Sydney Metro At-grade and Elevated Sections Corridor Protection Technical Guidelines

Contents

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1 Introduction

The structural stability and operation of existing and future Sydney Metro at-grade and elevated infrastructure, such as viaducts, stations, embankments, cuttings and any other associated infrastructure needs to be protected.

Any new Development or works near existing Sydney Metro at-grade and elevated infrastructure has the potential to impact on the structural stability and operations of this infrastructure. Similarly, Development or works proposed near planned metro at-grade and elevated infrastructure has the potential to impact on the feasibility of future metro construction and/or operations.

Sydney Metro exercises functions in relation to proposed Development which has the potential to effect Sydney Metro underground infrastructure. In doing so, Sydney Metro reviews Development Applications for proposed Development near Sydney Metro underground infrastructure, both planned and existing, to ensure any potential impacts are appropriately assessed and managed through the development consent process.

For activities which are permissible without consent (typically carried out by public authorities), and for which there is no requirement to notify Sydney Metro or obtain Sydney Metro's concurrence, Sydney Metro encourages proponents to consider the potential effects of their activities on Metro Infrastructure and consult with Sydney Metro accordingly.

This Guideline provides requirements and technical guidance for Applicants and proponents to consider and address in their assessment of the potential effects and risks of proposed Development and activities.

There are different rail authorities for different rail corridors. If proposed Development requires referral to, or concurrence from, other transport agencies (e.g. TfNSW or Sydney Trains), separate documentation related to their rail infrastructure must be provided to those rail authorities and will generally be dealt with separately.

2 Purpose of this Guideline

This Guideline provides the technical requirements to assess and manage the potential effects and risks associated with proposed Developments and activities near existing and future at-grade and elevated Metro Infrastructure. This includes but is not limited to viaducts, station precincts, operational services buildings, emergency evacuation points, at-grade sections, embankments and cuttings.

Metro Infrastructure could be on any land that is owned, leased, managed or controlled by Sydney Metro for the purpose of its railway or rail infrastructure facilities (including construction sites, stabling and maintenance facilities, relevant associated utilities etc.).

This Guideline is based and builds on TfNSW's Asset Management Branch (AMB) Standard TS 02404 Airspace and External Developments.

2.1 Purpose

The purpose of this Guideline is to provide Applicants and proponents with the information needed to ensure their Development and activities comply with the identified requirements to protect the safety, structural integrity and the safe and effective operation of existing or proposed Metro Infrastructure in the vicinity of their works.

This Guideline explains the definitions and requirements of the railway environment, including rail corridor protection reserves, works that are prohibited in or adjacent to the rail corridor, and specific technical considerations. Performance requirements that must be satisfied for different application types and an outline of approvals to be obtained for undertaking works within the rail corridor are also provided.

Definitions of terminology (capitalised words/phrases) used within this Guideline are provided in Appendix C – Glossary.

For details on existing and planned Metro Infrastructure, Applicants should consult Sydney Metro for the latest information (see Section 10.1).

Throughout every stage of works – planning, design, construction and operation – Applicants should refer to the Guidelines and follow Sydney Metro's identified requirements.

2.2 Legislation

Under delegation from TfNSW, Sydney Metro is the rail authority exercising functions in relation to proposed Development as set out in relevant planning instruments, for the purpose of ensuring the protection of Sydney Metro's infrastructure. These planning instruments include:

- State Environmental Planning Policy (Transport and Infrastructure) 2021
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021
- State Environmental Planning Policy (Precincts – Central River City) 2021.

Sydney Metro's review of Development Applications and the recommendations it makes to consent authorities are based on the requirements in this Guideline to ensure the safe and effective coexistence of Development with underground Metro Infrastructure.

A summary of documentation requirements for Development Applications is provided in Appendix B – Development Application lodgement checklist.

Proponents and determining authorities for activities that are permissible without development consent and must comply with Part 5, Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) (typically activities that are carried out by public authorities), are requested to have regard to these Guidelines as appropriate when assessing and carrying out such activities. Sydney Metro strongly encourages proponents and determining authorities to consult Sydney Metro in relation to both the likely effect of the activity on Metro Infrastructure and any potential impacts of Metro Infrastructure on the activity.

For ease of reference, these Guidelines refer to "Development and works" proposed by "Applicants"; however, proponents and determining authorities should consider these terms extend to them and the activities they are carrying out or assessing, as appropriate, and consult with Sydney Metro as necessary to ensure potential effects of and on activities are properly understood and managed.

2.3 Applicability

This Guideline applies to works near existing and future metro lines, namely:

- Sydney Metro M1 Northwest and Bankstown Line, comprising:
- Sydney Metro – Northwest (Tallawong to Chatswood), including Sydney Metro-converted Epping to Chatswood Rail Line (ECRL)
- Sydney Metro – City (Chatswood to Sydenham)
- Sydney Metro – Southwest (Sydenham to Bankstown)
- Sydney Metro – West (Sydney CBD to Westmead)
- Sydney Metro – Western Sydney Airport (St Marys to Bradfield via WSA).

Appendix A – Sydney Metro network includes descriptions of Metro Infrastructure for each of the existing and future Sydney Metro lines. These descriptions provide an overview of the metro alignments and general location of the at-grade and elevated elements for each section.

For other future metro corridors either identified in an environmental planning instrument or under investigation, Applicants/public authorities should consult with Transport for NSW's Corridors team (see Section 10.2). The principles of this Guideline would be applied.

This Guideline applies to and in respect of Development proposed and Development Applications referred to Sydney Metro for concurrence or consideration after 1 August 2025.

Where formal concurrence, referral or notification is not required for proposed Development or activities, Sydney Metro should still be consulted on proposals that may impact Metro Infrastructure and operations to ensure safety, structural integrity and long-term infrastructure protection.

2.4 Underground sections

For Development above, below or adjacent to underground sections of these lines, consult Sydney Metro's Underground Corridor Protection Technical Guidelines.

2.5 Corridors transitioning to underground sections

Development near Metro Infrastructure must carefully consider transitions between underground and surface sections of the metro line. These transition areas are critical, and nearby Development must be designed to maintain the structural integrity and operational safety of both underground and surface assets.

Dive Structures, which enable the shift between underground and surface tracks, are particularly sensitive and require management of factors such as stability, load distribution, vibration control and drainage.

For works near transition sections, Applicants must consider the identified requirements in both these Guidelines and the Underground Corridor Protection Technical Guidelines, and assess any potential impacts on the transition sections to ensure the protection of Metro Infrastructure.

3 Corridor protection

Protection reserves define the area that has been established to protect existing Metro Infrastructure and the feasibility of planned Metro Infrastructure from adjacent proposed Development.

'Rail infrastructure facilities' is defined in the Transport and Infrastructure State Environmental Planning Policy (SEPP). At-grade and elevated Metro Infrastructure includes, but is not limited to, the following elements:

- track slabs
- underbridges (including viaducts)
- cuttings and excavation support structures in cuttings, such as permanent rock anchors (or bolts), piled and shotcrete walls, and related drainage systems
- earth or reinforced earth wall embankment structures, including retaining walls and related drainage systems
- drainage structures
- trackside infrastructure, rail services cable support systems, fencing and gates
- stations
- associated utilities (e.g. overhead power lines)
- rail infrastructure facility buildings.

A 'rail corridor' is defined in the Transport and Infrastructure SEPP and includes land owned, leased, managed, or controlled by a public authority for the purpose of a railway or rail infrastructure facilities.

A general description of Metro Infrastructure by line and location is included in Appendix A – Sydney Metro network.

Applicants must determine the location of the protection reserves based on the requirements provided within this Guideline and ensure that their design and construction meet the stated requirements.

Other utilities linked to Sydney Metro facilities, such as water, sewer etc. are critical to safe and efficient rail operations and must also be protected. Where relevant, these utility providers should also be consulted and may have additional protection requirements.

3.1 Protection reserves

The First Reserve represents the area that must not be encroached upon by any future Development and its construction, with exception of Minor Works, subsurface investigations, utilities and landscaping, subject to Sydney Metro approval.

Minor Works (see Appendix C – Glossary) comprise Development with limited excavation and ground loading, such as footpaths or playground equipment.

The Second Reserve surrounds the First Reserve and covers the areas where Development has the potential to adversely impact on the performance of the support elements of at-grade and elevated infrastructure, metro operations or the feasibility of planned Metro Infrastructure.

Any proposed Development that takes place within the Second Reserve requires an engineering assessment of the works to demonstrate that induced effects on the rail infrastructure are acceptable to Sydney Metro, in accordance with the performance requirements outlined in Section 5 of this Guideline.

Applicants must determine the location of the protection reserves based on the requirements provided within this Guideline and ensure that the design and construction meet the stated requirements. Protection reserves may extend into adjoining properties. The location of Metro Infrastructure may be required to calculate the First and Second Reserves (refer to Section 10.1 on how to obtain this information).

Section 3.1 describes:

- the different corridor typologies (e.g. track on viaduct, in cutting) along the at-grade and elevated sections of the Sydney Metro network
- the 'First Reserve' and 'Second Reserve' protection areas for each typology.

Note that some Development sites may be adjacent multiple rail typologies, and hence reserve boundaries may not be linear (in which case more than one part of Section 3.1 should be consulted).

Section 3.2 describes what Development is generally permitted in each protection reserve.

3.1.1 Underbridges (including viaducts)

An underbridge is a bridge structure that supports a railway track or tracks that can span over roadways, pathways, flood plains, waterways, other railway tracks and large openings. The bridge is 'under' the track. Underbridges include viaducts, flyovers, dives, pedestrian subways, concrete box culvert structures and suspended station structures supporting rail traffic.

Figure 3.1 illustrates the key features and protection reserves for underbridge sections between stations.

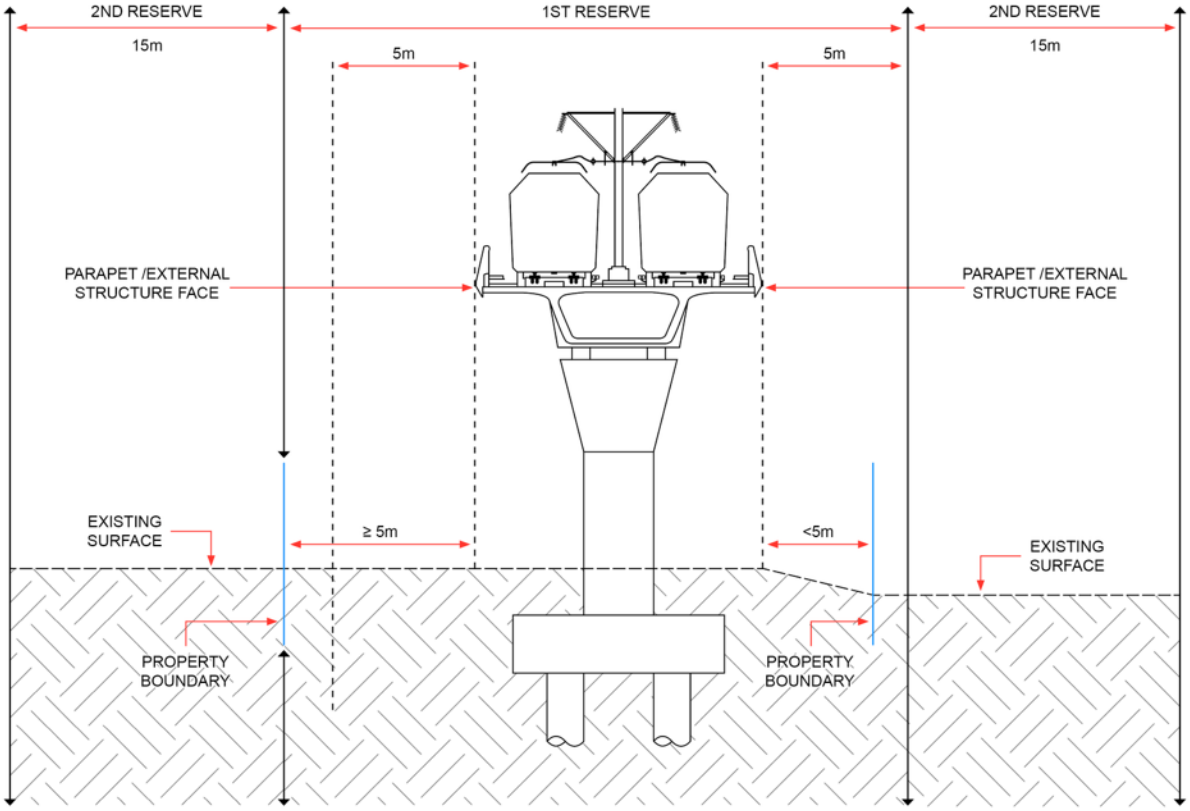

Figure 3.1 Underbridges between stations – protection reserves.

Note: Not to scale.

Figure 3.2 illustrates the key features and protection reserves for underbridge sections at stations.

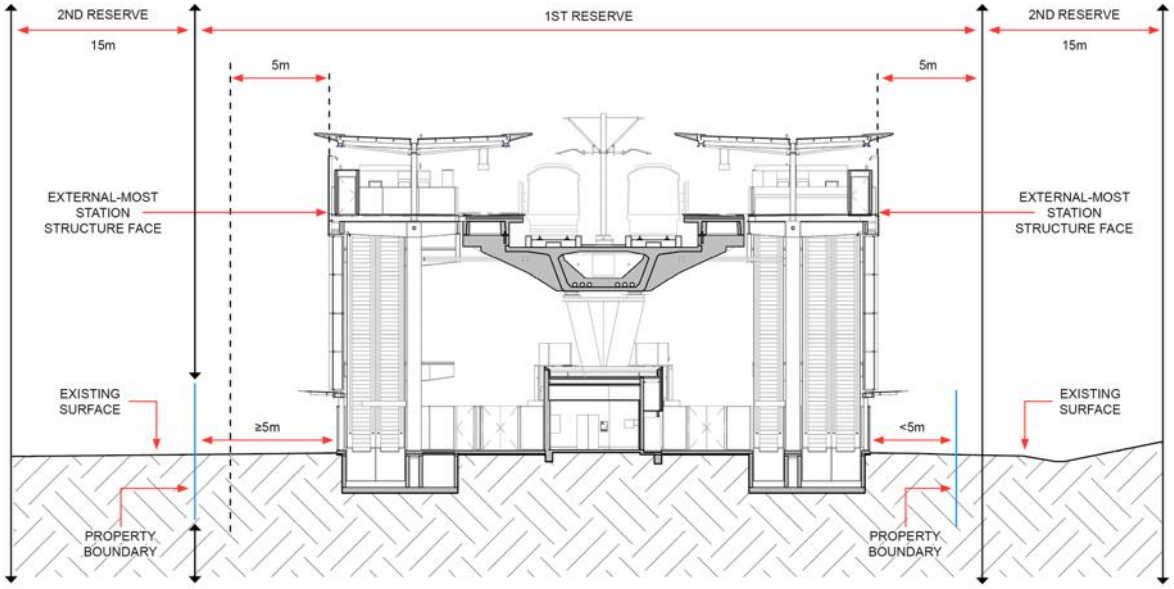

Figure 3.2 Underbridges at stations – protection reserves.

Note: Not to scale.

The dimensions of First and Second Reserves are indicated in Table 3.1.

Table 3.1 Determination of reserves for underbridges

Boundary (dimension reference as shown in Figure 3.1 and Figure 3.2)	Reserve dimensions (m)
First Reserve[1,2]	Underbridges between stations: The distance that is the greater of either: • 5 m extending outwards (horizontal) from each parapet/external structure face; or • the distance from each parapet/external structure face to the boundary of the rail corridor. Underbridges at stations: The distance that is the greater of either: • 5 m extending outwards (horizontal) from each external-most station structure face; or • the distance from each external-most station structure face to the boundary of the rail corridor.
Second Reserve	First Reserve + 15 m

Notes:

1. *Including above and below the underbridge.*
2. *Where there are sections of corridor with two tracks existing and two tracks proposed (such as through Western Sydney Airport (WSA) or in the vicinity of Bradfield), the First Reserve is calculated from the external-most underbridge parapet/external structure face. Applicants can consult Sydney Metro and TfNSW regarding proposed infrastructure.*

3.1.2 Cuttings

Figure 3.3 illustrates the key features and protection reserves for cutting sections.

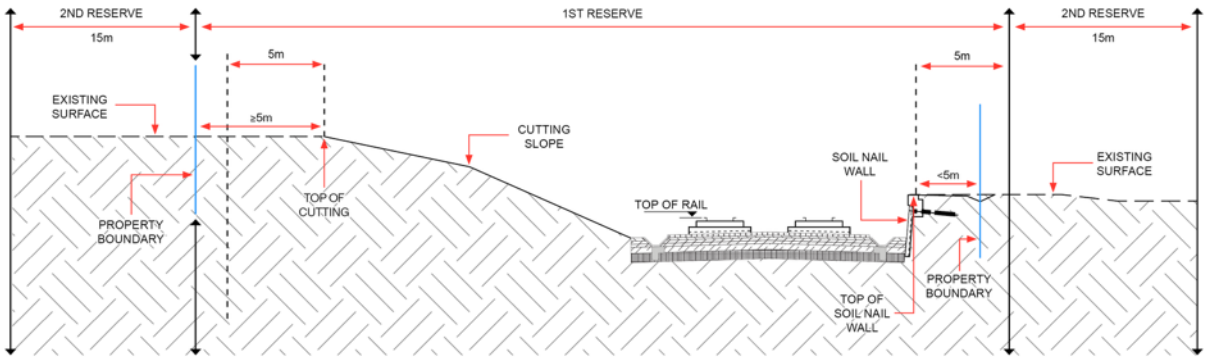

Figure 3.3 Section in cutting – protection reserves.

Note: Not to scale.

The dimensions of First and Second Reserves are indicated in Table 3.2.

Table 3.2 Determination of reserves for cuttings

Boundary (dimension reference as shown in Figure 3.3)	Reserve dimensions (m)
First Reserve[1,3]	The distance that is the greater of either: • 5 m extending outwards (horizontal) from the top of a cutting or retaining wall[2]; or • the distance from the top of a cutting or retaining wall to the boundary of the rail corridor.
Second Reserve	First Reserve + 15 m

Notes:

1. *Including above and below the cutting.*
2. *The top of a cutting will be the interface between the highest point of a slope or retaining wall and existing ground level. Where a cutting has two or more angles/slopes or a retaining wall and a slope, the top of the cutting will be the highest point.*
3. *Where there are sections of corridor with two tracks existing and two tracks proposed (such as through WSA or in the vicinity of Bradfield), the First Reserve is calculated from the external-most top of any existing or proposed cutting/retaining wall. Applicants can consult Sydney Metro and TfNSW regarding proposed infrastructure.*

3.1.3 Embankments

Figure 3.4 illustrates the key features and protection reserves for embankment sections.

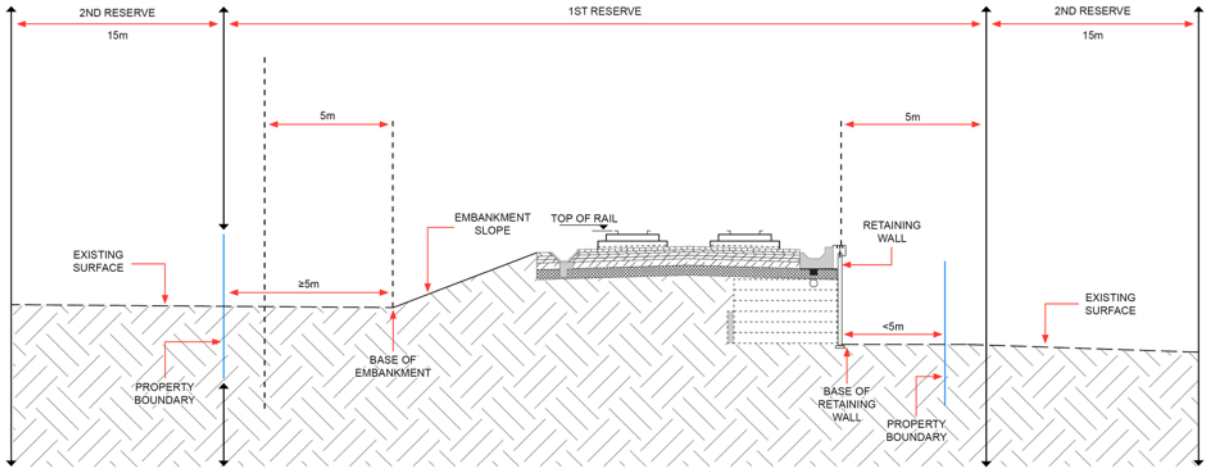

Figure 3.4 Section of embankment/retaining wall – protection reserves.

