

Technical Memorandum

Date: Wednesday, February 06, 2019

Project: Draft Fish Creek Daylighting Analysis; Term Hydrology Task #1; PO # 2018003992;
Contact No. 44000000625/2018P006

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Subject: Daylighting Evaluations

Introduction

This report provides a high-altitude evaluation and rough order of magnitude (ROM) cost estimate to rebuild the creek channel of Fish Creek from Cuddy Park on 40th Avenue to the downstream (west) side of Minnesota Drive at 41st Avenue. More than 60 years of urban development has resulted in the diversion of this section of Fish Creek into an underground piped stormwater sewer system. Much of the creek channel upstream of Minnesota Drive has been fully or partially lost. It should be noted that before development this area of Fish Creek was a slow meandering creek with low gradient and wide marsh dominated flood plain. Any daylighting attempt will produce a similar low gradient creek with wide ponding areas dominated by wetland plant communities. These types of aquatic communities may be the environments needed to clean up the urban storm water runoff that now dominates the system. Although these reaches of Fish Creek do not support fish because of various culvert impediments, it is assumed that with improvements in downstream structures fish will again have access to this waterway; channel and conveyance designs would target this eventuality.

Channel Design Considerations

The primary considerations of daylighting this portion of Fish Creek center on the elevations and alignments of the reconstructed channel. Because the creek flows have been placed in underground pipes, the opportunity to reconstruct the channel at ground surface elevation has been lost unless the waters of the creek are pumped back to the surface. This is an expensive and unrealistic option. The remaining alternative is to lower the new channel such that it intersects the elevation where the creek flows are currently and then carry that "dug in" channel to its connection with the downstream existing channel. This digging in of the channel varies along the proposed alignments from a relatively shallow excavation of two feet to deeper sections of six to ten feet. As a planning exercise, the side slopes of the new channel are proposed at 3:1 with a wide flood plain consistent with the shallow gradient creek that will result.

For fish to have access to this waterway, numerous culverts will have to be evaluated and modified to be adequate for fish passage. The Alaska Department of Fish and Game (ADF&G) has an online Anadromous Waters Catalog that contains detailed information about each culvert and their overall fish passage rating (AK DF&G, 2019). For Fish Creek, the Anadromous Waters Catalog has culvert information from approximately W 30th Avenue and Brookside Drive north to Bootlegger Cove. Based on the Catalog, seen in Figure 1, there are two fully blocked culverts (indicated by red) and two partially blocked culverts (indicated by gray) within that stretch of creek that require evaluation and possible modification to support fish passage. From Minnesota Drive to approximately W 30th Avenue, culvert data has not been collected. Culverts that need to be evaluated and possibly modified for fish passage within this stretch of creek include those located within the "Spensard Wall", pass under the Alaska Railroad, and those under Minnesota Drive. This is not a comprehensive list and the culvert evaluation and possible fish passage modifications are not included in this evaluation nor the rough order of magnitude cost estimate of this project.

