

**RESTORATION PLAN
for
PORTAGE CREEK AREA
TIME CRITICAL REMOVAL ACTION**

**Kalamazoo County
Kalamazoo, Michigan**

Prepared for:

USEPA Region 5
Emergency Response Branch
77 West Jackson
Chicago, IL 60604

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Prepared by:



Environmental Quality Management, Inc.
1800 Carillon Blvd.
Cincinnati, Ohio 45240

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1. INTRODUCTION

1.1 Project Summary

Environmental Quality Management, Inc. (EQ) is performing a Time Critical Removal Action (TCRA) to remove polychlorinated biphenyl (PCB) contaminated sediments from targeted locations over a 1.8-mile section of Portage Creek. The Portage Creek Area Site (Site) is a portion of the Allied Paper/Portage Creek/Kalamazoo River Superfund Site. The Site is located in Kalamazoo County, Michigan, and is pervasively contaminated with PCBs as a result of historic waste practices associated with several paper mills. The Site, which was listed on the National Priorities List (NPL) on August 30, 1990, is located in the City of Kalamazoo, Michigan, beginning at East Cork Street and proceeding northward approximately 3 miles to the confluence of the Kalamazoo River. Activities associated with this removal action are anticipated to occur in segments along a 1.8-mile stretch of Portage Creek. Work activities will occur primarily between Reed Avenue to the East Walnut Street bridge, the South Pitcher Street bridge to the railroad crossing west of Rochester Street, and the bend in Portage Creek east of Rochester Street to the confluence with the Kalamazoo River. The general approach for dredging contaminated sediment in Portage Creek involves conducting dry excavations in 10 individual sections or excavation areas, and progressing from the upstream end to the downstream confluence of Portage Creek with the Kalamazoo River. Figure 1-1 provides a Site Location Map, and Figure 1-2 presents a Site Plan showing all excavation segments.

The areas of Portage Creek targeted for action have been divided into distinct Removal Areas, as shown in Figure 1-2. The areas targeted for dry excavation will be referred to as SA (slope area) 1-A, SA1-B, SA1-C, SA3-A, SA5-A, SA5-C, Axtell Creek, SA5-D, SA6, and SA7. It is anticipated that the project work will span two to four construction seasons subject to funding allocations and seasonal working conditions. The phases may be split over multiple construction seasons as available budget and working conditions permit completion of individual removal areas. It is estimated that preparation activities in removal area SA7, including mobilization and setup of the equipment, materials, personnel, and facilities necessary to complete the project, will

