Department of Planning and Environment

Our ref: DOC22/244379 Your Ref: SSI-22765520

Keith Ng
Senior Environmental Assessment Officer
Energy, Resource and Industry Assessment
Department of Planning and Environment
Locked Bag 5022
PARRAMATTA NSW 2124

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Subject: Request for Advice: the Sydney Metro West - Rail infrastructure, stations, precincts and operations (SSI-22765520)

Dear Mr Ng

Thank you for your email received 22 March 2022 seeking comments on the above project. Environment and Heritage Group (EHG) has reviewed the environmental impact statement for this project and provides the following comments.

EHG notes that a waiver to prepare a Biodiversity Development Assessment Report was signed on 9 November 2021. EHG also notes that the project sites are largely in urbanised areas with limited native vegetation and that potential impacts associated with the removal or disruption to buildings which may provide habitat for threatened microbat species was assessed and approved as part of SSI-10038.

EHG notes that several aspects regarding the potential flooding aspects will require further consideration and assessment. EHG's full comments on this aspect of the project are located at Attachment A.

EHG notes that this review has not considered potential impacts to heritage items, including any archaeological impacts which may be associated with this project. A separate response may come from Heritage Division in EHG.

If you have any queries please contact David Way, Senior Conservation Officer via David.Way@planning.nsw.gov.au or 02 8275 1324.

Yours sincerely,

S. Harrison

Susan Harrison

Senior Teams Leader
Greater Sydney Branch
Biodiversity and Conservation

Attachment A: Flood risk management comments on Sydney Metro West - Rail infrastructure, stations, precincts and operations (SSI-22765520)

1. Flood Risk

Flood risk to the stations needs further work for the environmental impact assessment (EIS) to address flood protection, flood barriers and the response to climate change.

1.1. Flood protection at station entrances

The EIS has provided only the flood level for the 'defining flood event' and corresponding design level for locations around stations. Further information should be provided to assess:

- the level of passive flood protection afforded
- the frequency of inundation or flood immunity and
- how often active protection (flood barriers) would be needed.

The proposed freeboard to the 1% annual exceedance probability (AEP) flood is stated as generally being 500 millimetres, but this should be explicitly stated for each entry. If a reduced freeboard is proposed, this should also be noted and justified. The required information for each entry should be provided in a table or tables with the following columns:

- 5% AEP climate change flood level (may not be relevant for all stations)
- 1% AEP climate change flood level
- Adopted freeboard
- 1% AEP climate change flood level plus freeboard
- Intermediate event levels if relevant (Parramatta Station),
- Probable Maximum Flood (PMF) level, and
- Design level.

It would be prudent to include flood levels for events more frequent than the 5% AEP flood for stations experiencing frequent flooding.

1.2. Flood Barriers

EHG does not generally support the use of active flood protection (flood barriers) due to the significant additional risk compared to passive protection. Passive protection can be provided by designing floor and entry levels to prevent the ingress of floodwater. Further investigation must demonstrate that the additional risk due to flood barriers is acceptable.

The EIS proposes flood barriers at three stations – Parramatta, Pyrmont and Hunter Street, where the flood or flood planning level is higher than the design levels (or finished floor levels) of the station entries.

It is not clear whether flood barriers would be required at The Bays Station. The EIS (Chapter 13) indicates that the flood protection level would be higher than the station entry level at The Bays. However, Table 5-16 of the Hydrology Report indicates that the flood level would be lower than the station entry level. These details need to be checked and updated accordingly.

The design levels of Parramatta Station entries would be one and two metres lower than the PMF level. The proposed height of the flood barriers at entries would be in the order of 1 metre to 2 metre.

The proposed flood barriers, particularly at Parramatta Station, would likely prevent or restrict access by emergency services, which would add new risks to commuters and workers within the station. The EIS should state if and how each station will remain accessible to the public and emergency services when flood barriers are activated.

The flood barriers at Parramatta Station would pose considerable risks to commuters and station infrastructure considering how much floodwater they would control. The volume of flood water potentially entering the station could be dangerously high and would pose risk to life for commuters and workers in the event of flood barrier failure or malfunction. The flood barriers would operate based on certain rules and may activate based on observed and anticipated flood levels. The consequences of failure must be considered.

Additional information is needed on the frequency of barrier activation and associated false alarms. These stations are subject to flash flooding, including Parramatta. Flash flooding means there is unlikely to be sufficient warning time. Active flood protection and associated emergency management measures would need to be activated early, while flood forecasts are still uncertain. This situation typically results in a high proportion of false alarms.

For example, flood barriers to protect against a 1% AEP flood may need to be activated multiple times each year because of the high degree of uncertainty in rainfall forecasts. There are multiple negative consequences of false alarms, including significant risk that the flood barriers will no longer be used. Flood barriers would introduce significant and possibly unacceptable risks and create compliance issues that would be difficult to monitor and regulate.

