| COUNCIL AGENDA/INFORMATION | | | | |
|---|---|---|---|---|
| ☐ In Camera | Date: | | Item # | |
| ☐ Regular | Date: | | Item # | |
| ☐ Agenda Addendum | Date: | | Item# | |
| ☐ Info Package | | | | |
| ☐ Council Workshop | DM# | Date: | Mailbox: | |

| Dept. Manager | Director | CAO |
|---|---|---|
| | | |

# The District of North Vancouver
# REPORT TO COUNCIL

February 16, 2021
File: 11.5340.01/000.000

**AUTHOR**: Stephen Bridger, Section Manager Engineering, Planning and Design

**SUBJECT**: **UBCM Community Emergency Preparedness Fund - Flood Risk Assessment, Flood Mapping & Flood Mitigation Planning Application for Coastal Wastewater Infrastructure Flood Mitigation and Sea Level Rise Adaptation Plan**

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**RECOMMENDATION**:

THAT the application for grant funding through the *UBCM Community Emergency Preparedness Fund - Flood Risk Assessment, Flood Mapping & Flood Mitigation Planning Application for Coastal Wastewater Infrastructure Flood Mitigation and Sea Level Rise Adaptation Plan* be supported.

REASON FOR REPORT:

A resolution of Council is required to support the grant application to the *UBCM Community Emergency Preparedness Fund – Flood Risk Assessment, Flood Mapping & Flood Mitigation Planning* program.

The recently completed North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy identified that specific sections of the District's municipal wastewater infrastructure (sanitary sewers and pump stations) are exposed to sea level rise and require adaptation planning. The proposed project will develop a comprehensive flood mitigation and sea level rise adaptation plan for all of the District's wastewater infrastructure at risk from coastal flood hazard, with a focus on the Deep Cove area where low-lying sanitary sewers and pump stations already experience impacts from high tide water level events (e.g. annual winter high tides). The proposed project will advance the following two priority actions recommended in the sea level rise strategy:

- Continue to build knowledge about the impacts of sea level rise; and
- Integrate sea level rise strategy findings into community-wide initiatives (including asset management plans).

The proposed project results will be used to update and refine the sanitary sewer and lift station asset management plans and may also provide policy recommendations for how new developments in coastal flood hazard areas interact with District wastewater infrastructure. The project will also be complementary to other projects related to recommendations arising from the sea level rise strategy, including the development of a coastal development permit area.

## FINANCIAL IMPACTS

The proposed total budget for the project is $160,000 with a maximum grant contribution of $150,000 and will be funded through the Sewer Utility. This study will be used to update and inform the long range financial plan for wastewater infrastructure capital and maintenance improvements through ongoing asset management planning.

Staff are very familiar with the UBCM grant management procedures and shall meet necessary the reporting requirements.

Respectfully submitted,

Stephen Bridger,
Section Manager Engineering Planning and Design

| REVIEWED WITH: | REVIEWED WITH: | REVIEWED WITH: | REVIEWED WITH: |
|---|---|---|---|
| ❑ Sustainable Community Development | ❑ Clerk's Office | External Agencies: | Advisory Committees: |
| ❑ Development Services | ❑ Corporate Services | ❑ Library Board | ❑ _____ |
| ❑ Utilities | ❑ Communications | ❑ NS Health | ❑ _____ |
| ❑ Engineering Operations | ❑ Finance | ❑ RCMP | ❑ _____ |
| ❑ Parks & Environment | ❑ Fire Services | ❑ Recreation Commission | |
| ❑ Economic Development | ❑ Human resources | ❑ Other: _____ | |
| | ❑ ITS | | |
| | ❑ Solicitor | | |
| | ❑ GIS | | |

## Community Emergency Preparedness Fund

# Flood Risk Assessment, Flood Mapping & Flood Mitigation Planning

## 2021 Application Form

Please complete and return the application form by February 26, 2021. All questions must be answered by typing directly in this form. If you have any questions, contact cepf@ubcm.ca or (250) 387-4470.

| **SECTION 1: Applicant Information** | **AP** *(for administrative use only)* |
|---|---|
| Name of Local Government or First Nation: District of North Vancouver | Date of Application: February 26, 2021 |
| Contact Person*: Stephen Bridger | Position: Section Manager, Engineering Planning and Design |
| Phone: 604-990-2273 | E-mail: BridgerS@dnv.org |

