



Construction Monitoring Report 5 – September 2020 to February 2021

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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. In addition, limited groundwater monitoring took place as part of an update to the CSWMP.

This report provides the results of the CMP for the period September 2020 to February 2021.

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 previous CMR was submitted on 23/10/2020 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 Groundwater Monitoring

The area surrounding the SMu project has a variety of land-uses, including residential, industrial, commercial, and rail corridor. The site sits on Ashfield shale and the Quaternary alluvium geological layers. The Quaternary alluvium underlies the Cooks River and its tributaries and forms an aquifer. There is also groundwater present within localised alluvial deposits in some gullies. The Preliminary Contamination Report (GHD, 2017) found that heavy metals were present within groundwater at elevated concentrations. The Sydney Metro City and Southwest – Chatswood to Sydenham – Sydenham Station and Sydney Metro Trains Facility South Modification Report states that these samples are likely to be representative of the background aquifer. The modification report also states that “*groundwater has been observed discharging from open cuttings along the T3 Bankstown Line*” and that the “*surface groundwater system is likely to be recharged by rainfall and percolation from irrigation of residential gardens and open spaces, as well as incidental runoff from impervious surfaces, such as roads and footpaths*”.

Groundwater management has been integrated into the SMu Construction Environmental Management Plan due to limited interaction with the groundwater table. This Construction Monitoring Report is the first for the project to include groundwater monitoring data since the commencement of construction.

As part of an update to the SMu Construction Soil and Water Management Plan and Groundwater ERAP in the Construction Environmental Management Plan, the requirement to conduct limited groundwater monitoring was added specifically for limited interaction with groundwater during underbore works for a 132kv Ausgrid reroute. The underbore included excavations to approximately 6m bgl. Previous geotechnical investigations had indicated that groundwater was observed within the underbore location at 5.4m bgl. The works involved the excavation of two adjacent central launch pits within the existing construction site at 11 Sydenham rd Marrickville, one receiving pit located on Hogan Avenue and one receiving pit located adjacent to Sydenham Road. A schematic of the works can be seen in Figure 1.

