SCANLON RESERVOIR DECISION SUMMARY
MINNESOTA POLLUTION CONTROL AGENCY
REMEDIATION DIVISION

Site Name:	Scanlon Reservoir
Address:	Carlton County, Scanlon Minnesota
SR/AI Number:	SR0001374/AI190320
Project Manager:	Steven Schoff
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STATEMENT OF PURPOSE

This Decision Summary presents the selected remedial action for the Scanlon Reservoir of the St. Louis River Area of Concern (SLRAOC or St. Louis River AOC) and summarizes the facts and determinations made by the Minnesota Pollution Control Agency (MPCA) in approving the selected response actions. MPCA has selected a modified combination of Alternative 2: Enhanced Monitored Natural Recovery with Thin-Layer Amended Cover and Alternative 5: Enhanced Monitored Natural Recovery with Broadcast Amendment. The response action is designed to prevent transfer of contaminants of concern (COCs) from the sediment into the pore water, which will reduce bioaccumulation into the food web.

SITE BACKGROUND

The Scanlon Reservoir is located immediately east of Scanlon, Minnesota, and downstream of the nearby city of Cloquet, Minnesota. The Reservoir is approximately 40 acres in size and consists of the water body located immediately upriver of the Scanlon dam. The Reservoir water has been used for hydroelectric generation since construction was completed in 1923. Sources of historical discharge to the St. Louis River (SLR), which is directly upriver from and feeds into the Reservoir, include the following: municipalities, building materials manufacturing, paper manufacturing, and match manufacturing. Releases from these sources resulted in dioxin/furan contaminated sediment in the Scanlon Reservoir.

The Reservoir is bounded on all sides by forested lands owned by Minnesota Power and Sappi Cloquet, LLC. The forested lands extend for nearly 1 mile to the east, northeast, and north, after which low-density residential neighborhoods and farmland are present. Upriver and to the northwest are the cities of Scanlon and Cloquet, and the location of former industries that discharged into the SLR up until 1979. The Site is bounded to the west by a small strip of forested land between the Site and State Highway 45. Beyond State Highway 45 are residential neighborhoods associated with the City of Scanlon. The Site is bounded to the south by the Scanlon hydro station and associated dams. Beyond the hydro station are downstream portions of the SLR along with a mix of residential properties, commercial properties, and forested lands.

SITE HISTORY

Little is known about the area of the Scanlon Reservoir prior to 1922; records only indicate that it was the site of the old Scanlon wagon bridge. In 1922, the St. Louis River Improvement Company began construction of the Stevens Dam, now referred to as the Scanlon Dam. The Site has been used for hydroelectric generation since construction was completed in 1923. Scanlon Reservoir (the Site) is one of five reservoirs downstream of Cloquet, Minnesota, that regulates streamflow into the downstream portion of the SLR. The other four reservoirs are Northwest Paper (Potlatch), Thomson, Fond du Lac, and Knife Falls. A hydroelectric power station located at the southern (downstream) portion of the Site is owned and operated by Minnesota Power and has the capacity to generate up to 1.6 megawatts of electricity for the electrical grid. The power generating and dam infrastructure consists of four major components: a west channel dam; an east channel dam; and two non-overflow gravity dams that are located on the island that separates the east and west channels of the river. The west channel structures consist of two Tainter gated spillways flanking a powerhouse and a short concrete gravity non-overflow section keyed into the island bedrock. The Scanlon hydroelectric station is a “run of river” station, meaning it doesn’t store water in a reservoir for future use. Rather, the station relies on the water that is currently available to generate electricity. As water flows downstream, some of it is diverted through turbines in a powerhouse and then is immediately released back into the river.

DESCRIPTION OF CONTAMINANTS

In 2010-2011, The United States Environmental Protection Agency (USEPA) and United States Army Corps of Engineers (USACE) conducted an extensive sediment characterization project in the St. Louis River AOC. MPCA used the AOC-wide sediment characterization data as a baseline for its planning level analysis of the assessment data, which determined areas of the SLRAOC in need of remediation, additional investigation, or restoration. In 2014, the MPCA conducted a targeted investigation of sediment quality in the Reservoir as documented in the 2020 Focus Feasibility Study (FFS) Report for the Reservoir. Based on this study, a 17-acre remedial area, within the 40 acre Reservoir, was identified with dioxin/furan sediment contamination and needs remediation.

