Integrated Management System

Planning Approval Consistency Assessment Form

SM ES-FT-414

Sydney Metro Integrated Management System (IMS)

Assessment Name:	Five Dock Single Cavern
Prepared by:	AFJV Environment Manager
Prepared for:	Sydney Metro
Assessment number:	AFJV01
Status:	Final
Version:	1.0
Planning approval:	CSSI 10038 Sydney Metro West Concept and Stage 1
Date required:	August 2021
iCentral number	SM-21-00280381

Form information – do not alter

Form number	SM ES-FT-414
Applicable to:	Sydney Metro
Document Owner:	Principal Manager, Sustainability, Environment & Planning
System Owner:	Executive Director, Safety, Sustainability & Environment
Status:	Final
Version:	2.0
Date of issue:	27 April 2018
Review date:	27 April 2019

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The Planning Approval Consistency Assessment Form should be completed in accordance with the Sydney Metro Planning Approval Consistency Assessment Procedure (SM ES-PW-314) and Sydney Metro Environmental Planning and Approval Manual (SM ES-ST-216)

1.0 Existing Approved Project

Planning approval reference details (Application/Document No. (including modifications)):

- CSSI 10038 Sydney Metro West Concept and Stage 1 (11 March 2021)
- Administrative Modification 1 (28 July 2021)

Date of determination:

11 March 2021

Type of planning approval:

CSSI, Critical State Significant Infrastructure.

Description of existing approved project you are assessing for consistency:

In its entirety, the Sydney Metro West project involves the design, construction and operation of a metro rail line of approximately 24 kilometers between Westmead and Sydney. The intention of the project is to provide a fast, reliable and frequent connection between Greater Parramatta and the Sydney CBD, and result in the following beneficial outcomes:

- Relieve the congested T1 Western Line, T9 Northern Line and T2 Inner West and Leppington Line
- Double the existing rail capacity between the Parramatta and Sydney CBDs
- Significantly boost economic opportunities for Greater Parramatta.

Stage 1 of the planning approval for the Sydney Metro West project involves major civil construction work between Westmead and The Bays, including:

- Enabling works
- New station excavations for proposed metro stations at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock and The Bays
- Tunnel excavation including tunnel support activities
- Shaft excavation for services facilities at Rosehill and Silverwater
- Civil works for the stabling and maintenance facility at Clyde
- A concrete segment facility for use during construction
- Excavation of a tunnel dive structure and associated tunnels at Rosehill to support a connection between the Clyde stabling and maintenance facility and the mainline metro tunnels.

To construct the above, the Sydney Metro West Stage 1 is divided into multiple packages, each with their own design and construction scope The package relevant to this Consistency Assessment is the Central Tunnel Package (CTP) which has an overall design and construction timeframe of approximately three years, from July 2021 to Q4 2024.

Relevant background information (including EA, REF, Submissions Report, Director General's Report, MCoA):

- Sydney Metro West Concept and Stage 1, Environment Impact Statement, April 2020
- Sydney Metro West Concept and Stage 1, Submissions Report, November 2020
- Sydney Metro West Concept and Stage 1, Director General's Assessment Report (SSI 10038), March 2021
- Sydney Metro West Concept and Stage 1, MCoA, released on 11 March 2021 and updated on 28 July 2021.

2.0 Description of proposed development/activity/works

Describe ancillary activities, duration of work, working hours, machinery, staffing levels, impacts on utilities/authorities, wastes generated or hazardous substances/dangerous goods used.

Construction of the Five Dock Station is included as an element of the CTP. Five Dock Station is located in the core of the Five Dock local centre off Great North Road with an entrance on Fred Kelly Place. Great North Road is the primary north-south spine through the locality leading from Parramatta Road to the peninsula suburbs of Abbotsford and Drummoyne[1].

Five Dock Station is described in the EIS in detail in Section 9 which describes Five Dock Station as a binocular mined cavern station, excavated underground via the shafts installed for future station entry and vertical transport would be typically offset from the location of future 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 cavern and pedestrian connections. Spoil would be moved to the shafts, transferred to the surface and then removed from site[2].

The proposed change being assessed is the configuration of the underground station at Five Dock. The original, approved design is a binocular shaped underground cavern, meaning the platforms for each direction of train movement are separated by a wall, resulting in a binocular shape when viewed in cross section. The proposed final configuration is as a single underground cavern, meaning the removal of the separation wall between the two platforms to create an open space with free movement between both platforms. To accommodate the proposed single cavern station, the railway track alignment for the Up Line will be adjusted closer to the Down Line track. This is best demonstrated in the plan view shown in **Appendix A**. Consistent with the approved project, the proposed change would be constructed underground (i.e. as mined caverns, rather than an open cut methodology) using roadheader and Tunnel Boring Machine methodologies.

