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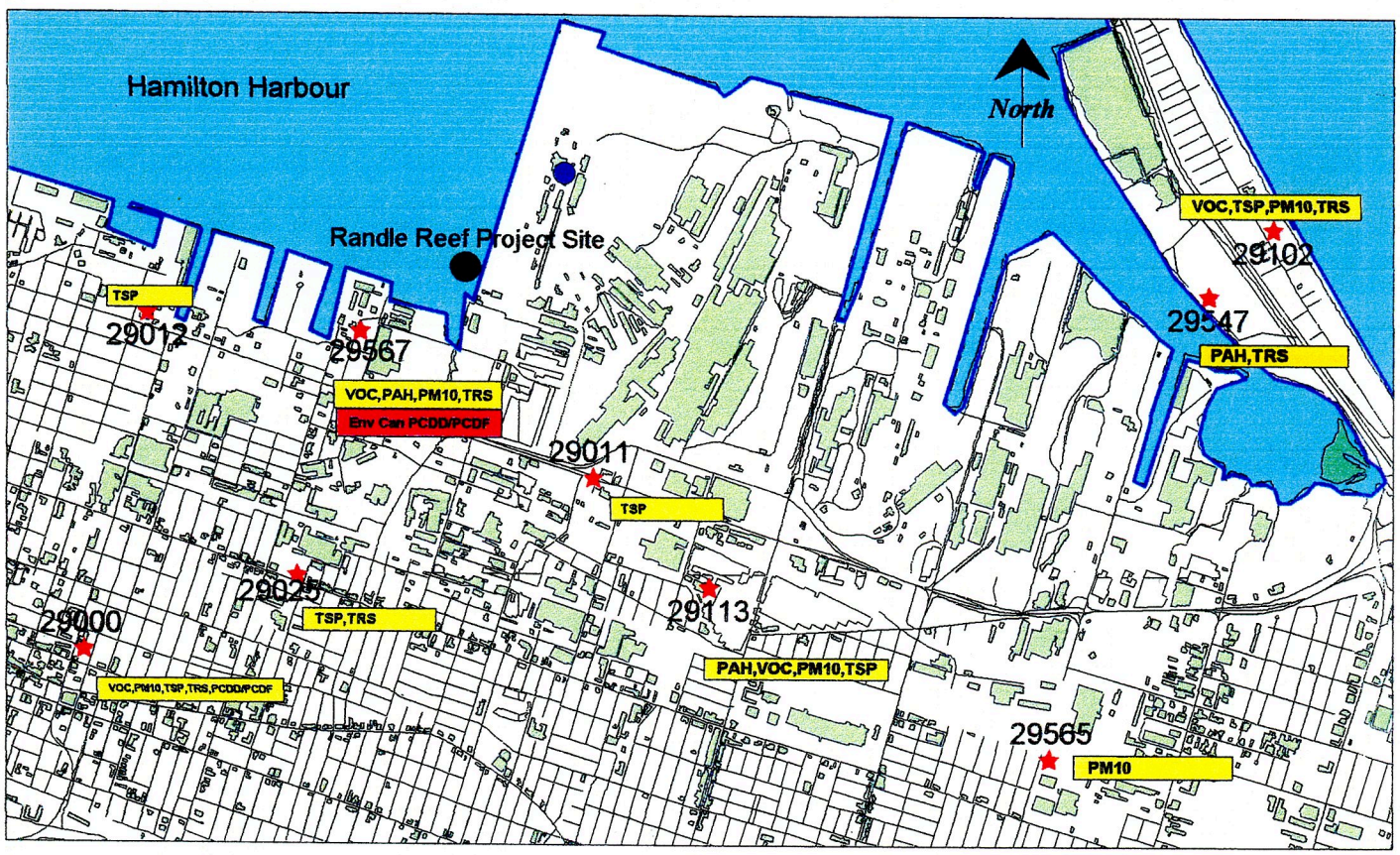
RANDLE REEF SEDIMENT REMEDIATION PROJECT
ENVIRONMENTAL SCREENING REPORT



(Courtesy: Ministry of the Environment)

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1.0 INTRODUCTION

This document has been written as a screening level environmental assessment to comply with the *Canadian Environmental Assessment Act (CEAA)*. The objective of this document is to identify and evaluate the significance of environmental effects associated with the remediation of contaminated sediment near Randle Reef in Hamilton Harbour.

The purpose of the project is to reduce the exposure of organisms to the most persistent toxic substances in the harbour sediment. This project is one phase of the Hamilton Remedial Action Plan (RAP) Strategy for Contaminated Sediment defined for the harbour.

Throughout 1996, the Randle Reef Remediation Steering Committee, led by the Hamilton Region Conservation Authority, investigated remediation alternatives for this contaminated area. Appendix A provides a list of members participating on this committee. Alternatives evaluated included "inaction", no immediate action, capping, in-situ treatment, containment, removal, treatment, disposal, and re-use. Generic treatment alternatives and generic points of disposal were considered in the evaluation of alternatives. The Steering Committee reached agreement that action was required and that the best alternative would include removing the contaminated sediment from the harbour floor. Conclusions were not reached on a preferred treatment technology, however, the Steering Committee preferred, in principle, a disposal option that allowed for re-use of the dredged material.

The proposed remedial action described in this screening document involves the re-use of dredged material after processing in the Stelco Inc. Hilton Works sinter plant and blast furnace. The remediation of sediment near Randle Reef will be funded through a collaborative working agreement involving both public and private funds. Identification of a solution with economic viability was a concern to all parties. The Randle Reef Steering Committee's decision to process the material through the Stelco Inc. Hilton Works sinter plant and blast furnace was viewed as an effective economical solution, which also incorporated the preference for re-use.

The proposed remedial process involves the removal of approximately 20,000 m^3 of highly contaminated sediment, conditioning the dredged material for organics and processing the material in the Stelco Inc. Hilton Works sinter plant and blast furnace. This process will result in the production of iron and blast furnace slag.

As will be discussed later in this report, landfilling the dredged material is being carried forward as a fall back measure. If the dredged material does not meet Stelco Inc. sinter plant criteria, then dredging will cease and the limited quantity of material already removed will be sent to a landfill. The landfill contingency measure is also evaluated in this environmental assessment. p.30

The following agencies and groups have participated in the review of this environmental assessment report: Department of Fisheries and Oceans, Environment Canada, Ontario Ministry of the Environment, Ontario Ministry of Natural Resources, Hamilton Harbour Remedial Action Plan Team, Hamilton Harbour Commissioners, The Corporation of the City of Hamilton, The Regional Municipality of Hamilton-Wentworth, members of the Randle Reef Remediation Steering Committee, Bay Area Restoration Council, and the Bay Area Implementation Team. This document may be distributed to other parties/individuals who have not been identified in this document but who are interested in the project.

1.1 Background

Hamilton Harbour is located at the west end of Lake Ontario. Urban centres located on the watershed include Hamilton, Burlington, Stoney Creek, Dundas, Flamborough and Ancaster. The harbour has a long history of contamination commencing in the late 1800's when Hamilton's sewage was first drained into the harbour. Into the latter part of the 19th century, large industries developed along the south side of the harbour. The steel mills began operation after 1910. Through the turn of the century to the 1950's, the commercial fishing industry slowly declined and disappeared. Industrial waste discharges from such plants reached their peak levels in the 1970's. Today, the highest concentration of heavy metal industry in Canada is located on the south shore of the harbour.

Three main natural creeks enter the harbour basin. Sewage treatment plants from both Hamilton and Burlington discharged effluent into the habour. In addition , urban runoff from the cities of Hamilton and Burlington enter the harbour. Combined storm and sanitary sewer channels overflow during rains which results in raw sewage directly entering the harbour (RAP, 1989). These pollutants, combined with urban and industrial point and non-point sources, led to the harbour's designation by the Great Lakes Water Quality Board of the International Joint Commission (IJC) as an Area of Concern (AOC) in 1985.

Contaminated sediment is associated directly, or indirectly, with many of the 14 impaired beneficial uses of the aquatic ecosystem identified by the IJC. These are (Hamilton RAP, 1995):

- restriction on fish and wildlife consumption
- degraded fish and wildlife
- fish tumors or other deformities
- bird or animal deformities or reproductive problems
- degradation of benthos
- restriction on dredging activities
- eutrophication or undesirable algae

The Hamilton RAP identified sediment contamination in the harbour as a "principal concern" and summarized the conditions as follows (Hamilton RAP, 1995):

1. metals and PCBs throughout the harbour sediments are generally found at concentrations greatly in excess of the *Provincial Sediment Quality Guidelines,* (subsequent analysis of Randle Reef sediments indicates sum PCB range from not detectable to 2896 ng/g and a median value of 236 ng/g (assumes not detectable is 1 ng/g),
2. *in situ* assessment of benthos indicates a stressed community structure dominated by pollution-tolerant species, and
3. laboratory bioassessment of sediments using oligochaetes, bacteria, Daphnia, and mayfly larvae have identified a large zone where... the sediment causes significant mortality, inhibits growth, and interferes with reproductive success.

In 1995, the Hamilton RAP Strategy for Contaminated Sediment identified an area near Randle Reef as a high priority zone. The RAP recommended removal of the highly contaminated sediment, where concentrations of polycyclic aromatic hydrocarbons (PAHs) were in excessive concentrations, noting that "...the very worst of the coal tar contaminated material represents too great an environmental risk to be dealt with by any other means other than removal." (Hamilton RAP, 1995).

2.0 APPROACH TO DECISION MAKING

2.1 *The Canadian Environmental Assessment Act*

The environmental assessment for this remediation project is being conducted under the *Canadian Environmental Assessment Act (CEAA).*

The *CEAA* is federal legislation that is triggered for certain projects where the federal government proposes a project, where there is federal money or property involved, or where approval from a federal authority is required. The *Act* specifies a process whereby the federal authority which is responsible for the project (i.e. the federal authority providing money, land or approval) ensures that the requirements of the *Act* are fulfilled. The federal authority responsible for the project is called the Responsible Authority (RA). Environment Canada is an RA for the project because it is providing the funding to allow the project to be carried out and is acting as the lead proponent for the project.

When various alternatives were originally considered, it was felt that there was a possibility that some of the potential alternatives to the project would require a Comprehensive Study under *CEAA* (Hamilton Harbour RAP, 1997). These projects are specifically defined *in Part X of the Comprehensive Study List Regulations*, which applies to *Waste Management* projects involving:

> *"The proposed construction, decommissioning or abandonment of a facility used exclusively for the treatment, incineration, disposal or recycling of hazardous waste, or an expansion of such a facility that would result in its production capacity of more than 35 per cent."*

The project as defined in this assessment does not meet this definition under the regulation, and therefore, the assessment will be conducted as a screening level. For a screening, *CEAA* requires the RA to, amongst other things:

- determine the scope of the project and the scope of the factors to be considered in the screening;
- determine if any factors in addition to those required to be considered under the screening process should be considered;
- consider the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project;
- consider any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- consider the significance of the environmental effects of the projects and the cumulative environmental effects referred to above;
- consider comments from the public that are received;
- consider measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- ensure that a screening report is prepared;
- make a decision on whether, taking into account any mitigation measures, the project is likely to cause significant adverse environmental effects; and
- ensure that any mitigation measures that the RA considers appropriate are implemented.

The Ministry of the Environment, Environmental Assessment and Approvals Branch has reviewed this project to determine the Province of Ontario requirements under the *Ontario Environmental Assessment Act*. Although the Ministry of the Environment is providing funding and guidance on the undertaking, Environment Canada is the lead proponent. Environment Canada is not designated as a proponent under the *Ontario Environmental Assessment Act*. The *Ontario Environmental Assessment Act* does not apply to this undertaking.