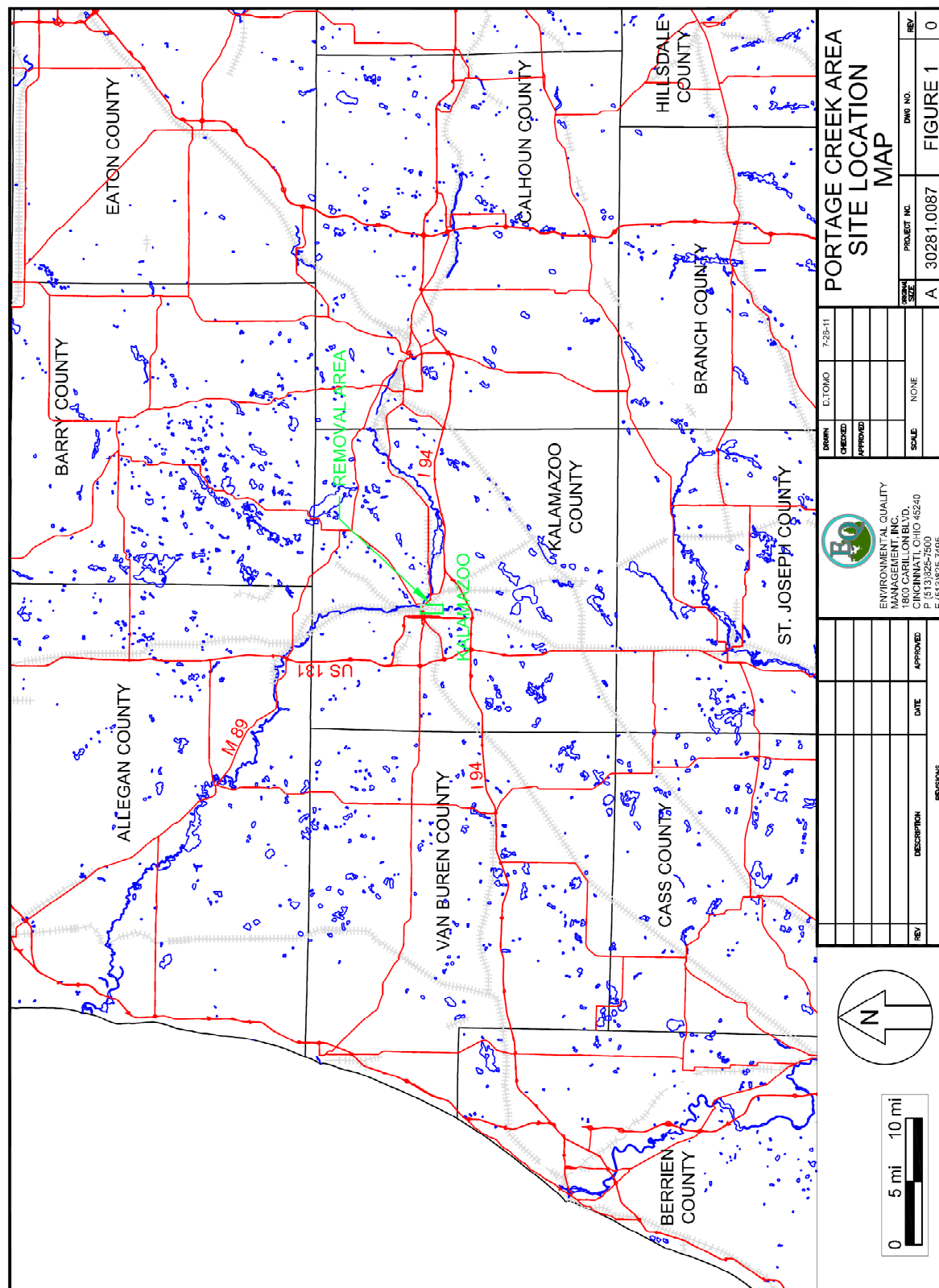


Figure 1. Site Location



Figure 2. Sediment Removal Areas



begin in late Fall 2011. The primary project tasks will consist of the following: install appropriate sedimentation and erosion controls; mechanically dredge the contaminated sediments from Portage Creek; dewater and solidify the sediments and transport the solidified sediments by truck to a permitted off-site disposal facility; place residual cover aggregate over the dredged areas; conduct all appropriate and required environmental controls and monitoring; and restore the creek in accordance with the project design. A summary of the primary work activities is provided below.

Sediments will be removed from the creek by mechanical dredging techniques, including the use of long-reach excavators equipped with both environmental buckets and standard excavating buckets. Excavation areas in the creek will be isolated by the use of various methods, including installation of steel sheet pile cofferdams and pumping the water around the excavation areas and discharging it back into the creek downstream of the active excavation sites.

Silt curtains will be placed in strategic locations in Portage Creek to control turbidity during sediment excavation. Solidification of creek sediment will take place either in the stream bed or in a miser box immediately adjacent to the stream bed, and then the material will be hauled by dump trucks to the staging area for dewatering and further processing.

Recharge groundwater in the excavation, decontamination water, and liquids removed from the sediment dewatering process will be treated at an on-site wastewater treatment plant and discharged back to Portage Creek, in accordance with the Substantive Requirements Document (SRD).

Restoration activities will include returning all disturbed areas to pre-construction conditions. This will involve aggregate placement in the creek; removal of temporary roads and project support structures/facilities; and grading, seeding, and replanting of native perennials that were removed during construction work. Other restoration or environmental enhancement work activities will include, as necessary, installation of coir logs at the toe of the slope and armoring the toe slope portions of the creek with rock.



1.2 Site Objectives

The objective of the Portage Creek Area Time Critical Removal Action is to mitigate threats to public health, welfare, and the environment presented by the presence of a potential uncontrolled release of PCBs from creek channel bottoms, creek bank soils, and floodplain soils located within the Portage Creek area. Specific removal action objectives for the Portage Creek Area are listed below:

- Stem the potential loading of PCBs to the Kalamazoo River from creek banks and channel bottoms in the Portage Creek Area by removing contaminated sediments and soils.
- Dispose of removed sediment containing PCBs off site in a way that does not present unreasonable risk to human health or the environment.
- Mitigate potential adverse environmental impacts of construction.
- Complete restoration activities/habitat enhancement to disturbed areas of removal activities.

