

Feasibility Report for Mount Olivet Stream Stabilization and Parkers Lake Drainage Improvement Projects

Plymouth, Minnesota



Prepared for
Bassett Creek Watershed Management Commission

May 2020



Feasibility Report for Mt. Olivet Stream Stabilization Project and Parkers Lake Drainage Improvement Project

May 2020

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1.0 Executive Summary

1.1 Background

The Mount Olivet Stream Stabilization Project in the City of Plymouth will reduce erosion, total suspended solids, and phosphorous loading to Medicine Lake. The lake is a state-listed impaired water for excess nutrients, with an approved total maximum daily load (TMDL) plan, and a Priority-1 water body of the Bassett Creek Watershed.

This project meets two gatekeeper criteria (as defined in the BCWMC Watershed Management Plan, Reference (1)), including improving/protecting water quality in a priority water body and addressing an approved TMDL. In addition to gatekeeper criteria, this project also protects previous Commission investments in Medicine Lake, addresses erosion and sedimentation issues, and addresses Commission goals of improved water quality, aesthetics, and wildlife habitat.

The Parkers Lake Drainage Improvement Project in the City of Plymouth will reduce erosion, total suspended solids, and phosphorous loading to Parkers Lake, a Priority-1 water body of the Bassett Creek Watershed. Additionally, the project may reduce chloride loads to Parkers Lake, a state-listed impaired water for chlorides with an approved TMDL.

This project meets the gatekeeper criteria of improving/protecting water quality in a priority water body and addressing an approved TMDL. In addition to gatekeeper criteria, this project also enhances previous Commission investments intended to protect Parkers Lake and addresses erosion/sedimentation issues and the Commission goals of improved water quality, aesthetics, and wildlife habitat.

1.2 Project Definition and Site Characteristics

This feasibility report includes proposed projects at two separate locations within the Bassett Creek Watershed. The Mount Olivet Stream Stabilization Project is located adjacent to Mount Olivet Lutheran Church in Plymouth, MN. This project site will be called the Mount Olivet Stream Stabilization project area throughout this text.

The Parkers Lake Drainage Improvement project is located within the Parkers Lake Community Playfields in Plymouth, MN. This project includes two subprojects involving the restoration of the stream and implementation of stormwater water quality improvement projects. The stormwater water quality improvement projects are further divided into the implementation of physical best management practices and strategies for chloride reduction in the contributing watershed. The two primary project components will be called the Parkers Lake Stream Stabilization and Parkers Lake Water Quality improvements throughout this text.

See Table 1-1 for a summary of the project area definitions.

Table 1-1 Feasibility Study Project Area Definitions

Project Definitions
Mount Olivet Stream Stabilization Project
Mount Olivet Stream Stabilization—Restoration of eroding stream features
Parkers Lake Drainage Improvement Project
Parkers Lake Stream Stabilization—Restoration of eroding stream features Parkers Lake Water Quality Improvements—Improvements to stormwater water quality <ol style="list-style-type: none"> 1) Best management practices 2) Chloride reduction strategies

1.2.1 Mount Olivet Stream Stabilization Project Area

The Mount Olivet Stream Stabilization Project area is located in and along an unnamed stream in the City of Plymouth. The project area borders Mount Olivet Lutheran Church to the west, Old Rockford Road to the north, an apartment complex to the east, and a pond in Clifton E. French Regional Park of Three Rivers Park District (TRPD) to the south. The stream feeds into wetland areas upstream of Medicine Lake. During the non-winter months, the naturally ephemeral stream generally has fairly consistent, low flows with high, flashy flows during rain events due to the steep slopes in the ravine, minimal access to a floodplain, and receiving significant amounts of stormwater runoff; in the winter, the stream freezes over. The Mount Olivet Stream Stabilization Project area extends just over 1,000 feet south along the stream from Mount Olivet Lutheran Church. Erosion of the channel banks is moderate-to-high and primarily confined to isolated sections with 4- to 5-foot-high vertical eroding faces. This feasibility study identifies four reaches for evaluation, based on physical and geomorphic distinguishing features.

1.2.2 Parkers Lake Stream Stabilization and Water Quality Improvements Project Area

The Parkers Lake Stream Stabilization Project area is located within Parkers Lake Community Playfields, upstream of Parkers Lake. This feasibility study evaluates the restoration of stream features and reviews alternatives for improving the water quality of runoff from the park and contributing watershed.

