

MEMO

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SUBJECT	Lyon Ave site options assessment				

The Commissioners for the Central Interceptor Hearing have requested further information to assist their deliberations. This memo details Marshall Day Acoustics' response to the request and provides further information as follows:

- A review of the acoustic assessment for the two Mt Albert Grammar School alternative ("MAGS Alternative") site options, namely the pipe-jacked and trenched options. A conclusion as to the preferred option from a noise effects perspective.
- A brief effects comparison of the MAGS Alternative site option with the proposed Lyon Avenue site.

Description of Site Options

The following options form the basis of the assessment:

- MAGS Alternative 1 ("pipe-jack option"): pipe-jacked micro-tunnel with construction and operational access via Morning Star Place and MAGS access road
- MAGS Alternative 2 ("trenched option"): cut and cover trench with construction access via MAGS site access road only, and operational access via MAGS and Morning Star Place to the permanent facilities remaining at each of those sites
- Watercare's proposed Lyon Avenue site ("proposed site"): the details of this assessment are contained in the existing application documents with the relevant results summarised therein.

MAGS Alternative Option Review

Significant noise generating activities have been compared for each option as follows.

Access and Drop Shafts

Both options locate the access and drop shafts at the northern end of the MAGS playing fields. The shafts would be excavated into East Coast Bay Formation (sandstone) typically using sheet piling cofferdams, with shaft excavation and muck-out by excavator/crane. Therefore, similar activity noise levels would be received for St Lukes Garden Apartments (SLGA) and MAGS receivers under each option.

From an acoustic perspective there is no significant difference between the options.

Connection Sewer

The trenched option would employ a “cut and cover” trench that would connect the drop shaft to the connection chamber and would be formed primarily using excavators and sheet piles for trench wall retention and the coffer dam. Trench excavation would encounter basalt from Meola Creek eastwards to the connection chamber (approximately 35 metres) therefore requiring rock-breaking/excavation or controlled blasting/excavation to remove spoil.

Under the pipe-jack option the connecting sewer would be formed and lined using a micro-tunnel boring machine utilising the pipe-jacking method. The tunnel would be bored below the basalt layer (RL circa 10-15 metres) therefore no rock-breaking or controlled blasting would be required for its construction.

From a noise generating perspective, construction of the cut and cover trench would emit higher noise levels, particularly where basalt is broken up using rock breaking, for a longer duration than the pipe-jack option.

Therefore, the pipe-jack method is preferred for this activity.

Diversion Chamber

For both MAGS Alternatives and the proposed Lyon Avenue site, the diversion chamber is located in a similar position, adjacent to 27 Morning Star Place, therefore construction and operational activity noise levels would be the same.

From an acoustic perspective there is no significant difference between the options.

Connection Chamber and Reception/Drop Shaft

The connection chamber (trenched option) and reception/drop shaft (pipe-jack option) are located in similar positions therefore both would require rock-breaking/excavation or controlled blasting/excavation to break up the basalt layer. The reception/drop shaft would require longer excavation time (approximately 2 months) due to its greater depth (RL 6 metres versus RL 21 metres) however the deeper section of the shaft would be constructed through more forgiving ground once the basalt layer was penetrated and would therefore employ conventional excavation rather than rock-breaking or controlled blasting.

As similar methods would be employed to break through the basalt layer for each site option, the associated noise levels from basalt excavation would be comparable.

From an acoustic perspective there is no significant difference between the options.

Cut and cover trench vs Pipe-jacked tunnel

MDA considers that the pipe-jack option, even after taking into account the longer duration to construct the deeper reception/drop shaft, would have less noise impact when compared to the cut and cover trench.

For the MAG Alternative 2 – trenched option, construction noise levels would be higher as noted above, because the trench excavation and pipe installation activities being the open rather than underground as

for the pipe-jack option. The noise levels generated by these activities are predicted to be 70 to 78 dB L_{Aeq} for the nearest apartments in Lyon Avenue and Morning Star Place respectively, without mitigation.

The 78 dB L_{Aeq} predicted for the nearest apartments in Morning Star Place slightly exceeds the construction noise limit of 75 dBA L_{eq} . However, with the use of temporary noise barriers this could be mitigated by 5 to 8 decibels thus achieving a compliant level.

Therefore, from a noise perspective, the pipe-jack method is preferred for this activity.

Site Access

For the trenched option, access to the site would be solely via Alberton Avenue whereas for the pipe-jack option vehicle access would be split between Alberton Avenue, for drop/access shaft construction, and Morning Star Place, for diversion chamber and reception/drop shaft construction works. The pipe-jack option is considered to be the preferred of the tow MAGS Alternatives as it involves less daily heavy traffic noise exposure for SLGA receivers, particularly at sensitive times such as early morning and Saturdays, and would involve less traffic movements adjacent to the MAGS dormitory compared to the trenched option which only incorporates access via Alberton Avenue.

MDA considers that the noise effects from heavy vehicle and other traffic on the access road from the Alberton Avenue site entrance and adjacent to the MAGS dormitory could be mitigated by using a two metre high noise barrier achieving an acceptable level of 47 dB L_{Aeq} . However, installation of such a barrier would prevent access to the School House parking areas and would also restrict access for emergency and service vehicles. If a noise barrier was not used the noise level at the closest façades of the school dormitory would be up to 13 decibels higher and up to 60 dB L_{Aeq} based on the maximum anticipated vehicle flow of 56 truck and 14 standard vehicles per day.