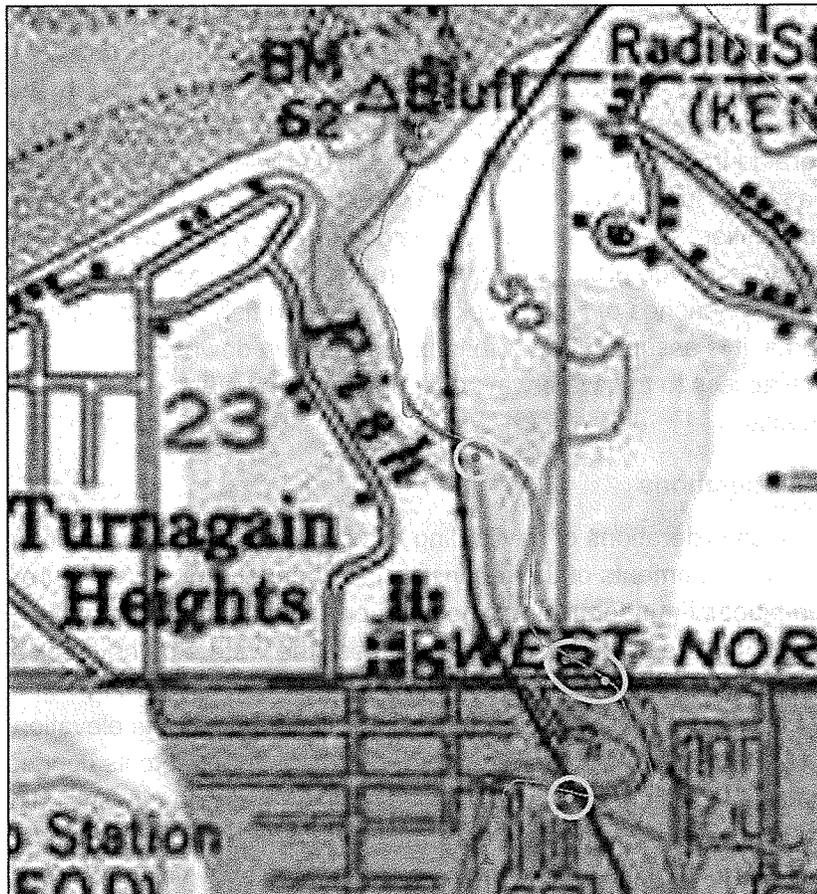


Figure 1: ADF&G Anadromous Waters Catalog: Fish Creek (ADF&G, National Geographic Society)

Location and Ownership

The Fish Creek drainage is located in Midtown Anchorage between the larger drainages of Campbell Creek to the south and Chester Creek to the north. Its headwaters are in the low glacial hills north-east of Lake Otis and Tudor Roads, then it traverses the Waldron wetlands and enters the storm drain system along Tudor Road. In the storm drain system, Fish Creek traverses Midtown Spenard and Turnagain communities where it daylights downstream of Minnesota Drive. In Turnagain, Spenard Lake drains into Fish Creek and outfalls to Knik Arm along the Coastal trail west of West Chester Lagoon, see Figure 2. The Municipality of Anchorage retains drainage and easements for the creek; however, the surrounding land is owned by private landowners.

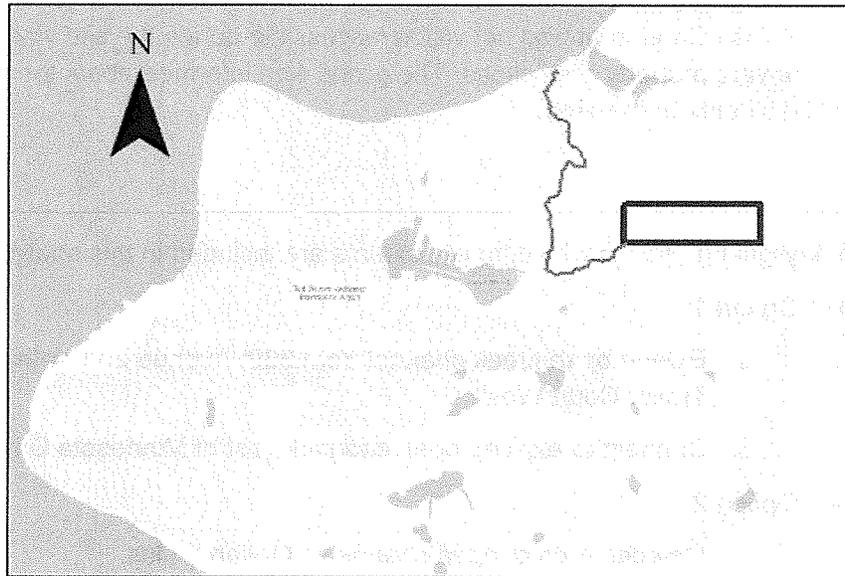


Figure 2: Project Area (Esri, HERE, Garmin, Open StreetMap)

Site Visit

The project team conducted a site visit on August 14, 2018; Tyler Robinson from Cook Inlet Housing Authority accompanied the group. The weather was overcast with a light drizzle and approximately 55° F. The site visit was conducted to photo-document the on-the-ground conditions that may impede daylighting. Significant observations during the site visit are listed below. See Appendix A for corresponding figures.

- i. The ditch line along Kathy Estates Trailer Court was dry and littered with garbage (Figures A-1 and A-2)
- ii. At 1109 Chugach Way, the property owner informed the project team that the ditch line (behind the residence) fills in after a significant rain event. There were large cottonwood trees and other shrubs in the ditch. The cottonwood trees are estimated to be 40+ years in age based on their trunk size (Figures A-3 through A-7).

- iii. The area along the northwest end of Chugach Way contains a vacant lot and ditch line along its north and west borders. The ditch line was dry and contained shrubbery and garbage (Figure A-8).
- iv. Downstream of Chugach Way, Fish Creek flows into an open channel along the east side of the "hockey stick" lot. The slope of this channel is very shallow resulting in very slow flow velocities. At the southwest end of the lot the creek disappeared back into the ground, likely due to infiltration (A-9 through A-18).
- v. The east side of Minnesota Drive, just north of 40th Avenue, contained small, wet ditch lines (A-19).
- vi. The west side of Minnesota Drive, down Roosevelt Drive, contained a portion of Fish Creek that was not visible/accessible during the site visit due to private property restrictions. The group was informed about the creek by residents of the area.

