

NO: R079

COUNCIL DATE: June 5, 2023

REGULAR COUNCIL

TO: **Mayor & Council**

DATE: **May 29, 2023**

FROM: **General Manager, Engineering**

FILE: **6019-001**

XC: **5225-23**

SUBJECT: **2023 Federal Disaster Mitigation and Adaptation Fund Program Intake**

RECOMMENDATION

The Engineering Department recommends that Council:

1. Receive this report as information;
2. Endorse the priority projects, as presented in this report, to Infrastructure Canada's 2023 Disaster Mitigation and Adaptation Fund ("2023 DMAF") program intake;
3. Authorize the Mayor to send a letter to the Minister of Public Safety and Solicitor General, as well as the Minister of Emergency Management and Climate Readiness, supporting the City's 2023 DMAF application; and
4. Direct staff to complete an application submission to the Federal Government for the 2023 DMAF program intake, which is due on July 19, 2023.

INTENT

The intent of this report is to obtain Council endorsement for the priority projects intended for the Federal Government's 2023 DMAF program intake.

BACKGROUND

The City acknowledges the need for substantial investment to adapt to climate change impacts and mitigate the risk of coastal and riverine flood hazards. In 2019, the City successfully secured \$77.6 million in Federal funding through Infrastructure Canada's DMAF Program. The City's first round of DMAF was primarily intended to tackle coastal flooding risks and is currently in progress, with a completion deadline set for the end of 2027. The proposed 2023 DMAF program will complement previous work by focusing on projects that enhance resilience against riverine flooding in the Nicomekl-Serpentine floodplain.

DISCUSSION

The 2023 DMAF program consists of 11 projects, as illustrated in Appendix “I”, which have been categorized into three primary themes as outlined in Appendix “II”:

1. Pumping improvements via upgrades and replacements of existing drainage pump stations;
2. Dyking upgrades to raise and widen dykes along the rivers, complemented by a sediment capture facility to enhance the conveyance capacity of the Nicomekl river; and
3. Replacement of two critical bridge crossings of the Serpentine and Nicomekl rivers to ensure continuity of riverine flood protection with the adjacent dyking system.

The estimated cost of the 2023 DMAF program is \$116 million with a requested Federal contribution of \$46 million (40% cost-share as mandated by the DMAF program rules). The remaining \$70 million is expected to be secured through a combination of the City’s Drainage Utility and Transportation budgets along with Provincial funding, as outlined in Appendix “III”.

Once the 2023 DMAF program intake receives endorsement from the Council, City staff will initiate discussions with the relevant Provincial Ministries. The Province plays a vital role in evaluating DMAF applications and it is crucial for the Province to commit to supporting the City’s application.

CONCLUSION

By securing funding through the 2023 DMAF program intake, the City will be able to further its ongoing efforts to adapt to the impacts of climate change and enhance resilience against riverine-induced flood hazards. This funding will enable the City to implement critical projects and initiatives aimed at reducing vulnerability and strengthening the community's ability to withstand and recover from flood events.

Scott Neuman, P.Eng.
General Manager, Engineering

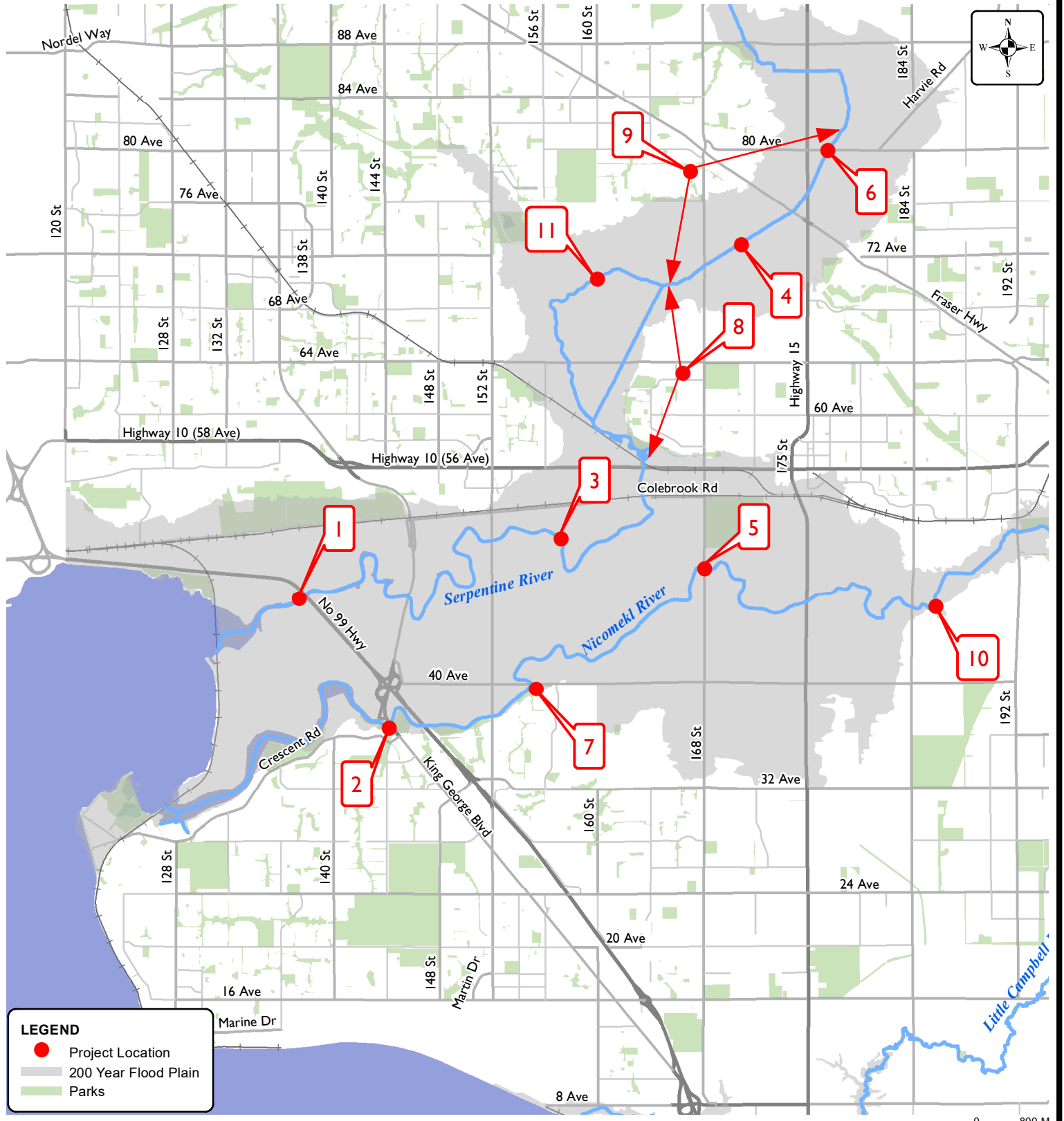
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Appendix “I” – Project Map