Note: Not to scale.

The dimensions of First and Second Reserves are indicated in Table 3.3.

Table 3.3 Determination of reserves for embankment/retaining wall

Boundary (dimension reference as shown in Figure 3.4)	Reserve dimensions (m)
First Reserve[1,3]	The distance that is the greater of either: • 5 m extending outwards (horizontal) from the base of an embankment or retaining wall[2]; or • the distance from the base of an embankment or retaining wall to the boundary of the rail corridor.
Second Reserve	First Reserve + 15 m

Notes:

1. *Including above and below the embankment.*
2. *The base of an embankment/retaining wall will be the interface between the lowest point of a slope or retaining wall and existing ground level. Where an embankment has two or more angles/slopes or a retaining wall and a slope, the base of the embankment will be the lowest point.*
3. *Where there are sections of corridor with two tracks existing and two tracks proposed (such as through WSA or in the vicinity of Bradfield), the First Reserve is calculated from the external-most base of any existing or proposed embankment/retaining wall. Applicants can consult Sydney Metro and TfNSW regarding proposed infrastructure.*

3.1.4 At-grade sections

Figure 3.5 illustrates the key features and protection reserves for at-grade sections. Sections are considered to be at-grade should the height between the First Reserve boundary and the bottom of the track formation not exceed a level change above 1.2m. Should the difference in surface level exceed 1.2m, see the appropriate definition (e.g. cutting, embankment) for First and Second Reserves.

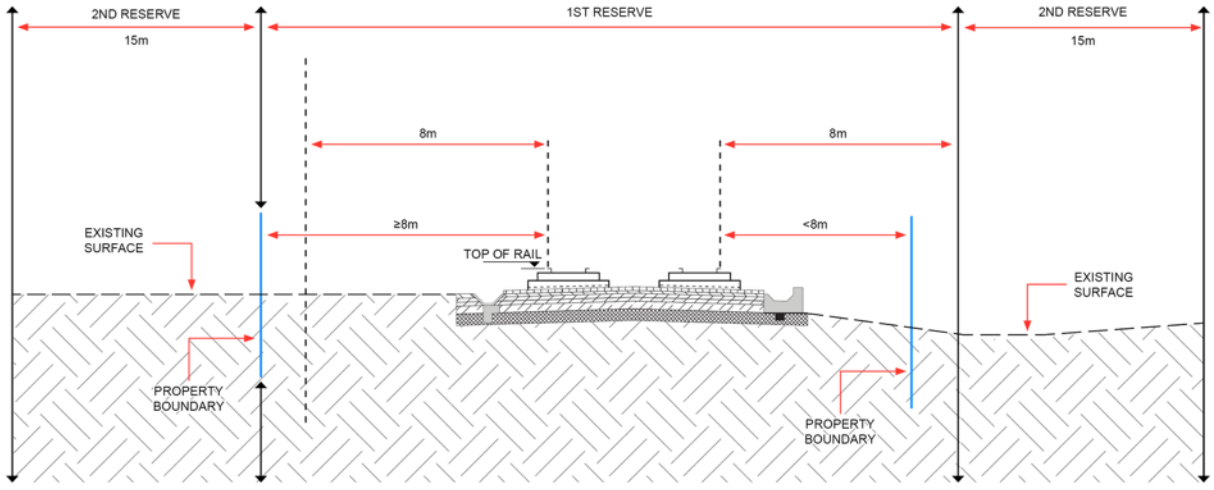

Figure 3.5 Section at-grade – protection reserves.

Note: Not to scale.

The dimensions of First and Second Reserves are indicated in Table 3.4.

Table 3.4 Determination of reserves for at-grade sections

Boundary (dimension reference as shown in Figure 3.5)	**Reserve dimensions (m)**
First Reserve[1]	The distance that is the greater of either: • 8 m extending outwards (horizontal) from the outer running rail; or • the distance from the outer running rail to the boundary of the rail corridor.
Second Reserve	First Reserve + 15 m

Notes:

1. *Including above and below the tracks.*
2. *Where there are sections of corridor with two tracks existing and two tracks proposed (such as through WSA or in the vicinity of Bradfield), the First Reserve is calculated from the external-most, existing or proposed outer running rail. Applicants can consult Sydney Metro and TfNSW regarding proposed infrastructure.*

3.2 Construction restrictions

Table 3.5 describes the construction restrictions that are applied to each reserve.

Table 3.5 Construction restrictions for First and Second Reserves

Types of construction[4]	**First Reserve[1],[5]**	**Second Reserve[1]**
Excavation for basements, footings, trenches and tunnels	Not allowed	Excavations less than 2.0 m depth from surface level, assessment not required Excavation greater than 2.0 m depth, assessment required[2]
Shallow footings or pile foundations	Not allowed	Allowed, subject to assessment[2]
Ground anchors	Not allowed	Allowed, subject to assessment[2]
Demolition of existing structures	Not allowed	Allowed, subject to assessment[2]
Above-ground Development	Not allowed	Allowed, subject to assessment[2,3]
Penetrative subsurface investigations (e.g. boreholes, instrumentation)	Allowed, subject to assessment[2]	Allowed, subject to assessment[2] (refer to Section 7.1.1 for requirements)
Utilities	Allowed, subject to assessment[2]	Allowed, subject to assessment[2]
Landscaping[6]	Allowed, subject to assessment[2]	Allowed, subject to assessment[2]

Types of construction[4]	First Reserve[1,5]	Second Reserve[1]
Minor Works	Allowed, subject to meeting definition (see Appendix C – Glossary)	Allowed, subject to meeting definition (see Appendix C – Glossary)

Notes:

1. *Sydney Metro's allowances in the First and Second Reserves are not intended to substitute or eliminate benefits or restrictions in Easements and their conditions. Applicants should consult relevant titles.*
2. *Assessments are to be submitted to, and be to the satisfaction of, Sydney Metro.*
3. *Development above underbridge parapet level subject to additional conditions.*
4. *Appropriate utilities/services searches (see Section 5.7) must be undertaken for all proposed Development and works. Risk assessment and modification of design and construction methodology may accordingly be required.*
5. *Development over the First Reserve, such as a bridge or over station Development (including support in the First Reserve), would be considered and is subject to the concession process (see Section 7.2.3), assessment and Sydney Metro approval.*
6. *Any proposals for landscaping in the reserves will be subject to a review by Sydney Metro (see Section 9.1). Landscaping needs to avoid access/maintenance Easements and restrictions may be imposed on the type, amount and/or size of trees to ensure safe metro operations.*

4 Potential impacts of Development

The scope of this Guideline includes proposed demolition, excavation or construction above, below or alongside existing or future Metro Infrastructure, that is:

- located within the protection reserves or
- construction that is located outside these protection reserves, but still has the potential to cause safety, engineering, maintenance and operational impact construction-induced groundwater drawdown and vibration that may affect Metro Infrastructure.

4.1 Structural integrity, safety and operations

Proposed Development near Metro Infrastructure must be planned, designed, constructed and maintained to ensure the protection of existing and future Metro Infrastructure including effects on:

- the safety and structural integrity of rail infrastructure by Development-related loads, induced ground displacement or structural movement
- the safe and effective operation of the network including the operational capacity, maintenance and the efficiency of the network during any stage of the proposed Development
- the safety of the public and staff using the transport infrastructure and any interface with the external Development.

Development near rail corridors can impact on the structural integrity of the transport infrastructure and its engineered structures. Poorly designed and implemented earthworks can cause subsidence, deterioration of existing structures, alter existing loading profiles and other engineered features and, in a worse-case scenario, cause structural failures and collapse.

Development-related loads and ground displacements could have the potential to cause deformation of existing structures and, in extreme situations, could cause structural failure and collapse.

Structures and the surrounding ground need to be protected to avoid movement which could cause structural instability, groundwater ingress and encroachment of support into rail functional areas, such as rolling stock kinematic envelopes.

For electric railways there are significant additional safety issues associated with risks of electrocution as well as risks related to the accelerated corrosive effects of electrolysis on metal surfaces.

Development that may impose on metro operations, such as by lowering train speeds, must be avoided.

Performance requirements are described in more detail in Section 5.

4.2 Construction restrictions

Construction activities are permitted within the Second Reserve, but may still have the potential to affect Metro Infrastructure. As such, restrictions may apply to the following construction within the Second Reserve:

- excavation for basements, footings, trenches and tunnels – beside or below
- shallow footing or pile foundations – beside
- ground anchors – beside or below
- demolitions of existing structure – beside or below
- geotechnical investigations/instrumentation – above, beside or below
- above-ground Development – beside or below
- Minor Works – beside or below.

Where existing Development above the First or Second Reserve is being refurbished, partly/wholly demolished and/or redeveloped, the principles of these Guidelines need to be considered.

While these restrictions focus mainly on impacts to existing at-grade and elevated infrastructure, in many cases they may be equally applicable to future Metro Infrastructure. The intent of construction restrictions for future Metro Infrastructure is to ensure that the feasibility of future metro construction and operations is not adversely affected by new Developments and their construction.

The construction of new Developments must also take into account:

- live road and rail operating conditions
- stormwater inflow, Metro Infrastructure drainage capacity, water table and contamination
- noise and vibration restrictions that are inherent to working near to an operating rail environment
- access requirements to the rail corridor that may be necessary for inspection, maintenance or emergency purposes.

4.2.1 Open excavations

Open excavations can be above and/or to the side of at-grade and elevated Metro Infrastructure and could potentially alter the in situ stress regime in the ground that directly affects support elements of rail infrastructure and other sensitive infrastructure.

Temporary and permanent anchors can be used to support open excavations, underground excavations and provide uplift resistance for construction cranes and basements. High stress concentrations around ground anchors can affect the surrounding ground locally and potentially impact on the stability of the rockmass and existing at-grade and elevated structures.

A range of excavation methods are available to excavate ground for new Developments. Activities such as rock breaking, pile driving and rock drilling/cutting works have the potential to impose temporary loads and excessive noise and vibration on Metro Infrastructure.

In addition, excavation activities will induce ground-borne vibration with the potential to affect Metro Infrastructure.

4.2.2 Foundations

Additional pressures from shallow spread footings and piled foundations designed to support proposed Developments could potentially destabilise rail

corridor supporting structures. The effects of the foundation loads must be considered, including opportunities to redistribute bearing pressures away from the protection reserves to minimise the impacts.

Of interest are the changes in stress distribution from foundations within the ground surrounding existing (or future metro) at-grade and elevated infrastructure, as a consequence of Development construction. Issues of potential concern relate to increase in vertical or horizontal pressures beneath foundation elements, increases in shear stress along known existing bedding planes in the rockmass and uplift pressures on Metro Infrastructure.

Ground-borne vibration from activities such as pile driving or bored piles installation and sheet pile installation must be considered.

4.2.3 Underground excavation

Underground excavations include the construction of adjacent rail and road tunnels (to the side and below Metro Infrastructure), utility tunnels, cable conduits, drainage pipes, pedestrian walkways and underpasses. Such underground excavations could potentially significantly alter the in situ stress field in the surrounding ground, resulting in stress concentrations, stress relief and displacements. These changes can significantly affect the existing Metro Infrastructure support elements.

In cases where underground excavations are designed to be drained structures (that is, the structural lining and ground support of tunnel and caverns are built to support the ground but permit groundwater to flow into the excavation), consideration must be given to the groundwater drawdown that could have impacts on nearby Metro Infrastructure.

Ground-borne vibration caused by underground excavation must also be considered.

4.2.4 Demolition

The demolition of any existing buildings or basements may affect existing metro at-grade and elevated infrastructure (e.g., station entrances, over station Developments) and/or cause disruption to metro operations. Where necessary, measures may be needed to protect metro assets during demolition works of existing buildings and structures.

4.2.5 Geotechnical investigations

Geotechnical and subsurface investigations may be required, including drill holes, geophysical exploration, in situ tests and permeability tests. During construction, instrumentation holes such as inclinometers, piezometers and extensometers can be drilled to measure the ground reaction and the impacts.

Importantly, the drilling of boreholes and installation of instrumentation must be planned to avoid existing Metro Infrastructure and avoid disruption to metro operations.

Where works are proposed to be undertaken in a similar timeframe to Sydney Metro construction activities, additional information may be required in the Development Application to assess potential impacts and mitigation measures.

Applicants are encouraged to consult with Sydney Metro at the earliest time possible to exchange information and understand scope, programs, construction methodology and risk.

4.3 Safety

Development near Metro Infrastructure must address the following aspects of safety in respect of the metro and its operation at any stage of the life cycle of that Development:

- structural safety
- operational safety
- fire safety
- inspection and maintenance and
- flood protection.

Consideration must be given to maintenance and to future users of the Development. Importantly, Development must not obstruct emergency access to Metro Infrastructure and any maintenance access requirements.

Approval from Sydney Metro is required prior to entry to any Metro assets for the purpose of drilling a borehole, dilapidation survey, installation of instruments, monitoring and visual inspections. Those carrying out these activities and works must be accompanied by safety personnel from Sydney Metro and/or the Operator and/or principal contractor and may require specific rail safety induction. Refer also to Section 9.

4.4 Transport planning, place making and precinct activation

Sydney Metro is committed to ensuring that its rail corridors and infrastructure provide opportunities for transport connectivity, place making and integration with local precincts.

Sydney Metro manages metro operations to deliver integrated, reliable, customer-focused and efficient services, for the current and future metro network and associated precincts. It is focused on developing an integrated metro network with connected transport services and thriving precincts, achieving urban amenity, commercial viability and supporting corridor growth. Interchanges around metro stations are essential for integrated transport operations and are not to be adversely affected by the construction or operations of Development.

Better Placed[1], Movement and Place[2] and Biodiversity in Place[3] are the leading state government design policies for design and place principles for consideration. Relevant local government design and road/street codes should also be consulted.

[1]<https://www.governmentarchitect.nsw.gov.au/policies/better-placed>

[2]<https://www.governmentarchitect.nsw.gov.au/guidance/movement-and-place>

[3] <https://www.planning.nsw.gov.au/government-architect-nsw/policies-and-frameworks/biodiversity-in-place>

5 Performance requirements

The design and construction of Development and works must be carried out with full understanding of potential effects on the performance of existing Metro Infrastructure or the feasibility of future metro construction and operations.

As an overarching principle, Development must not affect the stability and integrity of Metro Infrastructure and its safe operation. Broadly, Applicants must ensure that Development and its construction do not adversely affect the performance of Metro Infrastructure in respect of the following:

- amenity
- aesthetics
- structural integrity
- durability
- function
- customer benefits
- safety during construction and operation
- environmental performance.

It should be noted that throughout the carrying out of works, Applicants must monitor the actual effects of construction against design predictions and in accordance with the project-specific construction phase monitoring requirements (refer to Sections 7.9 and 8.11).

Aspects of Development and its construction which could adversely affect the Metro Infrastructure include the following:

- loading or unloading from the Development (including, but not limited to, additional proposed Development storeys)
- ground deformation resulting from excavations, tunnelling, thrust boring/pipe jacking and external loading
- induced vibrations during construction and operation
- ground-borne and airborne noise impacts
- discharge of stormwater from the Development
- changes to groundwater levels affecting design assumptions
- loss of support to any at-grade or elevated rail structure (including rockbolts and anchors)
- load from anchors
- temporary structures
- electrolysis from earth leakage currents
- protection of the traction power, high voltage (HV) and low voltage (LV) power systems and earthing system
- electro-magnetic interference

- environmental management of the Development
- inhibiting access for operations and maintenance (including to emergency evacuation access zones).

This section details the design and performance requirements that must be complied with to address these issues. Reference should also be made to documents listed in Appendix F – Reference documents.

5.1 Structural integrity

Development-induced load and displacements must not have any short or long-term adverse effects on the support structure or system of Metro Infrastructure.

The construction of Development structures over, under and/or adjacent to metro at-grade or elevated support structures and systems must be suitably designed having regard to existing and future Metro Infrastructure. Suitable construction work methods must be developed as part of the design process.

The potential effect on metro support elements and other Metro Infrastructure at all stages of the life cycle of the Development must be assessed to ensure that the works always remain compliant with relevant requirements and standards. These structural support elements include, but are not limited to:

- underbridge/viaduct girders, columns, footings and piled foundations
- rail infrastructure facility buildings
- excavation support structures in cuttings, including permanent rock anchors (or bolts), piled and shotcrete walls, and related drainage systems
- earth or reinforced earth wall embankment structures, including retaining walls and related drainage systems
- track slabs
- drainage structures and
- trackside infrastructure, rail services cable support systems, fencing and gates.

5.1.1 Imposed loading

Any works (temporary or permanent) adjacent to Metro Infrastructure could be subject to the influence of train loading and as such will need to be assessed in accordance with AS 5100.2 Bridge design Part 2: Design loads (AS 5100.2) for live load surcharge. Parts of the Development that could be affected must be designed to comply with TS 01719 Miscellaneous Structures and TS 02404 Airspace and External Developments.

Supports for structures positioned within 20 metres of the centreline of the railway track must comply with the collision protection provisions of AS 5100.2, whether within TfNSW or Sydney Metro owned land or not. For at-grade Metro Infrastructure, including embankments, an assessment of the need to provide additional train derailment collision protection measures at the boundary of the proposed Development is required and assessed in accordance with AS 5100.2.

The design of permanent works adjacent to existing or future Metro Infrastructure must consider loading impacts from any proposed future metro.

Refer to Section 10 for contact details to obtain information about future Metro Infrastructure.

The proposed Development structure design must allow for the effects due to movement that may occur as a result of the future removal of the ground adjacent to the rail corridor boundary (to a level no lower than the lowest building basement level) and a 20 kPa surcharge applied at ground level.

The foundations for the proposed Development structure must not rely on passive earth pressure from within the boundary of any TfNSW or Sydney Metro owned, managed and/or leased land.

5.1.2 Induced movement

Development must not induce movement that affects the operational functionality and durability of the Metro Infrastructure. Consideration must also be given to the possibility that future metro construction may induce movement on the Development (infrastructure details described in Appendix A – Sydney Metro network).

The design and construction of any Development or works must make adequate provisions to check and ensure that Metro Infrastructure is not subjected to deformation and changes that will not allow trains to operate at the maximum design speed.

The following movement/displacement limits apply:

- underbridge (including viaduct structures) – total settlement of 10 mm vertical, +/- 5 mm horizontal at pier head or 1:1000 whichever is lesser, and differential settlement between piers of 10mm or 1:1000 whichever is lesser. This is subject to tolerance of viaduct bearings against further movements including settlement
- embankment structure – total movement in any direction of 10 mm and differential movement in any plane of 10 mm or 1:1000 whichever is lesser
- cutting or excavation support structure - total movement in any direction of 10 mm and differential movement in any plane of 10 mm or 1:1000 whichever is lesser
- track distortion – twist / change in cant of 1.5 mm measured over 3 m or 1:2000, vertical dip or peak of 5 mm measured over a 5 m chord and change in horizontal versine of 6mm measured over a 16 m chord
- rail corridor land adjacent to the proposed Development – 10 mm vertical and +/- 10 mm horizontal
- for the running rails, the allowable total movement in any direction is 8 mm and differential movement in any plane is 8 mm or 1:2500, whichever is less.

