Technical Memorandum

To: Jason Briedert, Yakama Nation

CC:

From: Matt Cox, Inter-Fluve Inc.

Date: October 14Th, 2014

Re: Results of Soil Pits and Pump Tests: Nason Creek Lower White Pine Groups 2 and 3

Introduction

Soil test pits and groundwater pump tests and were performed at the Nason Creek Lower White Pine Groups 2 and 3 project site on October 1, 2014. These tests were recommended to provide additional information necessary to complete the design of particular project elements. The groundwater pump tests will be used to evaluate the potential for groundwater discharge along the alignment of a proposed backwater\flow-through channel as well as the need to consider additional groundwater collection strategies, such as an infiltration gallery. The soil pits were used mainly to characterize the subsurface material in order to inform the future design of side channel banks (slope angle and stability) and overall channel dimensions.

Methodology

Testing Locations

The groundwater pump tests were performed near the proposed alignments of a downstream backwater connection to the existing Oxbow wetland, and an upstream flow through side channel (see attached map). The pits were not located precisely in the proposed alignments due to access issues and limitations to digging within areas that had been examined for artifacts of cultural significance.

Groundwater pump test

The groundwater pump tests were used to understand the potential for groundwater to enter a constructed channel by measuring the groundwater entering soil pits of known dimensions. The timing of the tests during a lower flow period provides a conservative estimate of groundwater recharge potential in this location. After each pit was excavated, it was allowed to fill naturally to a static level within the pit. Once a static level was achieved the water level was drawn down to the extent possible by a 1.5 inch gasoline powered pump was run at a maximum flow rate. Following the initial drawdown, the pump throttle was reduced as the water level in the trench was observed. Trial and error was used to determine a pumping rate that resulted in a stable water level in the trench.

After the water level in the trench had remained stable for over 30 minutes, the pumping rate was measured by timing the filling of a container of known volume. Static groundwater levels are now being continually monitored by piezometers installed in both soil pits locations during backfilling. The piezometers are installed in PVC stand pipes with a diameter of 4".

Pump Test Results

Soil Pit 1

The pit was 30 feet in length, with an average wetted width of 6 feet and an average wetted depth of 1.0 feet after pumping maintained a static water level. The water level in the trench was allowed to equilibrate for approximately 1 hour before starting the pump test. Due to the low flow rate, volume calculations were performed by repeat measurements of time to fill a 5 gallon container.

Metric	Value
Overall groundwater recharge rate into pit	4.8 gal/min (0.008 cfs)
Recharge rate per unit length	0.16 gpm/ft (0.00036 cfs/ft)
Recharge rate per unit area	0.02 gpm/ft^2 (0.00005 cfs/ft^2)
Drawdown rate (pumping at 4.8 gal/min)	0.2 ft

Table 1 - Soil Pit 1 - Groundwater inflow metrics

Soil Pit 2

The pit was 13 feet in length, with an average wetted width of 7 feet and an average wetted depth of 2.7 feet after pumping maintained a static water level. The water level in the trench was allowed to equilibrate for approximately 2 hours before starting the pump test. Due to the higher flow rate, volume calculations were performed by repeat measurements of time to fill a 32 gallon container.

Metric	Value
Overall groundwater recharge rate into pit	74.4 gal/min (0.155 cfs)
Recharge rate per unit length	5.72 gpm/ft (0.013 cfs/ft)
Recharge rate per unit area	0.46 gpm/ft^2 (0.001 cfs/ft^2)
Drawdown rate (pumping at 74.4 gal/min)	0.67 ft

Table 2 -Soil Pit 2 - Groundwater inflow metrics

Soil Pit Results

Details on the soils encountered in both are included in attached pages at the end of this document.

