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KIAMA NSW 2533

Thursday, 24 February 2022

**Our Reference:**  
22003 IA4 Final DSI and RAP

**SUBJECT: Interim Advice 4, AUDIT 48 Campbell Street, Gerringong, NSW: Review of Final Detailed Site Investigation and Remedial Action Plan**

**This letter is provided as Interim Advice and does not constitute a Site Audit Report or Site Audit Statement.**

Where required for clarity, the Auditor's opinion in this letter is enclosed in a box to separate the Auditor's opinion from quoted opinions from Consultants' reports or other sources.

A discussion of the scope of site audits is appended to this advice (page 15).

## 1 Introduction

### 1.1 Audit Background

Allen Price and Scarratts Pty Ltd has engaged Tim Chambers of Phreatic Consulting to act as Contaminated Site Auditor in relation to contamination management at 48 Campbell Street, Gerringong, NSW, NSW. The audit relates to part of Lot 2 DP 1168922.

The audit site has an area of approximately 12.83 ha and is zoned *RU2 – Rural Landscape*.

The Audit is required to support a planning proposal to re-zone the site..

### 1.2 Proposed Development

The works form part of a planning proposal<sup>1</sup> for re-zoning, and no subdivision is currently proposed. The planning proposal

*... seeks to amend the Kiama Local Environmental Plan (KLEP) 2011 and to extend the Gerringong residential zone from Campbell Street to align with the southern boundary of 48 Campbell Street, (Lot 2 DP 1168922), Gerringong.*

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<sup>1</sup> Allen, Price and Scarratts (2.12.2020) *Planning Proposal Elambra West Urban Release Area, Lot 2 DP 1168922, No 48 Campbell Street, Gerringong.*

The Site Audit is required to support the planning proposal.

Kiama Municipal Council requested additional information in support of the proposal, including a Stage 1 Contaminated Site Assessment (since conducted by Construction Sciences). A requirement regarding this report is that is is *“prepared in accordance with the NSW Managing Land Contamination – Planning Guidelines:SEPP 55-Remediation of Land”* and must address Ministerial Direction 2.6 – Contaminated Land. This requires that item 2.6(4) (and in this case 2.6(4)(c)) is met:

- (4) *A planning proposal authority must not include in a particular zone (within the meaning of the local environmental plan) any land specified in paragraph (2) if the inclusion of the land in that zone would permit a change of use of the land, unless:*
- (a) *the planning proposal authority has considered whether the land is contaminated, and*
  - (b) *if the land is contaminated, the planning proposal authority is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for all the purposes for which land in the zone concerned is permitted to be used, and*
  - (c) *if the land requires remediation to be made suitable for any purpose for which land in that zone is permitted to be used, the planning proposal authority is satisfied that the land will be so remediated before the land is used for that purpose.*

It is further understood that Council will require site remediation under the Kiama Local Environmental Plan 2014 in relation to the planning proposal.

## 1.3 Site Background

The site has been used for agricultural (grazing) purposes. Recent works have identified some fragments of asbestos on the site in shallow soils, anticipated to be residual fragments from historical demolition of structures.

The extent and degree of impact has been adequately assessed and a remedial action plan documenting the remediation and validation approach required for the site has been developed, and is reviewed in this letter.

## 1.4 Asbestos Nomenclature For Contaminated Sites

A primary contaminant of concern at the site is asbestos. Acceptable methods for sampling asbestos contamination, and acceptable concentrations of asbestos in the environment are discussed in NEPC (2013)<sup>2</sup>. Particular nomenclature is used when referring to asbestos contamination, as follows:

- ▼ ACM, Asbestos Containing Material. Fibre cement products, insulation or any other material containing asbestos.

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2 National Environment Protection Council (2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure No 1*.

- ▼ Bonded ACM: Asbestos-containing-material which is in sound condition, although possibly broken or fragmented, and where the asbestos is bound in a matrix such as cement or resin (e.g. asbestos fencing and vinyl tiles). This term is restricted to material that cannot pass a 7 mm x 7 mm sieve. Bonded ACM is equivalent to 'non-friable' asbestos in Safe Work Australia (2020)<sup>3</sup>, which is defined therein as 'material containing asbestos that is not friable asbestos, including material containing asbestos fibres reinforced with a bonding compound'.
- ▼ Fibrous Asbestos (FA): Comprises friable asbestos material and includes severely weathered cement sheet, insulation products and woven asbestos material. This type of friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. This material is typically un-bonded or was previously bonded and is now significantly degraded (crumbling).
- ▼ Asbestos Fines (AF): AF includes free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve. Note that for bonded ACM fragments to be small enough to pass through a 7 mm x 7 mm sieve implies a substantial degree of damage to the original material, which increases the potential for fibre release.
- ▼ From a risk to human health perspective, FA and AF are considered to be equivalent to 'friable' asbestos in Safe Work Australia (2020), which is defined therein as 'material that is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry, and contains asbestos'.

## 2 Current Interim Advice

The following reports have been provided for the Auditor's review, and are discussed in this Interim Advice:

- ▼ ENRS (2022a) *Detailed Site Investigation (DSI)*, 48 Campbell Street, Lot 2 / DP 1168922 Gerringong. Reference ENRS2069.r2e1\_APS\_48 Campbell St Gerringong\_DSI
- ▼ ENRS (2022b) *Remediation Action Plan (RAP)*, 48 Campbell Street, Lot 2 / DP 1168922 Gerringong. Reference ENRS2069.r2e1\_APS\_48 Campbell Street Gerringong\_RAP

The review of these documents has been in general accordance with the requirements in the NSW EPA (2017) *Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd Edition)* and the NSW EPA (2020) *Contaminated Land Management: Consultants Reporting on Contaminated Land*. The primary focus of the review documented here has been to assess the adequacy of the assessment to identify and delineate site contamination, and of the remedial action plan to identify an appropriate and effective method to address the identified contamination at the site.

The overall objective of this audit is to provide comment on whether the land at the site is suitable for the proposed uses with respect to contamination.

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3 Safe Work Australia (July 2020) *How to manage and control asbestos in the workplace, Code of Practice*

## 3 ENRS (2022) Detailed Site Investigation

The Auditor reviewed the draft report in previous Interim Advice<sup>4</sup>. The final report reviewed here was prepared with due consideration of the Auditor's comments.

### 3.1 Summary Of Works Conducted

The Auditor summarises the works conducted in the preliminary site assessment (PSI) as follows:

- ▼ Review previous report and available data.
- ▼ Sampling of site soils from ninety test pits:
  - ▽ Due to the size of the site, sampling locations were placed using a combination of judgemental and grid based sampling within the identified areas of concern, with additional distributed samples outside key risk areas for completeness.
  - ▽ Submit a total of 71 samples for laboratory analysis for
    - heavy metals – arsenic, cadmium, chromium, copper lead, mercury, nickel and zinc,
    - TRH – total recoverable hydrocarbons,
    - BTEX – benzene, toluene, ethylbenzene and xylenes,
    - PAH – polycyclic aromatic hydrocarbons,
    - PCB – polychlorinated biphenyls,
    - OCP/OPP – organochlorine and organophosphate pesticides
    - asbestos (quantitative assessment for compliance with NEPC (2013) HSL values)
- ▼ Sampling of surface water at four locations:
  - ▽ Submit four samples for laboratory analysis for
    - heavy metals
    - TRH
    - BTEX
    - PAH
    - ammonia
    - fluoride
    - sulphate
    - nitrate
    - pH

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4 Phreatic Consulting (18.02.2022) *Interim Advice 2, AUDIT 48 Campbell Street, Gerringong, NSW: Review of Detailed Site Investigation*. Document 22003 IA2 DSI

The Auditor has prepared a graphical representation of the analytical data in Figure 1, attached, and summarises the findings of the investigation below:

- ▼ Metals (lead, mercury and zinc) exceeded the screening criteria (NEPC HIL A) at several locations. Statistical analysis (see below) shows that these impacts are acceptable without remediation as they comply with the statistical requirements of NEPC (2013) Schedule B1 Section 3.2.1.
- ▼ Asbestos was identified at the site surface as ACM and within this soil profile at concentrations which exceed the screening criteria (NEPC (2013) HSL A) and will require remediation to make the site suitable from a health based perspective.
- ▼ Asbestos as ACM was also present in the soil profile at concentrations below the screening criteria and while acceptable from a health perspective may not meet aesthetic criteria for the proposed residential land use.
- ▼ Asbestos identified as being friable was noted at one location (AEC-R04) while all other observed asbestos materials were considered to be non-friable.
- ▼ ENRS revised the initial list of areas of concern based on the results of the assessment, concluding that the areas where contamination was identified are:
  - ▼ *AEC-R01: ~1,000m<sup>2</sup> of shallow asbestos impacted soils on the southern side of the Sites northern residential dwellings. AEC-R01 comprised preliminary AECs AEC13, AEC22 and AEC24.*
  - ▼ *AEC-R02: ~40m<sup>3</sup> stockpile of soil, vegetation, and non-putrescible waste with heavy fraction (C16-C34) hydrocarbons. AEC-R02 comprised preliminary AEC36.*
  - ▼ *AEC-R03: ~400m<sup>2</sup> of uncontrolled fill and reworked natural ground within the centre of the Site. Isolated fragments of non-friable ACM and one (1) presumed isolated pocket of historical fill with chemical exceedances of SAC. AEC-R03 comprised preliminary AEC17.*
  - ▼ *AEC-R04: ~500m<sup>2</sup> of aggregate roadway with laboratory exceedance of friable asbestos. Depth of asbestos impacted gravel varied between 0.2 and 0.5mbgl.*
  - ▼ *AEC-R04 comprised part of preliminary AEC33.*
  - ▼ *AEC-R05: ~4,700m<sup>2</sup> of shallow asbestos impacted soils within the centre of the Site with chemical exceedances of SAC. Depth of asbestos impacted soils varied between 0.1 and 0.5mbgl. AEC-05 comprised preliminary AECs AEC5, AEC14, AEC15, AEC18, AEC19, AEC20, AEC21, AEC29 and AEC31.*
  - ▼ *AEC-R06: ~600m<sup>2</sup> of historical, uncontrolled Fill within and adjacent to a localised waterway on the eastern boundary of the Site. Non-friable ACM and chemical exceedances of SAC reported within soil samples from the Fill. Chemical exceedances of SAC also reported in surface water samples from the waterway. AEC-R06 comprised preliminary AEC35.*
  - ▼ *AEC-R07: ~4,200m<sup>2</sup> of livestock yards surrounding the Sites previously operational dairy. AEC-R07 characterised by two (2) separated areas; cattle holding/feeding yards with exposed surface soils and a grassed horse paddock. Chemical exceedances of SAC reported, and two (2) isolated ACM fragments of unknown origin identified. AEC-R07 comprised part of former AEC28.*

The Auditor notes that the potential contaminants listed are common urban contaminants and are reasonable to assume for the site. The identified areas of potential contamination appear reasonable.

The Auditor notes that where buildings, including historical farm sheds, have been demolished, shallow asbestos impacts are common. Asbestos building materials are also commonly buried in pits on site and may not be apparent from surface investigation alone.

The Auditor notes that NEPC (2013) Schedule B1 Section 3.2.1 states that contaminant concentrations are considered to be acceptable where the maximum concentration ( $C_{max}$ ) is less than 250% of the criteria, the standard deviation ( $\sigma$ ) is less than half the criteria and the 95% upper confidence limit of the mean is less than the criteria. The Auditor has calculated these values for the lead, mercury and zinc assessment data across the site and taking the maximum of primary and duplicate pair values (excluding the lower value to avoid biasing the results towards particular points), on the understanding that the samples are collected from natural site soils (or re-worked site soils) potentially affected by site activity and can be regarded as a single statistical population. It is noted that the data did not conform to either a normal or log-normal distribution and the Auditor has relied on the Chebyshev method for calculating the 95% upper confidence limits. All the metals impacts were found to be acceptable without need for remediation based on this method. The Auditor's summary of the relevant statistics is shown in Table 1 below).

Table 1: Auditor's Statistical Review of Lead, Mercury and Zinc Contamination Data

Contaminant	HIL A	No. samples	$C_{max}$	$\sigma$	95% UCL <sub>mean, Chebyshev</sub>	UCL < HIL	$\sigma < \frac{1}{2} \times \text{HIL}$	Max < 2.5 x HIL
Lead	300	65	630	122	147	✓	✓	✓
Mercury	10	65	15.5	1.9	1.4	✓	✓	✓
Zinc	7,400	65	13,700	1,735	1,420	✓	✓	✓

## 3.2 Data Reliability

The Auditor has reviewed the reliability of the assessment data with respect to standard data quality indicators recommended in NEPC (2013) Schedule B2: precision, accuracy, representativeness, completeness and comparability.

### 3.2.1 Precision And Accuracy

Precision and accuracy of analytical data is assessed through field and laboratory quality control and quality assurance. The Auditor has reviewed the field and laboratory quality control assessment data below.

#### 3.2.1.1 Field Quality Control

ENRS (2022) included the following quality control sampling for field data:

- ▼ Soil (65 primary samples)
  - ▽ Six duplicate (intra-laboratory duplicate) sample pair tested for heavy metals, TRH and BTEX:
    - A10/TP1-0.2 / A10/DUP1-02 with elevated RPD for lead and zinc

- A18/TP1-0.2 / A18/DUP2-02 with acceptable results
  - A23/TP1-0.3 / A23/DUP3-03 with acceptable results
  - A32/TP1-0.2 / A32/DUP4-02 with acceptable results
  - A32/TP9-0.2 / A32/DUP5-02 with acceptable results
  - A35/TP5-0.2 / A35/DUP6-02 with elevated RPD for zinc
- ▽ Six triplicate (inter-laboratory duplicate) sample pair tested for heavy metals, TRH and BTEX. The Auditor notes that the triplicate sample IDs were not given in the relevant results tables (tables 22 – 27) and are listed here as question marks:
- A10/TP1-0.2 / ?? with acceptable results
  - A18/TP1-0.2 / ?? with acceptable results
  - A23/TP1-0.3 / ?? with acceptable results
  - A32/TP1-0.2 / ?? with acceptable results
  - A32/TP9-0.2 / ?? with acceptable results
  - A35/TP5-0.2 / ?? with elevated RPD for zinc
- ▽ No trip blank
- ▽ No trip spike
- ▽ No rinsate samples

The Auditor is satisfied that the duplicate and triplicate sampling frequency is adequate as it exceeds the 5% (1 duplicate per 20 primary samples) requirement stated in AS4482.1. There is an indication heterogeneity in the zinc concentrations in A10 and A35 as the observed elevated RPD values for zinc were not apparent in the other contaminant results.

The Auditor has regarded duplicate and triplicate RPD results where one or more samples are less than ten times the laboratory limit of reporting as acceptable at any value. Due to the relative scale of results, elevated RPDs are expected within this range and can not be relied on to assess field data quality.

The absence of trip blank and trip spike samples reduces the ability to determine the accuracy of results for volatile samples as the potential for loss or gain of contaminants during sample transport is not assessed. No volatile contaminants were reported at concentrations above the laboratory limit of reporting and the Auditor is satisfied that volatile contaminants were not gained by the samples during transport.

The absence of rinsate samples due to the use of disposable field equipment is reasonable from the perspective of cross contamination between sampling locations but does not allow for potential introduction of contaminants from the sampling equipment itself. There is, at this site, no indication in the results that there is unexpected impact in any samples and in this case the issue is not material to the interpretation of the results.

The Auditor is satisfied that the field QC data indicates acceptable data quality but notes that there is some uncertainty around the accuracy and precision of zinc (due to heterogeneous impact) and



volatile contaminants (potentially lost during transport) in soil which must be considered in the interpretation of the results.

### 3.2.1.2 Laboratory Quality Control

The Auditor has reviewed the quality control data for the following laboratory reports included in Alliance (2021):

- ▼ ALS EW2105020 Primary Soil
  - ▽ Holding time exceeded for moisture, microbial, TRH and BTEXN
- ▼ Envirolab 284012 Triplicate soil
  - ▽ All QC requirements met
- ▼ ALS EW2105036 Primary water
  - ▽ Holding time exceeded for pH and salmonella
- ▼ ALS ES2145700 Primary soil
  - ▽ All QC requirements met
- ▼ Envirolab 285485 Triplicate soil
  - ▽ All QC requirements met
- ▼ ALS ES2145701 Primary water
  - ▽ Holding time exceeded for pH
- ▼ ALS EW2200245 Primary soil
  - ▽ All QC requirements met
- ▼ Envirolab 286983 Triplicate soil
- ▼ ALS EW2200244 Primary soil
  - ▽ Holding time exceeded for pH
  - ▽ Insufficient number of laboratory duplicates for PAH and TRH

The laboratory QC results were not met in all cases, and there is therefore reduced confidence in the results for moisture, soil pH, salmonella, PAH and TRH in some sample batches. It is noted that as multiple sample batches were sent as field work progressed, not all results are affected. Accordingly, any results within an order of magnitude of screening criteria should be examined closely where they may affect management decisions for the site.

The Auditor is satisfied that subject to the comment above, all laboratory QC requirements were met and that the laboratory data is adequately precise and accurate for the purposes of the assessment (identification and initial delineation of impacts).



### 3.2.2 Representativeness

Due to the size of the site, a stratified approach has been adopted by the consultants with judgemental assessment applied within identified areas of potential contamination. Sampling has focused on the active parts of the site, with a reduced density in less heavily used areas (paddocks). ENRS summarise the approach taken as:

*A total of ninety (90) soil sampling points and four (4) surface water sampling points were installed during the investigation program. Where asbestos was encountered, additional test pits were installed to further delineate the CoPC in general accordance with the the WA 2021 asbestos guidelines which states that densities within NSW EPA (1995) guidelines are increased by a coefficient of between 0.5-2.0.*

*Sampling locations were limited to Areas of Environmental Concern (AECs) and accessible areas at the time of this investigation based on Site infrastructure, hardstand (if any) and services. Final sample locations were selected based on ground conditions observed during investigation.*

*Sample locations are depicted in [ENRS report] Figure 7, Figure 8 and Figure 9. Consideration was also given to:*

- ▼ *Targeted AECs;*
- ▼ *Potential Fill, current and former building areas;*
- ▼ *Down-gradient and up-gradient boundaries;*
- ▼ *Accessible ground and safe standing conditions for test pit excavations; and*
- ▼ *Safe working distance from services and utilities.*

*Sample locations were recorded in the field using a handheld GPS.*

The Auditor has reviewed the spatial distribution of samples and is satisfied that the areas identified as potentially contaminated have been adequately sampled to allow understanding of the extent of impact present at the site.

