GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of Environment and Conservation
Pollution Prevention Division

GUIDANCE DOCUMENT

Title: **Determination of Petroleum Product Resemblance and Comparison to Tier I Cleanup Criteria for Impacted Sites**

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Approved By: _____
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PETROLEUM PRODUCT RESEMBLANCE AND TIER I CLEANUP CRITERIA
GD-PPD-044

1.0 SUBJECT:

The determination of petroleum product resemblance and applicable Tier I cleanup criteria for the management of petroleum impacted sites.

2.0 OBJECTIVE:

To set out the procedures for characterizing petroleum hydrocarbon contamination and for selecting the appropriate Modified TPH cleanup criteria, when following the Tier I method described in the Department's "Guidance Document for the Management of Impacted Sites" (latest version).

3.0 DEFINITIONS:

Atlantic RBCA model: The latest version of a software model used to assess human health risk and develop site-specific remedial criteria (currently endorsed by the four Atlantic Provinces for petroleum hydrocarbon contamination only, although other parameters are being considered).

BTEX: An acronym for the hydrocarbon compounds benzene, toluene, ethyl benzene and xylene(s).

CCME: Canadian Council of Ministers of the Environment

Contaminant: A substance that causes or may cause an adverse effect.

Designated Contaminated Site: A site formally designated as a contaminated site by the Minister of Environment under section 26 of the *Environmental Protection Act SNL 2002 cE-14.2*.

Impacted Site: A designated or non-designated contaminated site.

Non-Designated Contaminated Site: A site on which the Department has knowledge that there has been a release of a substance (which includes a spill or leak of gasoline or an associated product including heating oil), which causes or may cause an adverse effect but which has not been formally designated as a contaminated site by the Minister of Environment and Conservation.

Person Responsible: The person(s), association of persons, corporate entity, or municipality determined, by the Province, to be responsible for the remediation of an impacted site.

PIRI: A Partnership in RBCA (Risk-Based Corrective Action) Implementation, which in Atlantic Canada is implemented through the Atlantic PIRI Committee.

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4.0 BACKGROUND:

It is the Department's policy that impacted sites are to be managed in accordance with the "Guidance Document for the Management of Impacted Sites." [1] As outlined in that document, the Department has adopted a tiered approach to the management of impacted sites, whereby three tiers of increasing technical complexity are available for use. The person responsible is able to choose Tier I, II or III depending on the specifics of the site and various other factors. [1]

The Tier I method streamlines the management process by providing cleanup criteria in tables (Tier I Look Up Tables) found in the "Guidance Document for the Management of Impacted Sites." This method is typically applicable to sites having lesser amounts of contamination, and may only be used if the site meets mandatory conditions listed in the Preamble to the Tier I Look Up Tables. [1]

Generic remedial criteria for petroleum hydrocarbon contamination, as specified in the Tier I Look Up Tables, have been established by the Atlantic PIRI Committee using the Atlantic RBCA model. Criteria for Modified TPH are provided in these tables for three types of fresh, unweathered petroleum products (gasoline, diesel/#2 oil and #6 oil). When using the Tier I method to evaluate a site containing petroleum hydrocarbon contamination, it is necessary to determine which of the three petroleum product types the contamination resembles in order to select the appropriate cleanup criteria. This guidance document outlines the process to be followed in making this determination.

5.0 LEGISLATION:

Applicable Legislation:

- Environmental Protection Act, Sections 26(2), 29(a) and 29(b)

6.0 PROCEDURE:

The following procedure is based largely on protocol established by the Atlantic PIRI Committee. [2]

6.1 Applicable Modified TPH criteria should be selected for each actual or potential petroleum contaminant source on the site.

6.2 No more than one Modified TPH criteria shall be selected for each actual or potential contaminant source. Where two or more samples are collected and analysed for a single source, the procedure outlined in the following sections shall be performed for each sample individually. If the laboratory results for the samples differ to the extent that more than one hydrocarbon product type is identified for a single source, the most stringent Modified TPH criteria of the identified product types should be selected for the source.

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6.3 Analytical laboratories report Modified TPH as three carbon ranges (C6-C10{minus BTEX}, >C10-C21 and >C21-C32). These ranges are not the same as the three petroleum product types specified in the Tier I Look Up Tables, and must not be individually compared to the Modified TPH criteria for the specified product types (e.g., the laboratory results for >C10-C21 should not be compared directly to the diesel criteria). Rather, the laboratory results for the three carbon ranges must be added together and the total then compared to the applicable Modified TPH criteria.

6.4 The applicable Modified TPH criteria for a given site should be selected based on a clear indication of a single product type by the laboratory, when such information is provided in their product resemblance comments. If a single product type is not clearly identified by the laboratory, the Modified TPH criteria should be selected upon consideration of the following information:

- review of historical information for the site (petroleum usage, storage and/or spillage); and

- comparison of the carbon fraction distribution obtained from laboratory results to the values provided in Table 1 (these percent distributions, published by Atlantic PIRI, are considered to be representative of fresh hydrocarbon products). [2]

Table 1: Percent Distribution of Carbon Fractions in Fresh Hydrocarbon Products [2]

	C6 – C10	>C10 – C21	>C21 – C32	TOTAL
Gasoline	80	20	0	100
Diesel / #2 Oil	6	89	5	100
#6 Oil (Lube/Heavy Oil)	1	59	40	100

Note: BTEX must be included in the C6-C10 fraction when using this table.

6.5 When considering historical records for product determination, it is important to reconcile the information with laboratory results to ensure the Modified TPH criteria are applicable to the existing state of the product. In some circumstances, weathering of a petroleum product may result in the loss of the more volatile fractions, such that it more closely resembles a 'heavier' product. For example, if gasoline weathers to the extent that the C6-C10 fraction forms only 6% or less of the total TPH in the sample, the product may have similar chemical and toxicological properties as diesel. In such a situation, the Modified TPH criteria for diesel should be selected as the applicable cleanup criteria.

6.6 In certain situations, weathering of petroleum products or mixing of different product types on a site can make it difficult, if not impossible, to provide a definitive identification of a petroleum product type. When laboratory results for a given source provide resemblance comments or a carbon fraction distribution that could be indicative of more than one hydrocarbon product type, the most stringent Modified TPH criteria of the possible product types should be selected.

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7.0 REFERENCES:

1. Government of Newfoundland and Labrador, Department of Environment and Conservation, *Guidance Document for the Management of Impacted Sites*, Version 1.02, May 2006.

2. Atlantic PIRI Committee, *Atlantic RBCA (Risk-Based Corrective Action) Reference Documentation for Petroleum Impacted Sites*, Version 2.0, October 2003.

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