



CSAP

Contaminated Sites Approved Professionals of British Columbia

CSAP Technical PD Workshop Oct 15, 2009

Lessons Learned Session



Welcome to the Lessons Learned Session

PD Committee Moderator - Michael Geraghty

Representing MOE – Peggy Evans and Vince Hanemayer

Representing CSAP – The PA Committee

Bob Symington, PAC Chair, Panel Member

Reidar Zapf-Gilje, Delegated Member

Dave Newton, Delegated Member

Cindy Ott, Delegated Member

Alex Bath, Panel Member

Kristi Thornhill

Performance Assessment (PA) Process

The key players in a performance assessment along with their acronyms are;

- **PA Coordinator** is Catherine Schachtel who is our Executive Direction.
- The **delegated member** of the Performance Assessment Committee or **DM** of the PAC (Current DM's are Reidar Zapf-Gilje, Dave Newton and Cindy Ott).
- **The Performance Assessment Panel (PAP) members** who are APs selected on a rotating basis to undertake the PA's (there are currently approximately 20 on the list).
- The **PA Panel** consists of the PA Coordinator, DM and 2 to 4 PAP members.

PA Process

When a Submission has been selected for a PA you will receive an email notification from the PA Coordinator and you will be provided with;

- Timeframe for the review,
- A request for two additional copies of the complete Submission

(Additional time and costs will be incurred in defence of your submission)

PA Process

Roles of the participants in the PA

- The **PA coordinator** is the key contact for the **AP** and is responsible for appointing the **DM** and the **PAP members** (who are selected on a rotating basis). All correspondence should be directed to the **PA Coordinator** for distribution.
- The **DM** is the direct contact for the **AP(s)** with respect to technical questions. The **DM** chairs the PA and provides guidance to the **PAP members** with respect to regulatory and technical questions and may contact **MOE** the **PAC** or other qualified professionals for clarifications.
- The PAP members conduct the review of the reports. The primary guidance to the PAP members is to **“identify any deficiencies that would have an effect on the final conclusions”**

PA Process

The Stages of the review are the **Stage I Report** and **Final Findings Report (or Stage 2 Report)** prepared by the **PAP members** and the and **Final Consultation** on the PA prepared by the DM.

- The **Stage I Report**, finds the report to be **Sufficient** or requests that **Additional Information** is required.
- The **PAP members** share their reports and you will find in general that many of the points identified by the members will be the same.
- The **Stage I Report(s)** should supply you with enough information to allow you to understand the question.
- Should your submission found to require **Additional Information** you may schedule a meeting address these issues with a written submission provided to **PA Coordinator** in advance of the optional meeting with the **Panel**.

PA Process

Final Findings Report and Final Consultation.

- Following receipt of the APs written comments and the optional meeting the PAP members will finalize their reports as a **Final Findings PA Report**.
- The conclusions of the **Final Findings PA Report** are either **Sufficient** or **Deficient**
- The **Final Findings PA Reports** are provided to the **DM** by the **PAP members** for review and discussion among the **Panel**.
- The **DM** then prepares a covering letter outlining the conclusions of the Panel and whether the submission is **Sufficient** or **Deficient**

PA Process

PA Templates

In order to maintain continuity to the review process and to provide basic tools for the Panel a series of templates have been created.

Submitting APs should consider reviewing these tools to understand the methodology applied by the Panel in the review process. These tools include;

- Stage 1 PA Review Template
- Final Findings PA Review Template
- Appendices A-C which will replace the PSI and DSI Checklist.

PA Lessons Learned!

Common Roster Submission Deficiencies
encountered in Performance Assessments



Review Findings Report by AP

- Some APs prepare a findings report, which include additional assessments or interpretations that the AP considers necessary to make the submissions satisfactory for a submission under the Protocol 6 submission process.



Lack of Scope, Clarity and Quality of Reports

- The initial PSI, DSI and Remediation work performed by Consultant did not meet the CSR requirements. Only through substantial additional work requested by AP, could AP make a recommendation for a COC.
- AP was diligent in his review and in preparing recommendations to resolve issues. Where professional opinion was involved, AP provided carefully prepared and well founded rationale, including hand drawn cross-sections and marked up figures, tables and text.
- Alternatively APs to request a re-submission with complete and updated information, for submissions that are inadequate.



