water Table at Passive Side:

Point	Z-water	X-water
1	10.0	0.0
2	10.0	800.0

Output data: **********

Total Force above Base= 3.93 per one linear foot (or meter) width along wall height
Static Force above Base= 3.93

Apparent Pressure above Base - Output to Shoring
Active/At-Rest Force above Base, Ea = 3.93

No	Z1	P1	Z2	P2	Slope	Coef.

0	0.0	0.00	0.1	0.00	0.0397	0.3610
1	0.1	0.00	0.1	0.00	0.0192	0.1281
2	0.1	0.00	10.0	0.10	0.0100	0.1003
3	10.0	0.11	14.0	0.14	0.0092	0.2170
4	14.0	0.14	18.9	0.17	0.0061	0.4845
5	18.9	0.47	19.0	0.47	0.0245	0.4181
6	19.0	0.44	23.2	0.55	0.0266	0.4250

Driving Pressure below Base - Output to Shoring

No	Z1	P1	Z2	P2	Slope	Ka or Ko
0	23.2	0.32	31.0	1.81	0.1904	3.0415
1	31.0	1.16	51.0	1.04	-0.0059	-0.1117
2	51.0	0.82	52.0	0.84	0.0192	0.2096
3	52.0	0.27	232.2	2.03	0.0098	0.1053

Passive Pressure below Base - Output to Shoring

No	Z1	P1	Z2	P2	Slope	Kp
0	23.2	0.00	31.0	1.46	0.1878	3.0000
1	31.0	1.70	51.0	4.51	0.1405	2.6703
2	51.0	6.20	52.0	6.67	0.4724	5.1570
3	52.0	14.29	232.2	184.97	0.9472	10.2287

****

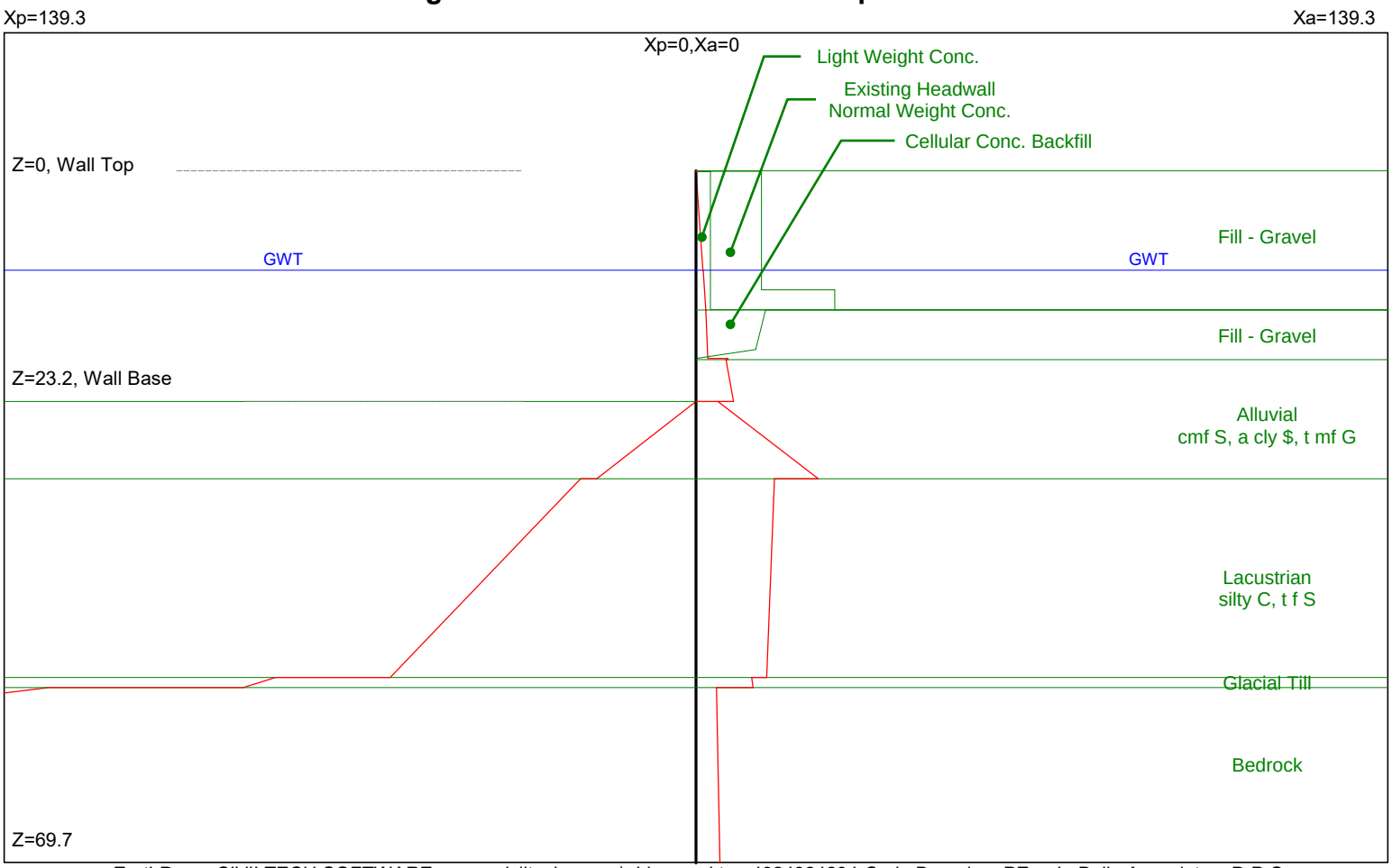
DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

Z, Xa, Xp - Coordinates of ground lines
Z- Depth measured from wall top
Xa - Distance measure from wall to active side.
Xp - Distance measure from wall to passive side

Z1, P1, Z2, P2 - Four values to define a pressure diagram
Z1- Top depth of the diagram
P1- Top pressure of the diagram
Z2- Bottom depth of the diagram
P2- Bottom pressure of the diagram
Slope - (P2-P1)/(Z2-Z1), Slope of the diagram. It also called
Equivalent fluid density.
Coef. - Pressure Coefficient = Slope/Unit We9ight
Ka - Active Earth Pressure Coefficient
Ko - At-Rest Earth Pressure Coefficient
Kp - Passive Earth Pressure Coefficient

Elk Street Commerce Park - New Bulkhead Wall

Design River Bottom 23.22' below top of sheets



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UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

Date: 10/9/2020 File: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Bulkhead Shoring\Bulkhead Wall.ep8

* INPUT DATA *

Wall Height=23.2 Total Soil Types= 8

Soil No.	Weight	Saturate	Phi	Cohesion	Nspt	Type	Description
1	110.0	121.0	28	0	2	5	Gravel
2	115.0	125.0	30	0	9	4	cmf S, a cly
3	105.0	115.0	27	0.125	0	2	silty C, t f
4	140.0	154.0	40	0	45	5	Glacial TILL
5	150.0	155.0	55	0	60	4	BEDROCK
6	150.0	155.0	55	0	60	4	Conc-Normal
7	100.0	105.0	55	0	60	4	Conc-Light
8	70.0	75.0	55	0	60	4	Conc-Cell

Ground Surface at Active Side:

Line	Z1	Xa1	Z2	Xa2	Soil No.	Description
1	0.0	0.0	0.0	800.0	1	Gravel
2	0.1	0.0	0.1	2.9	6	Conc-Normal
3	0.1	2.9	0.1	13.2	6	Conc-Normal
4	0.1	13.2	12.0	13.2	6	Conc-Normal
5	12.0	13.2	12.0	27.9	6	Conc-Normal
6	12.0	27.9	14.0	27.9	6	Conc-Normal
7	14.0	27.9	14.0	800.0	6	Conc-Normal
8	0.1	0.0	0.1	2.9	7	Conc-Light
9	0.1	2.9	14.0	2.9	7	Conc-Light

10	14.0	2.9	14.0	800.0	7	Conc-Light
11	14.0	0.0	14.0	800.0	8	Conc-Cell
12	18.9	0.0	18.0	12.0	1	Gravel
13	18.0	12.0	14.0	14.0	1	Gravel
14	14.0	14.0	14.0	800.0	1	Gravel
15	19.0	0.0	19.0	800.0	2	cmf S, a cly
16	31.0	0.0	31.0	800.0	3	silty C, t f
17	51.0	0.0	51.0	800.0	4	Glacial TILL
18	52.0	0.0	52.0	800.0	5	BEDROCK

Water Table at Active Side:

Point	Z-water	X-water
1	10.0	0.0
2	10.0	800.0

Ground Surface at Passive Side:

Line	Z1	Xp1	Z2	Xp2	Soil No.	Description
1	23.2	0.0	23.2	800.0	2	cmf S, a cly
2	31.0	0.0	31.0	800.0	3	silty C, t f
3	51.0	0.0	51.0	800.0	4	Glacial TILL
4	52.0	0.0	52.0	800.0	5	BEDROCK

Water Table at Passive Side:

Point	Z-water	X-water
1	10.0	0.0
2	10.0	800.0

Wall Friction Options: 1.* No wall friction
Wall Batter Angle = 0
Apparent Pressure Conversion: 1.* Default (Terzaghi and Peck)*
Water Density = 62.4
Water Pressure: 1.* No seepage at wall tip

* OUTPUT RESULTS *

Total Force above Base= 3.93 per one linear foot (or meter) width along wall height
Total Static Force above Base= 3.93

Driving Pressure above Base - Output to Shoring - Multiplier of Pressure = 1

Z1	Pa1	Z2	Pa2	Slope	Coef.
0.00	0.00	0.05	0.00	0.0397	0.3610
0.05	0.00	0.10	0.00	0.0192	0.1281
0.10	0.00	10.00	0.10	0.0100	0.1003
10.00	0.11	14.01	0.14	0.0092	0.2170
14.01	0.14	18.90	0.17	0.0061	0.4845
18.90	0.47	19.00	0.47	0.0245	0.4181
19.00	0.44	23.22	0.55	0.0266	0.4250

Driving Pressure below Base - Output to Shoring - Multiplier of Pressure = 1

Z1	Pa1	Z2	Pa2	Slope	Ka or Ko
23.22	0.32	31.00	1.81	0.1904	3.0415
31.00	1.16	51.00	1.04	-0.0059	-0.1117
51.00	0.82	52.00	0.84	0.0192	0.2096
52.00	0.30	69.66	0.35	0.0030	0.0328

Passive Pressure below Base - Output to Shoring - Multiplier of Pressure = 1

Z1	Pp1	Z2	Pp2	Slope	Kp
23.22	0.00	31.00	1.46	0.188	3.0000
31.00	1.70	51.00	4.51	0.140	2.6703

51.00	6.20	52.00	6.67	0.472	5.1570
52.00	9.55	69.66	30.62	1.193	12.8859

UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

Date: 10/9/2020 File Name: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Bulkhead Shoring\Bulkhead Wall.ep8

****

SHORING WALL CALCULATION SUMMARY
The leading shoring design and calculation software
Software Copyright by CivilTech Software
www.civiltech.com

****

ShoringSuite Software is developed by CivilTech Software, Bellevue, WA, USA.
The calculation method is based on the following references:

1. FHWA 98-011, FHWA-RD-97-130, FHWA SA 96-069, FHWA-IF-99-015
2. STEEL SHEET PILING DESIGN MANUAL by Pile Buck Inc., 1987
3. DESIGN MANUAL DM-7 (NAVFAC), Department of the Navy, May 1982
4. TRENCHING AND SHORING MANUAL Revision 12, California Department of Transportation, January 2000
6. EARTH SUPPORT SYSTEM & RETAINING STRUCTURES, Pile Buck Inc. 2002
5. DESIGN OF SHEET PILE WALLS, EM 1110-2-2504, U.S. Army Corps of Engineers, 31 March 1994
7. EARTH RETENTION SYSTEMS HANDBOOK, Alan Macnab, McGraw-Hill. 2002
8. Temporary Structures in Construction, Robert T. Ratay (Co-author of Chapter 7: John J. Peirce), McGraw-Hill. 2012
9. AASHTO HB-17, American Association of State and Highway Transportation Officials, 2 September 2002

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft, Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

---

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Date: 10/11/2020 File: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Bulkhead Shoring\Bulkhead Wall.sh8

Title: Elk Street Commerce Park - New Bulkhead Wall
Subtitle: Design River Bottom 23.22' below top of sheets

**********INPUT DATA**********

Wall Type: 1. Sheet Pile
Wall Height: 23.22
Pile Diameter: 1.00
Pile Spacing: 1.00
Factor of Safety (F.S.): 1.50
Lateral Support Type (Braces): 2. Strut, Raker
Top Brace Increase (Multi-Bracing): No
Brace Position (One Brace Case): Normal Brace*
Embedment Option: 1. Yes
Friction at Pile Tip: No
Pile Properties:
Steel Strength, Fy: 50 ksi = 345 MPa
Allowable Fb/Fy: 0.66
Elastic Module, E: 29000.00
Moment of Inertia, I: 255.50
User Input Pile: PZC18

* DRIVING PRESSURE (ACTIVE, WATER, & SURCHARGE) *

No.	Z1 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	*	Above	Base		
2	0.000	0.000	0.050	0.002	0.039714

3	0.050	0.000	0.100	0.001	0.019220
4	0.100	0.001	10.00	0.100	0.010030
5	10.00	0.106	14.01	0.143	0.009244
6	14.01	0.143	18.90	0.173	0.006105
7	18.90	0.466	19.00	0.468	0.024501
8	19.00	0.442	23.22	0.554	0.026607
9	*	Below	Base		
10	23.22	0.324	31.00	1.805	0.190399
11	31.00	1.157	51.00	1.040	-0.00587
12	51.00	0.821	52.00	0.841	0.019200
13	52.00	0.257	185.7	1.597	0.010021

* PASSIVE PRESSURE *

The pressures below will be divided by a Factor of Safety =1.5

No.	Z1 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	*	Below	Base		
2	23.22	0.000	31.00	1.461	0.187800
3	31.00	1.699	51.00	4.508	0.140456
4	51.00	6.200	52.00	6.672	0.472381
5	52.00	13.74	185.7	141.7	0.956736

* ACTIVE SPACE *

No.	Z depth	Spacing
1	0.00	1.00
2	23.22	1.00

* PASSIVE SPACE *

No.	Z depth	Spacing
1	0.00	1.00

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, DEADMAN, OR SHEET PILE AS ANCHOR*

No.	Z brace	Angle	Spacing	Input1*	Input2*	Type
1	5.00	0.0	8.00	10.00	0.31	Strut

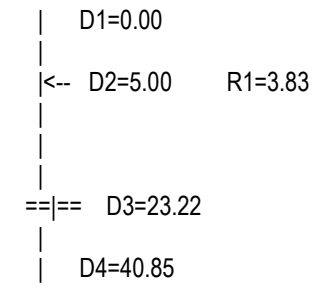
*For Tieback: Input1 = Diameter; Input2 = Bond Strength
*For Plate: Input1 = Diameter; Input2 = Allowable Pressure
*For Deadman: Input1 = Horz. Width; Input2 = Passive Pressure;
*For Sheet Pile Anchor: Input1 = Horz. Width; Input2 = Passive Slope;

**********CALCULATION**********

The calculated moment and shear are per pile spacing. Sheet piles are per one foot or meter; Soldier piles are per pile.

Top Pressures start at depth = 0.00

NUMBER OF BRACE LEVEL = 1



D1 - TOP DEPTH
D2 - BRACE DEPTH R1 - REACTION
D3 - EXCAVATION BASE
D4 - PILE TIP

TOTAL REACTION: R1 = 3.83
TOTAL PRESSURES ACTING ON WALL = 3.83
Total Reactions = Total Pressures, OK!

BRACE NO.1 AT DEPTH = 5.00
R1 = Brace Load = 3.83

**********RESULTS**********

* EMBEDMENT *
MINIMUM EMBEDMENT = 17.63, TOTAL MINIMUM PILE LENGTH = 40.85

* MOMENT IN PILE (per pile spacing)*
Pile Spacing: sheet piles are one foot or one meter; soldier piles are one pile.

No.	Depth	M @ Brace	Mmax in Span	Depth of Mmax
1	5.00	0.20	46.23	23.04

Overall Maximum Moment = 46.23 at 23.04
Maximum Shear = 4.59
Moment and Shear are per pile spacing: 1.0 foot or meter

* BRACE: STRUT, TIEBACK, ANCHOR PLATE, DEADMAN, OR SHEET PILE AS ANCHOR*
The calculated brace force are per brace spacing.

No.	DEPTH	Tangle	SPACING	HORIZONTAL	VERTICAL	TOTAL LOAD
1	5.00	0.0	8.00	30.61	0.00	30.61

No.	DEPTH	Free length	Brace Type

1	5.00	0.00	Strut

---

* VERTICAL LOADING *
Vertical Loading from Braces = 0.00
Vertical Loading from External Load = 0.00
Total Vertical Loading = 0.00

**********SPECIFIED PILE **********

Overall Maximum Moment = 46.23 at 23.04
The pile selection is based on the magnitude of the moment only. Axial force is neglected.

