Broomfield Water Resources
August 2011

- Historical Review of Supplies
- Current Sources of Supplies
- Reuse Water System
- Future Activities
- Annual Water Quality Report
The Early Water System

- City of Broomfield purchased water utilities from the Broomfield Heights Mutual Service Association in 1963
- Great Western Reservoir, treatment plant, storage tank, water rights, pipelines, etc.
- Great Western was originally constructed in 1904 for agricultural uses
- Sources of water to fill Great Western Reservoir were Clear Creek and Coal Creek
- The primary water used to fill the reservoir was from the Church Ditch off Clear Creek
Denver Water Purchase Contract

- Initial contracts date to 1971 for growth and expansion
- Potable water delivered to Broomfield through Conduit 81 facilities
- Significant amendment in 1978 to include emergency provisions related to Rocky Flats
- Most recent update to the agreement was in 1994
Early System Summary

From roughly 1971 to 1997, Broomfield had two primary water sources for its drinking water supply.

Great Western Reservoir System
- Surface Water from Clear Creek and Coal Creek

Potable Water Contract with Denver Water
Rocky Flats Nuclear Weapons Plant

- In 1952, Rocky Flats plant was constructed and began producing “pits” used in America’s nuclear arsenal
- Plant expanded several times
- Additional buffer area purchased in 1972
- **NUMEROUS INCIDENTS, INCLUDING:**
  - Plutonium fire in building 771 in 1957
  - Plutonium fire in building 776 in 1969
  - Tritium released off-site in 1973
Rocky Flats FBI Raid

- In 1989, the FBI raided Rocky Flats facility to investigate alleged environmental law violations.

- Future Safety of Broomfield’s drinking water system was in serious doubt.

- Immediate responses:
  - Put entire City on Denver Water
  - Built a ditch so runoff from the RF plant would not enter Great Western.
Water Supply Protection / Replacement Projects

- Resolve the impact of Rocky Flats to the downstream water supplies of Standley Lake and Great Western Reservoir

- Two options were identified:
  - Standley Lake Protection Project -- $25 M
  - Great Western Reservoir Replacement Project -- $75 M

- Total cost was $100 million

- Through extensive lobbying and federal legislation, Broomfield’s portion was funded by a grant from DOE and the sale of Broomfield’s water rights
Great Western Reservoir Replacement Project

- Project Goal: Completely sever the physical connection between the Rocky Flats Plant and Broomfield’s drinking water supply

- Main Components:
  - Acquisition of West Slope water rights
  - Construction of a new water treatment facility (located on 144th Ave.)
  - Construction of a pipeline from Carter Lake to the new water plant
  - Broomfield sold its Clear Creek water rights
Current Water Supplies
(Potable and Reuse)

- Denver Water Contract (Treated Water)
- Broomfield supplies treated at the Water Treatment Facility
  - Colorado-Big Thompson Project
  - Windy Gap Project
- Reuse / Raw Water System
  - Windy Gap Effluent
  - Local Surface Water
Annual Water Deliveries
(in acre-feet per year)
Denver Water Contract

- Treated water purchased through a master meter (128th Ave. and Zuni)
- Annual minimum – 4,700 acre-feet
- Annual maximum – 6,500 acre-feet
- Fixed price contract that is substantially more expensive during high demands
- During droughts, deliveries can be curtailed
Colorado Big-Thompson and Windy Gap Projects
(West Slope Water Supplies)
Colorado-Big Thompson Project (CBT)

- Managed and operated by the Northern Colorado Water Conservancy District (Northern Water)
- 1.6 million acres in service area; 30 public water supply systems
- Source of supply: Upper Colorado River and Willow Creek Watersheds
- Total Project includes 310,000 CBT units
- CBT units are divided though allotment contracts
- Broomfield owns 12,849 CBT Units (4.1% of total project)
- Broomfield’s annual firm yield = 8,994 acre-feet
Windy Gap Project

- Managed and operated by Northern Water’s Municipal Subdistrict; uses excess capacity in CBT Project when available
- 480 Total Project Units divided among 13 Windy Gap Allottees
- Source of Supply: Upper Colorado and Fraser Rivers
- Broomfield owns 56 Windy Gap Units (11.7% of total project)
- Broomfield uses Windy Gap water two times: Once for the drinking water system and then for the reuse irrigation system
- Average project yield = 100 acre-feet per unit; however, current firm reliable yield is ZERO.
Windy Gap Firming Project
Chimney Hollow Reservoir