While the internal size of the single cavern option is larger, the total excavation volume is smaller than the binocular design, therefore reducing spoil generation and spoil haulage. Additionally, the internal surface area of the cavern is reduced than that of the binocular arrangement, therefor reducing required shotcrete volumes and internal support (bolts) installations.

[1] EIS Section 6.7.6 *Five Dock Station*
[2] EIS Section 9.4.3 *Stations*

The proposed construction methodology, including the following elements, will remain consistent with the approved project:

- Excavation methodology (i.e. use of roadheaders and other excavation equipment for the station excavation and Tunnel Boring Machine for the tunnel)
- Internal excavation support mechanisms
- Ancillary facilities required to support the works
- Working hours
- Staffing levels
- Impacts on utilities/authorities
- Hazardous substances/dangerous goods used.

3.0 Timeframe

When will the proposed change take place? For how long?

The change in design of the Five Dock cavern will be implemented during construction in line with the current project timeframe, and will not generate a significant change in the timeframe for delivery of the project overall. However, at a site level, there will be a modest shortening of the duration of construction work at the Five Dock Station as a result of the reduced excavation requirement; the single cavern station arrangement will save potentially six weeks of construction in contrast to the binocular cavern design.

The design change is a permanent change and will remain as part of the operation of the project.

4.0 Site description

Provide a description of the site on which the proposed works are to be carried out, including, Lot and Deposited Plan details, where available. Map to be included here or as an appendix. Detail of land owner.

Five Dock Station is located towards the middle of the Five Dock local commercial centre at Great North Road, with a proposed future station entrance on Fred Kelly Place. As described in the EIS[3], Five Dock Station will be constructed from two surface construction sites, a western construction site and an eastern construction site as described below:

- The Five Dock Station western construction site would cover about 4,150 square metres and would be located between Great North Road and East Street, to the north of Fred Kelly Place and south of St Albans Anglican Church.
- The Five Dock Station eastern construction site would cover about 2,150 square metres and would occupy the Second Avenue council car park and a number of residential properties located on Waterview Street. The construction site would be used to excavate Five Dock Station using a mined technique.

The Five Dock Station cavern is located underground and would be accessed during construction from shafts excavated within the two construction sites. **Appendix A** includes a figure of the Five Dock Station in the context of the broader project area. Minor adjustments to the shafts, such as a slight increase in the size of the western shaft, may be required within the approved footprint and will be determined as part of detailed design, however the significant elements of change would be underground and not perceived from ground surface during construction or operation.

[3] EIS Section 9.5.8 *Five Dock Station construction site*

5.0 Site Environmental Characteristics

Describe the environment (i.e., vegetation, nearby waterways, land use, surrounding land use), identify likely presence of protected flora/fauna and sensitive area.

The surface works associated with the Five Dock Station are located within the Five Dock commercial area, being an existing built up area of mixed land use including commercial and residential areas.

The site has been heavily disturbed as part of previous development, and there is no naturally occurring native vegetation present within the construction footprint. Additionally, the site does not contain any sensitive environmental features and the nearest waterway is Iron Cove Creek / Dobroyd Canal which is a concrete-lined disturbed waterway located approximately 700 metres to the southeast. All proposed changes will be accommodated within the approved surface project boundary.

Underground, the cavern footprint is made up of shale which overlies sandstone rock.

6.0 Justification for the proposed works

Address the need for the proposed works, whether there are alternatives to the proposed works (and why these are not appropriate), and the consequences with not proceeding with the proposed work.

The proposed change is considered an overall improvement to the design and Project program and budget, with faster construction, reduced internal support installation and reduced spoil generation. The reduced spoil generation would reduce the need for spoil haulage and disposal. The proposed design would also require about 15% less concrete versus the original design (and consequently reduced concrete truck movements).

Further environmental and climate change benefits are discussed in Section 7 and Section 9 of this Consistency Assessment Form.

7.0 Environmental Benefit

Identify whether there are environmental benefits associated with the proposed works. If so, provide details:

There are multiple improvements across the aspects of environment and community impact, these are summarised below:

- The station construction will be reduced by approximately six weeks therefore reducing:
  - The duration of amenity impacts to sensitive receivers;
  - Vibration risks to the heritage structure on neighbouring the site, including St Albans Church
  - Heavy vehicle spoil haulage movements within Five Dock
- There would be a reduction in spoil waste being generated from the cavern construction, resulting in less spoil being disposed off site.

