



## SWENSON, HAGEN & CO. P.C.

civil engineering . surveying . land planning . hydrology  
landscape & site design . construction management

July 5, 2007

Mr. Keith Demke, PE  
Bismarck Public Works  
PO Box 5503  
Bismarck, ND 58506-5503

Re: **Sonnet Heights Additions Masterplan / North Washington Street Watershed  
Storm Water Management Plan - Revision**

Dear Mr. Demke:

Recently it was determined that the location of Halifax Street was to be relocated to its original location within Sonnet Heights Addition. An additional roadway crossing, upstream of Halifax Street was also determined to be used to cross the greenway corridor.

Since prior crossing locations and flows have already been determined, one goal from the result of the changes was to maintain, as a minimum, the flows and timing of the system as previously determined. As determined in the previous report, the timing of the watersheds made dramatic differences downstream.

Halifax Street has been moved further downstream towards Canada Avenue. This will create some problems with runoff from the La Salle Drive crossing. It should be noted that since the original model and report were written, there has been a change in the Canada Avenue / La Salle Drive intersection. The La Salle Drive intersection will now be named West Canada Avenue Crossing and the Canada Avenue Crossing will now be named East Canada Avenue Crossing.

Two peak inflows still remain, the first being from West Canada Avenue (La Salle Crossing from previous report) and the second being from Halifax Crossing. East Canada Avenue still remains as the most sensitive portion of the watershed and Ottawa Street and Highway 83 still remain as the bottle neck in the watershed.

### **Future Unnamed Street # 1**

No changes to the proposed crossing were made, the crossing still provides a 100-year protection.

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<b>Unnamed Street #1</b> Proposed <u>5'x7' RCP</u> Box (Headwall) Invert 1850.0 / Overflow <u>1859.0</u> 6-Hour Rainfall Events (NGVD 29) Proposed Storage Area = <u>13.3 Ac-Ft</u>			
Frequency	Projected Peak Inflows (cfs)	Projected Peak Discharges (cfs)	Projected Water Surface Elev. (msl)
2-Year	82	80	1852.8
10-Year	204	198	1855.1
50-Year	342	324	1857.4
100-Year	384	363	1858.3
500-Year	710	654	1859.6

(-0.6 ft)

**Future Unnamed Street # 2**

<b>Unnamed Street #2</b> Proposed 2 - 48" RCP (Grooved End & Headwall) Invert 1834.0 / Overflow 1844.0 6-Hour Rainfall Events (NGVD 29) Proposed Storage Area = 10.6 Ac-Ft			
Frequency	Projected Peak Inflows (cfs)	Projected Peak Discharges (cfs)	Projected Water Surface Elev. (msl)
2-Year	82	81	1836.8
10-Year	200	199	1838.8
50-Year	327	316	1841.6
100-Year	364	349	1842.7
500-Year	651	592	1844.5

A second crossing was added midway between the upstream unnamed crossing and the Halifax Crossing. This provides an additional crossing and an opportunity to help control runoff as provided in the previous study. This crossing and the new Halifax Crossing together approximately equal the same storage as the previous location of the Halifax Crossing. Originally Halifax was located to optimize available storage within the greenway. Two 48" RCP culverts are utilized to provide conveyance through the roadway crossing. Both culverts will require the use of a headwall and will be set at the same elevation.

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**Halifax Street**

Moving Halifax Street to its original location provides several issues that will need to be addressed during design. The right-of-way encroaches on the conveyance channel of the West Canada Avenue Crossing. This channel will need to be re-established through grading of adjacent property and additional easements may need to be obtained. Since the channel will need to be graded, it will need to be stabilized by the use of erosion control blankets and seeding or geotextile fabric and riprap. Another concern is turning the flows downstream of Halifax. The channel will need to turn approximately 90 degrees. Halifax will also require a substantial amount of fill to cross the coulee.

<b>Halifax Street</b> Proposed 2 - 48" RCP (Grooved End & Headwall) Invert 1823.0 & 1824.3 / Overflow 1832.0 6-Hour Rainfall Events (NGVD 29) Proposed Storage Area = 8.6 Ac-Ft			
Frequency	Projected Peak Inflows (cfs)	Projected Peak Discharges (cfs)	Projected Water Surface Elev. (msl)
2-Year	82	82	1826.4
10-Year	201	198	1828.5
50-Year	316	305	1830.9
100-Year	349	338	1831.9
500-Year	590	571	1832.6

The proposed culverts to be used are recommended to have a headwall and a grooved entrance. This improves the flow characteristics and allows 48" culverts to be used instead of 54" culverts. There is an approximate increase of 10-20% in full flow per culvert due to the improvements, thus reducing the overall cost of the project.

**West Canada Avenue (previously La Salle Drive)**

One change was made to this crossing, which allowed one watershed to be discharged downstream from the crossing and not stored upstream of the crossing. This change was made based on the timing of other watersheds downstream. The change had a minimal effect on this crossing but showed benefits downstream.

