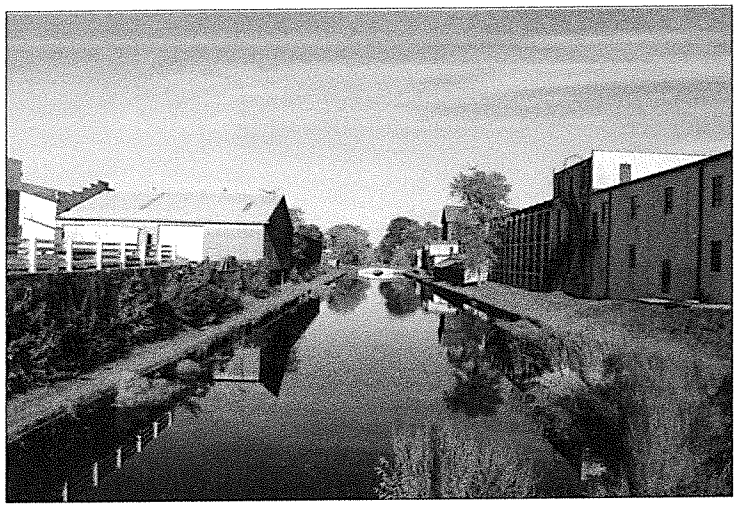
Final Report

Conceptual Design Report
Portage Canal Rehabilitation
WisDOT Project I.D. 6996-05-06



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1. Introduction

In 2002 the City of Portage and the Wisconsin Department of Transportation (WisDOT) retained Mead & Hunt, Inc., a Madison-based architectural/engineering firm, to develop plans for the rehabilitation of the Portage Canal and the construction of a bicycle/pedestrian trail adjacent to the canal. For planning purposes, the project is divided into four segments (see Appendix A):

- Segment 1: Wisconsin River Lock to Adams Street
- Segment 2: Adams Street to Canadian Pacific Railroad Bridge
- Segment 3: Canadian Pacific Railroad Bridge to State Trunk Highway (STH) 33 Bridge
- Segment 4: STH 33 Bridge to Fox River

Mead & Hunt's project is expected to result in an approved environmental document for the four segments and final plans for Segments 1 and 2. The environmental document will describe work that is envisioned to be completed with federal funding in the near or long term. This work includes the rehabilitation of the Portage Canal, including provision of water quality and supply improvements; reconstruction of historic revetment walls; construction of a bicycle/pedestrian trail along the length of the canal; provision of bicycle/pedestrian crossings at the Wisconsin River Lock and Hamilton Street; construction of open-span structures at Wisconsin and Adams Streets; and provision of amenities along the canal, including lighting, signage, landscaping, and seating. This comprehensive approach to the environmental document precludes the need to conduct additional environmental reviews as planned project elements are completed in the future.

The final design for Segments 1 and 2 is expected to be completed in the spring of 2004 and construction is expected to begin in the winter of 2004. A phased approach will be used to complete construction as funds become available. Section 9 of this report presents options for *Future Funding.*

This Conceptual Design Report describes the community's long-term vision for the rehabilitation of the Portage Canal and construction of a bicycle/pedestrian trail along its entire length. The community vision for this project includes the following goals:

- Provide an adequate water supply in the canal.

- Address community property rights concerns.

- Implement design that is low maintenance, historically compatible, and directed toward maximum usage.
- Articulate the concept for entire canal, but first build from the Wisconsin River to the Canadian Pacific Railroad Bridge.
- Connect the new trail to the existing Levee Trail.
- Consider opportunities for navigation of the canal.
- Provide access to trail for residences on city's east side.
- Position the city for additional funding by successfully completing the initial project.

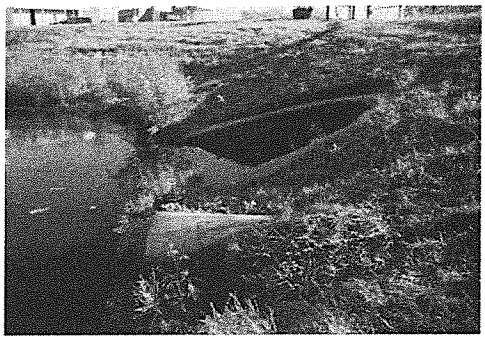
This report strives to describe an approach to this project that meets the community's objectives, maintains the historic integrity of the Portage Canal, and preserves long-term opportunities for further rehabilitation and interpretation.

2. Project Description

A. Introduction

The proposed project (WisDOT I.D. 6996-05-06) will rehabilitate the Portage Canal and construct a bicycle/pedestrian trail adjacent to the canal. The project's purpose is to rehabilitate the canal by improving water quality and quantity in the canal and maximizing use of the canal by making it accessible to many types of users, including pedestrians, bicyclists, canoeists, and kayakers. The project seeks to achieve this with minimal right-of-way acquisition and minimal filling in of the canal. The canal is listed in the National Register of Historic Places (National Register). It begins at the Wisconsin River where the Wisconsin River Lock is located and runs northeast approximately 2.5 miles to its terminus at the Fox River, just north of the remnants of the Fort Winnebago Lock. This report describes the preferred alternative and includes conceptual project plans in Appendix B. Project alternatives that were considered but not selected are discussed below.

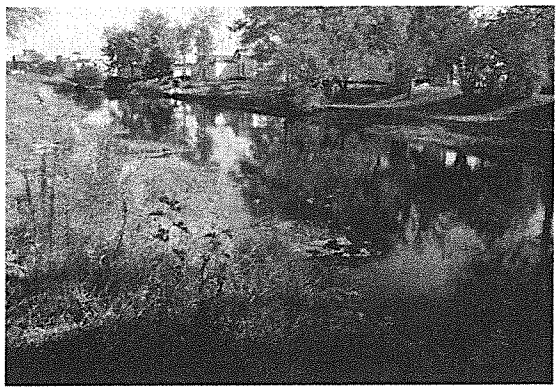
B. Background Information



In 1998 the U.S. Army Corps of Engineers (USACE) completed the levee that blocks the entrance to the canal at the Wisconsin River. An intake structure was built to provide for minimal water flow into the canal. This flow is estimated to be less than 0.1 cubic feet per second (cfs) and is inadequate to prevent stagnation of water in the canal. Two culverts, which carry vehicular traffic across the canal at Wisconsin and Adams Streets, further restrict the canal's ability to function as a navigable waterway. The culvert at Wisconsin Street was built in 1959; the culvert at Adams Street was first built in 1954 and replaced in 2000. Since the last dredging occurred in 1927, much of the canal has filled with sediment, resulting in water depths that range from 0 to 3 feet.

The existing concrete Wisconsin River Lock was constructed in 1926-28 by the USACE. The lock chamber measures 35 feet 2 inches wide by 28 feet 2 inches deep by 170 feet long and features steel miter gates. The side walls of the lock chamber, measuring 12 feet wide at the base and 6 feet 6 inches wide at the top, are truncated inward and keyed into the concrete slab floor. The total length of the lock is 209 feet. Stone and concrete wing walls, measuring 35 feet long, extend from the west end of the lock. The walls of the second Wisconsin River Lock (built 1892-93) formed the base of the retaining walls that were located east of the current lock. As they appeared in 1928, these walls were sheathed with double, 2-inch x 12-inch fir planking and had a 6-foot-wide concrete walk along the top. The retaining walls extended about 180 feet from the eastern edge of the current lock and were about 35 feet apart.

The Wisconsin River Lock was deactivated and modified in 1959-60. The modification of the structure from a lock to a water control structure involved removing hardware such as the spars, tripods, and tripod platforms; filling in of some of the areas left by removal of the tripods; lowering the stone walls of the second lock structure; and grading the adjacent banks. Features of the lock that were retained included hardware such as the valve rods and handles, the safety rails along the gates, and the gate levelers and plates. The valves, valve maneuvering gears, and iron snubbing posts were also retained. Both pairs of gates were retained but welded in the closed position. Due to a drowning death, cyclone fencing was placed around the structure in 1968.



The existing canal ranges from 52 to 80 feet wide. Segment 1 from the Wisconsin River Lock to Adams Street has the narrowest canal sections, with the width varying from 52 to 59 feet; while the canal in Segments 3 and 4 is 75 to 80 feet wide. Wood revetment walls, which were installed during a 1986-88 rehabilitation effort, are present in Segment 1. These walls are deteriorated, with much of the north side walls between the lock and Wisconsin Street having collapsed. A gravel trail exists in this section, but is not maintained. Concrete stairways lead from the trail to the 1984 pedestrian bridge, which is located east of the Riverwood Apartment Building, and to the sidewalk adjacent to the Wisconsin Street canal crossing. A grass footpath is present on the south side of the canal between Wisconsin and Adams Streets. In this area, 75 feet separates the buildings along the north and south sides of the canal. Scattered wood posts in Segments 2, 3, and 4 are remnants of the historic revetment walls. These remnants in Segments 3 and 4 likely date to 1897, when a significant portion of the canal's revetment walls were replaced.

The Fort Winnebago Lock was dismantled in 1959-60. The lock's hardware, the east gates, and most of the wing walls were removed. The side walls, not required to support the west or upper lock gates, and the walls within 10 feet east of the upper gates were dismantled to the waterline and the stone was pushed into the lock chamber. The west gates were cut down and secured in a closed position. Fill material was placed on the east and west sides of the gates. The resultant structure functions as a waste weir. The wood footbridge across the lock remnants was constructed in 1965.

The canal is owned by the State of Wisconsin and administered by the Wisconsin Department of Natural Resources (WDNR), which has entered into a cooperative agreement with the city for purposes of executing the rehabilitation and trail construction projects. The land adjacent to the canal is owned by private individuals, the State of Wisconsin, the Portage Canal Society, and the Colonial Dames of America. Land uses in the vicinity of the canal include residential, commercial, industrial, and recreational. Part of the proposed trail will follow the course of the existing Ice Age National Scenic Trail through the City of Portage.

C. Preferred Alternative

This report describes the preferred concept for the rehabilitation of the Portage Canal. In order to rehabilitate and maximize use of the canal, the proposed project will construct a pedestrian/bicycle trail adjacent to the canal and revetment walls along the length of the canal. Construction of the trail and revetment walls will require some grading and/or fill of the banks on each side of the canal and some narrowing of the canal in certain areas. Rehabilitation will be completed for the Wisconsin River Lock. Canal rehabilitation work involves increasing the canal's water supply and quality through dredging canal sediments, increasing water flow into the canal from the Wisconsin River, and implementing sediment control measures to reduce sediment loading into the canal. The depth of the canal is expected to range from 3 feet to a maximum of 4 feet to permit for passage of small watercraft, further maximizing use of the canal. For the length of the canal, revetment walls will be constructed with approximately 2 feet exposed above the waterline, as described in the original canal specifications.

The quantity of water into the canal from the Wisconsin River will be increased by modifying the USACE underdrain intake system under the Wisconsin River. Approximately 10.0 cfs is the minimum amount considered necessary to significantly improve water quality in the canal. This is discussed in further detail in Section 5 – *Canal Structures*. The modified intake system will consist of multiple, slotted drain pipes buried in gravel-filled trenches extending under the river bottom. The drain pipes will terminate in a collection header pipe which empties into the existing concrete manhole on the upstream slope of the USACE levee. The existing slide gate structure on the levee crest, and 48-inch-diameter reinforced concrete outlet pipe are in good condition and will be utilized to discharge flows into the canal. Installation of a submersible, centrifugal pump into the collection manhole is being investigated to supplement gravity flows into the intake during low Wisconsin River stage levels.

In Segment 1, an asphalt-surfaced trail with gravel along the canal and turf on the outside shoulder is proposed to be constructed along both banks of the canal. From the Wisconsin River Lock to Wisconsin Street, the trail will be 10 feet wide with 2-foot shoulders. On the south bank, the trail will be 10 feet wide with 2-foot shoulders, but will narrow to 8 feet as it nears Wisconsin Street due to building constraints. From Wisconsin to Adams Street, the trail will be 8 feet wide with 2-foot shoulders due to building constraints. The trail continues on the south side of the canal only for the remaining length of the project.

In Segment 2, the trail will have a 10-foot asphalt-surfaced trail, 2-foot gravel shoulder along the canal, and 2-foot turf outside shoulder. Adjacent to the Samuels Recycling Building and under the Canadian Pacific Railroad Bridge, the paved trail narrows to 8 feet to minimize encroachment into the canal. In Segments 3 and 4, a 10-foot-wide paved trail with 2-foot turf shoulders is proposed. For these segments, the trail will follow its current alignment, approximately 10 to 15 feet from the canal in Segment 3, and 25 to 30 feet from the canal in Segment 4. Construction of a hard-surfaced trail in Segment 4 will require negotiation with the property owner. The asphalt-surfaced trail allows for maximum recreational usage of the canal.

Some narrowing of the canal is necessary to accommodate the trail given constraints imposed by existing buildings. The proposed canal widths accommodate construction of the trail with limited canal narrowing and right-of-way acquisition. From the Wisconsin River Lock to Wisconsin Street, the canal's width will remain at approximately 60 feet. The canal will have a 49-foot width from Wisconsin to Adams Streets. The canal's width from Adams Street to the Canadian Pacific Railroad Bridge will be approximately 60 feet. However, existing encroachments by the Samuels Recycling Building, located 700 feet downstream of Adams Street on the east bank of the canal, and the Canadian Pacific Railroad Bridge, limit the canal's width to approximately 55 feet at these locations. The canal's width from the Canadian Pacific Railroad Bridge to the Fox River will be maintained at approximately 75 feet.

In Segments 1 and 2, railing is proposed between the trail's shoulder and water's edge to meet federal safety standards. The railing design will be based on a historic railing that was found along a retaining wall adjacent to the canal at Wisconsin Street. In Segment 3, the trail will be 10 to 15 feet from the water's edge; in Segment 4, the trail will be 30 to 40 feet from the water's edge. Therefore, railing is not required for these segments.

Crossings for pedestrians and bicycles will be provided over the Wisconsin River Lock and at Hamilton Street to link the trail with commercial and residential areas of the city. The bridge over the lock follows the design of the historic bridge that existed at this location from 1913 to 1945 and provided access to the curling club building that was located on the levee. The bridge at Hamilton Street will be similar to the pedestrian and snowmobile bridges that currently cross the canal.

This project will rehabilitate the 1926-28 Wisconsin River Lock, including the following work: repairing the exposed concrete surfaces; sandblasting and repainting the lock gates; and refurbishing and reassembling the gate mechanisms, which are currently stored off-site. The upstream gates will be set in the closed position and the downstream gates fixed in the open position. Holes will be cut in the upstream gate door at the waterline to allow water to pass through the lock. The lock chamber will also be cleaned out and filled with gravel to provide a maximum water depth of 3 to 4 feet to minimize the potential for accidental drowning. A 4-foot railing around the lock is proposed for safety. Retaining walls east of the lock will be constructed to resemble the appearance of retaining walls that existed after construction of the current lock

in 1928. However, the new wood-faced retaining walls will rise 4 feet from the waterline, whereas the original walls extended approximately 9 feet from the waterline.

Amenities to be provided along the canal and trail as funding becomes available include lighting, signage, landscaping, and seating. Interpretive signs make using the trail an educational experience and can increase visitors' appreciation of the canal as a historic resource. Styling of these features will be compatible with the historic period for the canal.

The design concept includes several construction items to be completed in the long-term (expected to be 10 to 30 years). This work includes the replacement of the Wisconsin and Adams Streets culverts with open-span structures that allow for passage of the trail and small watercraft underneath. A nonfunctional replica of the Fort Winnebago Lock is also proposed to be constructed at the original lock site. In the meantime, the remnants of the Fort Winnebago Lock will be left undisturbed. The canal's original opening to the Wisconsin River could also be interpreted through landscape demarcation of the canal entrance.

D. Project Alternatives

Several alternatives were investigated during project planning and development. Project alternatives were considered in light of the project's purpose of rehabilitating the canal, improving the canal's water quality and quantity, and maximizing canal usage, while minimizing both fill and right-of-way acquisition. Alternatives for the intake system, trail location and width, and canal width were investigated.

One or more high capacity groundwater wells were considered as an alternative to supplement the water supply to the canal, but were considered cost prohibitive as compared to modifying the existing intake system for the quantity of flow desired.

From the Wisconsin River Lock to Adams Street (Segment 1) the canal's width varies from 52 to 59 feet; while the canal in Segments 3 and 4 is 75 to 80 feet wide. Constructing a trail adjacent to the canal while creating uniform canal widths of either 60 or 75 feet were investigated as project alternatives. Uniform widths of 60 or 75 feet represent the eras of initial canal construction and later improvement and widening of the canal, respectively, but are not consistent with project objectives. In general, a 60-foot uniform width would involve considerable filling of portions of the canal and a 75-foot uniform width would result in the demolition of buildings adjacent to the canal and the need to acquire more right-of-way.

For a 60-foot uniform canal width from the Wisconsin River Lock to Wisconsin Street, the trail would be 10 feet wide with 2-foot shoulders on the north bank. On the south bank, the trail would be 8 feet wide with 2-foot shoulders. While this allows for a 60-foot canal width, it does not allow for maximum trail usage. Another alternative for a 60-foot width from the Wisconsin River Lock to Wisconsin Street would be

to construct a 10-foot trail on the north side and 5-foot walking trail on the south side. This allows for a 60-foot canal width but does not maximize use of the trail.

From Wisconsin to Adams Streets, a 60-foot canal width could be achieved by constructing a 6-foot-wide trail with 2-foot shoulders that allows for one-way traffic only. However, there are safety concerns with one-way trails. A 60-foot canal width could also be achieved by constructing a 10-foot trail on the south side of the canal only. While this allows for a wider canal from Wisconsin to Adams Streets, as well as from the Wisconsin River Lock to Wisconsin Street, it does not maximize usage of the trail.

In Segment 2, from Adams Street to the Canadian Pacific Railroad Bridge, a 60-foot canal width could be achieved by constructing a narrower path, such as a 5-foot walking path, on the south side of the canal. This would not allow for maximum recreational usage of the trail. The Samuel's Recycling Building and the Canadian Pacific Railroad Bridge encroach upon the canal and would need to be acquired and demolished to make room for a 60-foot canal with an 8- or 10-foot trail. A 60-foot canal width could also be maintained by constructing the path on the north bank. However, this would involve acquiring right-of-way from residential property owners.

Since the canal is currently 75 to 80 feet wide, a 60-foot uniform width in Segments 3 and 4 would require significant filling in of the canal. While this would allow for limited right-of-way acquisition, it would result in adverse wetland impacts.

A 75-foot uniform width for the canal is equally incompatible with the goals of this project. Due to existing encroachments, a 75-foot width would result in the need to acquire right-of-way and demolish buildings along the canal. Buildings between Wisconsin and Adams Streets are approximately 75 feet apart, leaving no space to have a trail and maintain a 75-foot width. In addition, the Samuel's Recycling Building and the Canadian Pacific Railroad Bridge impede the construction of a 75-foot canal. In Segments 3 and 4, however, the existing canal is 75 to 80 feet wide with no impediments to constructing a trail and maintaining a 75-foot width.

3. Historical Background

A. Introduction

The City of Portage, established in 1854 and the third oldest settlement in Wisconsin, has a rich heritage that is clearly conveyed by the physical presence of the Portage Canal. The Portage Canal was listed in the National Register on August 26, 1977, with the listed property, including the following historic features: the Portage Canal, the Wisconsin River Lock, and remnants of the dismantled Fort Winnebago Lock.[1] Established as commerce began to move along the canal, the Portage Retail Historic District, also listed in the National Register, rises just north of the canal. Other places of historical interest within the community include the Ice Age National Scenic Trail, Indian Agency House, Surgeon's Quarters of Fort Winnebago, Museum at Portage, Zona Gale House, Henry Merrell House, Society Hill Historic District, Church Hill Historic District, and the Portage Industrial Waterfront Historic District (at 106, 107, and 131 East Mullett Street). A summary of the Portage Canal's history and role within the community and state follows.

B. Portage and the Fox-Wisconsin Waterway

The City of Portage was established along the watershed between the Fox and Wisconsin Rivers in northwest Columbia County. The site of the community, first known as "the Portage," was the land area where early explorers, Native Americans, and settlers transported boats and supplies from one waterway to the other. This heritage is clearly conveyed through the physical presence of the National Register-listed Portage Canal, as well as other associated properties.

Native Americans and later European explorers and fur traders of the Upper Mississippi Valley used the narrow portage between the Fox and Wisconsin Rivers as a primary connection between the Great Lakes and Mississippi River. This connection brought together two sections of the nation, the Northeast along the Erie Canal and the Great Lakes and the Midwest along the Mississippi. As American settlement spread into these two sections, early boosters of the territory recognized the importance of the route to the region's economic growth.