Options

Two daylighting options with different extents are included in this analysis:

- Option 1:
 - Extend open creek channel from 36th Avenue and Kathy Estates Trailer Court West
 - Connect to existing open channel west of Minnesota Drive
- Option 2:
 - Includes area of open channel in Option 1 plus:
 - Extends open creek channel and fish passage crossings of major roads east to the ponds in Cuddy Park.
 - Includes:
 - Piped under A Street
 - Daylighted between C Street and A Street
 - Piped under C Street
 - Daylighted through Centerpoint Business Park and Springer Street Park
 - Piped under Arctic Boulevard
 - Connect at Kathy Estates Trailer Court to Option 1

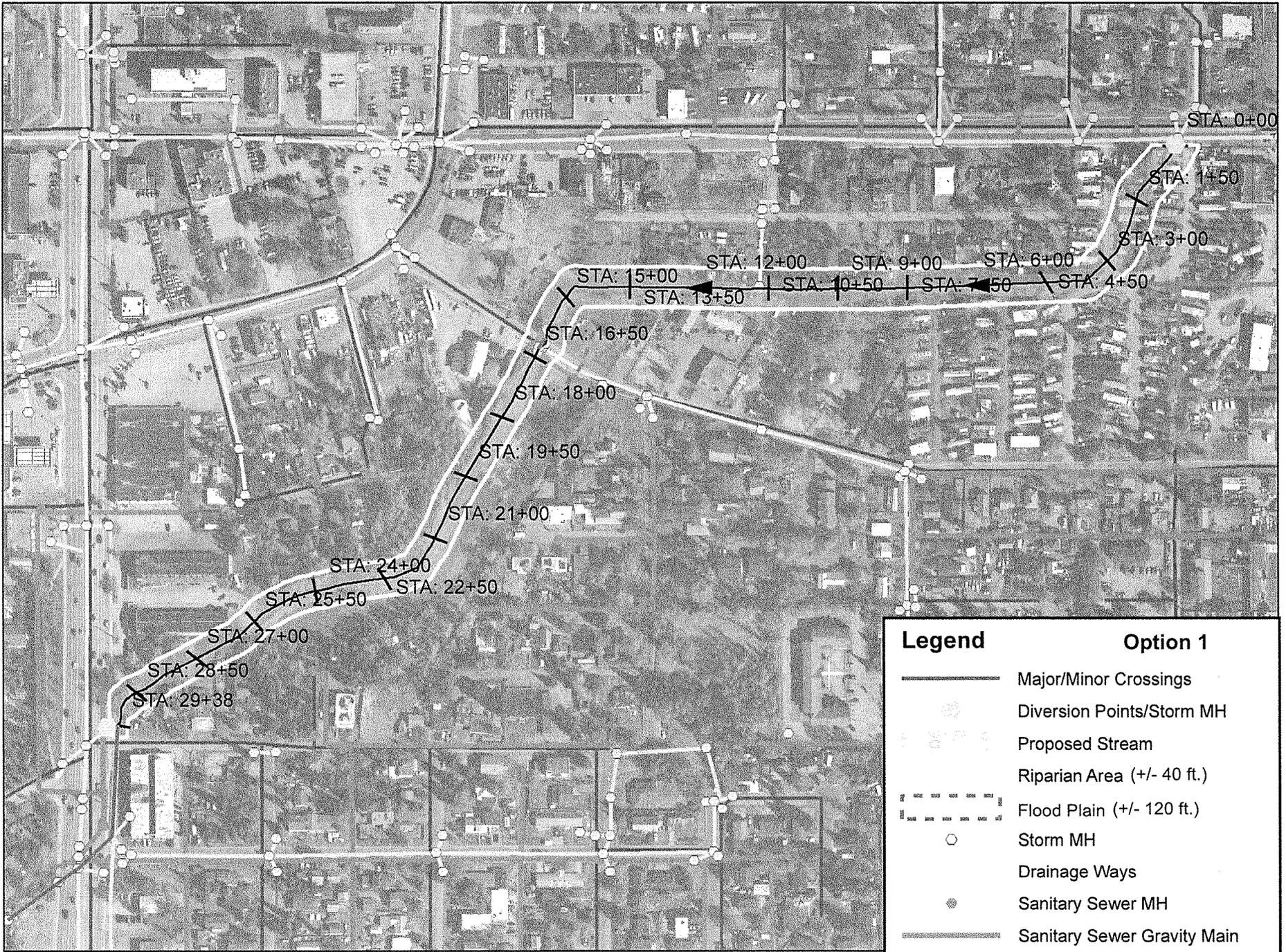
These daylight options were chosen based on existing conditions, surface and ground elevations, water and sewer utility line placements, property boundaries, building edges, and construction costs.

