

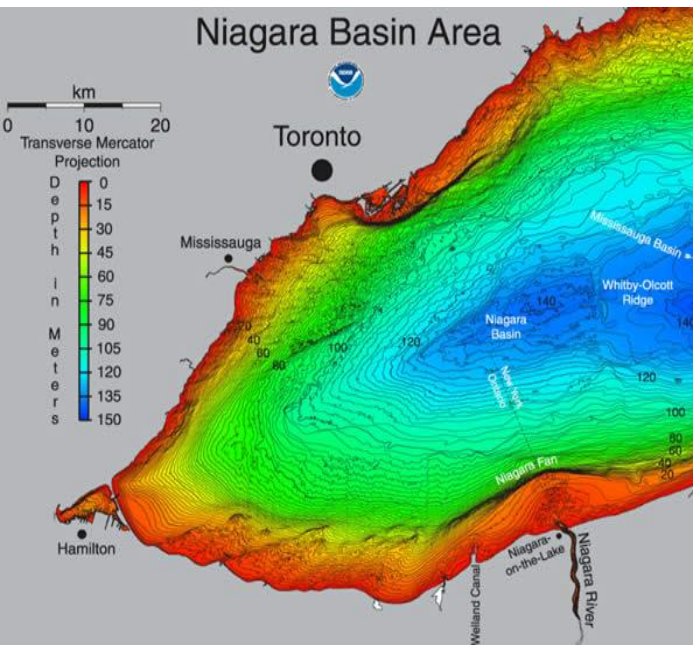


Cleaning Up Our Waterways:

“Update” The ‘Don River and Central Waterfront’ Project and The ‘Ashbridges Bay Treatment Plant outfall’

*Focus of projects : “Lower Don River and Toronto’s
Inner Harbour” & “Ashbridges Bay ”*

For Nov 14 2016 RAP Science Forum



Presented by
Dr Bill Snodgrass ,Dr Jian Lei, Susan Atlin , and
Grace Lin
Toronto Water
City of Toronto



Key Actions for Delisting

(supported by C of T projects)

1. Eutrophication or Undesirable Algae

- Continue to support **upgrades to the City of Toronto's Ashbridges Bay Treatment Plant** including the construction of a high rate treatment facility, a treatment wetland, and a new outflow pipe extension with diffusers (2016-2020)
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2. Beach Closures

- Continue to support the planning, design and implementation of the **City of Toronto's Don River and Central Waterfront** Combined Sewer Overflow Project (2016 to 2020)
- Continue Toronto Health Department **monitoring of bacterial levels at all waterfront beaches** during the June to September swimming season (2016-2020)
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- Continue to support the **City of Toronto's Beaches Plan** which includes **beach grooming** (2016-2020)

A wide-angle photograph of the Toronto skyline as seen from across Lake Ontario. The CN Tower stands prominently on the left side of the frame. The city's skyscrapers are clustered in the center, with various architectural styles. The water in the foreground is dark blue with gentle ripples. A small white boat is visible on the right side of the water. The sky is a clear, bright blue with some light, wispy clouds.

Don & Central Waterfront Project

WWFMP Implementation

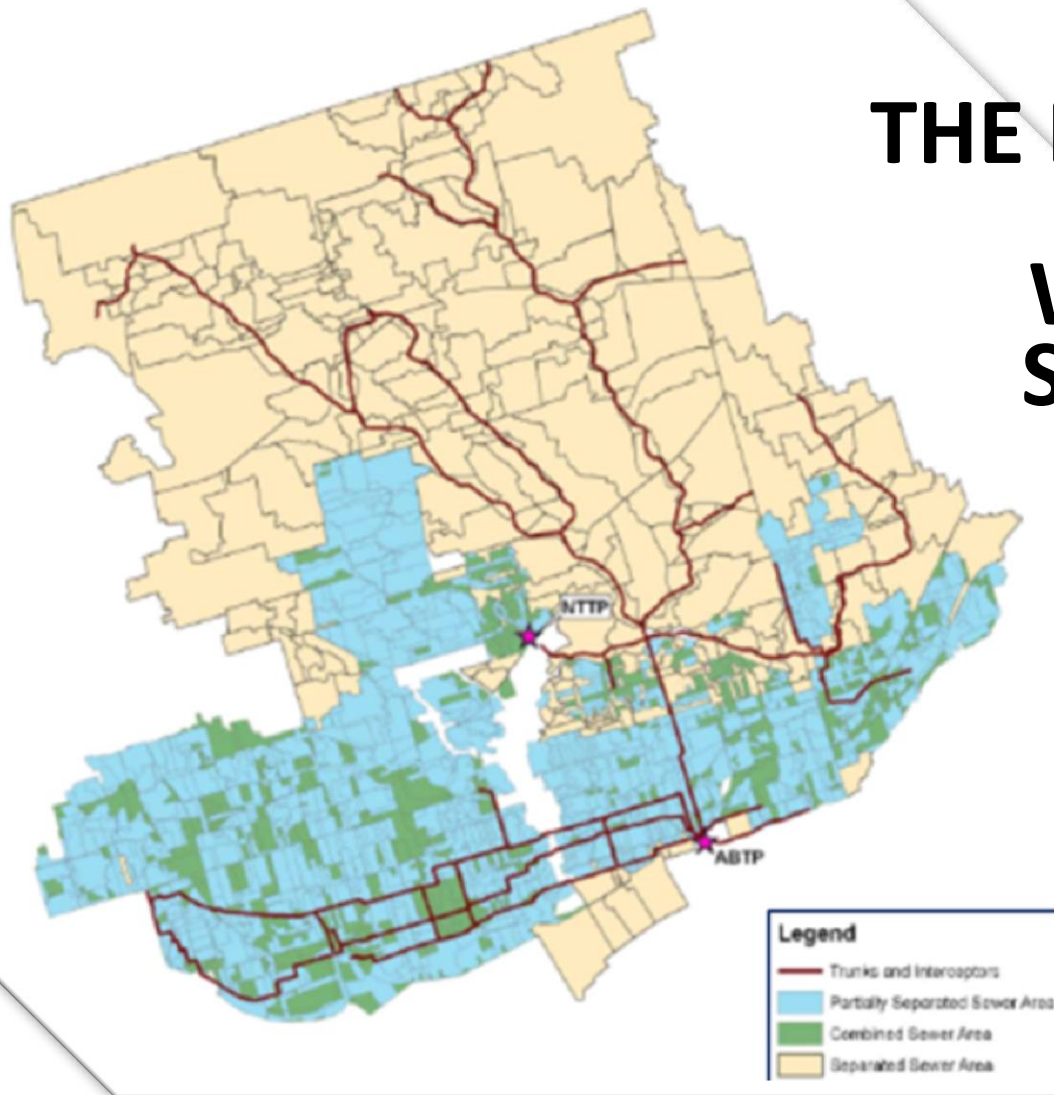
(See Significant progress that has been made in **2015 RAP Update**
[**Sect. 3.2, 4.2, and Chap 5**])

