REPORT

Kingston Inner Harbour Sediment Sampling Programs 2021-2024 Summary Report

Transport Canada and Parks Canada Water Lots, Kingston, Ontario

Submitted to:

Public Services and Procurement Canada

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Executive Summary

A series of sediment sampling programs within Kingston Inner Harbour (KIH) was conducted between 2021 and 2024 to update and expand the current data set for harbour sediment quality, including both surface samples (0.0 to 0.1 metres below surface [mbs]) and subsurface samples (>0.1 mbs). The program focussed on the sediments above the native clay layer; these sediments, which are fine-grained and loosely consolidated, contain most of the legacy contamination and are usually limited to the upper metre of sediment. The sampling programs and analyses focused on understanding the concentrations of contaminants of concern (CoC) that previous work has shown is causing elevated health risks to humans and ecological receptors. This information has been used to refine the areas of contamination requiring physical intervention (i.e., dredging and/or capping) for the detailed design phase of the KIH Sediment Management Project (the Project). The key results of the program and implications on the detailed design are summarized below.

Surface Sediment Quality

- The primary CoCs in sediment include legacy substances determined to cause elevated environmental risks including chromium, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). These primary CoCs are the risk drivers for chemical management within KIH. Other metal and metalloid CoCs, including arsenic, mercury, and copper are also present at levels of potential environmental concern, but are found in smaller and local areas (i.e., of environmental concern in only a single or a few management units[1]) relative to the primary CoCs. By addressing the risk from primary CoCs, the other co-occurring CoCs in most management units will also be addressed adequately.
- There are broad patterns of sediment contamination for several substances, with lower concentrations in the central harbour relative to the western management units. The contaminant concentrations are elevated in large portions of central KIH compared to the eastern harbour and conditions upstream of the KIH, but the degree of environmental risk in the central harbour is lower than the western management units. As a result, no physical intervention will be taken in the central harbour areas, but long-term monitoring will occur to make sure conditions are stable or gradually improving over time.
- There was no widespread evidence of significant recovery or deterioration of sediment quality over the past 10 years, with concentrations of primary CoCs remaining well above sediment quality guidelines, and at similar magnitude and spatial distribution to historical characterizations. Although some localized changes to sediment quality were observed relative to historical results (e.g., spatial extent of PAH contamination expanded in southern KIH, PCB elevations slightly reduced in central KIH) these changes did not reduce the overall environment risk in the KIH and therefore were not significant enough to warrant broad changes to the planned remediation design.
- Dredging is required in several areas of western KIH, due to evidence of moderate to high contamination in surface sediments that is driving unacceptable risks, with conditions not significantly improving over time. Where elevated sediment chemistry was observed, it tended to be mixed within the vertical sediment profile,

[1] The term “management units” refers to subsections of the KIH water lots and are divided based on a combination of property ownership and sediment contamination profile. The prefix abbreviations for the management units indicate the property owner (i.e., PC indicates Parks Canada, TC indicates Transport Canada, DND indicates Department of Defence, WM indicates Woolen Mill, and PP indicates that ownership is under evaluation). Larger water lots are divided into multiple management units, using numbered suffixes.

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without clear and consistent layering within the sediment bed. Although some localized areas exhibit vertical gradients in contamination, such patterns were not widespread. The areas requiring dredging are closest to the upland sources of legacy contaminating activities including historical railway, shipyard, fueling, coal gasification, tannery, lead smelter, and landfill activities. Some areas of moderate contamination do not require sediment dredging but require low-intervention approaches such as enhanced natural recovery with amendments, or thin layer capping to reduce chemical exposure while protecting habitats and other harbour values.

Subsurface Sediment Quality

- CoCs in subsurface (i.e. depths >0.1m) sediment are not in direct contact with most organisms and therefore are not driving ecological or human risks in the short-term. However, the extent and magnitude of CoC concentrations in the subsurface provides information on the potential for long-term changes to sediment chemistry profiles, the potential for release of buried contaminants under scenarios of disruption (e.g., major storm event, climate change conditions, or harbour development), and the depth of sediment targeted for removal where dredging is proposed.
- The highest concentrations of CoCs are commonly found in the shallow subsurface sediments (i.e., at depths between 0.1 and 0.5 m) compared to the concentrations found in the surface sediment, confirming that the source of contamination in KIH is generally from legacy sources rather than from recent deposits. However, the contamination profile for the deposited soft sediments for most CoCs and sampling locations indicated that substantial mixing of constituents between surface and shallow subsurface sediments has occurred over time.
  - Metal contamination in the shallow subsurface sediments are generally well mixed with surface sediments with marginal differences between adjacent sediment intervals. Because sediments have historically been mobile, both laterally and vertically, the shallow subsurface sediments may influence surface contamination over the long term. Although the highest contamination concentrations in some areas were measured at depths greater than those where biological activity would typically take place, physical mixing from wave action or biological mixing from burrowing organisms can cause these deeper contaminants to become disturbed and mix with shallower sediments.
  - Organic contaminants in the shallow subsurface sediments, particularly PAHs, were less well-mixed compared to metals. In some areas of KIH, concentrations of PAHs and PCBs in shallow subsurface sediments were often much higher than in the surface sediments, particularly in the southern harbour near Anglin Bay. To avoid these deeper contaminants being brought to the surface through events that disturb the sediment, removal of the highest concentrations (hot spots) is planned, including contamination at depth.

- The native clay material underlying the softer sediments in KIH was confirmed to be uncontaminated relative to a typical background condition. The clay layer provides a confining layer for contamination and bounds the depths of dredging. Where dredging is proposed, soft sediments are planned to be removed to the depth of the native clay layer; the depth of this layer varies by management unit and distance from shoreline but is less than one metre deep throughout most dredging areas. In most dredged areas, dredging will be followed by placement of clean capping materials to return bathymetry to baseline conditions, enhance recovery of the benthic community following physical disturbance, and provide a layer that dilutes and/or attenuates residuals from the dredging program.

Contaminants of Emerging Concern in Sediment

- The 2023 and 2024 sediment sampling programs focused on evaluating contaminants of emerging concern (CECs) that have been identified over the past decade in urban environments; such substances are increasingly being detected in water bodies but are not consistently monitored or regulated. CECs that could be of public interest include endocrine disrupters that may pose potential risk to aquatic biota, such as bisphenol A (BPA), perfluoroalkyl and polyfluoroalkyl substances (PFAS), and polybrominated diphenyl ethers (PBDE). Such sources would not originate from activities on the federal water lots but are of interest prior to detailed design to confirm that current source controls are sufficient.
  - PBDE concentrations were compared to a conservative federal guideline, which is a value at which no negative effects would be seen for aquatic life. PBDE concentrations were above this federal guideline in some areas of KIH adjacent to the storm sewer outfalls which capture runoff from downtown Kingston; however, the concentrations were similar to other urban areas of Lake Ontario, except for Anglin Bay. The higher PBDE concentrations observed in Anglin Bay do not affect the remediation design because the contaminated sediment within Anglin Bay has already been identified as a high priority for removal given the presence of other CoCs.
  - PFAS concentrations were compared to a conservative no-effect guideline, which is a value at which no negative effects would be seen for aquatic life; the stringency of this guideline is greater than what is commonly applied for management of working harbours in Canada. PFAS concentrations were slightly above this screening criterion in Anglin Bay. Individual PFAS parameters of regulatory concern (PFOA and PFOS) were measured below the applied criteria in all sediment samples. Similar to PBDE, the higher concentrations do not affect the remediation design because Anglin Bay sediments have already been flagged for remediation.
  - Bisphenol A (BPA) concentrations above the generic screening guidelines were identified within surface sediment samples in Anglin Bay. However, published sediment toxicity data in the literature shows that the concentration of BPA in Anglin Bay sediment is well below the level at which no negative effects are expected.
- Overall, concentrations of the three groups of CECs did not indicate unacceptable levels of contamination from the perspective of sediment quality for a working harbour.
- Separate work is currently being conducted to understand the relative contribution that point sources (i.e., storm water outflows) have on long-term CEC loadings into KIH, particularly in Anglin Bay where CEC concentrations are the highest.

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List of Abbreviations

%	percent
>	greater than
µg/kg	micrograms per kilogram
2LAET	Second Lowest Adverse Effect Level
ALS	ALS Laboratories
BPA	bisphenol A
CCME	Canadian Council of Ministers of the Environment
CEC	contaminant of emerging concern
cm	centimetre
CoC	contaminant of concern
DIA	Detailed Impact Assessment
DND	Department of National Defence
DP	sediment sample collected using geoprobe (deep profile core)
DQO	data quality objective
dw	dry weight
ENR	enhanced natural recovery
EQS	Environmental Quality Standards
ESV	Ecological Screening Value
FEQG	Federal Environmental Quality Guidelines
FOC	fraction of organic carbon
ha	hectare
ISQG	Interim Sediment Quality Guideline (CCME)
KIH	Kingston Inner Harbour
km	kilometre
LAET	Lowest Adverse Effect Level
LEL	Low Effects Level
m	metres
mbs	metres below surface
mg/kg	milligrams per kilogram
MOE	Ontario Ministry of the Environment (now Ministry of the Environment, Conservation and Parks)
NEtFOSSA	N-ethyl perfluorooctane sulfonamido acetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PAH	polycyclic aromatic hydrocarbon
PBDE	polybrominated diphenyl ether
PCA	Parks Canada Agency
PCB	polychlorinated biphenyl
PC-E	Parks Canada East management unit
PC-N	Parks Canada North management unit

PC-OM	Parks Canada Orchard Street Marsh management unit
PC-W	Parks Canada West management unit
PEC	Probable Effects Concentration
PEL	Probable Effect Level (CCME)
PFAS	per- and polyfluorinated substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PP-OM	Orchard Street Marsh brownfield zone management unit (ownership under evaluation)
PSPC	Public Services and Procurement Canada
QA/QC	quality assurance/quality control
RBCA	Atlantic Risk Based Corrective Action
RPD	relative percent difference
RSV	refinement screening value
SC	sediment sample collected using Tech-Opscore (sediment core)
SG	surface sediment sample (sediment grab)
SMP	Sediment Management Plan
TBT	tributyltin
TC	Transport Canada
TC-1	Transport Canada management unit 1
TC-2A	Transport Canada management unit 2A
TC-2B	Transport Canada management unit 2B
TC-3A	Transport Canada management unit 3A
TC-3B	Transport Canada management unit 3B
TC-4	Transport Canada management unit 4
TC-5	Transport Canada management unit 5
TC-AB	Transport Canada Anglin Bay management unit
TC-E	Transport Canada East management unit
TC-OM	Transport Canada Orchard Street Marsh management unit
TC-RC	Transport Canada Rowing Club management unit
TDS	total dissolved solids
TEC	tolerable effect concentration
VC	sediment sample collected using vibracore
WM	Woolen Mill management unit
WSP	WSP Canada Inc.

1.0 INTRODUCTION

WSP Canada Inc. (WSP) has prepared this report summarizing the results of the recently completed sediment quality programs (herein referred to as the “Sampling Programs”) conducted within Kingston Inner Harbour (KIH; the Site). The report was completed at the requested of Public Services and Procurement Canada (PSPC), on behalf of Transport Canada (TC), Parks Canada Agency (PCA), and Department of National Defence (DND). The report summarizes methods and results of sampling conducted from 2021 to 2024 to support the Sediment Management Project (the Project). The primary purpose of the Sampling Programs was to validate and refine sediment quality distributions from earlier studies to confirm and support the design stage of remediation and risk management activities for the Site.

A history of industrial activity in the area surrounding KIH resulted in contamination of the sediment that lines the harbour bed. Historical uses included a railway, shipyard, fueling, coal gasification, tannery, lead smelter, landfill and other operations. Most of these sources are no longer present, but the legacy of these older activities remains.

Despite several decades of natural recovery, many areas of the harbour have not sufficiently recovered to be safe for current uses by people (such as wading), or for semi-aquatic birds and mammals and aquatic organisms such as fish and benthic invertebrates. Studies have concluded that people and wildlife[2] may experience negative health effects (risks) if exposed to contaminated sediment in some areas of the harbour on an ongoing basis (Golder 2016).

Much of the Site, including the eastern and central portions of KIH, have been proposed to be left unmodified, given the lower risks identified in those areas. However, several management units along the western edge of KIH have elevated chemical risks that have been identified as requiring action following the federal decision-making framework for aquatic sites. Therefore, management measures have been recommended to address those risks, including dredging (sediment removal), capping (covering sediment with clean material), enhanced natural recovery (covering the sediment bed with amendments that will reduce the toxicity of contaminants), nature-based shoreline rehabilitations (reducing nearshore access by humans and erosion through habitat enhancements), and allowing remaining areas to be left to recover naturally. These measures have been outlined in the 2023 conceptual Sediment Management Plan (SMP) (WSP 2023), and the design stage of the project is ongoing.

The primary purpose of the Sampling Programs was to update and expand the current data set for sediment quality at the Site, including both surface[3] and subsurface samples[4]. The data collected provide a substantial update to the earlier sediment quality distributions that were used in the human and ecological risk assessment stages of the Project. This information is being used to update/refine the areas of contamination requiring physical intervention (i.e., dredging and/or capping) for the detailed design phase of the Project.

[2] For this Project, “wildlife” includes all non-human organisms that rely on KIH aquatic habitats for all or part of their life cycle, including birds, mammals, reptiles, amphibians, fish, and benthic invertebrates. The term “semi-aquatic wildlife” refers to organisms that experience chronic exposures to sediment during some, but not all, portions of their life cycle.

[3] Surface sediment is the top layer of the lakebed and is generally the settled particulate matter located at or below the high-water mark. Biological organisms may be exposed to CoCs in surface sediments because of habitat presence and disturbance by human activity.

[4] Subsurface sediments are present below the surface sediment layer, and generally comprised of more compact materials, which are less vulnerable to disturbance. For the purposes of this program, the subsurface sediments were defined as material present below the surface sediment layer, and above the hardpan clay.

A related objective of the Sampling Programs was to monitor conditions of urban-influenced sediment contamination, including common anthropogenic constituents such as polycyclic aromatic hydrocarbons (PAHs) and contaminants of emerging concern (CEC) such as polybrominated diphenyl ethers (PBDEs). Although recently released contaminants are not the primary focus of the Project, which is focused on management of legacy environmental contamination, the distributions of other constituents are of interest to stakeholders.

2.0 PROJECT BACKGROUND

2.1 Project Objective

The objective of the Project is to reduce the potential for people and wildlife to experience negative health effects (i.e., risks) from exposure to contaminated sediments within KIH through management of sediment quality, while protecting sensitive species, habitats, and valued features (e.g., archeological or recreational). The Project is intended to balance the short and long-term disruptions and risks from multiple stressors and align chemical risk reductions with other values of KIH to Indigenous Groups, stakeholders, and the public. Broadly, the Project intends to implement targeted removals, sequestration, and/or isolation of contamination in a manner that will:

- Provide both localized and broad (harbour-wide) reductions of primary contaminants of concern (CoCs)[5] to reduce ecological and human health risks.
- Provide efficient removal of chemicals, such that the positives of chemical risk reduction outweigh short-term disruptions.
- Rely on natural processes to maintain (or slowly improve) sediment quality in areas of the harbour that currently have risks that are negligible to low.
- Prevent or limit the degree of habitat disruption during project works, particularly for sensitive ecological components.
- Provide potential for recolonization and rehabilitation[6] of affected areas, and where possible achieve conservation gains of improved habitat conditions.
- Improve the quality of sensitive aquatic habitats through nature-based shoreline restoration; options for this method include planting natural vegetation to reduce human use of these areas, strengthening the stability of the existing shoreline with appropriate materials (large woody debris and rock to reduce erosion), and design of shoreline habitat elements to balance physical integrity with natural habitat features.
- Provide removal and/or isolation of contaminants compatible with potential redevelopment of the shoreline and including maintenance of existing recreational uses of the water lots.
- Prevent unacceptable resuspension or release of contaminants during project works, thereby mitigating impairment of water quality.

[5] The primary CoCs in sediment include legacy substances determined to cause elevated risks (moderate magnitude or greater), including chromium, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). Primary CoCs are the risk drivers for chemical management within KIH. Other metal and metalloid CoCs, including arsenic, mercury, and copper are also present at levels of potential environmental concern, but are more spatially localized relative to the primary CoCs. By addressing primary CoCs, the other co-occurring CoCs will also be addressed adequately.

[6] Recolonization refers to allowing ecological species such as plants and macroinvertebrates to repopulate areas post construction. Rehabilitation refers to providing suitable habitat conditions in terms of depth, substrate, vegetation, and cover features post construction.

2.2 Project Location

Kingston Harbour is adjacent to the City of Kingston, at the eastern end of Lake Ontario. The entire Kingston Harbour is approximately 765 hectares (ha) in size and includes an Inner and Outer Harbour. KIH is bounded by Highway 2 (LaSalle Causeway Bridge) to the south and Highway 401 to the north and includes a five-kilometre (km) length of the Great Cataraqui River. KIH is further divided into northern and southern sections by Belle Island and Cataraqui Park, respectively. The sediment management area within KIH is bounded by Highway 2 (LaSalle Causeway Bridge) to the south and Belle Island/Cataraqui Park to the north and includes an approximate 1.7 km length of the Great Cataraqui River (Figure 1).

2.3 Project Jurisdiction

Jurisdiction of most of the southern section of KIH (i.e., south of Belle Island and Cataraqui Park) is held by Transport Canada (TC). The northern section between Orchard Street Marsh and Belle Island is held by Parks Canada Agency (PCA). A small percentage of the southern half of KIH is also managed by other parties, including the City of Kingston and the Department of National Defence (DND) (Figure 1)[7].

The Project has specific management units designated throughout KIH defined by ownership. These include:

- Parks Canada management units coded as: Parks Canada West (PC-W), East (PC-E), North (PC-N), and Orchard Street Marsh (PC-OM).
- Transport Canada management units coded as: Transport Canada East (TC-E), Orchard Street Marsh (TC-OM), Rowing Club (TC-RC) Units 1 to 5 (i.e., TC-1, TC-2A, TC-2B, TC-3A, TC-3B, TC-4 and TC-5), and Anglin Bay (TC-AB).
- Department of National Defence management unit coded as: Department of National Defence West (DND-W).
- Woolen Mill (WM) management unit, which is a municipally owned water lot.
- An additional water lot near the Orchard Street Marsh brownfield zone for which ownership and responsibility are currently being evaluated (PP-OM).
- Multiple small shoreline sections that fall between the formal property boundaries of Transport Canada management units and the high-water mark; these areas are owned by the City of Kingston but have been grouped with the adjacent Transport Canada management units. The area of sediment in this category is greatest for the shoreline areas adjacent to Douglas Fluhrer Park.

[7] TC, PCA and DND are all federal departments

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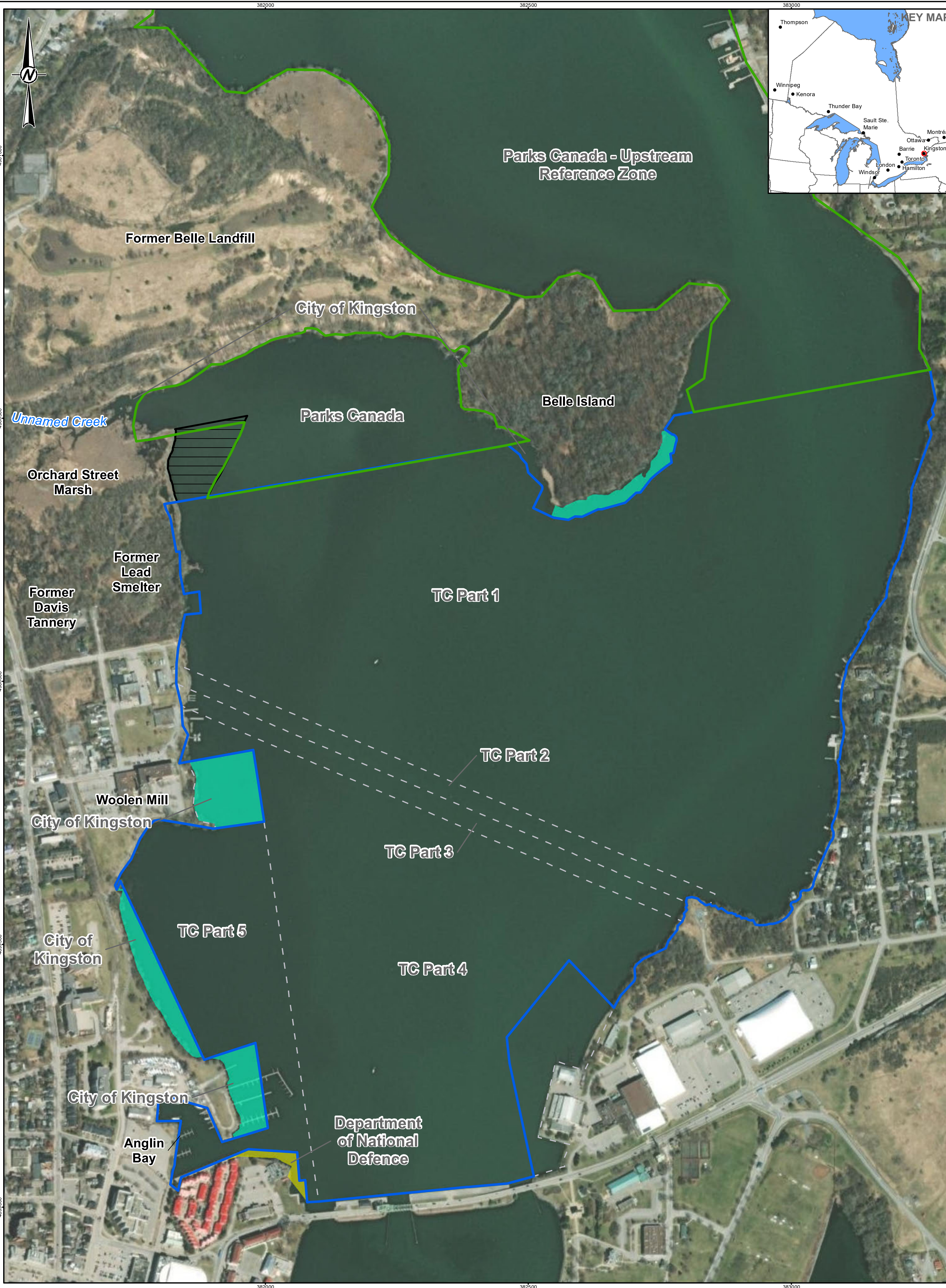

LEGEND

- FEDERAL WATER LOT BOUNDARY
- MUNICIPALLY OWNED WATERLOT
- OWNERSHIP/JURISDICTION PENDING
- PARKS CANADA JURISDICTION
- TRANSPORT CANADA JURISDICTION
- DEPARTMENT OF NATIONAL DEFENCE JURISDICTION

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4. PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
SPATIAL DOMAIN OF KIH STUDY AREA AND WATER LOT BOUNDARIES

CONSULTANT

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DESIGNED	JD
PREPARED	JP
REVIEWED	
APPROVED	

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2.4 Study Context

Multiple field studies and desktop evaluations have been conducted in KIH to characterize the spatial extent and magnitude of contamination, including assessment of the risks of contaminants to humans and wildlife. Despite decades of time for natural recovery, several areas have not recovered sufficiently to be considered safe (Golder 2016). The primary CoCs in sediment include chromium, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). Other metal and metalloid CoCs, including antimony, copper, lead, mercury silver and zinc are also present at levels of potential human health and environmental concern, but are more spatially localized relative to the primary CoCs. By addressing primary CoCs, the other co-occurring CoCs will also be addressed adequately.

Multiple strategies and technologies to reduce the potential for negative health effects from exposure to the CoC in sediment have been identified. These include:

- Higher intrusive options such as dredging (removal of sediment) and capping (covering the sediment with clean material).
- Lower intrusion options such as nature-based shoreline rehabilitation (allowing improved habitat for wildlife and plants), enhanced natural recovery (covering the sediment bed with a very thin layer of material that will reduce the toxicity of contaminants), and monitored natural recovery (allowing areas with minimal contamination to recover without intervention over time, with thorough monitoring to make sure they are improving).

The selection of these options integrated multiple scientific and logistical factors, and balance reducing risk while minimizing ecological impacts (WSP 2023).

Sediment sampling programs to update and expand the sediment quality data set for KIH were completed from 2021 to 2024 (Golder 2022; WSP 2024a and b). This information was used to update and refine areas of contamination requiring physical intervention, to provide a baseline for sediment quality before intrusive remediation, to confirm the depth of contaminated sediment, and to assess changes in surface sediment chemistry over time to evaluate the success of natural recovery.

A reliable baseline for sediment quality within the Project area is required before starting any in-water works; such baseline data will maximize effectiveness of dredge monitoring and support the development of water quality management objectives. These objectives provide confidence that sediment disruption does not cause negative environmental effects from the resuspension or release of contaminants. The recent sediment sampling from 2021 to 2024 provided comprehensive coverage of the management units, and provided data collected using highly standardized field sampling and analytical methods.

The 2023 and 2024 sediment sampling programs also focused on evaluating contaminants of emerging concern (CECs) as there have been several CECs identified over the past decade in urban environments; such substances are increasingly being detected in water bodies but are not consistently monitored or regulated. CECs that could be of public interest include endocrine disrupters that may pose potential risk to aquatic biota, such as bisphenol A (BPA), perfluoroalkyl and polyfluoroalkyl substances (PFAS), and polybrominated diphenyl ethers (PBDE). Such sources would not originate from activities on the federal water lots but are of interest prior to detailed design to confirm that current source controls are sufficient. Accordingly, it was recommended that samples for CEC analysis be collected to confirm the presence of CECs and magnitude of contamination.

2.5 Remediation Stages and Activities

The Project is currently in the intermediate stages of physical design; the final detailed design will likely include the following elements:

- Installation of temporary facilities and laydown-area(s).
- Dredging of contaminated areas within KIH with the highest concentrations of primary CoCs, with off-site disposal of contaminated material.
- Monitored natural recovery for sediment in the central portion of KIH. Some of these areas are currently at low risk levels for human and ecological health and the chemical hazard will remain stable or further decrease slowly over future decades, so they will be allowed to recover without intervention (but with monitoring).
- Placement of a thin cover of natural materials (i.e., sand, activated carbon, and/or organic materials) over the contaminated sediment as part of a method referred to as enhanced natural recovery. This is possible in lower risk areas, where dredging residuals are of potential concern, or in areas where dredging is not feasible.
- Placement of a thicker cover of natural materials (i.e., sand and finer-grained and/or organic materials) over dredged areas to return bathymetry close to original grade and accelerate recovery from disturbance.
- Placement of a conventional sand cap with activated carbon over contaminated sediments within Anglin Bay where dredging of subsurface sediments is proposed.
- Nature-based shoreline rehabilitation using rocks, large woody debris, and natural vegetation to enhance ecological habitat and prevent erosion, while limiting the potential for human access to the water and addressing nearshore contamination.
- Implementation of buffer zones between the dredging footprint and shoreline (5 to 15 metre [m]) to preserve the integrity of shorelines, sensitive habitats, and archaeological features in some areas. Near Belle Island, the buffer zone has been further increased to 40 m to accommodate increased potential for finds of cultural significance.
- Associated site monitoring and rehabilitation works.

Overall, the general design concept is to maintain and protect existing shore protection features, and to retain and where possible improve the habitat along the shoreline.

The PCA Orchard Marsh management unit (PC-OM) currently proposes use of low-intervention application of thin layers of activated materials designed to bind contaminants (without substantial habitat modification). This approach is likely to be shaped further through Indigenous consultation and stakeholder engagement, along with input from the Detailed Impact Assessment (DIA).

3.0 OBJECTIVES AND METHODS

The sediment sampling programs included the collection of both surface and subsurface sediments samples throughout the western and central portions of KIH to inform the detailed design and cost estimates for the Project. Sediment sampling was not limited to areas of proposed physical works but also included samples from areas upstream of the KIH and from areas proposed for monitored natural recovery. Sample locations from the sampling programs are illustrated on Figure 2.

3.1 Surface Sediment Sampling

Surface sediment sampling was conducted in September to October 2021, August to October 2023, and September 2024. The specific objectives of the surface sediment sampling programs were to:

- Update and expand the historical sediment quality data set to confirm, and where necessary refine, areas of contamination requiring physical intervention, where:
  - the sampling programs were designed with highest density in management units proposed for active in-water works (i.e., dredging, capping, or other physical modification)
  - the sampling programs were designed with intermediate density in management units proposed for enhanced natural recovery
  - sampling in reference areas upstream of the KIH (i.e. north of Belle Island) was included as a baseline for sediment quality in urban areas not influenced by the legacy contamination sources in KIH
- Assess changes in surface sediment chemistry over time, particularly relative to data used in the risk assessment and conceptual remediation design, to evaluate the success of natural recovery or other changes in contamination profiles over the last decade.
- Evaluate the presence of CECs within KIH sediments.

The field sampling was conducted using specific protocols for sampling collection, handling, storage, and transport, and followed the proposed Sample Analysis Program that was approved by PSPC in advance of mobilization. Surface sediment samples were collected to assess sediment quality at 166 stations in KIH across all management units (excluding the upstream reference area, identified as PC-N). In the reference area (i.e., PC-N), surface sediment samples for sediment quality were collected at 10 stations. Surface sediment samples were collected up to 0.15 metres below surface (mbs) using either a petite ponar grab sampler or an Ekman dredge in accordance with industry best-practices. Surface sediment samples are identified by the prefix “SG” (i.e., sediment grab) in sample names.

3.2 Subsurface Sediment Sampling

Subsurface sediment sampling was conducted in September to October 2021, October to November 2023, and July to September 2024. The specific objectives of the subsurface sediment sampling programs were to:

- Collect cores from select management units where dredging is proposed to confirm the depth of contamination and sediment stratigraphy.
- Collect and analyze native clay material underlying softer sediment that has been deposited in KIH.

Subsurface sediment samples were collected to determine the depth of contaminated sediment in 9 management units, with 37 stations across all management units in KIH where dredging is proposed (i.e., within the PC-E, PC-W, PC-OM, PP-OM, TC-OM, TC-RC, TC-4, TC-AB, and WM management units). Across sampling stations, 206 samples were collected. Six sampling stations were confirmed to have reached native clay; in other samples, clay was not retrieved, but the stratigraphy of the Site indicated that the depth of refusal was associated with a layer unlikely to be contaminated by legacy industrial contamination. Subsurface sediment samples were collected using multiple coring techniques, including Tech-Ops coring in 2021, vibracoring in 2023/2024, and deeper geotechnical drilling using geoprobes in 2024, in accordance with industry best-practices. Subsurface sediment samples collected using the Tech-Ops cores are identified by the prefix “SC” (i.e., sediment core), those collected using vibracores are identified by the prefix “VC”, and those collected using geoprobes are identified by the prefix “DP” (i.e., deep profile core). Prior to core collection, potential presence of sensitive species was investigated using an underwater camera. Once the work area was cleared of sensitive species, underwater noise was measured.

The Tech-Ops coring in 2021 had difficulty penetrating the consolidated sediments at depth. This is typical of sampling into deep, dense substrate such as native lacustrine deposits[8]. The vibracoring programs in 2023 and 2024 attempted to penetrate to the native clay underlying the less-dense overlying contaminated sediment. However, even with vibracores, vertical delineation[9] of contaminants in the northern management units of TC-OM, PP-OM, PC-W and PC-E could not be achieved due to the presence of a dense root-mat layer which limited the penetration depth. Therefore, the geoprobe coring in 2024 focused on sampling and analyzing sediment down to the native clay layer in these management units as it was able to penetrate consolidated material such as the root-mat layer. Native clay layers were expected to be uncontaminated due to their age of deposition (i.e., predating historical industrial contamination) and resistance to movement of porewater or groundwater from adjacent stratigraphic units. Chemistry results from sampling the native clay layers provide confirmation of this expectation.

[8] Lacustrine deposits are defined as sedimentary material that have formed over time due to the accumulation of sediment and other organic materials in the bottom of lakes and other waterbodies. The materials described as “native” indicate sediments that consolidated prior to industrialization; in KIH these are found in highly consolidated and dense layers and are distinguished from the looser and organically enriched near-surface sediments.

[9] Vertical delineation refers to reliable determination of the depth where CoCs are below environmental quality guidelines protective of aquatic life and rely upon measurement of a confirmed uncontaminated sample interval at depth, rather than inference from stratigraphy.

3.3 Laboratory Analysis

Sediment samples selected for chemical analysis were submitted to ALS Laboratories (ALS) in Mississauga, ON, and dispersed to various labs depending on specific analysis requirements. Sediment samples were analyzed for physical (including moisture, particle size, and total organic carbon [TOC]), and chemical parameters (metals, PAHs, PCBs, tributyltin (TBT), PBDE, PFAS, and BPA).

3.4 Quality Assurance/Quality Control

Quality assurance (QA) encompasses management and technical practices designed to ensure that the data generated are of consistent high quality. Quality control (QC) is a specific aspect of this QA process that incorporates internal techniques used to measure and assess data quality.

QA procedures included the use of standard operating procedures by experienced field personnel, and calibration of field equipment at appropriate intervals. Detailed field notes were recorded in field notebooks and on pre-printed field data sheets. Field data were checked at the end of each day to verify that the necessary data had been recorded, and entries were within realistic ranges for the data being recorded.

Following field data entry, the data underwent a 100 percent (%) transcription check by a second person not involved in the initial data entry process. QA/QC measures during field sampling included the collection of duplicate samples on 10% of the samples submitted for chemistry analysis.

Field duplicate samples of subsurface sediments were collected in 2021 and 2023 to ensure consistency between samples and the duplicate. No field duplicates were collected in 2024 due to the small sample size (less than 10 samples). To assess variability between field duplicates, the relative percent difference (RPD) between reported analyte concentrations was calculated. In accordance with the CCME (2016) data quality objective (DQOs) for samples was 60%.

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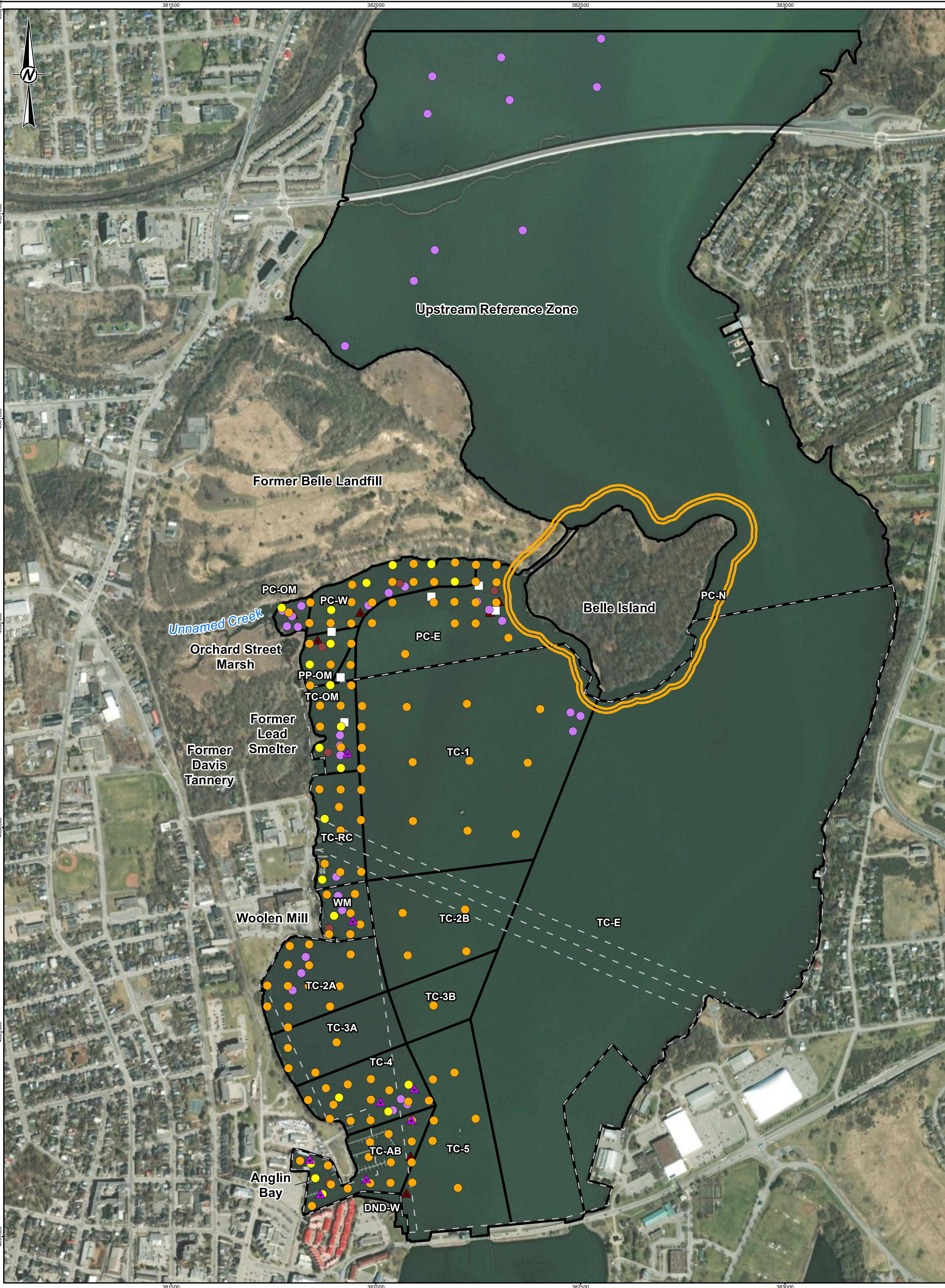

LEGEND

- MANAGEMENT UNIT
- FEDERAL WATER LOT BOUNDARY
- BELLE ISLAND EXCLUSION ZONE

SAMPLE LOCATION AND TYPE

- SURFACE GRAB (2021)
- SURFACE GRAB AND HAND CORE (2021)
- VIBRACORE LOCATION (2023)
- SURFACE GRAB (2023)
- SURFACE GRAB (2024)
- GEOPROBE (2024)
- VIBRACORE LOCATION (2024)

FOR DISCUSSION PURPOSES ONLY

DRAFT

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REFERENCE(S)

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2. INSET BASE OBTAINED FROM ESRI CANADA.
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4. PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
2021 TO 2024 SEDIMENT SAMPLING LOCATIONS

CONSULTANT

wsp

YYYY-MM-DD	2025-02-12
DESIGNED	JD
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
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3.5 Data Evaluation

3.5.1 Primary and Secondary Contaminants of Concern

Sediment chemistry data were compared to the Canadian Council of Ministers of the Environment (CCME) Interim Sediment Quality Guidelines (ISQGs) and the Probable Effects Levels (PELs) for the protection and management of aquatic sediment (CCME 1999 and updates). Where CCME guidelines were not available, the data was also compared to the Ontario Ministry of the Environment (OMOE) sediment quality Low Effects Levels (LELs) and Severe Effect Levels (SELs) (OMOE 2008), representing concentrations likely to affect the health of sediment-dwelling organisms.