There are also issues with reliability and operability of flood barriers and activation of barriers due to the level of accuracy of flood warning services. There is no available service from the Bureau of Meteorology that provides flood warnings for the Parramatta River or other relevant catchments. The proponent must detail how the flood barriers would be activated. This may include any discussion with the City of Parramatta Council regarding its flood warning system and whether this could provide any benefit for the Metro.

The EIS should provide schematics and plots at the locations of the proposed flood barriers along with the following details based on a comprehensive analysis of:

- Design levels at entries of these stations.
- The flood immunity or frequency of inundation.
- Rise and fall of floodwater for the modelled events including the PMF event (i.e., time versus water level). The critical storm for peak flood levels is unlikely to be the same as the critical storm for rate of rise of floodwaters.
- Duration of inundation and /or expected time for isolation when the barriers are active. The critical storm for peak flood levels is unlikely to be the same as the critical storm for flood duration. East Coast Lows are a common cause of flood producing rain in Sydney and can cause flooding for multiple days. The commuters and workers at some stations would be trapped for extended days under such circumstances and the anticipated risks would be extremely high. This is recognised in the Parramatta City Centre Development Control Plan, which requires refuge facilities be designed for 72 hours of isolation.
- Failure of the flood barriers at the entries of Parramatta River would have effects like dam break conditions. An assessment of the breach or failure conditions of the flood barriers should be undertaken to determine the anticipated risks within Parramatta Station (i.e., population at risk and potential loss of life). An estimate of the volume of floodwater that would enter the station (and tunnel) during failure conditions of a flood barrier is required. The dewatering of floodwater from an underground station (and tunnel) following a failure of a flood barrier would take considerable time and the station would not be operable during that period. These details should also be documented as part of assessment of the consequences of flood barrier failure.
- Failure of flood barriers at Pyrmont and Hunter Street Stations will also need to be undertaken as per above.

- Undertake the above assessment for the full range of flooding events including the PMF event.
- The number of commuters and workers that would be isolated when flood barriers are activated at different times, i.e., during peak and low traffic conditions in weekdays and weekends, under the full range of flooding conditions at these stations.
- Whether the Metro line will continue to operate once flood barriers have been deployed. This is significant in understanding the regional implications for evacuation.

The EIS should evaluate the performance and anticipated reliability of flood barriers as well the risks (such as vulnerabilities of commuters and workers at stations) and explore alternative arrangements to mitigate risks. It should be noted that a station is unlikely to be accessible for inbound commuters when the flood barriers are active under major flooding events as the areas adjacent to the station would be inundated. The number of outbound passengers trapped in the station could become very high when the metro trains are in service. The risks to commuters and workers trapped in a station in these situations are likely to be unmanageable and unacceptable.

While it may not be possible to preclude the use of flood barriers, every effort should be made to increase the level of passive protection, because this will reduce (and /or eliminate) some of the risk associated with flood barriers. For example, if passive protection cannot be provided to the PMF level, a 0.1% AEP flood level could be considered.

1.3. Climate Change and Sea Level Rise

Projected sea level rise is assumed to be constant throughout the Parramatta River estuary and will particularly impact both the Clyde Maintenance and Stabling Facility as well as The Bays Station. Parramatta Station may also be impacted in the PMF.

The assumptions in the EIS for climate change impacts on flooding include a 21.3% increase rainfall and a sea level rise of 0.9 metre. The EIS states that data '*per ARR 2019*' was adopted and this is assumed to include use of the Data Hub to determine rainfall intensity increases. The ARR Data Hub provides rainfall intensity increases to the year 2090. The sea level rise of 0.9 metre roughly corresponds to the latest Intergovernmental Panel on Climate Change (IPCC) projections for mid-range medium or low confidence processes in the SSP5-8.5 to 2100.

As previously advised, flooding conditions under projected climate change scenarios should be evaluated for the full design operational phase of the infrastructure. This is required for the development of adaptive and long-term flood risk mitigation measures. The EIS only discusses climate change to 2090 for rainfall intensity and 2100 for sea level rise, which will be less than 80 years from the completion of the project.

It is recommended to consider increases to both rainfall intensity and sea level rise projected to the year 2150. Modelling should be undertaken using data from the latest IPCC reporting for the SSP5-8.5 scenario using at least the mid-range estimates for medium confidence processes. Projected temperature increases may be used to calculate rainfall intensity increases in accordance with the methodology in Australian Rainfall and Runoff. While additional measures beyond 2100 may not need to be implemented immediately, proof of concept should be developed now to ensure future flood risk is not inadvertently introduced. This is particularly important given the project already relies on flood barriers, which are considered a last resort generally reserved to manage flood risk for existing development.

