



Construction Monitoring Report - September 2019 to February 2020

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Compliance Matrix

Condition	Requirement	Reference
C16	The results of the Construction Monitoring Programs must be submitted to the Secretary for information, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program	Section 1.1

1. Introduction

The Construction Monitoring Program (CMP) is being implemented to monitor impacts on surrounding surface water quality resources and impacts from noise and vibration on the surrounding areas during the construction phase. The surface water monitoring program and noise and vibration monitoring program are also both designed to assess the effectiveness of the mitigation measures applied as part of the SMu Project. This report assesses the results of this monitoring program in comparing actual performance with predicted performance.

This report provides the results of the CMP for the period September 2019 to February 2020.

1.1 Submission Requirements

In accordance with condition C16, this will be submitted to the following agencies for information:

- NSW EPA
- Inner West Council
- DPIE

The Independent Environmental Representative will review and endorse the report as required by Condition of Approval A24(d) prior to submission to the Secretary DPIE.

The previous CMP was submitted on 25/10/19 to stakeholders for information. No further request was received from any of the agencies following the submission of the previous monitoring report.

1.2 Surface Water

The project site is located within the rail corridor at Sydenham Station and several hundred metres to the north and south of the station, 11 Sydenham Road, Marrickville, NSW, the Sydenham Pit and Drainage Pump Station and future precinct areas on Railway Parade and Burrows Avenue, Sydenham, NSW.

The Project site forms part of the overall Cooks River catchment with water from the area discharging into the Cooks River via the Eastern Channel. The catchment area is highly urbanised with mixed residential, commercial and industrial properties. The closest watercourses to the project are man-made, the eastern channel and connecting culverts bordering the project. These collect urban stormwater from the surrounding area and typically exhibit low flow rates outside of rain events and the operation of Sydenham drainage pump.

Water quality is measured on an ongoing basis for the wider Cooks River catchment by the NSW Office of Environment and Heritage as part of the Beachwatch programme. The monitoring point is at Kyeemagh Baths at the mouth of the Cooks River in Port Botany. Water quality within the Cooks River catchment is influenced by stormwater, fertilisers, industrial discharges and sewage contamination.

The Project site also includes the Sydenham Pit. The Sydenham Pit is a large stormwater detention structure that captures stormwater from the Marrickville and Newtown area. The water is detained temporarily before being pumped out into the Eastern Channel. The Sydenham Pit is owned and operated by Sydney Water. The project has specific requirements when working within Sydenham Pit regarding water quality and management, which are contained in the project EPL (21147) and Construction Soil and Water Management Plan (CSWMP)..

Objectives for water quality management during construction are:

- The prevention of pollution of surface water through appropriate erosion and sediment control
- Maintain existing water quality of surrounding surface watercourses
- Construct the Project in accordance with the NSW Water Quality Objectives

1.3 Noise and Vibration

The area surrounding the SMu project contains a variety of land-use types and receivers, including residential receivers, commercial, industrial, and sensitive non-residential receivers. These land-uses are mixed within the identified noise catchments, though in general there are clusters of industrial and commercial areas north of the rail corridor, and primarily residential areas to the south of the rail corridor. The area surrounding the project is affected by rail noise and vibration and is also underneath flight paths from Sydney Airport. There are therefore a number of residential properties under the Sydney Airport Noise Management Plan. Many, though not all, of these residential receivers have been fitted with double glazed windows, leading to lower internal noise levels originating from outdoor sources, when compared with standard windows.

There are three noise sensitive areas potentially affected by the proposed construction:

- Edgeware Road / Lord Street – Located within NCA5. Many residences potentially affected by the construction works in this area have been fitted with heavy double glazing as part of the Sydney Airport Noise Management Plan, but some residences still retain standard single glazed windows.
- Burrows Avenue / Railway Road Area – Located within NCA3. All potentially affected residences in this area have been fitted with heavy double glazing as part of the Sydney Airport Noise Management Plan;
- Meeks Road Area – Located within NCA1. Many residences potentially affected by the construction works in this area have been fitted with heavy double glazing as part of the

Sydney Airport Noise Management Plan, but some residences still retain standard single glazed windows.