The apartments and residences to the north of the access road are approximately 80 metres distant. The noise generated by the anticipated maximum of 70 vehicle movements per day is predicted to be 45 dB L_{Aeq} at the façades of the nearest dwellings without any noise barriers. This level is readily compliant with all relevant noise criteria and likely to have little appreciable impact on occupiers.

Therefore, from a noise perspective, and taking all the above factors into consideration, the pipe-jack option is preferred for this activity.

Overall Assessment

In conclusion, MDA considers the pipe-jack option to be the preferred option overall based on the balance of facts detailed above, provided that a noise barrier could be erected to provide screening for the MAGS dormitories.

Noise Level Predictions and Assessment of Effects – Pipe-jack Options vs Preferred Site

Construction noise emissions have been predicted for the pipe-jack option¹ and compared to Watercare's proposed Lyon Avenue site. It should be noted that additional source positions and receiver locations

¹ Based on drawing LYON –SK1001 Issue A dated 3 September 2013

have been added to the proposed Lyon Avenue site for comparative purposes. Refer to the attached Tables 1 and 2, which details the predicted noise levels for each site option.

Based on the predicted noise levels given in the attached tables, the following conclusions are made:

- Noise effects from diversion chamber construction will be similar for both options. Break-up of the existing concrete chamber would be by rock-breaker and occur intermittently for a period of approximately one month.
- Construction of the reception shaft/drop shaft under the pipe-jack option is closer to SLGA receivers than the drop shaft in the proposed Lyon Avenue site, therefore receivers would experience higher noise levels over a similar duration. Controlled blasting would reduce the duration of effects from four months down to two months, for both options.
- For the pipe-jack option, noise effects on SLGA receivers from the construction of drop and access shafts on the MAGS sports-field would reduce appreciably by 10 decibels or more and would be readily compliant with NZS 6803:1999.
- For the pipe-jack option, noise effects on MAGS receivers associated with drop and access shaft construction on the MAGS sports-field, would increase by 6 decibels but would remain readily compliant with NZS 6803:1999.

MDA notes that where controlled blasting is used, similar noise levels to those detailed in the attached Tables 1 and 2 would likely occur from blast hole preparation work using rock drills, and rock breakers to tidy up the shaft faces. It is the duration of noise and its associated effects which can be significantly reduced with the use of blasting. Tables 1 and 2 detail the estimated reduction in duration of effects based on current estimated construction time frames for controlled blasting, as supplied by AECOM²

Overall, in terms of noise impact, it is considered that Watercare's proposed Lyon Avenue site is preferred over the two MAGS alternatives, as the predicted construction noise levels for the apartments in Morning Star Place and the MAGS sports-field are lower. Also, with the proposed Lyon Avenue site there would be no need for the access road from Alberton Avenue thus reducing the construction noise impact from its widening and from the passage of trucks on the MAGS dormitories.

For operational noise, it is considered that there would be no appreciable difference in received noise levels. For both options compliance with the recommended project noise criteria will be achieved thus ensuring that any noise effects would be no more than minor.

² John Cooper (Aecom) via email dated 12 September 2013

PREDICTED NOISE LEVELS FROM ROCK-BREAKING

Table 1: MAGS Alternative 1: Pipe-jack option

Affected Receiver	Activity	Duration of Effects (months)	Predicted Noise Level Without Mitigation (dB L _{Aeq})	Mitigation Options where non-compliant with NZS6803: 1999	Duration of Effects After Mitigation (weeks)	Predicted Noise Level with Mitigation (dB L _{Aeq})
27 Morning Star Place	Diversion chamber rock-breaking/drilling	<1	75- 80	Management through CNMP	<1	Up to 73
	Connection chamber rock-breaking/drilling	4	72-75	Controlled blasting	2	-
	Drop shaft and access shaft	<1	61-63 ³	Controlled blasting	<1	-
28 Morning Star Place	Diversion chamber rock-breaking/drilling	<1	75-78	Management through CNMP	<1	Up to 80
	Connection chamber rock-breaking/drilling	4	72-74	Controlled blasting	2	-
	Drop shaft and access shaft	<1	59-60 ³	Controlled blasting	<1	-
MAGS classrooms adj access road	Diversion chamber rock-breaking/drilling	<1	54-57	Not required	<1	-
	Connection chamber rock-breaking/drilling	4	59-62	Not required	2	-
	Drop shaft and access shaft	<1	59-60 ³	Not required	<1	-
	Vehicles on access road		61 – 63	Not required		47 - 49 ⁴

³ Excavation in ECBF

⁴ dB L_{Aeq} 12 hrs

Table 2: Proposed Lyon Avenue site

Affected Receiver	Activities	Duration of Effects (months)	Predicted Noise Level without mitigation (dB L _{Aeq})	Mitigation Options where non-compliant with NZS6803: 1999	Duration of Effects After Mitigation (weeks)	Predicted Noise level with mitigation (dB L _{Aeq})
27 Morning Star Place	Diversion chamber rock-breaking/drilling	<1	Up to 73	Management through CNMP	<1	Up to 73
	Connection chamber rock-breaking/drilling	4	-	-	-2	-
	Drop shaft and access shaft	4	-	Controlled blasting	2	-
28 Morning Star Place	Diversion chamber rock-breaking/drilling	<1	Up to 80	Management through CNMP	<1	Up to 80
	Connection chamber rock-breaking/drilling	4	-	-	-2	-
	Drop shaft and access shaft	4	77-80	Controlled blasting	2	-
MAGS classrooms adj access road	Diversion chamber rock-breaking/drilling	<1	23 - 45	Not required	<1	-
	Connection chamber rock-breaking/drilling	4	-	-	2	-
	Drop shaft and access shaft	4	22 - 42	Not required	2	-