The remedial action is driven by the ecological risk to benthic organisms in the sediment. Numerical sediment quality targets (SQTs), adopted for use in the SLR AOC to protect benthic invertebrates, can be used as benchmark values to assess ecological risk. Contaminant concentrations below the Level I SQTs are unlikely to have harmful effects on sediment-dwelling organisms (i.e., benthic invertebrates). Contaminant concentrations above the Level II SQTS are more likely to result in harmful effects to benthic invertebrates (MPCA, 2007). A qualitative comparison value midway between the Level I SQTs and Level II SQTs (i.e., Midpoint SQT) was used to establish criteria to identify, rank, and prioritize sediment-associated COCs within the Site.

Dioxins are the main contaminants of concern and are the driver of the remediation. The mean concentration of dioxins as TEQ KM Fish over all intervals was 37.74 ng/kg, substantially greater than the Midpoint Sediment Quality Target (SQT) of 11.2 ng/kg. Forty-four of the 48 samples collected exceeded the Level I SQT, 23 exceeded the Midpoint SQT, and 20 exceeded the Level II SQT. A total of 28 of the Midpoint or Level II SQT exceedances occurred within the 0.0- to 0.15-meter interval and 23 occurred within the 0.15- to 0.50-meter interval. Only a single sample was collected from the 0.50- to 1.0-meter interval; this sample exceeded the Level I SQT. Dioxins were also assessed in benthic invertebrate and fish bioaccumulation studies in 2016 and were found to bioaccumulate in tissue significantly more than reference areas. Based on bulk sediment chemistry and bioaccumulation results, dioxins are considered a COC for the Reservoir due to numerous exceedances of the Midpoint SQT and bioaccumulation in sediment dwelling organisms and fish tissues substantially higher than the reference site. The volume of contaminated sediments in the remedial area is estimated to be approximately 55,000 cubic yards. The Reservoir is a high priority for remedial action in the SLRAOC based on:

- Exceedance of the Midpoint Sediment Quality Target (SQT) for Dixons over a 17 acre remedial area of the 40 acre reservoir.
- Presence of bio-accumulating contaminants that have been shown to bioaccumulate in benthic invertebrates, fish, and other wildlife.
- Significant area of bioactive zone sediments and benthic habitat impacted by contaminants.

Contaminated sediment identified in the 17-acre remedial area, is considered to present a high likelihood of significant effects to benthic invertebrate communities.

Contaminant	Units	Cleanup Level	Maximum Concentration Detected	Mean Concentration
Dioxins	ng TEQ/kg	11.2	392.7	32.58

ng TEQ/kg – nanograms toxic equivalency per kilogram

As identified in the St. Louis River Remedial Action Plan (RAP), dated 2016, and later verified in the Scanlon Reservoir Final Focus Feasibility Study (FFS) Report, dated June 2020, the contamination in the Reservoir is contributing to the following beneficial use impairments to the SLRAOC:

1) Restrictions on dredging

2) Degradation of the benthos environment

The Report titled **" IDENTIFYING AND RECRUITING PARTNERS FOR GREAT LAKE LEGACY AND PROJECT ,St Louis River AOC , Minnesota Scanlon Reservoir, Prepared for: U.S. EPA Region 5 , dated November 2018,"** indicates discharge from upstream industrial sources was deposited into the sediments in a 17-acre remedial area within the Reservoir. Industrial sources of COCs were reduced, if not eliminated, beginning in the late 1970s when the Western Lake Superior Sanitary District (WLSSD) accepted all industrial and municipal waste water from the area. Ambient sources, such as atmospheric deposition, constitute the primary ongoing source of COC levels entering the river and Reservoir.

As identified in the St. Louis River Remedial Action Plan (RAP, 2016) and later verified in the Final Focus Feasibility FFS Report, dated June 2020, indicates that areas contributing to river sediment impairments should be addressed through remedial activities. The St. Louis River, including the Duluth/Superior Harbor, is listed as impaired water on the Clean Water Act 303(d) list for bioaccumulative toxins. Toxins include mercury, PCBs, and pesticides (DDT, dioxin, etc.). Reduction of bio toxins within the St. Louis River, estuary, and harbor, and removing or isolating the contaminated sediments from the surface water/sediment interface will help in the reduction of the impaired water resulting from bioaccumulative toxins in the SLRAOC.

