



REPORT

of the

EPH/LEPH/HEPH Task Force

**Submitted by the Science Advisory Board
For Contaminated Sites in British Columbia**

To

The Ministry of Water, Land and Air Protection

May 2004

1.0 INTRODUCTION

Schedule 4 of the Contaminated Sites Regulation (CSR) lists Generic Numerical Soil Standards for hydrocarbons where:

- VPHs include volatile petroleum hydrocarbons with the exception of benzene, toluene, ethyl benzene and xylene.
- LEPHs include light extractable petroleum hydrocarbons with the exception of nine specified PAHs¹.
- HEPHs include heavy extractable petroleum hydrocarbons with the exception of the nine specified PAHs (as listed for LEPHs).

Standards are legal entities and as such, the assessment and verification of remediation of petroleum hydrocarbon contaminated sites in British Columbia requires analyses of samples in accordance to the standards specified in the CSR.

Technical issues have been expressed with regard to the standards for LEPHs and HEPHs. The British Columbia Environmental Laboratory Quality Assurance Advisory Committee (BCELQAAC) has recommended to the Director that the CSR be modified to include separate standards for extractable petroleum hydrocarbons that would not require PAH analysis and would be equivalent to the current LEPH and HEPH standards at sites where PAH contamination is not a regulatory issue^{2, 3} (**Appendix 1**). The bases for the recommendation as described by the BCELQAAC include:

¹ benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene and pyrene.

² October 6 2003 letter to Eric Partridge, (Director Environmental Management Branch) from Mr. Mark Hugdahl, (Chair, Technical Subcommittee, British Columbia Environmental Laboratory Quality Assurance Advisory Committee)

³ It is noted the PAH corrections (and hence basis of the current standards for LEPH and HEPH) were originally requested by the petroleum industry to prevent “double counting” of contaminants.

- PAH concentrations in soil and groundwater from many petroleum product contaminated sites are generally far lower than extractable petroleum hydrocarbon (EPH) concentrations and their subtraction is normally of little consequence.
- PAHs must be analyzed by more sophisticated procedures relative to the analytical procedures for extractable petroleum hydrocarbons and the requirement for PAH analysis implies an increased analytical cost (approximately double) to meet the requirements of the current standard. The current standards for EPHs require PAH analyses even if historical information has negated the presence of PAHs and preliminary investigations have confirmed the absence of PAHs in excess of the CSR standards.
- PAH testing should be required based only on its own merit, e.g. at sites where PAHs are present, or are potentially present.

The Director has requested the advice of the Science Advisory Board (SAB) in responding to the letter by BCELQAAC (**Appendix 2**). The SAB then formed a Task Force to investigate the issue and to provide draft recommendations to the SAB for consideration. The members of the Task Force are listed in **Appendix 3** of this document.

This document constitutes the report of the Task Force to the Science Advisory Board.

2.0 TERMS OF REFERENCE

Based on the contents of the Director's referral and based on subsequent verbal communication with the Ministry⁴, the Task Force adopted the following terms of reference:

- Document the reasons for the PAH correction as specified in the BC CSR standard. Verify with the petroleum industry whether the issue of "double counting" is still of concern.
- Assess analytical procedures for EPH and PAHs to determine whether the PAHs can be reliably quantified by use of the same procedure used for determination of EPH. Assess whether analytical costs for LEPH and HEPH can be reduced. Document and advise the Ministry of the Task Force findings with regard to analytical procedures.
- Determine the means to provide the Ministry with a level of comfort with regard to hydrocarbon-contaminated sites if PAHs are not analyzed.
- Provide recommendations to the Ministry whether separate standards for extractable hydrocarbons (i.e., without PAH correction) should be derived.
- Assess compatibility of the BC petroleum hydrocarbon standards with federal guidelines.
- Provide an overview report to the Ministry that includes the findings of the above noted tasks.

4 Discussion with Glyn Fox, Ministry of Water, Land and Air Protection

3.0 RESULTS OF TASK FORCE REVIEW

3.1 RE: REASONS FOR PAH CORRECTION

3.1.1 Background

During the process of derivation of standards for the CSR, the petroleum industry (Canadian Petroleum Products Institute, or CPPI) expressed concern that there would be two sets of standards for PAHs - one set of standards for individual PAHs and another set of standards for extractable hydrocarbons that include PAHs. The industry considered the situation as “double counting” and the Ministry therefore adopted standards for extractable hydrocarbons that would not include individual PAHs for which there are standards.

