



Special Council Meeting

Conducted Electronically via Microsoft Teams

Tuesday, December 15, 2020

1:00 PM

Agenda

Public Participation for December 15, 2020 Special Council Meeting

Council will be conducting the December 15, 2020 special meeting through electronic communications in accordance with the Meeting Procedures (COVID-19 Suppression) Regulation, Order in Council 99/2020.

- Residents can listen to the live audio stream at www.rmwb.ca/Council
- Anyone wishing to participate in the meeting is encouraged to do so by registering to speak as a delegate by way of teleconference or by submitting their delegation comments by email.
- To participate by teleconference:
 - Anyone wishing to speak by teleconference to an item on the December 15, 2020 Council Meeting Agenda must pre-register by 3:00 p.m., Monday, December 14, 2020.
 - To register to speak via teleconference, please email Legislative.Assistants@rmwb.ca or call 780-743-7001 with your name, the phone number that you will be dialing in from and an email address that you can be reached at prior to and during the meeting.
 - You must provide the name of the agenda item that you wish to speak to.
 - All registrants will be emailed the details on how to participate prior to the start of the meeting.
 - Each registrant will be given a maximum of **5 minutes** to address Council.
- To make written submissions as a delegation before or during the live meeting:
 - Please complete the online form found at <https://www.rmwb.ca/writtendelegations/> or email Legislative.Assistants@rmwb.ca
 - Please note that written comments for an agenda item must be received prior to the start of that item during the meeting. Emails that are received after the agenda item has been introduced or are not relevant to an agenda item, will not become part of the record of this meeting.
 - All written submissions are public and will be included in the Council Meeting Agenda Package as part of public record.

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1. Call to Order**2. Unfinished Business**

2.1. **Presentation** – Associated Engineering re: Infrastructure Performance During the 2020 Flood

2.2. **Presentation** - 2021 Flood Preparedness

2.3. Sanitary Sewer Backwater Prevention Program

- Introduction from Administration
- Delegations
- Questions/Debate/Vote

THAT the Sanitary Sewer Backwater Prevention Program – Policy OPE-50, as outlined in Attachment 2, be approved, to come into effect March 1, 2021; and

THAT \$1,000,000 be allocated from the Emerging Issues Reserve to fund the Backwater Prevention Program.

2.4. **Presentation** – Flood Mitigation and Community Resiliency Update - Taiga Nova Eco-Industrial Park

2.5. **Presentation** – Flood Mitigation and Community Resiliency Update - Downtown

2.6. **Presentation** – Flood Mitigation and Community Resiliency Update - Longboat Landing

2.7. Flood Mitigation and Community Resiliency Update – Waterways

- Introduction from Administration
- Delegations
- Questions/Debate/Vote

THAT Administration continue with building a structural mitigation solution as previously directed; and

THAT Administration limit development below 250.9m and introduce enhanced flood provisions in the Land Use Bylaw for development above the 250.9m elevation.

2.8. Flood Mitigation and Community Resiliency Update – Draper

- Introduction from Administration
- Delegations
- Questions/Debate/Vote

THAT Administration determine the feasibility of a grant program for lot-by-lot individual flood mitigation solutions for properties in Draper where the underside of the main floor joists are below 251m as the flood risk treatment for Draper and report back to Council; and

THAT Administration limit development below 251m and introduce enhanced flood provisions in the Land Use Bylaw for development above 251m.

2.9. Flood Mitigation and Community Resiliency Update - Ptarmigan Court

- Introduction from Administration
- Delegations
- Questions/Debate/Vote

THAT Council direct Administration to proceed with offering a voluntary buyout until May 31, 2021 to all property owners in Ptarmigan Court at the 2020 assessed value.

Adjournment



2020 Ice Jam Flood Event

Performance of Municipal Infrastructure

Jason Vanderzwaag, MASc., P.Eng.
Nelson Dos Santos, P.Eng.

December 15, 2020

Outline

- Introductions and Purpose
- Background and Flood Standards
- Overview of the 2020 Ice Jam Flood Event
- Infrastructure Performance
 - Lower Townsite
 - Water Treatment Plant
 - Taiga Nova
- Key Findings and Recommendations



Purpose

Provide an independent assessment of how key Municipal infrastructure performed during the 2020 Flood event, substantiated by first-hand field observations and follow-up analysis by Associated Engineering staff.

Background and Flood Standards

RMWB Flood Standard - History

- Based on Alberta Environment (1993) and Trillium (2000) Reports:
 - 1:100 year – 250.0 m
 - 1:40 year – 248.5m
- Trillium (2000) recommended dykes built to 1:100 year standard with an incremental approach of initially building to 1:40 year.
- 2007 to 2010 - RMWB constructed East Loop Road (i.e. Clearwater Drive east of Riedel) to nominal 248.5m
- Land Use Bylaw established development controls below 250m (249m for commercial)



RMWB Flood Standard – Recent History

- Hangingstone River flood in 2013 and LTS redevelopment plans led to renewed discussion about flood protection
- After Wildfire, December 13, 2016 letter from GOA affirmed 1:100 year flood standard of 250.0m
- Clearwater Drive (west of Riedel) built to nominal 250.5m (includes 0.5m freeboard)
- Current flood mitigation program (i.e. Reach 7, 8, 9 etc.) constructing to 250.5m



Current Infrastructure Status

- Key infrastructure built to 1:40 year (248.5m)
 - Clearwater Drive (East of Riedel Street)
 - Saline Creek Drive (Mills Avenue to Waterways)
 - Lift Station 1A (249.0m)
- Key infrastructure built to 1:100 year (250m +)
 - Reach 1 (completed 2014, to 250.0)
 - Clearwater Drive (west of Riedel Street) built to 250.5
 - Reach 9 construction underway (250.5m)



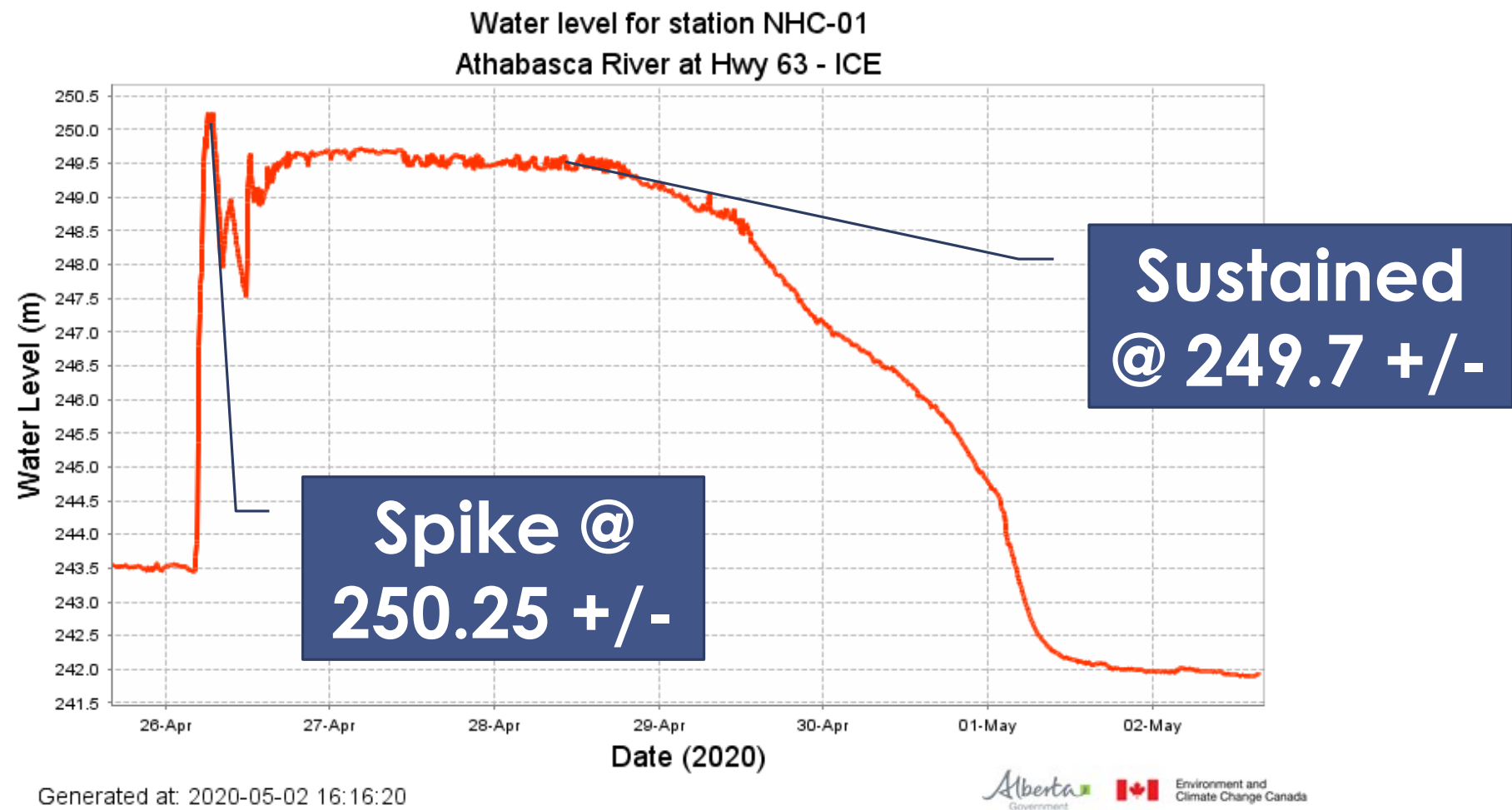
2020 Ice Jam Flood Event

2020 Ice Jam Flood Event

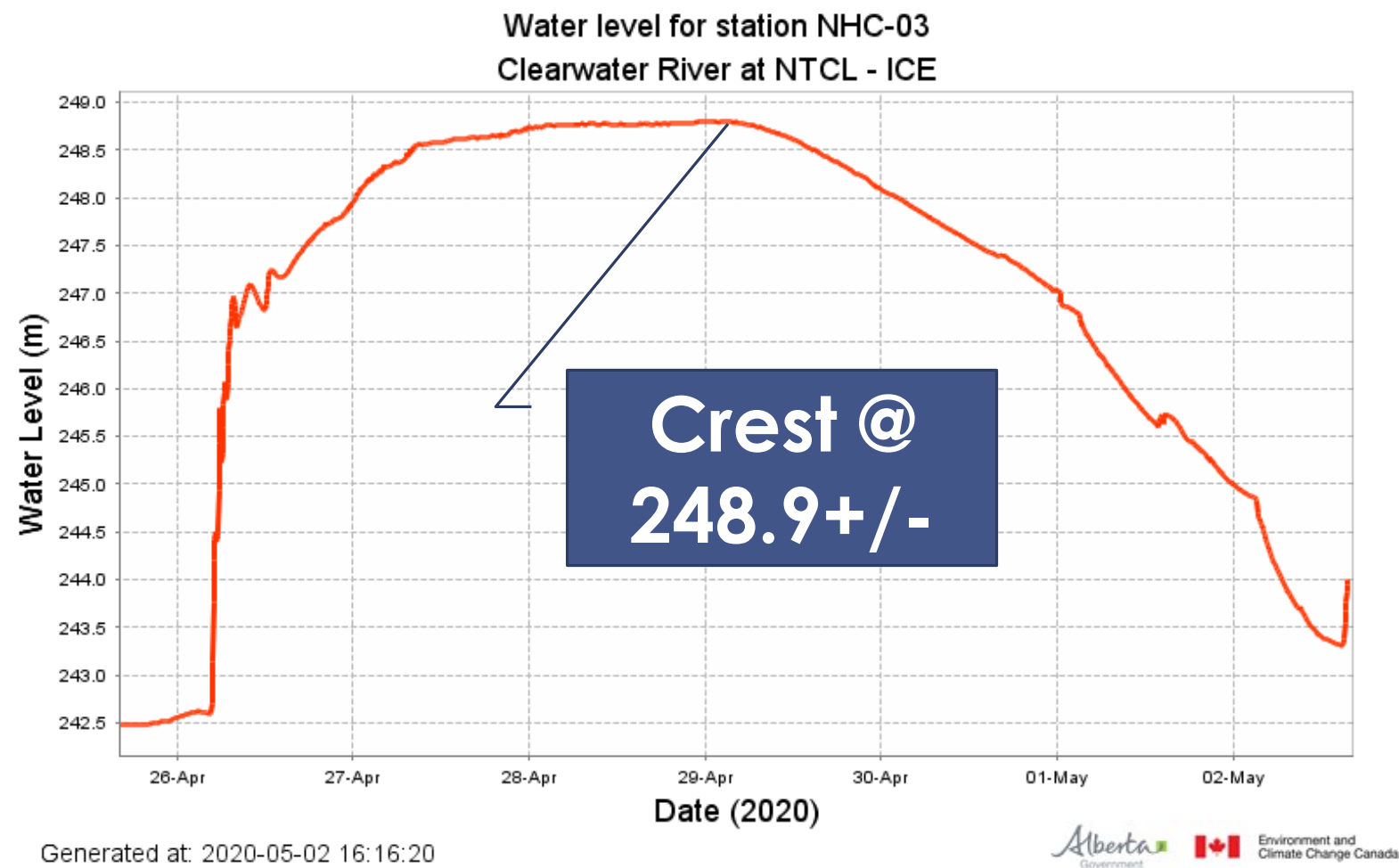
- Athabasca River started to break on April 26, 2020
- Ice Jam formed downstream of confluence of Athabasca and Clearwater Rivers, causing water levels to rise
- Water levels spiked to 250.25 at Athabasca Bridge / WTP
- Water levels peaked at 248.9 +/- on Clearwater
- Approximately 5 days for water levels to recede



Flood Stage at Athabasca River Bridge



Flood Stage at Clearwater River



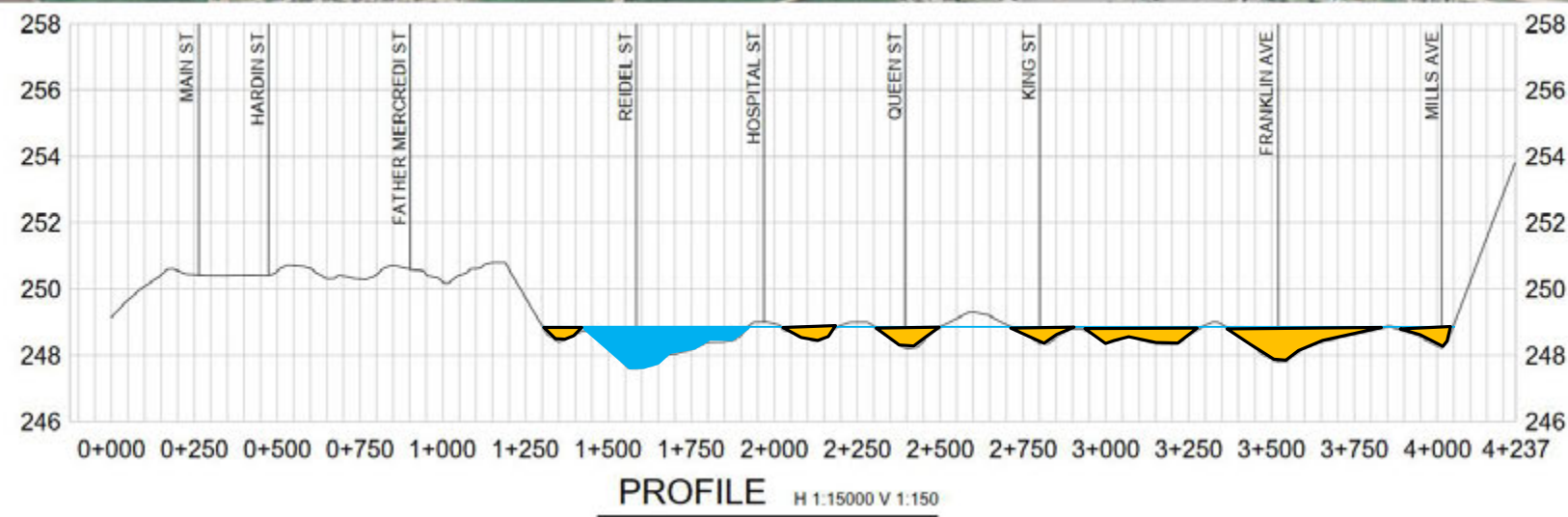
Lower Townsite Flood Pathways - Overland

Floodwater Pathways - Overland

- By 11pm on April 26 water was approaching 248.0 level, and was at or close to breaching Clearwater Drive at the following locations:
 - Mills Avenue (248.1m)
 - Franklin Avenue (247.9m)
 - King Street (248.5m)
 - Queen Street (248.3m)
 - Riedel Street (247.7m) – already breached
- Crews mobilized to build Emergency Clay Dykes on CWD



Clearwater Drive



Emergency Dyke Construction CWD @ Franklin



Attachment: 2020 River Break Flood Infrastructure PPT (2020 Flood Infrastructure



Emergency Dyke Construction CWD @ Franklin



Attachment: 2020 River Break Flood Infrastructure PPT (2020 Flood Infrastructure



Emergency Dykes Summary

- All of the emergency dykes successfully constructed EXCEPT for Riedel Street
- Emergency dykes were holding back ~1m of water
- Water still rising inside of the dykes
- At 1:30 pm April 27, emergency dyke construction abandoned due to rising waters and concern for worker safety



Lower Townsite – Underground Flood Pathways

Storm Outfalls and Flapgates

- Storm sewers from Lower Townsite discharge directly to the river
- Outfalls include a flapgate, which opens to allow flow out, but closes to prevent backflow from the river.
- No evidence flap gates failed during 2020 flood

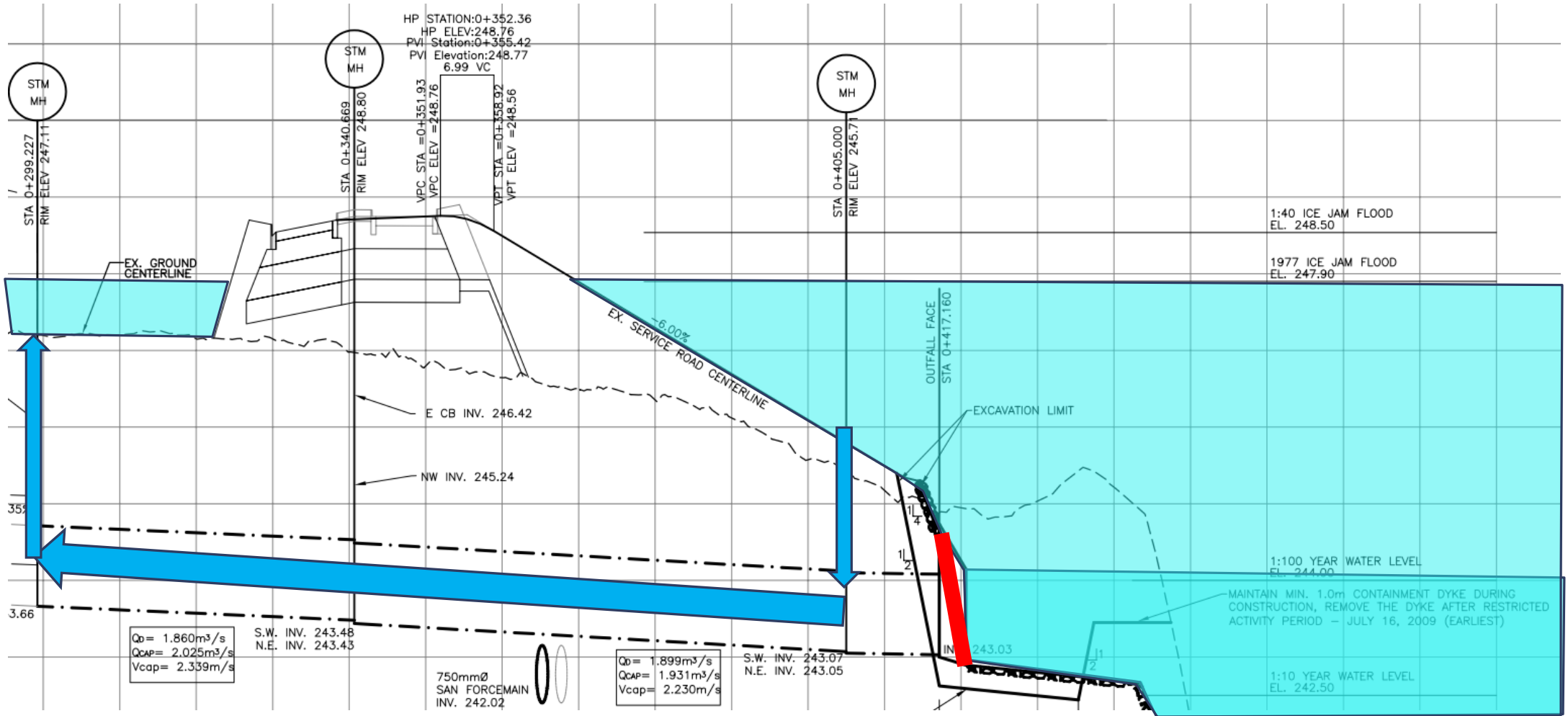


Underground Floodwater Pathways

- Flood water was observed inside of the dykes before overland breaches occurred.
- Water continued to rise inside of dykes, despite emergency dyke construction.
- Underground pathways allowed water to bypass the flap gates flooding both the storm and sanitary sewers.
- Once inside the dyke system, water will keep flowing until equalization



Underground Flooding Pathway Example



Main Street Outfall



Main Street Outfall

2.1.a



Attachment: 2020 River Break Flood Infrastructure PPT (2020 Flood Infrastructure



Hardin Street Outfall



Clearwater Drive
(Dyke at 250.5)

2 x Catch
Basins with
Grated Cover

Storm
Outfall w
Flapgate

Hardin Street Outfall



Flooding @ Hardin and Main St



Attachment: 2020 River Break Flood Infrastructure PPT (2020 Flood Infrastructure

Franklin Avenue Storm Outfall



- Note: Final alignment of permanent or temporary dykes may solve the backflow problem here

Riedel Street / Riverwalk Villas



Underground
Parkade Air
Vents



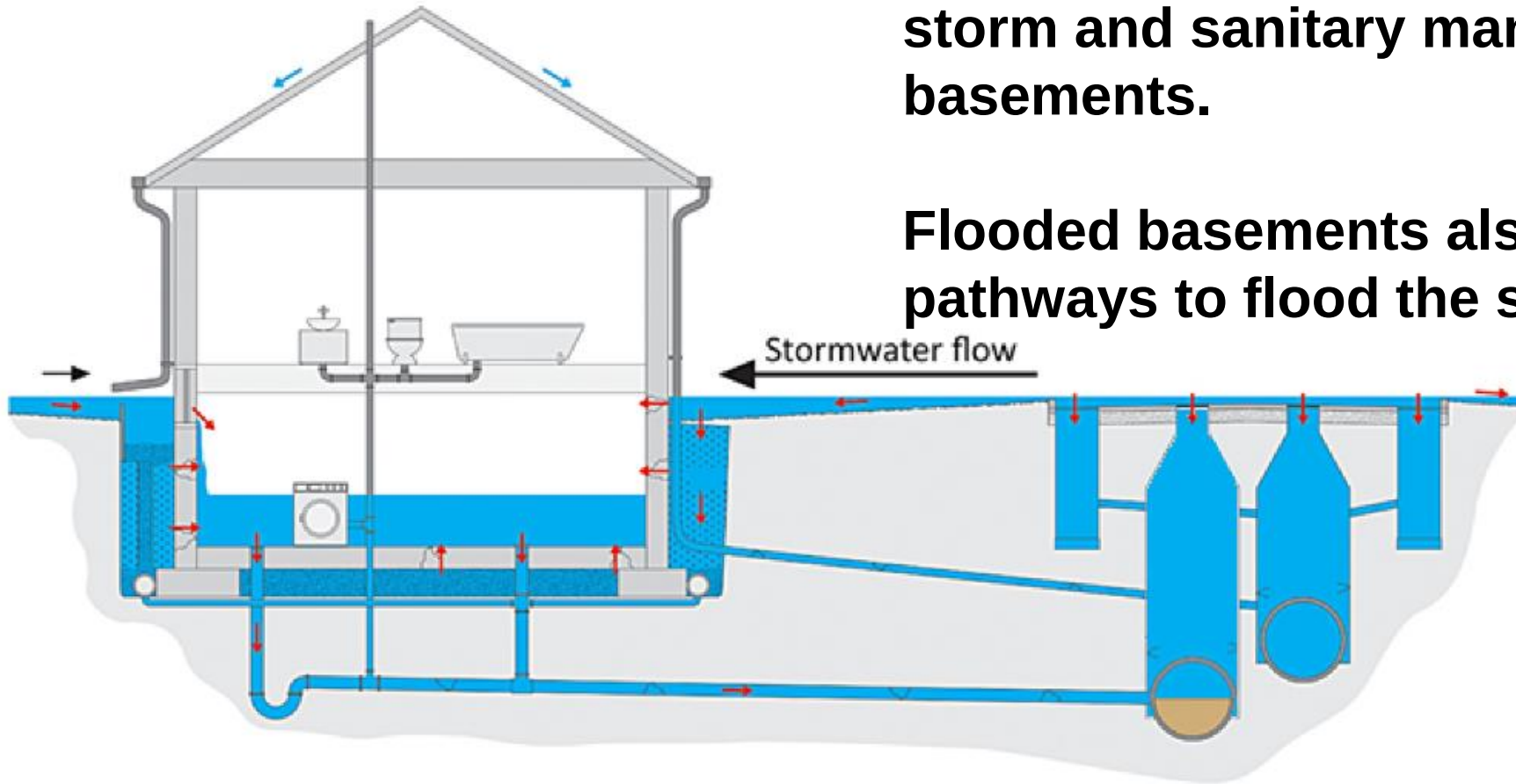
Riedel Street - Water Flow



River Water Flood Damage

Flood water will follow path of least resistance to fill low points, including storm and sanitary manholes, and basements.

Flooded basements also provide more pathways to flood the sanitary system.

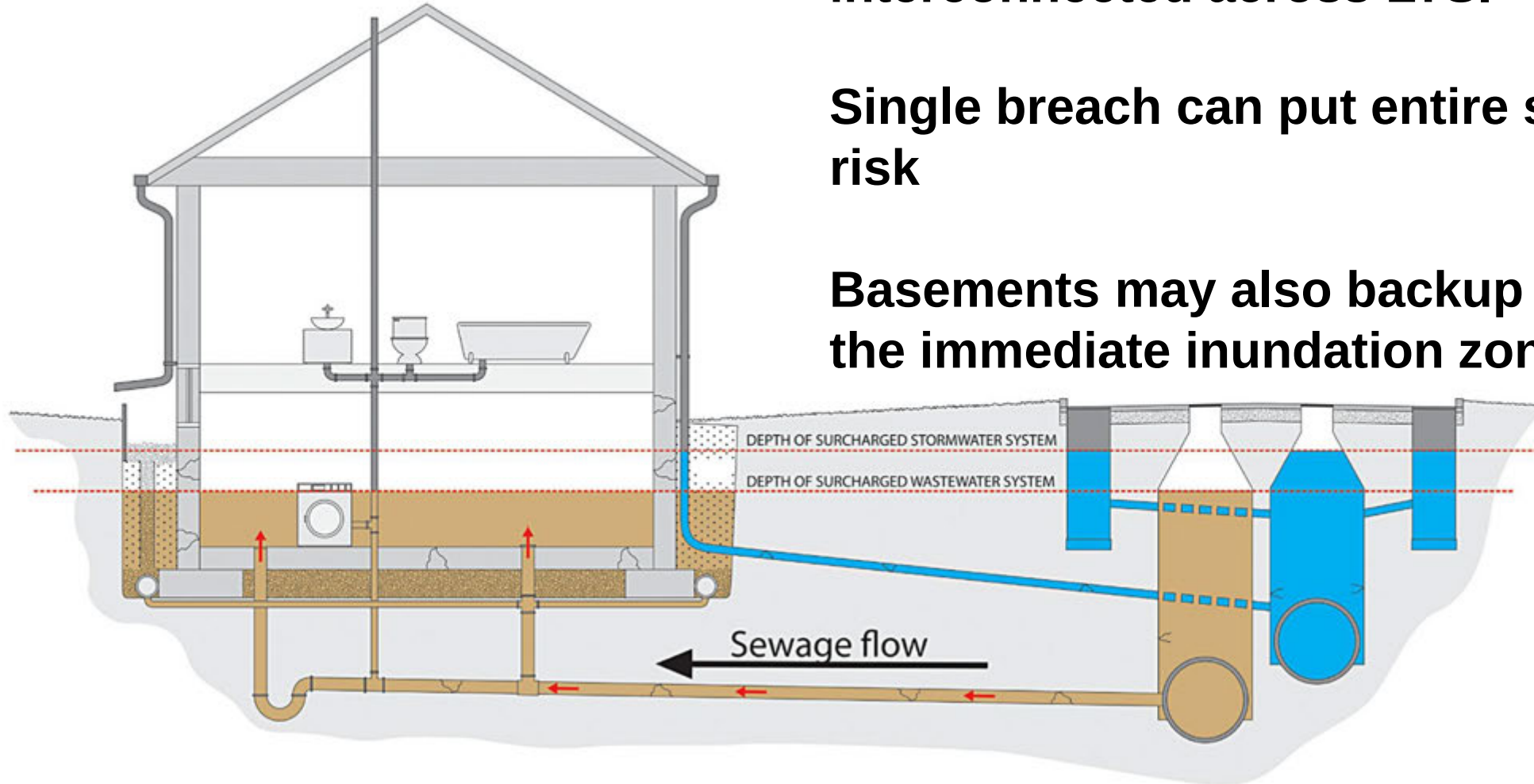


Sewage Back-Up Damages

Sanitary Sewer collection system is interconnected across LTS.

Single breach can put entire system at risk

Basements may also backup outside of the immediate inundation zone.



Longboat Landing

- Storm system is separate from rest of Lower Townsite (dedicated outfall)
- Original storm pond & outfall washed out in 2013 Hangingstone River floods
- Developer was approved to reinstall back flow preventer
- Inspection on November 30 identified that no backflow preventer was in place.



Longboat Landing

- Flood waters breached Denholm Gate and Fontaine Crescent from river
- Flood extent and damage independent of absent flap gate.



Cases of Successful Flood Mitigation

Successful Flood Mitigation

- No bridges damaged
- No flooding from Athabasca River / MacDonald Drive Causeway (i.e. 250.25 “spike” didn’t inundate downtown)
- No Flooding at River Park Glen (Reach 1)
- Lift Station 1A protected by 2013 dykes
- Hospital did not flood



Reach 1 / River Park Glen



Attachment: 2020 River Break Flood Infrastructure PPT (2020 Flood Infrastructure

Lift Station 1A

- Floor slab at flood risk
- Dykes Constructed around LS1A in 2013 to 250.0
- Dykes prevented flooding and submergence of mechanical and electrical systems



Hospital

- Bay doors and mechanical room at risk of flooding.
- Manholes plugged with sandbags to slow flood waters.



Water Treatment Plant

Water Treatment Plant – Infrastructure

- Outfalls damaged by river ice
- Sluice gate at outfall not sealed
- Flap gates bypassed at clearwell overflow piping



Water Treatment Plant – Failure Mechanisms

- River Water flowed into a Clearwell storage cell and quickly entered the pumping chamber. This was due to the close proximity of the overflow trough to the pump chamber.
- Operations had limited information that the Clearwell had been breached so contaminated water was pumped through the distribution network.



Water Treatment Plant – Failure Mechanisms

- Operations attempted to isolate the affected Clearwells but could not due to buildup of precipitate on the isolation valves.
- Boil Water Order implemented in coordination with AHS / AEP



Water System Recovery

- Water System Recovery Program undertaken by Municipal operations with contractor support.
- Entire water distribution system cleaned and disinfected, with all Boil Water Orders lifted by June 22, 2020.



Water Treatment Plant – Repairs and O&M

Inspections and Repairs completed:

- Sluice gate and flap gates repaired
- Dive team removed precipitate from valves

“Short Term Flood Mitigation” study identified Recommendations, including O&M improvements.



Taiga Nova Eco-Industrial Park

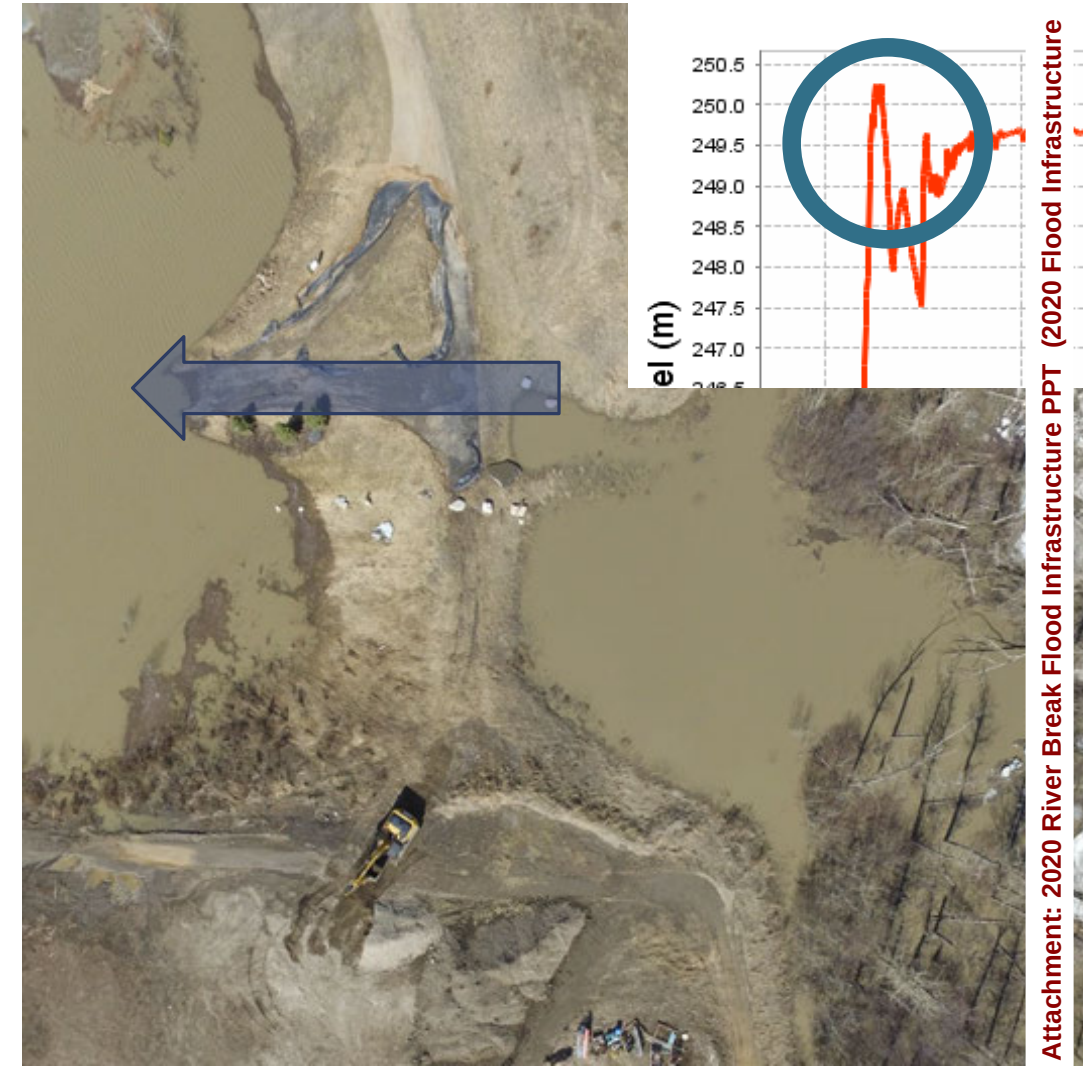
Taiga Nova Eco Industrial Park

- First Community to be flood-impacted (mandatory evacuation order 10:23am April 26)
- Two flooding mechanisms:
 1. Initial dyke breach
 2. Backflow from WWTP outfall



Taiga Nova Eco Industrial Park

- Initial “spike” on Athabasca River caused water levels to breach dyke at storm pond
- Visible erosion in drone photos
- Storm pond backed up, causing flooding in eco park
- Breach was temporary – river dropped below dyke crest

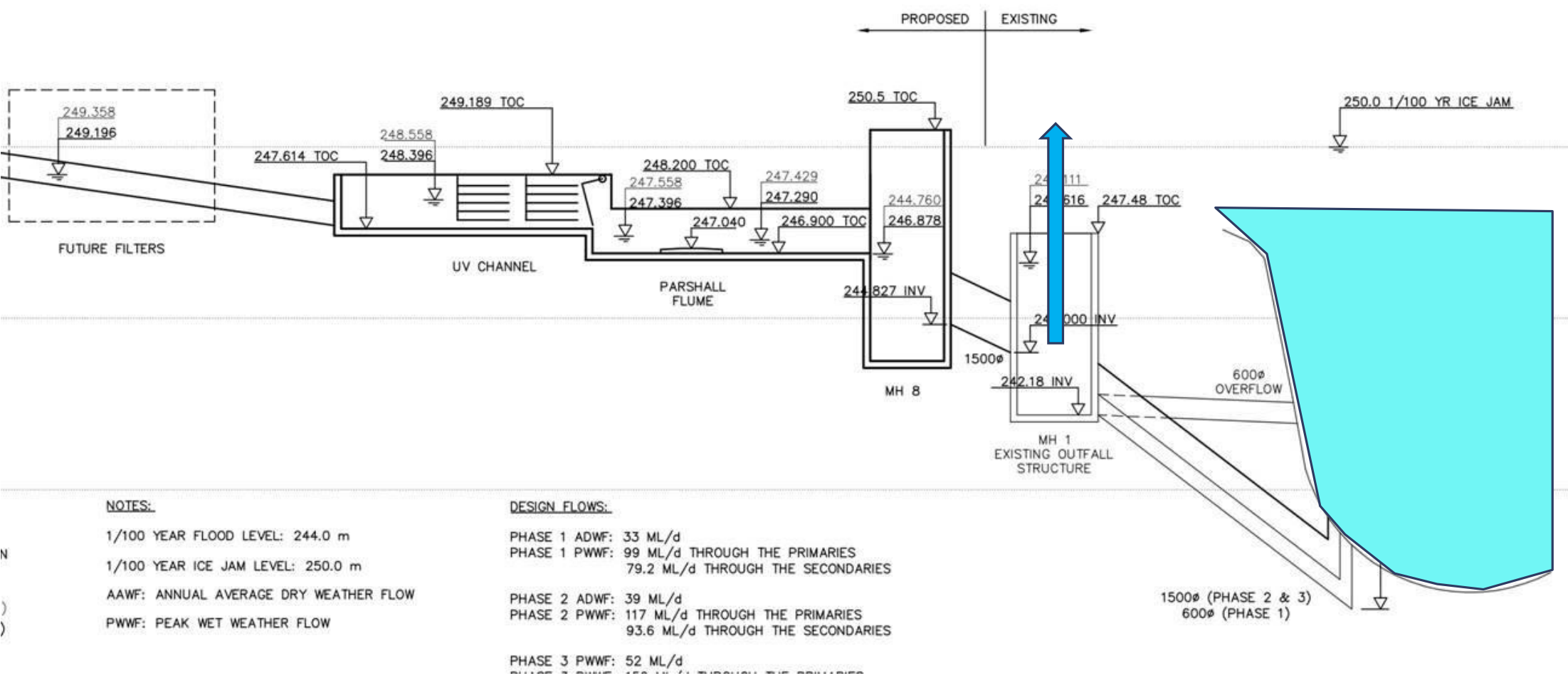


Taiga Nova Eco Industrial Park

- After “spike”, Athabasca River levels at Taiga Nova stabilized around 247.5 +/-
- Dykes and flap gate did not fail, as maximum water level inside eco park was 245.7 (2m lower than river)
- High river level contributed to flooding, via WWTP outfall pipe (no flap gate)
- Water was reported flowing from manholes, with enough force to remove MH covers.

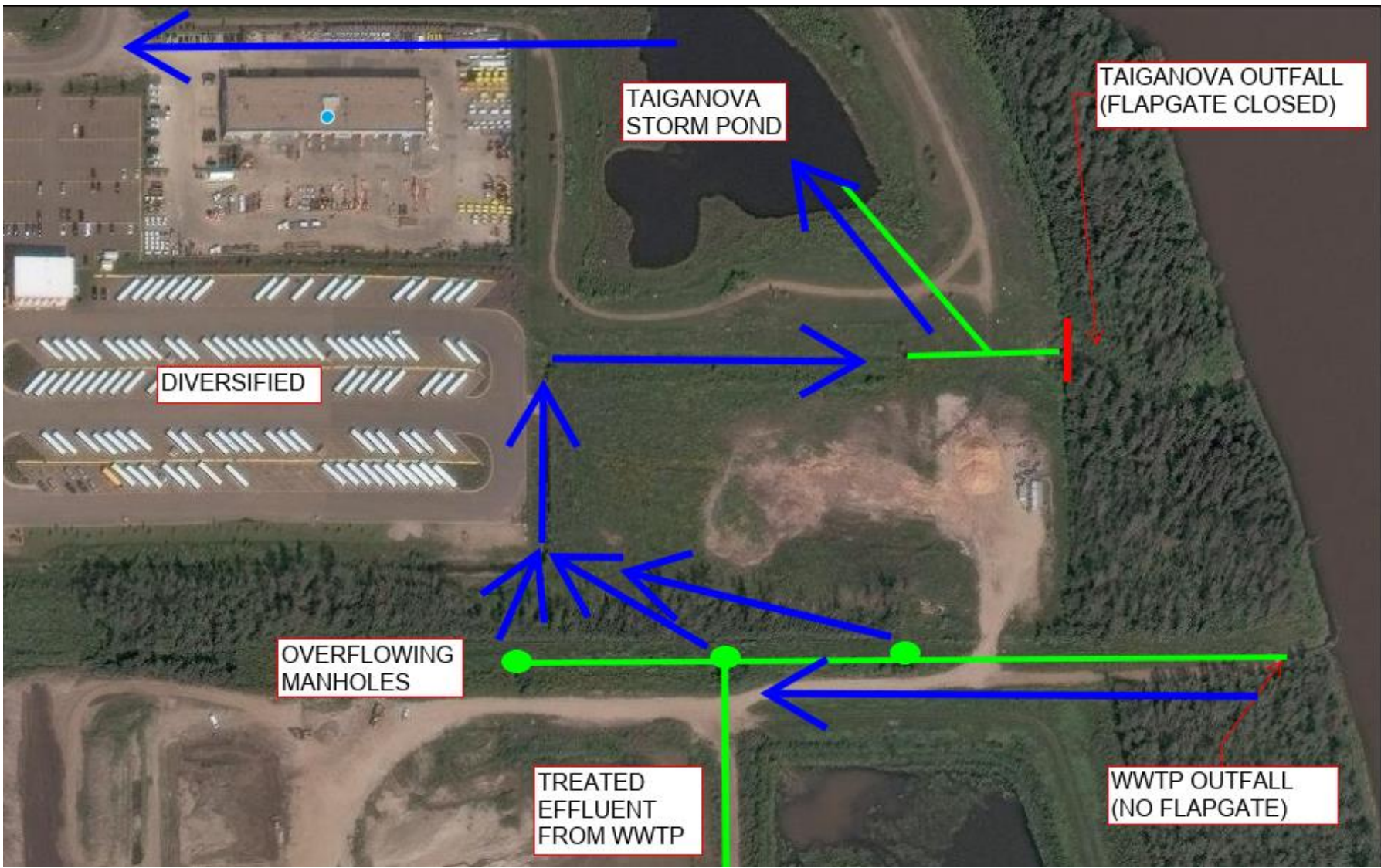


WWTP & Taiga Nova – Underground Flow Path



Attachment: 2020 River Break Flood Infrastructure PPT (2020 Flood Infrastructure

WWTP Outflow Pipe to Taiganova Flow Path



Attachment: 2020 River Break Flood Infrastructure PPT (2020 Flood Infrastructure

Key Findings

Key Findings:

1. A comprehensive Flood Protection System was not in place at the time of the 2020 River Breakup Flood Event.
2. Flood infrastructure composed of pieces, built to different standards (1:40 vs 1:100), not a single comprehensive system.
3. Flap gates did not fail. However, no process in place to identify underground pathways where water can bypass flap gates.



Key Findings:

4. Recommendations from Trillium (2000) for secondary line of flood defense or active pumping systems never implemented.
5. Incremental approach to establish protection to 1:40 and ultimately 1:100 per Trillium (2000) was still underway at time of 2020 flood.
6. The 2020 flood had a maximum water level of 248.9m, which exceeded the capacity of all infrastructure designed to only 248.5m



Key Findings (cont'd)

7. The attempt to build the emergency dykes along Clearwater Drive was not successful because:
 - a) Unable to build emergency dykes at Riedel Street due to flood waters already breaching
 - b) Underground water pathways through existing penetrations in the flood protection system
 - c) A single point of failure in the system will allow water to enter, and follow sanitary sewer to impact all low-lying areas in Lower Townsite.

Key Findings (cont'd)

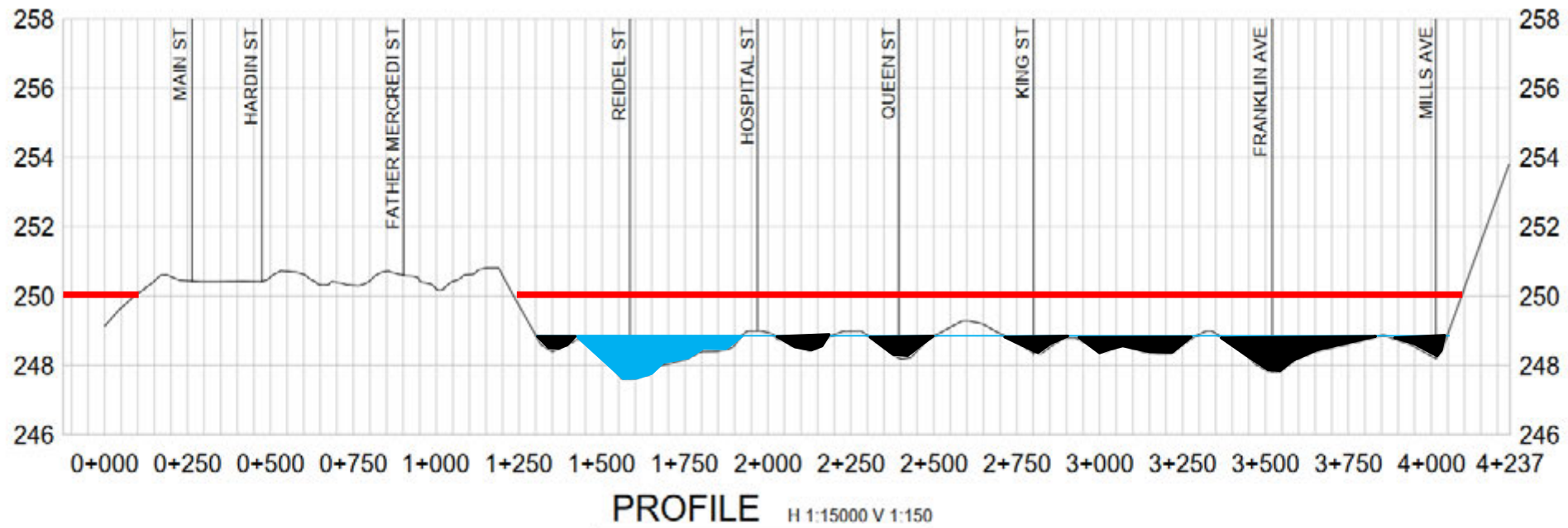
8. Underground flood pathways exist at multiple locations that will need to be reviewed and mitigated:
 - a) Main Street, Hardin Street Outfalls
 - b) Riedel Street / Riverwalk Villas
 - c) Wastewater Treatment Plant -> Taiga Nova
 - d) Other sites, depending on location and placement of temporary and final dyke alignment



Key Recommendations

Key Recommendations

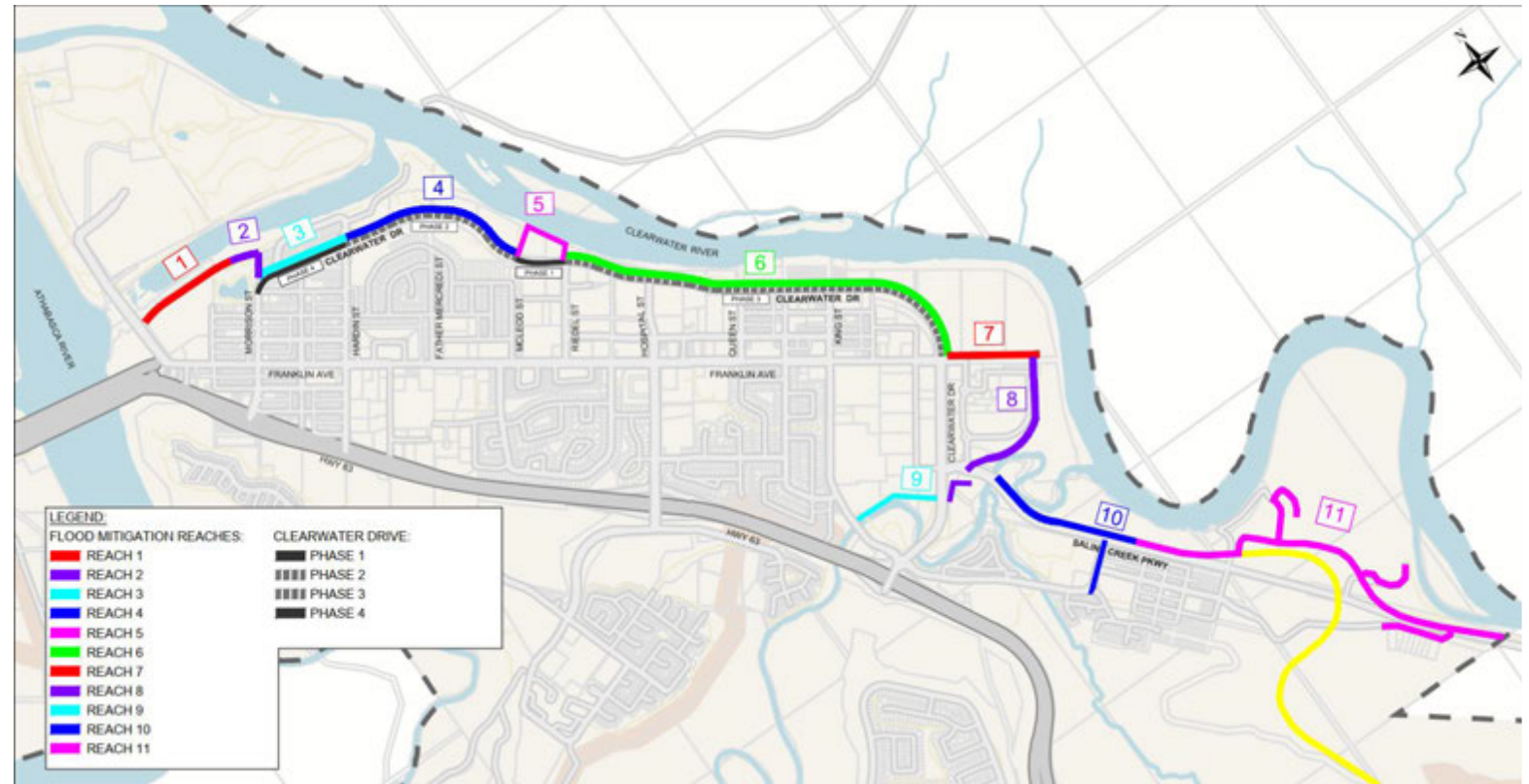
1. Adopt a consistent flood protection standard in accordance with Provincial guidelines and best practices



Key Recommendations (cont'd)

2. Implement a comprehensive Flood Protection System

- a) Accelerate design and construction of permanent dykes and flood barriers
(Program Management)



Key Recommendations (cont'd)

2. Implement a comprehensive Flood Protection System (continued)
 - b) Identify and plug all underground flooding pathways
 - c) Apply a multi-barrier approach, including redundancy for critical infrastructure (e.g. Hospital), and means of isolation to limit damage in the event of a breach
 - d) Implement pumping measures to manage drainage inside of the dykes



Key Recommendations (cont'd)

3. Develop an inspection and maintenance program for the Flood Protection System (i.e. Asset Management)
 - a) Pre-River Break, During River Break, Post River Break
 - b) Review and monitor existing and proposed infrastructure that may compromise the flood protection system
 - c) Multi-faceted approach to public infrastructure, private developments, third-party utilities, grading and landscaping, and natural processes including erosion, vegetation, etc.



Thank You

Special Thanks to McMurray Aviation for aerial imagery



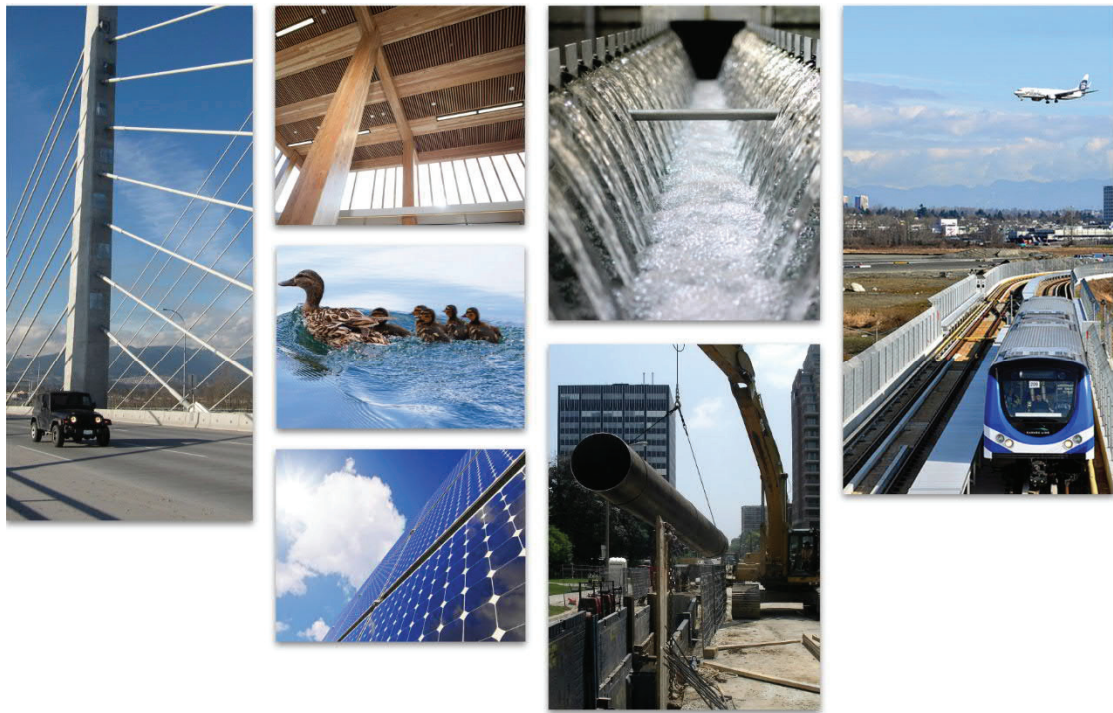
**Associated
Engineering**

*GLOBAL PERSPECTIVE.
LOCAL FOCUS.*

REPORT

Regional Municipality of Wood Buffalo

2020 Ice Jam Flood Event Infrastructure Performance



DECEMBER 2020

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EXECUTIVE SUMMARY

1 INTRODUCTION AND PURPOSE

On April 26, 2020, an ice jam formed during the breakup of the Athabasca River leading to widespread flooding in various geographic areas of Fort McMurray: Lower Townsite and Longboat Landing, Waterways and Ptarmigan Trailer Court, Draper, Taiga Nova. The Water Treatment Plant was also impacted, with untreated water contaminating the drinking water system, leading to a Boil Water Order implemented for the entire Fort McMurray water service area.

This report is prepared by Associated Engineering for the Regional Municipality of Wood Buffalo, to provide an independent assessment of how Municipal infrastructure performed during the 2020 Ice Jam Flood event. Key findings and recommendations are provided for the Municipality to consider as part of the long-term flood protection strategy.

2 BACKGROUND AND INFRASTRUCTURE STATUS

Previous studies have established the 1:100-year return period flood event for the Lower Townsite as the 250.0 m elevation, and the 1:40-year return period as the 248.5 m elevation. The Trillium (2000) report identified a strategy for establishing flood protection on an incremental basis, by constructing initially to the 1:40-year flood level, and ultimately to the 1:100-year flood level. Trillium (2000) also recommended all storm outfalls be equipped with automatic gates (i.e. flap gates), as well as a secondary line of defence in the form of manually-operated gates and pumping to manage landside drainage when the flap gates are closed.

In general alignment with the Trillium (2000) report, the RMWB constructed the eastern half of Clearwater Drive to a nominal elevation of 248.5m circa 2010 as the first phase of establishing a perimeter flood barrier around the Lower Townsite. Following the Hangingstone River flooding event in 2013, the RMWB renewed their attention on flood standards; the western half of Clearwater Drive was constructed to a nominal elevation of 250.5m, and was substantially completed in 2019. As such, at the time of the 2020 flood, the flood mitigation infrastructure consisted of some reaches built to the 1:40 year standard and some built to the 1:100 year standard, with various low points along the alignment including a significant gap at Riedel Street.

Longboat Landing was developed in general conformance to the flood abatement clauses of Section 60 of the 1999 version of the Land Use Bylaw. In 2013, the Hangingstone River flood destroyed the outfall system for Longboat Landing, including the storm pond and flap gate. At the time of the 2020 flood, there was no backflow preventer in place on the storm system.

There was no completed flood infrastructure in place for Waterways, Ptarmigan Trailer Court or Draper.

Taiga Nova Eco Industrial Park was constructed with a perimeter dyke to the 1:40 year flood level. At the southeast corner of the development, the dyke is connected to the perimeter berms around the lagoons at the Wastewater Treatment Plant.

The Water Treatment Plant was designed with a perimeter flood protection dyke of elevation 253.0 m. Ground settlement over time has reduced the effective dyke elevation to be closer to 252.4 m at the time of the 2020 ice jam flood.

The storm drainage system and reservoir overflow systems at the Water Treatment Plant discharges through an outlet sluice gate chamber which controls drainage to the Athabasca River. The sluice gate inside of the chamber provides the WTP operators the ability to isolate the plant piping from the river. From an operational perspective, this gate is closed every year in advance of river breakup. As part of the underground piping system, the overflow line from each clearwell is also fitted with a flap gate.

3 2020 ICE JAM FLOOD EVENT

As the Athabasca River broke in the morning of April 26, 2020, an ice jam formed along the river near the confluence of the Clearwater River. According to gauges at the Athabasca River bridge, the ice jam was accompanied with an initial rapid spike in water levels, up to approximately 250.25 m. The water levels then fluctuated for a number of hours, before stabilizing at around 249.7 m.

On the Clearwater River, water levels rose quickly to flood levels on April 26, then gradually over the next two days before peaking in the early morning hours of April 29 at 248.9m.

Water levels began to rapidly recede on May 1 as the ice jam broke up, and returned to normal water levels on May 2, 2020.

4 LOWER TOWNSITE

The Snye Dyke / MacDonald Drive causeway was successful at keeping the initial spike on the Athabasca River from impacting the Lower Townsite. Localized flooding was reported at the intersection of Highway 63 and Morrison Street, and is attributed to the fact the Alberta Transportation storm outfall does not have a flap gate.

As the maximum water level on the Clearwater River reached 248.9 m, Clearwater Drive was inundated at all locations which were nominally constructed to only 248.5 m. Emergency clay dykes were constructed overnight on April 26 along Clearwater Drive in an attempt to mitigate the flood damage. In the vicinity of Riedel Street, the road elevation was only 247.7 m, and by the time of construction, the water was too deep and too fast to place clay on the road. As the emergency dyke could not be constructed at Riedel Street, this location became the primary route for overland flooding to enter into the Lower Townsite.

In addition to overland flooding at Riedel Street, the Lower Townsite was impacted by water following underground flow pathways. There is no evidence that the flap gates at the storm outfalls had failed. Rather, water was able to find pathways that bypassed the flap gates and entered the storm system through catch basins, pipes and other openings in the infrastructure between the flap gate and the dyke crest.

Identified locations for underground flow pathways include culvert inlet pipes at the Main Street outfall, catch basins at the Hardin Street outfall, and the parking lot near Riverwalk Villas. The parkade at Riverwalk Villa was itself also a pathway for water to enter into the Lower Townsite, via two large air vents facing the Clearwater River. These vents allowed flood water to flow directly into the parkade, and into the storm sewer and spill onto the street.

The ultimate flood level within the Lower Townsite matched the peak levels on the Clearwater River, at 248.9 m. Any buildings or developments at or below this elevation were vulnerable to flood damage. Homes and other buildings outside of the immediate inundation area were also vulnerable to flood damage, if their basement was near or below the 248.9 m elevation, and their sanitary sewer service was not equipped with a back flow preventer.

The status of the infrastructure in place at the time, combined with the extreme water levels of the 2020 ice jam flood, allowed the flood water to enter the Lower Townsite via both overland flow (at Riedel Street) and multiple underground pathways. The maximum flood level reaching 248.9 within the Lower Townsite, and the associated flood damage, cannot be attributed to the failure of any one particular infrastructure component, but rather that the system as a whole was not prepared for a flood of this magnitude.

In Longboat Landing, the absence of the back flow preventer led to early observations of storm sewer backups in the parking lots and other low points in the development. However, as the Clearwater River levels continued to rise, the flood waters eventually breached Denholm Gate and Fontaine Crescent. At this level, the absence of the back flow preventer was irrelevant, as the flood water levels within the development equalized with the Clearwater River to an elevation of 248.9 m.

Locations where the flood infrastructure and other mitigation measures prevented flood damage include Reach 1 / River Park Glen, Lift Station 1A and the Hospital. There was also no flood damage to any bridges, which allowed the Municipality to re-open transportation corridors immediately after the flood event had passed.

5 WATER TREATMENT PLANT

At the Water Treatment Plant, the flood waters from the Athabasca River were able to bypass both the sluice gate at the outfall chamber, and the two flap gates at the treated water reservoirs (i.e. clearwells). The untreated river water mixed into the treated water and was pumped into the distribution system. Once the contamination was discovered, a Boil Water Order was put into place for the entire Fort McMurray water system.

Following the recovery of the water system, a series of investigations was conducted to determine the failure mechanisms. It was discovered that the mounting platform for the sluice gate was cracked, leading to the stem bending and the gate not properly sealing. Deficiencies were also identified on the two flap gates leading to the reservoir cells. All of the critical deficiencies identified during the inspection have since been repaired.

A follow-up study entitled “Short Term Flood Mitigation Recommendations” identified other improvements to the operation and maintenance at the plant, including installation of additional barriers to prevent another contamination event in the future.

6 TAIGA NOVA ECO INDUSTRIAL PARK

The Taiga Nova Eco Industrial Park was subjected to two flooding mechanisms. During the initial “spike” on the Athabasca River, there is evidence that the floodwaters overtopped the dyke at the storm outfall, flooding the storm pond and causing backup into the roads and properties. The river flood levels dropped below the crest of the dyke before the water levels inside of the industrial park could equalize with the river. The elevated flood levels however still caused water to backflow through the Wastewater Treatment Plant effluent pipeline, and spill out of three

manholes. The water from these manholes then followed the ditches into the Taiga Nova storm pond, leading to additional flooding within the industrial park.

7 KEY FINDINGS

A comprehensive Flood Protection System was not in place at the time of the 2020 ice jam flood.

The flood infrastructure that existed at the time of the 2020 flood consisted of a series of dykes constructed to different design criteria, as opposed to a single comprehensive system. With a maximum flood water elevation of 248.9, the 2020 ice jam flood event was higher than what the flood infrastructure was designed to mitigate.

There was no evidence of flap gates failing in the Lower Townsite. However, in conjunction with the lack of a comprehensive system, there was no process in place to identify potential underground pathways for water to bypass the flap gates and backflow under the dykes, and to remedy such issues.