Risk to human health

The Scanlon Reservoir is located in a semi-rural area immediately east of the City of Scanlon. The surrounding properties consist primarily of forested, undeveloped lands owned by Minnesota Power and Sappi Cloquet, LLC. Access to the Reservoir is potentially available via a public parking area located approximately 0.25 miles to the south and a recreational trail extending north from the parking area to western shoreline. The portion of the SLR directly downstream of the Site is a popular kayaking route. It is possible that kayakers also use the Site, although a hydroelectric dam separates the Site from the portion of the SLR commonly used by kayakers and no official portage is present between the Site and the kayaking route. Fishing is also a popular recreational activity within the Duluth area. It is possible that some fishing is actively conducted within the Reservoir; however, due to limited public access to the Reservoir, and no public fishing docks or boat launches, significant fishing traffic is unlikely. Direct exposure to contaminated sediments by the public thru wading and swimming is possible given the shallow depth to sediments in some areas of the Reservoir, but unlikely due to limited public access to the Reservoir. All information to date indicates that the proposed future use of the Reservoir is consistent with the current use.

Dioxins are generally non-volatile and not emitted from the waters of the Reservoir; therefore, the inhalation exposure pathway is considered incomplete for human receptors.

There is a potential that contaminated sediments at the site are contributing bioaccumulative contaminants into the food web and contributing to the overall impaired use in the SLRAOC. In summary, risk to human receptors from contaminated sediments in the Reservoir is low.

Ecological risks

The 2016 DGI fish sampling tissue results, found in 2016 Tissue Analysis Project Plan for Duluth Reservoirs, dated March 10, 2017, indicate fish and other aquatic organisms accumulate dioxins from food and sediment that they ingest or through direct partitioning from water to biological tissues.

Complete ecological exposure pathways for the Reservoir include the following:

- Exposure to ecological receptors through incidental ingestion and dermal contact with sediments; and
- Ingestion of biota that have consumed contaminated sediments.

The complete ecological exposure pathways and available analytical data indicate that sediments with concentrations of COCs that exceed the Midpoint SQT value are considered a risk to the benthic community and the larger ecological environment where they are found.

In summary, the analysis of the sediment data and available exposure pathways in the 2020 FFS indicated that COCs are present at the Reservoir, and exposure pathways are complete; therefore, a potential risk to ecological receptors from contaminated sediments exists at the Reservoir.

Receptors that are potentially exposed to COCs include the following ecological receptors:

- Emergent and submerged vegetation;
- Benthic and aquatic invertebrates;
- Mammals and birds consuming fish, benthic and aquatic invertebrates, and vegetation; and
- Undetermined receptors if future maintenance dredging is needed or other intrusive activities take place.

Reducing surface sediment concentrations or chemical bioavailability is the primary goal of sediment remediation processes. The deposition of cleaner sediment that buries and isolates COCs below the upper bioturbation layer reduces risk of chemical exposure to benthic receptors. No models have been developed for the Site to predict sediment deposition rates. Based on assumptions made about the hydrodynamic environment at the Site, overall sedimentation is likely minimal or occurs infrequently and only during high water events.

SELECTION AND DESCRIPTION OF REMEDY

The MPCA established the following remedial action objectives (RAOs) to be accomplished by the remediation project.

The following RAOs for the Reservoir Include goals for the protection of ecological receptors:

1) Minimize or remove exposure to sediment contaminants that bioaccumulate in the food chain;
2) Minimize or remove exposure of the benthic organisms to contaminated sediments above sediment cleanup goals; and
3) Maintain current reservoir operating capacity and functionality.

The Focused Feasibility Study (FFS), dated 2020, evaluated alternatives to remediate contaminated sediments that represent a risk. Alternatives were identified and screened to determine whether they met the RAOs. The following alternatives were evaluated in the FFS.

Alternatives Developed for the Site

Alternatives were identified and screened to determine whether they could meet the RAOs. The following alternatives were evaluated in the 2020 FFS:

Alternative 1: No Action – The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at Title 40 Code of Federal Regulations (CFR) provides that a No Action Alternative should be considered at every site. The No Action Alternative should reflect the site conditions described in the baseline risk assessment and remedial investigation (RI). The No Action Alternative included within this FFS does not include any treatment or engineering controls, institutional controls (ICs), or monitoring. There are no costs associated with the No Action Alternative.

