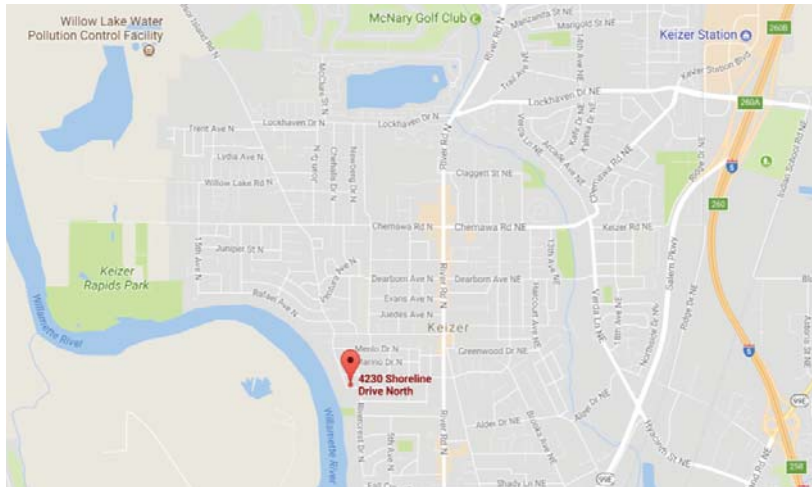


APWA Project of the Year 2017
Category: Environmental, Less than \$5 Million
Shoreline Drive Storm Drain Repair
Keizer, Oregon

Submitted by: City of Keizer



This site marks one of several locations throughout the city where storm lines have been discovered directly under structures.



Home built over storm drain prior to second story addition.



The home addition was completed before the storm drain could be relocated.

General Description

Much of the City of Keizer's stormwater system was inherited from Marion County and built years before the City was established. Over the years, the City has discovered many peculiarities including homes built directly over storm lines. Each year the City replaces a portion of these lines as opportunities arise to prevent a pipe failure from causing major damage to homes.

In the Spring of 2016, shortly after the City finished improvements to Shoreline Drive, City staff noticed a homeowner who was constructing a major addition to their home. The homeowner had obtained all necessary permits for adding a second story and was beginning construction. Since City staff were very familiar with the utilities in Shoreline Drive, they realized that a storm drain was running right beneath the house. Given the nature of the homeowner's addition, the City needed to act quickly to move the storm drain.

The City turned to their consultant Engineer of Record, AKS Engineering & Forestry, to design the emergency project. Initial research indicated that no easements existed for the line, so one of the first steps for the City was to negotiate easements with the property owners. Because the City had already established credibility with homeowners along Shoreline Drive, they were able to obtain the needed easements at no cost to the City by convincing them of the immediate need of the project and the benefits they would receive.



City crews first had to locate the manhole.



The new storm drain needed to be placed directly under existing carports and mature landscaping.



The existing outfall was directly under mature trees.



A 170-foot-long bore placed a 20-inch steel casing along the alignment.

Meanwhile, AKS conducted the necessary surveying, evaluated the site, determined the desired alignment, and evaluated the construction alternatives. They determined that the outfall for the storm drain needed to be moved as well. The new line would be placed between two existing houses. The challenge was that the houses had attached carports, storage sheds, and mature trees that could not be disturbed by construction. The solution was to construct the new line using a directional bore.

A 170-foot-long bore placed a 20-inch steel casing within the 15-foot strip of land between the two houses. From the manhole near the street, the casing was placed almost 11 feet deep and then tapered to just under 3 feet deep at the outfall. Inside the casing a 12-inch 3034 pipe was placed that stretched from the street-side manhole to the river outfall. The line was positioned inside the casing with spacers and then tapered to at-grade at the outfall. This provided adequate gravity flow for the line.

One of the challenges was that the outfall was located in the river floodplain and needed to be relocated to align with the relocated storm pipe. 250 feet of temporary easements were obtained to facilitate construction. Due to the emergency nature of the project and that the improvements created no change to the drainage area, no special permits were necessary. This allowed the project to be completed in the needed 30-day time schedule.

With the storm drain placed and the outfall moved, the existing storm drain located under the house was filled with concrete so that there would not be any future possibilities of collapse. Finally, the City restored all disrupted landscaping for the homeowners.