* *Contact person must be an authorized representative of the applicant.*

**SECTION 2: Project Summary**

1. **Name of the Project:**

   Coastal Wastewater Infrastructure Flood Mitigation and Sea Level Rise Adaptation Plan

2. **Type of Project.** Please identify each component you are applying for:

   ☒ Flood Risk Assessment

   ☐ Flood Mapping

   ☒ Flood Mitigation Planning

3. **Project Cost & Grant Request:**

   a. Total Project Cost: $160,000.00 Total Grant Request: $150,000.00

   b. Have you applied for or received funding for this project from other sources (i.e. NDMP, Gas Tax, or other?) If yes, please indicate the source and the amount of funding received or applied for.

   No

c. Does this proposal relate to other current proposals in your region? If yes, please explain.

No

**4. Project Summary.** Please provide a summary of your project in 150 words or less.

Develop a plan for mitigating wastewater infrastructure damage and environmental pollution risk associated with coastal hazards including flooding from high tides and storm surges, and erosion from wind and vessel generated waves. The District's wastewater system includes sanitary sewers and pump stations along the north shore of Burrard Inlet including Deep Cove. These sewers can experience ocean water ingress resulting in system performance issues and concerns about infrastructure degredation and environmental polution. These risks are already being realised increasing over time as the infrastructure ages and sea level rises. The plan will build on the recently completed North Shore Sea Level Rise Strategy and will advance a key recommendation of the strategy which involves integrating climate change adaptation planning and asset management.

## SECTION 3: Detailed Project Information

**5. Project Area.**

a. Describe the proposed project area (location, size, population, land use, etc.).

*Map indicating the location of the proposed project must be included with this application*

The study area will focus on existing District of North Vancouver wastewater infrastructure located along the coastal shoreline of Burrard Inlet and Indian Arm. Figure 1 (attached) shows the Distrct's's wastewater infrastructure along Burrard Inlet in relation to the coastal flood management and sea level rise planning area developed through the North Shore Sea Level Rise Strategy. The wastewater infrastructure along Burrard Inlet serves catchments with approximatley 6,200 residents and 2,000 buildings. The catchments also cover two of the District's town centres (Lynn Creek and Maplewood) designated for mixed land uses and growth in the Official Community Plan.

Figure 2 (attached) shows the wastewater infrastructure in Deep Cove along Indian Arm. The Deep Cove area will be a particular focus of the project because the infrastructure is very low-lying and already experiences flooding impacts during high coastal water level events. The Deep Cove area wastewater infrastructures serves catchments with approximatley 3,500 residents and 1000 buildings. Land use is primiarly residential with a commercial centre on Gallant Avenue.

b. Does the proposed project build on other recent projects in your region? If yes, please explain.

Yes. The plan will build on the recently completed North Shore Sea Level Rise Risk Assessment and Adaptive Management Strategy which was led by the District of North Vancouver in partnership with the District of West Vancouver, the City of

North Vancouver, Squamish Nation, and the Port of Vancouver. The strategy produced coastal flood hazard mapping for a variety of flood events under current and future sea level rise scenarios. The flood hazard analysis was used to conduct a quantitative flood risk assessment that identified wastewater infrastructure exposure and risk which this plan will address. The risk assessment specifically identified that up to 18 wastewater pump stations in the District of North Vancouver are or will be exposed and vulnerable to coastal flood damage under current and future sea level. The strategy provides sea level rise criteria, scenarios, mapping, and an adaptation planning framework which will be applied in the proposed planning project. More information (including a copy of the strategy report) is available at www.dnv.org/sealevelrise.

**6. Proposed Activities.**

a. What specific activities will be undertaken as part of the proposed project? Please refer to Section 4 of the Program & Application Guide for eligibility and note that activities must align with the required workplan and budget.

The District will retain an engineering consultant team to develop the Coastal Wastewater Infrastructure Flood Mitigation and Sea Level Rise Adaptation Plan through 5 major activity phases:

Phase A - Background Information and Coastal Hazard Review

Phase B - Infrastructure Vulnerability and Risk Assessment

Phase C - Mitigation Options Development and Feasibility Review

Phase D - Engagement and Options Evaluation

Phase E - Implementation Plan

These phases are described below and specific tasks for each phase are listed in the attached Table 1 - Work Plan and Budget.

