


MEMORANDUM

State of Alaska

Department of Transportation & Public Facilities
Design and Engineering Services – Central Region
Highway Design

TO: Joel St. Aubin, P.E.
Director, Design & Construction

DATE: July 7, 2016


THRU: Jim Amundsen, P.E.
Chief, Highway Design 
Carla Smith, P.E.
Project Manager

TELEPHONE NO: 907-269-0612

FAX NUMBER: 907-243-4409

PROJECT: Abbott Rd Rehab – Phase 1

PROJECT NO: 0506005/Z539420000

FROM: Kristen E Keifer, P.E. 
Project Engineer

SUBJECT: Proposed South Fork Little Campbell
Creek Culvert

This memo is intended to disclose the concerns and responses related to how the proposed South Fork Little Campbell Creek culvert on the Abbott Road Rehab project will affect the downstream properties of South Fork Little Campbell Creek.

There is concern whether the proposed South Fork Little Campbell Creek culvert will increase the maximum flow rate downstream of the culvert, resulting in a rise of the water table in the area. The responses are as follows:

The existing 36" diameter culvert is being replaced with a longer and larger culvert for the following four reasons:

1. Accommodate the increased Abbott Road width.
2. Adequately pass discharges expected during the culvert life as required by DOT&PF policy.
3. Meet fish passage criteria required by the Alaska Department of Fish and Game. This is required by Alaska statute 16.05.841-871.
4. Meet the FEMA mapped floodway no rise requirement.

The proposed culvert outlet is adjacent and just upstream of a Federal Emergency Management Agency (FEMA) mapped floodway as shown on FEMA Flood Insurance Rate Map (FIRM) panel 0764 dated September 25, 2009. By FEMA policy, the proposed culvert replacement cannot cause the water surface elevation to rise in a floodway during the FEMA regulatory discharge. The culvert was designed to satisfy this criterion. Calculations that document this have been submitted to the Municipality of Anchorage and a flood hazard permit for the proposed work has been received. The recommended culvert also meets the stream simulation design (Tier 1) criteria in the Fish Passage Memorandum of Agreement between ADF&G and DOT&PF dated 2001.

Table 1 provides the water surface elevations at the proposed culvert outlet for various return intervals. With the exception of a small rise during the discharge with a 100 year- return interval, all of the water surface elevations for the proposed condition are less than or equal to the water surface elevations for the existing conditions.

Note: If the relatively short history of this stream can predict the future, the discharge with a return interval of X will occur, over a long time span, on the average, every X number of years. Also, the units of discharge are ft³/sec (cfs); 1 cfs = 448.8 gal/min.

Table 1: Water surface elevations at the proposed culvert outlet during return intervals.

Water Surface Elevations (ft)				
Return Interval, years	2	10	50	100
Discharge (cfs)	3.9	73	204	312
w/existing culvert	229.10	230.70	231.02	231.58
w/proposed culvert	228.99	230.02	231.02	231.61

The FEMA regulatory discharge is 155 cfs.

The discharges in Table 1 assume the entire drainage basin is developed to the maximum allowed by current zoning. With development there is typically an increase in impervious surfaces (paved roads, roofs, sidewalks/pathways, etc.). An increase in impervious surface area will result in an increase in the discharge for any return interval. Currently, the drainage basin is not developed to the maximum allowed by current zoning. Therefore, the discharges for each return interval in Table 1 are expected to be higher than existing.

Water surface elevations at the outlet of the proposed South Fork Little Campbell Creek culvert at Abbott Road are not expected to increase during discharges with a return interval equal to or less than 50 years. During the discharge with a return interval of 100 years, the water surface elevation at the culvert outlet is expected to rise 0.03 feet. The groundwater elevation adjacent the South Fork Little Campbell Creek is directly linked to the water surface elevation in the stream. Therefore, the groundwater table elevations downstream of the proposed culvert outlet are not expected rise during future discharges with a return interval of 50 years or less and the rise is expected to be minimal or less during future discharges with a 100 return interval.

Peak discharges in South Fork Little Campbell Creek are expected to increase with time as the drainage basin upstream develops. Consequently, discharges for any return interval downstream of Abbott Road are expected to increase with time. In other words, as development increases in the drainage area upstream of Abbott Road, less water will percolate into the ground. This will increase surface water runoff and consequently also increase the discharge (water volume per time) in the South Fork Little Campbell Creek. The more intense rainfall events occur less frequently than the less intense rainfall events. Therefore, the average time interval between the more intense rainfall events that create the larger creek discharges is longer than between the less intense rainfall events and the smaller creek discharges. Consequently, the average time (return interval) between the larger creek discharges is longer than between the smaller creek discharges. Therefore, as development upstream of Abbott Road increases, the creek discharges for any return interval will increase. This is also the case for any discharge area.

Based on the proposed design, calculations show that the recommended culvert and appurtenances will not raise the water surface elevation in the mapped floodway during the regulatory flood discharge. For more information see the recommendations from the Regional Hydrologist.