

FINAL DMMP Report with
Integrated Environmental Assessment

Pool 2 Dredged Material Management Plan

Upper Mississippi River

Hennepin, Ramsey, Dakota and Washington Counties,
Minnesota



**US Army Corps
of Engineers**
St. Paul District

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Executive Summary

The purpose of this Dredged Material Management Plan (DMMP) is to prepare a coordinated, long-term plan for managing material dredged in Pool 2 of the Upper Mississippi River for the continued operation and maintenance of the 9-Foot Channel Navigation Project.

Pool 2 serves as a link between the upstream ports of Minneapolis, St. Paul, the Minnesota River, and the remaining Mississippi River navigation system downstream. Between 2006 and 2015 barge freight through Lock and Dam 2 ranged from 4.7 to 7.4 million tons with an average of 6.8 million tons. The most common commodities hauled are farm products moving from local terminals in St. Paul and on the Minnesota River to the Gulf of Mexico for export. Other commodities include fertilizer, crude materials (sand, gravel, and stone, road salt, scrap metal, etc.), cement, and petroleum products. A modern 15-barge tow transports approximately 26,250 tons, equivalent to 1,050 semi-trucks, or 240 rail cars. In 2015 the 9-Foot Channel Navigation Project generated an estimated \$3 billion of transportation cost savings.

Records of maintenance dredging kept since 1970 show that there are 13 historic channel dredge cuts in Pool 2. Ten of the historic dredge cuts have been dredged since 2000. Approximately 3.65 million cubic yards of material were dredged from the channel between 1981 and 2014. In addition to the channel cuts, historic dredging has been completed at the St. Paul Small Boat Harbor, lock chamber, and access to dredged material placement sites, though volumes generated in these locations are generally marginal.

This DMMP addresses a change in dredged material management needs resulting from increased flows and dredging volumes throughout Pool 2, additional dredging required for increased channel maintenance in Lower Pool 2, and the need to unload three temporary dredged material placement sites in Lower Pool 2 to a permanent location. The selected plan must comply with Corps policy for managing dredged material pursuant to the Federal Standard. The Federal Standard (33 Code of Federal Regulations Part 335.7) for dredged material placement sites is defined as “the dredged material disposal alternative or alternatives identified by the Corps which represent the least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process. . . .”

Evaluation and Selection of Placement Sites

Existing and potential new dredged material placement sites were evaluated using the factors of cost effectiveness, environmental acceptability, and operational feasibility.

Current local land uses were assessed and coordinated with local river interests and land use management representatives to develop a list of more than 20 sites potentially suitable for temporary or permanent placement of dredged material. Once identified, sites were evaluated and placed into one of four categories. The evaluation was based on the study objectives and constraints, which are specified in Section 4.3 of the report. The primary objective is to secure capacity for the dredged material produced in Pool 2 over the next 40 years or more, while fitting within the constraints of least cost, operational feasibility, and environmental acceptability. The four categories that the placement sites were grouped in are:

1. Sites screened from further consideration because they would not meet one or more study objectives, or fit within the identified constraints.
2. Sites that could provide an opportunity for beneficial use of material in the future but were determined to be unsuitable as part of the plan to meet the long-term capacity needs.
3. Sites designated as placement sites in the approved Corps' Channel Maintenance Management Plan and carried forward for potential future use.
4. Sites that were the most promising candidates for fully meeting the study objectives and the Federal Standard.

Eight sites were screened out because of high costs or unacceptable environmental impacts. An additional five sites were screened out, because they didn't meet the DMMP planning criteria, but were identified as having some potential as future beneficial use sites – one-time placements of dredged material to accomplish future projects. Eight sites considered for the Pool 2 DMMP were already identified in the Corps' Channel Maintenance Management Plan (CMMP) with potential environmental impacts discussed in the Corps' 1997 Final Environmental Impact Statement (FEIS) for the 9-Foot Channel Navigation Project, published June 6, 1997. These sites are carried forward as part of the Pool 2 DMMP for continued or potential future use, but for various reasons are not able to fully meet the study objectives.

Two sites were carried forward for detailed analysis as part of the Tentatively Selected Plan (TSP) for the Pool 2 DMMP. One of those sites is an existing active Corps dredged material placement site (Southport), which is identified in the CMMP. The other site is a mining pit located on Lower Grey Cloud Island. This would be a new permanent placement site analyzed here in detail for impacts to natural resources, socioeconomic effects, and operational feasibility.

Increase in Dredging Requirements

Between 1981 and 2014, the average amount of material dredged per year in Pool 2 was approximately 107,000 cubic yards. A sediment assessment was completed in September 2016 to predict future dredging requirements throughout Pool 2. The *Assessment of Pool 2 (RM 815.2–847.6) Sediment Sources and Dredging* (Hendrickson and Libbey 2016) addressed the impact that increasing flow conditions and changes in dredging practices in the Upper St. Anthony Falls (USAF) Pool and Pool 1 will have on channel dredging throughout Pool 2. In summary, dredging requirements throughout Pool 2 are anticipated to increase substantially—to approximately 169,000 cubic yards per year. Therefore, the 40-year target capacity for the Pool 2 DMMP is approximately 6.8 million cubic yards.

Recommendation

The TSP for the Pool 2 DMMP has been identified as the least-costly, operationally-feasible, and environmentally acceptable alternative. The tentatively selected plan is to use two permanent dredged material placement sites: Southport and Lower Grey Cloud Island Pit. The combined sites are capable of accepting material generated from dredging activities throughout Pool 2 for the next 40 years. The Southport site is currently being used successfully for dredged material management, and therefore was included in the TSP as the best location identified for managing material dredged in upper Pool 2. The Lower Grey Cloud Island Pit site is an active aggregate mining pit in close proximity to the dredge cuts in lower Pool 2. Use of this site would be the least cost alternative due to this close proximity. Because it is a deep mining pit, there are few environmental concerns for placing dredged material there. Mining pits typically have little aquatic life, especially in deeper areas most suitable to receive dredged material, and water quality in active pits such as this is affected by mining activities. Also, any suspended sediment resulting from the placement of material there would be contained to the pit, and not affect the adjacent Mississippi River waters.

In addition to the TSP sites there are a number of CMMP-designated sites with limited capacity that could be used on a contingency basis: Highbridge, Holman Field, CF Industries (Dock), CF Industries (Pit), Pine Bend, Upper Boulanger, and Lower Boulanger. Pine Bend, Upper Boulanger, and Lower Boulanger are temporary placement sites; using those sites costs more because dredged material initially placed there must later be moved to a permanent location. While not preferable due to the costs of this double handling, these sites have been used regularly and will be retained for potential future use on a contingency or emergency basis for temporary placement of dredged material once they have been emptied and are the primary alternative to the Lower Grey Cloud Island pit site.

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CHAPTER 1.

Introduction

1.1 Authority

The U.S. Army Corps of Engineers (Corps) is responsible for maintaining a navigable channel on the Mississippi River. Authority for continued operation and maintenance of the Upper Mississippi River (UMR) 9-Foot Channel Navigation Project is provided in the River and Harbor Acts of 1930 and 1932. Original authority for the Corps to work on the Mississippi River was provided in the Rivers and Harbors Act of 1878. In addition, pursuant to Section 1103(i) of the Water Resources Development Act of 1986 (33 U.S.C. § 652(i)), Congress authorized the Corps to dispose of dredged material from the system pursuant to the recommendations of the Great River Environmental Action Team (GREAT) I study, which were implemented, in part, in the Channel Maintenance Management Plan (CMMP). The proposed project is authorized by the referenced legislation, and its purpose is compatible with the annual Operations and Maintenance appropriation.

1.2 Project Location and Study Area

The study area encompasses Pool 2, located between Lock and Dam 2 at river mile (RM) 815.2 near Hastings, MN and extends upstream through St. Paul and Minneapolis to Lock and Dam 1 at RM 847.7. Pool 2 flows through portions of Ramsey, Hennepin, Dakota, and Washington Counties (Figure 1). Plates 1 and 2 show the study area and identify some of the landmarks and local place names referenced in this report.

Upper Pool 2 is situated in the urban area of Minneapolis and St. Paul. Pigs Eye Lake, a 628-acre, shallow backwater lake, situated southeast of St. Paul, is an important feature of Upper Pool 2. The Minnesota River confluence near Fort Snelling is another significant feature of Upper Pool 2; the Minnesota River joins the Mississippi River at RM 844.



Figure 1: Pool 2 Study Area

Lower Pool 2 is situated in an area where the main-navigation channel meanders back and forth across the floodplain. The river is approximately 160 feet below the surrounding upland bluffs. The Upper Mississippi River corridor in Lower Pool 2 includes industrial (e.g., Aggregate Industries), urban, agricultural, and natural (e.g., Spring Lake Park Reserve) landscapes. While much of the floodplain is submerged (e.g., island and sloughs) and exhibits lentic characteristics, vestiges of pre-inundation landforms and habitat remain near the upper portion of the pool. The corridor supports commercial navigation, recreation, industrial water supply, wastewater treatment, and important fish and wildlife habitat. The dominant open water feature in Lower Pool 2 is Spring Lake. The principal features of Pool 2 are identified in Table 1.

Table 1: Principal Features of Pool 2

Length of Pool	Mississippi River	32.5 river miles
	Minnesota River	25.0 river miles
River Mile Limits	Mississippi River	815.2–847.7
	Minnesota River	0.0–25.0
Project Pool Elevation	Mississippi River	687.2 feet
Pool Surface Area	Mississippi River	9,652 acres
Shoreline Miles	Mississippi River	110 miles

1.3 Purpose and Need

This Dredged Material Management Plan (DMMP) is a coordinated, long-term plan for managing dredged material in Pool 2 of the Upper Mississippi River for continued operation and maintenance of the 9-Foot Channel Navigation Project. This plan was initiated for two primary reasons: 1) the Corps’ real estate interest in the Southport placement site in Upper Pool 2 was nearing expiration; 2) the existing capacity of temporary dredged material placement sites in Lower Pool 2 are estimated to be full within a few years, and no permanent placement sites are currently available. In lower Pool 2, the remaining capacity at the temporary placement sites is approximately 250,000 cubic yards. This is estimated to provide at most two years of capacity for dredged material. In upper Pool 2, the Corps has historically held temporary agreements for use of a placement site. A short-term interim agreement has been in place since the agreement expired on 31 December 2017. The limited remaining capacity and the expiration of the agreement contribute to the purpose and need for the Pool 2 DMMP.

The selected plan must comply with Corps policy for managing dredged material pursuant to the Federal Standard. The Federal Standard (33 CFR Part 335.7) for dredged material placement sites is defined as “the dredged material disposal

alternative or alternatives identified by the Corps which represent the least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process. . . .”

The DMMP details how the Corps arrived at its recommendation. It is a formal decision document and an integrated National Environmental Policy Act (NEPA) document in accordance with the Corps’ Planning Guidance Notebook, Engineer Regulation (ER) 1105-2-100. The plan is later used as a tool for routine operations and maintenance.

1.4 Related Studies and Reports

Numerous studies and reports are available for the Upper Mississippi River that include Pool 2. The following studies and projects addressing channel maintenance, resource management, land use, and recreational planning in Pool 2 have the most relevance to this study.

1.4.1 9- FOOT CHANNEL NAVIGATION PROJECT ENVIRONMENTAL IMPACT STATEMENT

This Environmental Impact Statement (EIS) was completed in 1974 and assesses the environmental effects of the operation and maintenance of the 9-Foot Channel Navigation Project within the St. Paul District.

1.4.2 GREAT RIVER ENVIRONMENTAL ACTION TEAM STUDY (GREAT I)

Section 117 of the Water Resources Development Act of 1976 authorized a comprehensive study of the Mississippi River called the “Great River Environmental Action Team I Study”. This study produced a nine-volume report which was completed in 1980 and documents the results of the 5-year Great River Environmental Action Team study for the St. Paul District reach of the Mississippi River (including the head of navigation in Minneapolis MN, downstream to Guttenberg, Iowa). The report contained numerous recommendations for improved management of the river, the most important of which was a 40-year plan for dredged material placement for all of the historic dredging locations in the St. Paul District. Many of the study's recommendations have been implemented.

1.4.3 CHANNEL MAINTENANCE MANAGEMENT PLAN AND EIS

The 1996 plan (CMMP) and accompanying 1997 EIS are the St. Paul District's guidance for managing channel maintenance activities. Much of the plan is devoted to designating and designing dredged material placement sites. Included

in this plan is a discussion of the district's program for channel management. This DMMP for Pool 2 is part of that program and a tiered NEPA document.

1.4.4 LOWER POOL 2 CHANNEL MANAGEMENT STUDY

The Boulanger Bend to Lock and Dam No. 2 study focuses on the part of the Mississippi River in Lower Pool 2 between RMs 815.2 and 821.0.

This segment of the 9-foot navigation channel has experienced changing sedimentation patterns that have exceeded the Corps' ability to maintain the channel. The degraded channel has adversely affected commercial navigation and strained the U.S. Coast Guard's ability to set safe conditions for all users.

The Lower Pool 2 Channel Management Study's recommended plan is to excavate and maintain a wider channel that is still within authorized dimensions and put into place two new training structures (rock sills)--one on the right descending bank and one on the left descending bank.

These minor changes would improve navigability, safety, and reduce channel maintenance requirements. This additional dredging to restore the channel to wider dimensions would produce approximately 350,000 cubic yards of material; that material is currently planned to be placed on the temporary placement site islands. Some or all of the material could also be used for construction of the Pigs Eye Lake Continuing Authorities Program (CAP) Section 204 project. Material placed on the temporary islands would eventually be offloaded to a permanent placement site in Lower Pool 2 as identified in this DMMP. If this DMMP results in the availability of a permanent placement site prior to the Pool 2 Channel Management Study (CMS) project dredging, the dredged material may be placed directly into the new site to avoid double-handling on the temporary islands. Phase I of this project – construction of the west rock sill training structure – was completed in 2018.

1.4.5 PIGS EYE LAKE SECTION 204 FEASIBILITY REPORT

The Corps recently approved the Pigs Eye Feasibility Study, which evaluated the feasibility of constructing habitat enhancement features in Pigs Eye Lake utilizing dredged material under the authority of Section 204 of the Continuing Authorities Program. The Recommended Plan of the Pigs Eye Lake Section 204 Feasibility Report includes multiple islands, sand benches, marsh habitat, and terrestrial plantings. This plan is estimated to accommodate approximately 413,000 cubic yards of material as beneficial use.

1.4.6 LOCK AND DAM 2 EMBANKMENT

This effort is in the plan formulation stage, where the Corps is considering the possibility of constructing some form of an embankment protection along the

upstream side of the current earthen embankment at Lock and Dam 2. The current embankment has experienced degradation due to erosion via wind-driven wave action, ice action and river currents. Repair needs at the Lock and Dam 2 embankment were determined through a Problem Appraisal Report (PAR) conducted by the Corps. Alternatives include a riparian berm, offshore island or a combination of both. The goals of the project would be to provide embankment stability, environmental benefits, and utilizing dredged material for beneficial purposes. A riparian berm alternative would likely require about 2,100 feet of berm, with a footprint of about 5.5 acres, on the upstream side (Pool 2 side) of the embankment.

1.4.7 ASSESSMENT OF POOL 2 (RM 815.2–847.6) SEDIMENT SOURCES AND DREDGING

The purpose of this assessment was to estimate future dredging throughout Pool 2 for consideration while developing the Pool 2 DMMP. The *Assessment of Pool 2 (RM 815.2–847.6) Sediment Sources and Dredging* (Hendrickson and Libbey 2016) addressed the impact of increasing flow conditions on the Minnesota and Mississippi rivers, changes in dredging practices in the USAF Pool and Pool 1, and channel dredging throughout Pool 2. Dredging requirements throughout Pool 2 are anticipated to increase substantially, to approximately 169,000 cubic yards per year.

CHAPTER 2.

Affected Environment

A description of components of the nearby environment is given here to show the current state of the project location. This description is necessary to establish an understanding of the resources that may be affected by the alternative actions under consideration.

2.1 Socioeconomic Conditions

2.1.1 POPULATION CHARACTERISTICS

Pool 2 of the Upper Mississippi River is within the 13-county Minneapolis-St. Paul-Bloomington, MN and Wisconsin metropolitan statistical area (MSA). The 2010 population for this area was 3,279,833, an increase of 10.5 percent over the 2000 population. The MSA per capita income in 2010 was \$32,226, which is 9.6 percent greater than the state level and 20.7 percent greater than the nation as a whole. Important industries for employment include social services (which includes education and health care, 23.2 percent for the MSA vs. 23.2 percent for the United States), trade (14.7 percent vs. 14.4 percent), manufacturing (13.4 percent vs. 10.4 percent), professional services (12.4 percent vs. 10.7 percent), finance (8.5 percent vs. 6.6 percent), and leisure and tourism (8.4 percent vs. 9.4 percent).

The study area within the MSA includes these cities: Minneapolis, St. Paul, Newport, St. Paul Park, Cottage Grove, South St. Paul, Rosemount, and Inver Grove Heights, MN. There is considerable industrial development along the shoreline of the Upper Mississippi River.

2.1.2 TRANSPORTATION

Transportation corridors are found on both sides of the floodplain in Pool 2. Railroad tracks and industries border both sides of the river. The Canadian Pacific Railway runs along the north side of Pool 2, adjacent to Pigs Eye Lake. State Highway 10 runs parallel to Pool 2 on the east side of the river from St. Paul to Hastings. Bridges are concentrated in the Minneapolis and St. Paul area in Upper Pool 2; state Highway 61 bridges the river at Hastings in Upper Pool 3, and the

next bridge upstream is Interstate 494 connecting South St. Paul on the west and Newport on the east.

The St. Paul Downtown Airport (Holman Field) is located adjacent to Pool 2 and has three runways and services more than 64,000 takeoffs and landings annually.

2.1.3 LAND USE

The proposed project is located primarily within the Mississippi River floodplain of Pool 2. Land use outside of the floodplain is a mix of state, county, and city parks and natural areas interspersed with low-density residential. Notable nearby public lands include Spring Lake Regional Park and Park Reserve, and Grey Cloud Dunes Scientific and Natural Area (Plates 1 and 2).

Upper Pool 2, upstream of RM 829.0, is largely confined by high bluffs and is heavily developed with residential, commercial, and industrial establishments. Downstream to Lock and Dam 2, the pool broadens and is considerably less developed. The Minnesota River enters Pool 2 near Fort Snelling. Spring Lake, a backwater area, is the dominant open water feature of Lower Pool 2.

Islands within the floodplain are mostly low-lying, flood-prone, and mostly undeveloped. Much of these low-lying areas are significantly affected by erosion and sedimentation, which continue to slowly change the island configuration in Pool 2.

Pool 2 is also part of the Mississippi River Corridor Critical Area (MRCCA). The MRCCA was designated a state critical area in 1976 to protect its many unique natural and cultural resources and values. These resources and values are protected through development standards and criteria implemented via local land use plans and zoning ordinances (Minnesota Department of Natural Resources [MNDNR] website:

http://dnr.state.mn.us/waters/watermgmt_section/critical_area/index.html).

Pool 2 is entirely within the boundaries of the Mississippi National River and Recreation Area (MNRRA), a unit of the National Park Service. In 1988, the MNRRA was established by Congress to protect, preserve, and enhance the historic, natural, cultural, scenic, recreational, scientific, and economic resources within the Mississippi River Corridor in the Twin Cities metropolitan area. 16 U.S.C. § 460zz-3(b)(1) sets forth a process by which Federal agencies are to consult and coordinate with the Secretary of the Interior (and, by delegation, with the NPS) to ensure their actions within the MNRRA are compatible with the area's comprehensive management plan.

Lower Grey Cloud Island rises out of the floodplain, and land use is dominated by active aggregate mining, as well as previously mined and re-claimed areas. Lower Grey Cloud Island also contains several low-density residential areas at its eastern end, a small local park on the north side, and a church camp (Camp Galilee, United Pentecostal Church) (Plate 2).

Several islands are frequently utilized by the Corps for the temporary placement of dredged material. Temporary placement sites typically are in close proximity to dredge cuts and are used as temporary storage sites for the material until it is moved to a permanent location. Temporary sites typically have enough capacity to store the sand generated by dredging over a 10-20 year span and, therefore, are typically unloaded every 10-20 years. Pine Bend, Upper Boulanger, and Lower Boulanger were established by the Corps during the mid 1990s. The three sites were endorsed by the interagency advisory group known as the River Resources Forum (RRF) in April 1996. The RRF was established following the GREAT I study, in an effort to encourage continued coordination amongst government organizations with managerial responsibility throughout the Upper Mississippi River. These three sites have been used for temporary dredged material storage from their conception to the present.

2.1.4 RECREATION

In the past, poor water quality has limited the recreational value of Pool 2. Recent improvements and a persistent interest in the water quality of this region continue to increase the potential for recreational activities. There are several public boat accesses and marinas in Pool 2. Private docks and accesses are also scattered throughout the region, including several docks at the southern end of Boulanger Slough and a number of users that access the main navigation channel through a side channel to the northwest of the current main channel.

2.1.5 AESTHETIC RESOURCES

Schaar's Bluff Vista, located within Dakota County's Spring Lake Park Reserve, provides a scenic overlook of Lower Pool 2 of the Mississippi River. The top of the bluff stands approximately 100–150 feet over the river surface, and the view stretches for miles across the floodplain to the north and west (Plate 2).

2.1.6 COMMERCIAL NAVIGATION

The project area serves as a link between the upstream ports of Minneapolis, St. Paul, the Minnesota River, and the remaining Mississippi River navigation system downstream. Between 2006 and 2015 barge freight through Lock and Dam 2 ranged from 4.7 to 7.4 million tons with an average of 6.8 million tons. The most common commodities hauled are farm products moving from local terminals in St. Paul and on the Minnesota River to the Gulf of Mexico for export. Other commodities include fertilizer, crude materials (sand, gravel, and stone, road salt, scrap metal, etc.), cement, and petroleum products (Figure 2).

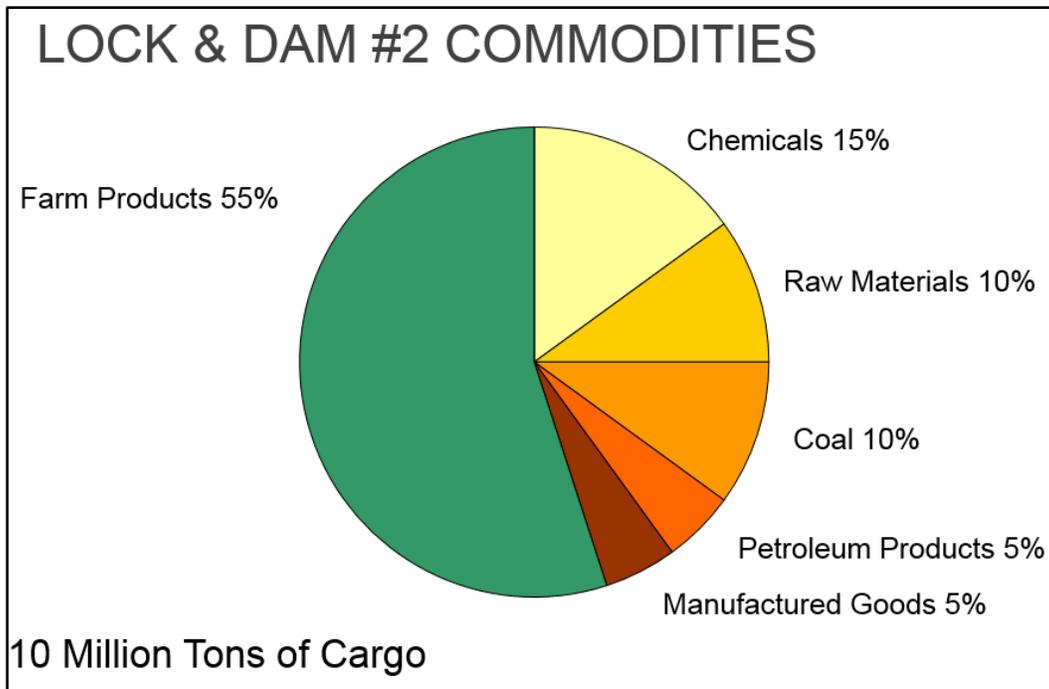


Figure 2: Lock and Dam 2 Commodities

2.2 Natural Resources

2.2.1 AIR QUALITY

The U.S. Environmental Protection Agency (EPA) is required by the Clean Air Act to establish air quality standards that primarily protect human health. These National Ambient Air Quality Standards regulate six major air contaminants across the United States (carbon monoxide, ground-level ozone, lead, nitrogen oxides, particulate matter, and sulfur dioxide). When an area meets criteria for each of the six contaminants, it is called an “attainment area” for that contaminant; those areas that do not meet the criteria are called “nonattainment areas.” Ramsey, Hennepin, and Washington Counties are classified as attainment areas for each of the six contaminants and are therefore, not regions of impaired ambient air quality. A portion of Dakota County (approximately four miles away from the river) is classified as a nonattainment area for lead, and the rest of the county is designated as an attainment area for each of the six contaminants. This designation means that the project area has relatively few air pollution sources of concern.

2.2.2 HYDROLOGY

Pool 2 extends approximately 32 river miles (RM) between Lock and Dam 1 (RM 847.5) in Minneapolis to Lock and Dam 2 (RM 815.2) at Hastings. The Upper Mississippi River upstream of Lock and Dam 2 extends approximately 579 miles to its source at Lake Itasca, and its basin above the mouth of the Minnesota River incorporates approximately 22,450 square miles. The major tributary entering Pool 2 is the Minnesota River, extending approximately 332 miles from its mouth in Pool 2 to its source at Big Stone Lake and draining approximately 17,000 square miles. Several named creeks (e.g., Minnehaha, Phalen, Battle, and Fish) and unnamed drainages enter Pool 2. In addition, bedrock (e.g., St. Peter sandstone) and glacial outwash (e.g., springs on the south side of Spring Lake) aquifers contribute flows to the pool. The UMR throughout Pool 2 collectively drains approximately 39,450 square miles (MNDNR 2013b).

Discharge rates are variable across the basin, driven in part by a continental climate characterized by extremes and modern landscape use (e.g., vegetation removal, cultivation, draining wetlands, tile systems, stream channelization). In the period of record from 1898 to 1998, annual peak discharges at the St. Paul gage range from a low of 9,670 cubic feet per second (cfs) in 1931 to a high of 171,000 cfs in 1965 (USACE 2004).

In general, mean annual flows on the Minnesota River (at Jordan Minnesota USGS gage) show an increasing trend over the period of record. Sand delivery to the Mississippi River from the Minnesota River is thought to have increased markedly sometime around 1990. On the Minnesota River, average annual discharge increased 63 percent for the time period 1991 to 2010 compared to the previous period, 1971 to 1990 (Figure 3). Discharge has increased 90 percent for the period 2010-2017 compared to the 1971-1990 time period.

