

## TECHNICAL MEMORANDUM

### City of Fort Saskatchewan

**Draft**

#### Sump Pump Retrofit Program Develop Prioritization Criteria Technical Memorandum No. 2

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June 2016

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# TECHNICAL MEMORANDUM

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# TECHNICAL MEMORANDUM

## 1 Introduction

The City of Fort Saskatchewan (City) has undertaken a Sump Pump Retrofit Program with Associated Engineering (AE) to develop a program to retrofit areas with excessive sump pump discharge from newly developed homes.

The first phase of the program is summarized in the Draft Technical Memorandum – Catalogue Affected Homes, January 2016 prepared by Associated Engineering (Affected Homes Memorandum).

The second phase of this program is to develop a system to evaluate and prioritize the properties within the program. The City and AE prepared evaluation criteria to provide a basis for the decision making to prioritize the retrofit projects. This second phase is summarized below.

## 2 Prioritization Criteria

A meeting was held with City and AE staff to develop suitable evaluation criteria on February 23, 2016. Evaluation criteria were developed based on the results of the homeowner survey and site inspection that were summarized in the Affected Homes Memorandum.

As a result of the meeting, results of the homeowner survey were rated on the severity of each issue, using a score between 0 and 10 (10 being the most severe). The issues from the homeowner survey were scored as follows:

- Soggy Lawn – 5
- Algae Growth – 6
- Residue/Staining on Sidewalk or Lawn – 3
- Cracking or Settlement of Sidewalk in Vicinity of Discharge – 9
- Ice Buildup in Winter – 9
- Basement Flooding - 4
- Power Outage/Pump Failure – 3
- Damage to Grass or Trees from Discharge – 6
- Sump Connected to Sanitary Sewer Service – 50

The scoring developed for the homeowner survey was also used to score the results of the site inspection. The issues from the site inspection were scored as follows:

- Asphalt Damage – 9
- Sidewalk/Driveway Settlement – 9
- Sidewalk/Driveway Staining – 3
- Sidewalk/Driveway Damage - 9



AE used these values to score each property within the study area. If an issue was observed as part of the site inspection, it was not scored for the property as part of the homeowner survey. The property scoring is shown in **Figure 1.0**. The properties with the highest scores only are shown in **Figure 2.0**.

The City would like to develop criteria for ranking the retrofits on a block-by-block basis to avoid retrofitting single properties. With this in mind, the study area was divided into blocks. The division into blocks in each neighbourhood was from intersection to intersection. In areas where there was a distance of 120 m or greater between intersections, the block was divided at the midpoint. This division of the study area into blocks is shown in **Figure 3.0**. AE then took the score from the individual properties within the blocks, and divided by the total lots within each block, to determine an average score per lot in each block. These average scores per lot for each block are shown in **Figure 3.0**.

## 3 Prioritization of Areas

The results of the scoring for each neighbourhood in the study area are summarized below.

### 3.1 SOUTHPOINTE/SOUTHFORT HEIGHTS

Results of the scoring are shown in **Figures 1.0, 2.0 and 3.0**. The figures show that 90 of the 377 properties (23.8%) in the neighbourhood were scored. Only 15 properties (4.0%) scored 31 or above, which is the second lowest for any neighbourhood in the study area. **Figure 3.0** shows that there is only one block that was with an average score per lot between 10.4 and 14.5, with the remainder having lower average scores.

### 3.2 SOUTHFORT ESTATES

Results of the scoring are shown in **Figures 1.0, 2.0 and 3.0**. The figures show that 32 of the 68 properties (47.1%) in the neighbourhood were scored. **Figure 2.0** shows that 2 properties (3.0%) scored 31 or above, which is the lowest for any neighbourhood in the study area. **Figure 3.0** shows that two of the six blocks in the neighbourhood had an average score per lot between 10.4 and 14.5, with the remainder having lower average scores.

### 3.3 SIENNA

Results of the scoring are shown in **Figures 1.0, 2.0 and 3.0**. The figures show that 159 of the 302 properties (53.6%) were scored. 46 properties (15.2%) scored 31 or above, which is the highest for any neighbourhood in the study area. **Figure 3.0** shows that there are eight blocks with an average score per lot between 14.6 and 21. These were the only eight blocks in the study area that scored between 14.6 and 21 per lot. As the City would like to rank the retrofits on a block-by-block basis, we recommend that these blocks be the first priority in the retrofit program.

