Sydney Metro Project Submission in respect to the Environmental Impact Statement

Prepared for Monte Sant' Angelo Mercy College

June 2016

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Executive Summary

This is a submission in respect to the proposed Sydney Metro project prepared on behalf of the Sisters of Mercy and Monte Sant' Angelo Mercy College, located in Miller Street, North Sydney otherwise referred to as the "Monte Campus".

The Victoria Cross Station and tunnel is proposed along the alignment of Miller Street directly adjacent to the Monte campus. While the underground station entry/exit will be from the southern end of the platform near the corner of Berry Street, the land to the immediate north of the School (194 Miller Street) has or will be acquired for the project. This site will operate as a construction site and tunnel access during the construction phase and then a services facility in the operational phase.

The proposed works associated with the Victoria Cross Station component of the project will have an **unreasonable and unacceptable impact** on the Sisters of Mercy and Monte Sant' Angelo Mercy College. This impact can be substantially attributed to the proposed location and construction of the northern services shaft at 194 Miller Street ("the northern site") which is immediately adjacent to the new performing arts centre of the Monte Campus as well as the convent buildings for the Sisters of Mercy.

Our submission has identified the following key impacts, **which we submit warrant the re-location of the northern construction site and future services building**. These impacts relate to:

- Airborne and ground borne construction noise that will have:
    - Severe impacts on the use of O'Regan Arts and Cultural Common (ACC) which includes a large theatre for the duration of the construction stage of the project.
    - Severe impacts on the Sisters of Mercy convent buildings located immediately adjacent to the tunnel shaft.
    - Adverse impacts on day to day use and operations of School in particular around important times of school examinations and the like.
- Impacts on school access, safety and security during the construction phase.
- Impacts at the operational phase of the project.
- The lack of information and detail in the EIS and the lack of adequate early consultation that has led to serious inadequacies in the environmental impact assessment.

While acknowledging the substantial scope of the Sydney Metro Project, the EIS fundamentally fails to properly and adequately identify and assess the impacts of the project on the Monte campus. It is our submission that a proper and thorough assessment of the site context would have at the outset identified the highly sensitive nature of the "northern site". This sensitivity is largely the result of the recently constructed performing arts centre immediately adjacent to the subject works, but equally the relationship between the construction site and the front door of the School to the immediate south which is a sensitive and highly pedestrianised environment.

To understand the likely severity of the impacts, the School has retained acoustic engineers Wilkinson Murray to undertake a technical review of the EIS and the supporting Technical Paper 2: Noise and Vibration prepared by SLR Consulting. This report is included as **Appendix 1** to this submission and substantiates the genuine concerns of the School in terms of airborne and ground borne construction impacts, which will reach unacceptable limits.

If pursued as proposed, the proposal will be manifestly unreasonable and result in material and substantial impacts on the Monte campus and the operational needs of the School.

1 Introduction

This report identifies the key implications associated with the proposed Sydney Metro project as it will impact on the Sisters of Mercy and Monte Sant' Angelo Mercy College, located in Miller Street, North Sydney otherwise referred to as the "Monte Campus".

The Victoria Cross Station and tunnel is proposed along the alignment of Miller Street directly adjacent to the Monte campus. While the underground station entry/exit will be from the southern end of the platform near the corner of Berry Street, the land to the immediate north of the School (194 Miller Street) has been acquired for the project. This site will operate as a construction site and tunnel access during the construction phase and then a services facility in the operational phase.

This report specifically addresses the impacts associated with the works proposed within the Victoria Cross Station Precinct which includes the 194 Miller Street site ("the northern site") as well as the main station portal site located at the intersection of Berry Street. This report is supported by an independent assessment of the acoustic implications prepared by Wilkinson Murray Acoustic Engineers.

FIGURE 1 – SITE CONTEXT (SOURCE EIS – AS AMENDED TO SHOW RELATIONSHIP WITH MONTE CAMPUS)

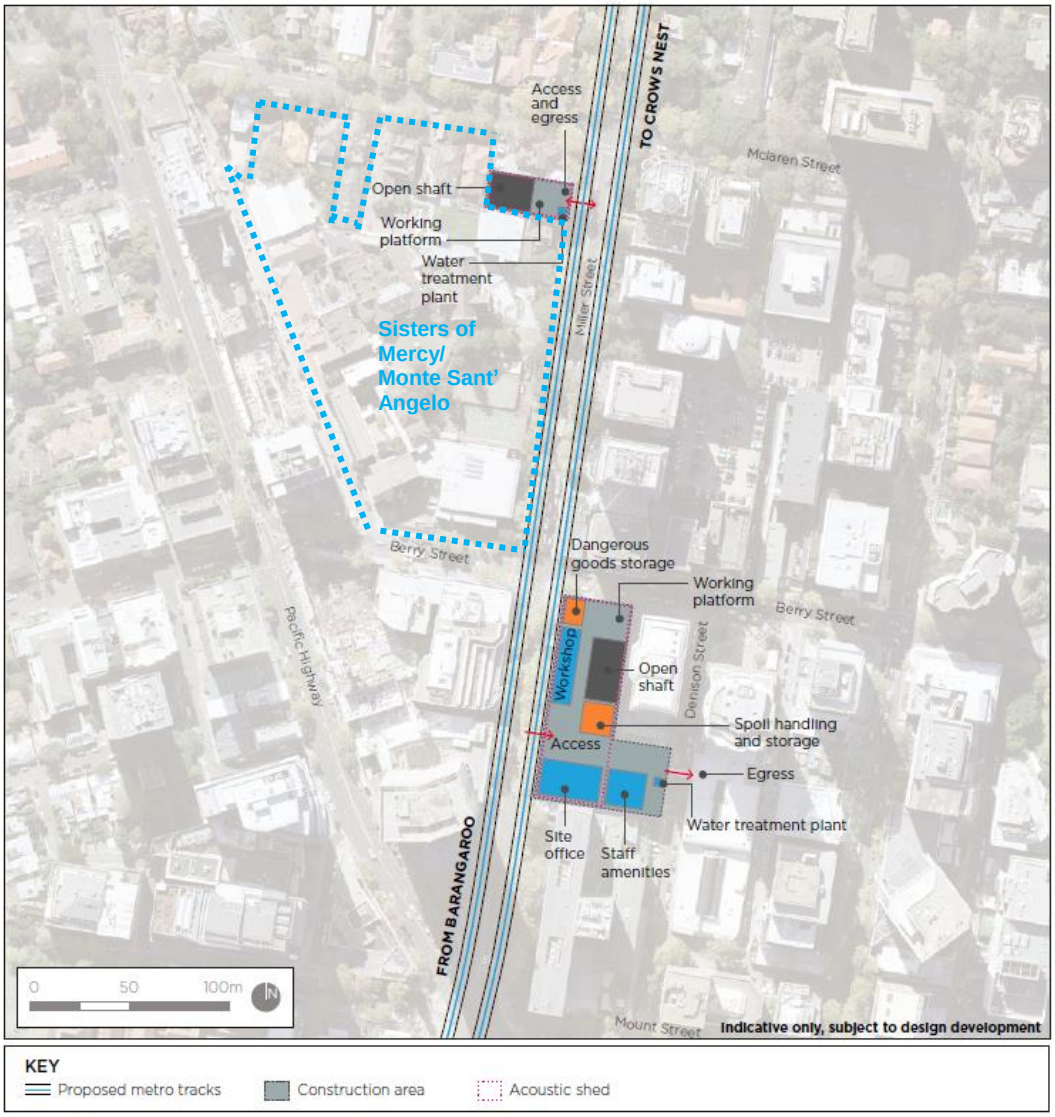


Figure 7-11 Victoria Cross Station construction site indicative layout

2 Description of the Monte Campus

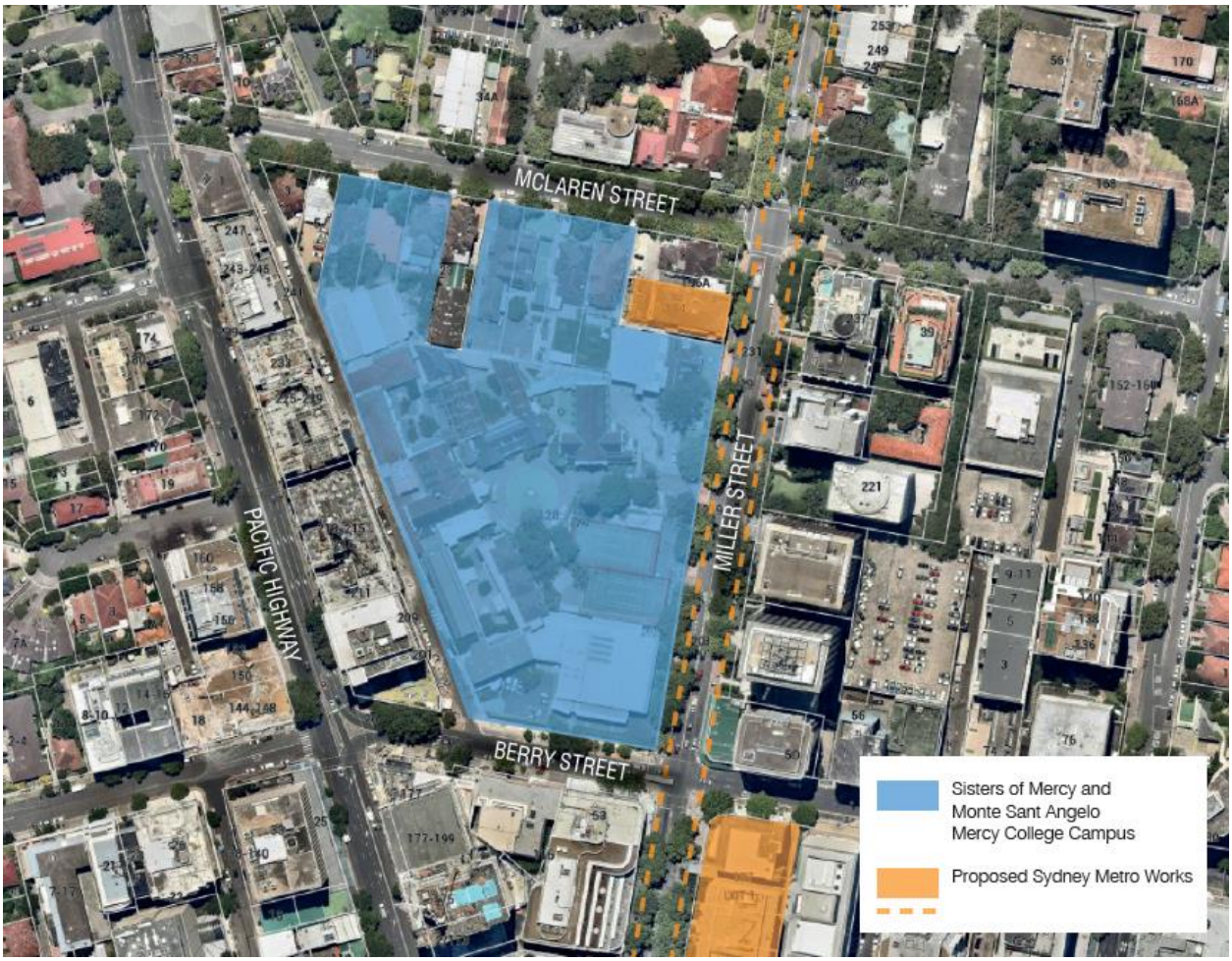
2.1 CONTEXT

The Sisters of Mercy land holding is an irregular shaped lot that occupies the majority of the street block, bordered by McLaren Street to the north, Miller Street to the east, Berry Street to the south and Angelo Lane to the west.

The land comprises two key components/uses being:

- The Monte Sant' Angelo Mercy College, which occupies the majority of the site, and
- The Congregational uses being the Sisters, which occupy the McLaren Street properties being Lots 5 to 8, 10 and 11 DP5030, otherwise referred to as the 'convent buildings'.

FIGURE 2 – SITE CONTEXT (SOURCE: NEAR MAP)



The main part of site is occupied by the Monte Sant' Angelo Mercy College, which is an independent Catholic secondary day school for girls in years 7-12. The College was founded in 1875 by the Sisters of Mercy under the aegis of Mother Ignatius McQuoin. The College continues a tradition of excellence and innovation in Catholic education in the Mercy tradition. Monte has a strong academic record; in 2007 it became the first Catholic girls' school in New South Wales to offer both the International Baccalaureate Middle Years and Diploma Programs. The College grounds are occupied by an assortment of education buildings, centred on a group of heritage listed buildings being Masalou, Mercy Hall, the Chapel and O'Regan House.