2.2 Environmental Effects Assessment Approach

The study area and focus of the impact assessment work is defined as Hamilton Harbour with a particular emphasis on the area near Randle Reef. Short term effects (during remediation) and long term effects (following remediation) have been considered.

The *CEAA* requires an assessment of changes to the biophysical environment caused by the project as well as effects on human health, socio-economic conditions and cultural resources as a direct result of those changes to the biophysical environment.

Assessment criteria were developed based on definition of the environment under the *CEAA* and include considerations related to:

Biophysical

- air quality
- aquatic environment
- hydraulics
- noise
- terrestrial environment and
- water quality

Socio-economic

- business operations
- commercial shipping
- cultural resources
- social environment
- recreational uses

In assessing the potential for effects and the significance of effects, reasonable mitigation measures (those that are technically and economically feasible) were assumed so that net effects were established. In assessing significance, the following matters were considered:

- magnitude of the net environmental effects - whether the effects are considered to be minor or major;
- geographic extent of the net environmental effects - whether effects associated with the project are localized or broad;
- duration and frequency of the net environmental effects - whether the net environmental effects are short-term or long-term, infrequent or frequent;
- reversibility of net environmental effects - whether the effects are reversible or irreversible; and
- ecological context - whether the ecological setting of the project is particularly sensitive to the net environmental effects or is it relatively unaffected by the net environmental effects.

2.3 Cumulative Effects

As part of the assessment of environmental effects, *CEAA* requires that cumulative effects also be considered. Cumulative effects are defined as:

> *The effect on the environment which results from effects of a project when combined with those of other past, existing and imminent projects and activities. These may occur over a certain period of time and distance.*

Cumulative effects assessment is conducted to reflect the potential influence of other past, future and ongoing projects and the concern that small incremental effects, when combined, may amount to a significant effect.

In this assessment, past and existing activities and projects are dealt with through the consideration of the existing environment.

3.0 EXISTING CONDITIONS

This section provides a description of existing conditions in Hamilton Harbour and at the site. Reference is given to Randle Reef Sediment Remediation Project, Analysis of Alternatives Report Under the Canadian Environmental Assessment Act (Hamilton Harbour RAP, 1997) for further description of existing conditions.

3.1 Socio-Economic Environment

3.1.1 Land Uses

The area surrounding Hamilton Harbour has a mixture of urban, industrial, agricultural and recreational land uses. The City of Burlington is located on the north shore of the harbour, with the City of Hamilton on the south shore. The harbour facilitates a commercial port and is considered a major shipping center for large industries. The highest concentration of heavy metal industry (primarily iron and steel) in Canada is located on the south shore of Hamilton Harbour (RAP, 1989). A network of highways and railways also surround the harbour on a number of its shores.

Approximately 65% of the land encompassing the harbour is used for agricultural purposes, such as mixed farming, livestock, hay, grains, corn, fruit and vegetable production.

Recreational areas include 13 conservation areas (200 hectares), the Royal Botanical Gardens (including a 835 hectare nature preserve) and natural areas and trails associated with the Niagara Escarpment (RAP, 1991). Several parks also surround the harbour, including LaSalle Park and the new Bayfront Park to the west of Hamilton's group of marinas.

Over the last twenty years, eight municipal landfill sites have been closed in the watershed. There are four privately operated non-hazardous solid industrial waste sites.

The proposed project site is located on the south shores of Hamilton Harbour, west of Stelco Inc. Pier 16, northeast of Pier 14 and north of Sherman Inlet Pier 15 (Figure 1). The lands adjacent to the site include a steel mill company along Pier 16, a marine construction/tug boat company on the west side of Pier 15, Hamilton Harbour Commissioner lands and warehouse on the east side of Pier 15 and an old creek outlet at Sherman Inlet. Along the dock face of Pier 16 is the steel mill's cooling water outfall pipe. A combined sewer overflow is located in Sherman Inlet. Commercial shipping vessels use the north face of Pier 14 and the northwest face of Pier 16. One of the largest tug boat operations in the Great Lakes operates from Pier 15.

3.1.2 Water Resource Use

Canada's largest port on the Great Lakes is Hamilton Harbour, handling 12,304,280 tonnes in 1998. Imports include general cargo, steel slabs, specialty ores, machinery and fertilizers. Exports include steel and general cargo. Bulk shipments of coal, iron ore, sand, scrap metal, petroleum products, tallow, grain, sugar, pelletized slag, mill scale and gypsum are handled.

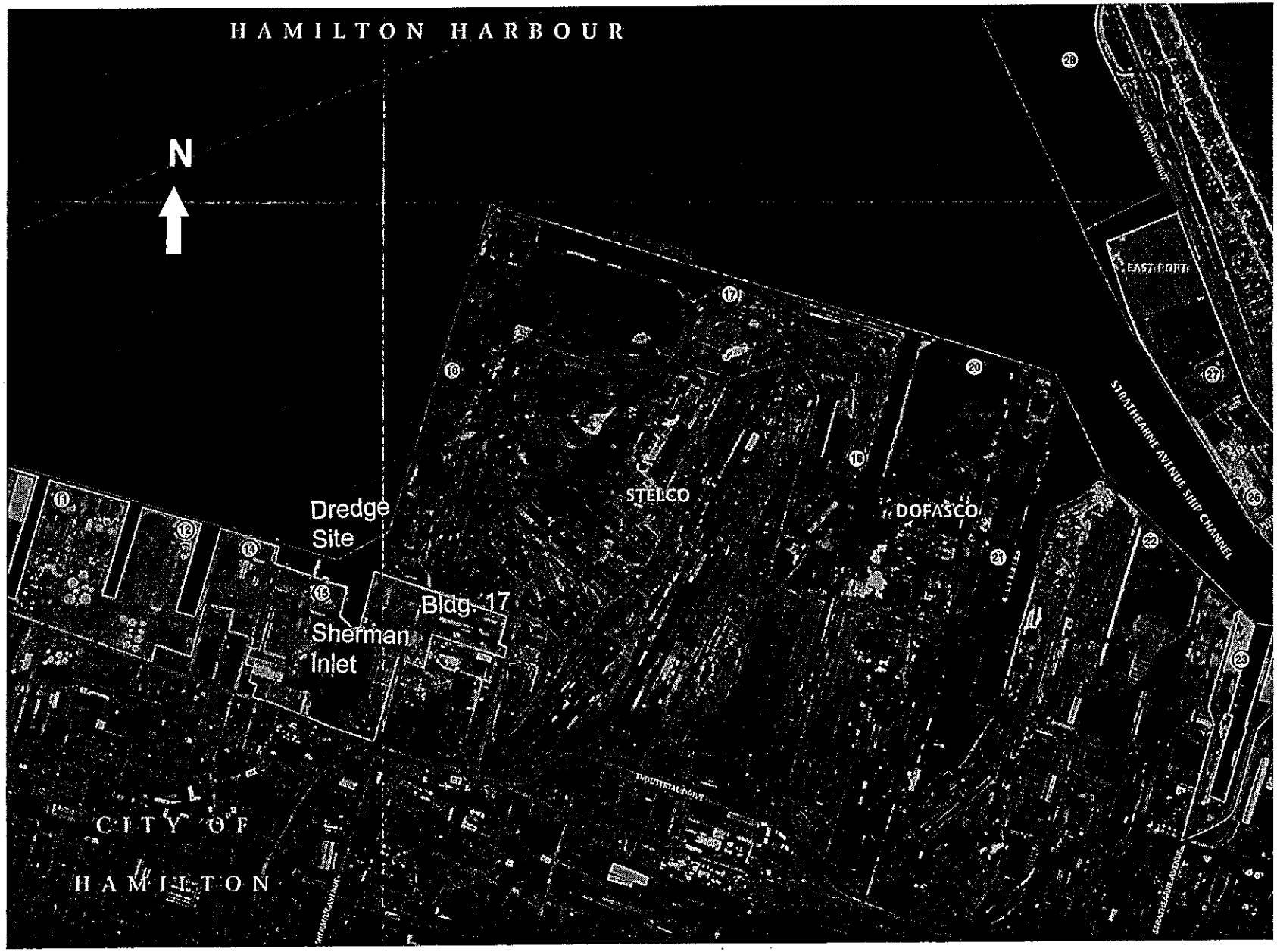
Recreational activities in the harbour include boating, sailing, rowing, wind surfing, bird watching, and fishing for salmon, trout, bass, pike and panfish. In the past, a Harbour Commission by-law prohibited swimming in the harbour. Due to the improved water quality at the southwest section of the harbour, swimming is now allowed off of Bayfront Park created in 1994.

Currently, the harbour remains as a receiving body for the local sewage treatment plants. Cooling and treated process water is also discharged into the basin from both of the integrated steel manufacturers.

3.2 Water Quality

Hamilton Harbour is a drainage basin for a large urban population and a large industrial sector. Water quality problems in Hamilton Harbour include excessive ammonia loadings caused primarily through sewage treatment plants, and phosphorus loadings and suspended solids caused by industries along the basin, inflowing streams, sewage treatment plants, and sewage overflows. These problems are all related to oxygen depletion and suspended solids.

Figure 1: Project Site



The highest potential for sediment re-suspension at the proposed site comes from the frequent passing of tug boats over the area. Water depths in this area range between 5 to 8 m. Past dredging activities have occurred in and near this area, with the last recorded operation in 1978.

3.3 Sediment Quality

Over the past ten years several sediment and water quality surveys have been conducted in Hamilton Harbour. The results of these studies have identified several zones throughout the harbour with different contaminant concentrations in the sediment. Heavy metals, PAHs, oil and grease are the main contaminants of concern at the project site.

The project site was identified by the Hamilton RAP as a high priority zone. Acute toxicity at the site was found to be one of the highest in Hamilton Harbour. Polycyclic aromatic hydrocarbon (PAH) concentrations at the site are higher than numerous sites in the Great Lakes, as reported by Fabacher et al. (1988), and are higher than those concentrations reported by Shiaris and Jambard-Sweet (1986) for contaminated estuaries of the world (Murphy et al., 1990).

PAHs are the contaminants of greatest concern at the site. PAHs are known to be persistent, toxic, bioaccumulative to a limited extent, and present in concentrations that far exceed the severe effect level for aquatic organisms (Murphy et al., 1990). Historical coal gasification plants are known to be significant PAH sources. The production of metallurgical coke is the most significant industrial source of PAHs in Ontario (Potvin et al., 1981). One by-product of coke production is coal tar (OMOE, 1989). Sediment containing coal tar can cause a long term source of contamination to the water column due to the slow release of organic solutes from the immobilized organic phase.