### 3.4 WESTPARK/VALLEY POINTE

Results of the scoring are shown in **Figures 1.0, 2.0 and 3.0**. The figures show that 22 of the 52 properties (40.7%) were scored. 4 properties (7.7%) scored 31 or above, which is the second highest of any neighbourhood in the study area. Figure 3.0 shows that two of the three blocks in the neighbourhood scored between 10.4 and 14.5 per lot, with the remaining block scoring lower.

### 3.5 SUMMARY

The neighbourhood summaries above indicate the following:

- The Sienna neighbourhood has the largest percentage of high scoring properties.
- The Sienna neighbourhood also has the only eight blocks in the study area with an average per lot score between 14.6 and 21. These eight blocks should be the first priority in the retrofit program.
- All the neighbourhoods have at least one block that with an average per lot score between 10.4 and 14.5. These blocks are recommended to be retrofitted once the retrofit work for the blocks with an average per lot score between 14.6 and 21 is complete.

## 4 Retrofit Options

Record drawings show storm sewers throughout every neighbourhood, with the exception of Southfort Estates, which does not have any storm sewer. In the Sienna, Westpark/Valley Pointe, and Southpointe/Southfort Heights neighbourhoods, sump pump service connections could be made to the storm sewer, or to a third pipe system. The third pipe system could then be connected to the storm sewer.

### 4.1 NEIGHBOURHOODS WITH STORM SEWERS

In the neighbourhoods with storm sewers, the record drawings show the existing storm sewers installed in some areas at approximately 2 metres or less below ground. In order to retrofit the sump pump into the existing storm sewer systems, the storm sewer service, third pipe or extension of the storm sewer will have to be installed at 2 metres or less in depth. This is within the frost zone, and may lead to the freezing of the storm sewer infrastructure.

In many municipalities (Strathcona County, City of Edmonton, City of Spruce Grove, City of St. Albert), an auxiliary surface discharge is installed on the retrofitted sump service to allow for discharge to the surface in the event that the storm drainage system cannot accommodate flows. This would include the storm sewer freezing in the winter. If the service or storm sewer main freezes, the sump pump will discharge onto a splash pad, and drain across the yard. This may result in ice buildup on sidewalks in the winter, but will prevent basement flooding.

In discussions with Strathcona County, they have retrofitted many neighbourhoods where the storm sewer was 2 metres deep. The sump services include an auxiliary surface discharge, and residents are encouraged to grade their properties to allow water to drain off them. There are neighbourhoods where the

sump services do freeze, and the sumps discharge to the surface resulting in ice buildup on the sidewalks. This has resulted in residents being unhappy with the retrofit solution that the County has provided.

In the City of Edmonton, they require all retrofitted storm sewer services to be 2.0 m deep at the property line. According to the City, at 2.0 m the frost does not affect the storm service due to blockage. Where services have to be installed above 2.0 m depth, the City requires them to be insulated. All retrofitted connections include an auxiliary surface discharge. In retrofitted areas, the City has residents sign an agreement where the sump pump drains to the surface in the summer and to the storm or combined sewer in the winter. Valves are installed inside the residence, which are operated by the homeowners to transition the flow from the surface to the sewer in the changing seasons.

Based on the above, the City should consider the following options in retrofitting neighbourhoods with storm sewer:

- Installation of an auxiliary surface discharge on the sump service;
- Connection to the storm sewer or third pipe system. In some areas, this will be in the frost zone, and may result in ice buildup on sidewalks in the winter with the use of an auxiliary surface discharge.
- Encouraging residents to grade their properties to allow water to drain off them.
- Insulation of any storm sewer service above 2.0 m in depth to be determined at detailed design.

#### 4.2 NEIGHBOURHOODS WITHOUT STORM SEWERS

Storm runoff in Southfort Estates is collected in ditches located along the side of the road for some properties. In others, runoff is drained to the back of the property via a side-yard swale easement. Ditches located at the rear of these properties collect the storm runoff. As such, retrofitting the sump pumps in this neighbourhood will not involve a connection to the storm sewer.