Distances between Wisconsin and its major markets in the East were great. Between the 1820s and the 1850s, waterways provided the major means to overcome problems of long-distance trade from isolated Midwestern settlements. Into the 1850s, most products from the Midwest traveled the down the Mississippi to New Orleans. This shipment was expensive, absorbing profits from the sale of farmers' products and hindering economic growth. The initial promotion of the Portage Canal between the late 1820s and the 1850s pointed to the creation of a significantly more direct waterway connecting the Great

[1] The Wisconsin River Lock is sometimes referred to as the Portage Lock in historical documents.

Lakes to the Mississippi. The success of the Erie Canal completed in 1825 demonstrated the potential for such a link.

The portage and the Wisconsin and Fox Rivers composed the original waterway. The Upper Fox descends gradually for 137 miles between Portage and Lake Winnebago, winding through a rural landscape of small communities. The Lower Fox drops an abrupt 168 feet in 39 miles between Lakes Winnebago and Michigan at Green Bay, connecting a series of urban communities that utilized its waterpower. Prior to the construction of power dams in the twentieth century, the Wisconsin was a shallow river flowing over a sandy bottom. Its many sand bars divided the river into numerous, sinuous channels. These characteristics eventually frustrated the development of a navigation channel between Portage and the Mississippi River at Prairie du Chien.

The geographic setting at Portage, with just 2 miles distance between the Wisconsin and Fox Rivers, stimulated the improvement of the Fox-Wisconsin Waterway navigation project of which the canal was a key part. Canal boosters soon realized that they required not only a channel between the two rivers, but they had to make the length of the two rivers navigable between their mouths and the canal. A slack water system along the Fox River altered the natural fall of the river to a series of steps by the construction of dams which created level pools between them. Short canals with one or more locks lifted boats around the dams between the pools.

In 1828 the U.S. government established Fort Winnebago at the Fox River end of the Portage. Settlement gradually increased near the fort and the Portage became a small commercial area. During the 1830s the concept of a canal to connect the Wisconsin and Fox Rivers first emerged. Early efforts to construct a canal, however, were largely unsuccessful. By the late 1840s, three informal communities emerged on the Portage. Each area included private residences, commercial, and industrial properties.

As the communities grew, the U.S. Congress recognized the value of developing the Fox-Wisconsin Waterway and the benefit of a canal both for the community and for military purposes. Congress advocated funding for the construction of the canal and locks followed by improvements to the Fox-Wisconsin Waterway. Congress designated the State of Wisconsin to complete the canal and the improvements to the Fox-Wisconsin Waterway. In 1849 the current route was chosen for the canal and the canal and its two locks were completed in 1851.

Once the canal was completed, improvements were made to the Fox-Wisconsin Waterway. The Fox-Wisconsin Waterway navigation project included improvements to the Upper and Lower Fox Rivers. A series of channels and 17 locks provided access around the dams of the Lower Fox by the late 1850s. By 1880, nine locks and their associated dams formed the navigation system along the Upper Fox. Despite attempts to straighten and deepen the Wisconsin River's course, efforts failed to create a navigation system between

the 1850s and mid-1880s. However, steamboats were able to navigate the waterway in times of high water.

After the USACE reconstructed the canal between 1874 and 1876, craft up to 300 tons could use the waterway. Between 1876 and 1905, steamboats carried freight such as lead ore, lumber, logs, coal, stone, lime, clay, and agricultural products, especially grain through the canal. Others carried only passengers, and many carried both. Although 13 individual steamboats running from Portage to other points on the Fox and Wisconsin were identified, the regularity of their trips between 1870 and 1900 is generally unknown. Lockage included a rising percentage of pleasure craft and excursion boats by the 1870s.

Along the Fox Waterway, 73 percent of products shipped were logs and other wood products. Coal and building materials composed much of the remainder. Few agricultural products, primarily grain, moved along the waterway. Most of the tonnage occurred along the Lower Fox. Tonnage along the entire Fox River system dropped precipitously during the economic reversal of the 1890s and never recovered. Total commerce between 1890 and 1914 fell 65 percent. On the Upper Fox, recreational trips became the most common use, doubling the lockage between 1900 and 1915. In 1918 the Upper Fox carried only 321 tons. Lockage data available between 1897 and 1918 indicates that the Wisconsin River Lock was the least used along the Fox, while the Fort Winnebago Lock became one of the most frequently used on the Upper Fox. By 1908, lockage at Fort Winnebago reached 2,461, but remained in the 100s and 200s at the Wisconsin River Lock.

During the 1890s, commerce along most of the waterway fell considerably as the railroads proved strong competition for easy transport of bulk agricultural and industrial products. The advent of the railroad, in addition to the canal, helped Portage become a service point for the lumber industry and a commercial base for the transportation of wheat to milling centers. Although the railroad helped Portage develop, it contributed to the decline of the canal. The railroad operated year-round and moved shipments faster than the water vessels. Even with the canal's decline, Portage continued to develop as a small, regional commercial center. In the first decades of the twentieth century, several buildings were constructed within the survey area, including commercial, industrial, and retail buildings within the historic district and several residential properties along the canal.

The low level of commerce on the Upper Fox led the USACE to conclude by 1922 that maintenance of existing navigation facilities was no longer economically practical. However, Congress failed to act on the USACE recommendation to close the Upper Fox. Encouraged by local canal boosters and without action by Congress, the USACE rebuilt the Wisconsin River Lock between 1926 and 1928 to accommodate deep draft vessels for a deep channel waterway that was envisioned as a way to maintain Midwestern shipping and compete with the railroads. The concrete lock with steel gates and steel operating mechanisms became the largest on the Fox Waterway. Stone masonry wing walls were completed using stone from previous locks.

C. Construction History of the Portage Canal

In 1829 the Summit Portage Canal Company and Road Company was incorporated under the laws of the Michigan Territory to construct the canal. However, this company failed to meet its commitments. The first real attempt at constructing a canal at Portage began in 1834 with the incorporation of the Portage Canal Company. The location of the canal was along the Wauona Trail. This effort produced a waterway approximately 2 feet wide by 1 foot deep, making it large enough for canoes. In 1837 a second Portage Canal Company was chartered under approval by the Legislative Council Territory of Michigan. This company spent $10,000 on improvements before work ceased in 1838. No further progress was made constructing the canal for over a decade.

The State of Wisconsin became responsible for completing the Portage Canal, as well as the Fox-Wisconsin Waterways, when it accepted a Congressional land grant on June 29, 1848. On March 6, 1849, the Wisconsin legislature instructed the Board of Public Works to first begin the project that resulted in the construction of the Portage Canal followed by improvement of the Fox-Wisconsin Waterway. Based upon previous surveys, the board selected the location of the current canal. It also prepared general specifications for the excavation of canals and for the construction of timber locks.

The original specifications for the Portage Canal were for a canal 4 feet deep at normal water levels, 44 feet wide at the bottom, and 60 feet wide at the top (see Figure 1).

FOX AND WISCONSIN RIVERS IMPROVEMENT.

SPECIFICATIONS

FOR EXCAVATION AND EMBANKMENT.

GENERAL DESCRIPTION.

1*st Specification.*—The Canal when not otherwise directed, to be so constructed that the water shall be 44 feet wide on the bottom, 60 feet wide at the top water line, and 4 feet deep at ordinary stages of water in the streams, with such slopes preserved on the inner and outer faces of the banks, as the Chief Engineer having charge of the work may direct. The towing path bank shall be 10 feet, and the berm bank 8 feet wide on top; the inside angles of the banks shall be from 4 to 5 feet, and the outside angles from 3 to 4 feet above top water line.

2*d Specification.—Grubbing and clearing.* From the space required for the Canal and its necessary banks and drains, all trees, saplings, brushes and roots shall be cut and grubbed up, and together with logs, brush and wood of every description, including all wood fences, shall be burned up, or removed from the ground, so as to do no unnecessary damage to the adjoining lands, as may be directed by the Chief Engineer in charge of said work.

3*d Specification.—Excavation.* From a space of such width, as may be directed by the aforesaid Engineer, under the bank or banks, all vegetable or perishable matter, and all porous earth or loose stone shall be excavated and wholly removed into the outside of the banks, or if directed, beyond the limits of the banks. And this work shall in all cases, be kept two chains in advance of the embankment of which it is to form the base or foundation. The surplus excavation not required for the adjoining Canal or Lock banks, shall be laid as spoil bank in an even and regular manner, and be carried up contiguous to and with the same slopes as the other banks of the Canal; and the top shall be finished in a uniform plane, having sufficient declivity (not less than one foot in twenty-five,) to carry the falling water freely off the back side of the bank.

4*th Specification.—Embankment.* Under this head is embraced all embanking, either for sides or bottom of Canal, or that is not formed from contiguous excavation within one hundred feet. All banks shall be formed by commencing them at full breadth on the base, and shall be carried up in a uniform manner, always keeping the sides as high as the centre. All loose and porous materials, and all muck and vegetable earth used in the construction of any bank, shall occupy the outward slope thereof only, and at least ten feet in breadth of each bank from top to bottom, shall be formed of the most solid, compact, durable and water tight earth that can be obtained from the adjoining excavation; and the top of the banks shall be formed of the driest, best and most durable material that can be obtained within the same limits. When the material, necessarily excavated for the Canal, are not sufficient to form the adjacent bank or banks, the materials necessary to complete the same, shall be taken from the nearest surplus excavation, or such other places as the Engineer may direct. And all excavation, embankment, lining or puddling, which may be required to complete the work, or, for changing the course of any contiguous stream, shall be executed of such shape and in such manner as may be required by said Engineer.

5*th Specification.—Lining and Puddling.* When materials for lining the face of the banks or bottom of Canal are obtained from the same place, as other portions of the same bank, they shall be estimated as embankment only; but when obtained elsewhere, they shall be counted as lining and deducted from the embankment, in which they are placed. The materials contained in the puddling shall also be deducted from the embankment in which they are placed, and estimated as puddling only, which is to include both the furnishing of materials and the labor of puddling them after delivery.

6*th Specification.—Slope or Protection Wall, Docking, Plank revetment, &c.*, shall be constructed on such portions of the work as the Engineer may deem necessary, in order to perfectly complete and protect the same, and shall be of such form and dimensions, and secured in such manner as said Engineer may direct.

Timber and Plank Protection, shall be constructed whenever required by the Engineer in the following manner. Piles from 10 to 12 feet in length, 10 inches wide and 8 inches deep shall be placed on the slope of the inner face of the bank, at intervals of 8 feet, and when so placed, their upper surfaces shall be flush with the face of the slope. Upon the heads of these piles a stick of Oak timber 8 inches deep by 10 inches wide, shall be secured either by a mortice and tenon, or treenails. Through this stick a sword piece 2 by 4 inches and from 3 to 4 feet long shall be driven into the bank. Upon the piles 2 inch pine plank shall be placed longitudinally with the Canal. The plank shall be thoroughly treenailed to the timbers, as often as the Engineer may require.

7*th Specification.*—All expenses incurred in the construction of coffer dams, in the removal of the same, and for bailing and pumping water and all other contingent expenses, which may necessarily be incurred during the progress of the work, in order to properly execute it, shall be considered as included and provided for in the prices of the various items of work enumerated in the annexed contract, and no further compensation will be allowed therefor.

For a more full and perfect explanation of the form and manner of constructing the work embraced in the annexed contract in all its details, profiles, plans and bills of timber, &c., will be furnished by the Engineer in charge of the work, who will also give such directions from time to time, during the progress of said work, as shall appear to him necessary and proper, in order to make the work in every respect, complete and perfect, on the plan contemplated in the foregoing specifications, and the said directions shall in every respect be complied with.

Figure 1. Original specifications for the Portage Canal.

Pine planking and oak structural members composed the revetment walls (see Figure 2). Below the waterline, the revetment designs involved pilings faced with planks and tie backs. Just 2 feet of the revetment walls – two 12-inch by 12-inch timbers – was visible above the waterline. Although the method of revetment construction below the waterline was modified for portions of the canal in 1876, the appearance of the revetments above the waterline remained unchanged throughout the canal's history.

According to the original specifications, the Wisconsin River Lock was to be a guard lock, preventing sand from washing from the Wisconsin into the canal. The Fort Winnebago Lock served as a lift lock between the Fox River and the canal. Both locks were 35-foot by 140-foot timber structures. The specifications also included a 10-foot-wide towpath along the canal. The towpath was constructed along the north side of the canal and existed until at least 1901. The canal reached completion by June 9, 1851, and the state formally accepted the canal as completed on July 3, 1851. By 1852, swing or draw bridges were erected over both the Wisconsin River Lock and the Fort Winnebago Lock.

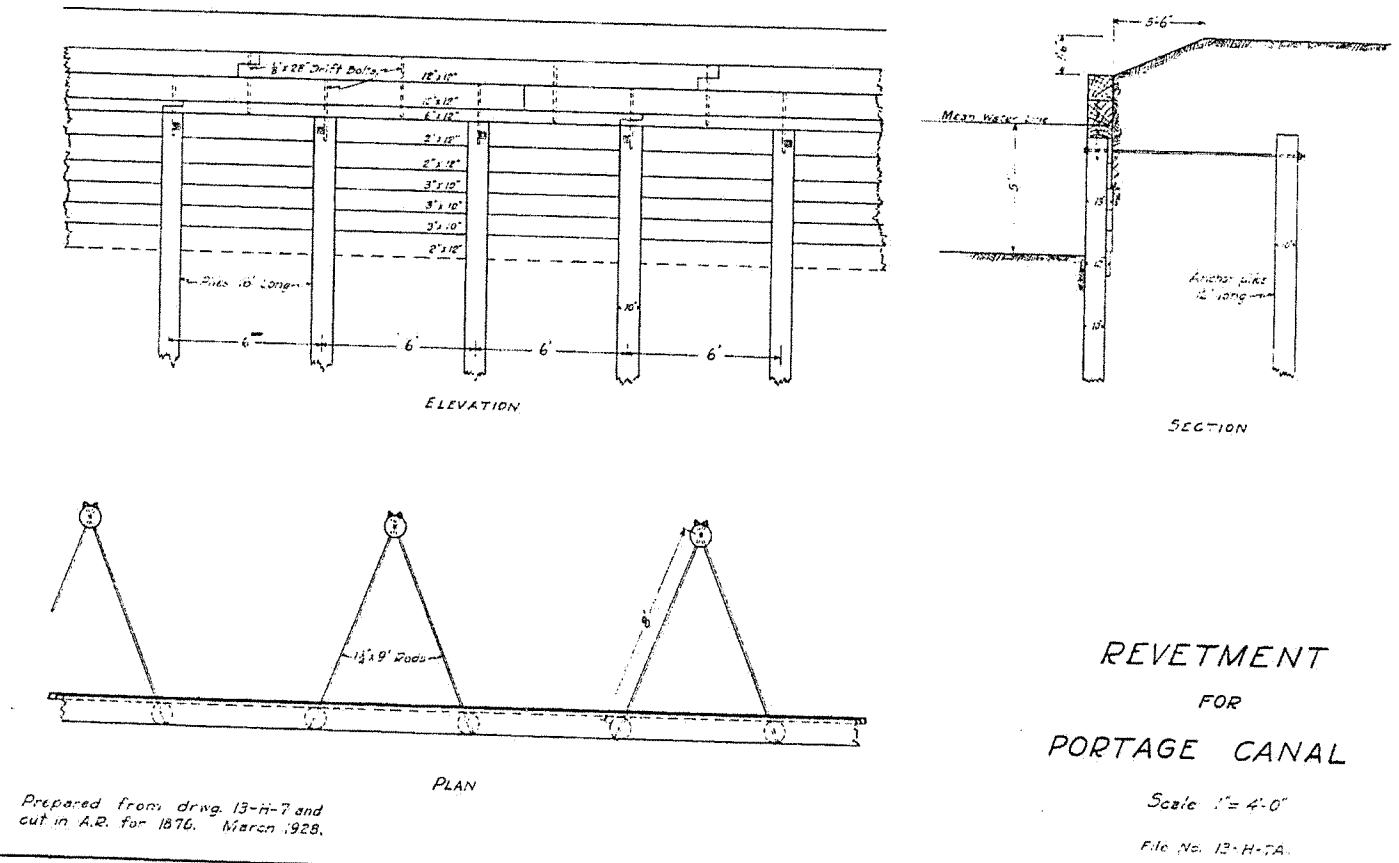


Figure 2. Original Plans for the Revetment Walls.

The depth and width of the canal was problematic for large boats. Large boats were only able to navigate the canal at times of high water, making improvements to the canal necessary. In 1851 two steamboats, the *John Mitchell* coming from the Fox River and the *Enterprise* coming from the Wisconsin River, were unable to pass each other within the canal. In order to facilitate improvements to the canal and Fox-Wisconsin Waterway, the legislature transferred responsibility of the canal to a private company in 1853.

In 1856 the Wisconsin legislature specified reconstruction of the locks at Portage and the enlargement of the canal so that boats could pass each other. Also in 1856, a bridge was constructed by the Milwaukee and La Crosse Railroad over the canal north of the current STH 33 Bridge. The legislature stipulated that all improvements were to reach completion by November 1858, and the dredging was to be finished by November 1859.

The private canal company in charge of these improvements conducted a large amount of dredging along the canal in 1858 and 1859. Even though the legislature stipulated enlargement of the canal, it is not known whether the canal was enlarged from a width of 60 feet to 75 feet at this time. Rebuilding of the Fort Winnebago Lock was also done in 1858-59. Constructed on the site of the first timber lock, the new composite lock was a 35-foot by 160-foot structure composed of stone-filled timber cribs. A wooden float bridge may have existed near the Fort Winnebago Lock by 1861. Other wooden float bridges spanning the canal at this time include ones over Wisconsin and Center Streets. Between 1864 and 1868, the Chicago, Milwaukee, and St. Paul Railroad erected two iron lift bridges near the location of the current Canadian Pacific Railroad Bridge.

The canal company sold the improvements it had completed along the Fox and Wisconsin Rivers, including those of the Portage Canal, to the federal government for $145,000 on September 18, 1872. After this time, the USACE was in charge of construction and maintenance of the canal and its locks. Between 1874 and 1876, the USACE dredged the Portage Canal extensively to specifications that called for a 75-foot-wide by 5-foot-deep channel. The earliest indication of a 75-foot width for the canal occurred in 1867 when a survey by the USACE indicated that the canal was 12,400 feet long and 75 feet wide. Sanborn maps from 1885, however, clearly indicate a 60-foot width for the canal through downtown Portage from the Wisconsin River Lock to just past Adams Street. Adjacent buildings may have restricted the USACE' attempt to achieve a 75-foot width for this section.

The USACE specifications also stipulated that the banks of the canal were to be reinforced where deteriorated with timber revetment walls. During the 1876 work, a modified method of revetment construction that eliminated the need for tie backs was used in select areas of the canal due to space constraints. The visible portion of the revetments remained two 12-inch by 12-inch timbers rising 2 feet above the waterline.

Parts of the Fort Winnebago Lock were replaced or repaired between 1874 and 1879, but it remained a composite structure. Between 1875 and 1876, a waste weir was constructed approximately 900 feet southwest of the Fort Winnebago Lock. The waste weir was located on the south side of the canal and extended from the canal to the Fox River. Between 1879 and 1880, the bridges over the canal at Wisconsin and Center Streets were replaced. While the bridge at Wisconsin Street may have remained a wooden structure, the wooden float bridge over the canal at Center Street was replaced with an iron swing bridge. In 1880 the Wisconsin River Lock received relatively extensive repairs, but it remained a timber structure.

The USACE substantially rebuilt the Fort Winnebago Lock in early 1890, erecting another composite structure of stone-filled crib walls on the existing timber base. To prevent water leakage through the walls, a 6-inch concrete facing was placed between the timber cribbing and planking that formed the exterior chamber walls. The timber Wisconsin River guard lock was replaced with a composite lift lock between 1892 and 1893. The second, 35-foot by 165-foot composite lock had walls composed of timber cribs filled with stone and finished with a concrete cap. Planking covered the walls and floor, and timber gates closed the structure.

Repairs were made to the revetments, and the canal was probably dredged in 1891-1892. The last identified systematic replacement of timber revetments along a significant portion of the canal occurred in 1897. At this time, the revetments were replaced from northeast of the railroad bridge to the Fort Winnebago Lock. The visible portion of the revetments remained unchanged – two 12 -inch by 12-inch timbers rising 2 feet above the waterline. When adjacent landowners charged workers with trespass, work was halted. Still, additional work on the revetments occurred in 1900 and 1902. After the flood of 1900, both locks received substantial repairs.