Option 1:

Option 1, shown in Figure 3, is more feasible in terms of constructability and cost. Water would be diverted out of the storm drain system at the junction of 36th Avenue and Kathy Estates Trailer Court and would tie into the existing ditch line between Wilshire Avenue and the northern end of L and L Trailer Court. At L and L Trailer Court, a sanitary sewer line parallels the creek below the existing creek bed. Further downstream, the open creek channel connects to a storm culvert and crosses under Minnesota Drive. At this point, a storm pipes picks up the creek and stormwater flows south under Minnesota Drive. At the west side of Minnesota Drive, along Roosevelt Drive, the creek flows into the open channel of Fish Creek and continues on through the Spenard and Turnagain areas.

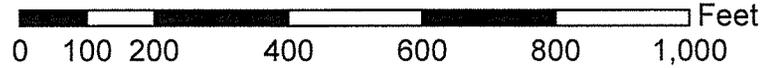
Daylighting this section of Fish Creek would result in approximately 40 feet wide spans of slow moving and meandering waterways interspersed with wider ponded and narrower sections. Side slopes of approximately 20 feet and setbacks of 80 feet would parallel each side of the creek. The floodplain is contained within the 80 foot setback area. This Option would result in the removal of approximately 17 residential units. Based on the existing conditions, surface and ground elevations, this waterway would create a wetland-dominated creek environment. This Option consists of one major road crossing at Minnesota Drive and one minor road crossing at Chugach Way.

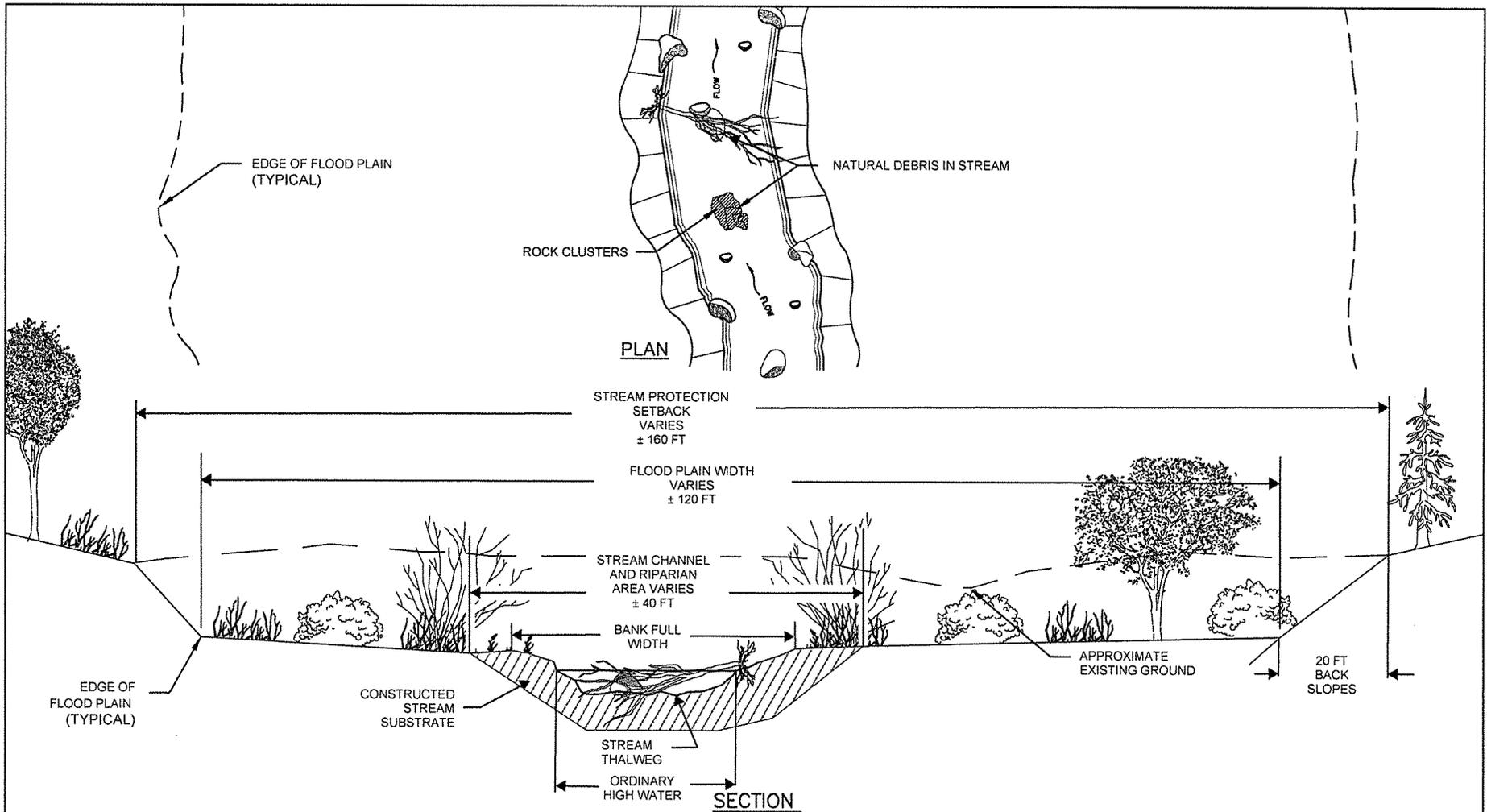
A typical channel cross-section with riparian area and flood plain area is shown in Figure 4.