Clarification is sought on this statement: *Climate change has been incorporated into the PMF event by applying elevated tailwater boundary conditions as appropriate.* EHG requests detail on the sea level rise adopted for the PMF. Given the PMF represents a worst-case scenario, particular consideration should be given to sea level rise, and especially with flood barriers.

2. Emergency Management

Emergency management can be complex and encompasses multiple aspects including evacuation access, potential human behaviours and severity of hazards. The project must not increase the existing risk to life and evacuation potential for the full range of flood events up to the PMF level.

Local flood plans, if available and current, should be considered as some Metro Stations will be surrounded by flood waters during rare flooding events. Although proposed flood barriers would mitigate some flood events in larger floods, the consequences from overtopping or failure of the barriers could place people in harm's way.

The EIS indicates that a shelter-in-place strategy would be adopted at some stations during hazardous flooding without mentioning the PMF. The impacts of major and extreme flood events in isolating and trapping commuters and workers at some critical stations will need to be evaluated. The cumulative impacts of developments on emergency response planning will need to be assessed by considering the capacity of emergency management services, evacuation routes and sheltering capacities (and adequacies) for stations, which are subject to significant flooding risks. The analysis should consider the flooding risks and performance of sheltering in place and evacuation options prior to recommending the preferred options. The EIS does not present due consideration of flood emergency response management, which is important for some stations.

The NSW State Emergency Service (NSW SES) is the agency responsible for emergency management and EHG recommends its early advice is sought on the emergency management measures for this project. The matter can be referred to rra@ses.nsw.gov.au.

Occupiers and operators at the Metro stations must be educated on the potential flood risk within and outside the vicinity of the stations, before, during and after a flood event. A flood emergency management plan including community education and awareness should also be discussed with the NSW SES.

3. Offsite Flood Impacts

Across several stations, flood level increases of more than 10 millimetres are reported. For those stations, any change in hazard category (H1-H6) should also be mapped and discusses. If the hazard category increases due to the project, additional mitigation measures should be developed to avoid that impact.

For North Strathfield and Burwood North Stations, significant unacceptable increases in flood levels have been reported, with the comment *hydraulic impacts will be mitigated as part of ongoing design*.

EHG does not support proceeding to the next stage of approval without first developing and documenting a design to mitigate these significant flood impacts. The EIS is the appropriate stage to demonstrate that the stations can be constructed with an acceptable level of flood impacts, preferably no significant impact.

EHG refers to the conditions of approval for Sydney Metro West Concept and Stage 1 (SSI-10038) and notes that there are inconsistencies between the approval conditions and the proposed definition of flood impacts in this EIS. The new EIS definition of 'not worsen' is less strict. EHG recommends that the project (in its entirety) retain the following criteria:

- A maximum increase of 10 millimetres in inundation at properties where floor levels are currently exceeded in a 1% AEP flood event.
- No inundation of floor levels which are currently not inundated in a 1% AEP flood event.

The proposal to define 'not worsen' in general as a maximum increase in flood levels of 50 millimetres in a one per cent AEP flood event is not supported by EHG. Typically, 10 millimetres is the adopted standard.

4. Comments on individual stations

4.1. Westmead Metro Station

EHG considers the EIS has adequately considered the impact from flooding on the station and the impact of the project on surrounding properties and infrastructure. However, ongoing consultation with the NSW SES and council in relation to potential impacts to existing community emergency management arrangements for flooding is supported by EHG.

4.2. Parramatta Metro Station

Flooding of Parramatta Station occurs via both local overland flow and riverine flooding. The 1% AEP flood event flooding is due to local overland flow, is limited in extent around the site, with flooding depths generally less than 0.1 metre. The PMF flood event results in potentially catastrophic flooding from Parramatta River, with depths of up to 2 metres at the station.

The great disparity between these two flooding mechanisms, and large change in flood behaviour between the 1% AEP flood event and PMF is unique among the stations and warrants further consideration. To properly satisfy the SEAR requesting the “Full range of flood events”, intermediate events between the 1% AEP event and the PMF should be modelled for this station. The flood risk for events such as the 0.5%, 0.2% and 0.1% AEP should be analysed. An initial investigation as to the significance of intermediate events should be made prior to proceeding with the analysis. City of Parramatta Council should be consulted for advice on which events impact the area.

The site is described as just downstream of the Charles Street weir. This is should be corrected. The site is just downstream of the Marsden Street weir and upstream of the Charles Street weir.