8.0 Control Measures

Will a project and site specific EMP be prepared? Are appropriate control measures already identified in an existing EMP?

The Five Dock construction site will be managed under the project CEMP (Construction Environment Management Plan). Appropriate control measures are already identified in the CEMP that will accommodate the changes proposed in this assessment.

There are no changes to the CEMP proposed as a result of the design change to a single cavern station arrangement at Five Dock.

9.0 Climate Change Impacts

Is the site likely to be adversely affected by the impacts of climate change? If yes, what adaptation/mitigation measures will be incorporated into the design?

The effects of climate change on the Sydney Metro West Stage 1 project was discussed in the EIS Chapter 26. The changes proposed to the underground arrangement at Five Dock are expected to result in an overall decrease in greenhouse gas emissions given there would be less materials usage (most significantly in concrete materials) less spoil haulage and less construction effort.

10.0 Impact Assessment – Construction

Attach supporting evidence in the Appendices if required. Make reference to the relevant Appendix if used.

Aspect	Nature and extent of impacts (negative and positive) during construction (if control measures implemented) of the proposed/activity, relative to the Approved Project	Proposed Control Measures in addition to project CoA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
Flora and fauna	No change from approved project	No additional measures	Y	Y	
Water	A minor reduction in water use would result in the decreased excavation and shotcreting (internal tunnel lining) requirements.	No additional measures	Y	Y	
Air quality	The station excavation method remains as a mined technique (i.e. rather than an open cut). A minor improvement in air quality impact is expected as a result of decreased spoil generation and subsequent spoil haulage requirements.	No additional measures	Y	Y	

Noise and vibration	A reduction in construction noise and vibration impacts is expected as a result of the reduced construction program (approximately six weeks). In order to confirm the degree of change, a construction and operational noise and vibration impact assessment was undertaken for the proposed single cavern station arrangement and compared to the original proposal as assessed in the environmental impact statement. This full report is provided in **Appendix B**. The outcomes of this assessment with regards to construction phase noise and vibration impacts, indicated: • The primary cause of difference is horizontal realignment of the up line (rather than the change in station shape). • Due to the shift in alignment of the tunnel, it would be constructed marginally further from some residences and marginally closer to others. This would result in 22 fewer properties experiencing temporary exceedances of the ground-borne noise night-time noise management level during construction. • The impact of the change in alignment is likely to result in a minor increase in temporary ground-borne noise and vibration associated with tunnel boring and/or road header usage at a small number of receivers located near the Alternative design alignment. • However, for most receivers within 150 metres of the tunnel for which the alignment has been adjusted, predicted maximum levels of construction ground-borne noise would either not change or would decrease. • .	No additional measures	Y	Y	

Indigenous heritage	No change from approved project	No additional measures	Y	Y	
Non-indigenous heritage	No change from approved project	No additional measures	Y	Y	
Community and stakeholder	Reduction in overall construction impacts due to a slight reduction (approximately six weeks) in proposed construction period.	No additional measures	Y	Y	
Traffic	A minor reduction in traffic disturbance is expected as a result of decreased spoil generation and subsequent spoil haulage requirements.	No additional measures	Y	Y	
Waste	A minor reduction in waste impacts is expected as a result of decreased spoil generation.	No additional measures	Y	Y	
Social	No change from approved project	No additional measures	Y	Y	
Economic	No change from approved project	No additional measures	Y	Y	
Visual	No change from approved project	No additional measures	Y	Y	
Urban design	No change from approved project	No additional measures	Y	Y	

Geotechnical	A risk assessment for the single cavern option was undertaken with conservative assumptions for both ground conditions and depth of building basement/foundation to ensure no change to potential impacts of ground settlement. Results identified: • a maximum settlement of <10mm • a maximum slope at <1:2500 • a limiting tensile strain value of 0.03%. In summary, this maintains outcome within a category of Risk Level 1, i.e. “Negligible”, as per EIS classification and other international standards/guides. Notwithstanding this, existing CoA relating to the allowable criteria for settlement (CoA D63) will be implemented and adhered.	No additional measures	Y	Y	
Groundwater	Five Dock Station would remain as a tanked station as outlined in Chapter 18 (Groundwater and ground movement) of the environmental impact statement. Potential groundwater inflow levels and groundwater drawdown impacts are therefore anticipated to be broadly consistent with those identified in the EIS.	No additional measures	Y	Y	
Land use and property	No additional land owners have been affected by the changes at Five Dock. Twelve properties around the station and a further 6 along the alignment are no longer affected by substratum property impacts.	No additional measures	Y	Y	

Climate Change	The proposed change is expected to result in a decrease in greenhouse gas emissions given there would be less materials usage (most significantly in concrete materials) less spoil haulage and less construction effort.	No additional measures	Y	Y	
Risk	No change from approved project	No additional measures	Y	Y	
Other	No change from approved project	No additional measures	Y	Y	
Management and mitigation measures	No change from approved project	No additional measures	Y	Y	

11.0 Impact Assessment – Operation

Attach supporting evidence in the Appendix if required. Make reference to the relevant Appendix if used.