- Public Outreach and Education
- Source control (LID) measures: **(Hierarchy Principle)**
- Municipal operations:
- Conveyance control: **(Hierarchy Principle)**
- Basement Flooding Protection Program:
- Stream Restoration:
- Environmental monitoring:
- End-of-pipe facilities (ABTP Service Area): **(Hierarchy Principle)**
 - Earl Bales Stormwater Management Pond -
 - Coatsworth Cut CSO and Storm Outfalls Control
 - Don River and Central Waterfront Project –
 - Don Valley Stormwater Management Wetlands
 - North Toronto Treatment Plant CSO Tank

THE DON RIVER & CENTRAL WATERFRONT SERVICE AREA

*267 km²
the Study Area*

*1.2 million
Population served*



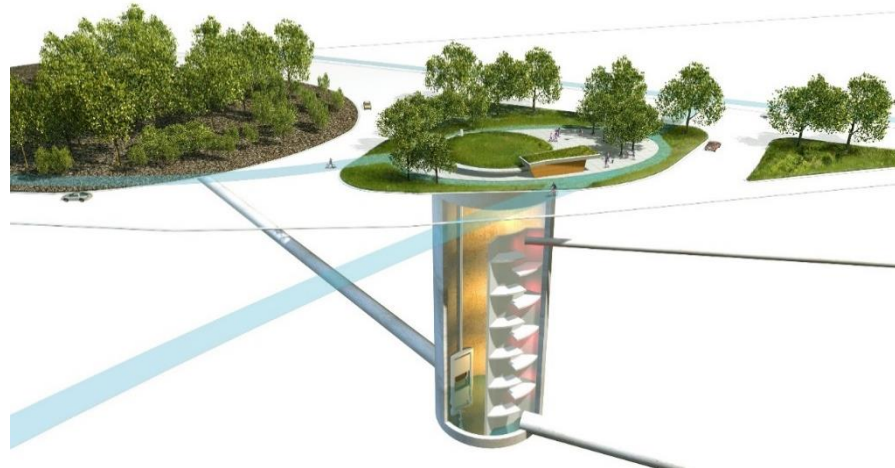
*Approximately 30% of the system
is combined sewers*

1. Tunnels (22 Km)
 2. Shafts (12 Total)
 3. Connections (27 Total)
 4. IPS
 5. HRT (Landform)
-
- The map illustrates the proposed tunnel route (red dotted line) and existing infrastructure (blue dotted line) for the Western Beaches WWSWTP project. The route starts at the Taylor-Massey area, passes through the DCAD area, and then follows the existing route through the BB-1 area, eventually leading to the HRT (Landform) area. The map also shows the location of various treatment stages, including the IPS (Inflow Pump Station) and the HRT (Horizontal Rectangular Tank). A legend indicates that green circles represent CSO (Combined Sewer Overflow) and blue circles represent Stormwater. A red arrow labeled 'Overflows' points to the area where the tunnel route is proposed. The map includes labels for various treatment stages and infrastructure, such as WBS-1, WBS-2, WBS-3, WBS-4, WBS-5, WBS-6, WBS-7, WBS-8, WBS-9, WBS-10, WBS-11, WBS-12, WBS-13, WBS-14, WBS-15, WBS-16, WBS-17, WBS-18, WBS-19, WBS-20, WBS-21, WBS-22, WBS-23, WBS-24, WBS-25, WBS-26, WBS-27, WBS-28, WBS-29, WBS-30, WBS-31, WBS-32, WBS-33, WBS-34, WBS-35, WBS-36, WBS-37, WBS-38, WBS-39, WBS-40, WBS-41, WBS-42, WBS-43, WBS-44, WBS-45, WBS-46, WBS-47, WBS-48, WBS-49, WBS-50, WBS-51, WBS-52, WBS-53, WBS-54, WBS-55, WBS-56, WBS-57, WBS-58, WBS-59, WBS-60, WBS-61, WBS-62, WBS-63, WBS-64, WBS-65, WBS-66, WBS-67, WBS-68, WBS-69, WBS-70, WBS-71, WBS-72, WBS-73, WBS-74, WBS-75, WBS-76, WBS-77, WBS-78, WBS-79, WBS-80, WBS-81, WBS-82, WBS-83, WBS-84, WBS-85, WBS-86, WBS-87, WBS-88, WBS-89, WBS-90, WBS-91, WBS-92, WBS-93, WBS-94, WBS-95, WBS-96, WBS-97, WBS-98, WBS-99, WBS-100. The map also includes a scale bar and a north arrow.