The primary sediment quality guidelines applicable to the identification of CoCs within working harbours (including KIH) are the CCME PELs, which defines the concentration above which adverse effects to biota are expected to occur frequently (FCSAP 2021). The ISQGs, in comparison, are much lower as they represent the concentration below which adverse biological effects are rarely expected to occur. These sediment quality guidelines were used for categorization of sediment quality. Summary statistics (*e.g.,* average, percentiles, maximum measured concentrations) were assigned to categories based on a range of sediment quality guidelines that offer different levels of protection, including the federal CCME ISQGs/PELs and the provincial OMOE SELs, as described above.

Total PAH results were compared to the sediment management criterion that is protective of the benthic community (i.e., 22.8 mg/kg)[10]. Although sediment chemistry data for individual PAHs are also available, use of a criterion for total PAHs provides better correspondence to the site-specific effects data relative to management of individual PAHs. Furthermore, the pattern of PAH composition is relatively stable across KIH, such that management for total PAH exposure will result in proportional reductions for all individual PAHs. The total PAH criterion was set equal to the upper range of the probable effects concentration (PEC; MacDonald *et al.* 2000), which has a similar level of protection as the CCME PEL. The use of a sediment quality benchmark based on total PAHs, rather than screening of individual PAHs, reflects the alignment of the benchmark with the results of the site-specific sediment quality investigations.

Other literature sources used to supplement the freshwater screening benchmarks for the main CoCs included:

- Michelsen (2003) – Washington Department of Ecology recommended SQGs for freshwater sediments, including Lowest Adverse Effect Level (LAET) and Second Lowest Adverse Effect Level (2LAET). These thresholds were considered for antimony, arsenic, chromium, copper, lead, mercury, silver, zinc, and total PCBs.
- MacDonald *et al.* (2000) – Tolerable Effect Concentration (TEC) and Probable Effect Concentration (PEC) for total PAHs. The TEC and PEC are based on a similar level of protection as the CCME ISQGs and PELs, respectively.

[10] The PEC for total PAHs and the results from the detailed ecological risk assessment support the use of this value for management of sediment areas; localized sediment toxicity to benthic invertebrates was generally observed in sediments with PAH concentrations above 22.8 mg/kg, and toxicity identification evaluations conducted in the detailed quantitative risk assessment (DQRA; Golder 2016) confirmed PAHs as a possible cause of toxicity at these concentrations.

3.5.2 Butyltins

Butyltins are a group of synthetic chemical compounds extensively used in marine antifouling paints, and known for high toxicity to aquatic organisms, particularly mollusks. There are no CCME or Ontario criteria for butyltins (including TBT], which is the most widely studied and toxicologically potent butyltin). Butyltin results were compared to the following criteria:

- Atlantic Risk Based Corrective Action (RBCA) Tier I Environmental Quality Standards (EQS) for Freshwater Sediment (RBCA 2022). The EQS are based on 1% TOC), and site-specific criteria based on 8% TOC (the average TOC across KIH) were considered for screening.
- United States Environmental Protection Agency (US EPA) Region 4 Ecological Screening Value (ESV) and Refinement Screening Value (RSV) for Freshwater Sediment (US EPA 2018).

Butyltins were included in a subset of the sediment sampling programs and stations to improve confidence in the characterization of sediment quality. Although not identified as a primary CoC in earlier sediment chemistry delineation, the number of samples with quantified butyltins was limited relative to other substances. Earlier profiling indicated that localized elevation of butyltins were observed in Anglin Bay, consistent with the historical use of antifouling paints for vessel use.

3.5.3 Contaminants of Emerging Concern

For CECs, including BPA, PBDE, and PFAS, there are no CCME or Ontario sediment quality guidelines. The Federal Environmental Quality Guidelines (FEQGs) derived by Environment Canada (Government of Canada 2023) were preferentially considered for these contaminants, where available. FEQGs are recommended thresholds to support federal initiatives and incorporate a similar level of protectiveness as CCME guidelines. They are set at a concentration that is protective of a low likelihood of direct adverse effects from the chemical on aquatic life, or in wildlife (birds and mammals) that consume aquatic life where chemicals may bioaccumulate[11]. FEQGs are available for BPA (Environment Canada 2018a) and PBDE (Environment Canada 2013).

For PFAS, FEQGs have only been derived for water and tissue (Environment Canada 2018b). Conservative PFAS screening values for sediment from the following agencies can be used for comparison:

- The European Environmental Quality Standards (EQS) for perfluorooctanesulfonic acid (PFOS) developed by the Scientific Committee on Health, Environmental, and Emerging Risks (SCHEER) protective of aquatic life (SCHEER 2022). The SCHEER endorses a direct contact sediment quality value for PFOS of 13.5 µg/kg dry weight derived for a sediment with 5% organic carbon that was proposed by the Swiss Centre for Applied Ecotoxicology (Casado-Martinez 2020).The Swiss Centre also proposed a sediment quality benchmark for PFOS (1.85 µg/kg dry weight) but it was not adopted due to uncertainty in the limited data available. This lower value was intended to protect against secondary poisoning which is the risk to higher levels of the food web under the assumption that those animals consume food contaminated by chemicals in sediments.
- The US Department of Defence (DoD) Risk Based Screening Levels (RBSLs) developed by the Strategic Environmental Research and Development Program (SERDP) protective of wildlife species from direct contact with sediment and ingestion of food items that have bioaccumulated PFAS from sediment (SERDP 2020). For PFOS, screening values for sediment included a no-effect benchmark of 1.4 µg/kg and a low-effect benchmark of 8.8 µg/kg.

[11] Bioaccumulation refers to the gradual accumulation of a chemical into an organism.

- The aquatic risk-based screening level summary for wildlife was based on most sensitive organism group (insectivore or invertivore), and sediment-based exposures through food-web modelling.

The PFOS criterion was applied as a surrogate for all parameters with sulfonic acid groups.

The screening values for PFOS listed above were intentionally developed to overestimate actual risk by using the most sensitive possible aquatic exposure pathways, use of no-effect levels, and exaggerated assumptions about animal foraging.

Because the lowest benchmarks are derived for protection of wildlife against secondary poisoning, they are intended to be applied over large areas of sediment where animals feed, rather than for specific locations or hotspots. Other derivations for PFOS benchmarks in sediment based on protection of lower-trophic organisms (animals like invertebrates that provide a food source to fish and wildlife) have shown these to be overly conservative. For example, Simpson et al. (2021) investigated the long-term toxicity of PFOS-spiked sediments to six benthic organisms to derive sediment quality guidelines and recommended a benthic screening value of 60 ug/kg dry weight PFOS (assuming only 1% organic carbon compared to the 8% average organic carbon across KIH). This value would be protective of 99% of species from any adverse effects. Simpson et al. (2021) concluded that not only is this higher screening value suitable for protecting benthic organisms but also applicable as a conservative screening value protective against secondary poisoning.

Given the conservatism in their derivation, minor exceedances of the SCHEER sediment quality value and DoD RBSLs should not be interpreted as evidence for harm, but rather as screening values. Actual harm would require contiguous areas of sediment to be contaminated well above the sediment benchmarks.

4.0 RESULTS

The results of the Sampling Programs between 2021 and 2024 are summarized below for both surface sediment quality (Section 4.1) and subsurface sediment quality (Section 4.2). Data are summarized in this section for primary and secondary CoCs for the Site (i.e*.,* antimony, arsenic, chromium, copper, lead, mercury, silver, zinc, total PAHs and total PCBs).

Figures depicting the CoC results can be found for surface sediment samples in Appendix A and for subsurface sediment samples in Appendix B. Summary tables for each CoC within each management unit in surface and subsurface sediment are available in Appendix C.

Results for butyltins and CECs are discussed separately in Section 4.3 and Section 4.4, respectively.

4.1 Surface Sediment Quality

The results for surface sediment quality are summarized in figures found in Appendix A and in tables found in Appendix C1 based on sediment samples collected by WSP between 2021 and 2024. The summary tables in Appendix C1 include the screening of maximum, minimum, average and percentile (25th, 75th, 90th, 95th) concentrations within each management unit against the applicable guidelines in Section 3.5 to illustrate the extent of contamination. Data for all reference samples from PC-N are provided in Appendix C2. The results based on maximum concentrations measured in each management unit are discussed below.

The surface sediment quality results presented in figures found in Appendix A also include results for DND-W based on data collected by Royal Military College, Environmental Sciences Group (RMC-ESG 2017).

4.1.1 Metals

4.1.1.1 Antimony

Antimony concentrations were detected above the Washington LAET[12] (0.545 milligrams per kilogram [mg/kg]) in PC-E, PC-OM, PC-W, PP-OM, TC-1, TC-2A, TC-2B, TC-3A, TC-4, TC-5, TC-AB, TC-OM, TC-RC, and WM. The highest detected concentrations were found in PC-OM (7.15 mg/kg). There were elevated detection limits in the DND-W water lot (<10 mg/kg); therefore, the indications of potential antimony contamination in this unit depicted in Figure A-1 are unreliable, as they assume contamination equal to the method detection limit. There are no indications of sources of elevated antimony in this portion of KIH.

Antimony concentrations in PC-N (reference area) were less than the Washington LAET, except for one sample with a concentration of 0.61 mg/kg. The maximum concentration measured in PC-N was less than the maximum concentration measured in all KIH management units except TC-3B.

Antimony is a secondary CoC in KIH, and risk from antimony exposure is not one of the main drivers for the Project. Antimony concentrations are highly correlated with primary CoCs including chromium and PCBs; therefore, the proposed remediation efforts for chromium and PCBs will result in reductions of risk for antimony. The areas of maximum detected antimony are included in the Project remediation footprint, but do not require customization specific to antimony; these areas of highest detected antimony are near Parks Canada water lot and the TC-RC and WM management units. The observed distribution of antimony concentrations is consistent with earlier sediment quality assessments, and the recent findings do not result in implications for remediation design.

4.1.1.2 Arsenic

Arsenic concentrations were above the CCME PEL (17 mg/kg) in TC-2A, TC-3A, TC-RC, and WM. The highest concentrations were found in TC-RC (67.6 mg/kg).

Arsenic concentrations in PC-N (reference area) were less than the CCME ISQG in all samples. The maximum concentration measured in PC-N was less than the maximum concentration measured in all KIH management units except TC-3B.

Arsenic contamination in sediment exhibits a spatial profile that is different from most other metals. Specifically, the exposure is concentrated in the areas adjacent to Emma Martin Park and Woolen Mill. The upland portion of this area once faced polluted soil and groundwater problems due to its industrial history, but the City of Kingston installed a barrier (zero-valent iron (ZVI) system[13]) to filter dissolved metals from groundwater. The residual arsenic contamination in sediment reflects legacy sources and remains similar in profile and concentrations to earlier sediment quality investigations in KIH; therefore, the recent findings do not result in implications for remediation design.

[12] The Washington LAET was used as a screening threshold in absence of CCME or Ontario criteria.

[13] Zero-valent iron system involves the use of metallic iron to treat contaminated water through redox reactions and sorption processes.

4.1.1.3 Chromium

Chromium concentrations in KIH were elevated relative to both reference conditions and sediment quality guidelines. This observation, and the observed gradient of decreasing chromium concentration with distance from the northwest of KIH (management units PC-OM and PC-W), remains consistent with earlier profiling of KIH sediment quality and the recent findings do not result in implications for remediation design:

- Total chromium concentrations were above the CCME PEL (90 mg/kg) in all sampled management units in KIH. The highest concentrations were found in PC-W (7,650 mg/kg).
- Chromium concentrations in PC-N (reference area) were less than the CCME PEL but generally not the CCME ISQGs (37.3 mg/kg), with concentrations ranging from 32.3 to 50.6 mg/kg. The maximum concentration measured in PC-N was less than the maximum concentration measured in all KIH management units.

Chromium remains a primary driver for sediment remediation in KIH, though the hazards are not as great as would be implied by comparison to PELs alone. The ecological risk assessment confirmed that concentrations of chromium can exceed the PEL by several fold without unacceptable risks as long as the composition of chromium remains dominated by trivalent chromium, the less toxic chromium species (compared to hexavalent chromium). Dominance of trivalent chromium does not convey lack of ecological risk but rather lower risk relative to hexavalent speciation. As such, both the total concentration and the speciation profile for chromium are relevant for sediment management.

To address the speciation issue identified above, a subset of sediment samples was analyzed for both trivalent chromium and hexavalent chromium. Trivalent chromium is an essential nutrient, with toxicological effects at higher doses relative to hexavalent chromium. Hexavalent chromium, often produced by industrial process, causes adverse effects at relatively low doses (ATSDR 2012). Trivalent chromium ranged from 81 to 7,650 mg/kg, whereas hexavalent chromium ranged from 0.12 to 36.7 mg/kg (WSP 2024b). Based on average concentrations, more than 99% of total chromium in KIH is made up of the trivalent species. This finding, which has previously been documented in KIH sediments (Golder 2016), is consistent with the environmental fate of chromium in most freshwater environments; where the reduction of hexavalent chromium to trivalent chromium in water with soil and sediment is very rapid, and the reduced trivalent chromium is then resistant to reoxidation (Amanatidou 2023).

4.1.1.4 Copper

Copper concentrations were above the CCME PEL (197 mg/kg) in TC-AB (838 mg/kg).

Copper concentrations in PC-N (reference area) were less than the CCME ISQG (35.7 mg/kg), except for one sample location with a concentration of 48.5 mg/kg. The maximum concentration measured in PC-N was less than the maximum concentration measured in all KIH management units except TC-3B.

Copper is a secondary CoC in KIH, and risk from copper exposure is not one of the main drivers for the Project, aside from the small area of elevated copper in the head of Anglin Bay. The observed distribution of copper concentrations is consistent with earlier sediment quality assessments, and the recent findings do not result in implications for remediation design.

4.1.1.5 Lead

Lead concentrations were above the CCME PEL (91.3 mg/kg) in all management units, except for TC-3B. The highest concentrations were found in TC-3A (500 mg/kg).

Lead concentrations in PC-N (reference area) were below the CCME PEL, except for two sample locations with concentrations of 103 mg/kg and 417 mg/kg.

Lead is a secondary CoC in KIH, and risk from lead exposure is not one of the main drivers for the Project. Lead concentrations are highly correlated with primary CoCs including chromium, PAHs, and PCBs; therefore, proposed remediation efforts for primary CoCs will result in additional reductions of risk for lead. The observed distribution of lead concentrations is consistent with earlier sediment quality assessments, and the recent findings do not result in implications for remediation design.

4.1.1.6 Mercury

Mercury concentrations were above the CCME PEL (0.486 mg/kg) in PC-W, TC-2A, TC-2B, TC-3A, TC-4, TC-RC, and WM. The highest concentrations were found in WM (2.3 mg/kg).

Mercury concentrations in PC-N (reference area) were less than the CCME ISQG in all samples. The maximum concentration measured in PC-N was less than the maximum concentration measured in all KIH management units except TC-3B.

Mercury contamination in sediment exhibits a spatial profile that is different from most other metals, except for arsenic. Mercury exposure is concentrated in the areas adjacent to Emma Martin Park and Woolen Mill, and nearshore areas downstream of those historical industrial sources. The upland sources of mercury have been controlled through a combination of groundwater treatment, soil remediation, and historical sediment remediation near the underwater utility corridor. The residual mercury contamination in sediment reflects legacy sources and remains similar in profile and concentrations to earlier sediment quality investigations in KIH. Because mercury is a substance that exerts effects primarily through bioaccumulation in the food web, rather than through direct contact, the elevated mercury contamination observed in management units TC-RC, WM, TC-2A, and TC-3A confirms the need for physical intervention in these areas. The mercury concentrations between the PEL and the SEL over a wide area, and above the SEL in a localized area of WM, warrant intervention to reduce health risks from mercury. Mercury remains one of the substances in KIH contributing to recreational fish consumption limits, but these fish consumption limits are not expected to be removed because of the remediation alone.

The recent sediment profiling for mercury confirms that concentrations are highest along the western shoreline near Emma Martin Park. These sediments have been identified for physical intervention as part of the remediation design and will contribute to improvement in sediment quality across KIH. Earlier remediation efforts within and adjacent to the TC-RC management unit have demonstrated local improvements in sediment quality, and this will be enhanced through the proposed dredging and other interventions in TC-RC (southern portion), WM, TC-2A, and TC-3A. It is neither practical nor necessary to remove all mercury-contaminated sediments but rather it is prudent to focus attention of areas with the highest concentrations (particularly those at or above the SEL).

4.1.1.7 Silver

Silver concentrations were above the Washington LAET (0.545 mg/kg)[14] in PC-OM, PC-W, PP-OM, TC-1, TC-2A, TC-2B, TC-3A, TC-4, TC-AB, TC-OM, TC-RC, and WM. The highest concentrations were found in TC-2A (2.96 mg/kg).

Silver concentrations in PC-N (reference area) were less than the LAET in all samples. The maximum concentration measured in PC-N was less than the maximum concentration measured in all KIH management units.

Silver is a secondary CoC in KIH, and risk from silver exposure is not one of the main drivers for the Project. Silver concentrations are highly correlated with primary CoCs including PAHs and PCBs; therefore, proposed remediation efforts for primary CoCs will result in additional reductions of risk for silver. The observed distribution of silver concentration is consistent with earlier sediment quality assessments, and the recent findings do not result in implications for remediation design.

4.1.1.8 Zinc

Zinc concentrations were above the CCME PEL (315 mg/kg) in PC-OM, PC-W, PP-OM, TC-1, TC-2A, TC-3A, TC-AB, TC-RC, and WM . The highest concentrations were found in WM (519 mg/kg).

Zinc concentrations in PC-N (reference area) were below the CCME PEL, except for one sample location with a concentration of 601 mg/kg.

Zinc is a secondary CoC in KIH, and risk from zinc exposure is not one of the main drivers for the Project. The observed distribution of zinc concentrations reflects both natural background and regional urban inputs. The few areas of KIH with zinc concentrations above regional background are correlated with primary CoCs including PAHs; therefore, proposed remediation efforts for primary CoCs will result in additional reductions of risk for zinc. The observed distribution of zinc concentrations is consistent with earlier sediment quality assessments, and the recent findings do not result in implications for remediation design.

4.1.2 Polycyclic Aromatic Hydrocarbons

Total PAH concentrations were above benchmarks commonly applied for screening of total PAHs, including both the BC sediment standard (10 mg/kg[15]) and the MacDonald *et al.* (2000) PEC (22.8 mg/kg)[16] in PC-E, PC-OM, PC-W, TC-4, TC-AB, TC-OM, TC-RC, and WM. The highest concentrations were found in TC-4 (184 mg/kg), although this finding is anomalous as the surrounding samples and chemistry results for other parameters indicated lower concentrations in sediment. Aside from the anomalous result in TC-4, the highest concentrations are found in TC-OM (155 mg/kg). The pattern of PAH contamination reflects historical industrial sources along most of the western shoreline of KIH, including landfill leachate, contaminated groundwater from Emma Martin Park, historical rail industry sources, and coal gasification sources near Anglin Bay.

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[14] The Washington LAET was considered as a screening threshold in absence of a CCME or Ontario criterion.

[15] The 10 mg/kg benchmark for total PAHs was selected using the Freshwater Sediment Standard in the BC Contaminated Sites Regulation (Schedule 3.4, Generic Numerical Sediment Standards). The BC standard and the PEC were used for screening in this document because CCME does not have a formal criterion for total PAHs.

[16] The MacDonald *et al.* (2000) PEC was considered as a screening threshold in absence of a CCME PEL.

Total PAH concentrations in PC-N (reference area) were below the PEC in all samples. The maximum concentration measured in PC-N (1.78 mg/kg) was marginally above the TEC (1.61 mg/kg) and was less than the maximum concentration measured in all KIH management units. Based on multiple federal investigations of urban harbours, concentrations of 1–2 mg/kg total PAHs are commonly observed from diffuse urban contamination lacking significant point sources.

PAHs are a primary group of CoCs in KIH, and risk from PAH exposure is one of the main drivers for the Project, particularly for the southwestern KIH and the Parks Canada water lots, which have been impacted by historical industrial activities. The observed concentration distribution of PAHs reflects the lasting influence of historical practices in waste disposal, particularly from the former coal gasification plant. The observed distribution of PAH concentrations are broadly consistent with earlier sediment quality assessments, but there are some areas of KIH where PAH concentrations have increased over the last decade. Although severe contamination (i.e., free product staining) is not evident at the sediment surface, the distribution of “warm spots” of elevated PAH concentrations in TC-AB and TC-4 has broadened in the southwest corner of KIH (Figure A-9), possibly due to dispersion and mixing of sediments from the historical Anglin Bay source area. This distribution confirms the need for intervention in several management units of KIH and provides evidence against natural recovery as being effective in these areas.

In the northern and central areas of KIH, the recent surface sediment profiles confirm the earlier pattern of elevated PAHs in nearshore areas, coincident with areas of sediment contaminated with other CoCs. For these areas, the observed distribution of PAH concentrations are consistent with earlier sediment quality assessments, and the recent findings do not result in implications for remediation design.

4.1.3 Polychlorinated Biphenyls

Total PCB concentrations were above the CCME PEL (0.3 mg/kg) in all management units except TC-3B. The highest concentrations were found in PC-W (1.46 mg/kg). Total PCB concentrations in PC-N (reference area) were less than the CCME PEL in all samples.

PCBs are a primary group of CoCs in KIH, and risk from PCB exposure is one of the considerations for remediation design for the Project. Because PCBs are a strongly bioaccumulative substance group, the main concern is widespread contamination that is sufficiently elevated in concentration to affect concentrations in food resources for higher trophic organisms. The updated spatial profile confirms that sediments in PC-W meet these criteria (i.e., with concentrations of PCBs exceeding 1.0 mg/kg identified as the management criterion in the Conceptual Sediment Management Plan [WSP 2023]).

The 1.0 mg/kg criterion is based on multiple lines of evidence and emphasizes the risks to wildlife from biomagnification through diet and contribution to human health risks from locally caught fish species (Golder 2016). This value is equivalent to the clean-up target set by United States Environmental Protection Agency for many PCB remediation projects, and it was also used in the Beaverdams Creek remediation near Thorold, Ontario (Richman, 2018). The distribution of PCBs confirms the need for intervention in some management units of KIH, including PC-W, and provides evidence against natural recovery as being effective in these areas. Elevated PCBs (0.3 to 0.6 mg/kg) have also been identified in central areas of KIH, but these lack the magnitude of risk to warrant intrusive action.

The 2021–2024 sampling programs did not identify any hotspots of PCBs in central KIH (i.e., although some marginal PEL exceedances were observed, no total PCB concentrations exceed either the LAET of 0.6 mg/kg or the 1.0 mg/kg management criterion). In historical samples collected prior to 2011, localized areas of PCB contamination above 0.6 mg/kg were identified in some central KIH locations (i.e., within management units TC-1, TC-2B, and TC-3B), but those elevations were patchy, limited in magnitude of difference, and not observed in the recent sampling. Implications of this information include:

- It is unknown whether historical differences in the central harbour PCB chemistry result from analytical variability, heterogeneity in sediments, or other causes. Nevertheless, the scale and magnitude of these differences, even if indicative of real changes, are small. None of the central harbour PCB contamination, either in past or present conditions, warrants intrusive management to achieve acceptable risk. Instead, emphasis on the nearshore hotspots, which overlap the contamination distributions for other primary CoCs, continues to provide the most effective way to manage PCB exposures. The lower concentrations of PCBs in central KIH, as confirmed from recent sampling, provide evidence that the conceptual remediation design remains appropriate.
- The updated concentration profile from the 2021–2024 sampling programs resolves previous uncertainty regarding representativeness of the earlier elevated PCB measurements in central KIH surface sediments. The earlier indications of “warm spots” above 0.6 mg/kg in a few central harbour locations were not consistent with the historical sources of PCBs (i.e., expected shoreline influence) nor consistent with the patterns of other hydrophobic substances that we would normally expect to be correlated with PCBs. However, because we did not identify any overt QA/QC issues with the earlier sediment chemistry data, no PCB data were excluded as anomalous, and all results from 2011–2024 were retained in the profiling of PCB contamination (Figure 4).
- In the southern portion of KIH, the observed distribution of PCB concentrations are broadly consistent with earlier sediment quality assessments but remains heterogeneous (patchy) in distribution. Heterogeneity in concentrations is common for substances like PCBs[18] and distribution of both PAHs and PCBs is complex and challenging to delineate in these southern units (TC-2A, TC-3A, TC-4, and TC-AB). For this reason, the remediation method (activated carbon in a thin-layer amendment) for most of this area is well suited to the conditions; the method can be broadly applied over areas of complex chemistry and does not rely on precise placements to have benefits for chemical exposure.

Overall, the implications of the new chemistry data in terms of remediation of PCBs are that the central area of KIH does not require intrusive management, and that remediation in the southern portions of KIH is best suited to a wide-area low-intervention technique, rather than precise delineation and removal. The remediation plan for PCBs in the northern KIH remains the same as specified in the SMP (WSP 2023), mainly because the drivers for remediation in this area included multiple co-located CoCs including PCBs, PAHs, and chromium.

[18] The determination of PCBs in sediment involves extraction with organic solvents, clean-up, and gas chromatographic separation with electron capture detection or mass spectrometry (Webster et al. 2013). Changes in analytical methods over time, and challenges with homogenization of PCBs in sediments, can result in increased variance in PCB quantitation among sampling programs relative to other substances.

4.2 Subsurface Sediment Quality

The results for subsurface sediment quality are summarized in Appendix B figures and screening tables found in Appendix C3 and C4.

The concentration of CoCs in subsurface sediment have lower immediate consequence for the Project as they are not driving ecological or human risks. Sediment contact with organisms is mainly confined to the top 10 cm of sediment, with a few faunae burrowing to deeper layers. However, the subsurface profiles of CoCs and sediment stratigraphy provides information on the potential for long-term changes to sediment chemistry profiles, the potential for release of buried contaminants under scenarios of disruption (e.g., major storm events, climate change conditions, or harbour development), and the depth of sediment targeted for removal where dredging is proposed. Overall, the subsurface sediment quality in KIH shows the following trends:

- Sediment contamination generally extends down to the transition to the native clay layer, but not beyond. In native clay material, chromium concentrations exceeded the CCME ISQGs but were determined to be indicative of background regional chromium. The native clay material was only characterized chemically during the geoprobe core sampling in 2024, as this was the only sampling technique that could consistently penetrate down to this layer. However, surveys of stratigraphy have confirmed low likelihood for legacy chromium contamination to penetrate or extend below this clay layer.
- It appears that the shallow subsurface contamination of CoCs may be acting as a secondary source of contaminants to surface layers through physical mixing (e.g., wave action) or biological mixing (e.g. bioturbation)[19].
- Higher concentrations of CoCs within a core were often found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs; typical of a grab sample depth and broadly representative of the biologically active zone[20]) of all assessed management units, except PC-E where higher concentrations were found in surface sediments compared to shallow subsurface sediments. This confirms that CoC impacts are mostly from legacy contamination. The proximity of the subsurface contamination to the biologically active layer, in combination with mobility of sediments during moderate to strong storm events, means that CoCs in shallow subsurface sediments remains an ongoing and long-term source of exposure to aquatic life.
- Differences in metal concentrations between the surface and shallow subsurface sediments were not large), except in TC-4 and TC-AB where the differences were larger.
- Differences in concentrations over the sediment profile were greater for organic constituents relative to metals:
  - For PCBs, the shallow subsurface sediment concentration were greater than surface concentrations in multiple management units, including PP-OM, TC-4, TC-AB and WM.
  - PAHs in the southern portions of KIH exhibited the largest differences in shallow subsurface versus surface contamination compared to the other CoCs.

The results are discussed in detail below for each CoC, and the implications of the subsurface results to the design strategy for the Project is discussed in Section 5.3.

[19] Bioturbation refers to the reworking of sediments by living organisms, such as from burrowing animals or plant roots.

[20] The definitions of surface (e.g., < 10 cm) and depth (e.g., > 10 cm) for sediment horizons used in this report follow those defined in the Canada-Ontario Decision-Making Framework for Assessment of Great Lakes Contaminated Sediment (EC and OMOE 2008).

4.2.1 Metals

4.2.1.1 Antimony

Antimony concentrations were above the Washington LAET (0.545 mg/kg) [21] in PC-OM (down to 0.5 mbs), PC-E (down to 0.25 mbs), PC-W (down to 0.5 mbs), PP-OM (down to 0.8 mbs), TC-4 (down to 0.6 mbs), TC-AB (down to 1.2 mbs), TC-OM (down to 0.5 mbs), TC-RC (down to 0.3 mbs), and WM (down to 0.5 mbs).

The vibracore programs[22] showed that higher concentrations of antimony within a core were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs) of all assessed management units, except PC-E where concentrations were higher in surface sediments.

Native clay material was sampled in PC-E, PC-W, PP-OM, and TC-OM and all antimony concentrations were below laboratory detection limits (<0.10 mg/kg) and did not exceed the LAET.

4.2.1.2 Arsenic

Arsenic concentrations were above the CCME PEL (17 mg/kg) in PC-W (down to 0.5 mbs), PP-OM (down to 0.8 mbs), TC-4 (down to 0.6 mbs), TC-AB (down to 0.5 mbs), TC-OM (down to 0.5 mbs), TC-RC (down to 0.3 mbs) and WM (down to 0.5 mbs).

The vibracore programs showed that higher concentrations of arsenic within a core were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs) of all assessed management units, except PC-E, where concentrations were higher in surface sediments.

In native clay material, arsenic concentrations were below the CCME ISQG (5.9 mg/kg).

4.2.1.3 Chromium

Chromium concentrations were above the CCME PEL (90 mg/kg) in PC-OM (down to 0.75 mbs), PC-E (down to 0.50 mbs), PC-W (down to 0.5 mbs), PP-OM (down to 0.8 mbs), TC-4 (down to 0.6 mbs), TC-AB (down to 1.2 mbs), TC-OM (down to 0.5 mbs), TC-RC (down to 0.3 mbs) and WM (down to 0.5 mbs).

Subsurface sediment samples were analyzed for both trivalent chromium and hexavalent chromium. Based on average concentrations, more than 99% of total chromium in KIH is made up of the trivalent species and this was consistent across sampled depths (WSP 2024a).

The vibracore programs showed that higher concentrations of chromium were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs) of all assessed management units, except PC-E where concentrations were higher in surface sediments.

In native clay material, chromium concentrations exceeded the CCME ISQG (37.3 mg/kg), indicative of background regional chromium, but were consistently below the CCME PEL (90 mg/kg). The highest chromium concentration in native clay was 72 mg/kg in PC-W.

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[21] The Washington LAET was considered as a screening threshold in absence of a CCME or Ontario criteria.

[22] Depths stated are general targeted horizon depths, actual depth varied on a station basis because of in-situ site conditions. See Appendix F for exact horizon interval.

4.2.1.4 Copper

Copper concentrations were above the CCME PEL (197 mg/kg) in TC-AB (down to 0.3 mbs).

The vibracore programs showed that higher concentrations of copper within a core were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs) of all assessed management units, except PC-E and PC-W, where concentrations were higher in surface sediments.

In native clay material, copper concentrations were below the CCME ISQG (35.7 mg/kg) except for PCW-DP-01 (36.8 mg/kg), which marginally exceeded the ISQG but was below the PEL (197 mg/kg).

4.2.1.5 Lead

Lead concentrations were above the CCME PEL (91.3 mg/kg) in PC-OM (down to 0.5 mbs), PC-E (down to 0.1 mbs), PC-W (down to 0.5 mbs), PP-OM (down to 0.8 mbs), TC-4 (down to 0.6 mbs), TC-AB (down to 1.2 mbs), TC-OM (down to 0.5 mbs), TC-RC (down to 0.3 mbs), and WM (down to 0.5 mbs).

The vibracore programs showed that higher concentrations of lead within a core were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs) of all assessed management units except PC-E, where concentrations were higher in surface sediments.

In native clay material, lead concentrations were below the CCME ISQG (35 mg/kg).

4.2.1.6 Mercury

Mercury concentrations were above the CCME PEL (0.486 mg/kg) in PC-OM (down to 0.5 mbs), PC-W (down to 0.5 mbs), PP-OM (down to 0.8 mbs), TC-4 (down to 0.6 mbs), TC-AB (down to 1.2 mbs), TC-OM (down to 0.5 mbs), TC-RC (down to 0.3 mbs), and WM (down to 0.5 mbs).

The vibracore programs showed that higher concentrations of mercury within cores were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs). This applied to all assessed management units except PC-E, where concentrations were higher in surface sediments.

In native clay material, mercury concentrations were below the CCME ISQG (0.17 mg/kg).

4.2.1.7 Silver

Silver concentrations were above the Washington LAET (0.545 mg/kg)[25] in PC-OM (down to 0.5 mbs), PC-W (down to 0.5 mbs), PP-OM (down to 0.8 mbs), TC-4 (down to 0.6 mbs), TC-OM (down to 0.5 mbs), TC-AB (down to 1.2 mbs), TC-RC (down to 0.3 mbs), and WM (down to 0.5 mbs).

The vibracore programs showed that higher concentrations of silver within a core were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs) of all assessed management units, except PC-E and PC-OM where concentrations were higher in surface sediments.

In native clay material, silver concentrations were non-detectable (<0.10 mg/kg) and did not exceed the LAET.

[25] The Washington LAET was considered as a screening threshold in absence of a CCME PEL.

4.2.1.8 Zinc

Zinc concentrations were above the CCME PEL (315 mg/kg) in PC-OM (down to 0.5 mbs), PC-W (down to 0.5 mbs), PP-OM (down to 0.5 mbs), TC-4 (down to 0.6 mbs), TC-AB (down to 0.5 mbs), and WM (down to 0.5 mbs).

The subsurface sediment programs showed that higher concentrations of zinc within a core were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs) of all assessed management units except PC-E and PC-W where concentrations were higher in surface sediments.

In native clay material, zinc concentrations were below the CCME ISQG (123 mg/kg).

4.2.2 Polycyclic Aromatic Hydrocarbons

Total PAH concentrations were above the MacDonald *et al.* (2000) PEC (22.8 mg/kg)[27] in several management units: PC-OM (down to 0.5 mbs), PC-W (down to 0.5 mbs), PP-OM (down to 0.5 mbs), TC-4 (down to 0.6 mbs), TC-AB (down to 0.5 mbs), and WM (down to 0.5 mbs). During the subsurface sediment sampling programs, observations of odour and sheen were observed across multiple core depths in TC-AB. This hydrocarbon contamination may reflect residual staining of sediment from the legacy coal gasification sources, and matches earlier observations of elevated hydrocarbon contamination in shallow subsurface vibracore sampling.

The vibracore programs showed that higher concentrations of PAHs within a core were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs) of all assessed management units, except PC-E, where higher concentrations of PAHs were found in the surface sediments compared to the shallow subsurface sediments. Overall, PAHs have the largest difference in shallow subsurface versus surface contamination compared to the other CoCs and this may be providing an ongoing source of PAHs that are likely causing long-term changes to surface sediment chemistry profiles, as discussed in Section 5.3.

In native clay material, total PAH concentrations were below the TEC (1.61 mg/kg).

4.2.3 Polychlorinated Biphenyls

Total PCB concentrations were above the CCME PEL (0.3 mg/kg) in PC-OM (down to 0.5 mbs), PC-W (down to 0.5 mbs), PP-OM (down to 0.8 mbs), TC-4 (down to 0.6 mbs), TC-AB (down to 1.2 mbs), TC-OM (down to 0.5 mbs), and WM (down to 0.5 mbs).

The vibracore programs showed that higher concentrations of PCBs within a core were found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs) of all assessed management units. The concentrations in shallow subsurface sediment were often greater than surface sediment.

In native clay material, total PCB concentrations were non-detectable (<0.015 mg/kg) and did not exceed the CCME ISQG.

[27] The MacDonald *et al.* (2000) PEC was considered as a screening threshold in absence of a CCME PEL.

4.3 Butyltins

Butyltins, including TBT, were analyzed as part of the 2023 Sampling Program and the results are presented on in Appendix D.

TBT concentrations were below the RBCA EQS (560 micrograms per kilogram [µg/kg]) and the US EPA ESV (47 µg/kg) in all management units, except TC-AB and PC-N. TBT concentrations in TC-AB were above the RBCA EQS and the US EPA RSV (320 µg/kg), ranging from 48.9 µg /kg to 4,820 µg /kg. In one sample collected from PC-N, TBT concentrations were 1.04 times greater than the US EPA Region 4 ESV (similar to the CCME ISQG), but lower than the RSV (similar to the CCME PEL). All concentrations in PC-N were below the Atlantic RBCA EQS.

