RAMBOLL

ENVIRONMENT
& HEALTH

12 October 2021

Development Estate Management Australia Pty Ltd, DEMA (NSW)
Attn: Greg Williams
0429 799 963

By email: greg@demansw.com.au

Dear Greg,

RE: INTERIM AUDIT ADVICE LETTER - DEMA (NSW)

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Ref: 318001314

Audit Number: FR076

1. INTRODUCTION

As a NSW Environment Protection Authority (EPA) accredited Contaminated Sites Auditor, I am conducting an Audit (FR076) in relation to the subject site under the NSW *Contaminated Land Management Act 1997* (CLM Act). This initial review has been undertaken to provide an independent review of the suitability and appropriateness of a Remediation Action Plan (RAP).

The site comprises Part Lot 1 DP1180181 and Lot 2 DP1180181 1A, Flowers Drive, Catherine Hill Bay, NSW. The site is approximately 21.5 Ha and consists of residential lots, vacant land and bushland, and is proposed for residential subdivision. The southern portion of Lot 1 DP1180181 is located on the eastern side of Flowers Drive and referred to as Area A (Hamlet A) and Lot 2 DP1180181 is located on the western side of Flowers Drive, and referred to as Area B (Hamlet B).

The site formerly operated as Pit E/Wallarah Colliery and included associated pit top and supporting infrastructure. Operations ceased at the site in the 1960s.

The subdivision project is currently seeking development approval and Council require a review of the adequacy of the RAP and investigation reports that have been prepared for the site specifically to determine if the land can be made suitable for a particular use (or uses) if the site is remediated or managed in accordance with a specified plan. The audit is not currently a statutory requirement.

This Interim Audit Advice is based on a review of the documents listed below. Due to time constraints and Covid restrictions a site visit has not been completed however a review of recent aerial imagery was undertaken. Discussions were held with DEMA (NSW) however no discussions were held with the consultants. The Auditors engagement occurred after completion of the RAP.

Ramboll Australia Pty Ltd
ACN 095 437 442
ABN 49 095 437 442

The reports reviewed are:

- 'Preliminary Contamination and Geotechnical Assessment, Proposed Residential Subdivision, Catherine Hill Bay', 12 October 2010, Douglas Partners Pty Ltd (**the PCA**, DP 2010).
- 'Stage One Preliminary Site Investigation, Lot 2 DP1180181 – Colliery Road, Catherine Hill Bay, NSW', 5 February 2016, Environmental and Safety Professionals (**the PSI**, ESP 2016)
- 'Report on Detailed Site Investigation for Contamination, Proposed Residential Subdivision, Part Lot 1, DP1180181 and Lot 2, DP1180181, Flowers Drive, Catherine Hill Bay', 16 April 2019 (the DSI, DP 2019)
- 'Remediation Action Plan, Lot 1 DP1180181 and Lot 2 DP1180181, 1A, Flowers Drive, Catherine Hill Bay, NSW', 19 August 2021, Qualtest Laboratory (NSW) Pty Ltd (the RAP, Qualtest 2021).
- Letter 'Proposed Residential Subdivision –1A Flowers Drive, Catherine Hill Bay, NSW, Response To Regional Planning Panel Report - Sepp No.55 - Remediation Of Land', 8 October 2021 (Qualtest 2021a)

An excerpt from a Heritage Assessment Report and Statement of Heritage Impact prepared by EJE Architecture (EJE, 2014) was also reviewed by the Auditor as it provided information on site history.

2. SITE DETAILS

2.1 Location

The site locality is shown on **Attachment 1**.

The site details are as follows:

Street address:	1A Flowers Drive, Catherine Hill Bay, NSW
Identifier:	Part Lot 1 DP1180181 and Lot 2 DP1180181 (**Attachment 2**)
Local Government:	Lake Macquarie City Council area
Owner:	Wallalong Land Developments Pty Limited
Site Area:	Approximately 21.5 ha
Zoning:	R2- Low Density Residential (majority of site) E2 – Environmental Conservation (small portion of land in the north eastern corner of Area B).

The boundaries of the site are not well defined by streets/adjoining properties.

2.2 Adjacent Uses

The site is located within an area of mixed residential properties and bushland. The surrounding site use includes:

North:	bushland, upslope of site
East:	residential / cemetery / beach, generally falling to the east
South:	residential adjacent to Flowers Drive and bushland falling to the south from a ridge line which runs along the southern boundary
West:	bushland, upslope of the site.

Middle Camp Gully (creek) is approximately 0.5 km from the site and considered to be the nearest sensitive receptor. Middle Camp Gully flows south east towards the Pacific Ocean.

The risk of gross contamination from off-site land uses is considered to be low due to the local topography and the neighbouring bushland.

2.3 Site Condition

The DSI noted that:

"Area B is the site of the former Pit E, it follows a valley feature which falls to the east. Area A is located on the eastern side of Flowers Drive and includes the lower portions of the gully. Slopes on the north and south sides of the valley are generally in the order of 5° to 15° and locally up to 25° in the south-east corner. Surface levels range from about 40 m AHD in the south-west corner to 4 m AHD along the creek line.

A creek (Middle Camp Gully) runs along the northern boundary in the western part of the site, with a widening forming a 'dam' feature, and then heads south east diagonally across the site and passes though culverts below Flowers Drive, continuing to the east.

"Most of the site has a locally undulating surface with a grassy ground cover however dense vegetation encroaches onto the western, southern and eastern boundaries of the western parts of the site. The western parts, in particular, contain dense weeds, suggesting prior disturbance.

Much of the site, mostly the central western grassed areas, is used for the grazing of horses.

The south-eastern slopes of the gully contains existing sparse residential development, with bitumen sealed access roads, no kerb and guttering, and single and two storey buildings of varying construction. The houses have tank water and septic tanks for sewage disposal B). Some of the grassed areas around the houses had been terraced / regraded."

Ramboll agrees with this summary of topography and drainage based on a review of aerial imagery. The Auditor additionally notes from a review of aerial imagery, that one former mine building currently remains on the Area B and is potentially the former bathhouse. Eight houses are also still remaining on site. No developments are present on Area A.

2.4 Proposed Development

It is understood that the site is to be redeveloped by the landowner into an approximate 210 allotment residential subdivision, with associated roads, infrastructure and services. Six existing houses in the eastern portion of Hamlet B are proposed to be retained and are included in the site audit.

The proposed concept design, and draft bulk earthworks plans, are provided in the RAP. It is understood that these plans are currently in concept deign (draft) phase and maybe subject to change in the future.

For the purposes of this audit, the 'residential with soil access' land use scenario will be assumed. The proposed development is shown in **Attachment 5a** and **5b**.

3. SITE HISTORY

The RAP provided summaries of the site history identified in previous investigation reports. Historically, the site had been used as a colliery with operations including associated pit top infrastructure, railway line, locomotive shed, fitters shed, electrical substation, bath house and saw mill previously located on the site. The coal mine and saw mill activities are considered to have operated from the late 1880's to mid 1960's. Since the closure of the site in the mid 1960s, the clearing activities occurred up until the 1980s and site regrading occurred in the early 1980's. Site regrading comprises reshaping of the land surface and grassing. Many concrete footings were reportedly left in place.

Residential cottages which were initially occupied by saw mill workers and their dependents have been constructed on the site since the late 1880's. Many of these cottages have been demolished however some still remain in the southern portion of the site. These are reported in the EJE report to have been provided with household services including electricity and reticulated water supply.

A review of the EJE heritage report includes descriptions of stockpiling of coal and the presence and demolition of buildings including the very large brick built power house.

The previous investigation reports summarised in the RAP identified contamination on the site in the form of metals, hydrocarbons, Asbestos Containing Materials (ACM) and asbestos fibres. There is also a high probability of acid sulfate soils (ASS) being present at the site.

3.1 Auditor's Opinion

In the Auditor's opinion, the site history provides an adequate indication of past activities and the site history is broadly understood. Previous site uses with the most significant potential to cause contamination include its use as a colliery and its associated pit top infrastructure (including rail line, locomotive shed, fitters shed, power house, bath house and saw mill), demolition of historical structures and filling at the site comprising coal chitter and demolition materials. The Auditor considers that the historical use of the site for these purposes has the potential to contaminate the site.

The image below taken from the RAP depicts the site in 1955 and shows the approximate outline of former structures.

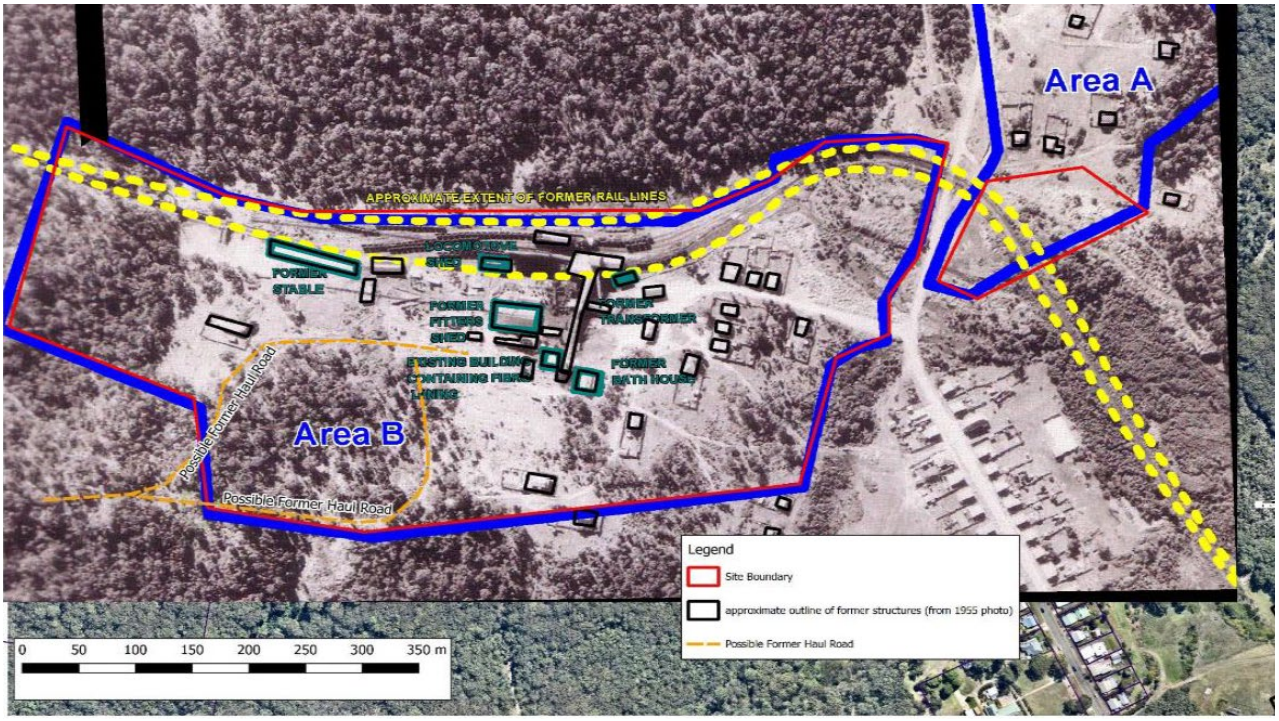


Figure 3-1: Historical Site Photo 1955, red line shows site footprint

Data gaps in site history include the exact placement of fill materials, decommissioning undertaken for former mine tunnels and shafts and whether historical groundwater contamination has occurred, however, the absence of specific details has been adequately compensated for by the investigations that have been completed and the nature of remediation and validation proposed.

There were no indicators of significant industrial uses in the surrounding offsite properties that would have the potential to contaminate the site.

4. CONTAMINANTS OF CONCERN

DP (2019) provided a list of the contaminants of potential concern (COPC) and potentially contaminating activities associated with the use of the site. The Auditor has tabulated the areas and contaminants of potential concern in **Table 4.1**.