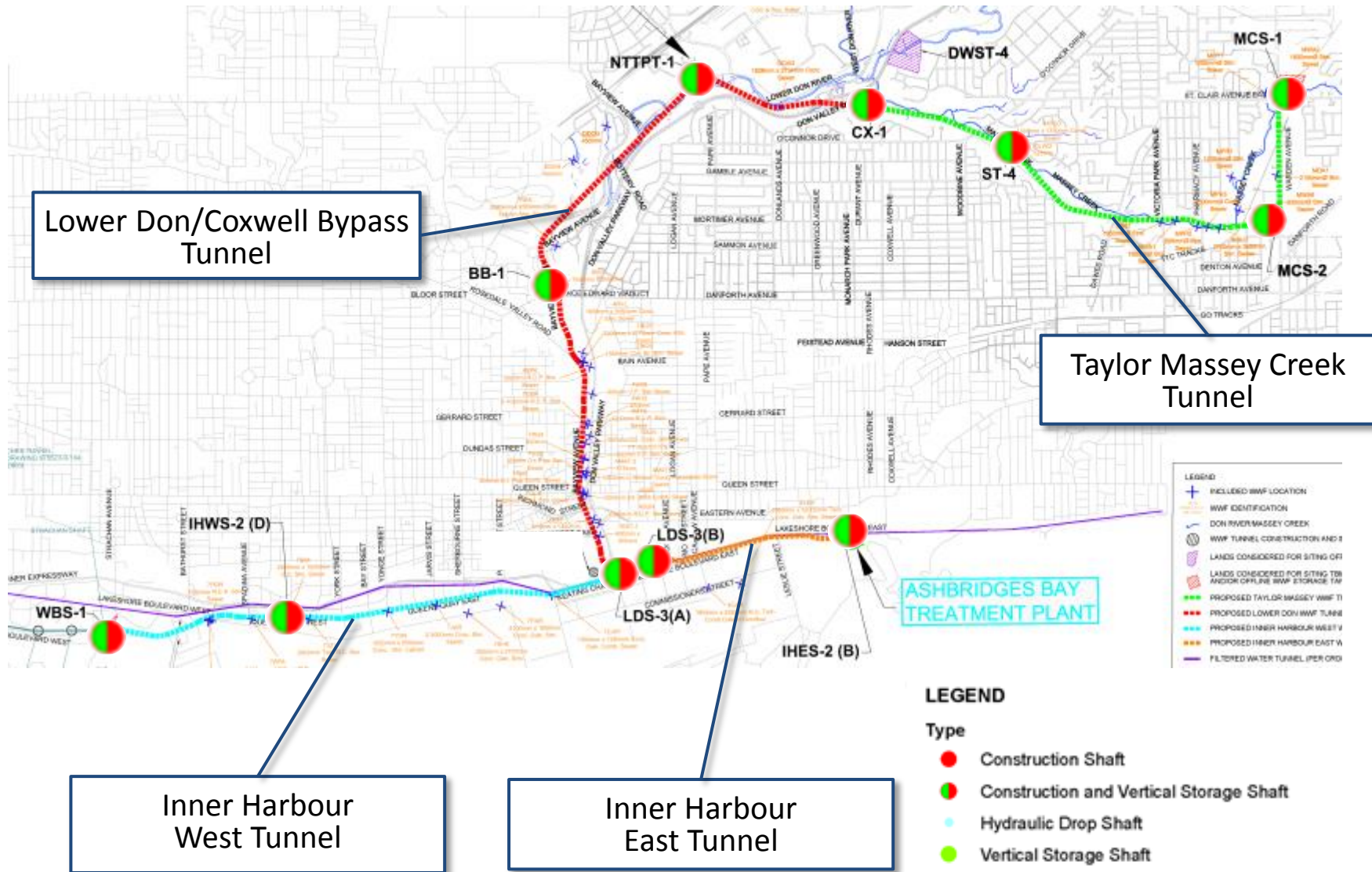
PRELIMINARY DESIGN

HYDRAULIC DESIGN REQUIREMENTS

- Sufficient **storage** to limit overflow to once per average year at each outfall
- Control hydraulic **transients**
- Minimize risk of **air entrapment** in tunnels to reduce risk of **geyser**
- Minimize **sediment accumulation** in tunnels



FINALIZING - INTEGRATED HYDRAULIC DESIGN FOR THE ENTIRE SYSTEM



DON RIVER AND CENTRAL WATERFRONT PROJECT

BLACK & VEATCH
Building a world of difference.

