

BANKSMEADOW TRANSFER TERMINAL

NOISE & VIBRATION IMPACT ASSESSMENT

REPORT NO. 13035
VERSION A

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PREPARED FOR

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

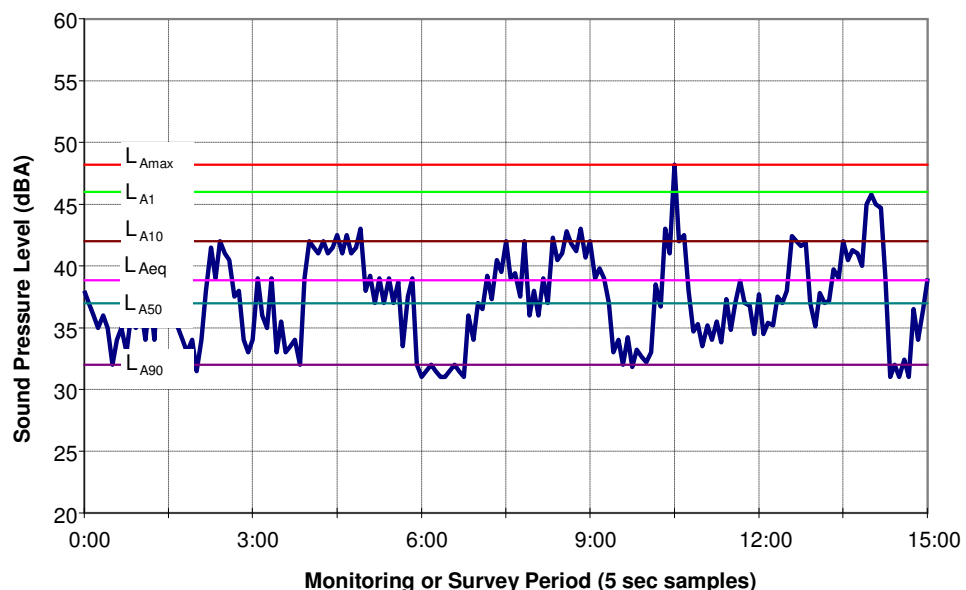
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Veolia Environmental Services (Australia) Pty Ltd (Veolia) is proposing to develop the Banksmeadow Transfer Terminal (TT) and associated rail infrastructure at an existing industrial site in Banksmeadow, NSW, within the Local Government Areas of Botany Bay and Randwick (the Proposal).

The Proposal involves the construction of a transfer terminal that would containerise putrescible waste for rail haulage to the Woodlawn Eco-Project site, near Goulburn, NSW, for treatment, recycling and energy recovery. The terminal would also house an area where loads of non-putrescible waste would be consolidated into semi-trailers for transfer to resource recovery facilities, such as the proposed Camellia Recycling Centre, for further recovery of recyclable material.

The Proposal would, over time, be capable of processing up to 400,000 tonnes (t) of putrescible waste per annum and 100,000 t of non-putrescible waste per annum for transfer to various resource recovery facilities.

Wilkinson Murray (WM) has been commissioned to undertake an assessment of potential noise and vibration impacts on surrounding noise sensitive receivers due to the proposal. This assessment has been carried out in accordance with the Director General Requirements (DGRs) and relevant NSW Environment Protection Authority (EPA) noise and vibration guidelines.

Potential noise and vibration impacts from on-site operations, road and rail transportation and construction have been considered.

1.1 Director General Requirements

The DGRs pursuant to Section 78A(8A) of the Environmental Planning and Assessment Act 1979 for State Significant Development, identifies noise as a key issue to be assessed.

Table 1-1 sets out each of the relevant matters addressed by this assessment, the section of the report where the matter is addressed and the relevant assessment guideline/policy.

Table 1-1: Assessment Particulars

Assessment Matter	Report Section and Page No	Relevant Guideline
On-Site Operational Noise	Section 6.2, Page 27	NSW Industrial Noise Policy (INP) (EPA, 2000) and INP Application Notes
Cumulative Operational Noise	Section 6.2.3, Page 32	NSW Industrial Noise Policy (INP) (EPA, 2000) and INP Application Notes
Off-Site Road Traffic Noise	Section 7, Page 34	NSW Road Noise Policy (RNP) (EPA, 2011)
Off-Site Rail Noise	Section 7, Page 35	Interim Guidelines: Assessment of Noise from Rail Infrastructure Projects (IGANRIP)
Demolition and Construction Noise	Section 8, Page 37	NSW Interim Construction Noise Guideline (ICNG) (DEDCC, 2009)
Vibration Impacts from Operations and Demolition /Construction	Section 9, Page 43	Assessing Vibration: A Technical Guide (DEC, 2006)
Mitigation Measures	Section 10, Page 45	

1.2 Scope of Work and Limitations

This report has been prepared and issued, subject to the limitations set out in Appendix D and is limited to the following scope of work. The scope of this assessment is to:

- identify potential noise and vibration generating activities associated with the proposed development's operation and construction;
- assess the existing acoustic environment, by undertaking noise monitoring;
- establish appropriate project-specific noise and vibration criteria;
- predict potential noise and vibration levels from the operational, road traffic, rail and construction activities by means of noise and vibration modelling and calculations;
- assess predicted noise and vibration levels against the established criteria and quantify any impacts;
- provide recommendations for appropriate noise and vibration mitigation measures and noise and vibration management practices, where required; and
- provide a statement of potential noise and vibration impacts.

2 LOCATION & DESCRIPTION OF SITE AND SURROUNDS

2.1 The Site

The site is situated in Banksmeadow, on the western side of Beauchamp Road and the northern side of McPherson Street. Figure 2-1 shows the site and surrounding area and additionally identifies the noise monitoring locations, as discussed in Section 4. Further to this Figure 2-2 identifies the existing land uses surrounding the proposed site.

The site is located within the Port Botany Site and zoned IN1 - General Industrial under the State Environmental Planning Policy (Port Botany and Port Kembla) 2013. It is located mainly within the City of Botany Bay Local Government Area (LGA), with the proposed main entry at the intersection between Beauchamp Road and Perry Street located in the Randwick Council LGA.

Figure 2-1: Proposed Site Location



Image sourced from SixMaps

The site currently includes a number of buildings, including a large warehouse building, some smaller factory and office buildings, mostly along the western portion of the site, and some existing rail yard infrastructure along the eastern portion of the site, including several rail sidings.

The eastern portion of the site is currently occasionally used for rolling stock storage and

container handling activities, however past rail terminal activities also included train shunting, minor wagon maintenance, container transfer between road and rail, and locomotive refuelling.

2.2 Surrounding Area

As shown in Figure 2-2, the site is surrounded by a number of industrial and commercial land uses.

Figure 2-2: Land Uses Surrounding the Site



The surrounding land uses can be described as follows:

- The main freight rail line into Port Botany lies immediately to the west of the site, beyond which is Orica's Southland site (which is currently undergoing remediation works).
- The Asciano rail yard is located directly to the east of the site. The Asciano rail yard sidings connect to the Port Botany rail line to the north of the subject site. The Orica Botany Bay site is located further east, beyond the Asciano rail yard.
- Adjacent to the site on McPherson Street is a construction and demolition recycling yard, which is bounded by the proposed site to its west, north and east.
- Further to the east of the site, on the opposite side of Beauchamp Road are industrial units and warehouses.
- To the south of the site, on the opposite side of McPherson Street is the Goodman Botany Bay Industrial Park, which comprises several warehouse and office units.
- Further west of the Goodman Industrial Park, on the other side of the freight line is a Toll shipping container depot.

2.3 Closest Residential Receivers

As identified in Figure 2-1, the closest residential receivers are located within the suburbs of Hillsdale and Matraville.

The closest Hillsdale receivers are located approximately 250-500 m to the east of the site, on the eastern side of Denison Street.

To the east-south-east of the subject site, the Matraville receivers are typically setback by distances of >350 m. Additionally, three industrially zoned properties located on Perry Street, potentially being used for residential purposes have been identified (Nos 20, 22 and 24 Perry Street). These are located approximately 120-150m east-south-east from the main site entrance.

3 PROJECT DESCRIPTION

The Banksmeadow TT would involve the development of a new waste transfer building, as well as associated road and rail infrastructure. Site plans showing the proposed layout are provided in Appendix E.

Once operating, the facility would be open to receive waste twenty four hours a day, seven days a week.

Municipal, commercial and industrial customers from within the Sydney region would transport waste to the site by trucks, entering via the Beauchamp Road access road. The waste would be delivered, in two distinct streams, those being putrescible waste (including mixed household waste) and non-putrescible waste.

Putrescible waste would be unloaded within the northern end of the transfer building, whilst non-putrescible waste would be unloaded within the southern end. The terminal building would be enclosed, with the exception of vehicle access openings and an air extraction system that would have a single point of exhaust.

As identified by the site plans, the proposed infrastructure on site would include:

- an access road for putrescible and non-putrescible waste trucks entering and exiting the facility from Beauchamp Road;
- an access road from McPherson Street for semi-trailers entering and exiting the facility for collection of outbound non-putrescible waste;
- incoming and outgoing weighbridges to check the waste type and weight of the waste being delivered to the facility;
- an enclosed building for the unloading and handling of waste, with environmental controls such as dust suppression and odour control systems;
- a hardstand area for temporary storage and manoeuvring of full and empty sealed shipping containers prior to loading on to trains; and
- rail sidings for the loading of containers onto trains for rail transport to Woodlawn.

The management of putrescible waste is discussed further in Section 3.1, whilst the management of non-putrescible waste is further discussed in Section 3.2.

3.1 Putrescible Waste

The Banksmeadow TT would have the capacity to containerise approximately 189 t of putrescible waste per hour.

Once the waste has been deposited on the floor of the enclosed building, it would be pushed by a front end loader to one of two chutes that feed the waste compactors, located within the terminal building (to the west of the building). A scale with an electric display would inform the front end loader operator when the compactor is approaching the maximum capacity of 31.5 t.