Phase A (Background Information and Coastal Hazard Review) will involve gathering and review of coastal wastewater infrastructure information, including as-built drawings, condition assessments, and performance monitoring data (i.e. SCADA information for water levels and pump station activity). Phase A will also involve reviewing the coastal flood hazard information from the North Shore Sea Level Rise Strategy to determine a hazard rating for coastal assets (e.g. annual probability of flooding for each asset under current and future sea level). The consutlant team will be required to determine the need for additional hydraulic modelling related to wave and erosion effects on coastal wastewater infrastructure which were not assessed in the North Shore Sea Level Rise Strategy.

Phase B (Infrastructure Vulnerability and Risk Assessment) will build on the high-level risk assessment conducted in the North Shore Sea Level Rise Strategy to develop a more detailed vulnerability and risk assessment for each coastal wastewater infrastructure asset. The assessment will prioritize the assets in terms of need and timing for mitigation, repair, or replacement using a risk-based approach that considers the condition of the asset, the asset's hazard exposure, the

consequences of asset failure, and the changing risk profile over time related to deteroriating condition and rising sea level).

Phase C (Mitigation Options Development and Feasability Review) will develop a detailed toolkit for coastal wastewater infrastrucuture upgrading and adaptation. The toolkit will be used to identify distinct options for each separate infrastructure system. Each option will be described by conceptual design drawings, Class-D construction and operation and maintenance cost estimates, and technical feasibility considerations. Options are anticipated to include immediate repairs (e.g. sewer re-lining) and long-term structural upgrades. Options are also anticipated to include land use and development related measures, including incremental infrastructure upgrades through redevelopment. Options will be developed for all of the District's coastal wastewater infrastructure, but emphasis and focus will be placed on the Deep Cove area infrastructure which is low-lying and is already experiencing performance issues related to coastal flooding. Phase C is anticipated to include workshops with the consulting team and District staff to develop and assess the feasability of different options.

Phase D (Engagement and Options Evaluation) will involve engagement meetings with key internal District of North Vancouver, Metro Vancouver, and regulatory stakeholders. Feedback on the mitigation options will be gathered and used as part of a multi-criteria, structured decision-making style evaluation of the options to determine the preferred options.

Phase E (Implementation Plan) will summarize the project activities and outcomes into a technical report which will include an implementation plan for the preferred options. The implementation plan will clearly identify the actions and timing trigger points to implement the preferred options. It is anticipated that the implementation plan will include immediate, short-term, and long-term actions. The report will also include recommendations to update asset management plans and land use planning to enable implementation of the plan through regular asset management activities and redevelopment applications.

b. If applicable, describe how hydrology analysis and/or hydraulic modeling may be conducted as part of your project.

The plan development will make use of tide and storm surge water levels that were analyzed and mapped under different sea level rise scenarios as part of the North Shore Sea Level Rise Strategy. Additional hydraulic modelling of local wind-generated waves may be conducted (to be determined by the consultant) for specific areas where wastewater infrastructure is exposed and vulnerable to shoreline erosion (e.g. Deep Cove area sanitary sewer).

7. **Implementation Risks.** List any potential implementation risks that may impact the ability to deliver on the project, and explain what mitigation measures are in place to address them (e.g. staff capacity, procurement, etc.).

The primary implementation risk for this project is related to schedule and completion on the required timeline by UBCM. To mitigate the risk, the District will issue a Request for Proposal (RFP) as early as possible to ensure a qualified firm is obtained to complete the project. We envision the procurement period taking approximately 6-8 weeks to

select a proponent. To minimize the impact to the project schedule, preparation work will be done by the District ahead of the notice of grant funding. The RFP will also require the consultant team to achieve the project as per the required timeline of the grant. Given the available background hazard analysis work from the North Shore Sea Level Rise Strategy, the consultant team will be able to advance the initial phases of the work program quickly.

**8. Rationale.** What is the rationale and evidence for undertaking this project? This may include local flood hazard and/or seismic vulnerability as identified in the Emergency Plan or flood mapping, threat levels identified in completed flood risk assessments and/or recent flood history (e.g. evacuation order and/or disaster financial assistance).