In addition, two sensitive non-residential receivers have been identified as potentially being affected by noise during the project, Tempe High School and Tillman Park Early Learning Centre (both located within NCA2) – see Figure 1. To date, no construction activities have taken place which were identified as significantly affecting these sensitive receivers during their operating hours.



Figure 1 - Surrounding Land-use and Sensitive Non-Residential receivers

Objectives for noise and vibration management on the project are:

- Minimise unreasonable noise and vibration impacts on residents and businesses
- Avoid structural damage to buildings or heritages items as a result of construction vibration
- Maintain positive, co-operative relationships with schools, childcare centres, local residents and building owners and undertake active community consultation

Construction noise levels for some SMu work activities are expected to exceed the external noise management level at times, particularly during works outside of standard hours, resulting in noise impacts to outdoor spaces. Internal and external noise levels will be assessed as part of the OOHW protocol and project EPL and monitored accordingly.

Most construction works in this area will not generate vibration which would be perceptible within the nearest residences, but some works, such as compaction by vibratory roller may generate vibration levels above the vibration criteria at the nearest residences in Railway Road. At Meeks Road, construction noise levels may exceed the noise management levels at residences at times. However, given that most of the construction works are well removed from Meeks Road, noise impact would be expected to be limited. Equally, vibration levels above the criteria are unlikely to occur in Meeks Road.

No blasting will be undertaken, and ground-borne noise and vibration is also unlikely to occur on the SSJ project as it is typically generated by underground activities such as tunnelling.

2. Methodology

2.1 Surface Water

Surface water monitoring is undertaken at two points, one upstream (EC1) and one downstream (EC 2) of the construction footprint. Both are located in the man-made eastern channel running alongside the rail corridor – See Figure 2. The channel is uncovered for the majority of its length along the project. The water level in the channel is generally fairly shallow outside of significant rain events (less than 20mm), with limited vegetation. Water sources are diverse urban run-off from collected stormwater.

The two locations identified for surface water monitoring are the only locations that offer safe access. There are several other drainage outlets along the length of the Eastern Channel that may convey water into the channel between the upstream and downstream monitoring locations, however gaining access to the channel at these point is not possible due to obstructions and safety reasons.

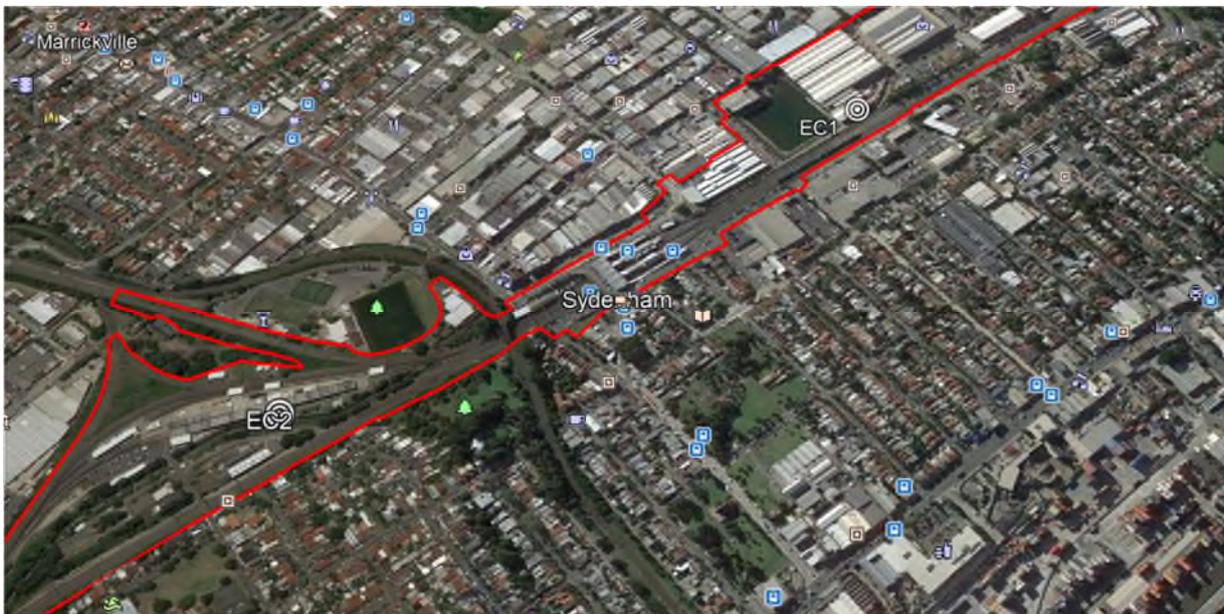


Figure 2 - Surface Water Monitoring Locations

Surface water quality monitoring will be undertaken as follows for the parameters in Table 1:

- Pre-construction – monthly following site control
- SSJ construction stage – every three months & up to 4 wet weather events per year

Pre-construction monitoring was conducted at points EC1 and EC2 monthly, once the project was given site control. Surface water quality monitoring of the receiving environment prior to construction is highly unlikely to define suitable standards or benchmarks for water quality discharges from the SSJ Works given that:

- Waterways along the site are mostly ephemeral
- Water quality from urban areas is highly variable and changes according to prevailing weather patterns and day-to-day during rainfall.

In the event of access issues, surface water monitoring will be taken from an accessible point nearby the culvert or eastern channel where feasible and noted in monitoring results. There were no occasions where an alternative monitoring point was required during this monitoring period.

The Environment Protection Licence (#21147) provides the project with criteria to discharge off-site through approved discharge points. These criteria must be met prior to discharge. A record of monitoring for dewatering on the project is maintained and made available on the EPA website. There are currently no active sediment basins on the project, and none have been identified during the construction phase of the project to date.

Sydney Airport Bureau of Meteorology (BOM) weather observations were used to report the amount of rainfall 24hrs prior to monitoring and to determine when a reportable rain event occurs.

SSJ also monitors water quality prior to any planned discharges to ensure water quality is within the parameters listed within the Environmental Protection Licence (No.21147), to minimise any potential impacts to surrounding waterways. This data is published monthly on the project website.

Table 1 - Water Monitoring Parameters

Parameter	Sampling Methods	Analytical Method	ANZECC Criteria* Freshwater	Proposed Trigger Values	Proposed Actions
Temperature (°C)	Probe	Field analysis	> 80%ile < 20%ile	Downstream results are > than upstream results in rainfall events up to and including the significant event threshold of >20mm in 24 hours.	Environment Manager (or delegate) to re-test to confirm results and undertake an inspection of the adjacent works and propose actions where required.
Dissolved Oxygen (DO)	Probe	Field analysis	Lower limit – 85 Upper limit – 110		
Turbidity (NTU)	Probe	Field analysis	6 – 50		
Oil and grease	Visual analysis, then grab sample if required	Visual assessment. Confirmed with lab analysis if required	-		
pH	Probe, grab sample if required	Field analysis, lab analysis if required	Lower limit – 6.5 Upper limit – 8.5		
Salinity (EC)	Probe	Field analysis	125 – 2200		
Total Suspended Solids (TSS)	Probe, grab sample if required	Field analysis, lab analysis if required	-		

2.2 Noise and Vibration Monitoring

As part of the Noise and Vibration Assessment within the Modification Report and Submissions Report, the area surrounding the Project site was divided into 3 Noise Catchment Areas (NCAs). Noise monitoring was undertaken in 2015 and 2016 to determine the Rating Background Level for these catchments. During the development of the Construction Noise and Vibration Impact Statement (CNVIS) further background noise monitoring was undertaken within the surrounding area between 18th & 27th June 2018. The additional monitoring has taken place at the following locations;

- NCA2 – 25 Bridge St, Tempe
- NCA3 – 4 Burrows Avenue, Sydenham
- NCA4 - 80 Unwins Bridge Road, St Peters

Following the development of the CNVIS and the additional monitoring, the area surrounding the project has now been split into 6 Noise Catchment Areas. Current Rating Background Levels for all NCAs are shown in Table 2.

Table 2 - RBLs for SSJ Noise Catchment Areas

NCA	Daytime RBL (7am to 6pm)	Evening RBL (6pm to 10pm)	Night RBL (10pm to 7am)
1*	47	45	40
2	41	46	40
3	51	49	42
4	58	51	43
5**	58	52	38
6***	52	43	38

*Noise levels adopted from Sydenham to Bankstown EIS
 **Noise levels adopted from Chatswood to Sydenham EIS
 ***Noise levels adopted from TSE Marrickville Dive Construction Site

Note: Reported RBLs are as per CNVIS findings, including in NCA2 where daytime is lower than evening.

