

Over the next few pages, Castle Rock Water provides highlights of the accomplishments and projects in 2016. Please join us as we take a look back at 2016.

Awards

Pursuing Excellence - Gold in 2016

Castle Rock Water was the first water provider to reach the Gold level. In 2016, Castle Rock Water submitted 14 optimization action plans to win the Gold. The Pursuing Excellence program, sponsored by the Colorado Department of Public Health and Environment, recognizes water providers for their accomplishments and encourages systems to go above and beyond regulations and standards. These accomplishments then become a resource of information to other water systems who may be looking at similar issues.

Castle Rock Residents Take the Mayors Challenge

In April 2016, the first Mayor's Challenge to Fill the Rock was conducted to take the receptive conservation culture of the Town a step further. During the month of April, residents were asked to make a free, online pledge toward individual conservation efforts. This now annual event sponsored by the Wyland Foundation, National League of Cities and the Environmental Protection Agency among others is a friendly competition between mayors nationwide to challenge their residents to conserve water, energy and other natural resources on behalf of their city. The pledge includes taking shorter shower, fixing those leaky faucets and only washing full loads of laundry among a host of other things. Those savings are then taken to "fill" the rock. If we make the top rank in our category, our residents are eligible to win prizes.



2nd Place in Water Taste Test

In 2016, Castle Rock Water came in second at the water taste test during the Rocky Mountain Section of the American Waterworks Assn. We take great pride in providing our Town with great tasting water in addition to exceptional service.

Community Events



Year	Volunteers	Bags Collected
2011	163	200
2012	142	78
2013	226	214
2014	172	352
2015	173	182
2016	180	192



Save the date!!

The next Spring up the Creek is May 6, 2017!



Household Chemical Round-up

Another popular community event is the Household Chemical Round-up. In 2016, 708 vehicles dropped off a variety of household chemicals, including aerosol cans, flammable materials, paint products, motor oil, tires, fluorescent light bulbs and pesticides. In all, over 89,000 pounds of waste was collected. These materials will not end up in our creeks, or water supplies.



METER SERVICES

Meter Services installed the 20,000th meter this year

Why is this significant? The 20,000th meter signifies our growing community and reminds us of how many people depend on us to provide clean, safe drinking water each and every day.



Our Meters team:

Kris Julseth, John Whitesel, Nikki Hoyt, Rob Chrestensen, Dominic Roybal and Mike Wilder (left to right)

Record setting all-time low of 55 skipped reads

The AWWA standard for skipped reads is currently 2 percent. This past year Meter Services achieved well below that average hitting an all-time low of only 0.28 percent. This is a testament to the dedication and commitment of the Meter Services team to complete monthly maintenance on

infrastructure. This continued commitment has improved reading efficiency, billing accuracy and has challenged the team to always strive for one less skipped read.

Completion of 1-inch and larger meter audits

Meter Services completed almost 900 large meter audits and field tested both of the Town's 6-inch meters. Even though the Town's large meters make up only 3 percent of the meters that are currently in service, they account for 30 percent of all the revenue. This audit was important to confirm the infrastructure age, ensure the billing and infrastructure were accurate and to capture potential revenue and water loss. Over time, we have identified and corrected approximately \$200,000 of net lost revenue through this project.



Six-inch meter bench test being conducted at the Justice Center inside the vault

Implementation of Etrak-It for residential meter set inspections

In September 2016, the team had a record setting month of 161 meter set inspections. To maintain customer service levels with the increased Town growth, the Meter Services team worked with Development Services and moved the tracking of meter set inspections into Etrak-It. This has provided an increased level of customer service to our building community that had not been offered previously. It has also allowed Superintendents and Development Services to have access to real time information regarding inspections. The implementation of Etrak-It has improved communication and efficiency of the overall meter set inspection process.

CUSTOMER BILLING

Updating Policies

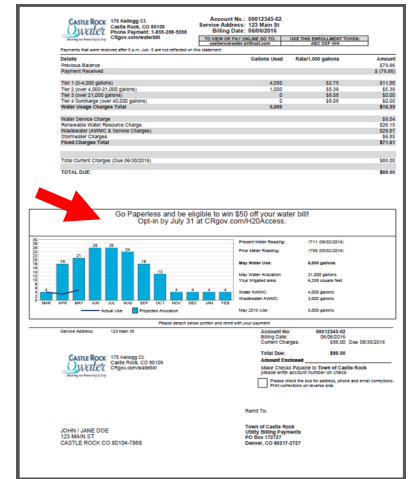
The customer billing team was hard at work in 2016 updating written policies and procedures. Some to note are payment agreements, returned payments, leak adjustments, waiving of fees and billing adjustments, just to name a few. The team reached out to other local water providers to ensure the final and approved policies were consistent with others in the surrounding area. This is important as it provides a written policy and procedure to ensure that all customers are treated consistently and fairly.

Bulk Water Program Changes

Bulk water customers are now able to receive their monthly statements paperless, make payments online, schedule auto pay or view/print/save 12 months of statements using the H2Oaccess customer portal. The customer portal is now conveniently available 24/7 free of charge to all Castle Rock Water customers. Bulk water station customers have been switched from a prepaid plan to a credit plan which allows them to access the station 24/7 with the convenience of insuring they have money on their account first.

Monthly Statement Messaging

In June 2016, we launched a new feature that provides the ability to add monthly messaging to our statements. This feature is used to inform and keep customers up-to-date on customer outreach related to awareness of seasonal programs, holiday closures, water conservation programs and upcoming events, just to name a few. A sample statement with a red arrow shows where the placement of the monthly statement messaging can be found (on the right.)



Special Charges

In January 2016, the team rolled out the updated special charges fee schedule that now will be updated annually along with the Rates and Fees Study. Throughout the year, the team performed an in-depth cost of service review on the special charges. Special charges include delinquency charges, specialized service order services, transfers of service and administrative related fees, just to name a few. In 2016, the revenue generated by these special charges was approximately \$500,000. These special charges should recover the actual cost of service delivery recovering costs directly from customers that access those services. This provides equity amongst customers and helps keep rates for all customers down.

H2OAccess

Approximately 1,300 new customers enrolled in 2016 with the online customer portal and took advantage of the many options available to them such as paperless statements, online payments and the ability to schedule auto pay or view/print/save 12 months of statements. We launched a paperless campaign in 2016 to encourage and increase the adoption of paperless billing through our online portal H2Oaccess. In 2016, approximately 925 customers choose to go paperless which was a 3 percent increase from 2015.

CUSTOMER OUTREACH

Welcome Packet

A welcome brochure was created this year to provide new residents with information on the services Castle Rock Water provides, how to read their bill and contact information. Along with a welcome letter from the Castle Rock Water Director, the brochure highlights our long term water plan and strategic goals. Conservation efforts, such as the watering schedule and educational classes are explained as well as the tiered water budget rate structure and some frequently asked questions. This brochure is being mailed to every new account along with seasonally-appropriate information, such as the watering calendar. Meter Technicians will also have them to hand out in the field, and they are available at various classes, community events and the front desk at Castle Rock Water. Starting in May 2016, approximately 2,081 packets were sent out.