Completion Date

contained in contract & time extensions:

The Shoreline Drive Storm Drain project was given a very tight timeline of 30 days for construction because of the private homeowners ongoing construction project. With careful planning and ongoing communication between the City, AKS, and Armadillo Boring, the project was accomplished four days early. Construction began on May 16th and substantial completion was achieved on June 10th. Furthermore, the project was accomplished within the \$81,900 budget.



The road was closed to accommodate the construction equipment.

Safety Performance

including number of lost-time injuries per 1,000 manhours worked and overall safety program employed during the construction phase:

Due to the safety protocols in place by the contractor and City, the project achieved zero injuries during construction. The contractor used shoring techniques for work in the open bore pit and outfall. Extra precautions were taken to protect the public by closing Shoreline Drive to vehicular traffic.



Shoring techniques were used to stabilize the excavated bore pit.

Community Need

a summary of how the project met the community needs as related to economic challenges, value engineering, creative use of resources, to the measurable benefit of the community:

This particular storm drain and outfall is the only outlet for the neighborhood. With Shoreline Drive improvements recently completed, one of the goals of the design team and City was to avoid tearing up any portion of the newly completed sidewalk, bikelane, or roadway. Through careful engineering analysis, AKS determined that a directional bore would provide the least amount of disruption to the neighborhood, would be the most cost effective, and provide the most value. Traditional construction of a storm drain typically involves digging a trench which disturbs the soil, landscape, and areas around it. This approach was not realistic as the pipeline route had mature landscaping and existing structures that would all need to be removed. Furthermore, excavating the trench would occur immediately adjacent to the foundations of the two houses. With the directional bore, the boring equipment simply needed a staging area at the start of the bore and no other property was disturbed until the bore reached the outfall location.



The existing storm drain and outfall provided drainage for the entire corner of the neighborhood.



The boring equipment fit snugly in the bore pit. The team successfully bored the smaller pilot bore and then placed the larger 20-inch steel casing - all within one weeks time.

The boring process was carefully planned by the contractor. After the bore pit was excavated, a pilot bore - or microbore - was placed through the alignment. This 6-inch bore established that the route was viable and that there were no obstructions along the route. This was a critical first step given the proximity of the bore route to existing structures and mature trees.



After the pilot bore was completed, then a larger 20-inch steel casing was bored into place and then a 12-inch storm pipe was fed through the casing. The casing provides extra protection around the storm pipe and allowed the contractor to fine tune the placement of the storm line to obtain the optimal slope for the gravity feed. The contractor used large

plastic spacers inside the casing to center the line precisely in the casing. At the outfall end of the line, no spacer was used to create a natural slope.

City staff personally knocked on the doors of neighbors to let them know of the upcoming work and to assure them that impacts to their daily routine would be minimal. The bore was completed in one week and the entire project in less than one month. Once again, the City delivered what they promised to neighbors.



Plastic spacers were used inside the casing to precisely position the storm drain line.



All materials excavated for the bore pit and outfall were temporarily stored and then reused in the project.

Sustainable Practices

use of alternative materials, practices, or funding that demonstrates a commitment to sustainability:

One of the safest ways to protect the environment from unnecessary erosion or impact is to avoid or minimize disruption to an area. In the case of this project, the City chose the most sustainable option available by selecting a directional bore as the construction method. With the extensive amount of work the City had recently completed in the area, they were confident the soil would be conducive to boring. This choice allowed them to preserve landscaping, mature trees, existing structures, sidewalks, and street frontage.

At the outfall location, the City again sought to minimize impacts. The new outfall location was excavated and the material was removed and stored at an off-site location by the City. Once the existing outfall was removed and the new location ready for use, the stored excavated native soil was reused to fill the old outfall location. This economical solution meant no outside fill material was needed to complete the project.

Environmental Considerations

including special steps taken to preserve and protect the environment, endangered species, etc., during the construction phase:

The biggest environmental component was the location of the existing outfall in the floodplain along the Willamette River. The new pipe location meant the outfall would need to be relocated as well. Because the project did not change the amount of impervious area draining to the outfall, and due to the emergency nature of the project, no environmental permitting was necessary. However, due to the proximity to the river, the contractor took the necessary precautions of installing erosion control.