Legend		Option 1
	Major/Minor Crossings	
	Diversion Points/Storm MH	
	Proposed Stream	
	Riparian Area (+/- 40 ft.)	
	Flood Plain (+/- 120 ft.)	
	Storm MH	
	Drainage Ways	
	Sanitary Sewer MH	
	Sanitary Sewer Gravity Main	
	Water Main	

Figure 3: Option 1





	TYPICAL CHANNEL PLAN & SECTION		FISH CREEK DAYLIGHTING ANALYSIS	
	<p>Notes: Not for construction. Plans are conceptual and require field verification prior to daylighting activities.</p> <p>Drawing is not to scale. Vertical is greatly exaggerated to show detail.</p> <p>Section cuts are taken facing in downstream direction.</p>		TYPICAL CHANNEL DETAILS	
			<p>DRAWN BY: KRG</p> <p>DATE: 02/06/19</p>	
			MAIN REPORT	SHEET 1

Figure 4: Fish Creek Daylighting Analysis - Typical Channel Details (Sheet 1)

The diversion location was chosen because it is the eastern-most storm connection within the block that does not conflict with existing structures and proposed land use changes. The difference between the existing storm pipe invert (approximately 83.5 feet) and the open channel on the eastern side of Minnesota Drive (78.1 feet) is an approximate 5.4 foot change in elevation. The distance between these two points is 2,938 feet, resulting in an average slope of 0.18 percent. An existing stretch of Fish Creek to compare this to would be the section near W. 30th Avenue and Brookside Drive (Figure 5), where a portion of the natural channel remains between residential housing.



Figure 5: W. 30th Avenue & Brookside Drive Fish Creek Section (Google Earth, 2018)

This section contains approximately 50 to 60 foot wide spans of slow moving and meandering waterways. This type of waterway creates a wetland environment that helps with flooding, bioremediation, and creates wildlife habitat.

Sanitary Sewer Conflicts

If the sanitary sewer were left at its current position and elevations, the proposed creek and sewer main would not meet the minimum clearances specified in the Anchorage Water and Wastewater Utility (AWWU) Design Criteria Manual (DCM) (section 30.02.06.01), which requires a minimum elevation distance of three feet between the open channel and sanitary sewer main. Additionally, the AWWU DCM requires sanitary sewer pipes with cover of less than three feet below scour depth of the creek bed to be encased in concrete. The sanitary sewer pipe would need to be moved lower in elevation or relocated from Stations 3+75 through 13+05 since its current depth is between 0.5 feet and 3.0 feet below the proposed creek bed. Pipe insulation may also need to be considered along this stationing.

Figure 6 shows the existing ground surface, proposed creek channel, and existing adjacent sanitary sewer profile for the segment of Option 1.

