C I T Y O F B O U L D E R
WATER RESOURCES ADVISORY BOARD
INFORMATION ITEM

MEETING DATE: January 25, 2016

AGENDA TITLE: Informational Item – Betasso Water Treatment Facility Design Improvements Update

PRESENTERS:
Jeff Arthur, Director of Public Works for Utilities
Douglas Sullivan, Acting Principal Engineer for Water, Wastewater and Stormwater
Tom Settle, Water Treatment Manager
Steve Buckbee, Engineering Project Manager

EXECUTIVE SUMMARY

This agenda item is intended to provide an update on the upcoming Betasso Water Treatment Facility improvements project. City staff and its engineering consultant, HDR Engineers, are in the process of completing design improvements for a major facility upgrade. The Betasso facility was originally constructed in 1964 and has a number of aging treatment process facilities. The Betasso facility requires significant treatment process upgrades to ensure that it can continue to meet current and future drinking water regulations.

The current design project has progressed past the 60 percent design milestone. Final design drawings and bid documents are scheduled for an April 2016 completion. City staff will bid the project's construction phase at that time. The design engineer's 60 percent construction cost estimate is approximately $28 million. An estimated $3 million will be required in addition to the bid amount to fund the project's construction phase services component. This project will involve relatively complex construction phasing to ensure that the treatment processes continue to operate and effectively meet the city's daily water demand and associated treatment regulations throughout the project's construction. The project's construction phase is estimated at a 27-month duration.

The City of Boulder will fund this project through a Water Utility bond in the second quarter of 2016. The current bond amount is estimated at $35 million. The bond's final amount will be set in the second quarter of 2016 after city staff has received the project's 90 percent design construction cost estimate. At that time, City staff will decide if any other Water Utility projects will be included in the bond.

The December 15, 2014 WRAB meeting was conducted at Betasso, which included a tour, and a presentation on the upcoming improvements project. The Betasso project was also identified in the 2016 CIP overview which was presented to the WRAB at the April 27, 2015 meeting. The purpose of this information item is to provide the WRAB a project design update.

BACKGROUND

The City's treated water system is served by two water treatment facilities – the Betasso Water Treatment Facility and the Boulder Reservoir Water Treatment Facility. The Betasso facility and is located several miles up Boulder Canyon west of the City limits. The Boulder Reservoir facility is located in northeast Boulder on 63rd Street immediately north of the Diagonal Highway. This WRAB Information Item focuses on the Betasso facility improvements project. The Betasso facility receives raw water from the City's two primary watersheds – North Boulder Creek and Middle Boulder Creek. These watersheds utilize a network of raw water reservoirs, raw water pipelines, and raw water hydroelectric facilities to convey water to the Betasso facility.

Over the past five years, the City's annual water system demand has averaged approximately six billion gallons. The Betasso facility operates year-round while the Boulder Reservoir facility typically operates seven months a year – between April and October, depending on the City's water demands. Approximately 2/3 of the annual water supply is provided by the Betasso facility and the remaining 1/3 of the water supply is provided by the Boulder Reservoir facility.

The two facilities supplement each other to provide greater redundancy during the higher demand periods. The Boulder Reservoir facility was upgraded years ago with increased capacity to provide greater resiliency to allow the Betasso facility to be taken off-line for maintenance during winter months if necessary. The City's water demand varies significantly from month to month with a baseline water use during the winter months and a much higher water use to address irrigation needs during the summer months. Water production at the two facilities varies from year to year and during the year based on water resource needs, operational requirements and improvement projects.