The Milwaukee and La Crosse Railroad Bridge, erected in 1856, was taken down in 1907. In 1912 the waste weir was replaced and a bridge was constructed over its juncture with the canal. The Wisconsin River Lock was repaired between 1913 and 1914. A narrow footbridge with a metal truss spanned the Wisconsin River Lock between 1913 and 1945. The footbridge used the lock walls as abutments and provided access to the Curling Club, which was located on the south side of the lock. The footbridge could be removed when access was not needed. A steel bridge replaced the iron structure over Wisconsin Street in 1918 and the iron swing bridge at Center Street was likely replaced in 1928.

The existing concrete Wisconsin River Lock was constructed between 1926 and 1928. The concrete and steel construction of the Wisconsin River Lock was not typical of locks found along the Fox Waterway. The specifications for the Wisconsin River Lock were completed in 1926 and required the construction of a concrete lock with steel gates and steel operating mechanism; the removal of the remaining walls of the first lock; the repair of the walls of the second lock to secure the banks; the building of a short levee to connect the new lock to the existing Portage Levee along the east bank of the Wisconsin River and around the

Curling Club; and the removal of an existing timber and clay cofferdam. This cofferdam was replaced in the fall of 1926. The size of the concrete lock chamber was to measure 35 feet 2inches x 170 feet, the overall length of the concrete lock extended 209 feet, and the total height of the lock reached 28 feet 2 inches. The lock walls measured 12 feet at the base and 6 feet 6 inches wide at the top, and were truncated inward and keyed into the concrete slab floor. The walls of the second Wisconsin River Lock were left in place east of the new concrete lock to serve as retaining walls. These retaining walls were clad in 2-inch by 12-inch wood planking and had 6-foot concrete caps that served as walkways. Eight steps were constructed between the concrete lock and the retaining walls. The retaining walls were about 35-feet apart and extended about 180-feet east of the concrete lock. The work was completed on April 5, 1928.

The USACE dredged a small portion of the canal in 1927, but sandbars and weeds choked parts of the canal by 1931. Because of the low prospect for future commerce, the agency discontinued dredging as Congress failed to act on a proposal to develop the waterway for deep draft vessels. Despite the reduction of maintenance by the 1930s, minor work occurred at the Wisconsin River Lock in 1936. Reconstruction of the Fort Winnebago Lock in the same year involved rebuilding the floor, at least a portion of the timber side walls, and the gates. The structure remained a composite lock with dry laid, stone masonry walls surrounded by timber cribbing sheathed with pine planking along the lock chamber.

Between 1937 and 1938, the railroad bridge that currently spans the canal was constructed. Although it was built as a lift bridge, few large ships used the canal and it was lifted for inspections only two times. The bridge's counterweights were removed in the early 1950s. By 1950, a small number of recreational vessels composed all the boat traffic on the canal and the level of improvement along the Upper Fox declined as use diminished. In 1950 the drawbridge at Center Street was removed and the current STH 33 Bridge was constructed. Construction began in October 1950, and the structure reached completion in November 1951. This bridge was designed to permit the passage of canoes and similar small watercraft, but not commercial boats. The fill and culvert crossing at Adams Street was built in 1954. A fill and culvert replaced the steel drawbridge crossing at Wisconsin Street in 1959.

Although water traffic was limited after 1951, the closing of the Portage Canal became official when it was transferred from federal ownership to the WDNR in 1959. The Wisconsin River Lock was deactivated and modified into a water-control structure at this time. Modification included the removal of hardware, such as the spars, tripods, and tripod platforms; the filling in of some of the areas left by removal of the tripods; the lowering of the stone walls, which remained west of the current lock; welding both pairs of gates in the closed position; and the shaping of the adjacent banks to a 1:1 slope. The valve rods and handles, the safety rails along the gates, and the gate levelers and plates were retained. The steps between the concrete lock and the retaining walls to the east were also retained, as were the gates and hollow quoins, valves, valve maneuvering gears, and iron snubbing posts.

The Fort Winnebago Lock was dismantled between 1959 and 1960. The remains of the Fort Winnebago Lock may be viewed as an archaeological site. A portion of the side walls were dismantled to the waterline and the stone was placed into the lock chamber. The lock's hardware, the east gates and associated connections, and most of the wing walls were removed. Also, the west gates were cut down and secured in a closed position. Fill material was placed on both sides of the gates to close off the valves. The resultant structure functions as a waste weir. The dike at the former waste weir 900 feet southwest of the Fort Winnebago Lock was raised to the height of the adjacent canal banks. A tool shed, constructed by the USACE in 1904 on the north side of the canal adjacent to the lock, was extant in 1960 but no longer remains. A footbridge was constructed over the lock remains in 1965.

D. Planning and Preservation Efforts

In the 1960s, the WDNR and the City of Portage began planning for the future of the Portage Canal. In 1964 the governor created a task force to investigate the potential uses and problems related to the Upper Fox Waterway, including the canal. Two subcommittees of this task force examined the historic sites in the Portage area and the Wisconsin River Lock and considered approaches for management and interpretation. In 1966 the governor created the Portage Canal Implementation Committee, which submitted a feasibility plan for historic sites in the Portage area and for management of the canal in 1968. In conjunction with this study, the Ad Hoc Committee for the city addressed long-range development goals for the canal and submitted a report in May 1971. While these reports confirmed the historical value of the canal and adjacent property, a lead agency was not delegated for its development.

The City of Portage created a waterway commission in 1973 to manage the canal. In October 1973 the city and the WDNR began to consider different maintenance options for the canal. Although the accumulation of pollutants and debris in the canal was a long-standing concern, maintenance of the property remained negligible until the early 1970s. Cyclone fencing was placed around the Wisconsin River Lock in 1968 due to a drowning death and the WDNR removed debris from the canal in 1970 and 1973. Formed in 1975, the Portage Canal Citizen's Group cleaned weeds and debris from the canal. The Portage Canal Society, formed in 1977, grew from this group.

In 1979 the Portage Canal Society, also known as the Portage Canal Preservation Society, expressed concern over encroachment upon the canal to the Citizen's Advisory Committee of Wisconsin due to a planned residential development adjacent to the canal. The Society contended that the state owned the 190-foot right-of-way, which included the 75-foot width of the canal. However, then Attorney General Bronson C. La Follette concluded that since private property owners had encroached upon the canal's right-of-way for over 100 years, the state possessed only a 75-foot corridor. As reported in the *Milwaukee Sentinel* on May 3, 1980, according to La Follette, "the state owns the canal in fee; the fee being 75 feet wide and 2.5 miles long. The state has no ownership interest in the attendant right of way along either side of the

canal." In 1981 Governor Dreyfus formally designated the WDNR as the agency to administer ownership of the property. He also requested a certified survey of the property at this time. This survey was completed in 1983 by Bridwell Engineering Company, Inc. of Madison, who defined a 75-foot right-of-way across the property. However, this survey appears to be incomplete and was not accepted. In 1982 the USACE placed the Lower Fox Waterway in a caretaker status.

In 1985 the City of Portage, Columbia County, and the State of Wisconsin signed a Memorandum of Understanding that sought to coordinate preservation efforts for the canal through the Fox-Wisconsin National Heritage Waterway Park Corporation. Its purpose was to guide the preservation and maintenance of the Portage Canal, establish a historic park along the canal and a portion of the Fox corridor, enhance support for the project, and hold rights to the property. Essentially carrying out this mandate, the University of Wisconsin Extension, Portage Canal Society, and the City of Portage took steps to enhance the historic image of the property. Enhancement efforts included the construction of a footbridge across the canal between the Wisconsin River Lock and Wisconsin Street in 1984; the placement of timber revetments along the banks of the canal from the footbridge to Adams Street between 1986 and 1988; and the establishment of a canoe trail, which entailed the addition of wooden piers along the canal. Additionally, the Fox River Management Commission was given the responsibility for maintenance and rehabilitation of the Wisconsin River Lock between 1985 and 1987. Several inspections of the lock by the USACE occurred during this period.

The Fox-Wisconsin National Heritage Waterway Corridor was proposed by the East-Central Wisconsin Regional Planning Commission in 1989. General Engineering Company, Inc. of Portage, which had conducted a feasibility study for reopening the Portage Canal in 1988, revised the study in 1991. The Portage Ad Hoc Committee on Flood Control was established in 1991 to guide the planning of a levee structure at the junction of the Wisconsin River and the canal and to initiate studies for treating the historic site. In 1992 the city passed resolution No. 4417 favoring the placement of a narrow-gated structure to provide water flow through the proposed levee. As an interim flood protection measure, the WDNR placed a temporary levee across the mouth of the canal in 1992. It remained in place until a permanent structure was built in 1998. The Ridge Runners Snowmobile Club is planning to construct a prefabricated metal truss bridge over the canal during the winter of 2002-03. The planned location of the bridge is just north of the STH 33 Bridge and construction will require the Ice Age National Trail, which runs along the south side of the canal from STH 33 to the Fox River, to be slightly rerouted away from the canal bank.

E. Conclusion

Although never emerging as a major shipping channel, the Portage Canal and the Fox Waterway gain historical significance by representing the transportation needs of early Wisconsin and the government policies that emerged to fulfill them. For more than 35 years, the WDNR, the City of Portage, and the Portage Canal Society have been actively engaged in efforts to rehabilitate and preserve the canal as a means to enhance its role as a destination of statewide historical importance and interest to visitors and residents. With the receipt of enhancement funding in 2001 and securement of a WDNR grant, these parties were brought closer to their goal.

4. General Requirements

The design concept for the rehabilitation of the Portage Canal and construction of an adjacent bicycle/pedestrian trail is governed by the following general project requirements.

A. Water Supply

An adequate water supply to the canal is needed to reduce stagnant water, mosquito breeding, and aquatic vegetation, and to allow for navigation by small watercraft. The canal currently has three general sources of contributing flows:

- A gated intake structure at the Wisconsin River designed by the USACE and built during levee construction in 1998.
- Groundwater flow into the canal.
- Storm water runoff from lands adjacent to the canal via surface flow or storm sewer outfalls that discharge into the canal.

Except during periods of high flow in the Wisconsin River when water flows directly into the top of the intake manhole, water enters the intake system by infiltrating through the river bottom sediments into two perforated drain pipes at approximate elevation 776.7 feet.[2] The drain pipes terminate at a collection manhole located on the upstream slope of the levee. From the manhole, water flows under the levee out to the canal via a 48-inch-diameter, reinforced-concrete pipe. A slide gate is located on the upstream side of the levee crest to control flows in the pipe. The USACE intake structure was designed to supply 4.0 cfs of water into the canal at river stage elevation 787.0 feet, approximately 0.4 foot below the manhole grate (Mid-States Associates, 1999). At lower river levels, flow into the canal will be less than 4.0 cfs. At river levels at or below elevation 781.0 feet, the water level is below the outlet pipe to the canal and there is no flow. At river stage elevations above 787.4 feet, flow into the canal will increase dramatically up to a maximum of 70.0 cfs since water will flow directly into the manhole through the grated cover.

Approximate measurements taken on November 8, 2002, indicate that actual flows at the outlet to the canal are no greater than 0.1 cfs at river stage elevation 784.4 feet. Water-level measurements taken in the collection manhole indicate large headlosses through the river bottom sediments and perforated piping. This is likely due to either clogging of the intake system or deposition of fine-grained sediments over the intake field.

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[2] All elevations in this report are given in feet and referenced to National Geodetic Vertical Datum (NGVD).

Measurements taken at Adams Street on the same date indicate approximately 4 to 6 cfs of water flowing over the stoplogs. Because there had been no recent precipitation, it can be concluded that, with the exception of the insignificant amount entering the canal via the USACE intake structure, this flow is due to groundwater infiltration into the canal.

These sources are insufficient to provide a reasonable level of water quality during most of the year. Therefore, Mead & Hunt's design effort will investigate modifying the existing intake structure to provide additional flow into the canal. If gravity alone cannot provide sufficient flow, adding one or more pumps in the intake system to increase flows will be investigated. Providing one or more high capacity groundwater wells were considered as an alternative for supplementing flows into the canal, but were considered cost-prohibitive as compared to modifying the existing intake system for the quantity of flow desired due to higher installation costs and greater power demands.

Further discussion of the intake system design criteria and concepts and minimum flow requirements are contained in Section 5 – *Canal Structures*.

B. Sediment Control

Siltation of the canal is caused primarily by deposition of solids from storm water runoff from lands adjacent to the canal. Much of this is concentrated in areas where storm water outfalls discharge directly into the canal. In order to improve water quality within the canal and minimize the frequency of required dredging to maintain the minimum navigation depth, sediment control measures will be investigated.

C. Historic Integrity

The project should maintain the historic integrity of the Portage Canal, which is listed in the National Register and possesses statewide historical significance. The National Register is the official federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture. Listed or eligible properties can be significant at the local, state, or national level. Historic integrity is defined as the authenticity of a property's historic identity, evidenced by the survival and/or rehabilitation of physical characteristics that existed during the property's historic period. For the Portage Canal, the historic period is 1849 to 1959, spanning the time from the original excavation of the canal to its official closure.

The National Register program recognizes seven aspects or qualities that, in various combinations, define integrity:

- *Location – The place where the historic property was constructed or the place where the historic event occurred.*
- *Design – The combination of elements that create the form, plan, space, structure, and style of a property.*
- *Setting – The physical environment of a historic property.*
- *Materials – The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.*
- *Workmanship – The physical evidence of the crafts of a particular culture, people or artisan during any given period in history.*
- *Feeling – A property's expression of the aesthetic or historic sense of a particular period of time.*
- *Association – The direct link between an important historic event or person and a historic property.*

The conceptual design for this project recognizes the historic significance of the Portage Canal. Implementation of the conceptual design will enhance the canal's appearance and is not expected to change its National Register status.

D. Small Watercraft Navigation

To encourage maximum use and enjoyment of the canal, the design concept provides for small watercraft navigation of the canal. The canal will be dredged to accommodate canoeists and kayakers. People using canoes and kayaks would enter the canal from the Wisconsin River via a portage at the Wisconsin River Lock. In the short-term, portages will also be necessary at Wisconsin and Adams Streets. Access points for canoes and kayaks are proposed at the Wisconsin River Lock, Adams Street, the Fort Winnebago Lock, and near the STH 33 Bridge.

Small watercraft navigation through the existing culverts at Wisconsin and Adams Streets is considered unsafe. Bar grates over the upstream end of these culverts will be provided to prevent the passage of small watercraft. In the long-term, these culverts should be replaced with open-span structures, making continuous canoe/kayak access possible for the length of the canal between the Wisconsin and Fox Rivers.

Adequate clearance for small watercraft is currently available under the Canadian Pacific Railroad Bridge and the STH 33 Bridge. For further discussion of short- and long-term improvements, see recommendations for the canal in Section 5 – *Canal Structures*.

E. Environmental Considerations

(1) Wetland Impacts

Any rehabilitation of the Portage Canal involving dredging, fill or trail construction will require a federal permit under Section 404 of the Federal Clean Water Act (CWA). Under the CWA, activities within waters of the United States are regulated by a permit program administered by the USACE, with oversight by the U.S. Environmental Protection Agency (USEPA).

For CWA purposes, the USACE operates under rules established under 33 CFR, which broadly defines "waters of the U.S." as including tidal waters, impoundments, rivers and tributaries, territorial seas, and a wide variety of wetlands (33 CFR Section 328.3). The jurisdictional limits of a water body are established by the limits of the high tide line, ordinary high water mark or a wetland boundary delineation as the case may be. With the Portage Canal project, the entire canal is a jurisdictional water body because its water surface elevation lies below the ordinary high water marks of both the Fox and Wisconsin Rivers.[3] Wetlands associated with the canal banks also raise the jurisdictional limits slightly higher.

A Section 404 permit issued by the USACE is not valid until it receives a Section 401 Water Quality Certification from a state regulatory agency. Consequently, in Wisconsin joint applications are made to the USACE and the WDNR. The WDNR issues water quality certifications under NR 299, after the relevant state water quality standards have been met. For wetlands, these standards are under NR 103.

A primary factor in obtaining any 404 permit, and the necessary 401 certification, is the proper "sequencing" of the proposed activity. The purpose and need of the activity must be clearly stated and practicable alternatives studied to identify the one that meets project objectives while avoiding and minimizing impacts to waters and/or wetlands. An alternative is considered practicable if it is capable of being implemented after taking cost, available technology, and logistics into consideration. For public transportation projects, safety is an additional criteria.

[3] Gary Knapton, USACE, personal communication.

The final step in sequencing is the mitigation of unavoidable, minimized impacts by the physical restoration of an equivalent or greater area of wetlands or other water bodies as deemed appropriate. In Wisconsin, mitigation is usually required for impacts affecting more than 0.1 acres of any water body or wetland. Under WisDOT projects, project-sequencing and mitigation are handled under the established Trans 400 environmental documentation procedures and the liaison structure of the WisDOT/WDNR Cooperative Agreement and associated technical guidelines. One of these guidelines allows mitigation to occur through use of "credits" generated by wetland banks previously restored by WisDOT. Preliminary agency coordination has indicated that this mitigation strategy will be acceptable for the Portage Canal Project.

Alternatives that consider cost, technical feasibility, public safety, trail design criteria, and the minimization of any impact "footprint" must be assessed. A final criteria may also be the type and quality of habitat enhancements offered under any dredging or trail construction alternative, which may balance or compensate for adverse environmental effects caused by project configurations desirable from a historic rehabilitation perspective.

(2) Transfer of Water Between the Wisconsin and Fox River Watersheds

The canal currently has two barriers to prevent the migration of exotic species between the Wisconsin and Fox River watersheds – the Wisconsin River Levee and the remnants of the Fort Winnebago Lock. Design of measures to improve water quality and flow quantity in the canal must consider maintaining a barrier to prevent transfer of biota between the watersheds.[4]

The USACE intake structure at the Wisconsin River Levee does not effectively prevent downstream passage of biota during periods of high water. The modified intake structure must incorporate an effective bio-barrier to prevent migration of species either upstream or downstream. An underdrain intake system that involves infiltration of water through the river bottom sands effectively serves this purpose.

The remnants of the Fort Winnebago Lock currently serve as a weir to develop backwater within the canal. It effectively prevents upstream migration of biota from the Fox River into the canal, but does not prevent downstream movement during high flow periods. If an effective two-way bio barrier is present at the Wisconsin River Levee, then a second bio-barrier is not required at the Fort Winnebago Lock.

[4] WDNR, personal communication, December 2002.

(3) Hazardous Materials

A Phase 1 Hazardous Materials Assessment was completed to satisfy environmental documentation requirements, limit environmental liabilities for WisDOT, avoid costly construction emergencies and delays, and address worker safety during construction. In general, WisDOT requires Phase 1 assessments for projects that involve acquisition of right-of-way or those that include significant excavation. A Phase 1 should provide sufficient information to determine the potential for contamination within the project limits and address potential environmental liability. A Phase 1 also evaluates the need for further environmental investigation and for incorporation of special provisions into the construction contract.

The *Phase 1 Hazardous Materials Assessment* was conducted for the Portage Canal Project in accordance with WisDOT's facilities development process. The Phase 1 assessment investigated past land uses and the potential of hazardous materials contamination on properties adjacent to the canal through records and database searches and field reconnaissance as specified in Procedure 21-35-5 of the WisDOT *Facilities Development Manual*. Records and databases that were reviewed include those from the WDNR, the USEPA, and the Wisconsin Department of Commerce (WDCOM). Site files documenting previously discovered contamination and remedial measures already undertaken were examined at WDNR and WDCOM offices. In addition, interviews of select property owners and personnel at the City of Portage were conducted. The field reconnaissance document visual evidence of hazardous material contamination, such as tanks, drums, stained soils, odors, stressed vegetation, soil borings, and monitoring wells.

Based upon the background research and field reconnaissance, 40 areas adjacent to the canal were assigned site numbers and evaluated for their potential to contain hazardous materials. Approximately eight of these sites warrant further environmental investigations. Recommendations for Phase 2 Environmental Subsurface Investigations are provided in the Phase 1 assessment.

F. Maintenance

In addition to functional, aesthetic, and historical considerations, Mead & Hunt's designs will be developed with an eye toward minimizing long-term maintenance costs. Improvements within the canal and trail right-of-way will be maintained by the city under agreement with the WDNR.

(1) Canal Intake

From the standpoint of long-term reliability and minimal maintenance, the preferred intake system is one that incorporates the following features:

- *A full gravity system:* No pumps required to transfer water from source to canal. If supplemental pumping is required during low river stage levels, an efficient pump design that minimizes the pump size (and cost) and power demands is desired. In addition, the pump system should be fully automated so that it trips on at a set water level, rather than requiring manual operator input.

- *Non-clogging:* No tendency toward migration of soils into the pipes, which can lead to reduced efficiency or clogging. Geotextile filter fabric "socks" around pipes are susceptible to clogging and should not be used. Use of slotted pipe encased in gravel rather than perforated pipe encased in filter fabric is preferred.

