Appendix D:

Alternatives Considered and Dismissed

Alternatives Considered and Dismissed

Throughout the NEPA process, several alternatives that meet the project purpose and needs were considered and studied but were eliminated from further evaluation. This section summarizes those eliminated alternatives including a brief description of the reasons for elimination.

TRENCHLESS PIPE RELOCATION ALONG AUDUBON TERRACE NW OR ALBEMARLE STREET NW

This alternative would abandon a portion of the sanitary sewer system in Soapstone Valley Park and construct a new pipe along the existing trail and Audubon Terrace NW or Albemarle Street NW using the following trenchless construction methods: jack-and-bore, microtunneling, and/or pilot-tube microtunneling. The benefit of these methods is the ability to install pipe without the need for excavation along the entire length of the proposed corridor, and only disturb the surface at the downstream end, upstream end, and at various intermediate points along the length of the corridor. The technology is limited to relatively short distances of 400-600 feet. Specific space requirements depend on the technology and project details, but temporary construction access is needed at suitable locations for pits/shafts. Although the equipment is more substantial, it would be transported to each work site within the same temporary construction access needed to gain entry to the pipelines and manholes.

The trenchless construction method along Albemarle Street NW would require an extensive amount of deep sewer along the narrow Albemarle Street corridor with associated buried utilities and traffic control concerns. It would also include an additional pump station to pump flow from the low end of Linnean Avenue back up to the new gravity sewer in Albemarle Street. Audubon Terrace would allow for a corridor with less uncertainty regarding traffic and existing utilities, a shallower installation, and elimination of a pump station.

The trenchless pipe relocation along Audubon Terrace NW would require extensive geotechnical investigation during the design phase as its feasibility is highly dependent upon the existing soil profile. It can be difficult to utilize trenchless construction methods in rocky stream channels because they tend to have variable soil profiles. For example, microtunneling can be configured to drill through a broad range of soil types, but it is difficult to account for varying conditions that may include fine silts in some locations and large boulders in other locations. Frequent variation in the types of soils at the face of the machine creates difficulties for this alternative. This alternative would require driving a drill rig to several points along the proposed alignment to obtain the necessary soil data to determine feasibility of these methods.

If the soil conditions are conducive to do so, this alternative would include replacing the pipe in a new location outside the Park along Audubon Terrace NW utilizing the trenchless methods described above. The sanitary sewer flow would need to be intercepted on Albemarle Street NW before it enters the Park. The new pipe would then be routed under the trail connecting Audubon Terrace NW to Albemarle Street NW. This alternative would abandon most of the exposed portions of the existing sanitary sewer pipe in the Park and would also require the installation of two aerial sewer line crossings to convey flow from west and south of the Park to the newly installed mainline. The aerial crossings would need further analysis to confirm hydraulic and geotechnical feasibility. If feasible, the crossings would be approximately 200 feet long, 30 feet over the streambed, and would require support structures

approximately 40 feet apart. Some support structures would be located within the Soapstone Creek. All aerial crossings would have ongoing failure risks and concerns due to natural elements and external forces, as well as require routine inspection and maintenance. An example of an aerial sewer crossing is shown to the right.

Due to the need for geotechnical borings in the Park and the need for aerial crossings, relocating the pipe along Audubon Terrace NW via trenchless construction such as microtunneling was dismissed as a viable alternative.

This photo is an example of an aerial sewer crossing.

OPEN-CUT PIPE REPLACEMENT IN SAME LOCATION

Installation of a new pipe in the same alignment (near the stream) would require open-cut excavation. Since portions of the sanitary sewer system are located within Soapstone Creek and the construction footprint would be over 30-feet wide along the length of the entire existing sanitary sewer pipeline, there would be numerous direct and indirect impacts to the waterway and associated natural resources. In addition, installing the pipe in the existing alignment would not eliminate stream crossings, leaving the pipe exposed in several locations. Although the new pipe could be installed at a lower elevation, it would still have several exposed pipe segments and require asset protection and bank stabilization. A new pipe along the existing alignment would be more susceptible to structural damage from ongoing meandering and erosion of the stream, leaving the pipe susceptible to increased infiltration and exfiltration in the future due to its location in the streambed. Removing the existing sanitary sewer pipe to allow installation of the new pipe requires a lengthier construction period and extended temporary bypass duration to provide maintenance of flow when compared to new pipes installed in a different location or other trenchless construction methods. Therefore, due to the environmental impacts associated with open-cut pipe replacement along the same alignment, this option was dismissed as a viable alternative.