Appendix “II” – Priority Projects - Approach and Summaries

Appendix “III” – Project Funding and Cost Sharing

APPENDIX "I"



2023 DMAF Projects

ENGINEERING
DEPARTMENT

The data provided is compiled from various sources and IS NOT warranted as to its accuracy or sufficiency by the City of Surrey. This information is provided for information and convenience purposes only. Lot sizes, Legal descriptions and encumbrances must be confirmed at the Land Title Office.

Priority Projects - Approach and One Page Summaries

Project Bundling

The City's Coastal Flood Adaptation Strategy (“CFAS”) highlights the need for significant investment to address the challenges posed by sea-level rise and increasing coastal flood hazards. While the initial DMAF program primarily focuses on coastal flood risks, additional capital projects are required to keep pace with the impacts of sea-level rise and rainfall-driven events on infrastructure, the community, and the environment.

City staff have carefully reviewed the updated DMAF Applicant Guide for the 2023 DMAF intake and have engaged in initial discussions with Federal staff to determine the eligibility of potential projects. Given the absence of a screening review with this intake, it is crucial that all proposed works meet the eligibility requirements to avoid rejection of the proposal.

The DMAF program emphasizes the bundling of components to create a comprehensive system that mitigates the impacts of a specific natural hazard. In this context, staff have put forth 11 2023 DMAF projects aimed at enhancing riverine flood protection. These projects collectively aim to reduce the flood vulnerability caused by prolonged, high-volume rainfall events within the Nicomekl-Serpentine floodplain.

The bundling process is a collaborative and iterative effort involving the City and external partners to develop a competitive proposal. A key requirement is demonstrating that the monetary value of the flood damages prevented by the projects exceeds the project cost by a ratio of at least 2:1. Alongside the business case, the applications are also assessed based on merit criteria to ensure they receive strong scores. The non-financial merit criteria include the following:

- Project Rationale
- Innovation
- Natural Hazard Risk Transfer
- Strategic Alignment
- Project Co-Benefits

Given the City's current priorities and actions set out in CFAS, the following core projects have been identified for the 2023 DMAF application in Table 1. One-page summaries of the core projects are included in this Appendix.

Table 1. 2023 DMAF Application Project Summary

| Project No. | Description | Dyking Upgrades, Including Sediment Capture | Drainage Pumping Upgrades | Flood Resilience Continuity Through Transportation Improvements | Eligible Costs |
|-------------|--|---|---------------------------|---|---------------------|
| 1 | Serpentine Water Control Structure – Pump Installation | | X | | \$9,000,000 |
| 2 | Nicomekl Water Control Structure – Pump Installation | | X | | \$9,000,000 |
| 3 | Gray Creek Drainage Pump Station Replacement | | X | | \$4,000,000 |
| 4 | Coast Meridian Drainage Pump Station Replacement and New Access Road | | X | X | \$15,000,000 |
| 5 | 168 St Drainage Pump Station Replacement and Conveyance Upgrades | | X | | \$6,000,000 |
| 6 | 80 Ave @ Serpentine River Bridge Replacement | | | X | \$5,000,000 |
| 7 | 40 Ave @ Nicomekl River Bridge Replacement | | | X | \$5,000,000 |
| 8 | Middle Serpentine River Dyke Improvements (Hwy 10 to 168 St) | X | | | \$15,000,000 |
| 9 | Upper Serpentine River Dyke Improvements (168 St to 88 Ave) | X | | | \$15,000,000 |
| 10 | Nicomekl River Sediment Capture Facility, Access Road and Flow By-Pass | X | | | \$5,000,000 |
| 11 | Fleetwood Drainage Pump Station Replacement and Serpentine/Bear Creek drainage conveyance improvements | X | | X | \$28,000,000 |
| | | | | Total | \$116,000,00 |

1. Serpentine Water Control Structure – Pump Installation

Over one hundred years ago, the farming community constructed two water control structures at the mouths of the Serpentine and Nicomekl rivers in the Surrey lowlands to reclaim fertile land for agriculture, provide a source of irrigation and provide transportation crossings for the Semiahmoo Trail.

Since the construction of these water control structures, Surrey’s population has increased by 500,000 and significant infrastructure of local, regional and national importance has been built in low-lying areas behind these structures.

Existing Serpentine water control structure (high tide, gates closed)



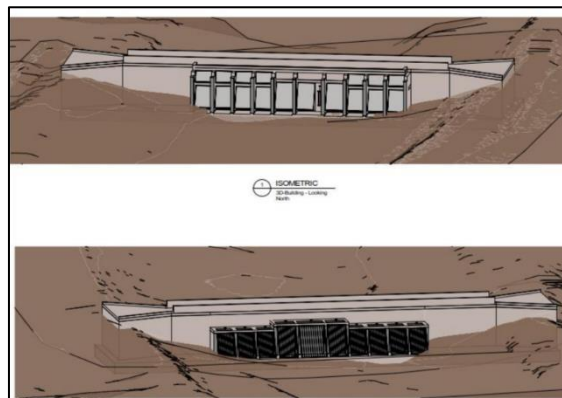
The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund (“DMAF”) program to compliment the work that is being done under the City’s first successful DMAF intake. This innovative, phased approach seeks to further enhance the resilience of Surrey’s water control structures to the effects of climate change.