The other precaution used by the contractor was the installation of shoring in construction of the outfall. As the contractor excavated the new outfall, the hole was lined with metal shoring to prevent the sides from collapsing. This provided an extra measure of safety for the benefit of the workers and equipment, but also provided an extra measure of erosion control.

Community Relations

a summary of the efforts by the agency, consultant, and contractor to protect public lives and property, minimize public inconvenience, and improve relations:

The City had established a trusted relationship with the residents of Shoreline Drive by completing the recent street improvements on schedule as promised. During the course of that project, the City had kept residents informed by being on site frequently, worked hard to minimize disruptions, and completed the project on time. Residents of Shoreline Drive now had newly widened sidewalks. Disturbing these fresh improvements would not be viewed kindly by residents.

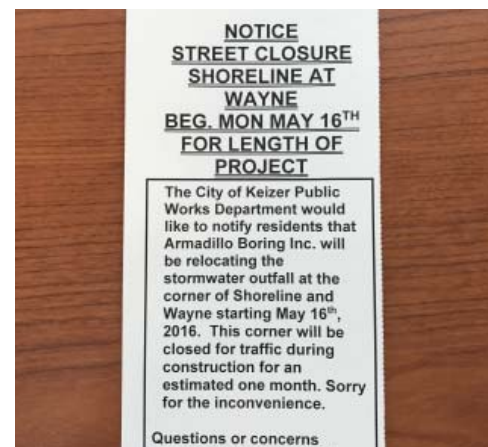
With the construction schedule and selected technique in hand for the storm drain, the City began knocking on doors to notify residents of the upcoming improvements. City staff assured residents that no part of the new street would be impacted and that the only inconvenience would be of the equipment and associated noise. These would also be kept to a minimum. The City also left door hangers for residents so they would have a number to call if they had any concerns. The residents were very understanding and appreciated the City's effort to limit further disruptions to their daily routine. The project proceeded without any issues or concerns.



The existing and new outfall locations were located in the floodplain. Special measures were taken to control potential erosion and confine the work area.



The new outfall location had to be designed into the existing landscaping. The team worked around planter boxes and worked carefully to avoid impacts to the floodplain.



Flyers were given to neighbors.



The City made good on their promise to replace turf that was disturbed during construction.



The storm drain relocation was completed well within the 30-day construction schedule.

For the two homeowners along the pipe route, they were grateful that the project was not going to disturb their existing homes, structures, mature trees, or major landscaping. The small area of grass impacted by construction equipment was on the property of the homeowner doing the home addition. That homeowner requested that sod be replaced when the project was complete as they were planning further landscape improvements once their remodel was completed.

Unusual Accomplishments Under Adverse Conditions

including but not limited to, adverse weather, soil or site conditions, or other occurrences over which there was not control:

Other than the emergency nature of this project to accommodate the remodel in process of a homeowner, the City was able to accomplish the construction of the new storm drain and outfall without the impact of adverse conditions. The project was constructed in spring under good weather conditions. After completing recent projects in the area, the City was confident the condition of the soil would provide no difficulties in construction.

Timing was the most crucial element. With the homeowner's second-story addition already under construction, the City was concerned the extra weight would cause the existing storm drain to collapse under the house. The City needed to act quickly to relocate the line. Project plans were prepared quickly by AKS while the City negotiated easements and notified neighbors. An informal bidding process was used to accelerate the selection of a contractor. As soon as the new line was placed and operational, the existing storm drain was filled with concrete to stabilize it and prevent potential collapse of the pipe. A 30-day timeline was established for construction and the project was completed well within this schedule.

Additional Considerations

such as innovations in technology and/or management applications during the project. Include a description of special aspects of the project:

Directional bores are often not considered as a preferred option on projects. If not done properly, they can cause noise, unwanted vibration, and can be more costly. However, in this situation, utilizing a bore to place the new storm drain was not only the best construction method, but it also provided a cost savings. The City was careful to select a contractor with a history of successful boring projects in urban environments. Clear expectations were established at the beginning for timing, equipment, noise and vibration restrictions, and allowable impacts to the neighborhood. The City monitored activities closely and AKS provided daily inspection of construction.