Equipment used for noise and vibration monitoring during the period is in the following table:

Type	Model Number	Serial No.	Calibration Date
Noise monitor	Svantek SVAN 971	61522	18/04/19
Sound level calibrator	Svantek SV-33A	90201	18/04/19
Triaxial accelerometer	Svantek SV-84	H3408	19/06/19
Sound and vibration analyser	Svantek Svan-958A	69013	19/06/19
Sound and vibration analyser	Svantek Svan-958A	69017	19/06/19
Triaxial accelerometer	Svantek SV-84	H3407	19/06/19

Based on planned work in the construction phase, the areas most regularly impacted by construction noise and vibration are expected to be NCA1 and NCA3. These two catchments contain a number of residential properties – See Figure 3 below.



Figure 3 - NCAs and identified residential and non-residential receivers

Monitoring is required to be undertaken during construction activities (including out of hours works) where required in accordance with Section 8 of the CNVIS and for validation purposes. Attended noise monitoring is also undertaken in the event of a noise complaint. Monitoring will be undertaken at the complainant's property, nearest to any work.

Vibration monitoring will be undertaken before and during works where buildings or structures exist within the safe work distances of vibratory plant. Monitoring will also be undertaken where vibration generating activities have the potential to impact on heritage items. In accordance with CoA – E28 and the requirements of the CNVIS, the vibration limits have been set out in the British Standard BS 7385-2:1993.

The Modification Report states that “based on the typical nature of buildings around the proposed modification, the cosmetic damage screening criteria of 7.5mm/s for unreinforced or light framed structures has been uniformly applied. This same screening criteria is also relevant for heritage items”. No heritage items in the footprint of the project have been screened as ‘structurally unsound.’

During activities that are expected to generate maximum noise levels at impacted receivers, as identified in the CNVIS, continuous real-time noise and vibration monitoring will be undertaken. Continuous real-time noise and vibration monitoring will be undertaken on the project boundary adjacent to one of the closest residences in the Burrows Avenue / Railway Road Area, at one of the closest residences in the Meeks Road Area, and at one of the closest residences in Lord Street/Edgeware Road to determine the LAeq15min and LAMax levels during times of nearby work.

There will be periods of time where no works will be occurring and it is not reasonable to have the real-time system in operation during these periods. There is a high likelihood that ambient noise and vibration levels from non-construction sources will need to be accounted for, particularly on the boundary of the rail corridor. Where the noise and vibration alert levels are exceeded as a result of project related works, the construction method and equipment will be reviewed/modified.

3. Results

3.1 Surface Water

Pre-construction monitoring took place over 3 months from June-August 2018, with 4 samples collected from two identified points. As noted in section 1.2 and surface water background results, the culvert has several inflows from the surrounding urban environment, including between the two monitoring points due to access limitations. As recorded in baseline monitoring, this has been noted as accounting for the high base Total Suspended Solids (TSS) recorded and turbidity noted in subsequent surface water monitoring, particularly when taken after a rain event. Turbid inflows of water from urban stormwater into the culvert have been visually confirmed in post-rainfall inspections.

Monitoring during the reporting period took place once per quarter at each of the two monitoring locations (EC1 and EC2), dated 5 November 2019 and 21 January 2020. In addition, sampling was conducted at EC1 and EC2 during one wet weather event on 11 February 2020. – see results in Table 3.

All results fell within accepted pH range. Change in pH between upstream and downstream monitoring points varied within the acceptable range. Temperature varied significantly, likely due to the low flow levels in the concrete culvert during monitoring.

As noted, Turbidity (TSS) levels within the channel have been exceeded in some baseline readings, and exceedances were recorded at both EC1 and EC2 even when no construction activities have taken place. Previously this has been observed particularly after high rainfall prior to monitoring, which is consistent with baseline readings obtained after a rain event. In combination with prior identification of the ephemeral nature of the watercourse, it is considered likely that external factors (e.g. industry/residence in the area and other rail/residential building projects nearby) are connected to the higher turbidity readings, including from inflows present from between EC1 and EC2 where a discrepancy has been noted.