The objective of this Restoration Plan is to define the approach EQ will follow to restore disturbed areas resulting from contaminated sediment and soil removal activities. Slope Area specific restoration plans will subsequently be prepared as modifications to this plan to address Slope Area specific restoration requirements.



2. SITE RESTORATION APPROACH

Site restoration for each Slope Area will be completed in three phases. The first phase will consist of bank stabilization and backfilling of the creek channel. The second phase will consist of removing site infrastructure required to conduct sediment removal operations and make necessary repairs to property and/or constructed features resulting from sediment removal operations. The third phase will consist of restoring the vegetation cover in areas disturbed by sediment removal operations. The majority of Phase 2 activities will be completed prior to completion of Phase 3 activities. EQ, however, will not remove all environmental controls that we consider a site infrastructure element until revegetation is established and accepted by USEPA. Environmental controls such as the silt fence and other control measures that prevent erosion and stabilize soil will remain in place until vegetation is reestablished.

2.1 Bank Stabilization and Creek Channel Backfilling

EQ will begin restoration in all excavated creek slope areas by stabilizing the toe of the creek bank. EQ will develop and use adaptive management techniques with direction from EPA for toe stabilization and backfilling of the excavated creek channel. EQ will first cover the excavated channel bottom with 8 ounce nonwoven geotextile from the top of excavation cut to top of excavation cut on the opposite bank. EQ will anchor geotextile to the sidewalls using pins pushed into soil formation through the geotextile and sand bags placed on the fabric along the top of the slope. Sand bags will be removed subsequent to placing final rock cover. Geotextile fabric will be trimmed back so that no exposed material is visible after rock placement. Several types of rock may be used to accomplish toe stabilization and provide final creek channel bank cover. EQ will place 6-inch mean river rock with a maximum diameter of 9 inches along the creek banks where sediment removal is <30 inches to establish a 1 to 3 grade from the average creek water level elevation to the bottom of the excavated channel as depicted in Figure 3, Typical Site Restoration 30" and Less Depth. EQ will fill the area between the river rock placement and above the post-excavation surface to the pre-removal creek bed elevation or to an