Test pits extended to natural soil, ensuring that the full thickness of any fill material encountered was examined. Samples of the natural soil were not taken and in the event that potentially mobile contaminants are identified in fill material, additional vertical delineation sampling may be required.

Groundwater was not sampled as no potentially mobile contamination was identified in the site soils. Additional consideration by the consultants of the need or otherwise for groundwater sampling in accordance with NEPC (2013) Schedule B6 will be required prior to completion of site remediation.

### 3.2.3 Completeness

The consultants included an assessment of completeness of both documentation and data in section 9.5 of the report and demonstrated in tabulated format that all the completeness DQIs had been met.

The Auditor is satisfied that the completeness assessment is adequate and that the assessment data can be considered to be complete.

### 3.2.4 Comparability

The consultants included an assessment of comparability in section 9.5 of the report and demonstrated in tabulated format that all the completeness DQIs had been met.

The Auditor is satisfied that the comparability assessment is adequate and that the assessment data can be considered to be complete.

### 3.2.5 Data Reliability Opinion

The Auditor is satisfied that the data is adequately reliable to characterise site impacts, subject to due consideration of potential increased variability in concentrations of zinc, PAH, TRH and BTEX in some locations.

## 3.3 Technical Comment

The Auditor's review of the document identified the following technical aspects of the report which have been reviewed by ENRS and will be addressed in future works:

1. Field duplicate samples were given identifiers which allow correlation with the corresponding primary sample to minimise the potential for unintentional bias in laboratory results which can distort the quality control process. It is preferable to have no connection between primary sample identifiers and those for blind duplicates. This will necessitate a sampling log being kept to record which QC sample corresponds to which primary sample and in what manner. ENRS have acknowledged this issue and will address it in subsequent works.
2. Test pits extended to natural soil, ensuring that the full thickness of any fill material encountered was examined. Samples of the natural soil were not taken and in the event that potentially mobile contaminants are identified in fill material, additional vertical delineation sampling may be required. This is acknowledged by ENRS and will be considered during remedial works.

## 3.4 Guideline Compliance

The Auditor has assessed ENRS (2022) against the reporting criteria for Detailed Investigation Reports listed in NSW EPA (2020) *Contaminated Land Management: Consultants Reporting on Contaminated Land*.

Section 1.3 of NSW EPA (2020) states that:

*The detailed site investigation report must be designed to provide information on the type, extent and level of contamination for the site and (as relevant) assessment of:*

- ▼ *primary sources of contamination, for example potentially contaminating activities, infrastructure (such as underground storage tanks, fuel line, sumps or sewer lines) or site practices*
- ▼ *contaminant dispersal in air, hazardous ground gases, surface water, groundwater, soil vapour, separate phase contaminants, sediments, infrastructure (e.g. concrete), biota, soil and dust*

- ▼ *contaminant characterisation and behaviour (volatility, leachability, speciation, degradation products and physical and chemical conditions on-site which may affect how contaminants behave)*
- ▼ *potential effects of contaminants on human health, including the health of occupants of built structures (for example arising from risks to service lines from hydrocarbons in groundwater, or risks to concrete from acid sulphate soils) and the environment*
- ▼ *potential and actual contaminant migration routes including potential preferential pathways*
- ▼ *the adequacy and completeness of all information available for use in the assessment of risk and for making decisions on management requirements, including an assessment of uncertainty*
- ▼ *the review and update of the conceptual site model from the preliminary and detailed site investigations.*

The Auditor is satisfied that the report adequately meets these broad objectives.

The Auditor's comparison of the report to the reporting criteria is appended to this advice (Table 6, page 35 below).

The report was found to satisfactorily meet the reporting guidelines with largely minor non-conformances which did not materially detract from the report findings. The Auditor notes the following items of non-compliance:

1. Procedures to be undertaken if the data does not meet the expected data quality objectives would have been beneficial to include prior to sampling.

Since adjusting the report to incorporate such a strategy would not affect the outcome of the assessment at this stage (sampling has been completed) there is no benefit to addressing this efficiency in the report. The concept should be included in future sampling, including validation of remedial actions.

## 4 ENRS (2022) Remedial Action Plan

The Auditor reviewed the draft report in previous Interim Advice<sup>5</sup>. The final report reviewed here was prepared with due consideration of the Auditor's comments.

### 4.1 Extent Of Remediation Required

ENRS identified seven areas (names AEC-R01 – AEC-R07) requiring soil remediation with contaminants and volume estimates summarised as follows:

- ▼ AEC-R01: 200 m<sup>3</sup> non-friable asbestos.
- ▼ AEC-R02: 40 m<sup>3</sup> heavy fraction hydrocarbons (TRH C<sub>16</sub> – C<sub>34</sub>).
- ▼ AEC-R03: 200 m<sup>3</sup> lead and non-friable asbestos.
- ▼ AEC-R04: 250 m<sup>3</sup> non-friable asbestos.

5 Phreatic Consulting (21.02.2022) *Interim Advice 3, AUDIT 48 Campbell Street, Gerringong, NSW: Review of Remedial Action Plan*. Document 22003 IA3 RAP

- ▼ AEC-R05: 2,350 m<sup>3</sup> lead and non-friable asbestos.
- ▼ AEC-R06: 300 m<sup>3</sup> lead, zinc and non-friable asbestos.
- ▼ AEC-R07: 840 m<sup>3</sup> pathogens and non-friable asbestos.

ENRS determined that the non-asbestos contaminants were not present at unacceptable concentrations based on the adopted screening criteria, but are coincident with asbestos impacts requiring remediation. The TRH impacted soil at AEC-R02 does not pose a health risk but exceeds ecological screening levels and is not suitable to remain at a residential development.

The total estimated volume of soil requiring remediation is 3,345 m<sup>3</sup>. ENRS estimated a corresponding tonnage of 5,686.5 tonnes (density of 1.7 tonnes per m<sup>3</sup>). The Auditor recommends estimating the tonnage based on a range of potential densities from 1.5 – 2.0, giving an estimated mass of 5,000 – 6,700 tonnes.

## 4.2 Summary Of Proposed Remediation

The Auditor summarises the proposed remedial work as follows:

- ▼ Review and compare the merits of three remedial methods (excavate and dispose to landfill, encapsulate on site, and manual picking to remove asbestos).
- ▼ Manual picking was determined not to be a feasible method of remediation at the site due to the clay soils making the method impractical and the lack of suitability for friable asbestos.
- ▼ The preferred remedial method recommended by ENRS is a combination of excavation and off-site disposal, and on-site encapsulation.
  - ▽ Soils from AEC-R02, AEC-R03 hotspot, AEC-R05 hotspots 1 and 2, AEC-R06 hotspot, and AEC-R07 hotspot to be disposed off-site to landfill.
  - ▽ Construction of an encapsulation cell in the western part of the Lot, outside the area which is proposed to be re-zoned. The encapsulation cell would be retained within existing agricultural land.
  - ▽ Soils from AEC-R01, AEC-R04 and the remaining soils from AEC-R03, AEC-R05, AEC-R06 and AEC-R07 are to be disposed to the encapsulation cell.
  - ▽ Complete capping construction of the cell.
- ▼ The remediation works are to be conducted by a Class A licensed asbestos removal contractor due to the established presence of friable asbestos at the site.
- ▼ Validation of the remedial areas will include:
  - ▽ Visual clearance by a licensed asbestos assessor.
  - ▽ Validation sampling of remediated surfaces through visual inspection in combination with sampling from a grid with one sampling point every 25 m<sup>2</sup> or part thereof. Large areas may have a reduced sampling density where statistically justifiable. Sampling is to include the collection of a 10L bulk soil sample to be sieved through a 7mm sieve to identify ACM fragments which are then weighed and measured to estimate the asbestos mass. A subsample is to be collected for laboratory analysis for AF/FA.

- ▼ Samples from remediation areas where other potential contaminants were apparent will also be analysed for those contaminants.
- ▼ The encapsulation cell construction will be validated through photographic documentation of emplacement of material and cap structure as well as survey of the top of waste and top of capping layer.

## 4.3 Technical Comment

The Auditor's review of the document identified no outstanding following technical aspects of the report which require comment or amendment.

## 4.4 Guideline Compliance

The Auditor has assessed ENRS (2022) against the reporting criteria for Remedial Action Plans listed in NSW EPA (2020) *Contaminated Land Management: Consultants Reporting on Contaminated Land*.