The flood mitigation program completed to date was constructed on an incremental basis over a lengthy time period, in general conformance with the Trillium (2000) report. With respect to Clearwater Drive as a dyke around the Lower Townsite, some infrastructure was constructed to the 1:40-year flood level, and some was constructed to the 1:100-year flood level, with a significant gap between the two at Riedel Street. A dyke system is only as effective as the elevation of the lowest point; the Lower Townsite was therefore vulnerable to any flood greater than 1:40-year flood levels. The implementation of the incremental approach to flood mitigation was still underway at the time of the 2020 flood.

8 KEY RECOMMENDATIONS

The Key Findings noted above leads to Associated Engineering recommending the following as a strategy to mitigate future flood damage.

1. Adopt a consistent flood protection standard in accordance with Provincial guidelines and best practices.
2. Once a flood standard has been adopted, implement a Comprehensive Flood Protection System to that standard.
 - a. Accelerate the flood mitigation program for the design and construction of permanent dykes and flood barriers, with consideration for top-lifting or raising to a consistent standard as required.
 - b. As part of the Comprehensive Flood Protection System, identify and resolve all underground flood water pathways and other gaps in the dyke system
 - c. Apply a multi-barrier approach, including redundancy for critical community infrastructure (i.e. Water Treatment Plant, Wastewater Treatment Plant, Hospital), and means of isolation to limit damage in the event of a breach or single point of failure.
 - d. Implement pumping measures to manage drainage inside of the dykes, including rain events while the flap gates are closed, or to address leakage water that may still pass through the dykes. As part of the

pumping system, consider alternatives to having hoses running across the road, as these impede emergency access and other vehicle movements.

3. Apply an Asset Management approach for the Flood Protection Infrastructure, including an inspection and maintenance program to preserve the integrity of the system:
 - a. Establish key roles, responsibilities and tasks for pre-river break-up activities, during river break, and post river break.
 - b. Actively review and monitor existing and proposed infrastructure, developments and other activities that may compromise the Flood Protection System
 - c. Apply a multi-faceted approach to protect the integrity of the Flood Protection System. The approach needs to consider public infrastructure, private developments, grading and landscaping activities, third-party utilities, regulatory constraints, natural processes (including erosion), vegetation, and nuisances such as burrowing animals.

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1 INTRODUCTION AND PURPOSE

On April 26, 2020, an ice jam formed during the breakup of the Athabasca River leading to widespread flooding in various geographic areas of Fort McMurray. This included significant portions of Downtown (also known as the Lower Townsite) including Longboat Landing, the community of Waterways including the Ptarmigan Trailer Court, and the community of Draper. The Taiga Nova Eco-Industrial park was impacted, as well as other business industrial lots on the east side of Highway 63 between the Thickwood interchange and the Wastewater Treatment Plant. The Water Treatment Plant was also impacted, with untreated water contaminating the treated water reservoir, leading to a Boil Water Order implemented for the entire Fort McMurray water service area.

This report is prepared by Associated Engineering for the Regional Municipality of Wood Buffalo, to provide an independent assessment of how Municipal infrastructure performed during the 2020 Ice Jam Flood event, substantiated by first-hand field observations and follow-up assessments by Associated Engineering staff.

Key findings and recommendations are provided for the Municipality to consider as part of the long-term flood protection strategy.

2 BACKGROUND

2.1 Previous Studies

The incidence of river ice jam flooding affecting Fort McMurray has been well studied and documented over the past number of decades. The recognition of the flood risks in the area is recorded as early as 1875. James H. Moberly, the Clerk with Hudson Bay Company, documented the sudden break-up of the ice on the Athabasca River, and the rapid rise in water levels that significantly inundated the lands along the riverbanks, including the low-lying lands known then as the Prairies, now the eastern half of the Lower Townsite. Through archival review, it has generally been accepted that the approximate elevation of the flood waters reached during the 1875 corresponds to a geodetic elevation of 253 m above sea level and is the largest flood event on record in Fort McMurray. In addition to the 1875 event, extreme ice jam flood events have also been recorded in the following years: 1885, 1925, 1928, 1936, the back-to-back years of 1962 and 1963, 1977, 1979 and 1997.

Numerous studies have evaluated the flood risks and recommended assorted options for providing flood mitigation. For the purpose of this report, the following three studies are deemed to provide the most relevant background information:

- T. Blench & Associates, "Flood Protection Proposals for McMurray" (Prepared for Provincial Planning Board, Province of Alberta), May 1964;
- Technical Services & Monitoring Division, Water Resources Services, Alberta Environmental Protection, "Review of Flood Stage Frequency Estimates for the City of Fort McMurray – Final Report" (Prepared for Technical Committee, Canada-Alberta Flood Damage Reduction Program), November 1993; and
- Trillium Engineering and Hydrographics Inc, "An Evaluation of Providing Flood Control at Fort McMurray by a Staged Diking Approach", (Prepared for Regional Municipal of Wood Buffalo), July 2000.

The Blench (1964) report recommended the construction of a dam across the southern mouth of the Clearwater River at MacDonald Island to prevent both ice jam formation at that location and the river water backflow up the Clearwater River. This work was undertaken in 1966 to construct the Snye dyke (i.e. the MacDonald Drive causeway), while

simultaneously creating the Snye as a backwater channel off the Clearwater River. As discussed in both the Alberta Environmental Protection (1993) study and the Trillium (2000) report, the construction of the Snye dyke did not have the desired effect of eliminating ice jam flooding, but it did have the positive effect of effectively reducing the ice jam flood levels on the Clearwater by approximately one meter. This is on account of moving the effective meeting point of the two rivers 2 km downstream along the Athabasca River (i.e. to a lower point on the hydraulic grade line of the river).

The Alberta Environmental Protection (1993) study is important, both in its statistical treatment of the historic 1875 event, and in its establishment of the benchmark for the 100-year flood. In performing flood-frequency analysis, the 1993 study recognized the benefit of the construction Snye dyke mentioned above, and therefore applied a correction to all historic flood levels recorded prior to the construction of the dyke. The three main conclusions from this study were as follows:

- Information available about the 1875 flood and other historic floods was sufficient to perform a flood-frequency analysis;
- The elevation of 250.0 m is recommended to be adopted as the 1:100-year design flood level for Fort McMurray; and
- The 1875 flood reached an elevation of 253.0 m at the current site of the Athabasca River Bridges and had an estimated return period of approximately 350 years.

The Trillium (2000) report is important because it established a methodological approach of providing incremental flood protection for the Lower Townsite of Fort McMurray and Waterways, and effectively shaped the Municipality's policies over the subsequent two decades. The report recommended that Fort McMurray be protected with dykes constructed with a top elevation of 250.5 m as this provides protection against the 1:100-year flood, plus 0.5 m of freeboard¹. The report also identified that the construction of an interim dyke at the 1:40-year flood level (248.5 m) would be a cost-effective strategy to provide a base level of flood protection around the Lower Townsite and Waterways, as a phased approach toward eventually providing the 1:100-year flood protection.

In addition to the dyke program for flood protection, the Trillium (2000) report also recommended improvements to the storm system. These include the installation of automatic gates that will close when the water reaches critical levels on the Clearwater River, and a secondary manually-operated gate that can be closed to ensure closure of the outfall and provide back-up to the automatic gate. The other recommended improvement was the implementation of pumping, to remove accumulated stormwater from rainwater or snowmelt during the period when the river levels are high (and the drainage gates are closed). The recommended course of action was the installation of a permanent sump and pump intake line at each outfall, to which a mobile pump could be temporarily connected each year and operated as required. To date, only the automatic gates have been installed in the form of flap gates.

Many other studies have been conducted on the topic of flooding in Fort McMurray. In general, these reports have found relatively consistent results in terms of the flood risk, design flood standard levels, and return periods as the reports identified above. Some reports have recommended alternative options for flood protection in lieu of dykes; however, no alternative options have been found to be technically feasible. For this reason, the other studies and alternative options are not considered relevant to this current report.

¹ Freeboard is vertical distance added to the design flood construction level to account for uncertainties in the flood-frequency analysis, and to provide a factor of safety to the design to account for phenomenon such as wind and wave action.

Notwithstanding the above, two recent reports merit specific mention, as follows:

- Northwest Hydraulic Consultants Ltd “Fort McMurray Flood Protection Conceptual Design” (Prepared for Regional Municipality of Wood Buffalo), August 2014; and
- Golder Associates Ltd “Fort McMurray River Hazard Study” (Prepared for Alberta Environment and Parks), November 2018.

The Northwest Hydraulic Consultants Ltd (NHC) (2014) report provides a reach-by-reach breakdown of the flood protection system. This report updates the concepts put forward in the Trillium (2000) report, including providing new recommended alignments for the flood protection works. Much of the Municipality’s current flood mitigation program including completed works (such as Reach 1) or are currently under design and construction (such as Reaches 7 through 9) are based on this report. Of note, the NHC (2014) report documents a direction by the Regional Municipality of Wood Buffalo to not include the 0.5m freeboard in the establishment of the flood construction level². This standard was in effect for the design and construction of Reach 1 to an elevation of 250.0m. This decision was eventually reversed, and the elevation of 250.5 became the standard for the design and construction of Clearwater Drive west of Riedel Street, and remains the current standard for all other ongoing flood protection works in the vicinity of the Lower Townsite.

The Golder (2018) report was undertaken at the direction of Alberta Environment and Parks (AEP) in part to update the flood mapping for the Fort McMurray area. The report was made publicly available for the purpose of public engagement and technical feedback over the period of July 20 to August 31, 2020. The report is expected to be updated and finalized based on the feedback received.

It is noted that the version of the Golder (2018) report that was made publicly available included material adjustments to the flood frequency analysis, including to the recommended 1:100-year flood level. While this may have some bearing on updated flood standards and flood mapping adopted by AEP, it is noted that the overall report is still considered draft, and the analysis does not include the 2020 flood as a data point. Therefore, the updated flood frequency from Golder (2018) is not taken into consideration in this report, but rather identified for the reader’s awareness, as it may change the future context of this current report.

As demonstrated above, ice jam flooding on the Athabasca and Clearwater Rivers is a complex issue that has been studied for decades. The Municipality has also been developing and implementing a flood mitigation strategy over this same extended period. The flood mitigation infrastructure that has been planned and constructed over this time period has also reflected the evolving design standards.

2.2 Land Use Bylaw

The 1999 Consolidated Land Use Bylaw included many clauses to restrict development within the Athabasca and Clearwater River floodplains. Some of these restrictions included the following:

- For residential development, the lowest habitable space must be a minimum of 250.0 m elevation;
- For commercial development, the main building floor slab must be a minimum of 249.0 m elevation; and

² Cited in Northwest Hydraulic Consultants Ltd (2014) on page 12 as “A directive provided by the executive branch of RMWB - John Buchko, personal communication”. No date given.

- Critical utilities, including life-safety equipment, electrical panels, gas meters, etc. were to be mounted above the 250.0 m threshold.

It is noted that many of these restrictions were repealed in 2013. This was done as part of the redevelopment plans in place at the time, as a means to attract new development into the Lower Townsite.

2.3 Clearwater Drive

As mentioned, the Trillium (2000) report recommended the establishment of a perimeter dyke built to the 1:100-year flood level. It also identified that the construction of a dyke built to the 1:40-year flood level was a prudent first phase of providing flood protection in an incremental manner. The alignment identified in the Trillium report follows what is present-day Clearwater Drive. This alignment had long been identified as a possible transportation corridor, dating as far back as transportation studies conducted in 1983.

In the early 2000s, population growth in Fort McMurray put pressure for new development and redevelopment areas, and in turn, new and updated infrastructure to accommodate the growth. The need for a loop road around the east and north side of the Lower Townsite was identified in the various planning documents in place at the time, including the Municipal Development Plan and the Lower Townsite Redevelopment Plan. The road was divided into two segments: the East Loop Road from Highway 63 to Riedel Street, and the West Loop Road from Riedel Street to Main Street with an optional extension to Morrison Street.

It is noted that the loop road has gone through various naming evolutions, including the East / West Loop Road, Prairie Loop Boulevard, and Clearwater Drive. To maintain consistency, this report uses Clearwater Drive as the name of the current road, and East Loop Road / West Loop Road in reference to the design and construction projects for the eastern and western portions of the road, respectively.

Associated Engineering prepared the preliminary design for both the east and west sections of the loop road. These preliminary designs are documented in the following reports:

- Associated Engineering “Lower Townsite East Loop Road and Connector Roads – Clearwater Drive Predesign Report” (Prepared for Regional Municipality of Wood Buffalo), June 2005; and
- Associated Engineering “Prairie Loop Boulevard – Phase 2” (Prepared for Regional Municipality of Wood Buffalo), December 2010.

As documented in the Associated Engineering (2005) report, the East Loop Road was designed in general conformance with the recommendation from the Trillium (2000) report, with a nominal minimum road elevation of 248.5 m to provide protection against the 1:40-year ice jam flood. The report also identified where storm sewers were required to be extended past the road toward the river, and/or upgraded to meet the current design standards. The outfalls of all storm sewers would also be fitted with a flap gate mounted to a concrete headwall. The flap gate would allow for discharge of stormwater from the Lower Townsite, and then close to prevent backflow of river water into the storm sewer when water levels in the river were high. Municipal Council accepted the preliminary design for the East Loop Road in November 2005.

The preliminary design drawings for the East Loop Road show the road profile as meeting the proposed minimum design elevation of 248.5 m along the entire alignment, with the exception of the western terminus of the project at Riedel Street. At this location, the design was constrained by existing buildings on both sides of the road, including the

Riverwalk Villas on the river side of the road. By design, the road ramped down from starting near Hospital Street, to match the existing elevation of approximately 247.7 m at Riedel Street.

The East Loop Road was substantially completed in 2010. Following construction of the East Loop Road, the record drawings show that the specified minimum elevation was not maintained along the final road profile, likely as a result of adjustments to the design required to tie into existing grades. Including Riedel Street as discussed above, the following intersections and approximate road elevation at locations that fell below the 248.5 m standard are noted below:

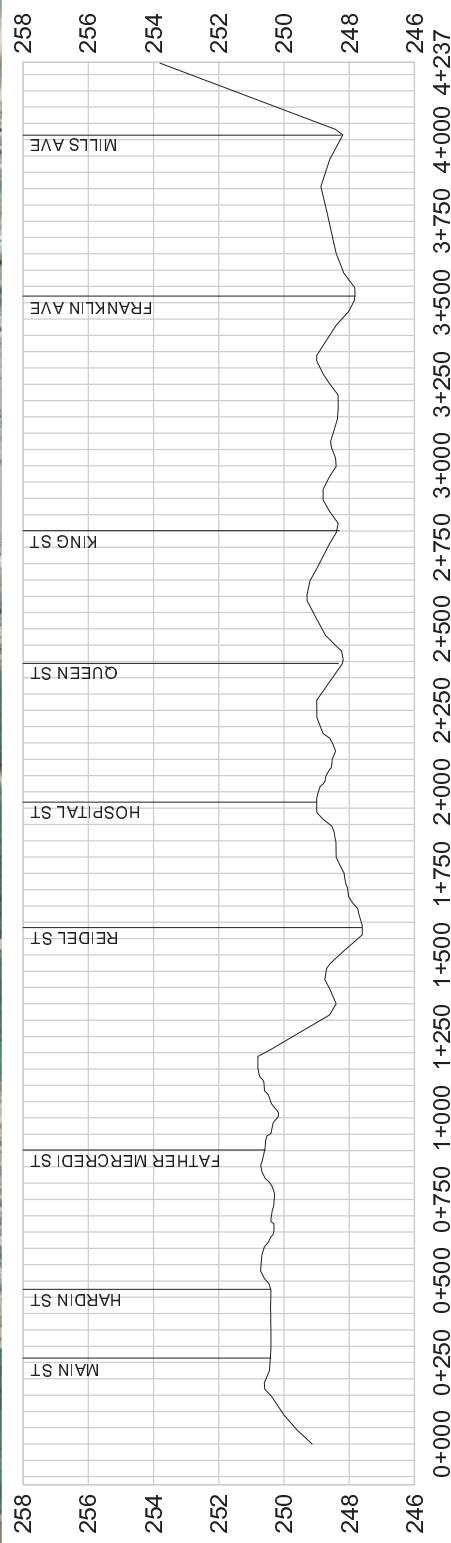
Clearwater Drive Intersection	Approximate Road Elevation
Mills Avenue / Saline Creek Drive	248.1 m
Franklin Avenue	247.9 m
Queen Street	248.3 m
Riedel Street	247.7 m

As documented in the Associated Engineering (2010) report, the original preliminary design report for the West Loop Road was similarly based on providing a minimum road elevation of 248.5 m for a 1:40-year flood protection. At locations where this could not be achieved, a berm with top elevation of 248.5 m was to be installed parallel to the road to create a barrier between the road and the river. Such locations included the interface between the West Loop Road and East Loop Road on either side of Riedel Street, and from Main Street to connect to the high ground at Borealis Park.

In June of 2013, a flood event occurred on the Hangingstone River and Saline Creek. Downstream of Highway 63, the Hangingstone River spilled its banks, causing flood damage to Heritage Park, Keyano College, and other properties. The flood also caused significant bank erosion along the communities of Grayling Terrace, Ptarmigan Trailer Court, and washed out the storm pond and outfall at Longboat Landing. While this was an open-water flood event, and not related to ice jam flooding, the event raised the profile flood mitigation, and its importance for community infrastructure.

In part as a result of the response to the 2013 flood, and in accordance with the recommendation of the NHC (2014) report, the Municipality made the decision to raise the design standard for the West Loop Road to the 1:100-year flood. The Municipality also made the decision to include freeboard in the design, thereby establishing the design flood construction level to be 250.5 m. Construction of the West Loop Road was substantially completed in 2019.

As a result of the above factors, the status of Clearwater Drive as a flood barrier for the Lower Townsite consisted of two sections constructed to two different design standards. The eastern portion was constructed to a nominal standard of the 1:40-year flood level, and the western portion was constructed to the 1:100-year level including an allowance for freeboard. A profile of the road surface along the entire length of Clearwater Drive as of 2020 is presented in the following **Figure 2-1**.



PROFILE H 1:15000 V 1:150

FIGURE 2-1

AE PROJECT No. 20203721400
 SCALE AS SHOWN
 APPROVED J. VANDERZWAAG
 DATE 2020 NOV 24
 REV 0
 DISCUSSION ISSUED FOR DISCUSSION
 DESCRIPTION PRAIRIE LOOP BOULEVARD PROFILE

REGIONAL MUNICIPALITY OF WOOD BUFFALO

2.1.b

2.4 Infrastructure Status

As part of the Municipality's implementation of the incremental approach to flood mitigation, different infrastructure was constructed primarily to two different standards. The two standards were the 1:40-year flood level, and the 1:100-year flood level. In addition, some infrastructure elements considered freeboard, and some did not.

The following provides an overview of the status of various elements of the flood mitigation infrastructure in place at the time of the 2020 ice jam flood.

2.4.1 Lower Townsite

The west side of the Lower Townsite along the Athabasca River is protected by the embankment of the Snye Dyke / MacDonald Drive causeway. This was constructed in 1966 to the elevation of 252.0, to mitigate direct flooding impacts from the Athabasca River. The dyke elevation of 252.0 m is not continuous; where the Athabasca River bridge ramp passes underneath the overpass as it approaches the Franklin Avenue / Highway 63 interface, the elevation of the road is approximately 251.4 m. Alberta Transportation also has a storm outfall immediately northwest of this intersection, and there is no evidence of a flap gate or backflow preventer on this outfall.

Reach 1 was constructed circa 2014, from MacDonald Drive to Borealis Park, with a top elevation of 250.0 m.

Borealis Park is the former location of the water treatment plant, and the berm around the pond (i.e. the former raw water reservoir) is approximately 252.0m. As such, the high ground of the park acts as part of the overall flood barrier.

As discussed previously, Clearwater Drive west of Riedel Street is constructed to a minimum elevation of 250.5m, and east of Riedel Street to a nominal minimum elevation of 248.5m. Both sides contain localized low points, including a significant gap at Riedel Street where the road elevation is 247.7m. As part of the Municipality's flood mitigation program, Reach 5 is intended to remedy this gap at Riedel Street; however, at the time of the 2020 flood there were no works in place.

The southeastern boundary of the Lower Townsite is formed by the Hangingstone River. In 2013 this river flooded over its banks, causing damage to Heritage Park and Keyano College. Following the 2013 flood, temporary berms were constructed along the Heritage Park boundary. Starting in 2019, these temporary berms are being replaced with a clay dyke constructed to the 250.5m elevation, as Reach 9 of the Municipality's flood program.

Other key infrastructure in the Lower Townsite includes sanitary lift stations and water pump stations. Most sanitary lift stations in the Municipality are constructed with a wet well / dry well configuration, where sewage flows are stored and pumped from the wet well, and much of the pumping equipment and related electrical gear is housed in the dry well. The elevation of the main floor slab elevation is therefore critical in preventing water from entering the dry well, where it could submerge and potentially damage the equipment.

Lift Station 1A is located at the north end of Father Mercredi Street. The main floor slab was designed with an elevation of 249.0m. Works were undertaken in 2013 to construct an emergency dyke around the facility, with a top elevation of 250.0m.

Lift Station 1B is located near the intersection of Franklin Avenue and Clearwater Drive. The main floor slab has an elevation of 250.0m.

The Mills Avenue water booster station is located near the intersection of Saline Creek Drive and Clearwater Drive. The main flood slab has an elevation of 250.0m.

2.4.2 Longboat Landing

While still part of the Lower Townsite, Longboat Landing merits special consideration as it is located outside of the Clearwater Drive flood barrier, and was a community developed specifically in accordance with the flood abatement clauses of Section 60 of the 1999 version of the Land Use Bylaw.

As described in the NORR Architects Planners “Longboat Landing Outline Plan” (Prepared for Clearwater Village Properties Inc) September 2010, the risk of flooding in Longboat Landing was acknowledged in the original design of the community. As described in the Outline Plan and in alignment with the Land Use Bylaw, all residential habitable space was specified to be above the 250.0m elevation, all roads above 249.0m, and all parking areas above the 248.0m. All key electrical installations such as power transformers or electrical panels for pumping systems were also specified to be above the 250.0m elevation.

The philosophy of the design of Longboat Landing is that in the event of a flood, the parking lots and roads would flood. In the residential buildings, the underground parkades or ground floor garages would also flood, but the habitable space above the parking areas would not be flood impacted.

The storm sewer collection system in Longboat Landing was designed to be independent of the rest of the Lower Townsite. Originally, the local collection system was routed to a new storm pond on the south side of the neighbourhood, from where it discharged to the Hangingstone River. During the 2013 floods, the entire storm pond and outfall system for Longboat Landing were destroyed when the Hangingstone River banks eroded. In 2016, the Municipality approved a design submitted by the developer to reconstruct the storm outfall system, including a duckbill-style backflow preventer to be installed in the upstream end of the outfall pipe, at the storm manhole in Fontaine Crescent. A review conducted by RMWB Underground Services on November 30, 2020 identified the absence of a flap gate or backflow preventer at this location, suggesting that no backflow preventer was in place at the time of the 2020 flood.

As part of the Municipality’s most recent flood protection program, Longboat Landing is scheduled to be protected by two dykes constructed to elevation 250.5m. Reach 7 will parallel the alignment of Franklin Avenue to the Clearwater River. Reach 8 will parallel Fontaine Crescent to provide protection along the Clearwater River and Hangingstone River. At the time of the 2020 flood, these dykes had not yet been constructed.

2.4.3 Waterways and Draper

The Trillium (2000) report identified a flood mitigation strategy for the community of Waterways, following McCormick Street and Tolen Drive as high ground, with new dykes to be constructed along Railway Avenue and then tying back to high ground. Saline Creek Drive was constructed circa 2013, providing a nominal minimum elevation of 248.5m from McCormick Street to Park Street. Southeast of the intersection of Park Street, Saline Creek Drive joins with the original alignment and elevation of Draper Road, which is within the floodplain of the Clearwater River. As such, there is currently no flood protection system in place to protect against flood waters coming into Waterways from the south.

In the NHC (2014) report, Waterways is proposed to be protected with Reach 10 and Reach 11. At the time of the 2020 flood, these works were not in place.

There is no flood protection infrastructure in place for Ptarmigan Trailer Court. The Trillium (2000) report identified that there was no cost-effective solution to provide flood protection for this location, and this was reiterated in the NHC (2014) report.

There is no flood protection infrastructure in place for the community of Draper.

2.4.4 Water Treatment Plant

The Water Treatment Plant was designed with a perimeter flood protection berm of elevation 253.0 m. The Thurber Engineering Ltd. "Fort McMurray Water Treatment Plant Berm Slope Stability Assessment Geotechnical Investigation" (Prepared for Associated Engineering Ltd on behalf of the Regional Municipality of Wood Buffalo), November 2019 identified that the perimeter berm at the Water Treatment Plant had settled between 0.4m and 0.5m, with local extremes of up to 0.6m. The effective berm elevation at the time of the 2020 flood was therefore closer to 252.4 m.

The storm drainage system at the Water Treatment Plant discharges through an outlet sluice gate chamber which controls drainage to the Athabasca River. The overflow pipelines from the treated water reservoirs (i.e. clearwells) also run to the outlet sluice gate chamber. The sluice gate inside of the chamber provides the WTP operators the ability to isolate the plant piping from the river. From an operational perspective, this gate is closed every year in advance of river breakup. As part of the underground piping system, the overflow line from each clearwell is also fitted with a flap gate.

2.4.5 Taiga Nova Eco Industrial Park

The Taiga Nova Eco Industrial Park was constructed circa 2010 on the west side of the Athabasca River, north of the Wastewater Treatment Plant. The park was designed with a perimeter berm set to the 1:40-year flood level with an elevation of 248.0m. This is 0.5m lower than the 1:40-year flood level established for the Lower Townsite, on account of the site being downstream of the mouth of the Clearwater River along the hydraulic grade line of the Athabasca River. The berm is tied into high ground of Highway 63 at the northwest corner, and the Wastewater Treatment Plant lagoon perimeter berms at the southeast corner.

The design of the eco-park includes a series of bioswales to collect local runoff and convey to a storm pond. The storm pond outlets into a manhole to the south, and then directly east to the Athabasca River via a storm outfall and flap gate. This same outfall pipe also conveys flow from a ditch that runs from the Diversified bus yard, draining an area that includes Highway 63 and the frontage road in front of the Wastewater Treatment Plant.

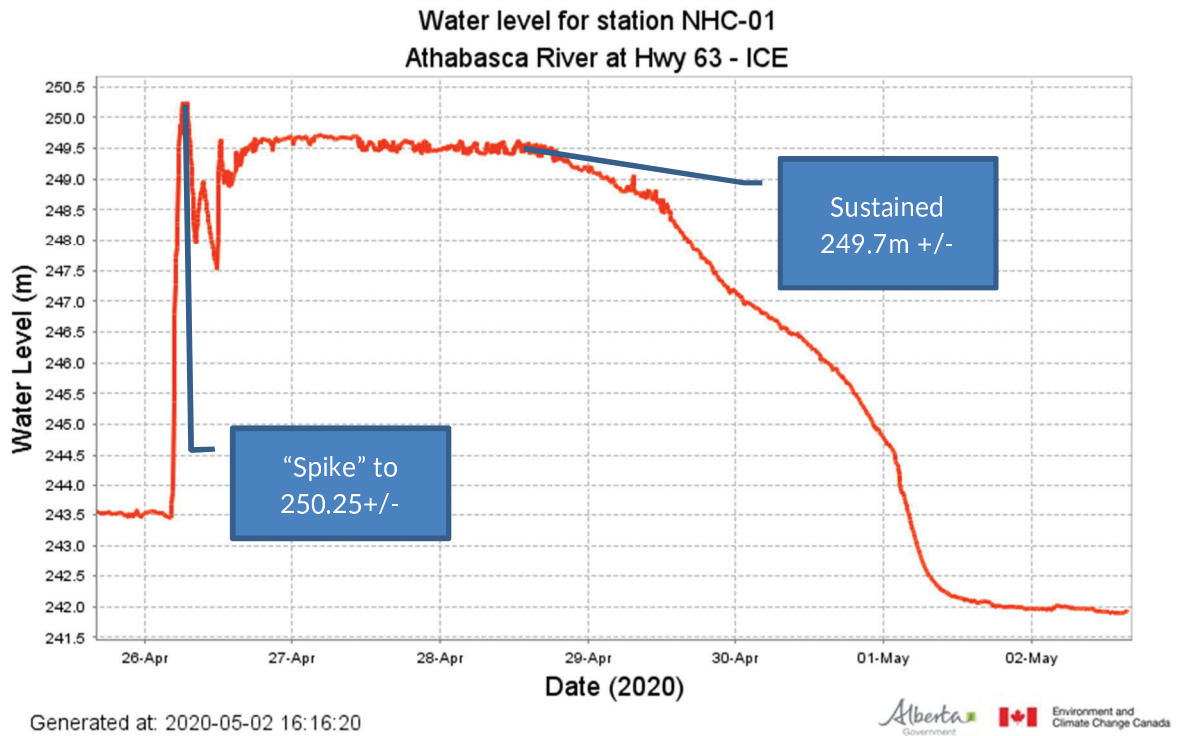
Of note, the Wastewater Treatment Plant effluent discharge outlet pipe is located approximately 150m to the south of the Taiga Nova storm outfall. Unlike the Taiga Nova storm outfall, there is no flap gate or backflow preventer on the effluent discharge pipeline from the Wastewater Treatment Plant.

3 2020 ICE JAM FLOOD EVENT

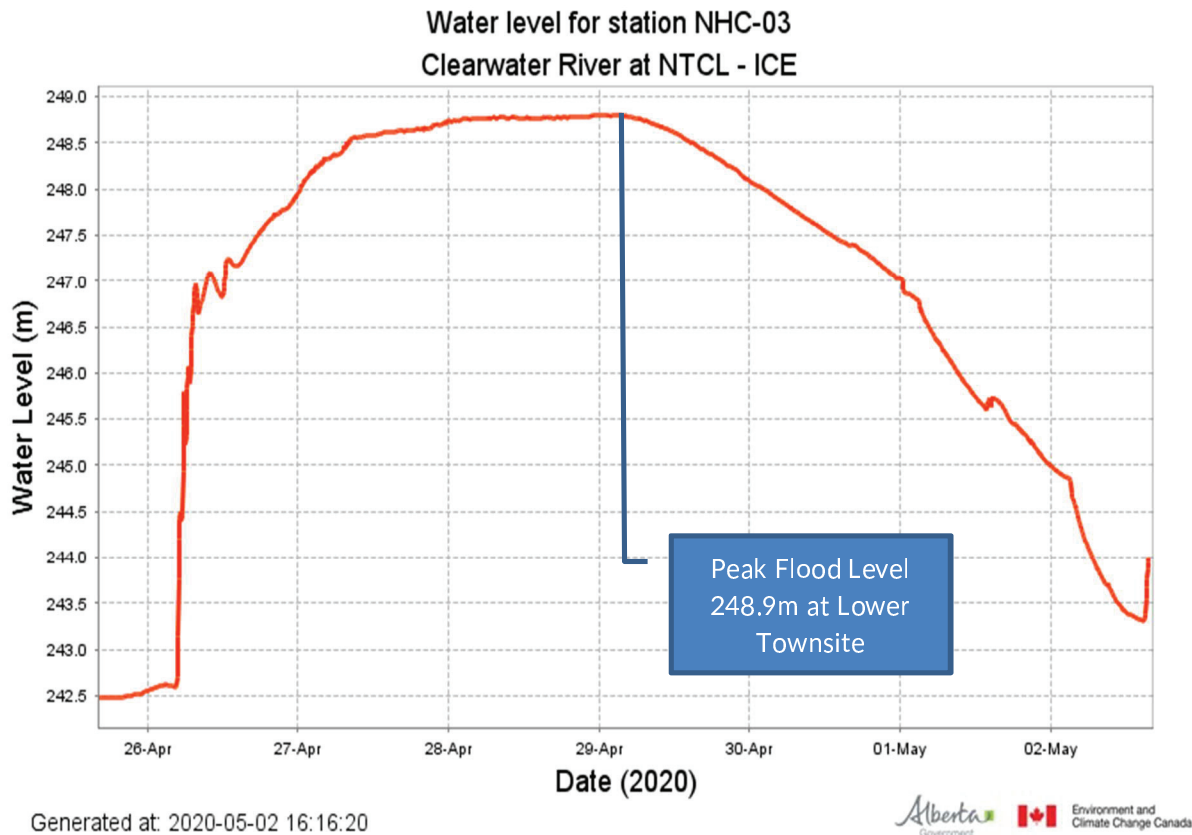
The ice on the Athabasca River began to break up in the morning of April 26, 2020, and nearly immediately formed an ice jam near the confluence with the Clearwater River.

The water level gauge at the Athabasca River Bridge identified a rapid water level rise of nearly 7m within minutes, to a maximum elevation of 250.25m. The water levels at the bridge fluctuated for a few hours, before stabilizing at around 249.7m, where it remained for two full days before the levels began to recede. Water levels returned to open water normal flow conditions on May 1, 2020.

The following figure shows the plot of the water level over the period of the flood event, from April 26 to May 2, 2020.



As with previous river breakup flood events, the ice jam on the Athabasca River caused backflow on the Clearwater River accompanied with increasing water levels. The following figure depicts the water trend as was recorded by the gauge at the NTCL docks on the Clearwater River in downtown Fort McMurray.



Following a rapid rise in water level to 247m on April 26, the water level peaked at approximately 248.9m in the early hours of April 29. The water levels then receded to normal ranges by May 2, 2020.

Based on the observed elevations on the Athabasca and Clearwater Rivers, the 2020 flood was an extreme event. In the context of the historical flood events recorded in Fort McMurray, it is the third-highest flood on record, following the 1875 flood and 1936. It is also the highest flood event since the construction of the Snye dyke in 1966.

4 LOWER TOWNSITE

4.1 Snye Dyke / MacDonald Drive Causeway

The Snye Dyke and MacDonald Drive Causeway was successful at preventing the initial “spike” of 250.25 m and the sustained river flood levels of 249.7 m at the Athabasca River bridge from inundating the Lower Townsite.

During the morning of April 26, there were early reports of flooding on Highway 63 at the intersection with Morrison Street. It is suspected that this is related to water that came up the Alberta Transportation storm outfall. It is recommended that an investigation be undertaken in coordination with Alberta Transportation to determine if

remediation works are required at this storm outfall to mitigate this as a potential pathway for future flooding into downtown.

4.2 Clearwater Drive Overland Flooding and Emergency Dyke Construction

By 11pm on the night of April 26, 2020, the water level on the Clearwater River was approaching the 248.0 level. Jason Vanderzwaag of Associated Engineering contacted the Regional Emergency Operations Center to review the status of the 248.5m flood threshold. A site visit identified that the water was at or near breaching Clearwater Drive at several locations. These are identified in the following table, including the approximate sag elevations identified in the record drawings:

Clearwater Drive intersecting road	Record Drawing Elevation (m)
Mills Avenue	248.1
Franklin Avenue	247.9
King Street	248.5
Queen Street	248.3
Riedel Street	247.7 (already breached at the time of the 11pm inspection)

With authorization from Keith Smith, Director of Public Works from the Regional Municipality of Wood Buffalo, Associated Engineering arranged for the mobilization of local contractor CLH to commence the construction of emergency dykes along Clearwater Drive.

The operation entailed the removal of clay from the existing stockpile at McCormick Drive, end-dumping directly on the road surface of Clearwater Drive at locations where the water was on or approaching the road, and track-packing with a dozer. Within two hours, CLH mobilized an excavator, two dozers, twenty dump trucks, and various light plants to illuminate each work zone.

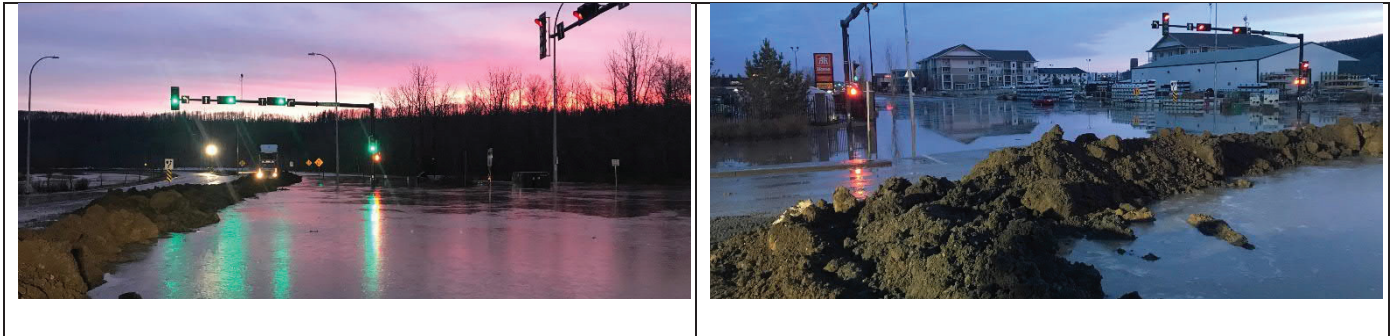
Two crews began working at approximately 1 am on April 27, 2020. The first crew was working at Clearwater Drive and Franklin Avenue. At that location, the decision was made to quickly cut off the access to Longboat Landing, as the community had already been evacuated, and there was no viable means to extend the emergency dyke construction to include it at that time.

The second crew began working at Riedel Street. The initial stages of dyke construction at this location were able to use the existing concrete barricades to start the dyke construction. However, once past the end of the row of concrete barriers, the depth and velocity of water as it ran across Clearwater Drive at this location washed away the clay immediately as it was placed. With the materials and resources immediately available to the crews, no viable solution was found to construct the emergency dyke at this location. At 2:30am the decision was made to leave Riedel Street, and re-deploy the second crew to Queen Street and other locations where the water began breaching.

At 4am on April 27, the dyke had been completed at Queen Street, and King Street was underway. The dyke at Franklin Avenue was about 75% complete. At this time, the crews noticed that water was coming up out of the storm sewers and catch basins on the land side of the works.

At 5:15am the dykes were completed at Franklin Avenue (including the low point in the nearby curve), Queen Street and King Street. Dyke construction was underway at Mills Avenue / Saline Creek Drive. At Saline Creek Drive, the dykes were constructed along the curb returns of the road, to maintain open the haul route along Saline Creek Drive to the McCormick Stockpile site.

The following photos show the status of the emergency dyke construction at Franklin Avenue and Clearwater Drive at approximately 5:30am on the morning of April 27, 2020. As can be seen, the dykes were holding back approximately 1m of water. However, as can be seen in the second photo, water was continuing to rise on the land side of the dyke.



Through the morning and into the afternoon, CLH continued the operation of hauling clay, plugging new low points as they were identified based on the rising water, and strengthening the existing dykes. However, by that afternoon, the water levels inside of the dykes continued to rise, as the water was flowing in from other locations. It was clear that the emergency dykes alone would not be sufficient to stop the flood waters. The rising waters inside of the dyke also posed safety concerns for the hauling operation personnel. At approximately 1:30 pm, the decision was made to suspend the emergency dyke construction operation.

The following photo taken by McMurray Aviation on April 29, 2020 shows the emergency clay dykes constructed on Clearwater Drive. The series of dykes can be seen as the thin dark line running along Clearwater Drive.



Once the water levels on the Clearwater receded, Associated Engineering coordinated again with CLH for the removal of the clay dykes from the road surface. The removal started on Thursday April 30th and was completed on Sunday May 3rd, 2020.

An additional observation of note regarding the operation during the flood, is the impact of pump hoses across the roadway and the impact on emergency vehicle access. While CLH was working on the east end of Clearwater Drive, Inner City Diesel was providing pumping services on the west end of Clearwater Drive, attempting to pump water from inside of the dyke back to the river. The pump hoses from Inner City Diesel were draped across Clearwater Drive, effectively blocking access at that location. While for the most part this was not a problem for CLH due to the different geographic work areas during this event, the potential for access conflicts needs to be considered in the emergency planning for a future flood event.

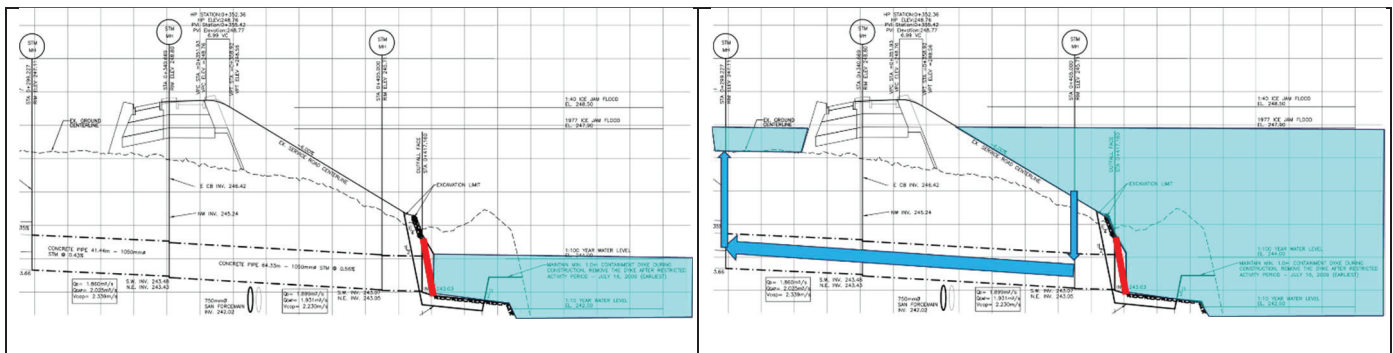
4.3 Underground Flooding Pathways

The Stantec report “2020 Fort McMurray Flood Storm Sewer Assessment - Outfalls” (Prepared for Regional Municipality of Wood Buffalo), June 2020 included an inventory and assessment of all the storm outfalls in the Lower Townsite and Waterways following the flood event. As indicated in the report, Stantec did not identify that any of the flap gates in the Lower Townsite had failed. Stantec identified that an outfall west of Riedel Street did not have a flap

gate. However, a review of the record drawings identified that this outfall only services the local parking lot at 100 Clearwater Drive, and the absence of a flap gate at this location was not a contributing factor to the 2020 flood event.

As indicated in the Stantec (2020) report, there is no evidence of failure of the flap gates. However, it is apparent that flood water was able to find underground pathways, where water was able to bypass the flap gates and enter the storm system. Any structure (such as a manhole, catch basin, inlet pipe) between the flap gate at the outfall and the crest of the dyke is a potential pathway for water to get into the storm system. Once a hydraulic connection has been established, water will equalize, flowing until the water levels inside of the dyke match the water levels outside of the dyke.

The following figures display this concept. The figure on the left depicts a high-water event on the river (light blue) with the flap gate (red line) closed, preventing back flow up into the storm system. During an extreme high-water event, the river level rises to a point near, but not overtopping the road that forms the dyke. If the water is able to enter the storm manhole located on the river side of the dyke, whether through vent holes in the manhole cover, or a connected catch basin, or some other opening, then the water will flow into the connected storm pipe, and backflow underneath the dyke, while completely bypassing the flap gate. Due to the hydraulic forces, water will naturally equalize, by flowing from one side to the other until both reach the same elevation. In this case, the water levels on the land side of the dyke will continue to rise until they equalize with the river, resulting in flooding on the land side.



Following the floods, Associated Engineering conducted a preliminary review of the storm infrastructure in the vicinity of the Clearwater River and Clearwater Drive. Several instances of underground flooding pathways were identified and are presented below.

4.3.1 Main Street

At the Main Street Outfall, there is a storm manhole on the south side of Morimoto Drive. This structure acts as a vertical drop chamber to allow the storm sewer to pass overtop of the adjacent watermain, and then underneath the adjacent sanitary sewer mains. The structure also includes two storm pipe inlets, to intercept the ditch drainage that is flowing in from both directions on the south side of Morimoto Drive.



During the 2020 flood, as the river levels began rising, water was able to flow into the two inlet pipes and bypass the flap gate to backflow up the Main Street storm sewer.

4.3.2 Hardin Street

In the vicinity of the Hardin Street Outfall, there are two catch basins in the green space near the entrance to Snye Point Park. These catch basins are connected to the storm sewer. Similarly to the Main Street outfall, as the river levels began to rise, water was able to flow into these catch basins, and bypass the flap gate to backflow up the Hardin Street storm sewer.



4.3.3 Franklin Avenue

The Franklin Avenue outfall discharges into a ditch that runs along Longboat Landing. There is a flap gate at the end of the pipe. Immediately upstream of the flap gate, at the intersection of Franklin Avenue and Denholm Gate, are three catch basins that are connected to the Franklin Avenue storm sewer.

During the operation for the construction of the emergency clay dykes, a consequence of placing the alignment of the clay dyke on Clearwater Drive at this location was inadvertently stranding these catch basins on the river side of the dyke. As the river waters rose and breached the intersection of Franklin Avenue and Denholm Gate, the water was able to enter the catch basins, bypassing the flap gate, and back flow up the Franklin Avenue storm sewer into the Lower Townsite.

It should be noted that this location was only problematic during the 2020 flood event on account of the alignment of the emergency dyke on Clearwater Drive not protecting the catch basins at Denholm Gate. Depending on the alignment of any future temporary or permanent flood structures, this location may not be problematic or require any particular remedy. This is an example of how easy it is to inadvertently create underground flooding pathways underneath the dyke.



4.3.4 Riverwalk Villas

The Riverwalk Villas condominium complex is located on the river side of Clearwater Drive at Riedel Street. There are two vents that face the Clearwater River, that provide direct connection into the parkade for the Riverwalk Villas development. During a site visit on November 26, 2020, the property manager confirmed that these vents are part of the make-up air system for the parkade. She also reported that during the 2020 flood event, she witnessed flood waters entering the parkade via these vents. The site visit also confirmed that the parkade is a single level, with at-grade access to the street near the intersection of Clearwater Drive and Riedel Street. A trench drain is located immediately outside of the overhead garage door, and this drain is connected directly into the storm sewer.



Vents facing the Clearwater River directly connected to the underground parkade at Riverwalk Villas



Secondary vent identified also connected to parkade

	
Make up Air unit inside parkade, connected to vents	Trench drain in front of at-grade overhead door access to parkade

Based on the review of the infrastructure at Riverwalk Villas, it is evident that the rising flood waters flowed freely through the vents into the underground parkade. Once the floor drain sumps were filled, water then flowed out the garage door, where it would have flowed into the trench drain, and directly into the storm sewer. Once the capacity of the 75mm connection pipe to the storm sewer was exceeded, flood waters would have then flowed freely out to the street, contributing to the overland flooding in the Lower Townsite via Riedel Street.

4.4 Longboat Landing

As discussed in Section 2.4.2, at the time of the 2020 flood, there was no backflow preventer on the storm outfall that serves the Longboat Landing storm system. As the river levels began to rise, water started flowing up the storm sewer in Longboat Landing, spilling from catch basins at the low points in the system. This is the explanation for why residents of Longboat Landing reported seeing backups from the storm sewer within the community while the Clearwater River levels were rising.

Over the course of the flood event as the Clearwater River continued to rise, both Denholm Gate and Fontaine Crescent breached, resulting in the entire community flooding to the same elevation as the river, to a maximum of 248.9m. The absence of a backflow preventer on the storm outfall was irrelevant at that water level, as the water was able to flow into the community over the roadways.

4.5 Reach 1 / River Park Glen

The Reach 1 dyke from MacDonald Drive to Borealis Park was successful at mitigating the overland flood waters at the River Park Glen (formerly Syncrude Towers) development at the end of Richard Street. There was some sanitary sewer back-up into the parking lot that needed to be pumped, on account of being interconnected to the rest of the Lower Townsite system. However, there were no reports of damage to the development, which is in the floodplain elevation range.

4.6 Lift Stations 1A and 1B

Lift Station 1A and Lift Station 1B avoided flood damage during the 2020 ice jam flood event. Lift Station 1B has a flood slab above the floodplain and was not adversely impacted by the flood.

For Lift Station 1A, the dykes constructed in 2013 were successful at keeping the floodwaters away from the immediate vicinity of the facility. A temporary road was constructed over the dyke to connect to the high ground at Father Mercredi Street so as to maintain operational access to the facility while the surrounding flood waters remained elevated.

4.7 Bridges and Culverts

Immediately following the floods, Associated Engineering undertook an assessment of the flood-impacted bridges and culverts, as documented in the technical memorandum: Associated Engineering “Post-Flood Inspections - Bridges and Culverts” (Prepared for Regional Municipality of Wood Buffalo), May 2020.

Based on the inspection, there was no structural damage to any of the bridges as a result of the 2020 ice jam flood. Three bridges were temporarily closed to pedestrians until accumulated debris could be cleaned.

4.8 Northern Lights Regional Health Centre

The basement of the Northern Lights Regional Health Centre (aka the Fort McMurray Hospital) is located within the floodplain and is vulnerable to flooding from high water levels. During the 2020 flood, after water levels had breached Clearwater Drive, the Hospital was identified as the next critical infrastructure requiring protection. Volunteers from the community created a sandbag barrier around the northeast corner of the property to prevent overland flow.

Associated Engineering personnel worked directly with the maintenance personnel for Alberta Health Services at the Hospital to review and identify other possible flood risks to the facility. The catch basin immediately outside of the bay doors is directly connected to the storm sewer, which was backing up at the same rate as the flood waters were rising. As a mitigation measure, the downstream manholes were plugged with sandbags. This slowed the water down sufficiently that the catch basin at the bay doors could be pumped down, and thereby avoiding any flood damage to the Hospital.

4.9 Infrastructure Performance Summary

The existing flood protection system that was in place to protect the Lower Townsite at the time of the 2020 flood was not designed to withstand flood elevations greater than those associated with a 1:40-year return period. With a peak water level of 248.9m, the 2020 ice jam flood inundated all the infrastructure that was only designed for 248.5m. In spite of the construction of emergency clay dykes along most of the way along Clearwater Drive, flood water was able to flow into the Lower Townsite, via overland at Riedel Street, and via the underground pathways discussed above.

There is no evidence that any flap gates failed in the Lower Townsite. However, the underground flow pathways identified in the previous sections provided a pathway for flood water to bypass the flap gate and back flow up the storm sewer. Once water was able to get inside of the dyke, it would flow through and fill the low-lying areas including ditches and sags in the road, and eventually into the sanitary sewers and the basements of impacted homes and other buildings. Because the sanitary sewer system is interconnected across the entire Lower Townsite, the sewer pipes also became a pathway for floodwaters to spread to multiple low-lying areas at the same time. This is the explanation for the reports of residents seeing flood water in the vicinity of the low-lying areas including behind Hill Drive, while the Clearwater River was still rising on April 26.

As the Clearwater River continued to rise over the course of the ice jam flood event, the overland flow at Riedel Street and the underground flow paths led the water level inside of the Lower Townsite to equalize with the river, and match the maximum flood elevation of 248.9 m. Through the roads and sewers, all low-lying areas in the Lower Townsite at the elevation of 248.9 m or lower were vulnerable to be impacted by flood waters. Dwelling units and other buildings outside of the immediate inundation area were also vulnerable to flood waters, if their basement elevation was below the 248.9m flood level and their sanitary service connection was not equipped with a functional backflow preventer.

Locations where the flood protection infrastructure or other applied flood mitigation measures were successful in preventing flood damage include the Snye Dyke / MacDonald Drive causeway, Reach 1 / River Park Glen, Lift Station 1A, the various bridges and culverts within the Clearwater floodplain, and the Hospital.

5 WATER TREATMENT PLANT

During the 2020 Flood event, water levels on the Athabasca River reached an elevation of 250.25 at the Water Treatment Plant. The perimeter dykes prevented overland flow of river water and ice from directly impacting the plant. However, the high water levels caused river water to flow backward through the storm outfall chamber and overflow piping, resulting in contamination of the treated water reservoirs (i.e. clearwells) with untreated and highly turbid river water. A detailed description of the failure mechanism that led to the contamination is discussed in Section 6.2, below.

The high turbidity of the contaminated water entering the clearwells caused an alarm at the SCADA control panel. At that time, the operations staff had approximately 300 simultaneous alarms, on account of the developing flood conditions across the entire system. This resulted in a delayed response to the contamination event. Once the contamination was discovered, operations staff attempted to isolate the affected clearwells, but were not able to close the valves³. Due to the inability to quickly isolate the impacted clearwells, and the fact that the overflow chamber is in close proximity to the pump chamber, contaminated water was pumped out to the distribution network almost immediately. The most significantly impacted communities were Timberlea and Thickwood, although the entire system was deemed compromised, on account of the interconnected water supply system leaving the Water Treatment Plant.

As a result of the contamination of the water system from the untreated river water, Alberta Health Services implemented a Boil Water Order across the entire Fort McMurray service area.

5.1 Water System Recovery

A Water System Recovery Plan was developed and executed to lift the Boil Water Order in coordination with the regulatory stakeholders at Alberta Environment and Parks (AEP) and Alberta Health Services (AHS). The water system recovery plan was developed in part based on the expertise and lessons learned from a similar water recovery process conducted following the 2016 Wildfire. The difference was that the primary concern following the Wildfire was

³ A thorough investigation conducted after the flood event identified build up of precipitate on the valve surfaces, that was a likely contributing factor to the valves being inoperable during the 2020 flood event. This has been attributed to increased usage of caustic soda in the treatment process following the 2016 Wildfire. See Emelko et al. "Drinking Water Security after Severe Wildfire in Alberta: Initial Risks and Treatment Technology Resilience - Research Progress Overview: Evaluation of 2016 Horse River Wildfire Impacts on Drinking Water Treatment in Fort McMurray", (Prepared for Alberta Innovates and Regional Municipality of Wood Buffalo), December 2020.

physical contaminants that may have entered the water system, so that primary objective was volume displacement to remove potential contaminants. For the 2020 water recovery works, the primary concern was bacteriological contamination from the untreated river water, and the primary objective was therefore disinfection.

The first phase of the recovery plan was the restoration of normal operation at the Water Treatment Plant, including a full cleaning and disinfection of the clearwells. The rest of the recovery plan entailed draining, cleaning, disinfecting and filling all of the reservoirs across the distribution network. As each reservoir was disinfected and filled, this cleaned water was then used for flushing and disinfecting each surrounding neighbourhood. This process of cleaning and disinfection was repeated across the entire water supply system, with appropriate controls in place to prevent recontamination of completed works.

The works were performed in accordance with standards published by the American Water and Wastewater Association. Specifically, AWWA C651-14 Section 4.11.3.3 identified a dose of 4 mg/L of free chlorine for 16 hours for disinfection of in-service pipelines. This dose of chlorine is akin to “pool water”, i.e. fit for human contact including bathing and cleaning. Communications and social media were used to advise residents to boil the water (in accordance with AHS guidelines) to reduce the unpleasant tastes and odours. To limit resident exposure, the 16-hour disinfection period within each neighbourhood was followed with a flushing program to replace the disinfection dose water.

Bacteriological, chemical and physical (turbidity) water test samples were taken across the water distribution network to confirm the water quality in support of lifting the Boil Water Order within each community as the work proceeded. Based on the successful execution of the Water Recovery Plan, the last stage of the Boil Water Order was lifted on June 22, 2020.

5.2 Failure Mechanisms

Following the successful recovery of the Fort McMurray water system, an investigation was undertaken into the failure mechanisms that led to the contamination event. This included a detailed site inspection of the sluice gate, the flap gates, the overflow pipelines, and the outfall pipeline to the river. The purpose of the investigation was to understand the conditions and the root causes of the failure, and improve the infrastructure to prevent similar events in the future. The following two reports (included as Appendix A and B respectively) identify the findings and recommendations from the investigation, as well as preventative measures to provide additional barriers to failure.

- Associated Engineering “Fort McMurray Water Treatment Plant Failure Inspections” (Prepared for Regional Municipality of Wood Buffalo), August 2020
- Associated Engineering “Fort McMurray Water Treatment Plant Flood Recovery Short Term Flood Mitigation Recommendations” (Prepared for Regional Municipality of Wood Buffalo), November 2020

The key findings are summarized below:

5.2.1 Sluice Gate

The outfall sluice gate is operated using a manually controlled actuator at the surface of the chamber. The main issue identified when attempting to close the gate was that when the gate was in its 100% closed position, there was still approximately 65-75 mm of opening, which would have caused river water leakage through the gate. The gate pedestal is partially bolted to a 600 mm thick solid concrete structure, and partially bolted to a 150 mm thick concrete hatch, which is cracked. The pedestal takes all the operating thrust of the sluice gate, and therefore, must be adequately secured and supported. When the gate was being closed, the cracked concrete hatch was being moved

upward as more pressure was applied, bending the operating stem of the gate and likely contributing to the gate not fully closing.

5.2.2 Clearwell 2 Flap Gate

The Clearwell 2 Flap Gate is on the overflow line that connects Clearwell 2 to the rest of the overflow piping. The gate is attached to a circular frame, which is bolted to the concrete wall of the manhole. The installed pipe leading into this manhole from the clearwell is a steel bare end pipe without a flange. In order to attach the gate to the pipe, a circular plate was installed and bolted to the wall; however, it was not grouted to seal the gap between the manhole and pipe. Thus, when water was entering the manhole, it was able to travel through this gap, bypassing the flap gate, resulting in leakage into the overflow pipe and Clearwell. The gap was measured to be approximately 25 mm between the back of the frame and the wall between each of the bolts. The gap was recommended to be grouted to ensure a proper seal.

During the inspection, the technician also noticed that the flap gate disc was not seated evenly on the lip seal, leaving approximately a 2 mm gap. The inspector was able to adjust the frame by loosening the front nuts and straightening the frame using the back nuts of the frame anchors on site to seal the gate. The inspector also noticed that a shipping bracket was still attached to the gate. While there is no evidence that the bracket interfered with the gate opening and closing operation, it was recommended that the bracket be removed.

5.2.3 Clearwell 1A Flap Gate

The Clearwell 1A Flap Gate is on the overflow line that connects Clearwell 1A to the overflow piping. The flap gate is bolted directly to the manhole wall. During the inspection it was noted that the upper section of the sealing system is damaged, creating leakage. In addition to this, some of the anchor nuts were loose and some washers were missing, which may have caused leakage if the seal between the wall and frame was not fully compressed. Some corrosion was also observed where carbon steel washers were used. The loose nuts were tightened on site; however, the washers still need to be replaced. Some grout on the flap gate disc surface, that may have also cause water to bypass the valve, was also recommended to be removed with a grinder and sandpaper.

5.2.4 Repairs and Operation and Maintenance

The following repairs have been completed at the Water Treatment Plant, based on the inspections described above

- A new design was developed for the support of the sluice gate pedestal at the outfall chamber. The works have been completed, and the gate was confirmed to seal in its closed position.
- The two flap gates for Clearwell 2 and Clearwell 1A respectively have been repaired, in accordance with the inspection recommendations. This work included grouting of the gap between the manhole and the steel pipe at the flap gate for Clearwell 2.
- A dive team removed all the accumulated chemical precipitate on the valves in the clearwell.

Associated Engineering understands that the following initiatives are being planned to be in place in advance of the 2021 River Breakup, in general conformance with the recommendations from the inspection reports:

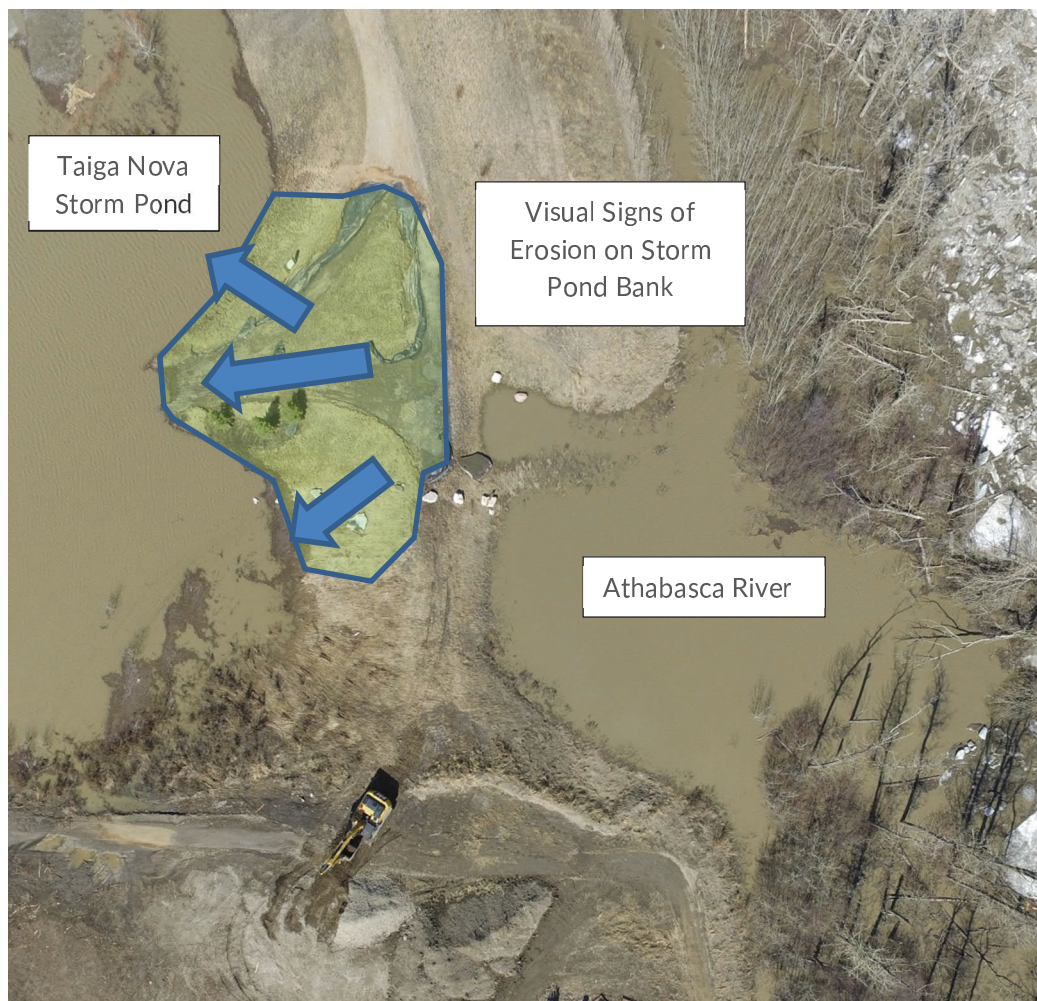
- Enhance Monitoring and alarm systems, including alarm rationalization;
- Automate shut down in the event of turbidity alarms;
- 6-month inspection cycle of valves and other critical infrastructure, to remove precipitate and other debris, and verify operation;
- Install additional flap gates at the end of all outfall pipes, as an additional barrier against flooding; and

- Have inflatable plugs on standby to be deployed in the overflow pipelines if required as a further barrier against flooding.

6 TAIGA NOVA ECO-INDUSTRIAL PARK

The Taiga Nova Eco Industrial Park was one of the first locations to be impacted by flood waters, with a mandatory evacuation order at approximately 10:30am on Sunday April 26th. The source of floodwater into Taiga Nova was not immediately clear. Accurate readings on the Athabasca River water levels in the vicinity of Taiga Nova are also not available because the nearby Water Survey Canada Gauge 07DA001 stopped recording at 4:40am that morning with a final reading of 244.15m, while the water was still rapidly rising. Nonetheless, a review of the available evidence suggests there were two floodwater pathways into Taiga Nova, discussed below.

The first floodwater pathway appears to be a breach overtop of the perimeter dyke near the Taiga Nova Storm outfall. Unfortunately, there are no photos available that capture the actual flow. However, the below photo (taken April 28, 2020) shows signs of bank erosion on the inside of the dyke, as river water spilled over the dyke crest and drained toward the storm pond.