Aspect	Nature and extent of impacts (negative and positive) during operation (if control measures implemented) of the proposed activity/works, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
Flora and fauna	No change from approved project	No additional measures	Y	Y	
Water	No change from approved project	No additional measures	Y	Y	
Air quality	No change from approved project	No additional measures	Y	Y	
Noise and vibration	No change from approved project	No additional measures	Y	Y	
Indigenous heritage	No change from approved project	No additional measures	Y	Y	
Non-indigenous heritage	No change from approved project	No additional measures	Y	Y	
Community and stakeholder	No change from approved project	No additional measures	Y	Y	
Traffic	No change from approved project	No additional measures	Y	Y	
Waste	No change from approved project	No additional measures	Y	Y	
Social	No change from approved project	No additional measures	Y	Y	
Economic	No change from approved project	No additional measures	Y	Y	
Visual	No change from approved project	No additional measures	Y	Y	

Aspect	Nature and extent of impacts (negative and positive) during operation (if control measures implemented) of the proposed activity/works, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
Urban design	No change from approved project	No additional measures	Y	Y	
Geotechnical	No change from approved project	No additional measures	Y	Y	
Land use	No change from approved project	No additional measures	Y	Y	
Climate Change	No change from approved project	No additional measures	Y	Y	
Risk	No change from approved project	No additional measures	Y	Y	
Other	No change from approved project	No additional measures	Y	Y	
Management and mitigation measures	No change from approved project	No additional measures	Y	Y	

12.0 Consistency with the Approved Project

Based on a review and understanding of the existing Approved Project and the proposed modifications, is there is a transformation of the Project?	No. The proposed change would not transform the project.
Is the project as modified consistent with the objectives and functions of the Approved Project as a whole?	Yes. The proposed change would be consistent with the objectives and functions of the approved project as a whole.
Is the project as modified consistent with the objectives and functions of elements of the Approved Project?	Yes. The proposed change would be consistent with the objectives and functions of elements of the approved project.
Are there any new environmental impacts as a result of the proposed works/modifications?	No. There are no new environmental impacts.
Is the project as modified consistent with the conditions of approval?	Yes. The proposed change is consistent with the conditions of approval.
Are the impacts of the proposed activity/works known and understood?	Yes. The impacts of the proposed change are understood.
Are the impacts of the proposed activity/works able to be managed so as not to have an adverse impact?	Yes. The impacts of the proposed change can be managed within the existing management measures.

13.0 Other Environmental Approvals

Identify all other approvals required for the project:	Nil. No additional environmental approvals are required.

Author certification

To be completed by person preparing checklist.

I certify that to the best of my knowledge this Consistency Checklist: • Examines and takes into account the fullest extent possible all matters affecting or likely to affect the environment as a result of activities associated with the Proposed Revision; and • Examines the consistency of the Proposed Revision with the Approved Project; is accurate in all material respects and does not omit any material information.			
Name:	Erran Woodward	Signature:	
Title:	Environmental Approvals Manager		
Company:	AFJV	Date:	24/8/2021

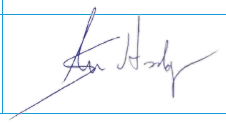
This section is for Sydney Metro only.

Application supported and submitted by			
Name:	Yvette Buchli	Date:	25/08/2021
Title:	Associate Director Planning Approvals	Comments:	
Signature:			