Any Development or works, whether beneath or adjacent to contained metro tracks, that has the potential to cause track movement/displacement must comply with the requirements of TS 03505 Track Monitoring Requirements for Undertrack Excavation. The track must be monitored and managed in accordance with the requirements stated in TS 03505 for monitoring, notification and intervention levels and emergency procedures.

For any Development or works that may induce movement of Metro Infrastructure Sydney Metro must be provided with a monitoring plan that

records induced movements and sets appropriate warning and trigger levels to ensure that:

- induced movements are in line with predictions from modelling
- suitable warning is given in advance of approaching the 8mm and 10mm displacement limits
- where applicable, the cumulative impact of settlement from both current and past Development at the subject and adjacent sites is considered, to ensure total settlement does not exceed the prescribed limit. To achieve this, details of prior induced settlements must be taken into account and shared with Sydney Metro to maintain visibility of the cumulative effects over time.

5.2 Excavation, groundwater and stormwater run-off

Excavation and all associated retaining works (along with other ground disturbance works associated with the proposed Development) must not affect the safety and operational integrity of the metro or cause the destabilisation of Metro Infrastructure. The methods of excavation employed are particularly relevant, especially where methods employ chiselling, percussive pile driving or similar methods. Importantly, explosives must not be used for the splitting and removal of rock and excavation.

Typical issues associated with excavation works include slippage, slumping, creation of fissures or cracks, rock or earth falls, exacerbated ground movements, water inflows, cracking the supporting structural elements and in extreme cases structural failure. Excavation works, including for underground tunnelling or thrust boring / pipe jacking construction, must be undertaken in a manner that minimises the risk of such occurrences.

Sections of temporary shoring installed to support excavations must have a minimum service life of 5 years, if their stability has the potential to affect Metro Infrastructure. Shoring systems must be designed by a Competent Person and independently verified unless Sydney Metro advises otherwise in writing. Allowance should be provided for minimum unplanned excavation in accordance with CIRIA C760 Guidance on Embedded Retaining Wall Design, 2017.

Temporary or permanent ground anchors or soil nails are not allowed within the First Reserve. The potential effect on Metro Infrastructure of any ground anchors or soil nails within the Second Reserve must be assessed. Anchors or soil nails must not be tested to the extent that the testing loads applied could cause collapse or failure, or both, in the surrounding soil and rock structure.

The assessment required must also consider the loading effect on Metro Infrastructure of cranes (including their foundation anchorage) within the excavation.

Construction near at-grade or elevated Metro Infrastructure can also impact the local groundwater regime. These impacts have the potential to cause adverse loading or settlement impact on the infrastructure. Critically, the groundwater regime must not be adversely affected or damaged.

The Applicant or public authority must carry out an engineering assessment of the impact of any temporary or permanent changes to the groundwater regime that may be caused by the Development. Issues of concern that have the potential to impact on Metro Infrastructure include the following:

- The Development and its construction may create a water barrier that dams groundwater flow adjacent to at-grade rail infrastructure, leading to saturation of embankment foundations and potential slip conditions, or water ingress into the rail cutting impacting the track formation support system.
- Groundwater ingress into excavations associated with the Development can cause dewatering of the local water table.

The stability of at-grade and elevated Metro Infrastructure adjacent to/below any Development excavation must be checked against the effect of buoyancy, uplifting, slope stability, etc.

The design of Temporary Works for any Development excavation must ensure adequate factor of safety against basal heave, hydraulic uplift of the base, toe-stability of retaining walls, material failure, strut failure, etc.

Surface water run-off from the Development area is not permitted into the rail corridor or into the Sydney Metro stormwater drainage or track drainage systems.

5.3 Piling works

Piling works including the construction of foundation piles, temporary or permanent earth retaining walls and any other drilling works are not allowed within the railway corridor First Reserve.

Any piling works proposed within the Second Reserve must be assessed for their potential effect on at-grade or elevated Metro Infrastructure, and comply with the following conditions:

- use of percussively driven concrete piles, steel H-piles, sheet-piles or tanalised timber piles is not acceptable unless it is demonstrated to the satisfaction of Sydney Metro that there would be no adverse impact on Metro Infrastructure
- use of drilling fluid in the drilling of piles must be carefully controlled to prevent an increase in the piezometric head in the First and Second Reserves.

5.4 Noise and vibration

Noise and vibration assessments for proposed Development must include noise and vibration generated by construction and rail operations. Sydney Metro does not accept liability for the generation of noise and vibration from railway operations (including track maintenance), or for its transmission into Development above, below or adjacent to Metro Infrastructure.

When designing Development, consideration must be given to existing and future, operational and construction vibration; as well as air, ground or structure-borne noise emissions in accordance with:

- Developments Near Rail Corridor and Busy Roads – Interim Guideline, Department of Planning, NSW Government 2008
- TS 01717 Development Near Rail Tunnels, and
- Australian Standard AS 2187: Part 2-2006 Explosives – Storage and Use – Part 2: Use of Explosives (AS 2187-2:2006), which recommends the frequency dependent guideline values and assessment methods given

in British Standard BS 7385 Part 2 – 1993 Evaluation and measurement for vibration in buildings (BS 7385-2:1993), as they "are applicable to Australian conditions".

Consideration should be given to whether Section 2.100 of the Transport and Infrastructure SEPP is triggered for impacts of rail noise or vibration on non-rail Development. If triggered, measures to achieve consistency with the requirements of the SEPP should be detailed.

More stringent limits may apply if rail equipment, that is sensitive to vibration, has the potential to be affected by the Development and its construction.

If predicted or actual vibration levels exceed tolerable limits, then the Applicant or public authority must modify the construction methodology in such a way that the vibration limits are satisfied.

5.4.1 Considerations during construction of Development

Any Development that occurs within the First or Second Reserve must consider construction vibration on Metro Infrastructure. The following peak component particle velocity assessment criteria based on AS 2187-2:2006 should be used for construction generating transient vibration to ensure minimal risk of cosmetic damage:

- Reinforced or framed structures (e.g. reinforced concrete bridge or station) – 50mm/s at 4 Hz and above
- Unreinforced or light framed structures (e.g. masonry station offices):
  - 15 mm/s at 4 Hz, increasing to 20 mm/s at 15 Hz
  - 20 mm/s at 15 Hz, increasing to 50 mm/s at 40 Hz
  - 50 mm/s at 40 Hz and above

For construction generating continuous vibration, the transient vibration limits above should be reduced by half as stated in BS 7385-2:1993.

For retaining wall structures, no guidance is provided in AS 2187-2:2006. For transient vibration construction, British Standard BS 5228-2:2009 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BS 5228-2:2009) provides the following guidance for acceptable peak particle velocity (PPV) vibration levels for retaining wall structures:

- Limit of 10 mm/s at the toe of the retaining wall
- Limit of 40 mm/s at the crest of the retaining wall

For construction generating continuous vibration, these limits for retaining wall structures should be reduced by half as stated in BS 5228-2:2009.

For structures that require additional protection due to their condition (e.g. a vibration-sensitive heritage structure) or cannot be classified under AS 2187-2:2006, Sydney Metro may deem it necessary to use more conservative criteria for vibration-sensitive structures of 2.5 mm/s peak component particle velocity as stated in DIN 4150-3:2016 Vibration in Buildings – Part 3: Effects on Structures to minimise the risk of cosmetic damage.

Sources of vibration that are to be considered include: demolition, piling, ground treatments (e.g. compaction), construction equipment, tunnelling and industrial machinery.

Continuous activities such as rock breaking/hammering and sheet piling, use of vibratory rollers or excavators etc. can give rise to dynamic amplification due to resonance.

Sydney Metro may request construction vibration monitoring of the at-grade and elevated metro supports, such as viaduct girders and embankments. In these instances, the Applicant or public authority should nominate an Alert level for monitoring and management purposes to advise when vibration levels are approaching these limits to ensure that the limits are not exceeded.

Atypical construction methods are to be assessed on a case-by-case basis with reference to relevant standards.

To assess the likelihood of cosmetic damage due to vibration, AS 2187-2:2006 specifies that the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) are to be compared with the guidance vibration velocity limits.

Buried services

Requirements in respect of buried structures and utilities such as gas pipelines and fibre-optic cables are to be assessed on a case-by-case basis.

A Competent Person must be engaged by the Applicant or public authority to liaise with the utility structure's owner to determine acceptable vibration levels.

Vibration-sensitive equipment

Where it is has been identified that vibration-sensitive scientific instruments are likely to be in use on Sydney Metro Operational Land, the Applicant or public authority must assess proposed mitigation measures to minimise impacts.

Objectives for the satisfactory operation of the instrument(s) would be sourced from manufacturer's data.

Baseline vibration measurements should be carried out at the site where vibration-sensitive equipment is located. These baseline measurements will determine what existing ambient vibration levels are. The site-specific equipment criteria must be agreed with the occupant/users of the equipment and Sydney Metro.

5.4.2 Considerations for operational noise and vibration impacts

The Applicant or public authority must obtain information to enable a thorough assessment of actual or potential airborne and ground-borne rail noise and vibration which could affect the Development site. This includes but is not limited to:

- number of train events expected in a 15-hour day (7 am to 10 pm) and 9-hour night (10 pm to 7 am) period, in the typical busiest weekday[4]. The assessment should include future operations as well as existing operations.
- the event noise and vibration levels from each train.

[4] This information may be obtained from the relevant Sydney Metro Environmental Impact Statement (EIS)/subsequent planning approval or for operational Sydney Metro sites from the Operational Noise and Vibration Review (available from sydneymetro.info).

- location of noise/vibration-sensitive Sydney Metro equipment. It will include stations where staff, tenants and customers are to be protected from noise and vibration impacts.
- location of noise/vibration-generating Metro Infrastructure. For operational Sydney Metro sites, a site survey and inspection would identify the location and type of noise and vibration-generating items, including substations and railway stations with outdoor public address systems.
- for construction assessments of impacts on sensitive receivers (for example, staff in stations), the Interim Construction Noise Guidelines (2009) will apply for operational noise impacts, the assessment must reference the Noise Policy for Industry (2017) and any other guidelines or policies which relate to the specific Development.

5.5 Stray currents and electrolysis

Sydney Metro's network operates with different electrical systems:

- 1500V DC traction system (similar to Sydney Trains) – Sydney Metro M1 Northwest and Bankstown Line (Tallawong to Bankstown)
- 25kV AC traction system – Sydney Metro West (Sydney CBD to Westmead) and Sydney Metro Western Sydney Airport (St Marys to Bradfield via WSA).

Stray current and electrolysis assessments are only required for DC systems, and so will not be required for Developments adjacent to Sydney Metro West or Sydney Metro Western Sydney Airport alignments, unless there is a DC operated system in close proximity (e.g. if the Development is located adjacent to an interchange station).

For DC systems, the running rails are usually used as a return conductor for traction current. Low electrical resistance between the return rails and the ground may cause stray current leakage, which in turn can cause or accelerate electrolytic corrosion of metallic objects/structures located in the vicinity of the rail system.

When designing Developments above or adjacent to at-grade or elevated Metro Infrastructure, consideration must be given to operational stray currents that may be present. The risk assessment must also consider the potential presence of stray currents and any mitigation measures.

The potential effects of stray electrical currents and electrolysis in the electrified area of the metro network must be considered in accordance with TS 03676 Electrolysis from Stray DC Current during the design of the Development.

Sydney Metro does not accept liability for the generation of stray currents from an operating electrified railway.

5.6 Power and earthing systems

Potential disruption to the metro operating electrical (HV, LV and traction) and earthing systems is a major rail safety risk and likely to cause significant disruption to the metro passenger operations and any emergency response activities. It is essential that any proposed utilities and Development construction trenching is coordinated and planned at the initial design stage to avoid impacting the metro operating electrical and earthing systems.

This will form part of the engineering assessment to be lodged by the Applicant at the Development Application (DA) stage and may require close coordination with Sydney Metro through the ongoing design and construction stages.

5.7 Utilities

Sydney Metro Operational Land contains utilities/services managed by Sydney Metro/the Operator and other parties which are essential for the operation of rail and other services. These utilities must be identified, taken into consideration and managed during any construction works to ensure no disruption.

The location of existing underground, aerial and surface utilities/services, including transmission lines, cables and pipelines are to be identified and considered in the design of the proposed Development or works and the construction methodology.

All Applicants must undertake a services search through the Before You Dig Australia service. Should any services be identified, Applicants should consult with the relevant authorities.

For any proposed Development or works on or in close proximity to Sydney Metro Operational Land, Sydney Metro can provide details of the location, type and any specific restrictions related to utilities/services (e.g. signalling, cabling). See Section 10.1 for Sydney Metro contact details.

Details of the searches and identified utilities/services are to be lodged with the DA.

Public authorities proposing utilities on, under or across Sydney Metro Operational Land are to consult with Sydney Metro at the earliest possible design stage.

5.8 Electro-magnetic interference

Developments in the vicinity of Metro Infrastructure must not introduce electro-magnetic interference (EMI) to railway signalling and telecommunications systems. Potential interference to the metro rail signalling and communications systems must be assessed at the initial design stage.

Potential line of sight disruption to train radio or microwave communication systems must be assessed for operational risk, and the mitigation required identified at the initial design stage.

Applicants must also assess potential EMI from railway infrastructure during the initial design stage to ensure reliable operation of any sensitive electronic and communication equipment within their Development.

5.9 Contamination and hazardous materials

The construction or operation of any proposed Development/works/use adjacent to Sydney Metro Operational Land must not result in any increased environmental risk or impact on Metro Infrastructure and operations.

The Applicant or public authority must take into account the environmental impacts from contamination/Hazardous Chemicals/Dangerous Goods that may affect Metro Infrastructure and operations to minimise any potential effects during the whole life cycle (conceptualisation, design, construction and operation) of the Development.

The storage of Hazardous Chemicals and Dangerous Goods within the First or Second Reserves may be permitted if the results from a risk assessment demonstrate that the risk to the Metro Infrastructure and operations can be appropriately managed.

5.10 Operations, maintenance and emergency evacuation

5.10.1 Sydney Metro operations, maintenance and emergency evacuation

The design and construction of Development must ensure that metro operations, maintenance and inspection areas are free from permanent obstructions.

Metro rail corridors also have a number of emergency response access and passenger evacuation points that are required to be permanently free from obstruction.

It is recommended that Applicants seek assistance from Sydney Metro to ensure these areas are identified and appropriate measures allowed for in the design stage.

5.10.2 Maintenance of adjacent Developments

Should Sydney Metro consider it necessary, the Applicant must provide a plan of how future maintenance of the Development interfacing with the rail corridor is to be undertaken. The maintenance plan is to be submitted to Sydney Metro prior to the issuing of the Construction Certificate.

5.10.3 Vegetation

Sydney Metro is supportive of having vegetation, particularly endemic native plants, around metro corridors for ecological and amenity benefits where operations are not impacted. Development or works should minimise any habitat removal or fragmentation.

To ensure safe and reliable metro operations, Sydney Metro restricts how close trees are to operational tracks and limits certain types and/or sizes of vegetation. No trees are to be planted within the First Reserve without the approval of Sydney Metro. Trees with a full-grown height less than 5m and shrubs/groundcover may be permitted within the Second Reserve.

Any proposed landscaping in either the First or Second Reserves will be subject to a review by Sydney Metro (see Section 9.1).

Landscaping needs to avoid areas required for Sydney Metro access/maintenance, including any Easements (see Section 5.10.1).

5.11 Safety and security

Development within or in close proximity to Sydney Metro corridors can present safety and security concerns which can have implications for infrastructure and operations. This can range from fire/smoke impacts to climbing hazards which provide unauthorised access on an operating line or major harm and disruption caused by potential terrorist acts.

Applicants must manage risks related to the Development to ensure safe rail operations to the satisfaction of Sydney Metro. As such Applicants must identify all reasonably foreseeable security risks and hazards to the metro and its operations and first seek to eliminate those risks. Where elimination is not

reasonably practicable, the Applicant must mitigate each risk so far as is reasonably practicable (SFAIRP), noting that any residual risk remains the responsibility of the Applicant.

5.11.1 Fire safety

Applicants must ensure Development activities:

- do not impact metro operations, safe passenger egress routes and/or safe passenger egress route capacity
- provide adequate protection against the spread of fire from any part of the Development or works
- do not allow the hazardous entry of smoke into the rail corridor resulting from fire at the Development or works
- do not compromise the provision of firefighting measures for the railway systems as a result of fire at the Development or works.

Sydney Metro may request the preparation of a Fire Safety Assessment Report to address the matters outlined above, or other site and/or Development-specific fire safety concerns.

5.11.2 Security

The identified security risks and their SFAIRP demonstration must be documented in alignment with the safety assurance process.

When designing Development above, below or adjacent to Metro Infrastructure, consideration must be given to security, including criminal, terrorist, and other deliberate malicious acts. The security risk assessment must consider the following hierarchy of risk control:

- remove the threat where possible and pragmatic to do so
- reduce asset vulnerabilities by using:
  - operational or procedural measures
  - physical or technical measures, or
  - a combination of both
- reduce the consequence of incidents should they occur
- increase asset resilience when all reasonable and practicable preventative incidents have been exhausted.

5.11.3 Vandalism

Measures should be considered at the design phase to minimise risks from vandalism involving objects being thrown onto passing trains, or into the rail corridor. This action can have safety implications for rail passengers and Operator staff. There are also repair costs associated with infrastructure damage coupled with transport delays as facilities are repaired and, in worst case scenarios, as accidents are cleared.

Recommended measures include:

- designs should (where possible) provide a high degree of surveillance

- pedestrian bridges, walkways, open balconies and windows should preferably be located outside of the Second Reserve
- where pedestrian bridges, walkways, open balconies and/or windows are within the First or Second Reserve:
    - pedestrian bridges and walkways are to be fitted with safety (anti-throw) screens
    - balconies are to be enclosed
    - louvred windows/restricted window openings are to be installed (maximum of 80 millimetres opening).

5.12 Metro operations

The safe and effective operation of the metro network, including its operational capacity, maintenance and the efficiency, is paramount during any stage of the proposed Development.

The Operator of Sydney Metro is obligated by contractual requirements to act as the rail transport Operator with applicable obligations under the Rail Safety National Law and associated National Rail Safety Regulations.

As such, Sydney Metro may refer any DA to the Operator for review, which could lead to specific conditions on the consent, possibly including further interface with the Operator.

6 Development Application stage

Proposed Development may trigger the requirement for referral for comment or concurrence from Sydney Metro. An urban planner and/or council will be able to advise when legislation is triggered to require referral or concurrence.

TfNSW has delegated its rail authority functions in relation to the Sydney Metro corridors to Sydney Metro.

Documentation must be provided as part of the Development Application package lodged with the consent authority to demonstrate that potential effects of the Development will be acceptable to Sydney Metro. Sydney Metro may also request documentation and supporting information at the design, construction and operation stages of the proposed Development.

6.1 Onus on the Applicant

The onus is on the Applicant to provide sufficient information that demonstrates to Sydney Metro that the potential effect of the proposed Development on Metro Infrastructure is acceptable including with any appropriate mitigation measures. Such information must clearly articulate the potential ways in which the proposed Development may impact Metro Infrastructure, with the level of detail and scope of the analysis being commensurate with the scale and complexity of the specific proposal.

The Applicant must demonstrate a thorough understanding of the risks and provide comprehensive analyses to support their conclusions, to the satisfaction of Sydney Metro. Statements made without supporting data will be considered insufficient for the purposes of Sydney Metro's assessment process.