Observations from the AE site inspection showed that some lots in the neighbourhood were graded to drain to the front and back. Some residents had their sump discharge directed to the front of the property to the ditch, others had it directed to the back of the property. There is an asphalt trail behind the houses on Greenfield Crescent, which was observed to be damaged due to sump pump discharge being directed towards it. There are no ditches in front of these houses, so the sump pump discharge cannot be directed to the front of these properties.

With no storm sewers, residents should be encouraged to grade their properties to allow water to drain off them to collect in the ditch in the front or back of the property. A storm sewer service could be installed, but it would have to be shallow to allow it to discharge into the storm ditch. This would leave the service susceptible to freezing. Therefore, the sump pump retrofits should also include the installation of an auxiliary surface discharge if a storm sewer service is installed.

For the homes on Greenfield Crescent, a storm sewer service installed to the drainage ditch beyond the asphalt trail would prevent damage to the trail. The City should consider this option when retrofitting Greenfield Crescent.

Based on the above, the City should consider the following options in retrofitting neighbourhoods without storm sewer:

- Directing all sump pump discharge to the ditch located in the front or back of the properties.
- Encouraging residents to grade their properties to allow water to drain off them.
- Installing a shallow storm service to discharge into the ditch. This storm service should include an auxiliary surface discharge.
- In areas such as Greenfield Crescent, the shallow storm service should be installed under the asphalt trail located at the back of the property to prevent damage to the trail.

## 5 Retrofit Priorities

As noted in Section 3.0, the Sienna neighbourhood has the largest percentage of high scoring properties, and the only eight blocks that had an average score between 14.6 and 21, which was the highest in the Study area. As the City would like to rank retrofits on a block-by-block basis, the eight blocks that scored between 14.6 and 21 should be the first priority in the Sump Pump Retrofit Program. Upon completion of the retrofits of the eight blocks, the analysis and cost estimates outlined below can be used to rank retrofits for blocks throughout the study area with an average lot score between 10.4 and 14.5.

To determine the order in which the eight blocks in Sienna are retrofitted, AE considered the following:

- The number of scored properties on each block;
- Whether service connections can be tied directly into the storm sewer, or whether a third pipe system is required; and
- The cost to retrofit each block.

### 5.1 COST ESTIMATES

To estimate the costs to retrofit the eight blocks, AE developed preliminary cost estimates based on two retrofit options for neighbourhoods with storm sewers identified in Section 4.1:

1. Retrofit the sump to a third pipe system, including the installation of the third pipe system
2. Retrofit the sump to the storm sewer main, with the storm main already installed.

For both options, it was assumed that all service connections will be made directly from the sump to the storm sewer or third pipe. At detailed design, the depth of the basements and storm sewer or third pipe systems should be considered to determine if the sump pump can be eliminated, and a gravity connection made from the weeping tile to the storm sewer main or third pipe system.

The costs for each option are outlined below.

1. Retrofit sump to a third pipe system

We have assumed that the mains for the third pipe system will be 200 mm in diameter and will be gravity mains installed using open cut methods. Services are assumed to be 100 mm in diameter, and can be installed by directional drilling or open cut methods. The assumed costs are as follows:

- Open cut 200 mm diameter third pipe main - \$700/m
- Directional drill or open cut services, from house to property line - \$2,500/lot
- Open cut service to the street and connection to main – \$3,000/lot
- Restoration costs per lot - \$2,500/lot.

Therefore, the total costs for this option would be \$700/m for installation of the third pipe system, and \$8,000/lot for the service installation.

2. Retrofit Sump to Storm Sewer

We have assumed that sump can be connected directly to the existing storm sewer main on the street. Services are assumed to be 100 mm in diameter, and can be installed by directional drilling or open cut methods. The assumed costs are as follows:

- Directional drill or open cut services, from house to property line - \$2,500/lot
- Open cut service to the street and connection to main - \$3,000/lot
- Restoration costs per lot - \$2,500/lot

Therefore, the total costs for this option would be \$8,000/lot for service installation and connection to the existing storm sewer main.