Under the first DMAF intake, Surrey is currently working to replace the Serpentine River water control structure which, due to anticipated sea level rise, is at risk of being overtopped. Additionally, this structure represents a significant seismic hazard to the City’s drainage system, highlighting a substantial vulnerability to coastal flooding. The consequences of these drainage vulnerabilities extend to infrastructure of local, regional and national importance, as the low-lying areas upstream of the water control structures support more than 200,000

daily journeys and billions of dollars’ worth (annually) of goods movement.

For this second DMAF intake, the City proposes the addition of the first high-capacity pump to the water control structure at the mouth of the Serpentine River to provide additional discharge capacity from the river to the ocean, which will reduce high water levels in the river upstream when a significant rainfall event occurs during high tide conditions. Pumping will help offset the increased frequency of flooding in the Serpentine – Nicomekl floodplain due to sea level rise and rainfall-induced flooding and allow for better management of water levels in the rivers during extreme rainfall, storm surges and high tide events.

Proposed water control structure design with allowance for future high-capacity pumps



The design of the water control structure has been carefully considered to ensure it can accommodate multiple phases of high-capacity pumps in a cost-effective and scalable approach.

The project has an estimated cost of \$9.0 M and will build on the ongoing Serpentine water control structure replacement work, providing numerous benefits to the community. These include improved flood control, better management of water resources during drought conditions, and enhanced fish passage to upstream habitats. Overall, this project will help ensure the long-term sustainability and resilience of Surrey’s infrastructure and natural resources in the Serpentine-Nicomekl floodplain.

2. Nicomekl Water Control Structure- Pump Installation

Over one hundred years ago, the farming community constructed two water control structures at the mouths of the Serpentine and Nicomekl rivers in the Surrey lowlands to reclaim fertile land for agriculture, provide a source of irrigation and provide transportation crossings for the Semiahmoo Trail.

Since the construction of these water control structures, Surrey's population has increased by 500,000 and significant infrastructure of local, regional and national importance has been built in low-lying areas behind these structures.

Existing Nicomekl water control structure (low tide, gates open)



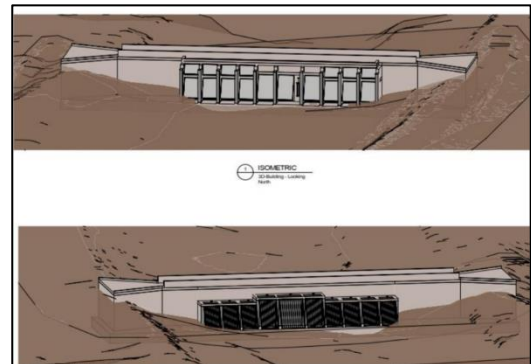
The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund (“DMAF”) program to compliment the work that is being done under the City's first successful DMAF intake. This innovative, phased approach seeks to further enhance the resilience of Surrey's water control structures to the effects of climate change.

Under the first DMAF intake, Surrey is currently working to replace the Nicomekl River water control structure which, due to anticipated sea level rise, is at risk of being overtopped. Additionally, this structure represents a significant seismic hazard to the City's drainage system, highlighting a substantial vulnerability to coastal flooding. The consequences of these drainage vulnerabilities extend to infrastructure of local, regional and national importance, as the low-lying areas upstream of the water control

structures support more than 200,000 daily journeys and billions of dollars' worth (annually) of goods movement.

For this second DMAF intake, the City proposes the addition of the first high-capacity pump to the water control structure at the mouth of the Nicomekl River to provide additional discharge capacity from the river to the ocean, which will reduce high water levels in the river upstream when a significant rainfall event occurs during high tide conditions. Pumping will help offset the increased frequency of flooding in the Serpentine – Nicomekl floodplain due to sea level rise and rainfall-induced flooding and allow for better management of water levels in the rivers during extreme rainfall, storm surges and high tide events.

Proposed water control structure design with allowance for future high-capacity pumps



The design of the water control structure has been carefully considered to ensure it can accommodate multiple phases of high-capacity pumps in a cost-effective and scalable approach.

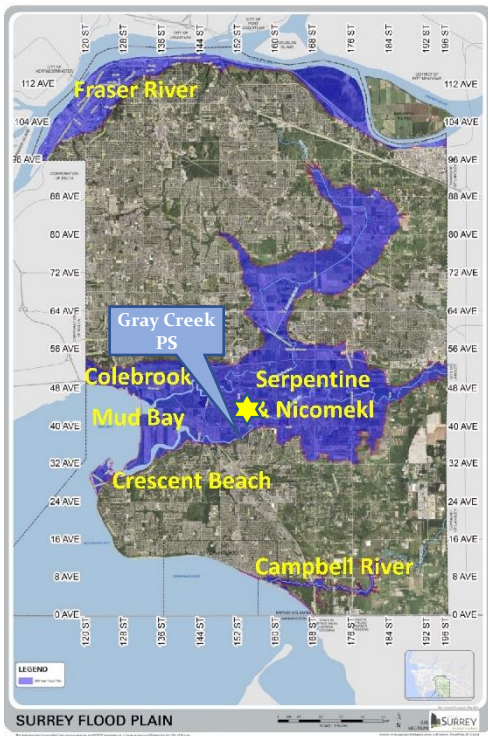
The project has an estimated cost of \$9.0 M and will build on the ongoing Nicomekl water control structure replacement work, providing numerous benefits to the community. These include improved flood control, better management of water resources during drought conditions, and enhanced fish passage to upstream habitats. Overall, this project will help ensure the long-term sustainability and resilience of Surrey's infrastructure and natural resources in the Serpentine-Nicomekl floodplain.

3. Gray Creek Drainage Pump Station Replacement

Approximately 20% of Surrey's land base is located within the 200-year joint floodplain of the Serpentine and Nicomekl Rivers. The majority of Surrey's upland areas ultimately drain to this lowland floodplain area. The river systems incorporate a comprehensive flood control system comprised of dykes, pump stations and flood boxes to support the protection of lands within the floodplain from flooding.