Once the correct weight is loaded, the compactor would compress the waste into a consolidated

bale that would be inserted into specially designed shipping containers, and the container would then be sealed.

The container would then be moved outside the terminal building where a container handler would lift it and transport it either directly to a waiting train, or to a container storage area, ready for transport on the next available train.

The compacting and filling process would take approximately 20 minutes per container. It is proposed that two compactors would operate at the Banksmeadow TT, allowing for regular maintenance of the compactors as part of the continued operation of the facility.

The specially constructed shipping containers would be railed, using ARTC's rail network, to the Crisps Creek Intermodal Facility near the Woodlawn Eco-Project site. From there the waste would be trucked approximately 8 km to the Woodlawn site. When the train returns to Sydney with the empty containers ready for re-loading, any surplus empty waste containers would be stored at the Banksmeadow TT site in the container storage area.

There would be up to six return train movements per week. Typically, the unloaded train would be expected to arrive at the Banksmeadow TT site at 12.30pm and depart loaded at 08.00am the following morning, though the timing of the train operations would be dependent to some extent on availability of train pathways on the main railway line.

Table 3-1 provides a summary of the inbound and outbound transport movements for putrescible waste.

Table 3-1: Traffic and Transport Generation associated with Putrescible Waste

Description	Quantity
Annual tonnage	400,000 tonnes
Weekly tonnage (t)	7,700 tonnes
Days per week of operation	Up to 7 days
Truck payload (t)	5.5 tonnes/ truck
Number of inbound loaded truck movements per day	215 trucks
Number of outbound empty truck movements per day	215 trucks
Total truck movements per day	430 trucks
Train payload (t)	
(Up to 42 wagons pulled by two Class 81 locomotives assumed)	1,325 tonnes/ train
<i>Based on 31.5t/container and 42 containers per train.</i>	
Total number of outbound loaded trains per year (to Woodlawn)	300 trains
Total number of inbound (empty container) trains (from Woodlawn)	300 trains
Total number of trains per week (52-week operation)	6 trains/ week/ direction

3.2 Non-Putrescible Waste

The Banksmeadow TT would be designed to receive up to 100,000 t per annum of non-putrescible waste, which will be consolidated into semi-trailers within the transfer building for transfer to resource recovery facilities, such as the proposed Camellia Recycling Centre, for recovery of recyclables prior to re-processing.

The incoming waste (greenwaste, timber, concrete and scrap metal) would be deposited, sorted and stored within the terminal building. A front end loader would be used to organise the waste and an excavator with a grapple arm would be used to load segregated materials into semi-trailers.

Up to 16 unloaded semi-trailers per day will enter the Banksmeadow TT via McPherson Street. Once loaded these would exit the site again by McPherson Street and transfer material to the appropriate recycling or reprocessing facility. Table 3-2 provides a summary of the inbound and outbound transport logistics for non-putrescible waste.

Table 3-2: Traffic and Transport Generation associated with Non-Putrescible Waste

Description	Inbound Waste	Outbound Bulk Haulage
Annual tonnage	100,000 tonnes	100,000 tonnes
Weekly tonnage (t)	1,930 tonnes	1,930 tonnes
Days per week of operation	Up to 7 days	Up to 7 days
Truck payload (t)	2.5 tonnes/ truck	22 tonnes/ truck
Total truck and semitrailer movements per day (considering movements to and from the site)	280 trucks	32 trucks

4 EXISTING ACOUSTIC ENVIRONMENT

4.1 Sensitive Receivers

WM undertook an inspection of the site and surrounding area on 20 May 2013, to evaluate the potential noise exposure to the closest residential and other sensitive receivers. This inspection identified two existing residential receiver groups located within approximately 1km of the site, as well as the closest commercial/industrial receivers, as set out in Table 4-1 and identified in Figure 2-1 and Figure 2-2.

Table 4-1: Existing Sensitive Receivers within Approximately 1km of the Site

Receiver	Classification	Description	Distance from Site Boundary
Hillsdale Residential Area	Residential	Residential suburb, to the east of the subject site, with closest receivers located on the eastern side of Denison Street.	250-500 m (Approx)
Matraville Residential Area	Residential	Residential suburb, to the east-south-east of the subject site, with the closest receivers located along Perry Street at setback distances of typically >350 m.	>350m (Approx)
Perry Street Residences	Residential	Three industrially zoned properties on Perry Street (Nos 20, 22 and 24) are located within approximately 120-150m from the main site entrance to the east-south-east. Whilst it has not been confirmed, these properties are potentially used for residential purpose.	Three receivers within 120-150 m (Approx)
Industrial Units Beauchamp Rd	Commercial	Commercial units located to the east of the Beauchamp Road site entrance, on the eastern side of Beauchamp Road.	30 m (Approx)
Goodman Botany Bay Industrial Park	Commercial	Commercial receivers located to the south of the McPherson Street site entrance, on the southern side of McPherson Street.	30 m (Approx)
Toll Container Depot	Commercial	Commercial receivers located to the south-west of the site, to the west of the existing freight rail line.	65 m (Approx)
Orica Southlands	Industrial	Industrial receivers located to the west of the site, to the west of the existing freight rail line.	35 m (Approx)
Orica Botany Bay	Industrial	Industrial receivers located to the east of the site, beyond the Asciano rail yard.	50 m (Approx)
Botany Building Recyclers	Industrial	Industrial receiver (construction/demolition/recycling yard) abutting the site to the south.	0 m (Approx)

Note: The Asciano Rail Yard operator has in-principle agreements with Veolia and operations would require mutual co-operation between these sites. For the purpose of this assessment, the Asciano rail yard has not been considered as a sensitive/affected receiver.

4.2 Noise Monitoring Locations

Of the receivers identified in Table 4-1, the Hillsdale residents were considered to be the potentially most affected by operational and construction noise from the Banksmeadow TT. Therefore a representative location on Denison Street (70 Denison Street) was selected for long-term noise monitoring in order to determine the existing level of noise exposure to these residents and to allow for the development of project specific noise criteria.

Additionally a further location on Beauchamp Road (30 Beauchamp Road) was selected for long-term monitoring, to establish existing road traffic noise exposure to residents located on this road, which has been identified as a transportation route to the site (as discussed in Section 7.1).

The noise monitoring locations were selected after careful examination of satellite imagery and inspection of the Project Site and surrounding area.

4.3 Noise Measurement Methodology

Noise loggers were deployed at the identified monitoring locations for a period of eleven days to establish the long-term noise ambient noise levels. Additionally, attended noise monitoring was undertaken during the night-time period of 15 October 2013 to supplement the long-term monitoring in order to determine the extent of existing industrial noise exposure to the identified receivers.

All measurements were undertaken in general accordance with *AS1055:1997: Acoustics – Description and Measurement of Environmental Noise* and the INP.

4.3.1 Noise Monitoring Equipment

The equipment detailed in Table 4-2 was used in the noise survey. These instruments comply with *AS IEC 61672.1:2004: Electroacoustics – Sound Level Meters – Specifications* and *AS IEC 60942:2004: Electroacoustics - Sound Calibrators* as appropriate, and have recent calibration certificates traceable to a NATA certified laboratory.

The loggers were set to A-Weighting and fast response and positioned in free-field conditions with their microphones at 1.2 m above ground level. Statistical noise levels were processed and stored by the instruments every 15 minutes for the whole eleven day monitoring period.

The equipment calibration was checked before and after the survey and no significant drift occurred.

Noise loggers determine a variety of descriptors such as L_{A1} , L_{A10} , L_{A90} and L_{Aeq} used to describe the existing noise environment. The L_{A90} level is taken as the background noise level and is used to derive the Rating Background Levels (RBLs) as per the requirements of the INP.

Table 4-2: Monitoring Equipment used for Noise Survey

Monitoring	Location	Monitoring Type	Item	Make	Model	Type	Serial Number
Background Noise	70 Denison Street	Long-term unattended	Noise logger	ARL	215	Type 2	194624
Road Traffic Noise	30 Beauchamp Road	Long-term unattended	Noise logger	ARL	215	Type 2	194505
Background Noise	70 Denison Street and 30 Beauchamp Road	Short-term attended	Sound Level Meter	B&K	2260	Type 1	WM2260

4.3.2 Background Noise Levels

Table 4-3 provides a summary of the daytime, evening and night-time RBLs derived directly from the unattended logging on Denison Street. As required by the INP, in deriving the RBLs, any effects due to extraneous noise sources or adverse weather (rain and wind greater than 5m/s at a height of 1.5m) have been excluded from the analysis. Meteorological data collected during the noise monitoring period at the Sydney Airport met station was reviewed for this purpose and some occasions of high winds were noted and excluded.

Table 4-3: Summary of Rating Background Levels from Unattended Logging

Address	Logging Period	Day (7.00am – 6.00pm)	Evening (6.00pm – 10.00pm)	Night (10.00pm – 7.00am)
70 Denison St	20 May to 30 May 2013	45	45*	45*

Note: * Evening and night-time RBLs of 46 dBA were determined by application of the INP calculation procedure. For the purpose of this assessment, the evening and night-time RBLs have been conservatively reduced and assumed to be 45 dBA, consistent with the daytime RBL.

Daily noise monitoring plots are provided in Appendix A of this report.

Due to the influence of road traffic noise during the daytime, it was not practicable to quantify the extent of existing industrial noise exposure to the residential receivers. Therefore a further site visit was undertaken during a night-time period, with suitable meteorological conditions, to undertake attended background noise monitoring.

Observations and results of the supplementary attended noise monitoring are detailed in Section 4.3.3. The results confirm that the identified background noise levels at 70 Denison Street are controlled by the operation of the Orica Botany Bay site, which generated a steady and continuous broadband noise, with somewhat higher existing industrial noise levels

experienced by receivers further south, closer to the influence from industrial noise emitters located in the vicinity of Port Botany.

4.3.3 Supplementary Attended Noise Monitoring

Attended noise monitoring was undertaken during the night-time period of 15 October 2013 to supplement the long-term monitoring in order to determine the extent of existing industrial noise exposure to the identified receivers. For this purpose a B&K Type 2260 (Type 1) sound level meter was used.