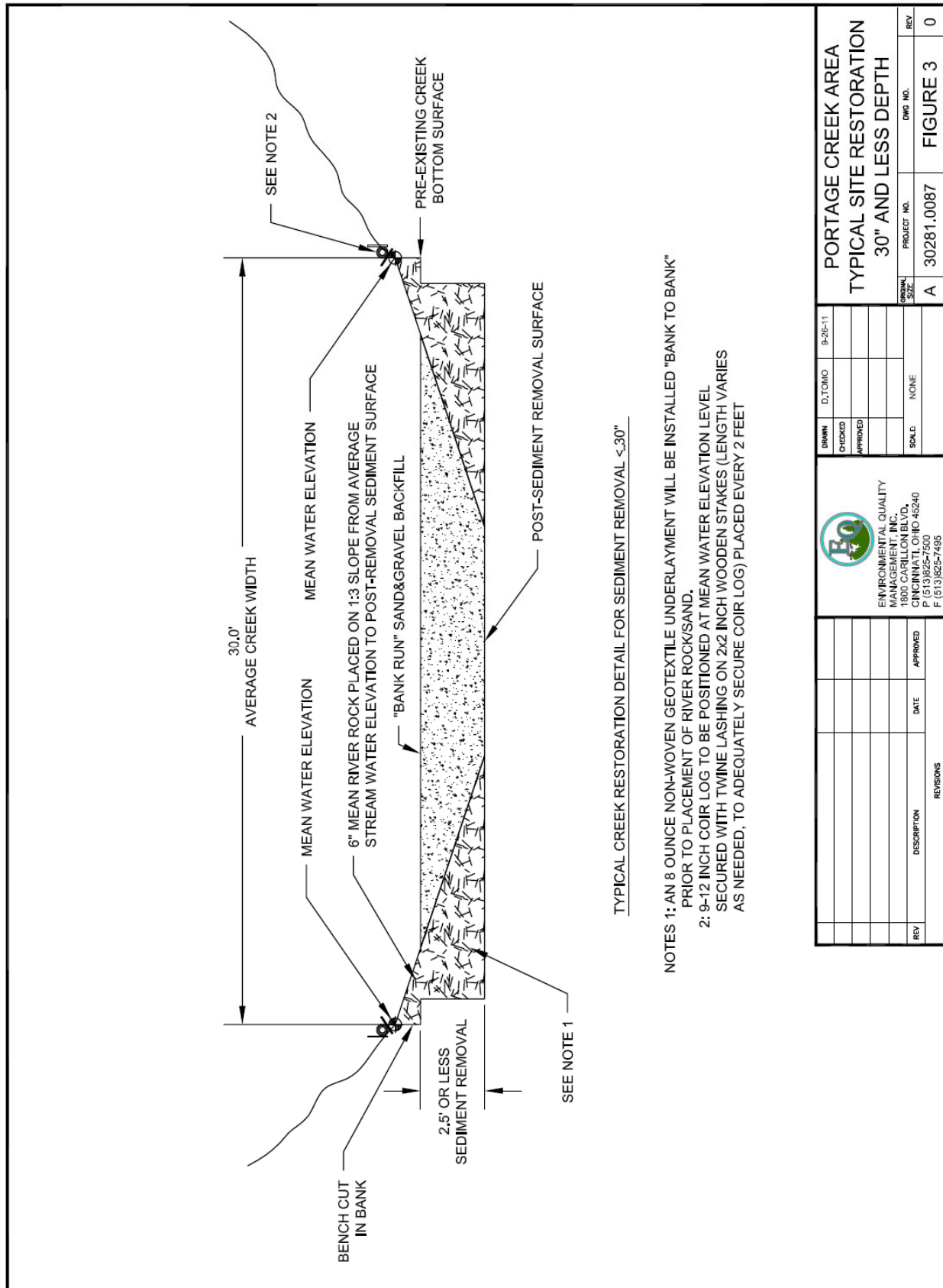


Figure 3. Site Restoration with a Depth of 30" or Less



elevation as directed by EPA with a bank run sand and gravel mix. In areas with >30 inch removal depths, EQ will place a 24-inch layer or more of 6-inch mean crushed stone from bank to bank in the creek bottom to provide additional supportive strength for toe bank stability (depicted in Typical Site Restoration Greater Than 30" Depth, Figure 4). Six-inch mean river rock will be placed on top of the crushed stone along the creek banks to establish a 1 to 3 grade from the average creek water level elevation to the top of the crushed 6-inch stone layer. EQ will then backfill with a bank run sand and gravel mix above the layers of 6-inch crushed stone/6-inch river rock to restore original creek bottom elevation or to an elevation directed by EPA.

Coir logs will be used in areas where significant erosion could occur on the east and west banks of Portage Creek. The coir rolls may be placed along the stream bank at the average creek level elevation just above the river rock. The adjacent ends of the coir rolls will be tied together with coir twine, the extra loops of which can be placed through the outer netting of adjacent coir rolls. Wooden wedges (approximately 48 inch) will be placed every 3 feet on the waterside. In the event the stream bank does not support the coir rolls, wooden wedges will be placed on the land side and the water side of the coir logs. The ends of the first and last coir roll will be dug into the bank.

The creek channel will then be backfilled to the original elevation of the creek bottom prior to removal activities. The amount of backfill at individual slope areas may be modified, however, as directed by the USEPA OSC to create additional stream capacity. The level of backfill will be determined with input from associated stakeholders and regulatory authorities and with the concurrence of USEPA. EQ will use a bank run sand gravel mix obtained from regional borrow sources that meets testing requirements set forth by the Field Sampling Plan, Quality Assurance Quality Control Plan, and the Construction Quality Control Plan. Analytical and geotechnical testing will be performed on backfill materials in compliance with these plans prior to their use on site.

