Analysis of Brownfield Cleanup Alternatives (ABCA) for Riverfront Park, Target Area C, North Bank Development Area

Riverfront Park Redevelopment Project
Riverfront Park
Target Area C, North Bank Development Area
Spokane, Washington

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Sign-off Sheet

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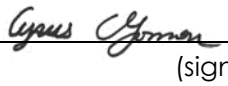
Cyrus Gorman, LG

Prepared by 
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Chris Gdak, PE

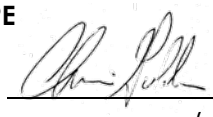
Approved by 
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Table of Contents

LIST OF TABLES

LIST OF FIGURES

Abbreviations

bgs	Below ground surface
cPAH	Carcinogenic polycyclic aromatic hydrocarbon
COC	Constituent of Concern
CY	Cubic yards
ESA	Environmental Site Assessment
HAZWOPER	Hazardous Waste Operations and Emergency Response
Mg/kg	Milligrams per kilogram
MTCA	Model Toxics Control Act
PAH	Polycyclic Aromatic Hydrocarbons
REC	Recognized Environmental Condition
RCRA	Resource Conservation and Recovery Act
EPA	United States Environmental Protection Agency
WAC	Washington Administrative Code

1.0 INTRODUCTION AND HISTORY

Riverfront Park is located at 507 N. Howard Street in the heart of Spokane, Washington and occupies approximately 100 acres of land and water with a rich and varied history. Spokane Falls and the surrounding land has long been a gathering place for people. Native Americans gathered and fished at the falls and in the late 1800's, pioneers settled here and started the City of Spokane then known as Spokane Falls. The railroad industry fueled the city's growth in the late 19th and early 20th centuries and rail yards covered Havermale Island, the present site of Riverfront Park.

With the steady decline of the railroad in the 1950s, the area around Havermale Island began to degrade and the City struggled with the challenge of how to revitalize the area. The City's response was to host Exposition '74 (Expo '74), "The World's Fair." In preparation for Expo '74, the rail yards were removed and the Great Northern Railroad Depot on Havermale Island was demolished. Massive amounts of fill were brought in to cover the historically industrial area. The Clock tower is the only vestige of the once famous 1902 Great Northern Depot.

Now, over 40 years after its creation following Expo '74, an extensive revitalization and rehabilitation effort being led by the City of Spokane's Parks and Recreation Department (Parks Department) is underway to bring new life to this local landmark. Because of the former industrial uses of the area now comprising much of the Park, contaminated soil has been encountered during the revitalization projects.

In May of 2017, the City of Spokane (City) was formally awarded three separate $200,000 United States Environmental Protection Agency (EPA) grants for cleanup of petroleum and hazardous substance brownfields sites within Riverfront Park. The three grants were awarded for Canada Island, Havermale Island and the North Bank. These grants will be used to fund soil cleanup activities at the respective areas within Riverfront Park, a brownfield property.

This Analysis of Brownfield Cleanup Alternatives (ABCA) is for Target Area C, North Bank (Figure 1). The funding provided through this grant is to address contaminated and impacted soil on the North Bank in conjunction with the revitalization project.

2.0 ENVIRONMENTAL BACKGROUND

The following section provides a summary of recent investigations completed at Riverfront Park.

2.1 PHASE I ENVIRONMENTAL SITE ASSESSMENT

GeoEngineers completed a Phase I Environmental Site Assessment (ESA) in October 2014 at Riverfront Park on behalf of the City of Spokane. The Phase I ESA identified historical occupants of the Property as recognized environmental conditions (RECs), including railroads, auto service stations and various types of mills and factories to name a few. The report indicated that a large amount of fill was imported and used throughout the Park for construction of the 1974 World's Fair. The exact amount of fill is unknown. A portion of the fill was sourced from Havermale Island and area west of Monroe Street near the courthouse.