3.1.2 Findings of Task Force

Mr. Adrian Michielsen, a member of the Task Force, undertook to contact members of the CPPI. The Task Force was informed via e-mail dated April 11 2004 that CPPI was no longer concerned about the issue of “double counting”. The e-mail indicated the CPPI members “would be pleased to see a move toward establishing EPH standards which are equivalent to the LEPH and HEPH standards”. “Unless PAHs are a significant concern at the site (which should typically be evaluated at the investigation stage) there would not be a need to analyze for them at the remediation stage.” The e-mail is attached as **Appendix 4**.

Discussions with laboratory personnel, consultants and members of the CPPI indicate that PAHs are not a frequent issue at many sites where petroleum products have been used. As a result, the need for PAH corrections to the analytical results of analysis for EPHs produces extra (and unnecessary) analytical costs and delays of remediation programs. The delays are a result of the complexity of the analytical procedure and hence the inability of field laboratories to analyze for PAHs. As well, it is noted that delays result in increased costs for remediation (due to downtime of heavy equipment) and increased concerns for site safety due to the need to maintain open excavations for longer periods.

3.2 RE: REVIEW OF ANALYTICAL PROCEDURES

3.2.1 Background

By verbal communication, the Ministry requested the Task Force to address the following questions:

- Can extractable hydrocarbons and PAHs be analyzed by means of the same procedure?
- Is there a means to reduce the cost of analyzing both extractable hydrocarbons and PAHs?

The following synopsis was prepared by Mr. Mark Hugdahl, a member of the Task Force.

3.2.2 Discussion of analytical procedures

It is true that PAH compounds form a component of the EPH parameter. This is part of the rationale for why CSR PAHs are subtracted from EPH to arrive at LEPH/HEPH. It is also true that the solvent extraction portion of the PAH and EPH methods can be combined for both soils and waters. But it is not feasible to combine the instrumental analysis portions of the PAH and EPH methods while meeting the objectives and requirements of both tests.

EPH is an aggregate parameter, which measures the combined total of extractable organics between a broad boiling point range (i.e. compounds with boiling points between the n-alkanes nC10 and nC32). EPH is analyzed by Gas Chromatography with Flame Ionization Detection (GC-FID). This is the standard international methodology for the analysis of semi-volatile hydrocarbons. Typical BC laboratory detection limits for EPH in soils are in the range of 200 mg/kg. GC-FID is used for this test because:

- FID is a low cost, universal, non-selective detector, with low sensitivity.
- The cost of a new automated GC-FID system is approximately CAD \$22,000 per detector.

- "Universal" means the FID responds to almost anything (anything that can be combusted).
- "Non-selective" means an FID cannot differentiate between different compounds which elute from a GC at the same time. For EPH, selectivity is not important, but for PAH it is critical.
- FID provides equal relative response by weight for most organic compounds, which is crucial for an aggregate test like EPH.
- GC-FID is amenable to operation in a remote or portable field laboratory setting.
- GC-FID systems have relatively low maintenance requirements, and require relatively little expertise to operate.

In contrast, the PAH components listed in the CSR are each discrete compounds. PAHs are analyzed by GC with Mass Spectrometric detection (GC-MS). The lowest CSR standards for individual PAHs are 0.1 mg/kg. Typical BC GC-MS laboratory detection limits for PAH in soils are in the range of 0.05 mg/kg, or about 4000x lower than the detection limits for EPH. GC-MS is the internationally recognized standard method for this test because:

- MS is a highly sensitive, highly selective detector, but comes at a high cost.
- The cost of a new automated GC-MS system is approximately CAD \$120,000.
- The high sensitivity of GC-MS (using SIM, or Selected Ion Monitoring mode) is necessary to meet PAH detection limit requirements.
- The high selectivity of GC-MS is necessary to prevent false positives from non-PAH organics of similar boiling points (e.g. diesel or motor oil components). MS detection is by molecular mass.
- GC-MS (in high sensitivity SIM mode) is not universal. It responds only to those compounds for which it has been programmed to respond to.
- GC-MS is not very amenable to operation in a portable or field laboratory setting.