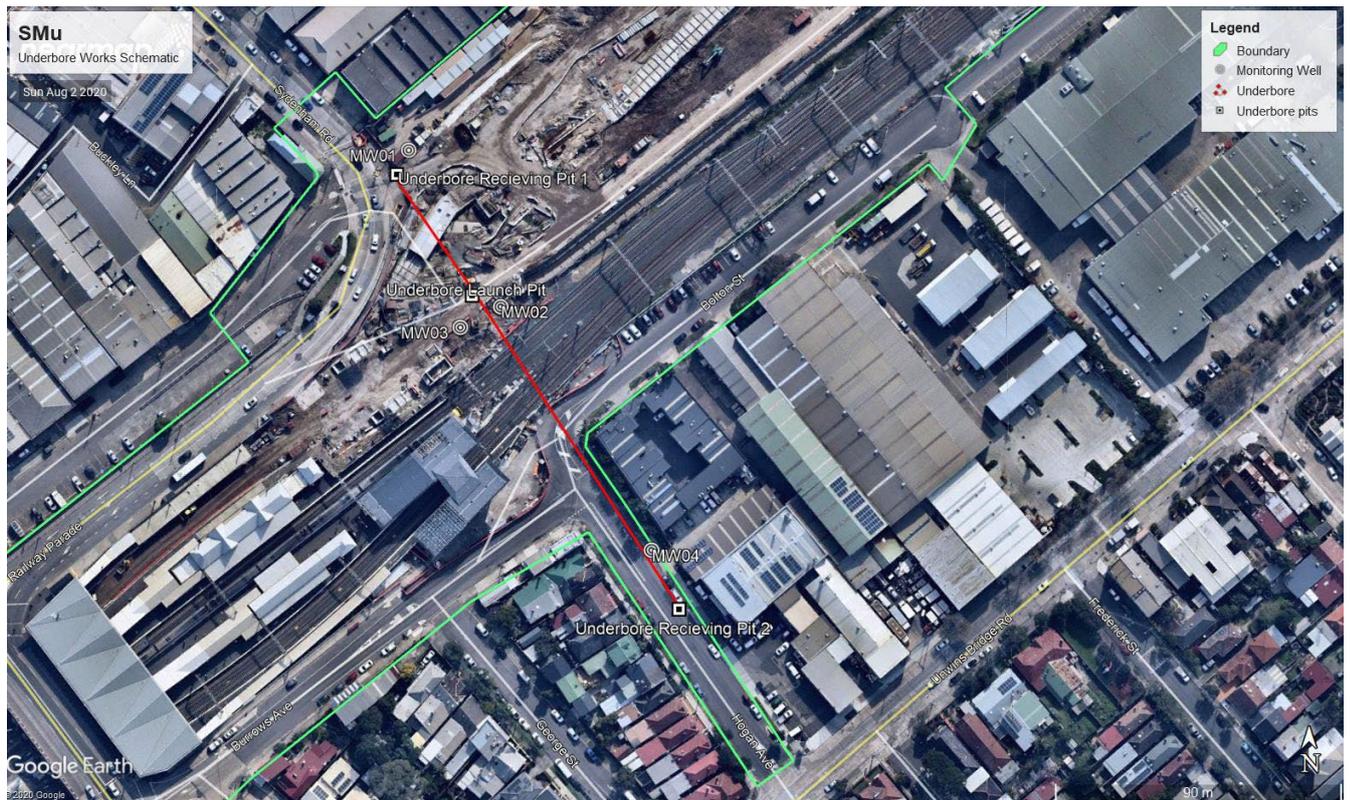


Figure 1 – Underbore excavations and monitoring well locations

Initial investigations found that the underbore will extend into clayey sediment above the Ashfield Shale aquitard. Water was observed within the clay at depth of approximately 5.4mbgl. This clayey sediment is not an aquifer but a water bearing zone with low transmissivity. Groundwater in the perched water-bearing zone is unconfined and varies in depth across the Site from 2 to almost 6 meters BGL. Groundwater in the perched zone is generally trapped in the clayey sediments above the shales which are encountered at a depth of about 9 meters BGL (RL of -4m to -5m AHD) on site at locations.

ADE undertook analysis of groundwater samples taken from the wells on site for a wide range of Contaminants of Potential Concern (CoPC). Groundwater quality testing indicated that elevated levels of ammonia, cyanide, copper and zinc were present. Initial testing at MW02, within the 11 Sydenham rd site (see figure 1), indicated an elevated level of total cyanide. Additional testing was undertaken to confirm the result and to test for a specific compound within the cyanide group, cyanogen chloride, as this related to the Groundwater Investigation levels under the National Environmental Protection (Assessment of Site Contamination) Measure. Secondary testing confirmed the presence of cyanide (total cyanide was 40 µg/L). Cyanogen Chloride was detected at low levels below the Human Health criteria (>0.004mg/L). Due to the industrial nature of land use in Marrickville and Sydenham areas, land and groundwater contamination is known to have occurred over the wider area, consist with results. The project monitored for levels of total cyanide and cyanogen chloride during interaction with groundwater during these underbore works. The methodology and results are included in Section 2.2 and 3.2.

1.4 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:

- Edgware 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.

