

Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Co.
Subject: Item 5A – Consider Approval of 60% Design Plans for 2021 Mt. Olivet Streambank Restoration & Parkers Lake Drainage Improvements Project, Plymouth (CIP 2021 ML-20 and PL-7) -- BCWMC June 17, 2021 Meeting Agenda
Date: June 10, 2021
Project: 23270051.52-2021-644&645

5A Consider Approval of 60% Design Plans for 2021 Mt. Olivet Streambank Restoration & Parkers Lake Drainage Improvements Project, Plymouth (CIP 2021 ML-20 and PL-7)

Summary:

Proposed Work: 2021 Mt. Olivet Streambank Restoration & Parkers Lake Drainage Improvements Project, Plymouth (CIP 2021 ML-20 and PL-7)

Basis for Commission Review: 60% Design Plans Review

Change in Impervious Surface: N.A.

Recommendations:

- 1) Conditional approval of 60% drawings
- 2) Authorize the City of Plymouth to continue design and bring 90% design plans to a future Commission meeting

At their meeting in September 2020, the BCWMC entered into an agreement with the City of Plymouth to design and construct these BCWMC CIP projects. The 2021 Mount Olivet Streambank Restoration & Parkers Lake Drainage Improvements Project (CIP 2021 ML-20 and PL-7) are being funded by the BCWMC's ad valorem levy (via Hennepin County). The City of Plymouth provided the combined 60% design plans for both projects to the BCWMC for review and comment, per the agreement with the City.

Feasibility Study Summary

The BCWMC completed the Feasibility Report for Mount Olivet Stream Stabilization and Parkers Lake Drainage Improvements Projects (Barr, June 2020) to examine the feasibility of restoring sites within these two separate project areas in the City of Plymouth. The Mount Olivet Stream Stabilization project area is located along an unnamed stream adjacent to Mount Olivet Lutheran Church and Clifton E. French Regional Park of the Three Rivers Park District (Figure 1). The Parkers Lake Stream Stabilization project area is located on an unnamed stream within Parkers Lake Community Playfields, upstream of Parkers Lake (Figure 2). At both sites, the feasibility report identified multiple locations where bank erosion, bank failure, and infrastructure repairs were needed, in addition to removal of debris and fallen trees.

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The feasibility report also included evaluation of potential projects that would improve the water quality of stormwater leaving the Parkers Lake Community Playfield site by reducing total phosphorus and total suspended solids (Alternatives 5a/5b) and chloride loading into Parkers Lake (Alternative 6).

The feasibility report identified 2 to 3 design options and a final recommendation for each project site. For most of the individual restoration sites, the feasibility report included two alternative designs: 1) a bioengineering (or soft armoring) approach using techniques that rely primarily on vegetation; 2) a more structural (or hard armoring) approach using rock and other non-vegetative materials. Some of the individual restoration sites included additional alternatives that did not focus on preserving the existing alignment or channel configuration, such as re-meandering the channel or conveying flow through a pipe rather than the stream channel. At their May 21, 2020 meeting, the Commission approved the following:

- Mount Olivet Stream Stabilization project: implementing Alternative 1—stream stabilization using bio-engineering techniques, wetland restoration, and installation of a manhole drop structure at the Mount Olivet Church parking lot
- Parkers Lake Drainage Improvements project:
 - For stream stabilization portion of the project, implementing Alternative 3—stream stabilization using bio-engineering techniques (this is the project included in the 60% design plans under current review)
 - For water quality improvement portion of the project, implementing Alternative 6—chloride reduction demonstration project for the northern tributary watershed (this is a separate project not included in the 60% design plans under current review)

The feasibility report estimated that this restoration project would require the removal of approximately 59 trees for the two sites combined—39 trees for the Mount Olivet site and 20 trees for the Parkers Lake site. The feasibility study also estimated that project implementation would reduce the total phosphorus load from the two sites combined by 25.4 pounds per year (5.3 pounds TP per year from the Mount Olivet site and 20.1 pounds TP per year at the Parkers Lake site) and the total suspended sediment load by 50,700 pounds per year (10,560 pounds per year TSS from the Mount Olivet site and 40,140 pounds TSS per year at the Parkers Lake site).