6.2 Staged Development

Applications for proposed staged Developments must include appropriate levels of technical and design requirements to be lodged with the initial Development Application, along with documentation that defines how the phased construction period will be managed, including a design change process for concurrence of potential future design changes.

6.3 Development/works risk profile

Sydney Metro receives numerous enquiries and applications regarding different types of Development within and adjacent to lines and future corridors, from underground cables, to boreholes, tree-planting, access roads, playgrounds and multistorey (above and below ground) superstructures.

To determine what investigations and assessment is required to determine whether the proposed Development impacts Metro Infrastructure or operations, Sydney Metro uses a risk matrix and considers the particular characteristics of the Development. Table 6.1 categorises types of Development or works and the associated level of risk Sydney Metro determines.

Table 6.1 Sydney Metro's indicative assignment of risk level to Development or works

Detailed Development Application (DA), Review of Environmental Factors (REF) or Environmental Impact Statement (EIS)			
Intrusion to First Reserve[2,3] (Temporary or Permanent)	Intrusion to Second Reserve[2,3] (Temporary or Permanent)		No intrusion into First or Second Reserves
	Less than 10m from the First Reserve or excavation greater than 2 m depth	Greater than 10m from the First Reserve and no excavation greater than 2 m depth	
High	Medium	Low	Low

Notes:

1. *Proposed utility proposals will be considered on a case-by-case basis.*
2. *This table does not apply to Minor Works (see Appendix C – Glossary).*
3. *Penetrative subsurface investigations (e.g. surveys, boreholes) only require a modified assessment, see Section 7.1.1.*

Should any doubt exist over the level of risk for a Development, Applicants are encouraged to discuss their Development with Sydney Metro. Sydney Metro will be the final determinant of the relevant risk level.

The level of risk assigned to a Development or works and their particular characteristics will determine the type of investigations and assessment required during the Development design, assessment and construction process (see Section 7).

6.4 Pre-Development Application

This Guideline provides information on what needs to be considered for proposed Development in the vicinity of Metro Infrastructure and should be distributed to the Applicant's development team.

The latest version of this Guideline can be downloaded from Sydney Metro's website[5]

It is recommended that experienced and qualified specialists (refer to Appendix D – Competent Person) be engaged early as part of the development team.

6.4.1 Locating Sydney Metro Stratum, protection reserves and infrastructure

To determine the location of First and Second Reserves, Applicants will need site title information and relevant survey plans. Survey plans are registered with and available from Land Registry Services, NSW (refer Section 10.2). A registered surveyor should be able to assist with this.

Applicants are to determine the First and Second Reserves based on this information and dimensions outlined in Section 3.

If Development is proposed within or close to the First Reserve, Applicants should advise the Sydney Metro Corridor Protection team (refer to Section 10.1 for

[5] <https://www.sydneymetro.info>

Sydney Metro contact details) who will provide information about relevant Metro Infrastructure to include in drawings and assessments.

Applicants should also conduct a Before You Dig Australia search (see Section 10.2) to identify any other potential infrastructure.

6.4.2 Planning Proposals

For Planning Proposals in respect of land in close proximity to Metro Infrastructure, proponents should consider undertaking a preliminary risk assessment.

6.4.3 Pre-DA lodgement meeting

The information provided in this Guideline should enable Applicants to lodge the required documentation with their Development Application without the need for a meeting with Sydney Metro.

However, for High risk proposals (refer Table 6.1), Sydney Metro requires a meeting with intended Applicants to discuss Metro Infrastructure and operations, the proposed preliminary design and required DA lodgement material.

A request should be sent to Sydney Metro for a meeting (refer to Section 10.1 for contact details).

The following documents should be provided prior to the meeting for comment and discussion during the meeting:

- a summary of the proposed Development
- plans of the location and existing layout of site, including any existing Easements, and adjacent Sydney Metro land
- architectural layout showing the general arrangement of the proposed Development
- plans and drawings of existing Metro Infrastructure obtained from Sydney Metro that show protection reserve boundaries based on this Guideline
- section view and plan view of the proposed Development (including the reduced level of basements) and protection reserves and
- site investigation plans (if they involve drilling within the protection reserves).

6.5 Development Application

6.5.1 Documentation to support a Development Application

Where legislation requires referral or concurrence in relation to Sydney Metro rail corridors for proposed Development, the Applicant must submit the following documents as part of their Development Application package:

- current title documentation for the applicable property, including all Easements (including rights of way), covenants and caveats
- a detailed survey plan and critical sections prepared by a NSW registered surveyor (examples provided in Appendix E – Sample plans and sections), including:

- Lot and Deposited Plan (DP) number(s)
- site dimensions
- reduced levels (RLs) to Australian Height Datum (AHD)
- existing basements within the subject site
- the boundaries between the Development and:
  - the rail corridor (including Sydney Metro First and Second Reserves)
  - adjoining (surface, below and above ground) rail infrastructure and utilities
  - any Sydney Metro land
  - any Easements (including right of ways).

- details of a recent services search including the location and type of any identified utilities/services
- architectural plans, elevations and sectional drawings (including proposed building footprint at ground level and below, the locations of, and distance to, the First and Second Reserves and Metro Infrastructure)
- civil drawings for (as appropriate): roadworks, stormwater drainage, wastewater drainage, utilities, earthworks, retaining walls and fencing (plans, elevations, long sections, cross-sections with dimensions, RLs and invert levels), including relationship to the railway corridor, Metro Infrastructure and Sydney Metro First and Second Reserves
- for proposals on sites located in areas that have been used for commercial, industrial or agricultural activities, or involved the storage of chemicals, such as service stations and dry cleaners, a Preliminary Site Investigation Report (contamination) in accordance with Section 7.5 of this Guideline

In addition, should the Development be designated Medium or High risk (refer Table 6.1), the following are also required to be submitted with a Development Application:

- Plans and sectional drawings of structural design, including details of Development footings and the geometric relationship to First and Second Reserves and Metro Infrastructure.
- Plans and sectional drawings showing details of any proposed excavation retention system, including details regarding Temporary Works (e.g. piled walls for basements, ground anchors) and the geometric relationship to First and Second Reserves and Metro Infrastructure.
- A Geotechnical Investigation Report with details in accordance with Section 7.1.2 of this Guideline.
- An associated Engineering Impact Assessment Report in accordance with Section 7.2.2 of this Guideline.
- For Developments in the First Reserve which can't meet Guideline requirements but propose an alternative approach to satisfy Sydney Metro, a Concession Application with evidence (refer Section 7.2.3).

- Proposed construction methodology for the Development, including construction staging/sequencing, details of the structural support to be provided to the Development and rail corridor during excavation and operation of the Development, and location and operations of tower cranes.
- A Risk Assessment Report in accordance with Section 7.3 of this Guideline.
- A Noise and Vibration Report in accordance with Section 7.4 of this Guideline.
- Any other reports which Sydney Metro may request due to site and/or Development-specific reasons.

In addition, should the Development be designated High risk (refer to Table 6.1), the following are also required to be submitted with a Development Application:

- an Independent Assessment Report by a Technically Assured Organisation (TAO) in accordance with Section 7.2.4 of this Guideline
- if required by Sydney Metro, a Fire Safety Assessment Report in accordance with Section 5.11.1 of this Guideline
- a Preliminary Site Investigation Report in accordance with Section 7.5 of this Guideline.
- if required by Sydney Metro, a Security Risk Assessment Report in accordance with Section 7.8 of this Guideline
- if required by Sydney Metro, a preliminary Monitoring Plan, in accordance with Section 7.9.1 of this Guideline.

Appendix B – Development Application lodgement checklist provides a checklist of the documents required to be included when the Development Application is lodged.

6.5.2 Standards and plans

Applicants are to ensure any standards being relied upon are relevant and current. Any reports and assessments mentioning standards should clearly state their correct title and version number.

Any plans provided should contain sources for information on the drawings (e.g. if there is a stormwater drain on a plan, the original drawing number should be quoted).

6.5.3 Concept Development Application lodgement

Concept Development Applications (DAs) set out concept proposals for the Development of a site, and for which detailed proposals for the site or for separate parts of the site are to be the subject of a subsequent DA(s). Sydney Metro will consider the likely impact of the concept proposals (and any first stage of Development included in the application).

Where legislation requires referral or concurrence in relation to Sydney Metro Infrastructure for proposed Development, the Applicant must lodge the following documents as part of their concept DA package:

- proposed staging of the Development

- geotechnical desktop study and concept foundation design that meet the requirements of Sydney Metro
- a detailed survey plan prepared by a NSW registered surveyor, which accurately defines the boundaries between the Development, the rail corridor (including First and Second Reserve), Metro Infrastructure, Sydney Metro land, any Easements (including right of ways)
- architectural plans and section drawings showing the proposed basements, locations of lifts and recommended type of foundation adjacent to the rail corridor and their relationship to the rail corridor (including First and Second Reserves); all reference measurements are to be included in the drawings and must clearly state the source survey used.

Subsequent detailed DAs will need to provide the information set out in Section 6.5.1 and will be reviewed when they are referred to Sydney Metro.

6.5.4 Land owner's consent

For DAs proposing any works on Sydney Metro property, including both permanent and Temporary Works (for example, boreholes), Applicants will need to request Sydney Metro's consent.

Refer to Section 10.1 for details on how to request Sydney Metro's land owner's consent for DAs.

Applicants must submit a detailed scope of work along with their request for land owner's consent to facilitate a thorough review and prompt approval process.

6.6 Deferred commencement

As Sydney Metro's concurrence is a requirement that must be met to enable the consent authority to grant consent to the DA, it cannot be deferred for later consideration through a deferred commencement condition under Section 4.16(3) of the EP&A Act.

It remains the case that all information required by Sydney Metro, in order for it to determine whether to give concurrence, must be provided and considered by Sydney Metro before concurrence can be given and development consent can be granted.

7 Investigations and assessments

Sydney Metro requires Applicants to fully assess the potential effects of their Development on Metro Infrastructure and operations. The level and timing of investigation required will be dependent on the complexity of the Development or works and the extent of interface with the rail corridor (see Table 6.1).

Table 7.1 indicates what is typically required for a range of Development (by risk level) along with the stage of Development when investigative reports will be required:

Table 7.1 Assessment type and timing by Development/works risk level

Report type	Level of risk of Development or works to Metro Infrastructure[2]			Stage of Development when report is required[1]
	Low	Medium	High	
Geotechnical Investigation Report	×	✓	✓	Development Application
Engineering Impact Assessment Report	×	✓	✓	Development Application
Independent Assessment Report (by TAO)	×	×	✓	Development Application
Risk Assessment Report	×	✓	✓	Development Application
Noise and Vibration Report	×	✓	✓	Development Application
Preliminary Site Investigation Report (contamination)	×[5]	×[5]	✓	Development Application (if required, Detailed Site Investigation (contamination) at Construction Certificate stage)
Hazardous Chemicals and/or Dangerous Goods assessment	×	✓[6]	✓[6]	Construction Certificate
Stray Current and Electrolysis Report	×	✓	✓	Construction Certificate
Fire Safety Assessment Report	×	×	✓[3]	Construction Certificate
Security Risk Assessment Report	×	×	✓[3]	Construction Certificate
Monitoring Plan(s)	×	✓[3]	✓[3]	Construction Certificate[4]

Notes:

1. *This table provides general advice only. In certain circumstances, Sydney Metro may request additional information or information at an earlier Development stage.*
2. *See Table 6.1 re assignment of risk levels to different types of Development or works.*
3. *If requested by Sydney Metro.*
4. *In some circumstances, Sydney Metro may ask for a preliminary monitoring plan to be submitted with a Development Application.*
5. *Sydney Metro requires Preliminary Site Investigation Reports at Development Application stage for proposals designated as Low or Medium risk on sites in areas that have been used for commercial, industrial or agricultural activities, or involved the storage of chemicals (such as service stations and dry cleaners).*
6. *Assessment only to be undertaken if Hazardous Chemicals and Dangerous Goods proposed to be used or stored in the First or Second Reserves.*

The following sections provide an explanation of the information that needs to be included in these reports to enable Sydney Metro to ascertain the relative impact of the Development on existing and future Metro Infrastructure.

The main aim of these assessments and investigations is to demonstrate that any adverse effects to Metro Infrastructure arising from the proposed Development remains within the defined acceptable limits, as described in Section 5 Performance requirements of this Guideline, as well as compliance with relevant standards and codes. The secondary aim is to provide confidence that through the assessment and investigation process, Applicants gain appreciation of the potential impacts that Sydney Metro operations and maintenance may have on the Development (e.g. noise and vibration, earthing and bonding effects etc.).

In terms of the engineering investigations and assessments undertaken for future Metro Infrastructure, the intent of these is to ensure the feasibility of future metro construction is not adversely affected by new Development or works and their construction. Applicants should:

- approach Sydney Metro for information that defines the extent of existing and future Metro Infrastructure in order to undertake these investigations and assessments (see Section 10.1)
- ensure any standards being relied upon are relevant and current. Any reports and assessments mentioning standards should clearly state their correct title and version number
- ensure drawings or reports contain information sources for any assets identified in them (e.g. if there is a stormwater drain on a plan, the original drawing number should be quoted)

Where a proposal is changed, Sydney Metro is to be notified and provided updated reports clearly demonstrating the changes, new assessments undertaken and conclusions made.

7.1 Geotechnical investigation

Geotechnical investigations need to assess:

- the soil or rock strata above, alongside and below existing and future Metro Infrastructure, as appropriate, to establish the existing ground conditions within the area affected
- what impacts excavation and earthworks from the proposed Development or works will have on Metro Infrastructure and operations.

The results of the investigation must be presented in a Geotechnical Investigation Report.

The intent of these geotechnical investigations must be as follows:

- Provide information that enables a geological model to be developed. Based on this model, sections must be prepared that illustrate the ground conditions in and around the interface of the proposed Development or works with Metro Infrastructure.
- Establish any likely in situ stress conditions within the soils and underlying rockmass surrounding the interface.
- Describe any potential presence of critical geological features such as bedding planes, joints and dykes.
- Present an interpretation of relevant rock and soil properties based on the results and any in situ and laboratory testing that has been undertaken. If no in situ or laboratory testing has been carried out, industry established rock and soil properties can be adopted with supporting justification.
- Provide an interpretation of the existing groundwater regime within and surrounding the interface.
- Identify and describe the presence of any human-made features within the Development site.

The scope of the geotechnical investigation may comprise the following:

- drilled boreholes
- in situ testing
- geological mapping
- geophysical exploration.

7.1.1 Site investigation proposals

While the installation of instrumentation and the drilling of investigation boreholes is permissible within the First and Second Reserve of the rail corridor with Sydney Metro's prior approval, they should be located and orientated to avoid the supporting systems of existing Metro Infrastructure. This will require a detailed study to demonstrate that risk to the infrastructure is appropriately managed for acceptance by Sydney Metro prior to the drilling of boreholes.

If boreholes 2 m or deeper are to be drilled within the First or Second Reserves, Sydney Metro is to confirm it has no objection to the boreholes prior to drilling. The following information is to be provided to Sydney Metro:

- Proposed borehole location plan and cross-sections, verified by a registered surveyor, showing:
- the distances from the boreholes to the First and Second Reserve boundaries
- the distances from the (sub)Stratum boundary (if applicable)
- borehole details (e.g. diameter and depth).
- A copy of the Safe Work Method Statement for the proposed works including a requirement to notify Sydney Metro if the driller encounters

any indications that Metro Infrastructure may has been encountered (e.g. sudden increase or decrease in ground resistance to drilling, interception of voids, sudden loss of water within boreholes). Sydney Metro can provide emergency contact details on request.

- Any other requirements consistent with Section 7.1 Geotechnical investigation of these Guidelines.

Please allow a minimum of two weeks for confirmation of no objection to proposed boreholes from Sydney Metro.

7.1.2 Geotechnical Investigation Report

As a minimum the Geotechnical Investigation Report will need to present the following information:

- borehole location plan, borehole logs, test results, geological mapping, photographic documentation and other relevant information
- description of the soil profile of the area
- critical geological features such as bedding planes, joints and dykes
- other relevant data from the geotechnical investigation
- rock and soil properties, laboratory and in situ test results
- existing in situ stress states in soils and rocks
- groundwater levels and conditions
- detailed geotechnical model for the analysis, including geotechnical design parameters
- geotechnical advice of constraints on works adjacent to Metro Infrastructure
- comments/recommendations on temporary and permanent ground support and foundation design, methods of shoring and excavation
- a copy of all plans, geotechnical data, operations and maintenance records with any qualifications and limitations provided by Sydney Metro to the Applicant/public authority.

7.2 Engineering impact assessment

An engineering analysis and impact assessment demonstrating the Development will not have unacceptable adverse impacts on existing or future Metro Infrastructure and operations must accompany a geotechnical investigation.

The engineering analysis and impact assessment must take into account any other adjacent Development or works planned for the future or that are taking place at the time of analysis. This information can be obtained from Sydney Metro and the local council/consent authority.

The assessment must be prepared and endorsed by a Competent Person with appropriate qualifications and experience related to the relevant field of engineering that is the focus of the report.

The results of the analysis and assessment must be presented in an Engineering Impact Assessment Report and submitted for review by Sydney Metro.

In some cases, Sydney Metro may request the Applicant arrange independent verification of the engineering analysis and impact assessment based on the project complexity and the potential effects on Metro Infrastructure.

7.2.1 Numerical modelling

For Medium and High Risk Development (see Table 6.1), two-dimensional or three-dimensional numerical modelling (finite element [FE] or finite difference [FD]) will be required to demonstrate that induced effects on rail infrastructure will be acceptable to Sydney Metro through predicting the effects on Metro Infrastructure at different stages of construction and the eventual or current operation of the metro. The modelling must also consider the effects of associated Temporary Works, such as construction loading (e.g. demolition, tower cranes and material stockpiling).

If undertaken, numerical modelling must:

- be based on a realistic geological model derived from the subsurface information gathered through the geotechnical investigation
- incorporate critical geological features that may be present, such as bedding planes, weak layers, joints and other discontinuities.

If necessary, the results from this numerical modelling may need to be validated during construction by comparison with the results from the field monitoring of installed instrumentation.

7.2.2 Engineering Impact Assessment Report

As a minimum the Engineering Impact Assessment Report must include the following:

- Details of the scope of the Development, including any proposed staging.
- Survey plans (including sections) verified by a NSW registered surveyor that show the location of the proposed Development in relation to metro Easements, protection reserves and the planned or existing metro alignment including track centre lines and details of structures.
- Metro Infrastructure shown in plan and various sections with the inclusion of the protection reserves as defined in this Guideline to clearly illustrate the comparative position of the Development in relation to the existing or planned Metro Infrastructure. They must also extend to the expected physical zone of influence, which is the extent to which the Development is expected to affect the surrounding ground.
- Cross-sections of the proposed sub-surface structure overlaid on an inferred subsoil profile.
- Detailed drawings depicting structural layout, foundation layout, foundation loads, drainage plans, Temporary Works such as dewatering, shoring and anchoring and permanent works of the proposed Development.
- Structural drawings that show the designs for shoring, as recommended by a Competent Person.
- Predicted displacements of existing Metro Infrastructure due to proposed Development at various stages, namely pre-construction

(including demolition), excavation, Development construction and post-construction.

- Predicted displacements, stresses and structural actions as imposed on the structural support of Metro Infrastructure at various stages of construction, namely pre-construction (including demolition), excavation, Development construction and post-construction. In most cases this support will be in the form of watertight structural concrete linings.
- Structural assessments of these predicted effects on existing Metro Infrastructure. This must include as appropriate the structural integrity of underground support (such as structural linings), track beds, existing drainage structures, waterproofing measures and structural clearances.
- Appropriate sensitivity analysis to ensure that the predictions are not adversely affected by reasonable variations in input parameters and different conditions that can occur during all stages of construction.
- Assessment of the effects of construction techniques and methodology on Metro Infrastructure.
- Assessment of train derailment collision protection requirements and proposed design response.
- Discussion on any design assumptions, qualifications or limitations that have been applied. This discussion must indicate how these have been considered as part of the sensitivity analysis and then integrated as identified risks as part of the risk assessment (refer to Section 7.3).
- Recommendations regarding any planned preventative or remedial action that may be required to limit Development-induced impacts on Metro Infrastructure.
- Demonstration that the proposed Development will not induce unacceptable adverse effects on Metro Infrastructure.

