

APPENDIX G: DQO/DQIS

As stated in Section 18 Appendix B of Schedule B2 of the ASC NEPM, the DQO process is a seven-step iterative planning approach used to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a site.

The seven-step DQO process adopted for the validation of remediation based on the RAP included in Appendix K is summarised in the following table.

G.1 DATA QUALITY OBJECTIVES

1. State the problem	<p>The primary objectives for the remediation of the Site is to remove contamination such that the Site can be removed from the EMR.</p> <p>Remediation is required to remove the Site from the EMR and will include:</p> <ul style="list-style-type: none"> the removal of OCP impacted soil materials which exceed the Remediation Criteria the removal of fill materials from the Site. <p>Validation of the Site is required to confirm that the remediation objectives have been achieved. The main problems are:</p> <ul style="list-style-type: none"> What areas require remediation? How should site soils be validated? What validation sampling density should be used? What contaminants should be analysed for?
2. Identify the decision	<p>Is the data suitable for assessing whether the areas requiring remediation have been remediated?</p> <p>Is the Site suitable for the proposed land uses?</p>
3. Identify inputs to the decision	<p>The primary inputs to assessing the above include:</p> <ul style="list-style-type: none"> Previous investigations (where applicable) Field observations including the presence of Unsuitable Fill Materials Analytical data of validation sample media, and quality assurance / quality control (QA/QC) samples Data quality protocols Remediation criteria (refer to Section 7.3).
4. Define the boundaries of the study	<p>The boundaries for the validation sampling program are identified as follows:</p> <ul style="list-style-type: none"> Spatial Boundaries: Lot 123 on RP46047, Lot 124 on RP46047, and Lot 125 on RP46047. Temporal boundaries: The status of the sampling points at the time of the investigation. The vertical study boundary will be the finished floor level of excavation from which validation samples were collected.
5. Develop a decision rule	<p>The decision rules to be applied to validation include:</p> <p>For OCPs in soil, the following approach is to be adopted:</p>

	<ul style="list-style-type: none"> Where OCPs concentrations for each sample are below the adopted remediation criteria, no further remediation is required. Where soil contaminant concentrations are reported to exceed the adopted remediation criteria the following additional steps will be undertaken: <ul style="list-style-type: none"> Review and modification of the Tier 1 HIL-A NEPM assessment criteria as appropriate. Where sufficient data is available, calculate the 95% Upper Confidence Level of the mean (95%UCL), data range and standard deviation. Where the 95% UCLs are less than the assessment criteria and no individual results in the data set are to be greater than 250% of the assessment criteria; and the standard deviation of the data set is to be within 50% of the assessment criteria, no further remediation is required. Where the 95% UCL is more than the assessment criteria, consider these results in the context of the current CSM to evaluate whether there are plausible pollutant linkages remaining. If plausible pollutant linkages are identified, then further remediation should be undertaken to remove impacted soil. <p>For fill materials, the following approach is to be adopted:</p> <ul style="list-style-type: none"> A SQP who is competent in the identification of fill materials will inspect the site to confirm that these materials have been removed.
6. Acceptable limits on decision error	<p>Decision errors are incorrect decisions caused by using data that is not representative of site conditions due to sampling or analytical error. As a result, a decision may be made that remediation/management is not needed when it is, or vice versa. There are two types of decision error:</p> <ul style="list-style-type: none"> Sampling errors, which occur when the samples collected are not representative of the conditions within the investigation area; and Measurement errors, which occur during sample collection, handling, preparation, analysis and data reduction. <p>To consider whether decision errors have been made, an assessment of data quality indicators will be undertaken as described in Appendix G.2. A QA/QC assessment of the data collected is included in Appendix F. The closeness of the data to the assessment criteria will also be considered.</p>
7. Optimise the design for obtaining data	<p>The methodology and rationale for obtaining relevant data for validation is described in Section 8.6 of the RAP, and Section 8.9 of this Validation Report.</p>

G.2 DATA QUALITY INDICATORS

Data Quality Indicators (DQIs) are used to show that the DQOs have been met. DQIs for the project are based on the field and laboratory considerations in Section 19.6 of ASC NEPM 2013 Schedule B2 Appendix B, which include:

- Completeness – a measure of the amount of useable data (expressed as %) from a data collection activity.
- Comparability – the confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event.
- Representativeness – the confidence (expressed qualitatively) that data are representative of each media present on the Site.
- Precision – A quantitative measure of the variability (or reproducibility) of data.
- Accuracy – a quantitative measure of the closeness of reported data to the true value; and
- The QA review will include a check of performance against the DQIs.

The DQIs adopted for soil sampling is discussed in the following tables.