Alternative 2: Enhanced Monitored Natural Recovery with Thin-Layer Amended Cover – This alternative incorporates construction of a 0.30-meter (1.0-foot) thick thin-layer amended sand cover over sediments with COC concentrations exceeding the preliminary cleanup levels (CULs; i.e., areas of the Site with exceedances of the Midpoint Sediment Quality Target [SQT] for dioxins), hereafter referred to as the remedial area, an area of approximately 17 acres in size. An amendment material such as activated carbon would be incorporated into the sand cover to facilitate sequestration of sediment contaminants. The objective of constructing an amended thin-layer cover over contaminated sediments would be to (1) reduce bioavailability of Site COCs in sediments and sediment pore water to aquatic organisms (primarily through contaminant sequestration) and thereby limit transfer of chemical contaminants to higher trophic organisms, and (2) provide some immediate isolation of contaminated sediments to aquatic life. Long-term mixing of cover materials into underlying in situ sediments from bioturbation processes could be anticipated and would result in delivery of amendment materials to deeper sediment depths.

Monitoring of chemical concentrations in sediment and cap material, sediment toxicity, and bioaccumulation of COCs in aquatic life would be conducted following the construction phase until sufficient contaminant sequestration, degradation, transformation, or other natural recovery processes reduce risks to acceptable levels. Institutional controls would be implemented to ensure that remedy integrity is maintained. The approximate present value cost associated with Alternative 2 is $8,219,000.

Alternative 3: Potential Bioactive Zone Cap – This alternative incorporates construction of a 0.5- to 1.2-meter-thick sand cap over the same 17-acre remedial footprint as Alternative 2. The constructed cap thickness would be equal in thickness to the Potentially Bioactive Zone, which is determined by the varying habitat areas at the Site and, therefore, provide contaminant isolation from aquatic plant and animal life. Construction of a cap will also mitigate exposure to human receptors, although human health criteria are not being used as cleanup criteria at this time. Armoring consisting of gravel and/or cobble would be placed over the sand cap in areas that could experience scouring during abnormally high flow events, such as the inlets immediately adjacent to the river's main channel. A monitoring period and implementation of ICs would be conducted following the construction phase as detailed for Alternative 2. Monitoring and enforcement of ICs would continue indefinitely until RAOs are achieved for the Site, but a period of 30 years was used for incorporation into each alternative's cost analysis. The approximate present value cost associated with Alternative 3 is $8,508,000.

Alternative 4: Sediment Dredging and Excavation – This alternative incorporates the removal of all sediments contained within the same 17-acre remedial footprint as Alternatives 2 and 3. Sediment removal would be conducted to a target depth ranging from 0.65 meter (2.1 feet) and 0.80 meter (2.6 feet) below the sediment surface. These target sediment removal depths include a Site-wide over dredge/excavation of 0.15 meter (0.5 feet) to increase the efficiency of sediment removal and limit the occurrence of dredge residuals. The total volume of sediment assumed for removal, including over dredge, is approximately 70,000 cubic yards. Some dredge residuals should be anticipated and would be addressed by constructing a 0.15-meter thick sand cover over the entire remedial footprint. In addition to addressing dredge residuals, the constructed sand cover would provide the additional benefit of providing clean substrate for benthic organisms, particularly if bedrock is encountered within the dredge areas.

The shallow eastern "arm" of the Site located outside the primary river channel would be contained within a cofferdam and dewatered so that excavation of contaminated sediments could be conducted "in the dry." All other areas of the Site located outside the cofferdam, which comprise approximately 4 of the 17-acre remedial footprint, would be dredged "in the wet." Monitoring and implementation of ICs was not incorporated into this alternative. The approximate present value cost associated with Alternative 4 is $10,101,000.

Alternative 5: Enhanced Monitored Natural Recovery with Broadcast Amendment – This enhanced monitored natural recovery (MNR) with broadcast amendment alternative would consist of applying a thin 0.01-meter layer of amendment material directly on top of the sediment surface in areas with sediment concentrations of COCs exceeding the preliminary CULs (i.e., areas of the Site with exceedances of the Midpoint SQT for dioxins), hereafter referred to as remedial areas. Amendment material would be mixed into the sediments over time through bioturbation. The chosen amendment would reduce exposure of aquatic life to COCs through sequestration the bioavailable fraction of sediment contaminants. Monitoring of sediment chemical concentrations, sediment toxicity, and bioaccumulation of COCs in aquatic life would be conducted until sufficient contaminant sequestration, degradation, transformation, or other natural recovery processes reduce risks to acceptable levels. A monitoring period and implementation of ICs would be conducted following the construction phase as detailed for Alternative 5. Monitoring and enforcement of ICs would continue indefinitely until RAOs are achieved for the Site, but a period of 30 years was used for incorporation into each alternative's cost analysis. The approximate present value cost associated with Alternative 5 is $3,355,000.