OPEN-CUT PIPE REPLACEMENT IN NEW LOCATION WITHIN THE PARK

Soapstone Valley Park does not possess suitable locations for a new pipe alignment within the Park utilizing an open-cut construction method. In the western half of the study area the only suitable location for a new pipe would be in proximity to the existing pipe alignment. This option, however, would maintain the pipe's location within the streambed leaving it susceptible to ongoing erosive forces. Additionally, the impact would consume more than half of the width of the Park in some locations. Due to the impacts associated with open-cut pipe replacement within the Park, this option was dismissed as a viable alternative.

TRENCHLESS CONSTRUCTION REPLACEMENT WITHIN SAME ALIGNMENT

Replacement of the mainline within the same alignment using a trenchless construction technique would reduce construction access requirements into the Park. However, installation of the new pipe within the existing alignment with a trenchless construction method is not feasible from an engineering standpoint. The most viable technologies would be pipe bursting and to a lesser degree microtunneling. Neither of these methods would work to replace the pipe in its existing location because of shallow depths that occur along the pipe alignment as well as variable pipe cross sections that could require excavation; therefore, trenchless construction replacement of the mainline within the same alignment was dismissed as a viable alternative.

TRENCHLESS CONSTRUCTION IN NEW LOCATION WITHIN THE PARK

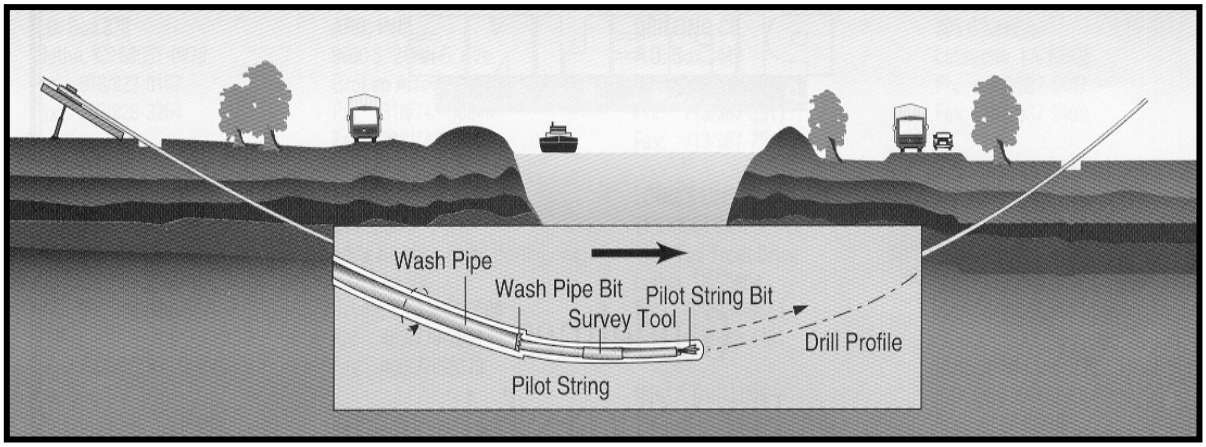
This alternative would relocate the pipe within the Park, which would require installation of a new pipe along the existing trail north of the stream. The existing pipe would be abandoned from the eastern end of Audubon Terrace NW to Broad Branch Road NW. The new pipe alignment would follow the trail along that same length and would be located farther into the hill slope, away from the existing stream. As a result, the sanitary sewer would no longer remain in the streambed, and the new location would provide better access for future maintenance. This alternative would abandon the pipe currently located in the stream channel. The new pipe would be installed using trenchless construction methods whose feasibility depends on the results of soil investigations. This alternative would require multiple aerial sewer crossings. Tributary sewers would be rehabilitated with CIPP and connected to the newly installed mainline pipe.

