

Priority 1: The following bullets summarize the recommendations following a review of the data from the perspective of performance of the network to detect changes in air quality after the implementation of Directive 84

- Remove stations? No
- Reduce parameters?
 - Can VOC/NMHC be eliminated given D84? No
 - Can SO₂ or TRS be eliminated? No, because SO₂ is relevant and TRS still shows exceedances at two stations.
 - Can meteorology be eliminated? No, given differences in wind roses at sites.
 - Eliminate either THC or CH₄ from reports? It is possible to report only one or the other, but not to remove the M/NMHC monitor itself.
- Move stations?
 - No, unless PRAMP desires to move a station into more dense emission areas as reflected in well density
- Change technology?
 - Passive or low-cost SO₂? Possible
 - Passive or gas-sensitive semiconductor technology VOC? Possible

Notes

- **Directive 84 excerpt:**

8 Ambient Air Monitoring

8.1 Objective

Monitor air quality to generate accurate, timely, and transparent information about odours and emissions from heavy oil and bitumen operations.

8.2 Requirement

41) Unless otherwise directed by the AER, licensees must participate in a regional ambient air monitoring program operating in the Peace River area, such as the Peace River Area Monitoring Program or other successor program.

TPM Perspective:

- **The long-term monitoring record in the PRAMP area suggests SO₂ isn't an air quality issue.**
- **Data review for TRS shows strong seasonal patterns suggesting natural rather than anthropogenic drivers.**

Priority 2: The following summarize the recommendations following on the review of the implications of adding PRC and Mercer stations to the network:

- Remove any of the new stations? No
- Reduce parameters?
 - Can SO₂ be eliminated given low values? Possibly, or investigate technology changes
 - TRS eliminated? No, TRS shows 1-h exceedances and odour potential
 - What about meteorology? No, given differences in wind roses at sites.
 - Eliminate either THC or CH₄ from PRC reports? It is possible to report only one or the other, but not to remove the M/NMHC monitor itself.
 - Eliminate PM monitoring at Mercer Town? No, given concentration spikes in spring and summer.
- Move stations?
 - No, as all are related to effects of specific plant sources
- PRC passive network changes?
 - Eliminate

Notes

- **Except for the passive monitoring program, there is likely limited flexibility on both the location and suite of parameters for both the PRC and Mercer regulatory monitoring programs.**

TPM Perspective

- **Are there opportunities to add value to these sites from a regional monitoring perspective? AQHI enhancement in Peace River is the low-hanging fruit.**

Priority 3: The following summarize the recommendations from consideration of spatial gaps in monitoring and the potential for emerging technology.

- Any monitoring-deficient areas? Yes, but are they not important enough to warrant monitoring? No
- Transboundary pollution? There is a potential for transboundary movement, based on pockets of higher-density wells but reported emissions are not large and there are few nearby residents. No
- Monitoring gaps?
 - Mercer PRPD: SO₂, THC, NMHC, CH₄, PM_{2.5}, CO, NO_x are not monitored, but the plant is a high emission source for these pollutants. Other considerations: additional monitoring is not an approval requirement; emissions and their effects are likely to be sufficiently covered by annual emission estimation and stack sampling, and periodic dispersion modelling; there are few residents nearby. No
 - Smaller communities? Maybe but this would be a local initiative given that AEP guidance indicates communities are too small to require it.
- New technologies?
 - PM_{2.5}: Yes, for forest fire monitoring
 - SO₂ or VOCs: Maybe, as a replacement for current instruments but need to investigate and then test the right replacements.

Notes

- **The largest point and area sources in the PRAMP area are within the current airshed boundaries (PRAMP and PAZA); no significant sources on the periphery.**

TPM Perspective

- **Monitoring in gap areas is likely only justifiable through the use of low-cost, small-sensor technologies and with existing monitoring assets (portable station)**

Overall Recommendations: Combining individual sets of recommendations by identifying commonalities and by considering the monitoring more holistically, AECOM made the following overall recommendations:

- Remove stations? **No**
- New stations in monitoring-deficient areas?
 - Are these areas important enough to warrant monitoring? **Not with current technology but possibly with low-cost sensors.**
 - **Instead, could redeploy PRC passives although it is not expected that SO₂ and H₂S are issues in locations currently not monitored.**
- Move stations?
 - No, unless PRAMP wishes to monitor in Walrus and nearby secondary emission areas.
- Reduce parameters?
 - Can VOC/NMHC be eliminated? **No**
 - Can SO₂ or TRS be eliminated? **No**, because SO₂ is relevant and TRS concentrations exceed thresholds at two stations.
 - What about meteorology? **No**, given differences in wind roses at sites.
 - Eliminate either THC or CH₄ from PRC reports? **It is possible to report only one or the other, but not to remove the M/NMHC monitor itself.**
- Change technology?
 - Passive or low-cost SO₂ in place of current continuous monitors? **Possible**
 - Passive or gas-sensitive semiconductor technology VOC? **Possible**
 - PM_{2.5}: **Possible**
 - Replace threshold-activated canister sampling with continuous low-cost sensors for specific VOCs? **Possible, provided the data quality of the low-cost sensors is adequate.**
 - To support AQHI in communities? **Possible.** Consider the addition of sufficient monitoring capacity to calculate the AQHI in Peace River, through additional sensors at Mercer Town or using low-cost technology at a new station in the heart of the community.
- PRC Passive network changes? **Eliminate.**

