United States
Environmental Protection
Agency

EPA/600/R-21/130
April 2021
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Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Duluth, Minnesota

Office of Research and Development
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Notice

The Kingsbury Bay-Grassy Point Habitat Restoration Health Impact Assessment (HIA) was led by U.S. Environmental Protection Agency (EPA) staff and contractors. EPA's Sustainable and Healthy Communities (SHC) research program and existing contracts within its Office of Research and Development (ORD) partially funded and provided personnel for the research described here. Members of state and local government; non-government organizations; and community residents also provided input for this report. The contents of this report are solely the responsibility of the authors and do not necessarily represent the views or policies of EPA. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by EPA. The report was subjected to the Agency's review and external peer-review processes and approved for publication as an EPA document.

Suggested Citation:

EPA. 2021. Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment. EPA/600/R-21/130. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

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Note: *The HIA Project Team recognizes that this HIA Report is an extensive document due to the level of detail provided. Therefore, a summary of the full HIA Report and a fact sheet on the findings of the HIA have also been produced and can be used to more easily advocate for health and raise awareness within the community. These documents, along with the HIA Report, can be found on EPA's HIA Case Studies web page:* (https://www.epa.gov/healthresearch/epa-health-impact-assessment-case-studies).

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Acknowledgements

The authors would like to thank the HIA Research Team, Advisory Committee, community members, other stakeholders, and Lawrence Burkhard for their contributions to this HIA and the peer reviewers, Timothy Ehlinger and Kristin Raab, for their thoughtful reviews.

Executive Summary

Background

This report documents the process and findings of a health impact assessment (HIA) performed on a Great Lakes Area of Concern (AOC) habitat restoration project being implemented by the Minnesota Department of Natural Resources (MNDNR) at two sites in the St. Louis River AOC – Kingsbury Bay and Grassy Point (i.e., the Kingsbury Bay-Grassy Point Habitat Restoration Project). The HIA examined the potential public health implications of the restoration project (i.e., potential impacts to physical, mental, and social well-being), including the MNDNR restoration work itself, and how people will access and utilize the project sites following restoration. The HIA was conducted to provide evidence-based recommendations to MNDNR and the City of Duluth, MN, who is responsible for any post-restoration park improvement work at these sites. The purpose of the recommendations was to address any disproportionate health impacts (i.e., unequal sharing of health burdens and benefits), mitigate potential adverse health impacts, and bolster potential health benefits of the habitat restoration and park improvement projects. The HIA recommendations are not regulatory in nature; they are offered as suggestions for improving the impact of the habitat restoration and park improvement projects on health and well-being. Adoption of the recommendations is at the discretion of the decision makers (MNDNR and the City of Duluth), as they must balance health considerations with the other technical, social, political, and economic considerations related to the projects.

This habitat restoration work was proposed by MNDNR at the Kingsbury Bay and Grassy Point sites along the St. Louis River in Duluth, Minnesota. The St. Louis River drains 3,634 square miles of Minnesota and Wisconsin and enters the southwest corner of Lake Superior between Duluth, Minnesota and Superior, Wisconsin. Kingsbury Bay and Grassy Point are two of fifteen aquatic habitat restoration sites in the St. Louis River AOC, one of the 27 remaining U.S. Great Lakes AOCs named in the Great Lakes Water Quality Agreement—a commitment between the U.S. and Canada to restore and protect the waters of the Great Lakes. The St. Louis River was named an AOC because of historical industrial and municipal wastewater discharges, contamination of river sediments, disposal of legacy debris, and habitat losses that impair the beneficial uses of the St. Louis River ecosystem.

Based on sediment testing, fish tissue analysis, macroinvertebrate sampling, and other studies at Kingsbury Bay and Grassy Point, remediation of the sites was generally not necessary; however, it was determined that restoration actions at these sites should consider the presence of contaminants. MNDNR is responsible for designing and implementing the restoration of approximately 240 total acres of aquatic habitat at the Kingsbury Bay and Grassy Point sites, funded through a Natural Resources Damage Assessment (NRDA) settlement and other funding sources. In Kingsbury Bay, the project will restore the wetland complex at the mouth of Kingsbury Creek by dredging up to 170,000 cubic-yards of sediment, including a delta containing invasive narrow-leaf cattails. The project will create open water habitat, improve the diversity of aquatic vegetation, and provide ecosystem benefits including recreational and human-powered boating and angling. At Grassy Point, legacy wood waste from two turn-of-the-century sawmills impairs the habitat. Habitat restoration will create a shallow sheltered bay,

upland island to shelter the bay, and improve the Keene Creek channel. Sediment dredged from Kingsbury Bay will be beneficially reused at the Grassy Point site. Ecosystem benefits that will result from the restoration at Grassy Point include improved boating, hiking, angling, birding, and scenic views.

In addition to the MNDNR habitat restoration work, the City of Duluth has been implementing an extensive effort to enhance recreational amenities along the St. Louis River, including at Kingsbury Bay. Kingsbury Bay is downstream from the Lake Superior Zoo, one of the City of Duluth's targets for renewal as part of the St. Louis Corridor Initiative. Kingsbury Bay is public land that connects three important public facilities – the Lake Superior Zoo, Indian Point Campground, and the Western Waterfront Trail (now known as Waabizheshikana or "The Marten Trail"). Nearby Grassy Point is a natural area with amenities to support outdoor recreation at the northern end of an extended Western Waterfront Trail and the only public river access in the Irving Neighborhood of Duluth. The City of Duluth will be enhancing public access to these sites through the development of enhanced recreational amenities and park improvements following completion of the habitat restoration, including the potential addition of a swimming beach at Kingsbury Bay.

Why was an HIA performed?

The U.S. Environmental Protection Agency (EPA) has identified HIA as a decision-support tool that can provide science-based resources and information for community-driven initiatives and promote sustainable and healthy communities. Several proposed St. Louis River AOC sediment remediation and habitat restoration projects were evaluated as potential HIA projects by EPA, and it was determined that the proposed habitat restoration project at Kingsbury Bay and Grassy Point and the subsequent park improvement projects at each site could benefit from an HIA. It was determined that the HIA would add value to the decision-making process, was timely, and achievable. Importantly, the HIA would facilitate the consideration of public health and well-being in the design of the project. The Kingsbury Bay-Grassy Point Habitat Restoration Project was timely because the project was funded and moving into the design phase, so input on the proposed path forward was well-timed. Furthermore, the Kingsbury Bay-Grassy Point Project was near the Irving and Fairmount neighborhoods, which were undergoing a revitalization planning process by the City of Duluth. The hope was that these two processes would inform and complement each other through intentional inclusion of City representatives and stakeholders, and that the HIA would provide information to the decision-makers, stakeholders, and the public about the potential beneficial and adverse impacts to health that may result from the Kingsbury Bay-Grassy Point Project.

Based on this information, EPA agreed to lead an HIA to evaluate this habitat restoration project from a health-focused perspective. As an EPA-led HIA Case Study, the HIA was conducted from a neutral position (i.e., not advocating for or against the proposed project), with an emphasis on identifying and explaining the relationships between ecosystem services provided by the two sites and public health.

Who performed this HIA?

Staff in EPA led the HIA. They established the HIA Project Team, which consisted of EPA staff, contractors, and research fellows, along with local professional stakeholders (e.g., individuals from

academia; community organizations; local, county and state government agencies; and environmental organizations). Members of the HIA Project Team served on the HIA Leadership Team, HIA Research Team, or both. The HIA Project Team conducted the HIA with input and guidance from an HIA Advisory Committee, made up of technical experts and representatives from several stakeholder groups.

What methods were used in this HIA?

HIA is "a systematic process that uses an array of data sources and analytical methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program or project on the health of a population and the distribution of those impacts within the population. HIA provides recommendations on monitoring and managing those effects."[1] The HIA process includes six steps – S*creening, Scoping, Assessment, Recommendations, Reporting,* and *Monitoring and Evaluation*.

This HIA utilized a mixed-methods approach to inform the assessment of health impacts, including the methods listed below.

- ✓ Analysis of pre-existing and publicly-available data
- ✓ Geographic information systems (GIS) mapping and spatial analyses
- ✓ Modeling and ecosystem services mapping
- ✓ Systematic review of the literature
- ✓ Stakeholder engagement and participatory mapping exercise to gather input from community members; tribal, professional, and scientific experts; and other stakeholders
- ✓ Statistical and graphical analysis
- ✓ Measurable (quantitative) and relative (qualitative) characterization of impacts

What was the scope of this HIA?

This HIA assessed the potential health impacts of the "85%-complete" habitat restoration design and concept plans for park improvements detailed in the Draft Environmental Assessment Worksheet (EAW) developed by MNDNR[2] and subsequent revisions made to that design to address some of the preliminary results and recommendations of the draft HIA, concerns raised during the design process, and input from the Minnesota Pollution Control Agency (the permitting agency). The revised design received from MNDNR and assessed in this HIA was chosen as the preferred project alternative in January 2018 and is detailed in the Final EAW (MNDNR, 2018)[3]. At the time of the HIA, the City's

[1] National Research Council. (2011). *Improving Health in the United States: The Role of Health Impact Assessment.* Washington, D.C.: The National Academies Press.

[2] As the responsible party for the review of the project, MNDNR developed an EAW to describe the environmental effects associated with the Kingsbury Bay-Grassy Point Habitat Restoration Project.

[3] The Final EAW was issued for public comment in March 2018, following completion of the HIA analysis and communication of the HIA findings and recommendations to stakeholders and the community. MNDNR determined that an Environmental Impact Statement (EIS) was not required for the project and issued a Record of Decision (ROD) on May 30, 2018, concluding the state environmental review process for the project (https://www.dnr.state.mn.us/input/environmentalreview/kingsbury-grassy/index.html).

recreational and park improvement plans for the two sites had not yet been finalized. The HIA had an opportunity to inform that design process and communicate the desires and concerns of the community for these park sites.

Based on input from stakeholders, including community members, scientific experts, and decision-makers, the HIA Project Team identified "pathways" through which the proposed habitat restoration and park improvements could potentially impact health. Seven pathways were identified for assessment in the HIA. These pathways encompass well-established social determinants of health (i.e., conditions in the physical and social environment that shape opportunities to be healthy). In many cases, these pathways also include impacts on nature and the benefits and services nature provides, also known as ecosystem services.

- Water Habitat and Quality;
- Equipment Operation, Traffic, and Transport;
- Air Quality;
- Noise and Light Pollution;
- Crime and Personal Safety;
- Recreation, Aesthetics, and Engagement with Nature; and
- Social and Cultural.

The HIA assessed each of these pathways by addressing four questions: What are the current conditions?; How will habitat restoration and park improvements impact the current conditions?; What is the connection of the pathway to health?; and How might health be impacted by habitat restoration and park improvements?

Main Findings and Recommendations of the HIA

Kingsbury Bay and Grassy Point

The proposed project will restore approximately 240 total acres of aquatic habitat at the Kingsbury Bay and Grassy Point sites. At Kingsbury Bay, the project will restore the wetland complex at the mouth of Kingsbury Creek by dredging up to 170,000 cubic-yards of sediment, including a delta dominated by invasive narrow-leaf cattails. The project will create open water habitat and increase the diversity of native aquatic vegetation. In addition to restored habitat, the project will provide ecosystem benefits including recreational boating and fishing opportunities.

Legacy wood waste impairs the habitat at Grassy Point. The site was home to two turn-of-the-century sawmills that deposited wood waste up to 20 feet deep in the river over time. Grassy Point is an existing natural area that is located adjacent to an industrial site. Currently, amenities at Grassy Point include a parking area, a carry-in canoe landing, and a boardwalk. The boardwalk is presently in disrepair from vandalism and lack of maintenance and is not accessible to individuals with mobile disabilities. Restoration will create a shallow sheltered bay, an island to shelter the bay, and will improve the Keene Creek channel. Sediment dredged from Kingsbury Bay will be reused for island creation and habitat

restoration at Grassy Point. Ecosystem benefits that will result from the restoration at Grassy Point include improved boating, walking, shore angling, birding, and scenic views.

Potential Health Impacts of the Proposed Habitat Restoration and Park Improvements

The HIA demonstrated that the proposed habitat restoration and park improvements work at Kingsbury Bay and Grassy Point could have both positive and negative impacts on health through a number of health determinants (i.e., factors known to directly or indirectly impact human health; Figures ES-1 and ES-2).

The majority of the negative health impacts potentially associated with the projects are expected to be short-term and to primarily impact residents and recreational users in the vicinity of the project sites and along the transportation routes during the habitat restoration and park improvements construction work. Potential negative impacts to health include pollution and noise impacts related to the operation of construction equipment, increased traffic, road damage, disruptions to recreational users, damage to aquatic habitat and wildlife, and material transport impacts.

In the longer term, the potential health impacts of habitat restoration and park improvements are expected to be positive and to improve the health of residents and recreational users in the surrounding communities of Duluth, as long as the sites are maintained and upkeep performed, as needed. Potential health benefits include decreased water, sediment, and biota pollutant levels; decreased fish tissue contamination; improved aquatic habitat; increased public green space; reductions in crime, as a result of beautification and on-going maintenance of the sites; and new and improved opportunities for outdoor recreation, social interaction, and cultural and spiritual experiences.

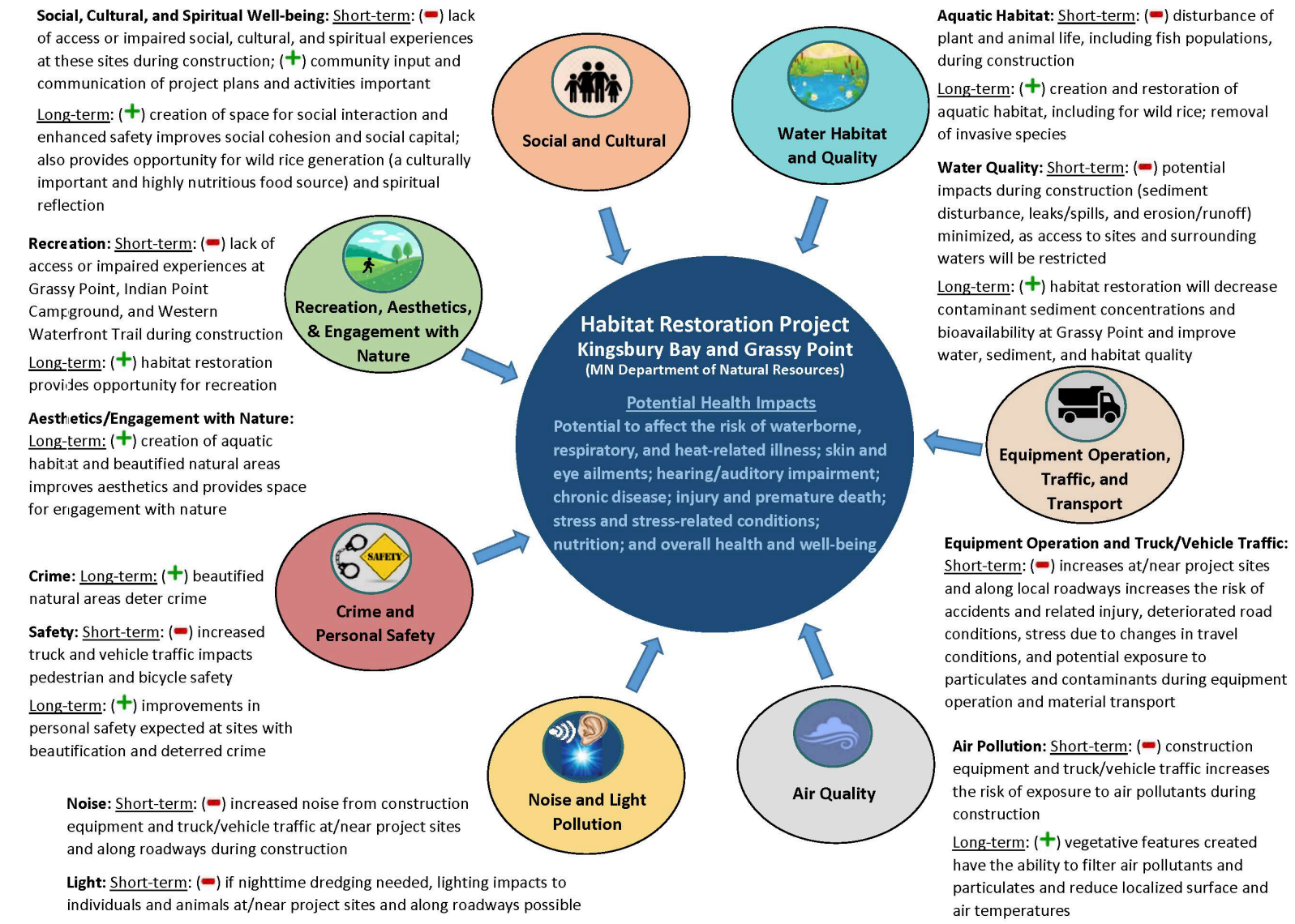

Figure ES-1. Potential impacts of the proposed habitat restoration on health and health determinants through seven pathways examined in the HIA. Negative impacts are denoted by (−); positive impacts are denoted by (+).

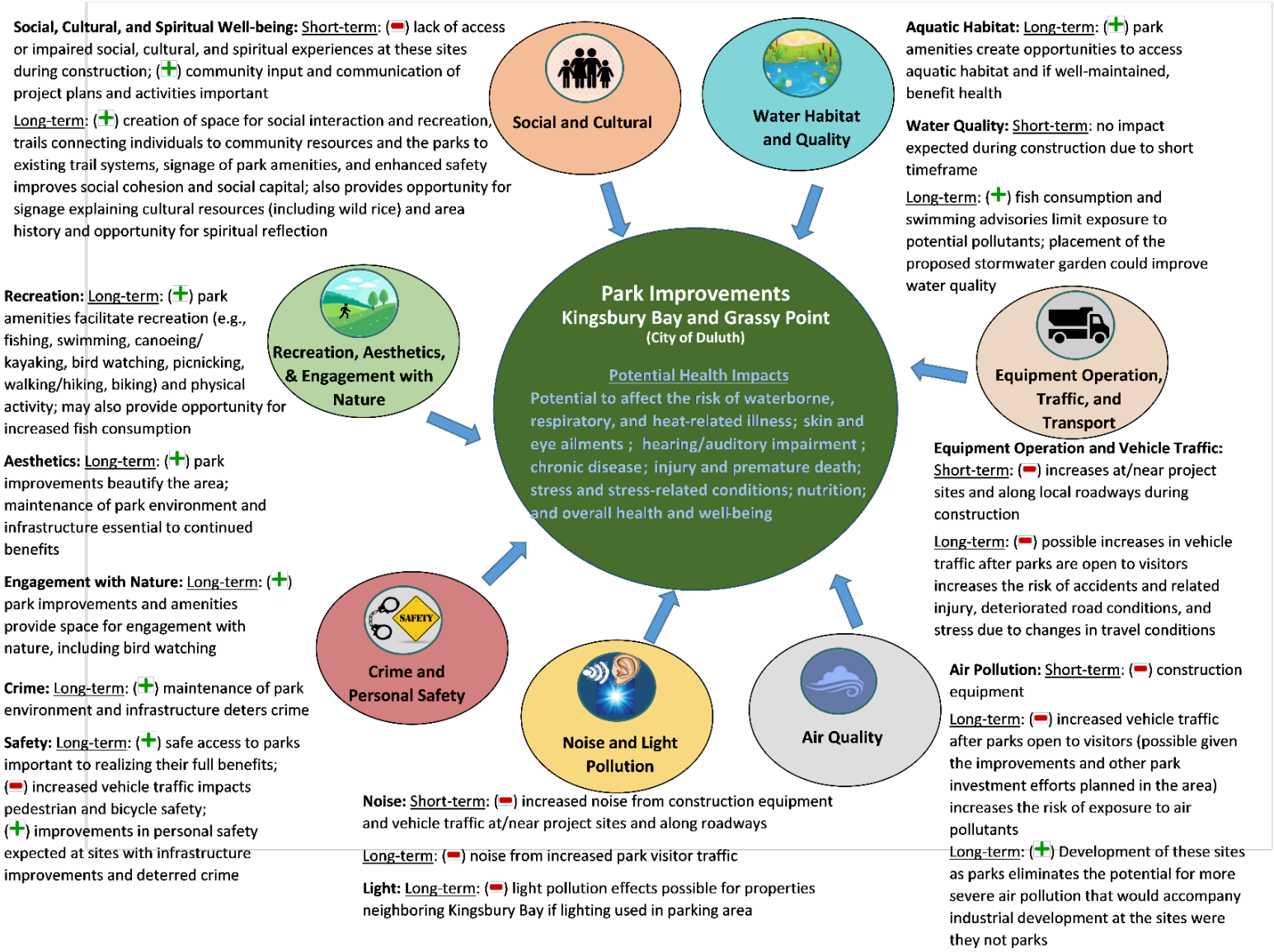

Figure ES-2. Potential impacts of the proposed park improvements on health and health determinants through seven pathways examined in the HIA. Negative impacts are denoted by (−); positive impacts are denoted by (+).

The HIA results suggest that there might be unequal sharing of the burdens and benefits of the proposed habitat restoration and park improvements within the population. Some groups of people within the community may be more sensitive to or more affected by the changes in the physical and natural environment, social environment, and economic environment as a result of the project, including:

- outdoor recreation users,
- fishermen/anglers,
- members of low-income households,
- minority and indigenous peoples,
- people that live near Kingsbury Bay and along truck transport routes,
- pedestrians and bicyclists,
- the elderly (age 65 or older) and physically disabled,
- children, and
- people with pre-existing health conditions.

Recommendations to Manage These Impacts

The HIA Project Team identified recommendations to maximize the potential positive health impacts (e.g., improved water habitat and quality; opportunities for outdoor recreation, social interaction, and cultural resources; etc.), minimize or avoid the potential negative health impacts (e.g., air pollution; noise and light pollution; impacts to residents and recreational users; etc.), and offer decision alternatives and health supportive measures. Adoption of any of these recommendations is at the discretion of the decision makers (MNDNR and the City of Duluth). Recommendations were related to:

- water, sediment, and biota management;
- aquatic and terrestrial habitat plans;
- equipment operation, traffic, and transport of materials;
- mitigation of air, noise, and light pollution;
- crime and safety;
- park access and amenities;
- cultural and social resources;
- communication and informational signage; and
- health supportive measures, such as creel surveys focused on fishing within the AOC, means for resident and stakeholder engagement and feedback throughout the process, and consideration of co-management models for the created parks.

Conclusion

The proposed habitat restoration and park improvements will have health impacts, both positive and negative. The majority of the negative health impacts potentially associated with the work are expected to be of short duration and include air quality, noise, and traffic impacts from equipment operation, traffic, and transport, as well as reduced access or impaired user experiences at the sites or nearby

recreational sites during the construction phases of the project. In the long-term, there is the potential for increased traffic as a result of this work and other park improvements in the area, which could increase exposure to traffic-related accidents and air quality impacts. However, **the habitat restoration and park improvements projects are expected to have a net positive impact on public health and community well-being overall,** through improved water quality and aquatic habitat, reductions in crime as a result of the beautification and maintenance of the created green spaces, increased opportunity for recreation and physical activity, and space for engagement with nature, social interaction, spiritual reflection, and access to cultural resources (such as wild rice)**.** Recommendations for enhancing the positive health impacts and reducing the negative health impacts of the Kingsbury Bay-Grassy Point Habitat Restoration Project are provided in this report for consideration by decision-makers.

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Acronyms/Abbreviations

Assumption

Limitation


Ecosystem Service

AADT	Annual average daily traffic
ACS	American Community Survey
ADHD	Attention deficit/hyperactivity disorder
AOC	Area of Concern
AQS	Ambient quality standard
ATSDR	Agency for Toxic Substances and Disease Registry
BSAF	Biota-sediment accumulation factor
CDC	Centers for Disease Control and Prevention
C-FERST	Community-Focused Exposure and Risk Screening Tool
CONUS	Continental United States
CPTED	Crime Prevention Through Environmental Design
CSO	Combined sewer overflow
dBA	A-weighted decibels
DWP	Duluth-Winnipeg-Pacific
EAW	Environmental Assessment Worksheet
EIS	Environmental Impact Statement
EJ	Environmental justice
EJSCREEN	Environmental Justice Screening and Mapping Tool
EPA	United States Environmental Protection Agency
ER	Emergency room
FEGS	Final ecosystem goods and services
FLV	Floating leaf vegetation
FWS	United States Fish and Wildlife Service
GIS	Geographic information systems
GLRI	Great Lakes Restoration Initiative
GLWQA	Great Lakes Water Quality Assessment
HIA	Health Impact Assessment
HiAP	Health in All Policies
IBI	Index of biological integrity
IPCC	Irving Park Community Club
LAEQ	24-hour equivalent sound levels
LOS	Level of service
MIC	Duluth-Superior Metropolitan Interstate Council
MDH	Minnesota Department of Health
MNDNR	Minnesota Department of Natural Resources
MNDOT	Minnesota Department of Transportation
MOE	Margin of error
MPCA	Minnesota Pollution Control Agency

MPN	Most probably number
MPO	Metropolitan planning organization
NAAQS	National Ambient Air Quality Standard
NAC	Noise area classification
NATA	National Scale Air Toxics Assessment
NHIS	National Health Interview Survey
NHTSA	National Highway Transportation Safety Administration
NIOSH	National Institute of Occupational Safety and Health
NO_2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NPCC	Norton Park Community Club
NRC	National Research Council
NRDA	Natural resources damage assessment
NRPA	National Parks and Recreation Association
O_3	Ozone
ORD	Office of Research and Development
OSHA	Occupational Safety and Hygiene Administration
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Polychlorinated dibenzofurans
PM	Particulate matter
REL	Reference exposure level
ROD	Record of Decision
RST	Restoration Site Team
SAV	Submerged aquatic vegetation
SHC	Sustainable and Healthy Communities
SO_2	Sulfur dioxide
SVI	Social Vulnerability Index
TEF	Toxicity equivalency factor
TMDL	Total maximum daily load
TRS	Thermal remote sensing
TSP	Total suspended particulates
UHI	Urban heat island
UMD	University of Minnesota Duluth
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
VOC	Volatile organic compounds
WDNR	Wisconsin Department of Natural Resources
WHO	World Health Organization
WWFT	Western Waterfront Trail (now known as Waabizheshikana or "The Marten Trail")

HIA Reader's Guide

This report documents the process and findings of this HIA, including potential health impacts of the proposed habitat restoration and park improvements work. The report also tries to make the relationship between ecosystem services and health more explicit by identifying discussions of ecosystem services ().

Throughout the report you will find assumptions and limitations of the HIA analysis indicated as follows:

A Assumption – indicates assumptions made in the analysis

L Limitation – indicates uncertainties, data gaps, and limits of analysis

The HIA Report is organized into the following sections:

- **Section 1: Introduction.** Provides background and an introduction to HIA in general and more specifically to this HIA conducted on a habitat restoration and park improvement project in Duluth, MN.
- **Section 2: Screening for an HIA.** Documents the habitat restoration and park improvements being considered at two sites – Kingsbury Bay and Grassy Point – and how the decision was reached to conduct this HIA.
- **Section 3: Scoping the HIA.** Explains the process that was used to identify HIA participants, engage stakeholders, determine the scope of the HIA, and develop an overall methodology for conducting the HIA.
- **Section 4: Assessment of Existing Conditions and Potential Health Impacts.** Documents the qualitative and quantitative evidence used to assess multiple pathways through which the proposed habitat restoration and park improvements could potentially impact health and discuss the findings of that assessment.
- **Section 5: Recommendations to Manage Impacts of the Decision.** Identifies evidence-based recommendations for managing the predicted health impacts of the habitat restoration and park improvements, so that potential benefits are maximized, and potential harm is avoided or minimized.
- **Section 6: Reporting.** Documents how communications and reporting of HIA findings and recommendations were accomplished.
- **Section 7: Monitoring and Evaluation.** Provides an evaluation of the HIA process, including successes, challenges, and lessons learned, and outlines actions that can be taken to determine the impact of the HIA on the decision-making process and monitor the impact of the habitat restoration and park improvements work on health.
- **Section 8: References.** Documents the evidence used in the HIA.
- **Appendices.** Contain supporting data and information.

1. Introduction

The U.S. Environmental Protection Agency (EPA) is working to test models, tools, and best practices that enable the shift from trade-off to mutual benefit so that communities can move towards more sustainable and healthy states. This is achieved by "creating and maintaining the conditions under which humans and nature can exist in productive harmony, that permit the fulfilling of social, economic, and other requirements of present and future generations" (EPA, 2016a). EPA's Sustainable and Healthy Communities (SHC) Research Program, in the Office of Research and Development (ORD), has identified health impact assessment (HIA) as one of many decision-support tools for providing science-based resources and information to decision-makers and for promoting sustainable and healthy communities.

1.1. HIA: A Tool for Sustainable and Healthy Communities

The pursuit of more sustainable communities has steered public health professionals to promote the use of comprehensive and integrated approaches to addressing public health challenges. HIA is one of the many tools used to consider health in traditionally non-health related decision-making processes. HIA is used to anticipate and manage potential impacts of proposed decisions to promote and protect the health of individuals and the community.

1.1.1 What is HIA?

The National Research Council (NRC) defines HIA as "a systematic process that uses an array of data sources and analytic methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of those effects within the population. HIA provides recommendations on monitoring and managing those effects" (National Research Council, 2011).

Stakeholder Input

Individuals or organizations who have something to gain or lose from the proposed decision should be engaged in the HIA process, such as people who:

- are affected by the prospective change,
- have an interest in the health impacts of the decision,
- have influence on the decision-making process and implementation of the decision, or
- have an economic or business interest in the outcome of the decision.

Stakeholders can include community members and residents, decision-makers, community organizations and advocacy groups, policy and subject matter experts, business and industry, academia, government representatives, and health professionals. In this HIA, stakeholder input was primarily gathered through meetings – community meetings for individual community members and residents and stakeholder meetings for persons representing an organization. Some community members attended both meetings.

HIA was developed based on the awareness that health, which is defined by the World Health Organization (WHO, 1948) as "a state of complete physical, mental, and social well-being; not merely the absence of disease and infirmity," is influenced by a spectrum of determinants (Figure 1-1). These health determinants are factors known to directly or indirectly impact an individual's health.

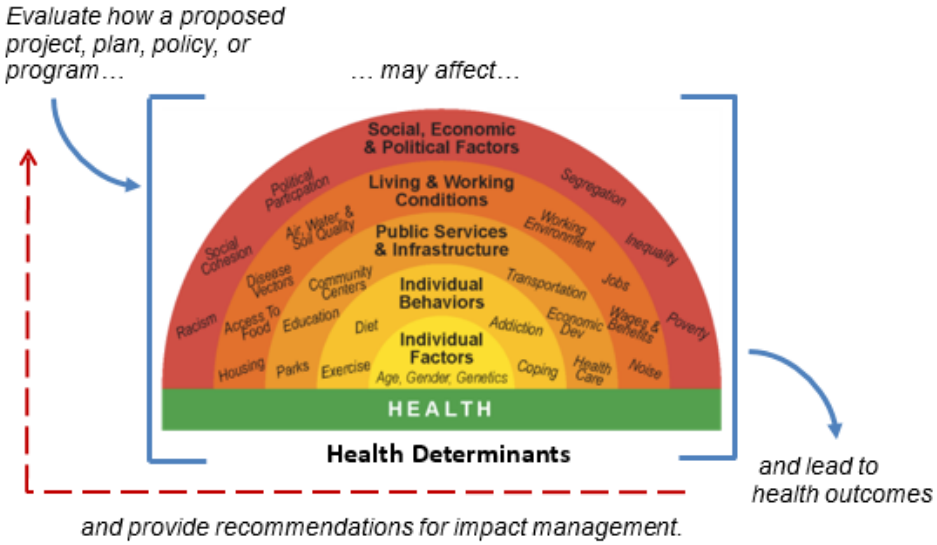

Figure 1-1. Overview of HIA and the role of health determinants in overall health.

There are six major steps in the HIA process (Table 1-1) – *Screening, Scoping, Assessment, Recommendations, Reporting, and Monitoring and Evaluation* – each of which includes several tasks (Bhatia R. , 2011; Human Impact Partners, 2011; National Research Council, 2011; Bhatia, et al., 2014; Human Impact Partners, 2014)

Table 1-1. Steps of the HIA Process

HIA Step	Description
Screening	Determines whether HIA is an appropriate approach to evaluate the pending decision and whether the HIA will provide information useful to the stakeholders and decision-makers. The proposal, any decision alternatives, and the anticipated added value of the HIA are explicitly identified.
Scoping	Establishes the purpose, goals, and team that will perform the HIA. Boundaries of the assessment are defined, including the geographic area, timeframe in which the HIA will be completed, health impacts that will be appraised, and the population and vulnerable sub-groups that will potentially be impacted by the proposal.

HIA Step	Description
Assessment	Involves a two-part process that a) describes the existing (baseline) status of health and related factors, and b) forecasts potential impacts that may result from the decision. A variety of data sources and analytical methods are used.
Recommendations	Identifies actions or strategies to manage the health impacts of the decision, if any are predicted. Recommendations are developed to enhance potential health benefits and minimize or avoid potential adverse health impacts.
Reporting	Documents the HIA activities, materials developed, and communicates the findings and recommendations of the HIA to stakeholders and the public.
Monitoring and Evaluation	Involves (or provides a plan for) follow-up activities that track how the HIA was implemented, the result of the decision, and impacts of the decision on health. Evaluations should be included that assess the HIA's impact on the decision and decision-making process (i.e., impact evaluation), whether the HIA met its intended goals/objectives and practice standards (i.e., process evaluation), and whether the decision affected public health (i.e., outcome evaluation).

These steps provide a structured, yet flexible, framework for conducting an HIA and are not necessarily performed in a linear sequence. For instance, although the decision as to which impacts will be examined in the HIA is made in the *Scoping* step, this decision may be revised as a result of evidence collected in the *Assessment* step of the process. In addition, impact and process evaluation (part of the *Monitoring and Evaluation* step) and *Reporting* can be performed throughout the process. For more information on the outputs of each HIA step and the five essential "core values" that guide the design and implementation of an HIA – comprehensive approach to health, equity, democracy, sustainable development, and ethical use of evidence – see Appendix A.

1.2. HIA in Minnesota

As of early 2020, thirty-three (33) HIAs had been completed or were in process in Minnesota, most of which focused on built environment, transportation, and planning projects (Figure 1-2). The Minnesota Department of Health promotes HIA as a tool for achieving Health in All Policies (HiAP) and provides HIA training and technical assistance. Three (3) of the 30 HIAs conducted in Minnesota through early 2017 took place in Duluth, MN – two on small area plans for Duluth neighborhoods and one on a roadway reconstruction project; this Kingsbury Bay-Grassy Point HIA was the fourth to be conducted in Duluth (https://www.health.state.mn.us/communities/environment/hia/hiainmn.html, accessed February 2020).

EPA Office of Research and Development conducted HIA Training for EPA Region 5 (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin) in November 2015 to share how HIA could be used to inform decision-making and to build capacity for conducting HIA within the Agency.

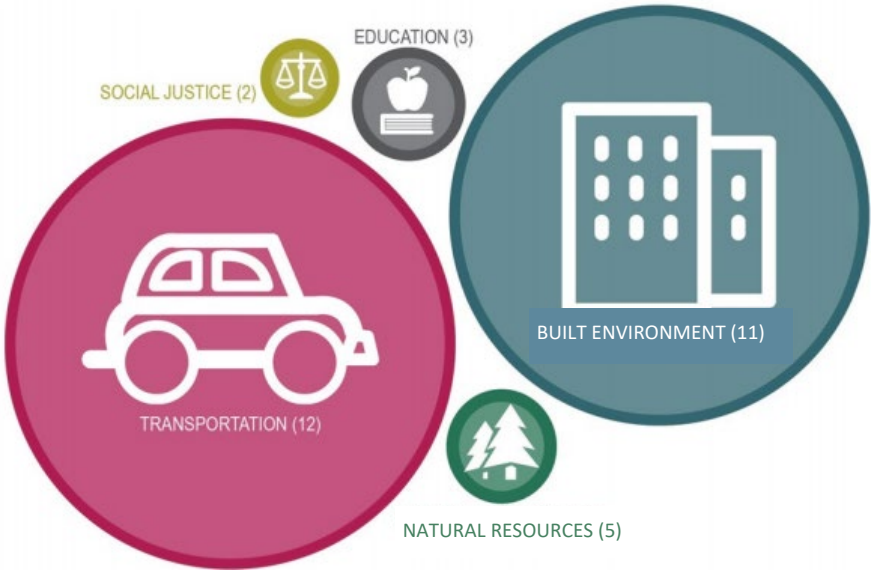

Figure 1-2. Health Impact Assessments in Minnesota by sector. Modified from (Minnesota HIA Coalition, 2016)

1.3. What is this HIA about?

This EPA-led HIA assessed a Great Lakes Area of Concern (AOC) habitat restoration project being implemented by the Minnesota Department of Natural Resources (MNDNR) at two sites in the St. Louis River AOC – Kingsbury Bay and Grassy Point. The HIA examined the potential public health implications of the restoration project, including the MNDNR restoration work itself, and how people will access and utilize the project sites following restoration. The HIA was conducted to provide voluntary, evidence-based recommendations to MNDNR and the City of Duluth, MN (who is responsible for any post-restoration park improvement work at these sites) to address any disproportionate health impacts (i.e., unequal sharing of health burdens and benefits), mitigate potential adverse health impacts, and enhance potential health benefits of the projects.

Great Lakes Areas of Concern (AOCs)

Forty-three (43) geographic areas in the Great Lakes were designated Areas of Concern in the Great Lakes Water Quality Agreement (GLWQA) because they had experienced environmental degradation "and significant impairment of beneficial uses… as a result of human activities at the local level." The GLWQA is a commitment between the U.S. and Canada, first signed in 1972 (and subsequently amended in 1983 and 1987), to restore and protect the Great Lakes, a series of interconnected freshwater lakes on the U.S.-Canada border. EPA and other federal and state agencies are working to restore the 27 remaining U.S. AOCs in the Great Lakes basin.

2. Screening for an HIA

In the first step of the HIA process, *Screening*, the proposed decision is clearly defined, including any alternative scenarios, and stakeholders consider whether an HIA is needed, feasible, and would add value to the decision-making process (National Research Council, 2011). Not all screenings result in an HIA, because an HIA is not always warranted and may not be the best approach for incorporating public health considerations into a decision. HIAs should be initiated when health is not already being considered in the decision process, the decision has the potential to significantly impact health, or when disproportionate health consequences are likely. In addition, there should be enough time for the HIA to inform the decision and stakeholder interest and capacity for conducting the HIA. The desired outputs of the HIA *Screening* step are detailed in Appendix A.

2.1 The Decision to Conduct an HIA

In EPA research planning efforts, HIA had been identified as an approach to better understand the impact of ecological improvements via ecosystem services (discussed more in Section 3.5.3) and explicitly incorporate ecosystem services and human health and well-being into the restoration projects being carried out in the Great Lakes AOCs. Individuals from EPA Office of Research and Development participated in HIA screening discussions in Duluth, MN in December 2016. Several proposed AOC sediment remediation and habitat restoration projects were evaluated as potential HIA projects, including Spirit Lake, an extensive remediation and habitat restoration project associated with a former steel plant; 40th Avenue West, inclusive of remediation in Erie Pier Ponds and a large aquatic habitat restoration project; 21st Avenue West, a complex habitat restoration site in close proximity to both transportation hubs and a wastewater treatment plant outfall; and Kingsbury Bay and Grassy Point, a habitat restoration project.

EPA *Screening* participants agreed that the proposed habitat restoration project at Kingsbury Bay and Grassy Point and the subsequent park improvement projects at each site could benefit from an HIA. It was determined that the HIA was feasible, timely, and would add value to the decision-making process. Moreover, the HIA would facilitate the consideration of health in the design of the project. The Kingsbury Bay-Grassy Point HIA was timely because funding for the project had just been approved, thus the habitat restoration could move forward. Furthermore, the Kingsbury Bay-Grassy Point Project was near the Irving and Fairmount neighborhoods, which were undergoing a revitalization planning process by the City of Duluth. The hope was that these two projects would inform each other through intentional inclusion of the City stakeholders, and the HIA would provide information to the decision-makers, stakeholders, and the public about the potential beneficial and adverse impacts to health that could result from the proposed project. EPA communicated the HIA concept to MNDNR and the City of Duluth, along with plans for coordinating the overlapping land use, city planning, and HIA activities.

Based on the results of the *Screening* exercise, EPA agreed to lead an HIA to evaluate the habitat restoration project from a health-focused perspective. As an EPA-led HIA case study, the HIA was conducted from a neutral position (i.e., not advocating for or against the proposed project), with an emphasis on identifying and explaining the relationships between ecosystem services provided by the two sites and public health. EPA's Sustainable and Healthy Communities Research Program and existing contracts within ORD provided funding and personnel for the HIA.

2.2 The Proposed Decision: Kingsbury Bay-Grassy Point Habitat Restoration

Habitat restoration work was proposed by the Minnesota Department of Natural Resources (MNDNR) at the Kingsbury Bay and Grassy Point sites along the St. Louis River in Duluth, Minnesota. This project is one of several projects that will restore lost habitat and restore beneficial uses of the Great Lakes ecosystem, contributing to the "delisting" of the St. Louis River AOC, one of the 27 remaining U.S. Great Lakes AOCs named in the Great Lakes Water Quality Agreement—a commitment between the U.S. and Canada to restore and protect the waters of the Great Lakes (Figure 2-1). The St. Louis River was named an AOC because of historical industrial and municipal wastewater discharges, contamination of river sediments, disposal of legacy debris, and habitat losses that impaired the beneficial uses of the St. Louis River ecosystem.

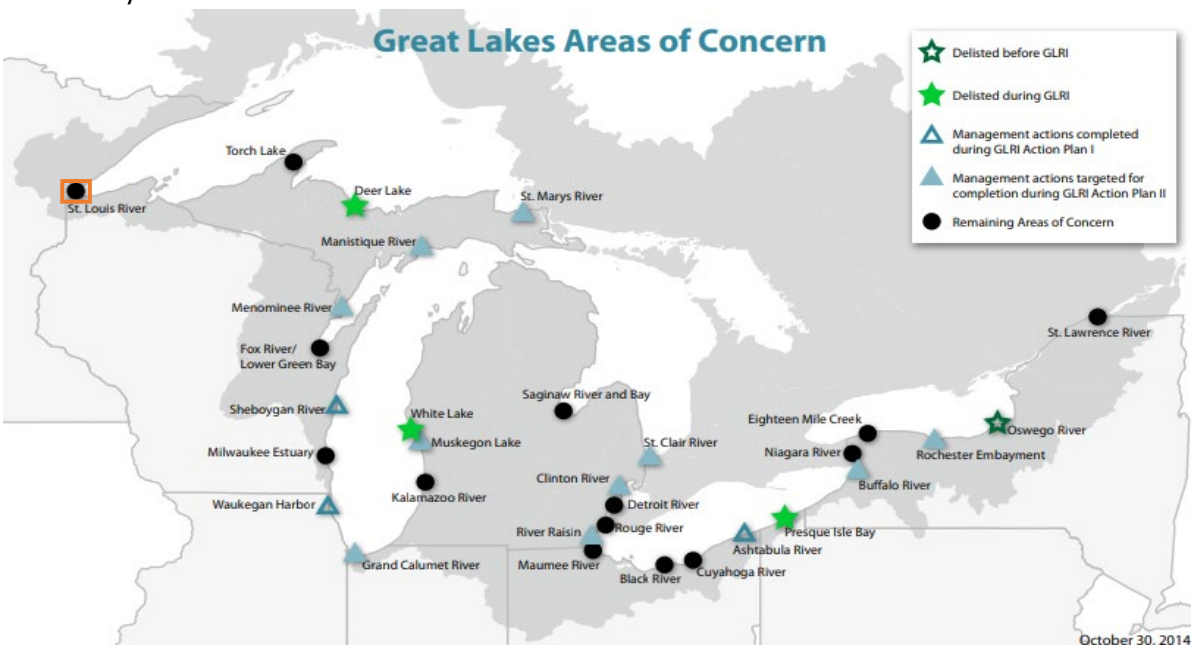

Figure 2-1. U.S. Great Lakes Areas of Concern, with St. Louis River AOC denoted by an orange square. GLRI – Great Lakes Restoration Initiative

The St. Louis River drains 3,634 square miles and enters the southwest corner of Lake Superior between Duluth, Minnesota and Superior, Wisconsin. Kingsbury Bay and Grassy Point are two of fifteen aquatic habitat restoration sites in the St. Louis Rive AOC (Figure 2-2).

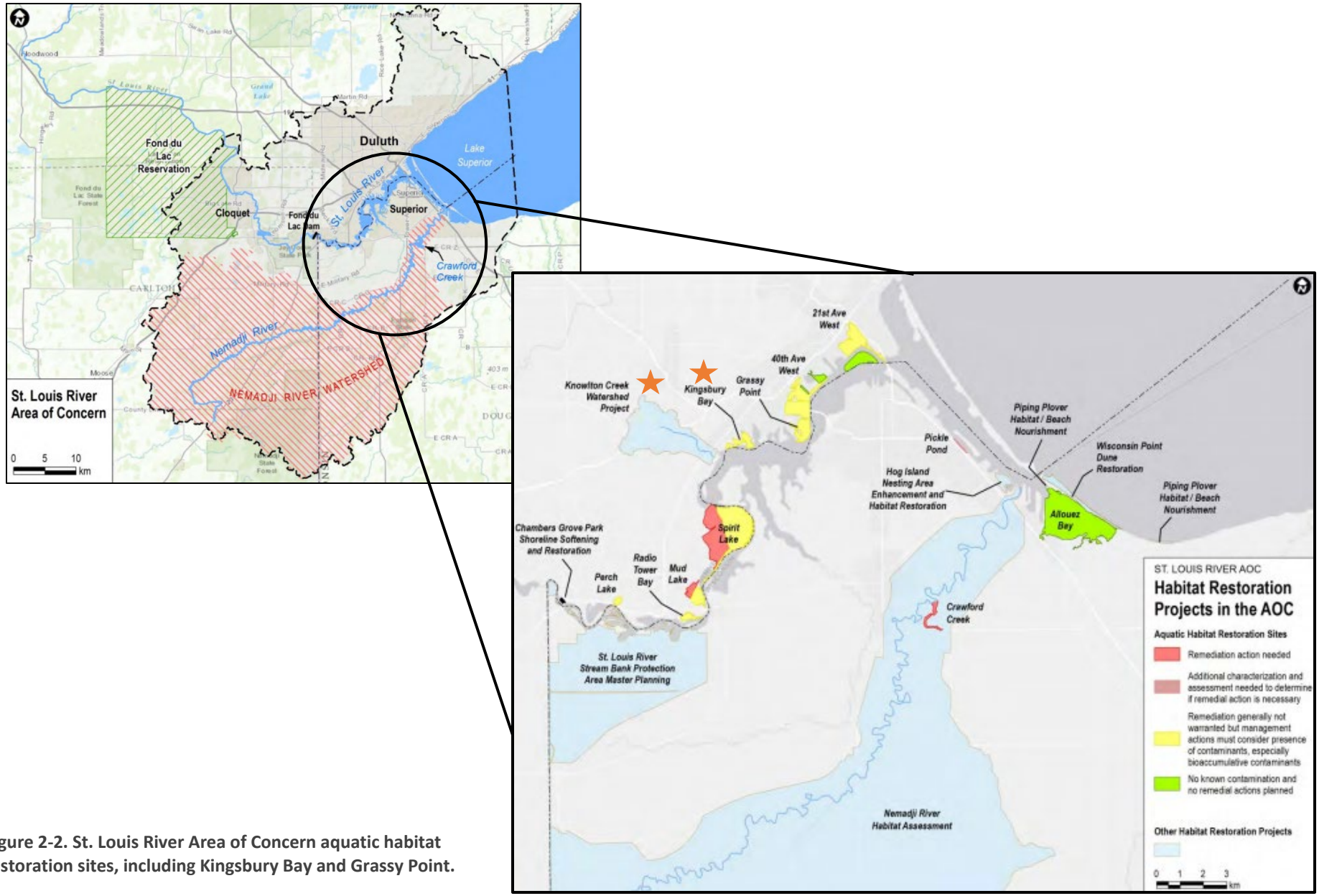

Figure 2-2. St. Louis River Area of Concern aquatic habitat restoration sites, including Kingsbury Bay and Grassy Point.

Based on sediment testing, fish tissue analysis, macroinvertebrate sampling, and other studies at Kingsbury Bay and Grassy Point, remediation of the sites was generally not necessary; however, it was determined that restoration actions at these sites should consider the presence of contaminants. MNDNR is responsible for designing and implementing the restoration of approximately 240 total acres of aquatic habitat at the Kingsbury Bay and Grassy Point sites, funded through a Natural Resources Damage Assessment (NRDA) settlement, as well as both federal and state funding sources. In Kingsbury Bay, the project will restore the wetland complex at the mouth of Kingsbury Creek by dredging up to 170,000 cubic-yards of sediment, including a delta containing invasive narrow-leaf cattails. The project will create open water habitat, improve the diversity of aquatic vegetation, and provide ecosystem benefits including recreational and human-powered boating, and angling. At Grassy Point, legacy wood waste impairs the habitat. The site was home to two former turn-of-the-century sawmills that deposited wood waste up to 20 feet deep in the river over time. The habitat restoration will create a shallow sheltered bay, upland island to shelter the bay, and improve the Keene Creek channel. Sediment dredged from Kingsbury Bay will be beneficially reused at the Grassy Point site. Ecosystem benefits that will result from the restoration at Grassy Point include improved boating, hiking, angling, birding, and scenic views.

In addition to the MNDNR habitat restoration work, the City of Duluth has been implementing an extensive effort to enhance recreational amenities along the St. Louis River, including at Kingsbury Bay. Kingsbury Bay sits at the mouth of Kingsbury Creek, downstream from the Lake Superior Zoo, one of the City of Duluth's targets for renewal as part of the St. Louis Corridor Initiative. Kingsbury Bay is public land that connects three important public facilities – the Lake Superior Zoo, Indian Point Campground, and the Western Waterfront Trail (now known as Waabizheshikana or "The Marten Trail"). Nearby Grassy Point is a natural area with amenities to support outdoor recreation at the northern end of an extended Western Waterfront Trail and the only public river access in the Irving Neighborhood of Duluth. The City of Duluth will be enhancing public access to these sites through the development of enhanced recreational amenities and park improvements following completion of the habitat restoration, including the potential addition of a swimming beach at Kingsbury Bay.

Western Waterfront Trail

Throughout this HIA, there will be mention of the Western Waterfront Trail; this was the name of the trail at the time of the HIA analysis. Since that time, the trail was renamed to Waabizheshikana (waa-bah-zhay-shay-kuh-nuh) or "The Marten Trail" in Anishinaabe, in honor of the Marten Clan that settled in this part of the St. Louis River. The Western Waterfront Trail/ Waabizheshikana is a hiking and biking trail system along the St. Louis River from Grassy Point to beyond Kingsbury Bay and provides access to the river.

At the time of the HIA, the City's recreational and park improvement plans for these two sites had not yet been finalized. The City was looking to undertake a park planning process to update the mini-master plan developed previously for Grassy Point and develop a plan for Kingsbury Bay. The HIA assessed concept plans for park improvements detailed in the Draft Environmental Assessment Worksheet (EAW) and had an opportunity to inform the park design process and communicate the desires and concerns of the community for these park sites.

3. Scoping the HIA

In the *Scoping* step, the HIA Project Team established the goals of the HIA, identified participants and defined participant roles, set a timeline for the HIA, and formulated a strategic plan for stakeholder engagement, communication, and reporting. The team specified the scope of the HIA (e.g., study area, potential health impacts of the proposed decision and pathways of impact that will be assessed in the HIA, and the populations potentially affected), and identified likely data sources and methods to be used (National Research Council, 2011). The scope of the HIA reflected the specific social, political, and policy context of the decision; the needs, interests, and questions of stakeholders and decision-makers; and the health status of the affected population. The desired outputs of the HIA *Scoping* step are detailed in Appendix A.

3.1. Goals of the HIA

The purpose of this HIA was to provide information about the potential health impacts that may result from the proposed habitat restoration project and subsequent park improvement activities from a neutral position (i.e., not advocating for or against the project), and provide recommendations aimed at optimizing health benefits and mitigating potential adverse health impacts for the community and other stakeholders in Duluth. The health effects examined and the extent to which the effects were assessed was based on stakeholder input and available resources and timing.

The following goals were established for the HIA:

- Inform the MNDNR and City of Duluth's decisions regarding the habitat restoration and subsequent park improvement projects at Kingsbury Bay and Grassy Point.
- Develop a set of evidence-based recommendations to elevate considerations of health in the decisions.
- Increase transparency, local accountability, and community empowerment through meaningful stakeholder engagement.
- Raise awareness of HIA as a decision-support tool.

In the *Monitoring and Evaluation* step (discussed in Section 7), the HIA was evaluated as to whether these goals were achieved.

3.2. HIA Kickoff Meetings with the Community and Other Stakeholders

The HIA Leadership Team (discussed in Section 3.3) distributed invitations announcing that an HIA would be conducted on the Kingsbury Bay-Grassy Point Habitat Restoration Project and inviting individuals to attend the initial HIA kick-off meetings to learn more about the HIA and share their knowledge, experiences, and input on the Kingsbury Bay and Grassy Point sites. The purpose of these kick-off

meetings was to give the public information about the proposed habitat restoration projects, information about the HIA process, and an opportunity to voice interests and concerns and contribute their knowledge to the project. In addition, the HIA Leadership Team hoped to identify individuals and groups interested in participating in the HIA. Two separate meetings were held – one for community members and a second for other stakeholders.

Figure 3-1. Participatory mapping exercise to gather community and stakeholder input.

3.2.1 HIA Community Kick-off Meeting

Invitations and Attendance

Invitations to the community kick-off meeting were distributed by email or hand delivered to faith-based organizations, schools, libraries, local businesses, community groups, and other stakeholders, and the meeting notice was posted to multiple community calendars. The community kick-off meeting was held on February 27, 2017 at City Center West, a meeting facility located adjacent to the public library and central to the neighborhoods nearest the Kingsbury Bay and Grassy Point sites. Attendees included twenty-seven (27) community members, six (6) HIA Leadership Team members, one (1) HIA Research Team member, two (2) members from the MNDNR, and one (1) graduate student from the University of Wisconsin-Milwaukee. The City of Duluth (the decision-maker for the park improvements portion of the project) did not attend the community kick-off meeting so that community members could feel comfortable to speak freely. Meeting notes from this meeting are included in Appendix B.

3.2.2 HIA Stakeholder Kick-off Meeting

Invitations and Attendance

Invitations to the stakeholder kick-off meeting were distributed by email to local non-profit organizations, community groups, indigenous tribes, businesses, and local and state government representatives. The stakeholder kick-off meeting was held the day after the community meeting (on February 28, 2017) at the EPA facility in Duluth. Attendees included twenty-two (22) stakeholders, six (6) HIA Leadership Team members, and one (1) HIA Research Team member. Both decision-makers, MNDNR and the City of Duluth, were present at the meeting. Meeting notes from this meeting are included in Appendix B.

3.3. Establishing the HIA Project Team and Advisory Committee

The HIA was conducted by the HIA Project Team, which included members of the HIA Leadership Team and HIA Research Team, with input from an HIA Advisory Committee made up of community members and other stakeholders (for descriptions of these roles, see Appendix C). Members of the HIA Project

Team and Advisory Committee consented to the HIA Rules of Engagement Agreement (Appendix C) in order to participate in the HIA.

3.3.1 HIA Project Team

The HIA Project Team included EPA staff, contractors, research fellows, and local professional stakeholders that served either on the HIA Leadership Team, the HIA Research Team, or both; see the HIA Participants section at beginning of the report for a list of HIA Project Team members. The HIA Leadership Team was established in January 2017 and by May 2017, they had identified a group of individuals to participate in the HIA as members of the HIA Research Team. Research Team members had professional or academic expertise related to (but not limited to) the St. Louis River Watershed, HIA, environmental sciences, social sciences, ecosystem services, public health, and environmental justice (EJ); or had professional or academic expertise in research practices, performing literature reviews, conducting geographic information systems (GIS) analysis, and designing studies. An HIA Research Team Kick-off Meeting was held May 11, 2017 to convene the HIA Research Team, provide an overview of HIA and the HIA process; provide background on the Kingsbury Bay-Grassy Point habitat restoration and associated park improvement activities; and detail the HIA next steps. Immediate tasks to be completed by the HIA Research Team, in cooperation with the HIA Leadership Team, included development of the pathways through which the project could impact health, assignment of pathways to HIA Research Team members, and development of a plan for carrying out the *Assessment* step of the HIA (documented in Section 3.5).

3.3.2 HIA Advisory Committee

The HIA Leadership Team solicited participants for the HIA Advisory Committee, a group of individuals responsible for helping to guide the HIA, from local community organizations and agencies and the community and stakeholder kickoff meetings in February 2017. Attendees at the kickoff meetings were also asked to inform others about the plan to perform the HIA and the opportunity to participate in the HIA process. EPA sent invitations to individual stakeholders and select community members requesting that they participate in the HIA in June 2017. Advisory Committee members were individuals with local knowledge and expertise in the history of the area, community leaders, and individuals associated with organizations or businesses with a vested interest in the decision. The Advisory Committee included individuals with expertise in community planning and resources, environmental and ecosystem health, public health, research, social systems and networking, and economic development, as well as individuals with a voice regarding the project and the future of Kingsbury Bay and Grassy Point. Formal roles in which stakeholders could participate, included the HIA Research Team (detailed in Section 3.3.1) or the HIA Advisory Committee, which was responsible for helping to guide the HIA.

An HIA Advisory Committee Kick-off Meeting was held June 28, 2017 to convene the HIA Advisory Committee; provide a recap of the HIA process, the Kingsbury Bay-Grassy Point Habitat Restoration Project, and associated park improvement activities; review pathways drafted by the HIA Project Team through which the project could impact health; and explain the next steps, including HIA Advisory Committee tasks.

3.4. HIA Timeline and Plans for Stakeholder Engagement, Communications, and Reporting

3.4.1 HIA Timeline

The HIA timeline was first drafted in the *Screening* step, further refined in the *Scoping* step, and then updated as needed throughout the HIA process. Figure 3-2 provides the final HIA timeline. The HIA analysis was performed in a 6-month window (from September 2017 to February 2018) to ensure it was timely and could inform the habitat restoration design and award of the habitat restoration contract, originally planned for Fall 2017. The HIA timeline extended beyond Fall 2017 to accommodate MNDNR habitat restoration design changes, the development of project alternatives by MNDNR and the Minnesota Pollution Control Agency (MPCA; the permitting agency), and subsequent project permitting. Following the presentation of the preliminary HIA findings and recommendations to the community, decision-makers, and other stakeholders in the Spring of 2018, the finalization of HIA recommendations and completion of the remaining HIA steps (including development of this HIA Report) were delayed due to a 35-day government shutdown and competing priorities within EPA. During this time, the HIA Project Team remained cognizant of the habitat restoration timeline and projected start, which also experienced delays, to ensure that the HIA could continue to inform the project. Throughout this time period, HIA Leadership Team members in Duluth continued to remain engaged in the habitat restoration and park improvement planning and operations and provided HIA information, as needed, to inform the activities as they progressed.

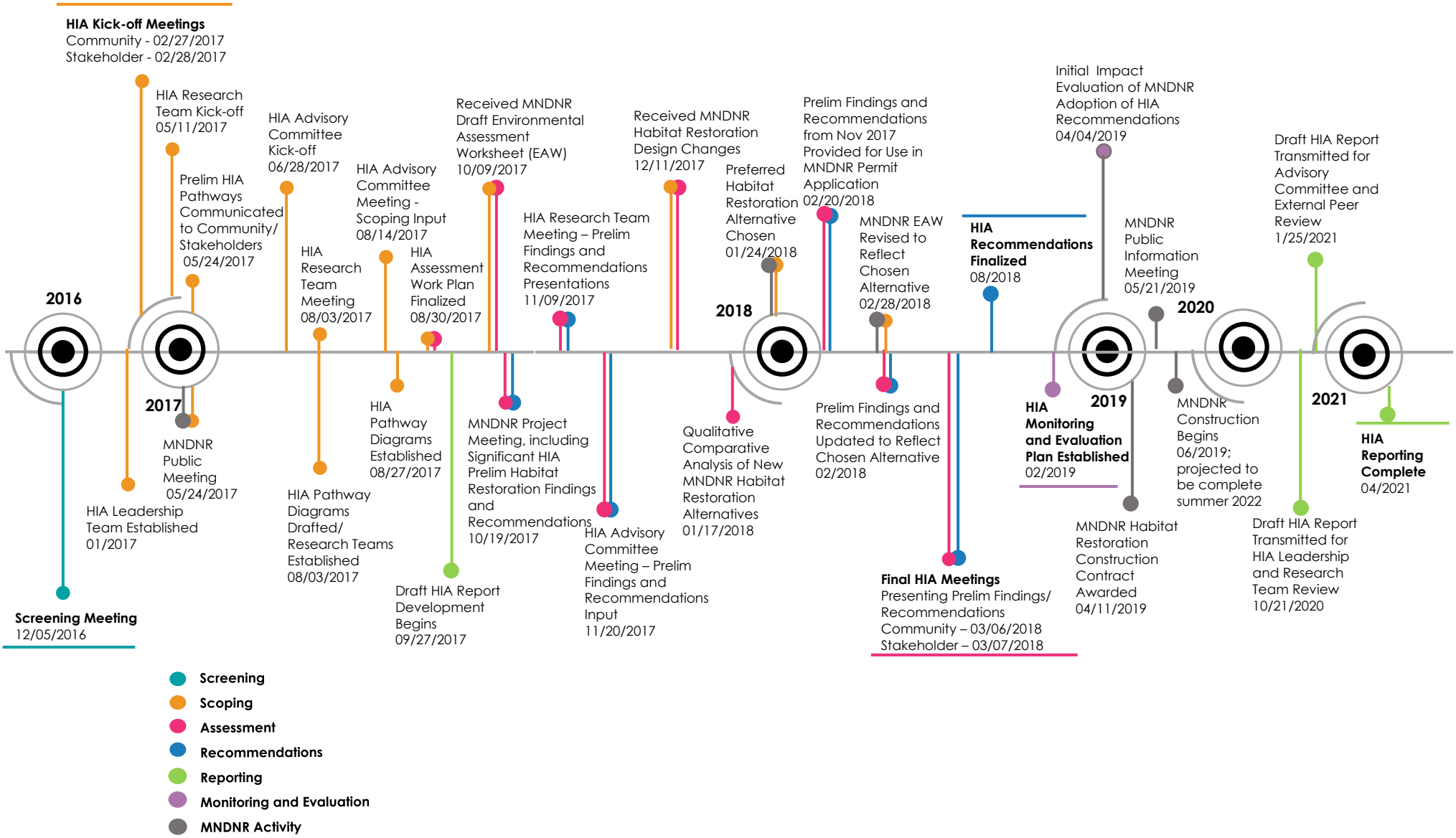

Figure 3-2. Final HIA timeline.

3.4.2 Stakeholder Engagement Plans

At the start of the HIA, the HIA Leadership Team was aware of complaints from the Duluth community and stakeholders about the extensive burden of engagement from the various federal, state, and locally-led projects and interventions occurring in the area. Taking this into consideration, the HIA Leadership Team planned to execute public meetings to engage stakeholders at two critical points in the HIA process – *Scoping* and *Recommendations* – and to provide stakeholders with the opportunity to review the draft HIA Report in the *Reporting* step. An additional opportunity for stakeholder and community consultation occurred during the *Assessment* step, when the MNDNR held a public meeting (Figure 3-3).

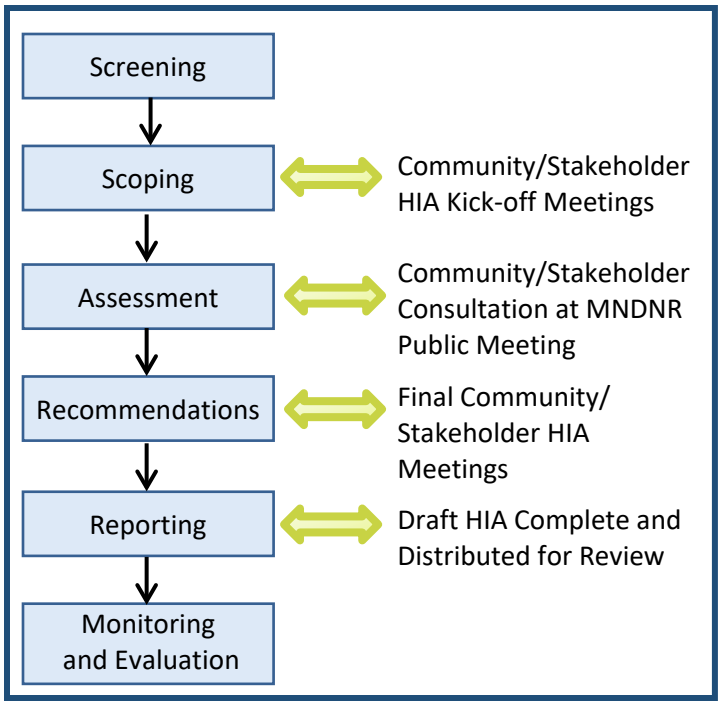

Figure 3-3. Stakeholder Engagement Plan

The HIA Leadership Team provided the City of Duluth with a general overview of the HIA plan at the start of the process, including how stakeholders would be engaged, how overlapping city planning and land use projects in these communities would be acknowledged, and how opportunities available to neighborhood residents to participate in these projects would be communicated.

Through the HIA Process, the following stakeholders were engaged in the decision-making process: local residents and business owners; the 1854 Treaty Authority; the City of Duluth; the Fond du Lac Band of Lake Superior Chippewa; the Friends of Western Duluth Parks and Trails; the Health in All Policies Coalition; Indian Point Campground/Spirit Lake Marina; the Irving Community Club; the Irving Recreation and Events Association; the Izaak Walton League; Lake Superior Zoo; Minnesota Department of Natural Resources; Minnesota Land Trust; Muskies, Inc.; Riverfront Community Development; Planning Commission; Save Lake Superior Association; St. Louis County Public Health; U.S. Army Corps of Engineers; U.S. Fish and Wildlife Service; University of Minnesota-Duluth; Verso Corporation; Wheels on Trails; and Wisconsin Department of Natural Resources.

3.4.3 Communications and Reporting Plans

HIA Reporting entails all aspects of the communication of the findings and recommendations of an HIA to decision-makers, the public, and other stakeholders (National Research Council, 2011). It includes the production and dissemination of written materials that document the HIA process, methods, findings, recommendations, and limitations of the analysis, and it includes the public dissemination of results through other channels, including formal and informal meetings with the public, decision-makers, and

other stakeholders. The Rules of Engagement Agreement (Appendix C) includes plans for communication and the review process for HIA materials.

An HIA Report (this report), summary report, fact sheets, and presentations to the public, decision-makers, and other stakeholders were all planned to help communicate the process, progress, and findings of the HIA. *Reporting* is described in detail in Section 6.

3.5. Setting the Scope of the HIA

3.5.1 Habitat Restoration and Park Improvement Project Design

Habitat Restoration Design

The habitat restoration design for the Kingsbury Bay and Grassy Point sites was informed by a Restoration Site Team (RST) made up of representatives from MNDNR, EPA, Minnesota Pollution Control Agency (MPCA), the City of Duluth, U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (FWS), Minnesota Land Trust, Wisconsin Department of Natural Resources (WDNR), the National Oceanic and Atmospheric Administration (NOAA), Fond du Lac Band of Lake Superior Chippewa, University of Minnesota Natural Resources Research Institute, 1854 Treaty Authority, Community Action Duluth, and St. Louis River Alliance.

The "85%-complete" habitat restoration design, detailed in RST presentations and documents, provided the scope of the habitat restoration work at Kingsbury Bay and Grassy Point. The HIA analysis was conducted on the "85%" design and park improvement concept plans shown in Appendix D; these "85%" design and park concept plans were eventually detailed in a Draft Environmental Assessment Worksheet (EAW) developed by MNDNR[4], that was available part way through the HIA *Assessment* step.

Following presentations of the HIA preliminary findings and recommendations at a MNDNR Project Meeting in October 2017 and an HIA Advisory Committee Meeting in November 2017, the HIA Project Team was notified that MNDNR had made some changes to the habitat restoration design. The "85%-complete" habitat restoration design analyzed in the HIA was revised in December 2017 to address some of the preliminary results and recommendations of the HIA and concerns raised during the design process (see Appendix D). These design changes had implications for the anticipated outcomes of the habitat restoration project (including aquatic vegetation, dioxin levels, fishing, recreation, and potential habitat for wild rice) and hence, the potential impacts of the project on health. The HIA Project Team assessed the potential impacts of the revised design and updated the HIA analysis to reflect the design changes. Around this same time, as part of the permitting process, MNDNR and MPCA were engaged in discussions around the EAW, specifically the metrics used in the project descriptions and the consideration of project alternatives to the single design submitted as part of the EAW. Ultimately, the

[4] As the responsible party for the review of the project, MNDNR developed an EAW to describe the environmental effects associated with the Kingsbury Bay-Grassy Point Habitat Restoration Project.

revised design received from MNDNR in December 2017 and assessed in this HIA (known as Alternative 2), was chosen as the preferred project alternative. For more detail on the design and permitting processes and how the HIA informed these processes, see Appendix D. The final habitat restoration design is detailed in the Final EAW (MNDNR, 2018)[5], available at: https://www.dnr.state.mn.us/input/environmentalreview/kingsbury-grassy/index.html.

Park Improvement Project Design

At the time of the HIA, the City's recreational and park improvement plans for these two sites had not yet been finalized. The City of Duluth was looking to undertake a park planning process to update the mini-master plan developed previously for Grassy Point and develop a plan for Kingsbury Bay. The HIA had an opportunity to inform that design process and communicate the desires and concerns of the community for these park sites.

3.5.2 Defining the HIA Study Area

The Kingsbury Bay-Grassy Point HIA Study Area encompasses the area surrounding the Kingsbury Bay and Grassy Point project sites. Initially, a 1-mile buffer was delineated around each of the project sites and combined to create the Kingsbury Bay-Grassy Point HIA Study Area, with the waterside portion of the study area cut off at the navigation channel. However, updated project information received from MNDNR revealed that the proposed truck route for moving material from Kingsbury Bay to Grassy Point extended north of the original study area, requiring the study area boundary to be revised.

The Kingsbury Bay-Grassy Point HIA Study Area is shown in Figure 3-4. Included in the study area are the Duluth (St. Louis County, MN) neighborhoods of Irving, Fairmount, and Norton Park and community features within the study area include Indian Point Campground, Western Waterfront Trail, and Lake Superior Zoo. The Census tracts that intersect the study area (Census tracts 33, 34, and 36) were included in the analysis, with exception of the far east Census tract (tract 158). This tract was excluded from the analysis because most households in this large tract are outside the study area (i.e., assumed to not likely be part of the impacted population) and have a very different demographic make-up than the populations that could be impacted by the project. The few households in tract 158 that could be impacted due to the proposed truck route were included in the assessment of impacts via a buffer analysis of the material transport truck route.

[5] The Final EAW was issued for public comment in March 2018, following completion of the HIA analysis and communication of the HIA findings and recommendations to stakeholders and the community. MNDNR determined that an Environmental Impact Statement (EIS) was not required for the project and issued a Record of Decision (ROD) on May 30, 2018, concluding the state environmental review process for the project (https://www.dnr.state.mn.us/input/environmentalreview/kingsbury-grassy/index.html).

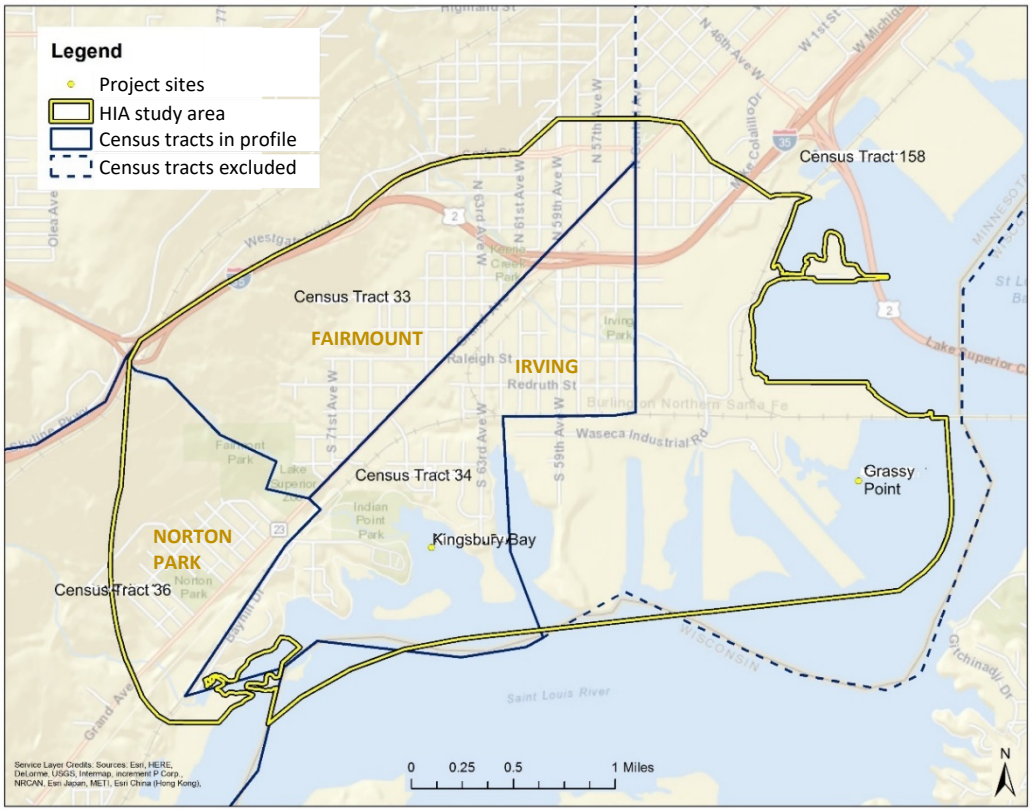

Figure 3-4. HIA study area.

3.5.2 Specifying the Pathways of Impact

Health begins where people live, work, and play. The HIA Leadership Team took the information gleaned from stakeholder discussions at the kick-off meeting and initial public meetings and drew from widely-accepted impact pathways that have been recognized by the World Health Organization, U.S. Centers for Disease Control and Prevention, and Society of Practitioners of Health Impact Assessment to organize the potential health impacts into categories or pathways through which health could potentially be impacted. Seven pathways were specified for assessment in the HIA (Figure 3-5). These pathways encompass well-documented social determinants of health (i.e., conditions in the physical and social environment that shape opportunities to be healthy). In many cases, these pathways also include impacts on nature and the benefits and services nature provides, which are known as ecosystem services.

Figure 3-5. Pathways through which habitat restoration and park improvements could impact health.

3.5.3 Incorporating Ecosystem Services in the Discussion

What are ecosystem services?

Ecosystem services are the biophysical outputs of nature that directly or indirectly contribute to the well-being and social welfare of humans (Boyd and Banzhalf, 2007; Munns et al., 2015). In plain terms, final ecosystem goods and services (FEGS) are the things in nature or the environment from which we directly benefit (i.e., components of nature directly enjoyed, consumed, or used by people), such as a river that provides scenic views and opportunities for recreation, air that is clean to breathe, or shade provided by trees. There are also intermediate ecosystem services–components of nature that are necessary to produce the final ecosystem services (e.g., nutrient retention by aquatic vegetation to improve water quality; habitat to support fish, birds, or other wildlife of value to people); and that indirectly contribute to human health and well-being. The concept of ecosystem services helps us to

connect ecosystems to the benefits they provide and their contribution to human well-being (Figure 3-6). These benefits have an impact (whether positive or negative) on human well-being and social welfare (Munns et al., 2015). Benefits may be characterized as a connection to nature, cultural fulfillment, education, health, living standards, safety and security, and social cohesion (Smith et al., 2013). Ecosystem services are valuable for communication purposes because they allow us to trace the connections between the biophysical attribute (e.g., the tree, air, fish, or wild rice) and the benefit to well-being (e.g., the shade, clean air, food, experience), and extend it to the contribution to human well-being (e.g., connection to nature, improved living standards, cultural or spiritual fulfillment).

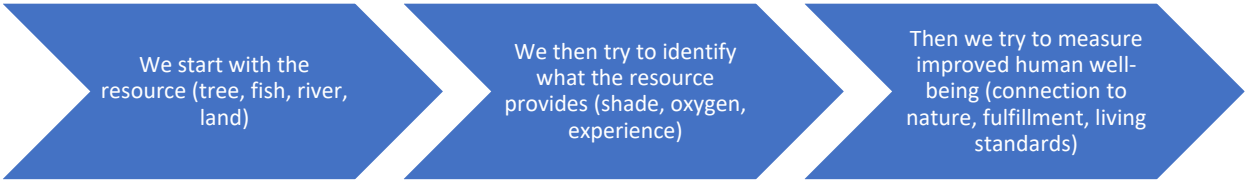

Figure 3-6. Ecosystem services as biophysical resource, identified service, and contribution to human well-being.

How do ecosystem services relate to health and well-being?

Numerous physical and mental health benefits are provided by the four different categories of ecosystem services specified by Daniel et al. (2012): provisioning services, regulating services, cultural services, and supporting services (Figure 3-7). For example, natural areas can provide recreation opportunities, which may promote physical activity, reduce stress, affect obesity and depression, and improve overall quality of life (Bell et al., 2008; Gariepy et al., 2014; Bryce et al., 2016). Trees and wetlands can filter air and water pollutants, which can reduce the occurrence of human respiratory, cardiovascular, and gastrointestinal diseases (Nowak et al., 2013).

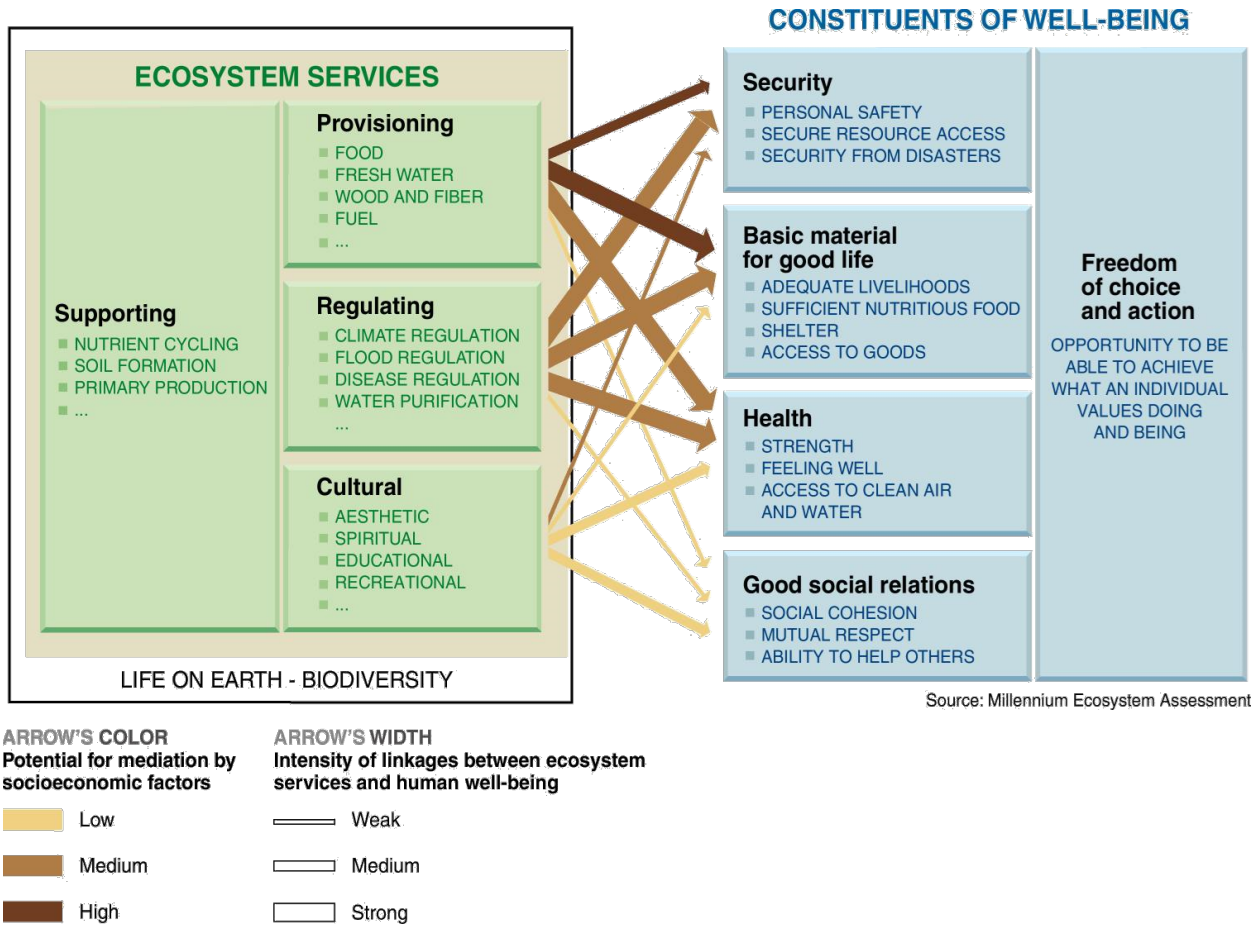

Figure 3-7. The connection between ecosystem services and human health and well-being. Taken from: (Millenium Ecosystem Assessment, 2005)

Ecosystem services in decision-making

Many of the choices and decisions we make directly or indirectly impact ecosystem services (Figure 3-8). Considering ecosystem services in decision-making has implications for public health, environmental, economic, and social benefits. Benefits from ecosystem services can be measured in three ways: monetary value, human health, or human well-being (Yee et al., 2017). While all three could be considered in an HIA, the latter two have direct applicability to public health. Decisions may directly alter ecosystem services and lead to potential health impacts, while in other cases, ecosystem services may be a mitigating factor influencing the impact of the decision on health. Incorporating ecosystem services concepts into decision-making helps ensure that benefits provided or lost from nature are not overlooked as decision alternatives are evaluated (Yee et al., 2017).

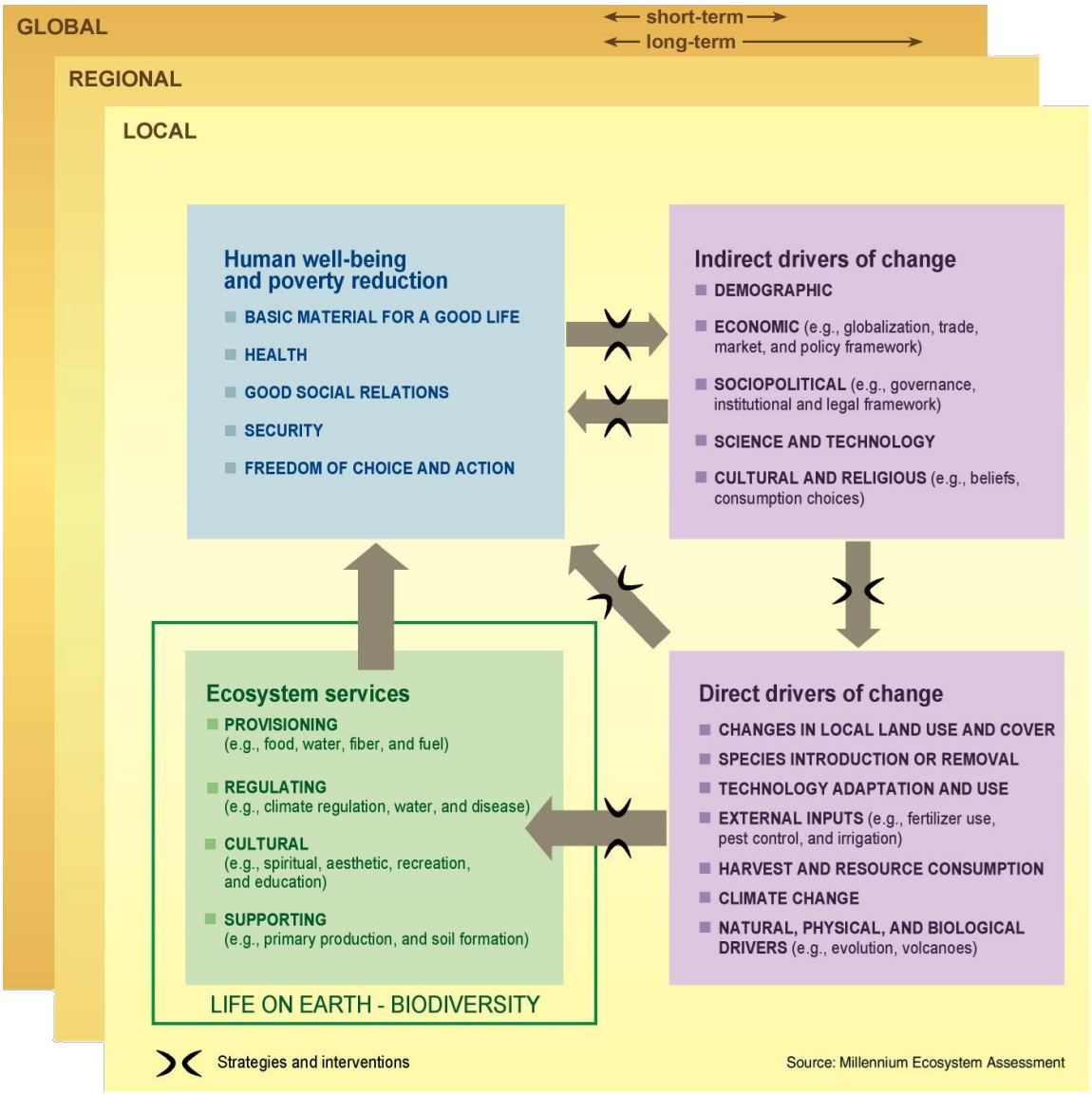

Figure 3-8. Interactions between biodiversity, ecosystem services, drivers of change, and human health and well-being. Taken from: (Millenium Ecosystem Assessment, 2005)

In this HIA, we examined how the environmental impairments to Kingsbury Bay and Grassy Point negatively impact ecosystem services and their associated health benefits. When ecosystem functions are impaired by habitat loss or degradation, the ecosystem benefits provided by those ecosystems can decline or change from positive to negative. For example, fish caught from clean waterbodies are generally a healthy diet option. However, fish caught from a waterbody with contaminated sediments may accumulate toxic contaminants in their bodies and can present a substantial health risk to people who eat those fish.

We were also interested in examining how improvements to ecosystem quality and services through the planned habitat restoration and park improvement projects could enhance the health benefits provided

by these ecosystems and contribute to human well-being. Some of the benefits might be difficult to describe because they are services that are intrinsically or collectively valued (Wenger and Pascual 2011). For example, creating wild rice habitat and seeding it to increase wild rice production will, if successful, produce a physical health benefit – a diet supplemented with wild rice. Wild rice also has an associated spiritual benefit for some stakeholders intrinsic to its role in culturally-important practices and ceremonies.

To incorporate ecosystem services into the HIA, it was first necessary to make a connection between the attributes of the environment that would be changed due to the habitat restoration and park improvements projects (both in the short-term and long-term) and their associated ecosystem service or services. For each pathway, we determined who would benefit from those services and identified any health determinant(s) or health outcome(s) associated with those ecosystem services. The results of this ecosystem services analysis are shown in the *Assessment* sections of the respective pathways and summarized in Section 4.9.

3.5.4 Identifying Populations Potentially Affected

The HIA study area was established to delineate the populations who live, work, and recreate near the project sites and could potentially be affected by the proposed habitat restoration and park improvements work.

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The HIA Project Team acknowledges that the Kingsbury Bay and Grassy Point parks could potentially be visited by individuals outside the study area; however, assessing the health implications for all potential visitors would be impractical.

Populations Likely to Experience Disproportionate Impacts

HIAs assess how the potential impacts of the decision vary among members of the population to determine if there may be unequal sharing of burdens and benefits that could result from the proposed decision. Some groups within the population can be more sensitive to or more affected by changes in the physical and natural environment, social environment, and economic environment as a result of the decision than other groups. Some groups can experience disproportionate impacts because of their geographic location relative to the decision, while others can be vulnerable populations at a higher risk for poor health outcomes as a result of barriers to health equity, including social, economic, political, and environmental factors and illness or disability. The HIA Project Team determined that some population groups, described below, can be more likely than others to experience disproportionate (positive or negative) health impacts.

- ***Outdoor Recreation Users***
  People who engage in outdoor recreation, such as boaters, swimmers, bird watchers, and hikers are being exposed to degraded water quality, contaminated sediment, invasive plant species, and deteriorated park amenities at the project sites. In the short term, outdoor recreation opportunities will be impeded by the habitat restoration and park improvements construction activities. However, individuals who recreate outdoors will, in the long-term, see improvements

to the natural environment and park amenities. These improvements will provide more opportunities for recreation, physical activity, social interaction, and engagement with nature, although some recreational activities also carry associated risks (such as the risk of drowning while swimming).

- ***Anglers (or Fishermen)***
  Like the outdoor recreation users, this group within the population is being exposed to the effects of degraded water quality and contaminated sediment, but possibly at greater levels, should they consume contaminated fish caught in the river at the sites. Some portions of the fishing population engage in fishing for sport, while others rely heavily on fish as a food source. In the short term, fishing access will be impeded by the habitat restoration and park improvements construction activities. Anglers, in the long term, will see improvements to existing aquatic habitats, including cold water habitat for trout in tributary streams; the addition of new fishing amenities; and a moderate, but unknown, reduction in the concentrations of contaminants in the tissue of resident fish such as Yellow Perch and sunfish. These improvements will provide greater opportunities for recreation, social interaction, and engagement with nature, as well as healthy food sources.

- ***People from Low-income Households***
  Individuals and households that are economically disadvantaged have fewer social, economic, and health resources, including less expendable income for nutritious food, health services, and pay-for-play activities; can experience greater risk of exposure to environmental hazards; and often have less capacity to adapt to changes in their health and environment than more affluent households. Low-income households may also rely on fishing as a significant source of nutrition, potentially exposing them to environmental contaminants. Health practitioners have concluded that as income increases, regardless of racial and ethnic group, health outcomes improve (Braveman, Egerter, An, & Williams, 2011; Heller, Malekafzali, Todman, & Wier, 2013). In the community profile presented in Section 4.1, low-income was quantified using the percent of a Census tract's population below the "poverty estimate."

- ***Minority and Indigenous Peoples***
  Like low-income households, minority populations often experience inequities that can make them more vulnerable to the potential health impacts of a project. These may include economic disadvantages, greater risk of exposure to environmental hazards, poorer health status, and racial discrimination. Minority and indigenous peoples may also rely more heavily on fishing or food gathering as a food source than other groups. Parks and park features, such as group gathering spaces, can serve as important social and cultural resource for these populations. Minorities and indigenous peoples may also experience language barriers that complicates communication of project updates and notifications of project impacts, dangers or warnings, such as fish advisories and beach closures. Minority populations are quantified in the population profile presented in Section 4.1 by the percent of individuals of a Census tract's population not classified as "white, non-Hispanic."

- ***People that live near Kingsbury Bay and along the Truck Transport Routes***
  Populations in neighborhoods physically located near Kingsbury Bay and along the truck transport routes may be at increased risk of impacts from equipment operation and transport; exposure to the associated air, noise, and light pollution; and disruption of daily activities during habitat restoration and park improvements construction.

- ***Pedestrians and Bicyclists***
  Pedestrians and bicyclists in the vicinity of the project sites and along the truck transport routes may be at increased risk of accidents and injury from operating equipment and truck transport and exposure to the associated air, noise, and light pollution during habitat restoration and park improvements construction. Pedestrians and bicyclists will also require safe access routes to the sites post restoration; this is currently a challenge.

- ***Elderly (Age 65 or Older) and Physically Disabled***
  Older adults (age 65 and over) are more likely to experience illness and disease due to waning immunity and health, and once affected, may develop more severe health outcomes. They have higher rates of chronic disease, which may make them more sensitive to environmental hazards like air and noise pollution. The elderly and physically-disabled individuals are also more dependent on the accessibility of the built environment, compared to those without physical restrictions.

- ***Children***
  Because of their low adaptive capacity and high dependency on others, children are highly sensitive to changes in physical, social, and economic conditions in the household and community. Young children may also be more vulnerable to illnesses and diseases due to their less-developed immune, gastrointestinal, respiratory or other systems; once exposed to negative health determinants (e.g., to water, air, or noise pollution, etc.), they may develop more severe health problems than adults.

- ***People with Pre-existing Health Conditions***
  Individuals with pre-existing health conditions may be more susceptible to the health impacts of a project and may have less capacity to adapt to changes in their health or environment. People with chronic conditions are more at risk of poor health outcomes and face a higher risk of depression. Pre-existing health conditions can impact an individual's quality of life.

Health Equity and Environmental Justice (EJ) Considerations

In the *Assessment* step of the HIA, the HIA Project Team paid particular attention to the distribution of potential health impacts across the population and whether any groups within the population were already facing health inequities (i.e., avoidable and unfair differences in health) often due to social, economic, or environmental disadvantage (HHS, 2008; SOPHIA Equity Working Group, 2016; ODPHP,

2018). Because not everyone starts from the same place or needs the same things to enjoy a full, healthy life, it is not enough to provide everyone the same access to resources and opportunities. As shown in Figure 3-9, equity occurs when fair access to resources is actually realized. In the HIA, recommendations were provided, where possible, to promote health equity and optimize health outcomes for all affected groups within the population.

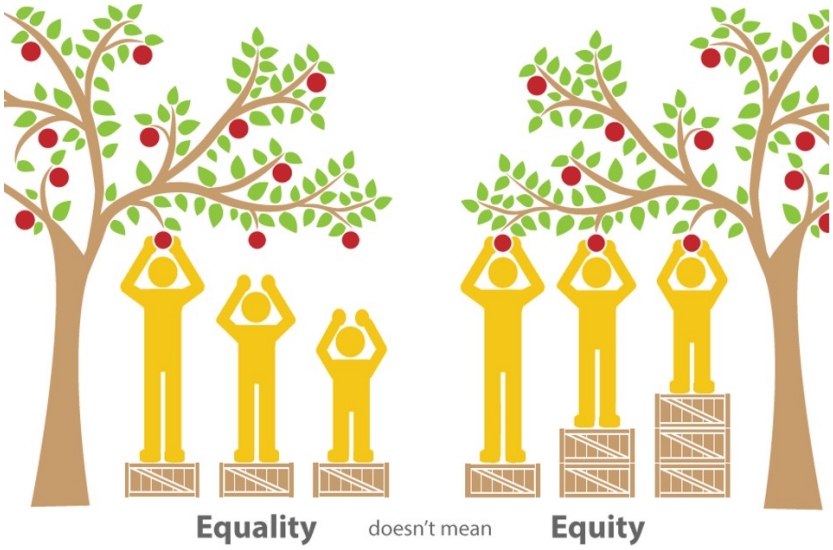

Figure 3-9. An illustration of health equity. Source: Georgia Health Policy Center

3.5.5 Developing the HIA Assessment Workplan

The HIA Project Team drafted an Assessment Workplan detailing the research questions, indicators, data sources, and methods to be used in the HIA analysis to: 1) establish the baseline conditions related to the health determinants in each pathway; and 2) determine how the proposed projects could potentially impact those conditions (i.e., to analyze potential health impacts in the *Assessment* step). Input from the community and stakeholder kick-off meetings was used in the development of the Workplan. Once the plan was drafted, the Advisory Committee was given the opportunity to review and provide additional input on the plan. See Appendix E for the final Assessment Work Plan that guided the HIA *Assessment* step.

4. Assessment of Existing Conditions and Potential Health Impacts

The third step of the HIA process, *Assessment*, involves two major tasks: 1) creating a profile of the population potentially affected by the decision, including a baseline health status and information on the conditions important to health; and 2) analyzing and characterizing the potential health impacts of the proposed decision and any decision alternatives under consideration (National Research Council, 2011). The desired outputs of the *Assessment* step of HIA are detailed in Appendix A.

This HIA assessed the potential health impacts of the three phases of the Kingsbury Bay-Grassy Point Habitat Restoration Project – Habitat Restoration Construction and Operations (i.e., the habitat restoration work), Park Improvement Construction (i.e., the construction work related to park improvements), and Park Improvement Operations and Maintenance (i.e., the operation and maintenance of the parks after construction). The HIA Research Team utilized a mixed-methods approach for the assessment, including analysis of both qualitative (narrative and nominal) and quantitative (numeric or measured) data. Analysis included geographic information system (GIS), epidemiologic, and social research methods, statistical and graphical analysis, and systematic literature review.

The following criteria were used to characterize the potential health impacts:

- **Direction** – indicates whether the impact is harmful, beneficial, or in some cases, unclear (values = "benefits health," "detracts from health," "no change," or "unsure/both benefit(s) and harm(s)")
- **Likelihood** – the chance or probability that the impact will occur (values = "highly likely," "possible," or "not likely")
- **Magnitude** – indicates the expected size of the impact; can be described by the number of people affected or by expected changes in the frequency or prevalence of symptoms, illness, or injury (values = "high" if thousands of people affected, "moderate" if hundreds of people affected, "low" if few to none are affected)
- **Distribution** – delineates the spatial or socioeconomic boundaries of various groups that are likely to bear differential effects (values = "all groups affected relatively equally" or "disproportionate impacts," with the groups likely to be affected disproportionately identified)
- **Severity (intensity)** – indicates the severity of the effect (values = "severe" for fatal or disabling, "moderate" if needs medical treatment or intervention to resolve, or "minor" if does not need medical treatment or intervention to resolve)
- **Permanence (timing and duration)** – indicates at what point of the proposed activity the effect will occur, how long it will last, and how rapidly the changes will occur (values = "immediate" if effect occurs within 1 year or "long-time" if effect takes 1 to several years; "short-term" if duration of impact is limited or "long-lasting" if impact is expected to persist for an extended period of time or be permanent)

- **Strength of evidence** –the scientific evidence used to verify (or refute) the connections hypothesized in the Scoping step and characterize the potential health impacts of the decision in *Assessment* was graded based on the levels of strength modified from the U.S. Agency for Healthcare Research and Quality's grading of evidence (values = "strong," "limited," "lacking," and "insufficient"); see Figure 4-1 for further details.

Strength of Evidence Determinations
(modified from the U.S. Agency for Healthcare Research and Quality)

- ***Strong*** – There is high confidence that the evidence reflects the hypothesized relationship between variables. Further research is very unlikely to change the confidence or the estimate of effect.
- ***Limited*** – The evidence reflects the hypothesized relationship between variables, but is limited in depth or replication. There are consistent conclusions, but few studies that confirm the relationship. Further research may change the confidence or the estimate of effect.
- ***Lacking*** – There is low confidence that the hypothesized relationship between variables exist, such that the evidence results in inconsistent conclusions or the evidence available concludes that no association between the variables of interest exists beyond coincidence.
- ***Insufficient*** – There is not enough evidence available to draw a conclusion one way or another, such that further research is needed to verify the hypothesized relationship and/or make an estimate of effect.

Figure 4-1. Strength of evidence grade descriptions

A table is presented at the end of each pathway narrative, characterizing the potential impacts of the project phases on health using the criteria above.

4.1. Profile of the Population

The HIA Research Team used a combination of national and local data to collect demographic, socioeconomic, and health status information of the populations in Census Tracts 33, 34, and 36 and when appropriate, compare that data to city, county, state, or national data. Unless otherwise noted, the population size, land area, household, demographic, and socioeconomic data were obtained through the 2014 U.S. Centers for Disease Control and Prevention (CDC) Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index (SVI)[6] Database (https://svi.cdc.gov/SVIDataToolsDownload.html; accessed October 16, 2017), which primarily utilizes U.S. Census American Fact Finder or American Community Survey (ACS) data. The health status data were obtained through the 2016 CDC National Center for Chronic Disease Prevention and Health

[6] The SVI indicates for each U.S. Census tract "the degree to which a community exhibits certain social conditions, including high poverty, low percentage of vehicle access, or crowded households [that] may affect that community's ability to prevent human suffering and financial loss in the event of a disaster" (i.e., the social vulnerability of the community) and ranks the Census tracts based on those factors.

Promotion 500 Cities Project Data[7] (https://www.cdc.gov/500cities; accessed October 16, 2017); these health data were augmented, as needed, with health data from the 2015 Bridge to Health Regional Health Status Survey[8] (Kjos, Kinney, Finch, & Peterson, 2016).

Following is a profile of the population living in the communities surrounding Kingsbury Bay and Grassy Point (U.S. Census tract 158 excluded; see Section 3.5.2). For reference, Census tract 33 has a land area of 0.9081 sq miles, includes the Fairmount neighborhood, and is located between I-35 to the North and Grand Avenue to the South; Census tract 34 (0.7205 sq miles in land area) includes the Irving neighborhood located south of Grand Avenue between the two project sites; and Census tract 36 is the largest of the three tracts, with 2.2804 sq miles of land area, and includes the Norton Park neighborhood, located west of Kingsbury Bay.

4.1.1 Population Size and Households

The HIA Project Team first looked at the size of the population surrounding the study sites (Table 4-1). Of special note is the number of individuals estimated to be in the tract during daytime hours (when construction activities are scheduled to take place).

Table 4-1. Population Size and Households

Measure[a]	Census Tract 33	Census Tract 34	Census Track 36
Population estimate, 2010-2014 ACS	2705 ± 343	1304 ± 130	1769 ± 169
Estimated daytime population, LandScan 2012[b]	1422	1254	821
Estimate number of housing units, 2010-2014 ACS	1093 ± 44	710 ± 23	739 ± 19
Estimated number of households, 2010-2014 ACS	1020 ± 79	662 ± 52	712 ± 36

[a] ACS = American Community Survey, estimate plus margin of error reported

[b] The Social Vulnerability Index (SVI) derived this variable from LandScan 2012 (http://web.ornl.gov/sci/landscan/index.shtml), following the instructions provided for processing in ArcGIS.