Some additional 120 outreach opportunities in 2016 included Water Wednesday posts on Facebook, Town Talk articles and press releases.

FINANCIAL

Certificate of Participation (COP's) Refinancing

2016 ends with a success story where Castle Rock Water successfully issued fixed rate revenue bonds to replace the variable rate certificates of participation (COP). This success has locked in an interest rate of 2.505 percent, which is significantly lower than the 3.35 percent that was previously used for the long term rate and fee modeling and budget. The impact has been immediate reducing the recommended water resources rate increases from 3.5 percent to 3.0 percent for the next four years.

WORK SMARTER NOT HARDER INITIATIVE

The Business Solutions Team took on another initiative in 2016 called "Work Smarter Not Harder" which encompassed many smaller projects intended to initiate cost savings, improve efficiencies, and streamline processes and overall produce more with less.

Here are just a few:

- Installed check scanner for daily check processing
Reduced staff time
- Outsourced bulk water statements
Reduced staff time and improved customer experience
- Disconnection deployment process
Increased efficiencies
- Tracking of multi-family customer accounts
Improved data reporting
- BillMaster (billing system) access control security
Improved security of data

Certifications



The water, wastewater and stormwater utility business is highly technical and regulated. As such, Castle Rock Water has to maintain an extensive staff of professionally licensed individuals. Most of these licenses require specialized education and the passing of state testing, as well as proof of continuing education.

Below is a list of certifications held by the staff at Castle Rock Water.

Commercial Driver's License	21
Wastewater Collection (Class 1-4)	28
Class I Plant Maintenance Technologist	3
Water Distribution (Class 1-4)	28
Class A Industrial Wastewater (National)	1
Class C Industrial Wastewater	2
Water License (Class A-D)	18
Wastewater License (Class A-D)	5
PACP - Pipeline Assessment	6
Backflow Prevention Assembly Tester	11
40-hour HAZWOPER (specialized safety training)	14
Flagger Training Certification	10
CDOT Erosion Control	3
Plant Maintenance Technologist	1
Excavation Safety Training for Competent Persons	9
National Assn. of Sewer Service Companies; Manhole, Pipeline & Lateral Assessment Certification; and Inspector Training; and CIPP	1
Professional Engineer (Colorado)	14
Professional Engineer (TX, GA, NE,WY, OK, SD)	6
Project Management Bootcamp	5
American Water Works Association Supervisory Certificate	8
Rocky Mountain Water Quality Analyst	1
Professional Geologist	1

2nd Annual Safety Fair

Castle Rock Water held its 2nd Annual Safety Fair in September. The event included a CPR demonstration by Castle Rock Fire Department (CRFD), and a scavenger hunt focusing on various safety practices around the site.

The highlight of the Safety Fair was the CPR demonstration and Q&A discussion that followed. The demonstration mirrored an actual event using a life-like dummy, and was made complete with the efforts of Safety Committee Member John Grahn trying to resuscitate him. The responders added even more to the real-life feel of the demonstration by carrying out the simulated administration of an Automated External Defibrillator (AED), and medicine that would typify an actual response.

As a result of this event, 36 Castle Rock Water staff became certified in First Aid.



Debbi Davenport, David Van Dellen, Dominic Roybal and Casey Stevenson find one of the clues in the Safety Scavenger Hunt.

Field Services

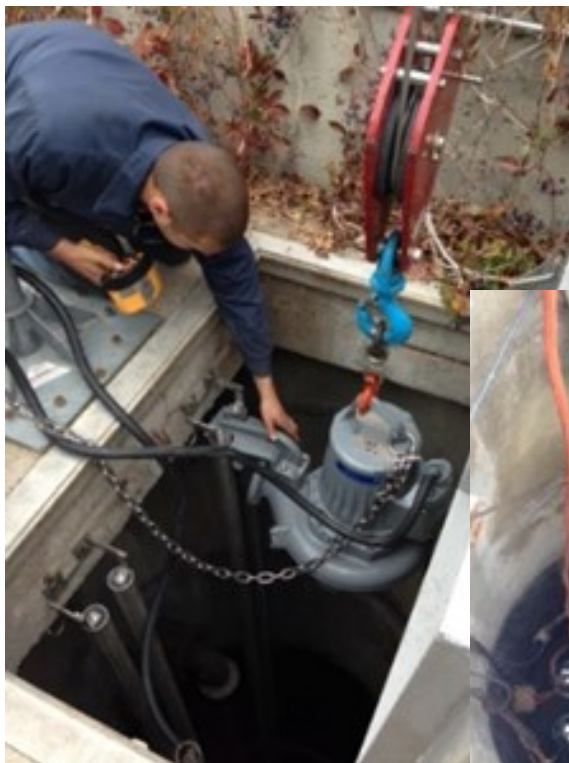
Key Performance Measure	2016 Total
DISTRIBUTION	
Leaks Repaired	16
Valves Repaired	8
Hydrants Repaired	58
Miles of Main Line Inspected(Leak Detection)	57.74
Valves Inspected	5,671- (52%)
Hydrants Inspected	3,154- (83%)
Hydrants Painted	0
Dead End Lines Flushed	471
Tanks Inspected	48
Tank Inspections	3
Bulk Water (K Gal)	2,859
COLLECTIONS	
Sanitary Sewer Overflows	1
Sanitary Sewer Stoppages	1
Miles of Line Cleaned	45.65 Miles
Miles of Line Inspected (CCTV)	42.44 Miles
Bulk Water (K Gal)	369
STORMWATER	
Infrastructure Inspections	1,144
Cubic Yards of Material Removed	17,394.60
Cubic Yards of Material Placed	90,056
Tons of Material Placed	1,260,784
Rehabilitation Projects Complete	3
Bulk Water (K Gal)	5
Bulk Water Used by Field Services (K Gal)	3,233
Utility Locating Requests	18469
BACKFLOW	
Hydrant Meter Permits Open	34
Backflow Prevention Test Letters Sent	552
Backflow Surveys Completed	621

System Statistics		
Distribution	Collections	Stormwater
383 Miles of Distribution 3,765 Total Hydrants 10,973 Total Valves 508 Air Release valves	250 Miles of Collection 11.78 Miles of Force Main 8,295 Manholes 10 Lift Stations 2 Odor Control Facilities	137 Miles of pipe 3,378 Manholes 4,448 Curb Inlets 490 Drop Structures 63 Detention Basins



Our team maintains about 780 miles of water, wastewater and stormwater pipeline, enough to run from Castle Rock to Las Vegas, Nevada.

COLLECTIONS



New pumps, guide rails and piping were installed at the Meadows 5 Lift Station as part of the wastewater system upgrades.



Wastewater's new easement machine allows the team to easily work on uneven terrain and allows access to facilities located in easements.



DISTRIBUTION



The clear well located at Ray Waterman Treatment Plant was cleaned and sanitized.



A repair was made to a broken 16" raw water line which feeds water from the North Central Well Field to the water treatment plant. A total of 26 feet of pipe was replaced.



The clear well at Plum Creek Water Purification Facility was cleaned and sanitized.