Lands within the Gray Creek drainage pump station catchment have experienced prolonged flooding in the past, mainly due to the contribution of upland runoff combined with insufficient pumping capacity at the pump station. Replacing the Gray Creek drainage pump station is necessary for effective drainage and flood management within the contributing catchment area. Various servicing options have been studied for this area and replacing the pump station was determined to be the best long-term solution.

Gray Creek Drainage Pump Station – Site Location



The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund (“DMAF”) program to compliment the

work that is being done under the City's first successful DMAF intake. The proposed Gray Creek drainage pump

station replacement has been identified as a critical project to increase Surrey's resilience to riverine-induced flooding.

High-intensity, long-duration rainfall events have resulted in runoff from upland areas overwhelming the capacity of the lowland conveyance systems and pump stations, which has led to flooding in the lowlands.

The Gray Creek Pump Station has only one pump, which often leads to insufficient pumping capacity during significant rainfall events as well as no pumping redundancy if the primary pump were to fail. The current situation poses a significant risk to economic, community, agricultural and infrastructure values within the catchment.

Upgrading the Gray Creek drainage pump station is necessary to increase its capacity and ensure effective drainage and flood management in the area.

Aerial view of Gray Creek Drainage Pump Station



The estimated cost of the proposed project is \$4.0 M. This work will provide the community with co-benefits such as sustained agricultural productivity, water quality, and proactive climate change adaptation. It will protect economic, community, agricultural, and infrastructure values from the impacts of flooding.

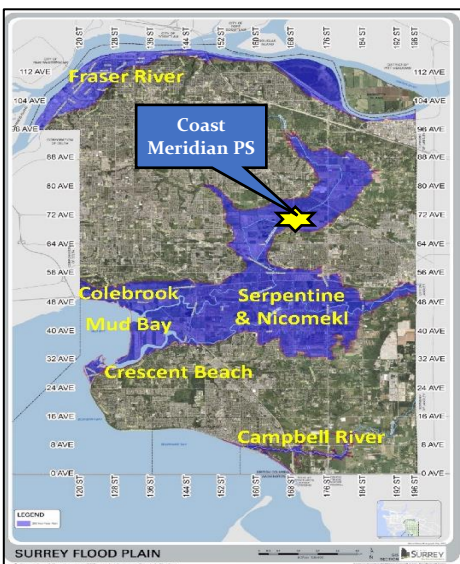
4. Coast Meridian Drainage Pump Station Replacement and New Access Road

Approximately 20% of Surrey's land base is located within the 200-year joint floodplain of the Serpentine and Nicomekl Rivers. The majority of Surrey's upland areas ultimately drain to this lowland floodplain area. The river systems incorporate a comprehensive flood control system comprised of dykes, pump stations and flood boxes to support the protection of lands within the floodplain from flooding.

The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund ("DMAF") program to compliment the work that is being done under the City's first successful DMAF intake. The proposed Coast Meridian drainage pump station replacement has been identified as a critical project to increase Surrey's resilience to riverine-induced flooding.

The Coast Meridian Pump station is located on the south side of the Serpentine River between 168 Street and Highway 15 and services areas with critical infrastructure such as Fraser Highway, Highway 15 and the proposed Surrey-Langley SkyTrain line. This pump station does not have sufficient capacity for its service area, is not seismically resistant and is not fish friendly.

Coastal Meridian Drainage Pump Station – Site Location



The new pump station will be fish friendly, have an increased forebay size and have higher pumping capacity to better support flood control as well as irrigation demands, which will assist in better drainage conveyance as well as support increased agricultural yield. Retrofitting the existing station is not feasible and constructing a new station while the existing station remains in service will make construction more efficient and with lower risk.

South facing view of Coastal Meridian PS draining into the Serpentine River



The project will also improve access to the site and increase conveyance to the pump station via ditching improvements and a new access road within the 72 Avenue road allowance west of Highway 15.

Proposed Access Road and conveyance improvements along 72 Avenue road allowance (via Highway 15)



The total cost of the project is estimated to be \$15.0 M. This project aims to improve the efficiency and effectiveness of the drainage system while enhancing accessibility and ease of maintenance for the City.

5. 168 St Drainage Pump Station Replacement and Conveyance Upgrades

Approximately 20% of Surrey's land base is located within the 200-year joint floodplain of the Serpentine and Nicomekl Rivers. The majority of Surrey's upland areas ultimately drain to this lowland floodplain area. The river systems incorporate a comprehensive flood control system comprised of dykes, pump stations and flood boxes to support the protection of lands within the floodplain from flooding.

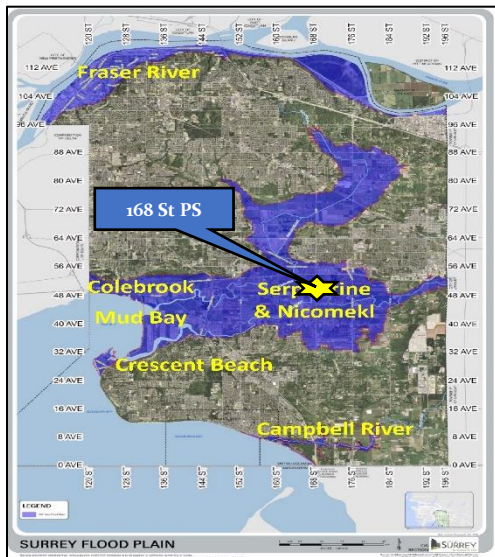
The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund ("DMAF") program to compliment the work that is being done under the City's first successful DMAF intake. The proposed 168 Street drainage pump station replacement has been identified as a critical project to increase Surrey's resilience to riverine-induced flooding.