Table 4.1: Contaminants of Concern

Former Site Use and Area	Activity	Potential Contaminants
Imported filling within the site, including within haul roads	Importation of contaminated fill material	Petroleum hydrocarbons (as total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), heavy metals (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc, Iron and Manganese), asbestos
Coal reject or ash placement on site	Placement of filling on-site from former mining activities such as coal and chitter	TRH, BTEX, PAH, Metals, acids
Vehicle/equipment servicing and storage oil/fuel drums	Spills and leaks, hydrocarbon sources	TRH, BTEX, PAH, Metals
Hazardous building materials, including asbestos from former buildings/fences	Demolishing old buildings/fences	Asbestos, PCBs, metals
Localised contamination along former railway line	Spills and leaks, possible discharge on to site	Oils, Asbestos, Pesticides, PAH
Grease/Oil traps	Spills and leaks, possible discharge/migration on to site	TRH, BTEX, PAH, Metals
Fuel Storage Tank/s	Spills and leaks/migration from nearby sites	TRH, BTEX, PAH, Metals
Possible pesticide use	Spraying of weeds/pests and/or spills/leaks from stored pesticides	Organochlorine Pesticides (OCP), Organophosphorus Pesticides (OPP), TRH, PAH, Metals
Former substation and power transformers	Spills and leaks, possible discharge on to site	PCB, TRH, BTEX, Metals, Asbestos
Blacksmiths	Spills and leaks, possible discharge/migration on to site	Metals, PAHs and hydrocarbons
Effluent Disposal Areas	Spills and leaks, possible discharge on to site	Nutrients, Metals
Soils in the vicinity of Middle Camp Gully	Potential to develop acid sulfate soils (ASS) on exposure to air	Actual and Potential ASS

4.1 Auditor's Opinion

The Auditor considers that the analyte list used by the consultants adequately reflects the site history and condition.

The laboratory analyte suite used in the PCA, PSI and DSI generally reflected the contaminants of potential concern and adequately reflects the site history and condition.

Combustibility of coal is included as a potential risk and the Auditor considers this to be a geotechnical risk however has included comment on the proposed treatment and validation of combustibility in **Section 11**.

The Auditor notes that nutrient testing has not been undertaken despite being listed as a COPC associated with effluent disposal. The absence of nutrient assessment was considered acceptable given the length of time since effluent disposal was undertaken at the site.

The Auditor also notes that phenols is listed by Qualtest as a COPC associated with the former colliery footprint in the RAP but no analysis for phenols has been undertaken. The lack of phenol sampling was considered acceptable, however, given that it is proposed as part of future sampling at the site.

There has been no assessment by the consultants for the presence of per- and poly-fluoroalkyl substances (PFAS) but in the Auditor's opinion there are no indications in the site history that they would be potential contaminants of concern.

5. STRATIGRAPHY AND HYDROGEOLOGY

Following a review of the reports provided, a summary of the site stratigraphy and hydrogeology was compiled as follows.

5.1 Stratigraphy

The DSI included a review geological maps and reported that the site is underlain by Triassic aged Narrabeen Group and the underlying Permian Age Moon Island Beach Subgroup of the Newcastle Coal Measures typically comprising tuff, claystone, sandstone, conglomerate and coal. Eastern parts of the site were overlain by Quaternary sandy alluvial deposits including in the area of the creek flowing east and south east to Middle Camp Beach.

Soil landscaping mapping from the Gosford-Lake Macquarie landscape map was presented in the DSI. Soil mapping indicated most soils in Area A and the eastern portion of Area B, as disturbed soils associated with the mine area known as Pit E. The presence of acid forming soils was identified across the remainder of the site. This appears conflicting with the Acid Sulphate Soil Risk Map for Catherine Hill Bay, which indicates only an area of low probability acid sulphate soils associated with the creek flowing east to Middle Camp Beach.

The DSI includes 57 test pits logs from the DSI and 46 test pit logs and 3 bore logs from the PCA investigation. The sub-surface profile of the site is summarised in **Table 5.1**.

Table 5.1: Stratigraphy

Depth (mbgl)	Subsurface Profile
0.0 – >3.1	Fill, comprising coal fines, some coarse rounded gravel, sandstone fragments, occasional anthropogenic inclusion such as brick, pipe, wood, concrete. Base of fill was not encountered in TP101, TP1017, TP13, TP17, TP18, TP19, TP21, TP22, TP25, TP26, TP28, TP33.
3.1[1] - >various	Sandy CLAY, very stiff, orange, residual. Sandy CLAY was overlain by Silty CLAY, Sandy SILT or SAND associated with the alluvial deposits.
>2.3[2]	Sandstone, medium strength, pale fine grey. Shallow Sandstone/siltstone/conglomerate was found in TP1023, TP1045, TP1046, TP1056, TP1057.

mbgl – metres below ground level

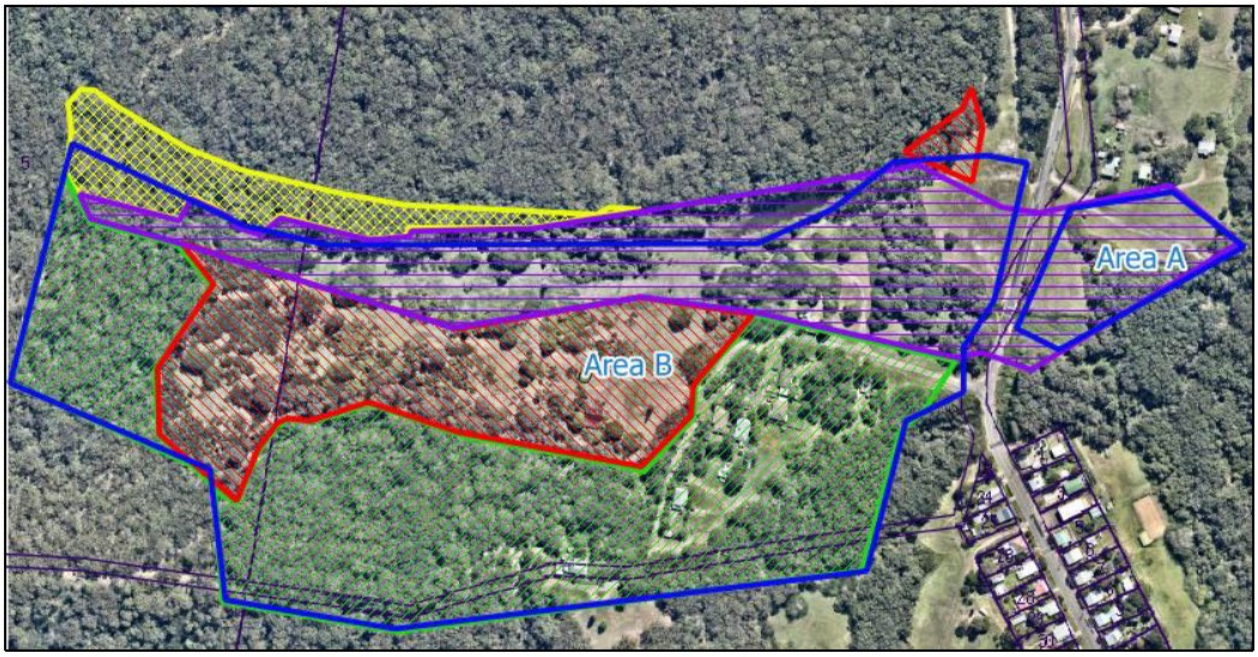
Fill material was variable in depth though generally found to be shallower than 2 mbgl. Fill typically comprised coal fines or silty sandy clay of mixed proportions. Anthropogenic inclusions were identified comprising pipe, bricks, plastic as well as concrete slabs and railway sleepers in some test pits. Black slag was identified at one location, TP68. **Figure 5-1** depicts the extent of fill determined at the completion of the 2007 investigations. A revision of this figure has not been provided however the distribution of fill was largely confirmed by the DSI investigations. The legend for the figure comprises:

[1] Depth of fill was variable

[2] Depth of rock was variable

- Yellow hatched area: alluvial soils
- Green hatched area: residual soils over bedrock
- Red hatched area: filling over residual soils and
- Purple hatched area: filling over alluvial soils.

Figure 5-1 Mapping of Anticipated Subsurface Conditions from investigations prior to the DSI, taken from Figure 6 of the DSI.



Acid sulphate soil sampling was completed during the DSI and found potential acid sulphate soil samples to be present consistent with the acid sulphate risk map. An acid sulphate management plan was recommended to manage these during site works.

Mine workings and coal chitter are known to be potential sources of ground gas. The PCA describes cover over mine workings to be between 10 m and 50 m. Mine workings are not present in Area A and there was also no mining along the base of the gully feature in Area B due to shallow depth of cover.

5.2 Hydrology

The DSI does not comment on potential impacts to surface water however these are presented in the RAP as a data gap. The Auditor has considered potential for impacts to surface water to be low based on the nature of identified site contaminants, as discussed in **Section 8**.

5.3 Hydrogeology

The DSI includes a search for registered bores (undated) and also searched in the PSI in 2016. Both reports describe the nearest registered bores to be located south east of the site with water bearing zones logged in coal seams at depths of 22 and 30 mbgl. Bore use was for stock or domestic purpose.

Groundwater flow was anticipated to be east to north east to the site and towards Middle Camp Gully. Site investigations in 2007 found groundwater to be encountered as perched water within the fill or as groundwater in the area of alluvium and at depths of 0.5 mbgl to 2.9 mbgl. A discussion of beneficial uses of groundwater in the area is not provided.

Surface water sampling was completed historically and discussed in the PCA, as had formed part of a previous investigation. Sampling indicated total phosphorus, coliforms, copper, zinc and iron to be present. Oil and grease, other metals, and turbidity were low. DP conclude concentrations identified were typical of background catchments and urban environments. The Auditor has not reviewed this source document.

5.4 Auditor's Opinion

The Auditor considers that the depth of fill and underlying stratigraphy have been adequately characterised. Three areas of the site are identified to be densely vegetated and have limited access which has restricted the extent of investigations of this area. These areas of the site were not occupied by former structures and vegetation appears present in the 1955 aerial photos. On this basis the absence of investigation of these areas is considered to be of low risk.

The heterogeneity and extent of fill material has the greatest potential to impact the remediation of the site. Further investigation to characterise fill material is not considered necessary prior to remediation and the extent of information available is considered sufficient to inform the remediation requirements in conjunction with an unexpected finds management plan.

Assessment of acid sulphate soils has found these potentially present in the area identified by the Acid Sulphate Soil Risk map. An acid sulphate soil management plan is required to manage risks from these soils during construction site development works.

The Auditor concludes that the shallow formation (sandy clay) underlying the site is of low permeability and therefore the potential for significant groundwater contamination or migration of contamination is low. Given that significant soil contamination has not been identified at the site (see Section 8), the Auditor is satisfied that intrusive assessment of groundwater or surface water is not required at the site for assessing the requirement for remediation. The Auditor considers that the site stratigraphy, hydrology and hydrogeology are sufficiently well known for the purpose of remedial planning.

Groundwater is not proposed to be used for the site development. Further assessment of groundwater suitability for use would be required if proposed.

6. EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports. The data sources are summarised in **Table 6.1**.

Table 6.1: Summary of Investigations

Investigations	Field Investigations	Analytical Data Obtained
Preliminary Contamination and Geotechnical Assessment (Douglas Partners, 2010)	Excavation of 94 test pits to 3 mbgl as follows: Area A and B: Pits 1 to 44 and 65 to 68 Pits 45 to 53 and 56, 61 and 63 and Bores 104 to 106 outside of proposed development and therefore results not included Pits 54, 55, 57 to 60, 62 and 64 were not excavated due to access restrictions Drilling of 5 bores in Area B up to 7 mbgl in areas where the filling or soft soil was deeper than 3 mbgl: Area B: Bores 101 to 103, 107 and 108	Soil: TRH, PAH, OCP, OPP, PCB, BTEX, Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)

Stage One Preliminary Site Investigation (ESP, 2016)	Excavation of 20 test pits to max. 2 mbgl: TP13, TP13A, TP17, TP18, TP19, TP21, TP23, TP24, TP36 and TP68 were collected at similar depths to Douglas Partners (2010) for comparison against NEPM (2013) criteria Additional 10 test pits (TP1 to TP10) do not correlate with sample locations in Douglas Partners (2010)	Soil: TRH, BTEXN, PAH, Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg), CEC, pH
Report on Detailed Site Investigation for Contamination (Douglas Partners, 2019)	Excavation of 57 test pits and bores up to 3.1 mbgl. Hand auger was used to bore in areas inaccessible for excavator to excavate test pit.	Soil: TRH, BTEXN, PAH, PCB, PCP, OPP, Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, Mn), Asbestos ID

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports. The Auditor's assessment follows in **Tables 6.2** and **6.3.**

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Data Quality Objectives (DQO) DP (2010) defined DQOs which were not in accordance with the seven step process outlined in NEPM 2013. The process used comprised four steps. There was no citation to reference material used to develop these steps. ESP (2016) defined DQOs which were not in accordance with the seven step process outlined in NEPM 2013. Instead, the DQO process was a five step process developed in accordance with US EPA (2006) *Data Quality Assessment: Statistical Methods for Practitioners* and NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition)*. DP (2019) defined DQOs in accordance with the seven step process outlined in Schedule B2 of NEPM 2013.	On the basis that the consultants have clearly stated the project objectives and have designed effective sampling strategies to achieve them, overall the Auditor considers that the omission of specific DQOs does not affect the outcome of the audit.
Sampling pattern and locations DP (2010) sample locations followed a systematic sampling procedure to address potential sources of contamination identified during a desktop review and site walkover. The site was divided into Area A to the east of Flowers Drive (7.32 ha) and Area B to the west of Flowers Drive (20.88 ha). A review of the report figures showed that the majority of sample locations targeted areas within the 'Heavily Disturbed Ground' where most of the former mine infrastructure and operations were located. ESP (2016) selected half of the sampling locations to correlate with DP (2010) sampling locations. The remaining half of the sampling locations were selected at the discretion of ESP with no further explanation for sample location selection. The investigation was completed within Area B (DP, 2010) to confirm previous findings. A review of the report figures showed that the sample locations were predominately located in the area described in DP (2010) as the 'Heavily Disturbed Ground'. DP (2019) sample locations followed a judgemental sampling pattern based on information from previous reports to provide a broad coverage of the site. Sample locations were distributed across the three Identified Areas of Environmental Concern – former colliery footprint (filled area and former structures) (9.6ha), filled area in	In the Auditor's opinion these investigation locations adequately target the main areas of concern.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
eastern part of Area B and southern part of Area A (2.8 ha), and Residual Areas of the site (10.3ha).	
Sampling density DP (2010) sampled at 53 sample locations comprising 48 test pits and 5 bores. An additional 46 test pits were excavated but were outside the proposed development area and therefore are not included in the report. The approximate total area of Area A and B as described in DP (2010) is 28.2 ha. Area A had a sample density of 4 sample points for an approximate area of 7.32 ha, and Area B had a sample density of 49 sample points for an approximate area of 20.88 ha. The surface areas of Area A and B are still too large to compare against EPA (1995) *Sampling Design Guidelines*. However, based on Table A of EPA (1995) *Sampling Design Guidelines* the sample density does not appear to be sufficient. ESP (2016) sampled at 20 locations over 24.5 ha. The sampling area is too large to compare against EPA (1995) *Sampling Design Guidelines*. However, based on Table A of EPA (1995) *Sampling Design Guidelines* the sample density does not appear to be sufficient. DP (2019) described sample densities per the three Identified Areas of Environmental Concern (AEC). The sample density for the AEC known as 'former colliery footprint' was 34 sample locations across 9.6 ha. The sample density for AEC known as 'Residual Areas of the site' was 10 sample locations across 10.3 ha. The sampling area is too large to compare against EPA (1995) *Sampling Design Guidelines*. However, based on Table A of EPA (1995) *Sampling Design Guidelines* the sample density does not appear to be sufficient. The sample density for AEC known as 'filled area in eastern part of Area B and southern part of Area A' was 13 sample locations across 2.8 ha. This sampling density did not meet the recommendations made by EPA (1995) *Sampling Design Guidelines.* DP (2019) stated in the body of the report that the combined number of sample locations from the 2 DP investigations across the revised total area of Area A and Area B equates to a sampling density of 128 test pit and 20 borehole sample locations across approximately 22 ha which DP (2019) has stated meets the NSW EPA sample density recommendations.	In the Auditor's opinion the sampling density was appropriate given the large site area and widespread regrading completed at the site. Whilst the sampling density does not meet the requirements in the Sampling Design Guidelines, sufficient sampling has been completed to broadly understand the nature of fill materials present and the presence of site contaminants. The Auditor further considers the level of sampling sufficient given the proposed site development incorporates bulk earthworks over much of the site and management of uncertainty through an unexpected finds protocol is considered appropriate and is expected to resolve uncertainty in site conditions. The Auditor considers there is likely to be greater impacts from ACM based on the level of anthropogenic materials and the historical indications of ACM being present on site.
Sample depths DP (2010) collected samples from test pits at various depths between ground surface and 3 mbgl, and from bores between ground surface and 6 mbgl. The general stratigraphy was fill located at the surface, clay ranging from 0.3m – 3.2 mbgl and sandstone/claystone from 0.4m – 6 mbgl. ESP (2016) collected samples from test pits at various depths between ground surface and 2 mbgl. The general stratigraphy was fill at 0m – 2 mbgl and clay/sandy clay from approximately 0.4m – 2 mbgl. The vertical extent of the investigation was limited to 2 mbgl with the purpose of confirming results reported in DP (2010) at 0 – 2 mbgl. The report noted solid waste (steel beams, discarded steel drums, timber sleepers) detected in four test pits. A review of the bore logs revealed only three bore logs noting debris between 0.1 – 0.5 mbgl. DP (2019) samples were collected from test pits and bores ranging in depth from 0.25 – 3.1 mbgl. The general stratigraphy encountered was sandy gravel fill between 0.15 and 1 mbgl, coal reject fill between 0.4 and 3 mbgl,	In the Auditor's opinion, this sampling strategy was appropriate and adequate to characterise the primary material types present on site. There is some discrepancy in the number of sample locations taken due to changes in site boundary over time. This is not considered significant.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
alluvial silt or sand between 1.4 and 3.3 mbgl, residual clay between 0.4 and 3.1 mbgl. Refusal was met at weathered sandstone between 0.5 and 1.7 mbgl.	
Well construction Monitoring wells were not installed for the purpose of groundwater chemical sampling.	Not applicable.
Sample collection method DP (2010) collected soil samples directly from the side walls of test pits or directly from the excavator bucket or auger using disposable nitrile gloves per sample. Samples were collected into laboratory-supplied sample jars. The report noted that care was taken to prevent extraneous material entering samples. All sampling equipment was decontaminated using Decon 90. ESP (2016) collected soil samples from the centres of the excavator bucket into laboratory-supplied glass sample containers. All non-disposable sampling equipment was decontaminated by washing with phosphate-free detergent and rinsing with water. The report did not mention the use of disposable nitrile gloves. DP (2019) collected soil samples from near the surface and at regular depth intervals or at changes in strata within each test pit. Soil samples were collected directly from side walls of test pits for from the excavator bucket using dedicated disposable nitrile gloves. The report noted care was taken to remove extraneous material deposited on the sample. Decontamination of all sampling equipment using a phosphate-free detergent (Decon 90) and tap water. Samples were collected directly into laboratory-supplied sample jars.	Overall the sample collection method was found to be acceptable.
Decontamination procedures DP (2010) reported the use of dedicated disposable nitrile gloves for each sample and decontamination of all sampling equipment with Decon 90 between samples. The report did not specify which sampling equipment was decontaminated. ESP (2016) reported decontamination procedures of all non-disposable equipment using Decon 90 and fresh water. The report did not mention to use of dedicated disposable nitrile gloves. The report did not specify which sampling equipment was decontaminated. DP (2019) reported the use of dedicated disposable nitrile gloves for each sample and decontamination of all sampling equipment with Decon 90 and tap water. The report did not specify which sampling equipment was decontaminated.	Acceptable
Sample handling and containers DP (2010) reported that samples were collected into laboratory-supplied sample jars which were then placed in a cooled, insulated, and sealed container for transport. A review of laboratory stamped COCs confirmed use of ice to chill samples. ESP (2016) reported that samples were collected into laboratory-supplied sample jars which were then placed in a cool, dark environment prior to submission to the laboratory. The report did not explicitly mention the use of a chilled Esky or equivalent. A review of laboratory signed COCs did not indicate the temperature of samples upon arrival.	Acceptable

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
DP (2019) reported that samples were collected into laboratory-supplied sample jars which were then placed in a cooled, insulated, and sealed container with ice for transport. A review of laboratory stamped COCs confirmed use that samples were cooled with ice upon arrival.	
Chain of Custody (COC) DP (2010) provided laboratory-stamped/signed COCs for primary and intra-laboratory duplicates. No inter-laboratory duplicates were sampled. ESP (2016) provided laboratory-stamped/signed COCs for primary and intra-laboratory duplicates. No inter-laboratory duplicates were sampled. DP (2019) provided laboratory-stamped/signed COCs for primary and intra-laboratory duplicates. No inter-laboratory duplicates were sampled.	Acceptable
Detailed description of field screening protocols DP (2010) described the use of a photo-ionisation detector (PID) to screen replicate samples for volatile organic compounds (VOCs). The report did not describe sampling procedure for PID screening. The PID was calibrated to 100ppm isobutylene. A calibration certificate was not including in the report. ESP (2016) described the use of a PID to screen replicate samples for volatile organic compounds (VOCs). The report did not describe sampling procedure for PID screening. Visual and olfactory indicators of contamination were also described in the field screening procedure. A calibration certificate for the PID was provided in the report appendices. DP (2019) described the use of PID to screen replicate samples for volatile organic compounds (VOCs). The sampling methodology involved the collection of a replicate sample into a plastic zip-lock bag which were then screened using the PID. The PID was calibrated to 100ppm. A calibration certificate was not provided in the report.	Acceptable
Calibration of field equipment DP (2010) report indicated that the PID had been calibrated but did not provide a calibration certificate. ESP (2016) provided a calibration certificate for the PID. DP (2019) report indicated that the PID had been calibrated but did not provide a calibration certificate.	Acceptable. Further validation sampling will require provision of a PID certificate.
Sampling logs DP (2010) provided soil logs within the report indicating sample depth, PID readings and lithology. The logs indicated signs of contamination (buried deleterious material, fibro fragments, black slag, black tar film on concrete slab and hydrocarbon odours) at multiple test pits and at various depths which was outlined in the body of the report. ESP (2016) provided soil logs within the report indicating sample depth, PID readings and lithology. The logs noted	Acceptable

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
visual or olfactory signs of potential contamination and whether debris (demolition waste, timber sleepers etc) was encountered which was outlined in the body of the report. DP (2019) provided soil logs within the report indicating sample depth, PID readings and lithology. The logs indicated signs of contamination (buried rail and rail sleepers, concrete slab, bricks, steel bars/pins/rods/cables, glass, electrical wire etc) at multiple test pits at various depths which was outlined in the body of the report.	