Mean Discharge 1971-1990 = 4433 cfs

Mean Discharge 1991-2010 = 7213 cfs (63% increase over the 1971-1990 discharge)

Mean Discharge 2010-2017 = 8540 cfs (90% increase over 1971-1990 discharge)

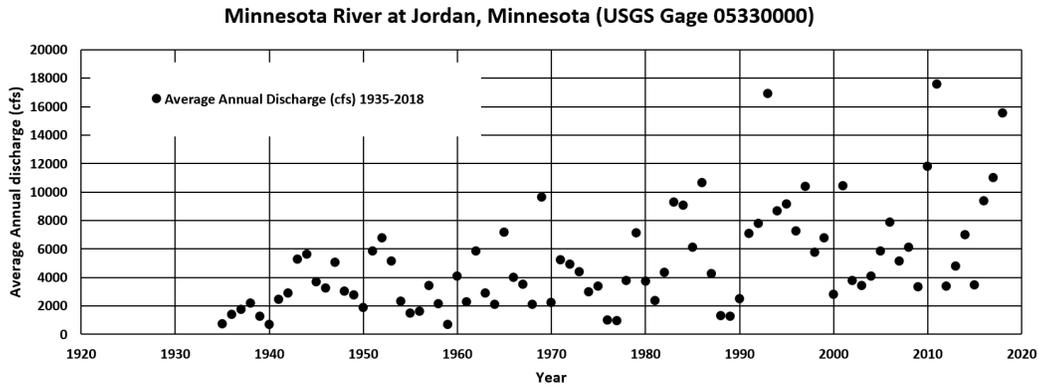


Figure 3 Mean Discharge, Minnesota River

On the Mississippi River at Saint Paul Minnesota (USGS gage), average annual discharge increased 21 percent for the two-decade time period 1991 to 2010 compared to the previous two-decade period, 1971 to 1990. The 2010 to 2018 period shows an increase of 51% (over the 1971 to 1990 period).

Mean Discharge 1971-1990 = 14052 cfs

Mean Discharge 1991-2010 = 16948 cfs (21% increase over the 1971-1990 discharge)

Mean Discharge 2010-2017 = 21162 cfs (51% increase over 1971-1990 discharge)

This shift in total annual flows coincides with the increase in dredging in Lower Pool 2. Total dredge volume shown in Table 2 includes sand volume and other materials (silts, clays, etc.). In addition, the frequency and magnitudes of extreme flood events have increased (e.g., Knox 1993, 2008). In general, the timeframe of 1981-2014 was utilized to calculate baseline dredging averages due to the fact that the dredge volumes throughout that period are most indicative of current dredging practices and data through 2017 doesn't impact time periods used in table 2.

Table 2: Summary of Pool 2 Dredge Sites Average Annual Dredging Volume

River Mile	Name	Avg. Annual Total Dredge Vol. (yd ³)	Notes
847.4–847.5	Lower Approach. LD 1	210	1981–2014 average of Lower LD 1 approach & LD 1 Aux. Lock
840.0–841.3	Above & Below Smith Ave.	300	Reduced from 1,470 yd ³ (1981–2014 average) to 300 yd ³ based on trend; only one dredging event has occurred between 2001 & 2014.
839.6	St. Paul Small Boat Harbor	4,750	1981–2014 average annual volumes adopted.
839.5–839.6	Above Wabasha Ave. Bridge	0	Reduced from 40 yd ³ (1981–2014 average) to 0 yd ³ based on trend; no dredging has been done at this site in the last decade.
838.0–839.0	Below Lafayette St. Bridge	0	1981–2014 average annual volumes adopted.
836.4–837.8	St. Paul Barge Terminal	25,720	Adopted 2008–2014 average following discussions with channels and harbors personnel that future dredging will continue similarly.
827.5–828.3	Grey Cloud Slough	0	Reduced from 4,740 yd ³ to 0 yd ³ due to construction of the Island 112 closure structure in 2005 that has eliminated dredging at this site (in recent years).
826.1	Robinson Rocks	0	Set to 0 yd ³ ; dredging has not been done here since 1954.
824.3–824.6	Pine Bend Landing	5,310	Annual average from 1993 to 2014 was used at this location to reflect recent dredging practices.
822.7–823.7	Pine Bend	21,400	Annual average from 1993 to 2014 was used at this location to reflect recent dredging practices.
820.7–821.4	Boulangier Bend	26,640	Annual average from 1993 to 2014 was used at this location to reflect recent dredging practices.
819.0–819.8	Boulangier Bend Lower Light	7,725	Annual average from 1993 to 2014 was used at this location to reflect recent dredging practices.
818.0–818.9	Freeborn Light	20,390	Annual average from 1993 to 2014 was used at this location to reflect recent dredging practices.
815.2–816.5	Upper Approach LD 2	0	Set to 0 yd ³ ; dredging has not been done here in more than ten years.

Although the surface of the water is mostly connected throughout the lower portion of the pool, stream velocity varies through the cross-section of the river. Velocity is highest in the main navigation channel, where velocities can exceed 3 feet per second during high water events. Outside of the main channel, the velocity is generally less than 1 foot per second. There are several smaller secondary channels, including Boulanger Slough, where current velocities are somewhere between those in the channel and those in the rest of the floodplain.

2.2.3 WATER QUALITY

According to the Minnesota Pollution Control Agency (MPCA) Surface Water Data Viewer (MPCA, 2020), the reach of the Mississippi River from Upper St. Anthony Falls to the St. Croix River (AUID 07010206-814), including Pool 2, is an impaired water for aquatic consumption, aquatic life, and aquatic recreation uses. Waters are listed as impaired when water quality standards are not met for a given contaminant and use.

Specific impairments for aquatic consumption are for mercury, polychlorinated biphenyls (PCB), and perfluorooctane sulfonate (PFOS) in fish tissue, and mercury and PFOS in the water column. These impairments result in fish consumption advisories.

Impairments for aquatic life are for nutrients and total suspended sediment (TSS) in the water column. In this case it means that Pool 2 may not support a thriving community of fish and other aquatic organisms due to the higher levels of these contaminants.

Impairments for aquatic recreation are related to periodic elevated levels of fecal coliform bacteria. This means that water may not always be suitable for swimming and wading due to high bacteria levels caused by the presence of human or animal waste in the water.

Currently, there are total maximum daily load (TMDL) plans approved for this reach addressing TSS and mercury.

2.2.4 GEOLOGY

The most significant geologic event explaining the nature of the Mississippi River within Pool 2 occurred at the end of the Pleistocene glaciation approximately 10,000 years ago. Tremendous volumes of glacial meltwater, primarily from the Red River Valley's Glacial Lake Agassiz, eroded the pre-glacial Minnesota and Mississippi river valleys. As meltwaters diminished, the deeply eroded river valleys aggraded substantially to about the present levels. Prior to impoundment, the broad floodplain of the river was depressions, sloughs, natural levees, islands, and shallow lakes. Since impoundment, a relatively thin veneer of silts, clays, or sands has been deposited over most of the river bottom within the pool. The depth

of sedimentation is generally greater in the slow moving backwater areas than in the major side channels and main channel portions of the impounded area.

2.2.5 SUBSTRATE/DREDGED MATERIAL QUALITY

Mississippi River sediment tends to have low levels of contaminants, however, due to the urban location and higher silt content, sediment quality in Lower Pool 2 has higher levels of contaminants compared to sediment in other pools located in the St. Paul District. Lower Pool 2 seems to be a sink for surrounding and upstream contaminant sources due to a decrease in water velocity and high silt content of the sediments. In general, silts have a higher affinity to attach to contaminants than larger mineral sands. Historical Corps grain size analysis of the sediment in the navigation channel have shown silt contents of around 75 percent in the stretch of river 818.5 - 819.7 in samples collected prior to about the year 2000. Samples collected since then have generally contained a much lower percentage of fine sediments in most locations within the main channel.

The St. Paul District has implemented a standard operating procedure to evaluate the physical and chemical properties of sediment in dredge cuts. This operating procedure calls for periodic sediment sample collection and analysis for a standard set of chemical and physical characteristics for the sediment in dredge cuts. Data obtained from periodic sample collections are used to evaluate the proper dredging and disposal alternatives for the dredged material based on its chemical and physical properties. Data collected are sufficient to provide a tier 1 or tier 2 analysis on the specific sediment cut tested as described in the CMMP.

Starting in the 1970s, the St. Paul District has completed 16 sediment surveys of the dredge cuts in Pool 2 (1974, 1975, 1978, 1981–1985, 1989, 1992, 1994, 2002, 2008, 2013, 2014, and 2017). The following summarizes the sediment quality in Pool 2 dredge cuts as determined from the district’s periodic sediment sample collection and analysis program. Additional information can be found in the data tables in Appendix E – Sediment Data.

Table 2 lists the historic dredge cuts in Pool 2. The historic dredge cuts are shown in Plates 3 and 4. There are thirteen cuts that have been dredged within Pool 2 of the St. Paul District. The frequency of the dredging depends on the sedimentation rates and navigational demands of each particular location. Thirteen of the fourteen cuts are in the main navigational channel and are primarily composed of sand and gravel in the Upper Pool, and sand and silt in the Lower Pool. The remaining cut is inside the Saint Paul Small Boat Harbor and is mostly composed of fine silt.

Sediment samples collected pre-2008 were recorded by dredge cut name and by river mile only. After 2008, all sediment surveys documented the sample locations using GPS coordinates.

At all sites, samples were obtained using a 9-inch Ponar dredge, which represents approximately the top 10 centimeters of sediment. Each sample was collected from a single location or was a composite sample from two to three sub-samples.

All samples were homogenized in a stainless steel pan, placed in laboratory-provided containers, and stored on ice immediately following sampling. All samples were repacked with ice and shipped by next day delivery to the laboratory. Large sites that were deemed in the field to have areas with different texture classes were split into separate composite samples. Normal quality assurance/quality control procedures were completed and several samples over the years were split in the field and sent to a different lab for comparison purposes. The sampling was accomplished by Corps' St. Paul District staff, state natural resource agencies, or through a sampling contract. Samples collected before 2008 were analyzed for metals, PCBs, pesticides, and grain size. Samples collected after 2008 were also analyzed for polycyclic aromatic hydrocarbons (PAHs). The 2008 sediment survey also included testing for Polyfluoroalkyl Substances (PFAS) and some toxicology testing.

To ascertain the extent of sediment pollution in Pool 2 dredge cuts, sample chemical concentrations collected before 2008 and after 2008 were compared to the MPCA's soil reference values (SRVs) and sediment quality targets (SQTs). The MPCA's SRVs are limits on pollutant concentrations for material being placed at two types of upland sites, either recreational/residential or commercial/industrial. In 2016, the MPCA proposed updated values for SRVs. The proposed updated values are not yet finalized, but are being used for analysis in this report. The SQTs (level I and level II) are guidelines used to identify contaminant concentrations that cause harmful effects on sediment-dwelling organisms. Level I SQTs are the concentrations that will provide a high level of protection for benthic invertebrates. Level II SQTs are the concentrations that will provide a moderate level of protection for benthic invertebrates.

In general, SRVs limits are higher concentration thresholds than SQTs. Furthermore, level II SQTs are higher than level I SQTs. In terms of contamination levels from low to high, if a contaminant found in sediment is below the SQT level I threshold, it has very low levels of that contaminant and is likely safe for bottom-dwelling aquatic organisms. If the contaminant level is higher than the level I SQT threshold but below the level II threshold, it is likely moderately safe for those organisms. If the contaminant level is above the level II SQT threshold, that contaminant is likely at a level that is harmful to bottom-dwelling aquatic organisms. An exceedance of the SQT level II threshold will often still be well below the SRV threshold, as the SRV thresholds are set at levels to protect human health based on contact with the material in two upland settings. Contaminant thresholds for SRVs in the recreational/residential setting are lower than the commercial/industrial setting because it is assumed that in the former setting there would likely be more contact with the sediment, including contact by children. To summarize, in order from lowest to highest levels of contamination, are level I SQT, level II SQT, SRVs for residential/recreation, and then SRVs for commercial/industrial.

Plates 1 and 2 show boring locations from after 2008 identified by their laboratory identification (Lab ID) numbers. Lab ID numbers correspond to the sample

chemical concentration data found in the tables in Appendix E. Pertinent chemical concentration data for the various dredge cuts are summarized here below.

Lower Approach, LD 1 (RM 847.4–847.5)

The Lower Approach to Lock and Dam 1 dredge cut was sampled in two spots in 2017. Grain size was mostly sand with around 10 percent silt. All tests results were below existing MPCA SRVs. Many PAHs, however, were detected at concentrations exceeding MPCA SQT Level I and Level II.

Above and Below Smith Ave. Bridge (RM 840.0–841.3)

Eleven sediment samples were collected between 1974 and 2013 from the Above and Below Smith Ave. Bridge cuts. Most samples consisted of primarily coarse to medium sand with usually less than 1–2 percent silt (particles finer than the No. 200 (75 µm) sieve). However two samples collected in 1989 were between 15–20 percent silt.

Considering that test results for the most recent samples, taken in 2013, are below SRV and SQT levels, this material does not have any regulatory concerns for removal and upland placement. There has been one historical exceedance, in 1989, of the SQT Level I guideline for mercury. The result was 0.64 milligram/kilogram, which was above the SQT Level I guideline of 0.18 mg/kg, but below the SQT level II guideline of 1.1 mg/kg.

Above Wabasha Ave. Bridge (RM 839.5–839.6)

The only data the St. Paul District has for the Above Wabasha Avenue Bridge dredge cut were from 2014, where two samples were collected from the cut. The material is primarily medium to fine sand and clean. The two samples collected did not have any exceedances of SRVs or SQTs.

Below Lafayette St. Bridge (RM 838.0–839.0)

The Below Lafayette St. Bridge dredge cut has not been sampled yet. Without any data, the assumption is that the material below the Lafayette Bridge is primarily medium to fine sand and clean, similar to the Above Wabasha Bridge dredge cut.

St. Paul Barge Terminal (RM 836.4–837.8)

The St. Paul Barge Terminal has been sampled 27 times since 1974. Granular size of the material found in this cut is generally medium to fine sand, but at some locations within the cut, silt may be greater than 50 percent of the sample. Historically this dredge cut has had some heavy metals, PCBs and pesticide contamination that exceeded SQTs, but since 2000, all of the samples (five) have been clean. SQT Level 1 exceedances prior to 2000 included: total PCBs, zinc,

lead, nickel, copper, cadmium, chlordane, and dieldrin. The one SQT Level II exceedance was for mercury (1.1. mg/kg) in 1974.

Grey Cloud Slough (RM 827.5–828.3)

The Grey Cloud Slough dredge cut has been sampled 31 times since 1974. Similar to St. Paul Barge Terminal, the material is usually medium to fine sand. Test results of recent samples collected in 2002 and 20013 were all below the SRV and SQT values. Samples collected before 2000 show some exceedances of SQTs. SQT Level I exceedances included: cadmium, chromium, mercury, and nickel. SQT Level II exceedances included PCBs and the pesticide lindane. One 1985 sample had a cadmium concentration of 4.5 mg/kg, which is a SRV recreation/residential exceedance.

Robinson Rocks (RM 826.1)

Robinson rocks is just downstream from Grey Cloud Slough. It has been sampled four times, twice before 2000 and twice after. The material is composed of medium to fine sand and no indication of any contamination has been detected.

Pine Bend Landing (RM 824.3–824.6) and Pine Bend (RM 822.7–823.7)

Pine Bend Landing and Pine Bend dredge cuts have been sampled 12 times before 2000 and twice after. The material is primarily medium to fine sand and clean. Samples collected in 2014 and 2017 have not shown any exceedance in SRVs or SQTs. The only recorded exceedances were for cadmium (SQT Level 1 and SRV recreation/residential) and a mercury (SQT Level 1) that were both detected in the mid-1970s.

Bou langer Bend (RM 820.3-821.4) and Bou langer Bend Lower Light (RM 819.3–820.3)

Bou langer Bend and Bou langer Bend Lower Light have been sampled eight times before 2000 and five times after 2000. The material in this area is medium to fine sand, but on the edges of the dredge cut there is some noticeable fines that drop out as the navigation channel makes a sharp turn and the pool resembles more of a lentic system as it approaches Lock and Dam 2. As a consequence of increased fines, which is widely recognized to have a greater affinity to metals and organic contaminants, several samples taken prior to 2000 exceeded SQT Level I and SRV values for: dieldrin, dichlorodiphenyldichloroethane (DDD), dichlorodiphenyltrichloroethane (DDT), chlordane, arsenic, cadmium, chromium, copper, nickel, and lead. The one SQT Level II exceedance was for mercury, which was detected in 1974. Exceedances for SRVs (recreation/residential) include arsenic and cadmium.

Test results for samples taken in 2008 and 2013 were all below SRV and SQT Level I + II values, except for two PAHs in 2013 (acenaphthylene and pyrene) that were above SQT Level I values.

Freeborn Light (RM 818.0–819.3)

Freeborn Light dredge cut was sampled twice in 2014. The limited data suggests that this location contains material that is a 90/10 mixture of fine sand and silt. Test results indicated no contamination, with the exception of one sample that exceeded the SQT Level II value for DDT, and exceeded the SQT Level I value for DDD (both derived from pesticides that are no longer in use).

Upper Approach LD 2 (RM 815.2–816.5)

The Upper Approach to Lock and Dam 2 has been sampled numerous times by the St. Paul District and the Metropolitan Waste Control Commission. In all, 26 samples were collected before 2000 and three samples were collected after 2000. This section of Pool 2 has had the most historical incidences of detected contamination. Prior to 2000, concentrations of numerous PCBs, metals, and pesticides were above both SQT and SRV (recreation/residential) values. Test results for samples taken in 2014 exceeded the SQT Level I values for four types of PAHs.

St. Paul SBH (RM 839.6)

The Saint Paul Boat Harbor is outside of the navigation channel but is still part of the district's normal dredging operations. The harbor has been sampled in 1981, 1989, 2002, 2008, and 2013. The material in the harbor is usually very fine with up to 50–90 percent silt. Test results for the most recent samples, collected in 2013, were below all SRV and SQT values. Test results from 1981 exceeded SRV (recreation/residential) values for cadmium and arsenic. Test results for samples taken in other years prior to 2013 exceeded SQT Level I values for chlordane, arsenic, and cadmium.

Toxicology Testing (2008 Sediment Survey)

As part of the district's 2008 sediment survey, five sediment samples from Pool 2 were analyzed for whole sediment toxicity (*Chironomus dilutus* [formally known as *C. tentans*] and *Hyaella azteca* 10-day whole sediment survival and growth toxicity tests). The samples were analyzed at Great Lakes Environmental Center (GLEC) following the Great Lakes Dredged Material Testing and Evaluation Manual.

The five sediment samples were collected and shipped by Corps personnel on August 20, 2008 and were received at GLEC, where they were assigned a unique GLEC laboratory identification number and stored at 4 °C until test initiation. The

five sediment samples: Boulanger 1, Boulanger 2, Boulanger 3, Pine Bend, and Above Lock and Dam 2 were used to initiate 10-day *C. dilutus* and *H. azteca* whole sediment toxicity tests on September 7, 2008.

Results of the toxicity testing (Appendix E – Sediment Data), showed that after 10 days of exposure to the sediment samples, *Hyaletta azteca* growth was significantly reduced for all five Pool 2 locations tested. Whereas, *Chironomus dilutes* growth was significantly reduced at two sites (Boulanger 1 and Pine Bend). Survival testing showed less of impact, with only *Hyaletta Azteca* survival significantly reduced for the Boulanger 2 sample. The mixed results of the toxicity testing are not too surprising since the sediment tested in lower Pool 2 have had numerous SQT Level I + II exceedances before 2008. However, sediment quality in Pool 2 has shown a marked improvement over the last ten years which suggests that any conclusion from this 2008 survey is now outdated.

Per- and Polyfluoroalkyl Substances (PFAS)

In recent years there has been a growing concern over the possible toxicity of Per- and Polyfluoroalkyl Substances (PFAS) in the environment. These compounds, which are known to bioaccumulate and resist degradation, were developed over the past fifty years for a wide-range of industrial and commercial applications. Common uses of PFAS include: paper and textile coatings, insecticides, fire-resistant foams and as polymerization aids for the manufacturing of fluoropolymers. Even though there has been a voluntary reduction of PFAS production, carboxylated and sulfonyl- based fluorochemicals are still being produced globally at unknown quantities. In 2000 alone, 3M produced 6.5 million pounds (Giesy and Kannan, 2002).

In 2008, the St. Paul District conducted sediment testing for PFAS in navigation channel dredge cuts and harbors in UMR Pools 2-4. Samples were analyzed for seventeen different PFAS compounds. The majority of compounds were below detection limits, but perfluorooctane sulfonate (PFOS), which is known to strongly sorb to solids and may be a major sink for PFAS (Higgins et al. 2005), was above detection limits in more than half the samples. Perfluorobutanesulfonic Acid (PFBS) was also detected in a number of samples.

Additional testing for PFAS was conducted in Lower Pool 2 in 2017 and 2018. Various PFAS compounds were detected in more samples than in 2008, but this is almost certainly due improved laboratory analyses that have lowered detection limits by about an order of magnitude since 2008. The various PFAS compounds measured in these samples were detected at very low concentrations, ranging from 0.033 to 1.2 ug/kg (parts per billion, ppb). The results from the 2008, 2017, and 2018 testing are presented in Appendix E.

Current SRVs for PFAS range from 330-63,000 ppb, and testing of dredged material in Pool 2 has found levels of PFAS ranging from less than one to about three ppb. The PFAS levels detected in Pool 2 navigation channel sediments have been on par with the relatively low levels found almost ubiquitously throughout Pool 2. In contrast, sediment samples in heavily contaminated areas of Pool 2

outside the navigation channel have returned PFAS levels an order of magnitude higher (up to 80.2 ppb PFOS near the 3M discharge location in Lower Pool 2, as reported by MPCA 2011-2012).

Summary

Sediment testing of historic dredge cuts in Pool 2 has shown that Lower Pool 2 has contained higher levels of contamination than other dredged cuts in different pools. The levels of Pool 2 contamination appear to increase downstream, with little or no SQT and SRV exceedances detected in the upper reaches to multiple exceedances detected around Boulanger Bend and the Upper Approach to Lock and Dam 2. The reason for the increased contamination in the lower portion of the pool is likely due to decreased granular size seen downstream where the pool becomes more lake-like. The increased affinity of smaller granular sizes to heavy metals and organic contaminants is probably the key factor influencing higher contamination, but point sources of urban, industrial and agricultural pollution between St. Paul and Lock and Dam 2 may also be contributing factors.

Sediment samples in more recent years have generally trended toward showing lower concentrations for the contaminants being tested. This is likely a result of the dramatic decrease in pollution inputs to the system due to increased environmental regulations. Sediment samples taken in areas of routine channel maintenance dredging in Pool 2 since 1985 have not exceeded SRVs. Since that time, the only exceedances detected were for the SQTs.

2.2.6 GROUNDWATER

The groundwater along the Mississippi River corridor in Pool 2 is present as surficial aquifers and bedrock aquifers. The surficial aquifers are sandy alluvial deposits with variable, but lesser amounts of, interbedded fine grain sediments. The sandy surficial aquifers near the river are susceptible to contaminants in the rivers and ground surface contaminants that can infiltrate through the soils via rainwater and flooding. Over the long term the upper bedrock aquifers can be susceptible to contamination from constituents in the river and land use sources. Groundwater flow is generally toward the river, but high river stages can cause changes in groundwater flow direction resulting in river water moving into the surficial aquifers, and to a lesser extent some bedrock aquifers. The upper bedrock aquifer in Pool 2 consists of dolomitic limestone over sandstone and is referred to as the Prairie Du Chien/Jordan Sandstone aquifer. Some areas of the Mississippi River corridor had deeper historic erosion into the underlying Franconia aquifer. The depth to bedrock varies significantly within the Pool 2 corridor. For instance at the Southport site the depth to bedrock, the Prairie Du Chien aquifer, is estimated to be 150' below ground surface. The depth to bedrock at Lower Grey Cloud Island is estimated to be 200 to 350 feet below ground surface. The thick sand and gravel deposit that has been mined in the Lower Grey Cloud Island pit is a remnant terrace deposit from the higher post glacial river flows. Much of the

Prairie Du Chien aquifer had been eroded at Lower Grey Cloud Island and the Franconia aquifer underlies the thick sandy deposits. North of Lower Grey Cloud Island bedrock outcrops of the Prairie Du Chien dolomite are at the surface and currently being quarried nearby.

There is a large area of groundwater northeast of and adjacent to Pool 2 known to be contaminated with perflurochemicals (PFAS). PFAS are a class of chemicals that have been manufactured since the 1940s for products that resist heat, stains, water, oil and grease. The Environmental Protection Agency issued lifetime health advisories for two PFAS, PFOS and PFOA of 70 ng/L, individually or combined. The Minnesota Department of Health (MDH) has recently issued more protective guidance values of 35 ng/L for PFOA and 27 ng/L for PFOS. As of 2017, PFOA has been detected in private wells on Lower Grey Cloud Island that exceed the MDH guidance values. Additional information can be found on the MDH website (<http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/>).

2.2.7 AQUATIC HABITAT AND WETLANDS

Aquatic vegetation consists of a wide variety of emergent and submerged flora typical of shallow open water, shallow marsh, and deep marsh communities (Eggers and Reed 1997; MNDNR 2013a). Shallow, open water areas are typically encountered along the main channel border and support submergent and floating plants, such as water lilies, pondweed, and wild celery. Shallow marshes are characterized by emergent plants, such as cattails, bulrushes, and arrowhead. Deep marshes include submergent, emergent, and floating plants. Shallow and deep marshes are typically located along tertiary channels and backwater areas. Dense stands of the invasive purple loosestrife are present in wetlands throughout the pool. Wetland areas support a wide variety of fish and wildlife.

Aquatic vegetation is often more prevalent at the upstream portions of navigation pools and less prevalent in the downstream portions. Downstream of Spring Lake in the inundated portion of the pool, aquatic vegetation is scarce and tends to occur mostly in areas almost entirely protected by islands. In this area, wind and wave action, combined with the high turbidity levels, contribute to these conditions.

2.2.8 FISH

The UMR on a whole supports a diverse assemblage of freshwater fish. Approximately 100 species of fish representing as many as 25 families have been recently sampled from the UMR between Minneapolis and Lock and Dam 10 (Schmidt and Proulx 2009). Most of the fish present are native warm water species. Common game species include walleye, sauger, northern pike, channel catfish, largemouth bass, bluegill, and white and black crappie. Common non-game fish include freshwater drum, carp, redhorses, buffaloes, and a wide variety

of minnows. Exotic species currently residing in the UMR include common carp, grass carp, bighead carp, goldfish, and rainbow and brown trout.

