Summary of Public Comments received on site-restricted Petroleum and Refinery Gases Draft Screening Assessment Report for the Petroleum Sector Stream Approach Stream 1

Comments on the draft screening assessment of Petroleum Sector Stream Approach (PSSA) site-restricted Petroleum and Refinery Gases (PRGs) to be addressed as part of the Chemicals Management Plan were provided by Keepers of the Athabasca, International Institute of Concern for Public Health (IICPH), and Canadian Petroleum Products Institute (CPPI).

A summary of comments and responses is included below, organized by topic:

- Physical-chemical properties
- Sources
- Releases
- Toxicity
- Exposure
- Data gaps and deficiencies
- Risk assessment conclusion
- Risk Management Scope

TOPIC	COMMENT	RESPONSE
Physical-chemical properties	No data are provided on the composition of these site-restricted petroleum and refinery gases (PRGs), specifically the range in percent composition of 1,3-butadiene and benzene.	Quantitative data on the composition of all PRG CAS RNs were not available. The available compositional data for 1,3-butadiene in 15 of the 40 PRG CAS RNs were included. These site-restricted PRGs substances are classified as substances of unknown, variable composition or biological origin (UVCBs) which vary in composition depending on the source of crude oil, bitumen, or natural gas, as well as the process operating conditions and processing units involved. Therefore, it cannot be definitively stated where each CAS RN would fall within the reported concentration distribution at a given time.

		Compositions of the Stream 1 PRG CAS RNs[1] in the assessment were inferred from boiling point ranges and carbon number ranges from industrial information. Given that these substances are gases of low molecular weight predominantly 1 to 5 hydrocarbons ($C_1 – C_5$), the percentage of benzene (C_6) is expected to be minor.
	No data are provided on the composition of these gases for upgraders and natural gas facilities.	Compositional data similar to that obtained for refineries were not available for upgraders and natural gas facilities.
	The assumption of a fixed ratio of benzene to 1,3-butadiene is not supported to estimate fugitive emissions and the dataset for the releases of 1,3-butadiene is too small to be used to estimate emission potential. In addition, the unknown amount of benzene in these substances raises questions about the validity of the ratios used for fugitive emissions of 1,3-butadiene.	No measured, and limited estimated quantitative data on emissions of 1,3-butadiene from Canadian petroleum facilities were identified. Emissions rates for 1,3-butadiene were derived by calculating ratios of facility wide benzene to 1,3-butadiene emissions, and applying those ratios to the measured emissions rate of benzene from a Canadian refinery. Benzene emissions were taken to be a measure of substance throughput in refinery facilities. Two ratios of benzene to 1,3-butadiene were derived from established emissions inventories, specifically the Canadian National Pollutant Release Inventory (NPRI) and the US EPA's Toxics Release Inventory (TRI) which were submitted to authorities by industry. The TRI database contains data from 65 US refineries and was used to expand the dataset and increase confidence in the numbers presented. As such, a range of derived emissions rates was presented using all available data and associated variations to reflect

[1] The Chemical Abstracts Service Registry Number (CAS RN) is the property of the American Chemical Society and any use or redistribution, except as required in supporting regulatory requirements and/or for reports to the government when the information and the reports are required by law or administrative policy, is not permitted without the prior written permission of the American Chemical Society.

		conservative estimates of the potential for fugitive emissions.
Sources	1,3-butadiene is not present in all 40 PRGs and these CAS RNs are not common to all refiners. Broad risk management is not supported. In addition, the values used to model benzene and 1,3-butadiene emissions are questioned.	All available data were used to evaluate the site-restricted PRGs. The site-restricted PRG substances are UVCBs which vary in composition depending on the source of crude oil, bitumen, or natural gas, as well as the process operating conditions and processing units involved. It cannot be definitively stated where each CAS RN would fall within the reported concentration distribution at a given time. In the site-restricted PRGs screening assessment, exposure of the general population focuses on a facility-wide production scenario. The median value for releases was used when representing emission potential, eliminating bias to various methods and process areas.
	No information was provided to indicate the proportion of substances that leave the site under different CAS RNs.	Once substances that are identified by specific CAS RNs are blended together, they form a new substance associated with a distinct CAS RN. The Stream 1 site-restricted screening assessments do not extend to the blend leaving the facility. Many of the substances that are reported to leave the facility and are listed under separate CAS RNs are being assessed under other Streams of the PSSA.
Releases	Does a “closed system” guarantee that there will be no releases to the environment?	The potential for fugitive releases of VOCs from these “closed systems” in petroleum facilities exists. Potential fugitive releases have been characterized in the assessment report.
	Amounts of PRGs released through venting, and the composition of flare gases is not included in the screening assessment. The statement that exposure of the general public or the environment from controlled releases is expected to be minimal is not well supported.	Information on quantities, composition or situations under which significant quantities of PRGs would be sent to flare at petroleum facilities was not identified. All available information was used to evaluate the potential for exposure of the general population and the environment to