Clarification is sought regarding the impact of the station on evacuation routes. The report refers to City of Parramatta documentation stating that Church Street is an evacuation route and that all streets adjacent to the station are feeder routes. The EIS (Figure C-06) shows an increase in PMF levels in Church Street, Macquarie Street and George Street adjacent to the site of 0.1 to 0.2 metre, which could have an impact on evacuation. EHG requests an investigation regarding the nature of this impact on evacuation.

Flood level impacts for intermediate events between the 1% AEP event and the PMF should be mapped. The impact on water level hydrographs should be assessed at the most-impacted locations in Church Street, Macquarie Street and George Street to determine the significance of the impact on evacuation.

These hydrographs should be plotted for relevant intermediate events and the PMF. The impact on peak PMF levels for evacuation is not as important as understanding the impact on levels at the initial phase of flooding, during which evacuation can still occur. It would be beneficial to illustrate impacts for short and long duration events, rather than solely the critical duration for flood levels. Once impacts are understood, the need for any mitigation measures can be assessed.

Further information is sought regarding the statement: *It is not expected that additional buildings would be impacted where they were not previously*.

This should be explicitly demonstrated through flood impact mapping for this station, as it is for others. The PMF impact mapping should be extended in all directions to demonstrate this.

The above comments also apply to cumulative impacts for the station, as these cumulative impacts relate solely to the Metro West project. Cumulative impacts should not be hidden or disguised through a series of related project approvals for the Metro.

The reasons for cumulative impacts should be further explained, beyond reference to increased conveyance at Horwood Place. This section requires further detail, especially regarding to what stages are included. The cumulative impacts are significant and, in cases, worse than those

reported for this stage alone. This includes an increase in PMF levels at 100 George Street, noted to include a childcare. This location was reported to have a decrease associated with this stage alone. The cumulative increase would be more important than a decrease associated with any one stage. The report should clearly state what permanent changes are being made above ground that influence flooding in addition to those included in this stage.

4.3. The Bays Metro Station

The shelter-in-place option has been suggested for the Bays Station under major and hazardous flood events. The suitability and adequacy of this option will need to be investigated further as The Bays Station will be developed as a multi-storey complex and the number of commuters, workers and visitors may be isolated for an extended duration when adopting this option. The assessment will need to be made on the durations of sheltering for the full range of flooding events and up to and including the PMF event and the provisions for emergency services during these events.

Some people may choose to leave the station despite of hazardous and high-risk flooding if the duration of sheltering in place is long. This may add additional responsibilities to the emergency management services (i.e., the NSW SES) when rescue operations are required.

A comprehensive assessment will be required for the development of flood risk management options at The Bays Metro Station, which will be integrated with the Bays West Place Strategy.

4.4. Clyde Stabling and Maintenance Facility and Rosehill Services Facility

The EIS states that *No additional flooding assessment has been carried out for this site* and, *The operation of this facility in this proposal and as outlined in Section 3.3 is not expected to introduce additional impacts to those that would have been resolved during construction.* On this basis, no flood mapping for Clyde and Rosehill has been included in the appendices.

EHG noted in previous advice on the Sydney Metro West Concept and Stage 1 Submissions Report that the identified potential impacts at this site include:

- the increases in flood levels in Duck Creek and adjacent properties in the 1% AEP flood event
- increases in flow velocities and the potential increased risk of scour at the proposed creek crossings and in the downstream channels
- the potential flooding impacts from filled features.

EHG understands further design and modelling has been undertaken and some of these impacts may have been improved with refined design. The results of the latest relevant design and modelling should be documented for EHG review.

4.5. North Strathfield Station

Significant flood impacts are predicted due to this station, with flood level increases on private properties up to 0.1 metre and covering a large extent. The report should note the nature of the properties and whether any sensitive or critical uses are present. The impacts should be resolved for the EIS, rather than delayed to a future stage. The cumulative impacts are very high, with flood level increases 0.3 metre and greater in the 1% AEP flood.

The very high PMF impacts are also concerning, but it is anticipated that the impacts in the PMF would also be reduced with work to reduce impacts in the 1% AEP flood. Nevertheless, PMF impacts should also be reviewed following further design.

4.6. Burwood North Station

The proposed Burwood North Station is located along the ridge line between the St Lukes Park and Saltwater Creek catchments in the highly built-up intersection of Burwood and Parramatta Roads. The adjoining areas have minor flood affectation for flooding events up to 1% AEP mainly confined within roads and some properties would flood during the PMF event under baseline conditions.

The above ground structure of the proposed station will obstruct the overland flow paths along with the loss of flood storage. These will change the floodwater depth and flooding extent from baseline conditions to the post-development scenario of the station. These will lead to inundation of additional properties under the PMF event as well as increase hazards and risks at Parramatta Road, which is a regional evacuation route.

The EIS should include the mitigation measures for the management of incremental flood risks based on alteration of overland flow patterns instead of deferring it to the design development stage.

End of Submission