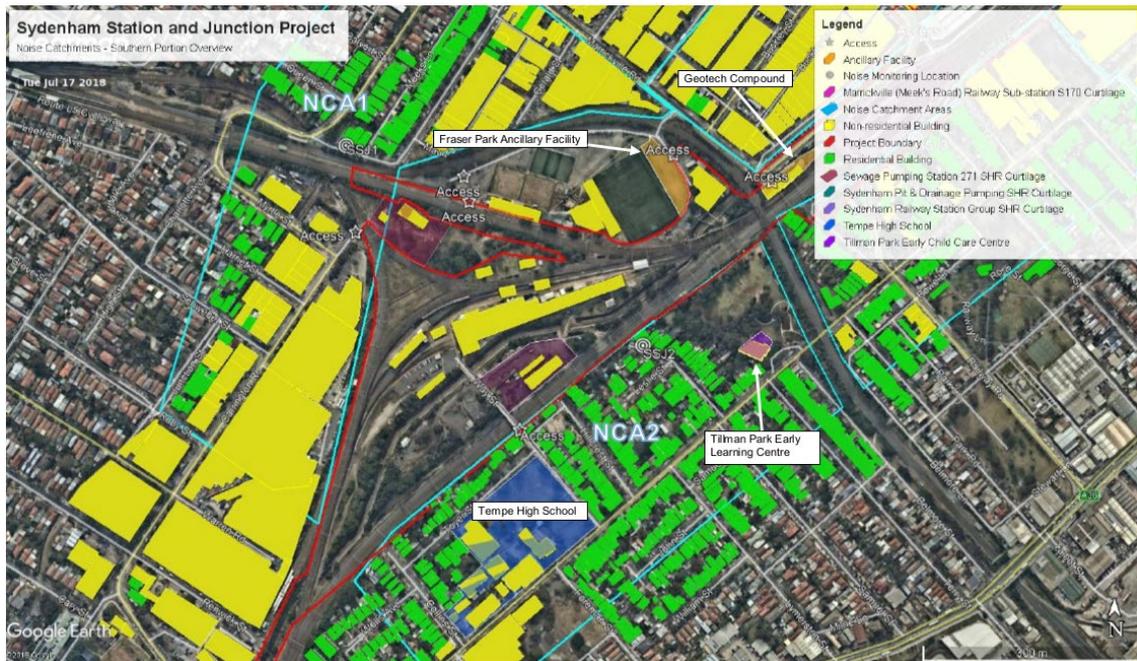


Figure 2 - Surrounding Land-use and Sensitive Non-Residential receivers

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 heritage 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, Edgeware rd and at properties surrounding Sydenham station, construction noise levels may exceed the noise management levels at residences at times. However, given that most of the construction works are within industrial areas and the rail corridor, noise impact would be expected to be limited primarily to out-of-hours works. Equally, vibration levels above the criteria are unlikely to occur.

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 covered for the majority of its length along the east-side of the project following the completion of the new aqueduct across Sydenham pit. The canal remains uncovered west of Sydenham station. 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 points is not possible due to obstructions and safety reasons.