2.2 RELATIONSHIP OF THE METRO PROJECT SITE TO THE METRO CAMPUS

The Monte Campus is located immediately to the south and west of the 194 Miller Street site which forms part of the project site for both construction and on-going operations of the Sydney Metro.

FIGURE 3 – RELATIONSHIP OF THE METRO PROJECT SITE TO THE MONTE CAMPUS

2.2.1 NORTHERN INTERFACE

In October 2014, the new O'Regan Arts and Cultural Common (ACC) located in the north-eastern corner of the campus was formally opened. This new facility valued at approximately $20million is an integral component of the School's offering and curriculum for students. The new Arts and Cultural Common building comprises:

- A New multi-level space to connect classrooms, theatre, and the O'Regan building;
- 4 New music classrooms, and 8 small music studios over two levels;
- A 300 seat black box theatre space, with back of house facilities and technical teaching areas, and

- Large ensemble practice studio.

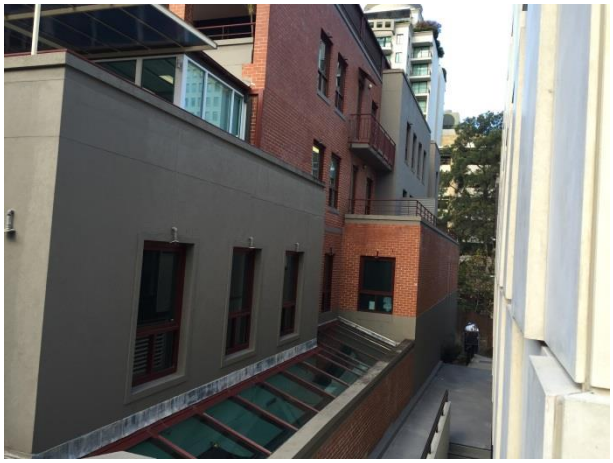
PICTURE 1 – O'REGAN ARTS AND CULTURAL COMMON (ACC)

PICTURE 2 – INTERFACE BETWEEN NORTHERN BOUNDARY OF MONTE (O'REGAN BUILDING) AND 194 MILLER STREET

PICTURE 3 – LOOKING TOWARDS THE NORTHERN BOUNDARY INTERFACE WITH 194 MILLER STREET FROM WITHIN THE MONTE CAMPUS

The theatre is significantly excavated into the natural ground level by up to 10 metres and is located within approximately 2 metres from the northern boundary adjacent to the 194 Miller Street site.

PICTURE 4 – EXISTING PERFORMANCE THEATRE LOCATED IMMEDIATELY ADJACENT TO THE BOUNDARY OF 194 MILLER STREET



PICTURE 5 – NORTHERN BOUNDARY INTERFACE

2.2.2 WESTERN BOUNDARY INTERFACE

The Sisters of Mercy Convent Buildings fronting McLaren Street exist along the northern boundary of the site which comprise:

- 27 McLaren – Stormanston House - used by the Sisters as their 'Home' for functions etc;
- 29 McLaren – Coolock House (formerly Fairhaven) - administrative headquarters of the Sisters of Mercy;
- 31-33 McLaren – Bermondsey Lodge – currently used as accommodation for the Sisters. This building is comprised of four separate dwellings.

PICTURE 6– VIEW OF COOLOCK HOUSE (ADMINISTRATIVE HEADQUARTERS FOR SISTERS OF MERCY AND BERMONDSEY LODGE USED AS ACCOMMODATION

PICTURE 7 – EAST BOUNDARY OF BERMONDSEY LODGE AND IMMEDIATE INTERFACE WITH PROPOSED SYDNEY METRO SHAFT EXCAVATION

3 Proposed Project Works

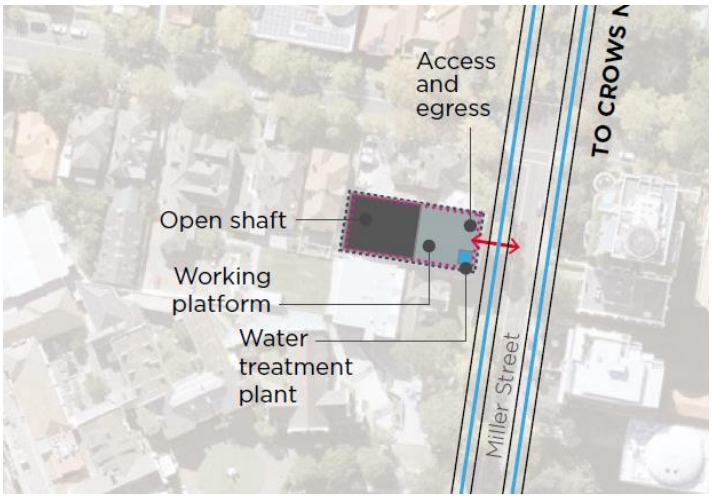
For the purposes of this submission, we have summarised the pertinent aspects of the project as it relates to the Victoria Cross Station components and the implications for the Monte campus. This is separated into construction and operational elements.

3.1 CONSTRUCTION PHASE

The level of information provided with the EIS to describe the construction process is very preliminary and schematic and inadequate to properly assess the implications of the project.

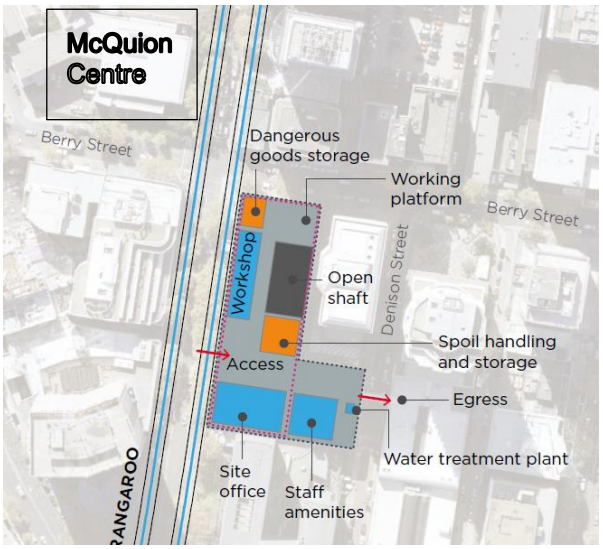
The primary element of interest is the construction site at 194 Miller Street which located immediately north of the Monte performing arts centre. As shown in the extract below from the EIS, the proposal involves the excavation of an open shaft within the western half of the site, with a working platform and water treatment plant to be provided within the eastern (Miller Street) portion of the site.

FIGURE 4 – PROPOSED CONSTRUCTION WORK AT 194 MILLER STREET ("NORTHERN SITE") SOURCE: EXTRACT FROM EIS



To the south-east of the Monte Campus is the construction site for the station portal. This includes a further open shaft which is located within 70metres of the McQuion Centre, which is the main hall at Monte where important activities such as HSC exams are undertaken.

FIGURE 5 – TYPE FIGURE CAPTION HERE.



The pertinent aspects of the construction process include:

- The construction process is estimated to occur over a 5-6 year period commencing in around 2017.
- An estimated 175,000 cubic metres of spoil is proposed to be removed from this precinct (between both construction locations) in North Sydney. Spoil will be transported away from the site by tip truck. The EIS suggests 20-25 trucks per hour (or 1 truck each 2-3 minutes) during the period of 9am and 4pm.
- The construction process will essentially involve the following steps:
  - Demolition of the existing building;
  - Removal of any vegetation including some street trees;
  - Construction of hoardings;
  - Initial earthworks and piling;
  - Construction of an 'acoustic shed' over the site excavation;
  - Excavation will commence with rock hammers and excavators but progress to controlled blasting below a depth of 15 metres.
  - Construction of a working platform fronting Miller Street allowing trucks to be loaded for spoil removal;
  - Excavation of a shaft that will penetrate to the depth of the rail tunnel (circa 45metres below the current ground level.
  - On-site treatment of groundwater drawn from the tunnel excavations;
  - On completion of the tunnel works, construction of a services building on the site.

There is no construction detail or methodology outlined in the EIS. The process is only graphically described in what might be described as "info graphics" that depict the concept but without detail of matters such as:

- Location of piling.
- Excavation setbacks from boundaries.
- Design, height and setbacks of the proposed acoustic shed.
- Truck access design to Miller Street.

FIGURE 6 – DESCRIPTION OF TYPICAL CONSTRUCTION PROCESS (SOURCE:EIS)

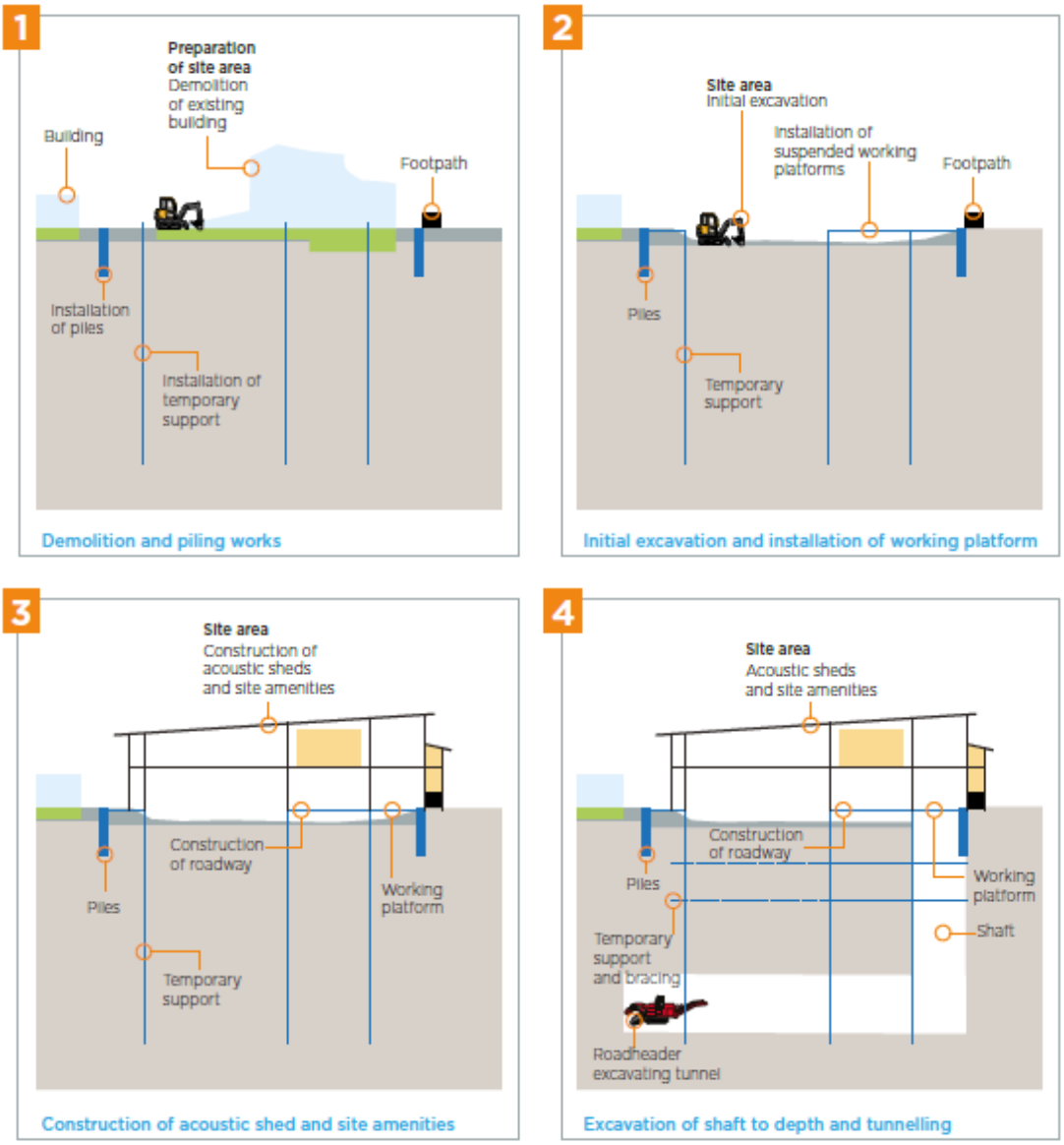


Figure 7-6 Typical mined station construction

3.2 OPERATIONAL PHASE

At the operational phase, the following is proposed:

- A services building (with no design detail) to be constructed on site.
- It is indicated that this building could be 10-12 metres high and setback in line with adjacent buildings, but there are no plans that support this proposition other than the cross section illustrated in Figure 7 below.
- The services building is described as being of utilitarian character as a service building noting that is sits within a heritage context, but there is no detail.
- A service building will provide for tunnel ventilation and smoke exhaust in the event of an incident

- During normal operations, tunnel ventilation would be provided by train movements and the operation of fans at the stations to exhaust air from the tunnels.
- Heat removal would typically occur via the tunnel exhaust; however, ventilation fans could also be operated to provide additional heat removal particularly in peak summer conditions