Water Level Logger Information

Water level loggers were installed at 5 locations at the Lower White Pine Groups 2 and 3 site on April 24, 2014 (see attached map). The data was collected on October 1st and corrected using atmospheric pressure data recorded nearby. Figure 1 shows water level data recorded at each of the 5 locations. In general, water levels in the Oxbow wetland track river levels implying some degree of connectivity. While following similar general trends, the forested wetland did not appear to be as connected hydrologically to the main channel. It is likely that both of the mainstem river piezometers were left dry by the descending hydrograph between late July (Mainstem downstream piezometer) and mid-August (Mainstem upstream piezometer), approximately indicated by the arrows in Figure 1. The downward trend is captured by the Oxbow piezometers, and a survey data point on October 1, 2014 confirms that the water surface is below the sensor elevation. The piezometers were not repositioned due to difficulty in finding a suitable location that both captures the lowest flows and is sufficiently sheltered during winter high flows.

Figure 2 shows temperature data from the piezometers. Diurnal trends present in the river piezometers are almost completely absent in the data from the wetland stations. Temperature at the mainstem downstream piezometer was very similar to that recorded at the upstream station and was omitted to aid figure clarity. While maximum water temperatures in the forested wetland and upstream section of the Oxbow are cooler than those recorded in the main channel, those in the upper Oxbow remain warmer through most of the spring. This may be due to solar loading in the upper Oxbow wetland, which has less canopy cover. It is not possible to interpret the relationship of the upper Oxbow and the mainstream temperature in later summer as the water level falls below the mainstem sensor elevation.

Conclusions

Groundwater pump test

The low flow rates observed at the upstream soil pit location suggest that a channel in this alignment would not be a significant source of groundwater. The downstream pit however, has potential to provide groundwater. Extrapolation of the pump test results to the ~600 ft. proposed backwater channel would yield 7.6 cfs of groundwater. However, some caution is required in applying these results over such a long distance, given that the pit was only 13 feet long. Additionally, it should be noted that there is potential risk that a channel in this location could alter hydrology in adjacent wetlands to some unknown degree. Observation of the groundwater piezometers will provide further insight into the surface/groundwater interactions at this site as design proceeds.