Trenchless construction methods would be used to install the mainline sanitary sewer pipe; these methods are difficult to deploy in areas with frequently varying soil conditions. This trenchless method is dismissed as a viable alternative because in addition to the aerial sewer crossings that would be necessary, soil conditions along the stream are expected to vary frequently resulting in an increase in construction risk.

INSTALLATION OF A SIPHON

An inverted siphon is a U-shaped pipe that operates under the same principle as the trap under a household sink, as demonstrated in figure below. A new pipe would be installed several feet below the streambed and rise up above the streambed on both banks. As wastewater enters the upstream side of the siphon, wastewater is pushed from the bottom of the "U" and exits the downstream side of the siphon. The "U" portion of the siphon is always full.

Siphons are difficult to maintain in part because they are subject to frequent blockages. Use of siphons



This schematic shows the process used to install a siphon via HDD. A drill bit is used to drill a hole in a U shape. Reamers are used to gradually make the hole larger until it reaches the appropriate diameter for the proposed pipe. The low point in the pipe needs to be carefully designed and is only applicable in a narrow range of design criteria. This project does not provide sufficient flow to install a siphon.

would require accommodations and arrangements for frequent cleaning. In addition, siphons require specific design conditions for flow rate, velocity, and available hydrostatic head. The sanitary sewer line in Soapstone Valley Park runs along an incised channel so the available hydrostatic head needed for a siphon could be sufficient to overcome the head losses. Because some of the sanitary sewer lines around Soapstone Valley Park serve small areas, they have relatively low flow rates and flow velocities. Flow rates and velocities must fall within an acceptable range for siphons to function properly, and some of the

estimated flow rates and velocities within the project area would be lower than the acceptable range. Due to the need for ongoing maintenance and the existing flow rates and velocities that are below design criteria, this option was dismissed as a viable alternative.

TRENCHLESS PIPE REHABILITATION OPTIONS

While the alternatives recommended for further evaluation use various trenchless rehabilitation methods, some trenchless rehabilitation methods that have been eliminated:

- Spiral wound pipe: This technique does not provide structural rehabilitation and is therefore not considered a feasible alternative.
- Fold-and-form: This technique does not meet the project requirements for diameter range.
- Horizontal Directional Drilling (HDD): HDD is not typically used for sewers because the grade control is not accurate enough for installation of gravity pipes.
- Pipe bursting: This technique would not work at locations where the pipe is at or above the ground, such as the multiple stream crossings. Pipe bursting could be used as a method to install new pipe under the embankments at road crossings.

Pipe ramming: This technique involves "hammering" a pipe through in-situ soil conditions without the benefit of tunneling ahead. As such, it cannot be steered and is heavily reliant on consistent soil conditions to maintain the pipe at the desired grade or elevation. Any disparity in soil type can cause the pipe to change direction, creating a varying slopes and elevations within the pipe. As a result, this technique is not preferred for gravity sewers.

REROUTE ALTERNATIVE

The Reroute Alternative would partially remove the sanitary sewer system from Soapstone Valley Park and would include the following components:

- Open-cut sanitary sewer and manhole installation
- Pump station installation
- Abandonment of inactive sanitary sewers and manholes
- Trenchless pipe rehabilitation and manhole repair of remaining sanitary sewers and manholes
- Asset protection and erosion prevention
- MS4 outfall rehabilitation

Open-Cut Sanitary Sewer Installation

Currently, most of the sanitary sewage enters Soapstone Valley Park near Manhole M-9787, just west of the Albemarle Street NW and 32nd Street NW intersection. To intercept this flow, a new gravity sewer would be installed beneath Albemarle Street NW to the Soapstone Valley Trailhead, then south along the Soapstone Valley Trail and Audubon Terrace until it reaches an existing manhole (M-10412), which is west of Linnean Avenue NW. The new 3,280-LF gravity sewer would require new manholes built along intermittently along its path. The construction of the sewer assets necessitates a 30-foot wide LOD along its entire length, as well as deep excavation under Soapstone Valley Trail, which would require sheeting to protect the existing slopes from failing.