FIGURE 7 – CROSS SECTION OF VICTORIA CROSS STATION INCLUDING PROPOSED SERVICES BUILDING (SOURCE: EIS)

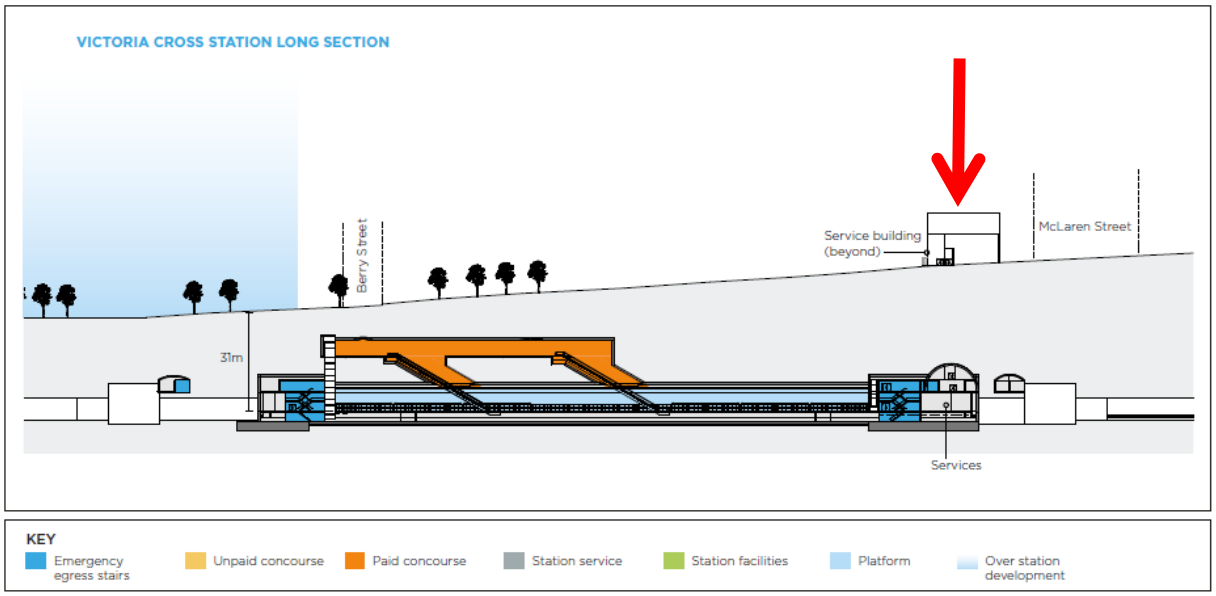


Figure 6-15 Victoria Cross Station – indicative cross-section and long section

4 Key Issues

4.1 OVERVIEW

The proposed works associated with the Victoria Cross Station component of the project will have an **unreasonable and unacceptable impact** on the Sisters of Mercy and Monte Sant' Angelo Mercy College. This impact can be substantially attributed to the proposed location and construction of the northern services shaft at 194 Miller Street ("the northern site") which is immediately adjacent to the new performing arts centre of the Monte Campus.

While acknowledging the substantial scope of the Sydney Metro Project, the EIS fundamentally fails to properly and adequately identify and assess the impacts of the project on the Monte campus. This is a significant shortcoming that we submit fails to meet the requirements of the *Environmental Planning & Assessment Act 1979* and the specific matters outlined in the Secretary's Environmental Assessment Requirements (SEAR's).

It is our submission that a proper and thorough assessment of the site context would have at the outset identified the highly sensitive nature of the "northern site". This sensitivity is largely the result of the recently constructed performing arts centre (ACC) immediately adjacent to the subject works, but equally the relationship between the construction site and the front door of the School to the immediate south which is a sensitive and highly pedestrianised environment.

Similarly, the EIS ignores the sensitive uses of the Sisters of Mercy. The Convent Buildings adjacent to the construction site will be significantly impacted both in terms of impacts on the residential and administrative functions. Coolock House for example is the headquarters of the Sisters of Mercy North Sydney and is frequented by many Sisters. It should be recognised that many of the Sisters are aged and with limited mobility. The significant disruption of the proposed works will therefore have a have substantial and long lasting impact on the Sisters.

To understand the likely severity of the impacts, the School has retained acoustic engineers Wilkinson Murray to undertake a technical review of the EIS and the supporting Technical Paper 2: Noise and Vibration prepared by SLR Consulting. This report is included as **Appendix 1** to this submission and substantiates the genuine concerns of the School in terms of airborne and ground borne construction impacts, which will reach unacceptable limits.

The ACC is now a centrepiece at the Monte campus will be rendered unusable for the duration of the major construction works. This is a period which is estimated at a minimum to last 3-4 years. In addition, the proposed works required to Miller Street and the location of major construction activities adjacent to a highly pedestrianised environment will create inevitable conflicts and safety risks that could be avoided if more suitable locations for this construction site is found.

If pursued as proposed, the proposal will be manifestly unreasonable and result in material and substantial impacts on the Monte campus and the operational needs of the School.

The EIS does not identify any alternative options to the location of the proposed shaft and services building, nor any substantive mitigating measures. Given the highly sensitive nature of the site selected, we submit that this is a major shortcoming in the assessment. On any reasonable assessment, the EIS should identify suitable alternative locations that are less environmentally sensitive but which can still achieve the operational needs of the Metro Project.

Our submission has identified the following key impacts, which we submit warrant the re-location of the northern construction site and future services building. These impacts relate to:

- Airborne and ground borne construction noise that will have:
    - Severe impacts on the use of the ACC for the duration of the construction stage of the project.
    - Severe impacts on the Sisters of Mercy residence and administration building located immediately adjacent to the tunnel shaft.

- Adverse impacts on day to day use and operations of School in particular around important times of school examinations and the like.

- Impacts on School access, safety and security during the construction phase.

- Impacts at the operational phase of the project.

- The lack of information and detail in the EIS and the lack of adequate early consultation that has led to serious inadequacies in the environmental impact assessment.

4.2 AIRBORNE AND GROUND BORNE CONSTRUCTION NOISE

Acoustic engineers Wilkinson Murray have been commissioned by the School to undertake a technical review of the EIS and the supporting Technical Paper 2: Noise and Vibration prepared by SLR Consulting. This report is included as **Appendix 1** to this submission.

Wilkinson Murray has identified some key shortcomings in the assessment as well as identified likely significant impacts associated with the project. In summary, the findings are as follows:

- *Ambient noise monitoring in the Noise Catchment Area covering Monte Sant Angelo College is not representative of the area. As a result construction noise management levels and operational noise criteria are at least 10 dBA too high. As a result the impacts from airborne construction noise are understated.*

- *The EIS fails to identify the specific uses of the College that have a higher acoustic sensitivity, such as the Theatre, Main Hall and Recording areas. Therefore impacts from airborne and ground borne noise are significantly underestimated.*

- *The EIS fails to identify the nearest residence to the northern access shaft and the impact construction noise and vibration on these residences which will be unacceptable.*

- *The EIS does not provide the confidence and commitments that noise and vibration from construction can be adequately managed to all the receivers associated with Monte Sant Angelo College, therefore the northern shaft site should be relocated away from the school and residences and reassessed.*

- *Operational assessment fails to take into account the Theatre which is 10 metres below the ground level whereby noise levels will be several decibels higher. Therefore the need for track isolation should be considered in light of the theatres' location and sensitivity to noise and vibration.*

- *Noise objectives for the operation of services plant associated with the Victoria Cross station should be revised to reflect representative noise levels of the area.*

In conclusion, their findings are that:

- *The impacts on the education components, particularly the entire Arts and Creativity Common, around the northern shaft will be significant and will **render these areas not fit for use.***

- *In the case of residences which are immediately to the west of the northern shaft the impacts at the two residential buildings, particularly at night **will render these buildings uninhabitable.***

4.2.1 SPECIFIC IMPLICATIONS FOR THE O'REGAN ARTS AND CULTURAL COMMON

As previously mentioned, an Arts and Creativity Common (ACC) has been recently constructed immediately adjacent to the northern construction site. This includes a theatre, recording facility, music practice and teaching facilities. The Theatre is located at a level 10 metres below the ground level and is used for recital, performance and recording. Typically this facility is used up to 9 pm in the evening.

This facility is located approximately 2-3 metres from the proposed Victoria Station northern access shaft.

Extracts from the approved plans of this development are provided in the following figures to illustrate the specific design of this building and its relationship with the proposed tunnel shaft to be located immediately adjacent.