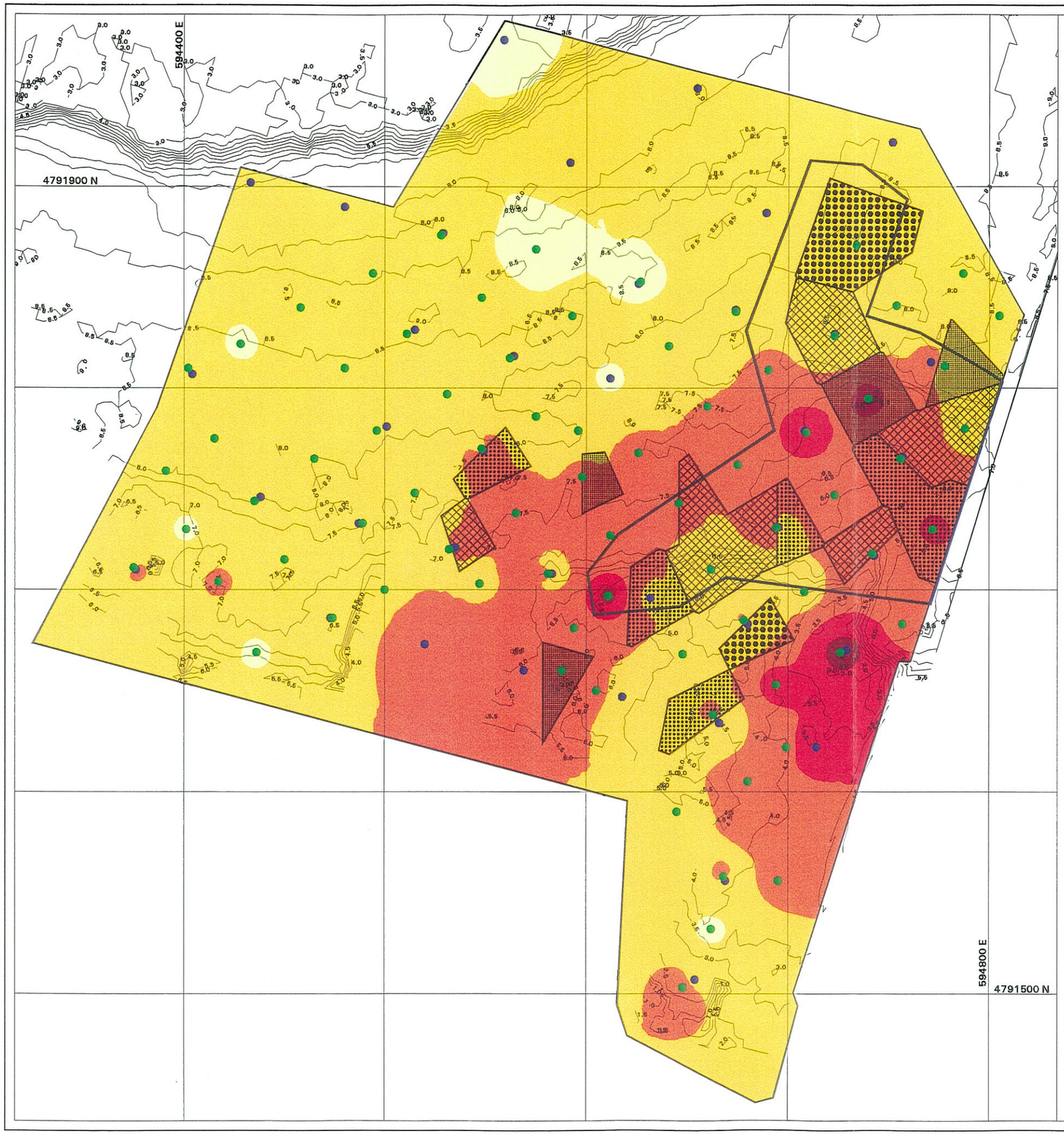
Sediments at this site are also mixed with oil (greater than 1% total petroleum hydrocarbons, TPH). The Hamilton RAP Technical Team defined the site boundary as being south of the 1% TPH zone, where greater potential for recirculation of contaminants exists (i.e. compared to the northern zone of contamination). The high priority area is defined where the sum PAH contamination (minus naphthalene) is in exceedance of 700 μg/g (Figure 2).

In June 1996, a preliminary sediment coring program was conducted to determine the vertical extent of this PAH contamination. A total of 41 sediment core samples were taken south of the TPH boundary. The data generated from this analysis indicated that the vertical and horizontal extent of contamination is highly varied. In November 1996, a closer sampling grid was produced and a total of 80 sediment cores were collected within the project site to determine the extent of variability within the site. All data collected was logged onto a GIS map. Figure 2 illustrates the remediation zone defined by the Hamilton RAP Technical Team. Note that the volume of material to be removed and the

FIGURE 2

SEDIMENT REMEDIATION ZONE - RANDLE REEF

Sediment Thickness and Total PAH - Naphthalene for 1996 and 1997 Data



Randle Reef

Sediment Thickness and Total PAH - Naphthalene for 1996 and 1997 data

Legend

Sediment Thickness in metres

- 0.00 - 0.49
- 0.50 - 0.99
- 1.00 - 1.49
- 1.50 - 1.99
- 2.00 - 2.20

(µg/g)

- 700 - 800
- 800 - 900
- 900 - 1000
- > 1000

- Proposed Dredge Area
- Bore Hole Locations 1996
- Bore Hole Locations 1997

N

Scale 1 : 2 000

25m 0m 25m 50m 75m 100m

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boundary of the dredge zone may be changed based on the on-going evaluation of existing and current chemical data and analysis of new geotechnical coring information. The final dredge plan will reflect an optimization strategy that removes the greatest amount of contaminated sediment from the area within the available budget.

3.4 Aquatic Vegetation

Little or no aquatic vegetation exists within the project area due to the highly toxic nature of the sediment.

3.5 Benthic Invertebrates

The benthic community in Hamilton Harbour is stressed. In 1964, samples were taken by Johnson and Matheson (1968) which concluded the harbour to be severely degraded and dominated by pollution-tolerant oligochaetes. Studies undertaken in 1984 documented an increase in biomass throughout the harbour between 5 and 20 fold with the community structure composed of more pollution-sensitive species. These findings indicated a shift away from pollution-tolerant species towards more pollution-sensitive species. An additional four genera of chironomids were collected and spaerids, which were not found in the 1964 study, were identified at 11 sites (RAP, 1992).

The health of benthic invertebrates could be considered as another indicator of harbour health, in addition to chemical measurements, since there is good evidence that benthic species accumulate contaminants through ingestion. Sufficient oxygen content is required at the sediment/water interface for most benthos to survive. Contaminants could continue to limit benthos in situ, even if hypolimnetic (deep water) oxygen depletion is rectified. This is evident in comparisons to tissue residues in bioassay organisms with those exposed to contaminated sediment (Krantzberg, 1994).

3.6 Fisheries

The fishery in Hamilton Harbour is diversified, with 19 families, 42 genera, and 59 species as represented in Table 1. It is important to note that the community structure of the late 1800's was larger with long-lived species. The recent community structure consists of smaller and short-lived species which are characteristic of an eutrophic ecosystem.

These communities show effects of habitat stress. Comparisons of fish data from electrofishing surveys indicate important differences in biomass, species composition and trophic structure between harbour and less stressed littoral habitats of the Bay of Quinte and Severn Sound. Although the species composition of the harbour is comprised of a few less desirable non-native species of fish, current high biomass levels indicate the productivity of the area to be high. This suggests the potential for restoring the habitat and for achieving the desirable fish targets set out by the RAP.

Table 1: Fish Species in Hamilton Harbour and Cootes Paradise, 1984 - 87 (Source: RAP, 1992)

Scientific Name	Common Name	Larvae
Petromyzon marinus	sea lamprey	
Anguilla rostrata	American eel	
Lepisosteus osseus	longnose gar	
Amia calva	bowfin	
Alosa pseudoharengusi	alewife	•
Dorosoma cepedianum	gizzard shad	•
Oncorhynchus kisutch	coho salmon	•
Oncorhynchus tshawytscha	chinook salmon	•
Salmo gairdneri	rainbow trout	
Salmo trutta	brown trout	
Salvelinus namaycush	lake trout	
Coregonus artedii	lake herring	
couesius plumbeus	lake chub	
Osmerus mordax	American smelt	•
Umbra limi	central mudminnow	•
Esox lucius	northern pike	
Carassius auratus	goldfish	•
Cyprinus carpio	carp	•
Notemigonus crysoleucas	golden shiner	•
Notropis atherinoides	emerald shiner	•
Notropis hudsonius	spottail shiner	•
Notropis heterolepis	blacknose shiner	
Notropis heterodon	blackchin shiner	•
Notropis cornutus	common shiner	•
Notropis chrysocephalus	striped shiner	•
Notropis volucellus	mimic shiner	•
Pimephalus promelus	fathead minnow	•
Pimephalus notatus	bluntnose minnow	•
Semotilus atromaculatus	creek chub	•

3.7 Terrestrial Environment

There are six significant areas around the Harbour which support wildlife. These include Cootes Paradise, Hendrie Valley/Carrolls Point, Hamilton Harbour Commissioner's CDF, Hydro Islands, Windemere Basin, and Hamilton Harbour proper. As many as 43 waterbird species are found in the harbour (Gebauer et al., 1992). The highest number of bird species tend to be found at the west end of the harbour.

There are no significant wildlife or bird species which inhabit the dredging site.

Sparse vegetation occupies the lands where the storage area and sediment preparation site may be erected (i.e. Harbour Commissioners property). Cattail beds fringe the old Sherman Inlet creek in some areas. Medium sized trees and larger shrubs are also present.

Some nesting of Mallards and Canada Geese likely occurs along the old Sherman Inlet creek shores. The trees around the pond may provide roosting habitat for Black-crowned Night-Herons, which nest in other areas around the harbour. Common breeding bird species of urbanized areas occur here, such as Song Sparrow, Red-winged Blackbird, Barn Swallow, European Starling, House Sparrow and Rock Dove. Other species noted include Yellow Warbler, Eastern Kingbird and Warbling Vireo (extracted from Hamilton Harbour RAP, 1997). Mammals which might inhabit the area include raccoons, muskrat, mice and voles.

4.0 DESCRIPTION OF PROJECT

The proposed project involves dredging sediment from the harbour and transporting it to the Hamilton Harbour Commissioners' property where it will be screened for coarse materials. If necessary, the material will be de-watered and stored as needed. Dredged material will be conditioned to meet feedstock quality for Stelco Inc. Hilton Works sinter plant specifications, and to ensure worker health and safety. All screening, de-watering, storage and conditioning operations will occur in a controlled environment. The treated decant water will be returned back to the harbour, or discharged to the Region's combined sewer system. Volatile emissions will be collected by an air containment system and the volatiles will be removed from the air with a treatment system. Once conditioned, the material will be transported to Stelco Inc. where it will be fed into the sinter plant and then into the blast furnace. The end products will be iron and blast furnace slag (Randle Reef Sediment Remediation Project Technical Team, 1997).

As a contingency measure, a limited quantity of material will be conditioned only for volatility/corrosivity and placed into a licensed industrial landfill in the event that it does not meet Stelco Inc. sinter plant specifications. In this scenario, only the material that has been removed and analyzed for specification acceptability will be landfilled. Dredging will be terminated if the sinter plant specifications cannot be met. Figure 3 is a flowchart outlining the project and provides both avenues for processing the material (i.e. through

the Stelco Inc. Hilton Works sinter plant and blast furnace, and also conditioning the material for corrosivity/volatility with disposal of material in a licensed industrial landfill).