In comparison to other UMR pools, Pool 2 supports a moderate fishery. Surveys have indicated that fish species diversity tends to increase from upstream to downstream between Minneapolis and Lock and Dam 10, reflecting an increase in backwater areas, improved water quality, and improved habitat (Schmidt and Proulx 2009; Pitlo et al. 1995). Upper Pool 2 provides mostly main channel and main channel border habitat because the floodplain is restricted by bluffs throughout the upper portion. In Lower Pool 2 where the floodplain expands, there are a few backwater areas and side channels available. Water quality also influences the fish community in Pool 2; high turbidity and high nutrient levels decrease the suitability of this habitat for some fish (see subchapter 2.2.3).

In the lower, impounded portion of the pool, the majority of the floodplain is submerged. The most common habitat types are main channel, main channel border, secondary channel, tertiary channel, and artificially impounded river-lake. Main channel habitats typically provide swift current, deep water, and coarse sand, gravel, or rock bottom. Freshwater drum and channel catfish are common commercial fish that use this habitat type. Game fish that use the main channel include walleye, sauger, smallmouth bass, and white bass.

In contrast to main channel and main channel border habitat, river lakes and backwaters in the impounded reach of the river typically have little current and provide habitat for fish species adapted to a lentic environment. Commercial species that commonly utilize backwater habitat include carp, bigmouth buffalo, and catfish while typical sport fish include northern pike, largemouth bass, crappies, and bluegill.

Secondary and tertiary channels are channels that carry less flow than the main channel. They represent a transition between main channel and backwater habitats. Secondary channels of the Mississippi River tend to provide more varied habitat and support a more diverse fish assemblage than main channel habitat (Weigel, Lyons, and Rasmussen 2006).

2.2.9 BIRDS AND WILDLIFE

At least 300 species of birds, about 60 percent of the total number of species in the conterminous United States, are known to use the UMR. The UMR valley is a major bird migration corridor for the mid-continental United States through which an estimated 40 percent of the continent's waterfowl migrate (U.S. Fish and Wildlife Service [USFWS] 2006). The Mississippi flyway also provides migration habitat for songbirds, colonial nesting birds, secretive marsh birds, and raptors, making the UMR a resource of national and international importance. Bald eagles are also commonly found year round throughout Pool 2.

Waterfowl are considered particularly important due to their large numbers and visibility. Approximately 30 species of waterfowl use the UMR. Widgeon, mallards, scaup, canvasbacks, and wood ducks are species that commonly use the

river. Based on weekly waterfowl surveys conducted by the USFWS during fall 2011, birds that utilized the Lower Pool 2 area in high numbers included Canada geese, mallards, ringnecks, cormorants, and white pelicans.

To the south of Pigs Eye Lake, on Pigs Eye Island, is the Pigs Eye Heron Rookery Scientific and Natural Area. This floodplain forest supports nesting colonies of a number of colonial waterbirds, including the great blue heron, great egret, black-crowned night-heron, double-crested cormorant, and yellow-crowned night-heron. This is one of only four locations within Minnesota where yellow-crowned night-herons are known to nest. Many other birds also utilize the site, and a total of 89 bird species have been documented on the island.

A variety of mammals inhabit the floodplain forests and wetlands in Pool 2. Floodplain habitat is not as expansive and is relatively fragmented, when compared with less urban portions of the Mississippi River. The area near Fort Snelling has a thriving deer herd, but deer numbers along the pool are considered moderate because of the fragmentation of habitat. Wooded and wetland areas support a variety of mammals including muskrat, beaver, mice, common rats, moles and shrews, rabbits, red fox, skunks, and raccoons.

2.2.10 AQUATIC INVERTEBRATES

The Upper Mississippi River supports 42 known species of native freshwater mussels. Freshwater mussels are important food items for some mammals like raccoon and muskrat, as well as for some species of fish. They also play a role in maintaining water quality by filtering contaminants and feeding on algae and other small floating particles.

Historically, as many as 41 species have occurred in Pool 2. Presently there are 32 known species living, thirteen of which are now either federally or state protected. Surveys in the late 1970s revealed that the mussel fauna in the UMR above Lake Pepin (including Pool 2) had declined significantly since the early 1900s — presumably due to water pollution. Since then, the MNDNR conducted mussel surveys in the UMR between the Coon Rapids Pool and Upper Pool 3 in 2000 and 2001 and reported a “recovering mussel community” compared to those reported in the 1970s. These surveys recovered 22 of the 29 species known to be living in Pool 2 and noted areas of high density as well as evidence of recent recruitment (Kelner 2017).

2.2.11 THREATENED AND ENDANGERED SPECIES

Federally Listed Species

The USFWS’ Information for Planning and Conservation (IPaC) website was consulted on July 2, 2019 to determine if any proposed, candidate, threatened, or endangered species occurred within the project area. The results indicated that a

total of five federally listed endangered species and two federally listed threatened species may occur within a four-mile-wide corridor of Pool 2 (Figure 4). Four species listed as endangered are freshwater mussels: the Higgins eye (*Lampsilis higginsii*), sheepnose (*Plethobasus cyphus*), snuffbox (*Epioblasma triquetra*), and winged mapleleaf (*Quadrula fragosa*). The other species listed as endangered is an insect, the rusty-patched bumble bee (*Bombus affinus*). Species listed as threatened include one mammal—the northern long-eared bat (*Myotis septentrionalis*) and one flowering plant—the prairie bush-clover (*Lespedeza leptostachya*). These species and their federal status as of July 2, 2019 are listed in Table 3, later in this chapter. No critical habitat for any of these species exists in Pool 2.

Suitable habitat for the four mussel species includes areas of various stable substrates in medium to large streams and rivers. The sheepnose mussel is not known to occur in Pool 2, but is known to occur in the St. Croix River. The other three species have been reintroduced in Upper Pool 2 in the reach between Lock and Dam 1 and the confluence of the Minnesota River. Only the Higgins eye has been found in other locations in Pool 2 in recent times. Higgins eye are most commonly associated with high-density and diverse mussel beds.

The rusty patched bumble bee occupies grasslands and tallgrass prairies of the Upper Midwest and Northeast. This bumble bee needs areas that provide food (nectar and pollen from flowers), nesting sites (underground and abandoned rodent cavities or clumps of grasses above ground), and overwintering sites for hibernating queens (undisturbed soil) (USFWS 2016).

Suitable habitat for the northern long-eared bat is variable depending on the season and the life stage of the individual. In the summer, these bats often roost under the bark of tree species such as maples and ashes within diverse mixed-age and mixed-species tree stands, commonly close to wetlands. In the winter, the northern long-eared bat hibernates in caves and abandoned mines. During periods of migration and foraging, these bats tend to use the “edge habitat” where a transition between two types of vegetation occurs.

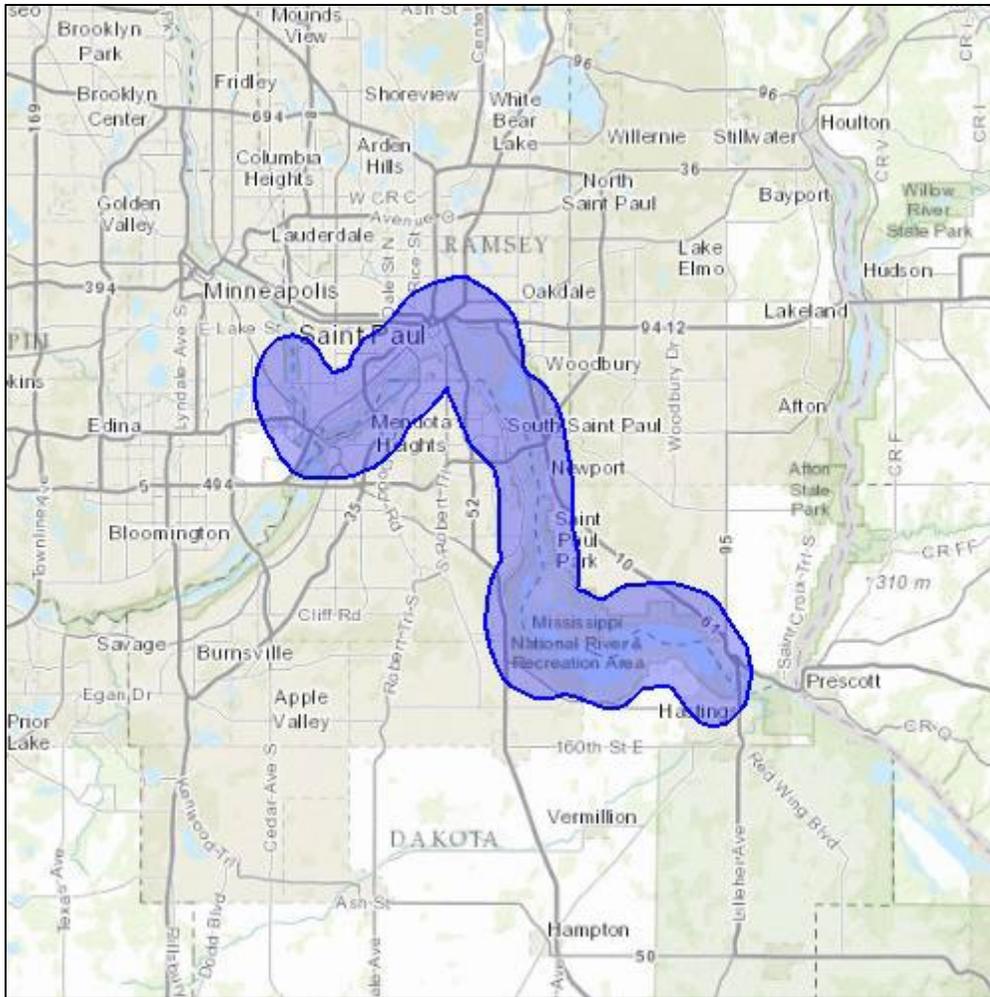


Figure 4: Search Area for IPaC Trust Report, July 2, 2019

The prairie bush clover only occurs within high-quality, dry to mesic, native tallgrass prairie habitats. The proposed project does not include any of these habitat types, and there are no known occurrences of the prairie bush clover within the proposed project area.

Table 3: Federally-Protected Species that May Occur Within Project Area

Scientific Name	Common Name	Federal Status
Mussels		
<i>Lampsilis higginsii</i>	Higgins eye	E
<i>Plethobasus cyphus</i>	sheepnose	E
<i>Epioblasma triquetra</i>	snuffbox	E
<i>Quadrula fragosa</i>	winged mapleleaf	E

Scientific Name	Common Name	Federal Status
Mammals		
<i>Myotis septentrionalis</i>	northern long-eared bat	T
Insects		
<i>Bombus affinus</i>	rusty-patched bumble bee	E
Plants		
<i>Lespedeza leptostachya</i>	prairie bush-clover	T

Status: E = endangered, T= threatened

Species of Local Significance

A number of species that are listed by the state of Minnesota as endangered or threatened have been documented in Pool 2 since about 1980. These species include freshwater mussels, fish, plants, birds, and a reptile and are listed in Table 4. The table includes species historically documented within one mile of Pool 2, based on a search of the Minnesota Natural Heritage Information System, conducted July 2019.

The historically-documented mussel species were compared with the results of recent mussel survey efforts in Lower Pool 2 to determine which species have recent records of occurrence. Of the historically-documented mussel species, four have not been found alive within Lower Pool 2 in more than thirty-five years: the elephant ear (*Elliptio crassidens*), spike (*Elliptio dilatata*), ebonyshell (*Fusconaia ebena*), and sheepnose (*Plethobasus cyphus*). The spike has been reintroduced in Upper Pool 2, but there has been no evidence of recruitment within the rest of the pool. The remaining ten species have been recently collected live within Pool 2.

Table 4: State-listed threatened or endangered species with records within one-mile of Pool 2

Scientific Name	Common Name	Minnesota Status
Mussels		
<i>Ellipsaria lineolata</i>	Butterfly	THR
<i>Fusconaia ebena</i>	Ebonysell ¹	END
<i>Elliptio crassidens</i>	Elephant Ear ¹	END
<i>Alasmidonta marginata</i>	Elktoe	THR
<i>Truncilla donaciformis</i>	Fawnsfoot	THR
<i>Lampsilis higginsii</i>	Higgins Eye	END
<i>Quadrula metanevra</i>	Monkeyface	THR
<i>Actinonaias ligamentina</i>	Mucket ¹	THR
<i>Tritogonia verrucosa</i>	Pistolgrip	END
<i>Arcidens confragosus</i>	Rock Pocketbook	END
<i>Plethobasus cyphus</i>	Sheepnose ¹	END
<i>Elliptio dilatata</i>	Spike ¹	THR
<i>Quadrula nodulata</i>	Wartyback	THR
<i>Megalonaias nervosa</i>	Washboard	END
Fish		
<i>Ictiobus niger</i>	Black Buffalo	THR
<i>Polyodon spathula</i>	Paddlefish	THR
<i>Notropis anogenus</i>	Pugnose Shiner	THR
Reptiles and Amphibians		
<i>Emydoidea blandingii</i>	Blanding's Turtle	THR
<i>Acris blanchardi</i>	Cricket Frog	END
Birds		
<i>Ammodramus henslowii</i>	Henslow's Sparrow	END
<i>Lanius ludovicianus</i>	Loggerhead Shrike	END
Plants		
<i>Juglans cinerea</i>	Butternut	END
<i>Sagittaria calycina</i> var. <i>calycina</i>	Hooded Arrowhead	THR

Scientific Name	Common Name	Minnesota Status
<i>Polanisia jamesii</i>	James' Polanisia	END
<i>Besseyia bullii</i>	Kitten-tails	THR
<i>Orobanche ludoviciana</i> var. <i>ludoviciana</i>	Louisiana Broomrape	THR
<i>Aristida tuberculosa</i>	Seaside Three-awn	THR
<i>Sagittaria brevirostra</i>	Short-beaked Arrowhead	END
<i>Scleria triglomerata</i>	Tall Nutrush	END
<i>Platanthera flava</i> var. <i>herbiola</i>	Tuberclad Rein Orchid	THR
<i>Bacopa rotundifolia</i>	Waterhyssop	THR

THR = Threatened; END = Endangered

¹ Species not collected live in Pool 2 since approximately 1980

*Copyright 2019, State of Minnesota, Department of Natural Resources (DNR). Rare Features Data included here were provided by the Division of Ecological and Water Resources, Minnesota DNR, and were current as of July 8, 2019. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present.

2.2.12 TERRESTRIAL HABITAT

The project area is situated within the Eastern Broadleaf Forest Province where the pre-European settlement vegetation consisted of tallgrass prairie and oak savanna (Marschner 1974). During the Holocene epoch, a succession of vegetation regimes were established after deglaciation in response to climate change driven in part by seasonal air mass boundaries originating from the Arctic, Pacific Ocean, and the Gulf of Mexico (Bryson 1966). Tundra was replaced by a boreal spruce forest, succeeded by pine forests before warm and drier conditions expanded prairie vegetation circa 8,000 Before Present (BP). Oak increased with a return of cool and moist conditions, and the pre-European prairie-forest ecotone was in place by circa 4,000 BP (Blumentritt et al. 2009; Wright 1972b, 1992; Wright et al. 1998). With more stable conditions following episodes of floods, floodplain forests and productive wetland communities were established by the Late Holocene era (Baker et al. 2001; Knox 1993; Wright et al. 1998).

Floodplain Vegetation

Alluvial bottomlands host wet floodplain forests dominated by maple and elm as well as river shore communities typically dominated by willows. Higher elevation landforms support more xeric communities (MNDNR 2013a). These habitats support a wide of variety of fauna.

Terrestrial Vegetation

In general, tallgrass prairie and oak savanna occupy uplands and portions of terraces. Maple-basswood dominated forests occupy slopes and ravines in areas protected from fire that occasionally include relict pine stands. Bedrock exposures support an assortment of cliff and talus communities, such as lichens, ferns, patchy trees, and shrubs (MNDNR 2013a).

2.3 Cultural Resources

The Pool 2 locality contains numerous cultural resources indicating continual human occupation over approximately the last 13,000 years. Hundreds of precontact and historic cultural resource sites have been identified in the area. Precontact sites include lithic and artifact scatters, village sites, petroglyphs, and burial mounds. Historic sites include Dakota villages, trading posts and forts, early town sites, standing structures, shipwrecks, transportation corridors, bridges, and river training structures. Cultural resources are situated on a variety of landforms, such as uplands, terraces, cliffs, islands, and natural levees. Several cultural resource sites within this locality are listed on the National Register of Historic Places (NRHP) or are eligible for listing on the NRHP. In addition, the pool contains several Historic Districts.

Interest in the archaeological record of the Upper Mississippi River Valley, including the Pool 2 locality, has been ongoing since the late 19th century (Anfinson et al. 2003; Arzigian and Stevenson 2003; Brower 1903; Finney 2000; Thomas 1894; Winchell 1911). Early inquiries shadowed national trends that centered on the contents of burial mounds and who built them. For example, many of the earthworks in the area were subjected to amateur excavations and subsequent destruction, including those situated along Dayton's Bluff (21RA5 [archeological site identifier]) and Indian Mounds Park (21RA10) just east of downtown St. Paul among other earthworks along the river. By the early 20th century most practitioners rejected the then-popular notion that a race of non-Native Americans constructed the mounds, and non-scientific investigations gave way to systematic mapping and excavation. Despite an awareness of cultural resources in the pool, no comprehensive pre-impoundment survey was completed prior to construction and subsequent operation of Lock and Dam 2 at Hastings in 1930.

Modern archaeological research within the pool began during the 1940s with research projects by the University of Minnesota and the St. Paul Science Museum (now the Science Museum of Minnesota) in the Spring Lake area (e.g., 21DK1, 21DK2), Lower Grey Cloud Island (e.g., 21WA1), and Ft. Snelling (21HE99) (Johnson 1959; Johnson and Taylor 1956; Hall 1987). In the 1970s, the Corps sponsored a survey of dredged material placement sites while the Minnesota Historical Society completed investigations on Grey Cloud Island (Birk 1973; Johnson and Hudak 1975). The Minnesota Trunk Highway

Reconnaissance Survey investigated a number of roadways adjacent to the river (Nystuen 1971).

Since the last quarter of the 20th century, several literature based overviews and numerous compliance driven cultural resource investigations have been completed within the greater Pool 2 locality (Abel 1998; Abel et al. 1998; Anderson and Ketz 1997; Anfinson et al. 2003; Dobbs et al. 1991; Finney 2000; Fleming and Hager 2010; Jalbert et. al. 1996; Madigan and Shermer 2001; Meyer and Schmidt 1995; Perkl et al. 2001; Terrell 2003; Trocki et al. 2005; Vogel and Stanley 1987; Woolworth 1976, Woolworth 1981). In addition to terrestrial resources along the pool, historic shipwrecks, wing dams, and other river training structures are documented within the river (Jensen 1992; Pearson 2003). However, the Pool 2 shoreline has not been subjected to a comprehensive cultural resources survey.

CHAPTER 3.

Historic Changes

This chapter summarizes changes to Pool 2 brought about by various navigation projects and other federal and non-federal activities. The purpose is to provide a background for the current conditions. It is not intended as a detailed description of all the changes that have occurred to the Mississippi River and its basin since European settlement.

3.1 Early Navigation Projects

The first navigation modifications and maintenance on the Upper Mississippi River were legislated by Congress in 1824. Then, Army engineers were authorized to remove snags, shoals, and sandbars and to close sloughs and backwaters so that flows were confined to the main channel to maintain depths for navigation.

The first comprehensive modification of the river for navigation was authorized by the Rivers and Harbors Act of 1878. This legislation authorized a 4.5 foot channel from the mouth of the Missouri River to St. Paul, Minnesota. The 4.5 foot channel was maintained by constructing dams at the headwaters of the Mississippi River to impound water for low flow supplementation, bank revetments, closing dams, and longitudinal dikes. A 6 foot navigation project was authorized by the River and Harbor Act of 1907. The additional depth for the 6 foot channel was obtained by increased construction of wing dams supplemented by limited dredging. Usually the banks opposite a wing dam field were protected with rock revetments to prevent erosion.

Available records show that a total of approximately 219 wing dams and 34 sections of revetment were constructed throughout Pool 2. The wing dams and revetment both span roughly 70,000 linear feet, totaling approximately 140,000 linear feet of structure placed throughout the study area. The average year of wing dam construction is 1889, while the average construction year of revetment is 1884. The total cost for initial construction of the wing dams and revetment throughout Pool 2 is estimated to be \$1.8 million.

These early navigation structures were designed to confine flow to the main channel. The closing dams would have reduced flow down side channels and, in combination with the wing dams, increased velocity and sediment transport in the main channel, resulting in a deeper channel. Sediments accreted between wing dams and in cut off side channels, converting aquatic habitat to terrestrial habitat.

This accretion and conversion is readily evident on pre-lock and dam aerial photographs.

3.2 9-Foot Channel Navigation Project

The Rivers and Harbors Act of 1930 authorized the 9-Foot Channel Navigation Project and led to the construction of a series of locks and dams to provide the necessary water depths. Some of the land that would be affected by the increased water levels was purchased. The Corps purchased approximately 1,219 acres in Pool 2 and acquired flowage easements on an additional 6,249 acres. Pool 2 is outside of the Upper Mississippi River National Wildlife and Fish Refuge, therefore, there is no cooperative agreement between the Corps and USFWS for lands managed in Pool 2. Lock and Dam 2 was constructed in 1930. Lock walls settled and tilted, which led to the construction of a second lock completed in 1948. Normal headwater elevation at Lock and Dam 2 is 686.8 (NAVD 1988 datum). Creation of the pool inundated thousands of acres of land.

The effects from creating navigation pools have been described in many other studies. They can be synopsized as follows. Creating navigation pools made thousands of acres of new aquatic habitat, benefiting those forms of fish and wildlife adapted to this habitat. Major beneficiaries were lentic fish species, waterfowl, marsh, and other waterbirds, and furbearers. Adversely affected were terrestrial wildlife and lotic fish species. The period from creating the locks and dams through the late 1950s could be termed an “era of plenty” due to the abundant fish and waterfowl resources generated by the newly created aquatic habitats.

As soon as the navigation pools were created, natural processes began to transform them. During the “era of plenty” noted above, these transformations either were not noticed, or were not given much concern by the public. In the 1960s, resource managers and the public began to take more notice of these natural changes, most specifically the filling of backwater habitats with sediments. Sedimentation was probably the most significant resource concern in the 1960s and 1970s and still is an important concern.

3.3 Other Projects in Pool 2

3.3.1 RAILROADS

The St. Paul and Pacific Railroad (SP&P) was a shortline railroad that existed from 1875 to 1879. It was originally founded as the Minnesota and Pacific Railroad, which served as the state’s first active railroad. The SP&P eventually

went bankrupt, was then taken over, and utilized as the basis for building the Great Northern Railway.

Presently, the Canadian Pacific Railway, Burlington Northern Santa Fe Railway, and Union Pacific Railroad are all operating within the study area. The majority of Pool 2 is encompassed by Burlington Northern Santa Fe Railway adjacent to the left descending bank and Union Pacific Railroad adjacent the right descending bank. Railroad crossings are not prevalent in the lower portion of the pool; however, there are several crossings near St. Paul that enable commodities to be transported by rail to their intended destination.

3.3.2 COMMERCIAL AND RECREATIONAL HARBORS

The St. Paul Small Boat Harbor is on the downstream end of Harriet Island in St. Paul, MN at Upper Mississippi River RM 839.7, on the right descending bank. The Corps is authorized to maintain the harbor to a depth of 5 feet below the low control pool elevation of 686.8 feet mean sea level. The Corps generally dredges the harbor to a depth of 6 feet to prolong the need for future dredging and to help provide enough clearance for dredging operations. Since 1990, the harbor has been dredged at least 14 times. On average, 8,800 cubic yards have been dredged per event. Recent dredging has occurred in 2008, 2011, and 2017. In 2006, the city of St. Paul contracted dredging work at its own expense because Corps' funding was not available. The city of St. Paul is the non-federal sponsor for the project and is required to furnish a suitable placement site for material dredged within the harbor. St. Paul delegated its responsibility for most of the docks and similar facilities to the St. Paul Yacht Club. Construction of the Harbor was completed December 5, 1949, at a cost of \$271,392. The length of the harbor is 2,375 feet. The width varies from 200 to 400 feet.

In addition to the St. Paul Small Boat Harbor, there are various recreational harbors or marinas for which the Corps is not authorized to maintain; they are: Watergate Marina, Twin Cities Marina, River Heights Marina, Castaways Marina, Hidden Harbor Marina, and River Grove Harbor Marina.

3.3.3 SPRING LAKE PARK RESERVE

Dakota County has prepared a Spring Lake Park Reserve Master Plan, which calls for improvements to Spring Lake.

The Spring Lake Park Reserve Master Plan was adopted by the Dakota County Board of Commissioners in December 2003. The Master Plan establishes a foundation for development planning during a fifteen-year timeframe, from 2003 to 2018. Planning will include: recreational use and activities, facilities and investments, boundaries, and resource protection and restoration. Dakota County has expressed interest in expanding Spring Lake Park Reserve in the future. Plans may include development along the shore of Spring Lake for recreational boat launching or day-use areas.

CHAPTER 4.

Planning Considerations

4.1 Forecasting Future Conditions

Planning for the future requires projecting future conditions under various scenarios, including a No Action alternative scenario. Corps planning regulations are contained in Engineering Regulation (ER) 1105-2-100 and include evaluating existing conditions compared to the “future without plan” conditions. Future without plan conditions form the basis from which a plan is formulated and impacts are assessed, and they are based on:

- Existing conditions and trend information.
- Available related forecasts; for example, land use plans and population projections.
- Established institutional objectives and constraints and local customs and traditions; for example, authorized projects, refuge master plans, and local recreational preferences.
- Reasonably foreseeable actions of people in the absence of any proposed action.
- Reasonably foreseeable natural occurrences; that is, annual high water and natural succession.

The Corps regulation providing guidance for the conduct of Civil Works Planning Studies is also contained in ER 1105-2-100. Dredged material management plans are to be developed to meet dredging needs for a minimum of 20 years. The St. Paul District has opted to develop a 40-year plan.

4.1.1 DREDGING

Dredged Material Management History in Pool 2

Pool 2 has 13 dredge cuts with recorded maintenance dredging since 1970. In addition to the 13 dredge cuts within the channel, access dredging is sometimes required for barges to offload material at the three temporary placement sites (Pine Bend, Upper Boulanger, and Lower Boulanger) in the lower portion of the pool. The St. Paul Small Boat Harbor has also required maintenance dredging

since 1970. The locations of the dredge cuts in Pool 2 are shown on Plates 3 and 4. The location of Pool 2 dredge cuts can also be found on Tiles 5–9 of the St. Paul District Channel Maintenance Management Plan, Tab 8, Location Maps.