- *Built in bio-barrier protection:* No separate bio-barrier net is required for an infiltration-type intake. An open conduit to the Wisconsin River would provide flow capacity, but would require a separate bio-barrier.

- *Minimize mechanical or electrical components:* Employ a simple, easy to construct design with the fewest possible moving parts subject to the environment and mechanical wear. The existing USACE slide gate is in good condition and generally satisfies this requirement. During storm events, however, the city must currently dispatch personnel to close down the gate to limit inflows to the canal from the Wisconsin River.

- *Durability:* Slotted-PVC or HDPE pipe is lightweight and has excellent long-term stability properties.

(2) Wisconsin River Lock

Structurally, the Wisconsin River Lock is in generally good condition. The exposed concrete surfaces have varying degrees of surface deterioration (cracking, spalling, and delamination) and will require some repair work. Otherwise, the monoliths are sound and exhibit no evidence of instability. The lock gates will require sandblasting and repainting, but are also generally in satisfactory condition from the standpoint of aesthetics. There is some full-section corrosion at the waterline, but this is not currently an issue since the lock is not functional. Some of the gate mechanisms are stored off-site and should be refurbished and reassembled on-site. Other than periodic cleaning and painting, no

major long-term maintenance will be required. The masonry approach walls on the upstream end need repointing but are in generally good structural condition. They will require periodic repointing.

(3) Canal and Revetments

The canal has filled in via sedimentation to a varying extent in the four segments. Dredging will be required in many areas to improve water quality, navigability, and inhibit wetland vegetation growth. Sediment-control measures should be incorporated into future designs of the storm sewer outfalls that discharge into the canal to minimize sediment loading. The design should ultimately be part of a comprehensive storm water management plan for the city.

Rehabilitation of the canal will also include installation of new revetment walls along both banks. Structural elements will be selected that require minimal long-term maintenance, such as plastic or steel sheet piling or concrete beam walls. Dredge spoils will be dewatered on-site and incorporated into the backfill behind the revetments to the maximum extent possible. A non-structural wood fascia will be provided to recreate the historic look of the original timber revetments. The wood fascia and trail surfacing will completely hide the structural elements from view.

Treated wood timbers will be used for the fascia and are estimated to have a life span of at least 50 years under similar conditions as the canal.

(4) Trail Surface

The proposed material for the trail surface is asphalt. Asphalt has been selected because hard, all-weather pavements generally provide a higher level of service and require lower maintenance. While crushed aggregate (gravel) as a trail surface can usually be placed at a lower cost, it has higher maintenance costs since it is prone to erosion and vegetation growth. A paved path also is not subject to rutting, as is a crushed aggregate surface. Additionally, crushed aggregate can get into property owners' yards and generate complaints. A paved facility is more conducive to multiple uses and users, including bicycles and pedestrians.

A 10-foot-wide paved path is the preferred width for a shared-use facility. It reduces maintenance costs over an 8-foot path due to the occasional vehicle wheel load not being located at the outside edge of the path, which can cause edge damage and deterioration. An 8-foot width should only be used where adequate passing areas exist on the facility and maintenance vehicle use is expected to be rare.

(5) Trail Amenities

Signage materials recommended for long-life, resistance to vandalism, and graphic reproduction, are fiberglas-embedded paper graphics or laser-etched granite with aluminum or steel-painted frames and mounting systems. Benches, railings, and lighting should be fabricated from durable materials such as cast iron, steel, and wood.

G. Property Ownership

In order to rehabilitate the canal and construct the adjacent bicycle/pedestrian trail, a varying width right-of-way corridor will need to be established. These widths will include the rehabilitated canal and recreational trail adjacent to the canal. These right-of-way widths are anticipated to be as follows:

- Wisconsin River Lock to Pedestrian Bridge — 90 feet
- Pedestrian Bridge to Wisconsin Street — 85 feet to 90 feet
- Wisconsin Street to Adams Street — 75 feet
- Adams Street to Railroad Bridge — 75 feet to 85 feet; 95 feet at Hamilton Street Bridge
- Railroad Bridge to STH 33 — up to 120 feet
- STH 33 to Fort Winnebago Lock — up to 135 feet

Additional temporary easements will also need to be acquired for grading to match into adjacent properties. The right-of-way width is limited between Wisconsin and Adams Streets by existing buildings.

An argument can be made that the WDNR currently owns a 75-foot-wide corridor. This is the result of a ruling in 1980 by former Attorney General Bronson C. La Follette. This width matches physical evidence discovered during a field survey where the metal bolts that attached the horizontal revetment wall planks to their pilings were found to be at a constant 75 feet apart. Any property beyond this corridor that is required to construct the project will need to be acquired in fee or easement. It is recommended that any permanent structures be constructed on property acquired in fee. Areas that are graded to match-into adjacent property can be temporarily acquired in easement.

5. Canal Structures

Each of the major project structures is discussed separately in this section.[5]

A. Canal Intake

As stated in Section 4A – *Water Supply*, the USACE intake structure was designed to supply 4.0 cfs of water into the canal at river stage elevation 787.0 feet, approximately 0.4 foot below the level of the high-level intake manhole. Design capacity decreases with lower river stage levels, to zero at river stage elevation 781.0 feet. Except during high river stage levels when water flows directly into the top of the manhole grating, little water flows into the canal from the existing USACE intake structure. Groundwater infiltration and storm water runoff from the surrounding lands are the primary sources of water, the latter being of low quality and laden with suspended-solids. A schematic plan view of the existing intake structure is shown in Exhibit 1.

Greater levels of minimum flow are required in the canal to prevent stagnation. Insufficient depth and flow, high nutrient levels, low dissolved-oxygen (DO) contents, and sedimentation from storm water and surface runoff have contributed to poor water quality, mosquito breeding, wetland vegetation development, and malodorous conditions.

Increasing flow velocities to prevent the deposition of fine sediments requires rather substantial flows and is not considered feasible. However, mosquito and vegetation control and higher DO levels can be achieved with canal deepening (minimum depth of 3 feet) and flow velocities on the order of 10 to 15 seconds per foot. For an average canal width of 75 feet, this corresponds to flow quantities ranging from 16 to 22 cfs. For an average canal width of 60 feet, the required flow reduces to between 12 and 18 cfs. Given the fact that approximately 5 cfs of flow enters the canal via groundwater infiltration, a minimum of 10 cfs additional flow is considered sufficient to significantly improve water quality. Minimum flow velocities in excess of this amount may create a safety hazard for recreational canoeists and kayakers at the existing culverts under Wisconsin and Adams Streets.

Periodic "flushing flows" through the USACE high-level intake (manhole elevation 787.4 feet) are not sufficient to create scouring flows within the canal to mitigate sedimentation. Also, the mild gradient of the canal bottom and the limited hydraulic capacity of the culverts under Wisconsin and Adams Streets limit the ability to create effective scouring flows. Sediment control into the canal is best handled by control at the source by implementing storm water "Best Management Practices (BMPs)." This is discussed in more detail later in this section. Flushing flows have been observed to cause some species mortality due to entrainment

[5] Structures are listed in order from upstream to downstream.

on the manhole grating. Also, high flows can pose a safety hazard to anyone who ventures too close to the culverts.

Modifications to the existing USACE intake system are recommended to provide additional flow into the canal. A minimum of 10 cfs inflow is recommended for Wisconsin River stage elevations equal to a 90-percent probability of exceedance – that is, 90 percent of the time during the course of the year, river levels are equal to, or higher than, this design level. Typically, at least 20 years of daily river gage data are analyzed to determine this level.

Currently, the preferred alternative is to replace the existing twin perforated pipes with multiple-slotted pipes covering a much larger area under the riverbed. A gravity-type, filter bed intake is generally maintenance-free, requires no electricity to operate, and provides a natural bio-barrier. Properly graded backfill will be placed around the pipes rather than filter socks to reduce the potential for clogging. The drain pipes will terminate in a collection header pipe with risers and openings to permit video inspection or clean out of the drain pipes, if necessary. The header pipe will be connected to the existing collection manhole. The existing 48-inch outlet pipe and slide gate structure are sufficiently sized to provide the required capacity and are in good condition. During low river stage levels, a gravity system alone may not be sufficient to provide the required flow into the canal. For this reason, the option of installing one or more submersible, centrifugal pumps into the collection manhole to create additional head differential and increase flow into the underdrain system is being investigated. The need for supplemental pumping and design details will be developed during detailed design. Conceptual renderings of required modifications to the existing intake are shown in Exhibit 2.

B. Wisconsin River Levee

No modifications to the slopes or crest of the Wisconsin River Levee are planned.

Water levels in the Portage Canal must be maintained at a certain minimum level to prevent high seepage gradients under the levee during the 100-year flood. The development of high gradients can lead to sand boils and piping. Therefore, a stoplog structure must be maintained at Adams Street to provide backwater in the canal during flood conditions.

C. Wisconsin River Lock

Structurally, the Wisconsin River Lock is in generally good condition. Anticipated renovation work includes the following:

(1) Lock Gates

- The lock gates are not operable. There is some corrosion at the waterline, but otherwise in good condition for aesthetic purposes.

- Rotate the east (downstream) lock gate to the open position to allow water to flow through the lock. The western (upstream) lock gate will be in a closed position with sections of the bottom panels removed at or below the waterline to facilitate water flow.

- Sandblast and repaint gates to original appearance and for corrosion protection.

- Remove and replace deteriorated wooden quoins (hinges).

- Inventory and assess the condition of the salvaged gate mechanisms from off-site storage. Retrieve, refurbish and reinstall. Some missing or heavily damaged or corroded parts may need to be refabricated.

(2) Concrete and Masonry Rehabilitation

- Remove and replace deteriorated and delaminating concrete to neat and level surfaces. Only surface repairs are required.

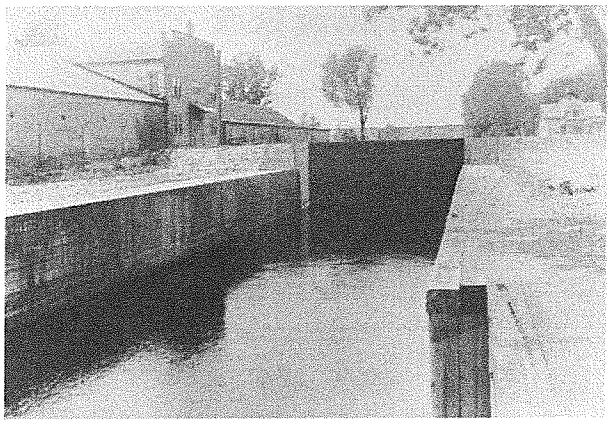
- Rehabilitate embedments for gate mechanisms.

- Repoint upstream masonry walls; no significant structural repairs are needed.

(3) Lock Chamber

- Clean out and fill lock chamber with clean, granular material such that the maximum water depth is 3 to 4 feet. Currently, the water depth is as much as 8 feet in places. This will reduce the possibility for accidental drowning within the lock chamber.

(4) Retaining Walls



Retaining walls that existed east of the lock following its completion in 1928 will be recreated. The historic retaining walls were 180 feet long and 35 feet apart, rising 9 feet from the waterline (see Exhibit 3). Historic photographs show these retaining walls sheathed in wood planking.

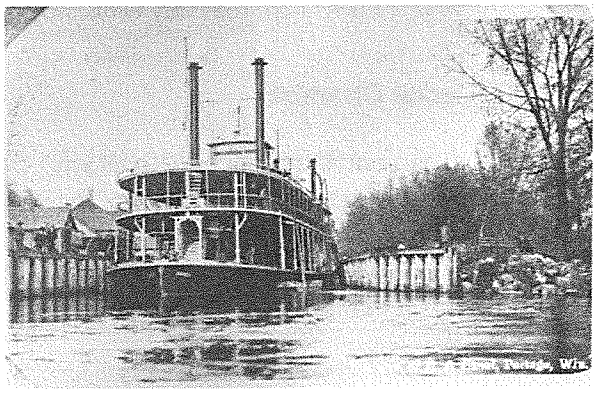
The proposed retaining walls will resemble the historic retaining walls with improvements to meet current safety requirements and site conditions. The proposed retaining walls will be faced with wood and rise 4 feet above the waterline.

(5) Pedestrian Crossing and Safety

- No pedestrian access will be permitted across the top of gates or on the lock walls.
- To provide a crossing and allow viewing into the lock chamber, recreate the bridge that existed over the lock as described in Section 6B – *Crossings*.
- Install fencing as described under Section 5C(6) – *Amenities* below.

(6) Amenities

Fencing proposed around the Wisconsin River Lock is a custom, fabricated pipe and tube-style railing that is 4 feet high in accordance with AASHTO standards. Historic photographs show this type of railing was used along the retaining wall at Wisconsin and Dewitt Streets. The proposed railing will match the historic style with improvements to meet current safety requirements A photograph of the historic railing is included in Section 6D – *Railing*.



Seating in the Wisconsin Lock area will be provided by using historic period style benches to offer a resting spot for walkers and bikers. Examples of benches are included in Section 6E – *Amenities*. A historic photograph of the Wisconsin River Lock shows a wood slat bench at the entry to the canal.

D. Canal

(1) Navigational Requirements

In the short-term, continuous canoe/kayak navigation of the canal from the Wisconsin to the Fox River will be possible by portaging over the Wisconsin River Levee, around the Wisconsin and Adams Street culverts, and around the remnants of the Fort Winnebago Lock. Insufficient vertical clearance and potentially unsafe flow volumes through Wisconsin and Adams Street culverts do not permit safe navigation. Bar grates will be placed over the upstream end of the Wisconsin and Adams Street culverts to prevent entrance. In the long-term, after removal of these culverts and replacement with bridges, continuous navigation through all four segments will be possible.

(2) Water Flow Requirements

A minimum of 10 cfs inflow is recommended for Wisconsin River stage elevations corresponding to a 90-percent probability of exceedance as described above.

(3) Dredging Requirements

Dredging of the canal will be performed to improve water quality and adequate depth for navigation by canoe or kayak. Target depths will vary from 4 feet at the center of the canal to 3 feet along the edges. This depth profile will provide about 1 foot of "reserve" depth over and above the minimum required to allow for long-term sedimentation.

Dredging will proceed from upstream to downstream starting at the Wisconsin River Levee. Detailed dredging and material handling requirements will be developed in consultation with dredging contractors based on the results of canal sediment testing currently in progress. Conceptually, the anticipated procedures are as follows:

Segment 1:

- Begin dewatering Segment 1 of the canal during early winter by closing the Wisconsin River Levee intake gate, and removing the stoplogs at Adams Street. An additional 1 foot of drawdown can also be achieved by removing the stoplogs at the bypass structure just upstream of the Fort Winnebago Lock. A temporary bulkhead can be placed on the downstream end of the Wisconsin or Adams Street culverts to protect the excavation from backwater inundation.

- Use low contact pressure earthmoving equipment to remove the canal bottom sediments. Create a settling basin area just downstream from the work area using sediment-control barriers. Pump standing water from the work area into the settling basin. If the volume of water from groundwater seepage is substantial, use tight sheet piling to create a barrier downstream of the work area to prevent backwater development.

- Dewater the excavated material on-site, if needed, depending upon its water content, and place and compact behind the new revetment walls.

- Upon completion of excavation from the first area, move the settling basin downstream and begin excavation of the next area. Move progressively down Segment 1 until complete.

Segments 2, 3, and 4:

- Keep the Wisconsin River Levee intake gate closed, but reinstall the stoplogs at Adams Street. Breach the dike adjacent to the whistle tube outlet or siphon water around the Fort Winnebago Lock to fully dewater Segments 2, 3, and 4.

- If possible, use low contact pressure earthmoving equipment where possible and excavate sediment similar to the procedure used in Segment 1.

- Deep, unconsolidated organic silts within Segment 2, due to runoff from residential and industrial areas and the large number of storm sewer outfalls, will probably not permit conventional excavation. If the results of the sediment-sampling tests indicates that wet dredging techniques are more economical in any of these segments, the canal will be allowed to refill.

- Dredging will be accomplished, if necessary, using a hydraulic cutter-head-type dredge. At this time, it is anticipated that on-site dewatering technology can be used such that construction of a large dewatering basin is not necessary. This involves centrifugal or hydraulic filter pressing of the dredge spoils in combination with polymer additives to further tie-up the free water. The dewatered dredge spoils can then be placed behind the new revetment walls. Further dewatering and consolidation is possible by placing the dredge spoils in geotubes behind the revetments and providing a means for water to be pumped or flow by gravity out from behind the walls. Again, design of the dewatering system will be highly dependent upon the grain size distribution of the spoil material.

The goal of this design is to place and compact as much of the dredge material behind the new revetment walls as possible. If hazardous materials are detected during the investigation phase of design or during construction, special waste-handling procedures will be required. Whether or not these materials can be encapsulated on-site will depend on the nature, concentration, and extent of contaminants encountered.

(4) Revetment Walls

In Segments 2, 3, and 4, only scattered posts of the historic timber revetment walls remain along the canal banks above the waterline. Revetment walls installed during the 1980s in Segment 1 are in poor condition. The canal banks are highly eroded and degraded along most of Segment 2. Natural soil slopes stabilized by vegetation are present through most of Segments 3 and 4.

To recreate the historic appearance of the canal, revetment walls will be reconstructed – ultimately along the entire length of the canal on both sides. Segment 1 will be the area of first priority, followed sequentially by Segments 2, 3, and 4. New revetment walls are required to stabilize the canal banks and maintain a 3-foot navigable depth up to the canal edge.

The conceptual plan for a typical revetment wall section is presented in Exhibit 4.

The following features were incorporated into this concept:

- Lightweight plastic or steel sheet piling or concrete beam walls with soldier piles driven to sufficient depth to provide a stable bulkhead wall. Spaced weep (drain) holes may be required to prevent buildup of the water table behind the wall over time. Note that all of these bulkhead wall types will have a non-structural, treated timber fascia above the waterline designed to replicate the historic timber planking. Because the fascia will be in contact with the water and subjected to ice loads, treated wood with an estimated life span of at least 50 years will be used. The structural piling will not be visible from any point at the surface in the final constructed works.

- Use dredge spoils as backfill to minimize hauling and disposal expenses.

- Overlay the dredge spoils with geotextile filter fabric and granular bedding to provide an adequate subbase for the trail. No such bedding layer is required for that side of the canal where no trail is planned.

- Add trail surfacing, shoulders lighting, railings, or other amenities, as required.

E. Canal Outlet Structure

The existing side channel bypass structure (whistle-tube outlet) upstream of the Fort Winnebago Lock has limited hydraulic capacity to lower the canal water levels or discharge flood waters. The lock remnants function as a weir to maintain backwater and pass flood flows through the canal but cannot be used for dewatering the canal. The remnants are also in poor condition structurally, with numerous seepage paths around and through the remnant walls.

Modifications to the side channel bypass structure will be required in conjunction with future reconstruction of the Fort Winnebago Lock. Since the new lock will not be functional for navigation and will not have the ability to regulate water levels in the canal or pass flows downstream, a new spillway structure will be required.

F. Fort Winnebago Lock

In the short-term, the remnants of the Fort Winnebago Lock will continue to be used in their current function as a weir structure. Breaching the dike adjacent to the side channel bypass structure or siphoning water around the Fort Winnebago Lock will be necessary to dewater the canal in Segments 2, 3, and 4. Breaching the dike would require coordination with the Colonial Dames of America and temporary displacement of the Ice Age Trail.

As part of the long-term plans for canal rehabilitation, a non-functional replica of the original Fort Winnebago Lock will be constructed. Surviving remnants of the original lock will be reused to the extent possible. To make use of remains, the reconstructed lock will recreate the composite structure built by the USACE in 1890, which featured stone-filled timber crib walls on a timber base with pine planking along the lock chamber. To prevent water leakage through the walls, a 6-inch concrete facing was placed between the timber cribbing and planking that formed the exterior chamber walls. The lock measured 35 feet by 160 feet.