General

- single land uses - only the predominant land use should apply. Exceptions would include urban park standards along riparian zones or areas covered by roadways, in which case a metes and bounds description must be provided.
- sediments are not always investigated when site is adjacent to a water course.
- not all APECs (especially offsite) are thoroughly investigated or explained.
- inadequate investigation of fill material
- inadequate explanation of monitoring well construction or placement.
- metes and bounds descriptions must state who provided the description including name of surveyor or engineering firm and date of drawing.
- AP commonly fails to track the 30 day to 60 day time requirement between preliminary and final determinations.

General

- An oil company who caused contamination on the adjacent property, signed the off-site SoSC. Either the land owner must sign the SoSC, or they must provide a letter authorizing an agent to do so.
- The stage 1 PSI site visit was completed during August 2005. The report was dated August 2008. The recommending CSAPs must confirm that current conditions near the site have not changed materially from those identified in the 2005 report.
- The former and current ownership, site activities and legal descriptions of the site make the Stage I PSI difficult to follow. More effort is required to describe this and to provide better rationale for the selection of APECs and PCOCs.
- All findings (previous data, significance of stratigraphy, well screen lengths and location, seasonal groundwater, fate and transport including indicators of biodegradation , etc.) must be included in interpretation to build “weight-of-evidence” arguments to support the conclusion. The fact that the samples met the standards was in this case not sufficient to conclude the site was not contaminated (submission for Determination).

New Standards and Lab Methods

- Sodium concentrations determined using standard metal analysis were above the new CSR CL standard which are based on saturated paste method. The AP did not specify whether sodium was a PCOC, or include sodium in the HHRA and ERA.

Conclusion: If AP can show that salt was not a PCOC then the previous result is not directly comparable to the new standard, and no testing by new method is required. Alternatively, the AP could include sodium in the risk assessment.



Soil Vapour

- Only one of the probes was located within the estimated contaminated zone. The probe was shallow at about 1.5 m depth, and located above a 3 to 5 m thick silt layers. The contamination was located at about 12 m depth at the water table. Headspace analyses on soil samples at this depth had 100%LEL concentrations.

Conclusion: Soil vapour delineation is typically required. Provide a rationale for the sampling conducted, or suggestions for how delineation can be achieved. Of particular importance is the potential migration onto adjacent sites, including the former service station where the silt layer is presumably absent.

Soil Vapour

- The attenuation factor used was not appropriate for probes with the top of screen located less than 1 m below ground. Since the remediation took place after February 2008, the grandfathering exemption did not apply. However, this was inconsequential as the unattenuated soil vapour concentrations measured were all below the Sched. 11 standards for industrial use (roadways and highways), and only slightly above the standard for commercial use (adjacent sites).
- Only one sampling event was undertaken. The measured concentrations were near or somewhat above the standards. However, as the attenuated concentrations, even with a default attenuation of 0.02 are much lower than the standards (by a factor of at least 1/10), it seems reasonable to conclude that the soil vapour testing was sufficient.

Water Use Standards

- AW standards: AP concluded that AW standards did not apply based on distance to nearest creek and estimated flow time. However:
 - Inspection of map indicated that the shortest distance to creek was very close to 1 km.
 - Previous investigation concluded that AW standard applied because surface water drainage ditches existed closer than 1 km, and these ditches discharged to the adjacent creek.
 - Groundwater flow estimate needed further explanation:
 - No field measurements of K
 - Stratigraphy sand deposits with silt, fine sand and gravel lenses was not considered
 - hydraulic gradient measured on site was used, without checking groundwater elevation at the site with surface water elevation of the creek

Groundwater Investigation

Physical hydrogeology

- The wells were not surveyed; hence the flow direction cannot be determined with the required accuracy.

Groundwater quality

- Based on the number of APEC with potential groundwater issues, an insufficient number of wells were installed; furthermore, the two downgradient wells may not have been optimally located, and the rationale for using 15 ft long screens were not provided.
- LEPH/HEPH was not considered a PCOC in groundwater at AECXX. Given that contaminated soil was excavated in this area, presents a potential data gap. Appendix D of the CSAP Guidance requires that the investigator has obtained sufficient data to confirm that the site has been satisfactorily remediated.

Adequate Rationale to Support Conclusions

All findings (previous data, significance of stratigraphy, well screen lengths and location, seasonal groundwater, fate and transport including indicators of biodegradation , etc.) must be included in the interpretation to build “weight-of-evidence” arguments to support the conclusion. The fact that the samples analyzed met the standards was in this case not sufficient to conclude the site was not contaminated (Determination).