STORMWATER



The Stormwater team refurbished the Fire Department Training Center detention pond.



Repairs made to the Plum Creek Ditch after it had become clogged with sediment, plants and debris, causing it to spill onto Plum Creek Parkway during severe storms. This overflow created road icing, which was a safety hazard for drivers on this main arterial.

CROSS CONNECTION



In an effort to prevent water theft, stickers alerting the public about related Municipal Codes have been attached to our fire hydrants.

The hydrant meter bulk water program is now offering dolly mounted hydrant meters complete with backflow device, to make it easier and less expensive for short term hydrant users to access our water.



Plant Maintenance / Treatment Services



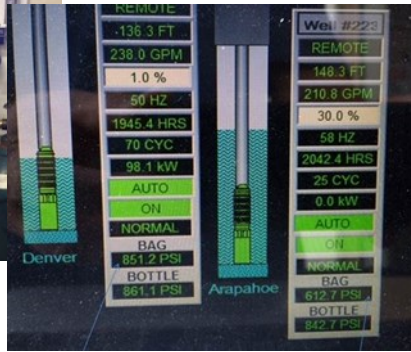
Utilizing our water rights, 50 million gallons of renewable water was taken from Plum Creek and sent to the Plum Creek Water Purification Facility. This was a joint effort that involved Field and Treatment Services staff.



The Treatment Operations staff during an exercise at the eight hour refresher course to renew Hazwoper certifications.

Plant Maintenance / Treatment Services

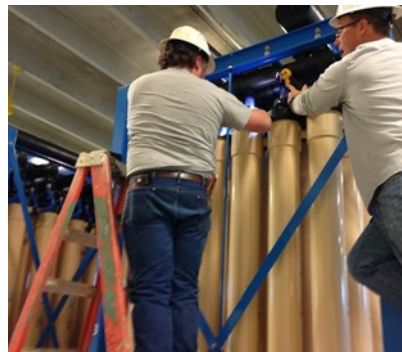
Field and Treatment Services work together to clean and inspect machinery, basins, and performed annual maintenance on equipment at the Plum Creek Water Purification Facility.



Plant operators and mechanics participated in the testing of our Aquifer Storage and Recovery (ASR) project, which included filling, storing, recovering and testing water sent down the well into the aquifer.



The variable frequency drive was replaced at Well 14R. This equipment is essential to supplying water to Plum Creek Water Purification Facility.



Plant Mechanics repaired a broken membrane strand that failed integrity testing during Pall membrane rack maintenance

Water Plant Tours

Tours of the Plum Creek Water Purification Facility continue to be a huge success. Over 230 school children, scout groups and their parents toured the facility in 2016. In addition to touring the plant, they learn about where our water comes from, the importance of water conservation, and the impact of stormwater on water quality.

We'd like for your group to tour this state-of-the art facility. To arrange a tour, visit CRgov.com/watertours.



Water in the Classroom

One of Castle Rock Water's goals is to promote water conservation and efficiency in the classroom. To further our goal, we visit 5th and 6th grade classes throughout the school year. Below is a summary of the schools visited:

- Clear Sky Elementary - about 120 students
- Sage Canyon Elementary - about 120 students
- Academy Charter School - about 75 students
- Renaissance School - about 50 students

These presentations include information about groundwater vs. surface water, renewable water vs. non-renewable water, the water cycle, source of our water, the importance of conservation and using our water efficiently, stormwater, water quality and the importance of keeping our water clean.

2016 Castle Rock Water Asset Management Year In Review

Castle Rock Water continued implementing an asset management program which is designed to maximize the life of our capital assets, and provide operation and maintenance in the most efficient manner possible. The program is having a huge positive impact.

Some key results from 2016 are shown below:



Water Main Repair Cost \$59,409
Total miles of Leak Detection 58 miles
Water Main Breaks 16
Total Customer Affected by Breaks 43

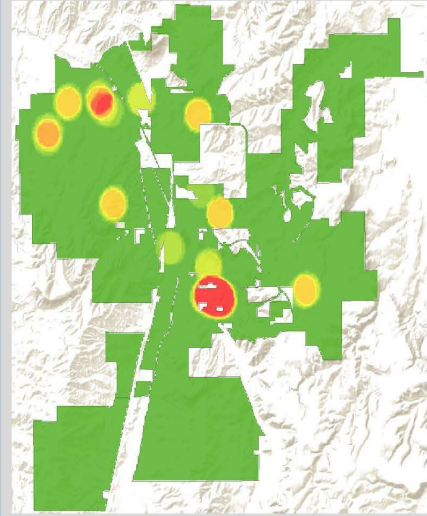


Hydrant Inspection and Repair Costs \$29,055
Number of Repair Tasks 58
Number of Inspections 2,874
Average Condition Rating Excellent

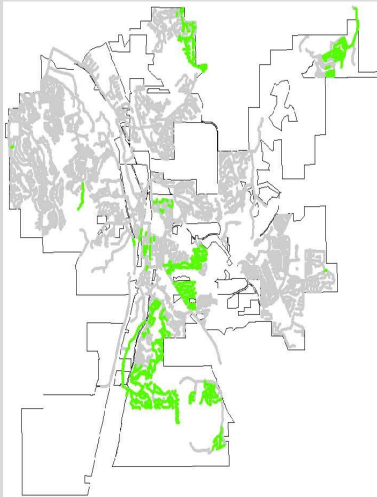


Water Valve Inspection and Repair Cost \$48,891
Total Inspections 5,582
Total Repair costs \$5,956
Average Condition Rating Excellent