To address these issues, the City will construct a new 168 St Pump Station on the west side of the Nicomekl River at 48 Ave. The project will include a new pump station structure and forebay, a pumping capacity of at least 580 L/s, and an electrical and controls building located above flood construction level. A three-phase power supply extension will be required from approximately 1 km away along 168 St. Associated civil and grading works such as maintenance access and fencing will also be provided.

Aerial view of the 168 PS draining into the Nicomekl River



168 St Drainage Pump Station - Site Location



The 168 St drainage pump station, built in 1982, is located on the north side of the Nicomekl River near 168 Street.

In November 2021, the City undertook emergency repairs and upgrades to the flood boxes and pump discharge lines at this pump station which were caused by a dyke piping failure during the atmospheric river event. While the emergency repairs have restored the functionality of this pump station, this station is ultimately undersized for its service area, is not seismically resilient, and is challenging to repair given its severely constricted site location.

The 168 St drainage pump station plays a crucial role in providing flood protection to the inter-river floodplain area (i.e., the lands situated between the Serpentine and Nicomekl rivers). Reliable and efficient pump operations are necessary to maintain an efficient water conveyance system that protects infrastructure and supports adjacent farmland.

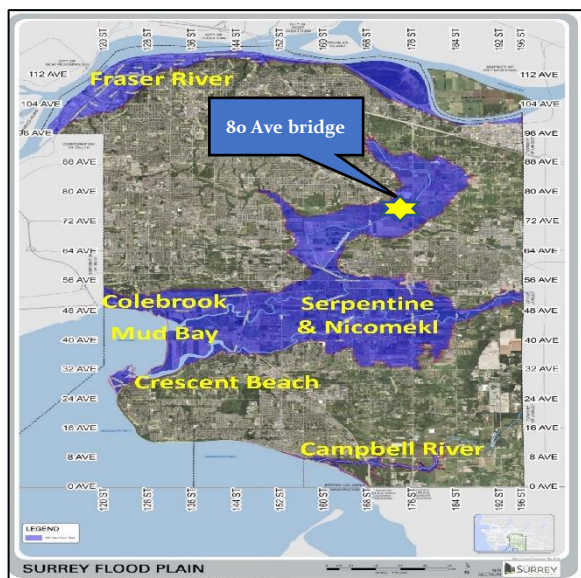
The total cost of the project is estimated to be \$6.0 M. This project aims to improve the efficiency and effectiveness of the local drainage system while protecting an important transportation corridor (168 St).

6. 80 Ave at Serpentine River Bridge Replacement

The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund (“DMAF”) program to compliment the work that is being done under the City’s first successful DMAF intake. The proposed replacement of the 80 Ave bridge crossing over the Serpentine River has been identified as a critical project to increase flood resilience, promote flood control system continuity along the river, and protect important transportation corridors.

The Serpentine River Bridge at 80 Avenue is an aging structure with freeboard height that does not meet current and future flood levels. Further, the adjacent dykes that tie into the bridge abutments are, or will be, above the bridge elevation which will make the bridge itself the low point for floodwaters overtopping from the river and spilling onto the lands behind.

80 Ave Bridge – Site Location



During the 2021 atmospheric river event, the 80 Avenue bridge needed to be closed as the high water levels in the Serpentine River put the bridge at risk of the abutments being displaced, and the bridge becoming buoyant.

High-water levels along the Serpentine River occur frequently, resulting in the crossing's closure an average of two times each winter, disrupting east-west traffic and goods movement across the City.

While the bridge deck is generally in fair condition, some critical structural elements have significantly deteriorated.

Deteriorating bridge abutments



The existing bridge along 80 Avenue is currently a low point in the dyke system, therefore, the new structure will be designed to accommodate future water levels throughout its lifespan and support a continuous flood protection system.

Additionally, the increased clearance between the bridge deck and water level will also minimize river obstruction resulting from debris in the river getting caught on the bridge piers.

Bridge Deck & Approach Deterioration



The estimated cost for the bridge replacement is approximately \$5.0M.

7. 40 Ave at Nicomekl River Bridge Replacement

The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund (“DMAF”) program to compliment the work that is being done under the City’s first successful DMAF intake. The proposed replacement of the 40 Ave bridge crossing over the Nicomekl River has been identified as a critical project to increase flood resilience, promote flood control system continuity along the river, and protect important transportation corridors.

During the 2021 atmospheric river event, the 40 Avenue bridge needed to be closed as the high water levels in the Nicomekl River put the bridge at risk of the abutments being displaced, and the bridge becoming buoyant (photo below).

Bridge at risk of floating during high water conditions



The 40 Ave bridge crossing the Nicomekl River, built in 1967, is a wooden frame structure. The bridge is 63m long, with a concrete deck and timber spans. This bridge carries two lanes of traffic but has neither shoulders nor sidewalks.

Bridge Deck & Approach Deterioration



The 40 Avenue bridge deck is generally in a fair condition with some critical structural elements having deteriorated significantly.

The bridge is already too low for today’s flooding levels and the risk of failure is increasing with climate change. The frequency of high-water levels require the crossing to be closed an average of two times every winter disrupting east-west movement across the City.

Bridge at low water showing aging timber piers and abutments



Increasing the flood resilience of this crossing will further leverage the original DMAF program benefits, as this structure will also tie into the upgraded dyke system on the Nicomekl River.

The increased clearance between the bridge deck and water level will also minimize river obstruction resulting from debris in the river getting caught on the bridge piers.

The cost to replace the bridge is estimated at approximately \$5.0M.

8. Middle Serpentine River Dyke Improvements (Hwy 10 to 168 St)

The dyking network on the Serpentine and Nicomekl rivers spans over 80 kilometers and includes the Nicomekl and Serpentine River dykes upstream of the existing water control structures, as well as various tributaries such as Bear Creek, Hyland Creek, Latimer Creek, 168 Street Canal, and 76 Avenue cut-off dyke.

The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund (“DMAF”) program to compliment the work that is being done under the City’s first successful DMAF intake. The proposed upgrade of the City’s dyke infrastructure along the middle reaches of the Serpentine River has been identified as a critical project to increase flood resilience and protect important transportation corridors, and will build on the lower dyke upgrades currently underway under the City’s first DMAF intake.