Table 6.3: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
Field quality control samples DP (2010) Field quality control samples comprised 8 intra-laboratory duplicates. A total of 66 primary samples were collected equating to a field quality control sampling rate of 12% meeting the required 5% (NEPM 2013). Inter-laboratory duplicates were not collected however the primary laboratory (SGS Environmental Services) is NATA Accredited. The report describes decontamination of sampling equipment yet rinsate samples were not collected. Analytical results indicate the presence of volatile organic compounds (VOCs) in soil samples, yet field trip blanks and spikes were not used. ESP (2016) Field quality control samples comprised 3 intra-laboratory duplicates and 1 inter-laboratory duplicate for metal analysis only. A total of 28 primary samples were collected equating to a field quality control sampling rate of 10.7% for intra-laboratory duplicates meeting the required 5% (NEPM 2013). However, the sampling rate for inter-laboratory duplicates was 3.6% which did not meet the required sampling rate. Although an inter-laboratory duplicate sample was collected, a secondary laboratory report was not provided. A review of the primary lab report showed that the inter-laboratory duplicate was analysed at the primary laboratory. The report describes decontamination of sampling equipment yet rinsate samples were not collected. Analytical results indicate the presence of volatile organic compounds (VOCs) in soil samples, yet field trip blanks and spikes were not used. DP (2019) Field quality control samples comprised 3 intra-laboratory duplicates. A total of 83 primary samples were collected equating to a field quality control sampling rate of 3.6% which did not meet the required 5% (NEPM 2013). A sample name within the report suggested an inter-laboratory duplicate had been collected however the body of the report did not indicate that an inter-laboratory duplicate sample was included as part of the field quality control and a secondary laboratory report were not provided for an inter-laboratory duplicate. The primary laboratory for sample analysis (Envirolab) is NATA Accredited. The report describes decontamination of sampling equipment yet rinsate samples were not collected. Analytical results indicate the presence of	Acceptable

Field and Lab QA/QC	Auditor's Opinion
volatile organic compounds (VOCs) in soil samples, yet field trip blanks and spikes were not used.	
Field quality control results DP (2010) The results of field quality control samples were generally within appropriate limits. The following exceptions were noted: The RPD for inter-laboratory duplicate pair was 100% for Arsenic. RPD for four inter-laboratory duplicate pairs ranged between 37% and 124% for Copper. RPD for four inter-laboratory duplicate pairs ranged between 42% and 130% for Lead. The RPD for one intra-laboratory pair was 43% for Nickel. RPD for five inter-laboratory duplicate pairs ranged between 34% and 280% for Zinc. The RPD for one inter-laboratory duplicate pair was 60% for TRH C10-C14. The RPD for two inter-laboratory duplicate pairs were 44% and 144% for TRH C15-C28. The RPD for one inter-laboratory duplicate pair was 33% for TRH C29-C36. The RPD for one inter-laboratory duplicate pair was 67% for Benzo(a)pyrene. The report noted sample heterogeneity as the main contributor to high RPDs and concluded that results were within acceptable limits. ESP (2016) The results of field quality control samples generally exceeded appropriate limits as summarised below: RPD for: RPD of one intra-laboratory duplicate pair and one inter-laboratory duplicate pair were 54% and 44% respectively for Arsenic. RPD for two intra-laboratory duplicate pairs and one inter-laboratory duplicate pair ranged between 34% and 77% for Chromium. RPD for three intra-laboratory duplicate pairs and one inter-laboratory duplicate pair ranged between 33% and 186% for Copper. RPD for one intra-laboratory duplicate pair was 84% for Lead. RPD for two intra-laboratory pairs and one inter-laboratory pair ranged between 32% and 68% for Nickel. RPD for one intra-laboratory duplicate pair was 82% for Zinc. The report noted that in most cases of RPD exceedance, contaminant concentrations were close to the PQL. The report also attributed elevated RPDs to sample heterogeneity. DP (2019) The results of field quality control samples were generally within appropriate limits. The following exceptions were noted: RPD in two intra-laboratory duplicate pairs were 33% and 40% for Total PAHs. RPD for one intra-laboratory duplicate pair was 62% for Chromium. RPD for one intra-laboratory duplicate pair was 67% for Zinc.	Overall, in the context of the dataset reported, the elevated RPD results are not considered significant and the field quality control results are acceptable.

Field and Lab QA/QC	Auditor's Opinion
RPD for one intra-laboratory duplicate pair was 60% for TRH F3. RPD for one intra-laboratory duplicate pair was 76% for Benzo(a)pyrene). The report concluded that the RPDs were considered acceptable due to the non-homogenous nature of the samples which comprised fill. Low contaminant concentrations were also attributed to the high RPDs for metal contaminants.	
NATA registered laboratory and NATA endorsed methods DP (2010) SGS Environmental Services was used as the primary laboratory for sample analysis and is NATA Accredited. Laboratory reports were NATA stamped. ESP (2016) Eurofins was used as the primary laboratory for sample analysis and is NATA Accredited. Laboratory reports were NATA stamped. DP (2019) Envirolab was used as the primary laboratory for sample analysis and is NATA Accredited. Laboratory reports were NATA stamped.	Acceptable
Analytical methods DP (2010), ESP (2016) and DP (2019) Analytical methods were included in the laboratory test certificates. Included within the test certificates were brief method summaries of in-house NATA accredited methods used based on USEPA and/or APHA methods for extraction and analysis in accordance with the NEPM (2013).	Acceptable Asbestos analysis has been presence/ absence and therefore an assessment of asbestos concentration has not been completed.
Holding times DP (2010) Holding times for some samples in Test Report 54460-R exceeded recommended holding times for semi-volatile compounds. Some samples were collected between 31/07/07 and 2/08/07 and were not analysed until 16/08/07 exceeded recommended 14 day holding time. ESP (2016) Review of the COCs and laboratory certificates indicate that the holding times had been met. DP (2019) Review of the COCs and laboratory certificates indicate that the holding times had been met. DP also reported that recommended holdings times had been met.	Acceptable given the nature of the contaminants found and expected to be present.
Practical Quantitation Limits (PQLs) DP (2010) PQLs were less than threshold criteria for contaminants of concern. ESP (2019) PQLs were less than threshold criteria for contaminants of concern. DP (2019)	Overall the soil PQLs are acceptable.

Field and Lab QA/QC	Auditor's Opinion
PQLs were less than threshold criteria for contaminants of concern with the exception of: PQL for Benzo(a)pyrene TEQ with was 5mg/kg for three samples (1024/1.2m, 1024/1.8m and 1024/2.7m) instead of 0.5mg/kg which was the PQL for all other samples in the same laboratory report. This was not explained by DP in the report.	
Laboratory quality control samples DP (2010) Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the laboratory. Laboratory quality control sampling was completed at the required rates. ESP (2016) Laboratory quality control samples including blanks, matrix spikes, duplicates and laboratory control samples were undertaken by the laboratory. Laboratory quality control sampling was completed at the required rates. DP (2019) Laboratory quality control samples including blanks, matrix spikes and surrogates, duplicates and laboratory control samples were undertaken by the laboratory. Laboratory quality control sampling was completed at the required rates.	Acceptable
Laboratory quality control results DP (2010) The results of laboratory quality control samples were generally within appropriate limits. Where some duplicate RPDs for Arsenic, Cadmium, Chromium, TRH C15-C28, TRH C29-C36, Phenanthrene, Fluoranthene, Benzo(b,k)fluoranthene, Naphthalene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, Anthracene and Benzo(ghi)perylene exceeded 30% RPD it was found that contaminant concentrations were less than 10 times the PQL. Therefore, the high RPDs were acceptable. ESP (2016) The results of laboratory quality control samples were generally within appropriate limits. Where some duplicate RPDs for Arsenic, Copper, Lead, Nickel and Benzo(b&j)fluoranthene and Phenanthrene exceeded 30% RPD it was found that contaminant concentrations were less than 10 times the PQL. Therefore, the high RPDs were acceptable. DP (2019) The results of laboratory quality control samples were generally within appropriate limits. Where some duplicate RPDs for Copper, Manganese, TRH C15-C20, TRH>C10-C16, TRH >C16-C34, Naphthalene, and Benzo(a)pyrene exceeded 30% RPD it was found that contaminant concentrations were less than 10 times the PQL. Therefore, the high RPDs were acceptable.	In the context of the dataset reported, the elevated RPD is not considered significant and the laboratory quality control results are acceptable.
Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy) DP (2010) DP did not define DQIs and did not undertake a formal QA/QC data evaluation against the five category areas. They did, however, complete a QA/QC contamination assessment which concluded that *"the accuracy and*	An assessment of the data quality with respect to the five category areas has been undertaken by the Auditor and is summarised below.

Field and Lab QA/QC	Auditor's Opinion
precision of the soil testing procedures… is generally considered to be of sufficient standard to allow the data reported to be used to interpret site contamination conditions". ESP (2016) Predetermined data quality indicators (DQIs) were set for laboratory analyses including blanks, replicates, duplicates, laboratory control samples, matrix spikes, surrogate spikes and internal standards. These were discussed with regard to the five category areas. There was limited discussion regarding actions required if data do not meet the expected objectives. DP (2019) DQIs were briefly mentioned within the DQO table. The five category areas were listed with a brief definition, but no quantitative indicators were included. There was insufficient detail regarding actions required if data did not meet expected objectives. DP completed a QA/QC assessment for contamination and concluded that the *"data is considered to be of sufficient standard to allow the data reported to be used to interpret site contamination conditions".*	

6.1 Auditor's Opinion

In considering the data as a whole the Auditor concludes that:

- The data is likely to be representative of the general fill and soil conditions however the Auditor notes uncertainty due to the extent of filling at the site. Uncertainty can be managed through the unexpected finds protocol.
- The data is complete.
- There is a high degree of confidence that data is comparable for each sampling and analytical event.
- The primary laboratory provided sufficient information to conclude that data is of sufficient precision.
- While most of the data is likely to be accurate, there is some doubt regarding possible loss of volatiles. This is because no trip spikes were used, and although samples were recorded as having been received at the primary laboratory in good (chilled) condition, some chain of custody forms were dated 3 or 4 days after sampling. Inappropriate analysis of composites for volatiles, etc.

Generally, the data is considered of sufficient quality to inform the requirement for remediation.

7. ENVIRONMENTAL QUALITY CRITERIA

Assessment criteria are the concentrations of a contaminant above which further appropriate investigation and evaluation will be required and provide the basis of a Tier 1 risk assessment. As defined in National Environmental Protection Council (2013) *National Environmental Protection (Assessment of Site Contamination) Measure* (NEPM (2013)), a Tier 1 risk assessment is a risk-based analysis comparing site data against generic assessment criteria for various land uses to determine the need for further assessment or development of an appropriate management strategy.

7.1 Human Health Assessment Criteria

The Auditor has adopted soil assessment and validation criteria protective of human health from the following Australian sources:

- NEPM (2013) Health Investigation Levels (HILs) for non-volatile soil compounds for 'Residential' (HIL-A) land use
- NEPM (2013) Health Screening Levels (HSLs) for TRH, BTEX and naphthalene compounds for 'Low-High Density Residential' (HSL-A&B) land use, for the vapour inhalation pathway. The HSLs assumed a sand soil type and a depth of 0-<1 m as the most conservative screening criteria
- NEPM (2013) Management Limits (MLs) for Petroleum Hydrocarbons for Residential and Open Space land use and assuming coarse soil texture
- Presence or absence of asbestos at a limit of reporting of 0.1 g/kg.

7.2 Ecological Assessment Criteria

The Auditor has adopted ecological soil assessment criteria from the following Australian sources:

- NEPM (2013) Ecological Screening Levels (ESLs) for 'Urban Residential land use, assuming coarse soil.
- NEPM (2013) Ecological Investigation Levels (EILs) for 'Urban Residential' land use. In the absence of site-specific soil data on pH, clay content, cation exchange capacity and background concentrations, the published range of the added contaminant limits have been applied as an initial screen.

The specific criteria adopted are summarised in **Section 8** in **Table 8.1**.

7.3 Soil Aesthetic Considerations

The Auditor has considered the need for soil remediation based on 'aesthetic' contamination as outlined in *Section 3.6 Aesthetic Considerations* of NEPM (2013) Schedule B1, which acknowledges that there are no chemical-specific numerical aesthetic guidelines. Instead, site assessment requires a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

7.4 Soil Combustibility

The adopted criteria for combustible material (Wollongong Council Guidelines) states chitter material must have an average combustibility not exceeding 30%, and a maximum combustibility not exceeding 40%.

7.5 Acid Sulfate Soils

DP completed a preliminary ASS assessment as part of the PCA (2010). The assessment was undertaken with reference to the criteria provided in the Acid Sulfate Soil Management Advisory Committee's (ASSMAC) *Acid Sulphate Soil Manual*, dated August 1998.

7.6 Consultants Assessment Criteria

The environmental quality criteria referenced by the Auditor are generally consistent with those adopted by ESP (2016) and DP (2019). The criteria adopted in DP (2010) has now been superceded by NEPM 2013. The reported soil results from this previous investigation were re-screened by ESP (2016) against current assessment criteria introduced in 2013. The comparison confirmed exceedances reported within outdated total recoverable hydrocarbon fractions and allowed a comparison with ecological based screening criteria.

Ecological criteria were derived for certain metals by ESP (2016) and for certain metals, DDT and naphthalene by DP (2019) using the *Interactive (Excel) Calculation Spreadsheet* (Standing Council on Environment and Water (SCEW) website. DP (2019) used different assumptions for different soil types (fill vs natural soils) based on an assumed clay content and measured values of pH and cation exchange capacity. This resulted in higher values than adopted by the Auditor. However, as this just resulted in the Auditor's assessment being more conservative, this was not material.