60% Design Plans

The 60% design plans follow many of the recommendations from the feasibility study and include the use of slope grading with bioengineering, stabilization of stormwater outlets, debris clearing, and vegetation management. Notable differences between the 60% design plans and the feasibility study recommendations for the selected alternatives are listed below, which are addressed in a May 19, 2021 submittal memorandum from the design engineers (WSB). Provided that the comments presented later in this memo that apply to the following design features are addressed in future project submittals, the Commission Engineer does not consider any of the following changes to represent a significant departure from the intent of the project as evaluated in the feasibility study.

- Addition of fieldstone riprap bank stabilization at targeted locations – The feasibility study recommended bank stabilization primarily with bioengineering methods, including slope grading, coir blanket with live stakes, and root wads. The 60% design plans include some targeted areas of hard armoring including fieldstone riprap for channel bank stabilization. Based on information provided by the design engineer, the areas selected for hard armoring represent areas with higher predicted velocities in the project hydraulic model (5-6 feet per second and higher) and observed erosion. There are areas with similar predicted velocities that do not have notable observed erosion due to existing vegetation, root structure, and soils that are not proposed for hard armoring. The areas proposed for riprap stabilization are limited in length to no more than 75 feet in any one segment, with most segments measuring between 20 and 50 feet in length. Several of the areas proposed for riprap stabilization are in lieu of the root wads recommended in the feasibility study, as discussed below.
- Proposed rock/log ditch checks in place of rock cross vanes – These structures differ in appearance but are similar in function to prevent headcutting and reduce flow velocity within the channel; one notable difference is that ditch checks do not tend to concentrate flow to the center of the channel as significantly as cross vanes.
- Removal of root wads – The feasibility study recommended the use of root wads in some locations at the Parkers Lake site. The 60% design plans do not include root wads but instead use riprap toe stabilization in areas of higher velocity and erosion as described above. The design engineer's rationale for removing root wads is that the structures are less effective and deteriorate more quickly when used in intermittent streams where they are not continually wetted by the stream flow.
- Removal of riprap revetments at roof drains – The feasibility study recommended riprap revetments to stabilize the outfalls from several apartment complex roof drains at the Parkers Lake site. The 60% design plans do not include these riprap revetments; the rationale for removing the revetments is that erosion at these locations has not been observed and the existing vegetation will continue to serve to prevent erosion.
- Proposed plunge pools in place of rock riffles – The feasibility study recommended a rock riffle at the downstream end of the Parkers Lake site. The 60% design plans include rock-armored plunge pools rather than riffles to provide energy dissipation.

The 60% design plans show the removal of approximately 57 trees for the two sites combined (23 trees for the Mt. Olivet site and 34 trees for the Parkers Lake site), which is similar to the total estimated tree removal numbers in the feasibility study. No tree plantings have been proposed based on the City of Plymouth's desire to open up the tree canopy in these areas and remove undesirable species and falling/diseased trees. The pollutant reductions estimated by the design engineer are slightly higher than those evaluated in the feasibility study due to refinements in the estimated existing length of eroding banks, with a total phosphorus reduction from the two sites combined of 27.5 pounds per year (5.4

pounds TP per year from the Mount Olivet site and 22.1 pounds TP per year at the Parkers Lake site) and a total suspended sediment load reduction of 54,840 pounds per year (10,720 pounds per year TSS from the Mount Olivet site and 44,120 pounds TSS per year at the Parkers Lake site) (Table 1).

Table 1 Estimated Pollutant Load Reduction Comparison

	Mt. Olivet		Parkers Lake		Combined	
	Feas. Study	60% Design	Feas. Study	60% Design	Feas. Study	60% Design
TP (lbs)	5.3	5.4	20.1	22.1	25.4	27.5
TSS (lbs)	10,560	10,720	40,140	44,120	50,700	54,840

The 60% design plans also include the installation of a manhole drop structure and storm sewer outlet to convey flow from the Mt. Olivet parking lot into the creek.

The submitted drawings were at a 60% design stage, which means there are a number of details yet to be worked out before the design is final. The Commission Engineer expects the majority of the comments below to be addressed in the 90% design stage drawings.