- GC-MS systems have relatively high maintenance requirements, and are generally operated by trained, experienced chemists.

To summarize, GC-FID is used for EPH because it is the best technology for this test, and also because of its low operational and capital costs. Its portability for field usage is an added benefit. The higher capital and operational costs of GC-MS are required for PAH analysis in order to "see through" interferences in order to avoid false positives and also to meet the very low detection limit requirements for these parameters.

3.3 RE: POTENTIAL CONSEQUENCES OF STANDARDS WITHOUT PAH CORRECTIONS

3.3.1 Background

The Ministry has verbally indicated its concern that if PAH analyses are not conducted on soil or groundwater with hydrocarbon contamination, then an investigation program with only EPH analyses may "miss" soil with PAH contamination in excess of CSR standards.

3.3.2 Summary of Task Force Considerations

Discussions within the Task Force indicated the following:

- The CSR lists standards for several individual PAHs. It is common that during a Stage II PSI an investigator will verify the presence/absence of PAHs if the Stage I PSI indicates petroleum hydrocarbons may have been present at the site or if the history of a site is uncertain. If the Stage II PSI indicates PAHs are found at concentrations above CSR standards, then PAH analyses would be required during additional investigation stages, and required during remediation of the defined areas where PAHs were in excess of CSR standards.
- The Task Force notes verbal Ministry guidance that if a Stage I PSI indicates potential presence of certain chemicals or products on a site, then field studies should focus only on those chemicals or products. The above noted investigative approach used for evaluation of petroleum hydrocarbons at a site applies this

guidance and furthermore undertakes field studies to verify whether PAHs are present at concentrations in excess of the CSR standards.

- Laboratories have noted that for a large majority of hydrocarbon contaminated sites, the PAH concentrations typically constitute a very small fraction of the EPH concentrations, and the corrections to EPH to attain LEPH and HEPH are generally insignificant. The exceptions are for sites where (for example):
 - Coal tar is present;
 - Wood preservation had occurred (i.e., creosote treatment and where PCP was dissolved in a carrier oil); or
 - Petroleum production had occurred (Upstream, midstream and refinery sources).

Therefore PAH testing should be based on its own merit. Any site suspected to contain hydrocarbon residues should undergo PAH testing in the Stage II PSI. If at this stage, PAHs are not found at concentrations above CSR standards, then additional PAH testing should not be required.

- For the purpose of completing investigations or verification of remediation, the Task Force concludes that EPH is a scientifically valid tool that is equally protective as LEPH and HEPH for the assessment of petroleum hydrocarbon concentrations, providing that potential sources such as those identified above are absent. The Task Force therefore recommends early verification whether PAHs are an issue on a site, i.e., analysis for PAHs should occur during a Stage II PSI at a site where there is potential that hydrocarbon residues may be present or at a site where there is uncertainty regarding the history of a site.

3.4 RE: SHOULD SEPARATE STANDARDS FOR EPHs BE DERIVED?

3.4.1 Background

The Ministry has requested the opinion of the SAB with regard to the question of derivation of separate standards for EPH.

3.4.2 Finding and recommendation of the Task Force

Current assessments and remediation of petroleum-contaminated sites are required to be in accordance to the legal standard. It is the opinion of the Task Force that the science and economics do not justify the current versions of the LEPH and HEPH standards for many sites.

The members of the Task Force are in agreement with the conclusions and recommendations presented by the BCELQAAC- that there be separate standards for extractable hydrocarbons (i.e., standards that do not require PAH correction).

3.5 RE: WHAT SEPARATE STANDARDS SHOULD BE DERIVED?

3.5.1 Background

The Task Force emphasizes it has not reviewed the rationale for the numerical values that constitute the LEPH and HEPH standards as listed in Schedules 4 and 6. It is understood the Ministry intends to review the scientific basis for the standards in the near future, with the timing contingent on other activities such as: a scientific review of the existing groundwater contaminant transport model (as used by the Ministry to derive the existing soil standards); and, a scientific review of a vapour transport model used for derivation of the Canada Wide Standards for Petroleum Hydrocarbons (CWS-PHCs). It is also understood the Ministry intends that the petroleum hydrocarbon standards will be developed as matrix standards within Schedule 5 of the CSR. It is anticipated the scientific review and preparation of draft standards will occur within

the next two years. The process will then require public and regulatory review of draft standards, as well as the legislative process for adoption.