Appendix C. *Secretary of the Interior's Standards for Rehabilitation*

Appendix C
Secretary of the Interior's Standards for Rehabilitation[8]

The Standards (Department of Interior regulations, 36 CFR 67) pertain to historic buildings of all materials, construction types, sizes, and occupancy and encompass the exterior and the interior, related landscape features and the building's site and environment, as well as attached, adjacent, or related new construction. The Standards are to be applied to specific rehabilitation projects in a reasonable manner, taking into consideration economic and technical feasibility.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

8. Significant archaeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

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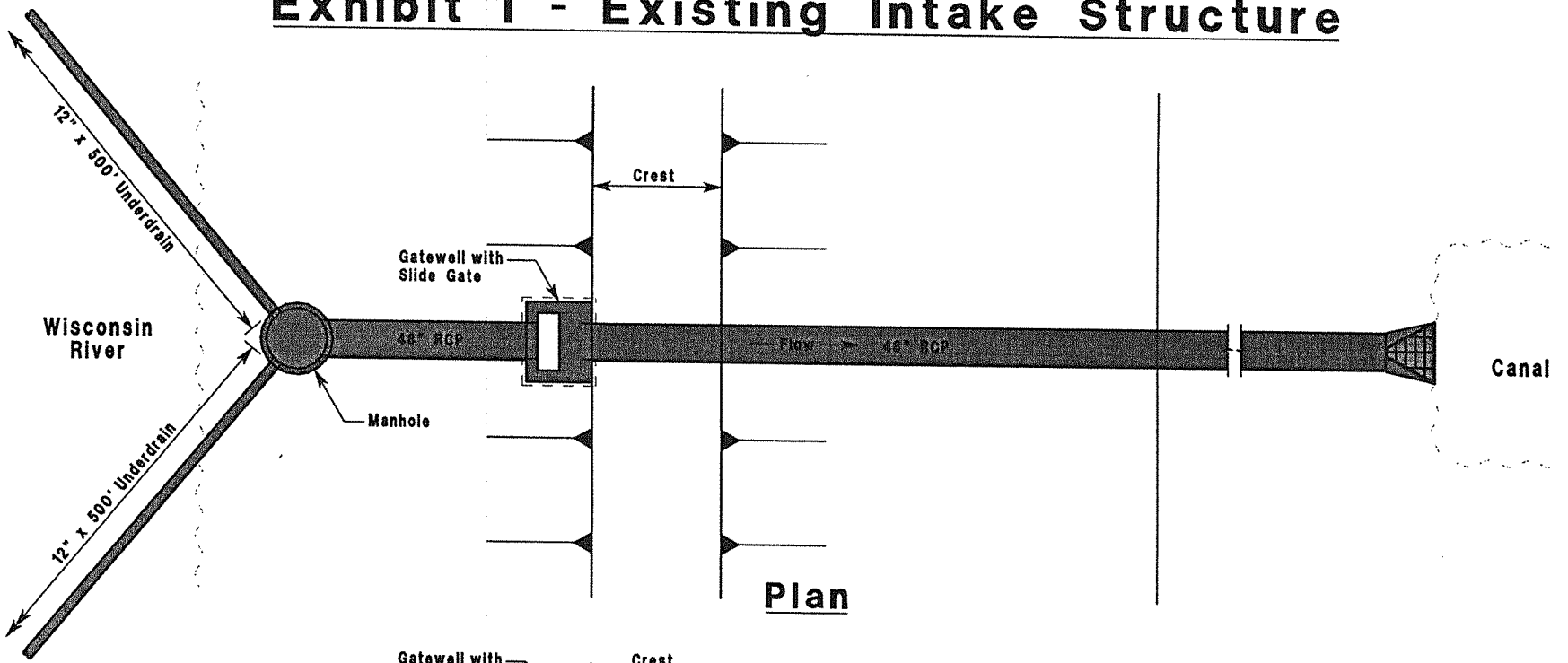
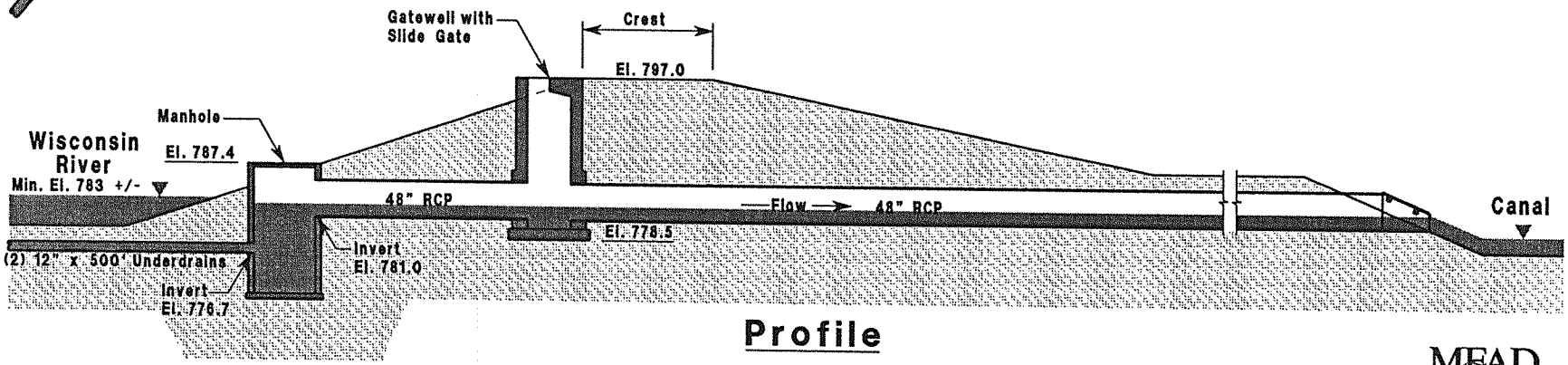
[8] The "Secretary of the Interior's Standards for Rehabilitation," 30 November 2001, <http://www2.cr.nps.gov/tps/tax/rehabstandards.htm> (Accessed 29 August 2002).

Exhibit 1. Existing Intake Structure

Exhibit 1 - Existing Intake Structure



Plan



Profile

MEAD & HUNT

...\COLUMBIA\portage\EXHIBIT1.dgn 02/10/03 03:15:13 PM

N

PROPOSED EDGE OF TRAIL

CONC. RET. WALL

EXISTING R/W

PROPOSED EDGE OF TRAIL

PROPOSED EDGE OF TRAIL

PROPOSED EDGE OF TRAIL

EXISTING R/W

PROPOSED BRIDGE

ASPHALT PARKING LOT

WELL

WELL

WELL

WELL

WELL

3+00

4+00

5+00

6+00

7+00

8+00

41.21 EXISTING EW

35.78 WALL TO WALL

39.6 EXISTING EW

60' PROPOSED EW

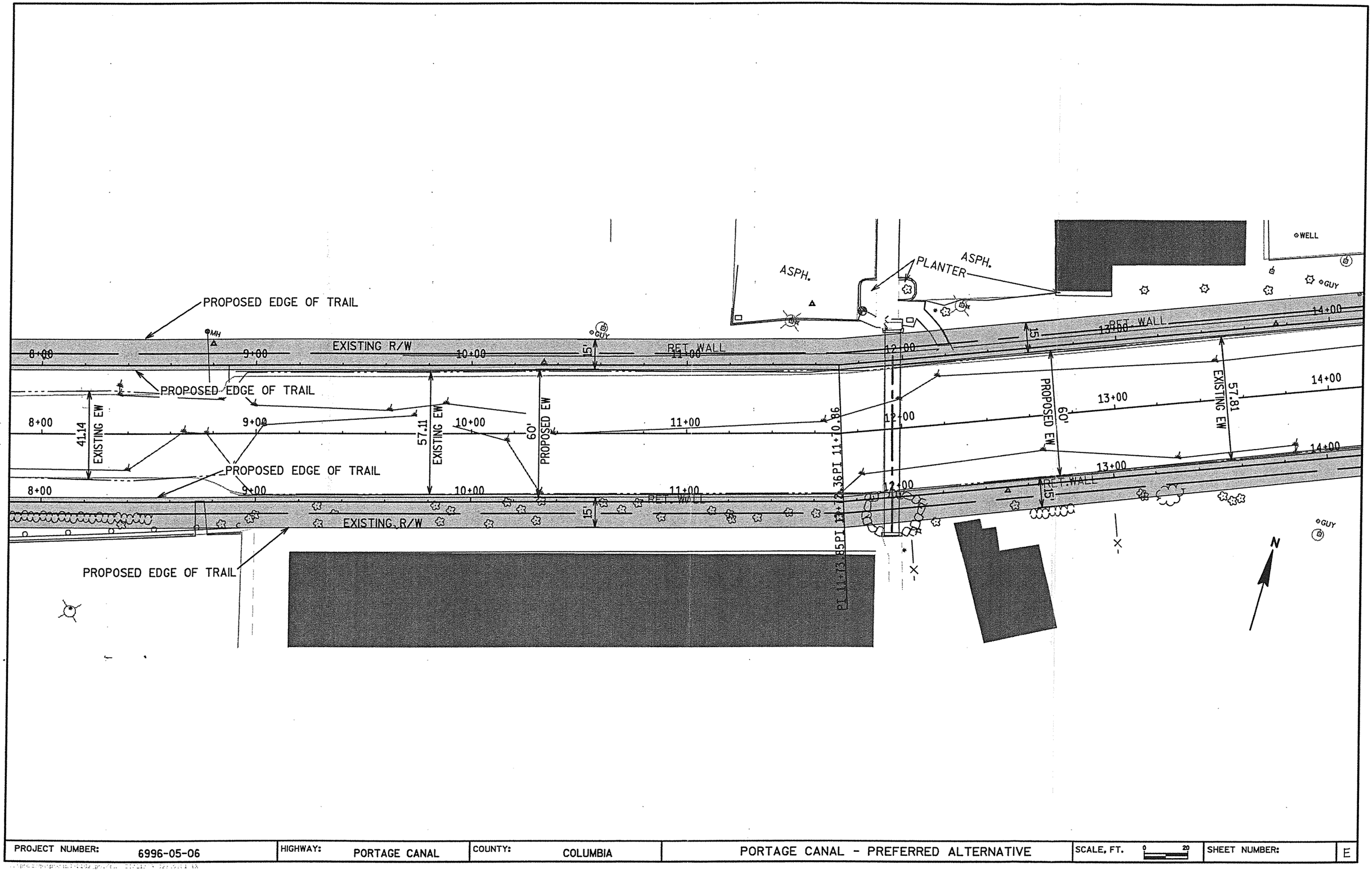
15'

15'

15'

14'

PROJECT NUMBER: 6996-05-06	HIGHWAY: PORTAGE CANAL	COUNTY: COLUMBIA	PORTAGE CANAL - PREFERRED ALTERNATIVE	SCALE, FT. 0 20	SHEET NUMBER: E



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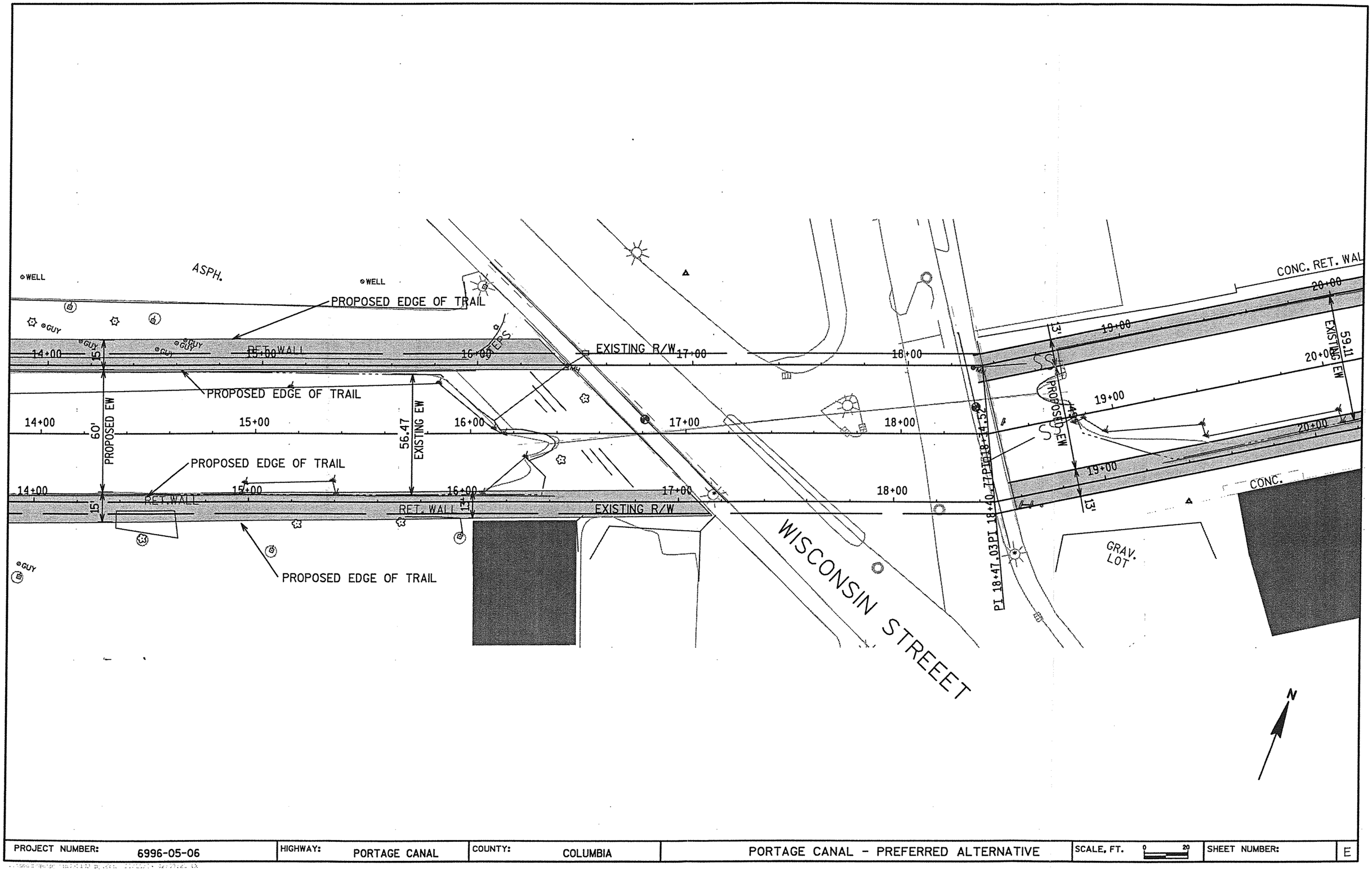

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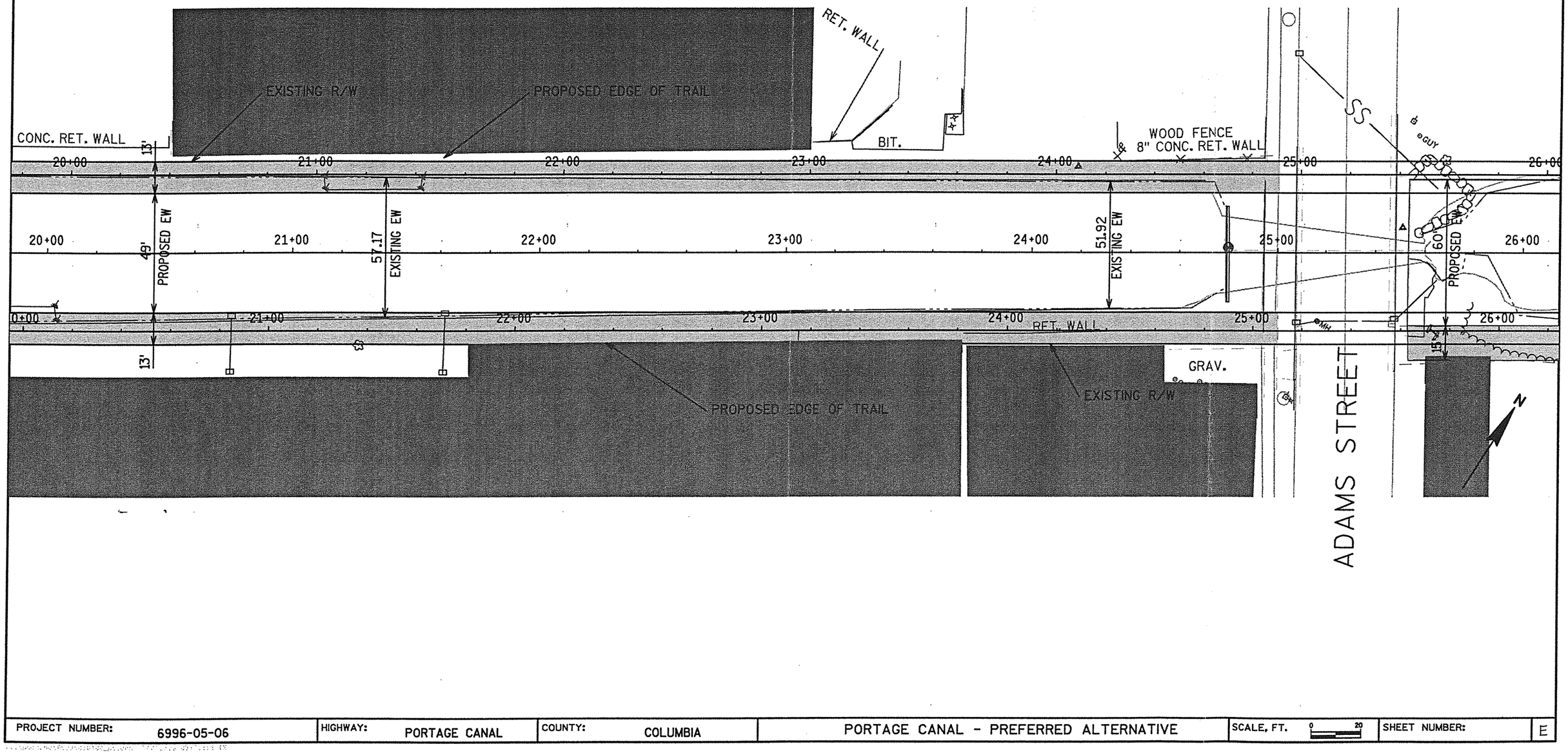


PROJECT NUMBER: 6996-05-06	HIGHWAY: PORTAGE CANAL	COUNTY: COLUMBIA	PORTAGE CANAL - PREFERRED ALTERNATIVE	SCALE, FT. 0 20	SHEET NUMBER: E

N

EXISTING R/W

26+00 27+00 28+00 29+00 IP 30+00 IP 31+00 32+00

60.58 EXISTING EW

60' PROPOSED EW

45.5 EXISTING EW

59.71 EXISTING EW

56.92 PROPOSED EW

12.56

26+00 27+00 28+00 29+00 30+00 31+00 32+00

6+00 27+00 28+00 29+00 30+00 31+00 32+00

PROPOSED EDGE OF TRAIL

15'

OLD FOUNDATION

OLD FOUNDATION

PROPOSED EDGE OF TRAIL

DOG HOUSE FLOOR (CONC.)

IP

IP

SS

LIFT STATION

PROJECT NUMBER: 6996-05-06	HIGHWAY: PORTAGE CANAL	COUNTY: COLUMBIA	PORTAGE CANAL - PREFERRED ALTERNATIVE	SCALE, FT. 0 20	SHEET NUMBER: E

N

EXISTING R/W

32+00 | 33+00 | 34+00 | 35+00 | 36+00 | 37+00 | 38+00

55.50' PROPOSED EW
60.72 EXISTING EW
51.63 EXISTING EW
EXISTING EW 23.43
60' PROPOSED EW
62.63 EXISTING EW

PROPOSED EDGE OF TRAIL

13'

ASPH.

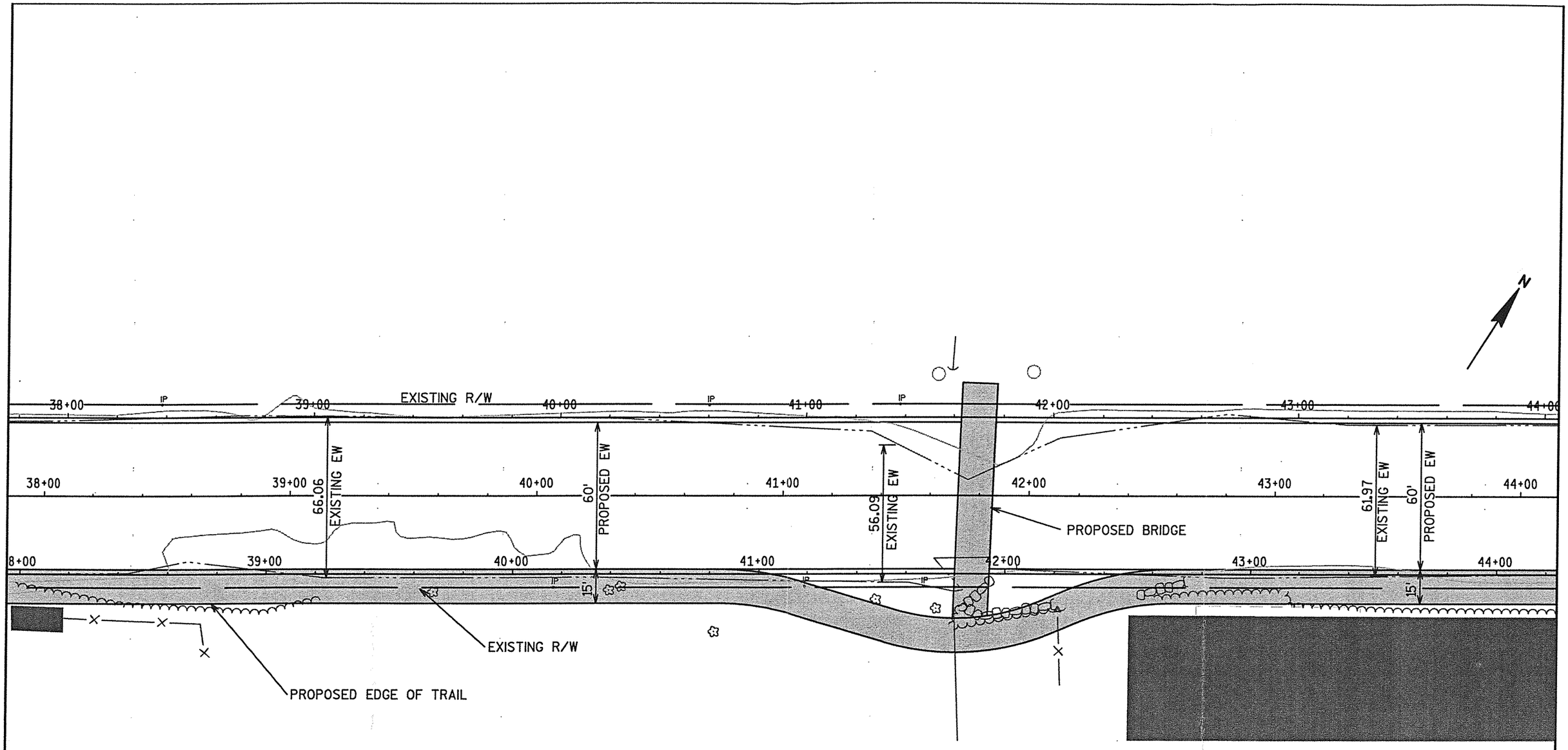
RET.WALL

15'

PROPOSED EDGE OF TRAIL

1/2" STEEL RET."