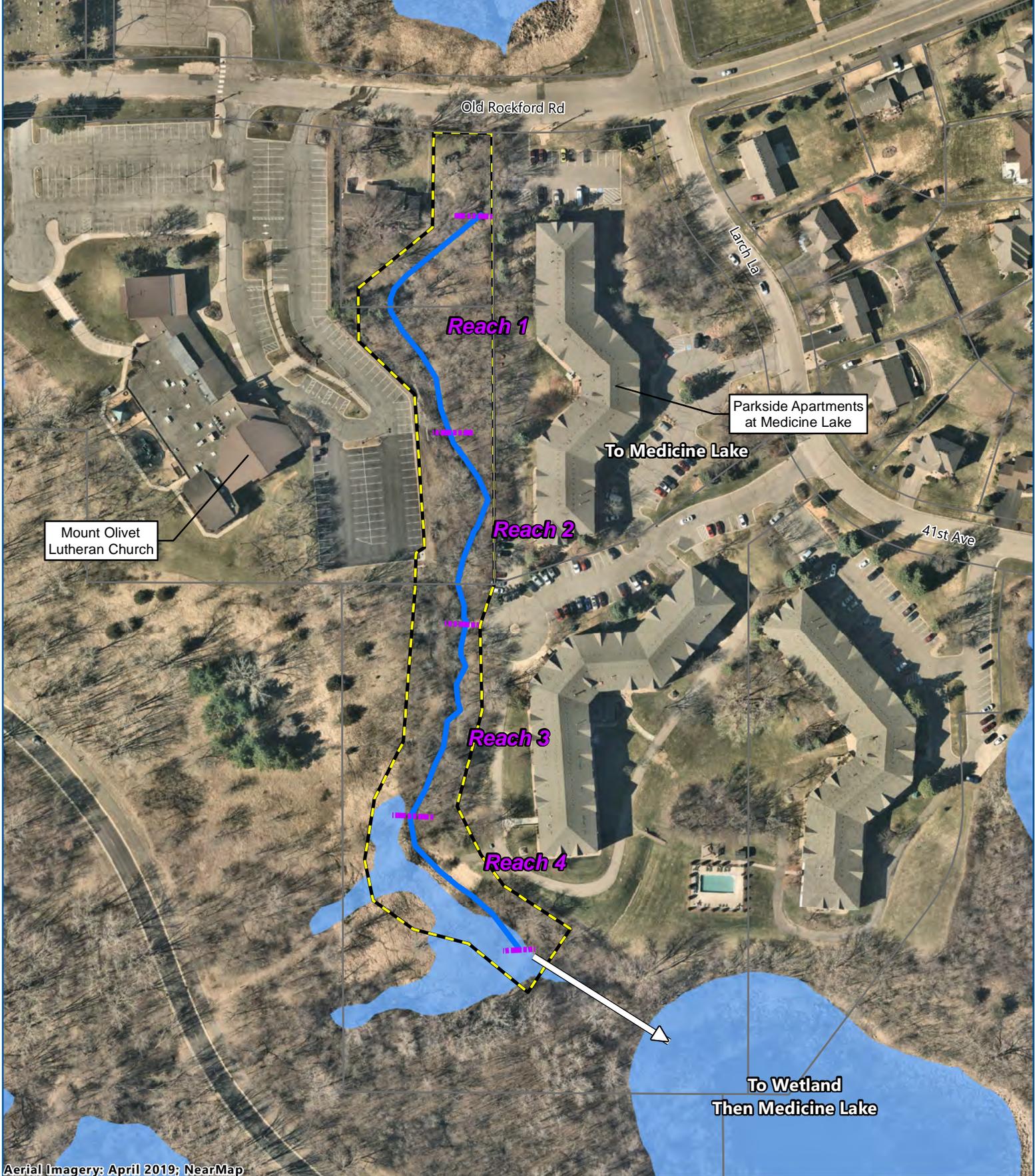
Recommendations

- A) Conditional approval of 60% design plans, recognizing that the current plans reflect the 60% level of design. The following comments must be addressed prior to submittal of 90% design plans:
 - 1) Comments that apply to both the Mt. Olivet Streambank Restoration and Parkers Lake Drainage Improvements projects:
 - a) The two-dimensional modeling results submitted with the 60% drawings show areas of high velocity during the 100-year flood event, with velocities reaching 6.1 ft/s at the Mt. Olivet site and 9.0 ft/s at the Parkers Lake site. Many of the highest-velocity areas are proposed for stabilization with fieldstone riprap armoring on the channel banks and as a component of rock ditch checks. We understand from communication with the design engineer that MNDOT Class III fieldstone riprap is proposed for these applications. Please confirm the proposed riprap gradation and provide additional detail to document that the proposed materials are adequately sized to meet the design stability criteria based on the hydraulic modeling results.
 - b) The plans do not provide a design typical cross section or detail for riprap bank stabilization applications. Please include a design riprap section on the design drawings, including proposed riprap sizes, thickness, filter, and side slopes.
 - c) The plans call for the use of geotextile fabric beneath ditch checks and in plunge pools; however, for in-stream applications, geotextile fabric can allow for the development of preferential flow paths beneath the fabric. Please revise the design to use a granular filter in

- place of the proposed geotextile fabric. This comment does not apply at flared end sections, where the use of the City-standard detail and geotextile fabric is appropriate.
- d) The plans include trees anchored to the side slope to provide protection against toe erosion, with the trees anchored by duckbill cable anchors. Please provide additional detail on the proposed cable anchors, including the number of anchors required per log to counteract buoyancy forces.
 - e) The plans call for rock and rock-log ditch checks at multiple locations, with a typical height of 30 inches above the existing channel bed. Please consider whether the ditch checks have the potential for downstream scour hole development and whether scour protection through material embedment in the channel bottom, flattening of the downstream slope of the ditch check, or a decrease in ditch check height is required.
 - f) The plans do not provide a design cross section or allowable slope limits for areas with grading only (“blend side slope into the ditch bottom”). Please include a design typical section on the design drawings, including proposed maximum slope and stabilization extents (erosion control blanket or other stabilization).
 - g) The plans include the use of bioroll (sediment control log) at the toe of graded areas and downstream floating silt curtain for erosion and sedimentation control. We understand from communication with the design engineer that bioroll is also proposed at the downstream locations to provide sedimentation control during very low-flow conditions. Please include the proposed bioroll/silt curtain combination on the drawings.