The monitoring was undertaken notionally between 11.30pm and 1.00am the following morning. For each measurement, the microphone was positioned approximately 1.2 m above the ground. The sound level meter was calibrated before and after the measurements using an acoustic calibrator and no material drift occurred between these calibration measurements.

The observed weather conditions during the measurements were suitable for noise monitoring. The period was fine and dry (no precipitation), the sky was clear and no discernable wind conditions were present (still conditions prevailed). Meteorological effects therefore had no material influence on the measured noise levels.

Table 4-4 provides a summary of the attended noise monitoring results.

Table 4-4: Summary of Attended Noise Monitoring Results

Address	Date and Time	L _{A90,15min} (dBA)	L _{Aeq,15min} (dBA)	L _{A1,15min} (dBA)	Notes
70 Denison St	15 October 2013, 11.32pm	46	65	85	- The L_{A90} noise level was controlled by the operation of the Orica Botany Bay site, which generated a relatively steady and continuous broadband noise; - The L_{Aeq} and L_{A1} noise levels were controlled by vehicle movements on Denison Street. 27 Light vehicle passbys occurred, generating instantaneous noise levels in the range 68-76 dBA; and 8 heavy vehicle passbys occurred, generating instantaneous noise levels in the range 78-85 dBA; - Other sources of noise, which were observed to have no material influence on the measured levels, included distant traffic and fauna (insects and birds).
30 Beauchamp Road	15 October 2013, 11.55pm	49	61	84	- The L_{A90} noise level was controlled by distant industrial hum, emanating from the direction of Port Botany (from the south and south-west). The character of the noise was principally steady and broadband, though various distant impact sounds were also observed; - The L_{Aeq} and L_{A1} noise levels were controlled by vehicle movements on Beauchamp Road. 17 Light vehicle passbys occurred, generating instantaneous noise levels in the range 68-84 dBA; and 2 heavy vehicle passbys occurred, generating instantaneous noise levels in the range 79-84 dBA; - Other sources of noise, which were observed to have no material influence on the measured levels, included distant traffic and fauna (insects and birds).
70 Denison St	16 October 2013, 12.46am	46	66	93	- The L_{A90} noise level was controlled by the operation of the Orica Botany Bay site, which generated a relatively steady and continuous broadband noise; - The L_{Aeq} and L_{A1} noise levels were controlled by vehicle movements on Denison Street. 9 Light vehicle passbys occurred, generating instantaneous noise levels in the range 65-75 dBA; and 7 heavy vehicle passbys occurred, generating instantaneous noise levels in the range 79-93 dBA (the upper level occurring due to a truck air-brake); - Other sources of noise, which were observed to have no material influence on the measured levels, included distant traffic and fauna (insects and birds).

Given the relatively steady and constant industrial noise observed to be emanating from the Orica Botany Bay site, the background ($L_{A90,15min}$) noise level measured at 70 Denison Street is considered to be typically representative of the L_{Aeq} industrial noise contribution at this location.

Further south at 30 Beauchamp Road, other industrial activities located within the vicinity of Port Botany influenced the measured noise levels. The cumulative noise from these activities was observed to be less steady than at 70 Denison Street. Given the temporal variation in the industrial noise, it was estimated that the industrial noise contribution at 30 Beauchamp Road was approximately L_{Aeq} 51 dBA (i.e. 2 dB above the $L_{A90,15min}$ level).

Notwithstanding this, for the purpose of this assessment, in establishing the operational and construction noise criteria, the lower of the determined industrial noise contributions discussed have been conservatively assumed to apply to all residential receivers.

How the existing level of industrial noise is relevant to the assessment criteria established by the INP process is discussed in Section 5.1.

4.3.4 Existing Traffic Noise Levels

Table 4-5 provides a summary of the measured daytime and night-time road traffic noise levels derived directly from the unattended logging on Beauchamp Road. Similarly to the RBLs, any effects due to extraneous noise sources or adverse weather have been excluded from the analysis.

Table 4-5: Summary of $L_{Aeq,Period}$ Traffic Noise Levels from Unattended Logging

Address	Logging Period	Day	Night
		(7.00am – 10.00pm)	(10.00pm – 7.00am)
30 Beauchamp Rd	20 May to 30 May 2013	68 dBA	63 dBA

Note: The *RNP* considers daytime (7.00am-10.00pm); and night-time (10.00pm-7.00am).

5 PROJECT NOISE & VIBRATION CRITERIA

5.1 Operational Noise Criteria

5.1.1 City of Botany Bay Council - Minimum Acoustic Requirements and Criteria

The City of Botany Bay Council sets minimum acoustical requirements that any proposed development or activity within the city must achieve to ensure satisfactory acoustic amenity. These requirements, which are based on the provisions of the NSW Industrial Noise Policy (INP), have been considered and adopted in preparation of this assessment.

5.1.2 Randwick City Council - Minimum Acoustic Requirements and Criteria

The Randwick City Council Comprehensive Development Control Plan (2013) also requires noise emissions from new developments to comply with the INP, which it notes, *"aims to balance the need for industrial activity with the desire for quiet in the community"*.

5.1.3 NSW Industrial Noise Policy (INP)

The INP provides the framework for deriving noise limits for consents and licences that enables the EPA to regulate premises that are scheduled under the Protection of the Environment Operations Act 1997 (POEO Act). This policy seeks to promote environmental well-being through preventing and minimising noise.

Section 1.1 of the INP states the specific policy objectives:

- To establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses.
- To use the criteria as the basis for deriving Project specific noise levels.
- To promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects.
- To outline a range of mitigation measures that could be used to minimise noise impacts.
- To provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise and vibration impacts with the economic, social and environmental considerations of industrial development.
- To carry out functions relating to the prevention, minimisation and control of noise from premises licenced under the POEO Act.

The policy sets out two noise criteria to assess the potential noise impacts resulting from industrial activity. The first is used to control short-term intrusive noise and its impacts on residences whilst the second is used to maintain noise level amenity for particular land uses including residences.

Intrusiveness Noise Impacts

The intrusiveness criterion is summarised as follows:

- $L_{Aeq,15 \text{ minute}} \leq \text{rating background level (RBL, } L_{A90}) + 5 \text{ dB(A)}$
 - $L_{Aeq,15 \text{ minute}}$ represents the equivalent continuous A-weighted sound pressure level of the source over 15 minutes, unless other descriptors are specified as more appropriate to characterise the source;
 - Intrusiveness noise impacts are assessed at the most affected point on or within the residential property boundary or if that is more than 30 m from the residence, then at the most affected point within 30 m of the residence.

Protecting Noise Amenity

The amenity criteria set limits on the total noise level from all industrial noise sources affecting a receiver. Different amenity criteria apply for different types of receiver (e.g. residential, commercial, industrial) and different areas (e.g. urban, suburban, rural).

Banksmeadow, Hillsdale and Matraville are recognised as urban areas, in terms of the receiver classifications identified by the INP. Notably, the INP recognises an urban area as an area with an acoustical environment that:

- is dominated by 'urban hum' or industrial source noise;
- has through traffic with characteristically heavy and continuous traffic flows during peak periods;
- is near commercial districts or industrial districts; or
- has any combination of the above.

It should be noted that an urban area in terms of this definition, may be located in either a rural, rural-residential or residential zone as defined on an LEP or other planning instrument, and also includes mixed land-use zones such as mixed commercial and residential uses.

Table 5-1 sets out the relevant amenity criteria recommended by the INP, applicable to residential receivers located in urban areas and commercial and industrial receivers. These criteria apply to cumulative industrial noise and not only the industrial noise contribution under assessment.

The noise level to be compared with the amenity criterion is the L_{Aeq} noise level, measured over the relevant day, evening or night time period, due to all industrial noise sources, but excluding non industrial sources such as off-site transportation, i.e. on public roads.

Where a new noise source is proposed in an area with negligible existing industrial noise, the amenity criterion for that source may be taken as being equal to the overall amenity criterion. However, where noise levels from existing industrial sources are already close to or above the acceptable amenity criterion, the INP requires that the acceptable amenity criterion for any further proposed industrial noise source is commensurately lowered, in the interest of preserving noise amenity. This provision is aimed at the prevention against cumulative noise increases over time due to industrialisation.

Table 5-1: INP Amenity Criteria

Receptor Location	Amenity Criterion					
	L _{Aeq,Period} dBA					
	Daytime		Evening		Night-time	
	(7.00am-6.00pm)		(6.00pm-10.00pm)		(10.00pm-7.00am)	
	Acceptable	Maximum	Acceptable	Maximum	Acceptable	Maximum
Residential Receivers	60	65	50	55	45	50
Commercial Receivers	65	70	65	70	65	70
Industrial Receivers	70	75	70	75	70	75

This assessment mostly considers the acceptable amenity criteria, noting that there may be some tolerance for industrial noise levels exceeding the acceptable criteria by up to 5 dB.

With respect to the existing level of industrial noise experienced by receivers on Denison Street (i.e. 46 dBA, as identified by the supplementary attended noise monitoring), the adjusted night-time acceptable amenity criterion for the proposed development reduces to L_{Aeq,10.00pm-7.00am} 37 dBA. This represents the controlling criterion for the subject site.

For the purpose of assessment this controlling criterion is conservatively applied to all residential receivers. It should be noted, however, that due to the materially higher industrial noise levels experienced by the residential receivers located closer to Port Botany and the relevant INP amenity criteria adjustments, less stringent assessment criteria would in fact be appropriate for these receivers. Adoption of the 37 dBA criterion for all residential receivers is therefore considered to provide a reasonable degree of conservatism.

Conservatively, maximum adjustments have additionally been applied to the evening and daytime periods, on the assumption that industrial noise significantly affects the existing environment during these periods. Regardless of these adjustments, the night-time criterion remains the controlling criterion for the site.

The project specific amenity criteria are summarised in Table 5-2.