4.1 Removal and Transport to Sediment Preparation Site

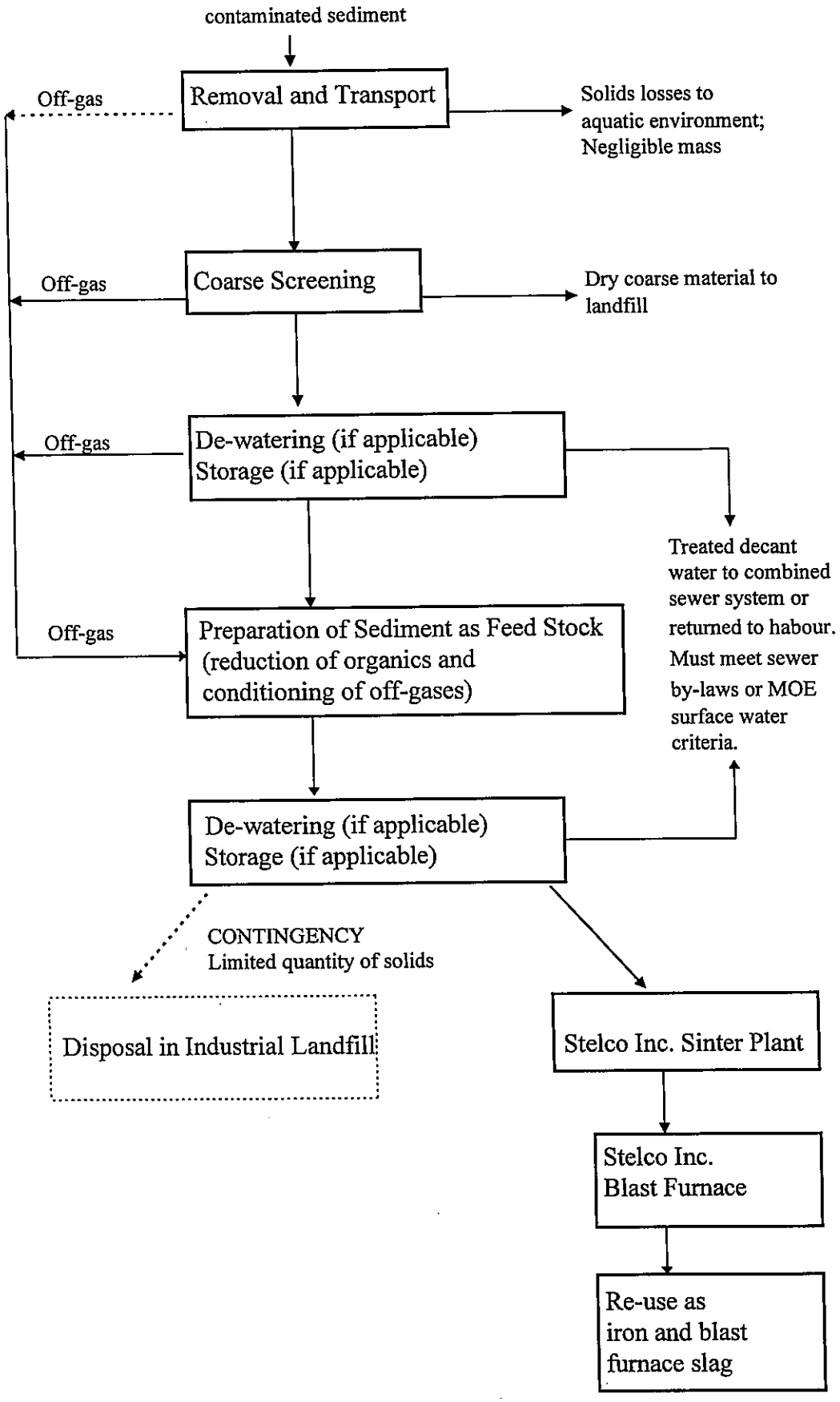
Removal of sediment involves dredging technologies which raise material from the bottom of a water column to its surface where it can be transported elsewhere. There has been more full-scale experience worldwide with removal/dredging than with any other remediation technology (Hamilton Harbour RAP, 1997).

This proposed project involves the use of a dredge to remove approximately 20,000 m^3 of in place sediment near Randle Reef. Sediments to be removed will have sum PAH concentrations greater than 700 µg/g PAH minus naphthalene. Once removed, the dredged material may be transported to the Hamilton Harbour Commissioners property (Figure 1) on Pier 15, adjacent to Stelco Inc. where the material will be prepared as feed stock.

Removal technologies fall into three general categories: mechanical, hydraulic and a combination of the two (refer to Hamilton Harbour RAP, 1997, Volume 3 for descriptive detail). Mechanical dredges use mechanical force to remove sediment from the bottom of the water column (e.g. clamshell, bucket ladder, dragline, dipper, backhoe). Transportation of the material from a mechanical dredge operation will involve the use of barges, lugger boxes and/or trucks. Hydraulic dredges use water, mixed with the sediment, to remove and transport the material in a slurry phase (e.g. cutterhead, suction, eddy pump, matchbox fluidizer, hopper, oozer). Air is sometimes substituted for water in pneumatic dredging operations (e.g. pneuma). Transportation of the material from an hydraulic dredge operation will involve the use of a flexible pipeline which will traverse across both water and land to Hamilton Harbour Commissioners property. Hybrid dredges use mechanical force for the initial handling of the material, followed by pumping. Similar to hydraulic dredging, the transportation mode will also require a flexible pipeline which will transverse across both water and land to Hamilton Harbour Commissioners property.

Water quality is an important factor considered for this project. Background water quality will be established prior to the start of the project. Baseline data collected prior to the project operations will provide the necessary information to develop water quality criteria and operational performance standards for the removal operation. Water samples will be taken and analyzed for a variety of physical parameters throughout the removal operations. Set parameters and operational standards will be enforced to help protect acceptable water quality levels. A typical water quality monitoring program is outlined in Appendix B. A silt curtain will also be deployed at the dredge site, depending on the contractor's ability to meet and ensure water quality objectives.

Figure 3: Sediment Remediation Plan



4.2 Coarse Screening and Mechanical De-watering

Screening and de-watering the dredged material may be required. Dredged material usually contains large objects and debris. Classification of coarser sediment grains and debris allows for oversized material to be removed from the dredged material with little or no processing requirements. Coarse screening will likely be required to separate larger material from smaller fines. Disposal of or recycling of the coarse screened material will be dependent on the manner appropriate for the material and the concentration of associated environmental contaminants. As an example, metallic debris can be washed and recycled, while inorganic matter may be washed and appropriately landfilled.

The remaining finer material may require de-watering, depending on the type of technology used to prepare the material for feed stock. When sediment is dredged, it contains water (e.g. interstitial and pore water). The anticipated water volumes vary depending on the type of dredge technology used.

This excess water will need to be removed to meet Stelco Inc. sinter plant specifications, either prior to or after the preparation of the feed stock. There are a number of processes that could be used to de-water the sediment including: passive de-watering, mechanical de-watering, evaporative de-watering and slurry injection (MDA, 1998). This document does not attempt to select the technologies to be used for the project. Technology selection will occur during the tendering process.

It is anticipated that the decant water will approach drinking water standards. If the problem of bacteria exists after the process, the treated decant water will be discharged to the Region's combined sewer system. Otherwise, the water may be returned back to the harbour. The contractor will be required to meet all the regulatory requirements, Certificates of Approvals, Region of Hamilton Wentworth sewer use by-laws and/or the Ontario Ministry of the Environment surface water criteria. Attachment 2, February 23 Report to Regional Council summarizes the conditions under which the Region of Hamilton Wentworth will accept the treated decant water. Settled fines resulting from either process will be re-directed to the technology vendor for processing.

4.3 Preparation of Sediment as Feed Stock

Once the dredged material is screened and de-watered (if appropriate), it may need to be stored at the preparation facility. Storage may be required for several reasons. First, the material may need to be contained until it can be processed. Second, not all of the material may be processed at the same time. The storage area acts as a holding facility until the material can be prepared as feed stock for Stelco Inc. Third, some conditioning processes work best when there is a constant feed of material entering the preparation facility and when that material is homogenous. The constant feed and homogenous nature can be obtained with proper storage and mixing of the sediment. Storage may also be required after the material is prepared as feed stock and de-watered (if applicable). The

feed stock may be stored on Stelco Inc. property with the sinter plant bedding and blending material.

The preparation facility will be located on the Hamilton Harbour Comissioners' property, either at Pier 15 adjacent to Stelco Inc. or west of the dredge site at Pier 11 or east of the dredge site at Pier 23. Each site is currently being assessed for applicability. Pier 15 (Figure 1) is the current preferred location due to the ease of access and proximity of the site to both the removal operation and to Stelco Inc. Hilton Works sinter plant. Options for Pier 15 include: a temporary preparation facility made of clay and synthetic materials constructed with a plastic roof to shield the area from potential human/wildlife contacts and weather effects; holding tanks; or Hamilton Harbour Commissioners Building No. 17 will be used to store the material. This warehouse has approximately 6,707 m^2 (25.6 x 262m) of space available.

Each of these noted options will require the site to be decommissioned upon completion of the project. The preparation facility will be completely fenced in with security locks. Twenty-four hour security may be arranged by the contractor.

Timeline details and schedules still need to be worked out, and, in part, are dependent on the selection of the technology vendor. The preparation facility size is dependent on the amount of material it will need to hold at one time and the amount of time required by both the technology vendor and Stelco Inc. Hilton Works sinter plant operation to process the material. As an example, if half of the entire dredged material is to be conditioned in a dry solids form, then the area required may need up to 1.25 ha of space (assuming material 1 m deep). If less dry solids are to be conditioned at one time, then the storage area will require less space. Likewise, facility size will vary if the material is in a slurry form.

Prior to being processed through the Stelco Inc. Hilton Works sinter plant, the dredged material will be conditioned to meet the plants' operational specifications (i.e. a reduction in organic contaminant levels). Three general technologies are applicable for this application: biological, organic extraction and thermal (refer to Hamilton Harbour RAP, 1997 for descriptive detail).

Biological technologies use bacteria, fungi and/or enzymes to accelerate the natural biodegradation of organic contaminants or to transform the contaminants to less or nontoxic forms. Accelerated growth of microorganisms and the increased production of enzymes, balanced with nutrients, oxygen and temperature are the mechanisms whereby target contaminants are converted to less or nontoxic by-products. Examples include bioslurry and landfarming.

Organic extraction technologies use a solvent (e.g. water, organic solvent and surfactants) to desorb or separate the organic contaminants from the particulate solids, and concentrate them in reduced volumes.

Thermal technologies heat the sediment to several degrees above ambient temperature to destroy, encapsulate, desorb or volatilize contaminants.

This document does not attempt to select the technologies to be used for the project. Technology selection will occur during the tendering process. The tender document will not be limited to these types of technologies. If a technology vendor has another technology which can condition the material to Stelco Inc. operational specifications and under acceptable environmental and economical conditions then that technology will be considered in the review process. It is anticipated that technology vendors within these three general categories will respond to the tender for this project.

Selection will be based on technological merit, efficiency, effectiveness, environmental impacts and mitigative measures, risk assessment, available resources and cost, management skills, qualifications of the operator, and public acceptance. The contractor will need to comply with set operational performance criteria. Volatile emissions from the contaminated material will be collected by an air containment system (where necessary) and the volatiles will be removed from the air with a treatment system. The sediment preparation site will be an enclosed structure, minimizing human/wildlife contact and weathering effects. The Hamilton Harbour Commissioners Building No. 17 is available for use by the vendor if space permits. A change room and washrooms are provided in this warehouse. A fence will surround the perimeter of the site. A security guard may be on duty through the contractor, restricting access to workers and official tours and inspections .

Stelco Inc. has developed preliminary sinter plant specifications, as identified in Attachment 1. Detailed specifications will be provided to the contractor. The dredged material will be conditioned to lower hydrocarbon or PAH concentrations to a level where the sinter plant can then accept the material. Once the dredge material meets the outlined specifications, it will be sent by truck to Stelco Inc. for processing in the sinter plant.

As a fall back measure, in the event that the material does not meet Stelco Inc. sinter plant specifications, the same technology will be used to lower the volatility and corrosivity of the material to levels acceptable to the receiving licensed industrial landfill. Once these levels are reached, a limited quantity of material will be trucked to the licensed industrial landfill.