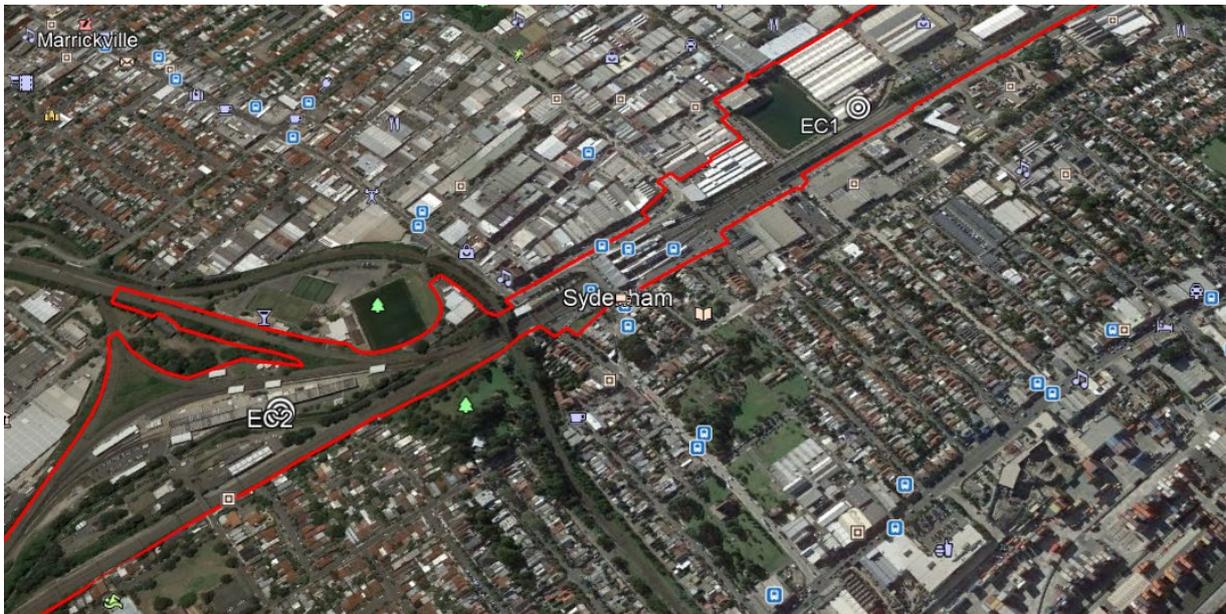


Figure 1 - Surface Water Monitoring Locations

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 Groundwater Monitoring

Based on the groundwater results from the preliminary monitoring well MW02 (see section 1.3), it was agreed JHLOR will monitor water within the launch pit locations (see figure 1) for total cyanide on a fortnightly basis and after rainfall of greater than 3mm in 24 hours. The monitoring would test for levels of total Cyanide and Cyanogen Chlorine as contaminants of concern to confirm levels found occurring within the works area. Noting that groundwater levels can fluctuate within the area, sampling will only be undertaken where access to water

within the launch pit is possible (i.e. if water level is not sufficient, no monitoring can take place).

As the works do not involve water extraction from an aquifer, it was agreed that no further groundwater monitoring is proposed, and monitoring will only take place up to the completion of the underbore works. These works were completed during the period covered by this Construction Monitoring Report in December 2020.

2.3 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.

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 2 - 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 22/09/2020 and 16/12/2020. In addition, sampling was conducted at EC1 and EC2 during two wet weather events on 26/10/2020 and 02/02/2021. – see results in Table 3.

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. The same is considered for salinity, where tidal water and surface water enter through different parts of the stormwater system feeding into the canal may cause changes to upstream and downstream readings.

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

Date	Site Activities	Total Rainfall in Previous 24hrs (mm)	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
22/09/2020	Culvert installation, Earthwork	0	Quarterly Monitoring: Low Flows Clear with build up of sediment visible. Upstream - no flow in eastern channel due to bypass, sample taken at bulkhead. Downstream - Flows too low in Eastern channel, sample taken from the Western Channel	14:12	42	22.14	7.64	0.006	76.2	92.4	0.004	No	14:45	43	29.73	7.56	0.007	75.7	90.3	0.004	No
26/10/2020	Drainage Installation, Site tidy up	22.4	Post Rainfall: Medium flows of turbid water at upstream, high flows of turbid water downstream. Extra sample taken at drainage bypass pump	12:05	253	17.2	7.97	0.458	289	117.7	0.298	No	12:48	207	18.4	7.62	0.458	206	115.3	0.458	No
16/12/2020	Station Culvert Excavation, Service, Building Fitout, Piling Pad Preparation	7.2	Quarterly Monitoring: Medium flow slightly turbid, note upstream sample taken within closed culvert, visual of source no longer possible	14:49	109	24.11	7.33	0.224	161	129.6	0.146	No	14:18	104	24.25	7.52	0.258	148	136.3	0.155	No
02/02/2021	Culvert Formwork, Services Building, Earthworks at Confluence	17.6	Post Rainfall: EC1 medium flows, sample taken from within aqueduct, no visibility to water, no oil within received sample. EC2 medium flows with some visible turbidity	12:34	125	24.36	8.07	0.123	125	190.8	0.3	No	12:50	91	24.94	7.64	0.221	105	193.1	233.6	No
	NWQMS ANZG 2000 Fresh and Marine Water Quality Trigger Values for Recreational ANZECC 2000				-	-	6.5-8.5	0.0125-0.220	6-50	85-110	-	-		-	-	6.5-8.5	0.0125-0.220	6-50	85-110	-	-

3.2 Groundwater Monitoring

Groundwater samples were taken during 8 monitoring events between 21st October and 10th December 2020; from the first round of sampling began following the excavation of first underbore launch pit until the backfill of these excavations. The samples were taken from the launch pit of Underbore 1 and 2, which are approximately in the same location as MW2 (see figure 1). A total of 10 water samples were taken, 7 samples from Underbore 1 and 3 samples from Underbore 2 – see results in table 4.