Table 5-2: Project Specific Amenity Criteria

Receptor Location	Amenity Criterion					
	$L_{Aeq,Period}$ dB(A)					
	Daytime		Evening		Night-time	
	(7.00am-6.00pm)		(6.00pm-10.00pm)		(10.00pm-7.00am)	
	Acceptable	Maximum	Acceptable	Maximum	Acceptable	Maximum
Residential Receivers	50	55	40	45	37	42
Commercial Receivers	65	70	65	70	65	70
Industrial Receivers	70	75	70	75	70	75

Project-Specific Noise Levels (PSNLs)

The PSNLs reflect the most stringent noise level requirement from the criteria derived from both the intrusiveness and amenity criteria to ensure that intrusive noise is limited and amenity is protected.

Table 5-3 summarises the nominated noise criteria applicable to the operation of the Project.

Table 5-3: Project-Specific Noise Levels (PSNLs)

Receptor Location	Intrusiveness Criterion			Amenity Criterion		
	$L_{Aeq,15min}$ dB(A)			$L_{Aeq,Period}$ dB(A)		
	Day	Evening	Night	Day	Evening	Night
Residential Receivers	50	50	50	50	40	37
Commercial Receivers	n/a	n/a	n/a	65	65	65
Industrial Receivers	n/a	n/a	n/a	70	70	70

As the Project would operate 24 hours a day, the controlling criterion for residential receivers, as shown in Table 5-3, would be the nominated night-time amenity criterion (37 dBA). For the purpose of this assessment, compliance with the night-time criterion implies compliance at all other times.

The PSNL is relevant to the noise contribution from the operation of the Project only, i.e. excluding the contribution from the background noise level, road traffic noise and other

industrial sites.

In assessing noise levels at residences or commercial/industrial receivers, the noise level is to be assessed at the most affected point on or within the property boundary, however, the commercial/industrial criteria are applicable only when such sites are in use (i.e. generally during business hours).

5.1.4 Sleep Disturbance Criteria

The most recent guidelines in relation to sleep disturbance are those contained in the EPA's "Application Notes – NSW Industrial Noise Policy" issued in July 2006. The pertinent section of the EPA's Application Notes states the following:

"DEC reviewed research on sleep disturbance in the NSW Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999). This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.

From the research, DEC recognised that current sleep disturbance criterion of an $L_{A1r(1 \text{ minute})}$ not exceeding the $L_{A90(15 \text{ minute})}$ by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, DEC will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

The detailed analysis should cover the maximum noise level or $L_{A1r(1 \text{ minute})}$, that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night time period. Some guidance on possible impact is contained in the review of research results in the appendices to the ECRTN. Other factors that may be important in assessing the extent of impacts on sleep include:

- how often high noise events will occur;*
- time of day (normally between 10pm and 7am);*
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).*

The $L_{A1r(1 \text{ minute})}$ descriptor is meant to represent a maximum noise level measured under 'fast' time response. DEC will accept analysis based on either $L_{A1r(1 \text{ minute})}$ or $L_{A(Max)}$.

On the basis that the night time RBL in the area is 45 dBA, the sleep disturbance screening criterion when assessed external to dwellings is 60dBA $L_{A1,1min}$.

The "sleep disturbance" criterion is only applicable to night time (10.00pm to 7.00am) operations.

5.2 Off-Site Traffic Noise Criteria

Criteria for off-site road traffic noise are specified in the NSW Road Noise Policy (RNP). The applicable criteria are summarised in Table 5-4.

The identified criteria do not apply to vehicle movements within the Project Site. For the

purpose of assessment any noise generated by on-site vehicle movements is considered as industrial noise and assessed holistically with on site fixed and mobile plant in accordance with the INP.

Table 5-4: RNP Criteria for Road Traffic Noise

Type of Development	Assessment Criteria – dB(A)	
	Daytime (07:00- 22:00)	Night (22:00- 07:00)
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15\text{ hour}}$ 60 (external)	$L_{Aeq,9\text{ hour}}$ 55 (external)
Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1\text{ hour}}$ 55 (external)	$L_{Aeq,1\text{ hour}}$ 50 (external)

The traffic route roads that have sensitive receivers located on them are all sub arterial / arterial roads and therefore for the purpose of assessing likely future road traffic noise arising from the Project the 60dB(A) $L_{Aeq,15\text{ hour}}$ (daytime) and 55dB(A) $L_{Aeq,9\text{ hour}}$ (night-time) assessment goals have been considered.

Further to the RNP base criteria, the Environmental Noise Management Manual (ENMM – RTA, 2001) identifies receivers exposed to traffic noise levels greater than or equal to $L_{Aeq,15\text{ hour}}$ 65 dBA and $L_{Aeq,9\text{ hour}}$ 60 dBA as 'acutely affected'.

Additionally, the RNP identifies that for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above the corresponding road traffic noise levels, due to general traffic growth, that would have occurred if the project had not proceeded. A 2 dB increase is typically considered not noticeable.

5.3 Off-Site Rail Noise Criteria

For the assessment of potential off site rail noise impacts, the EPA's Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects [IGANRIP] (2007) has been considered as this guideline has been specifically referenced in the DGRs. Whilst it is noted that this guideline has recently been superseded by the EPA's Rail Infrastructure Noise Guideline (RING), the adoption of either of these guidelines, has no material influence on the assessment outcome.

IGANRIP specifies 'trigger levels', which are "non mandatory targets that can be used to initiate an assessment of noise impacts and consideration of feasible and reasonable mitigation measures".

For residential receivers the noise trigger levels applying to absolute levels of rail noise have two components, L_{Aeq} and L_{Amax} . The L_{Aeq} contribution level of rail noise is assessed over both day and night periods. The application of the L_{Amax} descriptor for residential land uses recognises that rail events are not adequately described solely by the L_{Aeq} descriptor in terms of their effect on residential amenity and wellbeing. IGANRIP criteria are set out in Table 5-5.

Table 5-5: Airborne Rail Traffic Noise Trigger Levels for Residential Land Uses

Type of Development	Day (7am – 10pm)	Night (10pm – 7am)	Comment
New rail line development	Development increases existing rail noise levels		These represent external levels of noise that trigger the need for an assessment of the potential noise impacts from a rail infrastructure project.
	and		
	resulting rail noise levels exceed:		
	60 L _{Aeq} (15hr)	55 L _{Aeq} (9hr)	
	80 L _{Amax}	80 L _{Amax}	
Redevelopment of existing rail line	Development increases existing rail noise levels		An 'increase' in existing rail noise levels is taken to be an increase of 2 dB or more in L _{Aeq} in any hour or an increase of 3dBA or more in L _{Amax} .
	and		
	resulting rail noise levels exceed:		
	65 L _{Aeq} (15hr)	60 L _{Aeq} (9hr)	
	85 L _{Amax}	85 L _{Amax}	

The redevelopment criteria are relevant in the case of this assessment.

5.4 Construction Noise Criteria

5.4.1 NSW Interim Construction Noise Guideline

The noise criteria set out in the NSW Interim Construction Noise Guideline (ICNG) have been used to assess the potential impacts from construction noise. This document guides the EPA in setting statutory conditions in licences or other regulatory instruments for construction noise. Table 5-6 and Table 5-7 summarise the construction noise criteria specified in the Guideline.

Table 5-6: Construction Noise Criteria – Noise at Residences

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10dBA	The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. - The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: - times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; - if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
	Noise affected RBL + 5dB	- A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the noise affected level. - Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. - For guidance on negotiating agreements see section 7.2.2 of the Guideline.

Table 5-7: Construction Noise Criteria – Noise at Other Sensitive Land Uses

Land Use	Management Level, $L_{Aeq, 15min}$ (applies when properties are being used)
Commercial premises (offices, retail outlets, etc)	External noise level: 70 dB(A)
Industrial premises	External noise level: 75 dB(A)

5.4.2 Project-Specific Construction Noise Management Levels

For the purpose of assessment the daytime RBL determined at 70 Denison Street has been used to establish Construction Noise Management Levels for all residential receivers. Hence, the construction noise management levels set out in Table 5-8 are applicable for normal hours of construction.

Table 5-8: Project-Specific Construction Noise Management Levels

Receptor Location	Rating Background Level L_{A90} dB(A)	Noise Affected Level $L_{Aeq, 15min}$ dB(A)	Highly Noise Affected Level $L_{Aeq, 15min}$ dB(A)
Residential Receivers	45	55	75
Commercial Receivers	-	70	-
Industrial Receivers	-	75	-

5.4.3 Construction Traffic Noise Levels

The interim construction noise guideline does not include any criteria to assess off-site traffic noise associated with the construction. Off-site construction traffic noise has therefore been assessed under the NSW Road Noise Policy, as detailed in Section 5.2. Noise from traffic associated with the proposed construction is minimised as much as practical by limitations on construction hours and Australian Design Rules, which apply to road-registered vehicles.

5.5 Vibration Criteria

When assessing vibration there are two components that require consideration:

- human exposure to vibration; and
- the potential for building damage from vibration.

Construction work is generally considered an intermittent source of vibration.

5.5.1 Human Exposure to Vibration

The DECCW's *Assessing Vibration: A Technical Guideline* provides guidance for assessing human exposure to vibration. The publication is based on British Standard BS6472:1992. Intermittent vibration is best assessed by the Vibration Dose Value (VDV) which is based on the *weighted* root mean quartic (rmq) acceleration. However, for simplicity of assessment and monitoring, a peak particle velocity (PPV) goal is preferred.

Table 5-9 sets out PPV values for continuous and impulsive vibration as specified by *Assessing Vibration: A Technical Guideline*. The impulsive vibration goals are shown in brackets.

Table 5-9: Human Comfort Vibration Goals – PPV (mm/s)

Place	Day (7.00am-10.00pm)	
	Preferred	Maximum
Residences	0.28 (8.6)	0.56 (17.0)
Offices	0.56 (18.0)	1.1 (36.0)
Workshops	1.1 (18.0)	2.2 (36.0)

Note: Impulsive goals are shown in brackets – These are most relevant to activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.