[7] The 500 Cities project (a collaboration between CDC, the Robert Wood Johnson Foundation, and the CDC Foundation) provides city- and census tract-level health data for the largest 500 cities in the United States.

[8] The Bridge to Health Survey was conducted August 31 to November 10, 2015 in eight Northeastern MN Counties – Koochiching, Itasca, St. Louis (without Duluth), Lake, Cook, Aitkin, Carlton, and Pine – the City of Duluth, MN, and Douglas County, WI to better understand the health status of the region's population. For the City of Duluth, 531 mail surveys were received and the data underwent a data weighting step to adjust for differential responses by gender, age, poverty level, and education status. Due to the smaller sample size for the city of Duluth, 95% confidence intervals (CI) were provided for the results.

4.1.2 Population Demographics and Socioeconomic Status

Many demographic and socioeconomic measures are known to be associated with social vulnerability and poor health-related outcomes (Figure 4-2). The HIA Project Team examined these measures for the populations surrounding the study sites (Table 4-2).

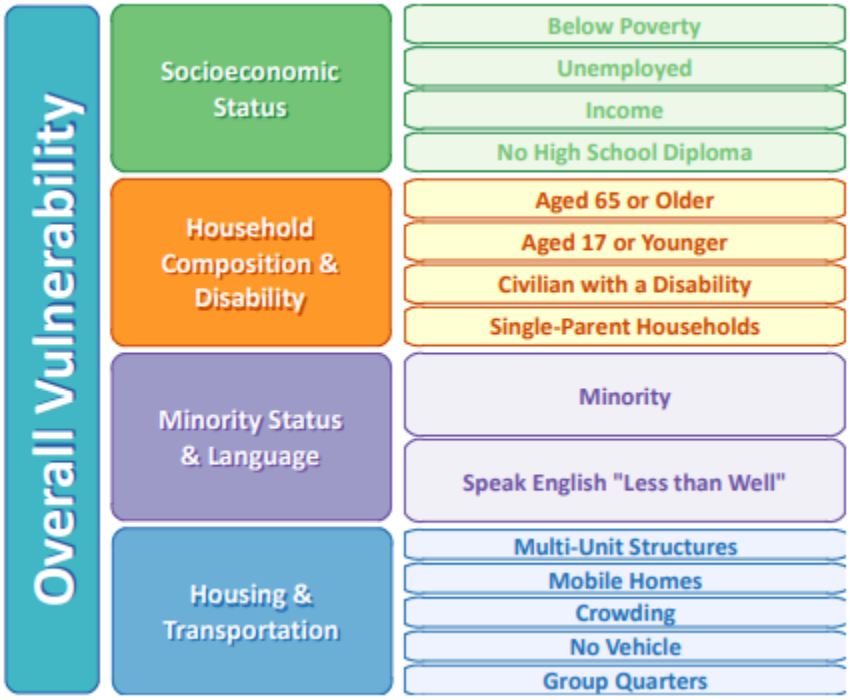

Figure 4-2. Demographic and socioeconomic measures examined that are known to be related to social vulnerability and poor health-related outcomes.(CDC, 2017)

Table 4-2. Population Demographics and Socioeconomic Status[a]

Measure[b]	Census Tract 33	Census Tract 34	Census Track 36	St. Louis County
Persons below poverty estimate, 2010-2014 ACS	**777 ± 392 (29.0 ± 12.3%)**	**360 ± 115 (27.6 ± 8.8%)**	286 ± 176 (17.3 ± 10.2%)	**32,742 ± 1,302 (17.0 ± 0.7%)**
Civilian (age 16+) unemployed estimate, 2010-2014 ACS	**185 ± 99 (12.8 ± 6.2%)**	32 ± 18 (4.7 ± 2.6%)	81 ± 46 (9.3 ± 5.2%)	8,120 ± 595 (7.9 ± 0.6%)
Per capita income estimate, 2010-2014 ACS[c]	**$16,838 ± $2,525**	**$20,051 ± $2,632**	$22,489 ± $2,711	$26,510 ± $385
Persons (age 25+) with no high school diploma estimate, 2010-2014 ACS	124 ± 57 (8.1 ± 3.7%)	135 ± 51 (15.0 ± 5.6%)	84 ± 48 (6.4 ± 3.6%)	9,462 ± 477 (7.0 ± 0.4%)
Persons aged 65 and older estimate, 2010-2014 ACS	236 ± 52 (8.7 ± 2.2%)	218 ± 54 (16.7 ± 4.4%)	299 ± 90 (16.9 ± 4.4%)	33,078 ± 69 (16.5 ± 0.1%)
Persons aged 17 and younger estimate, 2010-2014 ACS	**828 ± 195 (30.6 ± 6.1%)**	271 ± 71 (20.8 ± 5.0%)	361 ± 100 (20.4 ± 5.3%)	39,003 ± 0 (19.4 ± 0.0%)

Measure[b]	Census Tract 33	Census Tract 34	Census Track 36	St. Louis County
Civilian noninstitutionalized population with a disability estimate, 2010-2014 ACS	447 ± 206 (16.6 ± 7.4%)	189 ± 61 (14.5 ± 4.4%)	222 ± 63 (13.3 ± 3.7%)	27,480 ± 828 (13.9 ± 0.4%)
Single parent household with children under 18 estimate, 2010-2014 ACS	**224 ± 93 (22.0 ± 9.0%)**	88 ± 45 (13.3 ± 6.9%)	62 ± 40 (8.7 ± 5.7%)	7,753 ± 475 (9.1 ± 0.6%)
Minority (all persons except white, non-Hispanic) estimate, 2010-2014 ACS	382 ± 479 (14.1 ± 17.6%)	89 ± 183 (6.8 ± 14.0%)	75 ± 238 (4.2 ± 13.5%)	16,363 ± 53 (8.2 ± 0.0%)
Persons (age 5+) who speak English "less than well" estimate, 2010-2014 ACS	14 ± 40 (0.6 ± 1.7%)	0 ± 36 (0.0 ± 2.9%)	5 ± 36 (0.3 ± 2.3%)	598 ± 149 (0.3 ± 0.1%)
Housing in structures with 10 or more units' estimate, 2010-2014 ACS	28 ± 31 (2.6 ± 2.9%)	140 ± 68 (19.7 ± 9.6%)	15 ± 25 (2.0 ± 3.5%)	10,883 ± 506 (10.5 ± 0.5%)
Mobile homes estimate, 2010-2014 ACS	22 ± 33 (2.0 ± 3.0%)	0 ± 9 (0.0 ± 2.4%)	12 ± 17 (1.6 ± 2.4%)	5,153 ± 271 (5.0 ± 0.3%)
At household level, more people than rooms estimate, 2010-2014 ACS	15 ± 20 (1.5 ± 2.0%)	0 ± 12 (0.0 ± 1.9%)	11 ± 17 (1.5 ± 2.5%)	984 ± 147 (1.2 ± 0.2%)
Households with no vehicle available estimate, 2010-2014 ACS	146 ± 89 (14.3 ± 8.6%)	**131 ± 68 (19.8 ± 9.9%)**	55 ± 32 (7.7 ± 4.5%)	**8,288 ± 492 (9.7 ± 0.6%)**
Persons in institutionalized group quarters estimate, 2010-2014 ACS	25 ± 45 (0.9 ± 1.7%)	8 ± 12 (0.6 ± 0.9%)	**115 ± 94 (6.5 ± 5.3%)**	9,563 ± 999 (4.8 ± 0.5%)

[a] Bolded values indicate that the tract (or county) is in the top 10% of all tracts (or counties) in Minnesota (i.e., at the 90th percentile of values) for that variable, indicating high vulnerability related to that variable per the 2014 Social Vulnerability Index.

[b] ACS = American Community Survey; estimate plus margin of error reported

[c] Per capita income is the average income per person in each tract. Unlike the other variables for which a high percentage indicates potentially higher social vulnerability, a higher per capita income is associated with lower social vulnerability.

Per the 2014 SVI, the population in Census Tract 33 may exhibit higher social vulnerability for 5 of the 15 measures examined, Census Tract 34 may exhibit higher social vulnerability for 3 of the 15 measures, and Census Tract 36 may exhibit higher social vulnerability for only 1 of the 15 measures. All the values presented are estimates based on small sample sizes, but obtaining more accurate data for less populated areas is always a challenge; this is the best data available at this spatial scale.

Also important to note is that the population in closest proximity to both sites (Census Tract 34) may have a higher prevalence of households with no vehicle available, indicating that access to goods,

services, and recreation may be more limited for these individuals and that a higher percentage of individuals would likely be accessing the sites on foot or by bicycle.

4.1.3 Overall Health Status

The final step of creating the population profile was to examine the health status of the populations surrounding the study sites. The HIA Project Team was fortunate that the City of Duluth is one of the 500 largest cities in the United States, so health outcome, prevention, and unhealthy behavior data were available at the Census tract and City level from the 500 Cities Project (https://www.cdc.gov/500cities). Table 4-3 shows the crude prevalence of health outcomes and unhealthy behavior measures deemed relevant to the HIA (i.e., the proportion of the population with the specific health outcomes and behaviors, not adjusted for age). The crude prevalence of health prevention measures in the three study area Census tracts was similar to or less than the City and/or National prevalence (data not shown).

Table 4-3. Crude Prevalence of Health Outcomes and Unhealthy Behaviors

Category	Measure[a]	Tract 33	Tract 34	Tract 36	Duluth	U.S.
Health Outcomes	Cancer (excluding skin cancer) among adults aged >=18 Years	5.6% (5.3 – 5.9%)	7.0% (6.6 – 7.4%)	7.6% (7.2 – 7.9%)	6.0% (6.0 – 6.2%)	6.4% (6.3 – 6.6%)
	Chronic kidney disease among adults aged >=18 Years	2.1% (2.0 – 2.3%)	2.7% (2.5 – 3.0%)	2.4% (2.2 – 2.6%)	2.1% (2.1 – 2.1%)	2.8% (2.7 – 2.9%)
	Chronic obstructive pulmonary disease among adults aged >=18 Years	7.2% (6.4 – 8.2%)	8.4% (7.2 – 9.7%)	6.4% (5.7 – 7.2%)	5.6% (5.5 – 5.8%)	6.6% (6.5 – 6.7%)
	Coronary heart disease among adults aged >=18 Years	6.6% (6.0 – 7.2%)	8.6% (7.8 – 9.4%)	7.5% (6.9 – 8.2%)	5.9% (5.7 – 6.0%)	6.7% (6.5 – 6.8%)
	Current asthma among adults aged >=18 Years	10.4% (9.7 – 11.3%)	10.5% (9.7 – 11.3%)	9.0% (8.6 – 9.5%)	9.4% (9.3 – 9.6%)	8.9% (8.7 – 9.1%)
	Diagnosed diabetes among adults aged >=18 Years	9.0% (8.4 – 9.6%)	11.2% (10.5 – 12.0%)	9.5% (8.9 – 10.1%)	7.8% (7.7 – 8.0%)	10.5% (10.3 – 10.7%)
	High blood pressure among adults aged >=18 Years[b]	25.3% (24.2 – 26.5%)	31.3% (29.9 – 32.7%)	27.9% (26.9 – 28.8%)	24.8% (24.6 – 25.0%)	32.4% (32.1 – 32.7%)
	High cholesterol among adults aged >=18 Years who have been screened in the past 5 Years[b]	32.4% (31.2 – 33.7%)	37.1% (35.8 – 38.5%)	34.9% (33.8 – 35.8%)	32.6% (32.3 – 33.0%)	39.1% (38.8 – 39.5%)
	Mental health not good for >=14 days among adults aged >=18 Years	12.9% (11.5 – 14.4%)	12.4% (11.0 – 14.0%)	9.9% (9.1 – 10.7%)	10.3% (10.0 – 10.6%)	11.5% (11.3 – 11.7%)
	Physical health not good for >=14 days among adults aged >=18 Years	13.2% (11.8 – 14.6%)	14.5% (12.8 – 16.4%)	11.4% (10.4 – 12.3%)	10.2% (10.0 – 10.5%)	12.0% (11.8 – 12.2%)
	Stroke among adults aged >=18 Years	3.3% (2.9 – 3.7%)	4.1% (3.6 – 4.7%)	3.5% (3.1 – 3.8%)	2.8% (2.7 – 2.9%)	3.1% (3.0 – 3.2%)

Category	Measure[a]	Tract 33	Tract 34	Tract 36	Duluth	U.S.
Unhealthy Behaviors	Binge drinking among adults aged >=18 Years	20.7% (19.9 – 21.6%)	18.1% (17.4 – 18.9%)	19.9% (19.4 – 20.4%)	21.8% (21.6 – 22.0%)	16.0% (15.8 – 16.2%)
	Current smoking among adults aged >=18 Years	28.5% (24.9 – 31.9%)	26.3% (22.4– 29.9%)	21.5% (19.2 – 23.7%)	21.1% (20.4 – 21.8%)	17.4% (17.2 – 17.7%)
	No leisure-time physical activity among adults aged >=18 Years	26.6% (23.7 – 29.3%)	27.5% (24.4 – 30.7%)	23.4% (21.4 – 25.3%)	21.1% (20.5 – 21.6%)	23.7% (23.5 – 24.0%)
	Obesity among adults aged >=18 Years	33.0% (31.5 – 34.2%)	33.4% (32.0 – 34.8%)	29.5% (28.5 – 30.5%)	24.3% (24.2 – 24.6%)	28.9% (28.6 – 29.2%)
	Sleeping less than 7 hours among adults aged >=18 Years	33.7% (32.1 – 35.1%)	32.6% (31.0 – 34.1%)	30.5% (29.3 – 31.5%)	30.1% (29.7 – 30.5%)	34.8% (34.5 – 35.1%)

[a] Crude prevalence in 2014, unless otherwise noted; low and high confidence limits shown in parentheses.

[b] Crude prevalence in 2013; low and high confidence limits shown in parentheses.

The crude prevalence of many of the health measures is higher in the three Census tracts located in the HIA study area as compared to the City of Duluth as a whole, and in some cases, higher than the crude prevalence at the national level; however, because these estimates are not age adjusted and are based on a small sample size it is difficult to determine if the differences are meaningful.

Status of Specific Health Endpoints

Examining the seven pathways through which the habitat restoration and park improvements projects could potentially impact health, there were specific health measures or health endpoints that were identified as potentially being impacted (Table 4-4). A description of the baseline conditions related to each of these health endpoints follows. Specific ways in which the projects could impact these health endpoints are discussed more in the *Assessment* sections that follows.

Chronic Disease

There were no local data related to rates of chronic disease as a result of specific factors examined in the HIA; however, the prevalence of some chronic disease endpoints is higher in the study area as compared to the City or Nation. For example, the prevalence of cancer, coronary heart disease, and stroke in adults age 18 or older in Census tracts 34 and 36 was higher compared to both the City and National prevalence, as was the prevalence of stroke in Census tract 33 and the prevalence of chronic obstructive pulmonary disease (COPD) in both Census tracts 33 and 34 (see Table 4-3)[9]. The prevalence of kidney disease and hypertension (high blood pressure) among adults age 18 or older was higher in all three Census tracts compared to the City, but lower than the National prevalence, as was the prevalence of COPD in Census tract 36 (see Table 4-3).

[9] In Census tract 33, the prevalence of cancer was lower than both the City and National prevalence, and the prevalence of coronary heart disease was higher than the City, but about the same as the National prevalence.

Table 4-4. Health Endpoints Potentially Impacted by Habitat Restoration and Park Improvements, by Pathway

Health Endpoint	Water Quality and Habitat	Equipment Operation, Traffic, and Transport	Air Quality	Noise and Light Pollution	Crime and Personal Safety	Recreation, Aesthetics, and Engagement with Nature	Social and Cultural
Chronic Disease[a]	X	X	X	X		X	
Waterborne Illness	X						
Skin/Eye Ailments	X						
Stress and Stress-related Conditions[b]	X	X		X	X	X	X
Injury		X		X	X		
Premature Death			X				
Respiratory Illness/ Disease, including asthma			X				
Heat-related Illness			X				
Hearing/Auditory Impairment				X			
Nutrition						X	
Overall Health and Well-being				X		X	X

[a] Chronic disease endpoints potentially impacted include cancer, loss of neural function, cardiovascular and pulmonary disease, hypertension, stroke, kidney failure, and obesity.

[b] Stress-related conditions include poor mental health, high blood pressure, heart disease, obesity, diabetes, and decreased immune response.

Waterborne Illness & Skin/Eye Ailments

Since the advent of modern sewage treatment and the establishment of the Western Lake Superior Sanitary District, surface water quality has dramatically improved. Nevertheless, concentrations of bacteria (*Escherichia coli* or *E. coli*) in the river do periodically exceed Minnesota Department of Health (MDH) criteria (235 MPN 100 ml^{-1}), indicating a high risk of contracting a waterborne illness, and resulting in temporary beach and water access closures to protect the public. Over the last five years (2012-2017), there were two years in which no exceedances occurred; there were two years in which there were 1-2 days of exceedances, and in a single year there was about 4 weeks during which *E. coli* counts exceeded state criteria. While contact with contaminated sediment can cause skin and eye ailments, no baseline data are available.

Stress

According to a study released by SmartAsset, Duluth is the least stressed city in America for 2017 (out of 512 cities analyzed), jumping up from 3rd in 2016 (Miller D. , 2017). And according to the Bridge to Health Survey, rates of stress-related disease in the City of Duluth, including diabetes, pre-diabetes, heart trouble or angina, high blood pressure, and mental health, fall near the regional rates (Kjos, Kinney, Finch, & Peterson, 2016). However, well-being is not equally distributed throughout Duluth. According to the CDC's Social Vulnerability Index (CDC, 2016b; shown in Section 4.1.2), a relatively high proportion of the population in the HIA study area faces conditions that produce stress, such as poverty and single parenting. The prevalence of disabilities in the study area ranges from 13.3% in the Norton Park neighborhood to 16.6% in the Fairmount neighborhood. Similarly, higher rates of negative stress-related health endpoints are found in the HIA study area than Duluth in general. For example, the prevalence of obesity among adults age 18 and over was higher in all three Census tracts in the HIA study area compared to both the City and National prevalence, and the prevalence of poor mental health (for 14 or more days) and coronary heart disease among adults age 18 and over was higher than the City and National prevalence in two of the three study area Census tracts (tracts 33 and 34 and tracts 34 and 36, respectively)[10]; the prevalence of diabetes was higher in Census tract 34 compared to both the City and National prevalence, as well (see Table 4-3). The prevalence of several other health endpoints were higher in the study area compared to the City, but lower than or about the same as the National prevalence, including high blood pressure or hypertension (census tracts 33, 34, and 36), diabetes (census tracts 33 and 36), and coronary heart disease (census tract 33).

In the Bridge to Health Survey (Kjos, Kinney, Finch, & Peterson, 2016), nearly a third of the respondents from the City of Duluth reported "always receiving social and emotional support" and just 11.6% reported "receiving social and emotional support rarely or never." However, those in poverty (classified in the survey as 200% of the poverty level or less), reported lower rates of social and emotional support than households above the poverty line: 28.9% of households below the poverty line reported always

[10] The prevalence of poor mental health (for 14 days or more) among adults age 18 and over in Census tract 36 was lower than both the City and National prevalence.

receiving social and emotional support, compared to 34.1% of households above the poverty line; and 21.3% of the former reported rarely or never receiving this support compared to 5.6% in the latter. This same survey saw similar discrepancies in mental health, with individuals in poverty experiencing higher rates of depression, anxiety or panic attacks, and thoughts of suicide. This is of significance given the percentage of people living in poverty in the study area.

Injury

There is no local data related to rates of injury due to equipment operation at either of these sites or impaired task, functional, and cognitive performance or injury in occupational settings due to noise pollution. It should be noted, however, that in 2017, unintentional injury was the fourth leading cause of death in St. Louis County (MDH, 2018).

While there were no traffic-related fatalities within the study area from 2005–2014, there were traffic-related injuries according to the Minnesota Department of Transportation. Many of the accidents on Grand Avenue/Highway 23 resulted in minor to moderate injury, which is expected given the higher speeds and traffic volumes. Two of the accidents on Grand involved a person being struck by a moving vehicle – a pedestrian in 2009 and a bicyclist in 2013. All but two accidents on North Central Avenue and Raleigh Street involved only property damage; one accident on each street resulted in minor injury. Minnesota's Department of Transportation's Crash data from 2005 to 2014 identified one additional incident in the study area where a pedestrian was struck (also in 2009) and one additional incident where a cyclist was struck.

While injuries due to person-on-person crime in the study area were not substantial, there were a significant number of crimes reported in the study area from 2010 to 2017 (i.e., 7,919 reported crime incidents in Census tracts 33, 34 and 36). This equates to a crime rate of 171.3 cases for every 1,000 people per year in the study area. Property (non-violent) crimes were higher in the study area compared to violent crime (person-to-person and personal safety), although there were 195 cases of person-to-person crime (e.g., assault, physical harm to others, etc.) within 1000-m of both sites between 2010 and 2017.

Premature Death

Minnesota has one of the lowest premature death rates in the nation (The Commonwealth Fund, 2018). A study by MDH found between 2011 and 2015, one in five deaths of Minnesota residents under the age of 75 were potentially avoidable with health care treatment (MDH, 2019). However in Census tracts, like those in the study area, where there is racial diversity and individuals living in poverty, the rate of potentially preventable deaths was more than twice that of Census tracts that were higher income and majority white (MDH, 2019).

Respiratory Illness/Disease

Air pollution is a cause and aggravating factor of many respiratory conditions, such as asthma and chronic lung problems. There were no local data related to rates of respiratory illness as a result of air pollution. However, the prevalence of some potential health outcomes related to exposure to air

pollutants is higher in the study area as compared to the City or Nation. The prevalence of asthma and COPD in adults age 18 or older in Census tracts 33 and 34 was higher compared to both the City and National prevalence; in Census tract 36, the prevalence of asthma was slightly lower than the City prevalence and the prevalence of COPD was slightly lower than the National prevalence (see Table 4-3). In a Regional Health Survey conducted in 2015, 6.7% of respondents from the City of Duluth reported having chronic lung problems (Kjos, Kinney, Finch, & Peterson, 2016).

Heat-related Illness

Minnesota Department of Health reports emergency room (ER) visits and hospitalizations due to heat-related illness at the County level (https://mndatamaps.web.health.state.mn.us/interactive/heat.html). In St. Louis County, there were over 105 emergency room visits due to heat-related illness from 2014-2018, which equates to an age-adjusted rate of 10.4 individuals per 100,000 people. Over the period of 2009-2018, 21 residents of St. Louis County were hospitalized for heat related illness; that is an age-adjusted rate of 1 in 100,000 people.

Hearing/Auditory Impairment

There is no local data related to rates of hearing or auditory impairment in the study area or surrounding areas.

Nutrition

Food access is an issue of concern in the western neighborhoods of Duluth. Forty-one percent of respondents to Community Action Duluth's Needs Assessment Survey (26% of respondents from western Duluth neighborhoods, some of which are outside of the HIA study area) reported problems with food access, compared to 12% for St. Louis County or 10% for the State of Minnesota (Community Action Duluth, 2017). The survey found that affordability and transportation were the most commonly cited barriers to accessing food (Community Action Duluth, 2017). The report further noted that the HIA study area would not qualify as a food desert, because there is a large and reasonably-priced grocery store. However, according to the report, the HIA study area is the oasis between two food deserts, one to the east in Lincoln Park and one to the west in Morgan Park.

Overall Health and Well-being

Duluth has been praised for its quality of life. *Outdoor Magazine* named Duluth as the Best Town in 2014 and recently SmartAsset cited the city as the least-stressed city in the US (Duluth News Tribune, 2017). The scores were based on average hours worked per week, commute time, physical activity, unemployment rate, bankruptcy rate, housing costs, hours of sleep and divorce rate. Recently, Fitbit named Duluth the fittest city in America (Blanchette, 2017) based on the data they collect about activity and sleep levels.[11] However, the distribution of well-being is not equally distributed throughout Duluth.

[11] Fitbit use is one indicator that can be used to characterize well-being, but the data is limited to those who are Fitbit users and may not be representative of the city or study area.

The percentage of the population that gets less than 7 hours of sleep per night is slightly higher in the HIA study area compared to the City (see Table 4-3), and in the vicinity of Kingsbury Bay, there are a large number of shift workers, who could be at increased risk of sleep-related disorders or potentially impacted by sleep disruption due to daytime activities in the area.[12] Similarly, a higher percentage of the population in the HIA study area has no leisure-time physical activity (which is known to impact overall health and wellness) compared to the City of Duluth (see Table 4-3).

The percentage of the population age 18 or older reporting their physical health was not good for 14 or more days in the last 30 days was higher in the study area as compared to the City of Duluth, and in Census tracts 33 and 34 also higher than the National prevalence (see Table 4-3). The prevalence of several chronic diseases is also higher in the HIA study area compared to the City of Duluth or National prevalence, as discussed previously (see Table 4-3).

Approximately 10.4-15.2% of adults in the study area (age 18-64 years) lack health insurance (CDC, 2016a). Lack of health insurance can have a significant impact on overall health and well-being because preventative health care and treatment for illnesses or disease are not as readily available or may be delayed.

[12] In a Regional Health Survey conducted in 2015, 19.1% of respondents from the City of Duluth did report a sleep-related disorder (Kjos, Kinney, Finch, & Peterson, 2016).

4.2. Water Habitat and Quality

The water quality and habitat present in recreational and fishing waters, like the St. Louis River, can impact health directly through fish consumption and water contact, but can also impact social, recreational, and cultural aspects of life. Improving water, sediment, and habitat quality through habitat restoration can enhance nutrition and decrease chronic and waterborne disease incidence in anglers and decrease waterborne illness and skin and eye ailments in swimmers and recreational water users; for more on impacts to nutrition, see the *Recreation, Aesthetics, and Engagement with Nature* pathway. Improvements to water and habitat quality can also reduce stress and stress-related conditions by enhancing aesthetics and reducing the risk (actual or perceived) of pollutant exposures. These improvements can also impact social capital and recreational opportunities, as well.

Park improvements can contribute to health through the provision of features and amenities that help control stormwater, erosion, and runoff and that provide safe access to the river for the community.

4.2.1 Pathway of Impact

Figure 4-3 shows the pathways by which the proposed habitat restoration project and subsequent park improvement projects could potentially impact water habitat and quality.

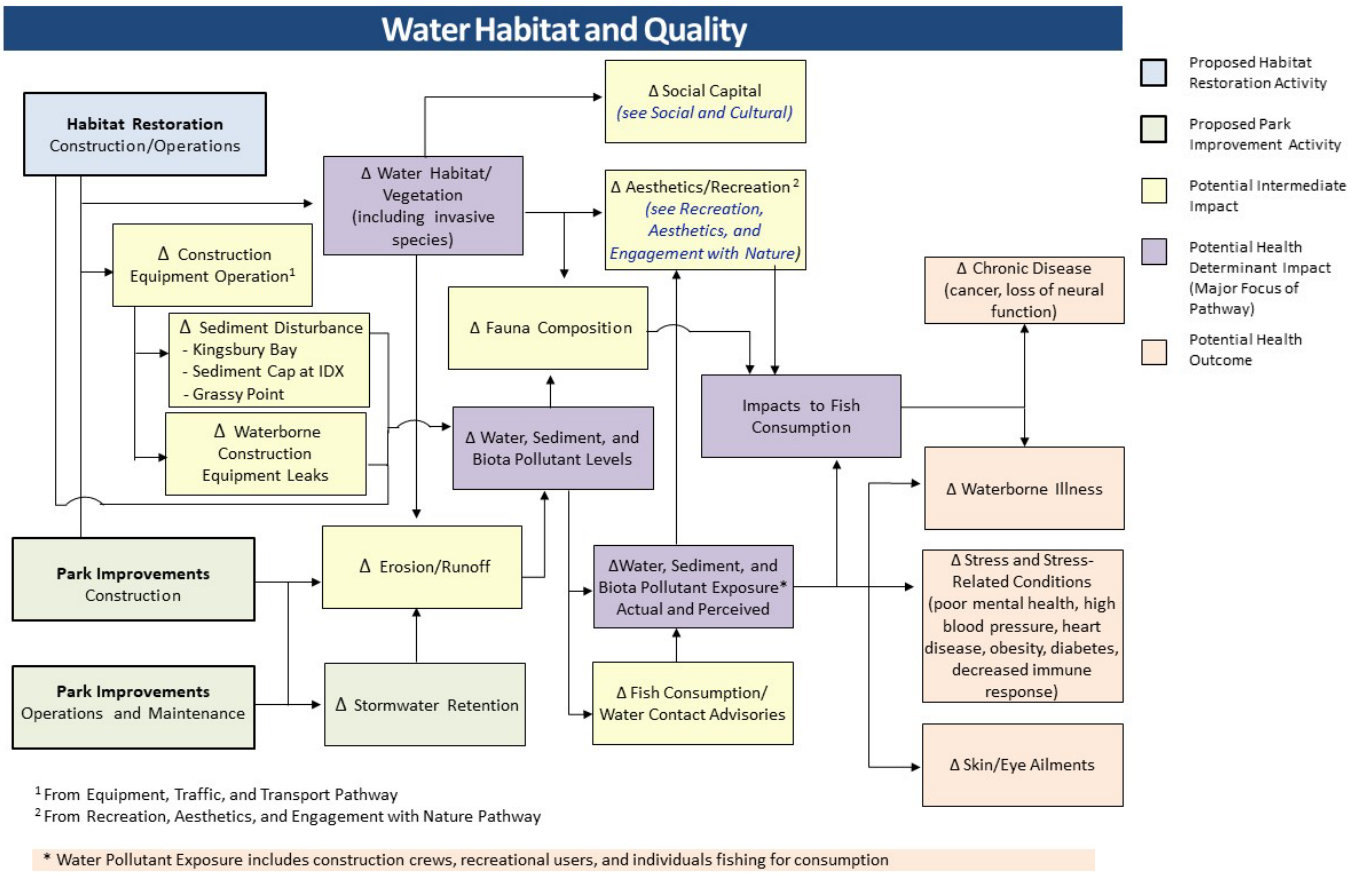

Figure 4-3. Water Habitat and Quality pathway diagram.

4.2.2 Results of the Literature Review

Water quality relates to the physical, chemical, and biological properties of the water. There are many factors that affect water quality, including precipitation (e.g., volume, intensity, and duration); presence of pollutants; and properties of the environment in which water travels, such as surface permeability, topography or grade, presence of plants and animals, and soil characteristics (EPA, 2012a). Water resources, such as the St. Louis River, provide invaluable ecosystem services, including a medium for transportation, food, habitat for wildlife, opportunities for recreation and tourism, viewscapes and opportunities to engage with nature, social/cultural benefits, and more. The quality of these water resources can affect both ecosystem health and human health. Living and non-living substances in the water, including pathogens (i.e., bacteria, viruses, parasites, and other agents that cause disease) and contaminants (e.g., heavy metals, pesticides, chemicals, etc.) can cause illness in humans and wildlife (EPA, 2012a).

In cities and urban areas, with extensive impervious surfaces, much of the rainwater flows over the surface of the ground to drainage ditches, sewers, streams, and other waterbodies. Upland and riparian vegetation and soil play an important role in reducing stormwater runoff and removing or filtering pollutants that could end up in our rivers, streams, lakes, and other waterbodies. Urban stormwater runoff is one of the leading causes of impairment of surface waters (EPA, 2003). Runoff can cause erosion and carry sediment, nutrients, pesticides, organic pollutants, metals, and other pollutants directly to rivers, streams, lakes, and other waterbodies (EPA, 2003).

Of the contaminants persisting in the St. Louis River, polychlorinated dibenzo-p-dioxins (PCDDs or dioxins), polychlorinated dibenzofurans (PCDF or furans), polychlorinated biphenyls (PCBs), and mercury constitute the most urgent threats to the health of wildlife and humans. Exposure to dioxins and furans exposure has been shown to be deleterious to the development of neurologic, immunologic, and reproductive systems in wildlife and humans and is especially hazardous to developing vertebrate organisms (White & Birnbaum, 2009). Exposure to dioxins can have developmental effects in humans, while also increasing the risk of skin and eye diseases (Tang et al., 2008; Takeuchi et al., 2009). Methylmercury is a vertebrate neurotoxin. Exposures to elevated concentrations of methylmercury has been associated with a range of neurological disorders, including developmental delays and neurological abnormalities (Marsh et al., 1980; Cox et al., 1995). PCBs do not readily break down in the environment and can accumulate in the sediment at the bottoms of streams, rivers, and lakes. These chemicals can be taken up by fish and other aquatic animals and accumulate, reaching levels magnitudes higher than found in the water (CDC, 2014). In high concentrations, PCBs pose serious health risks to people who frequently eat PCB-contaminated fish. PCBs are a potent carcinogen and are associated with impaired cognitive function in children and adults (Schantz et al., 2001).

Pathogens are also a problem in the St. Louis River, as indicated by counts of the bacteria *Escherichia coli* (*E. coli*), which episodically exceed water quality criteria in the St. Louis River. Even when a water body is in compliance with Clean Water Act standards, a use impairment may still exist, as tested bacterial indicator organisms may not represent pathogen contamination accurately (Arnone & Walling, 2007). The source of pathogens to surface waters is typically improperly treated animal waste, which

may come from malfunctioning septic systems, sewage system overflows, stormwater runoff, or direct water contact by wildlife. Exposure to waterborne pathogens can cause gastrointestinal illness (e.g., nausea, diarrhea, vomiting, and abdominal pain), respiratory illness, and illness of the eyes, ears, and skin, but can become more severe (EPA, 2012a; Fewtrell & Kay, 2015; Mannocci, et al., 2016). Gastrointestinal illness is the most common outcome of exposure to waterborne pathogens, and due to the generality of the symptoms, often goes unreported (Fewtrell & Kay, 2015).

In addition to deleterious physical effects, pollutants can negatively impact mental health and lead to health disorders in humans (Leslie and Cerin, 2008; Khan et al., 2019). A 2009 Gallop Poll reported that over half of Americans are concerned about river and lake contamination and, separately, about toxic substances in the sediment, and that these concerns seem to be increasing (Schwarzenbach et al, 2010; Saad, 2009). Within a local context, the natural mitigating factors against neuropsychiatric disorders may be impaired by contaminants. Long-chain omega-3 fatty acids in fish tissue may have a protective benefit against some neuropsychiatric disorder, although no distinct connection has been made (Sanchez-Villegas et al., 2007). However, mental and physical health benefits of eating fish from the St. Louis River may be insignificant compared to high levels of contaminants, particularly heavy metals, ingested with contaminated fish (Castro-Gonzalez & Mendez-Armenta, 2008).

Exposure to contaminants and pathogens in surface waters, like the St. Louis River, usually occurs via ingestion of contaminated water, dermal contact through recreational activities, such as swimming and boating, or as a result of eating contaminated fish. Exposure to contaminated water or water containing human pathogens does not guarantee illness will occur. In some cases, there is a level or duration of exposure that must be reached to induce symptoms (i.e., dose response). In other cases, there are factors that predispose an individual to develop illness, which may include age, immune system function, recent surgery or illness, and nutrition (Craun, Caldron, & Wade, 2006).

The use of aquatic ecosystems is influenced by a number of factors, including extent and influence of place-based knowledge; proximity to the resource; basic demographics such as age, gender, education, income; community type; aesthetic appeal of the resource; and primary reason for engagement with the resource (Flotemersch, Shattuck, Aho, Cox, & Cairns, 2019). For example, individuals may use an aquatic ecosystem for recreation, to engage with nature, for food (fish or crops, such as wild rice), or for social and cultural reasons. These individuals likely value different aspects of the aquatic resource based on their primary reason for engaging with the resource; this can have implications for habitat restoration work. Martilla et al. (2016) found that fisherman and resident stakeholder groups supported habitat restoration work on three different river systems, but were not equally satisfied with the outcomes of the work. The differences in satisfaction were related to how the restoration impacted what the individuals valued (e.g., fisherman were focused on how the changes would impact their fishing, residents who enjoyed the natural aesthetics of the river were unhappy with the unnatural appearance of some changes, etc.). The aesthetic appeal or apparent health of the ecosystem can also influence its use (i.e., people want to go to places they perceive as attractive), and several studies have shown that the perceived condition of the resource (which may or may not reflect the true health of the resource) often influences this appeal (Flotemersch, Shattuck, Aho, Cox, & Cairns, 2019).

4.2.3 Existing Conditions Related to Water Habitat and Quality

Existing Conditions – Water Quality

From the end of the 19th century through the mid-20th century, industrial activity along the St. Louis River and its estuary degraded water quality and contaminated its sediment with a variety of persistent chemicals. Poorly-treated sewage and sewage overflows led to persistent hypoxia or anoxia[13] from Fond du Lac Dam to Spirit Lake and was associated with high concentrations of bacteria and waterborne pathogens, such as *E. coli*, in the river (Minnesota State Board of Health et al., 1929). Since the advent of modern sewage treatment and the establishment of the Western Lake Superior Sanitary District, water quality has dramatically improved (Bellinger et al., 2016). Nevertheless, *E. coli* counts in the river do periodically exceed Minnesota Department of Health criteria (235 MPN/100 mL; denoted by the horizontal line in Figure 4-4), indicating an elevated risk of contracting a waterborne illness and resulting in a temporary beach or water contact closure to protect the public. From 2012-2017, there were no exceedances in two years, in two years there were 1-2 days of exceedances, and in one year there was about 4 weeks during which *E. coli* counts exceeded state criteria (Figure 4-4).

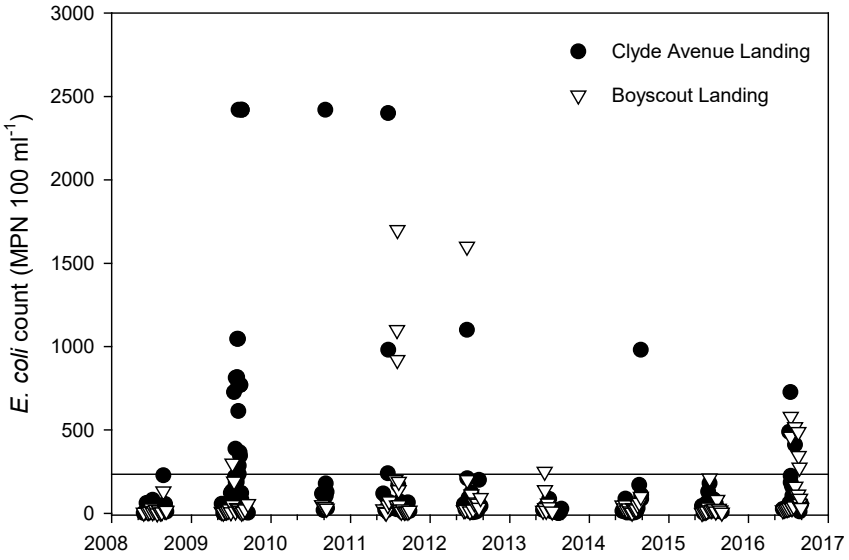

Figure 4-4. Counts of *Escherichia coli (E. coli*) bacteria in surface water samples taken from two boat landings (Clyde Avenue Landing and Boyscout Landing) upriver of Kingsbury Bay during the summers of 2008 through 2017. The solid line marks the Minnesota Department of Health criteria for beach closure (235 MPN 100 ml^{-1}).

[13] Hypoxia refers to a state of low or depleted oxygen in a water body and anoxia refers to the absence of oxygen in the water body. Hypoxia and anoxia can lead to waterbodies being unable to sustain aquatic life and can lead to die-offs of fish and other organisms.

Figure 4-5. The St. Louis River provides habitat for various species of fish.

The St. Louis River is a popular fishing destination for anglers from throughout the region (Lindgren, 2004). The St. Louis River estuary provides productive habitat for migratory gamefish, including Lake Sturgeon and Walleye, as well as resident gamefish, including Yellow Perch, Black Crappie, Smallmouth Bass, sunfishes (such as Bluegills), and Northern Pike. St. Louis River anglers primarily target Black Crappie, Yellow Perch, sunfishes, Northern Pike, and Walleye for consumption (Lindgren, 2004; Figure 4-5). Although less common in the harvest than Yellow Perch or Black Crappie during the most recent creel survey, it is notable that Walleye and Northern Pike have high concentrations of bioaccumulative PCBs, dioxins, and mercury because they are top predators and occupy a higher position in the food web.

Sediment at the project sites is contaminated by mercury, PCBs, and dioxins. Contaminant concentrations are not high enough to pose a human health risk from physical contact with river sediments. However, these contaminants accumulate and magnify through food webs and thereby, can present a major human health concern when consumed in fish, especially larger predatory species. Both resident and migratory fish are subject to Minnesota and Wisconsin fish consumption advisories related to elevated concentrations of mercury (a neurotoxin) and PCBs (a carcinogen; WDNR, 2013). Global, regional, and local mercury sources contribute to mercury in the St. Louis River (Cohen et al., 2004). Given the observed patterns in the Great Lakes, it is likely that both regional and local mercury sources contribute to mercury in the tissues of resident fish at the Kingsbury Bay and Grassy Point sites (Lepak et al., 2018). Given that many of these sources are from outside the basin, there is great uncertainty whether mercury in the project area sediments substantially contribute to mercury in the tissues of resident fish at the sites. In contrast, elevated PCBs concentrations in fish are strongly correlated to PCBs in sediment; PCBs are passed from sediments through the local food web and into fish through their diet. Dioxins, which (like PCBs) are a potent carcinogen that is primarily passed to fish from the sediment and up through the food web, are also of concern in the project area.

Based on mercury levels, many of the gamefishes in the St. Louis River should not be eaten more than once per month (WDNR, 2013). To assess the PCB- and dioxin-related toxicity of resident fish feeding in the project area, we used a species-specific and compound-specific biota-sediment accumulation factor (BSAF) model to predict fish tissue residues based on sediment contaminant and organic carbon concentrations (Ankley et al., 1992). Factors for the model were obtained from the US EPA BSAF database (https://archive.epa.gov/med/med_archive_03/web/html/bsaf.html), which included congener-specific factors[14] for whole Yellow Perch from the Fox River Superfund Site and Smallmouth Bass from the Portland Harbor Superfund site for dioxins and PCB-like dioxins. In brief, the carbon-

[14] A congener is a different form of the same class of compounds.

normalized sediment concentration was multiplied by the median factor value and assumed tissue lipid content (1%). For PCBs, the congeners were summed to estimate total PCB concentrations. For dioxins, individual congeners were also multiplied by congener-specific human health toxicity equivalency factors (TEFs) to account for congener-specific toxicity, and then all the congener-specific TEFs were summed to predict total toxicity in fish tissue.

A

The model outputs indicate that the potential for legacy sediment contamination to contribute to PCBs or dioxins and PCB-like dioxins in game fish in the vicinity of Kingsbury Bay is negligible, whereas in the vicinity of Grassy Point the potential is small, though higher than at Kingsbury Bay. The average total PCBs tissue concentration predicted for whole Yellow Perch using the BSAF model, and assuming they behave similarly to Fox River Yellow Perch, was 0.005 ppm for Kingsbury Bay and 0.118 ppm for Grassy Point. In comparison, the average dioxin and dioxin-like PCBs tissue concentration predicted for Smallmouth Bass using the BSAF model, and assuming they behave similarly to Portland Harbor Smallmouth Bass, was 0.02 parts per trillion of toxic equivalents (ppt-TEQ) for Kingsbury Bay and 0.08 ppt-TEQ for Grassy Point. Minnesota has not issued consumption advice for dioxins, but for reference, the Michigan Department of Health advises that fish with a dioxin-like compound tissue concentration of 0.5 ppt-TEQ can be eaten without restriction, but consumption of fish with higher tissue concentrations of 0.9 to 1.9 ppt-TEQ should be restricted to one meal per week.

Based on this evidence, routinely consuming fish from the project area presents a human health risk; the risk depends on consumption frequency, serving size, and fish species. The associated health impacts would be long-lasting and could be moderate to severe. While data were not available locally, nationally it is recognized that Asian, Pacific Islander, Native American, and multiracial people have higher exposure to mercury and PCBs; this is due, at least in part, to higher consumption of fish than other racial or ethnic groups (Xue et al., 2012; Xue et al., 2014; Xue et al., 2015). The balance of health risks of consuming contaminated fish compared to the health benefits of eating fish have not been will studied in the Great Lakes region (Turyk et al., 2012). Efforts to limit fish consumption where it presents a health risk, include signs posted at landings and fishing piers with updated waterbody-specific consumption advisory information. This information is available online for both Minnesota and Wisconsin. The effectiveness of these efforts on the St. Louis River is not known. If not communicated properly, health warnings may not reduce fish consumption among anglers that value the perceived general health benefits of fish consumption (Chess et al., 2005; Lin et al., 2014). However, populations that choose to reduce consumption of the most contaminated fish in favor of less contaminated fish can lower their mercury body burden (Xue et al., 2015). The most recent creel survey conducted on the St. Louis River estuary in winter of 2002-2003 and summer of 2003, found that about half (52%) of summer anglers and most winter anglers (90%) were either unaware of or did not heed fish consumption advisories (Lindgren, 2004).

Existing Conditions – Habitat Quality

The aquatic habitat is degraded by woody debris deposited on the river bottom at Grassy Point, excess sediment at Kingsbury Bay, and non-native plants at both sites. These impairments have resulted in the loss of aquatic habitat, reduced aquatic vegetation coverage and diversity, and in some areas, degraded

aquatic communities. Based on vegetation surveys, at Grassy Point, most of the aquatic habitat (~66% by area) is suitable for submerged aquatic vegetation and mixed aquatic vegetation (Table 4-5). At Kingsbury Bay, most of the aquatic habitat (~81% by area) is suitable for mixed aquatic vegetation and emergent vegetation.

Table 4-5. Existing Area of Suitable Aquatic Habitat at Kingsbury Bay and Grassy Point

Site	Aquatic Vegetation Habitat (acres)[a]				
	Total	Emergent	Mixed	SAV	Deep
Kingsbury Bay	101.6	31.5	50.3	5.6	14.2
Grassy Point	140.9	20.0	41.1	52.1	27.7

[a] Aquatic vegetation habitat total and divided into four depth-specific aquatic vegetation habitat types: emergent (<2 ft depth), mixed (2-4 ft depth), submerged aquatic vegetation (SAV; 4-6' depth), and deep (>6 ft depth).

L

Grassy Point has 1.3 acres of invasive common reed (*Phragmites australis*) and 26.8 acres of invasive narrow-leaved cattail (*Typha angustifolia*), and Kingsbury Bay has 10.4 acres of invasive narrow-leaved cattail. Current habitat area suitable at each site for three different aquatic plant categories were mapped based on available habitat suitability models (Angradi et al., 2013; Angradi et al., 2015). An important caveat is that the models did not account for woody debris; therefore, the models overestimate suitable habitat in the current conditions. The three plant categories were wild rice (*Zizania* spp.), floating leaf vegetation (typically pondweeds *Potomageton* spp. and water lilies family: Nymphaeaceae), and submerged aquatic vegetation (generally wild celery, *Valisneria americana*, in the St. Louis River; Figure 4-6 and Table 4-6). Based on these estimates, Grassy Point has about 34 acres of habitat suitable for wild rice. For floating leaf plants, Grassy Point is more suitable for spare vegetation stands (<50% cover) than thick stands (>50% cover). For submerged aquatic vegetation, the Grassy Point habitat is similarly suitable for thick stands (>75% cover) and mid-density stands (25-50% cover), and slightly less suitable for spare stands (<25% cover). In comparison, Kingsbury Bay has 79.5 acres of habitat suitable for wild rice. Similar to Grassy Point, the habitat for floating leaf plants at Kingsbury Bay is more suitable for spare vegetation stands than thick stands. For submerged aquatic vegetation, Kingsbury Bay is most suitable for thick vegetation stands, and much less so for mid-density or spare stands. Further, at Kingsbury Bay, the Kingsbury Creek delta limits the aquatic habitat area.

Figure 4-6. Wild rice (top), water lillies (middle), and wild celery grow in the St. Louis River.

Table 4-6. Predicted Area of Suitable Habitat for Wild Rice and Aquatic Vegetation Types at Kingsbury Bay and Grassy Point Currently[a]

Site	Wild Rice (acres)	Floating Leaf Vegetation [b] (acres)		Submerged Aquatic Vegetation [b] (acres)		
		0-50%	>50%	0-25%	25-75%	>75%
Kingsbury Bay	79.5	65.8	35.8	18.1	9.9	73.6
Grassy Point	34.4	123.6	17.6	40.4	50.1	50.8

[a] Percent values are predicted percent cover based on models.

[b] Aquatic vegetation areas are given by the corresponding probability of occurrence (analogous to percent cover). Estimates do not account for woody debris and therefore, overestimate suitable habitat.

For both sites, the area suitable for three different kinds of recreation were also predicted using Angradi et al. (2016): shore-based fishing, human-powered boating (e.g., canoes and kayaks), and recreational boating (e.g., small motorized watercraft). At Grassy Point, there is limited area for shore fishing and the depth is too shallow in many areas for recreational boating, but much of the area is suitable for human-powered boating (Table 4-7); shore fishing is limited by the lack of existing structures from which anglers can fish from shore. At Kingsbury Bay, area for shore fishing is also limited. Much of the area is suitable for human-powered boating, but is much less suitable for recreational boating owing to shallow waters. At Kingsbury Bay, the Kingsbury Creek delta also limits the area suitable for boating.

Table 4-7. Predicted Area Suitable for Shore-based Fishing, Human-powered Boating, and Recreational Boating at Kingsbury Bay and Grassy Point Currently

Site	Shore Fishing (acres)	Human-powered Boating [a] (acres)	Recreational Boating [a] (acres)
Kingsbury Bay	5.2	101.1	27.8
Grassy Point	2.4	140.3	95.6

[a] Human-powered boating includes vessels such as kayaks and canoes, and recreational boating includes small motorized watercraft.

4.2.4 Potential Impacts to Water Habitat and Quality

Habitat Restoration

Water Quality

In the short term, it is possible that habitat restoration will reduce water quality by increasing water turbidity as a result of woody debris removal, sediment dredging, dredge material placement, and by potential leaks (e.g., oil, fuel) from construction equipment. Mitigation activities, including silt curtains and spill containment at sediment transfer points, are required by the permit. Turbidity will be monitored on-site, and adjustments will be made if suspended sediment levels above permit requirements are detected. It is not likely that there will be long-term ecological effects from the short-term increases in turbidity that may occur during dredge material removal or placement.

In the long term, habitat restoration will likely improve water quality at Kingsbury Bay and Grassy Point but have little impact on waterborne pathogens, because the project will not affect the regional stormwater or sanitary sewer system, two potential source of contamination and waterborne pathogens. However, the habitat restoration is increasing the area of wetlands at the mouth of two urban creeks (Kingsbury Creek and Keene Creek), and these wetlands may help to filter excess nutrients, sediments, and pollutants often carried by stormwater runoff, if designed to directly intercept the stormwater.

Habitat restoration will decrease surface sediment concentrations of PCBs and dioxins in the project area, particularly by adding clean sediment to the Grassy Point project area, especially north of the C. Reiss facility, where dioxin concentrations are elevated compared to the rest of the project area. Moving sediment from Kingsbury Bay to Grassy Point is likely to reduce sediment concentrations of PCBs and dioxins, because the dredged material is presumed to be largely comprised of clean, upland sediment. Habitat restoration could also decrease the bioavailability of PCBs and dioxins in the project area by increasing wetland habitat, which reduce bioavailability of contaminants by increasing the carbon content of sediments.

Over time, the changes in PCBs and dioxins in the study area will result in a moderate, but unknown reduction in the concentrations and bioavailability of these contaminants in the tissue of resident fish, such as Yellow Perch and sunfish (Meier et al., 2015). Larger, older fish that people often target for consumption will respond more slowly than smaller, younger fish (Meier et al., 2015). The St. Louis River is a popular fishing destination for anglers from throughout the region, so improvement in the safety of fish for consumption would potentially impact thousands of people (Lindgren, 2004). Habitat restoration will have low impact on dioxin and PCB concentrations in other resident fish, such as Walleye, and migratory fish that feed throughout the river where these pollutants remain a problem. The greatest contamination close to the project area lies just outside the Grassy Point project area, between the eastern edge of the project boundary and the navigation channel. Changes in mercury methylation or mercury bioavailability levels in the project area as a result of habitat restoration are not known.

L

Habitat Quality

Habitat restoration is highly likely to substantially improve the aquatic habitat quality (Table 4-8) at both sites. Overall, there will be a net gain of 12 acres of aquatic habitat (-1 acres at Grassy Point, +13 acres at Kingsbury Bay), the result of removing the Kingsbury Creek delta. Broadly, the site will become deeper and more suitable for submerged aquatic vegetation with more deep refuge habitat for fish. Habitat greater than 4-6 feet deep (suitable for submerged aquatic vegetation) will increase by 23.3 acres, and habitat greater than 6 feet deep will increase by 4.2 acres (Figure 4-7). Consequently, there will be a 14.2-acre loss of emergent vegetation habitat (0-2 feet deep). The habitat is highly likely to improve as a result of removing 25.1 acres of invasive common reed and narrow-leaved cattail. MNDNR plans to remove all the invasive common reed (1.3 acres) at Grassy Point, as well as all the narrow-leaved cattail in Kingsbury Bay and half of the inhabited area on Grassy Point (goal of 23.8 acres removal).

Table 4-8. Area of Aquatic Habitat at Kingsbury Bay and Grassy Point Currently (Existing) and in the Future (Post Restoration)

Aquatic Vegetation Habitat Type [a]	Aquatic Habitat (acres)					
	Kingsbury Bay Existing	Kingsbury Bay Post Restoration	Kingsbury Bay Change	Grassy Point Existing	Grassy Point Post Restoration	Grassy Point Change
Total Aquatic	101.6	114.4	12.8	140.9	140.2	-0.7
Emergent	31.5	26.3	-5.3	20.0	11.0	-8.9
Mixed	50.3	46.9	-3.3	41.1	43.2	2.1
SAV	5.6	23.8	18.2	52.1	57.1	5.1
Deep	14.2	17.4	3.2	27.7	28.8	1.0

[a] Aquatic vegetation habitat total and divided into four depth-specific aquatic vegetation habitat types: emergent (<2 ft depth), mixed (2-4 ft depth), submerged aquatic vegetation (SAV; 4-6’ depth), and deep (>6 ft depth).

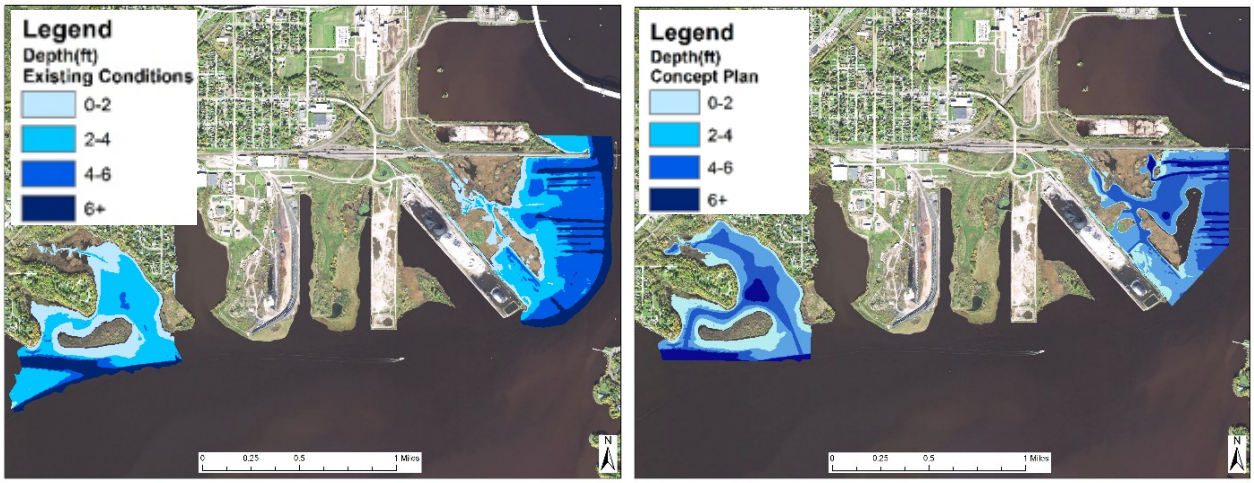

Figure 4-7. Existing bathymetric contours at the project sites (left) and bathymetric contours based on the habitat restoration concept plan (right).

Overall, the project will increase mid-density submerged aquatic vegetation (25% - 75% cover; Figure 4-8), with a net gain of 26 acres between the two project sites (Table 4-9). This is important because many of the desirable game fishes, including Northern Pike and Yellow Perch, prefer moderate or patchy vegetation cover (Inskip, 1982; Krieger et al., 1983). Areas suitable for dense floating leaf vegetation (>50% probability of occurrence) is not likely to be changed overall, because gains at Grassy Point resulting from creation of the large island (to create a shallow, sheltered bay) are offset by decreases due to the deepening of Kingsbury Bay (Figure 4-8).

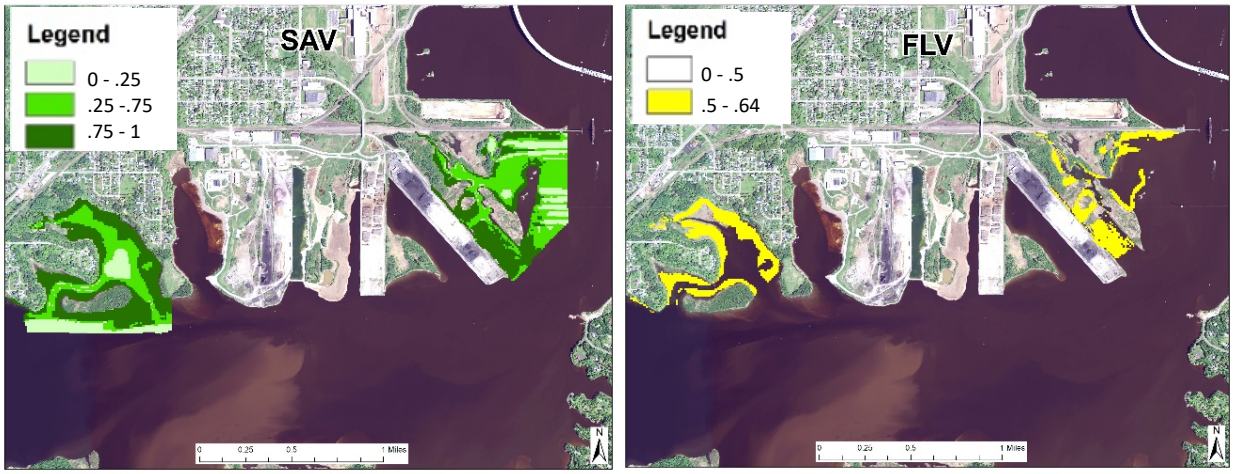

Figure 4-8. Probability of post-restoration occurrence (analogous to percent cover) for submerged aquatic vegetation (SAV; left) and floating leaf vegetation (FLV; right) based on the habitat restoration concept plan.

Table 4-9. Predicted Area Suitable for Wild Rice and Aquatic Vegetation at Kingsbury Bay and Grassy Point Currently (Existing) and in the Future (Post Restoration)

Aquatic Vegetation Type [a]	Aquatic Vegetation Area (acres)					
	Kingsbury Bay Existing	Kingsbury Bay Post Restoration	Kingsbury Bay Change	Grassy Point Existing	Grassy Point Post Restoration	Grassy Point Change
Wild Rice	79.5	75.7	-3.8	34.4	37.3	2.9
Floating Leaf: 0-50%	65.8	83.2	17.4	123.6	117.3	-6.3
Floating Leaf: >50%	35.8	31.2	-4.5	17.6	23.1	5.5
Submerged Aquatic Vegetation: 0-25%	18.1	24.0	6.0	40.4	42.3	2.0
Submerged Aquatic Vegetation: 25-75%	9.9	28.9	19.0	50.1	57.1	7.0
Submerged Aquatic Vegetation: >75%	73.6	61.5	-12.1	50.8	41.1	-9.7

[a] The aquatic vegetation areas are given by the corresponding probability of occurrence (analogous to percent cover). Estimates do not account for woody debris and therefore, overestimate suitable habitat.

Removing the Kingsbury Creek delta, which is currently dominated by invasive cattails, is likely to increase conditions suitable for wild rice (Figure 4-9); however, there will be little change in the total suitable wild rice habitat area because deepening both Grassy Point and Kingsbury Bay will offset the gain from removing the Kingsbury Creek delta (Table 4-9). At present, there is little wild rice at these locations, despite the physical suitability of both sites, presumably due to woody debris. Post habitat restoration, wild rice restoration efforts (i.e., spreading wild rice seed) at both sites should increase the amount of wild rice within the project area.

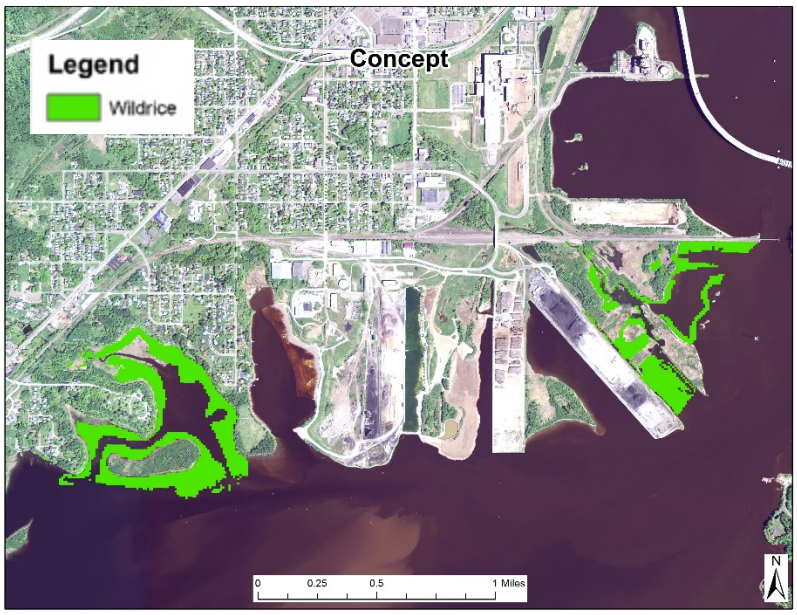

Figure 4-9. Post-restoration area suitable for wild rice based on the habitat restoration concept plan.

Restoration of Kingsbury Bay will likely provide habitat suitable for Black Crappie and Bluegills and will create open-water shore fishery and winter ice fishing opportunities. Grassy Point is close to the main river channel, and the restored habitat may offer a shore fishery for Walleye, particularly during spring and early summer. Habitat restoration is highly likely to increase aquatic habitat for migratory waterfowl. Habitat restoration may also increase nesting habitat for some species, depending on the riparian vegetation that develops post-restoration.

Park Improvements

Park Construction

Potential impacts to water quality and existing wetlands during trail and amenity construction will be evaluated and mitigation actions determined during the park improvements process. Based on the concept plans, any potential negative impacts on water quality and habitat are expected to be short-term, restricted to the construction period. In the long-term, park improvements can contribute to improvements in water quality through the selection of features and vegetation that help control stormwater, erosion, and runoff and can provide safe access to the river for the community. In addition to fishing piers and other amenities that will provide access to the river, the City of Duluth is proposing to build a new swimming beach at Indian Point Campground, near the mouth of Kingsbury Bay, after habitat restoration is complete.

Park Operations and Maintenance

Park improvements will increase access for both shore fishing and boat fishing, providing greater opportunity to catch both resident and migratory gamefish species (Figure 4-10). Multiple factors will affect the use of the project area by neighborhood residents from Irving and Fairmount for fishing. These factors include proximity to the project area, improved trail systems, new fishing docks, and improvements in other infrastructure, as well as greater abundance of desirable game fish owing to the deepened habitat. Improved fishing conditions may also draw anglers who currently fish at other locations along the river. The concept plan includes four new shore fishing locations at Grassy Point, including a fishing pier on the large island with access to deep water. To improve fishing, the existing pier at Indian Point Campground will be moved to the inside of the bay, close to the deep hole that will be created at the mouth of Kingsbury Bay. Improving fishing access is highly likely to generate more angler activity at the sites. Because other parts of the river will remain contaminated with PCBs, fish consumption advisories will remain after project completion. It is possible that visible improvement in habitat quality at Kingsbury Bay and Grassy Point could lead to the perception that the fish are safe to eat despite posted consumption advisories. Without improvements in public communication regarding the risk of fish consumption, some anglers will be unaware of or else ignore fish consumption advisories and consume more fish from the project areas than advised, potentially resulting in negative health impacts.

The area suitable for boating is also highly likely to increase (Table 4-10). We predict that there will be a net gain of 12 acres suitable for human-powered boating and a net gain of 46 acres suitable for recreational boating.

Figure 4-10. Areas suitable for shore fishing (left), as well as human-powered boating and recreational boating (right) based on the habitat restoration concept plan. Area suitable for shore fishing based on fishing piers proposed in the concept plan. Human-powered boating includes kayaking and canoeing, and recreational boating includes motorized watercraft.

Table 4-10. Predicted Area (acres) of Kingsbury Bay and Grassy Point Suitable for Shore-based Fishing, Human-powered Boating, and Recreational Boating

Recreation Scenario [a]	Kingsbury Bay Existing	Kingsbury Bay Post Restoration	Kingsbury Bay Change	Grassy Point Existing	Grassy Point Post Restoration	Grassy Point Change
Shore Fishing	5.2	3.5	-1.7	2.4	18.3	16
Human-powered Boating	101.1	113.9	12.8	140.3	139.9	-0.4
Recreational Boating	27.8	58.2	30.4	95.6	111.3	15.7

[a] Area suitable for shore fishing based on fishing piers proposed in the concept plan. Human-powered boating includes kayaking and canoeing, and recreational boating includes motorized watercraft.

The new swimming beach within Indian Point Campground at the mouth of Kingsbury Bay will provide new opportunities to access the river. At present, there is not a swimming beach along this part of the river; the closest designated swimming beach along the river is on Park Point (over 10 miles from the project sites). This improved access will disproportionately benefit the Irving, Fairmount, and Spirit Valley neighborhoods, which have no other access to local, safe swimming along the St. Louis River.

4.2.5 Potential Health Impacts Related to Changes in Water Habitat and Quality

With respect to environmental contaminants, human health impact is generally measured with respect to exposure risk. At Kingsbury Bay and Grassy Point, the two greatest health concerns arise from consuming contaminated fish and becoming ill from contact with the water.

Habitat Restoration – Construction and Operation

Sediment contamination within the project area does not pose a health risk from physical contact, but there is a risk associated with eating contaminated fish from the project area. Covering the area of greatest contamination at Grassy Point with clean sediment is highly likely to reduce PCBs and dioxins concentrations in sediment, recognizing the concentrations are low. Further, improving wetland extent will likely reduce the bioavailability of PCBs and dioxins, and subsequently bioaccumulation in fish. As a result, it is **highly likely** that the habitat restoration will have a positive impact on the risk of disease from fish consumption and **benefit health**, because the restoration is likely to decrease contaminant sediment concentration and bioavailability in the project area. The incremental improvement will be relatively small because the current risk is low. Nevertheless, this will positively impact the overall health of anglers and those who consume resident fish caught in the project area, especially those who are most vulnerable, including infants, children, and ethnic and racial minorities. It is also **highly likely** that the project would **benefit health** by reducing the risk of sediment-contact related risks, such as skin

and eye ailments, from contaminants. This would most benefit people wading at Grassy Point, who are most likely to be recreational users launching canoes or kayaks.

It is also **possible** that improving water and habitat quality will **benefit health** by reducing stress associated with actual and perceived contamination in the project area, benefitting mental health and increasing neighborhood satisfaction (Schwarzenbach et al, 2010; Saad, 2009; Leslie & Cerin, 2008). Improving the water and habitat quality at these sites can also improve social capital and recreational, spiritual, and cultural opportunities, all of which have associated health benefits (see related pathways). It is **possible** that the restoration will improve local water quality because wetlands can filter excess nutrients and sediments from tributaries. In turn, this might reduce the risk of waterborne illness, **benefitting health**. Any reduction in risk would most benefit Irving and Fairmount Park residents, especially youth, and Indian Point campground users who are likely to utilize the new swimming beach.

Park Improvements – Construction and Operation

Park construction is **highly likely** to have **no impact** on health related to water and habitat quality owing to its short-term nature. Park improvements can **benefit health** by providing amenities such as boat launches, fishing piers, and swimming beaches to encourage safe access to and use of the river and by selecting features and vegetation that help control stormwater, erosion, and runoff. The park improvement is **highly likely** to **benefit health** and have a positive impact on the risk of disease because it will provide improved shore fishing access to the restored habitat, with decreased contaminant sediment concentrations. The benefit will be greatest for anglers who fish from shore, as well as their family and friends with whom they share the fish. While improving fishing access is **highly likely** to generate more angler activity at the sites, without improvements in public communication regarding the risk of fish consumptions, some anglers will be unaware of or else ignore fish consumption advisories and consume more fish from the project areas than advised, potentially **detracting from health**.

Park improvements are also **highly likely** to have a positive impact on stress and stress-related conditions, **detracting from health**, because people will be able to experience the restored habitat, which will alleviate concerns regarding water and habitat quality. The benefit will be greatest to those who use the project area, including Irving, Fairmount, and Norton Park residents and recreational users of Indian Point campground, the Western Waterfront Trail, and the project area. Park operations are also **highly likely** to **benefit health** by having a positive impact on the risk to swimmers of waterborne illness. However, this assumes that the swimming beach to be built at Indian Point campground will be routinely monitored for water quality and officially closed when necessary to protect public health. If it is not managed on the basis of water quality, the operations are **highly likely** to **detract from health** because swimmers might use the swimming beach when conditions present a risk to health. The impact would be greatest for Irving, Fairmount, and Norton Park residents, especially youth, and Indian Point campground users, who would swim at the new swimming beach.

Table 4-11 provides a summary of the baseline health status and characterization of health impacts related to water habitat and quality during the various project phases.

Table 4-11. Characterization of Impacts Related to Water Habitat and Quality

Pathway							
Water Habitat and Quality	Baseline Health Status With respect to environmental contaminants, human health impact is generally measured with respect to exposure risk. Many of the gamefishes in the St. Louis River should only be eaten once per month or not at all due to elevated concentrations of mercury (a neurotoxin) and polychlorinated biphenyls (PCBs; a carcinogen), which are related to sediment contamination; however, based on creel surveys, about half (52%) of summer anglers and most winter anglers (90%) are either unaware of or do not heed consumption advisories. With regard to waterborne illness, concentrations of bacteria (*Escherichia coli*, or *E. coli*) in the river do periodically exceed Minnesota Department of Health criteria (235 MPN 100 ml^{-1}), indicating a high risk of contracting a waterborne illness, and resulting in a temporary beach closure to protect the public. Exposure to contaminants (actual or perceived) is also known to cause stress and stress-related conditions. While the City of Duluth has been rated one of the least stressed cities in the U.S., the prevalence of stress-related health outcomes (e.g., high blood pressure and mental health) are elevated in the study area as compared to the City and sometimes even the National rates.						
Project Phase	**Direction**	**Likelihood**	**Magnitude**	**Distribution**	**Severity (Intensity)**	**Permanence**	**Strength of Evidence**
Habitat Restoration Construction/ Operations	No Change during construction despite potential for sediment disturbance and leaks/spills, as access to sites and surrounding waters will be restricted; overall Benefit Health through improved water, sediment, and habitat quality	Highly Likely	Moderate	Disproportionate Impacts - Homeowners, Western Waterfront Trail users, campground users, Irving, Fairmount, and Norton Park residents, especially youth, and anglers who fish in and around the project locations and their families who consume gamefish would be most impacted; disproportionate effects on infants and children, as well as racial and ethnic minorities	Moderate to Severe	Positive impact will take a Long-Time, but will be Long-Lasting	Strong

Project Phase	Direction	Likelihood	Magnitude*	Distribution	Severity (Intensity)	Permanence	Strength of Evidence
Park Improvement Construction	No Change, although could Benefit Health depending on placement of proposed stormwater garden	Highly Likely	Low	Disproportionate Impacts - Homeowners and neighborhood members, anglers who fish in and around the project locations, Western Waterfront Trail users, and campground users	Minor	Short-term	Limited
Park Improvement Operations and Maintenance	Benefit Health, as long as the space is maintained, beach monitoring is conducted at the new swimming beach, and advisories are effectively communicated	Highly Likely	Moderate	Disproportionate Impacts - Shorefishing anglers, Irving, Fairmount, and Norton Park residents, especially youth, and Indian Point campground users would be most impacted because there is not a local swimming beach or extensive shore fishing opportunities at present	Moderate	Immediate and Long-Lasting as long as the space is maintained and beach monitoring is conducted at the new swimming beach	Strong; assumes communication strategy to inform public of beach closures and fish consumption risks are effective

4.2.6 Main Findings and Preliminary Recommendations Related to Water and Habitat Quality

Based on the main Assessment findings of this pathway, these preliminary recommendations were developed for promoting the positive health impacts and mitigating the adverse health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvements projects. For more details on these recommendations, including their intended purpose and implementation, as well as any additional recommendations added after review by the community and stakeholders, see the consolidated list of final HIA Recommendations in Section 5.

Main Finding

The project will likely improve water quality at both sites, but have little impact on waterborne pathogens. Adding a swimming beach to the area potentially increases exposure to waterborne illness, but also will provide a variety of health benefits.

- Follow best practices for stormwater management, erosion and runoff, and equipment leaks during the construction phases and implement mitigations, as necessary
- Identify regional stormwater outfalls and implement additional stormwater management practices to reduce potential impacts of combined sewer overflows (CSOs) at the future swimming beach at Kingsbury Bay
- Design the stormwater pond identified in the concept plan to intercept stormwater to maximize its ability to protect Kingsbury Bay water quality
- Implement routine beach monitoring at the future Kingsbury Bay swimming beach

Main Finding

Adding clean sediment and increasing wetland extent will likely cause the health risk of eating resident fish from the project area to improve. Improving fishing access will likely result in increased consumption of fish from the project area.

- Develop a sediment remediation target protective of human health based on surface-weighted area contaminant concentration, particularly for dioxins
- For a future project, cap or remove sediments to the east of the Grassy Point project area (currently outside the project area) to reduce bioavailability of dioxins
- Implement a fish monitoring program that includes mercury, dioxins, and PCBs, and targets both resident and migratory fish species
- Provide ethnically-appropriate communication on consumption-related risk that addresses specific-contaminant risk as well as fish species and size
- Conduct creel surveys focused on fishing within the AOC, and include information on race, ethnicity, location of residence, age, and fish consumption habits
- Should contaminant concentrations of certain fish species or sizes at the project sites meet human health guidelines, promote the consumption of local fish due to its health benefits

Main Finding

The project will substantially increase aquatic habitat and restore native aquatic plants. The project will have the greatest benefit for submerged aquatic vegetation and fish that prefer either vegetated or deep-water habitat.

- Develop a long-term, non-native species management plan for both Grassy Point and Kingsbury Bay
- To sustain the ecological integrity of the site, provide interpretative signage that provides information on wetland habitat types and the benefits each habitat provides for fish, reptiles, birds, and people
- Identify upland habitats within the site suitable for trees, and develop goals for the upland plant community that takes into account future changes in invasive species, water level, and climate
- Where compatible with project goals, protect existing high-quality aquatic plants at Kingsbury Bay
- Develop habitat plans for marsh birds, wading birds, and migratory waterfowl

4.3. Equipment Operation, Traffic, and Transport

Construction equipment, trucks, and vehicles are all sources of noise, light, and air pollution and have the potential for spills and leaks. Excavation and transportation of material (sediment and wood waste) increases the risk of exposure to particulate matter and contaminants, which can cause cardiovascular and pulmonary disease, cancer, and other chronic disease. Increased local truck and vehicle traffic can lead to congestion and increased time spent in traffic, and in the case of truck and heavy equipment traffic, the potential to damage roadways, all of which may be a source of stress for local residents and commuters. Equipment operation and increased traffic also present the potential for accidents, which can result in injury and even death.

4.3.1 Pathway of Impact

Figure 4-11 shows the pathways by which the proposed habitat restoration project and subsequent park improvement projects could potentially impact equipment operation, traffic, and transport.

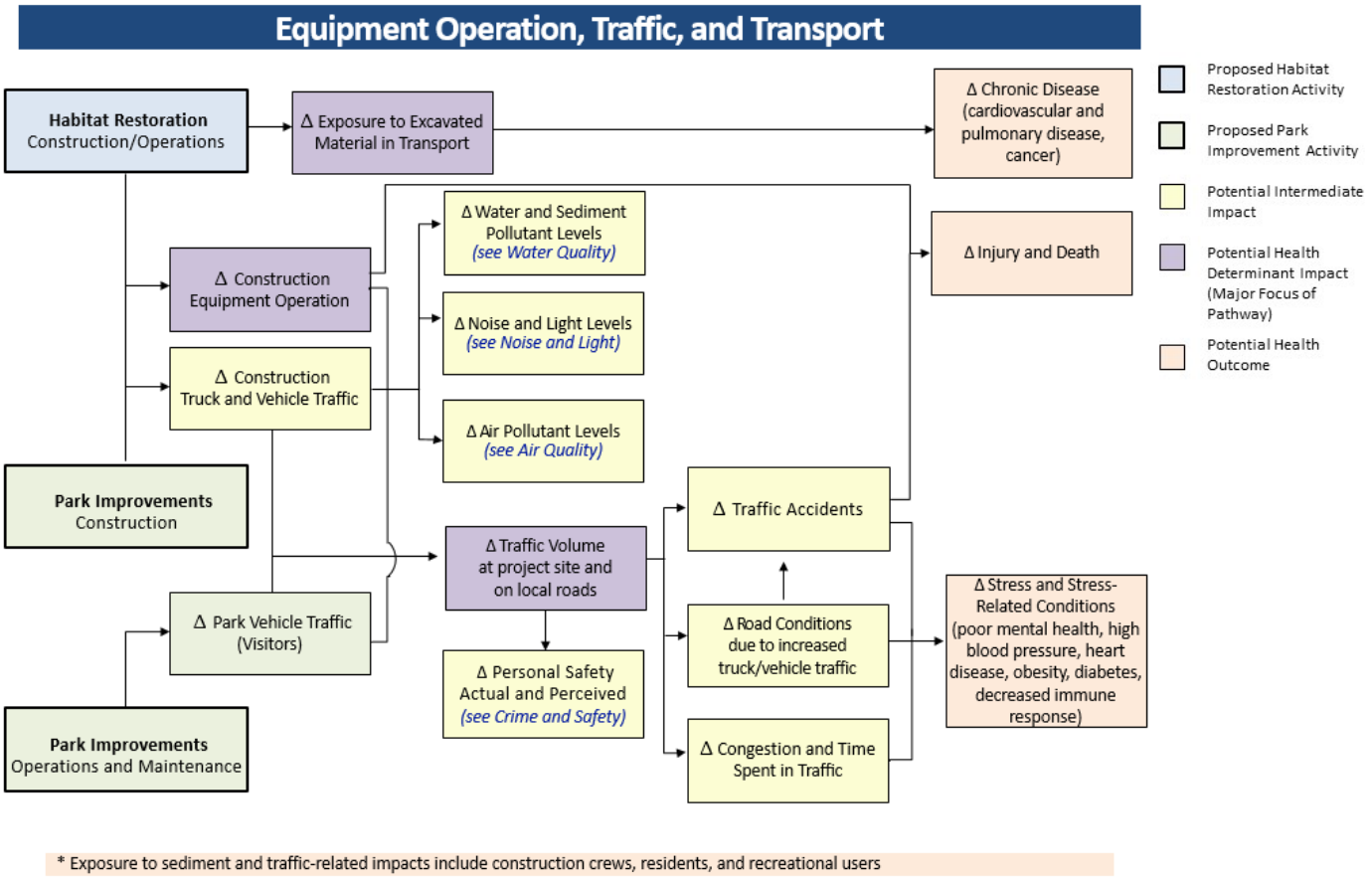

Figure 4-11. Equipment Operation, Traffic, and Transport pathway diagram.

4.3.2 Results of the Literature Review

Equipment

Habitat restoration and park improvements both require the use of heavy equipment and other construction-related equipment. Construction is a high hazard industry that can expose workers to hazards, such as moving machinery and equipment; electrocutions; slips, trips, and falls; noise; cold and heat stress; respiratory and contact exposures; musculoskeletal disorders; and others (OSHA, n.d.-b; CPWR, 2018; NIOSH, 2018a). In 2017, there were 198,100 nonfatal injuries and illnesses reported in the construction sector according to the Bureau of Labor Statistics (2018). One in five worker deaths in private industry in 2017 were in construction (n=971) and of those construction worker deaths, one third were due to falls (39.2%); other leading causes include being struck by an object (8.2%), electrocution (7.3%), and caught in or between equipment, collapsing structures, or material (5.1%) (OSHA, n.d.-a; NIOSH, 2018b). Compared to the general U.S. workforce, construction workers are more likely to be male (90.0% versus 53.0%), Hispanic (29.9% versus 16.3%), and foreign-born (26.9% versus 18.1%) (NIOSH, 2018b). The Occupational Safety and Health Administration (OSHA) has established standards for construction and vehicle and equipment operation to improve worker safety, and the National Institute for Occupational Safety and Health (NIOSH) has a program aimed at eliminating construction-related injuries, diseases, and fatalities.

Traffic and Transport

Habitat restoration and park improvements work and increased park visitation can have an impact on road conditions and traffic in the area. While regular vehicle traffic can affect pavement conditions, trucks and heavy construction vehicles are a major cause of road damage due to their weight (CBO, 2011; SSTI, 2011). In addition to affecting physical road conditions, changes in the number of vehicles using roadways can impact traffic patterns, commute times, congestion, and more. Extensive research has been conducted showing the impact of transportation on health, via safety, air quality, noise, and mobility and access to goods and services (Dannenberg & Sener, 2015). Unintentional injuries, including traffic–related injuries, have been the leading cause of death among individuals 1 to 44 years of age in the United States for some time (Heron, 2018). Motor vehicle–related accidents are one of the leading causes of death in the United States (CDC, n.d.). Motorized vehicles have been shown to be a major contributor to air pollution (Transportation Research Board, 2002), which can cause respiratory illness; chronic diseases, including cardiovascular disease, hypertension, stroke, and cancer; and even premature death (WHO, 2005; Peng, et al., 2009; Health Effects Institute, 2010; Litman, 2013; CDC, 2015; Dannenberg & Sener, 2015; Cohen, et al., 2017); for more on this, see Section 4.4. Motorized traffic also produces noise (Berglund & Lindvall, 1995; Miedema & Oudshoorn, 2001; Bluhm, Nordling, & Berglind, 2004), which can contribute to adverse health effects (Dannenberg & Sener, 2015); for more on this, see Section 4.3.5. Motorized transportation can also contribute to physical inactivity. Each additional hour spent in a car per day increases the likelihood of obesity (RWJF, 2012; Hoehner, Barlow, Allen, & Schootman, 2012). The health costs of traffic accidents, air pollution, and physical activity in the U.S. are hundreds of billions of dollars each year (Urban Design for Health & American Public Health Association, 2010; RWJF, 2012).

In addition to these documented health impacts, longer commutes, traffic congestion, variability in commute times, and roadway conditions have been associated with a number of negative health impacts, including increased stress and decreased satisfaction and well-being (Koslowsky, Kluger, & Reich, 1995; Hennessy & Wiesenthal, 1997; Kluger, 1998; Novaco, 2001; Hill & Boyle, 2007; Gottholmseder, Nowotny, Pruckner, & Theurl, 2009; Werner & Evans, 2011; Hilbrecht, Smale, & Mock, 2014; Legrain, Eluru, & El-Geneidy, 2015; Higgins, Sweet, & Kanaroglou, 2018). Common health-related consequences of stress include diabetes, obesity, heart disease, depression, cognitive impairment and other age-related chronic disorders (Yaribeygi, Panahi, Sahraei, Johnston, & Sahebkar, 2017).

Another factor related to both the operation of construction equipment and vehicles/trucks is the potential for fuel or material spills. An event of significant magnitude could impact roadway or waterway access and elevate the potential for contamination-related health risks.

4.3.3 Existing Conditions Related to Equipment Operation, Traffic, and Transport

Equipment Operation

The only existing equipment operation associated with the two project sites is the use of equipment for park maintenance, such as mowers to mow edges of trails and smaller equipment used for trail maintenance.

Traffic and Transport

In the study area, there are several main roadways (Figure 4-12):

- Grand Avenue/Highway 23 Corridor – an arterial route into Duluth that provides access to land uses along the St. Louis River and links neighborhoods in West Duluth to the rest of the city
- 63rd Avenue, 59th Avenue, and Central Avenue – north-south collector routes
- Raleigh Street – the only east-west collector roadway in the study area.

Grand Avenue, 59th Avenue, Central Avenue, Raleigh Street, and Waseca Industrial North Road all currently serve as truck routes. Daily traffic volumes and measures of flow and congestion on some of these truck routes are shown in Table 4-12. The City of Duluth has a proposal to extend Waseca Industrial to Grand Avenue, which would allow trucks to be prohibited in the neighborhood all together; however, this is a new road project proposal and may not occur until after habitat restoration is complete.

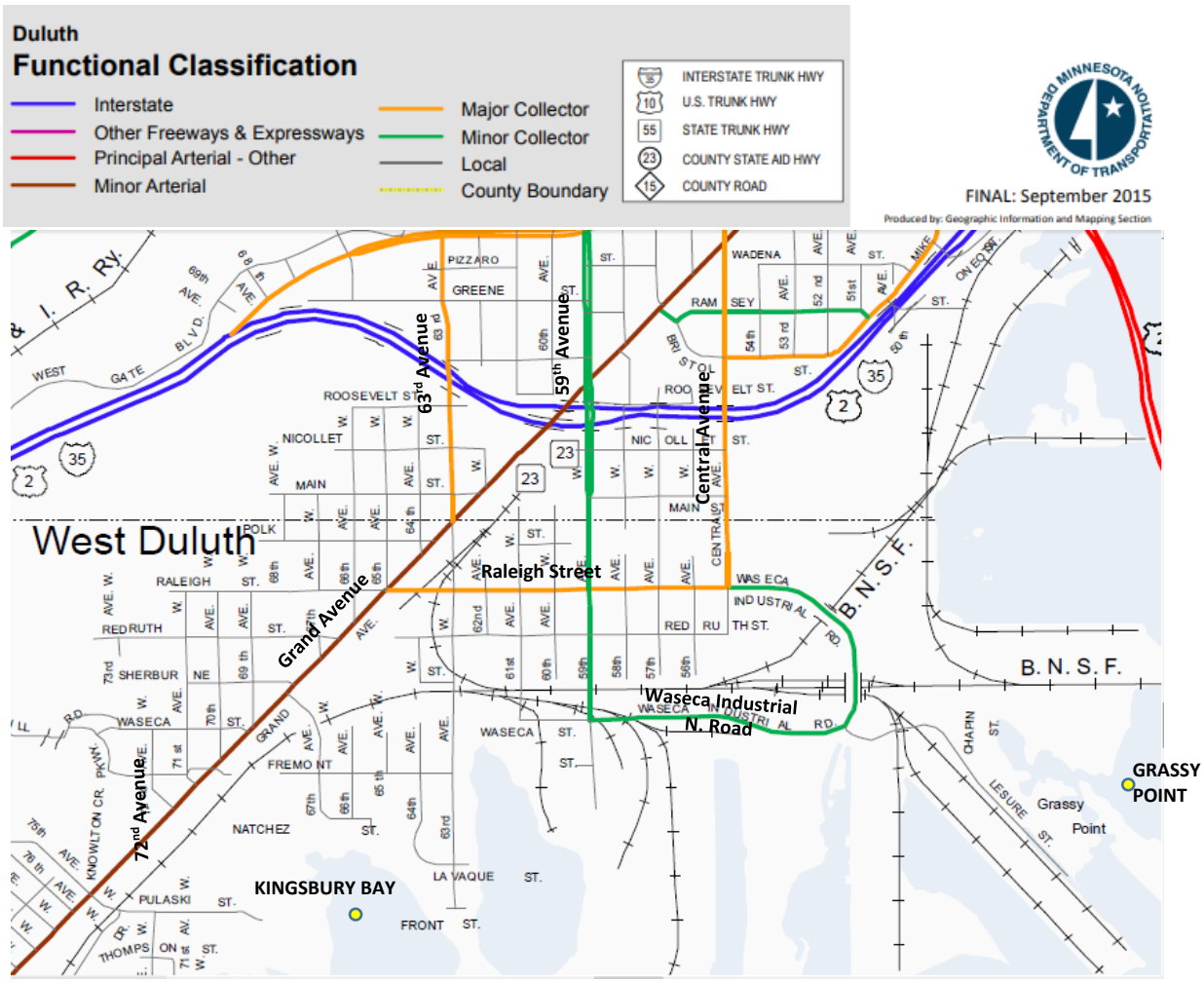

Figure 4-12. Classifications of roadways in Duluth. Source: (MNDOT, 2015)

Table 4-12. Annual Average Daily Traffic and Levels of Service for Major Streets That Could Potentially Be Used for Truck Transport

Street	AADT*	Motorized Travel LOS Description†
Grand Avenue	8,300-15,300 (2017)	LOS B - Virtually no congestion
Central Avenue	5,800-10,900 (2017)	LOS C - Slight delays during peak hours
Raleigh Street	1,300 (2017)	LOS A - No congestion
Waseca Industrial Road	810-1450 (2018)	LOS A - No congestion

* Annual Average Daily Traffic (AADT) = traffic volume in vehicles per day (MNDOT Traffic Mapping Application, https://www.dot.state.mn.us/traffic/data/tma.html)

† Level of Service (LOS) indicates flow and congestion of motorized traffic (Toole Design Group, 2016). LOS C, D, E and F are associated with declines in convenience and comfort.

The Duluth-Superior Metropolitan Interstate Council (MIC) – the bistate (Minnesota-Wisconsin) metropolitan planning organization (MPO) for the Duluth-Superior metropolitan planning area – conducted a study of the Grand Avenue/Highway 23 corridor (Duluth-Superior MIC, 2013). In the western portion of the HIA study area, the land use along Grand Avenue from 72nd Avenue West to Raleigh Street is considered "low-density urban" (Figure 4-13). There is very little residential development along the highway in this area and building setbacks vary from 10 feet to over 100 feet. Heading east along Grand Avenue from Raleigh Street to 62nd Street, land use in this area is considered "higher-density urban," with a dense mix of single- and multi-family residential development along the north side of the highway. Buildings on this portion of the corridor are adjacent to the road and only set back 9-15 feet (Duluth-Superior MIC, 2013).

Figure 4-13. Grand Avenue from 72nd Ave W to Raleigh St (top) and from Raleigh St to 62nd Street (bottom). Source: Duluth-Superior Metropolitan Interstate Council (MIC) 2013.

In addition to connecting many of the neighborhoods in the West Duluth area and serving as a local route for commuters, Grand Avenue also serves as a regional thoroughfare for individuals trying to access recreational amenities in the area and for trucks hauling freight. According to the Minnesota Department of Transportation (MNDOT), trucks account for approximately 4% of the current daily traffic on Grand Avenue, and due to less stringent weight restrictions, is often used by heavy haul trucks. In the western portion of the corridor, Grand Avenue is also in close proximity to a rail line that provides the opportunity for intermodal transfers.

Accidents

Between 2005 and 2014, 210 vehicle crashes occurred in the Western Port Area Neighborhood study area (similar to the HIA study area, but excludes Grand from Pulaski to South 67th Avenue W); the majority of these involved vehicles striking another parked or moving vehicle (Toole Design Group, 2016). Of the 210 crashes, 82 occurred on Grand Avenue. Of these, 31 were rear-end crashes (37%), 22 were sideswipe crashes (27%), and 15 were right-angle crashes (18%) (Toole Design Group, 2016).

No accidents are known to have occurred during equipment operation maintaining Grassy Point.

4.3.4 Potential Impacts to Equipment Operation, Traffic, and Transport

The habitat restoration and park improvement projects will increase equipment operation and truck and vehicle traffic at and near the project sites and along the material transport routes in the short-term (during habitat restoration and the construction phase of park improvements). In the long term (post-construction), there may be increased traffic at and around the sites due to the park improvements and other park investment efforts currently planned in the study area as part of the St. Louis River Corridor Initiative (https://duluthmn.gov/parks/parks-planning/st-louis-river-corridor/).

Increases in equipment operation and truck and vehicle traffic will be experienced disproportionately by those living, working, going to school, or recreating at or near the project sites and along the material transport routes. The magnitude of the population affected will depend greatly on the material transport route chosen, as well as the timing of construction earthwork activities at Kingsbury Bay and any increases in park visitor traffic.

Habitat Restoration

The habitat restoration work was originally planned to occur over a two year period, targeted to begin in June 2019 with equipment mobilization and staging and is anticipated to end during the winter of 2020, although the contract was not scheduled to end until September 2021 (MNDNR, 2019). Due to a number of variables, habitat restoration is now scheduled to be complete in summer 2022. Excavation of the Kingsbury Bay delta is planned to occur by mechanical dredging during the winter months and by hydraulic dredging during the summer months, although some mechanical dredging may also be required during the summer months. At Grassy Point, mechanical excavation of wood waste and placement of Kingsbury Bay sediment will take place during the winter and water-based mechanical and hydraulic dredging during the summer (MNDNR, 2018). Due to the projected duration of the project, equipment will operate between 7 am - 7 pm Monday through Saturday, with exception of the hydraulic dredging (MNDNR, 2019). Dredge and barge crews may work 24 hours a day, 7 days a week, if needed; however, no truck hauling will occur after 7 pm (MNDNR, 2019). Per the MNDNR Public Information Meeting conducted on May 21, 2019 (MNDNR, 2019), “advance notice of any schedule change, and other project updates are posted on the project website” (https://www.dnr.state.mn.us/st-louis-river-restoration/index.html). There is also a place on the project website for individuals to sign up for email updates regarding the project.

Construction and Operations Equipment

The habitat restoration work will require a fleet of equipment at both project sites, trucks and construction vehicles on local roads, and boats and barges on the St. Louis River. The following equipment, truck and vehicle traffic is expected during the habitat restoration work (Personal communication, John Lindgren, MNDNR):

Kingsbury Bay

Construction Equipment Operation

- Skid steers to shave off vegetation at the beginning of the project during the winter months (perhaps 2 or 3)
- Trucks to drag around tires to “drive down the frost”
- Large excavators (Figure 4-14) removing frozen material (perhaps 2)
- Large barge at Kingsbury to direct the cutter heads on the Hydraulic Dredge Unit
- Pumps on barges at perhaps two or three locations along the pipeline corridor from Kingsbury Bay to Grassy Point

Figure 4-14. Typical excavation equipment

Construction Truck, Vehicle, and Water Traffic

- Dump trucks (Figure 4-15) hauling material from Kingsbury Bay to Grassy Point (perhaps 10, but maybe less)
- Barges to move wood waste from excavated areas to the disposal area (perhaps 2)
- Boats to transport fuel, supplies, and personnel to and from the pumps and hydraulic dredge

Figure 4-15. Typical dump truck

Sediment Dredging

The total sediment to be dredged at Kingsbury Bay is estimated at 179,900 cubic yards (cy) – an increase of 9,900 cubic yards over original estimates. Of this total volume, 80,200 cy will be mechanically dredged (an increase of 24,000 cy over original estimates) and 93,400 cy will be hydraulically dredged.

Grassy Point

Construction Equipment Operation

- Large barge to support an excavator to remove wood waste at Grassy Point (Figure 4-16)
- Large barge with an excavator to take wood waste out of transport barges and place in the island disposal location
- Barge with a dredge material distributor for biomedium being placed at Grassy Point
- Trucks and excavators at XIK Dock #7 if used as a material management facility.

Figure 4-16. Typical mechanical dredge

Construction Truck and Vehicle Traffic

- Dump trucks hauling material from Kingsbury Bay to Grassy Point (perhaps 10, but maybe less)
- Barges to move wood waste from excavated areas to the disposal area (perhaps 2)
- Boats to transport fuel, supplies, and personnel to and from the pumps and hydraulic dredge

Traffic and Material Transport

Kingsbury Bay

Approximately 80,200 cy of material will be mechanically dredged from Kingsbury Bay during the winter (preferred) or summer. This sediment from Kingsbury Bay will be transported to Grassy Point (and potentially two other site St. Louis River locations – 21st Avenue W and 40th Avenue W). Given that 80,200 cy are estimated to be mechanically dredged, and assuming dump trucks with a 10-cy capacity, approximately 8,020 truckloads will be needed to transport the sediment by truck; this is an increase from the 6,500 truckloads originally estimated. Transport by truck would result in a maximum of 20 trucks/hour, seven days a week for approximately three months.

For the sediment moved by truck, MNDNR will work with the City of Duluth to determine the truck route. Information about the truck routes and the duration of use will be posted to the MNDNR project website (https://www.dnr.state.mn.us/st-louis-river-restoration/index.html), once they are determined and approved by the City of Duluth. There are currently two possible truck routes for transporting the mechanically-dredged cattail-free material (22,953 cy) from Kingsbury Bay to Grassy Point (Figure 4-17); transport may also occur by barge:

- Kingsbury Bay to Pulaski Street to Grand Avenue to North Central Avenue to Waseca Industrial Road to Lesure Street. [This is the route that has been proposed to date and is approximately 4 miles long. Note the acute angle needed for trucks to make the turn at Grand and North Central.]

- Kingsbury Bay to Pulaski Street to Grand Avenue to Raleigh Street to Waseca Industrial Road to Lesure Street. [This is another possible truck route identified by the HIA Team, but the City of Duluth has voiced concerns over sending trucks through the Irving neighborhood. This route is approximately 1 mile shorter than the proposed route.]

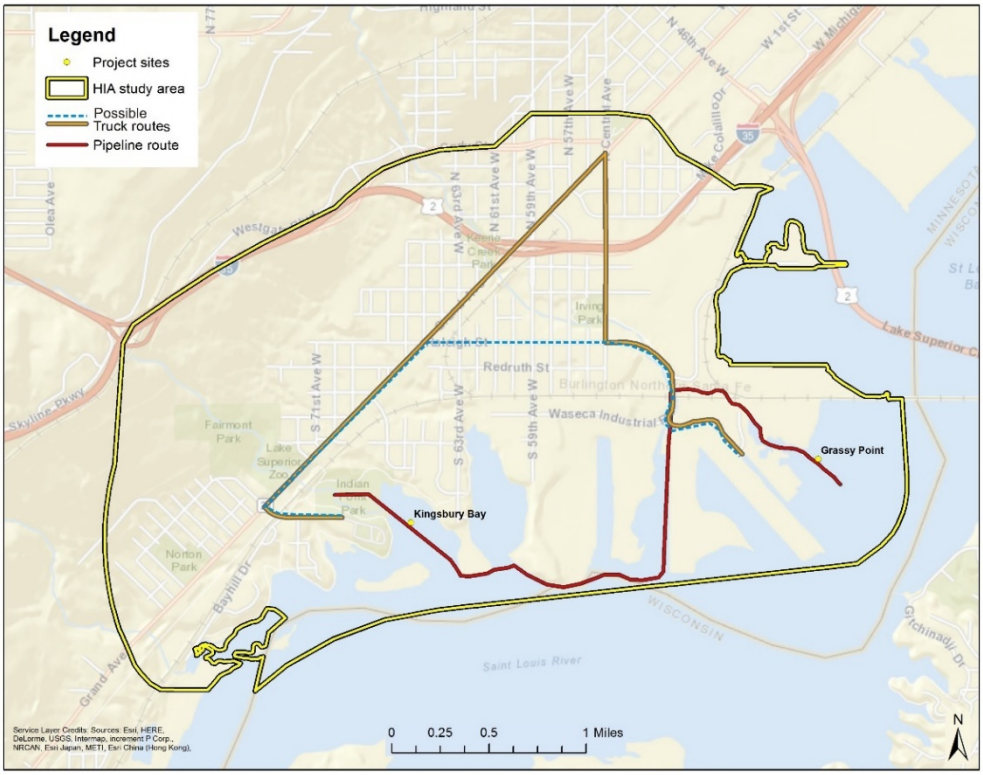

Figure 4-17. Truck and pipeline routes for movement of material from Kingsbury Bay to Grassy Point.

Note: The City of Duluth has also proposed to extend Waseca Industrial Road to Grand Avenue, which would allow the trucks to avoid the neighborhood all together; however this is a new road project proposal and the road work may not occur until after the habitat restoration work is complete.

Regardless of the truck route chosen, trucks will enter and exit Kingsbury Bay via Pulaski Street, which also services Indian Point Campground (i.e., a Duluth campground with river access) and a parking lot at

the trailhead of the Western Waterfront Trail (i.e., WWFT; a trail that runs along the St. Louis River shoreline from Grassy Point past Kingsbury Bay to Riverside and provides hiking, biking, birding, and access to the river). Also nearby is a trailhead of the Willard Munger State Trail (i.e., an extensive multi-use trail that offers hiking, biking, in-line skating, cross-country skiing, and snowmobiling). Trucks will have to cross the WWFT in order to gain access to Kingsbury Bay shoreline, so mechanical dredging will likely result in closures to both the WWFT and the trailhead parking lot. Access and staging areas will be chosen to minimize the impacts to the WWFT. In the May 2019 MNDNR Public Information Meeting, the public was notified of these closures (MNDNR, 2019). The handout from this meeting noted that "the Western Waterfront Trail (WWFT) will be closed at Kingsbury Bay (there will be closure and rerouting signs), the Kingsbury Bay parking lot will be used to stage equipment, alternate parking for WWFT access will be established on Spring Street, and the Kingsbury Bay snowmobile trail will be closed" (MNDNR, 2019).

