



# MEMORANDUM

JRS ENGINEERING CONSULTANT, LLC

**TO:** Rick Goncalves P.E., CCBWQA TAC Chairman  
Chuck Reid, CCBWQA Manager  
**CC:** Jason Trujillo, CCSP Park Manager  
**FROM:** James R. "Jim" Swanson P.E.  
**DATE:** July 18, 2018  
**SUBJECT:** 2018 Annual Inspection of PRF's at Cherry Creek State Park

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Presented herein are the results from the 2018 annual inspection of pollutant reduction facilities (PRFs) constructed by the Cherry Creek Basin Water Quality Authority (Authority) within Cherry Creek State Park (CCSP). The annual inspection is a requirement of the Operations and Maintenance Agreement between the Authority and CCSP dated January 14, 2006 (Agreement).

The purpose of the inspection is to assess whether the PRF's are functioning as designed and to identify routine, restorative, and rehabilitative maintenance requirements. The Technical Advisory Committee (TAC) of the Authority will use this report to provide recommendations to the Board for the following fiscal year budgeting of maintenance activities. Restorative and rehabilitative maintenance requirements are the responsibility of the Authority. Routine maintenance is the responsibility of CCSP. Other items, such as educational/interpretive sign replacement and weed control, as outlined in the Agreement, is shared 50/50 between CCSP and the Authority.

As defined in the Agreement, the term "Restorative and Rehabilitative Maintenance" shall mean all maintenance and repair reasonably necessary to keep the structural and other essential components or portions of a PRF in good working order and functioning as designed, including but not limited to the repair of walls, embankments, pipes, gates, monitoring facilities, erosion and riprap, the removal of sediment, and the replacement of vegetation within the disturbed area of a PRF as needed to maintain or restore the PRFs function. "Routine Maintenance" shall mean any and all maintenance that is necessary (other than Restorative and Rehabilitative Maintenance) to keep a PRF in a clean, sightly and safe condition, free from debris and rubbish, and protected from vandalism and malicious mischief to the same extent as any other public facility located within the CCSP.

For inspection scheduling purposes, PRFs have been organized this year into two groups, as follows:

- Group 1; Shop Creek, Cottonwood Creek, Cottonwood Wetlands and Cherry Creek at 12-Mile Park. These PRFs should be inspected at least annually and after significant storm events as they are part of the major drainage system.
- Group 2: East Boat Ramp, East Shade Shelter, Dixon Grove, Tower Loop, Quincy Drain, Mountain / Lake Loop Shoreline Stabilization and West Boat Ramp. These PRFs can be inspected on an as needed basis or as the Authority, CCSP and/or USACE personnel identify issues or concerns during the year. All of "Group 2" PRFs, except Quincy Drain and West Boat Ramp, are part of the shoreline stabilization program and are typically less sensitive to storm or flood events in the watershed. Quincy Drain has a small tributary area and most storm runoff events are infiltrated. West Boat Ramp is a parking lot drainage system capturing and routing storm flows into inlets, through an underground storm sewer collection system and then into a water quality basin prior to discharge into the reservoir.

The 2018 inspection, including Cottonwood Creek (Phases I and II), Cottonwood Wetland, 12-Mile Park Phases (I and II), East Boat Ramp, Tower Loop and Shop Creek, was conducted on Monday July 9, 2018 by Jim Swanson, on behalf of the Authority and Jason Trujillo, Larry Butterfield, Steven Stanton and Jon Kingery on behalf of CCSP.

A follow-up inspection including Mountain/Lake Loop Shoreline, East Shade Shelter, Quincy Drain, Dixon Grove and West Boat Ramp was performed on Friday July 13, 2018 by Jim Swanson, on behalf of the Authority.

**General Assessment:**

**Shop Creek:** CCSP has been performing routine maintenance by cleaning the trash racks, removing vegetation around the trash racks and removing woody vegetation in areas that could impact the soil cement structures. All trash racks require frequent cleaning for proper operation. All 6-drop structures<sup>1</sup> appear in good condition. Minor deterioration of the top of the dam at Structures #2 and #3 was noted, but was not determined to require repair at this time. See Photo 1. Drop Structure #4 showed signs of minor seepage through the dam. See Photo 2. No seepage was observed in Structures #1, #2, #3 and #5. Drop Structure #4 appeared to have minor root growth inside the inlet pipe. CCSP will snake the line to verify. Weeds and woody vegetation was observed at Structures #1, #2, #3, #4 and #5. Cutting and treating the woody vegetation is on CCSP's current routine maintenance list. See Photo 3. All five trash racks were replaced in 2015. Routine cleaning of the trash racks is included on CCSP's current maintenance list. All trash racks were observed to be free of debris. See Photo 4.