This project is a high priority for the District based on the current performance issues and maintainance requirements of the low-lying sanitary sewer and pump stations in the Deep Cove area (refer to Figure 2, attached). The project is also a high priority based on the outcomes of the North Shore Sea Level Rise Strategy which identified high risks related to wastewater infrastructure and includes a key action of integrating sea level rise planning into asset management. Wastewater infrastructure is the primiary District-owned asset exposed to sea level rise and this plan will enable asset management with a climate change adaptation and flood risk management lens. Without a comprehensive adaptation plan, the potential of wastewater infrastructure damage and failure grows over time as the infrastructure continues to age and sea level rises. Consequences of infrastructure failure could be severe and include: service disruption, watewater flooding into residences and associated health concerns, and untreated wastewater release into Burrard Inlet and associated habitat impacts.

**9. Engagement & Collaboration**

a. Describe how the proposed project will contribute to a comprehensive, cooperative and regional approach to flood planning.

The proposed project will implement a key action of the comprehensive, cooperative and regional approach to flood planning embedded in the North Shore Sea Level Rise Strategy by incorporating regionally-consitent sea level rise criteria and hazard/risk analysis into municipal asset management. The project will also contribute to regional flood planning by providing a case study and toolkit that other communities with vulnerable coastal wastewater infrastructure can use to manage their assets and their flood risk. Project lessons learned may be presented in conferences to provide awareness of resources to other communities.

b. List current and potential regional stakeholders and partnerships, and describe their level of engagement and commitment to the project. This may include other local governments or First Nations that are located in proximity to the project.

The project will primiarly focus on District-owned infrastructure and the key stakeholders are internal departments that would be engaged in decision-making, including: Engineering Services, Utility Operations, Environmental Sustainability, and Development Engineering.

Metro Vancouver will be informed about the project as it relates to connections of the District's infrastructure to Metro Vancouver's regional wastewater conveyance and treatment infrastructure.

Resources, interim and final results, and lessons learned from the project will also be shared with other North Shore communities (including Squamish Nation and Tsleil-Waututh Nation) through the North Shore Sea Level Rise Strategy Steering Committee which is being established as an on-going committee to enable regional collaboration on sea level rise adaptation beyond the completion of the strategy.

**10. Proposed Deliverables & Outcomes**

a. What specific deliverables will result from this project?

Technical report and related digital files, including:

- coastal hazard rating and condition rating for coastal wastewater infrastructure
- risk-based priority list of coastal wastewater infrastructure for upgrading
- coastal wastewater infrastructure adaptation toolkit
- conceptual design drawings
- class-D cost estimates (construction and operation and maintenance)
- options evaluation matrix
- implementation plan

b. Describe how the proposed project considers climate change in the project methodology and adapts to the impacts of climate change through the final deliverables.

Sea level rise occuring as an outcome of climate change is a defining feature of the proposed project. The Coastal Wastewater Infrastructure Flood Mitigation and Sea Level Rise Adaptation Plan will be developed with consideration of coastal hazards under current and future sea level. Criteria will be aligned with the North Shore Sea Level Rise Strategy which uses the current guidance from the Province of BC (1 m rise by Year 2100 and 2 m rise by Year 2200 over Year 2000 baseline sea level). The project will integrate sea level rise projection timelines with asset management timeline consideration (i.e. remaining useful life of the existing assets. The project will also incorporate uncertainty in sea level rise projections to enable an implementation plan that is flexible to changing sea level rise projections.

c. How will this proposed project lead to a better understanding of the social and economic impacts of flood events to the community?

The North Shore Sea Level Rise Strategy informed the public about coastal flood hazards and sea level rise through several activities. This included presenting the risk assessment results which highlighted the exposure and risk associated with wastewater infrastructure. The proposed project will build on the previous risk assessments and the results will be available to be incorporated into future and on-going public engagement initiatives that are recommended as part of the North Shore Sea Level Rise Strategy. Depending on the options generated and the implementation timing of the preferred options, additional engagement with the

public will be conducted in the future as part of implementing the plan to be developed by the proposed project.

d. If applicable, how does this project address and/or inform existing or future amendments to local plans, policies, building codes, floodplain zoning bylaws, and/or public awareness/education?

The proposed project results are anticipated to serve as a technical resource for the development engineering review of wastewater infrastructure required as part of new developments in coastal flood hazard areas. It is anticipated that the proposed project will result in a coastal wastewater infrastructure adaptation plan that in part relies on redevelopment to reduce risk over time, including requiring new developments to implement different sanitary sewer and pump station configurations. The proposed project may also include recommendations for changes to the development servicing by-law and the development of local service area plans to enable the implementation of infrastructure adaptation through redevelopment. The proposed project will also act as a complementary resource to the draft coastal development permit area (DPA) that is currently being contemplated by the District.