The remaining sediment from Kingsbury Bay will be hydraulically dredged (93,400 cy) and moved by pipeline or barge to Grassy Point in the summer. It is proposed that the hydraulic dredging pipeline will extend across the water, following the shoreline, to the former XLK Superfund site, through an abandoned storm sewer at the head of the XLK site, and then into Grassy Point – a distance of approximately 3 miles; alternatively, the pipeline may be routed in the water around the C. Reiss dock and into Grassy Point (Figure 4-17). The pipeline and hydraulic dredging equipment may interfere with recreational boating in the area and should be properly marked to prevent accident and injury. In addition to transport to Grassy Point, some sandy material from Kingsbury Bay may be placed along the Indian Point Campground shore in support of the future swimming beach planned by the City.

Note in Figure 4-17 that there is also an active rail line south of the Irving neighborhood that runs between the two sites. This represents an additional transport method not previously considered for the project – transport by rail. This transport method would greatly minimize the road and water traffic associated with the habitat restoration work.

Grassy Point

Transport of material from Grassy Point will include movement of excess sediment to 40th Avenue West (19,000 cy), excess wood waste transported to the incinerator or other locale (up to 5,000 cy), and debris (8,849 cy). There is no longer any excavation and transport of contaminated material proposed and almost all wood waste will be re-used at Grassy Point. No details were available about transport of these materials from Grassy Point; it is assumed the material will be transported by truck, but possible routes are unknown. Of particular concern is transport of the wood waste.

L

Exposure Risk

While remediation of Kingsbury Bay and Grassy Point was generally not required, it was determined that restoration of the sites could proceed, but should consider the presence of contaminants. The risk of exposure to contaminants during habitat restoration would be via the sediment or wood waste dredged from the sites and equipment and vehicle spills and leaks (e.g., fuel, oil, etc.). There would be a potential risk for workers and recreational water users during excavation of the material and for workers, residents, commuters, and recreational users during material transport.

The main truck routes to and from Kingsbury Bay and Grassy Point (Figure 4-17) are in close proximity to multi-unit, single-unit, and low income or public housing; senior centers and care facilities; schools; businesses; and parks and trails:

- Grand Avenue to Central Avenue – 1392 residences (of which 37 are public housing, housing authority or low-income housing), 2 schools, 5 senior centers or care facilities, and numerous parks and trails
- Grand Avenue to Raleigh Street – 745 residences (of which 20 are public housing, housing authority or low-income housing), 1 school, 2 senior centers or care facilities, and numerous parks and trails

The setback of buildings from the street varies along the possible truck routes, but in many areas, the building setback is minimal (Figure 4-18). In some areas along Grand Avenue northeast of Raleigh Street, the building setback is only 9-15 feet. Building setback along Raleigh Street is also minimal, and many of the streets also serve as on-street bike routes.

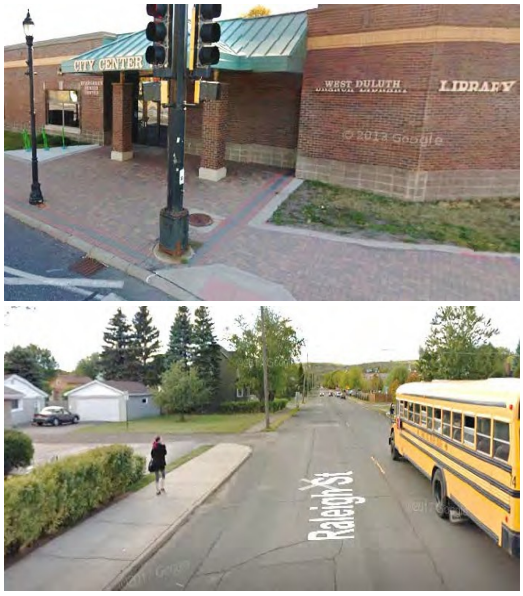

Figure 4-18. Building setback along the possible truck routes varies but in some areas is minimal.

The timing of the excavation and transport will be at the discretion of the construction contractor. MNDNR prefers that transport of Kingsbury Bay sediment by truck be done during winter to minimize exposure, as soil would be frozen, and it is assumed that residents would be indoors more.

However, an analysis of photos taken outdoors in the study area from December through March and then posted to Panoramio, Instagram, or Flickr (n=124) indicates that there are still recreational users during the winter months in the study area. Foot traffic in the Spirit Valley business district at Grand Avenue and Central Avenue is also expected to continue through the winter months, as well as foot traffic to schools, libraries, and other amenities and businesses along the truck routes.

Park Improvements

L

A

Park improvements construction is at a much smaller scale than the habitat restoration work. The park improvements schedule and plans were not detailed at the time of the HIA, but it was assumed that no night-time work would occur with this phase of the project – either during construction activities or during operation and maintenance activities following completion of the park improvements. In addition to this assumption, the following assumptions were made about the types and equipment that will be needed for the park improvements work.

Construction and Operations/Maintenance Equipment

Construction

A

Equipment needed at Grassy Point would be relatively light duty (e.g., equipment needed to build a path or board walk and perhaps upgrade the parking lot). At Kingsbury Bay, there are a number of amenities that would require earth movement (e.g., the swimming beach and stormwater retention pond), so presumably excavators, front loaders, and dump trucks would be required, at a minimum.

L

Quantities of construction-related equipment and trucks, as well as the duration of park improvements construction is unknown, but will be at a smaller scale than the habitat restoration work.

Operations and Maintenance

A

Equipment used for park maintenance, such as mowers to mow edges of trails and smaller equipment used for trail compaction or regrading would be utilized during operations and maintenance of the parks (Figure 4-19).

Figure 4-19. Equipment needed to maintain the parks will likely consist of mowers and other similar equipment.

Traffic and Transport

L

Quantities and routes of construction-related traffic is unknown, but will be at a much smaller scale than habitat restoration work. No data was available on park-related vehicle traffic, but it is assumed the vehicle traffic will increase in the vicinity of the parks, given the improvements at the project sites and other park investment efforts being undertaken in the study area.

A

4.3.5 Potential Health Impacts Related to Changes in Equipment Operation, Traffic, and Transport

Habitat Restoration and Park Improvements

The project is **highly likely** to increase equipment operation and truck and vehicle traffic at/near the project sites and material transport routes in the short-term (during the construction phases of habitat restoration and park improvements). In the long term, there may be increased traffic at and around the sites given the improvements at these sites and other park investment efforts currently planned in the study area as part of the St. Louis River Corridor Initiative. Increased equipment operation, traffic, and transport in the study area will **detract from health** because it increases the risk of accidents and related injury, stress due to changes in travel conditions, and exposure to particulates and contaminants during equipment operation and material transport.

Equipment operation, traffic, and transport impacts will be experienced **disproportionately** by those living, working, going to school, or recreating at or near the project sites and material transport routes. Construction crews, pedestrians, motor vehicle operators, and recreational users in the area will be more vulnerable to these impacts. The magnitude of the population affected will depend greatly on the

material transport route chosen, as well as the timing of earthwork activities at Kingsbury Bay and any increases in park visitor traffic.

The health impacts of these changes can be minor (annoyance and stress) to severe (injury, illness, and death) and will likely be experienced immediately. During construction, the traffic and transport impacts will be short-term (limited to the duration of construction), but during operation and maintenance of the parks the impacts will be long-lasting. There is strong evidence supporting the link between both equipment operation and traffic/transportation and injury and death. The link between exposure to material in transport and chronic diseases, such as cardiovascular and pulmonary disease and cancer, is limited.

Table 4-13 provides a summary of the baseline health status and characterization of health impacts related to equipment operation, traffic, and transport during the various project phases.

Table 4-13. Characterization of Impacts Related to Equipment Operation, Traffic, and Transport

Pathway							
Equipment Operation, Traffic, and Transport	**Baseline Health Status** Traffic accidents in the study area have resulted in minor to moderate injuries; from 2005-2014, no traffic-related fatalities have occurred. There have also been no known injuries during equipment operation as part of park maintenance activities at Grassy Point. Accidents, deteriorated road conditions, and traffic delays and congestion can all be sources of stress. While the City of Duluth has been rated one of the least stressed cities in the U.S., the prevalence of stress-related health outcomes (e.g., high blood pressure and mental health) are elevated in the study area as compared to the City and sometimes even the National rates. There is no local data related to rates of chronic disease as a result of exposure to contaminated sediment; however, the prevalence of some potential health outcomes related to exposure are higher in the study area as compared to the City or Nation.						
Project Phase	**Direction**	**Likelihood**	**Magnitude***	**Distribution**	**Severity**	**Permanence**	**Strength of Evidence**
Habitat Restoration Construction/ Operations	Detract from Health	Highly Likely	Moderate to High	Disproportionate Impacts - Those living, working, going to school, or recreating at or near the project sites and transportation routes would be most impacted. Construction crews, pedestrians, motor vehicle operators, and recreational users in the area will be more vulnerable to these impact	Minor (annoyance and stress) to Severe (injury, illness, and death)	Immediate, but Short-Term (limited to the duration of habitat restoration construction and operations)	Strong (equipment operation, traffic, transport, and injury/death); Limited (exposure to material in transport and chronic disease)
Park Improvement Construction	Detract from Health	Highly Likely	Low to High	Disproportionate Impacts - Those living, working, going to school, or recreating at or near the project sites and transportation routes would be most impacted. Construction crews, pedestrians, motor vehicle operators, and recreational users in the area will be more vulnerable to these impacts	Minor (annoyance and stress) to Severe (injury, illness, and death)	Immediate, but Short-Term (limited to the duration of park improvements construction	Strong
Park Improvement Operations and Maintenance	Detract from Health	Possible	Low to High	Disproportionate Impacts - Those living, working, going to school, or recreating at or near the project sites would be most impacted. Maintenance crews, pedestrians, motor vehicle operators, and recreational users in the area will be more vulnerable to these impacts	Minor (annoyance and stress) to Severe (injury, illness, and death)	Immediate, but Long-Lasting	Strong

* The magnitude of individuals impacted will depend on the quantities of equipment and traffic and the material transport routes chosen.

4.3.6 Major Findings and Preliminary Recommendations Related to Equipment Operation, Traffic, and Transport

Based on the Assessment findings of this pathway, these preliminary recommendations were developed for promoting the positive health impacts and mitigating the adverse health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvements projects. For more details on these recommendations, including their intended purpose and implementation, as well as any additional recommendations added after review by the community and stakeholders, see the consolidated list of final HIA Recommendations in Section 5.

Main Finding

Equipment operation and transport of sediment and other materials to and from the project sites will impact roadway and water traffic and have the potential to result in traffic accidents and injury to construction crews, residents, and recreational users.

- Clearly communicate the project, its duration, and expected roadway and water traffic impacts to residents, schools and daycare centers, senior centers and care facilities, businesses, and recreational users in the project area and along the transport route
- Hire companies with a proven safety record; local companies given priority in hiring can benefit the local economy
- Route trucks and other equipment and vehicle traffic away from neighborhoods, schools and daycare centers, senior centers and care centers, and recreation areas to the extent possible
- Take additional safety measures and/or limit the amount of truck traffic at the start and end of the school day to create safe routes to and from school for children
- Take into account traffic patterns, road geometry, and frequency and timing of trips to minimize traffic disturbance and congestion
- Repair damage to roadways caused by construction vehicles and transport (e.g., potholes, broken curbs, collapsed manholes, rail crossing damage)
- Consider the use of rail or barge to transport sediment between the two sites, as these routes would avoid residential areas, minimize roadway traffic impacts, and likely reduce the number of trips given the larger capacity of rail cars and barges
- Minimize impacts of the hydraulic pipeline and project-related barge traffic on recreational boaters and the navigation channel of the St. Louis River by using signs, markings, and warnings
- If the parks and other nearby enhancements increase the amount of traffic in the area post-construction, consider traffic calming measures (such as speed humps, raised crosswalks/intersections, traffic circles, medians, curb extensions or bump-outs, and signage or pavement markings) to minimize the risk for increased accidents

Main Finding

Excavation and transport of sediment and other materials to and from the project sites have the potential to increase exposure to particulate matter and contaminants.

- Route material transport traffic away from neighborhoods, schools and daycare centers, senior centers and care facilities, and recreation areas
- Minimize exposure to material in transport by covering transport vehicles and implementing other fugitive dust measures

4.4 Air Quality

Air quality is often described by the presence of and risk of exposure to harmful pollutants. Both natural and human activities influence outdoor air quality. Air pollutants can have natural sources, such as plants releasing pollen or wildfires, or may originate in human activity including burning fossil fuels, industrial emissions, spills, or accidents (EPA, 2019b). Combustion of diesel fuel in construction equipment and truck and vehicle traffic release pollutants such as fine particulate matter (PM2.5), particulates, ozone, and other toxics. Exposure to outdoor air pollutants and particulates can impact an individual's willingness to spend time outdoors, exacerbate asthma conditions, cause respiratory illness or disease, exacerbate heat-related illnesses and chronic disease (such as cardiovascular disease, hypertension, stroke, and cancer), and can cause premature death. Children, the elderly, and people with pre-existing health conditions are more vulnerable to health impacts of poor air quality.

4.4.1 Pathway of Impact

Figure 4-20 shows the pathways by which the proposed habitat restoration project and subsequent park improvement projects could potentially impact air quality.

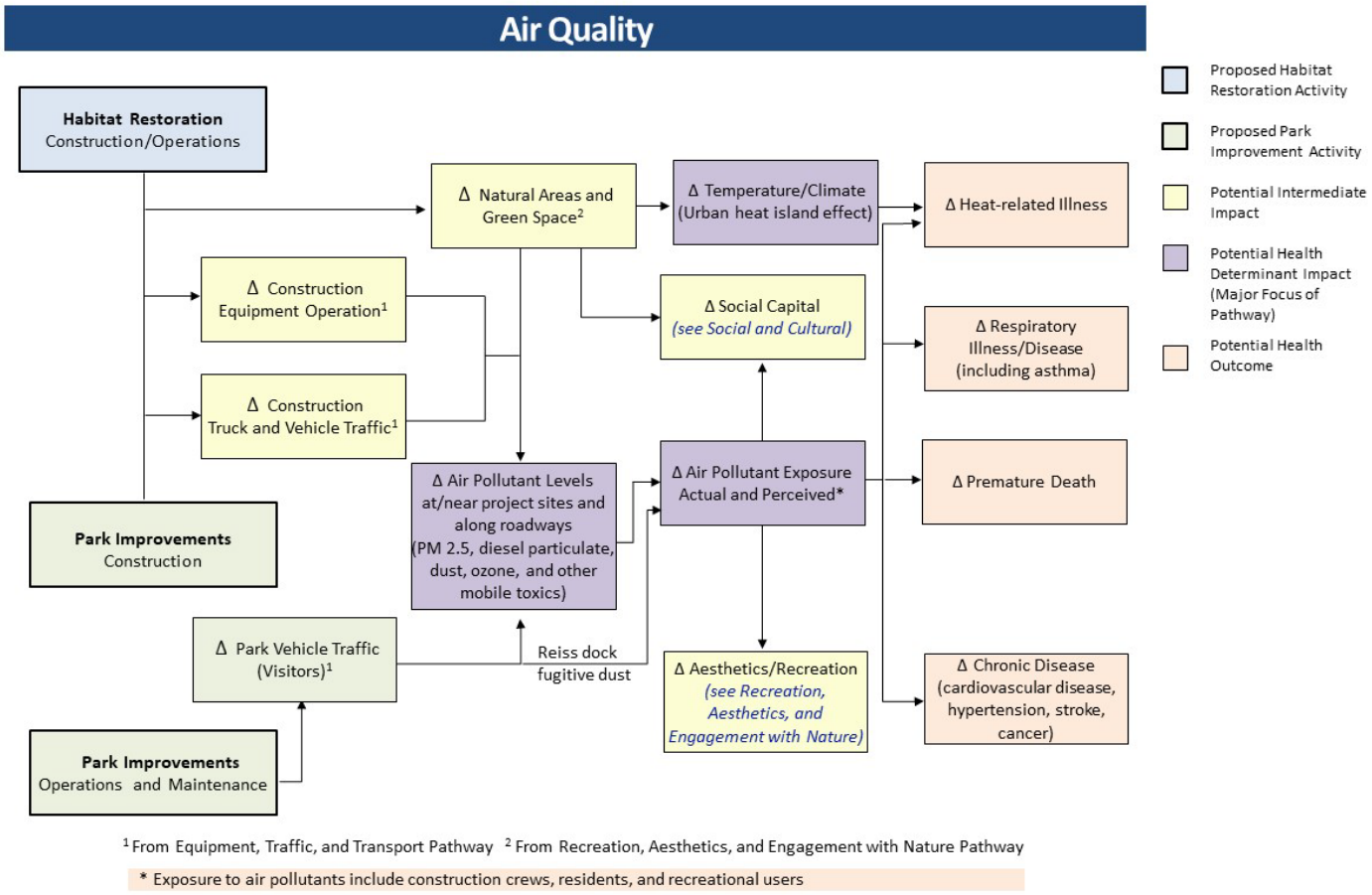

Figure 4-20. Air Quality pathway diagram.

4.4.2 Results of the Literature Review

Air Pollution and Human Impacts

Air Pollution

Most air pollutants result from human activities, including motorized transportation (e.g., motor vehicles, trains, ships, etc.) and industrial processes (e.g., manufacturing, refinings, power production, etc.) (EPA, 2012c; EPA, 2019c). The EPA monitors and regulates six harmful air pollutants for the protection of public health and the environment. Those "criteria" air pollutants include particulate matter, ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide and lead (EPA, 2018), all of which can come from road sources (e.g., vehicle emissions, pavement deterioration, tire particles, fuel and lubricant residue, etc.). Monitoring of other air pollutants occurs at the national, regional, state, and local levels; however, regulated standards have not yet been established for those pollutants.

Motor vehicles release harmful gases and particles into the air that travel and react to form other harmful pollutants (Figure 4-21). Harmful air pollutants such as airborne particles, nitrogen dioxide, and carbon monoxide are found in high concentrations along busy roadways and can persist as much as 300 meters or more from the road edge (EPA, 2015).

Figure 4-21. Motor vehicle and truck traffic are a major source of air pollution in cities.

The addition of plants, such as trees, shrubs, and grasses, along a street can influence the levels of ambient air pollutants. Some plants can contribute pollutants to the ambient air, such as volatile organic compounds (VOCs), which react with other pollutants to form ozone (Taha, 1996). However, low VOC-emitting species can actually reduce ozone levels, remove air pollutants, and reduce air temperature (Nowak, et al., 2000; Nowak, Crane, & Stevens, 2006). Trees and shrubs can reduce air pollutants by filtering pollutants from the air, absorbing pollutants (e.g., using carbon from gases in the atmosphere to build mass– a process known as carbon sequestration), and providing a physical barrier to the dispersal of pollutants, directing the air upwards and laterally, where it can mix with cleaner air (EPA, 2015; Nowak, Crane, & Stevens, 2006). Trees are the most efficient at filtering the air, followed by shrubs, then grasses (Givoni, 1991).

Air Pollution Exposure and Impacts

Exposure to air pollutants can increase respiratory symptoms, difficulty breathing, asthma, and risk of cardiovascular and respiratory disease; decrease the ability to ward off respiratory infections; damage lung tissue and the nervous system; and more (EPA, 2012c; EPA, 2016b). Persons most sensitive (vulnerable) to the effects of air pollutants are those with pre-existing respiratory conditions (e.g., persons with asthma and lung disease), the elderly, and young children (EPA, 2016b).

Schweitzer and Zhou (2010) examined neighborhood emissions and exposures in 80 metropolitan areas across the United States to determine whether air quality outcomes are better in compact, urban regions or in suburban and rural areas. They found that ozone concentrations were significantly lower in urban regions, but human exposures to ozone were higher. This is because urban areas are more densely populated, increasing the number of individuals exposed, but there is also more street-level activity (e.g., walking, biking, and street life) in urban areas, potentially increasing inhalation of pollutants even if the pollutants are present at relatively low levels. People who live, work, and go to school near roads are at a greater risk for adverse health effects associated with traffic-based air pollution; and low-income and other socially disadvantaged populations are typically located disproportionately in these near-road zones (EPA, 2015).

EPA performed an extensive review of the literature as part of their integrated science assessment for particulate matter (EPA, 2009a). Researchers found a positive association between short-term (24-hour) exposure to PM2.5 and a number of health outcomes, including cardiovascular disease, respiratory symptoms, and pre-mature deaths. Epidemiological studies reported consistent positive associations between exposure to PM2.5 and emergency room visits and hospital admissions for respiratory infections and cardiovascular-related symptoms. Currently, the National Ambient Air Quality Standards (NAAQS) for PM2.5 based on long-term and short-term exposures, are an annual average of 12.0 $\mu g/m^3$ (for sensitive populations)/15.0 $\mu g/m^3$ (for general public welfare) and 24-hour 35 $\mu g/m^3$, respectively (EPA, 2016c).

Ozone (O_3) is caused by complex chemical reactions in the atmosphere in the presence of ultraviolet radiation. Ground level ozone causes irritation of mucus membranes in the nose, throat, and airways (EPA, 2019d). Ozone also causes breathing problems and exacerbates symptoms of chronic respiratory diseases and reduced lung function (WHO, 2006; EPA, 2019d). Exposure to ozone for 6 to 7 hours, even at relatively low concentrations, significantly reduces lung function and induces respiratory inflammation in normally healthy people (non-asthmatics) (WHO, 2006).

Nitrogen dioxide (NO_2) is a normal component of ambient air that can react with water molecules in the air to form corrosive nitric acid and toxic organic nitrates, which contribute to acid rain. Nitrogen dioxide can reduce visibility and contributes to the development of ground level ozone and particulate matter (EPA, 2019e). A high level of nitrogen dioxide in the air causes significant inflammation of the airways, reduces lung function, and can lead to increased trips to the emergency room or hospital for difficulty breathing (EPA, 2019e).

Sulfur dioxide (SO_2) is a colorless reactive gas formed from burning sulfur-containing materials (EPA, 2019f). SO_2 affects the respiratory system, mainly through inflammation of lung tissue, and causes eye irritation (EPA, 2019f). People with asthma experience changes in pulmonary function and respiratory symptoms after periods of exposure to SO_2 as short as 10 minutes (WHO, 2006).

Carbon monoxide (CO) is an odorless, tasteless gas produced from the burning of fossil fuels (EPA, 2019g). When inhaled, CO enters the bloodstream where it prevents oxygen from bonding to hemoglobin, reducing oxygen delivery to the rest of the body and vital organs (EPA, 2019g). The loss of

oxygenated blood can lead to headaches, dizziness, nausea, and oxygen starved muscles (e.g., the heart). Long-term exposure or high exposures over a short amount of time can even cause death. Young infants, pregnant women, elderly, and persons with anemia, emphysema, or some types of heart disease have a higher risk of adverse health effects of CO exposure (EPA, 2019g). In cities, as much as 95% of all CO emissions may come from motor vehicle exhaust (EPA, 2008a).

Urban Heat Islands and Human Impacts

Urban Heat Islands

Climatologists have been studying the effects of urban development on climate conditions for several decades. Converting a permeable surface of soil or vegetation to an impermeable surface of pavement, concrete, or other material, can also change the ability of that surface to absorb, shed, and reflect heat. Infrastructure built of concrete, pavement, and metal, typically absorbs more energy than natural surfaces, reflecting less back to space. Berdahl and Bretz (1997) conducted a temperature survey of different building roof materials and found that on a dry, summer day, the roof surfaces were 50-90^{o}F (about 10-32^{o}C) higher than the ambient air temperature.

Warm surfaces can transmit heat to the surrounding air causing an increase in air temperature. As surface temperature rises, air temperature also rises, which can affect local climate conditions (Voogt & Oke, 2003). Development that increases impervious surface can lead to a phenomenon known as the urban heat island (UHI) effect. UHIs occur when urban, developed regions experience warmer temperatures than their rural, less-developed regions (EPA, 2008b). Daytime temperatures in urban areas are about 1-7°F higher than temperatures in outlying areas and nighttime temperatures are about 2-5°F higher (EPA, 2017).

Vegetation (i.e., trees, bushes, and grasses) plays an important role in regulating surface and air temperature, as shaded and wet surfaces resist temperature changes. Trees, especially deciduous trees (i.e., trees that grow and shed leaves) provide shading for surfaces, blocking the sun's radiation. Seasonal variations (e.g., leaf on or leaf off) influence changes in ground cover, which can impact surface temperatures. In addition to shading, plants release water into the surrounding air via evapotranspiration, which dissipates ambient heat and lowers air temperature (EPA, 2014). Elliot and Barnard (1990) found that tree size and texture can also influence wind flow, which has an impact on air temperature, as well.

Urban Heat Islands Exposure and Impacts

Urban heat islands exacerbate the effects of heat waves or relatively long periods of extreme heat. Living in areas that experience UHIs predisposes residents to health impacts of extreme heat events, which include general discomfort, heat-related illnesses, and complications with pre-existing health conditions, such as heart disease, behavioral disorder, and metabolic disorder. Although incidences are rare, extreme heat events can cause death. Those more vulnerable to extreme heat are children, older adults, and persons with certain heath conditions that predispose them to heat-sensitivity (Luber &

McGeehin, 2008). Dolney and Sheridan (2006) found that the average number of ambulance calls increased by 10% on "oppressively hot days," specifically in urban, industrial ,and recreation areas.

4.4.3 Existing Conditions Related to Air Quality

Industry

EPA regulates air quality by the authority outlined in the Clean Air Act. However, state and local governments perform most air quality monitoring (i.e., air sampling and data analysis). Facilities in the area that are regulated for air emissions include the C. Reiss Coal Company, Minnesota Power Inc - Hibbard Renewable Energy Ctr (2 locations), Verso Minnesota Wisconsin LLC -Duluth Paper Mill, and Hallett Dock Co - Dock 6. Only the C. Reiss Coal Company has had a noncompliance quarter in the last 3 years or a formal enforcement action in the last 5 years.

The C. Reiss Coal Company operates a bulk solid material handling facility directly adjacent to Grassy Point to the west. Materials such as coal, limestone, petroleum coke, salt, and other bulk solid fuels and bulk material commodities are unloaded onto a 19.5-acre storage pad area until they are loaded for final shipment. Dust emissions are controlled on-site with water when temperatures allow; other dust suppressants are used in freezing conditions. The facility was last inspected on February 4, 2020 with no violation observed. As of June 2020, the C. Reiss Coal Company is making plans to move its operations from Duluth across the St. Louis River to Superior, Wisconsin. The transition will likely take several years to complete.

Traffic

In Census tracts 33 and 34, over 5% and 2% of the population, respectively, live within 300 meters (984 feet) of roadways, making them at higher risk of exposure to diesel particulate matter (PM). As discussed in the Equipment Operation, Traffic, and Transport pathway (Section 4.3), several of the main roads in the study area are heavily traveled by both motor vehicle and truck traffic, and in some portions of the study area, building setbacks are minimal. GIS analysis shows some of the existing land uses within a 300-m buffer of the two possible truck routes for transporting material from Kingsbury Bay to Grassy Point – Grand Avenue to Central Avenue or Grand Avenue to Raleigh Street (Figure 4-22) – including residences, schools, senior centers and care facilities, and parks and trails. The percent tree canopy within 26 meters of the two possible truck routes is 20.82% and 25.24%, respectively; trees have the ability to filter air pollutants.

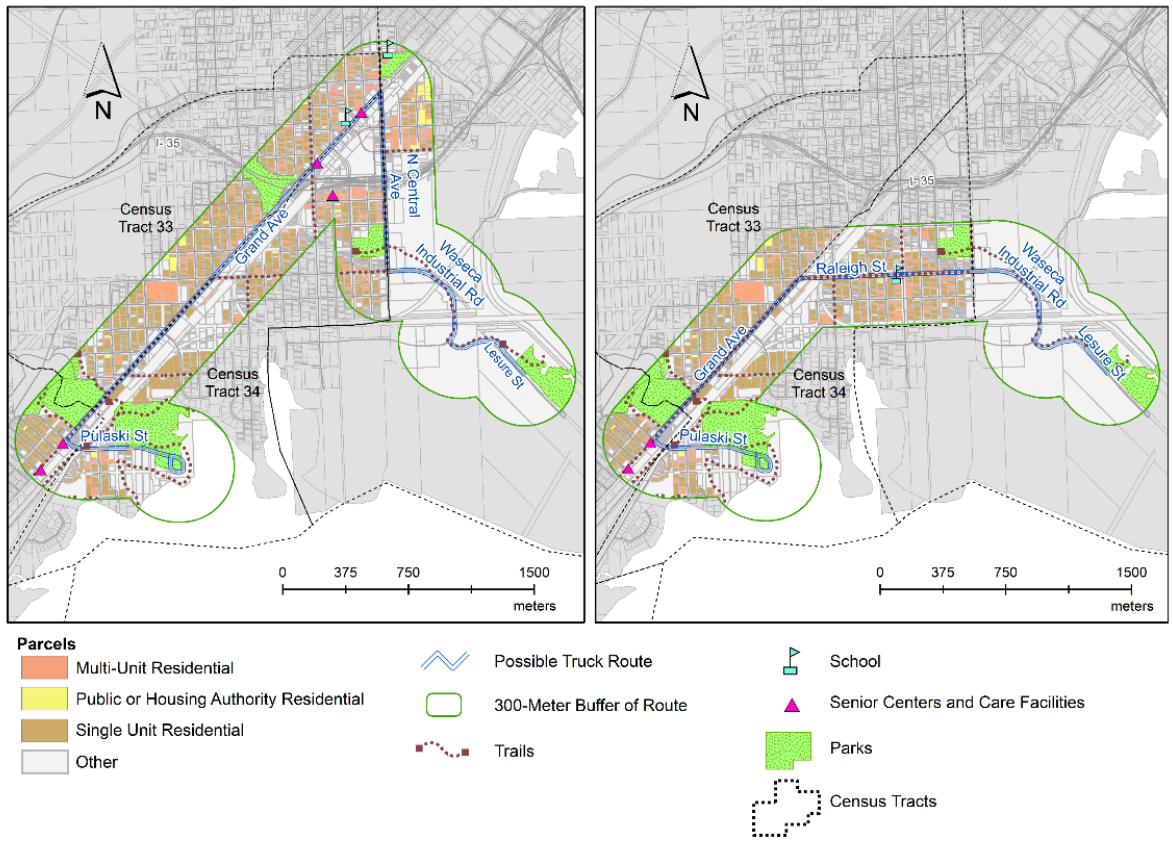

Figure 4-22. Select land uses within 300 meters of the possible truck transport routes - Grand Avenue to Central Avenue (left) and Grand Avenue to Raleigh Street (right).

Air Monitoring

There is one air quality monitoring site located off Waseca Industrial Road in the eastern part of the study area (AQS Site ID: 27-137-7555, MPCA Site ID: 7555) to monitor fugitive emissions from a variety of industrial and shipping facilities (Figure 4-23). This site, established in 2001, monitors every six days for total suspended particulates (TSP) and metals. Residential neighborhoods are located approximately 400 meters west of the site (MPCA, 2019). MPCA reports that metals did not exceed the lowest health benchmark at this monitor from 2010-2017 (https://www.pca.state.mn.us/air/air-toxics-data-explorer); however, TSP did exceed this standard. Figure 4-24 shows daily and annual TSP monitoring results from 2010-2018.

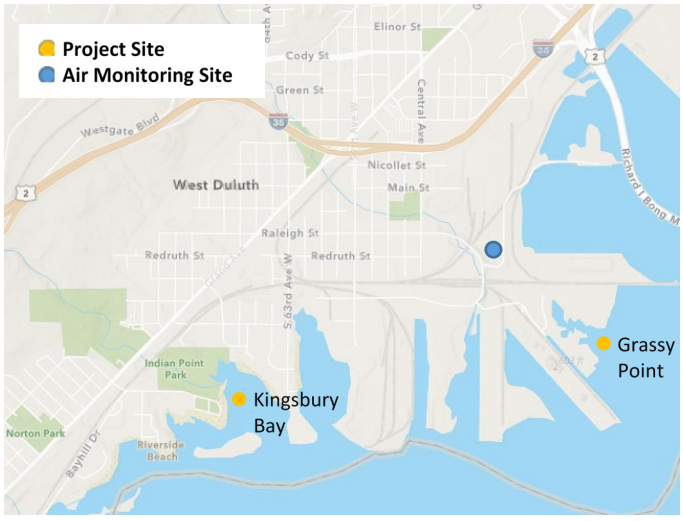

Figure 4-23. Location of air quality monitoring site in study area.

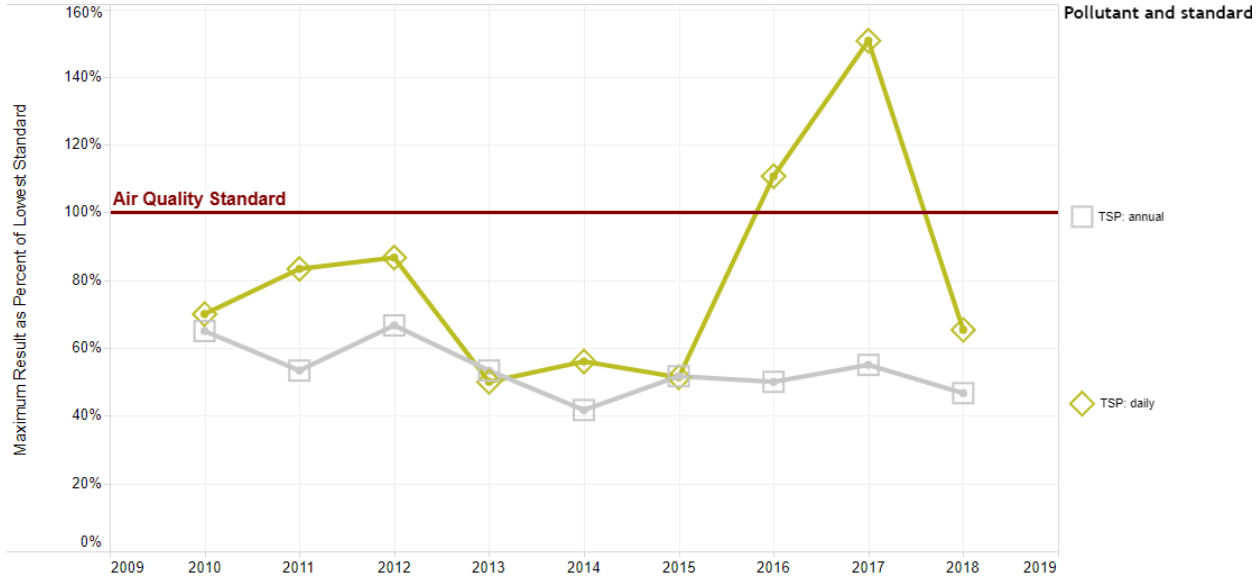

Figure 4-24. Total suspended particulate results from air monitor on Waseca Industrial Road, 2010-2018. Source: https://www.pca.state.mn.us/air/criteria-pollutant-data-explorer.

Table 4-14 shows that diesel PM environmental concentrations, human exposure estimates, and air toxics health risk estimates are higher in the Census tracts in which the sites are located compared to estimates for the county and state.

Table 4-14. Existing Air Quality-Related Conditions in the Study Area, As Compared to the County and State[a]

Existing Conditions	Tract 33	Tract 34	St. Louis County	MN
% population within 300-m of roadway	5.4	2.4	--	--
Outdoor Air – Diesel PM (µg/m^3)	1.3	1.1	0.3	0.4
Outdoor Air – Diesel PM Human Exposure Estimate (µg/m^3 annual average in human breathing zones)	0.6	0.5	0.2	0.4
Outdoor Air – Diesel PM Non-Cancer Respiratory Risk (Hazard Quotient[b])	0.12	0.11	0.04	0.08
Cumulative Air Toxics Cancer Risk[c] (risk per one million persons)	33.5	33.8	27.6	35.6
Cumulative Air Toxics Non-Cancer Respiratory Risk (Hazard Quotient[b])	1.98	1.73	1.03	2.20

[a] Source: EPA's Community-Focused Exposure and Risk Screening Tool (C-FERST), accessed 11/9/2017; air toxics data from the 2011 National-Scale Air Toxics Assessment (NATA).

[b] Hazard Quotient - the ratio of the potential exposure to a substance and the level at which no adverse effects are expected (calculated as the exposure divided by the appropriate chronic or acute value). A hazard quotient of 1 or lower means adverse noncancer effects are unlikely, and thus can be considered to have negligible hazard. For HQs greater than 1, the potential for adverse effects increases, but we do not know by how much.

[c] Cancer Risk - The probability of contracting cancer over the course of a lifetime, assuming continuous exposure (assumed in NATA to be 70 years).

4.4.4 Potential Impacts to Air Quality

Figure 4-25. Emissions from construction equipment are a source of air pollution.

Equipment operation and truck and vehicle traffic will increase air pollution in the study area and have the potential of placing construction crews, residents, and recreational users at increased risk of exposure to air pollutants (fumes, particulate matter, fuel combustion pollutants, dust, etc.) and their adverse health impacts. One of the largest sources of air pollution during the construction phase will be from the burning of diesel fuel in construction equipment (Figure 4-25), and during the transportation of sediment (via truck, rail, or barge). The particles from diesel fuel combustion are very small and are able to travel deep into the lungs and cardiovascular system. The health effects from air pollution are more serious for sensitive populations including children, elderly, and those with existing chronic lung or heart problems and diseases.

Emissions

Equipment Operation

Exhaust emissions measured from 18 different pieces of diesel-powered equipment used in earthmoving activities, included:

- Carbon dioxide (2608-2672 g/L);
- nitrogen oxide (3.5-63.1 g/L);
- hydrocarbons (0.5-16.3 g/L); and
- carbon monoxide (0.4-54.3 g/L) (Heidari & Marr, 2015).

Per the EAW, idling time for inactive equipment will be limited to 15 minutes, which will reduce the impact of equipment operation on air quality emissions. Air quality impacts of equipment operation during hydraulic dredging and earthwork activities at Kingsbury Bay during park improvements (e.g., building the beach and stormwater retention pond) have the potential to impact residents and recreational users due to the close proximity of these activities to residences and Indian Point Campground. It is assumed that equipment needed at Grassy Point will be relatively light duty and will not be a major air pollutant contributor. Air pollution from equipment used for park maintenance could impact recreational users, but is expected to be minor.

A

Truck Traffic

Construction traffic during habitat restoration and park improvements construction can increase congestion and disrupt road traffic and waterway navigation. Not only does this result in increased travel times, but also leads to greater fuel consumption and exhaust emissions. With increased idling and stop-and-go traffic, air emissions increase (Levy et al., 2010). Harmful air pollutants in these

emissions, such as airborne particles, nitrogen dioxide, and carbon monoxide, are found in high concentrations along busy roadways and can persist as much as 300 meters or more from the road edge (EPA, 2015), impacting those living, working, and playing in this near-road zone. Increases in air pollution (actual or perceived) can impact an individual's desire to spend time outdoors.

The land use analysis shown in Figure 4-22 identifies the existing land uses within a 300-m buffer of the two possible truck routes for transporting material from Kingsbury Bay to Grassy Point, including residences, schools, senior centers and care facilities, and parks and trails:

- Grand Avenue to Central Avenue – 1392 residences (of which 37 are public housing, housing authority or low-income housing), 2 schools, 5 senior centers or care facilities, and numerous parks and trails
- Grand Avenue to Raleigh Street – 745 residences (of which 20 are public housing, housing authority or low-income housing), 1 school, 2 senior centers or care facilities, and numerous parks and trails

A larger number of individuals are within the near-roadway zone of the Grand Avenue to Central Avenue truck route; these individuals also experience greater exposure to air pollution from Interstate 35 (I-35).

L
A

Impacts to air quality can be expected from transport of material from Grassy Point, however, no details on traffic, equipment, or routes were provided for park improvements work. It is assumed that a low to moderate number of individuals could be impacted during the construction phase of park improvements depending on the transport route chosen.

Vehicle Traffic

Vehicle traffic will likely increase in the vicinity of the parks post-park improvements, given the improvements at the project sites and other nearby park investment efforts currently planned as part of the St. Louis River Corridor Initiative. Increases in traffic will result in increased traffic-related air pollutants.

Fugitive Dust

Habitat restoration and park improvements construction may create temporary fugitive dust during handling, removal, and stockpiling of debris and sediment; truck and heavy equipment tracking and stirring up dust from the construction sites; and travel of trucks and cars in the vicinity of the sites, stirring up dust tracked to roadways. Fugitive dust is dust that is suspended in the air by wind or human activities and does not come out of a stack. Per the EAW, the contractor will be required to follow best management practices to reduce dust during habitat restoration, including covering loads, watering access routes, and placing temporary covers on exposed areas and stockpiles.

Vegetation, Air Quality, and Urban Heat Island Effects

Warmer conditions and more frequent and intense storms are predicted for the Great Lakes (MN Sea Grant, 2016). Planting trees, bushes, and greenery as part of habitat restoration and park improvements can reduce ambient air pollutants by absorbing pollutants, including greenhouse gases, and trapping the airborne particulates on their leaves. Increasing trees and vegetation through the habitat restoration and park improvements can combat urban heat island effects by reducing localized surface and air temperatures through shading and evapotranspiration.

4.4.5 Potential Health Impacts Related to Changes in Air Quality

Habitat Restoration and Park Improvements

The project is **highly likely** to increase equipment and truck and vehicle-related air pollution at and near the project sites and along material transport routes in the short term (during habitat restoration and the construction phase of park improvements). In the long term (post-construction), it is **possible** there will be increased traffic and traffic-related air pollution at and around the sites given the improvements at these sites and other park investment efforts currently planned in the study area as part of the St. Louis River Corridor Initiative. However, the vegetative features created by the habitat restoration and park improvements can filter air pollutants and particulates and reduce localized surface and air temperatures. In addition to the vegetative features created by habitat restoration and park improvements, **development of these sites as parks eliminates the potential for more severe air pollution that would accompany future industrial development at the sites were they not parks.**

Increased air pollution in the study area during habitat restoration and park improvements construction, as well as any traffic-related air pollution post-park improvements may **detract from health** for some individuals because exposure to air pollutants and particulates can exacerbate asthma conditions and cause respiratory illness or disease, heat-related illness, chronic disease (such as cardiovascular disease, hypertension, stroke, and cancer), and premature death. These impacts will be experienced **disproportionately** by those living, working, going to school, or recreating at or near the project sites and material transport routes. Children, the elderly, and those with pre-existing health conditions are more vulnerable to these impacts. The magnitude of the population affected will depend greatly on the material transport route chosen, as well as the timing of earthwork activities at Kingsbury Bay and any post-project increases in park visitor traffic. The vegetative features created by these projects in the long term can **benefit health**, by improving air quality and reducing surface and air temperatures.

Exposure to harmful air pollutants from equipment, truck, and vehicle emissions can impact human health in many ways (Table 4-15).

Table 4-15. Health Impacts of Air Pollution from Equipment, Truck and Vehicle Emissions Modified from EPA (2012c)

Pollutant	Sources	Health Effects
Ozone (O3)	Secondary pollutant typically formed by chemical reaction of volatile organic compounds (VOCs) and NOx in the presence of sunlight	Decreases lung function and causes respiratory symptoms, such as coughing and shortness of breath; aggravates asthma and other lung diseases leading to increased medication use, hospital admissions, ER visits, and premature mortality
Particulate Matter (PM)	Emitted or formed through chemical reactions; fuel combustion (e.g., burning coal, wood, diesel); industrial processes; agriculture (plowing, field burning); and unpaved roads	Short-term exposures can aggravate heart or lung diseases leading to respiratory symptoms, increased medication use, hospital admissions, ER visits, and premature mortality; long-term exposures can lead to the development of heart or lung disease and premature mortality
Oxides of Nitrogen (NOx)	Fuel combustion (e.g., electric utilities, industrial boilers, and vehicles) and wood burning	Aggravate lung diseases leading to respiratory symptoms, hospital admissions, and ER visits; increased susceptibility to respiratory infection
Carbon Monoxide (CO)	Fuel combustion (especially vehicles)	Reduces the amount of oxygen reaching the body's organs and tissues; aggravates heart disease, resulting in chest pain and other symptoms leading to hospital admissions and ER visits
Sulfur Dioxide (SO2)	Fuel combustion (especially high-sulfur coal); electric utilities and industrial processes; and natural sources such as volcanoes	Aggravates asthma and increased respiratory symptoms. Contributes to particle formation with associated health effects

Table 4-16 provides a summary of the baseline health status and characterization of health impacts related to air quality during the various project phases.

Table 4-16. Characterization of Impacts Related to Air Quality

Health Outcome							
Air Quality	**Baseline Health Status** No local data are available regarding respiratory illness, heat-related illness, disease, or premature death due to air quality. However, diesel PM environmental concentrations, human exposure estimates, and air toxics health risk estimates are higher in the Census tracts in which the sites are located compared to estimates at the county and state levels. Likewise, the prevalence of some potential health outcomes related to air pollution (e.g., asthma, coronary heart disease, chronic obstructive pulmonary disease) are higher in the study area as compared to the City or Nation. The prevalence of asthma in adults age 18 or older in Census tracts 33 (10.4%), 34 (10.5%), and 36 (9.0%) was higher compared to both the City and National prevalence, with exception of Census tract 36, which was slightly lower than the City average. In a Regional Health Survey conducted in 2015, 6.7% of respondents from the City of Duluth reported having chronic lung problems (Kjos, Kinney, Finch, & Peterson, 2016). From 2014-2018, 105 individuals in St. Louis County made an emergency room visit due to heat related illness (https://mndatamaps.web.health.state.mn.us/interactive/heat.html). And while rates of premature death are low in Minnesota, the rate is more than double in racially diverse areas where people are living in poverty (MDH, 2019).						
Project Phase	**Direction**	**Likelihood**	**Magnitude**	**Distribution**	**Severity**	**Permanence**	**Strength of Evidence**
Habitat Restoration Construction/ Operations	Detract from Health*	Highly Likely	Moderate to High**	Disproportionate Impacts - Those living, working, going to school, or recreating at or near the sites and transportation routes would be most impacted; children, the elderly, and those with pre-existing health conditions may be more vulnerable to the health impacts	Minor (annoyance) to Severe (premature death); Moderate Impacts (stress, illness, chronic disease)	Immediate, but Short-Term (limited to the duration of habitat restoration construction and operations)	Strong
Park Improvement Construction	Detract from Health*	Highly Likely	Low to High**	Disproportionate Impacts - Those living, working, going to school, or recreating at or near the sites and transportation routes would be most impacted; children, the elderly, and those with pre-existing health conditions may be more vulnerable to the health impacts	Minor (annoyance) to Severe (premature death); Moderate Impacts (stress, illness, chronic disease)	Immediate, but Short-Term (limited to the duration of park improvement construction)	Strong
Park Improvement Operations and Maintenance	Unsure/ Both Benefit (vegetation) and Harm (increased park traffic)	Possible	Low to High**	Disproportionate Impacts - Those living, working, going to school, or recreating at or near the sites would be most impacted; children, the elderly, and those with pre-existing health conditions may be more vulnerable to the health impacts	Minor (annoyance) to Severe (premature death); Moderate Impacts (stress, illness, chronic disease)	Impacts Immediate and could be Long-Lasting	Strong

* While the impacts of air pollution during habitat restoration and park improvements have the potential to detract from health, developing Grassy Point as a park eliminates the potential for more severe air pollution that would accompany future industrial development at the site were it not a park.

** The magnitude of individuals impacted will depend on the quantities of equipment and traffic and the material transport routes chosen.

4.4.6 Main Findings and Preliminary Recommendations Related to Air Quality

Based on the Assessment findings of this pathway, these preliminary recommendations were developed for promoting the positive health impacts and mitigating the adverse health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvements projects. For more details on these recommendations, including their intended purpose and implementation, as well as any additional recommendations added after review by the community and stakeholders, see the consolidated list of final HIA Recommendations in Section 5.

Main Finding

Equipment operation and truck and vehicle traffic will increase air pollution in the study area and have the potential of placing construction crews, residents, and recreational users at increased risk of exposure to air pollutants (fumes, particulate matter, fuel combustion pollutants, dust, etc.) and their adverse health impacts.

- Clearly communicate the project, its duration, and expected air pollution levels to residents, schools and daycare centers, senior centers and care facilities, businesses, and recreational users in the project area and along the transport route
- Provide a means for residents and other affected populations to provide feedback and/or lodge complaints about excess air impacts
- Include mitigation specifications in the contract (reduced idling and requirements for equipment fitted with catalysts and filters) and incentives for contractors with idle reduction policies, and newer or retrofitted equipment
- Route trucks and other equipment/vehicle traffic away from neighborhoods, schools, daycare centers, senior centers and care facilities, and recreation areas to minimize exposure to air pollution
- Consider the use of rail or barge to transport sediment between the two sites, as these routes would greatly minimize traffic-related air pollutants in the residential areas.
- Implement fugitive dust mitigation measures, including covering transport vehicles, watering access routes, and covering exposed soils/stockpiles

Main Finding

The vegetative features created by the habitat restoration and park improvements will have the ability to filter air pollutants and particulates and reduce surface and air temperatures.

- Select native trees and plants for planting. Trees have the greatest potential to filter air pollutants, followed by shrubs, and then grasses
- Select trees that have tall, broad canopies for increased shading and place in areas where people may congregate

4.5 Noise and Light Pollution

Noise and light pollution are unwanted or obtrusive sound or light that interferes with normal activities, diminishes quality of life, and has adverse effects on human health and ecosystem function (Seidman & Standring, 2010). Operating construction equipment, trucks, and vehicles all produce noise and when operating at nighttime, may produce excessive or misdirected light. Both noise and light pollution can cause sleep disturbance, impaired task or functional performance (which may lead to injury), stress, cardiovascular disease and hypertension, and affect ecosystem function, particularly in fauna. Noise pollution also has the potential to cause hearing impairment and has been associated with lowered cognitive performance among school-aged children.

4.5.1 Pathway of Impact

Figure 4-26 shows the pathways by which the proposed habitat restoration project and subsequent park improvement projects could potentially impact noise and light pollution.

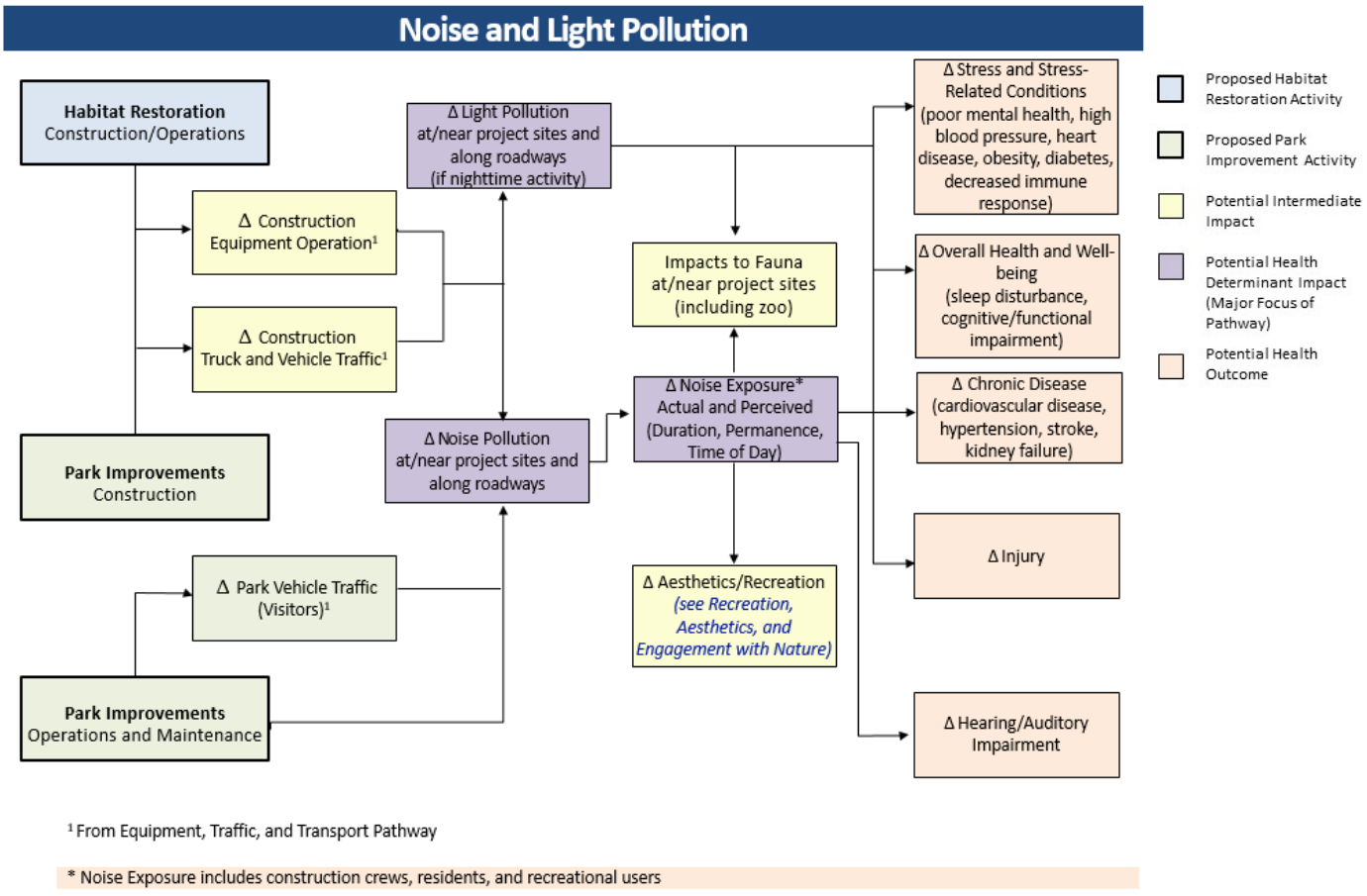

Figure 4-26. Noise and Light Pollution pathway diagram.

4.5.2 Results of the Literature Review

Noise Pollution and Human Impacts

Noise Pollution

The literature suggests that ambient noise in urban residential communities is a growing concern. People encounter noise throughout everyday life – outdoors, indoors, and in the workplace. Figure 4-27 shows the levels of common noises in A-weighted decibels (dBA), a measure of the loudness of sounds in the air as perceived by the human ear (adjusted for frequency). Noise can have auditory and non-auditory impacts depending on the intensity (decibels), duration (acute or chronic), and frequency of the sound, as well as personal and social factors of the individuals exposed to the noise (Guski, 1999).

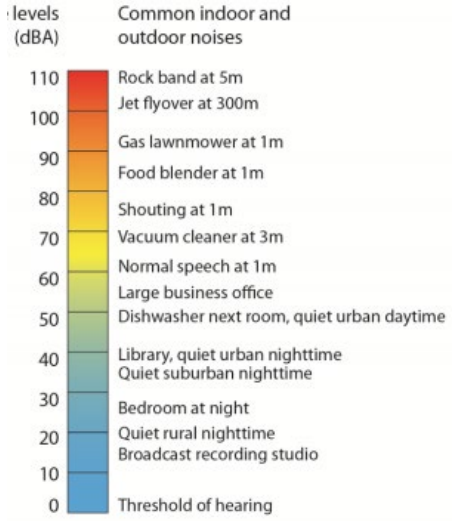

Figure 4-27. Common indoor and outdoor noises in decibels (dBA).

Noise Pollution Exposure and Impacts

The impacts of noise on health are well-documented in the literature and include: stress and stress-related conditions, annoyance, sleep disturbance, emotional and functional impairment (including performance at school and work), mental health, modification of social behavior, hearing impairment, and chronic diseases, such as cardiovascular disease, hypertension, stroke, and kidney failure (EPA, 1974; Berglund & Lindvall, 1995; Berglund B. , Lindvall, Schwela, & WHO, 1999; Passchier-Vermeer & Passchier, 2000; Babish, 2003; Shield & Dockrell, 2003; Ising & Kruppa, 2004; Goines & Hagler, 2007; Basner, et al., 2014).

Sources of environmental noise can include industry, construction, aircraft, and trains, but the main contributor to ambient noise in urban communities is road traffic (Berglund & Lindvall, 1995; Miedema & Oudshoorn, 2001; Bluhm, Nordling, & Berglind, 2004). Heavier vehicles (such as trucks), pavement type, traffic speed, and engine types are factors that can influence traffic noise. Distance from the noise source can affect the impact noise has on human health. For instance, doubling the distance between a highway and residence can generally reduce noise levels 3.0 - 4.5 decibels (Figure 4-28), although topography, vegetation, and site geometry also play a role in resident's exposure to highway noise (San Diego Association of Governments, 2015). Traffic noise has been found to impact the number of residents reporting frequent annoyance and sometimes or frequent sleep disturbance at noise levels above 50 decibels (Bluhm, Nordling, & Berglind, 2004), and the desire to stay outdoors above 48 decibels (Gidlöf-Gunnarsson & Öhström, 2007). Exposure to constant ambient noise or periodic levels of noise above 55 decibels have been associated with changes in behavioral and

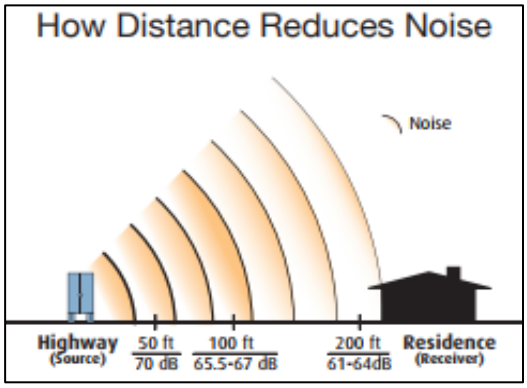

Figure 4-28. How distance of a residence from a highway affects noise levels.

mental activities, as well as lowered cognitive performance among school-aged children (Shield & Dockrell, 2003; EPA, 2009b).

Whether it is in a residential or occupational setting, most environments have more than one source of noise. **It is the total (combined) exposure to all present noise sources that determines the health impacts of noise on an individual** (Berglund B. , Lindvall, Schwela, & WHO, 1999)**.**

Figure 4-29. Noise can interfere with daily activities.

Some impacts of noise have been long known, such as hearing loss, annoyance, and interference with activities (Figure 4-29). In 1974, the EPA identified general environmental noise level limits to protect public health and welfare against hearing loss, annoyance and interference with activities (EPA, 1974); these limits were not an established standard or regulation, but meant to inform the establishment of noise standards. EPA (1974) recommended limiting exposure to environmental noise at 70 dBA average over a 24-hour period (75 dBA over 8-hours) to prevent measurable hearing loss. Noise-induced hearing loss is 100% preventable, but once it occurs is permanent and irreversible (NIOSH, 1998). The document also identified outdoor and indoor noise level limits to prevent annoyance and activity interference (i.e., levels of noise to permit spoken conversation, sleeping, working, recreation, etc.) – 55 dBA for outdoors activities and 45 dBA for indoor activities.

The impact of noise on cardiovascular health and other chronic diseases has come to the forefront in more recent years. Elevated noise has been shown to induce stress hormones in the human body, which can affect the heart, blood pressure, and blood glucose levels – all factors known to contribute to hypertension, cardiovascular disease, stroke, and kidney failure (Mead, 2007). Babish (2003; 2008) found that the risk of heart attack increased with increasing noise levels above 60 dB(A). During sleep, even low levels of noise are enough to cause stress. The World Health Organization (WHO) guidelines say that for a good sleep, sound level should not exceed 30 dB(A) for continuous background noise and 45 dB(A) for individual noise events (Berglund B. , Lindvall, Schwela, & WHO, 1999). Sleep loss can cause fatigue, exhaustion, cognitive impairment, and depressed moods (Griefahn, 2002), along with the common health related consequences of stress, including diabetes, obesity, heart disease, depression and other related chronic disorders (Zaharna & Guilleminault, 2010; Yaribeygi, Panahi, Sahraei, Johnston, & Sahebkar, 2017).

And although everyone can be affected by noise pollution, there are personal, social, and environmental factors that contribute to the impact of noise on human health (Bolund & Hunhammar, 1999; Guski, 1999; Gidlöf-Gunnarsson & Öhström, 2007; van Kamp & Davies, 2013). Populations most at risk to the health impacts of noise are children, the elderly, the chronically ill, people with a hearing impairment, and noise-sensitive individuals. Noise sensitivity may affect “shiftworkers, people with mental illness (e.g., schizophrenia or autism), people suffering from tinnitus, and fetuses” (van Kamp & Davies, 2013; Berglund B. , Lindvall, Schwela, & WHO, 1999). Noise sensitive areas (i.e., where noise interferes with the normal activities of the area) include residential areas, schools, churches, parks and recreational

areas, wildlife refuges, and cultural and historical sites where a quiet setting is a generally-recognized inherent feature (van Kamp & Davies, 2013). Vegetation, such as trees, shrubs, and grasses, have been shown to mitigate some of the environmental noise experienced in residential areas (Bolund & Hunhammar, 1999; Gidlöf-Gunnarsson & Öhström, 2007). Researchers have found that greener areas had fewer residents who perceived traffic noise as a neighborhood problem and reported less symptoms of traffic-related noise impacts (Gidlöf-Gunnarsson & Öhström, 2007).

In addition to noise exposures experienced in residential or urban settings, individuals in the workplace, especially in industrial or construction settings, can also be exposed to noise levels that are hazardous to human health. As part of the Occupation Safety and Health Act of 1970 (OSHA), the CDC's National Institute for Occupational Safety and Health (NIOSH) is responsible for establishing occupational safety and health standards. In 1998, NIOSH revised the recommended exposure limit (REL) for occupational noise exposures to be an 8 hour time-weighted average of 85 dbA (NIOSH, 1998); this recommended noise exposure limit was established to prevent job-related hearing loss. However, thousands of construction workers suffer noise-induced hearing loss each year from exposure on the job (Dong, Wang, Katz, West, & Lippy, 2018). Table 4-17 shows the average sound exposure levels needed in an occupational setting to reach the maximum allowable daily dose (NIOSH REL). In addition to hearing loss, noisy work environments can also cause individuals to lose concentration when performing work activities (Savale, 2014), making them more susceptible to accidents and injury.

Table 4-17. Noise Exposure Levels and Time Needed to Reach 100% of the Occupational Noise Dose Established by NIOSH Source: (NIOSH, 1998)

Exposure Level (NIOSH REL)[a]	Time to Reach 100% Noise Dose
85 dB(A)	8 hours
88 dB(A)	4 hours
91 dB(A)	2 hours
94 dB(A)	1 hour
97 dB(A)	0.5 hours
100 dB(A)	0.25 hours

[a] The National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) for occupational noise to avoid hearing loss.

Noise Mitigation

Strategies for controlling noise levels during construction include noise-related incentives built into contract specifications (e.g., regarding equipment selection and maintenance); using less noisy equipment; eliminating the noise when possible (e.g., turning of engines rather than allowing them to idle); instituting time constraints and minimizing noisy activities during sensitive times of the day; controlling the noise (e.g., instituting absolute noise criterion or lot-line noise limits; positioning equipment as far as possible from noise sensitive areas; using insulation, barriers, mufflers, shieldings, dampeners, enclosures, etc.); using hearing protection, and removing/isolating individuals from the noise source (FHWA, 2006; Savale, 2014).

Light Pollution and Human Impacts

Light Pollution

Like noise, light pollution has also become a growing concern with development and the increased use of artificial light. Light pollution is the "inappropriate or excessive use of artificial light" and can consist of:

- Glare – excessive brightness created by light that shines horizontally and causes visual discomfort
- Skyglow – brightening of the night sky over inhabited areas
- Light trespass – unwanted artificial light falling where it is not intended or needed
- Over illumination – use of artificial light beyond what is required
- Light clutter – poor spacing or unbalanced groupings of individual lights (IDA, n.d.; Chepesiuk, 2009).

Light pollution at night (Figure 4-30) can wash out starlight in the night sky, disrupt wildlife and ecosystems, affect human health and safety, and reduce the aesthetic value of communities (IDA Starry Skies Lake Superior, n.d.; IDA, n.d.; Chepesiuk, 2009).

Figure 4-30. Light pollution at night.

Light Pollution Exposure and Impacts

Humans and most other organisms have built-in clocks known as circadian rhythms that regulate the timing of daily behaviors and certain biological processes (Duffy & Czeisler, 2009). Light pollution at night is known to disrupt these circadian rhythms (Warman, Dijk, Warman, Arendt, & Skene, 2003; Duffy & Czeisler, 2009). Disruption of circadian rhythms has been linked to several health impacts in humans, including depression, hormone production, obesity, cardiovascular disease, cancer, mood and social disorders, learning deficits, and a number of sleep disorders, including shift-work sleep disorder, which affects people who rotate shifts or work at night, and delayed sleep–phase syndrome, in which people tend to fall asleep very late at night and have difficulty waking up in time for work, school, or social engagements (Pauley, 2004; Colton & Altevogt, 2006; Duffy & Czeisler, 2009; Stephenson, Schroder, Bertschy, & Bourgin, 2012; LeGates, Fernandez, & Hattar, 2014; Kubatka, et al., 2018).

Light Mitigation

The impacts of artificial lighting at night can be minimized by not installing or removing unnecessary lighting, choosing lighting only as bright as necessary, directing lighting only where it is needed, using shielding to protect sensitive areas, and turning off lights when not needed using timers, motion detectors, etc. (Longcore & Rich, 2016).

Noise and Light Pollution and Ecosystem Impacts

Noise pollution has been shown to cause changes in animal behavior and affect animal health, habitat use, reproduction, survival, and more. Noise can cause declines in the number and reproductive success of birds near roadways, declines in migratory birds at habitats that have become too noisy, and impacts on animals in captivity (Savale, 2014; FHWA, 2014). Aquatic organisms often rely on sound for a number of functions (e.g., echolocation to locate a mate or prey, detection of predators, navigation, etc.); therefore, any underwater sound, such as that from dredging and boats can have an impact on these functions (WODA Expert Group on Underwater Sound, 2013). Given that sound can travel four times faster underwater than in air, the scale of these impacts can be great.

Light pollution at night has also been shown to affect the biological and ecological processes of plants and animals (Rich & Longcore, 2006). In plants, night-time artificial light can impact photosynthesis and has been shown to cause early budding of trees, which can have implications for herbivores and wildlife that depend on trees for their habitat (Briggs, 2006). In animals, including birds, fish, amphibians, turtles, reptiles, and other wildlife, artificial light at night has been shown to affect circadian rhythms, night time physiology, wildlife behaviors, foraging, predator-prey interactions, spatial orientation, visual perception, and breeding (Rich & Longcore, 2006; Chepesiuk, 2009; Longcore & Rich, 2016).

4.5.3 Existing Conditions Related to Noise and Light Pollution

Noise

Baseline noise levels for the area are not known. Grassy Point is surrounded by industry and the railroad runs in close proximity to both sites, so background noise levels near the sites may be higher than a typical suburban neighborhood. There are also several major road thoroughfares in the area that contribute to the baseline noise levels. In Figure 4-31, you can see the 24-hour equivalent sound levels (LAEQ) in dBA from motor vehicle traffic for the major roadways in the HIA study area.

For noise to be considered a nuisance, it must significantly interfere with an individual's enjoyment of life and property. Slight or occasional noises are typically not sufficient to create a nuisance condition. In Minnesota, the Minnesota Pollution Control Agency (MPCA) has established noise standards to protect human health (see discussion in Section 4.5.4). Although MPCA has statewide authority, many cities in Minnesota also have local noise ordinances to help address community concerns (League of Minnesota Cities, 2017). For instance, the City of Duluth has noise ordinances covering nuisance events that disturb the peace (e.g., loud and boisterous conduct, noises, music and activities) and vehicle noise, including

the use of truck engine retarding brakes (Duluth Legislative Code § 40: Police and § 34-23: Vehicle Noise Limits); truck engine retarding brakes are not allowed in Duluth, except in case of emergency.

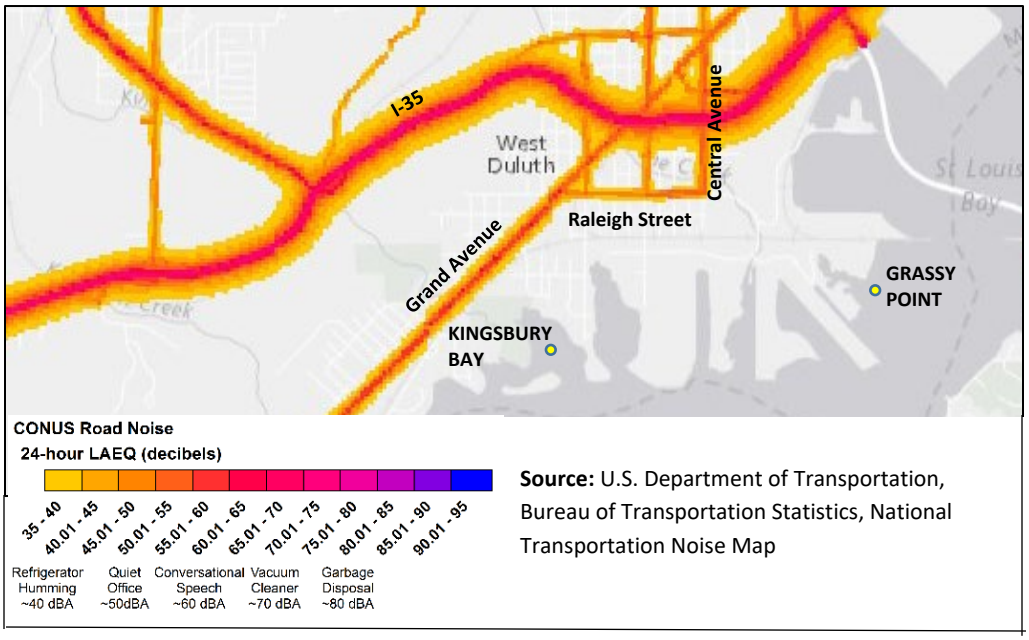

Figure 4-31. Continental U.S. (CONUS) Road Noise levels for major roadways in the HIA study area. L_{AEQ} is the 24-hour equivalent sound levels in DbA.

Light

Baseline nighttime light levels for the area can generally be estimated by the amount of skyglow in the area. While not as bright as downtown Duluth, the HIA study area has a fairly bright skyglow (Figure 4-32).

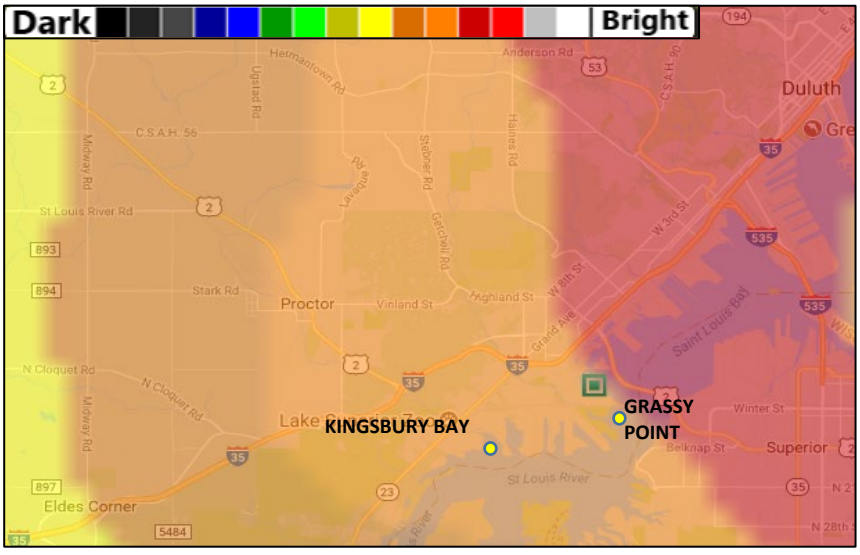

Figure 4-32. Sky glow in Duluth and the surrounding areas. Source: Light Pollution Atlas 2006.

4.5.4 Potential Impacts to Noise and Light Pollution

Equipment and Traffic-Related Noise

Several common characteristics of noise can be associated with construction activities, like those that will occur during habitat restoration and park improvements construction. "Construction noise can be perceived or considered to be too loud, impulsive, uncontrollable, contain annoying pure tones, occur unexpectedly, occur at undesirable times of day, and/or interrupt people's activities" (FHWA, 2006).

Equipment operation and truck and vehicle traffic will increase noise pollution in the study area and have the potential of placing construction crews, residents, and recreational users in the study area at increased risk of adverse health impacts from noise exposure. **The adverse health impacts of noise pollution are related to total noise exposure from all sources; this includes existing noise (e.g., roadway, industry, etc.) plus noise related to the habitat restoration and park improvements work**.

Nighttime construction activity is not anticipated with exception of hydraulic dredging; however, sound travels further at night and nighttime noise and light pollution can cause sleep disturbance and other adverse health effects.

Noise Standards

In Minnesota, MPCA has established noise standards based on the land use at the location of the person that hears the noise. The standards are stated as the noise level in decibels over 10% or 50% of an hour - L_{10} or 6 minutes/hour and L_{50} or 30 minutes/hour, respectively; Table 4-18).

Table 4-18. Minnesota Pollution Control Agency Noise Standards by Land Use.[a] Source: Minnesota Administrative Rule § 70300.0040: Noise Standards

Noise Area Classification (NAC)	Daytime 7:00 am-10:00 pm (dBA)		Nighttime 10:00 pm-7:00 am (dBA)	
	L_{10}	L_{50}	L_{10}	L_{50}
1 -Residential, Religious & Camping	65	60	55	50
2 -Commercial & Recreational	70	65	70	65
3- Manufacturing and Industrial	80	75	80	75

[a] L_{10} – noise level that can't be exceeded for more than 10% of the time for one hour (6 minutes/hour) in A-weighted decibels (dBA); L_{50} – noise levels that can't be exceeded for more than 50% of the time for one hour (30 minutes/hour) in dBA.

Equipment Noise

Sound levels associated with heavy construction equipment range from 80 to 120 dB(A) and power tools commonly used in construction produce sound levels up to 115 dB(A). Average noise level at 50 feet from a diesel-powered piece of construction equipment, including trucks, is 85 A-weighted decibels (dBA) and decreases by 6 dBA as the distance from the point source is doubled (Table 4-19; FHWA,

2006; MPCA, 2015). Doubling the number of pieces of equipment increases the decibels by 3. So, 4 pieces of equipment running at the same time would be 91 dBA at 50 feet.

Table 4-19. Noise Levels by Distance from Diesel-powered Construction Equipment (FHWA, 2006; MPCA, 2015)

Distance from Source (Feet)	Noise Level (dBA)
50	85
100	79
200	73
400	67
800	61

The levels of noise from a dredge depend in part on the type of dredge to be used, as different style dredges consist of different components (Figure 4-33). One study showed noise from a pipeline cutterhead is 172-185 dBA at 1 meter (3 ft); another showed cutterhead sounds peaked at 100-110 dBA and were inaudible at ~500 m (1640 ft) from the source (CEDA, 2011; Clarke, 2002). The EAW stated that hydraulic dredging operations may be conducted at night; it should be noted that sound travels further at nighttime and nighttime noise can have adverse health effects.

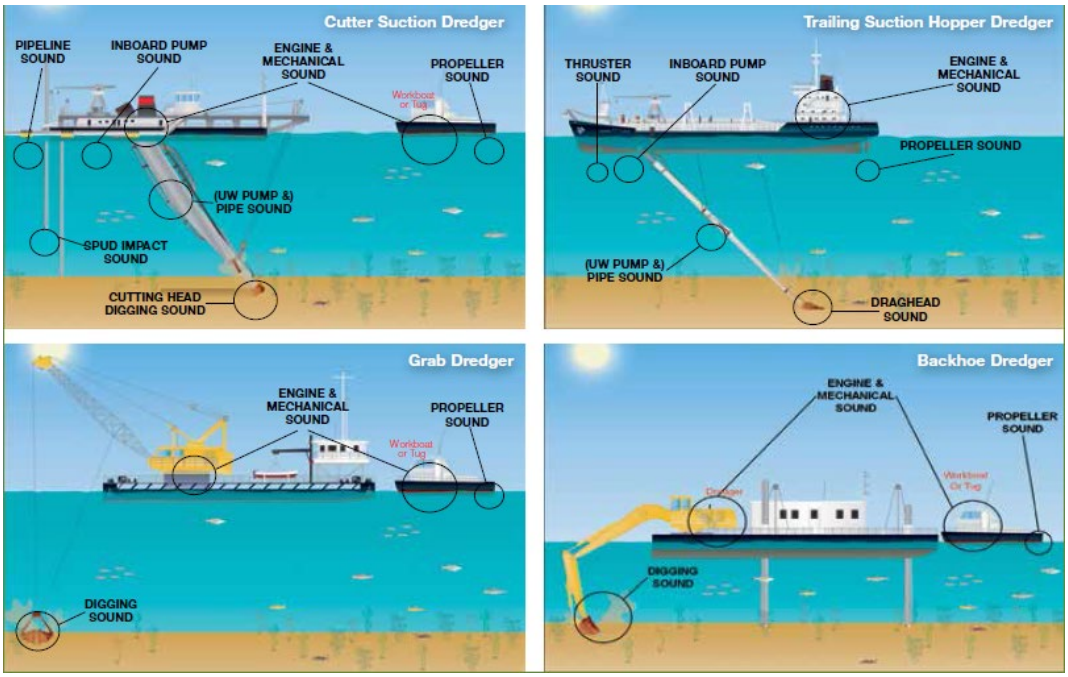

Figure 4-33. Noise sources during dredging by dredge type. Source: (WODA Expert Group on Underwater Sound, 2013)

Habitat Restoration Equipment Noise

The EAW states during habitat restoration, equipment would be operated during daylight hours (7 am-9 pm) in accordance with the City of Duluth's noise ordinance, with *exception* of hydraulic dredging. Noise will include equipment operation, back-up beepers, and material handling and hauling.

According to the EAW, both Kingsbury Bay and Grassy Point are considered NAC 2 (Commercial and Recreational), which means the daytime noise standards in place would be an L_{10} of 70 dBA and L_{50} of 65 dBA[15]. One piece of diesel-powered equipment exceeds these standards even at a distance of 400 ft. As discussed previously in Section 4.2.4, there will be numerous pieces of mechanical and hydraulic construction equipment running during the habitat restoration work, including excavators, dredges, generators, pumps, dump trucks, and more. Resident access to the sites will be prohibited during the habitat restoration work, mitigating the noise impacts; but the impact of the noise on nearby recreational users and residents should not be ignored.

During habitat restoration work, there is "an NAC 1 area (Residential, Religious, and Camping) 200 feet from the nearest excavation point at Kingsbury Bay (although most excavation will occur 400 ft from residences) and 0.5-1 mile from the Grassy Point construction zone." In addition to the excavation work, the use of the Pulaski Street parking lot as a staging area for this work will create noise pollution for neighbors in the Riverside neighborhood, residents adjacent to Pulaski Street, and those at Indian Point Campground. An NAC 1 area has a daytime L_{10} of 65 dBA and L_{50} of 60 dBA and a nighttime L_{10} of 55 dBA and L_{50} of 50 dBA. One piece of diesel-powered equipment running exceeds these standards, even at a distance of 400 ft. As discussed previously in Section 4.2.4, there will be numerous pieces of construction equipment running during the habitat restoration work, including excavators, dredges, barges, dump trucks, and more.

Noise Impacts to Fauna and the Zoo

- Noise levels during habitat restoration or park improvements construction could impact animal behavior and affect animal health, habitat use, reproduction, survival, and more. For example:
  - the underwater sound from dredging, barges, and boats could impact functioning of aquatic organisms, including echolocation to locate a mate or prey, detection of predators, navigation, etc.
  - declines could be witnessed in the numbers and breeding of birds at both sites due to the noise; this impacts not only the birds, but also the birdwatching pastime common at these sites).
- Due to its close proximity, equipment noise could also have an impact on zoo animals, zoo goers, and zoo staff.

Given the amount of equipment that will be in operation and the proximity of residences and recreational trails and water areas to the habitat restoration work (both mechanical and hydraulic dredging equipment), noise levels at Kingsbury Bay will exceed the noise standards shown in Table 4-18 for nearby residents and possibly recreational users and will require mitigation. It should also be noted

[15] L_{10} – noise level that can't be exceeded for more than 10% of the time for one hour (6 minutes/hour) in A-weighted decibels (dBA); L_{50} – noise levels that can't be exceeded for more than 50% of the time for one hour (30 minutes/hour) in dBA

that there are a large number of shift workers in the vicinity of Kingsbury Bay who could be at increased risk of sleep-related disorders or potentially impacted by sleep disruption due to daytime construction activities in the study area. Noise from habitat restoration work at Grassy Point is not expected to be an impact to residents, as the surrounding area is deemed a NAC 3 area (Manufacturing and Industrial) and per the EAW, the nearest residential property is approximately 2,000 feet from the closest point of excavation.

Mitigation of Noise Impacts During Habitat Restoration - Per the EAW, the MNDNR is undertaking several steps to help mitigate the potential impacts of noise and light, including:

- contacting the nearest residents along the St. Louis River shoreline to inform them of the project and potential for noise levels exceeding NAC Level 1 standards,
- restricting equipment operation only during daylight hours (7am – 9pm),
- requiring all equipment to have properly operating muffler systems,
- restricting idling time for inactive equipment to 15 minutes,
- notifying adjacent landowners and businesses about the intent of the project, duration, expected noise levels and complaint procedures, and
- informing construction operators of the nearby residential area and scheduling loud operations for mid-day.[16]

Park Improvements Construction Equipment Noise

A

The park construction plans are not detailed at this point in time, but it is assumed the equipment needed at Grassy Point would be relatively light duty and the noise would not impact nearby residents. At Kingsbury Bay, there are many amenities, a number of which that would require earth movement (e.g., building a swimming beach and the stormwater demonstration project) in areas in close proximity to residences and Indian Point campground. Per the EAW, creation of the swimming beach will be in an NAC 1 area and creation of the stormwater retention pond will be in close proximity to an NAC 1 area. Given the equipment that will be in operation and the proximity of residences and recreational trails and water areas to the construction work at Kingsbury Bay, it is likely for the noise levels to exceed the noise standards shown in Table 4-18 for nearby residents and possibly recreational users and require mitigation. Noise from construction at Grassy Point is not expected to be an impact.

Park Improvements Operations and Maintenance Equipment Noise

Noise from equipment used for park maintenance could impact recreational users, but is expected to be minor.

[16] During the final HIA meetings, stakeholders raised a concern about scheduling loud operations for mid-day, because there is a lot of shift work in the neighborhoods surrounding Kingsbury Bay and loud operations at this time of the day could interrupt the sleep of shift workers.

In addition to noise impacts to residents and recreational users during habitat restoration and park improvements construction, it is also important to recognize and mitigate the impact of noise on the construction workers themselves (Figure 4-34). The U.S. Occupational Safety and Health Administration (OSHA) has set a legally-allowable exposure limit for construction noise (i.e., the permissible exposure limit) of 90 dBA over an eight-hour period (29 CFR 1926.52). But noise induced hearing loss can result from unprotected exposure to noise over an extended period of time at levels below 90 dbA. Therefore, NIOSH has established a recommended exposure limit for occupational noise at 85 dBA for an eight-hour time-weighted period (NIOSH, 2018c). The Center for Construction Research and Training (CPWR, 2018) has shown that 73% of the time, construction workers are exposed to noise over the NIOSH recommended exposure limit. Noise mitigation, hearing protection, and operations schedules can be instituted to avoid exposure of construction workers to noise above NIOSH recommended exposure limits.

Figure 4-34. Construction workers may be subjected to noise over an extended period of time.

Traffic Noise

Habitat Restoration

Existing traffic noise along the two potential truck transport routes from Kingsbury Bay to Grassy Point was analyzed. In addition to traffic noise, the number of residences, facilities occupied by populations more sensitive to noise (i.e., schools and senior centers and care facilities), and recreation areas (i.e., parks and trails) within 300 feet of the potential truck routes was calculated to determine the populations potentially impacted by habitat restoration traffic noise (Figure 4-35). Also considered in analysis was the poverty rate in the two Census tracts along the routes to determine the potential for any disparate health impacts. Census tract 33 (north of Grand Avenue) has 19.4% of residents in poverty and Census tract 34 (south of Grand Avenue) has a poverty rate of 8.4%.

Analysis showed higher existing road noise and slightly more residences, facilities occupied by populations sensitive to noise, and parks and trails within 300 feet of the proposed truck route from Grand Avenue to Central Avenue (Figure 4-35a) compared to the alternate route from Grand Avenue to Raleigh Street (Figure 4-35b):

- Grand Avenue to Central Avenue – 309 residences (of which 5 are public housing, housing authority or low income housing), 1 school, 3 senior centers or care facilities, and numerous parks and trails; it should also be noted that a portion of the population along the northeast end of the route from Grand Avenue to Central Avenue also experience greater exposure to noise pollution from I-35.

- Grand Avenue to Raleigh Street – 306 residences (of which 8 are public housing or housing authority), 1 school, 1 senior care facility, and numerous parks and trails

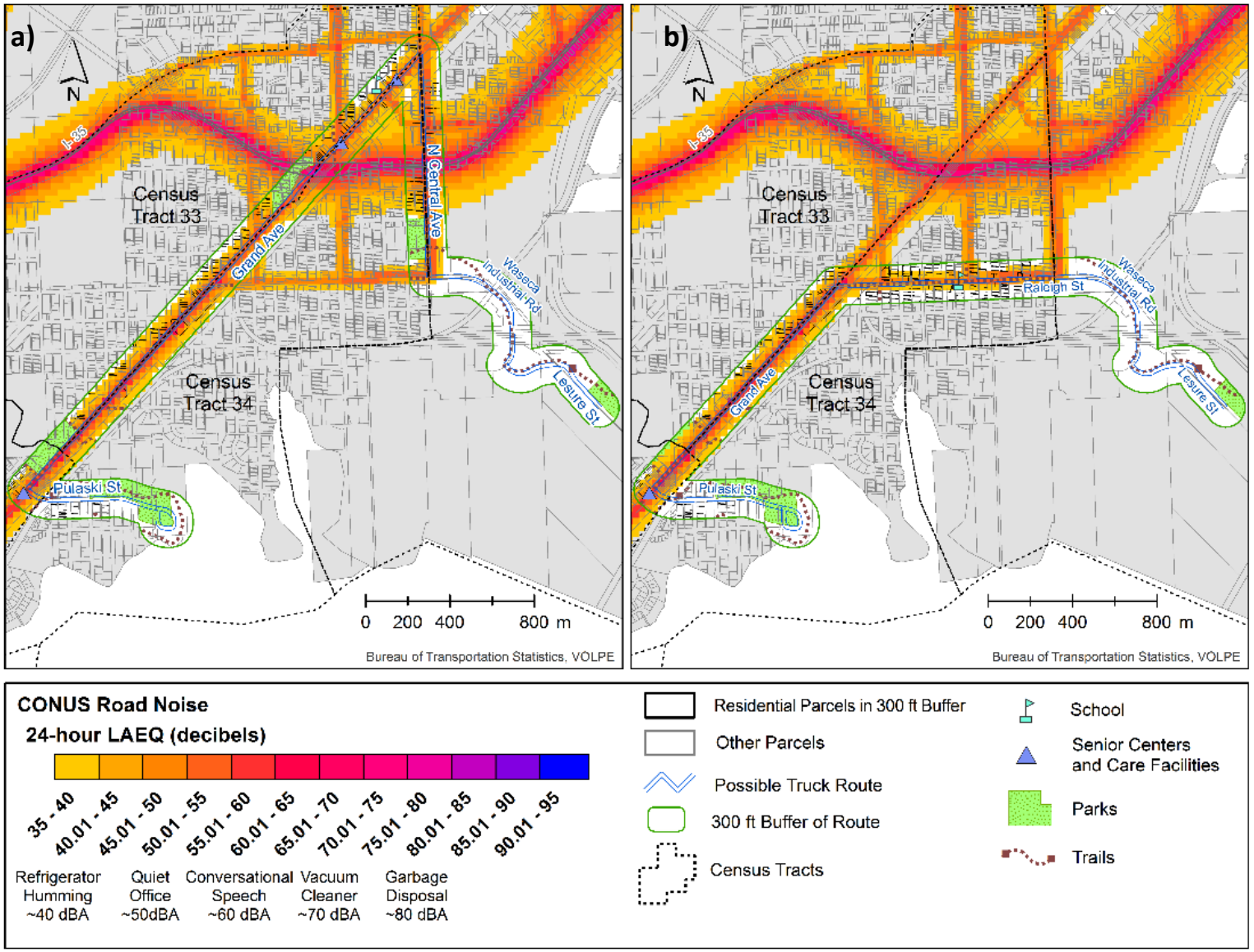

Figure 4-35. Continental U.S. (CONUS) road noise and populations within 300 feet of potential truck transport routes – a) Grand Avenue to Central Avenue and b) Grand Avenue to Raleigh Street.

Not only are there a large number of residences and facilities with sensitive populations within 300 feet of both routes, but as discussed previously, the building setback along areas of both Grand Avenue and Raleigh Street is minimal; many of the streets also serve as on-street bike routes. As stated previously, traffic noise has been found to impact the number of residents reporting frequent annoyance and sometimes or frequent sleep disturbance at noise levels above 50 decibels, and the desire to stay outdoors above 48 decibels; these thresholds are exceeded in several places along both potential transport routes (Figure 4-35). Exposure to constant ambient noise or periodic levels of noise above 55 decibels have been associated with changes in behavioral and mental activities, as well as lowered cognitive performance among school-aged children.

L

Noise is also expected from transport of material from Grassy Point, however, the HIA was unable to quantify the population affected, because no details on traffic, equipment, or routes were provided. A low to moderate number of individuals are expected to be impacted depending on the transport route.

Park Improvements

A

Noise is also expected from park improvements construction activities, and any increase in park vehicle traffic post-construction. It is assumed that vehicle traffic will increase in the vicinity of the parks, given the improvements at the project sites and other park investment efforts currently planned in the study area as part of the St. Louis River Corridor Initiative, which would result in increased near-roadway noise.

Equipment and Traffic-Related Light

The EAW states that during habitat restoration, equipment would be operated during daylight hours (7 am-9 pm) only, with *exception* of hydraulic dredging. During winter, sunset is between 4:30 and 7:30 pm (much earlier than 9:00 pm), but nonetheless, the potential for light-at-night impacts to residents seems to be minimal except during periods of nighttime hydraulic dredging. During periods of nighttime dredging, light-at-night impacts will require mitigation. During park improvements construction and operations and maintenance, no night-time work is anticipated.

Light at Night Impacts to Flora and Fauna

Light pollution at night during habitat restoration could affect the biological and ecological processes of both plants and animals, including photosynthesis of nearby trees and circadian rhythms, physiological activities, breeding, and

Park Operations and Maintenance Impacts on Light

If lighting is installed at the Kingsbury Bay entrance/parking lot, there is the potential for light trespass to nearby residences if not properly placed.

4.5.5 Potential Health Impacts Related to Changes in Noise and Light Pollution

Habitat Restoration and Park Improvements

The project is **highly likely** to increase equipment and truck and vehicle-related noise pollution and **possibly** light pollution (if nighttime activity occurs) at and near the project sites and material transport routes in the short-term during habitat restoration and the construction phase of park improvements. In the long-term (during park improvements operation and maintenance), it is **possible** there will be increased traffic and traffic-related noise pollution at and around the sites given the improvements at these sites and other park investment efforts currently planned in the study area as part of the St. Louis River Corridor Initiative.

Increased noise and light pollution in the study area may **detract from health** because both can cause sleep disturbance; impaired task, functional, and cognitive performance (which may lead to unintentional injury); stress; cardiovascular disease and hypertension; and affect ecosystem function, particularly in fauna. Noise pollution also has the potential to cause hearing impairment and can also increase the risk of injury in occupational settings (Masterson, Themann, Luckhaupt, Li, & Calvert, 2016). The adverse health impacts of noise pollution are related to total noise exposure from all sources and can vary widely (Table 4-20).

Table 4-20. Adverse Health Impacts of Noise Exposure[a]

Effect	Exposure Type	Measure[b]	dBA	Location of Assessment
Hearing Impairment	Environmental	L_{aeq} (24 hr average)	70	Indoors
	Occupational		75	
Hypertension	Environmental	L_{dn} (24 hr average)	70	Outdoors
	Occupational	L_{aeq} (24 hr average)	<85	Indoors
Ishchemic Heart Disease	Environmental	L_{aeq} (24 hr average)	70	Outdoors
Annoyance	Environmental	L_{dn} (24 hr average)	42 30 (impulse noises)[c]	Outdoors
	Occupational	L_{aeq} (24 hr average)	Industry <85 Office <55	Indoors
Performance	School	L_{aeq} (average during school day)	70	Outdoors
	Occupational		70	
Disturbance of Sleep Pattern	Sleep	L_{aeq} (overnight average)	<60	Outdoors
Awakening	Sleep	SEL	55	Indoors
Sleep Quality	Sleep	L_{aeq} (overnight average)	40	Outdoors
Mood Next Day (sleep disturbance)	Sleep	L_{aeq} (overnight average)	<60	Outdoors

[a] Adapted from Passchier-Vermeer & Passchier (2000)

[b] L_{aeq} = equivalent sound level measured over a period of time; L_{dn} = day-night levels (i.e., sound level measured over 24 hours with sound level measured during the night); SEL = sound exposure level (i.e., equivalent sound level of an event measured over 1 second)

[c] Impulse noise is instantaneous, sharp sounds.

These noise impacts will be experienced **disproportionately** by those living, working, going to school, or recreating at or near the project sites and material transport routes. In addition, children, the elderly, and those with pre-existing health conditions will be more vulnerable to the health impacts. The magnitude of the population affected will depend greatly on the material transport route chosen, as well as the timing of earthwork activities at Kingsbury Bay and any increases in park visitor traffic.

It should be noted, while habitat restoration and park improvements can contribute to noise and light pollution, **development of these sites as parks eliminates the potential for more severe noise and light pollution that would accompany future industrial development at the sites were they not parks.**

Table 4-21 provides a summary of the baseline health status and characterization of health impacts related to noise and light pollution during the various project phases.

Table 4-21. Characterization of Impacts Related to Noise and Light Pollution

Pathway							
Noise and Light Pollution	**Baseline Health Status** No local data is available regarding rates of hearing or auditory impairment or injury due to impaired task, functional, and cognitive performance or injury in occupational settings due to noise pollution. Likewise, there is no local data related to rates of chronic disease as a result of noise and light pollution; however, the prevalence of some potential health outcomes related to noise and light pollution (e.g., coronary heart disease) are higher in the study area as compared to the City or Nation. Noise and light pollution can also disrupt sleep and be a source of stress. One-third of adults aged 18 years or older in the study area reported sleeping less than 7 hours a night (CDC 500 Cities Project) and 19.1% of respondents to a regional health survey from the City of Duluth reported a sleep-related disorder (Kjos, Kinney, Finch, & Peterson, 2016). In the vicinity of Kingsbury Bay, there are a large number of shift workers, who could be at increased risk of sleep-related disorders or potentially impacted by sleep disruption due to daytime construction activities in the study area. While the City of Duluth has been rated one of the least stressed cities in the U.S., the prevalence of stress-related health outcomes (e.g., high blood pressure and mental health) are elevated in the study area as compared to the City and sometimes even the National rates.						
Project Phase	**Direction***	**Likelihood**	**Magnitude**	**Distribution**	**Severity**	**Permanence**	**Strength of Evidence**
Habitat Restoration Construction/ Operations	Detract from Health	Noise – Highly Likely; Light – Possible, if nighttime activity	Noise – Moderate to High, depending on the material transport route chosen; Light (during hydraulic dredging) – Low	Disproportionate Effects - Those living, working, going to school, or recreating at or near the sites and along the material transport routes would be most impacted; children, the elderly, and those with pre-existing health conditions may be more vulnerable to the health impacts	Minor (annoyance, sleep disturbance) to Moderate (stress, injury, hearing impairment, illness)	Immediate, but Short-Term (limited to the duration of habitat restoration)	Strong evidence supporting the link between noise and light pollution and negative health impacts
Park Improvement Construction	Detract from Health	Noise– Highly Likely; Light – Unlikely	Noise – Low to Moderate, depending on timing of earthwork activities at Kingsbury Bay	Disproportionate Effects - Those living, working, going to school, or recreating at or near the sites and along the material transport routes would be most impacted; children, the elderly, and those with pre-existing health conditions will be more vulnerable to the health impacts	Minor (annoyance, sleep disturbance) to Moderate (stress, injury, hearing impairment, illness)	Immediate, but Short-Term (limited to the duration of construction)	Strong evidence supporting the link between noise and light pollution and negative health impacts

Assessment – Noise and Light Pollution

Project Phase	Direction*	Likelihood	Magnitude	Distribution	Severity	Permanence	Strength of Evidence
Park Improvement Operations and Maintenance	Detract from Health	Noise – Possible; Light – Possible if lighting used in Kingsbury Bay parking area	Noise – Low to Moderate, depending on any increase in park visitor traffic; Light – Low	Disproportionate Effects - Those living, working, going to school, or recreating at or near the sites; in addition, children, the elderly, and those with pre-existing health conditions will be more vulnerable to the health impacts	Minor (annoyance, sleep disturbance) to Moderate (stress, injury, hearing impairment, illness)	Immediate and could be Long-Lasting	Strong evidence supporting the link between noise and light pollution and negative health impacts

* While the impacts of noise and light pollution during habitat restoration and park improvements have the potential to detract from health, developing Grassy Point as a park eliminates the potential for more severe noise and light pollution that would accompany future industrial development at the site were it not a park.

4.5.6 Main Findings and Preliminary Recommendations Related to Noise and Light Pollution

Based on the Assessment findings of this pathway, these preliminary recommendations were developed for promoting the positive health impacts and mitigating the adverse health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvements projects. For more details on these recommendations, including their intended purpose and implementation, as well as any additional recommendations added after review by the community and stakeholders, see the consolidated list of final HIA Recommendations in Section 5.

Main Finding

Equipment operation and truck and vehicle traffic will increase noise pollution in the study area and have the potential of placing construction crews, residents, and recreational users in the study area at increased risk of adverse health impacts from noise exposure. The adverse health impacts of noise pollution are related to total noise exposure from all sources.

- Clearly communicate the project, its duration, and expected noise levels to residents, schools and daycare centers, senior centers and care facilities, businesses, and recreational users in the project area and along the transport route
- Provide a means for residents and other affected populations to provide feedback and/or lodge complaints about excess noise
- Include noise mitigation criteria/specifications in the contract (e.g., absolute noise criterion for equipment, restricted idling, and use of mufflers, dampeners, shieldings, and enclosures)
- Include incentives for contractors who have established noise mitigation programs/policies and/or newer fleets
- Implement a noise monitoring program in the vicinity of both sites to assess overall noise levels (i.e., baseline noise plus project noise) and implement mitigation measures, as necessary, to minimize impacts
- Limit construction activities to daylight hours or the hours specified in the Duluth noise ordinance (7 am – 9 pm), whichever is more restrictive (i.e., sunset December-March is between 4:30 and 7:30 pm). Limit noisy operations to non-sensitive time periods (e.g., mid-day)
- Position stationary noise sources as far away as possible from noise sensitive areas (areas where a quiet setting is a generally recognized feature or attribute, such as residential areas, parks, recreational and wilderness areas, and cultural and historical sites)
- Implement hearing protection and operations schedules to avoid exposure of construction workers to noise above NIOSH recommended exposure limits (73% of the time construction workers are exposed over the recommended exposure limits)
- Route trucks and other equipment/vehicle traffic away from neighborhoods, schools and daycare centers, senior centers and care centers, and recreation areas to minimize exposure to noise pollution
- Prohibit the use of truck engine brakes, unless in case of emergency

Main Finding	Nighttime construction activity is not anticipated with exception of hydraulic dredging; however, sound travels further at nighttime and nighttime noise and light pollution can cause sleep disturbance and other adverse health effects.

- Avoid nighttime construction activity to the extent possible. During winter, sunset is between 4:30 and 7:30 pm (much earlier than 9:00 pm). When necessary, implement measures to minimize noise and light illumination impacts on nearby residences
- Ensure any lighting used in the parks are intelligently-designed, low glare, efficient outdoor lighting fixtures that direct illumination toward the ground (rather than upward) and evaluate the potential for motion sensors on lighting in certain areas of the parks or parking lots to minimize over-illumination

4.6 Crime and Personal Safety

Restoration of damaged habitats and improvements to the landscape at these sites can provide benefits to both environment and human health. An established body of research suggest that these benefits can often shape community attitudes and behaviors towards crime and safety. The amount of greenness in an urban community has also been linked to decreased aggression and violence, lower mental fatigue, higher resiliency to stressful life events, and increased social interaction and communication. These changes can improve community resiliency, social cohesion, and perceived safety and security. While it's not difficult to support the idea of crime as a threat to the health of individuals, negative perceptions of the natural environment can often translate directly to poorer health outcomes, such as decreased physical activity, poorer mental health, and increased risk of cardiovascular and chronic disease.

4.6.1 Pathway of Impact

Figure 4-36 shows the pathways by which the proposed habitat restoration project and subsequent park improvement projects could potentially impact crime and personal safety.