FIGURE 8 – PLAN SHOWING RELATIONSHIP BETWEEN THE ARTS AND CULTURAL COMMON AND PROPOSED TUNNEL SHAFT

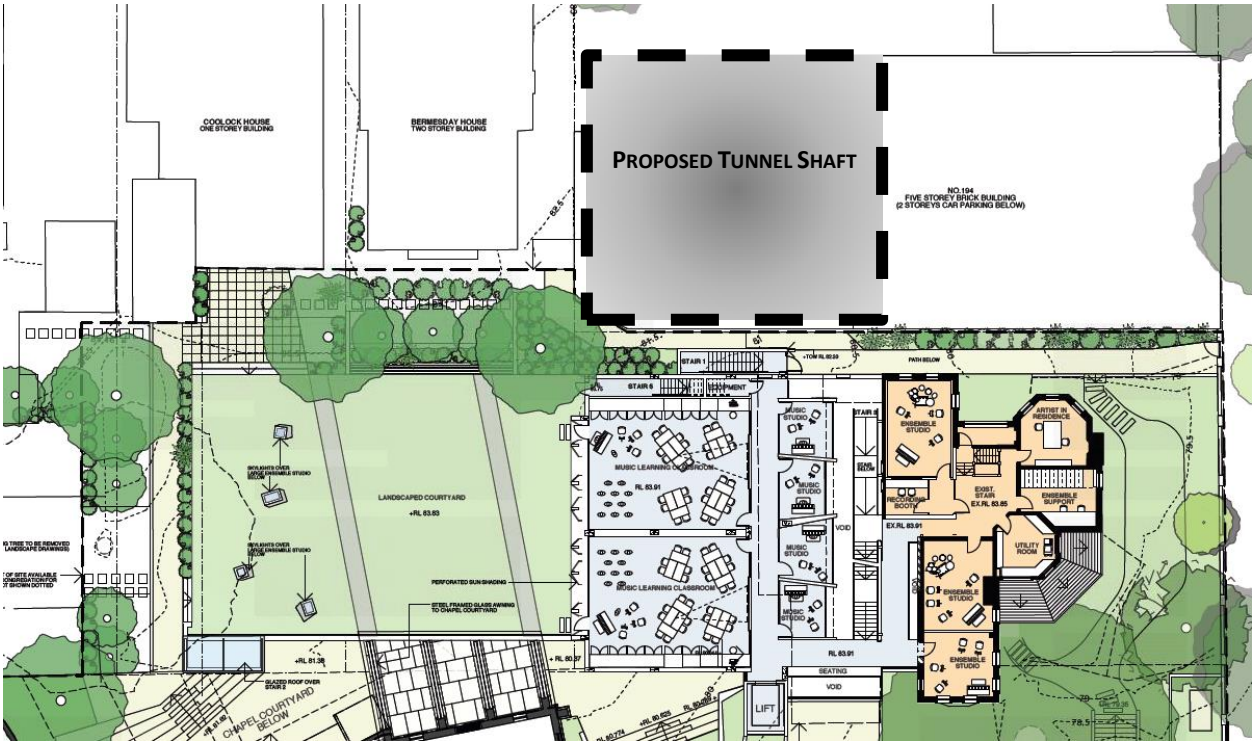


FIGURE 9 – PLAN SHOWING LOWER GROUND THEATRE LOCATED ADJACENT TO THE NORTHERN SIDE BOUNDARY

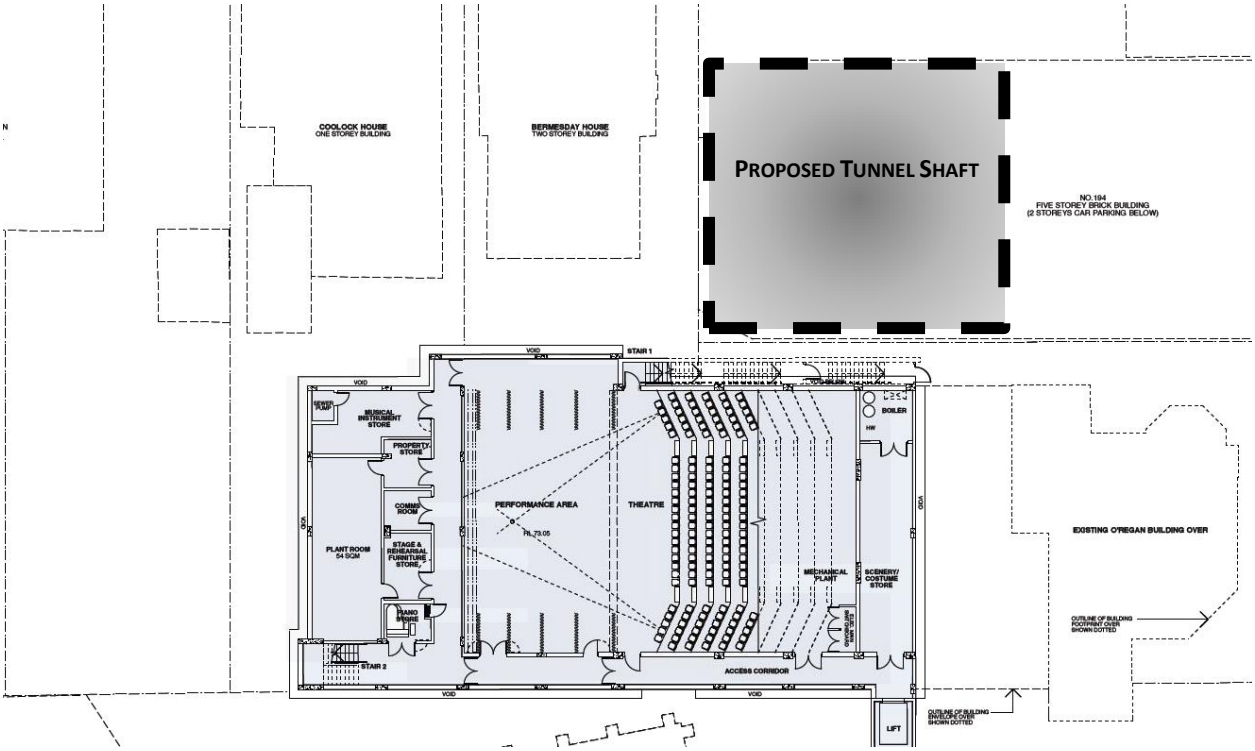


FIGURE 10 – CROSS SECTION OF THE ARTS AND CULTURAL COMMON BUILDING SHOWING THE DEPTH OF BELOW GROUND USE

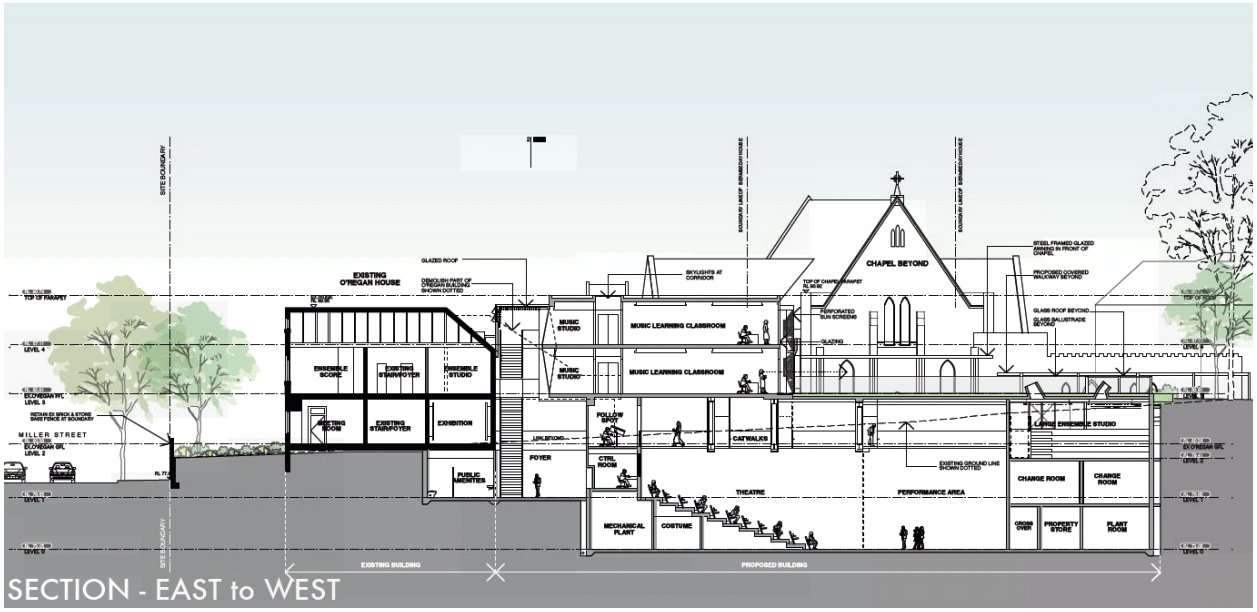


FIGURE 11 – SECTION SHOWING INDICATIVE RELATIONSHIP WITH PROPOSED TUNNEL SHAFT

These plans illustrate how close the proposed tunnel is to the existing arts and cultural common and the significant potential for impact.

Wilkinson Murray has identified the following key impacts for this building during the construction phase:

Airborne Noise

Airborne noise from construction works is predicted to be greater than 75 dBA at the Arts and Creativity Common. These noise levels will limit effective communication in areas in the northern outdoor areas of the school and outdoor areas rendering these areas unusable.

It is noted that these impacts are predicted with an acoustic shed over the site.

Ground Borne Noise

The greatest impacts are on the school is from ground borne noise associated with rock breakers and blasting. Noise from ground borne noise (due to rock breakers) is predicted to be up to 75 dBA in the Arts and Creativity Common, Theatre and adjacent residences. In the case of the Theatre, which is below ground level, this will be the dominant noise source from construction.

Advice from Wilkinson Murray is that vibration from these activities is also likely to be perceptible and cause cosmetic damage to buildings around the northern access shaft.

In respect to the Arts and Cultural Common, Wilkinson Murray conclude as follows:

> *The impacts on the education components, particularly the entire Arts and Creativity Common, around the northern shaft will be significant and will render these areas not fit for use.*
>
> *The only mitigation is proposed by way of using medium rock breakers and blasting however the resultant noise levels have not been quantified. No consideration of rock saws or reduced hours of operation have been considered.*
>
> *Based on these facts and findings it is considered that there will be significant noise and vibration impact at the school that provide no confidence that these noise and vibration impacts can be adequately managed. All that is presented are significant exceedances.*
>
> ***Therefore it is considered that the location of the northern shaft should be reconsidered and relocated away from the school site. In addition alternative excavation techniques, such as rock sawing should also be considered as a reasonable and feasible method of excavation. (our emphasis).***

To further emphasise the importance of this facility and the impacts of excessive construction noise, the Monte is “IB” (International Baccalaureate) School with many of the exams and student activities recorded and sent overseas for marking. These recordings need absolute silence and crystal quality which will not be achievable with the proposed location of the tunnel shaft.

4.2.2 SPECIFIC IMPACTS ON THE SISTERS OF MERCY CONVENT BUILDINGS

Similar to the above concerns, the proposed works will have a significant detrimental impact upon the Sisters of Mercy convent buildings located immediately adjacent to the west of the proposed tunnel shaft.

The Technical Acoustic Report accompanying the EIS fails to identify that 31-33 McLaren Road is a residential premises and incorrectly classifies this property as a commercial receiver. Wilkinson Murray has advised that in respect to this residence, the proposed works, particularly at night will render this building uninhabitable. In this case, the only mitigation measure would be to provide alternative accommodation to occupants of this residence.

In summary, the acoustic report supporting the EIS fails to identify this sensitive receiver and as such no suitable mitigation measures have been proposed. As advised by Wilkinson Murray, the proposed methodology and duration of works is likely to render this property uninhabitable and require relocation of occupants for an extended duration.

4.2.3 GENERAL IMPACTS ON SCHOOL ACTIVITIES

While concerns have been raised in respect to specific buildings, more broadly, significant concern exists in terms of the long duration of the construction works (projected over a 5-6 year duration) and the implications that this will have on the operation of the School and the health and well-being of students, staff and the broader School community.

The duration of the construction process essentially relates to the duration of a student’s senior school experience at Monte. While the initial years of excavation will see construction activities at its most disruptive, the duration of the works and the extent of impact cannot be under estimated.

Student well-being is of critical importance and the exposure to persistent very loud construction noise throughout the day is of major concern and represents a genuine health risk. Students are outside before school (pre 8:20am), recess (10:30am to 10:50am and lunch (12:45pm to 1:30pm) and this is important for student wellbeing. Noise during these times would be a major impact.

There is no consideration of such likely effects, nor are any tangible mitigation measures proposed such as:

- Respite periods;
- Ceasing of construction during exam periods and other critical school activities.

It is our submission that this impact can be ameliorated by relocating the northern construction site elsewhere. Anything less in terms of mitigation will only have limited benefit and will not address the substantive concerns.

This photograph below illustrates a class activity at the rear of the arts and creative common immediately adjacent to the construction site. Such activities would be impossible if construction was to occur as proposed.

PICTURE 8 – CLASSROOM ACTIVITY IN THE ARTS AND CULTURAL COMMON

4.3 IMPACTS ON STUDENT SAFETY, ACCESS AND AMENITY

The Monte school community is very familiar with the inevitable impacts that arise during building construction. The School has recently been through its own major project construction with the arts and cultural common building as well as current residential projects well under construction to the west on the opposite of Angelo Lane. What is however different with the current Metro project is the significant and long term impacts on the operations of the School which centre around:

- The volume of truck movements during the core school hours and which will cause major conflicts at the end of the school day where there is a major student outflow directly into Miller Street.
- The reduction in the width of the Miller Street footpath, which is already at full capacity in accommodating student pedestrian traffic at peak times.
- The loss of a bus stop immediately north of the school campus on Miller Street.
- The potential hazards to student pedestrians required to travel north of McLaren Street.

4.3.1 TRUCK MOVEMENTS

Truck movement will be a noticeable impact in both Miller and McLaren Street and is concentrated during School operating hours as is shown in the figure below sourced from the EIS.

Section 8.4.9 of the EIS states:

> *This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be six heavy vehicles per hour during the demolition and excavation phases.*

What is not however clearly explained in the EIS is the projected heavy vehicle movements of approximately 23 per hour between the times of 9am to 4pm.

While undoubtedly the concentration of trucks during these hours is designed to avoid the traditional peak hour periods (7am-9am and 5pm-7pm), this approach ignores the significant early peak generated by the school. This school peak occurs from around 3pm Monday to Friday.

FIGURE 12 – PROJECTED TRUCK MOVEMENTS (SOURCE: EIS)

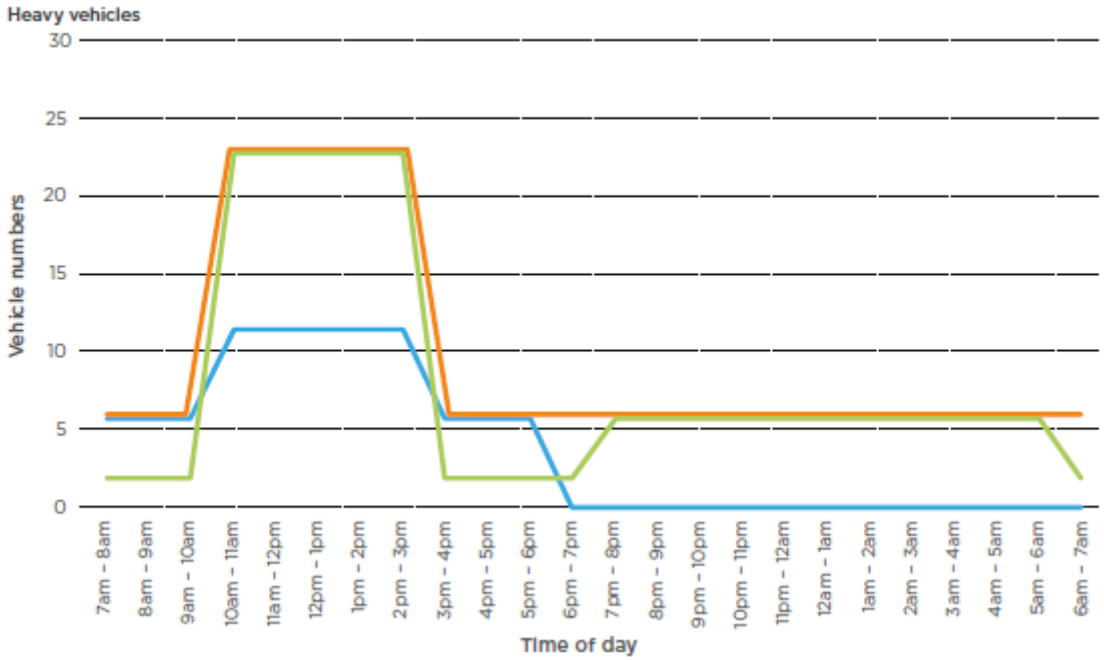


FIGURE 13 – PROPOSED HEAVY TRUCK ACCESS MOVEMENTS (SOURCE: EIS)