The Canada Wide Standards for Petroleum Hydrocarbons will obviously be considered within the Ministry program to develop Schedule 5 standards for petroleum hydrocarbons. Therefore, the Task Force has reviewed the CWS-PHCs and associated documentation to initiate consistency, where immediately possible, between the CWS-PHCs and B.C. standards.

3.5.2 Findings and recommendations of Task Force

- a. Given that the time-frame for the pending revision of petroleum hydrocarbon standards is in the order of 2 years or greater, and given the large costs encountered annually because of the necessity for PAH corrections, the Task Force recommends that there be an immediate adoption of separate standards for extractable hydrocarbons (i.e., where PAH correction is not required) and that for now, the numerical values of those standards be equivalent to the existing standards for LEPH and HEPH.
- b. There is incompatibility between the extractable petroleum hydrocarbon fractions selected by the Ministry and those of the CWS-PHC, i.e. the Ministry has standards for C10-C19 and C19-C32 fractions, while the CWS-PHC has guidelines for C10-C16 and C16-C34 fractions.

The Technical Subcommittee of the BCELQAAC⁵ and analytical laboratories individually^{6 7}, have recommended actions to initiate compatibility of the Ministry carbon fractions with the CWS-PHC. The Task Force is in agreement and recommends that the carbon fraction ranges of the BC analytical methods for Extractable Petroleum Hydrocarbons (EPH) be modified to be in harmony with the carbon ranges within the CWS for petroleum hydrocarbons.

⁵ Zhu , T. 2002. Letter to Glyn Fox, Ministry of Water, Land and Air Protection

⁶ Hugdahl, M. and T. Crowther (ALS Environmental), 2002, Letter to Advisory Panel on Contaminated Sites, July 18, 2002

⁷ Neumann, R. (Norwest Laboratories), 2002. Letter to Advisory Panel on Contaminated Sites, July 11, 2002.

In providing this recommendation, the Task Force notes that:

- o The Task Force has not reviewed the differences in analytical methodologies used by CCME and the Ministry for evaluation of extractable petroleum hydrocarbons. Therefore, the Task Force is not recommending the replacement of the BC hydrocarbon methods with the CWS methods.
- o Modifications will be required for the BC Ministry analytical procedures for “Extractable Petroleum Hydrocarbons in Solids by GC/FID” and for “Extractable Petroleum Hydrocarbons by GC/FIC”, to accommodate the recommended changes in the carbon fractions. It is understood the modifications would require only a moderate effort.
- o At this time, the hydrocarbon fractions under consideration in B.C. would be those within the range of C10 to C34. The need for consideration of other fractions such as the C34-C50 PHC fraction would be evaluated during the Ministry’s intended program of developing Schedule 5 standards for petroleum hydrocarbons.

With the adoption of the new carbon ranges, the Task Force recommends that carbon range subscripts be added to the LEPH and HEPH parameter names to reduce confusion with the historical definitions.

- c. In the case of sites where PAHs are in excess of CSR standards, it is recommended that there remains the option of PAH corrections to extractable petroleum hydrocarbons as per the current standards for LEPH and HEPH. The application of this correction is compatible with the approach noted with supporting documentation for the CWS-PHC⁸.

However, the Task Force notes that:

⁸ CCME, 2001. “Reference Method for the Canada Wide Standard for Petroleum Hydrocarbons in Soil, Tier 1 Method”, (pp 1-2) “Analyses for PAHs will be performed if there is any reasonable expectation that they may be present.” “Not all samples will be analyzed for PAHs. The subtraction of PAHs will only be done if there are sufficient PAHs present to change the result from the PHC analysis.”

- There are incompatibilities between the B.C. Ministry laboratory protocols for PAH correction⁹ for determination of LEPH and HEPH, and the PAH correction as noted in footnotes 10 and 11 in Schedule 4 of the CSR.
- Footnotes 10 and 11 of Schedule 4 are unclear, and give the impression that the same PAHs are to be subtracted from both EPH₁₀₋₁₉ and EPH₁₉₋₃₂, which would be both incorrect and inconsistent with the Ministry's approved lab protocols for the determination of LEPH and HEPH.