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<b>West Canada Avenue</b> Proposed 2 - 42" RCP (FES) Invert 1830.0 / Overflow 1839.0 6-Hour Rainfall Events (NGVD 29) Proposed Storage Area = 7.9 Ac-Ft			
Frequency	Projected Peak Inflows (cfs)	Projected Peak Discharges (cfs)	Projected Water Surface Elev. (msl)
2-Year	72	55	1832.4
10-Year	190	154	1834.5
50-Year	340	238	1836.9
100-Year	405	250	1838.3
500-Year	554	516	1839.6

**East Canada Avenue Crossing**

With the location of Halifax Street moving further downstream, the goal is to retain the same flows and timing of those flows as much as possible from the original study. For the most part, this has been obtained, although the timing varies slightly. The peak flows and their respective water surface elevations remain the same for the most part. Due to the routing advancement of the watersheds, the 2-year and 5-year events will see an increase in water surface elevations of 0.2 feet.

<b>East Canada Avenue Crossing</b> 6-Hour Rainfall Events (NGVD 29) Invert = 1815.0 / Overflow = 1823.2 Proposed Storage Area = 14.6 Ac-Ft Existing & Projected Total Drainage Area = 1274.2 acres			
Frequency	Proposed Peak Inflows (cfs)	Proposed Peak Discharges (cfs)	Projected Water Surface Elevation (msl)
2-Year	104.6	103.1	1818.1
10-Year	265.3	233.7	1820.1
50-Year	437.7	377.7	1822.1
100-Year	486.6	430.6	1823.1
500-Year	777.7	700.0	1823.8

Canada Avenue crossing is designed as a 100-year crossing and is set by an easement for a 500-year event. Two 60" RCP culverts are proposed to discharge the 100-year event without overtopping. The 500-year event will overtop the crossing by approximately 0.8 feet. There is approximately 14.6 acre-feet of storage upstream of Canada Avenue at the overflow.

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**Ottawa Street**

In general, the Ottawa / Highway 83 area rose between 0.1-0.2 feet over all events. A slight increase in peak flows were seen and overall the change is minimal.

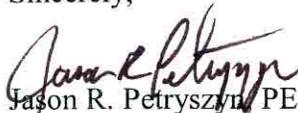
<b>Ottawa Street Crossing</b> 6-Hour Rainfall Events (NGVD 29) Invert = 1799.9 / Overflow = 1807.5 Existing & Projected Total Drainage Area = 1445.1 acres			
Frequency	Proposed Peak Inflows (cfs)	Proposed Peak Discharges (cfs)	Projected Water Surface Elevation (msl)
2-Year	106.7	105.3	1802.7
10-Year	257.8	240.1	1805.9
50-Year	428.9	393.5	1807.9
100-Year	521.4	449.0	1808.2
500-Year	740.8	612.0	1809.2

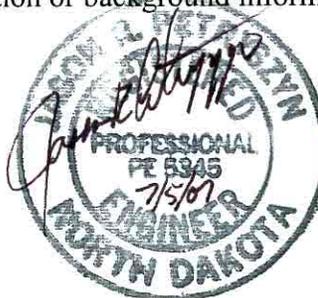
Ottawa Street was previously the old Highway 83 route before being moved to its current location. The existing roadway is currently sized with a 5' x 7' box culvert. The current overflow elevation is 1807.5. Although the roadway is overtopped on a 50-year event, the roadway will be classified as a local street once the connection is made from La Salle Drive to Highway 83. Because of this, an overflow depth of approximately 8" on a 100-year event is projected. No improvements to increase the culvert capacity or to increase the height of the roadway are planned at this time; however, the roadway could be improved and raised slightly with no impacts in water surface elevation.

In conclusion, although peak flows and water surface elevations changed slightly, this does not warrant not accepting the change in location of Halifax Street. However, the new Halifax location will provide some special design considerations with the West Canada Avenue Crossing.

Should you require additional information or background information, please let me know.

Sincerely,

  
Jason R. Petryszyn, PE  
North Dakota Registration No. 5345



JP;jh

c: Frank Wagner, Owner  
Wade Felton, Owner  
Mel Bullinger, City Engineer

57<sup>th</sup> AVENUE

N  
4

Unnamed Crossing #1

Unnamed Crossing #2

HALIFAX STREET

WEST EAST CANADA AVENUE CROSSING

EAST WEST CANADA AVENUE CROSSING

WASHINGTON STREET

1884.2  
1881.6  
1879.3  
1877.1  
1893.7  
1895.0  
1893.2  
1890.9  
1894.4  
1887.5  
1879.4  
1891.6  
1899.7

CANADA AVENUE

SANDSTONE LOOP

BASALT CIRCLE

GRANITE DRIVE