Request Min. Section Modulus = 16.81 in3/ft = 903.68 cm3/m, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

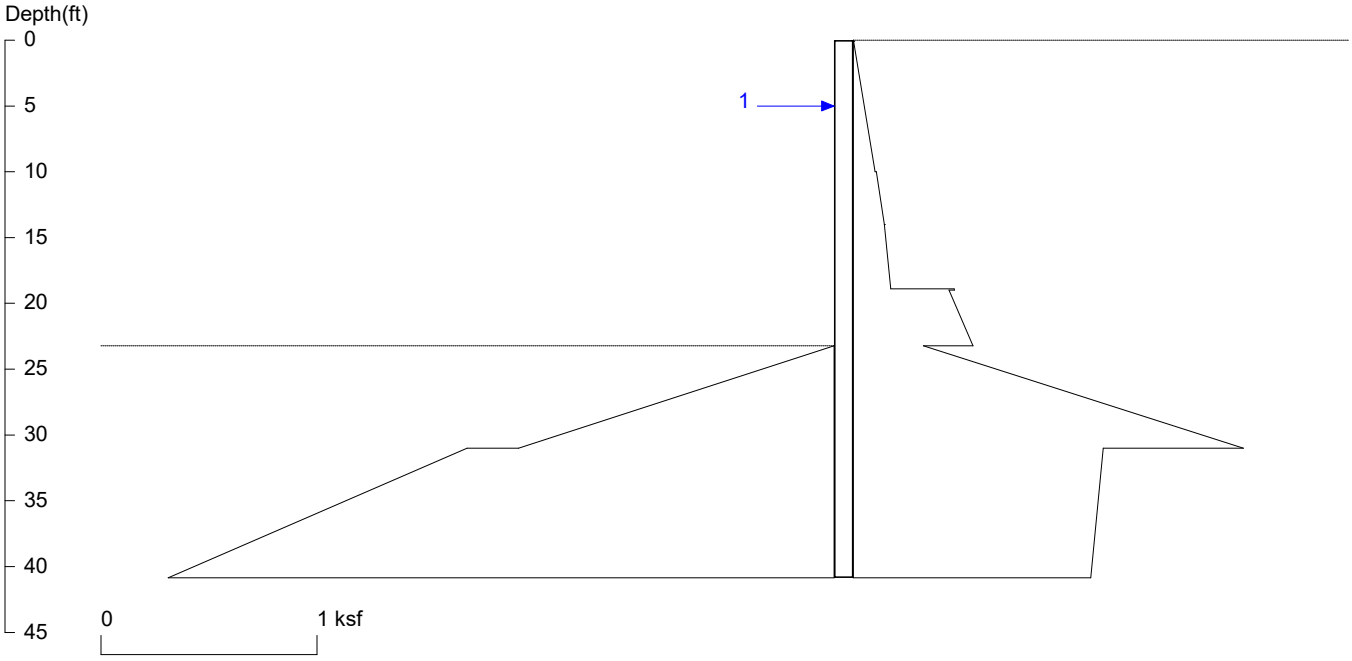
PZC18 has been found in Sheet Pile list!
PZC18(English): Sx= 33.50 in3/ft Ix= 255.50 in4/ft Weight= 24.20 lb/ft
PZC18(Metrics): Sx= 1800.96 cm3/m Ix= 348.91 x100cm4/m Weight= 0.353 kN/m

* Note: All the pile dimensions are in English Units per one foot width.

PZC18 is capable to support the shoring!
I (in4)/foot=255.50
Top deflection = -0.520(in)
Max. deflection = 1.154(in)

Elk Street Commerce Park - New Bulkhead Wall

Design River Bottom 23.22' below top of sheets



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File: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Bulkhead Shoring\Bulkhead Wall.sh8

Wall Height=23.2 Pile Diameter=1.0 Pile Spacing=1.0 Wall Type: 1. Sheet Pile

PILE LENGTH: Min. Embedment=17.63 Min. Pile Length=40.85
MOMENT IN PILE: Max. Moment=46.23 per Pile Spacing=1.0 at Depth=23.04

PILE SELECTION:
Request Min. Section Modulus = 16.8 in3/ft=903.68 cm3/m, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
PZC18 has Section Modulus = 33.5 in3/ft=1800.96 cm3/m. It is greater than Min. Requirements!
Top Deflection = -0.52(in) based on E (ksi)=29000.00 and I (in4)/foot=255.5

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	N/A	N/A
1. Strut	5.0	0.0	8.0	30.6	30.6	0.0	0.0	0.0

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
*	Above	Base		
0.000	0.000	0.050	0.002	0.039714
0.050	0.000	0.100	0.001	0.019220
0.100	0.001	10.00	0.100	0.010030
10.00	0.106	14.01	0.143	0.009244
14.01	0.143	18.90	0.173	0.006105
18.90	0.466	19.00	0.468	0.024501
19.00	0.442	23.22	0.554	0.026607
*	Below	Base		
23.22	0.324	31.00	1.805	0.190399
31.00	1.157	51.00	1.040	-0.00587

PASSIVE PRESSURES: Pressures below will be divided by a Factor of Safety =1.5

Z1	P1	Z2	P2	Slope
*	Below	Base		

23.22	0.000	31.00	1.461	0.187800
31.00	1.699	51.00	4.508	0.140456

ACTIVE SPACING:

No.	Z depth	Spacing
1	0.00	1.00
2	23.22	1.00

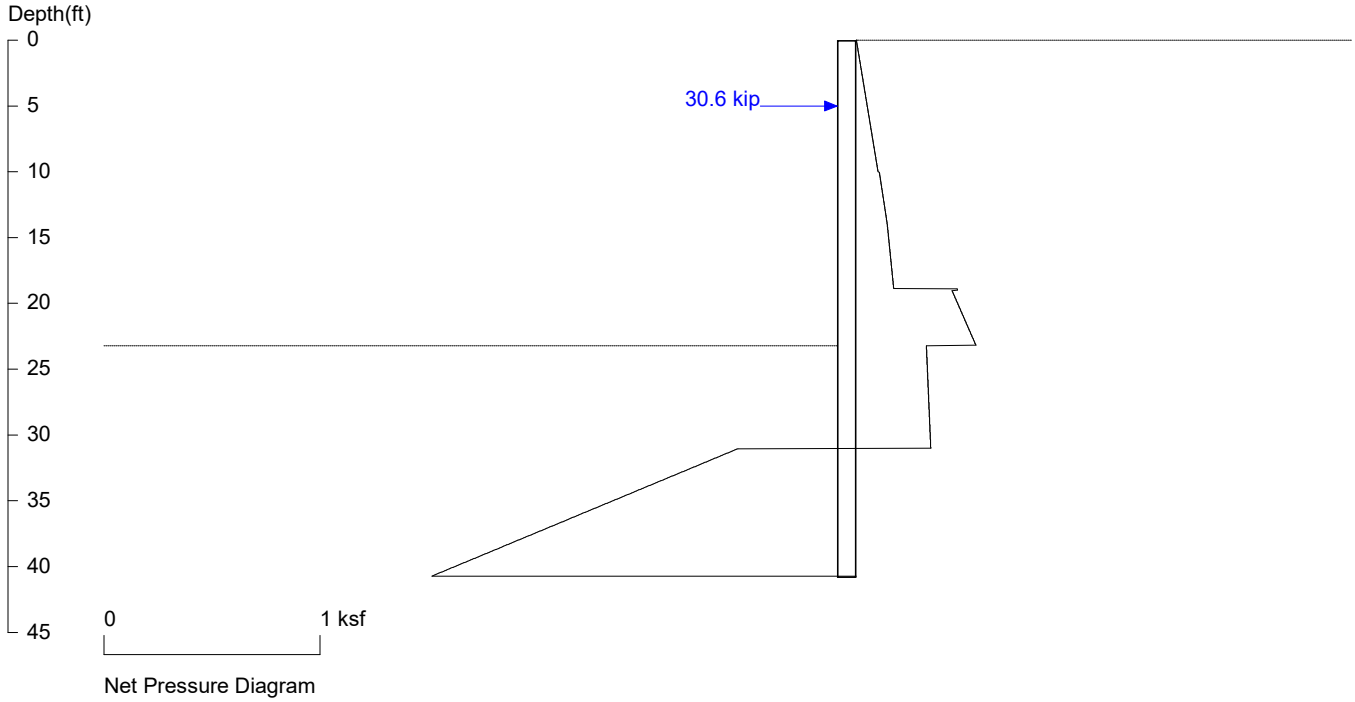
PASSIVE SPACING:

No.	Z depth	Spacing
1	0.00	1.00

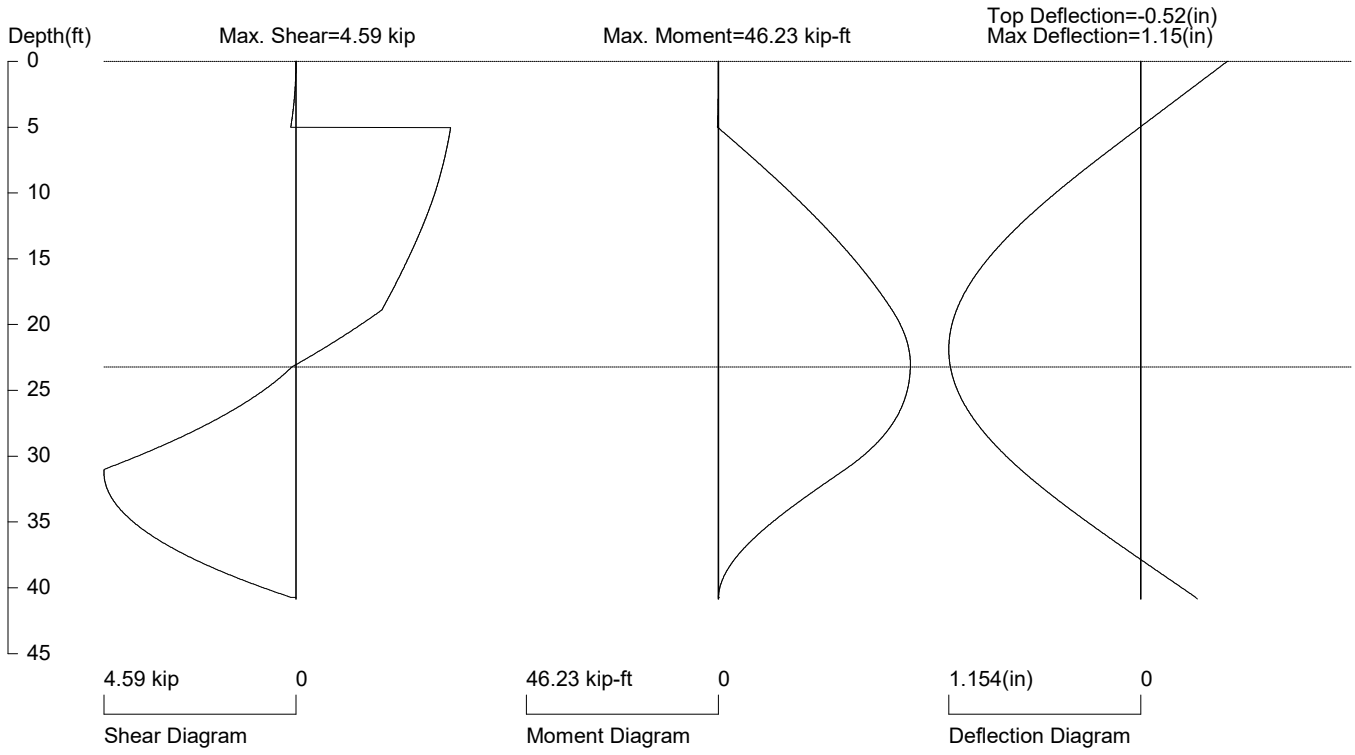
UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

Elk Street Commerce Park - New Bulkhead Wall

Design River Bottom 23.22' below top of sheets



Net Pressure Diagram



Shear Diagram | Moment Diagram | Deflection Diagram

PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 1.0 foot or meter

User Input Pile, PZC18: E (ksi)=29000.0, I (in4)/foot=255.5

File: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Bulkhead Shoring\Bulkhead Wall.sh8

****

EARTH PRESSURE ANALYSIS SUMMARY
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Date: 10/8/2020 File: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Coffer Dam Shoring\CofferDam.ep8

Title 1: Elk Street Commerce Park - Temporary Coffer Dam
Title 2: River Bottom 11.00' below top of sheets

Input data: **********

Wall Height = 11.00
Depth of Ground at Active Side = 0.00
Depth of Ground at Passive Side = 11.00
Apparent Pressure Envelope: 1.* Actual Pressures (All walls, All soils)
Pressure Type: 1.* Active, Ka
Earthquake Loading Apply to: 1. No Earthq. Loads
Earthquake Horizontal Acceleration, Kh = 0
Earthquake Vertical Acceleration, Kv = 0
Calculation Methods: 1.* Numerical Solution (Wedge Analysis)
Wall Friction Options: 1.* No wall friction
Wall Batter Angle = 0
Apparent Pressure Conversion: 1.* Default (Terzaghi and Peck)*
Water Density = 62.4
Water Pressure: 1.* No seepage at wall tip
User's Settings
Ignore Passive from Depth = 0
Multiplier of Active Pressure = 1
Multiplier of Passive Pressure = 1
Multiplier of Water Pressure = 1
Multiplier of Earthq. Pressure = 1
Estimated Embedment: Deep: 5H
Program's Settings
Max. Height, Hmax = 110.00
Analysis Segment, dz = 0.28
No. of Active Segment at H, nz0 = 1
No. of Active Segment at Hmax, nz = 5
No. of Passive Segment, nzp = 4
Active Depth at H, Zh = 11.00
Active Depth at Hmax, Z = 110.00
Passive Depth at Hmax, Zp = 110.00
Max. Pressure = 86.29

Total Soil Types= 5

Soil	Weight	W(S)	Phi	Cohesion	Nspt	Type	Description
1	110.0	121.0	28	0.0	2	5	Gravel
2	115.0	125.0	30	0	9	4	cmf S, a cly
3	105.0	115.0	27	0.125	0	2	silty C, t f

4	140.0	154.0	40	0.0	45	5	Glacial TILL
5	150.0	155.0	55	0.0	60	4	BEDROCK

Soil Type: 1 Equivalent Clay; 2 Clay; 3 Silt; 4 Sand; 5 Gravel

Ground Surface at Active Side:

Line	Z1	Xa1	Z2	Xa2	Soil No.
1	11.0	0.0	11.0	800.0	2
2	23.0	0.0	23.0	800.0	3
3	32.0	0.0	32.0	800.0	4
4	33.0	0.0	33.0	800.0	5

Water Table at Active Side:

Point	Z-water	X-water
1	0.0	0.0
2	0.0	800.0

Ground Surface at Passive Side:

Line	Z1	Xp1	Z2	Xp2	Soil No.
1	11.0	0.0	11.0	800.0	2
2	23.0	0.0	23.0	800.0	3
3	32.0	0.0	32.0	800.0	4
4	33.0	0.0	33.0	800.0	5

Water Table at Passive Side:

Point	Z-water	X-water
1	11.0	0.0
2	11.0	800.0

Output data: **********

Total Force above Base= 0.00 per one linear foot (or meter) width along wall height
Static Force above Base= 0.00

Apparent Pressure above Base - Output to Shoring
Active/At-Rest Force above Base, Ea = 0.00

No	Z1	P1	Z2	P2	Slope	Coef.
0	0.0	0.00	11.0	0.00	0.0000	0.0000

Driving Pressure below Base - Output to Shoring

No	Z1	P1	Z2	P2	Slope	Ka or Ko
0	11.0	0.00	23.0	0.25	0.0209	0.3333
1	23.0	0.13	32.0	0.31	0.0198	0.3766
2	32.0	0.25	33.0	0.27	0.0190	0.2069
3	33.0	0.10	110.0	0.85	0.0096	0.1041

Passive Pressure below Base - Output to Shoring

No	Z1	P1	Z2	P2	Slope	Kp
0	11.0	0.00	23.0	2.25	0.1878	3.0000
1	23.0	2.39	32.0	3.67	0.1416	2.6928
2	32.0	5.00	33.0	5.48	0.4786	5.2250