5.5.2 Building Damage from Vibration

There are currently no Australian Standards or guidelines to provide guidance on assessing the potential for building damage from vibration. It is common practice to derive goal levels from international standards. British Standard BS7385:1993 and German Standard DIN4150:1999 both provide goal levels, below which vibration is considered insufficient to cause building damage. Of these, DIN4150 is the more stringent. Table 5-10 summarises the goal levels specified in DIN4150.

Table 5-10 Guideline Values for Vibration Velocity to be used when Evaluating the Effects of Short-Term Vibration on Structures (DIN4150-3:1999)

Type of Structure	Guideline Values for Velocity – PPV (mm/s)		
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20
Structures that, because of their particular sensitivity to vibration, cannot be classified under either of the other classifications and of great intrinsic value	3	3 to 8	8 to 10

With regard to these levels DIN4150 states, "experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur. If damage nevertheless occurs, it is to be assumed that other causes are responsible. Exceeding [these] values does not necessarily lead to damage; should they be significantly exceeded, however, further investigations are necessary."

For general construction vibration, the dominant frequency of vibration is typically in the range 31.5 – 100 Hz. Because the dominant frequency of vibration cannot be determined with certainty, this assessment has adopted a conservative goal of 20 mm/s for commercial and industrial buildings and 5 mm/s for residential buildings.

6 ASSESSMENT OF POTENTIAL NOISE IMPACTS FROM SITE OPERATIONS

The assessment of potential noise impacts associated with the proposed operation of the Project is set out in the following sections.

6.1 Noise Modelling Methodology

Noise levels due to the proposed operation of the Project at the identified noise sensitive receptor locations have been predicted using a model created with the Cadna-A acoustic noise prediction software (Version 4.3.). This program is used and recognised internationally and is also recognised by the EPA as a preferred computer noise model.

Factors that are addressed in the noise modelling are:

- Equipment noise level emissions and location;
- Screening from structures;
- Receiver locations (the closest residential boundaries were considered to represent the residential receivers);
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption;
- Atmospheric absorption; and
- Influence of meteorology.

6.1.1 Meteorology

At relatively large distances from a source, the resultant noise levels at receivers can be influenced by meteorological conditions, particularly wind and temperature gradients, and can therefore vary from hour to hour and night to night. Where these factors are a feature of an area their effect on resultant noise levels is required to be taken into account.

The procedures described in the INP are directed toward finding a single set of meteorological conditions, representing generally adverse conditions for noise propagation, which should be used in noise assessment.

The procedures of the INP have been adopted for this assessment.

Wind

Wind can increase noise at a receiver when it blows from the direction of the noise source. However, an increase in wind strength can also result in a corresponding increase in wind noise at the receiver which masks noise from the source under investigation.

The affectation of noise due to wind should be considered when wind is a feature of the area under consideration. The INP defines this as where wind blows at speeds up to 3m/s for more than 30% of the time in any season. In this situation wind is considered to be a feature of the

area and noise level predictions must be made under these conditions.

To determine the prevalence of such wind conditions, the results of TAPM modelling for year 2012, as discussed in the Air Quality assessment prepared by WM, have been analysed. This analysis which has considered the modelled wind conditions for each season, within daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night-time (10.00pm-7.00am) periods, has not determined any particular prevailing wind conditions that would warrant further consideration in accordance with the provisions of the INP. Therefore no assessment under adverse wind conditions is required. Annual and seasonal windroses, prepared for the analysis are provided in Appendix B.

Temperature Inversion

Temperature inversions can increase noise levels at surrounding receivers by the diffraction of sound waves from warmer upper layers of air. Temperature inversions occur predominantly at night. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night-time period during a season, typically winter.

Accordingly, the 2012 TAPM modelling results have been analysed to determine the incidence of atmospheric stability conditions under which temperature inversions can occur. A summary of atmospheric stability class frequency of occurrences during winter nights is provided in Table 6-1.

Table 6-1: Frequency of Pasquill Gifford Stability Classes During Winter Nights

A	B	C	D	E	F
0%	2%	8%	30%	24%	37%

As the F Class condition (1.5 to >4.0 °C/100m - moderate to strong inversion) is indicated to occur for greater than 30% of the time (during winter nights), in accordance with the provisions of the INP, this condition is considered by the noise modelling assessment.

Accordingly, noise levels have been predicted separately for each of the meteorological scenarios in Table 6-2.

Table 6-2: Meteorological Conditions used in Noise Modelling

Met Scenario	Meteorological Conditions		
	Pasquill Gifford Stability Class	Wind Speed (m/s)	Wind Direction
Day - Neutral Met.	D	0	n/a
Eve - Neutral Met	D	0	n/a
Night - Neutral Met.	D	0	n/a
Night - Adverse Met.	F	0	n/a

Note: In all scenarios, air temperature of 10 °C and relative humidity of 70% has been applied. This temperature and relative humidity combination generally yields the lowest attenuation and therefore typically provides the most conservative results (from ISO 9613-1).

6.2 Operational Noise Assessment

6.2.1 Operational Noise Model and Sources

For the purpose of assessment a scenario has been developed, which is considered to be conservatively representative of the site operating at a typical maximum condition. This scenario assumes the operation of the noise sources identified in Table 6-3.

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Table 6-3: Summary of Operational Noise Sources Applied in Model

Plant	Type*	Location	Sound Power Level per Item ($L_{Aeq,15min}$ dBA)
Odour Extraction Fan Noise	Fantech 45kW (or Similar)	Stack located to North-West of Putrescible Area (Stack Opening at 21 m above Ground Level)	93
2 x Compactors	SSI 4500	Behind Putrescible Waste Area (to the west)	112
1 x Front end loader	CAT 966*	Putrescible Area	111
1 x Bobcat	Melroe S630*	Putrescible Area	107
2 x Container Handlers	Terex FDC450S4*	Moving between the end of the compactors and the container stacking area and rail spur (i.e. the northern portion of the site)	110
1 x Excavator	CAT 320*	Non-Putrescible Area	107
1 x Front end loader	CAT 966*	Non-Putrescible Area	111
1 x Prime movers/ walking floor trailers	Freightliner*	Loading Zone next to the Non-Putrescible Area (to the North of the terminal building)	90
1 x Sweeper	McDonald Johnston VT605*	On-Site Roads	95
Putrescible Waste Truck Movements: - 25 Peak hourly inbound movements (daytime) - 25 Peak hourly outbound movements (daytime) - 4 Peak hourly inbound movements (evening) - 4 Peak hourly outbound movements (evening) - 18 Peak hourly inbound movements (night-time) - 18 Peak hourly outbound movements (night-time)	Waste Truck	Site Access Road (Putrescible Truck Route)	105
Non-Putrescible Waste Truck Movements: - 19 Peak hourly inbound movements (daytime) - 19 Peak hourly outbound movements (daytime) - 1 Peak hourly inbound movement (evening) - 1 Peak hourly outbound movement (evening)	Waste Truck	Site Access Road (Non-Putrescible Truck Route)	105

- 9 Peak hourly inbound movements (night-time)			
- 9 Peak hourly outbound movements (night-time)			
Non-Putrescible Semi-Trailer Movements:	22 Tonne		
- 2 Peak hourly inbound movement (daytime)	Semi-Trailer		
- 2 Peak hourly outbound movement (daytime)		McPherson Street	
- 2 Peak hourly inbound movement (evening)		(Non-Putrescible	105
- 2 Peak hourly outbound movement (evening)		Semi-Trailer Route)	
- 0 Peak hourly inbound movement (night-time)			
- 0 Peak hourly outbound movement (night-time)			
Staff Light Vehicle Movements:	Car/Ute	Site Access Road	
- 28 Peak hourly movements (daytime)		(to Staff Carpark)	
- 7 Peak hourly movements (evening)			73
- 28 Peak hourly movements (night-time)			
Train Movements	2 x 81-Class	On-Site Rail Siding	
- 1 Peak hour outbound movement (daytime)	Locomotives		100
- 0 Peak hour movements (evening)			
- 1 Peak hour inbound movements (night-time)			
Note: * Estimated type & size of plant/equipment – exact model selection may vary; All on-site vehicle movements assumed to be at 20 km/Hr.			

Note: * Estimated type & size of plant/equipment – exact model selection may vary; All on-site vehicle movements assumed to be at 20 km/Hr.

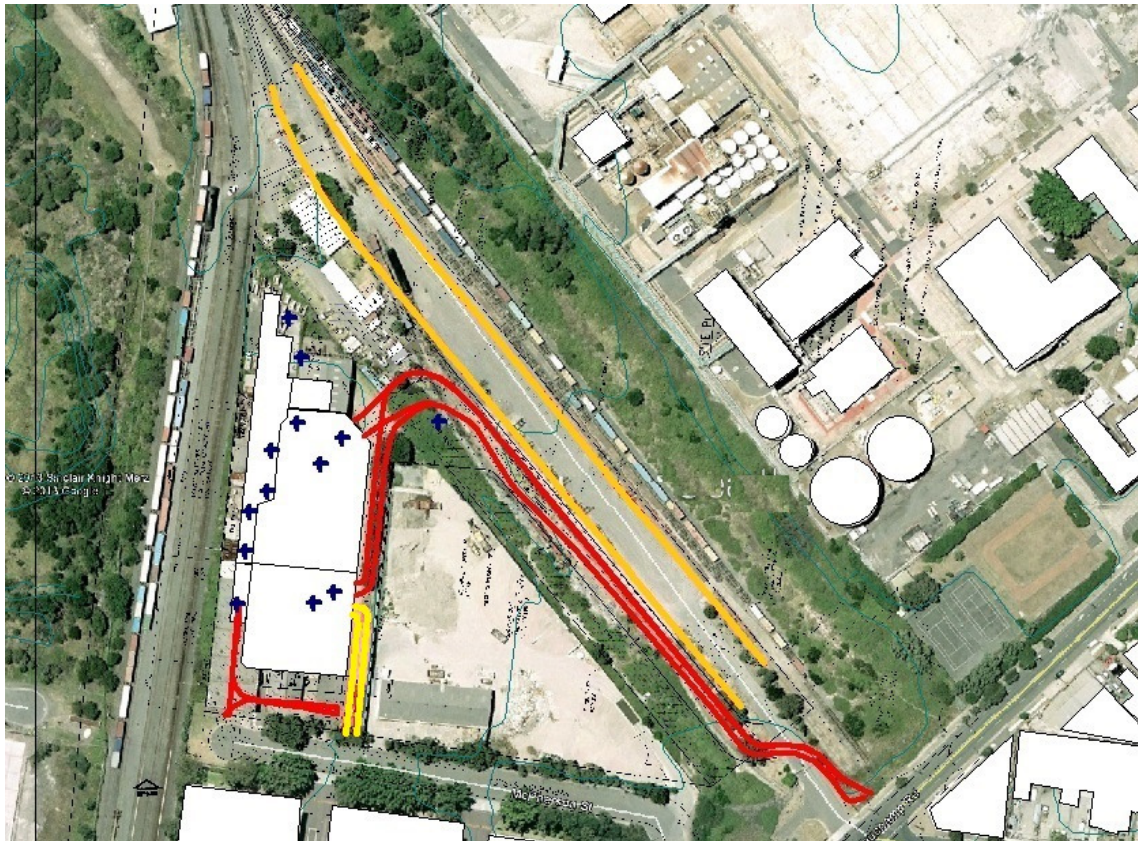
It has been conservatively assumed that all the identified on-site operational plant would operate continuously and simultaneously. It should be noted this represents a worst case scenario in terms of potential noise emissions from the site and typically this condition would rarely occur (under normal operational circumstances).

