DOWL

MEMORANDUM

TO:	City of Valdez, Flood Mitigation Taskforce
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DATE:	12/18/2019
SUBJECT:	Preliminary Engineer's Estimate of Flood Mitigation Actions on the Lowe River

1.0 Introduction

This memorandum outlines the preliminary engineer's estimate for flood mitigation improvements related to the Lowe River and the Alpine Woods subdivision, Valdez, AK. The following four items were assessed:

- Cost estimate for the proposed Lowe River Gravel Extraction project
    - Requested accuracy within 20% of final cost
- Cost estimate for buyout and relocation of the Alpine Woods subdivision - option to include costs for construction of new subdivision
    - Requested accuracy within 50% of final cost
- Viability of current maintenance and repair efforts with gravel extraction
- No Action Alternative

The memo attempts to provide context for the decision to proceed with work based on previous geomorphologic studies and observations from DOWLs work on the Lowe River over the past seven years. It should be noted that the actions detailed below should be considered as part of a continuing flood management plan rather a single solution for flood mitigation in the Lowe River floodplain.

2.0 Cost Estimate for Lowe River Gravel Extraction Project

Work detailed in the Lowe River Gravel Extraction and Dike Improvements scoping document is estimated below. The gravel extraction has been broken into five distinct phases that can be considered as standalone projects or grouped together. If phases are broken out in to individual projects, costs are likely to increase due to mobilization of equipment. The cost estimates for the Lowe River Gravel Extraction project are summarized in Table 1.

- Phase 1: Gravel Extraction
- Phase 2: Raising of Existing Dikes
- Phase 3: Joining of Groin One and Three
- Phase 4: Extend Downstream Dike (Groin 4)
- Phase 5: Extend Upstream Dike (Groin 3)

Table 1 - Lowe River Gravel Extraction Cost Estimate

	Estimated Cost		
Height of Dike Raise	4 FT Dike Raise	5 FT Dike Raise	6 FT Dike Raise
Phase 1: Gravel Extraction	$2,165,000	$2,165,000	$2,165,000
Phase 2: Raise of Existing Dikes	$3,310,100	$3,986,500.00	$4,987,967
Phase 3: Joining of Dikes 1 and 3	$1,070,333	$1,165,000.00	$1,263,000
Phase 4: Extend Downstream Dike	$1,581,033	$1,732,500.00	$1,889,300
Phase 5: Extend Upstream Dike	$1,322,944	$1,449,166.67	$1,579,833
Total	**$9,449,411**	**$10,498,167**	**$11,885,100**

Assumptions:

- Riverside and leeside of proposed dike improvements constructed at a 3H:1V slope
- Drivable surface of 18 feet width required at crest of revetment
- Elevation of existing revetment approximately 6 feet above bed elevation

3.0 Cost Estimate for Buyout and Relocation of Alpine Woods Subdivision

Buyout options were previously explored by DOWL, as detailed in the DOWL memorandum titled Lowe River Buyout Options (2017). This memorandum highlighted previous work related to buyout options; first, the U.S. Army Corp. of Engineers (USACE) found in 1982 that a buyout was the optimum solution despite the cost benefit ratio not being greater than one, and CH2MHill refined the USACE study and determined that partial dike/buyout and full dike surrounding the subdivision had cost benefit ratios greater than one. The engineer's estimate was estimated based on the complete removal of the Alpine Woods Subdivision from the floodplain of the Lowe River.

The cost estimate for the relocation is based on the creation of a new subdivision in Valdez to accommodate the same number of lots as sited in Alpine Woods. The relocation estimate is based on the services outlined in the DOT&PF guide, "Relocation Services for Residential Property" (DOT&PF, 2008). This includes administration fees, fair market value for the lot/house, deconstruction fees, tenant relocation costs, and planning and construction of a new subdivision.

The costs outlined in Table 2 are thought to be within 50 percent accuracy. Policy or legislative decisions should not be made with this estimate – a relocation study should be conducted to provide a sound basis for any further discussion in relocating Alpine Woods.

Table 2 - Alpine Woods Buy Out and Relocation Cost Estimate

ITEM	Pay Item Description	Pay Unit	Quantity	Estimated Unit Bid Price	Total
1	Administration Fees	LOT	146	$12,500.00	$1,825,000.00
2	Estimated Market Value	LUMP SUM	ALL REQUIRED	$18,302,875.00	$18,302,875.00
3	Purchase Supplement	LOT	146	$22,500.00	$3,285,000.00
4	Owner/Tenant Relocation	LOT	146	$5,250.00	$766,500.00
5	Cost of Demolition	LOT	146	$50,000.00	$7,300,000.00
6	Planning and Design of New Development	LUMP SUM	ALL REQUIRED	$12,000,000.00	$12,000,000.00
7	Purchase of Land for New Subdivision				
				Grand Total	**$43,479,375.00**

Assumptions:

- Relocation of all residents
- Decontamination of potentially contaminated lots remediated before sale of property to City
- Size of new subdivision similar to that of Alpine Woods
- The accuracy of the preliminary engineer's estimate is accurate within 50% of final cost
- Fair market value was assessed from data obtained from the City of Valdez

4.0 Viability of Current Maintenance and Repair Efforts with Gravel Extraction

The flood mitigation improvements currently proposed at Alpine Woods consists of refacing the dikes with riprap, clearing and grubbing, and monitoring of erosion, water elevation at the dikes and groundwater.