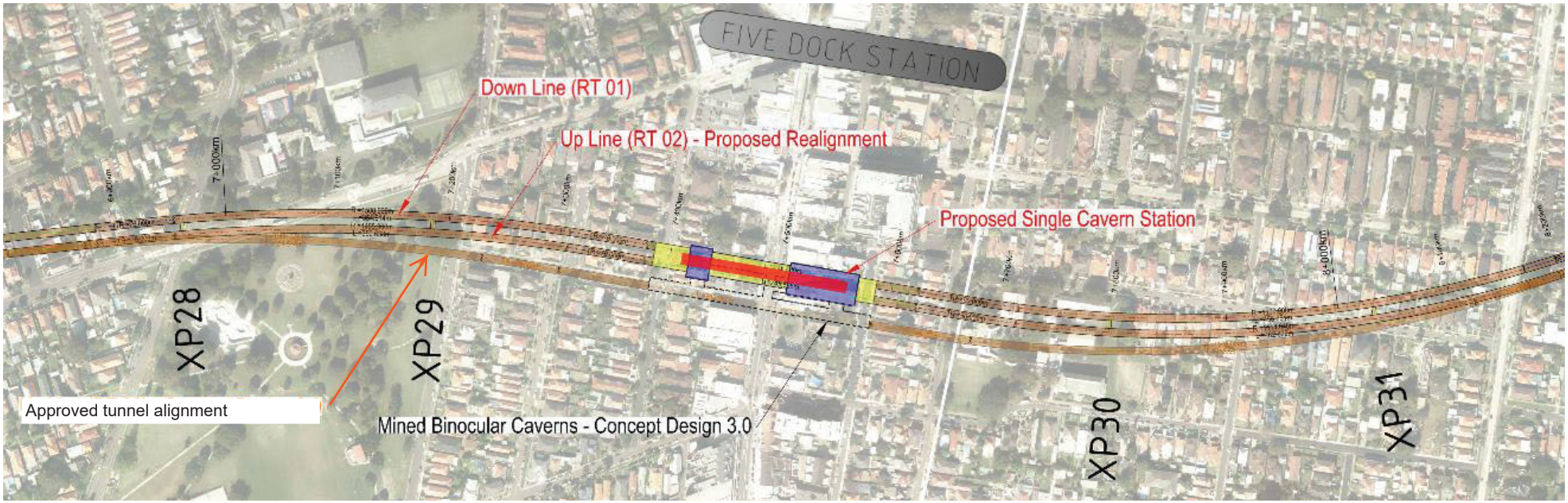
Based on the above assessment, are the impacts and scope of the proposed activity/modification consistent with the existing Approved Project?

Yes ☑ The proposed activity/works are consistent and no further assessment is required.

No ☐ The proposed works/activity is not consistent with the Approved Project. A modification or a new activity approval/ consent is required. Advise Project Manager of appropriate alternative planning approvals pathway to be undertaken.

Endorsed by			
Name:	Stuart Hodgson	Date:	25 August 2021
Title:	Director Environment, Sustainability & Planning, West	Comments:	
Signature:			

Appendix A Track alignment of proposed change


FIVE DOCK STATION
Down Line (RT 01)
Up Line (RT 02) - Proposed Realignment
Proposed Single Cavern Station
XP28
XP29
XP30
XP31
Approved tunnel alignment
Mined Binocular Caverns - Concept Design 3.0

Appendix B Construction Noise and Vibration Assessment

hutchison weller

Consistency Review

Five Dock Station – single cavern design

Project	Sydney Metro West Central Tunnelling Package
Client	Acciona Ferrovial Joint Venture

24 August 2021 21028-NV-CR-1-2

1 Introduction

Acciona Ferrovial Joint Venture (AFJV) is delivering the Central Tunnelling Package (CTP) of the Sydney Metro West project.

During detailed design, AFJV has identified an alternative design for the Five Dock Metro Station than was described in the Environmental Impact Statement for the Concept and Stage 1 of the Sydney Metro West project between Westmead and The Bays (the EIS) (the Alternative design).

The Alternative design involves construction of a single cavern structure rather than a binocular design (EIS design). The indicative binocular and single cavern designs are illustrated in Figure 1.

The Alternative design would retain the footprint of the proposed station box but would bring the Up line (RT02) within the station, a horizontal adjustment of approximately 22 metres. The Down line (RT01) would remain in its current position. No change to the vertical alignment change is anticipated.

The Alternative design would also result in a proportional change to the Up track horizontal alignment, as illustrated in Figure 2.

The proposed changes in design may have consequences for construction noise and vibration, with potential for differences to the impacts described in the EIS.

This document provides a review of consistency of the Alternative design with the EIS design including analysis of the impacts described in the EIS and how the Alternative design might affect these impacts.

