City of Fort Collins will make reasonable accommodations for access to City services, programs, and activities and will make special communication arrangements for persons with disabilities. Please call 221-6515 (V/TDD: Dial 711 for Relay Colorado) for assistance.

City Council Work Session
June 11, 2019
6:00 PM

● CALL TO ORDER.

1. Council Priorities for 2019-2021. (staff: Kelly DiMartino, Tyler Marr; 10 minute staff presentation; 45 minute discussion)

   The purpose of this item is to discuss and refine the list of Council priorities that were discussed at the May 4, 2019 Council retreat.

2. Water Resources, Watershed, and Water Quality Protection Overview. (staff: Kevin Gertig, Carol Webb; 15 minute presentation; 30 minute discussion)

   The purpose of this item is to provide City council with an overview of certain functions of the Water Utility, including water supply planning, watershed and water quality protection, and key partnerships on the Poudre River.

● OTHER BUSINESS.

● ADJOURNMENT.
SUBJECT FOR DISCUSSION


EXECUTIVE SUMMARY

The purpose of this item is to discuss and refine the list of Council priorities that were discussed at the May 4, 2019 Council retreat.

GENERAL DIRECTION SOUGHT AND SPECIFIC QUESTIONS TO BE ANSWERED

1. Does Council agree with the characterization of the priorities presented?
2. Does Council have any additional clarification to add for priorities prior to a resolution coming forward?

BACKGROUND / DISCUSSION

Every two years, following a Council election, the newly seated City Council sits for a planning retreat to identify priorities and confirm strategic direction. Priorities are identified for specific focus and action by the organization on items that fit within the broader context of the City’s Vision, Mission, Strategic Plan and ensuring world class service provision 24 hours a day, 365 days a year. Following the April 2, 2019 election, City Council held their retreat over a two-day period on May 3 and 4. Through a process of priority identification and selection, Council emerged with 20 priorities for its 2019-2021 term.

Many priorities reflect an enhanced effort of work already ongoing or a continuation of the previous Council’s priorities. Staff has summarized what are believed to be the desired outcomes based on Council discussion at the retreat. Following are the draft priorities and outcome statements:

- Affordable and accessible childcare
  o Continue to identify barriers and needs related to increasing the supply of affordable childcare, looking at a variety of solutions including development incentives and flexibility to ensure that childcare is not a career and lifestyle limiting factor in Fort Collins.

- Undergrounding of electric infrastructure (transmission and distribution)
  o Develop strategy to underground all electric system infrastructure within Fort Collins to improve reliability and community aesthetics, including Platte River’s and other utilities’ transmission lines and the remaining distribution lines owned by Light & Power.

- Low income benefits/rebates streamlining and consolidation
  o Continue to simplify access to and participation in the variety of income-qualified benefits and rebates the City offers. Explore elimination of redundant application and verification requirements as well as potential impacts of setting a single income level which qualifies residents for all programs.

- Equity and Inclusion
  o Implement the usage of an equity lens, including staff and Council training, develop indicators and metrics and consider a resolution regarding anti-discrimination.
- **Optimization of alleys outside of downtown**  
  o Develop strategy for identifying, improving, and maximizing the use of alleys outside of the downtown core, to fully utilize their potential and create opportunity through additional public spaces and enable access for accessory dwelling units or affordable housing options.

- **Equitable participation in culture and recreation programs**  
  o Understand current state of participation in cultural and recreation programming and subsequently make adjustments to current practices to improve equitable participation through potentially expanded programming and targeted support.

- **Mobile home park preservation and resident protections**  
  o Develop policies/programs to preserve mobile home parks as a source of affordable housing and enhance resident protections, particularly around issues of utility gouging and eviction.

- **Neighborhood park refresh/future needs**  
  o Complete assessment of current and future needs of neighborhood parks and explore funding options that include private and public partnerships to secure resources for timely refresh of parks.

- **Reduce plastic pollution**  
  o Consider local ordinances, state/federal advocacy, and expand educational efforts to reduce or eliminate plastic pollution in Fort Collins and continue to track advances in treatment technology for reducing or eliminating microplastics from water supplies (drinking, stormwater, wastewater, and instream).

- **Protect and enhance instream river flows**  
  o Continue to improve and protect the ecological condition, aesthetic quality, and resiliency of the Poudre River and its watershed/tributaries.

- **Improved air quality**  
  o Continue to reduce the impacts and prevalence of radon and ozone within the City through regional collaboration, reduction in ground level ozone, and expanded education. Improve understanding of microparticulates (particulate matter 2.5 microns or less in diameter) in Fort Collins and any disparate impacts they may be influencing.

- **Mitigate impacts of oil and gas encroachment into Growth Management Area**  
  o Reduce or eliminate surface impacts of oil and gas production within the growth management areas. Evaluate the impact and needed/desired changes as a result of Senate Bill 181 through a robust public engagement process.

- **Effective, innovative, and high-performing board**  
  o Equip City Council with the resources, training and tools to be a highly effective, innovative, and high-performing governing body.

- **Reimagine community engagement**  
  o Continue to improve community engagement and communication efforts to ensure policy decisions that are informed by representative and inclusive cross section of a community that has clear understanding of issues.

- **City financial stability**  
  o Increase understanding of revenue trends to inform revenue diversification, appropriate City fees, and efforts to increase tax generation within Fort Collins.
• Reimagine boards and commissions
  o Better structure the board and commission system to set up success into the future, align with Outcome Areas and allow for integrated perspectives. Explore models that allow for greater use of ad hoc meetings, diverse stakeholders and additional community participation.

The remaining priorities need clarification prior to staff beginning to move in specific policy directions. As such, staff is planning to bring the following priorities forward for newly scheduled work sessions to share work to date, gain additional Council input and direction, and explore desired outcomes and possible next steps. These priorities include:

• Strategies that create community jobs
• Small business plan
• Additional Bus Rapid Transit (BRT) corridors
• Affordable and achievable housing strategies

All of these priorities are outlined in Julia Novak’s retreat summary (Attachment 1), and staff will use this information, as well as Work Session feedback, to populate Council’s Priority Dashboard. The Dashboard will highlight intended outcomes and initial action steps when Council receives the first version in late June or early July. For those priorities with clarifying work sessions needed, the intended outcomes will likely evolve over time as the Council provides specific direction on each one.

ATTACHMENTS

1. Julia Novak Summary of Council Retreat (PDF)
2. Previous Council Priorities Dashboard, March 2019 (PDF)
3. Powerpoint Presentation (PDF)
City of Fort Collins, Colorado

2019 Retreat

May 3 & 4, 2019
On May 3 and 4, 2019, the Fort Collins Mayor and Council held a retreat to establish a foundation for effective governance and identify priorities for the next 12 to 24 months. The retreat was facilitated by The Novak Consulting Group.

**Day One**
The first day of the retreat included the Mayor, Mayor Pro Tem, City Councilmembers, City Manager, City Attorney, and Municipal Judge.

The Mayor started the retreat by sharing his excitement for this City Council and the work they can do over the next two years. He shared congratulations to three new City Councilmembers and the Mayor Pro Tem. Today is to learn about where one another is coming from and how we work with City staff. There is an opportunity to share hopes and expectations and, ultimately, to hold one another accountable. The better the Council works together, the better the community will be served. The City Council is unique – we work together through City staff. We get together weekly, and we work together like a family. The Mayor shared that the term “High Performing Community – for all” is his term and the question is, at the end of the day, how can we make this community better – for all? How can the Council be a high performing governing body – come together and accentuate the talents of one another to better serve the community? At the end of the Council experience, hopefully, we have all gained knowledge and experience and, hopefully, it develops us as individuals professionally. A high performing board works together and individually. How can talents be tapped? We can have a high performing government. Darin talks about how nobody believes government can be high performing, but we can in Fort Collins. That is why we are here.

**Setting the Stage and Introductions**
The group then introduced themselves and shared expectations that they had for the retreat for both Friday evening and Saturday:

- Come together as a Council – appreciate, understand, make a commitment to one another
- Develop shared priorities
- Begin the process of alignment between the City Plan – Strategic Plan and Council Priorities
- Get to know each other and what is important
- What do we have in common?
- Eager to serve with colleagues – camaraderie
- A better understanding of the backgrounds, gifts, and interests
- Stay away from “tried it before;” open to looking again, challenge assumptions
- Focus on the how
- Be willing to question why we do things
- Kick off our working relationship
- Shared expectations of how we build consensus
- Post-election learning – what you hear when knocking on doors
- Clarity – intentionally align resources around resources
- Appreciate that leadership can be lonely
- Visibility and appreciation for our 24x7x365 services the City provides
- Hear Council discussion – understand your interests
- Understand the limited resources we have
- Help one another stay balanced
- Do we need to stop doing something?
High Performing Government – for All
The Council explored four questions relating to what it means to have a High Performing Government – for All:
- What does it mean for City Government to be High Performing?
- What would it look like for the City to be led by a City Council committed to high performing governance?
- What are the characteristics of a high performing community – FOR ALL?
- What should the City Council do to ensure it provides high performing governance?

<table>
<thead>
<tr>
<th>What does it mean for City Government to be High Performing?</th>
<th>What would it look like for the City to be led by a City Council committed to high performing GOVERNANCE?</th>
<th>Characteristics of a high performing community – FOR ALL</th>
<th>What should the City Council DO to ensure it provides high performing governance?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accountability – to everyone</td>
<td>We are committed to learning – engaged with CML and NLC</td>
<td>Inclusive</td>
<td>Effective boards are intentional</td>
</tr>
<tr>
<td>SAR Process – responsive to resident questions</td>
<td>High functioning is a prerequisite to high performance</td>
<td>Active</td>
<td>Each person achieves something greater personally by being part of this</td>
</tr>
<tr>
<td>Clear in communication – multiple audiences, market</td>
<td>Focused on local policy and relevant action</td>
<td>Environmental commitment</td>
<td>Understand how each person contributes to the body</td>
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<tr>
<td>segmentation</td>
<td>Engaged and collaborative – externally, regionally, nationally</td>
<td>This can be a question that drives our decisions: Will this decision move us toward being a high performing community FOR ALL?</td>
<td>Identify shared learning opportunities</td>
</tr>
<tr>
<td>Always learning and being curious</td>
<td>Trustworthy, stable, and willing to change when appropriate to do so</td>
<td>Meet our community where THEY are</td>
<td>Be curious – “tell me more”</td>
</tr>
<tr>
<td>High functioning is a prerequisite to high performance</td>
<td></td>
<td>Let everyone THRIVE</td>
<td>Tapping into the knowledge of key stakeholders who can contribute expertise</td>
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<tr>
<td>Data-driven (informed) innovation – looking at things from</td>
<td></td>
<td>“If it is not for all, it is not for us.”</td>
<td>Build a base level of knowledge</td>
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<tr>
<td>a new perspective and able to address wicked problems</td>
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<td>Equitable</td>
<td></td>
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<tr>
<td>Efficiency and ROI</td>
<td></td>
<td>Engages – two-way – well!</td>
<td></td>
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<tr>
<td>No games to halt progress</td>
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<td>Engaged, durable partners who co-create a high performing community</td>
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<td>Outcome focused</td>
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<tr>
<td>Focused on what we can do for our community</td>
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</table>
What does it mean for City Government to be High Performing?

What would it look like for the City to be led by a City Council committed to high performing GOVERNANCE?

Characteristics of a high performing community – FOR ALL

What should the City Council DO to ensure it provides high performing governance?

- Focused on being attractive to future talent
- Demonstrate progress
- Deep, authentic, engagement with the community
- No silos within or outside – develop durable partnerships in all sectors

The Ideal Member of the Governing Body
The Mayor and Council were asked to consider what makes an “ideal member of the Governing Body” from three perspectives:
- What is the public looking for in a Mayor or City Councilmember?
- What is staff looking for from the Mayor and City Council?
- What are their council colleagues looking for in other members of the governing body?
The Novak Consulting Group
Strengthening organizations from the inside out.
<table>
<thead>
<tr>
<th>Public</th>
<th>Staff</th>
<th>Council</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honest</td>
<td>Work through the City Manager</td>
<td>Prepared (x3)</td>
</tr>
<tr>
<td>Empathetic (x2)</td>
<td>Available</td>
<td>Accountable</td>
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<tr>
<td>Trust</td>
<td>Humorous</td>
<td>Flexible</td>
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<td>o Trusting</td>
<td>Respectful (x3)</td>
<td>Open</td>
</tr>
<tr>
<td>Listens</td>
<td>Respectful of experience and knowledge</td>
<td>Open minded</td>
</tr>
<tr>
<td>o Listens to all sides</td>
<td>Informed</td>
<td>Consensus building (x2)</td>
</tr>
<tr>
<td>o Listens actively</td>
<td>Direct</td>
<td>Grateful</td>
</tr>
<tr>
<td>o Active listener</td>
<td>Efficient</td>
<td>Support</td>
</tr>
<tr>
<td>Persistent</td>
<td>Honesty</td>
<td>Engaged</td>
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<tr>
<td>Patient</td>
<td>Appreicate competence</td>
<td>Willing to engage</td>
</tr>
<tr>
<td>Decisive</td>
<td>Patient</td>
<td>Collegial</td>
</tr>
<tr>
<td>Thick skinned</td>
<td>Empowers Staff</td>
<td>Friendly and upfront</td>
</tr>
<tr>
<td>Grateful</td>
<td>Prescient</td>
<td>Act as a body</td>
</tr>
<tr>
<td>Accountable</td>
<td>Not overreaching</td>
<td>Respect different priorities</td>
</tr>
<tr>
<td>Lean into public concerns</td>
<td>Doesn’t cause extra work</td>
<td>Community-for-all perspective</td>
</tr>
<tr>
<td>Less agendas, more curiosity</td>
<td>Grateful</td>
<td>Acknowledges differences</td>
</tr>
<tr>
<td>Less policy solutions, more “What’s the problem?”</td>
<td>Trust</td>
<td>Articulate</td>
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<tr>
<td>Advocate</td>
<td>Thoughtful</td>
<td>For the right reasons</td>
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<tr>
<td>Courageous</td>
<td>Can do attitude</td>
<td>Transparent</td>
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<td>Ethical</td>
<td>Authentic</td>
<td>Fair</td>
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<td>Out in the community</td>
<td>Polite</td>
<td>Disagree respectfully</td>
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<tr>
<td>Leader</td>
<td>Diligent</td>
<td>Speak respectfully</td>
</tr>
<tr>
<td>Can do attitude</td>
<td>Leader</td>
<td>Respectful (x4)</td>
</tr>
<tr>
<td>Transparent</td>
<td>Systems thinking</td>
<td>Honest</td>
</tr>
<tr>
<td>Available (x2)</td>
<td>Clarity and Direction</td>
<td>Curiosity</td>
</tr>
<tr>
<td>Do what I want</td>
<td>Agreeable</td>
<td>Trust</td>
</tr>
<tr>
<td>Responsive (x3)</td>
<td></td>
<td>Community listening</td>
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<tr>
<td>Explains positions</td>
<td></td>
<td>Active listening</td>
</tr>
<tr>
<td>Communicates effectively</td>
<td></td>
<td>Listens</td>
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<tr>
<td>Engages with everyone</td>
<td></td>
<td>Future focus</td>
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<tr>
<td>Compassionate</td>
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<td>Openness</td>
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<td>Open minded</td>
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<td>Authentic</td>
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<tr>
<td>Sensitive</td>
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<tr>
<td>Caring</td>
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Council Assignments
Council reviewed opportunities to serve as liaisons to Boards and Commissions. That information was discussed on Day 1, and a summary of interest was provided on Day 2. The Council made some decisions and will have further discussions as the official liaison and committee assignments are brought back for adoption. The following items were discussed.

Board and Commission Assignments
- The Mayor agreed to be the interview partner for Landmark Preservation Commission and Parks and Recreation Board rather than being the liaison.
- Emily agreed to be the interview partner for Planning and Zoning.
- Julie will talk with Ken about the Women’s Commission.
- Susan will talk to Ken about the Senior Advisory Board.
- Emily will talk to Ken about the Commission on Disability.
- Emily will be alternate for Finance Committee.
- Kristin agreed to be the alternate for the Legislative Review Board

Other Organization Assignments
- City/CSU Leadership Committee will be determined later.
- The Mayor will remain on the Forfeited Property Disposition Committee.
- Larimer County Behavioral Health Policy Council will be determined later.
- North College Urban Renewal Ad Hoc Committee – Kristin will be the Alternate.
- North College Urban Renewal Plan CAG will be Emily.
- North College MPO will be determined later.
- The Mayor will do North I-25 Coalition.
- Ross will join the Regional Water Collaboration Steering Committee.

Closing Comments
Each person shared a final word that summed up how they felt about the first evening of the retreat.
Day Two
On the second day, the Executive Leadership Team joined the group. The Mayor kicked off the meeting with some opening remarks then shared highlights from the evening’s discussion about a high performing Council for all, a high performing City Council, and a high performing government. The conversation was exciting, positive, and forward moving for this City Council. A great Council will drive great governance for our community.

Setting the Stage and Introductions
The Executive Leadership Team (ELT) was invited to share their expectations for the day. Those present on Friday were asked to share a reflection about what was important to them about the conversation during that part of the retreat.

Expectations
- Absorb and learn
- Get to know the new Council
- Teach about Poudre Fire Authority and how we interact with the City
- Understand new Council Priorities
- Begin establishing relationships between the Council and ELT
- Listen and learn – where do we go?
- Listen, learn – understand how to deliver on Council priorities
- Learn what people are looking for from a strategic perspective
- Cliché Clarification, i.e. what is “City as a Platform?”
- Clarity is your friend
- Continue to come together as a Council
- Long term rhythms 30-50-100 years
- Listen and learn – align our staff around your priorities
- Be present – listen deeply – learn and adapt
- Coalesce as a legislative and executive team
- Clarity of flow into our leadership system
- Curiosity – Clarity

Reflections
- New Council is excited and open
- Robust conversation and feedback
- Enjoyed getting to know Council at a personal level
- Genuine interest in what it could mean to be high performing Council
- New Council – BE CONFIDENT AND BRING YOUR GAME
- Sense of anticipation and energy – eager to dig in and do the work
- TEAM – we are in it together – Co-Creation!
- Don’t be satisfied with average!
- Set clear goals and expectations for staff
- Open – easy to talk through; we left on the same page
- Challenge assumptions
- We want to be an effective and innovative governing body
- Encouraging – will bring their best selves to the game
- Cathartic – refreshing to see how we want to work together
Reviewing the Framework
The City Manager introduced the Strategic Plan and the organization's commitment to being accountable to the Mayor and Council for accomplishing their shared priorities. The intent is to accomplish the priorities in the two years this Council has to govern together.

Darin shared a drawing that depicted how the organization has evolved from responding as if everything is a priority to a place that understands what makes Fort Collins so special. Being responsive to everything stimulated a desire to be more strategic and develop a framework and a sense of priority for the organization. The Baldrige Framework moved the City into a framework of being aligned and heading in the same direction. Then the framework evolved to point toward the Vision – that clarity of Vision drives the organization. Fort Collins has become strategic, and this meeting is an important part of the rhythm of how things fit for the next two years.

1. The Election – Who is our Board of Directors?
2. Intentionally Onboard the Council – basics and logistics, an overview of services, tours of various City facilities, then three specific hats the Council will wear.
   i. General City
   ii. Urban Renewal Authority
   iii. Broadband
3. Two-Year Priorities.
4. Fall – Five-Year Strategic Plan Update – How do the first two years feed into the Strategic Plan and re-adoptions of the plan?
5. Spring (for Staff) and Summer and Fall (Council) two-year budget cycle. Putting money to the priorities. Adopt the Budget.
6. Develop Annual Workplans.
7. Execution – operationalize the strategic plan.

The City lives a cycle of Plan – Do – Check – Act. It is a continuous improvement cycle. The two-year cadence is very intentional. Staff is here today to be “all ears” and listen to your priorities, and we are also professionals here to resource and support you!
Strategic Outcome Areas
The Seven Strategic Outcome Areas have evolved over the last 10-12 years. The Two-Year Budget is framed around the Outcome Areas (buckets). Over the years, the Council has tweaked and adjusted the framework to reflect emerging priorities and provide further focus for the organization. The Council considered the current framework and made adjustments:

- Economic Health
- Transportation and Mobility
  - Mobility and Transportation Systems: Fort Collins provides safe, sustainable, convenient and reliable multi-modal travel to, from, and throughout the City.
- Safe Community
- Neighborhood Livability and Social Health
  - Healthy Communities: Fort Collins plans for a high-quality built environment, supports quality, diverse neighborhoods, and fosters the social health of the community.
- Culture and Recreation
  - Vibrant Community: Fort Collins celebrates our heritage and provides diverse arts, culture, and recreation opportunities.
- Environmental Health
- High Performing Government

Individual Initiatives
Councilmembers shared their individual priorities that were organized by Strategic Outcome Area. The Council was then provided 19 “dots” to use to identify their personal priorities, so we could gauge the energy of the full Council. The initial list of individual initiatives are below with the number of dots received noted in parenthesis.

<table>
<thead>
<tr>
<th>Strategic Outcome Area</th>
<th>Individual Initiatives</th>
</tr>
</thead>
</table>
| Economic Health        | • Workforce Support and Development (6)  
                        |   - City workforce Commission – City partner with PSD to create internships that lead to jobs  
                        |   • Affordable, Accessible Childcare (5)  
                        |   • Reviving small business development process (5)  
                        |   • 100% electric distribution underground (last 1% and high voltage lines PRPA) (4)  
                        |   • Sales tax revenue enhancement strategies (2)  
                        |   • Electric distribution grid more resilient for the integration of DG, RE, EV, DERMS at Neighborhood Level (2)  
                        |   • Economic Development Plan (2)  
                        |   • BHAG Business/Technology for Engagement/Partnership – talent, wealth generation for all (1)  
                        |   • Refine and Review Economic Development Strategies (1)  
                        |   • Innovation and Economic Prosperity partnership with CSU/BIZ (1)  
                        |   • Quarterly economic reports and updates (1)  
                        |   • Smart cities and broadband integration (1)  
                        |   • Refine Metro District Policies  

The Novak Consulting Group  
Strengthening organizations from the inside out.
<table>
<thead>
<tr>
<th>Strategic Outcome Area</th>
<th>Individual Initiatives</th>
</tr>
</thead>
</table>
| Mobility and Transportation Systems    | • BRT (5)  
  o Max #2 East-West  
  o North College BRT  
• Encouraging Transport use (understanding barriers to use (5)  
• New terminal at Northern Colorado Regional Airport (2)  
• Air hub service at FNL/NoCo RA (1)  
• Earlier adopters AVs/EVs/UAVs Innovation Mobility (1)  
• Transportation for seniors and low income – vans, buses for those who can’t access Transport |
| Safe Community                         | • Homeless Misbehavior – threats to residents, fights, more residents need to feel safe (2)  
• Look at misdemeanor offenses for trail infractions                                                                                                                                                                |
| Healthy Communities                    | • Affordable Housing (5)  
  o Land bank, land trust, mobile home park preservation  
  o Increase the resources for affordable housing  
  o Reviewing the development process for affordable housing  
  o Reevaluate the City down payment assistance program  
  o Down payment loans, using current stock, deed restrictions, more aggressive approach  
• Mobile Home Communities (5)  
  o Utility price gouging – quality of life standards  
  o Trailer Park as landowners – eliminate displacement and provide security  
  o Preserving mobile home communities and protecting residents  
• Streamline low-income rebates/access (4)  
• Diversity, Equity, and Inclusion (4)  
  o View policies and plans through this lens – CEDAW Resolution, elimination of discrimination  
• Improve Alleyways – pave and maintain (3)  
• Revisit U+2 (2)  
  o Right size U+2 to include neighborhood improvement and affordable housing  
• Mulberry Avenue Gateway Plan I-25 to Leman (2)  
• Transitional Housing/Prevention Homelessness (2)  
• Resolution for Medicare for all  
• Regional collaborative for affordable housing  
• Livability standards – transportation, housing cost, average salary, etc.  
• 5G Issues and Impact Mitigation                                                                                                                                                                                |
| Vibrant Community                      | • Diversity of culture and recreation opportunities (5)  
• Refresh old parks – make them the hub of the neighborhoods again (by Laurel Elementary) (4)  
• Arts and Culture Plan adoption and support  
• Art as an economic driver strategy – night time economy, music (1)                                                                                                                                          |
<table>
<thead>
<tr>
<th>Strategic Outcome Area</th>
<th>Individual Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable parkways and medians (1)</td>
<td>• Include private cultural entities in City planning – recognize symphony, opera, MoA Gallery Walk, etc. (1)</td>
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<td>• FoCo Tree Canopy Environment</td>
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<td>• Cultural Resource integration – telling FoCo story</td>
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<tr>
<td>Environmental Health</td>
<td>• Plastics (4)</td>
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<td></td>
<td>• Reduce single-use plastic pollution</td>
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<td></td>
<td>• Single-use plastic bags – charge? Tax?</td>
</tr>
<tr>
<td></td>
<td>• Plastic bag/straws</td>
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<tr>
<td></td>
<td>• River health (4)</td>
</tr>
<tr>
<td></td>
<td>• Further improve river/stream health</td>
</tr>
<tr>
<td></td>
<td>• Poudre River Health</td>
</tr>
<tr>
<td></td>
<td>• Maintain flows and purity of Poudre River</td>
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<td>• Air quality issues (4)</td>
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<td>• Regulations to protect FC from the encroachment of gas/oil (4)</td>
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<td>• Climate Action Plan – more buy-in from the community, more community solar (2)</td>
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<td>• Continue to expand open space/natural area inventory (while there is still time)</td>
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<tr>
<td>High Performing Government</td>
<td>• Professional development opportunities for Council (5)</td>
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<td></td>
<td>• Reimagine community engagement (5)</td>
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<td></td>
<td>• Focused roundtable information sessions</td>
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<td></td>
<td>• Board and Commission Evaluation and Modification (5)</td>
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<td>• Board/Commission Redo to align with outcomes and use more ad hoc</td>
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<td>• Continue to improve City financial sustainability (4)</td>
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<td></td>
<td>• Regionalism for local solutions (2)</td>
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<td></td>
<td>• Robust City/County Engagement and partnership – FNL, Waste, Health</td>
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<td></td>
<td>• Baldrige 2.0 – Community organizations, Council, FoCo Govt (1)</td>
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<td>• New City Hall Complex/Campus (1)</td>
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<td>• Why did 40% vote for the Council pay question (1)</td>
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<td>• More effective utilization of Ch. 14</td>
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</table>
**Council Priorities**

There were 11 items with five or more dots; nine with four dots and one with three dots that the Council agreed should move forward as Council priorities. Items with five or more dots will be called Top Priorities, four dots are High Priorities, and three dots are Other. Council then worked in small groups to refine the initiative and define success. Some items were combined when the groups worked together. The final initiatives presented by the groups are captured below and included as an attachment to this report. Staff will work to refine the Council work plan further and bring the priorities back to the Council for adoption.

<table>
<thead>
<tr>
<th>Strategic Outcome Area</th>
<th>Priority</th>
<th>Council Priority</th>
<th>Success</th>
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</thead>
</table>
| Economic Health        | Top Priority| EH-1: Create Strategies that lead to jobs for the community.                      | • Outcomes partnerships PSD and FRCC  
• Identify incentives  
• City lead by example  
• Internships  
• Job placement to fill high demand areas |
|                        | Top Priority| EH-2: Accessible, affordable childcare for all.                                   | • Increase capacity  
• Identify true need – barriers to childcare; define what the childcare needs are that exist in the community  
• Fee waivers to incent scholarships  
• Rebates for development fees for child care centers  
• More flexible development standards  
• Childcare no longer a career and lifestyle limiter  
• Reduce barriers to entry |
|                        | Top Priority| EH-3: Executable plan to support small business.                                 | • The same level of support as primary/key accounts  
• Development/licensing navigation  
• Identify needs and gaps  
• Resource awareness and education  
• Referrals to partners like Innosphere and SBDC |
|                        | High Priority| EH-4: 100% Electric Distribution underground (Last 1% and High Voltage Lines (PRPA)). | • Do as part of Connexion  
• Work with PRPA  
• Develop a phasing plan  
• Underground replacement strategy |
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| Mobility and Transportation Systems | Top Priority      | MT-1: Explore additional Bus Rapid Transit (BRT) Corridors and revisit transit priorities. | - Pursue transit priorities  
- Pursue Federal Funding  
- Mobility gap identification  
- Identify barriers to use and increase ridership |

| Healthy Communities          | Top Priority      | HC-1: Have staff explore the following options for affordable and achievable housing and bring them back to Council.  
- Purchase and deed restriction  
- Impact fees  
- Regional partnerships  
- Work with partners (CSU, land trusts, etc.)  
- Down payment assistance  
- Inclusionary zoning  
- Land bank strategy  
- Other best practices | Better align housing inventory with our residents’ income levels  
Mid-year budget offer on impact fee study  
Work session to inform Council on what is being worked on already |

| Top Priority                 | HC-2: Develop policies to preserve mobile home parks (zoning, right of purchase, purchasing the redevelopment areas encroaching on locations, etc.). | Develop policies and present them to Council |

| Top Priority                 | HC-3: Quality of Life Issues in Mobile Home Communities – Protect residents of mobile home parks; utility gouging; work with eviction and mediation. |  |

| High Priority                | HC-4: Provide an update to Council on what is happening to streamline low-income benefits. Look at best practices and coordinate with other organizations. | Understanding from Council on the status of efforts |

<p>| High Priority                | HC-5: Adopt an equity lens tool for past and future decision-making including hiring, boards and commissions, community engagement, budgeting, etc. and consider the CEDAW Resolution as part of the Equity Lens. | Understanding disparities in the community and make progress to reduce them |</p>
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<tr>
<td></td>
<td>Other Priority</td>
<td>HC-5: Develop a plan for opportunities for improved alleys outside of downtown area – placemaking, front door, access (ADU, granny flat, etc.).</td>
<td>• Full utilization and potential of alley public space</td>
</tr>
<tr>
<td>Vibrant Community</td>
<td>Top Priority</td>
<td>VC-1: Understand the current state regarding equitable participation in City recreation programs. Address gaps through specific programs or support. Develop opportunities that appeal to diverse populations. Develop metrics and desired state.</td>
<td>• Equitable participation in City cultural and recreational programs</td>
</tr>
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<td></td>
<td>High Priority</td>
<td>VC-1: Complete assessment of current and future needs for refreshing neighborhood parks. Develop funding options including public and private partnerships.</td>
<td>• Plan with timeline, scope, and metrics for neighborhood park updates</td>
</tr>
<tr>
<td>Environmental Health</td>
<td>High Priority</td>
<td>EH-1: Implement local ordinances to programs to address plastics under City authority. Explore state and federal legislative advocacy. Educate the community about plastic pollution – how to reduce.</td>
<td>• Reduce plastic pollution • Eliminate microplastics in drinking water and plastics in watersheds and other environmental areas</td>
</tr>
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<td></td>
<td>High Priority</td>
<td>EH-2: Programs to protect and enhance in stream flow. Assess and monitor current efforts on stream restoration. Reduce the impact of municipal runoff.</td>
<td>• Improved ecological and aesthetic quality, along with improved resilience of the Poudre River and streams</td>
</tr>
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<td></td>
<td>High Priority</td>
<td>EH-3: Air Quality – Local, state, and federal advocacy. Evaluate radon working group recommendations. Pursue further reductions of City ozone precursors. Expand community programs for ozone. Conduct assessment of the microparticulate impact on disparate groups.</td>
<td>• Impact mitigation of high radon levels • Reduce ozone precursors • Understand the prevalence of microparticulate pollution</td>
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<td></td>
<td>High Priority</td>
<td>EH-4: Evaluate SB181 and implications to Fort Collins. Robust public engagement around potential regulatory options.</td>
<td>• Reduce or eliminate surface impacts of oil and gas within the GMA</td>
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<td></td>
<td>High Priority</td>
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<tr>
<td>High Performing</td>
<td>Top Priority</td>
<td>HP-1: Professional Development for Councilmembers – assess the needs and interest of Councilmembers. Identify areas of overlap where staff and Council would share mutual benefit. Evaluate best practices. Develop and fund a plan.</td>
<td>• Councilmembers equipped at being a highly effective and innovative board</td>
</tr>
<tr>
<td>Government</td>
<td>Top Priority</td>
<td>HP-2: Improve Public Engagement – assess barriers to participation in existing outreach strategies. Measure the impact of our effort and fill the gaps as appropriate. Identify opportunities to flip the model of community engagement to where they are and on their time.</td>
<td>• Policy decisions are informed by representative and inclusive cross-section of community opinion</td>
</tr>
<tr>
<td></td>
<td>Top Priority</td>
<td>HP-3: Reimagine the Board and Commission program.</td>
<td>• Align with council priorities and strategic plan outcome areas</td>
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<td></td>
<td>High Priority</td>
<td>HP-4: Continue to improve City Financial Sustainability.</td>
<td>• Study sales tax leakage</td>
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*The Novak Consulting Group*

*Strengthening organizations from the inside out.*
Closing

The Novak Consulting Group
Strengthening organizations from the inside out.
Attachment A: 2019-2021 Fort Collins City Council Priorities

**Economic Health**
EH-1: Create Strategies that lead to jobs for the community.

EH-2: Accessible, affordable childcare for all.