Many of the Serpentine river dykes are non-standard and have become over steepened and narrow over time and require significant upgrades to bring their condition to a state of good repair as well as to increase their resiliency to riverine-induced flooding. Recent studies have indicated that the middle reaches of the Serpentine River between Hwy 10 and 168 St. will become increasingly vulnerable to flooding in the next two decades given that this dyke section does not meet current dyke standards.

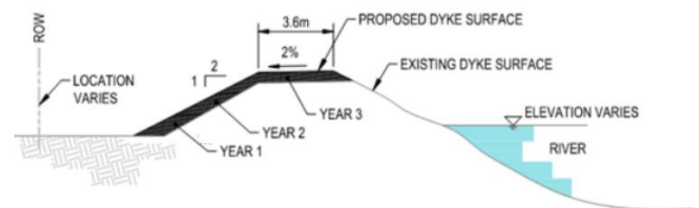
Aerial image of the extent of the middle reaches of the Serpentine Dyke



The proposed work will include raising the dyke up to the standard of the day and rehabilitating related drainage dyke infrastructure to enhance water conveyance in the area.

This project aims to improve the level of service of the dykes to make them more resilient to natural hazards such as ground subsidence and erosion as well as increase their height and width to prepare for the impacts of a changing climate. Where there are vulnerabilities posed by older pump stations adjacent to or on top of the dyke, the dyke will be reinforced. A significant number of flood boxes through the dykes also require replacement to meet modern engineering standards for improved resilience and to address corrosion issues to bring them to a state-of-good repair.

Example of proposed dyke raising work



Property acquisition will be required to support this work, and staff are in discussions with the Province about a phased approach to upgrades. The exact scope of this work will be confirmed with the Province.

The dyke upgrades in the middle of the Serpentine River will amount to roughly \$15.0 M and will include design and construction services, fill works, structure upgrades, and environmental remediation work. The exact costing structure for this work will be confirmed by the Province.

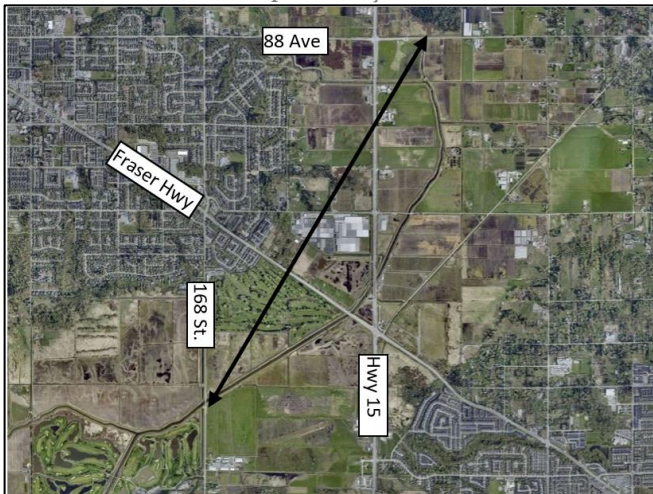
This work will play a critical role in protecting important transportation corridors such as Highway 10, 64 Avenue, and 168 Street, as well as important farmland, and play a critical role in ensuring the safety and resilience of the community.

9. Upper Serpentine River Dyke Improvements (168 St to 88 Ave)

The dyking network on the Serpentine and Nicomekl rivers spans over 80 kilometers and includes the Nicomekl and Serpentine River dykes upstream of the existing water control structures, as well as various tributaries such as Bear Creek, Hyland Creek, Latimer Creek, 168 Street Canal, and 76 Avenue cut-off dyke.

The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund (“DMAF”) program to compliment the work that is being done under the City’s first successful DMAF intake. The proposed upgrade of the city’s dyke infrastructure along the upper reaches of the Serpentine River has been identified as a critical project to increase flood resilience and protect important transportation corridors, and will build on the lower dyke upgrades currently underway under the City’s first DMAF intake.

Aerial image of the extent of the upper reaches of the Serpentine Dyke

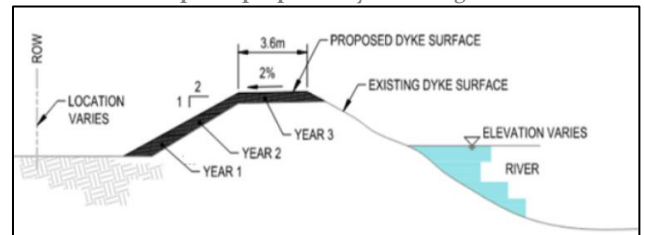


Many of the Serpentine river dykes are non-standard and have become over steepened and narrow over time and require significant upgrades to bring their condition to a state of good repair as well as to increase their resiliency to riverine-induced flooding. Recent studies have indicated that the upper reaches of the Serpentine River between 168 St and 88 Ave will become increasingly vulnerable to flooding in the next two decades given that this dyke section does not meet current dyke standards.

To address these issues, the proposed work will involve raising the dyke to the standard of the day and rehabilitating related important drainage dyke infrastructure to enhance water conveyance in the area. The project aims to make the dykes more resilient to natural hazards such as ground subsidence and erosion, as well as to prepare for the impacts of a changing climate by increasing their height and width.

The dyke upgrade project will also reinforce the dyke where there are vulnerabilities posed by older pump stations adjacent to or on top of the dyke. Additionally, a significant number of dyke flood boxes will be replaced to meet modern engineering standards for improved resilience and to address corrosion issues to bring them to a state-of-good repair.

Example of proposed dyke raising work



The proposed project will require property acquisition to support the work, and discussions are ongoing with the Province regarding a phased approach to the upgrades. The exact scope of this work will be confirmed with the Province.