Section 1.5 of NSW EPA (2020) states that:

*The remedial action plan must:*

- ▼ *summarise the findings of the preliminary and detailed site investigations and risk assessment (where applicable), and present the refined conceptual site model*
- ▼ *document the identified contamination risks to human health and/or the environment*
- ▼ *set remediation objectives that ensure the remediated site will be suitable for its current and/or proposed use and which will result in no unacceptable risk to human health or to the environment and state remediation criteria*
- ▼ *define the extent of remediation required across the site*
- ▼ *assess options and remedial technologies to achieve the remediation objectives and select and justify a preferred approach, which must include the consideration of the principles of ecologically sustainable development*
- ▼ *document in detail all procedures and plans to reduce risks posed by contamination to acceptable levels for the proposed site use*
- ▼ *identify the need for and reporting requirements of remedial technology pilot trials (if applicable)*
- ▼ *establish the environmental safeguards required to complete the remediation in an environmentally acceptable manner, including consideration of the potential for off-site impacts (such as air quality, odour and aesthetics)*
- ▼ *address contingencies and unexpected finds protocols*
- ▼ *identify the necessary approvals and licences required by regulatory authorities including any items contained in development consent conditions*
- ▼ *clearly outline waste classification, handling and tracking requirements in accordance with the Guidelines for the NSW Site Auditor Scheme and Waste Classification Guidelines (EPA 2014)*

- ▼ *ensure remediation is consistent with relevant laws, policies (including planning instruments and policies) and guidelines and reference these in the remedial action plan*
- ▼ *identify how successful implementation of the remedial action plan will be demonstrated, for example the validation requirements by documentation of site works and sampling and analysis etc (when sampling and analysis is required, a validation sampling and analysis quality plan must be included, with clearly defined acceptance validation criteria indicating what statistics will be used and any trend analysis following remediation, i.e. Mann-Kendall test)*
- ▼ *identify the need for, and nature of, any long-term management and/or monitoring following the completion of remediation and, if required, provide an outline of an environmental management plan and include this in the remedial action plan.*

The Auditor is satisfied that the report adequately meets these broad objectives.

The Auditor's comparison of the report to the reporting criteria is appended to this advice (Table 5, page 26 below).

The report was found to satisfactorily meet the reporting guidelines with only minor non-conformances which did not materially detract from the report findings.

## 5 Auditor's Conclusions

The Auditor is satisfied that the site assessment meets all technical and NSW EPA reporting requirements and has been adequate to identify the areas of the site where contamination is present, and to delineate the extent of the impact to a degree sufficient to allow derivation of a remedial action plan for the site.

The Auditor is satisfied that the remedial action plan presents a viable remedial methodology for the site, appropriate to address the identified site contamination. Accordingly, implantation of the remedial action plan by suitably competent persons, and subject to satisfactory validation documentation, will be adequate to make the proposed rezoning site suitable for residential use.

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I trust that this letter meets your requirements. Should you have any questions relating to this letter please feel free to contact the undersigned on 0458 888 033 or [tim.chambers@phreatic.com.au](mailto:tim.chambers@phreatic.com.au).

Sincerely



**Tim Chambers**  
NSW EPA Accredited Site Auditor 1004.

## Scope of Audits

Whereas interim audit advice is provided to assist in the assessment and management of contamination issues at the site, interim audit advice should not be regarded as 'approval' of any proposed investigations or remedial activities, as any such approval is beyond the scope of an independent review.

NSW EPA (2017) *Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, describes the site assessment and audit process as:

2. The **'first tier' is the work of a contaminated site Consultant**, generally engaged by the site owner or developer. The contaminated site Consultant designs and conducts a site assessment and any necessary remediation and validation, and documents the processes and information in reports.
3. The **'second tier' is the site audit** which involves a site auditor independently and at arm's length reviewing, for one of the audit purposes stated in the CLM Act, the Consultant's assessment, remediation, validation and management plans or reports. The material outcomes of a site audit are a site audit report and site audit statement.

Section 53B of the CLM Act describes that site audits conducted by EPA accredited site auditors must take the following matters into account:

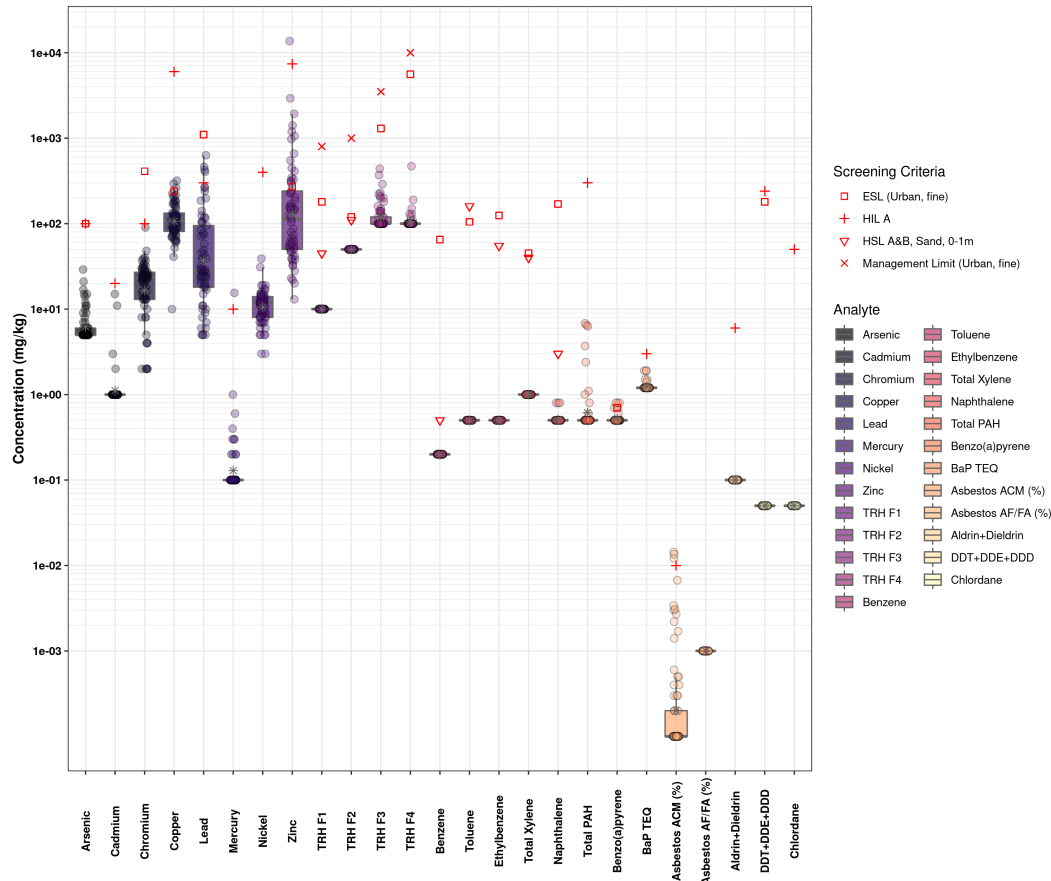
- ▼ the provisions of the CLM Act and the CLM Regulations;
- ▼ the provisions of any environmental planning instruments applying to the site; and
- ▼ the guidelines made or approved by the EPA.

Therefore, the contaminated land Consultant and other relevant parties should be satisfied that the work to be conducted conforms to all appropriate regulations, standards and guidelines and is suitable based on the site history and the proposed land use.



## Box Plots

Box width is proportional to the square root of the number of samples.  
Individual data points overlaid as circles. Mean indicated by an asterisk.



## Observations

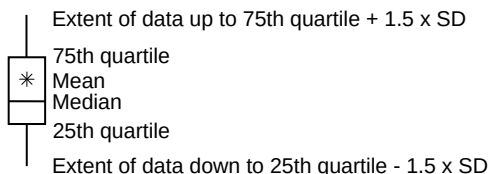
Lead and zinc were reported in some locations in excess of the health based screening criteria. Mercury was reported at one location in excess of the methyl mercury screening criteria but below the inorganic mercury screening criteria. Asbestos as ACM in soil was reported at concentrations in excess of the health based screening criteria. Benzo(a)pyrene was reported in marginal exceedence of the ecological screening levels (ESLs) at two locations due to a raised laboratory limit of reporting. No positive detection of benzo(a)pyrene in excess of the ESLs was reported.

No other contaminant concentrations were reported above the screening criteria. The criteria presented for pesticides shows only key common pesticides for clarity, although no pesticide compounds were reported at concentrations in excess of the laboratory limits of reporting.