EH-3: Executable plan to support small business.

EH-4: 100% Electric Distribution underground (Last 1% and High Voltage Lines (PRPA).

**Mobility and Transportation Systems**
MT-1: Explore additional Bus Rapid Transit (BRT) Corridors and revisit transit priorities.

**Healthy Communities**
HC-1: Have staff explore the following options for affordable and achievable housing and bring them back to Council.

- Purchase and deed restriction
- Impact fees
- Regional partnerships
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- Down payment assistance
- Inclusionary zoning
- Land bank strategy
- Other best practices

HC-2: Develop policies to preserve mobile home parks (zoning, right of purchase, purchasing the redevelopment areas encroaching on locations, etc.).

HC-3: Quality of Life Issues in Mobile Home Communities – Protect residents of mobile home parks; utility gouging; work with eviction and mediation.

HC-4: Provide an update to Council on what is happening to streamline low-income benefits. Look at best practices and coordinate with other organizations.

HC-5: Adopt an equity lens tool for past and future decision-making including hiring, boards and commissions, community engagement, budgeting, etc. and consider the CEDAW Resolution as part of the Equity Lens.

HC-5: Develop a plan for opportunities for improved alleys outside of downtown area – placemaking, front door, access (ADU, granny flat, etc.).

**Vibrant Community**
VC-1: Understand the current state regarding equitable participation in City recreation programs. Address gaps through specific programs or support. Develop opportunities that appeal to diverse populations. Develop metrics and desired state.

VC-1: Complete assessment of current and future needs for refreshing neighborhood parks. Develop funding options including public and private partnerships.
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EH-2: Programs to protect and enhance in stream flow. Assess and monitor current efforts on stream restoration. Reduce the impact of municipal runoff.
EH-3: Air Quality – Local, state, and federal advocacy. Evaluate radon working group recommendations. Pursue further reductions of City ozone precursors. Expand community programs for ozone. Conduct assessment of the microparticulate impact on disparate groups.
EH-4: Evaluate SB181 and implications to Fort Collins. Robust public engagement around potential regulatory options.

High Performing Government
HP-1: Professional Development for Councilmembers – assess the needs and interest of Councilmembers. Identify areas of overlap where staff and Council would share mutual benefit. Evaluate best practices. Develop and fund a plan.
HP-2: Improve Public Engagement – assess barriers to participation in existing outreach strategies. Measure the impact of our effort and fill the gaps as appropriate. Identify opportunities to flip the model of community engagement to where they are and on their time.
HP-3: Reimagine the Board and Commission program.
HP-4: Continue to improve City Financial Sustainability.
The purpose of this dashboard is to track the progress of priorities established during the May 2017 Council retreat. It will be updated quarterly and included in packets to guide the scheduling of items on the 6-month planning calendar.

### End of Council Term Update – As of March 18, 2019

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<tr>
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<td>ECONOMIC HEALTH</td>
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|          | ECONOMIC HEALTH FOCUS - Strategic Thinking about Fees | Purpose: Improve community understanding of why we have fees, how they are used, how they are calculated, and what alternatives to fees exist | Financial Services | Next Council Action: None – 2018 actions complete | Other Info:  
- 2019 planned efforts  
  a. Step 3 of CEFs  
  b. Development Rev Fees  
  c. Wet Utility Fees |
|          | ECONOMIC HEALTH FOCUS - Business Retention & Expansion (BRE) | Purpose: Enhance the ability of businesses to succeed | Sustainability Services | Next Council Action: No regular meetings or work sessions scheduled at this time | Other Info:  
- Minority Owned Business Listening Session – Completed (Great Attendance)  
- Developing individual Council Business Visit Strategies - Target Completion end of March  
- Sharing the results of the National Business Survey internally and externally |
|          | ECONOMIC HEALTH FOCUS - Continue focus on I-25 buildout | Purpose: Work with CDOT and regional partners to fund I-25 lane expansion from Fort Collins to Denver | Planning, Development, and Transportation | Next Council Action: No regular meetings or work sessions scheduled at this time | Other Info:  
- A letter of support for the CDOT INFRA Grant was prepared and sent to the U.S. Department of Transportation encouraging funding for the I-25 Segments 7 and 8 project |
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|          | ECONOMIC HEALTH FOCUS  - Workforce | **Purpose:** Address employer talent needs and diversify employment opportunities for residents  
**Outcomes:**  
- Close the skills gap and increase career pathways in the community  
- Create alignment between employers, partners, and educational institutions regarding current and future workforce needs  
- Strengthen systems for regional collaboration - specifically related to workforce | Sustainability Services | Next Council Action:  
No regular meetings or work sessions scheduled at this time  
Other Info:  
- Working with Fort Collins Area Chamber to support Talent Ambassador Program and other implementation steps  
- Talent 2.0 Website to go live in Q1 2019 |
|          | CONNECTED SMART CITY - Innovation / City as a platform | **Purpose:** Encourage an economic ecosystem that fosters the development of new and creative industry  
**Outcomes:**  
- Retain, develop, and recruit entrepreneurs and cutting-edge companies  
- Develop and support infrastructure that encourages entrepreneurship and innovation  
- Enhance economic diversification by supporting industry clusters | Sustainability Services | Next Council Action:  
No regular meetings or work sessions scheduled at this time  
Other Info:  
- Program evaluation and potential reset of Industry Cluster grant funding anticipated Q1, 2019  
- ELT Committee formed to prioritize implementation actions |
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|         | CONNECTED SMART CITY - Broadband | **Purpose:** Encourage the development of reliable, high speed internet services throughout the community  
**Outcomes:**  
- Fiber to the Premise to enable high speed symmetrical service to all premises within the GMA | Broadband | **Next Council Action:** No regular meetings or work sessions scheduled at this time  
**Other Info:**  
- Contracts in place for CIS/OSS, Electronics, Design & Construction.  
- Teams launched in Aug for the CIS/OSS implementation.  
- Design Electronics work began in Sep 2018.  
- **Hiring of internal staff for both Network, Outside Plant and MDU/Business Sales** is in progress.  
- Jan 2019 start design/build of neighborhood fiber.  
- Social media accounts launched in February – Facebook & Twitter  
- Marketing Strategy in development. |
|         | CONNECTED SMART CITY - Smart City Technology and Infrastructure | **Purpose:** Foster a data rich environment in the City that allows for the following outcomes  
**Outcomes:**  
- Increase the use of data for real time infrastructure monitoring  
- Increase access to City data sets for cocreation possibilities  
- Partner with other governments and business to address challenges | Information and Employee Services/Utilities/Sustainability Services / Planning, Development, and Transportation | **Next Council Action:** No regular meetings or work sessions scheduled at this time  
**Other Info:**  
- Core staff team is developing strategy for identifying priorities within this space and to prepare for Smart Cities Readiness Grant Application in Winter, 2019.  
- Open Data efforts continue to focus on publishing frequently requested data, expanding the inventory City-owned data, and creating new ways for the public to interact with City data |
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<td>SMALL BUSINESS VISIBILITY</td>
<td>Purpose: Increase visibility of small and medium sized businesses (SMEs) within the community</td>
<td>Sustainability Services</td>
<td>Next Council Action: No regular meetings or work sessions scheduled at this time</td>
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<td>Outcomes:</td>
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<td>Other Info:</td>
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<td>- Raise awareness of the benefits of supporting small businesses and the local economy</td>
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<td>- Continue support of the Larimer County Small Business Development Center ($40,000 annually)</td>
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<td>- Support the development of emerging industries and clusters</td>
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<td>- Working with Downtown Business Association and area businesses to increase access to Sales Tax Data</td>
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<td>- Understand the barriers to success faced by small businesses</td>
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<td>- Sharing the results of the Small Business Needs Assessment Survey with internal and external partners</td>
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<p>|          | ENVIRONMENTAL HEALTH | CITY OF FORT COLLINS UTILITIES AND WOODWARD INC. WASTE TO ENERGY PROJECT | Utilities | Next Council Action: No regular meetings or work sessions scheduled at this time |
|          |                       | Purpose: Partnership with other city departments and Woodward to design, procure, construct, and operate 2 Co-Gen units and 1 gas conditioning system. Once operational the infrastructure will enable the Drake Water Reclamation Facility to convert biogas generated from Anaerobic Digestion to beneficial on-site use for heat and energy needs |              | Other Info: |
|          |                       | Outcomes:              |              | - Procurement of gas conditioning unit has been executed. |
|          |                       | - Reduce the GHG emissions related to anaerobic digestion and current flaring of excess biogas generation |              | - Project design is substantially complete. Project construction will begin in June 2019 and expected to be complete end of 2020. |
|          |                       | Reduction in energy use at the Drake Water Reclamation Facility measured in % change in kWh |              |</p>
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|          | PRESCRIPTION DRUG TAKEBACK PROGRAM | Purpose: Provide opportunities to safely dispose of prescription and over-the-counter-drugs  
Outcomes:  
• Explore partnership with UC Health  
• Protect water quality by avoiding dumping  
Reduce presence of expired/unneeded prescription and over-the-counter drugs | Police Services/ City Manager’s Office / Utilities | Next Council Action: No regular meetings or work sessions scheduled at this time  
Other Info:  
• Daily drop-off location continues at FCPS  
• 2nd 2018 event held on October 27 collected 208 pounds of drugs  
• Total between kiosk and event equaled 1432 pounds of drugs collected  
• The next takeback event is scheduled for April 27, 2019 |
|          | PLATTE RIVER POWER AUTHORITY AND FORT COLLINS UTILITIES ENERGY FUTURES – Customer Requests for 100% Renewable Energy | Purpose: Offer customers the ability to procure 100% renewable portfolio options that Fort Collins Utilities can deliver with our generation provider Platte River Power Authority  
Outcomes:  
• Create options for customers who want to have 100% renewable energy delivery | Utilities | Next Council Action: Update will be provided with the Climate Action Plan update scheduled at the June 25 Work Session  
Other Info:  
• Fort Collins adopted a 10 renewable electricity by 2030 goal in October  
• Platte River adopted a 10 non-carbon by 2030 resource diversification policy in December  
• Platte River signed a Power Purchase Agreement for an additional 20MW of solar at the Rawhide Energy Station. Commercial Operation anticipated in 2020  
• Staff determining next steps on Green Energy program options based on planned changes to Platte River wholesale rate structure in 2020  
• Platte River is in progress on development of the Roundhouse wind project (165 megawatts) and a new 20 megawatt solar facility |
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<td>PLATTE RIVER POWER AUTHORITY AND FORT COLLINS UTILITIES ENERGY FUTURES - Integrated Resource Plan</td>
<td><strong>Purpose:</strong> Coordinate with Platte River Power Authority the transition to generation that meets the Climate Action Plan goals</td>
<td>Utilities</td>
<td><strong>Next Council Action:</strong> Update will be provided with the Climate Action Plan update scheduled at the June 25 Work Session&lt;br&gt;&lt;br&gt;<strong>Other Info:</strong>&lt;br&gt;• Platte River plans to complete their IRP in 202 one year ahead of the regularly scheduled due date of 2021&lt;br&gt;• Platte River will seek approval from Western Area Power Authority (WAPA) for an out-of-cadence IRP submission&lt;br&gt;• Platte River hosted public meeting October 25 to kick off the IRP process for public engagement with Utilities staff&lt;br&gt;• Staff is coordinating with Platte River on a range of sub-tasks, such as the demand side management potential study.</td>
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<td>AIR QUALITY ISSUES - Radon</td>
<td><strong>Purpose:</strong> Protect human health&lt;br&gt;<strong>Outcomes:</strong>&lt;br&gt;• Increase mitigation of high radon levels</td>
<td>Sustainability Services</td>
<td><strong>Next Council Action:</strong> Council update memo planned for April 2019&lt;br&gt;&lt;br&gt;<strong>Other Info:</strong>&lt;br&gt;• Continue outreach and subsidized kit sales&lt;br&gt;• Received 2018-2019 state funding&lt;br&gt;• Completed working group meetings to evaluate potential options to increase testing and mitigation rate&lt;br&gt;• Presented working group results to Air Quality Advisory Board in February 2019</td>
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## CITY COUNCIL INITIATIVE DASHBOARD

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| Ongoing  | AIR QUALITY ISSUES – Outdoor Burning | **Purpose:** Protect human health and reduce nuisance from outdoor wood smoke  
**Outcomes:**  
- Implement Council direction regarding residential outdoor burning | Sustainability Services | **Next Council Action:** March 19th Council Session scheduled for final consideration of:  
- Nuisance Code updates  
- Appropriation of resources for implementation and enforcement  
**Other Info:**  
- Received Council support for public engagement plan in February 2018  
- Policy research and public engagement was conducted in 2018  
- Received Council feedback to update nuisance code February 2019 Work Session |

| Ongoing | AIR QUALITY ISSUES - Ozone | **Purpose:** Protect human and environmental health by reducing ozone precursor emissions  
**Outcomes:**  
- Reduce ozone precursor emissions  
- Lead by example in reducing ozone precursor emission from lawn and garden equipment and other sources | Sustainability Services | **Next Council Action:** No regular meetings or work sessions scheduled at this time  
**Other Info:**  
- Update Air Quality Plan in 2018/2019, including addressing ozone emissions  
- Support Transportation Master Plan update in 2018/2019  
- Finalized purchases of electric municipal lawn and garden equipment with 2018 funds  
- Received 2019 RAQC commercial lawn and garden equipment grant.  
- Ozone monitoring site installed at the Gardens on Spring Creek, and will be accessible when new Gardens areas are open in 2019. |
### Continued Progress on Climate Action Plan

**Purpose:** Leverage efficiency and innovation to accelerate the transition to a clean energy economy and protect Fort Collins’ quality of life and climate.

**Outcomes:**
- Achieve the City’s 2020 climate action goal (20% below 2005) and long-term (2050) carbon neutrality goals.
- Increased community (business, resident, and academic) engagement in achieving the goals.

**Next Council Action:**
Climate Action Plan update scheduled for June 25 Work Session

**Other Info:**
- 2019-2020 will focus on Climate Action Plan update; plan update will be in partnership with the Energy Policy and Road to Zero Waste update and incorporate mitigation, resilience/adaptation and equity lenses.
- Currently conducting outreach to develop the plan’s scope.
- Will launch 2019 messaging campaign at Earth Day, April 22.

### Safe Community

**EXPAND COMMUNITY POLICING**

**Purpose:** Expand Community Policing to increase public safety and public trust outcomes

**Outcomes:**
- Open and operationalize a collaborative, shared space to be used by City and CSU departments

**Next Council Action:**
No regular meetings or work sessions scheduled at this time

**Other Info:**
- Campus West Connectic substation continues to host programs and neighborhood events at facility
- This project continues to be of value in bringing agencies together to work on neighborhood problems around campus.
- Low walk-in traffic and budget shortages have led to a conversation about reducing walk in hours.
- This facility continues to be a catalyst for collaboration and problem solving.
### COMMUNITY TRUST IN POLICING POLICY (COMMUNITY TRUST INITIATIVE)

**Purpose:** Gather information and conduct analysis of community-proposed Community Trust Ordinance

**Outcomes:**
- Review of proposed Community Trust Ordinance
- Review of existing policies
- Historical review and comparison
- Difference between a Sanctuary City designation and proposed Community Trust Ordinance
- Other City research
- Options for modifications of existing City policies or laws
- Process to report policy violations
- Community outreach process/plan

**Next Council Action:**
No regular meetings or work sessions scheduled at this time

**Other Info:**
- Community Trust Stakeholder Group concluded regular meetings. Met with new Police Chief in Sept. 2018
- Report provided to Council in late May 2018, detailing work to date, stakeholder views, and planned or continuing staff actions
- Established police-community group for cooperative discussion - training events
- Partnering with City Service Areas and NGO's to align missions and focus efforts with homeless/transient populations
- Police recruiters continue to attend La Familia cookouts
- Most relevant police policies translated into Spanish and posted on FCPS website
- Presented Spanish policies and plans to HRC in March 2019

### SHORT TERM RENTAL REVIEW

**Purpose:** Review STR implementation and consider potential code changes to address known challenges and community feedback

**Outcomes:**
- Consider code changes
- Continue to monitor implementation

**Next Council Action:**
Work session on March 26, 2019 to discuss STRs in Multifamily buildings.

**Other Info:**
- Staff will present proposals at March 26 work session to address building and fire code issues in multifamily STRs.
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</thead>
</table>
|          | RESIDENTIAL PARKING PERMIT PROGRAM AND CSU PARKING IMPACTS | Purpose: Review and amend existing RP3 program  
Outcomes:  
- Ensure program is being implemented as intended | Planning, Development, and Transportation | Next Council Action: No regular meetings or work sessions scheduled at this time  
Other Info:  
- Staff recommended a new fee policy regarding nonresidential RP3 permits primarily for schools and some existing businesses within the RP3 zones  
- Staff provided the new permit fee per administrative policy to the City Manager for authorization in September |
|          | EXPAND IGA DISCUSSION TO USE OF HUGHES STADIUM | Purpose: Engage CSU in a discussion on the use of Hughes Stadium. Suggest a community conversation with the County, CSU, residents, and the City  
Outcomes:  
- Help CSU engage in a community discussion about future uses of the stadium site | Planning, Development, and Transportation | Next Council Action: No further Council Action planned  
Other Info:  
- CSU has contracted with CalAtlantic Homes of Colorado (LENNAR Homes) to develop the property. Staff has met with representatives and encouraged holding at least 2 neighborhood meetings as part of community engagement prior to submitting any plans. The project is likely to be residential with a mix of housing types, solar, and include a park. |
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</table>
| Ongoing  | SMOKING IN OLD TOWN     | Purpose: Evaluate effectiveness and changes related to existing smoking ordinance  
Outcomes:  
• Reevaluate geographic boundary  
• Look at enforcement methods  
• Examine dedicated smoking locations  
• Make any Ordinance Amendments as desired | Planning, Development, and Transportation | Next Council Action: No further Council action planned.  
Other Info:  
• Council made a modification to the penalty associated with violating the smoking ordinance in December  
• Council received a memo in January with staff’s recommendation to not change the Smoke-Free Zone perimeter to include Library Park |
| Ongoing  | LAND BANK PROPERTY RFP OWNERSHIP | Purpose: Update Land Bank policy and successfully deploy another land bank property  
Outcomes:  
• Produce more affordable housing units by selling existing parcels to development partner(s)  
• Use sales proceeds to purchase additional land bank parcels  
• Maximize the development potential of the Land Bank program through identifying new resources and incentives | Sustainability Services | Next Council Action: No regular meetings or work sessions scheduled at this time  
Other Info:  
• Second RFP for Home Ownership product on Kechter parcel closed late February. Staff reviewing responses.  
• Grand Opening of Village on Horsetooth on March 14 with 96 one-four bedroom apartments. Leasing ongoing.  
• Work continues on acquiring additional parcels |
| Ongoing  | BEHAVIORAL HEALTH / DETOX FACILITY | Purpose: Partner with the County and others to build capacity for behavioral health services  
Outcomes:  
• Successful county ballot measure for a facility  
Identified ways to increase capacity in Fort Collins in the interim | Sustainability Services / City Manager’s Office | Next Council Action: No regular meetings or work sessions scheduled at this time  
Other Info:  
• Ballot measure passed in November  
• Council selected Councilmember Stephens to sit on the Policy Advisory Committee |
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<tr>
<td></td>
<td>UTILITY / EFFICIENCY PROGRAMS FOR LOW INCOME FAMILIES &amp; INDIVIDUALS</td>
<td>Purpose: Ensure low income segment is supported for utility bill, conservation and efficiency services and programs, which also includes renewable offerings</td>
<td>Utilities/ Sustainability Services</td>
<td>Next Council Action: No further Council Action planned after “Good News” update at Feb. 5 City Council meeting.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outcomes:</td>
<td></td>
<td>Other Info:</td>
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<tr>
<td></td>
<td></td>
<td>● User-friendly resources that support utility bill assistance</td>
<td></td>
<td>● Utilities Affordability Portfolio with the Income Qualified Assistance Program (IQAP) launched on Oct. 1, 2018</td>
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<td>● Outreach that brings materials and awareness on support for efficiency and conservation improvements</td>
<td></td>
<td>● Completed IQAP application process with 829 applications received. Largest low-income enrollment for a Utilities program.</td>
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<td></td>
<td></td>
<td>● Manage opportunities for low income to participate in renewable energy offerings</td>
<td></td>
<td>● Continuous enrollment initiated in 2019.</td>
</tr>
</tbody>
</table>

<p>|                  | CULTURE &amp; RECREATION | ARTS, CULTURE &amp; MUSEUM INTEGRATION | Purpose: Explore opportunities to leverage City resources through community partnerships and collaboration | Community and Operation Services | Next Council Action: No regular meetings or work sessions scheduled at this time |
|                  |                          |                          | Outcomes:            |              | Other Info: |
|                  |                          |                          | ● Promote opportunities for interaction between local museums and cultural institutions. |              | ● The Director of Cultural Services, and the Director of the Museum of Discovery met with the Mayor to discuss the initiative and believe that the FoCo Creates Arts and Culture Master Plan, as drafted, addresses the initiative. |
|                  |                          |                          | ● Examine Fort Fund programs for possible updates and revisions |              | ● Following editing and refinement, the FoCo Creates Arts and Culture Draft Plan is being shared with stakeholders and the public in February and March. |
|                  |                          |                          |                           |              | ● An assessment of the FoCo Fund program is a proposed action item in the Culture Plan. |</p>
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<tr>
<td>TRANSPORTATION &amp; MOBILITY</td>
<td></td>
<td><strong>Purpose:</strong> Update City sidewalk prioritization model to improve public safety and enhance safe routes to school</td>
<td>Planning, Development, &amp; Transportation</td>
<td><strong>Next Council Action:</strong> No further Council Action planned</td>
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<td><strong>Outcomes:</strong></td>
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<td><strong>Other Info:</strong></td>
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<td></td>
<td>- Make needed improvements near Lincoln Middle School and Poudre High School.</td>
<td></td>
<td>- City staff updated the citywide sidewalk prioritization model to include equity and safety to give a higher weight to arterial sidewalk needs</td>
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<td>- Produce new prioritization model for sidewalks</td>
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<td></td>
<td>COMPLETE SIDEWALK PROGRAM FOR PUBLIC SAFETY</td>
<td><strong>Purpose:</strong> Update City sidewalk prioritization model to improve public safety and enhance safe routes to school</td>
<td>Planning, Development, &amp; Transportation</td>
<td><strong>Next Council Action:</strong> No further Council Action planned</td>
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<td><strong>Outcomes:</strong></td>
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<td></td>
<td>COUNTY ENGAGEMENT FOR BUILDING INFRASTRUCTURE IN CITY GMA</td>
<td><strong>Purpose:</strong> Engage Larimer County in discussion about assistance for building infrastructure and programming within the City’s GMA</td>
<td>Planning, Development, and Transportation / Financial Services/ Community &amp; Operation Services</td>
<td><strong>Next Council Action:</strong> No regular meetings or work sessions scheduled at this time</td>
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<td></td>
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<td><strong>Outcomes:</strong></td>
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<td><strong>Other Info:</strong></td>
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<td></td>
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<td>- Gain County assistance in funding:</td>
<td></td>
<td>- Staff submitted an update to Council on Mar 8, 2019 regarding current City/County/PSD coordination in the GMA; projects under discussion include: ped/bike improvements along We Vine Drive, and Trail connections near Lincoln Middle School.</td>
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<td></td>
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<td>- Sidewalks</td>
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<td>- Streets</td>
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<td></td>
<td>- Bike trails</td>
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<td></td>
<td></td>
<td>- Neighborhood Issues</td>
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</table>
|          | NORTH COLLEGE BUS RAPID TRANSIT | Purpose:  
Short Term - Provide enhanced transit service as an interim solution to meet transit demand needs on the North College corridor.  
Long Term - Determine feasibility, plan and implement a North College Bus Rapid Transit service.  
Outcomes:  
Short Term  
• Improve transit access, connectivity to the transit system and higher frequencies of service to our riders with trips on the North College corridor  
• Collect ridership and other data to augment the planning efforts for long term BRT goals on North College  
Long Term  
• Implement a bus rapid transit system for North College | Planning, Development, & Transportation | Next Council Action:  
No further Council action planned.  
Other Info:  
• Staff has prepared a service improvement option for BFO 2019-20  
• BFO offer not funded. |
|          | HIGH PERFORMING GOVERNMENT | Purpose:  
Identify what’s working well within the existing City Plan in order to focus staff and Council resources on areas which need addressed | Planning, Development, & Transportation | Next Council Action:  
No further Council Action planned |
|          | REPRIORITIZE CITY PLAN | Purpose:  
Identify what’s working well within the existing City Plan in order to focus staff and Council resources on areas which need addressed  
Outcomes:  
Adjust scope and resource of City Plan to focus on identified needs. | Planning, Development, & Transportation | Next Council Action:  
No further Council Action planned  
Other Info:  
• Re-scoping is complete  
• Currently implementing revised scope and have initiated the project |
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<tbody>
<tr>
<td></td>
<td>REIMAGINE COMMUNITY ENGAGEMENT</td>
<td>Purpose: Enhance overall community engagement efforts and strengthen organizational capacity for effective public engagement</td>
<td>Information and Employee Services</td>
<td>Next Council Action: No regular meetings or work sessions scheduled at this time</td>
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<td></td>
<td></td>
<td>Outcomes: • Systematic use of public engagement framework and planning tools • Leverage new tools and technology to increase engagement with all segments of the community, with additional focus on underserved populations • Use data to evaluate and improve public engagement efforts</td>
<td></td>
<td>Other Info: • The City has updated the engagement spectrum to illustrate the progression and reciprocal nature of public engagement. This and additional tools also emphasize the community’s two largest stakeholder groups, businesses and residents. Quarterly training &amp; development opportunities will enhance and equip internal public engagement capacity and capability. • Internal resources and collaboration continue to grow. The new Public Engagement Collaboration Team works to align efforts and outreach to plan more effective outreach both online and on-the-ground.</td>
</tr>
</tbody>
</table>
Direction Sought

1. Does Council agree with the characterization of the priorities as presented?

2. Does Council have any additional clarification to add for priorities prior to a resolution coming forward?
Council-Term Planning Timeline

2019

ELECTIONS

- On Board/Retreat

PLANNING

- Strategic Plan

BFO Programs & Initiatives

2021

2022

EXECUTION

- 2019 Budget

- 2020 Budget

- 2022
Priorities

- Adopted formally by Resolution
- Provide specific focus and action within context of vision and mission
- Progress reported quarterly through Dashboard
  - Strategic plan, budget offers, Council or administrative action

<table>
<thead>
<tr>
<th>PRESCRIPTION DRUG TAKEBACK PROGRAM</th>
<th>Purpose: Provide opportunities to safely dispose of prescription and over-the-counter-drugs</th>
<th>Police Services/ City Manager’s Office / Utilities</th>
<th>Next Council Action: No regular meetings or work sessions scheduled at this time</th>
</tr>
</thead>
</table>
|                                   | **Outcomes:**  
- Explore partnership with UC Health  
- Protect water quality by avoiding dumping  
Reduce presence of expired/unneeded prescription and over-the-counter drugs |                                                                 | **Other Info:**  
- Daily drop-off location continues at FCPS  
- 2nd 2018 event held on October 27 collected 208 pounds of drugs  
- Total between kiosk and event equaled 1432 pounds of drugs collected  
- The next takeback event is scheduled for April 27, 2019 |
Priorities By Outcome Area

**Neighborhood Livability & Social Health**
1. Affordable and achievable housing strategies
2. Mobile home park preservation and resident protections
3. Equity and inclusion
4. Low income benefits/rebates streamlining and consolidation
5. Optimization of alleys outside of downtown

**Economic Health**
1. Strategies that create community jobs
2. Affordable and accessible childcare
3. Small business plan
4. Undergrounding of electric infrastructure (transmission and distribution)
## Priorities By Outcome Area

<table>
<thead>
<tr>
<th>Transportation</th>
<th>Culture and Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Additional Bus Rapid Transit (BRT) corridors</strong></td>
<td>1. Equitable participation in culture and recreation programs</td>
</tr>
<tr>
<td></td>
<td>2. Neighborhood park refresh/future needs</td>
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</table>
### Priorities By Outcome Area

<table>
<thead>
<tr>
<th>Environmental Health</th>
<th>High Performing Government</th>
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</thead>
<tbody>
<tr>
<td>1. Reduce plastic pollution</td>
<td>1. Effective, innovative, and high-performing board</td>
</tr>
<tr>
<td>2. Protect and enhance instream river flows</td>
<td>2. Reimagine community engagement</td>
</tr>
<tr>
<td>3. Improved air quality</td>
<td>3. City financial sustainability</td>
</tr>
<tr>
<td>4. Mitigate impacts of oil and gas encroachment into Growth Management Area</td>
<td>4. Reimagine boards and commissions</td>
</tr>
</tbody>
</table>
Next Steps

- Resolution consideration of all priorities on July 2
- Work sessions to clarify outcomes on:
  - Strategies that create community jobs
  - Small business plan
  - Additional Bus Rapid Transit (BRT) corridors
  - Affordable and achievable housing strategies
- Dashboard reporting starting this summer
Direction Sought

1. Does Council agree with the characterization of the priorities as presented?

2. Does Council have any additional clarification to add for priorities prior to a resolution coming forward?
WORK SESSION ITEM  
City Council

SUBJECT FOR DISCUSSION


EXECUTIVE SUMMARY

The purpose of this item is to provide City council with an overview of certain functions of the Water Utility, including water supply planning, watershed and water quality protection, and key partnerships on the Poudre River.

