

Attachment A12

Geotechnical and Contamination Assessment



Sydney Metro West

Planning Proposal for Hunter Street Over Station
Development

Geotechnical and Contamination Assessment

Document Number: SMWSTEDS-SMD-SCB-SN100-GE-RPT-044003

Revision	Date	Suitability Code	Teambinder Document Number	Tb Revision
D	25/03/2022	S4		

Approval Record

Function	Position	Name	Date
Author	Geotechnical Engineer Environmental Consultant	Mathew Tran Phil Matevski	25/03/2022
Technical Checker	Principal - Geotechnical Principle Environmental Engineer	Chenhui Lee Jonathan Steele	25/03/2022
Technical Reviewer	Technical Director - Geotechnical	Chanaka Gunasekara	25/03/2022
Coordinator	Technical Director - Environmental	Lucy Baker	29/04/2022
Approver	SM EDS Lead	Adrian Garnero	29/04/2022

Amendment Record

Date	Revision	Amendment Description	Author
26/11/2021	A	Initial Issue	Mathew Tran/Phil Matevski
14/12/2021	B	Final Draft	Mathew Tran/Phil Matevski
21/01/2022	C	Final	Mathew Tran/Phil Matevski
25/03/2022	D	Final for submission	Mathew Tran/Phil Matevski

Contents

Glossary	iv
Executive summary	vi
1 Introduction	1
1.1 Purpose	1
1.2 Objectives and intended outcomes	1
1.3 Planning process	2
1.3.1 State Significant Infrastructure	2
1.3.2 Over Station Development	2
1.3.3 Planning proposal	3
1.4 Site context	4
1.4.1 The Site	4
1.4.2 Local context	5
1.4.3 Site description	6
2 Geotechnical baseline investigation	9
2.1 Scope of assessment	9
2.2 Data sources	9
2.3 Assessment methodology	10
2.4 Existing baseline site condition	11
2.4.1 Topography and Hunter Street Station details	11
2.4.2 Soil and geology types	13
2.4.3 Preliminary geotechnical model	14
2.4.4 Groundwater and saline water intrusion	14
2.4.5 Ground movement and ground movement risk levels	15
2.5 Potential operational and construction impact assessment	15
2.5.1 Acid sulfate soils	15
2.5.2 Soil salinity	16
2.5.3 Groundwater and saline water intrusion	16
2.5.4 Ground movement	16
2.5.5 Building risks	16
3 Contamination assessment	17
3.1 Scope of assessment	17
3.1.1 Relevant contamination guidelines and legislation	18
3.2 Baseline site conditions	19
3.2.1 Land zone	19
3.2.2 Drainage	19
3.2.3 Surface water and flood potential	19
3.2.4 Acid sulfate soils	19
3.2.5 Hydrogeology	20
3.2.6 Sensitive receiving environments	20
3.3 Site background	20
3.3.1 NSW EPA records	20
3.3.2 Areas of Environmental Interest	22
3.4 Assessment of potential impacts	23
3.4.1 Contaminants of potential concern	23
3.4.2 Soil	24

Sensitive – NSW Government

3.4.3	Vapour and gas	24
3.4.4	Acid sulfate soils	25
3.4.5	Groundwater and flood impact	25
3.4.6	Contamination risk assessment	25
4	Conclusion	30
4.1	Geotechnical	30
4.2	Contamination	30
5	Limitations.....	31
6	References	33

Glossary

Term	Definition
AEI	Area of environmental interest
AHD	Australian height datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AASS	Actual ASS
ASD	Adjacent Station Development
ASS	Acid sulphate soil
ASSMAC	Acid Sulphate Soils Management Advisory Committee
ASSMP	Acid sulphate soil management plan
BTEX	Benzene, toluene, ethylbenzene and xylenes
CEMP	Construction environmental management plan
CLM Act	Contaminated Land Management Act 1997
CoPC	Contaminant of potential concern
CSSI	Critical State Significant Infrastructure
DECC	Former NSW Department of Environment and Climate Change (now OEHL)
DECCW	NSW Department of Environment, Climate Change and Water (formerly DECC, but now OEHL)
DPE	Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EPA	Environment Protection Authority (NSW Government)
GBI	Geotechnical Baseline Investigation
ISD	Integrated Station Development
Km	Kilometres
LEP	Local environmental plan
LGA	Local government area
m/day	Metres per day
Mg/L	Milligrams per litre
Mg/kg	Milligrams per kilogram
µg/L	Micrograms per litre
µS/cm	Microsiemens per centimetre
MMP	Material Management Plan
NEMP	National Environmental Management Plan
NEPM	National Environment Protection Measure
NSW	New South Wales
NSW DEC	NSW Department of Environment and Conservation

Sensitive – NSW Government

Term	Definition
NSW EPA	NSW Environment Protection Authority
NSW OEH	NSW Office of Environment and Heritage
OSD	Proposed Hunter Street Over Station Development
Planning Proposal	Sydney Metro West Hunter Street Station Over Station Development planning proposal
PAHs	Polycyclic aromatic hydrocarbons
PASS	Potential ASS
PFAS	Per- and poly- fluoroalkyl substances
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
RAP	Remedial Action Plan
RL	Reduced Level
SAQP	Sampling, Analysis and Quality Plan
SEARs	Secretary's Environmental Assessment Requirements
SMW	Sydney Metro West
SSD	State Significant Development
SVOC	Semi-volatile organic compounds
TPH	Total petroleum hydrocarbon
TRH	Total recoverable hydrocarbon
VOC	Volatile organic compounds

Executive summary

The Geotechnical and Contamination Assessment has been undertaken to support a Sydney Metro West Hunter Street Station Over Station Development Planning Proposal Request (Planning Proposal) to amend the maximum building height and maximum floor space ratio permitted for both the east and west sites under *Sydney Local Environmental Plan 2012* (Sydney LEP 2012) at the Hunter Street (Sydney CBD) station.

This report presents a geotechnical assessment including the anticipated subsurface ground condition and geotechnical risks associated with the proposed Hunter Street Over Station Development (OSD) sites, and a contamination assessment which evaluates the potential for contamination within the proposed Hunter Street OSD sites and the sites' suitability for its intended use. The suitability of the underlying ground conditions and contamination risks will be assessed and resolved under the Critical State Significant Infrastructure (CSSI) approvals, which precede the proposed Hunter Street OSD.

The Hunter Street OSD will be constructed after the completion of the tunnelling and major civil construction works, and the construction of the station structural elements. Planning approvals for the tunnelling works and the station construction have been submitted as part of the CSSI application. The baseline site condition for the proposed Hunter Street OSD will be based on a baseline environment that has considered the impacts of the tunnelling works, major civil construction works, station construction and long-term operation. Any potential soil and groundwater issues that may affect the OSD are identified from this new baseline condition.

Key geotechnical findings of this report include:

- *The area is underlain by the high strength Hawkesbury Sandstone rock. Relatively thin anthropogenic fill and residual soil can be found above the Hawkesbury Sandstone. The underlying high strength sandstone is a suitable foundation material for the Hunter Street OSD sites. Construction of Hunter Street OSD is not assessed to cause large ground movements which can impact the surrounding buildings and infrastructure.*
- *The Hunter Street OSD site is being developed within and above the station shaft footing. The station shaft will be designed to support the Hunter Street OSD sites. While the site is adjacent to several existing high-rise buildings, we consider that these development challenges can be adequately addressed through the utilisation of industry-standard design and construction techniques and practices.*
- *The Hunter Street OSD is not affected by soil erosion, saline soils or acid sulphate soils as it utilises the space above the station shaft. Any issues with soil erosion, saline soils or acid sulphate soils will be managed during the major civil and tunnelling construction works.*

Key contamination risks identified in this report include:

- *Five sites registered with the NSW EPA within 500 metres of the proposed Hunter Street OSD development that were either regulated or had been notified*

This report found that as the OSD will sit upon the station shafts at both sites, the likelihood of encountering contamination during the construction of the OSD is assessed to be very low, as all ground excavation would be completed during the major civil construction works associated with the CSSI which precedes the OSD.

1 Introduction

1.1 Purpose

The Sydney Metro West Hunter Street Station Over Station Development (OSD) Planning Proposal Request seeks to amend the maximum building height and maximum floor space ratio permitted for both the east and west sites under the *Sydney Local Environmental Plan (2012)*. This geotechnical and contamination assessment report forms part of the planning proposal submitted for the Sydney Metro Hunter Street Station OSD.

This report addresses the following requirements:

- *Provide an assessment of the local soil, outlining its suitability for the proposed uses with respect to erosion, salinity and acid sulphate soils.*
- *Provide an assessment of the proposed land uses in accordance with State Environmental Planning Policy (Resilience and Hazards) 2021.*

1.2 Objectives and intended outcomes

The Planning Proposal Request has been prepared to address the following objectives for future development on the Eastern and Western sites:

- *Be a catalyst for positive change by regenerating and invigorating the city with new development that engages with the precinct, raises the urban quality and enhances the overall experience of the city.*
- *Facilitate future development that promotes design excellence and is consistent with the objectives of the Central Sydney Planning Framework.*
- *Deliver high quality employment generating floorspace that aligns with the objectives for development within the tower cluster areas identified within the Central Sydney Planning Framework.*
- *Contribute towards the establishment of an integrated transport hub within the Sydney CBD which strengthens Sydney's rail network improving connectivity.*
- *Delivers employment density alongside the delivery of significant new public transport infrastructure servicing the site and surrounding precinct.*

The intended outcomes of the requested amendments include:

- *To amend the maximum building height and maximum floor space ratio (FSR) permitted for both the east and west sites under the Sydney Local Environmental Plan 2012 (Sydney LEP 2012) and allow an alternative approach to design excellence to deliver integrated station development that optimises the development potential of both sites*
- *To facilitate new development that demonstrates an appropriate distribution of built form and floor space as part of the delivery of the integrated station development.*

1.3 Planning process

1.3.1 State Significant Infrastructure

Sydney Metro West was declared as State Significant Infrastructure (SSI) and Critical State Significant Infrastructure (CSSI) under sections 5.12(4) and 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) respectively on 23 September 2020.

