
DATE: November 15, 2023

TO: Jane Clary, Wright Water Engineers, CCBWQA Technical Manager

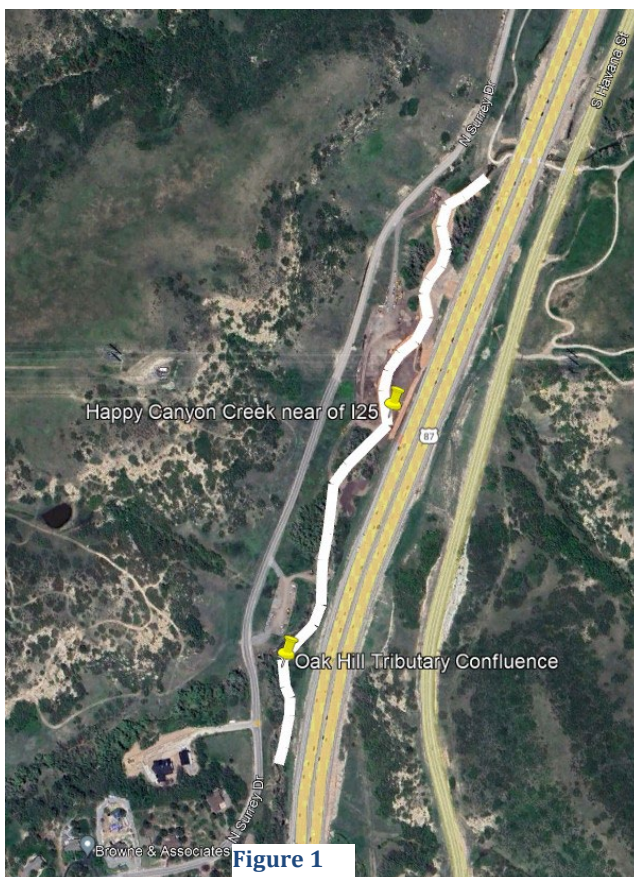
CC: Jon Erickson, CCBWQA Technical Advisory Committee Chairman

FROM: Richard Borchardt, PE & CFM

SUBJECT: Happy Canyon Creek upstream of I25 - Project Summary

Background and Purpose:

In 2013, Douglas County (Douglas) and the Mile High Flood District (MHFD) began stream reclamation on Happy Canyon Creek located upstream of I-25 (Project), shown with the white line in **Figure 1**, about 11.3 miles upstream of Cherry Creek Reservoir. In 2021 the Cherry Creek Basin Water Quality Authority (CCBWQA) and in 2022 the City of Lone Tree (Lone Tree) were added to the Project.



Existing Conditions:

Urbanization of the watershed upstream of the Project results in increased rate, frequency, and magnitude of storm flows in Happy Canyon Creek. The stream incised 4-10 feet with steep eroded banks up to 16 feet tall within the Project, evidence of bed and bank erosion. Although wetland and riparian vegetation existed; it was distressed due to the lowering of the groundwater table from the incised stream (see **Photos 1-3**).

Design Approach:

The goals of the design were to create a healthy stream, well connected to the adjacent wetland and riparian vegetation, and promote the natural and beneficial functions of filtration and infiltration to improve water quality. Muller Engineering Company (MEC) is the design consultant. MEC proposed a stream planform that raises the incised channel, promotes natural stream features, and includes engineered bed and bank protection. This approach created a multi-stage stream section that provides for sediment transport from base flows through minor flood stages (i.e. 2-year recurrence interval) and conveys the larger storms (i.e. from 2-year to 100-year recurrence intervals). This stream reclamation minimizes long-term maintenance and provides an environmentally sound and sustainable practice. MEC designed the Project using a combination of grade control structures (Riffle, Boulder Cascade, and Sculpted Concrete drop structures), bank protection (Void Filled Riprap and Vegetation), and grading to create overbanks, providing a wider stream corridor which reduces erosion potential. The Project includes stream reclamation of approximately 3,000 linear feet.



Photo 1 - near downstream end of project



Photo 2 - near middle of project



Photo 3 - near upstream end of project

R2R Engineers Memorandum

Construction:

Construction was started on the Project in February 2023, completed in November 2023, done by Naranjo Civil Constructors. **Photos 4-6** show the constructed stream reclamation. **Photo 4** highlights a few of the riffle drop structures, **Photo 5** shows the raised stream bed connected to the overbanks and the wetland and riparian plantings, and **Photo 6** shows the sculpted concrete drop structure.

Funding:

MHFD, Douglas, CCBWQA, and Lone Tree are partners on the Project. The Intergovernmental Agreement and Amendments include \$5,441,427 with CCBWQA's participation being \$500,000 or about 9%. MHFD's current project budget report shows a remaining balance of about \$612,000 after construction, which will be used to establish vegetation and clear permits, afterwards any remaining balance if any would be refunded to the partners according to their participation level, and the final project cost will be known.



Photo 4- near downstream end of project



Photo 5 - near middle of project



Photo 6 - near upstream end of project

Water Quality Benefits:

The Project includes stream reclamation which provides water quality benefits for the stream and ultimately Cherry Creek Reservoir¹. Stream reclamation reduces erosion and immobilizes nutrients (including phosphorus and nitrogen) in the soil, reducing the nutrient concentrations in the water. The Project immobilizes an estimated 51 pounds of phosphorus per year². The water quality capture area (Photo 7) that treats runoff from I-25 provides additional water quality treatment above the estimated 51 pounds of phosphorus per year.



Photo 7 - water quality capture area for runoff from I-25

Summary:

Water Quality Benefit is reduction of ≈ 51 pounds of phosphorus per year

Total Project Cost = \$5,441,427³

CCBWQA's Share = \$500,000⁴

Engineer: Muller Engineering Company

Contractor: Naranjo Civil Constructors

Additional information for the Project can be found on the websites below.

MHFD website link: <https://mhfd.org/resources/mapping/>

CCBWQA website link: <https://www.cherrycreekbasin.org/library/>

¹ CCBWQA Stream Reclamation, Water Quality Benefit Evaluation – Interim Status Report; CCBWQA Technical Advisory Committee; June 16, 2011.

² CCBWQA 2024-2033 Capital Improvement Program Supporting Data, Board Final Review, November 16, 2023

³ Final total project cost won't be known until after final vegetation establishment, permits are cleared, and any remaining balance if any refunded to partners.

⁴ Final CCBWQA's share won't be known until after final vegetation establishment, permits are cleared, and any remaining balance if any refunded to CCBWQA.