IN ASSOCIATION WITH
R.V. Anderson Associates Limited
engineering • environment • infrastructure



1
Inner Harbour WWF Connections - Nine WWF Connections are proposed along the inner harbour of Lake Ontario. The large vortex prop chamber has been designed to integrate within the urban context.



2
The Tunnel Boring Machine Launch Shaft will be located at Ashbridges Bay Treatment Plant. After completion of the 10.6m - 6.3m diameter Coxwell Bypass Tunnel, the site will be restored to promote public use of the space.



3
A Baffle Drop Structure will be used to convey flow from the existing Coxwell Sanitary Trunk Sewer into the new bypass tunnel.

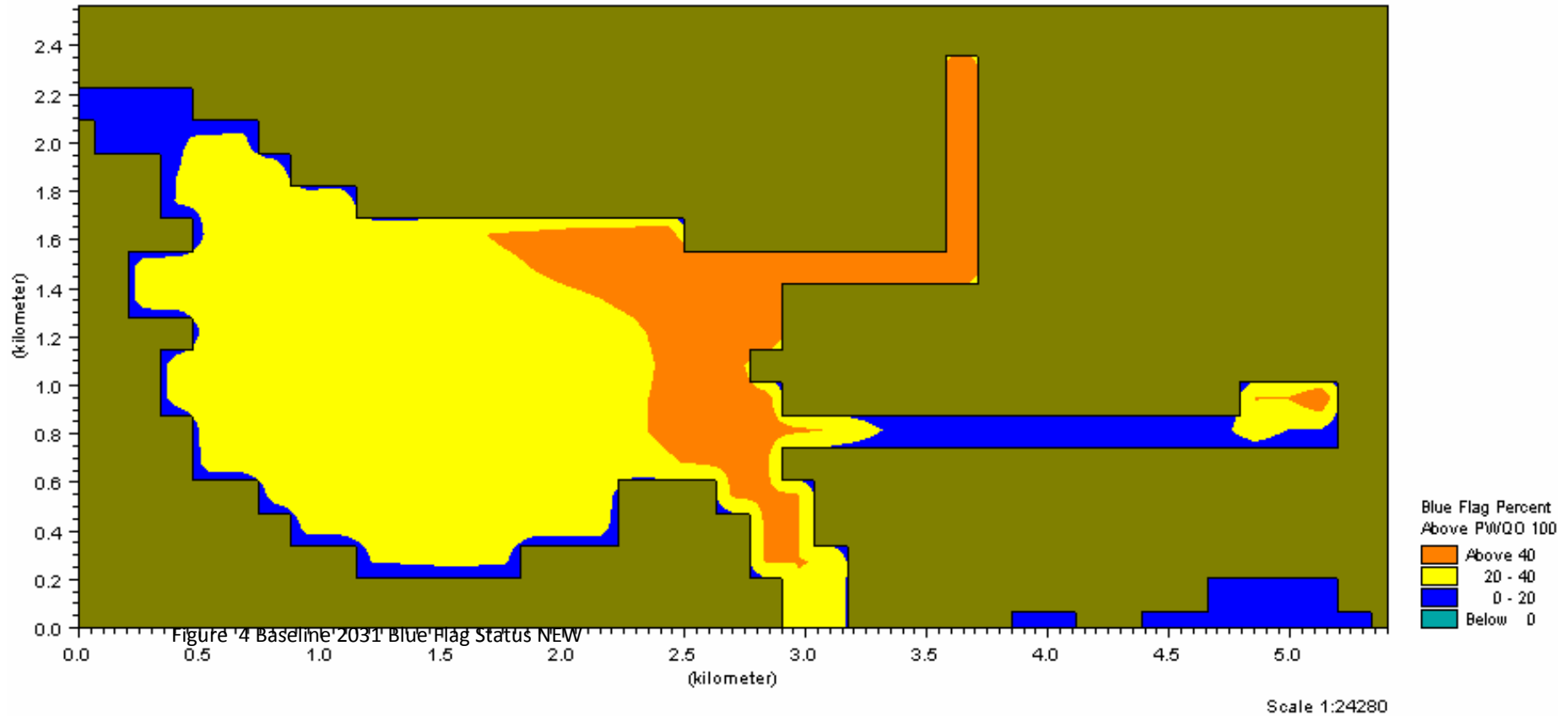


SCOPE OF WORK: The City of Toronto is constructing a Wet Weather Flow (WWF) System to greatly reduce CSOs and improve the water quality in the Don River, Taylor Massey Creek and Inner Harbour of Lake Ontario. The City will construct 22 km of tunnels and connect 46 existing combined sewer outfalls to the tunnel system via diversion and drop structures to reduce overflows to waterbodies from the existing outfalls. The total cost of the Don River and Central Waterfront Project is estimated at \$1.5 Billion. The first stage of the project, the 10.6 km - 6.3 m diameter Coxwell Bypass Tunnel, will commence construction in 2018 and has an estimated capital cost of \$400 million.