Table A: DQI Completeness

DQI	Field Considerations	DQI Performance	Laboratory Considerations	DQI Performance
Completeness	Critical locations sampled	Samples were collected from nominated locations with no deviation from the sampling plan, without reasonable justification.	Critical samples analysed according to sampling plan.	Samples were analysed for COPC.
	Samples collected	Samples were collected in accordance with Tetra Tech Coffey's Standard Operating Procedures (SOPs) during the assessment.	Identified COPCs included.	As above.
	Standard Operating Procedures (SOPs) appropriate and complied with	No departure from Tetra Tech Coffey SOPs without reasonable justification.	Appropriate methods and LORs	Samples were analysed by NATA accredited laboratories, for the analyses to be performed and appropriate methods were used. LORs were less than assessment criteria.
	Experienced sampler	Experienced Tetra Tech Coffey Environmental Scientists undertook the sampling.	Sample documentation complete	Chain of custody's (COCs) were returned, signed and dated by laboratory. NATA endorsed laboratory certificates were completed in accordance with Schedule B3 of the ASC NEPM. Field logs were completed in accordance with Coffey SOPs.

DQI	Field Considerations	DQI Performance	Laboratory Considerations	DQI Performance
	Documentation correct	Samples were handled and transported under appropriate chain of custody (COC) documentation. Coffey retained original COC documentation. Sample Receipt Notifications (SRN) from the laboratory were reviewed to assess that samples were received cool and in good condition.	Sample holding times were be complied with	Samples were analysed within holding times specified in Schedule B3 of the ASC NEPM.

Table B: DQI Comparability

DQI	Field Considerations	DQI Performance	Laboratory Considerations	DQI Performance
Comparability	Same SOPs used on each occasion	Tetra Tech Coffey SOPs were implemented.	Same sample analytical methods will be used.	The same NATA accredited laboratories were used to undertake analyses of primary, duplicate and triplicate samples collected for this study. The laboratory used the same analytical methods for each sample for each analytical parameter.
	Experienced sampler	Experienced Tetra Tech Coffey Environmental Scientist(s) conducted sampling.	Same sample LORs	As above
	Climatic conditions (temperature, rainfall, wind etc.)	Environmental scientist attempted to sample in similar climatic conditions if practicable.	Same laboratories	As above
	Same types of samples collected	Samples were collected in the appropriate laboratory supplied containers specific to the analyses performed.	Same units	As above

Table C: DQI Representativeness

DQI	Field Considerations	DQI Performance	Laboratory Considerations	DQI Performance
Representativeness	Appropriate media sampled according to sample plan	Soil samples were collected and analysed in accordance with Tetra Tech Coffey's SOPs.	Appropriate media sampled according to this plan	Collected samples were analysed by NATA accredited laboratories.
	All media identified in sample plan	Soil samples collected and analysed in accordance with Tetra Tech Coffey's SOPs.	-	-
	SOPs appropriate and complied	Tetra Tech Coffey's SOPs were be implemented.	Analysis of field duplicates	Laboratory duplicates were analysed in general accordance with ASC NEPM. Duplicate and triplicate samples collected for soil.

Table D: DQI Precision

DQI	Field Considerations	DQI Performance	Laboratory Considerations	DQI Performance
Precision	SOPs appropriate will be complied with	Tetra Tech Coffey's SOPs were implemented.	Analysis of laboratory duplicates	Relative Percent Differential (RPD) values for laboratory duplicates and recovery of matrix spikes were within acceptable ranges.
	Analysis of field duplicates	As for laboratory considerations	Analysis of field duplicates	Duplicates were analysed at a frequency set out in Appendix F. RPDs were be calculated and compared to relevant acceptance criteria. Tetra Tech Coffey adopted 30% for concentrations more than 10 times the LOR and 50% for concentrations less than 10 times the LOR (Standards Australia 1997).

Table E: DQI Accuracy

DQI	Field Considerations	DQI Performance	Laboratory Considerations	DQI Performance
Accuracy	SOP appropriate and complied with	Tetra Tech Coffey SOPs were implemented	Same sample analytical methods will be used.	The same NATA accredited laboratories were used to undertake analyses of primary, duplicate and triplicate samples collected for this study. The laboratory used the same analytical methods for each sample for each analytical parameter.
	Trip blanks	Trip blank sample was collected using laboratory supplied distilled water.	Trip blanks	A laboratory prepared trip blank was included for each sample set.
	Rinsate sample	Where reusable sampling equipment was utilised (if any) a rinsate sample was be collected using laboratory supplied distilled water. If rinsate sampling is not completed as part of the assessment, justification will be required.	Rinsate sample	Non-detection of COPCs in rinsate sample.
	-	-	Laboratory duplicate and Matrix spike	RPD values for laboratory control duplicates and recovery of matrix spikes were within acceptance limits.