3	33.0	10.66	110.0	85.60	0.9732	10.5096

Water Pressure - Output to Shoring

No	Z1	P1	Z2	P2	Slope
0	0.0	0.00	11.0	0.69	0.06
1	11.0	0.69	110.0	0.69	0.00

****

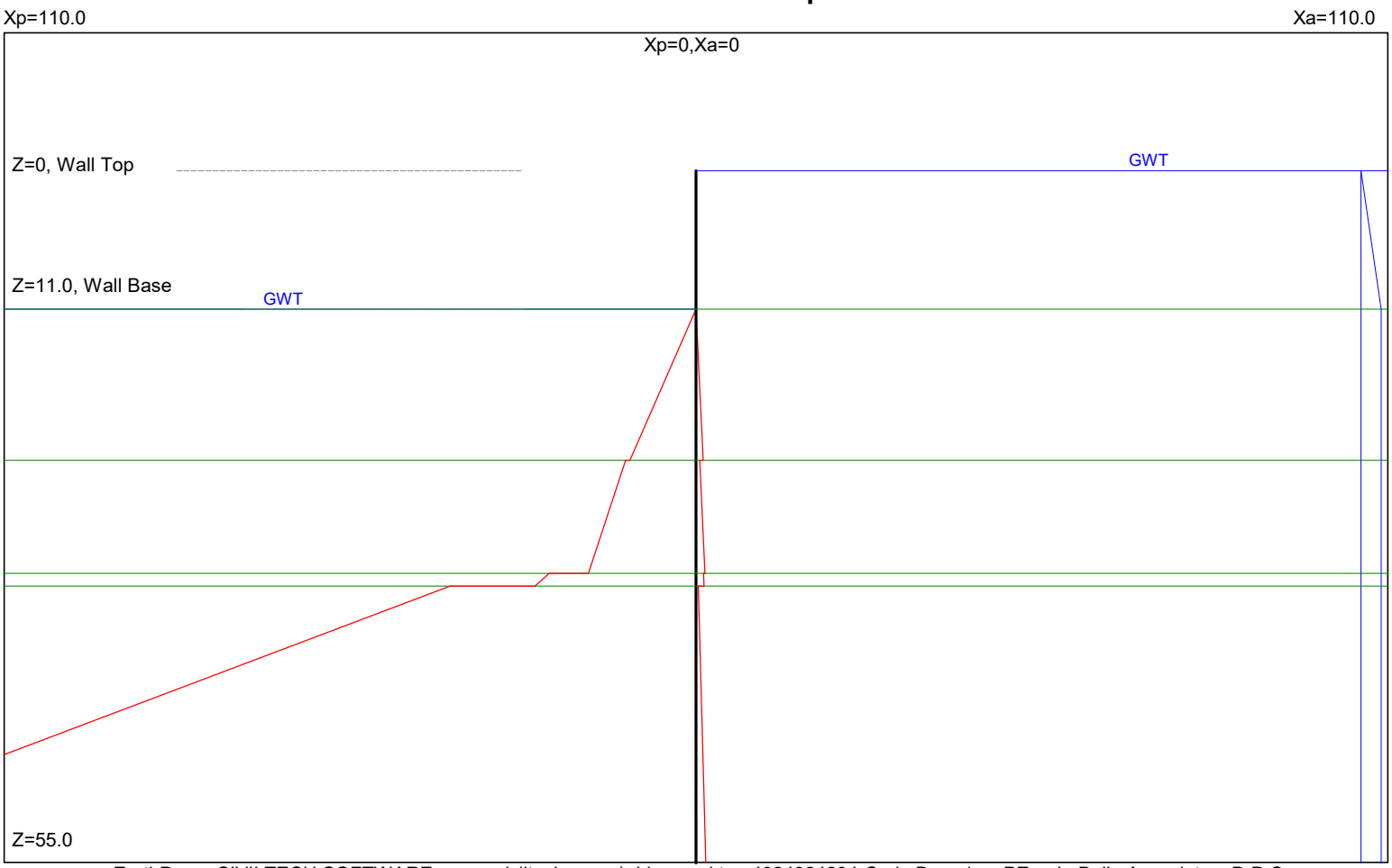
DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

Z, Xa, Xp - Coordinates of ground lines
Z- Depth measured from wall top
Xa - Distance measure from wall to active side.
Xp - Distance measure from wall to passive side

Z1, P1, Z2, P2 - Four values to define a pressure diagram
Z1- Top depth of the diagram
P1- Top pressure of the diagram
Z2- Bottom depth of the diagram
P2- Bottom pressure of the diagram
Slope - (P2-P1)/(Z2-Z1), Slope of the diagram. It also called
Equivalent fluid density.
Coef. - Pressure Coefficient = Slope/Unit We9ight
Ka - Active Earth Pressure Coefficient
Ko - At-Rest Earth Pressure Coefficient
Kp - Passive Earth Pressure Coefficient

Elk Street Commerce Park - Temporary Coffer Dam

River Bottom 11.00' below top of sheets



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UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

Date: 10/8/2020 File: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Coffer Dam Shoring\CofferDam.ep8

* INPUT DATA *

Wall Height=11.0 Total Soil Types= 5

Soil No.	Weight	Saturate	Phi	Cohesion	Nspt	Type	Description
1	110.0	121.0	28	0.0	2	5	Gravel
2	115.0	125.0	30	0	9	4	cmf S, a cly
3	105.0	115.0	27	0.125	0	2	silty C, t f
4	140.0	154.0	40	0.0	45	5	Glacial TILL
5	150.0	155.0	55	0.0	60	4	BEDROCK

Ground Surface at Active Side:

Line	Z1	Xa1	Z2	Xa2	Soil No.	Description
1	11.0	0.0	11.0	800.0	2	cmf S, a cly
2	23.0	0.0	23.0	800.0	3	silty C, t f
3	32.0	0.0	32.0	800.0	4	Glacial TILL
4	33.0	0.0	33.0	800.0	5	BEDROCK

Water Table at Active Side:

Point	Z-water	X-water
1	0.0	0.0
2	0.0	800.0

Ground Surface at Passive Side:

Line	Z1	Xp1	Z2	Xp2	Soil No.	Description
1	11.0	0.0	11.0	800.0	2	cmf S, a cly

2	23.0	0.0	23.0	800.0	3	silty C, t f
3	32.0	0.0	32.0	800.0	4	Glacial TILL
4	33.0	0.0	33.0	800.0	5	BEDROCK

Water Table at Passive Side:

Point	Z-water	X-water
1	11.0	0.0
2	11.0	800.0

Wall Friction Options: 1.* No wall friction
Wall Batter Angle = 0
Apparent Pressure Conversion: 1.* Default (Terzaghi and Peck)*
Water Density = 62.4
Water Pressure: 1.* No seepage at wall tip

* OUTPUT RESULTS *

Total Force above Base= 0.00 per one linear foot (or meter) width along wall height
Total Static Force above Base= 0.00

Driving Pressure above Base - Output to Shoring - Multiplier of Pressure = 1

Z1	Pa1	Z2	Pa2	Slope	Coef.
0.00	0.00	11.00	0.00	0.0000	0.0000

Driving Pressure below Base - Output to Shoring - Multiplier of Pressure = 1

Z1	Pa1	Z2	Pa2	Slope	Ka or Ko
11.00	0.00	23.00	0.25	0.0209	0.3333
23.00	0.13	32.00	0.31	0.0198	0.3766
32.00	0.25	33.00	0.27	0.0190	0.2069
33.00	0.08	55.00	0.33	0.0115	0.1242

Passive Pressure below Base - Output to Shoring - Multiplier of Pressure = 1

Z1	Pp1	Z2	Pp2	Slope	Kp
11.00	0.00	23.00	2.25	0.188	3.0000
23.00	2.39	32.00	3.67	0.142	2.6928
32.00	5.00	33.00	5.48	0.479	5.2250
33.00	8.37	55.00	33.31	1.133	12.2404

Water Pressure - Output to Shoring - Multiplier of Pressure = 1

No	Z1	Pw1	Z2	Pw2	kw1
0	0.00	0.00	11.00	0.69	0.06
1	11.00	0.69	55.00	0.69	0.00

UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

Date: 10/8/2020 File Name: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Coffer Dam Shoring\CofferDam.ep8

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SHORING WALL CALCULATION SUMMARY
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ShoringSuite Software is developed by CivilTech Software, Bellevue, WA, USA.
The calculation method is based on the following references:

1. FHWA 98-011, FHWA-RD-97-130, FHWA SA 96-069, FHWA-IF-99-015
2. STEEL SHEET PILING DESIGN MANUAL by Pile Buck Inc., 1987
3. DESIGN MANUAL DM-7 (NAVFAC), Department of the Navy, May 1982
4. TRENCHING AND SHORING MANUAL Revision 12, California Department of Transportation, January 2000
6. EARTH SUPPORT SYSTEM & RETAINING STRUCTURES, Pile Buck Inc. 2002
5. DESIGN OF SHEET PILE WALLS, EM 1110-2-2504, U.S. Army Corps of Engineers, 31 March 1994
7. EARTH RETENTION SYSTEMS HANDBOOK, Alan Macnab, McGraw-Hill. 2002
8. Temporary Structures in Construction, Robert T. Ratay (Co-author of Chapter 7: John J. Peirce), McGraw-Hill. 2012
9. AASHTO HB-17, American Association of State and Highway Transportation Officials, 2 September 2002

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft, Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

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Date: 10/8/2020 File: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Coffer Dam Shoring\CofferDam.sh8

Title: Elk Street Commerce Park - Temporary Coffer Dam
Subtitle: River Bottom 11.00' below top of sheets

**********INPUT DATA**********

Wall Type: 1. Sheet Pile
Wall Height: 11.00
Pile Diameter: 1.00
Pile Spacing: 1.00
Factor of Safety (F.S.): 1.00
Lateral Support Type (Braces): 1. No
Top Brace Increase (Multi-Bracing): No
Embedment Option: 1. Yes
Friction at Pile Tip: No
Pile Properties:
Steel Strength, Fy: 50 ksi = 345 MPa
Allowable Fb/Fy: 0.66
Elastic Module, E: 29000.00
Moment of Inertia, I: 255.50
User Input Pile: PZC18

* DRIVING PRESSURE (ACTIVE, WATER, & SURCHARGE) *

No.	Z1 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	*	Above	Base		
2	0.000	0.000	11.000	0.000	0.000000
3	*	Below	Base		

4	11.000	0.000	23.000	0.250	0.020867
5	23.000	0.128	32.000	0.307	0.019809
6	32.000	0.253	33.000	0.272	0.018951
7	33.000	0.101	99.000	0.745	0.009770
8	*	Water	Pres.		
9	0.000	0.000	11.000	0.686	0.062400
10	11.000	0.686	99.000	0.686	0.000000

* PASSIVE PRESSURE *

No.	Z1 top	Top Pres.	Z2 bottom	Bottom Pres.	Slope
1	*	Below	Base		
2	11.000	0.000	23.000	2.254	0.187800
3	23.000	2.393	32.000	3.667	0.141639
4	32.000	5.003	33.000	5.481	0.478613
5	33.000	10.369	99.000	75.358	0.984679

* ACTIVE SPACE *

No.	Z depth	Spacing
1	0.00	1.00
2	11.00	1.00

* PASSIVE SPACE *

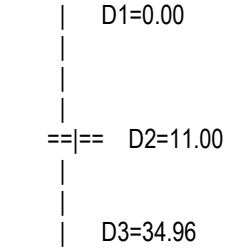
No.	Z depth	Spacing
1	0.00	1.00

*For Tieback: Input1 = Diameter; Input2 = Bond Strength
*For Plate: Input1 = Diameter; Input2 = Allowable Pressure
*For Deadman: Input1 = Horz. Width; Input2 = Passive Pressure;
*For Sheet Pile Anchor: Input1 = Horz. Width; Input2 = Passive Slope;

**********CALCULATION**********

The calculated moment and shear are per pile spacing. Sheet piles are per one foot or meter; Soldier piles are per pile.

Top Pressures start at depth = 0.00



D1 - TOP DEPTH
D2 - EXCAVATION BASE
D3 - PILE TIP

MOMENT equilibrium AT DEPTH=30.97 WITH EMBEDMENT OF 19.97
FORCE equilibrium AT DEPTH=34.96 WITH EMBEDMENT OF 23.96

The program calculates an embedment for moment equilibrium, then increase the embedment by 1.2

**********RESULTS**********

* EMBEDMENT Notes *
Based on USS Design Manual, first calculate embedment for moment equilibrium, then increased the embedment to get the design depth.
The embedment for moment equilibrium is 19.97
The program calculates an embedment for moment equilibrium, then increase the embedment by 1.2
The total desigh embedment is 23.96

Embedment Information:
If 20% increased, the total design embedment is 23.96
If 30% increased, the total design embedment is 25.96
If 40% increased, the total design embedment is 27.95
If 50% increased, the total design embedment is 29.95

* MOMENT IN PILE (per pile spacing)*
Pile Spacing: sheet piles are one foot or one meter; soldier piles are one pile.
Overall Maximum Moment = 60.46 at 22.98
Maximum Shear = 16.38
Moment and Shear are per pile spacing: 1.0 foot or meter

* VERTICAL LOADING *
Vertical Loading from Braces = 0.00
Vertical Loading from External Load = 0.00
Total Vertical Loading = 0.00

**********SPECIFIED PILE **********

Overall Maximum Moment = 60.46 at 22.98
The pile selection is based on the magnitude of the moment only. Axial force is neglected.

Request Min. Section Modulus = 21.99 in3/ft = 1181.94 cm3/m, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

PZC18 has been found in Sheet Pile list!
PZC18(English): Sx= 33.50 in3/ft Ix= 255.50 in4/ft Weight= 24.20 lb/ft
PZC18(Metrics): Sx= 1800.96 cm3/m Ix= 348.91 x100cm4/m Weight= 0.353 kN/m

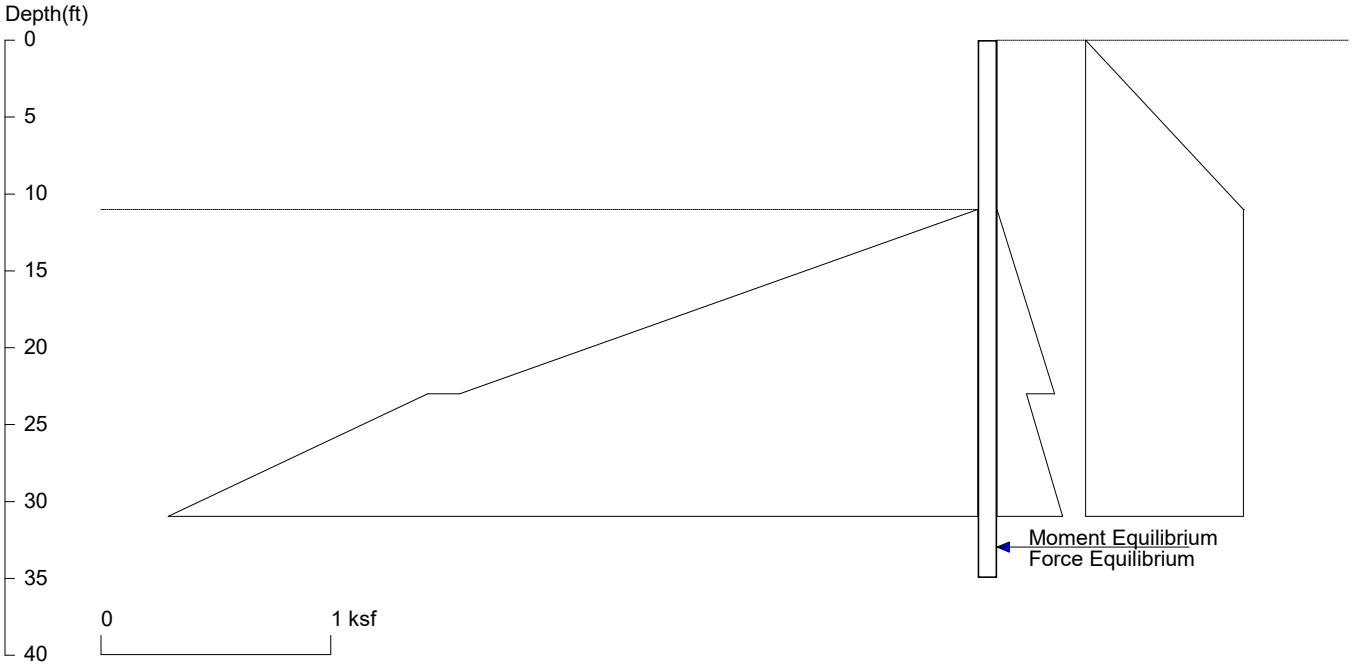
* Note: All the pile dimensions are in English Units per one foot width.