Dredged material composition, job size, and location have had a strong influence on how dredging has been managed in Pool 2. In the recent past, dredging volumes per job have been relatively small in the upper reach of Pool 2, which combined with a smaller site footprint, lend to mechanical dredging and placement. The material generated in the upper reach has been placed upland at the Southport placement site for the past twenty years, primarily through mechanical methods. All of the material placed at Southport has been removed and used beneficially or used as fill for development. Both mechanical and hydraulic methods have been used to manage material generated in the lower reach of Pool 2. Generally speaking, the job sizes are larger in the lower reach of the pool. In addition, the total dredging need is far greater in the lower reach than the upper reach. Three temporary sites have been used to manage material generated in lower Pool 2. Material placed on the temporary sites was later removed via a large-scale contract when the sites reached capacity.

As previously discussed, a sediment assessment was completed to forecast future dredging conditions throughout Pool 2 (Hendrickson and Libbey 2016). The total average annual dredging in Pool 2 equates to over 50 percent of all dredged material from the upper St. Paul District pools (USAF through Upper Pool 4). The total dredged volume includes sand as well as silts, clays.

Figures from the *Assessment of Pool 2 (RM 815.2–847.6) Sediment Sources and Dredging* (Hendrickson and Libbey 2016) illustrate the annual dredging of these sites from 1971 to 2014 plotted along with mean annual discharge on the Minnesota River at Jordan and the Mississippi River at St. Paul. Although there is variability from one year to another, there was a definite upwards shift in river discharge beginning in the early 1990s. On the Minnesota River, average annual discharge increased 68 percent for the two-decade time period 1991 to 2010 compared to the previous two-decade period, 1971 to 1990. On the Mississippi River, average annual discharge increased 24 percent for the two-decade time period 1991 to 2010 compared to the previous two decade period 1971 to 1990. This shift in average annual flows corresponds to the overall increase in dredging in Lower Pool 2.

In the last ten years, most dredging in Pool 2 has been conducted by mechanical methods for various reasons. First, fairly large placement sites (at least five acres of available space) are preferred to accommodate hydraulic dredging and dredged material placement. The additional space accommodates constructing berms and establishing a ponding area, which provides the material time to settle. As placement sites begin to reach their capacity, hydraulic placement becomes impractical and mechanical placement is the only feasible method. The capacity of available dredged material placement sites throughout Pool 2 is limited. Due to a combination of dredged material placement events and site reconfiguration, the operational footprint at placement sites in Pool 2 has been reduced over the past several years, thus requiring mechanical placement.

In addition, an efficient hydraulic dredging operation typically requires jobs of at least 20,000 cubic yards. Jobs of this volume are less common above Lake Pepin, which makes mobilizing the hydraulic dredge Goetz inefficient and uneconomical in most cases. It is not economical to mobilize a dredge plant, whether hydraulic or mechanical, vast distances for a relatively small volume of work. That volume of work differs substantially whether dredging mechanically or hydraulically, as noted above. Ultimately, management determines if and when it is appropriate to use specific dredge plant based on many factors. The primary factor prohibiting hydraulic dredging in recent years is lack of placement site capacity.

Table 5 shows the estimated dredged material volumes for each of the Pool 2 dredge cuts projected over the next 40 to 80 years.

Table 5 Projected Pool 2 Dredged Material Volumes

Pool 2 Dredged Material Management Plan Volumes (CY)			
	40 years	60 years	80 years
Dredge Cut	Project Lifecycle Volume	Project Lifecycle Volume	Project Lifecycle Volume
Lower Appch. L/D 1	11,676	17,514	23,352
Abv. & Blw. Smith Ave.	16,680	25,020	33,360
St. Paul Small Boat Harbor	264,100	396,150	528,200
Abv. Wabasha Ave. Br.	0	0	0
Blw. Lafayette St. Br.	0	0	0
St. Paul Barge Terminal	1,430,032	2,145,048	2,860,064
Grey Cloud Slough	0	0	0
Robinson Rocks	0	0	0
Pine Bend Landing	324,760	487,139	649,519
Access Pine Bend Site	53,821	80,731	107,642
Pine Bend	1,308,824	1,963,236	2,617,648
Boulangier Bend	1,629,302	2,443,954	3,258,605
Boulangier Bend Lwr. Lt.	472,461	708,692	944,922
Freeborn Light	1,247,052	1,870,579	2,494,105
Upper Appch. L/D 2	0	0	0
TOTALS	6,758,708	10,138,062	13,517,416

Dredging Trends in Pool 2

Pool 2 is very different from the pools adjacent to it. Pool 2 requires a high volume of dredging per year - particularly in the lower portion of the pool - but maintaining depth has also required an increase in dredging volumes for each five-year period over the last fifteen years. Upper Pool 2 and Pool 1 have generated a relatively steady amount of dredged material since dredging practices were modified in 1981, whereas Lower Pool 2 has seen significant increases in dredging volumes, largely attributed to increased flows in the Minnesota River.

Figure 5 shows dredging quantities averaged over a five-year period to better depict the data, because dredging doesn't occur at consistent locations every year. The red bar represents the overall average from 1981-2014, while the blue bar shows that depending on conditions in any given year or five-year period, the

actual amount dredged may be more or less than the overall average. The period 1981-2014 was used because this is the same period of time used in the Sediment Assessment Report (Hendrickson and Libbey 2016), and updating the time period through 2017 would not have any significant change on the expected future dredging needs in Pool 2 and the need for this DMMP Report.

From the chart, it is easy to see that the time period of 1996–2000 is an outlier. This is due to management decisions to dredge the channel to wider dimensions in 1999-2000, thereby increasing dredging volumes. The wider channel was not maintained and for a time after the wider channel was acting as a sediment sink. Since completing the channel widening in 1999–2000, Pool 2 displays a rising trend in dredging volume for each five-year period thereafter.

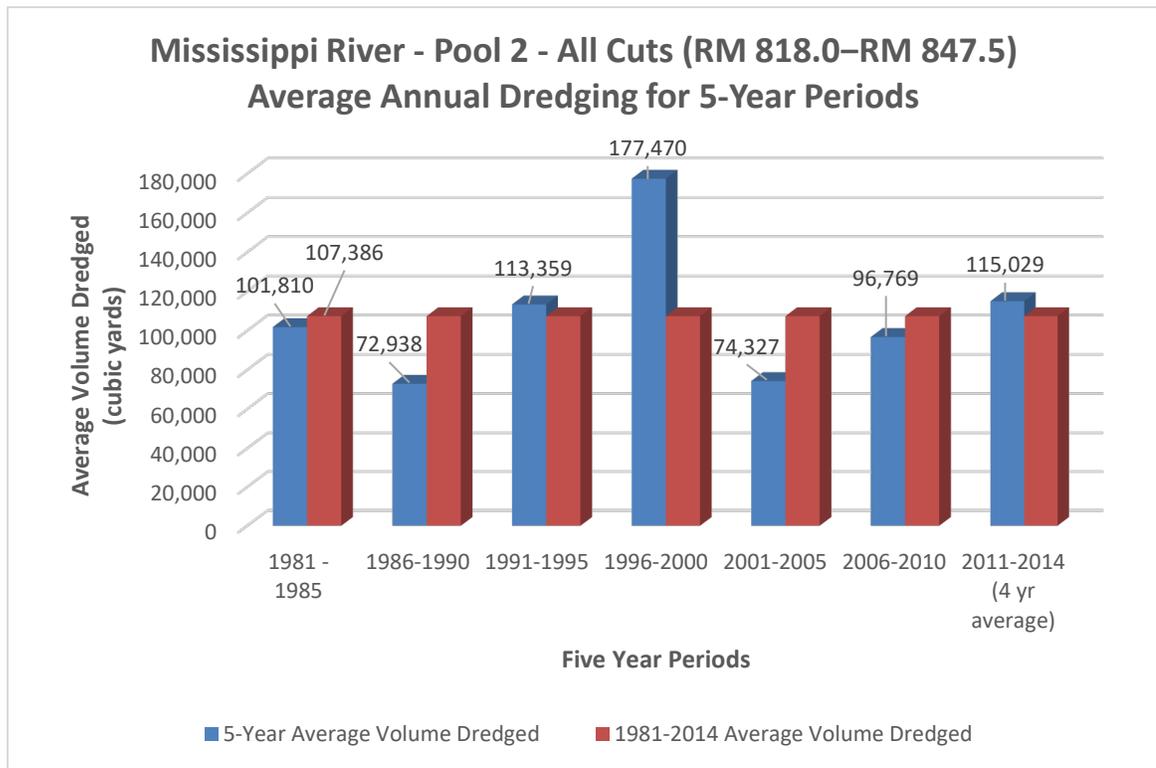


Figure 5: Pool 2 Average Annual Dredging

4.1.2 CLIMATE CHANGE

A qualitative climate change analysis was performed in accordance with Engineering and Construction Bulletin, 2016-25 *Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Work Studies, Designs, and Projects*. The full analysis is presented in Appendix C Climate Change.

The U.S. Global Research Program’s Third National Climate Assessment was completed in 2014. It states that:

“In the Upper Midwest extreme heat, heavy downpours, and flooding will affect infrastructure, health, agriculture, forestry, transportation, air and water quality, and more. Climate change will tend to amplify existing risks climate poses to people, ecosystems, and infrastructure. Climate change also alters pests and disease prevalence, competition from non-native or opportunistic native species, ecosystem disturbances, land-use change, landscape fragmentation, atmospheric and watershed pollutants, and economic shocks such as crop failures, reduced yields, or toxic blooms of algae due to extreme weather events.”

Important driving climate variables include seasonal precipitation and air temperature; both variables are expected to increase in the future. In the project area this could alter hydrologic characteristics such as the magnitude, duration, and timing of river flows; water quality variables such as temperature, dissolved oxygen, and turbidity; and geomorphic processes like sediment deposition and secondary channel erosion.

While climate change modeling and assessment at the project scale relies on qualitative information at this point in time, the existing hydrologic record can provide some insight on recent changes. An analysis of the Mississippi River discharge record at the nearby USGS gage at Prescott, WI indicates that the average annual discharge and the number of days of overbank flows per year have increased over the last four decades. Most of the increase is occurring during the spring and early summer months with smaller increases in the fall. During the winter months of December, January, and February overbank flooding has not occurred. Given that climate modeling indicates a wetter climate in the future, the increased flows indicated in the recent hydrologic record are likely to persist and potentially worsen. These changes will be considered during project planning and design.

4.1.3 PROJECTED FUTURE CONDITIONS

Between 1981 and 2014, the average amount of material dredged per year in Pool 2 was approximately 107,000 cubic yards. A sediment assessment was completed in September 2016 to predict future dredging requirements throughout Pool 2. The *Assessment of Pool 2 (RM 815.2–847.6) Sediment Sources and Dredging* (Hendrickson and Libbey 2016) evaluated the impact of increasing flow conditions and changes in dredging practices in the USAF Pool and Pool 1 on channel dredging throughout Pool 2. In summary, dredging requirements are anticipated to increase substantially throughout Pool 2 - to approximately 169,000 cubic yards per year. Therefore, the 40-year target capacity for the Pool 2 DMMP is approximately 6.8 million cubic yards.

Projecting the future dredging quantities in Pool 2 is difficult due to many of the unique factors that have impacted the pool over the course of the last decade, including the uncertain timing and level of increased sediment deposition Pool 2

will experience following the lock closure at USAF. Dredging quantities from 1981 to 2014 are thought to be most representative of historic dredging practices because there are limited irregular influences on dredging during that time period. The period 1981 – 2014 was also the period of assessment in the report *Assessment of Pool 2 (RM 815.2–847.6) Sediment Sources and Dredging* (Hendrickson and Libbey 2016). There are no influences on the dredging conducted in 2015-2018 that specifically warrant their exclusion; however, for consistency with the Hendrickson and Libbey assessment, this report references dredged quantities from 1981-2014. Changing the time period through 2018 would not have any significant change on the expected future dredging needs in Pool 2 and the need for this DMMP Report.

Dredging volumes from 1981 to 2014 do correlate with a record of increased flows on the Minnesota River and the Mississippi River in Pool 2. On the Minnesota River, average annual discharge increased 68 percent for the two-decade time period 1991 to 2010 compared to the previous two-decade time period 1971 to 1990. On the Mississippi River, average annual discharge increased 24 percent for the two-decade time period 1991 to 2010 compared to the previous two-decade time period 1971 to 1990 (Hendrickson and Libbey 2016). It is unknown whether flow conditions will continue to increase, and to what extent. Because increased flows would lead to increased dredging needs, the project delivery team determined it was necessary to exercise precautionary measures such as pursuing a site with excess capacity to accommodate potential increases in dredging conditions.

Shifting channel maintenance practices in the navigation channel upstream of Pool 2 following the recent USAF lock closure will also impact future dredging requirements in Pool 2. For the purpose of this study, the project delivery team assumed that dredging would cease in the Upper St. Anthony Falls Pool and Pool 1. Though a formal decision to discontinue dredging practices in the Upper St. Anthony Falls Pool and Pool 1 has not yet been made, there are several challenges to address if dredging continues, including mobilizing equipment and availability of dredged material placement sites. By factoring discontinued dredging operations in the Upper St. Anthony Falls Pool and Pool 1 and quantifying changes in sediment deposition as a result of the Grey Cloud Slough Project, the project delivery team anticipates dredging volumes to increase near 50 percent in the future. This projection is based on the sediment assessment in the 2016 Hendrickson and Libbey report as well as historical dredging data.

Pool 2 is also unique compared to other pools currently being studied for dredged material placement in that the composition of dredged material varies from granular sand to fine silt and clay, which requires diverse management capabilities. Sand can be stockpiled with ease and in most cases later removed for general construction fill. Finer materials often require placement into a holding cell and a varying drying period before the material may be utilized in a resourceful manner. Due to the diverse composition of dredged material throughout Pool 2 and the uncertain demands of beneficial use, it is necessary to identify alternatives that could accommodate all materials generated throughout

the 40-year project life. Because of this, the total volume of material generated throughout the 40-year project life was more influential than the annual dredging average in determining the required site capacity.

4.2 Problems and Opportunities

One of the critical steps performed early in the planning process is identifying problems and opportunities associated within the geographic scope of the project area. Problem and opportunity statements are concise characterizations of the broad issues that will be addressed with the project. Opportunities can be directly related to solving the problem at hand but can also be ancillary to the identified problem. From the list of problems and opportunities, objectives for the project are drafted. The success of the project planning is determined by achieving the objectives through identified alternative measures.

4.2.1 PROBLEMS

Problems identified within the Pool 2 study area include the following.

- Sedimentation is a continuing problem leading to the necessity for dredging and placement of the dredged material. Pool 2 has undergone changes in dredged material management needs. These changes are due to increased flows on the Minnesota and Mississippi rivers and dredging volumes throughout Pool 2, additional dredging required for increased channel maintenance in Lower Pool 2, and the need to excavate three temporary dredged material placement sites in Lower Pool 2. The majority of sediments entering Pool 2 are those carried in with the water entering upstream through Lock and Dam 1 and those carried in with the water entering through the confluence of the Minnesota River. Some of these sediments deposit within the designated navigation channel of Pool 2, reducing the available clearance for larger vessels such as towboats. Periodic removal (dredging) of this material and placing it elsewhere helps maintain the channel to dimensions suitable for large vessels.
- There are no existing long-term sites under Corps management available in the study area with capacity to place the amount of material dredged annually in Pool 2.

4.2.2 OPPORTUNITIES

Opportunities exist for potentially using significant amounts of dredged material for productive purposes, referred to as “beneficial use” of dredged material. Some of the sediment found in the main channel of the river in the study area consists of a medium to coarse sand, and none has exceeded current SRV thresholds since

2000 (see section 2.2.5). The material is suitable for a number of applications such as construction fill material and winter road maintenance. Because it is relatively contaminant free, it can also be placed in the water for such purposes as island construction. The material is highly suitable for beach nourishment and/or creation.

4.3 Goals, Objectives, and Constraints

4.3.1 GOALS

Planning goals are broad, conceptual statements that describe the ultimate and over-arching purposes for the study. The overarching national goal of water resources planning is to contribute to national economic development while protecting the nation's environment. The Corps' mission includes maintaining a commercially navigable channel in the UMR. The goal of this study is to identify the least costly, environmentally-acceptable method of managing the estimated 6.8 million cubic yards of material that will be dredged from Pool 2 during the 40-year planning period.

4.3.2 OBJECTIVES

Planning objectives are concise and focused descriptions of what an alternative plan should achieve. They are developed based on the problems and opportunities that are identified for a study. Clear objectives are used to identify measures and formulate alternatives that will achieve the project's goals. The objectives for the proposed project are:

- Secure a site for dredged material placement sufficient for 40 years of maintenance dredging or longer if a site with such capacity is identified. The Pool 2 area is very developed with limited potential options for dredged material placement; identification of a site with capacity to serve for the long term, for 40 years or more, is desirable.
- Continue to maintain a suitable navigation channel for commerce and recreation in an economically viable manner.
- Maximize beneficial use of dredged material for general public use, for gravel pit or mine reclamation and other specific upland uses, and for the construction or enhancement of authorized projects.
- Reduce Operations and Maintenance costs wherever possible.

4.3.3 CONSTRAINTS

The following constraints were identified and considered during planning.

Cost

Material placement sites must be cost effective for use.

Operational Feasibility

Placement sites must have dredged material capacity based on the existing conditions and anticipated future conditions. Ideally, sites would be suitable for both hydraulic and mechanical dredging and placement methods.

Environmental Acceptability

Plans need to comply with applicable Federal environmental laws and regulations, including the Clean Water Act (CWA), which requires projects to minimize impacts to wetlands and meet State water quality standards.

Avoid impacts to high value habitat and threatened and endangered species. Pool 2 provides habitat for an important and improving mussel community, including many state- and federally-listed threatened and endangered species.

Plan must avoid and minimize to the extent practicable any impacts to the 1 Percent Annual Exceedance Probability (“100-Year”) Flood Stage.

CHAPTER 5.

Formulation of Alternatives and Plan Selection

This chapter details site identification, site screening, alternative development, and plan selection.

A list of potential dredged material placement sites was developed by assessing current land uses and coordinating with local representatives. Consideration has been given to the full range of measures for dredged material management including: management of existing placement sites to extend their life, in-water placement, various combinations of new placement sites involving different placement methods, and measures to reduce dredging requirements, including reduced dimensions and the use of training structures.

The Federal Standard (33 CFR Part 335.7) for dredged material placement sites is defined as “the dredged material disposal alternative or alternatives identified by the Corps which represent the least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process...” In order to determine which sites meet the Federal Standard, all sites must be evaluated in terms of cost effectiveness, environmental acceptability, and operational feasibility.

As alternative plans were being developed and analyzed, it became evident that planning for dredged material placement throughout Pool 2 could be divided into two sub-planning efforts: one for Upper Pool 2 dredge cuts, and one for the Lower Pool 2 dredge cuts. Dredging is concentrated in the upstream and downstream portions of Pool 2, with approximately 9 river miles in-between where no maintenance dredging is typically required. Placement sites would not be mutually useful between upper and lower dredge cuts due to the distance between the upper and lower dredge cuts and the resulting high cost to move the material. Therefore, to simplify the planning effort, the identification of placement sites was divided between the upper and lower sections of Pool 2.

The overall DMMP goal is to identify the least costly, environmentally-acceptable method of managing the estimated 6.8 million cubic yards of material that will be dredged from Pool 2 during the 40-year planning period. Approximately 1.8 million cubic yards will be dredged from the cuts in Upper Pool 2 and approximately 5 million cubic yards will be dredged from the cuts in Lower Pool 2.

Table 6 lists the sites evaluated during the creation of this plan. Sites are listed from upstream to downstream. Site locations are shown on Plates 1 and 2.

This chapter is organized in a manner similar to the stepwise planning procedure applied to the study. Subchapter 5.1 describes the No Action Alternative.

Subchapter describes the planning process and planning constraints. Subchapter 5.3 and Plates 1, 2, and 7 detail each of the identified potential placement sites. Subchapters 5.4 and 5.5 present the sites that were identified but screened from detailed consideration because they would not meet the study objectives or fit within the identified constraints, including:

- Significant development or structures on site,
- Adverse environmental impacts, or
- Not cost effective.

Subchapters 5.6 and 5.7 describe sites that could provide an opportunity for beneficial use of material in the future but were determined to be unsuitable as part of the plan to meet the long-term capacity needs. Subchapters 5.8 and 5.9 describe the sites identified in the CMMP; these sites are carried forward for potential future use, but do not meet one or more components of the Federal standard. Subchapters 5.10 and 5.11 describe in detail the most promising sites for meeting the study objectives and represent the least-costly, environmentally acceptable alternatives.

Table 6: Potential Placement Sites Identified in Pool 2

Pool 2 Section	Placement Site Name	River Mile
Upper Pool 2 Sites	Highbridge	840.4
	St. Paul Barge Terminal Site	837.5
	Childs Road	837.0
	Holman Field	836.8
	Southport	836.3
	St. Paul Recreational Fill Area	835.3
	Pigs Eye Lake (Section 204 Study)	835.0
	Pigs Eye Ash Ponds	835.9
	Pigs Eye Landfill	836.5
Lower Pool 2 Sites	Upper Grey Cloud – Aggregate Industries	826.5
	MNDNR (west bank); Flint Hills Resource Pine Bend LLC	825.0
	Pine Bend (Temporary Site)	823.8
	CF Industries Dock Site	823.8
	CF Industries Pit Site	823.5
	Shiely Pit	822.5
	CF Industries Sales LLC – Spring Lake Park Reserve	823.0
	Dakota County – Spring Lake Park Reserve	822.3
	Lower Grey Cloud Island	822.9–821.7
	Upper Boulanger (Temporary Site)	821.5
	Lower Boulanger (Temporary Site)	821.1
	Freeborn Island (Temporary Site)	819.2

5.1 No Action Alternative

The No Action alternative for this DMMP represents no change in the current management plan. Under a normal feasibility study seeking authorization for a new project, the No Action alternative would mean that no action would be taken. However, in the instance of an ongoing program, the No Action alternative refers to no change in program direction. Therefore, under the No Action alternative, the 9-Foot Channel Navigation Project and congressional authority for the Corps to maintain a navigation channel in Pool 2 would remain in place. The No Action alternative represents continuing with dredging and material placement as it is

currently being implemented but under the forecasted future conditions. The current plan for managing dredged material is detailed within the CMMP.

The CMMP has identified the following order of priority for selecting placement sites for dredged material:

1. CMMP-identified permanent or transfer placement sites.
2. CMMP-identified emergency placement sites.
3. Non-CMMP designated placement sites.*

**Material placed at non-designated placement sites during imminent closure or emergency response situations would be coordinated with regulatory agencies if possible and moved to an approved CMMP site as soon as possible.*

The CMMP requires that long-term plans for managing dredged material be developed and implemented on an ongoing basis. This is done by developing dredged material management plans (DMMP). Based on the DMMP recommendations, sites are then added to the CMMP's list of designated sites for each pool.

The No Action alternative considers what would happen in the absence of preparing and implementing a new plan for managing dredged material in Pool 2 of the Upper Mississippi River. Because it is the policy of the Corps that dredged material placement capacity be available for at least 20 years of projected dredging needs, the No Action alternative is unlikely to last for an extended period of time. There is an imminent need to identify and acquire access to long-term acceptable placement site(s) for Pool 2.

Under the No Action alternative, currently approved and available placement sites in Upper Pool 2 could accommodate material placement needs for another twenty years due to restored capacity from beneficial use of dredged material. However, currently approved and available placement sites in Lower Pool 2 would not be expected to accommodate material placement needs for more than a few dredging seasons. If approved CMMP sites are not available when dredging is required in Pool 2 due to navigation emergency situations, dredged material may need to be placed at non-CMMP designated placement sites. Non-designated placement sites can include temporarily placing dredged material in the aquatic main channel border areas (in-water placement). The use of non-designated placement sites may result in higher costs and greater environmental or social impacts. Presumably though, these instances would be short-term, and a new planning effort would occur to identify the most acceptable dredged material management methods for the pool.

In summary, the No Action alternative under evaluation in this report is based on the assumption that there will continue to be a need for periodic dredging to maintain the navigation channel and that the currently-approved CMMP placement sites will not provide adequate capacity for dredging needs in the short- and long-term future.

5.2 Planning Process and Criteria

Planning in Pool 2 began with an evaluation of the current dredging practices, as described above. The targeted capacity is approximately 6.8 million cubic yards. This will accommodate the expected maintenance dredged material for Pool 2 over a 40-year period.

Current local land uses were assessed and coordinated with local river interests and land use management representatives to develop a list of more than 20 potentially suitable sites for permanent and temporary placement of dredged material. Sites were evaluated based on aspects of environmental acceptability, operational feasibility, and estimated costs of using the sites.

Alternative development consisted broadly of three steps:

1. Comparing the costs and environmental acceptability of the sites identified,
2. Defining the dredged material capacity need based on the existing conditions and anticipated future conditions, and
3. Identifying sites or groups of sites that would be environmentally acceptable and fulfill the capacity needs for the upper and lower reaches of the pool.

Once identified, sites were evaluated and placed into one of four categories:

1. Sites screened from further consideration because they would not meet the study objectives or fit within the identified constraints.
2. Sites that could provide an opportunity for beneficial use of material in the future but were determined to be unsuitable as part of the plan to meet the long-term capacity needs.
3. Sites designated as placement sites in the CMMP and carried forward for potential future use.
4. Sites that aligned with the study objectives.

5.2.1 COMPARISON OF SITES

Sites were compared based on aspects of environmental acceptability, operational feasibility, and estimated costs. Considerations made for each of these factors are discussed below.

Environmental Acceptability

To judge environmental acceptability criteria included consideration of natural and cultural resources; social impacts; flood stage impacts; hazardous, toxic, or radioactive wastes; and Clean Water Act Section 404(b)(1) guideline considerations.

Operational Feasibility

Suitability for both hydraulic and mechanical dredging and placement methods, short and long term beneficial use opportunities, and vicinity to dredging locations were considered under this criteria.

Estimated Costs

Costs were normalized to costs per cubic yard of dredged material for easy comparison and are considered parametric.

Unit Cost:

A cost per cubic yard was calculated for each site. These costs, as described below, are the required operational costs to place the material in its final resting place. Site acquisition and site development costs are not included because these costs divided by the total cubic yards dredged over 40 years amount to less than \$1.00/cubic yard. As such, real estate acquisition costs were not a material factor in analyzing the sites for the DMMP.