Given the results obtained, the Auditor considers that these discrepancies do not affect the overall conclusions reached by ESP, DP and the Auditor.

8. EVALUATION OF SOIL RESULTS

8.1 Field Results

Site observations include description of pipe, steel, fill mounds and coal chitter. Eight fragments of potentially asbestos containing materials were identified and collected for analysis. Hydrocarbon odours were noted in TP1024 and TP36 however visual signs of hydrocarbons are not recorded. PID readings were generally low and less than 10ppm, though mostly less than 1ppm. Black slag (confirmed through laboratory analysis) was identified at one location TP 68, and reportedly observed in a thin layer. Black slag is not reported in other test pits. A black tar substance present on a concrete slab was identified in TP23 within the fill. Groundwater seepage was identified in several test pits along the creek and gully area.

8.2 Analytical Results

Soil samples were analysed for a variety of contaminants including petroleum hydrocarbons, PAHs, asbestos and heavy metals. The results have been assessed against the environmental quality criteria and summarised in **Table 8.1**. Soil sampling locations are presented in **Attachment 2 and 3**.

Table 8.1: Evaluation of Soil Analytical Results – Summary Table (mg/kg)

Analyte	n	Detections	Maximum Result	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
Asbestos ID in Soil	85	2	**Present – chrysotile, amosite**	**2, no asbestos at the surface**	-
Asbestos ID in Material	3	3	**Present - chrysotile**	**3, no asbestos at the surface**	-
Benzene	149	0	<0.5	0 above HSL A&B 0-1 m, sand 0.5 mg/kg	0 above ESL (urban residential) (coarse) 50mg/kg
Toluene	149	0	<0.5	0 above HSL A&B 0-1 m, sand 55 mg/kg	0 above ESL (urban residential) (coarse) 85 mg/kg
Ethylbenzene	149	0	<1	0 above HSL A&B 0-1 m, sand 55 mg/kg	0 above ESL (urban residential) (coarse) 70 mg/kg
Total Xylenes	149	0	<1.5	0 above HSL A&B 0-1 m, sand 40 mg/kg	0 above ESL (urban residential) (coarse) 105 mg/kg
Naphthalene	83	0	<1	0 above HSL A&B 0-1 m, sand 3 mg/kg	0 above EIL (urban residential) 170 mg/kg
F1 (TRH C_6–C_{10} minus BTEX)	116	0	<25	0 above HSL A&B 0-1 m, sand 45 mg/kg	0 above ESL (urban residential) 180 mg/kg
F2 (TRH >C_{10}–C_{16} minus naphthalene)	116	48	330	**26 above HSL A&B 0-1 m, sand 110 mg/kg**	**22 above ESL urban residential) 120 mg/kg**
TRH C_6–C_{10}	83	0	<25	0 above ML (urban residential) 700 mg/kg	-
TRH >C_{10}–C_{16}	83	28	220	0 above ML (urban residential) 1000 mg/kg	-

Analyte	n	Detections	Maximum Result	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
F3 (TRH >C_{16}-C_{34})	116	65	6900	**3 above ML (urban residential) 2500 mg/kg**	**43 above ESL (urban residential) (coarse) 300 mg/kg**
F4 (TRH >C_{34}-C_{40})	116	15	510	0 above Direct Contact HSL A 6,300 mg/kg	0 above ESL (urban residential) (coarse) 2800 mg/kg
TPH C6-C9	66	0	<20	-	-
TPH C10-14	66	18	78	-	-
TPH C15-C28	66	31	2100	-	-
TPH C29-C36	66	30	2000	-	-
Benzo(a)pyrene	173	73	3.2	-	**1 above ESL (urban residential) 0.7 mg/kg**
Benzo(a)pyrene TEQ	107	24	<5	**3[1] above HIL A 3 mg/kg**	-
Total PAHs	149	101	54	0 above HIL A 300 mg/kg	-
Arsenic	177	71	460	**2 above HIL A 100 mg/kg**	**2 above EIL (urban residential) 100 mg/kg**
Cadmium	177	56	7.5	0 above HIL A 20 mg/kg	-
Chromium	177	168	120	**1 above HIL A 100 mg/kg**	0 above most conservative ACL (urban residential) 190 mg/kg
Copper	177	152	4500	0 above HIL A 6000 mg/kg	**38 above most conservative ACL (urban residential) 60 mg/kg**
Lead	177	174	6100	**2 above HIL A 300 mg/kg**	**2 above generic ACL (urban residential) 1100 mg/kg**
Mercury	149	47	0.6	0 above HIL A 40 mg/kg	-
Nickel	177	147	27	0 above HIL A 400 mg/kg	0 above most conservative ACL (urban residential) 30 mg/kg
Zinc	177	176	73000	**4 above HIL A 7400 mg/kg**	**61 above most conservative ACL (urban residential) 70 mg/kg**
PCB	149	0	<1	0 above HIL A 1 mg/kg	-
OCP	149	0	<2.5	0 above HIL A	0 above EIL
OPP	149	0	<0.4	0 above HIL A	-
Combustibility	20	20	58%	8 above recommended 30% maximum	-

n number of samples
- No criteria available/used
NL Non-limiting
<PQL Less than the practical quantitation limit
[1] Three sample LORs from DP (2019) exceeded HIL

The ASS assessment (DP, 2010) included pH field screening of 32 soil samples and analysis of 7 samples for the chromium reducible suite. Field screening and laboratory assessment indicate that potential acid sulfate soil (PASS) is likely in the vicinity of Middle Camp Gully. Management of the PASS is proposed as discussed in **Section 11**.

8.3 Auditor's Opinion

In the Auditor's opinion, the soil analytical results are consistent with the site history and field observations. The results indicate that the site has been impacted by metals, TRH and PAHs above the adopted residential landuse criteria in fill.

Anthropogenic observations were made where fill was encountered and ACM was also identified on the surface. Due to the presence of both ACM and anthropogenic materials, the Auditor considers it likely that ACM is potentially present within fill at depth and that the extent of ACM impact is greater than identified. The implications of this on the remediation are discussed in Section 12, however the Auditor considers the remediation strategy is sufficiently robust to manage an increase in ACM impacted materials.

In the Auditor's opinion the fill and underlying soils have been adequately characterised. The Auditor is satisfied that further investigation to characterise fill material is not considered necessary prior to remediation and the extent of information available is sufficient to inform the remediation requirements in conjunction with an unexpected finds management plan.

The contribution of organic hydrocarbons from the presence of coal to the TRH concentrations detected should be evaluated through silica gel clean up to confirm risk from TRH. Should this be the case the risk from TRH is likely to be less than that assumed in the conceptual site model (CSM) and the requirement of remediation is expected to be less.

The Auditor is satisfied that no further investigations are needed elsewhere across the site and the risks to relevant receptors including groundwater and surface water are acceptably low.

Specific evaluation of the residential properties proposed to be retained has not been completed. These properties have been used for residential purpose since the activities of the mining and are reported to be located on residual fill. Contaminants likely to have occurred are related to the resident itself and include asbestos in building materials and use of septic. On this basis it is considered low likelihood that building demolition or extensive remediation would be required. Assessment of these properties will be required as part of the validation programme.

9. EVALUATION OF GROUNDWATER RESULTS

A groundwater investigation was not undertaken. There are no indications that groundwater has been contaminated by site activities based on the historical site use and the soil contaminants and distribution identified. Groundwater investigation would be required to determine suitability for any proposed beneficial use, and abstraction permits obtained should groundwater use be proposed at the development in the future.

10. EVALUATION OF GAS RESULTS

A soil gas investigation was not undertaken. Soil gas could occur from the presence of coal chitter and the former mine workings. Investigation of soil gas is proposed as part of the RAP. The auditor considers that this investigation should be completed however also makes the following comments with regards to remediation requirements.

- Depth of cover over former workings is between 10 m and 50 m and therefore the potential for soil gas from mine workings is considered low

- Mine access shafts could provide potential preferential gas pathways and further identification and evaluation of these is required. However, geotechnical stabilisation of the site is proposed to include grouting of the mine workings and access shafts and this is expected to remove this pathways if they are identified to exist. Validation of these works for gas mitigation is to form part of the remediation strategy where gas risks are identified.
- Coal chitter is proposed to be blended with non-combustible materials for the purpose of managing combustibility risk and then buried below at least 1m of cover, or deeper where other contaminants are present. Should gas risk be identified it is expected that the proposed treatment for combustion and contamination would be similarly adequate for gas mitigation. The remediation strategy also allows for contingent offsite disposal where materials are found to be unsuitable for the site.

On the basis of the above, the Auditor considers that whilst gas investigations have not been completed, further assessment of these are unlikely to significantly alter the remediation works required at the site.

11. EVALUATION OF CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a representation of the source, pathway and receptor linkages at a site. DP (2010, 2019) and ESP (2016) each developed a CSM and used it iteratively throughout the site assessments to inform decisions around investigation requirements. The CSM has been updated as new information became available. **Table 10.1** provides the Auditors review of the final CSM prepared by Qualtest for the site to inform further investigation and remediation decisions as reported in the RAP. Areas of Environment Concern are shown on **Attachment 4**.

Table 10.1: Review of the Conceptual Site Model

Element of CSM	Consultant	Auditor Opinion
Contaminant source and mechanism	Qualtest identified the main sources of contamination at the site as being: Area of Environmental Concern 1 (AEC1) - Former colliery footprint (filled area and former structures): Including imported filling, placement of coal reject/ ash on the site, hydrocarbon impact from drips / spills / leaks, hazardous building materials including asbestos from former buildings and fences, former railway line, use and maintenance of steam locomotives, coal fired boilers, possible pesticide use, former power house, blacksmiths. AEC2 - Filled area in eastern part of Area B and southern part of Area A: Imported filling, hydrocarbon impact from drips / spills / leaks, hazardous building materials, possible pesticide use, combustibility in coal chitter and acid drainage. AEC3 - Residual Areas of the site Backfilling of underground mine workings, imported filling, hydrocarbon impact from drips / spills /leaks, hazardous building materials, possible pesticide use, combustibility in coal chitter and acid drainage. Contaminants of potential concern were identified as TRH, BTEX, PAH, heavy metals, pesticides, phenols and asbestos. The current extent of known impacts is: surface soils impacted with TRH (F2) and metals (arsenic, lead, zinc) exceeding the human health criteria, and surface soils impacted with TRH (C10-16 and C16-34 Fraction) and metals (arsenic, copper and zinc) exceeding the ecological criteria. Asbestos was also identified at the site. Anthropogenic wastes identified at the site pose unacceptable aesthetic issues at the site. There is a high probability of ASS being present at the site. Some soils containing coal/coal chitter have been shown to have unacceptable levels of combustibility.	Qualtest's assessment of contamination at the site is suitable. The Auditor notes that this assessment will be supplemented by further investigation works proposed in the RAP however the Auditor does not consider these investigations will significantly affect the scope of the remediation works proposed.

Element of CSM	Consultant	Auditor Opinion
Affected media	Qualtest identified affected media to comprise fill, underlying soils, surface water and groundwater.	Fill material is the affected media at the site based on the completed investigations. No investigation of surface, groundwater or ground gases has been undertaken at the site, though the Auditor notes that investigation of these media is proposed in the RAP as part of additional sampling to address data gaps based on previous assessments completed on the site. The Auditor does not consider risk to groundwater and surface water to be significant based on the low concentrations and mobility of soil contaminants identified. The Auditor notes that potential hazardous mine gases are proposed for further investigation. Further comment is provided in **Section 10.**
Receptor identification	Qualtest identified receptors to include current and future receptors as follows: Current site users Future construction workers and site users Soil biota/plants and transitory wildlife Onsite surface water – Middle Camp Gully Offsite surface water – Middle Camp Gully Groundwater Dependent Ecosystems	Qualtest has appropriately identified human and ecological receptors likely to be impacted by site contamination.
Exposure pathways	Qualtest identified the following potential exposure pathways: Plant root contact with contaminated soil Direct dermal contact with contaminated soil or surface water Ingestion of contaminated soil or surface water Inhalation of asbestos fibres Inhalation of contaminated soil (as dust) Inhalation of hydrocarbon odours Migration of contaminants to onsite/offsite surface water Migration of contaminants to groundwater Groundwater and surface water discharge from onsite to offsite (Middle Camp Gully).	Inhalation and building intrusion of hazardous ground gases is a potential exposure pathway at the site and should be included in the CSM as a potential mechanism of exposure. Whilst not identified in the CSM this has been incorporated in the data gaps.
Presence of preferential pathways for contaminant movement	Qualtest did not specifically identify any preferential pathways in the CSM. Elsewhere in the RAP, however, Qualtest identifies former tunnel entrances and vent shafts which may have been backfilled with contaminated fill and subject to the decommissioning process as a potential a source of hazardous mine gases including methane.	The Auditor notes that former tunnel entrances and vent shafts could act as preferential pathways for vapour movement.
Potentially complete source-pathway-receptor (SPR) linkages requiring remediation or management	Qualtest made the following assessment of potentially complete exposure pathways: AECs 1&2 - Complete exposure pathway for current and future site users and future construction workers, due to presence of asbestos fines, ACM, metals and TRH contaminated fill/soils (AEC1) and ACM (AEC2). Complete exposure pathway for current and future soil biota/plants and transitory wildlife, due to TRH contaminated fill/soils. Complete exposure pathway for aesthetics, due to anthropogenic wastes observed on the site. Potentially complete exposure pathway for onsite/offsite surface water.	The assessment made by Qualtest in relation to potential and complete exposure pathways is considered adequate. The contaminants present are generally non-volatile and non-leaching and are suitable to be retained onsite underneath capping to prevent access by occupants to site fill.