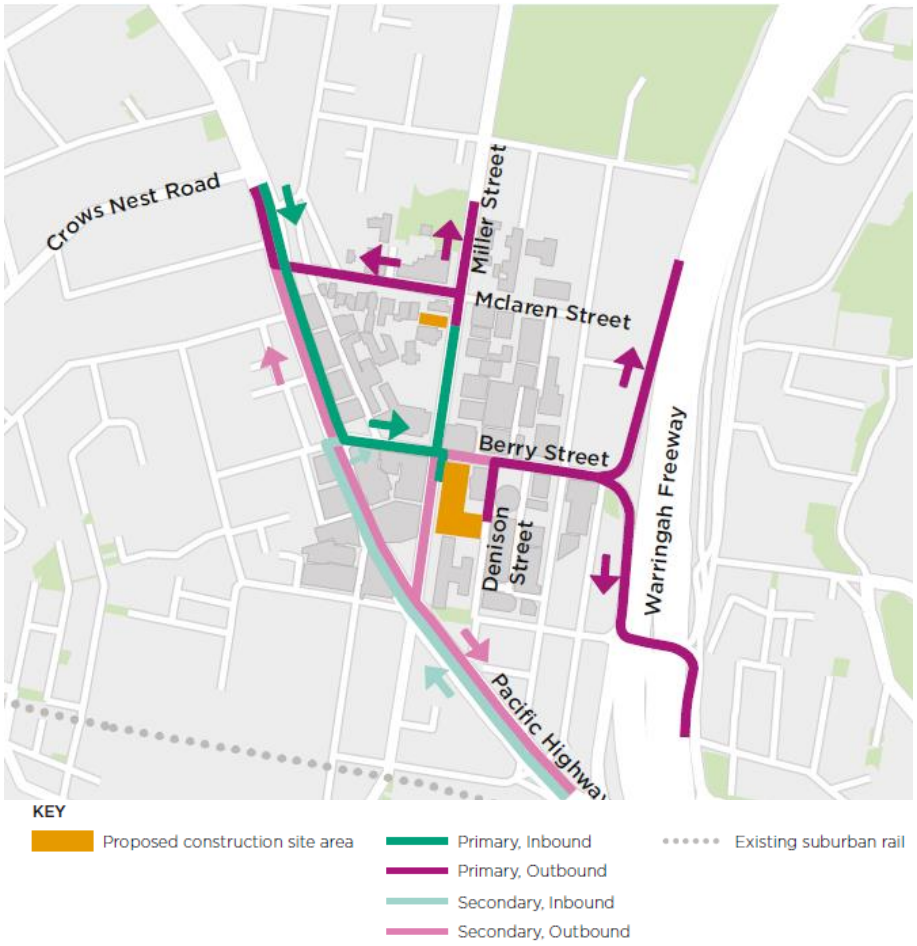


Figure 8-24 Victoria Cross Station construction site haul routes

The proposed haulage route for the northern construction site proposes heavy truck movements along:

- Miller Street frontage of the School;
- MacLaren Street which is a local residential street

The proposed heavy truck access route for the northern construction site further re-inforces our submission that the proposed northern construction site is not appropriate and should not be pursued in its current location. This impact has the potential to be further exacerbated by the statement in the EIS (page 218) that this northern construction site will be used for the delivery of materials as per the following statement:

> *"Shafts would also be excavated from the Victoria Cross north site to the underground station cavern. The Victoria Cross north site would become a future service facility. This shaft may also be used throughout the construction period for the delivery of materials." (our emphasis)*

The proposed construction access from the main station site to the south on the corner of Berry Street allows heavy truck access to the major roads being Pacific Highway, Berry Street and Warringah Freeway. This route avoids the sensitive interfaces of the School and residential properties and is far more appropriate and sensitive to the local environment.

In summary, we submit that the northern construction site is unsuitable and will have significant adverse impacts on the immediate environment which is exacerbated by the heavy truck movements that will be generated on a consistent basis throughout the daytime period both for the removal of spoil and the delivery of materials. Conversely, limiting heavy construction access to the main site at the intersection of Berry Street would alleviate this impact and should be further investigated.

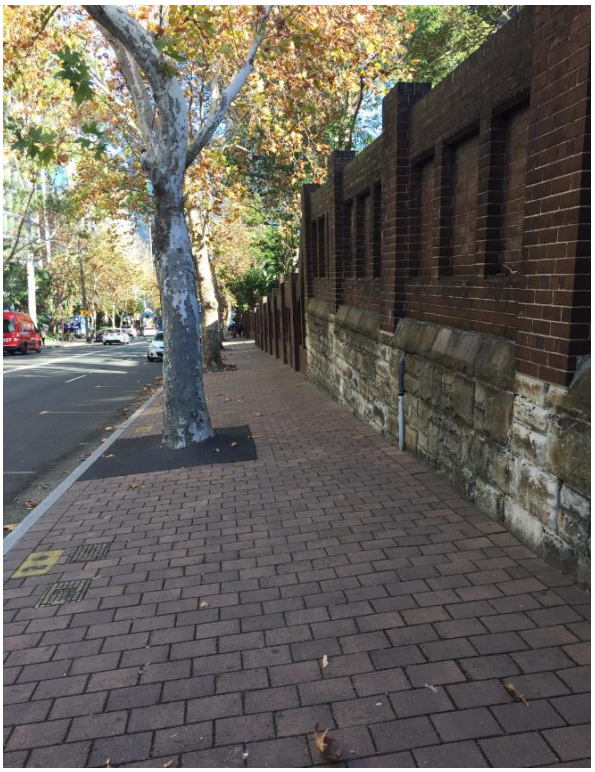
4.3.2 REDUCTION IN WIDTH OF MILLER STREET FOOTPATH

The proposed construction traffic and transport section of the EIS (page 314) states:

> *Pedestrian footpaths on Miller Street in the vicinity of each of the construction sites would be reduced in width by around 600 millimetres during the construction works."*

While it is asserted that a minimum footpath width of 2.4 metres will be retained in order to meet the Ausroad guidelines, the implications of this footpath reduction will be significant. The impacts include:

- The loss of significant street trees along the Miller Street frontage to the School as shown in Picture 9;
- The loss of footpath capacity along the footpath for students and the general public;
- The loss of an existing bus stop on Miller Street;



PICTURE 9 – EXISTING MILLER STREET FOOTPATH AND EXISTING STREET TREES TO BE LOST WITH PROPOSED 600MM FOOTPATH REDUCTION

The primary concern with the narrowing of the footpath on Miller Street is the impact on accessibility and safety of the School community. Miller Street is the main entry to the School and the front gates are used by the majority of students and all visitors to the campus.

While the typical school times are 8:20am to 3:20pm Monday to Friday, like many other Schools, the front gates are generally open between 6:30am to 6:30pm. In addition to this, there is generally some form of activity every night on the campus which includes debating, music performances, academic meeting and information nights, exhibitions etc.

From a recent survey undertaken by the School, 70% (or over 800 students) travel home by bus and therefore utilise Miller Street at that time. This is most acutely felt at the afternoon at the end of normal classes (around 3.20pm) when there is a large exodus of students within a short period of time. This is illustrated in Pictures 10 and 11 which highlight the large number of students that are either leaving or congregating at the entrance of the School.

It is our submission that any reduction in the width of the footpath along the Miller Street frontage is not sustainable based on this pedestrian volume.

PICTURE 10 & 11 – STUDENTS LEAVING THE SCHOOL IN THE AFTERNOON AFTER THE END OF SCHEDULED CLASSES

4.3.3 LOSS OF BUS STOP

The EIS recognises the loss of an existing bus stop located immediately within the frontage of the northern construction site. As illustrated in Pictures 12 and 13, this is an important bus stop to service the school population. There is no indication as to the potential alternative locations for the bus stop, but one would presume that it would need to be located further to the north in Miller Street, north of McLaren Street. While inconvenient, this will also increase the level of pedestrian movement across the frontage of the construction site which is undesirable from a safety and security perspective.

PICTURE 12 – EXISTING BUS STOP IN THE FRONTAGE OF THE NORTHERN CONSTRUCTION SITE

PICTURE 13 – STUDENTS ACCESSING THE BUS STOP DURING THE AFTERNOON PEAK PERIOD

4.3.4 SAFETY AND SECURITY OF STUDENTS AND PEDESTRIANS

Chapter 19 of the EIS addresses the issues of social impacts and community infrastructure. On page 791 of the EIS, the following statement is made:

> *Temporary changes may be required to public places and pedestrian routes near the construction sites on Miller Street. These changes may result in reduced sight lines, opportunities for casual surveillance and levels of activity in public spaces, potentially impacting people's perceptions of safety. This impact would be managed through the application of Crime Prevention through Environmental Design principles. The needs of people with mobility difficulties, including children, elderly people and people with disability would also be considered in the design of temporary pedestrian routes. This would be particularly important on Miller Street, which is a key pedestrian access to community facilities such as schools, childcare centres, churches, medical centres and council offices. Where possible, traffic controllers would be used to ensure safety for pedestrians and cyclists, such as at access points to construction sites.*

Given the volume of movements in and out of the northern construction site, the proposed strategy to mitigate risks to the School and broader community is manifestly inadequate. The footpath access north along Miller Street is an important access point for students and there are no measures or commitments proposed to manage safety and security. This re-inforces our submission that the location of a major construction site directly adjacent to the School and a highly trafficked footpath is ill-conceived and alterative locations need to be considered for the project.

4.4 OPERATIONAL IMPACTS

While the primary focus of this submission concerns the impacts during construction, the operational impacts associated with the future services building and the rail tunnel below are of strong interest and concern to the School.

The main concerns from an operational perspective include:

- Noise from rail operations;
- The visual impact of the future services building;
- Air quality and acoustic impacts from the services building.

4.4.1 NOISE FROM RAIL OPERATIONS

Wilkinson Murray has identified in its assessment that no track vibration treatment is proposed in the vicinity of the school. This is a result of the failure of the proponents to have identified the sensitivity of the Arts and Creativity Common, including the Theatre and recording facilities.

As a result a higher noise criterion of 40 – 45 dBA has been adopted for a standard school. A lower noise criterion is warranted for these areas consistent with Sound Recording Studios in Table 83 of the technical report.

In addition noise predictions of train noise are based on buildings at ground level. As the performance space is located 10 metres below the ground the resultant noise levels can be expected to be several decibels higher than those presented in the EIS.

Given these two factors, a lower applicable criterion and higher resultant rail noise level in the theatre, it is our submission that track vibration treatment should be considered in the tunnel near the northern end of the school.

4.4.2 VISUAL IMPACT

The SEAR's require the following analysis to be provided as part of the EIS:

> *The Proponent must assess the visual impact of the project and any ancillary infrastructure on: (a) views and vistas; (b) streetscapes, key sites and buildings; and (c) the local community. 2.*

The Proponent must provide artist impressions and perspective drawings of the project to illustrate how the project has responded to the visual impact through urban design and landscaping.

While a broad visual impact assessment has been undertaken of the precinct as part of the EIS, there is no design detail of the proposed services building to be located on the northern site. It is therefore impossible to assess the likely impact of the future development when no design detail or indeed key principles are articulated. The need for such detail is heightened given the location of this site amongst heritage listed buildings.

We submit that there is insufficient design detail to satisfy the SEAR's and to have any certainty regarding the design quality and visual impact of the future development.

4.4.3 AIR QUALITY AND ACOUSTIC IMPACTS

Consistent with the concerns expressed previously in this submission, there are inadequacies in the acoustic assessment undertaken to date which will have implications on the future school operations and the adjacent residence.

The northern site will house mechanical plant, such as fans, when operational. These will need to incorporate noise controls to protect the acoustic amenity of residences to the west of the site. Currently a night time noise criterion of 56 dBA at nearby residences is presented in the EIS. This is based on incorrect noise monitoring as previously detailed. If applied noise from plant would be 16 dBA above background noise levels at these residences. This would represent an unacceptable impact on these residences where a criterion of 45 dBA is appropriate.

In addition, air quality impacts associated with tunnel ventilation and the adjacency of the school grounds and the residence is of concern and requires further details to be provided.

4.5 INADEQUACIES OF THE EIS & CONSULTATION

4.5.1 INADEQUACIES OF THE EIS

The EIS is required to be prepared and documented in accordance with the Secretary's Environmental Assessment Requirements (SEAR's). The SEAR's require among a range of matters, the following action:

The Proponent must assess impacts from construction and operation on potentially affected properties, approved development applications, businesses, public open space, recreational users and land and water users (for example, recreational and commercial fishers, oyster farmers), including property acquisitions/adjustments, access, amenity and relevant statutory rights. (our emphasis).

