RAMBOLL

ENVIRONMENT
& HEALTH

City of Newcastle
16 Stewart Avenue
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Attn: Robert Dudgeon, Ben Elhorst

By email: rdudgeon@ncc.nsw.gov.au, belhorst@ncc.nsw.gov.au

Dear Robert, Ben

RE: INTERIM ADVICE LETTER NO. 1 – RICHMOND VALE RAIL TRAIL

Date 16/09/2021

1. INTRODUCTION

As a NSW Environment Protection Authority (EPA) accredited Contaminated Sites Auditor, I am conducting an Audit in relation to the subject site. This initial review has been undertaken to provide an independent review of the extent of investigation completed and the suitability of the site for the proposed use. The overall objective of the site audit is to assess suitability of the site for the proposed rail trail use.

The Audit has been commissioned by City of Newcastle. The Richmond Vale Rail Trail (RVRT) is a proposed shared pathway for cyclists and pedestrians along a former rail line extending from Shortland to Pelaw Main. The Audit relates to the section of the former rail line within the Newcastle local government area comprising approximately 15.6 km from Shortland to Minmi. The former rail line comprises existing cuttings and tunnels which will be used to form the RVRT. Where access is not possible minor roadways will be adopted. Works to convert the rail line to the RVRT will comprise regrading, placement of gravel road base and asphalt surface, replacement of dilapidated bridges including some excavation works and some cutting and retaining works. Removal of unsuitable and unsightly materials is proposed.

This interim advice letter is based on a review of the documents listed below as well as discussions with City of Newcastle and GHD Pty Ltd (GHD) who undertook the investigations and prepared the remedial strategy. A site visit has not been completed due to Covid restrictions in place at the time of the Audit. The Auditor has reviewed photographs provided by the GHD.

The reports reviewed were:

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- 'Environmental Site Assessment, Richmond Vale Rail Trail', Hunter Civilab Pty Ltd (Hunter Civilab), 9 June 2021 (**the ESA**)
- 'Richmond Vale Rail Trail, Contaminated Site Assessment', 7 September 2021 and earlier draft, GHD (**the CSA**)
- 'Richmond Vale Rail Trail, Remedial Action Plan', 16 September 2021, GHD (**the RAP**).

2. SITE DETAILS

2.1 Site Description

The site comprises the 15.6 km length and approximately 93,600 m^2 area of the RVRT within the City of Newcastle local government area (LGA). The site location and extent of GHD's study area is shown on **Attachment 1**. It is noted that Segments 1 to 3 and a portion of Segment 4 of the RVRT are located outside the Newcastle LGA and as such were not included in GHD's report or this Audit. The site description as identified from the GHD CSA is presented in **Table 2.1**. Site observations are from GHD investigations on 26 May 2016, 7 and 16 June 2021. Additional information sourced from the observations made for the ESA is also incorporated.

Table 2.1: Site Description, Surrounding Land Uses and Zoning, extract from the CSA

Segment number	Segment length	Description	Relevant LEP	Zoning
4	4 km	This area comprises rural residential, farmland and agricultural land use. From 15.4-17.6 km lies Lot 21 of DP1195619 (Rio Tinto). The segment then intersects with Cedar Hill Drive, the Pacific Motorway and Lenaghans Drive. The area from 17.7-19 km is encompassed by Lot 1 of DP1007615 (Black Hill Land Pty Ltd). The Pambalong Nature Reserve lies to the south-west of the trail. The water running below the Surveyors Creek bridge was a bright orange colour, suggesting the precipitation of iron. Dumped debris was also found including furniture and plastic. A piece of dumped concrete and broken bottles were also found.	Newcastle Local Environmental Plan 2012	SP2 Infrastructure E1 National Parks and Nature Reserves E2 Environmental Conservation
5	2.25 km	Segment 5 is the spur to Minmi and begins from 19.25 km and extends south west to the residential area within Woodford Street, Minmi via farmland and bushland. The trail in this segment covers areas from Lot 1 of DP1007615, Lot 10 of DP119449, Lot of 148 DP840897 (Hunter Water Corporation), Lot 2 of DP1193703 (Minmi Land Pty Ltd) and Lot 3 of DP1111997 (Sterling Property Services). No obvious signs of illegal dumping or potential signs of contamination.	Newcastle Local Environmental Plan 2012	R2 Low Density Residential E1 National Parks and Nature Reserves E2 Environmental Conservation
6	5.8 km	The segment extends to the north east and covers an area comprising bushland and farmland before transitioning into the Hexham Swamp Nature Reserve. The trail begins with a connection to the township of Fletcher before intersecting with the Hunter Water Pipeline (Lot 147 DP1143414) at 19.25 km whilst the straight component of the trail from 19.25-24 km lies within Lot 10 of DP119449 (Coal & Allied Industries Limited). This area also encompasses Lot 1 of DP90465 (The State of New South Wales). Disused pumping and piping infrastructure was found throughout this segment.	Newcastle Local Environmental Plan 2012	E1 National Parks and Nature Reserves E2 Environmental Conservation
7	2.5 km	This area consists of low-lying swampy terrain and intersects with Purgatory Creek approximately 360 m from Anderson Drive. From here the track transitions to the residential area of Tarro whereby the trail crosses the New England Highway and ends at the corner of Anderson Drive. The trail encompasses Lot 1 of DP128309 and Lot 1 & 2 of DP171105 owned by Hunter Water Corporation as well as Lot 102 of DP1084709 and Lot 10 of DP735235 (Aurizon Operations Limited). No obvious potential sites of contamination identified.	Newcastle Local Environmental Plan 2012	SP2 Infrastructure R2 Low Density Residential E2 Environmental Conservation
8	5 km	Segment 8 extends generally south along the boundary with the Hexham Swamp Nature Reserve (to the west). This area is primarily swampy marshlands on the western side of the track, whilst to the east lies the existing train line, the New England Highway and industrial areas. The segment includes Lot 1 of DP90465, Lot 3 & 4 of DP805274 and Lot 302 of DP1141267, all of which are under the ownership of the State of New South Wales, as well as Lot 2 of DP611518 (Hunter Water Corporation). No obvious potential sites of contamination identified.	Newcastle Local Environmental Plan 2012	IN3 Heavy Industrial E1 National Parks and Nature Reserves E2 Environmental Conservation
9	1.9 km	The beginning of segment 9 extends over Ironbark Creek (Crown land) on the outskirts of the Hexham Swamp Nature Reserve. The trail intersects with Ironbark Creek at 29.2 km Following this, the trail enters the suburban residential area of Shortland and runs adjacent to King Street before finishing at Sandgate Road at 30.9 km. The segment is	Newcastle Local Environmental Plan 2012	RE1 Public Recreation R2 Low Density Residential

Segment number	Segment length	Description	Relevant LEP	Zoning
		located within Lot 1 of DP611441, Lot 1 & 2 of DP805274 and Lot 302 of DP1141267 owned by Hunter Water Corporation. No obvious potential sites of contamination identified.		
10		Segment 10 begins at the southern end of Segment 8 and extends along the north-eastern boundary of the residential properties of Blanch Street. The trail continues towards the Hunter Wetland Centre generally in a south eastern direction, traversing the low-lying swampy terrain and ending at the Wetland Centre building. The trail includes Lot 50 DP 1201513 and Lot 5 DP 233520. The former Shortland Tip also known as the Astra Street Landfill is located to the east of the wetlands, adjacent to Sandgate train station.	Newcastle Local Environmental Plan 2012	E2 Environmental Conservation

The RVRT route encompasses a range of topographies. Elevations surrounding Segment 4 flatten out as the route approaches the Pambalong Nature Reserve before crossing the Pacific Motorway and Lenaghans Drive, where the elevation ranges from 10-30 m Australian Height Datum (mAHD). From Segment 5 onwards, the landscape is primarily flat and low lying with an elevation of approximately 10 mAHD as the RVRT route approaches and then passes through the Hexham Swamp region. For the final 2.31 km of the trail, the elevation ranges from 10-20 mAHD before again reaching the low-lying wetlands of 10 mAHD elevation.

2.2 Proposed Development

The site is to be redeveloped by City of Newcastle as a shared pathway for cyclists and pedestrians along a former rail line extending from Shortland to Pelaw Main. The proposed development is considered to fall within a 'recreational land use' exposure scenario.

2.3 Auditors Opinion

The site condition has been adequately described. The RVRT crosses several waterways, and enters the Hunter Wetlands (Segment 10), which is considered a sensitive receptor and is considered in the selection of criteria for the protection of ecology.

3. SITE HISTORY

GHD provided a site history based on aerial photographs, site photographs, council records and previous investigation reports. GHD's review of historical aerial photography is provided in **Table 3.1**.

Table 3.1: GHD's review of Historical Aerial Photographs, extracted from CSA

Segment	Year of photograph	Description
4	1966	There is minimal development in this area, with some pastoral land and associated farming infrastructure present in alignment with minor road networks. The current Pacific Motorway is present to the north east of the trail; however, Lenaghans Drive is yet to be constructed. The Pambalong Nature Reserve and surrounding land north of the trail remains undeveloped.
	1976	In this segment, John Renshaw Drive is now present some distance to the north of the RVRT. A significant portion of land to both to the north and south of the trail has been cleared to develop pastoral land. A new piece of significant farming/industrial infrastructure has been constructed to the north east of the trail between John Renshaw Drive and Black Hill Road. No significant infrastructure exists within close proximity to the trail.
	1984	There are no major changes from the 1976 photograph, except for a minor extension of the farming/industrial infrastructure to the north of the RVRT.
	1993	No major changes have occurred since the 1984 photograph.
	2004	Land clearing has occurred for the Pacific Highway and Lenaghans Drive. However, the Pambalong Nature Reserve to the north of the trail has remained undisturbed.
	2016	Land clearing and the construction of infrastructure associated with the Hunter Expressway has taken place.

Segment	Year of photograph	Description
	Source: Six Maps (accessed 21/11/2016)	
5	1966	Land clearing has occurred to develop the township of Minmi. Minimal residential properties have been constructed, however Woodford Street (that the RVRT segment follows) is well defined in this photograph.
	1976	No extensive land clearing has occurred, however more residential properties have been constructed to the east and west of Woodford Street.
	1984	Land clearing has occurred in the township of Minmi for low density residential area. Land has also been cleared to the east of this segment for pastoral land.
	1993	Significant land clearing has occurred to the south east of Woodford Street to make way for quarry or mining-like infrastructure.
	2004	More residential properties have been constructed along Woodford Street. Approximately a third of the land clearing south east of Woodford Street appears to have been rehabilitated, with the areas having been replaced with grassland.
	2016 Source: Six Maps (accessed 21/11/2016)	Extensive land clearing has made way for residential and commercial zones extending towards the southern portion of this segment. These built up areas are surrounded by National Parks and Reserves which have remained largely unchanged.
6	1966	This segment primarily consists of the Hexham Swamp Nature Reserve. At the beginning of the segment some minor residential and farming development is present to the north and south of the RVRT.
	1976	No major changes have occurred since the 1966 photograph.
	1984	No major changes have occurred since the 1976 photograph.
	1993	No major changes have occurred since the 1984 photograph.
	2004	Some land clearing to the north of the segment has occurred to make way for pastoral land and associated infrastructure. No other major changes to the land within close proximity of the RVRT have occurred.
	2016 Source: Six Maps (accessed 21/11/2016)	Minor land clearing has been due to the development and maintenance of the Hunter Water Pipeline and associated infrastructure. The remainder of the land to the south of the RVRT is part of the Hexham Swamp Nature Reserve.
7	1966	The township of Beresfield, north the of the RVRT, has been established. Apart from this low density residential area, the majority of clearing is for pastoral land. The New England Highway at Tarro and Pipeline Road have both been constructed.
	1976	Further development of the Beresfield residential areas has occurred; however no other major changes were noted.
	1984	The townships of Beresfield, Woodberry and Tarro have been developed significantly. In addition, much of the land south of the A1 Highway has been cleared and is now grass land and pastoral land.
	1993	No major changes have occurred since the 1984 photograph.
	2004	No major changes have occurred since the 1993 photograph.
	2016 Source: Six Maps (accessed 21/11/2016)	Further development of the low density residential areas and commercial areas has occurred. Other land clearing may be due to upgrades of roads, most notably Anderson Drive, Pipeline Road and the New England Highway. Woodberry, a township north of the RVRT has also been developed extensively.
8	1966	There are a number of small industrial areas present to the east of the RVRT and to the west of the Hunter River, just prior to the river dividing into the North and South Channels. Some residential properties exist along Old Maitland Road. Major industrial areas exist on each side of the Pacific Highway and residential properties exist east of the RVRT where the Pacific Highway merges into Maitland Road. Well defined tributaries of the Hunter River intersect the RVRT, connecting to the Hexham Swamp Nature Reserve.
	1976	At the northern end of this RVRT segment, rail infrastructure is visible to the east and potentially also consist of coal loading facilities. As the RVRT continues south, the tributaries to the South Channel of the Hunter River intersect with the trail, connecting with the Hexham Swamp Nature Reserve.