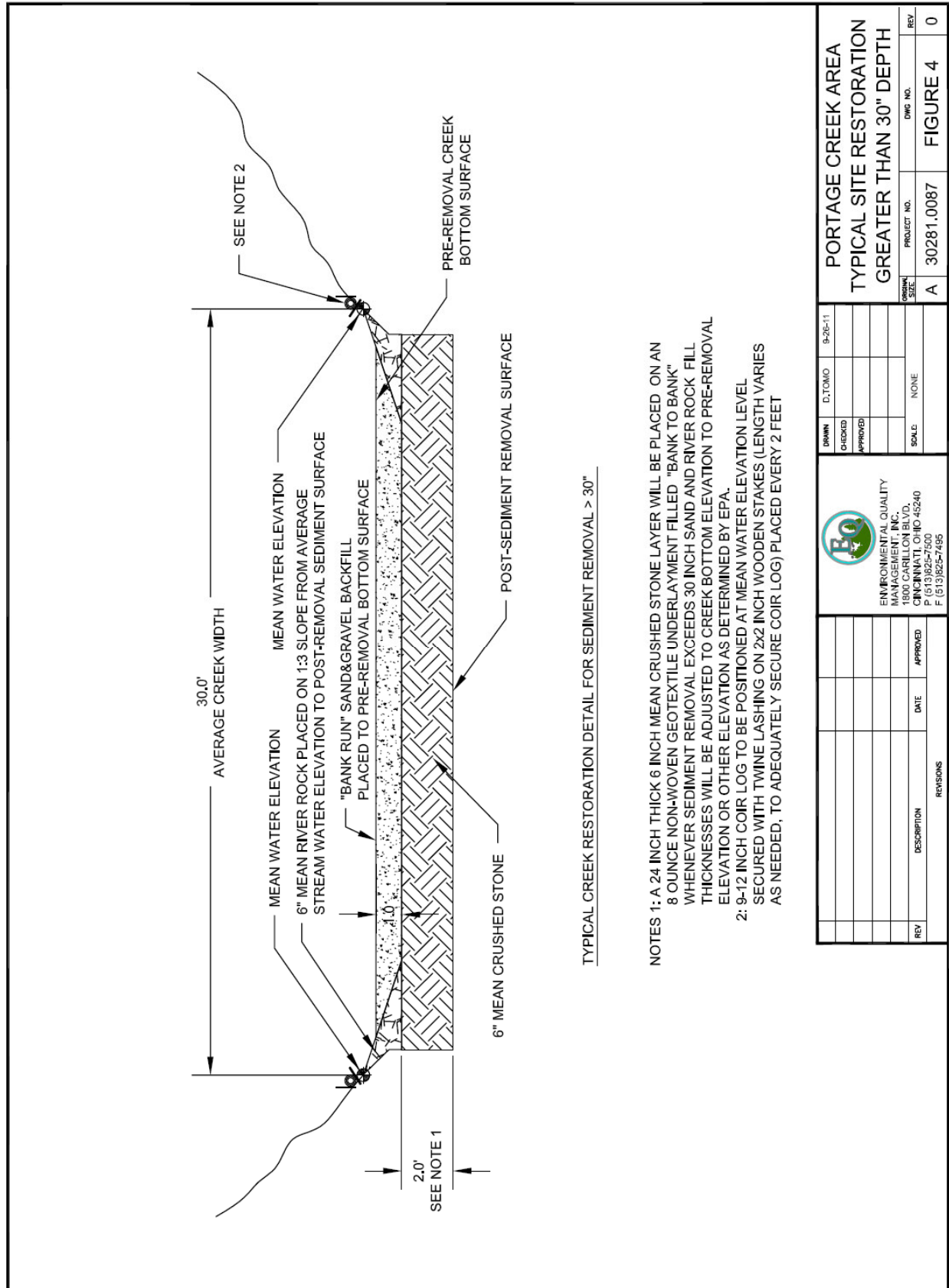


Figure 4. Site Restoration Greater Than 30" Depth



2.2 Infrastructure Removal and Site Repairs

2.2.1 Infrastructure Removal

Each slope area will require the installation of various types of infrastructure to facilitate sediment removal operations. This infrastructure must then be completely or partially removed to complete the successful sediment removal operation. The following infrastructures will typically be removed at each slope area sediment removal site:

- Isolation Structures—EQ will remove sheet pile cofferdams and dewatering pipelines/well points.
- Site Facilities—EQ will remove portable toilets, hand wash stations, and temporary utilities.
- Site Controls—EQ will remove, but not be limited to, controls such as construction exits, truck tire wash stations, signage, construction, and security fencing.
- Access Roads—EQ will remove access roads unless instructed otherwise. When roads are not removed, the top 6 inches of road aggregate will be removed and sampled to ensure residual contamination is not left on site.
- Site Equipment—EQ will remove equipment used on site such as excavation, dewatering, and monitoring equipment.

2.2.2 Site Repairs

EQ will repair pre-existing constructed features on site to their like-and-kind condition. A pre-condition site survey and an inventory of fixed constructed features will be conducted prior to the start of sediment removal activities to document pre-existing conditions. A post-removal condition survey will be completed to assess any damage to constructed features resulting from removal activities. EQ will complete any corrective actions necessary to repair damaged features resulting from sediment removal operations. EQ will coordinate with USEPA and appropriate stakeholders to verify their acceptance of the site repairs.