2.2 LOOFF CAROUSEL – GEOTECHNICAL AND ENGINEERING EVALUATION AND ENVIRONMENTAL SITE ASSESSMENT

In May 2016, GeoEngineers conducted a geotechnical engineering and environmental assessment to support construction a new Looff Carousel structure to replace the existing facility which had exceeded its useful life (GeoEngineers, 2016a). The investigation included the installation of eight soil borings to depths of 4 to 15 feet below ground surface (bgs) using a hollow-stem auger drill rig (Figure 2). Based on the investigation, soil beneath the asphalt pavement was observed to contain variable base material consisting of crushed rock base to fine to medium sand with variable silt content. In two borings advanced in the southeast corner of the Property, 12-inches of sandy topsoil were encountered. Beneath the pavement and topsoil, where encountered, fill extended to the maximum depths explored. The fill material consisted of loose to medium dense sand and gravel with variable silt and cobbles and debris (brick, concrete). Groundwater was encountered in four borings. At two of the locations (LC-1 & LC-4), the groundwater elevation was near that of the Spokane River (1,870.5 feet above mean sea level based on NAVD88) and at the remaining locations (LC-2 and LC-6), below the elevation of the River. GeoEngineers interpreted these data to suggest that groundwater in the project area flows from the River to the south. The analytical results revealed exceedances of lube oil petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), and lead. Lube oil petroleum hydrocarbons were greater than the Model Toxics Control Act (MTCA) Method A cleanup level in the soil sample collected from LC-4 at 1 to

2.5 feet bgs. PAHs exceeded the MTCA Method A in samples LC-1 at 3.5 to 5 feet bgs, LC-2 at 8.5 to 9 feet bgs, and LC-4 1 to 2.5 feet bgs.

2.3 ICE RIBBON AND SKY RIDE FACILITY-GEOTECHNICAL ENGINEERING EVALUATION AND ENVIRONMENTAL SITE ASSESSMENT

In June 2016, GeoEngineers conducted a geotechnical engineering and ESA for an adjacent Riverfront Park parcel to the southwest of Havermale, (GeoEngineers 2016b, Figure 2). The purpose of the investigation was to characterize soil prior to the planned construction of an Ice Rink and SkyRide Facility and to identify potential contaminants. Because this adjacent parcel is proximate to the Property and generally had the same historically uses it is included in this discussion because soil conditions on the Property are likely to be similar in nature. The scope of work included the advancement of 16 hollow-stem auger borings and the collection of soil samples for both geotechnical and chemical laboratory testing. During this investigation groundwater was encountered in only two of the borings, B-5 and B-17 at depths of approximately 6 feet bgs. Groundwater was not encountered consistently across the site due to the proximity of the Spokane River and varying depths to bedrock. Because groundwater is not expected to be encountered it will not need to be managed during construction activities.

Based on the investigation, an upper layer of organic topsoil is underlain by 5 to 10 inches of fill soil consisting of loose to medium dense sand and gravel with variable silt and cobble content. The analytical results indicate that soil samples from borings B-5, B-7, B-9, B-11, B-13, B-14, and B-18 contain carcinogenic polycyclic aromatic hydrocarbons (cPAHs) at concentrations greater than the MTCA Method A Unrestricted Land Use cleanup level. Lead was detected in borings B-13 and B-18 at concentrations greater than the MTCA Method A cleanup level. In addition, cadmium and chromium concentrations exceeded the MTCA Method A cleanup level in boring B-13. Soil from other locations was collected for geotechnical characterization and not submitted for chemical analysis. Lube-oil range petroleum hydrocarbons were also detected in one soil sample from B-13 at a concentration greater than the MTCA Method A Unrestricted Land Use cleanup level. The measured concentrations are generally below the cleanup standards that would apply to the site if still in use as a railroad facility. Therefore, the need for environmental cleanup is driven primarily by the ingestion exposure pathway and the change in land use by the City from industrial to recreational. Other anticipated environmental cleanup costs are associated with the need to

manage contaminated materials that will be excavated for construction purposes. Although some of the contaminants at the site are consistent with those frequently encountered on properties in use by railroad operations, the contaminants are also consistent with those occurring in urban areas subject to filling in the 1800s. In addition, the railroad tracks were located on an elevated platform. Therefore, it is uncertain whether any of the contamination present at the site can be directly linked to activities by the former owners. Regardless, anticipated cleanup costs are the result of the need to manage contaminated soil for the purpose of redevelopment as well as the conversion in land use that occurred following acquisition by the City (from industrial to recreational).