Segment	Year of photograph	Description
	1984	Further industrialisation has occurred to the east of the RVRT, particularly within the southern portion of the segment, towards Ironbark Creek. A number of the tributaries to the South Channel of the Hunter River have become thinner and less defined in comparison to the 1976 photograph.
	1993	No major changes have occurred since the 1984 photograph.
	2004	Tributaries to the South Channel of the Hunter River appear more well defined than the 1993 image. Further industrialisation has occurred, particularly to the north and south of Sparke Street, Hexham, at the One Steel Recycling facility.
	2016 Source: Six Maps (accessed 21/11/2016)	Minimal land clearing and development has occurred to the western side of the RVRT, however significant development has occurred to the east of the trail. These developments include Aurizon Operations Limited rail infrastructure and small heavy industrial businesses. The current aerial photograph shows that the area to the north of Ironbark Creek is orange/red in colour, potentially indicative of iron staining.
9	1966	The northern portion of this segment consists of low density residential areas and pastoral land. The southern portion of the RVRT in this area remains mostly undeveloped.
	1976	Further residential development has occurred at the northern end of the trail segment within the suburb of Shortland.
	1984	A cricket field has been constructed to the east of King Street. The residential area has continued to develop.
	1993	Residential housing has become slightly denser; however, no other major changes were noted.
	2004	There are minimal changes to this segment from previous photographs. The Hunter Water Pipeline to the west of King Street has become more well defined.
	2016 Source: Six Maps (accessed 21/11/2016)	The beginning of this segment remains relatively undeveloped, with Ironbark Creek intersecting the proposed RVRT at the northern end of the segment. The remainder of this segment comprises low density residential area in the township of Shortland. To the east of the trail lies the Shortland Wetlands Centre. Further commercial and residential development has occurred within the Shortland and Sandgate areas, particularly to the east and west of King Street and to the west of Sandgate Road.
10	1966	The northern portion of this segment consists of low density residential areas and rural or undeveloped land. The southern portion of the Segment 10 in this area remains mostly undeveloped.
	1976	Further residential development has occurred at the northern end of this trail segment within the suburb of Shortland. A large part of the wetlands has been converted to a complex of football fields (former Marist Park) and a club building. The Astra Street landfill is visible near Sandgate railway station.
	1984	There are minimal changes to segment 10 from previous photographs. The football fields appear no longer in use.
	1993	Residential housing has become slightly denser in the north. The former football fields have been redeveloped to form the Shortland Wetland Centre. Two ponds constructed north of the current converted wetlands building. The site has been further developed for recreation and conservation purposes with new wetland channels and walking trails constructed.
	2004	The Shortland Wetland Centre has changed little from the previous photograph. The Astra Street Landfill has ceased operations and has been sealed.
	2016 Source: Six Maps (accessed 21/11/2016)	Further commercial and residential development has occurred within the Shortland and Sandgate areas. The wetland segment of the trail remains the same.

3.1 Auditor's Opinion

The site history provides an adequate indication of past activities. The Auditor notes that a review of historic land titles, Section 10.7 certificates and dangerous goods licenses was not completed however does not consider this omission significant in the context of the known site history and the low likelihood of dangerous good storage along the alignment.

The information provided in the CSA indicates that large portions of the proposed RVRT route have historically been used as a rail corridor. Land adjacent to the RVRT has been used for roads, agricultural purposes, commercial/industrial properties and residential dwellings.

4. CONTAMINANTS OF CONCERN

GHD provided a list of the contaminants of concern and potentially contaminating activities., presented in the **Table 4.1**.

Table 4.1: Contaminants of Concern, extracted from the CSA

Description	Rationale/detail	Potential contamination	Risk level
Rail corridor	Contamination associated with long term railway use.	Heavy Metals, TPH, BTEX, PAHs, OCPs, asbestos.	Low to moderate
Road ways and verges	Contamination associated with run off from roads containing fuel and oil residues.	Heavy Metals, TPH, BTEX, PAHs	Low
Historical use of pesticides	Use of pesticides and herbicides for weed and insect control. Particularly along the rail corridor, road ways and faming land.	Arsenic, OCPs and OPPs.	Low
Presence of building and other waste materials	Historical demolition and waste disposal practices including burial of wastes (including landfills) and illegal dumping.	TRH, BTEX, PAHs, phenols, heavy metals, OCPs and OPPs, asbestos.	Low to moderate
Timber bridges	Potential coatings including use of lead based paint, pesticides and timber treatment chemicals.	TRH, PAHs, heavy metals, OCPs and OPPs	Low
Industrial properties	Contamination associated with industrial practices within the vicinity of the RVRT route.	Heavy Metals, TPH, BTEX, PAHs, phenols, OCPs, OPPS, PCBs, asbestos.	Low
Fill materials	Fill materials from unknown sources. Potential use of fill during initial development of the railway and development of surrounding areas.	TRH, BTEX, PAHs, phenols, heavy metals, OCPs, OPPs PCBs and asbestos.	Low
Hunter Water Chichester Trunk Gravity Main (CTGM)	Contamination associated with historical use of lead collars and joints in the water pipeline.	Lead	Low to moderate

TPH – Total Petroleum Hydrocarbons
BTEX – Benzene, Toluene, Ethyl-benzene, Xylenes
TRH – Total Recoverable Hydrocarbons
PAH – Polycyclic Aromatic Hydrocarbons
OCP – Organochlorine Pesticides
OPP – Organophosphate Pesticides
PCB – Polychlorinated biphenyls

4.1 Auditor's Opinion

The analyte list used by GHD adequately reflects the site history and condition. The Auditor additionally notes that coal chitter from the rail cargo and creosote for timber bridge treatment may also be present and appropriate analytes are included to assess for contamination from the presence of these materials.

GHD considered that per- and poly-fluoroalkyl substances (PFAS) were not likely to be a contaminant of potential concern as there was no evidence of land use activities immediately adjacent to the site that had potential to store or use significant amounts of PFAS chemicals. GHD did consider the former landfills (Astra Street and Tuxford Park) could potentially be a source of PFAS, however determined them to be a source unlikely to impact users of the RVRT as both are located 1 km of the Site. The Auditor agrees with this conclusion.

5. GEOLOGY AND HYDROGEOLOGY

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

5.1 Geology

The CSA reports that a review of the site geological maps for the area indicates underlying geology to vary between the Newcastle Coal Measures, Tomago Coal Measures and Quaternary Deposits. The soil landscape map identified the site lies within numerous natural soil landscaped and disturbed terrain from human activity.

The sub-surface profile of the site is summarised from site investigations completed for the ESA in **Table 4.1**.

Table 4.1: Stratigraphy

Depth (mbgl)	Subsurface Profile
Shortland Section	
0.0 – 0.2	TOPSOIL: Brown sandy silt
0.2 – 0.5	FILL: Dark brown silty sand and silty clay with trace gravels
0.5 – 1.0	Dark brown, mottled orange silty clays overlying weathered, light brown, mottled grey sandstone
Hexham Section	
0.0 – 1.5	FILL: Mixtures of sand, gravels, silts and clays, coarse and angular particles, generally brown to dark brown/black and grey. Some inclusions of coal and chitter noted
1.5 – 2.0	Dark brown, mottled orange silty clays overlying weathered, light brown, mottled grey sandstone
Minmi Section	
0.0 – 2.3	FILL: Coarse grained coal and coal chitter fill with cobble sized coal and shale fragments and light brown, mottled orange sandy clay and light brown and brown sand, gravel (including cobbles) and silt mixtures, full depth of coal chitter not found in BH11, BH12, BH19 and BH20
2.3 – 2.6	Brown, dark brown, black and grey silty clay

mbgl – metres below ground level

GHD reviewed the 1:25,000 scale Acid Sulfate Soil (ASS) Risk Map for Newcastle indicates that most of the segments that lie within Hexham Swamp have a high risk of encountering ASS conditions within 1 m or between 1 m and 3 m below the ground surface. It is noted that ASS is indicated to occur approximately 4 km downstream (north) of Willis Creek, and hence there is potential for encountering ASS on the section of the alluvial plain traversed by the rail corridor.

5.2 Hydrogeology

GHD undertook a search of the groundwater information database maintained by the NSW Government and identified 42 registered groundwater bores within a 1 km radius of the RVRT. The bores included 39 test or monitoring bores, two stock/domestic bores and one bore with no information provided.

Based on site observations and the environmental setting of the RVRT, GHD considered regional groundwater would flow in an easterly and south easterly direction towards the Hunter River ranging from very shallow (<1 mbgl) within the areas of Hexham to moderately deep (>5 mbgl) in areas of higher elevation.

GHD considered groundwater in the area could be used for a variety of purposes including domestic use (including potential drinking water), stock watering, irrigation purposes or monitoring purposes.

5.3 Auditor's Opinion

The depth of fill and underlying stratigraphy have been adequately identified however variability within the site is likely to occur. Further comment on managing variability is presented in **Section 8.1**.

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 relevant data from these sources is summarised in **Table 5.1**. Review of the quality of the data is summarised in **Tables 5.2** and **5.3**.

Table 5.1: Summary of Investigations

Investigations	Field Investigations	Analytical Data Obtained
ESA	40 primary samples from 20 boreholes (BH01 to BH20) (Attachment 2) at targeted, accessible locations along the alignment.	Metals, TRH/BTEX, PAHs, phenols, OCPs & PCBs (composites), asbestos, pH and Cation Exchange Capacity (CEC)
CSA	CSA incorporating findings of fieldwork undertaken for the ESA above, as directed by GHD	As above