Pump Station Installation

Two pump stations would need to be constructed to intercept the existing sanitary sewer flow into Soapstone Valley Park and reroute it away from the Park. A pump station (Pump Station No. 1) would be required to eliminate a source of sanitary sewage that currently flows into Soapstone Valley Park south via an alley between two residential low-rise buildings. Pump Station No. 1 and a retaining wall would be constructed at the end of the alley between the two buildings. The portion of the station that would be accessed for operation would be the same elevation as the alley; the remainder of the wet well would

extend down to the elevation of the Park. For the sewage flow to connect to the existing sanitary sewer system, a 100-LF, open-cut force main sewer would be built in the alley from the edge of the Park to Connecticut Avenue NW. From that point, an open-cut gravity sewer would be constructed under Connecticut Avenue north to Albemarle Street NW connecting to the new open-cut sanitary sewer.

Permanent 24-hour access for maintenance and emergency access to Pump Station No. 1 would not be feasible within the alley due to its current functions, which include providing the main entrance to the adjacent building to the south, a loading dock, and emergency access road. Therefore, a permanent access road through Soapstone Valley Park would be required to provide 24-hour access to Pump Station No. 1 for maintenance and emergency vehicles. The permanent access road would be constructed across Soapstone Creek, from the end of Audubon Terrace NW to Pump Station No. 1. The permanent access road would be a gravel road, and the stream crossing would likely be a concrete ford. The permanent gravel access road would also be used for construction of Pump Station No. 1 and would require HE access paths across the Park, due to the large equipment necessary for excavation, grading, and manipulation of heavy structures.

A third source of sanitary sewage entering Soapstone Valley Park is from the Van Ness East Condominium complex located at 2939 Van Ness Street NW. While redirection out of the Park to gravity sewers in Connecticut Avenue is preferred, the elevation difference between the condominium complex and existing gravity sewers under Connecticut Avenue NW does not allow redirection of the flow. Therefore, a pump station (Pump Station No. 2) would be required to remove the Van Ness East Condominium flow from the Park. Pump Station No. 2 would be constructed on Park property just north of the condominium complex. For the sewage flow to connect to the existing sanitary sewer system, an open-cut gravity sewer pipe would be constructed from an existing manhole to the pump station, and a 1,200-LF, open-cut force main sewer pipe would be built east of the condominium complex from the pump station to reconnect to the existing sanitary sewer system at the east end of Van Ness Street NW. The construction of Pump Station No. 2 would require substantial regrading to create relatively flat ground for the pump station building and access to the station from the adjacent parking lot.

The construction of open-cut gravity sewers and force main sewers would require an LOD of 30 feet along the length of the sanitary sewers. DC Water must manage and maintain both pump stations; therefore, a permanent easement would be required for both pump stations and the associated permanent access road associated with Pump Station No. 1.

Abandonment of Inactive Sanitary Sewers

Approximately 4,380 LF of existing sanitary sewers within Soapstone Valley Park would be abandoned in place as removal of the structures would result in substantial environmental impacts. Walking paths to each manhole within the abandoned section of sewers would be required. The abandoned manholes would likely be collapsed in place, partially filled with gravel or flowable fill, and covered with compacted soil to match the existing grade. Abandoned sanitary sewer pipes would be filled with flowable fill, where practicable.

Trenchless Pipe Rehabilitation and Manhole Repair of Remaining Sanitary Sewers

The pump stations and associated open-cut sanitary sewer lines associated with the Reroute Alternative would not completely remove the sanitary sewer system from Soapstone Valley Park. Approximately 1,900 LF of pipe would remain within the Park and would still require rehabilitation. The remaining pipes would be rehabilitated using CIPP trenchless technology. Rehabilitation of 18 sanitary sewer manholes would still be required.

Asset Protection and Erosion Prevention

Asset protection would be provided at three exposed sanitary sewer asset locations to provide protection from debris and preserve structural integrity. Two locations require protection of pipes in the streambed

and their associated manholes. One location requires the protection of two neighboring exposed manholes adjacent to the stream. Some exposed sanitary sewer infrastructure would remain in their existing conditions, and the use of those pipes and manholes would be abandoned.

DC Water designed this alternative until approximately 30% design. This alternative meets the purpose and need and is technically feasible. However, it was dismissed due to its overall costs, the necessity for pump stations, and the fact that the sanitary sewer system would not be fully removed from the park.