TBT is a secondary CoC in KIH, and risk from TBT exposure is not one of the main drivers for the Project. The observed concentration distribution of TBT is different from other CoCs and unsurprisingly is highest in exposure near the boat maintenance operations within Anglin Bay. Numerous investigations of organotins throughout Canadian ports and harbours have demonstrated a strong linkage between vessel maintenance and concentrations of organotins in sediment. Fortunately, the sources of TBT in the Great Lakes have diminished over time, based mainly on Canada's contribution and support for the International Maritime Organization's *International Convention on the Control of Harmful Anti-fouling Systems on Ships*; that convention prohibits organotin compounds from use in anti-fouling systems on ships. As of 1 January 2008, organotin compounds on ships must either be removed or sealed, and sale and use of products like organotin paints is regulated by Health Canada. As such, the TBT contamination within Anglin Bay reflects legacy sources only.

The contamination by organotins documented in the 2023 Sampling Program would normally warrant further investigation of potential for harm to aquatic life. However, because Anglin Bay sediments have already been identified as warranting physical intervention, such is unnecessary. TBT presence in Anglin Bay is coincident with other CoCs including PAHs, PCBs and copper; therefore, the proposed remediation efforts will mitigate potential risk from TBT.

4.4 Contaminants of Emerging Concern

The results for CECs in sediment are provided in WSP (2024a and b) and are summarized below and on in Appendix E.

- **Per- and polyfluoroalkyl substances (PFAS)**—Concentrations for two parameters (NMeFOSAA and NEtFOSSA [28]) were slightly above the conservative screening criteria protective of semi-aquatic wildlife within subsurface sediments of Anglin Bay. Concentrations of NEtFOSAA in one surface sample collected from TC-2A were also above the applied criteria protective of semi-aquatic wildlife. These minor exceedances were based on a comparison to a conservative no-effect guideline, which is a value at which no negative effects would be seen for aquatic life; the stringency of this guideline is greater than what is commonly applied for management of working harbours in Canada. PFAS parameters of regulatory concern (perfluorooctanoic acid [PFOA] and perfluorooctane sulfonate [PFOS]) were below the applied criteria in all sediment samples.

[28] PFOS screening criteria was applied as a surrogate for assessing N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA) and N-ethyl perfluorooctane sulfonamido acetic acid (NEtFOSSA)

- **Bis-phenol A (BPA)**—Concentrations above the screening criteria were identified within surface sediment samples in Anglin Bay. However, published sediment toxicity data in the literature shows that the concentration of BPA in Anglin Bay sediment is well below the guideline at which no negative effects would be seen for aquatic life.
- **Polybrominated diphenyl ethers (PBDEs)**—Concentrations above the FEQGs were identified within KIH management units TC-2A, PC-OM and TC-AB. These exceedances were generally small in magnitude and limited to exceedances of a conservative federal guideline, which is a value at which no negative effects would be seen for aquatic life; the stringency of the federal guideline is greater than what is commonly applied for management of working harbours in Canada. There is a lack of published low-effect values to understand the potential for the elevated PBDE concentrations to cause ecological effects. However, maximum concentration of BDE209 within Anglin Bay (TC-AB) sediment was several-fold higher than other KIH stations, and concentrations are elevated relative to Lake Ontario background concentrations.
  - The PBDE concentrations in Anglin Bay do not affect the remediation design because the contaminated sediment within Anglin Bay has been identified as a high priority for removal given the hydrocarbon contamination both at surface and at depth. Further, measurement of PBDEs at the margins of the proposed excavation (outside of the inner bay towards central KIH) were below the applicable screening criteria and confirm that the elevated PBDEs are localized within Anglin Bay adjacent to the storm sewer outfalls.
  - The PBDE concentrations in sediments were correlated to the storm sewer outfalls which drain developed catchments areas of downtown Kingston. Therefore, ongoing stormwater monitoring has been recommended to determine if the storm sewers represent a continuous source of PBDEs into KIH.

4.5 Summary of QA/QC Results

Field duplicate samples were collected to ensure consistency between samples and the duplicate. To assess variability between field duplicates, the RPD between reported analyte concentrations was calculated where concentrations were five-fold greater than the detection limit.

Between 2021 and 2023, calculated RPDs for the following COC and CEC parameters in surface sediment samples exceeded the DQOs (60%) for a subset of samples (see Section 3.4 for details):

- Antimony, arsenic, mercury, molybdenum, strontium, and tin.
- Acridine
- PBDEs: BDE 191, and BDE 79

Calculated RPDs for the following COC parameters in subsurface sediment samples exceeded the DQOs (60%) for a subset of samples (see Section 3.4 for details):

- Mercury
- Individual PAHs: acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b,j)fluoranthene, benzo(b,j,k)fluoranthene, fluoranthene, pyrene, fluorene, chrysene, phenanthrene, and total PAHs.

Where variances between the sample and duplicate pair were found, the data were reviewed on a sample-by-sample basis to evaluate potential impact to interpretation of the data. The few exceedances of DQOs in sediments were small in magnitude, and with frequency expected for a program of this size, recognizing the micro-scale heterogeneity that can occur in composite sediment samples. Based on this review, in the context of the project-specific regulatory criteria and overall objectives, the data are considered reliable and no impact to interpretation of data was identified.

No field duplicates were collected in 2024 due to the small sample size (less than 10 samples).

5.0 GENERAL DISCUSSION

5.1 Comparison of 2021–2024 Spatial Findings to Earlier Distributions

During early consultation stages, stakeholders asked whether the contaminant distributions in KIH sediment remain stable over periods of a decade or more. The comprehensive sediment sampling programs from 2021 to 2024 helped to answer this question by comparing the results to historical contaminant distributions. The 2021 to 2024 data were combined with sediment chemistry data since 2011[29] to produce an updated sediment chemistry surface. Updated sediment chemistry distributions for the primary and secondary CoCs are summarized in Appendix A.

Surface sediment distributions in Appendix A of this report were compared against the historical distributions found in Golder (2017) to identify similarities and differences. Some general conclusions from the updated sediment quality profiling included:

- The spatial distribution and magnitude of contamination in 2021 to 2024 remained broadly consistent with earlier profiling. There was no widespread evidence of significant recovery or deterioration of sediment quality over the past decade, with concentrations of inorganic and organic substances remaining well above sediment quality guidelines, and at similar magnitude and spatial distribution to earlier characterizations.
- The spatial extent, magnitude, and pattern of contamination in Parks Canada and Transport Canada water lots is largely unchanged relative to historical conditions from early this century. The profiles of chromium, PAHs, and PCBs support the decision to apply physical intervention in several shoreline management units, both in terms of reducing risk within the shoreline water lots and for reducing secondary release of contaminants to outlying parts of the harbour.
- Some CoCs historically exhibited isolated pockets of elevated sediment chemistry (principally PCBs) in the central KIH prior to 2011 (relative to surrounding areas within the same management unit). These localized areas were not observed in 2021 to 2024 (i.e., the inclusion of the recent data improved delineation and confirmed the smaller spatial extent of localized PCB elevations), providing confidence that the decision to apply monitored natural recovery for management of central harbour areas (e.g., TC-1, TC-2B) was appropriate.
- Antimony, mercury, and PCBs are examples of CoCs that exhibited smoother distributions with incorporation of the 2021 to 2024 data relative to the patchier profiles evident in earlier data compilations.

[29] Although data from prior to 2021 were included in the updated chemistry surfaces provided in Appendix A, most results depicted are from the 2021 to 2024 sampling programs. The figures in Appendix A distinguish between the most recent results (2021 to 2024) and prior decade (2011–2020 inclusive depicted as pentagonal symbols).

- Many substances remain elevated relative to both upstream reference conditions and relative to the eastern half of KIH. The gradient of improving sediment quality moving from west to east was confirmed, in accordance with proximity to legacy contaminant sources along the western shoreline.
- Substantial portions of KIH, including the central areas (e.g., TC-1, TC-2B) have elevated concentrations of CoCs relative to background and relative to conservative generic sediment quality criteria, but not at concentrations that yield unacceptable risks based on the results of quantitative risk assessment (Golder 2016). Because the remedial objective is to reduce only the substances that cause moderate or greater risks, leaving such low-level concentrations in place within the central harbour is acceptable, and the updated concentration profiles indicate that this approach remains appropriate.
- As discussed in Section 5.1.2, the spatial distribution of PAH concentrations in sediment in the southwestern KIH has exhibited some changes relative to earlier monitoring. Specifically, the area of elevated total PAH concentration (i.e., >10 mg/kg PAH[30]) has expanded in the last decade, posing concern for spatial extent of low to moderate magnitude risks. The spatial distribution of organic contaminants in southern KIH is complex and heterogeneous, both laterally and vertically. It is possible that legacy PAH contamination at depth, confirmed to be present within the shallow subsurface units (as discussed in Section 5.3), has provided a source for long term dispersion of disturbed sediments, with gradual movement from the nearshore areas to the central harbour. These observations and inferences help to justify the program of intervention in the southern KIH, with targeted removals in the areas of greatest PAH source, combined with capping and activated carbon amendments in the outlying areas with moderate contamination.

5.2 Evidence for Monitored Natural Recovery versus Dredging

Monitored natural recovery remains an important strategy for large volumes of sediment in the central portion of KIH. The Sampling Programs results presented in this report confirmed the broad patterns of low magnitude sediment contamination in large portions of central KIH (Figure 3); these conditions, although elevated relative to background, yield acceptable risk conclusions that support no further intervention other than long-term monitoring to make sure conditions are stable or gradually improving over time.

In comparison, the results from the Sampling Programs also confirmed that dredging is still required in several areas of western KIH due to areas of moderate to high contamination that are driving unacceptable risks. For the substances that are drivers of risk based on the site-specific risk assessment findings (Golder 2016), combined with application of the federal decision-making framework, such conditions warrant intervention. As discussed in Section 5.1, there was no widespread evidence of significant recovery or deterioration of sediment quality over the past decade, with concentrations of inorganic and organic substances remaining well above sediment quality guidelines, and at similar magnitude and spatial distribution to earlier characterizations. Minor changes in distributions of some substances (e.g., PCBs, PAHs) have been documented, but not to the extent that the fundamental decisions regarding risk magnitude or tolerance have changed. Therefore, active intervention in these areas is required.

[30] The 10 mg/kg benchmark does not necessarily indicate the transition from low to moderate contamination or a site-specific target level but rather reflects a screening value (BC Contaminated Sites Regulation, Schedule 3.4, Generic Numerical Sediment Standards) that is indicative of PAH contamination above a typical urban harbour level. CCME does not have a formal criterion for total PAHs.

5.3 Consequences of Subsurface Contamination on Design Strategy

The subsurface sediment program collected cores from select management units where dredging is proposed to confirm the depth of contamination and sediment stratigraphy. The CoCs in deep subsurface sediment (i.e., >0.5 mbs) are not in direct contact with most organisms, and therefore are not driving current ecological or human risks. However, shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) are of interest for risk management given the potential for sediment transport and mixing known to occur in KIH. The implications on level of intervention selected for the various areas of KIH (e.g., dredging versus monitoring natural recovery) depend on both the contamination magnitude in each area and the likelihood of that contamination being redistributed to places where exposure may occur. The shallow subsurface profiles of CoCs (i.e., 0.1 to 0.5 mbs) provide information on the potential for long-term changes to sediment chemistry profiles, the potential for release of buried constituents under scenarios of disruption (e.g., major storm event or climate change conditions), and the depth of sediment targeted for removal where dredging is proposed.

Higher concentrations of CoCs within a core were generally found in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) compared to the surface sediments (i.e., 0 to 0.1 mbs). The differences in concentration between the surface and shallow subsurface sediments were generally small in magnitude.). Steeper gradients were sometimes observed in TC-4 and TC-AB (as well as PP-OM and WM for PCBs) for organic contaminants. The proximity of the subsurface contamination to the biologically active layer, in combination with mobility of sediments during moderate to strong storm events, means that CoCs in shallow subsurface sediments remain an ongoing and long-term source of exposure to aquatic life. The vertical profiles of CoCs did not exhibit sufficient indications of improvement in sediment quality over time, nor consistent evidence of stable protective layers, to warrant monitored natural recovery as a defensible strategy for the management units that currently exhibit moderate environmental risks at the sediment surface. Rather, the profiles confirmed the need to physically intervene in several shoreline management units to remove both surface and shallow subsurface sediments.

Native clay material underlying softer depositional sediments in KIH was collected and analyzed. The goal was to confirm that this native clay material acts as confining layer for contamination and would not have concentrations of CoCs above sediment quality guidelines. Native clay material was sampled from PC-E (found at depths of 0.24 to 0.62 mbs), PC-W (found at depths of 0.57 mbs), PP-OM (found at depths of 0.65 mbs), and TC-OM (found at depths of 0.25 mbs). The concentrations of most CoCs in the native clay material were below the CCME ISQGs (or LAET/TEC where CCME ISQGs were not available), confirming that deep sediment horizons are not contaminated to levels of concern. Chromium concentrations exceeded the CCME ISQG (37.3 mg/kg) in the native clay material of all management units, indicative of background regional chromium, but were consistently below the CCME PEL (90 mg/kg).

Based on the subsurface profiles and sediment stratigraphy, the following key elements inform the design strategy for KIH:

- The highest concentrations of CoCs are found in the shallow subsurface sediments (i.e., >0.1 mbs), confirming that the source of contamination in KIH is generally from legacy sources.
- Metal contamination profiles in the shallow subsurface sediments (i.e., 0.1 to 0.5 mbs) are generally well mixed. These subsurface sediments may continue to influence surface contamination over the long term if not removed. Therefore, shallow subsurface contamination will also be removed where dredging is proposed, permanently removing significant contaminant mass. Sediment residuals following the dredging program will be covered with a layer of clean substrate, such that trace contaminant levels will be covered and/or diluted.

- It was confirmed that the concentrations of CoCs in the native clay material underlying the softer sediments in KIH were below the applicable guidelines, except for chromium, which exceeded the CCME ISQG. Therefore, soft sediments to the depth of the nature clay layer are recommended for removal where dredging is proposed.
- The elevated PAH concentrations in subsurface sediments compared to surface sediments (specifically for management units TC-4 and TC-AB) may present an on-going source of contamination as sediments move throughout the harbour. Therefore, targeted removals at depth for PAHs in select areas of southern KIH are proposed. The presence of PAHs at depth also necessitates the placement of a clean cap following dredging.

5.4 Chromium Speciation

With respect to chemical speciation factors, the risks of meaningful transformation of trivalent to hexavalent chromium are low. Given the remediation work is taking place over a relatively short period of time, there is inadequate time for such transformation to occur. A change in speciation is likely minimal in sediments that are removed, and the dredge residuals will be covered with cleaner sediments. As sediments at the current active surface layer are currently trivalent-dominant, and similar speciation observed at depth, trace levels of chromium in dredged areas is expected to remain trivalent.

5.5 Butyltins

Butyltins (specifically TBT) concentrations were below the applied guidelines in all management units, except TC-AB, where they were above the applied guidelines. Despite this, TBT is a secondary CoC in KIH, and risk from TBT exposure is not one of the main drivers for the Project.

The contamination by organotins documented in the 2023 Sampling Program would normally warrant further investigation of potential for harm to aquatic life. However, because Anglin Bay sediments have already been identified as warranting physical intervention, such is unnecessary. TBT presence in Anglin Bay is highly localized coincident with other CoCs including PAHs, PCBs and copper; therefore, the proposed remediation efforts will mitigate potential risk from TBT.

5.6 Contaminants of Emerging Concern

Overall, concentrations of PFAS, BPA, and PBDEs did not indicate unacceptable levels of contamination from the perspective of sediment quality for a working harbour. Work is currently being conducted to understand the relative contribution that storm water outflows have on long-term CEC loadings into KIH, particularly in Anglin Bay where CEC concentrations are the highest. This would help to determine the extent of source control measures (if any) that would be required related to the CEC inputs into the harbour. Despite the above, there is adequate information to support implementation of the Project to manage the primary CoCs, and ongoing investigations of CECs can continue in parallel.

6.0 CLOSURE

We trust the information in this report meets your needs at this time. Should you have any questions regarding this report, please do not hesitate to contact the undersigned.

WSP Canada Inc.

[redacted]

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7.0 REFERENCES

Amanatidou E. 2023. Speciation, Chemistry, Geogenic Formation and Dispersion of Chromium in Groundwater. In: Kumar, N., Walther, C., Gupta, D.K. (eds) Chromium in Plants and Environment. Environmental Science and Engineering. Springer, Cham. https://doi.org/10.1007/978-3-031-44029-8_2

ATSDR (Agency for Toxic Substances and Disease Registry). 2012. Toxicological Profile for Chromium, CAS#: 7440-47-3. Accessed January 2025. Available at: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=62&tid=17.

British Colombia Ministry of Environment and Climate Change (BC ENV). 2023. British Colombia Environmental Laboratory Manual. August 2023. Accessed January 2025. Available at: https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance/bc-environmental-laboratory-manual.

Casado-Martinez C. 2020. EQSsed – Proposal by the Ecotox Centre for: Perfluorooctane Sulfonate (PFOS). Swiss Centre for Applied Ecotoxicology, Duebendorf.

CCME (Canadian Council of Ministers of the Environment). 1999 and updates. Sediment Quality Guidelines for the Protection of Aquatic Life. Accessed January 2025. Available at http://ceqg-rcqe.ccme.ca/en/index.html#void.

EC and OMOE (Environment Canada and Ontario Ministry of the Environment). 2008. Canada-Ontario Decision-Making Framework for Assessment of Great Lakes Contaminated Sediment. Prepared by Peter Chapman (Golder Associates Ltd.) with the COA Sediment Task Group on behalf of Environment Canada and the Ontario Ministry of the Environment under the Canada Ontario Agreement (COA 2002). March 2008.

Environment Canada. 2013. Federal Environmental Quality Guidelines (FEQGs) for Polybrominated Diphenyl Ethers. February 2013. Canada Environmental Protection Act, 1999.

Environment Canada. 2018a. Federal Environmental Quality Guidelines (FEQGs) for Bisphenol A. June 2018. Canada Environmental Protection Act, 1999.

Environment Canada. 2018b. Federal Environmental Quality Guidelines (FEQGs) for Perfluoroalkyl and Polyfluoroalkyl Substances. May 2018. Canada Environmental Protection Act, 1999.

Federal Contaminated Sites Action Plan (FCSAP). 2021. Guidance for Assessing and Managing Aquatic Contaminated Sites in Working Harbours, Version 1.0.

Golder. 2016. Kingston Inner Harbour—Risk Assessment Refinement and Synthesis. Submitted to Public Works and Government Services Canada, Toronto, Ontario. Revised Final Report. Report Number: 1416134-004-R-Rev0. 17 August 2016.

Golder. 2017. Kingston Inner Harbour—Conceptual Remedial Options Analysis. Submitted to Public Works and Government Services Canada, Toronto, Ontario. Report Number: 1661792-001-R-Rev1. 17 August 2017.

Golder. 2022. Supplemental Sediment Sampling Program for the Kingston Inner Harbour: Transport Canada and Parks Canada Water Lots, Kingston, Ontario. March 2022.

Government of Canada. 2023. Federal Environmental Quality Guidelines (FEQGs). Accessed January 2025. Available at: https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/federal-environmental-quality-guidelines.html.

MacDonald DD, Ingersoll CG, Berger TA. 2000. Development of consensus-based sediment quality guidelines for freshwater ecosystems. *Archives Environmental Contamination and Toxicology.* 39: 20-31. DOI: 10.1007/s002440010075.

Michelsen T. 2003. Phase II Report: Development and Recommendation of Sediment Quality Values for Freshwater Sediments in Washington State.

OMOE (Ontario Ministry of the Environment). 2008. Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario: An Integrated Approach. Accessed January 2025. Available at: https://www.ontario.ca/document/guidelines-identifying-assessing-and-managing-contaminated-sediments-ontario/identification-and-assessment.

RBCA (Atlantic Risk-Based Corrective Action). 2022. Ecological Tier I Environmental Quality Standards for Sediment.

Richman L. 2018. Lyons Creek East Long-Term Monitoring Plan to Assess Monitored Natural Recovery as an Effective Remediation Strategy: 2015 Survey. Technical Memorandum prepared by Lisa Richman, Ontario Ministry of Environment, Conservation and Parks, Water Monitoring Section, Environmental Monitoring and Reporting Branch. November 2018.

RMC-ESG. 2017. Sediment Assessment of CFB Kingston Water Lot near Anglin Bay, Kingston, Ontario. Prepared for CFB Kingston Environmental Officer. Prepared by Environmental Sciences Group, Royal Military College, Kingston, Ontario, Environmental Sciences Group. RMC-CCE-ES-16-13. March 2017.

Scientific Committee on Health, Environmental and Emerging Risks (SCHEER). 2022. Scientific Opinion on "Draft Environmental Quality Standards for Priority Substances under the Water Framework Directive" – PFAS. August 2022.

SERDP. 2020. Approach for Assessing PFAS Risk to Threatened and Endangered Species. Accessed January 2025. Available at: https://serdp-estcp.mil/projects/details/76a4ac77-b411-4d53-af4d-5d9b0c7f2e2c.

US EPA. 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Scientific Support Section, Superfund Division. March 2018.

Webster L, Roose P, Bersuder B, Kotterman M, Haarich M, Vorkamp K. 2013. Determination of polychlorinated biphenyls (PCBs) in sediment and biota. ICES Techniques in Marine Environmental Sciences No. 53. 18 pp.

Welsh P. 2008. Memorandum from Paul Welsh (Standards Development Branch) to Rick Day (Niagara District Office) titled “Implications of Fuchsman et al., 2008 paper on the PCB TRV used for Mink in Lyons Creek East ERA and Proposed Sediment Management Options.” July 15, 2008.

WSP. 2023. Conceptual Sediment Management Plan for the Kingston Inner Harbour. Transport Canada and Parks Canada Water Lot, Kingston, Ontario. Submitted to Public Services and Procurement Canada, Toronto, ON by WSP Canada Inc., Vancouver BC. 22523199-013-R-Rev0. 19 September 2023.

WSP. 2024a. 2023 Supplemental Sediment Sampling Program for the Kingston Inner Harbour. Transport Canada and Parks Canada Water Lot, Kingston, Ontario. Submitted to Public Services and Procurement Canada, Toronto, ON by WSP Canada Inc., Vancouver BC. 22523199-018-R-Rev0. 21 March 2024.

WSP. 2024b. 2024 Supplemental Sediment Sampling Program for the Kingston Inner Harbour. Transport Canada and Parks Canada Water Lot, Kingston, Ontario. Submitted to Public Services and Procurement Canada, Toronto, ON by WSP Canada Inc., Vancouver BC. 22523199-018-R-RevA. In preparation.

WSP. 2024c. 2024 Surface Water and Storm Water Sampling Program for Kingston Inner Harbour. Transport Canada and Parks Canada Water Lot, Kingston, Ontario. Submitted to Public Services and Procurement Canada, Toronto, ON by WSP Canada Inc., Vancouver BC. CA0034529.1069. In preparation.

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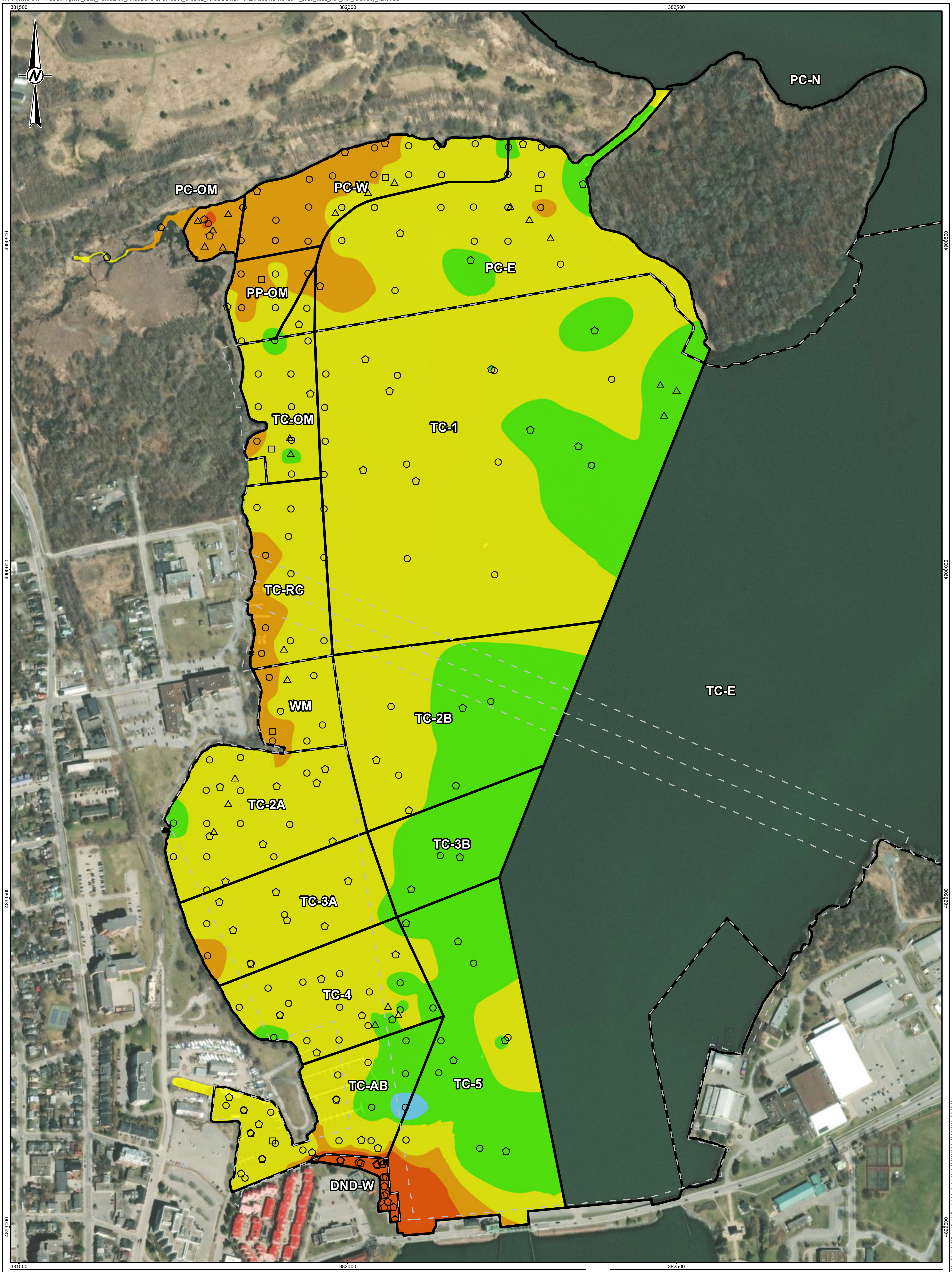
APPENDIX A

Surface Sediment Figures

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_A01_KIH_Antimony_Y2W.mxd



LEGEND

- MANAGEMENT UNIT
- 2011 - 2020 SEDIMENT SAMPLE LOCATION
- 2021 SEDIMENT SAMPLE LOCATION
- 2023 SEDIMENT SAMPLE LOCATION
- 2024 SEDIMENT SAMPLE LOCATION

ANTIMONY

- 0 - 0.2 mg/kg
- 0.2 - 0.6 mg/kg (<LAET)
- 0.6 - 1.9 mg/kg (<2LAET)
- 1.9 - 6 mg/kg
- 6 - 20 mg/kg
- > 20 mg/kg

0 110 220

1:5,500 METERS

REFERENCE(S)

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
ANTIMONY BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT

YYYY-MM-DD	2025-02-10
DESIGNED	SW
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	A-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

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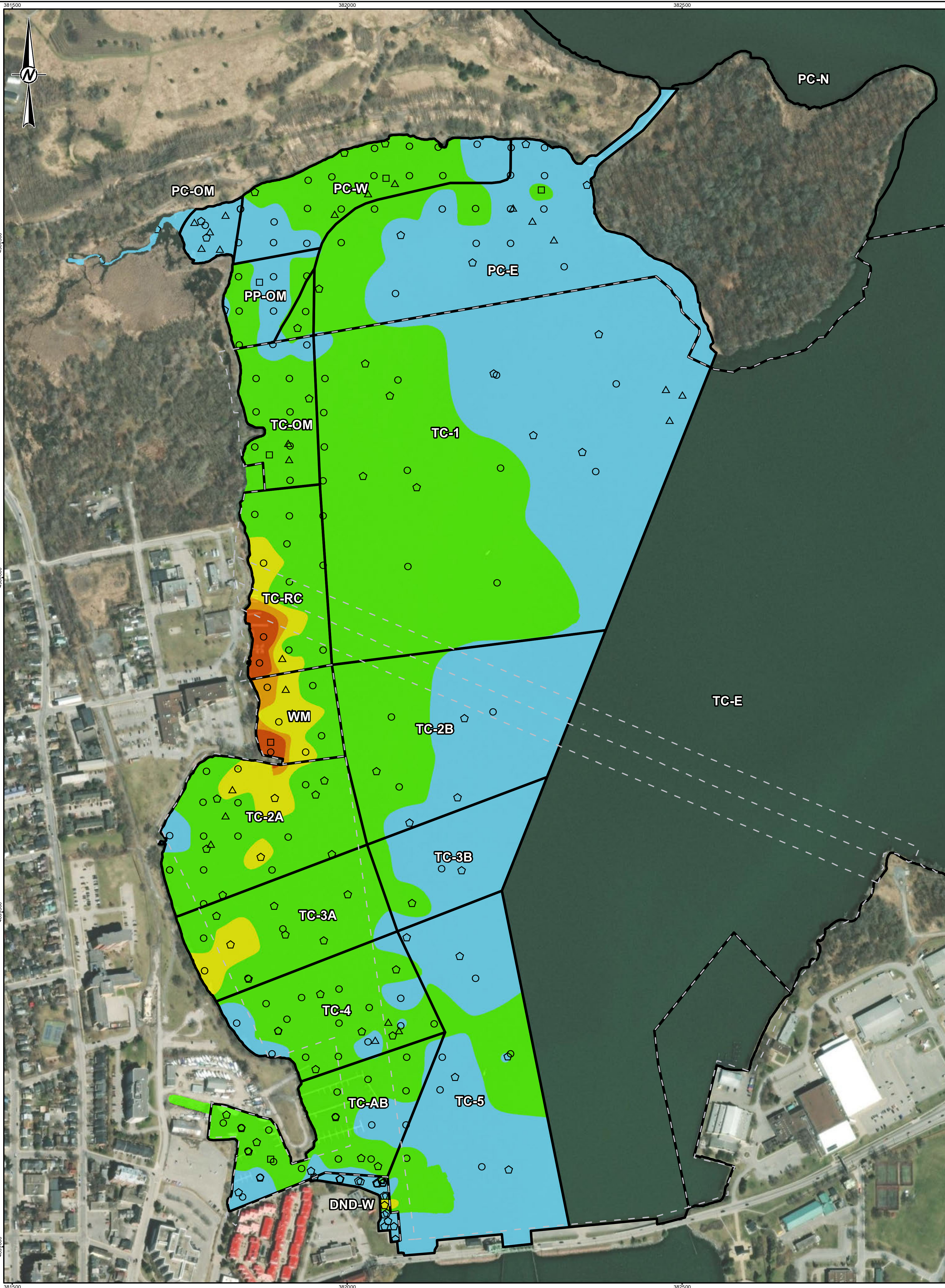

LEGEND

- MANAGEMENT UNIT
- 2011 - 2020 SEDIMENT SAMPLE LOCATION
- 2021 SEDIMENT SAMPLE LOCATION
- 2023 SEDIMENT SAMPLE LOCATION
- 2024 SEDIMENT SAMPLE LOCATION

ARSENIC

- 0 - 5.9 mg/kg (<ISQG)
- 5.9 - 17 mg/kg (<PEL)
- 17- 33 mg/kg (<SEL)
- 33 - 50.9 mg/kg (<2LAET)
- 50.9 - 100 mg/kg
- > 100 mg/kg

0 110 220

1:5,500 METERS

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PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
ARSENIC BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT

YYYY-MM-DD	2025-02-10
DESIGNED	SW
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	A-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

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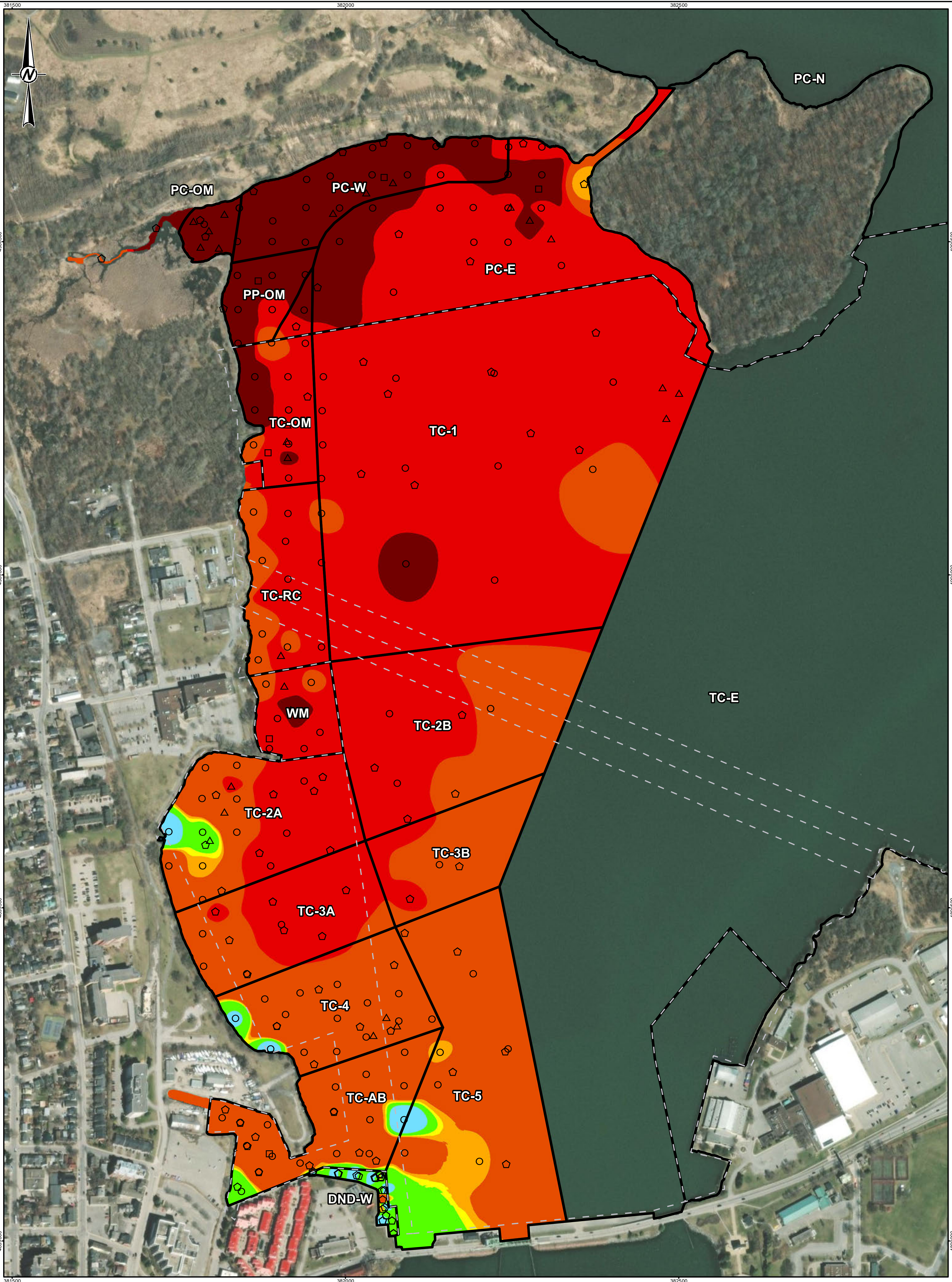

LEGEND

- MANAGEMENT UNIT
- 2011 - 2020 SEDIMENT SAMPLE LOCATION
- 2021 SEDIMENT SAMPLE LOCATION
- 2023 SEDIMENT SAMPLE LOCATION
- 2024 SEDIMENT SAMPLE LOCATION

CHROMIUM

- 0 - 37.3 mg/kg (<ISQG)
- 37.3 - 90 mg/kg (<PEL)
- 90 - 110 mg/kg (<SEL)
- 110 - 133 mg/kg (<2LAET)
- 133 - 500 mg/kg
- 500 - 1,000 mg/kg
- > 1,000 mg/kg

0 110 220

1:5,500 METERS

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PROJECT

KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE

CHROMIUM BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT

WSP

YYYY-MM-DD	2025-02-10
DESIGNED	SW
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	CA0018344.0750	A	**A-3**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