2016 Water Main Break Concentration



2016 Jetting Areas

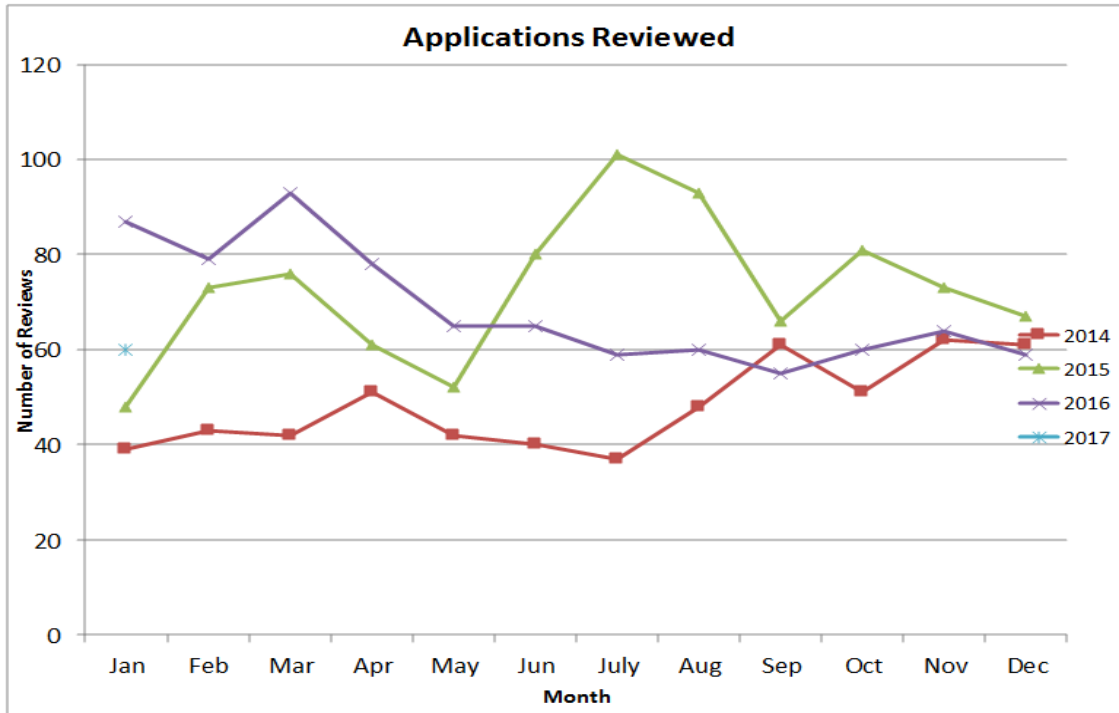


Sewer Main Inspection and Cleaning Cost \$556,239
Total Miles of Jetting 45.64
Total Miles of CCTV 42.5
Relining Project Costs \$215,589



Plan Review

Castle Rock Water provides plan review for all water, wastewater and stormwater projects submitted through the development review process. The line graph (below) shows development activity data (by month and year) since 2014.



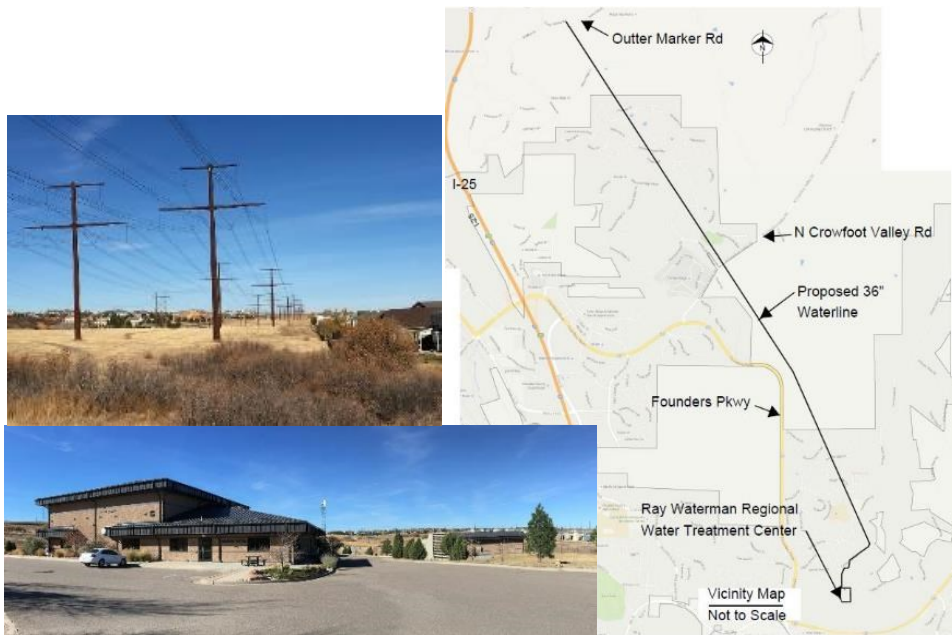
WISE Local Infrastructure

Project Manager: Walt Schwarz, P.E.

A near-term source of imported, renewable water will be from the Water Infrastructure and Supply Efficiency (WISE) Project. The WISE water supplies to be conveyed to the Town beginning in 2017 could total up to seven million gallons per day (MGD) and the Town anticipates northern water supplies to increase in the future. The pipeline has been sized to accommodate future additional supplies. The initial seven MGD is planned to be shared with Dominion Water and Sanitation District (Dominion) as specified in Intergovernmental Agreements.

Work for the WISE Local Infrastructure construction project generally consists of furnishing, installing, connecting, and testing a potable water pipeline as required to convey WISE water from the Parker Water and Sanitation District (PWSD) infrastructure near Outer Marker Road in Douglas County, to the Ray Waterman Regional Water Treatment Center (RWRWTC). Work includes installation of approximately 5.1 miles of 36-inch PVC and 1,300 linear feet of 24-inch PVC potable waterlines. Approximately 3,000 linear feet of 36-inch potable waterline will be installed by way of horizontal directional drilling (HDD), and approximately 1,200 linear feet of 48-inch steel casing is to be installed by trenchless bore construction methods. A steel casing pipe will be jacked into place and support the earthen conduit created by equipment used to bore the hole. The 36" diameter PVC water pipeline will then be installed through and supported within the casing pipe.

Bids for construction of the WISE Local Infrastructure construction project were received from five pre-qualified contracting firms who specialize in water infrastructure construction projects. Town Council authorized award of a construction contract to the low bidder (Garney Companies, Inc.) in the amount of \$13,448,015. Garney is scheduled to mobilize for construction work by mid-January 2017, and work is scheduled to be complete by late summer of 2017.



Upper Photo Typical of Alignment Corridor, Lower Photo of RWRWTC, and Location Map Showing Overall Project Extents

Water Storage Tank 3 Improvements and Repairs

Project Manager: Josh Hansen, P.E.



Tank 3 Concrete Roof Repair Sequence

Tank 3 is the Town’s oldest water storage tank currently in service. The water tank has a capacity of one million gallons, was built in 1969 and is rapidly approaching the half century mark. In today’s dollars, replacement of the tank could exceed \$2 million. During the Town’s routine tank inspections, several areas for improvements were identified at Tank 3 – the most important of these being repairs needed to address degradation of the concrete roof and walls. Canterbury Construction was the low bidder on the project and was awarded a contract in the amount of \$111,166.

Construction of the improvements began in May and was completed in July 2016. Temporary shoring support had to be installed inside of the tank before the damaged concrete could be removed from the roof. Additional improvements included installation of a new interior tank ladder and overflow pipe to replace corroded existing equipment and installation of a new raised tank roof hatch, raised air vents, and a silt stop on the tank outlet. Construction of the improvements was completed within budget, and the tank is back in service. The completed improvements will help improve staff safety at the tank, make sure we continue to meet the latest state regulatory standards, and significantly extend the lifespan of Tank 3.

As a side note on how construction has changed over the past half century, the original Tank 3 construction plans from 1969 were a total of four pages. The construction plans for the Town’s most recently designed water storage tank are 72 pages, along with 523 pages of technical specifications.



Tank 3 Temporary Shoring

New Clearwell Access Hatch at Ray Waterman Regional Water Treatment Center (RWRWTC)

Project Manager: Walt Schwarz, P.E.

The clearwell was built in 2005, along with the Ray Waterman Regional Water Treatment Center (RWRWTC), and has a capacity of approximately 546,000 gallons. Filtered water from RWRWTC flows into the clearwell and is then pumped out to the Town's potable water distribution system. A single three-foot square access hatch into the clearwell roof has proven inadequate for maintenance and operation activities. A new five-foot wide by nine-foot long access hatch on the existing clearwell was designed and bid for construction in 2015.