PZC18 is capable to support the shoring!
I (in4)/foot=255.50

Top deflection = 1.293(in)
Max. deflection = 1.293(in)

Elk Street Commerce Park - Temporary Coffer Dam

River Bottom 11.00' below top of sheets



Licensed to 4324324234-Craig Bruening, PE LaBella Associates, D.P.C. Date: 10/8/2020
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Wall Height=11.0 Pile Diameter=1.0 Pile Spacing=1.0 Wall Type: 1. Sheet Pile

PILE LENGTH: Min. Embedment=23.96 Min. Pile Length=34.96
MOMENT IN PILE: Max. Moment=60.46 per Pile Spacing=1.0 at Depth=22.98

PILE SELECTION:
Request Min. Section Modulus = 22.0 in3/ft=1181.94 cm3/m, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
PZC18 has Section Modulus = 33.5 in3/ft=1800.96 cm3/m. It is greater than Min. Requirements!
Top Deflection = 1.29(in) based on E (ksi)=29000.00 and I (in4)/foot=255.5

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
*	Above	Base		
0.000	0.000	11.000	0.000	0.000000
*	Below	Base		
11.000	0.000	23.000	0.250	0.020867
23.000	0.128	32.000	0.307	0.019809
32.000	0.253	33.000	0.272	0.018951
33.000	0.101	99.000	0.745	0.009770
*	Water	Pres.		
0.000	0.000	11.000	0.686	0.062400
11.000	0.686	99.000	0.686	0.000000

PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
*	Below	Base		
11.000	0.000	23.000	2.254	0.187800
23.000	2.393	32.000	3.667	0.141639
32.000	5.003	33.000	5.481	0.478613
33.000	10.369	99.000	75.358	0.984679

ACTIVE SPACING:

No.	Z depth	Spacing
1	0.00	1.00
2	11.00	1.00

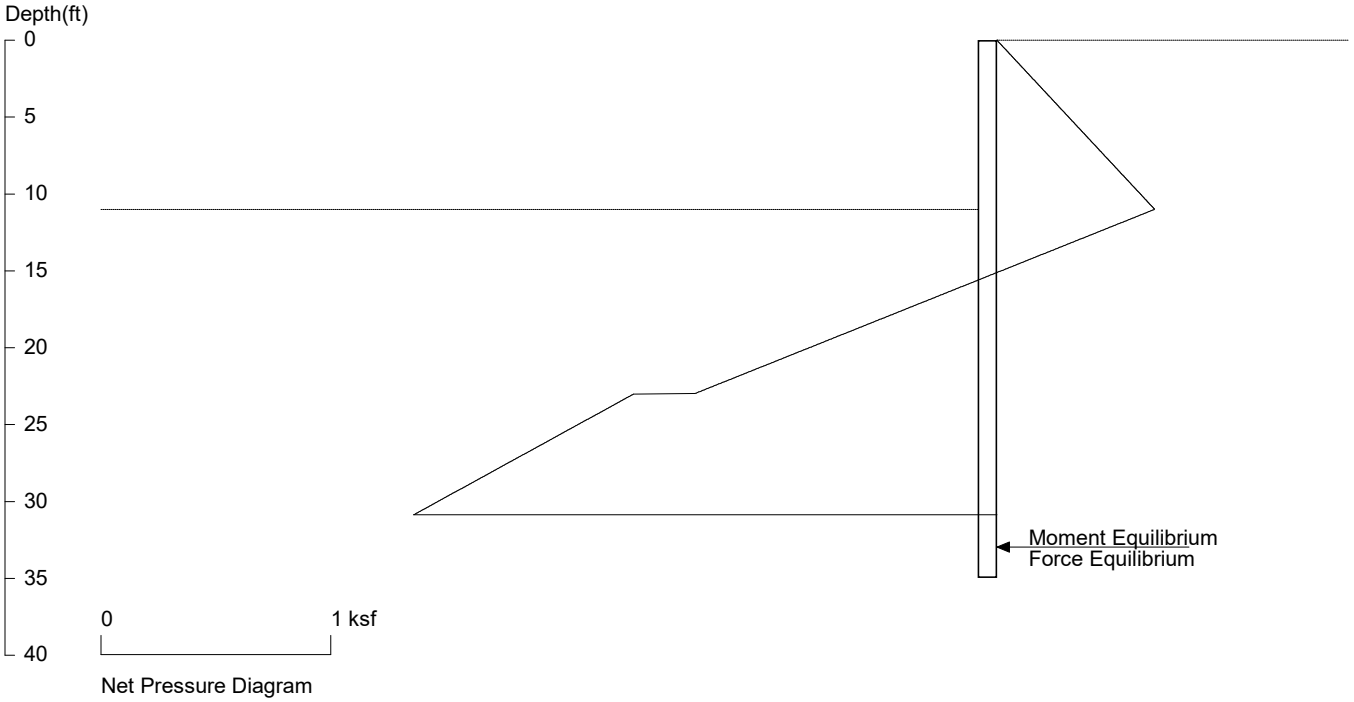
PASSIVE SPACING:

No.	Z depth	Spacing
1	0.00	1.00

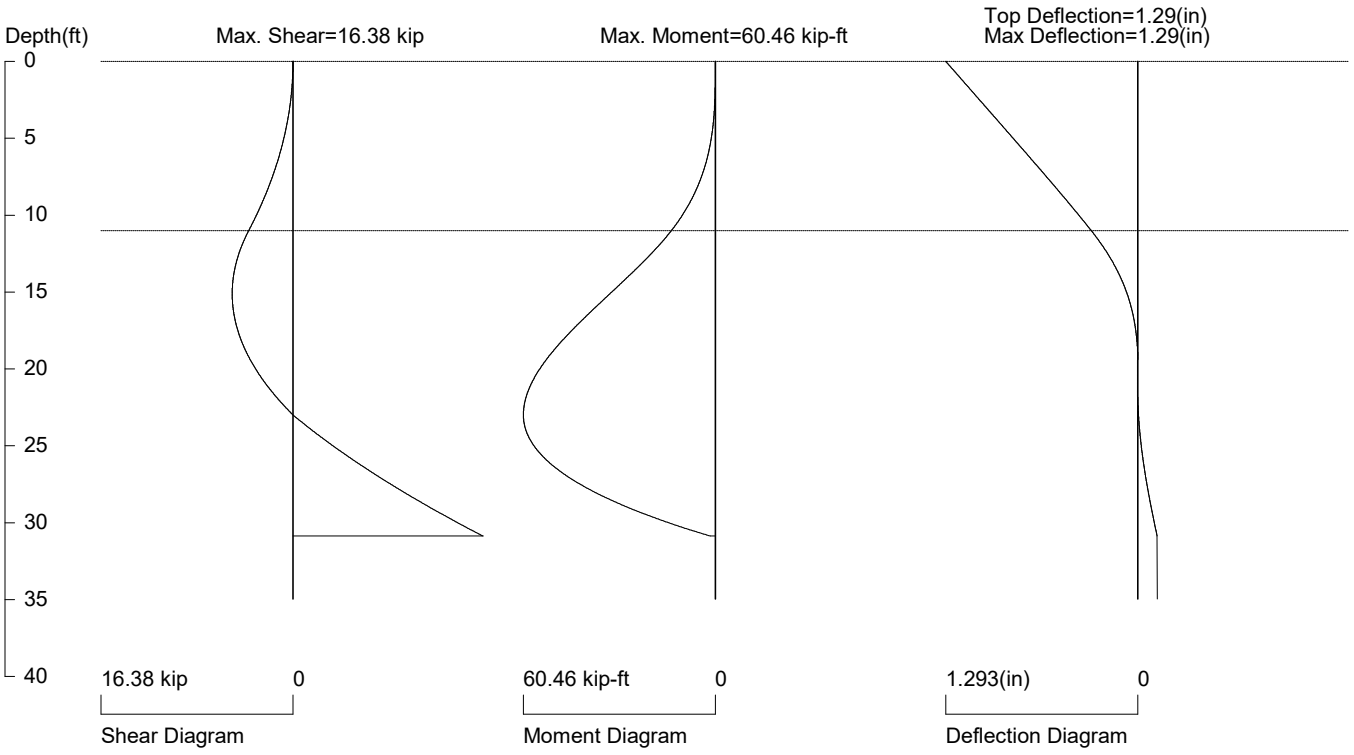
UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

Elk Street Commerce Park - Temporary Coffer Dam

River Bottom 11.00' below top of sheets



Net Pressure Diagram



Shear Diagram | Moment Diagram | Deflection Diagram

PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

Based on pile spacing: 1.0 foot or meter

User Input Pile, PZC18: E (ksi)=29000.0, I (in4)/foot=255.5

File: C:\Users\CBruening\Desktop\Elk Street - Travel Folder\Coffer Dam Shoring\CofferDam.sh8

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DEADMAN CALCULATIONS - SHEETING USED FOR DEADMAN

WALL GEOMETRY

Height of Sheeting:	**23.22**	feet
Height of Soil Above Sheeting:	**0.00**	feet
Depth to Tie Rod from Top of Sheeting:	**5.00**	feet
Height of Soil Above Tie Rod:	5.00	feet
Width of Sheeting Holding Soil:	**8.00**	feet

TIE ROD FORCES

Tie Back Force (Obtain from Shoring Suite):	**7.00**	kip / lin ft
Number of Tie Rods:	**1**	
Tie Rod Spacing:	8.00	feet
Tie Rod Tension Load:	56.0	kips

Find Tierod Type: Based on DwyiDag All-thread Rods Prestressed Steel ASTM A722 (GR 150)

Thread Bar Desig	Nominal Diameter (in)	Maximum Diameter (in)	Area of Steel (in^2)	Ultimate Tensile Strength (ksi)	Ultimate Tensile Load (kip)	Nominal Weight (lb/ft)	Thread Bar Desig
1"	0.950	1.200	0.709	150	106.3	3.01	1.000
1 ¼"	1.200	1.450	1.131	150	169.6	4.39	1.250
1 ⅜"	1.380	1.630	1.496	150	224.4	5.56	1.375
1 ¾"	1.825	2.075	2.616	150	392.4	9.23	1.750
2 ¼"	2.232	2.482	3.913	150	586.9	9.23	2.250
2 ½"	2.540	2.790	5.067	150	760.1	18.20	2.500
3"	2.896	3.146	6.587	150	988.0	24.09	3.000

Calculated Threadbar Desig: 1.375 Calculated Tie Rod FOS = $\frac{224.4}{56}$ = 4.0 Must be ≥ 3

Design Threadbar Desig: 1.750 **Design Tie Rod FOS = $\frac{392.4}{56}$ = 7.0** Use this size for corrosion protection

Maximum diameter includes threads; Mill Lengths: 60' for 1" to 1 ¾", 45' for 2 ¼" to 3"

PROPERTIES OF MATERIAL DEADMAN WILL BE INSTALLED

Type of soil where Deadman is to be installed: **FILL (silty Sandy GRAVEL)** γ_d: **110.0** pcf ϕ: **28** degrees

$K_a = \tan^2\left(45 - \frac{\phi}{2}\right) = \tan^2\left(45 - \frac{28}{2}\right) = 0.361$ $K_p = \tan^2\left(45 + \frac{\phi}{2}\right) = \tan^2\left(45 + \frac{28}{2}\right) = 2.770$

DEADMAN HEIGHT

$P_p \geq$ Tie Rod Tension + P_a

Use vertical portion of existing hanging wall sheeting consisting of SCZ-16 - Grade 50 A572 installed 2' to 20' bgs.

Assume Deadman Height of: **9.00** feet
Top of Deadman: **2.00** ft-bgs
Bottom of Deadman: 11.00 ft-bgs

$P_p = \frac{\gamma_d \times H^2 \times K_p}{2}$ $P_a = \frac{\gamma_d \times H^2 \times K_a}{2}$

P_p @ 2.00 ft-bgs $= \frac{110.0 \times 4.00 \times 2.770}{2} =$ 0.61 kip / lin ft x 8.00 = 4.8749 kips

P_p @ 11.00 ft-bgs $= \frac{110.0 \times 121.0 \times 2.770}{2} =$ 18.43 kip / lin ft x 8.00 = 147.47 kips

= 76.17 kips

P_a @ 2.00 ft-bgs $= \frac{110.0 \times 4.00 \times 0.361}{2} =$ 0.08 kip / lin ft x 8.00 = 0.6354 kips

P_a @ 11.00 ft-bgs $= \frac{110.0 \times 121.0 \times 0.361}{2} =$ 2.40 kip / lin ft x 8.00 = 19.221 kips

= 9.93 kips

P_p = 76.17 kips Tie Rod Tension = 56.00 kips P_a = 9.93 kips

Deadman FOS = $\frac{P_p}{\text{Tie Rod Tension} + P_a} = \frac{76.17}{56.00 + 9.93} =$ 1.16

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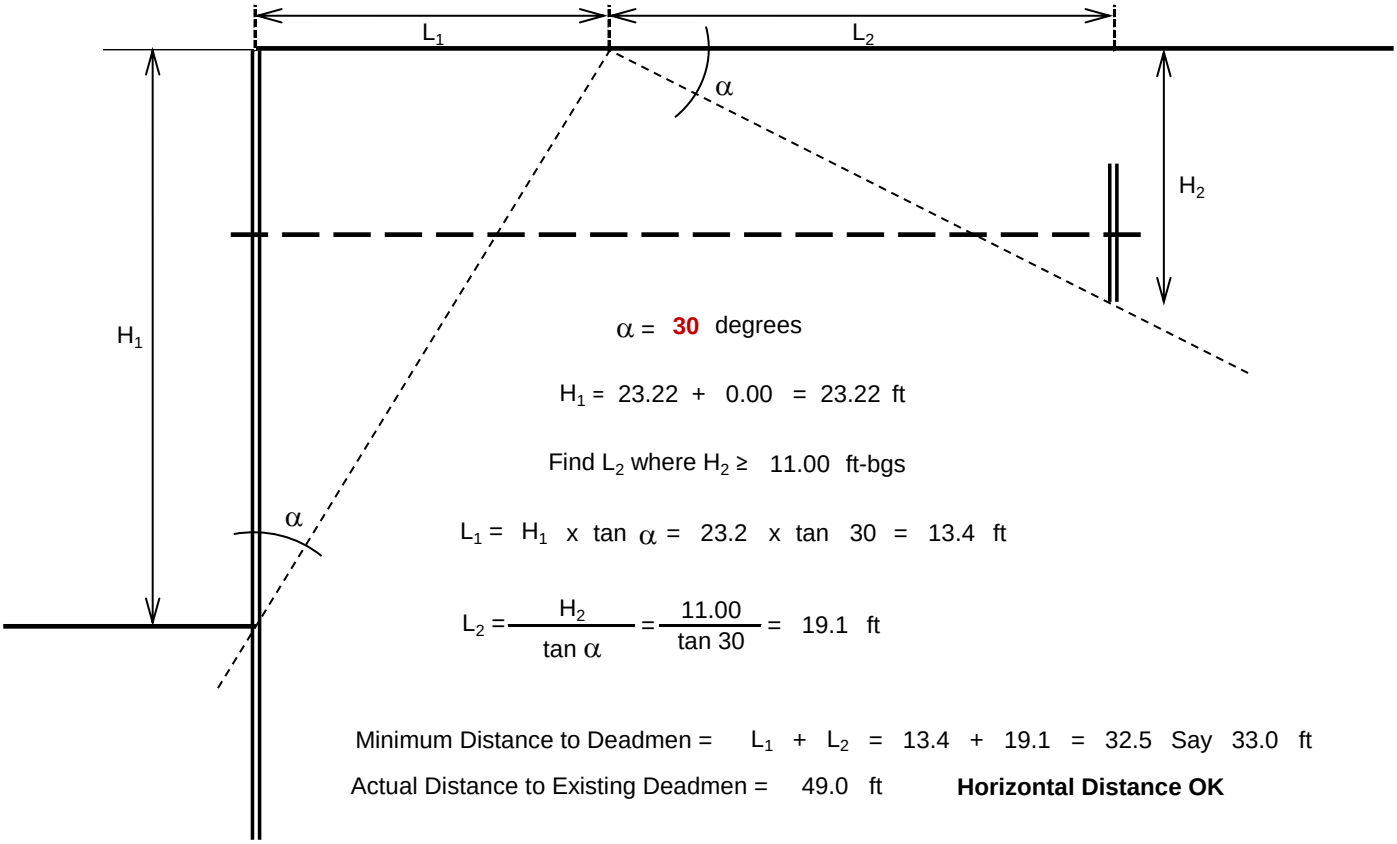
DEADMAN CALCULATIONS - SHEETING USED FOR DEADMAN

Distance to Deadmen (front face to front face)



α = **30** degrees

H_1 = 23.22 + 0.00 = 23.22 ft

Find L_2 where $H_2 \geq$ 11.00 ft-bgs

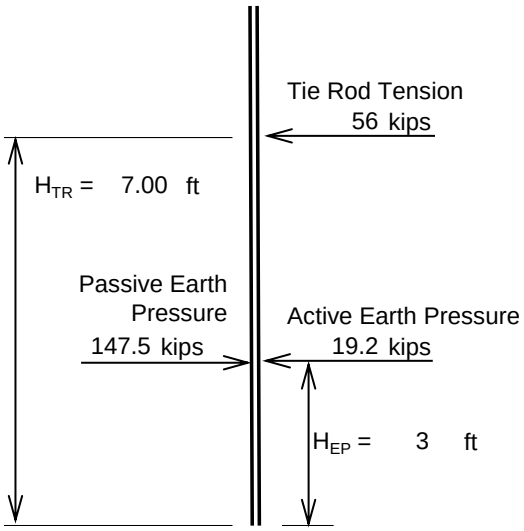
$L_1 = H_1 \times \tan \alpha = 23.2 \times \tan 30 = 13.4$ ft

$$L_2 = \frac{H_2}{\tan \alpha} = \frac{11.00}{\tan 30} = 19.1 \text{ ft}$$

Minimum Distance to Deadmen = $L_1 + L_2$ = 13.4 + 19.1 = 32.5 Say 33.0 ft

Actual Distance to Existing Deadmen = 49.0 ft **Horizontal Distance OK**

Check Moment



ΣMoment = (TRT x H_{TR}) + (P_a x H_{EP}) - (P_p x H_{EP})
+
= (56 x 7.00) + (19.2 x 3.00) - (147.5 x 3.00)
= 392 + 57.66 - 442.4
= 7.27 kip-ft

SCZ16 Grade 50 Maximum Allowable Moment: 43.31 kip-ft

Check Shear

Shear Force at Tie Rod = Pa @ 5' + TRT - Pp @ 5'

P = 3.97 + 56 - 30.5 = 29.5 kip

Area of SCZ16= 4.62 in^2

$$V = \frac{P}{A} = \frac{29.5}{4.62} = 6.38 \text{ ksi} < 50 \text{ ksi}$$

Shear Less Than Yield Strength

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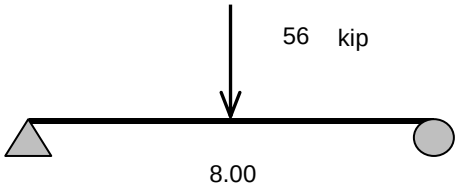
Project	Babcock Street CSO-Bulkhead		Sheet 3 of 3
Location	City of Buffalo, Erie Co., New York		Project No.
Client	Elk Street Commerce Park		2200012
Prep by	CTB	Date 10/08/20 Check by	Date