Table 3 - Surface Water Monitoring Results for Pre-construction and Construction Phases

Date	Site Activities	Total Rainfall in Previous 24hrs	Comments	EC 1									EC 2								
				Time	TSS (mg/l)	Temp (°C)	pH	Salinity (ms/cm)	Turbidity (NTU)	DO%	TDS (g/l)	Visible Oil / Grease	Time	TSS (mg/l)	Temp (°C)	pH	Salinity (ms/cm)	Turbidity (NTU)	DO%	TDS (g/l)	Visible Oil/Grease
05/11/2019	Concreting of Culvert, PASS Treatment 11 Sydenham, Canal Underbridge and GST work	14.2	Water noticeably turbid at both upstream and downstream monitoring points, dark green colouring	10.00	153	19.24	8.03	0.001	231	124.4	0.001	No	11.30	100	21.63	7.91	0.438	92.8	116	0.285	No
21/01/2020	Culvert and Aqueduct Installation	2.4	Hot day. EC1 – Low flows of dark water with visible sediment EC2 – Low flow	10:30	77	26.39	8.03	0.496	64.1	232.7	0.322	No	14.49	58	21.83	7.31	0.416	43.5	66.2	0.141	No
11/02/20	Clean up from wet weather – investigation drilling	189	Post-flooding event (total >300mm over weekend). Sample taken following Sydney Water pumping Sydenham pit following overtopping	11.02	53	21.83	7.69	0.181	38.8	96.7	0.171	No	13.15	43	30.01	7.79	0.393	37	92.6	0.356	No

3.2 Noise and Vibration Monitoring

Attended noise monitoring was undertaken as required for OOHW and possessions, where noise modelling predicted significant exceedance of Rating Background Levels or otherwise required validation using this method. As modelled in the CVNIS, the majority of noise and vibration impacts have occurred in NCA 3 as a result of required out-of-hours work, during both rail and local possession, under lower evening and night-time RBLs. As part of attended noise monitoring, significant extraneous noise has been recorded as impacting receivers and monitoring results, including throughout the night-time period, well above the given RBLs. Monitoring locations and timing has been adjusted where necessary to try to isolate construction impact, however this is often not feasible. Common extraneous noise sources include:

- Loud noise from air traffic, as area is part of Sydney Airport Noise Management Plan and heavily affected by flight-path
- Road traffic, particularly near Gleeson Ave, as nearby industrial, commercial and other nearby construction projects use cause frequent heavy trucks trafficking the area
- Rail replacement buses during rail possessions
- Noise from trains passing and train signalling horns

Attended noise monitoring has been conducted for activities with significant predicted exceedances of noise management levels, mostly occurring where works are conducted in the evening or night-time periods. This occurred for seven rail possessions and seven local area works within the reporting period. SSJ have committed to review impacts and mitigation of construction activity and document outcomes where an exceedance is recorded or a complaint is made related to project construction activities. To date there have been no exceedances of predicted construction related noise levels assessed as relating to ongoing construction activities on the project. All elevated noise levels above predicted levels recorded by attended monitoring have been attributed to extraneous noise rather than construction activity. These are detailed in the results shown below in Table 4

Continuous real-time noise and vibration monitoring has been undertaken during six rail possessions, and during demolition works on Platform 1 of Sydenham Station during the reporting period, in order to assess noise and vibration impacts and that works fall within relevant criteria. Vibration monitoring was undertaken during a representative period of piling works near Sydenham pit pump station to demonstrate that vibration screening was within relevant criteria. The data has been made available in real-time as per condition C11 and all detailed records are maintained. Two rail possessions conducted during the reporting period were considered low risk, one due to limited scope, and one was considered low risk for noise and vibration with significant external works taking place in close proximity, therefore only attended noise monitoring was undertaken. To date, there have been no exceedances of vibration from construction activities, and recorded vibration (PPV in mm/s) has been well below cosmetic vibration limits for affected structures. As above, attended noise and vibration monitoring has identified that external non-construction noise and vibration sources are frequent in the area, which is also expected to reflect in the results of any real-time continuous monitoring.