Table 5.2: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Data Quality Objectives (DQO) The DQO process is used to define the type, quantity and quality of data needed to support decisions. GHD defined specific DQOs in accordance with the seven-step process outlined in Schedule B2 of NEPM 2013 in the CSA. These are summarised as follows: Problem: Council requires preliminary advice on the presence of contamination and the potential risk to human health or the environment for the proposed Newcastle LGA portion of the RVRT pathway. Decision: The data from the investigation will be used to: 1) Assess the historical and current contamination conditions within the proposed Newcastle LGA portion of the RVRT 2) Assess the potential risk to human health and the environment that may exist at the site as a result of past and/or current site uses. Inputs: Data inputs for the project include: Desk top data including review of previous reports, site inspection/s, soil sampling and analysis undertaken as part of the CSA, current assessment criteria as listed in the CSA. Boundary: The portion of the RVRT subject to this audit is 15.6 km long and between 3 and 6 m wide (covering an area of approximately 93,600 m²). The vertical boundaries of the study is the maximum depth of soil investigations (2.6 mbgl). The intrusive works for the study were limited	These were considered appropriate for the investigations conducted.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
to accessible areas with access restrictions noted in the Minmi area due to dense vegetation and damaged bridges across several small creeks. Decision rule: Reviews of historical site information was used to identify the major potential contaminants of concern and results reported as part of this assessment will be used to assess the potential risk to human health and/or the environment that may exist as a result of past and current site uses. Decision errors: Guidelines presented in the CSA will be used to assess the contamination status of soils within the site. DQIs as described in the CSA will be used to evaluate the acceptability of the data. Optimise design: sampling as per Auditor approved sampling plan. QA/QC procedures were used and QC samples collected to allow evaluation of DQIs as described in the CSA.	
Sampling pattern and locations *Soil:* Investigation locations were positioned to areas of potential concern from specific activities as well as to assess the nature of fill materials and contamination from the rail line operations. Sampling targeted impacts from fuels, oils, grease and asbestos along the former rail line, use of pesticides and herbicides, potential for lead impacts in the area of the former/current CTGM, potential for coal chitter, areas of urban development, potential for contaminants in fill materials, and the Astra Street Landfill.	These investigation locations provide reasonable coverage of the alignment and target the main areas of concern. Areas of the site not accessible comprise low lying flood plain and swamplands. Whilst these areas were not sampled, there were no potentially contaminating activities identified other than the construction and operation of the rail line. On this basis, investigation of fill material and potential contaminants from the rail line use are considered to provide an indication of the risks through the inaccessible areas. However, as there remains some uncertainty, the Auditor considers the additional investigation outlined in the RAP is appropriate to ensure any unexpected site conditions encountered during construction works can be appropriately managed. A review of the RAP is included in **Section 10**.
Groundwater: No investigation of groundwater characteristics or quality were undertaken as part of the CSA.	GHD states that *"Although low levels of contaminants including metals and hydrocarbons were reported in soils, due to the sparse locations of metal impacts, and that elevated TRH are likely associated with the presence of coal/chitter based fill, the potential for significant groundwater contamination as the result of leaching of contaminants is considered unlikely. In addition, the pathway will be sealed, limiting surface water infiltration and further reducing the potential leaching of contaminants. Based on the above, further assessment of groundwater is not considered to be required."* Overall, this conclusion is considered acceptable in the context of the additional investigation to be undertaken as part of the RAP.
Sampling density *Soil:* The sampling density of 20 locations over approximately 15.6 km represents on sample every 800 m approximately. However, samples were concentrated in accessible areas and therefore higher density in these areas was achieved.	The limited sampling density achieved for the CSA and that large sections of the RVRT route (e.g., within the Hunter Wetlands National Park and areas of dense vegetation and damaged bridges) were inaccessible and not sampled. In light of the low risk of contamination identified, this uncertainty represents a low risk which can be appropriately managed under the during construction. The RAP has been prepared to this end and will be implemented during additional investigations proposed by the RAP as well as during construction.
Sample depths Samples were collected and analysed from a range of depths, with the primary intervals being within the shallow fill and at, slightly above or slightly below the fill/natural interface.	The sampling strategy was appropriate and adequate to characterise the primary material types present on site.
Sample collection method Soil sampling were undertaken by Hunter Civilab for the ESA on 7 and 16 June 2021 with initial supervision by GHD (7 June 2021) to confirm sampling methodology. Sample collection was via auger flight in the Shortland and Hexham sections. Soils were collected from the auger	Sampling from auger flights may result in loss of volatile contaminants. However, significant volatiles were considered unlikely given the age of the contaminants present and photoionisation detector (PID) readings during the field program did not detect the presence of volatiles. On this basis, the method of sampling was not considered to affect the conclusions of the report.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
flights, with external material removed prior to collecting the sample. Sample collected in Minmi section was by hand, directly from the sidewall of the borehole. For deeper samples, a hand auger was used.	Overall, the sample collection method was found to be acceptable in the context of the site history and the likely contaminants present.
Decontamination procedures Sampling equipment was cleaned with phosphate-free detergent (Decon Neutracon), tap water and then de-ionised water prior to sampling and between sampling events to prevent cross contamination. Augers were brushed down between sampling locations.	Acceptable
Sample handling and containers Samples were placed into prepared and preserved sampling containers provided by the laboratory and chilled during storage and subsequent transport to the labs. Samples for asbestos analysis were placed in plastic zip-lock bags.	Acceptable
Chain of Custody (COC) Completed chain of custody forms were provided in the report.	Acceptable
Detailed description of field screening protocols Field screening for volatiles was undertaken using a PID. Soil sub-samples were placed in ziplock plastic bags and the headspace measured for VOCs after allowing time for equilibration.	Acceptable
Calibration of field equipment The reports indicated that calibration had been undertaken prior to use and checks were performed during use. Calibration certificate from the equipment supplier was provided.	Acceptable
Sampling logs Soil logs are provided within the report, indicating sample depth, PID readings and lithology. Logs identified the presence of anthropogenic inclusions and other observations relevant to site contamination.	Acceptable

Table 5.3: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
Field quality control samples The following field quality control samples were undertaken: 2 x trip blanks, trip spikes, rinsate blanks (one per field day) 3 x field intra-laboratory and 1 x inter-laboratory duplicates were undertaken. GHD noted there was an error in which one of the inter-laboratory samples was analysed as an intra-laboratory sample.	Overall, the quality control samples were undertaken at appropriate frequencies with the exception of inter-laboratory analysis. The reduced frequency is expected to have a negligible impact on the outcome of the Audit.
Field quality control results The results of field quality control samples were generally within appropriate limits. The following exceptions were noted: RPDs for the inter and intra-laboratory soil duplicate samples for majority of the metals ranged from 40 to 173%. The highest result was used in the assessment and considered appropriate. RPDs for the inter and intra-laboratory soil duplicate for some TRH and PAHs ranged from 52 to 100%. The highest result was use in the assessment and considered appropriate.	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
NATA registered laboratory and NATA endorsed methods Laboratories used included: SGS (Sydney and Melbourne). Certificates were NATA stamped.	Acceptable
Analytical methods Analytical methods were included in the laboratory test certificates.	Acceptable
Holding times Review of the COCs and laboratory certificates indicate that the holding times had been met with the exception of the extraction for one rinsate sample exceeding TRH and VOCs by 1 day.	Acceptable
Practical Quantitation Limits (PQLs) *Soil:* PQLs (except asbestos) were less than the threshold criteria for the contaminants of concern. *Asbestos:* The limit of detection for asbestos in soil was 0.01% w/w.	*Soil (except asbestos):* Overall the soil PQLs are acceptable. *Asbestos:* In the absence of any other validated analytical method, the detection limit for asbestos is considered acceptable. A positive result would be considered to exceed the *"no asbestos detected in soil"* criteria, providing this is applied within a weight of evidence approach to assess the significance of the exceedance, accounting for the history of the site and frequency of the occurrence.
Laboratory quality control samples Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the laboratory.	Acceptable
Laboratory quality control results The results of laboratory quality control samples were generally within appropriate limits, with the following exceptions: RPDs for laboratory duplicates were within control limits with the exception of arsenic, chromium and nickel slightly outside of criteria and several PAHs and TRH fractions. Matrix spike recoveries were outside acceptance criteria for zinc, arsenic and a heavy end fraction (F3) of TRH.	The spike recoveries are not considered to significantly affect the usability of the data. In the context of the dataset reported, the elevated RPD are not considered significant, and the laboratory quality control results are acceptable.
Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy) A QA/QC narrative describing information relevant to the site assessment was included and concluded that *"the data can be accepted as being accurate, precise and reproducible"*.	An assessment of the data quality with respect to the five category areas has been undertaken by the Auditor and is summarised below.

6.1 Auditor's Opinion

The data set used for the CSA as collected by Hunter Civilab for the ESA is considered to be of sufficient completeness, comparability, precision and accuracy for the purpose of the Audit. Some areas of the site have a low sample density which may impact on the representativeness of the data for these areas. Management controls are proposed in the RAP to address this uncertainty.

7. ENVIRONMENTAL QUALITY CRITERIA

The Auditor has assessed the results against Tier 1 criteria from National Environmental Protection Council (NEPC) *National Environmental Protection (Assessment of Site Contamination) Measure 1999*, as Amended 2013 (NEPM, 2013). Based on the proposed development, the human health criteria for 'recreational land use' and ecological criteria appropriate for areas of ecological significance' due to the proximity of Hunter Wetlands. Ecological criteria for 'urban residential and public open space' were also adopted where guidelines for 'areas of ecological significance' were not published.

7.1 Soil Assessment Criteria

Human Health Assessment Criteria

The Auditor has adopted human health assessment criteria from the following sources:

- NEPM (2013) Health Investigation Levels (HILs) for 'Recreational' (HIL C) land use
- NEPM (2013) Health Screening Levels (HSLs) for 'Recreational' (HSL C) land use. The HSLs assumed a sand soil type to incorporate the presence of coal chitter
- NEPM (2013) Management Limits (MLs) for petroleum hydrocarbons for 'Residential and Open Space' land use and assuming coarse soil texture. Criteria are relevant for operating sites where significant sub-surface leakage of petroleum hydrocarbons has occurred and when decommissioning industrial and commercial sites and are therefore only applied as a guide in the context of the site
- Asbestos, presence or absence within a weight of evidence framework.

Ecological Assessment Criteria

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

- NEPM (2013) Ecological Screening Levels (ESLs) for 'areas of ecological significance' land use, assuming coarse soil due to the presence of chitter. These ESLs are adopted due to the proximity of the Hunter Wetlands to the site. These criteria are conservative for the ecology present at the site
- NEPM (2013) Ecological Investigation Levels (EILs) for 'areas of ecological significance' land use adopting an average soil pH and CEC from five samples collected of 6 pH units and 10 meq/100g respectively
- NEPM (2013) ecological guidelines for 'urban residential and public open space' were also considered.

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.

7.2 Consultants Assessment Criteria

The environmental quality criteria referenced by the Auditor are generally consistent with those adopted by GHD. Adoption of ecological guidelines for 'areas of ecological significance' is conservative for assessing risks to ecology within the site. The Auditor has considered this in the review of the conceptual site model in **Section 9**.

8. EVALUATION OF SOIL ANALYTICAL RESULTS

Soil samples were analysed for a variety of potential contaminants including metals, TRH/BTEX, PAHs, phenols, OCPs and PCBs and asbestos. The results have been assessed against the environmental quality criteria and are summarised in **Table 8.1** for samples of fill and **Table 8.2** for samples of natural soil. Soil sampling locations are shown as **Attachment 2**.

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

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria (AES)
Asbestos	36	0	No detection	None detected	-
Benzene	36	0	<PQL	0 above HSL C NL	0 above ESL 10 mg/kg
Toluene	36	0	<PQL	0 above HSL C NL	0 above ESL 10 mg/kg
Ethylbenzene	36	0	<PQL	0 above HSL C NL	0 above ESL 1.5 mg/kg
Total Xylenes	36	0	<PQL	0 above HSL C NL	0 above ESL 10 mg/kg
F1 (TRH C_6–C_{10} minus BTEX)	36	0	<PQL	0 above HSL C NL	-
F2 (TRH >C_{10}–C_{16} minus naphthalene)	36	18	190	0 above HSL C NL	-
TRH C_6–C_{10}	36	0	<PQL	0 above ML (open space) 700 mg/kg	-
TRH >C_{10}–C_{16}	36	18	**190**	0 above ML (open space) 1000 mg/kg	**18 above ESL 25 mg/kg**
TRH >C_{16}-C_{34}	36	19	**1,100**	0 above ML (open space) 2,500 mg/kg	**16 above ESL (open space) (coarse) 300 mg/kg**
TRH >C_{34}-C_{40}	36	1	41	0 above ML (open space) 10,000 mg/kg	0 above ESL 2,800 mg/kg
Naphthalene	36	9	0.5	0 above HSL C NL	0 above EIL 10 mg/kg
Benzo(a)pyrene	36	14	0.7	-	0 above ESL 0.7 mg/kg
Total PAHs	36	21	5.9	0 above HIL C 300 mg/kg	-
Pentachlorophenol	36	0	<PQL	0 above HIL C 120 mg/kg	-
Cresol	36	0	<PQL	0 above HIL C 4,000 mg/kg	-
Total Phenols	36	0	<PQL	0 above HIL C 40,000 mg/kg	-
Arsenic	36	36	39	0 above HIL C 300 mg/kg	0 above EIL 40 mg/kg
Cadmium	36	7	0.5	0 above HIL C 90 mg/kg	-
Chromium	36	36	37	0 above HIL C 300 mg/kg	0 above EIL 60 mg/kg
Copper	36	35	**110**	0 above HIL C 17,000 mg/kg	**1 above EIL 65 mg/kg**
Lead	36	35	**1,100**	**1 above HIL C 600 mg/kg**	**1 above EIL 470 mg/kg**
Mercury	36	17	0.28	0 above HIL C 80 mg/kg	-