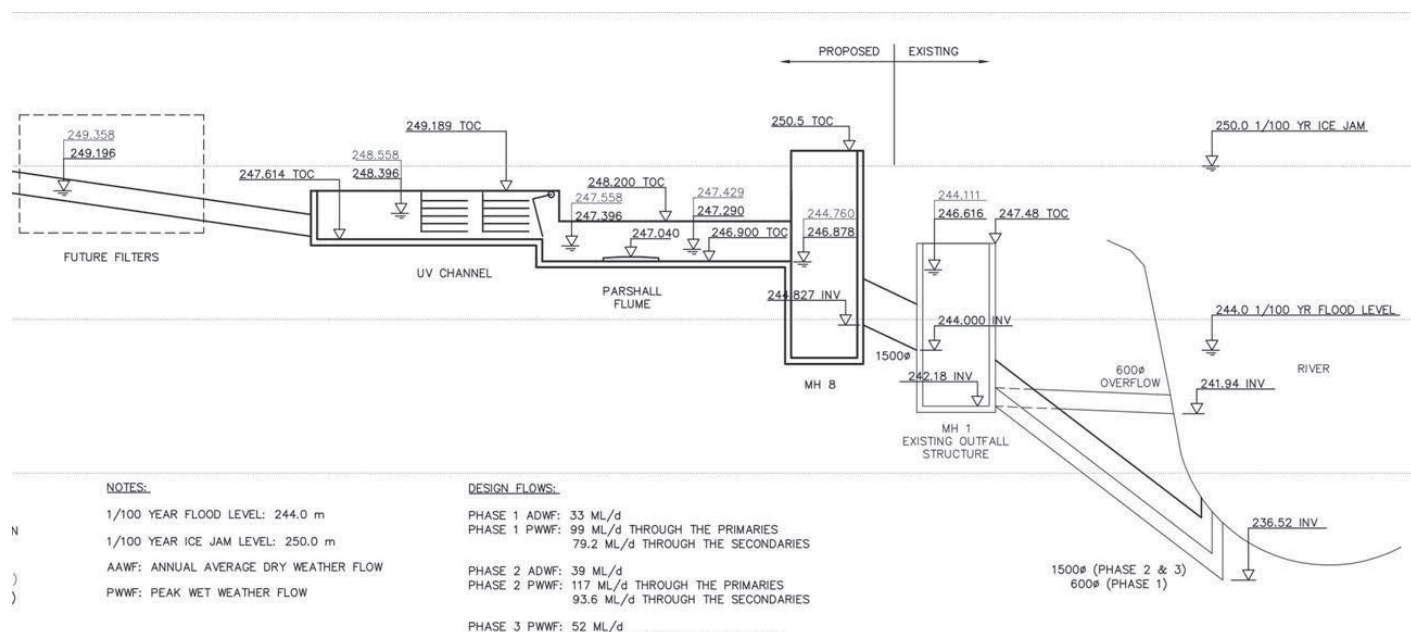


As stated above, accurate river water level at this location information is not known, but is estimated to have peaked just below the 248.0m (say 247.9), as flow was constrained to the location where the ground had settled near the storm outfall, and did not breach the entire berm. Fortuitously, the duration of this breach was relatively short, and likely coincided with the early “spike” that was observed at the Athabasca River Bridge on April 26 as shown in **Figure 3.1**.

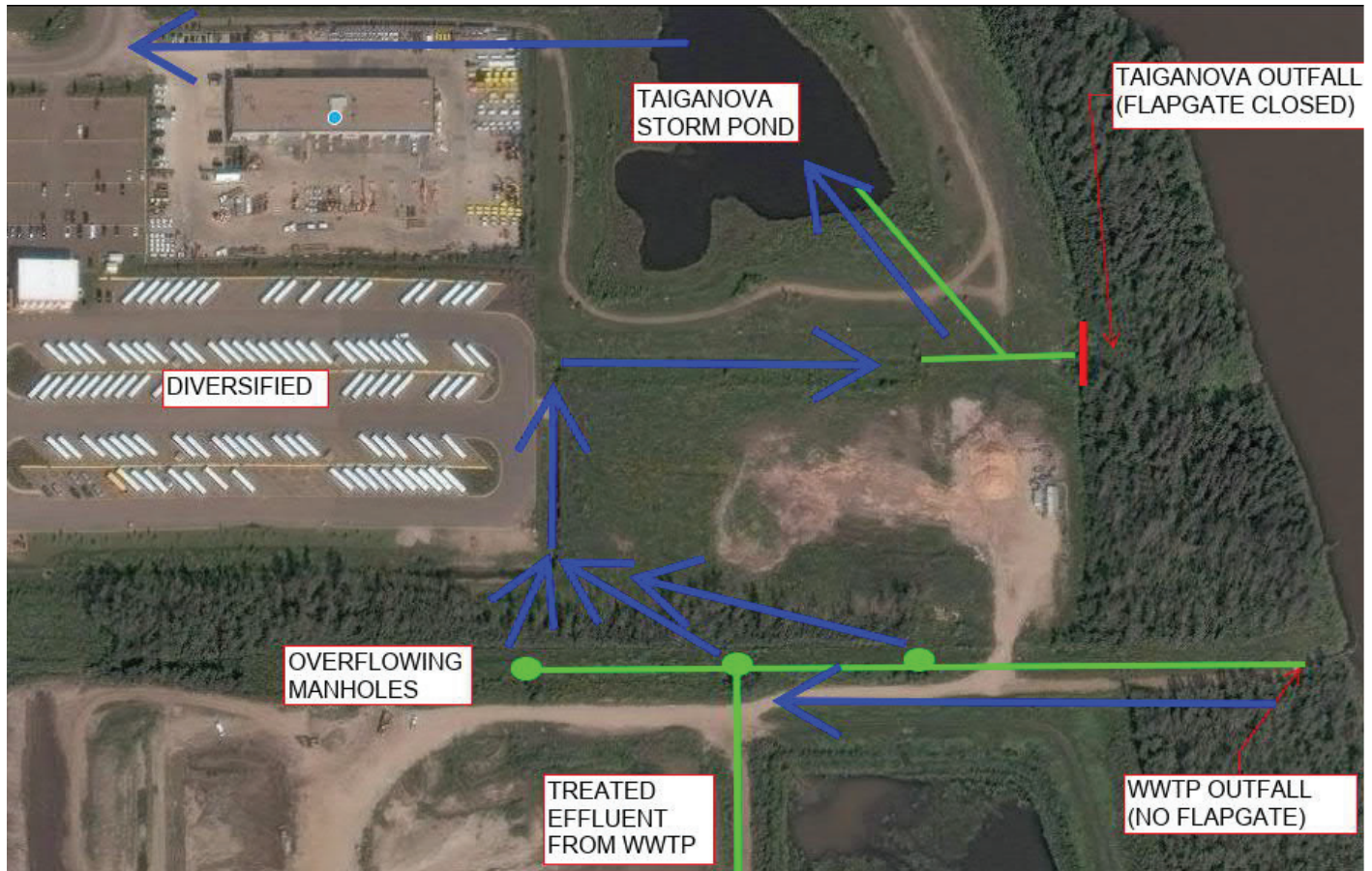
The water that flowed overtop of the dyke caused the Taiga Nova storm pond to overflow and cause flooding in the adjacent properties and roads, eventually reaching a maximum flood elevation inside the park of 245.7m. Once the breach overtop of the dyke had stopped, the flood water inside Taiga Nova was trapped, unable to drain because the flap gate at the Taiga Nova storm outfall was closed. The fact that the flood water elevation inside Taiga Nova never equalized with the river elevation despite the 2 m difference is also evidence that the Taiga Nova dyke and the flap gate did not fail.

Following the initial spike, it is believed that the Athabasca river level stabilized to an elevation of approximately 247.6m in the vicinity of Taiga Nova and the Wastewater Treatment Plant. While not high enough to cause another breach over top of the dyke, this elevated river level led to the second water flooding pathway into Taiga Nova, which was backflow of river water through the Wastewater Treatment Plant effluent discharge line. As indicated previously, there is no flap gate or backflow preventer on this pipe. The outflow pipeline follows a ditch on the north side of the wastewater treatment plant site, between the lagoon berms and the Municipal training yard. Municipal Underground Services staff reported that the concrete slab tops on the manholes along this pipeline had been pushed off from the hydraulic force of water backflowing and overflowing from these manholes. There was also visual evidence of grass caught in the fence line that follows the ditch, approximately 1m up from ground level, as evidence of water flow. Survey of the manhole rims and the grass caught on the fence suggest water was flowing in the ditch with a surface elevation of 247.6m.

The following excerpt from the WWTP record drawings shows the schematic for the outfall pipeline. As a schematic, not all structures are shown. The structure labeled as MH1 in the schematic is representative of the three manholes that were overflowing.



Once in the ditch, water was able to flow north to the Diversified site, then east into the junction manhole where it connects to the Taiga Nova storm outfall. As the flap-gate was closed due to the river levels, the water was then directed into the Taiga Nova storm pond. As the storm pond has already overflowed from the initial breach, this additional water likely contributed to the flooding already occurring in the industrial park. The likely pathway is indicated in the below figure.



One solution to prevent this line from overflowing and flooding into Taiga Nova in the future is to raise the three manholes on the outfall pipe, such that the rim is above the maximum flood elevation. This can be achieved by removing the concrete cover, installing concrete barrels to the required height, and then replacing the covers. The grading and landscaping in the vicinity of the manholes will need to be designed, including possible adjustments to the ditch line.

It should be noted that during the flood event, the wastewater treatment plant was still discharging treated effluent water, at a rate of up to 85 MLD (1,000 L/s) during the period of April 26 through April 29. Based on the analysis presented above, it is likely that the water that was discharging into Taiga Nova was a combination of treated effluent water and river water. The fact that the wastewater treatment plant was able to discharge this volume into Taiga Nova may have prevented the plant from flooding internally. If the overflow discharge pathway will no longer be available in the future scenario, the Municipality will need to review and update the WWTP's Emergency Response Plan in consideration of the hydraulic impacts of the river flood waters on effluent discharge.

7 KEY FINDINGS

A comprehensive Flood Protection System was not in place at the time of the 2020 ice jam flood.

The flood infrastructure that existed at the time of the 2020 flood consisted of a series of dykes constructed to different design criteria, as opposed to a single comprehensive system. With a maximum flood water elevation of 248.9, the 2020 ice jam flood event was higher than what the flood infrastructure was designed to mitigate.

There was no evidence of flap gates failing in the Lower Townsite. However, in conjunction with the lack of a comprehensive system, there was no process in place to identify potential underground pathways for water to bypass the flap gates and backflow under the dykes, and to remedy such issues.

The flood mitigation program completed to date was constructed on an incremental basis over a lengthy time period, in general conformance with the Trillium (2000) report. With respect to Clearwater Drive as a dyke around the Lower Townsite, some infrastructure was constructed to the 1:40-year flood level, and some was constructed to the 1:100-year flood level, with a significant gap between the two at Riedel Street. A dyke system is only as effective as the elevation of the lowest point; the Lower Townsite was therefore vulnerable to any flood greater than 1:40-year flood levels. The implementation of the incremental approach to flood mitigation was still underway at the time of the 2020 flood.

None of the recommendations for establishing a secondary line of flood defense in addition to flap gates, such as manually-operated flow control valves and active pumping of trapped rainwater and snowmelt inside of the dykes as identified in the Trillium (2000) report and other studies, have been implemented.

In recognition of the vulnerability of the system in the Lower Townsite, contractor crews were mobilized on the night of April 26, 2020 as the flood levels were rising to construct emergency dykes along Clearwater Drive. These dykes were constructed along much of the alignment of Clearwater Drive, blocking flood waters through the low points, and were able to hold back approximately 1 m of water. Unfortunately, the construction of emergency dykes along Clearwater Drive was not successful in preventing system wide flooding within the Lower Townsite, for the following three reasons:

1. The crews were unable to successfully build clay dykes at Riedel Street, which is the lowest point along the alignment of Clearwater Drive with an elevation of approximately 247.7m. By the time crews were mobilized, water was already flowing across Clearwater Drive at Riedel Street, and was so deep and fast that any placed clay was immediately washed away. As no emergency clay dyke could be constructed at Riedel Street, water freely flowed overtop of Clearwater Drive and into the Lower Townsite.
2. Flood water was freely flowing through underground pathways beneath the flood protection system, including the emergency clay dykes constructed on Clearwater Drive. These pathways include the outfall pipes at Main Street and Hardin Street, and the parkade at Riverwalk Villas. Other locations that may have contributed to underground pathways include the catch basins outside of Clearwater Drive at Riedel Street and Franklin Avenue.

3. The nature of the road network and the interconnected sanitary sewer system across the entire Lower Townsite made all low-lying areas vulnerable to any single point of water passage through or over the dyke.

With multiple pathways for water to pass through and/or overtop of the dyke, water levels inside of the Lower Townsite were able to equalize with the water levels on the Clearwater River. As the water filled and flowed through the sanitary sewers, all low-lying areas in the Lower Townsite at the elevation of 248.9m or lower were vulnerable to be impacted by flood waters. Homes and other buildings outside of the immediate inundation area were also vulnerable, if their basement elevation was below the 248.9 m and their sanitary service connection was not equipped with a functional backflow preventer.

As a result of the status of the infrastructure in place at the time, and the extreme water levels of the 2020 ice jam flood, the flood water was able to enter the Lower Townsite via both overland flow (at Riedel Street) and multiple underground pathways. Therefore, the maximum flood level reaching 248.9 within the Lower Townsite, and the associated flood damage, cannot be attributed to the failure of any one particular infrastructure component, but rather that the system as a whole was not prepared for a flood of this magnitude.

Flood infrastructure and related mitigation measures were successful in preventing flood damage at various locations, including the Snye Dyke / MacDonald Drive causeway, Reach 1 / River Park Glen, Lift Station 1A, the various bridges and culverts within the Clearwater floodplain, and the Hospital.

At the Water Treatment Plant, a series of infrastructure failures from the sluice gate, the flap gates, and the delayed response led to contamination of the water system by untreated river water. The key repairs have been completed, and additional measures are scheduled for implementation prior to the 2021 River Breakup to provide additional barriers and prevent a repeat occurrence.

At Taiga Nova, there is evidence that the perimeter dyke was overtopped during the initial “spike” of water levels on the Athabasca River. Following the initial spike, the existing dyke and flap gate were successful in holding back approximately 2m of water, preventing significantly worse flooding in the eco industrial park. Backflow from the Wastewater Treatment Plant outfall line contributed to secondary flooding in Taiga Nova. This can be mitigated in the future by raising the manholes in the ditch between the Wastewater Treatment Plant and the adjacent training yard.

8 KEY RECOMMENDATIONS

Based on the observations, assessments, and findings from the study, Associated Engineering recommends the following as a strategy to mitigate future flood damage.

1. Adopt a consistent flood protection standard in accordance with Provincial guidelines and best practices.
2. Once a flood standard has been adopted, implement a Comprehensive Flood Protection System to that standard.
 - a. Accelerate the flood mitigation program for the design and construction of permanent dykes and flood barriers, with consideration for top-lifting or raising to a consistent standard as required.

- b. As part of the Comprehensive Flood Protection System, identify and resolve all underground flood water pathways and other gaps in the dyke system
 - c. Apply a multi-barrier approach, including redundancy for critical community infrastructure (i.e. Water Treatment Plant, Wastewater Treatment Plant, Hospital), and means of isolation to limit damage in the event of a breach or single point of failure.
 - d. Implement pumping measures to manage drainage inside of the dykes, including rain events while the flap gates are closed, or to address leakage water that may still pass through the dykes. As part of the pumping system, consider alternatives to having hoses running across the road, as these impede emergency access and other vehicle movements.
3. Apply an Asset Management approach for the Flood Protection Infrastructure, including an inspection and maintenance program to preserve the integrity of the system:
- a. Establish key roles, responsibilities and tasks for pre-river break-up activities, during river break, and post river break.
 - b. Actively review and monitor existing and proposed infrastructure, developments and other activities that may compromise the Flood Protection System
 - c. Apply a multi-faceted approach to protect the integrity of the Flood Protection System. The approach needs to consider public infrastructure, private developments, grading and landscaping activities, third-party utilities, regulatory constraints, natural processes (including erosion), vegetation, and nuisances such as burrowing animals.

9 ACKNOWLEDGEMENTS

Special thanks go out to the municipal staff, consultants and contractor crews who responded to the flood event and assisted with the recovery works. The following organizations are deserving of special recognition, as well as many others who may have been missed:

BMAC Underground Services
 Clean Harbors
 CLH Contracting
 Corcoda
 Hatfield Consultants
 Maverick Inspection
 Northern Underwater Systems
 Sureway Construction

As well, a special thank you to McMurray Aviation for the use of aerial imagery of the flood event.

CLOSURE

This report was prepared for the Regional Municipality of Wood Buffalo to provide an independent assessment of how key Municipal infrastructure performed during the 2020 Ice Jam Flood event, substantiated by first-hand field observations and follow-up analysis by Associated Engineering staff.

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.



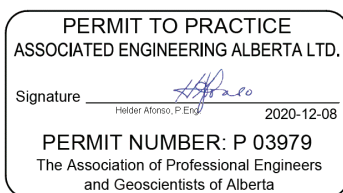
2020-12-08

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2020-12-08

Nelson Dos Santos, P.Eng.
Division Manager, Civil Infrastructure



REFERENCES

- T. Blench & Associates, "Flood Protection Proposals for McMurray" (Prepared for Provincial Planning Board, Province of Alberta), May 1964.
- Technical Services & Monitoring Division, Water Resources Services, Alberta Environmental Protection, "Review of Flood Stage Frequency Estimates for the City of Fort McMurray – Final Report" (Prepared for Technical Committee, Canada-Alberta Flood Damage Reduction Program), November 1993.
- Trillium Engineering and Hydrographics Inc, "An Evaluation of Providing Flood Control at Fort McMurray by a Staged Diking Approach", (Prepared for Regional Municipal of Wood Buffalo), July 2000.
- Northwest Hydraulic Consultants Ltd "Fort McMurray Flood Protection Conceptual Design" (Prepared for Regional Municipality of Wood Buffalo), August 2014.
- Golder Associates Ltd "Fort McMurray River Hazard Study" (Prepared for Alberta Environment and Parks), November 2018.
- Associated Engineering "Lower Townsite East Loop Road and Connector Roads – Clearwater Drive Predesign Report" (Prepared for Regional Municipality of Wood Buffalo), June 2005.
- Associated Engineering "Prairie Loop Boulevard – Phase 2" (Prepared for Regional Municipality of Wood Buffalo), December 2010.
- Thurber Engineering Ltd. "Fort McMurray Water Treatment Plant Berm Slope Stability Assessment Geotechnical Investigation" (Prepared for Associated Engineering Ltd on behalf of the Regional Municipality of Wood Buffalo), November 2019.
- Stantec report "2020 Fort McMurray Flood Storm Sewer Assessment - Outfalls" (Prepared for Regional Municipality of Wood Buffalo), June 2020.
- Associated Engineering "Post-Flood Inspections - Bridges and Culverts" (Prepared for Regional Municipality of Wood Buffalo), May 2020.
- Emelko et al. "Drinking Water Security after Severe Wildfire in Alberta: Initial Risks and Treatment Technology Resilience - Research Progress Overview: Evaluation of 2016 Horse River Wildfire Impacts on Drinking Water Treatment in Fort McMurray", (Prepared for Alberta Innovates and Regional Municipality of Wood Buffalo), December 2020.
- Associated Engineering "Fort McMurray Water Treatment Plant Failure Inspections" (Prepared for Regional Municipality of Wood Buffalo), August 2020. [Included as Appendix A]
- Associated Engineering "Fort McMurray Water Treatment Plant Flood Recovery Short Term Flood Mitigation Recommendations" (Prepared for Regional Municipality of Wood Buffalo), November 2020. [Included as Appendix B]

APPENDIX A – WATER TREATMENT PLANT FLOOD FAILURE INSPECTIONS

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**Associated
Engineering**

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LOCAL FOCUS.

REPORT

Regional Municipality of Wood Buffalo Fort McMurray Water Treatment Plant

Water Treatment Plant Flood Failure Inspections



AUGUST 2020

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1 BACKGROUND

On April 26, 2020, ice jam flooding on the Athabasca River caused water levels to exceed the 1:100-year level in Fort McMurray, AB. This flooding resulted in river water contamination at the Fort McMurray Water Treatment Plant (FMWTP). The river water travelled back through the outfall chamber and piping, into the overflow piping and Clearwells, contaminating the treated water in both Clearwell 1 and 2. Contaminated water was subsequently pumped to the North and South distribution networks. A boil water order was placed on the water system by Alberta Health Services, as a result, until the water distribution network could be recovered. Full recovery of the distribution system was lifted in various communities through a phased approach, with the final phase being completed on June 19, 2020.

On May 26, 2020, the members of the recovery team from the Regional Municipality of Wood Buffalo (RMWB) and Associated Engineering (AE) met to discuss the various failure mechanisms that resulted in the contamination at the FMWTP. After this meeting, AE was retained by the Municipality to lead the inspection of the points of isolation and further investigate the potential failure modes of the event.

1.1 Description of FMWTP Points of Isolation

The overflow lines from the Clearwells, at the FMWTP, and the local on-site storm drainage lines collect in a single chamber on the east side of the plant, known as the storm outfall chamber. There is a sluice gate mounted on the inside of the chamber, which can isolate the overflow outlet pipe that discharges to the Athabasca River. During the 2020 flood, river water came up through the outfall chamber and sluice gate, as the gate did not appear to be properly seated during the flood event.

Upstream of the sluice gate, the overflow lines connect to Clearwell 1A and 2. Where these lines branch to each respective reservoir, there is a manhole chamber that includes a flap gate for isolation. It was suspected that both flap gates failed, as there was evidence of river water in the overflow line of Clearwell 1A and turbidity alarms in Clearwell 2.

The Clearwell 1A and 2 flap gates were manufactured and supplied by Fontaine, as part of the 2010-2014 upgrades. AE engaged Vanex (Fontaine's recommended service company) to complete an inspection of both flap gates, as well as the sluice gate in the storm outfall chamber, to review the installation, determine potential cause of failure, if repairs would be required, or if improvements could be made.

An inspection of the sluice gate and the flap gates was conducted by AE and Vanex on July 6 and 7, 2020. The findings are described in the following section.

In addition to the items noted above, Valve Chamber #2 was also inspected, as it controls the flow from the raw water pond to the WTP and is another potential pathway for flood waters to reach the WTP. The condition was reviewed to determine if additional valves are required to establish isolation in a future flood event.

2 INSPECTION FINDINGS

The detailed inspection findings and photos are captured in the following three reports included in [Appendix A](#):

- Vanex Site Report;
- AE Mechanical Inspection Report; and
- AE Structural Inspection Report.

A summary of the findings is described in the sections below.

2.1 Storm Outfall Chamber

A mechanical and structural inspection were completed to review the condition of the outfall structure, sluice gate and outfall pipe. AE engaged Vanex, a water control gate specialist and service technician, to visit the site and inspect the sluice gate.

2.1.1 Sluice Gate Condition

The outfall sluice gate was manufactured by ARMCO and is operated using a manually controlled Rotork actuator at the surface of the chamber. The main issue identified when attempting to close the gate was that when the gate was in its 100% closed position, there was still approximately 65-75 mm of opening, which would have caused river water leakage through the gate. It was identified that the limit switch was not properly adjusted.

In addition to this, the gate pedestal is partially bolted to a 600 mm thick solid concrete structure, and partially bolted to a 150 mm thick concrete hatch, which is cracked. Since the gate is a rising stem type, the pedestal takes all the operating thrust of the sluice gate, and therefore, must be adequately secured and supported. When the gate was being closed, the cracked concrete cover was being moved upward as more pressure was applied, bending the operating stem and likely contributing to the gate not fully closing.

2.1.2 Outfall Pipe Condition

The site inspection and review of the outfall pipe revealed that the connection between the outfall pipe and sluice gate is compromised. The outfall structure contains a wall thimble, which is a frame embedded in the concrete wall to connect to the sluice gate. The wall thimble appears to have a broken section where it is connected to the outfall pipe. It is suspected that the outfall pipe has shifted down and the wall thimble has stayed in place resulted in a broken section. The 1050 mm outfall pipe is pulled apart by approximately 600 mm behind the sluice gate with granular material/backfill visible from inside the pipe between the two disjoint sections.

2.1.3 Outfall Chamber Flap Gates

While in the outfall chamber, the additional storm flap gates were inspected and determined to be in good working condition. These are original ARMCO flap gates on the storm lines that come into the outfall chamber. The anchor bolts were slightly corroded, and one anchor bolt was found to be loose.

2.1.4 Repair Recommendations and Next Steps

The following repairs are recommended for the outfall chamber:

- 1) Re-calibrate the actuator to have the gate reach its full closed position and adjust wedges to compress the slide sealing system against the frame seat.
- 2) Properly anchor gate pedestal to a fixed concrete surface. AE recommends completing a structural design to fully address anchoring the Rotork actuator.
- 3) Verify the gate stem condition to determine if it requires replacement due to deformation.
- 4) Replace corroded anchor bolts on the middle storm flap gate.
- 5) Complete a full investigation of the broken outfall pipe and wall thimble connection to determine rehabilitation requirements.

AE recommends that the RMWB proceed with a structural design for anchoring the gate pedestal, as well as re-calibrating the actuator on the sluice gate and checking the gates stem condition to complete the repair of the sluice gate.

Regarding item #5 listed above, AE recommends proceeding with a civil design review of the outfall pipe in order to determine the extent of the pipe rehabilitation and proceed with the repair.

2.2 Clearwell 2 Flap Gate Manhole

The Clearwell 2 Flap Gate is located in MH09-04 (refer to [Appendix B – Site Layout](#)) and is a 1050 mm Fontaine gate on the overflow line that connects Clearwell 2's overflow to the overflow pipe that goes to the river via the Storm Outfall Chamber. The gate is attached to a circular frame, which is bolted to the concrete wall of the manhole. The record drawings show the overflow pipe from Clearwell 2 to the manhole is a steel line and attached to the flap gate with a 150 lb flat face flange; however, the installed pipe is a steel bare end pipe without a flange. In order to attach the gate to the pipe, a circular plate was installed and bolted to the wall; however, it was not grouted to seal the gap between the manhole and pipe. Thus, when water was entering the manhole, it would have travelled through this gap, bypassing the flap gate, resulting in leakage into the overflow pipe and Clearwell. The gap was measured to be approximately 25 mm between the back of the frame and the wall between each of the bolts.

Another issue noted was the disc was not seated evenly on the lip seal, leaving approximately a 2 mm gap at two sections on the seating circumference. Vanex was able to adjust the frame by loosening the front nuts and straightening the frame using the back nuts of the frame anchors on site to seal the gate.

The third issue was that the shipping bracket on the gate appears to have been left in place during the installation of the flap gate. There is no evidence to suggest that the gate is experiencing interference with the bracket; however, it should be cut when the other repairs are carried out, to prevent potential interference with the frame nuts if the gate is not perfectly centered in the fully closed position.

The manhole structure itself was inspected and found to be in overall good condition.

2.2.1 Repair Recommendations

The following repairs are recommended for the MH09-04 flap gate:

- 1) Apply non-shrink high performance grout between the flap gate frame and manhole wall to eliminate gap.
- 2) Cut shipping bracket to provide clearance from frame nuts, to ensure zero interference with gate closure.

2.3 Clearwell 1A Flap Gate Manhole

The Clearwell 1A Flap Gate is located in MH09-03 (refer to [Appendix B – Site Layout](#)) and is a 600 mm Fontaine gate on the overflow line that connects Clearwell 1A's overflow to the overflow pipe that goes to the river via the Storm Outfall Chamber. The flap gate is bolted directly to the manhole wall. During the inspection it was noted that the upper section of the sealing system is damaged, creating leakage. In addition to this, some of the anchor nuts were loose and some washers were missing, which may have caused leakage if the seal between the wall and frame was not fully compressed. Some corrosion was also observed where carbon steel washers were used. The loose nuts were tightened on site; however, the washers still need to be replaced.

There was grout material stuck on the flap gate disc surface, which should be cleaned in order to provide optimum sealing. It was cleaned off using a scraper but is recommended to be completed again with a grinder and sandpaper at the same time as completing the other repairs.

2.3.1 Repair Recommendations

- 1) Replace damaged lip seal and readjust flap gate once the new seal is replaced.
- 2) Replace carbon steel washers with stainless steel.
- 3) Clean flap gate disc surface with grinder and sandpaper.

2.4 Valve Chamber #2

The north side of Valve Chamber #2 has an approx. height of 6.0 m in the main areas with approx. 1.0 m of ground cover over top. The area above the ceiling slab had been previously excavated and has yet to be backfilled, causing water to collect in this depressed area. The area of the hatch / ladder extends the full height to top of grade for an approx. height of 7.0 m. The south side of the chamber has an approx. overall height of 11.0 m with approx. 4.0 m extending above grade and covered by structure with a gravel ballast roof with the access hatch/ladder at the top.

At the time of the assessment there was approx. 500mm of water noted covering the floor in both the north and south side. This hindered access to and examination of some areas. Structurally, the interior concrete and wall penetrations appeared to be in good condition with no significant areas of concern or significant groundwater infiltration on both sides. It should be noted that pipe penetrations at the lower elevations, either partially or fully submerged in water could not be accurately assessed for leakage at those penetrations. In order to determine where the water is coming from, the chamber should be pumped out and inspected to try and identify where the leakage is coming from. Regarding the surface drainage in the vicinity of Valve Chamber #2, the RMWB should proceed with the recommendation made in the Fort McMurray Water Treatment Plant Drainage Project (Phase 1 – Assessment) Report, completed by AE in 2020. During this assessment, AE was informed that the grade of the chamber was such that it sat lower than the adjacent site and collected surface runoff. AE recommended raising the valve housing, vertically extending the valve stems to suit and backfilling the area to provide positive drainage.

The steel piping and valves observed were generally in fair to good condition with areas of surface corrosion / epoxy coating failure of varying degrees. There was also sludge still adhered to the pipes passing through the wall at the bottom of the space, which would seem to indicate that the water level inside had previously been much higher than observed at the time of inspection. Tube and clamp scaffolding were in place on the north side in areas, which may have been for recent maintenance work.

After review of drawings and on site, there is no isolation valve noted on the pond overflow piping. Adding an isolation valve to prevent overflow into the chamber, if the pond levels rise above overflow is possible; however, it would not provide protection to the chamber. The record drawings show the top of berm in this area is at 253.0 m and the pond overflow pipe is at 253.1 m; therefore, if a flood event resulted in high water levels in the raw water pond, reaching 253.0 m or higher, the flood water would breach the berm. A closed valve on the overflow line might protect the chamber itself for a short period; however, water would likely come in from the top of the chamber, since it would breach the berm. Recommendations were made under the Fort McMurray Water Treatment Plant Drainage Project (Phase 1 – Assessment) Report to raise the berms where they were found to be lower than designed.

3 ADDITIONAL IMPROVEMENTS

In addition to the required repairs on the current infrastructure, it is prudent to review the overflow and storm system in its entirety to determine if other redundancies should be built into the system and if other improvements are required to protect the WTP from future flood and rain events. Climate change is resulting in the frequency and potential severity of these events; therefore, it is important for the RMWB to plan for them and be adequately protected. The following list of items should be covered in a future study:

- 1) A functional review of the storm and overflow piping, to determine if the two systems should be separated into separate outfall chambers to adequately protect the WTP, particularly in a rain and flood event occurring simultaneously.
- 2) A review of adding in another point of isolation on the overflow system, for example a manhole and sluice gate between MH09-05 and MH09-06 (refer to the attached layout in [Appendix B](#)) to provide additional redundancy.
- 3) Developing a maintenance plan for inspection of WTP assets, based on manufacturer's recommendations.
 - a. The following tasks should be carried out at the recommended frequencies:

Table 3-1
Series 20 Sluice Gate

Maintenance Task	Frequency
Clean gate with clear water to remove all deposits	6 months
Inspect the resilient seals and slides to make sure they are in good condition	6 months
Inspect stem threads and lift-nut threads for wear	6 months
Clean and lubricate the stem	6 months
Check all fasteners for correct tightening	6 months

Table 3-2
Series 60 Flap Gate

Maintenance Task	Frequency
Clean gate with clear water to remove all deposits	6 months
Remove any debris or obstacles preventing proper seating	6 months
Inspect hinges to detect premature wear of bearing	6 months
Inspect the seal. Door must seat evenly on the entire perimeter of the EPDM gasket ring. Apply pressure by leaning on door.	6 months
Check all fasteners for correct tightening.	6 months

These tables are from Fontaine's O&M manual for Sluice Gates and Flap Gates. If the RMWB has the original ARMCO O&M manual for the outfall chamber sluice gate, this should be referenced and used.

4 REPAIR RECOMMENDATIONS SUMMARY

4.1 Repair Summary Table

The follow table outlines the various repair recommendations, timeline recommendation in terms of priority (low, medium or high) and approximate cost for repairs:

Table 4-1
Repair Summary Table

Repair Item	Location	Repair Description	Priority	Approximate Cost
1	Outfall Chamber	Re-calibrate sluice gate actuator, re-seal gate	High	\$35,000
2	Outfall Chamber	Anchor gate pedestal	High	\$50,000
3	Outfall Chamber	Review gate stem and replace if damaged	High	\$15,000
4	Outfall Chamber	Rehabilitate outfall pipe and gate connection	Medium	\$150,000
5	Clearwell 2 Manhole	Apply grout between the flap gate frame and manhole wall	High	\$40,000
6	Clearwell 2 Manhole	Cut shipping bracket on flap gate	High	
7	Clearwell 1 Manhole	Replace seal and readjust flap gate	High	\$20,000
8	Clearwell 1 Manhole	Replace carbon steel washers with stainless steel and clean flap gate	Medium	
9	Outfall Chamber and Overflow Piping	Additional Improvements: Review overflow piping & storm system, make improvements to separate outfall chambers, & add another point of isolation	Medium	\$2,500,000*
10	Valve Chamber #2	Pump out chamber to inspect source of leak	Medium	\$20,000

*Cost includes detailed design to construction completion.

5 FINAL RECOMMENDATIONS AND CONCLUSION

Associated Engineering recommends that the Regional Municipality of Wood Buffalo proceed with the repairs to the flap gates and outfall sluice gate, as soon as possible, to protect the treated water supply in the Clearwells. As well, further investigation into the outfall structure and pipe should be completed to review the condition and determine the extent of rehabilitation required.

A review and study of the items listed under “Additional Improvements” should be completed to ensure the Fort McMurray Water Treatment Plant is adequately protected from future natural disasters and to determine if the current infrastructure still meets the plant’s requirements, or if future improvements should be implemented.

CLOSURE

This report was prepared for the Regional Municipality of Wood Buffalo, Fort McMurray Water Treatment Plant to provide inspection findings from the flood that occurred at the Water Treatment Plant and determine potential causes of failure at each of the points of isolation, as well as to provide repair recommendations and next steps.

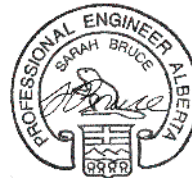
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Respectfully submitted,
Associated Engineering Alberta Ltd.



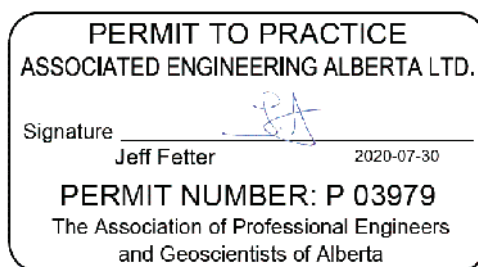
2020-Jul-30

Steve Justus, P.Eng.
Project Manager



2020-07-30

Sarah Bruce, P.Eng.
Project Engineer



APPENDIX A – INSPECTION REPORTS

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SITE REPORT

PROJECT: FORT MCMURRAY BUFFALO WOOD REGION **Date:** July 6th & 7th, 2020

CLIENT REFERENCE: Outfall gate and flap gates

Direct customer: ASSOCIATED ENGINEERING AB Ltd

Contact(s): Sarah Bruce (Process Engineer, ASSOCIATED ENGINEERING Ltd)

Site contact(s): Troy McKinnon (Technician, ASSOCIATED ENGINEERING Ltd)
Paul St-Claire (Maintenance Manager, BUFFALO REGION)

Visit main goal(s):

To perform the inspection of two leaking flap gates and the "Outfall" sluice gate.

DETAILS:

We arrived at the WTP at 8:30h am on July 5th 2020 as previously agreed. After the site meeting with all people involved, we have started with the 600mm diameter flap gate inspection located inside the manhole 09-03 at the North-East of the water plant. The 1050mm diameter flapgate was then inspected followed by the inspection of the OUTFALL gate on the second day.

The following report will provide details of those equipment inspection.



General view of Fort McMurray Drinking Water Facilities

EQUIPMENT IDENTIFICATION

Customer ID.....09-03
 Type of equipment.....Flap gate
 Manufacturer..... FONTAINE
 Dimensions..... 600mm diameter



600mm flap gate



Equipment manufacturer nameplate

1- SEAL DAMAGED

Situation: This flap gate is equipped with a neoprene lip seal secured onto the equipment wall frame. However, the upper section of the sealing system is damaged thus creating leakage. Refer to pictures below.



Upper section of the frame



Lip seal damaged

Recommendations: The damaged lip seal will need to be replaced and the flap gate disc readjusted as per the new seal. Refer to picture aside for a new seal view.

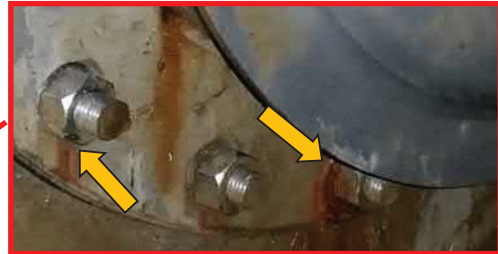


2- ANCHORS & FASTENERS

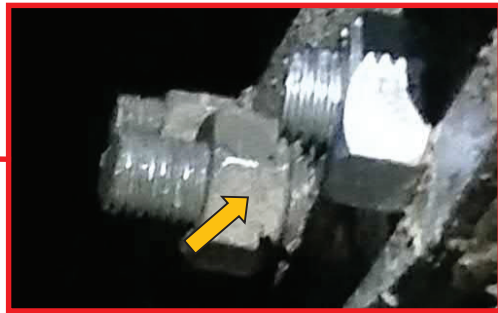
Situation : We have found several anchor nuts not properly tighten and without washers. This can create some leakage between the wall and the frame if the wall gasket is not properly compressed. Also, there was a rusted carbon steel washer that is contaminating the stainless steel flap gate. *Refer to pictures below.*



600mm flapgate



Missing and corroded washers



Loose nuts

Recommendations: We have retightened the loose nuts but we had no stainless steel washers available of this size. New stainless steel washers will need to be installed when replacing the flap gate lip seal and the nuts will need to be properly tighten in order to make sure there is no leakage at the EPDM wall gasket.

3- GROUT ON THE DISC SEAT

Situation: The seat of the flap gate disc is a machined surface. This surface must be flat and clean in order to achieve the expected sealing performance while seating onto the frame lip seal. However, this machined surface had some kind of grout material stick on it thus can create some leakage since the lip seal is not seating on a flat surface.

Recommendations: We have cleaned most of the grout using a scraper. However, it will be better to use a grinder with sandpaper in order to get a cleaner surface. *Refer to picture aside.*



Grout on the disc seat



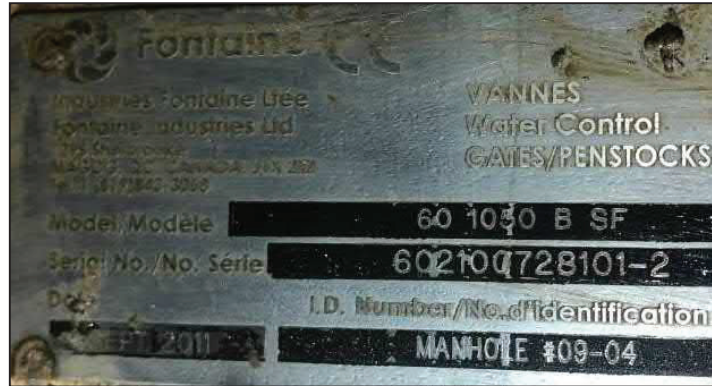
Grout cleaned

EQUIPMENT IDENTIFICATION

Customer ID.....09-04
 Type of equipment.....Flap gate
 Manufacturer..... FONTAINE
 Dimensions..... 1050mm diameter



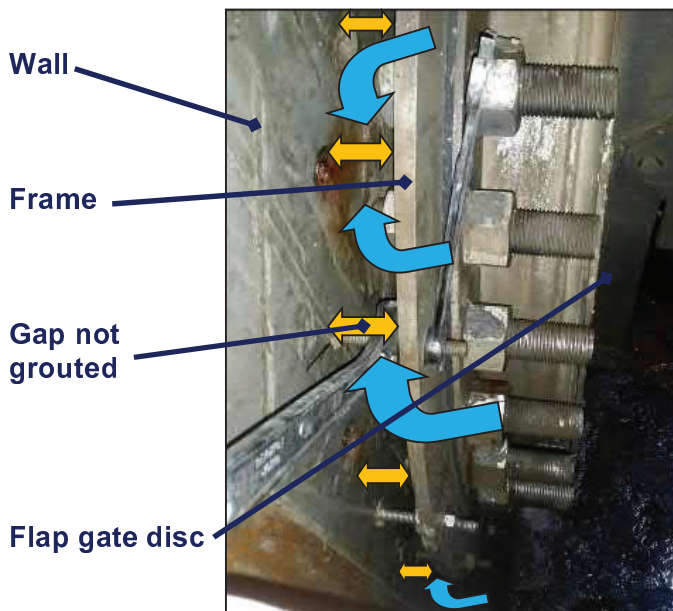
1050mm flap gate



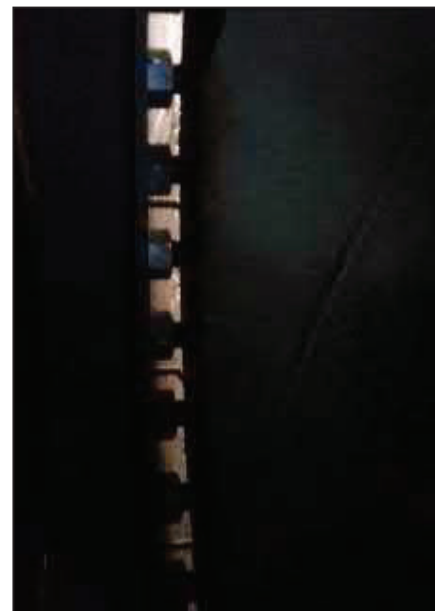
Equipment manufacturer nameplate

1- FRAME NOT GROUTED

Situation: The original flap gate installation works was not properly completed. The frame was not grouted on the wall as it should be; leaving a couple inches gap all around the frame circumference thus creating heavy leakage. *Refer to pictures below.*



Water is bypassing the flap gate



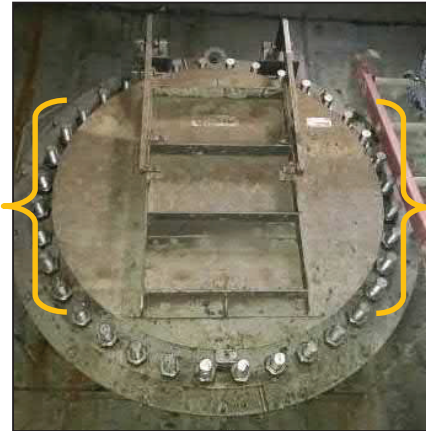
View from inside the pipe

Recommendations: The flap gate frame must be properly grouted using high performance none-shrink grout suitable for this application.

2- FLAP GATE ADJUSTMENT

Situation: The flap gate disc seating surface was not perfectly seating evenly onto the lip seal on both sides. There was up to a +/-2mm gap at two sections of the seating circumference.

Recommendations: Since the frame was not grouted yet, we have taken this “opportunity” to perform our self the required frame adjustment during this inspection. We loosen the front nuts and restraigten the frame using the backing nuts of the frame anchors. We were able to closed the gaps between the disc and the seal fairly easily. The frame is now ready to be poured. *Refer to picture below.*



+/-2mm gap sections



Frame readjustment using anchors back nuts

3- SHIPPING BRACKET INTERFERENCE

Situation: In order to avoid damage to the equipment during the shipping process, the manufacturer welded a shipping bracket to secure the flap gate in full close position. We noticed that this bracket could potentially interfere with the two frame nuts nearby. Therefore, if the flap gate is closing slightly sideways, this bracket will sit on the nuts and will prevent the disc to fully close. *Refer to picture below.*

Recommendations: We recommend to “zipcut” some of the bracket material on both sides (red lines on the picture aside) in order to get an acceptable clearance with the frame nuts.



Frame bottom section

EQUIPMENT IDENTIFICATION

Customer ID.....15-SGV-6001 Outfall valve
Type of equipment.....Cast iron wedge-action sluice gate
Manufacturer..... ARMCO
Dimensions..... 42"X42"
Motorization..... ROTORK



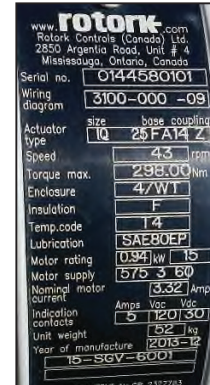
ARMCO sluice gate



Manufacturer nameplate



Pedestal and actuator



Nameplate

1- ACTUATOR NOT PROPERLY ADJUSTED

Situation: The gate was automatically stopping at 75mm before reaching it full close position. After looking deeper into the actuator settings, we noticed that the full close limit switch was not properly adjusted. Therefore, this gate was heavily leaking due to this situation. Otherwise, this sluice gate is generally in good condition. *Refer to pictures below.*



ARMCO sluice gate

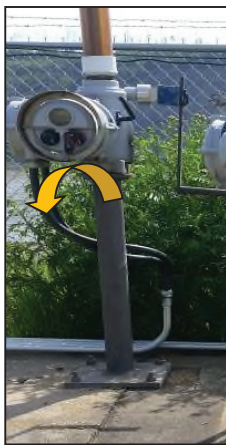


Full close wedges at 75mm away

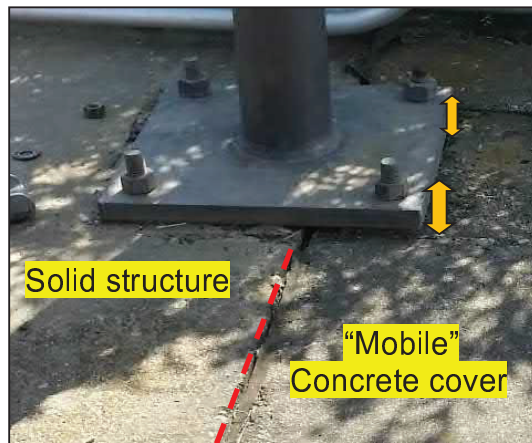
Recommendations: The actuator will need to be re-calibrated in order to have the sluice gate reaching it full close position. Eventually, the wedges will also require some adjustment to properly compress the slide sealing system against the frame seat.

2- PEDESTAL PARTIALLY BOLTED ON CONCRETE COVER

Situation: This gate is a rising stem type. With this operating arrangement, the pedestal (along with the actuator) is the key component and it is taking the entire sluice gate operating thrust. Therefore, it must be strongly secured onto a structural concrete floor slab or proper supports. However, the pedestal of this “Outfall sluice gate” have only two anchors bolted in the concrete slab and two anchors bolted inside a “mobile” concrete cover which is not attached to the structure. When the gate is reaching near the full close position, the concrete cover is moving upward thus bending the operating stem and not closing the gate. This could be the reason why the full close setting of the actuator was originally adjusted before the sluice gate is reaching it full close position. Refer to pictures below.



The pedestal is moving to the left because the cover is moving upward when closing the sluice gate



Operating stem and guides view from underneath

Recommendations: The pedestal must be anchored onto a fix and structurally sound surface. It could be possible to have a stainless steel bracket bolted on the thickness of the concrete slab in order to bolt on the 2 anchors that are actually on the “mobile” concrete cover. Another possibility is to extend the structural concrete slab underneath the entire pedestal. This will require a structural engineer to determine the best solution to solve this situation. We also recommend to have the operating stem straightness verify to make sure there is no permanent bent since it will affect the sluice gate operation. When all modifications and installation is completed the actuator switches will need to be readjusted as well as the closing wedges to make sure the gate is reaching it full close position and the actuator will stop before forcing/damaging any components.

3- SLUICE GATE WALL TIMBLE BROKEN

Situation: This ARMCO sluice gate is bolted directly against a “wall timble”. A wall timble is a heavy-duty frame embedded in the concrete wall with the female thread bolt pattern that is matching with the sluice gate. The gate itself has a square opening but the outfall pipe is round. The downstream side of the wall timble is design to match with the outfall pipe diameter. However, we noticed that the junction of the wall timble and the outfall pipe is broken at the bottom section. We suspect that the outfall pipe has moved downward but since the wall timble was strongly poured in the concrete wall it could not follow so it has broken at the bottom section. Also, we can see that the soil is coming out from erosion at the broken junction thus it may create supporting issues in the future. Refer to pictures below.



View inside the outfall pipe

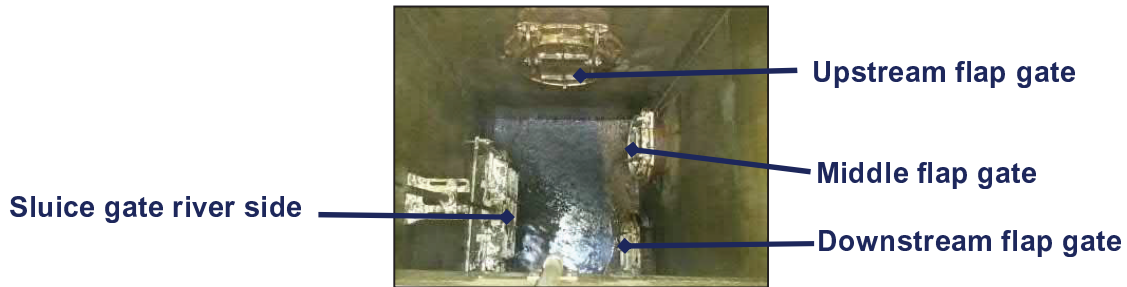


Wall timble broken section

Recommendations: We recommend to have an engineer to investigate deeper into this situation in order to avoid further issues.

4- OUTFALL CHAMBER FLAP GATES No.1, No.2 & No.3

Situation: Since we were inside the outfall chamber, we took a quick look at the 3 ARMCO flap gates installed inside it. Those are all in good working condition without damages on the disc, hinges nor the frames. However, the anchor bolts are in steel and slightly corroded. Also, one anchor is loose on the middle flap gate that will need to be repaired or replaced. *Refer to pictures below.*



Upstream side of river



Middle flap gate



Downstream

CONCLUSION

During this site visit we were able to safely and properly complete our scope of work by inspecting the “outfall” ARMCO sluice gate and the two leaking FONTAINE flap gates as described in this report. We had a very good collaboration and support from all people involved at the jobsite.

Do not hesitate to contact us for further information or if precisions are needed concerning this Buffalo Region water outfall project report.

Donald Côté,
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donald@vanex.pro
www.vanex.pro

INSPECTION REPORT

OWNER:	RMWB	REPORT NO.:	2020-46
PROJECT:	Fort McMurray WTP Flushing	SHEET:	1 OF 3
LOCATION:	Fort McMurray, Alberta	PROJECT NO.:	2020-3783
REPORT TO:	Jeff DaSilva, RMWB	FILE NO.:	2020-3783-00
CONTRACTOR:	Vanex / Clean Harbours	DATE:	July 06 - 07, 2020
WEATHER:	Varying Clouds (am) / Varying Clouds (pm)	TEMPERATURE:	High: +27 Low: +16

Labour Force: Vanex: 1 - Inspector
 Bravo Target Safety: 2 - Safety Personnel
 Clean Harbours: 3 - Hydrovac Personnel

Equipment on Site: Vanex: 1 - Crew Vehicle
 Bravo Target Safety: 2 - Crew Vehicles
 Clean Harbours: 1 - Hydrovac Truck, 1 - Crew Truck

Overview:

Vanex (Donald Cote) was contracted to be on site with Associated Engineering (Troy McKinnon / Alyssa Fortin-Paossi) Monday, July 6 and Tuesday, July 7th at FMWTP for condition assessments of the existing Flap Gates to Clearwell 1 (in manhole MH09-03) and Clearwell 2 (in manhole MH09-04) as well as the existing Sluice Gate in the Outfall Chamber. Associated Engineering was also to conduct a preliminary condition assessment of the valves and piping in Valve Chamber 2.

Preliminary Summary/Schedule of Work to be Completed:

July 6:

- * Inspection of Clearwell 1 Flap Gate by Vanex and AE.
- * Inspection of Clearwell 2 Flap Gate by Vanex and AE.
- * Bravo Target Safety on site to provide confined space entry and rescue services.
- * Clean Harbours on site to dewater outfall chamber.

July 7:

- * Inspection of Outfall Chamber by Vanex and AE.
- * Inspection of Valve Chamber 2 by AE.
- * Bravo Target Safety. to provide confined space entry and rescue services.
- * Clean Harbours back on site if required for further dewatering.

Progress Report:

July 6:

Work planning meeting held from 8:30am - 9:30am with AE, RMWB, Vanex, Bravo Target Safety and Clean Harbours to discuss logistics and plan work procedures for the day.

Clearwell 1 Flap Gate:

Inspection of 600mm Clearwell 1 Flap Gate (manufactured by Lafontaine) was completed by Vanex and AE at interior of manhole MH09-03, with the bottom of the flap gate 500mm up from the bottom on the manhole. No major defects were noted in the installation. However, minor (1-2mm) gapping was noted at the bottom half of the flap gate, allowing for the small possibility of water seeping past should it rise slowly in the structure and not put enough pressure on the flap gate to completely seal it closed. It was recommended by Vanex that the gasket be replaced. Also, some frame bolts were missing washers at the bottom, these should be replaced and all bolts retorqued.

(If necessary, continue report on another sheet.)

ASSOCIATED ENGINEERING REPRESENTATIVE: Troy McKinnon

INSPECTION REPORT

Approximately 200mm of standing water was noted at the bottom of the manhole at the time of inspection. This is level with the invert of the 1200mm concrete pipe out of the structure.

An assessment at the interior of the manhole was conducted by AE with the structure found to be in good overall condition with no issues noted.

Clearwell 2 Flap Gate:

Inspection of 1050mm Clearwell 2 Flap Gate (manufactured by Lafontaine) was completed by Vanex and AE at interior of manhole MH09-04, with the bottom of the flap gate 2000mm up from the bottom on the manhole. It was noted immediately that grout was missing from around the levelling bolts around the backside of the frame where it is mounted to the concrete wall around the steel pipe. Without this grout in place, water was able to leak in around these bolts in the approx. 25mm space between the back of the frame and the wall. This is a deficiency in the installation that was not noted. Also, a minor adjustment on the flap gate to slightly move it to a more centered position in the frame opening was also recommended and able to be completed by Vanex.

An assessment at the interior of the manhole was conducted by AE with the structure found to be in good overall condition with no issues noted.

Outfall Chamber:

Clean Harbors worked throughout the day to complete dewatering of the Outfall Chamber.

At end of day, Vanex entered the Outfall Chamber to conduct a preliminary inspection of the sluice gate. It was noted that even with the Rotork Actuator showing that the gate was fully closed, there was still an approx. 65mm gap at the bottom. This would have allowed rising river water to bypass this sluice gate and enter the overflow piping. It was then attempted to manually close the sluice gate further, but in doing so it was noted that the stem down to the sluice gate from the Rotork Actuator began to lean sideways to the north as more pressure was used in attempting to close the gate. RMWB WTP (Paul Sinclair) on site to discuss and it was concluded that the two bolts to the left (north) side of the mounting plate were securely anchored through 600mm thick concrete and could take the strain, the two to the right (south) were only through the corner of the 150mm thick concrete hatch that was cracking/lifting as more pressure was applied. Further discussion to be held next day with AE Structural Engineer on site.

July 7:

Work planning meeting held from 8:30am - 9:15am with AE, RMWB, Vanex and Bravo Target Safety to discuss logistics and plan work procedures for the day.

Clearwell 1 Flap Gate:

No work completed here today as all was completed last day.

Clearwell 2 Flap Gate:

Today, Vanex re-entered the structure to complete work on minor adjustments to the flap gate to slightly move it to a more centered position in the frame opening. The existing seal was lifted from the edges of the frame to allow it to better expand to a less compressed state. The bolts at top of the flap gate were also backed off slightly to allow it to stick out more at the top and make a good seal all the way around the opening.

All that remains to be completed in the grouting around the levelling bolts around the backside of the frame where it is mounted to the concrete wall around the steel pipe that was noted during entry last day.

Outfall Chamber:

Clean Harbors worked throughout the day last day to complete dewatering of the Outfall Chamber.

Today, Vanex re-entered the Chamber to conduct a further inspection of the sluice gate as well as the flap gates into the chamber from the existing storm lines. Last day, it was noted that even with the Rotork Actuator showing that the

(If necessary, continue report on another sheet.)

ASSOCIATED ENGINEERING REPRESENTATIVE: Troy McKinnon

INSPECTION REPORT

gate was fully closed, there was still an approx. 65mm gap at the bottom. This would have allowed rising river water to bypass this sluice gate and enter the overflow piping. It was then attempted to manually close the sluice gate further, but in doing so it was noted that the stem down to the sluice gate from the Rotork Actuator began to lean sideways to the north as more pressure was used in attempting to close the gate. The existing flap gate were all deemed to be in good working condition.

AE Structural Inspector on site and entered the structure to complete a structural assessment of the interior of the structure and to discuss the issue noted last day regarding the anchoring of the Rotork Actuator. At the interior of the chamber, it was noted that the 1050mm outfall pipe had completely pulled apart approx. 600mm behind the Sluice Gate with granular material visible. At the exterior, she agreed with the observations made last day that the two bolts to the left (north) side of the mounting plate were securely anchored through 600mm thick concrete and could take the strain, the two to the right (south) were only through the corner of the 150mm thick concrete hatch that was cracking/lifting as more pressure was applied.

A separate report to be completed containing any comments/observations from the interior of the chamber as well as recommendation/options to be provided for either using structural steel to reinforce to area under these two bolts to the south, or to remove the 150mm thick concrete hatch and replace this area with 600mm thick reinforced concrete to match the north side.

Valve Chamber 2:

AE Inspector on site in the afternoon and entered both the north and then the south hatches to conduct a condition assessment at the interiors.

The north side of the chamber has an approx. height of 6.0m in the main areas with approx. 1.0m of ground cover over top. The area above the ceiling slab had been previously excavated and has yet to be backfilled, causing water to collect in this depressed area. The area of the hatch / ladder extends the full height to top of grade for an approx. height of 7.0m. At the time of the assessment there was approx. 500mm of water noted covering the floor. This hindered access to and examination of some areas. Structurally, the interior concrete appeared to be in generally good condition with no significant areas of concern noted. The wall penetrations observed also were in generally good condition with no strong indications of groundwater infiltration. It should be noted that pipe penetrations at the lower elevations, either partially or fully submerged in water could not be accurately assessed for leakage at those penetrations. The steel piping and valves observed were generally in fair to good condition with areas of surface corrosion / epoxy coating failure of varying degrees noted throughout the space. There was also a sludge still adhered to the pipes at approx. the lower 3.0m of the space which would seem to indicate that the water level inside had previously been much higher than observed today. Tube and clamp scaffolding was also noted to still be erected in multiple areas which may have been for recent maintenance work.

The south side of the chamber has an approx. overall height of 11.0m with approx. 4.0m extending above grade and covered by structure with a gravel ballast roof with the access hatch / ladder at the top. Approx. 8.0m down there is an access landing at the bottom of the ladder where the inspection was conducted from as there was also approx. 500mm of water noted to be covering the floor at this side as well. The observations here were very much as was noted at the north side. Structurally, the interior concrete here also appeared to be in generally good condition with no significant areas of concern noted. The wall penetrations observed were also in generally good condition with no strong indications of groundwater infiltration. Again, the steel piping and valves observed were generally in fair to good condition with areas of surface corrosion / epoxy coating failure of varying degrees noted throughout the space. There was also a sludge still adhered to the pipes passing through the wall at the bottom of the space which would seem to indicate that the water level inside had previously been much higher than observed today.

(If necessary, continue report on another sheet.)

ASSOCIATED ENGINEERING REPRESENTATIVE: Troy McKinnon



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INSPECTION/SITE MEETING REPORT

Owner:	Regional Municipality of Wood Buffalo	Project No.:	2020-3783	Report No.:	1
Project:	Fort McMurray WTP Flushing	File No.:	2020-3783-00	Page:	1 of 7
Component:	Structural	Date:	July 7, 2020		
Location:	Water Treatment Plant	Issue Copies To:	N/A		
AE Representative:	Alyssa Fortin-Paossi, E.I.T.	Project Manager:	Steve Justus, P.Eng.		
Others Present:	Troy McKinnon, AE Donald Cote, Vanex	Owner Contact:	Paul Sinclair		

A visual structural inspection of the Outfall Chamber at the Water Treatment Plant was completed on July 7, 2020 by Alyssa Fortin-Paossi, E.I.T. The following photo report includes images of the defects and issues identified.



1. Looking at new outfall chamber gate



INSPECTION/SITE MEETING REPORT



2. Looking at former concrete outfall chamber gate



3. Deteriorated joint caulking around former concrete gate opening. Install new caulking.



INSPECTION/SITE MEETING REPORT



4. Bolted plate bearing 110 mm on former gate opening with cracking shown



5. Bolted plate not touching concrete by 10 mm



INSPECTION/SITE MEETING REPORT



6. Cracking shown on former concrete gate opening.



7. Looking at inside of outfall chamber walls from top platform. Concrete wall in generally good condition.



INSPECTION/SITE MEETING REPORT



8. Pipe opening of overflow line in Outfall Chamber to WTP. No immediate concern.



9. Section of outlet pipe to river disconnected, 3 ft from opening.



INSPECTION/SITE MEETING REPORT



10. Damaged bottom of pipe with exposed backfill



11. Hairline cracking from pipe penetration. No immediate concern.



INSPECTION/SITE MEETING REPORT



12. Looking at pipe penetration with surface corrosion on pipe.

Written By: Alyssa Fortin-Paossi, E.I.T.
Reviewed By: Kevin Danyluk, P.Eng.

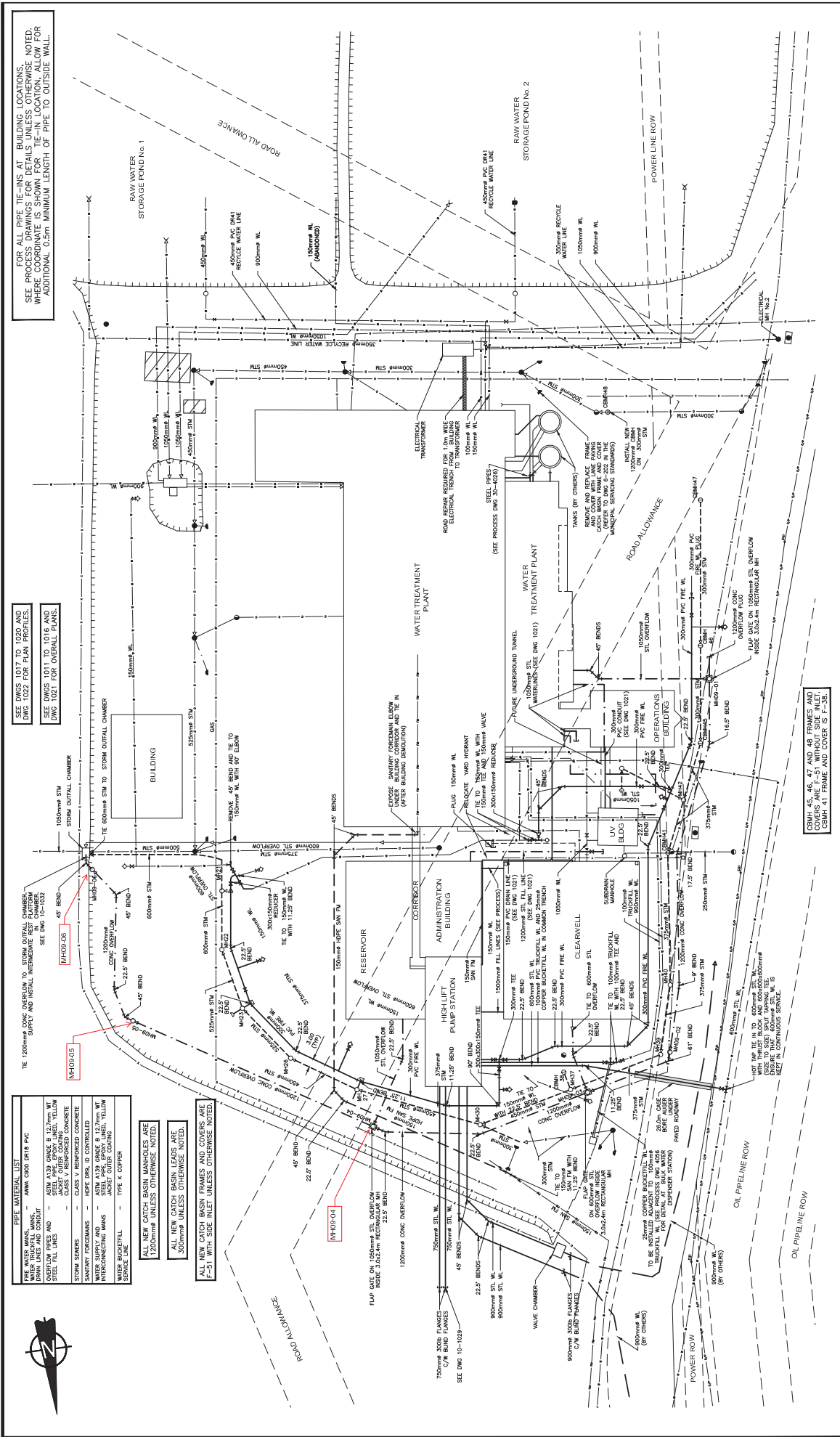
Regional Municipality of Wood Buffalo
Fort McMurray Water Treatment Plant

APPENDIX B – SITE LAYOUT

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This drawing is for the use of the client and project indicated. No representation of any kind is made to other parties.