GENERAL DIRECTION SOUGHT AND SPECIFIC QUESTIONS TO BE ANSWERED

Staff is not seeking direction from Council at this time regarding specific projects but would appreciate input on any information provided.

BACKGROUND / DISCUSSION

About the Water Utility

The City owns and operates the Water Utility, which is part of Fort Collins Utilities. The Water Utility provides a diverse portfolio of services and programs to its customers while supporting key outcomes for the City. The Water Utility provides reliable, high quality water service to approximately 35,000 customer accounts (32,000 residential and 3,000 commercial) and distributes about 8 billion gallons of treated water annually through over 500 miles of water mains. The Water Utility generated $40.6 million in revenue in 2018. 2018 operating expenses were $20.2 million. Capital expenditures range from an average of $10 million to $15 million annually.

The Water Utility serves approximately 73% of the residents within the City’s Growth Management Area (GMA). Fort Collins-Loveland Water District (FCLWD) provides water service for about 17% of Fort Collins residents in the southeast portion of the GMA, while East Larimer County Water District (ELCO) serves about 8% of Fort Collins residents in the northeast portion of the GMA. (Attachment 1)

From the source of our water supplies on the Cache la Poudre River (“Poudre River”) and Horsetooth Reservoir to the customer tap, the Water Utility ensures that customers are provided with a reliable supply of high-quality treated water. The Water Utility consists of many functions needed to provide a high level of service. This agenda item will focus on programs and services related specifically to water supply planning, watershed and water quality protection, and key partnerships to protect and enhance the Poudre River. Other functions, such as water conservation, finance, water distribution and engineering will not be addressed in this presentation, however, warrant a future discussion by City Council.

WATER SUPPLY PLANNING

Water Supplies and Demands

The Water Utility utilizes two main sources of water supply: the Poudre River and the Colorado-Big Thompson (CBT) Project, which includes Horsetooth Reservoir. On average, the Water Utility treats and supplies to customers about 24,000 acre-feet of water annually split about equally from these two sources. In addition to treated water, the Water Utility provides about 3,000 acre-feet per year of untreated (raw) water for irrigation of
City parks, golf courses, cemeteries, and other green belt areas. For reference, one acre-foot of water will supply on average about 3.5 homes with water for one year.

**Water Rights**

In order to provide a reliable water supply, the Water Utility has acquired water rights and cash-in-lieu (CIL) of those water rights over many decades. The Water Utility owns a diverse portfolio of water rights from the Poudre River and its tributaries. The Water Utility also owns contractual “units” in the CBT Project, which is administered by the Northern Colorado Water Conservancy District (Northern Water), which entitles the City to deliveries of water from Horsetooth Reservoir. Water in the CBT Project originates from the Colorado River basin, near Granby.

The City’s current water rights portfolio, valued at over $2 billion, yields in wet years more water than needed by the Water Utility customers. However, these water rights yield much less in drought years and most of the yield in good years cannot be stored or used by Water Utility customers due to the relatively small amount of water storage capacity available to the Water Utility.

The acquisition of water rights and CIL of water rights currently occur primarily through the Water Utility’s “Water Supply Requirements” (WSR), a fee assessed on new developments (or redevelopment) in the Water Utility water service area. WSR ensure that adequate water supply and associated infrastructure (e.g. raw water storage) are available to serve the development’s water needs.

City Council adopted changes to the WSR and the CIL value that became effective in 2018, moving primarily to a “cash-focused” system. The updated policy enables the Water Utility to collect adequate funds to develop water storage and other infrastructure and to acquire the appropriate water rights to serve future customers. The current CIL value per acre-foot of WSR is $17,300. This translates to about $9,300 per typical single-family home or $39,200 per 1-inch commercial tap. The CIL rate is proposed to increase to $21,500 per acre-foot of WSR in the coming year, due mainly to increased costs for the Halligan Water Supply Project. This proposed increase will be considered for adoption by City Council this fall. Even with this increase, the Water Utility’s CIL rate is one of the most affordable CIL rates in the region.

**WATER STORAGE, TRANSMISSION, AND DISTRIBUTION**

**Joe Wright Reservoir**

Joe Wright Reservoir is the only storage reservoir fully owned and operated by the Water Utility available for treated water purposes. Located near Cameron Pass on a tributary to the Poudre River, this reservoir has an active capacity of about 7,100 acre-feet and provides water to the Water Utility’s Water Treatment Facility via the Poudre River through two pipelines that divert off the Poudre River near Gateway Natural Area.

**Horsetooth Reservoir**

The Water Utility owns 18,855 units in the CBT Project, which are delivered to Utilities out of Horsetooth Reservoir (administered by Northern Water). Northern Water has policies that limit the Water Utility’s ability to store excess water in Horsetooth Reservoir for use in later years.

**The Halligan Water Supply Project**

The Water Utility is currently pursuing an enlargement of Halligan Reservoir to meet future water demands and improve water service reliability for current customers. Halligan Reservoir has a current capacity of approximately 6,400 acre-feet and is located northwest of Livermore, 24 miles upstream of the confluence of the North Fork with the mainstem of the Poudre River at Gateway Natural Area. The Halligan Project consists of raising the existing Halligan Dam by approximately 25 feet to increase reservoir capacity by 8,125 acre-feet to a total of about 14,525 acre-feet. Water in the existing Halligan Reservoir is currently used and operated by the North Poudre Irrigation Company (NPIC). After the enlargement of Halligan Reservoir, NPIC will continue to use and operate 6,400-acre foot of capacity in the reservoir.
Before Halligan Reservoir can be enlarged, the City must receive federal, state and local permits. The U.S. Army Corps of Engineers (Corps) is the lead permitting agency and is currently conducting an environmental analysis of the Project that considers and discloses to the public the analysis of potential environmental impacts of the proposed Halligan enlargement and several alternatives to the Halligan enlargement that would also meet the Water Utility's needs for the project. The Halligan Water Supply Project has been in permitting since 2006. A summary of the environmental analysis, known as the Draft Environmental Impact Statement (DEIS), is expected to be released by the Corps in late 2019. (Attachment 3)

Water Supply and Demand Management Policy

The Water Supply and Demand Management Policy is the governing policy (Attachment 4) adopted by City Council to direct the acquisition, development, and management of the City's and the Water Utility's water supplies. The current policy was adopted in 2012 and contains guiding principles and criteria related to water efficiency and demand management, water supply reliability, treated and raw water quality, use of surplus raw water supplies, and regional cooperation on water resources issues. A Budgeting for Outcomes (BFO) offer was funded in the 2019/2020 BFO process to update the Policy to reflect current conditions and to incorporate findings of the Water Supply Vulnerability Study (see next section).

Water Supply Vulnerability Study

The Water Supply Vulnerability Study, funded in the 2017/2018 BFO process, investigated impacts to our ability to meet water demands from changing hydrology due to a warming climate; from water supply disruptions, such as infrastructure failures or wildfire impacts; and from changing demands due to population shifts, land use changes, and altered demand patterns. Through the course of the Study, the Utilities Water Resources Division has updated its modeling systems, developed climate-altered hydrologies to capture future climate uncertainties, developed future demand estimates around proposed City Plan growth scenarios, and developed new tools to facilitate such a large-scale analysis. Study completion is expected by June 30, 2019. Current findings include:

- Climate is a critical driver for water supply reliability, resilience, and vulnerability (collectively called “system performance”).
- Without the Halligan Reservoir enlargement, system performance is reduced under most future conditions.
- Long-term reductions in CBT Project water supplies due to shortages in the Colorado River system is a top vulnerability to the Water Utility and its ability to provide a reliable water supply.
- The Water Utility now has a modeling system that can be used in the future to evaluate other risks and water supply alternatives.

Findings of this study will serve as the foundation for the next phase of planning, which includes an update of the Water Supply and Demand Management Policy and determination of goals related to system performance (reliability, resilience, and vulnerability) as well as mitigation strategies to achieve those goals.

Water Distribution

Fort Collins Utilities maintains and operates over 550 miles of pipeline within the distribution system. There over 12 miles of pipe that is 100 years old or greater and over 21 miles of pipe that rate as poor or very poor by the Water Distribution System Renewal Master Plan. These rankings are based upon ability of fire hydrants to meet fire flow requirements, age of pipe, number of breaks, service to critical facilities as well as other criteria.

Currently the Water Utility construction crews replace approximately 2 miles of pipe in the distribution system per year where main breaks are a problem. This is generally in the portion of town where development occurred in the late 70s and early 80s. Construction methods during that time did not adequately protect the ductile and cast-iron pipe from corrosive soils which is the cause of most main breaks. Compared to national benchmarks, the City does experience a higher rate of water main breaks per hundred miles than average. These breaks interrupt customer service and impact operating costs to the Utility.
The Capital Construction Team has been addressing aging pipe in the Old Town area over the past few years, including the Walnut Street and Old Town Library Projects. At the current renewal rate, pipe in the distribution system would need to serve for 200-250 years prior to renewal. Since the useful age of pipe, especially cast iron and ductile iron pipe, is 80-100 years; FCU is evaluating means to increase the rate of renewal of the distribution system to assure delivery of high-quality water service.

WATERSHED AND WATER QUALITY PROTECTION

Source Watersheds

As mentioned above, the Water Utility receives its water supplies from two primary watersheds - the Cache la Poudre River watershed and the combined Colorado and Big Thompson River Watersheds (which is where key CBT Project infrastructure like Horsetooth Reservoir is located). Combined, the watersheds encompass approximately 1,600 square miles of primarily forested, mountainous terrain. Concentrated development upstream is limited to the areas around Grand Lake and Estes Park.

Unlike many other water utilities, the City owns less than 1% of the land area in its watersheds. Rather, the land is owned and managed by a mix of federal, state, county and private landowners, and therefore, monitoring and managing risks to water supplies requires the City to work collaboratively and in many instances across jurisdictional boundaries to implement watershed protection projects. (Attachment 5)

Source Water Protection

Fort Collins Source Water Protection Plan (SWPP)

In 2016, Utilities Watershed Program in cooperation with the Colorado Rural Water Association and the Colorado Department of Health & Environment completed the City’s first Source Water Protection Plan. This planning document provides a roadmap for managing potential sources of contamination to the Water Utility’s water supplies that are treated and delivered to customers. Through this effort, the top risk to our water supply was identified as wildfires.

Watershed Restoration and Forest Fuels Management

Since 2013, the Water Utility has funded a reserved seat on the Board of Directors for the Coalition for the Poudre River Watershed (CPRW). This organization was formed after the 2012 wildfires to coordinate response and recovery activities among community non-profits, water utilities, private landowners and other community stakeholders.

In 2016, CPRW produced a Poudre River Watershed Resiliency Plan, which identifies priority watershed areas currently at highest risk from wildfires as well as remaining post-High Park Fire restoration needs. In 2017, the Water Utility committed $80,000 per year to fund watershed protection projects that mitigate risks in these priority areas. By working with CPRW and other partners, Water Utility funds are leveraged for greater impact, as they can be used as a match to secure additional funding for wildfire hazard mitigation projects.

In 2017, Watershed Program collaborated with CPRW, the U.S. Forest Service, and other partners to identify potential fuels reduction projects that will mitigate risks associated with large scale catastrophic wildfires in the Poudre basin and protect water quality in the Poudre River and Horsetooth Reservoir. Hazard fuels reduction around critical infrastructure in the watershed, such as Horsetooth and Joe Wright Reservoirs, Michigan Ditch and the Poudre intake facility, will receive highest priority.

Source Water Spill Response Plan

Developed for Upper Poudre River in 2019, the Source Water Spill Response Plan identifies chemical hazards to drinking water supplies that exist within the watershed and the Highway 14 corridor. This tool provides guidance for responding to chemical spills, including notification and communication procedures along with response actions and mitigation strategies.
The Response Plan is a partnership between the City and the many parties who respond to and/or are impacted by chemical spills, including first responders, downstream water users, and regulatory authorities who direct the final cleanup.

WATER QUALITY MONITORING PROGRAMS & RIVER HEALTH

Upper Cache la Poudre River Collaborative Water Quality Monitoring Program

Since 2007, Fort Collins Utilities, City of Greeley and the Soldier Canyon Water Treatment Authority (a governmental entity created for water treatment by ELCO, FCLWD, and North Weld County Water District) have partnered on a cooperative water quality monitoring program, designed to track trends in river water quality in order to anticipate future needs of the parties’ respective drinking water treatment operations. For example, monitoring data shows that increases in many constituents observed following 2012 wildfires were short-lived and that water quality in the Poudre River has largely returned to pre-fire condition. Utilities staff provide program management oversight and leads field sampling activities of this program. Annual and 5-year water quality reports as well as seasonal updates are made available to the public via the Utilities website. (Attachment 6)

Horsetooth Reservoir Water Quality Monitoring

The Water Utility maintains a 20+ year record of water quality in Horsetooth Reservoir. Beginning in 2015, the Utility moved from an in-house monitoring program to a cost-shared monitoring program with Northern Water. This partnership reduced redundancies in effort and offers significant cost-savings for the Water Utility. Under this agreement, Northern Water collects samples from Horsetooth Reservoir as part of their baseline water quality monitoring program and the City provides approximately $4000 each year through in-kind contribution of water quality analyses. Northern Water also provides the City all Horsetooth Reservoir water quality data and related reports.

Big Thompson Watershed Forum (BTWF)

The BTWF manages a water quality monitoring program on the Big Thompson River at key locations that influence water quality in Horsetooth Reservoir, as well as other locations on the Big Thompson River that are of interest to the funding partners. The City of Fort Collins, along with the Cities of Loveland and Greeley, and Northern Water are major funders for the BTWF and retains a seat on the BTWF Board of Directors. The Soldier Canyon Water Treatment Authority also contributes. The BTWF holds a joint-funding agreement with the USGS for the collection of all water quality sampling activities. Annual water quality reporting activities are managed by BTWF staff.

Poudre River Monitoring Alliance (PRMA)

The PRMA is a group of seven wastewater dischargers on the Poudre River who coordinate efforts to assist participants in meeting sampling requirements of certain water quality regulations and to demonstrate stewardship by tracking the quality of the Poudre River over time. The geographical scope of this program spans from just above the City’s Mulberry Water Reclamation Facility to downstream of the City of Greeley’s outfall near the confluence with the South Platte River. Utilities Watershed Program staff manage the PRMA while the Utilities Pollution Control Laboratory staff conduct the water quality sampling for the City and conduct sample analysis and reporting for the program partners. The Water Utility funds approximately $24,000 for maintenance of five PRMA sampling sites, with approximately 67% of the total cost offset by in-kind contributions of laboratory services.

Halligan Water Supply Project

Water quality studies are critical for the Project’s ongoing federal permitting and the required State water quality certification process. Currently, Watershed Program staff are collecting water quality information on Halligan Reservoir as well as the North Fork of the Poudre River. The data has been and will continue to be used to construct detailed water quality models, which will be used for future river health work.
State of the Poudre-A River Health Framework and Report Card

A collaborative project between Natural Areas and Utilities, the River Health Assessment Framework (RHAF) is a tool to understand current and future stresses on the Poudre River from the lower Poudre Canyon to just below I-25 and align management practices with desired outcomes. The RHAF is built around 10 indicators that represent the essential physical, chemical, and biological elements of the river ecosystem. The tool uses an academic grading scale (A, B, C, D, and F) to relate the sense of health or impairment in a way that is designed to be easily understandable. Grading guidelines provide specific criteria to describe the existing condition and/or magnitude of dysfunction to warrant a given grade. Each indicator and its metrics can be quantitatively evaluated, but lacking specific data, metrics can be assessed using best professional judgement following the established grading guidelines. The findings and grading for each zone of the River are summarized in the Poudre River Health Report Card. (Attachment 7)

The RHAF is significant because it supports the broad set of watershed services that a healthy River provides to the City. These include a reliable water supply; floodplain and stormwater management; clean water; ecological health; and a source of recreation, health and wellness for the community. There are a diverse and complex set of City objectives related to these watershed services and the RHAF, through data and metrics provides insight into how the City can improve outcomes for the community.

Key Partnerships

As noted above, the Poudre River provides a broad set of watershed services to a diverse set of stakeholders, including the City. Collaboration is critical to ensuring that this shared resource is healthy and resilient. To that end, the City has and will continue to engage in many partnerships to support the City's goal of sustaining a healthy and resilient river. Some of these partnerships are highlighted in sections above. Additional partnerships of note include:

Water Supply Partnerships

The Water Utility collaborates with other water users of both the Poudre River and Horsetooth Reservoir through water sharing agreements, water sales and delivery agreements, shared infrastructure, and other specific agreements. For example:

- In 2013, FCLWD purchased 5 million gallons of excess capacity in the Water Utility's Water Treatment Facility.
- The Water Utility and the Soldier Canyon Treatment Authority partnered in 2013 to fund the pre-sedimentation basin on the Pleasant Valley Pipeline to pretreat runoff from the High Park Fire.
- The Water Utility's Water Treatment Facility and Soldier Canyon Filter Plant utilize interconnects between the two water systems to share water during plant shutdowns and in other scenarios where additional treated water is needed by either party.
- City staff partnered with ELCO and FCLWD in 2018 to host a Growing Water Smart Workshop focused on the nexus between water and land use planning. This effort served as a foundation for future water resource planning in the Growth Management Area and integration of that planning into the recent City Plan update.

Regional Water Projects

In addition to the City's Halligan Water Supply Project (Halligan), there are five other major water supply projects in the Northern Colorado region. They include the Northern Integrated Supply Project (NISP), the Seaman Water Supply Project (Seaman), the Thornton Water Project (Thornton), the Windy Gap Firming Project and the Moffat Collection System Project. These projects are in various stages of permitting. Utilities and other City staff have focused mainly on the projects that effect the Poudre River, which include the Halligan, NISP, Thornton, and the Seaman.

Northern Integrated Supply Project (NISP)

The Northern Integrated Supply Project (NISP) is a water development and storage project proposed by the Northern Water on behalf of 15 municipalities and water providers, mainly south and east of Fort Collins. FCLWD,
which serves portions of southeast Fort Collins, is a NISP participant and will receive water from the project. NISP will draw water from the Poudre River. One of two proposed reservoirs for NISP, "Glade Reservoir" will be located near Ted’s place north of Fort Collins. In order to be constructed, NISP needs a variety of permits and approvals from federal, state, and local entities.

City Staff has been actively involved in NISP and NISP-related issues since the federal permitting process began in 2004. The City has submitted official comments prepared on various NISP permitting documents, such as: the draft environmental impact statement (“EIS”) in 2008; the supplemental draft EIS in 2015; the fish and wildlife mitigation and enhancement plan in 2017; and the final EIS in 2018. In addition to official comments, City Council authorized and directed City Staff in Resolution 2018-053 "to meet with Northern Water to seek to negotiate regarding NISP, and if Northern Water is so willing, to engage in negotiations regarding NISP."

Pursuant to that direction, City Staff and Northern Water (on behalf of the NISP participants) have met 8 times (between August 2018 and May 2019) to discuss the key priorities for both the City and Northern Water. The priorities that have been discussed are those described in Resolution 2018-053 and include:

- Water quality;
- Maintaining resilience and mitigating flood risk;
- Adequate availability of water supply to serve the region;
- Leveraging shared resources;
- Maintaining and enhancing the health of the Poudre River corridor, including environmental flows; and,
- Development of a structured and effective adaptive management approach.

Discussions to date have also included identification of options for addressing these priorities with a focus on options that are mutually beneficial to both parties. Some examples of opportunities discussed to date include:

- Partnering on flood risk and stormwater quality mitigation in areas of the Poudre River Corridor that are high priorities for both the City and for the NISP participants;
- Exploration of various management approaches for maintaining cooler temperatures in the Poudre River, particularly from Lemay Avenue to I-25;
- Exploration of options for the City to facilitate the NISP low flow conveyance realignment (i.e. diverting NISP water further downstream than initially planned for NISP) in support of maintaining minimum flows in the river through town as far downstream as feasible;
- Exploration of options to maintain springtime peak flows in the river, including the potential use of City water rights to create an environmental pool in Glade Reservoir;
- Collaboration on a study to identify sources of E. coli contamination in stormwater runoff; and,
- Partnering on retrofits of existing river diversion structures to facilitate fish and flow passage and support river connectivity.

The adaptive management approach outlined in NISP’s plans and environmental impact statement, and an overall collaborative framework to support a healthy Poudre River is a significant topic of focus in these discussions. Components of this conversation include:

- Adaptive management/collaborative framework governance structure;
- Identification of NISP’s predicted impacts and associated adaptive management and mitigation commitments, and ecological objectives and how those commitments intersect with an overall healthy Poudre River strategy;
- The role of the City in NISP’s adaptive management program;
- The level of funding needed from NISP to support their adaptive management commitments; and,
- Opportunities to utilize consistent data collection, analysis, and reporting methodology to support both the NISP adaptive management approach and the overall Poudre River collaborative framework.

City Staff will continue to meet with Northern Water to develop approaches and potential agreements or other instruments to memorialize commitments related to the priorities outlined above. Any draft agreements between the City and Northern Water would require approval by the City Manager or City Council pursuant to City Code Section 1-22.
Natural Areas River Partnerships

As part of their core mission, the City’s Natural Areas Department (NAD) purchases properties in the Poudre River floodplain for the purpose of conserving habitats. Because floodplain habitats are dependent on conditions in the river, NAD takes a multi-pronged approach to supporting Poudre River health. To accomplish the whole river system health objective and support other City initiatives, NAD engages with staff in the Water Utility, Wastewater Utility, Stormwater Utility, Parks, and Parks Planning to ensure an integrated approach and to enable a project to meet multiple objectives.

The NAD program has been working on restoring the river-floodplain connection to foster both aquatic and forest health. Because there are many diversion structures on the Poudre River, fish populations are prevented from accessing upstream and downstream habitats they need to thrive. NAD has been working with key partners to install fish passage to allow fish to move upstream as needed.

The Water Utility and Natural Areas also partnered on the construction and operation of Rigden Reservoir. Partnering allowed reduced costs for construction to both entities and helped Natural Areas improve adjacent properties including Topminnow and Running Deer Natural Areas.

Instream Flow Augmentation Plan

Natural Areas engages in a variety of regional water and flow related initiatives to protect or improve flow in the river. High spring flows are central to maintaining healthy habitats and during the fall and winter months the Poudre River experiences extremely low flows in certain places. Consequently, NAD and other City Staff are working to maintain the critical high flows as well as developing mechanisms for improving low flows. One such effort is being part of a regional collaborative to establish a legal mechanism for local water users to add water to the Poudre River and to protect that additional water from being diverted by others while it is in the river. This effort was previously known as an “instream flow augmentation plan,” but is now more commonly called the “Poudre Flows Plan” (the “Plan”).

Since 2013, the City has worked collaboratively with other Poudre River stakeholders (including the City of Thornton, the City of Greeley, Northern Water, the Cache a Poudre Water Users Association, the Colorado Water Conservation Board, and Colorado Parks and Wildlife) to develop the Plan with the goal of augmenting flow in the river for environmental benefit. If successful, the Plan could present a new approach for the development and protection of instream flows below the canyon mouth of the Poudre River, which is an objective that has been discussed for at least 40 years and that at times has appeared virtually unattainable. The Plan is an innovative application of Colorado water and remains in development.

CONCLUSION

The Water Utility is focused on providing high quality, reliable water service to our customers in an efficient manner. We utilize many strategies to meet our service commitments and continually seek to improve the level of service we provide. Key strategies related to water supply and water quality may be summarized as follows:

1. Planning – we plan so that we may provide reliable, high-quality water service to current and future customers.

2. Monitoring – we monitor the quality of our source water and our finished water to protect public health and to provide treated water of the highest quality.

3. Watershed Resiliency – we invest resources in protecting our watershed and natural resources so that we may be resilient to a changing climate and other vulnerabilities.

4. River Flows – we seek opportunities to promote both high flows and maintenance of low flows to support river health.

5. System Renewal – we are proactive in renewing our system as to eliminate and or minimize service interruptions and to contribute to the safety of our community.
6. Partnerships – we are committed to collaborating with key partners to ensure we utilize our water resources in an efficient and effective manner while protecting river health and its ecosystem. These strategies support our water supply, watershed, and water quality programs to ensure the level of water service that our community deserves.

ATTACHMENTS

1. Water Districts Map (PDF)
2. Water Supply System Map (PDF)
3. Halligan Water Supply Project Agenda Item Summary (PDF)
4. 2012 Water Supply and Demand Management Policy (PDF)
5. Fort Collins Source Watersheds Map (PDF)
6. 2017 Five Year Upper Poudre River Water Quality Report (PDF)
7. Poudre River Health Report Card (PDF)
8. PowerPoint Presentation (PDF)
City of Fort Collins Raw Water Facilities

Legend
- City GMA
- Continental Divide
- Major Watershed Streams
- Water Bodies
- Water Districts
- Fort Collins Utilities (Water)
- ELCO Water District
- Fort Collins Loveland Water District
- Sunset Water District
- West Fort Collins Water District
- Colorado Big Thompson Facilities
- Tunnel
- Pipes
- Canals

Key
- CFC - City of Fort Collins
- NPIC - North Poudre Irrigation Company
- NW - Northern Water
- USBR - U.S. Bureau of Reclamation
- WSSC - Water Supply and Storage Company

City of Fort Collins Water Supply System

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WORK SESSION ITEM
City Council

SUBJECT FOR DISCUSSION

Halligan Water Supply Project Update.

EXECUTIVE SUMMARY

The purpose of this item is to update City Council on the current status of the Halligan Water Supply Project (Project), including key milestones and activities planned for 2019. The City has been in the formal federal permitting process for this project since 2006.

The Project is needed to meet treated water demands of future Utilities customers and will provide added reliability for all Utilities customers, in case of prolonged drought and uncertainties such as wildfires or infrastructure failures.

The U.S. Army Corps of Engineers (Corps) plans to release the Draft Environmental Impact Statement (DEIS) this year as the Project reaches a key milestone in the federal permitting process. At the same time the City will release a Conceptual Mitigation Plan for the Project and an Operations Plan for the Enlarged Halligan Reservoir. Release of these documents marks a key milestone when the public will be able to review and comment on the project.

GENERAL DIRECTION SOUGHT AND SPECIFIC QUESTIONS TO BE ANSWERED

Does Council have any specific questions about the public process?

Does Council have any questions or concerns regarding the current plan for moving forward with the Halligan Water Supply Project?

BACKGROUND / DISCUSSION

Water Supplies and Demands

The Fort Collins Utilities' (Utilities) main sources of water supply are the Cache la Poudre River (Poudre River) and the Colorado-Big Thompson Project (CBT) (Note: Attachment 5 provides a glossary of key terms and acronyms used throughout this document.) On average, Utilities annually uses approximately an equal amount of water from these two sources. The Poudre River supplies are delivered to the City's Water Treatment Facility through two pipelines that divert off the Poudre River near Gateway Natural Area. Joe Wright Reservoir is located near Cameron Pass on a tributary to the Poudre River, has an active capacity of about 7,100 acre-feet, and is the only storage reservoir fully owned and operated by Utilities that directly provides water to the City's Water Treatment Facility. Utilities owns units in the CBT project, which is administered by the Northern Colorado Water Conservancy District (Northern Water). These CBT units are delivered to Utilities out of Horsetooth Reservoir, which is not owned or operated by Utilities. Northern Water has policies that limit the Utilities' ability to store excess water in Horsetooth Reservoir for use in later years.

Utilities currently delivers about 24,000 acre-feet per year of treated water to its customers and around 3,000 acre-feet per year of untreated (raw) water for irrigation of City parks, golf courses, cemetery, and other green belt areas. Per capita treated water demands, which are measured in gallons per capita per day (gpcd) and exclude large contractual use, have declined significantly over the last couple of decades from about 200 gpcd to around 145 gpcd more recently. This is about a 28 percent reduction in per capita water use and shows the effectiveness of
Utilities’ water conservation efforts. Water conservation efforts are ongoing, but conservation alone is not enough to meet future water demand.