2.4 PHASE II SITE ASSESSMENT REPORT - CANADA ISLAND, THEME STREAM, CENTRAL PROMENADE, HAVERMALE ISLAND AND THE NORTH BANK AREA

In June 2016, GeoEngineers conducted a Phase II ESA in five areas of the Park; Canada Island, Theme Stream, South Bank, Central Green, Havermale Island and the North Bank area (GeoEngineers, 2016c). The purpose of the investigation was to characterize soil within these redevelopment areas in order to identify potential contaminants. The scope of work included the advancement of 40 direct-push soil borings and the collection of soil samples for chemical laboratory testing. 21 of the soil borings, DP-01 through DP-21 were advanced on on the North Bank to depths between 2 and 15 feet bgs. The analytical results indicate that soil at the Property contains cadmium, lead, PAHs and lube-oil range petroleum hydrocarbons at concentrations greater than the MTCA Method A Unrestricted Land Use cleanup level.

A soil sample collected from one of the borings (DP-16) was analyzed for volatile organic compounds (VOCs) because field screening indicated the presence of VOCs. Chemical analysis indicated generally indicated VOC concentrations less than laboratory reporting limits. Other anticipated environmental cleanup costs are associated with the need to manage contaminated soil that will be excavated for construction purposes. GeoEngineers concluded that in their opinion the subsurface conditions across the Site should be considered impacted and/or contaminated with constituents of concern (COCs). Metals concentrations greater than the background concentrations have been used to characterize soil as impacted.

3.0 APPLICABLE REGULATIONS AND CLEANUP STANDARD

Relevant regulations and cleanup standards are identified below:

- MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses.
- Spokane Basin Background Metals Concentrations (San Juan 1994).
- Washington Administrative Code Dangerous Waste Regulations Chapter 173-303.

As outlined in the Soil Management Plan for Riverfront Park (GeoEngineers 2017), three soil handling categories were developed to guide the City and the City's contractors during soil excavation and stockpile management activities. Use of these categories and protocols is predicated on subsurface soil within each project area being adequately characterized and extents of each soil category sufficiently delineated. Based on the data collected from previous investigations, COCs in soil have been characterized.

Table 1- Cleanup Criteria for Unrestricted Land Uses

Analytical Parameter	Constituent	MTCA Method A Cleanup Level (mg/kg)
Total Petroleum Hydrocarbons	1. Gasoline Range Organics 2. Diesel Range Organics 3. Residual Range Organics	1. 100[1] 2. 2,000 3. 2,000
Metals	4. Arsenic 5. Barium 6. Cadmium 7. Chromium 8. Lead 9. Silver 10. Selenium 11. Mercury 12. Benzo(A)pyrene	4. 20 5. NE 6. 2 7. 2,000 8. 250 9. NE 10. NE 11. 2 12. 0.1
Polycyclic Aromatic Hydrocarbons	13. Naphthalene 14. cPAHs Toxic Equivalency	13. 5 14. 0.1[2]

Notes:
1 Cleanup level for total naphthalenes (naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene)
2 Toxic equivalfency for carcinogenic poly aromatic hydrocarbons (cPAHs) calculated using the toxic equivalency factors found in MTCA Table 708-2.
mg/kg = milligrams per kilogram; NE = Not Established

Table 2 - 90th Percentile Spokane Basin Background Soil Concentrations

Metal	Spokane Basin Background Concentration, 90th Percentile (mg/kg)
1. Arsenic 2. Cadmium 3. Chromium 4. Lead 5. Mercury	1. 9.34 2. 0.7 3. 17.8 4. 14.9 5. 0.02

3.1 CONTAMINATED SOIL

For the purposes of soil handling for the Redevelopment Project, soil is considered "contaminated" if:

- Contaminant concentrations for any analyte exceed MTCA Method A for Unrestricted Land Use cleanup criteria;
- Contaminant concentrations meet or exceed dangerous waste and dangerous waste source criteria as defined in WAC 173-303;
- Toxicity characteristic leaching procedure results exceed Resource Conservation and Recovery Act (RCRA) regulatory levels; or
- Physical evidence of contamination (sheen, chemical or petroleum odor, staining) is observed, unless additional chemical analysis is performed to further categorize the soil.