The peak hour truck movements set out in Table 6-3 have been based on the hourly distribution at the Clyde Transfer Terminal facility & the Port Botany Resource Recovery facility (as detailed in the traffic assessment - refer to Figures 14 and 15 of the traffic assessment). Based on the hourly distributions identified by the traffic assessment the peak hour movements for the delivery of putrescible and non- putrescible waste would not coincide. Nevertheless, to provide a further degree of conservatism, it has been assumed that they may for the purpose of this assessment.

The total number of wagons and locomotives per train movement would depend on the volume of waste to be transported to Crisps Creek. The two proposed rail sidings allow for surplus wagons to be left at the Banksmeadow TT if they are not required for a trip. At maximum operational capacity the complete train would comprise 42 wagons pulled by two Class 81 locomotives. For the purpose of calculations, two Class 81 locomotives have conservatively been assumed to operate continuously (with one idling/traversing on each of the sidings), though this would not represent typical operation.

Figure 6-1 identifies the locations of the noise sources. The source definitions and placements used by this assessment are considered to represent a typically worst-case condition.

Figure 6-1: Noise Source Locations in Noise Prediction Model



Note: Fixed and mobile plant indicated by blue crosses; rail sidings indicated by orange lines; truck routes indicated by red lines; staff vehicle routes indicated by yellow lines.

6.2.2 Operational Noise Predictions

Based on the above assumptions, worst case $L_{Aeq,15min}$ noise levels have been predicted at the closest sensitive receivers during the daytime, evening and night-time under the identified meteorological conditions. The results are provided in Table 6-4 and additionally presented graphically as noise contours in Appendix C.

Table 6-4: Predicted $L_{Aeq,15min}$ Operational Noise Levels

Receiver	L _{Aeq,15min} (dBA) Noise Levels				Intrusiveness Criteria L _{Aeq,15min} (dBA) Day/Eve/Night	Amenity Criteria L _{Aeq,Period} (dBA) Day/Eve/Night	Exceedance
	Neutral Met Conditions			Adverse Met Conditions Night			
	Day	Eve	Night				
Hillsdale Residential Receivers	34	32	34	36	50 / 50 / 50	50 / 40 / 37	Nil
Matrville Residential Receivers	35	31	35	36	50 / 50 / 50	50 / 40 / 37	Nil
Industrial Units Beauchamp Rd	61	53	59	60	n/a	65 / 65 / 65	Nil
Goodman Botany Bay Industrial Park	58	54	57	58	n/a	65 / 65 / 65	Nil
Toll Shipping	43	42	43	44	n/a	65 / 65 / 65	Nil
Orica Southland	64	64	64	64	n/a	70 / 70 / 70	Nil
Orica Botany Bay	65	64	65	65	n/a	70 / 70 / 70	Nil
Botany Building Recyclers	69	68	69	69	n/a	70 / 70 / 70	Nil

Note: The predicted $L_{Aeq,15min}$ noise levels (with consideration to a typical worst-case scenario) are shown. The levels shown for the Hillsdale receivers represent the highest levels predicted on Denison Street. The levels shown for the Matrville receivers represent the highest levels in Matrville, which are those at predicted at the Perry Street receivers (Nos. 20, 22 and 24).

The $L_{Aeq,Period}$ noise levels are estimated to be lower than the $L_{Aeq,15min}$ levels by at least approximately 2-3 dB, due to the intermittency of operational noise (and energy averaging) over the relevant daytime, evening and night-time periods. On this basis full compliance with the INP intrusiveness and amenity criteria is predicted under all relevant meteorological and operational conditions.

The results indicate that operational noise emissions from the proposed BTT site would be expected to fully comply with the relevant INP Project-specific noise levels at all identified receivers with respect to maximum operating conditions. Full compliance is predicted under neutral and prevailing adverse meteorological conditions.

Further to this, given the existing background noise levels experienced by the closest residential receivers to the site, operational activities would be expected to be rendered inaudible at these localities.

On the basis of this assessment, no specific requirement for mitigation has been identified to control operational noise to satisfactory levels.

6.2.3 Cumulative Operational Noise

Compliance with the INP amenity criteria indicates that operational noise from the project would not be expected to result in any material increase in cumulative industrial noise levels experienced by the existing residents.

Future developments in the local area would be subject to the same assessment process as discussed herein. This would limit the potential for industrial noise creeping up over time and thereby limit the potential for future cumulative noise impacts.

6.2.4 Sleep Disturbance Assessment

As outlined by the EPA's INP Application Notes, on the basis that the night time RBL in the area is 45 dBA, the sleep disturbance screening criterion when assessed external to dwellings is 60 dBA $L_{A1,1min}$. This criterion is only applicable to night-time (10.00pm to 7.00am) operations.

On-site operational activities that have potential to generate the highest (maximum) noise levels include train movements/shunting on the rail sidings, container unloading and re-loading of the train, container stacking within the external container storage areas, truck activities (braking, horns, door slamming, weighbridge impacts etc).

For the purpose of assessing potential sleep disturbance impacts, a scenario has been modelled, with consideration to the noise sources and attributed L_{A1} sound power levels, set out in Table 6-5. Whilst the likelihood of all the identified activities occurring simultaneously is considered to be very low, for the purpose of assessment they have been assumed to coincide.

Table 6-5: Maximum Sound Power Levels applied in Sleep Disturbance Assessment

Activity	Location	Maximum Sound Power Level per Activity ($L_{A1,15min}$ dBA)
Container Stacking Impact	Container Stacking Area (8 m noise source height has been considered, approximately based on containers being stacked three high and 2.6 m container height)	120
Container Loading Impact	Rail Spur	120
Truck Movement*	Site Access Road (Putrescible Truck Route)	120
Train Shunting Impact	Rail Spur (Northern End)	118
Train Shunting Impact	Rail Spur (Southern End)	118
Reversing Alarm	Container Stacking Area	110

* Veolia undertook a series of truck noise measurements at its Clyde transfer terminal during September 2012, in accordance with its Conditions of Development Consent. These measurements confirmed that no movements exceeded the maximum noise level of 85 dBA $L_{A1,1min}$ at a reference distance of 7.5 m. The maximum sound power level applied by this assessment has considered these measurement results.

Modelling results indicate that even in the unlikely event of all the identified activities occurring simultaneously during the night, under adverse meteorological conditions (F-class temperature inversion), the sleep disturbance criterion would be met. Maximum noise levels of up to 57 dBA $L_{A1,1min}$ are predicted at Hillsdale and up to 55 dBA $L_{A1,1min}$ at Matraville. These levels are less than the 60 dBA screening criterion and materially lower than the existing L_{A1} noise levels experienced by the receivers throughout the night, due to local road traffic movements. In this regard it is noted that the measured maximum noise levels due to road traffic typically exceeded 80 dBA $L_{A1,1min}$ throughout the night on Denison Street and Beauchamp Road.

On this basis, no sleep disturbance impacts are anticipated due to on-site night-time operations.

7 OFF-SITE TRANSPORTATION NOISE ASSESSMENT

As noted, the site would be open to receive waste 24 hours per day, seven days per week. Details of the anticipated off-site road and rail movements that would be generated by the construction and operation of the BTT are provided in the Traffic and Transport Impact Assessment prepared by Hyder Consulting (Veolia Banksmeadow Transfer Terminal - Traffic and Transport Impact Assessment Report No: F0001-AA005924-06-05-AAR-03).

7.1 Road Traffic Noise Assessment

The traffic assessment identifies relatively high existing vehicle volumes on the proposed off-site vehicle routes. Based on RMS traffic counts, existing volumes on the local road network surrounding the project are set out in Table 7-1.

Table 7-1: Existing Traffic Volumes Identified by Traffic Assessment

Station No.	Location	2005 AADT	2013 Projected AADT
16.098	Beauchamp Road, north of Botany Road	20,848	23,000
16.012	Botany Road, east of Beauchamp Road	24,266	27,500
16.013	Botany Road, west of Beauchamp Road	39,342	43,500
16.088	Foreshore Road, between General Holmes Drive and Botany Road	33,454	39,000
16.031	Wentworth Avenue, west of Bunnerong Road	18,862	23,000
16.033	Wentworth Avenue, east of Page Street	33,054	36,000
13.014	Bunnerong Road, north of Beauchamp Road	19,153	19,000

As discussed in Section 4.3, WM has undertaken road traffic noise monitoring on Beauchamp Road, in order to quantify the level of existing traffic noise exposure to residents on this section of road. As detailed in Section 4, an ARL noise logger was located for a period of eleven days at 30 Beauchamp Road for this purpose. The daytime and night-time road traffic noise levels as measured on Beauchamp Road are compared against the RNP criteria in Table 7-2.