- Original Project completed in 1985
- Since Windy Gap uses excess CBT Project capacity, when available, firm yield is ZERO
- Project will be firmed by the construction of a 90,000 acre-feet reservoir on eastern slope of the Front Range
- Broomfield will own about 29% of the total firming storage
Windy Gap Firming Project Status

- Land purchased in 2004
- Public comment period on Environmental Impact Statement (EIS) closed in December 2008
- Anticipated release of final EIS - Fall 2011
- Final Construction Permits and Record of Decision - Winter 2011
- Begin Engineering Design - 2012
- Begin Construction - 2014
- Complete Construction - 2017
Reuse Water System
Original Reuse System

- Initial sources of supplies consisted of untreated surface water
- Added tertiary treatment and disinfection at the wastewater treatment facility which came on-line in 2004
- New dual piping network to provide irrigation water to parks, athletic fields, golf courses and landscaped right-of-ways
- 7 miles of 24” diameter pipeline between the Wastewater Treatment Plant reuse pumping facility and Great Western Reservoir
The City and County of Broomfield
Reuse Water System

Legend
Water Tanks
- Nonpotable
Treatment Plants
- Nonpotable
- Potable
- Wastewater
Reuse Lines
Streets
- Water Reclamation Areas
- Broomfield Limits
Reuse Pump Facility - Wastewater Treatment Plant

Reuse Pump Facility - Great Western Reservoir
Reuse System Supplies

- Effluent from Windy Gap
- Surface water from Clear Creek and Coal Creek
- Heit Pit Reservoir
- South Platte Water Rights
  - Treated Effluent (Aurora and Consolidated Mutual)
  - Lupton Bottom Ditch Co.
  - Lupton Meadows
Future Activities

- Continued participation in the Windy Gap Firming Project
- Additional expansion of the Reuse Irrigation System
- Working on finalizing a project to meet long-term peak demands
- Updating existing Drought Contingency Plan
- Updating Broomfield’s 1996 Water Conservation Plan
Broomfield Water Supply Timeline

- **1904** Great Western Reservoir Constructed
- **1963** Broomfield’s GWR-based Water Supply
- **1971** Denver Water Contract
- **1989** FBI raid
- **1991** Great Western Reservoir Replacement Project
- **1993** Windy Gap Purchases Complete
- **1997** GWRPP Complete WTP On-line
- **2004** Original Reuse System
- **2009** Most Recent CBT Purchase
- **2011** Water Conservation Plan Update
- **2012 and Beyond** Additional Reuse System Expansion
- **2017** Windy Gap Firming Complete
- **2017** Additional Reuse System Expansion

Broomfield’s Ultimate Water Supply System:

- Denver Water
- Colorado-Big Thompson
- Windy Gap Reuse

Water Conservation Plan Update

- 2011
Broomfield’s treatment facility, built in 1997, is designed to treat 20 million gallons of water per day.

Certified Water Treatment Operators monitor the treatment process continuously to ensure consistent quality and safety.

Peak Day for WTP 9.3 million gallons on August 13
Peak day city-wide 19.7 million gallons on August 12
Chemicals specially formulated for drinking water treatment are added to the raw water to remove particles, microorganisms and other contaminants. These processes are called Coagulation and Flocculation.
Water Treatment Process

- The water is then filtered to remove any remaining particles.
- Water is finally disinfected with chloramines to inactivate bacteria and viruses and prevent harmful organisms from growing in the distribution system.
Annual Water Quality Report

- U.S. EPA requires community water systems who serve at least 15 service connections or regularly serve at least 25 year-round residents to provide Consumer Confidence Reports (CCR) to their customers.

- EPA developed the report format and contents in consultation with water suppliers, environmental groups, and the states.

- The purpose of the reports is to enable Americans to make practical, knowledgeable decisions about their health and their environment.
Drinking Water and Health

- To ensure that tap water is safe to drink, the Colorado Department of Public Health and Environment prescribes regulations limiting the amount of certain contaminants in water provided by public water systems.
- Regulations are based on human health risk assessments, and they are very conservative.
- Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants.
- The presence of contaminants does not indicate the water poses a health risk. The concentration of the contaminants is a key factor.
Broomfield’s Environmental Laboratory is a state Certified Drinking Water Laboratory.