DEADMAN CALCULATIONS - SHEETING USED FOR DEADMAN

WALER DESIGN (assume 2 channels back to back modeled as a simply supported beam)



Assume Maximum Deflection = **0.1875** in

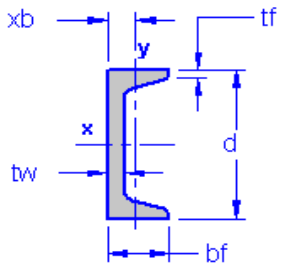
$$\Delta_{max} = \frac{P \times L^3}{48 \times E \times I} \quad \text{--OR--} \quad I = \frac{P \times L^3}{48 \times E \times \Delta_{max}}$$

$$I = \frac{56 \times 884736}{48 \times 29000 \times 0.19} = \frac{49545216}{261000} = 189.8$$ For 2 Channels

I = 94.9 For 1 Channel

Channel	Area	d	b_f	t_f	t_w	S_x	I_x
	(in^2)	(in)	(in)	(in)	(in)	(in^3)	(in^4)
C15 x 50	14.7	15	3.716	0.650	0.716	53.8	404
C15 x 40	11.8	15	3.520	0.650	0.520	46.5	349
C15 x 33.9	9.96	15	3.400	0.650	0.400	42.0	315
C12 x 30	8.82	12	3.170	0.501	0.510	27.0	162
C12 x 25	7.35	12	3.047	0.501	0.387	24.1	144
C12 x 20.7	6.09	12	2.942	0.501	0.282	21.5	129
C10 x 30	8.82	10	3.033	0.436	0.673	20.7	103
C10 x 25	7.35	10	2.886	0.436	0.526	18.2	91.2
C10 x 20	5.88	10	2.739	0.436	0.379	15.8	78.9
C10 x 15.3	4.49	10	2.600	0.436	0.240	13.5	67.4
C9 x 20	5.88	9	2.648	0.413	0.448	13.5	60.9
C9 x 15	4.41	9	2.485	0.413	0.285	11.3	51.0
C9 x 13	3.94	9	2.433	0.413	0.233	10.6	47.9
C8 x 18.75	5.51	8	2.527	0.390	0.487	11.0	44.0
C8 x 13.75	4.04	8	2.343	0.390	0.303	9.03	36.1
C8 x 11.5	3.38	8	2.260	0.390	0.220	8.14	32.6

$$FOS = \frac{144.0}{94.9} = 1.52$$



APPENDIX D

EXCAVATION NOTES:

1. ANY AND ALL EXCAVATION WORK SHALL BE CONDUCTED IN ACCORDANCE WITH THE EXCAVATION WORK PLAN THAT IS INCLUDED IN THE SITE MANAGEMENT PLAN.

GENERAL EROSION AND SEDIMENT CONTROL NOTES:

1. ALL WORK IS TO BE CONDUCTED IN ACCORDANCE WITH THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL (STATE STANDARDS) AND THE CONTRACT DOCUMENTS. IF A DISCREPANCY EXISTS BETWEEN THE STATE STANDARDS AND THE CONTRACT DOCUMENTS, THE STATE STANDARDS SHALL TAKE PRECEDENCE.

2. A TURBIDITY CURTAIN SHALL BE INSTALLED PRIOR TO BEGINNING ANY WORK OF THE PROPOSED SHEET PILE BULKHEAD. THE TURBIDITY CURTAIN SHALL BE THE LAST ITEM REMOVED AFTER ALL WORK HAS BEEN COMPLETED. THE CONTRACTOR SHALL INSTALL, INSPECT AND MAINTAIN THE PERFORMANCE OF THE TURBIDITY CURTAIN THROUGH OUT THE WORK.

3. A SILT FENCE OR SILT FILTER SOCK SHALL BE INSTALLED PRIOR TO BEGINNING ANY WORK OF THE PROPOSED SHEET PILE BULKHEAD. THE SILT FENCE OR SILT FILTER SOCK SHALL BE THE SECOND TO LAST ITEM TO BE REMOVED AFTER ALL WORK HAS BEEN COMPLETED. THE CONTRACTOR SHALL INSTALL, INSPECT AND MAINTAIN THE PERFORMANCE OF THE SILT FENCE OR SILT FILTER SOCK THROUGH OUT THE WORK.

4. ALL SOIL EROSION AND SEDIMENT CONTROL PRACTICES ARE TO BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE, OR IN THEIR PROPER SEQUENCE, AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.

5. EROSION AND SEDIMENTATION CONTROLS SHALL BE AUGMENTED OR SUPPLEMENTED IF THE INSTALLED MEASURES DO NOT PROVIDE ADEQUATE PROTECTION OF DOWNSTREAM RESOURCES AS DETERMINED BY THE ENGINEER OR DEPARTMENT.

6. ANY DISTURBED AREAS THAT WILL BE LEFT EXPOSED MORE THAN FOURTEEN (14) DAYS, AND NOT SUBJECT TO CONSTRUCTION TRAFFIC, WILL IMMEDIATELY RECEIVE TEMPORARY SEEDING AND MULCHING. IF THE SEASON PREVENTS THE ESTABLISHMENT OF TEMPORARY COVER, THE DISTURBED AREAS WILL BE MULCHED WITH HAY OR STRAW, OR EQUIVALENT MATERIAL, AT A RATE OF 2 TONS PER ACRE, ACCORDING TO STATE STANDARDS.

7. IMMEDIATELY FOLLOWING INITIAL DISTURBANCE OR ROUGH GRADING, ALL CRITICAL AREAS SUBJECT TO EROSION (I.E. STEEP SLOPES) WILL RECEIVE TEMPORARY SEEDING IN COMBINATION WITH HAY OR STRAW MULCH OR A SUITABLE EQUIVALENT, AT A RATE OF 2 TONS PER ACRE, ACCORDING TO STATE STANDARDS.

8. ALL SOIL WASHED, DROPPED, SPILLED, OR TRACKED OUTSIDE THE LIMIT OF WORK OR ONTO PUBLIC RIGHT-OF-WAYS SHALL BE REMOVED IMMEDIATELY.

9. PERMANENT VEGETATION IS TO BE SEEDED OR SODDED ON ALL EXPOSED AREAS AS SOON AS POSSIBLE AFTER FINAL GRADING. IF SEEDING IS NOT PERFORMED WITHIN 48 HOURS OF COMPLETION OF FINAL GRADING, ADDITIONAL SURFACE SCARIFICATION SHALL BE COMPLETED PRIOR TO SEEDING.

10. AT THE TIME THAT SITE PREPARATION FOR PERMANENT VEGETATIVE STABILIZATION IS TO BE UNDERTAKEN, ANY SOIL THAT WILL NOT PROVIDE A SUITABLE ENVIRONMENT TO SUPPORT ADEQUATE VEGETATIVE GROWTH SHALL BE REMOVED OR TREATED IN SUCH A WAY THAT WILL PERMANENTLY ADJUST THE SOIL CONDITIONS AND RENDER IT SUITABLE TO SUSTAIN VEGETATIVE GROWTH. IF THE REMOVAL OR TREATMENT OF THE SOIL WILL NOT PROVIDE SUITABLE CONDITIONS, NON-VEGETATIVE MEANS OF PERMANENT STABILIZATION SHALL BE EMPLOYED.

11. DEWATERING OPERATIONS SHALL BE UNDERTAKEN IN A MANNER TO MINIMIZE SEDIMENT TRANSFER. EFFLUENT FROM ANY DEWATERING OPERATIONS SHALL BE ROUTED TO THE ON-SITE TREATMENT FACILITY PRIOR TO FINAL DISPOSITION.

12. SHOULD THE CONTROL OF DUST AT THE SITE BE NECESSARY, THE SITE WILL BE SPRINKLED WITH WATER UNTIL THE SURFACE IS MOIST. TEMPORARY VEGETATIVE COVER SHALL BE ESTABLISHED OR MULCH SHALL BE APPLIED PER THE STATE STANDARDS. CALCIUM CHLORIDE SHALL ONLY BE USED FOR DUST CONTROL DURING FREEZING CONDITIONS.

13. THE OWNER AND CONTRACTOR SHALL ESTABLISH AN AREA WHERE THE CONTRACTOR MAY STAGE EQUIPMENT AND MATERIALS ON SITE.

14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY EROSION OR SEDIMENTATION THAT MAY OCCUR DOWNGRADIENT OF THE STORMWATER OUTFALLS/OUTLETS OR OFFSITE AS A RESULT OF CONSTRUCTION OF THE PROJECT.

STEEL SHEET PILE NOTES:

1. SHEET PILE TYPE: SHEET PILES SHALL BE PZC-18 HOT ROLLED STEEL SECTION CONFORMING TO ASTM A572 GRADE 50 (MINIMUM YIELD STRENGTH OF 50-KSI) WITH A SECTION MODULUS OF 33.5 IN^3/FT AND A MOMENT OF INERTIA OF 255.5 IN^4/FT OR EQUIVALENT SHALL BE USED FOR THE BULKHEAD STRUCTURE AND FOR THE TEMPORARY COFFERDAM.

2. STRAIGHT SHEET PILES ACTING AS FORMWORK SHALL BE PS-27.5 OR AS500-9.5 HOT ROLLED STEEL SECTION CONFORMING TO ASTM A572 GRADE 50 (MINIMUM YIELD STRENGTH OF 50-KSI). A L6X6X3/8 ANGLE SECTION SHALL BE WELDED TO THE OUTSIDE FACE OF EACH STRAIGHT SHEET PILE SECTION AND USED TO ATTACH THE SHEET PILE TO THE EXISTING CONCRETE HEADWALL. THE ANGLE SECTION SHALL BE BOLTED TO THE EXISTING CONCRETE HEADWALL USING HILTI HIT-Z ANCHOR RODS 1/2-INCH DIAMETER BY 7-3/4 INCH LONG, OR EQUIVALENT AND GROUTED IN PLACE USING HILTI HIT-HY200-R OR HIT-HY200-A ADHESIVE OR EQUIVALENT. NUTS AND WASHERS SHALL BE AS SPECIFIED BY THE WALL ANCHOR MANUFACTURER. WALL ANCHORS SHALL BE INSTALLED AT 16-INCH ON CENTER.

3. COLD ROLLED STEEL SECTIONS SHALL NOT BE USED.

4. DRIVING SHOES: THE SHEETING WILL BE DRIVEN TO PRACTICAL REFUSAL ANTICIPATED TO BE INTO THE UNDERLYING GLACIAL TILL AND/OR WEATHERED BEDROCK. DRIVE SHOES SHALL NOT BE REQUIRED. THE SUBSURFACE CONDITIONS SHOWN ON A PROFILE TITLED "GENERAL SOIL STRATIGRAPHY" OBTAINED FROM A DRAWING TITLED: "SUBSURFACE PROFILE SLURRY WALL WEST", PREPARED BY AMEC FOSTER WHEELER ENVIRONMENT & INFRASTRUCTURE, INC.; PROJECT NUMBER: 3617-16-7397; DWG: C-203, SHEET: 13 OF 28, DATED: JANUARY 2017 INDICATES THE SHEET PILES CAN BE INSTALLED USING A VIBRATORY HAMMER. THE STANDARD PENETRATION TEST N-VALUES WERE OBTAINED FROM THE DRAWING REFERENCED IN ABOVE FOR TEST BORING PDI-SB-013. BORING LOGS SB11/LB1 AND SB37 WERE ALSO USED TO OBTAIN SUBSURFACE INFORMATION.

5. STEEL SHEET PILE INTERLOCK SEAL: COMMON INTERLOCKS BETWEEN EACH PAIR OF STEEL SHEETS SHALL BE WELDED WITH A 1/4-INCH FILLET WELD TO SEAL THE INTERLOCK. THE LEADING NON-COMMON INTERLOCK SHALL BE EQUIPPED WITH SWELLSEAL APPLIED TO THE RECEIVING PORTION OF THE INTERLOCK PRIOR TO DRIVING.

6. SHEET PILE SPLICES: IT IS ANTICIPATED THAT REFUSAL WILL BE ENCOUNTERED BETWEEN 55- TO 60-FEET BELOW THE TOP OF THE EXISTING CONCRETE HEADWALL STRUCTURE. SPLICES ARE NOT ANTICIPATED TO BE REQURED.

7. WALER TYPE: WALERS SHALL CONSIST OF 2 - C12X25 HOT ROLLED STEEL SECTIONS CONFORMING TO ASTM A572 GRADE 50 (MINIMUM YIELD STRENGTH OF 50-KSI) WITH A SECTION MODULUS OF 24.1 IN^3/FT AND A MOMENT OF INERTIA OF 144 IN^4/FT OR EQUIVALENT PLACED BACK-TO-BACK. COLD ROLLED STEEL SECTIONS SHALL NOT BE USED.

8. TIEBACK TYPE: TIEBACK RODS SHALL BE DWYIDAG ALL-THREAD RODS PRESTRESSED STEEL CONFORMING TO ASTM A722 GRADE 150 (MINIMUM ULTIMATE TENSILE STRENGTH OF 150-KSI) WITH A DIAMETER OF 1-3/4-INCH, OR EQUIVALENT. ANCHOR NUT, BEARING WASHER AND WEDGE WASHER SHALL BE DWYIDAG THREADBAR PRESTRESSED STEEL HARDWARE GRADE 150 APPROPRIATELY SIZED FOR 1-3/4-INCH DIAMETER BARS OR EQUIVALENT. BEARING PLATE SHALL CONSIST OF STEEL PLATES 8-INCH BY 8-INCH BY 1-INCH THICK GRADE 50. SHIM PLATES SHALL BE USED BETWEEN THE TIE ROD BEARING PLATE AND THE WALER OR BETWEEN THE BEARING PLATE AND LOCKOFF NUT, AS APPROPRIATE. FOR CORROSION PROTECTION AT EACH CONNECTION, THE WALER, BEARING PLATE AND LOCKOFF HARDWARE SHALL BE ENCASED IN CONCRETE.

9. SHEET PILE CUTOFF: ALL BULKHEAD SHEET PILES SHALL BE CUT OFF AT THE SAME ELEVATION AS THE TOP OF THE EXISTING CSO HEADWALL STRUCTURE OR ELEVATION ±583.22 WITH THE EXCEPTION OF THOSE LOCATED AT THE CSO OUTFALL WHICH SHALL BE CUTOFF AT ELEVATION ±569.28 OR APPROXIMATELY 0.5' BELOW THE CSO INVERT. THE TEMPORARY COFFERDAM SHEET PILES SHALL BE CUTOFF AT ELEVATION ±575.00 OR APPROXIMATELY 0.2' BELOW THE CSO WIER CREST.

10. DRIVING CRITERIA: SHEET PILES SHALL BE DRIVEN TO REFUSAL WHICH IS ANTICIPATED TO BE APPROXIMATE ELEVATION OF ±530.0.

11. HAMMER COMPATIBILITY: SHEET PILE DRIVING HAMMER SHALL BE IDENTIFIED BY THE CONTRACTOR FOR INSTALLING THE SHEET PILE TYPE IDENTIFIED ABOVE FOR THE CONDITIONS ANTICIPATED TO BE ENCOUNTERED AT THE SITE. THE TYPE OF HAMMER CHOSEN SHALL HAVE THE NECESSARY CAPACITY TO INSTALL THE SHEET PILES WITHOUT OVERSTRESSING THE ELEMENT AS DETERMINED BY CONDUCTING A WEAP EVALUATION PRIOR TO PILE INSTALLATION. NO SHEET PILES SHALL BE INSTALLED UNTIL THE PROFESSIONAL GEOTECHNICAL ENGINEER HAS REVIEWED AND COMMENTED ON THE WEAP EVALUATION.

12. QUALITY ASSURANCE INSPECTION: A PROFESSIONAL GEOTECHNICAL ENGINEER OR REPRESENTATIVE THEREOF SHALL BE ENGAGED BY THE OWNER TO PROVIDE CONTINUOUS SPECIAL INSPECTION OF THE SHEET PILE WALL INSTALLATION. A SPECIAL INSPECTION FINAL LETTER SHALL BE PROVIDED AT COMPLETION OF THE SHEET PILE WALL INSTALLATION AND SHALL CERTIFY THAT ALL REQUIRED INSPECTIONS WERE PERFORMED AND WILL ITEMIZE ALL NON-CONFORMANCES, DEVIATIONS AND DEFICIENCIES THAT WERE NOT CORRECTED OR RESOLVED.

13. QUALITY CONTROL/QUALITY ASSURANCE: PORTIONS OF THE CONTRACT DOCUMENTS SHALL REQUIRE AND PROVIDE FOR PROCEDURES FOR THE PILE DRIVING CONTRACTOR TO SUBMIT VARIOUS INFORMATION AND ATTEND A MANDATORY PRE-INSTALLATION CONFERENCE.