Operational costs include physically handling the dredged material by means of mechanically dredging the material out of the river, barging the material to the placement site, unloading the material, placing the material, trucking the material if required, additional expenses as defined in the mechanical dredging contract such as use of extra equipment or pushing material beyond 900', and unloading the material in the cases of using the Temporary Placement sites. Mechanical dredging was assumed for cost comparisons because historically, most of the dredging in Pool 2 has been conducted in this manner. Hydraulic dredging typically is not cost-effective unless larger volumes are dredged than is normally dredged in this pool. However, hydraulic dredging may still be used in Pool 2 under some circumstances.

Dredging:

The unit price of \$9.10 per cubic yard was obtained from the 2019 USACE Mechanical Dredging Contract for the base year (2019 dollars) which includes barging up to 4 miles, unloading and placing the material on land within a 900 foot push. The incremental cost for transporting dredged material 4-8 river miles is \$1.15 per cubic yard, and an additional \$.40 per cubic yard beyond 8 river miles.

Trucking:

The unit price per cubic yard was obtained from the 2019 Mechanical Dredging Contract for the base year (2019 dollars). These costs are \$2.40/cubic yard for a

distance up to 0.5 miles and \$3.00/cubic yard for a distance between 0.5 miles and 1.5 miles.

Placement:

This cost includes any required equipment and labor required to move the material greater than 900 feet.

Unloading:

This cost is applied to all temporary sites that eventually need to be unloaded. The unit price, \$7.15/cubic yard was obtained from the 2019 Mechanical Dredging Contract for the base year (2019 dollars).

5.3 Placement Sites Considered

Sites are listed from upstream to downstream and grouped by Upper and Lower Pool 2. Sites screened from consideration are highlighted in red and are briefly described in subchapters 5.4 and 5.5. Sites with potential for future use are described in subchapters 5.6 and 5.7. Sites that met the requirements for Pool 2 DMMP and were carried forward are described in subchapters 5.10 and 5.11. Plates 1 and 2 show the location of the potential placement sites considered in Pool 2.

5.4 Sites Screened From Further Consideration in Upper Pool 2

The following paragraphs briefly describe each of the sites that were screened from detailed analysis in Upper Pool 2. All sites identified were considered. Sites were evaluated based on the criteria defined in Paragraph 5.2.1. Upon preliminary consideration of one or a number of these categories, it was clear that these sites would not meet planning considerations. Sites with very high costs or environmental impacts were screened out because other sites better met planning objectives and constraints. The specific reasons for screening are identified for each site in this chapter.

5.4.1 IN-WATER PLACEMENT

In-water placement concepts were considered, however, such alternatives were not carried forward for a number of reasons.

Simple in-water placement within the navigation channel below a dredge cut is impractical due to the longitudinal decrease in sediment transport capacity. Pool 2, like most navigation pools in the St. Paul District transitions from a riverine condition in its upstream reaches to a more lake-like condition in its lower reaches. This transition causes a decrease in sediment transport capacity from upstream to downstream, meaning that any sediment from a lower Pool 2 dredge cut placed back in the channel would not be mobilized out of Pool 2 and would have to be re-dredged, thereby significantly increasing costs.

In-water placement to construct stable features such as islands large enough to meaningfully address the dredged material placement needs in the pool is problematic for several reasons.

The objective of this DMMP is for the permanent placement of up to 6.8 million yards of granular/fine material to site over a 40-year period. The Corps has constructed multiple artificial islands in the lower pools under the Upper Mississippi River Restoration Program over the past 30 years. Typical artificial islands require on average about 12,000 cubic yards of granular material, for one-acre of island (typical wide type island, constructed in water 3-4 feet deep and 2 feet above water surface). These islands not only require a granular base, but at least one foot of fine material for topsoil, rock protection for erosion control (such as rock vanes, groins and end protection) as well as ground cover plantings. A typical conservative cost for an island is about \$200,000 an acre. If islands were constructed with 6 million yards of granular material it could result in the construction of 500 acres of islands at a total cost of about \$100,000,000. About half of this total cost is from the rock erosion control features and topsoil necessary for island construction, which would be avoided with the use of other placement alternatives considered here.

The construction of features such as islands is also limited by the impacts of increased flood stages and likely impacts to insurable structures. Pool 2 is located in a metropolitan area with many insurable structures adjacent to the floodplain. The induced flood level rise from placing structures in the floodway/floodplain cannot exceed zero (No-rise Certification), which is defined as 0.005 feet (1/16 inch) in Pool 2 per Federal Emergency Management Agency (FEMA) and MNDNR regulations. The Corps is constructing two low rock mounds in Lower Pool 2 near Boulanger Bend as part of the Lower Pool 2 Channel Improvement Project to help make the navigation channel safer and more reliable. Minimizing flood stage impacts from those features was only achieved through widening the navigation channel back to its original authorized width. Adding additional structures such as artificial islands would likely result in a flood stage rise exceeding 0.005 feet.

Another consideration is that filling aquatic habitat, especially at the magnitude required here, for the purpose of dredged material placement would likely have unacceptable environmental consequences. Even if impacts to wetlands could be avoided, Pool 2 provides habitat for an important and improving mussel community, including many state- and federally-listed threatened and endangered species. Such impacts would be unacceptable to partner resource agencies and

could be avoided through the selection of other available alternatives. Mitigating for impacts to high value habitat such as relocating mussels can run in excess of \$75,000 an acre.

Although in-water placement is not considered viable as a major component of the proposed alternative, opportunities to place material in-water for beneficial use will be considered on a case-by-case basis for projects such as the lock and dam 2 Embankment protection that is currently being studied, as described in Chapter 1.4.6.

Finally, the Clean Water Act prohibits in-water placement of dredged material into a water of the U.S. that is not the least environmentally damaging practicable alternative. In both Upper and Lower Pool 2, there are less damaging practicable alternatives to in-water placement.

5.4.2 ST. PAUL BARGE TERMINAL SITE, RM 837.5

This open water 28-acre site was identified by GREAT, but it never received endorsement from the interagency advisory group, River Resources Forum. Though this location was previously identified as a designated placement site in the CMMP, agency partners endorsed removal of the site at RRF meeting #51 (April 1998). This was due to the fact the Corps obtained a 20-year agreement with the St. Paul Port Authority to utilize the Southport placement site for dredged material placement. In addition, use of this site would have negative environmental impacts to aquatic resources. Estimated placement costs at this site are \$9.10/CY. Due to this site's adverse environmental impacts, this site was not pursued and was screened from further consideration.

5.4.3 CHILDS ROAD, RM 837.0

Childs Road, located at RM 837, is currently an industrial site. The capacity for dredged material is limited to an area of approximately 3 acres and would accommodate approximately 50,000 cubic yards of material. Plate 1 shows a larger conceptual area, including areas developed with buildings and equipment. Dredged material could only be placed in a small portion of the area shown, and placement here would negatively impact local industry at the site. Estimated placement costs at this site are \$9.10/CY. This site was not pursued because of its limited capacity and it does not meet the long-term dredged material placement needs for Upper Pool 2. Therefore, this site was screened from further consideration.

5.5 Sites Screened From Further Consideration in Lower Pool 2

The following paragraphs briefly describe each of the sites that were screened from detailed analysis in Lower Pool 2. All sites identified were considered. Sites were evaluated on the basis of site location relative to dredging locations, site capacity, placement costs, accessibility, current conditions, land use restrictions, environmental impacts, social impacts, and cultural resources. Upon preliminary consideration of one or a number of these categories, it was clear that these sites would not meet planning considerations at this time. Sites with very high costs or environmental impacts were screened out because there were other sites that better met planning objectives and constraints. The specific reasons for screening are identified for each site in this chapter.

5.5.1 IN-WATER PLACEMENT

In-water placement, as described in 5.4.1, was considered but not carried forward for reasons provided above.

5.5.2 FLINT HILLS RESOURCE LLC, RM 825.0

The MNDNR Flint Hills Resource Pine Bend LLC site is located at RM 825 on the west side of Lower Pool 2. Current land use of the site is bottomland forest and wetlands. Most of this area is part of the Minnesota State Pine Bend Bluffs Scientific and Natural Area (as shown on Plate 2). Estimated placement costs at this site are \$9.10/CY. This site is not environmentally acceptable due to wetland and habitat impacts. This site does not meet the Federal Standard because it would be more damaging to the aquatic environment than other cost effective alternatives. No further evaluation was recommended as part of the DMMP. This site was screened from further consideration.

5.5.3 FREEBORN ISLAND, RM 819.2

Freeborn Island is a partially eroded island at RM 819.2. The site provides backwater habitat and contains bottomland forest. Use of the site would negatively affect these environmental resources and cause flood stage impacts. This site could be used as a temporary placement site; like other island sites, material would have to be double handled to remove from the temporary site and ultimately move to a permanent site. Estimated placement costs at this site are \$16.25/CY. The site is not recommended for use due to high costs and environmental impacts; no further evaluation was recommended as part of the DMMP, and this site was screened from further consideration.

5.5.4 SHIELY PIT, RM 822.5

The Shiely pit site is identified in the approved CMMP with potential environmental impacts discussed in the Corps' 1997 FEIS. The site is part of the Aggregate Industries' Nelson Mine on Grey Cloud Trail. The pit has been mined for sand and gravel, and active mining operations continue within the vicinity of the identified site. Lower Grey Cloud Island exceeds 1,000 acres; however, the CMMP identified only fifteen acres on Lower Grey Cloud Island for initial placement of dredged material. Due to the limited acreage identified, this site does not best meet the DMMP study objectives when compared to the larger pit site now under consideration. There is no reason to carry Shiely Pit forward because the larger (325 acres) Nelson Mine pit is a few hundred yards away.

5.6 Screened Sites with Potential for Future Beneficial Use in Upper Pool 2

Several sites in Upper Pool 2 will not be pursued for this DMMP since other sites were deemed to better meet planning considerations. However, these sites could provide opportunities for beneficial use of dredged material in the future. These opportunities are described below.

5.6.1 ST. PAUL RECREATIONAL FILL AREA, RM 835.3

There may be opportunities for beneficial use at this outdoor recreational complex. Dredged material could be placed up to 2 feet over a 60-acre area. While this area is not large enough to accommodate a 20-year plan by itself continued coordination with the city of St. Paul Parks & Recreation Department is recommended to determine viable beneficial use opportunities in the future. Estimated placement costs at this site are \$9.10/CY.

5.6.2 PIGS EYE ASH PONDS

The Metropolitan Wastewater Treatment Plant disposed incinerator ash into four ponds located on the northwest side of Pigs Eye Lake. Estimated placement costs at this site are \$12.10/CY. If in the future the Metropolitan Council is interested, filling the ponds could be considered as a one-time beneficial use site, provided all necessary permits are obtained. This alternative may require a cost-share agreement with Metropolitan Council if the costs surpass the Federal Standard.

5.6.3 PIGS EYE LANDFILL

The Pigs Eye Landfill is listed on the MPCA's Superfund list. The site is bordered by the Canadian Pacific Railway yard to the north and east and Pigs Eye Lake to the south. If in the future the MPCA and the Metropolitan Council are interested, capping the landfill could be considered as a one-time beneficial use site, provided all necessary permits are obtained. Estimated placement costs at this site are \$12.60/CY. This alternative may require a cost-share agreement with Metropolitan Council and/or the MPCA if the costs surpass the Federal Standard.

5.6.4 PIGS EYE LAKE SECTION 204

Pigs Eye Lake is a proposed habitat project under Section 204 of WRDA 1996. This project will use dredged material to create islands in a 628-acre, shallow backwater lake, situated southeast of St. Paul, MN, within Pool 2 of the Mississippi River. The Pigs Eye Lake Section 204 Feasibility Report was approved in September 2018. If the project is funded, approximately 413,000 cubic yards of dredged material would be used to construct habitat islands in Pigs Eye Lake. Ramsey County, as the non-Federal sponsor, would share the costs of implementing this project above the Federal Standard.

5.7 Sites Screened with Potential for Future Beneficial Use in Lower Pool 2

Several sites in Lower Pool 2 were determined to be unsuitable for consideration as part of the long-term DMMP but could provide opportunities for beneficial use of dredged material in the future. These opportunities are described below, along with the reasons for screening them from consideration under the DMMP.

5.7.1 UPPER GREY CLOUD – AGGREGATE INDUSTRIES, RM 826.5

Upper Grey Cloud Island is a site owned by PAS Associates and under the management of Aggregate Industries. The site is currently operated as a mining pit and a rock quarry from which various materials are solicited to the public and contractors for construction purposes. The area shown on Plate 2 encompasses nearly all of Upper Grey Cloud Island, including buildings and forested areas. If this site were to be reconsidered in the future, specific portions of the area, compatible with the long-term site reclamation plan, would have to be identified for material placement. Dredged material placement on Upper Grey Cloud would require additional costs for barging material, as such, transportation costs for this site are higher than for other alternatives in Lower Pool 2. For this reason, no further evaluation was recommended as part of the DMMP, and this site was screened from further consideration as part of the DMMP. There is potential for

future beneficial use at the site as part of the long-term site reclamation when the area is no longer being mined (Plate 8). Estimated placement costs at this site are \$10.48/CY. To the extent costs for using this site exceed the Federal Standard at the time of use, a second party may be required to bear the excess costs.

5.7.2 CF INDUSTRIES– SPRING LAKE PARK RESERVE, RM 823.0

Located at RM 823, this site is currently vacant land and is partially cleared of vegetation. Estimated placement costs at this site are \$12.10/CY. This site would require trucking material and has higher costs due to the long haul distance and additional step of trucking the material. Transportation costs for this site are higher than for other alternatives in Lower Pool 2. The site is environmentally acceptable but not practicable due to cost, as compared to other alternatives. No further evaluation was recommended as part of the DMMP and this site was screened from further consideration.

5.7.3 SPRING LAKE PARK RESERVE, RM 822.3

There is an undeveloped youth YMCA camp at the Dakota County Spring Lake Park Reserve located at RM 822.3. Estimated placement costs at this site are \$12.10/CY. This site would require trucking material to the site which has higher costs due to the long haul distance and additional step of trucking the material. The site is environmentally acceptable but not practicable due to cost, as compared to other alternatives. No further evaluation was recommended as part of the DMMP and this site was screened from further consideration.

5.8 CMMP Sites Carried Forward for Potential Future Contingency Use in Upper Pool 2

Most of the placement sites previously identified in the CMMP are carried forward for potential future contingency use in Pool 2. Some of these sites will require further environmental analysis prior to use. The placement sites identified for use in the CMMP are retained as part of the DMMP to provide operational flexibility and contingency.

5.8.1 HIGHBRIDGE, RM 840.4

General Description: This site is a previously filled wetland that includes some sparse trees and grasses with a total area of approximately four acres. Highbridge is primarily used as a boat landing. The St. Paul Parks & Recreation Department manages the site, which is owned by the city of St. Paul. The city of St. Paul is the local sponsor for dredging the St. Paul Small Boat Harbor, and they initially

provided this site to the Corps as a potential location for storing dredged material from the harbor. This is a designated placement site in the approved CMMP with potential environmental impacts discussed in the Corps' 1997 Final Environmental Impact Statement (FEIS) for the 9-Foot Channel Navigation Project, published June 6, 1997, and will be retained for potential future dredged material placement, though only on a contingency basis, for example in an emergency situation, or when dredging multiple locations at once. Estimated placement costs at this site are \$9.10/CY.

Ownership: City of St. Paul.

Size and Capacity:

Site Area:	4 acres
Maximum Fill Height:	30 feet above low control pool elevation
Capacity:	100,000 cubic yards
Beneficial Use Removal:	Yes, landowner coordinated

Operational Feasibility: The site is suitable for mechanical placement of material from Upper Pool 2.

Natural Resources: This site is an established city boat landing, so few impacts to natural resources would be expected.

Socioeconomics: Dredged material placement at the Highbridge site would not be expected to adversely impact the surrounding area, other than immediate use of the landing during placement operations.

5.8.2 HOLMAN FIELD, RM 836.8

General Description: The St. Paul Downtown Airport, also known as Holman Field, is an airport adjacent to Pool 2 across the Mississippi River from downtown Saint Paul, MN. It is operated by the Metropolitan Airports Commission (MAC). The site was selected as a placement site in the 1980s during the GREAT I study and was carried forward in the 1990s for the CMMP (shown on Plate 1). The site consisted of 110 acres of undeveloped wetland at the time of selection. As part of the implementation of the CMMP, the site has been filled and buildings and parking lots have been constructed. Additional material could be provided to the Airport if future site development is planned. Material would be provided only after the airport operators acquire all federal, state, and local permits necessary for their fill activities. It is recommended to continue to communicate with the airport to determine if there are future beneficial use and cost-share opportunities. This site would be used at the request of the MAC based on material needs. If the site were to be used in the future, additional assessment would be required to determine the specific area and capacity where dredged material could be placed. This site will be retained for potential future dredged material placement, though

only on a contingency basis, for example upon the landowner's request for material. Estimated placement costs at this site are \$13.48/CY.

Ownership: Metropolitan Airports Commission.

Size and Capacity:

Site Area:	To be determined
Maximum Fill Height:	To be determined
Capacity:	To be determined
Beneficial Use Removal:	No material will be removed once placed. Material placed here would be used beneficially as constructed fill to develop an airport expansion.

Operational Feasibility: The site is suitable for mechanical placement of material from Upper Pool 2.

Natural Resources: No specific placement areas have been identified. Natural Resources effects would need to be evaluated prior to implementation, and the site owner would need to acquire all applicable federal, state, and local permits and approvals.

Socioeconomics: Dredged material placement at Holman Field would be coordinated with the MAC based on material needs. No specific placement areas have been identified. Socioeconomic effects would need to be evaluated prior to implementation.

5.9 CMMP Sites Carried Forward for Potential Future Contingency Use in Lower Pool 2

Most of the placement sites previously identified in the CMMP are carried forward for potential future contingency use in Pool 2. Some of these sites will require further environmental analysis prior to use. The placement sites identified for use in the CMMP are retained as part of the DMMP to provide operational flexibility and contingency. The capacity stated for the temporary placement sites is the capacity when the sites are empty, it is not the current remaining capacity at the sites. Furthermore, it is important to note that the temporary transfer sites are intended to be unloaded per the CMMP if no longer needed as a transfer site. Therefore, their capacities cannot be used as long-term placement solutions.

5.9.1 PINE BEND, RM 823.8

General Description: This location at RM 823.8 has been an active placement site since 1996 and is a designated temporary (island) placement site in the CMMP. The capacity at Pine Bend, however, is not sufficient for the long-term dredging needs in Lower Pool 2, and the unit cost is higher than other available sites in the area due to material re-handling. Estimated placement costs at this site are \$16.25/CY. The site is identified in the approved CMMP with potential environmental impacts discussed in the Corps' 1997 FEIS. The site could potentially be utilized when dredging multiple locations in Lower Pool 2 concurrently and is retained as part of the DMMP to provide operational flexibility and contingency.

Ownership: U.S. Army Corps of Engineers owns in fee.

Size and Capacity:

Site Area:	8 acres
Maximum Fill Height:	30 feet above low control pool elevation
Capacity:	379,500 cubic yards
Beneficial Use Removal:	No

Operational Feasibility: The site is suitable for both mechanical and hydraulic placement of material from Lower Pool 2.

Natural Resources: The site is bound by bottomland forest and the main navigation channel. There is little vegetation located within the operational boundary identified in the CMMP. There are no known cultural resources at the site, and there are no known federally listed threatened and endangered species within the placement and containment areas of the site.

Socioeconomics: There is no access to the site by road, which limits the beneficial uses and reduces potential for socioeconomic impacts.

5.9.2 CF INDUSTRIES DOCK SITE, RM 823.8

General Description: This is an industrial dock site located at RM 823.8 just upstream of Spring Lake. The area shown on Plate 2 is the larger conceptual area considered. However, dredged material placement at the dock site would be limited to approximately one acre in an area surrounded by the river, the CF industries dock, and bottomland forest. The site is identified in the approved CMMP with potential environmental impacts discussed in the Corps' 1997 FEIS. Estimated placement costs at this site are \$9.10/CY. The site could potentially be utilized when dredging multiple locations concurrently and will be retained for potential future dredged material placement, though only on a contingency basis,

for example in an emergency situation, or when dredging multiple locations at once.

Ownership: CF Industries.

Size and Capacity:

Site Area:	1 acre
Maximum Fill Height:	40 feet above low control pool elevation
Capacity:	40,000 cubic yards
Beneficial Use Removal:	Yes, landowner coordinated

Operational Feasibility: The site is suitable for mechanical placement of material from lower Pool 2.

Natural Resources: This site is established as an industrial dock site for CF Industries, so few impacts to natural resources would be expected.

Socioeconomics: Dredged material placement at the CF Industries dock site would not be expected to adversely impact the surrounding area.

5.9.3 CF INDUSTRIES PIT SITE, RM 823.5

General Description: This is an industrial pit site located at RM 823.5. This site would require trucking material and has a relatively high unit cost to move dredged material. Estimated placement costs at this site are \$11.50/CY. The site is upland and disturbed; vegetation includes grasses, brush, and a few trees. The site is identified in the approved CMMP with potential environmental impacts discussed in the Corps’ 1997 FEIS. The site could potentially be utilized when dredging multiple locations concurrently and is retained for potential future dredged material placement.

Ownership: CF Industries.

Size and Capacity:

Site Area:	6.5 acres
Maximum Fill Height:	40 feet above low control pool elevation
Capacity:	150,000 cubic yards
Beneficial Use Removal:	Yes, landowner coordinated

Operational Feasibility: The site is suitable for mechanical placement of material from Lower Pool 2.

Natural Resources: This site is established as an industrial pit site for CF Industries, so few impacts to natural resources would be expected.

Socioeconomics: Dredged material placement at the CF Industries pit site would not be expected to adversely impact the surrounding area.

5.9.4 UPPER BOULANGER, RM 821.5

General Description: This location at RM 821.5 has been an active placement site since 1996 and is a designated temporary (island) placement site in the CMMP. The capacity at this site is not sufficient for the future dredging needs in Lower Pool 2, and the unit cost is higher than other available sites in the area due to material re-handling. Estimated placement costs at this site are \$16.25/CY. The site is identified in the approved CMMP with potential environmental impacts discussed in the Corps' 1997 FEIS. The site could potentially be utilized when dredging multiple locations concurrently and is retained for potential future dredged material placement.

Ownership: PAS Associates and First Trust Company of Saint Paul; USACE has a perpetual easement to utilize the property for Project Operations.

Size and Capacity:

Site Area:	4 acres
Maximum Fill Height:	30 feet above low control pool elevation
Capacity:	200,000 cubic yards
Beneficial Use Removal:	No

Operational Feasibility: The site is suitable for both mechanical and hydraulic placement of material from Lower Pool 2.

Natural Resources: The site is bound by bottomland forest and the main navigation channel. There is no vegetation located within the diked containment and material placement site. There are no known cultural resources at the site, and there are no known federally listed threatened and endangered species within the placement and containment areas of the site.

Socioeconomics: There is no access to the site by road, which limits the beneficial uses.

5.9.5 LOWER BOULANGER, RM 821.1

General Description: This location at RM 821.1 has been an active placement site since 1996 and is a designated temporary (island) placement site in the CMMP. The capacity at this site is not sufficient for the future dredging needs in Lower Pool 2, and the unit cost is higher than other available sites in the area due

to material re-handling. Estimated placement costs at this site are \$16.25/CY. The site is identified in the approved CMMP with potential environmental impacts discussed in the Corps' 1997 FEIS. The site could potentially be utilized when dredging multiple locations concurrently and is retained for potential future dredged material placement.

Ownership: PAS Associates and First Trust Company of Saint Paul; USACE has a perpetual easement to utilize the property for Project Operations.

Size and Capacity:

Site Area:	8 acres
Maximum Fill Height:	30 feet above low control pool elevation
Capacity:	355,500 cubic yards
Beneficial Use Removal:	No

Operational Feasibility: The site is suitable for both mechanical and hydraulic placement of material from Lower Pool 2.

Natural Resources: The site is bound by bottomland forest and the main navigation channel. There is no vegetation located within the diked containment and material placement site. There are no known cultural resources at the site, and there are no known federally listed threatened and endangered species within the placement and containment areas of the site.

Socioeconomics: There is no access to the site by road, which limits the beneficial uses.

5.10 Sites Carried Forward as the Tentatively Selected Plan in Upper Pool 2

Following is the description of the site in Upper Pool 2 that met overall criteria and project objectives better than any other alternative site. This site constitutes the TSP (or “base plan”) and defines the Federal Standard.

5.10.1 SOUTHPORT, RM 836.3

General Description: The Southport site is located just downstream of downtown St. Paul. The site was selected as part of the GREAT I study. The site initially consisted of 18 acres of type 1 wetland with willows in the Mississippi River floodplain, the majority of which has since been filled and disturbed. The site is bordered by the main navigation channel on the east, a barge terminal on the southwest, and an airfield on the northwest. Since its inception, the site has been vastly reduced in size due to various reasons. The site is owned by the St.

Paul Port Authority and is managed at this time by LS Marine. LS Marine also utilizes a small portion of the original site for equipment staging. In addition, the St. Paul Port Authority has leased a portion of the initial site to Form-A-Feed, which distributes fertilizer and other products via barges utilizing the terminal. Presently, the Corps has access to approximately 6.8 acres of the previously identified GREAT I site for dredged material placement. The placement site is upland and highly disturbed. Though the site footprint has decreased, material is removed for beneficial use at a rate that ensures capacity is available to meet placement needs. LS Marine and the St. Paul Port Authority partner to market the dredged material very well, restoring the site's capacity to hold material each year. Since 1998, approximately 600,000 cubic yards of dredged material have been placed at the site and removed for beneficial use, and the annual demand for material is around 80,000 cubic yards. Estimated placement costs at this site are \$9.10/CY.

Ownership: St. Paul Port Authority. Historically the Corps real estate interest in the site consisted of an easement of a portion of the property.

Size and Capacity:

Site Area:	6.8 acres
Maximum Fill Height:	25 feet above low control pool elevation
Capacity:	100,000 cubic yards
Beneficial Use Removal:	Yes, landowner coordinated

Operational Feasibility: This site has been used historically for mechanical and hydraulic dredging. Estimated dredging and placement costs are \$9.10 per cubic yard. For hydraulic placement, the Corps coordinates with LS Marine well in advance of a dredging event so the site can be prepared. Considerably less notification is requested for mechanical dredging operations. The St. Paul Port Authority, LS Marine, and the Corps have collaborated to establish a site management manual that lays the groundwork for coordinating dredged material placement.

Natural Resources: This is an established industrial site, so few impacts to natural resources would be expected.

Socioeconomics: This is an established dredged material placement site with no expected socioeconomic impacts.

5.11 Sites Carried Forward as the Tentatively Selected Plan in Lower Pool 2

Following is the description of the site in Lower Pool 2 that met overall criteria and project objectives better than any other alternative site. This site constitutes the TSP and defines the Federal Standard.

