F1 QUALITY ASSURANCE AND QUALITY CONTROL PROGRAMME

F1 FIELD QA/QC PROGRAMME

Given that the investigation was limited and was not intended to meet the DECCW requirements for detailed site investigation , CES has conducted only a limited QA/QC programme. Field QA/QC for this investigation consisted of one blind replicate samples, two trip blank samples and two trip spike sample. Considering that the investigation was limited i

A description of the field QA/QC samples used as part of this investigation is provided in the following sections.

1.1.1 Primary Samples

Primary samples are the representative samples of soil or groundwater collected for analysis to determine aspects of their chemical composition. Primary samples are the original sample taken from a particular location and other samples from the same location are duplicates, replicates or triplicates.

1.1.2 Blind Replicate Samples

Blind replicate samples are provided by the collection of two similar samples from the same location or successively from the same monitoring bore using identical procedures and equipment in each instance. These samples are collected, preserved, stored, transported, prepared and analysed in an identical manner to the primary samples.

NEPC (1999) recommends that one blind replicate sample be collected for every 20 primary samples (*ie*. a frequency of 5%).

1.1.3 Trip Blanks

Trip blanks consisting of pre-washed bottles containing distilled or de-ionised water and appropriate preservatives will be supplied by the analytical laboratory. The role of trip blanks is to detect potential contamination during sample transport. These samples reside in transport vessels during sampling activities and are not opened in the field. Trip blanks are analysed at the laboratory as regular samples or only for volatile organic compounds, as deemed appropriate.

For soil sampling programmes, the trip blank consists of a laboratory-supplied sand blank containing quartz sand that has been heated to 400ºC.

1.1.4 Laboratory-prepared Trip Spikes

Laboratory-prepared trip spikes consisting of distilled, de-ionised water or sand spiked with known concentrations of BTEX should be included in QA/QC programmes where volatile TPH or BTEX concentrations are being measured. Laboratory-prepared trip spikes should be included at a rate of one per sample batch. These samples are to be submitted for BTEX analysis with results compared with the known additions. Generally, samples are spiked with concentrations of 10, 10, 10 and 30 ppm of benzene, toluene, ethylbenzene and total xylenes respectively. The purpose of these samples is to monitor VOC losses during transit.

Care will be taken to ensure that only freshly-prepared spiked samples are used. Spikes more than 2 days old at the time of receipt from the laboratory should be discarded. All trip spikes received will be checked for leakage or bubbles. Any spikes containing bubbles or any other defects will be discarded. Furthermore, only spikes delivered under laboratory COC will be accepted. COCs will be stored in the project file for reference.

F2 LABORATORY QA/QC PROGRAMME

The reliability of test results from the analytical laboratories will be monitored according to the QA/QC procedures used by the NATA accredited laboratory. The QA/QC programme employed by the NATA registered laboratory specifies sample tracking procedures, methods of extraction, analysis, Practical Quantitation Limit PQL) / Limit of Reporting (LOR) / Estimated Quantitation Limits (EQLs) and acceptance criteria for results. Laboratory QA/QC procedures adopted by the laboratories used in this investigation are summarised below.

1.1.5 Laboratory Duplicate Samples

Laboratory duplicates provide data on analytical precision for each batch of samples. The duplicate is crated by extracting a sub-sample from the primary sample which is then analysed in the same manner and within the same run as the primary sample.

The National Association of Testing Authorities (NATA), Australia specifies that 1 duplicate is analysed for every 10 primary samples.

1.1.6 Standards

Calibration standards are prepared from individual certified materials, ‘analytical reagent’ grade, or better reagents, purchased as certified mixtures. Stock solutions are replaced every 6 months. Working standards are prepared at least every month from the stock solutions.

1.1.7 Laboratory Control Samples

Laboratory control samples consist of a clean matrix (de-ionised water or clean sand) spiked with a known concentration of the analyte being measured. These samples monitor method recovery in clean samples and can also be used to evaluate matrix interference by comparison with matrix spikes. Laboratory control samples may be certified reference materials.

1.1.8 Surrogates

For organic analyses, a surrogate is added at the extraction stage in order to verify method effectiveness. The surrogate is then analysed with the batch of samples. Percent recovery is calculated.

1.1.9 Matrix Spike

A matrix spikes consist of samples spiked with a known concentration of the analyte being measured, in order to identify properties of the matrix that may hinder method effectiveness. Samples are spiked with concentrations equivalent to 4 to 10 times the Limit of Reporting/Estimated Quantitation Limit (LOR/EQL). Percent recovery is calculated.

1.1.10 Method Blanks

Method blanks (de-ionised water or clear sand) were carried through all stages of sample preparation and analysis at a rate of approximately 10%. Analyte concentrations in blanks should be less than the stated LOR/EQL. Reagent blanks are run if the method blank exceeds the LOR/EQL. The purpose of method blanks is to detect laboratory contamination.

F2 DATA ACCEPTANCE CRITERIA

Data Acceptance Criteria (DAC) for this investigation are summarised in Table F3.

Table F1: QA/QC Compliance Assessment

QA/QC Sample Type	Method of Assessment	Acceptable Range
Field QA/QC		
Blind Replicates Samples	The assessment of blind replicates and split samples is undertaken by calculating the Relative Percent Difference (RPD) of the blind replicate and split sample concentration compared with the primary sample concentration. The RPD is defined as: $RPD = 100 \times \frac{\lvert X_1 - X_2 \rvert}{Average}$ Where: X_1 = concentration of primary sample; X_2 = concentration of replicate or split sample.	The acceptable range depends upon the levels detected: ▪ 0 – 100% RPD (When the average concentration is < 5 times the PQL/LOR) ▪ 0 – 75% RPD (When the average concentration is 5 to 10 times the PQL/LOR) ▪ 0 – 50% RPD (When the average concentration is > 10 times the PQL/LOR)
Trip Blanks	Each blank is analysed as per the original samples.	Analytical Result < LOR/PQL
Laboratory-prepared Trip Spike	The trip spike is analysed after returning from the field and the % recovery of the known spike is calculated.	70% - 130%
Laboratory QA/QC		
Laboratory Duplicates	Assessment as per Blind Replicates and Split Samples.	The acceptable range depends upon the levels detected: ▪ 0 – 100% RPD (When the average concentration is < 4 times the PQL/LOR) ▪ 0 – 50% RPD (When the average concentration is 4 to 10 times the PQL/LOR) ▪ 0 – 30% RPD (When the average concentration is > 10 times the PQL/LOR)
Surrogates Matrix Spikes Laboratory Control Samples	Assessment is undertaken by determining the percent recovery of the known spike or addition to the sample. $\% Recovery = 100 \times \frac{C - A}{B}$ Where: A = Concentration of analyte determined in the original sample; B = Added Concentration; C = Calculated Concentration.	70% - 130% (General Analytes) 50% - 130% (Phenols) 60% - 130% (OP Pesticides) If the result is outside the above ranges, the result must be < 3x Standard Deviation of the Historical Mean (calculated over past 12 months)
Method Blanks	Each blank is analysed as per the original samples.	Analytical Result < PQL/LOR

Note: EQL = Laboratory Estimated Quantitation Limit (EQL) or the minimum detection limit for a particular analyte. LOR = Limit of Reporting or the minimum detectable limit for a particular analyte.

PQL (Practical Quantitation Limit) = LOR (Limit of Reporting) = Statistically demonstrated limit of the method/equipment under replicated lab conditions, including preparation of the samples, and accounts for background interference.