PORT COLBORNE

ENGINEERING AND OPERATIONS DEPARTMENT
ENGINEERING DIVISION

Report Number: 2014-30 **Date: September 8, 2014**

SUBJECT: UPDATE REPORT ON THE NICKEL PUMPING STATION CATCHMENT AREA EXTRANEOUS FLOW REDUCTION PROGRAM

1) PURPOSE:

This report is prepared by Jim Huppunen, Manager of Engineering Services under the direction of Chris Lee, Acting Director of Engineering and Operations to update Council on the progress and status of the Nickel Pumping Station (PS) Area Extraneous Flow Reduction Programs.

2) HISTORY, BACKGROUND, COUNCIL POLICY, PRACTICES

The City has been actively engaged in the identification and remediation of extraneous flows since the 1970's, when the first sections of the 1929 vitrified clay sanitary sewer system were replaced. Today, that system now consists of PVC pipe materials, which is substantially superior to previous materials such as asbestos cement. Emphasis on rehabilitation and remediation in the past has focused primarily on the infrastructure located within the road allowances, with few attempts to rectify sources of extraneous flow from the private sector.

In conjunction with the Region of Niagara, the Port Colborne Pollution Control and Infrastructure Study was completed in 2006. The study identified existing Combined Sewer Overflow (CSO) locations and sources of extraneous flow contributing to the problem. As a result of the study, recommendations for source control in key areas have been identified. As detailed in the Strategic Planning sessions and at Budget deliberations, Staff presented a proposed Pilot Program for the Arena Sewershed, with an initial allocation of $200,000 for 2008. A successful application under the Region's CSO Plan matched those funds with an additional $200,000 for the project. Upon the conclusion of the Pilot Program, Staff requested funds to start flow monitoring and investigation in the Omer PS catchment area in 2009 and then again in 2012 for the Nickel PS catchment area.

The results of source control measures will be lower treatment costs to the Municipality, reduced capital costs to the Region for pumping station, treatment plant upgrades and forcemain, gravity sewer replacements/upgrades and additional capacity for future development connecting to the system.

Redirection of any sources of storm water from the sanitary sewer system should be encouraged, since the payback in treatment costs is immediate. A source of sewer surcharging is removed, which could result in reduced instances of basement flooding.

By-law No. 5228/134/08 was adopted by Council in December 2008. The bylaw prohibits any form of storm water connection to the sanitary sewer system and provides the means to disconnect such connections. While the owner of the building is

responsible for the cost of disconnection of the sources of storm water, section 4.8.2 provides for a reimbursement program, subject to budget and Council concurrence, which would provide financial incentives to assist in the work. To date, it has not been necessary to levy fines under this by-law.

As reported to Council over the past seven years, we have been successful with a CSO remediation program in the Arena PS catchment area. Upon the completion of that project, the next phase of the CSO work has moved into the Nickel PS catchment area, where pre-flow monitoring, Closed Circuit Television (CCTV) work and private property inspections of the area has been completed. The Nickel area is approximately the same size as the Arena area and has presented new challenges to identification of sources of extraneous flow. The CSO projects are funded on a 50% basis, jointly by the Region and the City. The City's Arena CSO program was initiated in 2008 under the previous Region guidelines which allowed the 50% funding from the Region to be utilized to complete spot repairs and disconnection of sump pumps in the private sector, however, with changes to the terms of the Region's funding program in 2009, the City will be 100% responsible for any works related to private property works and spot repairs which are considered to be a maintenance item.

As part of the Nickel PS area program, the City also included a Storm Sewer Review Program in this area to determine the condition of the storm sewers to review the possibility of the redirection of sump pumps or weeping tiles from the sanitary sewer system. This program was funded 50% by the Region through the CSO funding program.