 - h) The plans do not show any construction staging areas within the construction limits or on adjacent areas. Please identify construction staging areas that will be required and provide appropriate erosion and sedimentation control measures on the plans.
 - i) Please include on the plans instructions for the contractor to limit tree clearing as much as possible and only at the direction of the Engineer. We understand from communication with the City that additional tree plantings are not proposed at this time, as discussed above.
 - j) Please include on the plans the elevations and upstream/downstream stationing for all proposed toe stabilization measures.
 - k) The proposed seed mixes in the wetland restoration area are BWSR mix 34-271 (wet meadow south and west) and BWSR mix 34-181 (emergent wetland). Stream bank bioengineering areas call for “seeding special” with a seed mix referenced in the specifications (not provided with the 60% drawings). Please provide the custom seed mix proposed for use on the stream bank areas for Commission review.
- 2) Comments that apply only to the Mount Olivet Streambank Restoration site:
- a) The plans do not specify any outlet protection or stilling basin at the proposed storm sewer outlet from the Mount Olivet parking lot at station 4+10. We understand from communication with the City that a City-standard outlet protection detail is proposed; please include the standard detail on the plans.

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- b) The plans call for widening of the stream channel to eight feet wide from station 7+00 to 9+00; however, a design cross section or proposed channel side slopes are not provided. Please specify a design cross section or side slopes and indicate the extent of the disturbance on the plans.
 - c) The plans do not show any downstream erosion control measures at the proposed wetland restoration and access route at the Mount Olivet site (downstream and to the south of the proposed construction areas). Please provide downstream erosion control, such as silt fence or bioroll along the access and at the wetland restoration location.
- 3) Comments that apply only to the Parkers Lake Drainage Improvements site:
- a) The plans call for grading of the stream channel bottom from station 13+00 to 14+80; however, only a portion of this length has accompanying bank stabilization measures shown. We understand from communication with the design engineer that the remaining length is proposed for sediment removal and reshaping of the bottom of the channel only and will not require additional bank grading. Please provide clarification regarding the proposed grading in the drawings, including a design slope and direction to the contractor to limit bank disturbance in this area.
- B) Authorize the City of Plymouth to continue design and bring 90% design plans to a future Commission meeting.