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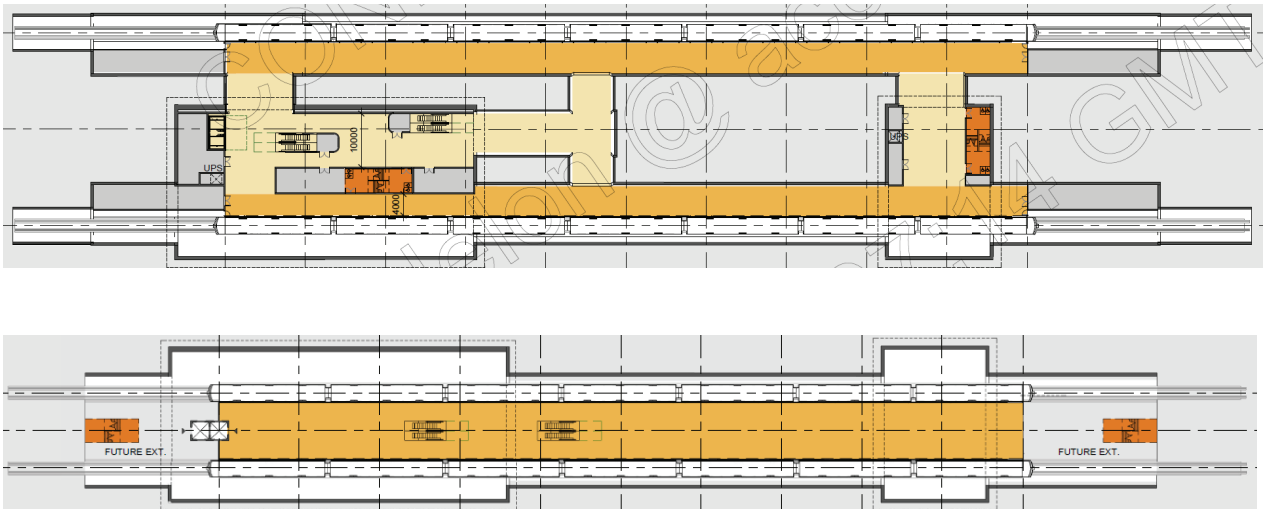

Figure 1 Indicative binocular (EIS design), top, and indicative single cavern (Alternative design), bottom

Figure 2 Tunnel alignment change

2 EIS design

2.1 Overview

The EIS described the Concept and Stage 1 of the Sydney Metro project. The Concept assessment was high-level, describing the major elements of the Sydney Metro project with a preliminary risk assessment of noise and vibration impacts.

The Stage 1 of the planning approval for Sydney Metro West addressed all major civil construction works between Westmead and The Bays including station excavation and tunnelling.

Future Stages of assessment will address stations, depots and rail systems, and operation of the line.

2.2 Concept findings

The EIS describes new station sites as being mostly underground with minimal impacts that can be effectively mitigated via standard engineering controls to comply with relevant guidelines. Relevant findings of the EIS for the Concept were:

- The potential for ground-borne noise and vibration impacts from operational rail lines in tunnels would be managed with consideration of various types of resilient track forms to suit the level of impact.
- The need for resilient track forms would depend on predicted ground-borne noise and vibration impacts, which have not been provided in the EIS and would be determined during future stage assessments.
- Factors to influence ground-borne noise are described as train speed, tunnel depth, tunnel design and position of track turnouts.
- Matters to be addressed in future, staged applications included noise and vibration impacts during construction and operation.

2.3 Stage 1 findings

Construction

The Five Dock Station would require two construction sites (east and west). The western site would sit between Great North Road and East Street, to the north of Fred Kelly Place and South of St Albans Anglican Church. The eastern site would occupy the Second Avenue council carpark and number of residential properties on Waterview Street.

Shafts would be excavated on each construction site to the binocular caverns, which would be mined.

The twin tunnels would be constructed by Tunnel Boring Machines (TBM), which would generate vibration and ground-borne noise (GBN) at sensitive receivers close to the tunnel alignment. The technical paper for noise and vibration describes the TBM as seven metres in diameters, progressing at a rate of between 25 and 50 metres per day, with tunnelling occurring 24 hours, 7 days. Rock breakers, used for cross passage excavation, would be around 900 kg in weight, mounted to 12 – 22 tonne excavators.

The EIS presents modelled levels of vibration and GBN over various distances for TBM and rock breakers. These modelled levels are reproduced in Figure 3.