In 2010 more than 25,000 tests were performed for over 100 different contaminants.

Laboratory staff routinely sample more than 220 locations throughout Broomfield.
Water Quality Data

- The tables below list all the constituents detected in drinking water that Broomfield water consumers could have received during the 2010 calendar year.

- Contaminants not reported in the table were not detected.
<table>
<thead>
<tr>
<th>Contaminant, Likely Source of Substances</th>
<th>Barium</th>
<th>Cyanide</th>
<th>Fluoride</th>
<th>Nitrate, as Nitrogen</th>
<th>Alpha particles</th>
<th>Uranium</th>
<th>Sodium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contaminant</td>
<td>ppm</td>
<td>ppb</td>
<td>ppm</td>
<td>ppm</td>
<td>pCi/L</td>
<td>ppb</td>
<td>ppm</td>
</tr>
<tr>
<td>CCR Units</td>
<td>2</td>
<td>200</td>
<td>4 (SMCL=2)</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>EPA Goal (MCLG)</td>
<td>2</td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Highest Level Allowed (MCL)</td>
<td>2</td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Level Detected for Compliance</td>
<td>0.037</td>
<td>ND</td>
<td>0.96</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Range Detected (ND = not detected)</td>
<td>0.017 – 0.039</td>
<td>ND - 25</td>
<td>0.96 – 1.1</td>
<td>ND – 0.23</td>
<td>ND – 2</td>
<td>ND – 1.0</td>
<td>ND</td>
</tr>
<tr>
<td>MCL Violation</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Sample Date/Frequency</td>
<td>Monthly</td>
<td>Monthly</td>
<td>Monthly</td>
<td>Monthly</td>
<td>Quarterly</td>
<td>Quarterly</td>
<td>Monthly</td>
</tr>
<tr>
<td>Likely Source of Substances</td>
<td>Erosion of natural deposits, discharge of drilling wastes</td>
<td>Byproduct of drinking water disinfection</td>
<td>Water additive to promote strong teeth, erosion of natural deposits</td>
<td>Fertilizer runoff, sewage, septic tank leachate</td>
<td>Erosion of natural mineral deposits that emit alpha radiation</td>
<td>Erosion of natural deposits</td>
<td>Naturally present in the environment</td>
</tr>
</tbody>
</table>
## REGULATED CONTAMINANTS TABLE

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>CCR Units</th>
<th>EPA Goal (MCLG)</th>
<th>Highest Level Allowed (MCL)</th>
<th>Level Detected for Compliance</th>
<th>Range Detected (ND = not detected)</th>
<th>MCL Violation?</th>
<th>Sample Date/Frequency</th>
<th>Likely Source of Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regulated in the Distribution System</strong>&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Trihalomethanes</td>
<td>ppm</td>
<td>0</td>
<td>80</td>
<td>25.6</td>
<td>16.9 – 32.1</td>
<td>No</td>
<td>Quarterly</td>
<td>Byproducts of chlorine disinfection of drinking water</td>
</tr>
<tr>
<td>Haloacetic acids</td>
<td>ppm</td>
<td>0</td>
<td>60</td>
<td>22.4</td>
<td>12.4 – 53.5</td>
<td>No</td>
<td>Quarterly</td>
<td></td>
</tr>
<tr>
<td>Total Chlorine (chloramine)</td>
<td>ppm</td>
<td>4 MRDLG</td>
<td>4.0 MRDL</td>
<td>1.9</td>
<td>ND – 3.8</td>
<td>No</td>
<td>20 per week</td>
<td>Drinking water disinfectant</td>
</tr>
<tr>
<td>Total Coliform Bacteria</td>
<td>Absent or Present</td>
<td>zero</td>
<td>Less than 5% positive per month</td>
<td>Highest monthly 0.9% positive samples in January</td>
<td>2 positive samples of total 1216 2010 samples</td>
<td>No</td>
<td>20 per week</td>
<td>Naturally present in the environment</td>
</tr>
</tbody>
</table>
Lead and copper monitoring is required only every 3 years because has had consistently low results. We monitor again in 2011.