Aerial Imagery: April 2019; NearMap

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

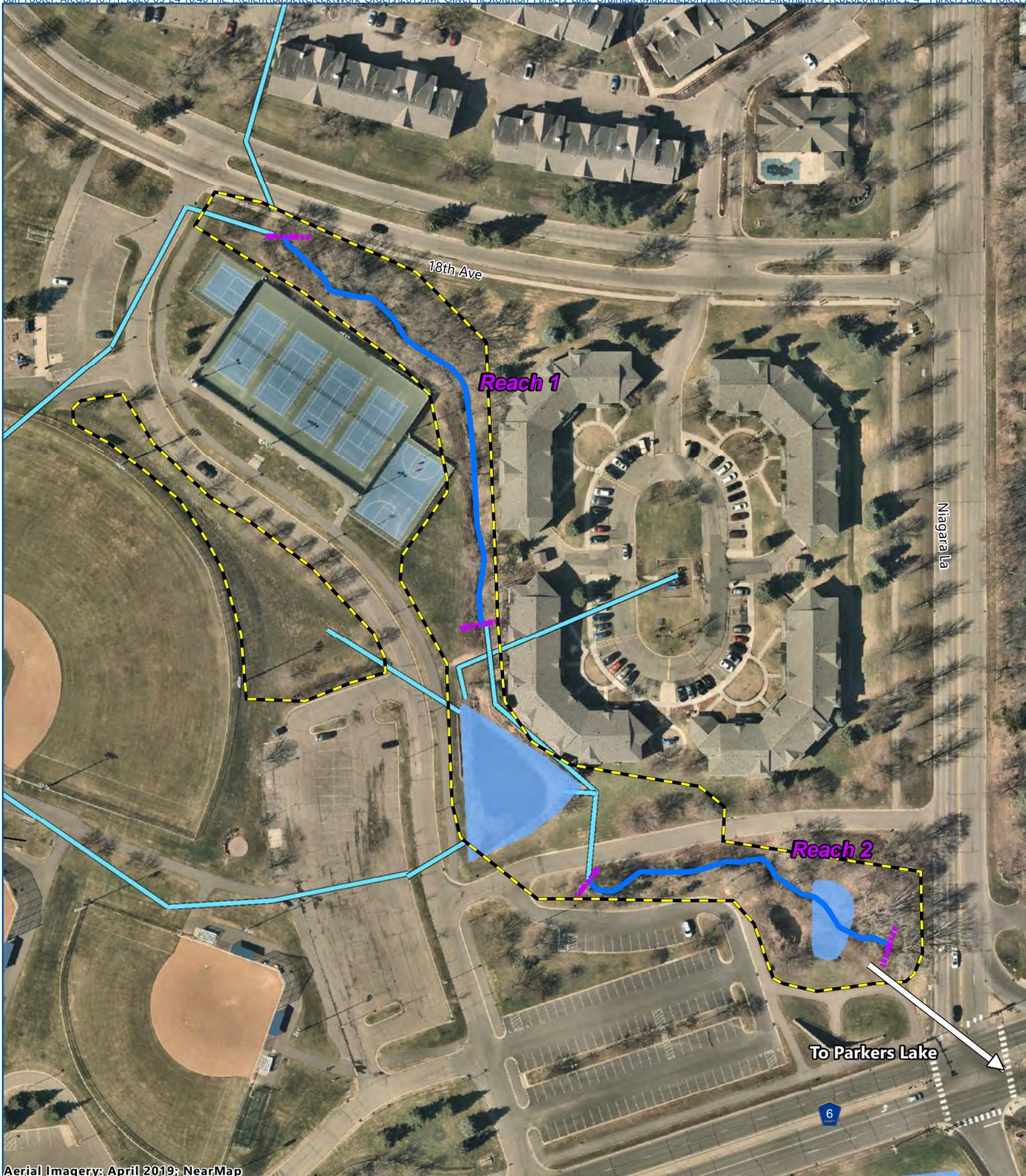


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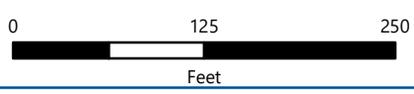
**MT. OLIVET
PROJECT AREA**
Mt. Olivet/Parkers Lake
Design Project Review

FIGURE 1



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
Design Project Review

FIGURE 2