3) STAFF COMMENTS AND DISCUSSIONS

Private Property Sources

To date there have been 94 sump pumps found to be connected to the sanitary system in the Nickel area out of the 218 properties that had been inspected. The City's consultant was not able to gain entry into approximately 56 properties but based on previous inspection records from the 1992 House to House Study, there could be approximately 24 additional sump pumps connected to the sanitary system. The sanitary sewer laterals were not inspected as part of this program in order to find efficiencies within the program. The total projected cost for work on private property is approximately $1,130,700 which will have to be funded 100% by the City as the Regional funding does not currently allow for work on private property.

During the inspection process, the City's consultant reviewed the possibility to redirect the sump pump discharges to the surface, however, the surface grading and the densely built up neighbourhood do not allow for this type of discharge without causing future surface flooding and icing conditions. Based on this information it was determined that the sump pump redirects must go into a storm sewer collection system.

Municipal Sanitary Sewer Sources

There have been 26 points of inflow and infiltration found within the sanitary sewer pipes. Out of the 26 points of inflow and infiltration, 11 points could be removed from the system by the spot repair method which is most cost effective for these types of inflow and infiltration points. The remainder of the points of inflow and infiltration are good candidates for full length pipe liners. There are also 2 sewer sections that are recommended to be replaced. The total estimated cost for the work above is approximately $282,875.

With the new guidelines for the Regional funding, only capital projects qualify for the 50% contribution. The private property work, full length liners and spot repairs to the sanitary sewers will need to be funded 100% by the City which may need to be phased over several years in order to complete spot repairs and full length liners to the sanitary system.

Municipal Storm Sewer Investigation

As part of the Nickel PS CSO program, the City's consultant also reviewed the City's storm sewer system to determine the condition and ability to handle additional flows from private property. The findings of the review determined that the storm sewers in the Nickel PS area are in very poor condition both structurally and operationally. A complete rebuild of the storm sewers in this area is suggested before any redevelopment or sump pump disconnections are completed. The total estimated cost for the reconstruction of the storm sewer system including sump pump redirects is approximately $6,240,448.

The total costs of the Nickel PS CSO program to date for all inspection work are $254,610.84. This cost includes all investigative and administrative work. Currently the City's expenses for the Nickel PS CSO program are $127,305.42 which dates back to 2012. There are approximately 118 sump pumps that are still connected to the sanitary sewer. These 118 sump pumps will need to be disconnected when redesigned storm sewers are established in the Nickel PS Area.

By removing extraneous flows from the sanitary system, the capacity of the entire system is theoretically increased allowing the City and the Region to delay future capital upgrades to the system such as construction of CSO tanks, sewer replacement, upgrade of pumping stations or the upgrade of the treatment plant.

Attached is the Executive Summary report, prepared by Associated Engineering, to provide Council with a report of the project. The attached report outlines the findings found during the Nickel PS Area project.

Most recently, Staff have been working with the Region of Niagara to revise the current CSO Policy and the Funding Options. There is the potential that the Region's CSO Funding Policy could be expanded to once again include private side work and sewer rehabilitation works such as spot repairs.

Staff recommend that the current Nickel PS Area project be deferred by providing direction to Staff to request the Region of Niagara to reassign the remaining funding for the Nickel PS Area project. This would allow City Staff to review the direction of the CSO Programs in the City and prepare new applications under the recently revised Region of Niagara CSO Control & Wet Weather Management Policy. The existing Regional funding applications for the Nickel PS Area program cannot be transferred over to another program.

4) OPTIONS AND FINANCIAL CONSIDERATIONS:

a) Do nothing.

This report is presented as information for Council.

b) Other Options

None.

5) COMPLIANCE WITH STRATEGIC PLAN INITIATIVES

Continue with CSO I&I investigative work with the Region of Niagara to identify sewer infiltration issues and their remediation from private property and City infrastructure. Second Phase of this program will continue during 2011 and Council will receive a report on the findings later this year. (P. 12 Strategic Planning Report 2010)

6) ATTACHMENTS

1. Nickel Area Inflow and Infiltration Reduction Program Final Report, Executive Summary prepared by Associated Engineering – November 2013

7) RECOMMENDATION

A. That the Council of the City of Port Colborne receive the Engineering & Operations Report 2014-30 – Update Report on the Nickel Pumping Station Catchment Area Extraneous Flow Reduction Program be received for information;

B. AND THAT the Council of the City of Port Colborne direct Staff to defer the current Nickel Pumping Station Catchment Area Combined Sewer Overflow Program by requesting the Region of Niagara to reassign the existing funding.