EQ will apply temporary seeding and mulch cover per the Soil Erosion and Sedimentation Control Plan dated September 2011 until final restorative planting is performed. The disturbed areas will generally be seeded with a temporary seed (winter rye) and then mulched following the completion of work activities and removal of the associated infrastructure within the area. The temporary seed, generally applied at a rate of 1 to 3 pounds per 1,000 square ft, will stabilize the disturbed area and act to control any potential erosion. Permanent seed will not be applied to



the site until the spring season to ensure the seed becomes well established in the disturbed areas. Temporary seeding must take place within 5 days of establishing the final grade.

2.3 Revegetation

EQ's approach to revegetation is modeled on the design requirements from the Plainwell No. 2 Dam Area TCRA Final Design Report and Contract Drawings dated July 2009. EQ has procured an ecological consultant through a competitive bidding process to conduct an inventory of mature trees/shrubs, classify the vegetation in the clearing and grubbing areas, and will incorporate that information into future versions of the Restoration Plan for the Portage Creek Area Time Critical Removal Action prior to clearing and grubbing activities to facilitate contaminated sediment removal. The ecological consultant will utilize the inventory and vegetation assessment to develop Slope Area specific vegetation restoration plans in cooperation with various stakeholders that include, but are not limited to, the City of Kalamazoo City Forester, City of Kalamazoo Parks and Recreation Department, Kalamazoo Tree Committee, and individual property owners. The ecological consultant will be required to periodically inspect the area for 1 year after planting during seasonal growing months to monitor the progress of re-vegetation, recommend corrective actions, and monitor for invasive species.

The State of Michigan's Department of Management and Budget's Soil Erosion and Sedimentation Control Guidebook will also be used as guidance for grading and shaping, seeding, and mulching activities.

Permanent seeding will be applied during the optimal planting periods such as spring or early fall. The areas containing the temporary seed will be slightly tilled, if necessary, and replanted with permanent seed applied at a rate of approximately 12 pounds per acre. Depending on the timing of the restoration activities, however, the permanent seeding may be applied during the current construction year in certain areas. Permanent seeding will only be applied during periods where acceptable growth could be expected. An annual rye grass, wheat, and/or winter barley will also be applied during application of the permanent seed at a rate of approximately 30 pounds per acre. These grasses will provide a temporary cover during development of the permanent seed.



Herbaceous plants and shrubs will be planted in certain areas. Oversight personnel will inspect and approve seed mixes before they are applied in order to verify that they are transported in appropriate containers and are labeled with the ratios of the included species, total weight, date of preparation, and source. Oversight personnel will also inspect woody plant materials to verify the correct species and check for insects, diseases, appropriate root development, and/or indicators of excessive stress. Plants that do not appear healthy or of adequate quality for planting will be rejected and replaced with better quality stock. Seeding and woody planting methodologies will be implemented to verify that the materials are handled and installed appropriately.

Floodplain forests that extend throughout the Portage Creek Area will be revegetated by seeding and planting woody trees and shrubs. Shade-tolerant wetland herbaceous plant species will be included in the seed mix for the floodplain forest habitat to provide ground cover after canopy development. Native trees and shrubs of the species observed in this habitat, as well as other species that typically inhabit and are adapted to periodic inundation, will be planted to a target density observed in tree plots surveyed during habitat characterization efforts. Tree and shrub stock will consist of container stock and/or root-balled trees that will be planted, supported, and protected from herbivory during the monitoring period.

The types of species ultimately selected will depend on availability and input from all appropriate stakeholders such as federal, state, and local officials as well as the property owner. EQ's ecological consultant will work with appropriate stakeholders when designing a re-vegetation plan for individual slope areas. EQ will incorporate the design into a "Request-for-Proposal" (RFP) to solicit landscaping firms to perform restoration planting. Planting will be performed when weather and soil conditions are suitable in accordance with industry practices. Plants will not be planted in areas unsuitable for proper growth. The plant species to be considered for planting in the restoration areas are presented in Table 2-1. Table 2-2 presents the emergent wetlands revegetation schedule. Table 2-3 presents the forested wetlands revegetation planting schedule, and Table 2-4 presents the forested uplands revegetation planting schedule.