The Task Force therefore recommends corrections to footnotes 10 and 11 of Schedule 4. It is noted the corrections would comprise of the concentrations of PAHs for which there are CSR standards.

- d. The application of separate standards should be described in a Ministry guideline document. A draft guideline document is provided in **Appendix 5** of this document.
- e. The Task Force therefore recommends the following standards for extractable hydrocarbons for the range of C10 to C34¹⁰:

Substance	Agricultural	Urban Park	Residential	Commercial	Industrial
VPHs(1) ⁸	200	200	200	200	200
LEPHs ₁₀₋₁₆ (2) or EPHs ₁₀₋₁₆ (3)	1000	1000	1000	2000	2000
HEPHs ₁₆₋₃₄ (4) or EPHs ₁₆₋₃₄ (5)	1000	1000	1000	5000	5000

All units are mg/kg. All analytical procedures and corrections are to be in accordance to the Ministry's analytical methods.

- (1). VPHs means Volatile Petroleum Hydrocarbons (in solids) within the range of nC6-nC10 with the exception of individual volatile hydrocarbons listed in Schedules 4 and 5 of the CSR that would elute in the nC6-nC10 range. The individual volatile hydrocarbons are listed in the BCMELP procedure for calculation of VPH in Solids or Waters.
- (2). LEPHs₁₀₋₁₆ means Light Extractable Petroleum Hydrocarbons (in solids) within the range of nC10-nC16, with the exception of PAHs listed in Schedules 4 and 5 of the CSR that would elute in the nC10-nC16 range. The list of applicable PAHs is noted in the BCMELP procedure for calculation of LEPH and HEPH in solids or water.

⁹ BCMELP Procedure for Calculation of EPH in Solids or Waters (Version 2.1, July 20 1999)

¹⁰ VPH (i.e., nC6 to nC10) standards are provided for information

- (3) EPHs₁₀₋₁₆ means Extractable Petroleum Hydrocarbons (in solids) within the range of nC10-nC16 without correction for PAHs.
- (4) HEPHs means Heavy Extractable Petroleum Hydrocarbons (in solids) within the range of nC16-nC34, with the exception of PAHs listed within Schedules 4 and 5 of the CSR that would elute in the nC16-nC34 range. The list of applicable PAHs is noted in the BCMELP procedure for calculation of LEPH and HEPH in solids or water.
- (5) EPHs₁₆₋₃₄ means Extractable Petroleum Hydrocarbons (in solids) within the range of nC16-nC34 without correction for PAHs.

For water, the following standards are recommended:

Substance	Contaminated Sites Regulation Aquatic Life Protective Water Quality Standards (µg/L)	Contaminated Sites Regulation Drinking Water Protective Water Quality Standards (µg/L)
VPH _w ¹¹	1500 ¹²	NS
LEPH _{w10-16} Or EPH ₁₀₋₁₆ ¹³	500 ⁹	NS
	NAPL presence ¹⁴	NAPL presence ¹²
VH _{w6-10}	15000 ¹²	15000 ¹²
EPH _{w10-16}	5000 ¹²	5000 ¹²

. All analytical procedures and corrections are to be in accordance to the Ministry's analytical methods.

"**VPH_w**" means Volatile Petroleum Hydrocarbons (in water) within the range of nC6-nC10, with the exception of individual volatile hydrocarbons listed in Schedule 6 of the CSR that would elute in the nC6-nC10 range. See BCMELP procedure for list of individual volatile hydrocarbons and for calculation of VPH in Solids or Waters. .

"**LEPH_{w10-16}**" means Light Extractable Petroleum Hydrocarbons (in water) within the range of nC10-nC16, with the exception of PAHs listed in Schedule 6 of the CSR that would elute in the C10-C16 range. The list of applicable PAHs is noted in the BCMELP procedure for calculation of LEPH and HEPH in solids or water

"**EPH_{w10-16}**" means Extractable Petroleum Hydrocarbons (in water) within the range of nC10-nC16 without PAH correction, as defined by the Ministry's analytical method for EPH in waters.

¹¹ VPH standards are included for reference.