The stream has experienced significant erosion along most of the reach. The channel bed has lowered by approximately 2 to 3 feet since the contributing storm sewer was installed. The stream exhibits limited geomorphic features that are characteristic of healthy streams and riparian habitat, such as riffles, runs, and pools. Similar to the stream Mount Olivet at the Stream Stabilization Project area, this naturally ephemeral stream generally has fairly consistent, low flows with high, flashy flows during rain events due to the minimal access to a floodplain and receiving a significant amount of stormwater runoff during non-winter months; in the winter, the stream freezes over.

Parkers Lake Community Playfields has open space available for the implementation of projects that would improve the water quality of stormwater leaving the site. The implementation of physical best management projects within these open-space areas would reduce the total phosphorus (TP) and total suspended solids (TSS) reaching Parkers Lake.

Additionally, Parkers Lake is listed as impaired for chlorides. TRPD, in partnership with the City of Plymouth, collected monitoring data at two stations within the Parkers Lake watershed. The monitoring data shows that the northern watershed tributary to Parkers Lake is the primary source of chlorides to the lake. This feasibility study identifies and evaluates a chloride-reduction demonstration project to help reduce chloride loads to Parkers Lake.

1.3 Project Alternatives

This feasibility study evaluates alternatives for the stabilization of the Mount Olivet Stream Stabilization Project area, the stabilization of the Parkers Lake Stream Stabilization Project area, and improved stormwater management in the Parkers Lake tributary area within the Parkers Lake Community Playfields (including chloride management in the larger tributary watershed north of Parkers Lake).

The measures considered for potential stream stabilization improvements include the following:

- Re-meandering the stream channel
- Restoring the vegetative buffer
- Restoring existing wetlands
- Grading stream banks and opening the tree canopy
- Installing a variety of stream stabilization measures, including riprap, root wads and toe wood, vegetated reinforced soil stabilization (VRSS), rock or log vanes, and stone toe protection
- Removing debris
- Replacing stream with storm sewer

The measures considered for improved stormwater management include a variety of best management practices (BMPs):

- Bioretention with iron-enhanced filtration media
- Wet retention ponds
- Chloride management opportunities

A summary of alternatives is provided in Table 1-2.

Table 1-2 Feasibility Study Alternative Summary

Alternative	Description
Mount Olivet Stream Stabilization Project	
Alternative 1	Stream stabilization utilizing bio-engineering techniques, wetland restoration, and installation of a manhole drop structure at the Mount Olivet Church parking lot
Alternative 2	Stream stabilization utilizing bio-engineering techniques, stream re-meandering, and installation of hard armoring/riprap at the Mount Olivet Church parking lot
Parkers Lake Drainage Improvement Project	
Alternative 1	Stream stabilization by conveying flow through a pipe rather than through the stream channel
Alternative 2	Stream stabilization utilizing a standard hard-armoring approach
Alternative 3	Stream stabilization utilizing bio-engineering techniques
Alternative 4	Diversion of low flows from the existing storm sewer system to an iron-enhanced bioretention filtration system
Alternative 5a/5b	Opportunities for a wet retention pond in open space along the existing stream alignment through the Parkers Lake Community Playfields site
Alternative 6	Chloride demonstration projects in the northern watershed tributary to Parkers Lake to reduce salt usage and chloride loads to the lake

Sections 5.0 and 6.0 provide more detailed discussion of the measures considered and alternatives evaluated.

1.4 Relationship to Watershed Management Plan

The Bassett Creek Watershed Management Commission (BCWMC) included the Mount Olivet Stream Stabilization Project and the Parkers Lake Drainage Improvement Project in its Capital Improvement Plan (CIP), based on the following “gatekeeper” policy from the BCWMC Plan. The items in bold italics directly apply to these projects.

110. The BCWMC will consider including projects in the CIP that meet one or more of the following “gatekeeper” criteria.

- Project is part of the BCWMC trunk system (see Section 2.8.1, Figure 2-14 and Figure 2-15 of the report)
- **Project improves or protects water quality in a priority waterbody**
- **Project addresses an approved TMDL or watershed restoration and protection strategy (WRAPS)**
- Project addresses flooding concern

The BCWMC will use the following criteria, in addition to those listed above, to aid in the prioritization of projects:

- Project protects or restores previous Commission investments in infrastructure
- Project addresses intercommunity drainage issues
- **Project addresses erosion and sedimentation issues**
- **Project will address multiple Commission goals (e.g., water quality, runoff volume, aesthetics, wildlife habitat, recreation, etc.)**
- Subwatershed draining to project includes more than one community
- Addresses significant infrastructure or property damage concerns

The BCWMC will place a higher priority on projects that incorporate multiple benefits and will seek opportunities to incorporate multiple benefits into BCWMC projects, as opportunities allow.