14. PRE-INSTALLATION CONFERENCE: A PRE-INSTALLATION CONFERENCE MEETING IS REQUIRED AND SHOULD BE SCHEDULED TWO WEEKS PRIOR TO THE SHEET PILE INSTALLATION CONTRACTOR MOBILIZATION, BUT AFTER ALL PRECONSTRUCTION SUBMITTALS ARE REVIEWED AND FOUND ACCEPTABLE. THE GENERAL CONTRACTOR, SHEET PILE INSTALLATION CONTRACTOR, OWNER'S REPRESENTATIVE, STRUCTURAL ENGINEER'S REPRESENTATIVE, CONTRACTOR'S LAND SURVEYOR, AND THE PROFESSIONAL GEOTECHNICAL ENGINEER SHALL ATTEND THE PRECONSTRUCTION CONFERENCE.

15. REQUIRED CONTRACTOR SUBMITTALS:
    a. SHEET PILE SECTION SUBMITTAL: TO INCLUDE BUT NOT LIMITED TO; SHEET PILE TYPE, SECTION, SIZE, WEAP ANALYSIS RESULTS.
    b. SHEET PILE DRIVING HAMMER SUBMITTAL: TO INCLUDE BUT NOT LIMITED TO; HAMMER MAKE AND MODEL, SERIAL NUMBER, RATED ENERGY, STROKE, RAM/HAMMER MASS, AND COMPUTATION (WEAP FORMULA) SHOWING PROPER IMPACT OR VIBRATORY HAMMER SELECTION FOR SHEET PILE SIZE, HELMET AND HAMMER CUSHION MATERIALS AND DIMENSIONS.
    c. CONSTRUCTION SEQUENCE PLAN: ANY REVISIONS TO THE SEQUENCE PLAN ALREADY PROVIDED BY THE SHEET PILE INSTALLATION CONTRACTOR AND INCLUDED HEREIN.

ATTACHMENTS AT CORNER AND TO EXISTING SHEET PILE NOTES:

1. AT THE CORNER WHERE THE SHEET PILE MAKES A 90-DEGREE TURN, A PZ-90 WILL BE INSTALLED TO ACCOMMODATE THE CORNER.

2. AT EACH END OF THE SHEET PILE WALL WHERE THE NEW SHEETING WILL BE ATTACHED TO THE EXISTING SHEETING THE FOLLOWING WILL OCCUR:
   A. A SECTION OF THE EXISTING SHEETING WILL BE WITHDRAWN.
   B. AT ONE END OF THE NEW SHEET PILE WALL EITHER A BBS-M (ONE LEG) OR WOM WILL BE ATTACHED TO THE WITHDRAWN SHEET AND AT THE OTHER END OF THE NEW SHEET PILE WALL EITHER A BBS-F (ONE LEG) OR WOF WILL ATTACHED TO THE WITHDRAWN SHEET. THE SHEETING CONTRACTOR SHALL DETERMINE WHICH CONNECTOR SHALL BE USED AT EACH LOCATION.
   C. THE CONNECTORS SHALL BE WELDED TO THE APPROPRIATE WITHDRAWN SHEET PILE USING A 1/4-INCH FILLET WELD THE ENTIRE LENGTH OF THE CONNECTOR.
   D. THE WITHDRAWN SHEET PILES SHALL BE REINSTALLED.

3. AT LOCATIONS WHERE THE TEMPORARY COFFERDAM OR STRAIGHT SHEET PILES (FORM-WORK) SHALL BE ATTACHED TO THE NEW SHEET PILE BULKHEAD, A PZ-TEE WILL BE INSTALLED TO ACCOMMODATE THE CONNECTIONS.

NELSON STUD NOTES:

1. NELSON STUDS SHALL BE 1/2-INCH IN DIAMETER AND A MINIMUM OF 6-INCHES LONG.

2. NELSON STUDS SHALL BE INSTALLED ALONG THE CENTERLINE OF THE INSIDE FACE OF EACH OUTER FLANGE OF THE NEW SHEET PILE WALL THAT IS PARALLEL TO THE EXISTING CONCRETE HEADWALL.

3. NELSON STUDS SHALL BE INSTALLED AT 16-INCHES ON-CENTER USING A 1/4-INCH FILLET WELD.

TRASH RACK NOTES:

1. THE EXISTING TRASH RACK AND GUIDES WERE VISUALLY OBSERVED AND IDENTIFIED TO BE IN SATISFACTORY CONDITION TO BE REUSED. THE EXISTING TRASH RACK AND GUIDES SHALL NOT BE DEMOLISHED, REMOVED OR MODIFIED BY THE CONTRACTOR. THE CONTRACTOR SHALL IDENTIFY THE LOCATION OF THE STRAIGHT SHEETS IN THE FIELD SO THAT THE ANGLES CAN BE FASTENED TO THE EXISTING CONCRETE HEADWALL AT THE APPROPRIATE LOCATIONS.

CELLULAR CONCRETE NOTES:

1. CELLULAR CONCRETE (I.E., GEOFILL LD MARINE OR EQUIVALENT, [GEOFILL, LLC; 1501 ABBOTT COURT BUFFALO GROVE, IL 60089; 888-820-3455]) SHALL BE USED TO FILL THE VOID BENEATH THE EXISTING CONCRETE HEADWALL/OUTFALL STRUCTURE.

2. CELLULAR CONCRETE SHALL BE JOBSITE MIXED WITH PRE-GENERATED FOAM FROM A LIQUID CONCENTRATE. AS CAST-IN-PLACE, CELLULAR CONCRETE SHALL HAVE THE FOLLOWING PROPERTIES:
   A. CEMENT TYPE: TYPE I/II (ASTM C150);
   B. AGGREGATE SAND (ASTM C33);
   C. FOAMING AGENT - LIQUID CONCENTRATE NON-PERVIOUS (ASTM 869), THE FOAMING AGENT SHALL COMPLY WITH ASTM C869 WHEN TESTED IN ACCORDANCE WITH ASTM C796;
   D. MAXIMUM CAST WET DENSITY 75 PCF;
   E. MAXIMUM CAST CURED DENSITY 70 PCF;
   F. MINIMUM COMPREHENSIVE STRENGTH: 500 PSI IN 28 DAYS; AND
   G. OTHER ADMIXTURES: ADMIXTURES FOR ACCELERATING, WATER REDUCING AND OTHER SPECIFIC PROPERTIES MAY BE USED WHEN SPECIFICALLY APPROVED BY THE MANUFACTURER. ADMIXTURES CONTAINING CHLORIDE IONS SHALL NOT BE USED.

3. CELLULAR CONCRETE SHALL NOT BE PLACED UNTIL ALL NEW SHEET PILES, TIEBACKS, AND WALERS HAVE BEEN INSTALLED.

4. PUMP OUT WATER FROM BEHIND NEW SHEETING SO CELLULAR CONCRETE CAN BE INSTALLED "IN THE DRY" TO THE BEST PRACTICAL EXTENT.

5. FOAM GENERATING EQUIPMENT SHALL BE USED TO PRODUCE A PREDETERMINED QUANTITY OF PRE-FORMED FOAM WHICH SHALL BE MIXED AND BLENDED WITH CEMENTITIOUS SLURRY. EQUIPMENT SHALL BE CALIBRATED TO PRODUCE CONSISTENT FOAM THAT SHALL RETAIN ITS STABILITY UNTIL THE CEMENT SETS TO FORM A UNIFORM CELLULAR STRUCTURE.

6. CELLULAR CONCRETE SHALL BE PRODUCED UTILIZING SPECIALIZED AUTOMATED PROPORTIONING, MIXING, AND FOAM PRODUCING EQUIPMENT, WHICH IS CAPABLE OF MEETING THE SPECIFIED PROPERTIES.

7. AVOID EXCESSIVE HANDLING OF THE MATERIAL. AFTER SUFFICIENT MIXING OF THE FOAM WITH SLURRY, CELLULAR CONCRETE SHALL BE TREMIE PUMPED AND CONVEYED PROMPTLY IN ITS FINAL LOCATION.

8. ALL EQUIPMENT USED TO FURNISH THE CELLULAR CONCRETE MUST BE APPROVED BY THE CELLULAR CONCRETE MANUFACTURER.

9. CELLULAR CONCRETE SHALL BE TREMIE PUMPED AND PLACED BENEATH AND UP TO THE BOTTOM OF THE EXISTING CONCRETE HEADWALL/OUTFALL STRUCTURE. ALLOW CELLULAR CONCRETE TO CURE FOR A MINIMUM OF 24 HOURS PRIOR TO ADDITIONAL CONCRETE BEING PLACED.

10. THE CONTRACTOR SHALL HAVE A RECORD OF EXPERIENCE AND QUALITY OF WORK PLACING CELLULAR CONCRETE OR SHALL HAVE A MANUFACTURER'S REPRESENTATIVE ON SITE WHO HAS EXPERIENCE PLACING CELLULAR CONCRETE TO GUIDE THE CONTRACTOR.

11. CELLULAR CONCRETE MANUFACTURER/CONTRACTOR SHALL:
   A. BE CAPABLE OF DEVELOPING A MIX DESIGN, BATCHING, MIXING, HANDLING, AND PLACING OF CELLULAR CONCRETE;
   B. BE REGULARLY ENGAGED IN THE PRODUCTION AND PLACEMENT OF CELLULAR CONCRETE FOR THIS PROJECT;
   C. HAVE SATISFACTORY COMPLETED DURING THE LAST THREE YEARS AT LEAST FIVE CELLULAR CONCRETE PROJECTS OF NO LESS THAN 200 CUBIC YARDS EACH; AND
   D. HAVE WORKERS, INCLUDING THE CONTRACTOR'S SUPERINTENDENT AND/OR FOREMAN, BE FULLY QUALIFIED TO PERFORM THE WORK AND HAVE HAD PREVIOUS EXPERIENCE IN PRODUCTION AND PLACEMENT OF CELLULAR CONCRETE UNDER SIMILAR CONDITIONS.

12. TESTING SHALL BE PERFORMED BY THE OWNER AND/OR APPROVED AGENCY.
   A. A MINIMUM OF FOUR 3"X 6" CYLINDERS SHALL BE MOLDED FOR EACH 100 CUBIC YARDS PLACED;
   B. CELLULAR CONCRETE MAY BE TESTED AT ANY AGE AFTER 3 DAYS FOR COMPRESSIVE STRENGTH IN ACCORDANCE WITH ASTM C-495. AT LEAST TWO SPECIMENS FROM EACH SET SHALL BE TESTED AT 28 DAYS; AND
   C. CONTRACTOR SHALL RECORD AND MEASURE WET CAST DENSITIES NEAR THE POINT OF PLACEMENT ON AN HOURLY BASIS. MIX SHALL BE ADJUSTED AS REQUIRED TO OBTAIN THE SPECIFIED CAST DENSITY.

LIGHT WEIGHT CONCRETE NOTES:

1. PRIOR TO INSTALLING LIGHT WEIGHT CONCRETE ALL LOOSE AND SPALLING CONCRETE ON THE OUTER FACE OF THE EXISTING CONCRETE HEADWALL SHALL BE REMOVED DOWN TO OR BELOW THE WATER LINE, DEPENDING THE PORTION OF THE CONCRETE HEADWALL THAT IS IN THE DRY.

2. A CONCRETE BONDING AGENT SHALL BE APPLIED TO CLEANED EXISTING CONCRETE HEADWALL SURFACE IN ACCORDANCE WITH THE MANUFACTURER'S DIRECTIONS BEFORE LIGHT WEIGHT CONCRETE IS PLACED.

3. STRUCTURAL LIGHT WEIGHT CONCRETE SHALL BE PLACED BETWEEN THE EXISTING CONCRETE HEADWALL/OUTFALL STRUCTURE AND NEW SHEET PILE BULKHEAD ON TOP OF THE CURED CELLULAR CONCRETE.

4. LIGHT WEIGHT CONCRETE SHALL BE JOB-SITE MIXED OR BATCH MIXED AND DELIVERED TO THE SITE. AS CAST-IN-PLACE, LIGHT WIGHT CONCRETE SHALL HAVE THE FOLLOWING PROPERTIES:
   A. CEMENT TYPE: TYPE I/II (ASTM C150 OR C595) AIR-ENTRAINING CEMENT SHALL NOT BE PERMITTED;
   B. AGGREGATE: EXPANDED SHALE, CLAY OR SLATE PRODUCED BY THE ROTARY KILN METHOD AND SHALL CONFORM TO ASTM C330. NATURAL SAND SHALL CONFORM TO ASTM C33;
   C. FLY ASH: SHALL MEET ASTM C618;
   D. AIR CONTENT SHALL BE 4% TO 6% BY VOLUME;
   E. MAXIMUM CAST CURED DENSITY 100 PCF;
   F. MINIMUM COMPREHENSIVE STRENGTH: 2,500 PSI IN 28 DAYS;
   G. CONCRETE SHALL BE DELIVERED AT THE MINIMUM SLUMP NECESSARY FOR EFFICIENT MIXING, PLACING AND FINISHING, SLUMP SHALL BE 6-INCHES TO 8-INCHES; AND
   H. OTHER ADMIXTURES: ADMIXTURES FOR ACCELERATING, WATER REDUCING AND OTHER SPECIFIC PROPERTIES MAY BE USED WHEN SPECIFICALLY APPROVED BY THE MANUFACTURER. ADMIXTURES CONTAINING CHLORIDE IONS SHALL NOT BE USED.

5. LIGHT WEIGHT CONCRETE SHALL NOT BE PLACED UNTIL ALL NEW SHEET PILES, TIEBACKS, AND WALERS HAVE BEEN INSTALLED.

6. PUMP OUT WATER FROM BEHIND NEW SHEETING SO LIGHT WEIGHT CONCRETE CAN BE INSTALLED "IN THE DRY" TO THE BEST PRACTICAL EXTENT.

7. LIGHT WEIGHT CONCRETE SHALL BE TREMIE PUMPED AND PLACED BETWEEN THE EXISTING CONCRETE HEADWALL/OUTFALL STRUCTURE AND THE NEW SHEET PILE BULKHEAD.

8. THE CONTRACTOR SHALL HAVE A RECORD OF EXPERIENCE AND QUALITY OF WORK PLACING LIGHT WEIGHT CONCRETE OR SHALL HAVE A MANUFACTURER'S REPRESENTATIVE ON SITE WHO HAS EXPERIENCE PLACING LIGHT WEIGHT CONCRETE TO GUIDE THE CONTRACTOR.

9. LIGHT WEIGHT CONCRETE MANUFACTURER/CONTRACTOR SHALL:
   A. BE CAPABLE OF DEVELOPING A MIX DESIGN, BATCHING, MIXING, HANDLING, AND PLACING OF LIGHT WEIGHT CONCRETE;
   B. BE REGULARLY ENGAGED IN THE PRODUCTION AND PLACEMENT OF LIGHT WEIGHT CONCRETE FOR THIS PROJECT;
   C. HAVE SATISFACTORY COMPLETED DURING THE LAST THREE YEARS AT LEAST FIVE LIGHT WEIGHT CONCRETE PROJECTS OF NO LESS THAN 200 CUBIC YARDS EACH; AND
   D. HAVE WORKERS, INCLUDING THE CONTRACTOR'S SUPERINTENDENT AND/OR FOREMAN, BE FULLY QUALIFIED TO PERFORM THE WORK AND HAVE HAD PREVIOUS EXPERIENCE IN PRODUCTION AND PLACEMENT OF CELLULAR CONCRETE UNDER SIMILAR CONDITIONS.

10. TESTING SHALL BE PERFORMED BY THE OWNER AND/OR APPROVED AGENCY.
   A. SAMPLES OF CONCRETE SHALL BE OBTAINED IN ACCORDANCE WITH ASTM C172, AND SHALL BE TRANSPORTED TO A PLACE ON THE SITE WHERE TESTS CAN BE MADE AND CYLINDERS STORED WITHOUT BEING DISTURBED FOR THE FIRST 24 HOURS. IN ADDITION, IF THE CONCRETE IS PLACED BY PUMPING, SAMPLES SHALL BE OBTAINED FROM THE END OF THE PUMP DISCHARGE LINE.
   B. COMPRESSIVE STRENGTH SPECIMENS SHALL BE MADE IN ACCORDANCE WITH ASTM C31, WITH THE EXCEPTION THAT THE CURING REQUIREMENT FOR THE TEST SPECIMENS SHALL BE 7 DAYS OF MOIST CURING FOLLOWED BY 21 DAYS OF AIR DRYING AND AS DETAILED IN ASTM C330. SECTION 8.1.1 FOR EACH OF THE FOLLOWING CONDITIONS:
      - EACH DAY'S PLACING;
      - EACH TYPE OF CONCRETE;
      - EACH CHANGE OF SUPPLIER OR SOURCE; AND
      - EACH 150 CU. YD. OF CONCRETE AND FRACTION THEREOF.
   C. COMPRESSIVE STRENGTH SPECIMENS SHALL BE TESTED IN ACCORDANCE WITH ASTM C39.
   D. DENSITY, SLUMP AND AIR CONTENT OF FRESH CONCRETE SHALL BE DETERMINED FROM EACH BATCH OF CONCRETE SAMPLED FOR COMPRESSIVE STRENGTH TESTS. FRESH DENSITY, SLUMP AND AIR CONTENT SHALL BE DETERMINED BY ASTM C138, C143, AND C173 RESPECTIVELY. THE FRESH DENSITY OF THE CONCRETE SHALL NOT EXCEED THE DESIGN WEIGHT PLUS THE WEIGHT LOSS FACTOR DETERMINED FROM PROJECT TRIAL MIXES BY ASTM C567.