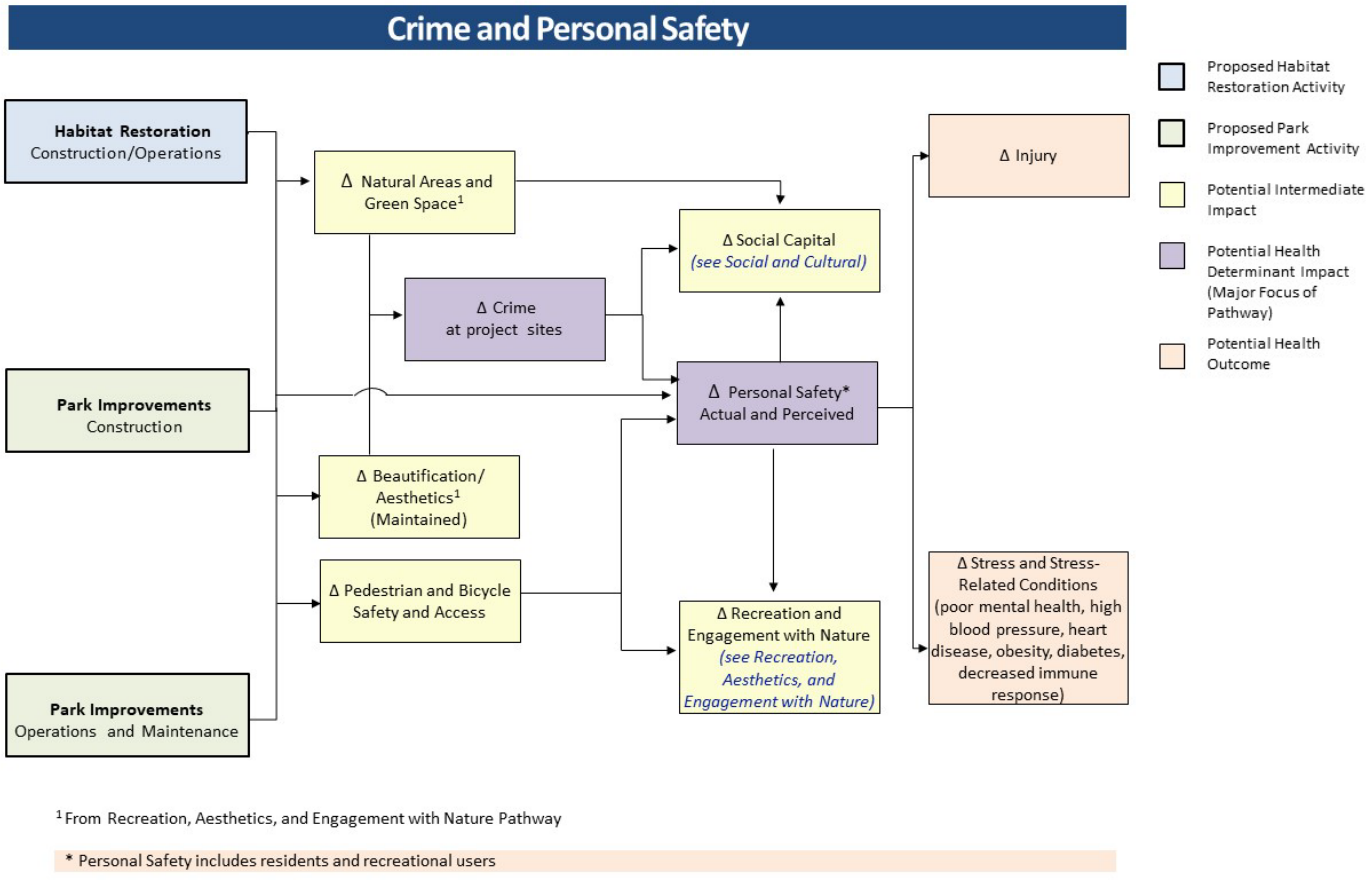

Figure 4-36. Crime and Personal Safety pathway diagram.

4.6.2 Results of the Literature Review

Green Space, Crime and Personal Safety

Today's growing green space research literature illustrates both positive and negative relationships among green space, violence, and crime. Of particular concern are studies demonstrating that green space can become occupied gang territory, space to sell and distribute drugs, and grounds for illegal dumping. In addition, a couple of studies suggest that green space can exacerbate discrimination and hostility between racially and ethnically homogenous neighborhoods as well as gangs vying for territory through the creation of ''green walls'' that physically divide neighborhoods (Kuo and Sullivan 2001a,b).

A more established body of research also highlights the importance of community perceptions of crime, violence, and urban green space. One of the most common fears arises when vegetation impedes visibility and appears to limit one's ability to easily escape. Similarly, studies describe resident fears that urban green space vegetation can hide criminals, which can lead to communities limiting their use of or altogether avoiding the space, thus missing out on numerous green space benefits (Mitchell and Popham, 2008). The application of Crime Prevention Through Environmental Design (CPTED) principles, including planting configurations and maintenance, can improve crime prevention, safety, and perceptions of crime. Hence, future research exploring relationships among urban green space, violence, and crime must remain cognizant of the potential for resident perceptions of urban green spaces as places that harbor crime and violence. Despite perceptions of urban green spaces as harbors of violence and crime, evidence from other studies refutes these perceptions (Weinstein et al., 2015).

Recently, research that directly explores relationships among urban green space, violence, and crime demonstrates findings that show green space as a facilitator in decreasing crime and violence, often through the same mechanisms that researchers have used to explain other green space health benefits. One review demonstrated 19 instances of decreases in crime and violence related to green space (Bogar and Beyer, 2016). Existing studies demonstrating empirical evidence of relationships between green space, crime, and violence, strongly suggest that the presence of green space can lead to reductions in specific crime and violence. For instance, in Bogar and Beyer's 2016 review, seven of the nine instances where crime appeared to increase in relation to green space, measures of crime were categorized into property crime and nuisance crimes only. The U.S. National Park Service studied the expansion of non-motorized trails (green space amenities) in three sites to explore the benefits to their surrounding communities and to determine the types and extent of crime-related problems experienced by users. Overall, trail users and landowners both reported increases in quality of life factors and were considered a good use of undeveloped open space (Racca and Dhanju, 2006).

The public health benefits of green space cannot be fully realized if residents cannot safely access the space. Infrastructure that makes the community walkable and bikeable, such as well-maintained contiguous sidewalks, clearly marked and frequent crosswalks, street lights, traffic calming, protected bike lanes, accessible public transit stops, curb extensions, and medians can encourage safe access (U.S. DOT, 2015a). Sidewalks or streets in disrepair, lack of maintained bicycle lanes, unsafe separation from motor vehicles, high-speed traffic, and multi-lane roads can pose hazards to pedestrians and bicyclists

and may inhibit residents from engaging in active transportation. Active transportation not only allows access to amenities within the community, but also offers greater mobility, opportunity for social interaction, and physical activity, all of which have been shown to benefit health (U.S. DOT, 2015b).

Crime, Personal Safety and Health

Quantifying the impact of crime on public health is difficult. In a study based on 840 responses from a postal survey administered to 4,100 households in Sheffield, England, located primarily in deprived areas where overall crime rates were high, non-violent crimes were more frequently reported than violent crimes. In general, inner city neighborhoods were associated with higher violent crime rates than elsewhere in the survey area (Tan and Haining, 2016). Out of 392 victims of crime, 27% of individuals detailed physical injuries resulting directly from a crime event and 31% had taken some medical steps to treat a crime-related injury. Eighty-six percent (86%) experienced at least one psychological or behavioral change, including stress, sleeping difficulties, loss of confidence, and depression. Violent crimes, such as sexual assault or homicide, can cause physical and detrimental harm to a victim, and were consistently linked with higher odds of seeking medical treatment and a higher likelihood of experiencing psychological ill health effects or behavioral changes. In comparison, victims of non-violent or property crimes were not significantly associated with mental health or behavioral/ lifestyle effects.

One factor that may affect perceived physical vulnerability—leading to higher levels of fear of crime—is physical health. The literature suggests that those in poor physical health and those who believe they are physically unhealthy are more afraid of crime (Gong et al., 2014). Researchers examining fear of crime have measured objective health using a list of health conditions (e.g., heart disease, cancer, stroke) and disability statuses (e.g., activities of daily living), finding that having an objective poor health condition or a disability significantly increases fear of crime. Some studies have also considered subjective health and how it affects fear of crime (Brown and Wycoff, 1987). These authors suggest that how sick people think they are may matter more in determining fear of crime than simply having a diagnosis. When examining self-rated health, people who rate their health lower report higher levels of fear of crime, and self-rated health may predict fear of crime better than objective health measures. So, the perception of poor health can have a strong effect on perceived vulnerability, but researchers still debate whether objective or self-rated physical health is a better predictor of fear of crime.

Other threats to personal safety may come as residents navigate their neighborhood. Many roads and transportation routes are designed to move individuals and goods efficiently from one point to another via motorized transportation, and with motorized transportation comes the risk of accidents, injury, and death. These transportation routes may or may not include safety measures for pedestrians and cyclists. A national telephone survey conducted by The National Highway Traffic Safety Administration (NHTSA) in 2012 found the leading cause of pedestrian injury was the poor quality of street facilities. Unintentional injuries, including traffic–related injuries, have been the leading cause of death among individuals 1 to 44 years of age in the United States for some time (Heron, 2018). Although active transportation does bring with it an increased risk of injury to pedestrians and cyclists from exposure to motor vehicles, the health benefits of active transportation have been shown to outweigh the potential risks (Mueller, et al., 2015).

Numerous studies have shown that perceived risks to personal safety and fear of crime can exacerbate health issues associated with cardiovascular and chronic disease, and can lead to decreased physical activity and poorer mental health (Vemuri and Costanza, 2006; Weinstein et al., 2015).

4.6.3 Existing Conditions Related to Crime and Personal Safety

Current Rates of Crime

The City of Duluth provided raw crime data of all calls for service in the HIA study area for the years 2010 through 2017. The reported crimes were coded into four categories: personal safety (e.g., drug incidents, suspicious activities, etc.); violent person-to-person (e.g., assault, physical harm to others, etc.); person-to-property (e.g., burglary, vandalism, etc.); and other (e.g., domestic disturbances). The raw data were filtered to remove service calls for which the nature of the incident could not be fully ascertained (e.g., traffic stop) and incidents not relevant to the HIA (e.g., water main break). The locations of the remaining incidents were mapped by category from 2010 – 2017 within the HIA study area (Figure 4-37).

Duluth Crime and Safety Data

The Duluth Police Department now uses LexisNexis to make crime and safety data publicly available and track crime hot spots. To access the data, simply go the Community Crime Map (http://communitycrimemap.com/) and either select Duluth in the "Jump to City" field or enter a specific address. Residents can stay informed about crime in their neighborhood by clicking the "Sign up for crime alerts" button in the Community Crime Map to receive neighborhood watch reports through LexisNexis.

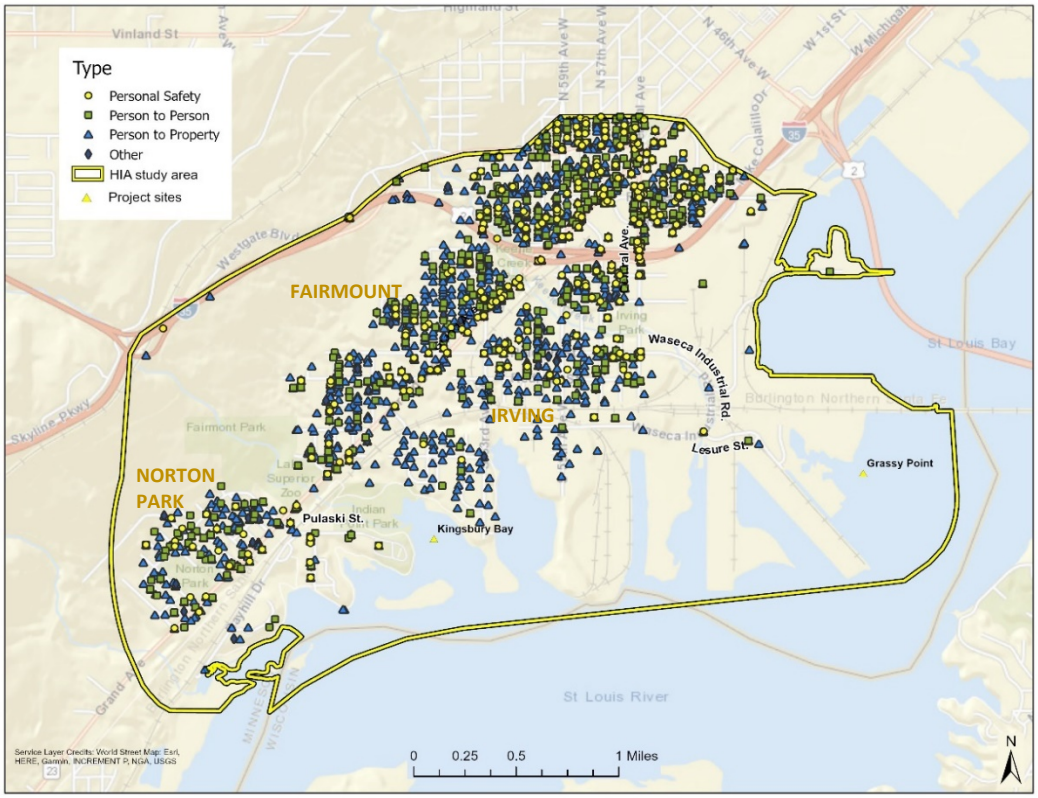

Figure 4-37. Map of crime type within HIA study area for years 2010 – 2017.

Crime incidence rate is used to describe the prevalence of crime in a community and can be used as a basis for comparison to other communities and benchmarks. From 2010 to 2017, there were 7,919 reported crime incidents in the study area (Census tracts 33, 34 and 36). **The crime rate was calculated as 171.3 cases for every 1,000 people per year in the HIA study area**.

$$\left[Crimes\ reported\ (n = 7{,}919) \Big/ Total\ Population\ (5{,}778)\right] * 1{,}000\ people * \frac{1}{8}\ years$$

The crime rate in the HIA study area was nearly 1.4 times that of the City of Duluth as a whole (about 121 cases per 1,000 people). In order to assess spatial patterns for the types of crime in the vicinity of the project sites, a 1,000-meter buffer was applied around the Kingsbury Bay and Grassy Point project areas (Figure 4-38). From 2010 – 2017, there were 1062 reported crime incidents within 1,000 meters of the two project sites. Among these incidents, the majority of crimes were around the Kingsbury Bay project site and fewer around Grassy Point. This is to be expected because there are few households near Grassy Point. There were fewer violent crime (person-to-person) and personal safety crimes within the buffer zones (Figure 4-39).

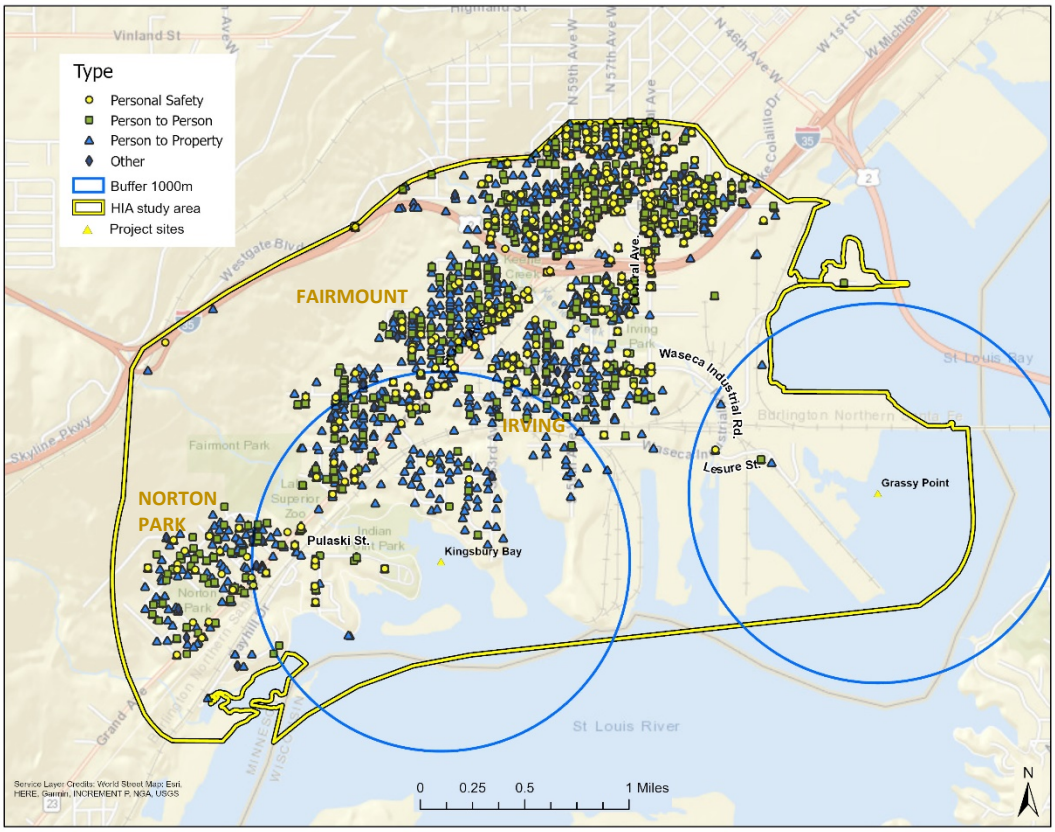

Figure 4-38. Map of crime type within 1000 meters of project sites for years 2010 - 2017. Person-to-person (e.g., assault, physical harm to others, etc.); personal safety (e.g., drug incidents, suspicious activities, etc.); person-to-property (e.g., burglary, vandalism, etc.); and other (e.g., animal disturbances).

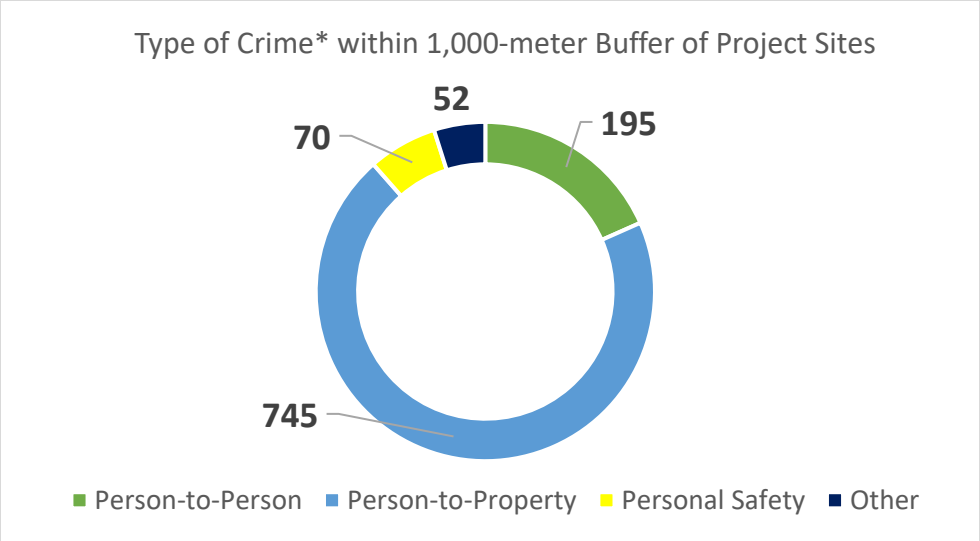

Figure 4-39. Types of crime within 1,000-meter buffer zone of the project sites for years 2010 - 2017. * Person-to-person (e.g., assault, physical harm to others, etc.); personal safety (e.g., drug incidents, suspicious activities, etc.); person-to-property (e.g., burglary, vandalism, etc.); and other (e.g., animal disturbances).

Pedestrian and Bicycle Safety and Access

Walk Score is an on-line tool that measures the walkability of a location based on the distance to nearby places, as well as pedestrian friendliness. West Duluth has a Walk Score of 29/100 (indicating it is car dependent; most errands require a car) and a Transit Score of 36/100 (indicating few nearby public transportation options). The neighborhood of Irving between Kingsbury Bay and Grassy Point is also car-dependent (Walk Score of 35/100) and has few nearby public transportation options (Transit Score of 30/100). Yet the population closest in proximity to both sites (Census tract 34, which includes the Irving neighborhood) has the highest prevalence of households with no vehicle available (19.8 ± 9.9%) (CDC, 2017), indicating that a higher percentage of individuals would likely be accessing the sites by foot or bicycle.

In an analysis of existing transportation and infrastructure conditions in the Western Port Area Neighborhoods in Duluth, there are three designated on-street bike routes in the study area – Grand Avenue, Central Avenue, and Raleigh Street (Toole Design Group, 2016). In addition, a portion of the Grassy Point Trail has an on-street segment along Waseca Industrial Road that has paved markings and signage for a designated bike lane (Figure 4-40). The bike routes along Raleigh Street and Central Avenue lack painted bike lane markings or signage, a safety issue which likely discourages use. The study identified

Figure 4-40. Some bike routes are less than ideal, with bicyclists traveling on busy streets, such as Grand Avenue (top), or roads with industrial traffic, such as Waseca Industrial Road (bottom).

a lack of a direct bicycle connection to the Willard Munger State Trail. Currently, bicyclists from the Irving Neighborhood would need to travel on-road along Grand Avenue to access the State Trail which may pose issues given the high traffic volumes and speeds along Grand Avenue.

According to Minnesota's Department of Transportation's crash data, only two incidents were identified where a pedestrian was struck (both in 2009) and two incidents where a cyclist was struck in the study area from 2005 to 2014. The report did not identify readily apparent clusters of crashes or locations that demonstrated an unusual crash history.

Community Perceptions of Project Sites

At the HIA kick-off meetings, community members and other stakeholders provided input on the current state and uses of both sites. Residents explained that Kingsbury Bay is poorly maintained, citing mudflats, thistles, cockleburs, and cattails. One local resident reported that people defecate in the park. At Grassy Point (described as "Junkie World" by one person), residents expressed fear of the people there and of the condition of the trail, highlighting the neglect, vandalism, and an unsafe environment where "seedy characters" may spend time (in the words of a community member). The neglect included broken boardwalks, vandalism, hypodermic needles, and debris, including discarded tires, shopping carts and garbage (Figure 4-41). Residents also felt that the Grassy Point area had "safety and traffic hazards" and that there were "no safe routes going to the park." Residents did not feel safe walking from the community of Irving to Grassy Point, "where [there] are a number of barriers, including a small under-road tunnel area that would need to be passed through" and the "unkempt nature of existing walking paths," which deterred people from access. Accessing the sites from the Fairmount and Norton Park neighborhoods, carry the added risk of crossing Grand Avenue, which is characterized by high traffic volumes and speeds.

Figure 4-41. Grassy Point boardwalk is overgrown and in disrepair. Graffiti is sprayed on the barricade.

Overall, community members expressed a lack of safety overall at the Grassy Point site, and in some cases, fear. One resident stated, "Fear. I feel fear when walking on the G[rassy] P[oint] trail - fear of people there and of the condition of the trail." Numerous studies have demonstrated that poorly maintained natural spaces negatively affect residents' sense of security and heightens perceptions (and possibly the incidence) of crime.

4.6.4 Potential Impacts to Crime and Personal Safety

Habitat Restoration

The Kingsbury Bay and Grassy Point project areas are currently inaccessible via larger boats due to shallow waters and at Grassy Point, the presence of woody debris. However, small boats and recreational watercraft such as canoes and kayaks can access the sites. During the construction phase of the restoration effort, stationary equipment such as floating pipelines and pumps will be installed along the edge of the main navigation channel of the St. Louis River. These pipelines will be buoyant and visible on the water surface and along with the associated dredging equipment may impact recreational boating activities. Plans to minimize water safety hazards are detailed in the EAW and MNDNR public waters permit, namely by positioning the pipeline near the shoreline; marking the pipelines with buoys and signage; and increasing visibility of the construction equipment with lights.

The habitat restoration work is also in close proximity to trails and other recreational outlets and has the potential to impact the personal safety of recreational users. Trucks will enter and exit Kingsbury Bay via Pulaski Street, which also services Indian Point Campground (i.e., a Duluth campground with river access) and a parking lot at the trailhead of the Western Waterfront Trail (i.e., a trail that runs along the St. Louis River shoreline from Grassy Point past Kingsbury Bay to Riverside and provides hiking, biking, birding, and access to the river). Also nearby is a trailhead of the Willard Munger State Trail (i.e., an extensive multi-use trail that offers hiking, biking, in-line skating, cross-country skiing, and snowmobiling). Increased truck traffic in this area poses a safety risk to pedestrians and recreational users in the area.

After restoration efforts are complete, the project sites will provide greatly enhanced recreational fishing and boating activities as a result of more open, vegetation-free channels and increased water depths (MNDNR, 2018). While the opportunities for public access and recreational use of the waters will be enhanced, the project currently does not plan to provide facilities or resources to facilitate watercraft use, such as marinas or boat docks. The enhanced opportunities for recreational boating in the bay bring along added risk for personal injury, loss of life, and property damage. While data on boating safety were not available for the project areas, this information can be inferred from the United States Coast Guard (USCG, 2016) who compiles national statistics on recreational boating safety. In 2016, the USCG reported 4,463 recreational boating accidents in the U.S. The most common vessel types involved in reported accidents were open motorboats (47%), personal watercraft (18%), and cabin motorboats (15%). In addition, the vessel types with the highest percentage of deaths were open motorboats (47%), kayaks (13%), and canoes (9%).

Restoration efforts are expected to improve the aesthetics of the project sites as accumulated wood waste and invasive plant species are removed and wetland habitats restored to a more diverse and natural condition. A number of empirical studies provide evidence that contact with natural environments improves the quality of people's social and community interactions, thereby lowering incidences of crime and increasing the perception of safety (Weinstein et al., 2015). While some studies have associated natural and vegetated areas with greater perceptions of the possibility of crime (Nasar,

1982), the growing body of literature predominantly suggests that more natural surroundings are negatively associated with crime, as nature facilitates residents spending more time outdoors and monitoring their environment (Kuo and Sullivan, 2001a,b).

Improvements to the project sites may influence the incidence rate for specific types of crime. In particular, enhancing the presence of green and natural space can potentially facilitate decreases in person-to-property crime (e.g., burglary, larceny, theft, arson, and vandalism). This is especially important for Kingsbury Bay and Grassy Point as person-to-property crime are highest around these sites.

Park Improvements

A number of post-restoration projects are being planned to improve and expand the trail systems that will ultimately provide greater public access and enhanced scenic views of natural St. Louis River habitats and wildlife. Currently, the Western Waterfront Trail (WWFT) borders Kingsbury Bay and provides nearly five miles of public waterfront access. The trail also connects the riverside neighborhood to the Lake Superior Zoo. The Duluth Cross City Trail Mini Master Plan (Hosington Koegler Group Inc., 2017) envisions a 10.3-mile multi-purpose, non-motorized paved trail system connecting downtown Duluth and the WWFT to the Willard Munger Trail, which would connect the project area to communities south of Duluth.

Conceptual park designs identified by the City promote additional recreational and development opportunities within and along the St. Louis River Corridor. For these future projects, improvements to aesthetics and existing infrastructure can facilitate a reduction in crime and offer improvements in perceived safety and security. However, studies have indicated that improvements to natural and green space must include a plan for maintenance to promote use and positive perceptions of park safety. Crime Prevention through Environmental Design (CPTED) outlines proper design and effective use of the built environment that can lead to a reduction in the fear and incidence of crime (Crowe, 2000). CPTED principles can provide park users a comforting feeling while discouraging potential criminals, thereby reducing crime proactively and unobtrusively. Recreational users must also be able to safely access the parks from the surrounding neighborhoods.

4.6.5 Potential Health Impacts Related to Changes in Crime and Personal Safety

Habitat Restoration

Ecological restoration of the coastal wetlands may **detract from health** during construction due to physical hazards posed on recreational boaters but will **not be likely** due to the stated mitigation measures and relatively small number of users**.** Post-restoration operations will **benefit health** because conditions will ultimately improve attitudes and behaviors and help reduce the risk of crime related injury and stress. It is **possible** that revitalization of land (Kingsbury Bay) and addition of wetlands, deep water/streams, and wooded plants (Grassy Point) will deter crime and promote positive perceptions of the project sites. Changes in crime and personal safety will only affect a **low** number of people due to the availability of public access points and size of residential zones surrounding the sites. Improving

crime and personal safety will benefit vulnerable populations such as youths, the elderly, and individuals in poor physical health. The health impacts from crime and decreased personal safety can be minor to moderate, depending on the nature of the crime. Building positive perceptions of the safety of the project sites will likely take a long time to take effect and can be easily reversed if conditions are allowed to deteriorate. There is limited evidence supporting positive changes in crime and personal safety through habitat restoration efforts.

Park Improvements

The trails and parks in the study area are perceived by some people as poorly maintained and unsafe. Construction-related activities may further **detract from health.** However, improving and maintaining park commodities will ultimately **benefit health** because it will support healthy behaviors, improve mental health, and reduce the risk of cardiovascular disease and related conditions. It is **possible** that increasing safe public access points, maintenance of park commodities, and availability of lighting on the trails will enhance perceived security and reduce the risk of crime related injury, stress, and stress-related illness. If they are well maintained, improvements to public perceptions of the safety of the parks will affect a moderate number. Improving crime and personal safety will benefit vulnerable populations, such as youths, the elderly, and individuals in poor physical health. The health impacts from crime and decreased personal safety can be minor to moderate, depending on the nature of the crime. Building positive perceptions on the safety of the park sites will likely take a long time to take effect and can be easily reversed if conditions are allowed to deteriorate. There is limited evidence (numerous but sometimes conflicting studies; vast majority of studies are cross-sectional and not representative of changes over time) supporting positive changes in crime and personal safety through park improvements.

Table 4-22 provides a summary of the baseline health status and characterization of health impacts related to crime and personal safety during the various project phases.

Table 4-22. Characterization of Impacts Related to Crime and Safety

Pathway							
Crime and Safety	**Baseline Health Status** From 2010 to 2017, there were 7,919 reported crime incidents in the study area (census tracts 33, 34 and 36), which equates to a crime rate of 171.3 cases for every 1,000 people per year in the study area. There were 195 cases of person-to-person crime (e.g., assault, physical harm to others, etc.) in the study area between 2010 and 2017. Minnesota's Department of Transportation's crash data from 2005 to 2014 identified only two incidents where a pedestrian was struck (both in 2009) and two incidents where a cyclist was struck. It should be noted, however, that in 2017, unintentional injury was the fourth leading cause of death in St. Louis County (MDH, 2018). Crime and impacts to personal safety (actual and perceived) can be a source of stress. While the City of Duluth has been rated one of the least stressed cities in the U.S., the prevalence of stress-related health outcomes (e.g., high blood pressure and mental health) are elevated in the study area as compared to the City and sometimes even the National rates.						
Project Phase	**Direction**	**Likelihood**	**Magnitude***	**Distribution**	**Severity (Intensity)**	**Permanence**	**Strength of Evidence**
Habitat Restoration Construction/ Operations	Unsure/Both Benefit and Harm	Injury - Not Likely; Reduce crime and stress – Possible	Low	Disproportionate Effects - youth, the elderly, and individuals in poor physical health are more vulnerable to impacts of crime and safety	Minor to Moderate	Immediate, but Short-term	Lacking
Park Improvement Construction	Detract from Health	Not Likely	Low	Disproportionate Effects - youth, the elderly, and individuals in poor physical health are more vulnerable to impacts of crime and safety	Minor to Moderate	Immediate, but Short-term	Lacking
Park Improvement Operations and Maintenance	Benefit Health	Possible	Low to moderate	Disproportionate Effects - youth, the elderly, and individuals in poor physical health are more vulnerable to impacts of crime and safety	Minor to Moderate	Long Time, but Long lasting	Limited

4.6.6 Main Findings and Preliminary Recommendations Related to Crime and Personal Safety

Based on the Assessment findings of this pathway, these preliminary recommendations were developed for promoting the positive health impacts and mitigating the adverse health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvements projects. For more details on these recommendations, including their intended purpose and implementation, as well as any additional recommendations added after review by the community and stakeholders, see the consolidated list of final HIA Recommendations in Section 5.

Main Finding

Design and maintenance of green spaces and natural elements can facilitate a reduction in crime and improvements in perceived safety and/or security. Improvements to aesthetics and existing infrastructure at Grassy Point will improve personal safety and perception of safety and/or security, as well.

- Communicate the improvements being made to Grassy Point to alleviate existing perceptions of crime and personal safety issues and encourage utilization of the space post-restoration
- Follow Crime Prevention through Environmental Design (CPTED) guidelines, including lighting and planting configurations. Where possible, reduce dense planting and shrubs around narrow pedestrian paths
- Construction activities that alter existing routes and access points should have clear signs and barriers to minimize the potential for trespassers
- Lighting should be improved and police surveillance considered to reduce crime and the perception of risk at these sites
- Provide clear signage and maps for pedestrian and bicyclist access to the parks. Important elements of access and design include effective wayfinding systems such as the use of landmarks, signage, distance to destination markers, and interest points to assist in navigating the routes easily
- After improvements of parks begin, increase enforcement or police presence to “set the tone.” Communicate to police department that their presence is important in the beginning to deter bad behavior and reduce crime. This is especially true at Grassy Point where it is more secluded and thereby, necessitates more formal surveillance. Delegation of those resources should be determined by the number of visitors and the expected frequency of crimes

Main Finding

The new parks and amenities need to be safely accessible by pedestrians and bicyclists, and access routes should be Americans with Disability Act (ADA)-compliant.

- Consider using NHTSA's Walkability and Bikeability Checklist to inform design of trails within the parks and leading to the parks
- Improve pedestrian and bicycle access to Grassy Point from the Irving neighborhood; current access is by footpath or walking/biking along Waseca Industrial Road
- Implement traffic calming measures (such as speed humps, raised crosswalks/intersections, traffic circles, medians, curb extensions or bump-outs, and signage or pavement markings) and bikeway improvements such as clear painted bike lane markings and signage to already designated bike routes

4.7 Recreation, Aesthetics, and Engagement with Nature

Access to outdoor recreation areas is an important component to individual and community mental and physical well-being. Parks provide opportunities for physical activity, which is known to reduce stress, cardiovascular disease, obesity, and other chronic disease. Activities such as fishing can further impact health through consumption of the catch.

Parks and aesthetically pleasant green space also promote engagement with nature, which has been shown to reduce stress and improve mental and overall health and well-being. The value of these spaces can be a product of ongoing contact with them.

4.7.1 Pathway of Impact

Figure 4-42 shows the pathways by which the proposed habitat restoration project and subsequent park improvement projects could potentially impact recreation, aesthetics, and engagement with nature.

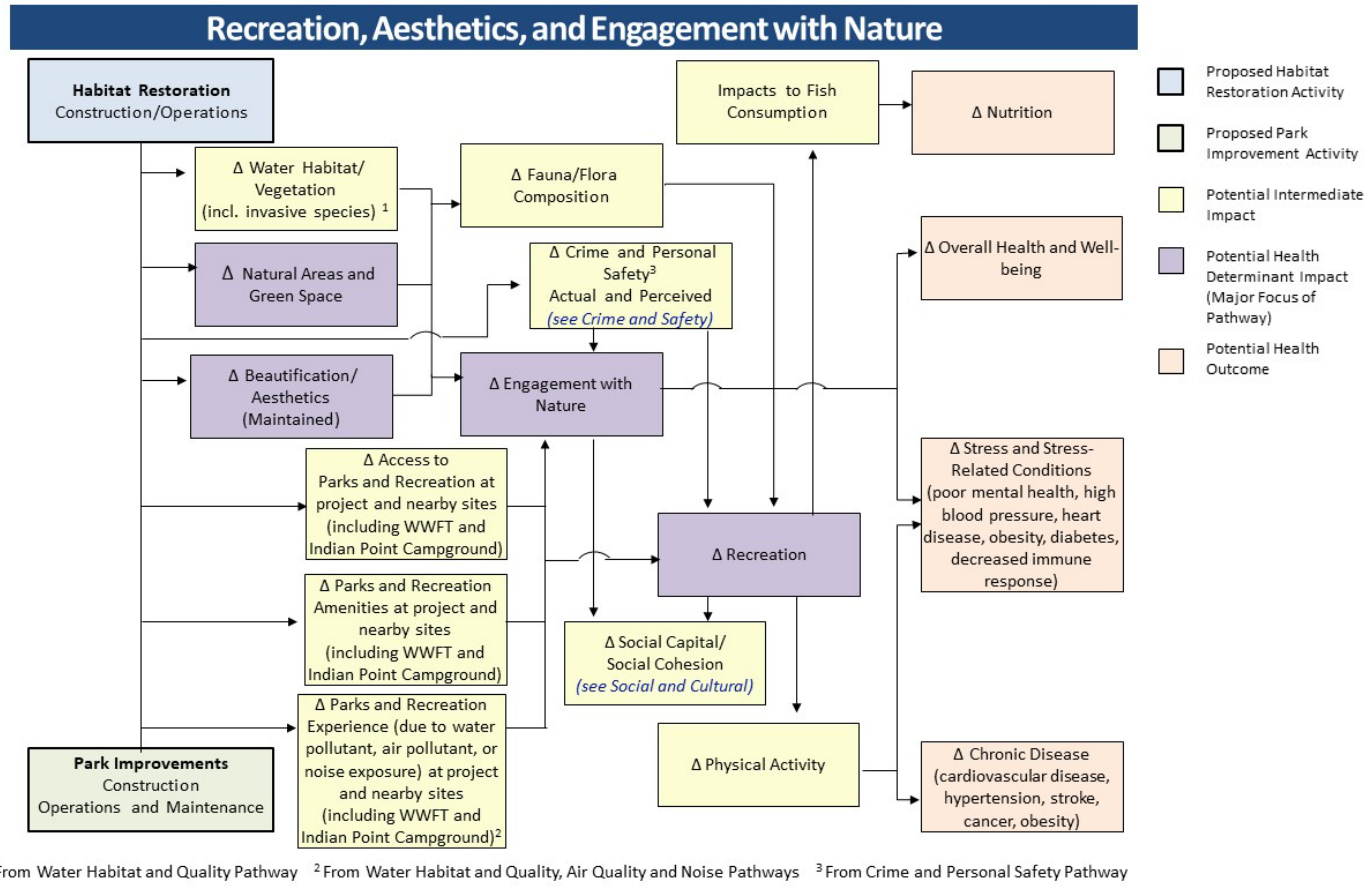

Figure 4-42. Recreation, Aesthetics, and Engagement with Nature pathway diagram.

4.7.2 Results of the Literature Review

Access to green space is multi-dimensional and based on factors such as proximity, safety, functionality, maintenance, and aesthetics. If any of these factors are lacking, access may be inhibited.

Green space and Well-being

Access to outdoor recreation opportunities is an important component of individual and community well-being (Abraham et al., 2010; Larson et al., 2016a, 2016b). Access to public green space, such as parks, trails, and sports fields, can have beneficial effects on both mental and physical well-being (Larson et al., 2016a, 2016b). Public green space provides a place for physical activity or exercise (Brown, Schebella, & Weber, 2014; Cohen et al., 2007), walking (Van Cauwenberg et al., 2015), pet exercise (Lee & Shen, 2013), and aesthetic appreciation (Buchel & Frantzeskaki, 2015). In addition to health benefits from increased physical activity, parks and aesthetically-pleasing green space promote mental well-being through attention restoration from mental fatigue, recovery from stress, evocation of positive emotions, and social integration (Abraham et al., 2010). One in four Americans are impacted by stress (NPR, RWJF, & Harvard School of Public Health, 2014). Physical manifestations of stress may include reduced mental health, high blood pressure, heart disease, obesity, diabetes, and diminished immune response. Some people are more susceptible to stress than others, including those in poor health, persons with disabilities, people with low incomes (<$20,000), and the parents of teens (NPR, RWJF, & Harvard School of Public Health , 2014). For individuals exposed to difficult family circumstances, poverty, or discrimination based on gender, social class, or ethnicity (Thoits, 2010), time in green space may improve mental and physical health through stress relief.

Evidence supports the assertion that nature is good for us (Howell & Passmore, 2013). Experiences in "beautiful" nature may promote pro-social behavior (Zhang et al., 2014), increase happiness (Zelenski & Nisbet, 2014), and facilitate social interactions (Buchel & Frantzeskaki, 2015; Larson et al., 2016a, 2016b). Scholars may disagree about which characteristics of natural settings contribute the most to human well-being and which provide specific ecosystem services (Keniger, Gaston, Irvine, & Fuller, 2013; Sandifer, Sutton-Grier, & Ward, 2015; Shanahan, Fuller, et al., 2015; Shanahan, Lin, et al., 2015). Charismatic species and biodiversity provide benefits through engagement with nature and place identity, as well as provide therapeutic value (Bryce et al., 2016). Evidence suggests that frequent visits to urban green space increases the recognition of the benefits humans receive from ecosystems (Baur, Tynon, Ries, & Rosenberger, 2014) and enhances the connection to a place (Lee & Shen, 2013). In other words, it is frequent contact with the biophysical environment that shapes knowledge of ecosystem services and their benefits (Cheng et al., 2003).

Parks and nature reserves in urban areas are important as places to access nature, as well as the ecosystem benefits they provide (Baur et al., 2014; Wendel, Zarger, & Mihelcic, 2012). Despite its importance to community and individual well-being, green space is not evenly distributed within most urban areas, which may limit the amount of and access to nature for some historically overburdened groups (Boone, Buckley, Grove, & Sister, 2009; Dai, 2011; Maroko, Maantay, Sohler, Grady, & Arno, 2009; Sister, Wolch, & Wilson, 2010; Geller et al., 2016). For example, although African Americans in

Baltimore, Maryland, generally live closer to parks, there is more total park acreage in white neighborhoods (Boone et al., 2009).

Studies have found that having a park within a half-mile or 10-minute walk (a common national standard for park access) is associated with higher levels of physical activity (Mowen, 2010; CDC, 2012; APA, 2015; Harnik and Martin, 2015).

Beautification and Aesthetics

Park condition is an important contributor to the ultimate benefit of green space. Although proximity to parks has been shown to increase physical activity (Kaczynski & Henderson, 2007), other factors like actual or perceived crime or park over-use may undermine the positive effects of park proximity (Cutts, Darby, Boone, & Brewis, 2009). Factors that are important for park use include personal safety, cleanliness and maintenance, amenity availability, quality, as well as aesthetics (McCormack, Rock, Toohey, & Hignell, 2010). Reflecting the importance of pleasing aesthetics and adequate maintenance, recently renovated and improved parks can draw more than twice the number of visitors compared to unimproved parks (Cohen et al., 2015). This is important because larger and amenity-rich parks may enjoy increased citizen and institutional support (Holifield & Williams, 2014).

Park size (Brown, Schebella, & Weber, 2014; Cohen et al., 2010) and the number of organized activities (Cohen et al., 2010) are the attributes that seem to have the most influence on physical activity by park users. Physical activity has been confirmed as one of the most effective methods of decreasing risk of premature death and chronic diseases, including cardiovascular disease, diabetes, some cancers, hypertension, obesity, depression, and osteoporosis (Warburton, Nicol, & Bredin, 2006; Reiner, Niermann, Jekuac, & Woll, 2013). Increased physical activity generates health benefits both for previously inactive and active people (Warburton et al., 2006).

Outdoor Recreational Activities

Participation in outdoor recreation can have a restorative effect and positively impact well-being (Kim, Kim, Lee, Mydin, & Marzuki, 2014; Korpela, Borodulin, Neuvonen, Paronen, & Tyrväinen, 2014). Outdoor recreation can include a broad range of activities including birding and nature study, fishing, hiking, biking, climbing, skiing, or boating. Other benefits from natural settings (Kux & Haider, 2014) include: improved cognitive functions and attention span (Hartig et al., 1991; Cimprich & Ronis, 2003), higher reported happiness and sense of rejuvenation (Hartig et al., 1991), and reduced stress hormone production and more steady heart rate (Lee et al., 2011).

Recreational activities in nature, such as birding, fishing, and trail hiking, connect people to the natural environment and ecosystem services. The act of bird watching can be an important method for creating a sense of place and personal identity (Wilkinson et al., 2014). Living or working near a natural area or green space may be one predictor of use (Dallimer et al., 2014).

Recreational Fishing

Recreational fishing consists of fishing for other than commercial or Indigenous cultural purposes. It includes non-subsistence fishing for food and catch-and-release fishing (Cooke & Murchie, 2015). Subsistence fishing (i.e., fishers who derive a significant part of their diet from fish) may be considered a type of recreational fishing (Ebbin, 2017). Understanding the distinction between types of fishing is important because studies of Native American fishers suggest that they eat fish at a higher rate than other anglers (Moya, 2004). Recreational anglers fish as a leisure activity (Ditton, Holland, & Anderson, 2002), as a source of food (Westphal et al., 2008), for relaxation (Ebbin, 2017), to forge social connections (Anderson & Loomis, 2005; Ebbin, 2017; Toth & Brown, 1997), and as a form of tourism (Ditton, Holland, & Anderson, 2002). Participation in recreational fishing activities may vary by race or ethnicity (Burger, 2002).

Motivations to fish, perceptions of the safety of fish for consumption, and fishing practices vary amongst ethnic groups (Fedler & Ditton, 1994; Westphal, Longoni, LeBlanc, & Wali, 2008). For example, West et al. (1992) found that African Americans were more motivated to fish for food than White Americans who placed more emphasis on non-catch aspects of fishing. Burger (2002) found that African Americans (78%) ate their catch more often than did Asians (76%), Hispanics (60%), or whites (51%) in a highly polluted estuary. The catching and eating habits of Native Americans were not included in this study. Similarly, Burger et al. (2001) found that African Americans consumed more self-caught fish than Caucasian anglers.

Leisure constraints are factors that interfere with an individuals' ability or desire to participate or achieve satisfaction in a leisure activity (Crawford & Godbey, 1987; Jackson, 1988). Constraints that may influence participation in recreational fishing include lack of time, equipment, knowledge or skills, water access (e.g., fishing piers), inadequate facilities, or perceptions of safety (Sutton, 2007). Studies of motivations and constraints for female anglers tend to show that accommodation for children are an important aspect of participation (Aas, 1995). People with disabilities constitute a group that may be highly motivated to participate in recreational fishing, but who face unique structural constraints (Freudenberg & Arlinghaus, 2009). Disabled anglers disproportionately use piers over other access facilities. Another relevant constraint is that disabled anglers often require one or more assistants to facilitate the experience (Freudenberg & Arlinghaus, 2009) which influences group size and related infrastructure and design considerations.

There is abundant evidence of the nutritional benefits of eating fish. Fish are a rich source of vitamins and omega-3 fatty acids which are essential for healthy brain, eye and nerve development in babies and children (Beveridge et al., 2013; Ruxton et al., 2004). They are also beneficial for heart health (Chowdhury et al., 2012; Djoussé et al., 2012) and there is emerging evidence to suggest that eating fish reduces the risk of cancer and arthritis. Omega-3 fatty acids may decrease the risk of depression (Grosso et al., 2014; Sarris et al., 2012), attention deficit/hyperactivity disorder (ADHD), Alzheimer's disease, dementia, and diabetes (Conner, 2000).

4.7.3 Existing Conditions Related to Recreation, Aesthetics, and Engagement with Nature

Park Conditions in HIA Study Area

Duluth has approximately three times more green space than most other U.S. cities of similar size (Kreag, 2002). The City of Duluth contains 129 parks (6,834 acres), 11,000 acres of green space, 12 miles of paved trails, 85 miles of unpaved bike-optimized multi-use trails, and 150 miles of unpaved hiking trails (Figure 4-43). There are 235 acres of parkland in nine parks and special use areas located in the HIA study area. Their sizes and uses are described in more detail below.

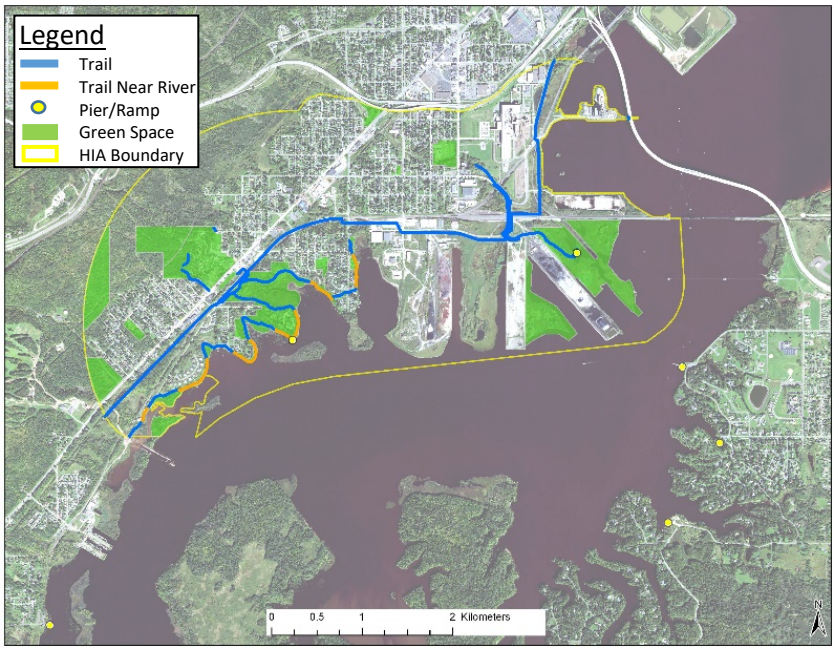

Figure 4-43. Map of the Kingsbury Bay-Grassy Point project area showing existing green space, trails, and piers or boat ramps within and near the project area boundary.

Neighborhood Parks[17]

- **Irving Park** (9 acres): The park contains ball and soccer fields, playground equipment, a basketball court, and a trailhead for the Grassy Point Trail. Keene Creek runs along the southern edge of the park. Irving Park was severely damaged in the 2012 flood; the community center was a total loss, and fencing was damaged. The City of Duluth approved the Irving Park Mini-Master Plan in October 2015 (City of Duluth, 2015). The first phase of improvements for Irving Park were completed during the summer of 2018.

[17] The park categories used by the City of Duluth are based on the National Recreation and Parks Association (NRPA) classification system (NRPA, 1996). Neighborhood parks in Duluth are those that serve a 0.25- to 0.50-mile radius and 1,000 to 5,000 persons, are 4-8 acres, and suited for intense development. Most neighborhood parks have amenities like play equipment, ball or soccer fields, winter ice activities, and community centers. A Mini-Master planning process was conducted for 11 neighborhoods parks in the St. Louis River Corridor in 2015-2016 (City of Duluth, 2016b).

- **Keene Creek Park** (13 acres): I-35 passes over the park. It contains a dog park, children's play area, and skate park. The Mini-Master Plan for Keene Creek Park (City of Duluth, 2016b) includes upgrades to lighting, trails, play areas, and riparian zone restoration.
- **Norton Park** (3 acres): The park includes a play area, little free library, community center, and ball fields. The Mini-Master Plan for Norton Park (City of Duluth, 2016b) includes upgrades for the existing facilities and extensive streambank stabilization.
- **Memorial Park** (3 acres): The park is located on Grand Avenue and contains ball fields and courts, picnic shelter and tables, and BBQ grills. It is adjacent to Laura MacArthur School.

Three of the four neighborhood parks in the HIA study area were heavily damaged in a devastating flood in 2012 (Figure 4-44). Many of the planned neighborhood park upgrades will address some of the unrepaired facilities, which will contribute to community resilience. Upgrades or planned projects for the parks include stream bank stabilization, athletic field repair, new lighting, and benches.

Figure 4-44 Ballfield damage in Norton Park (left) and Irving Park (right) have not yet been repaired after extensive flood damage in June 2012.

Regional Park[18]

- **Fairmount Park** (56 acres): The park is located adjacent to the Lake Superior Zoo. There are playground facilities, picnic areas, permanent restrooms, and a trailhead for the Superior Hiking Trail and connection to the Duluth-Winnipeg-Pacific (DWP) trail (Figure 4-45).

Figure 4-45. Fairmount Park includes a playground, picnic area, and a connection to the Superior Hiking Trail.

[18] Regional parks are the largest parks in the City of Duluth park classification system based on NRPA (1996). They are 50-100 acres in size, serve the entire city, and the service radius is about a 30-minute drive. Regional parks are a mix of recreation, as well as natural and open spaces.

Special Use Areas[19]

- **Indian Point Campground** (27 acres): This campground at Kingsbury Bay features 70 campsites, a permanent bathroom building, picnic shelter, grills, trash cans, a non-motorized boat landing, (Figure 4-46) and a fishing pier (Figure 4-48). The campground is adjacent to the Western Waterfront Trail. On-site amenities include RV hook-up, electric camp sites, internet connection, showers, laundry, ice machines, canoe and bicycle rental, and dock space with mooring buoys. According to campground policy, the accommodations are open to the public.

Figure 4-46. Non-motorized boat landing at Indian Point Campground also provides fishing access.

- **Grassy Point Park** (71 acres): This linear park is located in the Irving neighborhood of Duluth and is partly adjacent to industrial properties. Currently, amenities at Grassy Point are limited to a parking lot, a carry-in canoe landing, and boardwalk (Figure 4-47). The boardwalk is presently in serious disrepair from flooding and vandalism and lacks accessibility for individuals with mobile disabilities (Figure 4-47).

Figure 4-47. Signage at the entrance to Grassy Point Park (left). Grassy Point Trail boardwalk (middle). Current condition of the Grassy Point boardwalk near the observation platforms (right).

[19] Special use areas are intended to serve both residents and visitors with unique experiences and specialized facilities.

- **Western Waterfront Trail** (5 miles, 40 acres): This gravel trail is a linear park that runs along the St. Louis River shoreline through the HIA study area (Figure 4-48). There are portable bathrooms, trash cans, and several trailhead parking areas.

Figure 4-48. Western Waterfront Trail near Indian Point Campground (left). Fishing Pier at Indian Point Campground along the Western Waterfront Trail (right).

Current Use of and Perceptions of the Parks

The Duluth Parks Department does not currently track park use. However, an analysis of geotagged social media photos provides some insight on how parks are used in the HIA study area. A photo density analysis of Panoramio, Flickr and Instagram[20] photos suggest there is variable activity among parks. The local "hotspots" of activity are the Lake Superior Zoo, Keene Creek Park, Grassy Point, and both the Western Waterfront and Superior Hiking Trails (Figure 4-49).

The site with the most photos on all three platforms was the Lake Superior Zoo (Figure 4-49). The second-most popular site varied amongst the three platforms. Grassy Point was the second-most popular site on Flickr and contained many photos of birds. In contrast, the second-most popular site on Instagram was Keene Creek Park, home to a popular dog park, which was well represented among the posted photos.

[20] The set of photos was extracted from a larger set of photos related to Area of Concern research. Panoramio is largely a landscape photo-sharing platform where photos were taken on cameras and uploaded to the site, Flickr users typically upload photos from both cameras and phones, and Instagram users most often upload photos from their phones or take photos in the app.

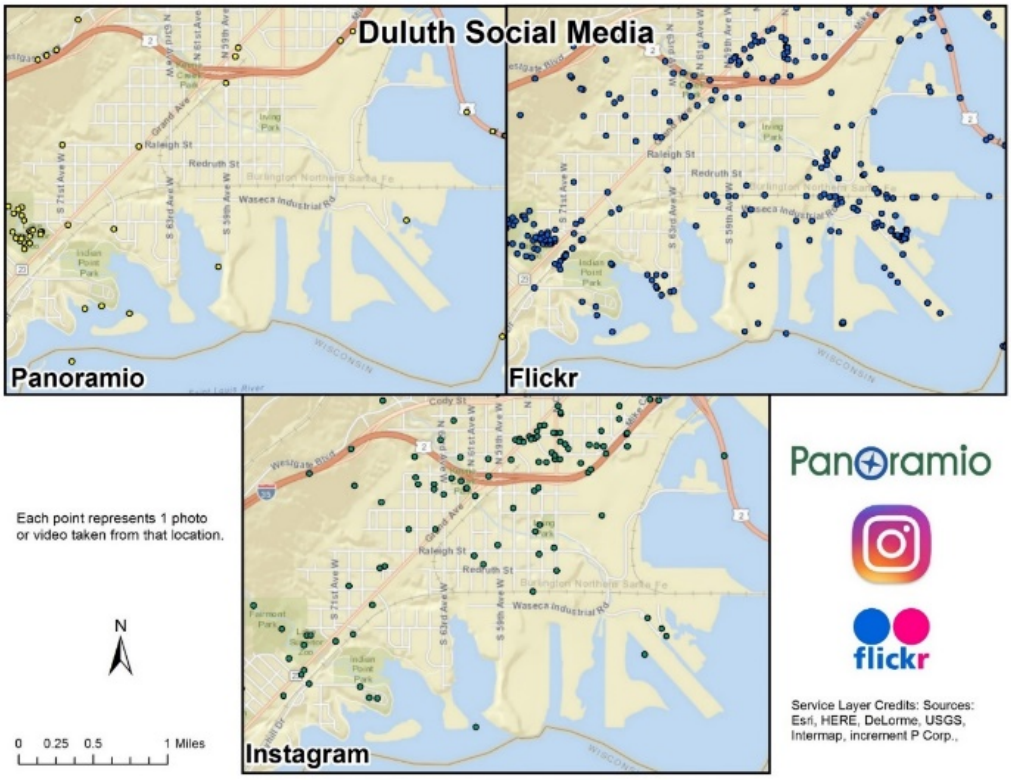

Figure 4-49. Social media photo analysis. Each point represents one photo or video taken from that location.

In addition to the photo analysis, public and stakeholder meetings were structured to capture data regarding park use. During the public and stakeholder meetings, attendees shared ideas about the potential for habitat and park improvements at Kingsbury Bay and Grassy Point. Resident and stakeholder comments reflected past and current insight and experience, as well as historical knowledge. In general, the residents and stakeholders raised concerns about park maintenance and condition and described current and desired park uses.

Concerns about park maintenance included:

- "The City already doesn't take care of the Western [Duluth] parks that it has and now they are going to add two more?"
- "Volunteers are the ones often left responsible for helping to keep the parks maintained."
- Many concerns about maintenance were directed towards Grassy Point. Residents shared that they feel unsafe there because of loitering and the poor condition of the boardwalk. Several residents felt that drug use and garbage dumping were currently problems at Grassy Point.

One resident stated, "Fear. I feel fear when walking on the G[rassy] P[oint] trail - fear of people there and of the condition of the trail." Not all comments about present conditions were negative, as many stakeholders and residents feel positively about the area and the current amenities:

- "Please keep the waterfront trail open during construction."
- Grassy Point was noted as a bird watching "hotspot."

- There were several comments asking that camping be preserved at Indian Point Campground, including "(what are the) plans for Indian Point? Continue/improve camping? – [The} city seems short on camping opportunities."

Several people expressed a hope for more fishing access at both Kingsbury Bay and Grassy Point. An overarching theme in the comments was that participants seemed to appreciate the current park amenities, even though many were concerned about maintenance or condition. It is important to recognize that the habitat restoration at Kingsbury Bay and Grassy Point are unfolding alongside the city of Duluth's St. Louis River Corridor initiative, which entails the creation of new park and trail amenities, along with the improvement of the existing parks. What stakeholders seem to fear is duplication of existing resources. Two comments speak to this concern:

- *"Keep it simple. Fairmont is a few hundred feet away. Don't duplicate what is there. Duluth lacks money and staff to adequately maintain existing parks and trails. How can this additional park and trail be maintained? Attention to this new park (adding new parks at Fairmont and Quarry) will leave even less money and staff for existing parks and trails. Neglected and poorly maintained parks and trails are a greater negative than positive for health, wellness and happiness. There are multiple other nearby parks people use and enjoy."*
- *"Nearby current parks are not adequately maintained and have 5-6-foot-tall thistles and cockleburs, yet there is planning to create brand new parks [which] makes users of existing nearby, neglected parks feel bad, frustrated, not important, yes – jealous."*

Finally, two submitted comments at the stakeholder meeting indicated that resource availability for the maintenance of new park amenities may be a concern for the City of Duluth, especially at Grassy Point:

- *"It will be expensive for the City to develop permanent connection to the island - what does it mean to not have access to the island by foot (only access by water)?"*
- *"City not interested in a peninsula vs. island at Grassy Point (more material, Keene Creek outlet).*"

Current Conditions for Recreational Fishing

The area has been noted for recreational fishing, although agency-based and academic experts have reported that the fishery is impaired by wood debris and lacks high-quality sediment for macroinvertebrates. Within the project area, there are two public fishing piers: on the Grassy Point Trail and at Indian Point Campground (Figure 4-43). Facilities at both locations are restricted to the piers. The pier at Indian Point Campground has about 225 feet of usable perimeter. The pier at Grassy Point has about 75 feet of usable perimeter (distances from Google Earth). The pier and boardwalk at Grassy Point are currently not in usable condition due to vandalism and lack of maintenance. There are about 5000 feet of public trail adjacent (<16 feet from shoreline) to open water in the project area that could be used to access the shoreline for fishing. The level of use of trail-adjacent access points for shore fishing is unknown.

There is a public landing for non-motorized boats at the Indian Point Campground and a picnic pavilion at Indian Point Campground, located about 600 feet from the fishing pier, which can be reserved for

private use. Several recreational fishing access amenities can be found within one mile of the Kingsbury Bay - Grassy Point project area. A boat ramp, rest rooms, parking, and fishing pier with about 220 feet of usable perimeter at Clyde Avenue provide fishing opportunities directly upriver of the project on the Minnesota side of the river (Figure 4-43). A double boat ramp, rest rooms, parking, and fishing pier with about 450 feet of usable perimeter are located across the river from Grassy Point off Belknap Street in Superior, Wisconsin. Furthermore, there is a boat ramp with parking in the first bay upriver from Belknap Street facility and a more sheltered location that may be used more frequently for launching non-motorized boats. Additionally, an unimproved access off Billings Drive is used to launch small boats and for ice access.

Finally, both Kingsbury and Keene Creeks are recognized trout streams, meaning that they have cool water and coarse stream beds. There is currently no developed shore fishing access for Kingsbury Creek or Bay.

4.7.4 Potential Impacts to Recreation, Aesthetics, and Engagement with Nature

Natural Areas and Green space

Once construction is complete, Kingsbury Bay and Grassy Point will provide natural areas and multi-use green space. Grassy Point and Kingsbury Bay are already sites where people enjoy hiking, birding, camping, and some fishing. In addition, biking, skiing, and other hiking opportunities are located nearby. The proposed concept plans contain both habitat restoration and potential new amenities. Potential changes include a new swimming beach at Kingsbury Bay located along the Western Waterfront Trail near Indian Point campground. The beach will add a new amenity, but might also impact the use of or access to Indian Point Campground. Table 4-23 outlines the changes in fishing and swimming access based on the site concept plans.

Beautification and Aesthetics

Public perception of the quality of an environment is an indicator of the aesthetic quality and potential use of a natural space. While Kingsbury Bay and Grassy Point are under construction, the reduced environmental quality caused by the disturbance will result in decreased aesthetics and quality, likely leading to less enjoyment by the public. After construction, the operation and maintenance of the restored habitat will contribute to the beautification and aesthetics of the natural spaces. Sustained maintenance will be especially important for Grassy Point, where there is a perception that the space is not well maintained and is therefore unsafe.

These spaces, especially Grassy Point, have the potential to connect the HIA study area to the St. Louis River and City of Duluth economic development. For example, the creation of Big Island will enhance access to the St. Louis River for aesthetic appreciation and fishing. The proposed changes at both Kingsbury Bay and Grassy Point will occur in the context of the larger revitalization of the St. Louis River Corridor, including the St. Louis River National Water Trail.

Table 4-23. Summary of the Projected Impacts of Habitat Restoration and Park Improvements on Recreation, Aesthetics, and Engagement with Nature.[a]

Changes in swimming and fishing access	Impact on existing resources
New swimming beach at the mouth of Kingsbury Bay.	Swimming beach will be located along the Western Waterfront Trail and Indian Point Campground, which may impact the current use of or access to Indian Point Campground.
Four new shore fishing locations at Grassy Point (one with deep water access).	Additional fishing opportunities at Grassy Point, boardwalks, and trails will facilitate access to Big Island and the pier. Increased depth at Kingsbury Bay will improve winter fishing.
The existing pier at Kingsbury Bay will be relocated in the bay on the other side of Indian Point Campground.	The current fishing pier will move from the western edge of Indian Point Campground to the tip of the point.
Net gain of 12 acres of kayak and canoe access.	Removing the delta in Kingsbury Bay and deepening channels at Grassy Point will create human-powered boat access and additional launches. Caution should be taken to reduce potential conflicts between recreational and human-powered boat users.
Net gain of 46 acres of recreational boating access.	Removing the delta in Kingsbury Bay and deepening channels at Grassy Point will create deeper water for other types of boats. Care should be taken to reduce conflicts between recreational boaters and residents along Kingsbury Bay.

[a] Projected impacts based on concept plans.

Engagement with Nature

Visitors to Kingsbury Bay and Grassy Point habitat restoration sites can engage with nature through recreation. There is expected to be a net gain of 12 acres of open water suitable for kayaks and canoes, and 46 acres of open water suitable for recreational boats (Table 4-23), resulting from the removal of the delta at Kingsbury Bay and deepening channels at Grassy Point (as detailed in the *Water Quality and Habitat* pathway). One expected result of the habitat restoration at Grassy Point is improved native vegetation and natural substrates, which will enhance the paddling experience. Also, the creation of Big Island will enhance bird habitat and provide bird watching sites.

Because of restricted access and perception of reduced environmental quality during habitat restoration and park improvement construction, opportunities and quality of engagement with nature may be temporarily limited. Construction activities may result in the displacement of wildlife in the project area resulting in reduced bird watching quality. In the May 2019 MNDNR Public Information Meeting, the public was notified of closures related to habitat restoration activities. The handout from this meeting stated that “the Western Waterfront Trail (WWFT) will be closed at Kingsbury Bay (there will be closure

and rerouting signs), the Kingsbury Bay parking lot will be used to stage equipment, alternate parking for WWFT access will be established on Spring Street, and the Kingsbury Bay snowmobile trail will be closed" (MNDNR, 2019). Similarly, during habitat restoration and park improvements the area may also be inaccessible for boaters.

Recreational Fishing

Opportunities for recreational fishing will be changed or enhanced at Kingsbury Bay and Grassy Point as a result of the habitat restoration and park improvements work. For example, there are potentially four new fishing locations at Grassy Point (including one with deep water access). Access to the fishing piers will be facilitated by the addition of trail and boardwalk access to Big Island. At Kingsbury Bay, the existing fishing pier will move to the other side of Indian Point Campground, which will change the view of the St. Louis River. During the construction phases, however, because of restricted access and perception of reduced environmental quality, opportunities for and quality of recreational fishing may be limited. Construction activities may result in the temporary displacement of fish in the project area resulting in reduced fishing quality.

4.7.5 Potential Health Impacts Related to Changes in Recreation, Aesthetics, and Engagement with Nature

Habitat Restoration and Park Improvements

It is **highly likely** that habitat restoration and park improvements construction will **detract from health** because there will be fewer opportunities for physical activity. The impact will be **moderate** because the public will be impacted in their ability to use the space, be affected by recreational amenity changes, and by the construction that will be occurring through the surrounding neighborhood. It is **highly likely** that stress will be increased during habitat restoration and park improvements construction for two reasons: because of disruption during construction and because landscape change may impact place identity and attachment, including reduced opportunities for birding at both Kingsbury Bay and Grassy Point. Populations impacted include nearby residents, birders, recreational users of the Western Waterfront Trail, campers at Indian Point Campground, and subsistence fishers. Effects will be disproportionately felt by those who most use and are attached to the sites

It is **highly likely** that habitat restoration and park improvements will **benefit health**, as they will improve the aesthetics of the sites, increase the public's ability to utilize the green space for recreation and engagement with nature, and increase amounts of green space that provide additional opportunities for physical activity. Impacted populations include nearby residents, birders, recreational users of the Western Waterfront Trail, and campers at Indian Point Campground.

The impacts on stress and overall health and well-being in the long-term (post habitat restoration and park improvements) will be positive as biodiversity increases and the landscape becomes more familiar. The negative effects of stress will be felt **disproportionately** on those who are most attached to the current sites because there is high value placed on the existing amenities and changing them could

cause distress. Furthermore, residents fear duplication of services and the subsequent neglect of existing parks.

It is **somewhat likely** the projects will **benefit health** and have a positive impact on nutrition as a result of improved natural resources and access and increased opportunity for fishing because of more fish habitat. The impact will be moderate because of the diversity of the public that will benefit from the restoration and park amenities. The groups that are most likely to be impacted include those who participate or depend on subsistence fishing for fulfilling their nutritional needs.

Table 4-24 provides a summary of the baseline health status and characterization of health impacts related to recreation, aesthetics, and engagement with nature during the various project phases.

Table 4-24. Characterization of Impacts Related to Recreation, Aesthetics, and Engagement with Nature

Pathway							
Recreation, Aesthetics and Engagement with Nature	Baseline Health Status Recreation, aesthetics, and engagement with nature has been shown to have a positive impact on overall health and well-being. However, well-being is not equally distributed throughout Duluth, resulting in higher rates of negative health outcomes in the HIA study area. For example, prevalence of less than 7 hours of sleep and lack of leisure-time physical activity is higher in the study area. There is also a higher prevalence of conditions related with stress in the study area (e.g., diabetes and poor mental health for 14 or more days) and lack of physical activity (i.e., chronic obstructive pulmonary disease, obesity, high blood pressure) in the HIA study area, compared to the city of Duluth (CDC, 2016a). The percentage of the population age 18 or older reporting their physical health was not good for 14 or more days in the last 30 days was also higher in the study area (11.4-14.5%), as compared to the City of Duluth (10.2%; CDC, 2016a). Improved natural resources and fishing can provide opportunity for increased fish consumption and impact nutrition. Food access is an issue of concern in the western neighborhoods of Duluth, including the HIA study area.						
Project Phase	**Direction**	**Likelihood**	**Magnitude***	**Distribution**	**Severity**	**Permanence**	**Strength of Evidence****
Habitat Restoration Construction/ Operations	Detract from Health during construction; Benefit Health when construction complete	Highly Likely; Impacts to nutrition – Somewhat Likely	Moderate	Disproportionate Effects - Nearby residents, birders, recreational users of the Western Waterfront Trail, campers at Indian Point Campground, subsistence fishers, and those who are most used and attached to the sites would be most vulnerable	Moderate	Immediate, but Short Term during construction; Immediate, but Long Term after constructions	Strong
Park Improvement Construction	Detract from Health	Highly Likely at Kingsbury Bay, Possible at Grassy Point	Moderate	Disproportionate Effects - Nearby residents, birders, recreational users of the Western Waterfront Trail, campers at Indian Point Campground, subsistence fishers, and those who are most used and attached to the sites would be most vulnerable	Moderate	Immediate, but Short Term	Strong

Project Phase	Direction	Likelihood	Magnitude*	Distribution	Severity	Permanence	Strength of Evidence**
Park Improvement Operations and Maintenance	Benefit Health	Highly Likely	Moderate	Disproportionate Effects - Nearby residents, birders, recreational users of the Western Waterfront Trail, campers at Indian Point Campground, and subsistence fishers would be most vulnerable. Stress will be lessened over time as landscape becomes more familiar.	Moderate	Immediate and Long Lasting, if the space is maintained	Strong

4.7.6 Main Findings and Preliminary Recommendations Related to Recreation, Aesthetics, and Engagement with Nature

Based on the Assessment findings of this pathway, these preliminary recommendations were developed for promoting the positive health impacts and mitigating the adverse health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvements projects. For more details on these recommendations, including their intended purpose and implementation, as well as any additional recommendations added after review by the community and stakeholders, see the consolidated list of final HIA Recommendations in Section 5.

Main Finding	Well-maintained spaces with diverse recreational options will enhance opportunities for recreation and overall health. *In spite of perceived condition, the recreational spaces around Grassy Point and Kingsbury Bay are well utilized for hiking, birding, and camping.*
Main Finding	Recreational fishing improves nutrition and overall health. Different populations fish for different reasons: subsistence, recreation, and as a social activity. *However, there are currently limited opportunities for shore and boat-based fishing in the study area.*

- Recommend that the City solicit deliberative community and stakeholder engagement[21] and examine the pathways through which the park efforts could impact health to help inform the park improvements design and implementation
- Offer diverse opportunities for recreation at both sites, including publicly-accessible gathering spaces, fishing piers, birding platforms, access to the water for water-based recreation, and trails, considering maintenance requirements of installed features
- Preserve and enhance fishing opportunities, with more formal locations (e.g., piers) and social gathering opportunities adjacent to those locations. The creation of Big Island at Grassy Point would provide an opportunity for a fishing pier and access to a fishery with more biodiversity; a bridge would be needed to access Big Island
- Create a higher upland area on Big Island to form a more sheltered bay, providing safer harbor for kayaks and canoes
- All swimming areas should include measures to enhance safety and minimize potential for user conflict. Measures should include signage about the availability of lifeguards and current water quality status. Buoys should separate swimming and boating areas

[21] Deliberative engagement "makes a difference, is transparent, has integrity, is tailored to the circumstances, involves the right number and types of people, treats participants with respect, gives priority to participant's discussions, is reviewed and evaluated to improve practice, and keeps participants fully informed." (Warburton, Colbourne, Gavelin, & Wilson, 2008)

- In advance of construction and in all project phases, clearly communicate to recreational users through multiple media sources reliable and timely information about disruptions to the Western Waterfront Trail and walkability and accessibility to both project sites
- Provide additional parking to increase access to and utilization of the restored Kingsbury Bay and Grassy Point sites
- Perform wetland restoration at the mouth of Kingsbury Creek to preserve the cold-water habitat for trout and provide deeper water for kayak and canoe access
- Create opportunities for social gatherings near the additional planned fishing piers, especially at Grassy Point, similar to the improvements at Chambers Grove Park
- Because recreational amenities are enjoyed by residents, any plans for future changes should include recognition of the value placed by residents who use the resources frequently
- Preserve and upgrade current birding locations, as well as enhance access to newly created birding habitat. Signage, raised platforms, and telescopes are all potential amenities. Upland plant communities should be restored to maximize potential for pollinator, including bird, habitat
- Recognizing the value placed on the existing resources, any changes to park amenities could add new features to existing parks and green space

Main Finding

Well-maintained spaces with diverse recreational options will enhance opportunities for recreation and overall health. *Partnerships with volunteer organizations may help support park maintenance.*

- Research and develop co-management models, where neighborhood organizations have more formal responsibility for park management. Co-management arrangements could empower the neighborhood and ease the maintenance burden on the city of Duluth
- Explore partnerships with organizations to facilitate access, education, and equipment sharing, additional recreational opportunities and leadership capacity building for underrepresented communities

4.8 Social and Cultural

The ability of the public to enjoy green spaces, engage with nature, and have opportunities for recreation and social interaction in nature has impacts to individual's overall health and well-being. Nature and green space that provide opportunities for socialization and trails to connect individuals to community resources help build social capital and cohesion. Green space, nature, and park amenities can also provide opportunities for spiritual reflection and cultural resources important to individuals in the community and the history of the area.

4.8.1 Pathway of Impact

Figure 4-50 shows the pathways by which the proposed habitat restoration project and subsequent park improvement projects could potentially impact social and cultural factors.

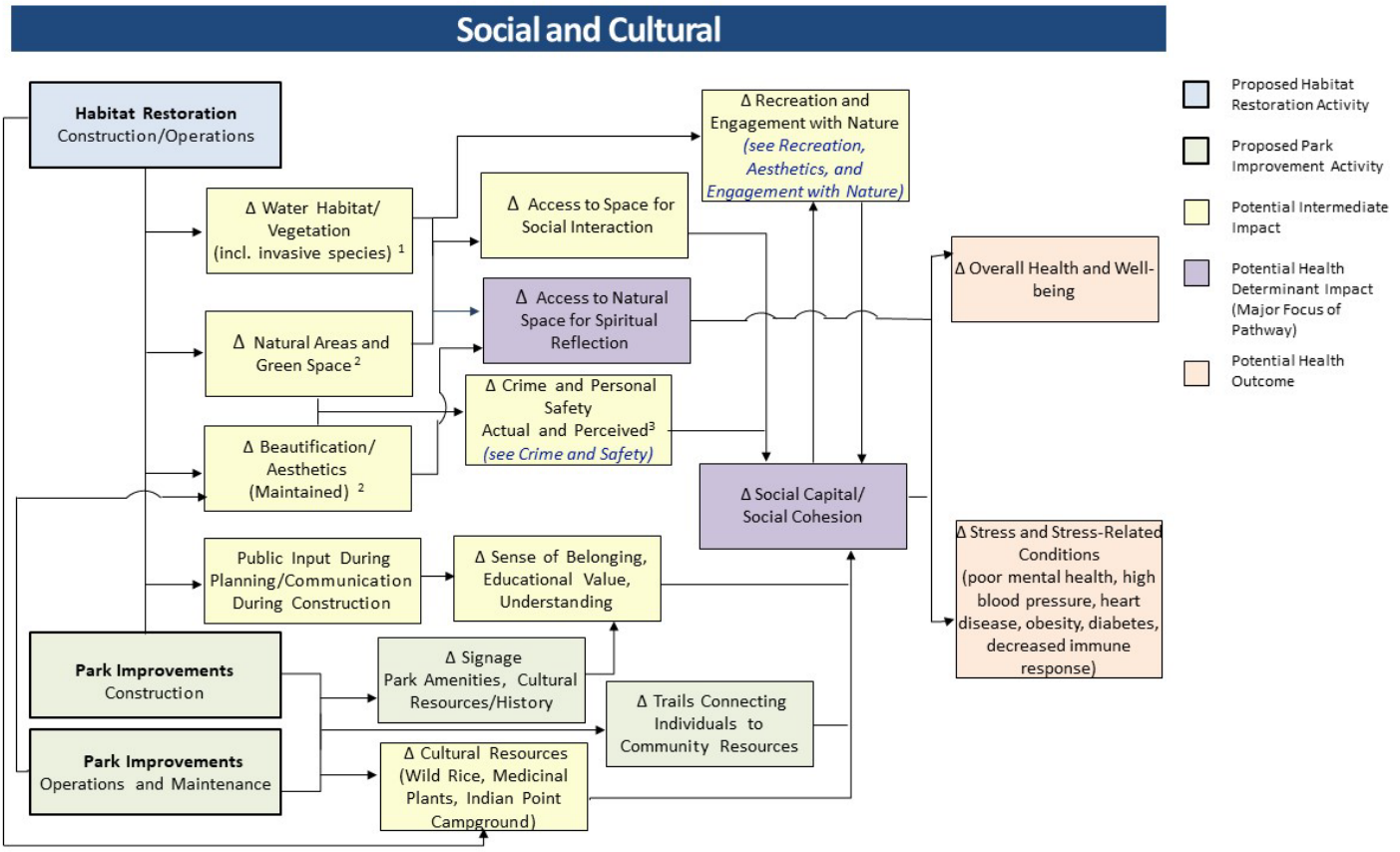

Figure 4-50. Social and Cultural pathway diagram.

4.8.2 Results of the Literature Review

Civic Engagement, Social Cohesion, and Social Capital

Social cohesion, or levels of trust, feelings of belonging, or willingness to participate and help (Chan, To, & Chan, 2006), is an important factor in a person's overall well-being. Having a sense of belonging and inclusion and being willing to promote the quality of life in one's neighborhood or community through civic engagement are important to building social cohesion. Social cohesiveness (i.e., people's willingness to interact and cooperate) is viewed as a vital part of society. A lack of social cohesion may be linked to reduced time spent outside, as the public may spend more time indoors, isolated from their community. This social isolation is related to increased risks to health and mental well-being, both for the socialization benefits, the benefits of being outdoors, and the opportunity for exercise (Cloete, 2014).

In order for communities to have social cohesion, they must create social capital, by building networks and relationships between people and places (Cloete, 2014). Interestingly, social capital was examined in different ways throughout the literature, including as input for regional development, attractor (Rodriguez-Pose & Ketterer, 2012), and existing condition (Kitchen, Williams, & Chowhan, 2012; Smith, Anderson, & Moore, 2012; Whitham, 2012; Petrosillo, Costanza, Aretaro, Zaccarelli, & Zurlini, 2013; Uphoff, Pickett, Cabieses, Small, & Wright, 2013). Access to green space can influence social cohesion in communities by improving their ability to build social capital, through community activities such as neighborhood clean-up events, parties, game competitions, and public art productions and displays. Increasing social capital can result in more positive perceptions of health, particularly mental health and life stress (Kitchen, Williams, & Chowhan, 2012).

There is an increasing awareness that access to green space can influence a person's sense of safety, social cohesion, and overall well-being. If people do not feel safe using the green space, then it will not have a positive influence on a person's social capital or health (van den Berg, Maas, Verheij, & Goenewegen, 2010). Different neighborhood factors can influence a person's feelings of safety in a green space. One of the biggest concerns for adults is experiencing anti-social behavior in nature. An example is encountering illegal activities in public parks (Gidlow & Ellis, 2011). Perceived safety is often improved by a well-maintained, adequately lit, and monitored public green space because of lower levels of crime (Sherer, 2006). Access to green space can enhance community identity and cohesion, which in turn can further decrease crime and enhance people's sense of safety (Hale, et al., 2011; Kuo & Sullivan, 2001b). This demonstrates how access to green space can create a self-reinforcing relationship between a person's sense of safety and social cohesion. Cerda, et al. (2012) demonstrated that increasing connectivity with nature decreased violence in a neighborhood experiencing a high rate of violence

Parks and green space have a positive relationship on social cohesion when they provide gathering places for intergenerational social groups, regardless of their ability to pay for access (NRPA, 2010). Access decreases isolation and increases social connections with neighbors, which can lead to a greater sense of community, trust in one's neighbors, and civic mindedness (Kearney, 2006; The Trust for Public

Land, 2004). One of the most important ways to foster community engagement is by involving the surrounding neighborhoods in the development of green space (Hale, et al., 2011). A participatory process can increase civic engagement and lead to community ownership of the space (Hale, et al., 2011). Also important to the utility of green spaces and their contribution to building social cohesion in a community is the availability of amenities and features that are culturally appropriate and provide a sense of belonging. Community engagement in the park planning process is vital to ensuring an understanding of the significance of green spaces in the community, adequate protection and representation of their meaning, and that green spaces are developed, maintained, and used for these reasons.

An ecosystem services perspective can be used to articulate the importance of natural spaces for building social cohesion, providing a space for spiritual reflection and access to cultural resources, and other services important to human well-being (Polishchuk & Rauschmayer, 2012). Natural spaces can provide cultural services, including access to natural space for social cohesion, spiritual reflection and cultural resources, as well as recreation, physical, and mental health; tourism; aesthetic appreciation and inspiration for culture, art, and design (FAO, 2018).

One of the most common connections between the environment and human well-being is outdoor recreation, which is positively related to outdoor recreational and cultural amenities (Besser & Miller, 2013). There is an “adventure gap” that exists between the white and non-white communities across the nation. Outdoor Foundation has studied this outdoor recreation disparity between the white and non-white communities for years and found that participation in outdoor recreation is much lower in Latino and African American populations compared to Caucasians across the nation. Beyond disparities in physical access, there has long been a history of excluding people of color from natural spaces (Larsen, 2014). Disproportionate access to green spaces can promote environmental health disparities (Jennings, Johnson Gaither, & Schulterbrandt Gragg, 2012). James Edward Mills discusses this issue in his 2014 book, “The Adventure Gap: Changing the Face of the Outdoors,” and many organizations and communities across the country are working to address access and perception of who is a typical environmentalist or recreationist. Mills defined the adventure gap as “the divide between peoples’ aspirations and interests, anything they want to do in life, and whether or not they achieve it… The adventure gap, in many ways, is defined by ourselves, in our own heads… The last thing I want is for young people today to say, ‘I don’t spend time outside because that’s not what I do as a person of color’” (Larsen, 2014).

Accessible green space can decrease feelings of loneliness, aggression, and stress (Kuo & Sullivan, 2001a; Maas, van Dillen, Verheij, & Groenewegen, 2009). When people value local green space and feel safe, they are more likely to utilize it and find more satisfaction with their neighborhood and personal well-being (Kuo & Sullivan, 2001a; Maas, van Dillen, Verheij, & Groenewegen, 2009; van den Berg, Maas, Verheij, & Goenewegen, 2010).

Access to Natural Space for Spiritual Reflection

In addition to these documented benefits, natural spaces also provide a space for spiritual reflection, which can promote overall health and well-being and reduce stress. Studies have shown that a person who holds spiritual beliefs has better overall health and well-being when they are able to practice their spirituality (Unruh & Hutchinson, 2011). When there is a limitation on the person's ability to practice their spirituality, such as when the environment in which they practice is negatively impacted or inhibited, they experience less well-being (Koenig, 2008). This negative impact on their well-being is also related to their level of stress. Studies show that a limitation in the ability to practice a person's religion leads to greater stress (Koenig, 2008).

Benefits of natural space for spiritual reflection are linked to the physical conditions of the landscape. Water quality, native vegetation, natural areas, green space, and beauty all influence the public's access to natural space for spiritual reflection by creating a hospitable environment (Nassauer, 2004). The prevalence of crime, homelessness, and drug use limit the public's access to natural space and influence their use patterns (see *Recreation, Aesthetics, and Engagement with Nature* Pathway).

Further, religiosity/spirituality itself is related to better health. Campbell, Yoon, and Johnstone (2008) conducted a survey of 168 participants with serious medical disorders (cancer, stroke, traumatic brain injury, and spinal cord injury) and found Daily Spiritual Experiences was the only "scale to significantly predict any of the variance in General Health Perception scores after taking demographic and health status variables into account." Ray (2004) describes the "pschyoneuroimmunological" models of health that demonstrate that positive thoughts are associated with physiological responses to stress, which lead to better ability to fight disease, which in turn leads to better health.

Cultural Resources

The restoration of habitat in the St. Louis River estuary is part of a long-term effort to restore beneficial uses of the river ecosystem. At the same time, the City of Duluth is working to create better access to the river and to renew recreational resources. These actions have implications for the cultural resources of the river and riparian areas. To that end, the relationship between cultural resources and amenities and social capital and cohesion were examined.

Cultural or historical amenities are important elements in community well-being and development. In some studies, cultural amenities translate as arts and culture in urban areas (Navarro, Mateos, & Rodriguez, 2014; Rodriguez-Pose & Ketterer, 2012; Servillo, Atkinson, & Russo, 2012) or contribute to a sense of place (Kloosterman, 2013; Liu, 2014; Smiley, Rushing, & Scott, 2016). There appears to be a divide in the studies: some treat cultural amenities as features to enhance economic development (Besser, McLain, Cerveny, & Banis, 2013; Rodriguez-Pose & Ketterer, 2012; Servillo, Atkinson, & Russo, 2012), while others examine how cultural amenities contribute to human well-being (Badland, et al., 2014; Ballas, 2013). There are cautions, as some enhancements of cultural amenities might lead to gentrification (Gunay & Dokmeci, 2012; Smiley, Rushing, & Scott, 2016).

Whereas social capital studies seem more closely related to development, discussions of cultural amenities and social cohesion more closely reflect the relationship between the built or natural environment and well-being or the social determinants of health (Eizaguirre, Pradel, Terrones, Martinez-Celorrio, & Garcia, 2012; Badland, et al., 2014). Many theoretical studies of ecosystem services argued that human well-being is based on human connections to the environment (Chan, et al., 2012). Examining the relationship between indigenous cultural ecosystem services and social capital or cohesion reveals a different connection to nature, where burial grounds may not be marked and forests or rivers may be sacred (Nzeadibe, et al., 2015). Bequest is among the highest value ecosystem service, even when compared to other livelihood-supporting ecosystem services (Oleson, et al., 2015). Thus, leaving out indigenous cultural values may negatively impact estimates of the value of the natural environment (Miller, Tait, & Saunders, 2015; Robinson, Maclean, Hill, Bock, & Rist, 2016). Social cohesion, itself, can be considered an ecosystem service (Barnes-Mauthe, et al., 2015). Ties to the land should be understood as a socio-cultural tie (Cook & Swyngedouw, 2012), where cultural practices and ecosystem services are an interdependent system where knowledge, belief, and practice co-evolve (von Heland & Folke, 2014).

Cultural Heritage Impact Assessments can help identify the specific characteristics or physical parts of a site that may hold particular cultural importance to the community nearby. The outcomes of a cultural heritage impact assessment are similar to a health impact assessment as they outline recommendations to minimize identified impacts to cultural heritage conditions and significance (Mott Connell Ltd, 2005).

4.8.3 Existing Conditions Related to Social and Cultural

Use of the Area as Green space

The citizens of Duluth find green space to be very valuable and consider engagement with nature to be a defining characteristic of Duluth (Kreag, 2002). Duluth has approximately three times more green space than other cities of similar size (Kreag, 2002). This means that Duluth residents already have multiple green space options to choose from. When citizens were asked about the amount of green space in Duluth, most residents felt there were already enough parks in the city (Kreag, 2002). The Minnesota Sea Grant found in a survey of eastern, central and western Duluth, that the majority of residents feel green space provides recreational opportunities and connects the community to nature (Kreag, 2002). There are different types of amenities and features that promote public usage. Walkways, beach and shoreline views, and fishing and boating access are three types of features and amenities that attract Duluth residents (Kreag, 2002).

Additionally, when citizens were asked to prioritize government functions, police protection and public safety were among the highest priorities to Duluth residents (Kreag, 2002). To ensure that residents use and benefit from Kingsbury Bay and Grassy Point, a sense of safety needs to be created in these parks.

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The abbreviated timeline and resources available for this HIA limited the opportunity to conduct interviews and other forms of stakeholder engagement that might have provided a more complete picture of the value of these green spaces to the residents of Duluth. However, during the community

engagement meetings for the HIA, the public described their perception of the parks and their uses. Residents described the neglect and poorly maintained nature of the sites, but also discussed the beauty of these parks and what activities draw them to use the parks. The Western Waterfront Trail attracts hikers, walkers, and bikers, and Kingsbury Bay serves as a birding area with blue herons and other wading birds, spring warblers, and other birds. Grassy Point and Kingsbury Bay were both referred to as beautiful and were considered important access points to the river and nature. These parks are also used for kayaking, recreational and subsistence fishing, canoeing, snowmobiling, camping, and exercise.

Use of the Area for Civic Engagement, Social Cohesion, and Social Capital

The parks in the HIA study area serve as a focal point for social relations and opportunities to build social capital. Both Irving Park and Norton Park have community clubs that support the parks (City of Duluth, 2013). The Irving Park Community Club (IPCC) is a neighborhood anchor institution and is a "voice of the Irving Neighborhood in West Duluth" (Irving Community Club, 2017). The IPCC supports organizations in West Duluth, like Valley Youth Centers and the Lake Superior Zoo (City of Duluth, 2016a). Valley Youth Centers in West Duluth provides youth programming and a "positive, safe, stable, and trusting environment where kids can grow" (Valley Youth Centers of Duluth, 2017). There are numerous sports-oriented community groups as well (City of Duluth, 2016a).

On the other side of Grand Avenue, Norton Park Community Club (NPCC) focuses its attention on the Norton Park neighborhood. The recent activities of the club include a garage sale to support the upgrades necessary to make the community center ADA accessible (Norton Park Community Club, 2017). This type of community support is important because the City of Duluth has asked that community organizations "co-create and co-manage outdoor recreation experiences in the neighborhood parks" in the corridor (City of Duluth, 2017). Co-creation and co-management require that community groups contribute to the project funding at a 9:1 (city: community group) ratio.

Chambers Grove Park located upriver and outside the study area contributes to social cohesion through restored river habitat and public river access facilities created as a result of habitat restoration and park improvement efforts. In 2012, MNDNR provided a $1 million grant to restore the Chambers Grove Park after it was damaged by a June 2012 flood. In fall 2015, the shoreline of the St. Louis River at Chambers Grove Park was reinforced with rock weirs, and public river access points were created. The habitat improvements also include spawning habitat for lake sturgeon and other fish (Myers, 2015). Restoration of the park itself began after the habitat restoration project was completed, and included the addition of an ADA-compliant restroom and playground, improved parking, improved road access and park infrastructure, an access and wet meadow nature area (City of Duluth, 2016a). In fall 2017, the Minnesota Land Trust hosted a fishing tournament at the park to celebrate the restored fish habitat and improvements in fish population (StarTribune, 2017).

Use of the Area as Spiritual and Cultural Experience

The Kingsbury Bay and Grassy Point natural areas have traditionally provided space for spiritual reflection and other tribal uses for the Native American communities in the area (Restoration Plan and Environmental Assessment Saint Louis River Interlake/Duluth Tar Site, draft, 2017). Subsistence fishing (i.e., fishing by individuals who derive a significant part of their diet from fish) is an inter-generational cultural and spiritual experience that takes place, often by minorities. The Anishinaabe People (Figure 4-51) are the indigenous people that are most likely to use and access the sites. The Anishinaabe People have a protected legal right to fish as a result of the Treaty of 1854 (1854 Treaty, Fond du Lac Band of Lake Superior Chippewa, MNDNR, MPCA, NOAA, FWS, BIA, WDNR, 2017), and the St. Louis River is a popular place for fishing. In addition to fishing, the tribes also have a legal right to hunt and gather natural resources in this area. These material uses, in addition to the spiritual uses, are impacted by "mercury in fish, PCBs in fish, E. coli, and chloride" (Restoration Plan and Environmental Assessment Saint Louis River Interlake/Duluth Tar Site, draft, 2017, p. 38). The Native American community faces disproportionately high rates of poverty and food insecurity (69% of American Indian households surveyed in Duluth reported experiencing poverty), and subsistence fishing and hunting are significant as sources of food for many families (Community Action Duluth, 2017). This means that if the fish are contaminated or are limited in quality or quantity, these populations will face a disproportionate impact on their diet and health (Burger, Pflugh, Luring, Von Hagen, & Von Hagen, 1999).

Figure 4-51. The thunderbird is a symbol of the Anishinaabe people.

Like Native Americans, African American families in Duluth also reported a high rate of poverty (55%), and both Native American and African American communities in the area are more likely to lack health insurance (52% reported lacking insurance) (Community Action Duluth, 2017). Poverty contributes to food insecurity, as households living in poverty are often unable to afford healthy food. Duluth has a much higher food insecurity rate (41%) than St. Louis County and Minnesota (12% and 10%, respectively), and this high rate suggests that subsistence activities such as fishing, ricing, and hunting are even more important to these communities (Community Action Duluth, 2017). Access to natural environments and green space contribute to a healthier lifestyle (University of Wisconsin HIA Graduate Class, 2012), and with such high rates of uninsured populations, these communities stand to benefit from greater access to green spaces from a health perspective.

As an ancestral home of the Anishinaabe people, the western end of Duluth contains many culturally-significant sites. Spirit Island, a short distance upstream from Kingsbury Bay and Grassy Point was the sixth and last stopping place on their westward migration. It was the first place where they encountered the prophesized wild rice, or "the food that grows on water." Historically, Native American maple sugar camps and burial grounds were found on Spirit Mountain, which spans much of western Duluth parallel to the St. Louis River and overlooks the HIA study area. The Anishinaabe feel that important places are

alive, that they have "animacy," and "are strong enough to survive time" (Turnstone Historical Research, 2015).

Listed below are several important sites in the HIA study area (Turnstone Historical Research, 2015), in addition to the likely many unnamed sites:

> **Aaron Crosier Point:** *There was once an Indian camp located on what would later become known as Aaron Crosier Point, near the St. Louis River at South 62nd Avenue West. The site served as a stop along an old Indian trail that was located between Minnesota Point and Duluth's Fond du Lac Neighborhood. The camp was apparently abandoned sometime prior to the mid 1850's, before Crosier owned the property.* (p. 48)
>
> **Indian Point Campground (adjacent to Kingsbury Bay):** *This site was the home of an early Ojibwe Indian camp. It is located along the St. Louis River at the very end of Pulaski Street in Duluth. The property is currently owned by the City of Duluth and is used as an RV park and campground.* (p. 50)
>
> **Spirit Mountain:** *The large hill that extends for several miles along the far western end of Duluth was called Manitouahgebik (Spirit Mountain) by the Ojibwe Indians. They believed that the Great Spirit resided within the forest at the top of Spirit Mountain. The first known recorded reference to the area was on a map dated 1762. Famous English geographer, Thomas Jefferys, created the map for the use of fur traders who made deals with the local Ojibwe Indians*. (p. 49).

Figure 4-52. Spirit Lake.

Spirit Mountain is also significant because of the vista it provides of Spirit Island and Spirit Lake (Figure 4-52), which are central to the creation story of the Ojibwe Indians, an Anishinaabe nation (Hollingsworth, 2011).

Figure 4-53. Spirit houses placed over burial sites.

Participants in the HIA have indicated that the river and the area are still culturally significant. Two comments in particular indicate the continued use of the river by the Ojibwe. One person indicated that he has seen spirit houses (Figure 4-53) near Indian Point Campground. Spirit houses are small houses placed over a burial site, with an opening facing west so the spirit can start its journey and where offerings may be left (Kisor, 2009). Another participant mentioned that "it is important to have healthy resources (water, fish, wildlife, and plants) and available access to these resources – necessary for exercise of treaty rights – also recreation." It is important to also identify the "adventure gap" that exists between the white and non-white communities in Duluth. Duluth community members cited this as a barrier to the true enjoyment of these spaces as sites for cultural significance for all members.

Founded in 2016, Youth Outdoors-Duluth, in partnership with Neighborhood Youth Services, has been bringing youth from all backgrounds out to the waterways and trails of Duluth to bridge the "adventure gap" in the city (Figure 4-54) (Kaczke, 2017). Youth Outdoors-Duluth, led by the Duluth Area Family YMCA, was created by the Bridging the Adventure Gap work group, a partnership of the Minnesota Land Trust, Northland Foundation, the City of Duluth, the Duluth school district, and nearly two dozen outdoor groups. Their Youth Adventure Series includes fishing, rock climbing, archery, paddling, and nature backpacking, as well as a gear and curriculum library. Over 1,129 children have participated in their programming since their founding (Youth Outdoors - Duluth, 2016). Local partnerships like this can make the difference in ensuring the sites are used by a diverse and representative number of citizens.

Figure 4-54. Youth enjoying the outdoors as part of Youth Outdoors-Duluth.

4.8.4 Potential Impacts to Social and Cultural

The potential impacts of the habitat restoration and park improvements work on social and cultural well-being are similar to those assessed in the HIA for a Lower Duwamish Waterway cleanup project in South Seattle, Washington (University of Wisconsin HIA Graduate Class, 2012):

- Providing the opportunity for increased physical activity and therefore reducing stress and increasing mental well-being (Sallis, Millstein, & Carlson, 2011)
- Increasing a sense of community (Sullivan, Kuo, & Depooter, 2004)
- Strengthening neighborhood social ties (Coley, Sullivan, & Kuo, 1997)
- Decreasing crime and fear (Kuo & Sullivan, 2001b)
- Assisting in mental fatigue recovery (Kuo & Sullivan, 2001a)

As noted previously, one of the most effective ways to foster community engagement and social cohesion is by involving the surrounding neighborhoods in the development of green space (Hale, et al., 2011). A participatory process should be undertaken in habitat restoration and park improvements planning to engage the public, increase civic engagement, and promote community ownership of the space (Hale, et al., 2011). Also important to the utility of the green spaces and their contribution to social cohesion is the availability of amenities and features that are culturally appropriate and foster a sense of belonging. Involving the public in planning the future of these sites can create a greater sense of understanding among residents of the collective value placed on these spaces.

Habitat Restoration and Park Improvements

Habitat restoration and park improvements construction may temporarily limit the public's access to natural space for social interaction, spiritual reflection, and cultural uses because the sites will be closed to the public at times. As noted in other pathways, the construction periods will also cause traffic, noise, and air pollution. These factors may further lead to a reduction in the public's access to natural space for social interaction, spiritual reflection, and cultural uses because they would reduce the value of the site for these contemplative activities.

Water Habitat and Vegetation

During the habitat restoration work, the water habitat in the Kingsbury Bay and Grassy Point areas may become turbid, decreasing water clarity. This could have a negative impact on the public's perception of the natural spaces for social interaction, spiritual reflection, and cultural uses. Research has shown that higher rates of water clarity is positively related to public perception of the water body (Dobbie & Green, 2013; Angradi, Ringhold, & Hall, 2018). In the long term, the improved water quality and riparian and upland vegetation will have a positive impact on the public's perception and use of natural space for social interaction, spiritual reflection, and cultural uses (including subsistence food gathering). The HIA Project Team recognizes that the Grassy Point is located in an industrial area, which may affect the area's potential as a quiet space for spiritual reflection and social interaction and the industrial pollution may affect the ecosystem's ability to support cultural natural resources, such as wild rice.

Natural Areas and Green space

The public has a greater appreciation for natural areas where they expect to have nature, and when a place is more green and more natural, their appreciation increases (Nassauer, 2004). Use of natural space for social interaction, spiritual reflection, and cultural practices is related to the perceived naturalness of the site, which is strongly linked to the amount and quality of green space present (Andersson, Tengo, McPhearson, & Kremer, 2015). Use of natural space for social interaction, spiritual reflection, and cultural uses may decrease during construction because the sites will be changed so extremely due to dredging and other construction activities. The public will have limited access to the site and further, the construction will make it seem less natural and will not provide a tranquil place to reflect.

However, the improvements to the environment through the habitat restoration and park improvements work has the potential to improve the natural environment and result in long-term increases in the amount and quality of green space for social interaction, spiritual reflection, and cultural uses. Green space is shown to reduce stress (Kahn, 1999). The benefits of exposure to natural environments and green space that promote good health, according to Mitchell and Popham (2008) and their analysis of the population of England below retirement age (n=40,813,236), include reduced socio-economic health inequalities.

Beautification and Aesthetics

Public perception of the quality of an environment is a great indicator of their likelihood to use a natural space, regardless of the objective scientific quality. While Kingsbury Bay and Grassy Point are under construction, the reduced environmental quality caused by the construction will cause aesthetics to decrease and this will lead to less enjoyment by the public. Further, this will limit their access to natural space for social interaction, spiritual reflection, and cultural uses, as a less enjoyable environment means a less pleasant experience. Habitat restoration and park improvements will contribute to the beautification and aesthetics of the natural spaces. Combined with maintenance of the restored habitats, the public's access to natural spaces for social interaction, spiritual reflection, and cultural uses will increase.