This project meets several gatekeeper criteria—the project will improve water quality as its primary goal by reducing the amount of sediment and pollutants (including chlorides) that enter Medicine Lake and Parkers Lake. This project will also help address multiple BCWMC goals by enhancing water quality and improving wildlife habitat.

1.5 Project Impacts

Section 7.0 and Section 8.0 discuss the potential impacts resulting from the stabilization and stormwater management projects, which include tree removals and temporary wetland impacts. Tree removal will be limited to only those necessary to complete the project, and trees will be replaced as appropriate. For the streambank stabilization projects, the removed trees will be re-used as part of the project’s stabilization features.

The proposed stream stabilization projects will result in reduced stream bank erosion and, therefore, reduced sediment and phosphorus loading to the downstream wetland, pond, and lakes. The water quality improvement project in the Parkers Lake watershed will reduce sediment loads, phosphorus loads, and/or chloride loads to Parkers Lake. Section 8.0 presents the estimated existing erosion rates and

pollutant loading and the pollutant load reductions. The estimated pollutant load reductions for the recommended projects are summarized in the following section.

1.6 Recommendations

Based on review of the project impacts; feedback from residents, representatives of the City of Plymouth, and regulators; the overall project costs and benefits; and existing water quality improvement needs; the BCWMC Engineer recommends the following projects:

- Alternative 1 for the Mount Olivet Stream Stabilization (stream stabilization with bioengineering wetland restoration, and manhole structure)
- Alternative 3 for the Parkers Lake Stream Stabilization (stream stabilization with bioengineering)
- Alternative 6 for the Parkers Lake Water Quality Improvements (chloride reduction demonstration project for the northern tributary watershed)

Table 1-3, below, shows the planning-level estimated costs for the recommended alternatives. We recommend that the BCWMC use the opinion of cost identified in this study to develop a levy request for the recommended combination of projects and that it proceed to design and construction. The BCWMC CIP funding (ad valorem tax levied by Hennepin County on behalf of the BCWMC) will be the sole source of funding for these projects.

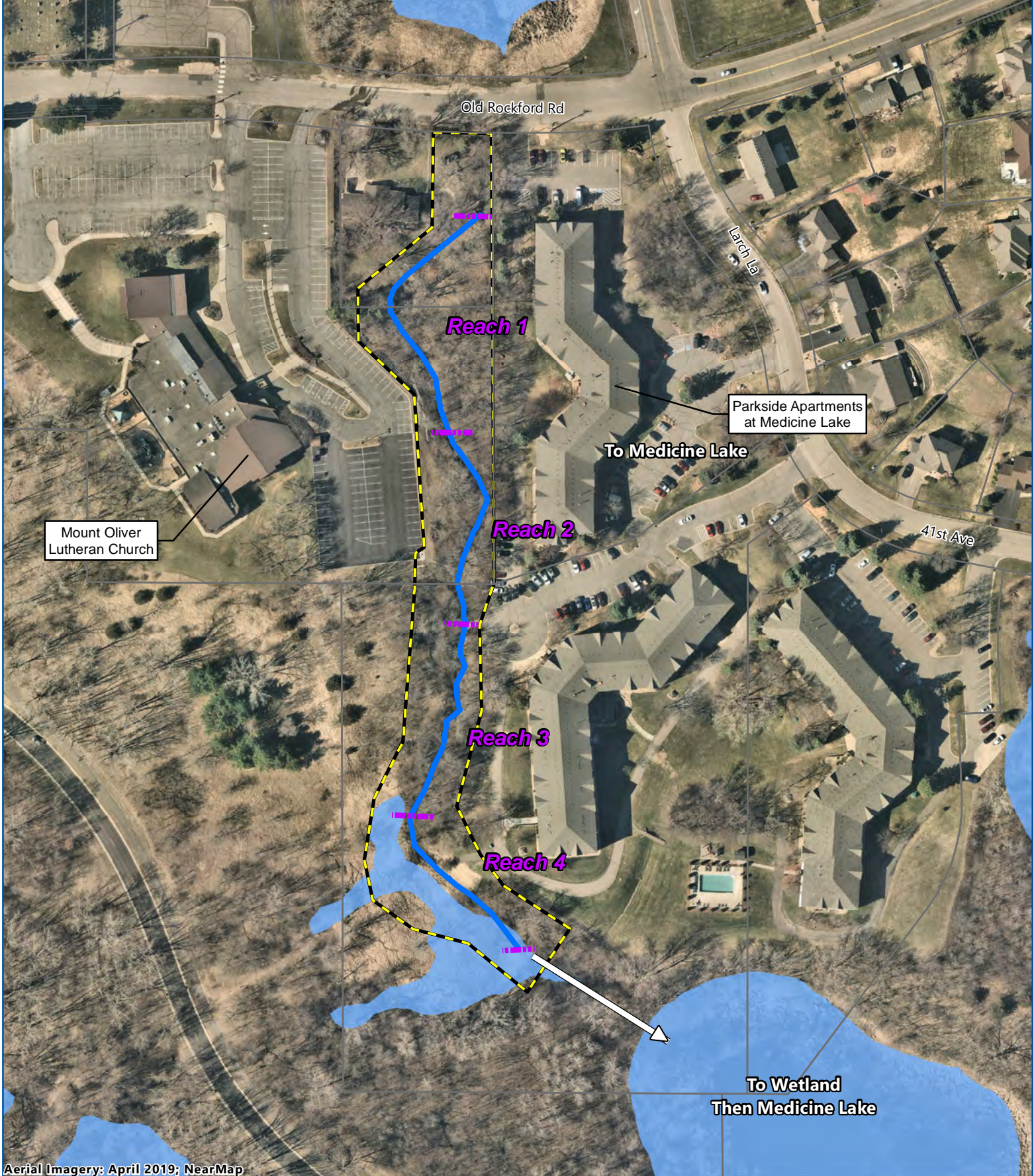
Table 1-3 Recommended Stream Stabilization and Water Quality Improvement Project Alternatives Cost Summary