The FFS included a comparative analysis to identify and compare advantages and disadvantages of each of the alternatives. This evaluation was done using the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) remedy selection criteria in general accordance with United States Environmental Protection Agency (EPA) guidelines for feasibility studies (EPA, 1990) which divides criteria into three groups.

1. **Threshold Criteria**, which relate to federal statutory requirements that each alternative must satisfy in order to be eligible for selection and including:
    - Overall protection of human health and the environment in both short and long term
    - Compliance with applicable or relevant and appropriate requirements (ARARs) under federal, state, or local environmental laws and regulations
2. **Primary Balancing Criteria**, which are the technical criteria upon which the detailed analysis is based on, including:
    - Long-term effectiveness and permanence
    - Reduction of toxicity, mobility, or volume through treatment

- Short-term effectiveness
- Implementability
- Costs

3. **Modifying Criteria based on state agency and community acceptance.**

Threshold Criteria

Overall Protection of Ecological Receptors

Only those alternatives that would meet the threshold criteria of providing overall protection of ecological receptors were carried forward with the comparative analysis. Alternative 1 would not meet the threshold criteria but was carried forward as it is required for analysis under the NCP. Alternatives 2, 3, 4, and 5 would adequately protect ecological receptors from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the Site; however, contaminated sediment would remain in place under Alternatives 2, 3, and 5 requiring monitoring to ensure long-term effectiveness. Alternative 4 would provide the highest level of protection, since contaminated sediments would be removed from the aquatic environment.

Compliance with Applicable or Relevant and Appropriate Requirements

Only alternatives that meet threshold criteria were carried forward, as stated previously. Alternative 1 does not meet the threshold criteria but was carried forward as it is required for analysis under the NCP. Alternatives 2, 3, 4, and 5 comply with the ARARs.

Balancing Criteria

Long-Term Effectiveness and Permanence

Alternative 1 is not effective in the long term or permanent. Bench scale testing indicates Alternatives 2 and 5 will likely be effective in the long term if amendment materials mix into underlying sediments and sequester sediment contaminants throughout the entire PBAZ, and if clean sediments are deposited at the Site over time and thus isolate sediment contaminants. Sediment erosion and deposition data are limited for the Site and uncertainty of the long-term permanence of Alternatives 2 and 5 is relatively high. Unknowns in the hydrodynamic model, such as the erosion of contaminated sediments, as well as the effects of periodic flooding, may also reduce the long-term effectiveness and permanence of Alternative 2 and 5. Further, Alternative 5 does not include armoring, which makes the amendment material more susceptible to erosion during high-flow events. Alternative 3 would be effective in the long-term but would require long-term O&M and ICs to ensure long-term effectiveness as contaminated sediments would remain in place. Therefore, Alternative 3 is not as permanent as Alternative 4. Alternative 4 would provide the highest degree of long-term effectiveness and permanence as all contaminated sediments would be removed, even though contaminants would not be permanently destroyed in the landfill.

In summary, Alternative 4 would provide a high achievement of this criterion by removing all of the contaminated sediment in the aquatic environment above the SQTs. Alternatives 2 and 5 would provide a moderate to high achievement of this criterion, since amendment materials would eventually mix into the sediment column and sequester contaminants within the most biologically active sediment zone; however, deeper contamination within the PBAZ may remain in place. Additionally, it is unknown if clean sediments would be deposited over the remedial footprint in the future. Alternative 3 would provide a moderate to high achievement of this criterion as it would isolate sediment contaminants and provide a full thickness PBAZ, yet would require long-term O&M and ICs

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 1, 3, and 4 would not provide a reduction in the toxicity, mobility, or volume through treatment. Although Alternative 3 does not incorporate treatment, the mobility of sediment contaminants would be reduced through capping, and concentrations of COCs in capped sediments would be reduced over time through natural processes. Alternative 4 also does not include treatment but would remove all contaminated sediment from the aquatic environment and place it in a maintained landfill, and thus would provide a reduction in toxicity, mobility, and volume of contaminants at the Site. Alternatives 2 and 5 would reduce the toxicity, mobility, or volume of sediment contaminants through treatment/sequestration of sediment contaminants in contact with amendment materials (i.e., near the sediment surface) rendering them unavailable to biota; however, it is unlikely that bioturbation processes would mix amendment materials to the maximum depth of contamination and, therefore, some contamination would remain in place indefinitely. In Alternative 2, amendment materials mixed into the sand cover would also reduce contaminant mobility into the water column by providing a sorptive barrier between contaminated sediments and the water column.