Canterbury Construction was the low bidder and was awarded the construction contract in the amount of \$98,967. In addition to the new hatch, the project included replacing a leaking metal wier box with 42-inch diameter ductile iron piping. The top of the new piping arrangement is approximately 15 feet above the clearwell floor. The elevation is important and is set to work hydraulically with the gravity flow filters.

Canterbury installed a steel reinforced concrete beam that was needed to add support to the clearwell roof after removing the concrete section. The project stayed within budget. Canterbury completed the hatch installation and other components of the project in February of 2016.



Left to right: Cutting and removing the 20,000 plus pounds of concrete; reinforcing and formwork for new concrete beam and hatch curb walls; and the new 42" diameter ductile iron pipe system.

Filter Media and Underdrain Replacement at RWRWTC

Project Manager: Walt Schwarz, P.E.

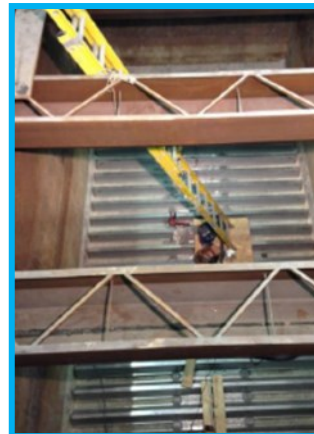
The filter underdrains installed during construction of the Ray Waterman Regional Water Treatment Center (RWRWTC) in 2005 were a plastic material with slotted openings on top. During normal operations filtered water collects in the underdrain, is then conveyed through piping to the clearwell, and is ultimately pumped into the water distribution system.

Since about 2010, it became apparent that the original media and underdrain systems were beginning to fail when filter media, along with the filtered water, were flowing into the clearwell and high service pump station. In 2015 Utilities worked with AWI-Anthratic to design, fabricate and install a new stainless steel underdrain system. AWI also installed a two layered filter media system consisting of a 22" deep layer of silica sand and a 28" deep layer of anthracite (combined total of 390 tons of media). The new AWI underdrains are constructed with slotted openings to allow filtered water to pass but small enough to hold back the filter media. This new system is a significant improvement over the original design that relied on various sized gravel layers (no longer needed) to prevent media from passing through the plastic underdrain (holes in plastic underdrain allowed media to pass).

The project was completed in March 2016 with a final cost for AWI of \$559,003. Town staff disinfected the eight filter cells (total filter area of 2,400 square feet) and ensured that areas passed the required bacteriological testing. A design and construction project permit with the Colorado Department of Public Health and Environment was closed out, and the filters were back in service in time for the summer high demand season.



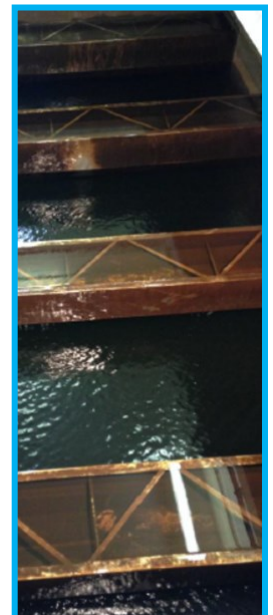
Delivered Media



New Underdrains Installed



Skimming Fines off Media Layers during Installation



Filtering Water After Completion

Service Line Improvement Project - Eaglestone Drive and Castle Creek Commons Apartments

Project Manager: Matt Hayes, P.E.

Castle Rock Water completed water service line improvements in two areas during the summer of 2016. Ten homes along Eaglestone Drive had been experiencing low pressure for a number of years. Castle Rock Water investigated these complaints and determined that service lines had been connected to the wrong water main when the homes were constructed in 2004. The Service Line Improvement Project relocated the residential service tap from the Red Zone main (lower pressure) to the Green Zone main (higher pressure). This project boosted the service pressure by approximately 60 pounds per square inch (psi). In addition to the service tap relocation, the project added two additional water quality sample stations to the Town's water distribution system.



Eaglestone Tap Relocation

The second part of the Service Line Improvement Project replaced four meter pits at the Castle Creek Commons apartment complex. The Meter Services Division identified these four meter pits for replacement. The water mains and services for the apartments were constructed in 1984. These meter pits were at the end of their useful life and did not meet the Town's current standards. The most critical issue that this project needed to address was that these services were installed without a curb stop. The curb stop allows for the service to be shut down for maintenance and emergencies. Without the curb stop, a section of the distribution main would need to be shut down, affecting numerous customers.

The service relocations for Eaglestone Drive were completed in July followed by the Castle Creek Commons meter pits in August. The total project cost was \$99,475. 53 Corporations was able to complete the project for approximately \$6,000 less than their original bid.



New Meter Assembly

Alluvial Well Field Project

Project Manager: Matt Hayes, P.E.

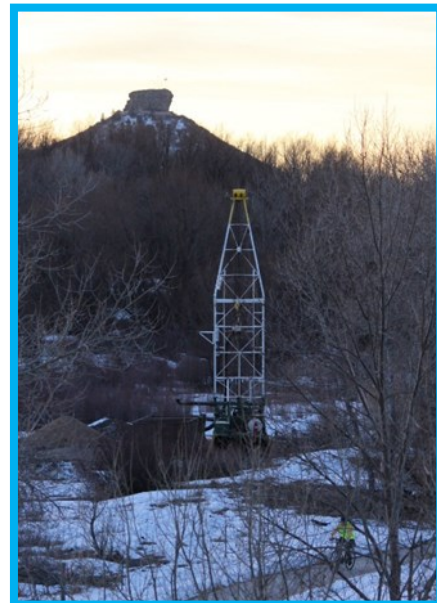
Water Resources Program Analyst: Heather Justus, P.G.

Castle Rock Water recently completed construction of three new wells in the Central Well Field, located along East Plum Creek. The Central Well Field consists of seven alluvial wells located in The Meadows development near East Plum Creek. Three wells in the Central Well Field were completed in 2013 and a fourth one was added in 2014, near Atrium Drive. The three new wells that were constructed this year are located near the Meadows Parkway Bridge. Castle Rock Water constructed these additional wells to increase the available renewable water supply to the Plum Creek Water Purification Facility. The Plum Creek Alluvial Well Field Project consisted of constructing the three remaining alluvial wells planned for the Central Well Field. Alluvial wells are simply defined as wells constructed in the alluvium deposits of a stream. Since the water source for the alluvial wells is an alluvial aquifer recharged, in this case by East Plum Creek, the wells are classified as a renewable water source.

Velocity Constructors, along with Layne Christensen Company and Directed Technology Drilling, constructed the project. The project consisted of drilling three new vertical wells that are approximately 50-feet deep, with approximately 450 feet of horizontal directionally drilled screen. The contractor also installed approximately 4,000 feet of 4-inch and 12-inch raw water pipe and the required electrical connections to operate the well. A new metering vault and control panels were also installed at the site. The construction of the project was completed in June, and the facility was approved by the Colorado Department of Public Health the beginning of August 2016. The new alluvial wells are anticipated to produce approximately 300,000 gallons per day.