Table 4 - Attended Noise Monitoring Results

Date	Time	Duration Mins	Location	Construction Activities	Main source of noise	LA(eq)	LA(Max)	Period	Audible noise from SSJ construction activities	NML	NCA	Predicted construction sound pressure level (LA(eq,15min))	Compliance	Comments
28/09/2019	22:30	15	Bridge St	Removal of OHW footing	Trains	59	75.9	Night	Hydreema, Excavator	45	2	64	Y	Trains dominant, LAm _{ax} attributed to train
29/09/2019	0:38	15	Railway Rd	ULX and restoration of Capping Ballast	Trains, Traffic	51.4	67.6	Night	Excavator with Ballast, Power tools	47	3	70	Y	Trains dominant, LAm _{ax} attributed to train
02/10/2019	22:33	15	Hogan Ave	Hammering of Road Surface	Traffic	63.4	83.4	Night	Hammering audible approx. 51dB	47	3	61	Y	Result due to traffic, LAm _{ax} attributed to motorcycle.
14/10/2019	22:06	15	Railway Rd	Augur of ADSS post	Air Traffic, Road and Rail Traffic	71.9	80.8	Night	No	47	3	61	Y	LAm _{ax} attributed to planes, considerable extraneous noise, works essentially inaudible
17/10/2019	23:05	15	Hogan Ave	Lift Shaft Install	Construction	63.9	80.8	Night	Welding of lift shaft	47	3	71	Y	
20/10/2019	2:27	15	George St	Lift Shaft Install	Traffic, external construction works	59.9	81.3	Night	Welding of Lift Shaft	47	3	73	Y	Wind above monitoring guidelines (30km/h). LAm _{ax} attributed to road traffic
22/10/2020	22:44	15	Hogan Ave	Hammering of Road Surface	Trains	54.2	84.1	Night	Hammering audible but faint	47	3	57	Y	Trains dominant, LAm _{ax} attributed to train
28/10/2020	23:34	15	Bridge St	Removal of OHW footing	Trains, external construction work	59.7	89.9	Night	No	45	2	67	Y	External work and loud trains meant SSJ construction was essentially inaudible
9/11/2019	23:33	15	Bridge St	Ballast and Capping	Trains	59.3	93.1	Night	Infrequent sound of ballast	45	2	66	Y	Trains dominant, LAm _{ax} attributed to train
19/11/2019	23:15	15	Hogan Ave	Saw cut of Asphalt and Pavement	Traffic and non-project heavy vehicles, trains	62.7	87.1	Night	Saw cutting audible	47	3	62.7	Y	Frequent traffic and non-project heavy vehicles (trucks)

Date	Time	Duration Mins	Location	Construction Activities	Main source of noise	LA(eq)	LA(Max)	Period	Audible noise from SSJ construction activities	NML	NCA	Predicted construction sound pressure level (LA(eq,15min))	Compliance	Comments
9/12/2019	22:33	15	Hogan Ave	Delivery, Manitou	Rail Traffic and Air Traffic	72.2	90.1	Night	Truck reversing	47	3	71	Y	Several loud planes, LA Max attributed to planes
12/12/2019	23:13	15	George St	Lifting of Roof Canopy	Crane, EWP	63.9	86	Night	Crane lifting	47	3	72	Y	
17/12/2019	21:40	15	George St	Assembly of Roof Canopy	Rattle Gun	72.5	89.3	Evening	Rattle gun and hand tools	54	3	74	Y	Rattle gun main source of noise, three planes overhead at end of monitor
25/12/2019	0:30	15	George St	Lift of Roof Canopy	Crane	62.5	92.6	Night	Crane, brief rattle gun use to fix canopy to structure	47	3	69	Y	
25/12/2019	1:40	15	Railway Rd	OHW welding and track removal	Excavators and hydreemas	57.1	72	Night	Excavator, hydreemas, brief cutting of rail	47	3	72	Y	
25/12/2019	15:28	15	Railway Rd	Work train and capping	Work Train and Excavators	67.9	86.1	Day (public holiday)	Work Train and excavator, hydreema	56	3	68	Y	
25/12/2019	15:58	15	Bridge St	Work Train and capping	Work Train and Excavators	63.8	83	Day (public holiday)	Work Train and excavator, hydreema	51	2	65	Y	
26/12/2019	1:23	15	Railway Rd	Work Train and capping	Work Train and Excavators	62.9	74.7	Night	Work Train and excavator, hydreema	47	3	68	Y	
26/12/2019	2:44	15	Bridge St	Work Train and capping	Work Train and Excavators	55.7	75.1	Night	Work Train and excavator, hydreema	45	2	65	Y	
30/12/2019	23:43	15	Hogan Ave	Overhead Wiring	Power tools	57.4	74.1	Night	EWP and power tools	47	3	61	Y	
31/12/2019	0:01	15	Railway Rd	Overhead Wiring	Power tools	57.9	76.7	Night	EWP and power tools	47	3	60	Y	