4.4 Stelco Inc. Hilton Works Sintering Plant and Blast Furnace

The conditioned dredged material will be processed through the Stelco Inc. Hilton Works sintering plant. Normal operations of the plant are expected to continue throughout the processing of this material. This material will be mixed in with the iron oxide fines and sludges normally entering the operations. This conditioned sediment will be used to replace existing raw material. It will not be added over and above the normal raw material. In addition, the conditioned sediment will be integrated at the rate of less than

1% of the total raw material. Once processed, the material will then be put through the Stelco Inc. blast furnace. The anticipated end products are iron and blast furnace slag.

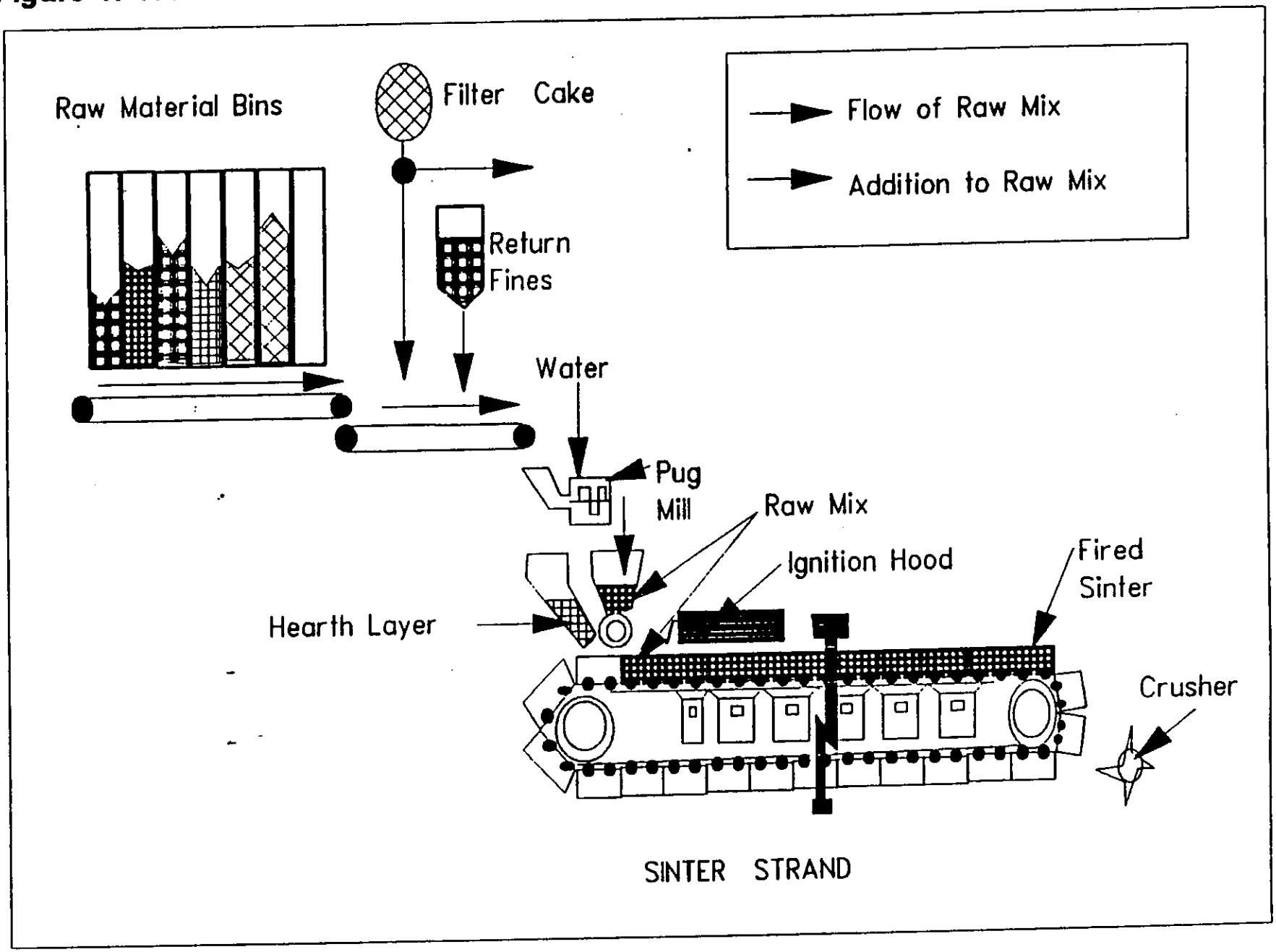
General sinter plant specifications have been developed by Stelco Inc. and are provided in Attachment 1. These specifications are preliminary and may be modified once the project has been given approval and details of the project are more fully scoped out. The specifications were established specifically for the conditioned sediment entering the sinter process based on the composition of materials currently sintered in high volumes (e.g. BOF slag and mill scale pellet fines). This was done for the purpose of avoiding the creation of new environmental aspects. The Ministry of the Environment has reviewed the information provided and for the parameters assessed, the introduction of conditioned sediment that meets the specification at a feed rate of less than 1% is not anticipated to change the characteristics of current sinter plant feed stock or emissions. Stelco has been requested to calculate emissions from the sintering plant and undertake dispersion modeling to determine compliance with Ontario Regulation 346 Point of Impingement (POI) standards. The information shows that all potential emissions would meet these POI standards.

A schematic of the Stelco Inc. Hilton Works sinter plant is provided in Figure 4. The sinter plant processes iron oxide fines from the blast furnace (raw materials handling operations) and recycles waste iron oxides contained in dusts from the air pollution control systems and scale from hot rolling mill operations. The annual capacity is 450,000 tonnes per year of sinter. The sintering process heats the iron oxide raw materials and flux materials (limestone) to high temperatures (1300 °C to 1480 °C) on a traveling grate. These materials become agglomerated. Flue dust is usually used as a fuel but may be supplemented with filter cake. Residual fines from the sinter strand are collected onto a wind box return conveyor where they are returned to the feed.

Particulate emissions typically occur at the sinter strand, raw material blending and sinter handling operations. The exhaust gases from the sinter strand are drawn into a venturi scrubber to remove particulates and other emittants. The gases then pass through a cyclonic separator and mist eliminator before they are released up the stack to the atmosphere. The wastewater from the scrubber is directed to the East Side Filtration Plant, with all other process wastewater, where the effluent is monitored to ensure it meets MISA and other regulatory standards. Air emissions from the material handling and sintering systems are collected into a baghouse.

Air quality is an important factor considered for this project. Background air quality will be established prior to the start of the project. Air samples will be taken and analyzed for a variety of physical parameters throughout the operations. Set parameters and operational standards will be put in place to help protect air quality. A typical air quality monitoring program is outlined in Appendix C.

Figure 4: Hilton Works Sinter Plant



In addition to the air monitoring program outlined in Appendix C, Environment Canada and the MOE will review the air quality data collected on a regular basis for the duration of the project. The MOE will continue to operate four ambient air monitoring stations, in the vicinity of the project area. These sites will serve as quality control points to the project air monitoring program. Additional enhanced monitoring during pre-operational and initial start-up period is proposed. The MOE will carry out additional 24 hour dioxin/furan measurements at two sampling sites (one upwind and one downwind of the source) located as close as possible to estimated maximum POI distances. In addition, hi-vol samplers will be set up to measure concentrations of specified metals. This monitoring will consist of the following.

During the pre-operational phase (background), a minimum of two sets of upwind/downwind samples will be collected at the estimated POI distances. During the initial start-up period, a minimum of five sets of upwind/downwind samples will be collected at the estimated POI distances. Sampling days will be selected when favourable wind conditions are forecast.

5.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS

Table 2 summarizes the environmental effects for each phase of the project. Possible mitigative measures and monitoring efforts are also documented. The following sections outlined in this chapter have, in part, been extracted from the Randle Reef Remediation Steering Committee's investigation of impacts related to the various activities associated with the project (Hamilton Harbour RAP, 1997, p.150 - 160). Reference is also given to the Randle Reef Remediation Project Pre-Engineering Technical Evaluation by MDA Consulting Engineers (MDA, 1998). Monitoring, and health and safety analyses were evaluated and tabulated as a guide for the project (MDA, 1998, Table 7.1).

The release of gaseous contaminants will most likely occur during the removal operation. Anticipation for this release is based on a 1992 pilot scale demonstration of technologies, conducted by Environment Canada, which removed and treated approximately 150 m^3 of contaminated material located near the Randle Reef project site. Air monitoring during the demonstration revealed that levels of naphthalene were highest in the air at the dredge site. Levels were well above worker exposure limits. Elevations were also high at the biological demonstration site after sediment mixing (Unkerskov, 1993).

High elevations of naphthalene are expected during both the removal and sediment preparation. At all times workers are expected to wear personal protective equipment. Where possible, air will be re-circulated and treated accordingly.

The technology selection process will evaluate technologies based on their ability to meet the established emission criteria for the project. Hydraulic and hybrid dredges use pipelines which can reduce or eliminate air emissions coming from the removal operations. Covers for mechanical dredge operations can be implemented to reduce air emissions at the site.

Throughout the operations, air quality monitoring will be conducted to determine compliance with regulatory standards and ambient air quality criteria. Monitoring of ambient air quality on site and downwind of the dredge and conditioning facility will be undertaken to ensure that contaminant concentrations do not exceed standards and guidelines and to quantify the impact of the work. Mass of particulates and contaminant loss due to emissions will be identified. Exceedances in air quality will result in shutdown or operational modifications. Appendix C outlines a generic air quality monitoring program.

Removal is unlikely to cause any impact on soil quality. The removal activity will create some noise, but this is expected to be consistent with ambient noise levels in this industrialized area. There is no anticipated effects on cultural heritage or native issues. The social effects of the removal operations are expected to be beneficial. Both the Hamilton RAP and BARC agree that removal of these sediments is acceptable and is in keeping with the overall sediment strategy of the harbour.

Removal operations will likely cause a temporary disruption to local businesses. The dredge contractor will be responsible for maintaining all navigational safety requirements laid out by the Harbour Master for the Port of Hamilton. All water vessels, such as tug boats, will be instructed to avoid the active dredge site at all times. Local businesses will be contacted and a schedule will be provided in advance of the project so that appropriate arrangements can be made to avoid the project site.

The removal phase of this project will create many beneficial effects. There is potential for some short term negative impacts, however, these impacts can be mitigated and/or are not considered significant.

[redacted]

5.1.2 Transport of Sediment

Potential impacts associated with sediment transport are expected to be minimal. The contractor will be required to contain and/or cover the sediment during the transport mode. There is the potential for accidental spills both over water and over land. This may result in a temporary increase in turbidity levels in the water column. The terms of the contract will require that the transport be halted until water quality levels return to normal. On land, the contractor will be required to ensure that spill pads be placed at the loading dock and off-loading areas to prevent soil and groundwater contamination. All spills will require immediate response and attention to contain the contaminants and clean the area. Dredging is proposed to proceed in phase with conditioning reducing the long-term storage of large quantities of untreated sediments. The operations will be reviewed and possibly modified to ~~prevent any~~ minimize the potential for future spills.

Potential air quality impacts exist during the transport mode. As described in the previous section, greater potential exists for volatile organic emissions when the dredged sediment comes in contact with air. To prevent this impact, operational performance standards will be imposed, requiring contractors to meet the MOE ambient air and point of impingement standards. All workers in contact with the sediment, and when conditions require it, will be required to wear personal protective equipment.

Noise from the operations is expected to be similar to everyday background levels in the area. Noise is not expected to be disruptive to the local businesses and is not considered significant.

