



Technical Memorandum

To: Chris Clemons, Yakama Nation
From: Inter-Fluve Inc.
Date: October 29th, 2014
Re: Results of Natapoc Soil Pits

Introduction

Soil test pits and groundwater investigations were performed at the Natapoc project site on September 29 and 30, 2014. These tests were recommended (Inter-Fluve 2013, Inter-Fluve 2014) to provide additional information necessary to evaluate the feasibility of a flow-through side channel through the Natapoc Property. The soil pits were used mainly to characterize the subsurface soils in order to inform the feasibility of future design of side channel banks (slope angle and stability) and overall channel dimensions. Depths to water encountered in the pits were noted. Groundwater inflow rates were too low to warrant pump tests.

Methodology

Testing Locations

The test pits were performed at three different locations along the proposed alignment of a flow-through side channel (Figure 1). Test pits were dug with a tracked excavator provided and operated by Wildlands, Inc. Results were observed and recorded with photos and notes. The pits were backfilled and the immediate area reclaimed. Perforated PVC groundwater monitoring wells with hobo data loggers were installed in each of the three pits.

A brief description of each pit with graphical soil profiles follows.

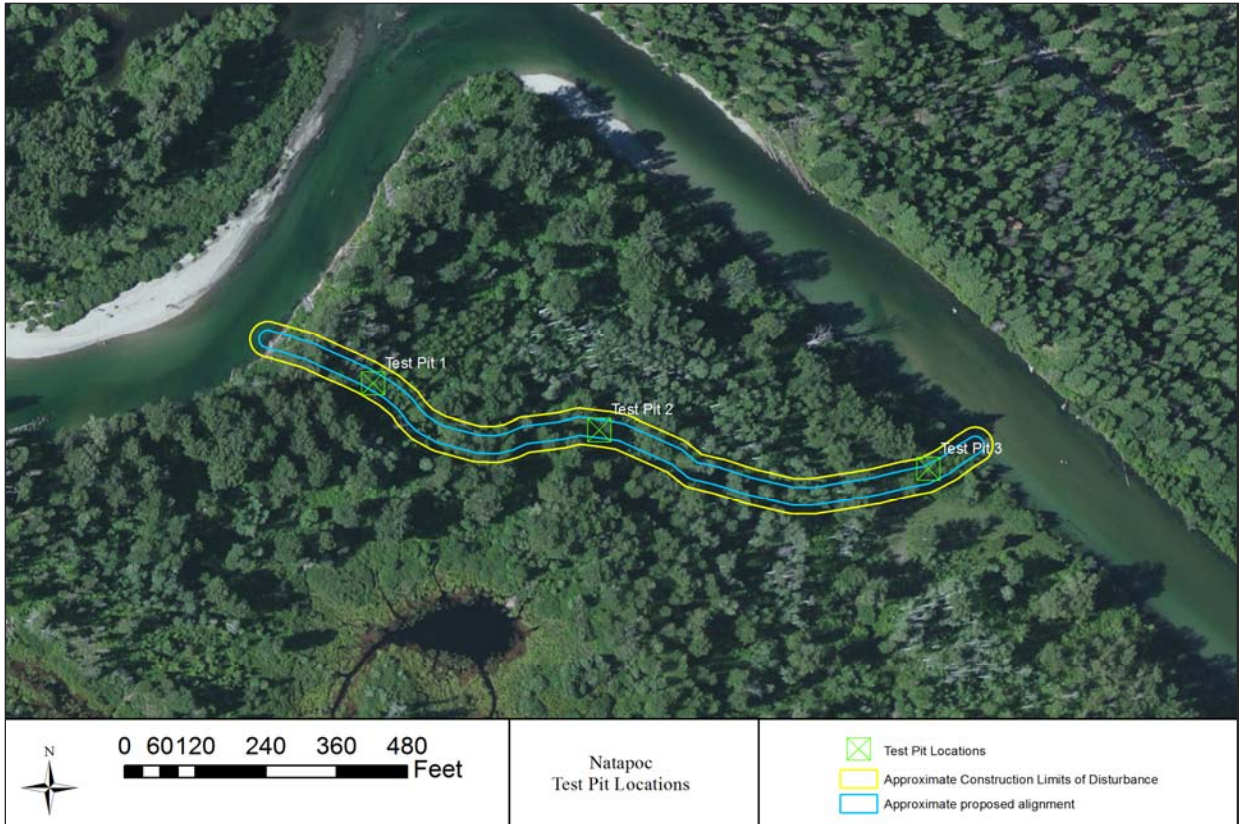


Figure 1 Test pit locations (Test Pits 1 and 2 dug on September 29, Test Pit 3 dug on September 30).

Soil Pit Results

Soil Pit 1

Soil Pit 1 was dug to a depth of 12 feet. Soils were predominantly silts and sand. Saturated conditions were observed at 7 feet below ground with standing water observed at 8 feet. As the pit was dug, material along the sides of the pit walls continued to collapse inward.