Cultural Resources

Relying first on the existing ethnographic survey (Turnstone Historical Research, 2015) and working with local experts, like the Indigenous Commission for the City of Duluth, an assessment should be conducted to establish a baseline of the cultural heritage conditions, and should include but not be limited to the cultural significance of the parks to Ojibwe residents and other ethnicities in the area, including African Americans, Latinos, Asian and Pacific Islanders, as well as those of Scandinavian and other European descent (Zenith City Press, n.d.).

Figure 4-55. Wild rice harvest.

The tribes are active managers of the aquatic resources in the St. Louis River. During habitat restoration and park improvements construction, tribal resource managers will work with other agencies, including the MNDNR, USFWS, and St. Louis River Alliance, to restore wild rice and other aquatic habitat on the river. Wild rice is only one culturally-significant plant of many in the area (although it may not be currently growing in the HIA study area; Figure 4-55). The restored habitat and water quality will have a positive impact on the ability of medicinal and utilitarian plants to grow, and park improvement will create safer and more official access to the plants. The restored habitat at the sites could support many culturally-significant plants, including:

- *Acorus calamus* (Sweet Flag) – Roots used by singers to sooth their throats
- *Alnus incana* (Speckled Alder) – Partially rotted wood ("punky wood") used to smoke animal hides for tanning
- *Betula papyrifera* (Paper Birch) – Bark used for making baskets and canoes; twigs used in tea to relieve arthritis
- *Chelone glabra* (White Turtlehead; Balmony) – Dried aerial parts used to treat liver problems and also acts as a tonic for the whole digestive system. Also used to treat gallstones, inflammation of the gallbladder and jaundice

- *Cornus sericea* (Red Osier Dogwood, known as "Red Willow") – Inner bark is used in smoking mixtures and has mild astringent (tissue shrinking) and tonic properties. Also used to treat diarrhea and fever
- *Equisetum arvense* (Horsetail) – Dried stem used as an astringent, especially for the genitourinary system, reducing hemorrhage. Also used in incontinence and bed-wetting
- *Eupatorium maculatum* (Spotted Joe-pye Weed) – Roots and flowers used as a diuretic and for bladder infections (best when combined with Uva-ursi), has some effect on kidney stones but its relative, *Eupatorium purpureum* (Gravel root), works best. Also sometimes used for gastric ailments
- *Eupatorium perfoliatum* (Boneset) – Leaves and flowers used as an anti-inflammatory and antibacterial. Also reduces fever and treats flu symptoms
- *Fraxinus nigra* (Black Ash) – Bark used as a tonic for the liver and stomach. The dried leaves used as a diuretic and laxative. Inner bark used for weaving baskets
- *Galium aparine* (Cleavers; Bedstraw; Stickywilly) – All parts used to treat ailments of the lymphatic system (including tonsillitis); also a poultice to treat skin irritations (wounds, stings, burns)
- *Hypericum perforatum* (St. John's Wort) – Aerial parts used to treat neurological disorders (especially anxiety and mild depression). In lotion form, it treats wounds, bruises, varicose veins, and mild burns
- *Impatiens capensis* (Jewelweed/Spotted Touch-me-not) – Juice from stems used to treat itching from stings, bug bites or poison ivy contact
- *Iris versicolor* (Blueflag) – Rhizome used in the treatment of skin diseases (especially eczema and psoriasis) by working through the liver. Also has both laxative and diuretic properties
- *Lycopus virginicus* (Bugleweed) – Aerial parts used specifically to treat overactive thyroid and heart palpations (due to nervousness)
- *Mentha* sp. (Mint, including peppermint, spearmint, and field mint) – Leaves used to reduce stomach upset and indigestion
- *Nuphar lutea* (Spatter Dock; Yellow Water Lily) – Fresh root was used as an astringent (shrinks tissues) and demulcent (soothes and protects inflamed tissues). A tea of the root used to treat dysentery and diarrhea. The root can be boiled (for a long time) and eaten (said to taste like sheep's liver) or dried and powdered and added to soups as a thickener. Seeds can be toasted like popcorn
- *Nymphaea odorata* (White Water Lily; Figure 4-56) – A tea made from the roots used to treat tuberculosis, bronchitis, and gastric ailments. Some people say the leaves can be eaten but also cause diarrhea

Figure 4-56. White water lily.

- *Sagittaria* sp. (Arrowheads) – Leaves used as a diuretic and astringent. The root bulb called Wapato or Duck Potato can be eaten
- *Salix* sp. (Willow) – Bark used to treat minor headache and other pain. Original source of aspirin.
- *Scutellaria lateriflora* (Skullcap) Aerial parts used to relieve pain and spasms

- *Spiraea alba* (Meadowsweet) – An infusion of the leaves (a tea) used as a "restorative" tonic. Some tribes use the stems for pipe stems
- *Thalictrum dasycarpum* (Meadow Rue) – Roots have diuretic and purgative properties. Can also be used to treat fevers
- *Typhus latifolia* (Common Cattail) – Young shoots eaten in salads; roots used as flour
- *Verbena officinalis* (Vervain) – Aerial parts used to ease depression, especially after an illness. Can be used to treat seizures and hysteria. Also used to treat the early stages of fever. A mouthwash can treat dental caries and gum disease
- *Zizania palustris* (Northern Wild Rice) – Seeds (grain) harvested and eaten for hundreds of years. Wild rice is more nutritious than white rice. Also, very beneficial to migrating waterfowl

During park improvements construction, there is also the opportunity to install educational signage highlighting the history and cultural resources present at the sites to create a sense of belonging and inclusion, as well as greater understanding of the significance of the sites.

Park Improvements Operation and Maintenance

Once construction is complete, the natural space will provide an opportunity for the public to engage in all of the activities included in this pathway that contribute to health. While some residents may have limited funding for extracurricular activities (Community Action Duluth, 2017), these natural areas will provide a space where the public can gather to socialize and enjoy the outdoors without additional cost. As a result of the restoration of wild rice and other medicinal plants, some members of the public will be able to enjoy the area as a site for social interaction and recreation, spiritual reflection, and cultural practices. The high value placed on green space by the Duluth community suggests that Kingsbury Bay and Grassy Point will be utilized by citizens after the habitat restoration and park improvements are complete. To ensure that residents will use Kingsbury Bay and Grassy Point, a sense of safety will need to be created in the parks; the habitat restoration and new park facilities have the potential to help increase the sense of public safety and promote park usage.

Aquatic Habitat/Vegetation and Beautification and Aesthetics

The aquatic habitat and vegetation will be greatly improved as a result of the habitat restoration. The restored environment will promote greater enjoyment of the natural spaces which will contribute to improved health for the public, as green space is evidenced to promote good health. Habitat restoration and park improvements will create a more pleasant environment, which will promote the public's interest in utilizing the spaces and reaping the public health benefits they provide. The renewed aesthetics of these natural spaces will please those who already use these sites and will also attract new users. Further, as Grassy Point is improved, the public's perception of the park as being dangerous and derelict will change. This requires proper maintenance of the habitat, as the conditions could deteriorate and the aesthetics worsen, reversing the gains made.

Cultural Resources

Public use of the green space for cultural resources will be increased as a result of the restored habitat. Utilizing local species, including species that are culturally significant and medicinally used, will increase

the cultural benefit of these environments. By preserving, promoting, and respecting the cultural and religious significance of these natural spaces and the species and conditions that support them, the decision-makers can further improve the overall health and well-being of area residents, including indigenous communities in and near Duluth.

4.8.5 Potential Health Impacts Related to Changes in Social and Cultural

Habitat Restoration – Construction and Operation

It is **highly likely** that during construction, the habitat restoration will **detract from health**, as the construction will limit the ability of users to utilize the green space for social interaction, spiritual reflection, or cultural resources. This will negatively impact well-being and overall health and stress as a result of the lack of access. Once the construction is completed, it is **highly likely** that the habitat restoration construction will **benefit health**, as the restored habitat will provide an opportunity for the public to engage in all of the activities included in this pathway that contribute to health. The public will be able to enjoy the area as a site for social interaction, through recreation and social events; for spiritual reflection; and for cultural resources, such as the restoration of wild rice production, and restoration of sustainable populations of medicinal plants. The negative impact during construction will be moderate because the public will be impacted in their ability to use the space. The renewed habitat will have a high impact, once restoration is complete, because the public will be able to use this space that was previously impaired and then under construction. The groups that are most likely to be impacted during construction and operation are birders, people with dogs, and nearby residents. The impact will be minor in that their overall health and well-being will not be severely impacted as a matter of life-threatening. The negative impact on social and cultural use of the habitats will be short-term during construction and the restored habitat's positive health impact will be permanent, as long as the site is maintained. There is strong evidence that providing public access to green space for social interaction, spiritual reflection, and cultural use positively impacts overall health and well-being and stress.

Park Improvements – Construction and Operation

The park improvements construction will **likely detract from health** and well-being and have a negative effect on stress levels, as the construction will limit users' ability to utilize the green space for regular uses, including social interaction (park use), spiritual reflection, or cultural resources (e.g., fishing). This will have a negative impact or increase the amount of stress as a result of the lack of access. Once the construction is complete, it is **highly likely** that the park operations and maintenance will **benefit health** and well-being of the users of Kingsbury Bay and Grassy Point, as the habitat restoration will create more fish habitat and conditions for native and culturally-important plants. Also, the park improvements will enhance the access to green spaces for regular uses, including social interaction, spiritual reflection, or cultural resources (e.g., fishing). The negative impact from construction will be moderate because the public will be impacted in their ability to use the space. The positive impact from the park improvements will also be moderate because of the diversity of public that will benefit from the restoration and park amenities. The groups that are most likely to be impacted during park improvements construction and

operation and maintenance are birders, nearby residents, trail and campground users, as well as anglers. The impact of both will be minor in that the increase in stress will not be life-threatening. Construction will have a short-term impact on the public's access to these parks and therefore their health, but once the park construction is complete, the positive impact on the public's health will be permanent as long as the site is maintained. There is strong evidence that access to green space for social interaction, spiritual reflection, and cultural use lowers stress.

Table 4-25 provides a summary of the baseline health status and characterization of health impacts related to social and cultural well-being during the various project phases.

Table 4-25. Characterization of Impacts Related to Social and Cultural

Pathway	
Social and Cultural	**Baseline Health Status** Access to green space for social interaction, spiritual reflection, and cultural experiences has been shown to have a positive impact on overall health and well-being. However, well-being and access to social and emotional support is not equally distributed throughout Duluth. According to the Bridge to Health Survey (Kjos, Kinney, Finch, & Peterson, 2016), individuals in poverty in Duluth are significantly more likely to never receive social and emotional support. There are also higher rates of negative health outcomes in the HIA study area (CDC, 2016a). For example, there is a higher prevalence of conditions related with stress in the study area (e.g., diabetes and poor mental health for 14 or more days) and lack of physical activity (i.e., chronic obstructive pulmonary disease, obesity, high blood pressure) in the HIA study area, compared to the City of Duluth (CDC, 2016a). The percentage of the population age 18 or older reporting their physical health was not good for 14 or more days in the last 30 days was also higher in the study area (11.4-14.5%), as compared to the City of Duluth (10.2%; CDC, 2016a). There are large health discrepancies between Native American/other minority communities and the majority White population as well. These low-income communities rely on subsistence fishing more than the wealthier communities and therefore benefit more from access to green space and areas for fishing. Further, with poorer health, the health and well-being of these communities may benefit more from access to green space.

Project Phase	Direction	Likelihood	Magnitude*	Distribution	Severity (Intensity)	Permanence	Strength of Evidence
Habitat Restoration Construction/ Operations	Detract from Health during construction; Benefit Health once construction completes	Highly Likely	Moderate	Disproportionate Effects - 3 season birders may be affected during construction negatively, and people with dogs, positively during operations. Winter users include people with dogs, as construction during the winter	Minor	Negative short-term during construction. Positive long-term during operations	Moderate- Green space and Identity/Place Attachment are important for overall wellbeing
Park Improvement Construction	Detract from Health	Highly Likely at Kingsbury Bay, Possible at Grassy Point	Moderate	Disproportionate Effects - Residents surrounding Kingsbury Bay, Western Waterfront Trail users, birders, users of recreation facilities, and Indian Point Campground users would be more impacted since they use the park more	Minor	Short-term	Green Space for Social Cohesion – Strong – lack of access to green spaces negatively impacts health
Park Improvement Operations and Maintenance	Benefit Health	Highly Likely	Moderate	Disproportionate Effects - Tribal groups who use the space for spiritual purposes; those who participate in subsistence fishing, recreational users, birders, Western Waterfront Trail Users, and Indian Point Campground users would be more impacted	Moderate	Long-term, as long as the space is maintained	Strong

* There are not hundreds of people who use Grassy Point and Kingsbury Bay, but out of a number of people who use them, a moderate amount would be impacted.

4.8.6 Main Findings and Preliminary Recommendations Related to Social Cultural Aspects

Based on the Assessment findings of this pathway, these preliminary recommendations were developed for promoting the positive health impacts and mitigating the adverse health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvements projects. For more details on these recommendations, including their intended purpose and implementation, as well as any additional recommendations added after review by the community and stakeholders, see the consolidated list of final HIA Recommendations in Section 5.

Main Finding Parks are places of social and cultural value and sites for spiritual reflection. Social cohesion, spiritual reflection, and the ability to participate in culturally-significant behavior are all positively correlated with health.

- Planners should conduct stakeholder meetings to the extent possible to better understand the social significance of these parks
- Make the public aware of construction activities in advance, the period of time for which construction will occur, and the planned changes, so they can plan when to visit and anticipate the improved resources
- Consult with 1854 Treaty Authority and Fond du Lac Band resource managers to identify significant sites for any use and determine the best approach to preserve, enhance or interpret resources

Main Finding As part of the St. Louis River, this place has special significance to the Anishinaabe people. These aspects should be considered in the development of the Habitat Restoration and Park Improvements plans.

Main Finding Spiritual reflection, while significant, may be challenging to address because of the urban nature of the parks, but it should not be minimized or ignored in the development of habitat restoration and park improvements plans.

Main Finding Public use of the green space for cultural resources will be increased as a result of the restored habitat, including wild rice production and restoration of viable populations of medicinal plants.

- Planners should strive to create natural spaces for social interaction and solitary spiritual reflection. Attention should be paid to develop spaces for spiritual reflection that minimize the noise and distraction from the nearby industry
- Signage may be considered that demarcate culturally significant spaces and that promote quiet reflection

- The planning team should prioritize the placement of native, medicinal, and culturally significant plants
- Attention should be paid to promote the presence of wildlife that may be culturally significant and specifically the abundance of fish for subsistence fishing

4.9 Summary of Potential Project Impacts

Figures 4-57 and 4-58 summarize the potential impacts of the habitat restoration and park improvements on health through the seven pathways examined in the HIA.

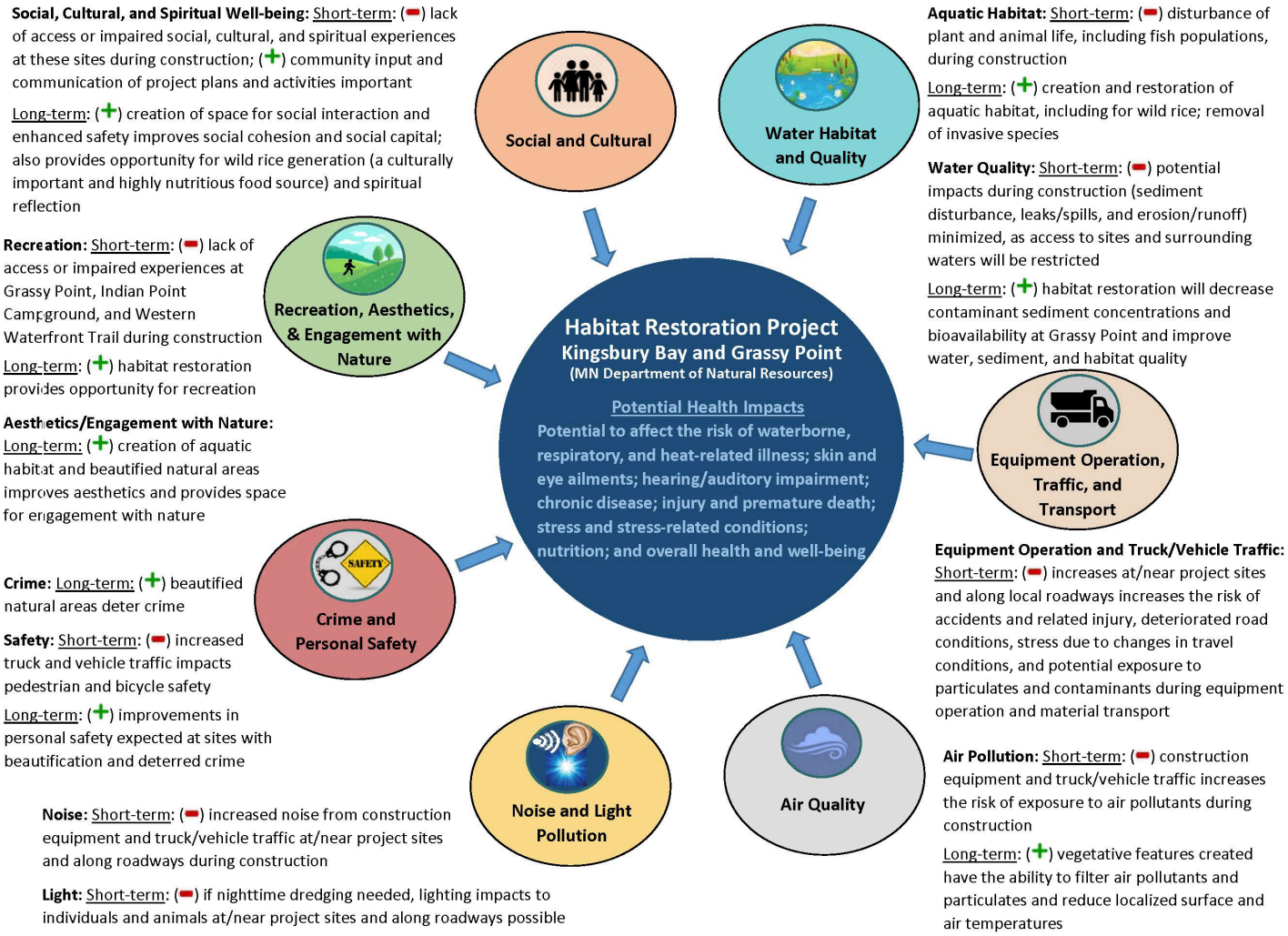


Figure 4-57. Potential impacts of the proposed habitat restoration on health and health determinants through seven pathways examined in the HIA. Negative impacts are denoted by (−); positive impacts are denoted by (+).

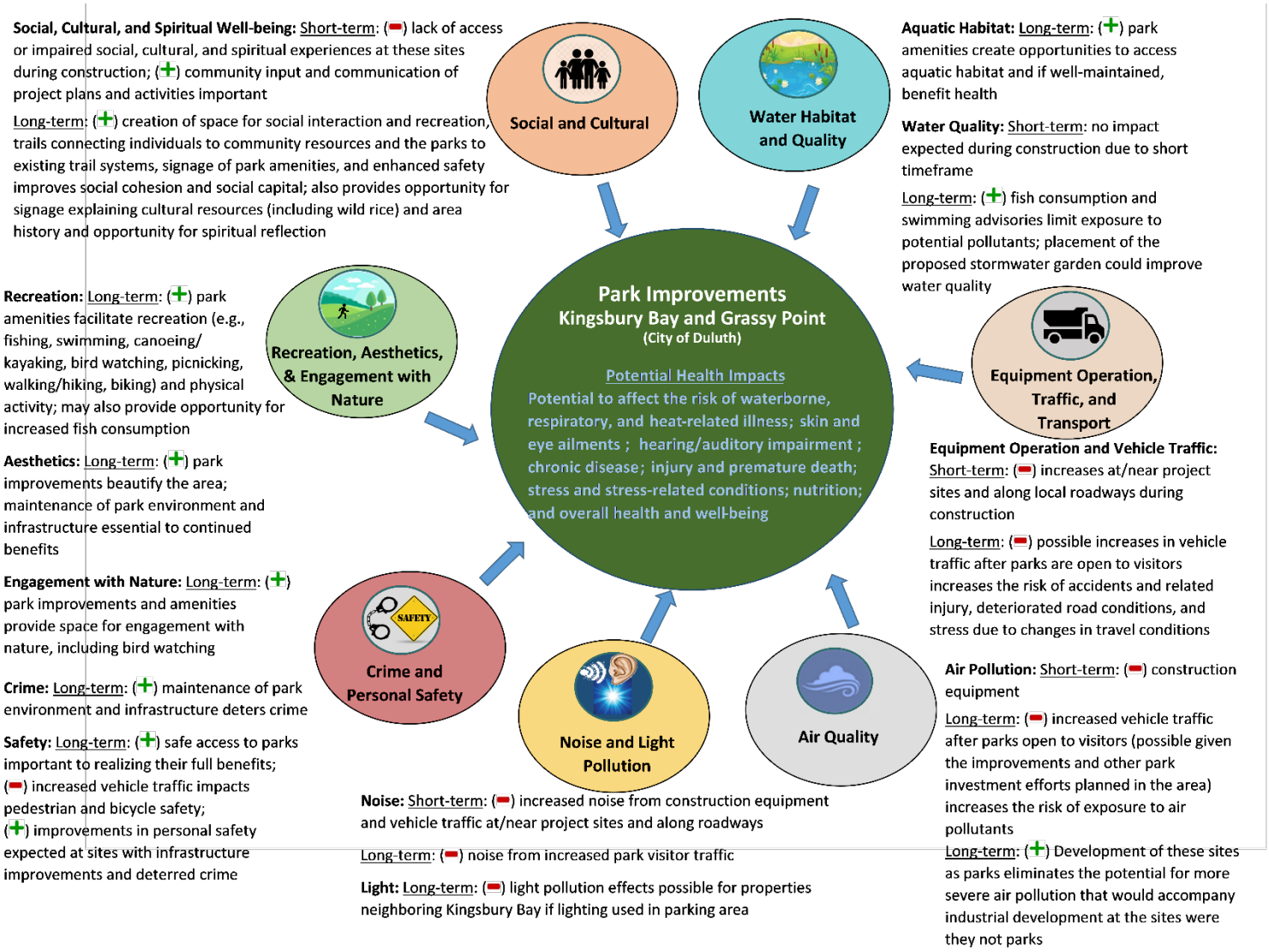


Figure 4-58. Potential impacts of the proposed park improvements on health and health determinants through seven pathways examined in the HIA. Negative impacts are denoted by (−); positive impacts are denoted by (+).

As mentioned previously, the HIA was also interested in examining how ecosystem services would be impacted through habitat restoration and park improvements. To do this, it was first necessary to make a connection between the things in the physical environment that will be changed (both in the short-term and long-term) due to the habitat restoration and park improvements projects and their associated ecosystem service or services. For each pathway, we then determined who would benefit from those services and identified any health determinant(s) or health outcome(s) associated with those ecosystem services (Table 4-26).

Table 4-26. Ecosystem Services Affected by the Habitat Restoration and Park Improvements Projects and the Associated Health Impacts

Ecosystem Services - Component	Ecosystem Services	Associated Beneficiaries	Associated Health Determinant/ Health Outcome
Wetland habitat	Habitat for marsh birds, wading birds, and migratory waterfowl	Recreational birdwatchers	Outdoor recreation, such as birdwatching, can provide opportunities to engage with nature, reduce stress, and provide opportunities for social cohesion
Shallow aquatic habitat	Production of wild rice	Indigenous community, recreational harvesters	Production of wild rice can provide opportunity for food gathering, nutrition, social cohesion, identity, place attachment, and cultural fulfillment
Deep aquatic habitat	Habitat for human-powered boating (canoes and kayaks)	Recreational users, such as boaters	Outdoor recreation, such as human-powered boating, can provide opportunities to engage with nature; reduce stress, cardiovascular disease, obesity, and other chronic disease; and provide opportunities for social cohesion
Deep aquatic habitat	Habitat for motor-powered recreational boating, and winter fishing	Recreational users, such as boaters and winter anglers	Outdoor recreation, such as boating and fishing, can provide opportunities to engage with nature, reduce stress, and provide opportunities for social cohesion
Submerged aquatic vegetation	Habitat for gamefish	Subsistence and recreational anglers	Outdoor recreation, such as fishing, can provide opportunities to engage with nature; reduce stress, cardiovascular disease, obesity, and other chronic disease; improve impact nutrition (if fish are consumed); and provide opportunities for social cohesion
Aquatic vegetation and reduced sediment contamination	Improved water quality	Recreational users, such as swimmers, human-powered boaters	Improved water quality can reduce water contact-related risks, such as skin and eye ailments
Reduced sediment contamination and improved water quality	Improved habitat for resident fish	People who consume fish from the river, including subsistence and recreational anglers	Improving water and sediment quality can decrease contaminant bioaccumulation, improve nutrition, and decrease chronic disease incidence due to consumption of contaminated fish

Ecosystem Services - Component	Ecosystem Services	Associated Beneficiaries	Associated Health Determinant/ Health Outcome
Clean sediment, water, and habitat	Scenic views, sights, and smells	Indigenous community, park visitors, hikers on adjacent trails, neighbors	Improved aesthetics can deepen place attachment and identity; decrease crime; provide opportunities for physical activity, spiritual reflection, cultural fulfillment, engagement with nature, and social cohesion; reduce stress; and improve mental and overall health and well-being
Upland habitat (trees and other vegetation)	Shade, localized filtering of air pollutants, and regulation of air and surface temperatures	Park visitors, hikers	Shade and decreases localized air and surface temperatures can reduce the risk of heat-related illness, and improved air quality can reduce the risk of respiratory illness and other chronic disease related to air pollutants
Natural area and green space	Accessible natural areas	Park visitors, hikers on adjacent trails	Green spaces can decrease crime; provide opportunities for physical activity, spiritual reflection, cultural fulfillment, engagement with nature, and social cohesion; reduce stress, and improve mental and overall health and well-being

5 Recommendations

In general, HIA recommendations identify specific actions that can be taken to avoid, minimize, or mitigate harmful effects identified during the course of the HIA or to take maximal advantage of opportunities for a proposal to improve health. The recommendations provided by an HIA should be evidence-based, feasible, relevant, and actionable. Depending on the nature of the proposed decision being assessed and the specific impacts identified, recommendations can take various forms:

- Proposal Alternative – provides an alternative to the decision scenarios being considered
- Mitigation Measure – a measure that minimizes a potential harm identified in the HIA
- Promotion Measure – a measure that maximizes a potential health benefit identified in the HIA
- Health Supportive Measure – a measure that generally supports health, but is not tied directly to a specific impact identified in the HIA

The evidence upon which recommendations are developed can include literature; policy; qualitative analysis; quantitative data analysis; geospatial analysis; modeling; established standards, metrics, and benchmarks; stakeholder input; community consultation; expert opinion; and more.

The desired outputs of the *Recommendations* step of HIA are detailed in Appendix A.

5.1 Developing the HIA Recommendations

The HIA Project Team used a step-wise approach to develop the recommendations. First, members of the HIA Project Team identified measures to help manage predicted changes to each health determinant assessed, so that potential benefits were enhanced and potential harms were avoided or minimized. Next, the HIA Project Team, as a group, verified whether the proposed recommendations were appropriate and evidence-based, and identified additional opportunities to mitigate or avoid potential harmful consequences of the proposed project, maximize co-benefits, and ensure equitable impact. Recommendations were developed related to:

- water, sediment, and biota management;
- aquatic and terrestrial habitat plans;
- equipment operation, traffic, and transport of materials;
- mitigation of air, noise, and light pollution;
- crime and safety;
- park access and amenities;
- cultural and social resources;
- communication and informational signage; and
- health supportive measures, such as creel surveys focused on fishing within the AOC, means for resident and stakeholder engagement and feedback throughout the process, and consideration of co-management models for the created parks.

The preliminary HIA findings and recommendations were then presented to the HIA Advisory Committee and updated to incorporate their input. The recommendations identified for each of the respective pathways in the Assessment section of this report reflect those updated preliminary recommendations.

The HIA Project Team prepared posters to present the preliminary findings and recommendations of the HIA to community residents and stakeholders and elicit their feedback (see Appendix F). The input received from the community and other stakeholders at the Final HIA Community and Stakeholder Meetings was incorporated and used to finalize the HIA recommendations (shown in Section 5.3). Attendees also participated in an exercise to prioritize recommendations important to them (Section 5.2).

5.2 Community and Stakeholder Prioritization of Recommendations

Attendees at the Final HIA Community and Stakeholder Meetings (community meeting, n=14; stakeholder meeting, n=12) were each given five post-it flags and asked to vote for the 5 HIA preliminary recommendations that were most important to them. Several community members attended both meetings – as an individual (community meeting) and as a representative of an organization (stakeholder meeting). Not all attendees at the community meeting voted. Table 5-1 shows the number of votes each recommendation received and is ordered by pathway; recommendations receiving no votes were removed.

Table 5-1. Results of Recommendation Prioritization at Final HIA Community and Stakeholder Meetings

4 votes	3 votes	2 votes	1 vote	0 votes

Priority Recommendations			
Pathway	**Preliminary HIA Recommendations**	**Votes at Community Meeting**	**Votes at Stakeholder Meeting**
Water Habitat and Quality	Follow best-practices for storm water management, erosion and runoff, and equipment leaks during the construction phases and implement mitigations, as necessary	1	0
Water Habitat and Quality	Design the storm water pond identified in the concept plan to intercept storm water to maximize its ability to protect Kingsbury Bay water quality	4	0
Water Habitat and Quality	Identify regional storm water outfalls and implement additional storm water management practices to reduce potential impact of combined sewer overflows (CSOs) at the future swimming beach at Kingsbury Bay	1	0
Water Habitat and Quality	Implement routine beach monitoring at the future Kingsbury Bay swimming beach	1	2

Priority Recommendations			
Pathway	**Preliminary HIA Recommendations**	**Votes at Community Meeting**	**Votes at Stakeholder Meeting**
Water Habitat and Quality	For a future project, cap or remove sediments to the east of the Grassy Point project area (currently outside the project area) to reduce bioavailability of dioxins	0	2
Water Habitat and Quality	Conduct creel surveys focused on fishing within the AOC, and include information on race, ethnicity, location of residence, age, and fish consumption habits	0	1
Water Habitat and Quality	Develop a long-term, non-native species management plan for both Grassy Point and Kingsbury Bay	0	3
Water Habitat and Quality	To sustain the ecological integrity of the site, provide interpretative signage that provides information on wetland habitat types and the benefits each habitat provides for fish, reptiles, birds, and people	2	3
Water Habitat and Quality	Identify upland habitats within the site suitable for trees, and develop goals for the upland plant community that takes into account future changes in invasive species, water level, and climate	1	1
Water Habitat and Quality	Develop habitat plans for marsh birds, wading birds, and migratory waterfowl	0	2
Equipment Operation, Traffic, and Transport	Hire companies with a proven safety record; local companies given priority in hiring can benefit the local economy	2	0
Equipment Operation, Traffic, and Transport	Route trucks and other equipment and vehicle traffic away from neighborhoods, schools and daycare centers, senior centers and care centers, and recreation areas to the extent possible	0	2
Equipment Operation, Traffic, and Transport	Consider the use of rail or barge to transport sediment between the two sites, as these routes would avoid residential areas, minimize roadway traffic impacts, and likely reduce the number of trips given the larger capacity of rail cars and barges	2	1
Equipment Operation, Traffic, and Transport	If the parks and other nearby enhancements increase the amount of traffic in the area post-construction, consider traffic calming measures (such as speed humps, raised crosswalks/intersections, traffic circles, medians, curb extensions or bump-outs, and signage or pavement markings) to minimize the risk for increased accidents	1	0
Air Quality	Clearly communicate the project, its duration, and expected air pollution levels to residents, schools and daycare centers, senior centers and care facilities, businesses, and recreational users in the project area and along the transport route	0	1

Priority Recommendations			
Pathway	**Preliminary HIA Recommendations**	**Votes at Community Meeting**	**Votes at Stakeholder Meeting**
Air Quality	Provide a means for residents and other affected populations to provide feedback and/or lodge complaints about excess air impacts	0	1
Air Quality	Select native trees and plants for planting. Trees have the greatest potential to filter air pollutants, followed by shrubs, and then grasses	4	1
Air Quality	Select trees that have tall, broad canopies for increased shading and place in areas where people may congregate	1	0
Noise and Light Pollution	Clearly communicate the project, its duration, and expected noise levels to residents, schools and daycare centers, senior centers and care facilities, businesses, and recreational users in the project area and along the transport route	0	2
Noise and Light Pollution	Provide a means for residents and other affected populations to provide feedback and/or lodge complaints about excess noise	0	1
Noise and Light Pollution	Include noise mitigation criteria/specifications in the contract (e.g., absolute noise criterion for equipment, restricted idling, and use of mufflers, dampeners, shieldings, and enclosures)	0	1
Noise and Light Pollution	Implement hearing protection and operations schedules to avoid exposure of construction workers to noise above NIOSH recommended exposure limits (73% of the time construction workers are exposed over the recommended exposure limits).	0	1
Noise and Light Pollution	Avoid nighttime construction activity to the extent possible. During winter, sunset is between 4:30 and 7:30 pm (much earlier than 9:00 pm). When necessary, implement measures to minimize noise and light illumination impacts on nearby residences.	2	0
Noise and Light Pollution	Ensure any lighting used in the parks are intelligently-designed, low glare, efficient outdoor lighting fixtures that direct illumination toward the ground (rather than upward) and evaluate the potential for motion sensors on lighting in certain areas of the parks or parking lots to minimize over-illumination.	3	2
Crime and Safety	Communicate the improvements being made to Grassy Point to alleviate existing perceptions of crime and personal safety issues and encourage utilization of the space post-restoration.	0	2
Crime and Safety	Follow Crime Prevention through Environmental Design (CPTED) guidelines, including lighting and planting configurations. Where possible, reduce dense planting and shrubs around narrow pedestrian paths.	1	0
Crime and Safety	Lighting should be improved and police surveillance may be considered to reduce crime and the perception of risk at these sites.	0	1

Priority Recommendations			
Pathway	**Preliminary HIA Recommendations**	**Votes at Community Meeting**	**Votes at Stakeholder Meeting**
Crime and Safety	Provide clear signage and maps for pedestrian and bicyclist access to the parks. Important elements of access and design include effective wayfinding systems such as the use of landmarks, signage, distance to destination markers, and interest points to assist in navigating the routes easily.	1	3
Crime and Safety	After improvements of parks begin, increase enforcement or police presence to "set the tone." Communicate to police department that their presence is important in the beginning to deter bad behavior and reduce crime. This is especially true at Grassy Point where it is more secluded and thereby, necessitates more formal surveillance.	3	1
Crime and Safety	Improve pedestrian and bicycle access to Grassy Point from the Irving neighborhood; current access is by footpath or walking/biking along Waseca Industrial Road.	3	1
Crime and Safety	Make trails and water access ADA-compliant.	0	2
Crime and Safety	Implement traffic calming measures (such as speed humps, raised crosswalks/intersections, traffic circles, medians, curb extensions or bump-outs, and signage or pavement markings) and bikeway improvements such as clear painted bike lane markings and signage to already designated bike routes.	0	1
Recreation, Aesthetics, and Engagement with Nature	Recommend that the City solicit deliberative community and stakeholder engagement and examine the pathways through which the park efforts could impact health to help inform the park improvements design and implementation	3	1 (stress on deliberative engagement)
Recreation, Aesthetics, and Engagement with Nature	Offer diverse opportunities for recreation at both sites, including publically-accessible gathering spaces, fishing piers, birding platforms, access to the water for water-based recreation, and trails, taking into account maintenance requirements of installed features	1	3
Recreation, Aesthetics, and Engagement with Nature	Preserve and enhance fishing opportunities, with more formal locations (e.g., piers) and social gathering opportunities adjacent to those locations. The creation of Big Island at Grassy Point would provide an opportunity for a fishing pier and access to a fishery with more biodiversity; a bridge would be needed to access Big Island	0	1
Recreation, Aesthetics, and Engagement with Nature	In advance of construction and in all project phases, clearly communicate to recreational users through multiple media sources disruptions to the Western Waterfront Trail and walkability and accessibility to both project sites	1	0

Priority Recommendations			
Pathway	**Preliminary HIA Recommendations**	**Votes at Community Meeting**	**Votes at Stakeholder Meeting**
Recreation, Aesthetics, and Engagement with Nature	Perform wetland restoration at the mouth of Kingsbury Creek to preserve the cold water habitat for trout and provide deeper water for kayak and canoe access	1	1
Recreation, Aesthetics, and Engagement with Nature	Because recreational amenities are enjoyed by residents, any plans for future changes should include recognition of the value placed by residents who use the resources frequently	1	0
Recreation, Aesthetics, and Engagement with Nature	Preserve and enhance current birding locations, as well as enhance access to newly created birding habitat. Upland plant communities should be restored to maximize potential for pollinator, including bird, habitat	0	3
Recreation, Aesthetics, and Engagement with Nature	Recognizing the value placed on the existing resources, any changes to park amenities could add new features to existing parks and green spaces	1	1
Recreation, Aesthetics, and Engagement with Nature	Research and develop co-management models, where neighborhood organizations have more formal responsibility for park management. Co-management arrangements could empower the neighborhood and ease the maintenance burden on the City of Duluth	1	1
Recreation, Aesthetics, and Engagement with Nature	Explore partnerships with organizations to facilitate access, education, and equipment sharing, additional recreational opportunities and leadership capacity building for underrepresented communities	1	3
Social and Cultural	Make the public aware of construction activities in advance, the period of time for which construction will occur, and the planned changes, so they can plan when to visit and anticipate the improved resources	0	3
Social and Cultural	Consult with 1854 Treaty Authority and Fond du Lac Band resource managers to identify significant sites for any use and determine the best approach to preserve, enhance or interpret resources	2	1
Social and Cultural	Planners should strive to create natural spaces for social interaction and solitary spiritual reflection. Attention should be paid to develop spaces for spiritual reflection that minimize the noise and distraction from the nearby industry	0	2
Social and Cultural	The planning team should prioritize the placement of native, medicinal, and culturally significant plants	0	1

Priority Recommendations			
Pathway	**Preliminary HIA Recommendations**	**Votes at Community Meeting**	**Votes at Stakeholder Meeting**
Social and Cultural	Attention should be paid to promote the presence of wildlife that may be culturally significant and specifically the abundance of fish for subsistence fishing	2	1
	TOTAL	47	60

Figures 5-1 and 5-2 show votes by pathway by those in attendance at the Final HIA Community and Stakeholder Meetings.

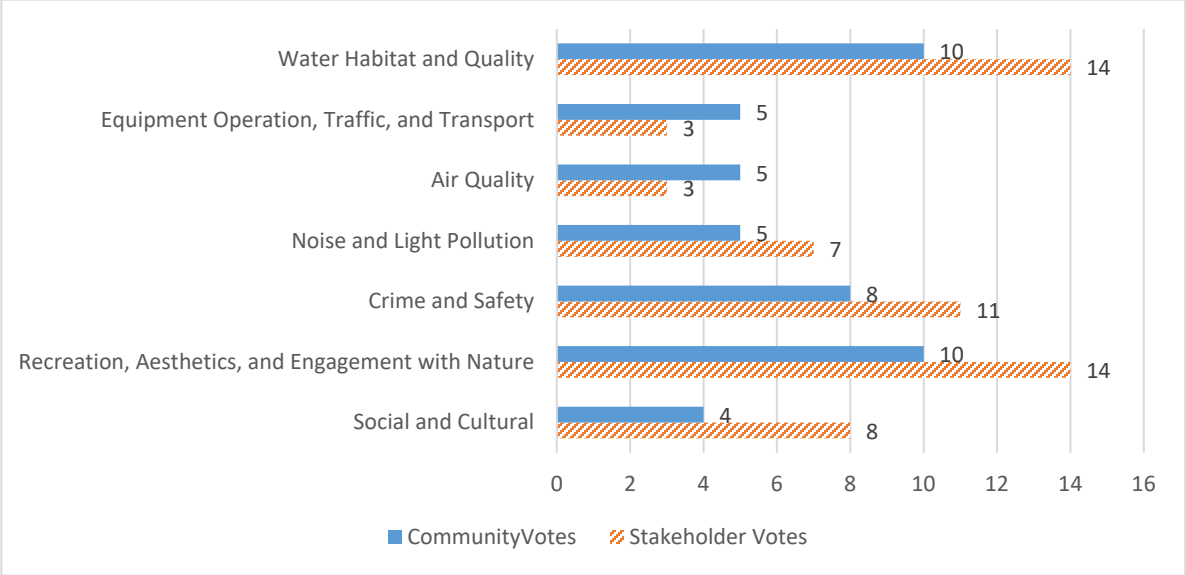
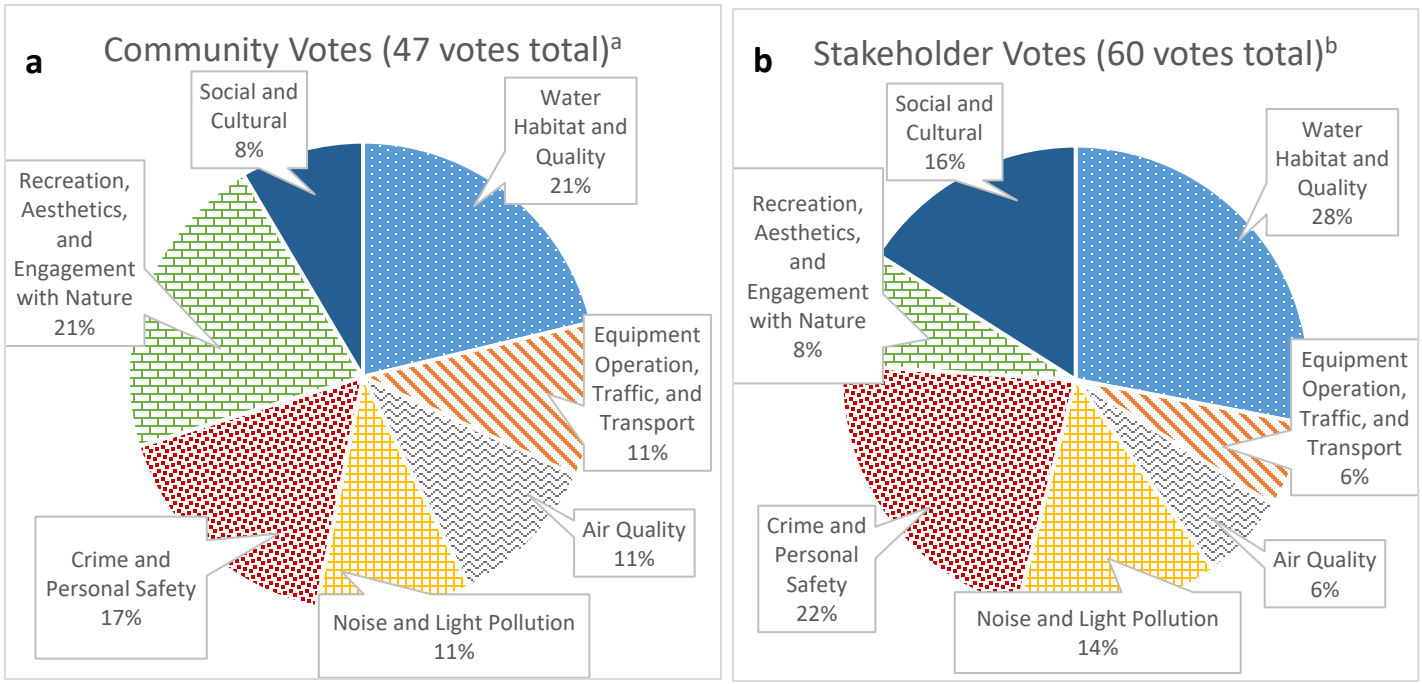


Figure 5-1. Prioritization of HIA recommendations at the Final HIA Community and Stakeholder Meetings by pathway Community Votes = votes from those in attendance at the Final HIA Community Meeting; Stakeholder Votes = votes from those in attendance at the Final HIA Stakeholder Meeting



[a] 2 recommendations received 4 votes; 4 recommendations received 3 votes; 6 recommendations received 2 votes; 15 recommendations received 1 vote

[b] 7 recommendations received 3 votes; 9 recommendations received 2 votes; 21 recommendations received 1 vote

Figure 5-2. Percentage of votes received in recommendation prioritization exercise by those at (a) the Final HIA Community Meeting and (b) the Final HIA Stakeholder Meeting, by pathway.

5.3 Final Recommendations to Decision-Makers

Table 5-2 presents the final 73 evidence-based recommendations that the HIA Project Team proposes for adoption and implementation as part of decision-making and execution of the habitat restoration and subsequent park improvements. Recommendations that were similar in wording across multiple pathways were combined into a single recommendation in the final HIA recommendations. These final recommendations also incorporate input received from the community and stakeholders during the Final HIA Community and Stakeholder Meetings (documented in Appendix F); this input is indicated by footnotes in the table.

The parties that would likely be responsible for implementing the majority of the final HIA recommendations are the decision-makers, MNDNR and the City of Duluth (and their contractors), but there are some recommendations that could be implemented by other parties, such as the Minnesota Department of Health (MDH), EPA, University of Minnesota-Duluth (UMD), and other academic and non-profit organizations.

The timeline for implementation identifies the applicable project phase (e.g., Habitat Restoration Construction and Operations, Park Improvements Construction, Park Improvements Operations and

Maintenance) and any temporal descriptors, such as before, during, after, within X amount of time, etc. (e.g., Before Habitat Restoration Construction and Operations).

Some of the recommendations for the habitat restoration work have already been adopted in design, included in the EAW, or adopted in the contract; this is noted in Table 5-2, where applicable[22]. Section 7.2, Plan for Impact and Outcome Evaluation contains the detailed plan for monitoring the implementation of these HIA recommendations and assessing the impact the HIA had on the decision, decision-making process, and decision-making climate, including indicators that can be used to track implementation of these HIA recommendations as the projects progress.

The top community prioritized recommendations are shaded in blue; these are recommendations that received 3 or 4 votes in the prioritization exercise at the Final HIA Community Meeting described in Section 5.2. The top stakeholder prioritized recommendations are shaded in orange; these are recommendations that received 3 votes in the prioritization exercise at the Final HIA Stakeholder Meeting.

These HIA recommendations are not regulatory in nature; they are offered as suggestions for improving the impact of the habitat restoration and park improvement projects on health and well-being. Adoption of the recommendations is at the discretion of the decision makers (MNDNR and the City of Duluth), as they must balance health considerations with the other technical, social, political, and economic considerations related to the projects.

[22] The HIA Project Team created a checklist of the Final HIA Recommendations, with four blank columns inserted to the right to be used to indicate whether the recommendation was adopted in design, included in the EAW, or adopted in the contract; and if not yet implemented, whether there is interest in adopting the recommendation in the future. The checklist was transmitted to the MNDNR St. Louis River Habitat Coordinator, Melissa Sjolund, as part of the initial phase of impact evaluation to assess adoption of the recommendations in the habitat restoration work to date; park improvement work by the City of Duluth had not yet begun. Ms. Sjolund completed the checklist and transmitted it to the HIA Project Lead on April 4, 2019.

Table 5-2. Final HIA Recommendations

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Water Habitat & Quality	Follow best practices for stormwater management, erosion and runoff, and equipment leaks during the construction phases and implement mitigations, as necessary	Mitigation Measure	• Community consultation • Established standards and benchmarks	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in design, included in EAW City of Duluth – N/A
Water Habitat & Quality	Develop habitat plans for marsh birds, wading birds, and migratory waterfowl	Promotion Measure	• Literature • Stakeholder input	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction • Park Improvements Operations and Maintenance	MNDNR – adopted in design, included in EAW City of Duluth – N/A
Water Habitat & Quality	Develop a long-term, non-native species management plan for both Grassy Point and Kingsbury Bay	Promotion Measure	• Literature • Stakeholder input • Community consultation	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	N/A
Water Habitat & Quality	Where compatible with project goals, protect existing high-quality aquatic plants at Kingsbury Bay	Promotion Measure	• Literature • Stakeholder input	MNDNR	Before and During: • Habitat Restoration Construction and Operations	MNDNR – adopted in design, included in EAW

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Water Habitat & Quality	Develop a sediment remediation target protective of human health based on surface-weighted area contaminant concentration, particularly for dioxins	Mitigation Measure	• Literature • Stakeholder input	MNDNR	During: • Habitat Restoration Construction and Operations	MNDNR – adopted in design, included in EAW
Water Habitat & Quality	For a future project, cap or remove sediments to the east of the Grassy Point project area (currently outside the project area) to reduce bioavailability of dioxins	Mitigation Measure	• Literature • Stakeholder input	MNDNR	After: • Habitat Restoration Construction and Operations	N/A
Water Habitat & Quality	Design the stormwater pond identified in the concept plan to intercept stormwater to maximize its ability to protect Kingsbury Bay water quality	Promotion Measure	• Literature • Community consultation	City of Duluth	Before and During: • Park Improvements Construction • Park Improvements Operations and Maintenance	N/A
Water Habitat & Quality	Conduct creel surveys focused on fishing within the AOC, and include information on race, ethnicity, location of residence, age, and fish consumption habits	Health Supportive Measure	• Literature • Stakeholder input	MNDNR	Before and During: • Park Improvements Operations and Maintenance	N/A
Water Habitat & Quality	Implement a fish monitoring program that includes mercury, dioxins, and PCBs, and targets both resident and migratory fish species	Mitigation Measure	• Literature • Stakeholder input	MNDNR, MDH	Before and During: • Park Improvements Operations and Maintenance	N/A

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Water Habitat & Quality	Provide ethnically-appropriate communication on consumption-related risk that addresses specific-contaminant risk as well as fish species and size	Mitigation Measure	• Literature • Stakeholder input	MNDNR, MDH	Before and During: • Park Improvements Operations and Maintenance	N/A
Water Habitat & Quality	Should contaminant concentrations of certain fish species or sizes at the project sites meet human health guidelines, promote the consumption of local fish due to its health benefits	Promotion Measure	• Literature • Stakeholder input	MNDNR, MDH	Before and During: • Park Improvements Operations and Maintenance	N/A
Water Habitat & Quality	Identify upland habitats within the site suitable for trees, and develop goals for the upland plant community that take into account future changes in invasive species, water level, and climate, as well as crime prevention and safety guidelines (e.g., Crime Prevention through Environmental Design guidelines)[23]	Promotion Measure	• Literature • Stakeholder input • Community consultation	MNDNR, City of Duluth	Before and During: • Park Improvements Construction • Park Improvements Operations and Maintenance (to adapt implementation to meet changing conditions)	N/A

[23] This recommendation was revised, based on stakeholder input, to ensure that crime prevention and safety aspects were taken into account when designing plantings.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Water Habitat & Quality	Identify regional stormwater outfalls or other sources of *Escherichia coli* and implement additional best management practices to improve water quality at the future swimming beach at Kingsbury Bay[24]	Mitigation Measure	• Literature • Stakeholder input • Community consultation	City of Duluth	Before and During: • Park Improvements Operations and Maintenance	N/A
Water Habitat & Quality	To sustain the ecological integrity of the site, provide interpretative signage that provides information on wetland habitat types and the benefits each habitat provides for fish, reptiles, birds, and people	Promotion Measure	• Stakeholder input • Community consultation	City of Duluth	Before and During: • Park Improvements Operations and Maintenance	N/A
Water Habitat & Quality	Implement routine beach monitoring at the future Kingsbury Bay swimming beach	Mitigation Measure	• Literature • Established standards and benchmarks	MDH	During: • Park Improvements Operations and Maintenance	N/A

[24] This recommendation was revised, based on community input, to accurately describe the various sources that potentially contribute *E. coli* to the river.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Equipment Operation, Traffic, and Transport Air Quality Noise and Light Pollution	Clearly communicate the project, its duration, project updates (including issues and concerns), and expected roadway and water traffic impacts, air pollution levels, and noise levels to residents, schools and daycare centers, senior centers and care facilities, businesses, and recreational users in the project area and along the transport route[25]	Health Supportive Measure	• Literature • Community consultation • Stakeholder input	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	N/A
Equipment Operation, Traffic, and Transport Air Quality Noise and Light Pollution	Provide a means for residents and other affected populations to provide feedback, questions and/or lodge complaints about general construction activities and excess traffic, air, and noise impacts[26]	Health Supportive Measure	• Literature • Community consultation • Stakeholder input	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	N/A

[25] This recommendation was revised, based on stakeholder input, to include communication of project updates as well. These updates could be sent to email lists and posted on City Planning and City Parks websites. MNDNR project and construction updates are reported on MNDNR's St. Louis River Restoration Initiative webpage.

[26] This recommendation was added, based on stakeholder input, to ensure residents and other populations have the opportunity and means to provide feedback and inquire about the general construction activities.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Equipment Operation, Traffic, and Transport	Hire companies with a proven safety record; local companies given priority in hiring can benefit the local economy	Mitigation Measure/ Health Supportive Measure	• Literature • Established standards and benchmarks	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in contract City of Duluth – N/A
Equipment Operation, Traffic, and Transport Air Quality Noise and Light Pollution	Route trucks, other equipment and vehicle traffic away from neighborhoods, schools and daycare centers, senior centers and care facilities, and recreation areas to the extent possible to minimize the risk of traffic impacts and exposure to noise and air pollution	Mitigation Measure	• Literature • Established metrics and benchmarks • Geospatial analysis • Quantitative data analysis • Community consultation • Stakeholder input	MNDNR, City of Duluth, and associated contractors	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	N/A
Equipment Operation, Traffic, and Transport	Take additional safety measures and/or limit the amount of truck traffic at the start and end of the school day to create safe routes to and from school for children	Mitigation Measure	• Literature • Geospatial analysis • Quantitative data analysis • Stakeholder input	MNDNR, City of Duluth, and associated contractor	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	N/A

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Equipment Operation, Traffic, and Transport	Take into account traffic patterns, road geometry, and frequency and timing of trips to minimize traffic disturbance and congestion	Mitigation Measure	• Literature • Established standards and benchmarks • Geospatial analysis • Community consultation • Stakeholder input	MNDNR, City of Duluth, and associated contractors	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	N/A
Equipment Operation, Traffic, and Transport	Repair damage to roadways caused by construction vehicles and transport (e.g., potholes, broken curbs, collapsed manholes, rail crossing damage)	Mitigation Measure	• Literature • Stakeholder input • Community consultation	MNDNR, City of Duluth and associated contractors	After: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in contract City of Duluth – N/A
Equipment Operation, Traffic, and Transport Air Quality	Consider the use of rail or barge to transport sediment between the two sites, as these routes would avoid residential areas, minimize roadway traffic impacts, likely reduce the number of trips (given the larger capacity of rail cars and barges), and minimize traffic-related air pollutants in the residential areas	Proposal Alternative/ Mitigation Measure	• Literature • Geospatial analysis • Quantitative data analysis • Community consultation • Stakeholder input	MNDNR and associated contractors	Before and During: • Habitat Restoration Construction and Operations	N/A

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Equipment Operation, Traffic, and Transport	Route material transport traffic away from neighborhoods, schools and daycare centers, senior centers and care facilities, and recreation areas to minimize the risk of exposure to particulate matter and contaminants in excavated material[27]	Mitigation Measure	• Literature • Community consultation • Stakeholder input	MNDNR and associated contractors	Before and During: • Habitat Restoration Construction and Operations	N/A
Equipment Operation, Traffic, and Transport	Minimize impacts of the hydraulic pipeline and project-related barge traffic on recreational boaters and the navigation channel of the St. Louis River by using signs, markings, and warnings	Mitigation Measure	• Literature • Established standards and benchmarks • Community consultation • Stakeholder input	MNDNR and associated contractors	During: • Habitat Restoration Construction and Operations	MNDNR – included in EAW, adopted in contract
Equipment Operation, Traffic, and Transport Air Quality	Minimize exposure to material in transport by covering transport vehicles and implementing other fugitive dust measures, including watering access routes, and covering exposed soils/ stockpiles	Mitigation Measure	• Literature • Established standards and benchmarks • Community consultation • Stakeholder input	MNDNR and associated contractors	During: • Habitat Restoration Construction and Operations	MNDNR – included in EAW, adopted in contract

[27] This recommendation was updated to include the reason for routing transport of excavated material away from neighborhoods, schools and daycare centers, senior centers and care facilities, and recreation areas.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Equipment Operation, Traffic, and Transport Crime and Safety	Implement traffic calming measures (such as speed humps, raised crosswalks/ intersections, traffic circles, medians, curb extensions or bump-outs, and signage or pavement markings) and bikeway improvements (such as clear painted bike lane markings and signage to already designated bike routes) to improve safe access to the parks and minimize the risk for increased accidents should the parks and other nearby enhancements increase the amount of traffic in the area post-construction	Mitigation Measure	• Literature • Established standards and benchmarks • Community consultation	City of Duluth	During: • Park Improvements Operations and Maintenance	N/A
Air Quality	Include mitigation specifications in the contract (reduced idling and requirements for equipment fitted with catalysts and filters) and incentives for contractors with idle reduction policies, and newer or retrofitted equipment	Mitigation Measure	• Literature • Established standards and benchmarks	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction • Park Improvements Operations and Maintenance	MNDNR – adopted in contract City of Duluth – N/A

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Air Quality	Select native trees and plants for planting that will do well in warming climate[28] Note: Trees have the greatest potential to filter air pollutants, followed by shrubs, and then grasses	Health Supportive Measure	• Literature • Stakeholder input • Community consultation	City of Duluth and associated contractors	During: • Park Improvements Construction	N/A
Air Quality	Select trees that have tall, broad canopies for increased shading and place in areas where people may congregate	Promotion Measure	• Literature	City of Duluth and associated contractors	During: • Park Improvements Construction	N/A
Noise and Light Pollution	Include noise mitigation criteria/ specifications in the contract (e.g., absolute noise criterion for equipment, restricted idling, and use of mufflers, dampeners, shieldings, and enclosures)	Mitigation Measure	• Literature • Established standards and benchmarks	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – included in EAW, adopted in contract City of Duluth – N/A
Noise and Light Pollution	Include incentives or priority in hiring for contractors who have established noise mitigation programs/policies and/or newer fleets[29]	Mitigation Measure	• Literature • Established standards and benchmarks • Stakeholder input	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	N/A

[28] This recommendation was updated, based on community input, to ensure that plant selection takes into account climatic variables.

[29] This recommendation was revised, based on stakeholder input, to reflect priority in hiring as an alternative to contract incentives.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Noise and Light Pollution	Limit construction activities to daylight hours or the hours specified in the Duluth noise ordinance (7 am – 9 pm), whichever is more restrictive (i.e., sunset December-March is between 4:30 and 7:30 pm). Limit noisy operations to non-sensitive time periods (e.g., mid-day)[30]	Mitigation Measure	• Literature • Policy • Community consultation • Stakeholder input	MNDNR, City of Duluth, and associated contractors	During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – contractor must adhere to city code City of Duluth – N/A
Noise and Light Pollution	Avoid nighttime construction activity to the extent possible. During winter, sunset is between 4:30 and 7:30 pm (much earlier than 9:00 pm). When necessary, implement measures to minimize light illumination impacts on nearby residences	Mitigation Measure	• Literature • Community consultation • Stakeholder input	MNDNR, City of Duluth, and associated contractors	During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – contractor must adhere to city code City of Duluth – N/A

[30] This recommendation was developed to reflect the noise ordinance that is in place in the City, but based on stakeholder input, decision-makers should note that there is shift work in these neighborhoods, so people may be home trying to sleep during daytime hours.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Noise and Light Pollution	Implement noise monitoring in the vicinity of both sites to assess overall noise levels (i.e., baseline noise plus project noise) and implement mitigation measures, as necessary, to minimize impacts	Mitigation Measure	• Literature • Stakeholder input • Community consultation	MNDNR, City of Duluth, and associated contractors[31]	During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – contractor must adhere to city code City of Duluth – N/A
Noise and Light Pollution	Position stationary noise sources as far away as possible from noise sensitive areas (areas where a quiet setting is a generally recognized feature or attribute, such as residential areas, parks, recreational and wilderness areas, and cultural and historical sites)	Mitigation Measure	• Literature	MNDNR, City of Duluth, and associated contractors	During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – contractor must adhere to city code City of Duluth – N/A
Noise and Light Pollution	Implement hearing protection and operations schedules to avoid exposure of construction workers to noise above NIOSH recommended exposure limits (73% of the time construction workers are exposed over the recommended exposure limits)	Mitigation Measure	• Literature • Established standards and benchmarks	MNDNR, City of Duluth, and associated contractors	During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in contract City of Duluth – N/A

[31] MDH or local academic institutions may be able to provide support for/help implement noise monitoring activities. While it is important to understand noise impacts at both sites, activities at Kingsbury Bay have the potential to impact a greater percentage of the population.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Noise and Light Pollution	Prohibit the use of truck engine brakes, unless in case of emergency	Mitigation Measure	• Literature	MNDNR, City of Duluth, and associated contractors	During: • Habitat Restoration Construction and Operations • Park Improvements Construction	N/A
Noise and Light Pollution	Ensure any lighting used in the parks are intelligently-designed, low glare, efficient outdoor lighting fixtures that direct illumination toward the ground (rather than upward) and evaluate the potential for motion sensors on lighting in certain areas of the parks or parking lots to minimize over-illumination	Mitigation Measure	• Literature • Established standards and benchmarks	City of Duluth	During: • Park Improvements Construction	N/A
Crime and Safety	Construction activities that alter existing routes and access points should have clear signs and barriers to minimize the potential for trespassers	Mitigation Measure	• Literature • Established standards, metrics, and benchmarks	MNDNR, City of Duluth	During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in contract City of Duluth – N/A
Crime and Safety	Clearly communicate the improvements being made to Grassy Point to alleviate existing perceptions of crime and personal safety issues and encourage utilization of the space post-restoration	Health Supportive Measure	• Literature • Community consultation • Stakeholder input	City of Duluth	Before, During, and After: • Park Improvements Construction	N/A

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Crime and Safety	Follow Crime Prevention through Environmental Design (CPTED) guidelines, including lighting and planting configurations. Where possible, reduce dense planting and shrubs around narrow pedestrian paths	Mitigation Measure	• Literature • Established standards, metrics, and benchmarks	City of Duluth	Before and During: • Park Improvements Construction • Park Improvements Operations and Maintenance	N/A
Crime and Safety	Lighting should be improved and police surveillance considered to reduce crime and the perception of risk at these sites[32]	Mitigation Measure	• Literature • Established standards, metrics, and benchmarks • Community consultation • Stakeholder input	City of Duluth	During: • Park Improvements Construction • Park Improvements Operations and Maintenance	N/A

[32] Note that while the literature and some stakeholders and community members support the use of lighting to deter crime, there were concerns voiced by others that lighting has not always been found to reduce crime in their community, especially in more remote areas (such as Grassy Point), and the addition of lighting means added maintenance requirements and costs that may not be able to be supported.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Crime and Safety	Provide clear signage and maps for pedestrian and bicyclist access to the parks. Important elements of access and design include effective wayfinding systems such as the use of landmarks, signage, distance to destination markers, and interest points to assist in navigating the routes easily	Mitigation Measure	• Literature • Established standards, metrics, and benchmarks • Community consultation • Stakeholder input	City of Duluth	During: • Park Improvements Construction • Park Improvements Operations and Maintenance	N/A
Crime and Safety	After improvements of parks begin, increase enforcement or police presence to "set the tone." Communicate to police department that their presence is important in the beginning to deter bad behavior and reduce crime. This is especially true at Grassy Point where it is more secluded and thereby, necessitates more formal surveillance. Delegation of those resources should be determined by the number of visitors and the expected frequency of crimes[33]	Mitigation Measure	• Literature	City of Duluth	During: • Park Improvements Operations and Maintenance (soon after completion of Park Improvements Construction)	N/A

[33] The recommendation was revised, based on stakeholder input, to add text explaining how this can be accomplished given the City's thinning police force.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Crime and Safety	Consider using the National Highway Transportation Safety Administration's (NHTSA's) Walkability and Bikeability Checklists to inform design of trails within the parks and leading to the parks[34]	Health Supportive Measure	• Literature • Established standards, metrics, and benchmarks	City of Duluth	Before and During: • Park Improvements Construction	N/A
Crime and Safety	Improve pedestrian and bicycle access to Grassy Point from the Irving neighborhood; current access is by footpath or walking/biking along Waseca Industrial Road	Mitigation Measure	• Community consultation	City of Duluth	During: • Park Improvements Construction	N/A
Recreation, Aesthetics, and Engagement with Nature	Recommend that the City solicit deliberative community and stakeholder engagement and examine the pathways through which the park efforts could impact health to help inform the park improvements design and implementation	Mitigation Measure/ Promotion Measure	• Literature • Community consultation • Stakeholder input	City of Duluth	Before and During: • Park Improvements Construction	N/A

[34] The NHTSA Checklists identify the factors that make a neighborhood pedestrian and bicyclist friendly (i.e., safe for pedestrians and bicyclists). Available at: https://one.nhtsa.gov/Driving-Safety

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Recreation, Aesthetics, and Engagement with Nature	Offer diverse opportunities for recreation at both sites, including publicly-accessible gathering spaces, fishing piers, birding platforms, access to the water for water-based recreation, and trails, considering maintenance requirements of installed features	Promotion Measure	• Literature • Community consultation • Stakeholder input	MNDNR, City of Duluth	During: • Habitat Restoration Construction and Operations • Park Improvements Construction • Park Improvements Operations and Maintenance	MNDNR – adopted in design, included in EAW City of Duluth – N/A
Recreation, Aesthetics, and Engagement with Nature	Preserve and enhance fishing opportunities, with more formal locations (e.g., piers) and social gathering opportunities adjacent to those locations. The creation of Big Island at Grassy Point would provide an opportunity for a fishing pier and access to a fishery with more biodiversity; a bridge would be needed to access Big Island	Promotion Measure	• Literature • Community consultation • Stakeholder input	MNDNR, City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction • Park Improvements Operations and Maintenance	MNDNR – adopted in design, included in EAW City of Duluth – N/A
Recreation, Aesthetics, and Engagement with Nature	Create a higher upland area on Big Island to form a more sheltered bay, providing safer harbor for kayaks and canoes	Proposal Alternative/ Health Supportive Measure	• Geospatial analysis • Modeling	MNDNR	Before and During: • Habitat Restoration Construction and Operations	MNDNR – adopted in design, included in EAW City of Duluth – N/A

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Recreation, Aesthetics, and Engagement with Nature Crime and Safety	Areas that support both human-powered and motorized boats should include measures to enhance safety and minimize potential for user conflict[35]	Mitigation Measure	• Community consultation • Stakeholder input	MNDNR, City of Duluth	During: • Habitat Restoration Construction and Operations • Park Improvements Construction • Park Improvements Operations and Maintenance	N/A
Recreation, Aesthetics, and Engagement with Nature	All swimming areas should include measures to enhance safety and minimize potential for user conflict. Measures should include signage about the availability of lifeguards and current water quality status. Buoys should separate swimming and boating areas	Health Supportive Measure	• Stakeholder input • Established standards • Expert opinion	City of Duluth	During: • Park Improvements Construction • Park Improvements Operations and Maintenance	N/A

[35] This recommendation was added, based on stakeholder input, to reflect the importance of minimizing the potential for user conflicts in areas that support both human-powered and motorized boats.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Recreation, Aesthetics, and Engagement with Nature Social and Cultural	In advance of construction and in all project phases, clearly communicate to recreational and water users, through multiple media sources, reliable and timely information about the construction periods, disruptions to the Western Waterfront Trail and walkability and accessibility to both project sites, and the planned changes at both sites so that users can anticipate the improved resources and plan to visit[36]	Mitigation Measure	• Community consultation • Stakeholder input • Literature	MNDNR, City of Duluth, and nonprofit organizations	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in contract City of Duluth – N/A
Recreation, Aesthetics, and Engagement with Nature	Provide additional parking to increase access to and utilization of the restored Kingsbury Bay and Grassy Point sites, using caution to minimize any potential environmental impacts of the added parking	Promotion Measure	• Established standards	City of Duluth	During: • Park Improvements Construction	N/A
Recreation, Aesthetics, and Engagement with Nature	Perform wetland restoration at the mouth of Kingsbury Creek to preserve the cold-water habitat for trout and provide deeper water for kayak and canoe access	Promotion Measure	• Stakeholder input • Expert opinion	MNDNR	During: • Habitat Restoration Construction and Operations	MNDNR – adopted in design, included in EAW

[36] This recommendation was revised, based on stakeholder input, to reflect the importance of considering the impact on water users, as well.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Recreation, Aesthetics, and Engagement with Nature Social and Cultural	The planners should strive to create natural spaces for social interaction and opportunities for social gatherings near the additional planned fishing piers, especially at Grassy Point, similar to the improvements at Chambers Grove Park	Promotion Measure	• Literature • Community consultation	MNDNR, City of Duluth, other partners	During: • Habitat Restoration Construction • Park Improvements Construction	MNDNR – adopted in design City of Duluth – N/A
Recreation, Aesthetics, and Engagement with Nature	Because recreational amenities are enjoyed by residents, any plans for future changes should include recognition of the value placed by residents who use the resources frequently	Mitigation Measure	• Literature • Geospatial analysis	City of Duluth	Before and During: • Park Improvements Construction	N/A
Recreation, Aesthetics, and Engagement with Nature	Preserve and upgrade current birding locations, as well as enhance access to newly created birding habitat. Signage, raised platforms, and telescopes are all potential amenities. Upland plant communities should be restored to maximize potential for pollinator, including bird, habitat[37]	Mitigation Measure	• Literature • Community consultation	MNDNR and City of Duluth	Before and During: • Habitat Restoration Construction • Park Improvements Construction	N/A

[37] This recommendation was revised, based on stakeholder and community input, to reflect potential birding amenities that could be provided at the sites.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Recreation, Aesthetics, and Engagement with Nature	Recognizing the value placed on the existing resources, any changes to park amenities could add new features to existing parks and green space	Mitigation Measure	• Literature • Community consultation	City of Duluth	During: • Park Improvements Construction • Park Improvements Operations and Maintenance	N/A
Recreation, Aesthetics, and Engagement with Nature	Create a water trail to serve as a by-way for kayaks, which can be nominated as a nationally designated water trail, and may provide opportunities for recognition and funding[38]	Health Supportive Measure	• Stakeholder input • Community consultation	City of Duluth and nonprofit organization partners	During: • Park Improvements Construction	N/A
Recreation, Aesthetics, and Engagement with Nature	Research and develop co-management models, where neighborhood organizations have more formal responsibility for park management. Co-management arrangements could empower the neighborhood and ease the maintenance burden on the city of Duluth	Health Supportive Measure	• Stakeholder input • Community consultation • Literature	City of Duluth, EPA, other academic and nonprofit organization partners	Before and During: • Park Improvements Construction • Park Improvements Operations and Maintenance	N/A

[38] This recommendation was added, based on stakeholder input, to identify a recreation opportunity that exists for the area. Although originally identified for the Social and Cultural pathway, the recommendation was better placed in the Recreation, Aesthetics, and Engagement with Nature pathway.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Recreation, Aesthetics, and Engagement with Nature Social and Cultural	The City should provide a means for assessing park usage and the ends to which the sites are being used (e.g., for social cohesion, spiritual reflection, and access to cultural resources). This could include reaching out to the University of Minnesota-Duluth Environmental and Outdoor Education program or other local organizations to create a service learning or citizen science project that monitors, through a 5-year monitoring and evaluation timeline, the use of the parks for these means or providing signage at the sites that includes a description of how to report usage of the park, including a QR code that sends them directly to a feedback form[39]	Promotion Measure	• Expert opinion • Stakeholder input	City of Duluth, UMD, and nonprofit organization partners	During: • Park Improvements Operation and Maintenance	N/A

[39] This recommendation was added, based on community and stakeholder input, to identify available methods of collecting data to determine the success of the park improvements in meeting the suggested uses of the space for social cohesion, spiritual reflection, and access to cultural resources.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Recreation, Aesthetics, and Engagement with Nature	Explore partnerships with organizations to facilitate access, education, and equipment sharing, additional recreational opportunities and leadership capacity building for underrepresented communities	Health Supportive Measure	• Stakeholder input	City of Duluth, EPA, other academic and nonprofit organization partners	Before and During, After: • Park Improvements Construction • Park Improvements Operations and Maintenance	N/A
Social and Cultural	The planning team should conduct stakeholder meetings to the extent possible to gather information needed to understand the social and cultural significance of these parks to the various populations in the community, including but not limited to a cultural heritage assessment of the sites[40]	Promotion Measure	• Literature • Expert opinion • Stakeholder input • Community consultation	MNDNR and City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	N/A

[40] This recommendation was revised, based on stakeholder input, to stress the importance of understanding the social and cultural significance of the sites for all people in the community and to indicate that a cultural heritage assessment could be used, in part, to understand the cultural significance of the sites.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Social and Cultural	The planners should strive to create natural spaces for solitary spiritual reflection. Attention should be paid to develop spaces for spiritual reflection that minimize the noise and distraction from the nearby industry and take into account the vistas from the space[41]	Promotion Measure	• Literature • Stakeholder input	MNDNR and City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in design City of Duluth – N/A
Social and Cultural	Signage may be considered that demarcate culturally-significant spaces and promote quiet reflection. The Duluth Indigenous Commission, Fond du Lac Band, and 1854 Treaty Authority should be consulted when developing signage to denote spaces that are significant for Native American populations[42]	Promotion Measure	• Expert opinion	City of Duluth	Before and During: • Park Improvements Construction	N/A

[41] This recommendation was revised, based on stakeholder input, to identify that the vistas from an area can contribute to its cultural significance.

[42] This recommendation was updated, based on stakeholder input, to identify the Duluth Indigenous Commission, Fond du Lac Band, and 1854 Treaty Authority as resources to be consulted when developing signage for spaces significant to Native American populations.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Social and Cultural	The planning team should prioritize the placement of native, medicinal, and culturally-significant plants	Promotion Measure	• Literature • Stakeholder input	MNDNR and City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in design City of Duluth – N/A
Social and Cultural	Attention should be paid to promote the presence of wildlife that may be culturally significant and specifically the abundance of fish for subsistence fishing	Promotion Measure	• Literature	MNDNR and City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in design, included in EAW City of Duluth – N/A
Social and Cultural	Consult with 1854 Treaty Authority, Duluth Indigenous Commission, and Fond du Lac Band resource managers to identify significant sites for any use and determine the best approach to preserve, enhance or interpret resources[43]	Mitigation Measure/ Promotion Measure	• Stakeholder input • Community consultation	MNDNR and City of Duluth	Before and During: • Habitat Restoration Construction and Operations • Park Improvements Construction	MNDNR – adopted in design City of Duluth – N/A

[43] This recommendation was updated, based on stakeholder input, to identify the Duluth Indigenous Commission as resources to be consulted when identifying and developing plans for spaces significant to Native American populations.

Pathway(s)	Recommendation	Intended Purpose	Evidence Supporting the Recommendation	Party(ies) Responsible for Implementation	When the Recommendation Should Be Implemented	Recommendation Adoption or Implementation as of April 4, 2019
Social and Cultural	Outreach should be conducted to engage and encourage park use by the African American youth in Duluth, perhaps through the YMCA, the Valley Youth Center, and the Duluth Outdoor Collaborative[44]	Promotion Measure	• Stakeholder input	City of Duluth and nonprofit organization partners	During: • Park Improvements Operation and Maintenance	N/A
Social and Cultural	To encourage park use by minority groups, the City of Duluth Parks Department could hire leaders from these underrepresented populations to work in public engagement, outreach, and park operations[45]	Promotion Measure	• Stakeholder input	City of Duluth	During: • Park Improvements Operation and Maintenance	N/A
Social and Cultural	Bag stations for dog poop pick-up should be installed at each park[46]	Promotion Measure	• Community consultation	City of Duluth	During: • Park Improvements Construction • Park Improvements Operation and Maintenance	N/A

[44] This recommendation was added, based on stakeholder input, to identify the need for social cohesion and access for an underserved population in the community.

[45] This recommendation was added, based on stakeholder input, to identify an opportunity to build social cohesion and access for underrepresented populations in the community.

[46] This recommendation was added, based on community input, to identify a need to create a space that is socially-appealing.

6 Reporting

The overall goal of the reporting step is to develop the HIA report, inform stakeholders on the progress of the HIA, and communicate HIA findings and recommendations to decision-makers, the population affected by the decision, and other stakeholders. The desired outputs of the *Reporting* step of HIA are detailed in Appendix A.

6.1. HIA Reporting and Communication

Several reporting activities were performed to support this HIA. The HIA Project Team was able to implement the reporting activities, as planned in *Scoping* and raise awareness about this HIA both within and outside the Agency to inform different communities of practice.

Examples of the communications materials and documentation from community and stakeholder engagement can be found in Appendices B and F**.** These meetings were in addition to meetings held with the Advisory Committee to report on HIA progress and gather stakeholder input to inform the analysis and impact characterization. The HIA Project Team used a standardized format or "brand" for almost all of the HIA communication materials. The use of branding helped increase recognition and consistency of HIA materials. Before materials were shared outside the team, several steps were followed. First, the materials were developed and reviewed by members of the HIA Project Team. Once comments and edits were addressed, HIA materials were sent to the HIA Project Leads for final approval. Once cleared, the materials were shared with members of the Advisory Committee and the general public.

6.2 Reporting of HIA Findings and Recommendations

6.2.1. Input Solicited on Preliminary Findings and Recommendations

The HIA Project Team presented the preliminary HIA findings and initial recommendations to the Advisory Committee to gather their input and then presented them to the community and other stakeholders through a series of two meetings. A short PowerPoint presentation was given at the beginning of the meeting, which provided an overview of the HIA process and what had been done for this HIA. Then community and stakeholders were asked to visit each of the posters staged around the room, which contained specific information about each of the pathways assessed. A member of the HIA Project Team stood at each of the posters to answer questions and facilitate discussions about the predicted impacts of the proposed project on that pathway and health. The poster presentation strategy allowed for a more individualized discussion about the assessment performed and provided direct access for the community and stakeholders to those who performed the assessment. The poster presentations are provided in Appendix F. Community and stakeholders were given post-it notes to allow them to provide feedback and comments about the assessment and findings presented directly on

the posters. The HIA Project Team discussed the community and stakeholder input received at and following the meeting and modified the verbiage of findings and recommendations, as needed. Modifications made to the recommendations as the result of these reviews are given in the footnotes in Section 5.3.

6.2.2 HIA Report Development

In addition to posters, flyers, factsheets, handouts, and PowerPoint presentations, members of the HIA Project Team developed an HIA Report and HIA Summary Report as the final reporting output of the HIA.

Draft HIA Report

The HIA Report was prepared over the duration of the HIA and a draft completed following the final community and stakeholder meetings. The Draft HIA Report was transmitted to the HIA Research Team for review and following resolution of their review comments, was transmitted to the Advisory Committee and two external peer-reviewers (an HIA practitioner and a habitat restoration expert) for review and comment.

Final HIA Reporting

Comments were received from the Advisory Committee and external peer reviews, and the HIA Report was revised to address comments, as appropriate. Following completion of comment resolution, the report was transmitted through the Agency review process and cleared for publication. An electronic copy of this report will be shared with MNDNR, the City of Duluth, the HIA Project Team, and the Advisory Committee. The HIA Report will also be made available to the public and other stakeholders upon request and uploaded to EPA's HIA website (https://www.epa.gov/healthresearch/epa-health-impact-assessment-case-studies).

6.3 Key Public Communications and Reporting Activities

Table 6-1 lists the key public communication and reporting activities performed to support this HIA, the date each was performed, its intended purpose, and the primary target audience. In addition to these reporting activities to inform decision-makers and stakeholders, presentations on the HIA were also given at several venues, including the 2017 and 2018 Great Lakes AOC Conference, 2018 Twin Ports Freshwater Folk Conference, 2018 International Symposium on Society and Natural Resources, and 2018 and 2019 St. Louis River Summit; it was included in the November 1, 2018 edition of Science Matters (highlighting how the HIA is working to preserve and promote the cultural significance of the sites and providing recommendations to ensure that tribal knowledge/input is incorporated into the restoration efforts); and it was highlighted in the April 2019 edition of the *EPA/ORD and ECOS: Partners for Meeting State Research Needs* summary, highlighting how ORD research and technical assistance support states across the Nation.

Table 6-1. Summary of Key HIA Public Communication and Reporting Activities

Reporting Outlet	Date	Purpose	Primary Audience
Overview of HIA Plan	January 31, 2017	A brief overview of the purpose and overall plan for conducting the HIA to inform the City, ask for their agreement to participate and consider the results, and start the discussion on how the HIA will fit into the other efforts currently underway.	City of Duluth
Community and Stakeholder Kick-off Meeting Flyers*	Released February 10, 2017; February 13, 2017	These one-page flyers were developed to inform the community residents and other stakeholders about the upcoming HIA and invite them to participate in the process by attending the HIA Community or Stakeholder HIA Kickoff Meeting.	Community, stakeholders, and decision-makers
HIA Community Kickoff Meeting **and** **HIA Stakeholder Kickoff Meeting**	February 27, 2017 February 28, 2017	The purpose of these public meetings was to inform community residents and stakeholders about the Kingsbury Bay-Grassy Point Habitat Restoration Project and the HIA process and its intended purpose, and to provide an opportunity for them to share their knowledge, experiences and input on the Kingsbury Bay and Grassy Point sites. In addition, the HIA Leadership Team hoped to gain from these meetings local knowledge and understanding about the interests and concerns of the community and other stakeholders and to identify individuals and groups interested in participating in the HIA. Two separate meetings were held – one for community members and a second for other stakeholders. The input from these meetings was used to guide the HIA scope.	Community, stakeholders, and decision-makers
Transmittal of HIA Community and Stakeholder Kickoff Meeting Presentations and Meeting Notes **and** **Invitation to Participate in the HIA Advisory Committee or Research Team**	Released March 30, 2017	Meeting notes were developed summarizing the discussions, activities, and input received during the HIA Community Kick-off Meeting and the Stakeholder Kickoff Meeting (see Appendix B). Community Kickoff Meeting presentation and notes were sent to the meeting attendees that provided their email or postal address. Stakeholder Kickoff Meeting presentation and notes were emailed to the meeting attendees and any individuals on the stakeholder invitee list that were unable to make the meeting. When transmitted, recipients were given information inviting them to participate further in the HIA as a member of the HIA Advisory Committee or HIA Research Team.	Community, stakeholders, and decision-makers

Reporting Outlet	Date	Purpose	Primary Audience
Transmittal of Save the Date Notice of MNDNR Public Meeting	Released April 26, 2017	Sent a Save the Date notice to the residents who attended the Community Kickoff Meetings and to the Stakeholder Kickoff Meeting invitees and attendees that the MNDNR would be holding a public meeting on May 24, 2017 to seek public comment on the design of the Kingsbury Bay-Grassy Point Habitat Restoration Project. Recipients were encouraged to attend this meeting to learn more about how the design of the project was progressing, receive a brief update on the HIA, and provide input that would help inform the habitat restoration project and HIA.	Community, stakeholders, and decision-makers
Kingsbury Bay-Grassy Point HIA Fact Sheet: Utilizing a Health Impact Assessment (HIA) to Connect Natural Resource Management and Community	May 15, 2017	A fact sheet was created for distribution at the May 2017 MDNR Public Meeting that defined HIA, described the Kingsbury Bay-Grassy Point habitat restoration and park improvement projects and opportunities for community and stakeholder participation in the HIA, and provided a status of the HIA.	Community and stakeholders
Transmittal of Preliminary Kingsbury Bay-Grassy Point HIA Pathways	May 24, 2017	Based on input from the community and other stakeholders at the HIA Kick-off Meetings, some example HIAs that looked at dredging and site remediation, and HIA Leadership Team and Research Team discussions, potential health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvement projects were identified. Those potential health impacts were grouped into seven categories or pathways through which the projects could potentially impact health. Figures were created summarizing the preliminary pathways identified for possible examination in the Kingsbury Bay-Grassy Point Habitat Restoration HIA. Transmitted a write-up to residents who attended the Community Kickoff Meetings and to the Stakeholder Kickoff Meeting invitees and attendees providing an HIA status, including the Preliminary HIA Pathways figures.	Community, stakeholders, and decision-makers
MNDNR Public Meeting	May 24, 2017	MNDNR held a public meeting to seek public comment on the design of the Kingsbury Bay-Grassy Point Habitat Restoration Project. Members of the HIA Leadership Team were in attendance and provided a brief update on the HIA. In addition, HIA materials were made available for review, including the HIA Fact Sheet and Preliminary HIA Pathways.	Community and stakeholders

Reporting Outlet	Date	Purpose	Primary Audience
Presentation of Significant HIA Preliminary Habitat Restoration Findings and Recommendations to MNDNR	October 19, 2017	Provided a brief summary of the significant preliminary HIA findings and recommendations related to the habitat restoration work at a MNDNR Project Meeting.	MNDNR, HIA Project Team
Final HIA Community Meeting **and** **Final HIA Stakeholder Meeting**	March 6, 2018 March 7, 2018	The purpose of these meetings was to update the community residents and stakeholders on the HIA's progress; report the preliminary findings and recommendations from the HIA; and elicit feedback on those findings and recommendations. Two separate meetings were held – one for community members and a second for other stakeholders. The input from these meetings was used to refine HIA findings and recommendations.	Community, stakeholders, and decision-makers
Transmittal of Final HIA Community and Stakeholder Kickoff Meeting Notes	Released March 37, 2018	Meeting notes were developed summarizing the discussions, activities, and input received during the Final HIA Community Meeting and Stakeholder Meeting (see Appendix F). Community Kickoff Meeting presentation and notes were sent to the meeting attendees that provided their email or postal address. Stakeholder Kickoff Meeting presentation and notes were emailed to the meeting attendees and any individuals on the stakeholder invitee list that were unable to make the meeting. When transmitted, recipients were given information inviting them to participate further in the HIA as a member of the HIA Advisory Committee or HIA Research Team.	Community, stakeholders, and decision-makers
HIA Report[47]	April 2021	The final HIA Report documents the details of the HIA process, including the methods used, persons involved, and outputs of the HIA.	Community, stakeholders, and decision-makers

[47] The HIA Project Team recognizes that this HIA Report is an extensive document due to the level of detail provided. Therefore, a summary of the full HIA Report and a fact sheet on the findings of the HIA have also been producedand can be used for advocacy and raising awareness within the community.

Reporting Outlet	Date	Purpose	Primary Audience
HIA Summary of Key Findings and Recommendations	April 2021	The Summary of the HIA Report highlights the main findings and recommendations of the HIA. As a supplement to the full HIA Report, this Summary Report aids in sharing and distributing the results of the HIA.	Community, stakeholders, and decision-makers
HIA Fact Sheet	April 2021	As a supplement to the full HIA Report, this fact sheet aids in sharing and distributing the results of the HIA.	Community, stakeholders, and decision-makers
HIA Briefing to City of Duluth	Spring 2021	A briefing will be given to the City of Duluth at the completion of the HIA to communicate the findings and recommendations of the HIA to help facilitate and inform the park planning and decision-making processes.	City of Duluth

7 Monitoring and Evaluation

After an HIA analysis is completed, several follow-up activities should occur:

- the design and implementation of the HIA should be evaluated (i.e., perform a process evaluation),
- there should be a follow-up on the result of the decision to determine whether the HIA influenced the decision-making process and final decision (i.e., perform an impact evaluation), and
- to some extent, the effect(s) of the final decision on health or determinants of health should be included in the follow-up activities (i.e., perform monitoring to inform an outcome evaluation).

Monitoring is an important follow-up activity to the HIA process and is performed after the HIA findings and recommendations have been reported. If monitoring is not included in the original HIA work plan, the HIA project team should provide a plan for monitoring the decision and health impact after the HIA is completed. There are two main aspects of monitoring – one is to follow up on the decision and decision-making process, and the other involves following up on the health impacts predicted in the HIA. These follow-up activities inform whether the HIA influenced the decision-making process and final decision (i.e., informs the impact evaluation) and help assess the effects of the final decision on health (i.e., informs the outcome evaluation). The desired outputs of the *Monitoring and Evaluation* step of HIA are detailed in Appendix A.

7.1 Process Evaluation

Process evaluation considers whether the HIA was carried out according to the plan of action and applicable standards (National Research Council, 2011). After the HIA analysis was complete, the HIA Project Team evaluated the ability of the HIA to meet its stated goals and the *Minimum Elements* and *Practice Standards of HIA* (Bhatia, et al., 2014). Evaluating the design and execution of the HIA results in valuable information that can be used to help refine methods and approaches used in HIA and advance the HIA community of practice. Early in the HIA process, the HIA Project Team developed a plan for evaluating the HIA, which included an Agency administrative review and an external peer-review by an HIA practitioner. In addition, the HIA Project Team also identified successes, challenges, and lessons learned, based on their experience and input received from community and stakeholders.

7.1.1 Achievement of HIA Goals

At the completion of this HIA, the HIA Leadership Team reviewed the original goals established in the Scoping step and evaluated whether those goals were achieved or not. The results of this evaluation are documented in Table 7-1.

Table 7-1. Evaluation of Achieving HIA Goals

HIA Goal	Achieved?	Documentation
Inform the MNDNR and City of Duluth's decisions regarding the habitat restoration and subsequent park improvement projects at Kingsbury Bay and Grassy Point.	Yes. The HIA informed the MNDNR habitat restoration work and some of the potential park features, but the impact of the HIA on the City's park improvement projects won't be fully realized until they begin the park planning process.	The MNDNR design was revised as a result of the HIA, and HIA recommendations and findings were incorporated into the MNDNR Habitat Restoration Final EAW and Contract (see Appendix D and Section 7.2.1). At the final stakeholder meeting, it was indicated that preliminary planning for Grassy Point was starting and the City planned to revisit the Master plan based on the HIA.
Develop a set of evidence-based recommendations to elevate considerations of health in the decisions.	Yes.	A final set of 73 evidence-based recommendations were provided by the HIA (see Section 5.3).
Increase transparency, local accountability, and community empowerment through meaningful stakeholder engagement.	Yes.	The community and stakeholders informed the *Scoping* of the HIA, were able to voice their concerns and desires for the spaces (which were incorporated into the *Assessment* and *Findings*), were kept informed as the HIA progressed, and informed the final set of HIA *Recommendations*. Transparency was maintained throughout communications and reporting.
Raise awareness of HIA as a decision-support tool.	Yes.	Comments were received from both community members and stakeholders regarding the use of HIA to inform decision-making (see Sections 7.1.2 and 7.2.1) and an assessment of another project in Duluth has since been conducted using elements of HIA. The City also noted that "health" and "fairness" have been incorporated as principles in the planning process and there are considerations for conducting future HIAs as part of the Comprehensive Plan.

7.1.2 Achievement of HIA Minimum Elements and Practice Standards

The *Minimum Elements and Practice Standards for HIA* were used as benchmarks when planning and conducting this HIA. Minimum Elements are the essential elements that constitute an HIA and set it apart from other practices and assessment methods, while Practice Standards are best practices in carrying out an HIA (Bhatia, et al., 2014). At the completion of the HIA, an HIA practitioner, serving as one of two peer reviewers for the project, evaluated whether these benchmarks were met.

7.1.3 HIA Successes

The HIA Project Team identified a number of successes in carrying out this HIA based on their experiences and the input received from community and stakeholders:

- The community engagement process – the act of physically incorporating the community's concerns, values, and input into the HIA and communicating those pieces to the decision-makers – as well as having transparent, follow-up communications with the community was important for community members who felt like they were "not being listened to and heard."

> *"I am optimistic about this process. Many of us have been involved in meetings like these. You asked for our email address and said you would follow up with us. The City has never done that."*
>
> - Duluth community member

- This HIA used a single person as the point of contact for communication with community-based groups and other stakeholders, which helped streamline the sharing of information and the recognition of materials coming from the HIA.
- Having a two-way, open line of communication with the decision-maker and being flexible and adaptive in carrying out the *Assessment* allowed the HIA to inform the habitat restoration planning as it progressed. Sharing preliminary HIA findings and recommendations, adapting to changes in project design, and being flexible to changes in the project schedule and timing points of influence allowed the value and impact of the HIA to be maximized. Stakeholders recognized this success, as well.

> *"This project was the perfect storm because the project and HIA were well timed together, with sufficient flexibility in project design and an especially suitable project."*
>
> - HIA stakeholders

- The community identified the value of prioritizing recommendations, because the decision-makers would "likely pick and choose from a handful." Both community members and stakeholders were given the opportunity to prioritize the recommendations most important to them. The results of these prioritization exercises were reported separately in the HIA Report.

- Stakeholders noted the value of bringing all the data about the sites and the health impacts together as part of the HIA.

> *"It is nice to see it in one place, as it helps make connections. For example, re-vegetation and terrestrial plantings, you have to consider helping birds by planting big trees and bushes, but seeing the crime pathway as well reminds us to consider line of sight and other safety concerns."*
>
> - HIA stakeholder

- Stakeholders voiced the value of HIA in the environmental review process, noting that the HIA seemed to be more "palatable" than an EAW and that pairing HIA with the EAW process should be a model for future work. When asked why:

> *"This fortunate circumstance [paired HIA and EAW] should be a model of how to do this work."*
>
> *"Human health impacts. Everyone can relate to conversations about health."*
>
> *"The format of engagement and the process of community outreach, especially early on, is great. Who wants to sit down and read a 200-page EAW? I would much rather review posters."*
>
> *"It's an adaptive process."*
>
> - HIA stakeholders

- Stakeholder noted several times the value of the systematic, transparent HIA process.

> *"There have been a lot of people involved and one core group, and it is good how systematic this process has been; you can see the development of ideas and issues as they developed through the stakeholder and assessment process. That there is little surprise is an indication of the transparent and how effectively things were integrated. It wasn't hap-hazard."*
>
> - HIA stakeholder

- The HIA was highlighted for its work to preserve and promote the cultural significance of the sites and provide recommendations to ensure that tribal knowledge/input was incorporated into the restoration efforts and as an example of how ORD research and technical assistance supports work by the states.

7.1.4 HIA Challenges

The HIA Project Team identified challenges faced during this HIA based on their experiences and the input received from community and stakeholders:

- Overall, the nature of being a federally-led HIA posed some unique challenges regarding expectations about the assessment and its intended purpose. One expectation was that EPA would perform a scientific evaluation of the proposed project; although the HIA process uses science-based methods, it is not a scientific process. An early misapprehension was that the recommendations would be binding. The HIA Leadership Team made it clear that the recommendations are just that – recommendations that can be adopted or not by the decision-makers; they are not binding.
- Complaints from Duluth community member and stakeholder about the excess burden of engagement from the various federal, state, and locally-led projects and interventions occurring in the area impacted the extent of engagement attempted by the HIA Project Team.
- Perceptions held by some community members that they were not being listened to or heard regarding the decisions that affect their everyday lives. In order to have meaningful engagement, the HIA Leadership Team had to emphasize the HIA core values of democracy and equity and share from experience that using a third party that is impartial can sometimes act a catalyst for inclusion of public input and action on the part of decision-makers to adopt recommendations.
- Addressing individuals that presented concerns based on experiences that did not match actual conditions. In these cases, the HIA Leadership Team discussed the concerns one on one with the individual(s) while examining the data.
- Because none of the HIA Project Team or Advisory Committee were dedicated to the HIA full-time, adjusting to changes in project conditions and design in real time was sometimes difficult.
- Although the HIA Project Team was able to complete the *Assessment* and *Recommendations* in the timeframe necessary to inform the habitat restoration work, changes in the project schedule, competing work priorities, scheduling conflicts, and a government shutdown delayed completion of the *Reporting* and *Monitoring and Evaluation* steps of the HIA.

7.1.5 HIA Lessons Learned

Based on the success and challenges experienced during this HIA, the HIA Project Team offers the following list of lessons learned for future HIA practice:

- Thorough *Screening* to ensure that an HIA would be feasible, value added, and timely will help maximize the potential for the HIA to inform the decision.
- Developing a core team of individuals responsible for conducting the HIA that have the necessary skills, knowledge, and expertise will help ensure that the various tasks in the HIA process can be accomplished successfully and in a timely manner.
- Reviewing previous HIA Reports and practice guidelines helps in the development of the HIA and in ensuring that the HIA achieves the *Minimum Elements and Practice Standards* (Bhatia, et al., 2014).

- Considering the amount of time participants can commit to the HIA when establishing the HIA project team and establishing different levels of participation intensity for individuals who have limited or varying levels of resources but want to participate can be beneficial in carrying out the HIA.
- Stakeholder engagement should solicit participation from community-based organizations, community residents, and other stakeholders. Representatives from both the community and the decision-makers should be at the table.
- Branding helps to increase recognition of the materials coming from the HIA and creates a unified format that expedited material production.
- Repeated messaging that the HIA is neutral and is meant to make the relationship between the decision and health more explicit, helps ensure that all those involved understand that the HIA advocates only for health and well-being.
- Hosting public meetings at libraries or other prominent public locations in the community helps to ensure accessibility for community residents to become engaged in the HIA process.
- Incorporating reporting and evaluation aspects of HIA early on in the process (i.e., as early as *Screening*) can help ensure documentation of the process is thorough and avoid too much time lapse between the completion of the HIA and reporting to stakeholders.

7.1.6 External Peer-Review of HIA

This HIA Report underwent a review by a habitat restoration expert and HIA practitioner external to the HIA effort (i.e., external peer-reviewers) who could provide an experienced perspective outside of those directly involved in the process and the decision. The peer reviewers were charged with evaluating the HIA against established HIA benchmarks (Bhatia, et al., 2014) and evaluating that the HIA findings and recommendations and the assumptions, parameters, and methodologies used in carrying out the HIA were appropriate and reasonable. Invitations were sent to potential reviewers inviting them to provide a critical review of the HIA. The two reviewers included Timothy Ehlinger and Kristin Raab. Mr. Ehlinger holds a PhD from UW-Milwaukee School of Nursing and is an expert in habitat restoration and community participation. Ms. Raab holds a Masters Degree from University of Minnesota-Twin Cities and is an expert in HIA at the Minnesota Department of Public Health. The external peer reviewers provided comments and proposed revisions, which the HIA Project Team considered and incorporated into the HIA Report, as needed.

7.2 Plan for Impact and Outcome Evaluation

7.2.1 Impact Evaluation

Impact evaluation seeks to understand the impact of the HIA itself on the decision-making process or on other factors outside the specific decision being considered (National Research Council, 2011). The HIA Project Team identified several questions that could be used to determine whether the HIA influenced the decision, decision-making process, or decision-making climate:

- Were the proposed habitat restoration and park improvement changes implemented as originally planned or were there changes made? If changes were made, what were the changes and why were they made? [Note: If MNDNR does not implement the proposed habitat restoration actions or the City of Duluth does not implement park improvements, then they should provide an explanation to the public explaining why this was the final decision and whether information from the HIA was used to make this decision.]
- Did MNDNR and the City of Duluth adopt and implement the recommendations of the HIA? If not, was there rationale provided for why the recommendation(s) were not adopted?
- Do MNDNR, the City of Duluth, and secondary decision-makers credit the HIA with informing the decision-making process (e.g., discussion of HIA findings in decision-making) or influencing the decision-making climate regarding health considerations?

Each of these questions can be answered in a short survey or by interview of a representative from MNDNR, the City of Duluth, or secondary decision-makers after the various project phases are complete. Implementation of the HIA recommendations can also be monitored as the projects progress using the indicators identified in the HIA Monitoring Plan (Section 7.2.3). Survey questions and responses, as well as any monitoring efforts, should be documented and preserved as part of the HIA impact evaluation.

7.2.2 Outcome Evaluation

Outcome evaluation focuses on the changes in health status or health indicators resulting from implementation of the proposal (National Research Council, 2011). Monitoring health impacts is not typically done as a part of the HIA, because the HIA is completed to inform the decision, and it may take years before changes to health are actually observed and reported. Monitoring changes in health outcomes and health determinants is a time-intensive process. Furthermore, it is difficult to attribute a change in health to any specific decision, simply because a person's health is affected by various factors that may or may not have been assessed as part of this HIA.

Note: *If one or more of the health determinants or health outcomes are found to be too impractical to monitor, a proxy or surrogate health determinant should be considered as a substitute. For example, waterborne illness can be difficult to diagnose and monitor, given that most illness is not reported and is treated with over-the-counter medications. A more practical and highly recommended option is monitoring water quality.*

Monitoring activities are often determined by the amount of resources available, but should be performed in interval periods (e.g., every 6 months, every year, every other year) after completion of the habitat restoration and park improvements work. Utilizing members from the community (i.e., citizen-participatory research) in follow-up activities allows for limited resources to be used more efficiently, improves specificity by targeting specific areas of concern, accelerates early detection of issues and remedial actions, and increases community buy-in. Through effective interval monitoring, the sustainability and success of the project can be evaluated and adaptive management actions identified to ensure the sites and benefits they provide are sustainable. For example, if monitoring starts to reveal

that there is “too much” recreation at the sites and it is beginning to harm the habitat and water quality, these issues can be raised and stakeholders can discuss what actions can be taken to address them.

While the HIA did not include funding or labor for monitoring and evaluation, it does identify programs and community organizations that could possibly partner together to conduct this phase of the project. EPA is looking at a 3- to 4-year strategic plan for monitoring and plans to see how the habitat restoration unfolds and how they can possibly contribute to monitoring and evaluation to determine the impacts of the project.

7.2.3 HIA Monitoring Plan (Impact and Outcome Evaluation)

Regardless of the methods or tools used in follow-up activities, the HIA Project Team stresses the importance of collaboration between stakeholders and the community to perform monitoring. For this reason, the HIA Project Team prepared a Monitoring Plan that identifies potential indicators, data sources, and partners that can be used to monitor implementation of HIA recommendations (Impact Evaluation) and outcomes of the habitat restoration and park improvements work and their impact on public health (Outcome Evaluation).