**Table 2-1. Potential Species for Revegetation**

| Common Name | Scientific Name | Wetland Indicator Status ⁽¹⁾ | Emergent Wetland | Forested Wetland | Forested Upland |
|--------------------------------------|---------------------------|---|------------------|------------------|-----------------|
| River Birch ^a | Betula nigra | FACW | | X | |
| Eastern Redbud ^a | Cercis Canadensis | FACU | | | X |
| Black Walnut ^a | Juglans nigra | FACU | | | X |
| Sycamore ^a | Platanus Occidentalis | FACW | | X | |
| Swamp White Oak ^a | Quercus bicolor | FACW | | X | |
| Pin Oak ^a | Quercus palustris | FACW | | X | |
| Red Oak ^a | Quercus rubra | FACU | | | X |
| American Elm ^a | Ulmus Americana | FACW | | | X |
| Speckled Alder ^b | Alnus incana | OBL | | X | |
| Black Chokecherry ^b | Aronia Melancarpa | FACW | | | X |
| Buttonbush ^b | Cephalanthus occidentalis | OBL | | X | |
| Redosier Dogwood ^b | Cornus sericea | FACW | | X | |
| Alternate-Leaf Dogwood ^b | Cornus alternifolia | NI | | | X |
| Silky Dogwood ^b | Cornus Amomum | FACW | | X | |
| Gray-Stem Dogwood ^b | Cornus Racemosa | NI | | | X |
| Northern Spicebush ^b | Lindera benzoin | FACW | | | X |
| Pussy Willow ^b | Salix discolor | FACW | | X | |
| Elderberry ^b | Sambucus Canadensis | FACW | | X | |
| New England Aster ^c | Aster novae-angliae | FACW | X | X | |
| Tall Coreopsis ^c | Coreopsis tripteris | FAC | X | X | |
| Joe-Pye-Weed ^c | Eupatorium maculatum | OBL | X | X | |
| Boneset ^c | Eupatorium perfoliatum | FACW | X | X | |
| Dense Blazingstar ^c | Liatris spicata | FAC | X | X | |
| Mountain Mint ^c | Pycnanthemum virginianum | FACW | X | X | |
| Green-Headed Coneflower ^c | Rudbeckia laciniata | FACW | X | X | |
| Wetland Sedges ^d | Carex spp. | UPL-OBL | X | X | |
| Switch Grass ^d | Panicum virgatum | FAC | X | X | |
| Wool Grass ^d | Scirpus cypernius | OBL | X | | |
| Prairie Cord Grass ^d | Spartina pectinata | FACW | X | X | |
| Seed Oats ^e | Avena sativa | NO | X | X | |
| Annual Rye ^e | Lolium multiflorum | NO | X | X | |
| American Slough Grass ^e | Beckmannia syzigachne | OBL | X | X | |

**Table 2-1. (continued)**^a Trees^b Shrubs^c Wildflowers^d Native grasses and sedges^e Temporary grassesWetland Indicator Status¹:

OBL = Obligate wetland; occur almost always (>99%) under natural conditions in wetlands

FACW = Facultative wetland; usually occur in wetlands (67-99%)

FAC = Facultative; equally likely to occur in wetlands or in non-wetlands (34-66%)

FACU – Facultative; usually occur in non-wetlands (67-99%), but occasionally found in wetlands (1-33%)

UPL = Obligate Upland; occur in wetlands in another region, but occur almost always under natural conditions in non-wetlands

NO indicates there is no indicator status for the species

References:

⁽¹⁾ 1996 National List of Vascular Plants that Occur in Wetlands. United States Fish and Wildlife Service**Table 2-2. Emergent Wetlands Revegetation Planting Schedule**

| Species | Plant Type | Height | Number to be Planted | Density | Spacing | Comments |
|-------------------------------|------------|--------|----------------------|-------------|---------|-----------------------------|
| Herbaceous – See Table 2-1 | Seed | N/A | N/A | 30 lbs/acre | Random | Broadcast or hydroseeded |