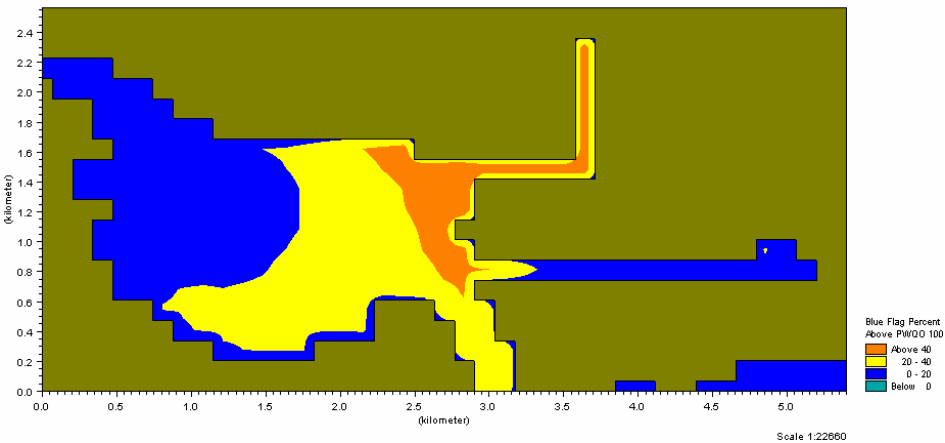
Receiving Water Quality Response

Figure – Existing Conditions

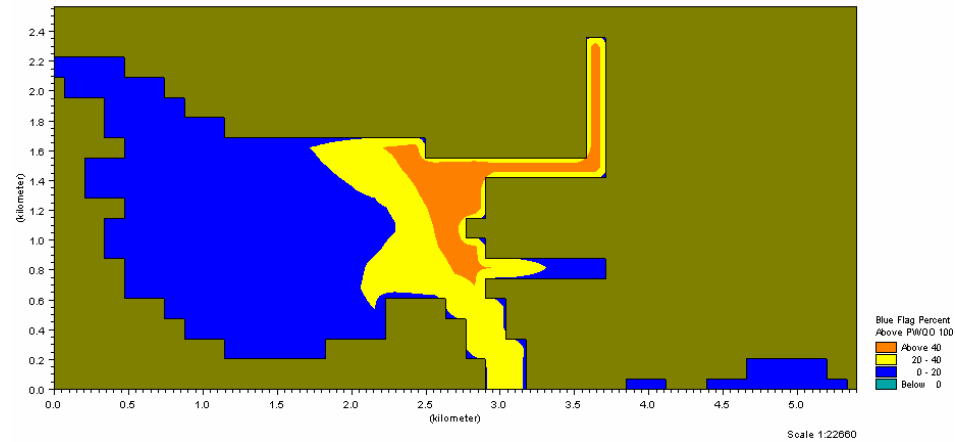


Receiving Water Quality Response

F-5-5 Control Level – Blue Flag Status



1 overflow per season - Blue Flag Status



PROJECT BENEFITS

- Virtual elimination of CSO discharges to the Don River and central waterfront
- Significant water quality improvements to the Inner Harbour, Lower Don River, and Taylor-Massey Creek
- Supports waterfront revitalization efforts and improves recreational uses and aquatic habitat
- Moves us closer to delisting Toronto's waterfront as an Area of Concern in the Great Lakes Basin