PROJECT NUMBER: 6996-05-06	HIGHWAY: PORTAGE CANAL	COUNTY: COLUMBIA	PORTAGE CANAL - PREFERRED ALTERNATIVE	SCALE, FT. 0 20	SHEET NUMBER: E



PROJECT NUMBER: 6996-05-06	HIGHWAY: PORTAGE CANAL	COUNTY: COLUMBIA	PORTAGE CANAL - PREFERRED ALTERNATE	SCALE, FT. 0 20	SHEET NUMBER: E

N

EXISTING R/W

44+00 45+00 46+00 47+00 48+00 49+00 50+00

60.19 EXISTING EW

60' EXISTING EW

71.73 EXISTING EW

PROPOSED EDGE OF TRAIL

4+00 45+00 46+00 47+00 48+00 49+00 50+00

EXISTING R/W

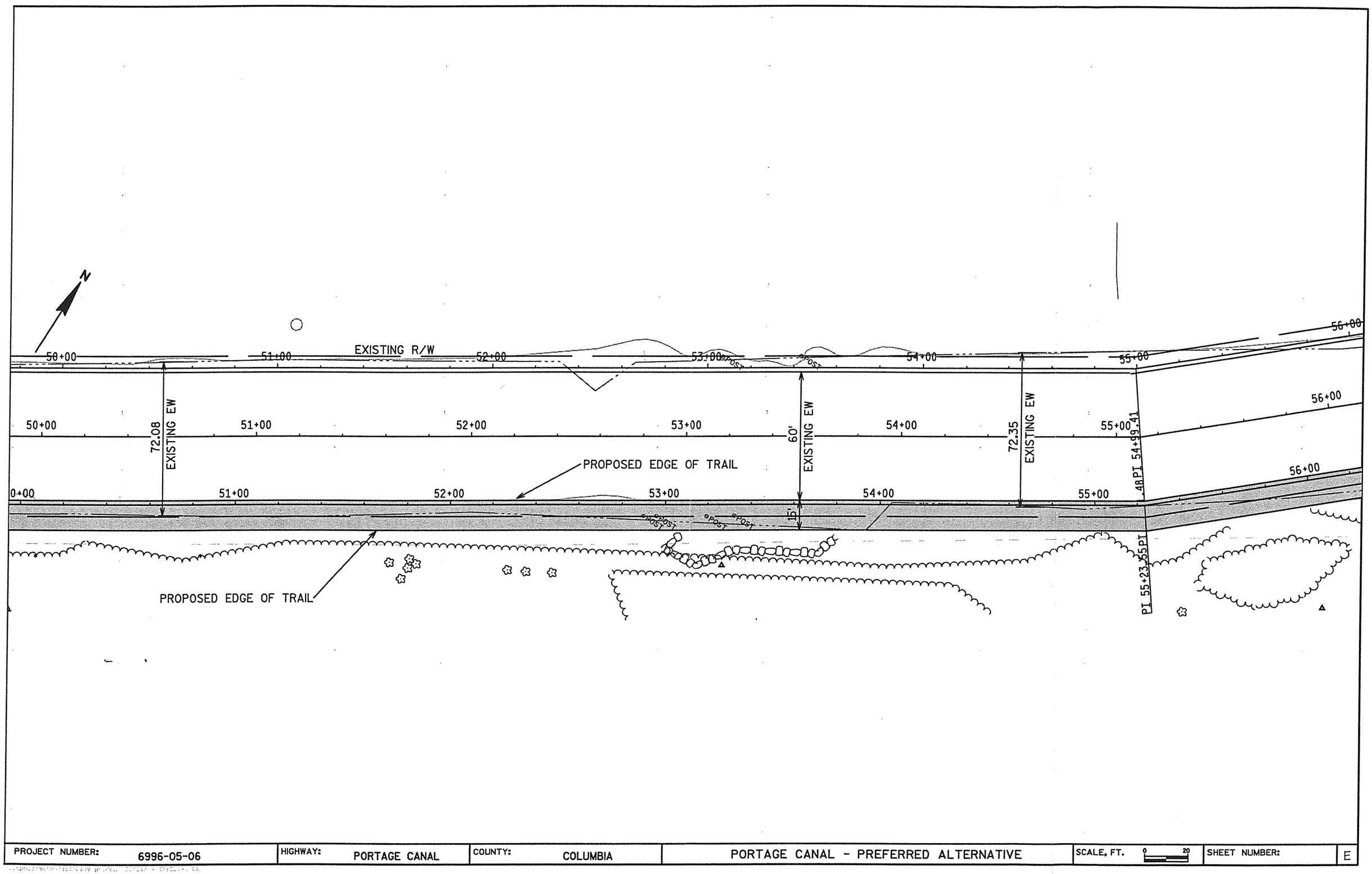
15'

PROPOSED EDGE OF TRAIL

PLANTER

1' HIGH CONC. PAD

PROJECT NUMBER: 6996-05-06	HIGHWAY: PORTAGE CANAL	COUNTY: COLUMBIA	PORTAGE CANAL - PREFERRED ALTERNATIVE	SCALE, FT. 0 20	SHEET NUMBER: E



PROJECT NUMBER: 6996-05-06	HIGHWAY: PORTAGE CANAL	COUNTY: COLUMBIA	PORTAGE CANAL - PREFERRED ALTERNATIVE	SCALE, FT. 0 20	SHEET NUMBER: E

N

EXISTING R/W

56+00 57+00 58+00 59+00 60+00

66.89 EXISTING EW

60' EXISTING EW

65.69 EXISTING EW

PROPOSED EDGE OF TRAIL

56+00 57+00 58+00 59+00 60+00

15'

PROPOSED EDGE OF TRAIL

EXISTING R/W

CANADIAN PACIFIC RAILROAD

PI 60+57.77

3 PI 60+15.10

61+00 62+00

69.75 EXISTING EW

61+00 62+00

61+00

IP

MATCH EXISTING TRAIL

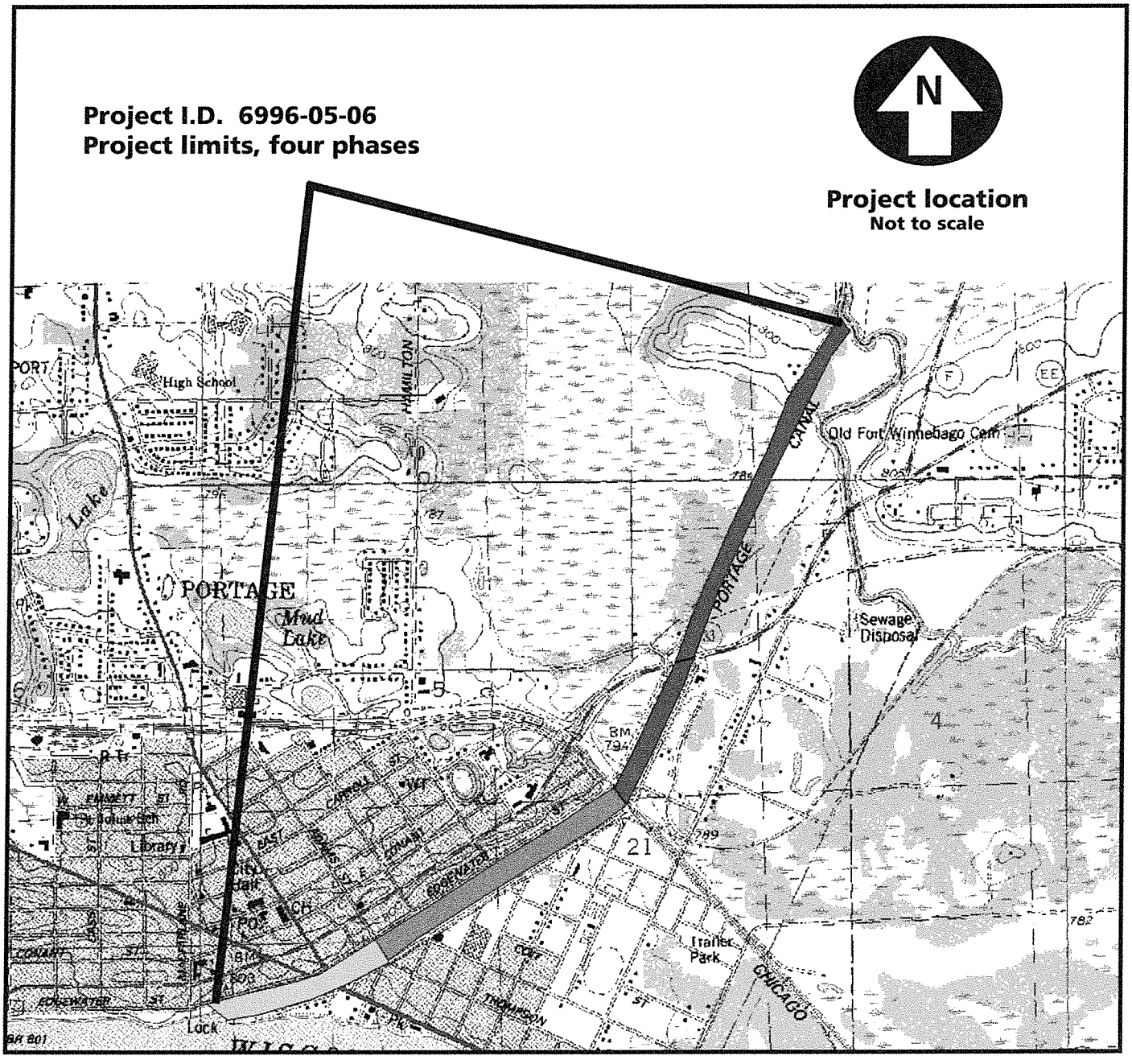
PROJECT NUMBER: 6996-05-06	HIGHWAY: PORTAGE CANAL	COUNTY: COLUMBIA	PORTAGE CANAL - PREFERRED ALTERNATIVE	SCALE, FT. 0 20	SHEET NUMBER: E

Appendix A. Project Location Map

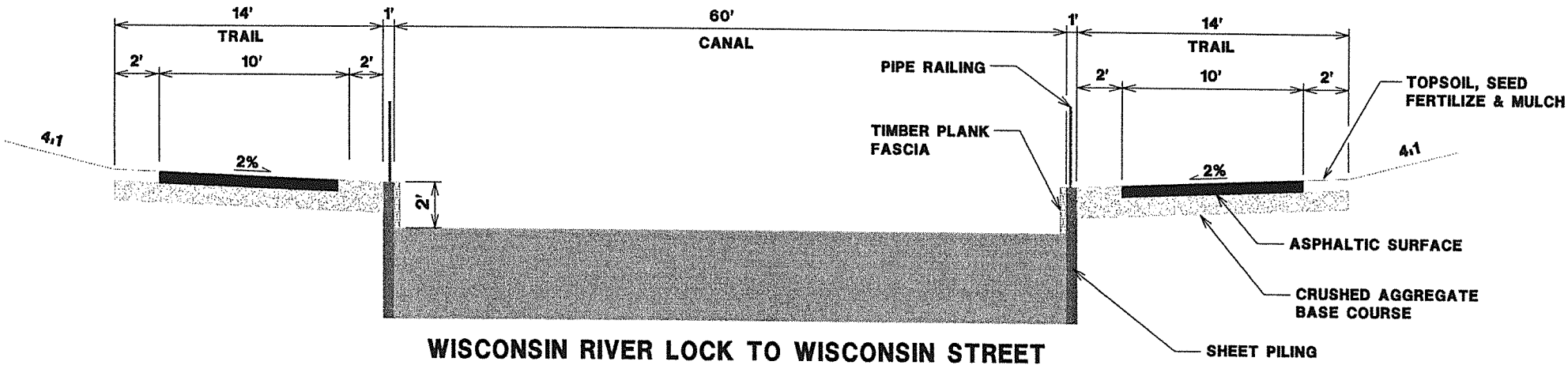
Project I.D. 6996-05-06
City of Portage, Columbia County

MEAD & HUNT

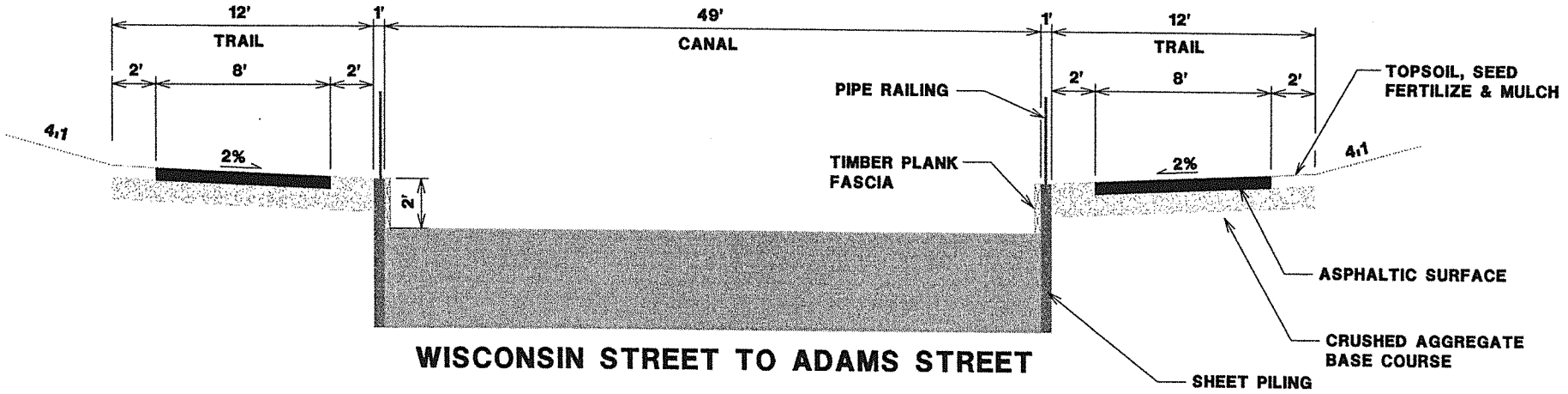
Portage Canal Restoration and Trail Construction



Appendix B. Preferred Alternative Conceptual Project Plans



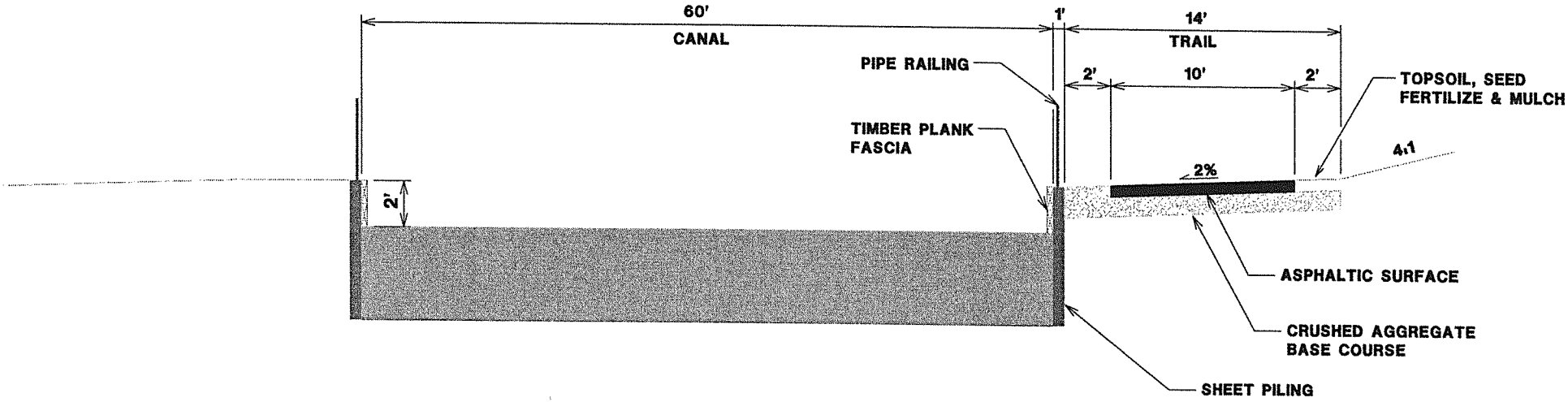
WISCONSIN RIVER LOCK TO WISCONSIN STREET



WISCONSIN STREET TO ADAMS STREET

PREFERRED ALTERNATIVE

MEAD & HUNT



ADAMS STREET TO THE CANADIAN PACIFIC RAILROAD BRIDGE

PREFERRED ALTERNATIVE

MEAD & HUNT

6. Bicycle/Pedestrian Trail

The trail will be designed to AASHTO standards for use by non-motorized modes of traffic, including bicycles and pedestrians.

A. Trail Design Details

Segment 1 (Wisconsin River Lock to Adams Street)

A two-way traffic trail to accommodate bicycles and pedestrians will be constructed on each side of the canal in Segment 1. An asphalt-surfaced trail with gravel along the canal and turf on the outside shoulder is proposed. From the Wisconsin River Lock to Wisconsin Street, the trail will be 10 feet wide with 2-foot shoulders on the north bank. On the south bank, the trail will be 10 feet wide with 2-foot shoulders, but will narrow to 8 feet as it nears Wisconsin Street due to building constraints. The 8-foot-wide trail meets AASHTO standards; however, a 10-foot width is recommended unless special circumstances warrant a narrower trail and it can be used safely. The 8-foot trail is recommended in this case to minimize fill in the canal and right-of-way acquisition.

Construction of the trail will require some fill material, which will be provided by the sediments dredged from the canal. After reaching the appropriate elevation with the fill material, a gravel layer will be placed and compacted, which will form the base for the asphalt pavement. An approximate 500-foot-long by 4- to 6-foot-high retaining wall will need to be constructed along a portion of the north side of the north trail. This portion of the trail will pass under an existing pedestrian bridge and when it connects with Wisconsin Street, it travels south to a pedestrian crossing.

On both banks of the canal from Wisconsin to Adams Streets, the trail will be 8 feet wide with 2-foot shoulders due to building constraints. The trail continues on the south side of the canal only for the remaining length of the project. The outside shoulder will consist of turf and the shoulder next to the bulkhead will be gravel. In this segment, railing is proposed between the trail's shoulder and water's edge to meet federal safety standards. The construction methods used will remain the same as the portion of the canal from the Wisconsin River Lock to Wisconsin Street.