Table 4 -Groundwater Monitoring Results for Underbore				
Date	Location	pH	Cyanogen Chloride as CN (mg/L)	Total Cyanide (mg/L)
21.10.2020	Underbore 1	8.86	<0.004	<0.004
26.10.2020	Underbore 1	NT	<0.004	<0.004
29.10.2020	Underbore 1	9.52	<0.004	0.026
02.11.2020	Underbore 1	NT	<0.004	0.023
06.11.2020	Underbore 1	9.48	<0.004	0.011
23.11.2020	Underbore 1	8.9	0.004	0.054
23.11.2020	Underbore 2	9.20	<0.004	0.389
04.12.2020	Underbore 1	11.6	<0.004	0.023
04.12.2020	Underbore 2	9.49	<0.004	0.354
10.12.2020	Underbore 2	8.29	<0.004	0.386
Human Health Guideline Values	NHMRC 2008 Guidelines for risk in recreational water	6.5-8.5	0.08	0.08
Water Quality for Recreational Purposes Guideline Values	NWQMS ANZG 2000 Fresh and Marine Water Quality Trigger Values for Recreational ANZECC 2000	6.5-8.5	N/A	0.1

The 7 samples collected from Underbore 1 did not exceed human health criteria for either Total Cyanide or Cyanogen Chloride, however all 3 samples collected from Underbore 2 launch pit exceeded both the human health guideline and recreational water quality guideline criteria for total Cyanide. This was consistent with preliminary monitoring well MW02, which detected existing levels of total cyanide (0.187mg/l) prior to the works, and no detectable levels of Cyanogen Chloride. As per section 1.3, elevated levels of background total cyanide levels are likely part of existing contamination of perched groundwater in Sydenham due to historical industrial activity.

Due to the levels of Total Cyanide identified in initial samples and throughout the sampling, all mitigation measures were followed as documented in section 6.9 the Construction Soil and Water Management Plan and Groundwater ERAP– including containment and offsite disposal of all encountered groundwater from the underbore to a licensed liquid waste disposal facility.

Works were completed as of December 2020 with the underbore fully backfilled, sealed and grouted. Given no other works are planned that are likely to intercept the groundwater table, no further groundwater monitoring is proposed.

3.3 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, specifically due to traffic noise during works with lower predicted exceedance on 10/10/20, 30/10/20 and 08/02/2021. These are detailed in the results shown below in Table 4.

Continuous real-time noise and vibration monitoring has been undertaken during two rail possessions and a period of piling near receivers at Bedwin rd track slab 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 works near retained Sydenham Station Buildings and Sydenham Pit and Pump House, including culvert demolition works and piling, underboring works, station trenching and footing works, and compacting of Bedwin rd track slab adjacent to properties on rail corridor 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. Several rail possessions conducted during the reporting period were considered low risk due to work only taking place at height or limited in scope. Two rail possessions were considered low risk for noise and vibration with significant external works taking place in close proximity, therefore only attended noise monitoring was undertaken. During one possession no valid real-time monitoring could be undertaken due to inclement weather (high winds and heavy rainfall). 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: see vibration monitoring results set out in Table 5. 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 (hrs)	Duration (mins)	Location	Construction Activities	Main source of noise	LA(eq)	LA(max)	Period	Audible noise from SSJ construction activities	NML	Predicted construction sound pressure level (LA(eq,15min))	Compliance	Comment
15/09/2020	0:10	15	30 Hogan Ave	Roof Lift	Faint Construction	45.2	74.4	Night	Faint, intermittent brief rattle gun	47	64	Yes	LaMax from intermittent power tool use*
16/09/2020	0:37	15	136 George St	Roof Lift	Faint Construction	45.3	65.3	Night	Faint	47	63	Yes	LaMax from car
26/09/2020	8:15	15	30 Hogan Ave	Milling and Station Work	Milling dominant	64.8	78.1	Day	EWP, excavator	56	68	Yes	LaMax from car
8/10/2020	0:30	15	136 George st	Roof Lift	Faint Construction	46.9	69.5	Night	Faint, brief rattle gun	47	63	Yes	LaMax from car
10/10/2020	11:41	15	110 Railway Rd	Backfill of retaining wall,	Faint Construction	68.3	88	Day	Faint excavator	56	65	Yes	Considerable extraneous noise, including trains, planes and loud vehicles. Laeq and LaMAX from loud traffic, planes overhead, buses etc.
24/10/2020	0:14	15	30 Hogan Ave	Crane (canopy)	Crane rev, powertools	53.5	71.5	Night	Crane faint, occasional powertools	47	66	Yes	LaMax from dump truck
24/10/2020	0:32	15	108 Railway Rd	Vac Truck, Excavator	Buses and Trains	58.5	77.5	Night	Vac truck and engine	47	67	Yes	LaMax from buses
24/10/2020	22:58	15	30 Hogan Ave	Crane (canopy), Concourse works, excavator travelling	Cars Passing	62.7	85.7	Night	Crane faint, EWP, occasional powertools	47	66	Yes	LaMax from Loud Car
25/10/2020	11:36	15	110 Railway Rd	Track drainage	Buses idling	64.1	80.5	Day	Excavator digging, reversing quacker	56	73	Yes	Replacement buses idling on Railway Road were the dominant source of noise. Note that wind speeds exceeded Australian Standard requirements - monitoring undertaken for indicative purposes only