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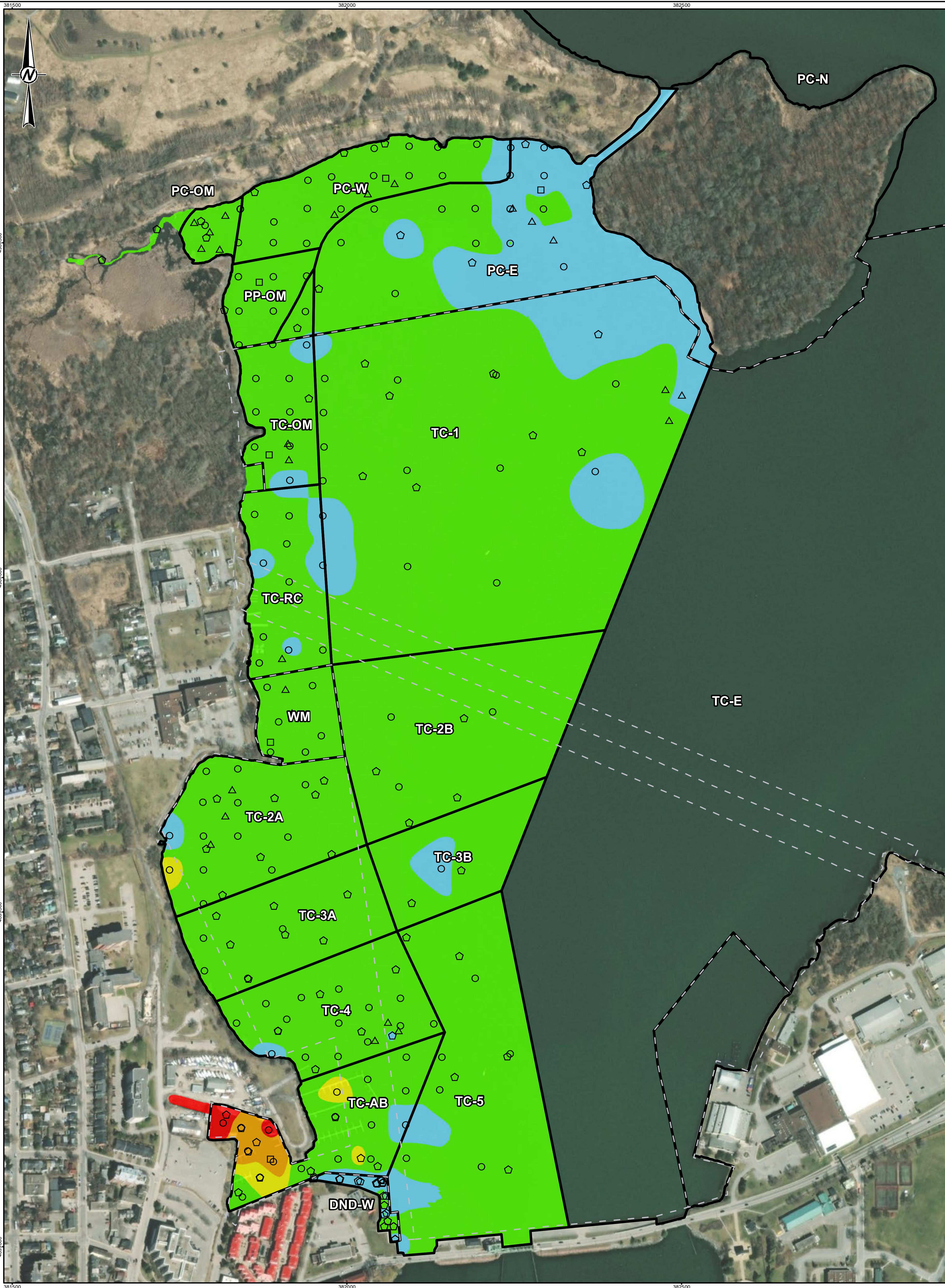

LEGEND

- MANAGEMENT UNIT
- 2011 - 2020 SEDIMENT SAMPLE LOCATION
- 2021 SEDIMENT SAMPLE LOCATION
- 2023 SEDIMENT SAMPLE LOCATION
- 2024 SEDIMENT SAMPLE LOCATION

COPPER

- 0 - 35.7 mg/kg (<ISQG)
- 35.7 - 110 mg/kg (<SEL)
- 110 - 197 mg.kg (<PEL)
- 197 - 619 mg/kg (<LAET)
- 619 - 829 mg/kg (<2LAET)

0 110 220

1:5,500 METERS

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

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PSPC

PROJECT

KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE

COPPER BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT

wsp

YYYY-MM-DD	2025-02-10
DESIGNED	SW
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	A-4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

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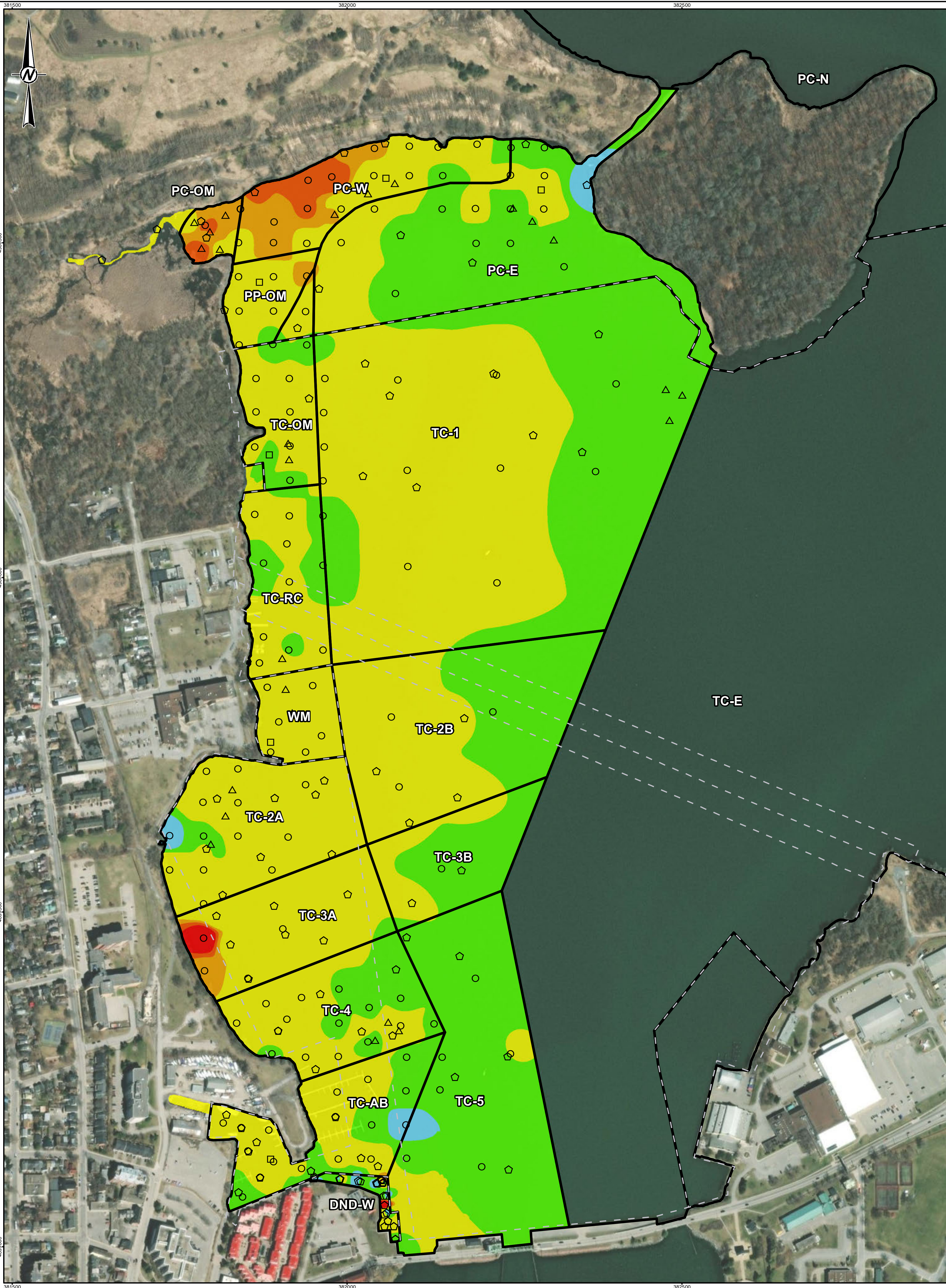

LEGEND

- MANAGEMENT UNIT
- 2011 - 2020 SEDIMENT SAMPLE LOCATION
- 2021 SEDIMENT SAMPLE LOCATION
- 2023 SEDIMENT SAMPLE LOCATION
- 2024 SEDIMENT SAMPLE LOCATION

LEAD

- 0 - 35 mg/kg (<ISQG)
- 35 - 91.3 mg/kg (<PEL)
- 91.3 - 250 mg/kg
- 250 - 335 mg/kg (<LAET)
- 335 - 431 mg/kg (<2LAET)
- >431 mg/kg

0 110 220

1:5,500 METERS

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

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PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
LEAD BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT

YYYY-MM-DD	2025-02-10
DESIGNED	SW
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	A-5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

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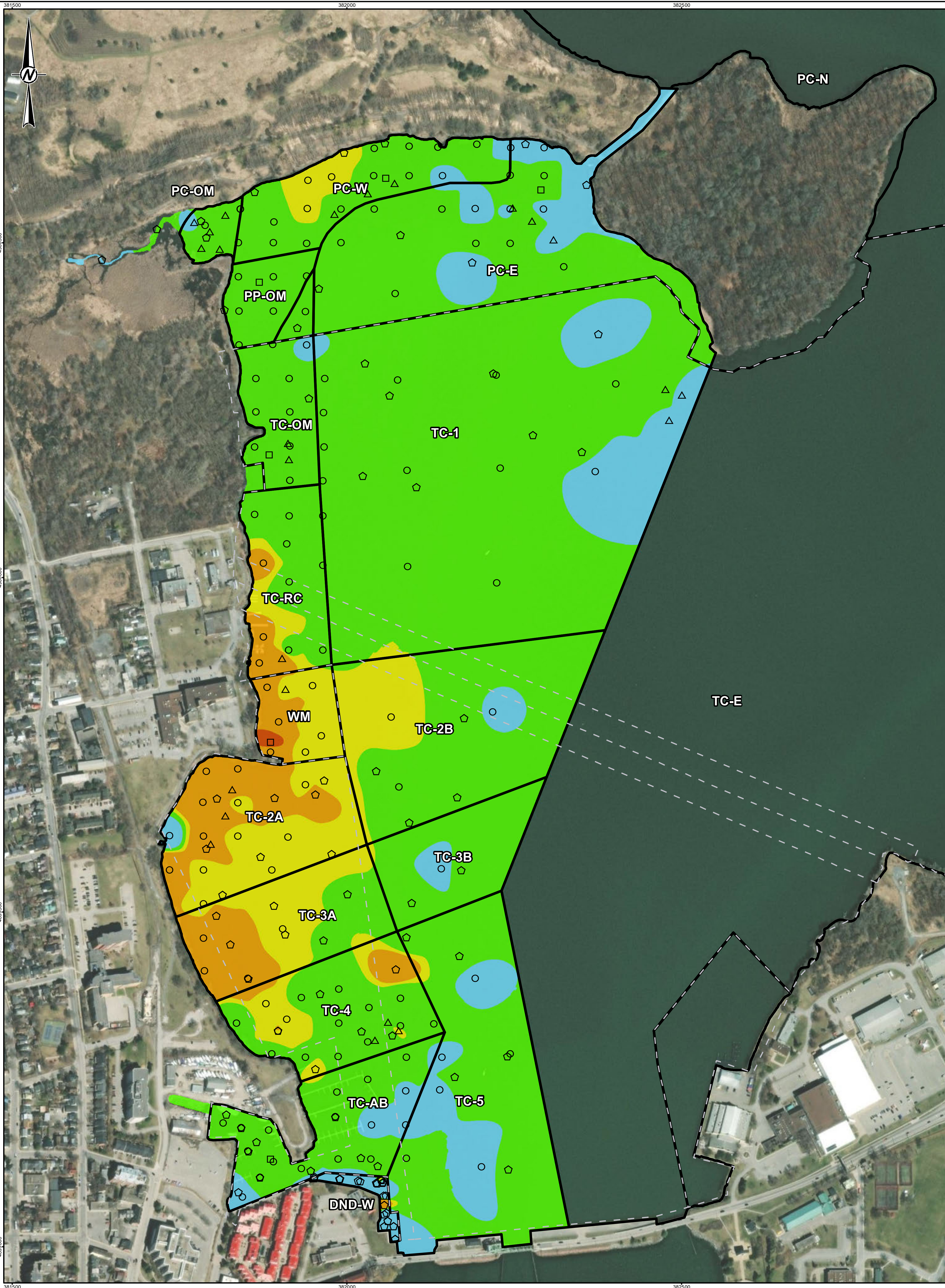

LEGEND

- MANAGEMENT UNIT
- 2011 - 2020 SEDIMENT SAMPLE LOCATION
- 2021 SEDIMENT SAMPLE LOCATION
- 2023 SEDIMENT SAMPLE LOCATION
- 2024 SEDIMENT SAMPLE LOCATION

MERCURY

- 0 - 0.17 mg/kg (<ISQG)
- 0.17 - 0.486 mg/kg (<PEL)
- 0.486 - 0.8 mg/kg (<LAET)
- 0.8 - 2 mg/kg (<SEL)
- 2 - 3.04 mg/kg (<2LAET)
- > 3.04 mg/kg

0 110 220

1:5,500 METERS

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

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PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
MERCURY BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT

YYYY-MM-DD	2025-02-10
DESIGNED	SW
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	A-6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

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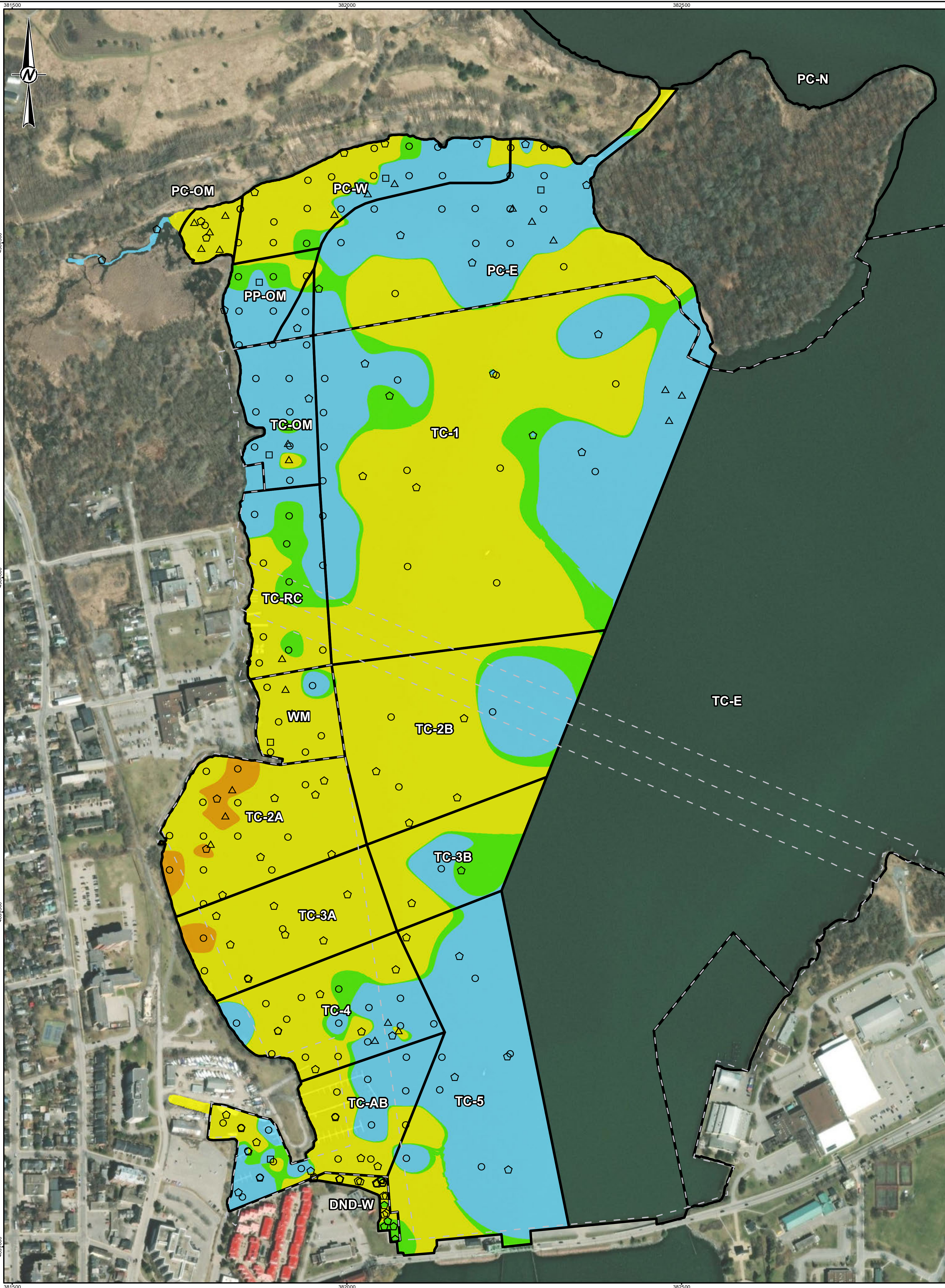

LEGEND

MANAGEMENT UNIT

2011 - 2020 SEDIMENT SAMPLE LOCATION

2021 SEDIMENT SAMPLE LOCATION

2023 SEDIMENT SAMPLE LOCATION

2024 SEDIMENT SAMPLE LOCATION

SILVER

- 0 - 0.5 mg/kg
- 0.5 - 0.545 mg/kg (<LAET)
- 0.545 - 2 mg/kg
- 2 - 3.5 mg/kg (<2LAET)
- 3.5 - 4.5 mg/kg
- > 4.5 mg/kg

0 110 220

1:5,500 METERS

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

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PROJECT

KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE

SILVER BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT

YYYY-MM-DD	2025-02-10
DESIGNED	SW
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	A-7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

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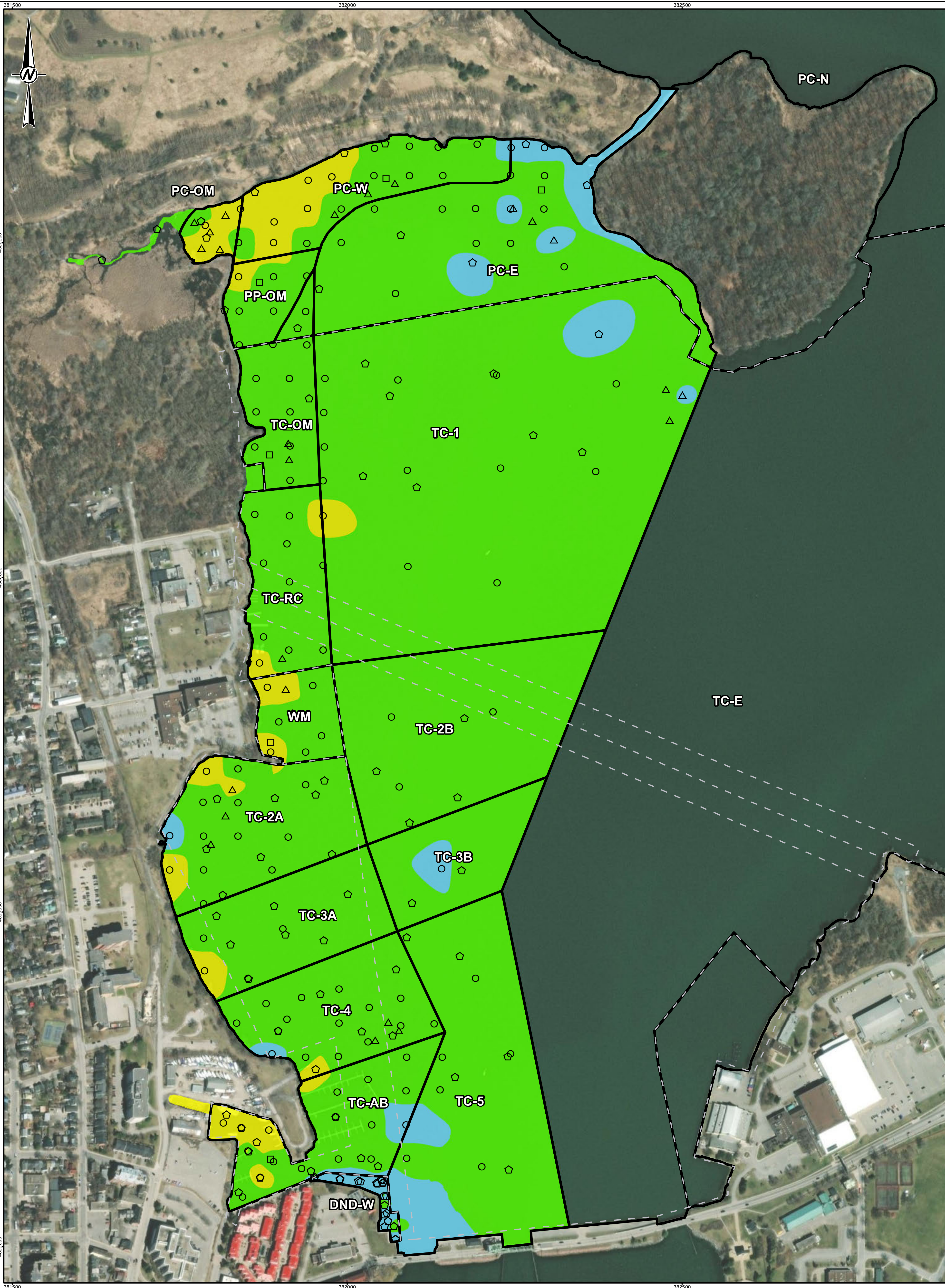

LEGEND

- MANAGEMENT UNIT
- 2011 - 2020 SEDIMENT SAMPLE LOCATION
- 2021 SEDIMENT SAMPLE LOCATION
- 2023 SEDIMENT SAMPLE LOCATION
- 2024 SEDIMENT SAMPLE LOCATION

ZINC

- 0 - 123 mg/kg (<ISQG)
- 123 - 315 mg/kg (<PEL)
- 315 - 683 mg/kg (<LAET)
- 683 - 820 mg/kg (<SEL)
- 820 - 1080 mg/kg (<2LAET)
- > 1080 mg/kg

0 110 220

1:5,500 METERS

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

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PSPC

PROJECT

KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE

ZINC BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT

wsp

YYYY-MM-DD	2025-02-10
DESIGNED	SW
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	A-8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

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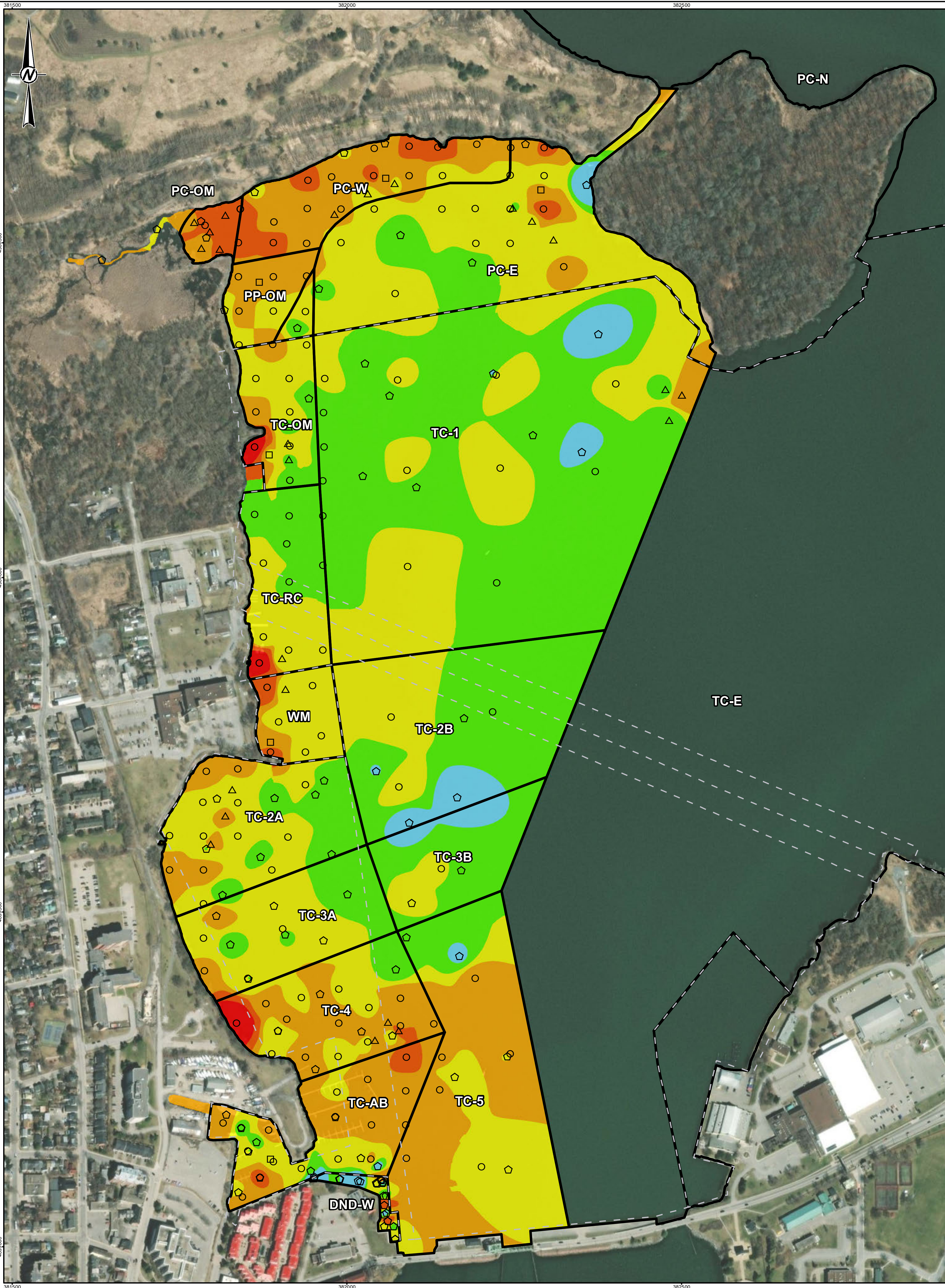

LEGEND

- MANAGEMENT UNIT
- 2011 - 2020 SEDIMENT SAMPLE LOCATION
- 2021 SEDIMENT SAMPLE LOCATION
- 2023 SEDIMENT SAMPLE LOCATION
- 2024 SEDIMENT SAMPLE LOCATION

TOTAL PAH

- 0 - 1.61 mg/kg (<TEC)
- 1.61 - 4 mg/kg (<LEL)
- 4 - 10 mg/kg
- 10 - 22.8 mg/kg (<PEC)
- 22.8 - 100 mg/kg
- 100 - 750 mg/kg

0 110 220

1:5,500 METERS

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
TOTAL PAH BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT: WSP

YYYY-MM-DD	2025-02-10
DESIGNED	SW
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	A-9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm

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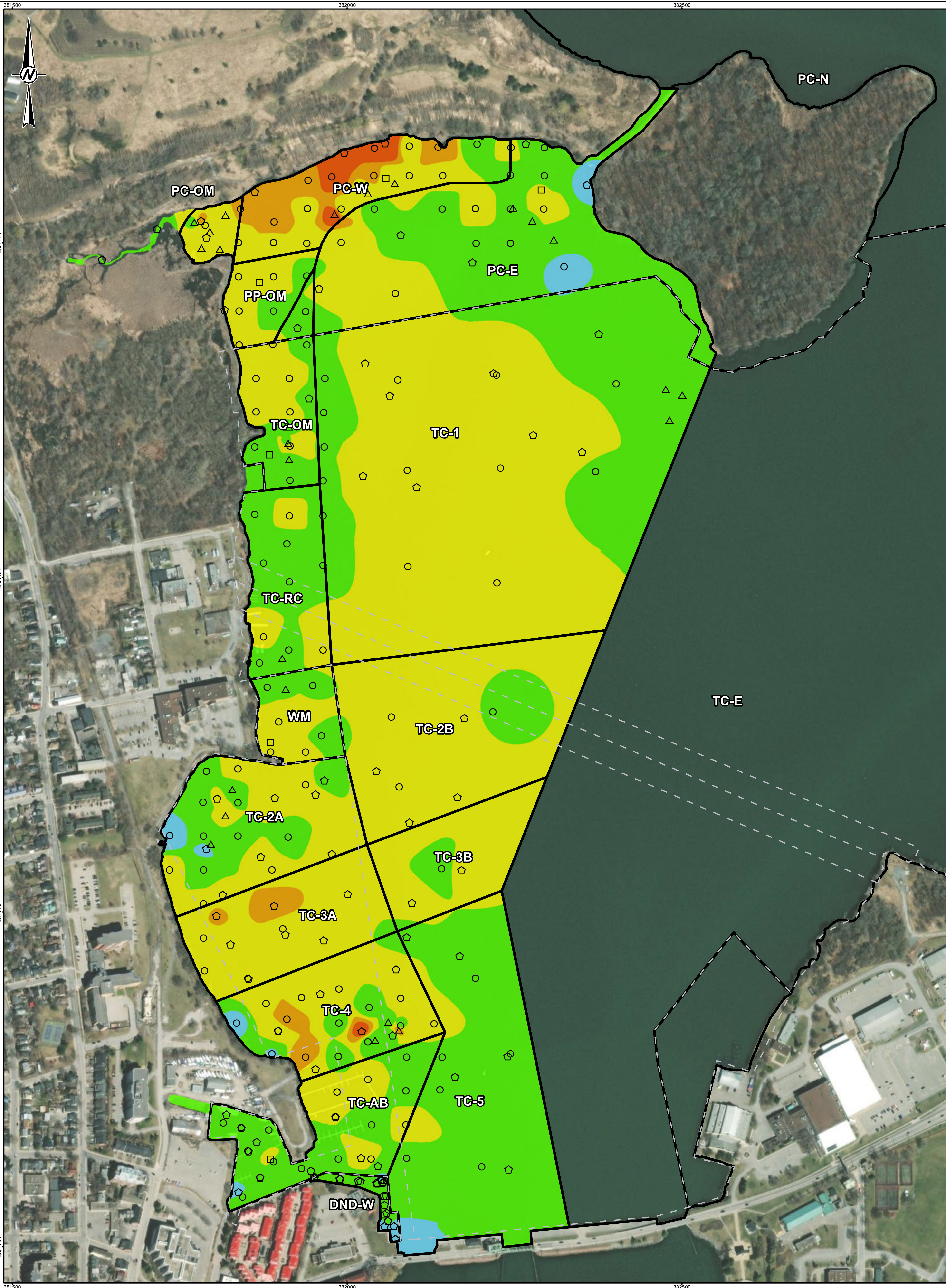

LEGEND

- MANAGEMENT UNIT
- 2011 - 2020 SEDIMENT SAMPLE LOCATION
- 2021 SEDIMENT SAMPLE LOCATION
- 2023 SEDIMENT SAMPLE LOCATION
- 2024 SEDIMENT SAMPLE LOCATION

TOTAL PCB

- 0 - 0.07 mg/kg (<LEL)
- 0.07 - 0.3 mg/kg (<PEL)
- 0.3 - 0.6 mg/kg (<LAET)
- 0.6 - 1 mg/kg
- 1 - 5.3 mg/kg (<SEL)
- > 5.3 mg/kg

0 110 220

1:5,500 METERS

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
TOTAL PCB BULK SEDIMENT CHEMISTRY AND INVERSE WEIGHTED DISTANCE SURFACE (2011 - 2024)

CONSULTANT		
wsp	YYYY-MM-DD	2025-02-10
	DESIGNED	SW
	PREPARED	JP
	REVIEWED	
	APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	A-10

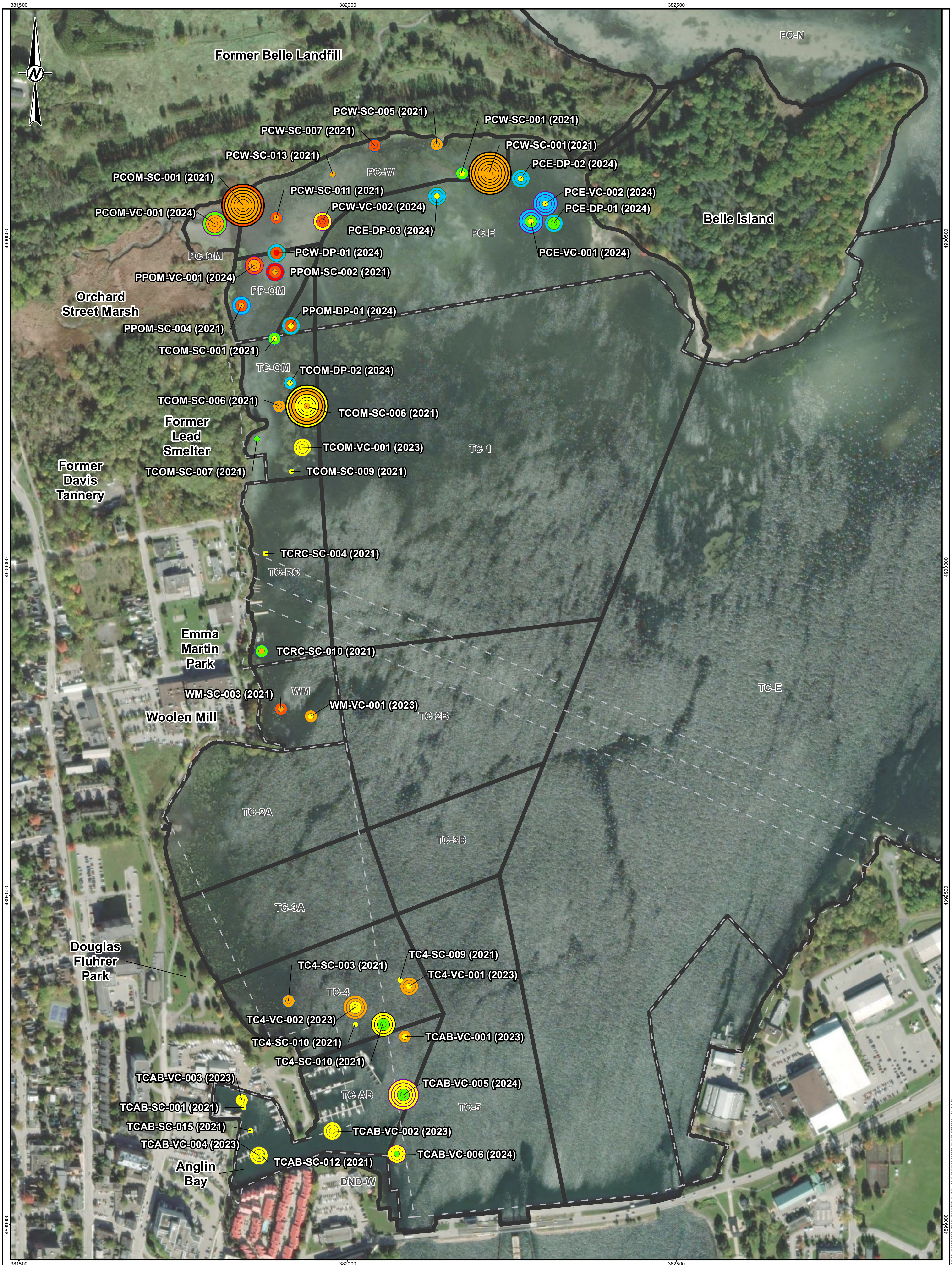
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

APPENDIX B

Subsurface Sediment Figures

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_B01_KIH_Antimony_Core_Y2W.mxd



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

LEGEND

FEDERAL WATER LOT BOUNDARY

MANAGEMENT UNIT

Antimony

- 0 - 0.2 mg/kg
- 0.2 - 0.6 mg/kg (<LAET)
- 0.6 - 1.9 mg/kg (<2LAET)
- 1.9 - 6 mg/kg
- 6 - 20 mg/kg
- > 20 mg/kg

2021 ORIGINAL SURFACE CORE (SC) LOCATION
- 10-30 cm
- 30-50 cm
- 50-80 cm

2021 ADDITIONAL SC LOCATION
- 0-5 cm
- 5-10 cm
- 10-15 cm
- 15-20 cm
- 20-25 cm
- 25-30 cm

2023 VIBRACORE (VC) LOCATION
- 0-10 cm
- 10-30 cm
- 30-50 cm
- >50 cm

2024 VC LOCATION
- 0-10 cm
- 10-25 cm
- 25-50 cm
- 50-75 cm
- >75 cm

2024 GEOPROBE (DP) LOCATION
- Sample Interval 1
- Sample Interval 2
- Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals.