		PRGs.
	Controlled releases cannot be ignored and must be taken into account as an exposure source for consideration in the site-restricted PRGs screening assessment.	Controlled releases typically occur under gas capture conditions and releases are generally low. However, the assessment considers potential contributions to releases from controlled sources. Release information submitted by industry to the NPRI and TRI was used together with measured data to determine a total release.
Toxicity	There is no evidence that forms a basis for aquatic and terrestrial ecotoxicity conclusions.	The ecotoxicity of the components of these CAS RNs have been characterized in the assessment: (i) potential for exposure of aquatic organisms is low since all releases of these gases are expected to be released to the atmosphere; (ii) based on the calculated exposure to 1,3-butadiene, terrestrial mammals are exposed to concentrations in air that are well below reported effect levels, (iii) the potentially harmful effects of ethene in air on vegetation are being comprehensively addressed in a separate assessment.
	Ethene toxicity should be included in the PRGs assessment report.	Ethene is being assessed in a separate report in order to comprehensively consider releases from multiple sources, including the petroleum industry. Should risk management be required to control ethene emissions, measures may be applied to petroleum as well as other relevant industrial facilities.
	Components of PRGs may be harmful or hazardous to aquatic or terrestrial organisms and ecological effects should be comprehensively assessed for all end-points. Chronic toxicity to aquatic and terrestrial organisms should be discussed.	Releases to the aquatic environment are not expected with these substances, and therefore this pathway was not considered within the assessment. Concentrations of components of petroleum and refinery gases in air surrounding petroleum facilities are not expected to be at levels that could result in harm to non-human organisms.

		Information on the chronic effects of a high hazard component of these CAS RNs (1,3-butadiene) has been added to the eco-toxicity section of the assessment.
	The ecological conclusions respecting PRGs appear to lack the support of release data, environmental monitoring and levels.	Information on the manufacture, import, and use of the site-restricted PRGs, as well as the number and location of facilities producing these substances, were collected through voluntary industry submissions, in-depth literature review, searching of Material Safety Data Sheets (MSDS), as well as a mandatory survey under section 71 of CEPA 1999. All available information, including confidential business information submitted through the section 71 survey, were used to inform the screening assessment of site-restricted PRGs. Confidential business information was appropriately masked within the assessment, consistent with statutory obligations in dealing with such information.
	More detail is required on the acute and chronic toxicity of representative structures.	The hazard characteristics (including consideration of potential for chronic toxicity) of the components of PRGs have been updated in the assessment report.
Exposure	The current ambient air monitoring data for 1,3-butadiene are limited and where available do not suggest the presence of 1,3-butadiene at appreciable levels. The screening assessment requires additional consideration to determine relevance of conclusions.	Monitoring data were summarized and used to provide context to ambient 1,3-butadiene levels in Canada. Due to a lack of measured 1,3-butadiene levels in the vicinity of petroleum facilities, dispersion models were used in conjunction with an emissions rate determined from the ratio of benzene to 1,3-butadiene at facilities based upon industry generated data submitted to the NPRI and TRI.
	Releases of, and monitoring for, these site-restricted PRGs as a whole are not provided in the screening assessment report.	Monitoring a complex combination of petroleum hydrocarbons, as defined by a PRG CAS RN as a whole is technically challenging given the CAS RN description which usually includes the process equipment involved and the

		location; typically only the individual constituents of concern can be monitored using standard techniques. Additionally, these monitoring results cannot be unambiguously attributed to release of any specific CAS RN from a facility. The limited availability of data is acknowledged in the uncertainties section.
	Other sources of information using Differential Absorption Light Detection and Ranging (DIAL) technology in Canada should be presented. Data using other methods available should also be presented.	The Chambers et al. (2008) study presenting DIAL measurements cited in the SAR was the only study identified for Canadian facilities. No information was obtained characterizing quantitative results using any other method of leak detection.
	The dispersion modeling adjustment factors used in the assessment appear unreasonably high. In addition, deletion of the paragraph on page 15 of the site-restricted PRGs screening assessment discussing the study by Chambers et al. (2008) is requested.	Exposures were modelled under typical conditions. The annual adjustment factor of 0.2 was selected based on recommendations in the manual of the SCREEN3 dispersion model for estimating concentrations from area sources in conjunction with consideration of the uncertainty in the data for the PRGs. Specifically, it is stated that concentrations close to an area source will not vary as much as those for point sources in response to varying wind directions and meteorological conditions and that the maximum 1-hr concentration be conservatively assumed to apply for averaging periods out to 24 hrs. The recommended point source adjustment factor for averaging periods out to annual was appropriately increased to derive a reasonable, conservative estimate for the area source estimated concentrations of PRGs. The study by Chambers et al. (2008) was the only source of measured data for a Canadian refining facility and is directly applicable to the assessment in the absence of other detailed monitoring data at Canadian refinery sites.