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria (AES)
Nickel	36	34	**52**	0 above HIL C 1200 mg/kg	**3 above EIL 30 mg/kg**
Zinc	36	36	**190**	0 above HIL C 30,000 mg/kg	**3 above EIL 90 mg/kg**
PCB	5	0	<PQL	0 above HIL C 1 mg/kg	-
OCP	5	0	<PQL	0 above HIL C	0 above EIL
OPP	5	0	<PQL	0 above HIL C	-

n number of samples
- No criteria available/used
NL Non-limiting
AES Area of ecological significance
<PQL Less than the practical quantitation limit

Table 7.2: Evaluation of Natural Soil Analytical Results – Summary Table (mg/kg)

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
Asbestos in material	2	0	No detection	0	-
Benzene	2	0	<PQL	0 above HSL C NL	0 above ESL 10 mg/kg
Toluene	2	0	<PQL	0 above HSL C NL	0 above ESL 10 mg/kg
Ethylbenzene	2	0	<PQL	0 above HSL C NL	0 above ESL 1.5 mg/kg
Total Xylenes	2	0	<PQL	0 above HSL C NL	0 above ESL 10 mg/kg
F1 (TRH C_6–C_{10} minus BTEX)	2	0	<PQL	0 above HSL C NL	-
F2 (TRH >C_{10}–C_{16} minus naphthalene)	2	0	<PQL	0 above HSL C NL	-
TRH C_6–C_{10}	2	0	<PQL	0 above ML (open space) 700 mg/kg	-
TRH >C_{10}–C_{16}	2	0	<PQL	0 above ML (open space) 1000 mg/kg	0 above ESL 25 mg/kg
TRH >C_{16}-C_{34}	2	0	<PQL	0 above ML (open space) 2,500 mg/kg	0 above ESL 300 mg/kg
TRH >C_{34}-C_{40}	2	0	<PQL	0 above ML (open space) 10,000 mg/kg	0 above ESL 2,800 mg/kg
Naphthalene	2	0	<PQL	0 above HSL C NL	0 above EIL 10 mg/kg
Benzo(a)pyrene	2	0	<PQL	-	0 above ESL 0.7 mg/kg
Total PAHs	2	0	<PQL	0 above HIL C 300 mg/kg	-
Pentachlorophenol	2	0	<PQL	0 above HIL C 120 mg/kg	-
Cresol	2	0	<PQL	0 above HIL C 4,000 mg/kg	-
Total Phenols	2	0	<PQL	0 above HIL C 40,000 mg/kg	-
Arsenic	2	0	<PQL	0 above HIL C 300 mg/kg	0 above EIL 40 mg/kg
Cadmium	2	0	<PQL	0 above HIL C 90 mg/kg	-

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
Chromium	2	0	<PQL	0 above HIL C 300 mg/kg	0 above EIL 60 mg/kg
Copper	2	0	<PQL	0 above HIL C 17,000 mg/kg	0 above EIL 65 mg/kg
Lead	2	0	<PQL	0 above HIL C 600 mg/kg	0 above EIL 470 mg/kg
Mercury	2	0	<PQL	0 above HIL C 80 mg/kg	-
Nickel	2	0	<PQL	0 above HIL C 1200 mg/kg	0 above EIL 30 mg/kg
Zinc	2	0	<PQL	0 above HIL C 30,000 mg/kg	0 above EIL 90 mg/kg

n	number of samples
-	No criteria available/used
NL	Non-limiting
AES	Areas of Ecological Significance
<PQL	Less than the practical quantitation limit

In assessing the results, the Auditor makes the following observations:

- No odours or staining were observed by GHD/Hunter Civilab during the sampling works. Nor was potential asbestos containing material (ACM)
- Groundwater was reported between 1.0 – 1.2 mbgl in boreholes located within the Minmi Section
- Lead was reported above the adopted human health criteria in one fill sample though was isolated and less than 250% of the guideline
- Elevated TRH C_6–C_{10} and TRH >C_{16}-C_{34}, lead, copper, nickel and zinc concentrations were variably reported above the adopted ecological criteria were reported in fill samples however these exceedances were marginal and not considered drivers for remediation in the context of the site development proposed, i.e., regrading and resurfacing of the site. Where soils are proposed for reuse outside of the corridor or in landscaped areas these require further assessment of suitability
- Contaminant concentrations in natural soil samples were reported below the adopted human health and ecological criteria.

8.1 Auditor's Opinion

The soil analytical results are consistent with the site history and field observations. Sufficient soil investigations have been conducted to conclude that there is low risk of contamination present. One exceedance of the human health guideline for lead was identified at a concentration less than 250% of the human health guideline. Several exceedances of the conservative ecological guideline for hydrocarbons were identified however these concentrations were low and associated with coal chitter present. Zinc, copper, and lead exceedances of the conservative ecological guideline were also identified however these were also low and below the guidelines relevant to urban open space.

Soil sampling shows contaminant concentrations along the alignment to be low and acceptable for the proposed use. However, the extent of investigation was limited due to access along sections of the rail trail passing through the Hunter Wetlands. No specific contaminating activities were identified through this area and therefore it is expected that concentrations would be similar to

those identified elsewhere. As there is some uncertainty, GHD has prepared a RAP to address potential variability and contamination that may be identified during construction works. The RAP is reviewed in **Section 10**.

9. EVALUATION OF CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a representation of the source, pathway, and receptor linkages at a site. GHD developed a CSM and used it iteratively throughout the site assessment to inform decisions around investigation and management requirements. **Table 9.1** provides the Auditor's review of the final CSM.

Table 9.1: Review of the Conceptual Site Model

Element of CSM	Consultant	Auditor Opinion
Contaminant source and mechanism	GHD identified the following potential contaminant sources: • Historical use of significant portions of the proposed RVRT route as a railway corridor with potential impacts from fuels, oils, grease and asbestos along the former tracks and surrounding areas • Historical construction of the railway corridor including use of coal rejects, building rubble and rock fill • Historical use herbicides or pesticides throughout the proposed RVRT route, particularly along the rail corridor and roadsides and associated with agricultural land • Use of land adjacent to the RVRT for roads with accumulation of run-off and residues from bitumen coatings, fuel and oil spills potentially directed to road verges and drainage lines • Potential for poor demolition practices and illegal dumping along the proposed route of the RVRT and presence of waste materials including scrap metal, timber, concrete and including potential asbestos containing materials • Dilapidated timber bridge structures and coatings including potential use of lead based paint, pesticides and timber treatment chemicals • Historical and current industrial/ commercial practices] • Potential for lead contamination to surface soils in the portion of the RVRT associated with the Chichester Trunk Gravity Main from use of lead collars and solder • Potential for the presence and disturbance of ASS	GHD has appropriately identified the contaminant sources and transport mechanisms.
Affected media	Soil	Acceptable, the Auditor agrees that other media are unlikely to be affected due to the low level of contaminants identified.
Receptor identification	Potential human receptors were considered to include workers, contractors and visitors to the site during further investigations and construction, future users of the RVRT and current and future occupants of surrounding properties (e.g., residents, workers and visitors).	Acceptable. Users of the RVRT include pedestrians and cyclers using the trail.

Element of CSM	Consultant	Auditor Opinion
	Potential ecological receptors were considered to include flora and fauna within the site and surrounding land, surface water systems throughout the proposed route of the RVRT and groundwater beneath the proposed route of the RVRT.	
Exposure pathways	GHD considered the primary exposure pathways to include: • Direct contact (including ingestion) with potentially contaminated soil • Inhalation of potential contaminants in soil, if disturbed (particularly asbestos if present) • Volatilisation to outdoor air and subsequent inhalation of potential hydrocarbon impacted soil or groundwater • Lateral migration of potential contaminants to nearby surface water • Vertical and horizontal migration of potential contaminants within the groundwater.	Acceptable
Presence of preferential pathways for contaminant movement	Preferential pathways have not been identified in the CSM.	Whilst this is a deficiency, based on the expected and identified contamination, migration along preferential pathways is considered to be low.
Evaluation of data gaps	GHD identified that as a groundwater investigation was not undertaken, there is a data gap with regards to groundwater contamination. However, the risk to groundwater was considered low based on the low levels of contamination identified in soils.	The Auditor notes that the sampling density was limited along sections of the RVRT route within the Hunter Wetlands National Park and areas of dense vegetation and damaged bridges. The risk of contamination through this section is low based on the absence of specific contaminating activities and the low concentrations identified. However, implementation of a RAP is can manage any unexpected conditions identified during site works.
Potentially complete source-pathway-receptor (SPR) linkages	GHD did not identify any potential complete SPR linkages. Risk to construction workers was considered in complete as all concentrations were below HIL D guidelines (relevant to workers) Risk to site users was considered to be low due to the low concentrations identified. One elevated concentration was identified however this is unlikely to represent a risk given the proposed development includes a pavement surface.	Acceptable, the Auditor considers that sufficient information is available to conclude that the risk of contamination along the RVRT is low. The presence of one elevated lead concentration is not considered to represent a risk due to the exposure profile of future users which comprises short exposure duration due to pedestrian and cycle use. The presence of minor concentrations above ecological guidelines are also considered low and acceptable.

9.1 Auditor's Opinion

The CSM was a reasonable representation of the contamination at the site and considers that uncertainties would be effectively managed under the RAP during construction. In addition to the above the Auditor notes ASSs are present along the alignment and that aesthetic impacts such as coal chitter, along the alignment are present and are proposed to be removed as part of the redevelopment work. An ASS management plan will be required as part of the construction works.

10. REVIEW OF REMEDIAL ACTION PLAN

10.1 Remediation Required

Whilst soil sampling during the CSA concluded that there is low risk of contamination present, the extent of investigation was limited due to access along sections of the rail trail passing through the Hunter Wetlands. As such, GHD prepared the RAP to review potential remedial options, approaches and methodologies applicable/feasible to address any soil contamination that may be identified during proposed additional investigations along the route as well as during the construction phase of the RVRT.

10.2 Evaluation of RAP

The Auditor has assessed the RAP by comparison with the checklist included in EPA (2020) *Guidelines for Consultants Reporting on Contaminated Land*. The RAP was found to address the required information, as detailed in **Table 10.1**, below.