Table 7-2: Measured Road Traffic Noise Levels on Beauchamp Road

Address	Logging Period	Daytime Traffic Noise Level $L_{Aeq,15 \text{ hour}}$	Night-time Traffic Noise Level $L_{Aeq,9 \text{ hour}}$	Daytime $L_{Aeq,15 \text{ hour}}$ Criteria		Night-time $L_{Aeq,15 \text{ hour}}$ Criteria	
				Base	Acute	Base	Acute
30 Beauchamp Rd	20 May to 30 May 2013	68	63	60	65	55	60

As shown, existing daytime and night-time road traffic noise levels already exceed acute criteria on Beauchamp Road and, based on the identified AADTs, existing exceedances of this order are considered likely along other sections of the proposed arterial/sub-arterial routes where residences exist.

In terms of additional traffic generation, the Banksmeadow TT is likely to generate 430 truck movements per day for the movement of putrescible waste to the site, 280 truck movements per day for the movement of non-putrescible waste to the site, and 32 trucks per day for the bulk hauls of non-putrescible waste to the Camellia Recycling Centre. A fewer number of trucks would be anticipated during the construction of the site.

Given the relatively high existing traffic volumes identified in Table 7-1, the additional traffic that would be generated during the construction and operational phases of the Project would not be expected to result in a noticeable change in traffic noise levels on the surrounding road network. A relative increase of less than 1 dB is anticipated on the proposed off-site routes, based the information available, and therefore the potential for noise impacts associated with the additional traffic movements is considered negligible in accordance with the NSW *Road Noise Policy*.

Existing vehicle volumes on McPherson Street were not available at the time of preparation of this report. However, anecdotal evidence provided by Veolia suggests that at peak times, the existing industrial operators located on McPherson Street may generate up to approximately 60 truck movements per hour on this street. A typical average of approximately 20 truck movements per hour has additionally been suggested.

Given these existing heavy vehicle movements and the commercial/industrial nature of the existing sites located on the street, noise impacts arising due to additional vehicle movements associated with the Banksmeadow TT on McPherson Street would be unlikely.

7.2 Off-Site Rail Noise Assessment

The Crisps Creek Intermodal Facility currently receives approximately 500,000 tpa of containerised waste by rail from the Clyde Transfer Terminal for road transfer to the Woodlawn Bioreactor, which equates to approximately one train per day, up to six days per week.

In 2011, under the Woodlawn Bioreactor consent, approval was granted to receive up to 1,180,000 tonnes per annum of waste by rail from Sydney, including transfer of up to 900,000 tpa to the Woodlawn Bioreactor and up to 280,000 tpa to the Woodlawn MBT Facility.

The proposed Banksmeadow TT on-site rail sidings would connect to the existing Asciano sidings and then to the ARTC operated dedicated rail freight line, which connects Port Botany and Enfield. This would enable additional volume to be transported by rail to the Crisps Creek Intermodal facility, prior to transfer to either of the Woodlawn facilities. The proposed annual volume of waste for transportation would fall within the maximum allowance under the Woodlawn Bioreactor 2011 consent.

According to the Environmental Assessment prepared for the Intermodal Logistics Centre at Enfield, by Sinclair Knight Mertz (SKM) on behalf of Sydney Ports Corporation, the daily rail freight movements along the dedicated rail freight line between Port Botany and Enfield would be expected to total 94 by 2016.

The Banksmeadow TT proposal would result in only two additional daily movements on the line (one to and one from the Banksmeadow TT). These additional movements would not be expected to materially increase off-site rail noise. A relative increase of less than 1 dB is predicted and therefore the IGANRIP trigger levels would not be exceeded.

8 CONSTRUCTION NOISE ASSESSMENT

The proposed facility will involve the development of a new transfer building, and associated road and rail infrastructure, as outlined in Section 3.

Four key construction phases have been identified as follows:

- Phase 1 - Site Preparation;
- Phase 2 - Earthworks, Drainage and Utilities Installations;
- Phase 3 - Pavement Construction and Terminal Building Construction; and
- Phase 4 – Rail Construction.

8.1 Indicative Construction Process

General construction activities would be confined to between 0700-1800 Monday to Friday, and 0800-1300 Saturday, with no work on Sundays or public holidays. Construction activities may be conducted outside these hours provided that the activities are not audible at any sensitive receiver beyond the boundary of the site.

Table 8-1 provides a further breakdown of the anticipated construction phases, activities and timeframes.

Table 8-1: Anticipated Construction Phases

Phase	Sub-Phase	Description of Construction Activities
Phase 1 – Site Preparation	1a - Site Establishment (Approx 2 Weeks)	Establishment of a compound with portable offices and amenities and connection to utility services
	1b – Demolition (Approx 18 Weeks)	Demolish existing structures and pavements Separating and stockpiling material for disposal or reuse Treatment of materials for reuse such as a crushing plant for concrete Disposal of materials not for reuse on-site to an authorised disposal or recycling facility
	1c - Clearing and Grubbing (Approx 1 Week)	Removal of grass and trees and grubbing of roots and stumps Disposal of organic matter to authorised disposal facility Removal of decommissioned underground services Stripping of topsoil and stockpiling for on-site reuse or disposal to an authorised disposal facility
	1d - Contamination Removal (Approx 1 Week)	Excavation and removal to authorised disposal facilities of identified contaminated materials
Phase 2 – Earthworks, Drainage and Utilities Installations	2a - Bulk Earthworks (Approx 12 Weeks)	Minor excavation of portions of site Filling of site to create grade for rail
	2b - Stormwater Drainage (Approx 2 Weeks)	Excavation of trenches for the construction of open stormwater channels, pipes and structures on Asciano site

Phase 3 – Pavement Construction and Terminal Building Construction		Backfilling of trenches and behind structures
		Laying of stormwater pipes
		Construction of stormwater drainage structures
	2c - Utility Services (Electricity, Sewer, Water, Fire, Gas, Telecoms) (Approx 2 Weeks)	Excavation of trenches for the construction of combined utility services pipes, conduits and structures Laying of pipes and conduits and construction of utility services structures Backfilling of trenches and behind structures.
	3a - Pavement and hardstand construction (Approx 4 Weeks)	Establish detailed construction platform Place base course Construct sub base Construct kerbs and gutters and concrete barriers etc
	3b - Construction of building slab (Approx 4 Weeks)	Construct base slab including the building of formwork and placing of reinforcement
	3c - Construction of transfer terminal (Approx 12 Weeks)	Erection of framework for shed Erection of shed walls and cladding Installation of ventilation system Installation of lighting and plumbing Building fit out
	4a - Rail link of approximately 15 m wide 500 m long (Approx 2 Weeks)	Placement of sleepers and tracks

8.2 Construction Noise Modelling Methodology

With consideration to the identified works phases and activities, the construction plant and sound power levels set out in Table 8-2 have been assumed for the purpose of assessment. The CadnaA acoustic noise prediction software has been used to model the emissions from the site for each of the identified construction stages. In each case, it has been assumed that all plant would operate simultaneously and continuously, which is considered to be conservatively representative of the typical worst case conditions.

Table 8-2 Indicative Sound Power Levels – Construction Equipment

Stage	Activity	Equipment	Quantity	Sound Power Level per Item L _{Aeq,15min} dB(A)	Sound Power Level per Activity L _{Aeq,15min} dB(A)
1a	Site Establishment (Approx 2 Weeks)	20 tonne trucks	2	105	114
		Backhoe/loader	1	108	
		Static & vibratory roller	1	108	
		Mobile cranes	1	106	
		Delivery trucks	2	105	
1b	Demolition (Approx 18 Weeks)	20 tonne tip truck	4	105	118
		Tracked excavator/hydraulic hammer	1	112	
		Truck floats	4	105	
		Backhoe	1	108	
		Air compressor	1	100	
		Jackhammer	1	110	
1c	Clearing and Grubbing (Approx 1 Week)	Dozers	2	110	117
		Tracked excavator	1	110	
		20 tonne tip trucks	2	105	
		20–40 tonne articulated tippers	2	105	
		Truck floats	2	105	
1d	Contamination Removal (Approx 1 Week)	Tracked excavator for tank pull	1	110	114
		20 tonne tip trucks	2	105	
		Truck floats to remove UST	2	105	
2a	Bulk Earthworks (Approx 12 Weeks)	Dozers	2	110	122
		Scrapers	1	116	
		Tracked excavators	1	112	
		Graders	1	116	
		20–40 tonne articulated tip truck	6	105	
		Water trucks	1	105	
		Vibratory and static rollers or compactors	1	114	
		Truck floats to and from the site	1	105	
2b	Stormwater Drainage (Approx 2 Weeks)	Backhoes or small excavators	1	108	118
		20–40 tonne articulated tip trucks	4	105	
		Delivery trucks (sand backfill, pipes etc)	2	105	
		Concrete agitator trucks	2	108	
		Air compressor	1	100	
		Compaction equipment	1	114	
2c	Utility Services	Backhoes or small excavators	1	108	117

	(Approx 2 Weeks)	20 tonne tip / trucks (road)	2	105	
		Delivery trucks (sand backfill, pipes etc)	2	105	
		Concrete agitator trucks	1	108	
		Air compressor	1	100	
		Compaction equipment	1	114	
3a	Pavement and Hardstand	Backhoes or small excavators	1	108	115
	Construction	Static and vibratory rollers	1	108	
	(Approx 4 Weeks)	20 tonne tip / trucks (road)	4	105	
		Delivery trucks (materials and equipment)	2	105	
		Concrete agitators	1	105	
3b	Construction of Building	Concrete agitator trucks	2	108	117
	Slab	Concrete pumping equipment	1	108	
	(Approx 4 Weeks)	Air compressor	1	100	
		Concrete vibrators	1	103	
		Concrete saws	1	114	
3c	Construction of Transfer	Mobile cranes	1	106	112
	Terminal	Air compressor	1	100	
	(Approx 12 Weeks)	Welder	1	105	
		Delivery trucks and low loaders	2	105	
4	Rail Construction	Delivery trucks (materials and equipment)	2	105	110
	(Approx 2 Weeks)	Mobile cranes	1	106	

8.3 Construction Noise Predictions

The noise levels generated by the indicative construction activities listed above have been predicted at each of the identified receiver locations, conservatively assuming a worst case scenario whereby all sources would operate continuously and simultaneously for a full 15 minute period.