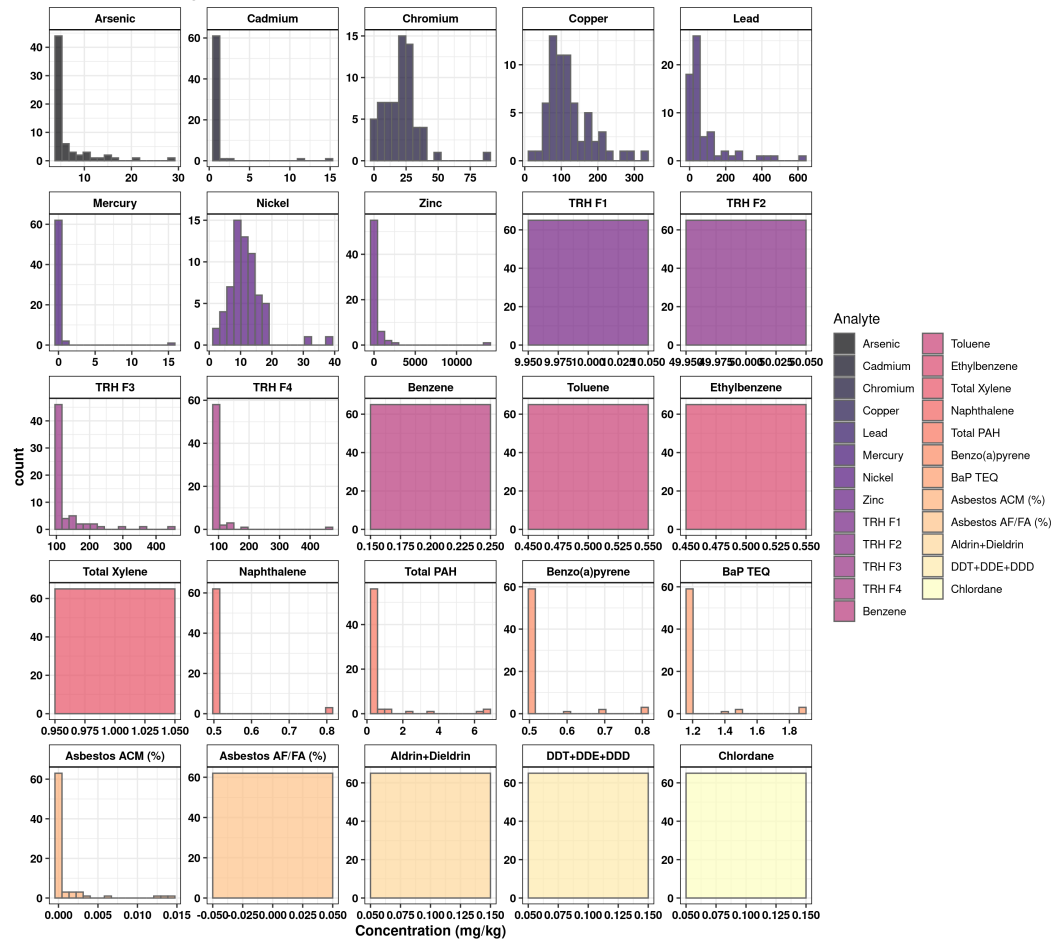
Analytes with identical values for all results, including the case where all results are below the laboratory limit of reporting, plot in a single bin on the histograms and show as a single block of colour.

Graphs produced by the Auditor using the open source software packages R and RStudio.

R Core Team (2017). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.  
RStudio Team (2020). *RStudio: Integrated Development Environment for R*. RStudio, PBC, Boston, MA URL <http://www.rstudio.com/>.



## Contaminant Histograms



## FIGURE 1 - DSI RESULTS SUMMARY

### Contaminated Site Audit

48 Campbell Street, Gerringong, NSW

Project 22003

Table 2: NSW EPA (2020) Reporting Requirements - Detailed Site Investigation (ENRS, 2022, FINAL)

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
<b>Document Control</b>			
Date, version number, author and reviewer (including certification details) and who commissioned the report	✓	p. ii	
<b>Executive Summary</b>			
Background	✓	pp. iii - vi	
Objectives of the investigation	✓	pp. iii - vi	
Scope of Work	✓	pp. iii - vi	
A summary of key findings, observations and sampling results (if available)	✓	pp. iii - vi	
Summary of conclusions and recommendations	✓	pp. iii - vi	
<b>Objectives</b>			
The objectives of the investigation/report and the broader objectives for the site/investigation	✓	Section 1	
<b>Scope of Work</b>			
Scope of work performed (and work not undertaken where relevant)	✓	Section 1	
<b>Site Identification</b>			
Site identification and detail items from ASC NEPM Field Checklist 'Site information' sheet			
Site name or description	✓	Section 2	
Street address (street number & name, suburb), town/city	✓	Section 2	
Property description (e.g. Section, hundred, plan, parcel)	✓	Section 2	
Current certificates of title (identifying portion or full title)	X		Previously provided
Latitude, longitude (centre of site, or site corners for regular shapes)	✓	Section 2	
Current owner(s)	X		Works commissioned by current owner
Current occupier(s)	X		
Site area and dimensions	✓	Section 2	
Local government authority	✓	Section 2	
Current zoning (planning)	✓	Section 2	
Locality map	✓	Figure 1	
Trigger for assessment (e.g. Change in land use)	✓	Section 1	
State or local government statutory controls assigned to the site			

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
Legal permission to access site required/obtained	X		Not documented but works commissioned by current owner
Consent of adjoining land owners and/or occupiers to access land (if required)	n/a		
<b>Site History</b> Site history items from ASC NEPM Field Checklist 'Site information' sheet	✓	Section 3	Comprehensive summary based on PSI
<b>Site Conditions and Surrounding Environment</b>			Site condition and surrounding environment items from ASC NEPM Field Checklist 'Site information' sheet
site inspection (date, by whom)	✓	Section 4	
topography of site and in relation to surrounding land	✓	Section 4	
elevation	✓	Section 4	
position on slope (e.g. crest, upper slope, mid slope, lower slope, flat), including direction	✓	Section 4	
quantification of slope (if required) as percentage slope	✓	Section 4	
summary of local meteorology - survey of climatic information from nearby weather stations (e.g. annual range in monthly temperature, precipitation, seasonal variations)	✓	Section 4	
climatic conditions (during fieldwork)	✓	Section 4	
current land use	✓	Section 4	
surrounding land uses (north, south, east, west) noting apparent condition	✓	Section 4	
density of residential use in surrounding area	✓	Section 4	
boundary conditions	✓	Section 4	
location and conditions of all visible features, including current buildings and surface structures, roads, foundations, positions of former buildings, tanks, pits, wells, drains and bores	✓	Section 4	
site building information:	✓	Section 4	
— occupancy and use of buildings	✓	Section 4	
— age of buildings	✓	Section 4	
— construction of buildings including materials (e.g. wood frame), openings (e.g. windows, doors), and height (e.g. one storey, multi-storey)	✓	Section 4	
— number of storeys	✓	Section 4	
— height of storeys	✓	Section 4	
— foundation type (e.g. basement, crawlspace, slab on ground), if combination	✓	Section 4	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
then percentage			
— depth below grade to base of foundation	✓	Section 4	
— foundation construction for both floor and subsurface walls (e.g. poured concrete, concrete block, brick, timber)	✓	Section 4	
— general condition of foundation (cracks, openings)	✓	Section 4	
— elevator shafts	✓	Section 4	
— sub-slab ventilation systems or moisture vapour barriers below buildings	✓	Section 4	
— sumps or drains or wells inside buildings	✓	Section 4	
— attached garage	✓	Section 4	
— below building parking	✓	Section 4	
— chemical use and storage	✓	Section 4	
— type of cooling and heating systems (e.g. natural gas, oil, radiant, steam, electrical)	✓	Section 4	
— equipment location (e.g. basement, crawl space, roof)	✓	Section 4	
— air intake and exhaust units	✓	Section 4	
— source of return air (e.g. inside air, outside air, combination)	✓	Section 4	
— system design consideration relation to indoor air pressure (e.g. positive pressure is often the case for commercial buildings)	✓	Section 4	
condition and type of surface cover e.g. bare ground, asphalt, concrete, gravel etc and estimate of percentage of site occupied by buildings, landscaped areas, paved or non-paved areas	✓	Section 4	
chemical storage and transfer areas, including the presence of waste or chemical containers	✓	Section 4	
underground storage tanks (USTs)- product stored, volume, direct or remote fill points, dispenser bowsers, contained or uncontained fill points, underground piping and ventilation points, dip stick volume gauge, age of tank, records of spills or stock loss	✓	Section 4	
above ground storage tanks (ASTs)- product stored, volume, remote fill, bunded or unbunded containment area, staining within bund, staining outside bund, bund plug in place, staining around bund plug, nearby drains, record of spills or stock losses	✓	Section 4	
locations of settlement ponds	✓	Section 4	
description and location of services and	✓	Section 4	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
utilities including on-site septic systems			
identification of electrical transformers/substation/capacitors	✓	Section 4	
odours	✓	Section 4	
visible signs of contamination such as discolouration or staining on the surface of soil or water, bare soil patches - on-site and at site boundaries	✓	Section 4	
presence of any stockpiled material, imported soil or fill material as well as any signs of settlement, subsidence or disturbed ground	✓	Section 4	
vegetation type and extent of cover (e.g. scattered, sparse, dense, absent, invasive, native)	✓	Section 4	
condition of vegetation (noting visibly distressed, disturbed or dead vegetation)	✓	Section 4	
assessment of soil loss or deposition that has occurred in the past and evaluation of the future erosion potential	✓	Section 4	
visible signs of erosion (on and off-site)	✓	Section 4	
surface water bodies (e.g. lakes, rivers, streams, wetlands), fresh/marine and distance from site	✓	Section 4	
surface water drainage (e.g. drainage bores, soak wells, sumps) and run-off and identification of ponding areas (and potential for flooding)	✓	Section 4	
direction of flow of water runoff from the site and adjacent properties	✓	Section 4	
depth of any standing water, the direction and rate of flow of rivers, streams or canals, together with their flood levels and any tidal inundations	✓	Section 4	
surface water and groundwater use on site including rate and location of abstractions (current and historical)	✓	Section 4	
evidence of possible naturally occurring contaminants	✓	Section 4	
identification of environmentally sensitive or significant features or habitats	✓	Section 4	
evidence chemical substances have migrated or are likely to have migrated to a neighbouring site and is or is likely to be causing contamination of the neighbouring property	✓	Section 4	
photographs of site and surrounding adjacent land, showing significant features, topography, nature of surface and existing structures)	✓	Section 4	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
differences between current site condition and site history	✓	Section 4	
<b>Conceptual Site Model</b>			
<u>All stages of reporting</u>			
Regional and local geology, hydrogeology and hydrology items from ASC NEPM Field Checklist 'CSM' sheet			
description of regional and site specific local geology records	✓	Section 2	
geophysical data	✗		Minor omission
drilling logs which clearly identify imported and locally derived fill (including refuse) and natural stratum	✓	Appendix D	
well logs including strata, casing or construction details and water level, quality and pump/discharge rate information	n/a		
aquifer types (unconfined, semi-confined, confined) and aquitards/aquicludes present	✓	Section 2	
direction and rate of groundwater flow	✓	Section 2	
values for soil bulk density and porosity	✗		Minor omission – relevant for bulk excavation
storativity or storage	✗		Not required at this stage – no groundwater assessment
soil organic matter content	✗		Not required unless contaminant fate and transport assessment is needed
cation exchange capacity	✓	Appendix A	
soil pH	✓	Appendix A	
redox potential measured in situ	✗		Not required unless contaminant fate and transport assessment is needed
regional and site-specific hydrogeologic information, including groundwater quality	✗		Not required at this stage – no groundwater assessment
hydraulic and piezometric heads and hydraulic gradients	✗		Not required at this stage – no groundwater assessment
Basic assessment of hydraulic conductivity and porosities	✗		Not required at this stage – no groundwater assessment
transmissivity	✗		Not required at this stage – no groundwater assessment
Reported depths to groundwater in unconfined and confined aquifers	✗		Not required at this stage – no groundwater assessment
Regional groundwater flow direction	✓	Section 2	
rate and direction of groundwater flow	✓	Section 2	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
current usage/resource potential			
existing monitoring wells and records of registered production wells or survey of surrounding landholders to determine the existence of wells where the resource may potentially be used in the vicinity of the site	✓	Section 2	
identify beneficial use of aquifers	✓	Section 2	
Details of any future realistic use	n/a		
Details of any relevant environmental beneficial uses	✓	Section 2	
Searches of databases and other sources of information for receptor surface water bodies such as wetlands, streams, rivers, open drains and oceans	✓	Section 2	Adequate summary
flow paths for surface runoff	✓	Section 2	
Identifying recharge sources, discharge points and other hydraulic boundaries	✗		Not required at this stage – no groundwater assessment
identification of Acid Sulfate Soil risk areas	✓	Section 2	
List of potential contaminants of concern	✓	Section 5	
Potential and known sources of contamination, on- and offsite	✓	Section 5	
Mechanism of contamination (e.g. 'top down' spill, sub-surface release from tank or pipe, atmospheric, deposition etc.)	✓	Section 5	
Potentially affected environmental media	✓	Section 5	
Consideration of spatial and temporal variations (e.g. weather).	✓	Section 5	
Actual or potential exposure pathways. Also consider preferential pathways for contaminant migration.	✓	Section 5	
Human and ecological receptors	✓	Section 5	
Frequency of exposure	✗		Minor omission – default NEPC (2013) exposure assumptions inherent in adoption of HIL and HSL screening criteria
Linkage of source, pathway and receptor assessed in terms of potentially complete pathways and likelihood	✓	Section 5	
Discussion on multiple lines of evidence (for complex sites)	n/a		
<u>Sampling analysis and quality plan, detailed site investigation, site-specific risk assessment, remedial action plan, detailed environmental management plan, ongoing</u>			



Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
<u>monitoring</u>			
Previous site investigations, contaminant characteristics and migration items from ASC NEPM Field Checklist 'CSM' sheet	✓	Section 3	
Conceptual site model items from ASC NEPM Field Checklist 'CSM' sheet	✓	Section 5	
Meteorological data items from ASC NEPM Field Checklist 'CSM' sheet	✓	Section 2	
Sources of variability	✓	Section 12	
Data gap identification	✓	Section 12	
Sensitivity analysis where modelling is undertaken Refer to NEPM Schedule B2 Section 4 for the requirements for developing a CSM	n/a		
Presentation in accordance with ASC NEPM Schedule B2 section guide in presenting conceptual site models	✓	Sections 5 & 12 and Figure 6	
<b>Data Quality Objectives</b> (if sampling is undertaken)			Refer to ASC NEPM Schedule B2 Appendix B for a comprehensive guide in reporting data quality objectives
Step 1: State the problem	✓	Section 7	
Step 2: Identify the decision/goal of the study	✓	Section 7	
Step 3: Identify the information inputs	✓	Section 7	
Step 4: Define the boundaries of the study	✓	Section 7	
Step 5: Develop the analytical approach	✓	Section 7	
Step 6: Specify performance or acceptance criteria	✓	Section 7	
Step 7: Develop the plan for obtaining data	✓	Section 7	
Are the data quality objectives linked to the conceptual site model, and have they been updated with the conceptual site model?	✓	Section 7	
<b>Sampling and Analysis Plan and Sampling Methodology</b> (if sampling is undertaken)			See SAQP table Table 3
<b>Quality assurance/quality control data evaluation</b> (if sampling is undertaken)			See QA/QC table Table 4
<b>Field and analytical results</b> (if sampling is undertaken)			
A table(s) of analytical results that:			
shows all essential details such as sample identification numbers and sampling depth	✓	Tables 19 – 21	
shows assessment criteria	✓	Tables 19 – 21	
highlights all results exceeding any assessment criteria	✓	Tables 19 – 21	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
Summary/discussion of the analytical results table	✓	Section 10	
Sample descriptions for all media where applicable (e.g. soil, sediment, surface water, groundwater, soil vapour, ground gas, indoor air and biota)	✓	Section 10 and Appendix D	
Test pit or bore logs (well construction details where appropriate for example groundwater level expressed in Australian height datum)	✓	Appendix D	
Site plan showing all sample locations	✓	Figures 7 – 12	
Site plan(s) showing the extent of soil and groundwater contamination (if known)	✓	Figures 7 – 12	
<b>Conclusions and Recommendations</b>			
Summary of all findings and discussion of results	✓	Section 13	
Conclusions addressing the stated objectives	✓	Section 13	
Assumptions used in reaching the conclusions.	✓	Section 13	
Extent of uncertainties in the results (quantified where possible)	✓	Section 12	
Recommendations for further work (if appropriate)	✓	Section 13	

Table 3: NSW EPA (2020) Reporting Requirements – Sampling and Analysis Quality Plan (ENRS, 2022 FINAL, where not duplicated)

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
A strategy to achieve pre-determined data quality objectives, including the sampling strategy and justification for the sampling design	✓	Section 8	
Procedures to be undertaken if the data does not meet the expected data quality objectives	✗		Beneficial to minimise the need for resampling
Sampling and analysis plan and methodology items from ASC NEPM Field Checklist 'SAP, QAQC' sheet	✓	Section 8	Adequate
Refer to the updated conceptual site model and identified data gaps to determine sampling locations (to ensure source-pathway-receptors have been considered)	✓	Section 12	
<b>Data quality indicators (sampling and analysis quality plan)</b> including details of the required quality assurance/quality control samples for the project (e.g. field blank, rinsate blank, trip blank, laboratory prepared trip spikes), including acceptable limits for field quality assurance/quality control	✓	Section 9	Refer to ASC NEPM Schedule B2 Appendix B for a comprehensive guide in reporting data quality objectives

Table 4: NSW EPA (2020) Reporting Requirements – Quality Assurance and Quality Control ENRS, 2022 FINAL)

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
<b>Any reports where sampling has been undertaken</b>			
Details of sampling team	✓	Section 4	PARCC
Reference to sampling plan/method, including any deviations from it – sampling and analysis quality plan	✓	Section 8	PARCC
Any information that could be required to evaluate measurement uncertainty for subsequent testing (analysis)	✓	Section 8	PARCC
Decontamination procedures carried out between sampling events	✓	Section 8	PARCC
Sampling Log: Logs for each sample collected, including date, time, location (with GPS coordinates if possible), sampler, duplicate samples, chemical analyses to be performed, site observations and weather/environmental (i.e. surroundings) conditions.	✗		PARCC Adequate data in tables and bore logs. Would benefit from compilation into a sample log
Chain of custody fully identifying – for each sample – the sampler, nature of the sample, collection date, analyses to be performed, sample preservation method, departure time	✓	Appendix A-C	PARCC

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
from the site and dispatch courier(s) (where applicable)			
Field quality assurance/quality control results (e.g. field blank, rinsate blank, trip blank, laboratory prepared trip spike)	✓	Section 9	PARCC
Sample splitting techniques – subsampling, containers/preservation (ensure unique ID for subsequent samples provided)	✓	Section 9	PARCC
Statement of duplicate frequency	✓	Section 9	PARCC
Background sample results	n/a		PARCC
Field instrument calibrations (when used)	✓	Appendix F	PARCC
Sampling devices and equipment	✓	Section 8	PARCC
<b>Any reports where laboratory analysis has been undertaken</b>			
A copy of signed chain-of-custody forms acknowledging receipt date, time and temperature and identity of samples included in shipments	✓	Appendix A-C, G	PARCC
Record of holding times and a comparison with method specifications	✓	Appendix A-C, G	PARCC
Analytical methods used, including any deviations	✓	Appendix A-C, G	PARCC
Laboratory accreditation for analytical methods used, also noting any methods used which are not covered by accreditation	✓	Appendix A-C, G	PARCC
Laboratory performance for the analytical method using inter-laboratory duplicates	✓	Appendix A-C, G	
Surrogates and spikes used throughout the full method process, or only in parts. Results are corrected for the recovery	✓	Appendix A-C, G	PARCC
A list of what spikes and surrogates were run with their recoveries and acceptance criteria (tabulate)	✓	Appendix A-C, G	PARCC
Practical quantification limits (PQL)	✓	Appendix A-C, G	PARCC
Reference laboratory control sample (LCS) and check results	✓	Appendix A-C, G	PARCC
Laboratory duplicate results (tabulate)	✓	Appendix A-C, G	PARCC
Laboratory blank results (tabulate)	✓	Appendix A-C, G	PARCC
Results are within control chart limits	✓	Appendix A-C, G	PARCC
Evaluation of all quality assurance/control information listed above against the stated data quality objectives, including a quality assurance/control data evaluation	✓	Section 9	PARCC

NOTE: Relevant data quality aspects are flagged as black. Non-applicable aspects are greyed out.