AL-16 Lateral Arm Installation



AL-18 Vertical Well Drilling

South Well Field Project

Project Manager: Matt Hayes, P.E.

Water Resources Program Analyst: Heather Justus, P.G.

Castle Rock Water (CRW) recently completed construction of improvements to the South Well Field, located along East Plum Creek. Two wells in the Central Well Field were completed in 2013 and a third one (CR-12R) was constructed in 1997. The two wells that were constructed in 2013, (CR-11R and CR-13R) were originally designed to include a lateral arm to improve the production of the vertical wells. The lateral arms were removed from the project due to the cost and lack of a qualified contractor that could construct them. CRW recently identified a drilling contractor, Directed Technology Drilling, with experience constructing horizontal directional drilled wells throughout the United States. This project also re-drilled well CR-12R, which had begun to fail.

Directed Technology Drilling, along with Velocity Constructors, constructed the project. The project consisted of drilling two new lateral arms for CR-11R and CR-13R, approximately 700 feet of horizontal directionally drilled screen. The contractor also re-drilled well CR-12R using horizontal directionally drilling technology with approximately 500 feet of screen. The project included new piping between CR-12R and the existing flow metering vault. Construction of the project was completed in October 2016. The new alluvial wells are anticipated to produce approximately 280,000 gallons per day.



CR-12R Pit less Installation



CR-12R



Well CR-12R Drilling

Castle Rock - 1 Diversion (CR-1)

Project Manager: Matt Hayes, P.E.

The transition from a water system that is primarily reliant upon deep, non-renewable groundwater to one that relies mostly upon renewable water took a big step forward in June 2016. Presently, around 89% of our annual supply comes from the Denver Basin Aquifer with the balance coming from alluvial wells along East Plum Creek. In late spring of 2016, staff members were walking the grounds around the Plum Creek Water Purification Facility (PCWPF) and noticed a 24-inch diameter HDPE pipe running across East Plum Creek from the Town's former wastewater treatment plant site (abandoned in the late 80's) towards the PCWPF property. The pipe was previously used to supply backwash water to the Castle Rock Sewage Treatment Plant from a backwash supply tank, located on the north side of East Plum Creek. The wheels began to turn, and team-members thought this would make an excellent location for a surface water diversion. In fact, a diversion at this general location had been contemplated for some time, as it was indicated in one of our water court decrees (13CW3028), which was originally entered to the court in September 1990 and specifically identified as Castle Rock Diversion No. 1 (CR-1) in our 12CW296 water court case, for which the Town recently received a final decree.

Conveniently, since infrastructure already existed to divert the water for use, the Town did not have to engage the U.S. Army Corps of Engineers in a permitting process for this diversion. With help from team members from the Water Resources, Engineering and Operations Divisions, we were able to get a temporary pumping system designed, outfitted and operating within eight weeks. The Colorado Department of Public Health and Environment (CDPHE) approved the surface water coming from CR-1 into PCWPF as a new source of supply, and the Water Commissioner from the Colorado Department of Natural Resources viewed the set up and operation on June 30, 2016 and gave us permission to operate. On June 30, the temporary system began pumping between 250 and 350 gallons per minute (gpm) to the main feedwater line of PCWPF. This flow is metered separately so that we can account for the volume of water we are pulling from the stream and report it in our daily water resources accounting. The temporary pumping system operated through mid-November 2016, produced 51.6 million gallons of raw water supply for the year, and averaged approximately 571,000 gallons per day.

Castle Rock Water engaged the services of W.W. Wheeler & Associates for the design of a permanent diversion, pumping, piping and metering system. Their design will be focused on a system that can pull up to 5.7 cubic feet per second (cfs, or 2,600 gpm). This design is to be completed in early 2017, with construction occurring in winter 2017, and in full operation by May 2017.



Variable Frequency Drive (VFD) Replaced at Well 14R

Project Manager: Heather Justus, P.G.

Well 14R supplies approximately one MGD of raw groundwater to the Plum Creek Water Purification Facility (PCWPF), and is critical to the successful operations of the plant.

The variable frequency drive (VFD) at Well 14R was replaced and is used to drive the well motor at different speeds, giving the operators the ability to speed up or slow down wells to maintain aquifer levels. The new VFD will improve energy efficiency, the reliability of the well, as well as guarantee the availability of parts in the event of a problem. The contractor on this project was Applied Ingenuity, and the project was completed on budget (\$90,803.89) and schedule.



VFD Located at Plum Creek
Golf Course

Box Elder Well Field Purchase

by: Sheri Scott, Water Resources Program Analyst

On Nov. 15, 2016, Town Council approved the purchase of the Box Elder well field and on Dec. 1, 2016, the Town of Castle Rock closed on the property for \$8.3 million. Over the past two and a half years, Castle Rock Water has been performing due diligence efforts on the property and working to acquire the majority of the water rights for the project. Closing on the property after Dec. 1st would have cost the Town an additional \$1.1 million. This savings will benefit water customers by either reducing the overall investments needed in the project, or offsetting higher costs to acquire the remainder of the needed water rights, or to help construct the infrastructure needed to move the water from the well field to Castle Rock.



Staff Checking Monitoring Well Levels at Box Elder Well Field

The Box Elder well field is one component of the hybrid solution to the Alternate Source of Water Supply (ASOS) Project. The Box Elder Project includes the following three components: (1) the Box Elder well field, (2) water rights acquisition, and (3) treatment and transmission infrastructure. Items 1 and 2 were designed to progress in tandem. Item 3 is part of the longer term renewable water program, and infrastructure is planned to be phased as our customer water demand increases. The purpose of the Box Elder well field is to serve as a point of diversion for acquired water rights. In other words, the place where the water is actually pumped out of the ground for transmission back to Castle Rock.

Town staff has worked with Stillwater (a water broker) on multiple water rights opportunities, and has purchased or has under contract up to 1,770 acre feet (AF) of renewable water that can be used with the Box Elder well field. This includes water already changed in Water Court to be used as augmentation water, and some other irrigation water rights that have already been changed for municipal use. Of the 1,770 AF, the Town owns 770 AF and has 1,000 AF under contract. Ultimately, the Town is looking for a package of water rights totaling 2,500 AF that provide the most cost effective approach to the hybrid project.

Now that the Town has finalized the purchase of the well field in combination with the water rights already secured, work can continue on the final aspect of the project. This includes the planning and design of infrastructure to treat and transport water from the site, and to augment Box Elder Creek and the Water Court application for the project. Leonard Rice Engineers will be completing hydrogeological work, including pump tests and monitoring water levels in the aquifer. Miller Groundwater Engineering, LLC will be optimizing the groundwater model. The data from this additional work will be used to support the Water Court application that will be submitted in late 2017. The Town will begin design and construction of the infrastructure for this project about a decade from now. In the meantime, the Town is considering extending the tenant farm lease on the property.