In developing the Impact and Outcome Evaluation Plans, the HIA Project Team followed these best practices:

1. The questions and decision outcomes to be addressed in outcome evaluation may likely be tied to the impact research questions identified in the HIA Assessment Work Plan.
2. Indicators may include data, metrics, performance measures, etc. There may be multiple indicators possible for a single monitoring question or decision outcome. Best practices for indicator selection:
    - Identify indicators that are SMART - Specific, Measurable, Attainable, Realistic, Timely
    - Identify indicators for Monitoring & Evaluation that were used in Assessment; this enables any changes to the baseline status of these indicators to be identified
    - Use health determinants and health behaviors as indicators for health impact; the relationship of these determinants and behaviors to health outcomes should be evidence-based
    - Tie indicators to the HIA recommendations
    - When possible, include data that are routinely collected and available over time
3. When identifying potential data sources and partners for implementation, consider leveraging resources (e.g., utilizing existing data collection and monitoring efforts) and using stakeholders and the community to conduct monitoring and evaluation

Note: The purpose of this Monitoring Plan is to provide a more focused approach for stakeholder collaboration in future monitoring efforts. The HIA Project Team did not account for cost or the availability of personnel to carry out the proposed monitoring plan, but did identify potential partners for conducting monitoring so that stakeholders could initiate conversations regarding these important follow-up activities.

Appendix G, Table G-1 identifies a plan for monitoring implementation of HIA recommendations (i.e., impact evaluation) and Table G-2 identifies a plan for monitoring the impact of the habitat restoration and park improvement projects on health and health determinants (i.e., outcome evaluation).

7.3 Initial Impact Evaluation Results

Prior to publishing this HIA Report, the HIA Project Team was able to perform an initial phase of impact evaluation to assess the impact of the HIA on the first phase of the project – the proposed habitat restoration:

- While the HIA was still underway, the "85%-complete" habitat restoration design analyzed in the HIA was revised to address some of the preliminary results and recommendations of the HIA and concerns raised during the design process. This revised design was ultimately the chosen design alternative for the project (see Appendix D for more details).
- Prior to award of the MNDNR Habitat Restoration contract, the HIA Project Team asked MNDNR to assess which of the HIA recommendations had been adopted in design, included in the EAW, or adopted in the contract; and if not yet implemented, whether there was interest in adopting the recommendation in the future. There were 46 HIA recommendations that identified MNDNR as a responsible party for implementation. As of April 2019, 22 of the 46 recommendations had been adopted in design, included in the EAW, or adopted in the contract (see Recommendations, Table 5-1); and MNDNR was interested in implementing 5 of those 22 recommendations further as the habitat restoration work progressed. In addition, MNDNR was also interested in adopting another 23 of the HIA recommendations in the future (data not shown).
- MNDNR has credited the HIA with informing their decision-making, design, and permitting. MNDNR acknowledged that the qualitative comparison of Alternatives conducted by the HIA Pathway Team Leads would be helpful in identifying the chosen design alternative in the permitting process and used the major findings of the HIA to complete the 401 water quality certification worksheet under the State's Anti-degradation water quality standards. Secondary decision-makers (i.e., those involved in other AOC work) also acknowledged the value of HIA as a tool for informing this and other AOC restoration work in the future.

> *"Through the HIA, EPA's team brought in a wide variety of methods and metrics capable of assessing these, and other, objectives as they relate to important health pathways. The HIA team involved members of the community through an extensive public input process, which was important as the Project areas are in close proximity to residential neighborhoods. EPA's assessments resulted in recommendations that were integrated in the Project design. We feel that the HIA process and products were a valuable addition to this Project's development."*
>
> - MNDNR Habitat Coordinator Melissa Sjolund

- MNDNR has undertaken regular communications and posted signage to keep the community, stakeholders, and recreational users informed of project updates and impacts (as recommended in the HIA), including a public information meeting prior to the start of work; a press release and signage alerting the community of trail and parking lot closures and alternate parking areas; a media event covering the project; monthly progress reports, which are emailed to more than 80 individuals and posted on the project webpage; regular project updates at the Irving Community Club meetings; personal email communications with Kingsbury Bay area residents regarding work in and around the bay, including information on boat use and safety; and responses to phone calls and emails from members of the community.
- The Minnesota Land Trust, the organization responsible for implementing the revegetation portion of the Kingsbury Bay-Grassy Point project, convened a Restoration Site Team meeting to develop the terrestrial restoration design and HIA recommendations are being used to guide the design.

While the impact of the HIA on the second phase of the project – the proposed park improvements – was unable to be assessed prior to publication of this report, members of the HIA Project Team are planning a follow-up workshop to engage with the community about the meaning and perception of safety at Grassy Point and gather additional input to help inform the City of Duluth as they update the park master plan for Grassy Point in 2021. Deliberative community and stakeholder engagement to help inform the park improvements design and implementation was a recommendation of the HIA.

In addition to assessing the impact of the HIA on the proposed habitat restoration and park improvements, the HIA Project Team was also able to preliminarily assess the impact the HIA had on the decision-making climate in general. Multiple community members inquired about the future use of HIA.

> *"You say this is a tool that can be used in a variety of decision-making contexts, but can we do this after you leave?"*
>
> *"How can the public advocate for more/another HIA in the area?"*
>
> - Duluth community member

Stakeholders at the Final HIA Stakeholder Meeting were asked "Did this HIA process bring value and would it be useful to you in another project?"

> *"Didn't see anything unexpected. But it is useful to conduct analysis like this through a systematic protocol."*
>
> *"HIA is a scientific way to discuss health impacts, building common language among experts and the public, and enough trust to agree and disagree without breaking down the process."*
>
> *"An HIA helps the public plan and channel their concerns about their experience and its impacts, which may lessen conflict during construction."*
>
> *"An HIA contributes to the idea of 3 sides to the story - your side, my side, and the truth."*
>
> - HIA stakeholders

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Appendix A – HIA Essential Elements, Core Values, Tasks and Outputs

The HIA process and its steps have been outlined in numerous HIA guidance documents (Bhatia R. , 2011; Human Impact Partners, 2011; National Research Council, 2011; Bhatia, et al., 2014; Human Impact Partners, 2014), which detail the essential elements of an HIA, guiding principles and core values, tasks to be undertaken, outputs to be produced at each step in the process, and best practices.

The *Minimum Elements and Practice Standards for Health Impact Assessment* (Bhatia et al. 2014) identifies essential (i.e., minimum) elements that constitute an HIA and benchmarks (i.e., practice standards) for how best to conduct an HIA. The minimum or essential elements that define an HIA and set it apart from other types of health assessments are that it:

- Is conducted to assess the potential health consequences of a proposed program, policy, project, or plan under consideration by decision-makers, and is conducted in advance of the decision in question
- Involves and engages stakeholders affected by the proposal, particularly vulnerable populations
- Systematically considers the full range of potential impacts of the proposal on health determinants, health status, and health equity
- Provides a profile of existing conditions for the populations affected by the proposal, including their health outcomes, health determinants, and vulnerable sub-groups within the population, relevant to the health issues examined in the HIA
- Characterizes the proposal's impacts on health, health determinants, and health equity, while documenting data sources and analytic methods, quality of evidence used, methodological assumptions, and limitations
- Provides recommendations, as needed, on feasible and effective actions to promote the positive health impacts and mitigate the negative health impacts of the decision, identifying, where appropriate, alternatives or modifications to the proposal
- Produces a publicly accessible report that includes, at minimum, documentation of the HIA's purpose, findings, and recommendations, and either documentation of the processes and methods involved, or reference to an external source of documentation for these processes and methods. The report should be shared with decision-makers and other stakeholders.
- Proposes indicators, actions, and responsible parties, where indicated, for a plan to monitor the implementation of recommendations, as well as health effects and outcomes of the proposal

And there are six established steps to the HIA process. Table A-1 identifies the tasks to be completed at each step of the process and the outputs expected at each step. Underlying this established six-step process are five essential "core values" that guide the design and implementation of HIA (Quigley, et al., 2006):

- ***Comprehensive approach*** to individual and community health issues (i.e., the analysis of potential health impacts is guided by the wider determinants of health, including physical, social, and economic factors that impact health);
- ***Equity*** in the opportunity for healthy living (i.e., includes authentic participation of the community and vulnerable populations, consideration of the distribution of health impacts across the population (paying specific attention to vulnerable groups), and recommendations to improve the proposed decision for affected groups and ensure equitable distribution of health benefits;
- ***Democracy*** in the decision-making process (i.e., community members and other stakeholders are engaged to help inform and influence decisions that affect their lives);
- ***Sustainable development*** (i.e., both short-term and long-term goals and impacts of the decision are examined to ensure that the decision is sustainable both in the present and for future generations); and
- ***Ethical use of evidence*** that includes transparent and rigorous methods (i.e., use of the best-available qualitative and quantitative evidence to determine potential impacts and inform recommendations, remaining neutral to the decision result and advocating only for health and wellness, and communicating the evidence, findings, and recommendations of the HIA to decision-makers and stakeholders).

Table A-1. Tasks and Outputs at Each Step of the HIA Process

HIA Step	Tasks	Outputs (National Research Council, 2011)
Screening	• Define the decision and its alternatives • Evaluate the value of performing an HIA • Assess the feasibility of conducting the HIA given the timeframe and available resources • Determine the willingness of partners and stakeholders to participate in the HIA	1. A description of the proposed program, policy, plan, or project the HIA will focus on, decision timeline, and HIA intervention points 2. A statement of why the decision was selected for screening and what factors were considered in making the decision to do an HIA 3. Potential of the decision to impact health/health inequities 4. Expected resource requirements for the HIA and capacity to meet those requirements 5. Description of the decision's political context and potential opportunities to influence decision-making
Scoping	• Establish the goals of the HIA • Determine the individuals/team that will conduct the HIA, participant roles, and plans for stakeholder involvement • Examine stakeholder concerns and pathways by which the decision could impact population health, including population and vulnerable groups likely to be affected • Set the scope of the HIA, including the timeline, analytic plan, research questions, impacts to be considered, and communication and reporting strategies • Determine methods, sources of evidence, and data types that will be used in assessment	A framework for the HIA and written project plan that includes: 1. Pathways showing how health could be affected by the proposed decision and the health effects to be addressed, including a rationale for how they were chosen and an account of any potential health effects considered but not selected. Pathway diagrams and scoping worksheets should also be included 2. Identification of populations and vulnerable groups potentially affected by the decision 3. A description of the research questions, data sources, methods to be used, and any alternatives to be assessed 4. Identification of data gaps and primary data collection that could be conducted to address the gaps (or a rationale for not undertaking data collection) 5. A summary of how stakeholders were engaged, the main issues raised by stakeholders, how those issues will be addressed, and if not addressed, the rationale for exclusion

HIA Step	Tasks	Outputs (National Research Council, 2011)
Assessment	• Gather existing data and collecting new data as needed; utilizing diverse sources • Use data and existing tools and methods to profile existing conditions and evaluate potential health impacts of the decision • Consider direction, magnitude, severity, likelihood, and distribution/equity of impacts via qualitative and quantitative analysis • Describe data sources and methods used, including documentation of stakeholder engagement • Acknowledge assumptions, strengths, and limitations of data and methods used	A summary or report that: 1. Describes the baseline conditions that could be impacted by the proposal, including health status of the affected population, health vulnerabilities or disparities, and health determinants that affect health. The baseline should be focused on the issues that are likely to be affected by the proposal 2. Characterization of beneficial and adverse health effects of the decision in terms of direction, magnitude, likelihood, severity, and distribution in the population 3. Integrates stakeholder input into the analysis of effects 4. Describes data sources and analytic methods, as well as methods used to engage stakeholders 5. Identifies limitations and uncertainties of the impact characterization clearly
Recommendations	• Develop recommendations (e.g., alternatives to the decision, modifications to the proposed decision, or mitigations of adverse health impacts) for promoting the positive health impacts and mitigating the adverse health impacts of the proposed decision • Prioritize recommendations, if desired • Develop an implementation plan for developed recommendations (e.g., responsible party for implementation, timeline, link to indicators that can be monitored)	1. The recommendations should be provided in the final HIA report and should document available supporting evidence, stakeholder input, and a health-management plan, which should do the following: • Discuss what entity has the authority or ability to implement each measure and document any commitments to do so • Propose appropriate indicators for monitoring • Propose a system to verify that measures are being implemented as planned 2. If no recommendations are made in the HIA report, an explicit rationale should be provided for the decision not to include them

HIA Step	Tasks	Outputs (National Research Council, 2011)
Reporting	• Communicate and report HIA progress, findings, and results throughout the HIA process • Develop a transparent, publicly-accessible HIA Report that documents the process, methods, findings, funding, and participants of the HIA • Prepare communication materials and communicating HIA findings and recommendations to stakeholders and decision-makers	The final HIA report should document the following: 1. The nature of the proposal being assessed, including alternatives that were included in the analysis 2. The population, subgroups, vulnerable populations, and stakeholders likely to be affected and how they were involved in the HIA process 3. Data sources and analytic tools used 4. Findings of each stage of the HIA and a summary of outputs at the end of each stage
Monitoring and Evaluation	• Establish a monitoring and evaluation plan • Delineate information that will be required for monitoring and evaluation, including data sources, tools, and methods for analysis • Identify the individual(s) or team that would be responsible for data gathering and conducting, completing and reporting monitoring and evaluation results • Conduct the monitoring and evaluation • Share the results with others involved in the HIA	1. Monitoring should provide information that allows the impact of the HIA on the decision-making process and the impact of the decision on health to be evaluated. 2. An evaluation plan should have been developed early in the HIA process to guide selection of the appropriate methods for conducting evaluations. 3. An evaluation report should be produced at the conclusion of the HIA that includes the following: • An evaluation of the HIA process against the HIA plan and applicable standards • A description of the HIA's impact on decision-making (to the extent that salient decisions have occurred by that time) • A discussion of whether the HIA achieved its initial objectives • Acknowledgement of plans for future outcome evaluation or discussion of limitations that prevent such an evaluation

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Appendix B – HIA Community and Stakeholder Kickoff Meetings

Upcoming Community Meeting!

Monday, February 27, 2017 at ***6:30 - 8:30 pm***

City Center West, 5830 Grand Avenue

Kingsbury Bay-Grassy Point Restoration Project: A Health Impact Assessment

There are numerous habitat restoration projects in and along the St. Louis River to improve water quality and clean-up sediment, restore fish habitat and create spaces for swimming and boating. The U.S. Environmental Protection Agency (EPA) will be conducting a health impact assessment (HIA) in western Duluth to consider the public health implications of both the environmental changes to the river at Kingsbury Bay and Grassy Point and the potential park amenities adjacent to the projects.

The purpose of the HIA is to help inform the Minnesota Department of Natural Resources (MNDNR) and City of Duluth's decisions regarding the design of habitat restoration and subsequent park improvement projects by providing valuable and timely health-focused information.

The HIA will evaluate each of the potential decision scenarios using science-based methods and citizen input to provide recommendations intended to maximize benefits and mitigate and/or avoid harmful impacts to human health.

What is an HIA?

A Health Impact Assessment (HIA) is used to evaluate objectively the potential positive and negative health effects of a project or policy before it is built or implemented, and recommends changes to manage those effects.

Why is HIA important?

HIA is a tool to ensure that health and equity are considered in decision-making.

We invite you to come and share your input

Please come share your experiences, thoughts and concerns for the future of Kingsbury Bay, Indian Point Campground, and Grassy Point Park.

For more information about this meeting, please contact:
Katie Williams
williams.kathleen@epa.gov
218-529-5203

What you will gain from these meetings:

- Information about the proposed habitat restoration projects
- Information about the HIA process
- A platform to voice your interests/concerns

What we hope to achieve from these meetings:

- Gain local knowledge and understanding about the community's interests/concerns
- Identify individuals and/or groups interested in participating in the HIA

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Community Kick-Off Meeting
February 27, 2017

Agenda

6:30 PM	**Welcome** - Introductions - Meeting Objectives - Meeting Agenda Ground Rules
6:40 PM	**Community Planning Projects - What's the Connection to Health?** - Overview of Planning Projects in Your Community - Projects in Your Community and Health - What is Health Impact Assessment? - Why perform an HIA?
7:00 PM	**Overview of HIA Process** - Steps of HIA - HIA Guiding Principles and Core Values
7:10 PM	**The Kingsbury Bay-Grassy Point Habitat Restoration Project** - St. Louis River Area of Concern - Kingsbury Bay-Grassy Point Habitat Restoration - Kingsbury Bay-Grassy Point Concept Plans and Amenities
7:30 PM	**Q & A**
7:35 PM	**Kingsbury Bay-Grassy Point Restoration Project HIA** - Where are we in the HIA process? - Opportunities for Community and Stakeholder Engagement - Community Consultation: Have Your Voice Heard
8:25 PM	**Meeting Wrap-up** - Next Steps in the HIA - How to Stay Involved Thank You

Meeting Overview

Katie Williams (U.S. Environmental Protection Agency [EPA] Office of Research and Development [ORD]) gave the welcome and opening remarks, briefly introducing each of the Health Impact Assessment (HIA) Leadership Team members to the attendees. This was followed by a brief presentation by Florence Fulk (EPA ORD), which provided an overview of planning projects in the Duluth community, highlighted the connection between planning and health, and introduced the concept of HIA and the importance of HIA in decision-making. Justicia Rhodus (Pegasus Technical Services, contractor to EPA) then described each

step of the six-step HIA process and the guiding principles and core values of HIA, including stakeholder and community engagement principles and the importance of equity in decision-making.

A short question and answer period about HIA and health was followed by an overview of the Kingsbury Bay-Grassy Point Habitat Restoration Project given by Joel Hoffman (EPA ORD). The overview included background on the St. Louis River Area of Concern, an overview of the Minnesota Department of Natural Resources (MNDNR) habitat restoration work planned at Kingsbury Bay and Grassy Point and the subsequent concept plans and amenities planned at each site, which will be the responsibility of the City of Duluth.

Following a lengthy question and answer period about the proposed work, Katie Williams (EPA ORD) gave a snapshot of where we are in the six-step HIA process and the opportunities that exist for community and stakeholder engagement throughout the process. The remainder of the time together was reserved for community consultation. Three stations were set up around the room containing maps showing the study areas and the concept plans for each of the sites. Attendees broke into small groups and rotated through each of the stations, providing their input on:

- Habitat Restoration – Construction and Operations;
- Kingsbury Bay – Current Uses and Park Improvements; and
- Grassy Point – Current Uses and Park Improvements.

At the conclusion of the meeting, the next steps of the HIA and ways for community members to stay involved were discussed.

Meeting Attendees

Twenty-seven (27) community members attended the HIA Community Kick-off Meeting, in addition to the six (6) HIA Leadership Team members, one (1) HIA Research Team member, two (2) members from the MNDNR, and one (1) graduate student from the University of Wisconsin-Milwaukee.

Meeting Attendees and Affiliation

Attendee(s)	Affiliation
Glenn Merrick	Local Resident, Izaak Walton League
Keith Stevens	Local Resident
Gail Gilliland	Local Resident
Janet Kennedy	Local Resident
Virginia Olson	Friends of Western Duluth Parks and Trails
Harry Hanson	Friends of Western Duluth Parks and Trails
Peder Yurisla	Local Resident
Alison Clarke	Local Resident, Friends of Western Duluth Parks and Trails
Caroline R Carlson	Local Resident
Mary Brisky	Local Resident
Nancy Olson	Local Resident
Brad Fox	Local Resident
Paul Ojanen	Local Resident, IKES
Craig Sterle	IKES
Julene Boe	Local Resident
Denette Lynch	Local Resident, Friends of Western Duluth Parks and Trails

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Attendee(s)	Affiliation
Gary Glass	Local Resident, IKES, SVSA
Larry Sampson	Local Resident
Chris Ostby	Local Resident
Bob Ostby	Local Resident
Pete Olson	Local Resident
Maureen Olson	Local Resident
Will Munger	Local Resident, Business Owner
[Unnamed]	Local Resident
[Unnamed]	Local Resident
[Unnamed]	Local Resident
[Unnamed]	Local Resident
Rosita Clarke, Florence Fulk, Joel Hoffman, Bill Majewski, Justicia Rhodus, Katie Williams	HIA Leadership Team
Jessy Carlson	HIA Research Team
John Lindgren, Molly MacGregor	Minnesota Department of Natural Resources
Chelsea Poeppel	UW-Milwaukee Master of Sustainable Peacebuilding Program

About the Health Impact Assessment

The EPA is leading a health impact assessment (HIA) of two Great Lakes Area of Concern (AOC) habitat restoration projects being conducted by the Minnesota Department of Natural Resources (MNDNR) – Kingsbury Bay and Grassy Point. The HIA will examine the potential public health implications of the restoration projects, including the MNDNR restoration work itself and how people will access and utilize the project sites following restoration. The HIA will provide evidence-based recommendations to MNDNR and the City of Duluth (who is responsible for any post-restoration work at these sites) to address any disproportionate health impacts, mitigate potential adverse health impacts, and bolster potential health benefits of the projects.

Why is EPA Leading an HIA?

EPA has identified HIA as a decision-support tool for promoting sustainable and healthy communities. The purpose of this HIA is to help inform the MNDNR Kingsbury Bay-Grassy Point habitat restoration project and the City of Duluth planning process in 2018.

Community Input

There were several opportunities for community input throughout the meeting, including prompt questions to gather attendees' thoughts on health and the Kingsbury Bay and Grassy Point sites, two question and answer (Q&A) sessions, and a community consultation exercise designed to gather community input specific to the proposed plans for Kingsbury Bay and Grassy Point.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Prompt Questions Asked of the Audience and Their Responses

Question	Audience Response
When you think of "health," what comes to mind?	- How I feel - Mental health - Being outside - Environmental factors exposed to and impact on health - Physical health/activity - Quality of life - Air/water quality - Quality of food
When you think of "Kingsbury Bay and Grassy Point," what comes to mind?	<u>Kingsbury Bay</u> - Fill/contamination with unnatural materials - Public entry to zoo and river - Needles (medical) <u>Grassy Point</u> - Embarrassing, neglected mess - Neglected – burning wire, crime, vandalism - Railroad ties treated near Grassy Point <u>Both</u> - Public access to river, birds, and nature; beautiful - Invasive species

Audience Questions/Comments and Responses

Audience Question/Comment	Response
When you talk about creating a baseline of health conditions, where do you get that information and is it relevant to these areas?	EPA: Baseline health data can be retrieved from a number of sources. There are some standard sources of health data that we often use in HIA, but we are lucky enough that Duluth is one of the CDC's 500 Cities, so we will have health data available to us at the Census tract level. But in making the baseline, we will not only take into account existing health conditions, but also the existing conditions for those health determinants that are determined to be applicable. So, for example, the prevalence, state, and accessibility of parks.
The City already doesn't take care of the Western parks that it has and now they are going to add two more? By show of hands, how many people feel the Western parks are neglected?	[Approximately 10 people raised their hands.] Resident (raised hand): Volunteers are the ones often left responsible for helping to keep the parks maintained. Resident (raised hand): But I don't think it's fair to say that all Western parks are neglected, because there are improvements being made to some of the parks.
Grassy Point offers great wildlife viewing and birding.	Resident: But I have gone down to Grassy Point and there's a car of boys just sitting there and I don't feel safe and just leave. Resident: I tried to go to Grassy Point with my mother and my grandchildren and I was scared. The boardwalk was underwater. It wasn't safe.
I am optimistic about this process. Many of us have been involved in meetings like these. You asked for our email address and said you will follow up with us. The City has never done that.	EPA: Community and stakeholder involvement is an important part of HIA. We can promise that communication regarding this HIA will be transparent and that you will hear from us again. You will be kept informed of what is going on with the HIA and we will come back to you with the findings and recommendations of the HIA to get your input.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Audience Question/Comment	Response
I notice the City is not here in the room tonight.	EPA: The City made the decision not to attend tonight's meeting so that you could feel to speak freely. Meeting notes will be developed to capture who was in attendance at this meeting, the discussions we had here tonight, and the input we receive from you and that will become part of the documentation of the HIA Report. The City will be participating in the HIA meeting being held tomorrow for other stakeholders in the process.
Who are the other stakeholders?	EPA: A number of stakeholders were invited to participate in the HIA, including the City, MNDNR, other government agencies, non-governmental organizations, community organizations and interest groups, not-for-profits, and business owners.
Did the City have a say in the stakeholders that could participate? Because there was a time when a stakeholder list was made up and then when the City saw the list, several stakeholders were uninvited.	EPA: No. The HIA Leadership Team identified and invited stakeholders to participate in this HIA. The stakeholder list was shared with the City, but they did not provide any feedback on the list. Even though decision-makers are stakeholders in the process, HIA is conducted from a neutral standpoint and does not advocate for a certain position or project; it advocates for health. The process and findings will be communicated and documented very transparently.
The presentation said 170,000 cubic yards of sediment will be removed from Kingsbury Bay. How many dump truck loads is that?	MNDNR/EPA: A dump truck carries about 10 cubic yards, so that would be 17,000 dump truck loads. But, only 65,000 cubic yards will be removed from Kingsbury Bay during the winter and hauled over land by truck (i.e., 6,500 dump truck loads). The remainder of Kingsbury Bay will be dredged during the summer and moved over water.
It says the sediment at Kingsbury Bay and Grassy Point is slightly contaminated. Contaminated with what?	EPA: Kingsbury Bay and Grassy Point are primarily contaminated with organic compounds and some metals discharged from a variety of sources (industry, local sanitation facilities before the combined sanitation facility was built, and other sources). And of course, at Grassy Point you have the wood waste and byproducts of the processes that took place at the two saw mills that used to stand at that site – things like oils.
Are the sediment contamination values an average for the entire site? Could there be some areas at the sites that are more contaminated than others?	EPA: That is a great question. The values shown on the PEC-Q scale are probable effect concentration quotients averaged for the entire site. While the average contamination levels are low and not of concern for wildlife and humans, you will see for Grassy Point there are plans to remove some of the wood waste and remediate some of the areas of the site where we see higher levels of contamination using a sediment cap.
How much is this restoration work going to cost and who is paying for it?	MNDNR: For Kingsbury Bay, $5.5 million will be coming from a Natural Resource Damage Assessment settlement associated with the St. Louis River Interlake/Duluth Tar Superfund Site. Those funds will be used to excavate material from the bay and river delta and transport it to Grassy Point for the beneficial reuse of covering wood waste. There is also $3.1 million from USEPA and another $5.8 million from Minnesota Dedicated Funding – Outdoor Heritage Fund, both of which could be applied at either the Grassy or Kingsbury elements of the project. So, all together we have $14.4 million to be applied for the integrated Kingsbury/Grassy Project.
What if the money from the settlement doesn't come through? Will the project be put on hold?	MNDNR: The settlement is essentially finalized; just the paperwork remains to be done.

Audience Question/Comment	Response
There are invasive species at Kingsbury Bay. How are you going to make sure you don't transport those to Grassy Point and the other sites?	EPA: This is a great point. We cannot transport sediment from Kingsbury Bay that has any invasive species present. This is an issue that we are well aware of, but still need to find an engineering solution.
If people want to have more of a say, they should attend meetings. The Comprehensive Planning process is a chance to share your opinion and be heard.	Acknowledged.
What is the role of the two HIA team members from Cincinnati?	EPA: We bring experience conducting HIA and are here to ensure that the HIA process is followed, that what we do in the HIA is transparent, and at the end, that we have recommendations to bring back to you, the other stakeholders, and the decision-makers.

Community Consultation Exercise

Following the presentation and question and answer period, attendees broke into small groups and rotated through each of the three stations containing maps showing the study areas and the concept plans for each of the sites. The following questions were used to guide this exercise:

- How might the proposed restoration activities affect daily life for you and your community?
- How do you currently use Kingsbury Bay and Grassy Point?
- What are your thoughts on the proposed concept plans for Kingsbury Bay and Grassy Point?
    - How would it change how you currently use the spaces?
    - What amenities would you like to see that aren't currently planned?
    - What concerns do you have with the proposed concept plans?

Attendees engaged in conversation with each other and the HIA Leadership Team members at each station and provided input on the proposed plans by writing their thoughts on post-it notes and sticking them on the maps. The maps available at each of the stations are shown below, along with the input received via post-it note and conversation.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Habitat Restoration – Construction and Operations

- Dredging noise? Night time.
- Parking? Crowding. Noise.
- Use existing access. (Conversation: The restoration plan doesn't need to add access points to the river as there are already access points in the region)
- Roads ruined by construction need to be repaired.
- Willing to tolerate the disruption because looking forward to fishing Kingsbury Bay post-restoration. (Conversation)
- Where precisely will the overland route for moving mud go? (Frequent topic of conversation)

Kingsbury Bay

Kingsbury Bay - Current Uses

- People using outdoor to "poo"
- No snowmobile access, so they use WWFT, need designated access to the bay
- Keep area near Munger/WWFT tranquil
- Please keep waterfront trail open during construction
- Keep campground, make bigger if possible
- Mudflats in summer
- Leave mouth of Kingsbury natural. No access. Move access for kayaks and snowmobiles to the campground where there is already a parking lot.
- Cattails and "nasty" mudflats
- Take all of the dirt you can here (with arrow). (name) Dig. Dig. Dig.
- Deepening channel will make better fishing conditions = more boats in bay
- Need less cars. Water taxi from downtown or Lincoln Park.

Kingsbury Bay - Park Improvements (Concept Plan)

- Spring warbler area
- Small power boating fishing. No access across river from homes.
- Beaver habitat
- Blue herons
- Birding. Responsible environmental management. Maintenance.
- In (up arrow) low water, no enough room if leave this mat for boats
- Duluth doesn't have enough money & staff to maintain current parks & trails. Don't add more parks & trails that will add to the problem.
- This is a birding area (with arrows)
- Great walking! Really great.
- Swimming?
- Fishing on docks/piers
- Take out old barge "Alice-Vivian"

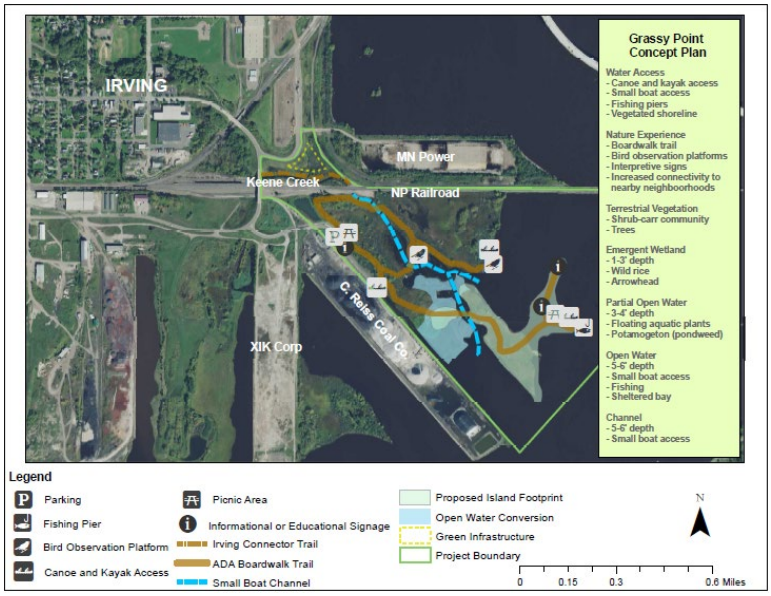
Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Grassy Point

Grassy Point - Current Uses

- There are so many nearby parks Keene, Irving, Fairmont, etc. that new amenities at Kingsbury & Grassy will not make me healthier or happier.
- Phragmites australis, Haploid Invasive
- Phragmites australis, C Haploid Invasive
- Junkie Junction
- Do not use area due to lack of upkeep
- Little pond (with arrow) so great for birding - love it. And peaceful (when not afraid!).
- Rednecks dumping garbage
- Fear. I feel fear when walking on the GP trail - fear of people there & of the condition of the trail.
- Stop (arrow) no boardwalk
- Purple loosestrife
- Boardwalk destroyed
- Use Grassy Pt to access the river to walk on the ice with dogs
- Junkie world
- Can't use. Poorly maintained.
- (name) Grassy Pt is not technically a "park" but a trail on tax forfeit land
- Stupid people fishing at Superfund site

Park Improvements (Concept Plan)



- Safety and traffic hazards. No safe route going to park and Grassy Point.
- (name) Safe access to Grassy Pt from Irving. Walking unsafe.
- Industrial traffic. Access and safety problems.
- Safety. Traffic.
- More welcoming feel to access area
- Connection is needed from Irving to site. Safe off-road walk/bike park.
- Need more explanation of what is there. Encourage more visitors.
- Make access area (parking, entry area) more welcoming to draw more people. This would keep illicit use down.
- Access for kayak. Walk in to launch.
- Retain stream channel, as one, i.e. don't fork at the island. This will protect the cap placed over contaminated sediment.
- After clean up-sell for development. Houses, condos, hotels.
- Not maintained now. No $ to properly maintain amenities. Poor maintenance looks bad, feels bad.
- Signage to direct way to park
- (arrow) Artesian spring in this area
- Fishing pier for kids focused on safe access
- People, especially older women, don’t feel safe walking from the community of Irving to Grassy Point. There are a number of barriers including a small under-road tunnel area that would need to be passed through, the unkept nature of existing walking paths, the industrial areas and traffic, plus just crossing the road. (Conversation)

Meeting Wrap-up

After the community consultation exercise, the meeting concluded with an overview of the HIA’s next steps and some final considerations. The HIA Leadership Team was meeting with other stakeholders the

next day to present the same information and gather their input on the Kingsbury Bay-Grassy Point Restoration Project. The next steps for the HIA (Scoping) include:

- Document the discussions and input from the community and stakeholder meetings and share the results
- Use community and stakeholder input and other evidence sources (including input from past community planning efforts) to establish the scope of the HIA, the potential for impacts to health, and populations likely affected
- Determine the individuals/team that will conduct the HIA and roles of the participants
- Establish the research questions, assessment plan, and communication and reporting strategies

Once these Scoping tasks are complete, the Assessment step of the HIA process (i.e., the analysis) will be initiated. The HIA Leadership Team identified ways for community members to stay involved - ask questions, share the information they learned with fellow community members, look for upcoming communications regarding the HIA, and consider how they can contribute to the HIA (e.g., provide input via public meetings or become a member of the Community Stakeholder Steering Committee and have a more active role in the HIA process).

HIA Contact Information

For more information on the HIA, contact one of the HIA Leadership Team members:

- **Rosita Clarke**, EPA Region 5 Brownfields Program, clarke.rosita@epa.gov
- **Florence Fulk**, EPA Office of Research and Development, fulk.florence@epa.gov
- **Joel Hoffman**, EPA Office of Research and Development, hoffman.joel@epa.gov
- **Bill Majewski**, Morgan Park Community Club & St. Louis River Alliance, bsmajewski@aol.com
- **Justicia Rhodus**, Pegasus Technical Services (contractor to the EPA), rhodus.justicia@epa.gov
- **Katie Williams**, EPA Office of Research and Development, williams.kathleen@epa.gov

Upcoming Stakeholder Meeting

Kingsbury Bay-Grassy Point Restoration Project: A Health Impact Assessment

There are numerous habitat restoration projects in and along the St. Louis River to improve water quality and clean-up sediment, restore fish habitat and create spaces for swimming and boating. The U.S. Environmental Protection Agency (EPA) will be conducting a health impact assessment (HIA) in western Duluth to consider the public health implications of both the environmental changes to the river at Kingsbury Bay and Grassy Point and the potential park amenities adjacent to the projects.

The purpose of the HIA is to help inform the Minnesota Department of Natural Resources (MNDNR) and City of Duluth's decisions regarding the design of habitat restoration and subsequent park improvement projects by providing valuable and timely health-focused information.

The HIA will evaluate each of the potential decision scenarios using science-based methods and citizen input to provide recommendations intended to maximize benefits and mitigate or avoid harmful impacts to human health.

What is an HIA?

A Health Impact Assessment (HIA) is used to evaluate objectively the potential positive and negative health effects of a project or policy before it is built or implemented, and recommends changes to manage those effects.

Why is HIA important?

HIA is a tool to ensure that health and equity are considered in decision-making.

We invite you to come and share your input

Tuesday, February 28, 2017 at ***12:30 – 3:30 pm***
USEPA, Mid-Continent Ecology Division

For more information about this meeting, please contact:
Katie Williams,
williams.kathleen@epa.gov

Please come to learn more about the health impact assessment process and more in-depth knowledge of the Kingsbury Bay-Grassy Point habitat restoration project. We want to hear your specific knowledge and concerns, because it will contribute to the development of recommendations to the MNDNR and City of Duluth.

What you will gain from these meetings:

- Information about the proposed habitat restoration projects
- Information about the HIA process
- An opportunity to contribute knowledge

What we hope to achieve from these meetings:

- Gain local knowledge and understanding about the stakeholder's interests/concerns
- Identify individuals and/or groups interested in participating in the HIA

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Stakeholder Kick-Off Meeting
February 28, 2017

Agenda

12:30 PM	**Welcome** - Introductions - Meeting Objectives - Meeting Agenda Ground Rules
12:40 PM	**Community Planning Projects - What's the Connection to Health?** - Overview of Planning Projects in Your Community - Projects in Your Community and Health - What is Health Impact Assessment? - Why perform an HIA?
1:00 PM	**Overview of HIA Process** - Steps of HIA - HIA Guiding Principles and Core Values
1:20 PM	**Break**
1:35 PM	**The Kingsbury Bay-Grassy Point Habitat Restoration Project** - St. Louis River Area of Concern - Kingsbury Bay-Grassy Point Habitat Restoration - Kingsbury Bay-Grassy Point Concept Plans and Amenities
2:05 PM	**Q & A**
2:15 PM	**Kingsbury Bay-Grassy Point Restoration Project HIA** - Where are we in the HIA process? - Opportunities for Community and Stakeholder Engagement - Community and Stakeholder Consultation: Have Your Voice Heard
3:20 PM	**Meeting Wrap-up** - Next Steps in the HIA - How to Stay Involved Thank You

Meeting Overview

Joel Hoffman and Katie Williams (U.S. Environmental Protection Agency [EPA] Office of Research and Development [ORD]) gave the welcome and opening remarks, briefly introducing each of the Health Impact Assessment (HIA) Leadership Team members to the attendees. This was followed by introductions of those in attendance at the meeting by name and affiliation. Florence Fulk (EPA ORD),

then provided an overview of planning projects in the Duluth community, highlighted the connection between planning and health, and introduced the concept of HIA and the importance of HIA in decision-making. Justicia Rhodus (Pegasus Technical Services, contractor to EPA) then described each step of the six-step HIA process and the guiding principles and core values of HIA, including stakeholder and community engagement principles and the importance of equity in decision-making. A short question and answer period about HIA and health followed.

After a short break, Joel Hoffman (EPA ORD) gave an overview of the Kingsbury Bay-Grassy Point Habitat Restoration Project. The overview included background on the St. Louis River Area of Concern, an overview of the Minnesota Department of Natural Resources (MNDNR) habitat restoration work planned at Kingsbury Bay and Grassy Point and the subsequent concept plans and amenities planned at each site, which will be the responsibility of the City of Duluth.

Following a question and answer period about the proposed work, Katie Williams (EPA ORD) gave a snapshot of where we are in the six-step HIA process and the opportunities that exist for community and stakeholder engagement throughout the process. The remainder of the time together was reserved for stakeholder consultation. Three stations were set up around the room containing maps showing the study areas and the concept plans for each of the sites. Attendees broke into small groups and rotated through each of the stations, providing their input on:

- Habitat Restoration – Construction and Operations;
- Kingsbury Bay – Current Uses and Park Improvements; and
- Grassy Point – Current Uses and Park Improvements.

Following that exercise, attendees gathered together again and Katie Williams reported out a summary of the input received at the community meeting the day before. The maps containing the post-it notes of community input were laid out for stakeholders to examine in more detail if they desired. At the conclusion of the meeting, the next steps of the HIA and ways for stakeholders to stay involved were discussed.

Meeting Attendees

Twenty-two (22) stakeholders attended the HIA Stakeholder Kick-off Meeting, in addition to the six (6) HIA Leadership Team members, and one (1) HIA Research Team member.

Meeting Attendees and Affiliation

Attendee(s)	Affiliation
Harry Hanson	Friends of Western Duluth Parks and Trails
Nancy Schuldt	Fond du Lac
Dave Warburton	USFWS
Virginia Olson	Friends of Western Duluth Parks and Trails
Gini Breidenbach	Minnesota Land Trust
Heidi Timm-Bijold	City
Daryl Peterson	Minnesota Land Trust
Melissa Sjolund	MNDNR

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Quan Li	**Visiting Scholar at UMD (from P.R.C.)**
Pat Okeson	Muskies, Inc.
Keith Okeson	Muskies, Inc.
Rick Gitar	Fond du Lac
Denette Lynch	Friends of Western Duluth Parks and Trails
Darren Vogt	1854 Treaty Authority
Amy Westbrook	St. Louis County Public Health
Corey Leet	Lake Superior Zoo
Steve Sternberg	Local Resident, UMD
John Lindgren	Local Resident, MNDNR
Lisa Luokkala	City of Duluth Parks
Wayne Dupuis	Fond du Lac
Matt Steiger	WDNR
Alan Mozol	US Army Corp of Engineers
Rosita Clarke, Florence Fulk, Joel Hoffman, Bill Majewski, Justicia Rhodus, Katie Williams	HIA Leadership Team
Jessy Carlson	HIA Research Team

About the Health Impact Assessment

The EPA is leading a health impact assessment (HIA) of two Great Lakes Area of Concern (AOC) habitat restoration projects being conducted by the Minnesota Department of Natural Resources (MNDNR) – Kingsbury Bay and Grassy Point. The HIA will examine the potential public health implications of the restoration projects, including the MNDNR restoration work itself and how people will access and utilize the project sites following restoration. The HIA will provide evidence-based recommendations to MNDNR and the City of Duluth (who is responsible for any post-restoration work at these sites) to address any disproportionate health impacts, mitigate potential adverse health impacts, and bolster potential health benefits of the projects.

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EPA has identified HIA as a decision-support tool for promoting sustainable and healthy communities. The purpose of this HIA is to help inform the MNDNR Kingsbury Bay-Grassy Point habitat restoration project and the City of Duluth planning process in 2018.

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There were several opportunities for stakeholder input throughout the meeting, including prompt questions to gather attendees' thoughts on health and the Kingsbury Bay and Grassy Point sites, two question and answer (Q&A) sessions, and a stakeholder consultation exercise designed to gather community input specific to the proposed plans for Kingsbury Bay and Grassy Point.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Prompt Questions Asked of the Audience and Their Responses

Question	Audience Response
When you think of "health," what comes to mind?	- Feeling good - Happiness - Energy - Clean water and air - Relationships - Better welfare
When you think of "Kingsbury Bay and Grassy Point," what comes to mind?	<u>Kingsbury Bay</u> - Twenty river otters <u>Grassy Point</u> - Where have I been – such a gem/hidden treasure - Neglected/not maintained - Trashy area, but great fishing potential - Abandoned sawmill/industrial waste <u>Both</u> - Green grass - Western Waterfront Trail, early 1970s, more open water; now difficult to see water

Audience Questions/Comments and Responses During Q&A

Audience Question/Comment	Response
What type of health data will be used in the HIA to establish the baseline conditions and analyze impacts to those conditions?	EPA: There are some standard sources of health data that are often used in HIA, but we are lucky enough that Duluth is one of the CDC's 500 Cities, so we will have health data available to us at the Census tract level. So we will use that and any other health data available to determine the health of the impacted populations. Then we'll look at the existing conditions for those health determinants that are determined to be impacted by the projects. We will be looking to you as stakeholders to help identify data sources. So, for example, we will look at the prevalence, state, and accessibility of parks. We know accessibility to parks has implications for physical activity, which has a number of health benefits; time in nature and exposure to greenness has been shown to have positive mental health benefits; having a place to spend time together as a family or to gather with neighbors promotes social capital and cohesion, both of which are shown to have positive health impacts.

Audience Question/Comment	Response
You say this is a tool that can be used in a variety of decision-making contexts, but can we do this after you leave?	EPA: Yes! You can conduct HIAs after we're gone. There are a number of guidance documents that lay out the steps of HIA, lessons learned, and best practices. And there are different levels of HIA that can be performed – from desktop or rapid HIAs that utilize existing data and literature to more comprehensive HIAs, like what we are doing here, that involve substantial community and stakeholder involvement. City of Duluth: The City of Duluth has performed several HIAs, not as extensive as this one, but we conducted an HIA on the Sixth Avenue East Duluth Study, the Gary New Duluth Small Area Plan, the Lincoln Park Small Area Plan, and are currently undertaking one in the Irving-Fairmont neighborhood as part of a Brownfields Redevelopment Project.
Is that 170,000 cubic yards of sediment removed from Kingsbury Bay or 17,000 cubic yards?	EPA: That's 170,000 cubic yards.
How is the sediment going to be moved from Kingsbury Bay to the other locations in the St. Louis River?	MNDNR: For Kingsbury Bay, $5.5 million will be coming from a Natural Resource Damage Assessment settlement associated with the St. Louis River Interlake/Duluth Tar Superfund Site. Those funds will be used to excavate material from the bay and river delta and transport it to Grassy Point for the beneficial reuse of covering wood waste. 65,000 cubic yards will be removed from Kingsbury Bay during the winter and hauled over land by truck (i.e., 6,500 dump truck loads); the remainder of Kingsbury Bay will be dredged during the summer and moved via a pipe located on the water and will then cut through the Interlake Superfund site.
Do you normally have health professionals on the HIA team?	EPA: We usually have individuals on the team with a public health background and then invite local or county health officials to participate in the process. An individual from the St. Louis County Health Department is in attendance at this stakeholder meeting.

Stakeholder Consultation Exercise

Following the presentation and question and answer period, attendees broke into small groups and rotated through each of the three stations containing maps showing the study areas and the concept plans for each of the sites. The following questions were used to guide this exercise:

- How might the proposed restoration activities affect daily life for you and your community?
- How do you currently use Kingsbury Bay and Grassy Point?
- What are your thoughts on the proposed concept plans for Kingsbury Bay and Grassy Point?
    - How would it change how you currently use the spaces?
    - What amenities would you like to see that aren't currently planned?
    - What concerns do you have with the proposed concept plans?

[These were the same questions asked of community members at the Community Kick-off Meeting the night before.]

Attendees engaged in conversation with each other and the HIA Leadership Team members at each station and provided input on the proposed plans by writing their thoughts on post-it notes and sticking

them on the maps. The maps available at each of the stations are shown below, along with the input received via post-it note and discussion.

Habitat Restoration – Construction and Operations

- (arrows) Material movement under interstate. * Not on Raleigh.
- Army Corps off-load dock for Erie Pier (arrow point to Erie Pier)
- Disrupt the XIK cap with hydraulic dredge (arrow)
- Interpretive information - Reiss, XIK, history of the port?
- Otter family disruption (arrows pointing)
- Tax forfeit land. Not a city park.
- Contiguous fence, wildlife coming into the zoo (Conversation: Concern that restoration would allow/facilitate uncontrolled access from the river and creek to the zoo, including wildlife)
- Noise + traffic for residents and zoo animals
- Drumstick Island - osprey platform
- Future/long-term uses of adjacent property. Stockpiling & storage of industrial materials.
- Positive interaction with the port?
- Material migration from Reiss? (Conversation: Concern here was focused on the current and future use of Grassy Point; not specific to the construction phase)
- Concern about the long-term stability of contaminants cap
- Non-lethal water quality effects on fish habitat quality, NH3, BOD (?), caused by excessive wood waste
- What will the trucking route be? (Frequent topic of conversation)
- Concern about disruption to wildlife (otter, osprey) in the region (Conversation)

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

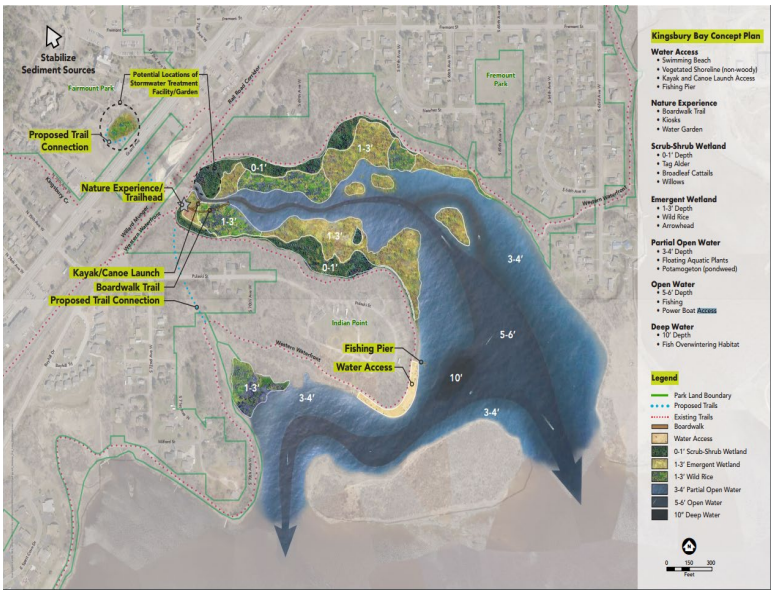
Kingsbury Bay

Kingsbury Bay – Current Uses

- Are there chemicals of concern from up the hill as Kingsbury goes through Proctor?
- NEED TO ADDRESS WATERSHED SOURCES OF SEDIMENTATION
- CCT to go under Grand Ave on West side to connect zoo to WWFT
- Current sedimentation pond and lower Kingsbury creek within zoo are neglected and not functioning well. Also aesthetically unpleasant.
- Signage and Wayfinding for existing 33 miles of WWFT going in '17/'18
- Traffic on Grand??
- Frequently bicycle the Western Waterfront Trail
- Unimproved park Mowed - that's it. Sell and build on it. Infill housing many other parks and greenspaces nearby.
- What is recommend from Irving-Fair Brownfield Pln?
- Change in Kingsbury Creek flow
- CCT will require box culvert under BN adjacent Kingsbury Creek
- In 60s there was many people who caught much smelt near grand avenue on Kingsbury Creek
- Recreational facilities -canoes -kayaks -bikes
- Swam till city dumped sewage -> no more swimming
- North Shore Free Wheelers Bicycle Club helped construct the trail in the late 1970s
- There might have been spirit houses here
- Why is this called Indian Point. Is there a history that could be told?
- Preferred outcomes -improved fish and wildlife habitat -enhanced people access for a variety of uses
- Consult with Bands on Indian Point -importance/history -plans moving forward
- Indian Point Mini-Master Plan anticipated for late 2017 or 2018
- Expand campground - rvs, campers and tents
- Drumstick Island

**Kingsbury Bay-Grassy Point Habitat Restoration:
A Health Impact Assessment**

Kingsbury Bay – Park Improvements (Concept Plan)



- Stormwater Treatment Facility (Noise, appearance, etc.)
- Will this be used to catch sediments? Will it get filled and be periodically cleaned? How is that a rain garden?
- Storm water treatment facility - what is this? Don't recall this on Fairmont/Zoo plan
- SO important to protect the restored habitat
- Keep it simple. Fairmont is a few hundred feet away. Don't duplicate what is there. Duluth lacks money and staff to adequately maintain existing parks and trails. How can this additional park and trail be maintained? Attention to this new park (adding new parks at Fairmont and Quarry) will leave even less money and staff for existing parks and trails. Neglected and poorly maintained parks and trails are a greater negative than positive for health, wellness and happiness. There are multiple other nearby parks people use and enjoy.
- Improved canoe/kayak access at the site would be welcome addition -closer in to mouth of creek such as on map
- Important to have healthy resources (water, fish, wildlife, plants) and available access to these resources -necessary for exercise of treaty rights, also recreation
- Plans for Indian Point? Continue/improve camping? - city seems short on camping opportunities.
- Don't lose or decrease campground space. Keep it campground focused, RV, tents, etc.
- MN DNR Fishing in the Neighborhood Program (name)
- When nearby current parks are not adequately maintained and have 5-6 foot tall thistles and cockleburs, yet there is planning to create brand new parks, makes users of existing nearby, neglected parks feel bad, frustrated, not important, yes - jealous
- I want improved hiking experience here better view. I like the beach idea!
- If swimming access is improved, monitoring for pathogens would need to be considered. Management of waterfowl if swimming beach.
- Good site for active cultural interpretation, i.e., seasonal wild rice camp, fishing

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

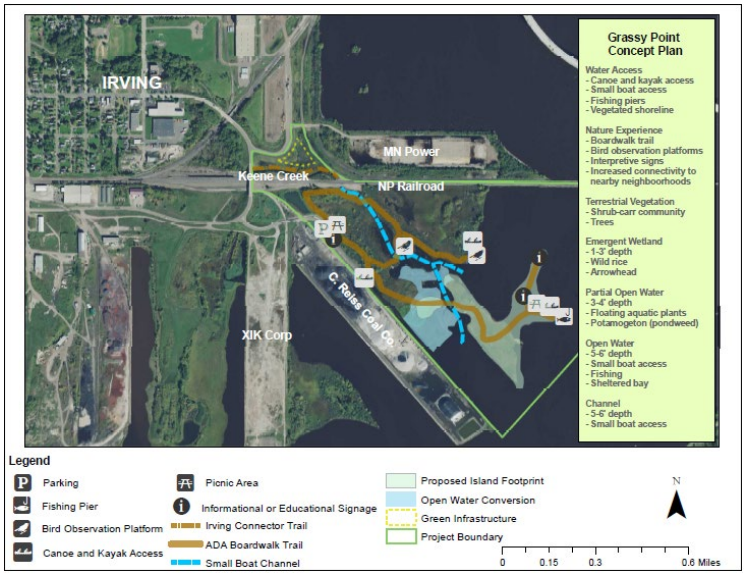
Grassy Point

Grassy Point – Current Uses

- CP Railroad
- Connection of this G.P. area to other trails + neighborhood is missing
- Lots of debris (shopping carts, tires, garbage, etc.) in Keene Creek
- CP Railroad ownership
- Diversity of terrestrial habitat at the site is clearly limited by the wood waste substrate
- Primarily from the water - Fish the main channel because we cant get into it
- Tracks - #, route is key - major health impact. Traffic, wear & tear on roads, lots of trucks hauling mud, returning for more loads - hours of work?
- Hiking. Picnic. Geo-cache. Snow-shoe.
- Have spent time mostly for work - NRDA @SLRIDT nearby. Have been in boat to view fr. water. Industrial.
- Fugitive dust issues
- Former water + boardwalk - excessive sedimentation + wood waste is aesthetically displeasing + obviously impacts habitat
- Current neighbor dock operations impact the site aesthetically
- Artesian spring (arrow)
- Ex-Carnegie Hall? Location?

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Grassy Point – Park Improvements (Concept Plan)



- Overlay of new to old to better understand the changes
- What is green infrastructure?
- Opportunity for aesthetics & education & water treatment
- Improved access to upland & open water habitat would be welcome addition (upland access is very limited currently)
- Improved upland habitat to accompany open water improvements would more fully enhance the site experience
- Many trails in this small area can decrease the nature that people are going there to enjoy. Keep it simple. Irving Park is only a block away. Don't duplicate what is there. Poorly maintained parks are a greater negative than they are a benefit for health, wellness, happiness, tourism & neighborhood value. Poorly maintained parks & trails make neighbors and users feel not valued, not worthwhile.
- Interesting the trail system would encourage my recreational use of the area
- Not a city park. Land is tax forfeit.
- Birdwatching "hotspot" - nice accessibility to see biodiversity. *Hopefully focus on non-motorized boating - minimize disturbance.
- Should improve fishing
- Can some signage provide history of site? So everyone can know what the site was like - railway yard & how did it get converted to this new experience?
- Will fugitive dust issues impair recreation?
- No need for 3 boat launches. One is fine. Use the one closest to the Reiss dock - hardened surface & protection from wind & waves for loading & unloading. | Conflict with 3 acres where boat channel crosses boardwalk. Bridge needed? Is this feasible? Practical?
- Artesian well?? Look at affect on contaminants cap.
- Is the forked trail going into the water feasible? Practical? Needed? The current floating things are unusable & unsafe. Current area has not been maintained city lacks funds & staff to maintain existing infrastructure. Why would we expect anything to be different going forward?

After the stakeholders finished providing their input, they reconvened and were presented a summary of the input received the night before from community members. Twenty-seven (27) community members were in attendance at the Community Kick-off Meeting held on February 27.

- Overarching sentiments regarding Kingsbury Bay/Grassy Point:
  - Concerns about maintenance of existing Western parks
  - Grassy Point – "an embarrassing, neglected mess"
  - Crime and vandalism
- Restoration Construction/Operations
  - Roads need to be fixed; concerns about crowding and traffic; noise; timing of dredging
- Grassy Point
  - Current – invasive species; conditions scary/afraid to use it
  - Future – Lack of connectivity to Irving; safety of accessing site; needs to be good signage; needs to be inviting not in disrepair
- Kingsbury Bay
  - Current – very shallow, disgusting mudflats; deeper water would mean better fishing; snowmobilers use Western Waterfront Trail to get to river; nuisance materials deposited; Western Waterfront Trail tranquil
  - Future – great walking on Western Waterfront Trail; make ideal for birding; boating concerns of available space due to island

Meeting Wrap-up

The meeting concluded with an overview of the HIA's next steps and some final considerations. The next steps for the HIA (Scoping) include:

- Document the discussions and input from the community and stakeholder meetings and share the results
- Use community and stakeholder input and other evidence sources (including input from past community planning efforts) to establish the scope of the HIA, the potential for impacts to health, and populations likely affected
- Determine the individuals/team that will conduct the HIA and roles of the participants
- Establish the research questions, assessment plan, and communication and reporting strategies

Once these Scoping tasks are complete, the Assessment step of the HIA process (i.e., the analysis) will be initiated. The HIA Leadership Team identified ways for stakeholders to stay involved - ask questions, share the information they learned in their professional and social circles, look for upcoming communications regarding the HIA, and consider how they can contribute to the HIA (e.g., provide input via stakeholder meetings or become a member of the Technical Advisory Committee and have a more active role in the HIA process).

HIA Contact Information

For more information on the HIA, contact one of the HIA Leadership Team members:

- **Rosita Clarke**, EPA Region 5 Brownfields Program, clarke.rosita@epa.gov
- **Florence Fulk**, EPA Office of Research and Development, fulk.florence@epa.gov
- **Joel Hoffman**, EPA Office of Research and Development, hoffman.joel@epa.gov
- **Bill Majewski**, Morgan Park Community Club & St. Louis River Alliance, bsmajewski@aol.com
- **Justicia Rhodus**, Pegasus Technical Services (contractor to the EPA), rhodus.justicia@epa.gov
- **Katie Williams**, EPA Office of Research and Development, williams.kathleen@epa.gov

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Appendix C – HIA Rules of Engagement and Roles and Responsibilities

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

RULES OF ENGAGEMENT AGREEMENT

The Rules of Engagement (ROE) cover a number of topics, including commitments and information sharing, which are critical to the overall success of the Kingsbury Bay-Grassy Point Habitat Restoration HIA. Members of the HIA Leadership Team, HIA Research Team, and HIA Advisory Committee must understand and agree to the following ROE.

HIA Roles and Responsibilities

This HIA will be led by Joel Hoffman (EPA Office of Research and Development) and Florence Fulk (EPA Office of Research and Development). These HIA Project Leads will be joined by several additional HIA Leadership Team members – Rosita Clarke (EPA Region 5 Brownfields Program), Bill Majewski (Morgan Park Community Club & St. Louis River Alliance), Justicia Rhodus (Pegasus Technical Services, contractor to EPA), and Katie Williams (EPA Office of Research and Development). The HIA will be conducted by the HIA Project Team, which includes members of the HIA Leadership Team and HIA Research Team, with input from an HIA Advisory Committee made up of community members and other stakeholders (Table 1).

Table 1. HIA Roles and Responsibilities

HIA Role	Responsibilities
HIA Leadership Team	Members will meet bimonthly (more often if needed), either in person or by phone. Members are responsible for discussing and managing HIA progress; planning logistics for upcoming HIA activities; designing the HIA processes; attending HIA Leadership Team, Research Team, Advisory Committee, and other HIA meetings; contributing to the development of HIA materials; approving HIA materials for distribution; and managing specific HIA tasks. The HIA Project Leads are responsible for securing funding vehicles and personnel to perform HIA activities, schedule and lead HIA meetings, lead group discussions, communicate with stakeholders, distribute final HIA products, and make final decisions regarding HIA activities.
HIA Research Team	Members will meet monthly (more often if needed), either in person or by phone. Members are responsible for assisting in the development and completion of the assessment plan and performing other specific tasks related to collecting, synthesizing, and analyzing data; contributing to the development of HIA materials; attending HIA Research Team meetings; and identifying initial recommendations. Members will also be responsible for appraising the HIA Leadership Team of the progress of and any challenges completing specific tasks.
HIA Advisory Committee	Members will meet monthly (more often if needed), either in person or by phone. Members are responsible for advising the HIA Project Team on technical aspects (e.g., implementation, enforcement, funding) and non-technical aspects (e.g., local knowledge, history, and interests and/or concerns of other community stakeholders) of the proposed projects; attending Advisory Committee meetings (or provide a representative); and providing input and feedback on the HIA goals, assessment plan, recommendations, follow-up activities, HIA materials, and implementation of the HIA process.

As a participant in this HIA, I:

1. Recognize that I may serve in more than one role, but must fulfill the responsibilities of each role, as described in Table 1.
2. Agree to remain neutral to the decision result and advocate only for health and wellness.
3. Recognize and accept the purpose of the HIA.

   The purpose of this HIA is to help inform the Minnesota Department of Natural Resources' habitat restoration projects at Kingsbury Bay and Grassy Point and the City of Duluth's subsequent park improvement projects at these sites by advocating for health and wellness of all stakeholders.

4. Agree to conduct my work with integrity, perform duties in an ethical manner, remain cognizant of the decision timeline, and commit to set deadlines.
5. Agree to be mindful and respectful of the view and opinions of other participants, when communicating my own view or opinion.
6. Agree that the final authority in all HIA-related decision-making is reserved for the HIA Project Leads (Joel Hoffman and Florence Fulk), especially in the event of a decision crossroads between participant groups.

HIA Communication, Information Sharing, and Material Review

As a participant in the HIA, I:

1. Understand that, by default, information provided or developed during the HIA will be documented and made public through the HIA report. Sensitive information must be noted as such prior to being shared.
2. Recognize that HIA materials will undergo an internal review process (Level 1) that will encompass review and editing by the HIA Project Team (see Figure 1).
3. Recognize that HIA materials will undergo an external review process (Level 2) in which stakeholders outside the HIA Project Team (e.g., the HIA Advisory Committee and other stakeholders) will have an opportunity to provide feedback/input on the information shared and propose edits to the HIA materials (see Figure 1).
4. Recognize that HIA materials may undergo an external review by the Agency (EPA) and/or peer-review (Level 3) for quality assurance (see Figure 1).
5. Recognize that feedback not provided by the assigned due date will not be considered.
6. Accept that not all input or suggestions received will be incorporated into HIA materials. Any significant changes proposed must be accompanied by evidence-based rationale. Information that is not evidence-based will be incorporated at the discretion of the HIA Project Team.

   NOTE: *All interim (draft) materials from the HIA must be approved first by the HIA Project Leads (Joel Hoffman and Florence Fulk) before being distributed or shared with other groups and/or individuals outside the HIA Project Team. This is to help prevent the dissemination of misinformation and/or miscommunication between stakeholder groups. Figure 1 outlines the flow of materials and how the decisions regarding dissemination of such materials will be made.*

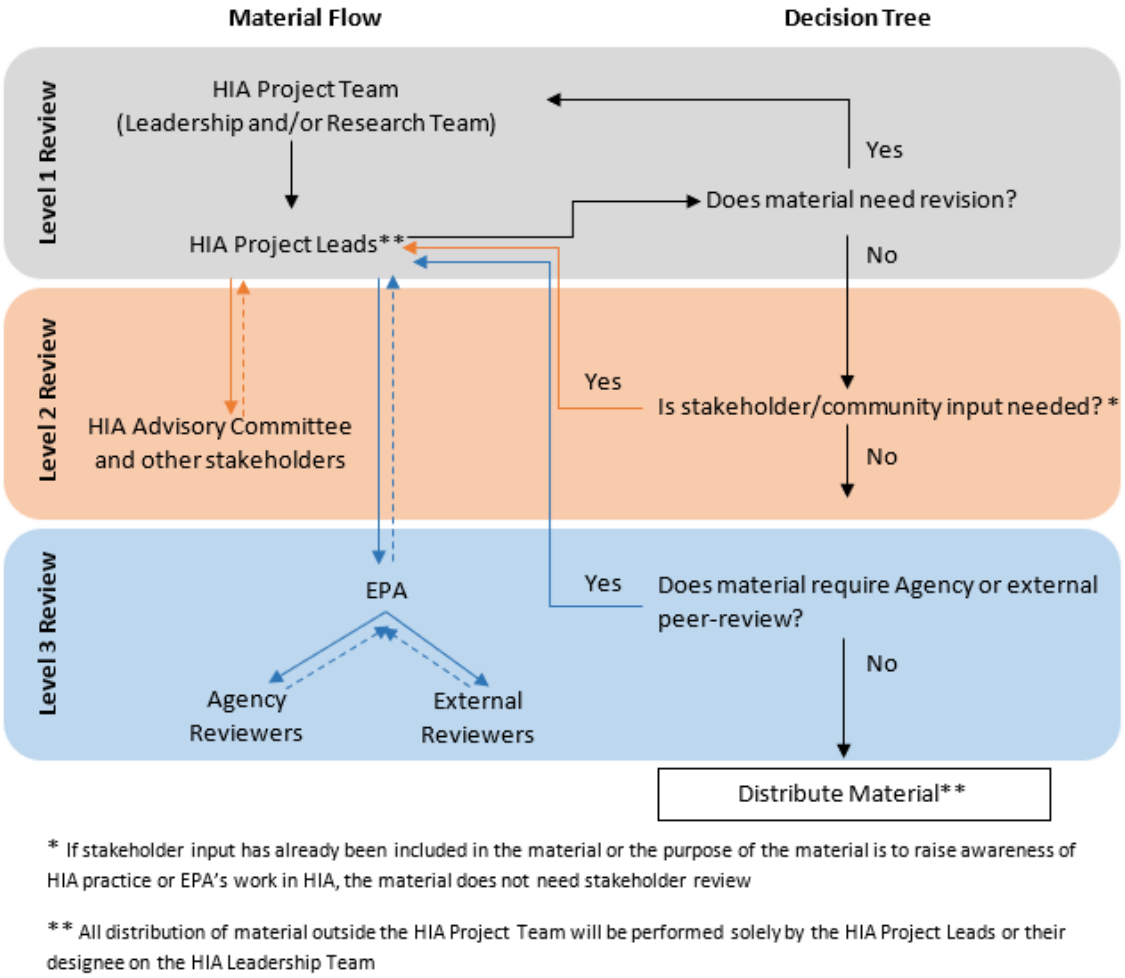

Figure 1. The process outline for communicating and sharing HIA information and material review.

Conflict Resolution

As a participant in this HIA, I will:

1. Seek first to understand and then be understood.
2. Agree that disagreements are expected, but a common ground should always be sought.
3. Agree to be respectful of one another and make a collaborative effort so that conflicts can be resolved as quickly as possible.
4. Agree to be inclusive and respectful of others, regardless of differing priorities, viewpoints, or concerns.

-End-

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Appendix D – Project Design and Permitting Process

D.1 Original "85%" Design

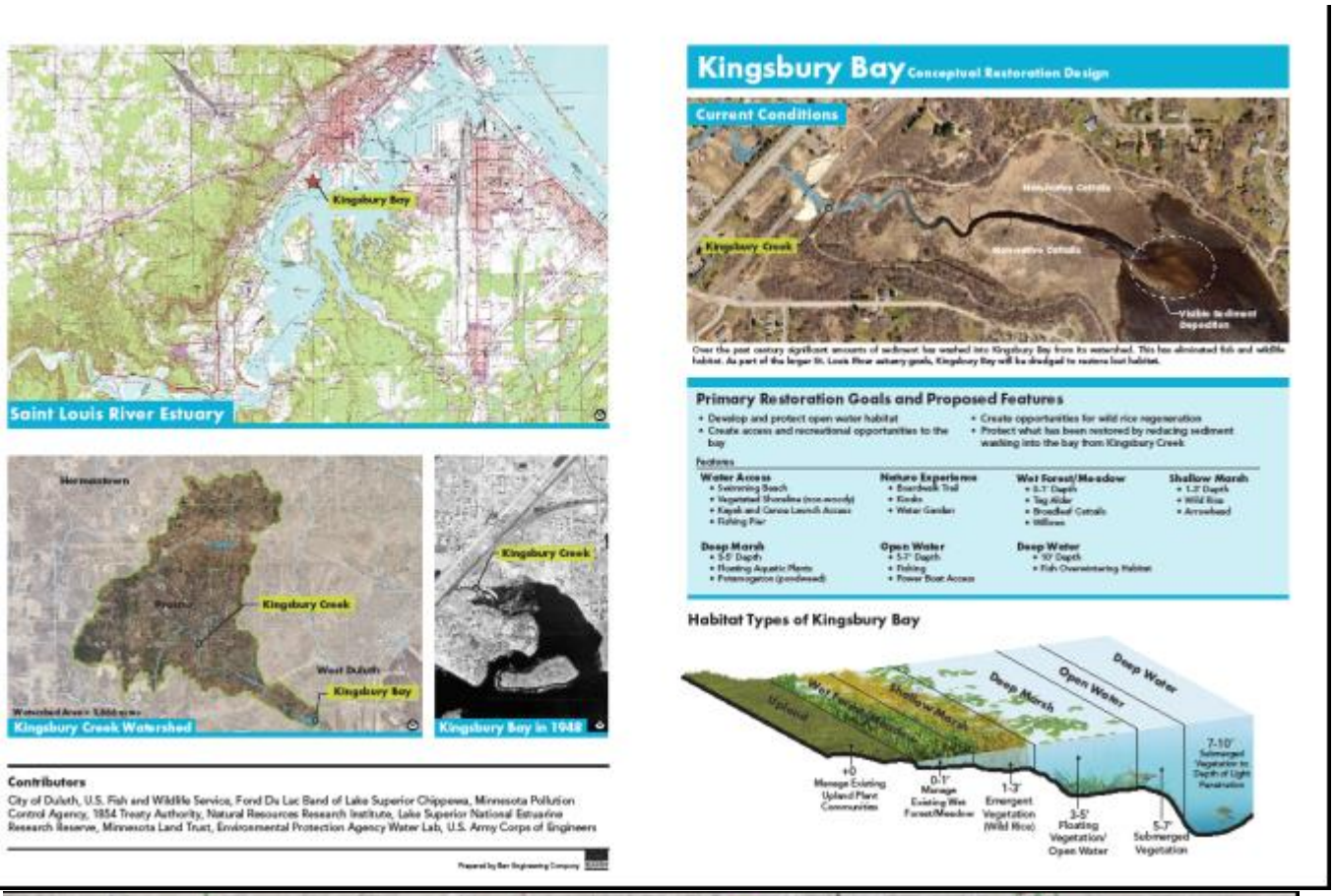
The "85%-complete" habitat restoration design, detailed in Restoration Site Team (RST) presentations and documents, provided the scope of the habitat restoration work at Kingsbury Bay and Grassy Point. The HIA analysis was originally conducted on this "85%" design and the park improvement concept plans (Figures D-1 and D-2). These "85%" design and park concept plans were eventually detailed in a Draft Environmental Assessment Worksheet (EAW) developed by MNDNR[48], available part way through the HIA *Assessment* step.

D.2 Revised Habitat Restoration Design

Following presentations of the HIA preliminary findings and recommendations at a MNDNR Project Meeting in October 2017 and an HIA Advisory Committee Meeting in November 2017, the HIA Project Team was notified that MNDNR had made some changes to the habitat restoration design. The "85%-complete" habitat restoration design analyzed in the HIA was revised in December 2017 to address some of the preliminary results and recommendations of the HIA and concerns raised during the design process. In this revised design:

- MNDNR would be preserving the cold-water habitat at the mouth of Kingsbury Creek by raising the streambed and not excavating; preservation of this habitat was a recommendation of the HIA. The adjacent wetland would also be made deeper, increasing the storage capacity. The cuts made would avoid impacts to the existing high quality submerged aquatic vegetation beds at Kingsbury Bay and in return, the channel along the shore would be deepened to accommodate recreational boat traffic and access to present and future docks.
- At Grassy Point, where Keene Creek comes in, minor modifications were made, but the biggest difference was between the Reiss facility and the big island. This is an area of low environmental quality in which sediment dioxins concentrations are sufficiently high to represent a risk to fish and wildlife. In the revised design, MNDNR proposed putting clean sediment over that entire (rectangular) area (not a cap per se, but if the sediment is carbon-rich it would essentially serve as a cap if it stays in place). The Kingsbury Bay sediment would likely be the source for the material.

[48] As the responsible party for the review of the project, MNDNR developed an EAW to describe the environmental effects associated with the Kingsbury Bay-Grassy Point Habitat Restoration Project.



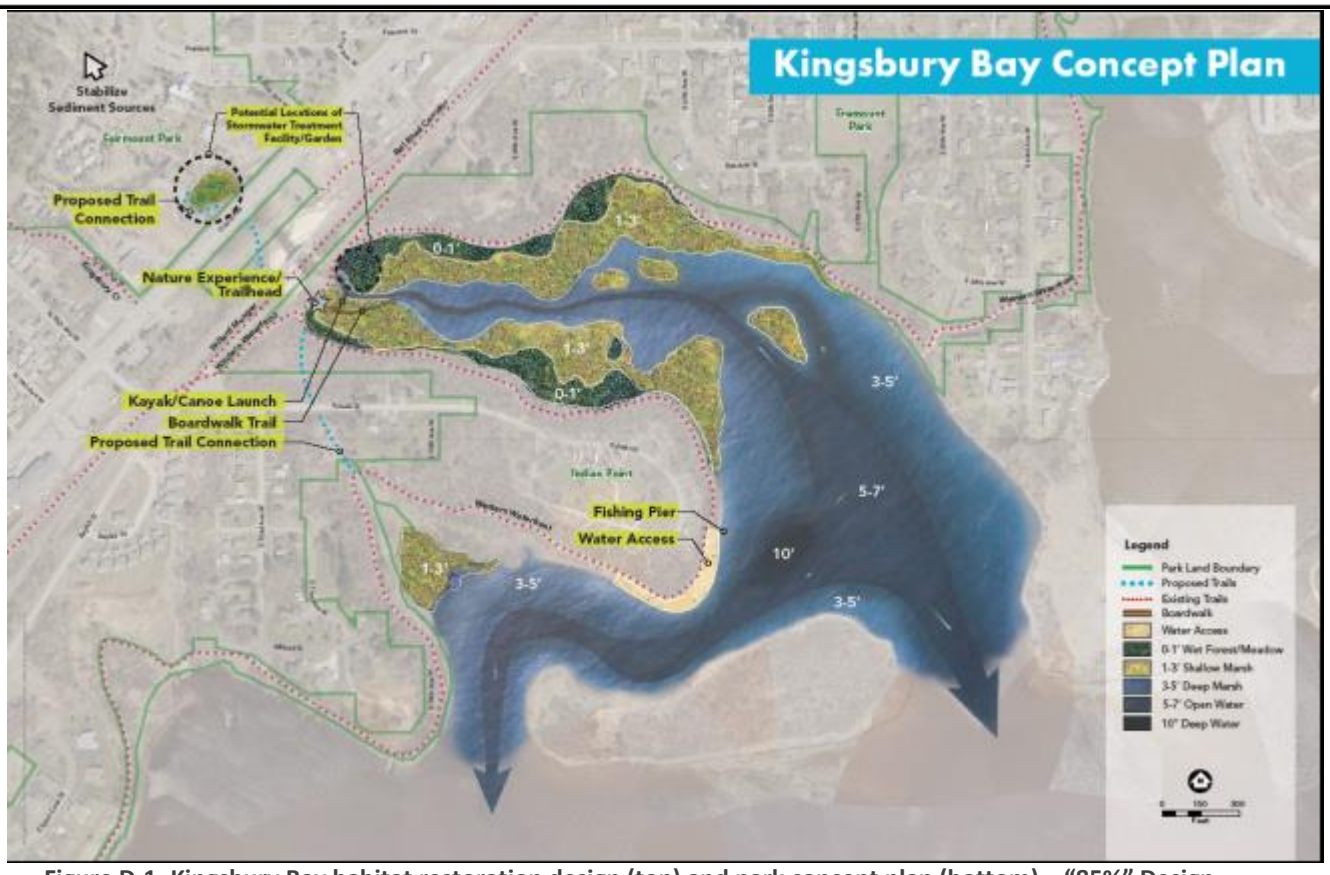
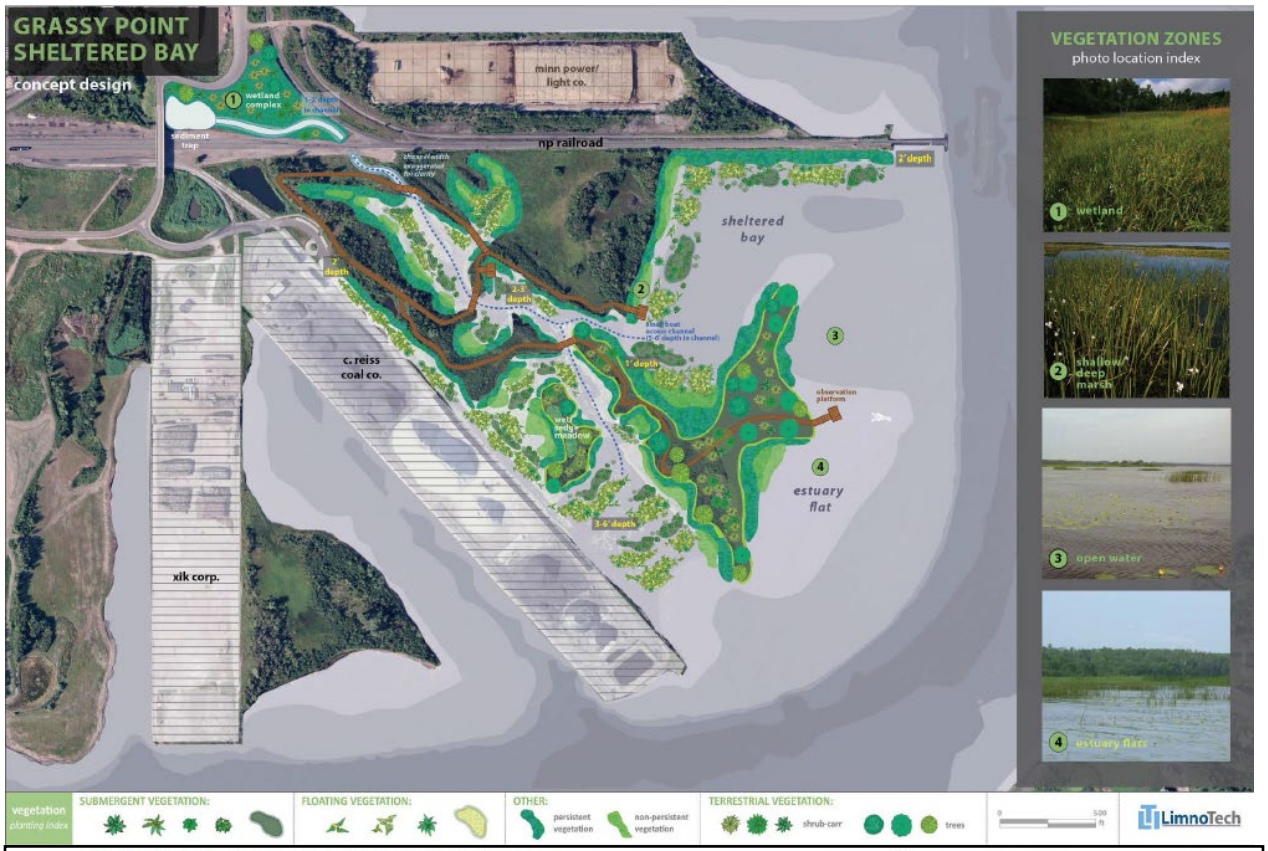


Figure D-1. Kingsbury Bay habitat restoration design (top) and park concept plan (bottom) – "85%" Design.



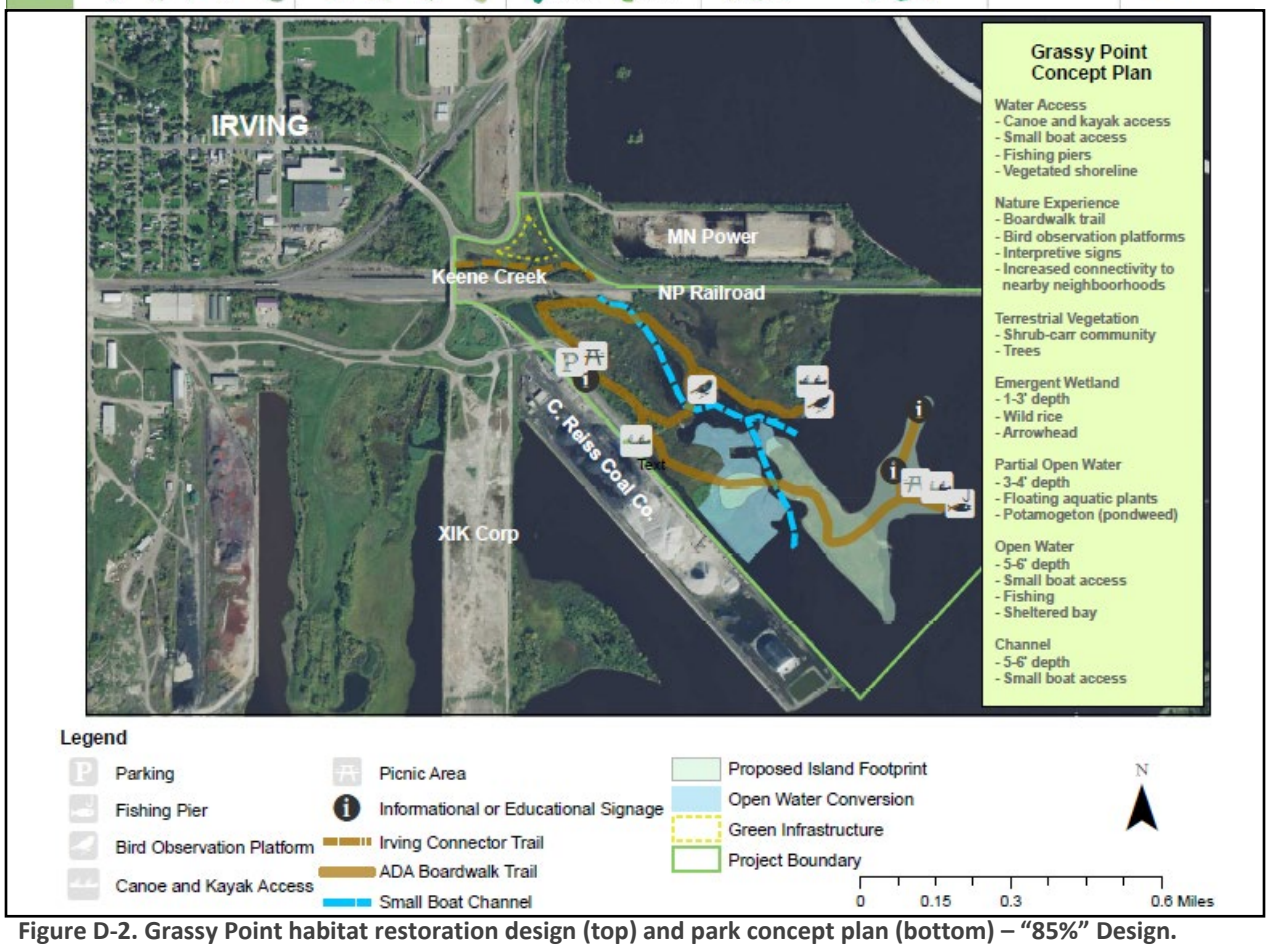


Figure D-2. Grassy Point habitat restoration design (top) and park concept plan (bottom) – "85%" Design.

- The MNDNR project boundaries changed. At Grassy Point, the boundary originally went to the foot of the railroad, but now only extend to the foot of the C Reiss dock. At Kingsbury Bay, the boundary was cut back substantially. The area that was now excluded from the project area at Grassy Point contains contaminated sediment; however, this was not an area they were planning to work in anyway[49].
- The head of Kingsbury Bay would be more constricted, but this would not have a big impact on the vegetation metric. They would also be preserving the vegetation bed at Kingsbury Bay, but it is very minimal (hard to even detect).
- At Grassy Point, the Big Island elevation was not included in the design. They would be increasing the elevation west of Big Island, which would eliminate the recreational boating channel west of the island and the ability to circumnavigate the island. The changes west of Big Island were minor as far as vegetation, but this area would be more heavily vegetated, which will result in more carbon. MNDNR was originally going to open up the existing wetland at Grassy Point for stormwater retention, but they would no longer be doing that due to costs. They would also no longer be touching Keene Creek; they would only do work south of the railroad.

These design changes had implications for the outcomes of the habitat restoration (including aquatic vegetation, dioxins levels, fishing, recreation, and potential habitat for wild rice) and hence, the potential impacts of the project on health. In order to keep up with the design process and ensure that the HIA could adequately inform the restoration activities, the HIA Project Team assessed the potential impacts of the revised design and updated the HIA analysis to reflect the design changes. This included calculating the new bathymetry; performing new model runs for depth analysis, Kingsbury shoreline post-construction, boating, fishing, floating leaf vegetation (FLV), submerged aquatic vegetation (SAV), and wild rice habitat; and conducting a new contaminants analysis.

D.3 Permitting Process and Consideration of Project Alternatives

Around this same time, as part of the permitting process, MNDNR and MPCA (the permitting agency) were engaged in discussions around the Environmental Assessment Worksheet (EAW) submitted by MNDNR, specifically the metrics used in the project descriptions and the consideration of project alternatives. In order to approve the project permit, MPCA was asking for meaningful metrics to be used in the project descriptions. MNDNR used an index of biotic integrity (IBI) and a plant index in the EAW submitted to MPCA; this showed the IBI would be lower after the restoration work. This is expected, because the site will be deeper; however, MPCA was strictly interpreting that as degradation. MNDNR worked on developing a broader suite of metrics, and EPA supported that work; much of the modeling done in support of the HIA helped inform those efforts. MPCA was also requesting that alternatives be

[49] Despite being excluded from the habitat restoration work, the decision was made to include this excluded area in the HIA contaminant risk analysis.

examined rather than just the single design submitted as part of the EAW. MNDNR was originally reluctant to develop alternatives, but in early 2018 agreed to examine four restoration design alternatives in the EAW for Grassy Point (Figure D-3):

- Alternative 1 – the "85%" design originally examined in the HIA
- Alternative 2 – the revised (December 2017) design, for which the HIA analysis was updated
- Alternatives 3 and 4 – alternatives proposed by MPCA that were designed to leave alone areas of Grassy Point with wood waste and relatively good condition benthic invertebrate communities.

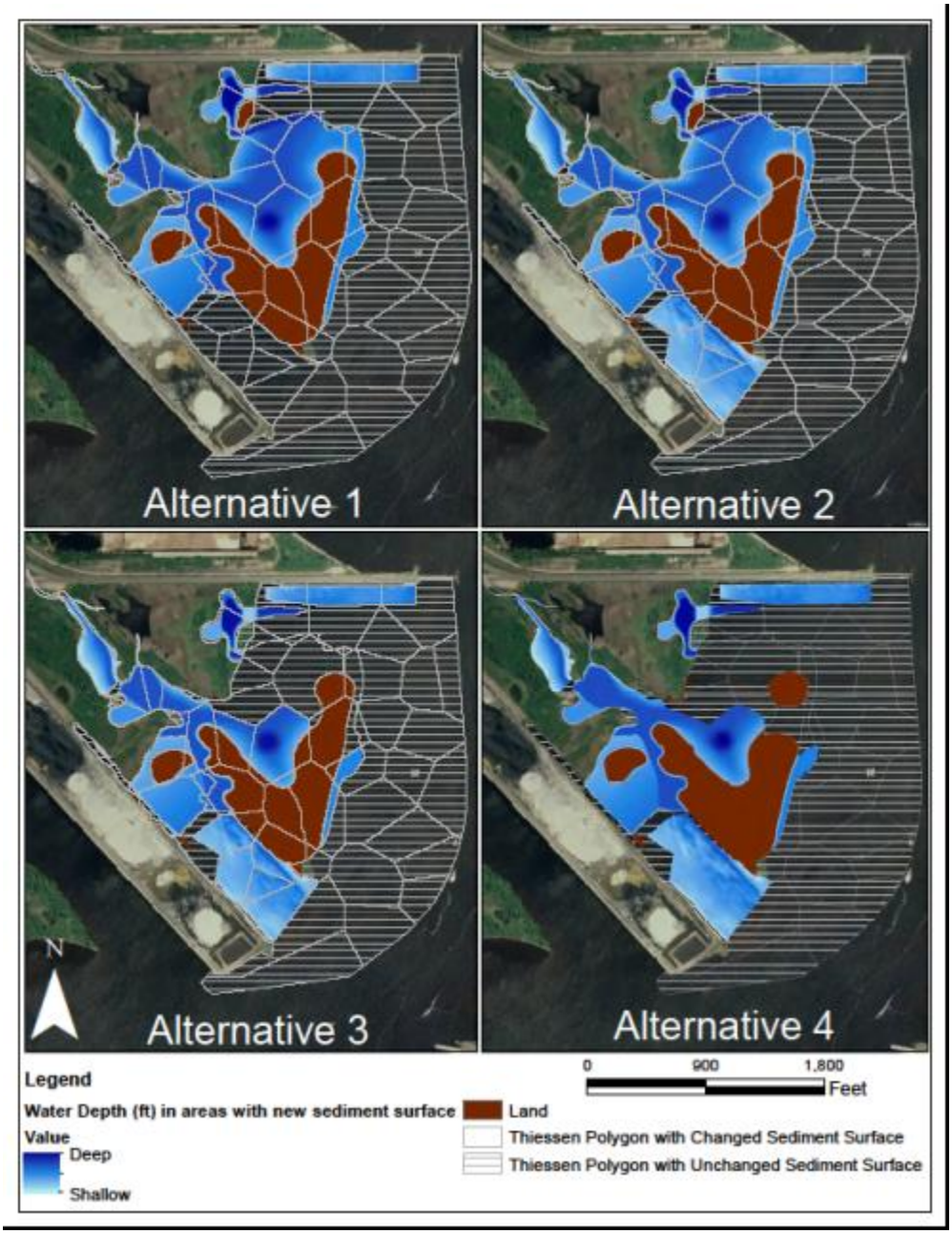


Figure D-3. Grassy Point habitat restoration design alternatives.

MNDNR asked if the HIA Team could perform a qualitative comparative analysis of the alternatives to share with MPCA and MNDNR Executive Leadership to help inform selection of the preferred alternative. That qualitative analysis provided by the HIA Team follows Section D.4.

D.4 Preferred Alternative

MPCA and MNDNR Executive Leadership met in January 2018, and MNDNR was given the green light to proceed with final design documentation for the MNDNR's (and HIA's) preferred alternative for the Kingsbury Bay-Grassy Point Habitat Restoration – Alternative 2.

MNDNR's design contractor developed the final design deliverables for Alternative 2, and MNDNR updated the Environmental Assessment Worksheet to reflect Alternative 2 as the preferred alternative; dredge and fill volumes for Alternative 2 are shown in Table D-1.

The HIA Assessment documented in Section 4 of this report details the potential impacts of the preferred alternative (Alternative 2) on public health.

Table D-1. Kingsbury Bay and Grassy Point Dredge and Fill Volumes (Preferred Alternative – Alternative 2)

DRAFT 1/22/2018

Dredge and Fill Material Volumes
Grassy Point/ Kingsbury Bay Restoration
Minnesota DNR
Duluth, MN

RSU #	RSU Name	Area (Ac)	Dredge Volume (CY)	Overdredge Volume (CY)[1]	Material Placement Volume (CY)	Excess Material (CY)[2]	Import Material (CY)[3]
Overall		**119**	**346,175**	**29,829**	**297,986**	**57,247**	**13,922**
Kingsbury Bay		**51**	**173,604**	**28,388**	**-**	**57,247**	**-**
1	Creek Delta	16.0	80,227	-	-	57,247	-
4	Soft Sediment	28.3	77,814	22,835	-	-	-
5	Sand	6.9	15,563	5,554	-	-	-
Grassy Point		**68**	**172,571**	**1,441**	**279,304**	**-**	**13,922**
2	Island Material Placement	10.0	-	-	72,065	-	2,941
3	Grassy Point Baymouth Bar Material Placement	8.2	-	-	137,785	-	9,887
6	Grassy Point Batmouth Bar Riparian Shallows	2.9	-	-	7,194	-	1,094
7	Area of Concern	22.6	100,345	-	39,575	-	-
8S	Outer Grassy Point Open Water Creation	5.3	38,374	-	8,530	-	-
8N	Additional Cut - Sand/Wetland	3.0	24,403	1,441	-	-	-
9	Inner Grassy Point Channel Expansion	2.8	9,449	-	-	-	-
10	Grassy Point Contaminated Sediment	9.7	-	-	8,188	-	-
11	Keene Creek Channel Restoration	-	-	-	-	-	-
12	KK Dock #7 Onsite Material Stockpile	-	-	-	-	-	-
13	Railroad Causeway Material Placement	3.7	-	-	5,967	-	-
40th Avenue W. Placement Areas		**-**	**-**	**-**	**18,682**	**-**	**-**
–	Place Biomedium[4]	-	-	-	18,682	-	-

Notes

1 Dredge tolerance to be +0.0'/-0.5' from dredging neat line for RSU 4, RSU 5 and RSU 8N. Overdredging of 0.5' beyond dredging neat line will be paid for. Excess sand to be used for sand berm or placement in RSU 6 and excess soft sediment to be transported to 40th Ave. Project. Dredge tolerance for all other RSUs to be +0.5'/-0.0' from dredging neat line and no overdredging quantity beyond the dredging neat line will be paid for.

2 Excess Material assumed to be wetland vegetation and organic topsoil not necessary for placement to reach final grades

3 Import Material assumed to be additional sand, granular buttress, shoreline protection materials. Assumes material generated from RSU 8N and RSU 5 meets minimum requirements for Sand Berm. If material does not meet minimum requirements, additional import sand will be required.

4 Biomedium placed at 40th Ave. W. is assumed excess dredged material from RSU 4. Actual designed areas and depths TBD.

Comparison of Proposed Alternatives 2, 3, and 4

1/17/2018

Health Impact Assessment Pathway Team Leads:

Joel Hoffman, Alexis Lan, Justicia Rhodus, Samantha Shattuck, and Kathleen Williams

The Kingsbury Bay-Grassy Point Habitat Restoration Project Health Impact Assessment (HIA) Pathway Team Leads were asked to qualitatively compare the health impacts of the Grassy Point project Alternatives 2, 3, and 4. This comparative analysis was based on the full project plans that have been developed for Alternative 2 and the schematics provided for Alternatives 3 and 4. Based on the schematics provided, we interpreted that in Alternative 3, the large estuary flat between the proposed large island in the middle of the project area and the shoreline was excluded from the project (relative to Alternative 2). In Alternative 4, in addition to the change in Alternative 3, the northward arm of the large island is smaller in size than in Alternative 2, leaving a segment of aquatic habitat between the tip of the island and main body of the island and creating a small island over the existing, remnant sawmill piers. Because the team is currently working on a detailed analysis of Alternative 2, this qualitative analysis compares the health impact of Alternatives 3 and 4 to Alternative 2. The HIA includes six health pathways; we qualitatively compared the various alternatives based on each of these pathways.

Summary. Overall, the potential health benefits of the project will be diminished by choosing Alternative 3 or 4 compared to Alternative 2. The key findings are that both Alternatives 3 and 4 would leave wood waste at the site, which prohibits the growth or restoration of native aquatic plants, reduces fish and bird habitat quality, and negatively impacts the aesthetics of the location relative to Alternative 2. The reduced restoration relative to Alternative 2 would impact use and value of the site, especially the recreational (boating, fishing, birding), aesthetic (appreciation of nature), and cultural (wild rice and medicinal plants) benefits to the community. Consequently, Alternatives 3 and 4 would reduce the corresponding potential health benefits of the project realized by Alternative 2, including reduced stress and chronic disease, as well as improved nutrition and overall health and wellbeing.

Water Habitat and Quality Pathway. Relative to Alternative 2, the major change in Alternative 3 is to maintain the area as a shallow (1 to 4 feet depth) estuary flat and leave wood waste on the river bottom. This wood waste covers the river bottom throughout the area excluded from the project and is generally 1 to 10 feet deep. Throughout much of the same area as the wood waste, there is no aquatic vegetation, although the water depth (1 to 4 feet) is suitable for aquatic plant growth. That is, the wood waste prevents aquatic plants from growing in these areas. The same region generally supports a benthic invertebrate community classified as good. Relative to Alternative 2, Alternative 4 would leave an additional area of wood waste (because it is not being converted to upland habitat as part of the large island), in an area with little aquatic vegetation and a benthic invertebrate community classified as

extremely good. The change in the pathway of adopting either Alternative 3 (relative to Alternative 2) or Alternative 4 is that the quality of habitat for fish and birds would be reduced because aquatic vegetation would remain scarce in that part of the project area and the range of depths would remain small relative to Alternative 2 (2 to 6 feet depth). This has implications for both the Recreation, Aesthetic, and Engagement with Nature and Social and Cultural pathways (below).

Equipment Operation, Traffic and Transport. Alternatives 3 and 4 would reduce the material transportation and disposal needs for the project. This change would (relative to Alternative 2) not substantially reduce the amount of project-related traffic or equipment operations on-site because the reduction in sediment excavation is small relative to the overall project.

Noise and Light Pollution. Alternatives 3 and 4 would not substantially reduce the amount of noise and light pollution because the scope and duration of the reduction in construction equipment operations and truck and vehicle traffic is small relative to the whole project.

Air Quality. Alternatives 3 and 4 would not substantially reduce the amount of air pollution relative to Alternative 2 because the scope and duration of the reduction in construction equipment operation and truck and vehicle traffic is small relative to the whole project.

Crime and Safety. Alternative 3 would potentially make Grassy Point less attractive to visitors because leaving the wood waste on site would decrease its perception as a natural area relative to Alternative 2. Alternative 4 would potentially result in a greater change in visitation because the large island could be perceived as less attractive owing to its smaller size and likely lower elevation (because of the smaller footprint) relative to Alternatives 2 and 3. The amount of human activity can exacerbate crime and safety concerns. Reducing visitors relative to Alternative 2 could potentially increase crime at Grassy Point by encouraging misuse.

Recreation, Aesthetics, and Engagement with Nature. Alternatives 3 and 4 would reduce recreational boating access to Grassy Point relative to Alternative 2 by maintaining the current depths between the proposed large island and shoreline, preventing navigation around the island. They would also reduce fishing and birding opportunities because there would be lower quality habitat for fish and birds.

Alternative 4, in particular, would potentially reduce shore fishing quality because the smaller island has reduced access to deep water habitat. Both Alternatives 3 and 4 would reduce the aesthetics of the site by leaving wood waste in a highly-visible location and consequently potentially negatively affect site usage, as well as the quality of opportunities to engage with nature (whether meditating, walking, hiking, canoeing, or kayaking). Leaving the wood waste could lead to the perception that the location has not been fully restored and thereby diminish the potential for community groups to assume formal responsibility for park management (a recommendation of the HIA) because it would be a lesser-quality natural area.

Social and Cultural. Alternatives 3 and 4 would limit the area of habitat suitable for wild rice and other aquatic plants of medicinal value by leaving the wood waste, reducing the cultural value of Grassy Point relative to Alternative 2. Further, relative to Alternative 2, Grassy Point will be utilized less as a site for building social cohesion and for spiritual reflection because recreation, aesthetics, and access to the natural area are reduced.

Appendix E – HIA Assessment WorkPlan

The HIA Project Team drafted an Assessment Workplan detailing the research questions, indicators, data sources, and methods to be used in the HIA analysis to establish the baseline conditions related to the health determinants in each pathway and determine how the proposed projects could potentially impact those conditions (i.e., to analyze potential health impacts in the *Assessment* step). Input from the community and stakeholder kickoff meetings was used in the development of the Workplan and once drafted, the Advisory Committee was given the opportunity to review and provide additional input on the plan. The HIA Assessment Work Plan that follows was used to guide the *Assessment* step of the HIA.