Sydney Metro West is being assessed as a staged infrastructure application under Section 5.20 of the *Environment Planning & Assessment Act 1979*. The approved Concept and major civil construction work for Sydney Metro West between Westmead and The Bays (Stage 1 of the planning approval process application number SSI-10038) were approved on 11 March 2021.

Stage 2 of the planning approval process (application number SSI-19238057) includes all major civil construction work, including station excavation and tunnelling, between The Bays and Sydney CBD (an Environmental Impact Statement for this application was exhibited between 3 November and 15 December 2021).

Stage 3 of the planning approval process (application number SSI-22765520, being the application for the tunnel fit-out, construction of stations, ancillary facilities and station precincts, and operation and maintenance of the Sydney Metro West line. This application seeks approval for the construction of the Hunter Street Station, including above and below ground structures, public domain works, and spatial provisioning and works to facilitate the construction and operation of an OSD above the two station entries which are described further in this report.

1.3.2 Over Station Development

The OSD components of the Hunter Street integrated station development are not declared as SSI or CSSI under *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). As such, separate development consent is required to be granted for the construction and operation of development above the Hunter Street Station.

The primary land use of the OSD sites is anticipated to be 'commercial premises' which has a capital investment value of more than \$30 million, and which are located within a rail corridor and/or are associated with railway infrastructure. Consequently, the future OSD will be classified as State Significant Development. The Sydney LEP 2012 is a relevant environmental planning instrument for the future development, though the Sydney Development Control Plan 2012 (Sydney DCP 2012) will not apply to the OSD sites.

To inform the planning controls relevant for the Hunter Street OSD sites, amendments are proposed to the Sydney LEP 2012 to provide additional Maximum Height of Building and floor space ratio (FSR) controls. Further, as the Sydney DCP 2012 does not apply to the land, the Proponent will prepare a design and amenity guideline to support the planning proposal to inform the future built form on the site including details such as street frontage heights, setbacks, massing and tapering, development adjacent to heritage items, building exteriors, and managing wind impact.

The inter-relationship of the scope of Sydney Metro EIS 3 (part of Critical State Significant Infrastructure CSSI) and this planning proposal is illustrated in Figure 1-1.

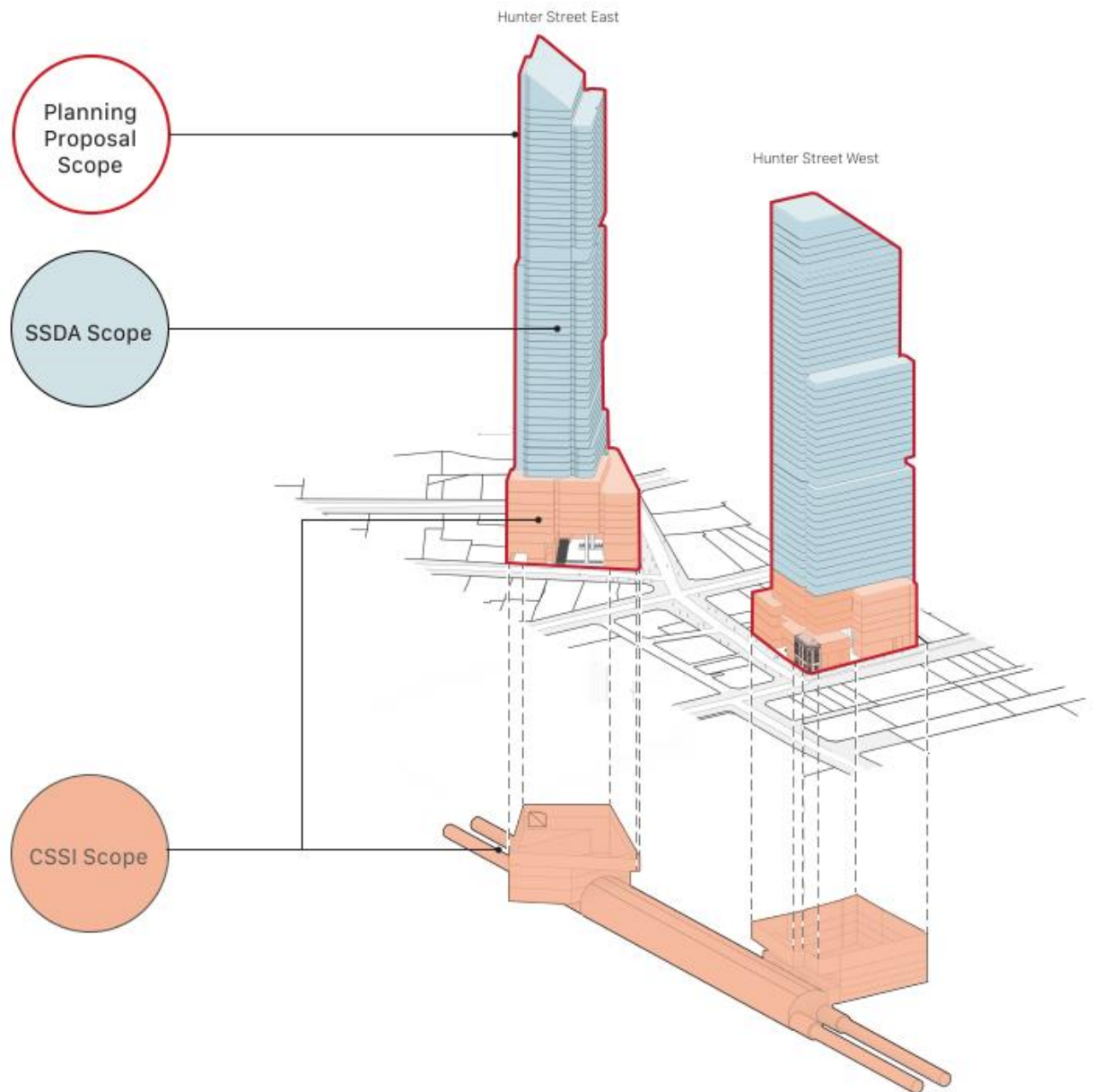


Figure 1-1: Hunter Street Station and proposed OSD

1.3.3 Planning proposal

The planning proposal seeks to amend the *Sydney Local Environmental Plan 2012* to enable development on the site(s) as follows:

- *Establish a maximum Height of Buildings control and maximum FSR control on the identified land, being the Hunter Street Station East and West sites.*
- *Enable the development of a commercial office building on the Hunter Street Station East and West sites*
- *Integration with the Hunter Street Station, the subject of a separate application process*

Sensitive – NSW Government

- *Adaptive reuse of the existing Former Skinners Family Hotel within the overall development on the West site*
- *Include site-specific controls which ensure the provision of employment and other non-residential land uses only on both the Hunter Street Station East and West sites.*
- *Include site-specific control allowing the provision of up to a maximum of 70 car parking spaces maximum total across both the Hunter Street Station East and West sites.*
- *Include a site-specific design guideline within the site-specific controls to guide future development sought under a State Significant Development Application process.*
- *Establish an alternative design excellence process for the Hunter Street Station East and West sites that responds to the integration of the development with the Sydney Metro West project and specifically the Hunter Street Station.*

A summary of the key development outcomes resulting from the Planning Proposal is set out in Table 1-1 below.

Table 1-1: Proposed concept built form outcomes

Built Form Component	Proposed Development Outcome
East Site	Based on a Site Area of 3,666 sqm
Height	Building height of 257.7m (RL 269.10)
FSR	22.82:1
GFA	Up to 84,287 sqm of GFA
Land Use(s)	Non-residential land uses only
West Site	Based on a Site Area of 3,735 sqm
Height	Building height of 213.0m (RL 220.00), including a setback interface from the heritage-listed Skinner Family Hotel
FSR	18.71:1
GFA	Up to 69,912 sqm of GFA
Land Use(s)	Non-residential land uses only
CI 7.6 – Carparking for Office and Business premises	Up to 70 car parking spaces, maximum total across both the Eastern and Western sites

1.4 Site context

1.4.1 The Site

The Hunter Street integrated station development is located in the northern part of the Sydney CBD, within the commercial core precinct of Central Sydney, within the Sydney local government area.

The east site is located on the corner of O’Connell Street, Hunter Street and Bligh Street adjacent to the existing CBD and South East Light Rail that extends from Circular Quay to Moore Park, Kensington and Kingsford. The east site is adjacent to the new Martin Place Station which forms part of the Sydney Metro City and Southwest, Australia’s biggest public transport project connecting Chatswood to Sydenham and extending to Bankstown.

The west site is located on the corner of George and Hunter Street, including De Mestre Place and land predominantly occupied by the existing Hunter Connection retail plaza.

Refer to Figure 1-2 below which illustrates the location of the Hunter Street Station within its regional context.