Photo 1 - Typical Structure Deterioration



Photo 2 - Typical Seepage Thru Structure



Photo 3 - Typical Weed / Woody Vegetation



Photo 4 - Typical Inlet Trash Rack

<sup>1</sup> The upstream drop structure is outside the park and is the responsibility of Aurora, but is included in the annual assessment since proper function of all drops is important to the overall performance of the Shop Creek system. Parks Structures are numbered 1 through 5 from upstream to downstream.

The water surface of Drop Structure Ponds #1 and #2 were each observed with significant duckweed coverage. See Photo 5. The water surface on Drop Structure Ponds #3, #4 and #5 were void of any duckweed. Pond #3 included a small noticeable growth of algae on the surface. The surface of the water quality / detention pond upstream of Aurora Detention Pond Structure (off-site of CCSP) was mostly covered with duckweed.

The presence of duckweed has been normal this past year when compared to previous years. Preliminary research into duckweed suggests that duckweed may not be a water quality concern and may be beneficial to water quality.



Photo 5 – Water Surface at Pond #1

**Cottonwood Creek Reclamation:** There were no signs of erosion or unraveling to the main channel area or structures. Vegetation along the creek is well established. See Photo 6. Vegetation at the south trail low water crossing is encroaching onto the trail and during periods of runoff will flood out the trail. Trimming and mowing is recommended along this area. See Photo 7. Areas of Canada Thistle, and other noxious weed growth were observed and are currently on CCSP's schedule for treatment. See Photo 8.



Photo 6 - Cottonwood Creek Vegetation Cover



Photo 7 - Cottonwood Creek Low Water Trail Crossing



Photo 8 – Canada Thistle Growth along Trail

**Cottonwood Wetlands:** Restoration of this PRF was completed in 2012, following the June 2012 flood which deposited silt/sediment along the right bank and damaged the upland seeding. Revegetation efforts, rainfall received and the annual noxious weed control performed has enhanced the vegetation growth at the wetland. See Photo 9. A recently completed shoreline project at the outlet structure has provided a stabilized surface for staff to routinely maintain the bar screen. See Photo 10.



Photo 9 - Cottonwood Wetland Vegetation



Photo 10 – Cottonwood Wetland Shoreline Stabilization

**Cherry Creek at 12-Mile Park Phase I:** Phase I was completed in 2012. It has experienced significant sediment aggradation from the 2014 and 2015 storm events. See Photo 11. Additional bank stabilization along the right bank was included with the Phase II construction completed in the spring of 2014. Noxious weed control has been performed annually since 2014. Channel sediment levels are currently being monitored. Photos 12 and 13 show the Phase 1 stream right bank breach caused by the sediment aggradation following the June 11, 2015 storm event. Cherry Creek flow was observed spilling out of the channel at the downstream end of Phase I early in 2017. This spill area is being monitored and will require a capital grading, erosion control and revegetation project to stabilize the eroded bank area.



Photo 11 - 12-Mile Park, Phase I, Sediment Aggradation, - looking downstream.



Photo 12 - 12-Mile Park, Phase I Channel Sediment Aggradation



Photo 13 - 12-Mile Park, Phase I, Bank Breach Spill from Channel entering Wetland

**Cherry Creek at 12-Mile Park Phase II:** Phase II was completed in 2014 and is experiencing high pedestrian / dog activity. Vegetation on the side slopes down to the creek bank, protected by the permanent fencing along the top of slope and the sides of each access point, is well established, see Photo 14. The vegetated areas outside the fence, between the fence and the trail was revegetated in May of this year, prior to the late May rainfall. See Photo 15. Signs were posted to inform Park users of the ongoing revegetation efforts. See Photo 16.

Recent Cherry Creek flow pattern changes have lowered the water level in the side channel between Access #6 and #8 at the south end of the Phase II project allowing dog and pedestrian access to the lower bank. This area was stabilized with soil wraps and is unraveling from the dog and pedestrian traffic. Temporary fencing and revegetation is required to close off the area and allow the revegetation to fill in the area. See Photos 17 and 18.



Photo 14 - 12-Mile Park, Phase II, Vegetated Channel Bank



Photo 15 - 12-Mile Park, Phase II, Vegetated Area between Permanent Fence and Trail



Photo 16 – 12-Mile Park, Phase II, CCBWQA  
Revegetation Signage



Photo 17 – 12-Mile Park, Phase II, Soil Wrap Bank  
Stabilized Area



Photo 18 – 12-Mile Park, Phase II, Soil Wrap Bank  
Stabilized Area

**Mountain / Lake Loop Shoreline Stabilization:**

Construction of this PRF was completed in 2013. The shoreline stabilization work including restoration work performed following the 2015 flooding was successfully completed and is performing as designed. Weed control and tree trimming on the new cottonwood trees is an ongoing maintenance requirement. The constructed jetty at the north end of the Lake Loop Parking Area has silted in and is currently supporting a health stand of willows and other vegetation. See Photos 19, 20, 21 and 22.