NO.		DATE	ENG.	BT	SUBJECT		REVISIONS	
1	14/12/15	D.S.	J.C.		RECORD DRAWING			
2	10/07/23	D.S.	J.C.		ISSUED FOR CONSTRUCTION			
3	10/06/19	D.S.	J.C.		ISSUED FOR AUDITING No. 5			
4	10/06/20	D.S.	J.C.		ISSUED FOR AUDITING No. 6			
5	10/07/21	D.S.	J.C.		ISSUED FOR TENDER			

VERIFY SCALES		OTHER INFORMATION	
BAR IS 200mm ON ORIGINAL DRAWING		ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED	
IF NOT 200mm ON ORIGINAL DRAWING, SCALES 1:200 ONLY		ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED	

PROJECT No. 2007-3411		SCALE 1 : 600	
DRAWN J. CALDWELL		DESIGNED D. SOWALDSON	
CHECKED E. STEPHAN		APPROVED E. ASSELIN	
DATE 2009-10		INITIAL	

CIVIL SITE WORKS OVERALL PLAN UTILITIES		REGIONAL MUNICIPALITY OF WOOD BUFFALO	
DRAWING NUMBER 10-10		FORT McMurray WATER TREATMENT PLANT UPGRADE	
REV. NO. 2		SHEET 10	

2.1.b

APPENDIX B - FORT MCMURRAY WATER TREATMENT PLANT FLOOD RECOVERY - SHORT TERM FLOOD MITIGATION RECOMMENDATIONS

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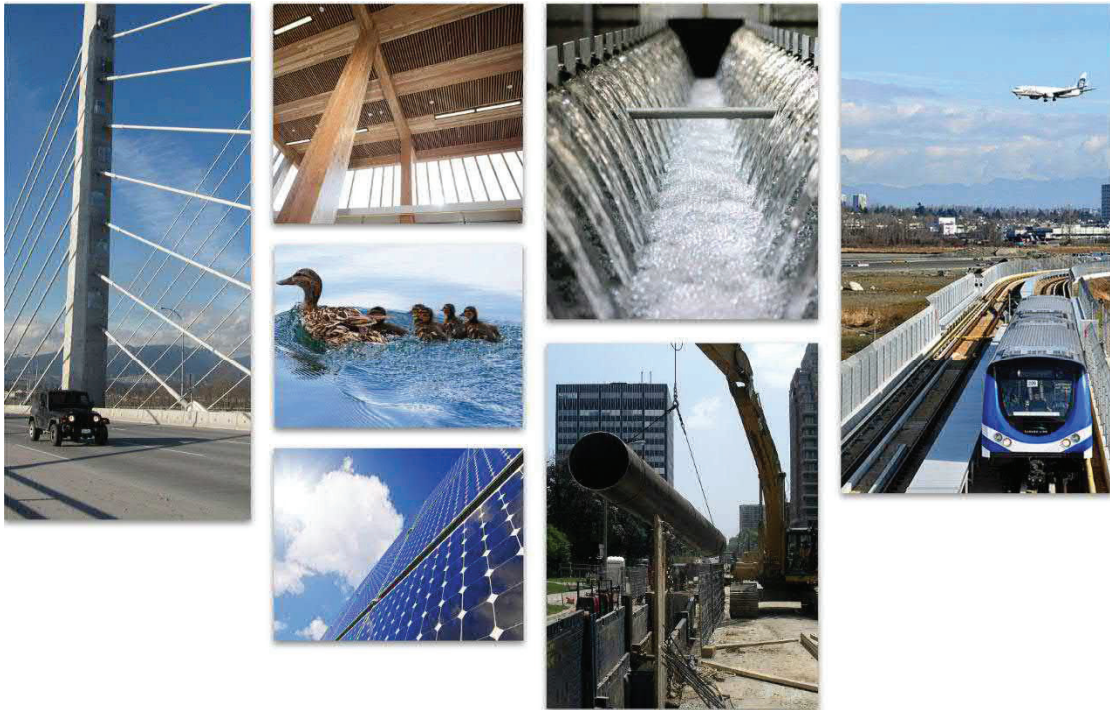
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REPORT

Regional Municipality of Wood Buffalo Fort McMurray Water Treatment Plant Flood Recovery

Short Term Flood Mitigation Recommendations



NOVEMBER 2020

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EXECUTIVE SUMMARY

1 BACKGROUND

The Fort McMurray Water Treatment Plant (WTP) is owned and operated by the Regional Municipality of Wood Buffalo (RMWB). In April 2020, high water levels in the Athabasca River caused river water to flow back through the storm outfall chamber and overflow piping at the WTP, resulting in contamination of the clearwells. A post-flood inspection of the points of failure was completed and the outcome of the inspection provided in the Post-Flood Failure Inspection Report (Associated Engineering, 2020). Proposed mitigations strategies were developed as part of the post-flood recovery works and will be discussed in this report, with recommendations on immediate steps forward to provide the WTP with improved flood protection. These strategies include:

- Repair of the sluice gate pedestal at the outfall chamber so that it can be fully sealed and provide isolation from the river.
- Confirmation that there are no existing cross connections between the clearwell overflow piping and the storm sewer through camera inspection of the overflow piping.
- Review of the options and development of a solution to install a temporary plug for the overflow piping to the river.

2 FLOOD MITIGATION STRATEGIES

2.1.1 Sluice Gate Repair and Further Recommendations

AE provided a design drawing to adequately support the sluice gate pedestal to allow the gate to close. This work was completed, and the gate was confirmed to seal in its closed position. Associated also noted that sedimentation was present at the bottom of the sluice gate at the time of testing. This will prevent a proper seal and was noted to the RMWB personnel present at the time.

2.1.2 Overflow Pipe Inspection

Tristar completed a site-wide camera inspection of the overflow piping on October 13, 2020. In general, the pipe is in good condition overall, however further cleaning is required to remove sticks and debris that are present as noted in the report that follows. No cross connections between the storm and overflow piping were observed.

2.1.3 Temporary Plug Options

A review of two inflatable plug options for flood protection of the overflow piping was completed as requested. The Lansas Multi-size Domehead plug and Oatey Cherne I-Series plug both are used for plugging storm sewer lines temporarily and were evaluated based on technical requirements, cost, and delivery. The Oatey Cherne plug was able to meet the required pressure requirements, is lighter weight, smaller when deflated, was quoted at a lower cost and faster delivery time than the Lansas plug.

The possibility of installing a Tideflex check valve in the overflow piping was also considered. The Tideflex valve can meet the pressure requirements and would be a permanent installation in the concrete overflow pipe. It would be a

higher cost than the inflatable plugs requiring pipe modifications and civil work to install. Given this, along with a longer delivery time, it would not be an immediate solution.

Based on the information presented above, the inflatable plugs are the most cost-efficient option for the short term. The Tideflex check valve should be further investigated with the long-term options being considered.

3 CONCLUSION AND RECOMMENDATION

In conclusion,

- The outfall sluice gate has been repaired and is functional.
- The overflow pipe is in good condition, although more cleaning is recommended. Based on the camera inspections of the overflow pipe, no cross connections with the storm system or other piping were observed.
- The supply of three temporary plugs will cost \$20,995 and will provide an additional level of protection for the WTP.
- The RMWB should continue to investigate the long-term solution for the Storm Outfall Chamber.

AE recommends the following steps for the short-term flood mitigation measures:

1. Clean the build up of debris at the bottom of the outfall sluice gate seat and alignment pins and fully stroke the valve to ensure proper seating as part of flood preparation.
2. Remove remaining debris from overflow pipe by flushing the line and manually removing debris as required.
3. Protect overflow pipe from nuisance animals by installing a trash grate.
4. Provide temporary additional flood mitigation by purchasing and installing two inflatable plugs on the overflow pipe and one on the pipe from Valve Chamber #2 to the river.
5. Operate the clearwells at 85% to allow for extra room for error an overflowing occurrence while plugs are installed.

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1 BACKGROUND

The Fort McMurray Water Treatment Plant (WTP) is owned and operated by the Regional Municipality of Wood Buffalo (RMWB). It services the Fort McMurray area and surrounding communities of Anzac, Draper, Gregoire Lake Estates and Saprae Creek Estates. In April 2020, high water levels in the Athabasca River caused river water to flow back through the storm outfall chamber and overflow piping at the WTP, resulting in contamination of the clearwells.

The Municipality engaged Associated Engineering (AE) to provide engineering services to support them in developing temporary flood mitigation strategies at the Water Treatment Plant. In July 2020, Associated Engineering carried out inspections of the points of failure at the WTP and prepared the flood failures inspection report. From this report and discussions with the Municipality, the proposed mitigation strategies were developed and include:

- Repair the sluice gate pedestal at the outfall chamber so that it can be fully sealed and provide isolation from the river.
- Confirm there are no existing cross connections between the clearwell overflow piping and the storm sewer.
- Review options and develop a solution to install a temporary plug for the overflow piping that travels from the WTP, through the Storm Outfall Chamber to the river and Valve Chamber 2's pipe to the river.

This report summarizes findings from the three items above and provides recommendations for next steps.

2 STORM OUTFALL CHAMBER IMPROVEMENTS

2.1 Sluice Gate Pedestal Bracket

AE provided a design drawing to the RMWB to adequately support the sluice gate pedestal ([Attachment 1 Appendix A](#)). This has been installed by Chandos and the sluice gate was adjusted and confirmed to be sealing correctly by Vanex. The final report provided by Vanex is included as an attachment to this report. ([Attachment 2 Appendix A](#)).

2.1.1 Sluice Gate Maintenance

During the inspection of the sluice gate after the pedestal was rehabilitated, an accumulation of sediment was found at the bottom of the storm outfall chamber. The bottom of the gate sits close to the bottom of the chamber. Furthermore, there is no sump within the storm outfall chamber, so accumulation builds up on the wall face where the gate is installed and can impede sealing the gate fully. Sand/gravel was noted in the depression for the alignment pins at the bottom of the sluice gate and had to be cleaned out in order to close the gate fully. For this reason, AE recommends that prior to closing the sluice gate in preparation of flood season, the RMWB clean out the bottom of the chamber to confirm the sluice gate is closed fully.

3 CAMERA INSPECTION OF OVERFLOW PIPE

The findings from the camera inspection of the overflow pipe are summarized in [Table 3-1](#). On October 13, 2020, Tristar was onsite to complete the camera inspection of the overflow pipe. [Figure 3-1](#) shows the sections that were inspected, as well as the areas that could not be accessed by the camera crawler due to debris buildup. On May 9, 2020, during the flood recovery work, Image Pipelines completed a camera inspection of the overflow piping from MH09-03 to MH09-06. In order to fill the gaps missed on October 13, 2020, AE reviewed the photos and videos from the May 9, 2020 and have included this information in [Table 3-1](#). Reports and videos for the CCTV inspections have been passed over to the RMWB for their records.

Table 3-1
Overflow Pipe Summary

Start	End	Condition/Cross Connections	Observations	Missed Section on Oct 13, 2020
MH09-01	WTP Connection	Good/None	- Approx. 15% pipe filled with water, 20 m from MH09-01. - Abandoned at 45° bends, 36 m from MH09-01.	Approx. 12 m
MH09-01	Plug South of MH	Good/None	None	None
MH09-01	MH09-02	Fair: Surface reinforcement visible at 18.75m from MH09-02 to MH09-01	- Sticks discovered 46 m & 87 m from MH09-01. - Abandoned at 87 m as camera could not pass. - Moved camera to MH09-02 & travelled back towards MH09-01. - Sticks found at 11 m & 27 m. - Abandoned at 27 m as camera could not pass.	Approx. 11 m
MH09-02	MH09-03	Good/None	Small amount of water present.	None
MH09-03	MH09-04	Good/None	Piece of wood found 22 m from MH09-03	None
MH09-04	MH09-05	Unknown from Oct. 13 inspection. Good condition & no cross connections from May 9 inspection.	- Debris at 0.2 m from MH09-04. - Settled gravel & fines found at 11 m & 19 m from MH09-04, respectively. - Abandoned at 19 m as camera could not pass. - Moved camera to MH09-05 & travelled back towards MH09-04. - Settled fines found at 11 m. - Abandoned at 11 m as camera could not pass.	Approx. 60 m
MH09-05	MH09-06	Unknown from Oct. 13 inspection. Good condition & no cross connections from May 9 inspection.	- Settled fines found at 11 m. - Abandoned as camera could not pass. - Moved camera to MH09-06 & travelled back. - Settled fines found immediately and survey abandoned.	Approx. 45 m
MH09-06	Outfall Structure	Good/None	Small amount of water present	None
Outfall Structure	River	Unknown from Oct. 13 and May 9 inspection. From the outfall chamber, the storm outfall pipes connection is compromised.	- Debris found at 0.4 m from outfall structure. - Abandoned as camera could not pass.	Entire steel pipe section from chamber to river

Generally, the overflow pipe is in good condition. It does not appear to have any cross connections with the storm system or any other pipe. Below are two photos comparing the pipe section from MH09-04 to MH09-05:

Figure 3-2
Photo Comparison MH09-04 to MH09-05



It appears that in both cases, there was water and debris buildup in the pipe. The inspection shows that further cleaning of the pipe is required to remove the remaining debris. This will require jet cleaning, followed by manual removal of the debris at the end of the line through entering the pipe and shovelling out the debris.

It is also recommended that the RMWB install a trash grate on the end of the outfall pipe to prevent nuisance animals from entering. After discussions with the RMWB, this was completed around the beginning of October. An additional grate could be placed on the 1200 mm overflow pipe where it enters the storm outfall chamber for further protection.

4 ISOLATION OPTIONS

AE reviewed short-term solutions for providing additional temporary flood protection to the WTP via the concrete overflow and Valve Chamber #2 to the river. The options reviewed include: (1) Inflatable plugs and (2) Duckbill check valves.

4.1 Hydraulic Pressure Requirements

The hydraulic pressure requirements were determined based on flood river levels and pipe elevation. This information is provided below and was used to confirm whether the isolation options could meet the required hydraulic pressure.

1. 1200 mm concrete overflow pipe = $250.50 \text{ m} - 244.37 \text{ m} = 6.13 \text{ m}$ of TDH = **8.70 PSI**
2. 900 mm steel pipe at Valve Chamber #2 to the river = $250.50 \text{ m} - 243.75 \text{ m} = 6.75 \text{ m}$ of TDH = **9.63 PSI**

4.2 Inflatable Plug Options

Two plugs were reviewed for the inflatable plug option and relevant technical data is captured in the table below. A practical comparison of each follows.

Table 4-1
Inflatable Plug Comparison

Location	Manufacturer	Pipe Size & Material for Plug Location	Min/Max Pipe Diameter (in)	Required Inflation Pressure (psi)	Maximum Back/Test Pressure (psi)	Product Dimensions		
						Deflated Length (in)	Deflated Diameter (in)	Weight (lbs)
Valve Chamber 2	Lansas Multi-size Domehead	900mm (36") steel pipe	22.00" – 48.25"	15	8	84.0"	21.5"	107
Valve Chamber 2	Oatey Cherne I-Series	900mm (36") steel pipe	19.00" – 40.00"	22	10.2	46.25"	18.5"	66
Overflow Pipe	Lansas Multi-size Domehead	1200mm (48") concrete pipe	34.50" – 60.25"	10	6	84.0"	29.5"	192
Overflow Pipe	Oatey Cherne I-Series	1200mm (48") concrete pipe	20.50" – 50.00"	22	10.1	68.0"	19.1"	125

As shown in **Table 4-1**, the Lansas Multi-Side Domehead plugs cannot meet the required backpressure of 8.7 psi and 9.6 psi. The supplier notes that although the maximum back pressure for the plugs is 8 psi and 6 psi respectively, additional reinforcement can increase the backpressure rating to upwards of 75 psi of head pressure. This can be accomplished by attaching a 1.4" steel cable and securing it to a nearby structure. The Oatey Cherne I-Series plugs meet the pressure requirement without additional reinforcement. Furthermore, the deflated diameter of the Lansas plugs are larger, making it challenging to install into a standard manhole. Modifications to the manhole structure would be required to install it at the overflow piping. The deflated diameter of the Oatey Cherne I-Series are 470 mm (18.5") and 485 mm (19.1") which will fit through a standard 600 mm manhole cover.

Both plug options come equipped with an inflation kit that has a pressure gauge with a hose, so the plug pressure can be monitored at anytime without entering the manhole or pipe. Further installation details can be provided by the supplier once the plugs are purchased. To provide double isolation of the overflow piping, one plug can be provided upstream of MH09-05 and another upstream of MH09-06, as shown in the drawing (**Attachment 3, Appendix A**). Technical datasheets are also provided for reference (**Attachment 4 & 5, Appendix A**).

Should the RMWB proceed with the inflatable plug, there is risk that the clearwells could overflow and backup in the pipe without being able to overflow to the river. In order to reduce the risk of this occurring, AE recommends the RMWB keep the clearwell levels to a maximum of 85% while the plugs are installed to provide more room for error during this time.

4.3 Check Valve Options

AE reviewed the possibility of adding in a duck bill check valve to the overflow piping and Valve Chamber 2, as an alternative to the inflatable plugs. The UltraFlex CheckMate Tideflex was recommended for this application and a technical data sheet is provided as [Attachment 6 in Appendix. A](#) Tideflex valve is intended for use on overflow lines to prevent unwanted backflow when river levels rise. They are typically used in combined sewer systems to prevent wastewater from entering stormwater catchments. The Tideflex valve is a more permanent solution than the inflatable plugs, as once they are installed, they are designed to last. The UltraFlex CheckMate can handle up to 30 psi of backpressure. This would provide protection up to a river level of 265.5 m at the overflow piping and 264.9 m at Valve Chamber #2. They are also a low headloss valve and will open and flow with as little as 1" of head pressure. Once the head pressure reaches 50-75% of the pipe diameter, the bill will fully open into a concave shape, allowing flow to increase up to the maximum flow capacity of the valve.

Significant effort would be required to install such a valve, as the valves are bigger than the manhole access and cannot be disassembled for installation. A rectangular manhole structure would be required, or modifications to the top portion of MH09-06 to fit the valve into the pipe.

4.4 Cost Comparison and Recommendations

Costs for both plug options and check valve are summarized in [Table 4-2](#) below:

Table 4-2
Cost Comparison

Manufacturer	Size (mm)	Cost	Type	Notes
Lansas	900	\$6,355	Plug	- Shipping from US is estimated at \$2,000 for order. - Protective sleeves are a \$3,000 add on. - Delivery is within 1-2 months.
Oatey Cherne	900	\$3,802	Plug	- Rental rate is \$1,080/month and would be discounted from purchase price if RMWB chooses to purchase. (Under 30 days, 100% of paid rent is discounted, within 90 – 120 days, 60% of paid rent is discounted). - Protective sleeves are a \$1,925 add on. - Delivery is 5-10 business days.
Tideflex	900	\$16,734 + (\$25,000 manhole addition)	Check Valve	- Installation costs and manhole modifications not included. - Delivery is 12 – 14 weeks.
Lansas	1200	\$10,980	Plug	Same comments as above.
Oatey Cherne	1200	\$5,569	Plug	Same comments as above.
Tideflex	1200	\$37,793 + (\$25,000 manhole addition)	Check Valve	Same comments as above.

Based on the information presented above, the inflatable plugs are the most cost-efficient option for the short term that will serve the purpose of providing additional isolation measures for the upcoming flood season. The plugs will provide a third and fourth point of isolation on the overflow piping now that the sluice gate and flap gates are functional.

Knowing the long-term plan for the storm outfall chamber will assist in determining how to proceed with further permanent isolation. If the long-term plan is to keep the overflow and storm outfall chamber combined, the Tideflex valve would provide the further isolation during flood events. Furthermore, it negates the concern for the possibility of a major flood event and major storm event happening at the same time and both systems being overrun. The check valves should be investigated further as part of the long-term solutions for the system.

Between the two plug options presented, AE recommends proceeding with purchasing and installing the Oatey Cherne plugs for the following reasons:

- Ability to meet pressure requirements without reinforcement;
- Lighter and smaller when deflated;
- Lower cost; and
- Faster delivery time.

The total supply cost for the plugs, if two are purchased for the overflow piping and one is purchased for Valve Chamber 2, is summarized below:

Table 4-3
Estimated Costs

Item	Part #	Description	Qty	Each	Total
1	314408	Cherne 20"-40" Pipe Plug	1	\$3,802.00	\$3,802.00
2	314488	Cherne 24"-48" Pipe Plug	2	\$5,569.00	\$11,138.00
3	301028	Protective Sleeve	3	\$1,925.00	\$5,775.00
		Shipping from Edmonton			280.00
TOTAL					\$20,995.00

The cost for installation of the plugs has not been included in [Table 4-2](#). The assumption is this will be done by the RMWB. The quote for the supply of the plugs is included as [Attachment 7](#) in [Appendix A](#).

5 CONCLUSION AND RECOMMENDATION

In conclusion,

- The outfall sluice gate has been repaired and is functional. It was proven to be fully closed after repairs were complete. Cleaning the bottom of the outfall chamber should be completed prior to isolating.
- The overflow pipe is in good condition, although more cleaning is recommended. Based on the camera inspections of the overflow pipe, no cross connections with the storm system or other piping were observed. A trash grate needs to be in place to prevent nuisance animals from entering and debris buildup.
- The three temporary plugs will cost \$20,995 for supply and will provide an additional level of protection for the WTP.

AE recommends the following steps for the short-term flood mitigation measures:

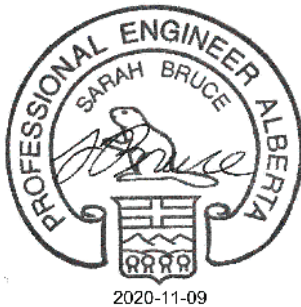
1. As part of flood preparation in April, clean the build up of debris at the bottom of the outfall sluice gate seat and alignment pins and fully stroke the valve to ensure proper seating.
2. Remove remaining debris from overflow pipe. Tri-Star proposes sending a Sewer Flusher into the pipe and removing as much material as they can with their hydrovac, and then sending a crew into the manholes to remove the remaining debris. They have provided an estimated cost of \$12,411.00 to complete this work (see Attachment 8 in the Appendix). This assumes three 10-hour days to clean the pipe and complete a post camera inspection. Tri-Star developed this estimate based their inspection of the current state of the pipe. If additional days are required, an hourly rate of \$220.00 would apply, however they believe the pipe can be cleaned out in the three days quoted.
3. Protect overflow pipe from nuisance animals by installing a trash grate. Additional measures could be provided by installing a second trash grate at the storm outfall chamber on the 1200 overflow pipe as it enters the chamber.
4. Provide temporary additional flood mitigation by purchasing and installing two inflatable plugs on the overflow pipe; One upstream of MH09-06 and another upstream of MH09-05 and one plug for the pipe from Valve Chamber #2 to the river. Further review the long-term plan for the storm outfall chamber to look at installing a check valve in an existing or new manhole, or separating the storm and overflow chambers, as well as investigate condition of outfall pipe from the outfall chamber to the river.
5. Operate clearwells at 85% to allow for extra room for error to prevent overflowing while plugs are installed.

CLOSURE

This report was prepared for the Regional Municipality of Wood Buffalo Fort McMurray Water Treatment Plant Flood Recovery to assist the Municipality with developing short term flood mitigation strategies for the WTP and provide recommendations for immediate flood protection needs.

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.

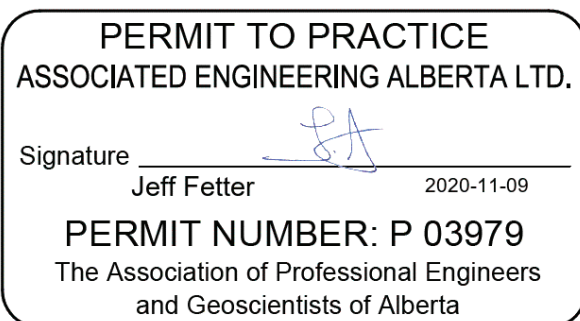
Respectfully submitted,
Associated Engineering Alberta Ltd.



Sarah Bruce, P.Eng.
Process Engineer



Nelson Dos Santos, P.Eng. ENV SP
Civil Engineer



APPENDIX A - ADDITIONAL INFORMATION

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SITE REPORT

PROJECT: FORT MCMURRAY BUFFALO WOOD REGION **Date:** July 6th & 7th, 2020

CLIENT REFERENCE: Outfall gate and flap gates

Direct customer: ASSOCIATED ENGINEERING AB Ltd

Contact(s): Sarah Bruce (Process Engineer, ASSOCIATED ENGINEERING Ltd)

Site contact(s): Troy McKinnon (Technician, ASSOCIATED ENGINEERING Ltd)
Paul St-Claire (Maintenance Manager, BUFFALO REGION)

Visit main goal(s):

To perform the inspection of two leaking flap gates and the "Outfall" sluice gate.

DETAILS:

We arrived at the WTP at 8:30h am on July 5th 2020 as previously agreed. After the site meeting with all people involved, we have started with the 600mm diameter flap gate inspection located inside the manhole 09-03 at the North-East of the water plant. The 1050mm diameter flapgate was then inspected followed by the inspection of the OUTFALL gate on the second day.

The following report will provide details of those equipment inspection.



General view of Fort McMurray Drinking Water Facilities

Support VANEX to repair flap gate. This is a confined space entry

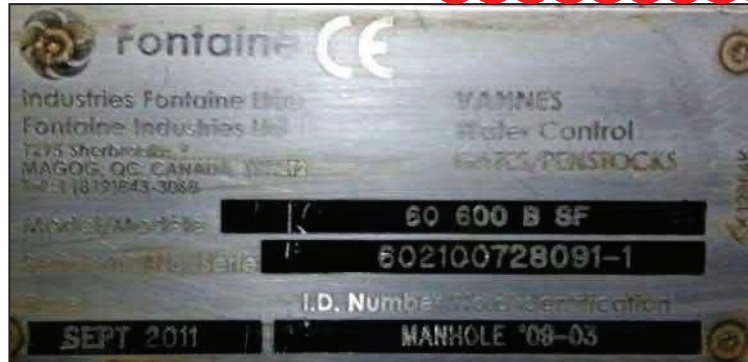
EQUIPMENT IDENTIFICATION

Customer ID.....09-03
 Type of equipment.....Flap gate
 Manufacturer..... FONTAINE
 Dimensions..... 600mm diameter

**All Repair
 Pictures at end
 of Document**



600mm flap gate



Equipment manufacturer nameplate

1- SEAL DAMAGED VANEX

Situation: This flap gate is equipped with a neoprene lip seal secured onto the equipment wall frame. However, the upper section of the sealing system is damaged thus creating leakage. Refer to pictures below.



Upper section of the frame



Lip seal damaged

Recommendations: The damaged lip seal will need to be replaced and the flap gate disc readjusted as per the new seal. Refer to picture aside for a new seal view



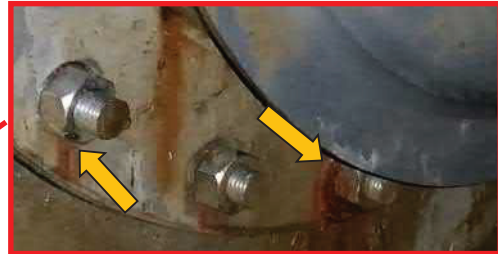
**Seal repaired with Sika 1a By Donald of Vanex Monday
 October 5th 2020**

2- ANCHORS & FASTENERS VANEX/CHANDOS

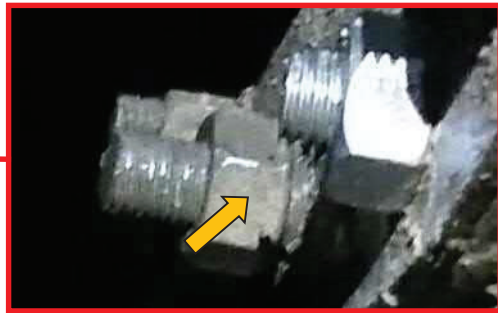
Situation : We have found several anchor nuts not properly tighten and without washers. This can create some leakage between the wall and the frame if the wall gasket is not properly compressed. Also, there was a rusted carbon steel washer that is contaminating the stainless steel flap gate. *Refer to pictures below.*



600mm flapgate



Missing and corroded washers



Loose nuts

Recommendations: We have retightened the loose nuts but we had no stainless steel washers available of this size. New stainless steel washers will need to be installed when replacing the flap gate lip seal and the nuts will need to be properly tighten in order to make sure there is no leakage at the EPDM wall gasket.

New stainless steel washers added and nuts tightened Monday October 5 2020 by Donald of Vanex

3- GROUT ON THE DISC SEAT CHANDOS

Situation: The seat of the flap gate disc is a machined surface. This surface must be flat and clean in order to achieve the expected sealing performance while seating onto the frame lip seal. However, this machined surface had some kind of grout material stick on it thus can create some leakage since the lip seal is not seating on a flat surface.

Recommendations: We have cleaned most of the grout using a scraper. However, it will be better to use a grinder with sandpaper in order to get a cleaner surface. *Refer to picture aside.*



Grout on the disc seat



Grout cleaned

Donald of Vanex used sandpaper Monday October 5 2020 to remove remaining grout from disk seat

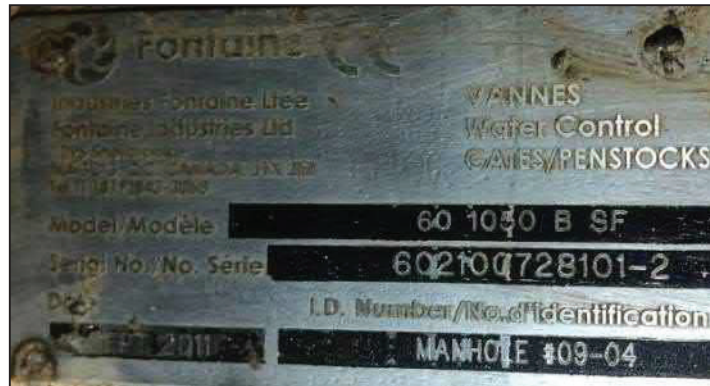
Support VANEX for misc adjustments. Provide construction services to pour grout around flap gate flange gap. This is a confined space entry with the flap gate 2 meters above the floor.

EQUIPMENT IDENTIFICATION

Customer ID.....09-04
 Type of equipment.....Flap gate
 Manufacturer..... FONTAINE
 Dimensions..... 1050mm diameter



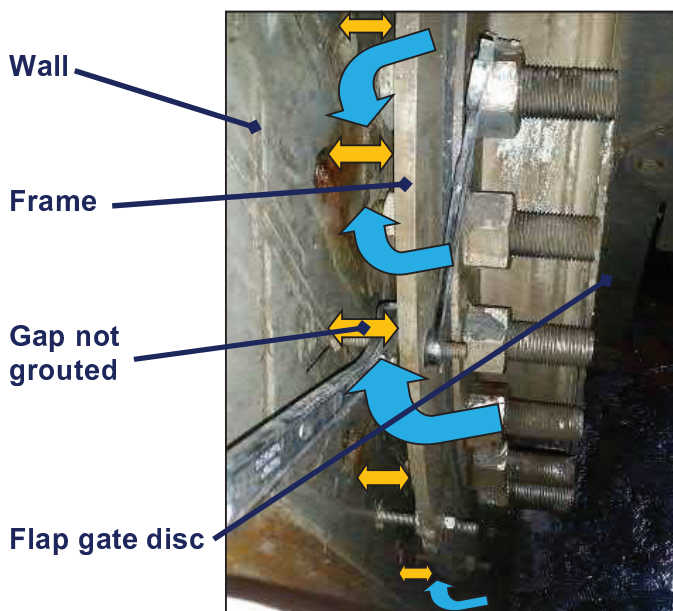
1050mm flap gate



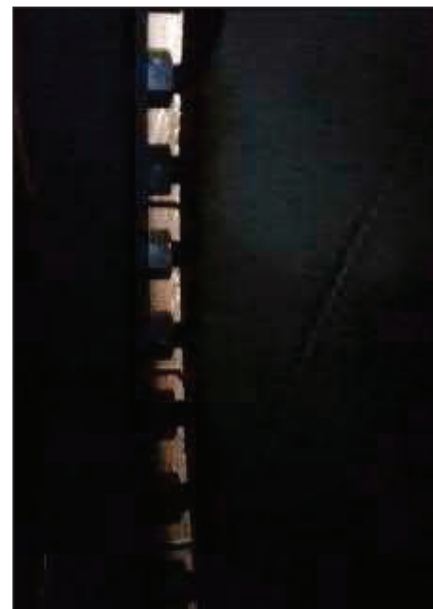
Equipment manufacturer nameplate

1- FRAME NOT GROUTED **CHANDOS**

Situation: The original flap gate installation works was not properly completed. The frame was not grouted on the wall as it should be; leaving a couple inches gap all around the frame circumference thus creating heavy leakage. *Refer to pictures below.*



Water is bypassing the flap gate



View from inside the pipe

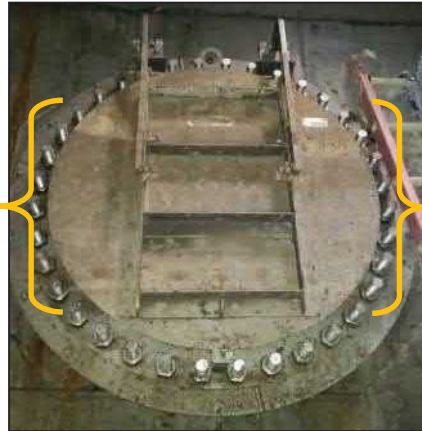
Recommendations: The flap gate frame must be properly grouted using high performance non-shrink grout suitable for this application.

Between Tuesday September 29 and Wednesday October 7 2020 Dave Stout of Chandos formed, poured Sika 212 grout to gap between 1050mm flap gate and concrete wall and stripped forms.

2- FLAP GATE ADJUSTMENT **VANEX**

Situation: The flap gate disc seating surface was not perfectly seating evenly onto the lip seal on both sides. There was up to a +/-2mm gap at two sections of the seating circumference.

Recommendations: Since the frame was not grouted yet, we have taken this "opportunity" to perform our self the required frame adjustment during this inspection. We loosen the front nuts and restraighten the frame using the backing nuts of the frame anchors. We were able to closed the gaps between the disc and the seal fairly easily. The frame is now ready to be poured. *Refer to picture below.*



+/- 2mm gap sections



Frame readjustment using anchors back nuts

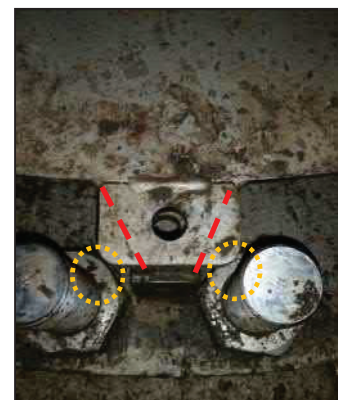
Donald Cote of Vanex inspected proper seal before and after placement of grout by Chandos

3- SHIPPING BRACKET INTERFERENCE **CHANDOS**

Situation: In order to avoid damage to the equipment during the shipping process, the manufacturer welded a shipping bracket to secure the flap gate in full close position. We noticed that this bracket could potentially interfere with the two frame nuts nearby. Therefore, if the flap gate is closing slightly sideways, this bracket will sit on the nuts and will prevent the disc to fully close. *Refer to picture below.*

Recommendations: We recommend to "zipcut" some of the bracket material on both sides (red lines on the picture aside) in order to get an acceptable clearance with the frame nuts.

Dave Stout of Chandos cut shipping bracket off entirely (at weld) Wednesday September 30 2020



Frame bottom section

This is a confined space approximately 10 meters deep. VANEX will work on the sluice gate. CHANDOS will install pedestal bracket and remove ladder cage from 1st level ladder. Confined space support is required for VANEX scope of work.

EQUIPMENT IDENTIFICATION

Customer ID.....15-SGV-6001 Outfall valve
 Type of equipment.....Cast iron wedge-action sluice gate
 Manufacturer..... ARMCO
 Dimensions..... 42"X42"
 Motorization..... ROTORK



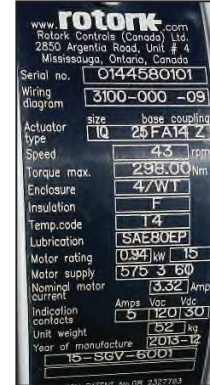
ARMCO sluice gate



Manufacturer nameplate



Pedestal and actuator



Nameplate

1- ACTUATOR NOT PROPERLY ADJUSTED

VANEX

Situation: The gate was automatically stopping at 75mm before reaching it full close position. After looking deeper into the actuator settings, we noticed that the full close limit switch was not properly adjusted. Therefore, this gate was heavily leaking due to this situation. Otherwise, this sluice gate is generally in good condition. Refer to pictures below.



ARMCO sluice gate



Full close wedges at 75mm away

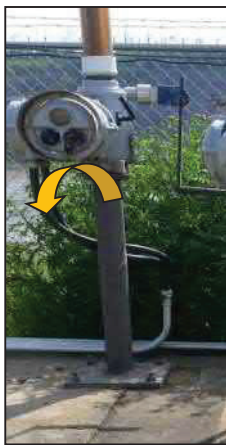
Recommendations: The actuator will need to be re-calibrated in order to have the sluice gate reaching it full close position. Eventually, the wedges will also require some adjustment to properly compress the slide sealing system against the frame seat.

Donald Cote of Vanex with the assistance of Dave Stout of Chandos repaired these problems Tuesday October 6 2020, it was found that there was some sort of grout as well as sand and gravel in the depression for the alignment pins at the bottom of the sluice gate, this was the main reason the gate would not fully close. The depression was chiseled/cleaned out, the sluice gate operating shaft was removed and straightened and the fully closed depth was reset with in the Rotork motor. To ensure proper closing in the future it is recommended the the depression at sluice gate bottom be cleaned

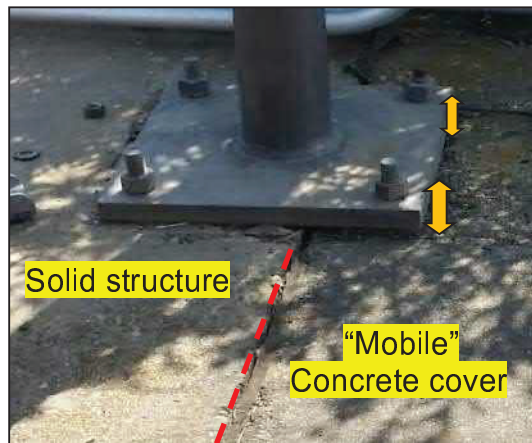
Install new pedestal bracket to secure pedestal to concrete base

2- PEDESTAL PARTIALLY BOLTED ON CONCRETE COVER CHANDOS

Situation: This gate is a rising stem type. With this operating arrangement, the pedestal (along with the actuator) is the key component and it is taking the entire sluice gate operating thrust. Therefore, it must be strongly secured onto a structural concrete floor slab or proper supports. However, the pedestal of this “Outfall sluice gate” have only two anchors bolted in the concrete slab and two anchors bolted inside a “mobile” concrete cover which is not attached to the structure. When the gate is reaching near the full close position, the concrete cover is moving upward thus bending the operating stem and not closing the gate. This could be the reason why the full close setting of the actuator was originally adjusted before the sluice gate is reaching it full close position. Refer to pictures below.



The pedestal is moving to the left because the cover is moving upward when closing the sluice gate



Operating stem and guides view from underneath

Recommendations: The pedestal must be anchored onto a fix and structurally sound surface. It could be possible to have a stainless steel bracket bolted on the thickness of the concrete slab in order to bolt on the 2 anchors that are actually on the “mobile” concrete cover. Another possibility is to extend the structural concrete slab underneath the entire pedestal. This will require a structural engineer to determine the best solution to solve this situation. We also recommend to have the operating stem straightness verify to make sure there is no permanent bent since it will affect the sluice gate operation. When all modifications and installation is completed the actuator switches will need to be readjusted as well as the closing wedges to make sure the gate is reaching it full close position and the actuator will stop before forcing/damaging any components.

October 1 2020 Dave Stout of Chandos added 2 steel base plates anchored to the concrete vault top with Hilti anchors and Hilti Hit, October 2 Northweld welded steel brackets to new base plates and existing sluice gate operating pedestal base plate, 2 C channel were then bolted across all there base plates. During sluice gate adjustments on October 6 it was found that this completely fixed the problem of unwanted movement in sluice gate operating shaft.

OUT OF SCOPE**3- SLUICE GATE WALL TIMBLE BROKEN**

Situation: This ARMCO sluice gate is bolted directly against a “wall timble”. A wall timble is a heavy-duty frame embedded in the concrete wall with the female thread bolt pattern that is matching with the sluice gate. The gate itself has a square opening but the outfall pipe is round. The downstream side of the wall timble is design to match with the outfall pipe diameter. However, we noticed that the junction of the wall timble and the outfall pipe is broken at the bottom section. We suspect that the outfall pipe has moved downward but since the wall timble was strongly poured in the concrete wall it could not follow so it has broken at the bottom section. Also, we can see that the soil is coming out from erosion at the broken junction thus it may create supporting issues in the future. Refer to pictures below.



View inside the outfall pipe



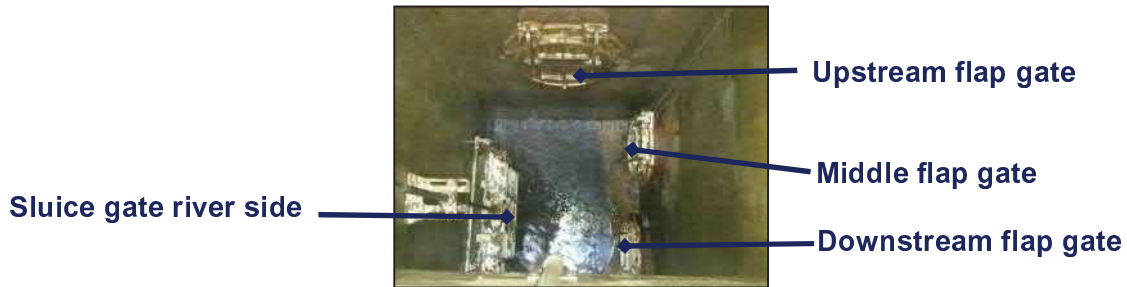
Wall timble broken section

Recommendations: We recommend to have an engineer to investigate deeper into this situation in order to avoid further issues.

4- OUTFALL CHAMBER FLAP GATES No.1, No.2 & No.3

CHANDOS/VANEX

Situation: Since we were inside the outfall chamber, we took a quick look at the 3 ARMCO flap gates installed inside it. Those are all in good working condition without damages on the disc, hinges nor the frames. However, the anchor bolts are in steel and slightly corroded. Also, one anchor is loose on the middle flap gate that will need to be repaired or replaced. *Refer to pictures below.*



Upstream side of river



Middle flap gate



Downstream

CONCLUSION

During this site visit we were able to safely and properly complete our scope of work by inspecting the "outfall" ARMCO sluice gate and the two leaking FONTAINE flap gates as described in this report. We had a very good collaboration and support from all people involved at the jobsite.

Do not hesitate to contact us for further information or if precisions are needed concerning this Buffalo Region water outfall project report.

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donald@vanex.pro
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LANSAS
PRODUCTS
Manufactured by Vanderlans & Sons, Inc.



New 5-LINE MULTI-SIZE FRONT & BACK PLUGS



The new 5-Line™ Multi-Size Front and Back Plugs are better in a number of ways. The most noticeable difference is in the very unique new design featuring the LANSAS proprietary "Flat-Rib"™ design which holds 60% more back pressure than standard O-ring ribbed plugs. We are using our improved reformulated rubber and laying the fabric in a way that the plugs can get the widest range of use on the market today. As with all other LANSAS products included in the 5-Line™ group, our 5-Line™ Multi-Size Front and Back plugs are equipped with the LANSAS **RPE** Rupture Protection. We trust in this design enough to back it with the 5-Line™ 5 YEAR WARRANTY. If you are looking for the most Return on Investment look no further than the LANSAS 5-Line™ where once again it shows LANSAS is BETTER BY DESIGN™ since 1955.

**Custom Designs
Are Always™ Available**



DOMEHEAD™ FRONT & BACK PLUGS

Patent # 5,785,090 Patent # 5,379,802 Patent # 4,079,755

THE LANSAS DOMEHEAD™ is the most durable multi-size pipe plug available. The unique design of this plug is covered under two U.S. patents. The first patent relates to the 2-ply of cross biased tire cord reinforcement (more on larger sizes). This design allows for controlled expansion of the plug. As this plug inflates it gets larger in diameter and shorter in length. By changing the shape of the plug rather than stretching the rubber we are able to make contact in the pipe at a lower pressure. This gives us higher contact pressure per square inch at an overall lower inflation pressure. Contact area and pressure are everything.

The second patent covers our superior end design. The ends are reinforced with a steel "spider™" ring wrapped in fabric. The fabric extends from the spider™ into the body of the plug. This advanced design transfers the stress of the inflation through the fabric to the steel spider™ ring leaving the bond at the base plate at a more relaxed state.



RUPTURE PROTECTED DOMEHEAD™ PLUGS

LANSAS RUPTURE PROTECTED PLUGS have a built in air relief valve that will prevent the plug from being over inflated due to faulty gauges or operator error. Once the valves cracking pressure is reached the Lansas **RP**™ Valve will open relieving the excess pressure. The **RP**™ Valve will reset at, or just below the required inflation pressure for the plug.

RP™ RUPTURE PROTECTED PLUG

Features:

- Eliminate operator error
- No broken discs to be replaced
- Plug stays in service
- Valve is recessed to prevent damage
- **RP**™ valves now available on most Multi Size Plugs
- Manufactured by Lansas Products
- Don't be sold by cheap imitations of the original
- Another original design by Lansas Products



LANSAS Newly Redesigned Protective Sleeves

The LANSAS Protective Sleeve now has large D-Rings in place of the typical loops you see on other manufacturer's sleeves. This simple design improvement is superior in strength and makes it much easier to restrain the sleeve using the LANSAS SMART-SECURE™ Protective Sleeve Cable Restraint System.

These D-Rings are tied into the sleeve with 2-Ply's of biased cord fabric for added strength to ensure years of reliable service. LANSAS Protective Sleeves help protect the plug while in the pipeline saving it from damage from debris, degraded pipe, barnacles, and more while in the pipeline. Additionally, it protects the Pipe Plug, your real investment, while on harsh job sites when stored improperly or simply from being moved from spot to spot during normal use.

LANSAS Protective Sleeves often times can be repaired at the LANSAS Factory Warehouses where repairs are complete.



IMPROVED



5 LINE MULTI-SIZE PLUGS

MULTI-SIZE BACK PLUG						
PART NUMBER	RANGE OF USE		REQUIRED INFLATION PRESSURE	MAXIMUM BACK/TEST PRESSURE	BYPASS SIZE	PRODUCT DIMENSIONS
	MINIMUM PIPE DIAMETER	MAXIMUM PIPE DIAMETER				
550-816	7.4"	16.25"	30 psi	15 psi	N/A	32.0" 7.3" 14 lbs.
550-1018	9.1"	18.25"	30 psi	15 psi	N/A	35.0" 9.0" 21 lbs.
550-1224	10.6"	24.25"	30 psi	15 psi	N/A	41.5" 10.5" 30 lbs.
MULTI-SIZE FRONT PLUG						
551-1018	9.1"	18.25"	30 psi	15 psi	3/4" + 1/4"	35.0" 9.0" 26 lbs.
551-1224	10.6"	24.25"	30 psi	15 psi	3/4" + 1/4"	41.5" 10.5" 37 lbs.

Plug for 900 mm steel pipe

ITEM 1 IN PRICE LIST

MULTI-SIZE DOMEHEAD™ BACK PLUG

PART NUMBER	RANGE OF USE		REQUIRED INFLATION PRESSURE	MAXIMUM BACK/TEST PRESSURE	PRODUCT DIMENSIONS	WEIGHT
	MINIMUM PIPE DIAMETER	MAXIMUM PIPE DIAMETER				
050-46	3.5"	6.25"	30 psi	15 psi	9.5" 3.5"	1 lbs.
050-610	5.3"	10.25"	30 psi	15 psi	19.7" 5.0"	4 lbs.
050-812	7.3"	12.25"	25 psi	15 psi	20.0" 7.0"	8 lbs.
050-1016	9.5"	16.25"	25 psi	15 psi	30.0" 9.30"	19 lbs.
050-1218	11.5"	18.25"	25 psi	15 psi	30.0" 11.0"	29 lbs.
050-1224	11.5"	24.25"	25 psi	15 psi	41.0" 11.0"	33 lbs.
050-1530	14.0"	30.25"	20 psi	8 psi	55.0" 13.0"	48 lbs.
050-1530RP	14.0"	30.25"	20 psi	8 psi	55.0" 13.0"	50 lbs.
050-2036	19.0"	36.25"	20 psi	8 psi	64.0" 18.5"	71 lbs.
050-2036RP	19.0"	36.25"	20 psi	8 psi	64.0" 18.5"	73 lbs.
050-2448	22.0"	48.25"	15 psi	8 psi	84.0" 21.5"	102 lbs.
050-2448RP	22.0"	48.25"	15 psi	8 psi	84.0" 21.5"	104 lbs.
050-3660	34.5"	60.25"	10 psi	6 psi	84.0" 29.5"	187 lbs.
050-3660RP	34.5"	60.25"	10 psi	6 psi	84.0" 29.5"	189 lbs.
050-4278	37.0"	78.25"	10 psi	6 psi	101.0" 37.0"	314 lbs.
050-4278RP	37.0"	78.25"	10 psi	6 psi	101.0" 37.0"	316 lbs.
050-4872	46.0"	96.25"	10 psi	6 psi	84.0" 43.5"	331 lbs.
050-4872RP	46.0"	96.25"	10 psi	6 psi	84.0" 43.5"	333 lbs.
050-5496	53.0"	96.25"	10 psi	6 psi	114.0" 51.0"	496 lbs.
050-5496RP	53.0"	96.25"	10 psi	6 psi	114.0" 51.0"	498 lbs.
050-6096	58.0"	96.25"	10 psi	6 psi	110.0" 56.0"	515 lbs.
050-6096RP	58.0"	96.25"	10 psi	6 psi	110.0" 56.0"	517 lbs.

ITEM 2 & 4 IN PRICE LIST

Plug for 1200 mm concrete pipe

MULTI-SIZE DOMEHEAD™ FRONT							
PART NUMBER	RANGE OF USE		REQUIRED INFLATION PRESSURE	MAXIMUM BACK/TEST PRESSURE	BY-PASS SIZES	PRODUCT DIMENSIONS	
	MINIMUM PIPE DIAMETER	MAXIMUM PIPE DIAMETER				LENGTH	WEIGHT
051-46	3.5"	6.25"	30 psi	15 psi	1/4" + 1/4"	9.5"	2 lbs.
051-610	5.3"	10.25"	30 psi	15 psi	1/2" + 1/4"	18.0"	7 lbs.
051-812	7.3"	12.25"	25 psi	15 psi	3/4" + 1/4"	20.0"	10 lbs.
051-1016	9.5"	16.25"	25 psi	15 psi	3/4" + 1/4"	27.5"	20 lbs.
051-1218	11.5"	18.25"	25 psi	15 psi	3/4" + 1/4"	28.5"	30 lbs.
051-1224	11.5"	24.25"	25 psi	15 psi	3/4" + 1/4"	41.0"	35 lbs.
051-1530	14.0"	30.25"	20 psi	8 psi	3/4" + 1/4"	55.0"	50 lbs.
051-1530RP	14.0"	30.25"	20 psi	8 psi	3/4" + 1/4"	55.0"	52 lbs.
051-2036	19.0"	36.25"	20 psi	8 psi	3/4" + 1/4"	64.0"	73 lbs.
051-2036RP	19.0"	36.25"	20 psi	8 psi	3/4" + 1/4"	64.0"	75 lbs.
051-2448	22.0"	48.25"	15 psi	8 psi	3/4" + 1/4"	84.0"	105 lbs.
051-2448RP	22.0"	48.25"	15 psi	8 psi	3/4" + 1/4"	84.0"	107 lbs.
051-3660	34.5"	60.25"	10 psi	6 psi	3/4" + 1/4"	84.0"	190 lbs.
051-3660RP	34.5"	60.25"	10 psi	6 psi	3/4" + 1/4"	84.0"	192 lbs.
051-4278	37.0"	78.25"	10 psi	6 psi	3/4" + 1/4"	101.0"	318 lbs.
051-4278RP	37.0"	78.25"	10 psi	6 psi	3/4" + 1/4"	101.0"	320 lbs.
051-4872	46.0"	96.25"	10 psi	6 psi	3/4" + 1/4"	110.0"	337 lbs.
051-4872RP	46.0"	96.25"	10 psi	6 psi	3/4" + 1/4"	110.0"	339 lbs.
051-5496	53.0"	96.25"	10 psi	6 psi	3/4" + 1/4"	114.0"	501 lbs.
051-5496RP	53.0"	96.25"	10 psi	6 psi	3/4" + 1/4"	114.0"	503 lbs.
051-6096	58.0"	96.25"	10 psi	6 psi	3/4" + 1/4"	110.0"	520 lbs.
051-6096RP	58.0"	96.25"	10 psi	6 psi	3/4" + 1/4"	110.0"	522 lbs.

NOTE: 10" x 16" PLUGS AND LARGER HAVE 2 INFLATION PORTS. (1) STANDARD 1/4" (F) NPT AND (1) SECONDARY 1/2" (F) NPT.

ITEM 2 & 4 IN PRICE LIST

PROTECTIVE SLEEVES		
PART NUMBER	FITS PLUGS WITH NOTED PART NUMBERS	WEIGHT
069-610	050-610, 051-610	2.5 lbs.
069-610FT	093-610	2.5 lbs.
069-812	050-812, 051-812	3 lbs.
069-812FT	092-812, 094-812, 096-812	3 lbs.
059-816	550-816	5 lbs.
069-1016	050-1016, 051-1016	6 lbs.
069-1016FT	094-1016, 096-1016, 098-1016	6 lbs.
059-1018	550-1018, 051-1018	8 lbs.
069-1218	050-1218, 051-1218	10 lbs.
069-1218FT	094-1218, 096-1218, 098-1218	10 lbs.
059-1224	550-1224, 551-1224	15 lbs.
069-1224	050-1224, 051-1224	14 lbs.
069-1224FT	094-1224, 096-1224, 098-1224	14 lbs.
069-1530	050-1530, 051-1530, 094-1530S	21 lbs.
069-1530FT	094-1530H, 096-1530, 098-1530	21 lbs.
069-2036	050-2036, 051-2036, 094-2036S	28 lbs.
069-2036FT	094-2036H, 096-2036, 098-2036	28 lbs.
069-2448	050-2448, 051-2448, 094-2448, 096-2448, 098-2448	53 lbs.
069-3660	050-3660, 051-3660, 094-3660, 096-3660, 098-3660	78 lbs.
069-4278	050-4278, 051-4278, 094-4278, 096-4278, 098-4278	93 lbs.
069-4872	050-4872, 051-4872, 094-4872, 096-4872, 098-4872	89 lbs.
069-5496	050-5496, 051-5496, 094-5496, 096-5496, 098-5496	160 lbs.
069-6096	050-6096, 051-6096, 096-6096, 098-6096	166 lbs.

Custom sleeves always available

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I-SERIES TEST-BAK PLUGS (NO BYPASS TUBE)



Cherne's I-Series plugs were designed to meet the needs of both the US and International markets in terms of size and expansion range. Our I-Series plugs have full body cording for added durability.

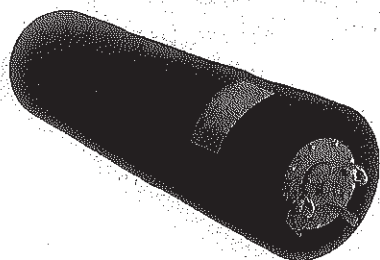
I-Series Plug Features:

- Superior expansion range
- Small deflated diameters
 - All plugs up through our 24-60" size easily fit through a 24" manhole frame
 - 48-72" and 54-96" plugs fit through 36" openings

15-32" and Larger Plug Features:

- Aluminum end plates – minimizes rust/corrosion
- 3/4" eyebolts on plugs 15-32" and larger – better holding strength
- Patented field replaceable rupture discs or pressure relief valves on plugs 15-32" and larger – protects plug from over-inflation

I-SERIES PLUGS



Protective sleeves available for 12"-18" diameter and larger plugs. See page 23.

PART NUMBER	NOMINAL SIZE	USAGE RANGE	MAXIMUM BACK PRESSURE	INFLATION PRESSURE	PRODUCT WEIGHT	DEFLATED LENGTH	DEFLATED DIAMETER	INFLATION THREAD	CHAIN / EYE BOLTS
310328	15"-32" (380-800 mm)	15"-32" (380-800 mm)	**	25 (1.72 bar)	65 lbs (29.5 kg)	48" (1220 mm)	14.3" (363 mm)	1/4" & 1/2"	3/4" (2)
310408	20"-40" (500-1000 mm)	19"-40" (475-1000 mm)	**	22 psi (1.5 bar)	66 lbs (30 kg)	46.25" (1175 mm)	18.5" (470 mm)	1/4" & 1/2"	3/4" (2)
310488	24"-48" (600-1200 mm)	20.5"-60" (521-1270 mm)	**	22 psi (1.5 bar)	125 lbs (57 kg)	68" (1730 mm)	19.1" (485 mm)	1/4" & 1/2"	3/4" (2)
310600	24"-60" (600-1500 mm)	20.5"-60.5" (520-1537 mm)	**	22 psi (1.5 bar)	140 lbs (63.6 kg)	88" (2235 mm)	19.1" (485 mm)	1/4" & 1/2"	3/4" (2)
310728	48"-72" (1200-1800 mm)	44"-72.25" (1118-1835 mm)	**	12 psi (0.83 bar)	290 lbs (132 kg)	100" (2540 mm)	43" (1092 mm)	1/2" (2)	3/4" (3)
310968	54"-96" (1400-2400 mm)	54"-96.25" (1400-2450 mm)	**	11 psi (0.75 bar)	500 lbs (228 kg)	128" (3200 mm)	50" (1270 mm)	1/2" (2)	3/4" (3)

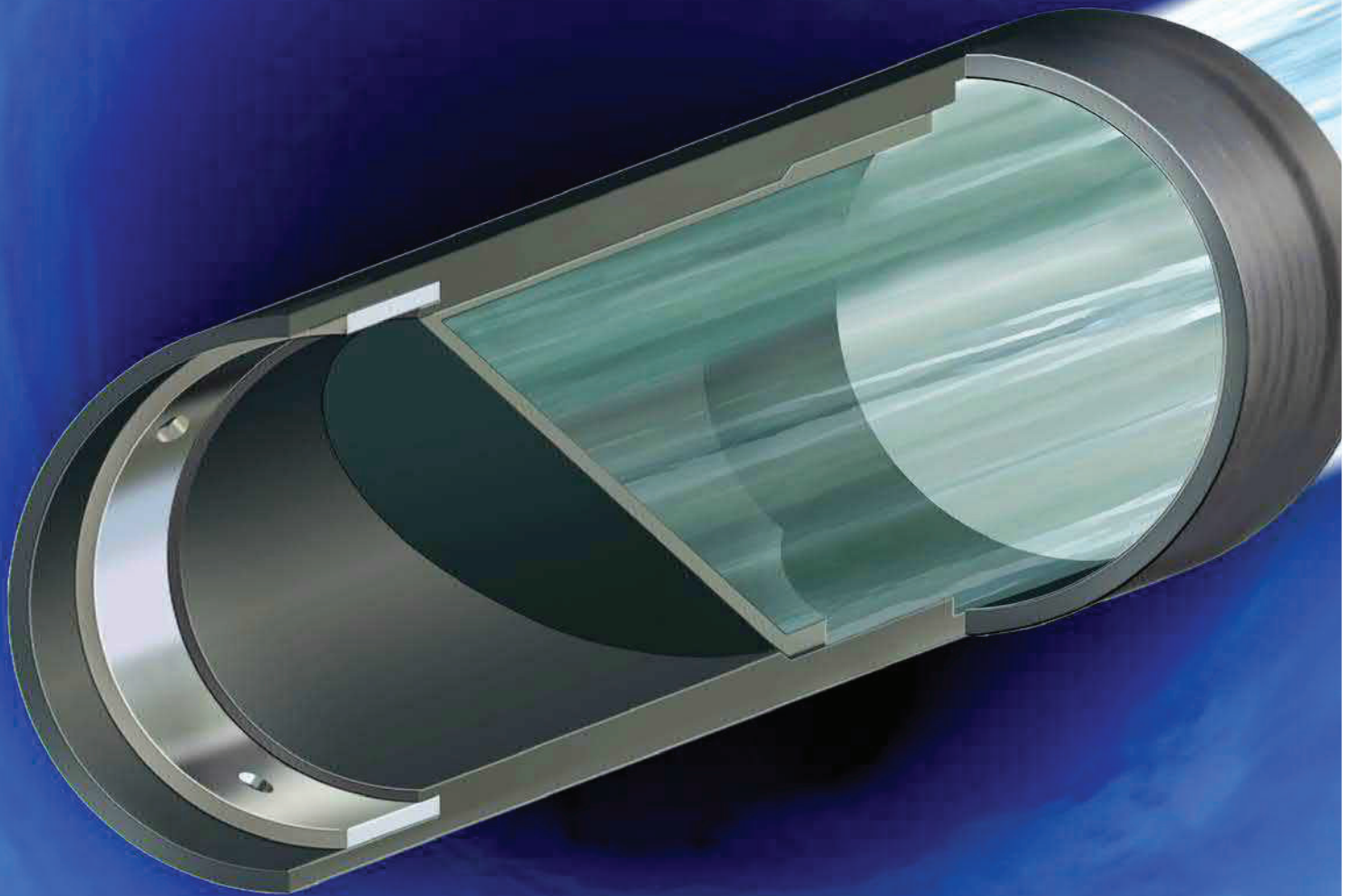
** Consult back pressure table below.

BACK PRESSURE DATA: I-SERIES PLUGS

PLUG SIZE	PIPE DIAMETER																		
	4"	6"	8"	12"	15"	18"	19.35"	21"	24"	30"	36"	42"	48"	54"	60"	66"	72"	84"	96"
15"-32"	-	-	-	-	18.6 psi	17.6 psi	17.2 psi	16.6 psi	15.4 psi	12.2 psi	-	-	-	-	-	-	-	-	-
20"-40"	-	-	-	-	-	-	-	13.6 psi	12.5 psi	11.2 psi	10.2 psi	8.7 psi	-	-	-	-	-	-	-
24"-48"	-	-	-	-	-	-	-	-	15.2 psi	13.9 psi	12.8 psi	11.4 psi	10.1 psi	-	-	-	-	-	-
24"-60"	-	-	-	-	-	-	-	-	15.6 psi	15.2 psi	14.8 psi	14.0 psi	12.6 psi	9.6 psi	6.0 psi	-	-	-	-
40"-60"	-	-	-	-	-	-	-	-	-	-	-	15.0 psi	13.0 psi	11.0 psi	8.7 psi	-	-	-	-
48"-72"	-	-	-	-	-	-	-	-	-	-	-	-	7.2 psi	6.8 psi	6.4 psi	6.2 psi	6.0 psi	-	-
54"-96"	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3 psi	7.2 psi	6.9 psi	6.8 psi	6.6 psi	6.4 psi

Consult page 69 for back pressure conversion to feet of head pressure.