7.2.3 Concession process

It is expected that every effort is made to comply with all requirements of these Guidelines in the first instance. However, in some instances it may not be viable to comply with all such requirements and it may be appropriate for an Applicant to propose an alternative approach that departs from the Guidelines but still satisfies Sydney Metro.

In such cases, a Concession Application must be made to Sydney Metro for approval. Sydney Metro can provide a Concession Application form upon request (refer Section 10.1).

Sydney Metro will only consider a Concession Application where it has been demonstrated by evidence that all other options have been considered and a detailed risk assessment prepared by a Competent Person has been provided to Sydney Metro's satisfaction.

Sydney Metro will not approve a concession unless it is provided with evidence that:

- adequate protection of Metro Infrastructure will be ensured across the whole-of-life of the proposed Development

- adequate safety risk management measures will be implemented.

7.2.4 Independent verification

Depending on the details of the proposed Development and the proximity to planned or future Metro Infrastructure, Sydney Metro may request that independent verification of the engineering analysis and impact assessment be carried out, which must be arranged by the Applicant.

At a minimum, all High Risk Developments (see Table 6.1) will require independent verification by a TAO **who is accredited for the design life cycle phase within the sub-disciplines of rail (geometry and alignment), bridges and structures, and/or geotechnical engineering as appropriate.**

A list of TAOs can be found on TfNSW's website[6].

The independent verification must include detailed engineering proof checking of all aspects of the engineering analysis and impact assessment including any proposed Temporary Works.

The Independent Verifier must prepare an Independent Assessment Report that describes its verification activities and demonstrates that the proposed Development will produce no unacceptable adverse effects on Metro Infrastructure and/or operations. The Independent Assessment Report must be submitted to Sydney Metro with the Engineering Impact Assessment Report at the Development Application stage.

7.3 Risk assessment

Applicants must manage risks related to the Development to ensure safe rail operations and the construction of future Metro Infrastructure to the satisfaction of Sydney Metro. As such Applicants must identify all reasonably foreseeable safety risks and hazards to the metro and its operations and first seek to eliminate those risks where reasonably practicable. Where elimination is not reasonably practicable each risk must be mitigated so far as is reasonably practicable (SFAIRP), noting that any residual risk remains the responsibility of the Applicant.

The identified risks and their SFAIRP demonstration must be documented in a manner that can be provided as assurance evidence to Sydney Metro. TS 04981 System Safety Standard for New or Altered Assets describes the assurance for changes impacting rail or transport assets. Reference should also be made to TS 02404 Airspace and External Developments when preparing the risk assessment.

A rail-related risk assessment report must be prepared and submitted for review by Sydney Metro addressing the following:

- Safety in Design that covers the whole of asset life cycle, including all stages of construction
- identify all hazards and risks to the Development and Metro Infrastructure
- present the risk identification process that has been adopted which considers the entire asset life cycle of the Metro Infrastructure

[6] <https://www.transport.nsw.gov.au/industry/asset-management-branch/find-a-tao>

- apply and present a risk ranking of all hazards assessing both likelihood and consequence of each hazard. This should be presented as a two-stage assessment, firstly considering the hazard 'unmitigated' and then reassessment following inclusion of all reasonably practicable controls
- confirm that all risks can and will be managed SFAIRP
- present the controls that are needed to manage risks from the proposed Development to Metro Infrastructure and operations; these may include early warning criteria for monitoring.

The risk of the proposal to Metro Infrastructure will be reflected in the amount of public liability insurance required as a condition of consent.

7.4 Noise and vibration assessment

If the Development is designated Medium or High risk (see Table 6.1), the Applicant must undertake a noise and vibration impact assessment and submit a Noise and Vibration Report at the DA stage, to Sydney Metro's satisfaction.

The Noise and Vibration Report must:

- be prepared by a Competent Person. A Competent Person in the field of acoustics is a member of the Australian Acoustic Society, Institution of Engineers Australia or the Association of Australasian Acoustic Consultants
- demonstrate that the Development is designed, and will be constructed and maintained to avoid damage or other interference which may occur as a result of airborne and ground-borne noise and vibration effects that may emanate from the rail corridor during rail construction and from the railway operations
- determine the effects of any noise or vibration impacts on the Metro Infrastructure and its operations arising from the proposed Development during demolition, excavation and construction (including any machinery causing heavy vibration levels) and its operation after completion
- assess any cumulative impacts with Sydney Metro operations, or any adverse impact to a soundscape that Sydney Metro has specifically designed for (i.e. station promenades and concourses)
- determine if monitoring is required and if so, recommend the proposed monitoring regime. Monitoring will be required for all High risk proposals.

Refer to Section 5.4 for further details regarding performance criteria to be considered.

7.5 Contamination assessment

For Development categorised as High risk (see Table 6.1) or Low or Medium risk on sites located in areas that have been used for commercial, industrial or agricultural activities, or involved the storage of chemicals (such as service stations and dry cleaners), the Applicant is required to undertake a Preliminary Site Investigation (PSI) to assess the potential for contamination to be present at, in, on or under the Development site that may impact Sydney Metro Operational Land. The PSI is to be submitted with the DA.

Should the PSI identify the need for a Detailed Site Investigation (DSI) to be conducted in order to further assess the risk to human health, ecological receptors or infrastructure on Sydney Metro Operational Land, a DSI must be undertaken to characterise soil, groundwater and soil vapour risks.

Both the PSI and DSI must be performed and reported in accordance with all guidelines made or approved by the NSW EPA, including the National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 1999) and the Contaminated Land Guidelines: Consultants reporting on contaminated land (NSW EPA, 2020).

Should a DSI identify any contamination migrating (or at risk of migration) from the Development site into the Sydney Metro Operational Land or where the DSI identifies a risk to human health or ecological receptors, the Applicant is required to:

- develop a Remediation Action Plan (RAP) in accordance with all guidelines made or approved by the NSW EPA
- remediate the contamination in accordance with the RAP prior to/during construction of the project in order to render Sydney Metro Operational Land suitable for its proposed or ongoing use and to ensure that there is no residual contamination risk to Metro Infrastructure
- prepare and submit a Validation Report, detailing the validation data collected during the remediation phase.

All PSI, DSI, RAPs and Validation Reports produced under these conditions must be authored, or reviewed and approved by a contaminated land consultant who holds current certification in accordance with the Contaminated Land Consultant Certification Policy (NSW EPA, 2022), as may be updated from time to time.

All contaminated land reports produced under these conditions will be subject to review by Sydney Metro. The Applicant must ensure its contaminated land consultants address and respond to comments provided by Sydney Metro, including by providing updated reports.

Where a NSW EPA-accredited Site Auditor is engaged by the Applicant, Sydney Metro must be provided copies of interim audit advice, Site Audit Statements and accompanying Site Audit Reports where produced.

7.6 Hazardous Chemicals and/or Dangerous Goods assessment

The proposed storage of Hazardous Chemicals and/or Dangerous Goods within the First or Second Reserves will be subject to a risk assessment.

The risk assessment must be undertaken by a Competent Person taking into the consideration the following:

- Safework NSW: How to manage work health and safety risks
- Safework NSW: Managing risks of Hazardous Chemicals in the workplace
- Safework NSW: Managing the work environment and facilities
- Safework NSW: Safe design of structures
- Safework NSW: First aid in the workplace
- Safework Australia: Managing risks of storing chemicals in the workplace

- Safework Australia: Storage of flammable liquids guide.

This assessment must address the potential impact on:

- Human health, including metro passengers, Sydney Metro/Operator staff and contractors, construction personnel and residents or visitors to facilities within or above Sydney Metro Operational Land
- Sydney Metro Infrastructure and operations

Appropriate safety precautions must be provided for storage of Hazardous Chemicals or Dangerous Goods in accordance with recommendations from the risk assessment.

7.7 Stray current and electrolysis assessment

Where required, the Applicant must submit a Stray Current and Electrolysis Report to assess the potential impacts of electrolysis effects on the Development from metro operations and to address whether preventative measures are required.

Electrolysis and related corrosion can be minimised by selecting suitable building materials and avoiding using metal finishes in the vicinity of high voltage electricity. Using masking agents or coatings to prevent exposure of metals or prevent direct contact between metallic parts will also assist in preventing the effects of electrolysis.

The Applicant should obtain appropriate advice on avoiding electrolysis, including through early consultation with the rail authority and assessing whether preventative measures are required.

The Stray Current and Electrolysis Report is to be prepared by a Competent Person, submitted prior to a Construction Certificate being issued and be to Sydney Metro's satisfaction.

Note: The Sydney Metro M1 Line (see Appendix A – Sydney Metro network) trains are powered by DC traction power, which will mean that the electrolysis assessment for Development in proximity to the M1 line will need consider stray current and include details on required mitigation measures to eliminate/reduce the impacts of stray currents from the railway onto the proposed Development. As Metro West and Metro Western Sydney Airport trains will be powered by AC traction systems, stray current will not be a factor for Development in proximity to these lines, unless there is a DC operated system in close proximity (e.g. if the Development is located adjacent to an interchange station).

7.8 Security risk assessment

Sydney Metro may request an Applicant to prepare and submit a Security Risk Assessment Report which must address/include the following:

- the identification of all cyber, physical, operational, and terrorism related security risks to Metro Infrastructure
- the security risk identification process (in alignment with ISO 31000: 2018 and HB 167: 2006) that has been adopted which considers the entire Sydney Metro asset life cycle and associated changes to the security threat environment
- the controls that are needed to manage risks from the proposed Development to Metro Infrastructure and operations

- demonstration that these risks have been eliminated to Sydney Metro Infrastructure, or where it is not reasonably practicable to eliminate these risks to Metro Infrastructure, that they are minimised so far as is reasonably practicable.

Where the threat environment changes, or the design changes, a revised security risk assessment must be undertaken.

The Security Risk Assessment Report must include details of threat protection design to reduce, to a defined extent, the risk to individuals of injury and fatality and to understand the damage in the event of an explosion that can be a person-borne or placed improvised explosive device (PBIED) or vehicle-borne improvised explosive device (VBIED) of a specified magnitude and location within or near the structure, which is achieved by:

- maximising standoff as far as reasonably practical, between a potential blast location, and vulnerable areas such as station infrastructure
- limiting structural collapse including prevention of progressive collapse where this would impact Metro Infrastructure
- minimising flying debris to minimise the potential for producing secondary fragmentation due to the explosive threat where this would impact Sydney Metro customers, or interfere with railway operations
- undertaking blast analysis to support the security outcome.

The security risk assessment process must be undertaken in consultation with and approved by the Sydney Metro Executive Director, Enterprise Security, with the report to be submitted prior to a Construction Certificate being issued.

Risk assessments created in line with this Guideline remain highly sensitive information and the use of them outside of the DA will require Sydney Metro Executive Director, Enterprise Security or Chief Executive approval.

7.9 Monitoring

Monitoring is undertaken to validate design assumptions for Development and to quantify that impacts being generated are within acceptable limits.

Ground movement and noise and vibration monitoring will be required for all High and Medium risk proposals (imposed as conditions of development consent).

The structural performance of Metro Infrastructure would be monitored as necessary during construction (including demolition and excavation) of the proposed Development to verify predicted displacements, stress levels in structural elements and vibration levels.

Where site or project-specific factors warrant it, Development may also be subject to other monitoring (e.g. earthing and bonding, contamination), at the discretion of Sydney Metro.

7.9.1 Monitoring plans

The Applicant's proposed monitoring plans must:

- be developed by a Competent Person
- monitor the behaviour of the existing Metro Infrastructure and the ground adjacent to it (see Section 5.1.2 for displacement limits)

- be submitted to Sydney Metro for review and approval prior to the commencement of construction (including demolition and/or excavation).

The Monitoring Plan must include, but is not limited to:

- description and consideration of all vibration-generating works from demolition through excavation and landscaping (e.g. vibratory rollers)
- proposed monitoring activities for likely vibration/crack/movement locations
- a monitoring instrumentation proposal, including:
  - layout plans and relevant cross-sections indicating the locations of proposed instruments relative to the existing Metro Infrastructure and protection reserves
  - details of the instruments or equipment, including the types, function of instruments, depth of installation, etc.
  - frequency of monitoring
  - valid calibration certificates for the instruments proposed, where applicable
  - schedule for instrument installation and removal works on Sydney Metro land, indicating the number and frequency of access required
- outlining the process for how the Applicant will assess the monitoring results continually and submit monitoring assessment reports to Sydney Metro for review
- a response regime outlining the process to manage 'Alert' (coming close to the limit) and 'Alarm' (equal to or over the limit) and a contingency plan/s to prevent damage to Metro Infrastructure.

Monitoring plans will generally be required to be produced and approved by Sydney Metro prior to a Construction Certificate being issued. However, for some High risk proposals, Sydney Metro may also request a preliminary monitoring plan to be lodged for review with a DA.

7.9.2 Types of monitoring required

Table 7.2indicates the circumstances where various types of monitoring may be required.

Table 7.2 Typical monitoring requirements for Development/work near Sydney Metro Infrastructure

Type of instrument	Deep open excavations or tunnels	Foundation works – shallow or deep
Rail track monitoring (distortion)	Yes	If required by Sydney Metro
Sydney Metro Infrastructure markers	Yes	If required by Sydney Metro
Ground settlement markers	Yes	Yes

Type of instrument	Deep open excavations or tunnels	Foundation works – shallow or deep
Building settlement markers	Yes	Yes
Vibration sensor	Yes	Yes
Microphone	If required by Sydney Metro	If required by Sydney Metro
Real time monitoring such as electrolevel beams, optical prism laser scanning	If required by Sydney Metro	If required by Sydney Metro
Inclinometer	Yes	Yes
Water standpipe	If required by Sydney Metro	If required by Sydney Metro
Piezometer	Yes	If required by Sydney Metro
Extensometer	Yes	If required by Sydney Metro

Note: exact composition of instruments to be outlined in monitoring plan.

Baseline data for each monitoring parameter must be established before commencement of construction. The Applicant must provide as a minimum, three sets of monitoring data to establish a baseline prior to excavation.

The equipment that is used for remote monitoring (particularly for alarm or warning systems) must have proven reliability in similar applications.

During construction or operation of Metro Infrastructure it may not be feasible to grant access for the purpose of installing monitoring equipment. If access to Metro Infrastructure is not granted, then the Applicant and Sydney Metro will determine an alternative monitoring location which can be used to represent or derive conditions.

8 Construction stage

8.1 Pre-construction

8.1.1 Construction Certificate(s)

Following the grant of a development consent and before any construction work can commence, Applicants will need to apply to a Principal Certifier (a registered building surveyor or local council) for a Construction Certificate.

For the Construction Certificate to be issued, Applicants will need to have met all the requirements Sydney Metro placed in conditions imposed on the development consent and provide further detailed information to supplement what was provided as part of the original DA, such as construction plans and methodology.

For Sydney Metro's requirements to be met prior to the issue of a Construction Certificate, refer to the relevant development consent.

Requirements depend on the location and type of Development and its associated risk level, and can include (but may not be limited to):

- detailed ground and vibration monitoring plan including trigger levels, action plans and remedial measures, details of the instrumentation and baseline monitoring readings (refer to Section 7.9)
- construction schedule, construction management plan including sequence plan identifying impacts
- construction layout of equipment relative to Metro Infrastructure
- final detailed Safe Work Method Statements (refer to Section 8.1.4)
- temporary safety plans and measures
- Temporary Works plan, including for temporary access, vehicle, plant and equipment such as cranes (including mobile cranes) and stockpiling
- noise, vibration and electrolysis studies and control measures
- a rail-related risk assessment and management plan
- list of machinery to be used during excavation/construction
- groundwater control plans
- environmental investigations/reports, such as for contamination
- design loadings and certified drawings for construction-related works that affect Metro Infrastructure
- agreed interface activities plan with Sydney Metro; and
- condition and dilapidation survey reports of all Metro Infrastructure affected by the Development (refer to Section 8.1.3).

Incomplete, inaccurate or unclear information provided for Construction Certificates will lead to Sydney Metro issuing requests for information (RFI) which may extend review times and lead to project delays.

Should Applicants propose staged Construction Certificates, they are to consult with Sydney Metro on the proposed staging, timing and information to be provided at each stage to meet metro-related development consent conditions.

Sydney Metro's approval is required for any changes to Development design and construction methods, and amended or additional impact assessment may also be necessary.

8.1.2 Deeds for work on Sydney Metro property

Any Applicant proposing to undertake works on, or seeking access to, land owned by Sydney Metro must enter into an appropriate deed with Sydney Metro prior to construction. The deed provides the terms and conditions under which access is granted and works may be carried out.

The deed outlines the responsibilities of the Applicant, including ensuring safety, mitigating risks to Metro Infrastructure and adhering to all relevant legislative requirements. It also stipulates insurance requirements and indemnity obligations.

These requirements ensure that all activities on Sydney Metro land, whether permanent or temporary, are carefully and appropriately managed and aligned with Sydney Metro's operational and safety requirements.

For details on how to initiate discussions with Sydney Metro on preparing a deed for work on metro property, refer to Section 10.1. Applicants are responsible for their own costs of preparing and entering into deeds with Sydney Metro.

8.1.3 Dilapidation survey and report

Sydney Metro may request that an inspection and survey of the existing at-grade and elevated Metro Infrastructure near the proposed Development be undertaken prior to the issue of a Construction Certificate.

If requested:

- the survey must be carried out by the Applicant (Sydney Metro are to be advised and may attend the inspection)
- the extent of Metro Infrastructure that must be surveyed will be determined by Sydney Metro
- physical condition surveys of metro structures and rail corridor infrastructure are to be carried out by a Competent Person
- the existing condition of the Metro Infrastructure must be recorded
- a detailed dilapidation report must be submitted to Sydney Metro describing conditions before commencement of works.

The dilapidation report must include the following as a minimum:

- details of existing defects
- dimensions and mapping of existing cracks
- survey of any subsidence, settlement, movement or heave
- photos of defects with labels that indicate their locations
- signs of deterioration from existing defects.

Sydney Metro may request:

- additional inspections may be required during construction
- an interim dilapidation survey report(s) as appropriate.

After completion of construction works, the Applicant is to undertake a final dilapidation survey (as per the methodology detailed above), prepare a report and submit to Sydney Metro.

The final dilapidation survey/report should provide a comparison to the pre-construction condition and identify any changes. Should there be demonstratable change, Sydney Metro, in consultation with the Applicant, will determine rectification processes, to be undertaken at the Applicant's expense.

8.1.4 Construction risk assessment

Prior to commencing any works, risk assessment reports issued in support of the DA(s) must be updated based on the detailed design prepared for the issue of a Construction Certificate. The updated risk assessment report must take into account any modifications to the design and the impact these may have on identified risks.

Safe Work Method Statements (SWMS) must also be prepared that include, as a minimum, the following:

- detailed work methods including the incorporation of the controls as stated in the risk assessment plan
- an emergency response plan.

The Applicant must submit the SWMS and updated risk assessment report to Sydney Metro for approval before the issue of a Construction Certificate.

8.1.5 Services search

The Applicant must conduct a Before You Dig Australia search to establish the existence and location of any Metro Infrastructure.

Where Metro Infrastructure is identified in close proximity of the proposed Development, the Applicant must ensure that all required clearances (e.g. electrical clearances) are observed at all times during the undertaking of works.