In summary, Alternatives 2 and 5 would provide a moderate to high achievement of this criterion by reducing the toxicity and mobility of sediment contaminants through treatment via amendment materials mixed into cover material and eventually mixed into the sediment column through bioturbation processes. Alternatives 3 and 4 would provide a low achievement as toxicity and mobility of sediment contaminants would be reduced at the Site, but not through treatment. Alternative 1 would provide no achievement of this criterion as sediment contaminants would remain in place and no remedial actions would be taken.

Short-Term Effectiveness

There are no short-term risks associated with Alternative 1 as no actions would be implemented at the Site. Alternatives 2, 3, 4, and 5 would have short-term risks associated with remedy implementation, and in general the potential short-term risks increase as the complexity of each alternative increases. Alternative 4 would require dredging/excavation of sediments that would result in removal of a portion of, or the entirety of, the PBAZ and temporary destruction of plant and animal habitat over the entire remedial footprint. Additionally, dry excavation of sediments would require dewatering of the area within the cofferdam and would result in disruption or death of fish, benthic, and other aquatic life. Dredging/excavation of sediments would remove contamination from beneath the water column and would require multiple transfers of contaminated sediments (and dredge contact water) by Site workers until eventual landfill disposal, thus creating additional opportunities for exposure to Site workers. Short-term adverse effects to aquatic habitat and biota would be similar among Alternatives 2 and 3 and would include displacement of fish and smothering of benthic organisms. Alternative 5 would provide the least adverse effects of the alternative because a 0.01-meter layer of amendment material would be place over the remedial footprint rather than a thicker cover or cap as in Alternatives 2 and 3. Alternative 5 also has a significantly shorter construction duration than the other alternatives, reducing site workers' exposure to contaminants and construction safety issues. Site workers' exposure in Alternatives 2 and 3 would be substantially less as compared to Alternative 4 but risks due to heavy equipment operation would be similar among all three. The effects on aquatic habitat and biota from Alternatives 2, 3, 4, and 5 would occur during remedy implementation and during the recovery period thereafter. Biota would be expected to be reestablished for all alternatives within several growing seasons.

In summary, Alternative 1 would provide a high achievement of the short-term effectiveness criterion as there would be no impact to surrounding community and aquatic habitat and no risk to Site workers. Alternative 5 would also provide a high achievement of this criteria due to limited impact to the benthic community and short construction duration. Alternatives 2 and 3 would have a moderate to high achievement of the short-term effectiveness criterion due to an increase in short-term adverse effects to aquatic biota during cover/cap construction; however, impacts are anticipated to be small. Alternative 4 would have a moderate achievement of the short-term effectiveness criterion due to the adverse effects to benthic organisms and Site workers through handling of contaminated sediments.

Implementability

There are no implementability concerns associated with Alternative 1 as no remedial or monitoring actions would be taken at the Site. Alternatives 2, 3, 4, and 5 are all technically feasible and implementable from an engineering perspective. Each of these alternatives relies upon highly proven technologies that have been implemented at a wide range of contaminated sediment sites. Additionally, each of these alternatives incorporates the use of widely available equipment and materials. The primary implementation concern associated with Alternatives 2, 3, 4, and 5 is the need for a staging area to be constructed adjacent to the Site to support all construction activities. This would require cooperation of landowners surrounding the Site and use of private lands for Site access and upland staging area construction.

Construction windows for alternatives may post implementability concerns. Alternative 5 and Alternative 2 has a shorter construction duration than the other alternatives, requiring only one construction season to implement and reducing timing constraints and implementability concerns. Alternatives 3 and Alternative 4 may require significantly more time to construct, likely requiring two construction seasons to implement.

Implementation of Alternative 4 is more complex than Alternatives 2, 3, and 5 as it involves installation of a watertight cofferdam, dewatering and treatment of water inside the cofferdam, and additional material handling operations related to sediment removal. Installation of a cofferdam and subsequent dewatering assumes that groundwater infiltration can be controlled during sediment removal activities and that the sediment surface will be firm enough to support crane mat roadways and/or equipment. The additional handling of contaminated sediments associated with Alternative 4 would also require the construction of a lined sediment stabilization pad in which to stage dredged materials prior to lead-out and transportation to a landfill.