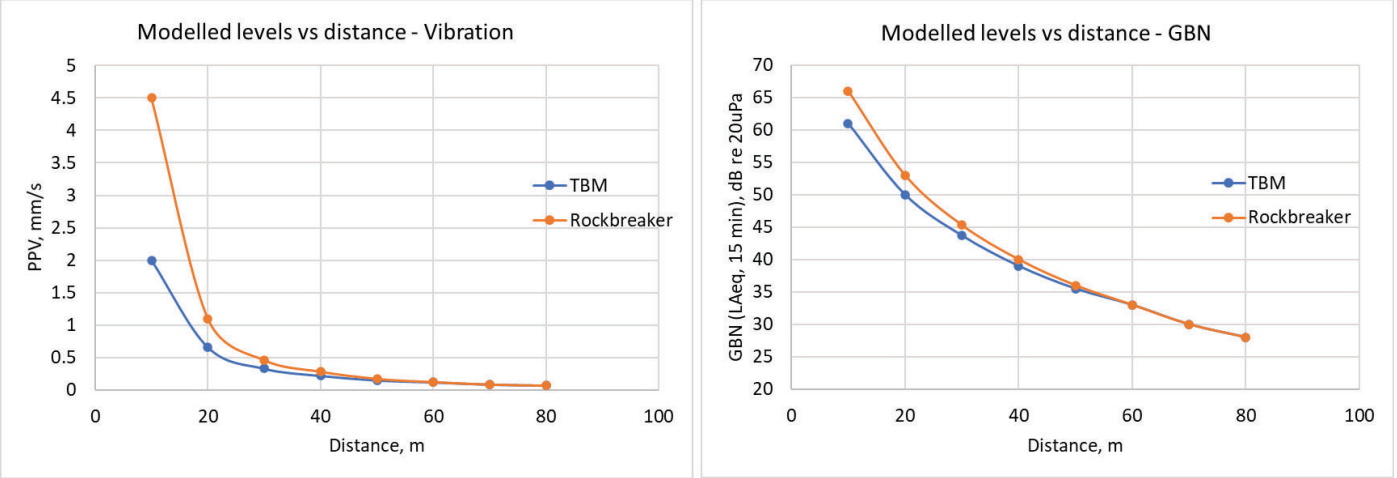

Figure 3 Modelled levels vs distance – vibration (left) and GBN (right), from EIS.

At closest receiver locations:

- Tunnelling with TBM is likely to exceed relevant GBN noise management levels (NMLs) by 1 – 10 dB at around 85 properties during standard hours.
- Outside standard hours, the number of exceedances would increase due to more stringent NMLs, with around 136 receivers likely to exceed the NML by 1 – 10 dB in the evening.
- At night, 101 receivers are likely to exceed the NML by up to 10dB and another 75 by between 11 dB and 20 dB.
- The duration of GBN impacts would be consistent with those outlined in Figure 81 of Technical Paper 2 (Noise and vibration) of the EIS.

The EIS found human comfort vibration management levels likely to be exceeded at up to 52 residences at night. No cosmetic damage or sensitive equipment exceedances were predicted.

The EIS describes excavation of cross passages between the twin tunnels as likely to result in GBN up to 3 dB louder than the TBM passage. The assessment found minimum slant distances inside which GBN NMLs may be exceeded at night would be 52 metres for a minor (1-10 dB) exceedance, 30 metres for a moderate (11-20 dB) exceedance and 17 metres for a high (>20 dB) exceedance of the 35 dBA criterion. These distances are reproduced in Table 1.

No tally of receivers within these ranges was provided in the EIS.

Table 1 Slant distances inside of which the GBN NMLs may be exceeded

Receiver type	Criteria (dBA)	Minor (1-10 dB)	Moderate (11-20 dBA)	High (>20 dB)
Residential (day)	45	30	17	10
Residential (night)	35	52	30	17
Educational	45	30	17	10
Medical	45	30	17	10
Place of worship	45	30	17	10
Childcare	40	39	23	13
Commercial	50	23	13	7

3 Alternative design

Comparison with concept

No change to the concept is proposed. The Alternative design would be constructed underground in a similar manner as described in the EIS, maintaining the location, scale and nature of the assessed design.

Of the proposed changes to the design, the tunnel depth would not be affected. Tunnel design would remain the same (i.e. construction materials and dimensions) notwithstanding a horizontal realignment of the up line to align with the new single cavern design. The change in horizontal alignment is discussed further below.

In general, the Alternative design remains consistent with the high-level assessment of the Concept stage presented in the planning approval.

Comparison with Stage 1

Assessment of Stage 1 of the planning approval focussed on construction noise and vibration and this assessment focusses on construction GBN and vibration. It is anticipated that air-borne noise impacts as a result of the Alternative design would be consistent with the Approved Project as the surface arrangements are not altered from the original design as described in the EIS, and are contained within the approved Project boundary.

As described in the EIS, there would be two construction sites located as per the EIS design, with shafts excavated to the cavern level. The twin tunnels would still be excavated via TBM and the single cavern mined using roadheader.