The current water supplies for Utilities are adequate in most years. However, these snowpack driven water supplies can vary significantly throughout the year and from year to year. Per the Water Supply & Demand Management Policy (Attachment 1), Utilities maintains enough water supply to meet demands through at least a 1-in-50 year drought event in the Poudre River basin while maintaining 20 percent of the annual demand in storage (storage reserve factor) to provide extra protection against emergency situations. In addition, the Policy directs Utilities to plan for a demand level (150 gpcd) that is higher than the water conservation goal (currently 130 gpcd by 2030). These criteria provide a water supply planning approach that addresses uncertainties such as climate change, river administration changes, system outages, and competing water rights.

The amount of future water supplies needed for the Utilities water service area depends on population and commercial growth. Utilities currently services about 134,000 treated water customers. The water service area population is projected to grow to about 178,000 by the year 2065. In addition, large contractual water use is expected to increase in the future. Utilities’ total projected treated water demand is expected to be about 38,400 acre-feet per year by the year 2065. These projected values are the basis of the purpose and need for the Halligan Water Supply Project.

A key concern for Utilities is that its water supplies are highly reliant on CBT project storage. Utilities has very little storage for its Poudre River water supplies, which restricts its ability to effectively manage these supplies and meet demands if the CBT supplies were ever unavailable. The Halligan Water Supply Project will allow Utilities to meet its projected demands, while also providing a storage reserve for emergency water shortage scenarios (e.g., infrastructure failures and impacts of wildfires) and a place to store water for later use. In addition, the Project aligns with other City Strategic Objectives such as ENV 4.6: provide a reliable, high-quality water supply and ENV 3.6: Invest in utility infrastructure aligned with community development.

**Halligan Water Supply Project**

Halligan Reservoir is an existing reservoir on the North Fork of the Poudre River (North Fork). It is located 24 miles up the North Fork from the confluence with the mainstem of the Poudre River at Gateway Park. The Project includes raising the existing Halligan Dam by approximately 25 feet to increase reservoir capacity by 8,125 acre-feet, from the existing 6,400 acre-feet to a total of approximately 14,525 acre-feet. Water in the existing 6,400-acre-foot Halligan Reservoir is currently used and operated by the North Poudre Irrigation Company (NPIC). After the enlargement of Halligan Reservoir, NPIC will continue to use and operate 6,400-acre foot of capacity in the reservoir.

The Project provides improvements to the existing North Fork habitat, as shown in Attachment 2. Triple bottom line benefits of the Project are demonstrated by supplying a cost-effective, reliable water supply, while providing significant environmental benefits to the North Fork of the Poudre River downstream of Halligan Reservoir.

The City has been involved in the Halligan Project since the late 1980s. Key milestones and City Council approvals for the project are shown on the timeline provided as Attachment 3.

**Federal Permitting Process**

Utilities officially entered the joint National Environmental Policy Act (NEPA) and Clean Water Act Section 404 permitting process in 2006. The lead permitting agency is the U.S. Army Corps of Engineers (Corps). The NEPA process requires the Corps to consider and disclose the analysis of potential environmental impacts and reasonable alternatives to any major federal action, such as the issuance of a permit under Section 404 of the Clean Water Act. To comply with NEPA the Corps is required to prepare an environmental analysis. The major components of this analysis are summarized in this section.

The NEPA process has many steps which are shown in Figure 1. The process includes:

- Determining the Utilities’ purpose and need for the proposed Project,
- Considering alternatives to the proposed Project (described below), and
- Providing detailed environmental analysis of all alternatives.

The detailed environmental analysis is summarized in the Draft Environmental Impact Statement (EIS), which is provided for public review and comment. Following public comment on the Draft EIS, the Corps will evaluate comments and address them for inclusion in the Final EIS. A Record of Decision will then be provided determining the Least Environmentally Damaging Practicable Alternative (LEDPA). Under the Clean Water Act and its regulations, the Corps must permit the LEDPA, which may or may not be the City’s preferred alternative of the enlargement of Halligan Reservoir.

In addition to the federal permitting process, several state and county processes also need to be conducted. These will be conducted in parallel with preparation of the Final EIS and are described in more detail below.

![Diagram of NEPA Process]

**Figure 1. The NEPA Process**

**EIS Alternatives**

The federal permitting process requires an identification and evaluation of alternatives to the City’s preferred alternative of the enlargement of Halligan Reservoir that will meet the purpose and need (provide firm yield for Fort Collins Utilities in 2065). These alternatives are:

- **Expanded Glade Reservoir: Enlargement of the proposed Glade Reservoir, part of the Northern Integrated Supply Project (NISP), which is currently also in the federal permitting process and under review by the Corps. This alternative is contingent on NISP being permitted.**
- **Agricultural Reservoir Enlargement: Purchase of dedicated storage space in existing agricultural reservoirs located north of Fort Collins.**
- **Gravel Pit Reservoir Enlargement: Involves using existing gravel pits located northwest of Fort Collins.**
- **No Action: See below.**

Each of the non-Halligan Reservoir Enlargement “action” alternatives would require pumping and associated greenhouse gas production, a larger area of disturbance, considerable pipeline infrastructure required to connect to Utilities’ Water Treatment Facility, and pretreatment of the water before reaching the Water Treatment Facility. The additional requirements of these alternatives result in higher capital and operations and maintenance costs than those of the enlargement of Halligan Reservoir. Capital and annual operation and maintenance costs of the other “action” alternatives are up to five times greater than those required for the Halligan enlargement.

The No Action alternative describes what actions would be taken should the Corps not issue a permit to construct the Halligan Reservoir enlargement or one of its alternatives. The No Action Alternative includes:

1. Change in operation of Joe Wright Reservoir;
2. Acquisition of additional water rights (over what is currently projected to be obtained); and

The NEPA process is required to include an evaluation of No Action as part of the EIS. However, the No-Action Alternative does not meet the purpose and need because mandatory drought restrictions would be necessary to provide water through the 1-in-50-year drought and even with water restrictions, the storage reserve is not met during the 1-in-50 year drought.

**Halligan Project Benefits and Impacts**

The Draft EIS will summarize impacts related to the enlargement of Halligan Reservoir and the alternatives summarized above. This section summarizes the impacts of only the enlargement of Halligan Reservoir.

In addition to meeting future demand and providing a reliable water supply, the enlargement of Halligan Reservoir has many benefits. The most significant benefits are summarized below:

- It enlarges an existing reservoir, creating fewer environmental impacts than building a new reservoir.
- It is the most cost-effective option to meet Utilities’ water storage needs. According to current cost estimates, it is less than $10,000 per acre-foot of firm yield, which is about eight times less expensive than the current cost of firm yield for CBT water.
- It will provide year-round flows on the North Fork of the Poudre River, a river that is currently segmented because it runs dry in some locations due to existing diversions and structures. These flows will reconnect the river and improve the fishery and aquatic habitat downstream of the Halligan Dam. (Attachment 2)
- It will be gravity-fed, and no pumping will be required to fill the reservoir or convey the water to the Poudre River to be exchanged to the Utilities’ Water Treatment Facility. Therefore, no greenhouse gas emissions will be generated during reservoir operations. This is consistent with the City’s climate action goals.
- It rehabilitates and improves an existing dam that will need to be rehabilitated in the future.
- It has been considered an “Acceptable Planned Project” by the Western Resource Advocates and is supported by other environmental groups such as The Nature Conservancy and Trout Unlimited.
- Portions of the reservoir area may be opened for limited public recreation, providing access to an area that has previously been restricted.

As with any water supply project of this scale, and despite the many net benefits in certain areas, there are some adverse impacts to enlarging Halligan Reservoir.

- Inundation of shoreline and riparian wetlands. (Shoreline wetlands will reform at the enlarged reservoir’s new shoreline, resulting in loss of less than 6 acres (net) of wetlands.
- Inundation of 11 acres of Preble’s Meadow Jumping Mouse (non-critical) habitat.
- Seasonal inundation of 0.75 miles of the North Fork upstream of Halligan Reservoir.
- Minor reduction in stream flows on both the North Fork and mainstem of the Poudre River during runoff season, mainly from the town of LaPorte upstream to Halligan Reservoir and the City’s pipelines.
- Temporary construction impacts such as noise, light, dust, access road improvements, ground disturbance in the area of the dam.

These impacts will be mitigated as part of the federal and state permitting processes.

**Project Cost**

Costs of the Halligan Project were estimated in 2018 and summarized for City Council in a memo dated April 6, 2018 (Attachment 4). The table below provides a breakdown of project costs, including the amount that has already been appropriated for the project and the amount that still needs to be appropriated.

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### Expenses ($Million)

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<td><strong>$36.7</strong></td>
<td><strong>$74.1</strong></td>
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Notes:

1. Life to date costs through February 2019.

2. Debt service payments from 2004 to 2014 were allocated as Halligan project expenses. All future debt service payments will not be accounted as a project cost.

3. Reimbursements were received from former project partners (North Poudre Irrigation Co. and the Tri-Districts) between 2005 and 2014; miscellaneous reimbursements have been and will be collected from the City of Greeley and from rents in the future.

4. Total Utility cost includes debt service and deducts reimbursements.

The current cost estimate, based on conceptual project information, indicates construction could be less than half of the overall cost of the project. Permitting costs to date have exceeded $13 million thus far, and the cost of permitting and mitigation together are anticipated to be over 25% of the total project cost. Anticipated costs of the Project have changed through time, as the size and scope changed, partners withdrew, or new information was identified. The graph below shows unit cost of the project on a per-acre foot basis. At each major change in the project costs have been reevaluated. These milestones are shown on the graph below.

The Project will be mostly funded through development fees, specifically the water supply requirement cash-in-lieu payment which is paid at the time of construction permitting. In addition, fees are collected via the Utilities’ excess water use surcharge assessed on current customers who exceed their annual water allotment. All funding for this Project will come directly from the Water Enterprise Fund, therefore, like all other capital investments made by the utilities, no tax dollars will be directed toward this Project.
Although current cost estimates indicate a total Project cost of approximately $74 million, standard engineering practices indicate total costs can be expected to vary in the future as additional information is obtained and Project requirements are further defined. The next cost estimate update will be performed in 2019, as land acquisition and mitigation needs continue to be refined. Costs will again be updated in 2020 after preliminary design is complete. As a part of each of these cost estimate updates, an annual anticipated spend (i.e. burn rate) will be developed. Annual spend can be expected to fluctuate on the project as the schedule progresses and permitting and design phases are implemented and completed. This information will be shared with Council as it is developed.

The Project continues to be the most cost-effective alternative for meeting the City’s water supply needs. The Project is currently anticipated to provide firm yield at less than $10,000 per acre-foot. For comparison, the current market rate for firm yield from the Colorado-Big Thompson (CBT) Project is approximately $80,000. Unit costs of the Northern Integrated Supply Project (NISP) and Windy Gap Firming Project are currently approximately $27,500 and $19,000 per acre-foot, respectively.

**Schedule**

The Project is approaching a key milestone this year with release of the Draft EIS. Once released, the Draft EIS will be available for public review and comment on the work that has been conducted over the past 13 years. The Corps will address public comments received during the Draft EIS in the production of a Final EIS prior to the Record of Decision (ROD). The schedule for the Final EIS, ROD and construction are largely dictated by the federal permitting process, over which the City has little control. Currently, best estimates place construction beginning in approximately 2024 and lasting approximately two years.

The schedule in Figure 3 shows the remainder of the federal, state and county permitting processes, as well as the schedule for design and construction.
State and County Permitting

In addition to the federal permitting process, several state and county processes also need to be conducted. These will be conducted in parallel with preparation of the Final EIS and are described in more detail below.

- **Fish and Wildlife Mitigation Plan (FWMP):**
  - **Requirements:** A Colorado statute requires a FWMP be prepared to ensure “that fish and wildlife resources that are affected by the construction, operation, or maintenance of water diversion, delivery, or storage facilities should be mitigated to the extent, and in a manner, that is economically reasonable and maintains a balance between the development of the state’s water resources and the protection of the state’s fish and wildlife resources.” A FWMP is the State of Colorado’s position on measures that will be employed to mitigate the impacts to fish and wildlife resources. The FWMP is not a permit but rather a recommendation to the Corps. Typically, FWMPs are integrated into federal permits or are enforced through separate agreements between the water project proponent (i.e., the City) and Colorado Department of Natural Resources.
  - **Timeframe:** Preparation of FWMP concepts will begin in 2020, after the public comments are received on the Draft EIS. The FWMP is anticipated to be complete before the Final EIS is released.

- **401 Certification:**
  - **Requirements:** Section 401 of the Clean Water Act requires that anyone applying for a federal permit or license which may result in a discharge of pollutants into waters of the United States, obtain a certification that the activity complies with all applicable water quality standards, limitations, and restrictions. No license or permit may be issued by a federal agency (such as the Corps) until certification required by section 401 has been granted by Colorado Department of Public Health & Environment.
  - **Timeframe:** The City will enter the 401 Certification process after the public comments are received on the Draft EIS and will be completed prior to the ROD such that the 401 Certification will be recorded in the ROD.
1041 Permit/Matters of State Interest:

- **Requirements:** In 1974, the Colorado Legislature enacted House Bill 74-1041, which authorizes counties to identify, designate, and regulate areas and activities of state interest through a local permitting process to allow counties to maintain their control over certain development projects. Larimer County’s 1041 regulations are in Chapter 14 of the County’s Land Use Code. Section 14.4(k) of the County’s Land Use Code requires a 1041 Permit for:

  
  Site selection and construction of a new water storage reservoir or expansion of an existing water storage reservoir resulting in a surface area at high water line in excess of 50 acres, natural or manmade, used for the storage, regulation and/or control of water for human consumption or domestic use and excluding a water storage reservoir used exclusively for irrigation.

The Project thus needs a 1041 Permit from Larimer County. A 1041 Permit can be awarded through an application and hearing process or through an intergovernmental agreement approved by the Larimer County Board of County Commissioners.

- **Timeframe:** Preliminary work toward the 1041 process for the Project will begin after the public comments are received on the Draft EIS. Once public comments have been received and reviewed, the City and Larimer County will decide whether the Project should pursue an IGA, or instead go through application and hearing process.

- **Recent Developments:** The Larimer County Commissioners have recently invested significant effort in reviewing requests for 1041 permits. Due to this scrutiny, the City is focused on the following to support a positive outcome for the City's Project:

  - An extensive environmental review and public review period provided through the NEPA process.
  - Proactively engaging landowners affected by the enlargement of Halligan Reservoir
  - The Project’s benefit to County residents.

  Staff is continuing to evaluate opportunities to support a positive 1041 permit outcome for the Project.

2019 Activities

Public Process

2019 is a milestone year for the Halligan Project. All indications are that the Corps will release the Draft EIS this year. At the same time, the City will release a Conceptual Mitigation Plan and a Draft Operations Plan.

These documents are briefly defined below.

- **Draft Environmental Impact Statement** – A document that describes the impacts on the environment as a result of a proposed action of the enlargement of Halligan Reservoir. It also describes impacts of other water supply alternatives, as well as plans to mitigate the impacts.

- **Conceptual Mitigation Plan** – A document that describes the City’s proposed approach to avoid, minimize, mitigate, or enhance resources that would be impacted by the enlargement of Halligan Reservoir and other alternatives. It is intended to provide agencies and the public with information that can be reviewed in parallel with the Draft EIS. Further information about the Conceptual Mitigation Plan is provided below.

- **Draft Operations Plan Report** – A document that describes the proposed plan of operations for the Halligan Project and alternatives included in the Draft EIS. The Operations Plan describes the reservoir operations, exchanges, and deliveries to facilities. The report will provide a reasonable depiction of a proposed plan of operations for the enlargement of Halligan Reservoir based on the best information currently available.
Once these documents are released this year, they will be available for public review on the Corps’ website for 30-60 days. All public comments on any of these documents must be sent to the Corps to be included in the Administrative Record for the Project. Staff anticipates many questions will be sent to Council, City leadership, and Staff during this time period. However, the Corps leads the public review and comment effort and as the applicant, the City plays a specific role in the project. During this time, City Staff and Council members can engage in the following ways:

- Answer clarifying questions about the Project.
- Provide the City’s opinion on the Project.
- Present at open houses or other public meetings hosted by the Corps.

However, City Staff and Council members cannot:

- Accept official comments on any of the Project documents. If these comments are not sent to the Corps, they are not considered “official” comments.
- Answer technical questions about contents of the Draft EIS.
- Provide any opinions on behalf of the Corps.

**Conceptual Mitigation Plan**

Utilities Staff has worked with Natural Areas, outside consultants and environmental groups, and other subject matter experts to develop concepts proposed to mitigate potential environmental impacts of the enlargement of Halligan Reservoir. These will be summarized in the Conceptual Mitigation Plan, which will be released for public review and comment in 2019. The Conceptual Mitigation Plan includes alternatives to minimize, mitigate, or enhance resources that would be impacted by the enlargement of Halligan Reservoir and alternatives. It is intended to provide agencies and the public with information that can be reviewed in parallel with the Draft EIS. It is not intended to be the final mitigation plan for the Project, but rather is designed to solicit input. The concepts described will likely change after public and agency input, and the Conceptual Mitigation Plan will be finalized and submitted to the Corps before the Record of Decision is issued.

The process used to identify when mitigation is needed is:

1. Design the Project to avoid impacts to the environment. Avoidance of impacts would be achieved through project design and layout, construction techniques, and operational measures.
2. Minimize measures that remain. Minimization of impacts would also be achieved project design and layout, construction techniques, and operational measures that focus on minimizing impacts that cannot be avoided.
3. Compensate for the remaining potential or unavoidable impacts to environmental and cultural resources described in the Draft EIS. This is called “compensatory mitigation” and would be achieved by restoration, establishment, enhancement, or preservation of those resources impacted by the project, such as wetlands.

In addition to mitigation measures, the Plan also summarizes voluntary measures of environmental enhancement proposed by the City that go beyond mitigation required for the Project. These voluntary measures are intended to improve environmental conditions in the Project area.

The guiding principles used to identify and develop mitigation concepts for the Project include:

- Prioritize opportunities for mitigation near Halligan Reservoir, to enhance or replace function in the North Fork or nearby location.
- Target local, degraded resources for mitigation, which have a greater impact and success than developing new resources.
Focus on concepts that benefit multiple resources or an entire ecosystem. For example, restoration along the North Fork improves not only the fishery, but macroinvertebrates, vegetation, etc.

Identify opportunities to work with local partners.

There are over 50 concepts described in the Conceptual Mitigation Plan that have been developed to avoid, minimize, mitigate or enhance resources affected by the Halligan Project. These will be described in detail in the Plan. The key mitigation concepts are described below:

**North Fork flows and habitat restoration:**
- Measures that establish minimum flows in the North Fork throughout the year and reconnect the currently disconnected stream, as well as other measures to improve flows and habitat.
- Two options have been developed for fish habitat restoration: 1) Retrofit of the existing North Poudre Canal diversion to allow fish bypass (subject to an agreement with North Poudre Irrigation Company) and 2) reintroduction of a pure-strain greenback cutthroat trout in the approximate 5-mile stretch of North Fork between the Halligan dam and the North Poudre Canal diversion (subject to a future evaluation of fatal flaws and agreements with pertinent agencies).

**Public recreation:** Provide limited public access to a portion of the enlarged Halligan Reservoir and its north shoreline. The recreation concept is described further below.

**Water quality:** Design of the raised dam would include a multi-level intake tower to allow selective withdrawals of water from specific locations in the reservoir water column to optimize temperature and dissolved oxygen of releases from the enlarged Halligan Reservoir.

**Wetlands & Riparian Resources:** Alternatives being considered include restoration or enhancement of land along the North Fork or on Robert’s Ranch, where the City owns a conservation easement on approximately 400 acres.

**Construction-related:** Measures include dust mitigation, monitoring for cultural and paleontological resources and wildlife, revegetation and restoration of disturbed areas, restoration of a widened access road, control of noxious weeds, stormwater control, traffic control, etc.

**Monitoring:** Post-construction regulatory and non-regulatory monitoring and ecological management measures to ensure that the expected benefits of the mitigation and enhancement efforts are achieved.

**Recreation**

Staff has developed a concept that would open portions of the enlarged Halligan Reservoir and its north shore to limited public recreation, including fishing, human-propelled boating while fishing, and wildlife viewing. Recreation would be provided at the enlarged Halligan Reservoir in order to mitigate the loss of fishing recreation on the North Fork of the Poudre River upstream of Halligan Reservoir, where a 0.75-mile stretch of the river will be inundated with the enlargement. This portion of the North Fork is currently publicly accessible through Cherokee State Wildlife Area. Opening Halligan to recreation also aligns with the City’s Strategic Plan, including providing a wide variety of high-quality recreation services and cultural opportunities.

The following goals of recreation at the enlarged Halligan Reservoir guided the development of the recreation concept:

- Provide safe public access.
- Maintain the primitive spirit of the Halligan Reservoir area.
- Avoid and minimize overuse impacts to the landscape, fish, wildlife, and vegetation.
- Minimize issues related to trespassing on surrounding private property.
- Maintain security of Halligan Dam and water quality of Halligan Reservoir.
Recreational access would be provided through the road owned and maintained by Colorado Parks and Wildlife from County Road 80C/Cherokee Park Road. This road is open to high-clearance 4x4 vehicles from May 2nd through August 31st.

- Drive-in access from during the summer (May 2 through August 31).
- Walk-in access (2 miles) on the CPW Road outside of summer (September 1 through May 1).

CPW has indicated that they would be willing to grant the City an easement across State Wildlife Area lands to provide public access to an enlarged Halligan Reservoir, if recreation at the enlarged reservoir is managed in a manner that is consistent with regulations for State wildlife areas (SWAs). SWAs are state or privately-owned lands that offer wildlife-related recreation to the public, mostly focused on hunting and fishing. These parcels of SWA land are paid for by sportsmen and women and managed under state law by Colorado Parks and Wildlife for hunting, fishing, observation, management, and preservation of wildlife. Due to the goals outlined above and the nature of the adjoining SWA property, recreation at the enlarged Halligan Reservoir would need to be carefully managed to be consistent with SWA regulations that limit recreational uses to those related to wildlife. As such, paddle boarding or use of other water craft without the purpose of fishing would be prohibited.

Limitations of Recreation Concept Development:

Based on conversations with local landowners, Colorado Parks and Wildlife staff, and Natural Areas staff, several significant limitations must be considered when developing a concept that opens Halligan Reservoir to public recreation. The area has unique challenges that accompany the remote, pristine, high-elevation nature of the area. These challenges are summarized below:

- Safety: Safety of those who recreate at Halligan Reservoir is a key concern. Strong winds combined with the fact that the dam spills on a yearly basis will require development of a robust safety and security plan. Safety measures may include a buoy system that can withstand the forces of ice and fluctuating water levels and preclude access to the east half of the reservoir, a dedicated staff to patrol and control access to the site, and safety mechanisms to address those who underestimate the strength of the wind and cannot paddle back to the western shore. These concepts have not yet been developed.

- Environmental protection: Based on discussions with City Natural Areas staff and Colorado Parks and Wildlife staff, a recreation area that includes a body of water will be a highly attractive place for recreators. Engineering controls will need to be implemented to limit the number of visitors to the site, such as a limited parking lot occupancy, dedicated staff to patrol the parking lot and turn away excess cars, and a monitoring plan to monitor impacts to the environment on a predetermined basis and implement environmental controls as necessary.

- Landowner concerns: The Landowners Association of Phantom Canyon Ranches is a preservation-minded group of landowners who greatly value land conservation and the pristine nature of the land around Halligan Reservoir. They have had exclusive access to the reservoir since 1987 and currently have an exclusive lease from the City of Fort Collins which is in effect until the Project begins construction. They are very concerned about public trespass onto their property and the potential environmental degradation associated with opening the area to public access. Staff is working closely with landowners to identify their concerns, which would ultimately be addressed in a Safety and Security Plan for the Halligan site.

Board/Commission Review

This item was presented to Water Board most recently on January 17, 2019. Feedback from Water Board included consideration of how overflow parking would be addressed, installation of buoys to prevent recreators from approaching the dam, and interest in fishing and kayaking downstream of dam. In addition, a memo about the Project was sent to all City boards on March 13, 2019 providing an opportunity to present the Project to each board.
Staff is scheduled to present an update on the project to the following boards in the next two months:

- Natural Resources Advisory Board
- Zoning Board of Appeals
- Transportation Board
- Energy Board
- Senior Advisory Board
- Cultural Resources Board

Public Outreach

In order to prepare for release of the Draft EIS, Conceptual Mitigation Plan, and Operations Plan, Staff has developed plans for public engagement and communication that focus on communications with project stakeholders and the public in order to:

- Develop public awareness about the Project and the opportunity to review and comment.
- Provide education about the Project, including purpose and need, the permitting process, timeline, impacts, and benefits.
- Provide education about the Project compared to other regional water supply projects such as NISP (includes Glade Reservoir), Windy Gap Firming Project (includes Chimney Hollow Reservoir), and Moffat (includes Gross Reservoir).

Public outreach to date has included articles in the Coloradoan, Utilities bill insert, presentations at CSU and the Chamber of Commerce, meetings with project stakeholders, updates to City and County Boards, updates to legislators and answering email questions and SARs.

Staff will continue to update the City’s project-specific website at https://www.fcgov.com/halligan/. Citizens can sign up at this website to be emailed updates on the project as they occur. Furthermore, an email address and internal process has been set up specifically for public communication related to this project: halligan@fcgov.com. This email address is being used to answer general questions about the project and guide citizens to the Corps’ website, where they can later find the documents.

ATTACHMENTS

1. Water Supply Demand Management Policy (PDF)
2. Current and Proposed River Conditions (PDF)
3. Project Timeline (PDF)
4. Halligan Cost Update Memo April 6, 2018 (PDF)
5. Glossary of Key Terms (PDF)
6. PowerPoint (PDF)
City of Fort Collins

Water Supply and Demand Management Policy

The City of Fort Collins’ Water Supply and Demand Management Policy provides a foundational framework for water supply and demand management decisions concerning the City’s water supply system. Operational and management actions and decisions by the Water Utility will be consistent with the provisions of this policy.

Objective

To provide a sustainable and integrated approach to 1) ensuring an adequate, safe and reliable supply of water for the beneficial use by customers and the community and 2) managing the level of demand and the efficient use of a scarce and valuable resource consistent with the preferences of Water Utility customers and in recognition of the region’s semi-arid climate.

This objective aligns with the 2010 Plan Fort Collins that provides a comprehensive 25-year vision for the future development of Fort Collins. Policy ENV 21.2 of Plan Fort Collins states, “Abide by Water Supply and Demand Management Policy: Provide for an integrated approach to providing a reliable water supply to meet the beneficial needs of customers and the community while promoting the efficient and wise use of water.”

This Water Supply and Demand Management Policy calls for a “sustainable and integrated approach” to water demand and water resources management. Sustainability is defined within the context of the triple-bottom-line decision making in Plan Fort Collins as, “To systematically, creatively, and thoughtfully utilize environmental, human, and economic resources to meet our present needs and those of future generations without compromising the ecosystems upon which we depend.” Aligning with Plan Fort Collins, the Water Utility will take a leadership role by incorporating the triple-bottom-line in its management of water supply and demand. When this core value is applied to the use and development of our valuable water resources, the Utility will strive to:

- Avoid, minimize or offset impacts to our environment
- Consider the social benefits of having a reliable and high quality water supply for health and safety, economic prosperity and healthy landscapes, as well as a healthy natural environment
- Analyze the cost to provide such supplies, while also considering the effects it has to our local and regional economies

Managing water supply and demand is a dynamic process that evolves along with changes in data management and technology, legal and political environments, economic development and water innovation, and as the State’s population continues to increase. Given these factors, it is important to maintain an up-to-date effective policy that is based on current data. The policy’s terms and conditions should be reviewed and updated by 2020, or sooner if desired by the City Council or the Utilities Executive Director.
1.0 WATER USE EFFICIENCY AND DEMAND MANAGEMENT

The City views its water use efficiency program as an important proactive response to supply variability and climate change. Elements of the City’s conservation program include reducing indoor demand through improved technology, leak reduction and behavior change and reducing outdoor demand through improved irrigation efficiency and reasonable changes in landscaping. The City believes water use efficiency is of vital importance for many reasons, including to:

- Foster a conservation ethic and eliminate waste
- Demonstrate a commitment to sustainability
- Provide water for multiple beneficial purposes
- Reduce the need for capital expansion projects and certain operational costs
- Prepare for potential impacts of climate change

1.1 Water Use Efficiency Goals for Treated Water Use

The City’s 2009 Water Conservation Plan1 established a goal of reducing the City’s treated water use to 140 gallons per capita per day (gpcd)2 by the year 20203. The City will utilize water use efficiency measures and programs with the aim of reducing its water use to an average of 140 gpcd, subject to 1) continuing study of the water requirements of the City’s urban landscaping, 2) impacts on water demand due to changes in land use policies, building codes and housing trends, 3) additional studies on climate change, and 4) changes in the water use goal as may be adjusted by any subsequent water conservation plans. This water use goal is subject to change as discussed above and is intended as a goal that can be met while sustaining reasonable indoor and outdoor values of the City.

The per capita peak daily demand4 will be reduced or maintained to be no more than 350 gpcd by the year 2020, but may be adjusted by any subsequent water conservation plans.

1.2 Water Use Efficiency Program

Policy ENV 21.2 of Plan Fort Collins states, “Conservation measures should be implemented in accordance with the Water Conservation Plan and periodically adjusted to reflect new and effective conservation measures.” The City will optimize water use efficiency through the programs and measures specified in its Water Conservation Plan. These programs and measures include educational programs, incentive programs, regulatory measures and operational measures. Specific measures and programs are outlined in the Water Conservation Plan.

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1 State guidelines are changing the terminology of Water Conservation Plans to Water Use Efficiency Plans, and likewise conservation is being changed to water use efficiency. For purposes of this policy, water use efficiency is referred to as water conservation; however, the terminology may be used interchangeably.
2 Gallon per capita per day (gpcd) calculations are based on the total treated water produced at the Water Treatment Facility for use by Water Utility customers (minus large contractual customers and other sales or exchange arrangements) divided by the estimated population of the Water Utility’s service area.
3 This goal represents an 8.5% reduction in water use compared to Fort Collins’ 2006-2010 average daily water use of 153 gpcd. It represents a 29% reduction in water use compared to Fort Collins’ pre-drought (1992-2001) average daily water use of 197 gpcd.
4 The peak daily demand is 2.5 times the average daily use water conservation goal and is based on historic ratios of average to peak daily use.
The overall effectiveness of these measures and programs will be evaluated on a regular basis and if necessary, modifications will be made to increase effectiveness or to modify the City’s water use goal. An annual water conservation report will be prepared to describe the status and results of the various measures and programs. The Water Conservation Plan will be updated at a minimum of every seven years, as currently required by the State of Colorado.