**11. Monitoring & Performance Measures.** Describe how the project will be monitored and what performance measurements will be used (e.g. work progress reports, timeline review, resource planning, procurement plan and roll out, etc.).

The project will be implemented using the District's Project Management Framework (PMF). The PMF is a step-by-step process to manage projects, using a scalable framework to ensure consistency across the organization in project planning, delivery, and close-out. The PMF helps staff to deliver projects within scope and budget as it provides tools and templates to ensure policy and best practices are followed.

This project will be monitored first and foremost by assigning a Project Manager (PM) to be responsible for its delivery from the project initiation to the closeout. The PM will be responsible creating the project charter, and initiating the procurement plan. After successful award, the PM will be the primary point of contact for the design team and the contractor. They will also be responsible for generating progress reports, and periodically reviewing the schedule to ensure the timeline for delivery is met.

**12. Qualified Professionals.** Flood risk assessment, flood mapping and flood mitigation planning require specialized technical knowledge and experience to provide meaningful results to your community. Outline your procurement process to engage the necessary subject matter expertise (Qualified Professionals) required for this work and the criteria you will use to make the selection.

All procurement by the DNV is subject to our Corporate Policy for Contracting and administrative policy (3-1220-2) Procurement of Goods and Services. Purchases greater than $75,000 require formal competitive bidding, usually in the form of a Request for Proposal (RFP). This method allows the District to ensure the consultant has the technical experience and team required to successfully deliver the project. This is achieved by evaluating bidders on their experience delivering similar projects in size and

scope, the capacity and skill of their project team, and their ability to comply with specifications among other requirements.

The DNV has a long history of collaborating with engineering consultants to develop planning studies for local watersheds. We have found that verifying a bidders' team experience through reference checks, and applying a robust evaluation through a review team to be crucial in awarding to the right consultant. While price is a significant factor, our procurement strategy is to find the best-value which is not necessarily the lowest bid.

13. **Additional Information.** Please share any other information you think may help support your submission.

The following referenced documents are attached to provide additional information and address application requirements:

Figure 1 - Burrard Inlet Focus Area

Figure 2 - Deep Cove Focus Area

Table 1 - Work Plan and Budget

District of North Vancouver Council Resoultion In Support of Application

Additional information about the North Shore Sea Level Rise Strategy is available at:

www.dnv.org/sealevelrise

## SECTION 4: Required Application Materials

Only complete applications will be considered for funding.

The following separate attachments are required to be submitted as part of the application:

- ☒ Local government Council or Board resolution, Band Council resolution or Treaty First Nation resolution, indicating support for the current proposed activities and willingness to provide overall grant management.
- ☒ Detailed workplan and budget for each component identified in the application. This must include a breakdown of work activities, tasks, deliverables or products, resources, timelines (start and end dates), and other considerations or comments. The budget must clearly identify the CEPF funding request, applicant contribution, and/or other grant funding.
- ☒ Map identifying the location of the proposed project.
- ☒ If applicable, copies of any relevant documents that support the rationale for this project must be included with this application. E.g. Mitigation planning applications should be supported by flood mapping and/or risk assessments for the proposed area. For risk assessments it is encouraged that proponents utilize the National Disaster Mitigation Program RAIT methodology and provide the complete RAIT with the application.