Where Metro Infrastructure is identified within the subject Development site, the Applicant must consult with Sydney Metro as to whether these services are to be relocated or incorporated within the Development site.

Adequate protection measures must be provided for protection of any Metro Infrastructure that may be in the vicinity of any excavation or loading zones for the Development.

The Principal Certifier must not issue the Construction Certificate (and hence works cannot commence) until written confirmation has been received from Sydney Metro confirming that this condition has been satisfied.

8.2 Demolition works and construction impacts

All metro property must be fully protected during construction of the Development and all site work (including clearances to metro tracks and protection reserves) must comply with the requirements outlined in this Guideline, as well as other relevant TfNSW standards relating to air space

Developments, external Developments and tunnels, and safe working requirements.

All construction carried out on Sydney Metro Operational Land must comply with relevant workplace health and safety (WHS) and environmental requirements.

The demolition of any existing buildings or basements must be planned to avoid all risks to existing Metro Infrastructure. The Applicant must take every possible action to minimise risks and must meet the costs of any protection required for Metro Infrastructure and any disruption to Sydney Metro's operations.

The impact of any proposed demolition work (including de-stressing, unloading and resulting ground vibrations) must be assessed to ensure that there are no adverse effects on Metro Infrastructure. If large-scale demolition works are involved, then the Applicant is required to install a vibration monitoring system to monitor vibration levels near adjacent Metro Infrastructure.

Hydraulic rock breakers must not be used within the First Reserve of any existing Metro Infrastructure.

Explosives must not be used for any demolition works.

8.3 Excavation works

For Medium and High Risk Development (see Table 6.1), the Applicant must submit the following for Sydney Metro's approval prior to commencing excavation for the Development:

- details of the extent of any excavations adjacent to any Metro Infrastructure, utilities, power cables, etc.
- an engineering assessment report which through the use of numerical modelling techniques (if required) demonstrates that the excavation will not cause any adverse effect on Metro Infrastructure
- design reports that detail the shoring system that supports excavations and must include evidence of certification by a Competent Person
- risk assessment and contingency plans
- detailed work method statements which include hold points at various stages of excavation and are linked to the acceptable monitoring results
- a detailed monitoring plan focusing on track movement or other critical infrastructure (as applicable).

The following requirements apply to excavation and piling works prior to construction:

- the position of at-grade and elevated Metro Infrastructure and protection reserves must be marked clearly on the ground for easy identification
- all piling contractors must be made aware of existing Metro Infrastructure adjacent to the construction site.
- Sydney Metro may:
- request to be informed at agreed intervals of the progress of piling and excavation works, foundations/support installations and superstructure construction up to the ground level

- require the presence of a Competent Person during excavation to carry out visual verifications of substrata, geological mapping and an assessment of monitoring results.
- The results of field monitoring undertaken during excavation or piling works must be assessed by a suitably Competent Person and reported to Sydney Metro at a frequency determined by Sydney Metro.

8.4 Noise and vibration

The effects of noise and vibration on existing Metro Infrastructure and on the proposed Development must be considered as part of the design and construction of proposed Developments.

The construction of the proposed Development must be carried out such that the effects of noise and vibration on Metro Infrastructure and facilities are minimised.

During Development construction, vibration monitoring may be required of metro at-grade and elevated structures, such as viaduct girders and embankments. Refer to Section 5.4.1 for metro requirements and Section 8.11.1 regarding who to contact should Alert or Alarm levels be triggered.

If the vibration levels exceed tolerable limits, then the Applicant must modify the construction methodology to comply with the vibration limits.

8.5 Contamination and hazardous materials

8.5.1 Contamination

If required by Sydney Metro, the Applicant will be required to develop and implement an Unexpected Contaminated Land and Asbestos Finds Protocol prior to the issuing of a Construction Certificate/commencement of works. Should any contamination be identified during construction, it is to be managed in accordance with that Protocol.

8.5.2 Hazardous Chemicals and/or Dangerous Goods

The proposed storage of Hazardous Chemicals and Dangerous Goods within the First or Second Reserves during construction will be subject to a risk assessment (see Section 7.6).

The risk assessment must be undertaken by a Competent Person taking into the consideration the following:

This assessment must address the potential impact on:

- Human health, including metro passengers, Sydney Metro/Operator staff and contractors, construction personnel and residents or visitors to facilities within or above Sydney Metro Operational Land
- Metro Infrastructure and operations.

Appropriate safety precautions must be provided for storage of Hazardous Chemicals or Dangerous Goods in accordance with recommendations from the risk assessment.

8.6 Borehole backfilling, grouting and reinstatement

Following any geotechnical investigations, Applicants are required to decommission boreholes by reinstating the ground surface to its original condition, including seeding if vegetation was removed due to ground investigation work. This should be undertaken in accordance with Sydney Metro General Specification – Geotechnical Investigations (Ref. SM-20-00130154), including Minimum Construction Requirements for Water Bores in Australia, 4th ed., 2020.

8.7 Development/works near utilities or services

A risk assessment is to be completed before any work near utilities/services is performed.

No excavation or boring for permanent or temporary work is permitted within 2m (horizontal) of high voltage electrical underground cables and within 1m (horizontal) of low voltage, signalling or other underground electrical cables without consultation with and approval of the Operator.

When work is performed near live HV insulated cables, appropriate precautions (in accordance with the relevant line Electrical Safety Rules) must be taken to ensure that the insulation is not damaged. Cables must not be moved while live.

Any electrical permits must be issued in accordance with these rules. An electrical permit must be issued for all work that requires isolation and earthing of electrical equipment.

Table 8.1 outlines restrictions applicable to any Development in the vicinity of utilities on Sydney Metro Operational Land.

Table 8.1 Construction in the vicinity of underground utilities

Excavation depth	Construction allowance
Excavation less than 2m depth from surface level near Sydney Metro underground utility	Allowed – subject to risk assessment: • Only non-destructive digging allowed. • Potholing to confirm live cable locations. • Spotters are required. • For operating Sydney Metro corridors, an electrical permit must be issued by the Operator for all works that require isolation and earthing of electrical equipment.
Excavation greater than 2m depth from surface level near Sydney Metro underground utility	Allowed – subject to risk assessment • Identify and assess the boundary of the 2m exclusion zone from the Sydney Metro asset in accordance with the relevant line Electrical Safety Rules.

Note: This construction restriction table only applies to excavation in the vicinity of utilities/services on Sydney Metro Operational Land. Separate requirements for construction restrictions in Sydney Metro reserves are specified at Table 3.5.

In addition, instructions are to be issued to construction workers outlining the controls identified in the risk assessment, which may include: defining the work area, isolating and earthing of the electrical equipment adjacent to the work area, the use of barriers and signs, the use of approved covering, the use of safety observers and the issue of an electrical permit defining access routes.

8.8 Drainage

During construction, water must not collect and pond on or near the railway infrastructure. No run-off from the Development must discharge onto TfNSW or Sydney Metro owned land, the Sydney Metro rail corridor, into the Sydney Metro stormwater system or into the track drainage system during construction.

8.9 Cranes, drilling or piling rigs and other construction equipment

The movement or operation of any crane, whether fixed or mobile, drilling or piling equipment, excavator or any other mechanical equipment or vehicle in the vicinity of the at-grade and elevated Metro Infrastructure is restricted, subject to the following requirements:

- Construction plant (including cranes, excavators, concrete pumps etc.) must not intrude into or above the First Reserve.
- Slew restrictors must be in place on cranes so as to not swing over the First Reserve, including preventing cranes 'weathervaning' into the First Reserve rail corridor when not in operation.
- Lifting of materials/equipment may only be carried out in the Second Reserve subject to approval of Sydney Metro, and must not be carried out in the First Reserve.
- Metallic equipment such as scaffolding, ladders, etc. are not permitted within the First Reserve and approval is required by Sydney Metro for metallic equipment to be located in the Second Reserve.

For projects adjacent metro corridors utilising construction plant, prior to construction the Applicant must submit a SWMS and risk assessment report to Sydney Metro's satisfaction detailing (at a minimum):

- location of the First and Second Reserves
- proposed work area and schedule, including any intrusion into protection reserves
- appropriate temporary work design certification by a Competent Person for use of any tower crane foundation, piling pad etc.
- risk assessment demonstrating all hazards relating to potential crane/piling rig (including for mobile equipment) failures have been mitigated SFAIRP
- procedure for delineation of work area from restricted area (e.g. barriers and/or warning flags along the First Reserve boundary)
- an emergency response plan for crane/rig structural failure.

In addition, the Applicant must:

- ensure the crane is registered and has a current Plant Item Registration from NSW SafeWork
- prior to erection, ensure the crane(s) are serviced as per the relevant Australian Standard and records are available
- verify by a Competent Person that the installation complies with the engineered drawings and is certificated as good to operate
- follow the relevant Australian Standard(s).

8.10 Rail corridor fencing

The security of fencing along the rail corridor is essential to prevent unauthorised entry. Given the frequency and speed of trains, particularly in built up areas, unauthorised entry is a key safety risk and has the potential to disrupt services.

Where construction occurs near existing rail-side fencing, provisions should be made to prevent damage to fencing.

In instances where new metallic rail-side fencing is proposed, it could be affected by electrolysis (refer Section 5.5).

The function of the rail corridor fence should also not be compromised by placement of plant, materials or structures in close proximity to the fence which could be climbed to gain entry to the rail corridor.

8.11 Construction monitoring

Where required during the Development construction phase, Applicants are to provide Sydney Metro with monitoring reports at regular intervals determined by Sydney Metro, which includes monitoring results and assessment by a Competent Person.

8.11.1 Alerts and Alarms

Any alarm or warning system should have a visual and audible alarm system to activate under conditions prescribed in the Monitoring Plan.

In the event of an Alert being trigged, the following entities must be contacted:

- Development site manager
- Applicant
- Sydney Metro (via email SydneyMetroCorridorProtection@transport.nsw.gov.au)
- the metro Operator (details below).

In the event of an Alarm being triggered during works, the Applicant must:

- stop work
- contact the relevant Sydney Metro/Operator emergency number:
    - Sydney Metro – Northwest Line and Sydney Metro – City:
        - Tallawong to Epping – (02) 9854 4641
        - Epping to Chatswood – (02) 9854 4642
        - Chatswood to Sydenham – (02) 8882 3026

- Sydney Metro – Southwest Line – 0458 901 670 and 0482 472 423
- Sydney Metro – West – 1800 612 173
- Sydney Metro – Western Sydney Airport – 1800 717 703

8.11.2 Monitoring inspections

Depending on the complexity of the Development, physical inspections of existing Metro Infrastructure may be required on a regular basis during critical stages of construction. If necessary, these inspections must be undertaken jointly with the Applicant and Sydney Metro representative (including a representative from the metro Operator as necessary).

8.11.3 Completion of monitoring

Monitoring must continue until it is demonstrated that no changes have occurred in three consecutive monitoring cycles after construction of the Development is complete. With prior agreement of Sydney Metro, monitoring frequencies may be decreased when the basement construction is completed. Sydney Metro must be informed before termination of the monitoring activities.

8.12 Post-construction phase

Should the Development be designated High risk (refer Table 6.1), the following are required to be submitted to Sydney Metro, after completion of the construction and prior to issue of an Occupation Certificate:

- as-built structural and foundation plans signed by a Competent Person
- as-built drawings for any ground anchors and other support details near the affected Metro Infrastructure
- monitoring summary report (refer to Section 8.11.3)
- copy of the geotechnical mapping report carried out during excavation works
- dilapidation survey report conducted after construction completion (refer to Section 8.1.3)
- if required in the Electrolysis Report, a stray current mitigation verification report, including maintenance base line measurements referenced to measured locations (refer to Section 7.7).

9 Access or works on Sydney Metro Operational Land

This section stipulates the procedures and requirements for obtaining an approval to access and carry out any Development or works on Sydney Metro Operational Land. These works may include, but are not limited to: the erection of temporary or permanent structures, installation of ground anchors, landscaping, construction of borehole logs, carrying out dilapidation surveys, installation of instruments, as well as monitoring and visual inspections.

Approval from Sydney Metro is required in addition to any development consent or other approval or authorisation that may have been given for the Development or works.

9.1 Application for access or works

An application for access or works is to be submitted to Sydney Metro by the Competent Person appointed for access/works supervision.

9.1.1 Application requirements

The application is to be accompanied by the following items to demonstrate that the proposal satisfies the key technical requirements of Sections 4 to 8 of this Guideline:

- plan for works, including physical protection measures of Metro Infrastructure (e.g. in a Construction Management Plan)
- engineering evaluation report
- relevant documents confirming any relevant planning approval
- monitoring plan (if monitoring equipment is proposed)
- landscape plan (if any new vegetation is proposed)
- construction schedule or itemised program for the proposed Development
- proposed timing of access or works, including start/finish and duration
- relevant documentation to confirm that the Competent Person (Protection Officer) appointed for supervision has the appropriate level of rail safety induction and will be present during the Development or works.

Accessing or carrying out works on Sydney Metro Operational Land is subject to review and approval from Sydney Metro and the Operator, where deemed necessary.

Any modifications to Sydney Metro assets may trigger a requirement for review and approval by the Operator's Configuration Change Board (CCB).

Refer to Table 9.1 for details on how to apply to Sydney Metro for an agreement to access and/or undertake Development or works on Sydney Metro Operational Land.

9.1.2 Agreements

As a part of the access approval process, Sydney Metro requires agreements be entered into with Applicants to:

- protect Sydney Metro's rights as the landowner
- set out Sydney Metro's requirements for the proposed works before, during and after construction
- nominate a Person Conducting Business or Undertaking (PCBU) for the purposes of workplace health and safety (WHS) legislation.

Different types of agreements are used, depending on the Development or works proposed and the complexity of the interface. These are described in Table 9.1.

Table 9.1 Sydney Metro agreement types

Name	Circumstance	Access/works timing
Site Interface Deed Poll	Access or Temporary Works on Sydney Metro Stratum (no structures and excavation no greater than 2m)	Deed Poll effective prior to any physical access or works on Sydney Metro Operational Land
Licence for Works	Access or Temporary Works on Sydney Metro Stratum (structures and/or excavation greater than 2m)	Licence effective prior to any physical access or works on Sydney Metro Operational Land
Corridor Protection Deed	Permanent works on Sydney Metro Stratum	Deed effective prior to issue of Construction Certificate
Project Interface Agreement	For public authorities proposing activities on, above or under Sydney Metro Operational Land	Agreement effective prior to any physical access or works on Sydney Metro Operational Land

Notes:

1. *Processing times depend on the nature of proposals and the information provided by proponents.*
2. *These agreements do not replace Applicant/public authority's other obligations (e.g. Rail Safety National Law or requirements imposed by the Operator).*
3. *Sydney Metro's Operator may require additional agreements.*

Specific restrictions not otherwise mentioned within this Guideline may be included in the agreements.

Applicants are responsible for their own costs in preparing and negotiating any agreements.

9.2 Accessing Sydney Metro Operational Land

Applicants should note that authorised access to operational areas such as the rail corridor would only be possible during maintenance shutdown periods in consultation and agreement with the Operator.

Those carrying out these works must be accompanied by the relevant safety personnel when accessing Sydney Metro Operational Land.

9.3 Completion of work

Sydney Metro and the Operator may request a dilapidation survey report be completed (to their satisfaction) following construction completion and demobilisation of equipment, to ensure that minimal impacts have occurred to Sydney Metro land.

10 Contact details and information sources

10.1 Sydney Metro contacts and information sources

Sydney Metro has a dedicated email address for queries relating to development of land in or near Metro Infrastructure. The contact details and information points are outlined in Table 10.1.

Table 10.1 Sydney Metro contact and information points

Contact	Detail
Sydney Metro email address	SydneyMetroCorridorProtection@transport.nsw.gov.au
Sydney Metro website	sydneymetro.info

10.2 Other contacts and information sources

Other useful sources for corridor protection activities are outlined in Table 10.2.

Table 10.2 Other contacts and information sources

Contact	Detail
TfNSW – non-Sydney Metro corridors	corridors@transport.nsw.gov.au
NSW Land Registry Services	nswlrs.com.au
NSW Major Projects (including Sydney Metro planning documents)	planningportal.nsw.gov.au/major-projects
TfNSW – Find a TAO	transport.nsw.gov.au/industry/asset-management-branch/find-a-tao
Before You Dig Australia	byda.com.au/

Appendix A – Sydney Metro network

M1 Northwest and Bankstown Line

Sydney's first metro, the Metro Northwest Line, opened on 26 May 2019. Services at the 13 metro stations operate every four minutes in the peak in each direction on Australia's first driverless railway. The new section of the M1 Line from Chatswood to Sydenham opened on 19 August 2024 and includes 15.5-kilometres of metro rail, extending the existing line from Chatswood, below the harbour and under the Sydney CBD, then out to Sydenham.

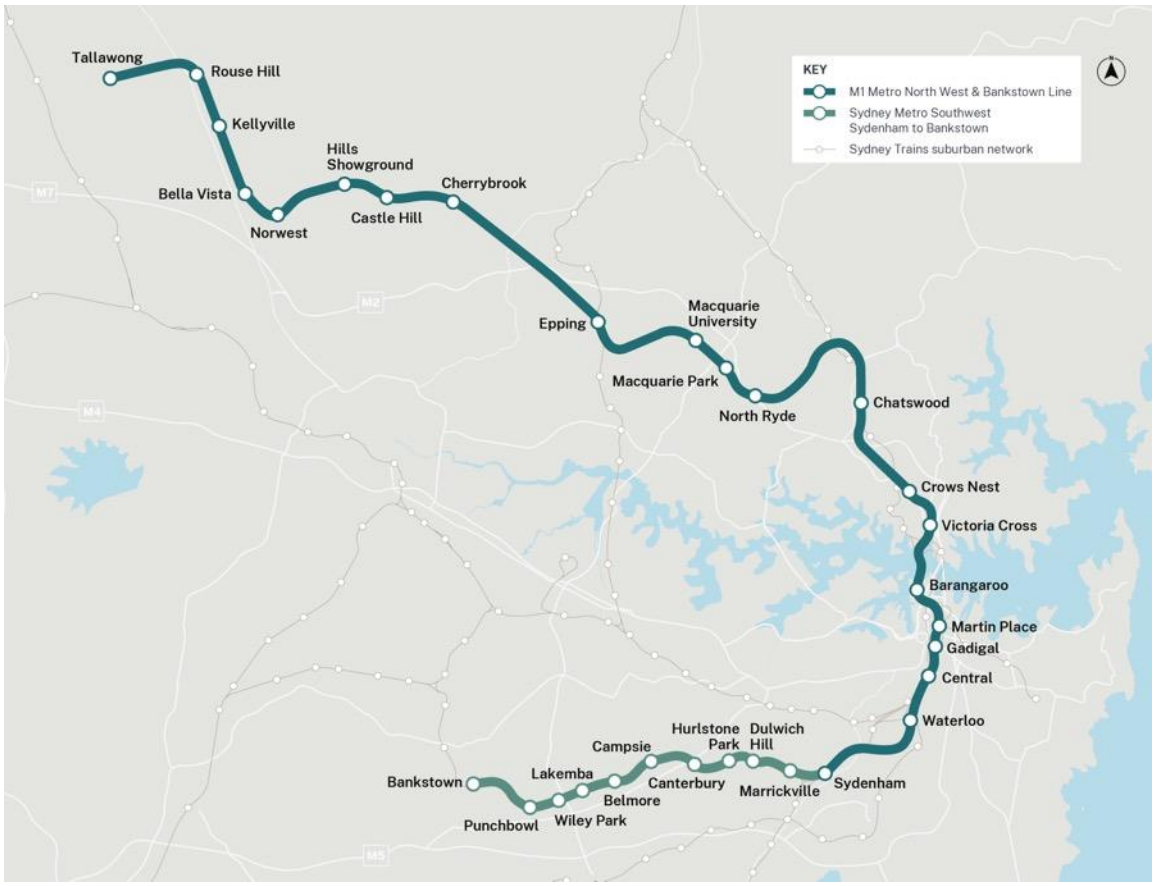

Figure A1 Map of M1 Northwest and Bankstown Line

Northwest section

Sydney's Metro Northwest Line is the first dedicated metro line to be constructed for the metro and extends for 36 kms from Chatswood through to the northwest. The Metro Northwest Line incorporates 13 km of track and rail infrastructure between Epping and Chatswood that has been modified and segregated to form part of the Sydney Metro.