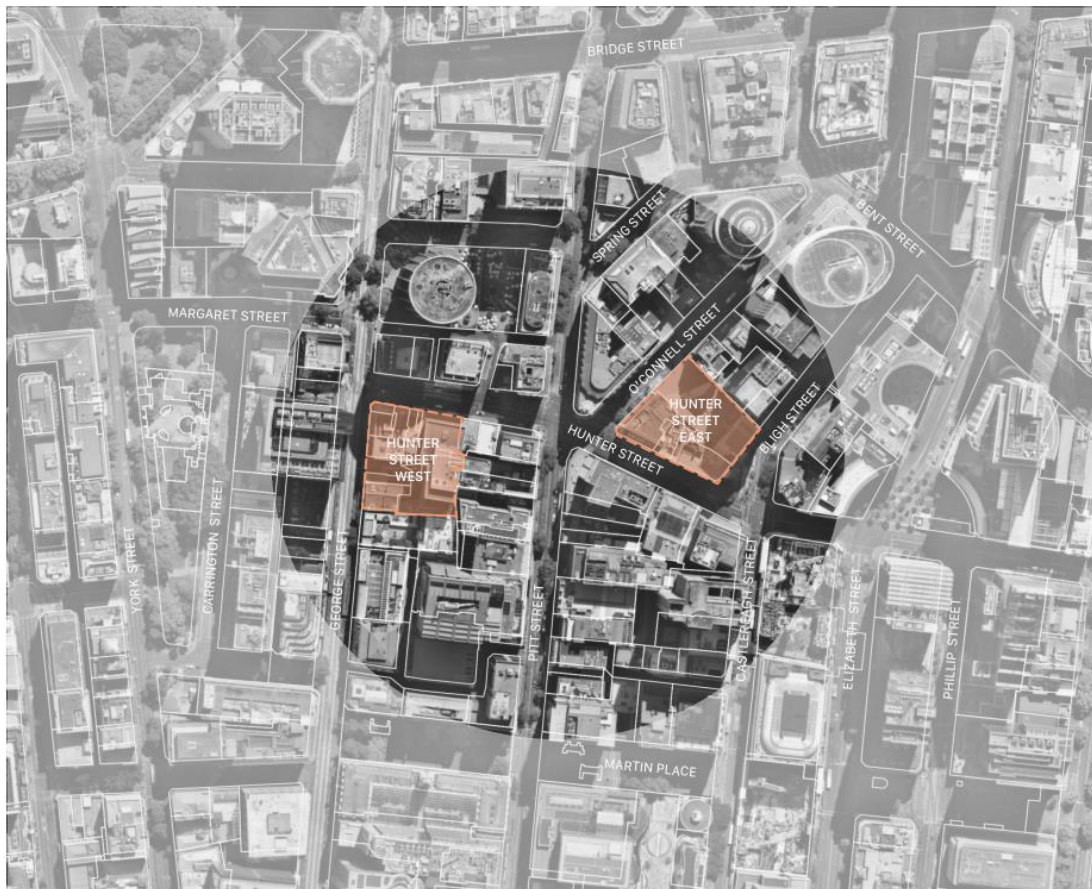


Figure 1-2: Location of the proposed Hunter Street Station OSD sites

1.4.2 Local context

The Sydney CBD is a highly developed commercial core with a wide range of commercial, retail, health, government and community-based uses, as well as high density residential developments.

A number of key commercial buildings are located in or around the Sydney CBD, including educational facilities, historic buildings and structures, law courts, public gathering spaces and places of worship. Significant areas of open space, such as the Botanical Gardens, the Domain and Hyde Park are also located within or near the Sydney CBD area, as well as the World Heritage Sydney Opera House and iconic Sydney Harbour Bridge.

Land uses surrounding the Hunter Street Station sites include:

Sensitive – NSW Government

- *North of the sites is a major commercial area comprising high density commercial towers along George Street, Pitt Street, and Bridge Street, including the MetCentre and Australia Square buildings. The area also comprises tourism and entertainment related uses including hotels, shops, restaurants, cafes, nightclubs and bars, with the area around Circular Quay and the Rocks a major tourism precinct and providing significant support for the night time economy.*
- *East of the sites are major commercial towers along Hunter Street, including Chifley Tower, 8 Chifley Square, Aurora Place and Deutsche Bank Place. Beyond Hunter Street, the State Library of NSW and the NSW Parliament House front onto Macquarie Street, and beyond that lies the public open space of The Domain.*
- *South of the sites, the land use remains predominantly multi-storey commercial offices but also includes cafes, bars and nightclubs, including the Ivy complex. Martin Place is a significant east–west pedestrian thoroughfare which contains many culturally significant buildings and structures including the Cenotaph memorial and the General Post Office building, as well as Martin Place Station. Beyond Martin Place the Sydney CBD continues towards Town Hall, Haymarket and the Central Station precinct.*
- *West of the sites, the land use remains predominantly high-density commercial offices, anchored by Wynyard Station. George Street contains the Sydney Light Rail (L2 Randwick Line and L3 Kingsford Line) and is a major north–south axis through the CBD, and along with Pitt Street connects Circular Quay, Wynyard, Town Hall and Central. East of Wynyard, the CBD continues towards the major commercial and entertainment areas around King Street Wharf and Barangaroo, which also contain significant high density residential apartment buildings.*

1.4.3 Site description

The Hunter Street integrated station development relates to the following properties:

- *28 O’Connell Street, 48 Hunter Street, and 37 Bligh Street, Sydney (East Site); and*
- *296 George Street, 300 George Street, 312 George Street, 314-318 George Street, 5010 De Mestre Place (Over Pass), 5 Hunter Street, 7-13 Hunter Street, 9 Hunter Street and De Mestre Place, Sydney (West Site).*

Table 1-2 and Table 1-3 below sets out the address, legal description and area of the parcels of land that comprise the Hunter Street Station land that is the subject of this Planning Proposal.

Table 1-2: Legal description of Hunter Street Station East site

Address	Lot and DP
28 O’Connell Street, Sydney	Lot 1, DP217112
28 O’Connell Street, Sydney	Lot 1, DP536538
28 O’Connell Street, Sydney	Lot 1, DP1107981
48 Hunter Street, Sydney	Lot 1, DP59871
48 Hunter Street, Sydney	Lot 2, DP217112

Sensitive – NSW Government

Address	Lot and DP
33 Bligh Street, Sydney	Lot 1, DP626651
37 Bligh Street, Sydney	CP and Lots 1-14, 21-31, 33-36, and 40, SP58859
37 Bligh Street, Sydney	CP and Lots 41-49, SP61852
37 Bligh Street, Sydney	CP and Lots 50-57, SP61922
37 Bligh Street, Sydney	CP and Lots 58-65, SP61923
37 Bligh Street, Sydney	CP and Lots 66 and 67, SP63146
37 Bligh Street, Sydney	CP and Lots 67-70, SP63147
37 Bligh Street, Sydney	CP and Lot 72, SP74004
37 Bligh Street, Sydney	CP and Lots 75-82, SP87437
37 Bligh Street, Sydney	CP and Lots 73-74, SP87628
Total Area: 3,694 sqm	

Table 1-3: Legal description of Hunter Street Station West site

Address	Lot and DP
296 George Street, Sydney	Lot 1, DP438188
300 George Street, Sydney	CP and Lots 1-43, SP596
312 George Street, Sydney	Lot 1, DP211120
314-318 George Street, Sydney	Lot 13, DP622968
5010 De Mestre Place, Sydney (Over Pass)	Lot 1, DP1003818
9 Hunter Street, Sydney	Lot 2, DP850895
5 Hunter Street, Sydney (Leda House & Hunter Arcade)	CP and Lots 1-63, SP71068
5 Hunter Street, Sydney (Leda House & Hunter Arcade)	CP and Lots 1-14, SP65054

Sensitive – NSW Government

Address	Lot and DP
7-13 Hunter Street, Sydney (Hunter Connection)	CP and Lots 1-53, SP50276
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 57 and 58, SP61007
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 54, 55 and 56, SP60441
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 59, 60 and 61, SP62889
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 62, 63, 64 and 65, SP69300
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 66 and 67, SP77409
7-13 Hunter Street, Sydney (Hunter Connection)	Lot 2, SP50276
De Mestre Place, Sydney	N/A
Total Area: 3,735 sqm	

2 Geotechnical baseline investigation

Hunter Street Station will be located in the heart of the Sydney CBD between Wynyard Station to the west and Martin Place metro station to the east. Hunter Street metro station provides the missing link between Wynyard Station and Martin Place metro station and will result in a continuous underground link that extends from Barangaroo to Martin Place.

The proposed Hunter Street OSD would be constructed above the Hunter Street Station access shafts at the western and eastern site.

To provide a better understanding of how the soils and groundwater baseline environment evolves prior to the proposed Hunter Street OSD sites, this Planning Proposal will first review the impact identified in SSI EIS 2 (tunnelling, major civil construction work) and SSI EIS 3 (station construction and long-term operation stage). Next, this Planning Proposal will consider the new baseline environment resulting from the impacts described in SSI EIS 2 and SSI EIS 3 and assess any additional soils and groundwater impact due to the proposed Hunter Street OSD sites. As part of the tunnelling and major civil construction work, contamination risk identified within the site will be addressed to make the site suitable for its intended land use prior to the commencement of the station construction and long-term operation.

2.1 Scope of assessment

The scope of assessment for this geotechnical baseline investigation has included:

- *A desktop review of available information sources, including the SSI EIS 2 and SSI EIS 3 prepared for the Hunter Street Station to understand the existing baseline environment and potential for soils and groundwater impact within the proposed Hunter Street OSD study area*
- *Consideration of the soils and groundwater impact following the construction of the station, prior to the proposed Hunter Street OSD construction activities commencing*
- *Identification of areas of geotechnical concern and assessment of potential impact to construction and operation from the geotechnical perspective (with no management measures to reduce these identified impacts)*
- *Identification of appropriate management responses to address the geotechnical impact, or where further investigation or remediation may be required.*

2.2 Data sources

The data sources used for the initial assessment are summarised below:

- *SSI EIS 2 Chapter 14 - Groundwater and ground movement (Sydney Metro West – The Bays to Sydney CBD | Major Projects - Department of Planning and Environment (nsw.gov.au)) by Sydney Metro EDS*
- *SSI EIS 3 Hunter Street chapter, Sydney Metro West - Rail infrastructure, stations, precincts and operations by AECOM*
- *Herbert C., (1980), Geology of the Sydney 1:100,000 Sheet 9130, Geological Survey of NSW, Department of Mineral Resources.*
- *eSPADE, (2021), Retrieved from NSW Department of Planning, Industry and Environment: <https://espade.environment.nsw.gov.au/>*

The geotechnical information used to develop this report is based on the following reports:

- *Eastern Tunnelling Package Geotechnical Interpretive Report for Concept Design, reference SMWSTEDS-SMD-SWD-TU000-GE-RPT-044001, Rev A, dated October 2021*
- *Sydney Metro West Geotechnical Investigation, Geotechnical Factual Report, Document No. 1791865-001-R-GDR-RevC, 24 October 2019, Golder / Douglas Partners*
- *Addendum Geotechnical Data Report Document No. 1791865-024-R-Rev1 GDR TSE addendum report, 9 April 2021, Golder/Douglas Partners.*

2.3 Assessment methodology

The assessment approach of potential soils and groundwater-related impact includes:

- *Desktop review SSI EIS 2 to understand the impact on the local groundwater table and surrounding soils and rock during the tunnelling, station excavation and major civil construction work. SSI EIS 2 discusses environmental impact during the construction of the station. The impact assessment covers an approximately 2-year construction period and deals with 'short term' effects. The impact assessments undertaken for SSI EIS 2 includes:*
 - Enabling works such as demolition, utility supply to construction sites, utility adjustments and modifications to the existing transport network
 - Tunnel excavation and tunnel support activities
 - Station excavation for new metro stations
 - A groundwater impact assessment due to the station excavation. Impact on the groundwater level, quality and groundwater-dependent ecosystems are discussed as part of the assessment
 - Ground movement induced by construction activities such as underground tunnelling and deep excavations for station access shafts. A risk-based approach has been adopted to assess the impact on nearby existing buildings, infrastructure and utilities.
- *Desktop review SSI EIS 3 to identify the impact to the local groundwater table and surrounding soils and rock due to the construction and operation of the Hunter Street station structure. SSI EIS 3 discusses the long-term environmental impact associated with the construction of the permanent station structure (access shafts and station cavern) and the operation of the station. The assessment does not include the impact of the proposed Hunter Street OSD. The construction of the station structure occurs after the excavation of the station cavern and access shafts (SSI EIS 2) and the baseline conditions considered for SSI EIS 3 are after the demolition of existing buildings at the construction site and completion of bulk excavation. The impact assessments undertaken for SSI EIS 3 includes:*
 - Fit-out of tunnels including rail systems for metro train operations
 - Construction, fit-out and operation of metro station buildings and the surrounding metro precincts, services facilities and traction substations
 - Operation and maintenance of the Sydney Metro West line

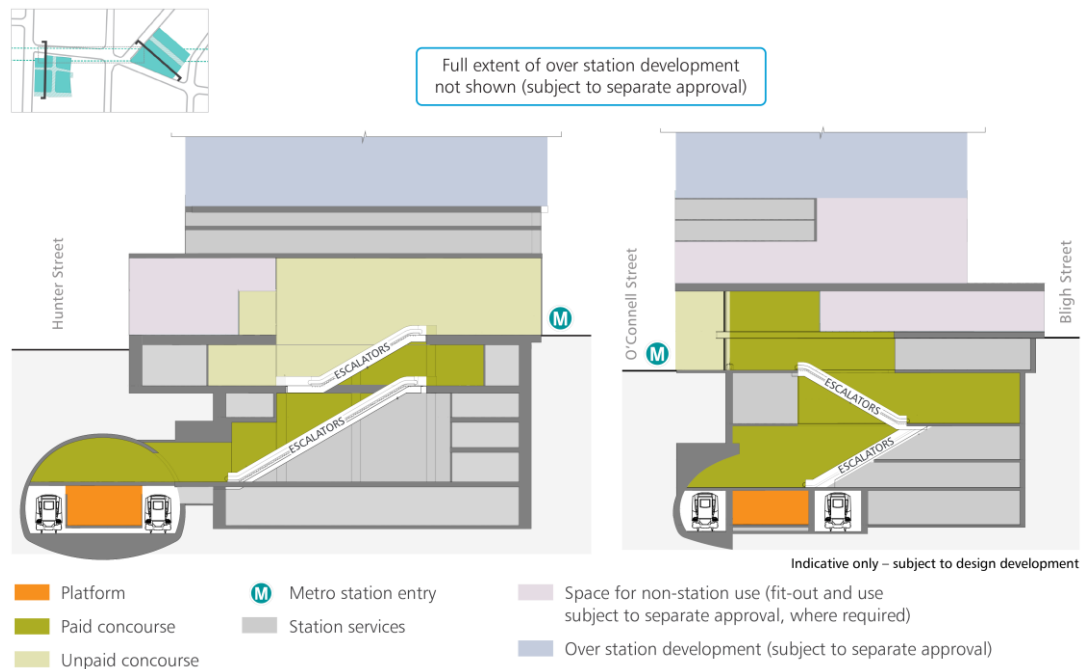


Figure 2-1: Indicative cross-sections - Hunter Street Station (Sydney CBD) in SSI EIS 3

- *Impact assessment of proposed Hunter Street OSD on the local groundwater table and surrounding soils and rock.*

2.4 Existing baseline site condition

This report discusses the impact of the proposed Hunter Street OSD construction which occurs after the station structural elements are constructed. The baseline site condition for the proposed Hunter Street OSD construction will be based on a baseline environment that has considered the impacts described in SSI EIS 2 and SSI EIS 3.

2.4.1 Topography and Hunter Street Station details

The proposed Hunter Street OSD is located in the heart of Sydney CBD and approximately 500m from the Sydney Harbour. The surrounding land is highly urbanised with typical ground surface elevations between about RL 10m AHD and 15m AHD, as shown in Figure 2-2.

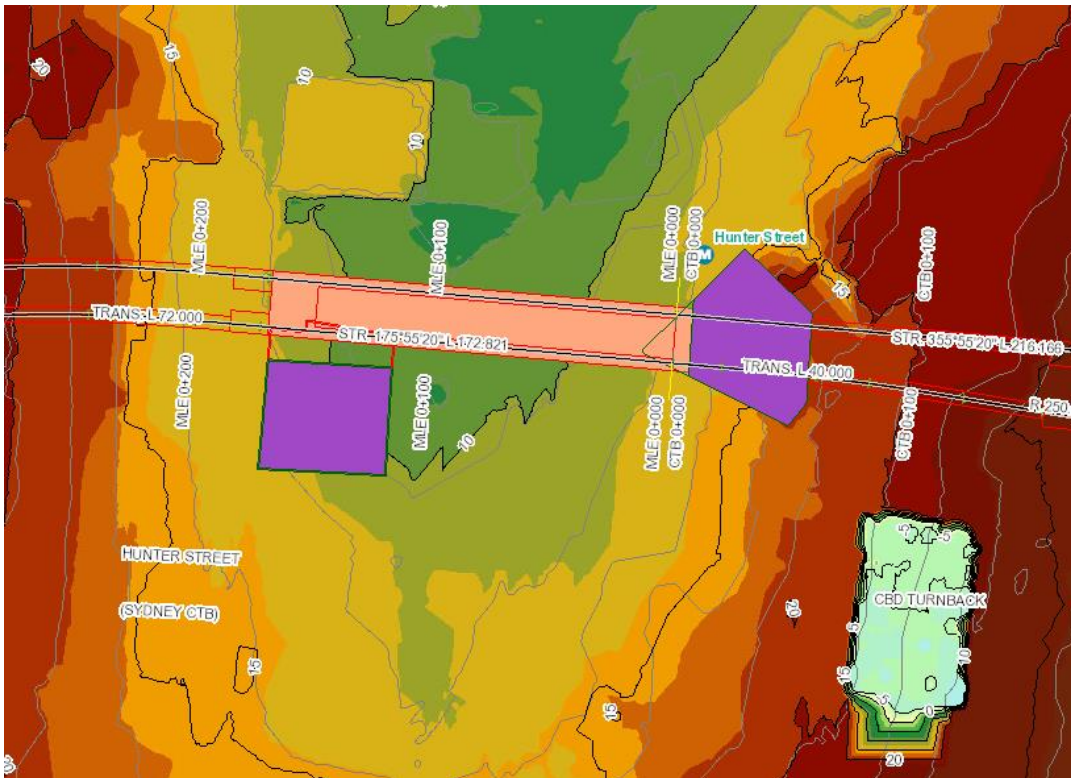


Figure 2-2: Hunter Street Station Site Topography

2.4.1.1 Western shaft

The western shaft is approximately rectangular in shape however the existing heritage building (Skinners Hotel) located at the corner of George and Hunter streets is to be maintained, thus removing a smaller rectangular portion of the site footprint. The site has a total perimeter length of about 228m measured at ground level. Existing ground surface levels across the site are approximately RL+9.0m AHD (Australian Height Datum) to +13.0m AHD. These levels are to be confirmed through a detailed site survey and may be affected by any existing building basements. The proposed excavation level of the shaft is approximately RL-18.2m AHD.

2.4.1.2 Eastern shaft

The eastern shaft has an unconventional polygon shape. The site has a total perimeter length of approximately 245m measured at ground level. Existing ground surface levels across the site range between RL+12.0 to RL+16.0m AHD with higher elevation towards the east. These levels are to be confirmed through a detailed site survey and may be affected by any existing building basements. The proposed excavation level of the shaft is approximately RL-19.4m AHD.

The features of Hunter Street Station are still being developed at the time of writing of this Concept Design. Table 2-1 provides a snapshot of the key details of Hunter Street Station.

Table 2-1: Key details of Hunter Street Station

Item	Cavern	Western Shaft	Eastern Shaft
Dimensions (approximate, m)	170 (length) 30 (width)	Roughly rectangular in shape 64 (length) 53 (width) 228 (total perimeter length)	Irregular polygon shape 245 (total perimeter length)
Range of existing surface levels (m AHD)	9.0 to 12.0	9.0 to 13.0	12.0 to 16.0
Depth below ground level (approximate, m)	30.0 to 33.0	27.2 to 31.2	31.4 to 35.4
Excavation level (approximate, m AHD)	-21.0 (bottom)	-18.2	-19.4

2.4.2 Soil and geology types

The Hunter Street Station has a relatively thin cover of anthropogenic ground (filling) which overly a relatively thin layer of residual soils derived from the Hawkesbury Sandstone unit. The underlying bedrock is Hawkesbury Sandstone. The Hawkesbury Sandstone is described as medium to coarse-grained quartz-rich sandstone with occasional shale lenses.

The Martin Place Joint Swarm is expected to intersect the station and tunnel alignment. The joint swarm has been intersected in previous major tunnel projects, excavations and boreholes between Ultimo and Martin Place Railway Station. The presence of the joint swarm results in increased fracturing of the sandstone which can increase the movement due to excavation.

Interpreted geological sections at Hunter Street Station are presented in Figure 2-3. The interpreted geological sections are approximate only and location-specific ground models should be developed for design purposes.