Segment 2 (Adams Street to the Canadian Pacific Railroad)

After Adams Street, the two trails join together on the south side of the canal to form a single, two-way traffic trail. A trail will not be constructed on the north side of the canal for the remaining length of the project. This portion of the trail will generally consist of a 10-foot-wide, asphalt-paved surface with a 2-foot shoulder on each side. Adjacent to Samuels Recycling and under the Canadian Pacific Railroad Bridge, the paved trail narrows to 8 feet to minimize encroachment into the canal. The

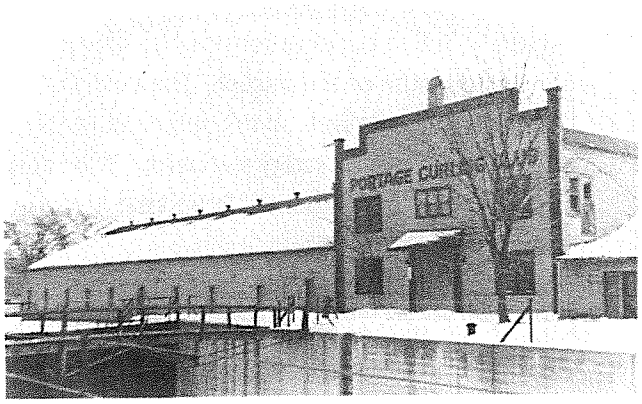
outside shoulder will consist of turf and the shoulder next to the bulkhead will be gravel. In this segment, railing is proposed between the trail's shoulder and water's edge to meet federal safety standards. The construction methods used will remain the same as Segment 1. Small retaining walls will be constructed at various locations along the side of the trail away from the canal in order to better match the existing ground.

Segments 3 and 4

A trail already exists along the south side of the canal in Segments 3 and 4. The trail in Segments 3 and 4 will follow the route and location of the current trail. The trail in Segment 3 currently has a turf surface and the trail in Segment 4 has a crushed-granite surface. The trail in these two segments will be graded to provide a smooth riding surface and sufficient sight distance. The gravel base will be placed and then paved with asphalt. The trail will consist of a 10-foot-wide, asphalt-paved surface with 2-foot turf shoulders. The trail will be far enough away from the edge of the canal that a railing will not be needed in these segments. The trail will travel under the STH 33 Bridge without encroaching on the canal. Currently, the Colonial Dames of America own the property that the Segment 4 trail travels through and negotiations will need to be conducted with them in order to make improvements to the trail.

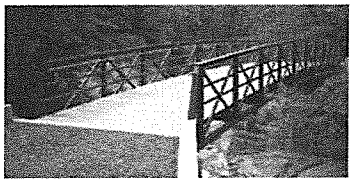
B. Crossings

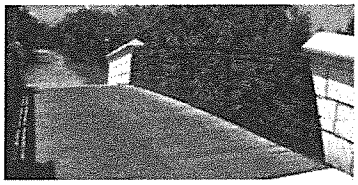
Two bridges will be constructed over the canal as part of this project. Each bridge will be a clear-span structure and will match the preferred trail width of 14 feet (10-foot-wide traveling surface and 2-foot shoulders).



The first bridge will be constructed over the Wisconsin River Lock, allowing trail users to access Point Park and the Top O' the Levee Trail by way of Lock Street. This crossing will also give visitors an opportunity to view the lock chamber. There is a historical precedent for a bridge at this location. A curling club building was located on the south side of the lock and, between 1913 and 1945, a bridge existed across the lock to provide access to this building. The proposed bridge across the lock will be fabricated to closely resemble the curling club bridge so that historical integrity is maintained. This bridge will need to be designed and fabricated. The proposed bridge will utilize the lock walls as a foundation.

The second bridge will be constructed in Segment 2 and will connect the trail with Hamilton Street. This crossing will provide access to the trail for residents in neighborhoods on the city's northeast side. This bridge will be fabricated to closely resemble existing bridges over the canal, including the foot bridge and the snowmobile bridge. The trail will move away from the canal to connect with the south end of the bridge. New abutments with deep-pile foundations will be constructed on each canal bank and the prefabricated bridge will be placed on the abutments.





C. Retaining Walls

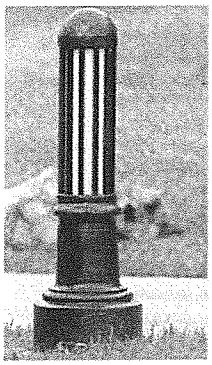
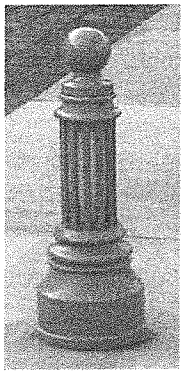
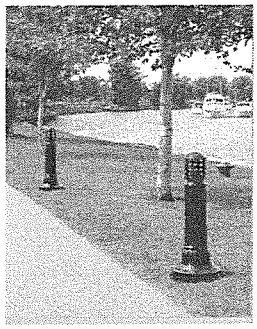
Retaining walls are proposed at several locations along the trail. A modular concrete-block retaining wall with a rough face that resembles stone is proposed. A stone retaining wall existed historically along the north side of the canal at Wisconsin and Dewitt Streets, in proximity to the location of the proposed 500-foot-long by 4- to 6-foot-high wall. A photograph of this wall is included in the Railing description below.

D. Railing

Locations along the trail that require a rail are described in Section 6A – *Trail Design Details*. A custom-fabricated pipe and a 4-foot-high, tube-style railing in accordance with AASHTO standards is proposed. The historic photograph used in Section 6C – *Retaining Walls* above shows this type of railing along the retaining wall at Wisconsin and Dewitt Streets. The proposed railing will match the historic style with improvements to meet current safety codes.

E. Amenities

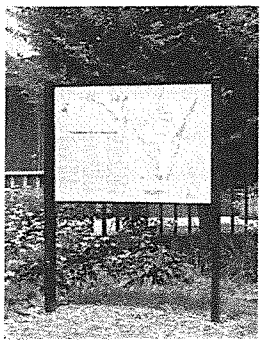
(1) Lighting

Historic period bollard-style light fixtures should be used to accommodate evening use of the trail and enhance safety. Light fixtures should provide house-side shields to minimize light spillage onto adjacent private property. Light levels should be keep to a minimum and should incorporate HPS (high-pressure sodium) lamp bulbs. Examples of bollard-style light fixtures are shown above.

(2) Signage

Three types of signage are recommended adjacent to the locks and trail – interpretive signs, way-finding directional signs, and regulatory signs. Ice Age Trail markers and interpretive signs should also be incorporated into the overall signage for the canal.



Vertical Interpretive Sign Example

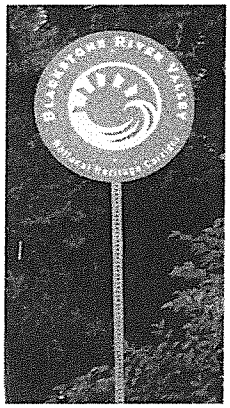
Angled Interpretive Sign Example

Kiosk Style Interpretive Sign

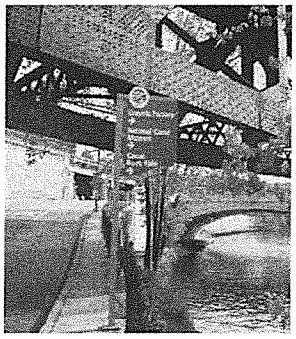
Interpretive signs would tell the story of the canal's history and engineering, and its significance to the City of Portage and the State of Wisconsin. These signs could include photographs, drawings, maps, and/or text. They make the trail an educational experience that can be enjoyed by users of the trail.

Way-finding directional signs offer the convenience of directing trail users to public destinations such as historic sites that are accessible from the trail.

Regulatory signs to encourage safe use of the trail may also be required.



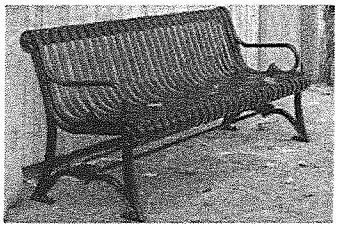
Trail Marker Example

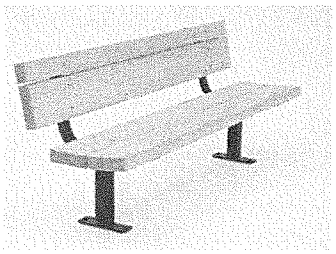


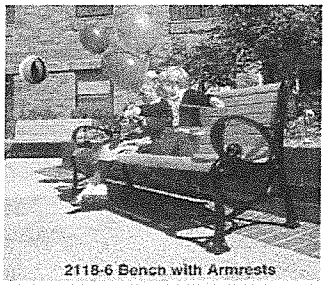
Directional Sign Example

(3) Seating

Historic-period benches could be placed along the trail to offer occasional resting spots for walkers and bikers. Retaining walls may provide other seating options.







7. Vehicular Bridges

Construction of structures over the canal in the future should be limited to the following locations, which are either existing or currently proposed:

Location	Type	Existing or Proposed Location
Over Wisconsin River Lock	Bicycle/pedestrian	Proposed
East of Riverwood Apartments	Bicycle/pedestrian	Existing
Wisconsin Street	Bicycle/pedestrian	Existing
Adams Street	Bicycle/pedestrian	Existing
Hamilton Street	Bicycle/pedestrian	Proposed
Canadian Pacific Railroad Bridge	Railroad	Existing
STH 33	Vehicular	Existing
North of STH 33	Snowmobile	Existing[6]
Over Fort Winnebago Lock	Pedestrian	Existing

The design for the proposed bicycle/pedestrian structures over the Wisconsin River Lock and at Hamilton Street is described under Section 6B – *Crossings.*

If an existing structure is to be replaced, the design of the replacement bridge should follow the standards set forth in the *Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines for Rehabilitating Historic Buildings.*[7] These standards are included in Appendix C. Any new bridge should accommodate pedestrian and bicycle traffic.

The existing structures at Wisconsin and Adams Streets are culverts. Replacement structures should be open-span bridges that allow for the passage of small watercraft, including canoes and kayaks. If space permits, the open spans should be designed to accommodate passage of the trail underneath with a minimum 8-foot vertical clearance.

[6] This structure was approved by the Portage Canal Society and City of Portage in 2002 and was constructed in winter 2003.

[7] U.S. Department of the Interior, National Park Service, 1992.

As owner of the canal, the WDNR is responsible for issuing permits for the construction of structures over and/or within the boundaries of the canal. The WDNR must consult with the Wisconsin Historical Society (WHS) prior to issuing permits to determine whether the society has a concern about the proposed construction. As stipulated by the WDNR, the Chapter 30 process will need to be followed for the construction of piers or docks in the canal.

8. Community Opportunities

With its location near the interstate and its access to a number of highways, the City of Portage is positioned at the nexus of an important transportation link for businesses and tourists. The current population is approximately 9,500, with a service area population of 45,000. The population of Portage is on the rise, growing 13.5 percent from 1990 to 2000. As the county seat for Columbia County, Portage offers many employment, retail, and recreational opportunities. The city is also the link between two major waterways, the Fox and Wisconsin Rivers, and has a wealth of important historical sites and places of interest. The city completed a charette project this year. This section outlines opportunities that exist for the community to maximize linkages between the Portage Canal Project and tourism, recreation, and economic development. These opportunities should be drawn upon in seeking additional funding, as discussed in Section 9 – *Future Funding*.

A. Tourism

With its location between two major waterways, Portage and the Portage Canal are key components of the Fox-Wisconsin National Heritage Waterway Corridor. Many historic sites and places of interest are in close proximity to the Portage Canal and will benefit from increased usage of this corridor. These include:

- Portage Retail Historic District (along East and West Cook Street west of Main Street and adjacent portions of Dewitt and Wisconsin Streets).
- Indian Agency House and Surgeon's Quarters of Fort Winnebago.
- Ice Age National Scenic Trail.
- Museum at Portage.
- Zona Gale House and Center.
- Henry Merrell House.
- Society Hill Historic District.
- Portage Industrial Waterfront Historic District (at 106, 107, and 131 East Mullett Street).

Events also draw residents and tourists to the vicinity of the Portage Canal.

- The Columbia County Fair is held each July at the fairgrounds two blocks south of the canal and features grandstand shows, fireworks, food, games, and other entertainment.
- The Canal Days Celebration features entertainment, a parade, and other canal-inspired events.
- Other community events, such as the Farmer's Market, Arbor Day Celebration, Friendship Village Celebrates Zona Gale, Taste of Portage, and outdoor concerts, are held during the summer months.

(1) Zona Gale Center

Featuring plays, concerts, and art exhibits, the Zona Gale Center offers something for area residents and tourists alike. The center is dedicated to the enhancement and cultural growth of those living in Portage and surrounding communities. The center has been developed for, and is used by, citizens and organizations sharing the goal of making life in this area a rich and rewarding experience. The Zona Gale Center was named for Zona Gale Breese, a Pulitzer Prize-winning playwright and author who was born and raised in Portage.

Located on the east edge of the downtown businesses district at the corner of East Cook Street (Highway 33) and Adams Street, the center occupies a building that was one of Portage's oldest churches. It is only one block north of the historic Portage Canal and across from convenient parking in the Market Square lot. The Center consists of an auditorium, an art gallery, rehearsal, and meeting rooms. Regular events include the Performing Arts Series, Gallery Exhibits, Zona Gale Young People's Theatre, and Gale Singers.

The Center is owned and managed by the Portage Center for the Arts, Inc., a nonprofit charitable organization formed in 1986. The Center receives broad community support. In addition to individual, group, and memorial donations, the Center receives funds from the City of Portage, sponsorship of performances by area businesses, and grants from foundations and the Wisconsin Arts Board.

B. Recreation

Recreation and enjoying the outdoors are a large part of life in Wisconsin. The canal corridor provides a valuable link to existing recreational trails, areas, and facilities, as well as to Portage's 18 city parks. Canoeing, boating, biking, birdwatching, hiking, snowshoeing, cross-country skiing, ice skating, snowmobiling, swimming, and fishing, are just some of the recreation opportunities available to Portage area residents and visitors in and around the canal. The Portage Canal and Marquette Segments of the Ice Age National Scenic Trail offer views of Wisconsin's glacial landscape, as well as a way to experience the canal. From the trailhead at Pauquette Park, which also features an ice-skating rink, the Ice Age Trail follows the canal until it crosses the footbridge over the Fort Winnebago Lock. Other trails that cross or connect to the canal include the Columbia County Bikeway and the Columbia County Snowmobile Trail. In addition, a bicycle and pedestrian path sits atop the Wisconsin River Levee.

Boating, canoeing, fishing, and swimming can be enjoyed on the Wisconsin and Fox Rivers. The canal itself provides fishing and canoeing opportunities. Other lakes in the area include Lake Wisconsin; Lake Columbia; the Big Slough; Lake Mason; Swan Lake; and Silver Lake, which also has a beach. The canal corridor will also provide a link to people visiting other natural areas in the vicinity, including the French Creek Wildlife Area, Lost Lake State Natural Area, Pine Island Wildlife Area, Swan Lake Wildlife Area, Baraboo River Wildlife Production Area, Governor's Bend Park, Lake George Park, and Owen Park.

The Rustic Road system was created to help preserve what remains of Wisconsin's scenic, lightly traveled country roads. Rustic Road 69 (Agency House Road) travels along the canal. The road leads to the historic Indian Agency House and connects with the Ice Age Trail.

C. Economic Development

Transportation corridors and location are key ingredients in Portage's appeal to business and industry. Interstate Highways 90/94 and 39 lie just 4 miles from the city limits. Travelers from Milwaukee, Chicago, and the east can continue on I-90/94 to the Twin Cities and points west, or choose I-39 for industrial destinations on the upper Wisconsin River or northern Wisconsin vacation destinations. Other major transportation routes cris-crossing the city include U.S. Highways 51, 16, and 151, and STHs 22, 33, 60, and 78. Portage lies 175 miles from Chicago, 121 miles from Green Bay, 98 miles from Milwaukee, 32 miles from Madison, and just 16 miles from Wisconsin Dells.

The Portage Municipal Airport serves private and chartered planes and plans are being developed for a new, larger municipal airport north of the canal. The Dane County Regional Airport (served by American, Midwest Express, Northwest, United, and TWA) is just 35 minutes from Portage. Portage is located on the Canadian Pacific Rail mainline, and is also a designated Amtrak station.

Approximately 183 businesses are located in the 30-block downtown core of the city. Sixty-five percent of downtown commercial buildings are owner-occupied, and 35 percent are rental. Portage also has a strong manufacturing and industrial base, including a full-service industrial park. The largest employers in Portage include:

- Divine Savior Hospital and Nursing Home
- Associated Milk Producers, Inc.
- Penda Corporation
- Tri-Enda Corporation
- Portage Public Schools
- Cardinal FG
- Columbia Correctional Institute
- Saint Gobain (Mox Med)
- Spartech Plastics
- Rayovac Corporation
- Columbia Generating

Three organizations work to foster constructive economic development activities in the community:

Portage Area Chamber of Commerce
139 West Cook Street
Portage, WI 53901
www.portagewi.com

Provides leadership for building a healthy economy and high quality of life in the Portage area; serves businesses, individuals, and organizations, and hosts a year-round visitors bureau.

Columbia County Economic Development Corporation
311 East Wisconsin Street, Suite 108
Portage, WI 53901
www.ccedc.com

Advertises available business and industrial sites, provides technical assistance, and financial sources for new businesses.

Portage Area Economic Development Corporation
P.O. Box 276
Portage, WI 53901
Telephone: 1-800-474-2525

(1) Main Street Program

The Main Street Program is a comprehensive revitalization program designed to promote the historic and economic redevelopment of traditional business districts in Wisconsin. The Department of Commerce selects communities to join the program. These communities receive technical support and training needed to restore their Main Streets to centers of community activity and commerce. The results in Wisconsin have been impressive. Wisconsin Main Street Programs have brought significant numbers of new businesses and jobs to their respective downtowns. Facade improvements and building rehabilitation projects have upgraded the image of Main Street. Promotional activities bring the community together in a positive way. Portage recently hired a Downtown Manager and is planning to apply for the program in 2003.

The Wisconsin Main Street Program advocates restoration of the historic character of downtown while pursuing traditional development strategies such as marketing, business recruitment and retention, real estate development, market analysis, and public improvements. There are no quick-fixes for declining downtowns, but success can be realized through the comprehensive and incremental approach of the Main Street Program.

Four elements combine to create this well-balanced program:

- *Organization* involves building a Main Street framework that is well represented by civic groups, merchants, bankers, citizens, public officials, and chambers of commerce. Everyone must work together to renew downtown. A strong organization provides the stability to build and maintain a long-term effort.

- *Design* enhances the attractiveness of the business district. Historic building rehabilitations, street and alley clean-ups, colorful banners, landscaping, and lighting all improve the physical image of the downtown as a quality place to shop, work, walk, invest in, and live. Design improvements result in a reinvestment of private and public dollars into the downtown.

- *Economic restructuring* involves analyzing current market forces to develop long-term solutions. Recruiting new businesses, creatively converting unused space for new uses, and sharpening the competitiveness of Main Street's traditional merchants are examples of economic restructuring activities.

- *Promotion* creates excitement downtown. Street festivals, parades, retail events, and image development campaigns are some of the ways Main Street encourages consumer traffic in the downtown. Promotion involves marketing an enticing image to shoppers, investors, and visitors.

9. Future Funding

A. Introduction

The greatest funding success will be produced by a project that has broad-based appeal to enable it to tap into as many potential programs, grants, investments, and other sources as possible. Additional funding will be required for full implementation of the conceptual design. Funding requests should facilitate integration of multiple-funding program by demonstrating how a partnering effect between funding efforts can be achieved, thereby magnifying the benefits of any one funding source. To this end, the Portage Canal rehabilitation project should be viewed as a part of a larger community and regional initiative rather than as an end in itself. Section 8 – *Community Opportunities* suggests themes and connections that can be pursued in achieving success for a broader initiative. The major contextual themes include heritage tourism, recreation, and economic development. The canal's location within the Fox-Wisconsin Rivers National Heritage Corridor may be an advantage for any funding effort.

B. Grant Planning

Funding organizations typically look for a comprehensive discussion of issues and benefits – the more interest areas that are provided for, the better. They are interested in seeing that the project is the product of broad-based planning, where a complete spectrum of issues and opportunities were considered. To this end, the canal project should be presented as part of a larger plan for economic development, tourism development, community renewal and downtown business district development, and/or regional/state historic resource development. Grant applications should demonstrate that funds invested in the project will produce the maximum amount of feasible benefits to the community, region, and beyond.

To maximize funding success, the project should also show innovation in planning, design, and collaboration. Large and specialized funding organizations like to see that their funds are supporting innovative ideas.

Missions of many major funding organizations include social benefit, ethnic involvement, and economic betterment. Using this project as a spark for economic development and ethnic involvement could be elements of the planning and funding approach for the Portage Canal. Native American habitation in the area and use of the portage provide opportunities to partner with tribes such as the Ho-Chunk.

C. Waterfront Revitalization

Nationally, revitalized and enhanced waterfronts have been very successful in attracting private investment such as restaurants, hotels, housing complexes, and offices within a context of public access, historic preservation, and recreation. Such waterfronts tend to be the focal point and center of vitality in their communities. A project that restores human activity to the Portage Canal would be consistent with its historic role as a center for shipping and recreation. A public/private revitalization strategy could make use of a tax increment finance (TIF) source of funding (see below) with proceeds directed toward canal and other community improvements. To encourage compatible uses along the canal frontage, the city could create special design/project requirements for specific frontage locations. In partnership with private groups, amenities could be provided along the canal and trail such as a restaurant/lodging interface or a rental watercraft concession. Private investment will be important to fully achieve the city's goal of maximizing canal usage.