Procedure – Aquitard Assessment

- Determination of groundwater use in a shallow aquifer can be different from the groundwater use in a deep aquifer if a significant continuous confining unit separating the shallow and deep aquifers at the site and offsite;
- the groundwater use (and standards) that applied to the deep aquifer is applied to the full thickness of the overlying aquitard/aquiclude and likewise the soil standards protective of this use;
- Only the shallow aquifer is offered relief from the groundwater standard (and matrix soil standard) that applied to the regional aquifer.
- Consultant is required to submit a formal application requesting a determination of applicable water use for a shallow aquifer at a site;
- application must be supported on the basis of detailed hydrogeological investigations carried out by a qualified hydrogeologist and presented in a technical report that documents and verifies that requisite hydrogeological conditions (listed on next slide) are satisfied.

Requisite Hydrogeological Conditions for Aquitard Assessment

- the semi-confining unit must be a continuous mapable unit identifiable on a regional scale (>> square kilometre) and continuous across the site and between the site and nearest receptor of groundwater in the regional aquifer;
- the semi-confining unit must be mapped as mainly silt to clay in composition with a maximum K of 10^{-7} m/s and must be absent sand interbeds and unfractured;
- the unit must be mapped at 3 metres minimum in thickness across its regional extent;
- must be confirmed by detailed on-site hydrogeological investigations and off-site geological records, maps and reports;
- the calculated travel time to nearest receptor of groundwater in the regional aquifer considering advective flow along the entire flow path (vertical and horizontal) is greater than 100 years.

Consent to Risk-based Off-site Remediation

- Email correspondence between the consultant, property owner and the City of Vancouver was provided as written approval of the risk-based approach. The consultant should have requested a former letter from the City. However, in this case, the Performance Assessment Panel members concluded that that the email chain was sufficient indication that the City accepted the risk-based.



Risk – Exposure Amortization

- It was assumed that construction workers could be exposed to the contaminated material in soils for a two week period while exposure to contaminated groundwater was assumed to occur one day per year. These exposures were amortized over an entire year.
- Although the consultant provides Dillon (2005) as support for this approach, this amortization is not considered appropriate without additional rationale (as indicated by Health Canada).
- In addition, US Environmental Protection Agency (US EPA) risk assessment guidance indicates that exposure assessments should match the toxicity assessment as much as possible.
- PAP member concluded that exposure amortization used was not supported by the toxicological data, and that the amortization approach used could underestimate the risks by as much as 25 to 50 times.

Risk – Exposure Amortization

- Construction worker: Two week period for soil amortizes over an entire year. This type of amortization is considered inappropriate without additional rationale. Exposure assessments should match the toxicity assessment as much as possible.
- Subchronic exposures should not be average over a longer period than the duration of exposure. For example, the exposure to a construction worker spending 42 days at a site should only be average over 8hr/day and 5days/week, not an entire year ($8/24 \times 5/7 = 0.286$; instead of $42/365 = 0.115$).



Risk – Particulate Emission

- The value used in the human health risk assessment (i.e., $0.76 \mu\text{g}/\text{m}^3$) was recommended by Health Canada for sites due to windborne erosion. Data cited by Health Canada suggest $250 \mu\text{g}/\text{m}^3$ for construction activities.



Risk – Absorption Factors

- RAIS dermal absorption factors are absolute, whereas HC use relative factors (relative to oral). The DAF for zinc should be 0.02 and not 0.1. For metal without a referenced DAF, a typical default of 0.1 is used (for example for tin).



Risk – Calculation Errors

- RFD and SF calculated from RFC and UR appear to be correct for some, but incorrect for others. For vapour inhalation, it would be simpler to use RFC and UR, and compare these directly with the measured or predicted air concentrations.



Risk Management Works

- Risk-based COC cannot be issued until the vapour control system “has been installed and a P.Eng. has certified that the system is performing as designed”, and “an AP (numerical or risk) has certified that, at the time of occupancy, the ACC or risk levels in the breathing zone will be met”.
- As the construction at the site was well underway and the cap and landscaping was scheduled to be completed within a month or two, the AP submitted the application for a COC, with a condition that an “as-built” report would be prepared by a P.Eng., and provided to MOE.
- MOE delayed issuing the COC until a confirmation inspection report had been provided by the consultant.



QA/QC

- Investigation did not appear to include the required QA/QC data such as field duplicate RPD, field blanks for groundwater, elevated detection limits for some PCOC; and discussion of lab QA/QC results.
- It was unclear whether water samples for metals were field filtered.
- Chain of Custody forms, sampling logs and test pit logs were missing.