Transport of sediment will not impact on cultural heritage resources or native issues. The social effects are consistent with those of the overall project. No negative effects are anticipated for human health. Local businesses are not expected to be negatively impacted. Temporary alternative transportation routes may be required, however if this is necessary, it is only expected to occur over a short period of time. Positive impacts may include local employment.

Sediment transport is expected to cause both negative and positive effects. The negative impacts are temporary, can be mitigated and are not considered significant.

5.2 Coarse Screening and Mechanical De-watering

All screening and de-watering operations will be conducted on an impermeable pad. Should accidents such as spills or leaks occur, this pad will provide the necessary soil, groundwater and surface water protection.

Worker activity in the area will most likely prevent terrestrial animals from coming in contact with the material. Where applicable, material will be contained at the end of each day to prevent animal contact and air emissions.

Air monitoring will be conducted throughout the operations. The contractor will be required to comply with regulatory approvals. At all times, workers are expected to wear personal protective equipment appropriate to the conditions and risks present in the area in which they are working or passing through. The technology selection process will evaluate and select technologies based on their ability to meet the established emission and treatment criteria of the project.

Potential impacts associated with the discharge of decant water are expected to be minimal. Ontario Provincial Water Quality Objectives will need to be met if the decant water is treated by the vendor and placed back into the harbour. Conditions under which the Region will accept the treated decant water into the combined sewer system are summarized in Attachment 2. The contractor who is handling the excess water will be responsible for meeting the agreed to performance specifications.

Significant noise increases from this operation are not expected. Cultural heritage resources, including native issues, will not be effected. Social effects are consistent with the effects of the overall project. Use of safety procedures and protective clothing will ensure human health. Fencing will be installed around the perimeter of the site and a sign will be posted to prevent public entrance into the area. Hamilton Harbour Commissioners are contributing lands for use. Local businesses are not expected to be negatively impacted.

Any negative impacts associated with screening and de-watering operations are considered to be either temporary or can be mitigated, and are considered insignificant.

5.3 Preparation of Sediment as Feed Stock

5.3.1 Storage

Negative impacts associated with storage of the sediment are not expected. To the extent possible, stockpiling of the sediment will be minimized by coupling the dredging rate to the sediment conditioning rate. Thus, negative impacts associated with storage of the sediment are not expected. Nevertheless, the facility will be constructed, inspected and/or modified with the anticipation of preventing leaks and spills. Operational procedures will be put into place to identify the potential for spills and to ensure quick responsive action. Should a leak or spill occur, immediate attention will be given to the area in order to prevent soil and groundwater contamination. If necessary, an impermeable liner may be added to replace and/or supplement the existing liner/clay berm, holding tanks or concrete pads.

A temporary enclosure of the facility may be implemented to prevent negative terrestrial impacts. The material may be covered either with a temporary or permanent roof, or contained in holding tanks. This will prevent birds from coming in direct contact with the material and it will also keep air emissions to a minimum. Leak detection sensors can be installed as a preventive measure. Air monitoring will also be conducted.

There will be some noise during the transport mode to and from the facility. However, noise directly associated with storage is not anticipated. The anticipated noise impact will be similar to the noise level associated in a typical industrial zone. No impact on cultural heritage resources or native issues are anticipated. The social effects are consistent with those of the overall project. Hamilton Harbour Commissioners are contributing lands for use. Local businesses are not expected to be negatively impacted.

Human health effects are not expected. All workers will be required to wear personal protective equipment when in contact with the material. The storage facility will be secured by fencing and signage will be posted to restrict unauthorized visitors, if necessary. Only authorized personnel and official tours will be allowed to enter into the site. All staff on the site will be required to have received site specific health and safety and contaminated site training.

The potential negative effects of sediment storage described above are expected to be temporary, can be mitigated and are not considered significant.

5.3.2 Preparation of Sediment

Sediment loading into and out of the sediment preparation facility will be conducted on an impermeable pad. Operational procedures will be put into place, continuously evaluated and modified to prevent accidents. Immediate response to these types of accidents will prevent soil and groundwater contamination.

Air quality monitoring will be conducted throughout the operations. Where possible, air will be re-circulated and treated. Exceedances of the air quality standards may result in operational shutdown and the installation of air pollution control devices. The contractor is responsible for ensuring that an adequate air monitoring program is in place for the preparation of the feedstock and that the program meets the air legislation for Ontario. Vendors who bid on this component of the project will receive a higher ranking under air quality criteria if the technology is capable of minimizing air emissions.

Worker activity in the area will most likely prevent terrestrial animals from coming in contact with the material. All material will be contained at the end of each day to prevent animal contact and air emissions.

The sediment preparation facility will be located in an industrial area. Noise from this operation is not expected to exceed background levels. Cultural heritage resources, including native issues, will not be effected. Social effects are consistent with the effects of the overall project. Use of safety procedures and personal protective equipment will control and minimize human health risks. Fencing will be installed around the perimeter of the site and signage will be posted to restrict unauthorized visitors, if necessary.. Hamilton Harbour Commissioners are contributing their lands for use. Local businesses are not expected to be negatively impacted. Local employment may be a positive outcome.

As a contingency measure, a limited quantity of dredge material will be conditioned for volatility and corrosivity and will be trucked to a licensed industrial landfill. This re-routing of material may occur if Stelco Inc. specifications cannot be met. No changes to the preparation facility are anticipated. The effects of this sediment on the environment will be the same as for any industrial waste which is disposed of in an industrial landfill. In Ontario, industrial landfills are approved under an Environmental Approvals process. Potential negative effects related to use of the landfill have already been assessed. Ability to accept the material at the landfill is based on the operator's license agreement.

Any negative impacts associated with the sediment preparation facility are considered to be either temporary or can be mitigated, and are considered insignificant.

5.4 Stelco Inc. Hilton Works Sintering Plant and Blast Furnace

All processing of material through the Stelco Inc. Hilton Works sinter plant and blast furnace will be conducted under the plant's current operating procedures and the plant's Certificate of Approval - Air, issued by MOE. The conditioned sediment will be used to replace a small portion of the existing raw material. It is expected that the dredged material will be blended in small quantities (i.e. less than 1% blend) with the iron oxide fines and sludges normally entering the operations.

Protocols for industrial hygiene and health considerations associated with handling this material will bein place through Stelco's existing material handling procedures and worker health and safety protocols.

The Stelco Inc. Hilton Works sinter plant is equipped with a wet venturi scrubber and mist eliminator to control particulate emissions from the unit. As this feed material is of the same consistency as the usual feed stock, control should be achieved by this scrubber.

The *Ontario Environmental Protection Act*, Section 9(1) states that:

> *"no person shall, except under and in accordance with a certificate of approval issued by the Director, (a) construct, alter or replace any plant, structure, equipment, apparatus, mechanism or thing that may discharge or from which may be discharged a contaminant into any part of the natural environment other than water or (b) alter a process or rate of production with the result that a contaminant may be discharged into any part of the natural environment other than water or the rate or manner of the discharge of a contaminant into any part of the natural environment other than water may be altered."*

Under Ontario Regulation 346, Section 5 sets limits based on dispersion modeling. It requires that where a facility emits a contaminant into the air, the concentration in the atmosphere resulting from the pollutant being emitted must be less than the prescribed limit. Compliance with Regulation 346 is achieved when the maximum ground level concentration at a point of impingement during any half-hour period is demonstrated to be below the applicable limit.

Stelco Inc. recently conducted a study which assessed the POI concentrations that would result from emissions of contaminants at the sintering plant. The study assessed PCB emissions, as well as emissions of aluminum, cadmium, chromium, copper, manganese, nickel, lead, zinc, mercury and dioxins/furans. The estimated emission rates for these contaminants were input into a dispersion model to determine the maximum off-property ground level concentrations at a point of impingement (i.e. POI concentration). The results show concentrations for the above contaminants that are well below Ministry POI standards. In these calculations, several conservative assumptions were made. The sediment concentration was based on the highest individual sample from the MDA report, sediment was consumed at a steady rate over a two year period and no capture of sediment contaminants by the wet scrubber or mist eliminator as would occur in reality. Also, the POI calculations were based on the addition of conditioned sediment at a rate of 2% (in addition to the current amount of raw material now being used). Based upon the information provided by Stelco in their study, the MOE has determined that the inclusion of the conditioned sediment into the feed stock at the proposed rate of less than 1% would not represent a significant change in the feedstock. The company also conducted a stack test for dioxins/furans at the sinter plant during normal operations of the process.

Currently there is limited data available on dioxin and furan concentrations in Randle Reef sediment. Two sediment samples have been analyzed in the past, one from the center of Hamilton Harbour and the other in the vicinity of the Canada Centre for Inland Waters. Dioxin and furan concentrations were detected at 41.2 pg TEQ/g and 38.0 pg TEQ/g respectively. Subsequent analysis of 5 samples from Randle Reef indicates a range for PCDDF of 16.3 pg TEQ/g to 57.1 pg TEQ/g. The Ministry Guideline for Use at Contaminated Sites in Ontario has a soil cleanup criterion for dioxin and furans on industrial/commercial property of 1000 pg/g.

Air quality monitoring will be conducted throughout the operations and compared with background baseline data. Recent stack testing Stelco Inc. and the application of MOE dispersion modeling indicates off site impacts of dioxins, furans and PCBs to be below Ministry POI standards.

Sediment processing through the Stelco Inc. Hilton Works sinter plant and blast furnace will reduce the consumption rate of other revert materials. These effects are recognized by the participating parties as a contribution by Stelco Inc. to the project.

Noise from this operation is expected to be consistent with everyday operations. Cultural heritage resources, including native issues, will not be effected. Social effects are consistent with the effects of the overall project.

Positive impacts associated with this process are associated with the re-use of conditioned sediment. High concentrations of toxic compounds will be removed from the aquatic environment, processed and then re-used as iron and blast furnace slag. Blast furnace slag is a by-product of the iron making process. Approximately 500,000 tonnes is produced annually by Stelco Inc. and sold to Lafarge slag where it is used to make a

variety of products including fill, engineered block and cement. The amount of slag production from the sediment feedstock will be less than 1% of the total slag production.

6.0 GOVERNMENT REGULATIONS AND APPLICABLE CRITERIA

The following is a description of applicable criteria required for the project:

Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario

These guidelines apply to the sediment in Hamilton Harbour while it is under water. The guidelines give numeric objectives for sediment quality: the "Severe Effect Levels" and the "Lowest Effect Levels". The guidelines also give flexibility to those considering remediation of sediment. A risk assessment or toxicity based approach can be used to develop site specific cleanup criteria.

Ontario Provincial Water Quality Objectives

The *Ontario Provincial Water Quality Objectives* (PWQO) are a set of criteria for fresh water in Ontario. The criteria given are desirable levels for nutrients, physical parameters (such as temperature), and toxic compounds. The guidelines are used to set discharge limits for activities in water and discharges to water. Although they are guidelines, they can be enforced under powers in the *Ontario Water Resources Act*.

The PWQO will apply to the dredging of the sediment and to any activity which releases water back to the harbour. Some of the sediment processing operations, particularly the dewatering, will create a water which will be either released to the harbour or, if the PWQO are not met, discharged to the municipal sewer (see *Municipal Sewer Use Bylaw*).

Ontario Environmental Protection Act (EPA) and the Waste Management Regulation made under the EPA

The Waste Management Regulation, O. Reg. 347 defines hazardous, industrial and municipal wastes and regulates their generation, handling and disposal. Approvals are required to generate hazardous or industrial waste, to handle, transport and/or dispose of it.