Alternative Description	Project Cost Estimate ⁽¹⁾	Annualized Cost ⁽²⁾	Total Phosphorus (TP) Loading		Total Suspended Sediment (TSS) Loading	
			Load Reduction (lb/yr)	Cost/lb/yr Reduced ⁽³⁾	Load Reduction (lb/yr)	Cost/lb/yr Reduced ⁽³⁾
Mount Olivet Stream Stabilization Alternative 1. Bio-engineering, wetland restoration, and manhole structure	\$134,000 (\$107,000–\$174,000)	\$10,000	5.3	\$1,892	10,560	\$0.95
Parkers Lake Stream Stabilization Alternative 3. Bio-engineering	\$113,000 (\$90,000–\$147,000)	\$8,000	20.1	\$399	40,140	\$0.20
Parkers Lake Water Quality Alternative 6. Chloride management	\$300,000	Chloride reduction strategies may have limited impact on TP and TSS load reductions; however, data compiled from the MPCA suggests that implementation of smart salting recommendations can result in 30–70% reductions in chloride use. Although chloride usage can vary significantly from year to year based on the climatic conditions, based on the monitoring data from TRPD, this could reduce chloride loading to Parkers Lake on average by 163 – 380 lbs chloride per acre of watershed per year.				

(1) A Class 4 screening-level opinion of probable cost, as defined by the American Association of Cost Engineers International (AACI International), has been prepared for these alternatives. The opinion of probable construction cost provided in this table is based on the Commission Engineer’s experience and qualifications and represents our best judgment as experienced and qualified professionals familiar with the project. The cost opinion is based on project-related information available to the Commission Engineer at this time and includes a conceptual-level design of the project. It includes 20% project contingency and 30% for planning, engineering, design, and construction administration. Lower bound assumed at -20% and upper bound assumed at +30%.

(2) Assumed to be 15% of the total project cost for annual maintenance plus replacement cost associated with major repairs and the initial project cost distributed evenly over a 30-year project lifespan.

(3) Annualized cost divided by estimated annual pollution load reduction.



