R2R ENGINEERS

RIFFLES TO RIPPLES

MEMORANDUM

DATE:	February 2, 2022
TO:	CCBWQA Manager
CC:	Jacob James, CCBWQA TAC Chairman
FROM:	Richard Borchardt, PE & CFM
SUBJECT:	McMurdo Gulch – 2020 Stream Reclamation Project Summary

Background and Purpose:

McMurdo Gulch is a western tributary to Cherry Creek that is 6.7 miles long and has a watershed area of 6.5 square miles. The McMurdo Gulch 2020 Stream Reclamation Project (2020 Project) continues the work that began in 2011[1] between the Town of Castle Rock (Castle Rock) and Cherry Creek Basin Water Quality Authority (CCBWQA). **Figure 1** shows the location of the McMurdo Gulch 2020 Stream Reclamation Project (see yellow pins). An Adaptive Management Approach (AMA) is used on McMurdo Gulch: as development occurs, stream changes and degradation are monitored, and the stream is reclaimed as needed. Castle Rock monitors and assesses McMurdo Gulch to determine the scope and schedule of stream reclamation needed to improve the stability, natural and beneficial functions, and improve water quality of the stream. In November 2016, Muller Engineering Company (MEC) prepared the 2016 McMurdo Gulch Reach Assessment[2] (MGRA). MEC started their

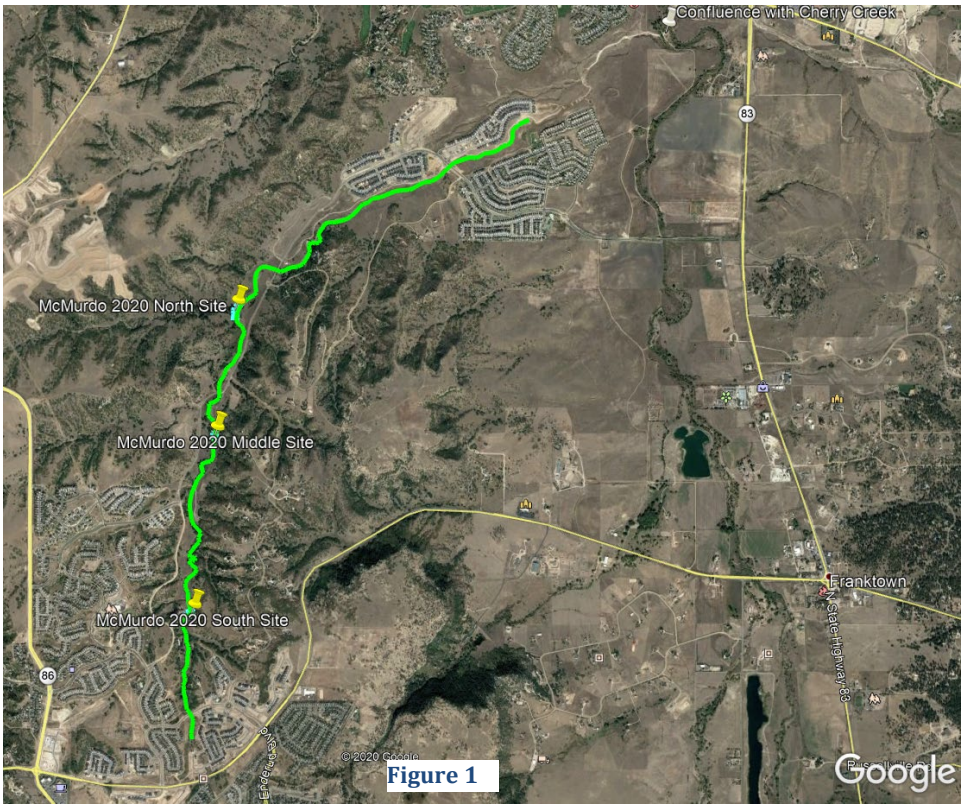

Figure 1

[1] McMurdo Gulch Stream Reclamation – Project Summary; William P. Ruzzo, PE, LLC; November 16, 2011.
[2] 2016 McMurdo Gulch Reach Assessment; Muller Engineering Company; November 3, 2016.


Photo 1


Photo 2


Photo 3

monitoring and assessment at the upstream end of McMurdo Gulch and continued downstream approximately 4.9 miles (see green line in **Figure 1**).

Existing Conditions:

From the 2016 MGRA, "The average gradient through the studied reach varies between 1.3% and 2.0%. Evidence of erosion was observed in many locations along the length of the channel. Head cuts, incision, and areas of instability were recorded. In addition, the level of instability and potential for future adverse impacts from the upstream watershed were noted and included in the assessment. Channel reaches in good condition were also noted so that they can be used as reference reaches for restoring stability to degraded reaches." The MGRA informed the first 3 priorities. The 2020 Project is the first priority in the MGRA and includes 3 sites; **Photos 1-3** show the existing condition of the 2020 Project's North, Middle, and South sites, respectively.

Design Approach:

McMurdo Gulch is changing with the development of the watershed, as can be seen through the bed and bank erosion in **Photos 1-3**. These changes seem relatively mild; however, through the adaptive management approach provides the right project at the right time. MEC designed the 2020 Project using a combination of grade control (Boulder Cascade and Riffle Drop Structures), bank protection (Void Filled Riprap and Vegetation), and grading to create overbanks and reduce erosion potential. The 2020 Project includes stream reclamation of approximately 2,000 Linear Feet of McMurdo Gulch.

Construction:

The 2020 project was constructed from June to November 2020 by 53 Corporation, LLC. **Photos 4-6** show the constructed improvements for the 2020 Project's North, Middle, and South sites, respectively. In 2021 at the north site, the overbank areas were lowered to provide better access to the groundwater and encourage hydrologic connection to stream flows. This adjustment provides better hydrology for wetland and riparian vegetation, which is required in the 404 permit and beneficial to water quality.


Photo 4


Photo 5


Photo 6

Funding:

Castle Rock and CCBWQA are partners on the 2020 Project. The cost sharing is 75% Castle Rock and 25% CCBWQA. The project cost is $970,000 with $242,500 being CCBWQA's share.

Water Quality Benefits:

The 2020 Project includes stream reclamation which provides water quality benefits for the stream and ultimately Cherry Creek Reservoir[3]. Stream reclamation reduces erosion and immobilizes nutrients (including phosphorus and nitrogen) in the soils, reducing the nutrient concentrations in the water. Ruzzo states, "Load and concentration reductions during base and storm flow conditions can occur by reducing flow velocities, providing greater areas for filtration and infiltration of stormwater and, to some extent, through increases in dissolved oxygen."[4] The 2020 Project immobilizes an estimated 34 pounds of Phosphorus per year[5].

Summary:

Water Quality Benefit of reduction of ≈ 34 pounds of Phosphorus per year
Total Project Cost = $970,000
Authority's Share = $242,500
Engineer: Muller Engineering Company
Contractor: 53 Corporation

[3] CCBWQA Stream Reclamation, Water Quality Benefit Evaluation – Interim Status Report; CCBWQA Technical Advisory Committee; June 16, 2011.
[4] McMurdo Gulch Stream Reclamation – Project Summary; William P. Ruzzo, PE, LLC; November 16, 2011
[5] CCBWQA 2020 Capital Improvement Program Supporting Data, Board Adopted Version November 21, 2019.

Additional information for the McMurdo Gulch – 2020 Stream Reclamation Project can be found at the project sponsor websites below.
Castle Rock website link: http://crgov.com/3258/McMurdo-Gulch-Stream-Stabilization
CCBWQA website link: https://www.cherrycreekbasin.org/library/