In summary, Alternative 1 has no actions to be implemented and thus provides a high achievement of the implementability criterion. Alternatives 2, 3, and 5 are the next easiest to implement since they do not incorporate dredging and provide a moderate to high achievement of this criterion. Alternative 4 provides a moderate achievement of the implementability criterion due to increased complexities related to construction activities and the uncertainty regarding removal of sediments in the dry.

Cost

Cost estimates were developed for each alternative. The cost estimates included: capital costs, including both direct and indirect costs; annual O&M costs; and net present value of capital and O&M costs.

In summary, Alternative 1 provides the most cost-effective option as no remedial or monitoring activities would take place, followed by Alternative 5 because it requires the least amount of time and materials of any active remedy. Alternative 2 is the next most cost-effective because it includes the construction of a cover thicker than Alternative 5 that includes both amendment material and sand. Alternative 3 is the next most cost effective as additional time and materials are required to place the thicker cap, but no expensive amendment material or sediment removal would be conducted. Alternative 4 is the least cost effective as it includes sediment removal and construction of a thin-layer cover following sediment removal. Sediment removal necessitates additional material handling, stabilization, transportation, and disposal costs.

Modifying Criteria

On July 30, 2020 a MPCA press release announced the clean-up options for the Scanlon Reservoir in the St. Louis River Estuary. The public was given thirty days to comment on the plan. No comments were received. MPCA has been in regular coordination with Minnesota Power to ensure that the proposed remedial action is consistent with the current and planned future power generation at the site. MPCA has also provided an opportunity for area resource managers to comment on the proposed remedial action, and have modified to proposed remediation based on their feedback.

Green Sustainable Remediation Criteria

Greenhouse Gas Emissions

Alternative 1 would have no GHG emissions. Alternatives 2, 3, 4, and 5 would result in GHG emissions from the mobilization, operation, and demobilization of all fuel-powered construction equipment required for cover/cap construction and sediment removal. Alternative 4 would also produce emissions during transport of sediments by truck to the disposal facility. Reduction of emissions can be accomplished by using equipment that is compliant with the latest USEPA non-road engine standards and retrofitting older equipment with appropriate filters.

Toxic Chemical Usage and Disposal

There are no known toxic chemicals associated with these alternatives.

Energy Consumption

Alternative 1 would consume no additional energy. Alternatives 2, 3, 4, and 5 would result in the consumption of fossil fuels for the mobilization, operation, and demobilization of all diesel-powered construction equipment associated with the removal, hauling, and disposal of contaminated sediments and the installation of cover/cap materials. The amount of cover/cap material placed for Alternative 5 is considerably less than Alternatives 2 and 3, and therefore, Alternative 5 requires less energy to implement. Alternative 4 would require the greatest amount of energy to implement as it involves sediment removal and cover construction.

Use of Alternative Fuels

Alternative 1 would not require the use of alternative fuels. Biodiesel blended fuels (B10 or B20) could be used as a supplemental fuel source for all diesel-powered construction equipment associated with Alternatives 2, 3, 4, and 5.

Water Consumption

Alternatives 1, 2, 3, and 5 would not require the consumption of water. A minimal quantity of water would be required to decontaminate personnel and equipment during sediment dredging activities associated with Alternative 4.

Waste Generation

Alternatives 1, 2, 3, and 5 would not generate waste. Alternative 4 would generate waste that includes the dredged/excavated contaminated sediments, contaminated dewatering pad materials, and any non-recyclable water treatment media that would be removed from the Site and disposed of.

Comparative Analysis Summary

The comparative analysis of alternatives identified Alternatives 2 and 5 as outscoring Alternatives 1, 3, and 4 in addressing contamination at the Reservoir. Alternative 1 does not achieve overall protection of ecological receptors, does not achieve ARARs, is not effective in the long-term, does not reduce toxicity, mobility, or volume of contamination, and is not effective in the short term; however, this alternative is implementable and cost effective. Alternatives 2, 3, 4, and 5 are all protective of ecological receptors and achieve ARARs. Alternative 4 is the most effective in the long-term and is the most permanent, while Alternatives 2 and 5 are the only alternatives that reduces the toxicity, mobility, or volume of contamination through treatment. Alternative 5 results in the least short-term effects resulting from remedy implementation and is also less expensive to implement than Alternative 2, 3, and 4. Excluding Alternative 1, Alternative 5 is the least expensive to implement, followed by Alternative 2, Alternative 3, and Alternative 4. Based on the comparative analysis, Alternatives 2 and 5 scored the highest.