Table 10.1: Evaluation of Remedial Action Plan

Remedial Action Plan	Auditor Comments
Remedial Goal • Complete additional investigations in inaccessible areas • Manage any aesthetic impacts so that they do not detract from the proposed redevelopment • Appropriately manage or remediate as required any unexpected finds that may be encountered during the site works.	Adequate
Discussion of the extent of remediation required As per **Section 10.1**, the risk of contamination being present along the RVRT is low. Section 2.2 of the RAP summarises the proposed redevelopment works, including proposed disturbance and earthworks activities.	Adequate, as should contamination be present it would be encountered during earthworks and other disturbance activities.
Remedial Options Remedial options were assessed and included: • Do nothing • Heath risk assessment • Management of exposure using site management plan • Vertical mixing of soil • Bioremediation • Chemical remediation methods, such as vitrification, acid leaching, thermal oxidation, catalytic chemical oxidation and immobilisation. • Soil washing • Physical separation, such as selective excavation or mechanical screening • Excavation and offsite disposal • Onsite capping and management.	An adequate range of options were considered, based on the uncertainty at the site.
Selected Preferred Option GHD considered a combination of excavation and offsite disposal (where materials are surplus) and onsite capping to be the most appropriate remedial options for the site.	Adequate
Rationale The decision was based on the event that soil contamination is identified during the additional investigations and/or during construction, the nature of expected contamination, the expected low volumes and project timeframes.	Adequate
Details of Proposed Remedial Works GHD provided the remedial work procedures for both the excavation and offsite disposal and onsite capping options to be implemented, the programs for which will differ slightly in their implementation. Both remedial approach scopes include preliminary works of licences and approvals, preparation of a detailed management plan by the remediation contractor (and will include work health and safety	Adequate

Remedial Action Plan	Auditor Comments
(WHS) plan and emergency response procedures, construction environment management plan (CEMP), asbestos management plan (AMP) and ASS management plan (ASSMP)), site mobilisation and establishment and set up of environmental and security controls. *Excavation* Excavators or backhoes will be used, and all excavations will be conducted with the CEMP. The environmental consultant will mark out areas for remediation based on the additional investigation or onsite observations. As the contaminated material is excavated, material will be segregated and stockpiled as different waste streams prior to waste classification for reuse onsite or offsite disposal. The excavation will be validated prior to reinstatement with validated stockpile material or imported backfill (virgin excavated natural material (VENM) or excavated natural material (ENM)), topsoil and revegetation. *Onsite capping* The area of pathway will be prepared for placement of contaminated materials. The contaminated material would be excavated as outlined above and placed in prepared area with a high geofabric maker layer above the contaminated material to delineate the material from the capping layer. The capping shall consist of the proposed pathway material, as the contaminants are unlikely to generate leachate and there is a low risk of penetration only a physical separation is required. The placement of capping will be documented, and the extent and level of capping is to be surveyed. A long-term environmental management plan (LTEMP) is to be prepared to prevent future exposure.	
Proposed Additional Investigation and Validation Criteria The proposed additional investigation and validation criteria for the site is criteria for public open space as defined by the NEPM (2013). GHD also propose to consider criterial for a commercial and industrial land use for the construction and maintenance of the shared pathway). Any soil that requires off-site disposal will be classified using the EPA (2014) *Waste Classification Guidelines – Part 1: Classification of Waste*.	Adequate
Proposed Additional Investigations GHD propose to sample soil from an additional 24 boreholes using a drill rig with solid flight auger attachment to a maximum depth of 2.0 mbgl (or 0.5 m into natural soil). Two samples per location are to be analysed for TRH, BTEX, PAH, heavy metals, phenols and asbestos. Eight three/four-part composite samples will be analysed for OCPs and PCBs, and eight samples will be analysed for pH and CEC.	The number of samples and the potential contaminants of concern to be adequate for investigating areas of the site previously inaccessible. Solid flight augers can lead to cross contamination and considers use of a push tube more appropriate. Where solid flights are used, consideration should be given to methodologies that limit cross contamination and any uncertainty that may apply to the results. However, based on the low risk of contamination this is unlikely to be material.
Proposed Validation Testing **Excavation:** Validation samples will be collected from the walls and base of any excavation and analysed for the contaminants of concern (based on investigation results and observations during remediation). Base samples will be collected at a minimum rate of 1 per 25 m^2, and wall samples at a minimum rate of one per 5 linear metres, with samples collected from each distinct strata of soil. **Stockpiles:** one sample per 25 m^3, or at least three samples from each excavation area ("batch" of material). For material exhibiting heterogeneity, GHD propose to implement Procedure B from EPA (1995) *Sampling Design Guidelines.* Samples would be analysed for contaminants of concern for the "batch". **Imported Material:** to be VENM or ENM, with the history of the source site documented, an inspection of the source site and inspection of the VENM/ENM as it is imported on to the site. One sample per 100 m^3, with at least three samples collected and analysed. **Asbestos Removal:** at least one sample from each wall of the excavation per 5 linear metres of strata of interest (or per 1 m depth). The base of the excavation would be visually inspected and samples at twice the minimum density outlined in EPA (1995) *Sampling Design Guidelines* (if suspect).	The Auditor broadly agrees with the validation elements proposed. A validation sampling and analysis quality plan should be prepared for Auditor review prior to the commencement of supplementary investigations.

Remedial Action Plan	Auditor Comments
Interim Site Management Plan (before remediation) None proposed. Prior to commencement of any remediation works the remediation contractor is responsible for the construction and/or maintenance of permanent fences and silt and sediment controls around the remediation area (Section 13.2 of the RAP).	There is low risk of contamination present. However, the Auditor notes that the proposed interim controls should be adopted prior to any construction works at the site.
Unexpected Finds Table 11.4 of the RAP outlines possible unexpected situations GHD considered may arise during additional investigations or during construction works. These included additional investigations identify contaminated soil, unexpected contamination (based on site history and site use) encountered, identification of ACM (friable or bonded), identification of buried waste and other aesthetically unsuitable material and potential dewatering of excavations.	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.
Site Management Plan (operation phase) including stormwater, soil, noise, dust, odour and OH&S Section 13 of the RAP outlines controls for protection of the environment and community during any required remediation works. GHD note that a construction environment management plan (CEMP) will be prepared as part of the construction works for the shared pathway, which will outline the required controls to manage any environmental impacts during construction. The remediation works shall be undertaken noting the requirements of this CEMP. GHD note that soil and water management (including surface runoff control, stockpile management, vehicle access and groundwater management), noise and vibration is the responsibility of the remediation contractor and includes a summary of relevant management measures to be implemented during remediation works. Air quality control procedures, including asbestos and odour, are provided in Section 13.8 of the RAP. Material tracking is described in Section 11.3.5 of the RAP and hours of operation are provided in Section 13.2. The RAP also outlines that the remediation contractor will prepare a site specific WHS Plan for the remediation works (Section 14 of the RAP).	Adequate
Contingency Plan if Selected Remedial Strategy Fails The remedial strategy has a low risk of failure, as validation failure would lead to further excavation. Contingency procedures are provided for the unexpected finds and asbestos.	Adequate
Contingency Plans to Respond to site Incidents Emergency response procedures and incident reporting arising during the remediation works is to follow the CEMP for the construction works.	Adequate
Remediation Schedule and Hours of Operation General working hours are provided in Section 13.2 of the RAP.	Adequate. The Auditor notes that a remediation schedule is difficult to produce due to the uncertainty at the site.
Licence and Approvals The RAP details regulatory requirements and approvals under various State legislation (i.e., *Protection of the Environment Operations Act 1997* (POEO Act), *Contaminated Land Management Act 1997* (CLM Act) and State Environmental Planning Policy 55 (SEPP55). GHD identified that any remedial works would be considered 'Category 2 Remediation' in accordance with SEPP55 and City of Newcastle is to be notified 30 days before the remediation works commence. Licensing would not be required under the POEO Act. Any asbestos works shall follow the guidelines of the Safe Work NSW Code of Practice - How to Manage and Control Asbestos in the Workplace (2019), and the Code of Practice – How to Safely Remove Asbestos (2019).	Adequate. An appropriately licensed landfill should be selected and the material tracked from the site to the landfill.
Contacts/Community Relations Contacts details are not provided, but contact details for key project contacts once confirmed, emergency services and utility authorities	Adequate

Remedial Action Plan	Auditor Comments
will be included in the WHS and Environmental Management Plans to be prepared by the remediation contractor.	
Staged Progress Reporting A site investigation report will be prepared following the additional investigations and validation report will be prepared following the remediation and validation works.	Adequate
Long-term site management plan A LTEMP has been proposed if residual contamination remains on site. The LTEMP would outline measures to prevent exposure under normal site use, and specific procedures developed for any works which would result in potential exposure. GHD state that the LTEMP would succinctly describe the nature and location of contamination remaining on-site and state what the objectives of the plan are, how contaminants will be managed, who will be responsible for the plan's implementation and over what time frame actions specified in the plan will take place.	Adequate

10.3 Auditor's Opinion

The proposed remediation works outlined in the RAP are appropriate should contaminated be identified at the site during the additional investigations or during construction works. If adequately implemented, it is anticipated the RAP should be able to ensure that the site is suitable for the proposed recreational land use. Successful validation will be required to confirm this.

11. CONCLUSIONS AND RECOMMENDATIONS

GHD concluded '*Based on the current and historical land use of the site and surrounding area and the findings of the investigation, the site is considered suitable for the proposed land use as a shared pathway. The overall risk of contamination being encountered that would require remediation during works that disturb the ground surface or by future site users is considered to be unlikely.*

To manage any potential impacts to sensitive environments or groundwater during construction, Council has requested that soils are managed in accordance with a Remediation Action Plan (RAP). This plan will include measures for the management of soils, including potential ASS, in additional to unexpected finds protocols and monitoring requirements for soils, sediments, groundwater and surface waters in the event that impacts are identified during construction.'

The Auditor agrees with the conclusion made by GHD. The Auditor considers that the CSA provides a sufficient information to confirm the potential for contamination at the site is low and acceptable for the proposed land use. 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 the RAP 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 excess materials.

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

- 'Richmond Vale Rail Trail, Remedial Action Plan', 16 September 2021, GHD

subject to the following:

- Acid sulphate soils are present along the alignment and an acid sulphate soils management plan should be developed and implemented

- Further soil investigations are reported for review by the Auditor. A revision of the RAP is completed and reviewed by the Auditor if required
- A Validation Sampling and Analysis Quality Plan is prepared and provided for review by the Auditor prior to investigation and remediation
- 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 recreational 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.

Yours faithfully
Ramboll Australia Pty Ltd

Fiona Robinson
EPA Accredited Site Auditor 1506

Attachments: 1 Site Locality Plan
2 Borehole Location Plans

Limitations

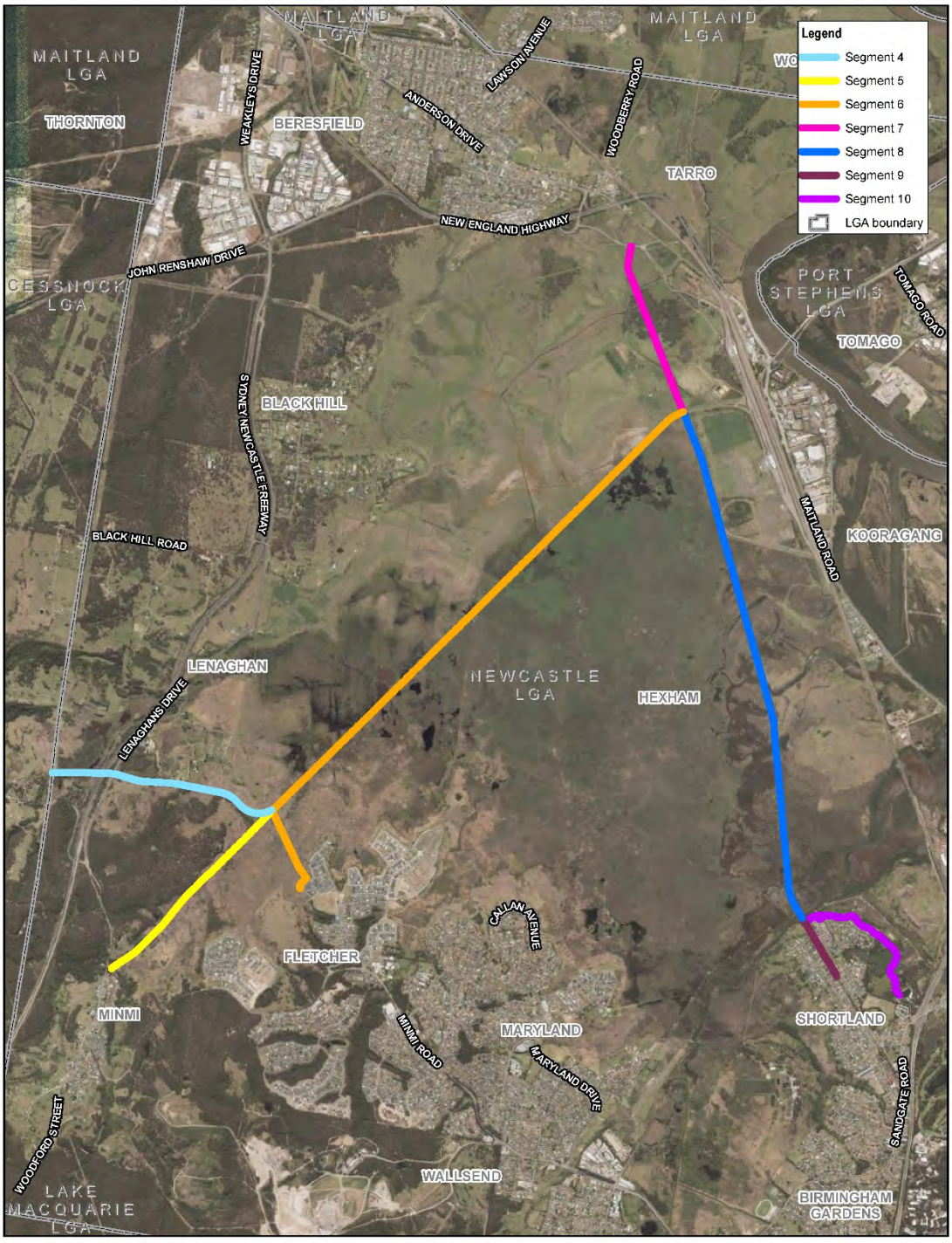
This Interim Audit Letter was conducted on the behalf of City of Newcastle Council for the purpose of assessing the appropriateness of a remedial action plan for rendering the site suitable for the proposed land use.