Element of CSM	Consultant	Auditor Opinion
	Potentially complete exposure pathway for onsite/offsite groundwater. AEC3 - Incomplete exposure pathway for current and future site users and future construction workers and soil biota/plants and transitory wildlife as no contamination above the adopted criteria has been identified. Likely incomplete exposure pathway for onsite/offsite surface water, as no contamination in fill/surface soils above the adopted criteria has been identified. Potentially complete exposure pathway for groundwater, due to backfilling of former underground mine workings. Assessment of groundwater is required. AECs 1 to 3 - Potentially complete exposure pathway for hazardous ground gases to accumulate in proposed buildings. Assessment of hazardous gases is required.	
Evaluation of data gaps	Unknown and incomplete source/ pathway/receptor linkages were clearly stated in the CSM. Qualtest completed a Data Gap Analysis based on the DP (2019) recommendations and Qualtest review of previous investigations, which is provided as Appendix C of the RAP. The following data gaps were identified: AEC 1 - Sampling Density is 89% of minimum recommended by NSW EPA (1995). No assessment of source of TRH contamination (no Silica gel completed). No location found for former power station (removed circa 1930) and workshops constructed in same location No leachability (TCLP) assessment of identified contamination. No surface water or groundwater sampling completed. No consideration of hazardous ground gases or potential acid drainage issues. AEC2 - Sampling Density is low – 60% of minimum recommended by NSW EPA (1995). No sampling undertaken in areas of thick vegetation. No assessment of source of TRH contamination (no Silica gel completed). No surface water or groundwater sampling completed. No assessment of potential acid drainage. No consideration of hazardous ground gases. AEC 3 - Sampling Density is low – 13% of minimum recommended by NSW EPA (1995). No surface water or groundwater sampling completed. No assessment of potential acid drainage. No consideration of hazardous ground gases. A Sampling, Analysis and Quality Plan (SAQP) is included in the Data Gap Analysis to outline the additional investigation works Qualtest recommend be undertaken at the site following DA approval and prior to earthworks commencing on the site to close out these data gaps. The additional proposed works include additional soil sampling and delineation works, further assessment of the nature of TRH contamination at the site, and undertaking an assessment of metals leachability, ground gases, surface water and groundwater.	The assessment made by Qualtest in relation to remaining data gaps is considered adequate. The Auditor has not identified any further data gaps that are considered to be critical. Whilst the Auditor agrees with the identified data gaps, the Auditor considers that sufficient investigation has been completed to inform the requirements for remediation in combination with geotechnical ameliorations required for the site and the use of an unexpected finds protocol.

11.1 Auditor's Opinion

The Auditor is of the opinion that the CSM gives a reasonable representation of the contamination at the site and indicates that there are potential complete linkages at the site. The site is currently not considered suitable for the proposed residential use without the proposed remediation and/or management of identified contamination being carried out. Data gaps exist and a program of investigation for these proposed, however based on the site history, information gathered in previous investigations and the nature of contaminants identified, the CSM developed is considered an adequate basis for assessing remedial requirements.

12. EVALUATION OF PROPOSED REMEDIATION

12.1 Remediation Required

Based on the investigations previously completed and presented in the DSI, the contaminants of concern that require remediation have been summarised in **Table 11.1.**

Remedial works are proposed following site clearing, removal and disposal of waste materials and lawful removal of material off-site and exposure of underlying soil.

An unexpected finds protocol and a program of sampling to address data gaps is included in the RAP that will address surface water, groundwater and ground gas conditions. As discussed in **Sections 5** and **8**, given the nature of site activities and the low mobility of contaminants identified and the geological context, the Auditor considers that these further investigations are unlikely to affect the requirement for remediation of the site for the proposed residential land use. These are discussed in **Table 11.2**.

Table 11.1: Remediation Required and Preferred Options

Description	Extent of Remediation Required	Preferred Options
Asbestos Fibre Contamination in Soil (AEC 1), fibres in one location (Pit 18) and asbestos cement containing materials in surface soils in and around site infrastructure	Lateral: Not specified, however impacted locations are identified asbestos impact Figure 5A and 5B in RAP. Vertical: fill depth, or 0.5m where fill depth is not known.	Excavate and place in a containment cell at depths greater than 5 mbgl finished level
Asbestos Containing Materials on the surface (AEC 1 and 2), asbestos cement containing materials in surface soils in and around site infrastructure	Lateral: Identified asbestos impact Figure 5A and 5B in RAP. Vertical: fill depth, or 0.5m where fill depth is not known.	Excavate and place in a containment cell at depths greater than 5 mbgl finished level
Metals and TRH concentrations above human health investigation levels	Lateral: Not specified, however impacted locations are identified asbestos impact Figure 5A and 5B in RAP. Vertical: fill depth, or 0.5m where fill depth is not known.	Excavate and place in a containment cell at depths greater than 5 mbgl finished level
Metals and TRH concentrations above human health investigation levels	Lateral: Not specified, however impacted locations are identified asbestos impact Figure 5A and 5B in RAP. Vertical: fill depth, or 0.5m where fill depth is not known.	Excavate and place in a containment cell at depths greater than 2 mbgl finished level

1.1.1 Auditors Opinion

The extent of remediation is not shown in the RAP however the locations where impact was identified are shown on figures and the extent has been determined as a 10m radius around these locations. AECs are shown on **Attachment 4** of this IAA. The Auditor considers the presence of asbestos and anthropogenic materials to be the main driver for remediation and the volumes and extent of

remediation proposed adequately includes the potential for other fill materials to be impacted by asbestos.

12.2 Evaluation of RAP

The Auditor has assessed the RAP by comparison with the checklist included in NSW EPA (2020) *Consultants Reporting on Contaminated Land*. The RAP was found to address the required information, as detailed in **Table 11.2**, below.

Table 11.2: Evaluation of Remedial Action Plan

Remedial Action Plan	Auditor Comments
Remedial Goal That the site is suitable for the proposed residential development.	In the Auditor's opinion, this goal is considered appropriate.
Discussion of the Extent of Remediation Required Remediation required for each area was discussed within the RAP (See Table above). The extent of remediation required is described as a 10m radius around each impacted area. The volume estimate and remediation extent are identified by Qualtest to be estimates and may change.	The Auditor agrees the volume estimates are likely to change due to further analysis proposed for TRH. The Auditor agrees with Qualtest that there is a high likelihood TRH present is related to coal content and does not represent a human or ecological risk, and does not warrant remediation, as discussed in **Section 8**. However, the Auditor also considers that the extent of anthropogenic material, and potentially ACM, is likely to be greater than currently documented. On the basis that there may be some over estimation of volume, and some under estimation, the Auditor considers that the volume extent assumed is reasonable.
Remedial Options Remedial options were assessed and included offsite disposal to landfill, onsite containment and chemical immobilisation.	The Auditor considers that a range of options were considered that were appropriate for the contaminants present.
Selected Preferred Option and Rationale The preferred option was discussed within the RAP and was determined to be onsite containment at depths of greater than 5 metres below finished level. The option was not considered to require an environmental management plan (EMP) due to the depth of contamination burial. The preferred option was selected on the basis of the bulk earthworks proposed to be completed at the site, the estimated costs for remediation and discussion with the client. The option was also considered to be more consistent with ecological sustainable development principles when compared to other options.	The Auditor considers the preferred option to be appropriate. The Auditor agrees that management under an EMP is not required for contamination at this depth however that the presence of contamination at depth should be noted on the Section 10.7 certificate.
Description of Remediation to be Undertaken Complete additional investigations as outlined in the RAP, (and presented in **Section 11**). Prepare an unexpected finds procedure and asbestos management plan Removal of surface anthropogenic waste including asbestos to landfill. Validation sampling where necessary. Blending of combustible material. Combustible material has been identified on site as part of the geotechnical investigation. Materials are proposed to be blended with non-combustible materials and then placed 1 metre below finish level and capped. Where materials also contain metals or TRH contamination these will be placed more than 5 metres below finished surface level or more than 2 metres below finished surface level depending on whether human health or ecological guidelines are exceeded respectively. Excavation and placement of known contamination under appropriately qualified supervision and utilising licenced contractors. Materials will be placed at 5 metres below finished surface level or more than 2 metres below	The description of remediation required is adequately detailed. Additional investigations are proposed initially, however these are unlikely to alter the scope of remediation required. The site works include major cut to fill and blending of most fill materials present. These works allow for further visually assessment of impacts and appropriate management of any uncertainty in site investigations through the unexpected finds protocol.

Remedial Action Plan	Auditor Comments
finished surface level depending on whether human health or ecological guidelines are exceeded respectively. Site survey to confirm the thickness of capping material Offsite disposal off any other wastes identified during site works following appropriate classification and disposal procedures.	
Proposed Validation Criteria Proposed validation criteria are: Human health criteria for a residential land use Ecological criteria for urban residential/ open space Combustibility criteria are included.	Validation criteria are appropriate. Validation criteria for acid sulphate soils are not included and will be required as will an acid sulphate soils management plan.
Proposed Validation Testing Excavation: 1 per 10 m, or 1 per 25 m^2 Areas underlying waste materials: 1 per 25 m^2 Re-use of Excavated Material: Imported Material: a certificate documenting VENM or otherwise an investigation to confirm VENM. For other materials, classification under a resource recovery exemption. Blended coal/coal chitter: 1 per 25 m^3 for volumes up to 250 m^3, minimum 10 samples for volumes between 250 and 2500 m^3, and 1 sample per 250 m^3 for volumes over 2500 m^3 Cap survey will comprise survey of the placed material prior to capping and following capping. Surveying is to demonstrate the depth of capping above contaminated material meets the remediation requirements.	Generally, the Auditor agrees with the proposed validation testing however the following comments are made. The Auditor requires a Validation Sampling and Analysis Plan be developed for the remediation validation and provided to the Auditor for review prior to commencement. The Auditor notes that imported material must either be VENM, ENM or be classified under a Resource Recovery Exemption. The density of testing would need to be commensurate with the documentation provided and the consistency of the results. Validation of imported fill was discussed in Section 7.4 of the RAP however does form part of the validation criteria and should be incorporated in Section 8.6 of the RAP, and the VSAQP. The sampling rate proposed for coal chitter where volumes greater than 250 m^3 require validation will depend on the variability of the material. Where material is shown to be statistically consistent a lower sampling density can be applied. An approach to determining low variability within the material will be required as part of the VSAQP. The VSAQP is to include assessment criteria for groundwater, surface water and bulk ground gases that are proposed to be investigated. Residential houses at the property remain occupied. Assessment of these properties will be required as part of the assessment of site suitability. Based on the historical site activities and the absence of fill at these locations, potential contaminants are likely related to the use of the residence itself. These properties are noted to potentially include asbestos construction and have septic tanks. Validation of these properties is to be incorporated in the VSAQP.
Contingency Plan if Selected Remedial Strategy Fails A number of options have been provided for specific potential problems. The remedial strategy has a low risk of failure, as validation failure would lead to further excavation, and offsite disposal has been included as an option. Contingency procedures are provided for the unexpected finds and asbestos.	In the Auditor's opinion, the procedure for handling unexpected finds, which includes stopping work and identification of materials is appropriate and practical and can be implemented within the proposed remediation strategy. As identified in Section 8, the Auditor considers ACM impacts are potentially greater than identified in the site investigations. Contingent responses for increased volume of impacted materials include additional excavation and on site disposal, or off site disposal. These are considered appropriate.
Interim Site Management Plan (before remediation) Interim management prior to remediation is not included.	Areas of former infrastructure at the site are not occupied and therefore the requirement for interim management is considered low. However, there is potential for illegal dumping of the property to occur and restricting access to reduce risk of illegal dumping should be considered. Residential houses at the property that remain occupied are not considered to require interim management as contamination risks to these properties are considered to be low based on the distribution of fill materials at the site and lack of mining activities undertaken at these locations.