1.3 Water Rate Structures

The City will have stable water rate structures with transparent accountability for all classes of customers. The water rate structures will provide an economic incentive to use water efficiently while also providing sufficient revenue for operational and maintenance purposes. Examples of structures that may be utilized include 1) tiered rates with increasing prices as water use increases, 2) seasonal blocks with higher rates during the irrigation season, and 3) water budget approaches based on appropriate targets for individual customers.

The City will annually review the effectiveness of its water rate structures as part of its financial analyses regarding Water Utility revenue, expenses and rates. Specific studies or changes to the rate structure may be made upon identification of the need to revise it. Any changes to the rate structure will require City Council approval.

1.4 Population Growth

Population growth is an important factor in determining the City’s water supply needs, since increases in population generally increase the need for additional supplies. Population growth projections and associated water demand are mostly a function of land use planning, development densities, annexation and other growth related issues that can be affected by City Council decisions. The Water Utility will continue to work closely with the Current Planning Department, which provides population projections that may be effected by changes in City policies related to growth.

2.0 WATER SUPPLY RELIABILITY

The City needs to meet future water demands in an efficient and reliable manner. Policy ENV 21.2 of Plan Fort Collins states, “Water supply reliability criteria will take into consideration potential effects of climate change and other vulnerabilities. Water supplies and related facilities shall be acquired or developed after careful consideration of social, economic and environmental factors.” One of the Water Utility’s primary objectives is to provide an adequate and reliable supply of water to its customers and other water users. Key principles that need to be considered when addressing water supply for municipal use include:

- Providing water supply system reliability and flexibility
- Considering a broad portfolio of resources that do not overly depend on any one source
- Maintaining a water storage reserve for unforeseen circumstances
- Maintaining water supply infrastructure and system security
- Being a steward of the City’s water resources, which includes watershed management
- Collaboration with the City’s regional water providers and users
- Maintaining awareness of state, national and worldwide trends and adapting as needed to meet our customer needs
2.1 Water Supply Planning Criteria

An integral component of the City’s water supply planning efforts is to maintain computer models that estimate the yield of its existing and future water supplies. The following water supply planning criteria are key parameters used in these models that provide a foundation for planning future supplies.

2.1.1 Planning Demand Level

The reliability of the City’s water supply should be maintained to meet an average per capita demand level of 150 gpcd\(^5,6\). This planning level provides a value that is higher than the water use goal to address uncertainties inherent in water supply planning.

It is important to have a planning number that can be used for development of long-range water supply facilities. Because water supply system infrastructure may take many years to permit and construct, it is desirable to use conservative assumptions to size facilities that may be needed for the long-term. A planning demand level should be larger than the water use goal, primarily because of the uncertainties related to projected water demands, yields from specific water rights, climate change and other unanticipated effects.

2.1.2 Drought Criterion

The reliability and capacity of the City’s water supply system should be maintained to meet the planning level demand during at least a 1-in-50 year drought event in the Cache la Poudre River Basin. Water rights should be acquired and facilities (including storage capacity) should be planned and constructed sufficiently ahead of the time to maintain the 1-in-50 year drought criterion, considering the time required to obtain water court decrees and permit and construct diversion, conveyance and/or storage facilities. In using this criterion, the City seeks to provide a balance among water supply reliability, the financial investment necessary to secure such reliability and the environmental impacts associated with water storage and diversions.

2.1.3 Storage Reserve Factor

The City’s water supply planning criteria will include a storage reserve factor that equates to 20% of annual demand in storage through a 1-in-50 year drought\(^7,8\). This factor provides an additional layer of protection intended to address dimensions of risk outside of the other

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\(^5\) The 150 gpcd value is based upon the normalized 2006-2011 average daily use.
\(^6\) The average per capita demand planning level is used for facility planning purposes. Gallons per capita per day (gpcd) calculations are based on the total treated water produced at the Water Treatment Facility for use by Water Utility customers (minus large contractual customers and other sales or exchange arrangements) divided by the estimated population of the Water Utility’s service area. This number is multiplied by population projections developed by the City’s Planning Department to calculate future water demands.
\(^7\) For the Water Utility, 20% of annual demand is equivalent to around 3.7 months of average winter demand and about 1.5 months of average July demand.
\(^8\) In meeting this factor, it is assumed that the City cannot rely on the existing Colorado-Big Thompson Project (CBT) carryover program. This program currently allows each CBT unit holder to carry over up to 20% of its CBT unit ownership in CBT reservoirs for use in the following year. However, this program has varied over the years and there is no guarantee that it will be continued in the future.
reliability criteria, including emergency situations (i.e. pipeline failure) and droughts that exceed a 1-in-50 year drought.

2.2 Climate Change

Climate change could significantly impact the reliability of the City’s supplies and/or the amount of water required to maintain existing landscapes\(^9\); however, there is a great deal of uncertainty related to current climate change projections along the Colorado Front Range and its impact on municipal demands and water supply systems. The City’s planning criteria and assumptions are conservative in part to account for climate change based on the information to date. The City will continue to monitor climate change information and, if necessary, will revise its water supply planning criteria and assumptions to ensure future water supply reliability.

2.3 Water Supply Shortage Response Plan

The City will maintain a plan for responding to situations where there are projected water supply shortages, either because of severe drought conditions (i.e., greater than a 1-in-50 year drought) or because of disruptions in the raw water delivery system. When needed, the Water Supply Shortage Response Plan will be activated based on the projected water supply shortage.

This plan will include measures to temporarily reduce water use through media campaigns, regulations, restrictions, rate adjustments and other measures. The plan may also include provisions to temporarily supplement the supply through interruptible water supply contracts, leases, exchanges and operational measures. Reducing the City’s water use during supply short situations may lessen adverse impacts to irrigated agriculture and flows in the Poudre River. The plan will be reviewed periodically and, if necessary, updated to reflect changes in the City’s water use and its water supply system.

2.4 Additional Supplies and Facilities

In order to meet projected growth within the Water Utility’s service area, as well as maintain system reliability and operational flexibility, the City will need to increase the firm yield of its current water supply system. The following policy elements address ways of meeting these needs.

2.4.1 Raw Water Requirements for New Development

The City shall require developers to turn over water rights as approved by the City, or cash in-lieu-of water rights, such that supplies can be made available to meet or exceed the demands of the Water Utility’s treated water customers during a 1-in-50 year drought.

Cash collected shall be used to increase the firm yield and long-term reliability of the City’s supply system. Potential uses of cash include acquiring additional water rights, entering into

\(^9\) Current research indicates that changes in precipitation in this area are uncertain but that temperatures will increase and therefore it is likely that runoff will come earlier and in a shorter amount of time, precipitation may more often come as rain, and higher temperatures will increase outdoor demands and change growing seasons for existing landscapes.
water sharing arrangements with agricultural entities, purchasing or developing storage facilities and pursuing other actions toward developing a reliable water supply system. Consideration will be given to providing a diversified system that can withstand the annual variability inherent in both water demands and supplies. The balance between water rights being turned over and cash received by developers should be monitored and adjusted as needed to develop a reliable and effective system.

2.4.2 Acquisition and/or Sharing of Agricultural Water Supplies

The City currently owns and will acquire additional water rights that are decreed only for agricultural use. The City will periodically need to change these water rights from agricultural use to municipal use to meet its water supply needs. The City will change those rights that come from areas upon which the City is growing, or from areas where the irrigation has ceased, when needed. For water rights that were derived from irrigated agricultural lands that remain in viable agricultural areas, the City will refrain from converting agricultural decrees to municipal use as long as other water supply options are available or other factors make it prudent to do so. The City will also work towards water sharing arrangements that provide water for municipal uses when critically needed and that allow for continued agricultural use of water at other times, in a manner that preserves irrigated agricultural lands over the long-term.

2.4.3 Facilities

The City will pursue the acquisition or development of facilities that are needed to manage the City’s water rights in an efficient and effective manner and enhance the City’s ability to meet demands through at least a 1-in-50 year drought. These facilities may include storage capacity, diversion structures, pipelines or other conveyances, pumping equipment, or other facilities that increase the firm yield of the City’s supply system.

Additional storage will be acquired or constructed considering 1) the City’s return flow obligations incurred from changes of water rights, 2) the City’s need to carryover water from wet years to dry years in order to meet its drought criteria, 3) operational flexibility, redundancy and reliability of the City’s water supply system, and 4) potential multiple-use benefits (i.e., environmental flows, recreational uses, etc.). The City will analyze the potential environmental impacts of developing storage along with other associated costs and benefits, and will develop that storage in a manner that avoids, minimizes or offsets the effects to the environment. Storage capacity options include the enlargement of Halligan Reservoir, the development of local gravel pits into storage ponds, the acquisition of storage capacity in new or existing reservoirs, the development of aquifer storage, or some combination of the above.

3.0 TREATED AND RAW WATER QUALITY

Policy ENV 21.1 of Plan Fort Collins states, “Develop and adhere to drinking water quality standards, treatment practices, and procedures that provide the highest level of health protection that can be realistically achieved.” In addition, the City will take an active role in protecting the quality of water in the various watersheds from which the City’s raw water is derived and maintaining the taste and quality of the City’s treated water. This may include mixing of the City’s source waters to maintain high water quality and require collaboration with private, county, state and federal land owners and managers. The acquisition, development, and
management of the City’s raw and treated water will be consistent with the City’s Drinking Water Quality Policy and other applicable policies related to watershed protection and water treatment.

4.0 USE OF SURPLUS RAW WATER

The City will use its existing supplies to meet municipal obligations with the following priorities: 1) to meet water demands by the City’s treated water customers, and 2) to meet the City’s raw water needs as well as other City raw water obligations. Raw water needs include use for such purposes as irrigation of City parks, golf courses, cemeteries and other greenbelt areas. Additional raw water obligations include primarily water transfers to other entities because of agreements or exchanges made to manage the water supply system more effectively.

Water not needed for the above purposes is referred to as surplus water and may be made available to others in accordance with decrees and other applicable policies. Since the City plans its water supply system using a 1-in-50 year drought criterion, it typically has significant quantities of surplus raw water in many years. This surplus water may be available on a year-to-year basis or through multi-year arrangements that do not significantly impair the City’s ability to meet municipal demands. The City will continue to rent its surplus supplies at a fair market price that helps offset the cost of owning such supplies and benefits the Water Utility ratepayers.

4.1 Commitment to Other Beneficial Purposes

Acknowledging that the City’s use of its valuable water resources has impacts to the environment and the region, the City will commit to using its surplus supplies for other beneficial purposes such as supporting irrigated agriculture, supplementing flows in the Poudre River or providing other regional benefits. The City’s surplus supplies come from a variety of sources, each of which has unique characteristics. These sources include CBT water and shares in several irrigation companies. Some sources are more suitable and available than others to meet beneficial purposes. Whether the surplus raw water can be used for these other purposes is dependent upon a number of factors, including the type of water, place of use and other decree limitations. Any potential use of these supplies should consider, and will likely require coordination with, other water users, state agencies and other groups. Some uses of the surplus supplies, such as maintaining an instream flow according to the State’s Instream Flow Program, may require a change of water rights through the water court process. The City will engage in a thorough evaluation of these issues as part of assessing the use of its surplus supplies for these beneficial purposes.

Utilities will evaluate implementing a program to allow voluntary contributions from its ratepayers (i.e., Utility bill “check-off box”) for programs that are designed to support the following purposes: preserving local agriculture, supplementing flows in the Poudre River, or meeting other beneficial purposes that our community may desire.

4.1.1 Agriculture and Open Space

Policy SW 3.2 of Plan Fort Collins states, “Participate in and follow the Northern Colorado Regional Food System Assessment project and other Larimer County agricultural efforts, and implement their recommendations at a local level, if appropriate.” In addition, Policy LIV 44.1
of Plan Fort Collins states, “Maintain a system of publicly-owned open lands to protect the integrity of wildlife habitat and conservation sites, protect corridors between natural areas, conserve outstanding examples of Fort Collins' diverse natural heritage, and provide a broad range of opportunities for educational, interpretive, and recreational programs to meet community needs.” To the extent that surplus water is available, the City will continue to support the local agricultural economy and help preserve the associated open spaces by renting surplus agricultural water back to irrigators under the respective irrigation companies.

The City will explore long-term rental and sharing arrangements with irrigators\(^\text{10}\) in order to support the regional food system, encourage agricultural open space and other benefits provided by irrigated agriculture, as well as benefit the Water Utility ratepayers.

### 4.1.2 Instream Flows

Policy ENV 24.5 of Plan Fort Collins states, “Work to quantify and provide adequate instream flows to maintain the ecological functionality, and recreational and scenic values of the Cache la Poudre River through Fort Collins.” Recognizing that its water use depletes natural streamflows, the City will seek opportunities to improve, beyond any associated minimum regulatory requirements, the ecological function of the streams and rivers affected by its diversions. The Water Utility will take a leadership role in working with other City departments, local and regional groups and agencies towards the following objectives in accordance with Colorado water law and the administration of water rights in Colorado: 1) encourage flows in local streams to protect the ecosystem, 2) pursue the operation of its water supplies and facilities in a manner that avoids, minimizes or offsets the effects to the environment while meeting customer demands, and 3) explore projects or measures that would provide flows in streams and water in reservoirs for recreational and aesthetic purposes.

### 4.1.3 Other Arrangements

The City will consider and participate in other surplus water supply arrangements with other entities that provide mutual benefits and support the region. These may include other rental agreements, augmentation plans and other cooperative arrangements with regional partners. These types of arrangements should be limited to unique opportunities that are mutually beneficial to the parties and provide significant social, economic or environmental benefits to the region.

### 5.0 REGIONAL COOPERATION

The City recognizes the importance in maintaining good relationships with regional entities and coordinating efforts to achieve mutual goals. The City also recognizes that growing Colorado municipalities are currently struggling to define a way to meet future water supply needs in a manner that minimizes negative impacts to agricultural economies and river ecosystems. The Water Utility will endeavor to be a leader in demonstrating how water supply can be provided in a manner that respects other interests.

\(^{10}\) The City’s largest irrigation company ownership interest is in the North Poudre Irrigation Company, which still has substantial lands in irrigated agricultural production and has a unique mix of native water and CBT water that lends itself to these types of partnership arrangements.
5.1 Working with Other Municipal Providers

The City will continue to work with the water suppliers throughout the northern Colorado Front Range to assure that adequate supplies are maintained in the region. When benefits are identified, the City will cooperate with area entities in studying, building, sharing capacity and operating water transmission lines, distribution systems and storage reservoirs for greater mutual benefit. The City has common interests and the potential to cooperate with regional entities including the water districts around Fort Collins, the City of Greeley and the Northern Colorado Water Conservancy District, as well as other Colorado water providers. In particular, the City should work closely with water districts that serve Fort Collins residents to encourage similar policies regarding drought protection, conservation and to provide mutual assistance during emergencies.

5.2 Working with Local Irrigation Companies

The City will continue to cooperate with local irrigation companies regarding the use, exchange and transfer of water in the Cache la Poudre River Basin. As a major shareholder in many of the local irrigation companies, it is necessary and desirable that the City work closely with these companies. Much of the water supply available to the City is through the ownership of shares in local irrigation companies.

5.3 Working with Others

City Departments will work together and also cooperate with local, state and federal agencies, civic organizations, environmental groups and other non-governmental organizations when common goals would benefit City residents and the surrounding community. Examples of goals that may involve City water supplies and be worthy of collaborative efforts include support for existing and development of new local food sources, promoting open space, improving river flows and supporting the local economy. Such efforts should identify appropriate entities and sources of revenue for specific goals or projects.
Map showing the locations of the City of Fort Collins’ source watersheds
WATER QUALITY TRENDS REPORT 2008 – 2017
Upper Cache la Poudre Watershed Collaborative Water Quality Monitoring Program

June 25, 2018

PREPARED FOR:
Fort Collins Utilities
City of Greeley
Soldier Canyon Water Authority

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City of Fort Collins Utilities
Water Quality Services Division
EXECUTIVE SUMMARY

BACKGROUND

The Upper Cache la Poudre Collaborative Water Quality Monitoring Program (hereafter referred to as the Upper CLP monitoring program) is designed to assist the City of Fort Collins, the City of Greeley and the Soldier Canyon Water Treatment Authority (formerly Tri-Districts) in meeting current and future drinking water treatment goals by reporting current water quality conditions and trends within the Upper Cache La Poudre River (CLP) watershed and summarizing issues that potentially impact watershed health. Annual reports were published in 2008 through 2011 and 2013 through 2016. The last five-year report was published in 2012.

SCOPE OF THE 2017 WATER QUALITY TRENDS REPORT

This water quality trends report analyzes the hydrology, climate, and water quality in the Upper CLP watershed over the last decade. Water quality data collected throughout the Upper CLP watershed were analyzed for long-term trends to determine if concentrations increased, decreased or stayed the same over the ten-year period of record from 2008 to 2017. This report documents 1) watershed impacts and issues of concern; 2) significant trends in climate, hydrology, and water quality in the Upper CLP watershed; 3) potential sources of pollution and/or watershed disturbances influencing water quality trends; and 4) a summary of significant findings and implications to water treatment.

STATE OF UPPER CACHE LA POUDRE WATERSHED

Watershed Impacts & Issues of Concern

Over the past ten years the Upper CLP watershed has experienced periods of wet and dry water years influencing both streamflow and water quality conditions in the CLP watershed. Exceptionally hot and dry conditions in 2012 led to extreme drought and two major wildfires in the watershed. In the following year, a long-duration, high intensity rainfall event brought severe flooding in streams and rivers throughout the Upper CLP watershed. These two events signify the extreme variability in the hydrology, and weather of the Upper CLP watershed and highlight potential future climate driven events that may impact water quality.

Forest insects and diseases have impacted the Upper CLP watershed over the past two decades. Although, recent surveys show the mountain pine beetle epidemic is declining, expanding outbreaks in Engelmann spruce forests suggests that forested watershed continue to be susceptible to forest insects and disease.

Watershed impacts caused by climate change and atmospheric deposition are less clear, but remain a major threat to future watershed processes and water quality. Unlike extreme-weather driven disturbances, the watershed response from climate change and atmospheric deposition impacts may be subtle emphasizing the importance of continued monitoring through the Upper CLP watershed.

Climate & Hydrology Trends

Air temperature increased at higher elevations in the Upper CLP watershed over the last decade. Precipitation volume did not change, but the maximum amount of water contained within the snowpack decreased over the past decade suggesting higher elevations of the Upper CLP watershed may receive less snowfall in the future. In addition, snowpack and precipitation data imply that precipitation patterns may be shifting in the upper CLP watershed. No trends were measured in the magnitude or timing of streamflow, but streamflow volume increased over the long-term period of record specifically during the winter months. This trend may be driven by the recent flood event in 2013 and elevated baseflows for several years following the flood.

Trends in Water Quality

Two types of trends were identified in the Upper CLP watershed. In general, step trends (an abrupt shift in data) were measured for most water quality parameters at monitoring sites from the South Fork CLP river (PSF) downstream to the Mainstem CLP river below the confluence with the North Fork (PBD). These trends occurred in response to the dramatic landcover change in the Mainstem CLP watershed caused by wildfire that burned in 2012. Monotonic trends, or gradual, continuous changes (increasing or decreasing) in the data over time, were measured in pH, total organic carbon, total dissolved solids, and ammonia.
Trends were detected at varying scales. Both site-specific and watershed-wide trends were detected in the Upper CLP watershed. Site-specific trends capture impacts to a specific site, while watershed-wide trends imply a large disturbance that impacted the entire basin or large areas of basin impacting multiple monitoring locations.

Implications to Water Treatment

Long-term trends in certain water quality parameters may pose issues to water treatment processes in the future. It is anticipated that water quality impacts caused by recent wildfire and flooding will recover with time. Wildfire impacted water quality parameters are trending toward baseline conditions in recent years implying watershed recovery. However, climate change projections for Colorado point to a warmer climate and unpredictable precipitation patterns that will likely increase the frequency and severity of drought and wildfires, and other extreme-weather events that can impact water quality.

Water quality changes were detected for the following parameters near the City of Fort Collins’, City of Greeley’s and Soldier Canyon Water Authority’s raw water intakes:

- Alkalinity and hardness
- pH
- Total dissolved solids
- Total organic carbon
- Nutrients
- Total coliforms

In general, the water treatment facilities should continue to closely monitor key water quality parameters and may be required to adjust blending ratios and chemical additions to meet current water treatment goals. Routine water quality monitoring throughout the Upper CLP watershed will allow the Upper CLP Collaborative Monitoring Program to continue to sustain a long-term data record providing program partners with valuable information on short and long-term trends that may arise in the future.
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LIST OF ABBREVIATIONS & ACRONYMS

%  percent
BMR  Barnes Meadow Reservoir Outflow (routine monitoring site)
Ca  Calcium
CO₃⁻  Carbonates
cfs  cubic feet per second
CHR  Chambers Lake Outflow (routine monitoring site)
CLAFTCCO  Cache la Poudre at Canyon Mouth Near Fort Collins Stream gage
CLP  Cache la Poudre River
cfu/100 mL  colony forming units per 100 milliliters
DBP  Disinfection By-Product
EPA  Environmental Protection Agency
FCWQL  Fort Collins Water Quality Lab
FCWTF  Fort Collins Water Treatment Facility
H⁺  Hydrogen ion
JWC  Joe Wright Creek above the Poudre River (routine monitoring site)
K  Potassium
LRT  Laramie River Tunnel (routine monitoring site)
m  meter
Mg  Magnesium
mg/L  milligrams per liter
Na  Sodium
NADP  National Atmospheric Deposition Program
NBH  North Fork of the Poudre River below Halligan Reservoir (routine monitoring site)
NDC  North Fork of the Poudre River above Dale Creek Confluence (routine monitoring site)
NFG  North Fork of the Poudre River below Seaman Reservoir (routine monitoring site)
NFL  North Fork of the Poudre River at Livermore (routine monitoring site)
ng/L  nanograms per liter
NH₃-N  Ammonia as nitrogen
NO₂⁻  Nitrite as nitrogen
NO₃⁻  Nitrate as nitrogen
NTU  Nephelometric Turbidity Units
OH⁻  Hydroxide ion
°C  degrees Celsius
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>PBD</td>
<td>Poudre River at the Bellvue Diversion (routine monitoring site)</td>
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<tr>
<td>PBR</td>
<td>Poudre River below Rustic (routine monitoring site)</td>
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<tr>
<td>PCM</td>
<td>Pine Creek Mouth (routine monitoring site)</td>
</tr>
<tr>
<td>PJW</td>
<td>Poudre River above the confluence with Joe Wright Creek</td>
</tr>
<tr>
<td>PNF</td>
<td>Poudre River above the North Fork (routine monitoring site)</td>
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<tr>
<td>PO₄</td>
<td>ortho-phosphate</td>
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<tr>
<td>ppt</td>
<td>parts per trillion</td>
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<tr>
<td>RCM</td>
<td>Rabbit Creek Mouth (routine monitoring site)</td>
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<tr>
<td>SCFP</td>
<td>Soldier Canyon Filter Plant</td>
</tr>
<tr>
<td>SCWTA</td>
<td>Soldier Canyon Water Treatment Authority</td>
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<tr>
<td>SCM</td>
<td>Stonewall Creek Mouth (routine monitoring site)</td>
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<td>SFC</td>
<td>South Fork above confluence with the Mainstem (routine monitoring site)</td>
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<td>SFM</td>
<td>South Fork of the Poudre River above the Mainstem (routine monitoring site)</td>
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<td>SMKT</td>
<td>Seasonal Mann-Kendall Test</td>
</tr>
<tr>
<td>SNOTEL</td>
<td>Snow telemetry network</td>
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<td>SWE</td>
<td>Snow water equivalent</td>
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<tr>
<td>T&amp;O</td>
<td>Taste &amp; Odor</td>
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<tr>
<td>TKN</td>
<td>Total Kjeldahl Nitrogen</td>
</tr>
<tr>
<td>TN</td>
<td>Total Nitrogen</td>
</tr>
<tr>
<td>TOC</td>
<td>Total Organic Carbon</td>
</tr>
<tr>
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<tr>
<td>µg/L</td>
<td>micrograms per liter</td>
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<td>µS/cm</td>
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<td>USGS</td>
<td>United States Geological Survey</td>
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<td>WTP</td>
<td>Water Treatment Plant</td>
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1.0 INTRODUCTION

1.1 BACKGROUND

The Upper Cache la Poudre (CLP) River is an important source of high-quality drinking water supplies for communities served by the City of Fort Collins Water Treatment Facility (FCWTF), the City of Greeley-Bellvue Water Treatment Plant (WTP), and the Soldier Canyon Water Treatment Authority’s (SCWTA) Soldier Canyon Filter Plant (SCFP). In the shared interest of sustaining this high-quality water supply, the City of Fort Collins, the City of Greeley, and the SCWTA partnered in 2007 to design the Upper CLP Collaborative Water Quality Monitoring Program. The Program was subsequently implemented in spring 2008. The goal of this collaborative monitoring program is to assist the participants in meeting current and future drinking water treatment goals by providing up-to-date information about water quality and trends within the Upper CLP watershed.

Raw CLP River water quality parameters that have historically had the most impact on treatment at the three treatment plants include:

- turbidity
- total organic carbon (TOC)
- pH
- alkalinity
- temperature
- pathogens (Giardia and Cryptosporidium),
- taste and odor (T&O) compounds

Seasonal updates, annual water quality reports, and five-year reports for the collaborative program are prepared by City of Fort Collins’ Source Watershed Program staff to keep participants informed of current issues and trends in water quality of the Upper CLP. Seasonal updates are provided throughout the monitoring season in the Spring, Summer, and Fall. These updates include a summary of precipitation, streamflow, and water quality conditions. The purpose of annual reports is to summarize hydrologic and water quality information for the current year, provide a comparison with water quality from the preceding three years, describe notable events and issues, and summarize the results of special studies. The five-year report provides a more in-depth analysis of long-term trends in watershed hydrology, climate and water quality. Upper CLP updates and reports are available on the City of Fort Collins Utilities’ Source Water Monitoring website: (www.fcgov.com/source-water-monitoring).

1.2 WATERSHED DESCRIPTION AND SAMPLING LOCATIONS

Sampling efforts are divided between the Mainstem (including the Little South Fork Cache la Poudre River) and North Fork Cache la Poudre River watersheds. Collectively these drainages encompass approximately 645,500 acres of forest, other natural land types, and agricultural land. An additional 4,700 acres, representing less than 1% of land surface, is developed for commercial, industrial, utility, urban or residential purposes.

The original monitoring network, established in 2008, consisted of 20 water quality monitoring locations selected to characterize the headwaters, major tributaries and downstream locations of the Upper CLP River near the City of Fort Collins, SCWTA, and City of Greeley raw water intake structures. In 2014, an additional monitoring location was included on the South Fork (SFC) approximately 500 feet upstream of the confluence with the Mainstem Poudre River. This monitoring location was added to the monitoring network to capture the full extent of the South Fork drainage following the 2012 High Park Fire. The South Fork above Mainstem (SFM) site was discontinued in 2015 because analyses between SFC and SFM revealed similar water quality conditions. The Seaman Reservoir (SER) monitoring locations were also discontinued from the Upper CLP monitoring program in 2015.

The current monitoring network consists of 18 monitoring locations (Figure 1.1). A description and rationale for each site is provided in Attachment 2.

1.3 SAMPLING PLAN AND PARAMETERS

The sampling frequency for the Upper CLP monitoring program was determined based on both statistical performance and cost considerations. Parameters included
in the monitoring program were selected based on analysis of historical data and aim to provide the best information possible within current budgetary constraints. A list of parameters is included in Attachment 3. Complete discussions of parameter selection and sampling frequency are provided in Sections 5.3 and 5.4, respectively, of the program design document by Billica, Loftis and Moore (2008). Previous year’s sampling plans are provided in their corresponding annual reports. The 2017 sampling plan is provided in Attachment 4 of this report.

1.4 SAMPLE COLLECTION AND ANALYSIS

Dr. William Lewis, from the University of Colorado Boulder, was contracted from 2008 through 2013 to perform sampling activities for the Upper CLP monitoring program at 17 of the 19 Mainstem and North Fork CLP sites. Staff from the City of Fort Collins collected samples at the remaining two locations: North Fork Poudre above the confluence with Dale Creek (NDC) and North Fork Poudre below Halligan Reservoir (NBH). Sampling methods, including those for the collection of physical field measurements for temperature, pH, conductivity, and dissolved oxygen are documented in Section 5.5 of Billica, Loftis and Moore (2008).

The City of Fort Collins Watershed Program coordinated and lead all Upper CLP monitoring activities from 2013 through 2017. Sampling methods, including those for the collection of physical field measurements for temperature, pH, conductivity, and dissolved oxygen are documented in the Upper Cache la Poudre Watershed Monitoring Standard Operating Procedure (Heath 2015).
All bulk water samples were analyzed by the City of Fort Collins Water Quality Lab (FCWQL), except for *Cryptosporidium* and *Giardia* filter samples, which were delivered to CH Diagnostic and Consulting, Inc., in Berthoud, CO for analysis. The analytical methods and detection limits for the FCWQL parameters are included in Attachment 5.

Consistent with the quality assurance guidelines outlined in Section 5.5 of Billica, Loftis and Moore (2008), at least ten percent of environmental samples consist of field blanks and field duplicate samples, which are identified in the sampling plan (Attachment 4). Quality assurance and quality control of field blanks and field duplicates is discussed further in Chapter 6 of this document.

### 1.5 SCOPE OF FIVE YEAR REPORT

Annual and five-year reports for the Upper CLP Collaborative Water Quality Monitoring Program are prepared by the City of Fort Collins’ Watershed Program to keep participants informed about current issues and trends in water quality of the Upper CLP. The purpose of annual reports is to summarize hydrologic and water quality information for the current year. Annual reports highlight significant events, issues of concern, the results of special studies, and provide a comparison with water quality from the preceding three years. Annual reports are available for the years 2008-2011 and 2013-2016.