QA/QC

- QA/QC and reliance on data from previous investigations, on which the current report relies, were not discussed. Also percentage of duplicates of the current work is limited, and the RPD for several substances exceeded the targets set.
- Consultant concluded that the data were reliable but did not discuss the implication of high RPDs.
- AP did not provide comments on significance on limited QA/QC information and indication of poor data quality.



QA/QC

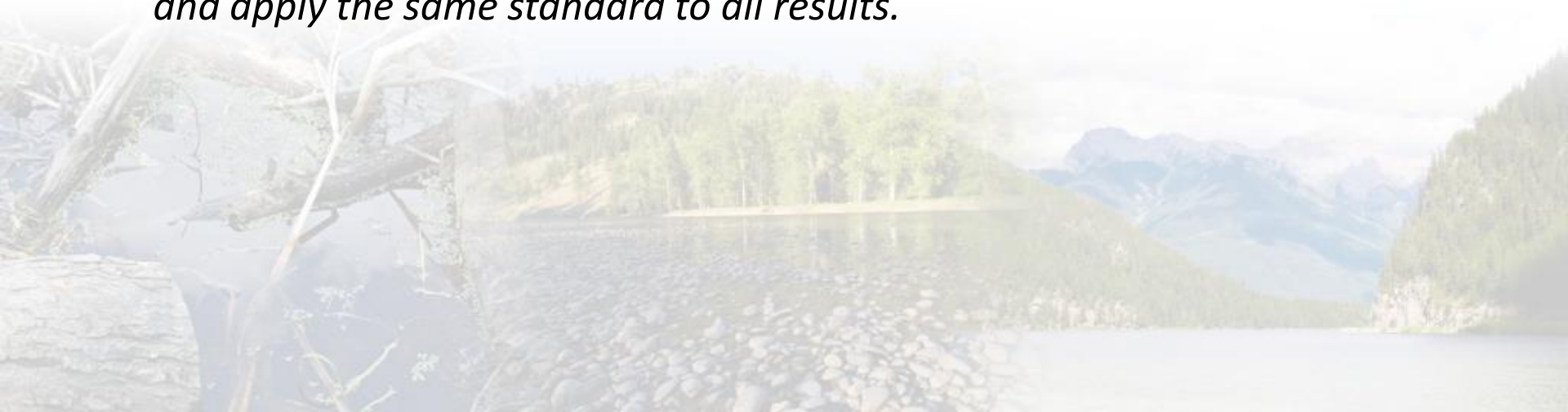
- An soil RPD of 113% requires some response such as:
 - re-analyses by the lab if possible
 - Inspection of sample
 - Discussion of implication on interpretation of soil contamination
- In light of some samples being close to the standard of 150 ug/g (one had a concentration of 149 ug/g) , the significance of high RPD on soil delineation must be provided.



Soil pH versus Soil Standard

- The soil pH for the remediation confirmation sampling appears to be at least one full pH unit higher than those obtained by the DSI. This has a significant potential implication, as the standard is pH dependent. For example:
 - 221 u/g at pH of 5.7 EXCEEDANCE
 - 255 ug/g at pH of 7.3 NOT EXCEEDANCE

Conclusion: Re-assess the data using the median pH value for the soil unit and apply the same standard to all results.



Remediation Confirmation Sampling

- No rationale or explanation was provided in the Closure Report for why the proposed post-remediation monitoring wells were not installed. Section 29 of Appendix D of the CSAP Guidance requires post-remediation monitoring to obtain sufficient data to confirm that the site has been satisfactorily remediated. Section 13 of the Guidance requires that deviations from the AIP and/or remediation plan are clearly identified together with any implications that such deviations may have on the conclusions.



Remediation

- A LEPH concentration of 44,000 mg/kg clearly indicates the potential for the HW standard to have been exceeded (for MOG). This may have led to non-compliance with HWR and TDG in terms of handling, transportation and disposal of contaminated soil.
- The report referred to Hazco handling the excavation and disposal, but information on quality of excavated soil and shipping and disposal of soil was not provided.

Conclusion: The AP provided copies of manifests, confirming the soil with the elevated LEPH concentration was shipped as hazardous waste facility.

Backfill Testing

- Consultant used imported backfill; however, the source was not identified. Although results of testing of backfill quality were provided, no details were presented on sampling method or how representative these samples may be of the soil placed at the site. In addition, the samples were only analyzed for hydrocarbons (which can often be detected visually/olfactory), but not for metals (which is generally not visible).