In response to this requirement, the proponent states that:

- Property impacts are addressed in Chapter12;
- Business impacts are addressed in Chapter 13;
- Social impacts are addressed in Chapter 19

From our review of the EIS, the specific responses to the likely impacts on the Monte Campus are simply glossed over or not even fully understood. We submit that the EIS fails to meet the requirements of the SEAR's and needs to be completely reviewed and updated.

We have identified the following examples of where the assessment of impact is completely inadequate given the likely severity of impact.

Chapter 12 – Property Impacts

Section 12.5.4 of the EIS provides an assessment of the direct impacts on existing land uses surrounding the Victoria Cross Station. The EIS states:

> *The direct impact on land use at this site would be a change in land use from commerical core / mixed use to transport infrastructure. Given the small scale of the change, the land use impacts would be minor. This minor impact may be mitigated by the replacement and / or expansion of areas of mixed use land associated with potential over station development.*

This assessment completely ignores impacts associated with land uses adjacent to the northern services building.

Chapter 19 – Social Impacts

Chapter 19 recognises that if unmanaged, noise, light spill, dust and vibration from construction activities may impact on the health and wellbeing of some residents and occupants of buildings nearest to construction sites.

The EIS states that:

> *Potential impacts on amenity may be experienced by users of community facilities due to noise and dust from surface work associated with excavation of the station shaft and ground-borne noise and vibration from excavation of the station cavern and tunnelling. Increased construction traffic, including heavy vehicles, removing spoil and delivering materials, may also impact on amenity at these facilities.*

Despite recognition of the potential for impact, there is little or no analysis of specific impact assessment or detail of effective mitigation measures. The EIS states:

> *The implementation of mitigation measures, in conjunction with ongoing consultation and communication with local communities, would help to manage potential impacts on community health (refer to Chapter 10 (Construction noise and vibration).*

In the absence of real and effective mitigation measures, we submit that consultation and communication is of no assistance or purpose. The Wilkinson Murray review of the acoustic report identifies that there are very limited measures capable of mitigating the expected significant impacts during the construction phase. Wilkinson Murray identify that the key uses immediately surrounding the northern construction site (the Arts and Cultural Common and the Sisters of Mercy residence) will be rendered unusable for the duration of what is a lengthy construction phase.

The only effective mitigation measure is for alternative locations to be investigated for the construction site and future services building if indeed such facility is actually required to support the Victoria Cross Station.

Lack of Design Detail

The proposal involves a significant shaft excavation immediately adjacent to the Monte Campus. Notwithstanding the significance of these works, there is scant detail on:

- The size and setbacks of the tunnel;
- Detail on the method of construction;
- Design and scale of the future services building.

Given the sensitive interfaces and the precinct generally (being surrounded by heritage items), a far more substantive level of design detail is required to properly assess the impacts of the proposed works.

4.5.2 INEFFECTIVE CONSULTATION

Monte Sant' Angelo Mercy College was consulted in the lead up to the preparation of the EIS, however in our submission this consultation has not satisfied the requirements of the SEAR's, in particular that:

> *The project must be informed by consultation, including with relevant government agencies, infrastructure and service providers, special interest groups, affected landowners, businesses and the community. (source: pg 91 EIS).*

It is our submission that the EIS has not been properly informed by this consultation noting the significant omissions and the lack of understanding of the sensitivities and specific uses on the Monte campus. As evidenced from the Wilkinson Murray report, the acoustic analysis has incorrectly and inadequately assessed the site interfaces and also overestimated the background noise levels. As a result, the impacts on the Monte Campus are completely understated.

Therefore, while the EIS as evidenced in the following statement recognises some potential impacts, this is very much a generalisation of likely impact without the required supporting detailed technical investigations and analysis to support such assertions.

> *Potential impacts on Monte Sant' Angelo Mercy College and the Sisters of Mercy North Sydney accommodation would generally relate to noise and dust from surface work associated with the excavation of the station shafts, ground-borne noise and vibration from station excavation and use of McLaren, Miller and Berry streets for hauling spoil, materials and equipment. The Sisters of Mercy North Sydney accommodation would also experience some night time noise impacts during the construction phase.*
>
> *Effects would be more noticeable in outdoor teaching and recreation areas. Potential disruption to students during school examination periods from construction activities was identified as a concern during early consultation for the project. Consultation would be carried out with the College during construction to assist in managing potential impacts. (our emphasis)*

We submit that the statement in the EIS that consultation with the School can assist to manage potential impacts completely mis-represents the severity of impacts expected. We re-iterate that the only effective means to mitigate these impacts is to re-locate the northern construction site to a less sensitive location.

5 Conclusion

This submission has identified genuine and significant impacts on the Monte Campus as a result of the proposed Sydney Metro Project.

The proposed works associated with the Victoria Cross Station component of the project will have an **unreasonable and unacceptable impact** on the Sisters of Mercy and Monte Sant' Angelo Mercy College. This impact can be substantially attributed to the proposed location and construction of the northern services shaft at 194 Miller Street ("the northern site") which is immediately adjacent to the new performing arts centre of the Monte Campus as well as the convent buildings for the Sisters of Mercy.

We submit that this impact will be most effectively mitigated by relocating the proposed northern construction site at 194 Miller Street to an alternative location. If this cannot be achieved then the following outcomes are expected:

- The performing arts centre now a centrepiece at the Monte campus will be rendered unusable for the duration of the major construction works, estimated at a minimum to last 3-4 years.
- The Sisters of Mercy convent buildings will be rendered uninhabitable during construction works.
- The proposed works required to Miller Street and the location of major construction activities adjacent to a highly pedestrianised environment at the front door of the School will create serious conflicts and safety risks.

The School would welcome the opportunity to further outline and discuss the important concerns and details of this submission.

Urbis

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Appendix A

Acoustic Report Peer Review by Wilkinson Murray

ACOUSTICS AND AIR

MONTE SANT ANGELO MERCY COLLEGE

SYDNEY METRO EIS IMPACT REVIEW

REPORT NO. 16200
VERSION A

JUNE 2016

PREPARED FOR

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WILKINSON MURRAY

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Final	15 June 2016	Brian Clarke	--

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EXECTUTIVE SUMMARY

A review of the Sydney Metro EIS with respect to noise and vibration impact on the Monte Sant Angelo College and associated residences indicates that there will be a significant impact associated with airborne and ground borne noise on college operations. The following issues have been identified:

- Ambient noise monitoring in the Noise Catchment Area covering Monte Sant Angelo College is not representative of the area. As a result construction noise management levels and operational noise criteria are at least 10 dBA too high. As a result the impacts from airborne construction noise are understated.
- The EIS fails to identify the specific uses of the College that have a higher acoustic sensitivity, such as the Theatre, Main Hall and Recording areas. Therefore impacts from airborne and ground borne noise are significantly underestimated.
- The EIS fails to identify the nearest residence to the northern access shaft and the impact construction noise and vibration on this residences which will be unacceptable.
- The EIS does not provide the confidence and commitments that noise and vibration from construction can be adequately managed to all the receivers associated with Monte Sant Angelo College, therefore the northern shaft site should be relocated away from the school and residences and reassessed.
- Operational assessment fails to take into account the Theatre which is 10 metres below the ground level whereby noise levels will be several decibels higher. Therefore the need for track isolation should be considered in light of the theatres' location and sensitivity to noise and vibration.
- Noise objectives for the operation of services plant associated with the Victoria Cross station should be revised to reflect representative noise levels of the area.

1 INTRODUCTION

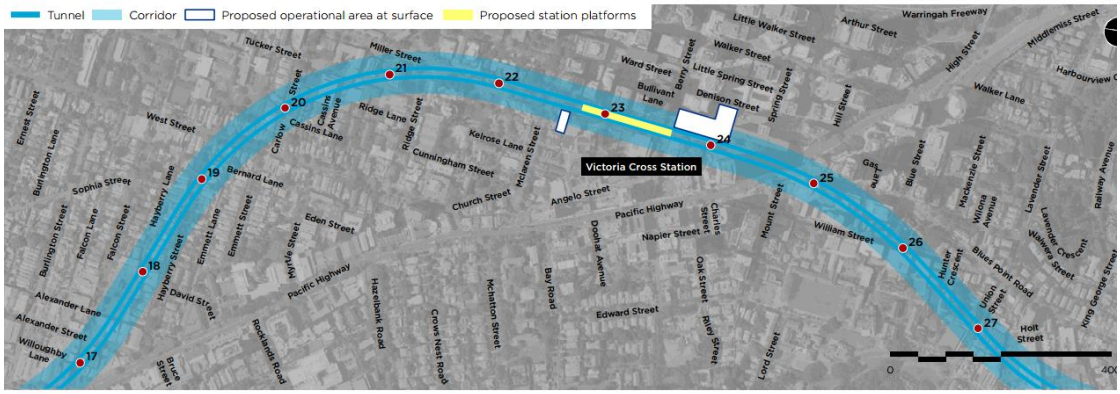
Wilkinson Murray has been engaged by Monte Sant Angelo College North Sydney to conduct a technical review of the Sydney Metro Chatswood to Sydenham Environmental Impact Statement dated 3 May 2016.

The purpose of the review is to determine the adequacy of the assessment with respect to construction and operational noise and vibration impacts on the school, its operations and associated residential accommodation. The review has relied on information presented in the main report of the EIS and the Technical Paper 2: Noise and Vibration prepared by SLR Consulting.

2 DESCRIPTION OF SCHOOL AND RESIDENTIAL PREMISES WITH RESPECT TO THE PROPOSED METRO

Figure 2-1, extracted from the EIS, shows the alignment of the proposed Sydney Metro and associated infrastructure which is near Monte Sant Angelo College.

Figure 2-1 Metro Alignment and Proposed Victoria Cross Station at North Sydney



The Monte Sant Angelo precinct consists of education facilities and residences which include:

- **An Arts and Creativity Common** which includes a Theatre, Recording Facility, Music Practice and Teaching Facilities. The Theatre is located at a level 10 metres below the ground level and is used for recital, performance and recording. Typically this facility is used up to 9 pm in the evening.

  This facility is located approximately 2-3 meters from the Victoria Station northern access shaft.

- **Main Hall** used for sports, assemblies and exams including the HSC.

- **Testing rooms for International Baccalaureate** which are recorded for examinations that are sent overseas.

- **Residences** on McLaren Street immediately to the west of the northern shaft.

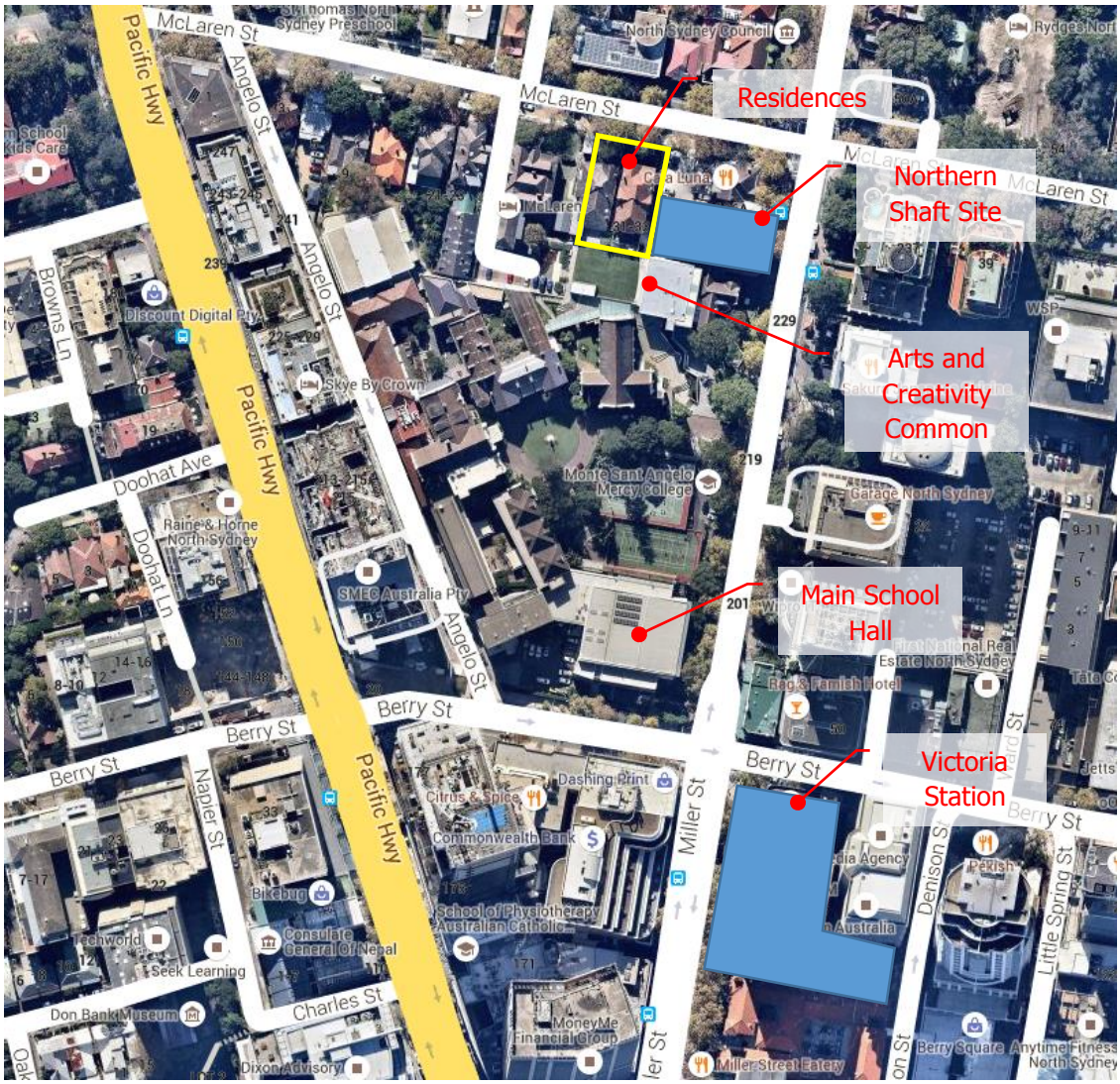
It is noted that the EIS classifies all of the school as general educational receivers and fails to identify the above uses and therefore recognise the acoustic sensitivity of these areas.

