# **Sanderson Gulch Channel Improvements**





**June 1, 2020** 







## Stormwater & Floodplain Management Project

## SANDERSON GULCH CHANNEL IMPROVEMENTS



## PROJECT DESCRIPTION

### Sanderson Gulch Channel Improvements: Lipan Street to South Platte River

In the past, Sanderson Gulch flowed through undersized culverts and a channel within a narrow urban corridor that had insufficient capacity for major storms. Peak flows associated with the 100-year storm event overtopped roadways and railroad tracks and spilled out from the channel, resulting in traffic disruption, dangerous conditions, and flood hazard for many nearby businesses. The City and County of Denver applied for and successfully secured Federal and State grant funding to aid in the effort to find a solution for these problems.

Design of the Sanderson Gulch improvements, from S. Lipan St. to the confluence with the South Platte River, included an innovative design approach to increase capacity for stormwater conveyance. The new unconventional channel and box culvert system now safely conveys the 100-year storm flows and has an additional 1,200 cfs capacity to allow for the City to construct planned storm sewer outfall projects at upstream locations in the future.

The project includes a 12' x 4' box culvert and a geomorphic channel with flood terrace for low flows; two 14' x 8' and four 16' x 4' box culverts to convey high flows below the channel, roadways and railroad crossing; complex and decorative boulder structures at the inlet and outfall to South Platte River; a

comprehensive restoration effort for long term health and stability of the stream and habitat; trail connections and increased safety for pedestrians.

**Denver.** Colorado

#### **Unique Challenges**

- Located near a former Superfund Site, the existing contaminated soils created a need for careful scanning, testing, handling, transport and disposal of excavated radioactive materials. Air monitors, inspections and protection from potential asbestos were also necessary. Treatment of contaminated groundwater required a large multi-stage dewatering treatment system.
- Close proximity to existing buildings required the use of extensive beam and lagging wall shoring along the entire project corridor.
- Existing shallow bedrock at the upstream end of the project resulted in difficult excavation for new foundations and structures.
- The new box culvert system required relocation of approximately 200-LF of a primary Denver Water 30-inch water conduit.









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- The 2018 Grandoozy music festival at Overland Golf Course and Levitt Pavilion summer concert series at Ruby Hill Park brought thousands of people and high traffic volumes near the project site. Security fences, security guards and surveillance cameras were used to ensure public safety.
- BNSF authorized a 96-hour period to install 65 large precast box culvert sections below the railroad tracks. The approved dates required the 24 hour work cycle to be completed during cold winter temperatures and a snow storm.
- The project team provided quality control inspections for the BNSF pre-cast box culvert fabrication, located in Omaha, NE. Each precast section weighs 45,000 lbs. and required semi flatbed trailers to haul pieces individually over 500 miles to the project site.

#### Enhancing Public Health Safety and Welfare

Long term safety for the project site was a consideration throughout the entire design process. During planning, alternatives including tall channel walls were eliminated due to concerns with fall heights, difficult emergency access for a confined channel, dangerous flow depths and velocities, and challenges for maintenance. Ultimately, the final project includes many safety considerations:

• Culvert pools, vertical box "step" transitions, and short culvert heights to make culvert entry more difficult at South Platte River outfall.

"A very complicated ultra-urban situation where resurfacing the creek was not fully possible but you made it into the best HFLM stream it could possibly be. Keep up the great work!"

> Ken MacKenzie, Executive Director Mile High Flood District

- Safety rails at culvert headwalls, traffic rails at S. Platte River Dr, and fences along trails.
- Shallow channel with low velocities and safe access between BNSF RxR and S. Platte River Dr.
- Boulder structure upstream from Lipan St. is a safety improvement compared to the previous steep sloping concrete structure.
- Landscaping plan including strategies from Crime Prevention Through Environmental Design. Vegetation selection and placement is intended to make entry into culverts more difficult.
- Interpretive and warning signs (English/Spanish) posted at trails and culvert openings to inform about potential dangers at the culverts and drainageway.

The project includes a water quality vault structure that will screen and collect trash and debris from Sanderson Gulch

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before it can reach the South Platte River. The open channel also provides opportunity for infiltration and filtration as water moves through the system.