The primary difference between the EIS and Alternative designs in the approximately 22 metre horizontal realignment of the up line from the binocular layout to the single cavern. This realignment also has up-track and Down-track alignment consequences about 500m east and west of Five Dock Station. There would be no change to the vertical alignment.

The main change in GBN noise and vibration impacts during tunnelling will result in the reduced or increased slant distance between the TBM and sensitive receiver. This will affect the resulting level of GBN and vibration.

An analysis of change in slant distances from the EIS to the Alternative design has been completed based on the modelled levels over distance provided by the EIS. Results for buildings within around 150 metres of the project (consistent with the EIS) are provided in Figure 4, which illustrates the likely change in GBN and vibration levels because of the Alternative design relative to the EIS design at the worst-case position (i.e. closest point to each building).

The numbers of receivers likely to experience a reduction, no change or increase in noise levels due to the change in horizontal tunnel alignment is summarised in Table 2.

Table 2 Estimated number of receivers to experience change in GBN level.

Estimated change in GBN	Number of receivers
Reduction > 2dB	123
Reduction -1 to 2 dB	120
Reduction 0 to 1 dB	53
No change	278
Increase 0 to 1 dB	12
Increase > 1 dB	1

Figure 4 Change in GBN/vibration impact as a result of Alternative design

Based on proposed changes in tunnel alignment, the Alternative design is likely to result in the following outcomes.

- Reduced slant distances at up to around 286 receivers and an increased distance for around 300 receivers.
- Although the increased slant distance should result in an increase in GBN and vibration from the Up line, the Down line, remaining in place, would continue to be the dominant source of GBN and vibration for nearby receivers.
- In total, up to 13 receivers are expected to experience an increase in GBN and vibration for the Alternative design relative to the EIS design.
- The increase in slant distance should result in a decrease in GBN and vibration at up to 296 receivers, which is an improvement on the EIS design. Around 278 receivers would not experience any change in the maximum GBN or vibration levels.

With reference to the number of receivers likely to experience GBN above the GBN management level, 35 dBA at night, the EIS design is expected to result in around 190 exceedances while the Alternative design would result in around 168 exceedances. A reduction overall.

Though the number of receivers likely to be affected would decrease with the Alternative design, due to the tracks being closer together the receivers formerly affected by a single tunnel's excavation would now likely experience GBN and vibration from two tunnels, potentially a doubling of duration of their impact.

As part of the Alternative design, additional cross-passages are proposed. These would be excavated by rock breaker. The EIS did not quantify the number of receivers likely to experience GBN and vibration above the management levels for cross-passage excavation. However, as described in Section 11.5.3 of the EIS:

- 'Moderate' exceedances of the night-time NML are expected where residential receivers have a slant distance of around 30m or less from the nearest cross passage.
- 'High' exceedances at residential receivers are likely where the slant distance is less than around 17m.

Receivers in the moderate to high categories may be offered respite, including alternative accommodation, in line with guidelines and mitigation measures described in the EIS, the Sydney Metro Construction Noise and Vibration Standard and the Conditions of Approval.

4 Summary

On review of the EIS assessment of the Concept and Stage 1 design of the Five Dock Station and comparison with the Alternative design proposed by AFJV, the following conclusions are presented.

1. The Alternative design is consistent with the Concept stage descried in the EIS. No changes proposed as part of the Alternative design conflict with the assessment or description of the Concept Stage.
2. Assessment of operational noise and vibration impacts, and number of receivers potentially affected by cross-passage excavation, were excluded from the EIS for Concept and Stage 1.
3. The description and assessment of Stage 1 in the EIS provided a description of the nature and scale of the Five Dock Station. No changes proposed as part of the Alternative design conflict with the assessment or description of Stage 1, except for the terminology of binocular vs single cavern design.
4. Construction methodologies are not proposed to change for the Alternative design and station and shaft excavation noise and vibration impacts would be consistent with the EIS.
5. Tunnelling would still be completed using a TBM for mainline and a road header with a rock breaker for cross-passages. Due to the shift in alignment of the tunnel, it would be constructed further from some residences but closer to others, with an overall reduction in the number of receivers affected by GBN.
6. The impact of the change in alignment is likely to result in a minor increase in ground-borne noise and vibration at a small number of receivers located near the Alternative design alignment. However, for most receivers within 150 metres of the tunnel, predicted maximum levels of TBM noise would either not change or would decrease.

Based on this review, the Alternative design is consistent with the EIS design in nature, scale and level of impact on sensitive receivers. Potential impacts would be managed in accordance with the guidelines and mitigation measures described in the EIS, the Sydney Metro Construction Noise and Vibration Standard and the Conditions of Approval.