ALWAYS BLOCK PLUGS WHEN CONDUCTING AIR TESTS.



Continuing a Legacy of Innovation, Leadership and Customer Service

More than 60 years ago, Red Valve Company was founded on a simple promise: provide the highest quality engineered valves backed by an unsurpassed level of technical innovation and customer service. With that promise began a legacy of leadership—and a never-ending quest to solve the world's toughest flow control challenges while exceeding our customers' expectations.

As the world leader in Pinch Valve and Check Valve technology, that legacy lives on every day at Red Valve Company, and the innovative CheckMate® Inline Check Valve is proof. The CheckMate® Inline Check Valve is rooted in the same superior understanding of elastomer technology as the legendary Tidellex® Check Valve, one of the most well-known valves proven for providing reliable long-lasting backflow prevention, across the globe.

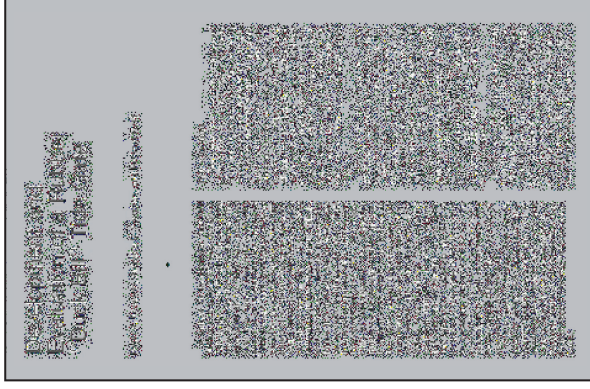
Being a world leader in valve technology is more than a slogan—it's a promise, carried forward by the hundreds of dedicated Red Valve employees and sales representatives around the world. Call us any time. We are ready to speak with you personally—right now.



The patented CheckMate® Inline Check Valve is rooted in the same superior understanding of elastomer technology as the legendary Tidellex® Check Valve, one of the most well-known valves in the world.

A Pioneer in the Check Valve Industry

In 1984, the United States Environmental Protection Agency (EPA) commissioned Red Valve Company to develop and test an alternative to tide gate valves. In their report, Development and Evaluation of a



Rubber "Duck Bill" Tide Gate, the EPA states, "Increasing the reliability and performance of tide gates has a beneficial impact on the general pollution abatement program for the nation's waterways."

In response, Red Valve Company developed and patented its elastomer "duckbill" Tidellex® Check Valve to eliminate the operational and maintenance problems associated with flapgate check valves, including corrosion of mechanical parts, freezing open or shut, warping and clogging due to entrapped debris.

The EPA rigorously tested the Tidellex® Check Valve for two years and found that the valve showed, "Significant improvement over flapgate valves in terms of leakage inflow, entrapment of debris, capability to self clean and susceptibility to marine fouling."

Since the creation of the Tidellex® Check Valve in 1984, years of research and development, testing and proven performance has led to the globalization of the TF-2 Tidellex® Check Valve and the next generation Tidellex® TF-1. With improved flow efficiency characteristics and the latest technology in elastomers, Red Valve continues to deliver on its promise of staying on the forefront of technology and new product development. The Tidellex® name is respected and recognized around the world as the most reliable valve for backflow prevention. It is also worth noting that the first Tidellex® Check Valve sold in 1984 is still in service today, with more than 700,000 Tidellex® Check Valves in service around the world, reliably solving inflow and intrusion problems.



CheckMate® Valve Solves City's Odor Problem

When foul odors were plaguing a soybean producing town in Illinois, officials turned to Red Valve for the most reliable, cost-effective solution.

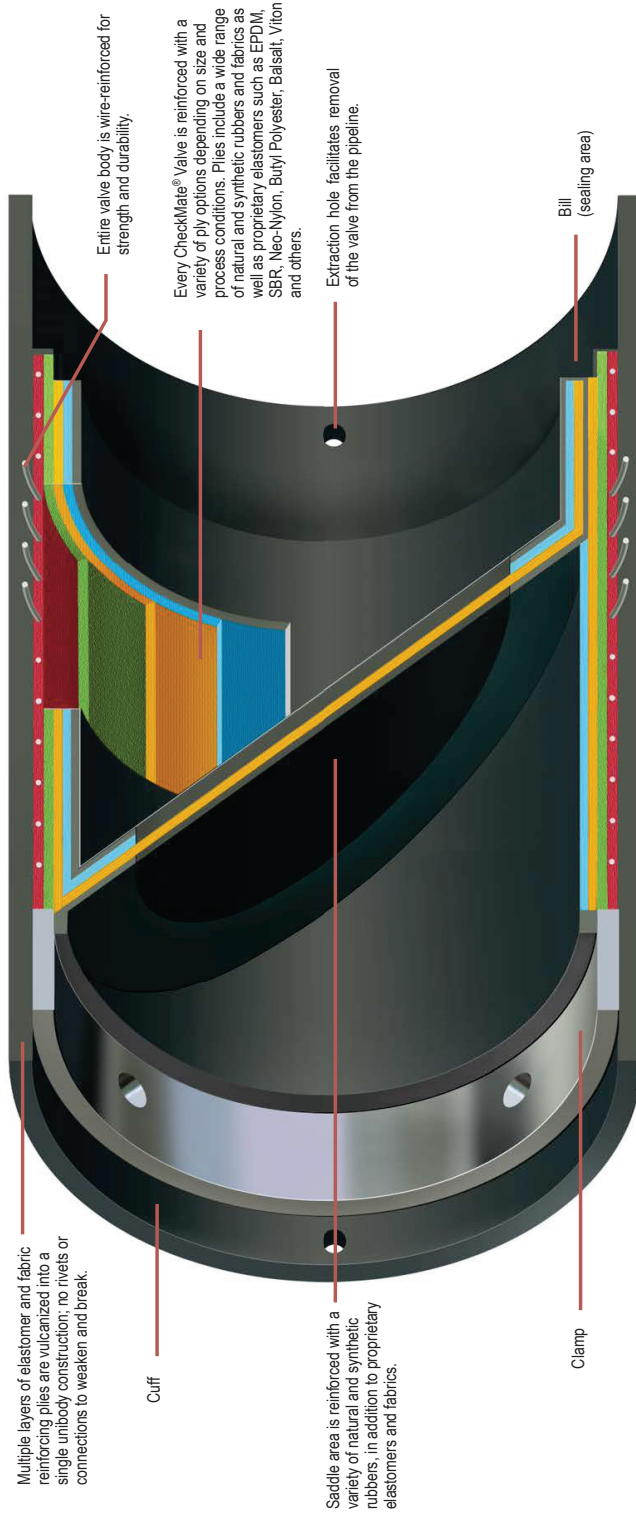
A chemical deodorizing system and a pump station were also evaluated, but far exceeded budget constraints. The CheckMate® Inline Check Valve proved to be the perfect solution.

The CheckMate® Inline Valve was installed in 2012 and has worked flawlessly ever since, completely blocking the backdraft of the odor. Best of all, there has been zero maintenance expense. According to a public works official, "This is one of the most cost-effective solutions to a nagging quality of life problem the City has ever implemented. We are now looking at other parts of the combined sewer system that has a few small odor problems due to escaping sewer gas."



For an animated demonstration of the CheckMate® in operation, please visit: <http://www.tidelflex.com/checkmate>

There Is Only One CheckMate® Inline Valve!

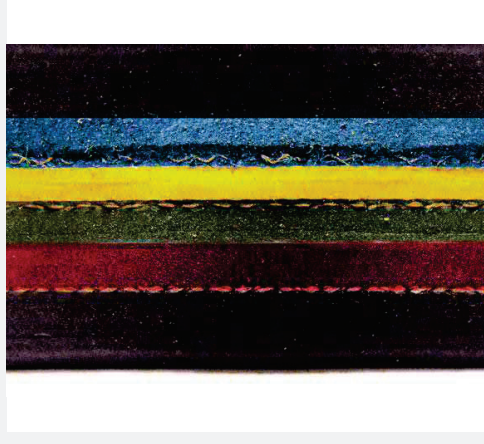


The CheckMate® Inline Check Valve: Accept No Substitutes!

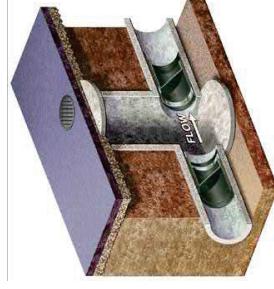
The innovative CheckMate® Inline Check Valve has quickly become the specified choice for inline residential, municipal and commercial areas where complete, dependable backflow prevention is critical. It has also become the valve of choice for municipal and industrial applications such as storm water, wastewater, highway runoff, CSO, SSO and flood control by preventing unwanted backflow that can cause surges and flooding. The CheckMate® Inline Check Valve minimizes damage to wetlands, beaches and residential areas and

eliminates hydraulic surges to wastewater treatment plants, saving municipalities millions of dollars in maintenance and treatment costs.

One of the keys to the CheckMate® Valve's exceptional dependability and longevity is Red Valve's unmatched elastomer experience—experience, application knowledge and engineering know-how. Every CheckMate® Inline Check Valve is hand-fabricated, made of multiple layers of varying natural and



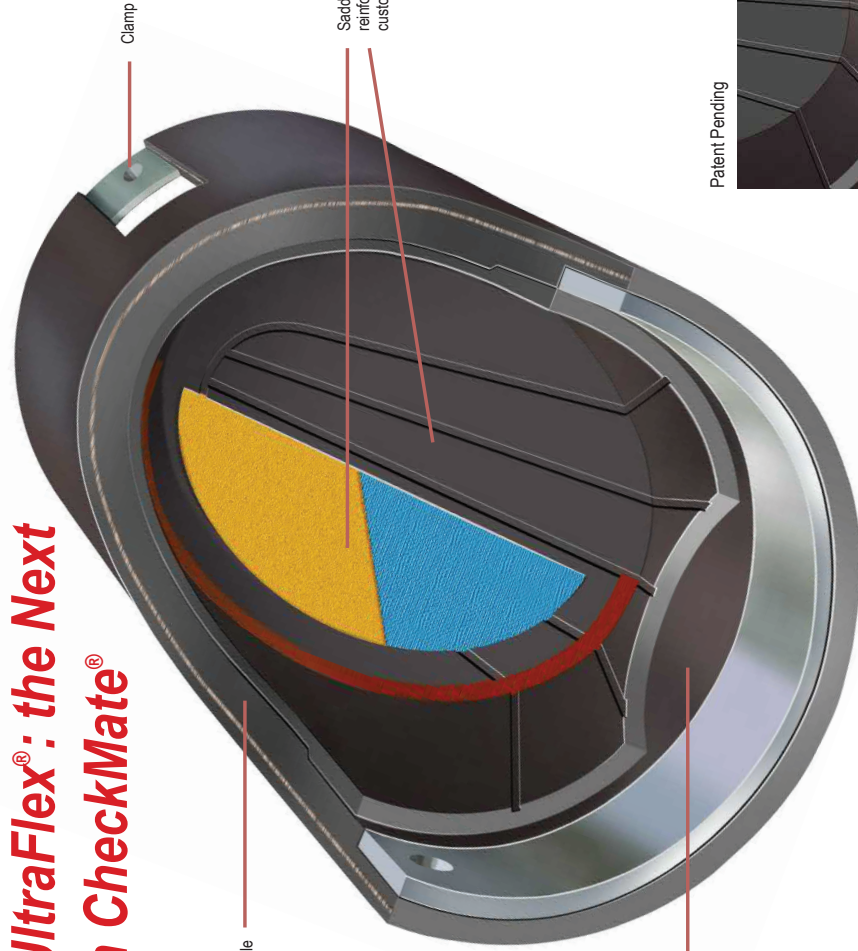
Red Valve's legendary elastomer technology and knowledge is the real story behind the CheckMate® Valve's unrivaled performance. Every CheckMate® Valve is reinforced with various natural and synthetic plies, specifically engineered for your specific application.



CheckMate® Inline Check Valves use state-of-the-art elastomers and fabric technology with no metal hinges, rivets, fasteners or moving parts. The valve's unibody construction is ideally suited for CSO and diversion chamber applications and installed inside the pipeline on either the upstream or downstream side of a diversion chamber.

Introducing UltraFlex®: the Next Generation in CheckMate® Technology!

Entire valve is vulcanized into a single unibody construction; no rivets or connections to weaken and break.



The "Arc Notch" in the UltraFlex® Valve's bill functions as a hinge, greatly reducing the forces required to unseat the valve. This patented design achieves a very low snap-open pressure.

Unmatched Elastomer Research, Innovation and Knowledge

The patented CheckMate UltraFlex® Inline Check Valve features drastically improved hydraulic and performance characteristics to its predecessor, the original CheckMate® Check Valve. Strategically placed reinforcing ribs, segmented pads and the "Arc Notch" bill combine to significantly improve flow efficiency with significantly reduced headloss, while providing absolute backflow protection.

Once upstream head pressure reaches a specific level, CheckMate® Inline Check Valves are designed to "snap" or "pop"

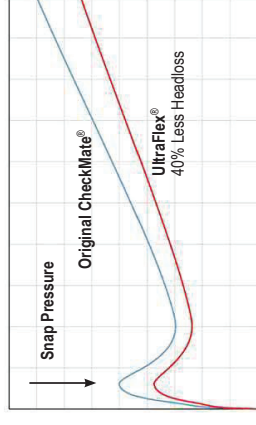
Saddle area features strategically placed reinforcing ribs and segmented pads customized for each application.

Patent Pending



Strategically placed reinforcing ribs, segmented pads and the bill's unique "Arc Notch" combine to significantly improve flow efficiency with significantly reduced headloss while providing absolute backflow protection.

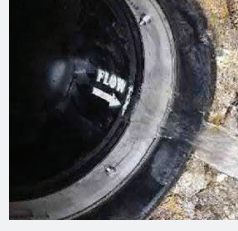
UltraFlex® Boasts 40% Lower "Snap Pressure"



The new CheckMate UltraFlex® Valve boasts a 40% lower snap pressure requirement to open or unseat the valve, without compromising the valve's ability to seal. This greatly improves capacity in pipelines and the rapid drainage of upstream flow through the valve. With its patented "Arc Notch" design, the CheckMate UltraFlex® Inline Check Valve boasts a significantly improved flow efficiency, due to reduced head pressure levels required to "snap" open the valve.



When upstream head reaches 50-75% of pipe diameter (for example, 9" head in a 12" valve), the UltraFlex® bill "snaps" open into a concave shape, allowing substantially more flow with the same amount of head. The valve will progressively open with increased head and flow. Picture shows moment when the valve "snaps" open.

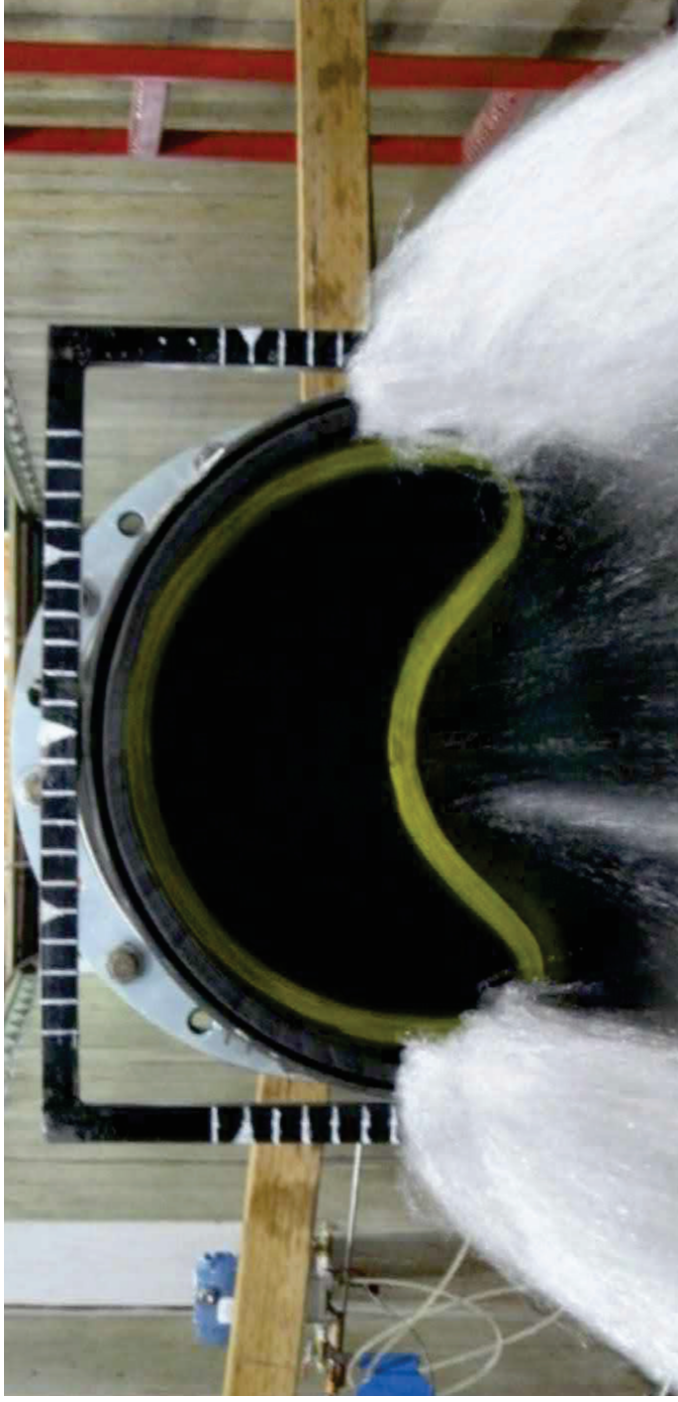


The CheckMate® Valve will crack open and flow with as little as 1" of head pressure.



Once the CheckMate® Valve "snaps" open, it achieves rapid discharge of flow.

Independently Tested, Field Validated



Independent Hydraulic Testing

CheckMate® Inline Check Valves are independently tested to determine their hydraulic characteristics in both free and submerged discharge applications. Published hydraulic data is validated through this independent testing, and Finite Element Analysis data is also provided to ensure the CheckMate® Valve meets your exact specifications. CheckMate® Valves are ideally suited for interceptor, manhole and outfall pipelines because

they allow flow to discharge with very little headloss and prevent backflow. The CheckMate® Valve's innovative inline design allows it to be easily installed without modifications to existing structures, making it the perfect choice for both municipalities and commercial property owners.

To supplement independent hydraulic testing, Red Valve continually conducts research and development and additional in-house testing to improve existing products and develop new products.



Thousands of CheckMate® Inline Check Valves are currently in service around the globe.

Features and Benefits of CheckMate®

- Extremely Low Headloss
- No Moving Mechanical Parts to Corrode, Catch Debris or Fail
- Heavy Duty Elastomer Unibody Construction
- Quick and Easy Installation
- Seals Around Debris
- Operates on Differential Pressure, Totally Passive
- Virtually No Maintenance
- Self-draining, 1" of Cracking Pressure
- Silent, Non-slaming
- Available in Sizes 3" (75 mm) to 84" (2100 mm)
- Extensive Independent Hydraulic Testing



CheckMate® Valves are ideally suited for interceptor, manhole and outfall pipelines, because they maximize pipeline storage and capacity while preventing backflow into upstream pipelines, collection systems and sewage treatment plants.

Simple Design for Simple Installation

The CheckMate® Inline Check Valve is extremely easy to install, regardless of the existing environment or piping. Its inherent design makes it the most user-friendly inline check valve on the market today. From the upstream or downstream end of the pipe, simply insert the valve into position and clamp it into place. Typically, no modification to the pipe or structure is required to install the CheckMate®. Because the CheckMate® is recessed inside of the pipe, additional permitting is not required. The results are construction cost savings, reduced installation time, and reduced operational costs.



CheckMate® Valves are easily installed regardless of difficult pipe end geometry or pipes in poor end condition. There is no need to rebuild headwalls.



A Wide Range of Shapes and Sizes

Elliptical, Arch and Rectangular Pipes

Elliptical, Arch and Rectangular Pipes for drainage and flood prevention projects have become popular, particularly in high water table areas with shallow surface gradients. CheckMate® Inline Check Valves are the perfect solution as they can be customized to meet your specifications.



Arch Pipe CheckMate®



Elliptical Pipe CheckMate®



Rectangular Pipe CheckMate®

Rubber Flanged

Rubber Flanged CheckMate® Valves can be manufactured with an integral rubber upstream or downstream flange. The flanged CheckMate® gets inserted into the host pipe, then can be bolted to a mating flange or anchored to a concrete headwall. The flange can be circular with standard drilling, or circular, square or rectangular with custom flange drilling. The valve is supplied with retaining rings for mounting.



Upstream Flanged CheckMate®

Thimble Inserts

A CheckMate® Thimble Insert is simply a CheckMate® Valve that is factory installed, clamped and pinned into flanged or plain-end pipe. The thimble insert assembly can either be inserted into the I.D. of the host pipe, or can be mounted to a mating flange or concrete headwall and extend beyond the pipe. Plain end thimble inserts are inserted into the host pipe and non-shrink grout is placed between the thimble insert O.D. and host pipe I.D. to form the seal.



CheckMate® Thimble Insert

2.1.b



Red Valve Company, Inc.

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Technologies

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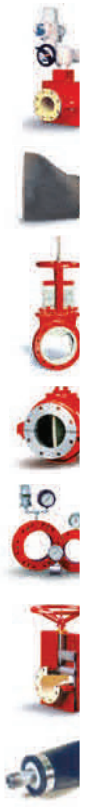
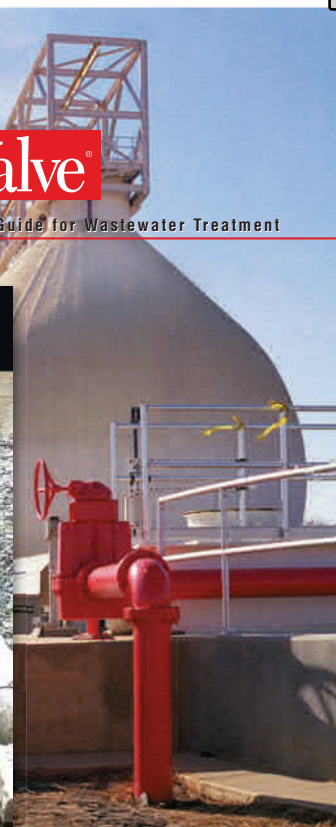
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Red Valve®

Valve Selection Guide for Wastewater Treatment



“Rely on Red” for a Total System Solution to Your Water and Wastewater Treatment Challenges

No other company can match Red Valve's “Total System Solution” for water and wastewater treatment plants and municipal collection and distribution systems.

Since 1953, Red Valve has provided products for each phase of collection, distribution, separation, aeration, treatment and final discharge. Our complete product line provides customers with one source for on/off and control valves, check valves, pressure measurement, expansion compensation, air diffusers and effluent diffusers. All Red Valve products are designed to handle the rigors of handling raw sewage, sludge, scum and grit with abrasion-resistant, non-clogging designs.

Contact us today for a free copy of our new “Total System Solution” brochure for Municipal Collection and Distribution, or our comprehensive Valve Selection Guide for Wastewater Treatment.



Quote

Mountainview Systems Ltd. provides BC, AB, and SK contractors, surveyors and municipalities with quality products and services designed to increase productivity and lower costs, while maintaining the highest level of accuracy

Quote Number:
Date: Oct. 22/20

EXPIRY DATE: Nov. 22/20

Prepared For: Sarah Bruce, Associated Engineering

Salesperson	Description	Shipping Method		Delivery Date	Payment Terms	# of Pages
EDM-HOUSE		PICKUP			NET30	

Item	Part #	Description	Qty	Each	Total
1	310408	Cherne 20"-40" Pipe Plug, no Bypass (10.2 PSI Back Pressure at 36")	2	\$3,802.00	\$7,604.00
2	310488	Cherne 24"-48" Pipe Plug, no Bypass (10.1 PSI Back Pressure at 48")	2	\$5,569.00	\$11,138.00
3	314408	Cherne 20"-40" Pipe Plug w/ 4" NPT Bypass (10.2 PSI Back Pressure at 36")	2	\$4,598.00	\$9,196.00
4	314488	Cherne 24"-48" Pipe Plug w/ 4" NPT Bypass (10.1 PSI Back Pressure at 48")	2	\$7,628.00	\$15,256.00
		Prices include 30' controller hose w/ 60 PSI gauge, valve & fittings for each			
		plug and freight from Brampton, Ontario to Edmonton			
		GST is extra			

Protective sleeves are \$1,925 each.

Attachment: 2020 Ice Jam Flood Infrastructure Performance Report (2020 Flood Infrastructure Performance)



Quote

Date: October 28th 2020

Service Provider

Tristar Hydrovac Ltd.
 370 Falconer Cresent
 Fort McMurray, AB
 T9H 0H9
 Phone: 1-780-881-0997
 Email: ryan@tristarcana.net
Ryan Brenton

Customer

Associated Engineer

Requested By: Sara Bruce

Worksite Location: Fort McMurray Water Treatment Plant

Job Description: Supply Sewer Flusher and crew to clean storm lines at the Water Treatment Plant in Fort McMurray. Upon completion of the flushing and debris removal, we will then camera the lines to confirm that they are clean and check the condition of the pipe.

Description	Quantity	Rate	Total
Hydrovac Hours	30	\$ 220.00	\$ 6,600.00
Water Charges	9	\$ 40.00	\$ 360.00
Dumping Fees	6	\$ 220.00	\$ 1,320.00
Fuel Surcharge 2.5%			\$ 165.00
Camera per meter	450	\$7.50	\$ 3,375.00
			\$ -
			\$ -
Subtotal			\$ 11,820.00
GST			\$ 591.00
Total			\$ 12,411.00

Operations Manager: 

Information is not an invoice and only an estimate of services described above. If You have any concerns you can contact me anytime at 780-881-0997 or via email at ryan@tristarcana.net.

Thank You and have great day.

Attachment: 2020 Ice Jam Flood Infrastructure Performance Report (2020 Flood Infrastructure Performance)

2021 Flood Preparedness

Presenter: Antoine Rempp

Title: Director, Environmental Services

Meeting Date: December 15, 2020

Key Recommendations Overview

1. Consistent Flood Protection Standard
2. Comprehensive Flood Protection System
 - a) Berms Structure
 - b) Underground & Water Treatment Plant Infrastructure
 - c) Pumping Measures
3. Inspection and Maintenance Program for Flood Protection System
 - a) Underground
 - b) Water Treatment Plant Infrastructure

Detailed Overview of this Presentation

Water Treatment Plant

- Spring 2021 Flood Preparedness
- Long-Term Resolutions

Storm and Sanitary System

- Spring 2021 Flood Preparedness
- Long-Term Resolutions

Taiganova

- 2021 Flood Preparedness

Water Treatment Plant

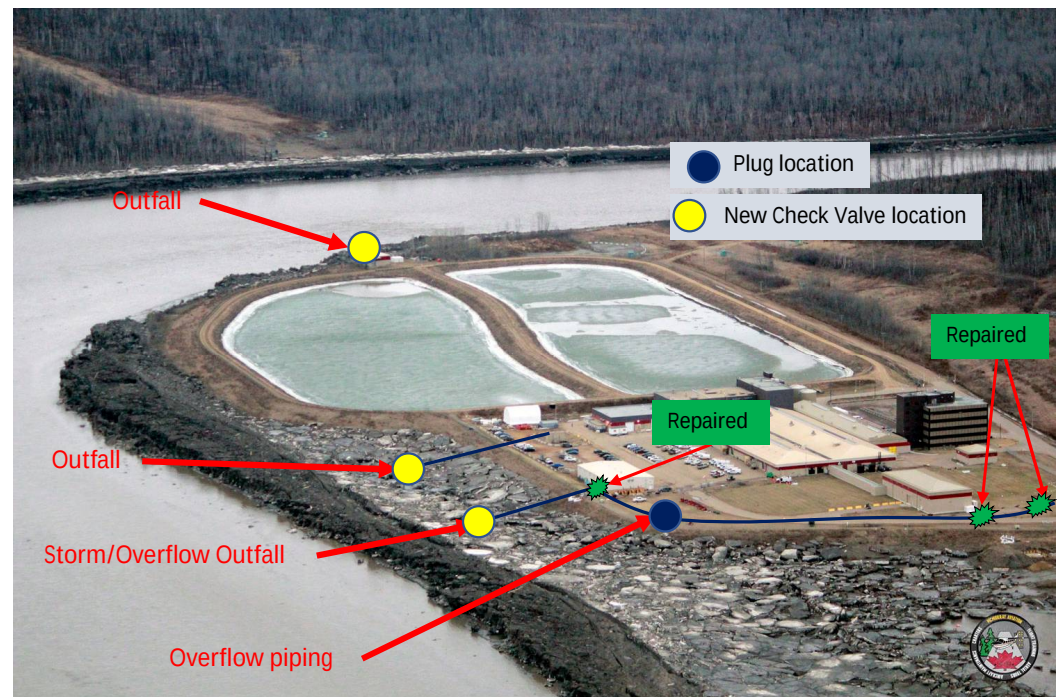
- 2021 Preparedness Measures
- Long-Term Resolutions



Fort McMurray Water Treatment Plant

Water Treatment Plant - 2021 Preparedness – Outfalls & Valves

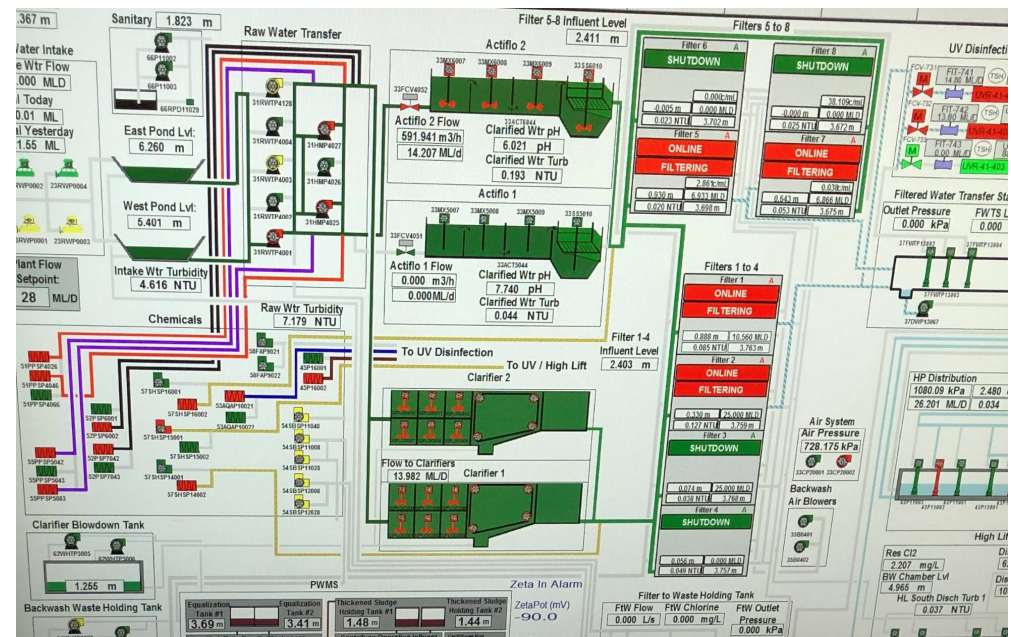
- Outfall sluice gate repaired
- Clearwells overflow flap gates repaired
- Temporary plug to be installed in Spring 2021



Water Treatment Plant - 2021 Preparedness

- Automation

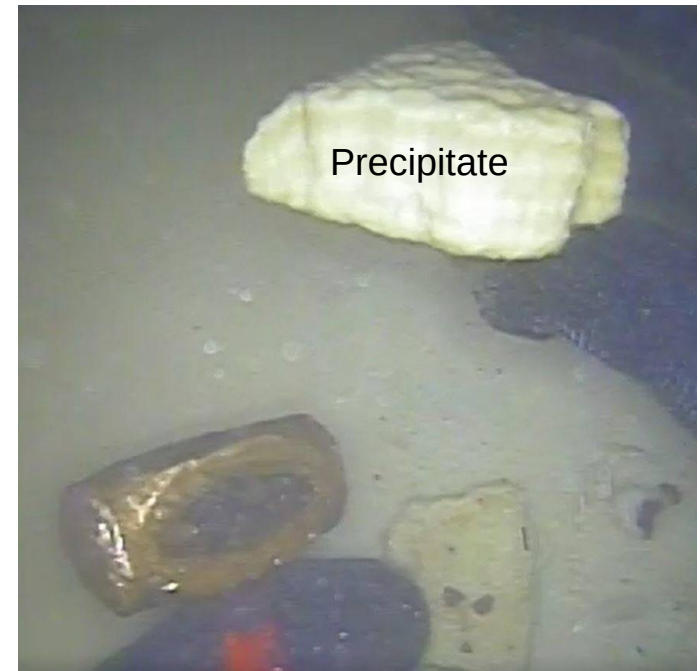
- Enhance monitoring and alarm systems
- Automation of Water Treatment Plant shut down following turbidity alarm in clearwells



Water Treatment Control Room System
SCADA (Supervisory Control and Data Acquisition)

Water Treatment Plant - Isolation Valve Maintenance Program

- Divers were mobilized in July 2020 to complete maintenance on valves and piping
- Build up of precipitate on the fittings, fixtures, and valves connected to the 2016 wildfire



Precipitate found on the isolation valves, next to a sledge hammer for scale reference

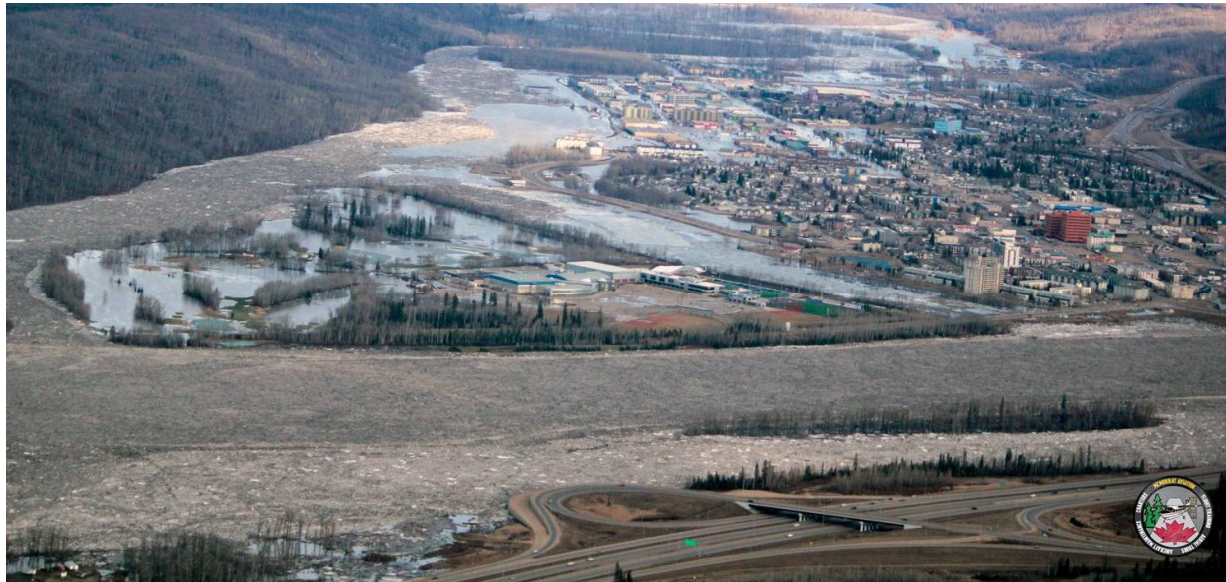
Water Treatment Plant – Long-Term Preparedness

Next Steps:

- Provide better isolation from the Athabasca River
- Operator training and nuisance alarm removal
- Control precipitates buildup due to effects of wildfire
- Valve Replacement program
- Inspection and maintenance

Storm and Sanitary Systems

- 2021 Preparedness Measures
- Long-Term Resolutions



Downtown Fort McMurray during the 2020 Flood

Storm System - 2021 Preparedness

- Inspection of all flap gates
- Plugging of the storm system
- Storm water management pumping plan
- Mitigate any inflow and/or infiltration



Storm System - Long-Term Resolutions

- Inspect critical components
- Install redundant infrastructure (i.e. Sluice Gates or other technologies)
- Reduce inflow and/or infiltration
- Interface with the Waterfront Revitalization program
- Overall review of storm water management during high river water events.



Sanitary System - 2021 Preparedness

- Sanitary bypass pumping
- Mitigate any inflow and/or infiltration
- Address any lift stations risks



Fort McMurray Sanitary Lift Station

Sanitary System - Long-Term Resolutions

- Develop additional low-cost annual preparedness plans
- Improve infrastructure flood resilience
- Sanitary Back Water Prevention program



Taiga Nova Eco-industrial Park

- 2021 Preparedness Measures



Taiganova during the 2020 Flood

Taiga Nova Eco-industrial Park – 2021 Flood Preparedness

- Raise effluent system manholes
- Mitigate any exfiltration from the effluent manholes
- Update the Wastewater Treatment Plant emergency response plan to address impacts of river flood



Sanitary manholes location south of Taiganova

Questions?



Subject: Sanitary Sewer Backwater Prevention Program

APPROVALS:

Jamie Doyle

Director

Chief Administrative Officer

Recommended Motion:

THAT the Sanitary Sewer Backwater Prevention Program – Policy OPE-50, as outlined in Attachment 2, be approved, to come into effect March 1, 2021; and

THAT \$1,000,000 be allocated from the Emerging Issues Reserve to fund the Backwater Prevention Program.

Summary:

On September 15, 2020 while discussing the Flood Mitigation and Community Resilience for Downtown, Council passed the following resolution:

“THAT Administration be directed to bring forward a backflow preventer program, including estimated costs, similar to that of the City of Edmonton, within 90 days.”

This report and the accompanying presentation are provided in response to this resolution to provide a recommended sanitary sewer backwater prevention program for Council’s consideration.

Background:

During the 2020 flood, overland flow entered the sanitary sewer system through manholes, causing sanitary backups in some buildings within the lower townsite. The suggestion of backwater prevention valves, among other measures, was identified as an opportunity to increase flood protection for residences.

As previously presented to Council, backwater valves are in-line valves installed on the sanitary service to a property that can help to prevent basement flooding caused by surcharging in the sanitary system. Backwater valves and other in-line manually operated valves can be effective flood protection measures when properly installed and maintained. The National Plumbing Code has required backwater valves on all new buildings since the early 2000’s. The RMWB’s Sanitary Sewer Utilities Bylaw (Bylaw No. 85/51) does not expressly mandate backwater valves on main services, however the

bylaw does mandate adherence to all relevant plumbing codes. As a result, all homes built in the community from the early 2000's onward should have backwater valves already installed. Many homes within the downtown were constructed well before this and therefore do not have backwater valves, or they may be in sub standard working condition.

Although backwater valves are a flood protection measure generally installed on private property, and therefore the responsibility of the property owner, many municipalities across Canada have implemented programs that provide both educational resources and financial support for property owners. Encouraging owners to take steps to protect their property from flooding where possible is part of providing responsible governance.

Administration has researched similar programs in other communities, and specifically connected with relevant staff at EPCOR, who run the backwater valve program within the City of Edmonton. Based on this research, and the recent 2020 flooding event, Administration has proposed a Sanitary Sewer Backwater Prevention Program for Council's consideration.

The proposed program would provide a subsidy to property owners to install a backwater valve on their sanitary service. Properties in areas at risk of experiencing overland flooding from the regional river network would also be eligible to install a manual valve. A subsidy of up to \$1,500 (plus \$100 for a manual valve) would be provided. It is also recommended that eligibility within the first year of the program be limited to higher risk areas within the community, expanding the program eligibility to the broader community in subsequent years.

The second element of the program, and arguably most important part, would consist of developing and making available educational resources to provide information to the public on the various actions they can take to protect their property and reduce the risk of basement flooding.

Alternatives:

- 1) **Do not implement a sanitary backwater prevention program:** This alternative would leave the implementation of backwater valves and any additional manually operated valves up to individual property owners, at their own cost.
- 2) **Change the proposed subsidy amount for the program:** This would impact the estimated budget/financial implications outlined below. It should also be noted that other municipalities experienced a correlated rise in the apparent cost of installing a backwater valves when the program subsidy was increased. Increasing the subsidy amount may not decrease the out-of-pocket costs for program participants. On the other hand, decreasing the subsidy amount may reduce overall program participation.
- 3) **Do not limit program eligibility to high risk areas within the first year:** This would allow greater participation in the program from the onset, but should a

budget cap be established for the annual program, it may result in some higher risk property owners not able to receive a subsidy within the first year.

Budget/Financial Implications:

To provide adequate opportunity for residents to participate in the program, while managing cash flow, Administration proposes a set budget allocation for the program on an annual basis. The current recommendation supports limiting eligibility to property owners within high overland flood risk areas (i.e. Downtown) within the first year. Based on the estimated number of homes within these areas that would be eligible to participate in the program, a budget of \$1,000,000 in 2021 would allow roughly 65% of properties to participate. Program uptake rates in other communities are often well below 50%, with the most successful programs achieving a participation rate around 50%.

In subsequent years of the program, as it is made available to the broader community, an annual budget of \$275,000 would provide a subsidy for approximately 180 properties. This is same amount that the City of Edmonton currently budgets for their program, with a much larger number of eligible properties

Rationale for Recommendation:

As a result of the 2020 flood, many downtown properties were impacted by flooding in the sanitary system. All properties, especially those without a backwater sanitary valve, are subject to basement flooding from sanitary system surcharging. As part of responsible governance, the RMWB should consider providing dedicated educational material and financial resources to support property owners in protecting their properties from flooding. Over 20 other municipalities across Canada have implemented similar programs, in supporting the resilience of their communities.

Strategic Priorities:

Responsible Government

Attachments:

Sanitary Sewer Backwater Prevention Program PowerPoint

Sanitary Sewer Backwater Prevention Program - Policy OPE-050

SANITARY SEWER BACKWATER PREVENTION PROGRAM

Presenter: Antoine Rempp

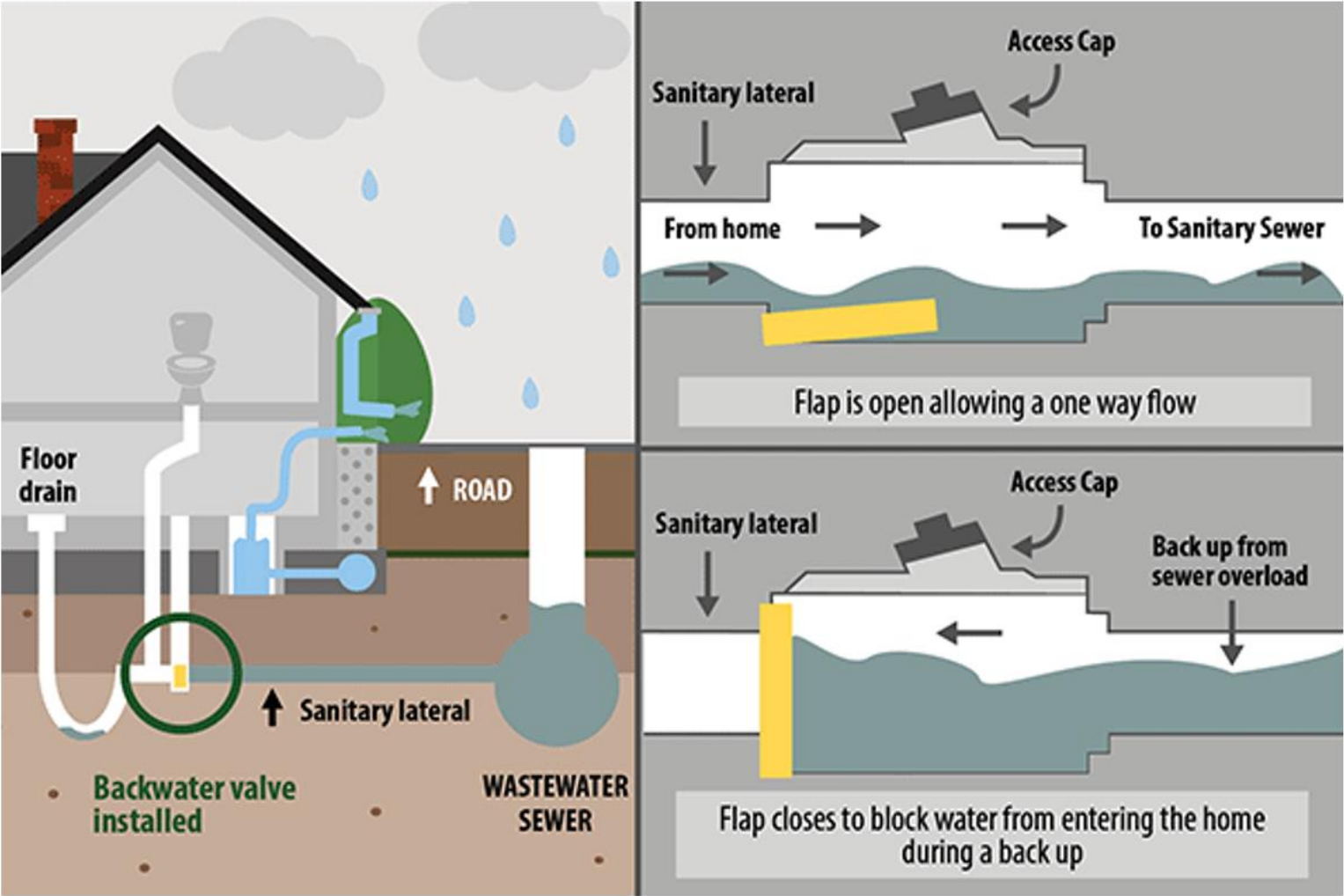
Department: Director, Environmental Services

Meeting Date: December 15, 2020

Overview

- Backwater Valves
- Backwater Prevention Programs
- RMWB Proposed Program
 - Grant Program
 - Education Program

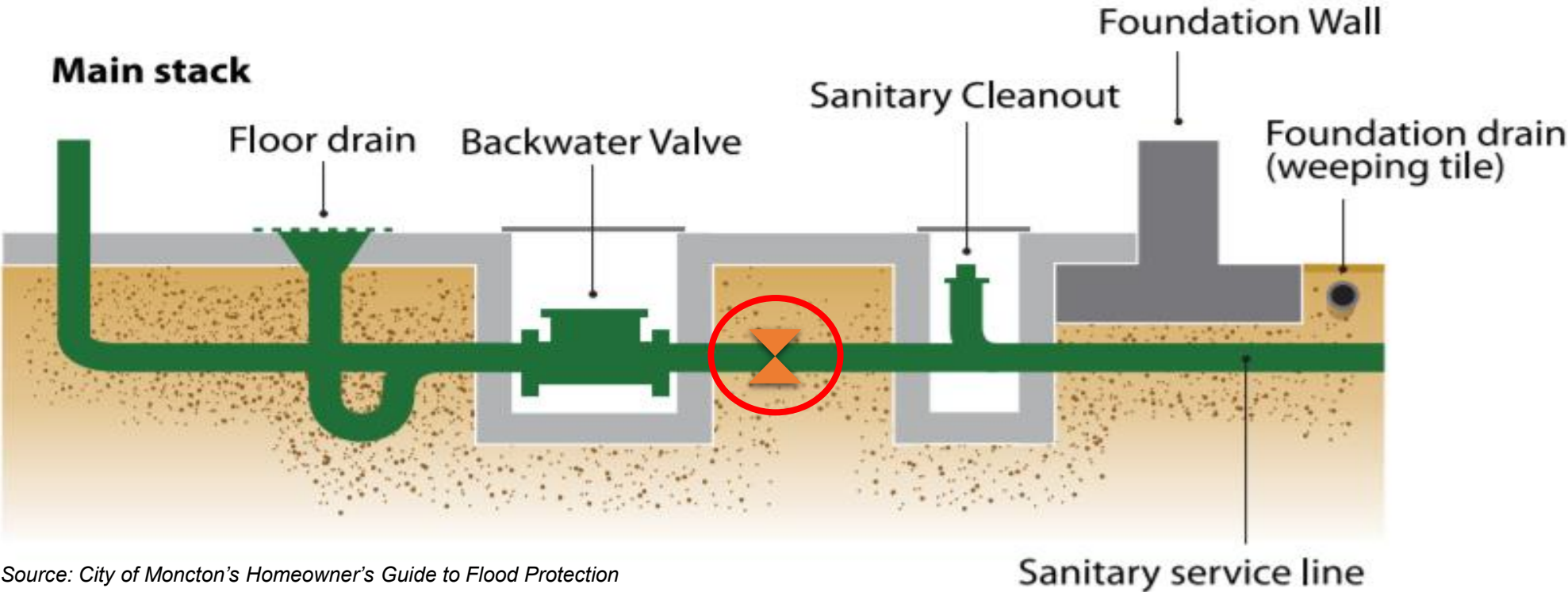
Backwater Valves – How They Work



Source: Halton Region
Backwater Valve
Installation Subsidy
Website

Backwater Valves Efficiency

- Effectiveness & Backup Manual Valves 



Source: City of Moncton's Homeowner's Guide to Flood Protection

Backwater Valves

- Limitations:
 - Self-Flooding
- Required by Code

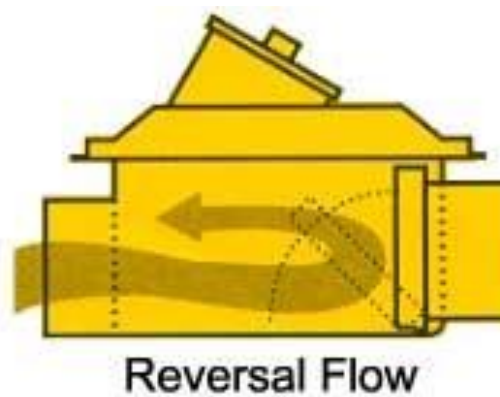


Backwater flow valve with plastic viewing cover.



Floor plate cover for backwater valve.

Source: Institute for Catastrophic Loss Reduction



Backwater Prevention Programs Types

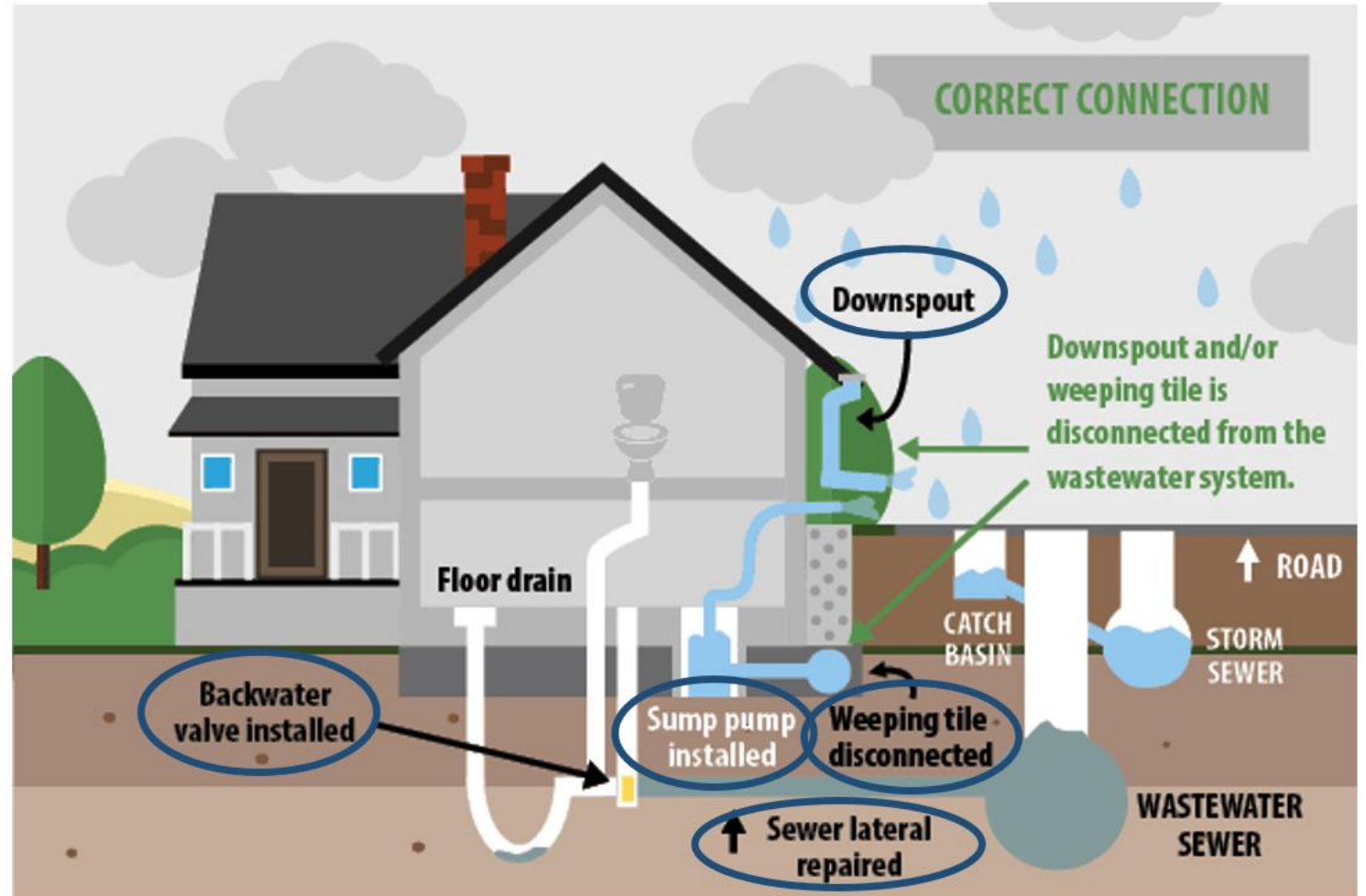
- Role of the Municipality
- Program Pillars
 - Education
 - Financial Assistance



Backwater Prevention Programs Initiatives

What Can Be Covered

- Backwater valve installation
- Downspout disconnection
- Weeping tile disconnection
- Sump pump installation
- Sanitary service repairs



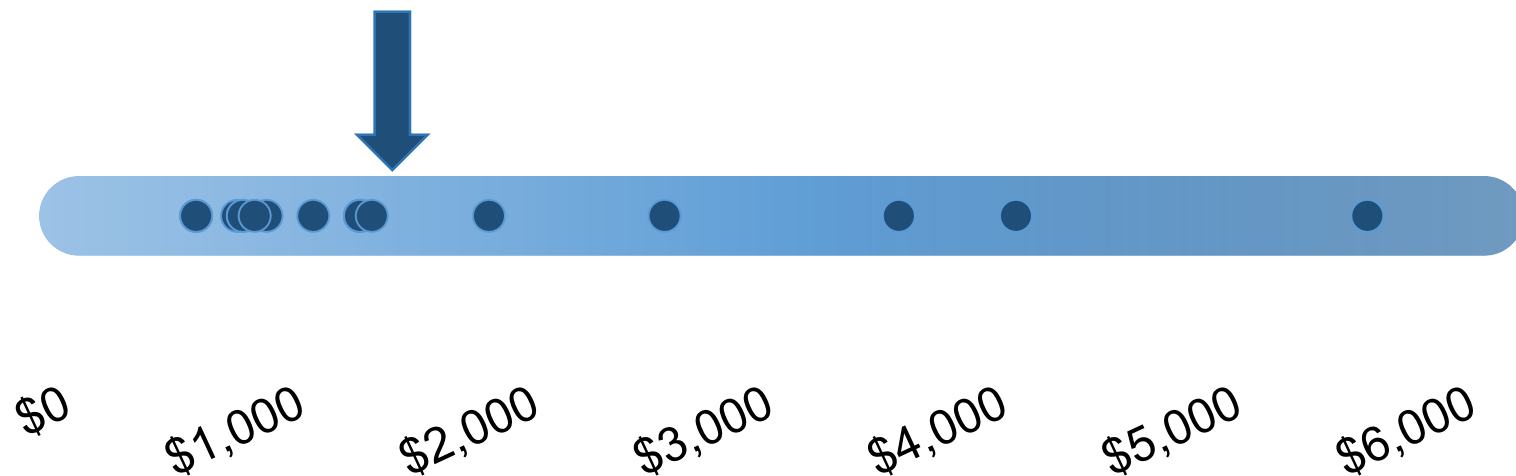
Source: Halton Region Basement Flooding Website

Attachment: Sanitary Sewer Backwater Prevention Program PowerPoint (Backwater

Backwater Prevention Programs Grant Range

Program Subsidy Amounts across Canada

- Flood Prevention Programs: \$500 to \$5,500
- Backwater Valve Grants form a portion
 - Average of \$1,500



*Backwater Valve
Grant Amounts
across Canadian
Municipalities*

Backwater Prevention Programs Lessons Learned

Lessons Learned

1. Subsidy Amounts
2. Program Participation
3. Communication

1. Subsidy Amounts

- Grant relative to actual cost

↗ Grant = ↗ Costs



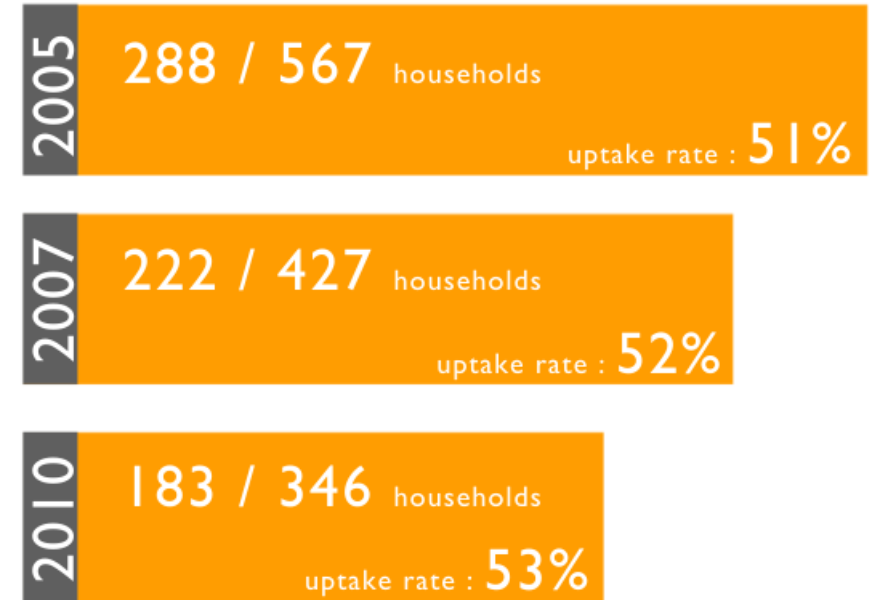
Retrofitting a backwater valve requires the breaking of concrete flooring in basement, disconnection of foundation drainage from sanitary sewer connections and may require re-grading of sewer connections, adding to the expense of backwater valve retrofits.

Source: Institute for Catastrophic Loss Reduction.

Backwater Prevention Programs - Participation

2. Program Participation

- Participation rates often low
- Strategies to improve uptake are:
 - Increased financial incentives
 - Offering programs immediately following flood events



Source: ICLR – Saskatoon's Flood Protection Program after each flooding event.

3. Communication and Engagement

- Public education is key
- Leverage existing processes

RMWB Proposed Backwater Prevention Program

- Grant Program
 - RMWB provided grant for property owners to install backwater valves, and manual valves in flood prone areas
- Education Program
 - Resources and information made available by the RMWB to the community regarding flood protection measures for private properties
- Overarching Council Policy

Grant Program - Eligibility

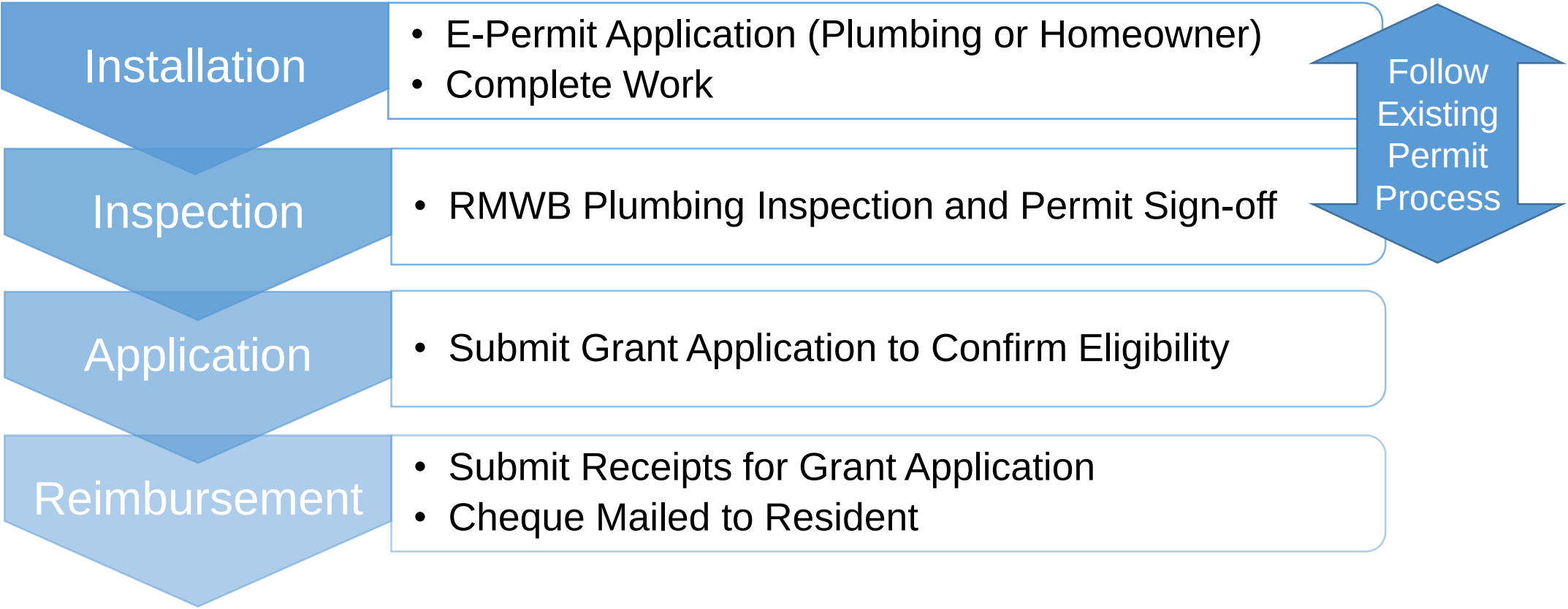
Eligibility

- Residential/single service
- Connected to RMWB piped sewer system
- No backwater valve currently installed
- Applicant is the homeowner or has approval from the homeowner
- Municipal fees and taxes current



Grant Program - Administration

How it Works



Grant Program - Schedule

Timing

- Program to start March 1, 2021
- Installations completed after May 1, 2020
- Program to run on an annual basis
- Property located within the Fort McMurray Urban Service Area, Fort McKay, or Fort Chipewyan
- Funding will be provided on a first-come, first-served basis, but priority in 2021 will be given to areas prone to overland flooding



Grant Program – Amounts

- Anticipated Homeowner Costs
 - Materials: \$300-\$1200
 - Labour: \$1000-\$4000
 - Range of likely costs incurred: \$1500-\$5500
- Grant
 - Up to \$1500 for the installation of a backwater valve
 - Up to \$150 for the installation of a manual valve (flood prone areas)

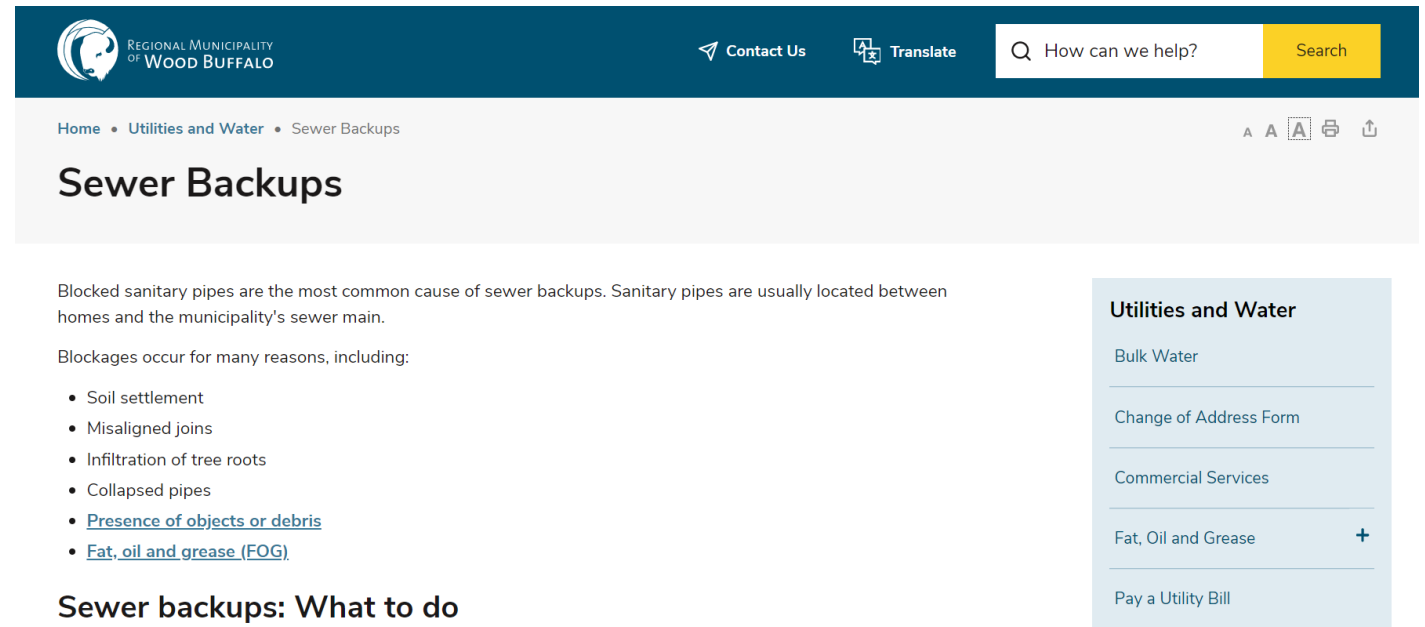
Grant Program - Funding

- Financial Impact
 - Program funding is first-come, first-served
 - Eligible expenses are reimbursed after work is complete

Program Year	Annual Budget (max.)	Funding Source
Year 1 (2021)	\$1 million	Emerging Issues Reserve Fund
Subsequent Years (2022+)	\$275,000	Operating Budget

Education Program

- Critical to provide citizens with information on how they can reduce the risk of flood damage on their own property
- Supports the success of the Grant Program
- Variety of approaches:
 - Web page update
 - Link resources
 - Media
 - Mail



Next Steps

- Accept Applications for the Grant Program Starting March 1, 2021
- Public Media Release for Grant Program
- Develop and Roll-out Education Program in Q1 2021
- Ongoing Program Administration

Recommended Motions

- THAT the Sanitary Sewer Backwater Prevention Program – Policy OPE-50, as outlined in Attachment 2, be approved, to come into effect March 1, 2021; and
- THAT \$1,000,000 be allocated from the Emerging Issues Reserve to fund the Backwater Prevention Program.

