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City of Vancouver
300-515 West 10th Avenue
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ATTENTION: Mr. Bruce Maitland

REFERENCE: **Proposed Environmental Management Plan for Southeast False Creek**

This letter is written in response to a request from City Council for review and recommendation of the most progressive approach(es) to soil management and remediation at the Southeast False Creek (SEFC) lands.

BACKGROUND

Environmental investigations of soil and groundwater conditions at the SEFC properties have been carried out by the City in a phased approach since 1994. The investigations have shown that soil at the properties is contaminated with metals and, to a lesser extent, hydrocarbons. In contrast, groundwater has been shown to be contaminated with hydrocarbons, and to lesser extent, dissolved metals.

The contamination is a result of historic activities on the land surface, but also the result of fill quality used in reclaiming ground at False Creek. As such, the distribution of contaminants in soil is spatially broad and extends, in many places, throughout the entire vertical profile of the fill materials (i.e., up to several metres). The composition of the fill materials varies greatly, but generally comprises heterogeneous mineral soil and significant amounts of wood waste. In many areas, debris is found in the fill material, including glass shards, metal fragments, rags, masonry mixed household waste (e.g., porcelain) and ash.

Groundwater is located within the fill materials, and generally flows northerly towards False Creek. Local variations in groundwater flow direction result from influence of inlets, buried underground sewers and diurnal variations in water level in False Creek.

Since the initiation of environmental investigations at the site in 1994, the City has undertaken two significant soil remediation projects where soil contamination appeared to be resulting in groundwater contamination that was potentially discharging to False Creek at concentrations greater than existing aquatic life standards. Based on post-remediation groundwater monitoring of these areas, and the site in general, there is only one remaining area where groundwater discharge to False Creek remains a potential concern. This one exception is adjacent to the embayment between the foots of Columbia and Manitoba Streets. At this location, further remediation is planned but cannot be completed without obtaining multi-agency approvals,

which is being sought along with approval for local shoreline reconfiguration and habitat improvement.

PROPOSED MANAGEMENT PLAN

The proposed method of management of the contaminated fill materials during development includes a combination of in situ management (i.e., fill material is not excavated), on site management (i.e., fill material is excavated then permanently managed on site) and off site disposal. Limited volumes of material considered Hazardous Waste would be excavated, treated if feasible, then disposed of at a permitted landfill.

The scientific basis for the management plan is based on eliminating potential contaminant exposure pathways (i.e., ensuring that potential receptors are not exposed to unacceptable levels of contaminants though leaching or uptake [i.e., by ecological receptors], or ingested or inhaled [i.e., by human receptors]). This will generally be accomplished by construction of physical engineered barriers (e.g., a thin clean soil cover over the contaminated soil). As such, site management is achieved by collecting the contaminated material and placing it at locations where it can be controlled; chemicals are not "remediated"; they are present in the soil now, and they will remain in the soil in the future.

EVALUATION OF PROPOSED PLAN

One objective of the management plan is to remediate market-housing properties (i.e., properties that will be divested by the City) to numeric standards in order to obtain an unconditional Certificate of Compliance for each property. Since the City will retain ownership of some properties developed for subsidised housing, parkland and roadway portions of the site, on-site management of contaminated soil and groundwater is the preferred approach for these lands in keeping with the City's objectives of developing the property in a sustainable manner.

The SEFC site provides a unique opportunity to achieve both objectives. Because many of the contaminants identified are difficult (e.g., heavy hydrocarbons) or impossible (e.g., metals) to "remediate" (i.e., to reduce contaminant levels through enhanced natural processes), and because of the heterogeneous nature of the fill materials, excavation is considered the only option to achieve numeric standards with a degree of certainty within a reasonable time frame. Removal of contaminated soil can be carried out concurrent with construction activities, which will include excavation of soils as part of building foundation and road construction. Excavated soils can be risk-managed on retained portions of the property, namely the park area, or disposed of off site at permitted landfills. This approach has the following advantages:

- it provides a permanent solution for portions of the site;
- it removes significant quantities of potential contaminant source mass, and manages it in a controlled manner;

- on portions of the site that will be excavated, it reduces risk from not identifying all areas of potential environmental concern from over 100 years of various industrial activities at the site;
- it will not result in unacceptable risk to human health and the environment;
- it avoids possible site development/construction delays;
- cost savings can be realized because remediation can be completed concurrent with site development;
- significant transport and disposal cost savings can be achieved, considering approximately one third of the estimated total volume of 270,000 m^3 of excavated fill materials that will be generated from construction activities can be managed on site; and
- it involves proven remedial techniques recognized as effective by provincial regulators.

The proposed management strategy is considered appropriate for the following reasons.

- It is scientifically defensible and technically achievable.
- The vast majority of contaminated fill materials at the site do not pose an unacceptable risk to humans or aquatic receptors (e.g., through contamination of groundwater discharging to False Creek). As such, it does not require "remediation" and is suitable for in situ/on site management as is. The material that may pose unacceptable risks will be isolated and removed from the site.
- While preliminary work indicates that contaminated fill material may potentially pose unacceptable risks to terrestrial and/or avian receptors, the work indicates that minimal cover will reduce the risk to acceptable levels. Considering the quality of fill material itself (i.e., entrainment of debris and woodwaste), a cover would likely be required in any event to support park development.
- Options for remediating soil prior to transport offsite for disposal are not considered practical or even technically feasible because the cost of onsite remediation combined with offsite disposal would exceed the cost of landfilling contaminated material offsite alone. Further, because of the stable nature of the most prevalent soil contaminants (i.e., metals), and considering the volume of contaminated material, the time, space and/or practical management of a remediation program is not consistent with an urban development plan. In addition, the feasibility of large scale "remediation" of metals contaminated soil is not a proven technology. Essentially there is no way to "remediate" metals contaminated materials – contaminants are merely displaced (and concentrated) from one media (i.e., the fill materials) to another (e.g., plants, in phytoremediation, or some form of sludge in other technologies that extract the contamination).

Alternative remediation options to reduce or remove contaminants from the fill materials, such as bioremediation of organic compounds, or phytoremediation or physical removal (e.g., soil washing) of inorganic contaminants are not necessary. Except for a very small percentage of the soil at the site, the soil that will be managed on site does not require remediation to reduce risks to acceptable levels.

We trust this letter provides the information you have requested. Please call if you require any further information.

Alan D. Walker, P.Eng.
Associate/Senior Project Manager

MORROW ENVIRONMENTAL CONSULTANTS INC.

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