3.2 IMPACTED SOIL

Soil is considered "impacted" if:

- Petroleum compound and PAH concentrations for any analyte exceed laboratory reporting limits but are less than the respective MTCA Method A Cleanup Criteria for Unrestricted Land Use; or
- Metal concentrations exceed the laboratory reporting limits and twice the established 90th percentile Spokane Basin Background Concentration, but are less than the respective MTCA Method A Cleanup Criteria for Unrestricted Land Use.

3.3 CLEAN SOIL

Soil is considered "Clean" if:

- Contaminants are not detected for any analyte at concentrations that exceed the respective method reporting limit (method reporting limits for non-detect analytes must be less than applicable MTCA Method A cleanup levels for unrestricted land use for soil to be considered "clean");
- Metal concentrations do not exceed twice the established 90th percentile Spokane Basin Background Concentrations;
- Physical evidence of contamination (sheen, odor or staining) is not observed; and
- Clean Soil includes soil where COCs are not detected or COC concentrations were detected at concentrations that represent background conditions. There are no special handling or end-use requirements for this soil.

4.0 SUMMARY OF REVITALIZATION ACTIVITIES

The area designated for revitalization along the North Bank is bordered by the Howard Street Promenade and the intersection of Howard and Mallon street to the west, a bedrock outcrop and existing neighboring properties to the north, Washington Street to the east and the Spokane River to the south. The area for revitalization along the North Bank is limited to the lower section of the North Bank and doesn't include the upper bluff area accessible from Cataldo Ave.

Revitalization of Riverfront Park on the North Bank will include construction of the north promenade, installation of a utility corridor along the Howard Street promenade, construction of two playgrounds and two paved surface parking areas. The existing restroom and Veterans memorial shelter will be retained. Much of the area (excluding the paved parked areas) will be finished with a combination of open turf areas, landscaping and impervious walkways.

The new utility corridor will include new communication, gas, electric and water utilities. As part of construction, an existing 12-inch-diameter water main will be upgraded to an 18-inch diameter water main. Buildings on the North Bank along Washington Street currently utilized by maintenance and operations for the park will partially be removed and reduced in size.

5.0 SUMMARY OF CLEANUP ALTERNATIVES

To address the management of impacted/contaminated soil along the North Bank, three different remedial alternatives were considered including Alternative #1: No Action, Alternative #2 Reuse of Soil and Capping and #3 Off-Site Disposal of Excavated Soils.

5.1 ALTERNATIVE #1 – NO ACTION

This alternative would leave in place soil with contaminant concentrations exceeding the cleanup levels. The playgrounds would be constructed over existing site soil and utilities (including the 18-inch diameter potable water line) would be installed though the existing site soil. The two paved parking areas would be installed and part of the maintenance and operations buildings would be removed. Stormwater would be directed to infiltration features as needed.

5.2 ALTERNATIVE #2 –REUSE OF SOIL AND CAPPING

This alternative includes segregating impacted/contaminated soil excavated from the utility corridor (200 CY) and stormwater features (100 CY) and reusing the soil in the terraced embankment fill for the Pavilion project. Clean imported fill would be brought in to replace soil in the utility trench.

Orange safety fencing used as a demarcation indicator would be installed over contaminated soil left in place at the playgrounds (15,132+16,100 SF). Site grading will be adjusted to generally avoid excavation into contaminated soil and focus on placing of one foot of clean soil over the site. If needed, relief type features could be used to consolidate small amounts of contaminated soil with a one-foot clean soil cover over the relief feature.