Gravel extraction is designed to mitigate the aggradation of material from the Lowe River and to provide another route to draw flow from the main channel adjacent to Alpine Woods. However, the removal material on an annual basis via gravel extraction would not abate the amount of material being deposited in the Lowe River flood plain. The Lowe River is depositing at a rate of approximately 1.1 to 2.4 inches per year over a 5.5 mile reach of the Lowe River and at 3 to 4 inches per year in the 1.5 mile reach adjacent to the subdivision based on the 2016 geomorphic analysis of the Lowe River (DOWL et al., 2016)

The aggradation of the material is thought to impact Alpine Woods in two ways; during high flow events, reduction in the available in the floodplain cross-sectional area is expected to raise the water surface elevation, and during lower flow events, the more material in the floodplain is expected to direct more flow to the existing main channels adjacent to Alpine Woods.

Due to the nature of the aggradation observed in the Lowe River floodplain and the unpredictable nature of braided streams, the gravel extraction work would be an annual occurrence as part of a long-term flood mitigation plan. The amount of gravel extraction is likely to vary depending on the amount of material deposited by the Lowe River, the amount of flow conveyed by the channel created by gravel extraction and other environmental conditions. Unless a significant change in the current channel configuration occurs, the gravel extraction should be considered as a part of

annual maintenance, but the extent of gravel of gravel extraction operations will vary from year to year.

Gravel extraction is thought to make the most difference during the lower flow events, when water is seen to be pushed up against the dikes. The gravel extracted from the Lowe River floodplain could be stored in the 12 Mile Pit

The costs summarized in Table 3 are an annual expenditure, based on stockpiling or riprap, maintenance of dike infrastructure, and the gravel extraction and stockpiling.

Table 3 - Annual Maintenance Estimate Cost

Pay Item Description	**Pay Unit**	**Estimated Unit Bid Price**	**Quantity**	**Estimated Cost**
Phase 1: Dike Maintenance / Annual				
Mobilization Demobilization	Lump Sum	$25,000.00	All Required	$25,000
Environmental Protection, SWPPP, Permitting	Lump Sum	$10,000.00	All Required	$10,000
Construction Survey	Lump Sum	$7,500.00	All Required	$7,500
As-Built Survey	Lump Sum	$7,500.00	All Required	$7,500
Gradation Testing	Lump Sum	$2,500.00	All Required	$2,500
Unclassified Alluvial Gravel	Cubic Yard	$20.00	-	-
Riprap, Class I	Cubic Yard	$60.00	250	$15,000
Riprap, Class III	Cubic Yard	$80.00	1,000	$80,000
Subbase, Grading F	Cubic Yard	$50.00	-	-
Total Excavation	Cubic Yard	$5.00	-	-
Clearing and Grubbing	Lump Sum	$10,000.00	All Required	$10,000
Seeding Fertilizing, Mulching	Lump Sum	$15,000.00	All Required	$15,000
Stockpile Rock				
Riprap, Class I (3% of Placed Rock)	Cubic Yard	$60.00	325	$19,500
Riprap, Class III (3% of Placed Rock)	Cubic Yard	$80.00	1,300	$104,000
Phase 2: Excavation				
Excavation	Cubic Yard	$21.23	50000	$1,061,275
			Grand Total	**$1,357,275**

Assumptions:

- No increase in the height of dikes
- No further extension of dikes
- No channel avulsion occurs upstream of Alpine Woods that would cause the breaching of 12-Mile Pit.

5.0 No Action Alternative

The ‘no action’ alternative is based on maintaining the dike infrastructure at Alpine Woods with no gravel extraction activities. Since the aggradation in the floodplain in the area adjacent to Alpine Woods is estimated at 3 to 4 inches per year, a crude inference can be made that every three years, the potential reduction in the effective height of the dikes reduces by one foot. The estimation of the effective height of the dikes does respond linearly to the depth of material deposited in the floodplain, but many variables that are sensitive to environmental change, such as flow from the Lowe River and its tributaries.

Risks that appear to be high priority are groundwater issues at Alpine Woods and the flanking of the dikes by channel avulsion at the 12 Mile Pit.

Assumptions:

- The integrity of the current dike infrastructure at Alpine Woods are good and does not require extensive maintenance

6.0 References

DOT&PF. 2008. Relocation Services for Residential Property
Accessed: 12/16/2019
URL: http://www.dot.state.ak.us/anc/business/generalAviation/propertyAcquisition/DOT-PF_RelocationServices.pdf

DOWL, NHC. 2016. Lowe River Geomorphic Atlas and Sediment Budget. Prepared for City of Valdez.

DOWL. 2017. Lowe River Buy Out Options Memorandum.

7.0 Disclaimer

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