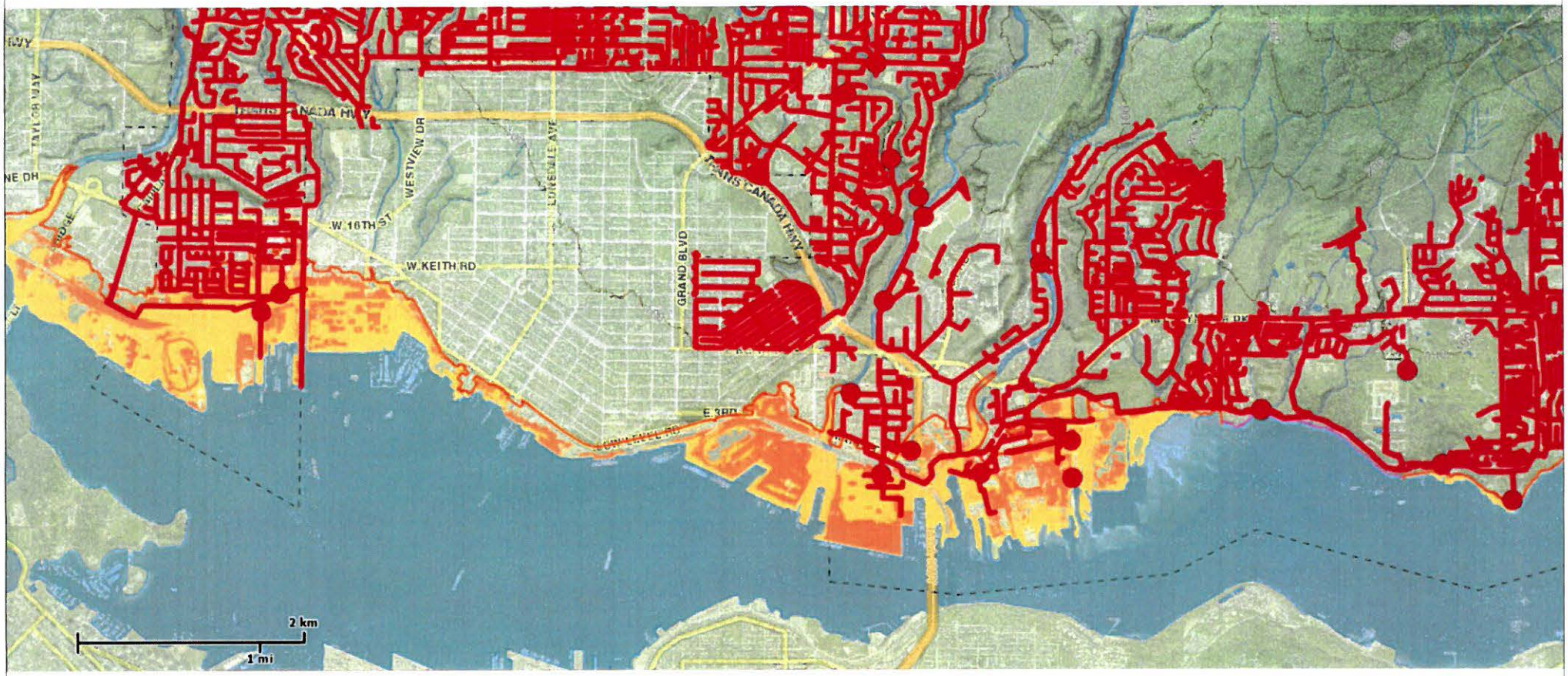
Approved applicants are required to grant the Province of British Columbia free and clear access and distribution rights, specifically a perpetual, royalty-free, non-exclusive, worldwide license to use, reproduce, modify and distribute, any and all of the spatial data products acquired/produced using CEPF funding.

| **SECTION 6: Signature** | |
|---|---|
| I certify that: (1) to the best of my knowledge, all information is accurate and (2) the area covered by the proposed project is within our local authority's jurisdiction (or appropriate approvals are in place). | |
| Name: Stephen Bridger | Title: Section Manager, Engineering Planning and Design |
| Signature:  <br>*An electronic or original signature is required.* | Date: February 26, 2021 |

Submit applications to Local Government Program Services, Union of BC Municipalities

E-mail: cepf@ubcm.ca

Mail: 525 Government Street, Victoria, BC, V8V 0A8




**FLOOD PLANNING AREA**
- FLOOD PLANNING AREA

**SANITARY FACILITIES**
- LIFT STATION

**SANITARY INSPECTION CHAMBERS**
- INSPECTION CHAMBER

**SANITARY MAINS**
- MAIN

**SANITARY MANHOLES**
- MANHOLE

**SANITARY SERVICE CONNECTIONS**
- SERVICE CONNECTION

**SANITARY SERVICE CONNECTIONS CAP**
- SERVICE CONNECTION - CAPPED

**SEA LEVEL RISE**
- 1M DURING EXTREME STORM
- 1M DURING EXTREME STORM (TWN, NO...
- 2M DURING EXTREME STORM
- 2M DURING EXTREME STORM (TWN, NO...