Figure 2 Representative photo of soil pit 1.

SOILS PIT - 1

DEPTH, FT	SYMBOL	DESCRIPTION	DEPTH, FT	NOTES
0'				
0.1'		ORGANIC MATTER		
0.8'		SILTY LOAM		
1.8'		SILT		
5'		SAND		
5.6'		LOAMY SAND	7'	FIGURE 1
8.2'			8'	WATER
10'		GRAVELLY SAND		
12'				
15'				



FIGURE 1 - 7' DEPTH



FIGURE 2 - PROFILE



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Yakama Nation Fisheries
 Natapoc
 Survey: September 29, 2014

SOILS TEST PIT 1

IN: WENATCHEE RIVER
 NEAR: LAKE WENATCHEE
 COUNTY: CHELAN STATE: WA
 DATE: OCTOBER 29, 2014

SHEET 1 OF 3

Soil Pit 2

Soil Pit 2 was excavated to 12.1 feet depth. Soils were sands to 3.3 feet below ground and predominantly sand to the pit bottom. Water was observed at 8 feet.



Figure 3 Non-cohesive sandy soils from Test Pit 2

SOILS PIT - 2

DEPTH, FT	SYMBOL	DESCRIPTION	DEPTH, FT	NOTES
0'				
0.2'		SAND		
		SANDY LOAM		
1.8'				
		SAND		
3.3'				
5'				
		COARSE SAND WITH SPARSE GRAVELS		
8'				(NON-COHESIVE) WATER
9'				FIGURE 1
10'				
12.1'				
15'				

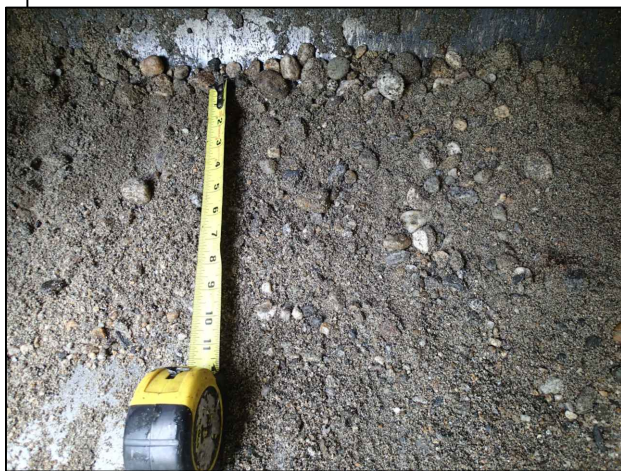


FIGURE 1 - 9' DEPTH



FIGURE 2 - PROFILE



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IN: WENATCHEE RIVER
NEAR: LAKE WENATCHEE
COUNTY: CHELAN STATE: WA
DATE: OCTOBER 29, 2014

SHEET 2 OF 3

Soil Pit 3

Soil Pit 3 was excavated to 12 feet depth. Soils were cohesive silts to 3 feet below ground, cobbly gravel from 3 to 6 feet, gravelly sand from 6 to 9 feet and cohesive sandy loam to the pit bottom. Water was observed at 7 feet. As the pit was dug, material along the sides of the pit walls continuously collapsed inward.



Figure 4 Offcast material from Soil Pit 3.

SOILS PIT - 3

DEPTH, FT	SYMBOL	DESCRIPTION	DEPTH, FT	NOTES
0'				
0.2'		ORGANIC MATTER		
		COHESIVE SILT		
3'				
5'		COBBLY GRAVEL		
6'			7'	WATER
		GRAVELLY SAND		
9'			9.5'	FIGURE 2
10'		COHESIVE SANDY LOAM		
12'				
15'				



FIGURE 1 - WATER AT 7' DEPTH



FIGURE 2 - SANDY LOAM



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SOILS TEST PIT 3

IN: WENATCHEE RIVER
 NEAR: LAKE WENATCHEE
 COUNTY: CHELAN STATE: WA
 DATE: OCTOBER 29, 2014

SHEET 3 OF 3

Conclusions

Soil Pit Implications

The predominant soil condition across the three soil pits were slightly cohesive silts to non-cohesive sands. Very little gravel or cobble material was encountered. These soils will not maintain the proposed excavated side slopes of 2:1, and would require either (1) acknowledgement and acceptance of a deformable channel with a potential high rate of lateral and vertical migration, (2) significantly flatter sloped banks which would increase excavation quantities and footprint substantially, or (3) vegetative or biodegradable fabric structural support along the entire length of the channel. Both options 2 and 3 would significantly increase the cost of the project.

References

Inter-Fluve, 2013. Natapoc Conceptual Design Report. Hood River, OR.

Inter-Fluve, 2014. Preliminary Design Report. Hood River, OR.