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Water Habitat and Quality Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Indirect health impact)	What types of water habitat, vegetation (including invasive species), and fauna (including fish) are currently present at the project sites?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the type of water habitats, vegetation (including invasive species), and fauna (including fish) at the project sites in the short-term and long-term?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities	• Elevation data (LiDAR) and bathymetry • Surface water elevation • Vegetation data • Habitat classes • Sheltered Bay classification • Invasive species (aquatic and terrestrial) • Rare and endangered species	• GIS data - elevation and bathymetry data, surface water elevation • Vegetation survey data from Carol Reschke at NRRI • Vegetation survey data (and database of numerous vegetation surveys) from Dr. Nick Danz at UW-Superior • Submerged Aquatic Vegetation (SAV) model • Depth-based aquatic habitat classification • Hollenhorst and Petersen model (sheltered Bay classification) • 1854 Authority mapping of phragmites (invasive species) • Community Action Duluth (invasive species) • MED's aquatic invasive species database • Map of hybrid cattail • MNDNR biodiversity areas, elemental occurrences (rare and endangered species) • Literature on water habitat/vegetation and impact on fauna composition erosion/runoff	• Literature/secondary data review • SAV modelling (vegetation data) • Depth-based aquatic habitat classification • Hollenhorst and Petersen model (sheltered Bay classification) • Hypsographic curve analysis • Forecast/estimate change in invasive species and vegetation	• Resident: Both sites have invasive species • Resident: There are invasive species at Kingsbury Bay. How are you going to make sure you don't transport those to Grassy Point and the other sites? [We cannot transport sediment from Kingsbury Bay that has any invasive species present. This is an issue that we are well aware of, but still need to find an engineering solution] • Resident: Kingsbury - cattails and "nasty" mudflats • Resident: Kingsbury- mudflats in summer • Resident: Leave mouth of Kingsbury natural. No access. Move access for kayaks and snowmobiles to the campground where there is already a parking lot. • Resident: Kingsbury - take all of the dirt you can here (with arrow). (name) Dig. Dig. Dig. • Resident: Kingsbury - Spring warbler area • Resident: Kingsbury - Beaver habitat • Resident: Kingsbury - Blue herons • Resident: Kingsbury - Birding; This is a birding area (with arrows) • Stakeholder: Kingsbury - 20 River otters; otter family disruption • Stakeholder: Kingsbury - Drumstick island -osprey platform; disruption to wildlife • Stakeholder: - Contiguous fence, wildlife coming into the zoo (Conversation: Concern that restoration would allow/facilitate uncontrolled access from the river and creek to the zoo, including wildlife) • Resident: Deepening channel at Kingsbury Bay will make better fishing conditions = more boats in bay • Resident: Kingsbury - Small power boating fishing. No access across river from homes. • Resident: Kingsbury - In (up arrow) low water, no enough room if leave this mat for boats • Resident: Kingsbury - Take out old barge "Alice-Vivian" —— • Resident: Grassy - Phragmites australis, Haploid Invasive • Resident: Grassy- Purple loosestrife • Resident: Grassy- Little pond (with arrow) so great for birding - love it.

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Water Habitat and Quality Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Indirect health impact) *(Cont. from previous pg)*	What types of water habitat, vegetation (including invasive species), and fauna (including fish) are currently present at the project sites? *(Cont. from previous pg)*	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the type of water habitats, vegetation (including invasive species), and fauna (including fish) at the project sites in the short-term and long-term? *(Cont. from previous pg)*					**• Resident: Grassy - Retain stream channel, as one; don't fork at the island This will protect the cap placed over contaminated sediment.** **• Resident: Grassy-(arrow) Artesian spring in this area** **• Stakeholder: Grassy- Diversity of terrestrial habitat at the site is clearly limited by the wood waste substrate** **• Stakeholder: Grassy- Former water + boardwalk - excessive sedimentation + wood waste is aesthetically displeasing + obviously impacts habitat** **• Stakeholder: Grassy- Artesian spring (arrow)** • Surface water elevation reference- 601.1 ft; might want ≥10 yr summer mean, low & high measures of surface water elevation • How much excavated at Kingsbury Bay below delta (healthy wetland community)? If not excavated, can't achieve depths originally planned • Habitat classes similar to those from Spirit Lake Concept Plan • Tom will contact Carol R about invasive species maps • Kingsbury Bay: Reduce impacts to high quality aquatic vegetation in more open portions of KB south of the delta by reducing cubic yards dredged in lower areas of KB. Instead use Grassy Pt sediments from invasive cattail stands that also need to be removed. • Park amenities create access to water habitat • Grassy Point: Significant areas of invasive cattails and a smaller area of invasive phragmites are present and need to be removed. These areas could be dredged out to provide sediment for new upland areas & restore wetlands. • Removal of cattails in Gr(assy) P(oin)t (N) Δ reeds (invasives)

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Primary (Indirect health impact) *(Cont. from previous pg)*	What types of water habitat, vegetation (including invasive species), and fauna (including fish) are currently present at the project sites? *(Cont. from previous pg)*	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the type of water habitats, vegetation (including invasive species), and fauna (including fish) at the project sites in the short-term and long-term? *(Cont. from previous pg)*					• Both Kingsbury Bay & Grassy Point: Invasive species control of narrowleaf cattails, phragmites (invasive species) and purple loostrife will be needed in surrounding areas (e.g., ½ to 1 mile radius of each project) to reduce re-seeding of invasive species from nearby populations on Clough Island, near Munger Landing & Talus Island, esp(ecially) • Construction disturbance may make sites more vulnerable to invasive species introductions (by boats and barges) and colonization (on disturbed substrates) • Consider plants to accommodate pollinators
Primary (Direct health impact)	What are the current water, sediment, and biota pollutant levels at/near the project sites?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact water, sediment, and biota pollutant levels and exposure of construction crews, recreational users, and individuals fishing for consumption at/near the project sites?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Water contaminant levels • Sediment contaminant levels and remediation efforts • Biota contaminant levels • Fish consumption/water contact advisories • # visitors/users • Sediment disturbance (planned dredging and sediment placement areas) • Waterborne equipment leaks • Stormwater infrastructure (storm water outlets, sediment traps, and retention areas) • Erosion/runoff (sources and mitigation)	• GIS data - sediment disturbance, storm water infrastructure • Army Corps standard method for considering risk of suspended sediment • Sediment core data • Surface-weighted Average Concentration Model (SWAC) • Yellow Perch Biota-Sediment Accumulation Factors (BSAF) Model • MNDNR Fish Consumption Advisories and Consumption Guidelines • MN Department of Health Water Contact Advisories • Literature on impact of construction and erosion/runoff and suspended sediment on water quality, impact of natural environment and stormwater retention on water quality, and exposure to water, sediment, and biota pollutant exposure	• Literature/secondary data review • Qualitative analysis of exposure to contaminants • Modelling/analysis of sediment and biota contamination levels and suspended sediment risk	**• Kingsbury Bay and Grassy Point are primarily contaminated with organic compounds and some metals discharged from a variety of sources (industry, local sanitation facilities before the combined sanitation facility was built, and other sources). And of course, at Grassy Point you have the wood waste and byproducts of the processes that took place at the two saw mills that used to stand at that site – things like oils.**

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Water Habitat and Quality Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact) *(Cont. from previous pg)*	What are the current water, sediment, and biota pollutant levels at/near the project sites? *(Cont. from previous pg)*	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact water, sediment, and biota pollutant levels and exposure of construction crews, recreational users, and individuals fishing for consumption at/near the project sites? *(Cont. from previous pg)*					• The values shown on the PEC-Q scale are probable effect concentration quotients averaged for the entire site. While average contamination levels are low and not of concern for wildlife and humans, you will see for Grassy Point there are plans to remove some of the wood waste and remediate some of the areas of the site where we see higher levels of contamination using a sediment cap. • Resident: Kingsbury - Fill/contamination with unnatural materials • Resident: Railroad ties treated near Grassy • Stakeholder: Army Corps off-load dock for Erie Pier (arrow point to Erie Pier) • Stakeholder: Disrupt the XIK cap with hydraulic dredge (arrow) • Stakeholder: Future/long-term uses of adjacent property. Stockpiling & storage of industrial materials. • Stakeholder: Positive interaction with the port? • Stakeholder: Material migration from Reiss? (Conversation: Concern here was focused on the current and future use of Grassy Point; not specific to the construction phase) • Stakeholder: Concern about long-term stability of contaminant cap • Stakeholder: Non-lethal water quality affects on fish habitat quality, NH3, BOD (?), caused by excessive wood waste • Stakeholder: Kingsbury- Are there chemicals of concern from up the hill as Kingsbury goes through Proctor?

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Water Habitat and Quality Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact) *(Cont. from previous pg)*	What are the current water, sediment, and biota pollutant levels at/near the project sites? *(Cont. from previous pg)*	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact water, sediment, and biota pollutant levels and exposure of construction crews, recreational users, and individuals fishing for consumption at/near the project sites? *(Cont. from previous pg)*					**• Stakeholder: Kingsbury- NEED TO ADDRESS WATERSHED SOURCES OF SEDIMENTATION** **• Stakeholder: Kingsbury- Current sedimentation pond and lower Kingsbury creek within zoo are neglected and not functioning well. Also aesthetically unpleasant.** **• Stakeholder: Change in Kingsbury Creek flow** **• Stakeholder: CCT will require box culvert under BN adjacent Kingsbury Creek** • Erosion/runoff should take into account concerns during construction and human recreation during park operations, as well as mitigation features (stormwater retention pond, natural areas with sediment and pollutant filtering capacity vs. impervious surface) • Need to address stormwater management and sediment flow at the watershed level; fixing the mouth of the stream before fixing the watershed is foolish • Stakeholder: Grassy - Artesian well?? Look at affect on contaminants cap. • There is one stormwater retention pond proposed, but we need to ask about its operating capacity • Propose using Yellow Perch BSAF model, so yellow perch stands in as representative of whole assemblage • Water contact advisory is probably no change • Mercury Pol(lution): May limit the use of fishing facil(ities) • Capping of contaminated sediments is like "sweeping the dirt under the rug." It only forces the future generations to deal with the contamination • People will notice increased turbidity (muddy or dirty water) or oil slicks and feel impacted

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Water Habitat and Quality Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact)	What is the current opportunity for and risk of consumption of fish from or nearby the project sites?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the opportunity for and risk of consumption of fish from or nearby the project sites?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Game fish presence/ absence • Opportunities for fishing (depth, habitat)	• Empirical data from previous surveys (Peterson et al. 2012) • GIS data - elevation and bathymetry data, surface water elevation • SAV model • Depth-based aquatic habitat classification • Hollenhorst and Petersen model (sheltered Bay classification) • Literature on game fish presence/absence and opportunities for fishing based on water habitat, depth, and quality	• Literature/secondary data review • SAV modelling (vegetation data) • Depth-based aquatic habitat classification • Hollenhorst and Petersen model (sheltered Bay classification) • Hypsographic curve analysis	**• Stakeholder: Grassy- Stupid people fishing at Superfund site**
Primary (Health outcome)	What are the baseline health conditions associated with nutrition, chronic disease, waterborne illness, and skin/eye ailments in the study area?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact nutrition, chronic disease, waterborne illness, and skin/eye ailments?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Nutrition, including pre-term births and low birth weight • Chronic disease rates (cardiovascular and pulmonary disease, stroke) • Water-borne illness • Stress (poor mental health, high blood pressure, heart disease, obesity, diabetes, decreased immune response) • Skin/eye ailments • State health standards for output of Yellow Perch BSAF Model	• 500 Cities Health Data (asthma, chronic obstructive pulmonary disease, coronary heart disease, high blood pressure, stroke, diabetes, obesity, physical health, mental health, chronic kidney disease*) • Duluth Community Health Needs Assessment • County-level health data • Health department data • National Health and Nutrition Examination Survey (NHANES) • Literature on impact of water, sediment, and biota pollutants on health and impact of fish consumption on nutrition	• Literature/secondary data review • Qualitative and/or quantitative analysis of health impacts	• All 500 Cities health data are reported for adults aged ≥ 18 years * Need to discuss if chronic kidney disease is the correct health endpoint

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Equipment Operation, Traffic, and Transport Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Indirect health impact)	N/A	During habitat restoration and park improvement construction activities, what construction equipment will be in use and during what schedule of operations?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities	• # and type of construction equipment • Construction operations schedule • Construction idling practices	• MNDNR Design (including Operations Plan) • Literature on typical construction equipment for habitat restoration and park improvements and operations schedules, etc.	• Literature/secondary data review	• Construction operations schedule includes days per week, hours of operation, time of day, time of year.
Primary (Direct health impact)	What are the current traffic volumes and associated traffic conditions (traffic accidents, road conditions, and congestion) at project sites and on local roads?	To what extent will truck and vehicle traffic associated with habitat restoration and park improvement construction impact traffic volumes and associated traffic conditions (traffic accidents, road conditions, and congestion)?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities	• Traffic volumes • Traffic accidents • Road conditions • Time spent in traffic • # trucks transporting sediment • Construction/operations schedule • Park visitor rates (as proxy for park vehicle traffic) • Park schedule of operation	• Irving Fairmount traffic study (baseline)? • AADT traffic volumes • GIS data - road/trail layers, traffic lights/controls, amount of traffic • MNDNR Design including proposed truck transport and access ("temporary" construction roads) route(s) and schedule • Duluth City Parks (statistics) • Public input/social media on park visitation • Literature on construction- and park- associated traffic and impact of traffic on accidents, road conditions, and congestion, etc.	• Literature/secondary data review • Qualitative analysis of road conditions and congestion • Forecast/estimate change in traffic volume during construction activities and during park operations and maintenance (translate volume of sediment trucked into # of trucks; park visitation rates into traffic) • GIS analysis - buffer around truck route, access roads, and sites to determine population impacted	• Road conditions includes potholes, broken curbs, collapsed manholes, rail crossings made worse • Construction/operations schedule and park schedule of operation includes days per week, hours per day, time of day, and time of year. • Traffic related impacts include impacts to construction crews, residents, and recreational users
		To what extent will vehicle traffic associated with park operations and maintenance impact traffic volumes and associated traffic conditions (traffic accidents, road conditions, and congestion)?	• Park Improvement Operations and Maintenance activities				
Primary (Direct health impact)	What is the current risk of exposure to sediment at/near the Kingsbury Bay site?	To what extent will habitat restoration activities impact the risk of exposure to Kingsbury Bay sediment in transport?	• Habitat Restoration Construction/Operations activities	• Sediment contamination levels • # trucks transporting sediment	• Sediment core data • MNDNR Design including proposed truck and pipe route(s) and schedule • Literature on construction transport and fugitive dust, exposure pathways, exposure to Kingsbury Bay sediment, etc.	• Literature/secondary data review • Qualitative analysis of change in risk (translate volume of sediment trucked into # of trucks) • GIS analysis - buffer around truck/pipe route to determine population impacted	• MNDNR at Kick-off meeting: Funds from the Natural Resource Damage Assessment settlement will be used to excavate material from Kingsbury Bay and the river delta and transport it to Grassy Point for the beneficial reuse of covering wood waste. 65,000 cubic yards will be removed from Kingsbury Bay during the winter and hauled over land by truck (i.e., 6,500 dump truck loads); the remainder of Kingsbury Bay will be dredged during the summer and moved via a pipe located on the water and will then cut through the Interlake Superfund site [Confirm] • Stakeholder: (arrows) Material movement under interstate. * Not on Raleigh.

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Equipment Operation, Traffic, and Transport Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact) (Cont. from previous pg)	What is the current risk of exposure to sediment at/near the Kingsbury Bay site? (Cont. from previous pg)	To what extent will habitat restoration activities impact the risk of exposure to Kingsbury Bay sediment in transport? (Cont. from previous pg)					• Stakeholder: Traffic on Grand?? • Contaminated or just sediment in general? • Inhalation and ingestion? Or just inhalation? • Exposure to sediment includes construction crews, residents, and recreational users • Core data will show level of contamination (should be safe if allowed to move) • Sediment will be partially frozen during transport by truck
Primary (Health outcomes)	What are the baseline health conditions associated with chronic disease, traffic-related injury and death, and stress in the study area?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact chronic disease, traffic-related injury and death, and stress?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Chronic disease rates (cardiovascular and pulmonary disease, cancer) • Traffic-related injury and death • Stress (poor mental health, high blood pressure, heart disease, obesity, diabetes, decreased immune response)	• 500 Cities Health Data (asthma, chronic obstructive pulmonary disease, coronary heart disease, high blood pressure, stroke, diabetes, obesity, physical health, chronic kidney disease*, cancer*) • Duluth Community Health Needs Assessment • County-level health data • Health department data • Literature on impact of sediment contaminants on health and traffic and traffic-related conditions (accidents, road conditions, and congestion/time spent in traffic) on health	• Literature/secondary data review • Qualitative and/or quantitative analysis of health impacts	• All 500 Cities health data are reported for adults aged ≥ 18 years * Need to discuss if these are the correct health endpoint. Cancer includes any type of cancer besides skin cancer

Kingsbury Bay-Grassy Point Health Impact Assessment

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Noise and Light Pollution Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct and indirect health impact)	What are the current sources and/or levels of noise pollution in the study area?	How will equipment operation and truck and vehicle traffic impact noise levels and the exposure of construction crews, residents, and recreational users (actual and perceived) to noise at/near project sites and along roadways?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities	• Noise sources/levels • Traffic volumes • # trucks transporting sediment and truck routes • # and type construction equipment • Idling of construction equipment • Construction operations schedule	• Irving Fairmount Traffic Study (Baseline)? • MNDNR Design, incl. proposed truck routes and access ("temporary" construction) roads • GIS data - road/trail layers, traffic lights/controls, amount of traffic • Literature on vehicle and equipment noise levels, noise exposure, impact of season and time of day on noise exposure, impact of noise on humans (and fauna), etc.	• Literature/secondary data review • Quantitative analysis - translate volume of sediment trucked into # of trucks • Estimate/forecast change in noise from equipment and traffic • GIS analysis - buffer around truck route, access roads, and project sites to determine population impacted	**• Construction operations schedule includes days per week, hours of operation, time of day, time of year.** **• Does summer v. winter make a difference in the distance from which you can hear noise? (summer v winter buffers)** **• Limit dredging operations to daylight hours in winter and to work/school hours (e.g., 9am-7pm) during summer?**
Primary (Direct and indirect health impact)		How will vehicle traffic associated with park operations and maintenance impact noise levels and along roadways and the exposure of residents and recreational users to noise at/near project sites?	• Park Improvement Operations and Maintenance activities	• Noise sources/levels • Traffic volumes • # park visitors (as proxy for park vehicle traffic)	• Irving Fairmount Traffic Study (Baseline)? • GIS data - road/trail layers, traffic lights/controls, amount of traffic • Literature on vehicle and equipment noise levels, noise exposure, impact of noise on humans (and fauna), etc.		**• Assume impact will be low for Grassy Point and potentially unpredictable for Kingsbury (depends on traffic from Zoo and Indian Point Campground)**
Secondary		How will noise levels impact fauna at/near the project sites, including the zoo?					
Primary (Direct health impact)	What are the current sources and/or levels of light pollution in the study area?	How will nighttime equipment operation and truck and vehicle traffic impact light levels and the exposure of construction crews, residents, and recreational users to light at/near project sites and along roadways?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities	• Light sources/levels • Construction operations schedule	• MNDNR Design, incl. proposed truck routes and access ("temporary" construction) roads • Literature on vehicle and equipment light pollution levels, exposure to light pollution, impact of light pollution on humans (and fauna), etc.	• Literature/secondary data review • GIS analysis - buffer around truck route, access roads, and construction site with night time work to determine population impacted	**• Construction operations schedule includes days per week, hours of operation, time of day, time of year.** **• Assume most impacted is first row of homes along Kingsbury Bay?**
Secondary		How will light levels impact fauna at/near the project sites, including the zoo?					

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Noise and Light Pollution Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Health outcome)	What are the baseline health conditions associated with stress, overall health and well-being, chronic disease, injury, hearing/auditory conditions?	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact stress, overall health and well-being, chronic disease, injury, hearing/auditory conditions for construction crews, residents, and recreational users?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Stress (poor mental health, high blood pressure, heart disease, obesity, diabetes, decreased immune response) • Sleep disturbance and cognitive/functional impairment • Chronic disease rates (cardiovascular and pulmonary disease, stroke, chronic kidney disease) • Noise and light-related injury • Hearing/auditory conditions	• 500 Cities Health Data (asthma, chronic obstructive pulmonary disease, coronary heart disease, high blood pressure, stroke, diabetes, obesity, chronic kidney disease*, poor physical health, poor mental health, sleeping less than 7 hours) • Duluth Community Health Needs Assessment • County-level health data • Health department data • OSHA injury rates • Behavioral Risk Factors Surveillance System (BRFSS), the National Health and Nutrition Examination Survey (NHANES), and the National Health Interview Survey (NHIS) • Literature on the impact of noise and light pollution on human health	• Literature/secondary data review • Qualitative and/or quantitative analysis of health impacts	**• All 500 Cities health data are reported for adults aged ≥ 18 years** *** Need to discuss if chronic kidney disease is the correct health endpoint**

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Air Quality Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact)	What are the current air pollutant levels at/near the project sites?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact air pollutant levels and exposure of construction crews, residents, and recreational users at/near the project sites?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Air quality levels (PM 2.5, diesel particulates, dust, ozone, mobile toxics) • # construction equipment • Idling of construction equipment • Truck routes and access roads • Traffic volumes • Reiss dock fugitive dust levels • Presence of green space	• MN Pollution Control Agency, AirNow • MNDNR Design, including Operations Plan • Irving Fairmount traffic study (baseline)? • AADT traffic volumes • GIS data - road/trail layers, amount of traffic, green space • MNDNR Design including operations plan and proposed truck transport and access ("temporary" construction roads) route(s) • Literature on impact of construction equipment and traffic on air quality, air pollution and exposure, and the ability of green space to mitigate air pollution	• Literature/secondary data review • Estimate/forecast change in air pollutants from equipment and traffic (translate volume of sediment trucked into # of trucks; park visitation rates into traffic) • GIS analysis - buffer around truck route, access roads, and project sites to determine population impacted	**• Stakeholder: Grassy - Fugitive dust issue** **• Stakeholder: Grassy - Will fugitive dust issues impair recreation?**
Primary (Direct health impact)	What is the current risk of urban heat island effect in the study area?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact urban heat island effect?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Extreme heat events • Heat-related illness rates • Temp heat maps/surface temps • Vegetation/forest canopy • Impervious surface	• PRISM (temperature model) • County or city health department (heat stress)? • MNDNR 95% design • GIS data - maps of natural areas, temp heat maps, forest canopy, land use/land cover map • I-Tree or solar radiation model • Literature on urban heat island effect, effect of green space on temperature/climate	• Literature/secondary data review • Quantitative analysis - translate volume of sediment trucked into # of trucks • Forecast/model change in urban heat island effect	
Primary (Health outcome)	What are the baseline health conditions associated with heat-related illness, respiratory illness/disease, and chronic disease?	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact heat-related illness, respiratory illness/disease, and chronic disease for construction crews, residents, and recreational users?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Heat-related illness • Respiratory illness/disease, including asthma • Chronic disease rates (cardiovascular and pulmonary disease, stroke, hypertension, cancer, obesity	• 500 Cities Health Data (asthma, chronic obstructive pulmonary disease, coronary heart disease, high blood pressure, stroke, obesity, chronic kidney disease*, cancer*) • Duluth Community Health Needs Assessment • County-level health data • Health department data • OSHA injury rates • Literature on the impact of urban heat island on heat related illness and exposure to air pollutants and respiratory illness and chronic disease.	• Literature/secondary data review • Qualitative and/or quantitative analysis of health impacts	**• All 500 Cities health data are reported for adults aged ≥ 18 years** *** Need to discuss if this is the correct health endpoint. Cancer includes any type of cancer besides skin cancer**

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Crime and Personal Safety Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact)	What are the current crime rates in the study area and state of personal safety at the project sites?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact crime and personal safety of construction crews, residents, and recreational users at/near the project sites?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Crime rates • Aesthetics including unmaintained areas, graffiti, lighting, etc. • Crime Prevention Through Environmental Design (CEPTD)/Deterring incentives • Perceived safety • Pedestrian safety at sites • Traffic safety • Walkability/bikeability • Access points and conditions	• St. Louis County Sherriff • Duluth Police Department (http://www.duluthmn.gov/media/542080/dpd-crime-stats-by-year.pdf) • GIS data: St. Louis County crime mapping, trails, traffic volumes, traffic controls, traffic accidents • Irving Fairmount traffic study (baseline)? • Walkscore • National Highway Traffic Safety Administration Walkability and Bikeability Checklist • Public/stakeholder input • Literature on the impact of natural space and beautification on crime and safety (actual and perceived), crime deterring incentives (CEPTD), impact of crime on safety (actual and perceived) pedestrian and bicycle safety and access	• Literature/secondary data review • Qualitative analysis of aesthetics/CEPTD • Walkability/bikeability analysis • GIS analysis - buffer around project sites to determine population impacted/access • Forecast change in crime and personal safety	• Resident: But I have gone down to Grassy Point and there's a car of boys just sitting there and I don't feel safe and just leave. • Resident: I tried to go to Grassy Point with my mother and my grandchildren and I was scared. The boardwalk was underwater. It wasn't safe. • Resident: Medical needles at Kingsbury Bay • Resident: Grassy Point an embarrassing, neglected mess; neglected - burning wire, crime, vandalism • Resident: Grassy - Junkie Junction • Resident: Grassy- Fear. I feel fear when walking on the GP trail - fear of people there & of the condition of the trail. • Resident: Grassy- Stop (arrow) no boardwalk • Resident: Grassy- Boardwalk destroyed • Resident: Grassy - Junkie world • Resident: Grassy - Safety and traffic hazards. No safe route going to park and Grassy Point. • Resident: Grassy - (name) Safe access to Grassy Pt from Irving. Walking unsafe. • Resident: Grassy - Industrial traffic. Access and safety problems. • Resident: Grassy - Safety. Traffic. • Resident: Grassy - More welcoming feel to access area • Resident: Grassy - Connection is needed from Irving to site. Safe off-road walk/bike park. • Stakeholder: Grassy - Connection of this G.P. area to other trails + neighborhood is missing • Resident: Grassy - Make access area (parking, entry area) more welcoming to draw more people. This would keep illicit use down. • Resident: Grassy - People, especially older women, don't feel safe walking from the community of Irving to Grassy Point. There are a number of barriers including a small under-road tunnel area that would need to be passed through, the unkept nature of existing walking paths, the industrial areas and traffic, plus just crossing the road.

Kingsbury Bay-Grassy Point Health Impact Assessment

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Crime and Personal Safety Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
							(Conversation) • Bikers can neg(atively) impact the visitor experience • Light can have a great improvement on reducing crime • Having a gated park can help with access
Primary (Health outcome)	What are the baseline health conditions associated with crime and personal safety-related injury and stress at/or near the project sites?	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact crime and personal safety-related injury and stress at/or near the project sites?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Injury • Stress (poor mental health, high blood pressure, heart disease, obesity, diabetes, and decreased immune response)	• 500 Cities Health Data (coronary heart disease, high blood pressure, diabetes, obesity) • Duluth Community Health Needs Assessment • County-level health data • Health department data • OSHA injury rates • Literature on the impact of crime and personal safety on health	• Literature/secondary data review • Qualitative and/or quantitative analysis of health impacts	• All 500 Cities health data are reported for adults aged ≥ 18 years * Need to discuss if this is the correct health endpoint. Cancer includes any type of cancer besides skin cancer

Kingsbury Bay-Grassy Point Health Impact Assessment

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Recreation, Aesthetics, and Engagement with Nature Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Indirect health impact)	What is the current status of natural areas and green space in the study area (availability, maintenance, aesthetics, safety)?	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the status of natural areas and green space in the study area (including availability, maintenance, aesthetics, and safety)?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Acres of green space and parks • Condition of green space and parks • Aesthetics • Safety	• Duluth Parks Department • Public/stakeholder input • Literature on relationship between aesthetics and maintenance	• Literature/secondary data review • Qualitative analysis of green space and park maintenance and aesthetics	• Resident: The City already doesn't take care of the Western parks that it has and now they are going to add two more? By show of hands, how many people feel Western parks are neglected? [10 people raised their hands] • Resident: Volunteers are the ones often left responsible for helping to keep the parks maintained • Resident: But I don't think it's fair to say that all Western parks are neglected, because there are improvements being made to some of the parks • Stakeholder: Kingsbury - Keep it simple. Fairmont is a few hundred feet away. Don't duplicate what is there. Duluth lacks money and staff to adequately maintain existing parks and trails. How can this additional park and trail be maintained? Attention to this new park (adding new parks at Fairmont and Quarry) will leave even less money and staff for existing parks and trails. Neglected and poorly maintained parks and trails are a greater negative than positive for health, wellness and happiness. There are multiple other nearby parks people use and enjoy. • Stakeholder: Kingsbury - When nearby current parks are not adequately maintained and have 5-6 foot tall thistles and cockleburs, yet there is planning to create brand new parks, makes users of existing nearby, neglected parks feel bad, frustrated, not important, yes - jealous • Resident: Kingsbury - People using outdoor to "poo" • Resident: Medical needles at Kingsbury Bay • Resident: Kingsbury - Mudflats in summer • Resident: Kingsbury - Cattails and "nasty" mudflats

Kingsbury Bay-Grassy Point Health Impact Assessment

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Recreation, Aesthetics, and Engagement with Nature Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Indirect health impact) *(Cont. from previous pg)*	What is the current status of natural areas and green space in the study area (availability, maintenance, aesthetics, safety)? *(Cont. from previous pg)*	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the status of natural areas and green space in the study area (including availability, maintenance, aesthetics, and safety)? *(Cont. from previous pg)*					• Resident: But I have gone down to Grassy Point and there's a car of boys just sitting there and I don't feel safe and just leave. • Resident: I tried to go to Grassy Point with my mother and my grandchildren and I was scared. The boardwalk was underwater. It wasn't safe. • Resident: Grassy Point an embarrassing, neglected mess; neglected - burning wire, crime, vandalism• Resident: Grassy - Junkie Junction • Resident: Grassy - Do not use area due to lack of upkeep • Resident:Grassy- Rednecks dumping garbage • Resident:Grassy- Fear. I feel fear when walking on the GP trail - fear of people there & of the condition of the trail. • Stakeholder:Grassy- CP Railroad • Stakeholder:Grassy- Lots of debris (shopping carts, tires, garbage, etc.) in Keene Creek • Stakeholder:Grassy- CP Railroad ownership • Stakeholder:Grassy- Have spent time mostly for work - NRDA @SLRIDT nearby. Have been in boat to view fr. water. Industrial. • Stakeholder:Grassy- Fugitive dust issues • Stakeholder:Grassy- Former water + boardwalk - excessive sedimentation + wood waste is aesthetically displeasing + obviously impacts habitat • Stakeholder:Grassy- Current neighbor dock operations impact the site aesthetically • Stakeholder:Grassy- Ex-Carnegie Hall? Location? • Resident: Grassy- Stop (arrow) no boardwalk • Resident: Grassy- After clean up-sell for development. Houses, condos, hotels. • Resident: Grassy- Not maintained now. No $ to properly maintain amenities. Poor maintenance looks bad, feels bad. • Resident: Grassy - Junkie world • Resident: Grassy - Can't use. Poorly maintained

Kingsbury Bay-Grassy Point Health Impact Assessment

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Recreation, Aesthetics, and Engagement with Nature Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact)	What are the current opportunities for recreation and engagement with nature (including amenities, access, and experience, including safety)?	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the opportunity for recreation and engagement with nature (including availability, amenities, access, and experience, including safety)?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Acres of green space and parks/miles trails • Accessibility of green space and parks (roads, traffic, trails, etc.) • Amenities offered (pavilions, picnic areas, fishing piers, play grounds, benches, biking/hiking/other trails, signage/interpretation areas, wild rice, etc) • Flora and fauna presence/absence • Recreational opportunities (camping, fishing, zoo, swimming, boating, birding, snowmobile, ice fishing, physical activity, programming - bird watching, guided hikes, events etc.) • # visits and trail usage • Demographics of visitors/users (age, income, etc.) • Ratings of recreational/ engagement with nature opportunities • Crime and personal safety	• Duluth Parks Department • Kingsbury Bay and Grassy Point Concept Plans (amenities and interpretation) • GIS data (roads, traffic, traffic controls, trails, camping, fishing, zoo, other amenities, signage/interpretation, wild rice, programming, demographic data) • Bald Eagle habitat model, Esocid spawning model or general game fish presence/absence, wild rice model • Shoreline fishing model, pike spawning model, ice fishing model, swimmable water model, boatable water models, birding model • Yellow Perch BSAF model (fish consumption) • Grassy Point Mini Master Plan • Western Waterfront Trail Plan • National Water Trail Plan • Shore fishing SPA maps • Public/stakeholder input on aesthetics, maintenance, and personal safety at project sites • Literature on maintained water habitat/ green space and engagement with nature/recreation; impacts of crime and safety (including safe access), access, amenities and experience on engagement with nature and recreation; recreation and physical activity	• Literature/secondary data review • Qualitative analysis of experience, aesthetics, personal safety • Model/analysis of change in trails (Western Waterfront, Cross-City, water trail, plus biking and hiking), camping (model/data?), zoo visits (model/data?), Spirit Mtn visits (model/data?), winter sports (model/data?), fishing (model), swimming (model), boating (models), birding (model)	• Stakeholder: Western Waterfront Trail, early 1970s, more open water; now difficult to see water • Stakeholder: Kingsbury - In 60s there was many people who caught much smelt near grand avenue on Kingsbury Creek • Stakeholder: Kingsbury - North Shore Free Wheelers Bicycle Club helped construct the trail in the late 1970s • Stakeholder: There are so many nearby parks Keene, Irving, Fairmont, etc. that new amenities at Kingsbury & Grassy will not make me healthier or happier. • Resident: Please keep waterfront trail open during construction • Stakeholder: Frequently bicycle the Western Waterfront Trail • Resident: Kingsbury Bay and Grassy Point offer public access to the river, birds and nature; beautiful • Resident: Kingsbury - Public entry to zoo and river • Resident: Kingsbury - Spring warbler area • Resident: Kingsbury - Beaver habitat • Resident: Kingsbury - Blue herons • Resident: Kingsbury - Birding; This is a birding area (with arrows) • Resident: Kingsbury - Great walking! Really great • Stakeholder: Kingsbury - Unimproved park Mowed - that's it. Sell and build on it. Infill housing many other parks and greenspaces nearby. • Stakeholder: Kingsbury - Drumstick Island • Stakeholder: Kingsbury - Swam till city dumped sewage -> no more swimming ---------- • Stakeholder: Kingsbury - SO important to protect the restored habitat • Stakeholder: Keep it simple. Fairmont is a few hundred feet away. Don't duplicate what is there. • Stakeholder: Kingsbury - What is recommend from Irving-Fair Brownfield Pln?

Kingsbury Bay-Grassy Point Health Impact Assessment

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Recreation, Aesthetics, and Engagement with Nature Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact) *(Cont. from previous pg)*	What are the current opportunities for recreation and engagement with nature (including amenities, access, and experience, including safety)? *(Cont. from previous pg)*	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the opportunity for recreation and engagement with nature (including availability, amenities, access, and experience, including safety)? *(Cont. from previous pg)*					• Stakeholder: Kingsbury - Preferred outcomes -improved fish and wildlife habitat -enhanced people access for a variety of uses • Stakeholder: Kingsbury - Important to have healthy resources (water, fish, wildlife, plants) and available access to these resources -necessary for exercise of treaty rights, also recreation • Stakeholder: Kingsbury - Consult with Bands on Indian Point - importance/history -plans moving forward • Stakeholder: Kingsbury - Indian Point Mini-Master Plan anticipated for late 2017 or 2018 • Stakeholder: Kingsbury - Expand campground - rvs, campers and tents • Resident: Keep campground, make bigger if possible • Stakeholder: Kingsbury - Plans for Indian Point? Continue/improve camping? - city seems short on camping opportunities. • Stakeholder: Kingsbury - Don't lose or decrease campground space. Keep it campground focused, RV, tents, etc. • Resident: Kingsbury -No snowmobile access, so they use WWFT, need designated access to the bay • Resident: Kingsbury -Keep area near Munger/WWFT tranquil • Resident: Kingsbury - Use existing access; the restoration plan doesn't need to add access points to the river as there are already access points in the region) • Stakeholder: Kingsbury - Recreational facilities -canoes -kayaks -bikes • Resident: Leave mouth of Kingsbury natural. No access. Move access for kayaks and snowmobiles to the campground where there is already a parking lot. • Resident: Deepening channel at Kingsbury Bay will make better fishing conditions = more boats in bay • Resident: Kingsbury - Small power boating fishing. No access across river from homes. • Resident: Kingsbury - In (up arrow) low water, no enough room if leave this mat for boats

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Recreation, Aesthetics, and Engagement with Nature Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact) *(Cont. from previous pg)*	What are the current opportunities for recreation and engagement with nature (including amenities, access, and experience, including safety)? *(Cont. from previous pg)*	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the opportunity for recreation and engagement with nature (including availability, amenities, access, and experience, including safety)? *(Cont. from previous pg)*					• Resident: Need less cars. Water taxi from downtown or Lincoln Park • Stakeholder: Kingsbury- Improved canoe/kayak access at the site would be welcome addition -closer in to mouth of creek such as on map • Resident: Kingsbury -Swimming? • Resident: Kingsbury -Fishing on docks/piers • Resident: Kingsbury -Take out old barge "Alice-Vivian" • Stakeholder: Kingsbury- MN DNR Fishing in the Neighborhood Program (name) • Stakeholder: Kingsbury- I want improved hiking experience here better view. I like the beach idea! • Stakeholder: Kingsbury- If swimming access is improved, monitoring for pathogens would need to be considered. Management of waterfowl if swimming beach. • Stakeholder: Kingsbury- Good site for active cultural interpretation, i.e., seasonal wild rice camp, fishing • Stakeholder: Kingsbury- Stormwater Treatment Facility (Noise, appearance, etc.) • Stakeholder: Kingsbury- Will this be used to catch sediments? Will it get filled and be periodically cleaned? How is that a rain garden? • Stakeholder: Kingsbury- Storm water treatment facility - what is this? Don't recall this on Fairmont/Zoo plan _____ • Resident: Grassy - Junkie Junction •Resident: Grassy - Do not use area due to lack of upkeep • Resident: Grassy- Rednecks dumping garbage • Resident: Grassy- Fear. I feel fear when walking on the GP trail - fear of people there & of the condition of the trail. • Resident: Grassy- Stop (arrow) no boardwalk • Resident: Grassy- Safety and traffic hazards. No safe route going to park and Grassy Point. • Resident: Grassy- (name) Safe access to Grassy Pt from Irving. Walking unsafe.

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Recreation, Aesthetics, and Engagement with Nature Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact) *(Cont. from previous pg)*	What are the current opportunities for recreation and engagement with nature (including amenities, access, and experience, including safety)? *(Cont. from previous pg)*	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the opportunity for recreation and engagement with nature (including availability, amenities, access, and experience, including safety)? *(Cont. from previous pg)*					• Resident: Grassy- Industrial traffic. Access and safety problems. • Resident: Grassy- Safety. Traffic. • Resident: Grassy- More welcoming feel to access area • Resident: Grassy- Connection is needed from Irving to site. Safe off-road walk/bike park. • Resident: Grassy- People, especially older women, don't feel safe walking from the community of Irving to Grassy Point. There are a number of barriers including a small under-road tunnel area that would need to be passed through, the unkept nature of existing walking paths, the industrial areas and traffic, plus just crossing the road. (Conversation) • Resident: Grassy- Little pond (with arrow) so great for birding - love it. And peaceful (when not afraid!) • Resident: Grassy Point offers great wildlife viewing and birding • Resident: Use Grassy Pt to access the river to walk on the ice with dogs • Stakeholder: Grassy- Hiking. Picnic. Geo-cache. Snow-shoe. • Resident: Grassy- Need more explanation of what is there. Encourage more visitors. • Resident: Grassy- Make access area (parking, entry area) more welcoming to draw more people. This would keep illicit use down. • Resident: Grassy- Access for kayak. Walk in to launch. • Resident: Grassy- (arrow) Artesian spring in this area • Resident: Grassy- Signage to direct way to park • Resident: Grassy- Fishing pier for kids focused on safe access • Stakeholder: Grassy- What is green infrastructure? • Stakeholder: Grassy- Opportunity for aesthetics & education & water treatment • Stakeholder: Grassy- Improved access to upland & open water habitat would be welcome addition (upland access is very limited currently)

Kingsbury Bay-Grassy Point Health Impact Assessment

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Recreation, Aesthetics, and Engagement with Nature Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact) *(Cont. from previous pg)*	What are the current opportunities for recreation and engagement with nature (including amenities, access, and experience, including safety)? *(Cont. from previous pg)*	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the opportunity for recreation and engagement with nature (including availability, amenities, access, and experience, including safety)? *(Cont. from previous pg)*					• Stakeholder: Grassy- Improved upland habitat to accompany open water improvements would more fully enhance the site experience • Stakeholder: Grassy- Many trails in this small area can decrease the nature that people are going there to enjoy. Keep it simple. Irving Park is only a block away. Don't duplicate what is there. Poorly maintained parks are a greater negative than they are a benefit for health, wellness, happiness, tourism & neighborhood value. Poorly maintained parks & trails make neighbors and users feel not valued, not worthwhile. • Stakeholder: Grassy- Interesting the trail system would encourage my recreational use of the area • Stakeholder: Grassy- Not a city park. Land is tax forfeit. • Stakeholder: Grassy- Birdwatching "hotspot" - nice accessibility to see biodiversity. *Hopefully focus on non-motorized boating - minimize disturbance. • Stakeholder: Grassy- Should improve fishing • Stakeholder: Grassy- Can some signage provide history of site? So everyone can know what the site was like - railway yard & how did it get converted to this new experience? • Stakeholder: Grassy- Will fugitive dust issues impair recreation? • Stakeholder: Grassy- No need for 3 boat launches. One is fine. Use the one closest to the Reiss dock - hardened surface & protection from wind & waves for loading & unloading. | Conflict with 3 acres where boat channel crosses boardwalk. Bridge needed? Is this feasible? Practical? • Stakeholder: Grassy- Is the forked trail going into the water feasible? Practical? Needed? The current floating things are unusable & unsafe. Current area has not been maintained city lacks funds & staff to maintain existing infrastructure. Why would we expect anything to be different going forward?

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Recreation, Aesthetics, and Engagement with Nature Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Direct health impact) *(Cont. from previous pg)*	What are the current opportunities for recreation and engagement with nature (including amenities, access, and experience, including safety)? *(Cont. from previous pg)*	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact the opportunity for recreation and engagement with nature (including availability, amenities, access, and experience, including safety)? *(Cont. from previous pg)*					• Creation of water habitat/ beautified natural areas improves aesthetics and space for engagement with nature • Construction - lack of access/ impaired experience at Grassy Point, Indian Point Campground, and Western Waterfront Trail (different constituents) • Habitat restoration provides opportunity for rec in long-term • Overuse/conflicting use because of development; bikes-hikers, dogs-wildlife, too many people • ADA accessible water access • What if elevation of island at Grassy Point raised 2-3 ft? (Current elevation only 3 in. above water line; impacts accessibility) • Expensive for city to develop permanent connection to island - what does it mean to not have access to the island by foot (only access by water)? • City not interested in a peninsula vs. island at Grassy Point (more material , Keene Creek outlet) • Kingsbury Bay: How far is kayak/canoe launch from the parking area? • Kingsbury Bay/Indian Point Campground – create an accessible canoe/kayak launch site for those with limited ability to carry canoe/kayak a long way from parking • Promoting birding access could have economic benefits • Plan if sustainability is succeeded (too successful) leading to overuse-degradation (e.g., Canal Park) • Use of "citizen science" to collect data to determine extent of success. • Tourism economic metric – develop it new

Kingsbury Bay-Grassy Point Health Impact Assessment

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Recreation, Aesthetics, and Engagement with Nature Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Health outcomes)	What are the baseline health conditions associated with nutrition, overall health and well-being, stress, and chronic disease?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact nutrition, overall health and well-being, stress, and chronic disease?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Nutrition, including pre-term births and low birth weight • Overall health and well-being • Stress (poor mental health, high blood pressure, heart disease, obesity, diabetes, and decreased immune response) • Chronic disease rates (cardiovascular and pulmonary disease, stroke, cancer, obesity, high cholesterol) • Physical activity rates	• 500 Cities Health Data (asthma, chronic obstructive pulmonary disease, coronary heart disease, high blood pressure, stroke, diabetes, obesity, physical health, mental health, cancer*, high cholesterol, no leisure time physical activity) • Duluth Community Health Needs Assessment • County-level health data • Health department data • Behavioral Risk Factors Surveillance System (BRFSS), the National Health and Nutrition Examination Survey (NHANES), and the National Health Interview Survey (NHIS) • Literature on health impacts of engagement with nature, recreation, and physical activity and impact of fish consumption on nutrition	• Literature/secondary data review • Qualitative and/or quantitative analysis of health impacts	**• All 500 Cities health data are reported for adults aged ≥ 18 years** *** Need to discuss if this is the correct health endpoint. Cancer includes any type of cancer besides skin cancer**

Kingsbury Bay-Grassy Point Health Impact Assessment

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Social and Cultural Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (direct health impact)	What is the current state of social capital and social cohesion in the study area?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact social capital and social cohesion in the study area?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Social bonding and ties (support) • Social cohesion and social contact • Sense of belonging • Culture and branding, including cultural resources (wild rice, medicinal plants, Indian Point Campground) • Social institutions (churches, schools, community centers) • Education outreach, including signage and interpretation (park amenities, cultural resources, history) • Democracy/public involvement in decision-making • Equity • Public meeting spaces • Connectivity to community resources • Capacity building (jobs) - sidebox (not full analysis)	• 2006 Social Capital Survey • Community Action Duluth • Valley Youth • Instagram data • GIS data: recreation/ community centers, churches, schools, green space, programming, wild rice • MNDNR Design, Concept Plans • Public involvement opportunities for Kingsbury Bay-Grassy Point and other decision-making that impacts community • Literature on social capital, social cohesion, aesthetics and social capital, crime and safety and social capital, sense of belonging, culture, including the use of plants by Native Americans	• Literature/secondary data review • Qualitative analysis of social capital	• Resident: I am optimistic about this process. Many of us have been involved in meetings like these. You asked for our email address and said you will follow up with us. The City has never done that. • Resident: Did the City have a say in the stakeholders that could participate? Because there was a time when a stakeholder list was made up and then when the City saw the list, several stakeholders were uninvited. [No they did not] • Stakeholder: Cross City Trail to go under Grand Ave on West side to connect zoo to WWFT • Stakeholder: Signage and Wayfinding for existing 33 miles of WWFT going in '17/'18 • Stakeholder: Kingsbury- There might have been spirit houses here • Stakeholder: Kingsbury- Why is this called Indian Point. Is there a history that could be told? • Stakeholder: Kingsbury- Consult with Bands on Indian Point - importance/history -plans moving forward • Stakeholder: Kingsbury- Indian Point Mini-Master Plan anticipated for late 2017 or 2018 • Stakeholder: Kingsbury - Important to have healthy resources (water, fish, wildlife, plants) and available access to these resources -necessary for exercise of treaty rights, also recreation • Stakeholder: Kingsbury- Good site for active cultural interpretation, i.e., seasonal wild rice camp, fishing • Resident: Grassy - More welcoming feel to access area • Resident: Grassy - Connection is needed from Irving to site. • Stakeholder: Grassy - Connection of this G.P. area to other trails + neighborhood is missing • Resident: Grassy- Need more explanation of what is there. Encourage more visitors. • Resident: Grassy- Signage to direct way to park • Resident: Grassy- Make access area (parking, entry area) more welcoming to draw more people.

Kingsbury Bay-Grassy Point Health Impact Assessment
Social and Cultural Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (direct health impact) *(Cont. from previous pg)*	What is the current state of social capital and social cohesion in the study area? *(Cont. from previous pg)*	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact social capital and social cohesion in the study area? *(Cont. from previous pg)*					• Stakeholder: Grassy- Can some signage provide history of site? So everyone can know what the site was like - railway yard & how did it get converted to this new experience? • Stakeholder: Interpretive information - Reiss, XIK, history of the port? • Jobs related to the construction, maintenance, operation/recreation - address in sidebox - opportunity for hiring local • Nonprofit management of park to address issues with maintenance Programming & maintenance; Maintenance; Foundation ($); Citizen science monitoring • Needs to be connected to Irving: schools, Valley Youth, churches • Structured education/interpretation for skills & knowledge development: especially inviting underrepresented groups to become leaders (the leader looks like the student) • Plan to intentionally included underrepresented group and indigenous people? (Interp(retive) signs should not just be on historical industry) • Kingsbury Bay: After removal of invasive buckthorn & honeysuckle shrubs along Western Waterfront Trail, plant culturally useful shrubs and trees such as red osier dogwood ("red willow"), paper birch, raspberries, thimbleberries, blueberries, and other plants used by traditional Indigenous people
Primary (direct health impact)	What is the current state of natural space in the study area for spiritual reflection?	To what extent will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact natural space in the study area used for spiritual reflection?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Nature and spirituality • Sense of belonging • Cultural practices	• Literature on nature and spirituality, cultural practices "Plants Used by the Great Lakes Ojibwa" by James E. Meeker, Joan E. Elias, and John A. Heim. Published by the Great Lakes Indian Fish and Wildlife Commission, Odanah, WI. Copyright 1993. "How Indians Use Wild Plants for Food, Medicine & Crafts" by Frances Densmore. Published by Dover Publications. Copyright 1974.	• Literature/secondary data review • Qualitative analysis of nature and spirituality	• St. Louis River is used by the Anishinabe (many of which reside in Duluth) for spiritual reflection and connection.

Kingsbury Bay-Grassy Point Health Impact Assessment

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Social and Cultural Pathway Assessment Plan

Priority	Baseline Research Question	Impact Research Question	Project Phase	Indicators	Data Sources	Analysis Approach	Comments
Primary (Health outcome)	What are the baseline health conditions associated with overall health and well-being and stress at/or near the project sites?	How will the Kingsbury Bay-Grassy Point Habitat Restoration Project impact overall health and well-being and stress at/or near the project sites?	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities	• Overall health and well-being (physical and mental health) • Stress (poor mental health, high blood pressure, heart disease, obesity, diabetes, and decreased immune response)	• 500 Cities Health Data (coronary heart disease, high blood pressure, diabetes, obesity) • Duluth Community Health Needs Assessment • County-level health data • Health department data • Behavioral Risk Factors Surveillance System (BRFSS), the National Health and Nutrition Examination Survey (NHANES), and the National Health Interview Survey (NHIS) • Literature on the impact of social capital and social cohesion on health	• Literature/secondary data review • Qualitative and/or quantitative analysis of health impacts	**• All 500 Cities health data are reported for adults aged ≥ 18 years** *** Need to discuss if this is the correct health endpoint. Cancer includes any type of cancer besides skin cancer**

Appendix F – Final HIA Community and Stakeholder Meetings

Upcoming Community Meeting!

Tuesday, March 6, 2018 at ***6:30 - 8:30 pm***

City Center West, 5830 Grand Avenue

Kingsbury Bay-Grassy Point Restoration Project: A Health Impact Assessment

There are numerous habitat restoration projects in and along the St. Louis River to improve water quality and clean-up sediment, restore fish habitat, and create spaces for swimming and boating. The U.S. Environmental Protection Agency (EPA) conducted a health impact assessment (HIA) in western Duluth to consider the public health implications of both the environmental changes to the river at Kingsbury Bay and Grassy Point and the potential park amenities adjacent to the projects.

The purpose of the HIA was to help inform the Minnesota Department of Natural Resources' (MNDNR) and City of Duluth's decisions regarding the design of habitat restoration and subsequent park improvement projects by providing valuable and timely health-focused information.

The HIA evaluated each of the potential decision scenarios using science-based methods and citizen input to provide recommendations intended to maximize benefits and mitigate or avoid harmful impacts to human health.

What is an HIA?

A Health Impact Assessment (HIA) is used to evaluate objectively the potential positive and negative health effects of a project or policy before it is built or implemented, and recommends changes to manage those effects.

Why is HIA important?

HIA is a tool to ensure that health and equity are considered in decision-making.

The EPA is hosting a community meeting to discuss the findings from the HIA and hear resident input on recommendations for MNDNR and the City of Duluth.

For more information about this meeting, please contact:
Katie Williams
williams.kathleen@epa.gov
218-529-5203

We invite you to come and share your input

What you will gain from these meetings:

- Information about the proposed habitat restoration projects, including changes in design
- Information about the HIA process
- Information on the preliminary findings and recommendations of the HIA
- A platform to provide input on the assessment findings and help identify recommendations

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EPA United States Environmental Protection Agency

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Final Community Meeting
March 6, 2018

Agenda

6:30 PM	**Welcome** - Introductions - Meeting Objectives - Meeting Agenda
6:35 PM	**What's the Connection to Health?** - Projects in Your Community and Health - Health Impact Assessment (HIA)
	The Kingsbury Bay-Grassy Point Habitat Restoration Project HIA - Kingsbury Bay-Grassy Point Habitat Restoration and Park Improvements - The HIA Process
6:45 PM	**Poster Presentations – Findings and Potential Impacts to Health**
7:35 PM	**Poster Presentations – Preliminary Recommendations**
8:15 PM	**General Discussion**
8:30 PM	**Next Steps and Meeting Wrap-up**

Meeting Overview

Katie Williams (U.S. Environmental Protection Agency [EPA] Office of Research and Development [ORD]) gave the welcome and opening remarks, briefly introducing each of the Health Impact Assessment (HIA) Leadership Team and Research Team members in attendance. This was followed by a brief presentation, which highlighted the connection between planning and health, and introduced the concept of HIA and the importance of HIA in decision-making.

Joel Hoffman (EPA ORD) then gave an overview of the Kingsbury Bay-Grassy Point Habitat Restoration Project, including the Minnesota Department of Natural Resources (MNDNR) habitat restoration work planned at Kingsbury Bay and Grassy Point and the park improvements and amenities planned at each site, which will be the responsibility of the City of Duluth.

Justicia Rhodus (Pegasus Technical Services, contractor to EPA) then described what was done at each step of the six-step Kingsbury Bay-Grassy Point HIA process, the timeline for the habitat restoration work, and how the HIA has informed that design.

The remainder of the time together was reserved for community consultation and feedback on the HIA findings and preliminary recommendations. Seven stations were set up around the room that corresponded to each of the seven HIA pathways – Water Habitat and Quality; Equipment Operation, Traffic, and Transport; Air Quality; Noise and Light Pollution; Crime and Personal Safety; Recreation, Aesthetics, and Engagement with Nature; and Social and Cultural. Each station contained three posters – the first communicated the HIA findings for that pathway; the second identified the potential impacts to

health via that pathway; and the third identified the preliminary evidence-based recommendations developed to address any disproportionate health impacts, mitigate potential adverse health impacts, or promote potential health benefits of the projects. Attendees rotated through each of the stations, providing their input on the HIA findings and preliminary recommendations.

At the conclusion of the meeting, the next steps of the HIA were discussed.

Meeting Attendees

Fifteen (15) community members attended the final HIA Community Meeting, in addition to the three (3) HIA Leadership Team members, and four (4) HIA Research Team members.

Meeting Attendees and Affiliation

Attendee(s)	Affiliation
Art Swede	Local Resident
Denette Lynch	Local Resident, Friends of Western Duluth Parks and Trails
Pete Olson	Local Resident
Maureen Olson	Local Resident
Will Munger	Local Resident, Business Owner, Friends of Western Parks and Trails
Mary Brisky	Local Resident
Kathy Resberg	Local Resident, Irving Community Club
Craig Sterle	Local Resident, Izaak Walton League
Jeanne Koneczny	Local Resident, Irving Recreation and Events Association
Jeff Urbaniak	Local Resident
Peter Stauduhar	Local Resident, Indian Point Campground/Spirit Lake Marina
Caroline Carlson	Local Resident
Marty Stepinski	Local Resident
Peder Yurisla	Local Resident
Rich Staffon	Local Resident, McCabe Izaak Walton League
Joel Hoffman, Justicia Rhodus, Katie Williams	HIA Leadership Team
Alex Lan, Chelsea Poeppel, Kate Preiner, Samantha Shattuck	HIA Research Team

About the Health Impact Assessment

The EPA is leading a health impact assessment (HIA) of two Great Lakes Area of Concern (AOC) habitat restoration projects being conducted by the Minnesota Department of Natural Resources (MNDNR) – Kingsbury Bay and Grassy Point. The HIA examined the potential public health implications of the restoration projects, including the MNDNR restoration work itself and how people will access and utilize the project sites following restoration. The HIA developed evidence-based recommendations to provide to MNDNR and the City of Duluth (who is responsible for any post-restoration work at these sites) to address any disproportionate health impacts, mitigate potential adverse health impacts, and bolster potential health benefits of the projects.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Why is EPA Leading an HIA?

EPA has identified HIA as a decision-support tool for promoting sustainable and healthy communities. The purpose of this HIA is to help inform the MNDNR Kingsbury Bay-Grassy Point habitat restoration project and the City of Duluth park planning process in 2018.

Community Input

There were multiple opportunities for community input throughout the HIA process:

- In the community kick-off meeting for the HIA held in February 2017, attendees were asked for their thoughts on health and the Kingsbury Bay and Grassy Point sites, there were two question and answer (Q&A) sessions, and a community consultation exercise designed to gather community input specific to the proposed plans for Kingsbury Bay and Grassy Point.
- Based on input from the community and other stakeholders, some example HIAs that looked at dredging and site remediation, and HIA Leadership Team and Research Team discussions, potential health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvement projects were identified. Those potential health impacts were grouped into seven categories or pathways through which the projects could potentially impact health. The preliminary pathway diagrams were shared with kick-off meeting attendees via email, made available at the MNDNR public meeting held in May 2017, and reviewed by the HIA Advisory Committee (made up of community members and other stakeholders).
- This final community meeting for the HIA, included a community consultation exercise designed to gather community input on the HIA findings and preliminary recommendations and a prioritization exercise in which attendees were asked to vote for the five HIA recommendations most important to them. The meeting also offered time for general discussion and Q&A.

Community Consultation Exercise

Following the short presentation on HIA and the Kingsbury Bay-Grassy Point Habitat Restoration Project, attendees rotated through each of the seven poster stations documenting the findings, potential impacts to health, and preliminary recommendations for the HIA pathways. The following questions were used to guide this exercise:

Poster	Questions
HIA Findings and Potential Impacts to Health	• *What are your thoughts on the findings? Did anything "stand out" to you?* • *Was there anything that was presented that you had not seen or heard before?* • *Do you agree with what the findings showed?* • *Do you have any concerns or issues with what was presented?*

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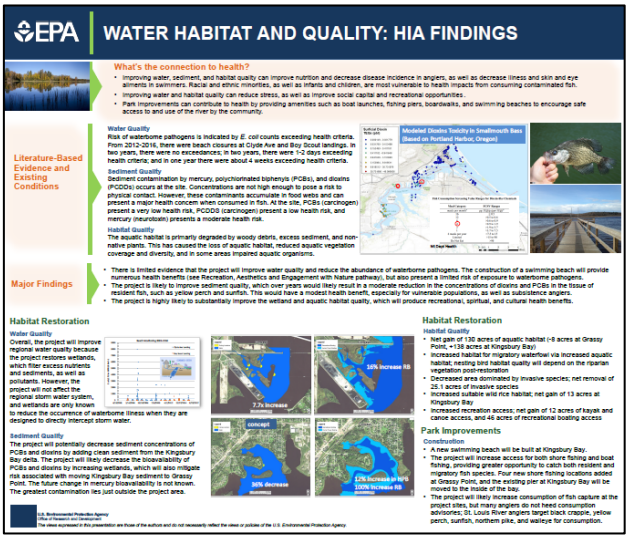
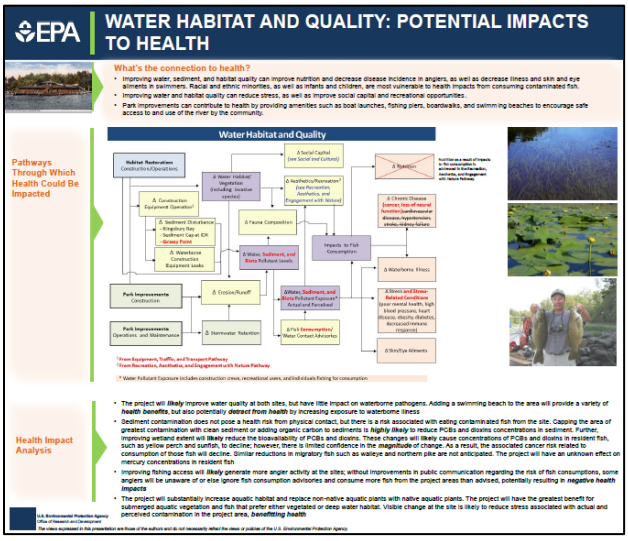
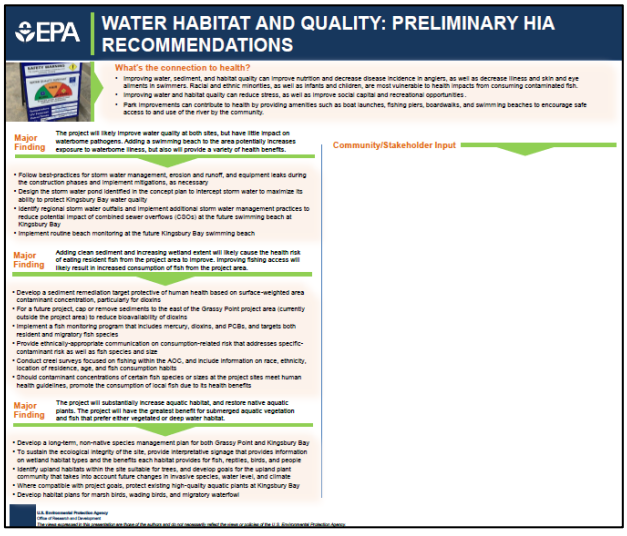
Poster	Questions
Preliminary HIA Recommendations	• *Do you agree with the recommendations made?* • *Do you think the recommendations are feasible/practical?* • *Is there anything that we may have missed or did not include in the recommendations that should be included?*

Attendees engaged in conversation with each other and the HIA Leadership Team or Research Team members at each station and provided input by writing their thoughts on post-it notes and sticking them on the posters. The posters available at each of the stations are shown below, along with the input received via post-it note and conversation.

Water Habitat and Quality







Input Received on Posters

- New growth of green slime at Kingsbury Bay this year
- Do you swim in the river? (incredulity, implying speaker does not believe river is safe for swimming)
- Where will the beach go?
- Where will the wild rice be? (x2)
- Is capping sediment safe?
- Are they going to stop erosion in Kingsbury Creek? (many times)

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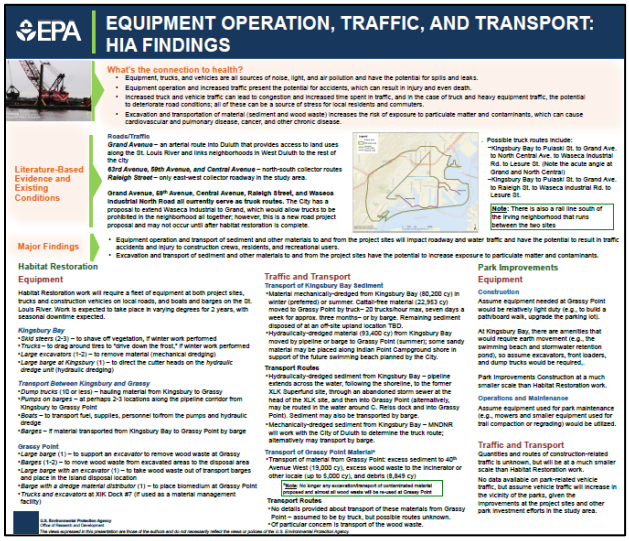
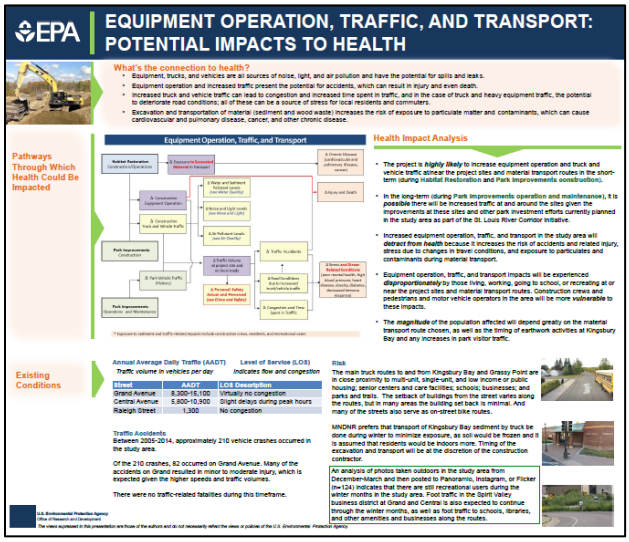
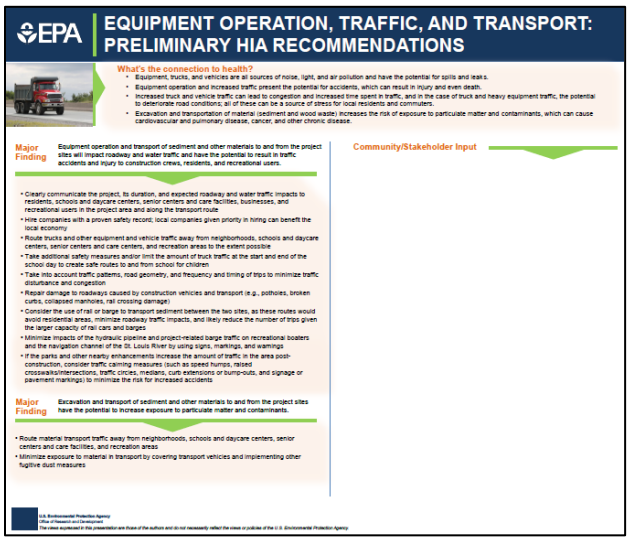
Equipment Operation, Traffic, and Transport







Input Received on Posters

- How/where will the truck-dredge handoff happen?
- Where will the Waseca Industrial Road extension run?

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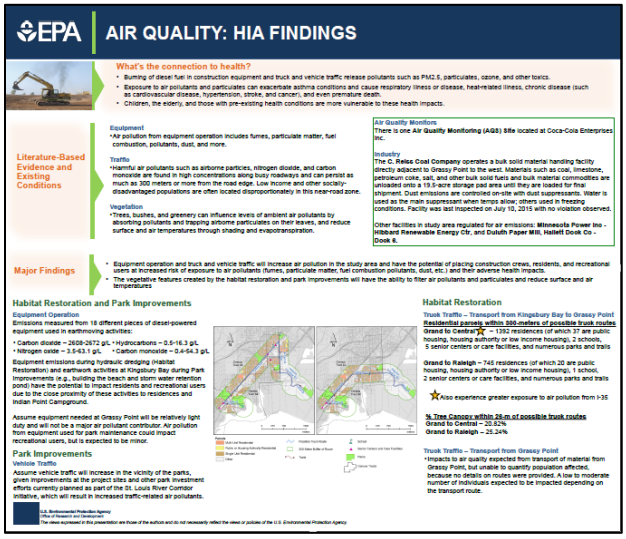
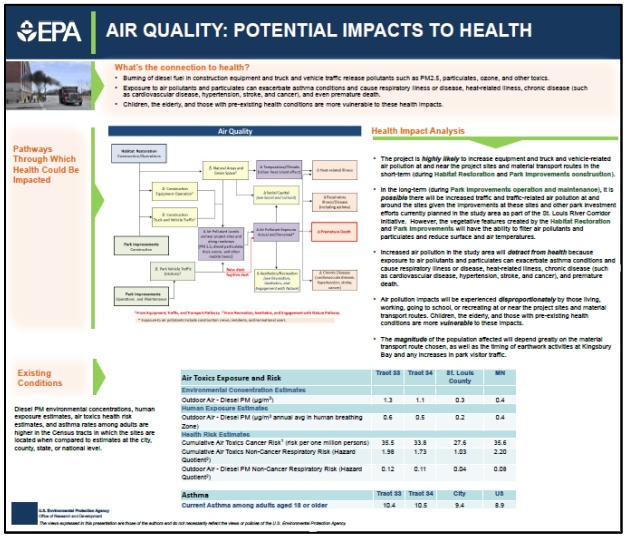
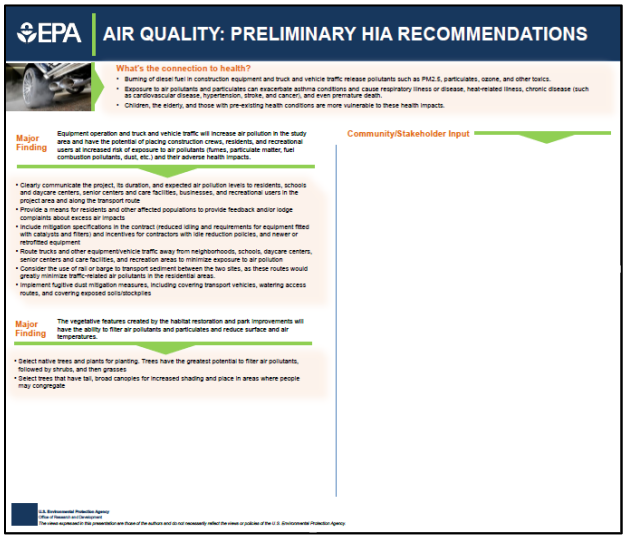
Air Quality







Input Received on Posters

- Select trees that will do well in warming climate

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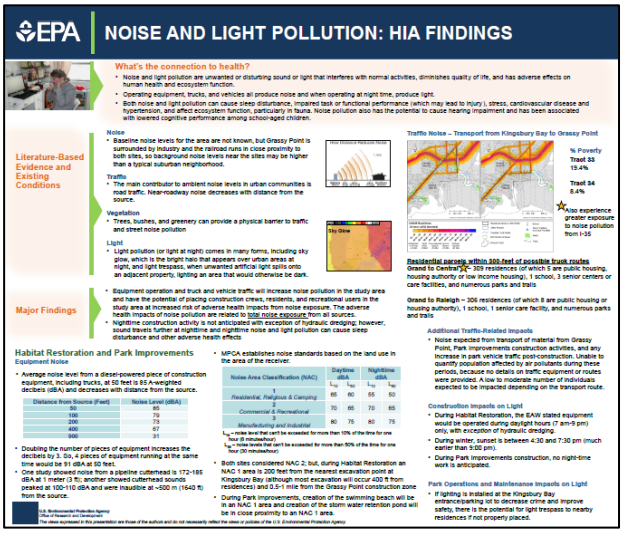
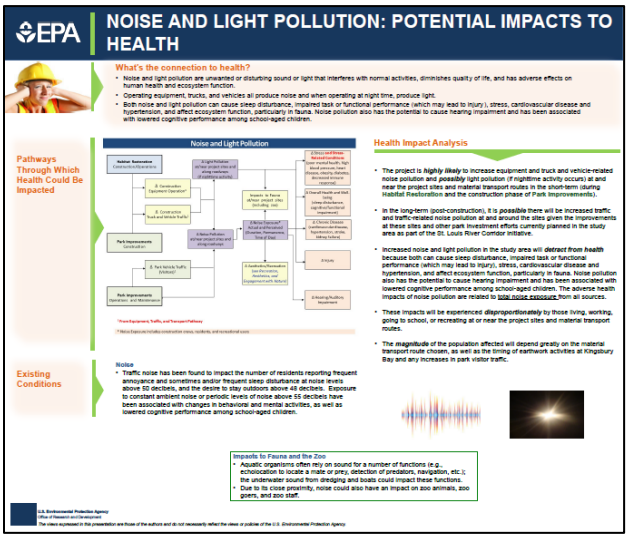
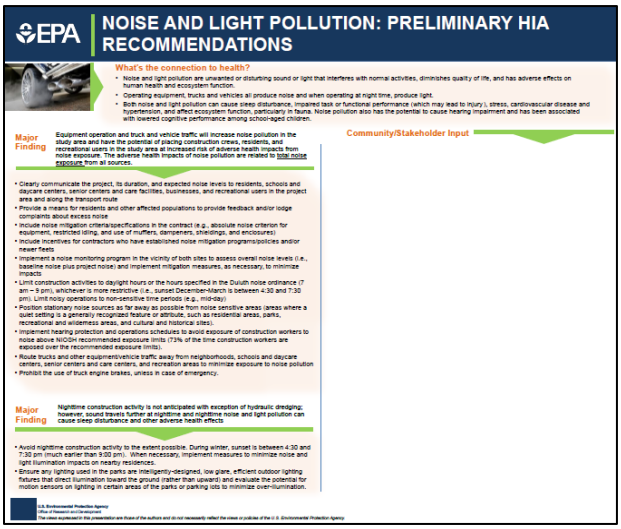
Noise and Light Pollution







Input Received on Posters

None

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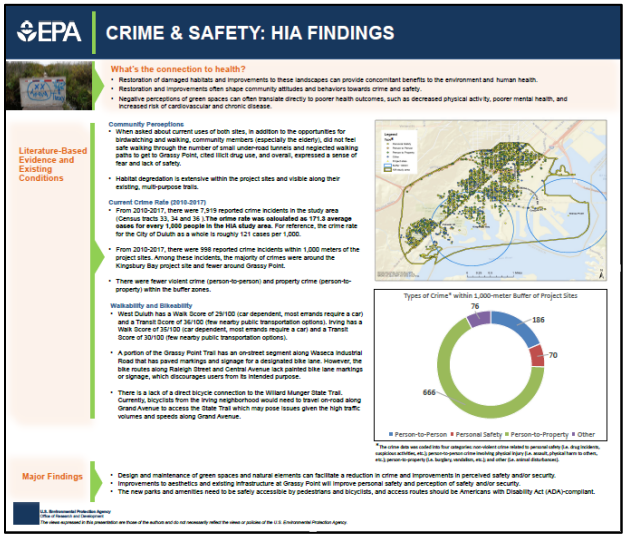
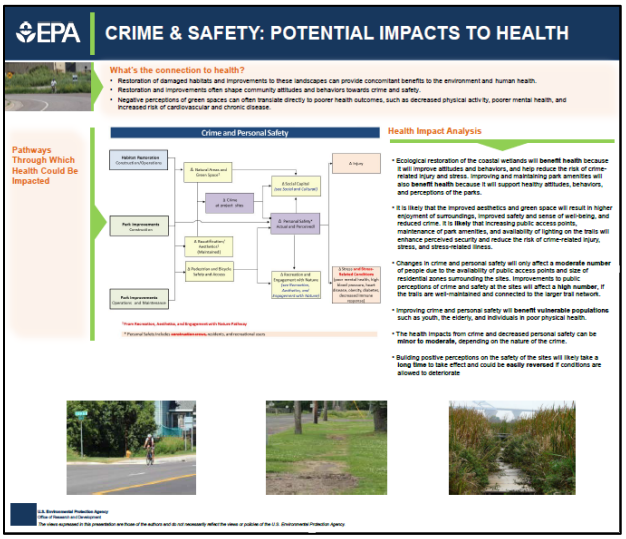
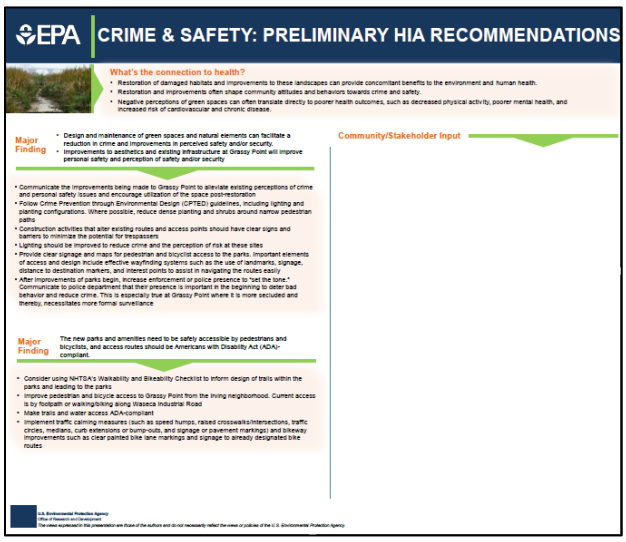
Crime and Personal Safety







Input Received on Posters

- No new bike/pedestrian lanes!
- Many, if not most will arrive by cars. Bike/ pedestrian shouldn't be only consideration
- A way for snow "machines" to enter bay without speeding along trail.
- No night-time lighting
- No lighting – encourages loitering/vandalism; cost; increases maintenance, increases use
- What is the NHTSA Walkability and Bikeability Checklist? Can't support since don't know what it is.
- Who says calming is needed? Speed study? Or is this per "literature"? Untrained person's perception.

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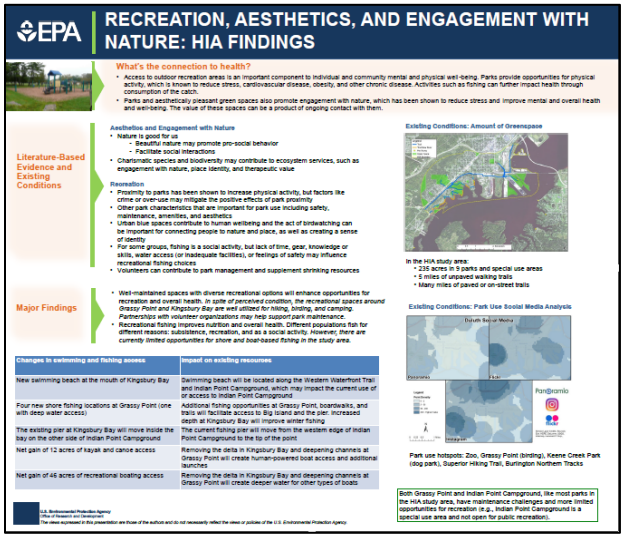
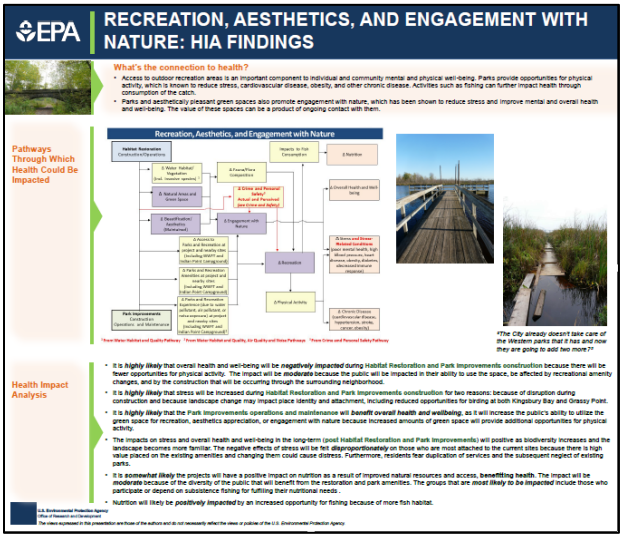
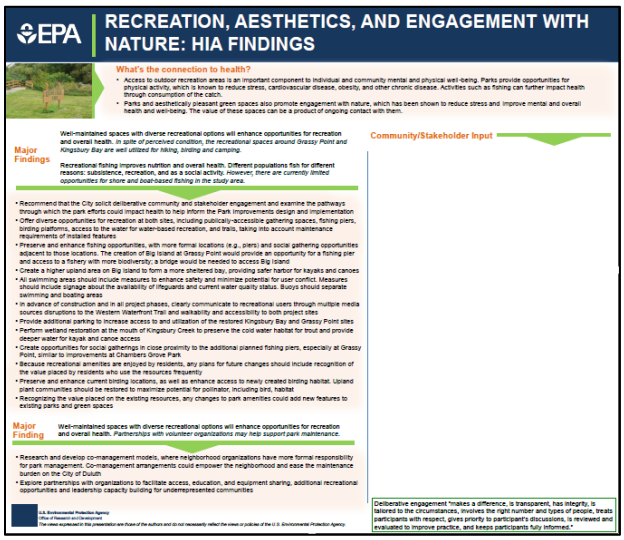
Recreation, Aesthetics, and Engagement with Nature







Input Received on Posters

- Social media graphics not very legible/visible. Explain data better.
- All the study has been done during high water in the bay. Has the very low water year been part of the study?
- This is the first year in 20 years I have noted a now green scum on bay close to shore that you are not going to dig.
- Some can be combined to achieve same goals: fishing, birding, water access, and social spaces can often be the exact same space.

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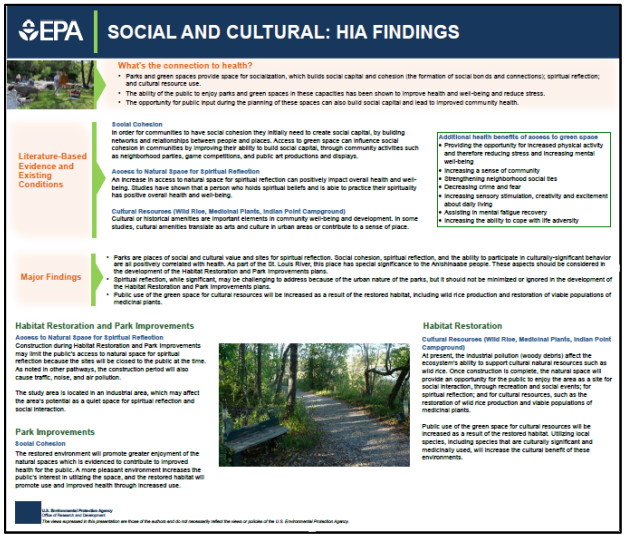
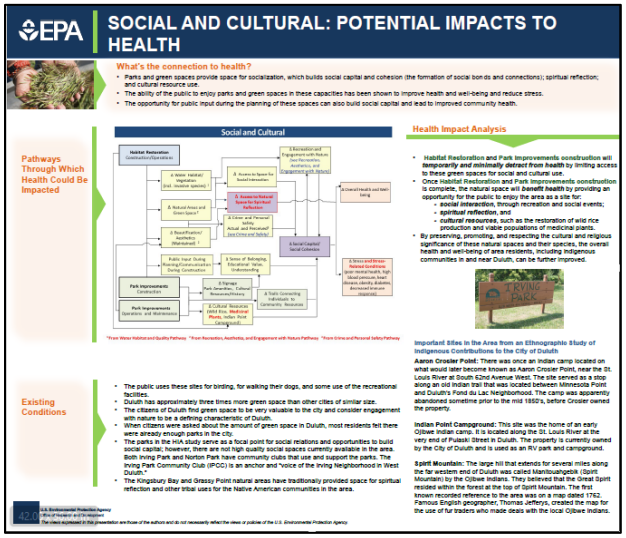
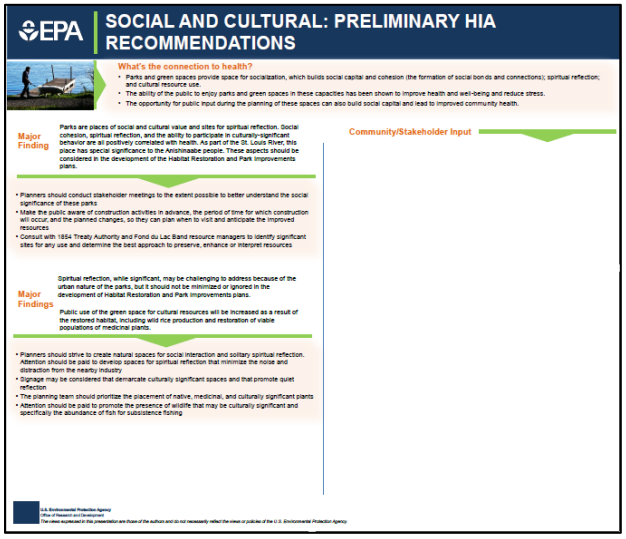
Social and Cultural







Input Received on Posters

- Dog poop stations
- Cultural resources: Not a strong connection between this goal and actual results. Whose culture? If Native Americans, then how can designers ensure that group will use the site.
- Spiritual reflection – serious? These are public parks.
- Really great to see the list of culturally significant sites – Aaron Crosier Point, Indian Point Campground and Spirit Mountain.
- Pathway is not a good word to use to describe the health characterization, especially since we're discussing parks, which may have their own pathways. Another member suggested flow-ways.

Prioritization of Recommendations

During the review of the Preliminary HIA Recommendations posters, attendees were given five post-it flags and asked to vote for the five HIA recommendations that were most important to them. Total votes= 47; not all attendees voted.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Community Priority Recommendations		
Pathway	**Preliminary Recommendations**	**Votes**
Water Habitat and Quality	Design the storm water pond identified in the concept plan to intercept storm water to maximize its ability to protect Kingsbury Bay water quality	4
Air Quality	Select native trees and plants for planting. Trees have the greatest potential to filter air pollutants, followed by shrubs, and then grasses	4
Noise and Light Pollution	Ensure any lighting used in the parks are intelligently-designed, low glare, efficient outdoor lighting fixtures that direct illumination toward the ground (rather than upward) and evaluate the potential for motion sensors on lighting in certain areas of the parks or parking lots to minimize over-illumination.	3
Crime and Safety	After improvements of parks begin, increase enforcement or police presence to "set the tone." Communicate to police department that their presence is important in the beginning to deter bad behavior and reduce crime. This is especially true at Grassy Point where it is more secluded and thereby, necessitates more formal surveillance.	3
Crime and Safety	Improve pedestrian and bicycle access to Grassy Point from the Irving neighborhood; current access is by footpath or walking/biking along Waseca Industrial Road.	3
Recreation, Aesthetics, and Engagement with Nature	Recommend that the City solicit deliberative community and stakeholder engagement and examine the pathways through which the park efforts could impact health to help inform the Park Improvements design and implementation	3
Water Habitat and Quality	To sustain the ecological integrity of the site, provide interpretative signage that provides information on wetland habitat types and the benefits each habitat provides for fish, reptiles, birds, and people	2
Equipment Operation, Traffic, and Transport	Hire companies with a proven safety record; local companies given priority in hiring can benefit the local economy	2
Equipment Operation, Traffic, and Transport	Consider the use of rail or barge to transport sediment between the two sites, as these routes would avoid residential areas, minimize roadway traffic impacts, and likely reduce the number of trips given the larger capacity of rail cars and barges	2
Noise and Light Pollution	Avoid nighttime construction activity to the extent possible. During winter, sunset is between 4:30 and 7:30 pm (much earlier than 9:00 pm). When necessary, implement measures to minimize noise and light illumination impacts on nearby residences.	2
Social and Cultural	Consult with 1854 Treaty Authority and Fond du Lac Band resource managers to identify significant sites for any use and determine the best approach to preserve, enhance or interpret resources	2
Social and Cultural	Attention should be paid to promote the presence of wildlife that may be culturally significant and specifically the abundance of fish for subsistence fishing	2
Water Habitat and Quality	Follow best-practices for storm water management, erosion and runoff, and equipment leaks during the construction phases and implement mitigations, as necessary	1

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Community Priority Recommendations		
Pathway	**Preliminary Recommendations**	**Votes**
Water Habitat and Quality	Identify regional storm water outfalls and implement additional storm water management practices to reduce potential impact of combined sewer overflows (CSOs) at the future swimming beach at Kingsbury Bay	1
Water Habitat and Quality	Implement routine beach monitoring at the future Kingsbury Bay swimming beach	1
Water Habitat and Quality	Identify upland habitats within the site suitable for trees, and develop goals for the upland plant community that takes into account future changes in invasive species, water level, and climate	1
Equipment Operation, Traffic, and Transport	If the parks and other nearby enhancements increase the amount of traffic in the area post-construction, consider traffic calming measures (such as speed humps, raised crosswalks/intersections, traffic circles, medians, curb extensions or bump-outs, and signage or pavement markings) to minimize the risk for increased accidents	1
Air Quality	Select trees that have tall, broad canopies for increased shading and place in areas where people may congregate	1
Crime and Safety	Follow Crime Prevention through Environmental Design (CPTED) guidelines, including lighting and planting configurations. Where possible, reduce dense planting and shrubs around narrow pedestrian paths.	1
Crime and Safety	Provide clear signage and maps for pedestrian and bicyclist access to the parks. Important elements of access and design include effective wayfinding systems such as the use of landmarks, signage, distance to destination markers, and interest points to assist in navigating the routes easily.	1
Recreation, Aesthetics, and Engagement with Nature	Offer diverse opportunities for recreation at both sites, including publically-accessible gathering spaces, fishing piers, birding platforms, access to the water for water-based recreation, and trails, taking into account maintenance requirements of installed features	1
Recreation, Aesthetics, and Engagement with Nature	In advance of construction and in all project phases, clearly communicate to recreational users through multiple media sources disruptions to the Western Waterfront Trail and walkability and accessibility to both project sites	1
Recreation, Aesthetics, and Engagement with Nature	Perform wetland restoration at the mouth of Kingsbury Creek to preserve the cold water habitat for trout and provide deeper water for kayak and canoe access	1
Recreation, Aesthetics, and Engagement with Nature	Because recreational amenities are enjoyed by residents, any plans for future changes should include recognition of the value placed by residents who use the resources frequently	1
Recreation, Aesthetics, and Engagement with Nature	Recognizing the value placed on the existing resources, any changes to park amenities could add new features to existing parks and green spaces	1
Recreation, Aesthetics, and Engagement with Nature	Research and develop co-management models, where neighborhood organizations have more formal responsibility for park management. Co-management arrangements could empower the neighborhood and ease the maintenance burden on the City of Duluth	1

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Community Priority Recommendations		
Pathway	**Preliminary Recommendations**	**Votes**
Recreation, Aesthetics, and Engagement with Nature	Explore partnerships with organizations to facilitate access, education, and equipment sharing, additional recreational opportunities and leadership capacity building for underrepresented communities	1

General Discussion

Following the community consultation exercise, the floor was opened for general discussion

Audience Question/Comment	Response
Add "bad ideas" stickers	EPA: If there are ideas that you thought were bad, we wanted to get that feedback, as well as positive feedback or questions, via the post-it notes.
Adding lights and parking changes the place, it's expensive, and there are no resources to support maintenance of the sites.	EPA: Acknowledged. We have heard the community concerns regarding maintenance of the sites and have incorporated that into the HIA.
Social places and sites for spiritual reflection can't both be there, as the sites are too small.	EPA: Acknowledged. Those recommendations reflect different health determinants (factors that affect health) and will need to be taken into consideration during the park planning process.
Need to prioritize recommendations as the City will likely pick and choose from a handful.	EPA: That was the intent of the exercise to have you vote for the recommendations that were most important to you. We will meet with other stakeholders tomorrow and have them do the same.
Recommendations are based on literature and the community recommendations may be different. Make clear which recommendations come from literature versus those that come from the community	EPA: The HIA Report will clearly document the process we undertook, the feedback and input received from the community and stakeholders, and how the recommendations were developed.
Budget and the cost is vague.	EPA: There is a $14 million budget for the DNR work. *Included in the budget*: Restoring the boardwalk and restoring the wetlands *Not included in the budget*: Swimming beaches, Indian Point campground, parking lots and lighting, development of a plan for upland vegetation
Is there a "no development" option, that would include habitat restoration but not park improvements?	EPA: That is not currently being considered. The public has cited Grassy Point as nuisance site, and they want improved facilities to encourage more people to visit them and limit their use as a nuisance site.

Has there been a discussion about gull nesting point?	EPA: There is no comprehensive upland vegetation plan to account for the creation of habitat for a specific species. This is one of the HIA recommendations (to create a comprehensive upland vegetation plan). Both birding and control of runoff are key to that design. We are also recommending a bird habitat plan for this very reason. Community member: Control of runoff is a great recommendation to include.
What about the impact on mental health and well-being as it relates to engaging in this process and not being listened to by the decision-makers? Sense of burnout from attending public meetings but not being listened to – will the amenities actually be funded? What is the mental health impact of not being heard?	EPA: HIA is meant to address these concerns. Using a 3rd party that is impartial can sometimes act as a catalyst for the inclusion of public input.
Are you tallying public votes separately from stakeholders' votes?	EPA: Yes, they are accounted for separately. We will document this meeting and the input received here (via post-it notes, votes, and discussion) in meeting minutes for this meeting and will do the same for tomorrow's meeting.
City planning amenities should be done concurrently/in tandem with the HIA	EPA: The city originally wanted us to include Fairmont and the Zoo in the HIA, but we had to limit the scope to the habitat restoration area.
We are only a few. How do we get more community input?	EPA: The public will have two additional weeks from the receipt of the posters and meeting minutes to give further feedback. The public present here can/should share out the preliminary results and recommendations with their peers in the public to gather more input. So, if you want to receive the posters for further review and/or to share with other community members, please be sure you provided your email or mailing address.

How does EPA determine where to conduct an HIA? How can the public advocate for more/another HIA in the area?	EPA: We typically have done training in various regions and then followed up by conducting an HIA in the area. There are organizations that provide funding to do HIA and provide resources and tools to do HIA. [Examples: Human Impact Partners and Health Impact Project]. MN Department of Health also does a lot of HIAs and has resources available. HIAs can be initiated by an advocate, a third party, the decision-maker, or the community.
How is city getting information and how is it influencing their work?	EPA: The city will receive our recommendations, but the recommendations are just that – recommendation; they are non-binding. The City has been asking for them as they develop their process and have asked for a briefing from the HIA Team at the completion of the HIA.
Can the HIA add qualifiers to help the city prioritize, such as using cost-savings information, etc.?	EPA: We want the public and stakeholders to inform the prioritization. The HIA is neutral – it only advocates for health and promotes the inclusion of the public and stakeholders in the decision-making process.

Meeting Wrap-up

After the community consultation exercise and general discussion, the meeting concluded with an overview of the HIA's next steps and some final considerations. The HIA Leadership Team was meeting with other stakeholders the next day to present the same information and gather their input on the Kingsbury Bay-Grassy Point Restoration Project. The next steps for the HIA (Scoping) include:

- Document the discussions from the community and stakeholder meetings and incorporate the input into the HIA findings and recommendations.
- Complete the last two steps of the HIA process - **Reporting** and **Monitoring and Evaluation**.
    - ***Report*** final HIA findings and recommendations to MN DNR, the City of Duluth, and stakeholders (briefings, HIA report*, fact sheets, etc.)
    - ***Evaluate*** the HIA process and impact of the HIA on the decision-making processes. Develop ***plans for monitoring*** the implementation of HIA recommendations and the impact of the Habitat Restoration and Park Improvement projects on health.

*The final HIA report is available on EPA's HIA website:
www.epa.gov/healthresearch/health-impact-assessments

HIA Contact Information

For more information on the HIA, contact one of the HIA Leadership Team members:

- **Rosita Clarke**, EPA Region 5 Brownfields Program, clarke.rosita@epa.gov
- **Joel Hoffman**, EPA Office of Research and Development, hoffman.joel@epa.gov
- **Bill Majewski**, Morgan Park Community Club & St. Louis River Alliance, bsmajewski@aol.com
- **Justicia Rhodus**, Pegasus Technical Services (contractor to the EPA), rhodus.justicia@epa.gov
- **Katie Williams**, EPA Office of Research and Development, williams.kathleen@epa.gov

Upcoming Community Meeting!

Kingsbury Bay-Grassy Point Restoration Project: A Health Impact Assessment

There are numerous habitat restoration projects in and along the St. Louis River to improve water quality and clean-up sediment, restore fish habitat and create spaces for swimming and boating. The U.S. Environmental Protection Agency (EPA) conducted a health impact assessment (HIA) in western Duluth to consider the public health implications of both the environmental changes to the river at Kingsbury Bay and Grassy Point and the potential park amenities adjacent to the projects.

The purpose of the HIA was to help inform the Minnesota Department of Natural Resources' (MNDNR) and City of Duluth's decisions regarding the design of habitat restoration and subsequent park improvement projects by providing valuable and timely health-focused information.

The HIA evaluated each of the potential decision scenarios using science-based methods and citizen input to provide recommendations intended to maximize benefits and mitigate or avoid harmful impacts to human health.

What is an HIA?

A Health Impact Assessment (HIA) is used to evaluate objectively the potential positive and negative health effects of a project or policy before it is built or implemented, and recommends changes to manage those effects.

Why is HIA important?

HIA is a tool to ensure that health and equity are considered in decision-making.

The EPA is hosting a community meeting to discuss the findings from the HIA and hear resident input on recommendations for MNDNR and the City of Duluth.

For more information about this meeting, please contact:
Katie Williams
williams.kathleen@epa.gov
218-529-5203

We invite you to come and share your input

Wednesday, March 7, 2018 at 12:30 – 3:30 pm
USEPA, Mid-Continent Ecology Division

What you will gain from these meetings:

- Information about the proposed habitat restoration projects, including changes in design
- Information about the HIA process
- Information on the preliminary findings and recommendations of the HIA
- A platform to provide input on the assessment findings and help identify recommendations

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Final Stakeholder Meeting
March 7, 2018

Agenda

12:30 PM	**Welcome** - Introductions - Meeting Objectives - Meeting Agenda
12:35 PM	**What's the Connection to Health?** - Projects in Your Community and Health - Health Impact Assessment (HIA)
	The Kingsbury Bay-Grassy Point Habitat Restoration Project HIA - Kingsbury Bay-Grassy Point Habitat Restoration and Park Improvements - The HIA Process
12:50 PM	**Poster Presentations – Findings and Potential Impacts to Health**
1:50 PM	**Break**
2:05 PM	**Poster Presentations – Preliminary Recommendations**
2:50 PM	**General Discussion**
3:20 PM	**Community Meeting Report-out**
3:30 PM	**Next Steps and Meeting Wrap-up**

Meeting Overview

Katie Williams (U.S. Environmental Protection Agency [EPA] Office of Research and Development [ORD]) gave the welcome and opening remarks, briefly introducing each of the Health Impact Assessment (HIA) Leadership Team and Research Team members in attendance. This was followed by a brief presentation, which highlighted the connection between planning and health, and introduced the concept of HIA and the importance of HIA in decision-making.

Joel Hoffman (EPA ORD) then gave an overview of the Kingsbury Bay-Grassy Point Habitat Restoration Project, including the Minnesota Department of Natural Resources (MNDNR) habitat restoration work planned at Kingsbury Bay and Grassy Point and the park improvements and amenities planned at each site, which will be the responsibility of the City of Duluth.

Justicia Rhodus (Pegasus Technical Services, contractor to EPA) then described what was done at each step of the six-step Kingsbury Bay-Grassy Point HIA process, the timeline for the habitat restoration work, and how the HIA has informed that design.

The remainder of the time together was reserved for stakeholder consultation and feedback on the HIA findings and preliminary recommendations. Seven stations were set up around the room that corresponded to each of the seven HIA pathways – Water Habitat and Quality; Equipment Operation,

Traffic, and Transport; Air Quality; Noise and Light Pollution; Crime and Personal Safety; Recreation, Aesthetics, and Engagement with Nature; and Social and Cultural. Each station contained three posters – the first communicated the HIA findings for that pathway; the second identified the potential impacts to health via that pathway; and the third identified the preliminary evidence-based recommendations developed to address any disproportionate health impacts, mitigate potential adverse health impacts, or promote potential health benefits of the projects. Attendees rotated through each of the stations, providing their input on the HIA findings and preliminary recommendations.

At the conclusion of the meeting, the next steps of the HIA were discussed.

Meeting Attendees

Twelve (12) stakeholders attended the final HIA Stakeholder Meeting, in addition to the three (3) HIA Leadership Team members, and four (3) HIA Research Team members.

Meeting Attendees and Affiliation

Attendee(s)	Affiliation
Daryl Peterson	Minnesota Land Trust
Diane Desotelle	City of Duluth
Dave Warburton	U.S. Fish and Wildlife Service
Janet Kennedy	Riverfront Community Development, Planning Commissioner
John Kelley	City of Duluth
Melissa Sjolund	Minnesota Department of Natural Resources
Guy Priley	Verso
Matt Steiger	Wisconsin Department of Natural Resources
Josh Gorham	St. Louis County Public Health
Lisa Luokkala	City of Duluth
Ken Gilbertson	UMD – Center for Environmental Education
Gini Breidenbach	Minnesota Land Trust
Joel Hoffman, Justicia Rhodus, Katie Williams	HIA Leadership Team
Alex Lan, Kate Preiner, Samantha Shattuck	HIA Research Team

About the Health Impact Assessment

The EPA is leading a health impact assessment (HIA) of two Great Lakes Area of Concern (AOC) habitat restoration projects being conducted by the Minnesota Department of Natural Resources (MNDNR) – Kingsbury Bay and Grassy Point. The HIA examined the potential public health implications of the restoration projects, including the MNDNR restoration work itself and how people will access and utilize the project sites following restoration. The HIA developed evidence-based recommendations to provide to MNDNR and the City of Duluth (who is responsible for any post-restoration work at these sites) to address any disproportionate health impacts, mitigate potential adverse health impacts, and bolster potential health benefits of the projects.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Why is EPA Leading an HIA?

EPA has identified HIA as a decision-support tool for promoting sustainable and healthy communities. The purpose of this HIA is to help inform the MNDNR Kingsbury Bay-Grassy Point habitat restoration project and the City of Duluth park planning process in 2018.

Stakeholder Input

There were multiple opportunities for stakeholder input throughout the HIA process:

- In the stakeholder kick-off meeting for the HIA held in February 2017, attendees were asked for their thoughts on health and the Kingsbury Bay and Grassy Point sites, there were two question and answer (Q&A) sessions, and a stakeholder consultation exercise designed to gather stakeholder input specific to the proposed plans for Kingsbury Bay and Grassy Point.
- Based on input from the community and stakeholders, some example HIAs that looked at dredging and site remediation, and HIA Leadership Team and Research Team discussions, potential health impacts of the Kingsbury Bay-Grassy Point habitat restoration and park improvement projects were identified. Those potential health impacts were grouped into seven categories or pathways through which the projects could potentially impact health. The preliminary pathway diagrams were shared with kick-off meeting attendees via email, made available at the MNDNR public meeting held in May 2017, and reviewed by the HIA Advisory Committee (made up of community members and other stakeholders).
- This final stakeholder meeting for the HIA, included a stakeholder consultation exercise designed to gather stakeholder input on the HIA findings and preliminary recommendations and a prioritization exercise in which attendees were asked to vote for the five HIA recommendations most important to them. The meeting also offered time for general discussion and Q&A.