0 120 240

1:5,500 METERS

NOTE(S)

DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

REFERENCE(S)

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
ANTIMONY SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

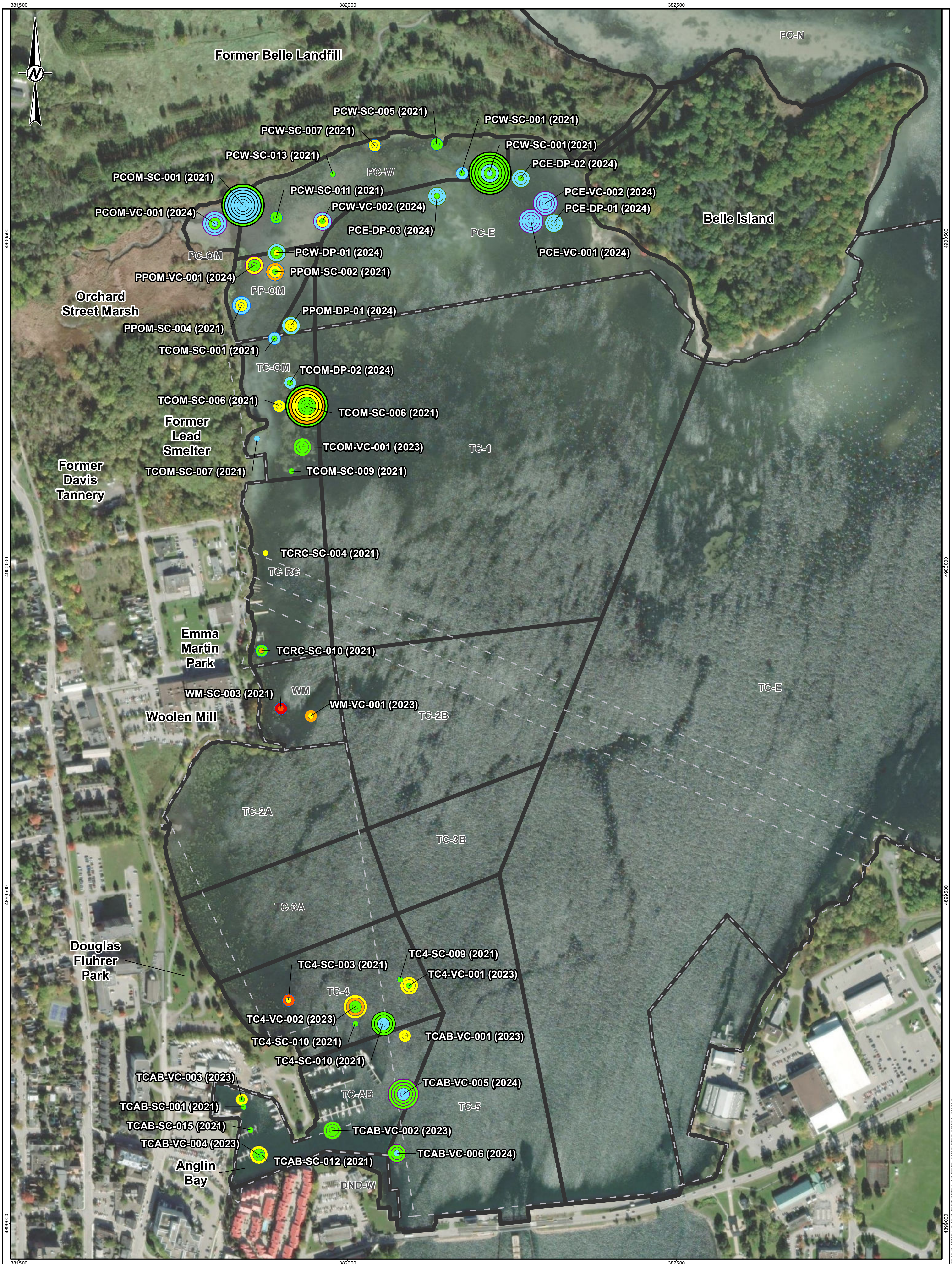
CONSULTANT

wsp

YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	B-1

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_B02_KIH_Arsenic_Core_Y2W.mxd



LEGEND

FEDERAL WATER LOT BOUNDARY
MANAGEMENT UNIT

Arsenic

- 0 - 5.9 mg/kg (<ISQG)
- 5.9 - 17 mg/kg (<PEL)
- 17 - 33 mg/kg (<SEL)
- 33 - 50.9 mg/kg (<2LAET)
- 50.9 - 100 mg/kg
- > 100 mg/kg

2021 ORIGINAL SURFACE CORE (SC) LOCATION
10-30 cm
30-50 cm
50-80 cm

2021 ADDITIONAL SC LOCATION
0-5 cm
5-10 cm
10-15 cm
15-20 cm
20-25 cm
25-30 cm
30-50 cm

2023 VIBRACORE (VC) LOCATION
0-10 cm
10-30 cm
30-50 cm
>50 cm

2024 VC LOCATION
0-10 cm
10-25 cm
25-50 cm
50-75 cm
>75 cm

2024 GEOPROBE (DP) LOCATION
Sample Interval 1
Sample Interval 2
Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals.

0 120 240
1:5,500 METERS

NOTE(S)

DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
ARSENIC SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

CONSULTANT

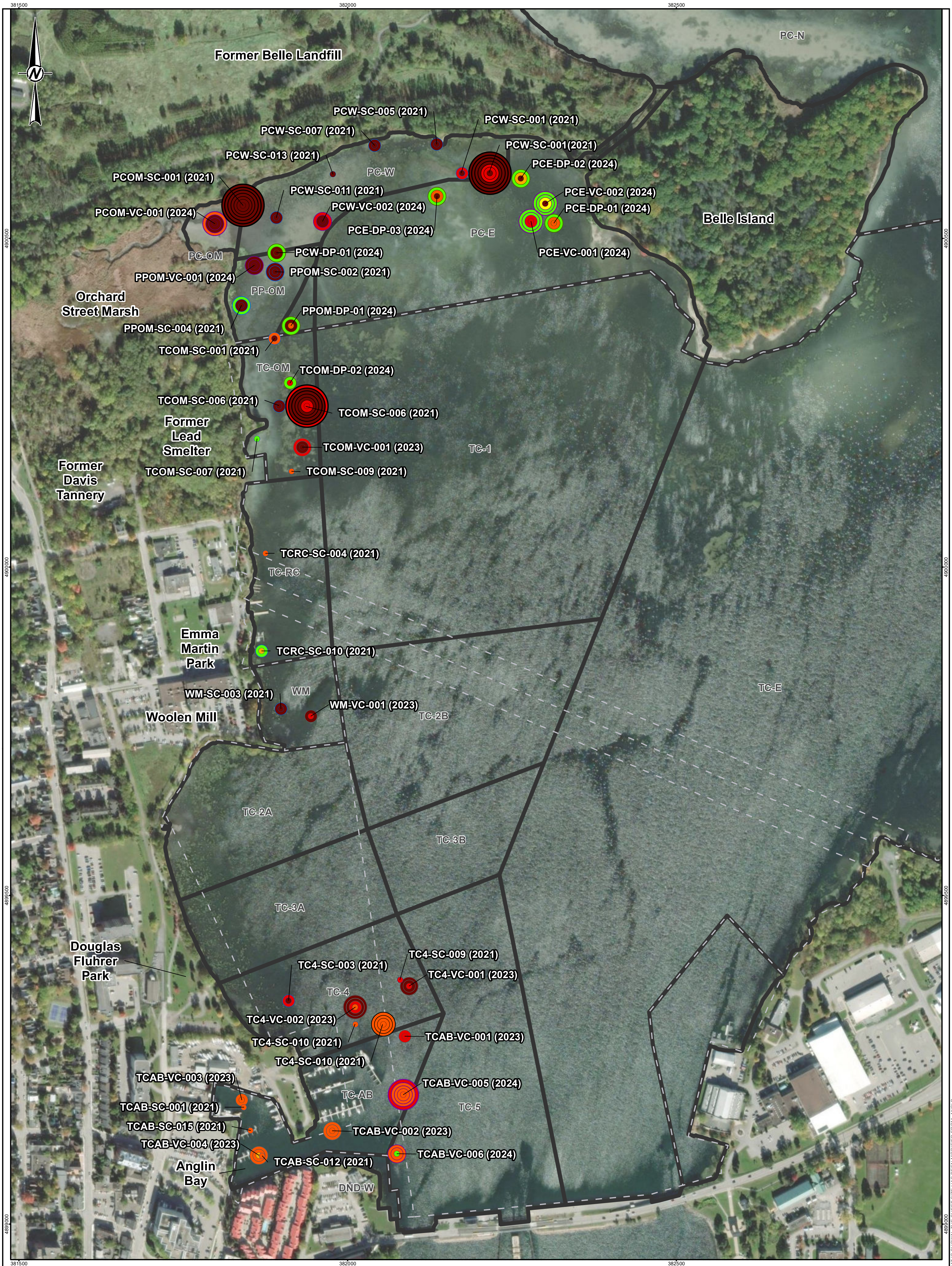
wsp

YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	B-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_B03_KIH_Chromium_Core_Y2W.mxd



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

LEGEND

FEDERAL WATER LOT BOUNDARY

MANAGEMENT UNIT

CHROMIUM

- 0 - 37.3 mg/kg (<ISQG)
- 37.3 - 90 mg/kg (<PEL)
- 90 - 110 mg/kg (<SEL)
- 110 - 133 mg/kg (<2LAET)
- 133 - 500 mg/kg
- 500 - 1,000 mg/kg
- > 1,000 mg/kg

2021 ORIGINAL SURFACE CORE (SC) LOCATION
- 10-30 cm
- 30-50 cm
- 50-80 cm

2021 ADDITIONAL SC LOCATION
- 0-5 cm
- 5-10 cm
- 10-15 cm
- 15-20 cm
- 20-25 cm
- 25-30 cm
- 30-50 cm

2023 VIBRACORE (VC) LOCATION
- 0-10 cm
- 10-30 cm
- 30-50 cm
- >50 cm

2024 VC LOCATION
- 0-10 cm
- 10-25 cm
- 25-50 cm
- 50-75 cm
- >75 cm

2024 GEOPROBE (DP) LOCATION
- Sample Interval 1
- Sample Interval 2
- Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals.

FOR DISCUSSION PURPOSES ONLY

DRAFT

0 120 240

1:5,500 METERS

NOTE(S)

DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
CHROMIUM SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

CONSULTANT

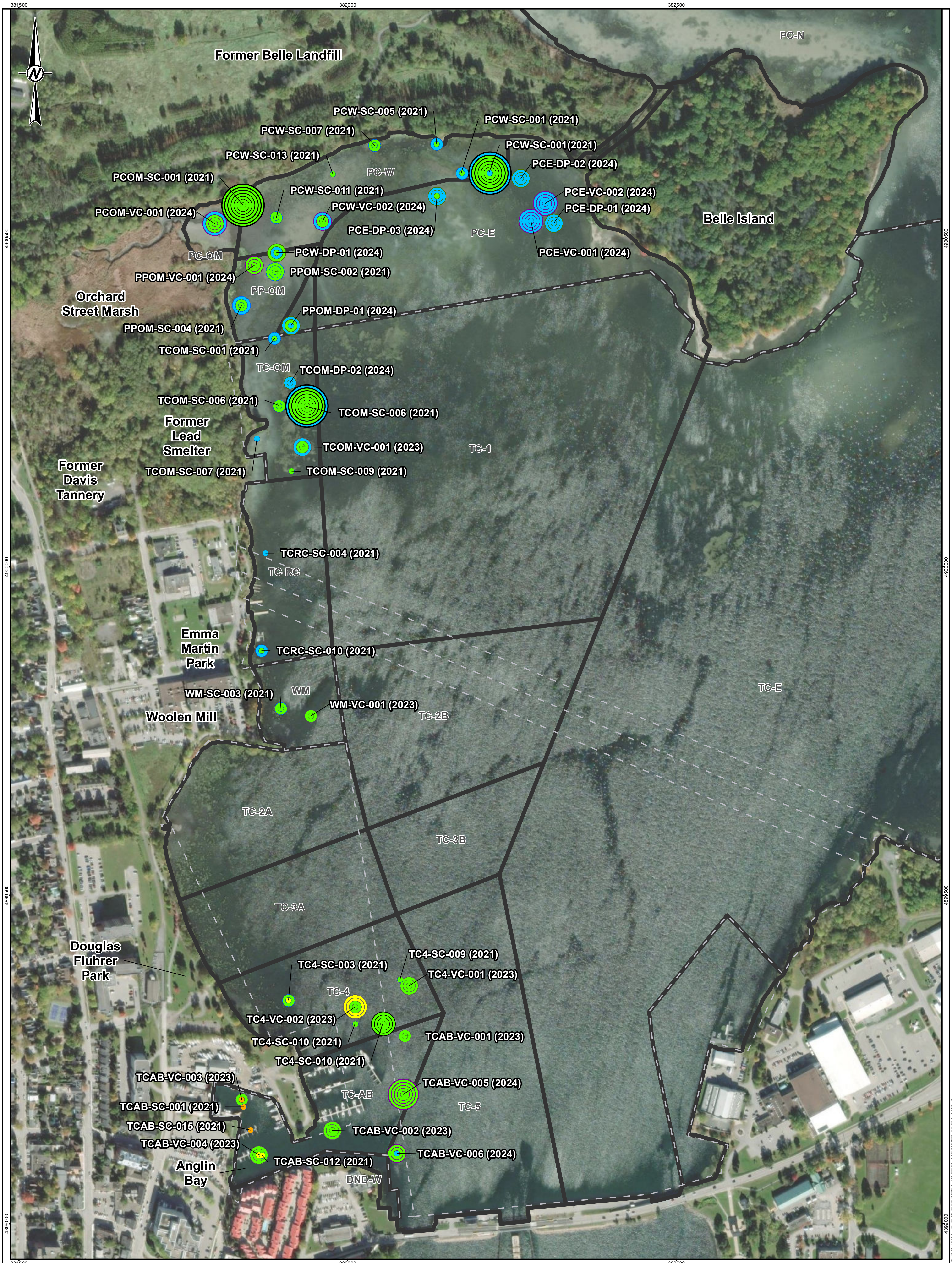
wsp

YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	B-3

25mm

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_B04_KIH_Copper_Core_Y2W.mxd



LEGEND

- FEDERAL WATER LOT BOUNDARY
- MANAGEMENT UNIT

Copper

- 0 - 35.7 mg/kg (<ISQG)
- 35.7 - 110 mg/kg (<SEL)
- 110 - 197 mg/kg (<PEL)
- 197 - 619 mg/kg (<LAET)
- 619 - 829 mg/kg (<2LAET)

2021 ORIGINAL SURFACE CORE (SC) LOCATION
10-30 cm
30-50 cm
50-80 cm

2021 ADDITIONAL SC LOCATION
0-5 cm
5-10 cm
10-15 cm
15-20 cm
20-25 cm
25-30 cm
30-50 cm

2023 VIBRACORE (VC) LOCATION
0-10 cm
10-30 cm
30-50 cm
>50 cm

2024 VC LOCATION
0-10 cm
10-25 cm
25-50 cm
50-75 cm
>75 cm

2024 GEOPROBE (DP) LOCATION
Sample Interval 1
Sample Interval 2
Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals.

0 120 240
1:5,500 METERS

NOTE(S)

DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
COPPER SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

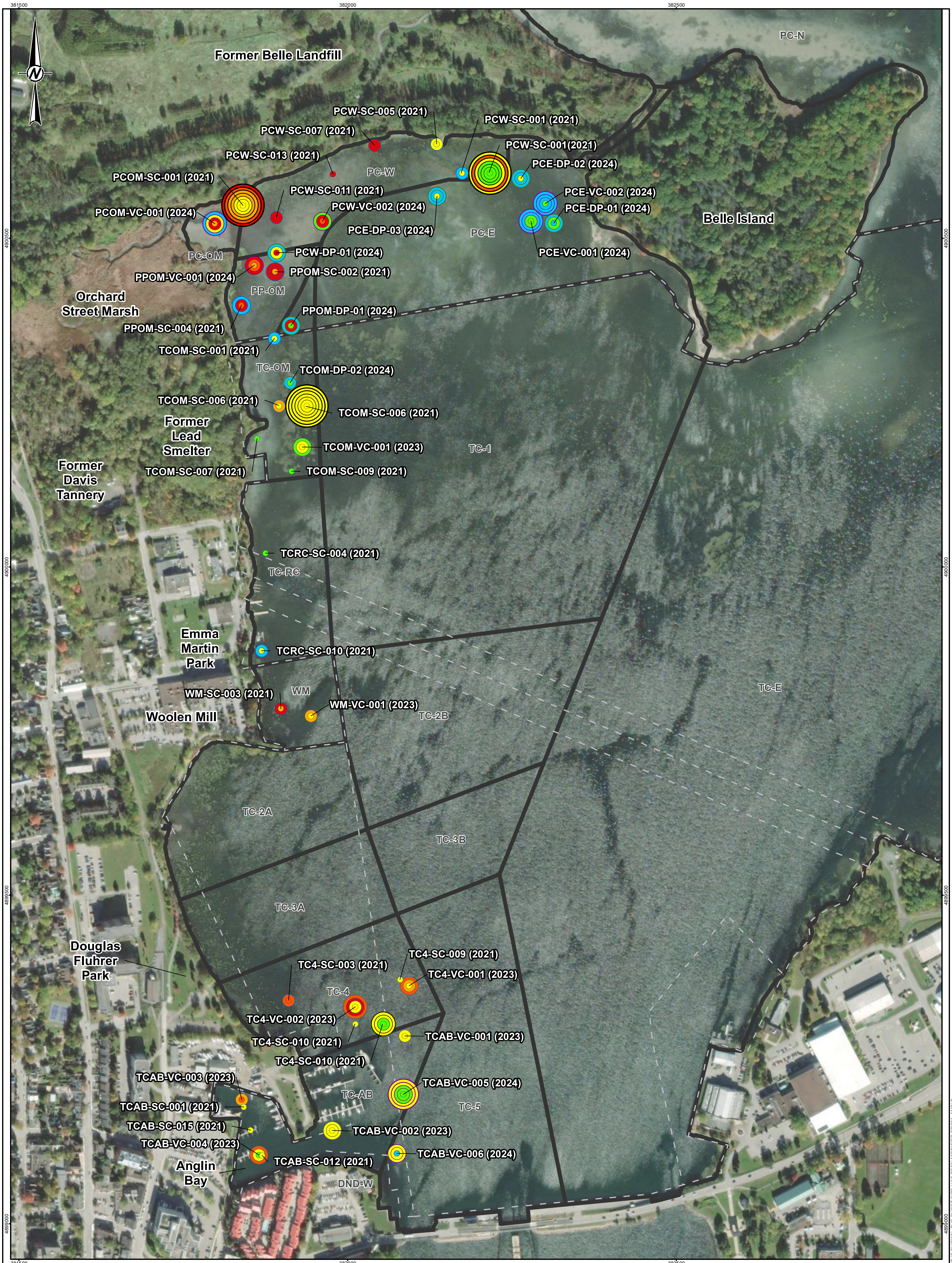
CONSULTANT

YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	**B-4**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_B05_KIH_Lead_Y2W.mxd



LEGEND

FEDERAL WATER LOT BOUNDARY

MANAGEMENT UNIT

Lead

- 0 - 35 mg/kg (<ISQG)
- 35 - 91.3 mg/kg (<PEL)
- 91.3 - 250 mg/kg
- 250 - 335 mg/kg (<LAET)
- 335 - 431 mg/kg (<2LAET)
- >431 mg/kg

2021 ORIGINAL SURFACE CORE (SC) LOCATION
10-30 cm
30-50 cm
50-80 cm

2021 ADDITIONAL SC LOCATION
0-5 cm
5-10 cm
10-15 cm
15-20 cm
20-25 cm
25-30 cm
30-50 cm

2023 VIBRACORE (VC) LOCATION
0-10 cm
10-30 cm
30-50 cm
>50 cm

2024 VC LOCATION
0-10 cm
10-25 cm
25-50 cm
50-75 cm
>75 cm

2024 GEOPROBE (DP) LOCATION
Sample Interval 1
Sample Interval 2
Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals.

0 120 240
1:5,500 METERS

NOTE(S)

DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
LEAD SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

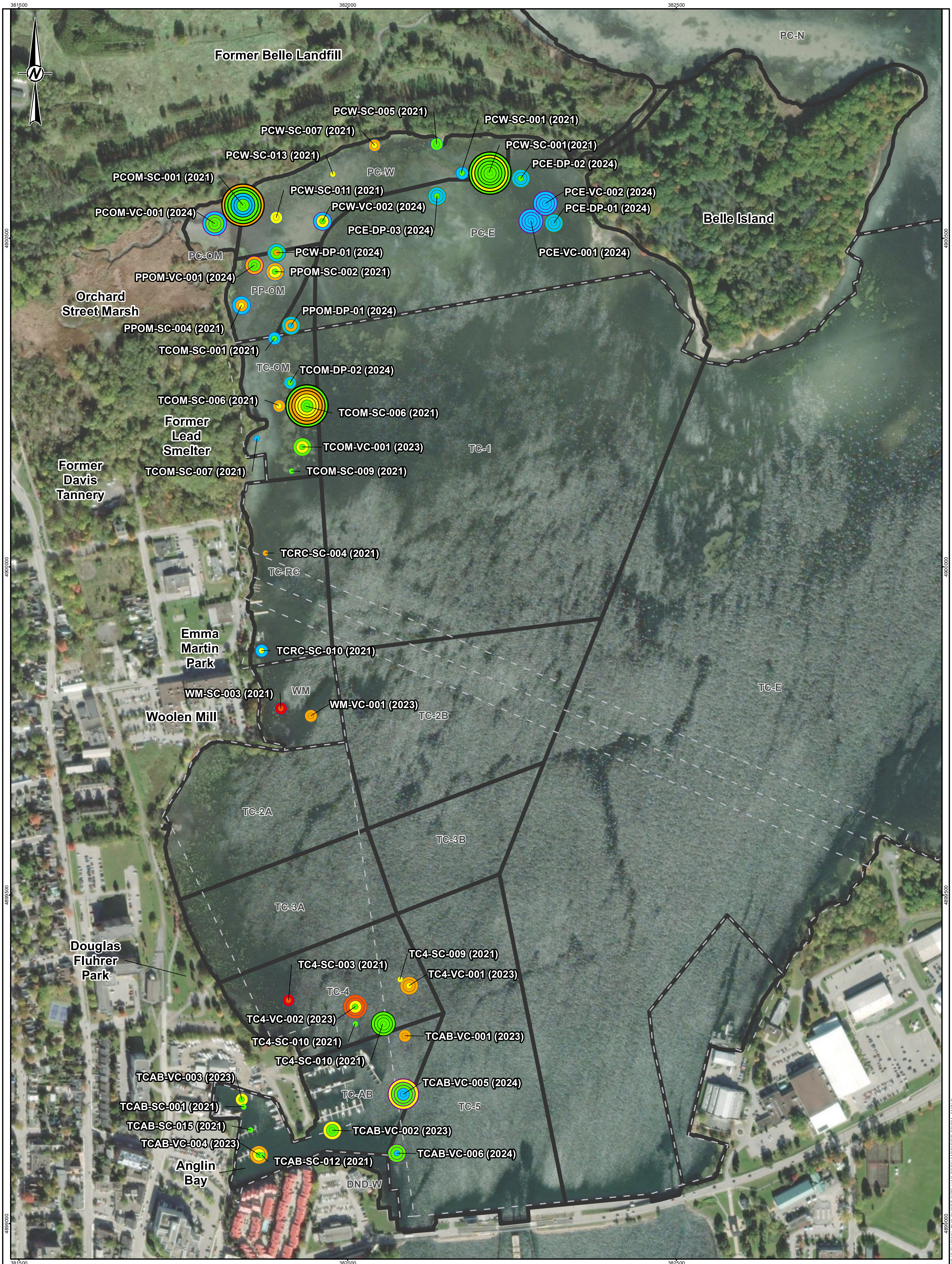
CONSULTANT

YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	B-5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_B06_KIH_Mercury_Y2W.mxd



LEGEND

FEDERAL WATER LOT BOUNDARY

MANAGEMENT UNIT

Mercury

- 0 - 0.17 mg/kg (<ISQG)
- 0.17 - 0.486 mg/kg (<PEL)
- 0.486 - 0.8 mg/kg (<LAET)
- 0.8 - 2 mg/kg (<SEL)
- 2 - 3.04 mg/kg (<2LAET)
- >3.04 mg/kg

2021 ORIGINAL SURFACE CORE (SC) LOCATION
- 10-30 cm
- 30-50 cm
- 50-80 cm

2021 ADDITIONAL SC LOCATION
- 0-5 cm
- 5-10 cm
- 10-15 cm
- 15-20 cm
- 20-25 cm
- 25-30 cm
- 30-50 cm

2023 VIBRACORE (VC) LOCATION
- 0-10 cm
- 10-30 cm
- 30-50 cm
- >50 cm

2024 VC LOCATION
- 0-10 cm
- 10-25 cm
- 25-50 cm
- 50-75 cm
- >75 cm

2024 GEOPROBE (DP) LOCATION
- Sample Interval 1
- Sample Interval 2
- Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals.

0 120 240

1:5,500 METERS

NOTE(S)

DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
MERCURY SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

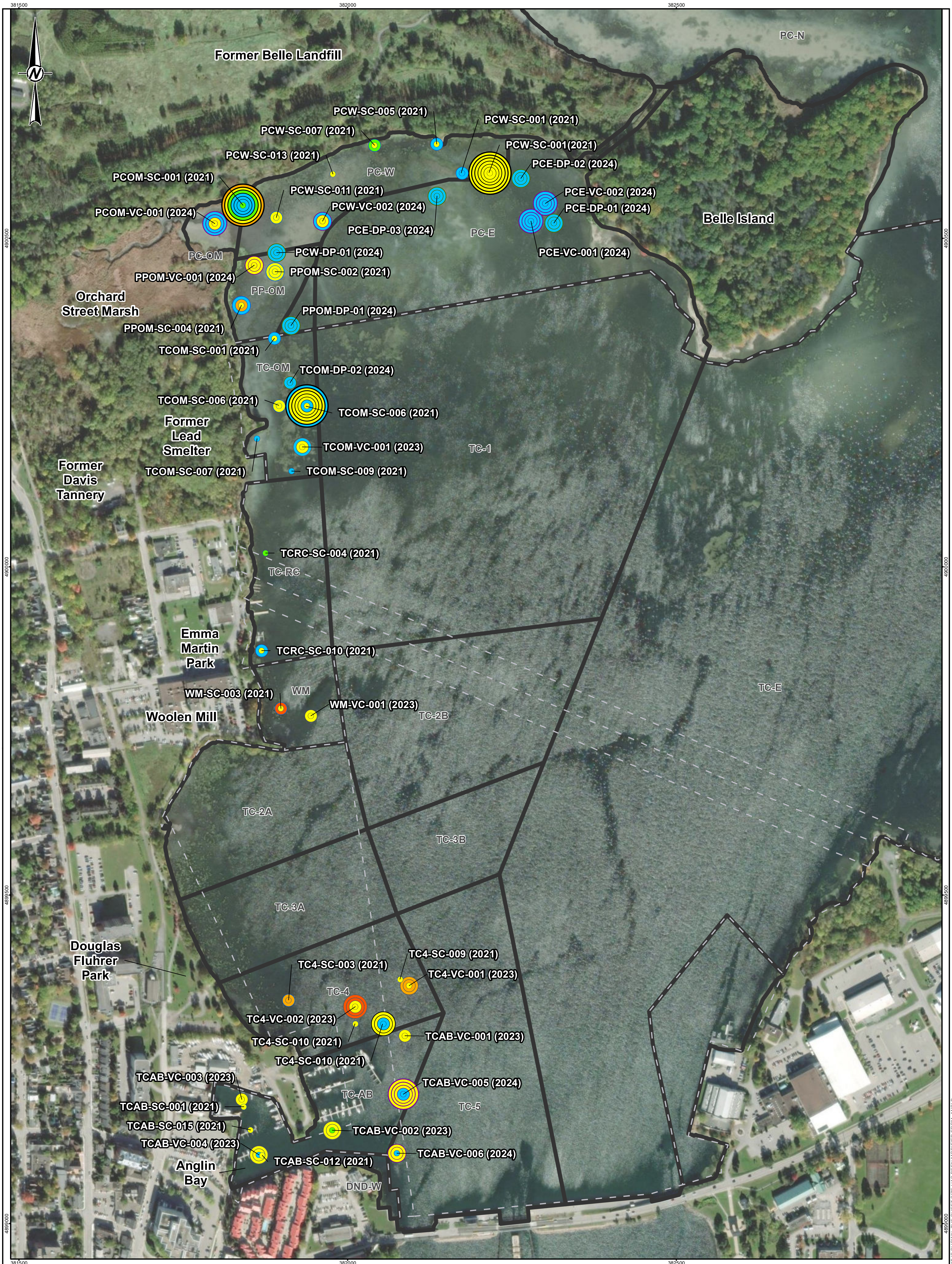
CONSULTANT

YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	B-6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm 0



LEGEND

FEDERAL WATER LOT BOUNDARY

MANAGEMENT UNIT

Silver

- 0 - 0.5 mg/kg
- 0.5 - 0.545 mg/kg (<LAET)
- 0.545 - 2 mg/kg
- 2 - 3.5 mg/kg (<2LAET)
- 3.5 - 4.5 mg/kg
- > 4.5 mg/kg

2021 ORIGINAL SURFACE CORE (SC) LOCATION
10-30 cm
30-50 cm
50-80 cm

2021 ADDITIONAL SC LOCATION
0-5 cm
5-10 cm
10-15 cm
15-20 cm
20-25 cm
25-30 cm
30-50 cm

2023 VIBRACORE (VC) LOCATION
0-10 cm
10-30 cm
30-50 cm
>50 cm

2024 VC LOCATION
0-10 cm
10-25 cm
25-50 cm
50-75 cm
>75 cm

2024 GEOPROBE (DP) LOCATION
Sample Interval 1
Sample Interval 2
Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals.

0 120 240

1:5,500 METERS

NOTE(S)

DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
SILVER SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

CONSULTANT

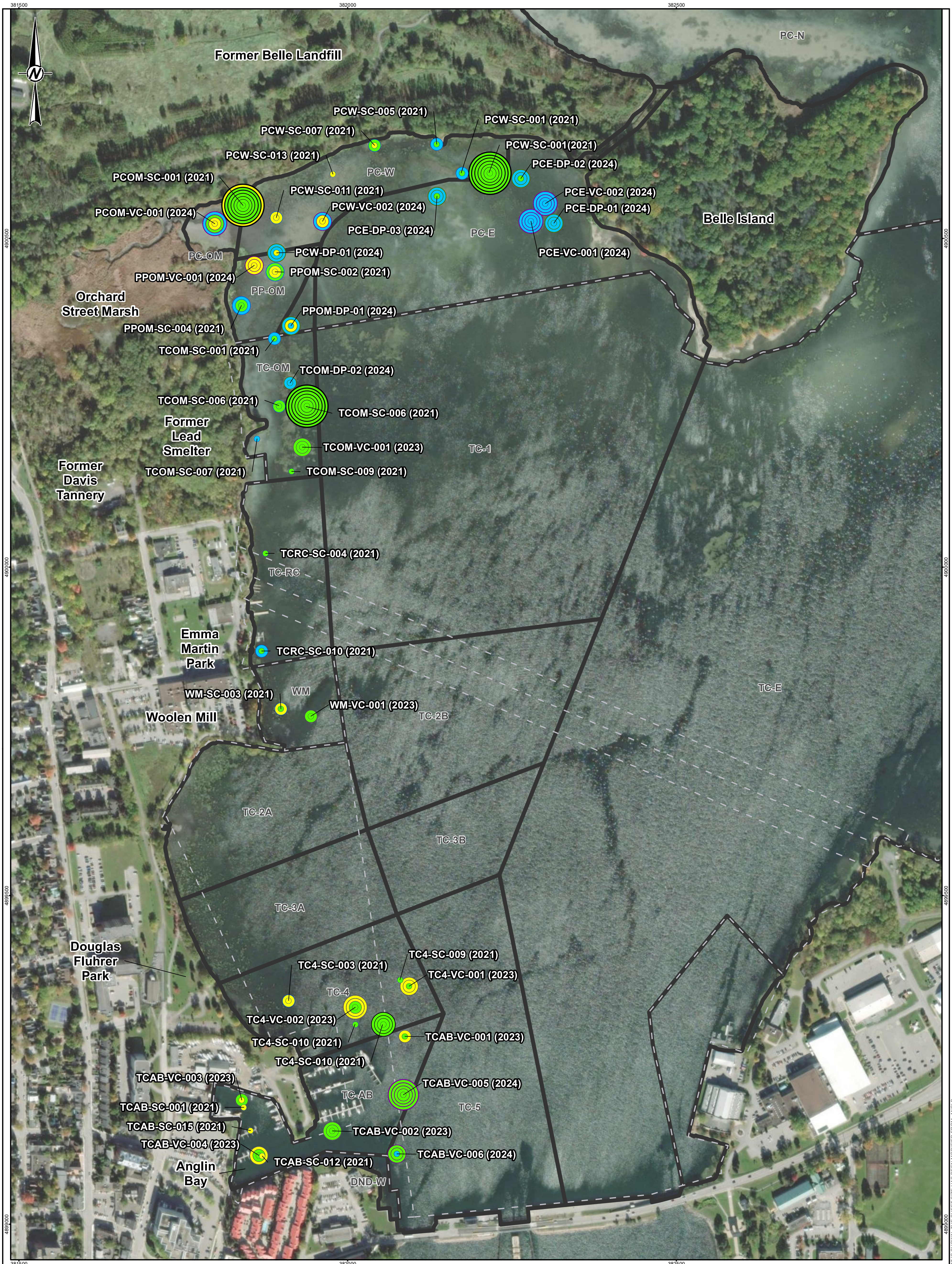
YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	B-7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_B08_KIH_Zinc_Y2W.mxd



LEGEND

FEDERAL WATER LOT BOUNDARY

MANAGEMENT UNIT

Zinc

- 0 - 123 mg/kg (<ISQG)
- 123 - 315 mg/kg (<PEL)
- 315 - 683 mg/kg (<LAET)
- 683 - 820 mg/kg (<SEL)
- 820 - 1080 mg/kg (<2LAET)
- > 1080 mg/kg

2021 ORIGINAL SURFACE CORE (SC) LOCATION
- 10-30 cm
- 30-50 cm
- 50-80 cm

2021 ADDITIONAL SC LOCATION
- 0-5 cm
- 5-10 cm
- 10-15 cm
- 15-20 cm
- 20-25 cm
- 25-30 cm
- 30-50 cm

2023 VIBRACORE (VC) LOCATION
- 0-10 cm
- 10-30 cm
- 30-50 cm
- >50 cm

2024 VC LOCATION
- 0-10 cm
- 10-25 cm
- 25-50 cm
- 50-75 cm
- >75 cm

2024 GEOPROBE (DP) LOCATION
- Sample Interval 1
- Sample Interval 2
- Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals.