Surface, Proposed Stream, and Sewer Elevations

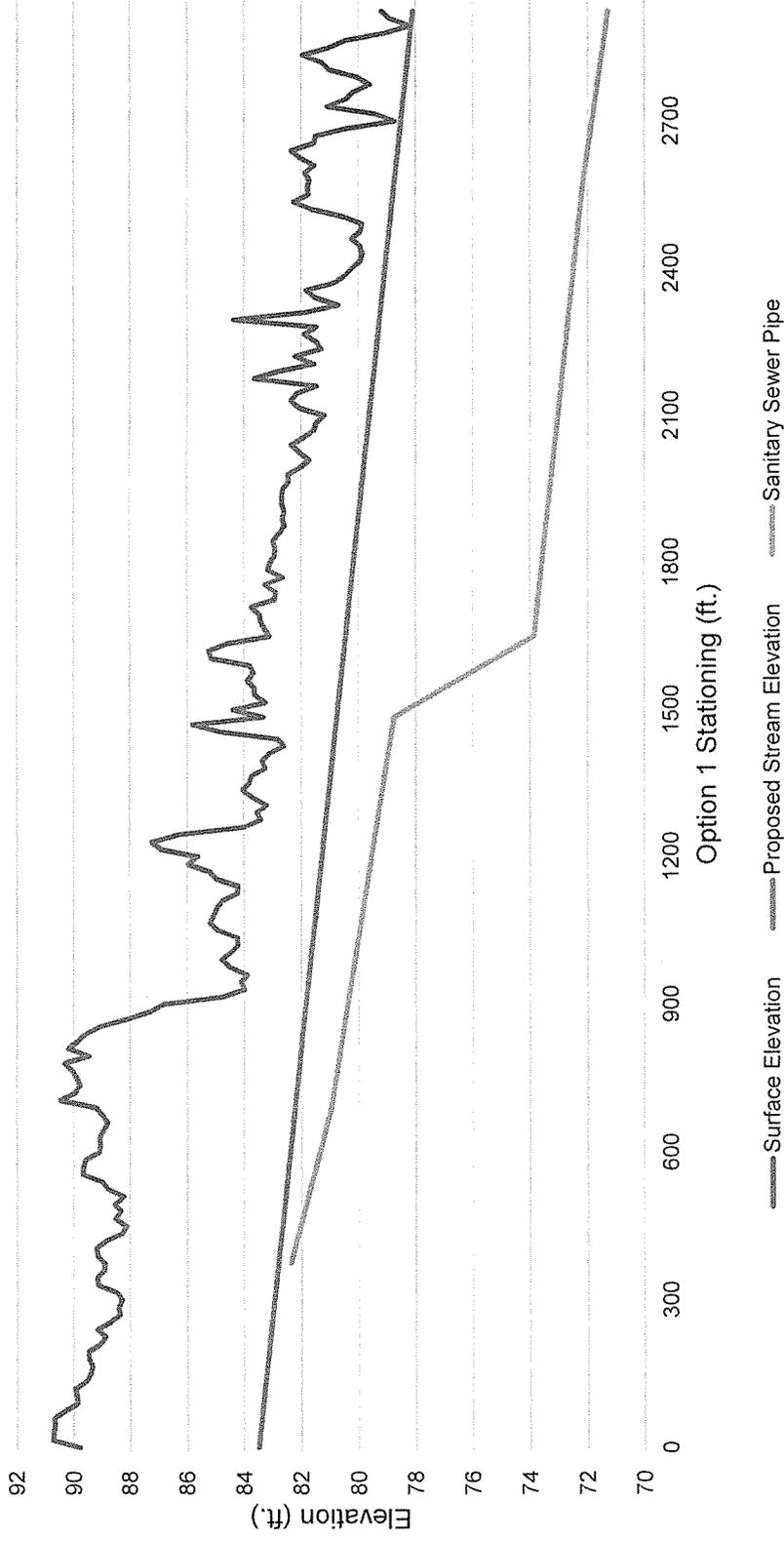


Figure 6: Option 1 – Profile View

Option 2:

Option 2, shown in Figure 7Figure 8, is a hypothetically feasible route from Cuddy Park in terms of constructability and cost. Water would be redirected from the main Cuddy Detention Pond to the North Detention Pond by means of an existing pipe, new fish passage conveyance or with an open channel. An open channel would be constructed to route Fish Creek under B Street and 40th Avenue to the junction of A Street and 40th Avenue. The creek would then be piped under A Street and C Street with an open channel, flowing north, in the median between the two major roads. Once across C Street, the water diverts out of the pipe system along the existing pathway and meanders through the Centerpoint Business Park's parking lots and parking lot medians, passing under the business park access roads. At the end of the business park it crosses into Springer Street Park and opens up to a wide, open channel through the park. At the west end of the park, the creek enters a storm culvert and crosses under Arctic Boulevard. Downstream of Arctic Boulevard, water diverts out of the storm drain system just north of Chugach Way and flows north to tie into the existing ditch line between Wilshire Avenue and the northern end of L and L Trailer Court. Further downstream, the creek reconnects to a storm culvert and crosses under Minnesota Drive. At the west side of the parkway, along Roosevelt Drive, the creek meets with an existing, open channel of Fish Creek and continues through the Spenard area.