30/10/2020	21:17	15	30 Hogan Ave	Underbore	Traffic, Trains	70.7	96.7	Evening	Faint	52	59	Yes	Laeq and Lamax from considerable extraneous noise, including cars, trucks and trains
31/10/2020	22:13	15	30 Hogan Ave	Underbore	Traffic, Trains	55.4	71.7	Night	Faint	47	59	Yes	Laeq and Lamax from extraneous noise, including cars, trucks and trains
10/11/2020	23:36	15	30 Hogan Ave	Crane Lift	Crane rev, powertools	55.7	73.4	Night	Faint	47	66	Yes	Lamax from extraneous noise, including cars, trucks and trains
26/11/2020	21:48	15	30 Hogan Ave	Grouting	Grouting, Wind	70.2	92.2	Night	Concrete Truck, Pump	47	75	Yes	Wind well above acceptable monitoring standards - Considerable ambient noise from wind
1/12/2020	0:31	15	136 George st	Crane lift	Trains	56.7	66.7	Night	Faint	47	62	Yes	LaMax from Trains
2/12/2020	0:42	15	30 Hogan Ave	Crane Lift	Powertools (intermittent)	60.1	75.8	Night	Powertools	47	62	Yes	
2/12/2020	13:12	15	360 Edgeware Rd	Jackhammering of Piles	Jackhammer	75.5	82	Day	Jackhammer	58	84	Yes	
5/12/2020	15:39	15	360 Edgeware Rd	Drilling on EWP	Traffic, Trains	59.8	82.4	Day	Drilling (infrequent), Ewp (faint)	58	71	Yes	LaMax from Motorbike
11/12/2020	13:47	15	24 Hogan Ave	Saw cut of road	Concrete saw	81.2	92.8	Day	Concrete Saw	56	82	Yes	Wind above acceptable monitoring standards.
12/12/2020	22:12	15	30 Hogan Ave	EWP Concourse work	Lighting Towers, Traffic	56.1	70.2	Night	Lighting Towers	47	68	Yes	LaMax from passing car
19/12/2020	4:27	15	30 Hogan Ave	Station concourse roofing and cladding	Road Traffic	57.6	80.6	Night	Infrequent tools (impact wrenches)	47	64	Yes	LaEq from passing cars, wind above monitoring standard
27/12/2020	1:49	15	30 Hogan Ave	Drainage Backfill	Excavator, Infrequent traffic	44	66.2	Night	Yes (infrequent)	47	71	Y	
27/12/2020	3:32	15	30 Hogan Ave	Ballast Backfill	Excavator, Infrequent traffic	48.5	71.1	Night	Yes (infrequent)	47	71	Y	LaMax from Motorbike
27/12/2020	16:05	15	30 Hogan Ave	Powertools on track	Traffic (road and air)	62.1	77.5	Day	Yes (infrequent)	56	71	Y	LaEq and LaMax from Truck
9/01/2021	0:04	15	360 Edgeware Rd	Rail Drop	Front end loader, unloading of rail and train	54.9	77.9	Night	Unloading of rail	38	67	Yes	Infrequent noise (laMAX) from unloading rail