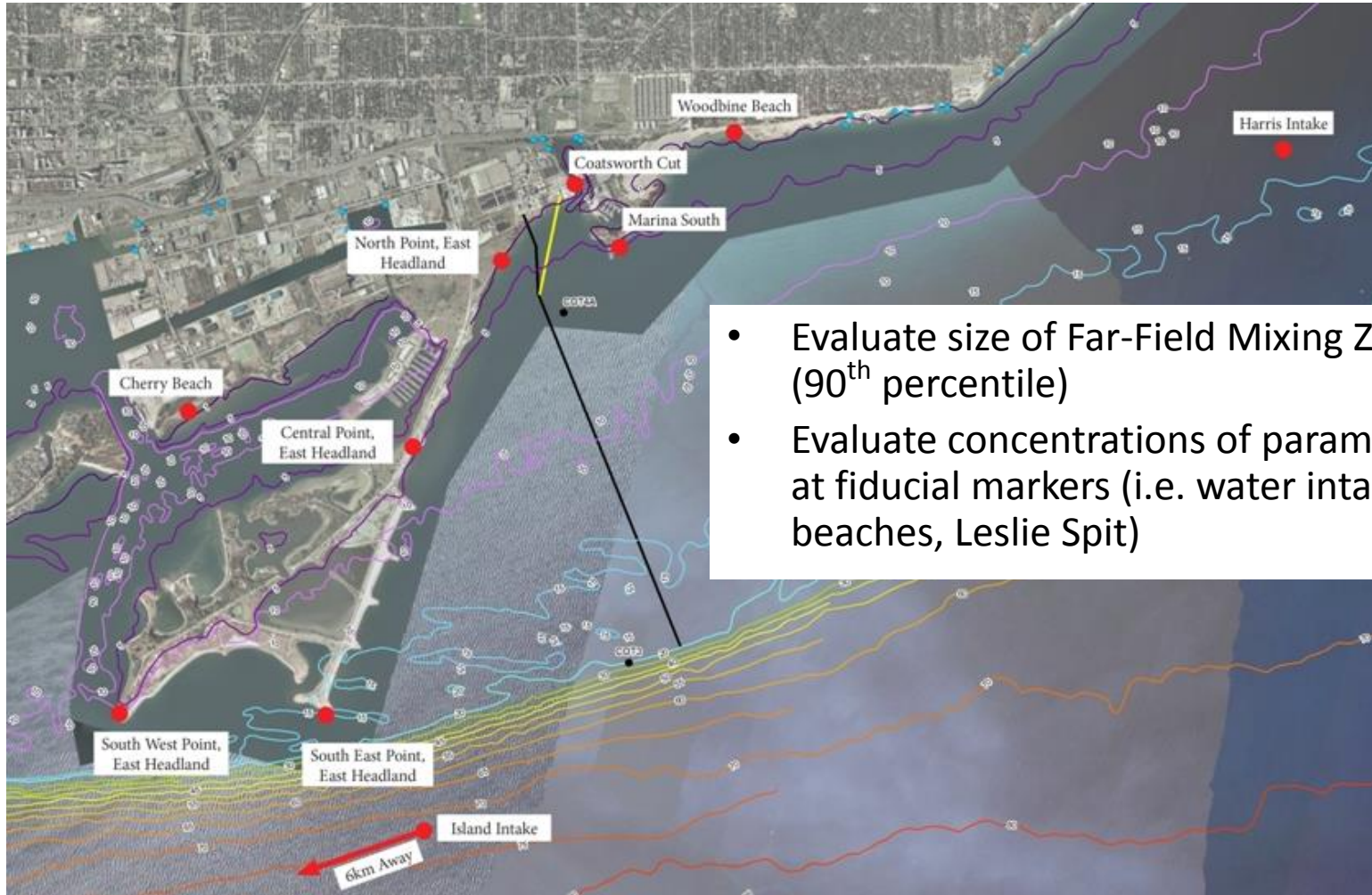
ABTP - OUTFALL : RECEIVING WATER ASSESSMENT & PRELIMINARY DESIGN

TORONTO RAP SCIENCE FORUM Nov 14 2016



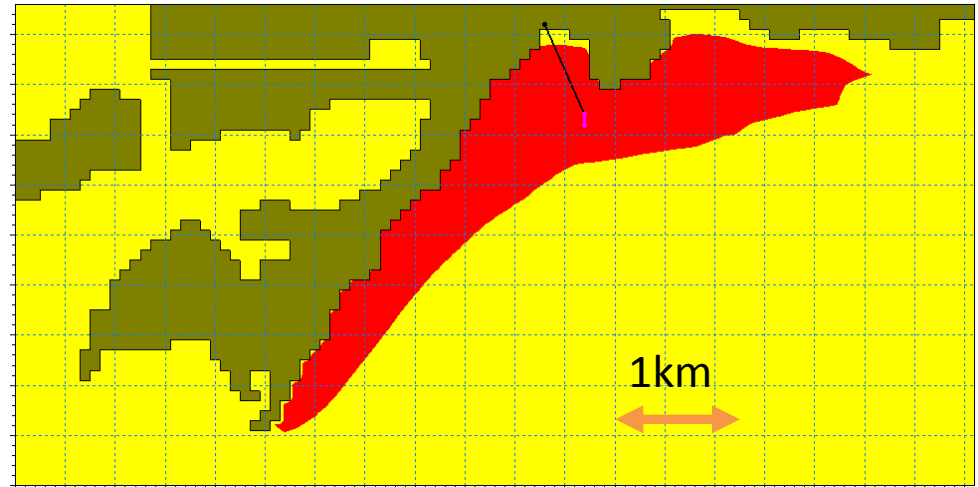
MODELLING APPROACH

- Far-field Model (MIKE3) - Evaluation



EVALUATION OF ALTERNATIVES – BEACHES AND SHORELINE

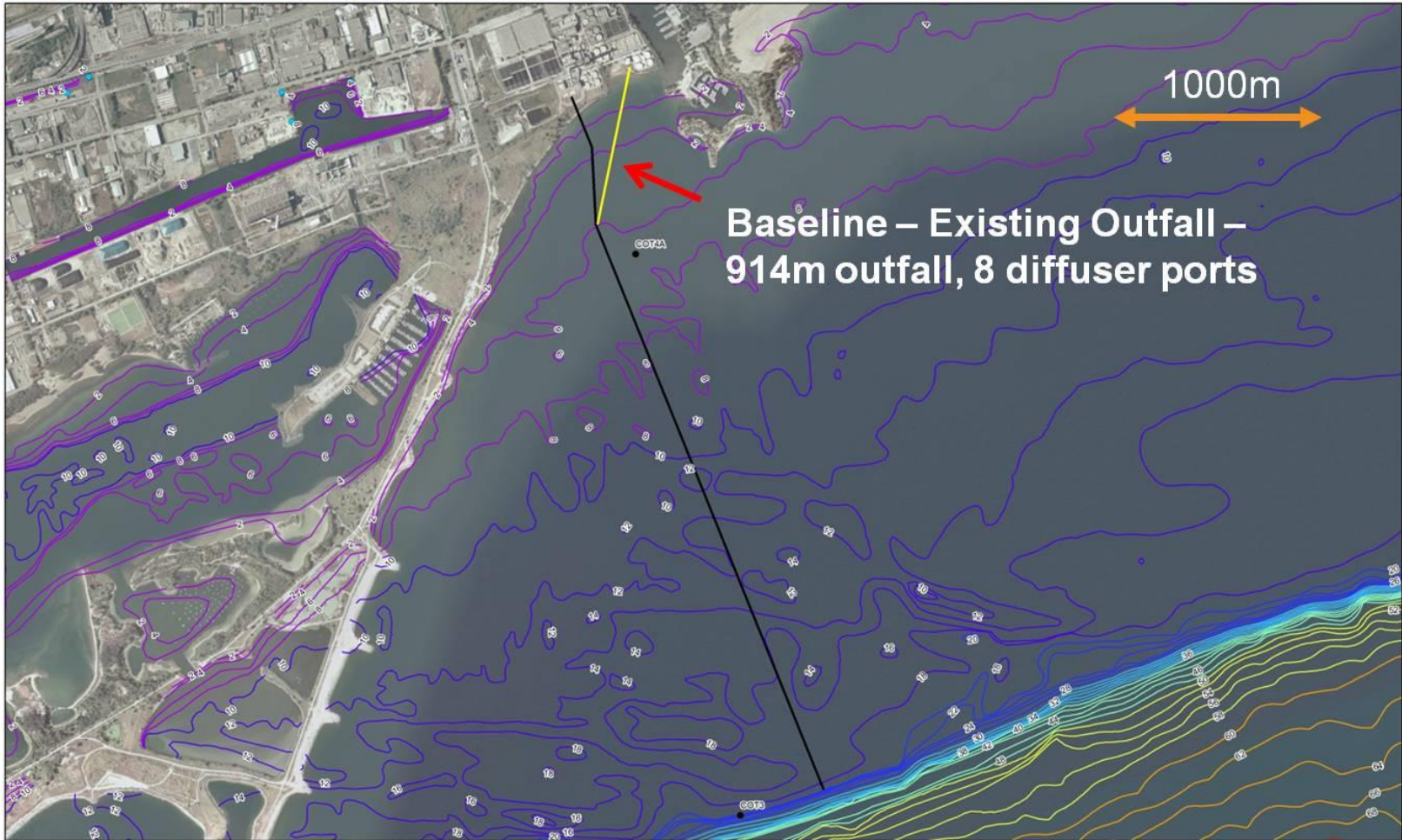
- Existing Outfall (914 m total length with 92m diffuser)
 - Total Phosphorus Mixing Zone interferes with shoreline (red colour)



- Outfall Alternative (3.5km total length, 1km diffuser section)