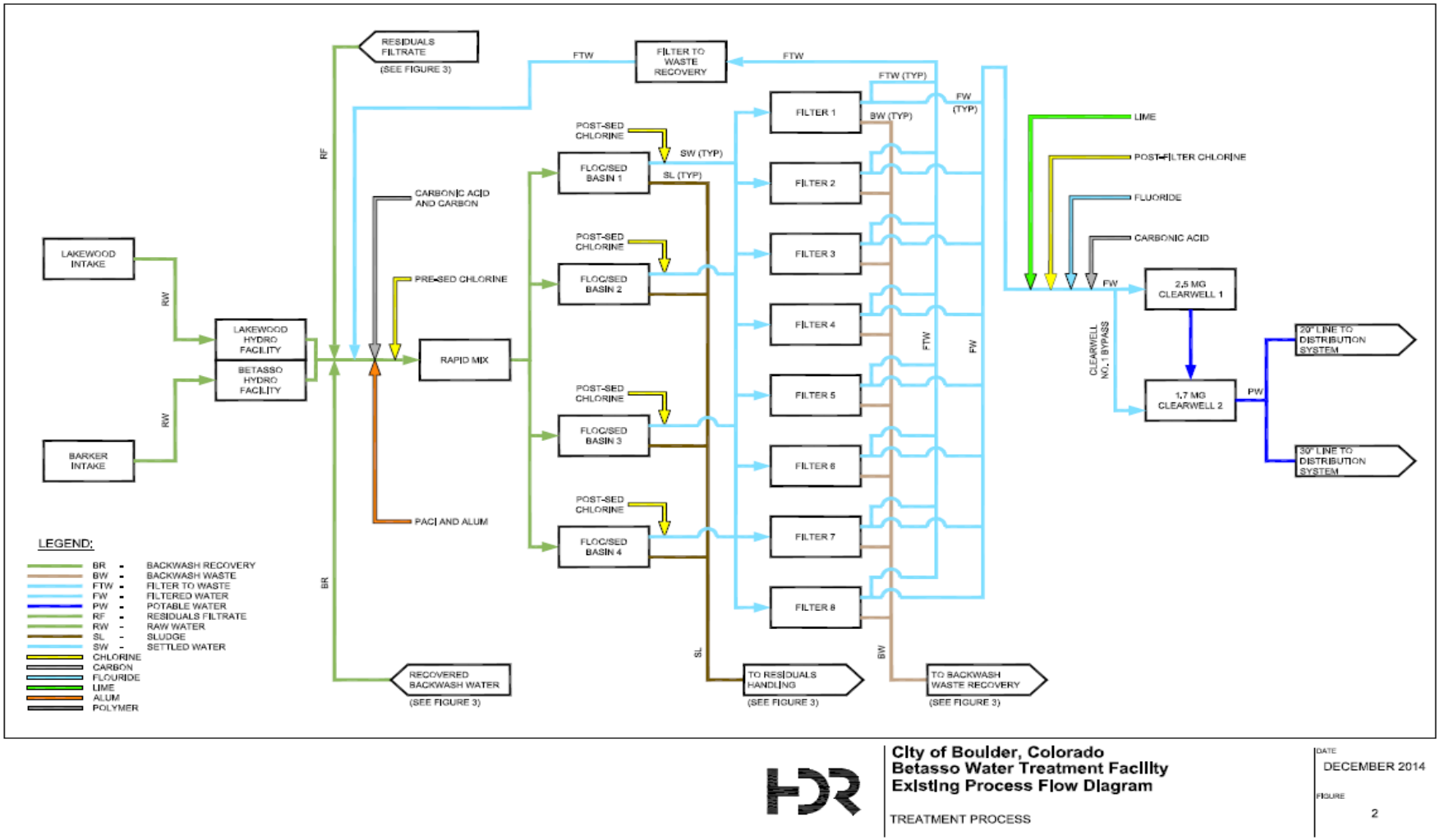
The Betasso facility has a rated capacity of 40 million gallons per day (mgd). However, the facility's reliable treatment capacity is closer to 32 mgd. There are significant operational issues associated with the pre-treatment and residuals handling processes that limit the capacity of downstream treatment processes. The primary purpose of this project is to upgrade the pre-treatment processes, replace equipment at the end of its useful service life, and add a new residuals handling building to ensure the facility has a firm capacity of 40 mgd.