¹² generic standard may be modified by developing a site specific standard

¹³ Either the LEPH_{w10-16} or EPH₁₀₋₁₆ can be used

¹⁴ Concentrations of VH_{w6-10} and EPH_{w10-19} in excess of 15,000 ug/L and 5,000 ug/L, respectively is considered proof of presence of NAPL. The regulation does requires that NAPL in water not be present.

"VHw₆₋₁₀" means Volatile Petroleum Hydrocarbons (in water) within the range of nC6-nC10 without BTEX correction, as defined by the Ministry's analytical method for VH in waters.

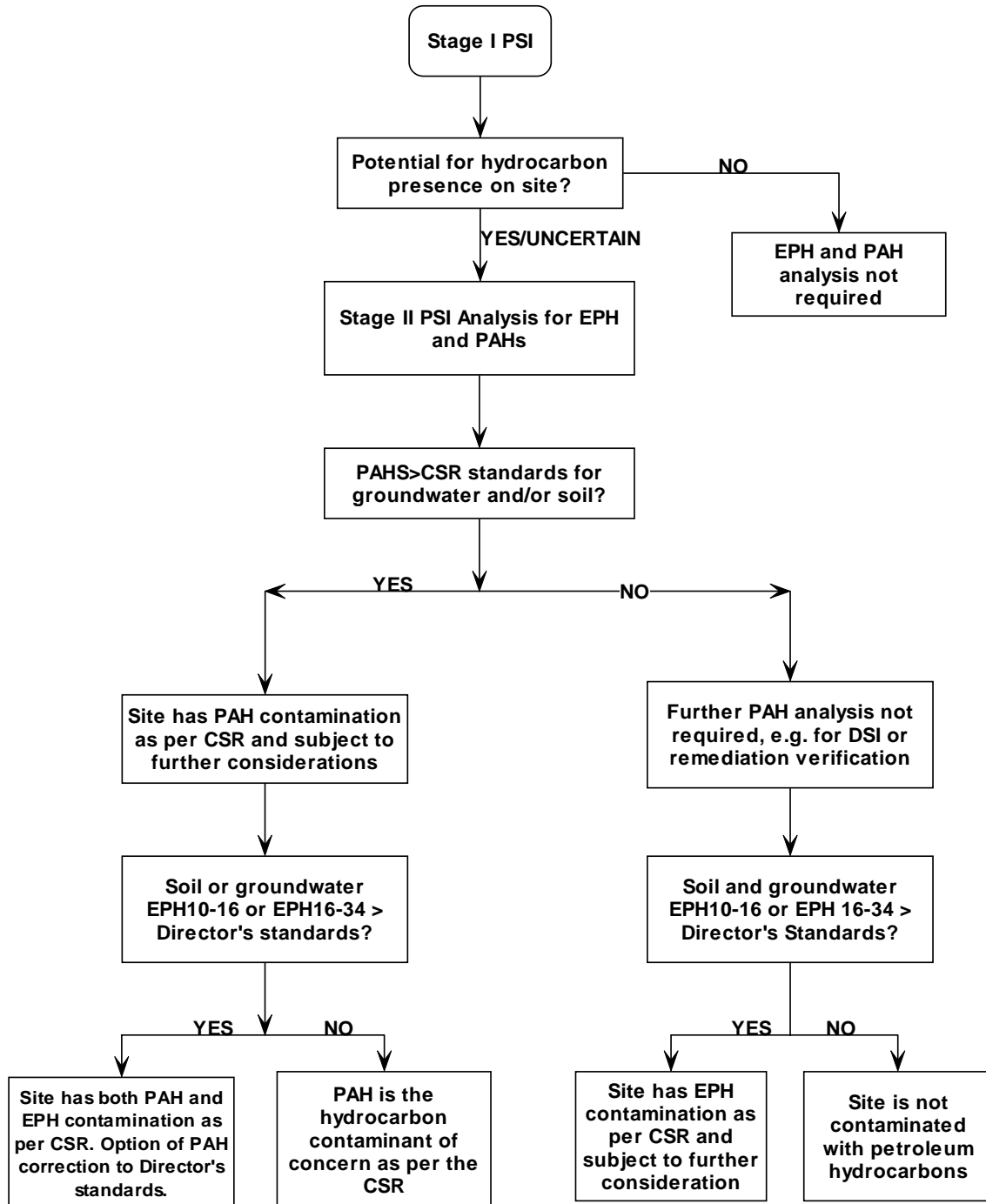
"NS" means no standard.