P Precision  
A Accuracy  
R Representativeness

Table 5: NSW EPA (2020) Reporting Requirements – Remedial Action Plan (ENRS, 2022, FINAL)

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
<b>Document Control</b>			
Date, version number, author and reviewer (including certification details) and who commissioned the report	✓	p. i	
<b>Executive Summary</b>			
Background	✓	p. ii	
Objectives of the investigation	✓	p. ii	
A summary of selected scope of remediation works	✓	p. ii	
<b>Objectives</b>			
The objectives of the remediation	✓	Section 1	
<b>Scope of Work</b>			
Summary of the scope of work	✓	Section 1	
<b>Site Identification</b>			Site identification and detail items from ASC NEPM Field Checklist 'Site information' sheet
Site name or description	✓	Section 2	
Street address (street number & name, suburb), town/city	✓	Section 2	
Property description (e.g. Section, hundred, plan, parcel)	✓	Section 2	
Current certificates of title (identifying portion or full title)	✗		Not required in RAP given previous reports
Latitude, longitude (centre of site, or site corners for regular shapes)	✓	Section 2	
Current owner(s)	✓	Section 2	
Current occupier(s)	✓	Section 2	
Site area and dimensions	✓	Section 2	
Local government authority	✓	Section 2	
Current zoning (planning)	✓	Section 2	
Locality map	✓	Figure 1	
Trigger for assessment (e.g. Change in land use)	✓	Section 1	
State or local government statutory controls assigned to the site	✓	Section 1	
Legal permission to access site required/obtained	✓	Section 2	
Consent of adjoining land owners and/or occupiers to access land (if required)	n/a		
<b>Site History</b>			Site history items from ASC NEPM Field Checklist 'Site information'

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
			sheet
Adequate summary provided based on previous reports	✓	Section 3	
<b>Site Conditions and Surrounding Environment</b>			Site condition and surrounding environment items from ASC NEPM Field Checklist 'Site information' sheet
site inspection (date, by whom)	✓	Section 5	
topography of site and in relation to surrounding land	✓	Section 5	
elevation	✓	Section 5	
position on slope (e.g. crest, upper slope, mid slope, lower slope, flat), including direction	✓	Section 5	
quantification of slope (if required) as percentage slope	✓	Section 5	
summary of local meteorology - survey of climatic information from nearby weather stations (e.g. annual range in monthly temperature, precipitation, seasonal variations)	✓	Section 5	
climatic conditions (during fieldwork)	✓	Section 5	
current land use	✓	Section 5	
surrounding land uses (north, south, east, west) noting apparent condition	✓	Section 5	
density of residential use in surrounding area	✓	Section 5	
boundary conditions	✓	Section 5	
location and conditions of all visible features, including current buildings and surface structures, roads, foundations, positions of former buildings, tanks, pits, wells, drains and bores	✓	Section 5	
site building information:	✓	Section 5	
— occupancy and use of buildings	✓	Section 5	
— age of buildings	✓	Section 5	
— construction of buildings including materials (e.g. wood frame), openings (e.g. windows, doors), and height (e.g. one storey, multistorey)	✓	Section 5	
— number of storeys	✓	Section 5	
— height of storeys	✓	Section 5	
— foundation type (e.g. basement, crawlspace, slab on ground), if combination then percentage	✓	Section 5	
— depth below grade to base of foundation	✓	Section 5	
— foundation construction for both floor and subsurface walls (e.g. poured concrete,	✓	Section 5	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
concrete block, brick, timber)			
— general condition of foundation (cracks, openings)	✓	Section 5	
— elevator shafts	✓	Section 5	
— sub-slab ventilation systems or moisture vapour barriers below buildings	✓	Section 5	
— sumps or drains or wells inside buildings	✓	Section 5	
— attached garage	✓	Section 5	
— below building parking	✓	Section 5	
— chemical use and storage	✓	Section 5	
— type of cooling and heating systems (e.g. natural gas, oil, radiant, steam, electrical)	✓	Section 5	
— equipment location (e.g. basement, crawl space, roof)	✓	Section 5	
— air intake and exhaust units	✓	Section 5	
— source of return air (e.g. inside air, outside air, combination)	✓	Section 5	
— system design consideration relation to indoor air pressure (e.g. positive pressure is often the case for commercial buildings)	✓	Section 5	
condition and type of surface cover e.g. bare ground, asphalt, concrete, gravel etc and estimate of percentage of site occupied by buildings, landscaped areas, paved or non-paved areas	✓	Section 5	
chemical storage and transfer areas, including the presence of waste or chemical containers	✓	Section 5	
chemical storage and transfer areas, including the presence of waste or chemical containers	✓	Section 5	
underground storage tanks (USTs)- product stored, volume, direct or remote fill points, dispenser bowsers, contained or uncontained fill points, underground piping and ventilation points, dip stick volume gauge, age of tank, records of spills or stock loss	✓	Section 5	
above ground storage tanks (ASTs)- product stored, volume, remote fill, bunded or unbunded containment area, staining within bund, staining outside bund, bund plug in place, staining around bund plug, nearby drains, record of spills or stock losses	✓	Section 5	
locations of settlement ponds	✓	Section 5	
description and location of services and utilities including on-site septic systems	✓	Section 5	



Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
identification of electrical transformers/substation/capacitors	✓	Section 5	
odours	✓	Section 5	
visible signs of contamination such as discolouration or staining on the surface of soil or water, bare soil patches - on-site and at site boundaries	✓	Section 5	
presence of any stockpiled material, imported soil or fill material as well as any signs of settlement, subsidence or disturbed ground	✓	Section 5	
vegetation type and extent of cover (e.g. scattered, sparse, dense, absent, invasive, native)	✓	Section 5	
condition of vegetation (noting visibly distressed, disturbed or dead vegetation)	✓	Section 5	
assessment of soil loss or deposition that has occurred in the past and evaluation of the future erosion potential	✓	Section 5	
visible signs of erosion (on and off-site)	✓	Section 5	
surface water bodies (e.g. lakes, rivers, streams, wetlands), fresh/marine and distance from site	✓	Section 5	
surface water drainage (e.g. drainage bores, soak wells, sumps) and run-off and identification of ponding areas (and potential for flooding)	✓	Section 5	
direction of flow of water runoff from the site and adjacent properties	✓	Section 5	
depth of any standing water, the direction and rate of flow of rivers, streams or canals, together with their flood levels and any tidal inundations	✓	Section 5	
surface water and groundwater use on site including rate and location of abstractions (current and historical)	✓	Section 5	
evidence of possible naturally occurring contaminants	✓	Section 5	
identification of environmentally sensitive or significant features or habitats	✓	Section 5	
evidence chemical substances have migrated or are likely to have migrated to a neighbouring site and is or is likely to be causing contamination of the neighbouring property	✓	Section 5	
photographs of site and surrounding adjacent land, showing significant features, topography, nature of surface and existing structures)	✓	Section 5	
differences between current site condition	✓	Section 5	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
and site history			
<b>Remediation Criteria</b>			Refer to HEPA (2018) PFAS National Environmental Management Plan (NEMP) or guidance on environmental levels that indicate the need for action.
Table listing all selected remediation criteria and references	✓	Tables 7 – 9	
Rationale for the selection of criteria, including assumptions and limitations of the criteria and any deviations from the approved guidelines.	✓	Section 10	
Rationale for any site-specific remediation criteria developed through a site-specific risk assessment. Refer to ASC NEPM Schedules B4, B5a, B5b, B5c, B6 and B7	✓	Section 10	
<b>Results</b>			
A summary is enough if detailed information was included in an available referenced previous report	✓	Section 3	
Tabulated previous results relating to the remedial action plan that:	✓	Tables 16 – 18	
show all essential details such as sample identification numbers and sampling depth	✓	Tables 16 – 18	
show remediation assessment criteria	✓	Tables 16 – 18	
highlight all results exceeding any remediation criteria	✓	Tables 16 – 18	
Sample descriptions for all media where applicable (e.g. soil, sediment, surface water, groundwater, biota)	✓	Tables 16 – 18	
Site plan showing all sample locations	✗		Minor omission given remediation area summary
Site plan(s) showing the extent of soil and groundwater contamination exceeding selected remediation criteria for each sampling depth, including sample identification numbers and sampling depths of all samples analysed	✓	Figure 6	
Site plan(s) showing the proposed extent of remediation	✓	Figures 5 – 8	
<b>Site Characterisation</b>			
A summary is enough if detailed information was included in an available referenced previous report	✓	Section 6	
Assessment of types of all environmental contamination	✓		Soil and surface water assessed. Insufficient soil impact with mobile contaminants to warrant