Hazardous waste, under this regulation, can be transported by an approved hazardous waste hauler to an approved hazardous waste facility. It may also be conditioned on site without any approvals under this regulation. Once conditioned, the material will either be an industrial waste or will be de-listed as a waste (meaning it can be re-used). If it is considered an industrial waste, it must be disposed of in a licensed industrial waste facility.

Under *Part 5 of the Act*, a waste processing approval is required by the Ontario Ministry of the Environment for de-watering the material and for the organic reduction components of the project. Since Environment Canada is acting as the proponent for this project, no *Environmental Protection Act* approvals will be required for this stage of the project. Direct discharge to the sanitary sewer will involve a municipal approval (see section on *Municipal Sewer Use Bylaws*).

Ontario Environmental Protection Act (EPA) and the General Air Regulation made under the EPA

The *General Air Regulation,* O. Reg. 346 sets out maximum ground level concentrations at a point of impingement for a number of scheduled contaminants and prohibits exceedance of these set limits. A certificate of approval (section 9 of the EPA) is required for the emission of contaminants to the air.

Many phases of the project will create air emissions. An air approval will be required if any additional discharge points are created by the process and if the project takes place on land not federally designated.

The sediment removal and conditioning process will take place on land under federal jurisdiction. The federal government agrees to apply the Ontario regulatory requirements to the operator of the sediment dredging and conditioning activities.

Studies have been conducted to determine the potential air emissions from the Stelco Inc. Hilton Works sinter stack. The recent POI study and the stack testing by Stelco Inc. indicate off site impacts of contaminants to be below POI standards.

Ontario Occupational Health and Safety Air Quality Standards

These standards protect worker health by setting limits for the amount of chemical contaminant that workers can be exposed from air emissions. The standards require that if the limits are exceeded, the employer must either make modifications to the workplace or provide protective equipment.

Previous studies with similar sediment have demonstrated that the *OHS Air Quality Standards* were exceeded for volatile organic compounds. Therefore, workers involved in the dredging and conditioning phase of this project will work inside an "exclusion zone" and may be required to wear personal protective equipment (e.g. respirators or supplied air systems). Visitors and non-essential personnel will be kept outside of the exclusion zone. Extra precautions are not an anticipated requirement for the sinter plant.

The Fisheries Act (Canada)

The *Federal Fisheries Act* is a piece of legislation which protects fish and fish habitat. The release of a deleterious substance to waters inhabited by fish is prohibited. Where

habitat is lost or expected, Department of Fisheries and Oceans Canada requires appropriate compensation habitat to ensure no net loss of habitat before they will issue an authorization under the *Act*.

Migratory Birds Convention Act

This *Act* protects migratory birds and their nests and eggs. It is an offense to harm a migratory bird (other than by permit). Harming migratory birds has been interpreted to also include creating any disturbance which prevents or interferes with nesting. The *Act* is enforced by the Environment Canada's Canadian Wildlife Service.

Canadian Environmental Assessment Act

This *Act* requires all projects involving a federal proponent, money, land and specific regulatory approvals to undergo an environmental assessment, through either a screening, comprehensive study or public review by a panel or mediator.

This document is an environmental screening document designed to meet the requirements of the *Act*.

Canadian Environmental Protection Act

The *Canadian Environmental Protection Act* gives the federal government the means to better protect human health and the environment from the risks posed by toxic substances and other pollutants. The *Act* embodies an ecosystem approach by focusing on pollution problems in water, on land and through all layers of the atmosphere. It establishes a comprehensive regime to control toxic substances at each stage of their life cycle from development and manufacture through transport, disturbance, use and storage, to their safe, ultimate disposal as wastes. The *Act* applies to all phases of the project.

Municipal Sewer Use Bylaws

Some municipalities with sewers and sewage treatment plants have bylaws regulating the quality and volume of water which can be discharged to the sewers. The bylaws usually allow the limits to be exceeded under special circumstances and with financial compensation to the municipality.

For this project, it is possible that treated decant water will be discharged to the Region's sewer system as part of the sediment preparation process. The contractor(s) who is creating the excess water will be responsible for arranging for sewer discharge agreements with the Regional Municipality of Hamilton-Wentworth, if necessary. The conditions under which the Region will accept the treated decant water are summarized in Attachment 2, February 23 Report to Regional Council.

Navigable Waters Protection Act

This *Act* requires that authorization be obtained for any marine works that may substantially interfere with the public right to navigation. Dredging and transport may temporarily impact on commercial navigation at the site. Provisions of this *Act* will be met, prior to operation in accordance with Fisheries and Oceans Canada's Canadian Coast Guard and Hamilton Harbour Commissioners requirements.

7.0 PUBLIC CONSULTATION

Public consultation is fundamental to the success of this proposed project. The Hamilton Harbour RAP has actively communicated the developmental stages of this project to the public.

In September 1994, the Bay Area Restoration Council (BARC) held a public meeting to discuss the need and strategy for sediment remediation in the harbour. The participants reaffirmed the priority to remediate contaminated sediment and agreed that the project site located near Randle Reef be remediated as a high priority initiative. Both BARC and the Bay Area Implementation Team (BAIT) have been given regular updates on the status of this proposed undertaking.

Throughout 1996, the Randle Reef Remediation Steering Committee investigated options to remediate the project site. Active members participating in the analysis of alternatives and agreement of the preferred alternative included:

- Bay Area Restoration Council
- City of Hamilton
- Environment Canada
- Fisheries and Oceans Canada
- Hamilton Harbour Commissioners
- Hamilton RAP
- Hamilton Region Conservation Authority
- Ontario Ministry of the Environment and Energy
- Regional Municipality of Hamilton-Wentworth
- Stelco Inc.

In July 1996, consultation with the public included:

- Three open houses were held in Hamilton and in Burlington to solicit public input on the selection of the preferred remedial alternative. A total of 36 public members attended;
- Approximately 500 project report summaries and comment sheets were sent to interested parties, including elected representatives, residents, BARC, environmental groups, and industries within a 500 m radius of the site. Copies were also made available at public libraries, the Hamilton RAP office and BARC office. Public comments were received up to one month after the last public forum;

- Telephone calls were made directly to over 30 tenants of the Hamilton Harbour Commissioners located in close proximity of the project site;
- Soliciting public input through a series of newspaper advertisements;
- Posting of project information on the electronic bulletin board used by *CEAA*.

Details of the consultation process including concerns, issues, support and recommendations have been documented (Hamilton Harbour RAP, 1997). In summary, there were no objections to the undertaking.

An information session is planned for the winter of 1999 to provide the public with an update on the proposed project plans.

8.0 SUMMARY AND RECOMMENDED *CEAA* DECISION

8.1 Summary of Significance of Environmental Effects

In Section 2.2 of this report, the criteria which would be used to identify the environmental effects were defined as:

Biophysical
- air quality
- aquatic environment
- hydraulics
- noise
- terrestrial environment
- water quality

Socio-economic
- business operations
- commercial shipping
- cultural resources
- social environment
- recreational uses

In that section it was also noted that the significance of environmental effects would be defined based on considerations related to magnitude, geographic extent of effect, duration and frequency of extent, reversibility of environmental effect, and ecological context. The following matrix (Table 3) summarizes the assessment of the significance of the environmental effects for each of the environmental components identified above.

TABLE 3: Summary of Environmental Effects and Their Significance

ACTIVITY	ENVIRONMENTAL COMPONENT								
	AIR QUALITY	AQUATIC ENVIRONMENT	NOISE	TERRESTRIAL ENVIRONMENT	WATER QUALITY	BUSINESS OPERATIONS	COMMERCIAL SHIPPING	CULTURAL RESOURCES	SOCIAL ENVIRONMENT
Removal	▲	▲/✓	▲	●	▲/✓	●	▲	●	▲
Transport	▲	●	▲	▲	▲	●	●	●	▲
Storage	▲	▲	●	▲	▲	●	●	●	▲
Screening and Dewatering	▲	●	▲	▲	▲	●	●	●	●
Biological	▲	●	▲	▲	●	▲/✓	●	●	●
Organic Extraction	▲	●	▲	●	●	▲/✓	●	●	●
Thermal	▲	●	▲	●	●	▲/✓	●	●	●
Stelco Inc. Hilton Works Sinter Plant and Blast Furnace	▲	●	▲	●	●	▲	●	●	●
Contingency: Disposal in Landfill	▲/●	●	▲/●	●	●	●	●	●	●

Legend:

✓ Positive Effect
▲ Negative Effect but can be mitigated and/or not considered significant
● No Effect

Note: Where effects differ between short term and long term 2 symbols have been used (i.e. short term / long term)

8.2 Cumulative Environmental Effects

Air emissions from the dredging, storage, screening, de-watering, preparation and sintering activities can potentially combine with ongoing air emissions from industrial activities nearby to cumulatively degrade air quality in the area. Monitoring of air emissions will provide ongoing assessment. Potential impacts will be minimized by meeting all regulatory requirements for air quality emissions.

An overall positive cumulative impact on the health of the aquatic ecosystem in Hamilton Harbour is expected from this project, in conjunction with other initiatives under the Remedial Action Plan. The project will not eliminate, but will diminish a source of stress in the aquatic ecosystem in Hamilton Harbour. It is therefore consistent with the long-term strategy of the Remedial Action Plan, which identifies all known stressors and seeks to diminish them over time. The cumulative effect of these efforts, provided they continue to be made as recommended in the RAP, and provided the introduction of significant new stressors can be prevented, will be a restored and protected local ecosystem (Hamilton Harbour RAP, 1999).

8.3 Conclusions and Screening Decision

The proposed project involves the removal of approximately 20,000 m^3 of sediment, contaminated with sum PAH minus naphthalene concentrations greater than 700 µg/g. Once dredged, the material will be conditioned to reduce some of the organics and then processed through the Stelco Inc. Hilton Works sinter plant and blast furnace. Anticipated end products include iron and blast furnace slag. As a fall back measure, in the event that the material does not meet Stelco Inc. specifications, a limited quantity of dredged material will be conditioned for volatility and corrosivity, and then it will be trucked to a licensed industrial landfill.

The potential environmental impacts of this project, including cumulative effects, have been assessed within this environmental assessment document. Taking into consideration the mitigative measures described in this report, as well as the comments received from the public throughout this process, it is concluded that there are no significant adverse environmental effects associated with this project pursuant to Section 20(1)(a) of the *Canadian Environmental Assessment Act*.

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APPENDIX A

RANDLE REEF REMEDIATION STEERING COMMITTEE

APPENDIX A - RANDLE REEF REMEDIATION STEERING COMMITTEE

Murray Charlton	Environment Canada, National Water Research Institute
Bob Edwards	Hamilton Harbour Commissioners
Ed Gill	Ontario Ministry of the Environment
Wally Rozenberg	Ontario Ministry of the Environment
Karen Gray	Fisheries & Oceans Canada, Fisheries and Habitat Management
Jim Halliday	Regional Municipality of Hamilton-Wentworth
Peter Dunn	Regional Municipality of Hamilton-Wentworth
Tim Huxley	Stelco Inc.
Rick Lane	Stelco Inc.
Louise Knox	Hamilton Harbour RAP Implementation Coordinator
Joe Lakatos	City of Hamilton
Simon Llewellyn	Environment Canada, Environmental Conservation, Ontario Region
Tom McGuire	Dofasco Inc. (observer only)
Ian Orchard	Environment Canada, Environmental Protection, Ontario Region
Mark Sproule-Jones	Bay Area Restoration Council
Frank Pearce	Bay Area Restoration Council
Ben Vanderbrug	Hamilton Region Conservation Authority
John Coates	Hamilton Region Conservation Authority
Rob Dobos	Environment Canada, Environmental Assessment Coordinating Committee

APPENDIX B

WATER QUALITY MONITORING PROGRAM

Production Rate

The production rate of the sediment removal equipment should be adjusted to show sufficient settling time for effluent to meet the *Ontario Provincial Water Quality Objectives (PWQOs)*. Therefore, the feed rate of the excavated material into the holding facility for transport to the sediment processing site should be adjusted accordingly.