## 5.2 BLOCK ANALYSIS

AE conducted an analysis of each of the eight blocks in the Sienna neighbourhood that have an average per lot score between 14.6 and 21 to prioritize the blocks for retrofitting. The analysis for each block is outlined below. The numbering of the blocks is shown in **Figure 4.0**.

A. Catalina Court - south of the intersection with Sienna Gate

This block has 26 total lots, and 16 that were scored. Four of the lots scored above 31 with two scoring above 51. There is an existing storm sewer on Catalina Court. Therefore, the sumps can be connected directly to the storm sewer. Retrofitting all the lots to the storm sewer results in an estimated cost of \$208,000.00, or approximately \$13,000.00 per lot scored.

B. Catalina Court – south of Block 1 to intersection east

This block has 26 total lots, and 14 that were scored. Seven of the lots scored above 31 with four scoring above 51. The existing storm sewer on Catalina Court ends at the boundary between Block 1 and Block 2. Therefore, a third-pipe system would be required to collect sump drainage on this block. Retrofitting all the lots to a newly installed third pipe system results in an estimated cost of \$287,100.00, or approximately \$20,500.00 per lot scored.

- C. Catalina Court – East of Navajo Lane Intersection to End of Cul-de-Sac  
This block has 26 total lots, and 14 that were scored. Five of the lots scored above 31 with one lot scoring above 51. There is an existing storm sewer that ends at the intersection of Navajo Lane and Catalina Court. Therefore, a third-pipe system would be required to collect sump drainage on this block. The estimated cost to retrofit all the lots to a newly installed third pipe system is \$295,500.00, or approximately \$21,100.00 per lot scored.
- D. Santa Fe Court Cul-de-Sac  
This block has 16 total lots, and 9 that were scored. Three of the lots scored above 31 with two scoring above 51. There is an existing storm sewer on Navajo Lane. Therefore, a third pipe system would be required to collect sump drainage on this block. The estimated cost to retrofit all the lots to a newly installed third pipe system is \$173,500.00, or approximately \$19,300.00 per lot scored.
- E. Sienna Gate  
This block has 20 total lots, and 11 that were scored. Seven of the lots scored above 31 with one scoring above 51. There is an existing storm sewer on Sienna Gate. Therefore, the sumps can be connected directly to the storm sewer. Retrofitting all the lots to the storm sewer results in an estimated cost of \$190,000.00, or approximately \$17,300.00 per lot scored.
- F. Navajo Lane  
This block has 11 total lots, and 8 that were scored. Two of the lots scored above 31 with one scoring above 51. There is an existing storm sewer on Navajo Lane. Therefore, the sumps can be connected directly to the storm sewer. Retrofitting all the lots to the storm sewer results in an estimated cost of \$88,000.00 or approximately \$11,000.00 per lot scored.
- G. Sonora Crescent west of Canyon Road  
This block has 30 total lots, and 17 that were scored. Six of the lots scored above 31 with two scoring above 51. There is an existing storm sewer on Sonora Crescent that runs from Canyon Road west to approximately 99 Sonora Crescent. The sumps up to this address can be connected directly to the storm sewer. A third pipe system will be required west of 99 Sonora Crescent to collect sump drainage on the remainder of the block. Retrofitting some lots to the storm sewer and the remainder to the newly installed third pipe system results in an estimated cost of \$324,000.00, or approximately \$19,100.00 per lot scored.
- H. Sonora Crescent east of Canyon Road  
This block has 21 total lots, and 14 that were scored. Three of the lots were scored above 31 with none scoring above 51. There is an existing storm sewer from the intersection of Canyon Road and Sonora Crescent that runs to the west. The sumps up to this intersection can be connected directly to the storm sewer. A third pipe system will be required east of the intersection to collect sump drainage on the remainder of the block. Retrofitting some lots to the storm sewer, and the

remainder to a newly installed third pipe system results in an estimated cost of \$227,500.00, or approximately \$16,000.00 per lot scored.