D. Transportation Enhancement Funds

The Transportation Equity Act for the Twenty-First Century (TEA-21) is intended to meet the challenges of improving safety and protecting and enhancing communities and the natural environment. The act was signed into law on June 9, 1998, authorizing highway, highway safety, transit, and other surface transportation programs until 2003. The Transportation Enhancement (TE)-funding program is included in this law. Congressional committee hearings have begun to reauthorize TEA-21 and TE spending for the 6-year period between 2003 and 2009. TE is one program within the broader federal transportation program.

TEA-21 includes 80 percent federal funding with the remaining 20 percent coming from state or local funds. Local governments have the option of contributing their funds in local dollars (a "hard" match). A "soft" match option allows local governments to provide their portion of funding through three alternate methods:

(1) They can choose to provide the match by applying other federal funds, such as Housing and Urban Development or Environmental Protection Agency money.

(2) They can use a non-FHWA-funded transportation-related expenditure, such as a storm sewer upgrade, as the match.

(3) The value of local and state government services, materials, and land utilized for the project and the costs of preliminary engineering prior to project approval may be credited to the state and local match.

An application for enhancement funds must emphasize the project's relationship to transportation.

Qualifying TE activities include:

- Provision of facilities for pedestrians and bicycles.
- Provision of safety and educational activities for pedestrians and bicyclists.
- Acquisition of scenic easements and scenic or historic sites.
- Scenic or historic highway programs (including the provision of tourist and welcome center facilities).
- Landscaping and other scenic beautification.
- Historic preservation.
- Rehabilitation and operation of historic transportation buildings, structures, or facilities (including historic railroad facilities and canals).
- Preservation of abandoned railway corridors (including the conversion and use thereof for pedestrian or bicycle trails).
- Control and removal of outdoor advertising.
- Archaeological planning and research.
- Environmental mitigation to address water pollution due to highway runoff or reduce vehicle-caused wildlife mortality while maintaining habitat connectivity.
- Establishment of transportation museums.

The best grant applications emphasize multiple enhancements under several qualifying activities. Environmental analysis, project planning and design, land acquisition, and construction-enhancement activities are eligible for funding. The funded activities must be accessible to the general public or targeted to a broad segment of the general public. The Portage Canal project received a funding set-aside through this program and competed unsuccessfully for additional funds in 2002. The city should consider making another application in the next funding cycle.

The application should clearly articulate the need for additional funds by describing how additional funds will build on past accomplishments. The application should also emphasize a broad range of qualifying activities

E. Save America's Treasures

Save America's Treasures grants are managed by the National Park Service, Department of the Interior. Grants must be matched equally with non-federal funds, thus stimulating state, local, and private involvement in projects. Each grant recipient must meet the standards of importance, urgency, educational value, and ability to complete the preservation work. Projects that receive grants can be considered Official Projects of Save America's Treasures.

The National Trust for Historic Preservation works to help Official Projects of Save America's Treasures encourage local preservation efforts, and attract gifts from corporations, foundations, and individuals to support community projects. Save America's Treasures Official Projects designation benefits recipients of federal grants as well. Since the grantees must match the federal award with private funding, Official Projects designation helps these historic sites and collections raise awareness and support. To date, nearly $174 million in public-private funds has been raised under this program.

This program funded about 30 projects in 2002, with six of them directly related to water or shore facility projects. The program emphasizes the reestablishment of activities in projects rather than passive enhancements. For the canal project, this would involve the reestablishment of some element of canal function, if possible. The application process is competitive but Wisconsin has under represented in recent awards. For the best chance of receiving this funding, the city should coordinate its application with the WHS and receive the support of this agency.

F. Land and Water Conservation Fund (LAWCON)

The Land and Water Conservation Fund (LAWCON) has been a cornerstone of conservation and recreation for more than 30 years. Federal and state land managers use the fund to buy land to preserve wilderness, create urban parks, protect trails, and address a host of other conservation and recreation needs. The program was established by Congress in 1964 and authorized at up to $900 million annually. Funded by offshore oil and gas leases, LAWCON appropriations since the early 1980s have been erratic at best. Over the past decade, some funds have been diverted to programs unrelated to conservation and recreation. These funds are administered through the WDNR. Although the program has recently received new federal funding, this may be an unlikely funding source. Projects must be consistent with state and local plans.

G. Economic Development Grants

TIF funding and state/federal business development programs may be available to achieve well-articulated economic development goals. Business development programs involving state and federal funds are usually dependent upon job creation. Federal Housing and Urban Development funds may be available through the Wisconsin Department of Commerce in the form of the Community Development Block Grants. The U.S. Department of Commerce Economic Development Administration public works program may also be considered. Administered through regional planning commissions, this program requires the creation of new jobs in an area meeting unemployment criteria.

(1) Tax Increment Financing (TIF)

This municipal funding program is used commonly by Wisconsin cities. TIF is typically used to fund the public infrastructure associated with projects that create a new tax base and jobs through redevelopment or new business development. Downtown redevelopment and riverfront developments are common uses of TIF funding. The amount of existing TIF funding may create a limitation on new funding projects. For the canal project, TIF funding would require a plan that shows the canal improvements relating to stimulating new business development nearby. TIF revenues usually comes from city bonding. Such funding is sometimes combined with existing or future local option sales tax and/or a lodging tax. This program would be a good approach for funding the redevelopment of properties fronting the canal.

H. Wisconsin Urban Nonpoint Source and Storm Water Grant Program

The State of Wisconsin Urban Nonpoint Source and Storm Water Grant Program provides financial assistance for projects in urban areas to control polluted urban runoff. The grant program is administered by the WDNR. Projects funded are site-specific and are targeted to address high-priority problems in urban areas. The annual deadline for submitting grant applications for the next state fiscal year is April 15. The canal is not currently within a high-priority area but may qualify for this program in the future. Eligible costs covered under this grant are:

- Preparation of storm water management plans.
- Storm water ordinance development and enforcement.
- Related information and educational activities and training.
- Design and construction of Best Management Practices (BMPs), including storm water detention ponds, streambank stabilization, and shoreline stabilization.

Cost sharing is 50 percent for eligible construction activities and up to 70 percent for planning, education, ordinance development, and training. Design activities are reimbursed at 50 to 70 percent, depending upon priority ranking. Local governments can apply, but preference is given to projects within Priority Watersheds.

The Urban Nonpoint Source and Storm Water Grant may not be used to fund:

- Construction site erosion control and post-construction BMPs for new development.
- Projects that are not water quality-based such as drainage or flood-control projects.
- Dredging projects

I. Local Sources

Local sources for program funding include fund-raising, grants from local/regional foundations, and gifts or memorials from private citizens. Local contributions may be enhanced by challenge grants from area industries, benevolent organizations, and/or individuals and families with a history of philanthropy in the community. Regional foundations that have funded historic preservation projects include the Alliant Energy Foundation and the Jeffris Family Foundation. Local funding sources allow the community to show support for the project and provide a supplement to overall project funding.

J. Other Sources

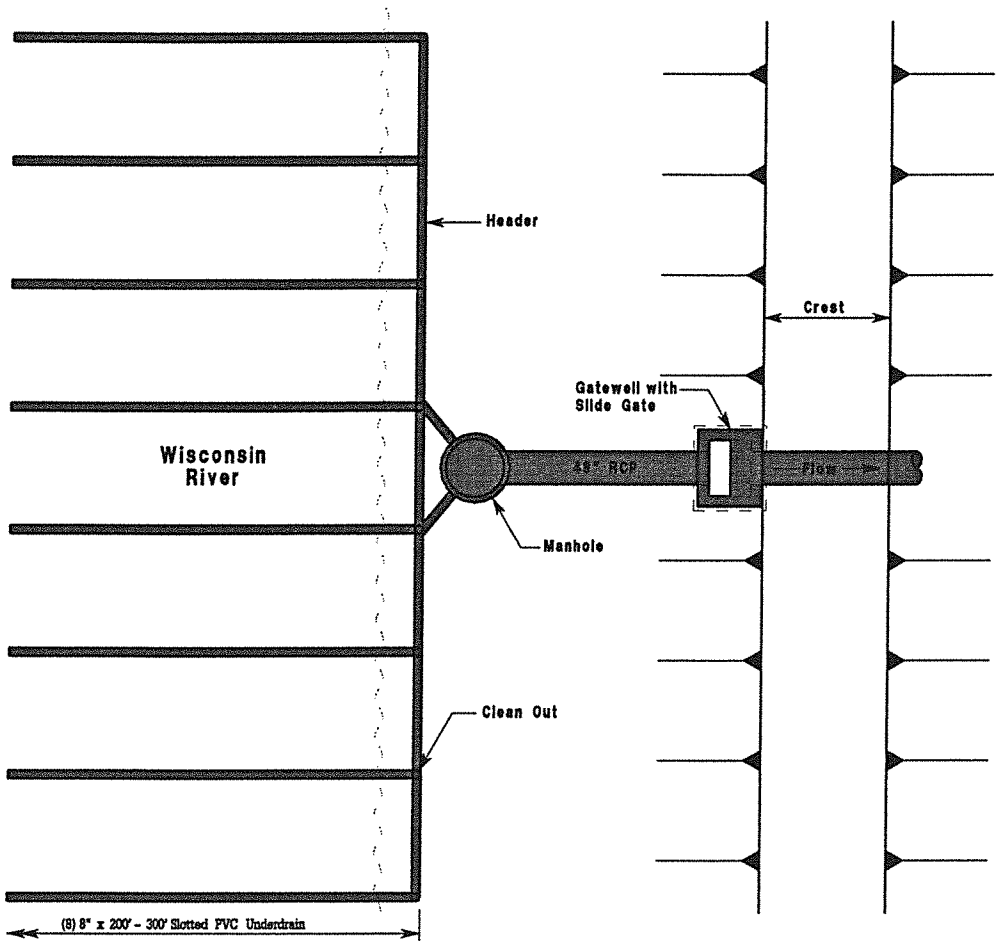
Tribal Funding – The Ho-Chunk Nation has a cultural resources program. The Portage area was within their historic tribal area, and they have shown an interest elsewhere in assisting with efforts that commemorate their heritage.

American Heritage Rivers Program, USEPA – Significant funding has been available through this program; however eligible rivers must be designated for inclusion in the program. The Wisconsin and Fox Rivers would have to be entered into the program.

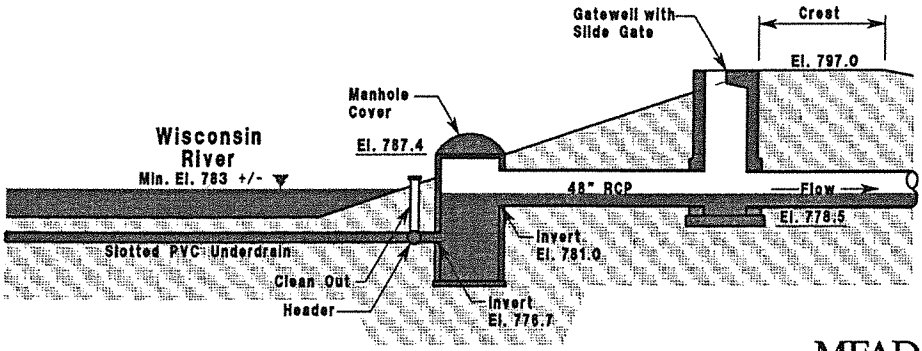
WDNR Programs – In addition to the Recreation Boating Facilities Program from which funding was already received and the Nonpoint Source Program discussed above, other WDNR-funding programs include the Recreation Trails Program, Urban Rivers Grant Program, River Management Grants Program and Municipal Flood Control Grant Program.

Exhibit 2. Proposed Modifications to the Existing Intake

Exhibit 2
Conceptual Modifications to Existing Intake



Plan



Profile

MEAD & HUNT

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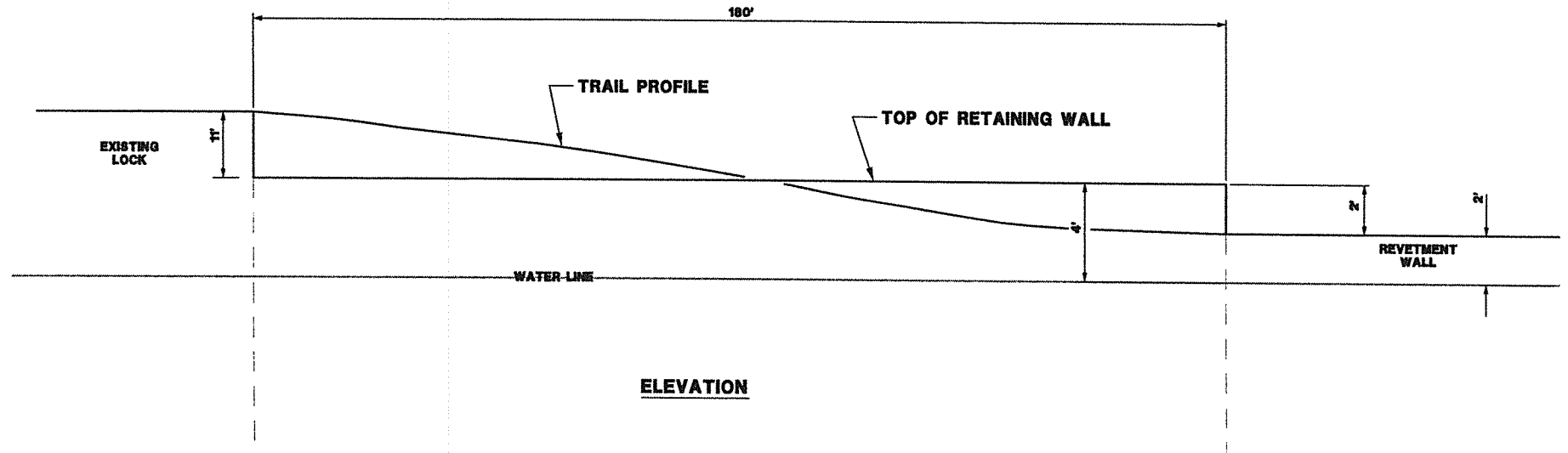
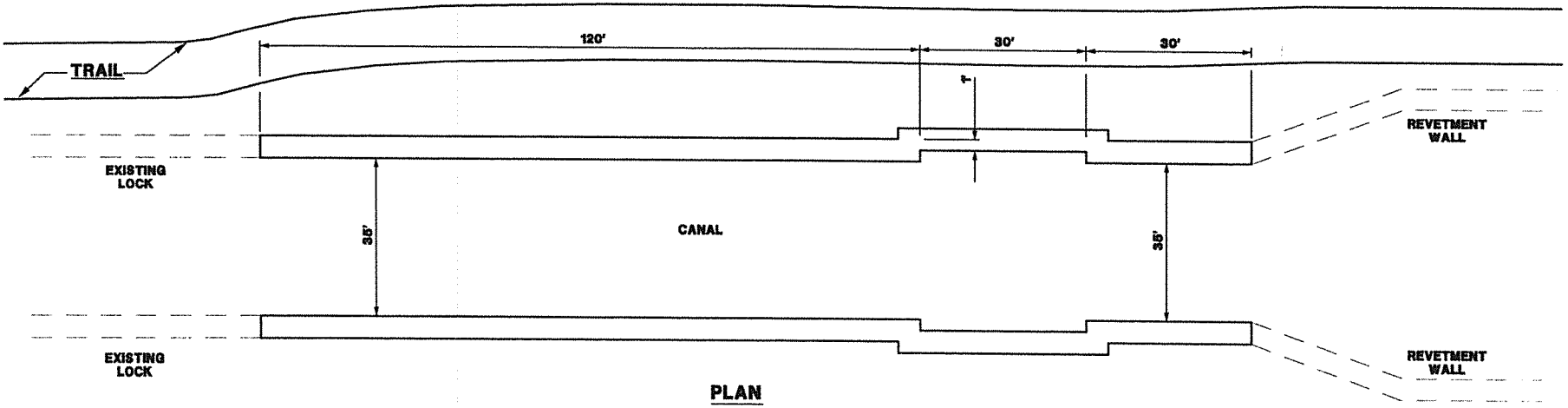
Exhibit 3. Retaining Walls East of the Wisconsin River Lock



ELEVATION



PLAN

Retaining Walls East of Wisconsin River Lock
Exhibit 3

MEAD & HUNT

PROJECT NUMBER: 6996-05-06	HIGHWAY: PORTAGE CANAL	COUNTY: COLUMBIA	EXHIBIT ___	SCALE, FT. 0 10	SHEET NUMBER: ____	E

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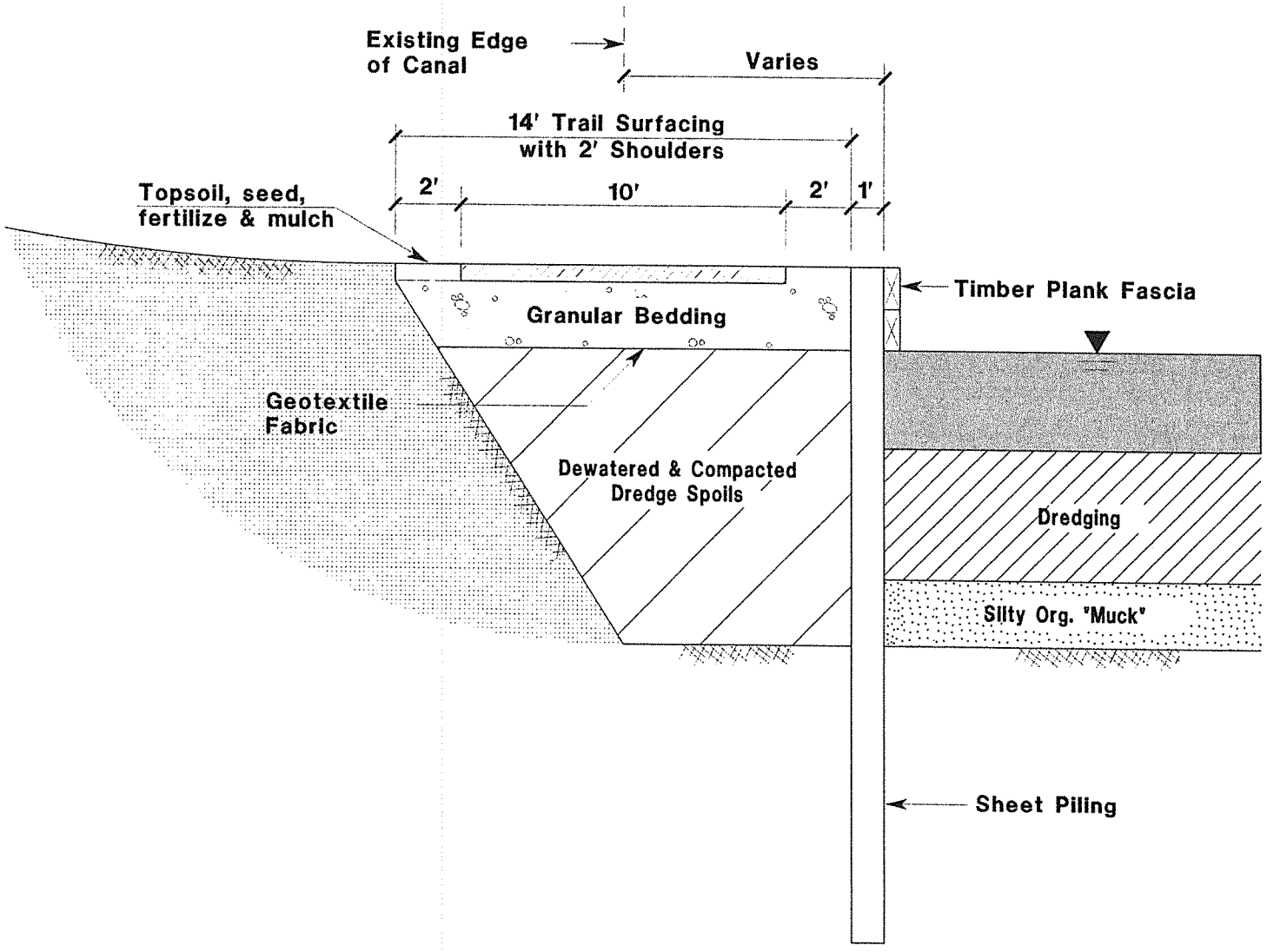
Exhibit 4. Typical Revetment Wall Section



Typical Revetment Wall Section
Exhibit 4

MEAD & HUNT