Sydney Metro's Underground Corridor Protection Technical Guideline is relevant for the 28 km tunnel section of the Metro Northwest Line from Chatswood to Bella Vista and associated underground Metro Infrastructure in other locations.

This Guideline is relevant for the at-grade and elevated sections of the corridor from Bella Vista to the Sydney Metro Trains Facility west of Tallawong.

Figure A2 Map of M1 Northwest (Chatswood to Tallawong)

The following are key features of the Metro Northwest section.

Epping to Tallawong

- 23 km of new track and rail infrastructure delivered through approximately 15 km of twin tunnels and 4 km of elevated structure, with the remaining 3 km of rail infrastructure provided at-grade with some sections in cutting.
- Eight new stations are located at Cherrybrook, Castle Hill, Hills Showground, Norwest, Bella Vista, Kellyville, Rouse Hill and Tallawong.
- The stations at Castle Hill, Showground and Norwest are contained within cut-and-cover concrete boxes, while stations at Cherrybrook and Bella Vista follow an open cut station configuration. Stations at Kellyville and Rouse Hill are elevated. Tallawong station is the only station that is at-grade.
- The approximately 15 km of twin running tunnels have an internal diameter of approximately 6.2 m and an external diameter of approximately 7.0 m and have been excavated predominantly through shale and sandstone mostly using tunnel boring machines (TBMs). The tunnels are supported using a precast concrete segmental lining except for the mined tunnels between the Epping Service Facility and Epping Station where in situ concrete has been used.
- There are 61 cross passages between running tunnels at approximately 240m centres. These cross passages have been mined and are supported using a permanent cast in situ concrete lining.
- There are services shafts at Epping and Cheltenham area which are cut-and-cover structures. These shafts are supported using permanent cast in situ concrete lining.

- Other structures include nozzle enlargement at the ends of stations at Castle Hill, Hills Showground and Norwest. These have been mined and are supported using a permanent cast in situ concrete lining.
- A 159 m long mined crossover cavern is immediately east (city side) of Castle Hill Station. The cavern has a span of 21 m wide and has a height that varies from 14 m to 17 m. The cavern is supported by a permanent cast in situ concrete lining.

Epping to Chatswood (previously ECRL)

- The 13 km length of existing track and rail infrastructure between Epping and Chatswood, previously known as the Epping to Chatswood Rail Link (ECRL), has been converted to form part of the Sydney Metro system.
- The underground infrastructure comprises twin single track tunnels with an excavation diameter of 7.2 m and four underground stations completed in 2008.
- The underground station structures at North Ryde, Macquarie Park and Macquarie University consist of large span platform caverns typically of about 19 m in span and 13 m in height, together with concourse caverns, access tunnels, adits, shaft and associated plant and equipment rooms. The station caverns have been excavated in mainly competent, horizontally bedded sandstone and shales permanently supported using composite linings consisting of rock reinforcement in the form of rock bolts and shotcrete.
- Epping Station comprises two platform caverns connected by cross passages and accessed through escalator tunnels, lift shafts and two large plant room ventilation shafts. This station is located beneath the existing surface station.
- The running tunnels were excavated by rock tunnel boring machines (TBMs) and underground stations and associated structures were excavated using roadheaders, rock hammers and rock saws. The running tunnel support consists of temporary primary support using rock bolts and shotcrete, and final support using unreinforced cast-in situ concrete lining, nominally 200 mm thick. A section of the running tunnels was lined with shotcrete for construction reasons. The invert of the tunnel consists of precast reinforced segments with a floating track slab.

City & Southwest section

The Sydney Metro City & Southwest project includes a new 30km metro line extending metro rail from the end of the existing metro line at Chatswood, under Sydney Harbour, through new CBD stations and southwest to Bankstown.

Sydney Metro City & Southwest delivered new metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Gadigal in the CBD, Waterloo and new metro platforms at Central and Sydenham stations. In addition, 11 stations between Marrickville and Bankstown have been upgraded and converted to metro standards.

This Guideline is relevant for the at-grade sections from Chatswood to Sydenham.

Figure A3 Map of M1 City and Southwest (Chatswood to Bankstown section)

The following are key features of the Sydney Metro City section

Sydney Metro City

- The city section consists of a short section of surface track from Chatswood Station to the dive and portal structure then underground infrastructure that extends under St Leonards, Crows Nest, North Sydney and Sydney Harbour and then beneath the Sydney CBD to Central and Waterloo and through to Sydenham where the metro comes to the surface at a portal and Dive Structure at Marrickville.
- New stations are located at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Gadigal in the CBD and Waterloo, with new metro platforms at Central and Sydenham stations.
- Twin running tunnels of approximately 14 km in length (portal to portal) were excavated using TBMs and supported using a precast concrete segmental lining to create a watertight environment. The tunnels predominantly align through siltstone and sandstone, except below the Sydney Harbour where TBM tunnelling was required through marine ground sediments.
- A total of 57 mined cross passages are located between running tunnels at regular intervals, with spacing of around 240 m centres. The cross passages were excavated using mechanical methods and supported using a tanked permanent lining, formed using cast in situ concrete. A services shaft connects with a cross passage at Artarmon. The shaft is supported by permanent cast in situ concrete lining.
- Waterloo Station, Barangaroo Station, Crows Nest Station and the underground metro platforms at Central Station are cut-and-cover box structures that contain island platforms. The stations are typically 24 m in width and range from 200 m to 215 m in length. Gadigal Station and Martin Place Station have binocular platform caverns that connect with

two entrance and services shaft structures, while Victoria Cross Station has a single-span cavern with an island platform, which also connects with two entrance and services shaft structures.

- At Martin Place Station and Gadigal Station the platform caverns range in length from 193 m to 246 m and have spans of approximately 12 m with an approximate height of 11 m. At the Victoria Cross Station, the platform cavern is approximately 174 m in length and has a span of 23 m with a height of 13 m. All the caverns and adits were excavated using mechanical methods and supported using a tanked permanent lining, formed using cast in situ concrete.
- A mined cross over cavern which is 226 m in length was constructed immediately north of Barangaroo Station. This cavern has an internal span of 23 m wide and a height that varies from 14 m to 17 m. The cavern is supported using a tanked cast in situ concrete lining.
- Mined tunnel enlargements that are up to around 17 m in length are provided to house tunnel ventilation equipment at either end of the Victoria Cross Station caverns, the northern end of the rail crossover at Barangaroo, the southern end of Waterloo Station and at the northern end of Crows Nest Station. The nozzle enlargements were excavated using mechanical methods and supported using a tanked permanent lining, formed using cast in situ concrete.

Sydney Metro Southwest (all infrastructure is at-grade or elevated)

- This section of the metro was part of the T3 Bankstown Line, but has been converted to metro standards from Sydenham to Bankstown.
- The extension of Sydney Metro in the southwest involves upgrading the T3 Bankstown Line and associated rail corridor from just beyond Sydenham Station through to Bankstown Station to enable the conversion to Sydney Metro operations.
- Ten existing stations at Marrickville, Dulwich Hill, Hurlstone Park, Canterbury, Campsie, Belmore, Lakemba, Wiley Park, Punchbowl and Bankstown have been upgraded to improve accessibility for customers and meet the standards required for metro operations.

Sydney Metro West

The Sydney Metro West project is a new 24-kilometre underground metro railway doubling rail capacity between Parramatta and the Sydney CBD.

Sydney Metro West stations include Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont, and Hunter Street in the Sydney CBD.

Sydney Metro's Underground Corridor Protection Technical Guidelines is relevant for the entire Sydney Metro West alignment as it is all underground, with the exception of the stabling and maintenance facility at Clyde.

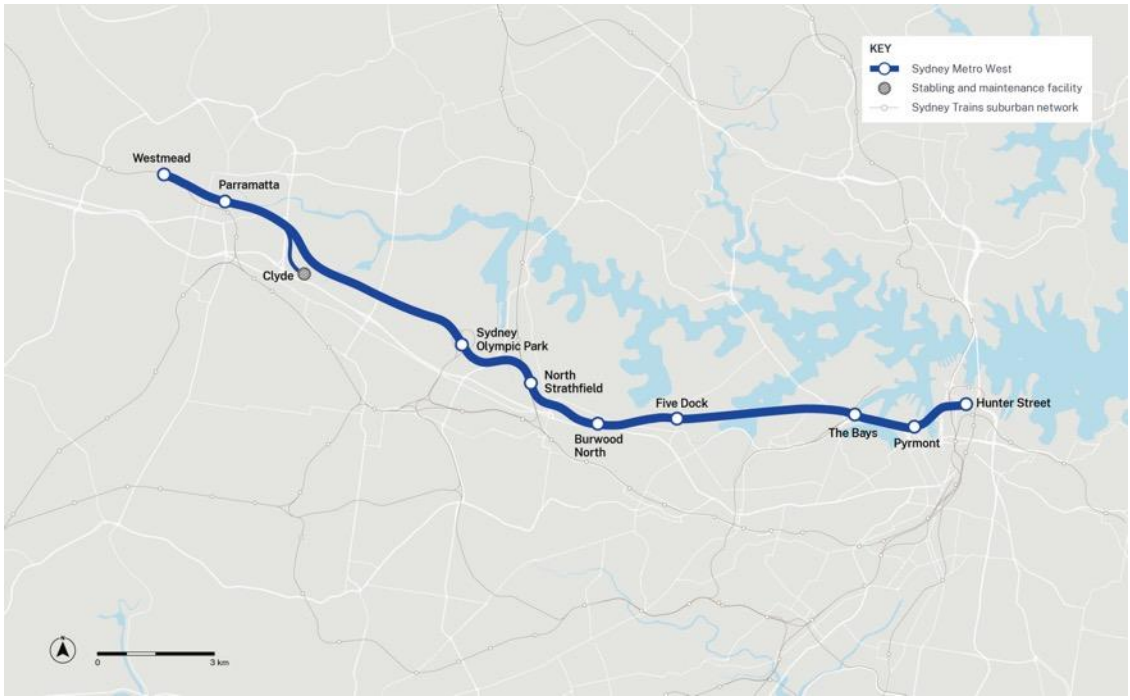

Figure A4 Map of Sydney Metro West

The following are key features of this planned section of the metro system:

Westmead to The Bays

- Tunnelling for Westmead to The Bays is expected to be complete by 2026. There are two tunnel boring machine (TBM) launch and support sites at Clyde and The Bays Station construction site.
- Sydney Metro West includes twin tunnels around 24 km in length, excavated using TBMs and supported using a precast concrete segmental lining to create a watertight environment. The tunnels have a circular cross-section with an internal lined diameter of about six metres and an excavated diameter of about seven metres.
- Cross passages are provided between running tunnels at regular intervals, with a maximum spacing of around 240 m. The cross passages are excavated using roadheaders and rock hammers and supported using a watertight permanent lining, formed using cast in situ concrete.
- Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North and The Bays are cut-and-cover stations.
- Five Dock is a binocular mined cavern station.
- A Dive Structure and Tunnel Portal are located at Rosehill within the Clyde stabling and maintenance construction site to provide for a connection from the Clyde stabling and maintenance facility to the mainline tunnels. Underground connecting tunnels are excavated by road header from the Tunnel Portal to the mainline tunnels.

The Bays to Hunter Street

- Tunnelling from The Bays to Hunter Street includes a launch and support site at The Bays Station construction site. Two TBMs launched

from this construction site and tunnelled towards Hunter Street in Sydney CBD.

- Twin tunnels around 3.5 kilometres in length, excavated using TBMs and supported using a precast concrete segmental lining to create a watertight environment.
- Excavation of the twin tunnels under the harbour at Johnstons Bay and Darling Harbour, before reaching Hunter Street.
- Roadheaders and/or rock hammers are used underground to dig crossover caverns and passages between the tunnels, and also a turnback cavern east of Hunter Street Station.
- The Bays is a cut-and-cover station, while Pyrmont and Hunter Street in the Sydney CBD are mined, single-span caverns.
- A crossover cavern located below Pyrmont Station provides a track crossing point that enables a train to cross between two parallel tracks, ensuring smooth metro service operations.

Sydney Metro Western Sydney Airport

The Sydney Metro Western Sydney Airport project is a new 23-kilometre railway for Greater Western Sydney, connecting communities and travellers with the new Western Sydney International (Nancy-Bird Walton) Airport and the growing region.

Sydney Metro - Western Sydney Airport extends from St Marys in the north connecting to stations at Orchard Hills, Luddenham, Airport Business Park, Airport Terminal and Bradfield. The new metro railway line includes a combination of tunnel, surface and viaduct sections.

The following are key features of this planned section of the Sydney Metro system:

- The new metro railway line is approximately 23 kms in length.
- 3.5 km of elevated viaduct at Orchard Hills and Luddenham.
- 6.7 km of earthworks for track formation.
- A stabling and maintenance facility is located in Orchard Hills to the south of Blaxland Creek and east of the alignment with access via Patons Lane.
- 9.8 km of twin tunnels were excavated using TBMs and supported using a precast concrete segmental lining to create a watertight environment. The tunnels have a circular cross-section with an internal lined diameter of about six metres and an excavated diameter of about seven metres.
- Cross passages are provided between running tunnels at regular intervals, with a maximum spacing of around 240 m. The cross passages have been excavated using roadheaders and rock hammers and supported using a watertight permanent lining, formed using cast insitu concrete.

These Guidelines are relevant for the at-grade and elevated sections as shown below and at-grade/elevated Metro Infrastructure in other locations.

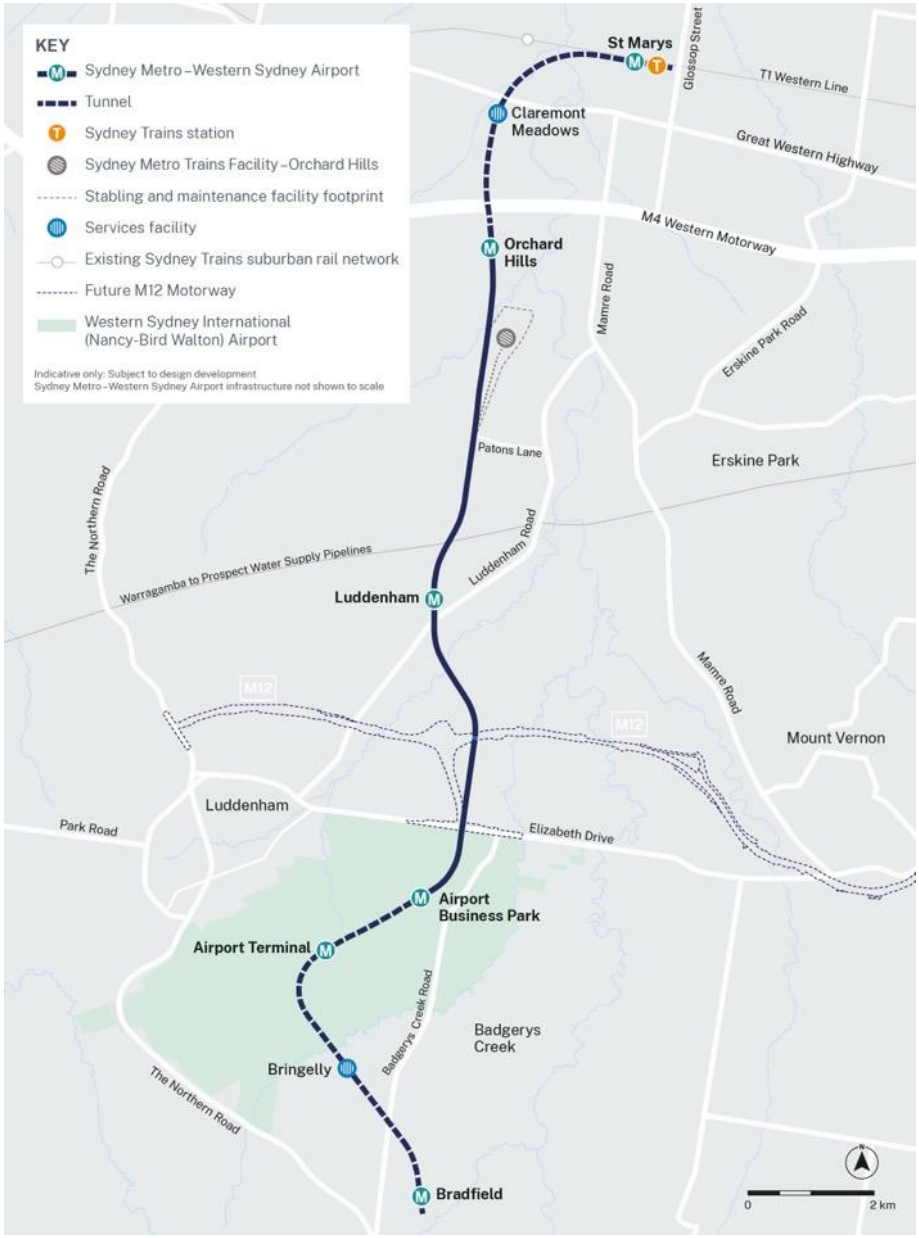

Figure A5 Map of Sydney Metro Western Sydney Airport

Proposed future extensions would link Sydney Metro Western Sydney Airport with Tallawong in the northwest and Macarthur in the south.

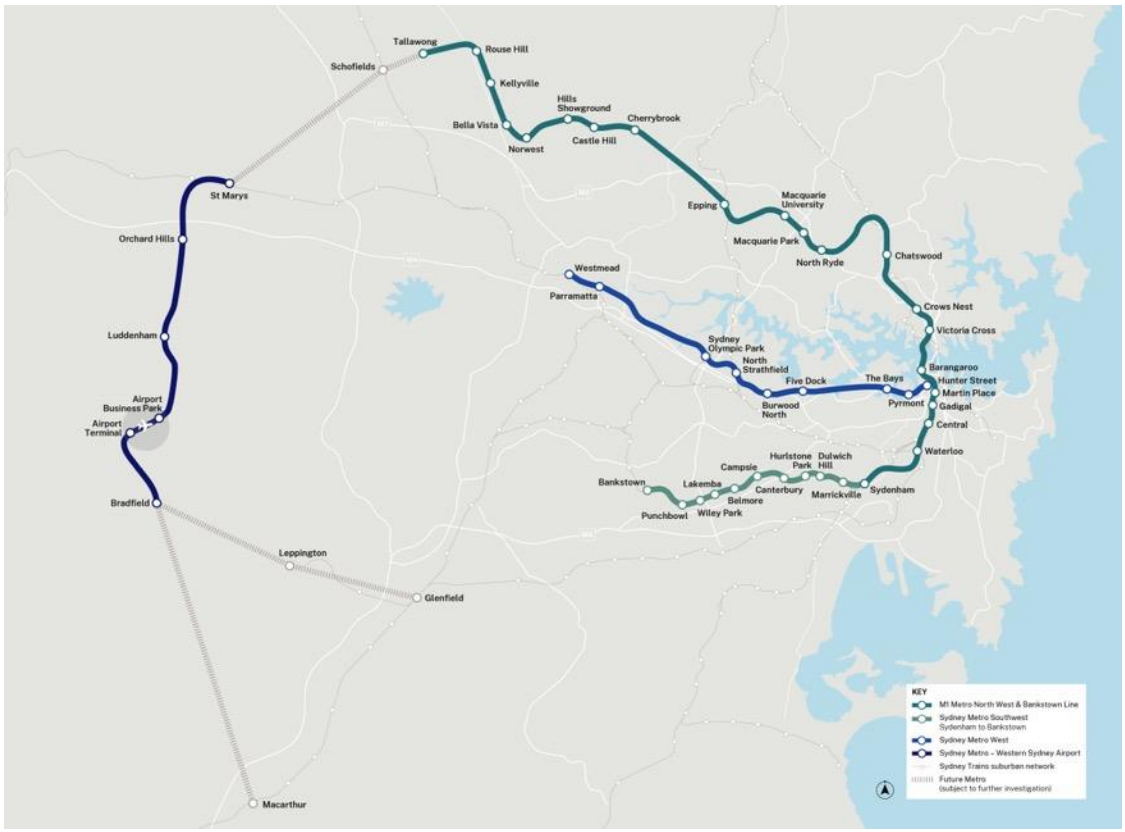

Figure A6 Map of Sydney Metro network – existing and future

It is intended that these Guidelines will be applicable to future Sydney Metro corridors as they are announced.