5.11.1 LOWER GREY CLOUD ISLAND PIT

General Description: The Lower Grey Cloud Island pit is located on the south side of Lower Grey Cloud Island which contains the Aggregate Industries’ Nelson Mine on Grey Cloud Trail. The pit was previously mined for aggregate and is currently being used for placement of tailings (mostly sand), as additional westward property is mined. Excavation is not being conducted in the area under consideration for dredged material placement, but it is part of the active mining operation because it is being used for the placement of tailings.

The Lower Grey Cloud Island pit and the majority of Lower Grey Cloud Island is owned by PAS Associates and First Trust Company of Saint Paul. The site is currently leased to Aggregate Industries. Temporary easement agreements have been used in the past to place dredged material on Grey Cloud Island; however, material has never been placed in the pit and there is no current real easement agreement. As of today, the portion of the property under consideration is a mined pit site; the aggregate mining pit has an uneven bottom and is filled with water ranging from a depth of about 20 feet in the shallowest area to as deep as about 150 feet. The area under consideration is used only for mine tailings, as active mining continues nearby. Estimated placement costs at this site are \$9.10/CY.

Ownership: PAS Associates.

Size and Capacity:

Site Area:	326 acres
Maximum Fill Height:	35 feet above low control pool elevation
Capacity:	12,000,000 cubic yards
Beneficial Use Removal:	Yes (Material stockpiled at beneficial use site)

Stockpiled material would likely be placed at the material offloading access point and the beneficial use site. Both of these locations are within the 500-year flood zone (Plate 7). Throughout the majority of the site, material would be utilized to fill in the pit. The maximum fill height would be comparable to pre-mining conditions throughout the surrounding area.

Operational Feasibility: The site is suitable for mechanical or hydraulic placement of material from Lower Pool 2. Estimated dredging and placement costs are \$9.10 per cubic yard. The site has adequate capacity for all the material expected to be dredged from Lower Pool 2 over the next 40 years and beyond. In addition, the site has capacity for permanent placement of the previously-dredged material currently stockpiled on the Pine Bend, Upper Boulanger, and Lower Boulanger temporary placement sites. It is the only large site that is centrally located to the Lower Pool 2 dredge cuts. River access is available, and material has been offloaded mechanically from the river and placed on Lower Grey Cloud Island near the pit site as recently as 2011. Access dredging is likely to be minimal if it is required, based on historical trends.

Natural Resources: This is an established mining site, so few impacts to natural resources would be expected. Placement of sand from the channel onto Lower Grey Cloud Island is consistent with the current approved Reclamation Plan that Aggregate Industries has developed as part of their permit. In addition, Lower Grey Cloud Island is designated as a rural and open space district (CA-ROS) in the recently published Mississippi River Corridor Critical Area District Map. Filling in portions of the gravel pit with sand is in keeping with this designation.

Socioeconomics: This is an established mining site with minimal socioeconomic impacts. Under the plan the property would have a similar industrial use but would be exempt from state and local taxes.

5.12 Tentatively Selected Plan Identification

The TSP for the Pool 2 DMMP has been identified as the least-costly, operationally-feasible, and environmentally acceptable alternative. The DMMP study tentatively recommends use of the following sites: Southport (Upper Pool 2) and Lower Grey Cloud Island Pit (Lower Pool 2).

CHAPTER 6.

Detailed Description of Tentatively Selected Plan

The TSP represents the Federal Standard for managing the material that will be dredged from Pool 2 during the 40-year planning horizon and beyond.

Components of the plan are:

- Southport
- Lower Grey Cloud Island Pit

6.1 Tentatively Selected Plan

Permanent Placement Site – Upper Pool 2

Southport, a permanent upland placement site, was selected for the TSP in Upper Pool 2. The site allows for placement of material directly from adjacent dredge cuts. Beneficial use is anticipated and historical precedent has shown that up to 80,000 cubic yards per year may be utilized. The estimated placement costs at this site are \$9.10/CY; this amount is the base plan or Federal Standard for Upper Pool 2.

<i>Site</i>	<i>Maximum Capacity</i>	<i>Placement</i>
Southport	100,000 Cubic Yards	Hydraulic, Mechanical

Permanent Placement Site – Lower Pool 2

The Lower Grey Cloud Island pit, which is selected as part of the TSP, has enough capacity to meet dredged material management needs in Lower Pool 2 for 80 years or longer. Dredged material placement costs for the site are based on transfer of the material directly from adjacent dredge cuts to the placement site. The estimated placement costs at this site are \$9.10/CY; this amount is the base plan or Federal Standard for Lower Pool 2.

<i>Site</i>	<i>Maximum Capacity</i>	<i>Placement</i>
Lower Grey Cloud Island Pit	12,000,000 Cubic Yards	Hydraulic, Mechanical

6.1.1 SOUTHPORT

Southport is an existing placement site in Upper Pool 2, which is proposed as part of the TSP. Southport has historically been an essential dredged material placement site for the Corps' navigation projects in Upper Pool 2 of the Upper Mississippi River, accommodating dredged material generated from channel dredging in addition to dredging from the St. Paul Small Boat Harbor. The Corps worked with the St. Paul Port Authority to develop a Record of Necessity in February 2017. The Record of Necessity documents the Corps' continued need to use the Southport placement site for dredged material management purposes. Historically the Corps' real estate interest in the site consisted of a temporary agreement on a portion of the property. The agreement expired 31 December 2017.

Operation and Beneficial Use:

Based on previous use of the site, dredged material placed at the Southport site is made available by the St. Paul Port Authority to the public for beneficial use. Dredged material typically consists of clean sand, which is useful for general construction fill, winter road maintenance, landscaping, and other applications. Some beneficial use of material placed at the site is assumed, which would continuously refresh the capacity available for material placement throughout the 40-year planning horizon. It is anticipated that an annual average of approximately 43,000 cubic yards of material will be placed at Southport; 36,000 cubic yards coming from the navigation channel and 7,000 cubic yards from the St. Paul Small Boat Harbor.

Site Layout and Preparation

This site has been used historically for both mechanical and hydraulic placement. Little to no preparation is needed prior to mechanical placement. Advanced preparation is required prior to hydraulic placement in order to establish berms to contain the water generated throughout the process. Precautions would be taken pertaining to drainage so that adjacent users, such as Form-A-Feed, are not negatively impacted throughout dredged material placement operations.

Access

Access points are shown in Figure 6.



Figure 6: Southport Access Points

6.1.2 LOWER GREY CLOUD ISLAND PIT

The Lower Grey Cloud Island pit is the proposed permanent placement site in Lower Pool 2. The area is currently being used as a mining operation for aggregate. The area is highly disturbed. With an estimated capacity of 12,000,000 cubic yards, the site would provide dredged material placement capacity for approximately 80 years. The site is owned by PAS Associates and First Trust Company of Saint Paul. The site is currently leased to another business, Aggregate Industries.

Through the site screening process, Lower Grey Cloud Island was identified as the best suitable location for material generated via channel dredging in Lower Pool 2. This was primarily due to the island's proximity to adjacent dredge cuts. Because Lower Grey Cloud Island is quite large, the team began by generating site alternatives that had the capacity to meet the 40-year planning need for dredged material management. This approach resulted in a number of alternatives to consider, of varying acreage, due to stockpile height restrictions among other things. But this approach was ultimately problematic for a number of reasons described below.

Filling in the mining pit is preferred to stockpiling material along the shoreline, and the estimated cost to move the dredged material is consistent with the Federal Standard. In addition, the pit provides significantly more capacity for dredged material compared to stacking material on the shoreline in the few locations where flood stage impacts can be avoided.

For the purpose of this plan, Lower Grey Cloud Island pit is evaluated as a single alternative that would include the entire pit and a smaller portion of the surrounding property. This alternative has a relatively low cost and would provide capacity for dredged material in Lower Pool 2 for up to 80 years. The pit covers 326 acres and ranges from a depth of about 20 feet in the shallowest area to as deep as about 150 feet; with this size, the pit can accommodate at least 12,000,000 cubic yards of dredged material. Because of the depth of the pit, the site could accommodate significantly more material than an upland site of similar size.

The Grey Cloud Island pit is relatively close to the Lower Pool 2 dredge cuts. Material dredged hydraulically could be placed directly into the pit, and material dredged mechanically could be unloaded from barges and pushed into the pit by a bulldozer. Trucking is not required to place dredged material within the pit. The temporary placement sites in Lower Pool 2 that have been used in the past require periodic unloading, resulting in double handling of the dredged material - once to dredge and place on the temporary site, then to remove the material to a permanent placement site. Eliminating the need to double handle dredged material generated in Lower Pool 2 could save the Corps an estimated \$50 million over the course of the 40-year planning period.

The Grey Cloud Island site is already heavily disturbed as it is an active mining area, and environmental impacts would be minimal. This is the least cost alternative and has adequate capacity for the projected dredged material placement needs in Lower Pool 2 throughout the planning period and into the future. Although the initial planning objective was capacity for a 40-year period, a larger site that could accommodate material over a longer time period is desirable.

Because of the size of the site and the potential complexity of dredged material placement planning, this DMMP only addresses the selection of the site and some minimal plan details for its use in the near future. After an appropriate real estate interest is acquired for the property, a more detailed planning effort will occur to develop a more detailed plan for the property. This more detailed plan will also undergo an environmental review as needed, including coordination with stakeholders and the general public.

Operation and Beneficial Use

It is anticipated that an annual average of approximately 126,000 cubic yards of material will be placed at the Lower Grey Cloud Island pit each year, all being generated from navigation channel dredging. Site management is illustrated in Plate 7 and shows points discussed in the following paragraphs.

Mechanical Placement

Material Offloading: The access point is located near the southwest corner of the pit. This primary mechanical offload point is the most logical from an operational and environmental perspective. The Corps has offloaded material from this access point on several occasions. Additional access points may be pursued in the future, if needed,

which would require additional environmental review. Assessment of these potential access points would be covered in a detailed management plan of the site. A beneficial use stockpile may be established at the southeast corner of the pit where Grey Cloud Trail South provides access for hauling on the road network.

Equipment Offloading: Mechanical equipment would likely be offloaded by barge at the same access point from which dredged material would be offloaded— the sand offloading – barge access point. If additional equipment is brought in by truck, that equipment may be offloaded near the beneficial use access point in the southeast corner of the site at the equipment offloading – truck access point. Weight limits on adjacent roadways will be a factor when offloading equipment and throughout beneficial use operations.

Barge Cycling / Access: Barge cycling would most often occur in the southwest corner of the site at the primary mechanical offloading access point. It is anticipated that access dredging would be required infrequently at this location. If access dredging is required at the primary offloading point, it is expected to be minimal based on such dredging as performed there in the past.

Hydraulic Placement

Equipment Offloading: Equipment required for hydraulic placement may be offloaded by water from a barge by utilizing the sand offloading – barge access point in the southwest corner of the site. If equipment needs to be offloaded by road from a truck, this may be done in the southeast corner of the site adjacent the beneficial use area.

On-site Water Management: No special actions are expected to be necessary to manage the carriage water generated by hydraulic placement of dredged material in the mining pit. The pit is expected to maintain water elevations similar to those in the pit now and in the adjacent Mississippi River, with water seeping laterally thorough the surrounding pit substrate. Therefore, there is no expected need to manage the return of surface water through management techniques such as drop structures. However, water levels would be monitored with each placement event and additional engineering and environmental evaluation would be performed in the future should it become necessary to include such features for managing return water.

Pipeline Location: The location of the pipeline would vary and is dependent on where the end pipe needs to be staged in order to direct the flow of water and sand in the proper direction. Each placement event may require the end pipe to be in a different location, which would influence the location of the pipeline. At this time, the pipeline could enter the pit at the previously-mentioned sand offloading – barge access location at the southwest end of the pit. Minor clearing or grubbing may be required to utilize other locations, depending on the placement event. The need for and effects of such clearing or grubbing would be addressed in the future and not as a part of this DMMP.

Beneficial Use

Beneficial use would most likely occur in the southeast corner of the site. This location of the site is already clear of vegetation and is close to road access. A haul road would be constructed linking the beneficial use stockpile to the adjacent public road.

Site Layout and Preparation

Placement Sequencing

Three locations have been identified as first priority fill areas. The area adjacent to the primary access point is a first priority fill area; mechanical placement may begin in this area immediately adjacent to the access point and proceed into the pit. The location in the southeast corner of the site is also identified as a first priority fill area and would likely aid in establishing a beneficial use area. The last first priority fill area in the north central part of the site would likely be utilized in order to establish a berm for future hydraulic placement within the pit. The closure berm would ensure that dredged material placed with hydraulic methods would be contained within the site boundary. The secondary priority fill area essentially includes the remainder of the pit.

The third priority fill area (tertiary) consists of all upland locations outside of the first and second priority fill areas. Fill in these upland areas is not directly addressed in this DMMP, but would be as part of the long-term management plan to be developed later if needed. Various factors were considered when determining where to place material specifically within the placement site. These factors consist of, but are not limited to: type of dredge plant being used, dredge cut location, availability of pipeline, availability of trucks, availability of additional equipment such as excavators and dozers, funding constraints, and site management priorities. If there is demand for significant dredged material for a construction project, it may be decided to stockpile a larger volume of material in the beneficial use area.

Visual Screening

All options would be evaluated prior to removing vegetation along the perimeter of the site, specifically along the shoreline of the river and adjacent to the public road. Maintaining sufficient visual screening is a priority to ensure that aesthetic impacts are minimized to the greatest extent practicable. If necessary, it may be decided to improve screening in certain locations by planting trees and/or by installing fencing.

Access

Marine

Access to the placement site would be made available by water and by road. Detailed marine access is described above in Section 6.3.1, for each mechanical or hydraulic placement scenario. Water access would be made available for operational purposes only.

It is not intended to establish a designated beach area along the shoreline, or to manage any of the site for recreational use. Recreation may be a contingent benefit of the property due to operational practices (e.g., sand placement) over time if the site is federally owned.

Road

Several roads would need to be established throughout the site for operational purposes. A perimeter road has been identified in the map, which may be constructed over time as the site is filled. Road access into the site from the public road, Grey Cloud Trail South, abutting the east boundary of the site is necessary. A highly durable road would need to be established in the southeast corner of the site in order to accommodate haul trucks for beneficial use and trailers bringing in equipment for operational purposes.

CHAPTER 7.

Evaluation of Environmental Effects

An environmental analysis has been conducted to address compliance with the National Environmental Policy Act (NEPA). This DMMP incorporates elements of the Corps' Channel Maintenance Management Plan's Final Environmental Impact Statement for the 9-Foot Channel Navigation Project, published June 6, 1997¹, as described in the Council on Environmental Quality (CEQ) guidelines 40 CFR 1502.20 and 1508.28.

The Pool 2 DMMP was initiated when uncertainty of the future availability of dredged material placement sites in the area prompted an effort to identify the best strategy for long-term management of dredged material within the pool. A detailed analysis of potential placement sites, documented in this report, suggests that the alternative that is both least costly and environmentally acceptable is the Tentatively Selected Plan described in Chapter 6.

This Environmental Assessment (EA) has been prepared to assess the environmental consequences of the No Action alternative and the Tentatively Selected Plan. The EA primarily focuses on the environmental effects of using the new placement site, specifically the Lower Grey Cloud Island Pit site. In addition, the EA evaluates the environmental effects of the continued use of Southport, which is an existing placement site previously identified in the CMMP's FEIS.

The effects of the No Action alternative are also considered in this EA. The No Action alternative is described in subchapter 5.1.

The effects evaluated under both the No Action alternative and the Tentatively Selected Plan are specific to the action of material placement and do not incorporate the effects of the main channel dredging itself. The effects of the channel dredging were evaluated in the Corps' 1997 FEIS. No substantial changes to channel dredging have occurred since 1997 that are relevant to environmental concerns. In addition, there are no significant new circumstances or information relevant to environmental concerns and bearing on channel dredging or its impacts.

¹ As of November 2019, the CMMP EIS is available at:

Volume I: <http://www.dtic.mil/docs/citations/ADA328183>

Volume II: <http://www.dtic.mil/docs/citations/ADA328184>

The environmental effects of the No Action alternative and the Tentatively Selected Plan are explained below and are summarized in Table 9.

7.1 Future Condition of Lower Grey Cloud Island

In addition to evaluating the environmental effects of the No Action alternative, the analysis also considers how the present and expected future use of Lower Grey Cloud Island compares to the Tentatively Selected Plan.

Currently, much of Lower Grey Cloud Island is part of an active aggregate mining operation. Under this operation, aggregate is mined by excavating material in the pit to a depth of up to about 150 feet. The aggregate is separated from other material, mostly sand, and this waste sand is returned to the pit. The excavated pit areas vary in depth ranging from a depth of about 20 feet in the shallowest area to as deep as about 150 feet. Mining operations are expected to continue for about another 15 years, expanding the pit to the west.

After aggregate mining on Lower Grey Cloud Island has ended, the site could be used for another purpose. The current landowner has developed plans for developing the island (Plate 8) (“Conceptual Plans”). The plans include commercial retail and residential development, a marina, interpretative sites and other features primarily to the west of the mine pit. The current mine pit would be partially filled with a mosaic of island and open water areas and would include a public beach, canoe launch, and boat landing. Finally, habitat areas such as meadows and oak savannas are also a part of the plan.

The likelihood of realizing the Conceptual Plans is unknown. Lower Grey Cloud Island is within the state-designated Mississippi River Corridor Critical Area (MRCCA). New rules regulating the MRCCA were published on December 27, 2016 and will be implemented over the next five years. Lower Grey Cloud Island is mapped as a rural and open space district (CA-ROS), that “must be managed to sustain and restore the rural and natural character of the corridor and to protect and enhance habitat, parks and open space, public river corridor views, and scenic, natural, and historic areas.” (Minnesota Rules, part 6106.0100, subp. 3, item A). Much of the commercial and residential development depicted in the Conceptual Plans may not be compatible with the CA-ROS designation. This development is shown as occurring over much of the western portion of the island. Because of this potential incompatibility, development there may not occur.

However, development does seem more probable for the mine pit. As described above, in addition to filling the mine pit with sandy material, the Conceptual Plans for the mine pit would include features that are conducive to the natural and scenic character of the area that may be more compatible with the CA-ROS designation. The Tentatively Selected Plan would be similar in some ways to the Conceptual Plans for the mine pit. Either plan would entail filling the mine pit with sandy material. Although, the Corps has no plans to have the site be recreationally used, filling the pit under the Tentatively Selected Plan could nevertheless be conducive for providing future recreational benefits. In sum, it appears likely that the pit would be filled in either the Conceptual Plans or Tentatively Selected Plan and would entail similar environmental effects

7.2 Socioeconomic Effects

7.2.1 POPULATION CHARACTERISTICS

Neither the No Action alternative nor Tentatively Selected Plan would have a measurable effect on populations in the project area.

Compliance with Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations requires consideration of social equity issues, particularly any potential disproportionate impacts to minority or low-income groups. Environmental justice considerations have been applied during the planning of this project, and no minority or low-income populations would be disproportionately affected by the Tentatively Selected Plan.

7.2.2 LAND USE

Neither the No Action alternative nor the Tentatively Selected Plan would have an effect on the overall land use in Pool 2 over the short- or long-term. Under the No Action alternative, the operation and maintenance of the navigation channel would continue as it has in the past until capacity runs out for dredged material placement. If this occurs, the Corps may dredge the channel less frequently or place dredged material in non-CMMP Recommended sites.

Under the Tentatively Selected Plan alternative, the Corps would continue to use the Southport site for dredged material placement for the Upper Pool. The Southport site is zoned as an industrial area in St. Paul's most recent comprehensive city plan.

The use of Lower Grey Cloud Island for dredged material placement would not result in a significant change in land use. Currently, the site is being used for the disposition of tailings from mining activities. Using the pit for placement of dredged material under the Tentatively Selected Plan would entail similar use to how the pit is currently being used for the disposal of tailings and proposed future use under the Conceptual Plan.

7.2.3 RECREATION

In the short-term, there would be no measurable impacts to recreation under the No Action alternative or Tentatively Selected Plan over the existing conditions at Lower Grey Cloud Island. In the long-term the Tentatively Selected Plan may have beneficial recreational effects when the pit becomes filled over time. At this time, however, there is no Corps plan for developing recreational opportunities on the site. There would be no measurable effect to recreation in the short- or long-term at Southport.

7.2.4 NOISE AND AESTHETIC RESOURCES

The No Action alternative may impact noise and aesthetics as a result of dredged material placement in non-recommended sites; however, the magnitude of the effects are unknown because placement areas are unidentified under this alternative.

Noise from dredged material placement is typically created by machinery used to place and manipulate the material at the placement site, which could include dozers, loaders, and trucks. The impact of this noise is related to what noise receptors (i.e., people that could be affected by this noise) are present in the placement area.

No additional impacts to noise or aesthetic resources are expected at the Southport site over those experienced in the past and now because of the continual use of the site.

The noise receptors nearest to the Lower Grey Cloud Island mine pit are located to the east of the proposed placement site. The nearest receptor is Camp Galilee, which is on the opposite side of Grey Cloud Trail S. The Camp's main building is approximately 700 feet away from the edge of the proposed beneficial use site, and the rest of the camp site ranges between 0 to 1,500 feet away from the nearest noise generator that would occur due to the project (i.e., trucks accessing the site via Grey Cloud Trail S.). Other noise receptors are several homes on the east side of Grey Cloud Trail S., all of which are over 1,000 feet from the placement site edge. Impacts to these receptors would be negligible because operations would not be expected to be situated on the edge of the site often, and because the noise reaching receptors that far away would be minimal.

Construction Equipment Reference Levels published by Federal Highway Administration list the types of equipment normally used at a dredged material placement site (e.g., dozers, dump trucks, excavators, loaders, etc.) ranging between 75 and 85 decibels at a distance of 50 feet from the vehicle (U.S. Department of Transportation, 2006). The table below (Table 7) shows how these noises are reduced at greater distances from the noise source.

Table 7. Decibels at specific distances.

Distance (ft)	Decibels at specified Distance, With Varied Starting Sound Levels			
	70	75	80	85
50	70	75	80	85
200	58	63	68	73
500	50	55	60	65
1,000	44	49	54	59

The Tentatively Selected Plan would have a minor adverse impact on noise at Lower Grey Cloud Island. This effect would be minor relative to existing conditions because the site is an active mine pit. However, there would be a periodic and notable increase in noise at the proposed beneficial use site caused by truck traffic near the Camp Galilee entrance road. At this time, the frequency and times of use at the proposed beneficial use site is unknown, but use at other such sites typically occurs during normal business hours.

Minnesota State Noise Standards are based on the land use activities at a site and the noise levels exceeded during 10% of an hour (L10) and exceeded 50% of an hour (L50). The current land use (mining activities and related services) and the proposed land use under the Tentatively Selected Plan (other resource production and extraction) fall under the same “Noise Area Classification” (NAC) level number 3. The State Noise Standards established for this NAC level is an L50 of 75 dB and L10 of 80dB. Even the loudest construction equipment used at the site would diminish below the 75dB standard at a distance of 200 feet. Trees and berms used for screening should further lessen the effect.

There would also be an increase in noise at the primary access point during times when dredged material is being unloaded there from barges, but there are no noise receptors identified near this point. It is expected that dredging would occur annually, during the open water season. Dredging may occur periodically during the open water season, for example 3 or 4 separate weeks during that time, or potentially additional time if poor conditions are present, or a temporary dredged material placement site is being unloaded.

Aesthetic effects typical of dredged material placement are changes in the way a site looks compared to when the project started. Following placement of dredged material, sites usually maintain a sandy characteristic for a long time. The changed appearance of the area is related to what visual receptors are present in the placement area.

The Tentatively Selected Plan would likely have negligible impacts to aesthetics because the site is currently an active mine pit. Using it as a placement site for dredged material is a similar activity to mining, especially considering that the mine operator has been placing excess sand in the pit. Over time the site may be developed in a manner that would improve the quality of its appearance. This could occur if the site is actively managed for natural resources and possibly for use by the general public. Management activities such as restoring plant communities would improve aesthetic qualities, but it is unknown when or if such activities would be implemented. The development of a new beneficial use site on Lower Grey Cloud Island may result in a minor adverse effect on aesthetics at that location of the site, although the effect would be minor since the setting is an active mine pit. The Tentatively Selected Plan would not have an adverse effect on the view from Schaar’s Bluff Vista. The view of the pit from the vista is mostly obscured by trees, and as discussed above, the dredged material placement activities are not expected to differ substantially from the ongoing mining activities.

7.2.5 CONTROVERSY

There is no apparent controversy under the No Action alternative. None is expected from the general public under the Tentatively Selected Plan as a result of filling a mine pit, or the continued use of the Southport site. However, there is the potential for controversy at a local level arising from the acquisition of private land which could limit the tax base and reduce future private development opportunities on Lower Grey Cloud Island.

7.2.6 TAX REVENUE

The No Action alternative is not likely to have an effect on tax revenues. The Tentatively Selected Plan in Upper Pool 2 would also have no effect on tax revenue resulting from the continued use of the Southport Site, assuming the site remains in the ownership of the St. Paul Port Authority. The Tentatively Selected Plan in Lower Pool 2 would have a local minor adverse effect on property tax revenues in Washington County if the mine pit is acquired under the Tentatively Selected Plan because the federal government does not pay such taxes on the land it owns. In this case, the Tentatively Selected Plan in Lower Pool 2 would remove a total of six tax parcels from the Washington County tax base (Figure 7). The combined parcels' ten year average annual tax revenue from 2008 through 2017 was \$54,358. Table 8 shows tax revenue data obtained from "Washington County Property Records and Taxpayer Services Department" website based on parcel descriptions.