Date	Time	Duration Mins	Location	Construction Activities	Main source of noise	LA(eq)	LA(Max)	Period	Audible noise from SSJ construction activities	NML	NCA	Predicted construction sound pressure level (LA(eq,15min))	Compliance	Comments
13/01/2020	0:04	15	Hogan Ave	Vac Truck	Rail and Road Traffic	56.3	73	Night	Faint	47	3	67	Y	Extraneous noise dominant, LAmax attributed to motorbike
17/02/2020	0:42	15	Hogan Ave	Glazing of Lift Shaft	Road Traffic	62.6	72	Night	Lighting Tower, occasional power tool use	47	3	73	Y	LAmax attributed to loud car
17/02/2020	1:02	15	George St	Glazing of Lift Shaft	Lighting Tower	54.7	62.6	Night	Lighting Tower, faint glazing	47	3	68	Y	
19/02/2020	0:04	15	Hogan Ave	Vac Truck	Road and Rail Traffic	61.1	79.5	Night	Vac truck consistent (approx. 49dB)	47	3	67	Y	Extraneous noise dominant, LAmax attributed to truck

3.3 Vibration

Table 5 - Vibration monitoring data

Monitoring Location	Date	Works being carried out	Attended or continuous	Event Base Monitoring Y/N	Measured PPV (mm/s)	Cosmetic Damage criteria (mm/s)	Compliant Y/N	Comments
Sydenham Pit Pump Station	13/09/19	Piling	Attended and Continuous	Y	0.5	7.5	Y	1 hour attended monitoring and 6 hours continuous monitoring
Geotech Building	28/09/19 to 30/09/19	Piling	Continuous	Y	0.95	25	Y	
Platform 6	17/10/19 – 20/10/19	Station Concourse Lift	Continuous	Y	0.38	7.5	Y	External work near SSJ project with greater risk of vibration
Geotech Building	9/11/19- 13/11/19	OHW removal	Continuous	Y	3.5	25	Y	
Geotech Building	24/12/19 to 02/01/20	Christmas Shutdown -Track Realignment, Vibratory Rolling Switch Installation and Rail Tamping	Continuous	Y	7.789	25	Y	
Platform 2/3	20/06/19 to 23/06/19	Demolition of Platform 1 Building 1	Continuous	Y	0.27	7.5	Y	
Geotech Building	28/06/19 to 30/06/19	Switch Installation and Rail Tamping	Continuous	Y	0.45	25	Y	

4. Mitigation Measures

4.1 Noise and Vibration

Standard mitigation measures were implemented as per Section 7 of the Construction Noise and Vibration Management Plan, and Sections 6.2 and 6.4 of the Construction Noise and Vibration Impact Statement. These were considered effective during the reporting period.

4.2 Water

Standard mitigation measures were implemented as per Section 6 of the Construction Soil and Water Management Plan. Controls were repaired as required and were effective during the reporting period.

5. Conclusion

Pre-construction surface water monitoring began in June 2018, with results showing potentially high turbidity and fluctuations due to urban environment. Construction monitoring results from locations upstream and downstream of the channel show parameters vary between rain events and channel conditions, including between upstream and downstream samples. Surface water data does not provide a clear correlation between construction activities and water quality, due to channel access issues and the ephemeral nature of the channel.

Erosion-sediment control plans are maintained and reviewed regularly, and JHLOR conducts weekly, pre- and post rainfall environmental inspections. The Environment Representative also conducts bi-weekly inspections and any observations are actioned by the project.

Noise monitoring records have validated modelling and are consistent with the predicted impact of construction activities on noise catchment areas, including sensitive receivers. There have not been any recorded exceedances regarding noise and vibration impacts attributed to construction activities.

Real time noise and vibration monitoring is conducted during relevant periods of construction, including for the duration of rail possessions. Both real-time and attended noise and vibration monitoring has observed exceedances due to non-construction sources, such as air, road and rail traffic.