In addition there are two residences immediately to the west of the proposed Northern Access shaft at numbers 29 and 31-33 McLaren Street which are part of the Monte School. The EIS fails to identify that 31-33 McLaren Road is a residential premises and incorrectly classifies this property as a commercial receiver.

The close proximity of the **Arts and Creativity Common and residences** to the northern shaft is not reflected in **Table 34** of the technical report.

Figure 2-2 shows these areas with respect to construction and facilities associated with Victoria Cross Station.

Figure 2-2 Aerial of Monte Sant Angelo and Proposed Sydney Metro Construction Sites



3 AMBINET NOISE LEVELS IN NCA13

Ambient noise monitoring has been conducted along the Sydney Metro route to determine existing ambient noise levels. These noise levels have been used to determine site specific construction noise management levels (NML) and operational noise criteria for ancillary services associated with the metro operation.

It is noted that Location B.18 – (237 Miller Street North Sydney) has been used for Noise Catchment Area 13 (NCA 13) which covers all of Monte Sant Angelo College and the associated residential accommodation. This monitoring location is on Miller Street and presents very high Rating Background Levels (RBL's) upon which site specific construction noise management levels and operational noise criteria are based.

These noise levels are compared to ambient noise measurements that were conducted by Wilkinson Murray in this area in Table 3-1, being:

- Rear of 31 – 33 McLaren Street North Sydney (May 2012), and;
- Side of 265 Miller Street (February 2015)

Table 3-1 Measured Rating Background Noise Levels (RBLs)

Time Period	RBL (dBA)		
	Location B.18	Rear of 31-33 McLaren Street	265 Miller Street
Daytime	65	50	54
Evening	57	44	47
Night Time	51	40	40

A review of the above indicates that noise levels at Location B.18 are at least 10 dBA, if not more, higher than ambient noise levels that have been measured in other location in the NCA13 area. Therefore the presented levels at Location B.18 are not considered representative of receivers in NCA13 and are therefore not suitable for use in determining construction noise management levels or operational noise criteria at receivers around ancillary facilities.

It can be concluded that:

- Construction noise impacts based on Location B.18 NML's will be significantly understated.
- Operational noise criteria would result in plant noise at nearby receivers that is at least 10 dBA higher than acceptable levels.

3-1 Construction Noise Management Levels

The noise management levels established for the Monte Sant Angelo School fail to recognise the uses in the school and the hours of operation. In particular the following uses warrant lower noise management levels for airborne and ground borne noise.

- Main Hall HSC studies
- Arts and Creativity Common Drama / Recital / Recording Facilities
- International Baccalaureate Recording Rooms

Further, these uses can extend up to 9 pm in the evening warranting assessment against evening noise management levels.

In the case of residential properties construction noise management levels are too high due to incorrect ambient noise monitoring, as discussed in the previous section.

4 CONTRUCTION NOISE IMPACTS

Noise impacts from construction will consist of airborne and regenerated noise from shaft and station excavation along with noise from tunnel excavation.

It would appear from the EIS that all works will be conducted on a 24 hours / 7 day a week basis and will include:

- Rock breakers,
- Blasting,
- Road headers, and;
- Tunnel Boring Machines

Of these sources it is the use of rock breakers and blasting of shafts at station and access areas that will have the greatest impact on the school and residences. Whilst tunnel boring activities will be audible in school and residential areas it is noted that the duration of this activity with be of a relatively short duration and therefore the impact from tunnel boring is likely to be acceptable.

The following conclusions can be drawn from the EIS.

4.1 Airborne Construction Noise

Airborne noise from construction works is predicted to be greater than 75 dBA for several months at the Arts and Creativity Common, Main Hall and residences. These noise levels will:

- Limit effective communication in areas in the northern outdoor areas of the school and outdoor areas of residences on McLaren Street main, rendering these areas unusable.
- Require windows of the Arts and Creativity Common, residences, Main Hall and Northern school areas to be closed during construction.
- Severely impact on the residential areas to the west of the Northern Shaft.

It is noted that these impacts are predicted with an acoustic shed over the site.

4.2 Ground borne Construction Noise and Vibration

The greatest impacts are on the school and residences is from ground borne noise associated with rock breakers and blasting which is presented in Appendix F of the report.

Noise from ground borne noise (due to rock breakers) is predicted to be up to 75 dBA in the Arts and Creativity Common, Theatre and adjacent residences. In the case of the Theatre, which has no windows and is below ground level, this will be the dominant noise source from construction.

Noise level in the Great Hall can be expected to be up to 45 dBA which would be likely to affect any exams or sensitive activities in this building.

Vibration from these activities is also likely to be perceptible and cause cosmetic damage to buildings around the northern access shaft.

4.3 Construction Noise and Vibration Management Strategy.

It is noted that the significant exceedances detailed in the EIS are based on noise controls being implemented. In addition a project Construction Noise and Vibration Management Strategy is included in the EIS which proposes to address noise and vibration from construction. It is stated that General and Location Specific Construction Noise and Vibration Impact Statements (CNIS) are to be prepared for work components. However, apart from offering relocation for residences, there is little clarity on how the proponent is going to manage the identified impacts.

Much of the strategy is aimed at assessment, prediction, notification and monitoring which in themselves will do nothing to reduce noise and vibration impacts.

We would expect that the areas around Monte Sant Angelo College would be the subject to a Location Specific Construction Noise and Vibration Impact Statements however given the magnitude of reported exceedances there is no confidence in the strategy that noise and vibration can be adequately managed in this area.

4.4 Discussion of Construction Noise and Vibration Impacts

Based on a review of the EIS and technical paper it is clear that there will be significant noise and vibration impacts associated with the construction of the Victoria Cross Station and Northern Access shaft. The impacts on the education components, particular around the northern shaft will be significant and will render these areas not fit for use.

In the case of residences which are immediately to the west of the northern shaft the impacts at the two residential buildings, particularly at night will render these buildings uninhabitable. The only mitigation measure would be to provide alterative accommodation to occupants of these residences.

The only mitigation is proposed by way of using medium rock breakers and blasting however the resultant noise levels have not been quantified. No consideration of rock saws or reduced hours of operation have been considered.

Based on these facts and findings it is considered that there will be significant noise and vibration impact at the school that provide no confidence that these noise and vibration impacts can be adequately managed. All that is presented are significant exceedances.

Therefore it is considered that the location of the northern shaft should be reconsidered and relocated away from the school site. In addition alternative excavation techniques, such as rock sawing should also be considered as a reasonable and feasible method of excavation.

5 OPERATIONAL IMPACTS

5.1 Noise from Rail Operations

No track vibration treatment is proposed in the vicinity of the school as the proponents have failed to identify the sensitivity of the Arts and Creativity Common, including the Theatre and recording facilities. As a result a higher noise criterion of 40 – 45 dBA has been adopted for a standard school. A lower noise criterion is warranted for these areas consistent with Sound Recording Studios in Table 83 of the technical report.

In addition noise predictions of train noise are based on buildings at ground level. As the performance space is located 10 metres below the ground the resultant noise levels can be expected to be several decibels higher than those presented in the EIS.

Given these two factors, a lower applicable criterion and higher resultant rail noise level in the theatre, track vibration should be considered near the northern end of the school.

5.2 Noise from Services

The northern access site will house mechanical plant, such as fans, when operational. These will need to incorporate noise controls to protect the acoustic amenity of residences to the west of the site.

Currently a night time noise criterion of 56 dBA at nearby residences is presented in the EIS. This is based on incorrect noise monitoring as detailed in Section

If applied noise from plant would be 16 dBA above background noise levels at these residences. This would represent an unacceptable impact on these residences where a criterion of 45 dBA is appropriate.

6 CONCLUSION

A review of the Sydney Metro EIS with respect to noise and vibration impact on the Monte Sant Angelo College indicates that there will be significant impact on college operations associated with construction airborne and ground borne noise.

The EIS fails to identify site specific uses in the college which have a higher sensitivity to noise and vibration. As a result the potential impacts to these areas in underestimated. Given these findings, there is no confidence that these issues can be adequately managed at construction stage therefore the location of the northern access shaft should be relocated away from the site.

Any new site should be assessed with respect to appropriate noise management levels based on representative background noise levels of the area identified uses and sensitivity of specific areas in the school. Appropriate measures such as respite and rock saws should be considered at any revised site.

In the case of residences the proposed methodology and duration of works is likely to render these properties and uninhabitable and require relocation of occupants for an extended duration

In the case of the operational impacts of the metro a revised assessment is require to determine if track isolation is require to protect the acoustic amenity of the Theatre which is below ground levels.

Further noise criteria for services associated with the station should be revised to reflect representative ambient noise levels in the vicinity of the residences on McLaren Street.

APPENDIX A

EXTRACTS FROM EIS

7.7 Stations

Seven stations are proposed along the tunnel alignment. This section provides an overview of the station excavation and structural work, aboveground building and fit-out.

7.7.1 Station excavation and structural work

Excavation method

Traditionally, excavation of the stations would be carried out through the use of excavators and rock hammers. Due to the anticipated magnitude and duration of impacts associated with this excavation method, a number of contemporary alternatives were explored. This includes blasting, track sawing, wire cutting, rock bursting / splitting and penetrative cone fracture; or a combination of methods.

Based on the preliminary construction planning carried out for the project, it is unlikely that track sawing, wire cutting, rock bursting / splitting or penetrative cone fracture would not be able to achieve the necessary excavation rates in isolation. However, there is potential they could be used to supplement other excavation methods in order to reduce overall construction timeframes.

Blasting is likely to result in an overall reduced duration of excavation, and associated impacts, of rock hammering. In order to achieve compliance with the relevant criteria for blasting, the use of rock hammers would still be necessary until appropriate offset depths are reached.

Based on the above analysis, the preferred excavation method for the stations is a combination of rock hammers, use of excavators and blasting. Due to the location of the metro platforms at Central Station, there are limited residential and commercial receivers which could be impacted by rock hammering works. Additionally, the site is located within a busy transport interchange and heritage precinct. As a result, the preferred excavation method is the traditional use of rock hammers and excavators for this station site.

Preferred excavation method

Initial excavation at each station site would involve the use of rock hammers and excavators until appropriate offset depths are reached in order to achieve compliance with the relevant blasting criteria. Based on the anticipated ground conditions, the depth at which blasting could commence at each site is provided in Table 7-5.

The initial charge size at these depths would be a maximum instantaneous charge on one kilogram or smaller. As the excavation progresses (and the offset distances to receivers increases), charge sizes would be increased while still meeting the relevant criteria. Further details regarding blasting are provided in Chapter 10 (Construction noise and vibration).