This Interim Audit Letter may not be suitable for other uses. Reports reviewed include limitations and this Audit 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.

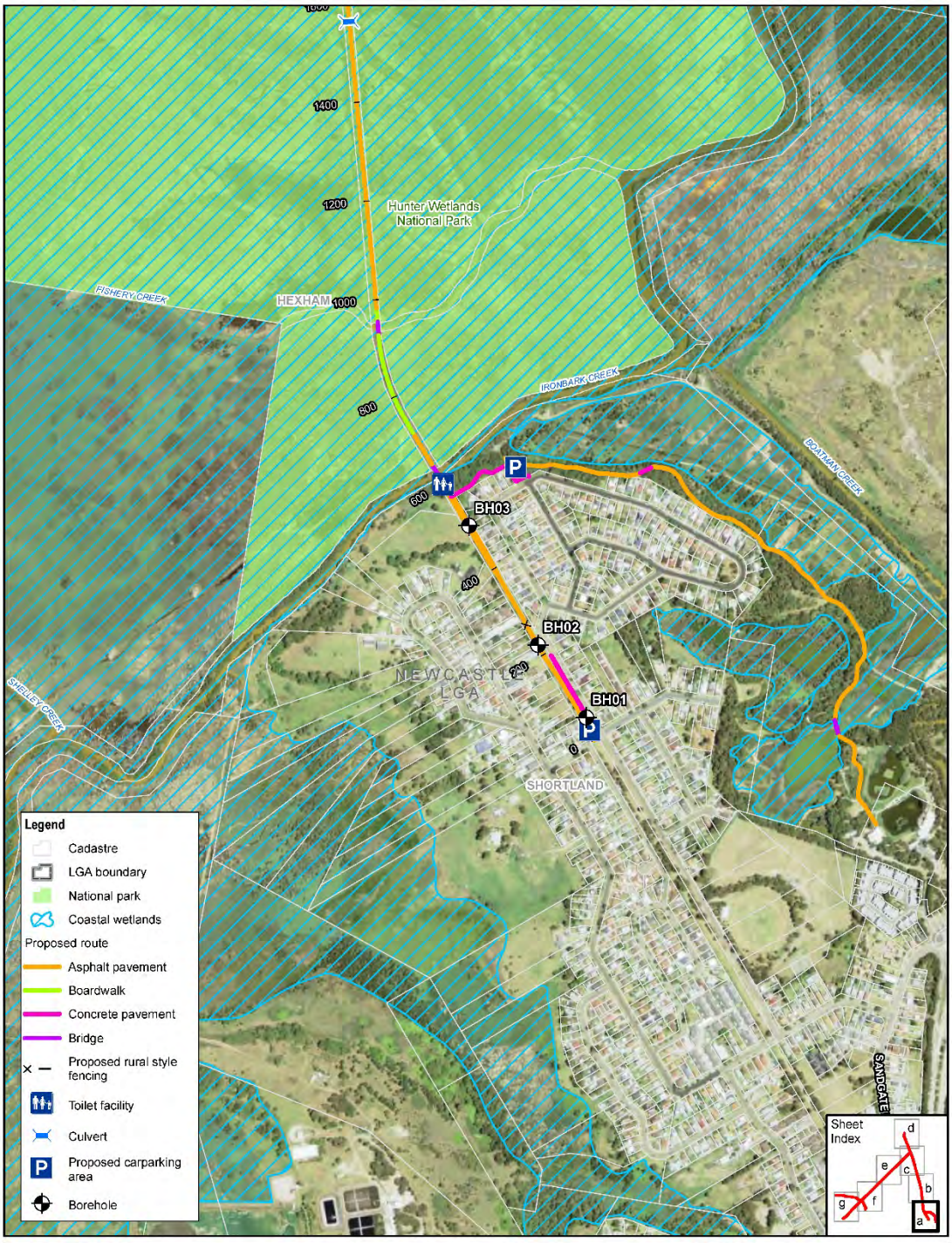
The Auditor has relied on the documents referenced in Section 1 in preparing the Auditor's opinion. If the Auditor is unable to rely on any of those documents, the conclusions of the Audit could change.

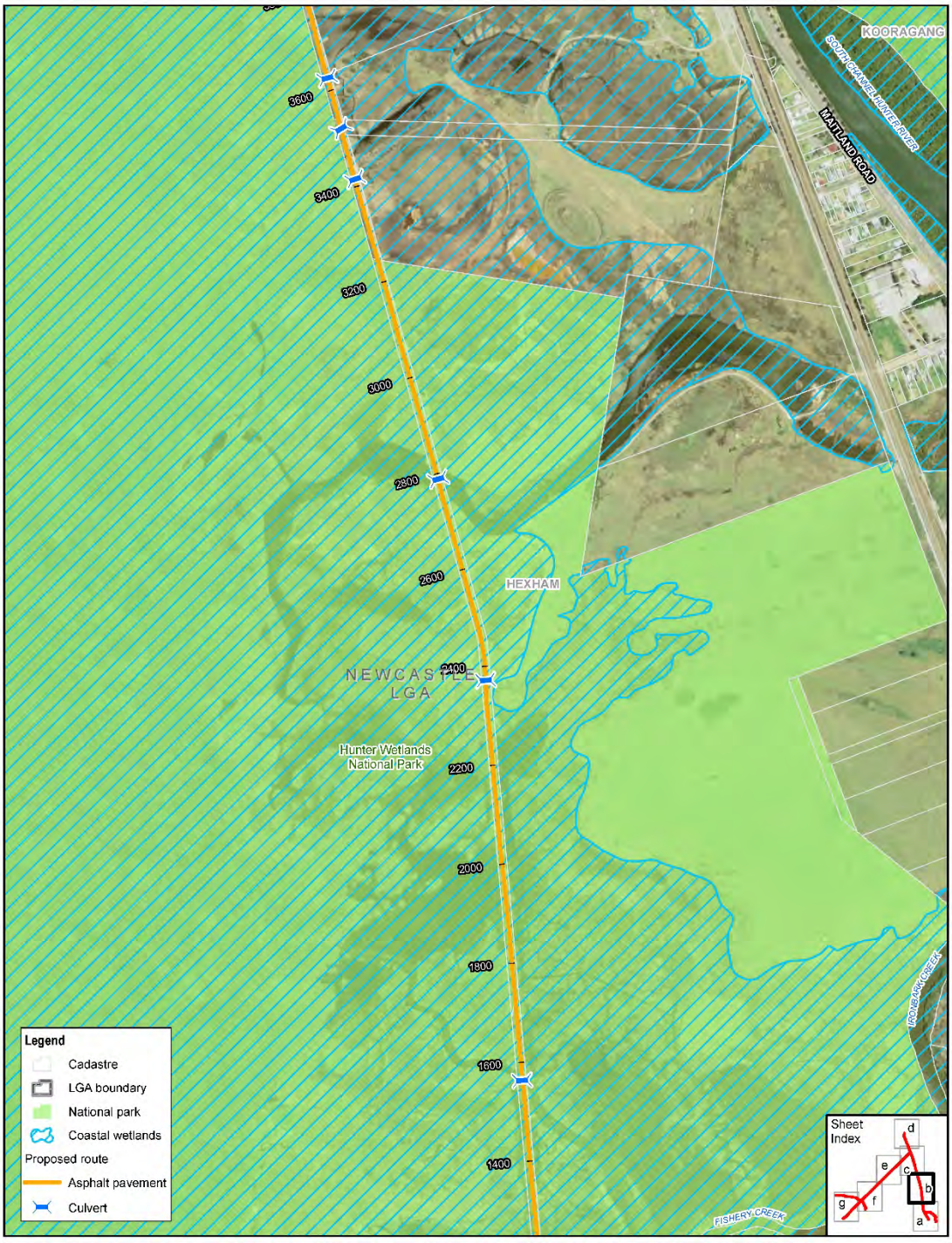
It is not possible in a audit to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect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