### Regulated at the Consumer's Tap

<table>
<thead>
<tr>
<th>Substance</th>
<th>Unit</th>
<th>Action Level (AL)</th>
<th>90th percentile value</th>
<th>Number of Homes exceeding the AL</th>
<th>MCL Violation?</th>
<th>Sample Date/Frequency</th>
<th>Likely Source of Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>ppb</td>
<td>0</td>
<td>= 15</td>
<td>7.3</td>
<td>Zero</td>
<td>Jul - Aug, 2008</td>
<td>Corrosion of household plumbing</td>
</tr>
<tr>
<td>Copper</td>
<td>ppm</td>
<td>1.3</td>
<td>= 1.3</td>
<td>0.206</td>
<td>Zero</td>
<td>Jul - Aug, 2008</td>
<td>Corrosion of household plumbing</td>
</tr>
</tbody>
</table>
## Regulated Contaminants Table

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Compliance Level/ Description</th>
<th>Requirement</th>
<th>Violation?</th>
<th>Sample Date/Frequency</th>
<th>Likely Source of Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbidity</td>
<td>0.15 NTU (maximum) on 11/8/10</td>
<td>At no time to exceed 1 NTU</td>
<td>No</td>
<td>Every 4 hours</td>
<td>Soil Runoff</td>
</tr>
<tr>
<td></td>
<td>100% (minimum)</td>
<td>Each month, at least 95% of samples must be less than 0.3 NTU</td>
<td>No</td>
<td>Every 4 hours</td>
<td></td>
</tr>
<tr>
<td>Control of Disinfection By-Product Precursors</td>
<td>Enhanced treatment was used to remove the required amount of natural organic material</td>
<td>Treatment technique</td>
<td>No</td>
<td>Monthly</td>
<td>Naturally present in the environment</td>
</tr>
<tr>
<td>Microscopic Particulate Analysis (MPA)</td>
<td>3-log removal</td>
<td>Treatment technique</td>
<td>No</td>
<td>Annual</td>
<td>Pollen, phytoplankton, algae, insects and zooplankton</td>
</tr>
<tr>
<td>Constituent</td>
<td>Units</td>
<td>Recommended Limit</td>
<td>Range in Distribution System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------</td>
<td>-------------------</td>
<td>------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>ppm</td>
<td>0.050 – 0.200</td>
<td>0.011 – 0.047</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td>ppm</td>
<td>250</td>
<td>4.3 – 27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>ppm</td>
<td>1.0</td>
<td>0.016 – 0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluoride</td>
<td>ppm</td>
<td>2.0</td>
<td>0.28 – 1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>ppb</td>
<td>300</td>
<td>Not detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manganese</td>
<td>ppb</td>
<td>50</td>
<td>0.8 – 3.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>Std. Units</td>
<td>6.5 - 8.5</td>
<td>7.2 – 8.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silver</td>
<td>ppm</td>
<td>0.10</td>
<td>Not detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfate</td>
<td>ppm</td>
<td>250</td>
<td>13 – 49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>ppm</td>
<td>500</td>
<td>69 – 170</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>ppm</td>
<td>5</td>
<td>ND – 0.010</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Unregulated Constituents

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Units</th>
<th>Recommended Limit</th>
<th>Range in Distribution System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity (as CaCO₃)</td>
<td>ppm</td>
<td>N/A</td>
<td>35 – 89</td>
</tr>
<tr>
<td>Hardness (as CaCO₃)</td>
<td>ppm</td>
<td>&lt;50 = “soft”, &gt;150 = “hard”</td>
<td>34 – 120</td>
</tr>
<tr>
<td></td>
<td>grains per gallon</td>
<td>&lt;3 = “soft”, &gt; 8.8 = “hard”</td>
<td>2 – 7</td>
</tr>
<tr>
<td>Calcium</td>
<td>ppm</td>
<td>N/A</td>
<td>11 – 43</td>
</tr>
<tr>
<td>Magnesium</td>
<td>ppm</td>
<td>N/A</td>
<td>1.7 – 6.1</td>
</tr>
<tr>
<td>Potassium</td>
<td>ppm</td>
<td>N/A</td>
<td>0.89 – 1.9</td>
</tr>
<tr>
<td>Sodium</td>
<td>ppm</td>
<td>N/A</td>
<td>12 – 20</td>
</tr>
</tbody>
</table>
What’s the bottom line?

- Broomfield has high quality drinking water.
- Last year, as in years past, our tap water met or surpassed all EPA and Colorado health standards for drinking water.
- We’re pleased to report that our system has never violated a Maximum Contaminant Level or any other regulatory requirement.
Questions

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