8) SIGNATURES

Prepared on August 28, 2014 by:

29/08/2014

X Jim Huppunen

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9/02/14

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Report

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

The City of Port Colborne

Nickel Area Inflow and Infiltration Reduction Program

Final Report

November 2013

Executive Summary

ES.1 Recommendations

The Nickel Area I&I Program was initiated with the intention of re-directing sump pump discharges to the existing local storm sewers to reduce extraneous sanitary sewer flows and treatment costs. In order to proceed with the intended sump pump disconnection/re-direction program, the condition of the local storm sewers must be addressed. AE recommends the following to address the condition of the existing storm sewers and to meet the City's objectives for community and infrastructure improvement projects in the Nickel Area:

1. **Do not redirect sump pumps to the existing storm sewer network.** Based on the capacity assessment, the existing storm sewer diameters and grades do not provide adequate capacity to support the sump pump disconnection program originally proposed for the Nickel Area I&I Program. Re-direction of sump pump discharges to the existing storm sewer will likely result in surcharging of the storm sewer, surface and basement flooding, and damage to public and private property. No significant savings in treatment costs are projected relative to implementation costs related to the sump pump disconnection program.

2. **Do not redirect sump pumps to grade, to the gutter or to soak away pits.** Existing lot sizes and grading are not adequate to accommodate any of these alternatives, and each alternative has a high potential for failure.

3. **Initiate a program to repair storm sewers having a structural grade of 5.** It is also recommended that the condition of sewers having a structural grade of 4 or 5 be monitored on a regular basis until they are repaired. A number of storm sewers are in poor condition, exhibiting severe structural defects and early stages of collapse. Collapse of storm sewers will result in collapse of the surrounding ground surface (including roads, sidewalks and private property) and will result in surface and basement flooding. This City of Port Colborne is at risk of potential liability arising as a result of damages caused by sewer collapse.

4. **In order to avoid potential risk associated with negative impacts on Vale's treatment facility, AE does not recommend any alternative that will contribute additional flow to the existing storm sewers on Davis Street. It is recommended that surface drainage of private properties and the Davis Street right of way be separated from the sewer leading to Vale's treatment facility.** The storm sewers on Davis Street drain north to south and onto the Vale industrial property. Vale operates its own on site treatment facility and outlet to Lake Erie. AE understands that surface runoff from the private residential properties on the west side of Davis Street, the road right of way, and a portion of the Vale property are all tributary to the Davis Street storm sewer and Vale's treatment facility. The scope of AE's field investigations was not of sufficient detail to quantify the contribution of

flow from any source. It is unclear if discharge within the right of way is limited to surface drainage, if it includes process water, or if it is suitable for discharge through a storm sewer outlet without any treatment. This will likely require the construction of new storm sewers on Davis Street and will require collaboration between the City and Vale to determine servicing, cost sharing, and maintenance responsibilities.

5. **Develop a strategy to design and construct a new storm sewer system in the Nickel Area.** It is recommended that the strategy accommodate the objectives of the I&I program and the future growth proposed by the CIP, and that construction of the new system be implemented in stages, with new sewers on Welland Street and Nickel Street constructed first. The storm sewers in the Nickel Area are nearing, or at, the end of their useful life. The existing condition of the storm sewers impedes adequate maintenance, and does not support the City's current I&I or CIP initiatives. The work to connect storm sewer laterals in support of the sump pump disconnection program would likely result in additional structural damage to sewers. The existing sewers do not have adequate capacity to accommodate the sump pump disconnection program or the East Waterfront CIP. Further deterioration of the storm sewers may result in sewer surcharging, surface or basement flooding and related damage to public and private property.

