UTILITIES DIVISION FAQS | WASTEWATER COLLECTION SYSTEM

What's the difference between a sanitary sewer and a storm sewer? Are they the same thing?

The city has two separate "sewer" systems:

Wastewater Collection System - The wastewater collection system, also known as the sanitary sewer system, delivers water and waste materials that go "down the drain" from homes and businesses to the city's Wastewater Treatment Facility located on 75th Street. The system consists of underground pipes that are accessed via manholes. The entire system functions using gravity with wastewater flowing downhill to the treatment facility (the exception being a portion of Gunbarrel that is pumped uphill). The smaller branches of the system that collect wastewater from individual neighborhoods merge into larger trunk lines or "interceptors." Flows are ultimately combined into two main interceptor sewers, one serving the Gunbarrel area and one serving the remainder of the city.

Stormwater Collection System – The stormwater collection system is also referred to as the storm drain, storm sewer, or MS4 (municipal separate storm sewer system). The stormwater collection system consists of inlets, catch basin, pipes, ditches, swales, street gutters, and other features that collect water from streets and convey it to a creek. The system is generally designed to keep streets passable during normal rain events. Most new pipes are designed (minimum 18-inch diameter) to convey a 2-year storm event (50 percent probability of occurrence in a given year) in residential areas and a 5-year storm (20 percent probability of occurrence in a given year) before the street becomes impacted.

If the systems are separate, why did the flooding impact the wastewater collection system?

There are two common ways for water to enter the wastewater collection system, other than by going down the drain or toilet in a home or business.

Inflitration - Wastewater collection system pipes are buried underground (sometimes more than 20-feet). The soil underground contains and conveys water (groundwater) and the depth at which the soil is saturated with groundwater (the water table) varies. Due to the tremendous amount of rainfall that occurred beginning on Sep. 11, the amount of water in the soil increased dramatically. Rainfall impacted the entire city and the cumulative impact of the groundwater leaking into the wastewater collection system was significant. This infiltration of groundwater used up collection system capacity that is normally able to convey wastewater. When the capacity of the pipe system to convey water downhill to the wastewater treatment facility was exceeded, gravity caused flows to divert to the next lowest location (in some cases basements). More than two weeks after the initial rainfall events, the wastewater collection

system was still receiving twice as much water as was being distributed to homes and businesses by the city's Water Treatment Facility.

Inflow – Inflow is defined as any non-wastewater flowing directly into the system via an opening such as a manhole, a basement floor drain draining flood waters, or an illegally connected storm drain. Because the wastewater collection system drains downhill via gravity to the wastewater treatment facility adjacent to Boulder Creek, significant portions of the system are located in close proximity to or cross facilities that convey flood waters like streets and creeks. While manhole lids weigh several hundred pounds, water can seep into them when they are submerged in a creek or flooded street. During the peak of the flood event, the amount of groundwater, stormwater, and wastewater inundating the collection system became so extensive that at some locations it lifted manhole covers out of their frames allowing even larger amounts of flood water, including dirt and debris, to flow in and out of the system. Inflow also occurred in residential/commercial basements impacted by flood and ground water. Unless this water was pumped out of affected basements, it likely entered the wastewater collection system through basement floor drains

Why did some homes have water flowing into basements?

There are many different scenarios that may have played out in homes depending on location, elevation and plumbing configuration.

In some cases, it appears that the excessive amount of floodwater and groundwater in the wastewater collection system caused water that could not fit in downstream pipes to flow to the next lowest point such as a basement or a crawlspace. There were also cases where dirt and debris were carried into the system (by floodwaters) and caused localized blockages. Based on the extent that issues were relieved as overall flows in the system subsided, it appears that most issues were caused by floodwater and groundwater and not by flood debris related blockages.

Below are additional scenarios that may have caused home flooding, outside of system wide backups:

- Homes were impacted by flood waters flowing directly into basements via window wells, doors and other openings;
- Homes were impacted when basement sump pumps were unable to keep up with the increased water table elevation around the building foundation.
- Wastewater from an upper floor of a residence may have discharged through plumbing in the basement of the same residence. This scenario is especially likely in situations where a homeowner installed a device to keep flows from the public wastewater system from flowing into their plumbing system; and

- Some plumbing configurations may not be up to modern standards or illegally connected to the city system, which may have allowed wastewater to enter a basement.

Why isn't the wastewater collection system designed to handle precipitation events?

The city has two separate systems; one for collecting and treating wastewater and one for collecting and discharging stormwater. While there a number of ways to characterize the magnitude of the recent precipitation event, it was significant enough to cause widespread flooding and infrastructure damage across the region.. Flows in the wastewater collection system exceeded 50 million gallons per day during the flood event and for several days after. During the same period, treated water delivered to customers was only 11.5 million gallons per day. While the system experienced significant operational issues as a result of the high inflows during and after the flood event, the most critical system components withstood impacts and were able to return to normal operations once flood waters and groundwater levels began to recede.