0 120 240

1:5,500 METERS

NOTE(S)

DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
ZINC SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

CONSULTANT

wsp

YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

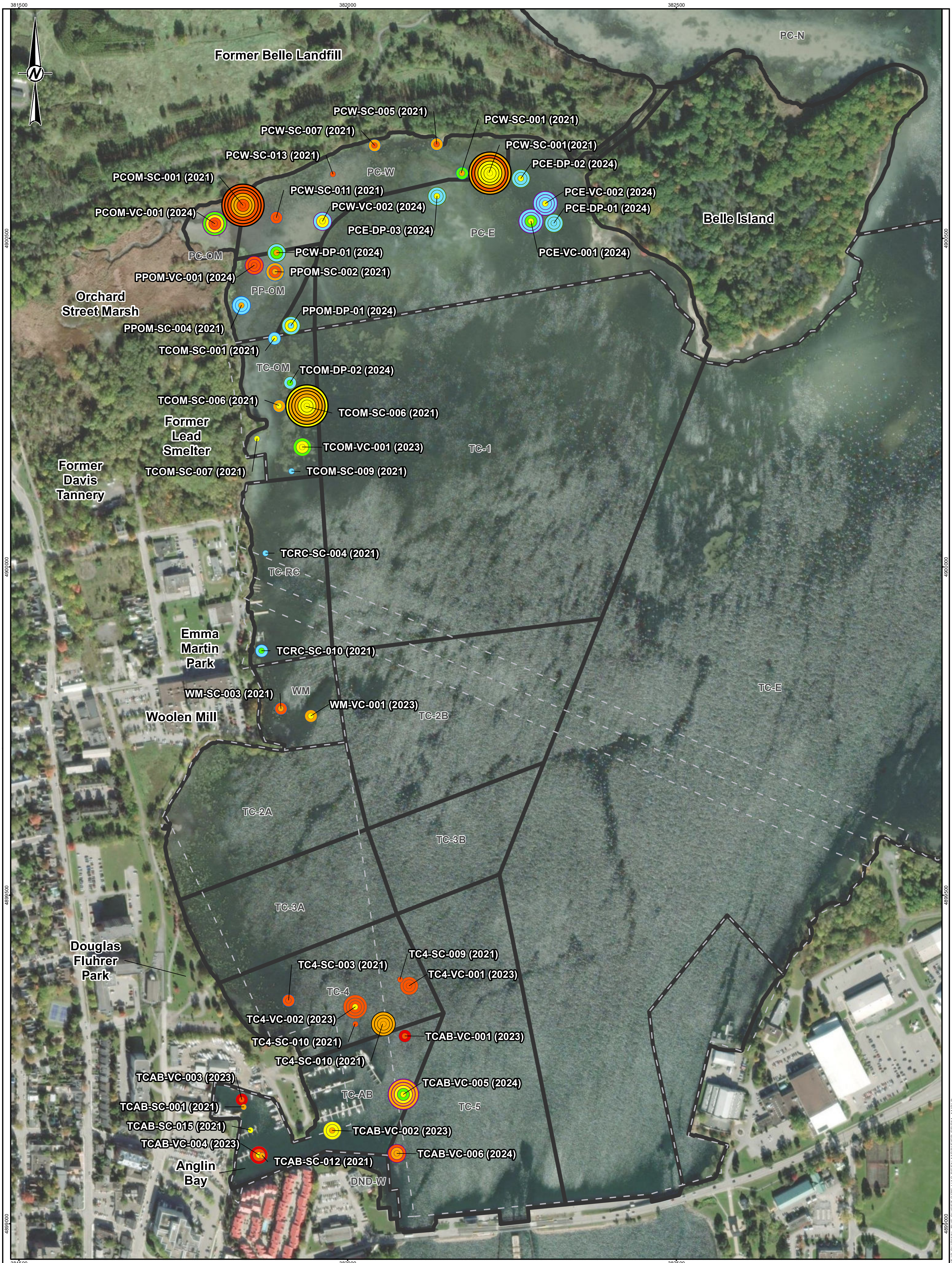
PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	B-8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_B09_KIH_Total_PAH_Y2W.mxd



LEGEND

FEDERAL WATER LOT BOUNDARY

MANAGEMENT UNIT

Total_PAHs

- 0 - 1.61 mg/kg (<TEC)
- 1.61 - 4 mg/kg (<LEL)
- 4 - 10 mg/kg
- 10 - 22.8 mg/kg (<PEC)
- 22.8 - 100 mg/kg
- 100 - 750 mg/kg

2021 ORIGINAL SURFACE CORE (SC) LOCATION: 10-30 cm; 30-50 cm; 50-80 cm

2021 ADDITIONAL SC LOCATION: 0-5 cm; 5-10 cm; 10-15 cm; 15-20 cm; 20-25 cm; 25-30 cm

2023 VIBRACORE (VC) LOCATION: 0-10 cm; 10-30 cm; 30-50 cm; >50 cm

2024 VC LOCATION: 0-10 cm; 10-25 cm; 25-50 cm; 50-75 cm; >75 cm

2024 GEOPROBE (DP) LOCATION: Sample Interval 1; Sample Interval 2; Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals

0 120 240

1:5,500 METERS

NOTE(S)

DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
TOTAL PAH SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

CONSULTANT

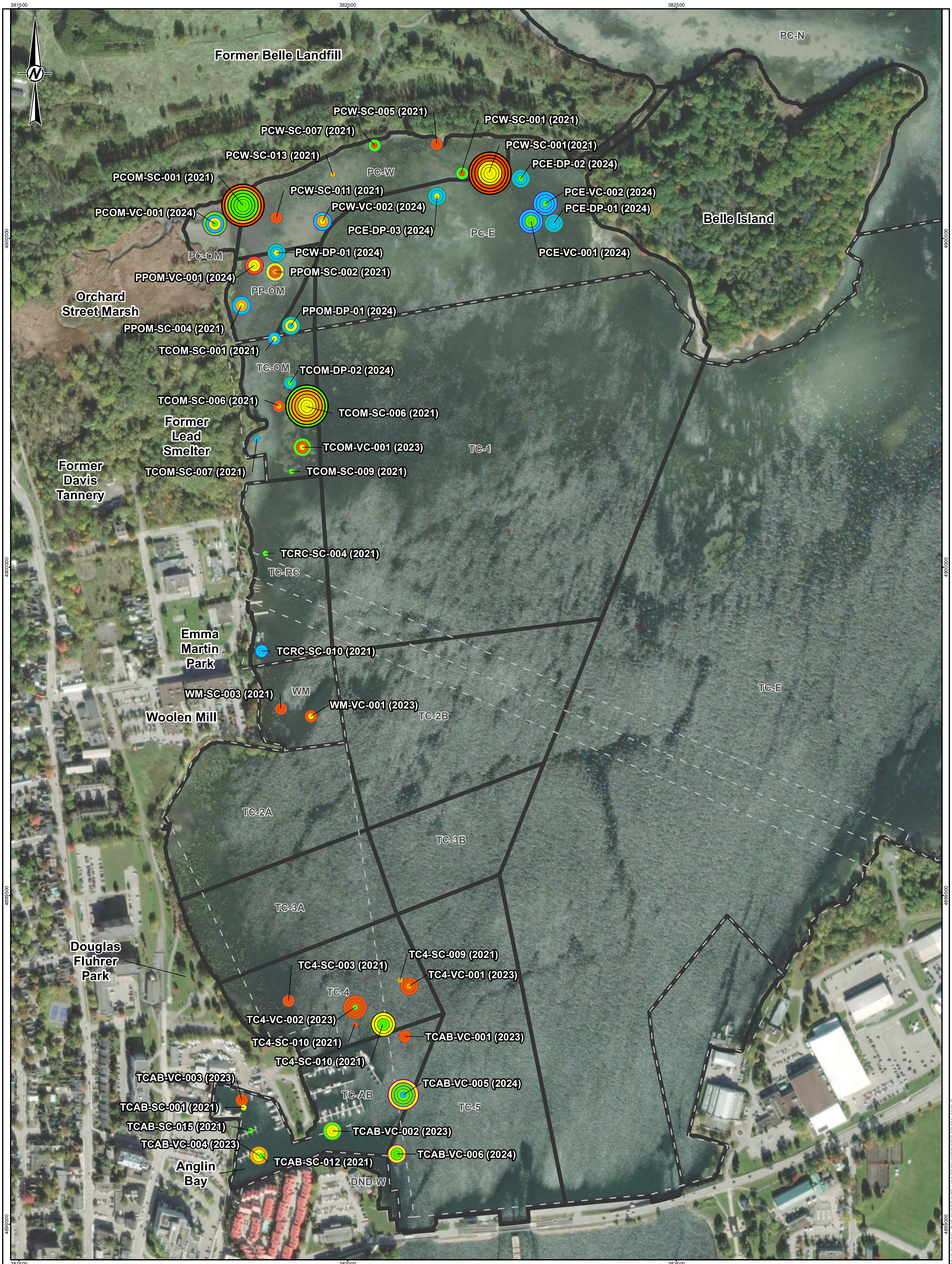
YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	B-9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

PATH: W:\Client\PWGSC\Kingston_Inner_Harbour\99_PROJECTS\CA0018344_0750\02_PRODUCTION\MXD\Report\CA0018344_0750_3000_B10_KIH_Total_PCB_Y2W.mxd



LEGEND

FEDERAL WATER LOT BOUNDARY

MANAGEMENT UNIT

TOTAL PCB

- 0 - 0.07 mg/kg (<LEL)
- 0.07 - 0.3 mg/kg (<PEL)
- 0.3 - 0.6 mg/kg (<LAET)
- 0.6 - 1 mg/kg
- 1 - 5.3 mg/kg (<SEL)
- > 5.3 mg/kg

2021 ORIGINAL SURFACE CORE (SC) LOCATION
10-30 cm
30-50 cm
50-80 cm

2021 ADDITIONAL SC LOCATION
0-5 cm
5-10 cm
10-15 cm
15-20 cm
20-25 cm
25-30 cm
30-50 cm

2023 VIBRACORE (VC) LOCATION
0-10 cm
10-30 cm
30-50 cm
>50 cm

2024 VC LOCATION
0-10 cm
10-25 cm
25-50 cm
50-75 cm
>75 cm

2024 GEOPROBE (DP) LOCATION
Sample Interval 1
Sample Interval 2
Sample Interval 3

Sample intervals were not conducted at specific depth intervals. Refer to Data Summary - Geotechnical Drilling (2024) for depth intervals.

0 120 240
1:5,500 METERS

NOTE(S)
DEPTHS STATED ARE GENERAL TARGETED HORIZON DEPTHS, ACTUAL DEPTH VARIED ON A STATION BASIS AS A RESULT OF IN-SITU SITE CONDITIONS.
SC = SURFACE CORE
VC = VIBRACORE
DP = GEOPROBE

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PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
TOTAL PCB SEDIMENT CONCENTRATION BELOW SEDIMENT SURFACE (2021 - 2024)

CONSULTANT
wsp

YYYY-MM-DD	2025-03-21
DESIGNED	CB
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	B-10

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

APPENDIX C

Data Summaries

C1: Summary Statistics for Surface Grabs

C2: Reference Data from PC-N

C3: Surface Core and Vibracore Data Summary

C4: Geoprobe Data Summary

Summary Statistics - Sediment Grabs (2021, 2023 and 2024)

Management Unit	Antimony (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	0.355	0.290	0.420	0.520	0.565	0.210	0.61
PC-E	0.91	0.66	1.09	< 2.0	2.14	0.54	2.14
PC-OM	3.97	3.48	4.13	4.61	5.88	2.48	7.15
PC-W	2.20	1.28	3.02	3.71	4.25	0.73	4.66
PP-OM	2.18	1.69	2.53	2.92	3.17	1.35	3.42
TC-1	0.77	0.62	0.94	1.08	< 2.0	0.46	< 2.0 (1.08)
TC-2A	1.12	1.05	1.29	1.40	1.43	0.29	1.44
TC-2B	0.72	0.65	0.81	0.84	0.85	0.54	0.86
TC-3A	1.54	1.11	1.82	2.15	2.26	1.00	2.37
TC-3B	0.40	0.40	0.40	0.40	0.40	0.40	0.40
TC-4	0.77	0.59	0.90	1.13	1.23	0.39	1.31
TC-5	0.610	0.503	0.635	0.800	0.870	0.470	0.940
TC-AB	1.02	0.64	1.43	1.52	1.61	< 0.10	1.78
TC-OM	1.07	0.77	1.28	1.41	1.78	0.50	2.28
TC-RC	1.57	0.84	2.21	2.96	3.27	0.63	3.57
WM	1.90	1.30	2.59	3.25	3.50	0.76	3.76

Screening:
- 0 - 0.2 mg/kg
- 0.2 - 0.6 mg/kg (<LAET)
- 0.6 - 1.9 mg/kg (<2LAET)
- 1.9 - 6 mg/kg
- 6 - 20 mg/kg
- > 20 mg/kg
- > 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level; > = greater than; < = less than.

Management Unit	Arsenic (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	3.29	3.06	3.54	3.78	3.96	2.72	4.14
PC-E	5.31	5.00	5.82	6.15	6.47	2.98	6.90
PC-OM	4.14	3.905	4.45	5.20	5.46	2.01	5.73
PC-W	7.23	5.84	8.24	9.53	9.92	5.35	10.40
PP-OM	6.60	5.55	7.46	8.14	8.36	4.95	8.59
TC-1	6.41	5.39	7.37	7.72	8.02	4.30	8.66
TC-2A	11.5	9.82	14.5	16.3	17.5	1.43	19.1
TC-2B	6.43	5.97	6.97	7.20	7.27	5.35	7.35
TC-3A	14.2	10.6	16.4	19.5	20.5	9.7	21.5
TC-3B	3.65	3.65	3.65	3.65	3.65	3.65	3.65
TC-4	6.80	5.4125	8.0175	9.53	10.0	2.67	12.4
TC-5	6.26	4.94	5.90	8.69	10.00	4.69	11.30
TC-AB	7.37	7.01	8.45	9.81	10.26	< 0.10	10.60
TC-OM	9.15	8.82	10.20	10.94	11.68	4.73	12.70
TC-RC	24.2	10.15	31.95	59.3	63.5	7.74	67.6
WM	29.11	17.70	40.45	55.40	57.65	10.30	59.90

Screening:
- 0 - 5.9 mg/kg (<ISQG)
- 5.9 - 17 mg/kg (<PEL)
- 17- 33 mg/kg (<SEL)
- 33 - 50.9 mg/kg (<2LAET)
- 50.9 - 100 mg/kg
- > 100 mg/kg
- > 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effects level; 2LAET = second lowest adverse effect level; > = greater than; < = less than.

Summary Statistics - Sediment Grabs (2021, 2023 and 2024)

Management Unit	Chromium (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	40.9	36.8	45.9	48.8	49.7	32.3	50.6
PC-E	1,032	872	1,148	1,444	1,521	670	1,640
PC-OM	3,496	2,330	4,458	4,704	4,767	1,780	4,830
PC-W	2,629	1,213	3,295	5,294	5,446	895	7,650
PP-OM	2,358	1,830	3,060	3,942	3,981	737	4,020
TC-1	697	603	819	946	977	371	1,020
TC-2A	321	139	508	669	699	20	712
TC-2B	524	446	628	659	669	315	679
TC-3A	427	359	467	576	613	264	649
TC-3B	166	166	166	166	166	166	166
TC-4	269	202	338	437	476	25	481
TC-5	166	133	192	215	223	123	231
TC-AB	194	166	238	298	333	1	339
TC-OM	802	598	973	1,088	1,348	197	1,720
TC-RC	575	452	697	850	865	259	880
WM	776	681	873	1,041	1,226	305	1,410

Screening:
- 0 - 37.3 mg/kg (<ISQG)
- 37.3 - 90 mg/kg (<PEL)
- 90 - 110 mg/kg (<SEL)
- 110 - 133 mg/kg (<2LAET)
- 133 - 500 mg/kg
- 500 - 1,000 mg/kg
- >1000 mg/kg
- > 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effects level; 2LAET = second lowest adverse effect level; > = greater than; < = less than.

Management Unit	Copper (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	31.7	28.7	31.0	36.3	42.4	26.7	48.5
PC-E	35.6	31.9	38.9	42.2	47.7	23.8	53.6
PC-OM	83.0	75.5	95.9	96.8	97.7	52.2	98.6
PC-W	56.3	46.1	66.0	81.4	82.0	33.8	85.9
PP-OM	65.0	57.6	70.9	75.8	78.9	46.6	82.0
TC-1	39.8	37.2	42.7	43.9	46.0	31.6	50.9
TC-2A	67.3	60.7	75.0	84.3	92.9	22.8	117
TC-2B	49.9	43.3	55.4	60.1	61.6	38.9	63.2
TC-3A	71.6	58.1	77.7	92.9	97.9	54.9	103
TC-3B	25.8	25.8	25.8	25.8	25.8	25.8	25.8
TC-4	50.9	45.5	56.0	63.3	67.1	25.2	80
TC-5	44.2	41.6	44.8	47.8	49.2	40.7	50.6
TC-AB	198.1	63.5	211.0	564.0	664.6	< 0.50	838.0
TC-OM	44.5	38.1	45.6	55.6	66.3	30.8	79.7
TC-RC	43.5	37.1	48.5	57.4	57.8	33.5	58.2
WM	63.1	51.2	77.4	91.7	92.4	37.6	93.1

Screening:
- 0 - 35.7 mg/kg (<ISQG)
- 35.7 - 110 mg/kg (<SEL)
- 110 - 197 mg.kg (<PEL)
- 197 - 619 mg/kg (<LAET)
- > 619 mg/kg
- > 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effects level; LAET = lowest adverse effect level; > = greater than; < = less than.

Summary Statistics - Sediment Grabs (2021, 2023 and 2024)

Management Unit	Lead (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	85	30	62	134	276	25	417
PC-E	88	73	103	111	119	52	142
PC-OM	298	227	361	372	375	207	378
PC-W	209	128	272	343	385	79	425
PP-OM	193	177	217	239	251	96	263
TC-1	93	78	104	113	118	65	132
TC-2A	127	108	159	190	193	20	195
TC-2B	88	77	102	106	108	60	109
TC-3A	283	179	356	442	471	127	500
TC-3B	38	38	38	38	38	38	38
TC-4	112	84	132	154	183	74	234
TC-5	64	52	70	90	97	44	104
TC-AB	104	79	113	167	187	< 0.50	229
TC-OM	106	76	128	134	154	64	185
TC-RC	111	87	109	149	186	78	222
WM	157	133	180	212	222	95	231

Screening:

Blue	0 - 35 mg/kg (<ISQG)
Green	35 - 91.3 mg/kg (<PEL)
Yellow	91.3 - 250 mg/kg
Light orange	250 - 335 mg/kg (<LAET)
Dark orange	335 - 431 mg/kg (<2LAET)
Red	>431 mg/kg
Hatched	> 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; ISQG = interim sediment quality guideline; PEL = probable effect level; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level; > = greater than; < = less than.

Management Unit	Mercury (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	0.095	0.091	0.104	0.106	0.117	0.057	0.128
PC-E	0.194	0.159	0.207	0.232	0.273	0.148	0.285
PC-OM	0.289	0.271	0.343	0.371	0.382	0.132	0.394
PC-W	0.339	0.252	0.383	0.560	0.598	0.158	0.681
PP-OM	0.298	0.277	0.328	0.374	0.383	0.196	0.393
TC-1	0.242	0.192	0.270	0.307	0.344	0.150	0.446
TC-2A	0.950	0.660	1.35	1.55	1.65	0.042	1.76
TC-2B	0.362	0.233	0.461	0.558	0.590	0.165	0.622
TC-3A	1.11	0.760	1.44	1.55	1.58	0.634	1.62
TC-3B	0.115	0.115	0.115	0.115	0.115	0.115	0.115
TC-4	0.362	0.244	0.457	0.627	0.664	0.174	0.729
TC-5	0.178	0.146	0.201	0.240	0.252	0.134	0.264
TC-AB	0.238	0.186	0.273	0.331	0.378	0.104	0.424
TC-OM	0.305	0.240	0.366	0.416	0.448	0.145	0.486
TC-RC	0.565	0.320	0.825	1.11	1.17	0.224	1.22
WM	1.082	0.688	1.345	1.565	1.948	0.577	2.330

Screening:

Blue	0 - 0.17 mg/kg (<ISQG)
Green	0.17 - 0.486 mg/kg (<PEL)
Yellow	0.486 - 0.8 mg/kg (<LAET)
Light orange	0.8 - 2 mg/kg (<SEL)
Dark orange	2 - 3.04 mg/kg (<2LAET)
Red	> 3.04 mg/kg
Hatched	> 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effects level; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level; > = greater than; < = less than.

Summary Statistics - Sediment Grabs (2021, 2023 and 2024)

Management Unit	Silver (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	0.113	0.103	0.120	0.141	0.146	< 0.10	0.150
PC-E	0.351	0.280	0.318	0.350	< 2.0	< 0.20	< 2.0 (0.35)
PC-OM	0.886	0.758	< 2.00	< 2.00	< 2.00	0.470	< 2.00 (1.2)
PC-W	0.568	0.368	0.740	0.810	1.018	0.250	1.560
PP-OM	0.464	0.415	0.515	0.544	0.562	0.320	0.580
TC-1	0.518	0.355	0.583	0.950	< 2.0	0.230	< 2.0 (0.95)
TC-2A	1.46	1.06	1.99	2.47	2.65	< 0.20	2.96
TC-2B	1.05	0.58	1.39	1.75	1.87	0.37	1.99
TC-3A	1.40	1.06	1.48	1.98	2.14	1.03	2.31
TC-3B	0.240	0.240	0.240	0.240	0.240	0.240	0.240
TC-4	0.57	0.345	0.75	0.84	1.14	< 0.10	1.96
TC-5	0.343	0.295	0.393	0.460	0.480	0.230	0.500
TC-AB	0.442	0.390	0.578	0.586	0.616	< 0.10	0.710
TC-OM	0.358	0.300	0.410	0.500	0.552	0.120	0.600
TC-RC	0.575	0.515	0.630	0.730	0.780	0.370	0.830
WM	1.056	0.853	1.128	1.693	1.752	0.480	1.810

Screening:

Blue	0 - 0.5 mg/kg
Green	0.5 - 0.545 mg/kg (<LAET)
Yellow	0.545 - 2 mg/kg
Light orange	2 - 3.5 mg/kg (<2LAET)
Orange	3.5 - 4.5 mg/kg
Red	> 4.5 mg/kg
Shaded	> 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level; > = greater than; < = less than.

Management Unit	Zinc (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	166	102	142	210	406	91	601
PC-E	141	123	153	168	193	106	200
PC-OM	352	299	396	405	430	228	454
PC-W	249	182	299	379	389	139	428
PP-OM	277	239	310	326	335	193	345
TC-1	172	153	169	183	241	122	400
TC-2A	265	237	296	347	377	70	432
TC-2B	158	149	168	174	176	140	178
TC-3A	309	223	343	442	476	214	509
TC-3B	91	91	91	91	91	91	91
TC-4	168	144	189	212	221	83	257
TC-5	154	146	163	167	168	136	169
TC-AB	251	168	319	406	426	8	457
TC-OM	167	147	177	194	216	124	247
TC-RC	188	149	182	214	318	129	421
WM	279	212	351	377	448	140	519

Screening:

Blue	0 - 123 mg/kg (<ISQG)
Green	123 - 315 mg/kg (<PEL)
Yellow	315 - 683 mg/kg (<LAET)
Light orange	683 - 820 mg/kg (<SEL)
Orange	820 - 1080 mg/kg (<2LAET)
Red	> 1080 mg/kg
Shaded	> 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effects level; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level; > = greater than; < = less than.

Summary Statistics - Sediment Grabs (2021, 2023 and 2024)

Management Unit	Total PAHs (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	1.04	0.72	1.45	1.72	1.75	0.44	1.78
PC-E	9.1	5.3	10.1	15.5	23.9	3.2	27.0
PC-OM	32.1	24.2	35.7	48.2	51.8	19.2	55.3
PC-W	16.5	10.3	22.4	25.7	26.1	6.2	33.8
PP-OM	12.5	10.3	14.6	15.7	16.2	6.8	16.8
TC-1	4.81	3.59	4.66	5.86	8.93	2.77	16.7
TC-2A	9.60	6.17	11.2	15.4	18.7	5.01	21.9
TC-2B	4.80	4.32	5.57	5.67	5.71	3.25	5.74
TC-3A	7.42	6.15	8.04	9.69	10.2	5.37	10.8
TC-3B	4.24	4.24	4.24	4.24	4.24	4.24	4.24
TC-4	22.9	9.09	18.3	23.8	54.4	7.42	184
TC-5	12.9	10.73	11.9	17.2	19.8	9.46	22.40
TC-AB	12.3	8.2	14.1	17.9	19.7	6.7	27.6
TC-OM	17.8	4.0	9.4	12.5	69.6	3.3	154.9
TC-RC	16.5	3.32	5.10	6.03	72.7	2.42	139
WM	11.3	5.2	14.4	25.8	29.0	4.6	32.2

Screening:
- 0 - 1.61 mg/kg (<TEC)
- 1.61 - 4 mg/kg (<LEL)
- 4 - 10 mg/kg
- 10 - 22.8 mg/kg (<PEC)
- 22.8 - 100 mg/kg
- 100 - 750 mg/kg
- > 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; TEC = tolerable effects concentration; LEL = low effect level; PEC = probable effects concentration.

Management Unit	Total PCBs (mg/kg)						
	Average	25th Percentile	75th Percentile	90th Percentile	95th Percentile	Min	Max
PC-N	0.030	0.019	0.039	< 0.177	< 0.177	< 0.015	< 0.177 (0.039)
PC-E	0.262	0.187	0.329	0.421	0.431	0.054	0.441
PC-OM	0.458	0.317	0.522	0.763	0.857	< 0.273	0.951
PC-W	0.602	0.363	0.826	1.183	1.218	0.165	1.460
PP-OM	0.362	0.334	0.490	0.546	0.556	0.141	0.565
TC-1	0.306	0.240	0.353	0.475	0.503	0.127	0.570
TC-2A	0.252	0.158	0.351	0.386	0.416	< 0.015	0.480
TC-2B	0.417	0.350	0.500	0.530	0.540	0.250	0.550
TC-3A	0.448	0.412	0.491	0.491	0.492	0.388	0.492
TC-3B	0.203	0.203	0.203	0.203	0.203	0.203	0.203
TC-4	0.329	< 0.26	0.462	0.695	0.911	0.059	0.911
TC-5	0.153	0.173	< 0.26	< 0.26	< 0.26	0.137	< 0.26 (0.24)
TC-AB	0.188	0.186	0.321	< 0.40	0.420	0.075	0.420
TC-OM	0.305	0.254	0.328	0.443	0.467	0.125	0.504
TC-RC	0.272	0.210	0.307	0.354	0.420	0.162	0.486
WM	0.370	0.265	0.500	0.537	0.538	0.203	0.538

Screening:
- 0 - 0.07 mg/kg (<LEL)
- 0.07 - 0.3 mg/kg (<PEL)
- 0.3 - 0.6 mg/kg (<LAET)
- 0.6 - 1 mg/kg
- 1 - 5.3 mg/kg (<SEL)
- > 5.3 mg/kg
- > 95th percentile reference concentration (PC-N)

Notes: mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-N = Parks Canada North (reference area); PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; min = minimum concentration; max = maximum concentration; LEL = low effects level; PEL = probable effects level; LAET = lowest adverse effect level; SEL = severe effects level.

Chemicals of Concern Concentrations for Parks Canada North Surficial Sediment Grabs (2023)

Station	Units	Antimony	Arsenic	Chromium	Copper	Lead	Mercury	Silver	Zinc	Total PCBs	Total PAHs
PCN-SG-001	mg/kg	0.360	3.21	32.3	27.8	48	0.102	0.100	110	0.022	0.71
PCN-SG-002	mg/kg	0.210	2.72	48.6	26.7	25	0.057	< 0.10	101	< 0.058	0.56
PCN-SG-003	mg/kg	0.290	2.72	34.4	28.6	34	0.096	0.120	91	< 0.103	1.71
PCN-SG-004	mg/kg	0.440	4.14	40.1	35.0	61	0.128	0.150	128	0.019	0.74
PCN-SG-005	mg/kg	0.220	3.17	50.6	29.4	29	0.075	0.100	105	< 0.015	0.44
PCN-SG-006	mg/kg	0.290	3.20	36.5	30.0	29	0.091	0.120	93	< 0.015	0.95
PCN-SG-007	mg/kg	0.330	3.31	43.6	31.0	62	0.104	0.120	147	0.026	1.17
PCN-SG-008	mg/kg	0.290	3.02	46.6	31.0	37	0.104	0.110	116	< 0.016	0.83
PCN-SG-009	mg/kg	0.510	3.74	38.0	28.8	103	0.093	0.120	167	0.039	1.54
PCN-SG-010	mg/kg	0.610	3.62	37.8	48.5	417	0.104	0.140	601	< 0.177	1.78

Antimony
- 0 - 0.2 mg/kg
- 0.2 - 0.6 mg/kg (<LAET)
- 0.6 - 1.9 mg/kg (<2LAET)
- 1.9 - 6 mg/kg
- 6 - 20 mg/kg
- > 20 mg/kg

Chromium
- 0 - 37.3 mg/kg (<ISQG)
- 37.3 - 90 mg/kg (<PEL)
- 90 - 110 mg/kg (<SEL)
- 110 - 133 mg/kg (<2LAET)
- 133 - 500 mg/kg
- 500 - 1,000 mg/kg
- >1000 mg/kg

Lead
- 0 - 35 mg/kg (<ISQG)
- 35 - 91.3 mg/kg (<PEL)
- 91.3 - 250 mg/kg
- 250 - 335 mg/kg (<LAET)
- 335 - 431 mg/kg (<2LAET)
- >431 mg/kg

Silver
- 0 - 0.5 mg/kg
- 0.5 - 0.545 mg/kg (<LAET)
- 0.545 - 2 mg/kg
- 2 - 3.5 mg/kg (<2LAET)
- 3.5 - 4.5 mg/kg
- > 4.5 mg/kg

Total PCBs
- 0 - 0.07 mg/kg (<LEL)
- 0.07 - 0.3 mg/kg (<PEL)
- 0.3 - 0.6 mg/kg (<LAET)
- 0.6 - 1 mg/kg
- 1 - 5.3 mg/kg (<SEL)
- > 5.3 mg/kg

Arsenic
- 0 - 5.9 mg/kg (<ISQG)
- 5.9 - 17 mg/kg (<PEL)
- 17- 33 mg/kg (<SEL)
- 33 - 50.9 mg/kg (<2LAET)
- 50.9 - 100 mg/kg
- > 100 mg/kg

Copper
- 0 - 35.7 mg/kg (<ISQG)
- 35.7 - 110 mg/kg (<SEL)
- 110 - 197 mg.kg (<PEL)
- 197 - 619 mg/kg (<LAET)
- > 619 mg/kg

Mercury
- 0 - 0.17 mg/kg (<ISQG)
- 0.17 - 0.486 mg/kg (<PEL)
- 0.486 - 0.8 mg/kg (<LAET)
- 0.8 - 2 mg/kg (<SEL)
- 2 - 3.04 mg/kg (<2LAET)
- > 3.04 mg/kg

Zinc
- 0 - 123 mg/kg (<ISQG)
- 123 - 315 mg/kg (<PEL)
- 315 - 683 mg/kg (<LAET)
- 683 - 820 mg/kg (<SEL)
- 820 - 1080 mg/kg (<2LAET)
- > 1080 mg/kg

Total PAH
- 0 - 1.61 mg/kg (<TEC)
- 1.61 - 4 mg/kg (<LEL)
- 4 - 10 mg/kg
- 10 - 22.8 mg/kg (<PEC)
- 22.8 - 100 mg/kg
- 100 - 750 mg/kg

Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Management Unit	Sample ID	Antimony (mg/kg)																		
		2021 Core Depth (m)			2021 Refined Core Depth (m)							2023 Core Depth (m)*				2024 Core Depth (m)*				
		0.1-0.3	0.3-0.5	0.5-0.8	0.0-0.05	0.05-0.1	0.1-0.15	0.15-0.2	0.2-0.25	0.25-0.3	0.3-0.5	0 - 0.1	0.1 - 0.3	0.3 - 0.5	0.5-0.6	0 - 0.1	0.1 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75-1.2
PC-OM	PCOM-SC-001	-	-	-	3.95	3.5	3.71	4.92	5.41	5.48	8.85	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.91	5.8	1.9	0.42	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.62	0.55	0.14	0.1	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.86	0.23	0.23	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.74	0.11	< 0.10	< 0.10	-
PC-W	PC-W-SC-001	1.30	0.47	-	<2.0	<2.0	<2.0	<2.0	<2.0	3.7	2.9	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	2.55	2.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	7.48	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	5.63	6.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.1	13.3	1.33	-	-
PP-OM	PPOM-SC-002	2.23	9.19	24.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	4.72	7.70	0.190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.36	4.26	12.4	-	-
TC-4	TC4-SC-010	0.93	-	-	0.43	0.47	0.67	0.77	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	3.68	3.44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	1.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	0.98	2.84	3.60	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	0.90	1.61	5.26	4.75	-	-	-	-	-
TC-AB	TCAB-SC-001	1.76	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	1.54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	1.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	1.48	2.11	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	0.82	0.88	0.93	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	1.43	1.80	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	1.44	1.45	1.82	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.58	0.58	0.64	0.86	1.03
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.31	0.75	0.9	-	-
TC-OM	TCOM-SC-001	1.59	0.270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	1.98	2.30	-	<2.0	0.65	1.42	1.8	2.22	2.9	1.040	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	0.34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	0.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	1.22	1.88	0.81	-	-	-	-	-	-
TC-RC	TCRC-SC-004	1.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	1.91	0.240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	4.69	15.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	1.22	3.84	-	-	-	-	-	-	-

Screening:

Blue	0-0.2 mg/kg
Green	0.2-0.6 mg/kg (<LAET)
Yellow	0.6-1.9 mg/kg (<2LAET)
Light orange	1.9-6 mg/kg
Dark orange	6-20 mg/kg
Red	> 20 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level.

* Depths stated are general targeted horizon depths, actual depth varied on a station basis as a result of in-situ site conditions. See Appendix F for exact horizon interval.

Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Management Unit	Sample ID	Arsenic (mg/kg) 2021 Core Depth (m)			2021 Refined Core Depth (m)							2023 Core Depth (m)*				2024 Core Depth (m)*				
		0.1-0.3	0.3-0.5	0.5-0.8	0.0-0.05	0.05-0.1	0.1-0.15	0.15-0.2	0.2-0.25	0.25-0.3	0.3-0.5	0 - 0.1	0.1 - 0.3	0.3 - 0.5	0.5-0.6	0 - 0.1	0.1 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75-1.2
PC-OM	PCOM-SC-001	-	-	-	3.28	2.82	2.48	2.23	3.1	3.91	6.71	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.13	6.96	5.01	2.63	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.6	4.44	2.42	1.91	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.98	2.62	2.26	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.43	3.5	2.4	1.64	-
PC-W	PC-W-SC-001	7.39	5.75	-	5.1	6.1	5.7	6.2	7.800	10.600	7.4	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	8.44	10.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	17.20	20.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	10.10	12.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	14.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.400	21.900	4.440	-	-
PP-OM	PPOM-SC-002	6.84	20.80	38.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	18.30	19.90	1.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.180	7.360	18.400	-	-
TC-4	TC4-SC-010	9.13	-	-	4.7	5.12	6.98	10.8	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	20.6	56.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	11.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	13.50	19.00	26.00	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	8.38	16.30	34.40	30.30	-	-	-	-	-
TC-AB	TCAB-SC-001	9.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	7.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	9.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	20.50	20.80	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	6.77	7.98	10.70	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	10.10	22.30	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	6.83	9.60	18.30	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.070	5.410	6.450	10.600	14.100
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.940	7.650	8.930	-	-
TC-OM	TCOM-SC-001	13.30	5.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	18.00	20.70	-	8	11	15.8	19.6	23	42.9	16.100	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	4.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	8.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	12.00	16.80	9.98	-	-	-	-	-	-
TC-RC	TCRC-SC-004	23.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	41.20	7.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	61.70	349.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	18.50	43.80	-	-	-	-	-	-	-

Screening:

- 0-5.9 mg/kg (<ISQG)
- 5.9-17 mg/kg (<PEL)
- 17-33 mg/kg (<SEL)
- 33-50.9 mg/kg (<2LAET)
- 50.9-100 mg/kg
- > 100 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effect level; 2LAET = second lowest adverse effect level.

* Depths stated are general targeted horizon depths, actual depth varied on a station basis as a result of in-situ site conditions. See Appendix F for exact horizon interval.

Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Management Unit	Sample ID	Chromium (mg/kg)																		
		2021 Core Depth (m)			2021 Refined Core Depth (m)							2023 Core Depth (m)*				2024 Core Depth (m)*				
		0.1-0.3	0.3-0.5	0.5-0.8	0.0-0.05	0.05-0.1	0.1-0.15	0.15-0.2	0.2-0.25	0.25-0.3	0.3-0.5	0 - 0.1	0.1 - 0.3	0.3 - 0.5	0.5-0.6	0 - 0.1	0.1 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75-1.2
PC-OM	PCOM-SC-001	-	-	-	2230	2310	1470	1600	3490	4620	15500	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3830	5530	1510	293	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	833	563	60	69	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1170	292	342	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1180	94	59	38	-
PC-W	PC-W-SC-001	2070	501	-	1020	872	697	1130	3140	5470	2950	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	4090	2410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	9810	8540	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	9790	10400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	5950	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5320	7230	781	-	-
PP-OM	PPOM-SC-002	2950	6120	16400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	5150	7400	81.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4080	5720	11400	-	-
TC-4	TC4-SC-010	445	-	-	188	220	296	386	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	1230	815	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	743	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	667	1430	1290	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	272	550	1460	1590	-	-	-	-	-
TC-AB	TCAB-SC-001	255	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	227	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	289	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	573	886	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	214	264	347	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	298	283	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	130	204	320	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135	182	323	447	551
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87	366	344	-	-
TC-OM	TCOM-SC-001	1810	136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	2350	2980	-	709	866	1540	2510	2650	2290	809	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	499	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	1170	1670	587	-	-	-	-	-	-
TC-RC	TCRC-SC-004	391	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	127	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	1830	1140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	911	1970	-	-	-	-	-	-	-

Screening:

- 0-37.3 mg/kg (<ISQG)
- 37.3-90 mg/kg (<PEL)
- 90-110 mg/kg (<SEL)
- 110-133 mg/kg (<2LAET)
- 133-500 mg/kg
- 500-1,000 mg/kg
- >1000 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effect level; 2LAET = second lowest adverse effect level.

* Depths stated are general targeted horizon depths, actual depth varied on a station basis as a result of in-situ site conditions. See Appendix F for exact horizon interval.

Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Copper (mg/kg)																				
Management Unit	Sample ID	2021 Core Depth (m)			2021 Refined Core Depth (m)							2023 Core Depth (m)*				2024 Core Depth (m)*				
		0.1-0.3	0.3-0.5	0.5-0.8	0.0-0.05	0.05-0.1	0.1-0.15	0.15-0.2	0.2-0.25	0.25-0.3	0.3-0.5	0 - 0.1	0.1 - 0.3	0.3 - 0.5	0.5-0.6	0 - 0.1	0.1 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75-1.2
PC-OM	PCOM-SC-001	-	-	-	70.8	66.4	77.5	70.8	78.2	76.6	89.2	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75.1	91.7	44.2	31.4	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.8	11.6	12.5	18.4	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.8	14.8	22.3	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28	22.1	22.8	9.91	-
PC-W	PC-W-SC-001	36.5	7.4	-	34.0	38.0	39.0	39.0	45.0	42.0	28.0	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	54.5	25.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	68.2	36.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	81.2	81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	76.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67.10	63.20	18.00	-	-
PP-OM	PPOM-SC-002	82.2	65	53.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	61.1	45.0	5.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	96.50	101.00	84.20	-	-
TC-4	TC4-SC-010	47.4	-	-	45.3	44.5	52.5	46.3	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	111	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	54.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	58.40	90.90	89.80	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	66.40	73.40	127.00	112.00	-	-	-	-	-
TC-AB	TCAB-SC-001	528	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	143	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	197	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	54.10	66.20	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	72.10	75.80	75.10	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	364.00	87.20	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	122.00	100.00	92.00	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43.90	44.20	45.20	52.80	57.40
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.80	53.00	54.80	-	-
TC-OM	TCOM-SC-001	47.2	9.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	58.5	51.5	-	41.0	40.1	52	57.9	50.1	48.5	34.7	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	31.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	36.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	43.90	47.30	28.70	-	-	-	-	-	-
TC-RC	TCRC-SC-004	32.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	37.4	26.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	68.9	81.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	57.60	61.60	-	-	-	-	-	-	-

Screening:

Blue	0-35.7 mg/kg (<ISQG)
Green	35.7-110 mg/kg (<SEL)
Yellow	110-197 mg.kg (<PEL)
Orange	197-619 mg/kg (<LAET)
Red	> 619 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effect level; LAET = lowest adverse effect level.

* Depths stated are general targeted horizon depths, actual depth varied on a station basis as a result of in-situ site conditions. See Appendix F for exact horizon interval.

Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Lead (mg/kg)																				
Management Unit	**Sample ID**	**2021 Core Depth (m)**			**2021 Refined Core Depth (m)**							**2023 Core Depth (m)***				**2024 Core Depth (m)***				
		0.1-0.3	**0.3-0.5**	**0.5-0.8**	**0.0-0.05**	**0.05-0.1**	**0.1-0.15**	**0.15-0.2**	**0.2-0.25**	**0.25-0.3**	**0.3-0.5**	**0 - 0.1**	**0.1 - 0.3**	**0.3 - 0.5**	**0.5-0.6**	**0 - 0.1**	**0.1 - 0.25**	**0.25 - 0.5**	**0.5 - 0.75**	**0.75-1.2**
PC-OM	PCOM-SC-001	-	-	-	211	205	200	287	310	423	763	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	279.0	459	140	29.1	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63.5	38.7	5.6	6.8	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	103.0	26.2	25.8	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78.4	9.7	10.3	9.0	-
PC-W	PC-W-SC-001	130.0	31.2	-	89.0	83.0	63.0	76.0	150.0	338.0	215.0	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	215.0	217.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	483.0	438.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	545.0	624.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	606.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	396.0	502.0	51.0	-	-
PP-OM	PPOM-SC-002	262.0	549.0	750.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	387.0	433.0	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	313.0	420.0	882.0	-	-
TC-4	TC4-SC-010	130.0	-	-	65.0	78.5	119.0	166.0	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	399.0	366.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	170.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	169.0	326.0	362.0	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	98.8	225.0	458.0	418.0	-	-	-	-	-
TC-AB	TCAB-SC-001	169.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	118.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	125.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	222.0	245.0	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	94.4	104.0	133.0	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	375.0	314.0	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	81.6	230.0	363.0	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57.6	64.6	90.6	151.0	208.0
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34.3	115.0	157.0	-	-
TC-OM	TCOM-SC-001	190.0	12.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	234.0	261.0	-	105.0	123.0	179.0	224.0	249.0	246.0	106.0	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	37.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	72.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	146.0	190.0	76.4	-	-	-	-	-	-
TC-RC	TCRC-SC-004	69.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	99.9	16.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	321.0	457.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	151.0	302.0	-	-	-	-	-	-	-

Screening:

Blue	0-35 mg/kg (<ISQG)
Green	35-91.3 mg/kg (<PEL)
Yellow	91.3-250 mg/kg
Light orange	250-335 mg/kg (<LAET)
Dark orange	335-431 mg/kg (<2LAET)
Red	>431 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; ISQG = interim sediment quality guideline; PEL = probable effect level; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level.

* Depths stated are general targeted horizon depths, actual depth varied on a station basis as a result of in-situ site conditions. See Appendix F for exact horizon interval.

Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Mercury (mg/kg)																				
Management Unit	**Sample ID**	**2021 Core Depth (m)**			**2021 Refined Core Depth (m)**							**2023 Core Depth (m)***				**2024 Core Depth (m)***				
		0.1-0.3	**0.3-0.5**	**0.5-0.8**	**0.0-0.05**	**0.05-0.1**	**0.1-0.15**	**0.15-0.2**	**0.2-0.25**	**0.25-0.3**	**0.3-0.5**	**0 - 0.1**	**0.1 - 0.3**	**0.3 - 0.5**	**0.5-0.6**	**0 - 0.1**	**0.1 - 0.25**	**0.25 - 0.5**	**0.5 - 0.75**	**0.75-1.2**
PC-OM	PCOM-SC-001	-	-	-	0.25	0.17	0.13	0.12	0.20	0.32	0.80	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.30	0.41	0.193	0.09	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	0.10	0.04	0.06	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.17	0.09	0.08	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15	0.06	0.05	0.02	-
PC-W	PC-W-SC-001	0.25	0.09	-	0.20	0.18	0.18	0.20	0.37	0.63	0.37	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	0.37	0.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	0.68	0.85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	0.55	0.76	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	0.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.46	0.68	0.11	-	-
PP-OM	PPOM-SC-002	0.31	0.78	0.92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	0.70	0.92	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.41	0.46	1.11	-	-
TC-4	TC4-SC-010	0.43	-	-	0.19	0.24	0.30	0.47	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	2.39	3.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	0.57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	0.59	1.04	1.37	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	0.28	0.73	2.28	2.17	-	-	-	-	-
TC-AB	TCAB-SC-001	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	0.27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	0.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	0.82	1.31	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	0.33	0.41	0.59	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	0.42	0.76	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	0.19	0.58	0.84	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15	0.17	0.24	0.47	0.73
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10	0.34	0.41	-	-
TC-OM	TCOM-SC-001	0.46	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	0.59	0.85	-	0.31	0.35	0.50	0.62	0.82	1.63	0.48	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	0.47	0.64	0.33	-	-	-	-	-	-
TC-RC	TCRC-SC-004	0.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	0.70	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	2.30	12.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	0.86	1.90	-	-	-	-	-	-	-

Screening:

Blue	0-0.17 mg/kg (<ISQG)
Green	0.17-0.486 mg/kg (<PEL)
Yellow	0.486-0.8 mg/kg (<LAET)
Orange	0.8-2 mg/kg (<SEL)
Dark orange	2-3.04 mg/kg (<2LAET)
Red	> 3.04 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effect level; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level.

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Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Management Unit	Sample ID	Silver (mg/kg)																			
		2021 Core Depth (m)			2021 Refined Core Depth (m)							2023 Core Depth (m)*				2024 Core Depth (m)*					
		0.1-0.3	0.3-0.5	0.5-0.8	0.0-0.05	0.05-0.1	0.1-0.15	0.15-0.2	0.2-0.25	0.25-0.3	0.3-0.5	0 - 0.1	0.1 - 0.3	0.3 - 0.5	0.5-0.6	0 - 0.1	0.1 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75-1.2
PC-OM	PCOM-SC-001	-	-	-	0.54	0.38	0.40	0.30	0.52	0.76	3.01	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.69	< 2.00	0.43	0.24	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.22	0.16	< 0.10	< 0.10	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.30	0.12	0.15	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.28	0.13	0.16	< 0.10	-
PC-W	PC-W-SC-001	0.47	0.10	-	<2.0	<2.0	<2.0	<2.0	<2.0	1.00	1.00	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	0.60	0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	1.09	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	1.34	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	1.44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2.00	< 2.00	0.12	-	-
PP-OM	PPOM-SC-002	0.70	1.02	0.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	0.85	2.00	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.76	< 2.00	< 2.00	-	-
TC-4	TC4-SC-010	0.70	-	-	0.37	0.42	0.71	0.74	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	2.60	2.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	1.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	0.97	3.04	2.64	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	0.77	1.40	3.57	3.57	-	-	-	-	-
TC-AB	TCAB-SC-001	0.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	0.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	0.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	1.13	1.69	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	0.51	0.72	1.24	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	0.89	1.05	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	0.39	1.60	1.57	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.30	0.41	0.63	0.90	0.96
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.20	0.71	1.02	-	-
TC-OM	TCOM-SC-001	0.60	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	0.86	0.83	-	<2.0	0.47	0.72	0.72	0.82	0.84	0.34	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	0.27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	0.68	0.74	0.26	-	-	-	-	-	-
TC-RC	TCRC-SC-004	0.54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	0.69	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	1.98	3.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	1.33	1.67	-	-	-	-	-	-	-

Screening:

- 0-0.5 mg/kg
- 0.5-0.545 mg/kg (<LAET)
- 0.545-2 mg/kg
- 2-3.5 mg/kg (<2LAET)
- 3.5-4.5 mg/kg
- > 4.5 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level.

* Depths stated are general targeted horizon depths, actual depth varied on a station basis as a result of in-situ site conditions. See Appendix F for exact horizon interval.

Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Management Unit	Sample ID	Zinc (mg/kg)																		
		2021 Core Depth (m)			2021 Refined Core Depth (m)							2023 Core Depth (m)*				2024 Core Depth (m)*				
		0.1-0.3	0.3-0.5	0.5-0.8	0.0-0.05	0.05-0.1	0.1-0.15	0.15-0.2	0.2-0.25	0.25-0.3	0.3-0.5	0 - 0.1	0.1 - 0.3	0.3 - 0.5	0.5-0.6	0 - 0.1	0.1 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75-1.2
PC-OM	PCOM-SC-001	-	-	-	280	238	187	166	220	299	401	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	334	408	158	83	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	84	43	16	22	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	114	30	43	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	108	29	79	62	-
PC-W	PC-W-SC-001	150	28	-	134	152	141	132	196	253	201	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	181	111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	318	214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	386	391	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	392	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	387	319	57	-	-
PP-OM	PPOM-SC-002	333	317	299	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	269	218	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	399	449	431	-	-
TC-4	TC4-SC-010	184	-	-	137	149	164	185	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	489	441	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	201	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	234	439	459	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	225	302	608	556	-	-	-	-	-
TC-AB	TCAB-SC-001	421	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	346	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	334	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	231	316	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	220	233	257	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	411	285	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	310	314	327	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	152	159	178	213	241
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78	200	214	-	-
TC-OM	TCOM-SC-001	201	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	246	236	-	160	164	220	257	235	223	135	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	180	202	124	-	-	-	-	-	-
TC-RC	TCRC-SC-004	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	220	78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	287	413	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	234	296	-	-	-	-	-	-	-

Screening:

Blue	0-123 mg/kg (<ISQG)
Green	123-315 mg/kg (<PEL)
Yellow	315-683 mg/kg (<LAET)
Light orange	683-820 mg/kg (<SEL)
Orange	820-1080 mg/kg (<2LAET)
Red	> 1080 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; ISQG = interim sediment quality guideline; PEL = probable effect level; SEL = severe effect level; LAET = lowest adverse effect level; 2LAET = second lowest adverse effect level.

* Depths stated are general targeted horizon depths, actual depth varied on a station basis as a result of in-situ site conditions. See Appendix F for exact horizon interval.

Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Management Unit	Sample ID	Total PAH (mg/kg)																		
		2021 Core Depth (m)			2021 Refined Core Depth (m)							2023 Core Depth (m)*				2024 Core Depth (m)*				
		0.1-0.3	0.3-0.5	0.5-0.8	0.0-0.05	0.05-0.1	0.1-0.15	0.15-0.2	0.2-0.25	0.25-0.3	0.3-0.5	0 - 0.1	0.1 - 0.3	0.3 - 0.5	0.5-0.6	0 - 0.1	0.1 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75-1.2
PC-OM	PCOM-SC-001	-	-	-	39.4	26.7	12.4	11.9	26.5	67.4	90.0	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.5	36.71	5.570	2.0	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	3.5	0.5	0.4	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1	0.8	0.4	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2	0.2	0.1	0.1	-
PC-W	PC-W-SC-001	17.3	2.5	-	8.21	7.49	6.93	6.28	11.9	36.3	22.2	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	30.6	22.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	33.7	22.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	28.1	47.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	29.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.3	7.4	0.7	-	-
PP-OM	PPOM-SC-002	15.9	33.9	14.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	14.2	0.40	0.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.3	38.1	36.3	-	-
TC-4	TC4-SC-010	25.3	-	-	10.52	10.67	14.0	14.2	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	25.9	31.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	24.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	35.4	71.5	75.9	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	9.2	31.0	74.3	66.0	-	-	-	-	-
TC-AB	TCAB-SC-001	21.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	11.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	8.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	86.7	138.9	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	10.4	7.9	4.5	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	26.1	187.0	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	8.8	33.7	124.7	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.7	3.5	5.0	14.7	19.6
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.4	15.0	29.7	-	-
TC-OM	TCOM-SC-001	5.99	0.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	7.84	11.9	-	5.93	6.44	7.98	13.7	10.67	11.4	4.10	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	7.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	1.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	6.8	8.3	3.5	-	-	-	-	-	-
TC-RC	TCRC-SC-004	1.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	3.82	1.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	14.8	28.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	6.9	18.2	-	-	-	-	-	-	-

Blue	0-1.61 mg/kg (<TEC)
Green	1.61-4 mg/kg (<LEL)
Yellow	4-10 mg/kg
Light orange	10-22.8 mg/kg (<PEC)
Orange	22.8-100 mg/kg
Red	100-750 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; TEC = tolerable effect level; LEL = low effects level; PEC = probable effects concentration.

* Depths stated are general targeted horizon depths, actual depth varied on a station basis as a result of in-situ site conditions. See Appendix F for exact horizon interval.

Data Summary for Sediment Tech-Ops Cores and Vibracores (2021 to 2024)

Management Unit	Sample ID	Total PCB (mg/kg)																		
		2021 Core Depth (m)			2021 Refined Core Depth (m)							2023 Core Depth (m)*				2024 Core Depth (m)*				
		0.1-0.3	0.3-0.5	0.5-0.8	0.0-0.05	0.05-0.1	0.1-0.15	0.15-0.2	0.2-0.25	0.25-0.3	0.3-0.5	0 - 0.1	0.1 - 0.3	0.3 - 0.5	0.5-0.6	0 - 0.1	0.1 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75-1.2
PC-OM	PCOM-SC-001	-	-	-	0.198	0.227	0.172	0.127	0.169	0.811	5.18	-	-	-	-	-	-	-	-	-
	PCOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.292	0.443	0.05	< 0.138	-
PC-E	PCE-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.186	0.241	< 0.024	< 0.019	-
	PCE-VC-002-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.23	< 0.027	< 0.015	-	-
	PCE-VC-002-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.212	< 0.015	< 0.015	< 0.015	-
PC-W	PC-W-SC-001	1.650	0.257	-	0.374	0.339	0.315	0.532	1.040	4.050	2.291	-	-	-	-	-	-	-	-	-
	PC-W-SC-005	1.910	1.380	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-007	4.570	0.203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-011	1.108	2.210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PC-W-SC-013	0.706	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PCW-VC-002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.464	0.609	0.060	-	-
PP-OM	PPOM-SC-002	0.877	1.480	0.512	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-SC-004	0.349	<0.80	<0.045	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PPOM-VC-001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.314	0.440	1.160	-	-
TC-4	TC4-SC-010	1.354	-	-	0.24	0.295	0.328	0.43	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-003	2.544	2.577	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-SC-009	0.943	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TC4-VC-001	-	-	-	-	-	-	-	-	-	-	0.76	3.99	1.50	-	-	-	-	-	-
	TC4-VC-002	-	-	-	-	-	-	-	-	-	-	0.21	1.22	1.94	3.96	-	-	-	-	-
TC-AB	TCAB-SC-001	0.424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-012	<0.27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-SC-015	<0.27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCAB-VC-001	-	-	-	-	-	-	-	-	-	-	2.4	2.0	-	-	-	-	-	-	-
	TCAB-VC-002	-	-	-	-	-	-	-	-	-	-	< 0.486	< 0.377	< 0.148	-	-	-	-	-	-
	TCAB-VC-003	-	-	-	-	-	-	-	-	-	-	< 1.41	1.6	-	-	-	-	-	-	-
	TCAB-VC-004	-	-	-	-	-	-	-	-	-	-	< 0.597	< 0.450	0.9	-	-	-	-	-	-
	TCAB-VC-005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.048	< 0.090	0.076	0.251	0.417
	TCAB-VC-006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.102	0.209	0.368	-	-
TC-OM	TCOM-SC-001	0.475	0.021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-006	0.832	1.152	-	0.376	0.499	0.577	0.758	0.86	0.789	0.260	-	-	-	-	-	-	-	-	-
	TCOM-SC-007	<0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-SC-009	0.095	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCOM-VC-001	-	-	-	-	-	-	-	-	-	-	0.44	1.04	0.13	-	-	-	-	-	-
TC-RC	TCRC-SC-004	0.147	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TCRC-SC-010	0.056	<0.0090	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WM	WM-SC-003	1.632	1.272	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	WM-VC-001	-	-	-	-	-	-	-	-	-	-	0.54	2.14	-	-	-	-	-	-	-

Screening:

Blue	0-0.07 mg/kg (<LEL)
Green	0.07-0.3 mg/kg (<PEL)
Yellow	0.3-0.6 mg/kg (<LAET)
Light orange	0.6-1 mg/kg
Orange	1-5.3 mg/kg (<SEL)
Red	> 5.3 mg/kg

Notes: ID = identification; m = metres; mg/kg = milligrams per kilogram; PC-OM = Orchard Street Marsh; PC-E = Parks Canada East; PC-W = Parks Canada West; PP-OM = Orchard Street Marsh brownfield zone; TC-4 = Transport Canada Unit 4; TC-AB = Transport Canada Anglin Bay; TC-OM =Transport Canada Orchard Street Marsh; TC-RC =Transport Canada Rowing Club; WM = Woolen Mill; SC = sediment core; VC = vibracore; LEL = low effects level; PEL = probable effects level; LAET = lowest adverse effect level; SEL = severe effects level.

* Depths stated are general targeted horizon depths, actual depth varied on a station basis as a result of in-situ site conditions. See Appendix F for exact horizon interval.

Data Summary - Geotechnical Drilling (2024)

Management Unit	PCE-DP-01			PCE-DP-02			PCE-DP-03			PCW-DP-01			PPOM-DP-01			TCOM-DP-02	
Chemical	Core Depth (m)																
	0 to 0.12	0.12 to 0.24	0.24 to 1.06	0 to 0.09	0.09 to 0.62	0.62 to 1.14	0 to 0.14	0.14 to 0.66	0.56 to 1.22	0 to 0.4	0.4 to 0.57	0.57 to 0.97	0 to 0.22	0.22 to 0.65	0.65 to 1.12	0 to 0.25	0.25 to 0.93
	Soft Sediment		Native Clay	Soft Sediment		Native Clay	Soft Sediment		Native Clay	Soft Sediment		Native Clay	Soft Sediment		Native Clay	Soft Sediment	Native Clay
Antimony[a]	0.35	0.45	< 0.10	1.2	0.12	< 0.10	1.18	0.2	< 0.10	26.4	7.17	< 0.10	1.36	8.45	< 0.10	0.73	< 0.10
Arsenic[b]	2.92	2.57	2.62	5.92	2.38	2.56	7.38	4.39	2.47	31.10	10.20	2.71	30.60	32.10	2.52	6.73	2.72
Chromium[c]	208	181	58	1830	116	54	1620	313	50	16700	1960	72	463	4750	65	669	57
Copper[d]	6.4	14.5	31.0	34.0	11.3	30.3	38.4	13.9	31.3	104.0	19.1	36.8	11.3	60.8	30.7	25.9	33.6
Lead[e]	20.0	37.0	9.6	119.0	8.9	8.3	108.0	20.2	8.5	1100.0	163.0	10.4	48.5	480.0	9.7	83.8	9.8
Mercury[f]	0.05	0.05	0.01	0.21	0.04	0.01	0.19	0.05	0.01	0.89	0.26	0.01	0.16	1.12	0.02	0.29	0.01
Silver[g]	< 0.10	< 0.10	< 0.10	0.41	< 0.10	< 0.10	0.40	< 0.10	< 0.10	< 2.00	0.18	< 0.10	< 0.10	< 2.00	< 0.10	0.29	< 0.10
Zinc[k]	32	37	85	138	21	86	142	38	84	526	111	103	45	332	117	107	87
Total PAH[h]	1.6	0.6	0.1	5.3	0.2	0.1	6.5	0.6	0.1	18.5	4.0	0.1	1.0	8.7	0.1	2.8	0.1
Total PCB[i]	0.068	0.025	< 0.015	0.293	< 0.015	< 0.015	0.368	0.053	< 0.015	0.571	< 0.047	< 0.015	< 0.060	0.305	< 0.015	0.192	< 0.015

Notes: DP = Drilling Program; PCE = Parks Canada East; PCW = Parks Canada West; PPOM = Private Property Orchard Marsh; TCOM = Transport Canada Orchard Marsh; < = less than; m = meters; mg = milligrams; kg = kilograms; TEC = threshold effects concentration; LEL = lowest effect level; PEC = probable effect concentration ; LAET = lowest apparent effect threshold; 2LAET = second-lowest apparent effects threshold; ISQG = Interim Sediment Quality Guidelines; SEL = severe effects level.

Antimony (mg/kg) Screening[a]:
- 0-0.2 mg/kg
- 0.2-0.6 mg/kg (<LAET)
- 0.6-1.9 mg/kg (<2LAET)
- 1.9-6 mg/kg
- 6-20 mg/kg
- > 20 mg/kg

Chromium (mg/kg) Screening[c]:
- 0-37.3 mg/kg (<ISQG)
- 37.3-90 mg/kg (<PEL)
- 90-110 mg/kg (<SEL)
- 110-133 mg/kg (<2LAET)
- 133-500 mg/kg
- 500-1,000 mg/kg
- >1000 mg/kg

Lead (mg/kg) Screening[e]:
- 0-35 mg/kg (<ISQG)
- 35-91.3 mg/kg (<PEL)
- 91.3-250 mg/kg
- 250-335 mg/kg (<LAET)
- 335-431 mg/kg (<2LAET)
- >431 mg/kg

Silver (mg/kg) Screening[g]:
- 0-0.5 mg/kg
- 0.5-0.545 mg/kg (<LAET)
- 0.545-2 mg/kg
- 2-3.5 mg/kg (<2LAET)
- 3.5-4.5 mg/kg
- > 4.5 mg/kg

Total PAH (mg/kg) Screening[h]:
- 0-1.61 mg/kg (<TEC)
- 1.61-4 mg/kg (<LEL)
- 4-10 mg/kg
- 10-22.8 mg/kg (<PEC)
- 22.8-100 mg/kg
- 100-750 mg/kg

Arsenic (mg/kg) Screening[b]:
- 0-5.9 mg/kg (<ISQG)
- 5.9-17 mg/kg (<PEL)
- 17-33 mg/kg (<SEL)
- 33-50.9 mg/kg (<2LAET)
- 50.9-100 mg/kg
- > 100 mg/kg

Copper (mg/kg) Screening[d]:
- 0-35.7 mg/kg (<ISQG)
- 35.7-110 mg/kg (<SEL)
- 110-197 mg.kg (<PEL)
- 197-619 mg/kg (<LAET)
- > 619 mg/kg

Mercury (mg/kg) Screening[f]:
- 0-0.17 mg/kg (<ISQG)
- 0.17-0.486 mg/kg (<PEL)
- 0.486-0.8 mg/kg (<LAET)
- 0.8-2 mg/kg (<SEL)
- 2-3.04 mg/kg (<2LAET)
- > 3.04 mg/kg

Zinc (mg/kg) Screening[k]:
- 0-123 mg/kg (<ISQG)
- 123-315 mg/kg (<PEL)
- 315-683 mg/kg (<LAET)
- 683-820 mg/kg (<SEL)
- 820-1080 mg/kg (<2LAET)
- > 1080 mg/kg

Total PCB (mg/kg) Screening[i]:
- 0-0.07 mg/kg (<LEL)
- 0.07-0.3 mg/kg (<PEL)
- 0.3-0.6 mg/kg (<LAET)
- 0.6-1 mg/kg
- 1-5.3 mg/kg (<SEL)
- > 5.3 mg/kg

APPENDIX D

Butyltin Chemistry Results

D1: Tributyltin Results in Surface and Subsurface Sediments

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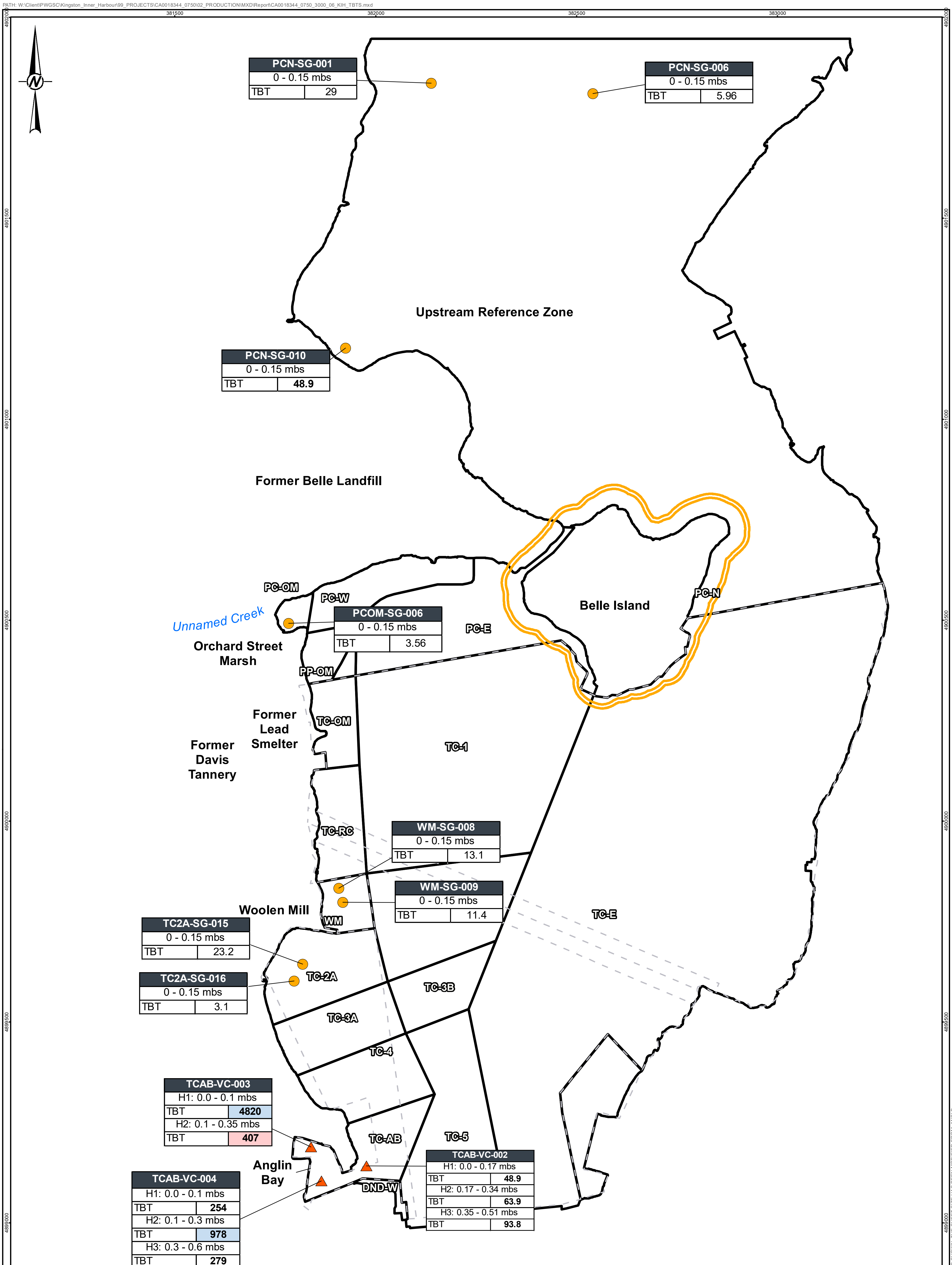

LEGEND

- MANAGEMENT UNIT
- FEDERAL WATER LOT BOUNDARY
- BELLE ISLAND EXCLUSION ZONE
- SURFACE GRAB
- VIBRACORE

0 200 400

1:9,000 METERS

	US EPA R4 ESV	US EPA R4 RSV	RBCA EQS
TBT (µg/kg)	47	320	560

Bold	indicates exceedance of US EPA R4 ESV
Bold and Shaded	indicates exceedance of US EPA R4 RSV
Bold and Shaded	indicates exceedance of RBCA EQS (normalized to 8% organic carbon)

Notes: µg/kg = micrograms per kilogram; EQS = environmental quality standard; ESV = ecological screening value; mbs = metres below surface; R4 = Region 4; RBCA = Risk-Based Corrective Action; RSV = refinement screening value; SG = sediment grab; TBT = tributyltin; US EPA = United States Environmental Protection Agency; VC = vibracore;.

REFERENCE(S)
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2. INSET BASE OBTAINED FROM ESRI CANADA.
3. PARKS OBTAINED FROM THE CITY OF KINGSTON
4. PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
LOCATIONS SAMPLED FOR TRIBUTYLTIN (TBT)

CONSULTANT		
	YYYY-MM-DD	2025-02-12
	DESIGNED	JD
	PREPARED	JP
	REVIEWED	
	APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	D1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

APPENDIX E

Contaminants of Emerging Concern Chemistry Results

E1: Contaminants of Emerging Concern Results in Surface and Subsurface Sediments

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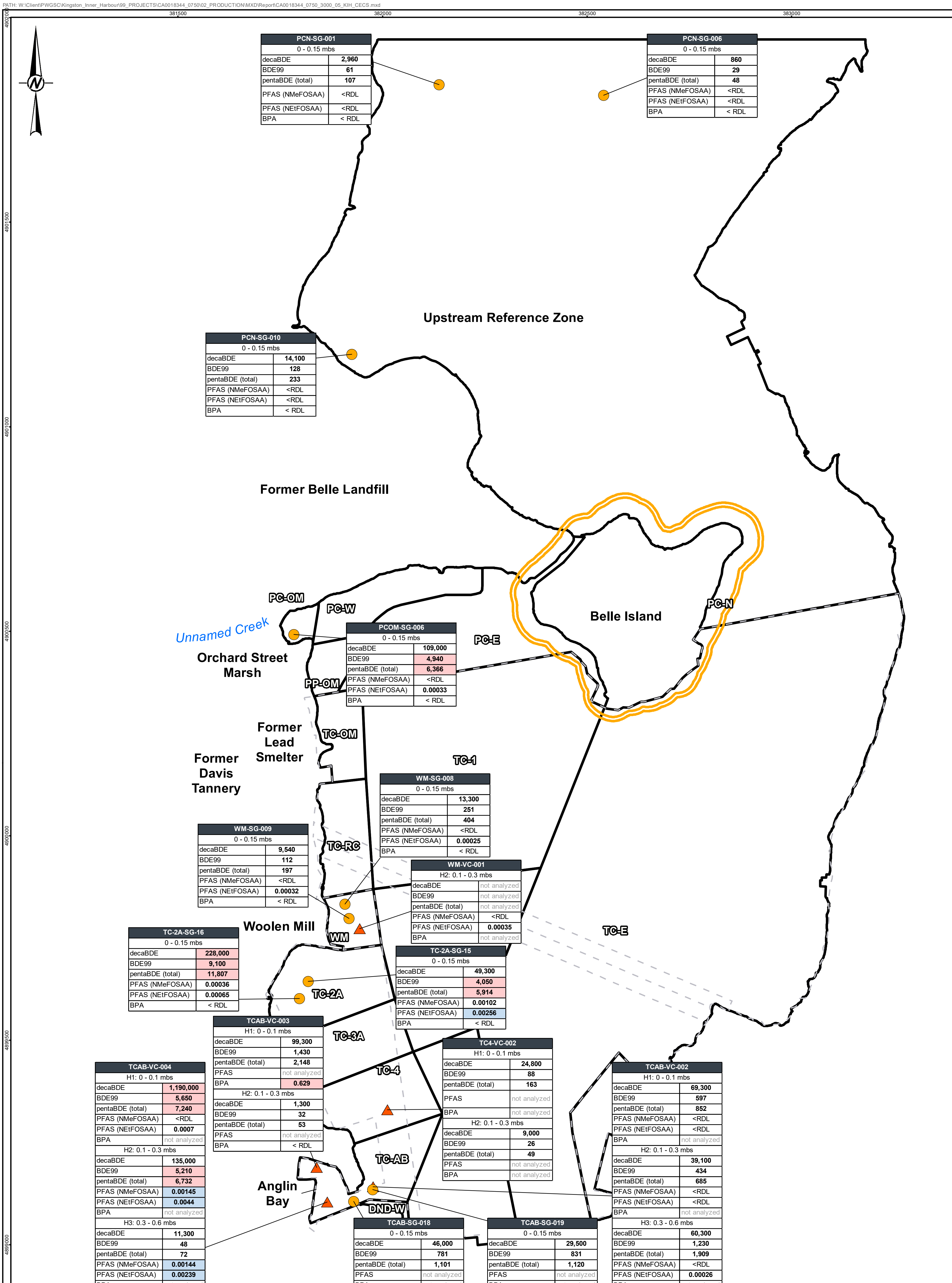

LEGEND

- MANAGEMENT UNIT
- FEDERAL WATER LOT BOUNDARY
- BELLE ISLAND EXCLUSION ZONE
- SURFACE GRAB
- VIBRACORE

0 200 400

1:9,000 METERS

CECs Above Criteria	FEQG	SHEER	SERDP
PBDE			
decaBDE (pg/g)	152,000	na	na
BDE99 (pg/g)	3,200	na	na
pentaBDE (pg/g)	3,200	na	na
PFAS			
NMeFOSAA (mg/kg)*	na	0.0135	0.00143
NEtFOSAA (mg/kg)*	na	0.0135	0.00143
BPA (mg/kg)	0.2	na	na

*PFOS criteria applied as a surrogate for all parameters with sulfonic acid groups

Bold and Shaded indicates detected concentration exceeds the FEQGs (based on 8% organic carbon)

Bold and Shaded indicates detected concentration exceeds the SCHEER or SERDP criteria

Notes: < = less than; CEC = contaminants of emerging concern; BDE = brominated diphenyl ether; BPA = bisphenol A; FEQG = Federal Environmental Quality Guideline; mbs = metres below surface; mg/kg = milligrams per kilogram; na = not applicable; NEtFOSAA = N-ethyl perfluorooctane sulfonamidoacetic acid; NMeFOSAA = N-methyl perfluorooctane sulfonamidoacetic acid; PBDE = polybrominated diphenyl

REFERENCE(S)
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2. INSET BASE OBTAINED FROM ESRI CANADA.
3. PARKS OBTAINED FROM THE CITY OF KINGSTON
4. PROJECTION: UTM ZONE 18 DATUM: NAD 83

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
CONTAMINANTS OF EMERGING CONCERN (CECS)

CONSULTANT

YYYY-MM-DD	2025-02-12
DESIGNED	JD
PREPARED	JP
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	A	E1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

APPENDIX F

Cross Sections

F1: Cross Section Location Plan

F2: Cross Section A-A’

F3: Cross Section B-B’

F4: Cross Section C-C’

F5: Cross Section D-D’

F6: Cross Section E-E’

Path: \\corp.pbwan.net\CA\CAKWL700\CAD-GIS\Client\PWGSC\Kingston Inner Harbour\10_CADD\CIVIL3D\09 CoC Sections\ | File Name: SITE PLAN.dwg | Last Edited By: gld_ryjames Date: 2025-03-24 Time:12:49:05 PM | Printed By: gld_ryjames Date: 2025-03-28 Time:1:35:37 PM

LEGEND

- MANAGEMENT UNIT
- FEDERAL WATER LOT BOUNDARY
- SEDIMENT CORE LOCATION (2021)
- VIBRACORE LOCATION (2023)
- VIBRACORE LOCATION (2024)
- GEOPROBE LOCATION (2024)

REFERENCE(S)

1. BASE IMAGERY © 2025 MICROSOFT CORPORATION © 2025 MAXAR © CNES (2025) DISTRIBUTION AIRBUS DS BING.
2. DATUM: NAD83 (ORIGINAL) PROJECTION: UTM ZONE 18

0 100 200
1:3,000 METRES

CLIENT
PSPC

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
CROSS-SECTION LOCATION PLAN

CONSULTANT

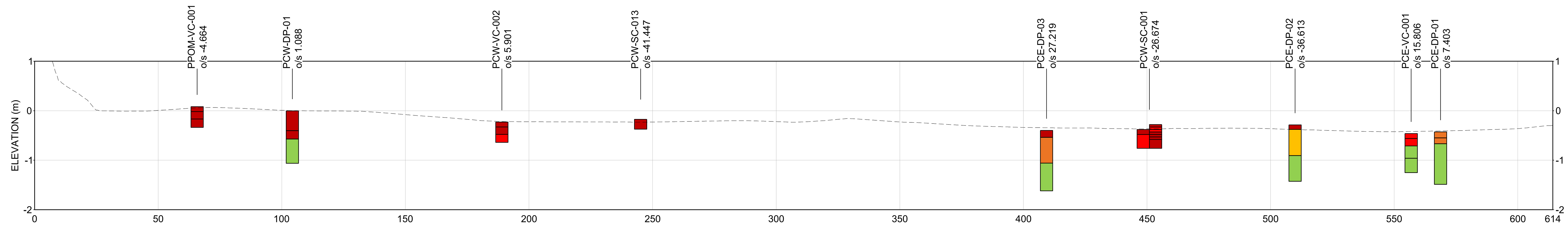
YYYY-MM-DD	2025-03-28
DESIGNED	JD
PREPARED	RTJ
REVIEWED	LF
APPROVED	JD

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	0	F1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
25 mm

CHROMIUM RESULTS

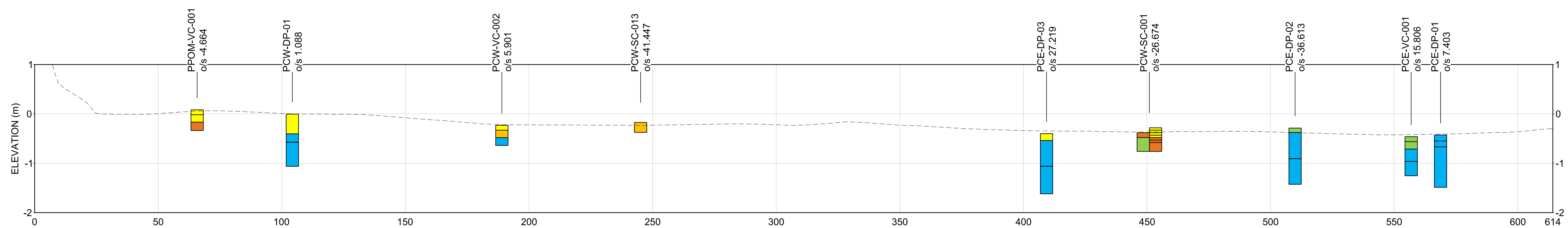
- 0-37.3 mg/kg (<ISQG)
- 37.3-90 mg/kg (<PEL)
- 90-110 mg/kg (<SEL)
- 110-133 mg/kg (<2LAET)
- 133-500 mg/kg
- 500-1,000 mg/kg
- >1000 mg/kg



HORZ. SCALE 1:1000 VERT. SCALE 1:50 A F1 SEDIMENT CORES - CHROMIUM

PCBs RESULTS

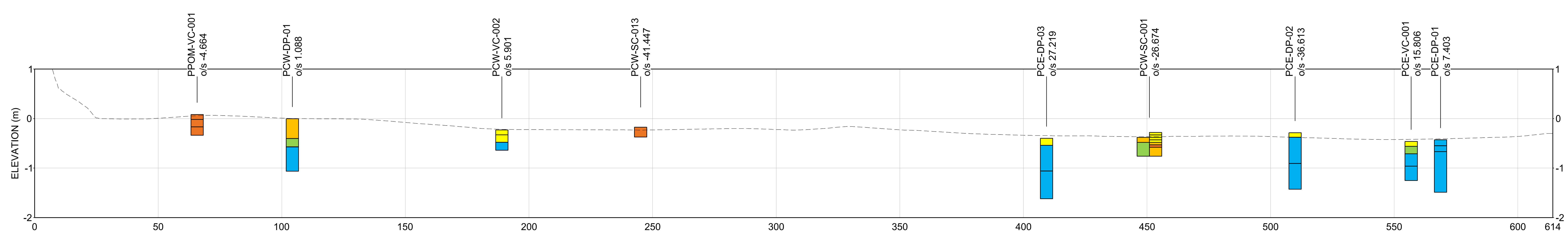
- 0-0.07 mg/kg (<LEL)
- 0.07-0.3 mg/kg (<PEL)
- 0.3-0.6 mg/kg (<LAET)
- 0.6-1 mg/kg
- 1-5.3 mg/kg (<SEL)
- > 5.3 mg/kg



HORZ. SCALE 1:1000 VERT. SCALE 1:50 A F1 SEDIMENT CORES - PCBs

PAHs RESULTS

- 0-1.61 mg/kg (<TEC)
- 1.61-4 mg/kg (<LEL)
- 4-10 mg/kg
- 10-22.8 mg/kg (<PEC)
- 22.8-100 mg/kg
- 100-750 mg/kg



HORZ. SCALE 1:1000 VERT. SCALE 1:50 A F1 SEDIMENT CORES - PAHs

NOTES

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. EXISTING LAKE BED ELEVATION IS BASED ON SURVEY DATA COLLECTED BY WSP IN 2021-2022, AND UPDATED BASED ON FIELD MEASUREMENTS THROUGH 2024.
3. ELEVATIONS ARE IN CHART DATUM (IGLD85 = +74.2 m CD)
4. OFFSET (o/s) IS THE DISTANCE FROM THE SECTION LINE TO THE SAMPLE LOCATION. THE GREATER THE OFFSET DISTANCE THE GREATER THE LIKELIHOOD OF A DIFFERENCE OF ELEVATION IN COMPARISON TO THE ACTUAL LAKE BED ELEVATION.