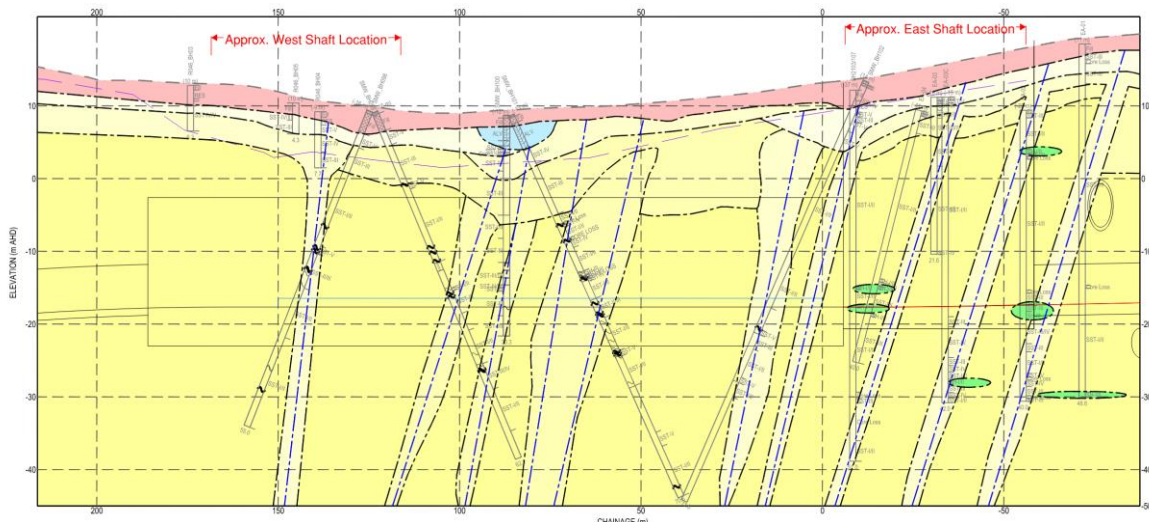


Figure 2-3: Hunter Street Station geological profile

2.4.3 Preliminary geotechnical model

A summary of the subsurface profile along the centreline of the station is presented in Table 2-2. The sandstone classes presented in Table 2-2 are based on the "Classification of Sandstones and Shales in the Sydney Region: A Forty-Year Review", Pells, et al 2019.

Table 2-2: Indicative Ground Profile

Geotechnical Unit	Description	Depth to Top of Unit (m)	Unit Thickness (m)
Fill	Existing, with variable material type and consistency	Ground Surface	Up to 3.5m
Residual Soil	Typically Sandy Clay or Clayey Sand	1.0 to 3.5m	1.3 to 2.1m
Hawkesbury Sandstone	Sandstone, highly weathered to fresh, low to very high rock strength	2.5 to 5.0m	Bedrock

The unit depths, thicknesses and material properties presented in Table 2-2 should not be assumed to represent the maximum or minimum values within the Hunter Street Station. Actual unit boundaries and material properties can be highly variable, particularly for fill.

2.4.4 Groundwater and saline water intrusion

Available groundwater monitoring data around the Hunter Street Station site indicates groundwater levels before the tunnelling and excavation activities is between -2.0 m AHD to -6.9 m AHD and is within the Hawkesbury Sandstone.

During the tunnelling and major civil construction work between The Bays and the Sydney CBD, SSI EIS 2 estimated groundwater level drawdown from construction at two years post-excavation is shown in Figure 2-4.

During the operation of Hunter Street Station, the groundwater flows to the tanked cavern would minimise groundwater inflows. The groundwater inflows to the drained shafts would continue throughout the operation. In the long term, the tanked station box would promote the reduction in drawdown until a new groundwater level is achieved around the station. This new groundwater level has not been modelled in SSI EIS 3 and groundwater drawdown levels are expected to be shallower than that shown in Figure 2-4.

The potential risk of saline water migration from Sydney Harbour towards the proposed Hunter Street Station service shafts due to long-term groundwater drawdown has not been discussed in SSI EIS 3 and no groundwater modelling has been undertaken. The potential risk of saline water migration is expected to be small due to the distance to Sydney Harbour.



Figure 2-4: Predicted Groundwater Drawdown Levels Two Years After the Start of Construction of Hunter Street Station (SSI EIS 2)

2.4.5 Ground movement and ground movement risk levels

Ground movement may occur as a result of construction activities such as underground tunnelling and deep excavation of station access shafts. Ground movement may also result from groundwater drawdown caused by the groundwater drainage during construction activities. However, in rock formation groundwater drawdown is less likely to result in additional movement.

Preliminary settlement assessment has been undertaken as part of the SSI EIS 2 and the identified existing buildings, infrastructure and utilities currently fall within risk category 1 or 2 where the damage is negligible or slight. Further detailed assessments were recommended at later design stages using a more sophisticated method, investigating the existing structural conditions of the asset, calculating building and infrastructure strain, undertaking structural assessment and developing management measures to address potential impact supported by instrumentation and monitoring.

2.5 Potential operational and construction impact assessment

2.5.1 Acid sulfate soils

The NSW Department of Planning, Industry and Environment hosts online ASS risk maps that are available to view via eSPADE (a Google Maps™ based information system). These maps predict the distribution of acid sulphate soils. They are based on landform assessment, extensive fieldwork and laboratory testing. These maps show a very low chance of acid sulphate soil occurring. The proposed OSD operation of the Hunter Street Station is not expected to have any further impact on acid sulfate soils, as there would be no excavation after completion of station construction. Any

acid sulphate soils encountered at the station site will be managed appropriately during the tunnelling and major civil works so that the site is suitable for its intended land use prior to the construction of the station structure and the OSD.

2.5.2 Soil salinity

The Sydney Metro West Environmental Impact Statement – The Bays to Sydney CBD (Sydney Metro, 2021a) identified there is the potential to encounter saline soils at Hunter Street Station. The proposed OSD operation of the Hunter Street Station is not expected to have any further impact on saline soils, as there would be no excavation after completion of construction.

2.5.3 Groundwater and saline water intrusion

The proposed Hunter Street OSD is constructed above the station shaft and does not directly impact the SSI EIS 3 groundwater levels.

The underground station shafts are designed as drained structures and drawdown on the groundwater table during construction and over the design life of the structure. These impacts are noted and discussed in SSI EIS 2 and SSI EIS 3 respectively.

As discussed in both SSI EIS 2 and SSI EIS 3, groundwater users and groundwater-dependent ecosystems have not been identified in the vicinity of the station site. Therefore, there is no impact on users or groundwater-dependent ecosystems as a result of this proposal.

2.5.4 Ground movement

The majority of the ground movement will occur during the excavation of the station cavern and access shafts. Some ground movement can occur due to the proposed Hunter Street OSD loading. However, the station structure would be designed such that these loads are transferred to the underlying high strength sandstone. The ground movements due to the proposed Hunter Street OSD loading is assessed to be minor relative to the excavation induced movements.

2.5.5 Building risks

The proposed Hunter Street OSD will be supported by the underlying station shaft. The station shaft and podium structure will be designed to transfer the OSD loads to the high strength sandstone and some lateral ground movements can occur as a result. Ground settlement due to the Hunter Street OSD building load is not expected. The design of the OSD however will consider potential impacts to nearby structures (including the State Heritage listed Tank Stream and Skinners Family Hotel) and aim to reduce these impacts.

3 Contamination assessment

The purpose of this contamination assessment is to evaluate the potential for contamination to be present within the proposed Hunter Street OSD sites in accordance with *State Environmental Planning Policy (Resilience and Hazards) 2021*. The assessment has considered the scope of works that would precede the construction of the proposed Hunter Street OSD, including the Hunter Street Station bulk earthworks and station development, which will have addressed existing contamination relevant to the sites.

3.1 Scope of assessment

The methodology for this contamination assessment includes:

- *A desktop review of available information sources and observations from previous site inspections to understand the existing environment and potential for contamination within the proposed Hunter Street OSD sites study area*
- *Consideration of the contamination status following the construction of the station, prior to the proposed Hunter Street OSD sites construction activities commencing.*
- *Identification of areas of environmental concern (with respect to contamination) and assessment of potential impacts during construction and operation from contamination (with no mitigation measures)*
- *Identification of contamination receptors and exposure pathways, and rank these in terms of risk using a prioritisation methodology to illustrate the potential harm*
- *Identification of appropriate mitigation and management responses for contamination, or where further investigation or remediation may be required.*

The desktop assessment involved a review of available information relevant to the Hunter Street OSD sites to understand the existing environment, the potential risk for contamination and the potential impacts. The review of information included:

- *Sydney Metro West - Rail infrastructure, stations, precincts and operations - Technical Paper 7: Contamination (Sydney Metro 2021)*
- *The Bays to Sydney CBD Environmental Impact Statement – Stage 2 Technical Paper 8 Contamination (Sydney Metro (2021)*
- *Existing land uses in vicinity to the proposed Hunter St OSD sites and information on topography, drainage, geology, soils, hydrogeology, ASS, and receiving environment data including relevant mapping and provisions in the relevant local environment plans*
- *Publicly available information including:*
 - The NSW Environment Protection Authority (EPA) register
 - Licenced activities under the POEO Act, 1997
 - The Commonwealth Scientific and Industrial Research Organisation (CSIRO) Australian Soil Resource Information System (ASRIS) ASRIS database
 - Former NSW Department of Primary Industries groundwater database
 - Publicly available information available via general internet searches for the key words (contamination, remediation and site investigation) for

Sensitive – NSW Government

City of Sydney and major projects within and adjoining the proposed Hunter St OSD sites.

Areas located within the construction site, nearby land uses, and potential areas of environmental concern (with respect to contamination) were visually inspected previously for Technical Paper 8 Contamination (Sydney Metro, 2021) as part of the Stage 2 CSSI application. The site inspection was completed from only publicly available areas and focused on the construction site, as well as nearby land uses and potential areas of environmental interest (AEIs).