The project will amount to roughly \$15.0 M and will include design and construction services, fill works, structure upgrades, and environmental remediation work. The exact costing structure for this work will be confirmed by the province

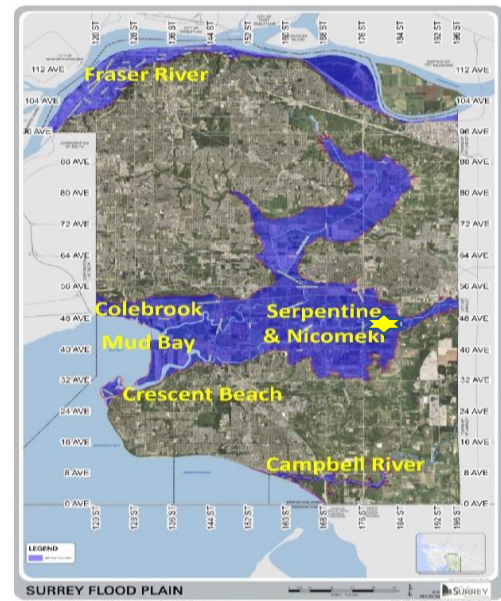
This dyke upgrades will play a critical role in ensuring the safety and resilience of the community by protecting important transportation corridors such as Fraser Hwy, Hwy 15, and 88 Avenue, as well as adjacent farmland.

10. Nicomekl River Sediment Capture Facility, Access Road and Flow By-Pass

The Surrey lowlands consist of a mix of soils, including sediment deposited long ago from glaciers as well as active sediment transport along the Nicomekl and Serpentine rivers. Stormwater runoff during rainfall events and erosive velocities in upland stream systems contribute to sediment generation and transport in general, however, given the low gradient of the Nicomekl and Serpentine Rivers, these river systems become a common deposition point for sediment as velocities slow in the rivers. Areas with steep terrain cut by watercourses and low-lying areas that are clayey or organic material and subject to flooding during heavy rains are the most vulnerable to this erosion and sediment deposition process; conditions that are common in Surrey as runoff transitions from upland conveyance systems to the lowland rivers.

The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund (“DMAF”) program to compliment the work that is being done under the City’s first successful DMAF intake. The upper reaches of the Nicomekl River, east of 184 St, have been experiencing significant sediment deposition due to the river’s meandering alignment, geomorphology, and low profile grade. The proposed Nicomekl River sediment capture facility, flow by-pass and access road to the facility site have been identified as critical to increase flood resilience, protect dyke infrastructure, improve the conveyance capacity of the Nicomekl River and protect important transportation corridors. This project will complement the existing in-stream sediment capture facility in the Serpentine River south of 88 Avenue.

Aerial image of the extent of the upper reaches of the Nicomekl River



The project involves the construction of an in-stream sediment capture facility, flow bypass pipe to facilitate the maintenance and dredging of the in-stream sediment facility, and access road. Sluice gates will be installed at the intake and outlet of the bypass pipe, allowing the pipe to be opened and closed during cleaning operations. Temporary sheet piles will also be installed upstream and downstream of the sediment trap to redirect the flow of water to the bypass pipe during cleaning. Furthermore, the construction of an access road from 184 St. is proposed.

Proposed location of work area on the Nicomekl river



The estimated cost of these projects is \$5.0 M. Overall, this work will play a critical role in enhancing flood protection to adjacent farmland and 184 Street, as well as help support improved water quality in the Nicomekl River.

11. Fleetwood Drainage Pump Station Replacement and Serpentine/Bear Creek drainage conveyance improvements

Approximately 20% of Surrey's land base is located within the 200-year joint floodplain of the Serpentine and Nicomekl Rivers. The majority of Surrey's upland areas ultimately drain to this lowland floodplain area. The river systems incorporate a comprehensive flood control system comprised of dykes, pump stations and flood boxes to support the protection of lands within the floodplain from flooding.

The City of Surrey is applying to the second intake of the Disaster Mitigation and Adaptation Fund ("DMAF") program to compliment the work that is being done under the City's first successful DMAF intake. The proposed Fleetwood drainage pump station upgrades and related conveyance improvements have been identified as critical to increase flood resilience and protect important transportation corridors.

Location of proposed projects in the Serpentine Fleetwood Area



Most of Surrey's 32 drainage and irrigation pump stations were constructed in the 1990's and early 2000's and require regular maintenance and upgrades to meet current standards to effectively protect its urban and agricultural areas from flooding during storm events, and to provide irrigation during the summer.

Existing Fleetwood Pump Station



The Fleetwood Pump Station located at the mouth of Fleetwood creek and the Serpentine River, was constructed in 1995 and is at the end of its service life. The station was overwhelmed in the 2021 atmospheric river event, resulting in nearly one month of flooding of the surrounding lands. A new, larger facility will be sized to accommodate three pumps, and supported by pile foundations for seismic resilience to ensure electrical components are above the flood level.

Conveyance upgrades are proposed at two locations to reduce instream flow restrictions impacting flood levels as well as impeding fish access. Flood resiliency in the Mid-Serpentine River area will be improved by increasing the conveyance capacity in the Serpentine canal bifurcation to Bear Creek through dredging and upgrading the existing dyke section in Bear Creek to cope with increased water volumes and accommodate the discharge from the new Fleetwood Pump Station.

Existing 168 St North Canal 72 Ave Crossing



A large tributary of the Serpentine River is the 168 St North Canal that has been constricted by over 250 metres of culvert. The culverts will be removed and replaced by a clear span bridge to increase conveyance of flood water and remove constraints to fish passage.

The estimated value of the proposed upgrades is \$27.7 M.

Project Funding and Cost Sharing

Adapting to climate change and managing flood risk is a collective responsibility that involves all levels of government. The 2023 DMAF intake presents an opportunity for the City to collaborate with other government entities through cost-sharing on improvement works. This approach recognizes the shared responsibility in addressing flood risks and allows for the acceleration of project implementation to reduce the risk of flooding for assets that hold national, regional, and community significance. By leveraging the 2023 DMAF grants, the City can enhance its flood resilience efforts and contribute to the overall reduction of flood risk in a coordinated and effective manner.