9/01/2021	22:18	15	133 Meeks Rd	In corridor, down track +- KM6 (on Bankstown Line) Sydenham Station ULX country side	Construction activities are barely audible	50.4	71.5	Night	No	42	58	Yes	Construction activities are barely audible
9/01/2021	23:00	15	30 Hogan Ave	In corridor, down track +- KM5 (on Bankstown Line) Sydenham Station ULX city side	Construction activities are not audible.	55.8	80.7	Night	No	42	56	Yes	Construction activities are not audible. LaEQ and LaMax from passing traffic, trains and trucks
30/01/2021	15:16	15	358 Edgeware Rd	Throw Screen Installation of bolts and anchors	Construction activities are audible, intermittent tools, faint EWP	64.4	83.9	Day	EWP and intermittent tools	58	71	Yes	LaMax from Truck
08/02/2021	21:08	15	134 George St	Cutting pavement for lightpost footing	Construction activities only faintly audible	70.7	92.2	Evening	Intermittent concrete saw faintly audible (approx. 49dBA)	54	59	Yes	Laeq and LaMax from passing traffic, trains and trucks
20/02/2021	14:32	15	360 Edgeware Rd	Throw Screen Installation of bolts and anchors	Construction activities inaudible during monitoring	65.9	95.3	Day	No	58	64	Yes	Construction was not audible at any time during monitoring session. LaEQ and LaMax from passing traffic, trains and trucks
08/03/2021	0:00	15	360 Edgeware Rd	Throw Screen installation of poles and screens	Intermittent powertools	56.8	81.7	Night	Intermittent power tools	42	71	Yes	* LaMax from intermittent use of powertools

3.4 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
Bedwin Road (Rail corridor fence)	11/09/2020	Piling	Continuous	Y	0.733	7.5	Y	
Platform 2/3 Station Building - City End	23/10/2020	Station Lift, Track Drainage, Conduit install	Attended	Y	3.802	7.5	Y	Monitoring during rail possession
Hogan Ave (22 Hogan Ave)	6/11/2020	Underbore Receiving Pit	Continuous	Y	0.525	7.5	Y	
Sydenham Pit Pump Station	11/11/2020	Demolition of Western Culverts	Continuous	Y	1.429	7.5	Y	
Platform 2/3 Station Building - City End	17/11/2020	Trenching of Platform 2	Attended and Continuous	Y	1.135	7.5	Y	
12/14 Garden St	17/11/2020	Asphalting of Sydenham Pit Access Ramp	Continuous	Y	0.881	7.5	Y	

2 Bolton St	25/11/2020	Underbore Receival Pit	Attended and Continuous	Y	0.813	7.5	Y	
Geotechnical Building	19/12/2020	WE 25 Possession	Continuous	Y	0.923	7.5	Y	Monitoring undertaken during weekend rail possession
Platform 1 Retaining Wall	10/01/2021	Excavation of Platform and Piling of Light posts	Continuous	Y	1.549	7.5	Y	
Platform 2/3 Station Building - City End	12/02/2021	Temporary Works Station Footings	Attended and Continuous	Y	2.786	7.5	Y	Vibration spikes appeared unrelated to hours worked – vibration readings may have been impacted by trains running in close proximity or interference from pedestrian platform.

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. All mitigation measures for groundwater interaction including separate storage and disposal at licenced facility were in place 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. Both real-time and attended noise monitoring has observed exceedances due to non-construction sources, such as air, road and rail traffic. Noise from construction was noted as being within expected levels during attended monitoring. No exceedances in vibration monitoring criteria have occurred during the reporting period.