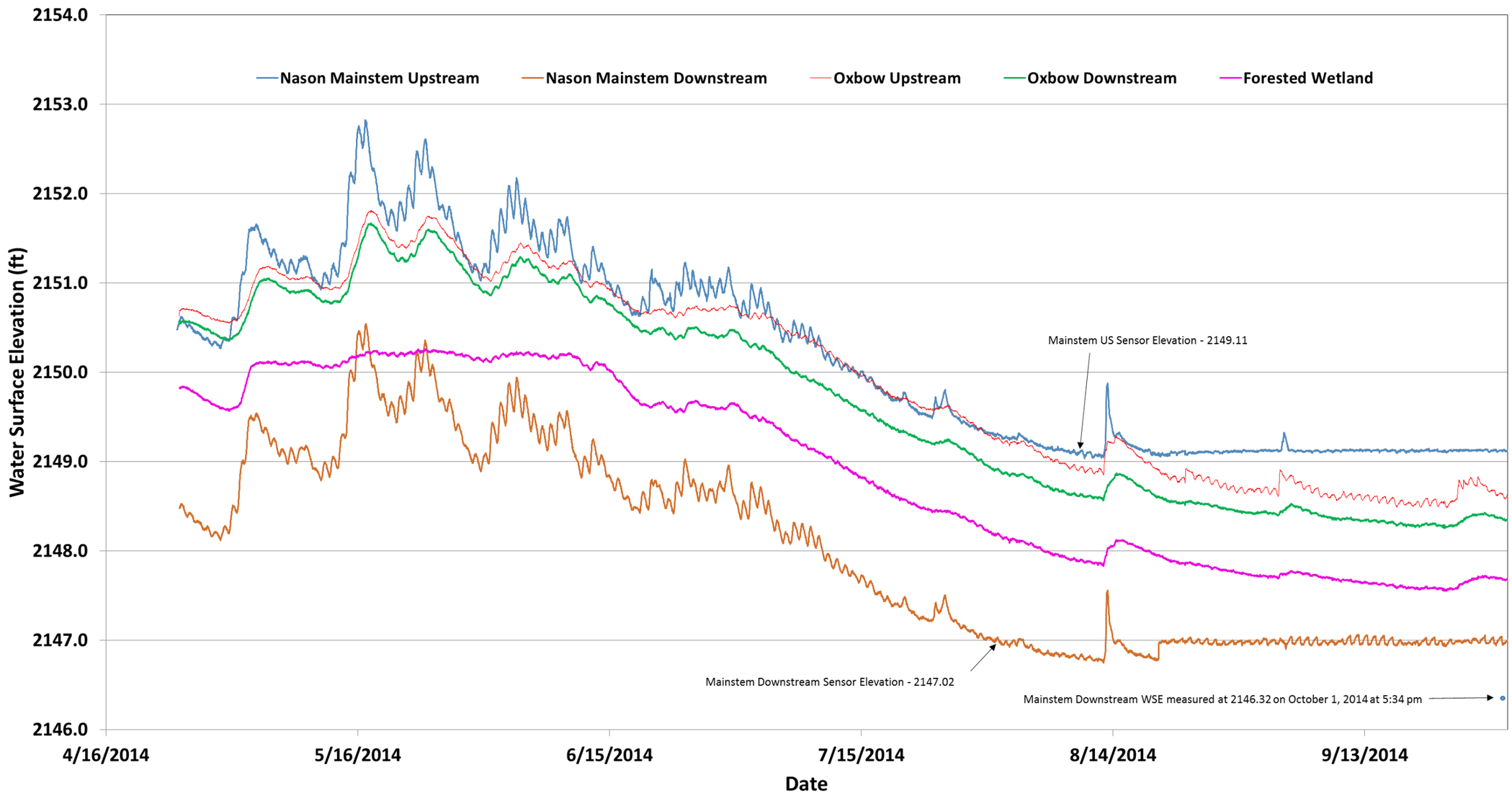


Figure 1 - Water level data at Nason Creek Lower White Pine Groups 2and3: April 24, 2014 to September 30, 2014