 - Total Phosphorus – no interference with shoreline
 - Peak daily average TP is below PWQO at all fiducial markers (beaches, Leslie spit)



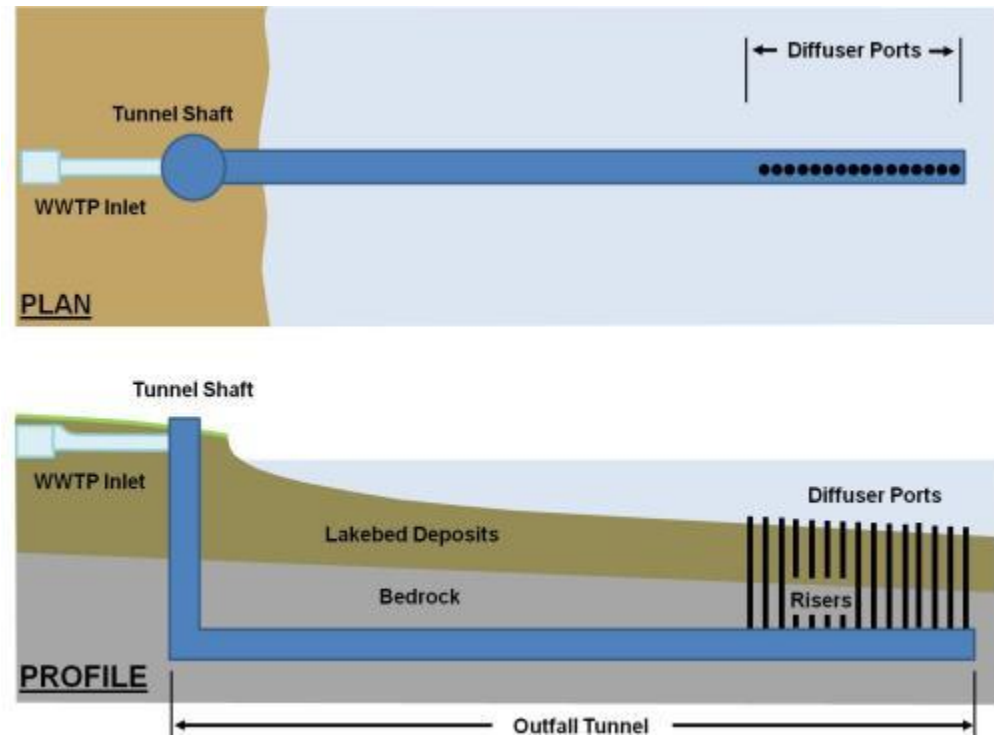
DETAILED DESIGN STAGE



Existing Baseline Conditions

Tunnel – Design Basis

- Single tunnel
- 7.0m internal diameter
- 3,500m length
- Similar to 1986 Concept in alignment and length
- Tunnel Boring Machine (TBM) methods in bedrock
- xx vertical “tunnel risers”
 - 1.0m inner diameter
- xx diffuser ports
 - 0.75m inner diameter