Meadows 5 Lift Station Pump Upgrade Project

by: Rich Platt, Maintenance Supervisor and Jeanne Stevens, Engineering Manager

The Meadows 5 Lift Station is approximately 27 years old and was originally constructed with a Gorman Rupp pumping system. The original pumps were replaced long ago with Wemco pumps. In 2015, staff replaced the WEMCO sanitary lift pump #1, which was failing, with a Flygt submersible chopper pump, which has been operating exceptionally well since. The lift pump #2 and mounting hardware was also worn out and failing. The existing Wemco pump would not seal against the mounting base due to wear and this reduced the pump's ability to efficiently move wastewater. The existing Wemco pump #2 was installed in 2006 and due to a lack of available parts, had exceeded its useful life. Additionally, the Wemco pump has had a history of plugging and failing seals. Staff chose to replace the aging Wemco pump #2 with a second matching Flygt pump, to have uniformity of systems and reduce disparate spare parts.

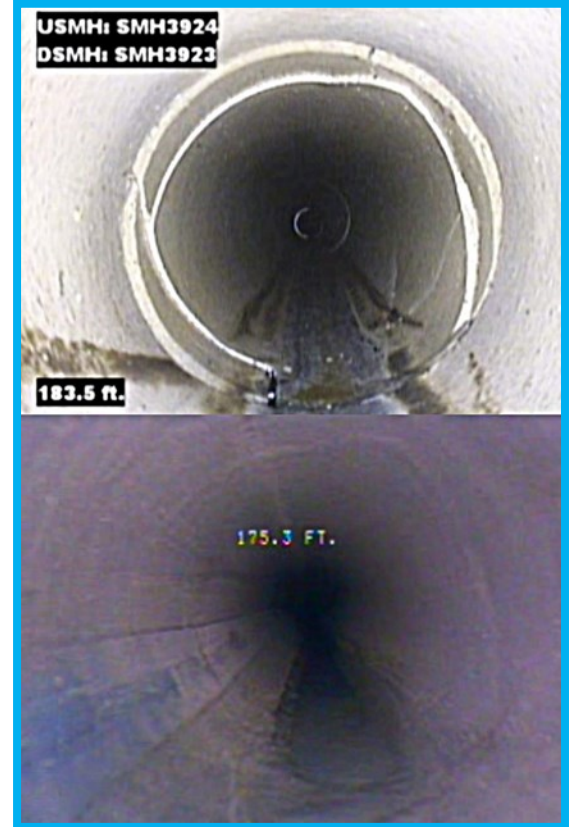
The Town selected Water Technology Group, the Flygt vendor, for the pump replacement. The project team developed a plan to keep residents in service by using contract vector truck services overnight, which required Town Council concurrence. The total cost for this project was \$39,134. The work was completed on time and under budget.



Sewer Rehabilitation Project

Project Manager: Josh Hansen, P.E.

As a result of Castle Rock Water's annual sewer cleaning and video inspection program, nearly two miles of old clay sewer pipe in the Castle North neighborhood of Town was identified for rehabilitation in 2016. Sewer pipe in this area was constructed in the 1970's and had a history of root intrusion, increased annual maintenance, and pipe defects. Sewer pipeline point repairs involving street cuts and excavation of short sections of pipe were completed in 2014 on some of the most critical defects in this neighborhood. Subsequent Cured in Place Pipe (CIPP) lining of the sewer system throughout the neighborhood was planned as part of the rehabilitation process. CIPP is constructed through a process in which a resin-saturated felt tube is pulled into the existing pipe, pressurized to fit tight against it, and then cured to form a new pipe within a pipe. No digging is involved in the construction process and the new CIPP is joint-less, corrosion-resistant, and has a minimum expected life of 50-75 years.



Cracked Clay Sewer Pipe (Top Photo) and Post-Construction CIPP Lined Pipe (Bottom Photo)

A Request for Proposals (RFP) for this 2016 CIPP Project was publicly advertised in August 2016 on the Rocky Mountain E-Purchasing System. Proposals were received from three qualified contractors, and Insituform Technologies was awarded the contract in the amount of \$215,590. Construction was completed under budget and ahead of schedule in November of 2016. The newly installed CIPP liners will extend the lifespan of the existing sewer pipes, reduce the frequency of street cut sewer repairs, reduce frequency of sewer cleaning and root cutting maintenance, and reduce groundwater infiltration of the sanitary sewer system.

6400 South Tributary Drop Structure Repair Project

Project Manager: Erik Dam, P.E.

The 6400 South Tributary drainageway starts just north of Coachline Road, and flows north through the Red Hawk Ridge Golf Course, Red Hawk subdivision, and much of The Meadows development before discharging into East Plum Creek northeast of Castle View High School. Much of this drainageway has been improved and stabilized through the construction of storm sewer culverts, drop structures, channel grading and regional detention facilities.

In late April of 2016, the Parks Department referred a stormwater maintenance issue to Castle Rock Water from a nearby homeowner. The resident was concerned about erosion at a storm sewer discharging into the drainage channel behind their home. Upon investigation it was determined that a much more serious condition existed with a grouted boulder drop structure at this location. Not only was the whole structure in danger of collapse, but it also protected a twelve inch water main and soft surface trail fifty-feet upstream. Failure to act quickly would result in much more expensive repairs in the future, and could interrupt the public water supply.

The Stormwater Team contracted with 53 Corporation for \$23,340 to complete emergency repairs to the structure, working closely with the contractor to determine a scope of work necessary to repair the facility and prevent more damage from subsequent rainfall events. Work began the last week in June 2016, and was completed in less than two weeks.

Additionally, as the channel immediately downstream of this location is still unstable and will eventually cause further harm to the structure, we have contracted with CORE Consultants to design permanent stabilization measures that will complete the ultimate channel improvements for this reach of the drainageway. The design work was completed in 2016 and construction is planned for 2017.



Before



After

East Plum Creek Stabilization at Meadows Parkway

Project Team: Barbara Horton, David Van Dellen, Jeanne Stevens, Wade Reeves, Brian Laschanzky, and Barbara Spagnuolo

Sheet pile protection across the low flow channel of East Plum Creek (EPC) was installed in 1992 as part of the 16-inch water main construction project to provide water service to The Meadows. In May 2015, Castle Rock Water became aware of a potential failure of the sheet pile. High flows along EPC in June 2015 accelerated erosion around the west end of the sheet pile causing failure of the system, which resulted in flow around the end of the sheet pile instead of over the top. The design life of the existing sheet pile was compromised due to the insufficient depth and width installed in relation to the EPC flow conditions at this location.

Castle Rock Water Operations and Maintenance staff were able to mobilize quickly in 2015 to place large sand bags between the sheet pile and eroded bank to redirect flow back over the top of the sheet pile, in an effort to maintain approximately three feet of remaining stream bed cover over the water main. This effort was an emergency response to minimize the impacts to the water main until the permanent stabilization improvements were constructed. Permanent improvements include installation of a new sheet pile cutoff wall the entire width of the 100-year floodplain, and soil riprap bank protection immediately upstream and downstream of the cutoff wall to provide additional protection and minimize risk of exposure to the existing water main during high flow events.