Five-year reports provide an in-depth analysis of long-term trends in the climate, hydrology and water quality of the Upper CLP watershed. Water quality data collected throughout the Upper CLP watershed were analyzed for long-term trends to determine if concentrations increased, decreased or stayed the same over the ten-year period of record from 2008 to 2017. This report documents 1) watershed impacts and issues of concern; 2) significant trends in climate, hydrology, and water quality in the Upper CLP watershed; 3) potential sources of pollution and/or watershed disturbances influencing water quality trends; and 4) a summary of significant findings and implications to water treatment. The last five-year report was published in 2013, which reviewed trends over the five-year period of record from 2008 to 2012 (Oropeza and Heath, 2013).
2.0 WATERSHED IMPACTS & ISSUES OF CONCERN

2.1 CLIMATE CHANGE

Climate change is one of the most critical issues related to watersheds and water supplies of the Colorado Front Range. It is predicted that warmer temperatures will result in changes to the water cycle, which will influence the watersheds that collect, store, and deliver clean water for consumptive and non-consumptive uses. The most serious consequences of climate change on Colorado watersheds include:

- Changes in precipitation patterns, timing and type;
- Shifts in timing and intensity of runoff and streamflow;
- Increases in severity and frequency of droughts and wildfires;
- Increases in frequency and intensity of forest insect infestations.

Colorado is already limited on its water resources and extremely vulnerable to increasing extremes due to climate change. Many of the consequences of climate change will directly impact drinking water supplies. Precipitation patterns in Colorado vary over space and time. Changes in precipitation patterns, timing, and type may result in periods of extended drought, as well as periods of intense precipitation events. These patterns result in extreme variability from year to year. Most of Colorado’s precipitation occurs during the winter months. Shifts in the timing of precipitation, in addition to more precipitation falling as rain than snow, will add to the uncertainty in the timing and intensity of runoff and streamflow. The onset of streamflow from melting snow is projected to shift earlier in the spring resulting in reduced runoff in the late summer. These climate-driven changes to the water cycle present many challenges to water managers making it difficult to estimate the quantity and quality of water available to meet current and future water needs.

In combination with changes to water quantity, changes to water quality may also occur because of climate change-driven impacts to Colorado watersheds. The increase in the severity, frequency, and intensity of droughts, wildfires, and insect infestations can result in dramatic changes to the land cover of Colorado’s watersheds, directly impacting water quality. Droughts are the leading cause of wildfires and therefore, with the occurrence of more prolonged droughts come increased frequency of wildfires. Wildfires impact watershed hydrology by changing ecosystem resources such as vegetation and soils resulting in increased pollution to drinking water supply.

2.2 DROUGHT AND WILDFIRE

Extreme drought conditions were observed throughout the State of Colorado and the Upper CLP watershed in 2012. The maximum amount of water stored in the snowpack (snow water equivalent) in 2012 at the Joe Wright Snow Telemetry station near Cameron Pass was 57% of normal and occurred nearly two months earlier than expected. Colorado experienced its warmest March on record and abnormally hot and dry conditions persisted throughout the summer and fall. The summer of 2012 (June-August) was the warmest summer on record with statewide temperatures greater than 4°F (2.2°C) warmer than the long-term average temperature. Peak streamflow in June of 2012 was less than 40% of the historical average because of the low snowpack and hot, dry conditions.

Figure 2.1 – Drought conditions in Colorado on July 3, 2012. Source: www.droughtmonitor.unl.edu
in the Upper CLP watershed. Potential impacts of drought on raw and treated water quality are summarized in Table 2.1.

Table 2.1 – Potential raw and finished water quality impacts related to drought. Adopted from Water Research Foundation Web Report #4324.

<table>
<thead>
<tr>
<th>Raw Water Quality</th>
<th>Finished Water Quality</th>
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<tbody>
<tr>
<td>Increased nutrients, algae, cyanobacteria, MIB, geosmin</td>
<td>Taste and odor potential for cyanotoxins</td>
</tr>
<tr>
<td>Increased water temperature</td>
<td>Increased water temperatures in distribution system</td>
</tr>
<tr>
<td>Color and turbidity</td>
<td>Color and turbidity</td>
</tr>
<tr>
<td>Increased microbial contamination</td>
<td>Cryptosporidium and giardia in treated water</td>
</tr>
<tr>
<td>Iron and manganese</td>
<td>Manganese, color</td>
</tr>
<tr>
<td>Increased TOC</td>
<td>DBPs (THMs and HAAs)</td>
</tr>
<tr>
<td>Decreased DO</td>
<td></td>
</tr>
<tr>
<td>Increased hardness</td>
<td></td>
</tr>
<tr>
<td>Low alkalinity</td>
<td>Corroded pipes</td>
</tr>
<tr>
<td>Increased concentrations of contaminants</td>
<td>Higher risk to public health</td>
</tr>
</tbody>
</table>

The exceptionally hot and dry conditions in 2012 (Figure 2.1) lead to extreme wildfire conditions throughout Colorado. The Upper CLP watershed was impacted by two major wildfires in 2012. The Hewlett Gulch Fire (May 14-22) burned 7,685 acres in dense Ponderosa Pine forest stands on the north-facing slopes, as well as shrub and grasslands that occupied much of the south-facing aspects. The burned area includes sub-watersheds that drain both to the Mainstem and into Seaman Reservoir on the North Fork.

The High Park Fire (June 9 - July 2) burned 87,415 acres of primarily forested landscape characterized by Ponderosa and Lodgepole Pine at the lower elevations and mixed conifer species at the upper elevations. To a lesser degree, shrublands, grasslands and riparian areas were also impacted. The burned area includes numerous sub-drainages that are tributaries to the Mainstem and the South Fork.

The 2012 wildfires caused dramatic changes to land cover within the Upper CLP watershed that had an immediate effect on watershed hydrology and water quality within and downstream of the burn scars. The disturbance caused an increase in streamflow and sediment erosion into streams draining burned sub-basins specifically during and following high-intensity storm events. The loss of vegetative cover altered the cycling of water, carbon, nutrients and other elements, directly influencing water quality in the Poudre River. Potential impacts on raw and treated water quality from wildfires are summarized in Table 2.2.

Table 2.2 – Potential raw and finished water quality impacts related to wildfire. Adopted from Water Research Foundation Web Report #4324.

<table>
<thead>
<tr>
<th>Raw Water Quality</th>
<th>Finished Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased nutrients, algae, cyanobacteria, MIB, geosmin</td>
<td>Taste and odor potential for cyanotoxins</td>
</tr>
<tr>
<td>Color and turbidity</td>
<td>Color and turbidity</td>
</tr>
<tr>
<td>Increased metals</td>
<td>Manganese, color</td>
</tr>
<tr>
<td>Increased TOC</td>
<td>DBPs (THMs and HAAs)</td>
</tr>
<tr>
<td>Decreased DO</td>
<td></td>
</tr>
<tr>
<td>Increased hardness</td>
<td></td>
</tr>
<tr>
<td>Increased alkalinity</td>
<td>DBPs (THMs and HAAs)</td>
</tr>
</tbody>
</table>

2.3 FLOODING

In September of 2013, the Colorado Front Range and adjacent foothills experienced a period of intense rainfall leading to severe flooding in streams and rivers throughout much of the South Platte and Arkansas River Basins. Intense rainfall was observed over a 7-day period from September 9th to September 16th with some areas receiving up to 18 inches of water (Figure 2.2). Several impacted areas measured record rainfall amounts that were greater than average annual perception totals.
In the foothills of Larimer County, 15 inches of rainfall was recorded over this period with areas in Fort Collins receiving over 12 inches of rain. Higher intensities and rainfall depth likely occurred at higher elevations in the Upper CLP watershed. As a result, extreme flooding occurred within the Cache la Poudre watershed with a return interval ranging from a 25 to 50-year flood on the CLP river (Yochum, 2015). The flood peak at the Canyon Mouth was nearly five times greater than the average snowmelt peak and measured 9,730 cubic feet per second (cfs) on September 13th. Flood waters began to recede following the flood peak and returned to baseflow (low-flow) conditions by early October. Baseflows remained higher than average in the years following the flood and appeared to return to near normal conditions in 2016. Potential impacts related to flooding and extreme rainfall events are outlined in Table 2.3.

### 2.4 FOREST INSECTS AND DISEASE

Native forest insects and disease are common in Colorado’s forests and play an important role in forest ecology and maintaining healthy, resilient forests that provide clean water to lakes, streams and rivers. Over the past two decades several forest insects and diseases have impacted Colorado’s forests.

The mountain pine beetle (MPB), a native bark beetle that infests all pine species, impacted over 3 million acres of Colorado’s forest over the past two decades. The mountain pine beetle epidemic began in 1996 and tree mortality peaked in 2008 at 1.2 million trees (Figure 2.3). Over the past 10 years, pine beetle-caused tree mortality steadily decreased to less than 900 acres of native pine forest affected in 2017 (Colorado State Forest Service, 2017). A large portion of the tree mortality caused by the mountain pine beetle was concentrated in lodge pole pine forest in north-central Colorado including portions of the Upper CLP watershed.

The spruce beetle has destroyed 1.78 million acres since 1996 and has been Colorado’s most common forest insect over the past six years, destroying more than 200,000 acres of high-elevation Engelmann spruce forest. The highest spruce beetle-caused tree mortality was observed in 2014 at over 400,000 acres (Figure 2.3). State-wide tree morality has been on the decline over the past three years (Colorado State Forest Service, 2017). In 2017, the Colorado State Forest Service identified significant infestations in Larimer County and noted the potential for expanding outbreaks in susceptible Engelmann spruce forests in the northern portion of the state suggesting the potential for future infestations and tree mortality in the Upper CLP watershed.

Douglas-fir beetle has also infested dense, mature, and drought stricken Douglas-fir forests across Colorado, but the impact and extent is much less compared to the mountain pine beetle and spruce beetle infestations.

### 2.5 AIR POLLUTION

Air pollution along Colorado’s Front Range and from other areas may impact water quality in the Upper CLP watershed through a process called atmospheric deposition. Atmospheric deposition occurs when pollutants emitted into the air are deposited on land and water with
precipitation (wet deposition) or as dry particles and gases (dry depositions). Acidic deposition has been the most widely studied form of atmospheric deposition, which has led to acidification of surface waters from acid compounds (sulfur and nitrogen) and other chemicals. The main source of sulfur dioxide to the atmosphere is large powerplants and the source of nitrogen oxide and ammonium emissions include vehicle emissions, oil and gas development, and agricultural practices.

The National Atmospheric Deposition Program (NADP; http://nadp.slh.wisc.edu/) is a cooperative effort between private, governmental and non-profit agencies that measures precipitation chemistry (wet deposition) throughout the United States with the goal of monitoring the chemistry of precipitation to determine changes over time. Atmospheric deposition has been monitored near the headwaters of the Cache la Poudre River in Rocky Mountain National Park since the early 1980s through the National Atmospheric Deposition Program.

Long-term records from monitoring stations in Rocky Mountain National Park and throughout Colorado show decreasing trends in sulfate since the early 1990s because of efforts to reduce emissions established under the 1990 Clean Air Act Amendments. The reduction in sulfur dioxide emissions has lessened the amount of sulfuric acid in the atmosphere and lead to declines in precipitation acidity and acidic deposition into Colorado’s watersheds (Mast, 2011).

In contrast, trends in nitrogen species (nitrate and ammonium) have been less sensitive to emission reductions and voluntary management strategies aimed at limiting nitrogen to the atmosphere. Increasing trends were observed in ammonium with the largest increase near agricultural and urban areas in eastern Colorado (Mast, 2011; Figure 2.4). It is expected that these trends will continue in the future because of projected population growth along the Colorado Front Range and increasing oil and gas production in Colorado.

Figure 2.3 – Mountain pine beetle-caused mortality impacted nearly 3.4 million acres compared to 1.78 million acres impacted by spruce beetle statewide over the last 20 years. While mountain pine beetle-caused mortality is currently considered at background levels, spruce beetle-caused mortality continues to remain at outbreak epidemic proportions (from https://csfs.colostate.edu/)

Figure 2.4 – Ammonia ion wet deposition has increased throughout the United States since the NADP began in 1985 (Source: http://nadp.slh.wisc.edu/).
3.0 WATERSHED HYDROLOGY AND CLIMATE

The hydrology of the Upper CLP plays an important role in regulating water quantity and quality. Precipitation events and snowmelt runoff largely control the quantity and timing of deliveries of material to the river, and the amount of water in the system at a given time influences the concentration of most water quality constituents. Changes to the timing, magnitude, and duration of snowmelt runoff and the effects on water quality have implications on water treatment operations that may need to be addressed in the future to continue to maintain a high-quality water supply to the public.

Evaluating Trends Short-Term and Long-Term Data

Short-term trends are presented for the most recent five years of data from 2013 to 2017 (current) and compared to baseline data from 2008 to 2012 (baseline). Annual and monthly mean air temperature, precipitation, and streamflow were calculated for the current period of record and compared to the baseline period of record.

Long-term trends are presented for the combined ten-year period of record from 2008 to 2017. The Seasonal Mann-Kendall test (SMKT) was used to evaluate long-term trends in air temperature, precipitation and streamflow. The SMKT was performed on 1) monthly average minimum, maximum and mean air temperature calculated from daily average minimum, maximum and mean air temperatures; 2) monthly cumulative precipitation calculated from daily precipitation; and 3) monthly mean streamflow calculated from daily average streamflow. The Mann-Kendall test was used to evaluated annual and seasonal trends. Seasons were defined as winter (December – February), spring (March – May), summer (June – August), and fall (September – November).

Statistical significance was determined to the 95% confidence level (p ≤ 0.05), while notable trends were identified to the 90% confidence level (p ≤ 0.10).

Hydrologic and Climatic Data Sources

The snow telemetry (SNOTEL) network, managed by the Natural Resource Conservation Service, includes approximately 600 automated monitoring sites located in remote mountain watersheds throughout the United States that measure snow water equivalent (SWE), accumulated precipitation, and air temperature. Joe Wright SNOTEL, located at an elevation of 10,120 feet, contains the longest record of continuous measurements in the Cache la Poudre Watershed dating back to 1978 (https://wcc.sc.egov.usda.gov/nwcc/site?sitenum=551).

The Cache la Poudre at Canyon Mouth near Fort Collins (CLAFTCCO) streamflow monitoring station managed by the Colorado Department of Water Resources (http://www.dwr.state.co.us/) contains the longest record of continuous streamflow in the Upper CLP watershed, dating back to 1883. The streamflow monitoring station is located at the Canyon Mouth and includes streamflow contributions from both the Mainstem and North Fork watersheds.

3.1 AIR TEMPERATURE

The annual mean air temperature measured at Joe Wright SNOTEL over the last five years was slightly warmer than baseline conditions. The mean temperature over the current five-year period was 35.6 degrees Fahrenheit (°F) (2.0 degrees Celsius (°C)) compared to a mean baseline temperature of 34.8°F (1.5°C) (Figure 3.1). Monthly mean air temperatures in the Upper CLP watershed were slightly warmer in most months over the recent five-year period compared to baseline conditions. Five-year monthly mean temperatures exceeded baseline monthly mean temperature in all months except April, May, and August (Figure 3.1).

Air temperature significantly increased at higher elevations in the Upper CLP watershed over the long-term period of record. A significant increase was detected in both the average monthly mean and minimum air temperatures. Average monthly mean temperatures increased at a rate of 0.24°F (0.13°C) per year, while average monthly minimum temperatures increased at a slightly greater rate of 0.32°F (0.18°C) per year (Table 3.1).

Seasonal trend analyses detected significantly increasing average monthly mean and minimum air temperatures during the winter season. Over the winter season, average monthly mean temperatures increased at a rate of 0.32°F per year, while average monthly minimum temperatures increased at a rate of 0.37°F (0.21°C) per year (Table 3.1).

No additional seasonal trends were detected in average monthly maximum air temperatures at the Joe Wright
Trend analyses of air temperature data collected at the Cache la Poudre at Canyon Mouth near Fort Collins (CLAFTCCO) streamflow monitoring station revealed no discernable trends.

### 3.2 PRECIPITATION

Annual mean precipitation over the five-year period was slightly greater than baseline annual mean precipitation. The five-year annual mean precipitation was 46.4 inches compared to 45.3 inches. The higher precipitation that fell over the five-year period was due to wetter conditions in the winter, spring, and fall seasons (Figure 3.2). Monthly mean precipitation during these seasons was greater in all months except April and October. Less precipitation fell over the summer season with notably lower precipitation in the months of June and July (Figure 3.2).

There were no significant long-term trends in annual, monthly, or seasonal precipitation over the long-term period of record. Total precipitation was variable from year to year. The highest precipitation was measured in water year 2011 with a total 64.4 inches of precipitation falling on the Upper CLP watershed. In contrast, only 32.2 inches of precipitation was measured in 2012 leading to severe drought conditions and wildfires in the Upper CLP watershed.

There were two notable long-term trends identified at the 90% confidence level for significance (p = 0.10). The maximum amount of water contained within the snowpack (peak snow water equivalent) showed a decreasing trend over the long-term period of record at a rate of 1.03 inches per year. Although there was considerable variability in peak SWE from year to year (Figure 3.3), the trend suggests higher elevations of the Upper CLP watershed may receive less snowfall over the snow accumulation season into the future. Another notable decreasing trend was detected in the peak SWE to precipitation ratio implying precipitation patterns may be shifting in the Upper CLP watershed with more precipitation falling as snow or rain in the spring following peak SWE or as rain in the fall.
3.3 STREAMFLOW

The five-year annual mean streamflow was greater than baseline streamflow conditions. Annual mean streamflow during the five-year period of record was 513 cubic feet per second (cfs) compared to the baseline of 326 cfs. The higher streamflow over the five-year period was driven by notably higher streamflow in all months except July (Figure 3.4).

A shift in seasonal flow contributions was observed over the five-year period. The proportion of water delivered during the winter season was similar compared to baseline conditions, but a smaller amount of water was measured during the summer season, notably in the month of July. The amount of water delivered over the spring and fall seasons was considerably greater over the five-year period of record (Figure 3.4). Five-year monthly mean streamflow was more than two times higher in the spring months of March, April, and May (Figure 3.4). Streamflow during the fall months was also greater over the five-year period likely due to extreme precipitation and flooding in September of 2013 and elevated baseflows in the following years. As a result, 500,000 more acre-feet of water was measured over the five-year period of record compared to baseline.

Streamflow significantly increased in the Upper CLP watershed over the long-term period of record (2008-2017). A significant increase was detected in both monthly mean streamflow and streamflow during the winter season. Monthly mean streamflow increased at a rate of 13 cfs per year, while winter streamflow increased at a rate of 9 cfs per year (Table 3.1). An increasing trend in spring streamflow was detected at a rate of 7 cfs per year, but this trend was not statistically significant (p=0.08).

There were no significant trends in the magnitude or timing of peak streamflow. Peak streamflow over the long-term period was higher than the historic (1881-2017) peak in seven out of 10 years averaging 988 cfs higher than the historic average peak (2,000 cfs). The timing of peak streamflow occurred an average of 1.3 days later than the historic average (June 11). The latest peak was observed on July 1, 2011 (20 days late) and the earliest peak was observed on May 31, 2014 (11 days early).

Figure 3.3 – Annual precipitation totals and peak snow water equivalent measured at the Joe Wright SNOTEL.

Figure 3.4 – Monthly average streamflow for the baseline period compared to the recent five-year period (top) and seasonal distribution of streamflow for the baseline period and current period (bottom).
Table 3.1 – Summary of statistically significant climatological variables detected in the Upper CLP watershed.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Statistic</th>
<th>Season</th>
<th>Trend Direction</th>
<th>Trend Estimate</th>
<th>Significance (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streamflow</td>
<td>Monthly Mean</td>
<td>Annual</td>
<td>Increasing</td>
<td>13 cfs per year</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Winter</td>
<td>Increasing</td>
<td>9 cfs per year</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Precipitation</td>
<td>Peak SWE</td>
<td>Water Year</td>
<td>Decreasing</td>
<td>1.03 inches per year</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>SWE/Precipitation Ratio</td>
<td>Water Year</td>
<td>Decreasing</td>
<td>0.02 inches per year</td>
<td>0.07</td>
</tr>
<tr>
<td>Temperature</td>
<td>Monthly Mean</td>
<td>Annual</td>
<td>Increasing</td>
<td>0.24°F (0.13°C) per year</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Winter</td>
<td>Increasing</td>
<td>0.32°F (0.18°C) per year</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Monthly Minimum</td>
<td>Annual</td>
<td>Increasing</td>
<td>0.32°F (0.18°C) per year</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Winter</td>
<td>Increasing</td>
<td>0.37°F (0.21°C) per year</td>
<td>0.05</td>
</tr>
</tbody>
</table>
4.0 TRENDS IN WATER QUALITY

Water quality data collected throughout the Upper CLP watershed were analyzed for long-term trends to determine if concentrations increased, decreased or stayed the same over the ten-year period of record from 2008 to 2017. Analysis of long-term water quality data for trends provides useful information about short and long-term impacts to water quality from watershed disturbances and pollution that may influence water treatment processes and direct watershed management now and in the future.

Preliminary data analyses

Preliminary data analyses were conducted to initially identify and characterize potential trends in the Upper CLP long-term data set. Time-series scatterplots were evaluated and data smoothing techniques were applied to further uncover general tendencies. Two types of trends were identified in this process: monotonic trends and step trends. Monotonic trends are defined as a gradual, continuous rate of change (increasing or decreasing) in the data over time and step trends are defined as an abrupt shift (up or down) in the data at a certain point in time.

Preliminary data analyses also provided additional information required for selecting the most robust trend test. Trend tests are generally categorized as parametric and nonparametric, and the statistical power of these analyses depends on the distribution of the data. Parametric trend tests are considered the most powerful analyses for normally distributed data sets and nonparametric tests are used on data where the assumption of normality for parametric statistics is not met (Lettenmaier 1976, Hirsch et al. 1991, Thas et al. 1998). Normality tests verified data distributions of water quality variables were not normal (p<0.01) and a nonparametric test would provide the most powerful and robust trend analyses.

Trend Analyses

Based on preliminary data analyses discussed above, two trend tests were selected to detect and quantify trends in water quality concentrations throughout the Upper CLP watershed. Monotonic trends were evaluated with the Seasonal Mann-Kendall Test (SMKT). Water quality in the Upper CLP watershed exhibits strong seasonal patterns and the SMKT accounts for variability in water quality due to seasonality (Helsel and Hirsch, 1992). The SMKT was performed on monthly concentrations measured over the ten-year period of record (2008 to 2017) with seasons defined by month. Bimonthly data collected in the months of April, May, and June were aggregated by month and a monthly median value was calculated for trend analyses. The output of the test provides a p-value and overall measure of the rate of change or trend slope. Statistical significance was determined to the 95% confidence level (p ≤ 0.05), while notable trends were identified to the 90% confidence level (p ≤ 0.10).

Step trends were evaluated with the nonparametric Mann-Whitney test. The Mann-Whitney test compares two population medians and calculates the corresponding point estimate and confidence interval. Step trends occurred in response to the dramatic landcover change in the Mainstem CLP watershed caused by wildfire that burned in the summer of 2012. Based on this extreme event, the long-term data set was divide into two separate periods of record and population medians were compared using the Mann-Whitney test at monitoring sites located within and downstream of the wildfire burn scar ((SFC, PSF, PNF and PBD). ‘Baseline conditions’ were defined as the period of record from 2008 to 2012 and ‘current conditions’ were defined as the period of record from 2013 to 2017. Statistical significance was determined to the 95% confidence interval (p ≤ 0.05), while notable trends were identified to the 90% confidence interval (p ≤ 0.10).

Selected Variables and Monitoring Sites

Trend analyses were performed on all monitoring sites throughout the Upper CLP watershed for the water quality parameters listed below:

- **Physical Parameters**
  - Temperature, pH, Conductivity, Turbidity
- **General Parameters**
  - Alkalinity, Hardness, Total Dissolved Solids
- **Total Organic Carbon**
- **Nutrients**
  - Nitrogen and Phosphorus
- **Microorganisms**
  - E. coli and Total Coliforms

These water quality parameters were selected because they either have a direct impact on water treatment processes or served as key indicators for other water quality parameters that may influence water treatment.
Presentation of Results

Presentation of the results focuses primarily on monitoring sites located directly on the Mainstem and North Fork CLP rivers that are considered representative of water quality conditions throughout the Mainstem CLP watershed; however, data collected from monitoring sites located on tributaries to the Mainstem and North Fork CLP rivers were analyzed and tested for trends. Significant and notable findings from these sites are also presented. A full list of monitoring sites, abbreviations and descriptions is available in Attachment 2. Finalized raw data are available upon request from the City of Fort Collins Watershed Program.

The graphics presented in the following sections of this report include time-series scatterplots customized with a smoothed line fit to the data. Data were smoothed using the locally weighted scatterplot smoothing (LOWESS) technique. The degree of smoothing (0-1) was set to 0.25 and the influence of outliers (0-10) was set to 10. The larger the weights, the more the smoothed values follow the data and the smaller the weights, the less jagged the pattern is in the smoothed values.

The colored bar graphs presented below the smoothed time-series graphs summarize trend test results from the SMKT. Bar graphs include the trend slope (rate of change over time), trend direction (increasing or decreasing), and statistical significance (p<0.05 and p<0.10). The trend slope is plotted on the y-axis and monitoring locations are on the x-axis. A positive value specifies an increasing trend and a negative value specifies a decreasing trend. Statistical significance and trend direction are color coded. Refer to table 4.1 for color codes and additional information for interpreting the results from monotonic trend analyses.

Trend tests detect significant trends and provide a measured rate of change, but do not provide insight to the cause of the trend. Interpretation of potential causes were based on technical expertise and local knowledge regarding specific events and impacts to watershed hydrology and land use over the period of record.

<table>
<thead>
<tr>
<th>Color Code</th>
<th>Trend direction</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increasing</td>
<td>95% confidence interval p-value &lt; 0.05</td>
</tr>
<tr>
<td></td>
<td>Decreasing</td>
<td>90% confidence interval p-value &lt; 0.10</td>
</tr>
<tr>
<td></td>
<td>Increasing</td>
<td>Not statistical significant p-value &gt; 0.10</td>
</tr>
</tbody>
</table>

Table 4.1 – Color code matrix used to present trend results from the Seasonal Mann-Kendall test indicating trend direction and significance (p-value).
4.1 PHYSICAL PARAMETERS

Water Temperature

Long-term trends were detected below Halligan and Seaman Reservoir in the North Fork CLP watershed. Water temperature at these monitoring sites (NBH and NFG) significantly increased 0.18°C (0.32°F) per year and 0.19°C (0.34°F) per year over the long-term (Figure 4.1). There were no trends observed in water temperature in the Mainstem CLP watershed. The noticeable decrease in temperature after 2013 was observed throughout the watershed and may be attributed to the 2013 flood event.

![Temperature Graph]

Figure 4.1 – Smoothed time-series plot for water temperature at NBH and NFG (top) and trend results for North Fork CLP river sites.

pH

pH is a measure of the amount of free hydrogen (H⁺) and hydroxide (OH⁻) ions in water and is measured on a logarithmic scale ranging from 0 to 14. Water with a pH near 7 is considered neutral, with more acidic conditions occurring below 7 and more basic, or alkaline, conditions occurring above 7. pH is an important water quality parameter to monitor because it influences the solubility and biological availability of chemical constituents, including nutrients and heavy metals.

pH increased at nearly all monitoring sites throughout the Upper CLP watershed over the long-term monitoring period (Figure 4.2). There were no trends detected at the highest elevation monitoring sites on Joe Wright Creek (CHR) and the Poudre River above the confluence with Joe Wright Creek (PJW). pH significantly decreased at BMR, but this trend did not influence pH trends downstream at JWC where pH significantly increased 0.03 units per year. Significantly increasing trends continued downstream with the greatest changes in pH measured on the Mainstem CLP river above and below the confluence with the North Fork CLP river (PNF and PBD). pH increased 0.07 units per year over the long-term period at PNF and slightly higher at PBD (Figure 4.2).

pH increased throughout the North Fork CLP watershed, but at a slower rate compared to the Mainstem CLP watershed. pH significantly increased 0.03 units per year at most sites, including Rabbit Creek (RCM) and Stonewall Creek (SCM). Although there was a slight increase in pH measured at PCM there the trend was not significant (Figure 4.2).

Turbidity

Turbidity is a measurement of the amount of light capable of passing through water. This water quality parameter is often monitored to track changes in water clarity, which is influenced by the presence of algae and/or suspended solids introduced to surface waters through various land use activities, including runoff and erosion, and urban storm water runoff and drainage from agricultural lands. Turbidity concentrations can signal changes in land use activity.

Step trends were measured at monitoring sites from the South Fork CLP river (PSF) downstream to the Mainstem CLP river below the confluence with the North Fork (PBD). Median turbidity values over the recent five-year period were 1.5 – 3 times greater than baseline conditions. Turbidity at these sites peaked in 2013 and gradually decreased in the following years to near baseline conditions. There were no trends in turbidity measured at
monitoring sites upstream of the wildfire burn scar suggesting that the abrupt increase in turbidity observed in 2013 was caused by post-fire erosion impacts. The decreasing trend in recent years provides evidence of watershed recovery (Figure 4.3).

Trend analyses of the recent five-year period of record detected significantly decreasing trends at wildfire impacted sites suggesting a return to baseline turbidity conditions. The highest turbidity was measured in 2013 and steadily decreased to near baseline conditions in 2017. Turbidity decreased 0.6 NTU per year at PNF and PBD over this period. The flood of 2013 likely accelerated the recovery to pre-fire turbidity levels by scouring the streambed. Turbidity also significantly increased 0.17 NTU per year at LRT in the Mainstem CLP watershed, but this trend did not influence water quality downstream at PBR.

Long-term trends were measured at two monitoring sites in the North Fork CLP watershed. Turbidity significantly increased 0.28 NTU per year on the North Fork CLP river below Seaman Reservoir at NFG (Figure 4.3). This trend did not translate downstream to the Poudre River at Greeley’s water intake at PBD. A notable increase in turbidity was also observed on the North Fork CLP above Halligan Reservoir at NDC. Although there is less certainty...
in this trend it will be important to continue to track this in the future as increased turbidity may indicate increased sediment loading into Halligan Reservoir. No trends were observed on the North Fork CLP or tributaries between Halligan and Seaman Reservoirs.