GENERAL CONSTRUCTION SEQUENCE NOTES:

1. SUBMITTAL OF MATERIALS.
2. REVIEW SUBMITTAL PACKAGE.
3. OBTAIN MATERIALS AND FABRICATION OF: SHEET PILES, TRASH RACK, ETC.
4. MOBILIZE PILE DRIVING EQUIPMENT AND FABRICATED ITEMS.
5. INSTALL TURBIDITY CURTAIN.
6. REMOVE EXISTING TRASH RACK AND STORE ONSITE FOR REUSE.
7. EXTRACT AND WELD INTERLOCK ON TO EXISTING KING PILE BULKHEAD SHEET.
8. INSTALL PZC-18 FRONT WALL BULKHEAD SHEETS:
   A. DRIVE FULL LENGTH SHEETS FROM KING PILE WALL UP TO CSO OPENING;
   B. AT CSO OPENING: DRIVE SHEET, EXTRACT, CUT SHEET TO LENGTH, REDRIVE SHEET; AND
   C. DRIVE FULL LENGTH SHEETS FOR REMAINDER OF BULKHEAD STRUCTURE
9. INSTALL TEMPORARY COFFERDAM SHEETS AT CSO OPENING.
10. INSTALL REMAINING OF PZC-18 (RETURN WALL) TO THE HANGING WALL.
11. EXTRACT SHEET PILE ON HANGING WALL AND WELD INTERLOCK TO EXISTING SCZ-16 AT JUNCTION.
12. INSTALL WALER SYSTEM AND TIE ROD SYSTEM AND LOCK OFF THAT WILL INCLUDE:
   A. CORING THROUGH THE EXISTING CONCRETE HEADWALL AT THE APPROPRIATE LOCATIONS;
   B. EXPOSING THE EXISTING HANGING WALL SHEETING LOCATED TO THE "UPLAND" SIDE OF THE EXISTING CONCRETE HEADWALL;
   C. INSTALLING THE WALERS AS SHOWN ON THE PLANS;
   D. CONNECTING THE TIERODS TO THE WALERS;
   E. INSTALLING THE ANCHOR BOLT SYSTEM TO ATTACH THE WALER TO THE NEW SHEET PILE BULKHEAD STRUCTURE; AND
   F. LOCKING OFF ALL NUTS.
13. SET UP AND INSTALL CELLULAR CONCRETE TO STRUCTURE INVERT.
14. INSTALL WELDMENTS AND STEEL STRUCTURE TO EXISTING CONCRETE BULKHEAD/OUTFALL STRUCTURE.
15. SET UP AND INSTALL LIGHT WEIGHT CONCRETE FILL BETWEEN EXISTING CONCRETE HEADWALL AND NEW STEEL SHEET PILE BULKHEAD.
16. INSTALL EXISTING TRASH RACK.
17. REMOVE TEMPORARY COFFERDAM.
18. REMOVE TURBIDITY CURTAIN AND DEMOBILIZE FROM THE SITE.

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4 CENTRE DRIVE
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ELK STREET COMMERCE PARK

625 ELK STREET
BUFFALO, NEW YORK

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NO:	DATE:	DESCRIPTION:

REVISIONS

PROJECT NUMBER: 2200012

DRAWN BY: TAP

REVIEWED BY: CTB

ISSUED FOR:

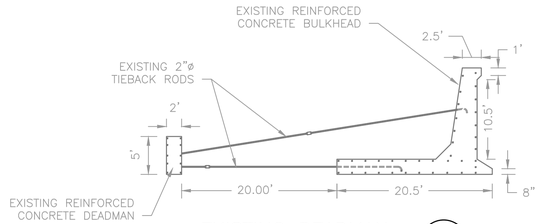
DATE: OCTOBER 27, 2020

DRAWING NAME:

CONSTRUCTION NOTES

DRAWING NUMBER:

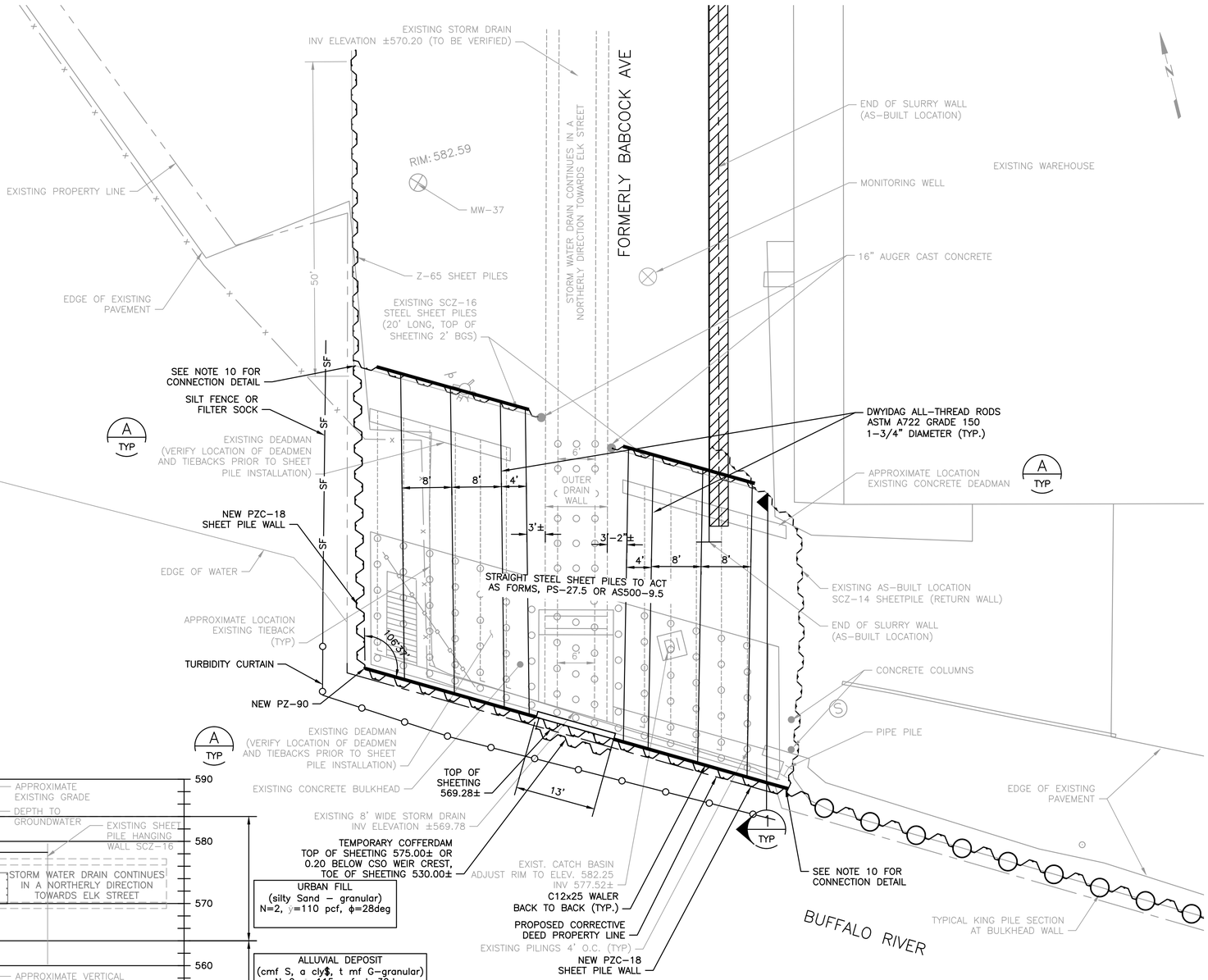
C001

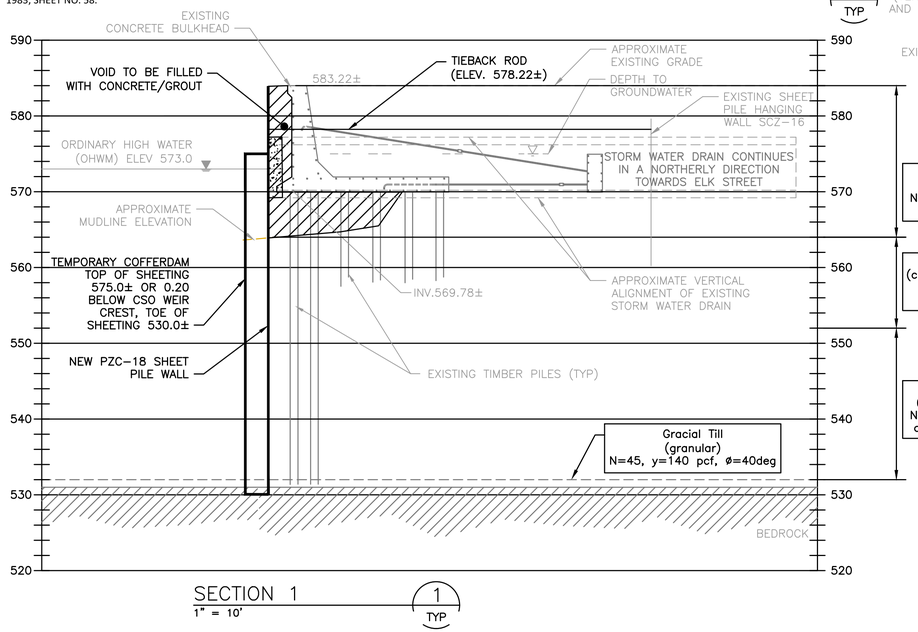


EXISTING DEADMAN
1" = 10'
A TYP

GENERAL NOTES:

1. ANY AND ALL EXCAVATION WORK SHALL BE CONDUCTED IN ACCORDANCE WITH THE EXCAVATION WORK PLAN THAT IS INCLUDED IN THE SITE MANAGEMENT PLAN.
2. THE BASE PLAN AND SECTION FIGURES WERE OBTAINED FROM A DRAWING PREPARED BY: AMEC FOSTER WHEELER ENVIRONMENT & INFRASTRUCTURE, INC.; TITLED: SITE PLAN WEST, OU3 SEEP REMEDY; PROJECT NO.: 3617-16-7397; DWG NO.: FIGURE 1; DATED: 8/31/20.
3. THE CONTRACTOR IS OBLIGATED TO CONTACT THE LOCAL ONE-CALL SYSTEM TO HAVE UTILITIES MARKED OUT.
4. BABCOCK CSO SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.
5. STEEL SHEET PILES ARE ANTICIPATED TO BE 60-FEET LONG AND SHALL BE INSTALLED TO REFUSAL (ANTICIPATED TO BE TOP OF BEDROCK). STEEL SHEET PILES SHALL BE HOT ROLLED SECTIONS, COLD ROLLED SECTIONS SHALL NOT BE USED.
6. COMMON INTERLOCKS SHALL BE WELDED, THE LEADING INTERLOCK SHALL HAVE A SWELL SEAL APPLIED PRIOR TO DRIVING.
7. NELSON STUDS SHALL BE WELDED TO THE SHEET PILES TO FORM A PERMANENT BOND BETWEEN THE CONCRETE/GROUT AND THE NEW SHEETING.
8. CELLULAR CONCRETE SHALL BE TREMIE PUMPED BENEATH THE EXISTING OUTFALL HEADWALL. LIGHTWEIGHT CONCRETE SHALL BE TREMIE PUMPED BETWEEN THE EXISTING HEADWALL STRUCTURE AND NEW SHEET PILE BULKHEAD WALL.
9. NEW BULKHEAD STRUCTURE TO BE TIED BACK TO THE EXISTING HANGING WALL SHEETING. WALERS SHALL CONSIST OF HOT ROLLED CHANNEL SECTIONS, COLD ROLLED SECTIONS SHALL NOT BE USED. TIEBACK RODS SHALL BE PRESTRESSED STEEL.
10. WHERE THE NEW SHEET PILE WALL SHALL BE JOINED TO EXISTING SHEETING, A SECTION OF THE EXISTING SHEETING SHALL BE WITHDRAWN, AN INTERLOCK OR NEW SHEET SHALL BE WELDED TO THE EXISTING SHEET AND THE MODIFIED SHEET SHALL BE REINSTALLED.
11. ELEVATIONS PROVIDED ARE FROM A PLAN TITLED "PLAN AND PROFILE" PREPARED BY C&S CONSULTING ENGINEERS FOR THE BUFFALO SEWER AUTHORITY BACK WATER PROTECTION IMPROVEMENTS - CONTRACT NO. 1A-SITE NO 80A; FILE NO. 140.009.001; DATED MARCH 21, 1983; SHEET NO. 58.





SECTION 1
1" = 10'
1 TYP

SECTION 1 GENERAL NOTES:

1. THIS SECTION PROVIDES GENERAL LAYOUT INFORMATION REGARDING THE LOCATION OF THE NEW STEEL SHEET PILE BULKHEAD, TEMPORARY COFFERDAM, TIEBACK ANCHOR ROD, AND GENERAL SOIL PROFILE. THIS SECTION DOES NOT DEPICT THE IMPROVEMENTS MADE TO THE CONCRETE HEADWALL IN 1983.
2. GENERAL SOIL STRATIGRAPHY OBTAINED FROM A DRAWING PREPARED BY AMEC FOSTER WHEELER ENVIRONMENT & INFRASTRUCTURE, INC.; TITLED: SUBSURFACE PROFILE SLURRY WALL WEST; PROJECT NUMBER: 3617-16-7397; DWG: C-203; SHEET: 13 OF 28; DATED: JANUARY 2017.
3. STANDARD PENETRATION TEST N-VALUES OBTAINED FROM THE DRAWING REFERENCED IN NOTE 1, TEST BORING: PDI-SB-013.
4. REFER TO THE PROFILE DETAIL FOR ADDITIONAL INFORMATION.

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BUFFALO, NEW YORK

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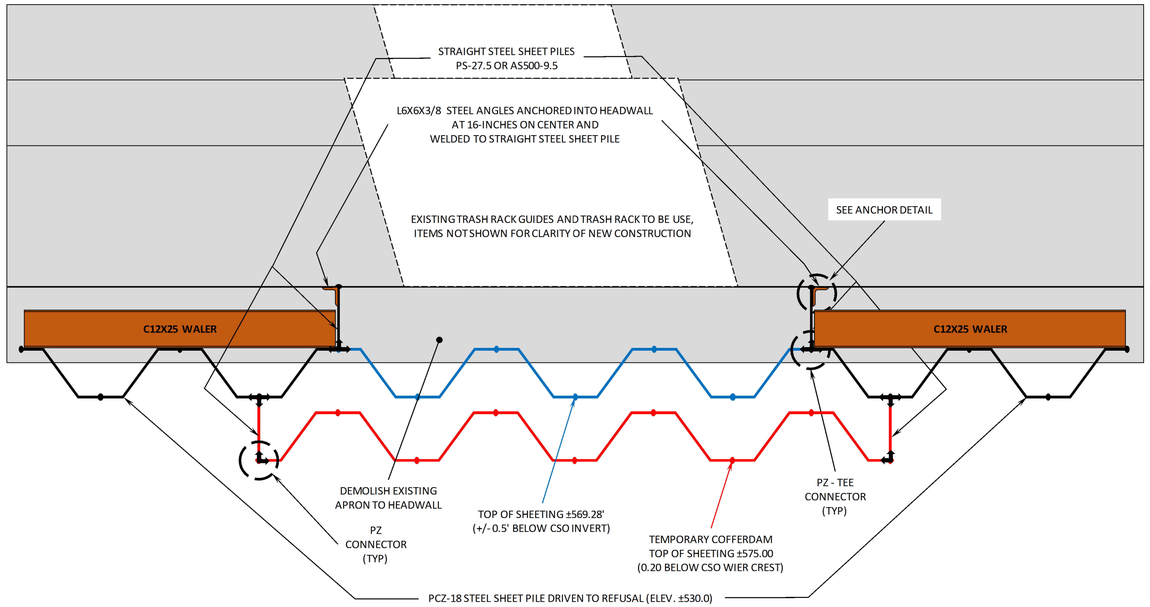
NO:	DATE:	DESCRIPTION:
REVISIONS		

PROJECT NUMBER: 2200012
DRAWN BY: TAP
REVIEWED BY: CTB
ISSUED FOR:
DATE: OCTOBER 27, 2020
DRAWING NAME:

SITE PLAN WEST

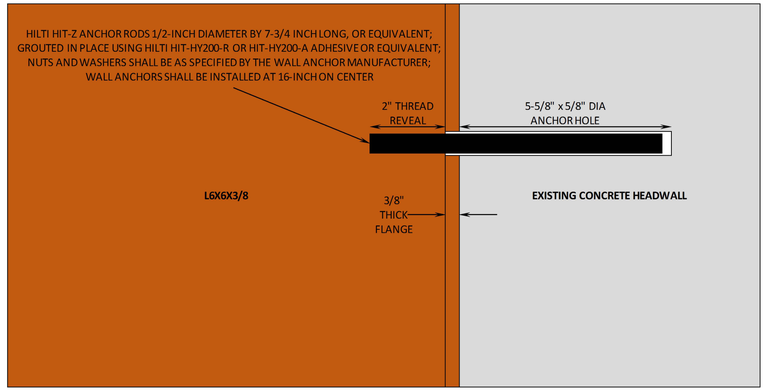
DRAWING NUMBER:

C201



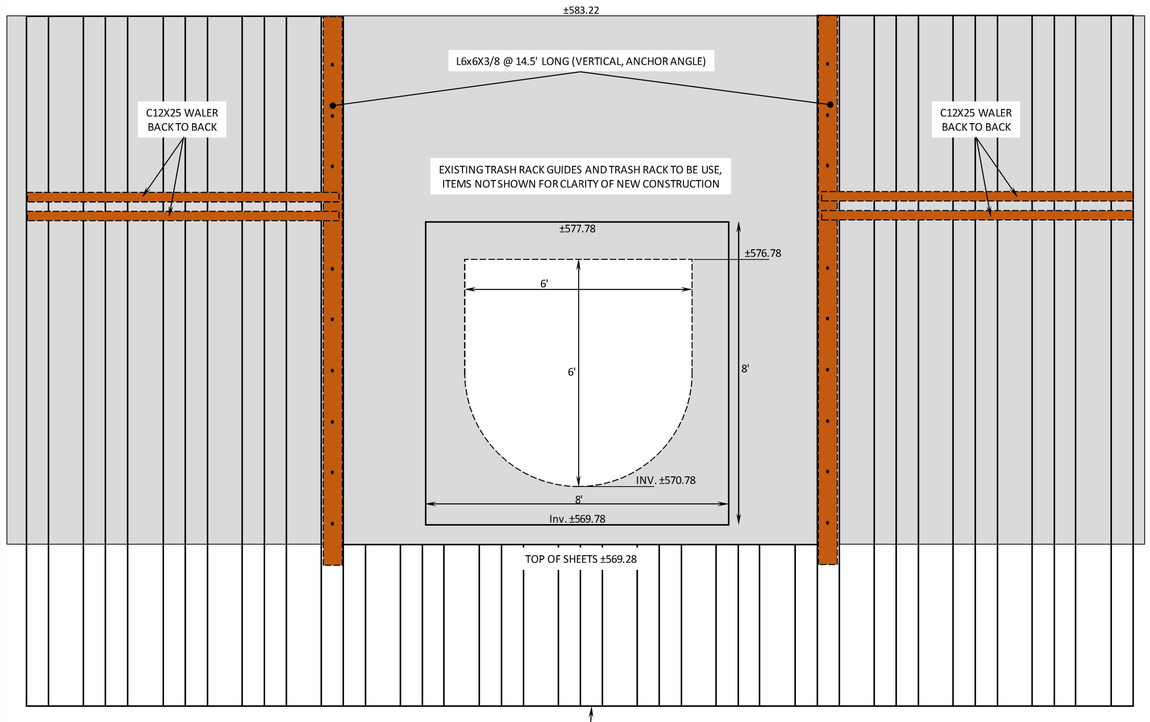
BABCOCK DRAIN CSO AND BULKHEAD SHEETING DETAIL

PLAN VIEW – SCALE 1/2" = 1'–0"



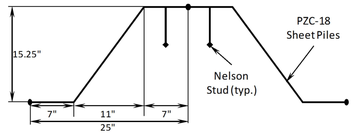
BABCOCK DRAIN CSO – ANCHOR DETAIL

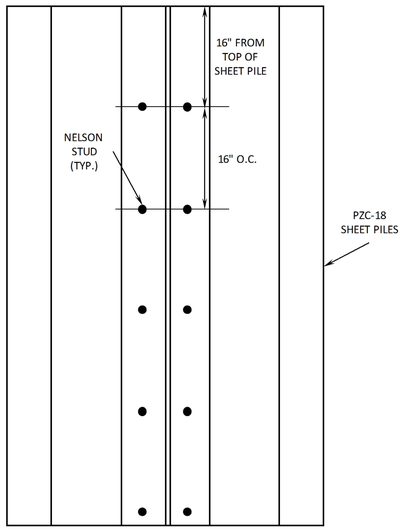
PLAN VIEW – SCALE 1/2" = 1'–0"



BABCOCK DRAIN CSO AND BULKHEAD SHEETING DETAIL

ELEVATION VIEW – SCALE 1/2" = 1'–0"





LAND SIDE OF SHEET PILE BULKHEAD WALL BACKFILLED WITH CONCRETE

BABCOCK DRAIN CSO NELSON STUD ATTACHMENT DETAIL
PLAN AND ELEVATION VIEWS

SCALE 1" = 1'–0"

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NO.	DATE:	DESCRIPTION:
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PROJECT NUMBER: 2200012

DRAWN BY: TAP

REVIEWED BY: CTB

ISSUED FOR:

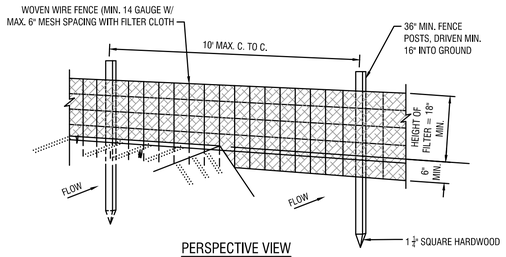
DATE: OCTOBER 27, 2020

DRAWING NAME:

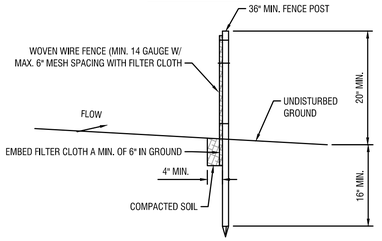
CONSTRUCTION DETAILS

DRAWING NUMBER:

C501



PERSPECTIVE VIEW



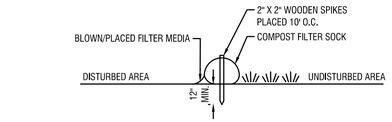
SECTION VIEW

NOTES:

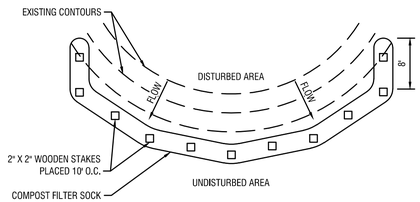
1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABLINKA 140N, OR APPROVED EQUAL.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUAL.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

SILT FENCE

NYS DEC DETAIL: SILT FENCE



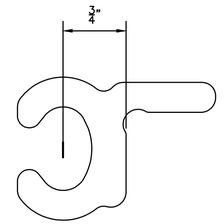
SECTION VIEW



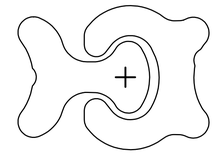
PLAN VIEW

COMPOST FILTER SOCK

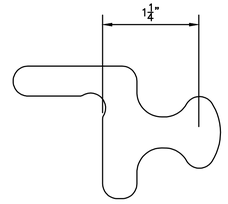
NYS DEC DETAIL: COMPOST FILTER SOCK



BBS–F ONE LEG



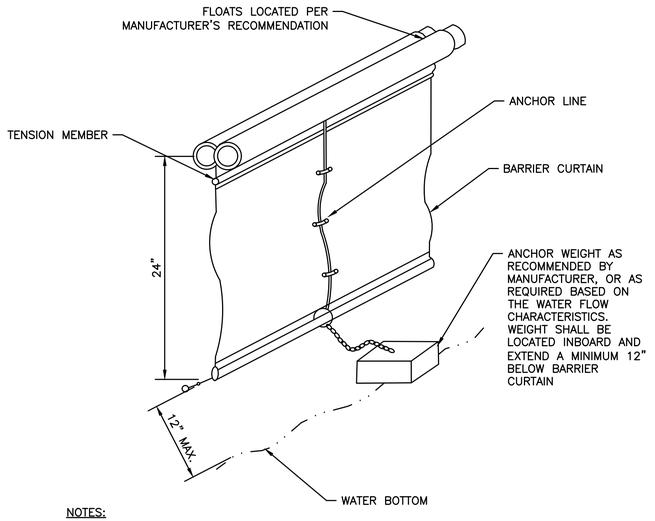
WOM–WOF



BBS–M ONE LEG

SHEET PILE CONNECTION DETAILS

N.T.S.



NOTES:

1. THE SILT CURTAIN SHALL BE DEPLOYED PRIOR TO DISTURBING THE RIVER BANK, BED, OR UPLAND SOILS.
2. THE SILT CURTAIN SHALL WITHSTAND A VELOCITY OF UP TO 5 FT/SEC.

TURBIDITY CURTAIN DETAILS

N.T.S.

LaBella
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300 Pearl Street, Suite 130
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716-551-6281

labellapc.com

ELK STREET COMMERCE PARK LLC

4 CENTRE DRIVE
ORCHARD PARK, NY 14127

ELK STREET COMMERCE PARK

625 ELK STREET
BUFFALO, NEW YORK

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NO:	DATE:	DESCRIPTION:
REVISIONS		

PROJECT NUMBER: 2200012

DRAWN BY: TAP

REVIEWED BY: CTB

ISSUED FOR:

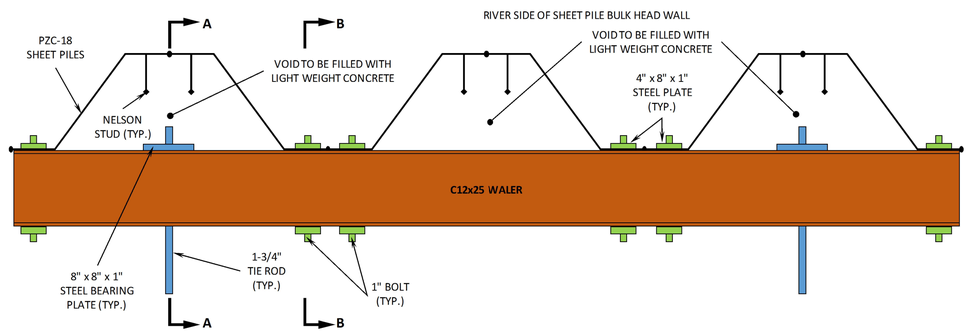
DATE: OCTOBER 27, 2020

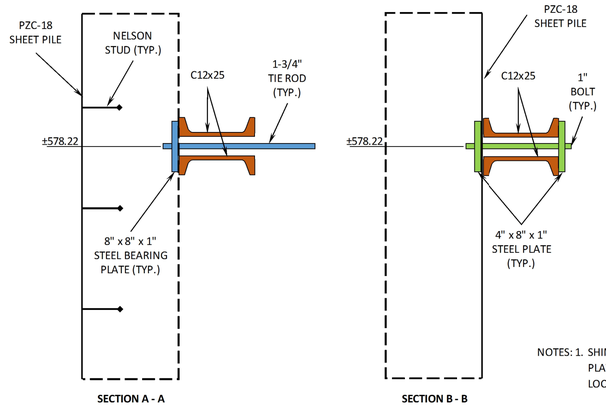
DRAWING NAME:

CONSTRUCTION DETAILS

DRAWING NUMBER:

C502

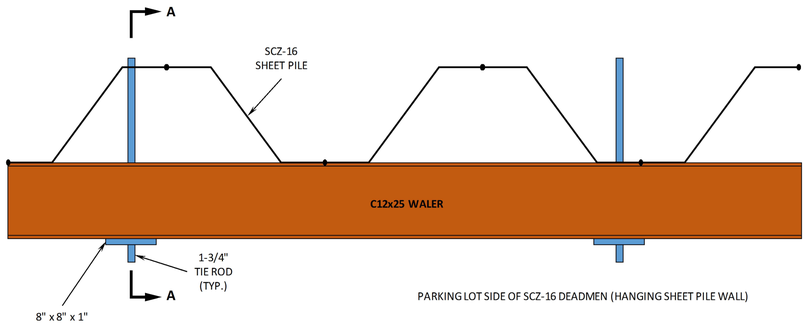




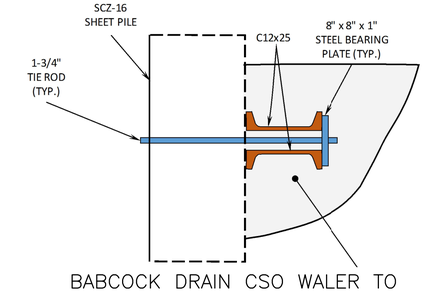
NOTES: 1. SHIM PLATES SHALL BE USED BETWEEN THE TIE ROD BEARING PLATE AND THE WALER OR BETWEEN THE BEARING PLATE AND LOCKOFF NUT, AS APPROPRIATE.

BABCOCK DRAIN CSO WALER TO PZC–18 CONNECTION DETAIL

SCALE: 1" = 1'–0"



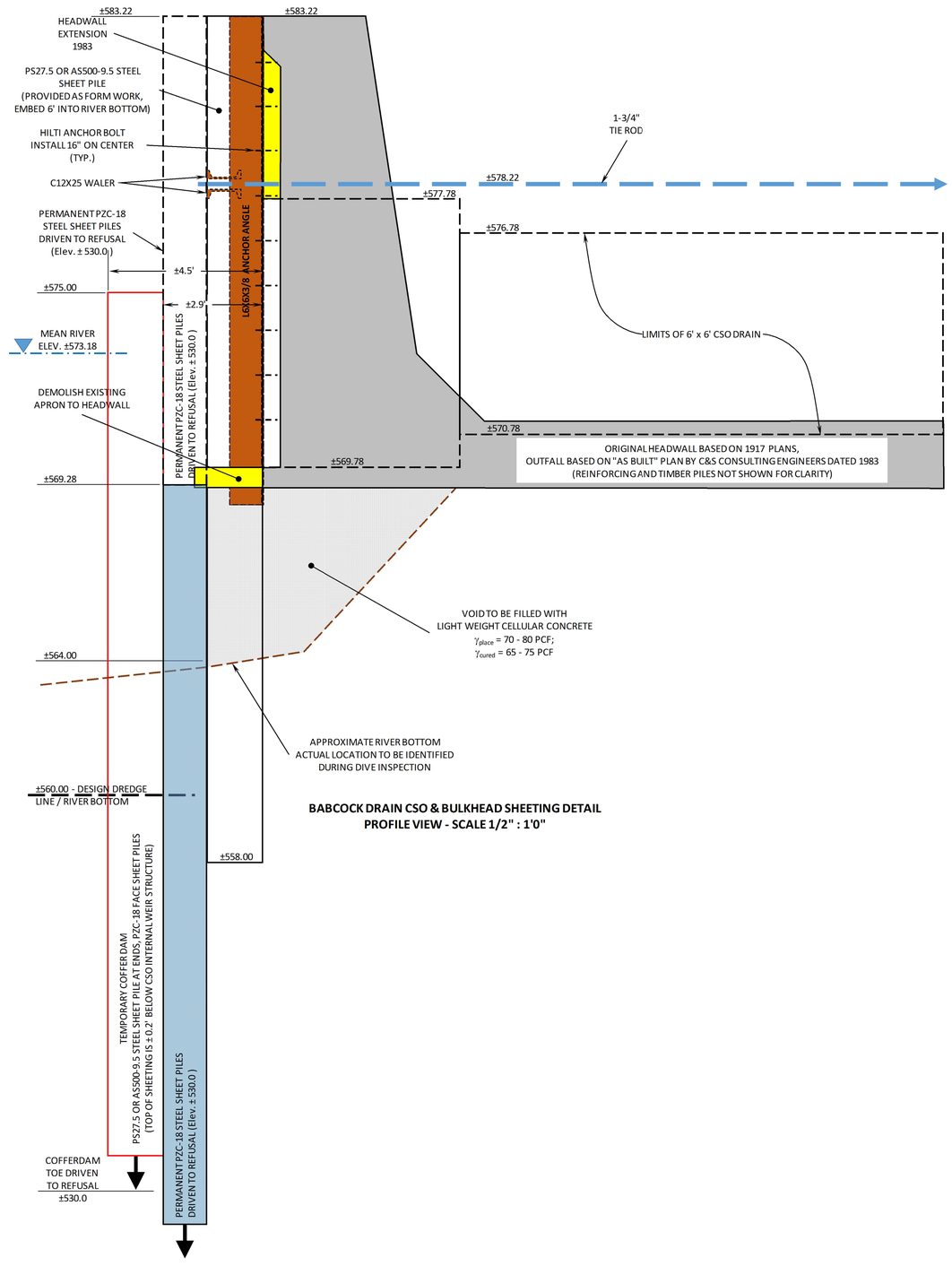
PARKING LOT SIDE OF SCZ-16 DEADMEN (HANGING SHEET PILE WALL)



NOTES: 1. SHIM PLATES SHALL BE USED BETWEEN THE TIE ROD BEARING PLATE AND THE WALER OR BETWEEN THE BEARING PLATE AND LOCKOFF NUT, AS APPROPRIATE.

BABCOCK DRAIN CSO WALER TO SCZ–16 CONNECTION DETAIL

SCALE: 1" = 1'–0"



BABCOCK DRAIN CSO & BULKHEAD SHEETING DETAIL
PROFILE VIEW - SCALE 1/2" : 1'0"

BABCOCK DRAIN CSO AND BULKHEAD SHEETING DETAIL

PROFILE VIEW – SCALE 1/2" = 1'–0"

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DRAWING NAME:

CONSTRUCTION DETAILS

DRAWING NUMBER:

C503