	Air dispersion model uses incomplete and unmeasured parameters.	The dispersion model used in the assessment is a screening model and is not intended to incorporate detailed chemical information or information about specific sites.
	Releases, such as the concentrations of 1,3-butadiene in ambient air, are uncertain and do not take into account production levels and facility type. In addition, some releases from facilities may be excessive, such as during accidents, which are not taken into account in the report.	Uncertainties with respect to the exposure database were acknowledged in the assessment and a model sensitivity analysis was included. In the absence of information about the nature of the releases, uniform release has been assumed.
	Emissions of other hazardous components of site-restricted PRGs should be considered, beyond 1,3-butadiene.	1,3-Butadiene was selected as a high hazard component. Health effects of other components are summarized in Appendix 4.
	Benzene has not been given adequate attention in the screening assessment of site-restricted PRGs.	Benzene is not expected to comprise a significant portion of the CAS RNs in the assessment on the basis of their physical chemical properties (high vapour pressures) and based on the carbon ranges reported in the CAS RN descriptions for the site-restricted PRGs.
Data Gaps and Deficiencies	Uncertainties cited in the assessment point to serious deficiencies (i.e., lack of critical data and reliance upon a single component to derive health effects in the site-restricted PRGs screening assessment.)	The data available for characterization of risk in the assessment of site-restricted PRGs were sufficient to derive a conclusion under section 64 of CEPA 1999. As PRGs are UVCBs, they can vary significantly in the number, identity and proportion of components, depending on operating conditions, feedstocks and processing units. Various information sources including process flow diagrams, information obtained through mandatory section 71 surveys, MSDS sheets and physical-chemical properties were used to inform the assessment of these site-restricted substances. Data on human health effects of the 40 PRG CAS RNs were

		limited, therefore, substances similar to PRGs and their components were considered.
	Cumulative effects from acute and chronic exposures when more than one facility is located in the same area have not been taken into account.	The use of conservative emission rates and adjustment factors in the dispersion modelling accounts for uncertainties in the exposure database (e.g., possibility of more than one facility located in the same area).
Risk Assessment Conclusion	The site-restricted PRGs should be designated as toxic and added to Schedule 1 of CEPA 1999.	The site-restricted PRGs are concluded to meet one or more of the criteria set out under section 64 of CEPA 1999. The Government will propose to add these substances to Schedule 1 of the Act.
	The margin of exposure is believed to be very conservative and not supported by studies in occupational epidemiology and community health. It is recommended that the high end bound estimate of exposure be reduced, increasing the margin of exposure.	All available information is evaluated and considered during screening assessments and forms the basis of decisions. Government evaluators examine lines of evidence and seek additional scientific advice and review from experts when proposing conclusions. The final screening assessment recognizes that there is uncertainty regarding the margin of exposure. However, given the existing understanding regarding the 40 PRG substances' hazard and exposure levels, the Government has determined that it is appropriate to be conservative to protect the health of Canadians. Uncertainties in the exposure characterization are acknowledged in the screening assessment.
Risk Management Scope	Current measures are not effective in dealing with PRGs. SNAc provisions are not an acceptable risk management tool for the site-restricted PRGs.	After considering comments received on the draft screening assessment and risk management scope, the current proposal for RM for these substances is to focus on additional practices and technologies, or the improved implementation of existing requirements, to reduce fugitive emissions from the petroleum facilities where these substances may be released. It has been determined that application of the SNAc provisions to these substances will not be pursued at this time.

	Limitations of the screening assessment and ways to address the uncertainties and data-gaps on site-restricted PRGs should be addressed in the risk management.	While uncertainties are acknowledged in the screening assessment, all available data on site-restricted PRGs were considered. During development of the risk management measures, the Government of Canada will consult with interested parties.
	Controlled and unintentional releases need to be monitored and measured. The risk management scope should include mandatory monitoring and reporting of all emissions, and should not be limited to fugitive emissions.	Monitoring a complex combination of petroleum hydrocarbons regardless of release type, as defined by a PRG CAS RN as a whole is technically challenging given the CAS RN description which typically includes the process equipment involved and the location; only the individual constituents of concern can be monitored using standard techniques. Additionally, these monitoring results cannot be unambiguously attributed to release of any specific CAS RN from a facility. Both controlled and unintentional releases were considered in the screening assessment report for site-restricted PRGs. Controlled releases are normally collected into a closed system, according to defined procedures, and usually go to a flare system for combustion. The screening assessment report concluded that exposure of the general population or the environment to controlled releases is expected to be minimal.
	It is more relevant to consider dispersion modelling results for a specific facility to determine the required approaches to manage human health exposures.	The development of risk management measures will be conducted using information contained in the final screening assessment report as well any additional pertinent information available. It would not be appropriate or relevant to develop risk management measures based on the specific operations of

		a single facility.