Transport

No Overflow or Leaks

No overflow or leaks of excavated material shall be allowed during the transport to the sediment preparation site. Use of pipelines or other fully closed transport mediums is encouraged.

Contact

After removal, no contact is permissible between the contaminated sediment and human, terrestrial and aquatic life.

Dewatering

Effluent quality of the supernatant water and effluent from the sediment preparation process should meet applicable Federal, Provincial and Municipal approvals and regulatory requirements. *Ontario Provincial Water Quality Objectives* will need to be met by the vendor for the treated decant water to be placed back into the harbour. Conditions under which the Region will accept the treated decant water into the combined sewer system is summarized in Attachment 2. The contractor who is handling the excess water will be responsible for arranging for decant water discharge agreements.

Waste Handling

All wastes from the sediment preparation process should be handled and disposed of in accordance with appropriated regulatory requirements.

Dredging may be shut down due to high turbidity concentrations and will be suspended until the problem is identified, solved and safe to proceed. Actions and responses will be defined in the Terms of Reference of the contract. The following actions may include such items as:

1. The on-site project manager and persons conducting any direct interfacing operations (i.e. sediment screening and dewatering) will be notified.
2. Profiles throughout the water column will be taken with a hand held multi-parameter monitor to determine if there is a breach in the curtain at a particular depth. Inspection of silt curtain and accessory equipment.

3. Dredging operations will be reviewed to determine whether a change in operations is necessary to further reduce silt resuspension.
4. Harbour bottom conditions will be examined to determine whether they have changed in a way that will result in a deterioration of sediment removal effectiveness.

APPENDIX C

AIR QUALITY MONITORING PROGRAM

APPENDIX C - AIR QUALITY MONITORING PROGRAM

The following is a generic air quality monitoring program for the project. It is the responsibility of the facility operator to provide adequate monitoring equipment and implementation of the program in compliance with Ontario's air legislation and the established project operational performance criteria.

Details of the set criteria will be finalized upon the writing, selection and review process of contract specification documents and the signing of project agreements between parties.

Baseline Data Monitoring

Air quality monitoring will start prior to any significant activity in the harbour. On-site monitoring will provide detailed background site information (upwind, downwind and at site location) to monitor potential emissions during project operations. Parameters for collection and analysis may include total VOCs, total PAHs and/or priority PAHs (e.g. naphthalene, benzo(a)pyrene, etc.), PCB, dioxins, furans, sulphur, metals, and oil and grease.

As an example, when monitoring for total PAHs, a time average high-volume polyurethane foam (PUF) sampler could be located upwind, downwind and within the immediate vicinity of the process being monitored. The PUF will require laboratory analysis for individual PAHs. The time averaging should initially be for a single working cycle (e.g. 10 hours), however, it will likely be possible to extend this time of sampling to composited operating periods. Logistics may require that the PFU's be changed each operating period to minimize contamination. The foam plugs will be able to be extracted in sequential groups. Compositing extracts will allow the concentrations to be determined over time averaged periods of, for example, one operational week. Sample extraction and compound specific analysis will have to be conducted by a certified laboratory or alternatively, could be conducted on site with a percentage of the analyses confirmed by a certified laboratory.

In addition to facility operator baseline monitoring, the Ministry of the Environment will continue to operate four existing ambient air monitoring stations, in the vicinity of the Project area. These sites are to serve as downwind observation posts.

Site #1 - Hillyard Street site (southwest of the Project location) will continuously monitor for Total reduced Sulphur (TRS) including H_2S and real-time PM_{10}, as well as continuous wind speed and direction. The MOE will conduct 24 hour PAH and Volatile Organic Compounds (VOC) monitoring on a 12 day cycle.

Site #2 - Pier #25, located on the Hamilton Harbour Commissioners' property east of the site, will continuously monitor for TRS and COH, with 24 hour PAH monitoring on a 12 day cycle.

Site #3 - the Beach Boulevard station east of the site, continuously monitors TRS, SO_2, NO_X and COH with 24 hour Total Suspended Particulates (TSP) and PM_{10} done on a 6 day cycle and VOC on a 12 day cycle.

Site #4 - the Elgin/Kelly Street site (southwest of the Hillyard St. site) will continuously monitor TRS, COH, CO, SO2, NO_X and $PM_{2.5}$ particulates, along with VOC on a one in 12 day cycle and Total Suspended Particulates (TSP) and PM_{10} done on a 6 day cycle. This station also measures 24 hour chlorinated dibenzo-p-dioxins/furans (PCDD/PCDF) on a 24 day cycle.

Real Time Monitoring

Real time (on-line) monitoring throughout the project will provide time-averaged exposures and emissions from project operations and will provide the necessary alert to avoid environmental and hygiene exceedances.

Samples will be collected upwind, downwind and at various locations at the conditioning facility. Instruments must be connected to an appropriate alarm system to identify when the project-based exposure values are exceeded. Instrumentation may vary depending on the type of parameter being measured. Total VOCs can be measured and the information downloaded in near real time mode utilizing Photovac's MicroFID (flame ionization detector), Photovac's 2020 Miniature PID (photo-ionization detector) or comparable instrumentation. As for the PAH example, these instruments can be calibrated for major hydrocarbons of concern with the PUF sampler. Sulphur (H_2S) can be measured using ENMET Spectrum Series Personal Gas Detectors. Personnel working in exclusion zones are required to carry real-time personalized exposure monitors at all times to monitor personal exposure limits. Instrumentation will be calibrated for key exposure parameters.

Project-based Operational and Performance Standards

All applicable Federal, Provincial and Local regulations, guidelines and criteria must always be adhered to. Operational criteria will be set for each phase of the project. If measurements exceed established air quality criterion, then:

1. The on-site project manager and persons conducting any direct interfacing operations will be notified immediately.
2. Operational activities will be temporarily halted until air profiles can be further analyzed and activities can be inspected to determine the need to change operational activities or make process modifications.
3. Operational activities will be allowed to resume when air quality returns to established criteria and mitigative measures are established (if necessary).

The project manager and the contractor will meet on a pre-determined basis (e.g. weekly) to review monitoring data and to review operational efficiency. Frequency of meetings will be determined on a as-needed-basis and may become less frequent as the project progresses.

ATTACHMENT 1

STELCO INC. HILTON WORKS SINTER PLANT - RANDLE REEF CONDITIONED SEDIMENT SPECIFICATIONS

ATTACHMENT 1

STELCO INC. HILTON WORKS SINTER PLANT -
RANDLE REEF CONDITIONED SEDIMENT SPECIFICATIONS
(REV 99/04/26)

PARAMETER	MAX LEVEL OF INDIVIDUAL RAW MATERIALS '95-'98 (ppm)	TYPICAL TOTAL RAW MIX JUNE 9-11'98 (ppm)	AVE CONC CONDITIONED SEDIMENT (ppm)	IMPACT A 0.5% FEED (ppm)	PROPOSED SPECIFICATION	COMMENTS
Copper	NT	TBD	99.7	TBD	120	20% over average concentration
Iron	768,000	462,000	100,000	*	NO LIMIT	beneficial to sintering process
Lead	400	<30	621	33	745	20% over average concentration
Zinc	2,900	200	5,120	224.6	6,144	20% over average concentration
Oil & Grease	7,600	TBD	17,000	TBD	10,000	1% limit ensures handling capacity
Phos	2,400	300	2,025	309	2,430	20% over average concentration
Manganese Oxide	85,000	14,067	2,316	*	14,067	based on typical raw mix
Mercury	NT	<0.01	8.6	0.053	10.3	20% over average concentration
Chlorides	2,030	TBD	<20	TBD		TBD
Total Sulphur	7,700	2,167	7,300	2,193	8,760	20% over average concentration
Carbon	544,000	53,667	~50,000	*	<2% DEVIATION	beneficial as a fuel if consistent conc.
Alkali (Na2O + K2O)	6,290	1,057	<1,000(est.)	*	1,200	20% over average concentration
Total PAHs	NT	<2.5	1,000	7	1,000	consistent with MOE soil stds
PCBs	NT	0.027	0.5	0.029	0.6	below MOE soil stds

Physical Properties: Dry and free flowing--ability to handle without dustiness or clumping--no discernible odour
All sampling to follow MOE standards and protocols

Notes:
* indicates less than current typical mix
oil and grease refers to toluene extractable components
NT indicates "not tested"
TBD indicates "to be determined"

ATTACHMENT 2

FEBRUARY 23, 1999 REPORT TO REGIONAL COUNCIL, CHAIRMAN AND MEMBERS OF THE ENVIRONMENTAL SERVICES COMMITTEE, THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

ATTACHMENT 2 -

FEBRUARY 23, 1999 REPORT TO REGIONAL COUNCIL, CHAIRMAN AND MEMBERS OF THE ENVIRONMENTAL SERVICES COMMITTEE, THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

The following excerpts have been extracted from the February 23, 1999 report to the Regional Municipality of Hamilton-Wentworth Council:

> The Region has been asked to provide in-kind services consisting of accepting the treated decant water from the sediment de-watering process, and treating it at the Woodward Avenue Wastewater Treatment Plant (WWTP).
>
> Sampling of the treated decant water, produced as a result of bench scale de-watering test conducted during preparation of the CEAA report, indicate that the concentrations of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD), Phosphorus, and Total Kjeidahl Nitrogen (TKN) found are within the Region's Sewer Use By-Law limits for discharge to the Region's sanitary and combined sewers (see Table 1). The Region's Sewer Use By-Law does not specifically address Naphthalene, but the Naphthalene concentration in the treated decant water from the Randle Reef sediment (11 mg/L) is significantly lower than reported tolerance limits for the treatment of Naphthalene by the activated sludge treatment process employed at the Woodward Avenue WWTP (500 mg/L), and would not adversely affect the performance of the plant (see Table 1). Staff would thus permit the discharge of the treated decant water from the Randle Reef sediment into our sanitary and combined sewer, provided the general prohibitions presented in Section 4 of the Sewer Use By-Law are not violated. If the untreated decant water does not meet the Region's Sewer Use By-Law limits, it will not be accepted.
>
> Also, as the treated decant water would be discharged into a combined sewer system, we would require that we review and approve the proposed point of discharge to the sewer system, and that this discharge only occur during dry weather. We would also only accept the treated decant water provided it does not upset the wastewater treatment process in any way, and the biosolids from the wastewater treatment process can still be land applied. Finally, we would require sample results from the actual treated decant water for review, to verify the above conditions are met prior to accepting this liquid for discharge into the sewer system and treatment at the Woodward Avenue WWTP.

Table 1: Randle Reef Treated Decant Water Quality

Parameter	Treated Decant Water[1] (mg/L)	Sewer -Use By-Law Limit (mg/L)
Total Suspended Solids	0	350
Biochemical Oxygen Demand	75	300
Total Kjeidahl Nitrogen	59	100
Total Phosphorus	0.26	10
Naphthalene	11	500[2]

[1] concentrations from WTI bench scale treatment tests.
[2] limits for Naphthalene is reported process tolerance limit below which there are no adverse impacts on activated sludge treatment process (USEPA).