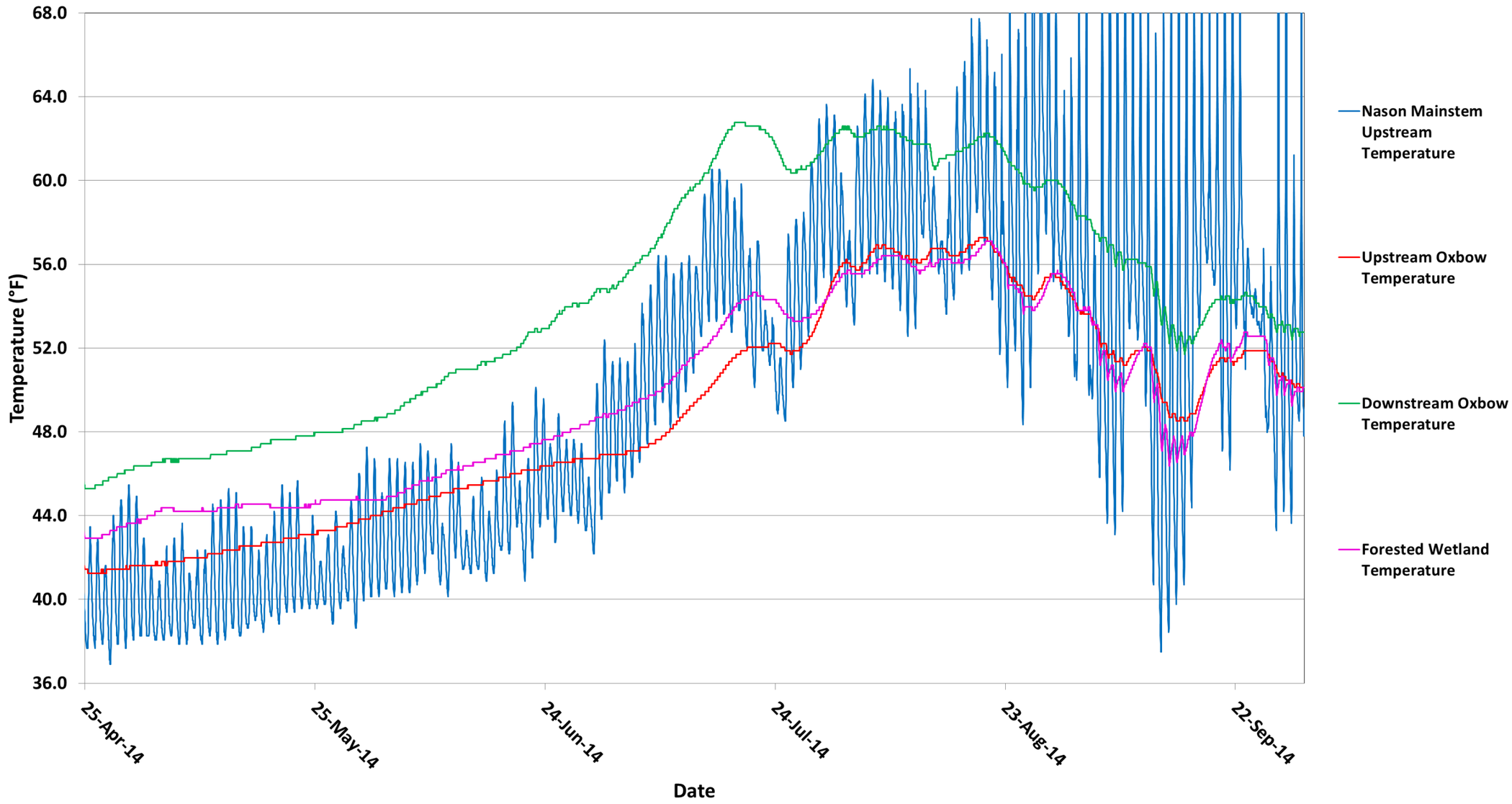
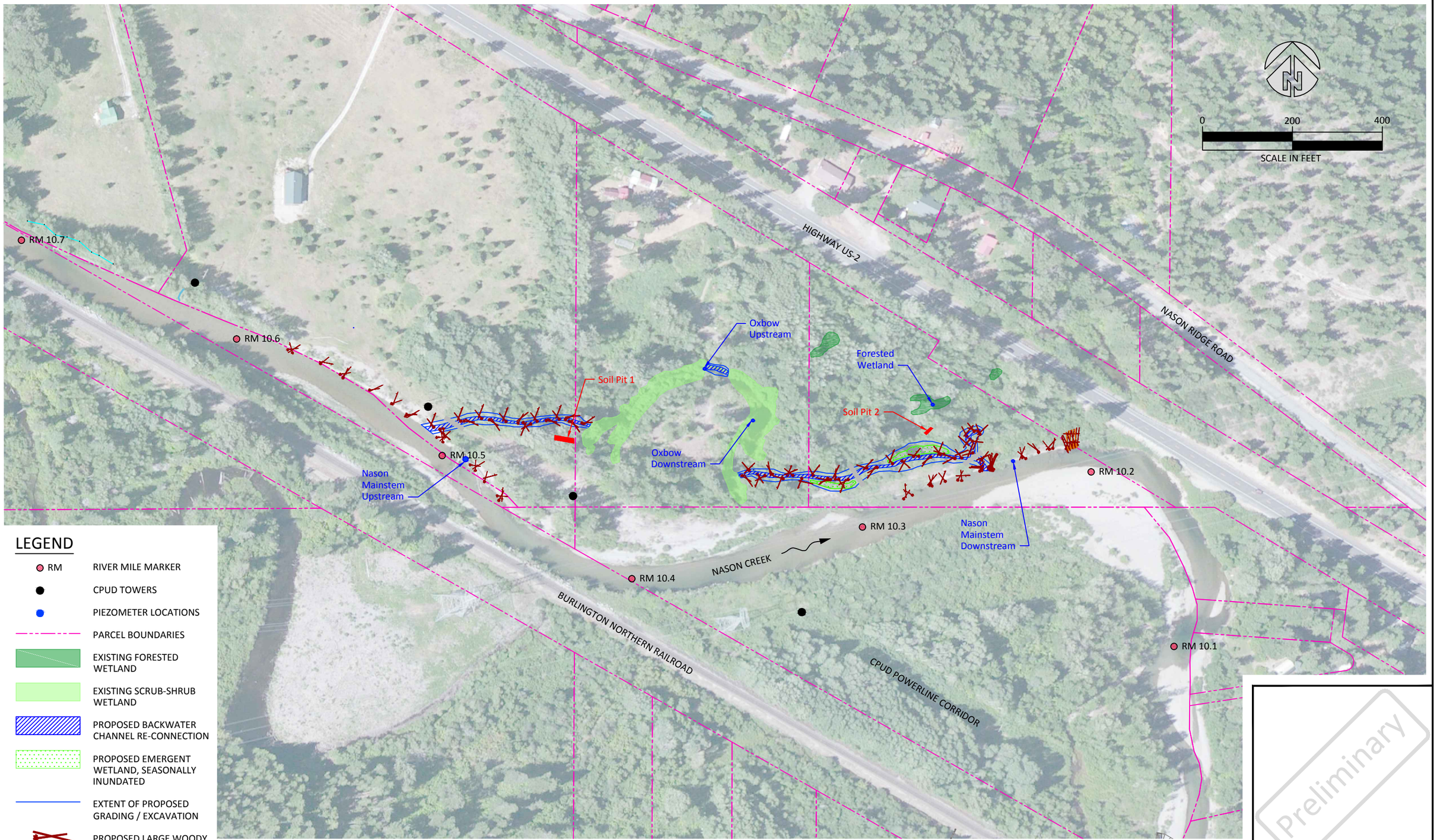