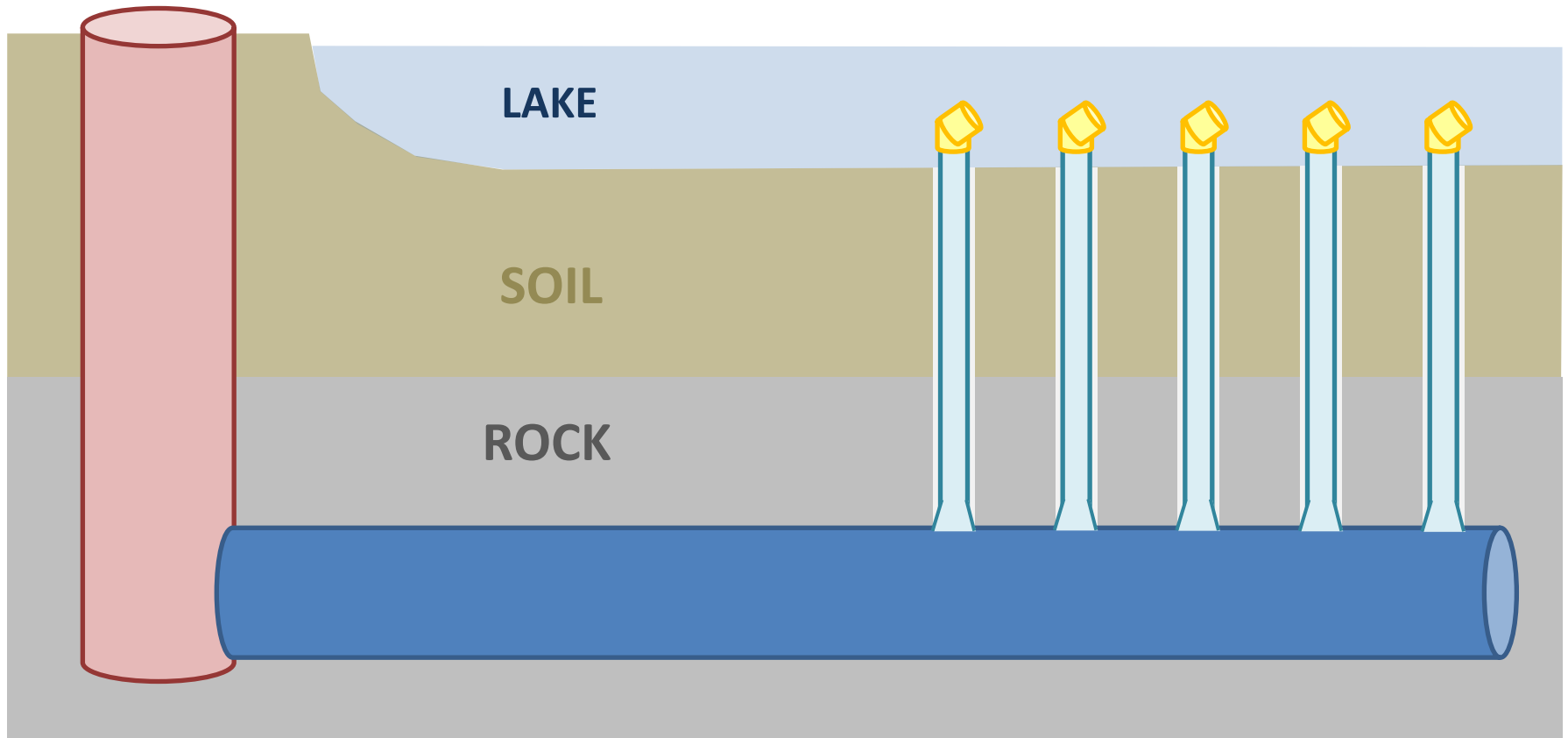
The figure consists of two main parts: a plan view at the top and a cross-section view at the bottom.

Plan View: Shows the proposed tunnel alignment (dashed line) passing through a blue area representing water. The alignment is marked with a series of points. A key plan inset in the top right corner shows the location of the tunnel relative to the city of San Francisco. Labels include "SHAFT LOCATION & NUMBER", "TUNNEL ALIGNMENT", "LAKE BED", "SOIL", "BEDROCK", and "END OF TUNNEL".

Cross-Section View: Shows the tunnel (1.0m O.D.) passing through soil and bedrock. The tunnel is shown as a horizontal line at the bottom. The soil is represented by a brown area above the tunnel, and the bedrock is represented by a grey area below the soil. The cross-section shows the tunnel passing through the soil and then the bedrock. Labels include "HIGH WATER LEVEL (APPROX.)", "LAKE BED", "SOIL", "BEDROCK", "END OF TUNNEL", and "1.0m O.D. TUNNEL".

Tunnel – Sequence of Construction

5 – Flood Tunnel and Mount Ports



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THANK YOU. ANY QUESTIONS?

2016 Toronto RAP Science Forum

14 November 2016

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