Castle Rock Water consulted with Felsburg Holt & Ullevig, Inc. (FHU) to provide design support and environmental permitting services. For projects along EPC, Castle Rock Water also relies on our Parks Natural Resource Specialist to provide guidance for compliance with Habitat Conservation Plan requirements. 53 Corporation was awarded the contract to construct these improvements, which began in August and were substantially completed in September 2016. Replanting of trees, shrubs and wetland grasses will occur in spring 2017 to improve chances of success.

The total construction cost for the project was approximately \$600,000. The project was completed on budget and schedule. The Stormwater and Water Capital Reserve Funds were utilized to cover engineering and construction costs. Phase II, to be completed at a later time, includes a grouted sloping boulder grade control structure immediately downstream of the cut-off wall and is estimated to cost approximately \$300,000.



Before



After

Industrial Tributary Repair - 840 Topeka Way

Project Manager: Erik Dam, P.E.

The Industrial Tributary is a major drainageway in the southwest part of Town that begins within Philip S. Miller Park, flowing to the northeast behind properties along the south side of Topeka Way and under Prairie Hawk Drive, before discharging into East Plum Creek. Since initial development of the light industrial area north of the tributary, significant erosion has occurred in the channel between Plum Creek Parkway and Prairie Hawk Drive.

Following a strong storm event that produced some localized flooding in this area, the property owner at 840 Topeka Way alerted the Town to a serious bank erosion condition within the channel behind the business. The channel bottom had dropped several feet over the years at this location, and a section of the site detention pond discharge pipe had separated and dropped into the drainageway, with a second section close to falling also. With our recent experience constructing a similar project on Omni Tributary several months earlier, repair plans were made.

Due to limited access to the work area, a right of entry agreement was reached between the Town and the owner of the property on the south side of Industrial Tributary, which is currently vacant land proposed for commercial development as Millers Landing. Notifications were sent out to Traffic Control West (complainant) and neighboring property owners in late October 2016, and repairs were completed by the Stormwater Field Services Team over the following two weeks. Repairs included reclamation of the site following construction.

Total construction cost for this project was \$16,868.



Before



After

Omni Tributary Repair - Epiphany Lutheran Church

Project Managers: Barbara Horton, P.E., and Erik Dam, P.E.

The Omni Tributary is a major drainageway in the southwest part of Town that generally follows Wolfensberger Road for much of its length, flowing to the northeast and passing along the south side of the Red Hawk neighborhood, before ultimately discharging into East Plum Creek. Increased runoff from development caused excessive bank erosion along unimproved sections of the channel.

The project is located adjacent to Epiphany Lutheran Church, at 550 Wolfensberger Road, with a near vertical stream bank encroaching to within 25 feet of the church's main building. After being alerted by the church to the dangerous condition that had developed as a result of heavy early spring rain events, the Stormwater Engineering Team responded by designing emergency repairs to stabilize the slope and prevent any further damage from occurring.

Notifications were sent out to the church and neighboring property owners in late April 2016, and repairs were completed by the Stormwater Field Services Team over the following two weeks. Subsequent reclamation of the site was accomplished under contract by Apex Companies as part of the 2016 Reclamation Project.

Construction cost for this project was \$35,567, plus \$6,212 for reclamation, for a total of \$41,779.



Before



After

Heckendorf Pond Improvement Project

Project Team: Barbara Horton, David Van Dellen, Wade Reeves, and Brian Laschanzky

In July 2014, the Town became aware of a failure at a grouted rundown at the south-east corner of the regional detention pond in Heckendorf Ranch, Filing 1. Subsequent storm events caused a complete failure of the rundown, leading to the unraveling of approximately seventy feet of dual 42-inch reinforced concrete pipe (RCP) storm sewer outfalling to the rundown. Although the specific cause of failure is unknown, it appears that surface water intrusion on the underside of the rundown structure created a void that eventually collapsed the system over time.

The Town consulted with EMK Consultants, Inc. to provide design support, and underwent a thorough review of alternatives to ensure that the replacement system is sustainable for the life cycle of the utility installation. Three alternatives were analyzed for reconstructing the outfall and rundown. A fully piped option that included a single 54-inch RCP storm sewer constructed to the bottom of the pond was selected as the most suitable and cost effective alternative. Also constructed were storm inlets at the top of the pond to capture and convey overland sheet flow to minimize future erosion on the pond embankment, and a concrete forebay at the pipe outfall to improve water quality within the pond.

Sabell's Enterprises, LLLP was awarded the contract to construct these improvements, which were completed in April 2016. The total construction cost for the project was \$247,000. These improvements were closely coordinated with the Fire Department and were designed to support the future fire station on the site above the failure area.



Before



After

Operations and Maintenance Building Parking Lot Paving

by Josh Hansen, P.E.



Castle Rock Water Operations staff moved into the newly constructed Operations and Maintenance (O & M) Facility in February 2016. Recycled asphalt millings were temporarily installed around the building near the end of construction. Money was budgeted in 2016 for upgrading the pavement to asphalt around the building. Public Works and Castle Rock Water staff teamed up in August to solicit bids from paving contractors that have completed previous work for the Town. PLM Asphalt and Concrete was awarded a contract in the amount of \$230,000 for paving more than 5,000 square yards of 6-inch asphalt on the north, west, and south sides of the facility. The contract also included installation of new concrete pads, sidewalk, and curb and gutter around the O & M Facility and elsewhere on the site. Pavement construction was completed on time and under budget in early October. After paving was finished, Public Works completed striping the parking lot. The new pavement improved staff and public safety access to the building, and also reduced tracking of mud into Castle Rock Water facilities. It also helps keep Town and personal vehicles cleaner. The area east of the O & M Building may be paved in the future.



Asphalt Work at the O & M Building

Operations and Maintenance Building Landscaping

Project Manager: Tim Friday, P.E.

Water Conservation Plan Reviewer: Ruth Stadler



Castle Rock Water Operations staff moved into the newly constructed Operations and Maintenance (O & M) Building in February 2016. Budget was appropriated to install landscaping around the building in the spring as a separate project. Landscaping plans were designed in-house and tailored to showcase what can be done with low water use (xeric) plantings. Staff issued a request for proposals to qualified contractors in April, and subsequently contracted with JSC Property Maintenance to complete the work for \$22,990. The work included construction of a five-zone drip irrigation system, landscape grading, crushed rock and boulders, and xeric plants. Construction of the improvements was completed on time and under budget in the early summer of 2016. The landscaping improvements provide an aesthetic complement to the building and give the overall building project a needed look of completion, as well as provide a public demonstration area for xeriscape landscape design. One of the many uses of the O & M Building Meeting Room is to conduct classes for Water Wiser Workshops, Xeric Design and related classes.

The young plantings will be stunning as they mature, and include Ornamental Pear and Honeylocust trees, Bosnian & Ponderosa Pine, Apple Serviceberry, Rabbit Brush, Blue Mist Spirea, Growlow Sumac, Bluestem Joint Fir, Karl Foerster Reed Grass, Miscanthus, Red Valerian, Black Eyed Susan, Kannah Creek Buckwheat, Orange Carpet California Fuchsia, East Friesland Sage, and Bridges Penstemon (some examples are pictured below).



Landscaping at the O & M Building