The North Promenade and playgrounds will then be finished with grass turf, bark, paths of concrete/asphalt and concrete pavers. An underground irrigation system will be installed to maintain the turf. Stormwater would not be directed to infiltrate into contaminated soil. Stormwater would be directed to treatment features before discharge to the Spokane River. The location of impacted and contaminated soil will be recorded in an environmental covenant. The two paved parking areas will be installed and part of the maintenance and operations buildings would be removed. Petroleum contaminated soil (1,500 CY) identified near the northeast corner of the North Bank site would be removed and disposed of off-site.

5.3 ALTERNATIVE #3 – OFF-SITE DISPOSAL OF ALL EXCAVATED SOILS

This alternative includes disposing of the soil from the utility trench and stormwater features (300 CY) at an off-site approved landfill facility and importing clean fill to replace it. Areas outside of the paved parking areas (116,000 sf) will be excavated approximately 3 feet bgs to bedrock. The soil would be disposed of off-site at an approved landfill. In addition, petroleum contaminated soil (1,500 CY) identified near the northeast corner of the North Bank site would be removed and disposed of off-site. The excavated area would be replaced with clean fill imported from off-site and stormwater features would be installed to infiltrate stormwater into the imported clean fill.

6.0 EVALUATION OF CLEANUP ALTERNATIVES

The three cleanup alternatives were evaluated based on the following criteria: effectiveness, implementation feasibility, remedial costs, and general reasonableness. Common element between the remedial actions were not considered like installation of the paved parking areas, contractor mobilization and construction of the revitalization features.

6.1 ALTERNATIVE #1 – NO ACTION

Effectiveness – The No Action Alternative is not effective to reduce mobilization of contamination from stormwater runoff or the potential for leaching into potable water supplies. It is also not effective in open grass areas and the playgrounds and allows contaminated soil to be located near the surface which could complete the ingestion pathway to the park users. The No Action Alternative would be effective to reduce exposure to contaminants under the paved parking areas which is about 50 percent of the site.

Implementation Feasibility – This alternative is easily implemented.

Remedial Costs – There is no additional remedial cost for this alternative.

General Reasonableness – This alternative provides no long-term management of the site's impacted and contaminated soil. It also allows potential ingestion pathways at the playgrounds and from the potable water lines. As a result, this is not a reasonable cleanup option.

6.2 ALTERNATIVE #2 – REUSE OF SOIL WITH ENGINEERED BARRIERS

Effectiveness – This alternative is an effective way to limit exposure and manage contaminated soil at the Property. An institutional control would need to be recorded to maintain the integrity of a soil cap and eliminate the ingestion pathway for the public. This alternative effectively manages contaminated soil that require removal from the Site while retaining soil that meets the criteria for reuse onsite. This alternative improves stormwater discharges to the Spokane River and reduces the chance of contaminants migrating into the potable water supply.

Implementation Feasibility – This alternative will be moderately difficult to implement because it will require planning and coordination with redevelopment activities to limit exposure to impacted or contaminated soil reused on-site at the Park. Impacted or contaminated soil excavated from the utility trench will need to be temporarily stockpiled until it can be incorporated into the fill for the terraced embankment. The contaminated soil will be capped with one foot of clean soil or placed under impervious surfaces to prevent ingestion of contaminants. Clean soil will be brought to the site to backfill around potable water lines. Stormwater features will need to be designed, permitted and constructed to treat and discharge stormwater to the Spokane River while minimizing infiltration into contaminated soil.

Remedial Costs – Remedial cost for this option include installation of 32,000 square feet (sf) of orange construction fencing over contaminated located below the playgrounds and capped with clean soil. Approximately 4,300 CY of would be required to cap contaminated soil in open areas, not covered by impervious surfaces. Additional costs include design, permitting and construction of stormwater treatment facilities and the removal of petroleum contaminated soil at the site. The cost includes consultant oversight. The estimated remedial costs for this alternative are approximately $312,233.

General Reasonableness – This alternative provides management of the site's contamination minimize exposure to contaminated soil and facilities site redevelopment. It does require a long-term commitment to maintain the soil covers and recording institutional controls for the Property.