Photo 19 - Mountain - Lake Loop Parking Lot Vegetation  
& Cottonwood Trees



Photo 20 - Mountain - Lake Loop Shoreline



Photo 21 - Mountain - Lake Loop Shoreline



Photo 22 - Mountain - Lake Loop Jetty Vegetation

**East Boat Ramp:** Previous shoreline stabilization work at this PRF appears to be functioning as designed; however, an area of shoreline adjacent to the boat ramp and previous shoreline stabilization area is unraveling and threatening adjacent infrastructure and trees. It appears wave action has caused this area to unravel. See Photos 23 and 24. The curb cuts, where stormwater drains into the vegetated areas requires minor maintenance and will continue to be observed for additional silt build-up and flow short circuiting. See Photo 25.



Photo 23 - East Boat Ramp Shoreline Erosion



Photo 24 – East Boat Ramp Shoreline Erosion



Photo 25 – East Boat Ramp Curb Cut Drainage

**East Shade Shelter:** The shoreline stabilization at the fishing pod of this PRF appears to be functioning as designed. The concrete handicap access to the water provides convenient access to the water's edge while serving as shoreline stabilization. The shoreline along the walk walkway is unraveling and requires repair. See Photos 26 and 27.

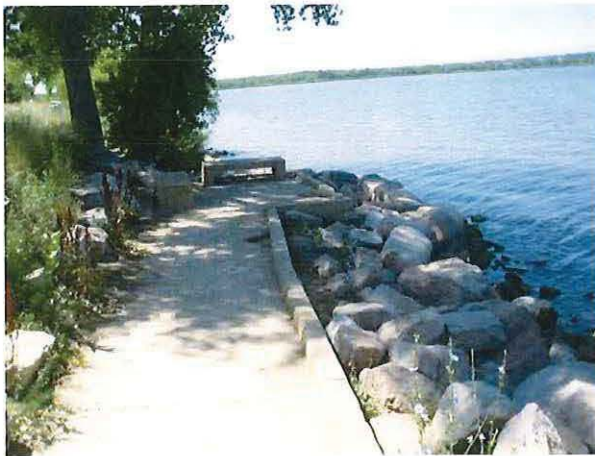


Photo 26 - Access Walk & Fishing Pod



Photo 27 – Shoreline Erosion along Walkway



**Dixon Grove:** No erosion or revegetation concerns were observed. See Photo 28.



Photo 28 – Dixon Grove

**Tower Loop:** Portions of the shoreline stabilization at this PRF appear to be functioning as designed; however, recent wave action has overtopped the rip rap protection and has undercut a portion of the access sidewalk adjacent to the north stairway. Other access areas are in need of routine maintenance. See Photos 29, 30 and 31.

A shoreline area extending approximately 120 feet to the south was being used for fishing and is experiencing a moderate amount of bank erosion. This area will be added to the 10-year capital improvement program.



Photo 29 - Tower Loop Parking Lot Drainage Outfall



Photo 30 - Tower Loop Shoreline Erosion at Access Walk



Photo 31 - Tower Loop Shoreline Erosion at Access Walk

**Quincy Drain:** No erosion or revegetation concerns were observed. See Photo 32.



Photo 32 – Quincy Drain

**West Boat Ramp Parking Lot Improvements:** Construction of this PRF was completed in 2014. All maintenance for this PRF is the responsibility of CCSP. Routine maintenance including weed control (mowing and spray application), outlet structure cleaning (box and screen) and clearing willows and woody vegetation from the detention pond is needed. See Photos 33, 34 and 35.



Photo 33 – WBR Vegetation along Top of Berm



Photo 34 – WBR Pipe Inlet Flared End Section



Photo 35 – WBR Outlet Structure

**Conclusions and Recommendations:**

Conclusions of the 2018 annual inspection are:

1. All PRFs are performing as designed; however, some routine, rehabilitative and restorative maintenance activities are recommended and are planned for 2019 and beyond.
2. Noted erosion areas will be included in the 2019 budget for restoration.
3. The projected total O&M cost as the result of this inspection is \$114,400 as compared to the 2018 budget of \$57,860.
4. Weed control (herbicide application) can be more readily accomplished by using the CCSP vendor for weed control (i.e.: Vegetation Management Inc, aka. VMI). The Authority purchased a seed drill for CCSP. Seeding areas are identified and a quantity of seed is estimated herein for budgeting purposes. CCSP will perform the reseeding and over-seeding on behalf of the Authority.

*Encl: 2018 Annual Inspection Report of PRFs at Cherry Creek State Park - Table.*