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
			groundwater assessment. No volatile contaminants identified on site.
Assessment of extent of all identified contamination, including off-site areas	✓		
<b>Conceptual Site Model</b>			
<u>All stages of reporting</u>			
Regional and local geology, hydrogeology and hydrology items from ASC NEPM Field Checklist 'CSM' sheet			
description of regional and site specific local geology records	✓	Section 2	
geophysical data	n/a		
drilling logs which clearly identify imported and locally derived fill (including refuse) and natural stratum	✓	Appendix B	
well logs including strata, casing or construction details and water level, quality and pump/discharge rate information	n/a		
aquifer types (unconfined, semi-confined, confined) and aquitards/aquicludes present	✓	Section 2	
direction and rate of groundwater flow	✓	Section 2	
values for soil bulk density and porosity	✓	Table 5	
storativity or storage	n/a		
soil organic matter content	n/a		
cation exchange capacity	n/a		
soil pH	n/a		
redox potential measured in situ	n/a		
regional and site-specific hydrogeologic information, including groundwater quality	✓	Section 2	
hydraulic and piezometric heads and hydraulic gradients	n/a		
Basic assessment of hydraulic conductivity and porosities	n/a		
transmissivity	n/a		
Reported depths to groundwater in unconfined and confined aquifers	✓	Section 2	
Regional groundwater flow direction	✓	Section 2	
rate and direction of groundwater flow	✓	Section 2	
current usage/resource potential	✓	Section 2	
existing monitoring wells and records	✓	Section 2	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
of registered production wells or survey of surrounding landholders to determine the existence of wells where the resource may potentially be used in the vicinity of the site			
identify beneficial use of aquifers	n/a		
Details of any future realistic use	n/a		
Details of any relevant environmental beneficial uses	n/a		
Searches of databases and other sources of information for receptor surface water bodies such as wetlands, streams, rivers, open drains and oceans	✓	Section 2	
flow paths for surface runoff	✓	Section 2	
Identifying recharge sources, discharge points and other hydraulic boundaries	n/a		
identification of Acid Sulfate Soil risk areas	✓	Section 2	
List of potential contaminants of concern	✓	Section 7	
Potential and known sources of contamination, on- and offsite	✓	Section 7	
Mechanism of contamination (e.g. 'top down' spill, sub-surface release from tank or pipe, atmospheric, deposition etc.)	✓	Section 7	
Potentially affected environmental media	✓	Section 7	
Consideration of spatial and temporal variations (e.g. weather).	✓	Section 7	
Actual or potential exposure pathways. Also consider preferential pathways for contaminant migration.	✓	Section 7	
Human and ecological receptors	✓	Section 7	
Frequency of exposure	✗		Default NEPC (2013) exposure assumptions inherent in the adoption of HIL and HSL screening criteria
Linkage of source, pathway and receptor assessed in terms of potentially complete pathways and likelihood	✓	Section 7	
Discussion on multiple lines of evidence (for complex sites)	n/a		
<u>Sampling analysis and quality plan, detailed site investigation, site-specific risk assessment, remedial action plan, detailed environmental management plan, ongoing monitoring</u>			
Previous site investigations, contaminant	✓	Sections 3 & 7	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
characteristics and migration items from ASC NEPM Field Checklist 'CSM' sheet			
Conceptual site model items from ASC NEPM Field Checklist 'CSM' sheet	✓	Sections 2 & 7	
Meteorological data items from ASC NEPM Field Checklist 'CSM' sheet	✓	Section 5	
Sources of variability	✓	Section 7	
Data gap identification	✓	Section 7	
Sensitivity analysis where modelling is undertaken	n/a		
Refer to NEPM Schedule B2 Section 4 for the requirements for developing a CSM			
Presentation in accordance with ASC NEPM Schedule B2 section guide in presenting conceptual site models	✓		
<b>Remediation Options Assessment and Remediation Strategy</b>			
Remediation objectives (these should already be defined under the general objectives and then the criteria derived.)	✓	Section 8	
Assessment of possible remedial options and how risk can be reduced	✓	Section 8	
Rationale for the selection of recommended remedial option, in accordance with the preferred hierarchy of site remediation and/or management set out in Key Principles for Remediation and Management of Contaminated Sites of the ASC NEPM Toolbox	✓	Section 8	
Description of the remediation works to be undertaken	✓	Section 11	
A validation plan which includes proposed testing to validate the site during/after remediation, including SAQP as per Table 2.2	✓	Section 18n/	See SAQP table – Table 6
Confirmation that waste imported onto the site is lawful	n/a		
Contingency plan if the selected remedial strategy fails	✓	Section 18	
Interim site management plan before remediation, including fencing, erection of warning signs, stormwater diversion, etc.	n/a		
Site management plan requirements (operational phase):	✓	Section 14	
site stormwater management plan	✓	Section 14	
soil management plan, including material tracking	✓	Section 14	
noise control plan	✓	Section 14	

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
dust control plan, including wheel wash (where applicable)	✓	Section 14	
odour control plan	✓	Section 14	
work health and safety plan	✓	Section 14	
remediation schedule	✓	Section 14	
hours of operation	✓	Section 14	
contingency plans to respond to site incidents, to remove potential effects on surrounding environment and community	✓	Section 14	
Description of regulatory compliance requirements such as licences and approvals or financial assurance	✓	Section 16	
Names and phone numbers of appropriate personnel to contact during remediation	✓	Section 16	
Community relations plans (where applicable)	n/a		
Outline of environmental management plan for ongoing management of contamination at the site (if needed)	✗		May be required if entombed asbestos concentrations exceed HSLs.
<b>Waste Management (if Applicable)</b>			Refer to the Site Auditor Guidelines section 4.3.7 Waste management for waste management requirements
Waste classification reporting requirements in accordance with EPA Waste Classification Guidelines (see Table 2(d))	✓	Section 15	
Description of material handling and tracking plan	✓	Section 15	
Statements regarding materials being disposed via appropriately licenced facility or re-used under an order or exemption	✓	Section 15	
Waste disposal dockets or other waste documentation for any disposed waste	n/a		
<b>Remediation Technology Pilot Trail (if applicable)</b>			
Details and results from treatability trials and Proof of Performance testing, to demonstrate the remediation option chosen was suitable for the site (for major remediation projects). If trials have not been completed, include an indicative scope of the proposed trial.	n/a		
<b>Conclusions and Recommendations</b>			
A list summarising the activities and physical changes proposed for the site	✓	Section 19	
Conclusions addressing the stated objectives	✓	Section 19	
Assumptions used in reaching the conclusions.	✗		Discussion regarding factors which may impact remediation is required, including but not limited to potentially greater volumes of

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
			impacted material being encountered.
A clear statement as to why the consultant considers the site can be made suitable for the proposed use if the remedial action plan is implemented	✓	Section 19	
A summary of proposed limitations and constraints on the use of the site post remediation and proposed environmental management plan for long-term management of residual contamination at the site (where applicable)	X		Required in relation to the proposed containment cell
Recommendations for further work, if appropriate	✓	Section 19	

Table 6: NSW EPA (2020) Reporting Requirements – Sampling and Analysis Quality Plan (ENRS RAP, 2022, where not included in previous table)

Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
<b>Sampling and analysis strategy and sampling methodology</b>			Refer to ASC NEPM Schedule B2 sections 5 and 6 for sampling and analysis plan and sampling methodology Refer to Sampling Design Guidelines for additional information on sampling design
Sampling and analysis data quality objectives.	✓	Section 18	
Step 1: State the problem	✓	Section 18	
Step 2: Identify the decision/goal of the study	✓	Section 18	
Step 3: Identify the information inputs	✓	Section 18	
Step 4: Define the boundaries of the study	✓	Section 18	
Step 5: Develop the analytical approach	✓	Section 18	
Step 6: Specify performance or acceptance criteria	✓	Section 18	
Step 7: Develop the plan for obtaining data	✓	Section 18	
Are the data quality objectives linked to the conceptual site model, and have they been updated with the conceptual site model?	✓		
A strategy to achieve pre-determined data quality objectives, including the sampling strategy and justification for the sampling design	✓	Section 18	
Procedures to be undertaken if the data does not meet the expected data quality objectives	✓	Section 18	
Sampling and analysis plan and methodology items from ASC NEPM Field Checklist 'SAP, QAQC' sheet	✓	Section 18	Adequate



Requirement in NSW EPA (2020)	Present	Location in Document	Auditor Comment
Refer to the updated conceptual site model and identified data gaps to determine sampling locations (to ensure source-pathway-receptors have been considered)	✓	Section 18	Adequate
<b>Data quality indicators (sampling and analysis quality plan)</b> including details of the required quality assurance/quality control samples for the project (e.g. field blank, rinsate blank, trip blank, laboratory prepared trip spikes), including acceptable limits for field quality assurance/quality control	✓	Section 18	Refer to ASC NEPM Schedule B2 Appendix B for a comprehensive guide in reporting data quality objectives