6.3 ALTERNATIVE #3 – OFFSITE DISPOSAL OF ALL EXCAVATED SOIL

Effectiveness – Comprehensive soil excavation and off-site disposal is a highly effective as it removes all hazardous and potentially hazardous substances and utilizes an approved off-site

disposal facility for final disposition. However; areas outside of the revitalization projects will likely remain and be contaminated with site COCs.

Implementation Feasibility – Implementation of this alternative is feasible; however, it has the highest cost of the three remedial alternatives and requires importing the greatest quantity of clean backfill material. Excavation of contaminated soil to bedrock in the open areas away from the paved parking areas could be difficult and depths would likely vary.

Remedial Costs – Remedial costs for this alternative include disposal of 13,200 CY of soil from the open areas, utility trench and stormwater infiltration features. This alternative also includes the cost to import 13,100 CY of soil to backfill the open areas and utility trench (not the infiltration features). Additional costs include the removal of petroleum contaminated soil at the site. The cost includes consultant oversight. The estimated remedial costs for this alternative are approximately $1,589,410.

General Reasonableness – This alternative provides management of the site's contamination minimize exposure to contaminated soil and facilities site redevelopment. It does require a long-term commitment to maintain the soil covers and recording institutional controls for the Property.

7.0 RECOMMENDED CLEANUP ALTERNATIVE

The recommended cleanup alternative is Alternative #2 – Reuse of soil and capping. This alternative is the most economical and is effective to reduce contaminant exposure risks with in the redeveloped areas of the North Bank. Additionally, the City has a plan in place to manage the soil through an environmental covenant.

8.0 REFERENCES

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FIGURES

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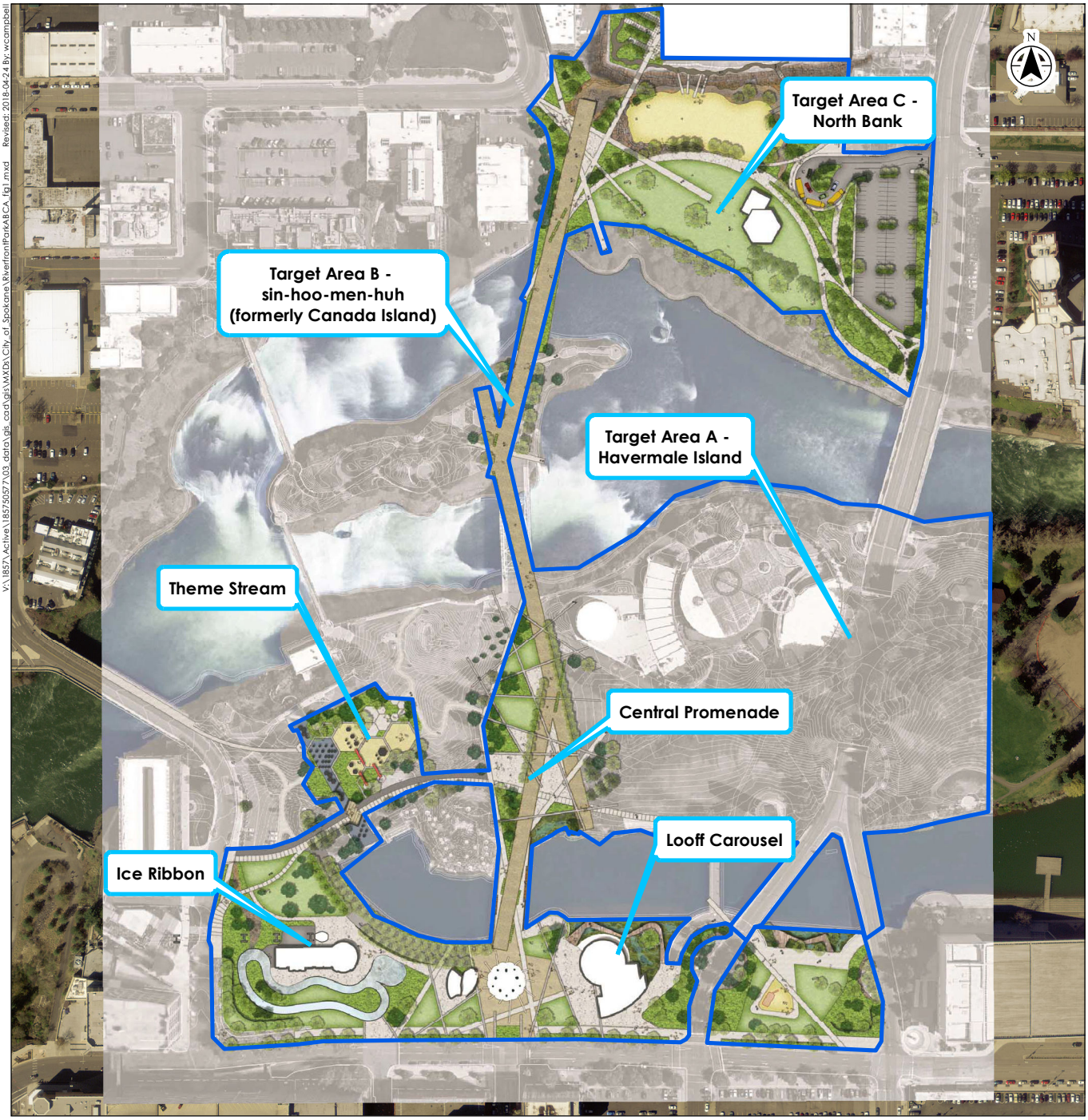