Implementation Priorities

- Initiate elimination of the PRC Passive Network, with the following actions.
 - Discuss with the AER what information is needed to remove the requirement from the EPEA approval. A more thorough evaluation of the data collected to date, to document performance, should be completed.
 - Investigate whether the passives could be used elsewhere to advantage. One example would be additional sampling in the Walrus and nearby areas of higher reported emissions, although as noted earlier, measuring H₂S and SO₂ may not be recommended in those areas.
- Establish a plan to “calibrate” the Purple Air sensors currently deployed in the network, using as a guide the information in Section 3.
- Investigate low-cost sensor packages that can be programmed to calculate the AQHI used in Alberta and that provide acceptable data quality, including sufficiently low detection limits.
- ~~• Investigate the elimination of THC reporting from stations, as THC is a calculated parameter with trends and concentrations very similar to methane. Retain methane / non-methane monitoring and reporting capability.~~
- Review the potential to eliminate the threshold-triggered VOC canister sampling from network operations
 - Perform a thorough review of the data to determine when health-based thresholds were and are exceeded (regulatory thresholds are occasionally exceeded). Given the occasional exceedances, further monitoring warranted.
 - Review low-cost sensors for the pollutants ECCC deems of interest – acrolein, benzene, chloroform, BTEX – should the need for ongoing monitoring be required. Determine whether low-cost sensors meet data quality requirements.
- Review the availability of low-cost sensors

Priority: PRC Passives

Item	Next Steps	Implementation Considerations
Initiate elimination of the PRC Passive Network.	<ul style="list-style-type: none">• Discuss with the AER what information is needed to remove the requirement from the EPEA approval. A more thorough evaluation of the data collected to date, to document performance, should be completed.• Investigate whether the passives could be used elsewhere to advantage. One example would be additional sampling in the Walrus and nearby areas of higher reported emissions, although as noted earlier, measuring H2S and SO2 may not be recommended in those areas.	<ul style="list-style-type: none">• Optimized (<i>read: increased spacing, lower density</i>) vs. elimination• Optimized re-deployment would likely have an increased operating cost associated with it.• Optimized re-deployment may increase the value of the data collected.

Priority: Purple Air Calibration

Item	Next Steps	Implementation Considerations
<p>Establish a plan to “calibrate” the Purple Air sensors currently deployed in the network.</p>	<ul style="list-style-type: none">• No action recommended at this time.	<ul style="list-style-type: none">• Others (EPA, UNBC) have conducted extensive work on operating and validating Purple Air sensors in the Canadian climate.• PRAMP to remain engaged in ongoing small sensor discussions with different forums including EPA, the Alberta Airsheds Council Technical Committee, and others.

Priority: Low-Cost Sensors and AQHI

Item	Next Steps	Implementation Considerations
<p>Investigate low-cost sensor packages that can be programmed to calculate the AQHI used in Alberta and that provide acceptable data quality, including sufficiently low detection limits.</p> <p>Review the availability of low-cost sensors</p>	<ul style="list-style-type: none">No action recommended at this time.	<ul style="list-style-type: none">PRAMP to remain engaged in ongoing small sensor discussions with different forums including EPA, the Alberta Airsheds Council Technical Committee, and others.Low-cost sensors and alternatives to traditional air quality monitoring systems are evolving quickly and uptake is increasing in several jurisdictions and groups involved in citizen science.

Priority: Canister System Alternative

Item	Next Steps	Implementation Considerations
<p>Review the potential to eliminate the threshold-triggered VOC canister sampling from network operations</p>	<ul style="list-style-type: none">• Perform a thorough review of the data to determine when health-based thresholds were and are exceeded (regulatory thresholds are occasionally exceeded). Given the occasional exceedances, further monitoring warranted.• Review low-cost sensors for the pollutants ECCC deems of interest – acrolein, benzene, chloroform, BTEX – should the need for ongoing monitoring be required. Determine whether low-cost sensors meet data quality requirements.	<ul style="list-style-type: none">• Triggered canister system provides discrete samples at limited locations during periods of elevated concentrations.• Low-cost sensors may provide continuous or semi-continuous measurements of target species at more locations, increasing both temporal and spatial coverage.• Phased-in transition; consider an attrition approach. Do not replace redundant, more expensive low-priority continuous analyzers at the end of their operating life; transition to low-cost sensors deployed in a dispersed array of monitoring locations.• Strong value-add contender.