Surrey Dyking District Transfer

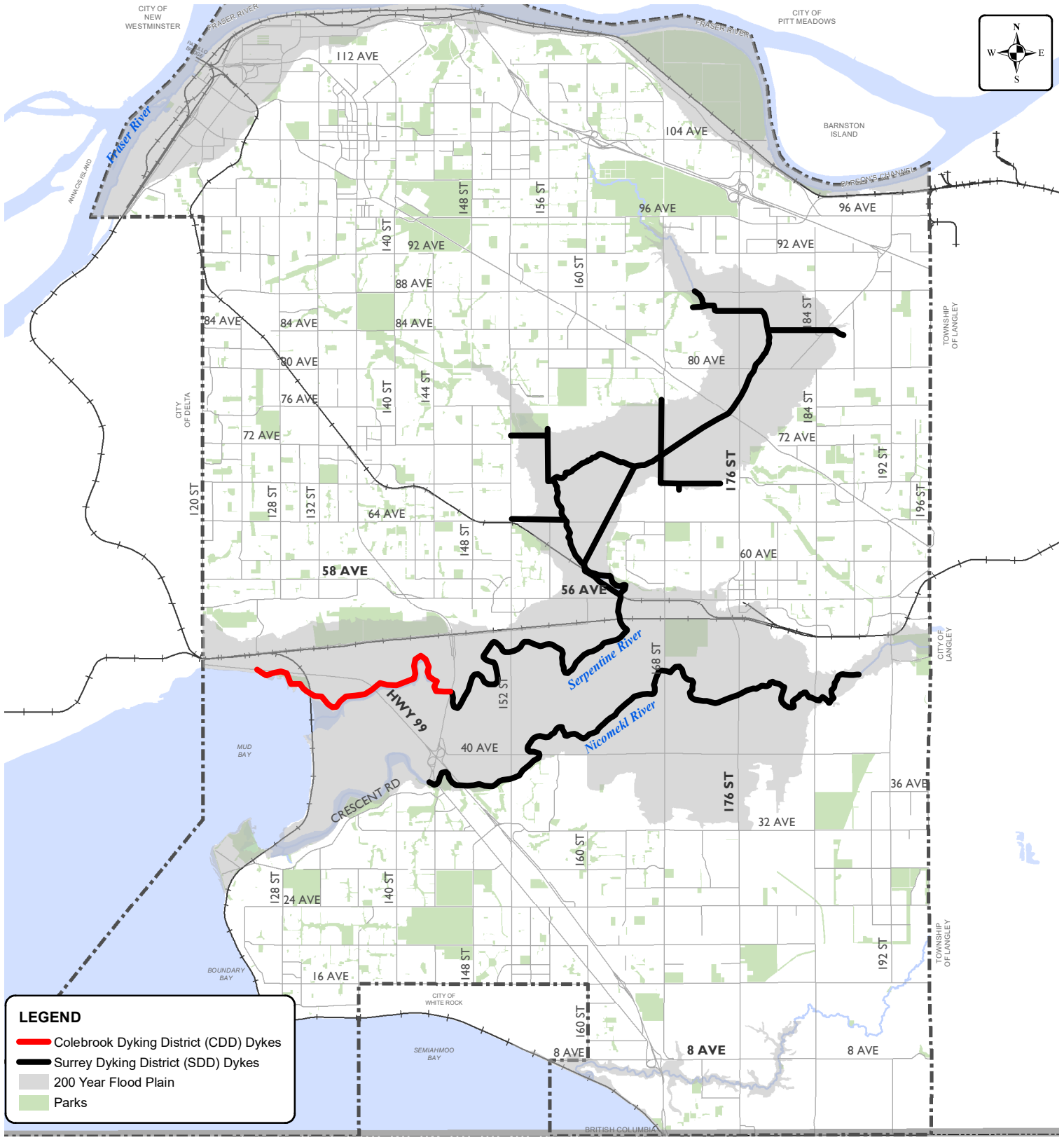
Flood control works in the Colebrook Dyking District (“CDD”) and Surrey Dyking District (“SDD”) are regulated by the Provincial Drainage, Ditch, and Dyke Act, which is set to be repealed by December 31, 2025. The Province is in the final stages of transferring the CDD’s flood control works to the City through a Transfer Agreement. A similar agreement has yet to be negotiated for the SDD. Ongoing maintenance and upgrades are needed to SDD assets to meet Provincial Flood Protection Standards, as well as to address dyke settlement, flood box pipe deterioration, and statutory right-of-way acquisitions to cover the assets.

Discussions are underway at the staff level between the City and the Province for the SDD transfer, including ongoing technical input on the cost and phasing of the necessary upgrades. However, given the large cost involved and the competing priorities of other jurisdictions in the Province impacted in the November 2021 atmospheric river flood event, elevating this matter to the political level to ensure that Surrey is a top priority is recommended. Further discussions and updates will be provided to Council on this process. A map of the Surrey Dyking Districts can be found below for reference.

2023 DMAF Project Funding

If the City’s 2023 DMAF application is successful, the confirmation of non-Federal funding sources will be required before executing a Contribution Agreement with the Federal Government. City staff have already initiated discussions with potential funding partners to secure adequate funding commitments for the proposed work. However, it is acknowledged that, similar to the previous DMAF program, a portion of the funding will need to come from the City.

Should the City’s application be approved in principle by Infrastructure Canada, staff will provide an update to Council on the cost-sharing discussions with the Provincial Government for the SDD transfer and present final recommendations on how the distribution and sources of the non-Federal funding, including any modifications needed to Engineering’s 10-Year Servicing Plan. Depending on the timing of the grant approval, a subsequent 10-Year Engineering Servicing Plan and City 5-Year Financial Plan will be updated to adequately fund the individual projects within the grant application.



Produced by GIS Section: 29-May-2023, P205803

Scale: 1:112,000 0 1,000 M



Surrey Dyking District and Colebrook Dyking District – Dyking Extents

ENGINEERING DEPARTMENT

The data provided is compiled from various sources and IS NOT warranted as to its accuracy or sufficiency by the City of Surrey. This information is provided for information and convenience purposes only. Lot sizes, Legal descriptions and encumbrances must be confirmed at the Land Title Office.