Figure 2 - Temperature data at Nason Creek Lower White Pine Groups 2 and 3: April 24, 2014 to September 30, 2014



SITE PLAN

Preliminary

NO.	BY	DATE	REVISION DESCRIPTION

DF	MC,GJ	MC,GJ
DRAWN	DESIGNED	CHECKED
GJ	3/28/2014	13-02-17
APPROVED	DATE	PROJECT

CONFEDERATED TRIBES AND BANDS OF THE YAKAMA NATION
NASON CREEK - LWP GROUP 2 & 3
FISH ENHANCEMENT PROJECT

inter·fluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

CONCEPTUAL ALTERNATIVES AND SOIL PIT LOCATIONS

SHEET 1 OF 1

G:\I-L\Lower White Pine Group 2&3_130217\Drawings\Cox_working\IFI_LWP_GRP2_3_soilpitfigures.dwg - mcox - 10/15/14

SOIL PIT - 1

DEPTH, FT	SYMBOL	DESCRIPTION	DEPTH, FT	NOTES
		SURFACE ELEV = 2159.8' +/-		
0'		DENSE ROOTS WITH ORGANICS	1'	TOPSOIL SANDY LOAM WITH SOME GRAVELS
		3" MINUS SANDY GRAVEL. D50 ABOUT 1"	2.4'	
5'		3" MINUS SANDY GRAVEL D50 LESS THAN 1'	5.5'	GROUNDWATER ENCOUNTERED AT DEPTH OF 5.5 FT
		2" MINUS GRAVELLY SAND COARSE SAND DOMINANT	7.5'	LOWEST LAYER WAS PROGRESSIVELY SANDIER ON EAST END OF SOIL PIT
8'		BOTTOM ELEV = 2152.3' +/-		

5' DEPTH

7.5' DEPTH

PIT

inter·fluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

Confederated Tribes and Bands of the Yakama Nation
Nason Creek - Lower White Pine Groups 2 and 3
Survey October 1, 2014

SOILS TEST PIT 1

SOIL PIT - 2

DEPTH, FT	SYMBOL	DESCRIPTION	DEPTH, FT	NOTES
		SURFACE ELEV = 2150.8 +/-		
0'		ORGANIC MATERIAL	1'	TOPSOIL SILT/SAND
		SILT WITH SOME SAND	3.0'	GROUNDWATER ENCOUNTERED AT DEPTH OF 4.0 FT
5'		3" MINUS SANDY GRAVEL WITH SOME SILT'	8.0'	SUBSTRATE VARIATION NOT OBSERVED BELOW 3'
8'		BOTTOM ELEV = 2142.8' +/-		

5' DEPTH

PIT - 0' TO 4'

inter·fluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

Confederated Tribes and Bands of the Yakama Nation
Nason Creek - Lower White Pine Groups 2 and 3
Survey October 1, 2014

SOILS TEST PIT 2