**Table 2-3. Forested Wetlands Revegetation Planting Schedule**

| Species | Plant Type | Height | Number to be Planted | Density | Spacing | Comments |
|----------------------------------|-----------------------------------|--------------------------|---------------------------------|---------------------------------|---|---------------------------------|
| Herbaceous: See Table 2-1 | Seed | N/A | N/A | 30 lbs/acre | Random | Broadcast or hydroseeded |
| Shrubs: | 1-gallon container | >18 in. | Location-specific-based on area | TBD by EQ ecological consultant | Clumps of 2-3 same species, randomly distributed at least 5-ft apart | Even distribution among species |
| <i>Alnus incana</i> | | | | | | |
| <i>Cephalanthus occidentalis</i> | 1-gallon container | >18 in. | | | | |
| <i>Cornus amomum</i> | 1-gallon container | >18 in. | | | | |
| Saplings: | 5-gallon container or root-balled | >48 in.; >1 in. diameter | Location-specific-based on area | TBD by EQ ecological consultant | Clumps of 2-3 same species; randomly distributed at least 10-ft apart | Even distribution among species |
| <i>Betula nigra</i> | | | | | | |
| <i>Quercus bicolor</i> | 5-gallon container or root-balled | >48 in.; >1 in. diameter | | | | |
| <i>Platanus occidentalis</i> | 5-gallon container or root-balled | >48 in.; >1 in. diameter | | | | |
| <i>Quercus palustris</i> | 5-gallon container or root-balled | >48 in.; >1 in. diameter | | | | |

**Table 2-4. Forested Uplands Revegetation Planting Schedule**

| Species | Plant Type | Height | Number to be Planted | Density | Spacing | Comments |
|------------------------------|-----------------------------------|--------------------------|---------------------------------|---------------------------------|--|---------------------------------|
| Herbaceous: See Table 2-1 | Seed | N/A | N/A | 30 lb/acre | Random | Broadcast or hydroseeded |
| Shrubs: | 1-gallon container | >18 in. | Location-specific-based on area | TBD by EQ ecological consultant | Clumps of 3 same species; randomly distributed at least 5-ft apart | Even distribution among species |
| Aronia melancarpa | | | | | | |
| Cornus alternifolia | | | | | | |
| Cornus racemosa | | | | | | |
| Lindera benzoin | | | | | | |
| Saplings: | 5-Gallon container or root-balled | >48 in.; >1 in. diameter | Location-specific-based on area | TBD by EQ ecological consultant | Clumps of 3 same species; at least 10-ft apart | Even distribution among species |
| Quercus rubra | | | | | | |
| Cercis Canadensis | | | | | | |
| Juglans nigra | | | | | | |
| Ulmus americana | | | | | | |

Figures 5 through 14 detailing restoration features for SA1-A, SA1-B, SA1-C, SA3-A, SA5-A, SA5-C, SA5-D, Axtell Creek, SA6, and SA7 will be prepared and amended to this plan. These figures will be prepared in conjunction with work progression. Additional data will be collected, such as topographic survey information and assessment of pre-removal vegetative conditions, that were unavailable at the time of preparation of this initial Restoration Plan. These figures will provide:

- Topographic contours and pertinent elevation data
- Slope area specific excavation depths
- Backfill design
- Revegetation design



3. MONITORING AND MAINTENANCE

3.1 Monitoring

EQ and its ecological consultant will monitor the progress of restorative planting for a period of 1 year subsequent to planting in individual Slope Areas. EQ will task the ecological consultant to qualitatively monitor the areas that are seeded/planted after excavation during the first growing season, and to quantitatively monitor the area once during the first year after planting. The monitoring inspections will be performed to evaluate the health and growth of planted vegetation and to determine whether stressful environmental conditions (e.g., insect infestations, drought) are jeopardizing plant survival. Quantitative vegetation data (e.g., number of species present, relative population sizes) will be collected once annually for evaluation against performance standards to assess the development of the desired plant community. Maintenance activities may be necessary to address observed deficiencies or damage. Restored areas will be adaptively managed by responding to the observed successes and failures of the vegetative communities and by focusing on enhancing species associations that are adapting favorably. Maintenance activities – which may consist of control of herbivory, reseeding of bare spots in ground cover, weed control, or replacement of non-surviving plants – will be discussed with USEPA.

3.2 Maintenance

EQ will perform maintenance to restorative plantings during seasonal growing periods for 1 year after seeding/planting individual slope areas. EQ will either self perform or subcontract maintenance activities subject to the nature of the maintenance task. EQ will work with the ecological consultant and landscape contractor to provide the proper maintenance at the frequency required for selected plantings. EQ will adjust the maintenance frequency as needed to accommodate seasonal fluctuations in precipitation and temperature. Maintenance will include but not be limited to:

- Watering
- Fertilizing
- Weed control



- Reseeding/plant replacement as required

During the maintenance period, EQ will monitor and maintain Site erosion and sedimentation controls at individual Slope Areas until the vegetation has become established and accepted. EQ will remove site environmental controls upon acceptance by USEPA.