Questions?

COUNCIL POLICY



REGIONAL MUNICIPALITY
OF WOOD BUFFALO

Document Name: Sanitary Sewer Backwater Prevention Program

Department Name: Environmental Services

Document Number: OPE-050

Effective Date: March 01, 2020

Next Revision Date: March 01, 2024

STRATEGIC PLAN LINKAGE

Strategic Priority 1 – Responsible Government

PURPOSE AND OBJECTIVE

The purpose of the Sanitary Sewer Backwater Prevention Program Policy (“Policy”) is to:

1. establish a Residential Backwater Valve Grant Program (“the Grant Program”);
2. outline value of the Grants;
3. determine Grant eligibility under the Policy; and
4. establish a Basement Flooding Prevention Education Program (“the Education Program”).

The objective of this Policy is to increase community resilience to flooding events due to surcharging in the sanitary sewer system. The Grant Program aims to reduce the overall impact to residential basements due to flooding by the installation of Backwater Valves, and the Education Program aims to reduce the likelihood of sanitary sewer surcharge events by providing residential property owners with information and actionable steps to reduce the risk of backwater flow into residences via the sanitary sewer system.

GENERAL PRINCIPLES

1. Definitions:

- 1.1. “Applicant” means a property owner, a property owner’s representative, or a tenant (with property owner permission) who submits an application.
- 1.2. “Backwater Valve” means a mechanical device installed on a Sanitary Sewer Service that automatically closes when the sanitary sewer system surcharges.
- 1.3. “Eligible Costs” means the cost of the Backwater Valve or the Manual Valve and the labour associated with its installation.
- 1.4. “Grant” means a transfer of monies from the Municipality to a Recipient for a project or purpose according to the requirements outlined in the Sanitary Sewer Backwater Prevention Program Administrative Procedure OPE-050-P01.

- 1.5. “Manual Valve” means a mechanical device installed on the Sanitary Sewer Service that can be manually closed and opened to hydraulically disconnect the Sanitary Sewer Service from the rest of the sanitary sewer system.
- 1.6. “Municipality” means the Regional Municipality of Wood Buffalo.
- 1.7. “Property” means a lot or parcel of land together with all the building structures located thereon.
- 1.8. “Recipient” means an Applicant that is approved by the Municipality to receive a Grant.
- 1.9. “Residential” means a building that is regularly used by its occupants as a permanent place of abode, which is made one’s home as opposed to one’s place of business, and which has housekeeping and cooking facilities for its occupants only.
- 1.10. “Sanitary Sewer Service” means those pipes used to remove sanitary sewer from the building to the sewer mains.

2. Responsibilities:

2.1. Council to:

- 2.1.1. approve this Policy;
- 2.1.2. approve any amendments to this Policy.

2.2. Chief Administrative Officer (CAO) to:

- 2.2.1. recommend any amendments to this Policy;
- 2.2.2. support the implementation of this Policy; and
- 2.2.3. review and support any amendments to the Grant Program or Education Program.

3. Residential Backwater Valve Grant Program

3.1. Grant Program Area:

- 3.1.1. The Grant Program applies to eligible Applicants and building types in the Fort McMurray Urban Service Area, Fort McKay, and Fort Chipewyan.

3.2. Grant Program Duration:

- 3.2.1. The Municipality will accept complete Applications starting on March 01, 2021.
- 3.2.2. Funding will be provided on a first-come, first-served basis, for successful Recipients until the budget for the Grant Program has been exhausted.

3.3. Grants:

3.3.1. The Grant Program provides the following Grants:

3.3.1.1. Backwater Valve Grant; and

3.3.1.2. Manual Valve Grant.

3.3.2. Funding will be provided in the form of a reimbursement Grant up to the values identified in sections 3.6.1 and 3.7.1 whereby funds are paid to Recipients upon the successful completion of the work and confirmation by the Municipality.

3.4. Municipal Control:

3.4.1. The Municipality may close the Grant Program to new Applications at any time without notice.

3.4.2. The Municipality reserves the right to determine Applicant participation in the Grant Program on a case-by-case basis.

3.4.3. The Municipality may terminate the Grant Program at any time without notice.

3.5. General Eligibility Criteria:

3.5.1. The Recipient must be the property owner(s), a property owner's legal representative, or a tenant with written permission from the property owner(s).

3.5.2. The Applicant has obtained all required permits and approvals prior to completing the work and applicable inspections are completed by the Municipality.

3.5.3. The installation of the Backwater Valve or Manual Valve must have occurred after May 01, 2020.

3.5.4. The following are ineligible for the Grant Program:

3.5.4.1. Non-Residential buildings;

3.5.4.2. Residential units whose Sanitary Sewer Service is not located on or below the ground floor of the building;

3.5.4.3. Sanitary Sewer Services that service to more than one Residential unit;

3.5.4.4. Residential buildings that were constructed after 2000; and

3.5.4.5. Residential units that already have a Backwater Valve installed.

3.5.5. The following must be satisfied and will be verified by the Municipality at the time the Recipients request reimbursement:

3.5.5.1. Property taxes must be current and paid;

3.5.5.2. Utility bills must be current and paid;

- 3.5.5.3. Properties must not have an unresolved order to comply with the Land Use Bylaw, Building Code, Fire Code, Nuisance Bylaw, or other regulation; and
- 3.5.5.4. Applicant is not a party to a legal dispute with the Municipality.

3.6. Backwater Valve Grant:

3.6.1. Grant Value:

- 3.6.1.1. The Municipality will provide a Grant of \$1,500 or the cost to complete the eligible work, whichever is less.

3.6.2. Additional Eligibility Criteria:

- 3.6.2.1. In addition to section 3.5, the following shall also be met to be eligible:
 - a. For applications received in 2021, priority will be given to Properties located within the Lower Townsite or Waterways neighbourhoods.
 - b. The Applicant has installed a new Backwater Valve on their Sanitary Sewer Service.

3.7. Manual Valve Grant:

3.7.1. Grant Value:

- 3.7.1.1. The Municipality will provide a Grant of \$150 or the cost to complete the eligible work, whichever is less.

3.7.2. Additional Eligibility Criteria:

- 3.7.2.1. In addition to section 3.5, the following shall also be met to be eligible:
 - a. The Property is located within the Lower Townsite or Waterways neighbourhoods.
 - b. The Applicant has installed a new Manual Valve on their Sanitary Sewer Service.
 - c. The Applicant is eligible for and has received the Backwater Valve Grant in section 3.6 or the Applicant's Sanitary Sewer Service has an existing Backwater Valve.

4. Basement Flooding Prevention Education Program

- 4.1. The Municipality shall develop and provide informational resources for residents outlining measures they may take on their Property to help protect against basement flooding and to protect the Municipal sanitary system in general.
- 4.2. This information will be made publicly available and reflect current best practices.

APPROVAL

This Policy was approved by Council. It will be reviewed not later than its next Revision Date to determine its effectiveness and appropriateness. It may be assessed before that time as necessary.

Don Scott, Mayor

Jade Brown, Chief Legislative Officer

Date

SUPPORTING REFERENCES AND POSITION RESPONSIBLE

- Cross References:
- Bylaw No 85/51 – Municipal Sanitary Sewer Utilities
 - Residential Backwater Valve Grant Program Administrative Procedure OPE-050-P01

Position Responsible: Director, Environmental Services

COUNCIL POLICY DETAILS AND REVISION HISTORY

Date	Action	Description
March 01, 2021	Establishment	Establishment of program

Flood Mitigation and Community Resiliency Update

Taiga Nova Eco-Industrial Park

Presenter: Brad McMurdo

Title: Director, Planning and Development

Meeting Date: December 15, 2020

Council Direction

Administration be directed to:

1. Complete flood mitigation to 1:200 level (250.9m).
2. Limit development below 250m and introduce enhanced. Land Use Bylaw provisions above 250m.
3. Complete this work by October 15, 2021.

Update: Flood Mitigation

1. Conceptual design complete for raising and extending the berm to 1:200 level.
2. RFP to be issued for design of berm around Wastewater Treatment Plant.
3. Temporary earth berm completed around Taiga Nova in advance of spring 2021.
4. Berm development costs included in 2021 flood mitigation budget request, totaling \$44M.

TEMPORARY FLOOD PROTECTION FOR 2021

Taiga Nova

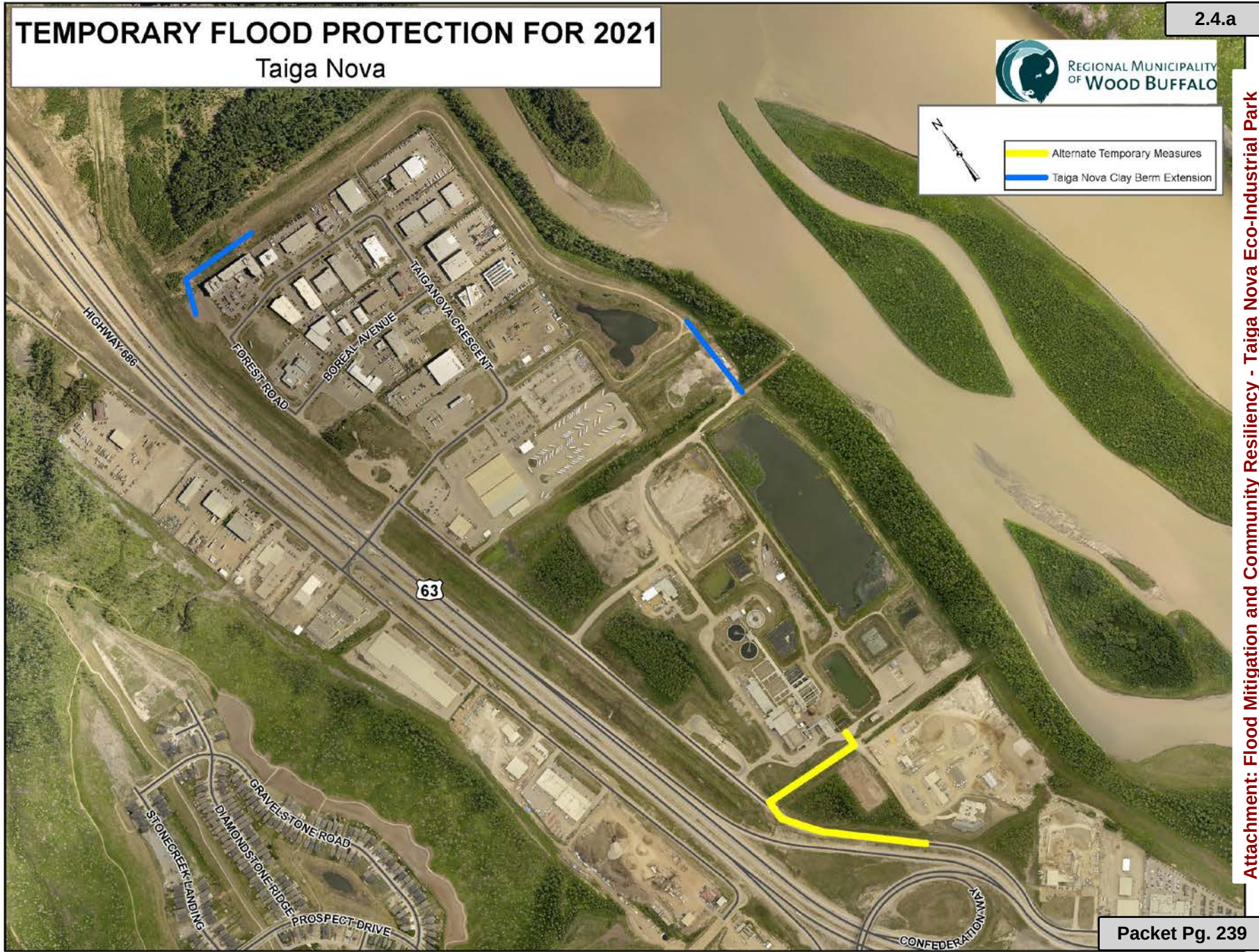
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REGIONAL MUNICIPALITY
OF WOOD BUFFALO



- Alternate Temporary Measures
- Taiga Nova Clay Berm Extension



Attachment: Flood Mitigation and Community Resiliency - Taiga Nova Eco-Industrial Park

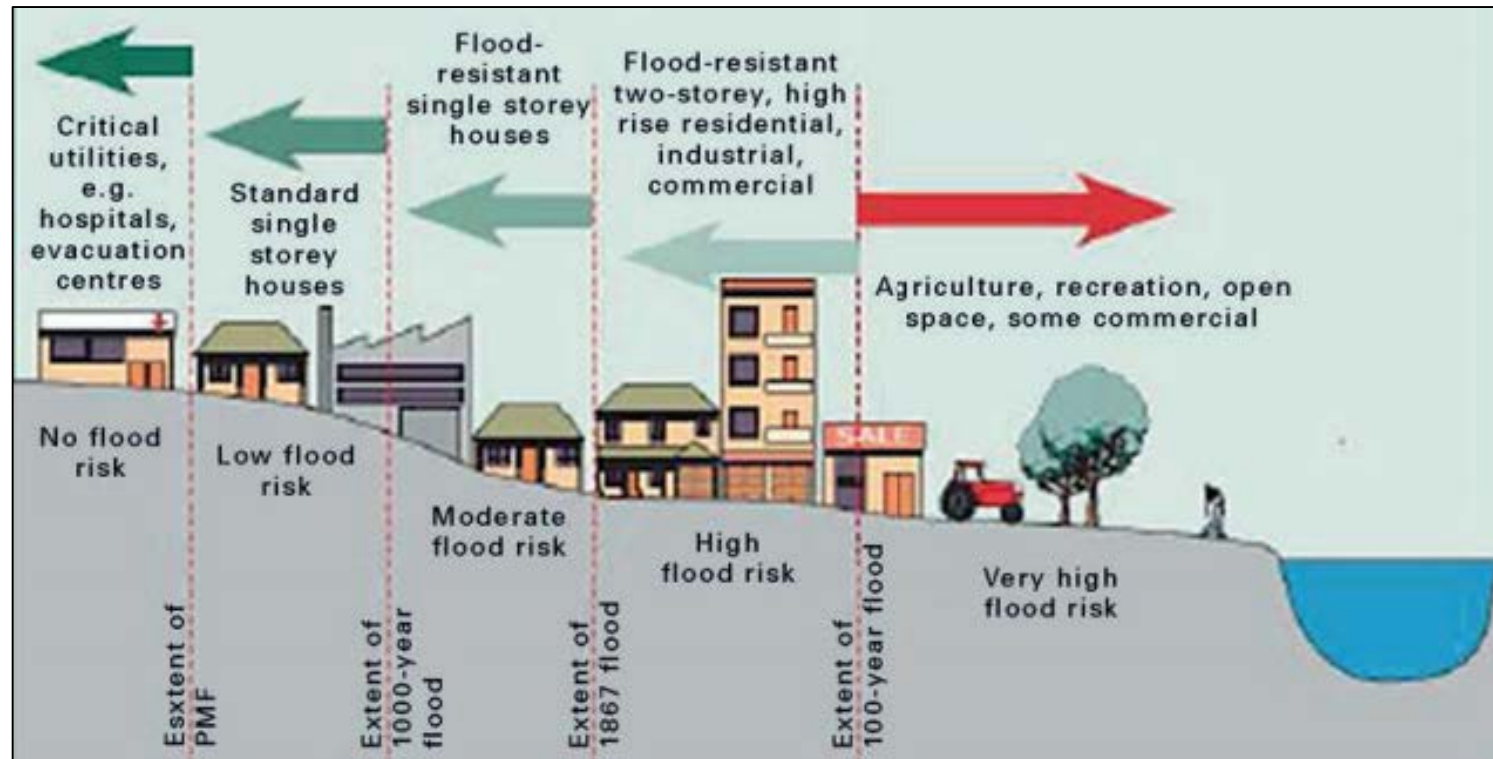
Update: LUB Provisions

1. Applies across the flood hazard area.
2. Not proposed to be retro-active – would apply to new development only.
3. Will not come forward as part of the new LUB re-write as engagement with property owners must occur.

Approach to Flood Provisions

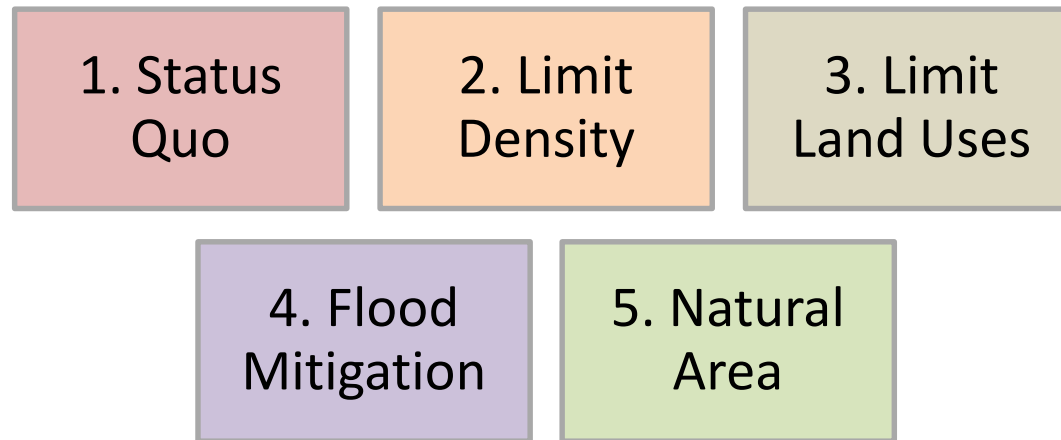
1. Establish *categories* based on flood impact and severity.
2. For each *category*, develop *policy statements* which can then be applied to each area or neighbourhood as decisions are made.
3. For each *category* and *policy statement*, develop a suite of Land Use Bylaw provisions.
4. *Categories, policies, and provisions* can be combined as necessary.

Approach to Flood Provisions



Categories of Flood Provisions

- A group of provisions can be developed based on the categories below:



- There may be overlap between categories.

Category Descriptions

- Status quo: no provisions for areas within the flood plain determined to be above the impacted area.
- Limit Density: limiting number of people impacted by future flood by placing maximums on number of units or building size.
- Limit land use: limiting presence of sensitive uses like basement suites and storage of hazardous materials.
- Flood mitigation: require special structural elements and water-resistant materials.
- Natural area: leave un-protected undeveloped areas in a natural state or allow passive uses.

Next Steps

1. Continue with structural flood mitigation.
2. Continue with Land Use Bylaw provisions to inform development in the flood hazard area.

Questions

Flood Mitigation and Community Resiliency Update

Downtown

Presenter: Dennis Warr
Title: Director, Engineering
Meeting Date: December 15, 2020

Council Direction

On September 15, 2020, Council directed Administration to:

1. Complete flood mitigation to 1:200-year level (250.9m) by October 15, 2022; and
2. Limit development below 250m, and introduce enhanced flood provisions in Land Use Bylaw for development above 250m; and
3. Report back to Council with a progress update within 90 days.

Further, Council resolved to advocate on behalf of Downtown property owners to the Government of Alberta and the Insurance Bureau of Canada.

Permanent Flood Mitigation Update

- Reach 9 construction (Heritage Village) is substantially complete to the 250.5 m elevation
- Given that this reach is less than 500 m in length, the preferred solution to achieve the 250.9 m elevation is to use alternative measures during annual river break-up
- Request for proposals are being prepared for:
 - The detailed design of Reach 5 (Riverwalk Villas); and
 - The conceptual design of Reach 6 (Clearwater Drive, from Riedel Street to Franklin Avenue)

Permanent Flood Mitigation Update continued

- Engagement with the public on the conceptual design of Reach 6 will inform the detailed design
- Planning for conceptual design to raise elevation of the already completed Reaches 1, 2, 3 and 4 to 250.9 m, will be undertaken in collaboration with other plans for development of the area

Temporary Flood Mitigation Update

- Consists of temporary clay berms and alternative measures
- Clay berms are complete
- Request for proposals for alternatives measures is scheduled to close on December 15, 2020
- Selected alternative measures will be in place prior to anticipated 2021 river break-up

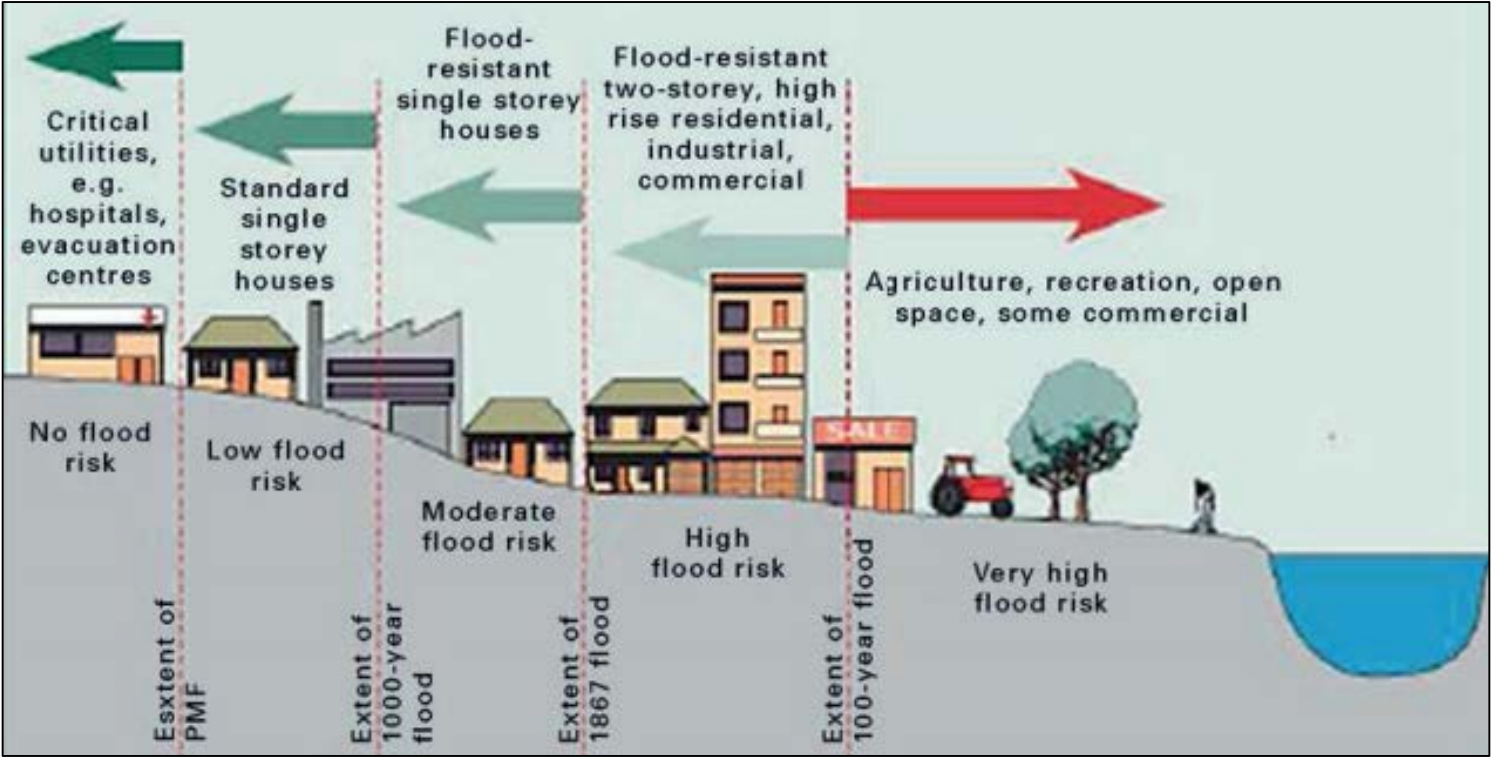
Land Use Bylaw (LUB) Provisions Update

- Applies across the flood hazard area, not just Downtown
- Not proposed to be retroactive, would apply to new development only
- Will not come forward as part of the new LUB re-write and engagement with property owners must occur

Approach to Flood Provisions

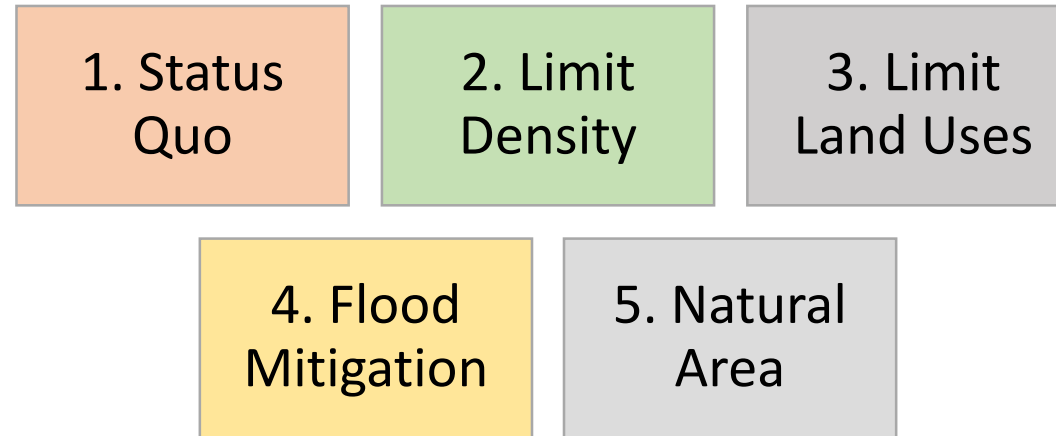
- Establish *categories* based on flood impact and severity.
- For each *category*, develop *policy statements* which can then be applied to each area or neighbourhood as decisions are made.
- For each *category* and *policy statement*, develop a suite of Land Use Bylaw provisions.
- *Categories, policies, and provisions* can be combined as necessary

Approach to Flood Provisions



Approach to Flood Provisions

- A group of provisions can be developed based on the categories below:



- There may be overlap between categories.

Category Descriptions

- Status quo: no provisions for areas within the flood plain determined to be above the impacted area.
- Limit Density: limiting number of people impacted by future flood by placing maximums on number of units or building size.
- Limit land use: limiting presence of sensitive uses like basement suites and storage of hazardous materials.
- Flood mitigation: require special structural elements and water-resistant materials.
- Natural area: leave un-protected undeveloped areas in a natural state or allow passive uses.

Insurance Advocacy Update

- Letters sent to
 - Premier Kenney
 - Deputy Prime Minister and Minister of Finance, Hon. Chrystia Freeland (in her capacity as Minister of Finance)
 - Lloyd's of London
 - Insurance Bureau of Canada (IBC)
- Received response from Premier Kenney
- Met with Insurance Bureau of Canada

Next Steps

1. Continue constructing flood mitigation to 1:200-year level (250.9 m) by October 15, 2022.
2. Temporary flood mitigation.
3. Continue with Land Use Bylaw provisions to inform development in the flood hazard area.

Questions

Flood Mitigation and Community Resiliency Update

Longboat Landing

Presenter: Dennis Warr
Title: Director, Engineering
Meeting Date: December 15, 2020

Council Direction

On September 15, 2020, Council directed Administration to:

- Complete the flood mitigation to 1:200-year level (250.9m) by October 15, 2021;
- Limit development below 250m, and introduce enhanced flood provisions in Land Use Bylaw for development above 250m;
- Report back to Council on progress within 90 days;
- Engage with residents about the pedestrian walkway;
- Ensure that a pedestrian walkway is part of the flood mitigation project taking into account, feedback for Longboat Landing; and
- Landscape all municipal property near Longboat Landing adjacent to the river on or before October 15, 2022 as part of flood mitigation.

Council Direction continued

- Further, Council resolved to advocate on behalf of Longboat Landing property owners to the Government of Alberta and the Insurance Bureau of Canada; and
- that a delegation including the Mayor, Councillors and members of Administration, meet with Lloyd's of London and any other companies as may be beneficial to consult with, to advocate on behalf of residents impacted by the 2020 flood for a direct market presentation regarding the availability of reasonably priced insurance.

Public Engagement Update

- Engagement campaign launched December 14
- Scaled drawings of the location, height and alignment of the pathway on the berm are being shared for property owners to provide feedback
- Engagement methods include:
 - vision boards posted in high traffic areas;
 - information packages emailed to all condo associations; and
 - door-hangers left at all dwelling units in Longboat Landing.
- The engagement will run for eight weeks, until mid-February 2021

Permanent Flood Mitigation Update

- Tender package for Reach 7 (Franklin Ave Right of Way) has been posted
- Letter of Intent for the remaining land acquisition for Reach 8 (around Fontaine Crescent) has been signed, and final documents are being prepared
- Designs for both Reach 7 and Reach 8 have been revised to the 1:200 year flood elevation

Temporary Flood Mitigation Update

- Temporary earth berms have been constructed across from the Mills Avenue Booster Station at Saline Creek Parkway and Denholm Gate roundabout
- Remainder of the Longboat Landing neighbourhood will be protected via alternative mitigation measures
- Request for proposals for these alternative measures is scheduled to close on December 15, 2020
- Selected alternative measures will be publicly communicated
- Measures will be in place prior to anticipated 2021 river breakup

Temporary Flood Mitigation Update continued



Yellow = alternative measures; Purple = temporary clay berms

Insurance Advocacy Update

- Letters sent to
 - Premier Kenney
 - Deputy Prime Minister and Minister of Finance, Hon. Chrystia Freeland (in her capacity as Minister of Finance)
 - Lloyd's of London
 - Insurance Bureau of Canada (IBC)
- Received response from Premier Kenney
- Met with Insurance Bureau of Canada

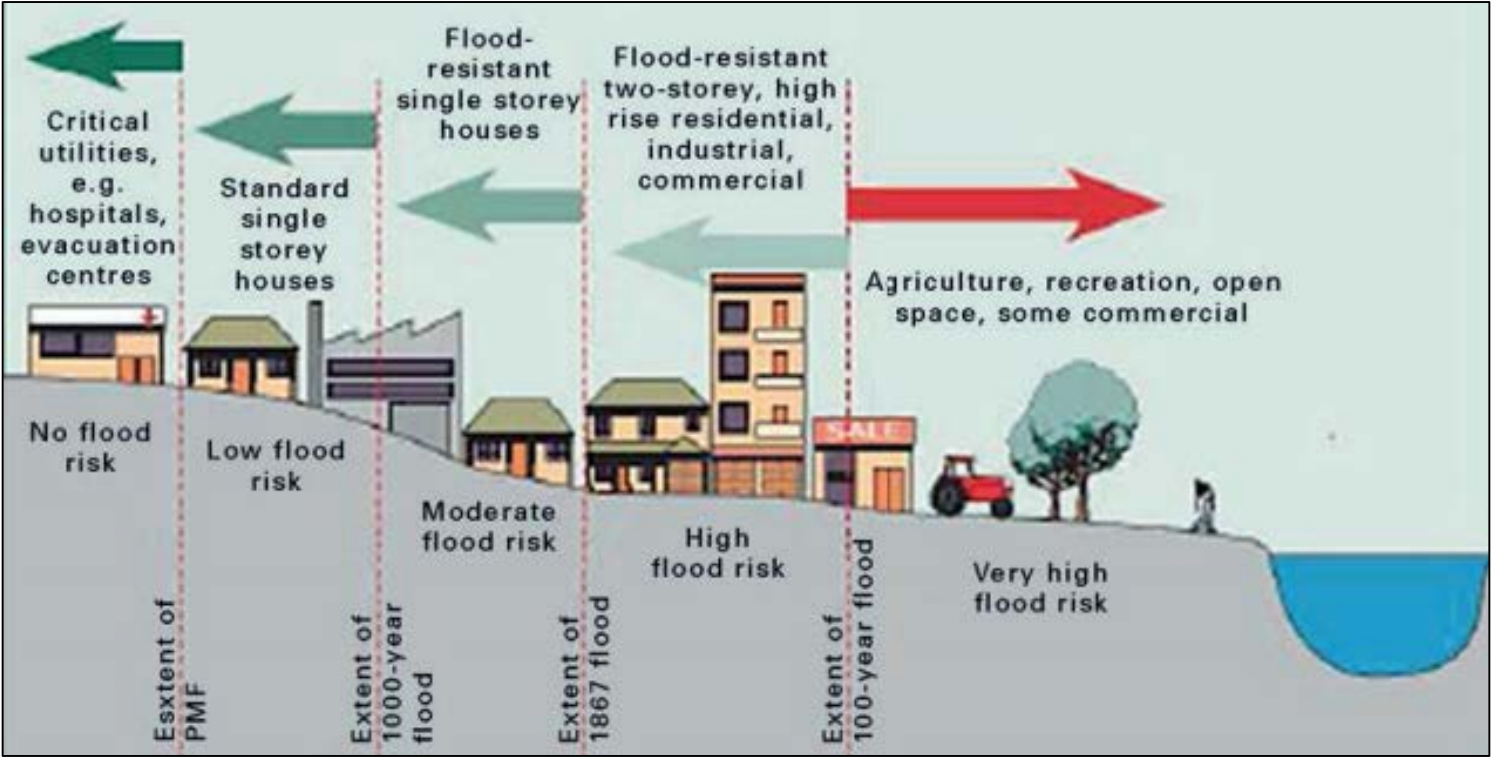
Land Use Bylaw (LUB) Provisions Update

- Applies across the flood hazard area
- Not proposed to be retroactive, would apply to new development only
- Will not come forward as part of the new LUB re-write and engagement with property owners must occur

Approach to Flood Provisions

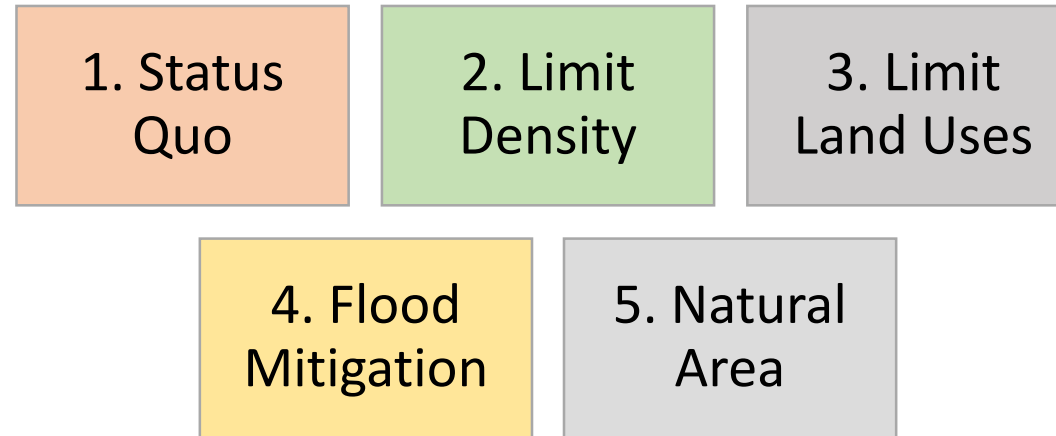
- Establish *categories* based on flood impact and severity.
- For each *category*, develop *policy statements* which can then be applied to each area or neighbourhood as decisions are made.
- For each *category* and *policy statement*, develop a suite of Land Use Bylaw provisions.
- *Categories, policies, and provisions* can be combined as necessary

Approach to Flood Provisions



Approach to Flood Provisions

- A group of provisions can be developed based on the categories below:



- There may be overlap between categories.

Category Descriptions

- Status quo: no provisions for areas within the flood plain determined to be above the impacted area.
- Limit Density: limiting number of people impacted by future flood by placing maximums on number of units or building size.
- Limit land use: limiting presence of sensitive uses like basement suites and storage of hazardous materials.
- Flood mitigation: require special structural elements and water-resistant materials.
- Natural area: leave un-protected undeveloped areas in a natural state or allow passive uses.

Next Steps

1. Complete flood mitigation to 1:200-year level (250.9 m) by October 15, 2021.
2. Temporary Flood Mitigation
 - a) RFP closes on December 15th which will identify alternative measures of protection for remaining portion of Longboat Landing.
 - b) Measures will be in place prior to anticipated 2021 river breakup.

Next Steps continued

3. Engage with residents about the pedestrian walkway.
4. Limit development below 250.9 m, and introduce enhanced flood provisions in Land Use Bylaw for development above 250.9 m.
5. Landscape all municipal property near Longboat Landing adjacent to the river on or before October 15, 2022 as part of flood mitigation.

Questions



Subject: Flood Mitigation and Community Resiliency Update - Waterways

APPROVALS:

Jamie Doyle

Director

Chief Administrative Officer

Recommended Motion:

THAT Administration continue with building a structural mitigation solution as previously directed; and

THAT Administration limit development below 250.9m and introduce enhanced flood provisions in the Land Use Bylaw for development above the 250.9m elevation.

Summary:

On September 15, 2020, Council passed the following resolution:

- THAT Administration complete the structural flood mitigation project for Waterways to a level of 1:200 (250.9m) by October 15, 2022, limit development below 250m, and introduce enhanced flood provisions in Land Use Bylaw for development above 250m;
- THAT Administration explore land swaps to property owners below 250m subject to land availability;
- THAT Council advocate on behalf of Waterways property owners to the Government of Alberta and the Insurance Bureau of Canada on the availability of overland flood insurance; and
- THAT Administration report back to Council with a progress update within 90 days.

The following report and presentation are provided as an update on these resolutions.

Background:

Structural Mitigation Update

The design of Reaches 10 and 10JHP (J. Howard Pew Park), which address Waterways, is being updated to accommodate the change in design elevation to a 1:200 level, or 250.9m.

Temporary Mitigation Update

A temporary earth berm was constructed parallel to Saline Creek Drive. In the event of a flood, Saline Creek Drive will need to be blocked off between McCormick Drive and the Tolen Drive bridge, and at Park Street (after Draper has been evacuated) to ensure a continuous line of flood mitigation. Residents will be able to leave Waterways via Tolen Drive.

Land Use Bylaw Update

Administration is developing a set of enhanced Land Use Bylaw provisions for development in the flood hazard area. These new provisions may only apply to certain parts of the flood hazard area depending on what kind of development is expected to take place. These provisions are still in draft form and will focus on different ways to influence development whereby more than one may be applied to a given part of the flood hazard area. The categories are as follows:

A) Status quo: additional provisions are not likely to be proposed for areas that are within the flood plain but that are determined to be above the impacted area.

B) Limiting density: this is intended to address the social implications of a flood by limiting the number of people who may be impacted by a future flood. This may include new maximums on the number of dwelling units allowed on a property, or upper limits on the total size of a building (commonly measured through "gross floor area").

C) Limiting land use: provisions may be proposed which limit the presence of sensitive uses such as basement suites in residential properties and storage of hazardous materials in commercial and/or industrial properties.

D) Flood mitigation: provisions proposed in this category would capture structural elements and employing materials that are resistant to flooding. There is an opportunity for this to extend beyond the Land Use Bylaw to providing policy guidance to owners (i.e. recommending installation of spray insulation and water-resistant wiring).

E) Natural area: for areas that are not protected by structural flood mitigation, they may benefit from having passive uses or be left in a natural state. This is envisioned to include areas on the side of the berm that are susceptible to flooding.

The new Land Use Bylaw provisions are not expected to be retro-active and should apply to new development only. As these provisions are an important aspect of the Bylaw, they will be brought forward separately from the re-write that is currently underway. This will ensure that there is an opportunity for the community to provide feedback on this important work.

Public Engagement Update

On October 7, 2020, a press release was issued inviting one-on-one engagement with all property owners in Waterways at/below 250.9m. Property owners were asked to contact Pulse to confirm contact information, and staff connected one-on-one by phone or email, depending on contact information provided.

From October 8 - 23, 2020, staff visited homes of all properties that had not already responded. If no one was at the home, a door-hanger was left behind with instructions on how property owners could engage.

On November 10, 2020, a letter was sent via registered mail to remaining property owners that had not yet been engaged, inviting them to get in touch for a one-on-one conversation.

A series of questions, tailored to each neighbourhood and based on Council's resolutions of September 15, were designed to frame the conversation.

In Waterways, property owners were asked:

- Would you be interested in exploring a land swap (subject to land availability)?
 - o If yes: What neighbourhood-in-town/community-in-the-region would they be interested in?

There are 105 properties at/below 250.9m in Waterways, 50 of which are vacant lots. Staff spoke with owners of 58 properties:

- 29 responded: not interested in land swap
- 11 responded: yes, they are interested in land swap
- 10 responded: they need more information
- 1 responded: they don't know
- 7 did not provide a response

Comments provided by property owners in Waterways during one-on-one engagements are included in Attachment 1.

Insurance Advocacy Update

On October 16, 2020 letters were sent to Premier Kenney, Deputy Prime Minister and Minister of Finance, Hon. Chrystia Freeland (in her capacity as Minister of Finance), and to Lloyd's of London on December 7, 2020. On October 28, the Premier responded, acknowledging that although greater flood insurance coverage is available now in comparison to a few years ago, the Government of Alberta is aware that "flood

coverage may remain unaffordable or unavailable to those in high-risk areas who may need coverage the most.” He also expresses continued commitment to work IBC, other provinces, as well as other orders of government on flood issues, including the insurance needs of citizens.

On October 16, 2020 a letter was also sent to the Insurance Bureau of Canada (IBC), expressing interest in collaborating to find flood insurance solutions for the region, and inviting a formal meeting to members of the association to provide a better understanding of local risk mitigation measures. Consequently, a meeting was scheduled for December 9, attended by the Deputy Chief Administrative Officer and Director of Emergency Management.

Alternatives:

Administration is actively working with the Province to acquire land that could be suitable for the purposes of a land swap. At this time, the Province has made no commitments with respect to whether land may be provided, how much may be transferred, or what the approximate timeline might be. Land in the communities of Parsons Creek and Saline Creek has been the primary focus of conversation, as the Province controls approximately 658 ha and 399 ha respectively in each.

Budget/Financial Implications:

The cost of land swaps cannot be estimated at this time. The creation of Land Use Bylaw provisions is captured through Planning and Development's operational budget and no additional financial implications are anticipated.

Rationale for Recommendation:

During the public engagement following September 15, Administration discovered limited interest in land swaps. However, 10 property owners self-identified as wanting a buyout; staff believe that the number of property owners interested in pursuing a land swap might increase following additional reinforcement that buyouts will not be offered to property owners in Waterways.

Based on the engagement feedback, it was clear the lack of certainty around timelines or potential costs was a barrier to property owners being able to make an informed decision as it relates to desiring a land swap. Administration has continued to work to acquire land from the Province to be used for land swaps, however the Regional Municipality of Wood Buffalo does not have control over when/if lands from the Province will be transferred. Without land available, possible outcomes or processes as they relate to land swaps would be speculative and attempting to estimate outcomes may foster false expectations.

At the September 15, 2020 meeting, Council directed Administration to protect the community of Waterways to a 1:200-year level via structural mitigation. The commitment to protect the neighbourhood is aligned with Council's direction for Taiga Nova, Downtown and Longboat Landing, and provides an equal level of protection to

the above communities.

Offering additional flood risk treatment solutions (such as a land swap) would provide Waterways property owners with a solution that is not being made available to other communities where a structural mitigation solution (berm) is being installed. Continuing with construction of a structural mitigation solution is a fair and equal application of flood risk treatments. When complemented by the added layer of protection provided by Land Use Bylaw provisions, an enhanced level of community resilience can be provided.

Strategic Priorities:

Responsible Government

Attachments:

Waterways - Community Conversation Engagement Update September 28 - December 7 2020

Flood Mitigation and Community Resiliency - Waterways Presentation

Engagement Results to Date

Waterways

There are 105 properties at/below 250.9m in Waterways, 50 of which are vacant lots. We have spoken with owners of 58 properties:

- 29 responded not interested in land swap
- 11 responded yes, they are interested in land swap
- 10 responded that they need more information
- 1 responded that they didn't know
- 7 did not provide a response

Property Owner Comments:

- Character and landscaping and large spaces important.
- Parsons North. Concern for current neighborhood condition and ability to sell in the future.
- Not going anywhere.
- Prefers a buyout absolutely. If there's not buyout, he is left with unsellable land. Buyout is the only option for this resident.
- Felt that he's been treated very poorly. Absolutely not interested in a land swap. Will only live in Waterways (35-year resident of Waterways).
- RMWB has failed to give us any information about a land swap. We cannot make any decision based on zero information. It seems as if RMWB is not taking this seriously. Our lots are older and bigger. My concern is, what will we replace our homes with? We have large lots and big basements. Do I get the same size lot and land? There is no information to base anything on. Would you be "pro land swap" if you had no idea where you were even going? We've already done a lot of work on our home. If you relocate us, who is going to pay for this? RMWB has not answered any questions. How can you get legit information when nobody has the information? Who is going to pay for everything? If you move my home and there are damages to the home in transit, who pays for this? Who pays for rewiring the home and paying for utilities again?
- Absolutely not. Owns 5 properties in Waterways. Do not want a piece of land that I still have to pay for. The Council vote to not buy out properties under 250m elevation, and to limit development on the affected properties, practically steals the properties from the owners. It is not fair because the value of the property has become zero as I cannot build on the location nor be able to sell it in the open market without a 100% loss. Who would

buy a property that he/she could not build on it? During the Council meeting it was commented that you did not want to see residents abandoning Waterways by selling out to RMWB. I counted there are about 45 vacant lots in Waterways that are under 250M elevation. There are no houses on affected the properties, hence no residents! Majority of the vacant lot owners including myself want RMWB to buy out especially after RMWB put a limit development on them. If RMWB decides to buy out all the affected vacant lots at fair market value, say \$150,000 each, it will cost only \$6.75 million.

- Only interested in a buyout.
- Would like to stay in the house - current location is close to work and they have put in a lot of work to set-up their house.
- Happy to not be in the flood zone.
- Owns with his daughter. Family has been on this property in since the late 1950's. Have not had any issues with flooding since they've owned this property.
- Historical connection since Sep 17, 1979, via Greyhound bus. At the 250m elevation, need more clarification of the determination of the 250.9m elevation classification. Concern for the value of the property now that RMWB has classified as the area flood plain. Would like to sell house without losing her shirt and move away for retirement.
- Resident of 40 years. In Waterways for 20 years. Seems like we've been left behind. Nobody is taking responsibility. If we don't get bought out, we will never be able to sell our properties. Timberlea got sidewalks before Waterways. I am just angry.
- I'm not open to a land swap. I need a buyout. The buyout is the best option. I watched the Council meetings. Our properties have been devalued to nothing. Should have explored the option to buy the vacant lots. Nobody is ever going to build on them. They are just going to sit there. I disagree with this motion 100%. We can't build on them. We can't get insurance on them. Unless flood zone designation gets taken off, nobody will ever build in Waterways. This is wrong. Saying we don't want people to leave is not appropriate. There are 40 something vacant lots. You can make these useful again (like a park) if you buy them out. This process has been very upsetting. With limited construction, it's over for us. What happens next year when it floods? People aren't getting answers.
- I don't want a land swap. But if it's all that's on the table (I prefer a buyout), then I would have to look at it. This is my retirement home. I am retiring in 4 years. I will not be able to sell it. If they built the berm, that would put me a bit more at ease. I've been in Fort McMurray since 1967. No intention to leave. I was raised here. Grandchildren raised here. If I had to do a land swap, I would not want to go south of the bridge.

- Need a buyout. If there is a buy out, it needs to be more than 2020 assessment (2018 is better) because of the fire. The flood was beyond our control and because the flood could have been mitigated in the first place, my property value decreased.
- I do not want to live anywhere else. If I have to leave Waterways, I will leave Fort McMurray. I do not like going across the bridge or Gregoire or Beacon Hill. The RMWB needs to buy my house out. If my house doesn't get bought out, what is the value on my home? Now that my home is in the flood zone, what am I going to be able to sell my house for? Will I be able to sell my house based on my tax assessment? I need to sell my house to make my life whole again. This property has never flooded. Yet now I'm technically in a flood zone. There is a long history of Waterways being underserved while other parts of town see development.
- I was born in Fort McMurray. My grandmother lived here. I am not going anywhere. However, I do not enjoy having to deal with preventable natural disasters. My house sits in the lowest part of town. Common sense needs to prevail. I have a beautiful house. I am very proud of it. Now I'm watching everything I own go back into my house. What needs to happen before anyone pays attention? Complete obliteration? I am not looking for a handout. But I see all these potential breaches where water could get in. Everything is reactive. Now that flood has subsided, we are just waiting to see what happens. What are we going to wait for? I lost basement and top floor. And now it'll take until next year to do anything about mitigation. It seems like we are doing just more engagement. I have no faith that anything will be rectified, or a solution be found. This seems like one big circle of saving face. Some people are now bankrupt. Some aren't back from the fire. We are spending money back into our homes only to have it flood again. Anyone that wasn't impacted by the flood has forgotten about it. I can't answer the question because there is not enough information. What does a land swap even entail? We need more information. Are you buying the mortgage and the land? These are the questions everyone has but nobody can answer. I'm very frustrated. This is an anxiety that is never going to go away for people living in lower townsite.
- Buyout is the preferred option. I am retired and this was my investment property. If buyouts are not viable, then a land swap. Must be someplace above the 250.9 elevation. Not in a flood zone.
- The must fix the berm so I can sell this place. Sounds like they are not interested in doing any purchasing. A buyout would have been my first choice. It would give me the ability to move away from the flood zone. To a safer area. The land swap is wonderful if you want to build a completely new house. I don't want to do that. I've already done this after the fire.

- What does a land swap entail? To get a land swapped, what happens with my house? Does RMWB rebuild my house? I have a \$900K house. What happens to this in a land swap? During the fire, we were on Cliff Avenue. Then RMWB purchased the land from us (slope stability). If the slope wasn't stable enough to build on, why were we allowed to build back here in the first place? Why was rebuilding in Waterways even entertained? The oldest parts of Fort McMurray should get more work done (more than happening in Timberlea, etc). This is work that should have been done 25 years ago. I got sewer back up. Not flood. My basement was demolished from 4ft, down. There has still not been any sewer work done. Now I no longer have sewer or water coverage. 2 years ago, I did. If all of Waterways did a land swap, then I would. But I need my home rebuilt exactly the same as it is now. Where will the land be? It's a 1600 sq ft bungalow. This is going to be very difficult. In an ideal world, I'd like RMWB do what they were supposed to do 25 years ago (berm, back flow valves) and start in oldest parts of town first. Get the expertise from industry and get the work completed. How can other communities get this done and we haven't? We are supposed to be a driving force of innovation and industry in Canada, yet we haven't figured this out yet?
- I am not interested in swapping land. I prefer a buyout.
- I don't want to have to go through renovations and rebuilding again. I love Waterways but maybe it's time to get out of the area. I had a house completely redone after the fire. I was out of my home for 18 months at the time.
- Why the change in elevation? Why is Longboat Landing is not included? Many different questions on multiple subjects.
- I would prefer a buyout. I've washed my hands of this. I didn't rebuild after the fire. The realtor says I have zero chance of selling down there. So I need a solution.
- I understand there are restrictions to building below 250. I need to understand what that means. I don't intend to rebuild in Waterways. RMWB (permitting system) made it so difficult to rebuild, that I decided to buy a ready-built home in Draper. RMWB made my lot worthless by putting restrictions on what I can develop. So would we have to raise to above 250m to be developed? I would like the RMWB to pay me out. I assumed this would happen based on Administrations recommendations to Council. I was extremely disappointed when Council passed the current motion. The reason I am not in Waterways (I can't stress this enough) is that the permitting and building/development process was prohibitively antagonistic.
- Above 250M (but below 250.9M). We are going in a ridiculous direction here. I've been here since 1977 and there was a major flood (in 77 and 97). A dyke should have been built in 1978. 42 years and no berm? Two bridges were built going into Waterways. Bridges cost millions of dollars. And then there is the gall to ask citizens to buy out

properties and abandon this location? That is not in the mandate of Council. They have no mandate to buy anyone out with their own money. Using taxpayer money to rearrange real estate priorities in Fort McMurray (devaluing one area while increasing the value in another area) is a conflict. Council is not in the real estate business. The city's job is to maintain services and provide infrastructure to citizens of the region. It should not be socially engineering peoples' properties. It's not the city's job to mitigate the risk to the property owner. If I purchased in a flood area, it is not my fellow citizen's responsibility. It's mine. The city should only be responsible for the flood mitigation. Not buyouts. The homeowner signed the mortgage. He assumes all risk. RMWB did not bail out people in Penhorwood or Abasand. Those people were hurt more than the people of Waterways. Neither one of those property owners got anything. Why do we have all this focus on Waterways and Ptarmigan Court? Probably 15-20 homes were damaged severely. All the rest made it through with minimal or no damage. Though the damage in Ptarmigan Court was minimal, it seems that RMWB is trying to get rid of the neighbourhood. Why were we never given the monetary figure of each individual area (of the damage)? The real problem is the name. The name Waterways itself now synonymous flooding. Now there's a stigma attached to the name Waterways. People assumed every property in Waterways was flooded. I didn't get affected by the flood, but my friend on Pond Crescent did. Now there's a perception that simply shouldn't be there. RMWB has invested a lot of money in parks, two brand new bridges, saline creek partway. This is way too big of an investment into the area to ask the citizens to take a significant downgrade to any other part of Fort McMurray. The people that want a buyout have either left Fort McMurray or want to leave. I love living in Waterways. I wouldn't leave this area for anything.

- I prefer a buyout.
- My floor is at 250m. I want to tell RMWB this: thank you for making our properties worthless. I've worked my whole life to afford a place and now thanks to the bad publicity the property is considered worthless in the community. They could have dealt with the flood and fire right off the hop. I am very frustrated with all three levels of government. I am 60 years old and I feel that I have to start over again. I do not want to take on another mortgage. I cannot afford to be out of pocket on any of these options. I feel that we are going to be screwed any option we head into. If there was a land swap, I don't know what option I would select. My lot is 45x120. I have lots of land and room for parking. There is not the same sort of space in Thickwood or Timberlea. These are peoples' lives. These are peoples' life savings.
- Would like a subject matter expert to come to their property. The property we have is an investment property. It was a duplex. Our preferred settlement would be some sort of a

buyout. However, if a land swap was the only option, we would prefer land in an already developed area (Beacon Hill, Timberlea, etc.).

- The only acceptable option is buyout. A land swap is not in the negotiation.
- I already have a property downtown that is no longer occupied. I no longer live in Fort McMurray. I am not interested in getting reestablished there. There are not enough details provided regarding a land swap. What would it include? My preferred option is a buyout. A land swap doesn't benefit me at all, unless there is no other alternative.
- Buyout is my preferred option.
- I am very familiar with the region. The character, the greenspace and natural environment are irreplaceable and there's simply nothing comparable in the region. The 2020 assessment value is not a fair benchmark for buyout. However, it's more reasonable than the land swap option. If the berm is built, would I be able to develop the land? Would I be able to get flood insurance? Will insurance companies see the berm as a solution?
- I am interested in exploring a land swap; however, more details are needed. It was a lot of work to rebuild from the fire. It would be sad to swap this property. However, now the lot is less valuable and quite vulnerable to flooding. This property was indeed affected by the 2020 flood. We have 3 lots, combined into one. The slope/hill is another concern. Our garage butts up against the hill. In a landslide situation, our property could be impacted significantly and very suddenly. Drainage and water have been a major issue, though RMWB has mitigated some of the concerns (only last week). We are quite happy with this. We could still end up with slope/sliding issues, though. If I had to swap, I would pick Eagle Ridge/Stone Creek. Potentially Parsons Creek (closer to my job). Does the land swap have to be in town? Can it be in BC, for example? Would a land swap be the same size as my current property? Would there be parking and yard space, etc.? Waterways is a quiet neighbourhood - close to the river, and close to the downtown.
- A land swap would/might mean breaking a mortgage and having to requalify for another mortgage. I can see this being very difficult for many residents. Even if we wanted to do it, I don't think many people would be able to do a land swap. I also think that a land swap would actually cost me at least \$100K. I would not want to be out-of-pocket for any of these options. I also have the challenge that I am on the hill side and the slope is affecting my property. I don't think Council is thinking about the financial burden to property owners. Where will this money come from? Many residents are struggling to make ends meet for just basic cost of living, never mind moving expenses. We are seeing many contractors come in from out of town. There is no support for our own community. So how are people supposed to afford to switch over when they can't even get a job. This is disappointing.

- A buyout would be his preferred option. He would be interested in a land swap, in addition to what you have below (Timberlea/Thickwood) he would also be interested in Parson's Creek. Pre-fire assessment buyout preferred option, followed by land swap to on the north hill (especially Timberlea or Thickwood)
- He would like to know why buyouts were not selected as an option for Waterways. He is seeking a buyout or the ability to move his home to another location. He would like to know how much the berms will cost and how it is a more cost-effective solution. He feels his property will be at a greater risk with the berms in place protecting the downtown. He believes a decision maker has a connection to the company contracted to do the berms. He feels the questionnaire was unfair with vague concepts rather than options. He would like to speak to a decision maker, Council.
- Land swap is not my #1 choice. My first choice would be a buyout. I don't have enough information. If you're not allowing people to build without any caveats, then I'd like a buyout.
- Owner wants buyout
- A few years ago when land was purchased, Tariq Mendis provided literature assuring the land was not in the flood zone. Was the flood zone revised in the last few years?
- Mobilization fees would be very significant. To take the home off the property, move it, store it, and put it back would be very expensive. On top of that there would be the costs of any damages incurred in the process. There is a huge pile of dirt in front my home and it's been there for a few years. Now, they are hauling dirt from all over the region, without using the dirt that's been in front of my house, to build the temporary berm. I've lived in this community my whole life. I can't see the river rising like this again. It seems like a lot of knee-jerk reactions to appease the public. I don't want to move.
- I am hoping for a buyout. My property is a vacant lot and it's been for sale for 2 years. Now, with the flood, it will be even more difficult to sell. In 2 years, I didn't get a single call or offer on the property. If I ever do get a land swap, I would still have to sell that land anyway.

Flood Mitigation and Community Resiliency Update

Waterways

Presenter: Brad McMurdo

Title: Director, Planning and Development

Meeting Date: December 15, 2020

Council Direction

Administration be directed to:

1. Complete flood mitigation to 1:200 level (250.9m) by October 15, 2021.
2. Limit development below 250m and introduce enhanced Land Use Bylaw provisions above 250m.
3. Explore land swaps for property owners below 250m.
4. Advocate to the Province and Insurance Bureau of Canada on the availability of overland flood insurance.
5. Report back to Council within 90 days.

Update: Engagement

1. Residents engaged via multiple means, including electronic, registered mail, and in-person.
2. 58 properties out of 105 below 250.9m (remaining 50 are vacant) responded to whether they would be interested in a land swap:

Question	Responses
Not interested in a land swap	28
Interested in a land swap	12
Need more information	10
Don't know	1
Did not answer	4

Update: Permanent Mitigation

1. Design for Reach 10 up to Howard Pew Park being updated to reflect 1:200 level (250.9m).
2. Berm development costs included in 2021 budget request, totaling \$44M.

Update: Temporary Mitigation

1. Temporary earth berm constructed parallel to Saline Creek Drive.
2. During a flood, Saline Creek Drive would be blocked off between McCormick Drive and Tolen Drive bridge to provide continuous line of protection.
3. In event of a future flood, residents will be able to evacuate via Tolen Drive.
4. Berm development costs included in 2021 budget request, totaling \$44M.

Update: Insurance Advocacy

1. Letters have been sent to Premier Jason Kenney and Deputy Prime Minister Chrystia Freeland.
2. Premier responded and will support efforts to work with Insurance Bureau of Canada and other levels of government.
3. Letter sent to Lloyd's of London requesting meeting to discuss insurance availability for residents.
4. Letter sent to Insurance Bureau of Canada requesting meeting, which took place on Dec. 9, 2020 with Administration.