Before improvements, there was a narrow footpath located between the edge of S. Platte River Drive and a tall steep slope to the South Platte River that was dangerous for everyone walking this route. The roadway alignment has been shifted and a new concrete trail connection between the Regional Trail and Florida Ave. has been constructed for safe pedestrian travel.

A primary goal for this project was to increase capacity for Sanderson Gulch and reduce flood hazard potential for the adjacent roadways and nearby businesses. The result of these improvements was Removal of 107 parcels and 102 structures from the FEMA regulatory floodplain.

"Amazing! No other words; this structure exceeds all expectations. I had driven by it and it looked nice, but having stopped and walked around this new facility, I am truly amazed at how beautifully designed this space is, as well as the "natural" stream channel leading to it. Thank you so much for putting this level of effort into this. It makes a big difference in our City."

> Gordon Robertson, Director Planning, Design and Construction Parks and Recreation City and County of Denver

#### Incorporation of Creative, Unique, Innovative Solutions

The project separates stream base flows and low flows from high discharges during large storm events using a multi-stage boulder structure and special box culvert inlet configuration. The low flows are conveyed through a water quality vault to screen trash and debris and then go to the open channel system to support the native vegetation and habitat. Large flows are diverted into a complex box culvert system located below the open channel to safely convey the stormwater to the South Platte River. Given the size of the structure and the living system above, it can be recognized as a major stormwater improvement and an intensive green roof amenity for the community.

Plant selection and establishment is important for the long term success of the channel. A site specific plant palette was created and a custom grow contract was utilized to secure the desired native plant material in our region. The project site also serves as a case study for innovative weed control strategies. Test areas were established throughout the corridor to manipulate soil chemistry with soil amendments. These areas will be used to study and directly compare weed control and vegetation success to areas without the treatment. Initial results are showing quicker establishment of native forbes and grasses for the areas with treatment.



#### A Model for Other Community Projects

The approach for project design and construction had stream health, water quality, and functional open space in mind. The primary goals were to protect people, property and the environment.

The approach and efforts with monitoring and safe handling of hazardous materials discovered at the site can be helpful information for other communities that encounter project sites with similar difficulties.

Consistent public outreach, through website, email and meetings, was provided to inform nearby business owners, neighborhoods and the rest of the community about construction progress, potential delays, and anticipated changes to traffic patterns. It was an important and successful effort that was helpful for the entire community.

#### **PROJECT DETAILS:**

Design Cost	\$846,430
Construction Cost	\$14,500,000
HMGP (Federal) Grants	\$5,290,603
CDBG-BR (State) Grants	\$881,767
Completion Year:	March 2020

#### **PROJECT SPONSORS:**

- City and County of Denver
- Mile High Flood District

#### **DESIGN TEAM:**

ICON Engineering	Civil Engineer
Valerian	Landscape Architect
Great Ecology	Ecological Design
San Engineering	Structural Engineer
HDR Engineering	Water Utility Engineer
Aztec Engineering	Utilities
Base Tactical	Grant Management
Corvus Environmental	404 Permitting
Kumar & Associates	Geotechnical Engineer
Pinyon Environmental	Environmental Engineer
Stolfus & Associates	Traffic Engineer
Zoeller Consulting	Public Outreach

#### **CONTRACTOR:**

- Ralph L. Wadsworth (Prime Contractor, Civil)
- Habitat Management, Inc. (Site Restoration)
- BT Construction (Denver Water Conduit Relocation)

## LINKS TO ADDITIONAL INFORMATION

Sanderson Gulch Project Website: Full project overview project presentation, proposed designs and cross sections, mid construction and final construction drone videos, flood risks addressed, and water quality improvements.

<u>ArcGIS StoryMap</u>: Presents an interactive timeline of the project from design through construction.

Time Lapse: 96-hour time lapse footage of box culvert installation beneath the railroad, which took 9 months of planning and coordination to execute.

**Drone Flyover:** Drone Video over the completed Sanderson Gulch project.









"You made an impossible dream a reality! You make the City and us so proud as recognized by the directors at Denver. Thank you for your vision and leadership throughout the project."

#### Barb Chongtoua, PE, CFM, Project Mgr. | Mile High Flood District