The Sydney Metro website [7] has further information about future Sydney Metro corridors.

[7] <https://www.sydneymetro.info>

Appendix B – Development Application lodgement checklist

Where legislation requires referral of or concurrence for proposed Developments in or near Sydney Metro rail corridors, the Applicant must lodge the following documents as part of their Development Application package:

Notes:

1. *Applicants are to ensure any standards being relied upon are relevant and current. Any reports and/or assessments mentioning standards should clearly state their correct title and version number.*
2. *Any plans provided should contain sources for information on the drawings (e.g. if there is a stormwater drain on a plan, the original drawing number should be quoted).*

Table B1 Development Application lodgement checklist

Item	Description	Check
For all applications		
Title and survey		
1.	Copy of the current land title(s) including all Easements (including rights of way), covenants and caveats	☐
2.	Detailed survey plan and critical sections prepared by a NSW registered surveyor, including: • Lot and Deposited Plan (DP) number(s) • site dimensions • reduced levels (RLs) to Australian Height Datum (AHD) • existing basements within the subject site, which accurately defines the boundaries between the Development and: • the rail corridor (including Sydney Metro First and Second Reserves) • adjoining (surface, below and above ground) Metro Infrastructure and utilities • any Sydney Metro land • any Easements (including right of ways). (Examples provided in Appendix E – Sample plans and sections)	☐
Searches		
3.	Evidence of a recent: • Before You Dig Australia search; and • (if any Development is proposed within the First Reserve), a request to and information provided by Sydney Metro regarding utilities in Sydney Metro Operational Land.	☐

Item	Description	Check
	Architectural drawings (all measurements contained within the sectional drawings must be verified by a registered surveyor or clear reference should be provided on the drawings to the source survey.)	
4.	Plans, elevations and cross-sectional drawings showing: • Proposed building footprint at ground level and below • Dimensions • RLs • the position and distances from the rail corridor (including Sydney Metro First and Second Reserves) and Metro Infrastructure • fencing details • balcony and window design (for Development in the First or Second Reserves).	☐
	Engineering reports and drawings (all measurements contained within the sectional drawings must be verified by a registered surveyor or clear reference on the drawings should be provided to the source survey.)	
5.	Civil drawings for (as appropriate): roadworks, stormwater drainage, wastewater drainage, utilities, earthworks, retaining walls and fencing (plans, elevations, long sections, cross-sections with dimensions, RL's and invert levels), including relationship to the railway corridor, Metro Infrastructure and Sydney Metro First and Second Reserves.	☐
	For proposals on sites located in areas that have been used for commercial, industrial or agricultural activities, or involved the storage of chemicals, such as service stations and dry cleaners (in addition to the information listed above)	
6.	Preliminary Site Investigation Report (contamination) in accordance with Section 7.5 of this Guideline.	☐
	For Medium and High Risk proposals (in addition to the information listed above)	
	Engineering reports and drawings (all measurements contained within the cross-sectional drawings must be verified by a registered surveyor or clear reference should be provided on the drawings to the source survey.)	
7.	Plans and cross-sectional drawings of structural design, including details of Development footings.	☐
8.	Plans and cross-sectional drawings showing details of any proposed excavation retention system, including details regarding Temporary Works (e.g. piled walls for basements, ground anchors).	☐
9.	Geotechnical Investigation Report with details in accordance with Section 7.1 of this Guideline.	☐
10.	Engineering Impact Assessment Report with details in accordance with Section 7.2 of this Guideline.	☐

Item	Description	Check
11.	For Developments in the First Reserve which can't meet Guideline requirements but propose an alternative approach to satisfy Sydney Metro, a Concession Application with evidence (refer Section 7.2.3).	☐
12.	Proposed construction methodology for the Development, including construction staging/sequencing, details of the structural support to be provided to the Development and rail corridor during excavation and operation of the Development.	☐
13.	Risk Assessment Report in accordance with Section 7.3 of this Guideline.	☐
14.	Noise and Vibration Report with details in accordance with Section 7.4 of this Guideline.	☐
15.	Any other reports which Sydney Metro may request due to site and/or Development-specific reasons.	☐
For High Risk proposals (in addition to the information listed above)		
Engineering reports		
16.	Independent Assessment Report (by a TAO) with details in accordance with Section 7.2.4 of this Guideline.	☐
17.	If required by Sydney Metro, a Fire Safety Assessment Report in accordance with Section 5.11.1 of this Guideline.	☐
18.	Preliminary Site Investigation Report (contamination) in accordance with Section 7.5 of this Guideline.	☐
19.	If required by Sydney Metro, a Security Risk Assessment in accordance with Section 7.8 of this Guideline.	☐
20.	If required by Sydney Metro, a preliminary monitoring plan in accordance with Section 7.9.1 of this Guideline.	☐

Note: Sydney Metro will likely request (as a part of a development consent) additional information to be provided with a Construction Certificate application or to be provided prior, during and/or after construction.

Appendix C – Glossary

Abbreviation	Explanation
Alarm	Notification required to be given when monitored works reach or exceed a limit specified in a monitoring plan.
Alert	Notification required to be given when works are approaching a limit specified in a monitoring plan.
Applicant	A person or organisation applying for consent for Development, as well as a person or organisation carrying out Development.
Competent Person	An individual who has the means and ability to undertake design, checking and verification activities to a recognised standard with the appropriate combination of technical knowledge, skills and relevant experience. Refer to Appendix D – Competent Person for the process to determine a Competent Person. A Competent Person will be required to provide a factual curriculum vitae, statement of qualifications, experience and supporting documentation that provides evidence of competence which will be subject to review and acceptance by Sydney Metro.
Dangerous Goods	As defined in the Australian Code for the Transport of Dangerous Goods by Road and Rail (also known as the Australian Dangerous Goods Code).
Designer	Competent Person responsible for preparing a detailed design and analysis that demonstrates the effects of changed conditions on Metro Infrastructure arising as a consequence of a proposed Development. Competence definitions for Designer are set out in Appendix D – Competent Person.
Design Checker/Designer/ Design Verifier	Competent Person responsible for checking that a design is correct. Competence definitions for Design Checker/Designer/Design Verifiers are set out in Appendix D – Competent Person.

Abbreviation	Explanation
Development	Has the same meaning as given to that term in the EP&A Act and for the purpose of this Guideline includes as the case requires: associated works, demolition, excavation, alteration of existing structures, temporary and permanent groundwater drawdown, pipe jacking, site investigations, and construction of and works associated with basements, foundations, anchors, tunnels and retaining walls.
Dive Structure	The section of railway infrastructure that allows tracks to transition from surface level to underground, facilitating changes in elevation.
Easement	A right applying over land. An Easement enables a parcel of land to have the use of other land that may be in different ownership for a specific non-exclusive purpose. The Easement can be limited in either height or depth or width or all. The land the subject of the Easement may be referred to as Easement land.
EP&A Act	*Environmental Planning and Assessment Act 1979*
First Reserve	Represents the area that must not be encroached upon by any future Development or works, with the exception of Minor Works, penetrative subsurface investigations, utilities and/or landscaping. (Refer to Table 3.5).
Hazardous Chemicals	Substances, mixtures and articles that can pose a health or physical hazard to humans. They may be solids, liquids or gases.
IV	Independent Verification
Independent Verifier	Competent Person responsible for independently verifying a discipline-specific design complies with relevant requirements and standards and is safe and fit for purpose. Competent individual responsible for checking that the design is correct. (Only required for High Risk Developments).
Metro Infrastructure	Rail infrastructure facilities (within the meaning of that term in Section 2.91 of the Transport and Infrastructure SEPP) that are for the purpose of a Sydney Metro line.

Abbreviation	Explanation

Minor Works	Works that must not impact Metro Infrastructure, including:
	• not exceeding:
	  ○ 1 m excavation (excepting approved boreholes); and
	  ○ 20 kPa ULS (Ultimate Limit State) uniform load (or equivalent); and
	• not preventing or affecting access or access for repair and maintenance to Metro Infrastructure; and
	• not being a habitable structure

Operator	The rail transport Operator for Sydney Metro with applicable obligations under the Rail Safety National Law and Rail Safety Regulations.
Principal Certifier	A council or registered certifier (or the Minister for Planning as the case may be for Development for which the Minister granted Development consent), who is appointed as the Principal Certifier in accordance with the EP&A Act.
Second Reserve	Surrounds the First Reserve and covers the areas where Development or works has the potential to adversely impact on the performance of the support elements of at-grade and elevated Metro Infrastructure, metro operations or the feasibility of planned Metro Infrastructure. (Refer to Table 3.5).
Stratum	Land owned which is limited in either height or depth or width or all. This is also referred as Stratum land. Refer to Section 6.4.1 for details to obtain Sydney Metro Stratum information.
Sydney Metro	The corporation and NSW Government agency of that name constituted under the *Transport Administration Act 1988*.
Sydney Metro Operational Land	Land owned, leased, managed or controlled by Sydney Metro or an organisation acting on behalf of Sydney Metro.
Temporary Works	Mobile cranes, scaffolding and other items which may exert temporary loading.
TfNSW	The corporation and NSW Government agency with the name of Transport for NSW constituted under the *Transport Administration Act 1988*.

Abbreviation	Explanation
Transport and Infrastructure SEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
Tunnel Portal	The entrance or exit point of a tunnel where it transitions to the surface.

Appendix D – Competent Person

The tables below are based on the Sydney Metro Competency Management Plan and are provided to indicate the levels of competency that would be acceptable to Sydney Metro.

Table D1 Minimum competency levels

Role	Low risk / complexity	Moderate risk / complexity	High risk / complexity
Designer	Level 1	Level 2	Level 3
Technical Manager	Level 2	Level 2	Level 2
Design Checker	Level 1	Level 2	Level 3
Design Verifier	Level 2	Level 4	Level 4
Engineering assurance	Level 3	Level 3	Level 4
Independent Verifier	N/A	N/A	Level 4 (and TAO)

Note: Risk category is defined in Table 6.1. *Sydney Metro will be the final determinant of Development/works risk level.*

Four competence levels are identified from Level 1 – the most junior to Level 4 – the most experienced. Criteria and definition of each level is described in Table D2.

Table D2 Competency levels

Level	Description
Level 1 – Qualified Practitioner (supervised)	The Qualified Practitioner possesses basic knowledge of at least 80% of the systems within the practice area, including the principles around functional analysis, design, acceptance and application. They shall have received formal education and will work under the supervision of a designated Practitioner at a greater level of proficiency. Minimum requirements are discipline-specific tertiary degree or equivalent Industry Certification within the Australian Qualifications Framework (AQF) and five years general work experience relevant to the discipline.
Level 2 – Experienced Practitioner	The Experienced Practitioner possesses the basic knowledge of a Qualified Practitioner, with additional detailed knowledge and understanding of one or more practice areas. Knowledge must include safety implications and key functional aspects, failure mechanisms across multiple modes of operation and use, and lifecycle considerations such as maintainability, availability and reliability. They shall have had direct experience of applying their knowledge in a number of projects, preferably including in the rail sector. Minimum requirements are as a Qualified Practitioner, with additional five years' experience relevant to one or more practice areas, and evidence of relevant continued professional development equivalent to the requirements of Engineers Australia Continuing Professional Development (CPD) requirements or equivalent professional body.
Level 3 – Senior Practitioner	The Senior Practitioner possesses the knowledge and experience of an Experienced Practitioner, with additional experience supervising or guiding less experienced practitioners, and/or a leadership role in the area(s) of practice. Minimum requirements are as an Experienced Practitioner with additional five years' experience relevant to one or more practice areas, with Chartered professional accreditation such as Chartered Professional Engineers (CPEng), as conferred by Engineering Australia or ability to demonstrable equivalent level of relevant and continued professional development.
Level 4 – Expert Practitioner	The Expert Practitioner possesses the technical knowledge, experience and accreditation of a Senior Practitioner, with additional substantial experience applying domain knowledge across a range of comparable projects and a demonstrable record of successfully leading other engineers or practitioners, of managing technical risk, and leading safety in engineering practice in their area or specialisation. The Expert Practitioner will have established a recognised profile within a relevant industry association. Minimum requirements are as a Senior Practitioner with additional five years' experience relevant to one or more practice areas, and evidence of relevant, continued professional development or maintaining professional accreditation.

Appendix E – Sample plans and sections

The provision of surveys with applications and/or associated reports are essential for accurate assessment of a Development proposal.

Survey plans and sections are to be prepared by a NSW registered surveyor and accurately define the boundaries between the proposed Development, the rail corridor (including track centre lines, First and Second Reserves), Metro Infrastructure, Sydney Metro land and any Easements (including right of ways).

Surveys are to be accompanied by a Deposited Plan (title documentation) for the applicable property(s).

Metro Infrastructure should be based on Work as Executed (WAE) drawings unless such drawings do not exist. Such drawings can be requested from Sydney Metro (see Section 10.1).

Examples of acceptable surveys with key features highlighted, for both construction work and boreholes, are provided in the following sections.

Development

The proposed Development is to be overlaid on the plans and sections verified by a registered surveyor or clear reference should be provided on the drawings to the source survey.

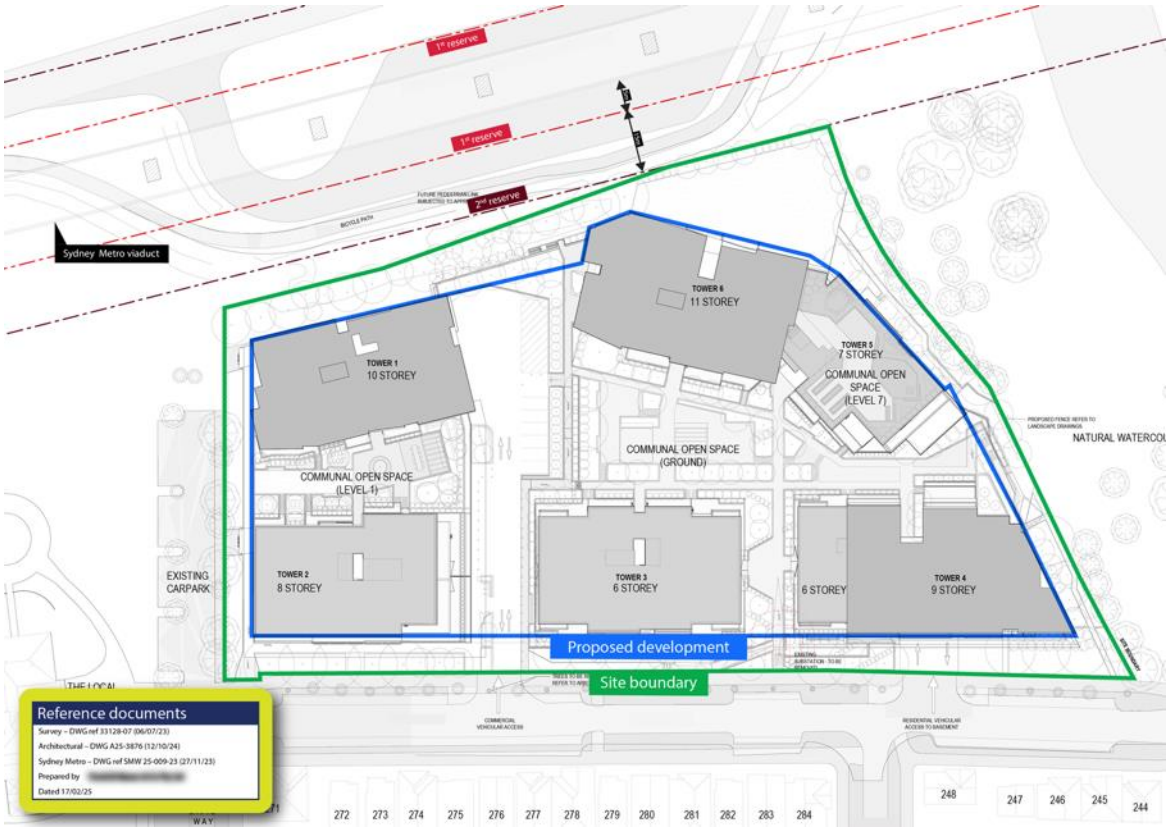

Figure E1 Plan showing Development footprint and relationship to Metro Infrastructure

Figure E2 Cross-section showing Development envelope and relationship to Metro Infrastructure

Boreholes

The location of proposed boreholes are to be provided on plans and cross-sections prepared by a NSW registered surveyor.

Figure E3 Proposed borehole plan

Appendix F – Reference documents

The following documents have been referenced to prepare this Guideline.

Legislation and guidelines

NSW

- Environmental Planning and Assessment Act 1979
- State Environmental Planning Policy (Transport and Infrastructure) 2021.
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021.
- State Environmental Planning Policy (Precincts – Central River City) 2021.
- Contaminated Land Guidelines: Consultants reporting on contaminated land (NSW EPA, 2020).
- Contaminated Land Consultant Certification Policy (NSW EPA, 2022)
- Development Near Rail Corridors and Busy Roads – Interim Guidelines – (NSW Department of Planning, 2008)
- Interim Construction Noise Guidelines (NSW EPA, 2009)
- Noise Policy for Industry (NSW EPA, 2017)

Australia

- Rail Safety National Law and associated National Rail Safety Regulations
- National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 1999)

Transport for NSW Standards

- TS 01717 Development Near Rail Tunnels.
- TS 01719 Miscellaneous Structures
- TS 02404 Airspace and External Developments
- TS 03505 Track Monitoring Requirements for Undertrack Excavation
- TS 03676 Electrolysis from Stray DC Current
- TS 04981 System Safety Standard for New or Altered Assets

Other reference documents

- Australian Standard AS 2187: Part 2-2006 Explosives – Storage and Use – Part 2: Use of Explosives
- Australian Standard AS 5100.2 – 2004 Bridge design – Part 2: Design loads
- British Standard BS 5228-2:2009 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration

- British Standard BS 7385 Part 2 -1993 Evaluation and measurement for vibration in buildings Part 2
- CIRIA C760, Guidance on Embedded Retaining Wall Design, 2017
- DIN 4150-3:2016 Vibration in Buildings – Part 3: Effects on Structures
- HB 167: 2006 Security risk management
- ISO 31000: 2018-02 Risk management – Guidelines
- Safework Australia: Managing risks of storing chemicals in the workplace
- Safework Australia: Storage of flammable liquids guide
- Safework NSW: First aid in the workplace
- Safework NSW: How to manage work health and safety risks
- Safework NSW: Managing risks of Hazardous Chemicals in the workplace
- Safework NSW: Managing the work environment and facilities
- Safework NSW: Safe design of structures
- Sydney Metro General Specification – Geotechnical Investigations (Ref. SM-20-00130154), including Minimum Construction Requirements for Water Bores in Australia, 4th ed., 2020
- Australian and International Standards referenced in any of the Transport for NSW Standards and legislation and guidelines listed above