Planned Development Areas

0 200 400 Feet

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Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China

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Stantec

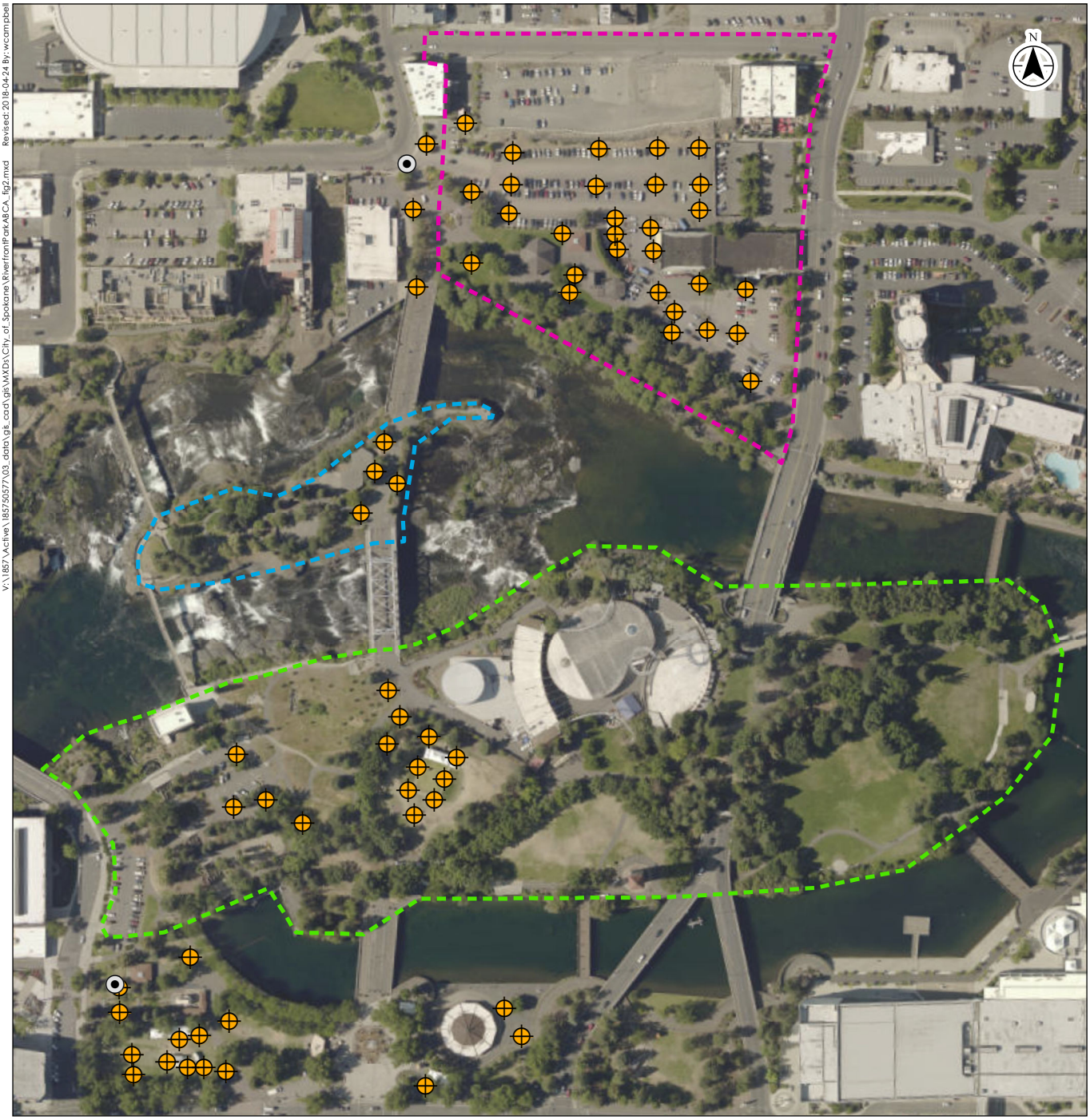
Project Location
Riverfront Park
Spokane, WA