4.0 SUMMARY OF RECOMMENDATIONS

- a. The Task Force accepts the conclusions and recommendations as presented by BCELQAAC- that there be separate standards for extractable hydrocarbons in addition to the existing standards for LEPH and HEPH (i.e. standards that do not require PAH corrections).
- b. There should be separate standards for extractable hydrocarbons in both soil and groundwater.
- c. The separate standards at this time should be numerically equivalent to the existing standards for LEPH and HEPH.
- d. The petroleum hydrocarbon fractions for the proposed separate standards and the existing standards for LEPH and HEPH should be the same as those listed within the Canada Wide Standards for Petroleum Hydrocarbons, i.e., nC10-nC16 and nC16-nC34 versus the current nC10-nC19 and nC19-nC34 fractions.
- e. The PAH corrections for the new proposed LEPH₁₀₋₁₆ and HEPH₁₆₋₃₄ standards should be described and defined in a revised LEPH/HEPH calculation protocol that reflects the new carbon ranges. The PAHs to be subtracted are those listed in the applicable BC CSR schedules for PAHs in soils or waters, and which are included in the new EPH₁₀₋₁₆ or EPH₁₆₋₃₄ parameters. This protocol will be similar to the PAH correction option within the Canada Wide Standards for Petroleum Hydrocarbons.
- f. The Task Force recommends the immediate approval of the standards as recommended in this document, with an "effective date" following completion of the necessary modifications to the Ministry laboratory analytical methods.

- g. A guidance document should be developed for application of the new separate standards and the existing LEPH and HEPH standards. A draft guidance document has been prepared by the Task Force (**Appendix 5**).
- h. Where historical information indicates the potential presence of hydrocarbon residues (or where there is a lack of satisfactory information negating the presence of hydrocarbons), there should be initial studies where analysis of soil and groundwater would verify the absence or presence of PAHs in excess of the CSR standards. The subsequent procedure for use of the proposed standards is shown in **Figure 1**.

Figure 1: Recommended process for use of revised standards for petroleum hydrocarbons



Appendix 1: Copy of letter from BCELQAAC to Eric Partridge

Appendix 2:

Copy of letter from Eric Partridge to BCELQAAC

Appendix 3: List of members of Task Force

Mark Hugdahl, B.Sc.
Technical Manager
ALS Canada Ltd.
Vancouver, B.C.
(Also, Chair, Technical Subcommittee, British Columbia Environmental Laboratory Quality Assurance Advisory Committee)

Dennis Konasewich, Ph.D. , P.Eng. (Chairman)
Vice President, Technical Services
Hemmera Envirochem Inc.
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Jim Malick, Ph.D., R.P. Bio., P.Ag.
Executive Vice President, Technical Services
Seacor Environmental Inc.
Vancouver, B.C.

Adrian Michielsen, P.Eng.
Team Leader, B.C.- Site Remediation
Engineering, Maintenance and Repair
Imperial Oil, Products and Chemicals Division
Burnaby, B.C.

Appendix 4: Copy of e-mail from Adrian Michielsen re conference call with CPPI members

-----Original Message-----

From: adrian.p.michielsen@esso.ca [<mailto:adrian.p.michielsen@esso.ca>]
Sent: Sunday, April 11, 2004 12:29 PM
To: Dennis Konasewich
Cc: Glyn.Fox@gems3.gov.bc.ca; jmalick@seacorcanada.com;
mark.hugdahl@alsenviro.com
Subject: Re: FW: Task Force meeting re: EPH/LEPH/HEPH

I checked with the CPPI members on Thurs to see if there was any concern regarding the previously expressed concern of "double counting" of contaminants. All members in the conference call (Shell, Petro-Can, Husky, Chevron and IOL) indicated that they did not have any concerns with the proposed approach due to the reasons discussed at the SAB EPH/LEPH/HEPH task force meeting. Thus they would be pleased to see a move toward establishing EPH standards which are equivalent to the LEPH and HEPH standards. Thus unless PAHs are a significant concern at a site (which should typically be evaluated at the investigative stage) there would not be a need to analyze for them at the remediation stage.

Regards,

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Appendix 5: Draft guideline document for application of separate EPH standards