Only one area has been identified where the collection system was destroyed and is currently being rebuilt. Given the magnitude of the storm event, it is fortunate that the wastewater collection system and the wastewater treatment facility were able handle the storm with only operational challenges and isolated damages. Widespread damage to infrastructure would have significantly impaired the community's ability to continue to occupy their homes and businesses.

Are there things that property owners can do to protect themselves from wastewater collection system issues during future flood events?

Options will vary depending on specific plumbing configurations, but there are a variety of products designed to prevent wastewater backups that are permitted under adopted building codes and can be installed by a qualified plumber in homes and businesses. Property owners should consult with a plumber to determine what methods may be most appropriate for their specific situation. In many cases, additional coverage for wastewater backups and floods can be purchased through insurance providers.

Is there something the city could do to prevent wastewater collection system problems during future flood events?

The city will be reviewing the information from the flood event to identify areas where reprioritization of capital investments may be appropriate or where there may be community support for additional investment in wastewater collection and flood management infrastructure. As an example, the city currently invests approximately half a million dollars per year to rehabilitate aging wastewater collection pipes, in part to reduce groundwater

infiltration. The city will also be looking at ways to further reduce inflows of floodwater into the system. Sanitary sewer manhole lids that lock in place to avoid displacement have been previously installed at a number of strategic locations in the system. While these manholes remained in place and reduced infiltration, and traffic hazards, the amount of pressure in the system indicated that piping in areas with lock-down manholes began to show signs of impending structural failure.

Was this a 100-year flood?

A variety of experts have weighed in on what type of flood event the city of Boulder recently experienced and opinions vary. The city is primarily focused on determining how the extent of flood inundation correlates with adopted FEMA mapping. This information will help improve mapping, emergency response and prioritization of future mitigation efforts. Preliminary assessments indicate that some creeks, such as Boulder Creek, experienced flows much less than anticipated 100-year levels. Other creeks, such as Fourmile Canyon Creek in North Boulder may have experienced flows and inundation significantly larger than a 100-year event. Over the next several months, data compiled by staff, consultants and the public will be used to more fully analyze the flood event.

Why wasn't the city distributing sandbags during the flooding?

During a widespread flood event, it is generally not feasible to use sandbags (in specific locations) to keep water in creeks, culverts or drainageways since it may simply divert impacts to a new location downstream. Flooding was widespread and city resources were focused on preserving critical public infrastructure to maintain access for emergency response and allow for post flood recovery. Sandbags were provided to protect some critical facilities such as Boulder Community Hospital.

Is the drinking water system functional?

Yes. Both the city's Betasso and Boulder Reservoir Water Treatment Facility are fully operational and capable of meeting current city demands. The city's Boulder Reservoir Water is limited to treating water from Boulder Reservoir due to substantial damage to the Boulder Feeder Canal from Carter Lake.

Why doesn't the city remove the trash racks/bar screens on culverts? The reason the culverts are overflowing is because the trash racks are full of debris.

The trash racks installed on the upstream end of road culverts are designed to catch debris in a location where it can be more easily removed. Once debris enters a culvert, it is extremely difficult to remove, particularly while water is actively flowing.

A culvert in my neighborhood overflowed because it was plugged with debris. Why didn't the city clean it out?

The recent flood event impacted the entire city and crews were generally not able to respond to requests related to specific culverts. The flood event significantly exceeded the capacity of most culverts in the city, which are designed to handle only routine storms and are easily blocked by dirt and debris. Where resources were available to clear culverts, work needed to proceed in a systematic manner to avoid releasing water that may have flooded downstream areas.

Did Barker Dam break? Why didn't it stop the flooding?

No, Barker Dam did not break and functioned as it was designed to. Barker Reservoir, located just east of the Town of Nederland, is a storage reservoir for the city's water system. In most years, including 2013, it fills with snow melt in the spring and the water level slowly recedes over the remainder of the year as it delivers water to the city's Betasso Water Treatment Facility. The city operates Barker Reservoir as a municipal water storage facility and maintains as much water as possible in the reservoir to ensure the city has adequate supply under a variety of conditions. Barker Dam was not designed or intended as a flood control facility.

Barker Dam did not break, but the reservoir completely filled. When Barker Reservoir is full, excess water is released to Middle Boulder Creek via a spillway channel designed and constructed for that purpose. Just prior to the storms, Barker Reservoir was about 80 percent full. It took several days before the reservoir filled and began to spill water to Middle Boulder Creek. Flood waters had already begun to recede at this point, and a discernible increase in overall stream flows due to reservoir spilling did not occur. Barker Dam performed as intended during the recent flood event. Gross Reservoir, operated by Denver Water, serves a similar function for the City of Denver and operated in a similar manner in the South Boulder Creek watershed.