Prepared by JB/WC on 2018-04-23
Technical Review by CG on 2018-04-24
Independent Review by CG on 2018-04-24

Client/Project
City of Spokane
EPA Brownfield Cleanup Grant

Figure No.
1

Title
Planned Development Areas



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Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,

Exploration Location - clean soil as defined in the SMP*

Exploration Location - contaminated and/or impacted soil as defined in the SMP

Target Area A - Havermale Island

Target Area B - sin-hoo-men-huh

Target Area C - North Bank

*SMP = Riverfront Park Soil Management Plan, Rev. 1, May 2017

0 200 400 Feet

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Stantec

Project Location
Riverfront Park
Spokane, WA

Prepared by WDC on 2018-04-23
Technical Review by CG on 2018-04-24
Independent Review by CG on 2018-04-24

Client/Project
City of Spokane
EPA Brownfield Cleanup Grant

Figure No.
2

Title
Target Areas and Previous Environmental Exploration Locations

TABLE 3

Table 3 -Projected Soil Cleanup Costs
North Bank Development Area C
Riverfront Park Redevelopment
Spokane, Washington

	Alternative Cost	Total Cost
Alternative 1-No Action		
No Remedial action taken	$0	$ 0
Alternative 2-Reuse Onsite and Capping		
Import 200 CY of clean soil to backfill the utility trench (315 tons, at $20/ton)	$6,300	
Place 32,000 sf orange construction fencing for demarcation ($0.08/sf)	$2,500	
Import one foot of clean fill over unpaved areas (116,000 sf, 6,766 tons, at $20/ton)	$135,333	$312,233
Stormwater infiltration design, permitting and construction	$30,000	
Removal of 1,500 CY of petroleum contaminated soil (2,362 tons, at $50/ton)	$118,100	
Consultant oversight and reporting	$20,000	
Alternative 3 Off-Site Disposal		
Off-site disposal of 300 CY of contaminated soil from utility trenching and stormwater infiltration features (473 tons at $50/ton)	$23,650	
Off-site disposal of 12,900 CY of contaminated soil from areas outside of paving (20,300 tons at $50/ton)	$1,015,000	$1,589,410
Import 13,100 CY of soil to backfill the open area and utility trench (20,633 tons at $20/ton)	$412,660	
Removal of 1,500 CY of petroleum contaminated soil (2,362 tons, at $50/ton)	$118,100	
Consultant oversight and reporting	$20,000	