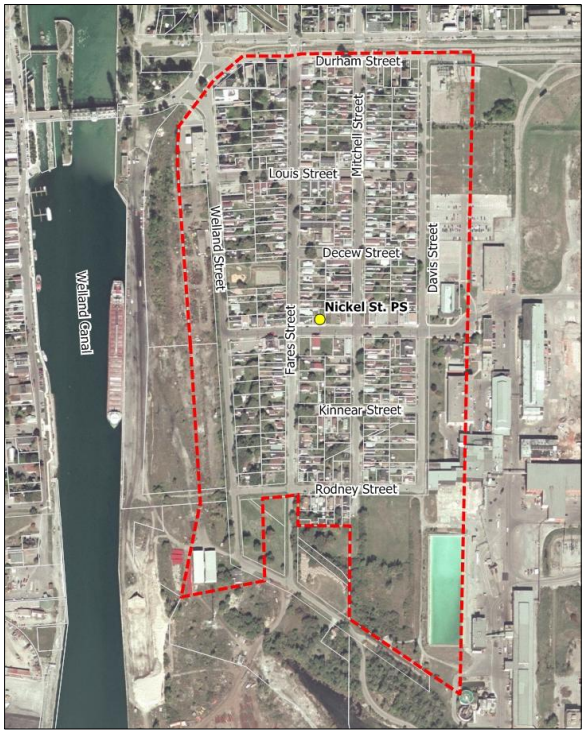
6. **Investigate potential outlet configurations or end of pipe facilities to be constructed in conjunction with a new storm sewer system.** A new storm sewer system designed to current standards to service the Nickel Area will consist of pipes that are both deeper and of larger diameter than the existing sewers and outlets to the Welland Canal. Assessment of alternatives should consider technical feasibility, regulatory requirements and costs. Alternatives may include gravity flow to a new, larger, deeper outlet, or gravity flow to a pond combined with pumped discharge to a rehabilitated Nickel Street outlet, or Bell Street outlet.

ES.1 Introduction

The Inflow and Infiltration (I&I) Reduction Program is a comprehensive work plan designed to identify, quantify and remediate all sources of I&I within the targeted study area. The Nickel Area Inflow and Infiltration (I&I) Program is the third phase in the City of Port Colborne's I&I reduction initiative. Previous efforts were focused on the Arena and Omer Sanitary Pump Station catchment areas.

The study area for the current program is defined as sanitary catchment area 14, which is the area tributary to the Region of Niagara's Nickel St. Pump Station. The study area includes approximately 300 private residential and commercial properties and represents a drainage area of approximately 35 ha. Figure ES-1 illustrates the study area boundaries and properties within the study area.

Figure ES-1 – Nickel Study Area



The Nickel Area I&I Program is funded in part by the Regional Municipality of Niagara's CSO Policy Budget for 2012, 2013 and 2014.

ES.2 Public Consultation

Property owners in the Study Area were engaged in the program through a variety of newspaper advertisements, direct mailed letters and information packages. Every advertisement, letter or brochure provided to residents included AE's contact information, and AE's Project Manager was always available to discuss the program with residents.

ES.3 Private Property Investigation

The City of Port Colborne's Sewer Use Bylaw 5228/134/08 provides the necessary legislation to allow entry upon private property for the purposes of inspection and remediation/removal of sources of I&I.

Each of the ±300 properties in the study area was inspected and all inspection data was stored in a Project Knowledge Database System. A total of 94 private properties were found to have sump pumps connected directly to the sanitary sewer.

ES.4 Municipal Sanitary Sewer Investigation

The City's 2012 sewer inspection program targeted the Nickel I&I Program Study Area. The entire data record resulting from the sewer inspection program was placed in the Project Knowledge Database System, and evaluated using purpose built queries to extract defects deemed as contributing extraneous flow. These defects were then plotted within the project GIS to give an overall view of the defect record.