**TEMPORARY FLOW MONITORS**
- TEMPORARY FLOW MONITOR

GEOtools

# Figure 1 - Burrard Inlet Focus Area

Wastewater Infrastructure & Coastal Flood / Sea Level Rise Planning Area

NORTH VANCOUVER DISTRICT

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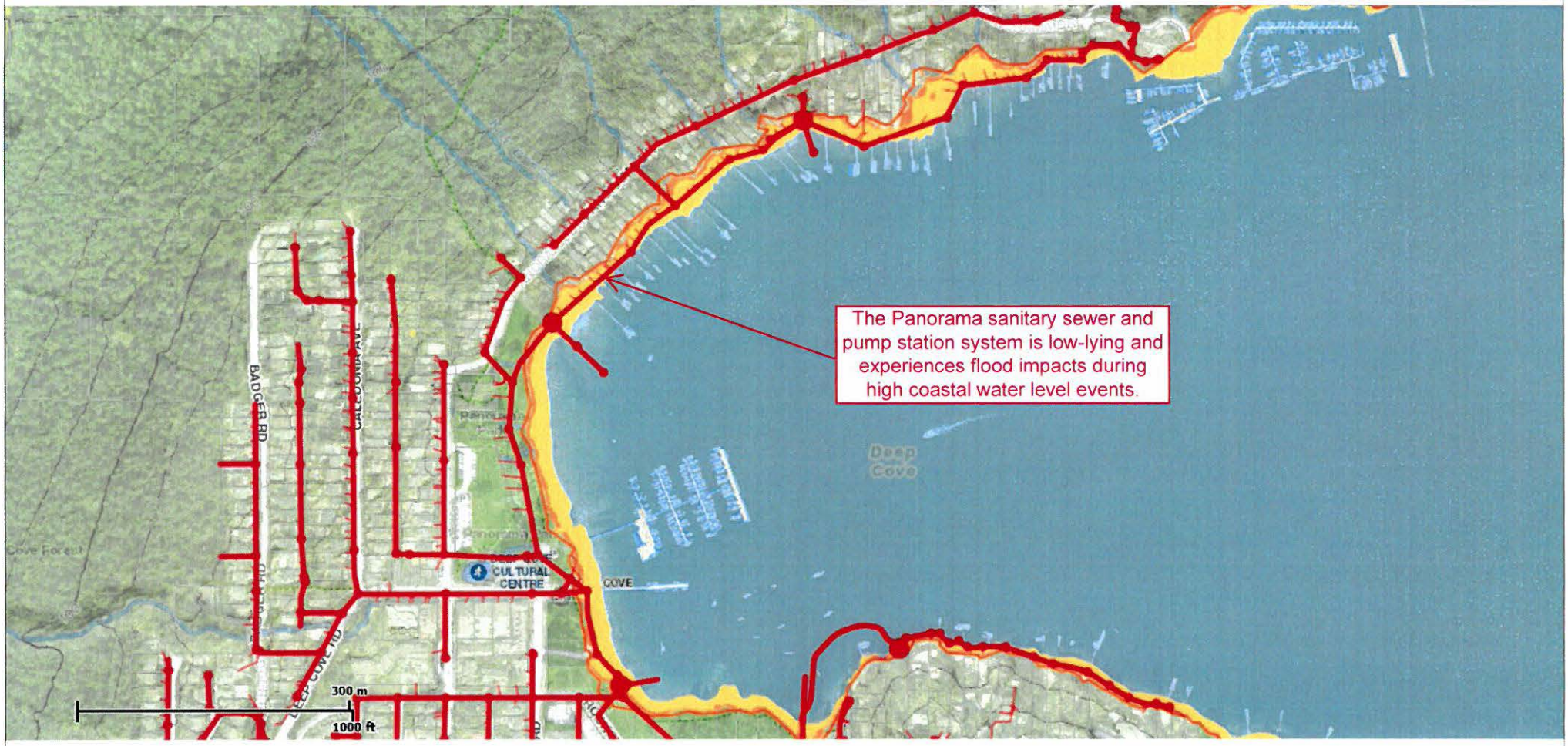


**FLOOD PLANNING AREA**
- FLOOD PLANNING AREA

**SANITARY FACILITIES**
- LIFT STATION

**SANITARY INSPECTION CHAMBERS**
- INSPECTION CHAMBER

**SANITARY MAINS**
- MAIN

**SANITARY MANHOLES**
- MANHOLE

**SANITARY SERVICE CONNECTIONS**
- SERVICE CONNECTION

**SANITARY SERVICE CONNECTIONS CAP**
- SERVICE CONNECTION - CAPPED

**SEA LEVEL RISE**
- 1M DURING EXTREME STORM
- 1M DURING EXTREME STORM (TWN, NO...
- 2M DURING EXTREME STORM
- 2M DURING EXTREME STORM (TWN, NO...