3.1.1 Relevant contamination guidelines and legislation

In preparing this contamination assessment, the following guidelines were considered (where relevant):

- *National Environment Protection (Assessment of Site Contamination) Measure, 1999 (as revised 2013)*
- *PFAS National Environmental Management Plan (Heads of Environment Protection Authorities, January 2020).*
- *Consultants reporting on contaminated land - Contaminated Land Guidelines ((Environment Protection Authority), 2020)*
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMICANZ, 2000, ANZG, 2018, and draft ANZG, 2020).*
- *National Health and Medical Research Council (2008) Guidelines for Managing Risks in Recreational Waters*
- *Guidelines made or approved under section 105 of the Contaminated Land Management 1997, including:*
 - *Contaminated Sites: Sampling Design Guidelines (EPA, 1995)*
 - *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd Edition) (EPA, 2017)*
 - *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination (DEC, 2007)*
 - *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 Environment Protection Authority, 2015*

The relevant legislation, regulations and policies for contaminated land matters that have been considered during the preparation of this assessment include:

- *Contamination Land Management Act 1997 (New South Wales Environment Protection Authority, 1997)*
- *State Environmental Planning Policy (Resilience and Hazards) 2021*
- *Protection of the Environment Operations Act 1997 (POEO Act) (New South Wales Environment Protection Authority, 1997)*
- *Protection of the Environment Operations (Waste) Regulation 2014 (New South Wales Environment Protection Authority, 2014)*
- *Environmental Planning and Assessment Act 1979*
- *Sydney Local Environment Plan (LEP) 2012*

3.2 Baseline site conditions

3.2.1 Land zone

The proposed Hunter Street OSD sites currently comprises a mixture of retail and commercial office buildings. Prior to the commencement of the proposed Hunter Street OSD sites, all structures within the proposed OSD sites, except for one heritage building (former Skinners Family Hotel) will be demolished. The demolition works will be completed under the Sydney Metro Stage 2 CSSI approval which includes the bulk excavation works for the station box. Once done, the station buildings and infrastructure will be constructed under the Sydney Metro Stage 3 CSSI approval.

The land use zones within 500 metres of the proposed Hunter Street OSD sites are a combination of Commercial Core (B3), Infrastructure (SP2), Mixed (B4) and Public Recreation (RE1) as described by the City of Sydney Local Environmental Plan 2012.

The land zoning within the proposed Hunter Street OSD sites is Metropolitan Centre (B8). In this land zone, the use of the land is limited to commercial premises, community services including childcare centres, community facilities, educational establishments, entertainment facilities, function centres, information and education facilities, registered clubs, respite day care centres, restricted premises, roads, tourist and visitor accommodation.

3.2.2 Drainage

Both sites (eastern and western) have underground drainage networks in the adjacent road reserve generally following existing kerb lines and connecting into Pitt Street where flows discharge to Circular Quay.

Groundwater flow into the underground station box at each site will be captured by the station infrastructure and piped to a groundwater treatment plant at Rosehill.

3.2.3 Surface water and flood potential

The Hunter Street OSD sites would be located in an area with significant urban development, which has an elevation fall toward Circular Quay from south to north.

Flood modelling for this proposal has determined that the western site is flood affected by up to about 0.35 metres in a one per cent Annual Exceedance Probability (AEP) flood event and up to 0.04 metres along the northern boundary in a Probably Maximum Flood (PMF) event. The eastern site is flood affected by up to about 0.25 metres in a one per cent AEP flood event and up to 0.4 metres in a PMF event. Flooding is expected to be generally contained within the adjacent roadways.

Flood hazard in a one per cent AEP event would be high within some adjacent roadways including Hunter Street and a small section of George Street. In a PMF event, flood hazard in adjacent roadways is also high which could be a hazard risk to pedestrians and vehicles, potentially restricting access and evacuation routes from the sites.

There are no mainstream flooding or coastal inundation risks relevant to the sites and immediate surrounds.

3.2.4 Acid sulfate soils

Potential acid sulfate soils risk maps from the former Office of Environment and Heritage (now part of NSW Department of Planning, Industry and Environment

[DPIE]) and Sydney Local Environmental Plan 2012 indicate the proposed Hunter Street OSD development site is located in a Class 5 area. Acid sulfate soils are not typically found in Class 5 areas.

For more information on geology of the proposed Hunter Street OSD sites, refer to Section 2.4.2. For a summary of the preliminary geotechnical model assessment, refer to Section 2.4.3.

3.2.5 Hydrogeology

There are no groundwater bores located within 1 km of the Hunter Street OSD sites. Groundwater has been previously measured at 2.97 to -5.56 metres AHD in the vicinity of the Hunter Street construction site.

Groundwater acting as baseflow to surface water features is considered to be a minor component of recharge in the area surrounding Hunter Street OSD sites.

Section 2.4.5 details the anticipated movement of groundwater following the excavation of the Hunter Street metro station as a part of the Sydney Metro West – major civil construction between The Bays and Sydney CBD. Figure 2-4 illustrates this anticipated movement of groundwater.

Groundwater is not likely to interact with creeks associated with Cockle Bay and Circular Quay as they are concrete-lined channels which serve mainly as stormwater discharge. These channels fall outside the area of predicted drawdown as evidenced in Figure 2-4

3.2.6 Sensitive receiving environments

There are no coastal wetlands as defined by the State Environmental Planning Policy (coastal management) 2018 within close proximity to the proposed Hunter Street OSD sites. The closest coastal wetland is located approximately 3.2 kilometres from the Hunter Street OSD sites. Sydney Harbour has a high conservation and community value and supports ecosystems that are particularly sensitive to contamination or degradation of water quality.

3.3 Site background

The following sections are a summary of background information on the proposed Hunter Street OSD site, including EPA records.

3.3.1 NSW EPA records

3.3.1.1 Contaminated Land Records of Notice

A review of the NSW EPA Contaminated Land Records of Notice was undertaken on 17 November 2021 to evaluate if the EPA has issued a regulatory notice in relation to the proposed Hunter Street OSD sites under Section 60 of the Contaminated Land Management Act 1997 (CLM Act, 1997). Three sites were identified within 500 metres of the proposed Hunter Street OSD sites. These sites are summarised in Table .

3.3.1.2 NSW Contaminated Sites notified to the EPA

A search conducted on 17 November 2021 of the NSW EPA Contaminated Sites Record of Notices (under section 58 of the Contaminated Land Management Act 1997) and the list of contaminated sites notified to the NSW EPA (under section 60 of the Contaminated Land Management Act 1997) indicated that there were five sites

Sensitive – NSW Government

registered with the NSW EPA within 500 metres of the proposed Hunter Street OSD sites that were either regulated or had been notified. The sites are summarised in table below.

Table 3-1: NSW EPA regulated / formerly regulated / notified sites within 500 metres of the proposed Hunter Street OSD sites:

Site address	Contamination status	EPA listing	Site activity	Location relative to the proposed Hunter Street OSD sites
Road reserve fronting 30–38 Hickson Road, Millers Point	Contamination currently regulated under CLM Act	Regulated	Gasworks	About 300 metres west of Hunter Street Station western construction site
36 Hickson Road, Millers Point	Contamination currently regulated under CLM Act	Regulated	Gasworks	About 300 metres west of Hunter Street Station western construction site
38 Hickson Road, Millers Point	Contamination being managed via the planning process (Environmental Planning and Assessment Act 1979)	Notified	Gasworks	About 300 metres west of Hunter Street Station western construction site
30–34 Hickson Road, Millers Point	Regulation under CLM Act not required	Notified	Gasworks	About 300 metres west of Hunter Street Station western construction site
447 Kent Street, Sydney	Regulation under CLM Act not required	Notified	Chemical Industry (dry cleaning)	About 500 metres south of Hunter Street Station western construction site

3.3.1.3 Licenced activities under the POEO Act 1997

A search conducted on 17 November 2021 of the NSW EPA Protection of the Environment Operations (POEO) Act 1997 public register (under section 308 of the POEO Act 1997) indicated there were two sites within 500 metres of the proposed Hunter Street OSD sites that have current environmental protection licences (EPL). The sites are summarised in Table . EPLs that are no longer in force or surrendered have not been included in the table as it has been assumed that potential contamination risk is only associated with current licensed activities.

Table 3-2: Sites with current EPL within 500 metres of the proposed Hunter Street OSD sites.

Site Address	Licence holder	Activity	Location relative to the proposed Hunter Street OSD sites
Australian Rail Track Corporation (ARTC) Network, Sydney	Australian Rail Track Corporation Limited	Railway infrastructure operations	About 400 metres south of the Hunter Street Station construction sites
Between Chatswood dive site and Sydenham dive site, Sydney (associated with Sydney Metro)	CPB Contractors Pty Limited	Railway infrastructure operations (<50,000T)	About 400 metres south of the Hunter Street Station construction sites

EPLs generally detail requirements for the management of pollution risks associated with the licenced activities. As such, if activities are operating in accordance with their respective EPL, the risk of those activities causing contamination would be reduced.

3.3.1.4 Review of PFAS sources

Considering the high mobility of Per- and poly- fluoroalkyl substances (PFAS) within the environment, a search of potential PFAS sources was carried out within one kilometre of the proposed Hunter Street OSD sites. The search involved a review of:

- *NSW EPA Contaminated Sites Record of Notices (under section 58 of the Contaminated Land Management Act 1997) and the list of contaminated sites notified to the NSW EPA (under section 60 of the Contaminated Land Management Act 1997) for PFAS as a contaminant of concern*
- *Current and historical (from 1955 onwards) aerial imagery for visually identifiable industry and/or operations which may be associated with PFAS contaminants (as defined by the PFAS National Environmental Management Plan, 2018) including aviation, coal works, power generation (including switchyards), petrochemical production, fuel production, petroleum products storage, aviation, sewage treatment plants and waste disposal*
- *A review of available aerial imagery services (GoogleEarth).*