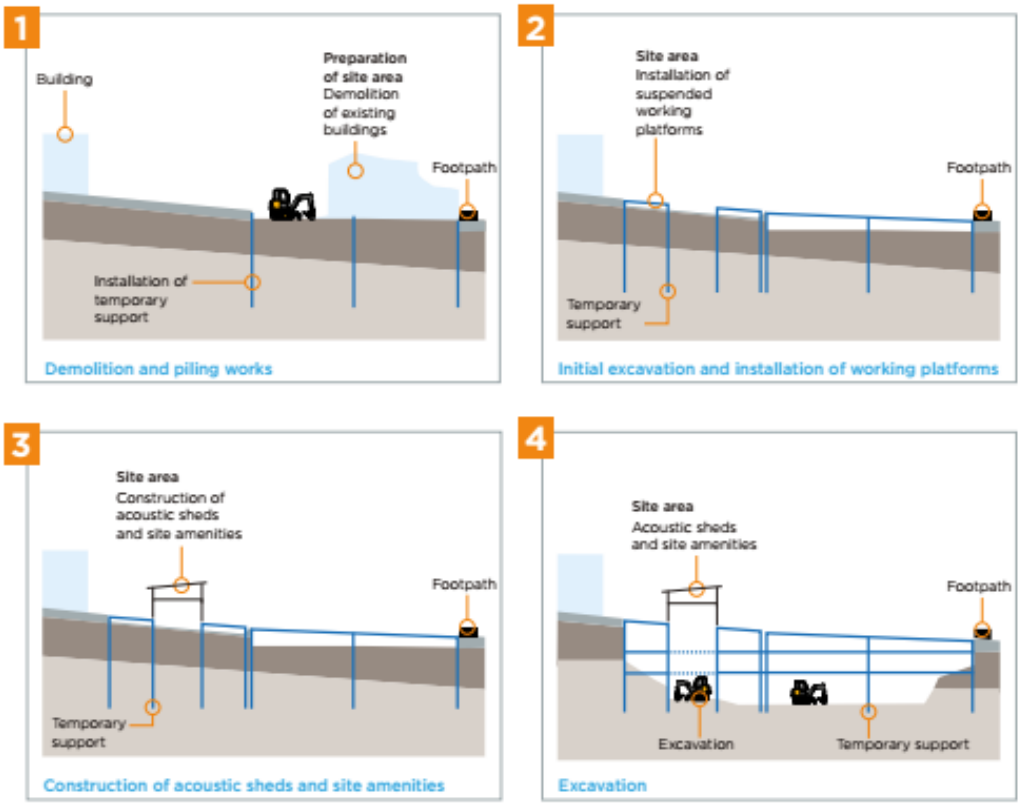


Figure 7-5 Typical cut-and-cover station construction

Mined stations

The stations at Victoria Cross, Martin Place and Pitt Street would be mined. A typical construction method for mined station excavation is shown in Figure 7 6. Acoustic sheds are proposed at the mined stations, although alternative means of achieving the same noise outcome, such as acoustic panels over the shaft excavations, may be adopted. The specific noise mitigation measures would be determined during detailed construction planning taking into account construction program, construction working hours and construction traffic management in accordance with the *Construction Noise and Vibration Strategy* (Appendix E).

For mined stations, the station entry and vertical transport would be typically offset from the station platforms. Shafts would be progressively excavated from the surface within the footprint of the future vertical transport to an intermediate floor level. Roadheaders and other excavation equipment would then be lowered through the shaft to excavate the underground station and pedestrian connections. Spoil would be moved to the shafts, transferred to the surface and then removed from site.

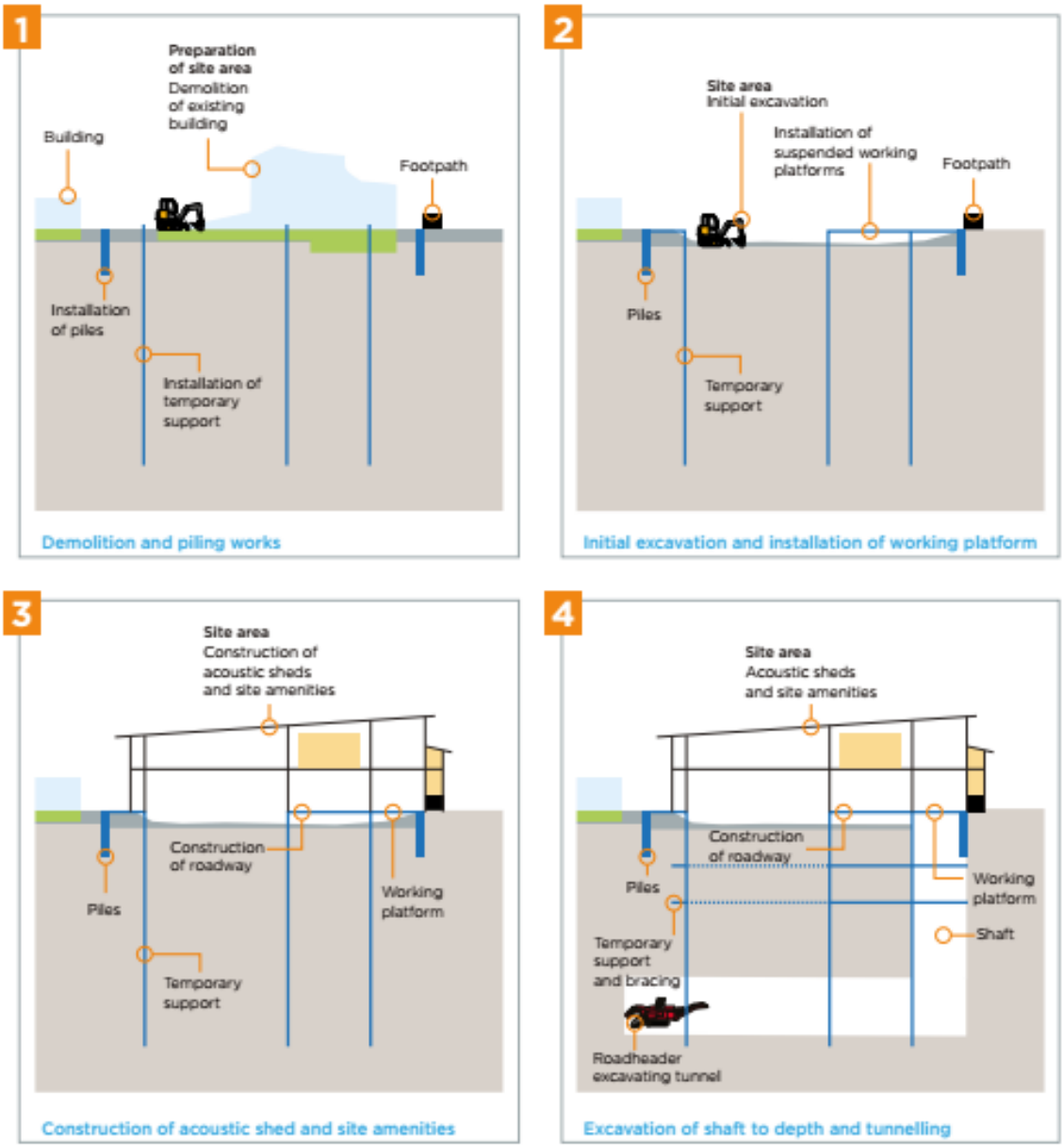


Figure 7-6 Typical mined station construction

7.10.4 Victoria Cross Station construction sites

Construction of Victoria Cross Station would require two sites:

- The Victoria Cross north site would cover about 700 square metres on the western side of Miller Street, towards the northern extent of the station. This site currently contains one commercial building
- The Victoria Cross south site would cover about 4,700 square metres on the south east corner of Berry and Miller streets. The site currently contains commercial buildings.

The station would be constructed using a mined technique. A shaft would be excavated within the Victoria Cross south site adjacent to the proposed station cavern. This shaft would be used to provide the future station entry and vertical transport. The station cavern, located under Miller Street, would then be excavated from the shaft.

Shafts would also be excavated from the Victoria Cross north site to the underground station cavern. The Victoria Cross north site would become a future service facility. This shaft may also be used throughout the construction period for the delivery of materials.

About 175,000 cubic metres of spoil would be removed to construct the station.

It is also likely that roadheaders would be established from this site to excavate stub tunnels located to the north of Victoria Cross Station. These stub tunnels would enable a future expansion of the metro network.

Access to and egress from the Victoria Cross south site would be left-in via Miller Street and left-out to Denison Street. Access and egress to and from the Victoria Cross north site would be left-in and left-out via Miller Street.

Street level working platforms would be required over the shaft excavations at both sites. The platforms would house support services including office, amenities, spoil handling and storage, and workshops.

The location and indicative layout of the Victoria Cross Station construction site, including vehicle access and egress, are illustrated in Figure 7-11. The indicative construction program is outlined in Table 7-10.

Table 7-10 Victoria Cross Station indicative construction program

Construction activity	Indicative construction timeframe																											
	2017				2018				2019				2020				2021				2022				2023				2024			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Enabling works and site establishment																																
Station excavation																																
TBM pass through station																																
Station structural works																																
Station fit out																																
Station testing and commissioning																																

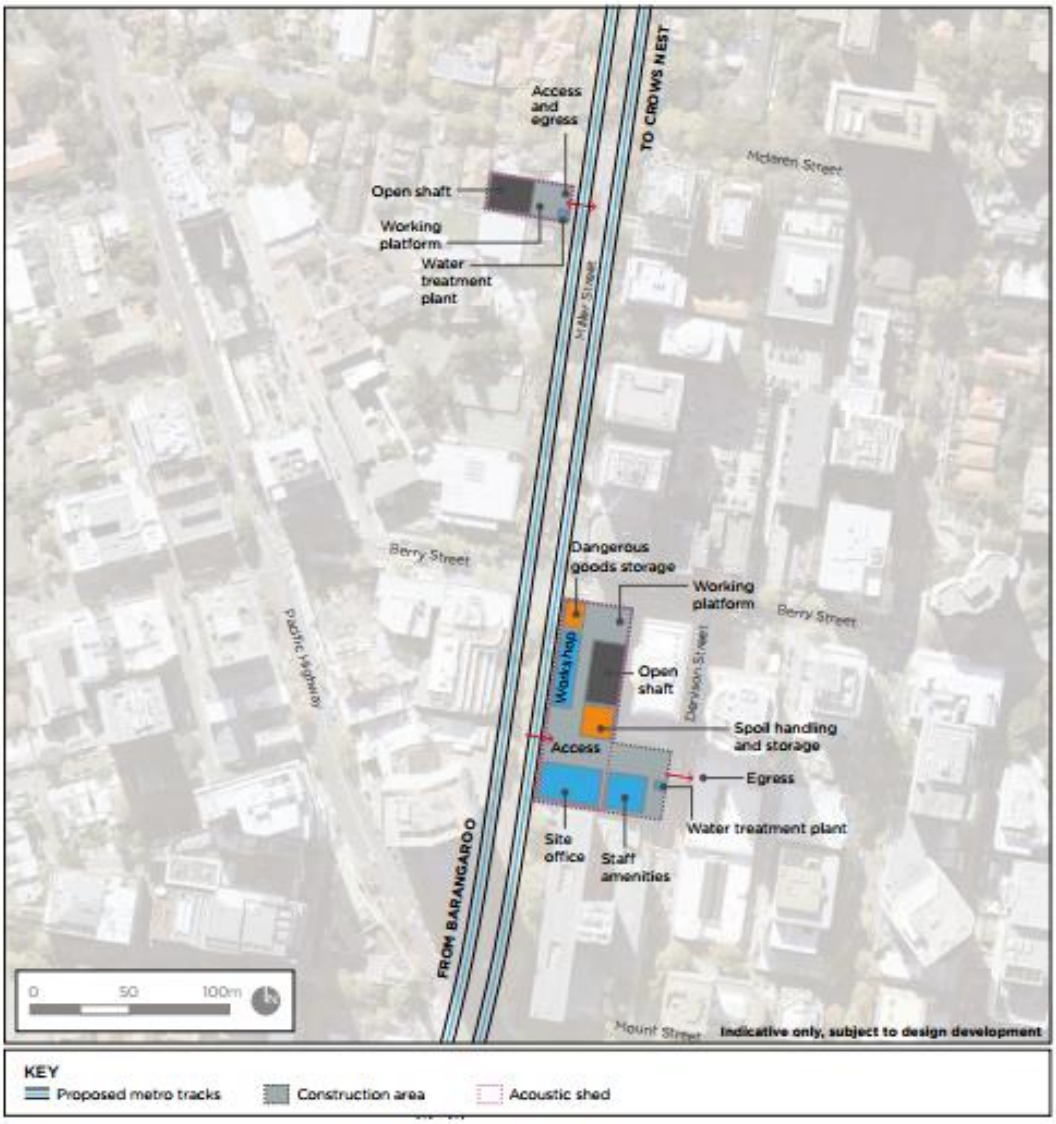


Figure 7-11 Victoria Cross Station construction site indicative layout

Sydney
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