LEGEND

- - - - - EXISTING LAKE BED ELEVATION

ABBREVIATIONS

ISQG	INTERIM SEDIMENT QUALITY GUIDELINE
LEL	LOW EFFECTS LEVEL
LAET	LOWEST ADVERSE EFFECT LEVEL
PEC	PROBABLE EFFECT CONCENTRATION
PEL	PROBABLE EFFECTS LEVEL
2LAET	SECOND LOWEST ADVERSE EFFECT LEVEL
SEL	SEVERE EFFECT LEVEL
TEC	TOLERABLE EFFECT CONCENTRATION

0 2 4 1:50 METRES

0 50 100 1:1,000 METRES

CLIENT
PSPC

CONSULTANT

YYYY-MM-DD	2025-03-28
DESIGNED	JD
PREPARED	RTJ
REVIEWED	LF
APPROVED	JD

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

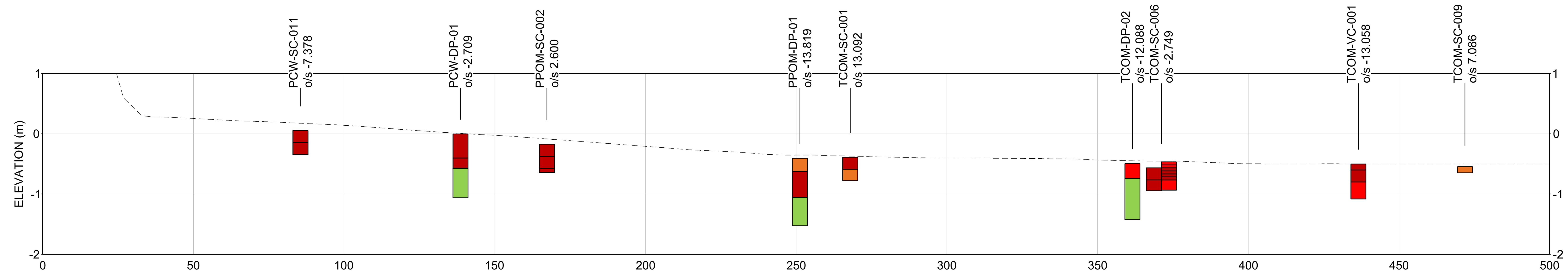
TITLE
CROSS-SECTION A-A'
SELECT SEDIMENT CONCENTRATIONS

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	0	F2

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

CHROMIUM RESULTS

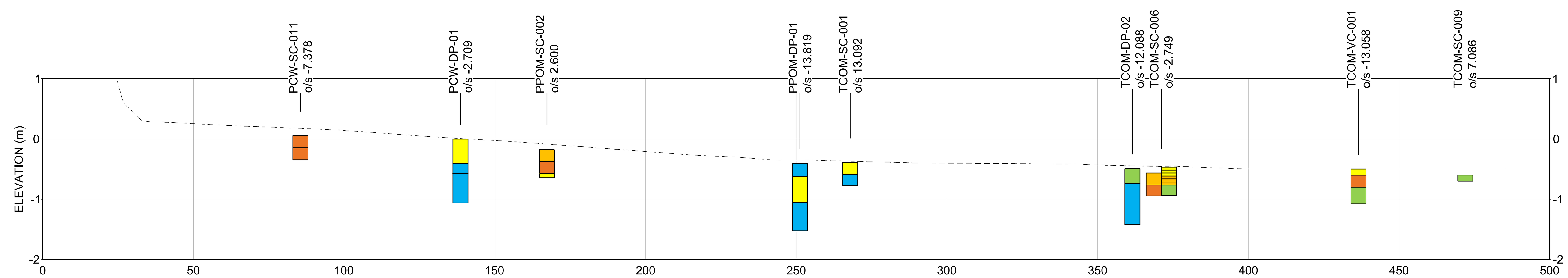
- 0-37.3 mg/kg (<ISQG)
- 37.3-90 mg/kg (<PEL)
- 90-110 mg/kg (<SEL)
- 110-133 mg/kg (<2LAET)
- 133-500 mg/kg
- 500-1,000 mg/kg
- >1000 mg/kg



HORZ. SCALE 1:1000 | VERT. SCALE 1:50 | B / F1 | SEDIMENT CORES - CHROMIUM

PCBs RESULTS

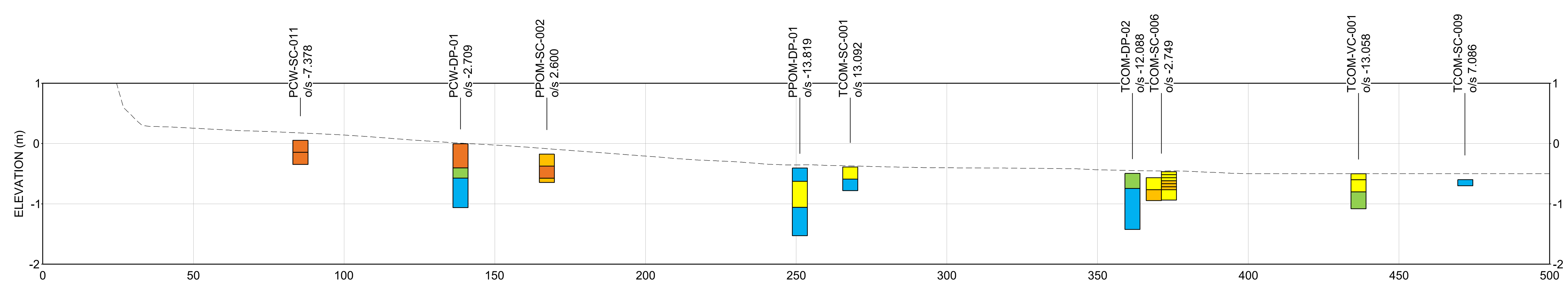
- 0-0.07 mg/kg (<LEL)
- 0.07-0.3 mg/kg (<PEL)
- 0.3-0.6 mg/kg (<LAET)
- 0.6-1 mg/kg
- 1-5.3 mg/kg (<SEL)
- > 5.3 mg/kg



HORZ. SCALE 1:1000 | VERT. SCALE 1:50 | B / F1 | SEDIMENT CORES - PCBs

PAHs RESULTS

- 0-1.61 mg/kg (<TEC)
- 1.61-4 mg/kg (<LEL)
- 4-10 mg/kg
- 10-22.8 mg/kg (<PEC)
- 22.8-100 mg/kg
- 100-750 mg/kg



HORZ. SCALE 1:1000 | VERT. SCALE 1:50 | B / F1 | SEDIMENT CORES - PAHs

NOTES

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. EXISTING LAKE BED ELEVATION IS BASED ON SURVEY DATA COLLECTED BY WSP IN 2021-2022, AND UPDATED BASED ON FIELD MEASUREMENTS THROUGH 2024.
3. ELEVATIONS ARE IN CHART DATUM (IGLD85 = +74.2 m CD)
4. OFFSET (o/s) IS THE DISTANCE FROM THE SECTION LINE TO THE SAMPLE LOCATION. THE GREATER THE OFFSET DISTANCE THE GREATER THE LIKELIHOOD OF A DIFFERENCE OF ELEVATION IN COMPARISON TO THE ACTUAL LAKE BED ELEVATION.

LEGEND

- - - - - EXISTING LAKE BED ELEVATION

ABBREVIATIONS

ISQG	INTERIM SEDIMENT QUALITY GUIDELINE
LEL	LOW EFFECTS LEVEL
LAET	LOWEST ADVERSE EFFECT LEVEL
PEC	PROBABLE EFFECT CONCENTRATION
PEL	PROBABLE EFFECTS LEVEL
2LAET	SECOND LOWEST ADVERSE EFFECT LEVEL
SEL	SEVERE EFFECT LEVEL
TEC	TOLERABLE EFFECT CONCENTRATION

0 2 4 — 1:50 METRES

0 50 100 — 1:1,000 METRES

CLIENT	PSPC
CONSULTANT	WSP
YYYY-MM-DD	2025-03-28
DESIGNED	JD
PREPARED	RTJ
REVIEWED	LF
APPROVED	JD

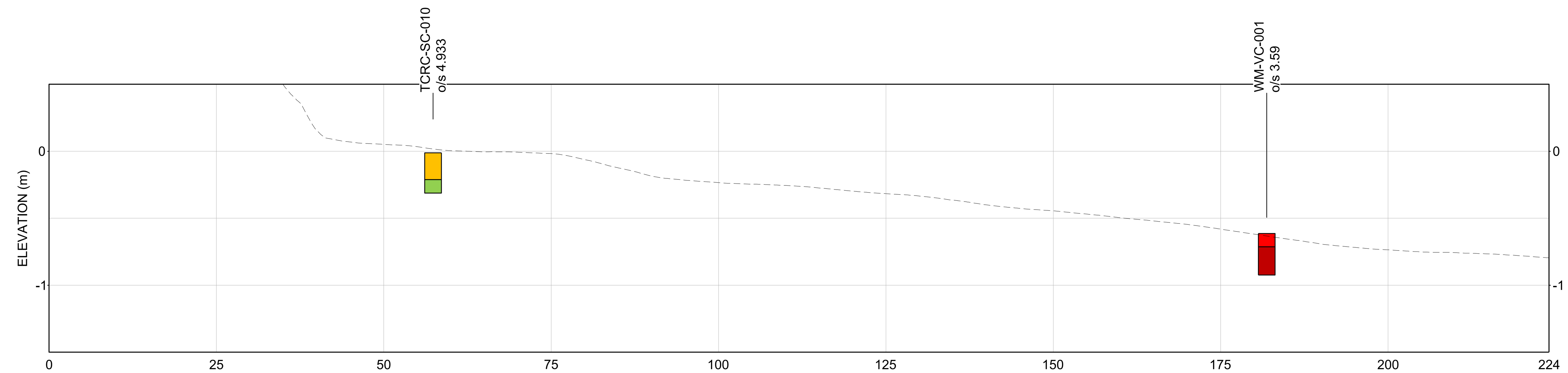
PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
CROSS-SECTION B-B'
SELECT SEDIMENT CONCENTRATIONS

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	0	F3

CHROMIUM RESULTS

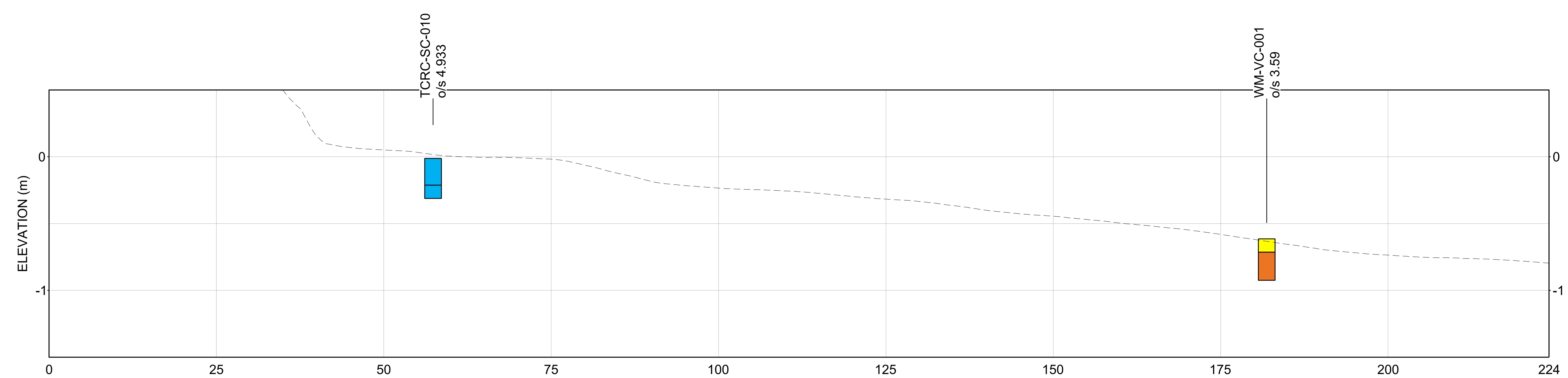
- 0-37.3 mg/kg (<ISQG)
- 37.3-90 mg/kg (<PEL)
- 90-110 mg/kg (<SEL)
- 110-133 mg/kg (<2LAET)
- 133-500 mg/kg
- 500-1,000 mg/kg
- >1000 mg/kg



HORZ. SCALE 1:500 | VERT. SCALE 1:20 | C / F1 | SEDIMENT CORES - CHROMIUM

PCBs RESULTS

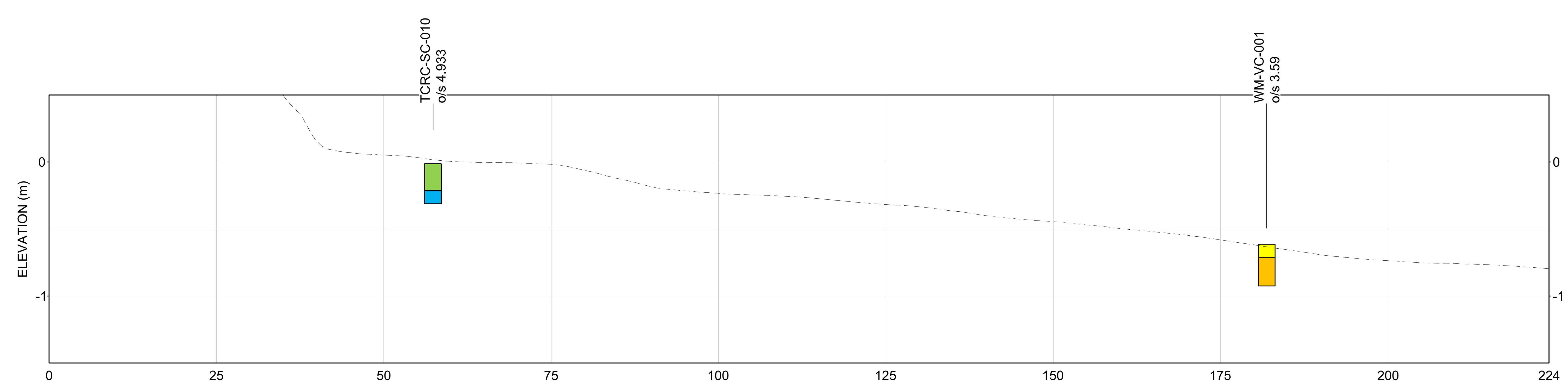
- 0-0.07 mg/kg (<LEL)
- 0.07-0.3 mg/kg (<PEL)
- 0.3-0.6 mg/kg (<LAET)
- 0.6-1 mg/kg
- 1-5.3 mg/kg (<SEL)
- > 5.3 mg/kg



HORZ. SCALE 1:500 | VERT. SCALE 1:20 | C / F1 | SEDIMENT CORES - PCBs

PAHs RESULTS

- 0-1.61 mg/kg (<TEC)
- 1.61-4 mg/kg (<LEL)
- 4-10 mg/kg
- 10-22.8 mg/kg (<PEC)
- 22.8-100 mg/kg
- 100-750 mg/kg



HORZ. SCALE 1:500 | VERT. SCALE 1:20 | C / F1 | SEDIMENT CORES - PAHs

NOTES

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. EXISTING LAKE BED ELEVATION IS BASED ON SURVEY DATA COLLECTED BY WSP IN 2021-2022, AND UPDATED BASED ON FIELD MEASUREMENTS THROUGH 2024.
3. ELEVATIONS ARE IN CHART DATUM (IGLD85 = +74.2 m CD)
4. OFFSET (o/s) IS THE DISTANCE FROM THE SECTION LINE TO THE SAMPLE LOCATION. THE GREATER THE OFFSET DISTANCE THE GREATER THE LIKELIHOOD OF A DIFFERENCE OF ELEVATION IN COMPARISON TO THE ACTUAL LAKE BED ELEVATION.

LEGEND

- - - - - EXISTING LAKE BED ELEVATION

ABBREVIATIONS

ISQG	INTERIM SEDIMENT QUALITY GUIDELINE
LEL	LOW EFFECTS LEVEL
LAET	LOWEST ADVERSE EFFECT LEVEL
PEC	PROBABLE EFFECT CONCENTRATION
PEL	PROBABLE EFFECTS LEVEL
2LAET	SECOND LOWEST ADVERSE EFFECT LEVEL
SEL	SEVERE EFFECT LEVEL
TEC	TOLERABLE EFFECT CONCENTRATION

0 1 2
1:25 METRES

0 20 40
1:500 METRES

CLIENT
PSPC

CONSULTANT
wsp

YYYY-MM-DD	2025-03-28
DESIGNED	JD
PREPARED	RTJ
REVIEWED	LF
APPROVED	JD

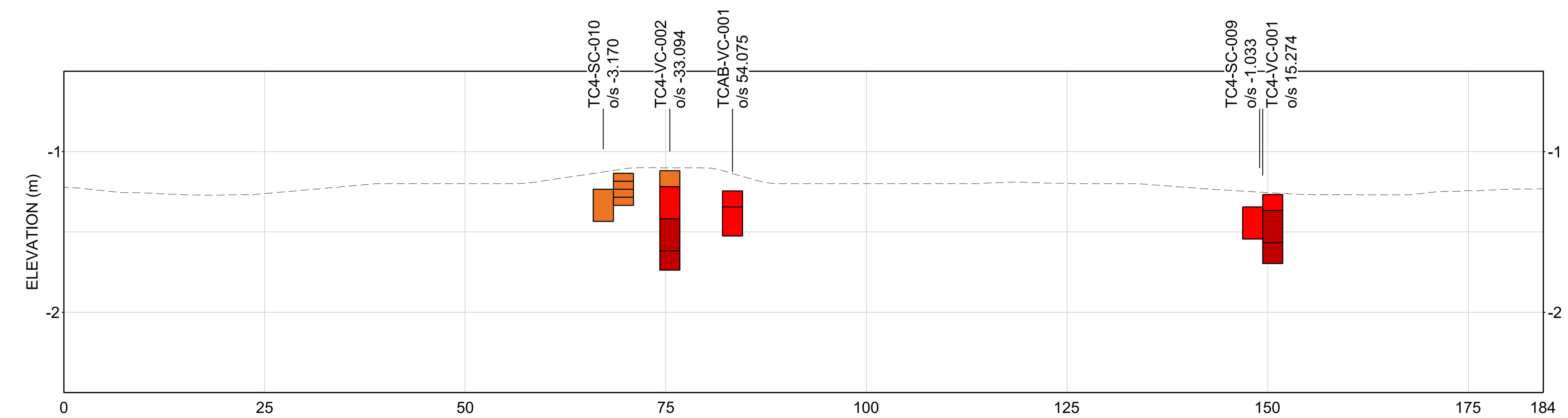
PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
CROSS-SECTION C-C'
SELECT SEDIMENT CONCENTRATIONS

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	0	F4

CHROMIUM RESULTS

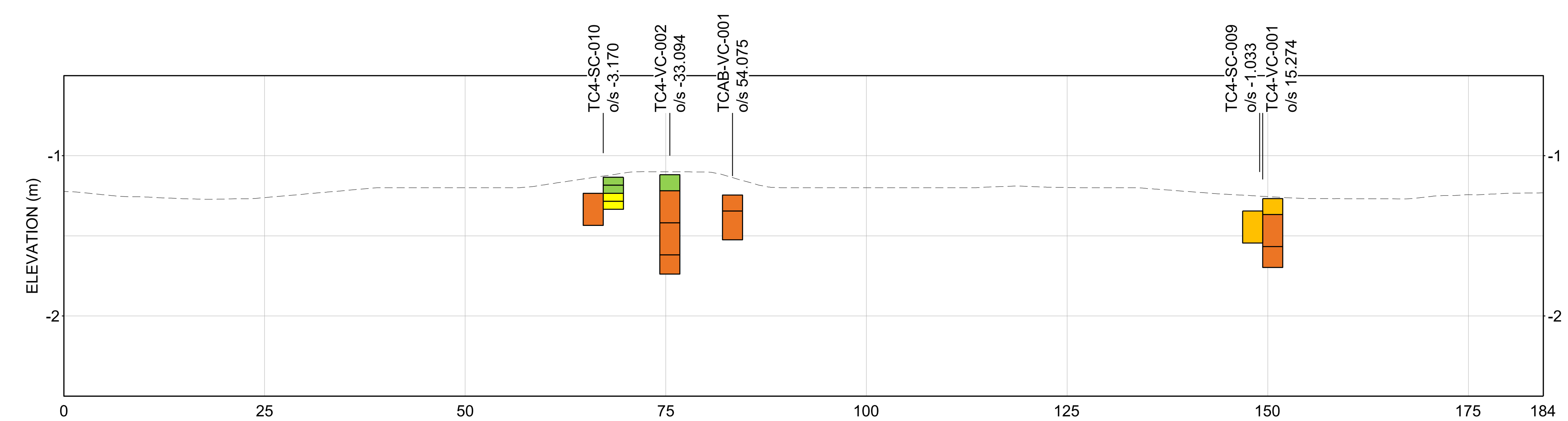
- 0-37.3 mg/kg (<ISQG)
- 37.3-90 mg/kg (<PEL)
- 90-110 mg/kg (<SEL)
- 110-133 mg/kg (<2LAET)
- 133-500 mg/kg
- 500-1,000 mg/kg
- >1000 mg/kg



HORZ. SCALE 1:500 | VERT. SCALE 1:25 — D / F1 SEDIMENT CORES - CHROMIUM

PCBs RESULTS

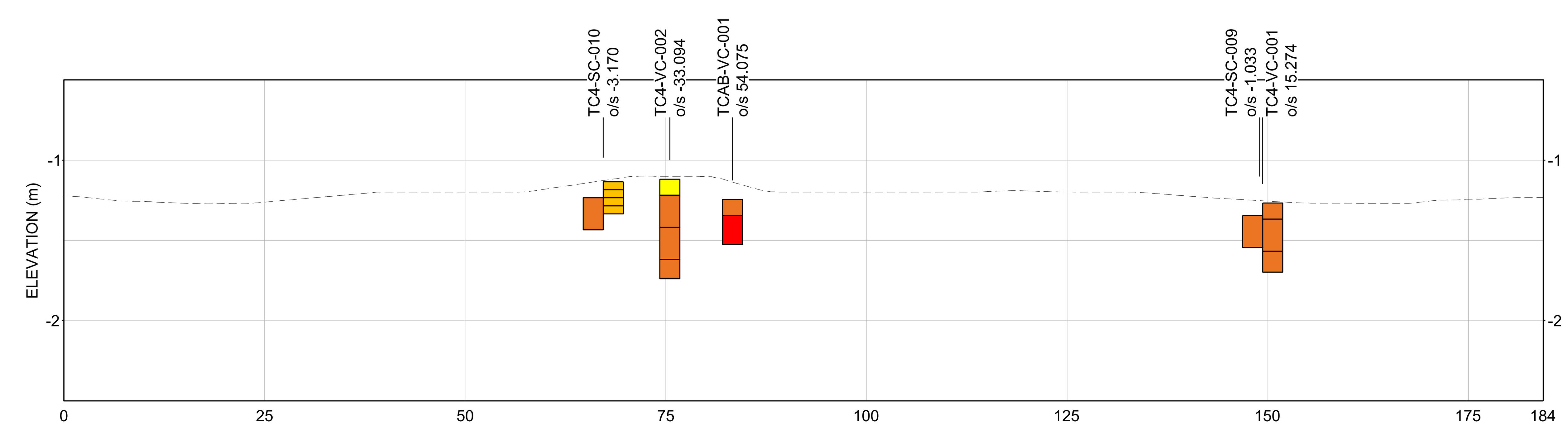
- 0-0.07 mg/kg (<LEL)
- 0.07-0.3 mg/kg (<PEL)
- 0.3-0.6 mg/kg (<LAET)
- 0.6-1 mg/kg
- 1-5.3 mg/kg (<SEL)
- > 5.3 mg/kg



HORZ. SCALE 1:500 | VERT. SCALE 1:25 — D / F1 SEDIMENT CORES - PCBs

PAHs RESULTS

- 0-1.61 mg/kg (<TEC)
- 1.61-4 mg/kg (<LEL)
- 4-10 mg/kg
- 10-22.8 mg/kg (<PEC)
- 22.8-100 mg/kg
- 100-750 mg/kg



HORZ. SCALE 1:500 | VERT. SCALE 1:25 — D / F1 SEDIMENT CORES - PAHs

NOTES

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. EXISTING LAKE BED ELEVATION IS BASED ON SURVEY DATA COLLECTED BY WSP IN 2021-2022, AND UPDATED BASED ON FIELD MEASUREMENTS THROUGH 2024.
3. ELEVATIONS ARE IN CHART DATUM (IGLD85 = +74.2 m CD)
4. OFFSET (o/s) IS THE DISTANCE FROM THE SECTION LINE TO THE SAMPLE LOCATION. THE GREATER THE OFFSET DISTANCE THE GREATER THE LIKELIHOOD OF A DIFFERENCE OF ELEVATION IN COMPARISON TO THE ACTUAL LAKE BED ELEVATION.

LEGEND

- - - - - EXISTING LAKE BED ELEVATION

ABBREVIATIONS

ISQG	INTERIM SEDIMENT QUALITY GUIDELINE
LEL	LOW EFFECTS LEVEL
LAET	LOWEST ADVERSE EFFECT LEVEL
PEC	PROBABLE EFFECT CONCENTRATION
PEL	PROBABLE EFFECTS LEVEL
2LAET	SECOND LOWEST ADVERSE EFFECT LEVEL
SEL	SEVERE EFFECT LEVEL
TEC	TOLERABLE EFFECT CONCENTRATION

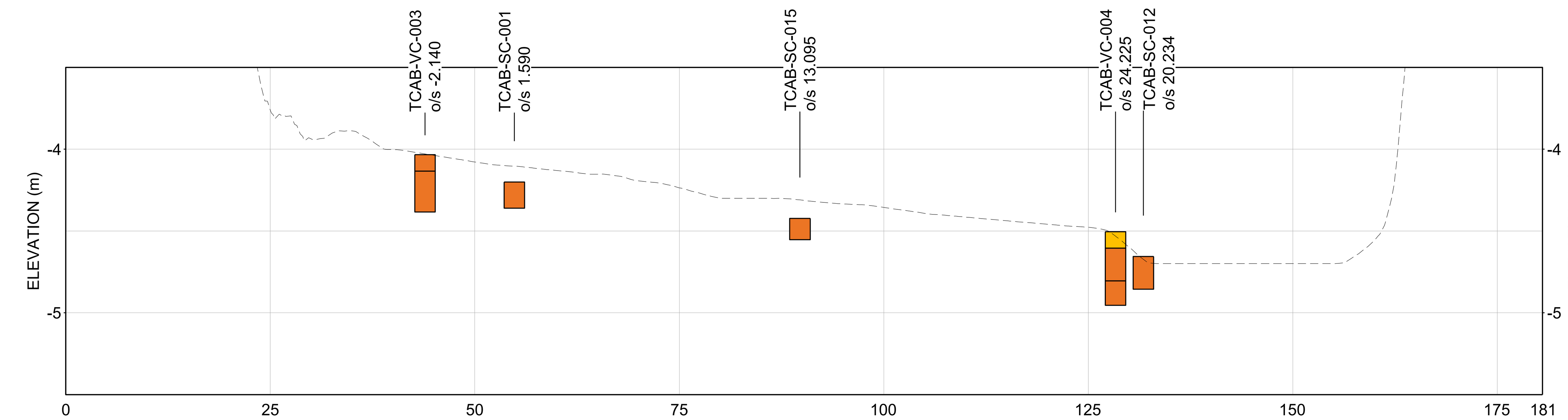
0 1 2
1:25 METRES

0 20 40
1:500 METRES

CLIENT PSPC		PROJECT KINGSTON INNER HARBOUR KINGSTON, ONTARIO	
CONSULTANT wsp	YYYY-MM-DD: 2025-03-28 DESIGNED: JD PREPARED: RTJ REVIEWED: LF APPROVED: JD	TITLE **CROSS-SECTION D-D'** **SELECT SEDIMENT CONCENTRATIONS**	
		PROJECT NO.: CA0018344.0750 PHASE: 3000	REV.: 0 FIGURE: F5

CHROMIUM RESULTS

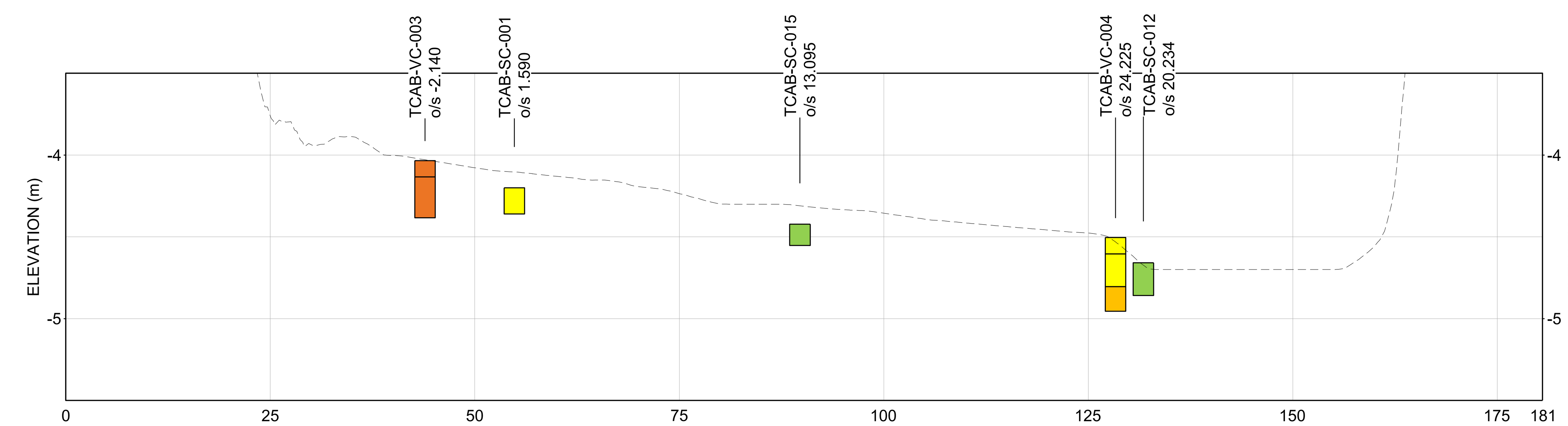
- 0-37.3 mg/kg (<ISQG)
- 37.3-90 mg/kg (<PEL)
- 90-110 mg/kg (<SEL)
- 110-133 mg/kg (<2LAET)
- 133-500 mg/kg
- 500-1,000 mg/kg
- >1000 mg/kg



HORZ. SCALE 1:500 E SEDIMENT CORES - CHROMIUM
VERT. SCALE 1:25 F1

PCBs RESULTS

- 0-0.07 mg/kg (<LEL)
- 0.07-0.3 mg/kg (<PEL)
- 0.3-0.6 mg/kg (<LAET)
- 0.6-1 mg/kg
- 1-5.3 mg/kg (<SEL)
- > 5.3 mg/kg



HORZ. SCALE 1:500 E SEDIMENT CORES - PCBs
VERT. SCALE 1:25 F1

PAHs RESULTS

- 0-1.61 mg/kg (<TEC)
- 1.61-4 mg/kg (<LEL)
- 4-10 mg/kg
- 10-22.8 mg/kg (<PEC)
- 22.8-100 mg/kg
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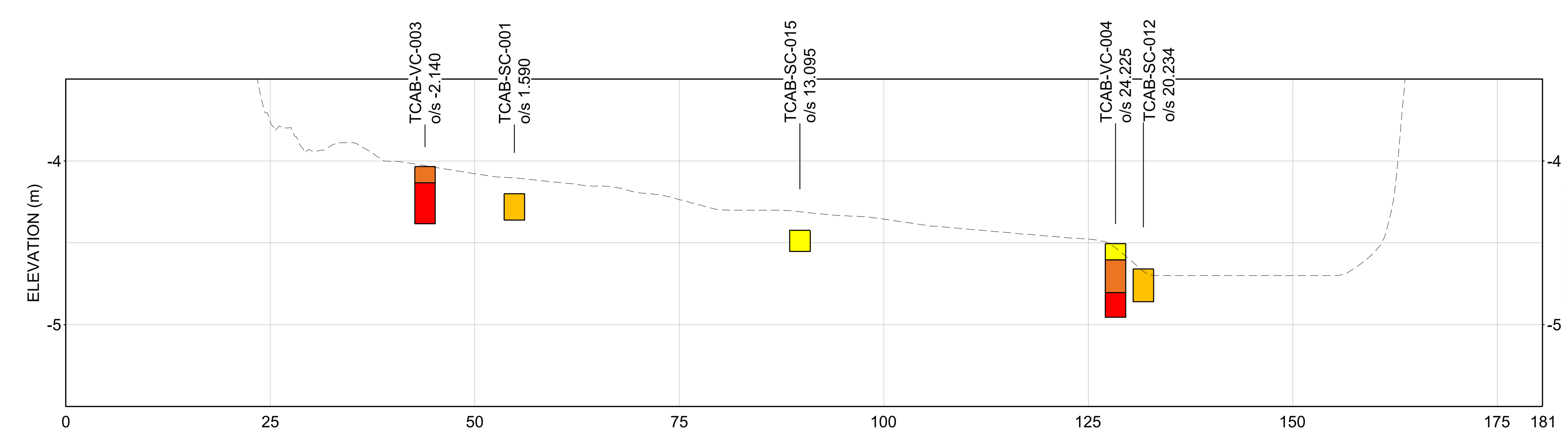

HORZ. SCALE 1:500 E SEDIMENT CORES - PAHs
VERT. SCALE 1:25 F1

NOTES

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3. ELEVATIONS ARE IN CHART DATUM (IGLD85 = +74.2 m CD)
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LEGEND

- - - - - EXISTING LAKE BED ELEVATION

ABBREVIATIONS

ISQG	INTERIM SEDIMENT QUALITY GUIDELINE
LEL	LOW EFFECTS LEVEL
LAET	LOWEST ADVERSE EFFECT LEVEL
PEC	PROBABLE EFFECT CONCENTRATION
PEL	PROBABLE EFFECTS LEVEL
2LAET	SECOND LOWEST ADVERSE EFFECT LEVEL
SEL	SEVERE EFFECT LEVEL
TEC	TOLERABLE EFFECT CONCENTRATION

0 1 2
1:25 METRES

0 20 40
1:500 METRES

CLIENT
PSPC

CONSULTANT

YYYY-MM-DD	2025-03-28
DESIGNED	JD
PREPARED	RTJ
REVIEWED	LF
APPROVED	JD

PROJECT
KINGSTON INNER HARBOUR
KINGSTON, ONTARIO

TITLE
CROSS-SECTION E-E'
SELECT SEDIMENT CONCENTRATIONS

PROJECT NO.	PHASE	REV.	FIGURE
CA0018344.0750	3000	0	F6

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