Figure 7: Lower Grey Cloud Island Property Parcels

Table 8: Tax Revenue for Lower Grey Cloud Island Property Parcels

		Parcel								
Tax year		31.027.21.31.0001	31.027.21.42.0001	31.027.21.41.0003	06.026.21.21.0	06.026.21.12.0	06.026.21.11.0001			
1	2017	\$ 22,732	\$ 13,092	\$ 7,010	\$ 1,430	\$ 752	\$ 726			
2	2016	\$ 24,992	\$ 15,940	\$ 7,938	\$ 1,478	\$ 770	\$ 750			
3	2015	\$ 24,550	\$ 15,818	\$ 7,808	\$ 1,358	\$ 762	\$ 756			
4	2014	\$ 26,052	\$ 16,538	\$ 8,262	\$ 1,462	\$ 816	\$ 812			
5	2013	\$ 26,634	\$ 16,594	\$ 8,408	\$ 1,498	\$ 842	\$ 840			
6	2012	\$ 26,268	\$ 15,706	\$ 7,876	\$ 1,400	\$ 806	\$ 808			
7	2011	\$ 23,516	\$ 14,958	\$ 7,422	\$ 1,340	\$ 778	\$ 782			
8	2010	\$ 49,790	\$ 16,356	\$ 5,632	\$ 1,364	\$ 956	\$ 526			
9	2009	\$ 39,352	\$ 12,240	\$ 3,812	\$ 684	\$ 754	\$ 528			
10	2008	\$ 36,148	\$ 11,136	\$ 3,462	\$ 476	\$ 710	\$ 572			
10 yr Average Tax Revenue		\$ 30,003	\$ 14,838	\$ 6,763	\$ 1,249	\$ 795	\$ 710		\$ 54,358	

7.2.7 COMMERCIAL NAVIGATION

The No Action alternative could have minor short- and long-term adverse effects on commercial navigation. Temporary placement sites in lower Pool 2 are nearly full and the lack of capacity could result in adverse effects to the dredging program. Overall, the navigation channel would still be maintained and closures, while possible, would be unlikely in the short term. However, deteriorated channel conditions (narrower or shallower than would typically be maintained) may result from the just-in-time dredging that would be likely when it is difficult to find material placement locations.

The Tentatively Selected Plan would have minor beneficial effects on commercial navigation by providing sufficient dredged material placement capacity to maintain the navigation channel.

9-Foot Navigation Channel Federal Operation and Maintenance Costs

The No Action alternative would likely cause an increase in costs incurred by the federal government in operating and maintaining the 9-foot navigation channel in Pool 2 of the UMR. In instances where placement sites are not available when dredging is required, temporary placement sites are sought, which often leads to double-handling the dredged material. Double-handling increases the expense of managing the material. Costs may be incurred for use of placement sites not owned by the federal government. Restoration of a temporary placement site may also be necessary, further increasing costs.

This study has identified the Tentatively Selected Plan as the base plan (or Federal Standard), which is defined as “the dredged material disposal alternative or alternatives identified by the Corps which represent the least costly alternatives, consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process.” Therefore, the Tentatively Selected Plan would result in the lowest cost to the federal government for operating and maintaining the 9-foot navigation channel in Pool 2 of the UMR.

7.2.8 AIRPORT WILDLIFE HAZARDS

The St. Paul Downtown Airport (Holman Field) is located adjacent to Pool 2 and within 500 feet of the Southport site. The airport has three runways and services more than 64,000 takeoffs and landings annually. Aircraft collisions with birds and other wildlife can pose a threat to aircraft safety. Federal Aviation Administration Advisory Circular 150/5200-33B provides guidance on certain land uses that have the potential to attract hazardous wildlife on or near public-use airports. The use of the Southport site, and similar dredged material placement practices in general, do not provide an attractant to hazardous wildlife. Prior to dredged material placement, the Southport site had some wetland habitat, and maintaining it as a placement site would maintain its limited potential to attract hazardous wildlife.

7.3 Natural Resource Effects

7.3.1 AIR QUALITY

The No Action alternative would likely have a negligible effect on air quality relative to current conditions. There is a possibility of a minor adverse effect if dredged material were placed in a non-CMMP recommended site and required double-handling. This double-handling would result in the use of additional fuel, and that would result in increased exhaust emissions. Likewise, the Tentatively Selected Plan would also likely have a negligible effect on air quality, though a permanent placement site for the long term would ensure that unnecessary double-handling of material would be avoided.

The development of a beneficial use site at the southwest end of the mine pit on Lower Grey Cloud Island would result in additional truck traffic there, which is near Camp Galilee. However, the camp is far enough from this site that it is highly unlikely exhaust emissions would be detectable there. The dredged material stockpiled for beneficial use would be coarse-grained sand, which is unlikely to contribute dust to the surrounding areas. Features around the site such as a berm and vegetation would also act as screening and would further reduce any potential for the site to create nuisance dust.

No additional adverse impacts to air quality are expected at the Southport site under the Tentatively Selected Plan over the minor effects already occurring there under its continued use.

7.3.2 HYDROLOGY

The No Action alternative may temporarily impact the one percent flood profile (height of the 100-year flood) if dredged material had to be placed in the river adjacent to dredge cuts. The magnitude of the effects is unknown because placement areas are unidentified under this alternative. Placing the dredged material next to the dredge cuts may increase flood heights as long as that material remained. However, the effects would likely be

temporary because the dredged material would be moved to a location either outside of the floodplain or to an existing placement area within the current flood map.

Placing dredged material within the mine pit under the Tentatively Selected Plan would have no effect on the one percent flood profile because the material placed there would not be placed at an elevation higher than the surrounding land and therefore would not obstruct the flow of water during flood conditions. The continued use of Southport would have no effect on the flood profile because there would be no meaningful change in the amount of fill placed at the site, and because it is outside the mapped floodway.

7.3.3 WATER QUALITY

The No Action alternative could have temporary adverse effects to water quality as a result of placing dredged material in the water adjacent to a dredge cut in the main channel border. If such placement is required, it would result in minor increases in total suspended solids (TSS) levels at the immediate placement site. However, these increases would be short-lived and negligible relative to ambient TSS levels in Pool 2. Overall water quality in Pool 2 under the No Action alternative would not have significant long term effects.

The Tentatively Selected Plan would result in some increased in TSS levels in the mine pit when dredged material is being placed there, especially when it is being placed by a hydraulic dredge. However, this effect is likely to be similar to the current ongoing use of the site. Water quality in the mining pit is currently being affected by the placement of tailings from the ongoing mining operation. It is likely that the pit is anoxic in the lower water column and is unable to support much aquatic life there. Therefore, the impacts of the Tentatively Selected Plan are expected to be minor.

7.3.4 SUBSTRATE/DREDGED MATERIAL

As discussed in Section 2.2.5, material dredged in Pool 2 in support of navigation has been found to have some contamination. That contamination appears to increase downstream, likely due to decreased granular size seen downstream where the pool becomes more lake-like. However, levels of contamination have also been decreasing over time. Sediment testing since 2000 has revealed fewer types and decreased levels of contamination. Since 2000 sediment samples have only exceeded Sediment Quality Target (SQT) Level I limits for several PAHs (e.g., acenaphthylene and pyrene), and two pesticides (DDD and DDT). These contaminants were found at relatively low levels that would have a limited effect on benthic aquatic organisms based on Minnesota SQT guidelines. No sediment samples tested since 2000 have exceeded the Soil Reference Value (SRVs). It is likely all of the dredged material currently available on temporary placement islands was dredged after 1999–2000.

Impairments identified (by the MPCA) in this stretch of river include PFOS, PCBs, and mercury. Although PFOS and other PFAS compounds have been detected in navigation channel dredge cuts in Pool 2 (Appendix E), measured levels have been well below state guidelines for acceptable levels in dredged material. Furthermore, as discussed in Section

2.2.5, the levels found within and near dredge cuts were generally low relative to areas of known contamination and consistent with levels found throughout the pool. No sediment samples since 2000 have shown SRV or SQT exceedances for PCBs or mercury.

Placement of dredged material from Pool 2 under the No Action alternative would likely have minimal adverse effects given the low contamination levels historically found in the dredged material. Placement site locations are unknown under the No Action alternative. If in-water placement occurs, material would likely be placed adjacent to a dredge cut on sediment similar in composition to the dredged material.

Placement of dredged material in the mine pit under the Tentatively Selected Plan would not be expected to adversely affect aquatic life there. This is because the exceedances are primarily limited to the SQT Level I levels, and also because little benthic aquatic life likely exists in the pit. Benthic organisms most likely to be affected by contaminated sediments are likely limited due to a lack of food and habitat, and oxygen depletion in the greater depths.

Dredged material that would be placed for beneficial use, including that placed at Southport, would likely be acceptable for all uses (recreational/residential or commercial/industrial), because the dredged material tested has not exceeded any of the SRVs since 2000. Furthermore, sediment testing would continue in the future to minimize the risk that any material placed for beneficial use would exceed an SRV.

7.3.5 GROUNDWATER

Depth to groundwater at the existing Southport site is estimated at 5-15 feet based on the topography and limited well construction logs from Department of Health well data of two nearby wells (Figure 8, Section 7.3.5). One well is located near the end of the runway of the St. Paul Airport, (Well # 565296), and is a piezometer test well that showed a depth of groundwater of about 11.9 feet. The other well is located over a half-mile northwest of the site (Well # 207097), and is a commercial well that showed a depth to groundwater of about 5 feet. Groundwater levels at the Southport site will be very close to the Mississippi River levels.

Depth to groundwater at the proposed Lower Grey Cloud Island placement site would be 0 feet, as the pit has been dug down to a depth that has intercepted groundwater. The groundwater levels surrounding the pit (residential wells and existing monitoring wells) are expected to be close to river levels and depending upon the local topography 20 to 55 feet below ground surface.

Neither Southport nor LGC is located within a WHPA (wellhead protection area) as of October 13, 2017, (MN Department of Health website:

<http://www.health.state.mn.us/divs/eh/water/swp/maps/index.htm>

Waters within the Lower Grey Cloud Island mine pit are separated from the surrounding watershed by the Mississippi River and Mooers Lake. The mine pit is located within the Quaternary aquifer, wells north of the Lower Grey Cloud Island are installed in the bedrock aquifer so there is little concern of contamination due to activity in the gravel pit because of the separation in aquifers, and also because of the general flow of

groundwater from north to south. Most wells on Lower Grey Cloud Island are finished within the Quaternary aquifer within the depth of the mined material, and could be, or are being, influenced by material placement within the pit.

There are approximately fifteen known wells on Lower Grey Cloud Island, as identified on Figure 9. Three of the wells are Corps of Engineers monitoring wells installed in 1999 for previous dredge placement. The well labeled 15 has been sealed.

There are no effects to groundwater expected at the Southport site. This site is currently being used for mechanical dredged material placement and has been used for hydraulic placement in the past. There are no residential wells nearby (Figure 8). No groundwater monitoring has been done in the past, and none is anticipated for the near future with continued placement procedures expected to continue at the Southport site.

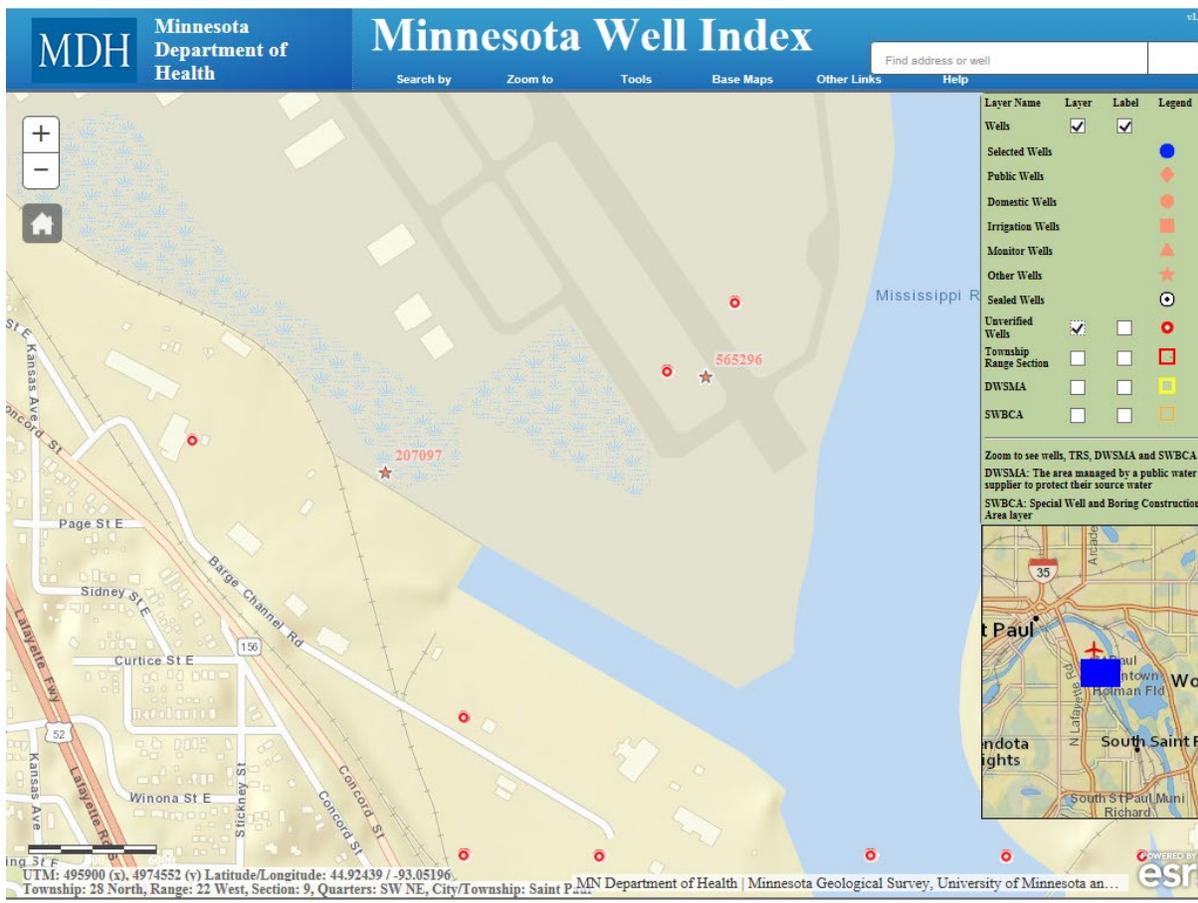


Figure 8: Wells near the Southport Site

There are no significant long term negative effects to groundwater expected as a result of placing dredged material in the Lower Grey Cloud Island pit site. Dredged material to be placed would be periodically assessed (as discussed in Section 2.2.5) for a full suite of contaminants that are known or suspected to exist in the area. Current mining in the pit to depths of about 150 feet below original grade has involved mining of the sand and gravel and placement of sandy tailings back within the pit. This 50-year mining activity

has likely resulted in local disturbance of the surficial aquifer. The proposed dredged material placement would have similar effects.

Placement of dredged material in the pit is not expected to cause a material increase in levels of contamination in groundwater. Previous baseline sampling and testing in 1999 on Lower Grey Cloud Island (conducted for the 2000 dredged material placement) included 8 residential wells, one surface water sample, and 3 Corps of Engineers (COE) monitoring wells. The placement site utilized in 2000 was located on the south side of Lower Grey Cloud Island in an area more removed from residential wells, and the pit had been a settling pond area that was clay lined. No detrimental groundwater effects were noted from that placement. One of the original 1999 COE wells has been sealed (Well 15, Figure 9) and a replacement well would be sited between the current pit and the existing public/residential wells located west of the pit.

As discussed above in Section 7.3.4, sediments sampled in the main channel in Pool 2 have not contained contaminant levels that exceeded SRVs since 2000. The current contamination of groundwater by PFAS on Lower Grey Cloud Island would not be the result of sediment placement. That contamination may be the result of groundwater movement, because groundwater in this area generally is moving from the north toward the Mississippi River, and there are numerous wells with elevated levels of PFAS north of Lower Grey Cloud Island (see Minnesota Department of Health Map <http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/sites.html>). Considering that the current SRVs for PFAS range from 330-63,000 ppb, and testing of dredged material in Pool 2 has found levels of PFAS ranging from less than one to about three ppb, the placement of dredged material into the pit is not expected to have a material effect on PFAS in the groundwater.

Prior to placing dredged material within the pit on Lower Grey Cloud Island, the existing wells on the island would be assessed to verify well depths and past disruptions (residential surveys/interviews) due to the mining operation. When the dredged material placement activity proceeds, periodic monitoring of the groundwater would occur to determine if any detrimental effects from dredged material placement are occurring. The well testing would include the more recent chemicals of concern (PFAS). Some previous dredged material placement projects have included supplying bottled water to local residents during the dredging activity as well as a period of time after (approx. 6 months based on well testing). This provides some assurance for the local community that the project would not negatively affect their existing drinking water quality. Similar services may be provided during placement operations on Lower Grey Cloud Island if necessary for reasons of public safety. Some of the existing wells on the island are likely not up to

current MN Dept. of Health code. Upgrading these wells may help ensure that no degradation occurs to drinking water quality during dredge material placement.

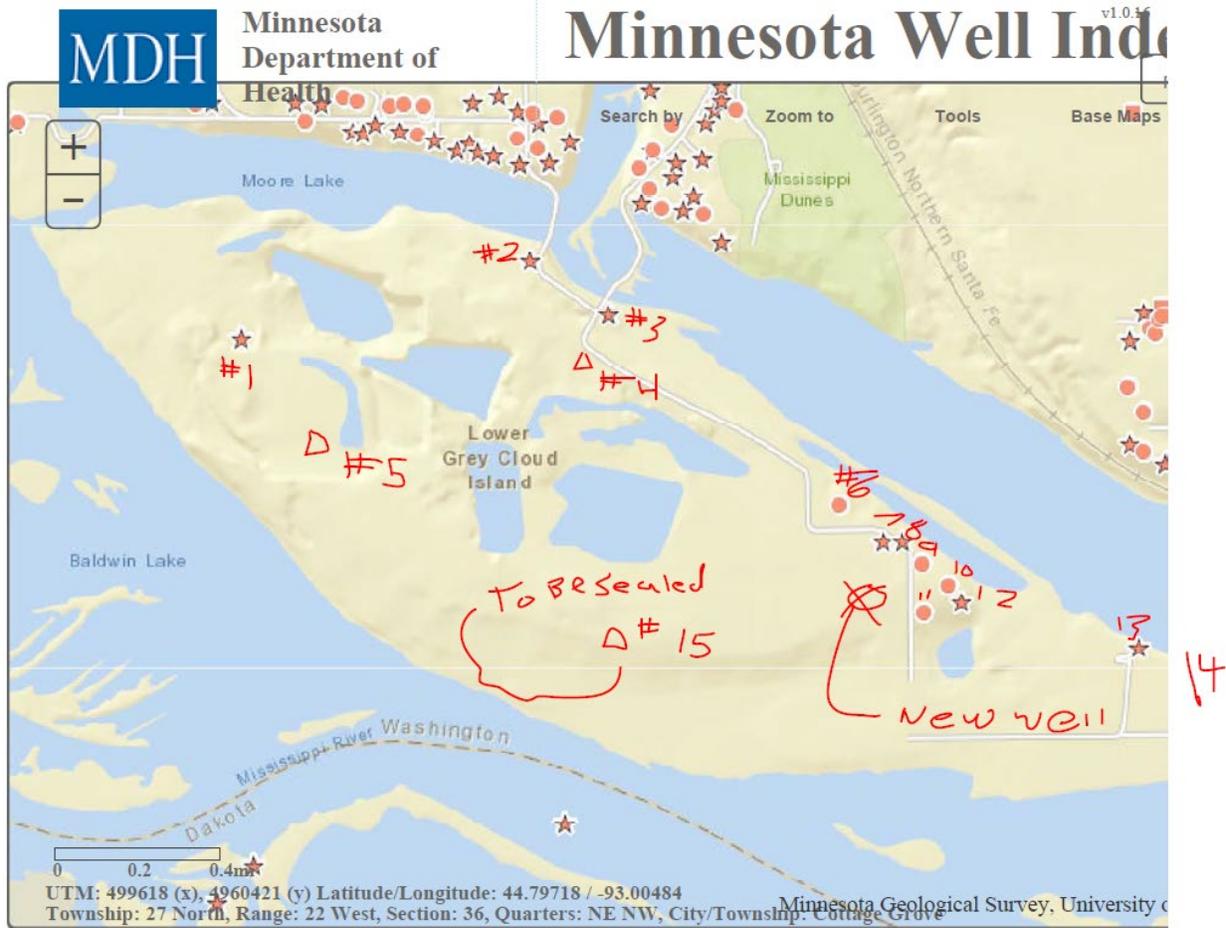


Figure 9: Wells on Lower Grey Cloud Island

7.3.6 AQUATIC HABITAT AND WETLANDS

Under the No Action alternative, placement of materials in aquatic habitats or wetlands would be avoided, if at all possible, but may be necessary under certain conditions if no alternative, practicable placement sites are identified. Every practicable measure would be taken to first avoid filling wetlands. There is an increased risk that without pre-identified sites the Corps would have to do emergency placement in aquatic habitat or wetlands (e.g., side-casting of dredged material in main channel border areas). While undesirable, this could happen in the event of an emergency closure of the navigation channel. Impacts typical of dredged material placement in aquatic areas include the smothering of macroinvertebrates and aquatic vegetation and conversion of the area to a sandy substrate (or conversion to land, if enough material is placed). Mobile biota would temporarily avoid the area during disturbance and could avoid the area longer if habitat is substantially altered. It is possible that aquatic placement could cause benefits if these

characteristics are preferred over what exists in an area. Ultimately, the risk for undesirable effects to biological resources is greater under this alternative than the Tentatively Selected Plan.

Under the Tentatively Selected Plan, filling of the pit on Lower Grey Cloud Island would have a minor adverse effect on the amount of aquatic habitat available there. The value of the aquatic habitat that would be filled is limited due to a lack of vegetation in the deep areas that would be targeted for filling. In the long-term, some level of filling the pit may even improve its value as aquatic habitat, as shallower conditions may increase the growth of aquatic vegetation and, therefore, overall biological productivity. As of now, peripheral areas of the pit that show potential to support aquatic vegetation would not be filled without additional environmental review and coordination. Therefore, no impacts to wetlands within the pit are expected at this time.

Minor periodic access dredging for the primary access point at the southwest end of the pit would be required, which may have minimal effects to aquatic habitat at that location. Access dredging to the pit is expected to be infrequent, possibly being needed once every ten years or so because there is reliable deep water immediately adjacent to the location and because river flows tend to not cause sedimentation there.

Continued placement at the Southport site would have no effect on aquatic habitat.

7.3.7 FISH

The No Action alternative would be expected to have minimal adverse effects to fish if dredged material were placed in the water under emergency or imminent closure conditions. Fish would likely leave such a temporary placement site and would be minimally affected.

There is no known fishery within the mine pit on Lower Grey Cloud Island; therefore, filling the pit under the Tentatively Selected Plan would likely have no effect on fish. However, if there are fish within the mine pit, placing fill in the pit may have an effect over the long term. Filling the pit completely would eliminate a fishery; however, filling the pit partially and such that depths are maintained to support aquatic vegetation and fish could have a long-term benefit to a fishery.

Periodic dredging at the proposed access point under the Tentatively Selected Plan would have negligible effects on fish because they would simply leave the area during the dredging. In the long-term, filling of the pit may improve its habitat by allowing vegetation to grow. This could then lead to the development of a fishery under the Tentatively Selected Plan. Continued placement at the Southport site would not affect fish.

7.3.8 BIRDS AND WILDLIFE

No measurable effects to birds or wildlife are expected under the No Action alternative or Tentatively Selected Plan. Bird and wildlife use of the main channel border is minimal in most locations, such as the mine pit on Lower Grey Cloud Island. Some effects could be

expected under the No Action alternative if an upland placement site is selected, but any such effects are unknown at this time.

Although the bald eagle (*Haliaeetus leucocephalus*) is no longer protected under the Endangered Species Act, it remains protected under the Bald and Golden Eagle Protection Act. If an eagle nest is discovered within proximity to a placement site, measures to avoid and minimize impacts to the eagles would be evaluated and incorporated into the project as necessary (in accordance with the National Bald Eagle Management Guidelines), and the action would be coordinated with the U.S. Fish and Wildlife Service.

7.3.9 AQUATIC INVERTEBRATES

The No Action alternative may have a minor adverse effect on aquatic invertebrates if dredged material is placed in the water adjacent to a dredge cut under emergency or imminent closure conditions. Any benthic aquatic invertebrate, including mussels, would be smothered under such conditions. If dredged material is placed on upland locations, no effects to aquatic invertebrates would be expected to occur.

The Tentatively Selected Plan, however, is expected to only have minor effects on aquatic invertebrates. No effects are expected from the continued use of the Southport site, because it is upland. Placement of dredged material in the mine pit is not expected to have meaningful effects on invertebrates, because such organisms are likely to be absent there. The lack of food and low oxygen levels within the pit make it inhospitable for most benthic organisms. The most likely organisms that could inhabit such places are chironomids (midge larvae), because they are better able to withstand low oxygen levels, but the lack of organic matter would also be a limiting factor for them.

The potential for the project to affect native mussels was also considered throughout the planning process. Mussel skimmer-dredge (sled) surveys were conducted near Lower Grey Cloud Island (Figure 10) in 2012 and 2016. The results of those surveys, found in Table 9, show that the occurrence and diversity of mussels is greater near the southeast end of the pit (yellow oval on Figure 10). This area was also intensively surveyed in 2009 as part of an evaluation of a potential mine expansion into that area. The 2009 survey also detected a relatively diverse and abundant mussel bed in that location. Earlier plans for an offloading location at the southeast end of the pit were abandoned in part because of the presence of this mussel bed and the access dredging that would be required there for barges hauling mechanically-dredged material.

Use of the primary access point at the southwest end of the pit under the Tentatively Selected Plan, however, would be expected to have minor or negligible effects to mussels. Mussel surveys in that location (surveys 2012-01 and 2016-06) only produced four live individuals of three relatively common species (Table 9). None of these species are federally or state listed.



Figure 10: Mussel Survey Locations at Lower Grey Cloud Island

Table 9: Number of Mussels Collected in Sled Surveys at Lower Grey Cloud Island (“X” denotes dead shell, *state listed as threatened or endangered)

Scientific Name	Common Name	Sample ID						
		2012-01	2016-01	2016-02	2016-03	2016-04	2016-05	2016-06
<i>Amblema plicata</i>	Threeridge		2	1		3	X	
<i>Arcidens confragosus</i>	Rock Pocketbook*			1				
<i>Elliptio crassidens</i>	Elephant Ear*							X
<i>Fusconaia flava</i>	Wabash Pigtoe	1	1	1	1	4	5	
<i>Leptodea fragilis</i>	Fragile Papershell			X				
<i>Obliquaria reflexa</i>	Threehorn Wartyback	1		2		9	2	1
<i>Potamilus ohioensis</i>	Pink Papershell	X				X		
<i>Pyganodon grandis</i>	Giant Floater					X		
<i>Quadrula nodulata</i>	Wartyback*			2		1		
<i>Quadrula pustulosa</i>	Pimpleback	1						
<i>Quadrula quadrula</i>	Mapleleaf				1	X		
<i>Truncilla donaciformis</i>	Fawnsfoot*	X						
<i>Truncilla truncata</i>	Deertoe					1		

7.3.10 THREATENED AND ENDANGERED SPECIES

Three federally-listed mussel species are known to occur in Pool 2: the Higgins eye (*Lampsilis higginsii*), snuffbox (*Epioblasma triquetra*), and winged mapleleaf (*Quadrula fragosa*). The sheepnose mussel is not known to occur in Pool 2, but is known to occur in the St. Croix River. Only the Higgins eye is known to occur in the pool below the mouth of the Minnesota River and therefore is the only one of these three that would potentially be affected by the No Action alternative or Tentatively Selected Plan. Under the No Action alternative, placement of dredged material in the water adjacent to a dredge cut under emergency or imminent closure conditions could result in smothering mussels in those locations. However, mussel habitat in such locations would not be expected to be high-quality because every effort would be made to place that material close to the active dredge cut. Also, the incidence of Higgins eye in the pool is very low, and it is unlikely that the species would be present even in good mussel habitat. Finally, the need to conduct in-water placement under the No Action alternative would only be used as a last resort and is relatively unlikely. Potential impacts to the species under the Tentatively Selected Plan would be limited to those that may occur through access dredging at the primary access point and in filling the mine pit. No mussels are known to occur in the mine pit, and surveys conducted in the river at Lower Grey Cloud Island, including those near the primary access point, have not detected this species.