This diversion location was chosen because there has been community interest to daylight Fish Creek from Cuddy Park. The Detention Pond has a surface elevation of 96.5 feet and the North Detention Pond has a surface elevation of 97.0 feet. The elevation from the Detention Pond will be used in the slope calculations because modifications would have to be made to the North Detention Pond's surface elevation allow water from the Detention Pond flow to the North Detention Pond. The elevation difference between the existing Detention Pond surface (96.5 feet) and the open channel on the eastern side of the Minnesota Drive (78.1 feet) is a -18.4 foot difference. The distance between these two points is 6830 feet, resulting in an average slope of 0.27 percent.

This Option consists of four major and five minor road crossings. The major crossings are: A Street, C Street, Arctic Boulevard, and Minnesota Drive; the minor crossings are B Street, Centerpoint Drive, within the southwest parking lot of the Centerpoint Business Park, crossing from the Centerpoint Business Park to Springer Street Park, and Chugach Way. Construction of a creek channel in the Centerpoint Business Park would result in a loss of approximately 177 parking spaces, therefore the number of post-project parking spaces may no longer be compliant with Title 21 of the MOA municipal code. It is assumed that all road crossing would be made with fish passage designed conveyance structures.

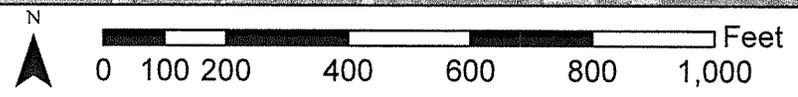
Similar to Option 1, this daylighted portion of Fish Creek would be considerably flat in elevation and would need to consider lowering or moving the sanitary sewer line along the daylighted section that runs parallel to L and L Trailer Court. This Option

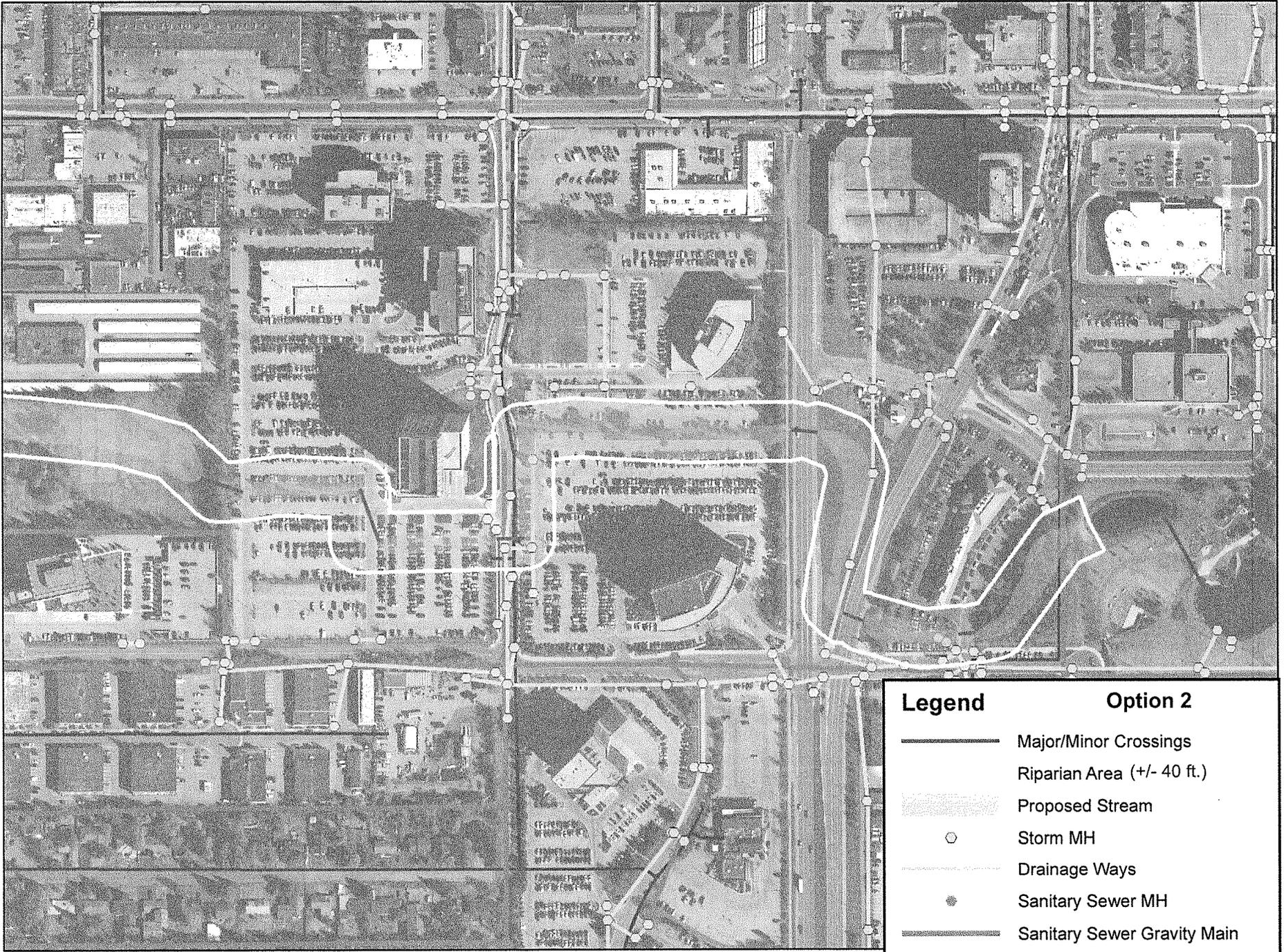
would result in the removal of approximately 16 residential units. Figure 7Figure 8 show the proposed alignment.