A total of 26 points in the sanitary sewer were identified as exhibiting active infiltration, evidence of previous infiltration or defects that could potentially cause I&I to the sewer system. Each of the defects were identified as good candidates, and recommended, for trenchless spot repair.

Two sanitary sewers, located in rear yard easements on Welland Street and Fares Street are in particularly poor condition and are recommended for full replacement. AE understands that City Staff are aware of the condition of these two sewers and that their replacement is complicated by their location in very narrow private property easements. AE recommends that these two sewers be inspected on an annual basis until such time as they are replaced.

ES.5 Municipal Storm Sewer Investigation

Many of the storm sewers in the Nickel Area are believed to be the original sewers constructed circa 1929. A significant effort was expended to flush clean and inspect the storm sewers, however several heavy debris deposits remain. Review of CCTV inspection reports indicates that the condition of the existing storm sewers is poor both structurally and operationally. It is quite possible that work to connect sump pumps will cause additional damage to the already poor condition storm sewer. Additional flow from sump pumps may also cause the existing storm sewers to deteriorate more rapidly, or even collapse.

While it is understood that the Nickel Area is not subject to surface flooding, assessment of the storm sewer sizes and grades indicates that the existing sewers do not have adequate capacity for the 2-Year Buffalo Storm. Based on this assessment, it is very likely that redirection of sump pumps to the existing storm sewers will result in surface and basement flooding.

ES.6 Flow Monitoring and Quantification of Extraneous Flow

Two open channel flow monitors were placed at strategic locations in the study area for a total of approximately 12 months. Flow data was compared against local rainfall data and infiltration coefficients were calculated as a means of quantifying I&I under existing conditions.

The Infiltration Coefficient (C_v) is calculated as the ratio of extraneous flow measured in the sewer to the volume of rain that fell over the monitored area. Typical values for infiltration coefficients in a sanitary sewer are as follows:

- 0% to 5% - "Tight" separated system

- 5% to 10% - Separate system
- 10% to 15% - Separate system where improvements can be reasonably achieved
- 15%+ - Typical of a Combined System

The annual cost associated with treatment of extraneous flow is calculated in Table ES-1, below, based on the average infiltration coefficient for each sub-catchment area. The annual precipitation volume for each drainage area is based on an annual precipitation of 973.75mm, as recorded at the Seaway WWTP Rain Gauge in 2011. The annual treatment cost is based on a theoretical volumetric cost of $0.859/m3, which was calculated based on order of magnitude information provided by the Region of Niagara.

Table ES-1 – Cost of Extraneous Flow

	MH1401 - West	MH1402 - West	Nickel Area Total
Total Area Monitored (m^2)	157,037	198,445	355,482
Annual Precipitation Volume (m^3)	152,915	193,236	346,151
Average Infiltration Coefficient	48%	29%	38%
Average Annual Extraneous Flow Volume (m^3)	72,979	55,441	132,258
Treatment Cost of Average Extraneous Flow	$62,699	$47,631	$113,627
Cost per Parcel	$506	$289	$393

The above analysis indicates that the cost of treating extraneous flow in the Nickel Area is approximately $113,627 annually.

ES.7 Alternatives for Drainage Improvements

The following alternatives were identified as potential solutions to address the condition of the existing storm sewers and to meet the City's objectives for community and infrastructure improvement projects in the Nickel Area:

- Alternative 1 - Do Nothing
- Alternative 2 - Redirect Sump Pumps to Existing Storm Sewers
- Alternative 3 - Replace Worst Pipes
- Alternative 4 - Replace Select Pipes
- Alternative 5 - Replace Worst and Select Pipes
- Alternative 6 - Replace All Pipes
- Alternative 7 - Design and Construct a New System
- Alternative 9 - Redirect Sump Pumps to Grade
- Alternative 10 - Redirect Sump Pumps to Gutter
- Alternative 11 - Redirect Sump Pumps to Soak Away Pits

Each alternative includes various combinations of sump pump disconnection, construction of storm sewer laterals, and repair or replacement of storm sewers.