Upland federally-listed species that may occur in Pool 2 are the rusty-patched bumblebee (*Bombus affinus*), the northern long-eared bat (*Myotis septentrionalis*), and the prairie bush-clover (*Lespedeza leptostachya*). Upland areas with these species that may be affected by the No Action alternative are unknown. Upland areas potentially affected under the Tentatively Selected Plan are highly disturbed and very unlikely to provide habitat for these species. It is possible that the bat may use trees surrounding the mine pit on Lower Grey Cloud Island; however, no tree removal is being included as part of the Tentatively Selected Plan. Any future tree removal would not be conducted without first ensuring compliance with the Endangered Species Act, just as any such activities are reviewed now under operation and maintenance of the 9-foot navigation channel.

The St. Paul District has determined that the Tentatively Selected Plan would have no effect on any federally-listed threatened or endangered species.

For similar reasons related to the disturbed nature of areas potentially affected by the Tentatively Selected Plan, the only group of state listed species that may be affected by the project are mussels and possibly the cricket frog. State listed mussels are generally abundant in Pool 2, and two such species, wartyback and rock pocketbook, were collected live near Lower Grey Cloud Island. However, those mussels were collected in the higher-density mussel bed, and no live state listed mussels were collected near the primary access point. No mussels are likely to inhabit the mine pit. No mussels are affected by the continued use of the Southport site. While it is possible that the cricket frog could be found in portions of the mine pit, it is unlikely they are present near the primary access point or in the pit due to the habitat present, and the recent and continued disturbance. A survey for cricket frog habitat was conducted on November 14, 2019 at Lower Grey Cloud Island and the Southport sites; no high-potential cricket frog habitat was observed at either site. For these reasons, the Tentatively Selected Plan is unlikely to affect any state-listed species.

7.3.11 TERRESTRIAL HABITAT

Impacts to terrestrial habitat under the No Action alternative are not known, since alternate future placement sites have not been identified. Any terrestrial areas used for dredged material placement would be transformed into relatively barren sandy areas.

The Tentatively Selected Plan would have no adverse effects to terrestrial habitat on Lower Grey Cloud Island because dredged material would be placed in a mine pit and terrestrial areas that would be used for access are currently disturbed from mining activities. In the long-term some or all of the pit would be converted to terrestrial habitat. Furthermore, even though no plans for upland habitat restoration exist at this time, it is likely that in the long term the upland areas would be managed and developed into some type of preferred upland habitat.

Impacts to terrestrial habitat at the Southport site would be negligible due to the fact that the site is disturbed and is continually used for dredged material placement. The level of disturbance is not expected to change under the Tentatively Selected Plan.

7.4 Cultural Resource Effects

7.4.1 SOUTHPORT

This site is just south of the St. Paul Downtown Airport and situated in an area previously occupied by a backwater lake, channel, and wetlands. The site has been severely disturbed with the creation of the barge slip and associated terminal infrastructure. This activity would have destroyed any cultural resources that may have once resided in the area.

No cultural resources have been identified within or adjacent to the Southport onshore transfer site. However, the location of Pettit Corbeau's village of Kaposia (21RA17/21DK1) shifted from each bank of the river during the 19th Century (Carver 1781; Coues 1895; Trygg 1964; Gibbon 2003; Larpenter 1981). A portion of the semi-permanent Dakota village may have been situated within the Southport complex. A lone burial mound (21DK14) was situated approximately one-quarter of a mile south of the transfer site and the NRHP eligible Northwest Airlines Hanger, Office, and Terminal Building (built circa 1920, RA-SPC-5621) north of the area. Across the river lies the historic ghost town of Pigs Eye Village (21RA2, 21RAj) where the Metropolitan Wastewater Treatment Plant is situated.

7.4.2 LOWER GREY CLOUD ISLAND PIT

Areas within the active quarry slated to receive dredged material have been previously disturbed from mining operations and dredged material placement events. No historic properties reside within the quarried and filled areas. However, the project would use existing haul roads that transect the remnants of site 21WA48 and potentially 21WA9. Any improvements to the haul roads not placed over previously disturbed areas would be constructed of fill material with no grading or grubbing of vegetation. The re-handling area along the river has previously been built up with fill. With implementation of these protective measures, the Corps has determined that the project would likely have no adverse effect to historic properties.

Lower Grey Cloud Island (a glacial terrace remnant) contains several precontact and historic cultural resources. The NRHP listed Schilling Archaeological District (21WA1) is on the island's eastern end (Birk 1973; Withrow et al. 1987). Along the north central portion of the island are the remnants of the Michaud-Koukal Mounds (21WA2) and a precontact find spot (21WAe). In the south central portion of the island, the Nelson Mine West Site (21WA110) is along the main channel, and the Grey Cloud Mounds Site (21WA9) that once harbored 48 burial mounds is along the shoreline and goes inland as well as the Grey Cloud Townsite (21WA48) (Gronhovd and O'Brien 2008a, 2008b; Harrison 2010a, 2010b). Site 21WA48 contains historic and precontact materials. Historic and recent mining has obliterated the majority of site 21WA48. No shipwrecks or wing dams are recorded along the main channel of the river in the area where access for placement would be located.

7.4.3 COORDINATION

Coordination with the Minnesota State Historic Preservation Office (SHPO) and various Native American groups has occurred. In a letter dated 22 Feb 2018 the SHPO concurred with the Corp's determination of No Adverse Effect on historic properties. The Lower Sioux Community are participating in continued consultation with the undertaking. See Appendix B for coordination letters.

7.5 Cumulative Effects

The proposed action is a component of the much larger set of plans and actions undertaken as maintenance of the 9-foot navigation channel on the UMR. The cumulative effects of the proposed action would include those discussed in the 1997 CMMP EIS, as well as additional impacts discussed here.

The Minnesota DNR considers the Tentatively Selected Plan here to be a phased portion of Lower Pool 2 Channel Management Study, requiring the preparation of Mandatory Environmental Assessment Worksheet.

7.5.1 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

Cumulative effects are defined by the Council on Environmental Quality as, “[T]he impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” 40 CFR § 1508.7.

7.5.2 ACTIONS IDENTIFIED WITHIN THE PROJECT IMPACT ZONE

The following past, present, and reasonably foreseeable future actions were identified as having the potential to interact with or have impacts related to those of the proposed project.

Past Actions

Modifications to the Upper Mississippi River for Navigation

The floodplain geomorphology, stream hydraulics, and water levels of the Upper Mississippi River have been modified by impoundment and other navigation features since the 1820s. The most relevant navigation improvement actions within the project impact area are likely the construction of hundreds of channel training structures placed between 1866 and 1907 as part of the 4-foot, 4.5-foot, and 6-foot navigation channel

projects. Following the construction of these structures was the construction of Lock and Dam Number 2 in 1930, which raised water levels by several feet in the immediate project area and allowed for a 9-foot-deep navigation channel. The cumulative effect of these actions has played a large role in the development of the habitat that currently exists in the project area.

Closure of Upper St. Anthony Falls Lock and Dam to Navigation

Due to concerns regarding the spread of invasive Asian carp, Section 2010 of the Water Resources Reform and Development Act of 2014 (WRRDA 2014) directed the Secretary of the Army to close the Upper St. Anthony Falls lock to navigation within one year after enactment. The WRRDA 2014 was signed into law on June 10, 2014. The WRRDA 2014 allows the lock to continue to be operated for emergency flood control. The lock was closed to navigation on June 9, 2015. The WRRDA 2014 did not direct further disposition of the lock, though a study has been initiated to determine this (see below).

Grey Cloud Island Slough Restoration

Grey Cloud Island is located adjacent to and slightly upstream of the project area. The upper end of the slough is located at approximately River Mile 827.5, and the lower end of the slough is located in the northwest of Freeborn Bend, at approximately River Mile 819.5. The connectivity of the slough was severed in 1965 when flooding provoked an emergency raise of the bridge during which the bridge culverts were filled. Since 1965, the ecological condition of the two disconnected ends of the slough has degraded. In the summer of 2018, the barrier causeway on County Road 75 was replaced with a bridge that restored flow to the slough. The restoration of connectivity and flow to the slough is estimated to result in a diversion of an estimated 1-5% of the total Mississippi River flow through this slough.

Proposed Nelson Mine Expansion

There is an ongoing mining operation utilizing an area of Grey Cloud Island, adjacent to the proposed project area. The mining company, Aggregate Industries, produced a Draft Environmental Impact Statement for a proposed expansion of the mining activities. Mining operations would be expanded into 230 acres of privately-owned backwaters in order to access approximately twenty-one million tons of aggregate material. The project would have extended the useful life of the equipment currently being used for mining on the island, and would be estimated to proceed for approximately twenty years. However, the expansion project was suspended in 2014.

Concurrent and Ongoing Actions

Navigation on the UMR

The operation, maintenance, and navigation use of the main channel of the UMR at its current authorized level is expected to continue into the future.

Lake Pepin Eutrophication Total Maximum Daily Load (TMDL) Study and South Metro Mississippi River Total Suspended Solids TMDL Study

The Minnesota Pollution Control Agency has identified the Mississippi River from Lock and Dam 1 to the head of Lake Pepin to be impaired for phosphorus and total suspended solids (TSS). Ongoing TMDL studies are being undertaken to identify the maximum quantities of these pollutants that can be allowed to enter the water body without exceeding water quality standards. The proposed project would have a minor effect on TSS and turbidity levels. Turbidity in this reach of the river began increasing in the early 1920s as the Twin Cities metropolitan area grew and agricultural use of the Minnesota River Basin increased. Sediment cores from Lake Pepin have shown that the sediment load to Lake Pepin doubled between the 1930s and the 1960s and has stabilized at that level, although the source of the sediment has shifted from farm fields to increased erosion of stream banks and bluffs.

Minnesota River Watershed Study

The Corps is currently working on an integrated watershed study of the Minnesota River, with the intent to produce a watershed management plan. The results of the study will enable examination of existing conditions, forecasting of future conditions, and simulation of alternatives to identify management actions that are ecologically sustainable, economically sound, and socially desirable.

Pool 2 CMS

The Lower Pool 2 Channel Management Study's recommended plan is to excavate and maintain a wider channel that is still within authorized dimensions and put into place two new training structures (rock sills)--one on the right descending bank and one on the left descending bank.

These minor changes would improve navigability, safety, and reduce channel maintenance requirements. This additional dredging to restore the channel to wider dimensions would produce approximately 350,000 cubic yards of material; that material is currently planned to be placed on the temporary placement site islands. Some or all of the material could also be used for construction of the Pigs Eye Lake CAP section 204 project. Material placed on the temporary islands would eventually be offloaded to the permanent placement site in Lower Pool 2 as identified in this DMMP. If this DMMP results in the availability of a permanent placement site prior to the Pool 2 CMS project dredging, the dredged material may be placed directly into the new site to avoid double-handling on the

temporary islands. Phase I of this project – construction of the west rock sill training structure – was completed in 2018. Phase II – construction of the east rock sill training structure – was completed in 2019. The channel dredging portion of the project remains to be completed.

Reasonably Foreseeable Future Actions

Lower Grey Cloud Island Development

Plans to develop Lower Grey Cloud Island (outside the pit area) are known to exist and are described in Section 7.1 and shown on Plate 8. Filling of the pit as depicted in the plan, however, seems to be reasonably foreseeable as discussed in Section 7.1.

Pigs Eye Lake Ramsey County, MN Section 204

Pigs Eye Lake is a 628-acre, shallow backwater lake, situated southeast of St. Paul, Minnesota, within Pool 2 of the Mississippi River. The Corps of Engineers, in partnership with Ramsey County, MN, investigated and approved the feasibility of constructing islands and other habitat enhancement features in the lake to improve habitat there. The project would be implemented under the Section 204 authority, which targets the beneficial use of dredged material. As such, material dredged from the UMR in Pool 2 in support of the Nine-Foot Navigation Project will be used to construct the proposed features. The feasibility report and environmental assessment was approved in September 2018. Construction of the project is anticipated to start as early as 2020.

Lock and Dam 2 Embankment

The Corps of Engineers is currently working on a design for embankment protection along the current earthen embankment at Lock and Dam 2. The current embankment has experienced degradation due to erosion via wind-driven wave action, ice action and river currents. Repair needs at the Lock and Dam 2 embankment were determined through a Problem Appraisal Report (PAR) conducted by the Corps. Alternatives being considered include a riparian berm, an offshore island or a combination of both. The goals of the project would be to provide embankment stability, environmental benefits and utilize dredged material for beneficial purposes. A riparian berm alternative would likely require about 2,100 feet of berm, with a footprint of about 5.5 acres, on the upstream side (Pool 2 side) of the embankment.

Section 216 Disposition Study, Upper and Lower St. Anthony Falls and Lock and Dam 1, Upper Mississippi River

This study will investigate the appropriate future disposition of three locks and dams located in Minneapolis, MN, including Upper St. Anthony Falls (USAF), Lower St. Anthony Falls (LSAF) and Lock and Dam 1. USAF was closed to navigation on June 9, 2015, under the direction of Section 2010 of the Water Resources Reform and

Development Act of 2014. The act did not de-authorize or direct further disposition of the lock. The lock continues to be operated for flood damage mitigation. Commercial navigation at LSAF and Lock and Dam 1 has decreased due to the closure of the USAF lock. A disposition study will examine the benefits and costs of continuing to operate the three lock and dam sites. The appropriate disposition of each site will be analyzed and an environmental assessment will be prepared in compliance with the National Environmental Policy Act (NEPA). If disposal of the properties is not recommended, additional studies may be performed to modify the projects to serve existing or new authorized purposes, or for additional uses identified by a potential non-federal sponsor and authorized under a new start feasibility study.

7.5.3 CONSEQUENCES OF CUMULATIVE EFFECTS

The Tentatively Selected Plan includes the continued use of an existing placement site (Southport) and the use of new placement site that is an existing mine pit with limited natural resources and ongoing mining disturbance. Furthermore, the mine pit is within an island, and physically separated from the main flow in the river. The Tentatively Selected Plan will not have a significant impact to natural resources when added collectively to the other past, present and reasonably foreseeable actions in Pool 2.

Commercial Navigation

The Tentatively Selected Plan, in combination with the Pool 2 CMS, and the Lock and Dam 2 Embankment project would have a combined beneficial effect to Commercial Navigation on Pool 2. The outcome of the future disposition study would affect commercial navigation in the upper pools, but the effect on navigation in Pool 2 would likely be limited and there would be no cumulative adverse effect from the Tentatively Selected Plan.

Hydrology, Hydraulics, and Sediment Transport

The now completed Grey Cloud Island Slough Restoration will have minor effects on the hydraulic function of the area, by redirecting 1-5% of the Mississippi River's flows through the slough. This minor change is not expected to impact the sediment capacity of the navigation channel.

The closure of Upper Saint Anthony Falls Lock could change dredging quantities in Pool 2, however this depends on future dredging practices in the Upper St. Anthony Falls (USAF) Pool and Pool 1. If dredging in just the USAF Pool was eliminated, the increase in dredging in Pool 2 would be minimal, as long as dredging in Pool 1 was increased to account for the additional sediment load from the USAF Pool. If dredging in both the USAF pool and Pool 1 were eliminated, the increase in dredging in Pool 2 could be substantial. Sediment budget analysis indicates that annual dredging volumes could increase by as much as 40-percent, however an unknown is the amount of time for the increase in Pool 2 dredging to occur. Observation from other river reaches where large changes in sediment transport capacity or dredging volumes have occurred suggest that it

could be a decade or more before increased dredging occurs in lower pool 2. If there is a substantial increase in the sediment load in Pool 2, the Tentatively Selected Plan would help mitigate the potential effects by placing increased quantities of dredged material in a placement site with a high capacity and relatively few adverse impacts to natural resources.

7.6 Summary of Environmental Effects

Table 10 provides a summary of the environmental consequences of the No-Action alternative and the potential effects of the Tentatively Selected Plan. The No-Action alternative is considered to be the base condition, and includes those actions expected to be undertaken in the future in the absence of an additional project. Therefore, the impacts to each of the resource categories under the No-Action alternative are in general the impacts that would occur without additional dredged material placement capacity. The impacts listed under the proposed alternative are those discussed in detail within Chapter 7. Impacts in the table denoted by a “?” are considered possible but uncertain.

Table 10: Environmental Assessment Matrix

PARAMETER	No Action Alternative						Tentatively Selected Plan							
	BENEFICIAL			ADVERSE			BENEFICIAL			ADVERSE				
	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. Social Effects														
1. Noise Levels					?							X		
2. Aesthetic Values				?					?	X				
3. Recreational Opportunities				X					?	X				
4. Transportation				X						X				
5. Public Health and Safety				X						X				
6. Community Cohesion (Sense of Unity)				X						X				
7. Community Growth and Development				X						X				
8. Business and Home Relocations				X						X				
9. Existing/Potential Land Use				X						X				
10. Controversy				X								?		
B. Economic Effects														
1. Property Values				X						X				
2. Tax Revenue				X								X		
3. Public Facilities and Services				X						X				
4. Regional Growth				X						X				
5. Employment				X						X				
6. Business Activity				X						X				
7. Farmland/Food Supply				X						X				
8. Commercial Navigation					X				X					
9. Flooding Effects				X	?					X				
10. Energy Needs and Resources				X						X				
C. Natural Resource Effects														
1. Air Quality				X	?				?	X				
2. Terrestrial Habitat				X	?				?	X				
3. Wetlands				X						X				
4. Aquatic Habitat				X	?							X		
5. Habitat Diversity and Interspersion				X						X				
6. Biological Productivity				X						X				
7. Surface Water Quality				X	?							X		
8. Water Supply				X						X				
9. Groundwater				X						X				
10. Soils				X						X				
11. Threatened or Endangered Species				X						X				
D. Cultural Resource Effects														
1. Historic Architectural Values				X						X				
2. Prehistoric & Historic Archeological Values				X						X				

CHAPTER 8.

Environmental Compliance and Review

8.1 Applicable Environmental Laws and Executive Orders

The proposed action would comply with federal environmental laws, Executive Orders and policies, and applicable state and local laws including but not limited to the Clean Air Act, as amended; the Clean Water Act, as amended; the Endangered Species Act of 1973, as amended; the Fish and Wildlife Coordination Act of 1958, as amended; the Land and Water Conservation Fund Act of 1965, as amended; the National Historic Preservation Act of 1966, as amended; the National Environmental Policy Act of 1969, as amended; Executive Order 11990 – Protection of Wetlands; Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations; the Farmland Protection Policy Act of 1981 (the proposed action would not result in the conversion of farmland, as defined by the Farmland Policy Act, to non-agricultural uses); and Executive Order 11988 – Floodplain Management.

8.2 Public Involvement

A stakeholder meeting was held on 13 September, 2018 in St. Paul, Minnesota. The purpose of the meeting was to discuss the Corps long-term needs for dredge material placement in Pool 2, specifically Lower Grey Cloud Island, and solicit feedback from agencies regarding their regulatory requirements and long-term plans for the island. Federal, state, and local agencies participated, as well as the land owner and tenant of the mining pit on Lower Grey Cloud Island. Additional information related to this meeting can be found in Appendix B, Coordination and Correspondence.

A public notice of availability of the Draft Report was published on 26 November 2019 on the Corps website. A notice was also sent via email to various stakeholders and agency partners. A public meeting was held at Cottage Grove City Hall, on 9 December, 2019 to discuss the project and obtain public input. A memo documenting the results of the public meeting can be found in Appendix B.

The review period for the Draft Report ended on 8 January 2020. Comments received can be found in Appendix B. All comments were reviewed, categorized, and responded to in the Comment Responses table in Appendix B. Most comments were addressed with simple clarifications and only minor changes to the Draft Report were made as a result.

8.3 Coordination

Planning for the overall project has been coordinated with the public, state and federal agencies, and other interested parties. Detailed descriptions of compliance efforts for certain regulations follow.

8.3.1 CLEAN WATER ACT

The Tentatively Selected Plan includes filling the mine pit on Lower Grey Cloud Island. The St. Paul District Regulatory Office has determined that the mine pit does not currently meet the definition of a water of the United States and is not subject to the provisions of Section 404 of the Clean Water Act given that the area at issue was previously dry upland. Therefore, a Section 404(b)(1) evaluation has not been prepared for the proposed fill activities in the pit on Lower Grey Cloud Island at this time. If hydraulic placement occurs at the Tentatively Selected Plan placement sites, the return water discharge from placement activities may be covered under a nationwide permit. Currently, Nationwide Permit 16 covers return water discharges from upland contained disposal areas in Minnesota and Wisconsin.

While the mine pit on Lower Grey Cloud Island is not currently a water of the United States subject to Section 404 of the Clean Water Act, the St. Paul District has nevertheless determined that there is no practicable alternative to this site that would have less adverse impact on the aquatic ecosystem. This determination is based on an analysis of using other potential sites in Lower Pool 2. For reasons explained in other sections of this report, the Lower Grey Cloud Island pit is the only practicable site for the placement of channel maintenance dredged material in Lower Pool 2.

A Section 404(b)(1) evaluation was completed for the Southport Site under the CMMP and EIS. The placement site is in continual use being filled and excavated.

8.3.2 RIVERS AND HARBORS ACT

Compliance with Section 10 of the Rivers and Harbors Act of 1899 is required for activities conducted below the ordinary high water elevation of navigable waters of the United States. (33 U.S.C. § 403). The proposed action would be in compliance with Section 10. Using the new placement site would not result in any appreciable differences with dredging operations as it relates to Section 10 compliance and existing dredging activities.

8.3.3 FISH AND WILDLIFE COORDINATION ACT, ENDANGERED SPECIES ACT

In compliance with the Fish and Wildlife Coordination Act, project plans have been coordinated with the USFWS, the MNDNR, and the MPCA. The St. Paul District has determined that the proposed alternative would have no effect on any state- or federally-listed threatened or endangered species, or any critical habitats.

8.3.4 STATE PERMITS

The St. Paul District will request approval from the RRF to add the Lower Grey Cloud Island pit to the CMMP.

The St. Paul District will request, out of comity, that the MPCA and MNDNR add the Lower Grey Cloud Island pit site to the existing programmatic State Disposal System (SDS) and Public Waters Work permits, respectively, for activities associated with maintenance of the 9-foot navigation channel.

This project is being considered as a phased action (*see Minnesota Rules, part 4410.0200, subpart 60*) of a previous project which required preparation of a Mandatory Environmental Assessment Worksheet (EAW): “Lower Pool 2 Channel Management Study: Boulanger Bend to Lock and Dam No. 2” (Record of Decision with Negative Declaration signed September 6, 2017). The Corps has worked with the Responsible Government Unit (the Minnesota DNR) to complete an EAW that will be released for public comment at a later yet-to-be-determined date.

8.3.5 CULTURAL RESOURCES AND TRIBAL COORDINATION

Coordination with the Minnesota State Historic Preservation Office (SHPO) and various Native American groups has occurred. In a letter dated 22 Feb 2018 the SHPO concurred with the Corp's determination of No Adverse Effect on historic properties. The Lower Sioux Community are participating in continued consultation with the undertaking. See Appendix B for coordination letters.

8.4 Distribution of the Draft Environmental Assessment

This environmental assessment was provided on the following website: <http://www.mvp.usace.army.mil/Home/Public-Notices/>. A notice of availability was sent to interested citizens and the following agencies:

Federal

Environmental Protection Agency
U.S. Fish and Wildlife Service
National Park Service

Tribes

Lower Sioux Indian Community
Shakopee Sioux Community

State of Minnesota

Department of Natural Resources

Pollution Control Agency

Others

Dakota County

Hennepin County

Ramsey County

Washington County

St. Paul Port Authority

8.5 Comments on the Environmental Assessment

The review period for the Draft Report started on 22 November 2019, and ended on 8 January 2020. Comments received can be found in Appendix B. All comments were reviewed, categorized, and responded to in the Comment Responses table in Appendix B. Most comments were addressed with simple clarifications and only minor changes to the Draft Report were made as a result.

A list of environmental requirements are located in Table 11.

Table 11: Compliance Review with All Applicable Environmental Regulations and Guidelines

Environmental Requirement	Compliance¹
<u>Federal Statutes</u>	
Archaeological and Historic Preservation Act	Full
Bald and Golden Eagle Protection Act of 1940, as amended	Full
Clean Air Act, as amended	Full
Clean Water Act, as amended	Full
Coastal Zone Management Act, as amended	N/A
Endangered Species Act of 1973, as amended	Full
Federal Water Project Recreation Act, as amended	Full
Fish and Wildlife Coordination Act, as amended	Full
Land and Water Conservation Fund Act of 1965, as amended	Full
Migratory Bird Treaty Act of 1918, as amended	Full
National Environmental Policy Act of 1969, as amended	Full
National Historic Preservation Act of 1966, as amended	Full
National Wildlife Refuge Administration Act of 1966	Full
Noise Pollution and Abatement Act of 1972	Full
Watershed Protection and Flood Prevention Act	N/A
Wild and Scenic Rivers Act of 1968, as amended	N/A
Farmland Protection Policy Act of 1981	N/A
<u>Executive Orders, Memoranda</u>	
Floodplain Management (E.O. 11988)	Full
Protection and Enhancement of Environmental Quality (E.O. 11514)	Full
Protection and Enhancement of the Cultural Environment (E.O. 11593)	Full
Protection of Wetlands (E.O. 11990)	Full
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 30 August 1976)	N/A

¹ The compliance categories used in this table were assigned according to the following definitions:

- a. Full – All requirements of the statute, E.O., or other policy and related regulations have been met for the current stage of planning.
- b. Partial – Some requirements of the statute, E.O., or other policy and related regulations remain to be met for the current stage of planning.
- c. Noncompliance (NC) – Violation of a requirement of the statute, E.O., or other policy and related regulations.
- d. Not Applicable (N/A) – Statute, E.O., or other policy and related regulations not applicable for the current stage of planning.

² Full compliance to be achieved with the District Engineer's signing of the Finding of No Significant Impact.

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