Legend		Option 2	
	Major/Minor Crossings		Riparian Area (+/- 40 ft.)
	Proposed Stream		Storm MH
	Drainage Ways		Sanitary Sewer MH
	Sanitary Sewer Gravity Main		Water Main

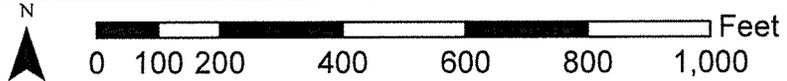
Figure 7: Option 2 - Plan View West





Legend		Option 2
	Major/Minor Crossings	
	Riparian Area (+/- 40 ft.)	
	Proposed Stream	
	Storm MH	
	Drainage Ways	
	Sanitary Sewer MH	
	Sanitary Sewer Gravity Main	
	Water Main	

Figure 8: Option #2 - Plan View East



Rough Order of Magnitude Cost Estimate

The Rough Order of Magnitude (ROM) Cost Estimate was determined using the Engineer's Estimate from the 2014 Chester Creek at Muldoon Road Realignment and Channel Improvements project for the Municipality of Anchorage (MOA). The Schedule of Costs from a similar project recently constructed on Chester Creek at Muldoon Road similar creek channel improvements has been extrapolated and applied to this evaluation. Costs for crossing Muldoon Road were used to estimate the cost of crossing a major road and a percentage (50 percent) of that cost was used as the cost for minor roads. Associated costs were factored in as a percent of construction costs. The estimate reflects an annual three percent material and labor price inflation from 2014 to 2020. Sanitary sewer main relocation and fish passage culvert modifications are not included in the estimate. The following tables give a summary of estimated administration and construction costs and a compilation of included items. See Appendix B for complete bid tabulations.

Option	Schedule Cost	Associated Costs	Total Cost Estimate (millions)
1	\$7,420,701	\$8,904,841	\$16
2	\$25,624,534	\$30,749,441	\$56

Items Included in Cost Estimate	
Construction Costs, based on Bid Item Compilation:	Associated Costs, Based on Percentage of Construction Costs
<ul style="list-style-type: none"> • Open Creek Channel • Demolition • Roadway Crossings • Storm Drain Improvements • Landscape Improvements 	<ul style="list-style-type: none"> • Design • Administrative Costs • ROW Acquisition • Utilities • Contingency

Conclusions

Option 1 is the most feasible in terms of constructability and cost. Option 2, which would cross A and C Street, and require a significant amount of commercial property acquisition, is increasingly complex and expensive in terms of construction. Option 1 would require property acquisitions, a diversion structure, a major road crossing and channel construction. Additional studies will be required to determine the expected flows although some modeling has been done as a result of the MOA Fish Creek Phase IV project.

Some benefits of daylighting sections of Fish Creek may be hard to judge. There are certainly terrestrial, avian and aquatic habitat improvements as well as water quality improvements to be generated along the new aquatic and riparian corridor. Fish may eventually return to the creek after improvements are made in other downstream sections. This type of restoration also provides increased land values and non-motorized transportation corridors if incorporated. Anchorage has a history of regenerating its stream corridors and using them as community amenities. The Chester Creek corridor is an excellent example of this phenomenon.

References

Anchorage Water and Wastewater Utility. (2018). 30.02.06.01 Creek Crossings. *DESIGN AND CONSTRUCTION PRACTICES MANUAL*, 46-47.

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Appendices

Appendix A Site Visit Photographs

Appendix B Bid Tabulations