Remedial Action Plan	Auditor Comments
Site Management Plan (operation phase) including stormwater, soil, noise, dust, odour and OH&S A site management plan is included that describes controls proposed for asbestos management, dust, odour, noise, stormwater and soil, traffic, working hours and occupational health and safety.	The site management plan is appropriate for the contaminants present. A Construction Environmental Management Plan is proposed to be developed by the contractor. The CEMP should incorporate the recommendations for site management outlined in the RAP.
Remediation Schedule and Hours of Operation A timeline is not provided.	The Auditor understands Area A remediation and development will commence prior to Area B.
Contingency Plans to Respond to Site Incidents Contingency plans are included to respond to site incidents are not included.	The Auditor notes that the RAP provides management and contingency plans that are directly applicable for the proposed works.
Licence and Approvals The consultant identified that notification to Council would be required for remediation works. A licence asbestos contractor would be engaged to remove asbestos, and notification to SafeWork NSW would be completed. An appropriately licensed landfill should be selected and the material tracked from the Site to the landfill.	Acceptable. Development approval for the remediation is being sought from Lake Macquarie City Council.
Contacts/Community Relations Contacts details are to be confirmed. Stakeholder consultation is proposed to be undertaken during the development application.	Acceptable. The Auditor is aware from conversations with Client that discussions have been held with property owners onsite.
Staged Progress Reporting Not stated	Staged progress reporting may be required as the site is proposed to be developed in two parts comprising Area A and then Area B.
Waste Management Waste classification is to be completed in accordance with the NSW EPA Waste Classification Guidelines and Materials Tracking is proposed and will be documented in a Materials Management Plan.	Appropriate. The Auditor requires waste management to be incorporated in the CEMP and in the VSAQP.
Remediation Technology Pilot Trial A remediation technology pilot trial is not proposed.	The Auditor considers trialling of amendments for reduction of combustibility may be required.

12.3 Auditor's Opinion

In the Auditors' opinion, the proposed remediation works are appropriate. If adequately implemented, the RAP should be able to ensure that the site is suitable for the proposed land uses through the removal of fill impacted by asbestos containing material, further assessment of TRH contamination and the removal of anthropogenic materials. Successful validation will be required to confirm this.

13. CONCLUSIONS AND RECOMMENDATIONS

Qualtest state *'This RAP outlines the remedial strategies to render the site suitable from a contaminated land perspective based on the concept design of the proposed development. It is noted that the previous assessments completed to date are considered suitable to inform this RAP. Additional assessments have also been proposed; however, it is considered that the additional assessments can be completed following DA approval, during detailed design/subdivision approvals and prior to earthworks commencing on the site. Following the additional assessments, this RAP will need to be refined.'*

Qualtest 2021a further states *'Provided the additional assessments and remediation strategies outlined in the RAP are completed prior to earthworks/construction, it is considered the site can be rendered*

suitable, from a contamination perspective in accordance with Clause 7 of State Environmental Planning Policy No 55—Remediation of Land, for the proposed residential development.'

The Auditor agrees with the statements made by Qualtest. The Auditor considers that the previous investigations provide sufficient information to confirm the potential for contamination and to inform the requirements for remediation. The site has been tested at regular intervals however not all areas of the site have been investigated. While the risk of identifying contamination in these areas is low based on the site history and investigations completed to date, management of this uncertainty through completion of additional confirmation investigation and implementation of an unexpected finds protocol is appropriate. The RAP outlines requirements for additional investigation, steps to be taken in the event of an unexpected finds and details the appropriate management of materials. Further specific assessment of the retained residential properties will be required. Based on the site history, contaminants are expected to be related to residential land use and can be appropriately managed under the RAP.

On this basis, the Auditor considers that the site can be made suitable by following the RAP:

- 'Remedial Action Plan, Lot 1 DP 1180181 and Lot 2 DP 11801181 1A Flowers Drive, Catherine Hill Bay, NSW', 19 August 2021, Qualtest

subject to the following:

- Acid sulphate soils are present within the site and an acid sulphate soils management plan should be developed and implemented
- A Validation Sampling and Analysis Quality Plan is prepared and provided for review by the Auditor prior to further investigation and remediation. The VSAQP includes recommendations outlined in this IAA.
- Further investigations are reported for review by the Auditor. A revision of the RAP is completed and reviewed by the Auditor if required
- A Construction Environment Management Plan including a Materials Management Plan is developed for management of the works
- The final cell design including cut to fill is provided to the Auditor for review prior to commencement of remediation
- Soils are placed onsite at depths that do not require an Environmental Management Plan.
- Validation works outlined in the RAP are documented to be successful.

At the completion of the site development works a site audit assessing the implementation of the RAP is to be completed and conclude on the suitability of the site for the residential land use.

* * *

Consistent with the NSW EPA requirement for staged 'signoff' of sites that are the subject of progressive assessment, remediation, and validation, I advise that:

- This advice letter does not constitute a Site Audit Report or Site Audit Statement.
- At the completion of the site works I will provide a Site Audit Statement and supporting documentation.
- This interim advice will be documented in the Site Audit Report.

14. LIMITATIONS

This interim audit advice was conducted on the behalf of DEMA (NSW) for the purpose of assessing the suitability and appropriateness of a remedial action plan (RAP). This summary report may not be suitable for other uses.

The Auditor has relied on the documents referenced in Section 1 in preparing the Auditors' opinion. The consultants included limitations in their reports. This interim audit advice must also be subject to those limitations. The Auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which the Auditor had some control or is reasonably able to check. If the Auditor is unable to rely on any of those documents, the conclusions of this interim audit advice could change.

It is not possible to present all data which could be of interest to all readers of this interim audit advice. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

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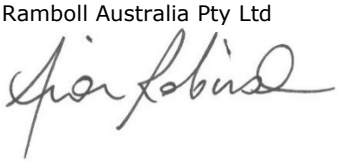
Consistent with the NSW EPA requirement for staged 'signoff' of sites that are the subject of progressive assessment, remediation and validation, I advise that:

- This advice letter does not constitute a Site Audit Report or Site Audit Statement.
- This interim advice will be documented in the Site Audit Report.

Yours sincerely
Ramboll Australia Pty Ltd



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Enc:
Attachment 1: Site Location Plan
Attachment 2: Site Area and Sample Locations
Attachment 3: Asbestos Sampling Locations
Attachment 4: Area of Environmental Concern

Attachment 1: Site Locality Plan

LEGEND:

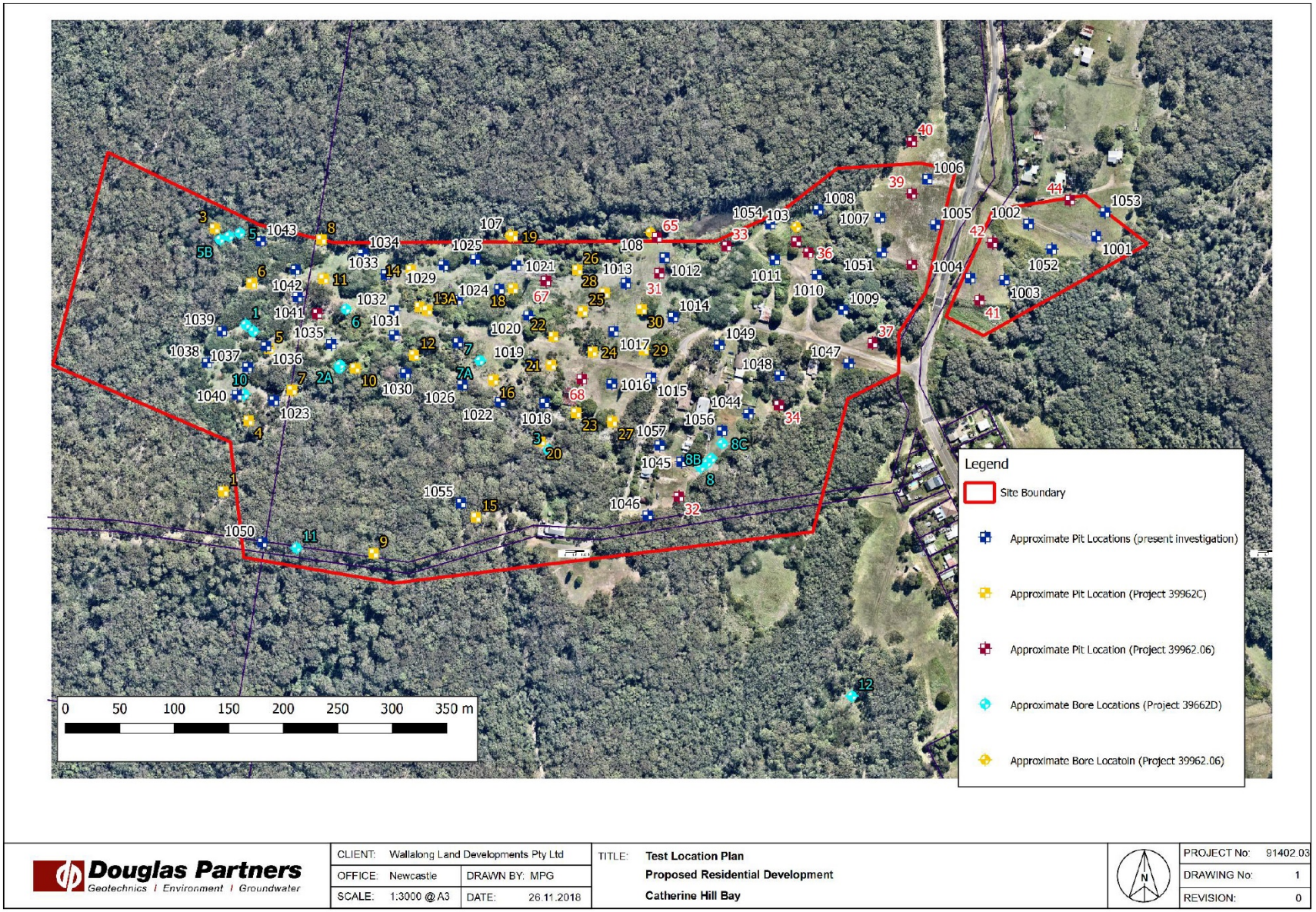
Site Boundary

Image obtained from Google Maps on 01 October 2016

Qualtest LABORATORY (NSW) PTY LTD

Client:	Wallalong Land Developments	Drawing No:	FIGURE 1
Project:	Proposed Residential Subdivision	Project No:	NEW21P-0118-AA
Location:	Flowers Drive, Catherine Hill Bay	Scale:	N.T.S.
Title:	Site Location Plan	Date:	10/08/2021