Aerial Imagery: April 2019; NearMap

-  Stream Path
-  Reach Boundary
-  Project Area
-  Ponds and Wetlands
-  Parcels

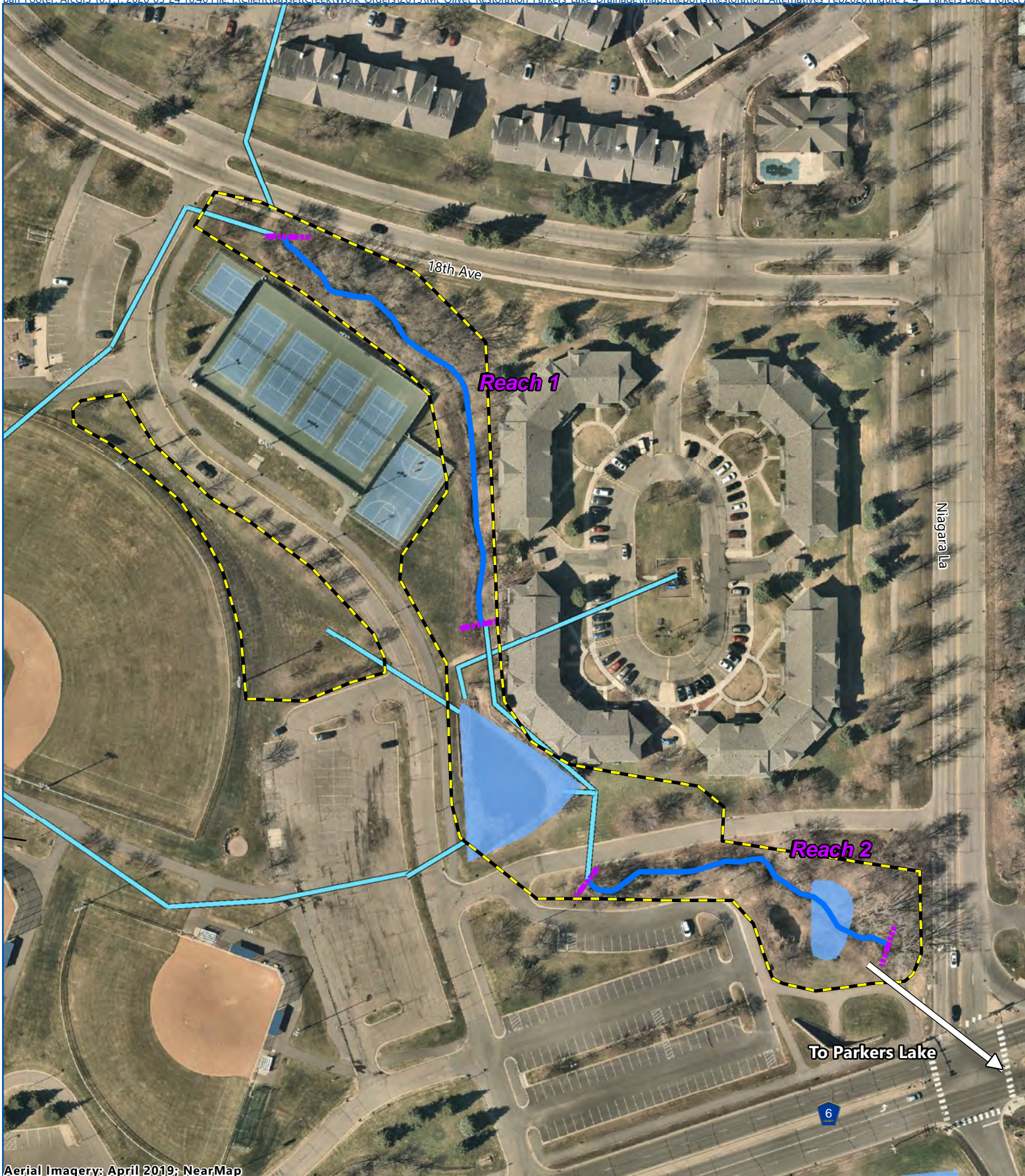


0 150 300
Feet



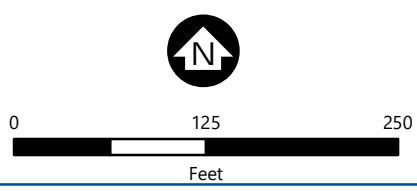
**MT. OLIVET
PROJECT AREA**
Mt. Olivet/Parkers Lake
Feasibility Study

FIGURE 2-2



Aerial Imagery: April 2019; NearMap

- Stream Path
- Reach Boundary
- Project Area (Stream/BMPs)
- Ponds and Wetlands
- Storm Sewer



PARKERS LAKE
PROJECT AREA
Mt. Olivet/Parkers Lake
Feasibility Study
FIGURE 2-4