**Specific Conductivity**

Conductivity is an index of dissolved ionic solids in water, and hardness is an index of the total calcium (Ca) and magnesium (Mg) in water. Alkalinity is a measure of the effective acid buffering capacity of water, and is derived from the dissociation of mineral carbonates (CO$_3^-$), bicarbonates (HCO$_3^-$), and hydroxides (OH). Conductivity, hardness, and alkalinity are influenced by local geology, as well as other dissolved constituents derived from land use practices throughout the watershed.

In the Mainstem CLP watershed, long-term trends were identified at monitoring sites located above the wildfire burn scar and step trends were identified at monitoring sites located within the wildfire burn scar. Specific conductivity significantly decreased 0.5 $\mu$S/cm per year at PJW with notable decreasing trends at CHR and LRT (-0.28 and -0.90 $\mu$S/cm per year) over the long-term monitoring period (Figure 4.4).

Step trends were measured at monitoring sites located within the wildfire burn scar. Specific conductivity was significantly higher over the current five-year period compared to baseline conditions at PNF. The abrupt increase in specific conductivity was first observed in 2013 and continued through 2017. Median specific conductivity measured over this period was 1.5 times greater than baseline conditions (Figure 4.4). The elevated specific conductivity provides further evidence of post-fire effects that continue to impact water quality five years after the wildfire (Figure 4.4).

Specific conductivity increased over the long-term record at higher elevation monitoring sites in the North Fork CLP watershed and step trends were observed at mid- and low-elevation monitoring sites. Specific conductivity significantly increased 1.35 $\mu$S/cm per year at NDC and 1.83 $\mu$S/cm per year at NBH.

Step trends were observed from NRC downstream to NFG with an abrupt increase in 2012 followed by an abrupt
A decrease in 2013. These shifts are likely correlated with streamflow variability and the concentrating effects of low streamflow caused by drought conditions in 2012 and dilution effects of high streamflow following the 2013 flood event. Over the long-term period of record a decreasing trend was detected at these monitoring sites. Specific conductivity significantly decreased 5.25 μS/cm per year at NRC and 4.98 μS/cm per year at NFL (Figure 4.4). The slight decrease in the rate of change between NRC and NFL may be influenced by the inflowing waters of Stonewall Creek, which have characteristically higher specific conductivity. Specific conductivity significantly decreased 3.54 μS/cm per year at NFG and this trend may have abated the wildfire impacts downstream as no trends were observed at PBD (Figure 4.4).

Figure 4.4 – Smoothed time-series plot for specific conductivity on the Mainstem (top left) and North Fork (top right) CLP rivers and corresponding trend results with estimated trend slope (bottom).
4.2 GENERAL PARAMETERS

Alkalinity and Hardness

Long-term trends in alkalinity and hardness were nearly identical to specific conductivity (Figure 4.4). Significant trends were detected in both the Mainstem and North Fork CLP watersheds, but there was no indication of watershed wide changes except for monitoring locations impacted by wildfire.

Hardness significantly decreased at BMR and PJW over the long-term period, but these trends did not translate downstream (Figure 4.5b). Step trends were observed at monitoring sites located within and downstream of the wildfire burn scar. Like specific conductivity, median alkalinity and hardness concentrations were 1.5 – 2 times greater over the recent five-year period compared to baseline conditions and remained elevated through 2017.

Alkalinity and hardness significantly increased above and below Halligan Reservoir (NDC and NBH, respectively). Decreasing trends were detected at NRC and SCM, but these trends were not detected downstream at NFL or NFG (Figure 4.5).

Total Dissolved Solids

The total dissolved solids (TDS) concentration provides a qualitative measure of dissolved ions and comprise inorganic salts (calcium, magnesium potassium, sodium, bicarbonates, chlorides, and sulfates) and a small portion of organic matter. Sources of TDS in surface water consist of natural weathering and erosion of geologic material, mining, industrial and sewage effluent, and agriculture.

Elevated TDS concentrations in drinking-water sources do not pose a health risk, but high levels can cause aesthetic risks including corrosion, salty or brackish taste, and scale formation. Because of these potential risks the Environmental Protection Agency established a secondary drinking water standard for TDS. Elevated TDS concentrations may also be used as an indicator of elevated ions; some of which have primary or secondary drinking water standards.

A watershed wide increase was observed in total dissolved solids throughout the Mainstem CLP watershed over the long-term monitoring period. Significantly increasing trends were identified at all sites along the Mainstem CLP river and on Joe Wright Creek at JWC. Concentrations gradually
increased at mid- and high-elevation monitoring sites at a rate of 1.1 mg/L per year (Figure 4.6). TDS at these monitoring sites steadily increased in the years following the 2013 flood highlighting the persisting impacts of extreme flooding on water quality.

Step trends were identified at monitoring sites from the South Fork CLP river downstream and within the wildfire burn scar. Median TDS concentrations measured over the recent five-year period were 20 mg/L greater at PNF and PBD compared to baseline conditions (Figure 4.6). Total dissolved solids remained elevated in 2017 at PNF and PBD, but concentrations at PBD appear to be returning to baseline conditions.

Total dissolved solids significantly increased above and below Halligan Reservoir (NDC and NBH, respectively), and on Stonewall Creek over the long-term monitoring record in the North Fork CLP watershed. Step trends were observed from NRC downstream to NFG with an abrupt increased in 2012 followed by an abrupt decreased in 2013. Analogous to the trends observed in specific conductivity, the shifts in TDS are likely correlated with streamflow variability and the concentrating effects of low streamflow caused by drought conditions in 2012 and dilution effects of high streamflow following the 2013 flood event.

Figure 4.6 – Smoothed time-series plot for total dissolved solids on the Mainstem (top left) and North Fork (top right) CLP rivers and corresponding trend results with estimated trend slope (bottom).
4.3 TOTAL ORGANIC CARBON

Total organic carbon (TOC) is a measure of the total concentration of dissolved and particulate organic matter in water. TOC is derived from both terrestrial and aquatic sources. Terrestrial TOC originates from soils and plant materials that are leached and/or delivered to surface waters during storms and spring snowmelt runoff, whereas aquatic-derived TOC originates from algal production and subsequent decomposition within surface waters.

Total organic carbon is an important indicator of water quality, particularly as it relates to water treatment. Water treatment requires the effective removal of TOC because the interaction between residual TOC and chlorine can form regulated disinfection by-products (DBPs). DBPs are strictly regulated due to their carcinogenic potential. Increases in source water TOC concentrations pose concern due to the potential for higher residual TOC (post-filtration) and increased DBP formation potential. In addition, increased levels of TOC in source waters require additional removal requirements at the water treatment facility based on alkalinity levels (Table 4.2).

Table 4.2 – Total organic carbon removal requirements for water treatment facilities based on source water alkalinity and total organic carbon concentrations.

<table>
<thead>
<tr>
<th>TOC (mg/L)</th>
<th>Source water alkalinity (mg/L as CaCO$_3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;60</td>
</tr>
<tr>
<td>2-4</td>
<td>40%</td>
</tr>
<tr>
<td>4-8</td>
<td>45%</td>
</tr>
<tr>
<td>&gt;8</td>
<td>50%</td>
</tr>
</tbody>
</table>

Total organic carbon concentrations gradually increased throughout the Mainstem CLP watershed over the long-term period of record. Significantly increasing trends were measured at all monitoring sites. The greatest increase was measured at the Barnes Meadow outflow diversion (BMR) where TOC concentrations increased 0.29 mg/L per year. TOC concentrations on the Mainstem CLP river changed at a slower rate. The greatest change was observed at the highest elevation monitoring site at PJW. Although, the rate of change was similar at mid- to lower-elevation monitoring sites (PBR to PNF), there was a slight increase in the trend slope moving downstream (Figure 4.7).

In the North Fork CLP watershed, TOC concentrations have been steadily decreasing over the most recent five-year period, but significant trends were only detected on Stonewall Creek and on the North Fork CLP river below Seaman Reservoir at NFG. TOC significantly increased 0.07 mg/L per year at SCM and significantly decreased 0.06 mg/L per year at NFG (Figure 4.7). It appears the decreasing TOC trend at NFG had a slight influence on downstream at PBD where the rate of change over the long-term period was slightly less than PNF upstream (0.08 mg/L per year and 0.10 mg/L per year; Figure 4.7).

There was a short-term decrease in TOC at all monitoring sites throughout the Upper CLP watershed in 2012 further highlighting the impacts of severe drought on water quality. In contrast to other water quality variables, severe drought and resultant low snowpack and streamflow limit the delivery of organic carbon to surface waters. Potential drivers of increasing TOC in the Mainstem CLP watershed include:

- Catchment characteristics
- Hydrology, climate and weather
- Declining atmospheric acid deposition
- Increasing In-stream algal production
- Increasing algal production in high alpine lakes
Figure 4.7 – Smoothed time-series plot for total organic carbon on the Mainstem (top left) and North Fork (top right), and corresponding trend results with estimated trend slope (bottom).
4.4 NUTRIENTS

Nutrients are an important component of source water quality monitoring. In high concentrations and under certain environmental conditions, nutrients can lead to algal growth. In extreme situations, nutrients can cause abundant growth of cyanobacteria, which are responsible for the production of cyanotoxins and other compounds that can affect the taste and odor of drinking water supplies. Potential sources of nutrients in aquatic systems include animal waste, leaking septic systems, fertilizer run-off, erosion, and atmospheric deposition.

Ammonia (NH\textsubscript{3}-N), nitrate (NO\textsubscript{3}-N), nitrite (NO\textsubscript{2}-N), and ortho-phosphate (PO\textsubscript{4}) are dissolved forms of nitrogen and phosphorus that are readily available for plant uptake. Both Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP) serve as aggregate measures of potential nitrogen and phosphorus availability to the system.

Total nitrogen (TN) is the sum of TKN and inorganic nitrogen (NO\textsubscript{3}-N and NO\textsubscript{2}-N). TKN is a measure of ammonia plus organic nitrogen and comprises the largest fraction of TN, with inorganic nitrogen representing lesser fraction. Likewise, TP is a measure of dissolved phosphorus as well as phosphorus bound to sediments and organic matter. For this report, the discussion of results only pertains to values above the reporting limits currently used by the FCWQL. Current reporting limits are 0.005 mg/L (5 μg/L) for PO\textsubscript{4}, 0.01 mg/L (10 μg/L) for ammonia and TP, and 0.04 mg/L (40 μg/L) for nitrate and nitrite. In the calculation of TN (TKN + NO\textsubscript{3}-N + NO\textsubscript{2}-N), concentrations below their respective reporting limit were reported as half the reporting limit (Helsel and Hirsch, 2002).

Caution should be taken when interpreting the observed long-term trends for most nutrient water quality constituents because of the uncertainty associated with values reported below the reporting limit. In most cases, trend slope output from the SMKT revealed zero rate of change for significant trends, and therefore, corresponding trend results bar graphs were not included in the presentation of results. Instead, median values measured over the recent five-year period were compared to the baseline median values.

Nitrogen

Total nitrogen appeared to increase at all monitoring sites over the long-term period of record throughout the Mainstem CLP watershed. Total nitrogen gradually increased at high- to mid-elevation monitoring sites from Joe Wright Creek to Mainstem CLP river above the South Fork CLP river (PBR). TN significantly increased 9 μg L\textsuperscript{-1} per year at PJW over the long-term period, but this trend did not appear to influence TN downstream at PBR. Step trends in TN were observed at monitoring sites from the South Fork CLP river downstream to PBD (Figure 4.8). A notable increase in TN was also measured in the North Fork CLP watershed at NDC. No trends were observed for TKN.

Nitrate followed a similar pattern to that of total nitrogen over the long-term period of record, but there was uncertainty in the observed long-term trend because...
Figure 4.9 – Median nitrate and ammonia concentrations over the recent five-year period compared to baseline concentrations on the Mainstem and North Fork CLP rivers. The red line indicates the City of Fort Collins Water Quality Laboratory’s reporting limit. $+$ = significantly increasing step trend and $+$ = significant increasing long-term trend.
Concentrations were below the reporting limit at most sites over the baseline period. Significant step trends were observed at monitoring sites from the South Fork CLP river downstream to PBD in the years following wildfire. In contrast, there were no step trends detected at higher elevation monitoring sites in the Mainstem CLP watershed providing further evidence of wildfire related impacts on water quality (Figure 4.9).

Nitrate concentrations in the years following the wildfire were 1 – 2 times greater than baseline conditions, but still relatively low (Figure 4.9). Median nitrate concentrations were trending down to baseline conditions over the recent five-year period suggesting watershed recovery (Figure 4.9). No long-term trends were detected in nitrate on the North Fork CLP watershed, but nitrate concentrations below Halligan and Seaman Reservoir were slightly higher over the recent five-year period compared to baseline conditions (Figure 4.9).

A significantly increasing trend was detected in ammonia at most monitoring sites throughout both the Mainstem and North Fork CLP watersheds. Higher concentrations over the recent five-year period were responsible for the observed long-term trend. Ammonia concentrations measured during the baseline period of record were routinely below the laboratory’s reporting limit (20 μg/L) at most sites, except below Halligan and Seaman Reservoirs where concentrations are usually detected above the reporting limit (Figure 4.9). In recent years, ammonia concentrations throughout the Upper CLP watershed were detected above the reporting limit more often and median ammonia concentrations over the five-year period were greater than baseline conditions, especially on the North Fork CLP river where median concentrations were 1 – 3 times greater than baseline conditions (Figure 4.9). The exact cause of elevated ammonia throughout the watershed is unknown; however, atmospheric deposition may be an attributable source.

**Phosphorus**

Site specific long-term trends were identified in total phosphorus in both the Mainstem and North Fork CLP watersheds. Significantly increasing trends in TP were measured on Joe Wright Creek (CHR and JWC), the South Fork CLP river and the Mainstem CLP river below the confluence with the North Fork (PBD). TP concentrations on Joe Wright Creek steadily increased over the long-term period of record, whereas an abrupt increase in TP

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**Figure 4.10** – Smoothed time-series plot for total phosphorus on the Mainstem (left) and North Fork (right).

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concentrations was observed at monitoring sites located within the High Park wildfire burn scar (Figure 4.10). Median TP concentrations measured over the recent five-year period were elevated compared to baseline conditions.

The highest concentrations were measured in the year immediately following the wildfire at PNF and PBD, but concentrations fell in subsequent years. Median TP concentrations at PNF were below baseline conditions in 2017, implying watershed recovery and a return to pre-fire conditions. TP concentrations remained elevated at PBD, which may be attributed to significantly increasing TP concentrations on the North Fork CLP river below Seaman Reservoir at NFG. A significantly increasing trend was also measured on the North Fork CLP river above Halligan Reservoir at NDC (Figure 4.10). Median TP concentrations steadily increased over the recent five-year period with the highest median concentration measured in 2017.

Step trends were detected in ortho-phosphate at most monitoring sites throughout the Mainstem and North CLP watersheds. Median ortho-phosphate concentrations over the current five-year period were measured slightly above the laboratory reporting limit, while baseline conditions were generally below the reporting limit (Figure 4.11). Ortho-phosphate concentrations were slightly higher than the reporting limit from JWC downstream to PSF in 2015 and 2016, which may be attributable to flooding in 2013. In general, ortho-phosphate steadily increased from 2013 to 2015 and then slowly returned to baseline conditions by 2017. This short-term watershed wide trend in ortho-phosphate provides further evidence of water quality impacts associated with the 2013 flood event.

Figure 4.11 – Median ortho-phosphate over the recent five-year period compared to baseline concentrations on the Mainstem and North Fork CLP rivers. The red line indicates the City of Fort Collins Water Quality Laboratory’s reporting limit. +s = significant increasing step trend and + = significantly increasing long-term trend.
4.5 MICROORGANISMS

Total Coliform and *E. coli*

Coliforms are types of bacteria found naturally in the environment in plant and soil material, but can also be found in the digestive tract of animals, including humans. Disease causing bacteria or pathogens can be introduced to the raw drinking water supply from fecal contamination. The Upper CLP Collaborative Monitoring Program tests its source water supply for the presence of bacterial contamination by measuring the total amount of coliforms, an indicator organism for the presence of pathogenic bacteria. In addition, *Escherichia coli* (*E. coli*) is measured and used as an indicator of human or animal fecal waste pollution since the source of origin is more specific than total coliforms. Total coliform counts are greater than *E. coli* counts because total coliform includes all types and sources of coliform bacteria.

Site specific trends were identified in total coliforms and *E. coli* in the Upper CLP watershed. Median total coliforms were greater over the current five-year period compared to baseline conditions at all sites (Figures 4.12). A step trend was identified at PNF with significantly higher counts of total coliforms over the current five-year period. Median total coliform counts were 1.5 times higher than baseline conditions (327 CFU/100 mL and 488 CFU/100 mL measure for current and baseline, respectively). A similar step trend was measured downstream at PBD, but contributions from the North Fork may have diluted the trend considering total coliforms significantly decreased on North Fork CLP river at NFG over the long-term period of record. The abrupt increase at monitoring sites on the Mainstem CLP river is likely a result of increased erosion and delivery of coliforms following the wildfire.

*E. coli* significantly increased 0.50 CFU/100 mL per year at PBR over the long-term monitoring period, which is likely caused by a steadier increase in recent years. This trend may indicate aging and leaking septic systems located near the river in the Town of Rustic. No other trends were identified in *E. coli* in the Mainstem CLP watershed or at NFG on the North Fork CLP river, although cell counts were higher over the current five-year period compared to baseline conditions (Figure 4.12).

Figure 4.12 – Median total coliforms (top) and *E. coli* (bottom) over the recent five-year period compared to baseline concentrations on the Mainstem and North Fork CLP rivers. + = significantly increasing trend and - = significantly decreasing trend.
5.0 SUMMARY & IMPLICATIONS

5.1 WATERSHED IMPACTS & ISSUES OF CONCERN

Over the past ten years (2008 – 2017) the Upper CLP watershed has experienced periods of wet and dry water years influencing both streamflow and water quality conditions in the CLP watershed. It is projected with current climate models that the frequency and timing of wet and dry years will be more unpredictable in the future. The most serious consequences of climate change on Colorado watersheds include: changes in precipitation and streamflow patterns, increasing severity and frequency of droughts and wildfires, and increasing frequency and intensity of forest insects and disease.

Over the past two decades several forest insects and diseases have impacted Colorado’s forests. The mountain pine beetle (MPB), a native bark beetle that infests all pine species, impacted over 3 million acres of Colorado’s forest over the past two decades. The spruce beetle has destroyed 1.78 million acres since 1996 and has been Colorado’s most common forest pest insect over the past six. In 2017, the Colorado State Forest Service identified significant infestations in Larimer County and noted the potential for expanding outbreaks in susceptible Engelmann spruce forests in the northern portion of the state suggesting the potential for future infestations and tree mortality in the Upper CLP watershed.

Exceptionally hot and dry conditions in 2012 lead to extreme drought and two major wildfires causing extensive disturbance to mid- and low-elevation streams and rivers throughout the watershed. Flood peaks were several orders of magnitude greater than expected baseflows during that time of year, which may have lessened the impacts to water quality following the wildfires by scouring the river channel of ash and sediment deposits from previous debris flow events; however, changes in water quality in recent years may be attributable to the flood disturbance caused by elevated baseflows and erosion.

The watershed response to atmospheric deposition is less clear. The reduction in sulfur dioxide emissions has lessened the amount of sulfuric acid in the atmosphere and lead to declines in precipitation acidity and acidic deposition into Colorado’s watersheds. Nitrogen deposition is more of a concern as increasing trends in ammonium have been observed in Colorado (Figure 2.4). It is expected that these trends will continue in the future because of projected population growth and oil and gas development along the Colorado Front Range.

5.2 TRENDS IN CLIMATE & WATERSHED HYDROLOGY

Long-term climate records throughout the Rocky Mountains have indicated that annual mean minimum air temperatures increased 0.7°C per decade with stronger trends in the Colorado Rocky Mountains. Over the past decade, similar trends were detected in air temperature at higher elevations in the Upper CLP watershed. Monthly mean air temperatures increased 0.24°F (0.13°C) per year. This trend was driven by increasing minimum temperatures during the winter season.

Precipitation trends were not detected over the long-term period of record. However, the maximum amount of water contained within the snowpack (peak snow water equivalent; SWE) decreased 1.03 inches per year over the past decade suggesting higher elevations of the Upper CLP watershed may receive less snowfall in the future. In addition, the peak SWE to precipitation ratio decreased over the last decade implying that precipitation patterns may be shifting in the Upper CLP watershed.

Streamflow significantly increased in the Upper CLP watershed over the long-term period of record. Monthly mean streamflow increased 13 cfs per year and winter
streamflow increased 9 cfs per year. No trends were observed in the magnitude or timing of peak streamflow.

### 5.3 TRENDS IN WATER QUALITY

Water quality data collected throughout the Upper CLP watershed were analyzed for long-term trends to determine if concentrations of water quality parameters that have historically had the most impact on treatment at the three treatment plants have increased, decreased or stayed the same over the ten-year period of record from 2008 to 2017. Trend analyses were performed on all monitoring sites throughout the Upper CLP watershed for the following water quality parameters:

- Physical Parameters
- General Parameters
- Total Organic Carbon
- Nutrients
- Microorganisms

Two types of trends were identified in the Upper CLP watershed. Monotonic trends were identified as gradual, continuous changes (increasing or decreasing) in the data over time and step trends were recognized as an abrupt shift (up or down) in the data at a certain point in time. In general, step trends were measured for most water quality parameters at monitoring sites from the South Fork CLP river (PSF) downstream to the Mainstem CLP river below the confluence with the North Fork (PBD). These trends

<table>
<thead>
<tr>
<th>Water Quality Parameter</th>
<th>MAINSTEM CLP WATERSHED</th>
<th>NORTH FORK CLP WATERSHED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JWC</td>
<td>PJW</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Specific Conductivity</td>
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<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td>+S</td>
<td>+S</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>+</td>
<td>+S</td>
</tr>
<tr>
<td>Hardness</td>
<td>-</td>
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<tr>
<td>Total Dissolved Solids</td>
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<td>+</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
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<td>+</td>
</tr>
<tr>
<td>Nutrients</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Microorganisms</td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>

Table 5.1 – Summary of water quality trends detected throughout the Upper CLP watershed over the long-term period from 2008 to 2017. (+ = increasing trend; - = decreasing trend; and +s = increasing step trend)
occurred in response to the dramatic landcover change in the Mainstem CLP watershed caused by wildfire that burned in 2012.

Trends were detected at varying scales. Both site-specific and watershed-wide trends were detected in the Upper CLP watershed. Site-specific trends capture impacts to a specific site, while watershed-wide trends imply a large disturbance that impacted the entire basin or large areas of basin impacting multiple monitoring locations.

Table 5.1 summarizes significant trends detected throughout the Upper CLP watershed over the long-term period from 2008-2017.

### 5.4 IMPLICATIONS TO WATER TREATMENT

Long-term trends in certain water quality parameters may pose issues to water treatment processes in the future. It is anticipated that water quality impacts caused by recent wildfire and flooding will recover with time. Wildfire impacted water quality parameters are trending toward baseline conditions in recent years implying watershed recovery. However, climate change projections for Colorado point to a warmer climate and unpredictable precipitation patterns that will likely increase the frequency and severity of drought and wildfires, and other extreme-weather events that can impact to water quality.

Water quality changes and trends on the Mainstem CLP river at PNF and PBD have the most direct impact to water treatment at the City of Fort Collins’, Soldier Canyon Water Authority and City of Greeley water treatment plants. The following bullets summarize water quality trends detected at PNF and PBR and implications to water treatment:

- Alkalinity and hardness were 1.5 – 2 times greater over the recent five-year period compared to baseline conditions. Elevated levels over this time were caused by post-fire erosion and flood effects. More alkaline water influences water pH and may affect the taste of drinking water. Despite elevated concentrations in recent years, alkalinity remains relatively low in CLP raw water. Because of seasonal influences on alkalinity levels in CLP raw water, blending and chemical additions will continue to be the best practice to meet drinking water treatment goals.

- pH increased 0.07 units per year over the past decade at PNF and PBD indicating that CLP raw water is becoming more alkaline. Increasing CLP raw water pH may affect the taste of drinking water requiring additional blending with an alternate raw water source or chemical additions to adjust pH levels to meet drinking water treatment goals. pH increased throughout the Upper CLP watershed indicating a watershed wide change potentially attributable to the watershed’s response to declining precipitation acidity over the past two decades. Elevated carbonates associated with post-fire erosion and flooding may be elevating the alkalinity at PNF and PBD.

- Total dissolved solids increased abruptly at PNF and PBD following wildfire. Concentrations were 20 mg/L (median) greater over the recent five-year period compared to pre-fire baseline conditions, but remain very low compared to finished drinking water levels throughout the country. Elevated TDS concentrations in CLP raw water do not pose a health risk, but high concentrations indicate elevated levels of minerals, salts, metals, cations or anions. High levels of dissolved solids in finished water can cause water quality concerns including corrosion, scale formation or taste issues if not addressed through treatment.

- Total organic carbon gradually increased 0.10 mg/L per year at PNF and 0.08 mg/L per year at PBD over the past decade. Higher TOC levels in CLP raw water pose concern due to the potential for higher residual TOC (post-filtration) and increased disinfection by-products (DBPs) formation. Increasing TOC in the CLP raw water supply may require additional blending with other raw water sources or increased coagulant for efficient TOC removal. Additional treatment implications for higher CLP raw water TOC may include increased removal requirements as concentrations more frequently exceed 4.0 mg/L.

- Elevated nutrients (nitrate and ortho-phosphate) were observed at PNF and PBD in years following the wildfire. Concentrations were still relatively low, but even small increases in nutrient loads in low nutrient environments can lead to algal growth and potential taste and odor issues. Nutrient concentrations over the recent five-year period have steadily decreased at PNF and PBD.
indicating watershed recovery and a return to pre-fire baseline conditions.

- Total coliforms were greater over the recent five-year period compared to baseline conditions at PNF. Median total coliform counts were 1.5 times higher than baseline conditions. A similar trend was observed at PBD, but contributions from the North Fork may have lessened the trend. The abrupt increase at monitoring sites on the Mainstem CLP river is likely a result of increased erosion and delivery of coliforms following the wildfire.
6.0 DATA QUALITY ASSURANCE AND CONTROL

The Upper CLP watershed collaborative monitoring program assures comparability and validity of data by complying with monitoring methods and implementing quality assurance and quality control (QAQC) measures. QAQC measures are good practice in environmental monitoring and can be used to determine potential error in data due to contamination of water samples, sampling error, equipment contamination, and/or laboratory error. The Upper CLP monitoring sites are representative of the goals and objectives outlined previously and demonstrate the true character of the watershed at the time of sampling. The following summarizes QAQC data collected over the 2017 monitoring season. Refer to Upper CLP annual reports for QAQC summaries for subsequent years (2013-2016).

6.1 FIELD QUALITY CONTROL

In 2017, field duplicates were collected during each Mainstem CLP monitoring event. Field duplicates (11 duplicates in total) were obtained at PNF during each monitoring event to determine precision of data, while field blanks (22 blanks in total) were collected at different monitoring locations on both the Mainstem and North Fork, to identify potential for sample contamination. The field data quality sampling schedule is outlined in the 2017 annual sampling plan (Attachment 4). QAQC samples and accuracy of field equipment is reviewed by Source Watershed Program staff.

Field Duplicates

In 2017, twelve percent (33 out of 183) of the environmental samples collected were QAQC samples. Precision is a measure of the deviation from the true value. For most constituents, duplicate determinations should agree within a relative percent difference of 10%. Duplicate samples that differ greater than 10% were flagged for further quality assurance and control measures. Blank samples should not contain analytes above the reporting limit. The results of the field quality assurance and control sampling indicate that precision and accuracy were acceptable.

Field Blanks

Eighty-seven percent of field blank samples reported below the constituent’s respective reporting limits in 2017. The 13% of field blank samples that were detected above the reporting limits included Ni, NH₃-N, turbidity, and TDS

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Range in QAQC sample concentration</th>
<th>Reporting Limit</th>
<th>Absolute Mean Difference</th>
<th>Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>min</td>
<td>max</td>
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<td>25th</td>
</tr>
<tr>
<td>Alkalinity (mg/L)</td>
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<tr>
<td>Ammonia (ug/L)</td>
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<td>ortho-Phosphate (ug/L)</td>
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<tr>
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Table 6.1 – Data quality assurance statistics calculated for duplicate samples collected at PNF monitoring location in 2017.
Water quality constituents that exceeded their respective reporting limit were similar to blank exceedances reported in previous years.

Concentrations exceedances were reported only slightly above the reporting limit for most samples and concentrations were minimal compared to concentrations of environmental samples. Potential causes of these contaminants are listed below:

- Atmosphere/particulates in the air slightly increasing Ni, ammonia, turbidity, and total dissolved solids. It is recommended to cap sample bottles between rinses and as quickly as possible following the blank sample collection.

- Inadequate rinsing of sample bottles either in the field or laboratory may have left residuals increasing turbidity and total dissolved solids. It is recommended that sample bottles be subject to a final rinse with deionize water in the laboratory prior to storage and triple rinsed in the field with deionize water prior to blank sample collection.

- Ammonia contamination may be introduced by the field sampler and/or laboratory staff accidentally breathing on the sample. It is suggested to limit the amount of time the sample is exposed to the environment by immediately capping the sample bottle following sample collection and/or sample processing in the laboratory.

**Instrument Accuracy**

Accuracy is a measure of the degree of closeness a measurement is to the true measurement. Equipment calibrations were conducted prior to field monitoring exhibitions using certified standards to assure the accuracy of sensors on the multi-parameter water quality sonde.

**6.2 LABORATORY QUALITY CONTROL**

Upper CLP water quality samples analyzed by the Fort Collins Water Quality Laboratory are reviewed by the Quality Assurance Coordinator to ensure data are free of sample contamination, analytical, and/or data entry errors.

The City of Fort Collins Water Quality Laboratory implements analytical QAQC measures by conducting laboratory blank, duplicate, replicate, and spiked samples. The City of Fort Collins WQL conducts a majority of analyses for the Source Water Quality Monitoring Program, and is a U.S. EPA Certified Drinking Water Laboratory with an established QA plan that is applied to all samples received by the laboratory (Elmund et al, 2013). The primary features of their QA protocol include:

- **Precision:** one duplicate sample is analyzed for every 10 samples; relative deviation should be less than 10%.