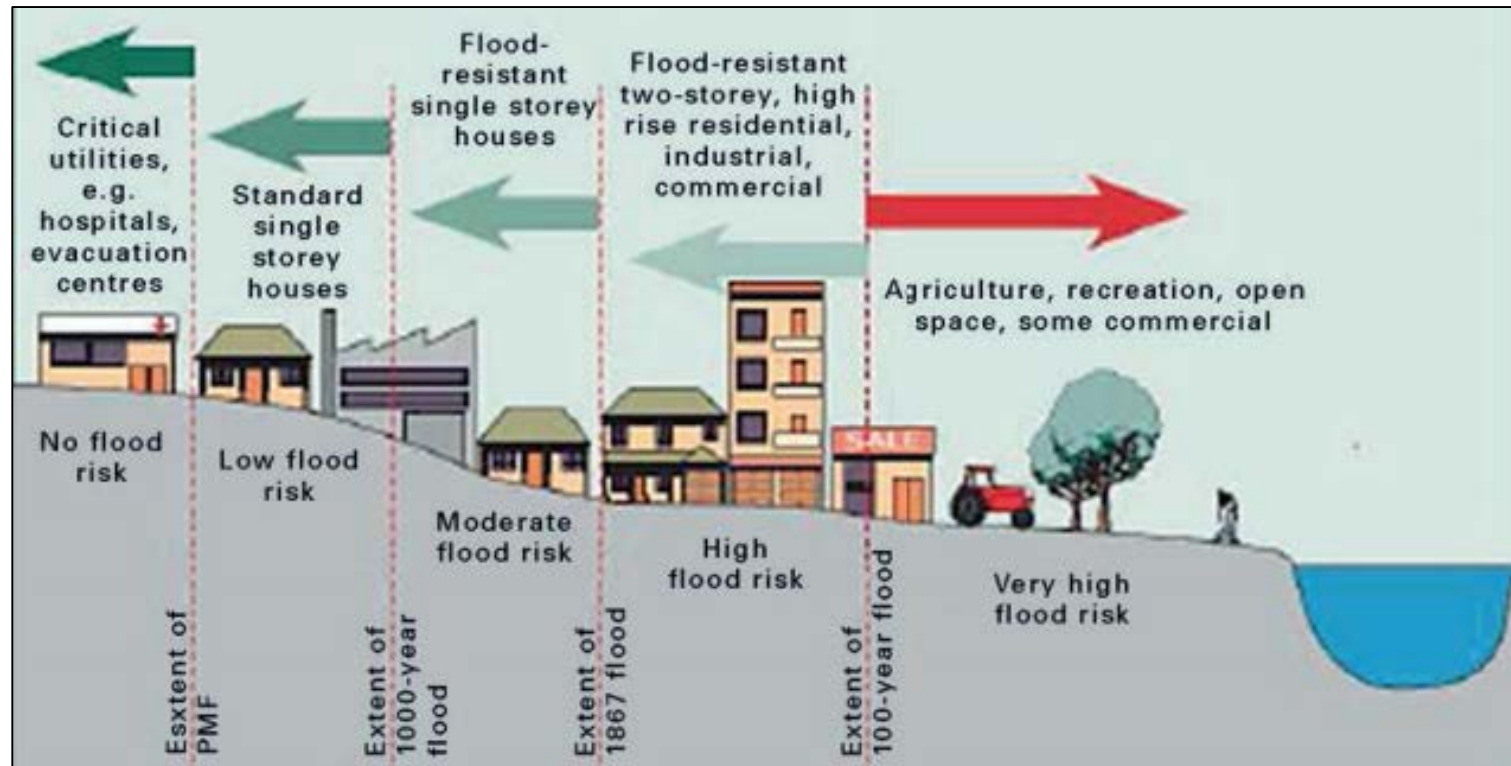
Update: LUB Flood Provisions

1. Applies across the flood hazard area.
2. Not proposed to be retro-active – would apply to new development only.
3. Will not come forward as part of the new LUB re-write as engagement with property owners must occur.

Approach to Flood Provisions

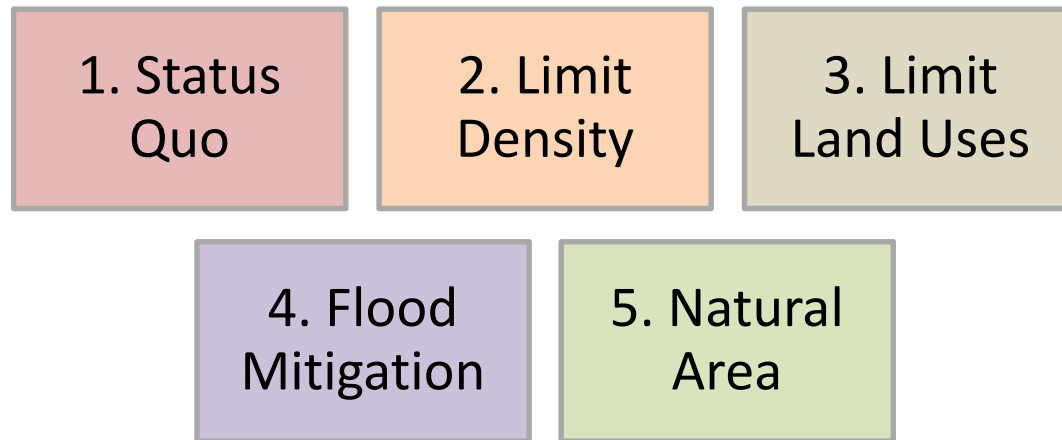
1. Establish *categories* based on flood impact and severity.
2. For each *category*, develop *policy statements* which can then be applied to each area or neighbourhood as decisions are made.
3. For each *category* and *policy statement*, develop a suite of Land Use Bylaw provisions.
4. *Categories, policies, and provisions* can be combined as necessary.

Approach to Flood Provisions



Categories of Flood Provisions

- A group of provisions can be developed based on the categories below:



- There may be overlap between categories.

Category Descriptions

- Status quo: no provisions for areas within the flood plain determined to be above the impacted area.
- Limit Density: limiting number of people impacted by future flood by placing maximums on number of units or building size.
- Limit land use: limiting presence of sensitive uses like basement suites and storage of hazardous materials.
- Flood mitigation: require special structural elements and water-resistant materials.
- Natural area: leave un-protected undeveloped areas in a natural state or allow passive uses.

Alternative: Land Swap

1. Administration actively working with Province.
2. Province has made no commitments at this time.
3. Province currently controls 658 ha in Parsons Creek and 399 ha in Saline Creek.
4. Appropriately zoned land to accommodate mobile homes does not exist in Parsons Creek, making an LUB amendment necessary to support any land swap.
5. Costs cannot be estimated at this time.
6. Title would need to be cleared.

Recommendation

1. Administration continue with building a structural mitigation solution, as previously directed.
2. Administration limit development below 250.9m and introduce enhanced flood provisions in the Land Use Bylaw for development above the 250.9m elevation.

Rationale

1. Interest in a land swap was limited but may increase if buyouts are not offered.
2. Lack of certainty around timelines and costs was a barrier for residents to make an informed decision.
3. Without land available, offering a land swap would be speculative and may foster false expectations.
4. Work on structural mitigation is proceeding and provides an equal level of protection to Taiga Nova, Downtown and Longboat Landing.
5. Offering land swaps would provide property owners with a solution not being offered to other communities where structural mitigation is being installed.

Questions

2.7. Flood Mitigation & Community Resiliency – Waterways

Written Submissions

- Rod Hansen
- Gee Young

To: Mayor and all Councillors, please pass this to all Council Members and please have my letter read at the Dec. 15th, 2020 Flood Mitigation Council Meeting.

I own 4 Commercial Lots in Waterways and our Commercial Building in Waterways burned down in the past Wildfire. After the Wildfire there was an updated new designated Flood zone established by the Alberta Government and put into effect in Waterways. Our property up until that time was not in any designated Flood zone. So we never rebuild as it was basically next to impossible to get Flood Insurance when you are in a known designated Flood Zone, so why would anyone invest and rebuild. Then came the Flood last spring and as you are fully aware Council came up with a new resolution that was supposed to resolve the Flooding issues in Waterways by building a Barrier. What really surprised me was that no one from the RMWB even contacted us or any of the other people in Waterway's that were actually affected prior to making their presentation to Council. I think that would have been the very first thing that should have happened. I believe Council should have had the input from all the people who were really directly impacted and I would have thought that all Council members would have made such a request prior to making any type of decision in regards to what was the best approach for Waterways in the areas which were affected below the 250 meter level. Since that Council meeting we have now talked to one person from RMWB about our concerns. There are approx. 50 vacant Lots in Waterway's right now which in my opinion will never be built on again. Just spending all this money building the Barrier as Council suggested will not solve this issue as we still will be in a designated Flood zone with Limited Building restrictions below the 250 Meter Level. With the designated Flood zone that will still be in effect after the Barrier is built and then only being allowed limited Building restrictions, this has made all these Vacant Lots pretty much worthless and they will not be built on in the future. In my opinion the RMWB should purchase all these Vacant Lots at fair Market Value based on Lot values prior to the Flood. In my opinion to buy the vacant lots would cost the RMWB about seven to eight Million Dollars. Then the RMWB would own all the vacant Lots. Then the RMWB could at that point deal separately with the actual home owners that still live in Houses in Waterways that are in the Flood zone and then the RMWB could meet each of those people on a one on one basis and see what they may desire, some may want to stay and take on all the future risk upon themselves, that would be for each homeowner to decide. I do not think that the Alberta Government in the future will keep helping out anyone in Waterways anymore, unless the RMWB intends on taking on the Liability and helping those homeowners out when this happens again in the future. After the RMWB purchases the vacant lots and then meets with the existing home owners I feel in my opinion then the Waterway's Flooding issue could be resolved without building any Barrier. Also in the last Council meeting held re Waterways Flooding some people were very concerned that people will leave Waterways, well to those concerned people a lot of the people that were affected in Waterways have already left and they will not be coming back. About 50 Lots are Vacant and even if they wished to come back they cannot get Flood Insurance so why would anyone ever build again in Waterways in the designated Flood zone? Waterways is very different than the other areas as it has all these vacant Lots that are going to remain Vacant and will just be an eye sore for years to come, at least the RMWB could do something beneficial to all Fort McMurray residents by utilizing these vacant Lots. Thanks very much ---Rod Hansen

PETITION

2.a

Petition to: The Mayor, Councilors, and Administration of RMWB

Petition Objectives: City Council to consider "Buy-out" of Vacant Properties below 250M Elevation in Waterways.

Advantage of the buy-out option for vacant lots only in Waterways: 1)there is no concern of residents moving out of the community because these lands are un-occupied; and 2) It is cost effective for RMWB to carryout. At fair market value, say \$150,000.00 per lot, it will cost RMWB \$6.45 Million (not counting the lots of the TOP Church who seeks land swap option)

Petition Organizer: Gee Young Phone: **Section 17 (1) FOIP**

Petition recruiting method: Due to COVIC-19,through personal direct conversation and confirmation with the owners by the organizer.

Petition Note: Since the Council Meeting being held in September 15, 2020, the organizer has been susseccful in contacting all affected Property owners with exception to 5 properties whose owners were not reachable.

Owners of Vacant Lots that are below 250m Elevation in Waterways

consent to pettition RMWB for Buy-out Option of the Flood Mitigation of Waterways.(with the

exception of the TOP Church who is only interested in Land swap)

Please note: the following information is confidential and private-only for the use by the Mayor, the Councilors, and Administration Staffs of RMWB in the consideration of this petition.

<u>Lot</u>	<u>Property Address</u>	<u>Owner Name</u>	<u>Phone #</u>	<u>Email Address</u>
Section 17 (1) FOIP	Railway Ave	Nesredin Berhan	Section 17 (1) FOIP	
	Railway Ave	Abdulghani Abdo		
	Railway Ave	Mark Tolend		
	Railway Ave	Jim Roger		
	Tomlinson	Richard Sheldrake		
	Railway Ave	Rod Hansen		
	Railway Ave	Rod Hansen		
	Railway Ave	Rod Hansen		
	Railway Ave	Rod Hansen		
	Railway Ave	TOP Church		
	Railway Ave	TOP Church		
	Railway Ave	TOP Church		
	7 Bishop St.	Jim Roger		
	Railway Ave	Jim Roger		
	Railway Ave	Tam Nguyen		
Section 17 (1) FOIP				
	Railway Ave	Glenn/Nancy Grant		
	Bulyea Ave	Gee Young		
	Bulyea Ave	Monica McGrandle		
	Tomlinson St.	LAKHBINDER S MINHAS		
	Bulyea Ave	Gee Young		

Bulyea Ave	TOP Church
Bulyea Ave	TOP Church
Bulyea Ave	TOP Church
Bulyea Ave	TOP Church
Bulyea Ave	Ralph Scharfl
Bulyea Ave	Gee Young
Bulyea Ave	Gee Young
Bulyea Ave	Gee Young
Huggard St.	LIAM- Bill DeSilva
Bulyea Ave	Ron/Yvonne Ormson
Bulyea Ave	Section 17 (1) FOIP
Bulyea Ave	Tom Talbots
Bulyea Ave	Nicole /Rob McKenzie
Bulyea Ave	Gavin McGladdery
Bulyea Ave	Dan Forsberg
Bulyea Ave	Islamic Society C/O Mohammed Alzabidi
Bulyea Ave	Islamic Society C/O Mohammed Alzabidi
Bulyea Ave	Section 17 (1) FOIP
Bulyea Ave	Islamic Society C/O Mohammed Alzabidi
Hughes Ave	Moh Tabalan
Hughes Ave	Dean Wood
Bishop St.	Jackie Hardisty
Hughes Ave	Doug Golosky

Section 17 (1) FOIP

2.a

Section 17 (1) FOIP

Section 17 (1) FOIP

Hughes Ave

Hughes Ave

Hughes Ave

Hughes Ave

Hughes Ave

Hughes Ave

Section 17 (1) FOIP

Brian Jean

Jacqueline/Gerald Galambos

Jacob Goetz

Brian Jean

2.a

Section 17 (1) FOIP

Attachment: Written Submissions - Waterways (Intake 1) (Written Submissions - Flood Mitigation &

2.7. Flood Mitigation & Community Resiliency – Waterways

Written Submissions (Intake 2)

- Tracy Holland

Heather Fredeen

From: Section 17 (1) FOIP
Sent: Tuesday, December 15, 2020 12:11 PM
To: Legislative Assistants; Mike Allen; Krista Balsom; Keith McGrath; Phil Meagher; Verna Murphy; Jeff Peddle; Bruce Inglis; Claris Voyageur; Sheila Lalonde; Jane Stroud; Don Scott; Jamie Doyle; mathhew.hough@rmwb.ca
Subject: December 15, 2020 Special Meeting Agenda 2.7 Flood Mitigation and Community Resiliency Update – Waterways

Dear Mayor, Council and Administration,

Today is going to be a very difficult day for many. I have been trying to formulate the words, but I cannot possibly get through what I would like to say in a short 5 minute span. Instead here is 3 minutes of input.

Any shred of faith I had left in the RMWB was gone the minute the Engineering Department reported that the Clearwater River was flat and that the Hangingstone River would stop flood waters from crossing it.

In hopes the latest information would restore some faith, I took the time to read it. But after reading so much ridiculousness and to see the willingness of the RMBW continue to knowingly place people and property in harms way, hope was quickly dashed.

Since reviewing the Agenda Packet for today's meeting, I have been cycling through an emotional roller-coaster to where I now sit ... very thankful our family made the choices and decisions we made to lessen the impact but very sad for those who have suffered and continue to suffer due to what seems as an abuse of power and mismanagement of a region.

Is Alberta Municipal Affairs the only entity that can step in to save those who have lost so much?

It appears as though some influential administration and council have lost sight of what their responsibilities are and who they are responsible to protect.

It appears there are a few personal agendas, outside influences and poor behaviours that are clouding good judgement and the ability for some to remain serving the public in a reasonable and responsible manner.

Administration is not bringing forth what the taxpayer or the RMWB wants or needs. Council needs to ensure Administration does better. Council needs to do better. The taxpayer has been demanding better for a very long time.

Some on Council are not understanding nor willing to take the time to see what is being done that is destroying families and their neighborhoods, for the 3rd time ... destroyed by fire, flood and along the way what appears as irresponsible decision-making by those who are responsible to build safe and viable neighborhoods. It appears the focus of some on Council and Admin is not on public serving, the focus seems to be more on self-serving.

Not one taxpayer asked for this costly and catastrophic exercise in futility to take place. Not one taxpayer asked to have their property devalued to the point of no return. This is an Administration and Council created disaster that has destroyed and continues to destroy so many people and the biggest investment in their lives. Without a formal plan for the very neighborhoods that are being destroyed, how can you possibly agree with the recommendations before you?

In my opinion, the RMWB made a mess of the wildfire recovery and the downward spiral continues today.

RMWB Administration and Council seem to have forgotten the people they need to listen to are those that have hired them, the tax-payer. Those tax-payers who have suffered and continue to suffer deserve better.

It feels as though this unsolicited disaster that seems to have been bestowed upon so many speaks volumes of the poor decisions that have plagued Fort McMurray Wood Buffalo for years. Until we see a change in the staff and council that have lost sight, one can only continue to predict man-made disasters will continue to destroy what little is left and the tax-payer will be left hanging in the balance.

How can you possibly attract people to a region when you can't look after the ones you have now?

What has been happening is not fair, it is not right and it needs to stop.

This whole situation is embarrassing and simply disgraceful.

Severely disappointed,

Tracy Holland



COUNCIL REPORT

Meeting Date: December 15, 2020

Subject: Flood Mitigation and Community Resiliency Update - Draper

APPROVALS:

Jamie Doyle

Director

Chief Administrative Officer

Recommended Motion:

THAT Administration determine the feasibility of a grant program for lot-by-lot individual flood mitigation solutions for properties in Draper where the underside of the main floor joists are below 250.9m as the flood risk treatment for Draper and report back to Council; and

THAT Administration limit development below 250.9m and introduce enhanced flood provisions in the Land Use Bylaw for development above 250.9m.

Summary:

On September 15, 2020, Council passed the following resolutions:

- THAT Administration be directed to conduct one-on-one engagements with property owners in Draper under 250.9m to gather information including property elevation, relating to whether funding to raise properties to 250.9m elevation (main floor) or other forms of flood mitigation will be most amenable to property owners; and
- THAT this information, including full costing of all available options, be brought forward to Council; and
- THAT Administration provide progress updates to Council every 90 days; and
- THAT Council advocate on behalf of Draper property owners to the Government of Alberta and the Insurance Bureau of Canada on the availability of overland flood insurance.

The following report is provided as an update on these resolutions.

Background:

Public Engagement

On October 7, 2020, a press release was issued inviting one-on-one engagement with all property owners in Draper at/below 250.9m. Property owners were asked to contact Pulse to confirm contact information, and staff contacted owners by phone or email to complete a one-on-one, depending on contact information provided.

From October 8 to 23, 2020, staff visited homes of all properties that had not already responded. If no one was at a home, staff left a door-hanger with instructions on how to engage. On November 10, 2020, a letter was sent via registered mail to remaining property owners that had not yet been engaged, inviting them to get in touch for a one-on-one conversation.

A series of questions, tailored to each neighbourhood and based on Council's resolutions of September 15, 2020, were designed to frame the conversation. In Draper, property owners were asked:

- Would funding to raise your property to 250.9m elevation be most amenable to you?
 - o If no: What other form of flood mitigation would be most amendable to you? Options provided were buyout, land swap, or structural mitigation.

There are 46 properties at/below 250.9m in Draper. We have connected with owners of 31 of these properties. Thirteen (13) indicated funding to raise their property would not be most amendable; 7 indicated that funding to raise their property would be most amenable; and, 11 did not provide a response to the question.

Nine (9) residents responded to the follow-up question: What other form of mitigation would be amenable? Of those, 4 indicated buyout and 5 indicated structural mitigation.

Comments provided by Draper property owners during one-on-one engagements are included in the attached Appendix.

Land Use Bylaw Provisions

Administration is developing an enhanced set of Land Use Bylaw provisions for development in the flood hazard area. These new provisions may only apply to certain parts of the flood hazard area depending on what kind of development is expected to take place. These provisions are still in draft form and will focus on different ways to influence development whereby more than one provision may be applied to a given part of the flood hazard area. The categories are as follows:

A) Status Quo: Additional provisions are not likely to be proposed for areas that are within the flood plain but that are deemed to be above the impacted area.

B) Limiting Density: This is intended to address the social implications of a flood by limiting the number of people who may be impacted by a future flood. This may include

new maximums on the number of dwelling units allowed on a property, or upper limits on the total size of a building (commonly measured through "gross floor area").

C) Limiting Land Use: Provisions may be proposed which limit the presence of sensitive uses such as basement suites and storage of hazardous materials in commercial and/or industrial properties.

D) Flood Mitigation: Provisions proposed in this category would capture structural elements and employing materials that are resistant to flooding. There is an opportunity for this to be extended beyond the Land Use Bylaw to providing policy guidance to owners (i.e. recommending installation of spray insulation and water-resistant wiring).

E) Natural Area: For areas that are not protected by structural flood mitigation, these may benefit from having passive uses or be left in a natural state. This is envisioned to include areas on the side of the berm that are susceptible to flooding.

The new Land Use Bylaw provisions are not expected to be retro-active and should apply to new development only. As these provisions are an important aspect of the Bylaw, they will be brought forward separately from the re-write that is currently underway. This will ensure that there is an opportunity for the community to provide feedback on this important work.

Insurance Advocacy

On October 16, 2020, letters were sent to both Premier Jason Kenney and Deputy Prime Minister and Minister of Finance, Hon. Chrystia Freeland (in her capacity as Minister of Finance). Correspondence was sent to Lloyd's of London on December 7, 2020. On October 28, 2020, the Premier responded, acknowledging that although greater flood insurance coverage is available now than a few years ago, his government is aware that "flood coverage may remain unaffordable or unavailable to those in high-risk areas who may need coverage the most." He also expressed continued commitment to work with the Insurance Bureau of Canada (IBC), other provinces, as well as other orders of government on flood issues, including the insurance needs of citizens.

On October 16, 2020, a letter was also sent to the IBC, expressing interest in collaborating to find flood insurance solutions for the region, and inviting a formal meeting to members of the association to provide a better understanding of local risk mitigation measures. Consequently, a meeting was scheduled for December 9, 2020, attended by the Deputy Chief Administrative Officer and Director of Emergency Management.

Alternatives:

Community-level structural flood mitigation is not considered technically feasible or cost-effective for Draper. Instead, several lot-specific options could be considered as noted below. The associated financial implications of these alternatives are identified in the following section.

Buyout

On July 15, 2020, Administration presented a buyout of Draper as a possible option for increasing community resiliency, owing to the impracticality of providing structural flood mitigation. Geotechnical issues on the hillside were also a concern expressed by residents.

Land Swap

Administration is actively working with the Province to acquire land that could be suitable for the purposes of a land swap. At this time the Province has not confirmed whether land will be provided, how much may be transferred, or what the timeline might be. Land in the communities of Parsons Creek and Saline Creek has been the focus of this conversation, as the Province controls approximately 658 hectares and 399 hectares respectively in each.

Raise Main Floor Elevation

This option was tabled by Council on September 15, 2020, and involves raising residential structures by cranes, jacking or other means. It would require utilities to be raised as well. While raising structures may reduce the amount of damage to the structure itself, it does not create a safe means of egress, so the need to evacuate during a flood would remain.

Grade Elevation Reports and Grading

For properties that are situated partially above 250.9m, or close to 250.9m, site grading may be a viable option for flood mitigation. This approach requires further evaluation on a lot-by-lot basis, along with evaluation of relocating foundation drains, etc. While grading may reduce the amount of damage incurred to the structure itself, it does not create a safe means of egress, so the need to evacuate during a flood would remain.

Temporary Mitigation

Inflatable dams or aggregate-filled bags are a potential option for temporary mitigation on individual private properties. These methods could be deployed and removed by residents themselves, with minimal assistance, to a height of 1.07m. Beyond this height, most products require larger equipment and labour to deploy. The use of these systems may reduce the amount of damage incurred on private property, but it does not create a safe means of egress, so the need to evacuate during a flood would remain.

Budget/Financial Implications:

Buyout

Buyout costs were determined based on 2020 assessed values. The cost to acquire all 98 private properties is \$60.3 million, while the cost of acquiring the 64 properties below 250m is approximately \$40 million.

Land swap

The cost of land swaps cannot be estimated at this time.

Raise Main Floor Elevation

Due to the variety of structures in Draper, feasibility and potential costs vary significantly and would have to be determined on a lot-by-lot basis. Initial enquiries to contractors suggest a base cost of \$75,000 to \$100,000 per structure.

Grade Elevation Reports and Grading

Grade elevation reports would be specific to each property. The cost to alter the grade would vary based on the individual property, the need to replace or relocate fences, utilities, foundation drains, etc.

Temporary Mitigation

Preliminary cost estimates to supply Draper residents with temporary flood mitigation barriers that reach a height of 1.07m range from \$20,000 to \$80,000 (for the average-sized home in Draper). The products included in this estimate are considered suitable for deployment by a homeowner.

Temporary mitigation higher than 1.07m would require different product models, equipment to install, labour, and cost more.

Rationale for Recommendation:

Draper properties vary in elevation, lot size, structure size and type. As such, it is difficult to recommend one approach for all of Draper. Administration has engaged owners of 31 properties and continues to engage with property owners in Draper; however, there has been limited interest in funding to raise properties.

A berm surrounding all of Draper is not viable for a number of reasons. The Municipality would need to acquire privately owned land to develop a berm for the area; it would be cost-prohibitive from a cost-benefit perspective; and, time-consuming (it would take years to acquire neighbouring parcels of land). Additionally, while technical analysis has confirmed that building berms in Downtown and Waterways would not impact flood elevations in Draper, it is currently unknown what impact structural mitigation in Draper itself may have on flood elevations in Draper. The Municipality has engaged a specialist consultant to provide a technical opinion.

As with Waterways and Ptarmigan Court, the primary challenge of using land swaps as a risk treatment option is that there is no land available. Considering land swaps as a risk treatment for Draper is further complicated by lot sizes. It is unlikely the Municipality will have at its disposal land with comparably sized lots in a location with similar characteristics, consequently eliminating land swaps as a desirable option for residents.

Some Draper property owners indicated an interest in being bought out at the 2020 assessed values. Following the September 15, 2020, Council meeting, Administration has continued to seek support from the Federal and Provincial Governments to support funding for a possible buyout but have not been successful in securing funding for this option. A voluntary buyout of all of Draper without external funding support would have a significant impact on the Municipality's budget and subsequently the ratepayers of the region.

Based on discussion and decisions made at the September 15, 2020, Council meeting, Administration is not recommending buyouts in Draper.

Having eliminated all other risk treatment alternatives, Administration developed a recommendation that provides a path forward to improve resiliency for the diverse range of structures and properties in Draper. It is recommended that Council direct Administration to explore the feasibility of a grant program for lot-by-lot flood mitigation for properties in Draper where the underside of the main floor joists is below 250.9m, and report back to Council. This would not eliminate the need to evacuate in the event of a flood.

Strategic Priorities:

Responsible Government

Attachments:

Flood Mitigation and Community Resiliency - Draper Presentation

Draper - Community Conversation Engagement Update September 28 - December 7 2020

Flood Mitigation and Community Resiliency Update

Draper

Presenter: Dennis Warr
Title: Director, Engineering
Meeting Date: December 15, 2020

Council Direction

On September 15, 2020, Council directed Administration to:

- Conduct one-on-one engagements with property owners in Draper under 250.9 M to gather information including property elevation, relating to whether funding to raise properties to 250.9 m elevation (main floor) or other forms of flood mitigation will be most amenable to property owners; and that this information, including full costing of all available options, be brought forward to Council;
- provide progress updates to Council every 90 days; and
- advocate on behalf of Draper property owners to the Government of Alberta and the Insurance Bureau of Canada on the availability of overland flood insurance.

Public Engagement Update

- Residents were engaged via multiple means, including online and virtual, by phone, registered mail, and in-person
- Connected with owners of 31 out of 46 properties
 - 7 indicated that funding to raise property would be most amenable
- Only 9 people responded to the follow-up question, what other form of mitigation would be amenable:
 - 4 indicated buyout
 - 5 indicated structural mitigation

Insurance Advocacy Update

- Letters sent to
 - Premier Kenney
 - Deputy Prime Minister and Minister of Finance, Hon. Chrystia Freeland (in her capacity as Minister of Finance)
 - Lloyd's of London
 - Insurance Bureau of Canada (IBC)
- Received response from Premier Kenney
- Met with Insurance Bureau of Canada

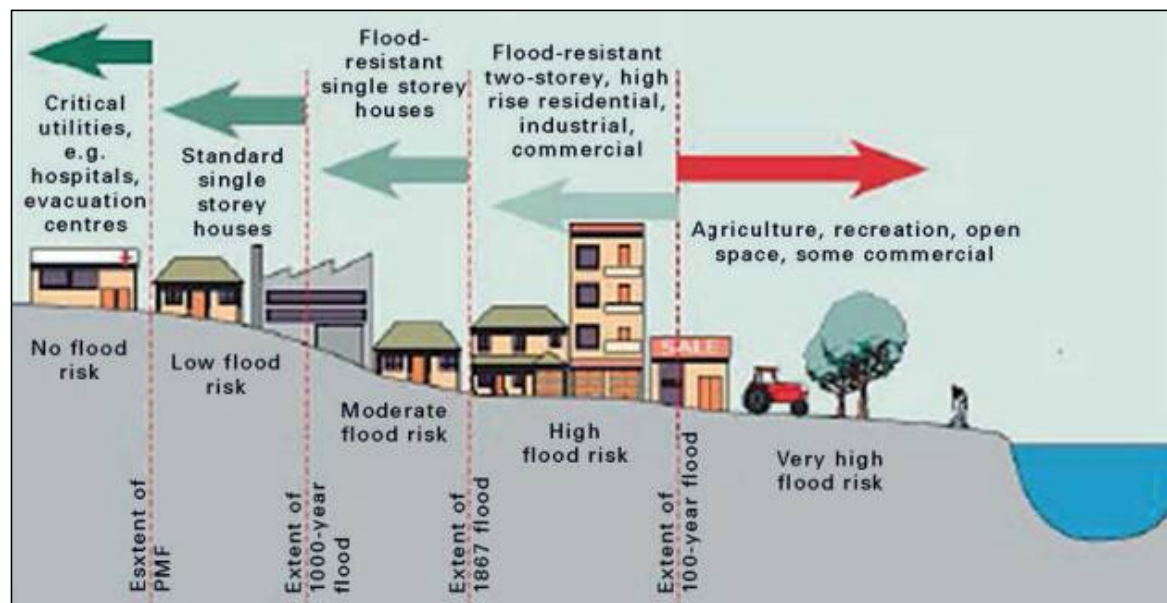
Land Use Bylaw (LUB) Provisions Update

- Applies across the flood hazard area, not just Draper
- Not proposed to be retroactive, would apply to new development only
- Will not come forward as part of the new LUB re-write and engagement with property owners must occur

Approach to Flood Provisions

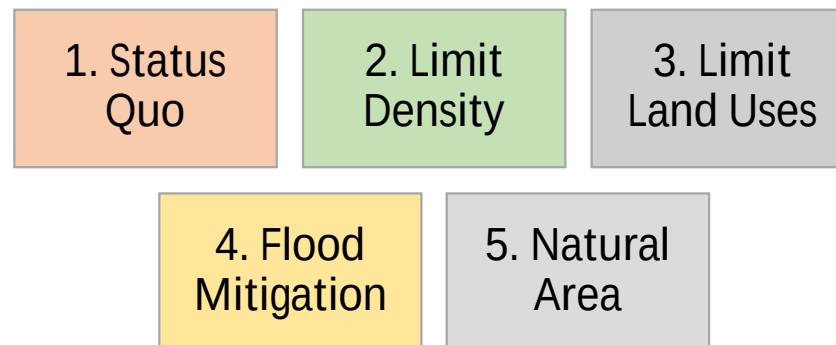
- Establish *categories* based on flood impact and severity.
- For each *category*, develop *policy statements* which can then be applied to each area or neighbourhood as decisions are made.
- For each *category* and *policy statement*, develop a suite of Land Use Bylaw provisions.
- *Categories, policies, and provisions* can be combined as necessary

Approach to Flood Provisions



Approach to Flood Provisions

- A group of provisions can be developed based on the categories below:



- There may be overlap between categories.

Category Descriptions

- Status quo: no provisions for areas within the flood plain determined to be above the impacted area.
- Limit Density: limiting number of people impacted by future flood by placing maximums on number of units or building size.
- Limit land use: limiting presence of sensitive uses like basement suites and storage of hazardous materials.
- Flood mitigation: require special structural elements and water-resistant materials.
- Natural area: leave un-protected undeveloped areas in a natural state or allow passive uses.

Temporary Flood Mitigation Update

Administration is investigating temporary mitigation options:

- Inflatable dams or bulk-sized aggregate-filled bags could be placed by residents themselves, up to a height of 1.07 m
 - Depending on structure footprint, this could cost between \$20,000 and \$80,000 for material supply only
- Providing protection above 1.07 m would involve different products, require larger equipment and more labour
- Residents would likely still have to evacuate in event of a flood

Mitigation Options

1. Buyout
2. Land swap
3. Raise main floor elevation
4. Provide elevation report and grade
5. Temporary mitigation

Option 1: Buyout

- A possible option for increasing community resiliency, owing to the impracticality of providing structural flood mitigation
- Geotechnical issues on the hillside a point of concern for residents

Option 2: Land Swap

- Working with the Province to acquire land
- At this time no commitments with respect to:
 - whether land may be provided
 - how much may be transferred
 - what the approximate timeline might be
- Land in the communities of Parsons Creek and Saline Creek has been the primary focus of conversation

Option 3: Raise Main Floor Elevation

- Involves raising residential structures by cranes, jacking or other means
- Utilities would have to be raised as well
- Does not necessarily eliminate the need to evacuate during a flood

Option 4: Provide Elevation Report and Grade

- For properties that are at least partially above 250.9 m, or close to 250.9 m, site grading may be a viable option
- Would be evaluated on a lot-by-lot basis
- Does not necessarily eliminate the need to evacuate during a flood

Option 5: Temporary Mitigation

- Inflatable dams or aggregate-filled bags could potentially be used for temporary mitigation for individual properties
 - Not recommended as a substitute for permanent mitigation or residual risk reduction
- Does not necessarily eliminate the need to evacuate during a flood

Administrative Recommendation

- Explore the feasibility of a grant program for lot-by-lot individual flood mitigation solutions for properties in Draper at and below 250.9 m.

Questions

Engagement Results to Date

Draper

There are 46 properties at/below 250.9m in Draper. We have connected with owners of 31 of these properties. 20 responses were provided:

- 7 indicated that funding to raise property would be most amenable
- 13 indicated that funding to raise property would not be most amenable
- 11 did not respond
- Only 9 people responded to the follow-up question: what other form of mitigation would be amenable. Of those, 4 indicated buyout, and 5 indicated structural mitigation.

Participant Comments:

- RMWB nor province has let me know if this is the case or not. Worried about upstream level. If my basement is renovated (waterproof or water-resistant materials, including mechanical room), this could be a solution. I do have flood insurance. I don't have confidence that I'm going to be helped. I have a fully developed basement and \$50K mechanical room. I feel that I'm being left hung out to dry along with other Draper residents - especially if the berm downtown dams off at the Athabasca, then water will rise and back up into Draper (from Clearwater).
- On the 250.9m (half property is below). Open to a buyout.
- Flooded really badly. 6 ft under water. We had insurance and still do. Everybody would be upside down if they paid market value right now. Due to Council/Admin mishandling of this, the property values plummeted. Admin said it was unlivable down here, due to flooding risks. Then they didn't buy us out. I have 6 acres. Nothing in the municipality compares. Before they came out with these options (buy outs or land swaps) there should have been talks with the province. There is no money and no land. That is embarrassing. We need to sit down with a subject matter expert to come to our home and figure out what's feasible. Every house property is different. I need to know what RMWB can afford and undertake, realistically. I can't answer the question because I don't know anything. Draper is like the ignored, neglected stepchild of the city. We feel that the message was: we are going to berm everything but Draper. So, if the water rises, it's going through Draper. Draper has been chosen to flood in order to save other neighbourhoods. Draper is the sacrificial lamb.
- There is a stigma that's now in place for Draper. This was a million dollar plus property and now we're having to contend with the perceived value of the home/investment. It's going to be impossible to sell now. My daughter and wife are now terrified to go back there. First the fire, then the flood. I saw where the water went. 250.9m elevation wouldn't be an adequate height. Where did this 250.9m number come from? If the berm is built, the water is going to end up upstream to Clearwater River toward Draper. The other communities will be protected but Draper will not be. Even at 250.9m, Draper will

not be protected. If we are in the same situation again - with one way in, there is the issue of evacuation too. If there are any landslides or floods in the middle of the road, we have no option to get out. The cost to raise properties - as mentioned in the Council meeting - between \$75K and \$100K is not at all realistic (factoring all components; coming from a construction background). There are many other elements that must be considered. It would easily cost 3-5 times this amount. We built our neighbour's house after the fire. Infill alone was over \$600K (and this property was already at 248m). A buyout is most fair to everybody. We have 11 acres of riverfront property here. Can this be replicated in Eagle Ridge? The assessed value (2020), I'm okay with.

- I'm disappointed in the delivery of promised utilities. I have concerns over property value. I am worried about slope stability and I have slope movement on my property right now.
- Berm the whole area. Berming the whole downtown and not Draper is ridiculous. It's setting us up. I want an actual one on one - face to face appointment with someone from RMWB. Someone from Planning & Development. We are facing major issues with drainage, ditching (we've had water in our ditches all summer long and nobody has addressed the issue. Water is not being drained properly). Nobody is going to want to buy our house now. I want a buyout.
- Aesthetically this would be horrible. We should have followed provincial guidelines in the first place. If there was a dyke around the house how would run-off water from the top of the dyke even get off the property? These are very large homes. 5,000 ft. I would need 6 of the tiger dams and they are \$30K each (for just one home). I own 2 properties. I believe this option is unfeasible and unrealistic. I would have accepted my tax assessment for a buyout. I feel that Draper is set up to fail. The one-in-200-year level would still completely flood my property. The roads are not high enough. Only because of the road construction occurring at the time were we able to get out of the flood. If it happened again, we would be trapped. The road infrastructure isn't even adequate. If there is another emergency we'd be relying on boats. We are continuing to throw money into a bad area. I can see the writing on the wall. I feel the city is holding our heads under water.
- The motion passed was my best-case scenario. I do not want a buyout and I do not want additional amendments to LUB. Funding to raise all of my property to 250.9m is the best route forward for myself. All of my property includes driveways/roadways, general area, structure (house). My primary concern is that my house is going to be end up with a moat or a mountain. I feel this is the safest way and creating a ring dyke.
- I'm above the 250.9m but I'm currently on a landslide (the slope is sliding). This is my biggest concern right now.
- We sunk \$30K to build up two lots to the 250M elevation already. RMWB has been draining water onto our property for at least 7 years. We have a lake on our property. It would be the right thing for the city to do (buy us out). There is no draining into the river at this point. It's all being drained onto private property. Some neighbours have 4 sump pumps running all the time to get water out of their basement. Draper has been vilified in the community.

- I would like to remain in Draper. I would like RMWB to finish paving the road and getting the RWSS complete (and natural gas/ATCO). I already put in a \$5K down payment to ATCO. If RMWB delays any longer, I will likely lose that deposit.
- Although I live close to the river, I have a creek that runs through my yard. I don't feel that at any point that we were in a lot of danger of flooding. We have been out in Draper for four generations. We have never seen a flood that high. I believe RMWB elevation measurements are wrong. Elevation markers used by city are incorrect. A family member had his land surveyed and his property goes right up to the road, which is up to the 250m. We are 100% against any buyout. We will be staying in Draper. We have flooded many times and we always get out. I believe the excuse of one-way exit in case of emergency is a poor excuse for a buyout. Other communities in RMWB are also only one-way in/out (Saprae Creek, Fort Chipewyan, downtown). We agree the slope should not be part of the flood mitigation conversation. I've spoken to others below 250. We find people below 250, in general, want to stay. Poor life choices by other people, should not reflect on my situation. As far as sewer/water is concerned, we are not interested in water/sewer. Not interested in RWSS program. It's a waste of money to build the system that is probably not going to work anyway. Please look at every property individually. We are pleased with Council's direction regarding the motion of looking at every property individually.
- I am prepared to have someone come to my house to show them the impact of the flooding. The best opportunity for me - and others - would be to have the house lifted, rather than berming or buying houses out. We have raised our home all on our own. If we had professional help, it would have gone much quicker. Regular homes (not just modulares) can be lifted, contrary to popular belief. This is the most cost-effective option. I want to stay in Draper. I want as many of my neighbours to stay, too. Otherwise, it's not a community anymore. I am of an "all for one and one for all" mindset.
- Has a brand-new home unable to live in. Very frustrated and financially strained due to this property. Hillside pushing up on house due to construction above. Lived here for 40+. Will not answer questionnaire until some speaks to him in person.
- Main concern is the hillside stability.
- We'd like to stay on our property.
- I want to be left alone. I don't want to deal with paperwork or surveying. I've paid over \$30k for surveying. I want nothing to do with RMWB. I just want permission to build my trailer on the property.
- Drenching would help. Still waiting on contractors. Empty promises. Longtime family home (40+ years) 58 acres.
- Requires a face to face, at the property, to explain the elevation to 250.9m elevation would be facilitated. Also dealing with the slope instability.
- Hill stability concerns. Lost 20' from the back yard for the hill coming down. He said he was close to the 250.9m elevation but didn't know for sure.
- Does anyone realize the work and expense required to raise a property? I listened to Council. A lot of Councillors seemed to have disregard for Waterways and Draper Road.

By doing what they did, they lowered the property value down here. It's going to be very difficult to sell my property. There seems to be a stigma about Draper Road.

- I'm open to either/or option (whether buyout or staying). If a buyout, there will be a compensation package put together by my lawyer based on what I think is fair. If we are staying, Draper Road needs to be brought to the 1:200-year level, plus freeboard (which has been done in other wards). Is the water/sewer going to be completed for Draper? If RMWB does buyouts, does that change the amounts we've been told for our hookup fees? I'm disappointed, also, because natural gas was supposed to be hooked up for winter. Because of the RMWB's emergency road to the airport (a future plan that we don't even have confirmation is happening), there's an interference and ATCO is reluctant to deliver service. This proposed road does not provide a secondary point of egress for emergency, as intended for Draper or Sapræ Creek. We would like to see RMWB (whomever is in charge of working with Canada Post), actually give us a physical address. I can't order anything. Most retailers will not ship to post offices. I'd like a super box/mailbox at the end of the road. RMWB has to release the land so Canada Post can accommodate this. I would like Council to explain Draper's emergency egress in case of flooding this next spring. When they put the dam across Draper Road, we will not have any sort of egress. How can I even get in/out of town if there's a dam across the road? We've already lost our home in Draper because of slope stability. There seems to be a lot of lip service and not a lot of action.
- My question is - what happens when the berm is done? I am disappointed that Draper now has a terrible reputation, real estate-wise. They should not have announced buyouts before it was confirmed.
- Requests an in-person reassessment of the elevation while owner is home. Need more based information based on individual property before any preferences can be discussed.
- This resident is above the 250.9m level but would not be interested in a buyout.
- Due to the unique size and existing structures on property it is cost prohibitive to protect the property with mechanical berms and/or raise rough grade elevation and or floor elevation to 250.9m. As per our one-on-one engagement held on Friday Oct 2nd, it was decided by the Church board in communication with RMWB Administration that a Land Swap for 128 Garden Lane would be mutually amenable. TOP Church has been striving to rebuild since 2016 +/- 4 years and has subsequently been through development challenges post wildfire and now post flood. We are encouraging RMWB Administration to gather information expeditiously to make 2021 construction season available to landowners to action individual property solutions. The church and Corcoda have continued to remain in communication and connected with RMWB Planning & Development in an effort to move forward with their rebuild. On behalf of our client Corcoda is available at any time to provide and answer any questions that would aid Administration with their presentation(s) to council.
- Resident was quite upset that the registered letter he received in the mail was our first time communicating with him since the flood. During our phone call, I was able to ask and receive his answer to the engagement question. He's already begun raising his

trailer/property to 251 M. His preferred option was for funding to raise his property. He was not interested in “other forms of flood mitigation”, but he did say he’d take a buyout if offered one.

- A reasonable buyout based on market value might be easier and less expensive for the RMWB than raising property. We have 30 acres, so the cost of raising that land would be considerable.

2.8 Flood Mitigation & Community Resiliency - Draper

Written Submission

- Brandon Howse

From: Section 17 (1) FOIP
To: [Legislative Assistants](#)
Subject: December 15 meeting
Date: Monday, December 14, 2020 7:37:02 AM

Hello Council,

I am writing to you once again about Draper and how you are so apathetic towards us residents.

You people talk about Draper as if our issues are self-inflicted which we all know they are not.

So here is an option not yet talked about. Why can't the municipality take an insurance policy out for Draper properties against flooding and cover that cost for us? You can spend millions on the rest of the city for flood mitigation or any other service without hesitation. Why not help Draper a little more?

Or since it looks like Draper is not getting water, sewer, natural gas connections or any sort of flood mitigation stop collecting my \$3100 in property tax at let me use that money to subsidize my increased heating and insurance bills. The only service provided to Draper is a plowed road during winter. I pay for my water, sewer and garbage collection on a separate bill like the rest of the city.

Regards,

Brandon Howse

Attachment: Written Submission - Draper (Intake 1) (Written Submissions - Flood Mitigation & Community Resiliency - Draper)

2.8 Flood Mitigation & Community Resiliency - Draper

Written Submission (Intake 2)

- Brad Friesen
- Sandy Bautz (Paragon Properties Inc.)

I am speaking on behalf of myself/wife at 116 Garden Lane we are hoping for options for buyouts similar to Ptarmigan Court as buyouts based on assessed values of 2020 although we'll incur losses we are better than living with fear of the next flood and what help may or may not come from the province. Should you look at help for us to build up our home you'd be looking at likely \$1,400,000.00. Keep in mind when our home was constructed in 2002 the previous owners followed all height requirements to build the house at. All we as homeowners can do is what is expected of us otherwise how can we rely on our elected officials and unfortunately when new people become elected they must stand beside what their earlier predecessors' decisions were. All this said I hope in respect of this that you will make the right decision and at least give those of us affected by the flood the options for voluntary buyouts. Thanks

- **Written submission**

RMWB Special Council Meeting – Tuesday, December 15th, 2020 at 1 pm MST

Submission to Council by:

Paragon Properties (Draper Road) Inc., as the owner of 115 acres of located on Draper Road in the RMWB and legally described as:

MERIDIAN 4 RANGE 8 TOWNSHIP 88

SECTION 33

ALL THAT PORTION OF THE SOUTH WEST QUARTER

Background

The 250.0 M contour line and requirements thereof, i.e. drainage easement and restricted development area, were considered in the owner's development plans for 30 country residential lots. The proximity to the Clearwater River and surrounding forested areas were considered natural amenities for the enjoyment of residents.

The 2015 Draper ASP and 2016 RMWB Capital Budget encouraged such development and indicated capital budget funding for planned improvements, such as extension of Draper Road, servicing, and emergency services.

In the 2016 RMWB Capital Budget, nearly \$100 million dollars was requested for flood mitigation design and construction through to 2019.

The Great Flood

The Flood of 2020 was unprecedented and Natural Resources Canada Flood Extent Map for Draper indicates overland flooding over the 115 acres.

The majority of landownership in the Draper ASP is held by the Province of Alberta and the RMWB. These lands are apparently undeveloped and, as such, there appears to be little urgency for buyout of the minority private landowners.

Buyout Rationale

Mr. Meacher's December 4th, 2020 email in response to my request for update to the proposed buyout, indicated that the RMWB has no need for a single residential lot.

Our request is not for a single lot but for a parcel of 115 acres and probably is best utilized as a nature preserve or park similar to Sitskaw

(Horse Pasture) Regional Park.

The property has no development potential.

There is no access to the property. Draper Road, the only access road, was washed out to the east at Waterways and there is no west connector to Saprae Creek.

RMWB advises that no flood mitigation is planned for Draper.

Public consultations in Jul through October indicated that buyouts are preferred.

65% of the private properties are located below the 250.0 M contour.

RMWB 2021 budget of \$44,000,000 for temporary flood protection for the Lower Townsite and Waterways provides for a clay berm and other temporary measures. Both of which may exacerbate the Clearwater River flooding in Draper.

Enclosures:

2020 Property Assessment Notice

Contour map of the 115 acres

- **Upload any related documents**

1. [2020 Property Assessment Notice.pdf \[115.1 KB\]](#)

- **Acknowledgment**

I have read and understand that my name and comments will be made publicly available in the Council agenda. My contact information will NOT be included in the public record.



Regional Municipality of Wood Buffalo

2020 ANNUAL PROPERTY ASSESSMENT NOTICE

Roll Number: 8340000150 Account Number: 10519116

Owner Name: PARAGON PROPERTIES (DRAPER ROAD) INC;

Civic Address:

Legal Description: SW 33-88-8-4

Date Mailed: January 20, 2020

Notice of Assessment Date: January 28, 2020

Final Date of Complaint: March 30, 2020

The assessment roll will be open for inspection at the Regional Assessor's office (Fort McMurray) and at the local Municipal offices in the rural areas during regular office hours.

RECEIVED JAN 23 2020

2020

Total Assessment

\$1,951,930

Tax Status

803: FULLY TAXABLE(100%): JAN-2020 TO DEC-2020

School Support

PUBLIC 100.00%

Property Description

Percent Tax Class

RES VACANT LAND - RURAL

100 RURAL RES

2019

Total Assessment

\$1,951,930

TAX CLASSES

Code	Description	Code	Description
COM	URBAN NON-RESIDENTIAL	COR	RURAL NON-RESIDENTIAL
CRN	RURAL NON-RES NO SCHOOL	INR	RURAL INDUSTRIAL
MER	RURAL MACHINERY & EQUIP.	MEU	URBAN MACHINERY & EQUIP.
MRS	URBAN OTHER RESIDENTIAL	MSC	URB OTHER RES. NO EDUC TAX
RER	RURAL RESIDENTIAL	RES	URBAN RESIDENTIAL
RLR	RURAL LINEAR	RNS	RURAL RES. NO EDUC. TAX
UNM	URBAN NON RES-NO MUNI TAX	UNR	URB OTHER RES NO REQ'S

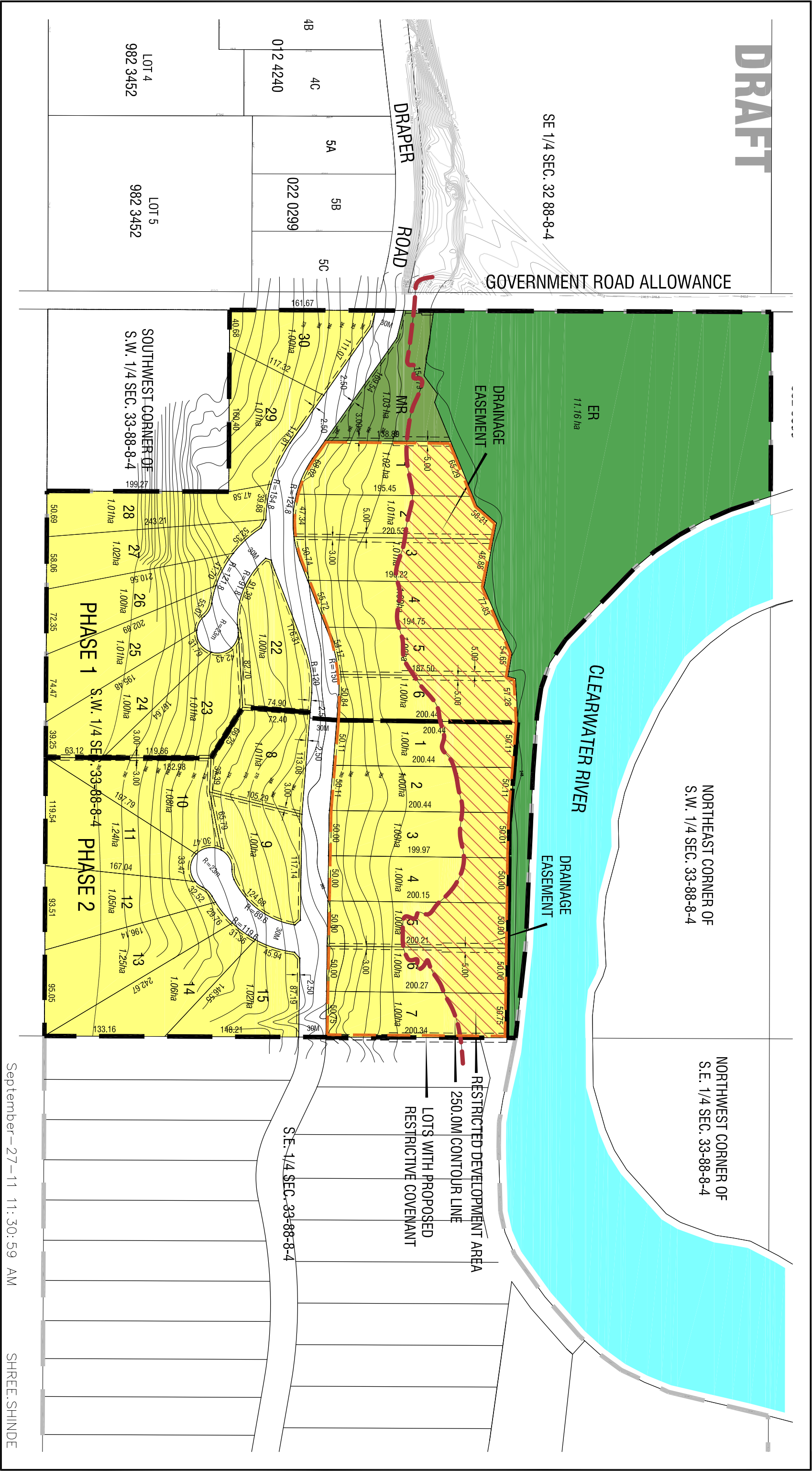
Please review this Property Assessment Notice carefully. The assessed value of your property reflects the market value (most probable selling price) of your property as of **July 1, 2019** including any physical changes up to **December 31, 2019**. This assessed value will be used to calculate the amount of tax billed for your property. Your tax bill will be calculated in late May. If you disagree with any of the assessment information on this notice, you have the right to submit an Assessment Complaint with the Clerk of the Assessment Review Board (see reverse for contact information) by 4:30 pm on **March 30, 2020**.

COMPLAINTS CANNOT BE SUBMITTED AFTER 4:30 pm on March 30, 2020.

The Assessment Review Board cannot hear your complaint unless the Assessment Review Board Complaint Form, accompanied by the appropriate filing fee, is submitted to the Clerk of the Assessment Review Board by 4:30 pm on March 30, 2020. Complaints cannot be submitted against the amount of tax you will be billed in late May. If you wait until tax notices are mailed in late May, you will miss the complaint deadline, as identified above.

Changes in School Support designation and mailing address must be made in writing to the Assessment & Taxation Department listed on the reverse of this notice. If your Property Assessment Notice indicates your school support as "undeclared", we do not have a record of receiving a completed School Support Declaration form. Please contact the Assessment & Taxation Department at 780-743-7900 to request a School Support Declaration Form or visit our website below.

http://www.rmwb.ca/Municipal-Government/municipal_departments/Assessment-and-Taxation-Department/Tax-Forms.htm



DRAFT

SE 1/4 SEC. 32 88-8-4

GOVERNMENT ROAD ALLOWANCE

DRAPER ROAD

DRAINAGE EASEMENT

CLEARWATER RIVER

DRAINAGE EASEMENT

NORTHEAST CORNER OF S.W. 1/4 SEC. 33-88-8-4

NORTHWEST CORNER OF S.E. 1/4 SEC. 33-88-8-4

RESTRICTED DEVELOPMENT AREA

250.0M CONTOUR LINE

LOTS WITH PROPOSED RESTRICTIVE COVENANT

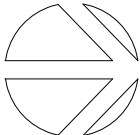
S.E. 1/4 SEC. 33-88-8-4

September-27-11 11:30:59 AM

SHREE.SHINDE

TITLE:

DRAPER ROAD PHASE 1 AND 2



DRAWN BY: SHS

DATE: September 27, 2011

SCALE: 1:4000

DWG. J:\29997_DraperRoadPl\5.9 Drawings\59planning\current\Concepts\CON1_PHASEING_2011_09_27.dwg

IBI GROUP



Subject: Flood Mitigation and Community Resiliency Update - Ptarmigan Court

APPROVALS:

Jamie Doyle

Director

Chief Administrative Officer

Recommended Motion:

THAT Council direct Administration to proceed with offering a voluntary buyout until May 31, 2021 to all property owners in Ptarmigan Court at the 2020 assessed value.

Summary:

On September 15, 2020, Council passed the following resolutions:

THAT Administration be directed to conduct one-on-one engagements with the residents in Ptarmigan Court to assess which option will work for each individual resident to determine whether buy outs, funding to raise properties to 250m elevation (main floor elevation) or land swaps will work best for the majority of residents in that particular community; and

THAT a further Council report be brought back for consideration once this has been completed with accurate financial costing included; and

THAT Administration provide updates to Council every 90 days including updates on discussions with the Province of Alberta specific to funding and land swaps related to this matter.

The following report and presentation are provided as an update on these resolutions.

Background:

Update on Public Engagement

On October 7, 2020, a press release was issued inviting one-on-one engagement with all property owners in Ptarmigan Court. Property owners were asked to contact Pulse to confirm contact information, and staff connected one-on-one by phone or email, depending on contact information provided.

From October 8 - 23, 2020, staff visited homes of all properties that had not already responded. If no one was at a home, staff left a door-hanger with instructions on how to engage.

On November 10, 2020, a letter was sent via registered mail to remaining property owners that have not yet been engaged, inviting them to get in touch for a one-on-one conversation.

A series of questions, tailored to each neighbourhood and based on Council's resolutions of September 15, were designed to frame the conversation.

In Ptarmigan Court, property owners were asked:

- What is your preferred option: a buyout, funding to raise property to 250.9m elevation or a land swap?
 - o If land swap: What neighbourhood in town/community in the region would they be interested in?
- What is your second option?
- What is your third option?

There are 69 properties in Ptarmigan Court, 20 of which are vacant lots. We have spoken with owners of 52 properties. Of those that provided a response, the following are the most preferred options: 31 prefer buyout, 8 prefer funding to raise property, 4 prefer land swap (preferred areas identified are Parsons Creek, Anzac, Beacon Hill, Prairie Creek).

26 respondents indicated a second option: 8 for buyout, 6 for funding to raise property, and 12 for land swap.

14 respondents indicated a third option: 2 for buyout, 7 for funding to raise property, and 5 for land swap.

Additional comments offered by property owners are included in the attached Appendix.

Update on Buyout

On July 15, 2020, Administration presented a full buyout of Ptarmigan Court as a possible option for increasing community resiliency, owing to the impracticality of providing structural flood mitigation. At least one of the permanent flood mitigation options would also require the acquisition of several properties. Administration determined the buyout costs based on 2020 assessed values and presented a total expected cost of \$14 million to acquire all 69 privately owned properties.

Update on Land Use Bylaw Provisions

Administration is developing a set of enhanced Land Use Bylaw provisions for development in the flood hazard area. These new provisions may only apply to certain parts of the flood hazard area, depending on what kind of development is expected to take place. These provisions are still in draft form and will focus on different ways to influence development whereby more than one may be applied to a given part of the flood hazard area. These categories are as follows:

A) Status quo: additional provisions are not likely to be proposed for areas that are within the flood plain but that are determined to be above the impacted area.

B) Limiting density: this is intended to address the social implications of a flood by limiting the number of people who may be impacted by a future flood. This may include new maximums on the number of dwelling units allowed on a property, or upper limits on the total size of a building (commonly measured through "gross floor area").

C) Limiting land use: provisions may be proposed which limit the presence of sensitive uses such as basement suites in residential properties and storage of hazardous materials in commercial and/or industrial properties.

D) Flood mitigation: provisions proposed in this category would capture structural elements and employing materials that are resistant to flooding. There is an opportunity for this to extend beyond the Land Use Bylaw to providing policy guidance to owners (i.e. recommending installation of spray insulation and water-resistant wiring).

E) Natural area: for areas that are not protected by structural mitigation, they may benefit from having passive uses or be left in a natural state. This is envisioned to include areas on the other side of the berm that are susceptible to flooding.

The new Land Use Bylaw provisions are not expected to be retro-active and should apply to new development only. As these provisions are an important aspect of the Land Use Bylaw, they will be brought forward separately from the re-write that is currently underway. This will ensure that there is an opportunity for the community to provide feedback on this important work.

Alternatives:

Raising main floor heights

In response to Council's direction to raise main floor heights to the 250m elevation, Administration hired a surveyor to evaluate the heights of manufactured homes in Ptarmigan Court. Following the survey work, a contractor specializing in the placement of manufactured homes was hired to determine the process and costs associated with raising homes. Out of the 69 private properties, there are 49 homes of which 16 have a main floor at or above 250m. This leaves 33 structures that would need to be raised, ranging from 35 cm to over 1.3m.

It should be noted that there are also concerns around raising older structures which may result in unintended damage to the home. After the wildfire there were 16

structures that were not replaced that remain today, and some of them will require a detailed individual lot assessment. It should also be noted that raising trailers would not eliminate the need to evacuate during a flood, nor would accessory structures (sheds, etc.) be raised. Attached decks and patios would also need to be re-constructed, and utilities would need to be raised.

Land Swap

Administration is actively working with the Province to acquire land that could be suitable for the purposes of a land swap. At this time, the Province has made no commitments with respect to whether land may be provided, how much may be transferred, or what the approximate timeline might be. Land in the communities of Parsons Creek and Saline Creek has been the primary focus of conversation, as the Province controls approximately 658 ha and 399 ha respectively in each.

It is important to note that neither Saline Creek nor Parsons Creek have land that is appropriately zoned to accommodate manufactured homes if they were to be relocated from Ptarmigan Court. Therefore, amendments to the Land Use Bylaw would be required to accommodate these homes.

Permanent or Temporary Mitigation

As Ptarmigan Court is severely space constrained, the only permanent mitigation option that would permit all lots to remain as-is would be a concrete floodwall, and given the truss system required to resist ice forces, it is possible that some of the trusses would in fact intrude into some of the lots. Moreover, a concrete wall would greatly detract from the livability of the neighbourhood.

Temporary mitigation is planned for spring 2021. As Ptarmigan Court is vulnerable to open water flooding as well as ice jam flooding, any mitigation would be needed for potentially up to six months of the year; it would be both expensive and risky to use temporary mitigation measures in lieu of permanent measures over such a long period. Temporary mitigation would also have the same impact on livability as permanent mitigation in these circumstances.

Budget/Financial Implications:

The buyout of 69 private properties in Ptarmigan Court carries a total cost of nearly \$14 million, based on 2020 assessed value.

The potential cumulative costs of raising homes is estimated at \$1,185,660 for the entire community or \$20,000 to \$32,000 per home, depending on the required lift. This cost was derived from the work required to raise not just the main floor above 250m, but the bottom of the main floor joists as well. This is an important technical detail, as the submersion of floor joists can dramatically increase the scope of repair work. Raising homes so that the bottom of the main floor joists was at 250.9m was estimated to cost \$1,488,840 for the entire community, or \$21,000 to \$38,000 per home. Please note that this differs substantially from an estimate presented previously to Council, as the

previous estimate included substantial contingencies and additional costs.

The cost of land swaps cannot be estimated at this time.

Permanent mitigation costs have been estimated at \$20M - \$25M.

The creation of Land Use Bylaw provisions is captured through Planning and Development's operational budget and no additional financial implications are anticipated.

Rationale for Recommendation:

As per Council's direction at the September 15, 2020 meeting, Administration has endeavored to contact the owners of all properties in Ptarmigan Court. As of November 27, we have been in contact with the owners of 52 properties in Ptarmigan Court, and the majority (60%) have indicated an interest in being bought out.

Through the engagement, approximately 40% per cent of property owners identified funding to raise structures or a land swap as their preferred flood risk treatment.

Administration has determined that there are no structural mitigation solutions that would not involve acquiring some private lands. The feasibility of raising structures has also been investigated, and while possible, it is not the recommended approach but is a viable alternative. It does not provide the greatest level of residual risk reduction, nor does it have sufficient community support to be considered as the outcome for the community. Furthermore, the flood risk extends beyond future flood damage to properties if Ptarmigan properties are raised. Residents in the neighbourhood will continue to face risks posed by a more significant flood event, and limited access and egress by first responders will continue to be a concern in any flood event that results in inundation.

Land swaps would provide a similar level of risk reduction to a voluntary buyout. However, Administration is not recommending land swaps as a solution due to their complexity, the fact that the Municipality does not own the necessary land, no clear timeline for implementation, and a lack of public support.

Through engagement, Administration has continued to explore potential approaches for pursuing a buyout. Administration has heard that not all owners are willing to participate in a buyout. Administration explored alternatives to determining property value. As a result, Administration is recommending that 2020 assessed value (plus 10% for professional fees) be used to commence the buyout process. Local appraisers were also engaged to offer a preliminary assessment, which indicated that appraised value would be approximately 30% lower than assessed value. Administration is recommending putting an end date on the voluntary buyout program to evaluate next steps for planning, land use and servicing requirements. The end date for offering voluntary buyouts is proposed to be May 31, 2021.

Administration is recommending a voluntary buyout but has also identified alternatives.

The best policy is to remove people and assets from harm's way, however, if property owners choose to not participate in the voluntary buyout program, they will be doing so with the knowledge that their property is in a known flood hazard area. The future development of any remaining properties will be subject to the proposed Land Use Bylaw provisions for flood hazard areas. Further, questions remain around residents' ability to secure private market buyers for their properties and potential reluctance by lenders to finance the purchase of properties. Insurance providers may also be averse to offering property insurance policies that cover loss of or damage to homes in Ptarmigan Court.