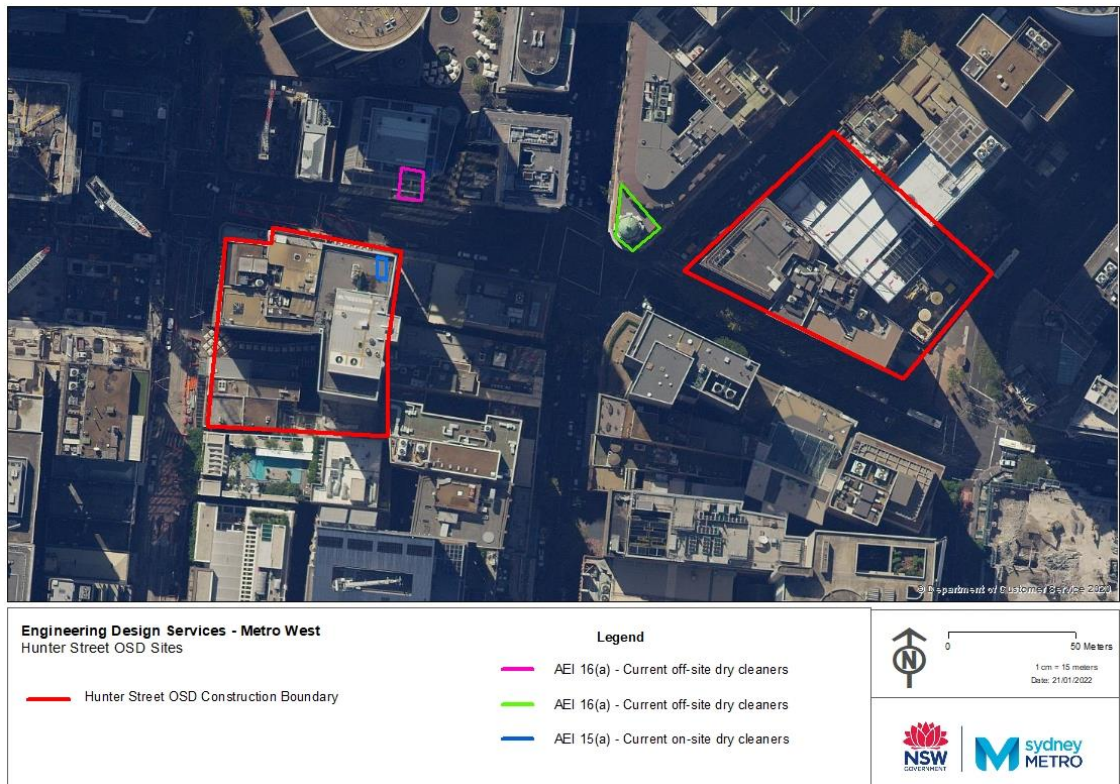
Following the review, no PFAS sources were identified within one kilometre of the proposed Hunter Street OSD sites.

3.3.2 Areas of Environmental Interest

Based on the findings of the desktop review and site inspections completed by Sydney Metro (2021), a number of known and potential contamination sources (areas of environmental interest (AEI)) were identified within and/or adjacent to the proposed Hunter Street OSD sites.

Figure 3-1 shows the approximate location of several AEIs within, or in close proximity to the Hunter Street OSD sites. Table 3-2 details the AEIs within 500 metres of the Hunter Street OSD sites.

As part of the Sydney Metro Stage 2 CSSI approval, AEI15 will be demolished; however, residual soil and groundwater contamination could remain (Sydney Metro, 2021).



Note: “(a)” Denotes new area of environmental interest identified from the Stage 2 planning approval (Sydney Metro, 2021) to differentiate from AEIs with the same number from the Stage 1 planning approval (Sydney Metro, 2020).

Figure 3-1: Hunter Street OSD sites – Areas of Environmental Interest (AEI)

3.4 Assessment of potential impacts

The potential for impacts from contamination to sensitive receivers are described in the following sections.

3.4.1 Contaminants of potential concern

Based on the review of available information, the contaminants of potential concern (CoPC) relating to current and historical activities in and surrounding the proposed Hunter Street OSD sites includes:

- *Heavy metals (including lead): In Australia, paints containing as much as 50 per cent lead were used on the inside and outside of houses built before 1950, and paint containing more than 1 percent lead was still being used until the late 1960 (Sydney Metro, 2018). As a result, selected metals including lead, cadmium, chromium and zinc may be sourced from the metal-based paints which may have been applied to and still*

exist on the interior and exterior walls of the current buildings or may be present within the soil since redevelopment.

- *Polycyclic Aromatic Hydrocarbons (PAHs) – related to some petroleum hydrocarbon use, bitumen emulsion, lubricating oils and waste oils. PAHs can also potentially be present in fill (dependent on the origin of the fill material)*
- *Volatile Organic Compounds (VOCs) (including chlorinated hydrocarbons), Benzene, toluene, ethylbenzene and xylenes (BTEX) and total recoverable hydrocarbons (TRH) – related to various industrial processes, particularly where solvents are used and are associated with contamination from dry cleaning facilities and maintenance facilities. VOCs can also potentially be present in fill (dependent on the origin of the fill material).*

The above potential contamination sources could cause localised soil and sediment contamination, groundwater and surface water pollution if not managed appropriately.

3.4.2 Soil

Surface soils within the proposed Hunter Street OSD sites may be impacted by heavy metals, hydrocarbons (TRH, BTEX, PAH) and VOCs (Sydney Metro 2021) as well as any contamination resulting from the excavation and development of Hunter Street Station. Significant excavation is not expected for the proposed Hunter Street OSD, with most of the civil works being associated with the station construction. However, limited disturbance of surface soils associated with general construction activities could have potential for impact. Potential impacts as a result of disturbance of contaminated soil without appropriate management and/or remediation may include:

- *Contaminant exposure risk to construction personnel and the general public*
- *Contaminant exposure to environmental receptors (such as Sydney Harbour) through wind-blown soil and surface water runoff*
- *Cross contamination associated with the incorrect handling or disposal of spoil and unexpected finds*
- *Contamination of previously clean areas.*

All potential soil contamination identified can be managed subject to the implementation of appropriate management measures and/or remediation.

The sealed nature of the developed site would preclude an impact from potential soil contamination during operation.

3.4.3 Vapour and gas

Vapours are generally partitioned from compounds present within soil and groundwater. The generation of vapours can be influenced by sub-surface conditions and the presence of below ground and on surface structures. If present, vapours could accumulate within below ground excavations and enclosed structures at concentrations which could represent an explosion or acute/chronic health risk (Sydney Metro 2021).

As the proposed development is above grade, and limited inground excavations are expected the potential for an impact from vapour or gas contamination is expected to be low.

3.4.4 Acid sulfate soils

Excavation of soils with a potential for acid sulfate soil is unlikely to occur at the proposed Hunter Street OSD sites, as the site is listed as a Class 5 acid sulphate soil risk (DPIE 2021, Sydney LEP 2012) and ground excavations are expected to be limited.

3.4.5 Groundwater and flood impact

Groundwater drawdown as a result of the station excavation will occur. Groundwater will be collected by the station infrastructure which will convey it to a treatment plant at Rosehill prior to discharge into the environment. The depth of the groundwater following drawdown would be 25-30m, therefore it is unlikely that any excavations associated with the Hunter Street OSD sites would interact with groundwater.

A preliminary flooding assessment completed for the Hunter Street OSD sites demonstrates that the Hunter Street Over Station Development (OSD) will not significantly adversely affect flood behaviour resulting in affectation of other properties assets and infrastructure and it will provide the required flood immunity to comply with flood planning levels.

3.4.6 Contamination risk assessment

To understand the potential for contamination to be present of the Hunter Street OSD sites with contamination, each AEI has been assessed to identify the potential contamination risk. Table 3-3 outlines the potential source, pathway and receptor for potential contamination located within the proposed Hunter Street OSD sites.

Sensitive – NSW Government

Table 3-3: Areas of Environmental Interest

AEI	Media and CoPCs	Contamination status	Pathway	Receptor	Risk identified for the proposed Hunter St OSD
AEI 6(2) - Dry cleaning business (447 Kent Street) (off-site)	Surface soil: Chlorinated hydrocarbons (included within the classification volatile organic compounds (VOCs))	Low potential for contamination to be present at concentrations above the relevant assessment criteria and limited in extent	Contamination very unlikely to be exposed during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors	None associated with the Hunter Street OSD	Very low as the site is approximately 500 metres away from the Hunter Street OSD sites
	Groundwater: Chlorinated hydrocarbons (included within the classification Volatile Organic Compounds (VOCs))	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	Contamination very unlikely to be interacted with during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors.	None associated with the Hunter Street OSD	Very low given the depth of drawdown in relation to the Hunter Street OSD - the OSD are raised above the ground on the station podiums
	Vapour: Chlorinated hydrocarbons (included within the classification Volatile Organic Compounds (VOCs))	Contamination possibly present at concentrations above the relevant assessment criteria	Contamination very unlikely to be interacted with during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors	None associated with the Hunter Street OSD	Very low due to the OSD being raised above the ground on the station podiums
AEI 7(2) - Former gasworks at	Surface soil: Heavy metals, hydrocarbons;	Low potential for contamination to be present at	Contamination very unlikely to be exposed during the construction and operational phases of the Hunter	None associated with the Hunter Street OSD	Very low as the site is approximately 300 metres away from the

Sensitive – NSW Government

AEI	Media and CoPCs	Contamination status	Pathway	Receptor	Risk identified for the proposed Hunter St OSD
Millers Point (off-site)	Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene and Xylene (BTEX) and Polycyclic Aromatic Hydrocarbons (PAH).	concentrations above the relevant assessment criteria and limited in extent.	Street OSD sites, therefore unlikely to impact upon human and environmental receptors Streetsites		Hunter Street OSD sites
	Groundwater: Heavy metals, hydrocarbons (TRH, BTEX, PAH)	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent.	Contamination very unlikely to be interacted with during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors	None associated with the Hunter Street OSD	Very low given the depth of drawdown in relation to the Hunter Street OSD - the OSD are raised above the ground on the station podiums
	Vapour: Hydrocarbons (TRH, BTEX, PAH)	Contamination possibly present at concentrations above the relevant assessment criteria and potentially widespread.	Contamination very unlikely to be interacted with during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors	None associated with the Hunter Street OSD	Very low due to the OSD being raised above the ground on the station podiums
AEI 15(a) - Current dry cleaners (within western	Surface soil: Chlorinated hydrocarbons, VOCs	Low potential for contamination to be present at concentrations above the relevant	Contamination very unlikely to be exposed during the construction and operational phases of the western Hunter Street OSD site because the AEI will be demolished and the land	None associated with the Hunter Street OSD	Very low given the development work preceding Hunter Street OSD