Stakeholder Consultation Exercise

Following the short presentation on HIA and the Kingsbury Bay-Grassy Point Habitat Restoration Project, attendees rotated through each of the seven poster stations documenting the findings, potential impacts to health, and preliminary recommendations for the HIA pathways. The following questions were used to guide this exercise:

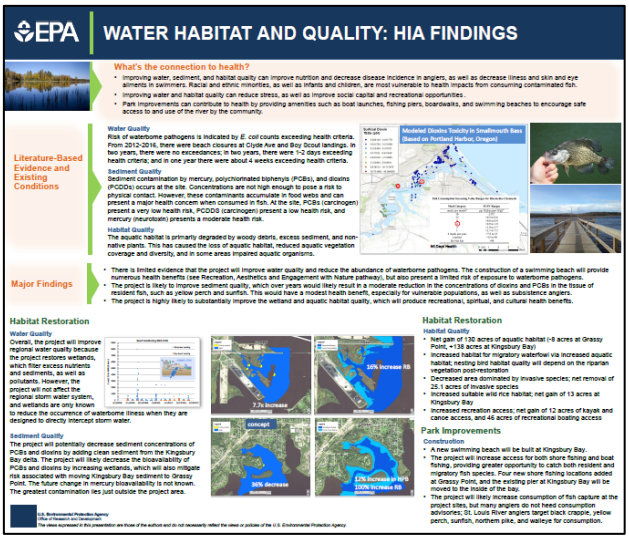
Poster	Questions
HIA Findings and Potential Impacts to Health	• *What are your thoughts on the findings? Did anything "stand out" to you?* • *Was there anything that was presented that you had not seen or heard before?* • *Do you agree with what the findings showed?* • *Do you have any concerns or issues with what was presented?*

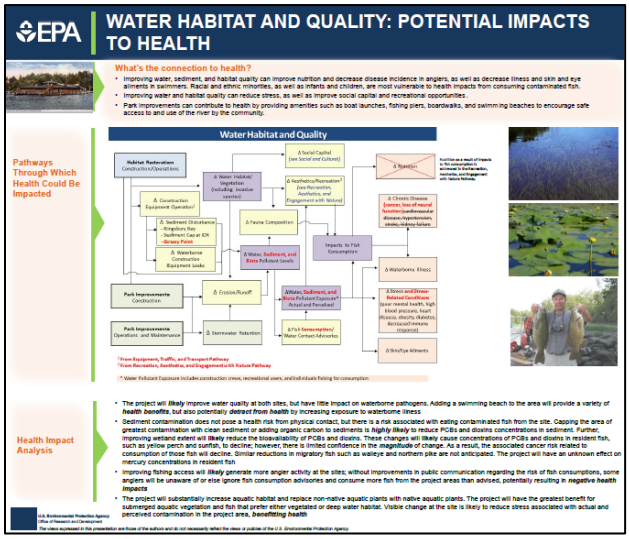
Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

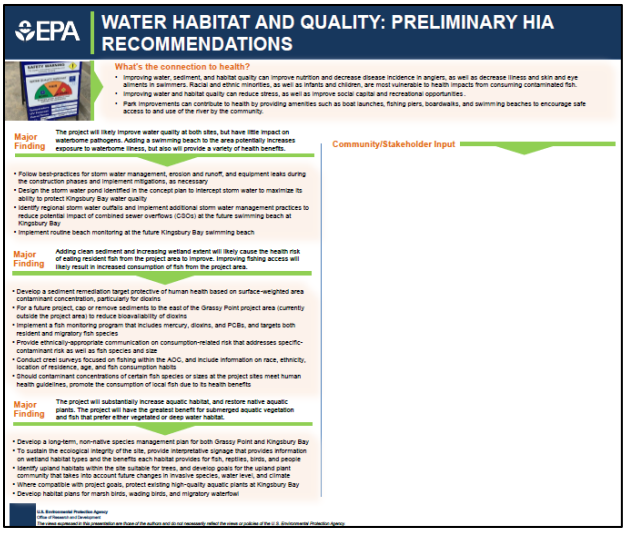
Poster	Questions
Preliminary HIA Recommendations	• *Do you agree with the recommendations made?* • *Do you think the recommendations are feasible/practical?* • *Is there anything that we may have missed or did not include in the recommendations that should be included?*

Attendees engaged in conversation with each other and the HIA Leadership Team or Research Team members at each station and provided input by writing their thoughts on post-it notes and sticking them on the posters. The posters available at each of the stations are shown below, along with the input received via post-it note and conversation.

Water Habitat and Quality





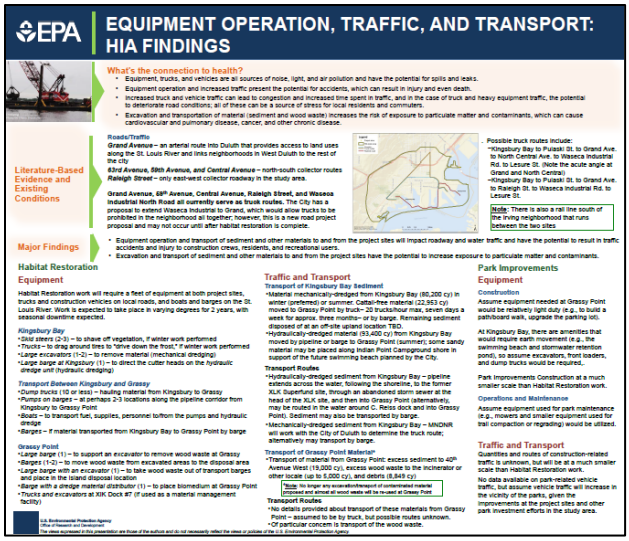


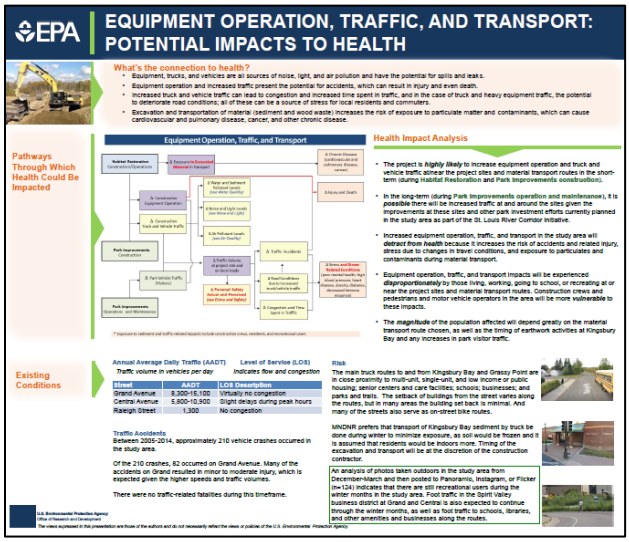
Input Received on Posters

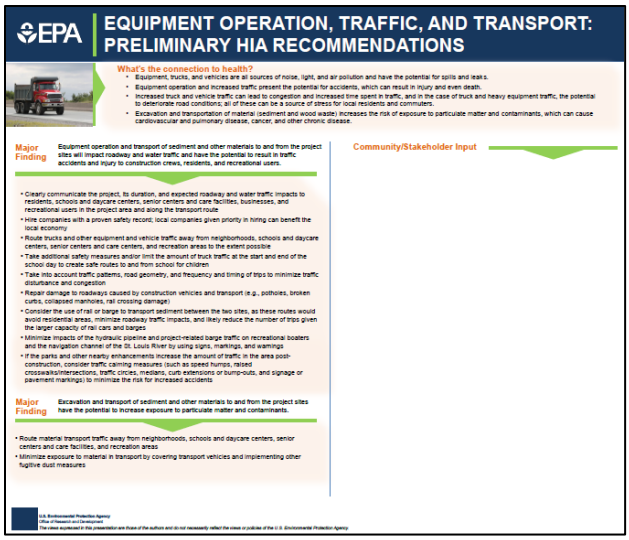
- What recommendations could be made for restoring/improving terrestrial plant communities that would have positive health effects?
- Make sure reveg and habitat plans are compatible with Crime and Safety recommendations.
- City does not have CSOs any longer.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Equipment Operation, Traffic, and Transport





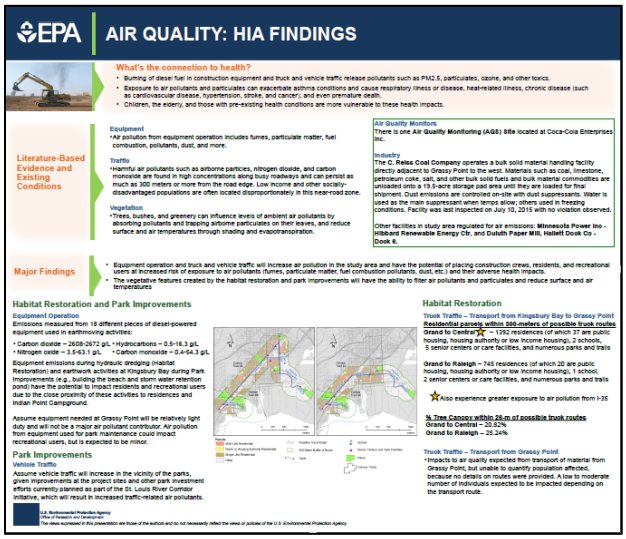


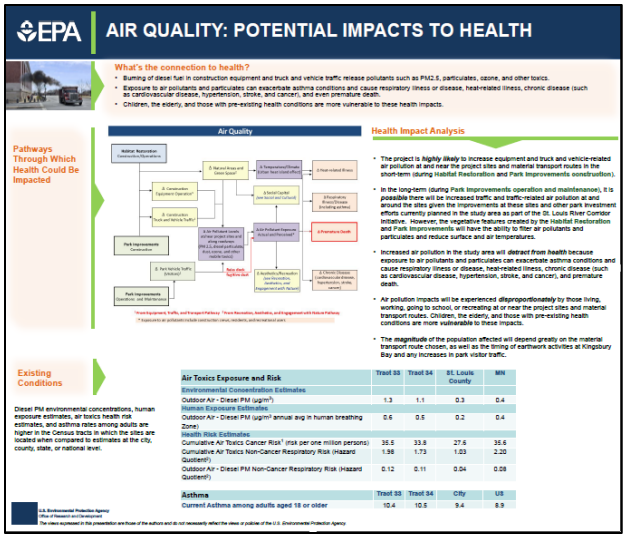
Input Received on Posters

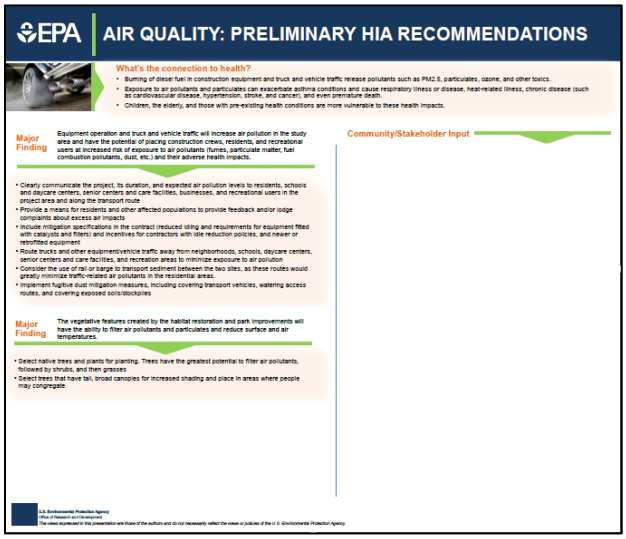
- During Construction: DNR provide project update – issues, concerns, and who to contact (construction project manager) with questions or concerns. These updates should be sent to email lists, posted on city websites (planning and parks)
- Consider water recreation (users) impact during construction
- Impact of project by preventing long term, traffic, air, and noise and light impacts by preventing industrial development at Grassy Point.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Air Quality





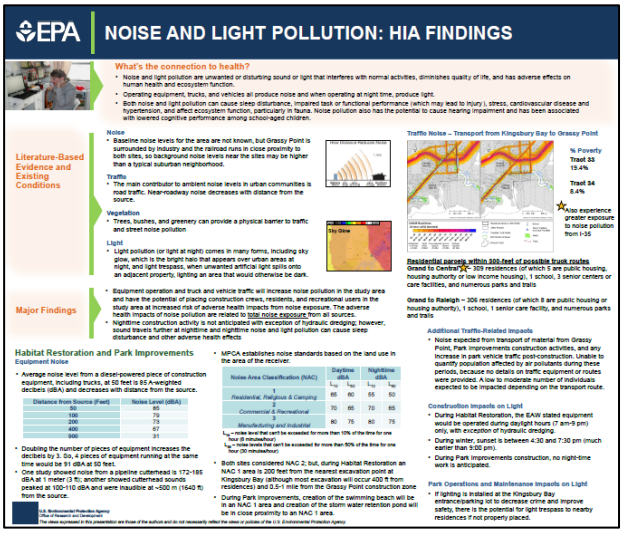


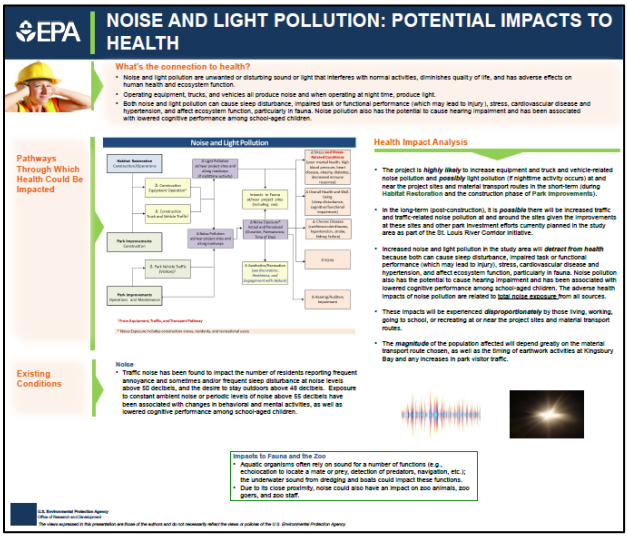
Input Received on Posters

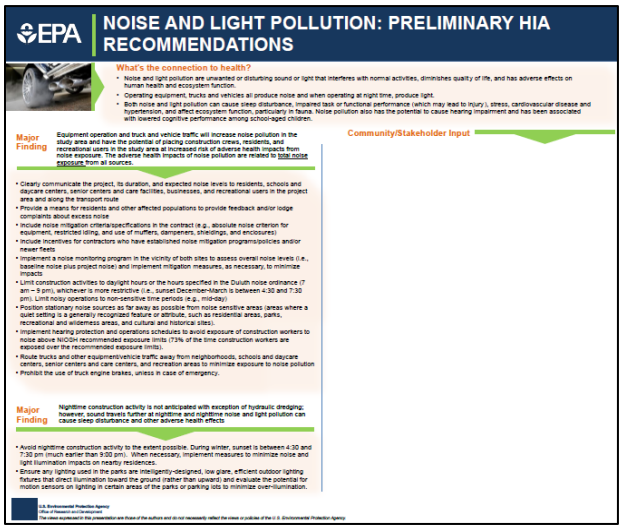
- Value of project after completion: keeping gains or preserving air quality over adding new sources if property was developed for industrial waterfront (current zoning).
- If the recommendation "Select native trees and plants for planting" was decoupled from the second part of the recommendation "Trees have the greatest potential to filter air pollutants, followed by shrubs and then grasses," I would have voted for it as a priority recommendation.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Noise and Light Pollution





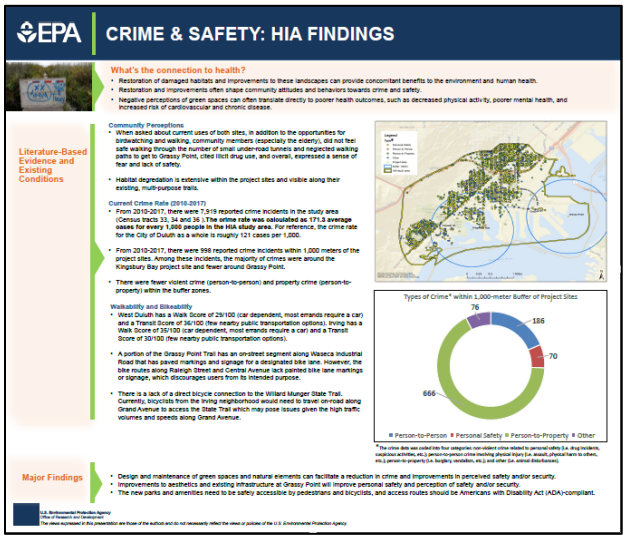


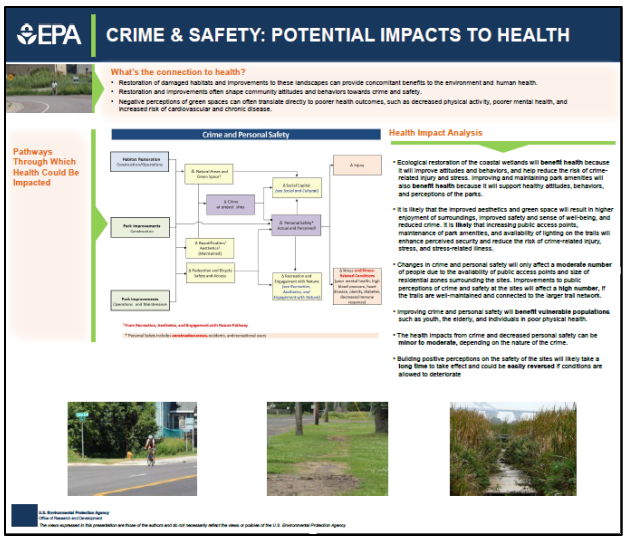
Input Received on Posters

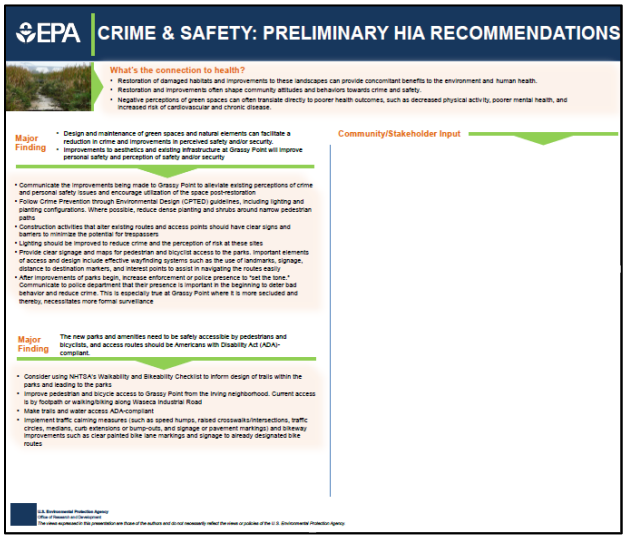
- Staging area use of Pulaski St. parking lot will create temporary secondary noise/light pollution to neighbors in Riverside Neighborhood and/or residents adjacent to Pulaski St./Indian Point Campground.
- DNR cannot provide incentives [re: recommendation to Include incentives for contractors who have established noise mitigation programs/policies and newer fleets]
- I could see this being in response to complaints only [re: recommendation to limit construction activities to daylight hours or the hours specified in the Duluth noise ordinance (7am -9pm), whichever is more restrictive (i.e., sunset December-March is between 4:30 and 7:30 pm). Limit noisy operations to non-sensitive time periods (e.g., mid-day.]

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Crime and Personal Safety





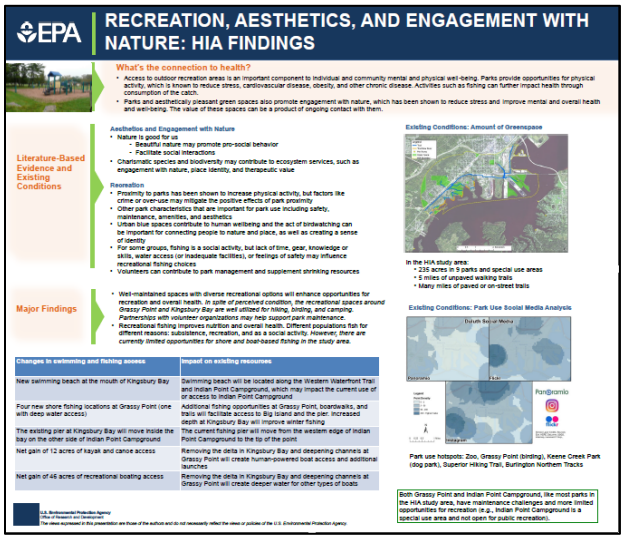


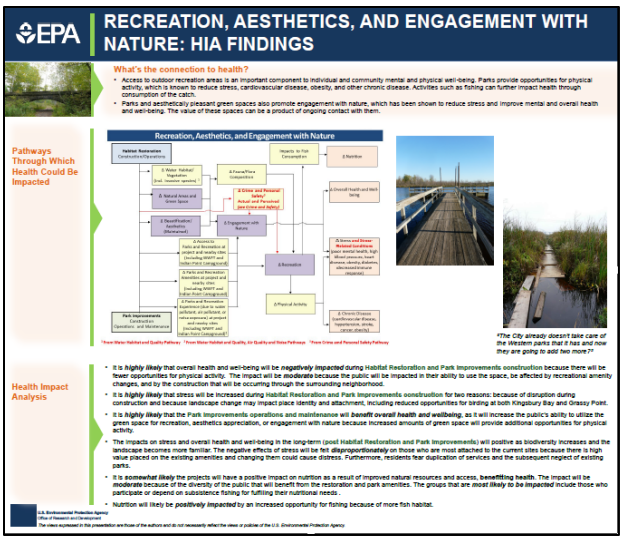
Input Received on Posters

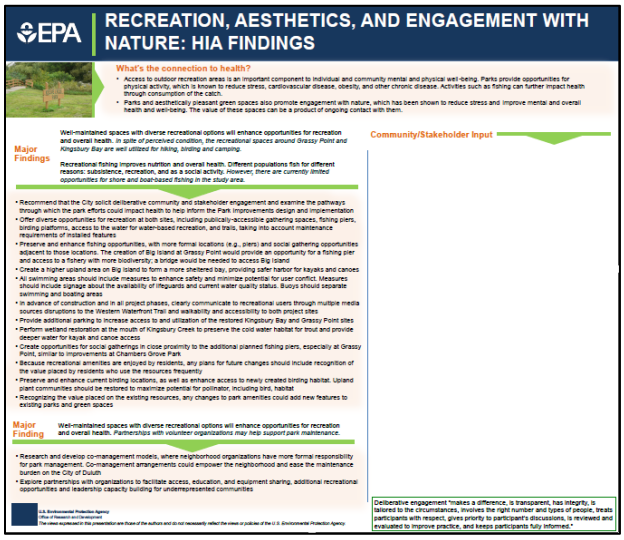
- West Duluth is an older community and has less opportunities for active transportation than other neighborhoods. UMD area is a model for active transportation.
- There shouldn't be bikes on Central Avenue, as there are trucks and semi-trucks on that road. Alternatively, the cross city trail can provide opportunity for biking.
- Raleigh street may be a better place for bikes, if the trucks are kept off of it.

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Recreation, Aesthetics, and Engagement with Nature





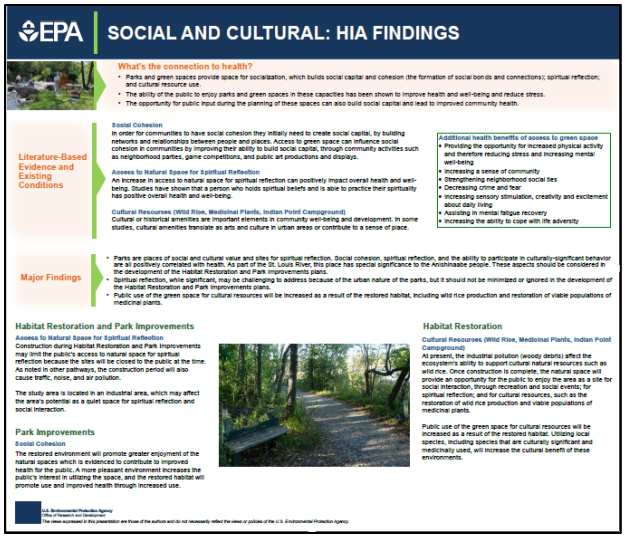


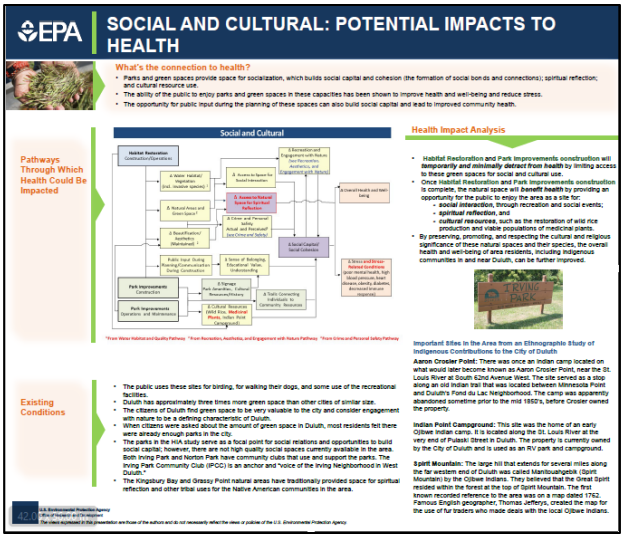
Input Received on Posters

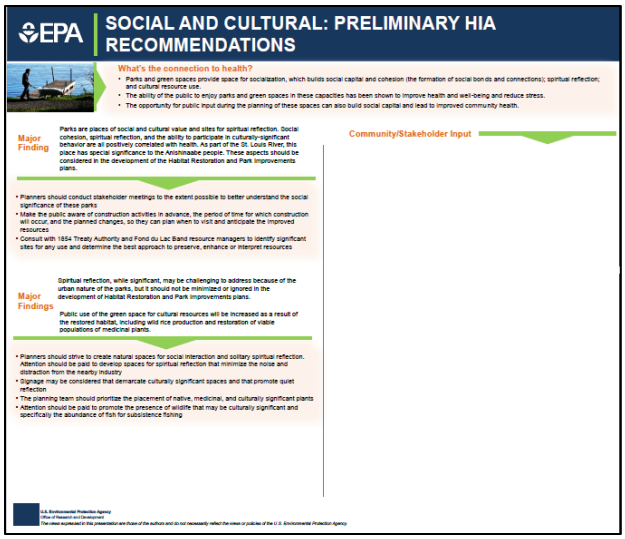
- Is the deeper water for boating introducing a conflict between motor and human-powered boats?
- Will an unintended consequence be disturbance to residents from motor boats in Kingsbury Bay
- Δ Recreation (in pathway diagram) also connect to Social and Cultural pathway?
- Are there any connections with the Open Space recommendations in the comp plan?
- Both recommendations regarding development of co-management models and partnering with organizations to facilitate access, education, and equipment sharing, etc. are important

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Social and Cultural







Input Received on Posters

- There should be a recommendation to conduct a cultural assessment of the site.
- GND Alliance Park by Stone Elementary has a bench meant for quiet reflection.
- There is an indigenous commission for signage efforts, to consider engaging when developing signage.
- Regarding the recommendations for wild rice production: Wild rice needs to be re-seeded annually because MDNR hasn't figured out how to keep it coming back; there is a limited amount of seed available; and the geese eat it.
- What is the funding available for planting wild rice? How many acres are being considered to be developed?
- There is an estuary wide plan that was created by the MN DNR in 2014, that describes the cultural significance and historical scale of wild rice in the estuary. The goal is now to replant 275 acres, though it was up to 5,000 acres in the past.
- Regarding spiritual reflection: Spirit Mountain is significant because of its vista of Spirit Island and Spirit Lake, so consider selection of culturally significant sites based on their vistas.
- Consider a water trail, a by-way for kayaking. There are national nominations for nationally designated water trails that we may secure recognition and/or funding from.
- While some may say we have a lot of parks, we have a limited number of those with water access, estimating about four.
- There is an adventure gap, you need to outline social cohesion for all and access to all. This can include working with the YMCA and the Valley Youth Center.

- Regarding representation: On the posters, there is no discussion about non-white non-native communities; the significance of these parks to them and recommendations to engage them. There should be engagement with these communities to include their stories and histories. Organizations to consider working with the bring these stories in: Health in All Policies, the NAACP, and the ACO, which is a native organization that focuses on intersectional work. Susanna Woodward at UMD discusses cultural diversity.
- The USFWS is trying to develop the cultural significance signage and will be informed by this HIA.
- The NAACP is working to protect and develop fishing opportunities in Western Duluth as part of understanding and supporting subsistence fishing.
- The recommendations are lacking a discussion in diversity.
- There are other culturally-significant plants than wild rice.
- Recommendation that says to support wildlife should be more specific – birding and fish.
- Identify who to work with to bring people to the site, particularly those from underrepresented communities.
- Provide opportunities for vistas; consider overlapping with spaces for spiritual and quiet reflection.
- Communicate the stages of development to businesses and the public during construction (i.e., this phase there may be more traffic or less).
- The City has heard from some native communities that they did not want signage to identify native plants because they didn't want them to be destroyed; this is a consideration for posting the signs at these parts.

Prioritization of Recommendations

During the review of the Preliminary HIA Recommendations posters, attendees were given five post-it flags and asked to vote for the five HIA recommendations that were most important to them. Total votes= 60; all attendees voted.

Stakeholder Priority Recommendations		
Pathway	**Preliminary Recommendations**	**Votes**
Water Habitat and Quality	Develop a long-term, non-native species management plan for both Grassy Point and Kingsbury Bay	3
Water Habitat and Quality	To sustain the ecological integrity of the site, provide interpretative signage that provides information on wetland habitat types and the benefits each habitat provides for fish, reptiles, birds, and people	3
Crime and Safety	Provide clear signage and maps for pedestrian and bicyclist access to the parks. Important elements of access and design include effective wayfinding systems such as the use of landmarks, signage, distance to destination markers, and interest points to assist in navigating the routes easily.	3
Recreation, Aesthetics, and Engagement with Nature	Offer diverse opportunities for recreation at both sites, including publically-accessible gathering spaces, fishing piers, birding platforms, access to the water for water-based recreation, and trails, taking into account maintenance requirements of installed features	3

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Stakeholder Priority Recommendations		
Pathway	**Preliminary Recommendations**	**Votes**
Recreation, Aesthetics, and Engagement with Nature	Preserve and enhance current birding locations, as well as enhance access to newly created birding habitat. Upland plant communities should be restored to maximize potential for pollinator, including bird, habitat	3
Recreation, Aesthetics, and Engagement with Nature	Explore partnerships with organizations to facilitate access, education, and equipment sharing, additional recreational opportunities and leadership capacity building for underrepresented communities	3
Social and Cultural	Make the public aware of construction activities in advance, the period of time for which construction will occur, and the planned changes, so they can plan when to visit and anticipate the improved resources	3
Water Habitat and Quality	Implement routine beach monitoring at the future Kingsbury Bay swimming beach	2
Water Habitat and Quality	For a future project, cap or remove sediments to the east of the Grassy Point project area (currently outside the project area) to reduce bioavailability of dioxins	2
Water Habitat and Quality	Develop habitat plans for marsh birds, wading birds, and migratory waterfowl	2
Equipment Operation, Traffic, and Transport	Route trucks and other equipment and vehicle traffic away from neighborhoods, schools and daycare centers, senior centers and care centers, and recreation areas to the extent possible	2
Noise and Light Pollution	Clearly communicate the project, its duration, and expected noise levels to residents, schools and daycare centers, senior centers and care facilities, businesses, and recreational users in the project area and along the transport route	2
Noise and Light Pollution	Ensure any lighting used in the parks are intelligently-designed, low glare, efficient outdoor lighting fixtures that direct illumination toward the ground (rather than upward) and evaluate the potential for motion sensors on lighting in certain areas of the parks or parking lots to minimize over-illumination.	2
Crime and Safety	Communicate the improvements being made to Grassy Point to alleviate existing perceptions of crime and personal safety issues and encourage utilization of the space post-restoration.	2
Crime and Safety	Make trails and water access ADA-compliant.	2
Social and Cultural	Planners should strive to create natural spaces for social interaction and solitary spiritual reflection. Attention should be paid to develop spaces for spiritual reflection that minimize the noise and distraction from the nearby industry	2
Water Habitat and Quality	Conduct creel surveys focused on fishing within the AOC, and include information on race, ethnicity, location of residence, age, and fish consumption habits	1
Water Habitat and Quality	Identify upland habitats within the site suitable for trees, and develop goals for the upland plant community that takes into account future changes in invasive species, water level, and climate	1

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Stakeholder Priority Recommendations		
Pathway	**Preliminary Recommendations**	**Votes**
Equipment Operation, Traffic, and Transport	Consider the use of rail or barge to transport sediment between the two sites, as these routes would avoid residential areas, minimize roadway traffic impacts, and likely reduce the number of trips given the larger capacity of rail cars and barges	1
Air Quality	Clearly communicate the project, its duration, and expected air pollution levels to residents, schools and daycare centers, senior centers and care facilities, businesses, and recreational users in the project area and along the transport route	1
Air Quality	Provide a means for residents and other affected populations to provide feedback and/or lodge complaints about excess air impacts	1
Air Quality	Select native trees and plants for planting. Trees have the greatest potential to filter air pollutants, followed by shrubs, and then grasses	1
Noise and Light Pollution	Provide a means for residents and other affected populations to provide feedback and/or lodge complaints about excess noise	1
Noise and Light Pollution	Include noise mitigation criteria/specifications in the contract (e.g., absolute noise criterion for equipment, restricted idling, and use of mufflers, dampeners, shieldings, and enclosures)	1
Noise and Light Pollution	Implement hearing protection and operations schedules to avoid exposure of construction workers to noise above NIOSH recommended exposure limits (73% of the time construction workers are exposed over the recommended exposure limits).	1
Crime and Safety	Lighting should be improved and police surveillance may be considered to reduce crime and the perception of risk at these sites.	1
Crime and Safety	After improvements of parks begin, increase enforcement or police presence to “set the tone.” Communicate to police department that their presence is important in the beginning to deter bad behavior and reduce crime. This is especially true at Grassy Point where it is more secluded and thereby, necessitates more formal surveillance.	1
Crime and Safety	Improve pedestrian and bicycle access to Grassy Point from the Irving neighborhood; current access is by footpath or walking/biking along Waseca Industrial Road.	1
Crime and Safety	Implement traffic calming measures (such as speed humps, raised crosswalks/intersections, traffic circles, medians, curb extensions or bump-outs, and signage or pavement markings) and bikeway improvements such as clear painted bike lane markings and signage to already designated bike routes.	1
Recreation, Aesthetics, and Engagement with Nature	Recommend that the City solicit deliberative community and stakeholder engagement and examine the pathways through which the park efforts could impact health to help inform the Park Improvements design and implementation	1 (stress on deliberative engagement)
Recreation, Aesthetics, and Engagement with Nature	Preserve and enhance fishing opportunities, with more formal locations (e.g., piers) and social gathering opportunities adjacent to those locations. The creation of Big Island at Grassy Point would provide an opportunity for a fishing pier and access to a fishery with more biodiversity; a bridge would be needed to access Big Island	1

Kingsbury Bay-Grassy Point Habitat Restoration: A Health Impact Assessment

Stakeholder Priority Recommendations		
Pathway	**Preliminary Recommendations**	**Votes**
Recreation, Aesthetics, and Engagement with Nature	Perform wetland restoration at the mouth of Kingsbury Creek to preserve the cold water habitat for trout and provide deeper water for kayak and canoe access	1
Recreation, Aesthetics, and Engagement with Nature	Recognizing the value placed on the existing resources, any changes to park amenities could add new features to existing parks and green spaces	1
Recreation, Aesthetics, and Engagement with Nature	Research and develop co-management models, where neighborhood organizations have more formal responsibility for park management. Co-management arrangements could empower the neighborhood and ease the maintenance burden on the City of Duluth	1
Social and Cultural	Consult with 1854 Treaty Authority and Fond du Lac Band resource managers to identify significant sites for any use and determine the best approach to preserve, enhance or interpret resources	1
Social and Cultural	The planning team should prioritize the placement of native, medicinal, and culturally significant plants	1
Social and Cultural	Attention should be paid to promote the presence of wildlife that may be culturally significant and specifically the abundance of fish for subsistence fishing	1

General Discussion

Following the stakeholder consultation exercise, the floor was opened for general discussion.

Audience Question/Comment	Response
Grassy Point preliminary planning is happening and they plan to revisit the Master plan based on the HIA.	Acknowledged
What will the final product be?	EPA: The HIA Report is the final product, which will include findings, recommendations, and the outcome of stakeholder engagement. In addition, there will be briefings, fact sheets, and the HIA will be on EPA's HIA website (https://www.epa.gov/healthresearch/health-impact-assessments).
What about monitoring and evaluation, how will you know if these health impacts will be effectively addressed?	EPA: The next steps in the HIA include reporting out and creating a plan for monitoring and evaluation. Monitoring examines the implementation of the project and the impact of the project on health. Existing conditions as outlined in the report will be used as a baseline to monitor the impact of the project. And the monitoring plan will also include a list of potential responsible parties and partners for monitoring.

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Audience Question/Comment	Response
Is there funding for monitoring and evaluation? What role would the EPA play in monitoring and evaluation?	EPA: No, the HIA project funding does not include funding or labor for monitoring and evaluation, but it does identify programs and community organizations that may want to partner to do it. The EPA is looking at a 3 to 4-year strategic plan for monitoring. The EPA wants to see how the habitat restoration unfolds and will look into how the EPA can contribute to monitoring and evaluation and study the impacts as they unfold.
Conducting a health impact assessment on habitat restoration seems to be new. Have we learned that HIA would be helpful on future habitat restoration projects?	EPA: HIA and habitat restoration is relatively new; there have been other HIAs performed on these types of projects, but there is limited literature on the impact of an HIA on habitat restoration. We do a "lessons learned" section in the monitoring and evaluation section. EPA: One of the values of the HIA is asking stakeholders, "Did this process bring value, and would it be useful to you in another project?" (see attendee responses following the table).
What is the longevity of the site?	EPA: That is a great point. In a decade, the population using the site may be different, with different recreational habits and preferences for natural spaces. How do you monitor through shifting factors?
Bringing all the data together about the site and health impacts as part of the HIA is beneficial.	EPA: Agreed. That is often cited as a benefit of HIA – just bringing all the information together in one place to help inform the decision.
This is like an EAW, but more health in the center of it. How do we get an EAW to the public? How does this HIA get to the public in this project?	EPA: We held community meetings yesterday, as well as in 2017, in the same style and format as these stakeholder meetings. The EPA has an internal working group that is currently working on the integration of HIA into EIS at the federal level through NEPA.
The HIA seems more palatable than an EAW, why might that be?	Stakeholder: Human health impacts. Everyone can relate to conversations about health. Stakeholder: The format of engagement and the process of community outreach, especially early on, is great. Who wants to sit down and read a 200-page EAW? I would much rather review posters. Stakeholder: It's an adaptive process.

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Audience Question/Comment	Response
In the city's comprehensive plan, there is a lot of consideration to continue to do HIAs, and the city has incorporated "health" and "fairness" into the principles of the planning process.	EPA: That is great. Yes. Health and equity are core values of HIA.
In other HIAs on conceptual plans, community ideas, the process is not often seen as "palatable" and "high functioning." This project was the perfect storm because the project and HIA were well timed together, with sufficient flexibility in project design and an especially suitable type of project.	EPA: These types of characteristics are considered in the screening step of an HIA, to determine if an HIA is feasible and would contribute to the project.
This "fortunate circumstance" [paired HIA and EAW] should be a model of the how to do this work.	EPA: The EPA considered this in selecting this project on which to do an HIA. "Is this the right project?" is a vital part of the process. An HIA may also not be the right tool in every case; there are many tools.

Prompt question: Did this HIA process bring value and would it be useful to you in another project?

Stakeholder: Didn't see anything unexpected. But it is useful to conduct analysis like this through a systematic protocol.

EPA: The HIA is also valuable to bring community and entities together on this and future projects. The decision-making climate is improved by these connections.

Stakeholder: HIA is a scientific way to discuss health impacts, building common language among experts and the public, and enough trust to agree and disagree without breaking down the process.

Stakeholder: An HIA helps the public plan and channel their concerns about their experience and its impacts, which may lessen conflict during construction.

Stakeholder: An HIA contributes to the idea of 3 sides to the story, "your side," "my side," and "the truth."

Prompt question: We tried to do an in-depth characterization of the health impacts. Was there anything surprising in the existing conditions?

Stakeholder: We were not surprised by what was included. It is nice to see it in one place, as it helps make connections. For example, re-vegetation and terrestrial plantings, you have to consider helping birds by planting big trees and bushes, but seeing the crime pathway as well reminds us to consider line of sight and other safety concerns.

Stakeholder: There have been a lot of people involved and one core group, and it is good how systematic this process has been; you can see the development of ideas and issues as they developed through the stakeholder and assessment process. That there is little surprise is an indication of the transparent and how effectively things were integrated. It wasn't "hap-hazard."

Stakeholder: Sustainability of projects needs to be considered, and there needs to be a discussion of adaptive management through effective monitoring. What does success look like, and what does too much success look like? For instance, if there is too much recreation and it begins to harm the habitat, how might that be addressed? This is self-defined.

Prompt question: There are a variety of formats to disseminate the information from the HIA. Are there any formats that would be useful to the group here? They would be a priority for the HIA team.

Stakeholder: Written recommendations should be celebrated – it's rare to see them move from recommendations to implementation. The report should identify, monitor how the HIA recommendations have already affected project implementation. Simplify recommendations for easier implementation.

EPA: In the final report, we'll show what is already in the EAW, what was added in the contracting phase, as this helps cause the effectiveness of the HIA and its process, all in the monitoring and evaluation section.

Community Meeting Report Out

This same information was presented to the public last night in the same format as you saw it here today. Here are the results of that meeting:

Public Comments on HIA Posters (15 people in attendance)	
Water Habitat and Quality	- New growth of green slime at Kingsbury Bay this year - Do you swim in the river? (incredulity, implying speaker does not believe river is safe for swimming - Where will the beach go? - Where will the wild rice be? (x2) - Is capping sediment safe? - Are they going to stop erosion in Kingsbury Creek? (many times)
Equipment, Traffic, and Transport	- How/where will the truck-dredge handoff happen? - Where will the Waseca Industrial Road extension run?
Air Quality	- Select trees that will do well in warming climate
Crime and Safety	- No new bike/pedestrian lanes! - Many, if not most will arrive by cars. Bike/ pedestrian shouldn't be only consideration - A way for snow "machines" to enter bay without speeding along trail. - No night-time lighting - No lighting – encourages loitering/vandalism; cost; increases maintenance, increases use - What is the NHTSA Walkability and Bikeability Checklist? Can't support since don't know what it is. - Who says calming is needed? Speed study? Or is this per "literature"? Untrained person's perception.

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Public Comments on HIA Posters (15 people in attendance)	
Recreation, Aesthetics and Nature	- Social media graphics not very legible/visible. Explain data better. - All the study has been done during high water in the bay. Has the very low water year been part of the study? - This is the first year in 20 years I have noted a now green scum on bay close to shore that you are not going to dig. - Some can be combined to achieve same goals: fishing, birding, water access, and social spaces can often be the exact same space.
Social and Cultural	- Dog poop stations - Cultural resources: Not a strong connection between this goal and actual results. Whose culture? If Native Americans, then how can designers ensure that group will use the site. - Spiritual reflection – serious? These are public parks. - Really great to see the list of culturally significant sites – Aaron Crosier Point, Indian Point Campground and Spirit Mountain. - Pathway is not a good word to use to describe the health characterization, especially since we're discussing parks, which may have their own pathways. Another member suggested flow-ways.

Priority Recommendations Identified by the Public	
Design the storm water pond identified in the concept plan to intercept storm water to maximize its ability to protect Kingsbury Bay water quality	4
Select native trees and plants for planting. Trees have the greatest potential to filter air pollutants, followed by shrubs, and then grasses	4
Ensure any lighting used in the parks are intelligently-designed, low glare, efficient outdoor lighting fixtures that direct illumination toward the ground (rather than upward) and evaluate the potential for motion sensors on lighting in certain areas of the parks or parking lots to minimize over-illumination.	3
After improvements of parks begin, increase enforcement or police presence to "set the tone." Communicate to police department that their presence is important in the beginning to deter bad behavior and reduce crime. This is especially true at Grassy Point where it is more secluded and thereby, necessitates more formal surveillance.	3
Improve pedestrian and bicycle access to Grassy Point from the Irving neighborhood; current access is by footpath or walking/biking along Waseca Industrial Road.	3
Recommend that the City solicit deliberative community and stakeholder engagement and examine the pathways through which the park efforts could impact health to help inform the Park Improvements design and implementation	3
To sustain the ecological integrity of the site, provide interpretative signage that provides information on wetland habitat types and the benefits each habitat provides for fish, reptiles, birds, and people	2
Hire companies with a proven safety record; local companies given priority in hiring can benefit the local economy	2
Consider the use of rail or barge to transport sediment between the two sites, as these routes would avoid residential areas, minimize roadway traffic impacts, and likely reduce the number of trips given the larger capacity of rail cars and barges	2

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Priority Recommendations Identified by the Public	
Avoid nighttime construction activity to the extent possible. During winter, sunset is between 4:30 and 7:30 pm (much earlier than 9:00 pm). When necessary, implement measures to minimize noise and light illumination impacts on nearby residences.	2
Consult with 1854 Treaty Authority and Fond du Lac Band resource managers to identify significant sites for any use and determine the best approach to preserve, enhance or interpret resources	2
Attention should be paid to promote the presence of wildlife that may be culturally significant and specifically the abundance of fish for subsistence fishing	2

* 15 recommendations received 1 vote

General Discussion with the Public (Due to time constraints, these were not reported out during the stakeholder meeting, but are included here in the documentation).

- Add "bad ideas" stickers
- Adding lights and parking changes the place, it's expensive, and there are no resources to support maintenance of the sites.
- Social places and sites for spiritual reflection can't both be there, as the sites are too small.
- Need to prioritize recommendations as the City will likely pick and choose from a handful
- Recommendations are based on literature and the community recommendations may be different. Make clear which recommendations come from literature versus those that come from the community
- Budget and the cost is vague.
    - $14 million budget from the DNR (from a consultant estimate)
    - Included in the budget:
        - Restoring the boardwalk
        - Restoring the wetlands
    - Not included in the budget:
        - Swimming beaches
        - Indian Point campground
        - Parking lots and lighting
        - Development of a plan for upland vegetation
- Is there a "no development" option, that would include habitat restoration but not park improvements?
    - Not currently being considered. The public has cited Grassy Point as nuisance site, and they want improved facilities to encourage more people to visit them and limit their use as a nuisance site.
- Has there been a discussion about gull nesting point?
    - There is no comprehensive upland vegetation plan to plan for the creation of a specific habitat for a specific species. This is one of the HIA recommendations (to create a comprehensive upland vegetation plan); both birding and control of runoff are key to that design.
    - Control of runoff is a great recommendation to include
- What about the impact on mental health and well-being as it relates to engaging in this process and not being listened to by the decision-makers? Sense of burnout from attending public meetings but not being listened to – will the amenities actually be funded? What is the mental health impact of not being heard?

  - HIA is meant to address these concerns. Using a 3rd party that is impartial can sometimes act as a catalyst for the inclusion of public input.
- Are tallying public votes separately from stakeholders' votes?
  - Yes, they are accounted for separately
- City planning amenities should be done concurrently/in tandem with the HIA
  - The city originally wanted us to include Fairmont and the Zoo in the HIA, but we had to limit to the habitat restoration area
- We are only a few. How do we get more community input?
  - The public will have two additional weeks from the receipt of the posters and meeting minutes to give further feedback.
  - The public present here can/should share out the preliminary results and recommendations with their peers in the public to gather more input.
- How does EPA determine where to conduct an HIA? How can the public advocate for more/another HIA in the area?
  - We typically have done training in various regions and then follow up by conducting an HIA in the area.
  - There are organizations that provide funding to do HIA, and provide resources and tools to do HIA.
  - MN Department of Health also does a lot of HIAs and has resources available. HIAs can be initiated by an advocate, a third party, the decision-maker, or the community.
- How is city getting information and how is it influencing their work?
  - The city will receive our recommendations, but they are non-binding. They have been asking for them as they develop their process and have asked for a briefing from the HIA Team.
- Can the HIA add qualifiers to help the city prioritize, such as using cost-savings information, etc.?
  - We want the public to inform the prioritization
  - The HIA is neutral - it only advocates for health and promotes the inclusion of the public and stakeholders in the decision-making process.

Meeting Wrap-up

After the stakeholder consultation exercise and general discussion, the meeting concluded with an overview of the HIA's next steps and some final considerations. The next steps for the HIA (Scoping) include:

- Document the discussions from the community and stakeholder meetings and incorporate the input into the HIA findings and recommendations.
- Complete the last two steps of the HIA process - **Reporting** and **Monitoring and Evaluation**.
  - ***Report*** final HIA findings and recommendations to MN DNR, the City of Duluth, and stakeholders (briefings, HIA report*, fact sheets, etc.)
  - ***Evaluate*** the HIA process and impact of the HIA on the decision-making processes. Develop ***plans for monitoring*** the implementation of HIA recommendations and the impact of the Habitat Restoration and Park Improvement projects on health.

*The final HIA report will be available on EPA's HIA website:
www.epa.gov/healthresearch/health-impact-assessments

HIA Contact Information

For more information on the HIA, contact one of the HIA Leadership Team members:

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Appendix G –HIA Monitoring Plan (Impact and Outcome Evaluation)

Table 7-2 identifies a plan for monitoring implementation of HIA recommendations (i.e., impact evaluation) and Table 7-3 identifies a plan for monitoring the impact of the habitat restoration and park improvement projects on health and health determinants (i.e., outcome evaluation).

Table G-1. Proposed Plan for Monitoring Implementation of HIA Recommendations (Impact Evaluation Plan)

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Water Habitat & Quality	Were best practices for stormwater management, erosion and runoff, and equipment leaks during the construction phases followed and mitigations implemented, as needed?	• Measures of turbidity at the project site • Oily sheens on the water • Post-construction visual assessment for evidence of erosion	• Monitoring data acquired during construction phases • Post-construction aerial photos	• Contractor (for construction phase monitoring) • MNDNR • MPCA	• During Habitat Restoration • During Park Improvement Construction
Water Habitat & Quality	Were habitat plans developed for marsh birds, wading birds, and migratory waterfowl?	• Presence or abundance of bird species • Measures of available bird habitat	• Inventories of bird sightings* • Bird habitat surveys	• Natural Resources Research Institute • MNDNR	• After Habitat Restoration • After Park Improvement Construction
Water Habitat & Quality	Was a long-term, non-native species management plan developed for both Grassy Point and Kingsbury Bay?	• Presence or abundance of non-native species	• Non-native species survey	• City of Duluth • Environmental NGOs • Academia	• After Habitat Restoration • After Park Improvement Construction
Water Habitat & Quality	Were existing, high-quality aquatic plants at Kingsbury Bay protected (where compatible with project goals)?	• Presence of high-quality aquatic plants at Kingsbury Bay	• Aquatic plant survey	• MNDNR • Natural Resources Research Institute • Academia	• After Habitat Restoration • After Park Improvement Construction
Water Habitat & Quality	Did project managers develop a sediment remediation target protective of human health based on surface-weighted area contaminant concentration, particularly for dioxins?	• Surface sediment contaminant concentration data • Fish tissue contaminant concentration data	• Sediment survey • Fish survey	• MPCA • EPA ORD	• After Habitat Restoration (ongoing, in 3-5 year intervals)

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Water Habitat & Quality	Are there future plans to cap or remove sediments to the east of the Grassy Point project area (currently outside the project area) to reduce bioavailability of dioxins?	• Surface sediment contaminant concentration data • Fish tissue contaminant concentration data	• Sediment survey • Fish survey	• MPCA • EPA ORD	• After Habitat Restoration
Water Habitat & Quality	Was the stormwater pond identified in the concept plan designed to intercept stormwater and maximize its ability to protect Kingsbury Bay water quality?	• Nutrient and sediment concentrations in Kingsbury Bay surface waters • Bacteria (*E. coli*) concentrations in Kingsbury Bay surface waters	• Water quality survey • Beach health monitoring program	• MPCA • EPA ORD • Academia	• After Habitat Restoration • After Park Improvements Construction
Water Habitat & Quality	Has MNDNR or a partner planned or conducted a creel survey focused on fishing within the AOC, including information on race, ethnicity, location of residence, age, and fish consumption habits?	• Population awareness of fish consumption advisories • Population willingness to follow fish consumption advisories • Age and ethnographic information on people who are consuming St. Louis River fish • Targeted fish species and sizes for consumption	• Creel survey	• MNDNR • Natural Resources Research Institute	• After Habitat Restoration • After Park Improvements Construction
Water Habitat & Quality	Have MPCA and MNDNR planned or implemented a fish monitoring program that includes mercury, dioxins, and PCBs, and targets both resident and migratory fish species?	• Fish fillet contaminant concentration for commonly consumed fish species and targeted fish sizes	• Fish contaminant monitoring program*	• MPCA • MNDNR • EPA ORD	• After Habitat Restoration (ongoing, in 3-5 year intervals)

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Water Habitat & Quality	Has ethnically-appropriate communication on consumption-related risk that addresses specific-contaminant risk as well as fish species and size been developed or implemented?	• Population awareness of fish consumption advisories • Population willingness to follow fish consumption advisories • Nutrition, including pre-term births and low birth weight • Life expectancy, or cancer incidence	• Creel Survey • 500 Cities Health Data • Duluth Community Health Needs Assessment • County-level health	• MNDNR • EPA ORD • City of Duluth • St. Louis County Public Health • MN Department of Health • Community members • NGO partners • Academia	• After Habitat Restoration • After Park Improvements Construction
Water Habitat & Quality	Have communications been developed to promote the consumption of local fish due to its health benefits (presuming contaminant concentrations of certain fish species or sizes at the project sites meet human health guidelines)?	• Population awareness of fish consumption advisories • Population consumption of St. Louis River fish • Nutrition, including pre-term births and low birth weight • Life expectancy, or cancer incidence	• Creel Survey • 500 Cities Health Data • Duluth Community Health Needs Assessment • County-level health	• MNDNR • EPA ORD • City of Duluth • St. Louis County Public Health • MN Department of Health • Community members • NGO partners • Academia	• After Habitat Restoration • After Park Improvements Construction
Water Habitat & Quality	Have project managers identified upland habitats within the site suitable for trees, and developed goals for the upland plant community that take into account future changes in invasive species, water level, and climate, as well as crime prevention and safety guidelines (e.g., Crime Prevention through Environmental Design guidelines)?	• Upland plant species presence or abundance • Plantings of trees suitable for future climate	• Upland plant survey • Remote sensing	• MNDNR • City of Duluth • Minnesota Land Trust • NGO partners • USDA • US Forest Service	• After Habitat Restoration

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Water Habitat & Quality	Were regional stormwater outfalls or other sources of *Escherichia coli* identified, and did project managers implement additional best management practices to improve water quality at the future swimming beach at Kingsbury Bay?	• Bacteria (*E. coli*) concentrations in Kingsbury Bay surface waters • *E. coli* DNA analysis to determine source	• Water quality survey • Beach health monitoring program • *E. coli* DNA study	• MPCA • EPA ORD • Academia	• After Habitat Restoration • After Park Improvements Construction
Water Habitat & Quality	Did either MNDNR or the City of Duluth post interpretative signage that provides information on wetland habitat types and the benefits each habitat provides for fish, reptiles, birds, and people?	• Existence and content of interpretive signage • Population awareness of park natural features and habitats • Existence and attendance of natural feature-based programming or outreach at Kingsbury Bay or Grassy Point	• Survey data • Program evaluations from organizations conducting natural feature-based programming or outreach	• City of Duluth • Environmental Education NGOs • Community Organizations	• After Park Improvements Construction
Water Habitat & Quality	Did MPCA implement routine beach monitoring at the future Kingsbury Bay swimming beach?	• Bacteria (*E. coli*) concentrations in Kingsbury Bay surface waters	• Beach health monitoring program	• MPCA	• After Habitat Restoration • After Park Improvements Construction
Equipment Operation, Traffic, and Transport Air Quality Noise and Light Pollution	Was the project, its duration, project updates (including issues and concerns), and expected roadway and water traffic impacts, air pollution levels, and noise levels clearly communicated to residents, schools and daycare centers, senior centers and care facilities, businesses, and recreational users in the project area and along the transport route?	• Number and location of project notices regarding the project, its schedule and duration, and expected impacts • Number, type and location of community meetings	• Community meetings • MNDNR St. Louis River Restoration Initiative website • MNDNR Construction Updates • City of Duluth website • City of Duluth emails • Notices on Facebook, Nextdoor, and Twitter • Community feedback	• MNDNR • City of Duluth • EPA ORD • Community members and recreational users • NGO partners	• During Habitat Restoration • During Park Improvements Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Equipment Operation, Traffic, and Transport Air Quality Noise and Light Pollution	Was a means provided for residents and other affected populations to provide feedback, questions and/or lodge complaints about general construction activities and excess traffic, air, and noise impacts?	• Community feedback/ communication process • Complaints/questions about general construction activities and excess traffic, air, and noise	• MNDNR • City of Duluth • Community meetings • Community feedback	• MNDNR • City of Duluth • EPA ORD • Community members and recreational users • NGO partners	• During Habitat Restoration • During Park Improvements Construction
Equipment Operation, Traffic, and Transport	Were companies with a proven safety record hired and local companies given priority in hiring to benefit the local economy?	• Contractor safety record • Project equipment-related injury or death	• RFP and contract documentation	• MNDNR • City of Duluth	• During Habitat Restoration • During Park Improvements Construction
Equipment Operation, Traffic, and Transport Air Quality Noise and Light Pollution	Were trucks, other equipment and vehicle traffic routed away from neighborhoods, schools and daycare centers, senior centers and care facilities, and recreation areas to the extent possible to minimize the risk of traffic impacts and exposure to noise and air pollution?	• Project planning efforts • Truck, equipment, and vehicle traffic routes • Complaints about project-related traffic impacts, noise, or air pollution • Complaints about asthma and other respiratory issues near project sites or transport routes	• MDNR and City of Duluth project planning and implementation documents • MNDNR Construction Updates • Community feedback	• MNDNR • City of Duluth • Community members and recreational users • NGO partners • Academia	• During Habitat Restoration • During Park Improvements Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Equipment Operation, Traffic, and Transport	Were additional safety measures taken and/or the amount of truck traffic limited at the start and end of the school day to create safe routes to and from school for children?	• Project planning efforts • Safe routes to/from school (safety measures instituted or truck traffic limited at the start and end of the school day) • Truck and equipment patterns, routes, frequency, timing • Project-related pedestrian injury or death near the project sites and along the transport routes	• MDNR and City of Duluth project implementation documents • MNDNR Construction Updates • Duluth Police Department calls • School feedback • Community feedback	• MNDNR • City of Duluth • Duluth-Superior Metropolitan Interstate Council • City of Duluth Police Department • Schools • Community members • NGO partners • Academia	• During Habitat Restoration • During Park Improvements Construction
Equipment Operation, Traffic, and Transport	Were traffic patterns, road geometry, and frequency and timing of trips taken into account to minimize traffic disturbance and congestion?	• Project planning efforts • Truck and equipment patterns, routes, frequency, timing • Use of rail or barge to transport material • Change in traffic volumes near the project sites and along the transport routes • Change in congestion and time spent in traffic near the project sites and along the transport routes • Roadway and waterway traffic accidents near the project sites and along the transport routes	• MDNR and City of Duluth project planning and implementation documents • MNDNR Construction Updates • Community feedback	• MNDNR • City of Duluth • Community members • NGO partners	• During Habitat Restoration • During Park Improvements Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Equipment Operation, Traffic, and Transport	Was any damage to roadways caused by construction vehicles and transport (e.g., potholes, broken curbs, collapsed manholes, rail crossing damage) repaired?	• Road conditions or repair of damage (potholes, broken curbs, collapsed manholes, railroad crossing damage) near the project sites and along the transport routes	• Road repair requests • Duluth Public Works Online Form to Report Road Issues • MNDNR and City of Duluth reporting • Community feedback	• Duluth Public Works and Utilities • MNDNR • City of Duluth • Community members • NGO partners	• During Habitat Restoration • During Park Improvements Construction
Equipment Operation, Traffic, and Transport Air Quality	Was the use of rail or barge considered to transport sediment between the two sites (as these routes would avoid residential areas, minimize roadway traffic impacts, likely reduce the number of trips given the larger capacity of rail cars and barges, and minimize traffic-related air pollutants in the residential areas)?	• Project planning efforts • Use of rail or barge to transport material	• MDNR project planning and implementation documents • MNDNR Construction Updates	• MNDNR • NGO partners	• During Habitat Restoration
Equipment Operation, Traffic, and Transport	Was material transport traffic routed away from neighborhoods, schools and daycare centers, senior centers and care facilities, and recreation areas to minimize the risk of exposure to particulate matter and contaminants in excavated material?	• Project planning efforts • Traffic patterns, routes, frequency, timing • Fugitive dust measures (e.g., covering transport vehicles) • Exposure to sediment-related particulate matter and contaminants	• MDNR and City of Duluth project planning and implementation documents • MNDNR Construction Updates • Community feedback	• MNDNR • City of Duluth (route selection) • Community members and recreational users • NGO partners • Academia	• During Habitat Restoration

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Equipment Operation, Traffic, and Transport	Were steps taken to minimize the impacts of the hydraulic pipeline and project-related barge traffic on recreational boaters and the navigation channel of the St. Louis River by using signs, markings, and warnings?	• Waterway signs, markings, and warnings • Project-related waterway traffic injury or death near the project sites and along the transport routes	• MNDNR Construction Updates • Community feedback • Duluth Seaway Port Authority • MNDNR Boating and Water Safety Enforcements	• MNDNR • City of Duluth • Community members and recreational users • Duluth Seaway Port Authority • NGO partners	• During Habitat Restoration
Equipment Operation, Traffic, and Transport Air Quality	Was exposure to material in transport minimized by covering transport vehicles and implementing other fugitive dust measures, including watering access routes, and covering exposed soils/ stockpiles?	• Fugitive dust measures (e.g., covering transport vehicles, watering access routes, covering exposed soils/stockpiles) • Complaints about fugitive dust, material spills, etc.	• MNDNR Construction Updates • Community feedback	• MNDNR • Community members and construction crews • NGO partners	• During Habitat Restoration

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Equipment Operation, Traffic, and Transport Crime and Safety	Were traffic calming measures (such as speed humps, raised crosswalks/ intersections, traffic circles, medians, curb extensions or bump-outs, and signage or pavement markings) and bikeway improvements (such as clear painted bike lane markings and signage to already designated bike routes) implemented to improve safe access to the parks and minimize the risk for increased accidents should the parks and other nearby enhancements increase the amount of traffic in the area post-construction?	• Traffic calming measures • Pedestrian and bicyclist use of the access points, trails, and parks • Incidences of injury to pedestrian and bicyclists	• Duluth road projects • Park usage data • Duluth Police Department calls • Community feedback	• Duluth Public Works and Utilities • Duluth Parks Department • Duluth Police Department • NGO Partners • Community members and recreational users • Academia	• After Park Improvements Construction
Air Quality	Were mitigation specifications included in the contract (reduced idling and requirements for equipment fitted with catalysts and filters) and incentives provided for contractors with idle reduction policies, and newer or retrofitted equipment?	• Contract air pollution mitigation specifications and incentives	• MNDNR and City of Duluth contracts	• MNDNR • City of Duluth	• Prior to and During Habitat Restoration • Prior to and During Park Improvements Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Air Quality	Were native trees and plants selected for planting that will do well in warming climate?	• Trees and plants planted at project sites and their characteristics (potential air pollutant filtering capability, adaptation to warming climate)	• Revegetation Plans • Park Design Documents	• City of Duluth • Duluth Parks Department • Minnesota Land Trust • NGO partners • Community members and nature enthusiasts • Academia	• Prior to and During Park Improvements Construction
Air Quality	Were trees selected that have tall, broad canopies for increased shading and place in areas where people may congregate?	• Trees with tall broad canopy • Position of trees with tall broad canopy • % Tree Canopy	• Revegetation Plans • Park Design Documents • Community feedback	• City of Duluth • Duluth Parks Department • Minnesota Land Trust • NGO partners • Community members and recreational users • Academia	• Prior to and During Park Improvements Construction
Noise and Light Pollution	Were noise mitigation criteria/ specifications included in the contract (e.g., absolute noise criterion for equipment, restricted idling, and use of mufflers, dampeners, shieldings, and enclosures)?	• Contract noise pollution mitigation specifications and incentives	• MNDNR and City of Duluth contracts	• MNDNR • City of Duluth	• Prior to and During Habitat Restoration • Prior to and During Park Improvements Construction
Noise and Light Pollution	Were incentives or priority in hiring included for contractors who have established noise mitigation programs/policies and/or newer fleets?	• Contractor noise migration program/policies • Contractor equipment • Noise complaints	• MNDNR and City of Duluth contracts • MNDNR and City of Duluth Contractor Operations Plans	• MNDNR and their contractors • City of Duluth and their contractors	• Prior to and During Habitat Restoration • Prior to and During Park Improvements Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Noise and Light Pollution	Were construction activities limited to daylight hours or the hours specified in the Duluth noise ordinance (7 am – 9 pm), whichever is more restrictive (i.e., sunset December-March is between 4:30 and 7:30 pm)? Were noisy operations limited to non-sensitive time periods and the presence of shift workers in the surrounding community taken into account to limit interruption to daily activities?	• Project planning efforts • Construction operations schedule	• MDNR and City of Duluth project planning and implementation documents • MNDNR Construction Updates • Community feedback	• MNDNR, City of Duluth, and their contractors • Community members • NGO partners	• During Habitat Restoration • During Park Improvements Construction
Noise and Light Pollution	Was nighttime construction activity avoided to the extent possible and, when necessary, measures implemented to minimize light illumination impacts on nearby residences?	• Project planning efforts • Construction operations schedule • Nighttime lighting configuration • Complaints about light at night	• MDNR project planning and implementation documents • MNDNR Construction Updates • Community feedback	• MNDNR and their contractors • Community members • NGO partners	• During Habitat Restoration
Noise and Light Pollution	Was noise monitoring implemented in the vicinity of both sites to assess overall noise levels (i.e., baseline noise plus project noise) and implement mitigation measures, as necessary, to minimize impacts?	• Daytime and nighttime total noise levels (baseline noise plus project noise) • Complaints about excess noise, sleep disturbance, or classroom disturbance	• Noise monitoring program • Community feedback • Duluth Police Department complaints/calls	• MNDNR, City of Duluth, and their contractors • St. Louis County Health and Human Services/ MN Department of Health • Academia • Community members, recreational users, and construction crews	• During Habitat Restoration • During Park Improvements Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Noise and Light Pollution	Were stationary noise sources positioned as far away as possible from noise sensitive areas (areas where a quiet setting is a generally recognized feature or attribute, such as residential areas, parks, recreational and wilderness areas, and cultural and historical sites)?	• Stationary noise source position (as far as possible from noise sensitive areas)	• MNDNR and City of Duluth project planning and implementation documents • MNDNR and City of Duluth Contractor Operations Plans • Community feedback	• MNDNR and their contractors • City of Duluth and their contractors • Community members • NGO partners	• Prior to and During Habitat Restoration • Prior to and During Park Improvements Construction
Noise and Light Pollution	Were hearing protection and operations schedules implemented to avoid exposure of construction workers to noise above NIOSH recommended exposure limits?	• Construction operations schedule to avoid exposure above NIOSH recommended exposure limits) • Hearing protection for construction workers	• MNDNR and City of Duluth contracts • MNDNR and City of Duluth Contractor Operations Plans • OSHA Safety and Health Complaints	• MNDNR and their contractors • City of Duluth and their contractors • Occupational Safety and Health Administration (OSHA)	• Prior to and During Habitat Restoration • Prior to and During Park Improvements Construction
Noise and Light Pollution	Was the use of truck engine brakes prohibited, unless in case of emergency?	• Policy/instructions prohibiting use of truck engine brakes • Complaints about use of truck engine brakes	• MNDNR and City of Duluth Contractor Operations Plans • Community feedback • Duluth Police Department complaints/calls	• MNDNR, City of Duluth, and their contractors • St. Louis County Health and Human Services/ MN Department of Health • Academia • Community members, recreational users and construction crews	• During Habitat Restoration • During Park Improvements Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Noise and Light Pollution	Was lighting used in the parks intelligently-designed, low glare, efficient outdoor lighting fixtures that direct illumination toward the ground (rather than upward) and was the potential for motion sensors on lighting considered in certain areas of the parks or parking lots to minimize over-illumination?	• Park lighting features/ configuration	• Park Design Documents • Lighting Assessment	• City of Duluth • NGO partners • Community members • Academia	• During Park Improvements Construction
Crime and Safety	Were clear signs and barriers used when construction activities altered existing routes and access points to minimize the potential for trespassers?	• Installed signs and barriers • Rate of injury of residents and recreational users • Rate of reported trespassers	• MNDNR • City of Duluth • Community feedback • Duluth Police Department	• MNDNR, City of Duluth and their contractors • NGO partners • Community members and recreational users	• During Habitat Restoration Construction and Operations • During Park Improvements Construction
Crime and Safety	Were the improvements made to Grassy Point clearly communicated to alleviate existing perceptions of crime and safety issues and encourage utilization of the space post-restoration?	• Number and location of project notices • Number, type and location of community meetings • Number of engaged neighborhood groups • Number of engaged community partners	• Community Meetings • City of Duluth website • City of Duluth emails • Notices on Facebook, Nextdoor, and Twitter • Community feedback	• City of Duluth • Community members and recreational users • NGO partners	• After Park Improvements Construction
Crime and Safety	Were Crime Prevention through Environmental Design (CPTED) guidelines, including lighting and planting configurations, followed? Where possible, were dense planting and shrubs around narrow pedestrian paths reduced?	• Amount of dense planting installed or removed • Lighting and planting configurations that meet CPTED guidelines	• Park Design Documents • CPTED Assessment • Community feedback	• City of Duluth • Duluth Parks Department • Community members and recreational users • NGO partners • Academia	• During Park Improvements Construction • During Park Improvements Operations and Maintenance

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Crime and Safety	Was lighting improved and police surveillance considered and/or implemented to reduce crime and the perception of risk at these sites?	• Amount and types of lighting installed • Frequency of police surveillance of the sites • Community perceptions of the sites	• Park Design Documents • Lighting assessment • Duluth Police Department Community Policing and Volunteers in Policing Programs • Community feedback	• City of Duluth • Duluth Police Department • Community members • NGO partners • Academia	• During Park Improvements Construction • During Park Improvements Operations and Maintenance
Crime and Safety	Was clear signage and maps provided for pedestrian and bicyclist access to the parks? Did these markers use effective wayfinding systems, such as the use of landmarks, signage, distance to destination markers, and interest points, to assist in navigating the routes easily?	• Installation of signage along routes to the parks • Increased use of pedestrian and bicyclist access points	• Duluth road projects (markings, signage, etc.) • Park usage data • Community feedback	• Duluth Public Works & Utilities • Community members and recreational users • NGO partners • Academia	• During Park Improvements Construction • During Park Improvements Operations and Maintenance
Crime and Safety	Was police enforcement increased after park improvements began to "set the tone"? Were there communications with the police department encouraging their increased surveillance and presence at the parks?	• Frequency of police surveillance of the sites • Police-community engagement	• Duluth Police Department Community Policing and Volunteers in Policing Programs • Community feedback	• City of Duluth • Duluth Police Department • Community members • NGO partners	• During Park Improvements Construction • During Park Improvements Operations and Maintenance
Crime and Safety	Was the National Highway Transportation Safety Administration's (NHTSA's) Walkability and Bikeability Checklists used to inform the design of trails within and leading to the parks?	• Park planning documentation • Compliance with NHTSA Walkability Checklist and Bikeability Checklist Guidelines	• Park Design Documents • Walkability and Bikeability Audit/ Checklists • Community feedback	• City of Duluth • Community members and recreational users • NGO partners • Academia	• During Park Improvements Construction • During Park Improvements Operations and Maintenance

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Crime and Safety	Was pedestrian and bicycle access to Grassy Point from the Irving neighborhood improved?	• Increased use of the pedestrian and bicyclist access points and trails from the Irving neighborhood • Increased use of the park by community members from the Irving neighborhood	• Park usage • Community feedback	• City Parks Department • Community members and recreational users • NGO partners • Academia	• After Park Improvements Construction
Recreation, Aesthetics and Engagement with Nature	Did the City of Duluth solicit community and stakeholder input and examine the pathways through which park improvement could impact health to inform park improvements design and implementation?	• Number, type, and location of community and stakeholder meetings • Park Improvement planning documents mention of health	• Meeting notices, including locations (of posting and meeting) • Meeting notes and reports • Planning and design documents • Community feedback	• City Parks Department • EPA ORD • Community members and recreational users	• During Park Improvement Planning
Recreation, Aesthetics and Engagement with Nature	Are diverse opportunities for recreation offered at Kingsbury Bay and Grassy Point, including publicly-accessible gathering spaces, fishing piers, birding platforms, access to the water for water-based recreation, and trails? Were maintenance requirements of installed features considered?	• List of park amenities • List of organized recreational opportunities	• Park inventory • Park plans • DNR project plans • Site survey • Community feedback	• MNDNR • City of Duluth • Minnesota Land Trust • Community members and recreational users • Academia • NGO partners	• During and After Habitat Restoration and Park Improvement Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Recreation, Aesthetics and Engagement with Nature	Were fishing opportunities preserved and enhanced with more formal locations (e.g., piers) and social gathering opportunities implemented adjacent to those locations?	• Number of fishing piers • Change in inventories or indices of biotic integrity for fish (see Water Quality and Habitat Pathway)	• Park inventory • Park plans • MNDNR project plans • Community feedback	• MNDNR • City of Duluth • Minnesota Land Trust • Community members and recreational users • Academia • NGO partners	• During and After Habitat Restoration and Park Improvement Construction
Recreation, Aesthetics and Engagement with Nature	What type of upland area was created on Big Island? Does it form a more sheltered bay, providing safer harbor for kayaks and canoes?	• Acres of upland • Acres of water at a depth appropriate for human-powered boats	• Park plans • MNDNR project plans • Bathymetry and elevation maps	• MNDNR • EPA ORD • Academia • NGO partners	• After Habitat Restoration
Recreation, Aesthetics and Engagement with Nature Crime and Safety	Were measures included in areas that support both human-powered and motorized boats to enhance safety and minimize potential for user conflict?	• List of park safety features, including signage and buoys	• Park inventory • Park plans • Community feedback	• City of Duluth • EPA ORD • Community members and recreational users • NGO partners • Academia	• After Park Improvement Construction
Recreation, Aesthetics and Engagement with Nature	Are measures included in swimming areas that enhance safety, such as signage about the availability of lifeguards and current water quality status? Are measures included in these areas that minimize potential for user conflict (e.g., buoys separating swimming and boating areas)?	• List of park safety features, including signage, buoys, lifeguards, or water quality status	• Park inventory • Park plans • Community feedback	• City of Duluth • EPA ORD • Community members and recreational users • NGO partners • Academia	• After Park Improvement Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Recreation, Aesthetics and Engagement with Nature Social and Cultural	In advance of construction and in all project phases, was construction and project information clearly communicated to recreational and water users, through multiple media sources, including reliable and timely information about the construction periods, disruptions to the Western Waterfront Trail, walkability and accessibility to both project sites, as well as the planned changes at both sites so that users can anticipate the improved resources and plan to visit?	• Number of project notices • Placement of project notices	• MNDNR St. Louis River Restoration Initiative website • MNDNR Construction Updates • City of Duluth website • City of Duluth emails • Notices on Facebook, Nextdoor, and Twitter • Community feedback	• MNDNR • City of Duluth • EPA ORD • Community members and recreational users • NGO partners	• During Habitat Restoration and Park Improvement Construction
Recreation, Aesthetics and Engagement with Nature	How did parking opportunities change access to and utilization of the restored Kingsbury Bay and Grassy Point sites? Was caution taken to minimize any potential environmental impacts of added parking?	• Number and location of parking spaces	• Park plans • MNDNR project plans • Post-construction site survey	• MNDNR • City of Duluth • Academia	• During Habitat Restoration Planning • During Park Improvements
Recreation, Aesthetics and Engagement with Nature	Was wetland restoration at the mouth of Kingsbury Creek performed to preserve the cold-water habitat for trout and provide deeper water for kayak and canoe access?	• Acres of cold-water fish habitat • Acres of water at a depth appropriate for human-powered boats	• Park plans • MNDNR project plans • Bathymetry and elevation maps	• MNDNR • EPA ORD • NGO partners • Academia	• After Habitat Restoration Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Recreation, Aesthetics and Engagement with Nature Social and Cultural	Were natural spaces for social interaction and opportunities for social gatherings implemented near the additional planned fishing piers, especially at Grassy Point? Are they similar to the improvements at Chambers Grove Park?	• List and location of park amenities, including tables, platforms, benches, grills, and signage	• Park inventory • Park plans • MNDNR project plans • Community feedback	• MNDNR • City of Duluth • Minnesota Land Trust • Community members and recreational users • NGO partners • Academia	• After Habitat Restoration • Park Improvement Construction
Recreation, Aesthetics and Engagement with Nature	Was the value placed on existing recreational amenities by residents who use the resources frequently recognized in the park improvement plans and any changes to amenities?	• List of park amenities • Before and after maps • Community input/values regarding amenities	• Park inventory • Park plans • MNDNR project plans • Site survey • Community feedback	• City of Duluth • EPA ORD • Community members and recreational users • NGO partners • Academia	• During and After Park Improvements Construction
Recreation, Aesthetics and Engagement with Nature	Were current birding locations preserved and upgraded and access to newly created birding habitat enhanced? Were upland plant communities restored to maximize potential for pollinator, including bird, habitat?	• List and location of park amenities, including signage, raised platforms, and telescopes • List of and location of trails • Number and types of native plants • Acres of pollinator habitat	• Park inventory • Park plans • MNDNR project plans • Community feedback	• MNDNR • City of Duluth • Minnesota Land Trust • Audubon Society • Community members and recreational users • NGO partners • Academia	• During Habitat Restoration and • During Park Improvement Planning • After Construction • After Habitat Restoration
Recreation, Aesthetics and Engagement with Nature	How were existing resources and park amenities valued by residents changed? Are users attracted by the new features created?	• List of park amenities • Before and after maps	• Park inventory • Park plans • MNDNR project plans • Site survey • Community feedback	• City of Duluth • EPA ORD • Community members and recreational users • NGO partners • Academia	• After Park Improvements Construction • During Park Improvements Operation and Maintenance

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Recreation, Aesthetics and Engagement with Nature	Was a water trail created to serve as a by-way for kayaks that can be nominated as a nationally designated water trail and provide opportunities for recognition and funding?	• Existence of a St. Louis River National Water Trail • Nominations/recognition	• National Water Trails System	• MN Land Trust • MNDNR • EPA ORD • NGO partners	• After Park Improvements Construction
Recreation, Aesthetics and Engagement with Nature	Were different types of co-management models developed and implemented, where neighborhood organizations have more formal responsibility for park management?	• Identify the co-management arrangements • Number of engaged neighborhood groups • Number of engaged community partners • Number and types of community led parks management and recreational activities	• City of Duluth website • City of Duluth emails • Notices on Facebook, Nextdoor, and Twitter • Community feedback • NGO websites • NGO feedback	• City of Duluth • EPA ORD • Community members and recreational users • NGO partners • Academia	• During Park Improvements Operation and Maintenance
Recreation, Aesthetics and Engagement with Nature	How many and what types of partnerships were created with organizations to facilitate access, education, and equipment sharing, additional recreational opportunities, and leadership capacity building for underrepresented communities?	• Number of engaged neighborhood groups • Number of engaged community partners • Number and types of community led activities	• City of Duluth • Community feedback • NGO feedback	• City of Duluth • EPA ORD • Community members and recreational users • NGO partners • Academia	• During Park Improvements Operation and Maintenance

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Social and Cultural	Did the planning team gather information needed to understand the social and cultural significance of the parks to the various populations in the community, including but not limited to a cultural heritage assessment of the sites?	• Number, type, and location of community and stakeholder meetings/engagement • Park Improvement planning documents mention of social and cultural significance	• City of Duluth • Planning and design documents • Cultural heritage assessment • Community feedback • NGO feedback	• City of Duluth • EPA ORD • Community members and recreational users, including minority groups (e.g., Native Americans and African Americans) • NGO partners • Academia	• During Park Improvements Planning
Social and Cultural	Were natural spaces created for social interaction and solitary spiritual reflection, including spaces for spiritual reflection that minimize the noise and distraction from the nearby industry and take into account the vistas from the space?	• Number of natural spaces created for social interaction and solitary spiritual reflection	• City of Duluth • Planning and design documents • Site survey • Community feedback • NGO feedback	• City of Duluth • EPA ORD • Community members and recreational users, including minority groups • NGO partners • Academia	• During Park Improvements Construction, Operations and Maintenance
Social and Cultural	Was signage created to demarcate culturally-significant spaces and promote quiet reflection? Were the Duluth Indigenous Commission, Fond du Lac Band, and 1854 Treaty Authority consulted when developing signage to denote spaces that are significant for Native American populations?	• Type and quantity of signage used to demarcate culturally-significant spaces and promote quiet reflection • Number of meetings and quality of engagement with the Duluth Indigenous Commission, Fond du Lac Band, and 1854 Treaty Authority	• City of Duluth • Planning and design documents • Site survey • Community feedback • NGO feedback	• City of Duluth • Community members and recreational users • Duluth Indigenous Commission, Fond du Lac Band, and 1854 Treaty Authority • NGO partners • Academia	• During Park Improvements Construction, Operations and Maintenance

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Social and Cultural	Were the placement of native, medicinal, and culturally-significant plants prioritized?	• Quantity of native, medicinal, and culturally-significant plants • Engagement with the public, including the Duluth Indigenous Commission and ecologists, to identify the specific species of plants that are native, medicinal, and culturally-significant	• City of Duluth • Park planning and design documents • Site survey • Community feedback	• City of Duluth • Community members, recreational users, and Nature Enthusiasts • Duluth Indigenous Commission • NGO partners • Academia	• During Park Improvements Planning and Construction
Social and Cultural	What was done to promote the presence of wildlife that may be culturally significant and specifically the abundance of fish for subsistence fishing?	• Presence of habitat for culturally-significant wildlife and fish for subsistence fishing • Types and quantity of wildlife • Engagement with the public, including the Duluth Indigenous Commission and ecologists, to identify the specific wildlife species that are native and culturally-significant	• MNDNR planning and implementation documents • City of Duluth • Habitat assessment • Wildlife/fish survey • Creel survey • Community feedback	• MNDNR • City of Duluth • Community members and recreational users • NGO partners • Academia	• During Habitat Restoration • During Park Improvements Construction
Social and Cultural	Were the 1854 Treaty Authority, Duluth Indigenous Commission, and Fond du Lac Band resource managers consulted to identify significant sites for any use and determine the best approach to preserve, enhance or interpret resources?	• Engagement with the public, including the 1854 Treaty Authority, Duluth Indigenous Commission, and Fond du Lac Band to identify significant sites for any use, including the number of meetings, notices for meetings, reporting of findings and results to the public	• Community meetings/ engagement • Park planning and design documents	• City of Duluth • 1854 Treaty Authority, Duluth Indigenous Commission, and Fond du Lac Band	• During Park Improvements Planning and Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Social and Cultural	Was outreach conducted to engage and encourage park use by the African American youth in Duluth?	• Number of announcements, meetings, social media outreach, engagement at schools and community centers, including the YMCA, the Valley Youth Center, and the Duluth Outdoor Collaborative	• Community meetings/ engagement • City of Duluth website • City of Duluth emails • Notices on Facebook, Nextdoor, and Twitter • Community feedback	• Duluth Parks Department • NAACP • Schools • YMCA, Valley Youth Center, Duluth Outdoor Collaborative • Community members and recreational users	• During Park Improvements Operation and Maintenance
Social and Cultural	What was done to encourage park use by minority groups? Has the City of Duluth Parks Department hired leaders from these underrepresented populations to work in public engagement, outreach, and park operations?	• Number of announcements, meetings, social media outreach, engagement at schools and community centers to reach out to underrepresented groups? • Newly hired employees of the city parks and recreation to work in public engagement, outreach, and park operations.	• Community meetings/ engagement • City of Duluth website and hiring notices • Community feedback • NGO feedback	• Duluth Parks Department • Community members and recreational users • NGO partners • Academia	• During Park Improvements Operation and Maintenance
Social and Cultural	Bag stations for dog poop pick-up should be installed at each park.	• Inventory of amenities, including bag stations	• Park plans • Park inventory • Community feedback • NGO feedback	• Duluth Park Department • Community members and recreational users • NGO partners	• During Park Improvements Construction

Pathway	Monitoring Question	Potential Indicators	Potential Data Sources	Potential Partners for Implementation	Timing
Recreation, Aesthetics, and Engagement with Nature Social and Cultural	The City should provide a means for assessing park usage and the ends to which the sites are being used (e.g., for social cohesion, spiritual reflection, and access to cultural resources). This could include reaching out to the University of Minnesota-Duluth Environmental and Outdoor Education program or other local organizations to create a service learning or citizen science project that monitors, through a 5-year monitoring and evaluation timeline, the use of the parks for these means or providing signage at the sites that includes a description of how to report usage of the park, including a QR code that sends them directly to a feedback form	• Park usage data • Park visitor counters	• Service learning or citizen science project • Park usage self-reporting mechanism • Community feedback • NGO feedback	• Duluth Parks Department • Community members and recreational users • Academia • NGO partners	• During Park Operations and Maintenance

Table G-2. Proposed Plan for Monitoring Health Impacts Post-decision (Outcome Evaluation Plan)

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Water Habitat and Quality Pathway	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted the type of water habitats, vegetation (including invasive species), and fauna (including fish) at the project sites both in the short-term and long-term?	• Change in area of aquatic vegetation classes (e.g., emergent, mixed, submerged aquatic vegetation, floating leaf, and deep) • Change in inventories or indices of biotic integrity for aquatic vegetation, aquatic macroinvertebrates, fish, and birds. • Change in area of terrestrial and aquatic habitat classes (e.g., open water, wetland, and riparian habitat) • Change in bathymetry of aquatic habitat • Change in inventories and areal assessments of invasive species • Change in inventories of rare, threatened, or endangered species	• Federal, tribal, and state agency biological surveys • MNDNR conducting pre- and post-project habitat assessments • Academic research within the project area	• MNDNR • Federal and tribal agencies • Academia • Lake Superior National Estuarine Research Reserve • Anglers and bird-watchers • Citizen scientists	• After Habitat Restoration • Continuing through Park Improvement Operations and Maintenance

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Water Habitat and Quality Pathway	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted water, sediment, and biota pollutant levels and exposure of construction crews, recreational users, and individuals fishing for consumption at/near the project sites?	• Change in concentration of contaminants (especially PCBs, dioxins, and mercury) in dredged and placed sediment • Project site monitoring for equipment leaks and sediment disturbance • Change in surface water turbidity and nutrient concentration	• MNDNR • City of Duluth • Contractor	• None; required under permitting	• During Habitat Restoration Construction and Operations • During Park Improvements Construction
		• Change in *E. coli* counts from Kingsbury Bay or other monitored locations nearby • Change in water contact and beach closure advisories at/near the two sites • Days of beach closure per swimming season at the sites • Change in concentration of contaminants in sediment, aquatic invertebrates, fish, and marsh birds • Sediment toxicity testing (*Limbriculus* test, *Hyallela* test)	• MDH beach health monitoring program (existing program) • MDH water contact advisories • Contaminant data would need to be obtained by MN or under contract	• MDH • Federal, tribal, and state agencies • Academia • Consulting firms	• After Habitat Restoration • Continuing through Park Improvements Operations and Maintenance

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Water Habitat and Quality Pathway	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted the opportunity for and risk of consumption of fish from or nearby the project sites?	• Change in the number of individuals fishing • Proportion of anglers consuming fish and sharing fish with family or friends • Angler frequency of consuming fish and portion size • Typical species and sizes of game fishes consumed by anglers • Concentration of contaminants in game fish fillets • Change in fish consumption advisories • Proportion of anglers aware of existing fish consumption advisories	• Park usage data • Creel survey or interviews • MPCA/MNDNR fish tissue monitoring program • MNDNR Fish Consumption Advisories (existing data) • Contaminant data would need to be obtained by MN or under contract	• City of Duluth (park usage) • MNDNR • Federal and tribal agencies	• During Park Improvements Operations and Maintenance
Water Habitat and Quality Pathway	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted the health of construction crews, recreational users, and individuals fishing for consumption?	• Days of beach closure per swimming season • Change in human exposure risk to contaminants in fish tissue • Change in human exposure risk to contaminants in sediments	• MDH beach health monitoring program (existing program) • Creel survey or interviews of recreational anglers or boaters • Human health study of concentration of contaminants in blood or cord blood or other tissues	• MDH • MNDNR • Federal and tribal agencies • Academia • Anglers • Citizen scientists	• During Park Improvements Operations and Maintenance

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Equipment Operation, Traffic and Transport	How have habitat restoration and park improvement activities impacted traffic volumes and associated traffic conditions (traffic accidents, road conditions, and congestion) at/near the project sites and along roadways and waterways?	• Change in traffic volumes near the project sites and along the transport routes • Change in congestion and time spent in traffic near the project sites and along the transport routes • Roadway and waterway traffic accidents near the project sites and along the transport routes • Road conditions or repair of damage (potholes, broken curbs, collapsed manholes, railroad crossing damage) near the project sites and along the transport routes	• Traffic counts during construction • Traffic studies • Park visitor rates (as a proxy for park vehicle traffic) • Annual Average Daily Traffic (AADT) • Traffic accident reports • MNDNR Boating Accident and Drowning Summary • Road condition complaints	• Citizen scientists (traffic during construction) • MNDOT (traffic counts) • City of Duluth Public Works and Utilities Department (street conditions and traffic concerns) • Duluth Police Department (accident reports) • MNDNR (boating accidents)	• During Habitat Restoration Construction and Operations/ Park Improvement Construction (All); • During Park Improvement Operation and Maintenance (Changes in traffic volume and congestion; traffic accidents)

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Equipment Operation, Traffic and Transport	How has habitat restoration and park improvement equipment operation and traffic/transport impacted the health of construction crews, community members, and recreational users?[1]	• Project-related roadway and waterway traffic injury or death near the project sites and along the transport routes • Project equipment-related injury or death • Reported project-related stress • Exposure to sediment-related particulate matter and contaminants	• Traffic accident/ injury reports • MNDNR Boating Accident and Drowning Summary • Hospital discharge data • OSHA (equipment-related injury or death) • Complaints of project-related stress and exposure to sediment	• MNDNR and City of Duluth and its contractors • Duluth Police Department (accident/injury reports) • MNDNR (boating accidents) • OSHA (construction injury and death) • Hospitals • Community members (complaints)	• During Habitat Restoration Construction and Operations/Park Improvement Construction (All); • During Park Improvement Operation and Maintenance (Traffic injury or death near sites)
Air Quality	How have habitat restoration and park improvement activities impacted air quality and exposure of construction crews, community members and/or recreational users to air pollutants and particulates at/near the project sites and along roadways and waterways?	• Modeled or measured air pollutant levels (carbon dioxide, nitrogen oxide, hydrocarbons, carbon monoxide) • Particulate levels • Complaints about air pollution, diesel exhaust, fumes, particulates, or dust	• Project air monitors • MPCA Air Now • Community feedback/ reports	• MNDNR • MDH • MPCA • Community members • Citizen scientists • Academia	• During Habitat Restoration Construction and Operations/ Park Improvement Construction • During Park Improvement Operation and Maintenance (impact of increased park traffic on air quality)

[1] These are health indicators that can most easily be used to measure direct health impacts of the Habitat Restoration/Park Improvement Projects; otherwise, impacts on health determinants and health behaviors (measured by the other monitoring questions for this pathway) will need to be used as indicators of health impact

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Air Quality	How has urban heat island effects in the vicinity of both sites changed as a result of the habitat restoration and park improvement efforts?	• % impervious surface • % tree canopy • Public Health Tracking Network extreme heat events • Temperature heat maps/land surface temperature maps	• MN Geospatial Commons Landcover • Tree Canopy study • U.S. Forest Service I-Tree • PRISM (temperature model) • Landsat Thermal Remote Sensing (TRS) Tools for ArcGIS Desktop (land surface temps)	• MNDNR and City of Duluth • Friends of Duluth Trees • U.S. Forest Service • Community members • Citizen scientists • Academia	• During Park Improvement Operation and Maintenance
Air Quality	How have air pollutants and particulates from habitat restoration and park improvement activities impacted the health of construction crews, community members, and recreational users?[2]	• Complaints about asthma and other respiratory issues during construction efforts • Complaints about asthma and other respiratory issues with increased vehicle traffic from park visitors	• Community feedback/ complaints	• Community members	• During Habitat Restoration Construction and Operations/ Park Improvement Construction (impacts of construction efforts) • Park Improvements Operation and Maintenance (impacts of increased park traffic)

[2] These are health indicators that can most easily be used to measure direct health impacts of the Habitat Restoration/Park Improvement Projects; otherwise, impacts on health determinants and health behaviors (measured by the other monitoring questions for this pathway) will need to be used as indicators of health impact

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Noise and Light Pollution	How have habitat restoration and park improvement activities impacted overall noise levels and total noise exposure at/near the project sites and along roadways?	• Daytime and nighttime total noise levels (baseline noise plus project noise) • Complaints about excess noise, sleep disturbance, or classroom disturbance	• Noise monitors • Community feedback/ reports • Duluth Police Department complaints/ calls	• MNDNR, City of Duluth, and their contractors • St. Louis County Health and Human Services/ MN Department of Health • Academia • Community members and recreational users and construction crews	• During Habitat Restoration Construction and Operations/ Park Improvement Construction (construction-related noise) • Park Improvements Operation and Maintenance (park noise and noise from park-related traffic)
Noise and Light Pollution	How have habitat restoration and park improvement activities impacted overall light levels and light pollution exposure at/near the project sites and along roadways?	• Light measurements • Complaints about excess light or sleep disturbance • Reported project-related stress	• Light meters • Community feedback/ reports	• MNDNR, City of Duluth, and their contractors • St. Louis County Health and Human Services/ MN Department of Health • Academia • Community members and recreational users and construction crews	• During Habitat Restoration Construction and Operations/ Park Improvement Construction (construction-related light) • Park Improvements Operation and Maintenance (park-related light)

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Noise and Light Pollution	How has noise and light pollution from habitat restoration and park improvement activities impacted the health of construction crews, community members, and recreational users?[3]	• Complaints about excess noise/light, sleep disturbance, or classroom disturbance • Noise and light related injury • Hearing impairment (as a direct result of project)	• Community feedback/ complaints • OSHA reports	• MNDNR, City of Duluth, and their contractors • Community members	• During Habitat Restoration Construction and Operations/ Park Improvement Construction
Noise and Light Pollution	How has noise and light pollution from habitat restoration and park improvement activities impacted fauna at/near the project sites, including the zoo?	• Complaints (from recreational users, fishermen, and zoo personnel)	• Community feedback/ complaints • Reports from zoo personnel	• Community members • Zoo personnel	• During Habitat Restoration/Park Improvement Construction

[3] These are health indicators that can most easily be used to measure direct health impacts of the Habitat Restoration/Park Improvement Projects; otherwise, impacts on health determinants and health behaviors (measured by the other monitoring questions for this pathway) will need to be used as indicators of health impact

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Crime and Safety	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted crime and personal safety of construction crews, residents, and recreational users at/near the project sites?	• Crime rates • Aesthetics including unmaintained areas, graffiti, lighting, etc. • Crime Prevention Through Environmental Design (CPTED)/Deterring incentives • Perceived safety • Pedestrian safety at sites • Traffic safety • Walkability/bikeability • Access points and conditions	• GIS Data: St. Louis County crime mapping trails, traffic volumes, traffic controls, traffic accidents • Irving Fairmount traffic study • National Highway Traffic Safety Administration (NHTSA) Walkability Checklist and Bikeability Checklist • Surveys of the public	• St. Louis County Sheriff • Duluth Police Department	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities
Crime and Safety	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted the health of recreational users and residents?	• Injury • Stress (poor mental health, high blood pressure, heart disease, obesity, diabetes, and decreased immune response)	• Duluth Community Health Needs Assessment • County-level health data • Health department data	• County Health Department • City of Duluth	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities
Crime and Safety	Were design efforts taken to improve safety in these parks?	• Implementation of Crime Prevention through Environmental Design (CPTED) guidelines • Construction activities that have clear signs and barriers to minimize trespassing • Installation of clear signage and maps for pedestrian and bicyclist access.	• CPTED guidelines (existing resource) • NHTSA's Walkability Checklist and Bikeability Checklist (existing resource)	• MNDNR • City of Duluth	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Recreation, Aesthetics and Engagement with Nature	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted the status of natural areas and green space in the study area (including availability, maintenance, aesthetics, and safety)?	• Acres of green space and parks • Condition of green space and parks • Aesthetics • Safety	• Duluth Parks Department • Public/stakeholder input • Law enforcement report and call logs	• EPA ORD • City of Duluth • Community members • NGO partners • Academia	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Recreation, Aesthetics and Engagement with Nature	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted the opportunity for recreation and engagement with nature (including availability, amenities, access, and experience, including safety)?	• Acres of green space and parks/miles trails • Accessibility of green space and parks (roads, traffic, trails, etc.) • Amenities offered (pavilions, picnic areas, fishing piers, play grounds, benches, biking/hiking/other trails, signage/interpretation areas, wild rice, etc.) • Flora and fauna presence/absence • Recreational opportunities (camping, fishing, zoo, swimming, boating, birding, snowmobile, ice fishing, physical activity, programming - bird watching, guided hikes, events etc.) • # visits and trail usage • Demographics of visitors/users (age, income, etc.) • Ratings of recreational/ engagement with nature opportunities • Crime and personal safety	• Duluth Parks Department • Kingsbury Bay and Grassy Point Concept Plans • GIS data (roads, traffic/traffic controls, trails/camping/ fishing, zoo, amenities incl. signage/interpretation, wild rice, programs, demographics • Modeling [Bald Eagle habitat, Esocid spawning, general game fish presence/ absence, wild rice, shoreline fishing, pike spawning, ice fishing, swimmable water, boatable water, birding, Yellow Perch BSAF (fish consumption)] • Grassy Point Mini Master Plan, Western Waterfront Trail Plan, National Water Trail Plan • Shore fishing SPA maps • Public/stakeholder input on aesthetics, maintenance, and personal safety at sites • Literature (maintained green space and engagement with nature/ Recreation; crime/safety; access, amenities, experience and engagement with nature and recreation; recreation and physical activity	• EPA ORD • City of Duluth • MNDNR • Community members • NGO partners • Academia	• Habitat Restoration • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Recreation, Aesthetics and Engagement with Nature	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted the health of recreational users and residents?	• Nutrition, including pre-term births and low birth weight • Overall health and well-being • Stress (poor mental health, high blood pressure, heart disease, obesity, diabetes, and decreased immune response) • Chronic disease rates (cardiovascular and pulmonary disease, stroke, cancer, obesity, high cholesterol) • Physical activity rates	• 500 Cities Health Data • Duluth Community Health Needs Assessment • County-level health data • Health department data • Behavioral Risk Factors Surveillance System (BRFSS), the National Health and Nutrition Examination Survey (NHANES), and the National Health Interview Survey (NHIS) • Academic literature on health impacts of engagement with nature, recreation, and physical activity consumption on nutrition	• EPA ORD • City of Duluth • MNDNR • St. Louis County Public Health • MN Department of Health • Community members • NGO partners • Academia	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Social and Cultural	How has the habitat restoration and park improvement activities impacted social capital and social cohesion in the study area?	• Sense of belonging • Social cohesion and social contact • Presence of social institutions, particularly those using the parks (churches, schools, community centers) • Education outreach, including signage and interpretation (park amenities, cultural resources, history) • Democracy/public involvement in decision-making • Connectivity to community resources • Diversity of user groups	• Survey of park visitors, asking questions about their use of the space, their sense of belonging, their community • When booking reservations for the Indian Point Campground sites and picnic sites in the parks, these questions can be included in advance or as a follow up survey. • Comment card opportunities placed at the parks • Documentation of public participation in the planning stage and discussion on operation and maintenance of the sites.	• City of Duluth • Academia • Community organizations • Local citizen advocacy groups, made up of recreational users.	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities

Pathway	Monitoring Question/ Decision Outcome	Potential Indicators, including Health Determinants and Health Outcomes	Potential Data Sources	Potential Partners for Implementation	Timing
Social and Cultural	How has the Kingsbury Bay-Grassy Point Habitat Restoration Project impacted natural space in the study area used for spiritual reflection?	• Presence of the public in the specific sites for spiritual reflection • Use of and support for the culturally significant plants, including but not limited to wild rice and medicinal plants • Maintained presence of culturally significant plants, including but not limited to wild rice and medicinal plants • Implementation of quiet spaces for spiritual reflection, such as benches	• Survey of park visitors, asking questions about their use of the space as a site for spiritual reflection and their knowledge of and appreciation for the culturally significant plants • Comment cards or signs with QR codes placed at the parks to solicit visitor input	• City of Duluth • Academia • MNDNR, as they are managing the wild rice • Community organizations • Local citizen advocacy groups, made up of park users	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities
Social and Cultural	How has the habitat restoration and park improvement activities impacted the health of recreational users, residents, and native populations?	• Overall health and well-being (physical and mental health) of park users and nearby residents • Stress (poor mental health, high blood pressure, heart disease, obesity, diabetes, and decreased immune response) of park users and nearby residents	• Survey of park visitors and nearby residents, asking questions about their use of the space and their personal sense of their overall health and well-being and the impact of the parks on their state • Comment card or signs with QR codes placed at the parks to solicit input • Duluth Community Health Needs Assessment • County-level health data • Health department data • National Health Interview Survey (NHIS)	• City of Duluth • Academia • County health department • Community organizations • Local citizen advocacy groups, made up of park users and nearby residents	• Habitat Restoration Construction/Operations activities • Park Improvement Construction activities • Park Improvement Operations and Maintenance activities