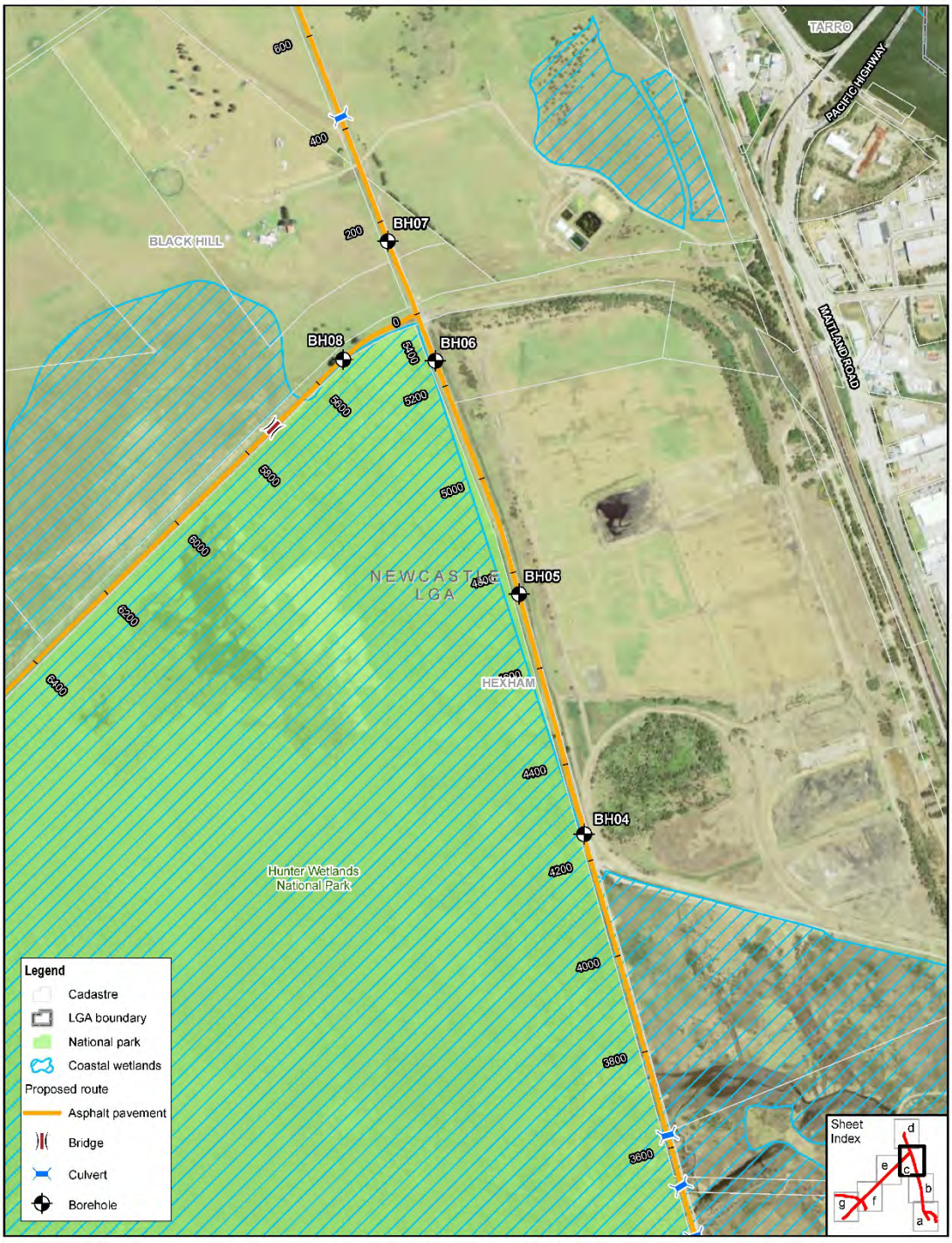
ATTACHMENT 1
SITE LOCALITY PLAN

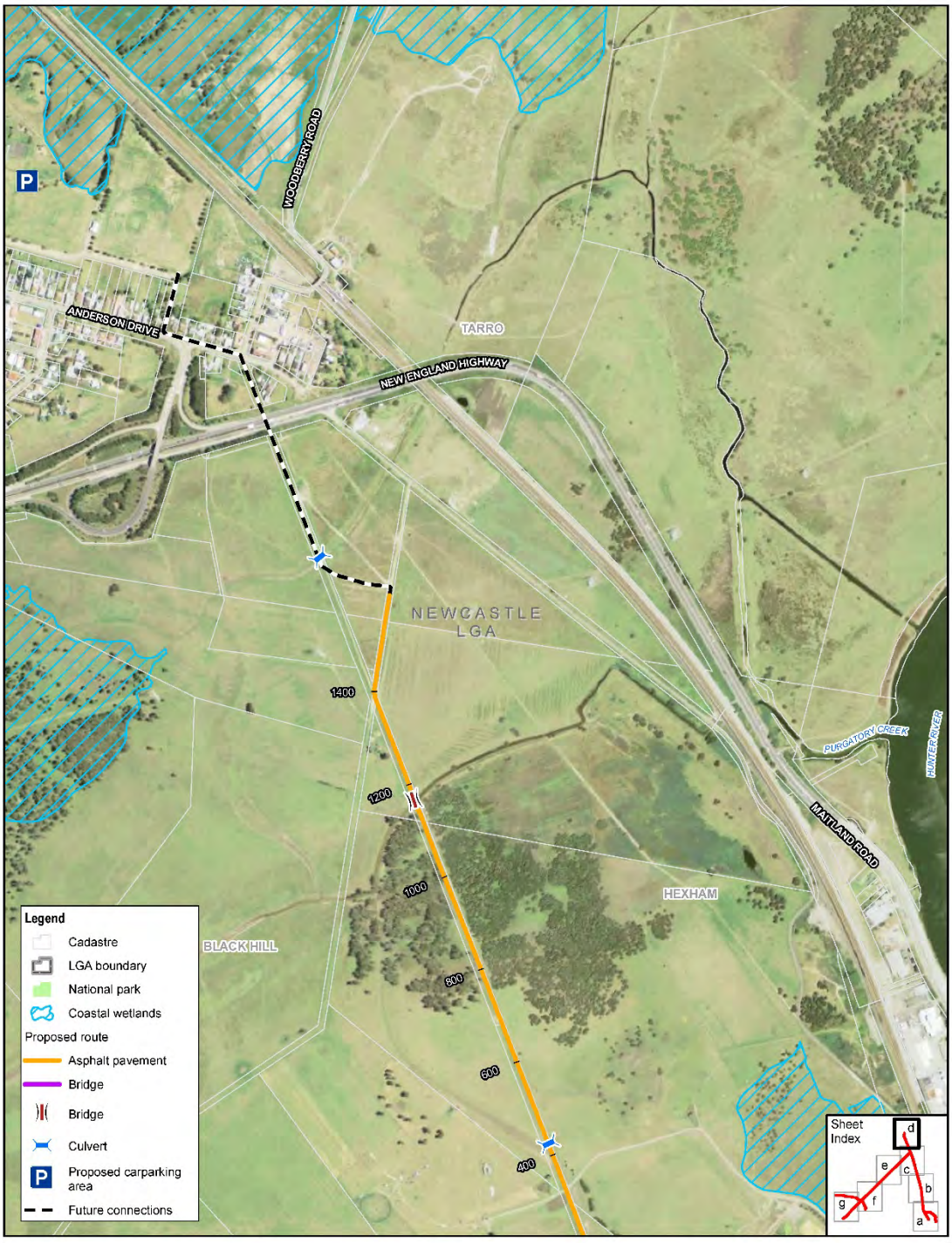

MAITLAND LGA
MAITLAND LGA
MAITLAND LGA
THORNTON
BERESFIELD
WEAKLEYS DRIVE
ANDERSON DRIVE
LAWSON AVENUE
WOODBERRY ROAD
TARRO
NEW ENGLAND HIGHWAY
JOHN RENSHAW DRIVE
CESSNOCK LGA
PORT STEPHENS LGA
TOMAGO ROAD
TOMAGO
BLACK HILL
SYDNEY NEWCASTLE FREEWAY
BLACK HILL ROAD
MAITLAND ROAD
KOORAGANG
LENAGHAN
LENAGHANS DRIVE
NEWCASTLE LGA
HEXHAM
CALLAN AVENUE
FLETCHER
MINMI
MINMI ROAD
MARYLAND
MARYLAND DRIVE
SHORTLAND
SANDGATE ROAD
WOODFORD STREET
LAKE MACQUARIE LGA
WALLSEND
BIRMINGHAM GARDENS
Legend
Segment 4
Segment 5
Segment 6
Segment 7
Segment 8
Segment 9
Segment 10
LGA boundary
Paper Size ISO A4
0 0.3 0.6 0.9 1.2
Kilometers
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56
N
GHD
City of Newcastle
Richmond Vale Rail Trail
Phase 1 Contaminated Site Assessment
Project No. 12544891
Revision No. 0
Date 15 Sep 2021
Proposed RVRT Route
FIGURE 2
Data source: LPI: DTDB / DCDB, 2017. © Department of Customer Service 2020. Created by: tmorton, tmackay