Sensitive – NSW Government

AEI	Media and CoPCs	Contamination status	Pathway	Receptor	Risk identified for the proposed Hunter St OSD
construction site)		assessment criteria and limited in extent.	redeveloped as a station as part of the preceding stages of development		
	Groundwater: Chlorinated hydrocarbons, VOCs	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	Contamination very unlikely to be interacted with during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors.	None associated with the Hunter Street OSD	Very low given the depth of drawdown in relation to the Hunter Street OSD - the OSD are raised above the ground on the station podiums
	Vapour: Chlorinated hydrocarbons, VOCs	Contamination possibly present at concentrations above the relevant assessment criteria and potentially widespread.	Contamination very unlikely to be interacted with during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors	None associated with the Hunter Street OSD	Very low due to the OSD being raised above the ground on the station podiums
AEI 16(a) – Current dry cleaners (off-site sources in Hunter Street)	Surface soil: Chlorinated hydrocarbons (included within the classification Volatile Organic Compounds (VOCs))	Low potential for contamination to be present at concentrations above the relevant assessment criteria and limited in extent.	Contamination very unlikely to be exposed during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors	None associated with the Hunter Street OSD	Very low as the site is outside of the Hunter Street OSD sites

Sensitive – NSW Government

AEI	Media and CoPCs	Contamination status	Pathway	Receptor	Risk identified for the proposed Hunter St OSD
	Groundwater: Chlorinated hydrocarbons (included within the classification Volatile Organic Compounds (VOCs))	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent.	Contamination very unlikely to be interacted with during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors	None associated with the Hunter Street OSD	Very low given the depth of drawdown in relation to the Hunter Street OSD - the OSD are raised above the ground on the station podiums
	Vapour: Chlorinated hydrocarbons (included within the classification Volatile Organic Compounds (VOCs))	Contamination possibly present at concentrations above the relevant assessment criteria.	Contamination very unlikely to be interacted with during the construction and operational phases of the Hunter Street OSD sites, therefore unlikely to impact upon human and environmental receptors	None associated with the Hunter Street OSD	Very low due to the OSD being raised above the ground on the station podiums

4 Conclusion

The Geotechnical and Contamination Assessment has been undertaken to support a Planning Proposal Request to amend the maximum building height and maximum floor space ratio permitted for both the east and west sites under Sydney Local Environmental Plan 2012 (Sydney LEP 2012) at the Hunter Street (Sydney CBD) station. The outcomes of the assessment are presented below.

4.1 Geotechnical

The Hunter Street OSDs will utilise the space above the existing station podiums and additional excavations are not required to construct the OSD. The impacts of the proposed OSD on the surrounding ground conditions are considered and summarised below:

- *The site is underlain by high strength sandstone bedrock which is a suitable founding material for the OSD. Some additional lateral ground movement could occur due to the additional OSD loading. Compared to the movements caused by the station excavation, the additional ground movement from OSD is assessed to be small and can be managed through the utilisation of good design and construction techniques and practices.*
- *The OSD construction is above ground and does not directly impact the groundwater table. Any long-term impacts to the groundwater table are assessed in SSI EIS 3.*
- *Temporary and/or permanent ground anchors are not required to construct the OSD.*
- *Piled foundations are not expected to be required to support the additional OSD load but this additional loading needs to be considered during the permanent station design.*
- *Further geotechnical investigations are recommended to develop a better understanding of the ground conditions for the design of the OSD.*
- *The State heritage-listed Tank Stream and the Skinners Family hotel are in proximity to this proposal and will be retained and protected within the site. Some indirect impact (to the setting or from vibration) can be managed during construction to within neutral or negligible impact.*

4.2 Contamination

Prior to the development of the Hunter Street OSD sites, all structures except for one heritage building (former Skinners Family Hotel) will be demolished and station infrastructure and buildings constructed. The OSD will sit upon the station podiums at both sites, therefore the contamination risk is considered very low as there is no excavation to be completed in order to construct the Hunter Street OSDs.

5 Limitations

Exclusive Use

- *This report has been prepared by Mott MacDonald at the request of Sydney Metro (“Client”) exclusively for the use of its Client. This report has been prepared in accordance with the proposed Hunter Street OSD sites brief only and has been based in part on information obtained from the client and other parties.*
- *The basis of Mott MacDonald’s engagement by the Client is that Mott MacDonald’s liability, whether under the law of contract, tort, statute, equity or otherwise, is limited as set out in the terms of the engagement.*
- *The advice in this report relates only to the proposed Hunter Street OSD sites and all results, conclusions and recommendations made should never be used for any other purpose. Mott MacDonald accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This contamination assessment should not be reproduced without prior approval by the client or amended in any way without prior approval by Mott MacDonald, and should not be relied upon by other parties, who should make their own enquires.*

Investigation

- *Investigation of potential contamination is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the investigation considered appropriate based on the regulatory requirements. The high-level desktop study conducted relies on publicly available information such as aerial photographs, government records and analysis of local historical records.*
- *No sampling or laboratory analyses were undertaken as part of the investigations. Potential contaminants and areas of concern are based on the information detailed in the site history. This Report does not provide confirmation of the presence of soil and groundwater contamination within the proposed Hunter Street OSD sites.*
- *Changes to site conditions may occur subsequent to the investigations, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.*
- *This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, Mott Macdonald reserves the right to review the report in the context of the additional information*

Third Parties

- *It is not possible to make a proper assessment of this report without a clear understanding of the terms of engagement under which the report has been prepared, including the scope of the instructions and directions given to and the assumptions made by the consultant who has prepared the report.*
- *The report is a report scoped in accordance with instructions given by or on behalf of Client. The report may not address issues which would need to be addressed with a third party if that party's particular circumstances, requirements and experience with such reports were known and may make assumptions about matters of which a third party is not aware.*
- *Mott MacDonald therefore does not assume responsibility for the use of, or reliance on, the report by any third party and the use of, or reliance on, the report by any third party is at the risk of that party.*

6 References

ANZECC and ARMCANZ (2000), ANZG (2018), and draft ANZG (2020). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*

Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, The Guidelines (Chapters 1-7)*. Canberra: Australian Government Publishing Service. ISBN 09578245 0 5 (set).

Australian Standard (AS 4482.1-2005). *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds*.

Australian Standard (AS 4482.2-1999). *Guide to the sampling and investigation of potentially contaminated soils – Volatile substances*.

Bureau of Meteorology (2018). Groundwater Dependent Ecosystems (GDE) Atlas, <http://www.bom.gov.au/water/groundwater/gde/>, accessed April 2021.

Chapman G.A., Murphy C.L., Tille P.J., Atkinson G. and Morse R.J. (2009) Soil Landscapes of the Sydney 1:100,000 Sheet map, Ed. 4, Department of Environment, Climate Change and Water, Sydney.

Department of Defence (2016). *Lancer Barracks, Parramatta, New South Wales*.

Department of Environment and Conservation NSW (DEC) (2007) *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination*. Sydney, New South Wales: Department of Environment and Conservation NSW.

Department of Environment, Climate Change and Water NSW (DECCW) (2010) *Vapour Intrusion: Technical Practice Note*. Sydney South, New South Wales: Department of Environment, Climate Change and Water NSW.

Department of Planning (2008). *Acid Sulfate Soils Assessment Guidelines*

Department of Primary Industries (2013). *Salinity hazard report for Catchment Action Plan update – Sydney Metropolitan CMA*

Department of Land and Water Conservation (2002). *Urban and regional salinity* [Online] Available from: <http://www.environment.nsw.gov.au/salinity/solutions/urban.htm>

EDS (2021). *Hunter Street Planning Proposal Integrated Water Management Plan*

Environment Protection Authority (2020), *Consultants reporting on contaminated land - Contaminated Land Guidelines* ((Environment Protection Authority), 2020)

Golder & Douglas Partners (2020a), *Sydney Metro West Geotechnical Investigation, Factual Contamination Assessment Report, 1791865-002-R-CAR-Rev0, 6 May 2020*

Golder & Douglas Partners (2021), *Sydney Metro West Geotechnical Investigation, Groundwater Monitoring Report – Stage 2 Locations, 1791865-023-R-GWM-Stage 2 Rev 0, 26 February 2021*

Golder and Douglas Partners (Golder-Douglas) (2018) *Sydney Metro West Groundwater monitoring report, October 2018*

National Environment Protection Council (NEPC) (1999) *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013)*.

NSW Acid Sulfate Soils Management Advisory Committee, 1998, *Acid Sulfate Soils Assessment Guidelines*

NSW Environment Protection Authority (EPA) (2012). *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases*. Sydney: NSW EPA.

NSW Environment Protection Authority (2015a). *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*. Sydney South, New South Wales: NSW EPA.

NSW Environment Protection Authority (2015b). *Technical Note: Light Non-Aqueous Phase Liquid Assessment and Remediation*. Sydney: NSW EPA.

NSW Environment Protection Authority (2017). *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme* (3rd Edition). Sydney: NSW EPA.

NSW Environment Protection Authority Contaminated Sites Register and Record of Notices.

NSW Environmental Protection Authority (1995). *Contaminated Sites: Sampling Design Guidelines*. Sydney: NSW EPA.

NSW Government (2015). *WestConnex, M4 East Environmental Impact Statement*, Appendix P

NSW State Government (2021) MinView, Seamless Geology, Department of Mining, Exploration and Geoscience, <https://minview.geoscience.nsw.gov.au/>, accessed April 2021

NSW State Government (2021) SIX Maps, Spatial Services, accessed April 2021

Ramboll (2020) Infrastructure NSW, Site Audit Report Revised Remedial Action Plan, The New Sydney Fish Market, 13 August 2020

Roads and Maritime Services (2016) Rozelle Rail Yards – Site Management Works, Review of Environmental Factors

Senversa (2021), Factual Contamination Investigation Report – The Bays, Sydney Metro West, White Bay Site Investigation, 21 May 2021

Soil Conservation of NSW (1966). Sydney 1:100,000 Soil Landscape Series Sheet 9130

SMEC (2014). *WestConnex M4 Widening, Pitt Street, Parramatta to Homebush Bay Drive, Homebush*

Sydney Metro (2020) Westmead to The Bays and Sydney CBD Environmental Impact Statement Concept and Stage 1, Technical Paper 8 Contamination

Sydney Metro (2021) The Bays to Sydney CBD Environmental Impact Statement – Stage 3 Technical Paper 8 Contamination.

WaterNSW (2021) Real-time data, <https://www.waternsw.com.au/waterinsights/real-time-data>. Accessed April 2021

Winkler, M.A., Nicholson, A., Jenkins, B.R., Muller, R., Cook, W., Moore, C.L. and Wooldridge, A. (2012) Salinity hazard report for Catchment Action Plan upgrade – Sydney Metropolitan CMA, NSW Department of Primary Industries, February 2013