**TEMPORARY FLOW MONITORS**
- TEMPORARY FLOW MONITOR

GEOtools

# Figure 2 - Deep Cove Focus Area

Wastewater Infrastructure & Coastal Flood / Sea Level Rise Planning Area

NORTH VANCOUVER DISTRICT

Printed on: Monday, February 15, 2021

**UBCM - Community Emergency Preparedness Fund**

**Flood Risk Assessment, Flood Mapping, & Flood Mitigation Planning - February 26, 2021 Intake**

Project Name: Coastal Wastewater Infrastructure Flood Mitigation and Sea Level Rise Adaptation Plan
District of North Vancouver, British Columbia

**Table 1 - Work Plan and Budget**

| Phase / Task | Consultant Team Roles, Hourly Rates, and Estimated Level of Effort (hours) by Task | | | | | Total Budget | District of North Vancouver Contribution | CEPF Budget Request |
|---|---|---|---|---|---|---|---|---|
| | Project Manager | Sr. Engineer | Project Engineer | Junior Engineer | GIS Analyst | | | |
| | $ 180 | $ 195 | $ 150 | $ 110 | $ 110 | | | |
| PM-1 General project management and 4 progress meetings | 60 | 8 | 16 | | | $ 14,760 | | $ 14,760 |
| **Phase A - Background Information and Coastal Hazard Review** | | | | | | | | |
| A-1 Infrastructure condition review (desktop analysis) | 2 | 16 | 24 | 80 | 40 | $ 20,280 | | $ 20,280 |
| A-2 Coastal hazard review (possible new wave analysis in Deep Cove) | | 16 | 40 | 40 | 8 | $ 14,400 | | $ 14,400 |
| **Phase B - Infrastructure Vulnerability and Risk Assessment** | | | | | | | | |
| B-1 Asset probability of flooding calculations (0 to 2 m sea level rise) | | 8 | 16 | 16 | 8 | $ 6,600 | | $ 6,600 |
| B-2 Asset flooding vulnerability and consequence rating (qualitative) | | 8 | 16 | 40 | 4 | $ 8,800 | | $ 8,800 |
| B-3 Prioritization of assets for mitigation and upgrading | | 8 | 16 | | | $ 3,960 | | $ 3,960 |
| **Phase C - Mitigation Options Development and Feasibility Review** | | | | | | | | |
| C-1 Coastal wastewater infrastructure toolkit development | | 8 | 16 | 40 | **8** | $ 9,240 | | $ 9,240 |
| C-2 Mitigation options development workshop | 2 | 16 | 16 | 20 | | $ 8,080 | | $ 8,080 |
| C-3 Technical feasibility assessments and class-D cost estimates | | 8 | 32 | 60 | | $ 12,960 | | $ 12,960 |
| **Phase D - Engagement and Options Evaluation** | | | | | | | | |
| D-1 Prepare engagement materials on risk assessment and mitigation options to share with stakeholders | | 2 | 8 | 40 | 16 | $ 7,750 | $ 5,000 | $ 2,750 |
| D-2 Virtual engagement and feedback summary | 4 | 4 | 12 | 16 | | $ 5,060 | $ 5,000 | $ 60 |
| D-3 Option evaluation matrix and evaluation workshop | 4 | 8 | 16 | 40 | | $ 9,080 | | $ 9,080 |
| **Phase E - Implementation Plan** | | | | | | | | |
| E-1 Develop draft implementation plan | | 16 | 40 | 20 | | $ 11,320 | | $ 11,320 |
| E-2 Implementation plan review workshop | 4 | 16 | 16 | 16 | | $ 8,000 | | $ 8,000 |
| E-3 Draft project report | 4 | 16 | 40 | 8 | | $ 10,720 | | $ 10,720 |
| E-4 Final project report | 4 | 6 | 20 | 8 | | $ 5,770 | | $ 5,770 |
| | | | | | Sub-total | $ 156,780 | $ 10,000 | $ 146,780 |
| | | | | | Disbursements (2%) | $ 3,136 | | $ 3,136 |
| | | | | | **Total (Rounded)** | **$ 160,000** | **$ 10,000** | **$ 150,000** |