- **Accuracy:** one external QCS sample is analyzed with each set of samples analyzed. Methods may specify an acceptable recovery range. In general, Standard Methods limits are ± 5% and EPA methods are ± 10%.

- **Recovery:** one sample is spiked for every 10 samples; if there are different matrices, at least one sample per matrix is spiked. Limits for most methods are ± 15%. If one type of matrix spike fails and all other QC passes, those samples may be flagged.

A complete description of laboratory personnel, equipment, and analytical QA methods is outside of the scope of this report and is not addressed in detail here. As part of the City’s Environmental Services Division the WQL operates under the guidance of a general QA plan (Elmund et al., 2013).

**Table 6.2 – Blank samples detected above their respective detection limit from 2013 to 2017.**

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Samples above DL</th>
<th>Total samples</th>
<th>% exceedance</th>
<th>Reporting Limit</th>
<th>Max Exceedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni (ug/L)</td>
<td>1</td>
<td>4</td>
<td>25%</td>
<td>1</td>
<td>1.11</td>
</tr>
<tr>
<td>NH₃-N (ug/L)</td>
<td>8</td>
<td>22</td>
<td>36%</td>
<td>0.01</td>
<td>0.04</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>16</td>
<td>22</td>
<td>73%</td>
<td>0.05</td>
<td>0.99</td>
</tr>
<tr>
<td>TDS (mg/L)</td>
<td>13</td>
<td>22</td>
<td>59%</td>
<td>10</td>
<td>23</td>
</tr>
</tbody>
</table>
7.0 REFERENCES


### ATTACHMENT 1

**LAND USE COMPARISON OF THE NORTH FORK AND MAINSTEM CLP (AREAS CALCULATED USING USGS SEAMLESS GIS DATA SETS)**

<table>
<thead>
<tr>
<th>Land Use Comparison</th>
<th>North Fork (acres)</th>
<th>Main Stem (acres)</th>
<th>North Fork Area (%)</th>
<th>Main Stem Area (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed land (commercial, industrial, residential, urban, and utilities)</td>
<td>2,817</td>
<td>1,945</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Agricultural use and grassland (Cropland, pasture, other agriculture, scrub and grasses)</td>
<td>183,719</td>
<td>54,765</td>
<td>52.3</td>
<td>18.3</td>
</tr>
<tr>
<td>Forest (forest and brush)</td>
<td>154,654</td>
<td>213,879</td>
<td>44.1</td>
<td>71.5</td>
</tr>
<tr>
<td>Natural lands (exposed rock, bare ground, wetlands, tundra, lakes)</td>
<td>9,926</td>
<td>28,473</td>
<td>2.8</td>
<td>9.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>351,116</strong></td>
<td><strong>299,062</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>MAIN STEM</td>
<td>Description</td>
<td>Rationale</td>
<td>GPS Coordinates</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-----------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>100CHR</td>
<td>Chambers Lake Outflow</td>
<td>Outflow from Chambers Lake</td>
<td>N 40° 36.039 W 105° 50.203</td>
<td></td>
</tr>
<tr>
<td>090BMR</td>
<td>Barnes Meadow Reservoir outflow</td>
<td>High TOC and nutrients compared to CHR</td>
<td>N 40° 36.039 W 105° 50.203</td>
<td></td>
</tr>
<tr>
<td>080JWC</td>
<td>Joe Wright Creek at Aspen Glen Campground</td>
<td>Joe Wright Creek above confluence with main stem</td>
<td>N 40° 37.233 W 105° 49.098</td>
<td></td>
</tr>
<tr>
<td>070PJW</td>
<td>Poudre at Hwy14 crossing (Big South Trailhead)</td>
<td>Above confluence Joe Wright Creek</td>
<td>N 40° 38.074 W 105° 48.421</td>
<td></td>
</tr>
<tr>
<td>060LRT</td>
<td>Laramie River at Tunnel at Hwy 14 crossing</td>
<td>Laramie River diversion water</td>
<td>N 40° 40.056 W 105° 48.067</td>
<td></td>
</tr>
<tr>
<td>050PBR</td>
<td>Poudre below Rustic</td>
<td>Midpoint between Laramie River Tunnel and South Fork; impacts to river from Rustic</td>
<td>N 40° 41.967 W 105° 32.476</td>
<td></td>
</tr>
<tr>
<td>040SFM</td>
<td>South Fork at bridge on Pingree Park Rd.</td>
<td>Only access point on South Fork; South Fork water quality differs from main stem</td>
<td>N 40° 37.095 W 105° 31.535</td>
<td></td>
</tr>
<tr>
<td>041SFC</td>
<td>South Fork above confluence with Mainstem</td>
<td>Capture 15% more watershed area than SFM</td>
<td>N 40° 41.224 W 105° 26.895</td>
<td></td>
</tr>
<tr>
<td>030PSF</td>
<td>Poudre below confluence with South Fork - Mile Marker 101</td>
<td>Below confluence with South Fork</td>
<td>N 40° 42.087 W 105° 14.484</td>
<td></td>
</tr>
<tr>
<td>020PNF</td>
<td>Poudre above North Fork 1/2 mile upstream from Old FC WTP#1</td>
<td>Represents water diverted at Munroe Tunnel and at Old FC WTP #1</td>
<td>N 40° 39.882 W 105° 12.995</td>
<td></td>
</tr>
<tr>
<td>010PBD</td>
<td>Poudre at Bellvue Diversion</td>
<td>Greeley WTP Intake</td>
<td>N 40° 53.852 W 105° 22.556</td>
<td></td>
</tr>
<tr>
<td>280NDC</td>
<td>North Fork above Halligan Reservoir; above confluence with Dale Creek</td>
<td>Inflow to Halligan Reservoir</td>
<td>N 40° 52.654 W 105° 20.314</td>
<td></td>
</tr>
<tr>
<td>270NBH</td>
<td>North Fork at USGS gage below Halligan Reservoir</td>
<td>Outflow from Halligan Reservoir</td>
<td>N 40° 49.640 W 105° 16.776</td>
<td></td>
</tr>
<tr>
<td>260NRC</td>
<td>North Fork above Rabbit Creek</td>
<td>Main stem North Fork above Rabbit Creek; downstream of Phantom Canyon</td>
<td>N 40° 48.615 W 105° 17.146</td>
<td></td>
</tr>
<tr>
<td>250RCM</td>
<td>Rabbit Creek Mouth</td>
<td>Tributary to North Fork; drainage area includes agricultural/grazing lands; significant flows late spring to early summer only</td>
<td>N 40° 48.458 W 105° 15.195</td>
<td></td>
</tr>
<tr>
<td>240SCM</td>
<td>Stonewall Creek Mouth</td>
<td>Tributary to North Fork; drains area east of Hwy 287</td>
<td>N 40° 48.796 W 105° 17.231</td>
<td></td>
</tr>
<tr>
<td>230PCM</td>
<td>Lone Pine Creek Mouth</td>
<td>Tributary to North Fork; drainage area includes Red Feather Lakes; significant flows late spring to early summer only</td>
<td>N 40° 47.269 W 105° 15.130</td>
<td></td>
</tr>
<tr>
<td>220NFL</td>
<td>North Fork at Livermore</td>
<td>At USGS gage</td>
<td>N 40° 42.274 W 105° 14.210</td>
<td></td>
</tr>
<tr>
<td>210SER</td>
<td>Seaman Reservoir</td>
<td>Reservoir profiles; impacts to water quality from nutrient loadings</td>
<td>N 40° 42.143 W 105° 14.064</td>
<td></td>
</tr>
<tr>
<td>200NFG</td>
<td>North Fork below Seaman Reservoir</td>
<td>At gage below Seaman Res; sample before flow enters Poudre main stem</td>
<td>N 40° 36.039 W 105° 50.203</td>
<td></td>
</tr>
</tbody>
</table>
# ATTACHMENT 3

## 2016 UPPER CLP MONITORING PARAMETER LIST

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rationale</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conductance</td>
<td>Indicator of total dissolved solids.</td>
<td>All sites with water quality sonde.</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Profile indicates stratification, importance for aquatic life and chemical processes.</td>
<td>All sites with water quality sonde.</td>
</tr>
<tr>
<td>Temperature</td>
<td>Reflects seasonality; affects biological and chemical processes; water quality standard.</td>
<td>All sites with water quality sonde.</td>
</tr>
<tr>
<td>pH</td>
<td>Measure of acidity.</td>
<td>All sites with water quality sonde.</td>
</tr>
<tr>
<td><strong>General &amp; Miscellaneous Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alkalinity</td>
<td>Indicator of carbonate species concentrations; Acid neutralizing capacity of water; treatment implications.</td>
<td>Measured during sampling at NRC, RCM, SCM, PCM, PJW, SFC when conditions allow</td>
</tr>
<tr>
<td>Discharge</td>
<td>Necessary for flow dependent analysis and load estimation.</td>
<td></td>
</tr>
<tr>
<td>Geosmin</td>
<td>Taste and odor compound</td>
<td>Measured monthly at PBR and PNF</td>
</tr>
<tr>
<td>Hardness</td>
<td>Treatment implications. Hard water causes scaling and soft water is considered corrosive.</td>
<td></td>
</tr>
<tr>
<td>Total Dissolved Solids (TDS)</td>
<td>Indicator of overall water quality; includes both ionic and non-ionic species.</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon (TOC)</td>
<td>Important parameter for water treatment; precursor of disinfection byproducts.</td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td>Indicator of suspended material; important for water treatment.</td>
<td></td>
</tr>
<tr>
<td><strong>Nutrients</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen, Ammonia</td>
<td>Primary source of nitrogen to algae, indicator of pollution by sewage, septic tanks, agriculture and atmospheric deposition; water quality standard.</td>
<td></td>
</tr>
<tr>
<td>Nitrate</td>
<td>Primary source of nitrogen to algae; indicator of pollution by sewage, septic tanks, agriculture, and atmospheric deposition; water quality standard.</td>
<td></td>
</tr>
<tr>
<td>Nitrite</td>
<td>Toxic inorganic nitrogen species; rarely encountered at significant concentrations; water quality standard.</td>
<td></td>
</tr>
<tr>
<td>Total Kjeldahl Nitrogen</td>
<td>Sum of organic nitrogen and ammonia.</td>
<td></td>
</tr>
<tr>
<td>Ortho-Phosphorus (Soluble Reactive Phosphorus)</td>
<td>Form of phosphorous (dissolved PO₄⁽⁻³⁾) most available to algae; indicator of pollution by sewage, septic tanks, agriculture and atmospheric deposition.</td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>Includes dissolved and adsorbed, organic and inorganic forms of phosphorus, indicator of pollution by sewage, septic tanks, agriculture and atmospheric deposition.</td>
<td></td>
</tr>
<tr>
<td>Major Ions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Calcium</td>
<td>Major ion.</td>
<td>6x/yr</td>
</tr>
<tr>
<td>Chloride</td>
<td>Major ion.</td>
<td>6x/yr</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Major ion.</td>
<td>6x/yr</td>
</tr>
<tr>
<td>Potassium</td>
<td>Major ion, minor importance as a nutrient.</td>
<td>6x/yr</td>
</tr>
<tr>
<td>Sodium</td>
<td>Major ion.</td>
<td>6x/yr</td>
</tr>
<tr>
<td>Sulfate</td>
<td>Major ion.</td>
<td>6x/yr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Microbiological Constituents</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Coli</td>
<td>Indicator of human or animal waste contamination; water quality standard.</td>
<td>Only from Rustic downstream, NFL, NFG, SER</td>
<td></td>
</tr>
<tr>
<td>Total Coliform</td>
<td>Indicator of human or animal waste contamination.</td>
<td>Only from Rustic downstream, NFL, NFG, SER</td>
<td></td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>Pathogen, indicator of human or animal waste contamination.</td>
<td>Monthly above and below Halligan Reservoir, and below Seaman Reservoir</td>
<td></td>
</tr>
<tr>
<td>Giardia</td>
<td>Pathogen, Indicator of human or animal waste contamination.</td>
<td>Monthly above and below Halligan Reservoir, and below Seaman Reservoir</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metals</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum, total &amp; dissolved</td>
<td>Natural occurs in rocks and soil. Indicator of pollution from mining activity at elevated levels; Aesthetic effects to drinking water</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Arsenic, total &amp; dissolved</td>
<td>Natural occurs in rocks and soil. Indicator of pollution from mining activity at elevated levels; water quality standard.</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Cadmium, total &amp; dissolved</td>
<td>Natural occurs in rocks and soil. Indicator of pollution from mining activity at elevated levels; water quality standard.</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Chromium, dissolved</td>
<td>Natural occurs in rocks and soil. Water quality standard.</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Copper, dissolved</td>
<td>Natural occurs in rocks and soil. Water quality standard.</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Iron, total &amp; dissolved</td>
<td>Natural occurs in rocks and soil. Affects aesthetic quality of treated water.</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Lead, total &amp; dissolved</td>
<td>Natural occurs in rocks and soil. Indicator of pollution from mining activity at elevated levels; water quality standard.</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Manganese, total &amp; dissolved</td>
<td>Natural occurs in rocks and soil. Aesthetic effects to drinking water; water quality standard</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Nickel, dissolved</td>
<td>Natural occurs in rocks and soil. Indicator of pollution from mining activity at elevated levels; water quality standard.</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Silver, dissolved</td>
<td>Natural occurs in rocks and soil. Indicator of pollution from mining activity at elevated levels.</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Zinc, total &amp; dissolved</td>
<td>Natural occurs in rocks and soil. Indicator of pollution from mining activity at elevated levels.</td>
<td>Only PNF &amp; NFG</td>
<td></td>
</tr>
<tr>
<td>Mercury, Low Level</td>
<td>Accumulates in fish tissue even when present in very low concentrations.</td>
<td>Sample every 3 to 5 yrs.</td>
<td></td>
</tr>
</tbody>
</table>
# ATTACHMENT 4

## UPPER CLP COLLABORATIVE WATER QUALITY MONITORING PROGRAM 2016 SAMPLING PLAN

### 2017 Sampling Dates

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>North Fork CLP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mainstem CLP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Grab samples taken at two depths (Top & Bottom); depth profiles at 1-m intervals.
2. Call River Commissioner to find out if water is flowing. If not flowing, skip sample.
3. SFC = South Fork above Confluence w/ Mainstem, new site in 2014 to capture fire impacts.

Blanks analyzed for NH₃, NO₃, TOC, TDS, NTU and Cl⁻

1 Grab samples taken at two depths (Top & Bottom); depth profiles at 1-m intervals.
2 Call River Commissioner to find out if water is flowing. If not flowing, skip sample.
3 SFC = South Fork above Confluence w/ Mainstem, new site in 2014 to capture fire impacts.
## ATTACHMENT 5

### ANALYTICAL METHODS, REPORTING LIMITS, SAMPLE PRESERVATION, AND HOLDING TIMES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method</th>
<th>Reporting Limit</th>
<th>Preservation</th>
<th>Holding Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microbiological</td>
<td>Total Coliform, <em>E. coli</em> - QT</td>
<td>SM 9223 B</td>
<td>0</td>
<td>cool, 4C</td>
</tr>
<tr>
<td>Giardia &amp; Cryptosporidium (CH Diagnostics)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Algae I.D. (Phyto Finders)</td>
<td>SM 10200E.3, SM 10200F.2c1</td>
<td></td>
<td>Lugol's Solution, cool, 4C</td>
</tr>
<tr>
<td>General &amp; Misc.</td>
<td>Alkalinity, as CaCO₃</td>
<td>SM 2320 B</td>
<td>2 mg/L</td>
<td>cool, 4C</td>
</tr>
<tr>
<td></td>
<td>Chlorophyll a</td>
<td>SM10200H modified</td>
<td>0.6 µg/L</td>
<td>cool, 4C</td>
</tr>
<tr>
<td></td>
<td>Hardness, as CaCO₃</td>
<td>SM 2340 C</td>
<td>2 mg/L</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>Specific Conductance</td>
<td>SM 2510 B</td>
<td></td>
<td>cool, 4C</td>
</tr>
<tr>
<td></td>
<td>Total Dissolved Solids</td>
<td>SM 2540 C</td>
<td>10 mg/L</td>
<td>cool, 4C</td>
</tr>
<tr>
<td></td>
<td>Turbidity (NTU)</td>
<td>SM2130B, EPA180.1</td>
<td>0.01 units</td>
<td>cool, 4C</td>
</tr>
<tr>
<td>Nutrients</td>
<td>Ammonia - N</td>
<td>Lachat 10-107-06-2C</td>
<td>0.01 mg/L</td>
<td>H₂SO₄</td>
</tr>
<tr>
<td></td>
<td>Nitrate</td>
<td>EPA 300 (IC)</td>
<td>0.04 mg/L</td>
<td>cool, 4C (eda)</td>
</tr>
<tr>
<td></td>
<td>Nitrite</td>
<td>EPA 300 (IC)</td>
<td>0.04 mg/L</td>
<td>cool, 4C (eda)</td>
</tr>
<tr>
<td></td>
<td>Total Kjeldahl Nitrogen</td>
<td>EPA 351.2</td>
<td>0.1 mg/L</td>
<td>H₂SO₄ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Phosphorus, Total</td>
<td>SM 4500-P B5,F</td>
<td>0.01 mg/L</td>
<td>H₂SO₄ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Phosphorus, Ortho</td>
<td>SM 4500-P B1,F</td>
<td>0.005 mg/L</td>
<td>filter, cool 4C</td>
</tr>
<tr>
<td>Major Ions</td>
<td>Calcium</td>
<td>EPA 200.8</td>
<td>0.05 mg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Chloride</td>
<td>EPA 300 (IC)</td>
<td>1.0 mg/L</td>
<td>none (eda)</td>
</tr>
<tr>
<td></td>
<td>Magnesium, flame</td>
<td>EPA 200.8</td>
<td>0.2 mg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Potassium</td>
<td>EPA 200.8</td>
<td>0.2 mg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Sodium, flame</td>
<td>EPA 200.8</td>
<td>0.4 mg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Sulfate</td>
<td>EPA 300 (IC)</td>
<td>5.0 mg/L</td>
<td>cool, 4C (eda)</td>
</tr>
<tr>
<td>Metals</td>
<td>Cadmium</td>
<td>EPA 200.8</td>
<td>0.1 µg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Chromium</td>
<td>EPA 200.8</td>
<td>0.5 µg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Copper</td>
<td>EPA 200.8</td>
<td>3 µg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Iron, (total &amp; dissolved)</td>
<td>EPA 200.8</td>
<td>10 µg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Lead</td>
<td>EPA 200.8</td>
<td>1 µg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Nickel</td>
<td>EPA 200.8</td>
<td>2 µg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Silver</td>
<td>EPA 200.8</td>
<td>0.5 µg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td></td>
<td>Zinc</td>
<td>EPA 200.8</td>
<td>50 µg/L</td>
<td>HNO₃ pH&lt;2</td>
</tr>
<tr>
<td>TOC</td>
<td>TOC</td>
<td>SM 5310 C</td>
<td>0.5 mg/L</td>
<td>H₃PO₄ pH&lt;2</td>
</tr>
</tbody>
</table>

Analysis conducted by City of Fort Collins Water Quality Lab (FCWQL), unless otherwise noted.

Reporting Limit = lowest reportable number based on the lowest calibration standard routinely used.
STATE of the
POUDRE
A River Health Report Card
The purpose of the River Health Report Card is to provide a description of the current health of the Poudre River from approximately Gateway Natural Area to I-25. This Report Card provides the City of Fort Collins with a new tool to benchmark progress towards its vision of sustaining a healthy and resilient Cache la Poudre River.

The Cache la Poudre River (Poudre) is a complex natural system that has been altered by nearly two centuries of human use. This has resulted in dramatic changes to water quantity and quality, the physical structure of the river, floodplain, forests, and wildlife communities associated with it. The human footprint continues to expand, placing additional pressure (or stresses) on the river ecosystem and the natural processes that sustain it.

OVERALL GRADE
For the study area the Poudre River received an overall grade of C. This grade indicates that even though the Poudre has been altered and degraded by a suite of local and system wide stresses that impair its health, it continues to support basic elements of a functioning river ecosystem.

APPROACH
While the Poudre flows 126 miles from its headwaters to its confluence with the South Platte near Greeley this study focuses on a 24-mile reach from the lower canyon through Fort Collins. Six key indicator groups are informed by metrics, the measurable elements of the system. Metrics grades are developed by collecting and incorporating many types of data and then translated into an A-F grading system.

SIX KEY INDICATORS GROUPS were used to evaluate river health:

FLOWS
River flows are the primary driver of river health. Snowmelt brings high flows in spring and early summer. These high flows refresh the riverbed for fish, scour away silt and debris, and provide water to riverside vegetation. Base flows are low flows that occur throughout the rest of the year and sustain the river. Understanding fluctuation of flows (how quickly flow volumes change over short time periods) is create unnatural and challenging conditions.

SEDIMENT
Sediment includes soil, sand, and rock that are transported from watershed slopes and the riverbanks into and down the river. A natural component of all rivers, too much or too little can cause imbalances in the river’s physical processes. Sediment can affect fish and insect populations by limiting the capacity of the river channel to convey sediment.

RIVER CHANNEL
The shape of the river’s winding path, its width and depth, the presence of finer in-stream habitats, and the ability of the river to convey flows at greater speed or slower moving waters influence this indicator group. The river’s response, or resilience, to natural disturbances (such as floods or drought) is closely linked to the condition of its physical setting.

WATER QUALITY
This is the chemical ability of water to support life, including the plants and animals that live in and depend on it including humans. Dissolved oxygen and temperature are critical factors controlling which types of organisms can live there. While nutrients are necessary to support aquatic life, excessive levels can degrade water quality and cause algal blooms, decreased clarity, and bad odor.

AQUATIC LIFE
Introduced, non-native trout are prized for their recreational values while small bodied native fish are valued as an element of a healthy Poudre River. Aquatic insects (insects that live part of their life on the river bottom) are an essential part of the river system and form the base of the food chain. The upstream-downstream connectivity of aquatic insects is a critically important component of this indicator.

RIPARIAN CORRIDOR
The interaction of land and water results in forests, wetlands, and grasslands. A healthy riparian corridor supports river health by slowing floodwaters, filtering pollutants, and providing critical habitats for many animals closely tied to or dependent on the river itself.
Sediment and River Channel

The river channel has seen fundamental alterations over the past two centuries due to human activities. Disruption of the river movement, including braided channels, has been reduced as a single, confined channel, which has negatively impacted habitat for aquatic insects and fish. Introduced non-native trout appear to be doing well, but the local loss of native fish is a major concern. The river once formed multiple braided channels increasing the system's capacity to mitigate large floods, but now as a single, confined channel it has reduced resilience to flooding. Diversion dams and the lack of large wood in the channel negatively impact habitat for aquatic life.

Riparian Corridor

The riparian corridor has widespread disconnect between the floodplain. In many places, the river is only a narrow band that hugs the riparian corridor, and there are pockets of healthy riparian forests. Restoring floodplain connection and aggressive non-native tree removal can help create a mosaic of diverse habitats, supporting wildlife. The riparian corridor is a self-sustaining ecosystem, but it can be managed to enhance its resilience to large disturbances.

Urban Zone

The river flows through large areas of land managed as conserved open lands, which improves river health in the Plains zone. However, the legacy of land use and water diversions continues to have a significant influence on river health. Diminished peak flows and significantly impacted base flows have created a smaller-than-natural river channel that is frequently disconnected from its floodplain. Low numbers and diversity of native fish are a major concern, but fish passage structures allow for better aquatic habitat connectivity.

Plains Zone

As the river flows through large areas of land managed as conserved open lands, river health improves slightly in the Plains zone. Nevertheless, other major factors like land use patterns and water diversions continue to have a significant influence on river health. Diminished peak flows and significantly impacted base flows have created a smaller-than-natural river channel that is frequently disconnected from its floodplain. Low numbers and diversity of native fish are a major concern, but fish passage structures allow for better aquatic habitat connectivity.

Rural Zone

The river flows through large areas of land managed as conserved open lands, which improves river health in the Plains zone. However, the legacy of land use and water diversions continues to have a significant influence on river health. Diminished peak flows and significantly impacted base flows have created a smaller-than-natural river channel that is frequently disconnected from its floodplain. Low numbers and diversity of native fish are a major concern, but fish passage structures allow for better aquatic habitat connectivity.
**WHAT’S NEXT?**

A “B” grade for river health is desired to fulfill the City’s vision for a healthy and resilient river. This holistic and science-based river assessment can help the City evaluate operational, management, and policy options for preserving or enhancing the river’s health.

This assessment can also serve as a benchmark for monitoring river health and changes in the future. Broader communication and engagement of diverse Poudre River stakeholders can strengthen our impact to manage for a healthy river now and in the future.

**YOU CAN HELP**

<table>
<thead>
<tr>
<th>Action</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct your downspout to water some of your landscape with rain instead of treated water. Use water-efficient fixtures and eliminate water waste like leaky toilets or damaged irrigation equipment.</td>
<td>Conserves water, reduces overall water demand from streams and rivers.</td>
</tr>
<tr>
<td>Clean up wastes around your home and pollutants like lawn chemicals, pet waste, trash and automotive fluids so they don’t wash into the storm drain when it rains.</td>
<td>Helps protect river water quality by preventing pollutants in urban stormwater runoff.</td>
</tr>
<tr>
<td>Abide by regulations, wildlife and restoration closures, and stay on trails to reduce erosion along banks.</td>
<td>Supports health of wildlife and vegetation.</td>
</tr>
<tr>
<td>Buy fishing license or Habitat Stamp from Colorado Parks and Wildlife.</td>
<td>Supports Colorado Parks and Wildlife management of fisheries.</td>
</tr>
<tr>
<td>Volunteer! Opportunities include river cleanups, water-related boards and commissions, education and outreach.</td>
<td>Contact <a href="mailto:engage@fcgov.com">engage@fcgov.com</a>.</td>
</tr>
<tr>
<td>Get out, recreate, participate in educational programs and enjoy the beautiful wildlife, forests and sounds of flowing water.</td>
<td>Personal renewal, appreciation, reminds you why river health is important to you and your community.</td>
</tr>
</tbody>
</table>

**ACKNOWLEDGMENTS**

This report card represents a summary of findings. For the full report and online mapping tool, visit fcgov.com/poudrereportcard.

Auxiliary aids and services are available for persons with disabilities.
Water quality is a Council priority

1. Water Supply Planning

2. Watershed and Water Quality Protection
1. Any questions regarding our provision of water to our customers?
2. Any additional water quality strategies that you would like us to enhance or accelerate?
Environmental Health

ENV 4.6: Provide a reliable, high-quality water supply

ENV 4.9: Sustain and improve the health of the Poudre River and its watershed
About the Water Utility

- 35,000 customer accounts
- 8 billion gallons of water treated
- 550+ miles of water mains
- 2018 Revenue = $40.6M
- 2018 O&M Expenses = $20.2M
- Capital Expenses = ~$10-$15M annually
Fort Collins Water Districts

Fort Collins Water Utility service area

Legend
- Water Features
- GMA
- Major Streets
- City Limits
- Railroad

Water Districts
- ELCO Water District
- Fort Collins Loveland Water District
- Fort Collins Utilities (Water)
- Sunset Water District
- West Fort Collins Water District
Water Supplies

- **Michigan Ditch**
- **Joe Wright Reservoir**
- **Poudre River (50%)**
- **Horsetooth Reservoir (50%)**

AF = acre-foot, supplies water for 3.5 homes for one year

- ~24,000 AF Treated Water
- ~3,000 AF Raw Water
Halligan Water Supply Project

- Enlarge existing dam on North Fork of Poudre River
- Provide reliable future water supply
- 6,400 acre-feet → 14,500 acre-feet
- Federal permitting process since 2006;
- Draft Environmental Impact Statement expected late 2019

fcgov.com/halligan
Goal = Reduce use to 130 gallons per capita per day
=> 10% reduction over next 10 years

Strategies
• Advanced Meter Data
• Outdoor Water Efficiency
• Land Use Planning/Building Codes
• Commercial/Industrial Strategies
• Water Literacy
Water Supply & Demand Management Policy

- Water efficiency and demand management
- Water supply reliability,
- Treated and raw water quality
- Use of surplus raw water supplies
- Regional cooperation on water resources issues.
Water Supply Vulnerability Study

Scope
- Changing hydrology due to climate change
- Impacts of other vulnerabilities (e.g. wildfire)
- Changing water demands from populations shifts and altering demand patterns

Key Findings
- Climate is a critical driver for system performance
- Water storage & C-BT supplies are critical
Watershed Protection

Wildfire Restoration/Mitigation

Spill Response Plan

Source Water Protection Plan

Infrastructure Wildfire Risk Assessment
System renewal a key focus

Issues
- Capacity
- Aging Water Lines
- Water Main Breaks
River Health Assessment/Report Card

- Utilities/Natural Areas Partnership
- Tool to understand stresses on the Poudre River System
- Align management practices with desired outcomes
- Grading scale to relate health in an understandable way
Plan for augmentation for instream flow purposes

- CWCB and Water Court-approved plan
- Water would be added to the river and protected from diversion by others in a stream reach.

In progress since 2013
Halligan Water Supply Project:
Entity: Fort Collins
Size: 6,400 to 14,525 acre-feet

Seaman Water Supply Project:
Entity: Greeley
Size: 5,000 up to 88,000 acre-feet

Windy Gap Firming Project:
Entity: Northern Water for 12 participants
Size (Chimney Hollow Res.): 90,000 acre-feet

Moffat Collection System Project
Entity: Denver Water
Size (Gross Res.): 42,000 to 119,000 acre-feet

Northern Integrated Supply Project:
Entity: Northern Water
Water for 15 participants

Galeton Reservoir:
Size: 45,600 acre-feet

Thornton Water Project
Entity: Thornton
Size: 48-inch pipeline to deliver ~14,000 acre-feet/year
City actively engaged in NISP permitting since 2008

Initiated direct discussion in 2018

Opportunities discussed to date
- Flood risk and stormwater quality mitigation
- Temperature mitigation
- NISP low flow conveyance realignment
- Maintenance of peak flows
- Fish/Flow Passage
- Adaptive Management
1. Any questions regarding our provision of water to our customers?
2. Any additional water quality strategies that you would like us to enhance or accelerate?