Attachment 2: Site Area and Investigation Locations



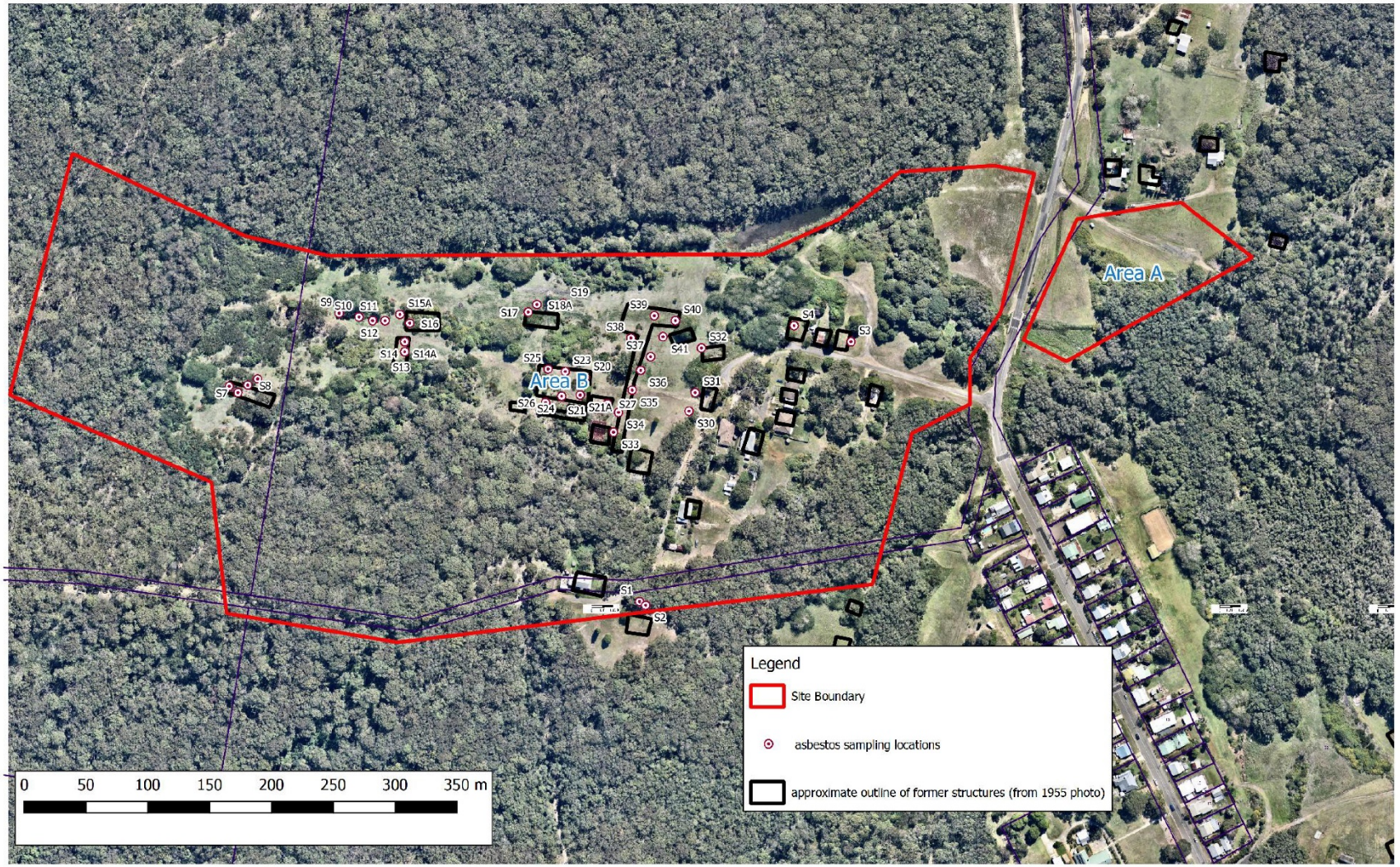
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Wallalong Land Developments Pty Ltd		
OFFICE:	Newcastle	DRAWN BY:	MPG
SCALE:	1:3000 @ A3	DATE:	26.11.2018

TITLE: **Test Location Plan**
Proposed Residential Development
Catherine Hill Bay

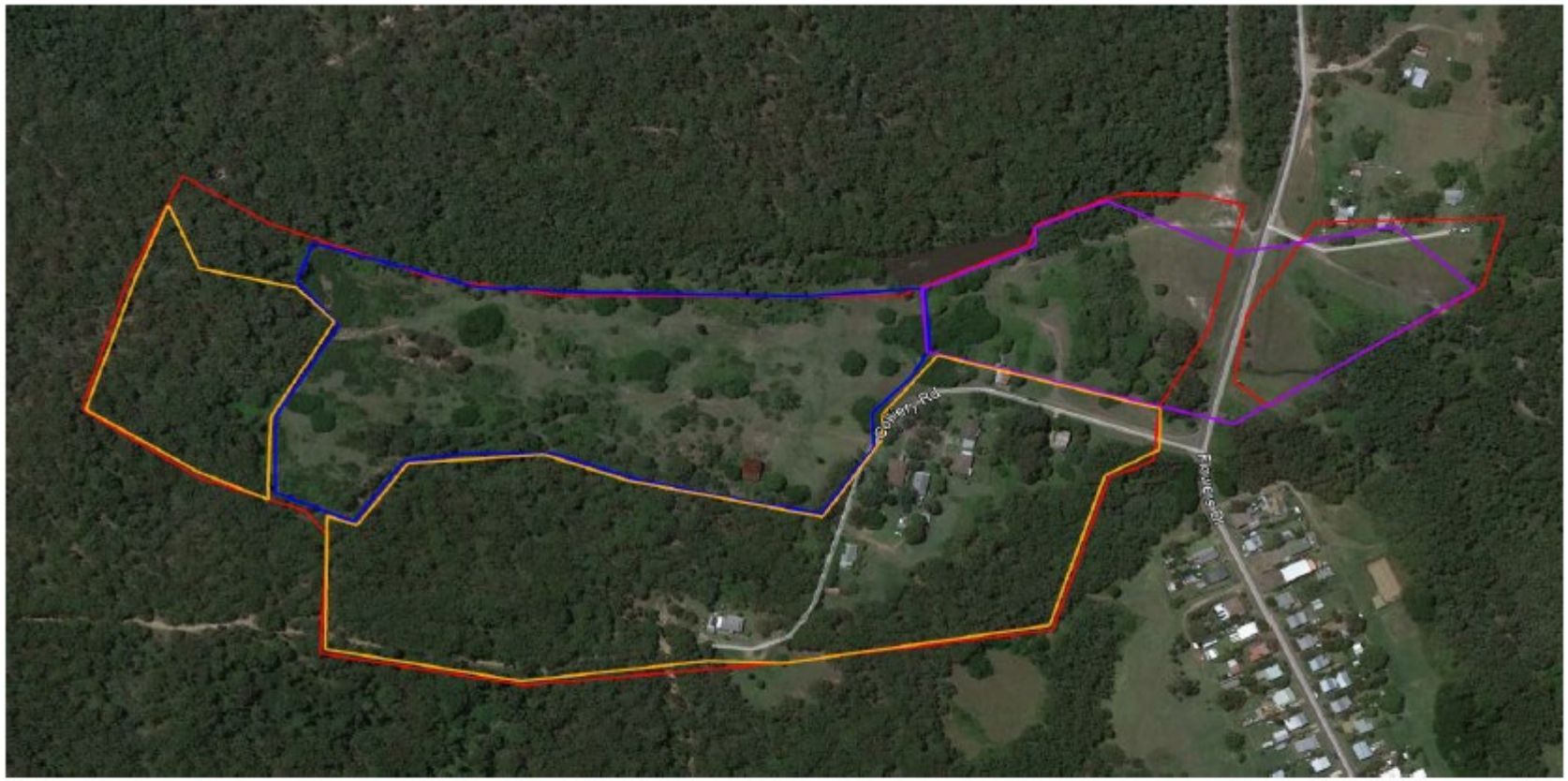
PROJECT No:	91402.03
DRAWING No:	1
REVISION:	0

Attachment 3: Asbestos Sampling Locations



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Wallalong Land Developments Pty Ltd		TITLE: Location of Surface Samples for Asbestos Testing Proposed Residential Development Catherine Hill Bay	N	PROJECT No: 91402.03
	OFFICE: Newcastle	DRAWN BY: MPG			DRAWING No: 7
	SCALE: 1:3000 @ A3	DATE: 19.03.2019			REVISION: 0

Attachment 4: Areas of Environment Concern



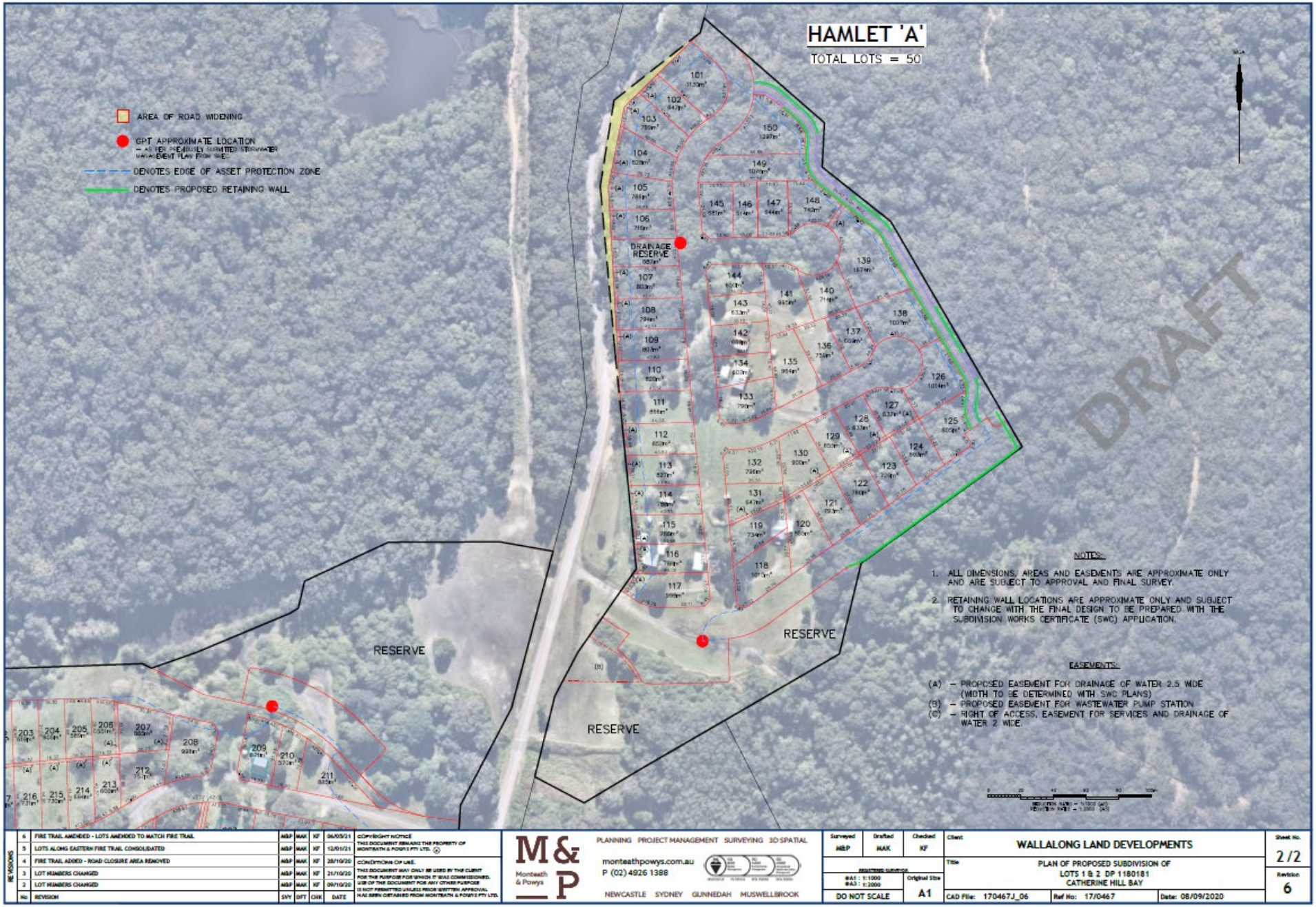
LEGEND:

- Site Boundary
- AEC 1 - Former colliery footprint (filled area and
- AEC 2 - Filled area in eastern part of AReа B
- AEC 3 - Residual areas of the site

Qualtest

Client:	Wallalong Land Developments	Drawing No:	FIGURE 3
Project:	Proposed Residential Subdivision	Project No:	NEW21P-0118-AA
Location:	Flowers Drive, Catherine Hill Bay	Scale:	N.T.S.
Title:	Areas of Environmental concern - DP (2019)	Date:	10/08/2021

Attachment 5a: Proposed Development



Attachment 5b: Proposed Development