Treatment Process

The Betasso Water Treatment Facility was originally constructed in 1964. A significant facility expansion was completed in 1976 to increase the rated capacity. There have been numerous modifications to the facility throughout the years. The treatment process includes the following key components: chemical addition, rapid mix, flocculation, sedimentation, filtration, and disinfection. Powdered activated carbon can be added upstream for taste and odor control.

Figure 1 provides a flow diagram of the Betasso Water Treatment Facility.

Figure 1 - Betasso Water Treatment Facility – Flow Diagram



HDR

City of Boulder, Colorado
Betasso Water Treatment Facility
Existing Process Flow Diagram

TREATMENT PROCESS

DATE
DECEMBER 2014

FIGURE
2

ANALYSIS

City staff selected HDR Engineers as the design consultant in 2014 for the Betasso improvements project. To date HDR has completed a plant-wide assessment, an alternatives analysis, and a long-term capital improvements plan. HDR is currently working on the project design and is developing updated cost estimates at major project milestones. The 60 percent construction cost estimate is approximately $28 million. **Attachment A** provides the HDR 60% Design Review package highlights (pages 1-6) which includes the current cost estimate and associated schedule.

The current project scope and associated cost estimate are significantly greater than the original project estimated in 2011. There are several reasons for the scope and cost increase. The primary reason for the increase is that last year's 20-year Water Utility CIP identified two Betasso projects instead of one. The first project was scheduled in 2016 and the second project was scheduled in 2026. In 2015, these two projects were combined into a single project which now represents the current design approach. Other factors impacting the cost increase include a scope increase which was based on greater facility needs following the completion of the facility assessment.

The City's approach will utilize a base bid with a few bid alternatives to provide the city flexibility in awarding the contract. Based on the bid price and the city's budget, the bid alternatives could be removed from the bid in the event the bids are higher than expected. Recent Front Range construction bids along with recent City of Boulder construction bids have come in significantly higher than their corresponding engineer's estimated construction cost.

Preliminary design for the Betasso facility improvements project began in September 2014. Major issues identified in the facility assessment and alternatives phases include the following:

- Pretreatment is inadequate to sustain effective treatment at flows in excess of 32 mgd
- During periods of high concentrations of color and total organic carbon in the source water, the filters have limited run time due to turbidity breakthrough
- Residuals thickening, dewatering, and drying processes are insufficient to treat the volume of solids generated
- Replacement of many assets at the end or beyond useful life
- A new backup generator and increased fuel storage

Based on the facility assessment findings, the current project goals include the following:

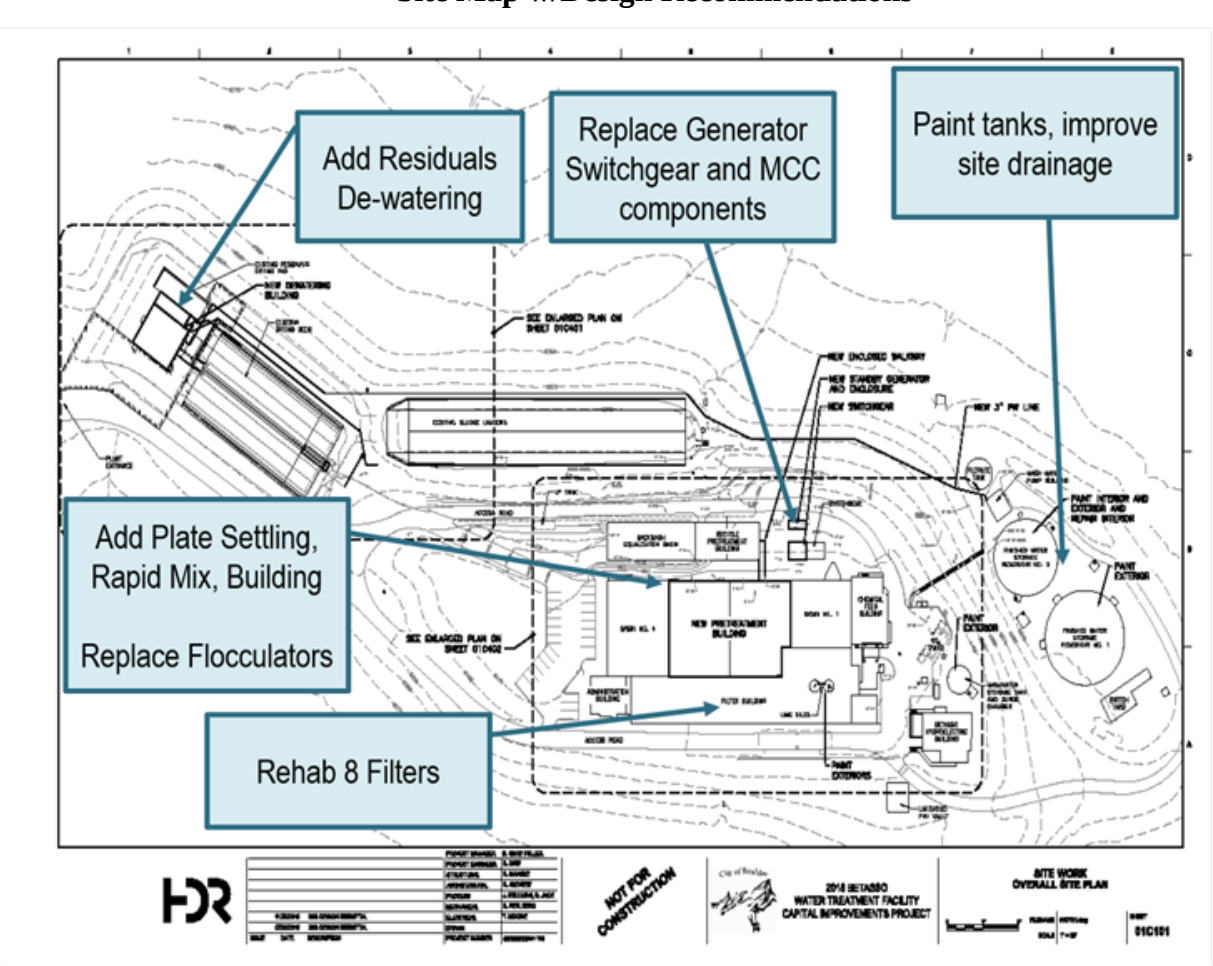
- Provide a sustainable capacity of 40 mgd at all times of the year
- Only haul solid (dry) residuals from the facility
- Replace all equipment at the end of its useful life
- Provide robust pre-treatment
- Retain operational simplicity and gravity flow when possible
- Provide a long term strategic plan for replacing and maintaining assets
- Reuse, repair and repurpose facility infrastructure when possible

Seven major CIP improvements were selected for inclusion in the 2016 design project to address the project goals. These improvements are listed below. **Attachment B** provides the HDR CIP memo highlights (pages 1-8) which includes a description of the seven major process improvements.

- Pretreatment Improvements
- Pretreatment Building Addition
- Filter Improvements
- Filter Valve Replacement
- Residuals Handling Improvements
- Power Reconfiguration and Backup Power Improvements
- Outdoor Tank Improvements

Figure 2 provides a site map of the Betasso Water Treatment Facility with the design recommendations identified.

Figure 2 – Betasso Water Treatment Facility
Site Map w/Design Recommendations



Project Schedule:

- Contractor Prequalification – 1st quarter 2016
- County Special Use Permit Approval – 2nd quarter 2016
- Project Bid – 2nd quarter 2016
- Bond Issuance – June 2016
- Contractor Mobilization – 3rd quarter 2016
- Project Closeout – 4th quarter 2018

NEXT STEPS

WRAB Mid-Project Construction Tour – 3rd quarter 2017

ATTACHMENTS

A – HDR 60% Design Review package (pages 1-6) – Jan 12, 2016
B – HDR CIP Memo (pages 1-8) – September 30, 2015