The modifying criteria, state/support agency acceptance, and community acceptance were assessed formally after the public comment period. Stakeholder and community input provided valuable insight as for MPCA in the selection of a preferred alternative. The MPCA released the findings of the FFS and invited resource managers, the public and local units of government prior to the public comment period.

Based on the information provided in the FFS report and on input provided by adjacent property owners, comments from the public meeting and other stakeholders, the MPCA staff has selected a COMBINED REMEDIAL Alternative using Alternatives **2 and 5: Enhanced Monitored Natural Recovery with Thin-Layer Amended Cover and Broadcast Amendment** as the preferred option. Some of the primary reasons for selecting the combined Alternative 2 and 5 as the preferred option are summarized below.

- Combined Alternatives 2 and 5 is protective of human health and the environment.
- Combined Alternatives 2 and 5 are cost effective and are the only alternatives that reduces the toxicity, mobility, or volume of contamination through treatment.
- Primary stakeholders, including adjacent property owners, support Combined Alternatives 2 and 5, which will not adversely affect the current or planned future uses of the Reservoir.

DETAILED DESCRIPTION OF SELECTED COMBINED REMEDIAL ALTERNATIVES 2 and 5: Enhanced Monitored Natural Recovery with Thin-Layer Amended Cover and Broadcast Amendment

This combined remedy incorporates construction of a 4–6 inch thick thin-layer activated carbon amended sand cover over sediments with COC concentrations exceeding the preliminary cleanup levels (CULs; i.e., areas of the reservoir with exceedances of the Midpoint Sediment Quality Target [SQT] for dioxins) that are in deeper areas of the remedial footprint not delineated as wetlands. In shallower water areas that have been delineated as wetlands and exceed the CULs, a broadcast pelletized activated carbon amendment will be placed. These areas comprise the “remedial footprint” and total approximately 14 acres in size. Areas were selected to comprise the remedial footprint where sediments are known to have COCs exceeding the CULs, or where net deposition was suspected based on bathymetry, aerial imagery, and sediment stability analysis and thus assumed to contain historically deposited contamination. Further Site characterization will be completed during the design phase to better delineate concentrations of COCs at the Site and finalize the remedial footprint.

The objective of placing carbon amendments in a thin-layer cover and in a broadcast pelletized form over contaminated sediments is to: 1) reduce bioavailability of Site COCs in sediments and sediment pore water to aquatic organisms and thereby limit transfer of chemical contaminants to higher trophic organisms; and 2) provide some immediate isolation of contaminated sediments to aquatic life. It is anticipated that cover material and associated amendments would be mixed into the underlying sediments over time through natural bioturbation processes caused by burrowing organisms, larger animal life, and rooting plants. Natural mixing of amendments into in situ contaminated sediments will increase the rate of contaminant sequestration and, therefore, more rapidly decrease availability of contaminants to aquatic life.

Contaminated sediments will remain in place, although sequestered, as part of this alternative; therefore, ICs would be implemented and Long Term Monitoring will commence following construction of the remedy.

Long-Term Monitoring
The LTM plan will be developed in the Remedial Design phase of the project and commence after remedy implementation.

Institutional controls
ICs will be necessary to ensure contaminated sediments will remain in-place and the remedy remains protective of human health and the environment. The IC plan will be developed in the remedial design phase of the project and implemented following remedy construction.

Cost

The costs associated with each alternative are presented as Class 4 (+50/-30) estimates and are appropriate for remedial design alternative evaluations only. The estimated total present value cost for the combined Alternative 2 & 5, is $6,000,000.

PUBLIC COMMENTS AND RESPONSES

On July 30, 2020 a MPCA press release announced the clean-up options for the Scanlon reservoir site in the St. Louis River Estuary. The public was given thirty days to comment on the plan. No comments were received.

MPCA site decision

The selected response actions are consistent with the Minnesota Environmental Response and Liability Act, Minn. Stat. §§ 115B.01 to .18, and are not inconsistent with the Federal Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9601 et. seq. and the National Contingency Plan, 40 C.F.R Part 300. I have determined the selected response actions are protective of public health, welfare, and the environment.

Signature: Kathy Sather Date (mm/dd/yyyy): 11/24/2020

(This document has been electronically signed.)

Kathy Sather
Division Director
Remediation Division