### 5.3 SUMMARY

To prioritize the eight blocks, we have weighted each block based on overall cost, cost per lot scored, and the amount of lots scoring above 31. Equal weighting was given to the total cost, cost per lot scored, and amount of lots scoring above 31. Based on these weightings, the prioritization of the eight priority lots is as follows:

1. Block E – The third lowest total cost and cost per lot scored, has seven lots scoring above 31 with one scoring above 51.
2. Block F – The lowest total cost and cost per lot scored, has two lots scoring above 31 with one scoring above 51.
3. Block A – The fourth lowest total cost, second lowest cost per lot scored, has four lots scoring above 31 with two scoring above 51.
4. Block B – The third highest total cost, second highest cost per lot scored, has seven lots scoring above 31 with four scoring above 51.
5. Block D – The second lowest total cost, third highest cost per lot scored, has three lots scoring above 31 with two scoring above 51.
6. Block G – The highest total cost, fourth highest cost per lot scored, has six lots scoring above 31 with one scoring above 51.
7. Block H – The fourth highest total cost, fourth lowest cost per lot scored, has three lots scoring above 31 with none scoring above 51.
8. Block C – The second highest total cost, highest cost per lot scored, has five lots scoring above 31 with one scoring above 51.

It is our understanding that the City will be budgeting \$150,000.00 per year to undertake the Sump Pump Retrofit Program. This cost is below the total estimated retrofit cost for all the priority blocks with the exception of Block 6. Based on this information, we recommend the following:

- The City undertakes the retrofit of the eight priority blocks based on the prioritization above.
- With the estimated cost of most blocks being above the City's annual budget, the City consider retrofitting each block over a two year period, doing half the block at a time. Conversely, the City could perform a retrofit every two years.
- The City undertakes the retrofit of Block 5, and uses the tendered costs for the retrofit to refine the cost estimate for the remaining blocks.



# TECHNICAL MEMORANDUM



## Closure

This report was prepared for the City of Fort Saskatchewan to develop a system to prioritize the properties within the Sump Pump Retrofit Program.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,  
Associated Engineering Alberta Ltd.

Patrick Mastromatteo, P.Eng.  
Project Manager

Scott Kusalik, P.Eng.  
Project Engineer

PERMIT STAMP





Legend:

Rating Total

- 3 - 15
- 16 - 30
- 31 - 40
- 41 - 51
- 51+



CITY OF  
FORT SASKATCHEWAN

FIGURE No. 1

CITY OF FORT SASKATCHEWAN  
SUMP PUMP RETROFIT PROGRAM

PROPERTY EVALUATION CRITERIA  
SINGLE PROPERTY RATINGS

AE PROJECT No. 2015-3556  
SCALE 1:5,000  
APPROVED  
DATE 2016JUN  
REV  
DESCRIPTION





Legend:

Rating Total

- 31 - 40
- 41 - 51
- 51+



CITY OF  
FORT SASKATCHEWAN

FIGURE No. 2

CITY OF FORT SASKATCHEWAN  
SUMP PUMP RETROFIT PROGRAM

PROPERTY EVALUATION CRITERIA  
HIGHEST SCORING SINGLE PROPERTIES

AE PROJECT No. 2015-3556  
SCALE 1:5,000  
APPROVED  
DATE 2016JUN  
REV  
DESCRIPTION





Legend:

AverageRating

- 0 - 2.4
- 2.5 - 6.3
- 6.4 - 10.3
- 10.4 - 14.5
- 14.6 - 21
- Block Boundary

FIGURE No. 3  
CITY OF FORT SASKATCHEWAN  
SUMP PUMP RETROFIT PROGRAM  
PROPERTY EVALUATION CRITERIA  
BLOCK RATINGS

AE PROJECT No. 2015-3556  
SCALE 1:5,000  
APPROVED  
DATE 2016JUN  
REV  
DESCRIPTION





- Legend:
- AverageRating
- 2.5 - 6.3
  - 6.4 - 10.3
  - 10.4 - 14.5
  - 14.6 - 21
  - Block Boundary



CITY OF  
FORT SASKATCHEWAN

FIGURE No. 4

CITY OF FORT SASKATCHEWAN  
SUMP PUMP RETROFIT PROGRAM

PROPERTY EVALUATION CRITERIA  
PRIORITY BLOCK NUMBERING

AE PROJECT No. 2015-3556  
SCALE 1:2,500  
APPROVED  
DATE 2016JUN  
REV  
DESCRIPTION