Strategic Priorities:

Responsible Government

Attachments:

Ptarmigan Court - Community Conversation Engagement Update September 28 - December 7 2020

Flood Mitigation and Community Resiliency - Ptarmigan Court Presentation

Ptarmigan Survey Data

Engagement Results to Date

Ptarmigan Court

There are 69 properties in Ptarmigan Court, 20 of which are vacant lots. We have spoken with owners of 52 properties. Of the 43 that provided a response, the following are the most preferred options:

- 31 prefer buyout
- 8 prefer funding to raise property
- 4 prefer land swap (preferred areas identified are Parsons Creek, Anzac, Beacon Hill, Prairie Creek)

26 respondents indicated a second option:

- 8 for buyout
- 6 for funding to raise property
- 12 for land swap

14 respondents indicated a third option:

- 2 for buyout
- 7 for funding to raise property
- 5 for land swap

Property Owner Comments:

- No secondary option.
- Do not have enough information to give input regarding buyouts or raising the house.
- Rebuilt after the fire with the promise of a flood wall. Concern of evacuation every year even if property is protected. Not willing to raise property. Land swap - south of bridge, transit available & near parks and school (or easy transportation to school).
- Only prefers buyout option.
- Buyout at the value I think it's worth. Not based on 2020 assessment. I owe \$49K more than the assessment is worth. If a land swap, would prefer Fort Chip, on a serviced lot.
- In an agreement with Syncrude for mortgage assistance (Housing Subsidy) until July 26, 2023. Large family. Want to stay above all else. If land swap, the expectation would be property for property, move the house with paved driveway, fence & landscaping. Would like to avoid a buyout.
- We don't know enough about each option. Our home is worth pennies. Less than we owe. If we take a buyout would we be leaving here in the hole? Everyone is in a different situation. There is simply not enough information. If I had to pick - without knowing anything else - I would opt to have my property raised. Buyouts can't just cover

mortgage. We don't want to live our quiet little nest in order to go live near the airport. I really wish we would have more background for each option presented.

- A buyout would have to be more than the mortgage. We would want everything we put into the house (expenses to date). I am upset that we were promised a berm for years and then it never came. So, this feels like a slap in the face.
- There have been issues in Ptarmigan since the fire. I would rather be able to move to another part of Fort McMurray. I work here and have a life here. Paying rent and a mortgage is extremely difficult. I am not going to take a chance allowing RMWB to select a plot of land for me. I have no faith RMWB would select a desirable plot of land.
- We do not have enough information to make any decisions. There are no details.
- These are rental properties. This is income for me. I am retired. I have to put in a driveway in each property (I own 3 properties). I don't want to invest the money into a driveway if we are getting bought out or doing a land swap.
- The only acceptable option is a buyout. I foresee land swaps being a multi-year calamity. I don't think most people understand how complicated this is going to be. The timeframe seems incredibly long. We will see another flood season with no answers.
- Not enough information. If land swap, needs the same size lot (including space for garage and the garage, period). Has a large lot. Needs the same size driveway, etc. Moved to Ptarmigan because it's exactly what he wanted. If a land swap, would prefer to be out by the airport (between Gregoire and the airport). South of the bridge for sure.
- After the fire, we wanted to raise our ground level. However, we were only allowed to raise it to 250.74 (floor level). Our ground level isn't quite 250. We are high enough that we did not get impacted whatsoever. Our frustration is that we were not permitted to build higher in the first place. We did everything we were supposed to do after the fire, including putting our homes on piles. We do not want to move.
- I am rebuilding my home. My home is arriving next month. I am one of the first urban, legal tiny home in Canada. I lost my home in the fire. My neighbours are great and I do love this neighbourhood. I am in the middle of getting everything done. If something happens down the road, I am going to be aggressive toward any decision that takes me out of my home. Next year, I am so motivated and sparked by this Council's agenda that I am running for Council to stop it. I am trying to do something unique. I had an interview with CBC yesterday. I am going to put up a huge fight if we are forced to leave Ptarmigan Court. I asked Council if I am allowed to put my piles at a height higher than the current LUB allowed for. I did not hear back from anyone at RMWB. I am fighting for my neighbourhood/community - for those who want to stay in Ptarmigan Court. We are here to stay, regardless.
- There is no way to protect my trailer from future flooding. If you put berms on the river side, Hangingstone and Grayling Creek will flood. The water will have no place to disperse. Water will come through the manholes. I had over 1m of water in the past flood. I've been doing this work for 40 years, and I am 100% certain that the berms are not going to protect our properties. After the flood in 2013, the fire, and now the flood, we are out of money. The DRP is not even close to helping financially. This experience has

been traumatic on my family - especially my autistic child. Raising a trailer? Raise the shed, too? Land swap? Absolutely not. We've been promised things in the past by RMWB that didn't happen (the berm) so how can I trust RMWB to do the right thing with land swap? I am in the lower end of the trailer court. I was told at Open House that 30% of Ptarmigan Court could potentially be bought out. I am committed to the region. I have 2 daughters in the region. I have grandchildren in the region. We won't leave the region.

- My property backs onto Saline Creek. I can walk to the downtown area and I have access to trails for walking and cycling. If we do a land swap, I would like a larger plot of land to compensate for being removed from this unique property. I am also very close to work. Moving away from Ptarmigan Court would impact my daily commute significantly. We also have trailer storage in Ptarmigan Court and a new plot of land would also have to account for this. Even a small acreage community (or quarter acre) would be a great solution.
- Not knowing where the land would be makes it difficult to weigh in on that option. This would prolong the process for sure. How is it possible to move everybody? Everyone from Draper, all the way down to the Towers?
- Second option would be land swap. I don't understand how the properties would be raised. This seems impossible to me. Logistically, it doesn't make sense to me and no details have been provided. A buyout based on 2020 assessment won't even cover my mortgage. Minimum would be \$250k. This process is going very slowly.
- Do not want a land swap at all.
- If everyone takes a buyout would I be left alone in neighborhood. What would that do to property value?
- No land swap.
- Need more information. Feel like he's getting false facts. Buyout - he won't take on a larger mortgage. Land swap would be okay but no current land options
- It's difficult to weigh in on the options without knowing concrete details for each. We are open to further discussions, but we need more information, including who is paying for what. We want answers and it seems that we are getting half-answers or half-ideas. There is also a lot of hearsay in the community. We love our area. My husband was born and raised in Waterways. I've lived in the region for over 40 years, and I've never lived north of the bridge.
- Land swap is not an option.
- For one, there's not enough information or details to weigh in on any of these options. Also, is it majority wins? If I want a buyout but 90% of Ptarmigan Court wants a land swap, am I forced to do a land swap?
- The buyout would depend on the price. The assessed value does not cover the mortgage. The entire property should be appraised. We've invested a lot into the property and the buyout price should reflect this.
- A buyout is the only acceptable option for our family.
- Our first choice is buyout, but without details or specifics, it's really difficult to weigh in. In order to protect the community responsibly, a buyout is the best option for Council to

make. However, a buyout must be fair and would need to make the residents whole. For example, we rebuild in the fall of 2018. Our insurance did not cover the expenses, so we put over \$200K of our own cash to rebuild. This doesn't include the purchase price of the home before the fire. I have a brand-new home in Ptarmigan Court. We need to know how Council would determine what would be a fair offer. A less-than-2-year old home still has significant value. We would need to be made whole. The problems in the area - a constant thorn since 2016 - have created significant financial and emotional strain on us as homeowners.

- If land swap - only interested in Oliver BC, or a property worth more so he could sell. Need more information to confirm selection
- Land swap means where he could keep his trailer and move it to higher ground. The land swap was the only option that he saw working for his situation. A buyout wasn't preferred as he bought his place in 2015 and would still owe on the trailer in the event of a buyout. He didn't believe that raising his property would be a feasible or practical option.
- So many variations to the options, need more information. Prepared to go to court if more flooding occurs. He's answered the questions already at the townhalls and open houses. Only want to hear a solid option (offer) to decide what he will do.
- It is too difficult to weigh in without knowing any details.
- Buyout is the only acceptable option for me.
- This is not my primary residence. I would consider any of the three options, but I do not know the details. I'm not paying a mortgage on an empty lot. And I'm losing income because the dwelling is usually rented. When I went to RMWB to look at rebuilding, everything was on hold. If buyouts are based on 2020 assessments, I would still be owing on the mortgage. The lot that I own backs onto the creek. There is nobody behind it. There is not a similar piece of land in the region for a land swap. I don't want to be on the north side of the bridge.
- This property has been surveyed at 250.7m. A buyout would not be sufficient to even cover the mortgage. Funding to raise the property is our only selection. Our current property is close to our workplaces. A land swap would add so much to our commute. We love this little community. The water didn't touch our home. I would like to see the berm put in and I would love to see the flood mitigation being done to protect this land. I have a park on each side. We do not want to move. The location is prime for us. I don't want to move to Parsons Creek. I don't want to start over with another 25-year mortgage. I don't want to go backwards. I would not want to live in something built PRE-fire because I am concerned about chemicals of the homes built before the fire.
- None of the options are acceptable. RMWB had the money to do flood mitigation since 2016. I feel that Waterways is the forgotten people. Money has been spent elsewhere in the city and not on flood mitigation. Where is the money going for flood mitigation? Why hasn't it started yet? Everyone is stressed out. When it comes to insurance for these areas. We had overland water insurance until February 2020. It was cancelled due to the RMWB not doing anything with flood mitigation. If there was proper flood mitigation, the

people in these areas would be able to have overland insurance. We should be given other options than what has been given us. I believe majority of trailer park doesn't want to leave. People want the RMWB to do their part. If you want to raise the trailers, how about the city get money from federal govt or get money dedicated to building a berm to build a concrete berm. People don't want to be uprooted and taken from their homes. We do not want to be moved. My mother's health is declining because of the challenges we're facing. Where would land be? There is no land. Why give people the option when there is no land? I hear there is no money. So why making this an option? I am not going to give you an answer to these questions. These are not feasible options in my eyes - nor the eyes of my family. People aren't clear on the buyout procedure. It's based on last year's taxes. Will city pay for upgrades? Like air conditioners and upgraded appliances? What would happen to the area and what would happen to our home? We are tired. We thought we were in our forever home.

- Would like to know a timeline on a decision. Property is vacant as he did not rebuild after the fire. Cannot sell land with this decision outstanding.
- Not keen on a swap.

Flood Mitigation and Community Resiliency Update

Ptarmigan Court

Presenter: Brad McMurdo

Title: Director, Planning and Development

Meeting Date: December 15, 2020

Council Direction

Administration be directed to:

1. Engage with residents to determine preferred mitigation option: buyout, land swaps, or raising structures.
2. Report back to Council on engagement results and costing of each option.
3. Provide updates to Council every 90 days on discussions with the Province regarding land swaps.

Update: Engagement

1. Residents engaged via multiple means, including electronic, registered mail, and in-person.
2. 52 properties responded out of 69 (20 of which are vacant).

Option	First preference	Second preference	Third preference
Buyout	31	8	2
Land Swap	4	12	5
Funding to Raise	8	6	7

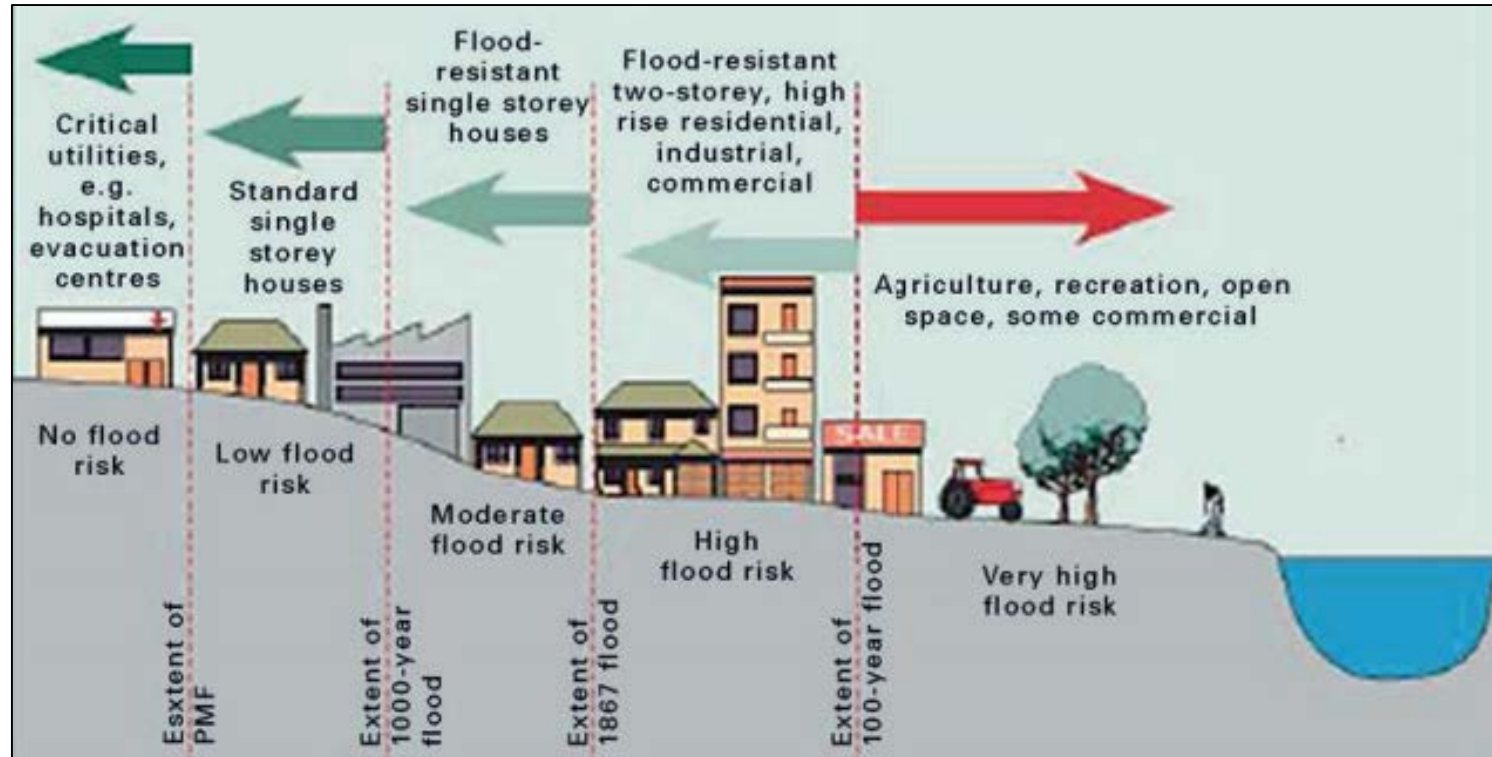
Update: LUB Flood Provisions

1. Applies across the flood hazard area.
2. Not proposed to be retro-active – would apply to new development only.
3. Will not come forward as part of the new LUB re-write as engagement with property owners must occur.

Approach to Flood Provisions

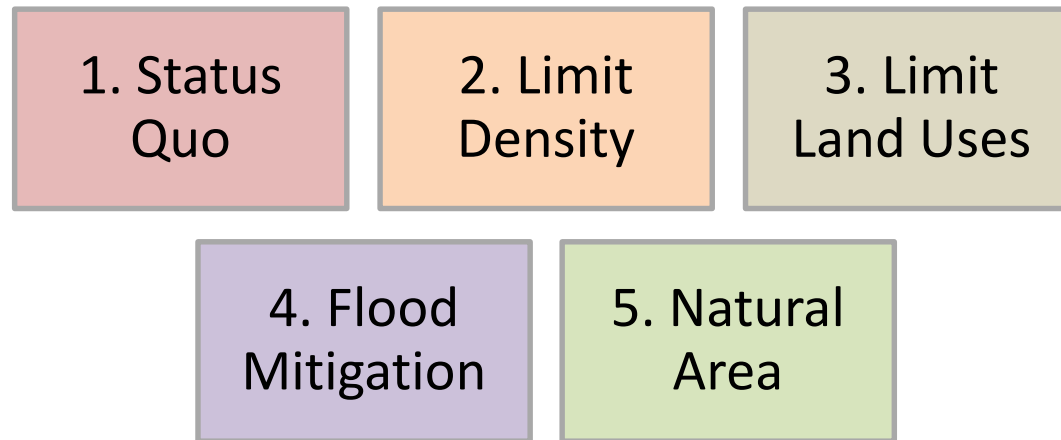
1. Establish *categories* based on flood impact and severity.
2. For each *category*, develop *policy statements* which can then be applied to each area or neighbourhood as decisions are made.
3. For each *category* and *policy statement*, develop a suite of Land Use Bylaw provisions.
4. *Categories, policies, and provisions* can be combined as necessary.

Approach to Flood Provisions



Categories of Flood Provisions

- A group of provisions can be developed based on the categories below:



- There may be overlap between categories.

Category Descriptions

- Status quo: no provisions for areas within the flood plain determined to be above the impacted area.
- Limit Density: limiting number of people impacted by future flood by placing maximums on number of units or building size.
- Limit land use: limiting presence of sensitive uses like basement suites and storage of hazardous materials.
- Flood mitigation: require special structural elements and water-resistant materials.
- Natural area: leave un-protected undeveloped areas in a natural state or allow passive uses.

Community Options

1. Buyout of all private properties.
2. Land swap
3. Raising main floor heights
4. Permanent or temporary structural mitigation

Option 1: Buyout

1. Buyout was recommended owing to impracticality of providing structural flood mitigation.
2. Structural flood mitigation would require the acquisition of several properties.
3. Cost to buy out all 69 private properties (based on 2020 assessed value) is \$14 million.
4. Local appraisers offered preliminary assessment which indicated that appraised value would be approximately 30% lower than assessed value.
5. Title would need to be cleared.

Option 2: Land Swap

1. Administration actively working with Province.
2. Province has made no commitments at this time.
3. Province currently controls 658 ha in Parsons Creek and 399 ha in Saline Creek.
4. Appropriately zoned land to accommodate mobile homes does not exist, making an LUB amendment necessary to support any land swap.
5. Costs cannot be estimated at this time.
6. Title would need to be cleared.

Option 3: Raise Main Floor

1. Surveyor retained to identify elevations of all properties and homes, including main floor.
2. Contractor specializing in mobile home placement retained to determine costs to raise homes.
3. Of 69 properties, 49 homes exist.
4. 16 homes have a main floor at or above 250m, leaving 33 structures that would have to be raised.
5. Concerns exist over unintended damage that could arise from raising older homes.
6. Raising bottom of main floor to 250m estimated to cost \$1.2 million.

Option 4: Structural Mitigation

1. Space constraints make concrete wall the only option that would allow lots to remain as-is.
2. Concrete wall may detract from livability and truss system would intrude into some lots.
3. Temporary mitigation planned for 2021 and would be required for up to 6 months each year.
4. Temporary measures will have same impact on livability and still present risks.
5. Permanent structural mitigation estimated to cost \$20-\$25 million.

Recommendation

1. Proceed with Land Use Bylaw Provisions to inform development in the flood hazard area.
2. Proceed with offering a voluntary buyout until March 31, 2021 at 2020 assessed value.

Rationale

1. Majority of property owners (60%) prefer buyout.
2. There are no structural mitigation solutions that do not also require property acquisition.
3. While raising structures is viable, it still presents risks and was least preferred amongst homeowners.
4. Land swaps not recommended due to uncertainty around land availability.
5. Local appraisers advise that appraised value is approximately 30% less than 2020 assessed value.
6. Future development on any remaining properties will be subject to Land Use Bylaw flood provisions.

Questions

All Residences

Ptarmigan Court

Legend

BR = Back Right
BL = Back Left
FR = Front Right
FL = Front Left

Lot	Block	Plan	Address #	Street Name	Additional elevation required 250	Cost to raise 250	Additional elevation required 250.9	Cost to raise 250.9	Roof Peak Elevation	Roof Elevation	Main Floor Elevation	Average Ground Elevation	Building Corner Elevation (BR)	Building Corner Elevation (BL)	Building Corner Elevation (FR)	Building Corner Elevation (FL)	Lot corner elevation (BR)	Lot corner elevation (BL)	Lot corner elevation (FR)	Lot corner elevation (FL)	Survey date
21	30	1347	1	Paradise Road			0.22	21,920.00	254.66	253.56	250.98	249.93	249.85	250.02	250.73	249.75	249.8	250.25	249.5	249.57	10/29/2020
20	30	1347	3	Paradise Road			0.41	22,060.00	254.49	253.37	250.79	249.63	249.76	249.87	249.54	249.62	249.66	249.8	249.26	249.5	10/29/2020
19	30	1347	5	Paradise Road			0.41	27,460.00	254.47	253.37	250.79	249.52	249.75	249.84	249.56	249.58	249.41	249.66	249.11	249.26	10/29/2020
18	30	1347	7	Paradise Road			0.78	29,680.00	254.12	253.01	250.42	249.28	249.34	249.42	249.35	249.2	249.34	249.41	249.05	249.11	10/29/2020
16	30	1347	11	Paradise Road			0.8	25,400.00	253.98	252.96	250.44	249.30	249.44	249.58	249.26	249.34	249.42	249.43	248.93	249.03	10/29/2020
6	29	1347	12	Paradise Road			0.57	24,020.00	254.44	253.22	250.63	249.11	249.27	249.27	249.22	249.26	248.98	248.93	249	248.94	10/29/2020
15	30	1347	13	Paradise Road			0.59	21,140.00	254.29	253.19	250.61	249.22	249.39	249.48	249.21	249.1	249.42	249.42	248.79	248.93	10/29/2020
7	29	1347	14	Paradise Road	0.03	20,780.00	0.93	26,180.00	254.07	252.84	250.27	249.06	249.23	249.18	249.33	249.3	248.93	248.79	248.94	248.77	10/29/2020
14	30	1347	15	Paradise Road	0.07	21,020.00	0.97	26,420.00	254.02	252.8	250.23	249.09	249.37	249.41	248.9	248.76	249.36	249.42	248.71	248.79	10/29/2020
13	30	1347	17	Paradise Road	0.15	21,500.00	1.05	26,900.00	253.94	252.72	250.15	249.03	249.32	249.33	248.86	248.76	249.28	249.36	248.65	248.71	10/29/2020
12	30	1347	19	Paradise Road	0.27	22,220.00	1.17	27,620.00	253.83	252.6	250.03	248.94	249.18	249.16	248.74	248.72	249.22	249.28	248.56	248.65	10/29/2020
11	30	1347	21	Paradise Road	0.35	23,500.00	1.25	28,900.00	253.75	252.51	249.95	248.88	249.1	249.09	248.84	248.5	249.1	249.22	248.63	248.56	10/29/2020
9	30	1347	25	Paradise Road	0.19	21,740.00	1.09	27,140.00	253.72	252.68	250.11	248.75	248.93	248.94	248.61	248.59	248.99	249.05	248.44	248.47	10/29/2020
8	30	1347	27	Paradise Road	0.42	27,520.00	1.32	32,920.00	253.59	252.48	249.88	248.45	248.97	248.96	248.58	248.49	246.99	248.99	248.19	248.44	10/29/2020
6	30	1347	31	Paradise Road	0.58	28,480.00	1.48	33,880.00	253.19	252.29	249.72	248.61	249.01	249	248.3	248.29	248.9	249.04	248.09	248.26	10/29/2020
5	30	1347	33	Paradise Road	0.69	24,740.00	1.59	30,140.00	253.13	252.22	249.61	248.51	248.87	248.8	248.25	248.18	248.92	248.9	248.1	248.09	10/29/2020
4	30	1347	35	Paradise Road	0.6	28,600.00	1.5	34,000.00	253.4	252.29	249.7	248.41	248.7	248.72	248.24	248.1	248.69	248.73	247.96	248.1	10/29/2020
3	30	1347	37	Paradise Road	0.72	24,920.00	1.62	30,320.00	253.08	252.19	249.58	248.47	248.81	248.77	248.29	248.26	248.84	248.83	248.01	247.96	10/29/2020
2	31	1347	4	Parkview Drive	0.72	24,920.00	1.62	30,320.00	253.29	252.17	249.58	248.30	248.55	248.73	248.18	248.03	248.55	248.61	247.84	247.89	11/5/2020
3	31	1347	6	Parkview Drive	0.81	25,460.00	1.71	30,860.00	252.99	252.08	249.49	248.31	248.64	248.71	248.13	248.03	248.61	248.64	247.89	247.84	11/5/2020
4	31	1347	8	Parkview Drive	0.85	25,700.00	1.75	31,100.00	253.11	251.97	249.45	248.32	248.62	248.73	248.09	247.86	248.62	248.92	247.84	247.86	11/5/2020
6	31	1347	12	Parkview Drive	0.74	29,940.00	1.64	35,340.00	253.04	252.09	249.56	248.42	248.76	248.78	248.28	248.21	248.83	248.75	247.9	247.84	11/5/2020
9	31	1347	18	Parkview Drive	0.84	25,640.00	1.74	31,040.00	252.94	252.01	249.46	248.23	248.4	248.38	248.23	248.04	248.46	248.25	248.18	247.93	11/5/2020
12	31	1347	24	Parkview Drive	0.91	26,060.00	1.81	31,460.00	253.01	251.99	249.39	248.09	248.38	248.38	248.04	247.95	248.24	248.1	247.78	247.81	11/5/2020
13	31	1347	26	Parkview Drive	1.08	31,480.00	1.98	36,880.00	252.92	251.81	249.22	248.03	248.14	248.14	248.13	248.13	248.1	247.97	247.81	247.85	11/5/2020
17	28	1347	4	Pelican Drive					254.46	253.63	251.21	249.97	250.2	250.15	250.12	249.83	249.92	249.69	250.09	249.78	11/5/2020
16	28	1347	6	Pelican Drive			0.39	26,740.00	254.5	253.38	250.84	249.69	249.94	249.75	249.84	249.51	249.69	249.48	249.78	249.49	11/5/2020
15	28	1347	8	Pelican Drive			0.75	28,900.00	253.98	252.88	250.45	249.33	249.53	249.29	249.51	249.26	249.48	249.2	249.49	248.9	11/5/2020
14	28	1347	10	Pelican Drive	0.11	25,660.00	1.01	31,060.00	253.4	252.61	250.19	248.99	249.21	249.13	248.97	248.88	249.2	248.94	248.9	248.72	11/5/2020
13	28	1347	12	Pelican Drive	0.82	29,920.00	1.72	35,320.00	252.87	252.02	249.48	248.64	248.93	248.66	248.71	248.67	248.94	248.32	248.72	248.15	11/5/2020
12	28	1347	14	Pelican Drive	0.7	24,800.00	1.6	29,480.00	252.92	252.01	249.6	248.30	248.48	248.54	248.39	248.22	248.32	248.21	248.15	248.11	11/5/2020
3	29	1347	15	Pelican Drive	0.57	28,420.00	1.47	33,820.00	253.23	252.31	249.73	248.58	248.93	248.92	248.4	248.41	248.92	249	247.95	248.14	11/5/2020
11	28	1347	16	Pelican Drive	1.34	28,640.00	2.24	34,040.00	251.63	251.49	248.96	248.22	248.4	248.4	248.24	248.19	248.21	248.14	248.11	248.08	11/5/2020
10	28	1347	18	Pelican Drive	1	26,600.00	1.9	32,000.00	253.11	251.92	249.3	248.15	248.33	248.29	248.13	248.07	248.14	248.17	248.08	247.96	11/5/2020
1	29	1347	19	Pelican Drive	0.55	23,900.00	1.45	29,300.00	253.49	252.3	249.75	248.19	248.26	248.59	248.02	247.9	248.32	248.58	247.91	247.9	11/5/2020
8	28	1347	22	Pelican Drive	1.24	32,440.00	2.14	37,840.00	251.56	251.42	249.06	247.89	248.03	247.97	248.02	247.96	247.9	247.62	247.84	247.75	11/5/2020
6	28	1347	26	Pelican Drive	1.15	31,900.00	2.05	37,300.00	252.85	251.72	249.15	247.93	248.07	248.08	248.08	247.82	247.9	247.97	247.76	247.74	11/5/2020
4	28	1347	30	Pelican Drive	1.1	31,600.00	2	36,000.00	252.81	251.58	249.2	247.94	247.97	248.16	248.04	247.9	247.8	247.86	247.96	247.86	11/5/2020
3	28	1347	32	Pelican Drive	0.94	26,240.00	1.84	32,640.00	252.82	251.88	249.36	247.99	248.11	248.13	248.01	247.99	247.86	247.98	247.86	247.99	11/5/2020
2	28	1347	34	Pelican Drive	1.04	31,240.00	1.94	36,640.00	252.3	251.74	249.26	248.14	248.34	248.27	248	248.28	247.98	248.19	247.99	248.08	11/5/2020
1	28	1347	36	Pelican Drive	1.12	31,720.00	2.02	37,120.00	252.35	251.8	249.18	248.13	248.27	248.24	248.23	248.08	248.19	248.07	248.08	247.85	11/5/2020
24	31	1347	1	Primrose Lane	0.68	29,080.00	1.58	34,480.00	253.12	252.22	249.62	248.49	248.6	248.61	248.59	248.52	248.65	248.07	248.48	248.4	11/5/2020
23	31	1347	3	Primrose Lane	0.41	26,860.00	1.31	32,260.00	253.36	252.44	249.86	248.62	248.78	248.82	248.7	248.5	248.64	248.65	248.42	248.48	11/5/2020
22	31	1347	5	Primrose Lane	0.36	27,160.00	1.26	32,560.00	253.46	252.54	249.94	248.69	248.84	248.79	248.77	248.72	248.92	248.64	248.4	248.42	11/5/2020
21	31	1347	7	Primrose Lane	0.43	27,640.00	1.33	33,040.00	253.37	252.44	249.87	248.65	248.84	248.87	248.49	248.42	248.83	248.92	248.39	248.4	11/5/2020
20	31	1347	9	Primrose Lane	0.6	27,400.00	1.5	32,800.00	253.24	252.31	249.7	248.62	248.92	248.82	248.51	248.45	248.75	248.83	248.25	248.39	11/5/2020
18	31	1347	13	Primrose Lane	0.7	28,000.00	1.6	33,400.00	253.28	252.18	249.6	248.42	248.61	248.71	248.37	248.3	248.49	248.43	248.2	248.22	11/5/2020
17	31	1347	15	Primrose Lane	0.87	29,020.00	1.77	34,420.00	252.89	251.96	249.43	248.34	248.47	248.47	248.32	248.3	248.34	248.49	248.1	248.2	11/5/2020
15	31	1347	19	Primrose Lane	1.08	30,280.00	1.98	34,580.00	252.97	251.88	249.28	248.14	248.35	248.37	248.01	247.97	248.36	248.22	247.74	248.07	10/23/2020
						1,052,740.00					1,488,840.00										

In summary it can be noted the total costs for all 39 affected units raised to 250 meters is \$1,052,740.00 and the total for all 48 affected units raised to 250.9 meters is \$1,488,840.00
It is recommended that all units currently on blocks should be placed on steel screw piles, as stability would be compromised if elevation is increased

Note: Roof Peak Elevation for 22 Pelican was gathered using a different method (UAV or "drone") than all other elevations

Attachment: Ptarmigan Survey Data (Ptarmigan Court Update)

Residences Below 250 m

Ptarmigan Court

Lot	Block	Plan	Address #	Street Name	Additional elevation required 250	Cost to raise 250	Additional elevation required 250.9	Cost to raise 250.9	Roof Peak Elevation	Roof Elevation	Main Floor Elevation	Average Ground Elevation	Building Corner Elevation (BR)	Building Corner Elevation (BL)	Building Corner Elevation (FR)	Building Corner Elevation (FL)	Lot corner elevation (BR)	Lot corner elevation (BL)	Lot corner elevation (FR)	Lot corner elevation (FL)	Survey date	
11	30	1347	21	Paradise Road	0.35	23,500.00	1.25	28,900.00	253.75	252.51	249.95	248.88	249.1	249.09	248.84	248.5	249.1	249.22	248.63	248.56	10/29/2020	
8	30	1347	27	Paradise Road	0.42	27,520.00	1.32	32,920.00	253.59	252.48	249.88	248.45	248.97	248.96	248.58	248.49	246.99	248.99	248.19	248.44	10/29/2020	
6	30	1347	31	Paradise Road	0.58	28,480.00	1.48	33,880.00	253.19	252.29	249.72	248.61	249.01	249	248.3	248.29	248.9	249.04	248.09	248.26	10/29/2020	
5	30	1347	33	Paradise Road	0.69	24,740.00	1.59	30,140.00	253.13	252.22	249.61	248.51	248.87	248.8	248.25	248.18	248.92	248.9	248.1	248.09	10/29/2020	
4	30	1347	35	Paradise Road	0.6	28,600.00	1.5	34,000.00	253.4	252.29	249.7	248.41	248.7	248.72	248.24	248.1	248.69	248.73	247.96	248.1	10/29/2020	
3	30	1347	37	Paradise Road	0.72	24,920.00	1.62	30,320.00	253.08	252.19	249.58	248.47	248.81	248.77	248.29	248.26	248.84	248.83	248.01	247.96	10/29/2020	
2	31	1347	4	Parkview Drive	0.72	24,920.00	1.62	30,320.00	253.29	252.17	249.58	248.30	248.55	248.73	248.18	248.03	248.55	248.61	247.84	247.89	11/5/2020	
3	31	1347	6	Parkview Drive	0.81	25,460.00	1.71	30,860.00	252.99	252.08	249.49	248.31	248.64	248.71	248.13	248.03	248.61	248.64	247.89	247.84	11/5/2020	
4	31	1347	8	Parkview Drive	0.85	25,700.00	1.75	31,100.00	253.11	251.97	249.45	248.32	248.62	248.73	248.09	247.86	248.62	248.92	247.84	247.86	11/5/2020	
6	31	1347	12	Parkview Drive	0.74	29,940.00	1.64	35,340.00	253.04	252.09	249.56	248.42	248.76	248.78	248.28	248.21	248.83	248.75	247.9	247.84	11/5/2020	
9	31	1347	18	Parkview Drive	0.84	25,640.00	1.74	31,040.00	252.94	252.01	249.46	248.23	248.4	248.38	248.23	248.04	248.46	248.25	248.18	247.93	11/5/2020	
12	31	1347	24	Parkview Drive	0.91	26,060.00	1.81	31,460.00	253.01	251.99	249.39	248.09	248.38	248.38	248.04	247.95	248.24	248.1	247.78	247.81	11/5/2020	
13	31	1347	26	Parkview Drive	1.08	31,480.00	1.98	36,880.00	252.92	251.81	249.22	248.03	248.14	248.14	248.13	248.13	248.1	247.97	247.81	247.85	11/5/2020	
13	28	1347	12	Pelican Drive	0.82	29,920.00	1.72	35,320.00	252.87	252.02	249.48	248.64	248.93	248.66	248.71	248.67	248.94	248.32	248.72	248.15	11/5/2020	
12	28	1347	14	Pelican Drive	0.7	24,800.00	1.6	29,480.00	252.92	252.01	249.6	248.30	248.48	248.54	248.39	248.22	248.32	248.21	248.15	248.11	11/5/2020	
3	29	1347	15	Pelican Drive	0.57	28,420.00	1.47	33,820.00	253.23	252.31	249.73	248.58	248.93	248.92	248.4	248.41	248.92	249	247.95	248.14	11/5/2020	
11	28	1347	16	Pelican Drive	1.34	28,640.00	2.24	34,040.00	251.63	251.49	248.96	248.22	248.4	248.4	248.24	248.19	248.21	248.14	248.11	248.08	11/5/2020	
10	28	1347	18	Pelican Drive	1	26,600.00	1.9	32,000.00	253.11	251.92	249.3	248.15	248.33	248.29	248.13	248.07	248.14	248.17	248.08	247.96	11/5/2020	
1	29	1347	19	Pelican Drive	0.55	23,900.00	1.45	29,300.00	253.49	252.3	249.75	248.19	248.26	248.59	248.02	247.9	248.32	248.58	247.91	247.9	11/5/2020	
8	28	1347	22	Pelican Drive	1.24	32,440.00	2.14	37,840.00	251.56	251.42	249.06	247.89	248.03	247.97	248.02	247.96	247.9	247.62	247.84	247.75	11/5/2020	
6	28	1347	26	Pelican Drive	1.15	31,900.00	2.05	37,300.00	252.85	251.72	249.15	247.93	248.07	248.08	248.08	247.82	247.9	247.97	247.76	247.74	11/5/2020	
4	28	1347	30	Pelican Drive	1.1	31,600.00	2	36,000.00	252.81	251.58	249.2	247.94	247.97	248.16	248.04	247.9	247.8	247.86	247.96	247.86	11/5/2020	
3	28	1347	32	Pelican Drive	0.94	26,240.00	1.84	32,640.00	252.82	251.88	249.36	247.99	248.11	248.13	248.01	247.99	247.86	247.98	247.86	247.99	11/5/2020	
2	28	1347	34	Pelican Drive	1.04	31,240.00	1.94	36,640.00	252.3	251.74	249.26	248.14	248.34	248.27	248	248.28	247.98	248.19	247.99	248.08	11/5/2020	
1	28	1347	36	Pelican Drive	1.12	31,720.00	2.02	37,120.00	252.35	251.8	249.18	248.13	248.27	248.24	248.23	248.08	248.19	248.07	248.08	247.85	11/5/2020	
24	31	1347	1	Primrose Lane	0.68	29,080.00	1.58	34,480.00	253.12	252.22	249.62	248.49	248.6	248.61	248.59	248.52	248.65	248.07	248.48	248.4	11/5/2020	
23	31	1347	3	Primrose Lane	0.41	26,860.00	1.31	32,260.00	253.36	252.44	249.86	248.62	248.78	248.82	248.7	248.5	248.64	248.65	248.42	248.48	11/5/2020	
22	31	1347	5	Primrose Lane	0.36	27,160.00	1.26	32,560.00	253.46	252.54	249.94	248.69	248.84	248.79	248.77	248.72	248.92	248.64	248.4	248.42	11/5/2020	
21	31	1347	7	Primrose Lane	0.43	27,640.00	1.33	33,040.00	253.37	252.44	249.87	248.65	248.84	248.87	248.49	248.42	248.83	248.92	248.39	248.4	11/5/2020	
20	31	1347	9	Primrose Lane	0.6	27,400.00	1.5	32,800.00	253.24	252.31	249.7	248.62	248.92	248.82	248.51	248.45	248.75	248.83	248.25	248.39	11/5/2020	
18	31	1347	13	Primrose Lane	0.7	28,000.00	1.6	33,400.00	253.28	252.18	249.6	248.42	248.61	248.71	248.37	248.3	248.49	248.43	248.2	248.22	11/5/2020	
17	31	1347	15	Primrose Lane	0.87	29,020.00	1.77	34,420.00	252.89	251.96	249.43	248.34	248.47	248.47	248.32	248.3	248.34	248.49	248.1	248.2	11/5/2020	
15	31	1347	19	Primrose Lane	1.08	30,280.00	1.98	34,580.00	252.97	251.88	249.28	248.14	248.35	248.37	248.01	248.01	247.97	248.36	248.22	247.74	248.07	10/23/2020
								919,820													1,096,200	

Attachment: Ptarmigan Survey Data (Ptarmigan Court Update)

Residences Above 250 m
Ptarmigan Court

Lot	Block	Plan	Address #	Street Name	Additional elevation required 250	Cost to raise 250	Additional elevation required 250.9	Cost to raise 250.9	Roof Peak Elevation	Roof Elevation	Main Floor Elevation	Average Ground Elevation	Building Corner Elevation (BR)	Building Corner Elevation (BL)	Building Corner Elevation (FR)	Building Corner Elevation (FL)	Lot corner elevation (BR)	Lot corner elevation (BL)	Lot corner elevation (FR)	Lot corner elevation (FL)	Survey date
21	30	1347	1	Paradise Road			0.22	21,920.00	254.66	253.56	250.98	249.93	249.85	250.02	250.73	249.75	249.8	250.25	249.5	249.57	10/29/2020
20	30	1347	3	Paradise Road			0.41	22,060.00	254.49	253.37	250.79	249.63	249.76	249.87	249.54	249.62	249.66	249.8	249.26	249.5	10/29/2020
19	30	1347	5	Paradise Road			0.41	27,460.00	254.47	253.37	250.79	249.52	249.75	249.84	249.56	249.58	249.41	249.66	249.11	249.26	10/29/2020
18	30	1347	7	Paradise Road			0.78	29,680.00	254.12	253.01	250.42	249.28	249.34	249.42	249.35	249.2	249.34	249.41	249.05	249.11	10/29/2020
16	30	1347	11	Paradise Road			0.8	25,400.00	253.98	252.96	250.44	249.30	249.44	249.58	249.26	249.34	249.42	249.43	248.93	249.03	10/29/2020
6	29	1347	12	Paradise Road			0.57	24,020.00	254.44	253.22	250.63	249.11	249.27	249.27	249.22	249.26	248.98	248.93	249	248.94	10/29/2020
15	30	1347	13	Paradise Road			0.59	21,140.00	254.29	253.19	250.61	249.22	249.39	249.48	249.21	249.1	249.42	249.42	248.79	248.93	10/29/2020
7	29	1347	14	Paradise Road	0.03	20,780.00	0.93	26,180.00	254.07	252.84	250.27	249.06	249.23	249.18	249.33	249.3	248.93	248.79	248.94	248.77	10/29/2020
14	30	1347	15	Paradise Road	0.07	21,020.00	0.97	26,420.00	254.02	252.8	250.23	249.09	249.37	249.41	248.9	248.76	249.36	249.42	248.71	248.79	10/29/2020
13	30	1347	17	Paradise Road	0.15	21,500.00	1.05	26,900.00	253.94	252.72	250.15	249.03	249.32	249.33	248.86	248.76	249.28	249.36	248.65	248.71	10/29/2020
12	30	1347	19	Paradise Road	0.27	22,220.00	1.17	27,620.00	253.83	252.6	250.03	248.94	249.18	249.16	248.74	248.72	249.22	249.28	248.56	248.65	10/29/2020
9	30	1347	25	Paradise Road	0.19	21,740.00	1.09	27,140.00	253.72	252.68	250.11	248.75	248.93	248.94	248.61	248.59	248.99	249.05	248.44	248.47	10/29/2020
17	28	1347	4	Pelican Drive					254.46	253.63	251.21	249.97	250.2	250.15	250.12	249.83	249.92	249.69	250.09	249.78	11/5/2020
16	28	1347	6	Pelican Drive			0.39	26,740.00	254.5	253.38	250.84	249.69	249.94	249.75	249.84	249.51	249.69	249.48	249.78	249.49	11/5/2020
15	28	1347	8	Pelican Drive			0.75	28,900.00	253.98	252.88	250.45	249.33	249.53	249.29	249.51	249.26	249.48	249.2	249.49	248.9	11/5/2020
14	28	1347	10	Pelican Drive	0.11	25,660.00	1.01	31,060.00	253.4	252.61	250.19	248.99	249.21	249.13	248.97	248.88	249.2	248.94	248.9	248.72	11/5/2020
						132,920		392,640													

Attachment: Ptarmigan Survey Data (Ptarmigan Court Update)

Residences Below 250.9 m
Ptarmigan Court

Lot	Block	Plan	Address #	Street Name	Additional elevation required 250	Cost to raise 250	Additional elevation required 250.9	Cost to raise 250.9	Roof Peak Elevation	Roof Elevation	Main Floor Elevation	Average Ground Elevation	Building Corner Elevation (BR)	Building Corner Elevation (BL)	Building Corner Elevation (FR)	Building Corner Elevation (FL)	Lot corner elevation (BR)	Lot corner elevation (BL)	Lot corner elevation (FR)	Lot corner elevation (FL)	Survey date
20	30	1347	3	Paradise Road			0.41	22,060.00	254.49	253.37	250.79	249.63	249.76	249.87	249.54	249.62	249.66	249.8	249.26	249.5	10/29/2020
19	30	1347	5	Paradise Road			0.41	27,460.00	254.47	253.37	250.79	249.52	249.75	249.84	249.56	249.58	249.41	249.66	249.11	249.26	10/29/2020
18	30	1347	7	Paradise Road			0.78	29,680.00	254.12	253.01	250.42	249.28	249.34	249.42	249.35	249.2	249.34	249.41	249.05	249.11	10/29/2020
16	30	1347	11	Paradise Road			0.8	25,400.00	253.98	252.96	250.44	249.30	249.44	249.58	249.26	249.34	249.42	249.43	248.93	249.03	10/29/2020
6	29	1347	12	Paradise Road			0.57	24,020.00	254.44	253.22	250.63	249.11	249.27	249.27	249.22	249.26	248.98	248.93	249	248.94	10/29/2020
15	30	1347	13	Paradise Road			0.59	21,140.00	254.29	253.19	250.61	249.22	249.39	249.48	249.21	249.1	249.42	249.42	248.79	248.93	10/29/2020
7	29	1347	14	Paradise Road	0.03	20,780.00	0.93	26,180.00	254.07	252.84	250.27	249.06	249.23	249.18	249.33	249.3	248.93	248.79	248.94	248.77	10/29/2020
14	30	1347	15	Paradise Road	0.07	21,020.00	0.97	26,420.00	254.02	252.8	250.23	249.09	249.37	249.41	248.9	248.76	249.36	249.42	248.71	248.79	10/29/2020
13	30	1347	17	Paradise Road	0.15	21,500.00	1.05	26,900.00	253.94	252.72	250.15	249.03	249.32	249.33	248.86	248.76	249.28	249.36	248.65	248.71	10/29/2020
12	30	1347	19	Paradise Road	0.27	22,220.00	1.17	27,620.00	253.83	252.6	250.03	248.94	249.18	249.16	248.74	248.72	249.22	249.28	248.56	248.65	10/29/2020
11	30	1347	21	Paradise Road	0.35	23,500.00	1.25	28,900.00	253.75	252.51	249.95	248.88	249.1	249.09	248.84	248.5	249.1	249.22	248.63	248.56	10/29/2020
9	30	1347	25	Paradise Road	0.19	21,740.00	1.09	27,140.00	253.72	252.68	250.11	248.75	248.93	248.94	248.61	248.59	248.99	249.05	248.44	248.47	10/29/2020
8	30	1347	27	Paradise Road	0.42	27,520.00	1.32	32,920.00	253.59	252.48	249.88	248.45	248.97	248.96	248.58	248.49	246.99	248.99	248.19	248.44	10/29/2020
6	30	1347	31	Paradise Road	0.58	28,480.00	1.48	33,880.00	253.19	252.29	249.72	248.61	249.01	249	248.3	248.29	248.9	249.04	248.09	248.26	10/29/2020
5	30	1347	33	Paradise Road	0.69	24,740.00	1.59	30,140.00	253.13	252.22	249.61	248.51	248.87	248.8	248.25	248.18	248.92	248.9	248.1	248.09	10/29/2020
4	30	1347	35	Paradise Road	0.6	28,600.00	1.5	34,000.00	253.4	252.29	249.7	248.41	248.7	248.72	248.24	248.1	248.69	248.73	247.96	248.1	10/29/2020
3	30	1347	37	Paradise Road	0.72	24,920.00	1.62	30,320.00	253.08	252.19	249.58	248.47	248.81	248.77	248.29	248.26	248.84	248.83	248.01	247.96	10/29/2020
2	31	1347	4	Parkview Drive	0.72	24,920.00	1.62	30,320.00	253.29	252.17	249.58	248.30	248.55	248.73	248.18	248.03	248.55	248.61	247.84	247.89	11/5/2020
3	31	1347	6	Parkview Drive	0.81	25,460.00	1.71	30,860.00	252.99	252.08	249.49	248.31	248.64	248.71	248.13	248.03	248.61	248.64	247.89	247.84	11/5/2020
4	31	1347	8	Parkview Drive	0.85	25,700.00	1.75	31,100.00	253.11	251.97	249.45	248.32	248.62	248.73	248.09	247.86	248.62	248.92	247.84	247.86	11/5/2020
6	31	1347	12	Parkview Drive	0.74	29,940.00	1.64	35,340.00	253.04	252.09	249.56	248.42	248.76	248.78	248.28	248.21	248.83	248.75	247.9	247.84	11/5/2020
9	31	1347	18	Parkview Drive	0.84	25,640.00	1.74	31,040.00	252.94	252.01	249.46	248.23	248.4	248.38	248.23	248.04	248.46	248.25	248.18	247.93	11/5/2020
12	31	1347	24	Parkview Drive	0.91	26,060.00	1.81	31,460.00	253.01	251.99	249.39	248.09	248.38	248.38	248.04	247.95	248.24	248.1	247.78	247.81	11/5/2020
13	31	1347	26	Parkview Drive	1.08	31,480.00	1.98	36,880.00	252.92	251.81	249.22	248.03	248.14	248.14	248.13	248.13	248.1	247.97	247.81	247.85	11/5/2020
16	28	1347	6	Pelican Drive			0.39	26,740.00	254.5	253.38	250.84	249.69	249.94	249.75	249.84	249.51	249.69	249.48	249.78	249.49	11/5/2020
15	28	1347	8	Pelican Drive			0.75	28,900.00	253.98	252.88	250.45	249.33	249.53	249.29	249.51	249.26	249.48	249.2	249.49	248.9	11/5/2020
14	28	1347	10	Pelican Drive	0.11	25,660.00	1.01	31,060.00	253.4	252.61	250.19	248.99	249.21	249.13	248.97	248.88	249.2	248.94	248.9	248.72	11/5/2020
13	28	1347	12	Pelican Drive	0.82	29,920.00	1.72	35,320.00	252.87	252.02	249.48	248.64	248.93	248.66	248.71	248.67	248.94	248.32	248.72	248.15	11/5/2020
12	28	1347	14	Pelican Drive	0.7	24,800.00	1.6	29,480.00	252.92	252.01	249.6	248.30	248.48	248.54	248.39	248.22	248.32	248.21	248.15	248.11	11/5/2020
3	29	1347	15	Pelican Drive	0.57	28,420.00	1.47	33,820.00	253.23	252.31	249.73	248.58	248.93	248.92	248.4	248.41	248.92	249	247.95	248.14	11/5/2020
11	28	1347	16	Pelican Drive	1.34	28,640.00	2.24	34,040.00	251.63	251.49	248.96	248.22	248.4	248.4	248.24	248.19	248.21	248.14	248.11	248.08	11/5/2020
10	28	1347	18	Pelican Drive	1	26,600.00	1.9	32,000.00	253.11	251.92	249.3	248.15	248.33	248.29	248.13	248.07	248.14	248.17	248.08	247.96	11/5/2020
1	29	1347	19	Pelican Drive	0.55	23,900.00	1.45	29,300.00	253.49	252.3	249.75	248.19	248.26	248.59	248.02	247.9	248.32	248.58	247.91	247.9	11/5/2020
8	28	1347	22	Pelican Drive	1.24	32,440.00	2.14	37,840.00	251.56	251.42	249.06	247.89	248.03	247.97	248.02	247.96	247.9	247.62	247.84	247.75	11/5/2020
6	28	1347	26	Pelican Drive	1.15	31,900.00	2.05	37,300.00	252.85	251.72	249.15	247.93	248.07	248.08	248.08	247.82	247.9	247.97	247.76	247.74	11/5/2020
4	28	1347	30	Pelican Drive	1.1	31,600.00	2	36,000.00	252.81	251.58	249.2	247.94	247.97	248.16	248.04	247.9	247.8	247.86	247.96	247.86	11/5/2020
3	28	1347	32	Pelican Drive	0.94	26,240.00	1.84	32,640.00	252.82	251.88	249.36	247.99	248.11	248.13	248.01	247.99	247.86	247.98	247.86	247.99	11/5/2020
2	28	1347	34	Pelican Drive	1.04	31,240.00	1.94	36,640.00	252.3	251.74	249.26	248.14	248.34	248.27	248	248.28	247.98	248.19	247.99	248.08	11/5/2020
1	28	1347	36	Pelican Drive	1.12	31,720.00	2.02	37,120.00	252.35	251.8	249.18	248.13	248.27	248.24	248.23	248.08	248.19	248.07	248.08	247.85	11/5/2020
24	31	1347	1	Primrose Lane	0.68	29,080.00	1.58	34,480.00	253.12	252.22	249.62	248.49	248.6	248.61	248.59	248.52	248.65	248.07	248.48	248.4	11/5/2020
23	31	1347	3	Primrose Lane	0.41	26,860.00	1.31	32,260.00	253.36	252.44	249.86	248.62	248.78	248.82	248.7	248.5	248.64	248.65	248.42	248.48	11/5/2020
22	31	1347	5	Primrose Lane	0.36	27,160.00	1.26	32,560.00	253.46	252.54	249.94	248.69	248.84	248.79	248.77	248.72	248.92	248.64	248.4	248.42	11/5/2020
21	31	1347	7	Primrose Lane	0.43	27,640.00	1.33	33,040.00	253.37	252.44	249.87	248.65	248.84	248.87	248.49	248.42	248.83	248.92	248.39	248.4	11/5/2020
20	31	1347	9	Primrose Lane	0.6	27,400.00	1.5	32,800.00	253.24	252.31	249.7	248.62	248.92	248.82	248.51	248.45	248.75	248.83	248.25	248.39	11/5/2020
18	31	1347	13	Primrose Lane	0.7	28,000.00	1.6	33,400.00	253.28	252.18	249.6	248.42	248.61	248.71	248.37	248.3	248.49	248.43	248.2	248.22	11/5/2020
17	31	1347	15	Primrose Lane	0.87	29,020.00	1.77	34,420.00	252.89	251.96	249.43	248.34	248.47	248.47	248.32	248.3	248.34	248.49	248.1	248.2	11/5/2020
15	31	1347	19	Primrose Lane	1.08	30,280.00	1.98	34,580.00	252.97	251.88	249.28	248.14	248.35	248.37	248.01	247.97	248.36	248.22	247.74	248.07	10/23/2020
598,520.00						765,740.00															

Attachment: Ptarmigan Survey Data (Ptarmigan Court Update)

Residences Above 250.9 m
Ptarmigan Court

Lot	Block	Plan	Address #	Street Name	Additional elevation required 250	Cost to raise 250	Additional elevation required 250.9	Cost to raise 250.9	Roof Peak Elevation	Roof Elevation	Main Floor Elevation	Average Ground Elevation	Building Corner Elevation (BR)	Building Corner Elevation (BL)	Building Corner Elevation (FR)	Building Corner Elevation (FL)	Lot corner elevation (BR)	Lot corner elevation (BL)	Lot corner elevation (FR)	Lot corner elevation (FL)	Survey date
21	30	1347	1	Paradise Road			0.22	21,920.00	254.66	253.56	250.98	249.93	249.85	250.02	250.73	249.75	249.8	250.25	249.5	249.57	10/29/2020
17	28	1347	4	Pelican Drive					254.46	253.63	251.21	249.97	250.2	250.15	250.12	249.83	249.92	249.69	250.09	249.78	11/5/2020
								21,920.00													

2.9. Flood Mitigation & Community Resiliency – Ptarmigan Court

Written Submissions

- Shannon Kirby
- Holly Lucier

December 11, 2020

Mrs. Holly Lucier

Section 17 (1) FOIP

RMWB

Mayor Scott, Council and Administration

Dear Sirs,

Re: Council Meeting December 15, 2020
Concerns Regarding Flood Mitigation – Ptarmigan Court

Thank you for taking the time and consideration to read my correspondence. I write to you with respect to the residential properties that were affected by the 2020 flood disaster, namely, the areas of Draper and Ptarmigan Court, as these areas have properties that cannot be mitigated for flood effected.

While many people celebrated the rebuilds and community here in Fort McMurray, many upon many, were left in various states of disaster and rebuild, fighting every step of the way, often while being displaced and traumatized. They faced many challenges in getting support and alleviation of the financial burdens of living out of home and the expenses associated with that. Not to mention the emotional upheaval and trauma of displacement, trying to support and find resources for children -much too young to be dealing with such heightened emotions, fears and stresses - in a community that is lacking in mental health resources and children's psychiatry. It was up to each family to evaluate their own unique and personal circumstances and seek out alternative supports, to adapt, to persevere however they had to. For some of these families, this upheaval has been an ongoing reality since 2013 and it is ongoing at the risk of their own mental health and wellbeing as well as their children's.

I understand that the RMWB will be making a decision with respect to the flood effected properties and it is my hope that this decision will be made to evaluate each individual homeowner and their family. Each homeowner had to structure their ability to survive each disaster for themselves, advocating for their own resources, for their own unique set of circumstances. One way of survival wouldn't have served for all, just like one solution for the homeowners with flood effected properties will not serve for all. These are residential homes, with families who have been living in constant transition and turmoil, waiting for answers to come so that they can take the necessary steps to move forward. This decision shouldn't have to be made in great pain staking lengths while the health and wellness of families who have already endured so much hangs in the balance.

The reality for these families is that they are living in an area that is not safe, above all else. (Please see Appendix A, attached.) The reality for them is that if another disaster strikes, another flood, they will once again be forced to endure the trauma and stress of displacement, evacuating with children, not knowing when or if they will be able to return home – the place a person trusts to be safe. The affects of these disasters on families lasts a lifetime, never mind families who have lived through several. The stress that

looms for these families now is that upon another flood occurring, they will be forced to evacuate again and go through yet again another displacement and all that goes along with it. Only this time, there is no insurance for overland because of the 2020 Spring Flood. If they endure any other unprecedented events in that area, all expenses will be out of pocket and they may not have homes that they can return to. The fear of this possibility, not being able to plan for the future or their security and stability has created a stress that is all encompassing. This kind of stress takes a toll on a person's entire quality of life and health and this is the reality for these residents right now.

For many of these families, they rebuilt their homes after the 2016 fires because of the promise for flood mitigation. Had they known that this would be the reality they would be living should another disaster come their way, they likely would have chosen differently for themselves and deserve the opportunity to do so now. They deserve the opportunity to be able to decide how their families will be moving forward without any further delays or restrictions.

In the area of Ptarmigan Court, 68 residential private properties lie below 250m elevation, 1 is above, of which 48 are developed. 15 are vacant lots. From my understanding of the information provided from a survey that was completed and of the remaining owners who provided answers, 32 prefer a buy out, 8 prefer funding to raise property and 5 prefer a land swap in the areas of Parsons Creek, Anzac, Beacon Hill or Prairie Creek as comparable property choices. The urgency for this decision to be made is so that these families are no longer residing in a flood hazard area. This decision affects the safety and wellbeing of their families.

This is a huge decision and yet one that cannot withstand further delay given the seriousness of the circumstances surrounding these properties and the families who live there. I strongly support a decision, without further delay, to buy out the properties and land swap those who are wanting to proceed with these options, in addition to prohibiting the areas from future residential development so that these foreseeable tragedies can be prevented from happening to other homeowners/families. If we have the opportunity to prevent homes from being flooded and provide families with the security and safety that they deserve to have then it can't be too much to ask to make a decision in favour of relieving some of these tremendous burdens off of shoulders that can no longer bare to carry the weight.

This is a community built on safety and taking care of one another, the safety of these homeowners and their families should boldly be a concern for all.

Thank you for your time and consideration for allowing me to share my support.

Yours truly,

Mrs. Holly Lucier
Concerned Citizen

Appendix A

1. Excerpt from: *Council Report Re: Flood Mitigation and Community Resiliency Update – Ptarmigan Court, from the September 15, 2020 Council Meeting (Page 336 of Agenda Packet)*,
 “Recommended Motion: That Administration offer to buy out properties in Ptarmigan Court at 2020 Fair Market Value, until May 31, 2021.” This report goes on to state “...further analysis still has not found a viable structural mitigation solution to protect the community and that the recommendation to buy out is being made to support overall community resiliency in this area.” It goes on to say that “those owners who decline to accept a buy out, will face continued uncertainty about completion and effectiveness of structural flood mitigation, continued availability of provincial disaster recovery program DRP eligibility, and the possibility of notations being registered against title signifying the property is flood susceptible and will be excluded from further disaster recovery compensation.”

2. Excerpt from: *Council Report Re: Flood Mitigation and Community Resiliency Update – Ptarmigan Court, from the September 15, 2020 Council Meeting (Page 341 of Agenda Packet)*,
 “The Proposed Approach for Ptarmigan Court is Buy Out all of the properties and potential land swap. This option sees all 69 private residential properties removed from the flood hazard area. Not only is the installation of flood mitigation more expensive than the minimum buy out costs but installing flood mitigation may require buy out of some riverfront properties regardless. This option provides the maximum community resilience by removing residents from the flood hazard area so that neither they nor the Municipality have to contend with future disaster remediation costs.

 The proposed policy for Ptarmigan Court is to pursue maximum community resilience by removing residents from the hazard area.

 Potential future uses are more limited owing to the area’s smaller size but may include parkland or a naturalized area.”

From: Section 17 (1) FOIP
To: [Legislative Assistants](#)
Cc: [Mayor and Councillors](#); [Recovery](#); [Brad McMurdo](#); [Jamie Doyle](#); [Matthew Hough](#)
Subject: Ptarmigan Court - Flood Recovery
Date: Saturday, December 5, 2020 2:47:10 PM

Hello Mayor, Council and Administration

I am writing once again to request you consider the following in your decision.

1. We purchased our home in 2012, at that time there were no recorded floods in Ptarmigan Court and planned flood mitigation to 1:40 year.
2. In 2013 Mayor and Council, as well as the province promised us flood mitigation to 1:100 year flood level AND protection by way of the Disaster Recovery Plan while the Flood Mitigation was being completed. Admin completed the started mitigation to 1:40 year flood and deferred mitigation to the recommended 1:100 year flood, which we were not made aware of until after the fire.
3. When we waited to rebuild in 2016 we were told there would be flood mitigation completed. We were shown images of what that would look like and assured our homes would be protected from flooding. We rebuilt in good faith that the city would finally complete that mitigation.
4. We flooded. For a 3rd time, our family had to be evacuated from our home, for an unknown span of time. The trauma from these events will impact us and our children for the rest of our lives. The idea that it would be humane for anyone to live somewhere that requires them to relocate habitually for natural disasters is absurd. If the city had been transparent that it could not be done in 2016, we would never have rebuilt and not have been living here for our 3rd natural disaster. Raising our properties is not an option, we would still need to evacuate if there was another event. Buyout or land swapping and turning the land into nonresidential means no other families will have to endure what ours has. Its not about the "things", we've lost everything before, its about our right to feeling safe in our homes.
5. Our property values have been cut in half in a matter of 9 months (we had our home valued in the spring preflood) because of this further negligence of our city. Grant it, everyone's property values have taken a hit in our region, at least other areas can sell their properties. The city has made our properties unsellable.
6. We are no longer able to obtain insurance for overland water because of the spring flood. If there is another event, we will be out of pocket.
7. We struggle to find new insurance for this and another property because of these 2 not at fault large losses in 4 years.

For our family, a buyout is the right option. It will allow us to choose where in town to relocate for our specific needs. We personally do not want a landswap because of the risks associated with moving our home, and what would most certainly be chaos. We would be out of our home, and having to put our things in storage, waiting for hookups and redoing our landscaping. No doubt, we would need to wait on things like bus routes, side walks, parks, etc to be provided to whatever parcel you've relocated us to. As a resident of Ptarmigan, I have spent nearly 10 years waiting for road repairs and flood mitigation, I cannot imagine how long it would take in a new area of town to get the basic necessities that drew up to this area, an area chosen because it was on a bus route and within walking distance of downtown.

I do, however, recognize that a buyout may not be appropriate for some of our neighbours due

to their debt. Perhaps our city would consider offering buyouts to these folks that would be for the land and expense to move a home only and allowing them to purchase land elsewhere and relocate their homes in a specified time frame. Similar to a landswap, only the homeowner will find the land.

I think that the council should also consider that the homes they are buying out could be put up for auction or sold by the city to reclaim some of the funds.

Input on ideas for the land left behind

- An RV park or campground for summer camps - Spots along the river and creek, in between two of the most popular parks in town and along a river and a creek to play in. With the boat launch and trails nearby this could be a spot to attract tourists and somewhere fun for locals.
- An outdoor pool - conveniently located between two popular parks
- A permanent place for the outdoor market, it would bring people by heritage park.

I appreciate the time you have put into researching this decision, I understand that it does not come lightly, I recognize the importance of the process but for us this has been an ongoing issue and neglect from the city. Almost 10 years of deteriorating roads, frozen storm drains, and empty promises. I hope you vote on this at this meeting, so that we can move on with our lives.

Thank you

The Kirbys

--

Shannon R Kirby

Section 17 (1) FOIP