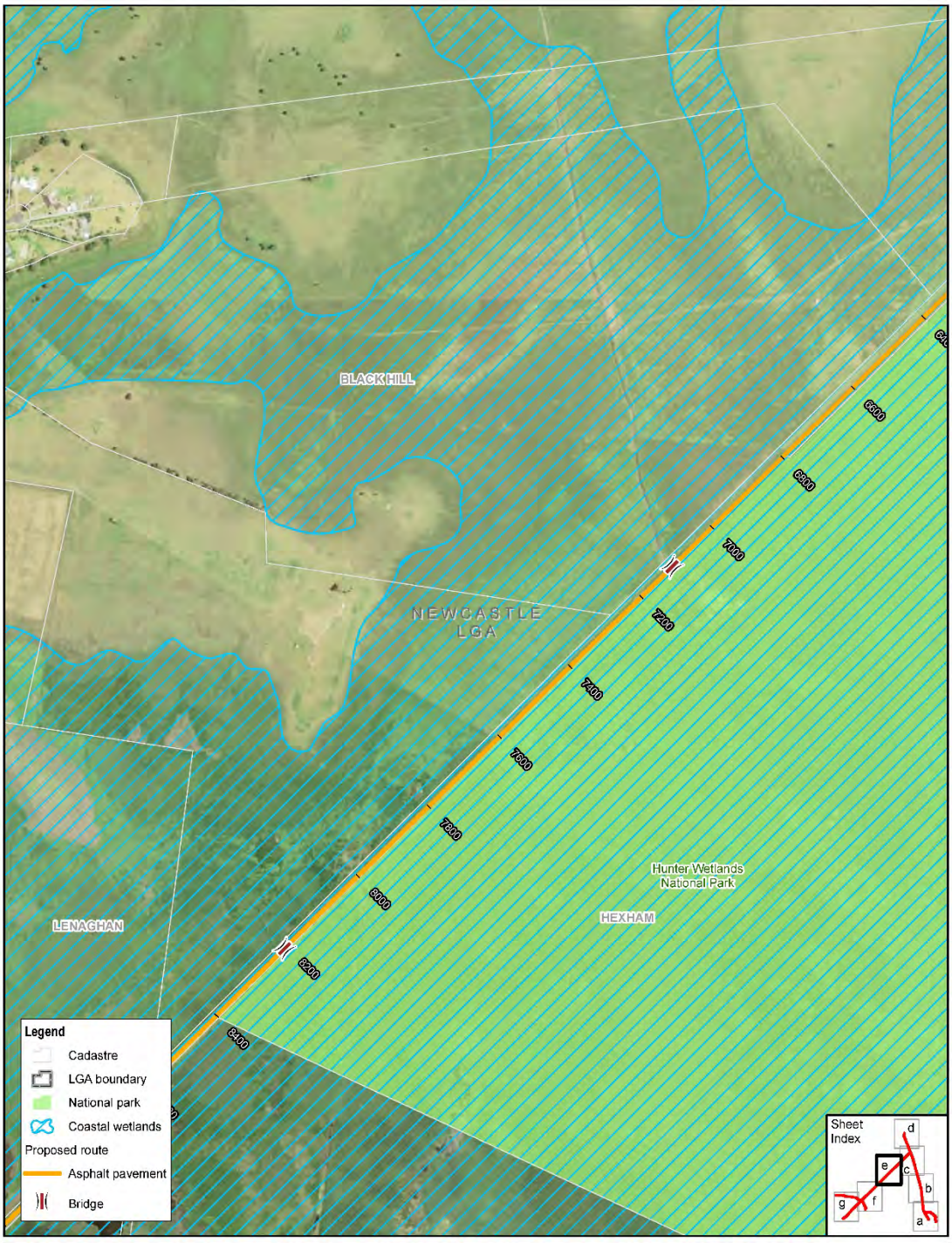
ATTACHMENT 2
BOREHOLE LOCATION PLANS

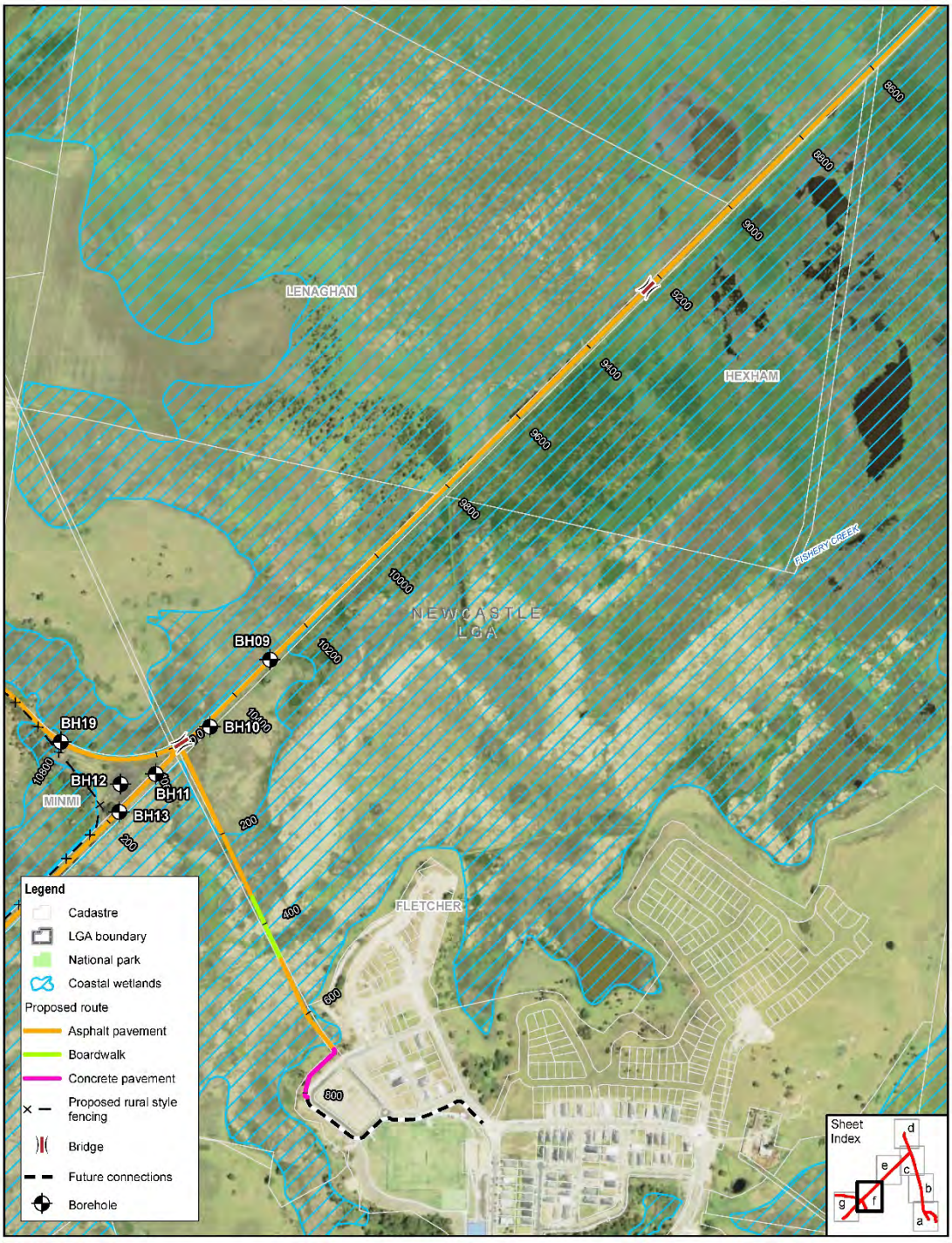

1400
1200
1000
800
600
400
200
0
Hunter Wetlands National Park
FISHERY CREEK
HEXHAM
IRONBARK CREEK
BOARMAN CREEK
BH03
BH02
BH01
NEWCASTLE LGA
SHELLEY CREEK
SHORTLAND
SANDGATE
Legend
Cadastre
LGA boundary
National park
Coastal wetlands
Proposed route
Asphalt pavement
Boardwalk
Concrete pavement
Bridge
Proposed rural style fencing
Toilet facility
Culvert
Proposed carparking area
Borehole
Sheet Index
Paper Size ISO A4
0 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56
N
GHD
City of Newcastle
Richmond Vale Rail Trail
Phase 1 Contaminated Site Assessment
Project No. 12544891
Revision No. 0
Date 15 Sep 2021
Sampling locations
FIGURE 4a
Data source: LPI: DTDS / DCDB, 2017. © Department of Customer Service 2020. Created by: fmackay

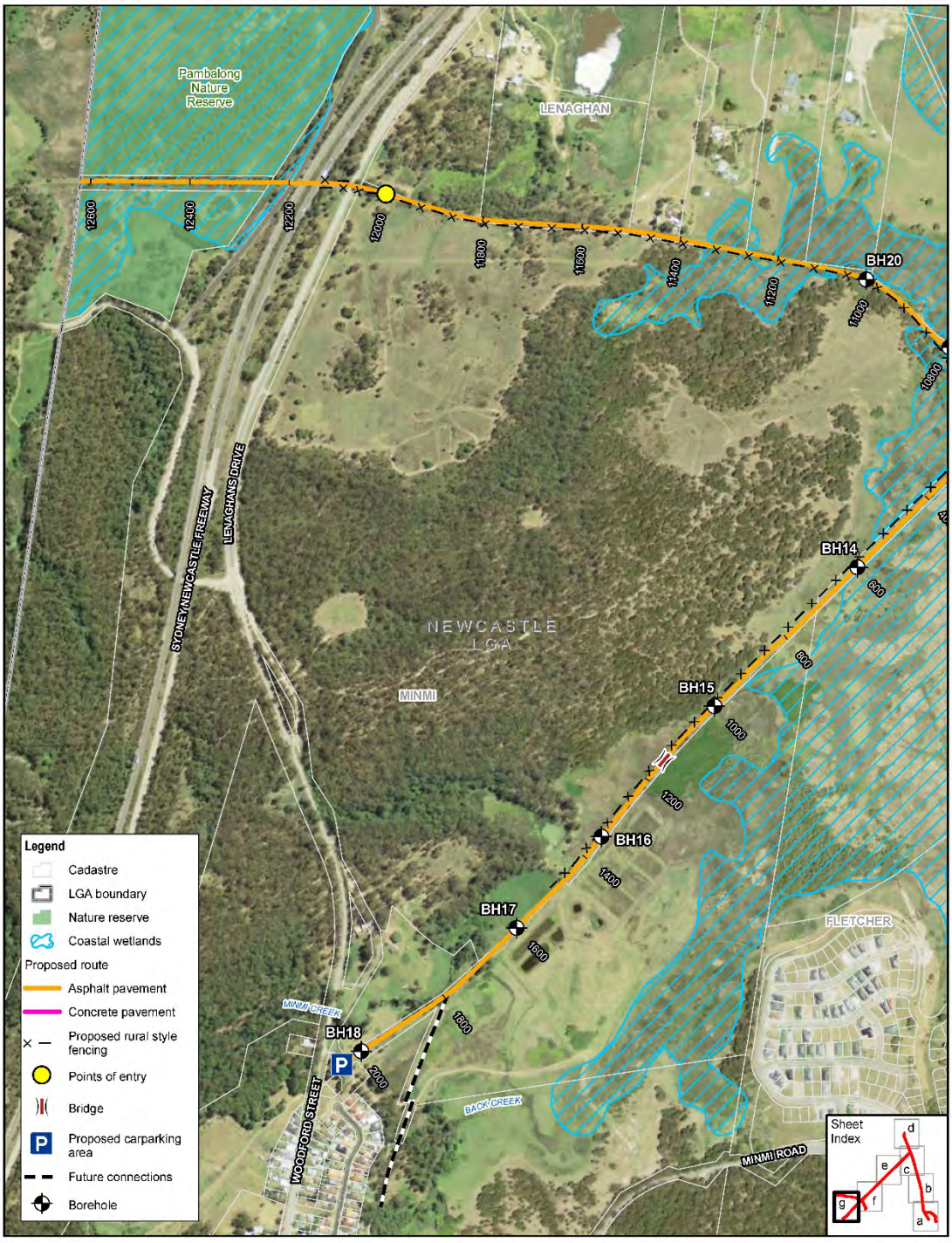

KOORAGANG
SOUTH CHANNEL HUNTER RIVER
HAITLAND ROAD
3600
3400
3200
3000
2800
2600
HEXHAM
NEWCASTLE LGA
2400
Hunter Wetlands National Park
2200
2000
1800
1600
1400
NOWARK CREEK
FISHERY CREEK
Legend
Cadastre
LGA boundary
National park
Coastal wetlands
Proposed route
Asphalt pavement
Culvert
Sheet Index
a
b
c
d
e
f
g
Paper Size ISO A4
0 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56
N
GHD
City of Newcastle
Richmond Vale Rail Trail
Phase 1 Contaminated Site Assessment
Project No. 12544891
Revision No. 0
Date 15 Sep 2021
Sampling locations
FIGURE 4b
Print date: 15 Sep 2021 - 10:12
Data source: LPI: DTDS / DCDB, 2017. © Department of Customer Service 2020. Created by: fmackay


TARRO
PACIFIC HIGHWAY
MAITLAND ROAD
BLACK HILL
BH07
BH08
BH06
BH05
BH04
NEWCASTLE LGA
HEXHAM
Hunter Wetlands National Park
600
400
200
0
5400
5200
5000
4800
4600
4400
4200
4000
3800
3600
6000
6200
6400
Legend
Cadastre
LGA boundary
National park
Coastal wetlands
Proposed route
Asphalt pavement
Bridge
Culvert
Borehole
Sheet Index
a
b
c
d
e
f
g
Paper Size ISO A4
0 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56
N
GHD
City of Newcastle
Richmond Vale Rail Trail
Phase 1 Contaminated Site Assessment
Sampling locations
Project No. 12544891
Revision No. 0
Date 15 Sep 2021
FIGURE 4c
G:\12544891\GIS\Maps\Deliverables\12544891_CSA004_Geotech_DDP_0.mxd
Print date: 15 Sep 2021 - 10:12
Data source: LPI: DTDS / DCDB, 2017. © Department of Customer Service 2020. Created by: fmackay


WOODBERRY ROAD
ANDERSON DRIVE
TARRO
NEW ENGLAND HIGHWAY
NEWCASTLE LGA
1400
1200
1000
800
600
400
PURGATORY CREEK
HUNTER RIVER
MAITLAND ROAD
HEXHAM
BLACKHILL
Legend
Cadastre
LGA boundary
National park
Coastal wetlands
Proposed route
Asphalt pavement
Bridge
Bridge
Culvert
Proposed carparking area
Future connections
Sheet Index
d
e
c
b
g
f
a
Paper Size ISO A4
0 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56
N
GHD
City of Newcastle
Richmond Vale Rail Trail
Phase 1 Contaminated Site Assessment
Project No. 12544891
Revision No. 0
Date 15 Sep 2021
Sampling locations
FIGURE 4d
Print date: 15 Sep 2021 - 10:12


BLACKHILL
NEWCASTLE LGA
LENAGHAN
HEXHAM
Hunter Wetlands National Park
6200
6400
6600
6800
7000
7200
7400
7600
7800
8000
Legend
Cadastre
LGA boundary
National park
Coastal wetlands
Proposed route
Asphalt pavement
Bridge
Sheet Index
a
b
c
d
e
f
g
Paper Size ISO A4
0 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56
N
GHD
City of Newcastle
Richmond Vale Rail Trail
Phase 1 Contaminated Site Assessment
Sampling locations
Project No. 12544891
Revision No. 0
Date 15 Sep 2021
FIGURE 4e
G:\12\18831\GIS\Maps\Deliverables\12544891\Contam_NewcLGA\12544891_CSA004_Geotech_DDP_0.mxd
Print date: 15 Sep 2021 - 10:12
Data source: LPI: DTDS / DCDB, 2017. © Department of Customer Service 2020. Created by: fmackay


LENAGHAN
HEXHAM
NEWCASTLE LGA
FLETCHER
MINMI
FISHERY CREEK
BH09
BH10
BH19
BH12
BH11
BH13
8600
8800
9000
9200
9400
9600
9800
10000
10200
10400
10600
200
400
600
800
Legend
Cadastre
LGA boundary
National park
Coastal wetlands
Proposed route
Asphalt pavement
Boardwalk
Concrete pavement
Proposed rural style fencing
Bridge
Future connections
Borehole
Sheet Index
a
b
c
d
e
f
g
Paper Size ISO A4
0 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56
N
GHD
City of Newcastle
Richmond Vale Rail Trail
Phase 1 Contaminated Site Assessment
Project No. 12544891
Revision No. 0
Date 15 Sep 2021
Sampling locations
FIGURE 4f
Print date: 15 Sep 2021 - 10:12
Data source: LPI: DTDS / DCDB, 2017. © Department of Customer Service 2020. Created by: tmackay


Pambalong Nature Reserve
LENAGHAN
NEWCASTLE LGA
MINMI
FLETCHER
SYDNEY/NEWCASTLE FREEWAY
LENAGHANS DRIVE
WOODFORD STREET
MINMI ROAD
MINMI CREEK
BACK CREEK
BH14
BH15
BH16
BH17
BH18
BH20
12600
12400
12200
12000
11800
11600
11400
11200
11000
10800
800
600
1000
1200
1400
1600
1800
2000
Legend
Cadastre
LGA boundary
Nature reserve
Coastal wetlands
Proposed route
Asphalt pavement
Concrete pavement
Proposed rural style fencing
Points of entry
Bridge
Proposed carparking area
Future connections
Borehole
Sheet Index
a
b
c
d
e
f
g
Paper Size ISO A4
0 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56
N
GHD
City of Newcastle
Richmond Vale Rail Trail
Phase 1 Contaminated Site Assessment
Project No. 12544891
Revision No. 0
Date 15 Sep 2021
Sampling locations
FIGURE 4g
Print date: 15 Sep 2021 - 10:12
Data source: LPI: DTDS / DCDB, 2017. © Department of Customer Service 2020. Created by: fmackay