Noise emissions would vary as construction progresses. The upper predicted $L_{Aeq,15min}$ construction noise levels are provided in Table 8-3, with those exceeding the noise affected management level shown in bold font. As the modelled scenarios would be unlikely to occur often, the noise levels at receivers would typically be lower than identified.

Table 8-3: Predicted Construction Noise Levels $L_{Aeq,15min}$ dBA

Receiver	Construction Stage											Noise Affected Management Level
	1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	$L_{Aeq,15min}$ dB(A)
Hillsdale Residential Receivers	38	42	41	38	46	42	41	39	41	36	34	55
Matraville Residential Receivers	40	44	43	40	48	44	43	41	43	38	36	55
Industrial Units Beauchamp Rd	72	76	75	72	80	76	75	73	75	70	68	70
Goodman Botany Bay Industrial Park	69	73	72	69	77	73	72	70	72	67	65	70
Toll Shipping	56	60	59	56	64	60	59	57	59	54	52	70
Orica Southland	71	75	74	71	79	75	74	72	74	69	67	75
Orica Botany Bay	67	71	70	67	75	71	70	68	70	65	63	75
Botany Building Recyclers	71	75	74	71	79	75	74	72	74	69	67	75

Note: Worst case construction noise levels, based on all the identified sources operating simultaneously and continuously, are presented in the table. It should be noted that typically lower noise levels than presented would be expected for most of the time. Attenuation from site boundary fencing has been disregarded as these details were not available at the time of preparation. Additionally, it should be noted that the commercial receiver criterion has been considered for the Industrial Units on Beauchamp Road, the Goodman Botany Bay Industrial Park and the Toll Shipping depot, on the basis that these sites may contain some offices. Arguably a higher management level could be applied for these receivers.

8.3.1 Residential Receivers

The results indicate that construction noise emissions would be expected to comply with *ICNG* $L_{Aeq,15min}$ 55 dBA noise management level at all times at all identified residential receiver locations. No construction noise impacts are anticipated with respect to any residents.

8.3.2 Commercial Receivers

As noted in the footnote of Table 8-3, the commercial receiver criterion has conservatively been

considered for the Industrial Units on Beauchamp Road, the Goodman Botany Bay Industrial Park and the Toll Shipping depot.

There is potential for exceedance of the $L_{Aeq,15min}$ 70 dBA noise management level at the closest commercial receivers located on Beauchamp Road and McPherson Street, particularly so during the earthworks or other noisy activities undertaken close to the site entrances on Beauchamp Road and McPherson Street. It should be noted however, that any such exceedance would be expected to be for only a relatively short duration and any impact would be considered to be relatively minor. For most of the time, where construction occurs away from the site entrances, thereby providing a greater typical setback distance between construction plant and the closest commercial receivers, construction noise levels are predicted to comply with the noise management level.

Construction noise emissions would be expected to comply with $L_{Aeq,15min}$ 70 dBA noise management level at all times at the Toll Shipping site.

8.3.3 Industrial Receivers

Results indicate the potential for exceedance of the $L_{Aeq,15min}$ 75 dBA noise management level at the Orica Southland site and the Botany Building Recyclers site, during the earthworks stage. It should be noted, however, that this is on the conservative assumption that all equipment would operate simultaneously. At most times, given the intermittent nature of construction activities, compliance would be expected to be generally achieved. Given the industrial use of these sites and the worst case scenario noise modelling approach, these exceedances are not considered significant and no material impacts on these neighbouring sites are anticipated.

It is understood that Veolia is in consultation with the operators of the adjacent Building Recyclers yard and would discuss any potential exceedances with respect to this receiver. Additionally, whilst not considered a sensitive receiver by this assessment, an agreement is in place with the adjoining Asciano rail yard.

Notwithstanding this, to limit any potential exceedance of the noise affected management level, the works would be closely managed and best practice management strategies put in place to minimise any potential noise impacts. These measures are set out in Section 10.2.

It is recommended that the neighbouring commercial and industrial receivers are kept informed with respect to the construction schedule and the timing of any particularly noisy activities. As construction progresses, where practicable, consideration should be given to providing quiet respite periods for these receivers, should this be required.

9 VIBRATION ASSESSMENT

Activities undertaken on the site during construction may generate ground vibration. With respect to the construction plant identified in Table 8-2, the highest levels of vibration would be expected to occur during construction phases 1a, 2a and 3a, due to the use of a vibratory roller. Somewhat lower levels of vibration may also arise with the use of an excavator mounted hydraulic hammer and jackhammer during Phase 1b.

Results from vibration monitoring trials of vibratory rollers operating on high speed and high amplitude settings, previously undertaken by WM are set out in Table 9-1. These provide a guide to the levels that may occur due to similar activities undertaken on the on the subject site. It should be noted, however, that actual levels would depend on the specific site geological conditions.

Table 9-1: Measured Vibration Levels from Vibratory Rollers

Roller	Peak Particle Velocity, PPV (mm/s)			
	5m*	10m	20m	30m
Multipac VV2504PD Super Silenced – 25-tonne padfoot	8	6.177	3.311	1.558
HAMM3414 – 15-tonne smooth drum	5	3.552	2.000	0.906

Note: Vibration level at 5m has been inferred by extrapolation.

The other construction activities have been considered and deemed to produce vibration levels that are below the levels in Table 9-1 and are not significant in terms of human comfort and building damage criteria.

9.1.1 Residential Receivers

Given the substantial setback distances to the closest residential receivers, any ground vibrations arising due to on-site activities would be unnoticeable at these locations and significantly below the relevant guideline criteria for human comfort and structural damage.

9.1.2 Commercial Receivers

The closest existing commercial buildings (Goodman Botany Bay Industrial Park) are setback from the BTT site by at least 25 m. Any ground vibrations arising due to on-site activities would be substantially reduced by this distance from the source.

As detailed in Section 5.5.2, this assessment has adopted a conservative building damage criterion of 20 mm/s for commercial/industrial buildings. As shown in Table 9-1, as the anticipated levels are substantially below this criterion, no material risk of building damage from vibration effects is anticipated for these receivers.

In terms of the anticipated effects of vibration on the occupants of the closest commercial

buildings, the expected level from vibratory rolling has the potential to exceed the human comfort criterion recommended for offices (0.56 mm/s preferred and 1.1 mm/s maximum).

On this basis it is recommended that pre-construction vibration trials are undertaken on site to confirm that the use of vibratory rollers can comply with the maximum level of 1.1 mm/s at the Goodman site. This testing should consider the recommendations of *Assessing Vibration: A Technical Guideline*, giving due consideration to the vibration dose method described by the guideline.

It is considered that the trial monitoring would likely confirm that compliance may be achieved by limiting either:

- the size of the roller,
- the rollers vibratory settings,
- periods of continuous operation, or
- any combination of the above.

Should trials indicate that maximum level for human comfort cannot be practicably achieved, it would be recommended to negotiate an acceptable limit with the affected commercial sites or consider alternate compacting methods.

9.1.3 Industrial Receivers

The existing building located within the adjacent construction/demolition/recycling yard, is setback from the site boundary by an estimated 6 m and from the proposed terminal building by approximately 15 m.

Based on the levels identified in Table 9-1, no material risk of building damage from vibration effects is anticipated for this closest structure, with respect to the adopted 20 mm/s criterion.

The human comfort criteria for workshops (1.1 mm/s preferred and 2.2 mm/s maximum) has been considered for the adjacent recycling yard.

Table 9-1 indicates the potential for exceedance of the maximum human comfort criterion recommended for workshops, when the roller is operated within approximately 20 m of the building.

It is considered, however, that adjacent site may tolerate a higher level of vibration, given that this site operates heavy plant of its own during normal operations.

It is recommended that an acceptable level for the adjacent site is determined during the proposed pre-construction vibration trials or by negotiation with the operator of this site.

Further to this, it is noted that stockpiles of waste building materials are stored on the adjacent site. During the pre-construction vibration trials, these stockpiles should be visually monitored to ensure vibrations due to the construction activities do not compromise their stability.

10 NOISE MANAGEMENT MEASURES

10.1 Operational Noise

No specific requirement for mitigation has been identified to control operational noise to satisfactory levels. Notwithstanding this, the following noise management strategies would be applied, which would further reduce the potential for noise issues during operations:

- Ensuring that all transportation fleet (trucks and train) are appropriately maintained and in correct operational order;
- Maintaining a 20 km/hr on site speed limit for all vehicles;
- Ensuring machinery engine covers are normally kept closed, equipment is well maintained and silencers/mufflers are used as appropriate, including routine maintenance for major items of operational equipment that contribute to operational noise emissions from the site;
- Provision of awareness training for staff and contractors in environmental noise issues including:
 - Minimising the use of horn signals and maintaining a low volume. Alternative methods of communication should be considered;
 - Avoiding any unnecessary noise when carrying out manual operations and when operating plant;
 - Switching off any equipment not in use for extended periods; and
- Maintaining a suitable complaints register. Should noise complaints be received, they should be immediately investigated. Where substantiated, reasonable and feasible measures would be implemented to reduce noise impacts.

10.2 Construction Noise

During construction works it is recommended that best practice management strategies are implemented to minimise any potential noise impact. The following noise management strategies should be applied, which would reduce the potential for noise issues during construction:

- Restricting construction activities to between the nominated construction hours, between 0700-6.00pm Monday to Friday, and 8.00am-1.00pm Saturday, with no work on Sundays or public holidays;
- Where practicable any particularly noisy works should be staged with consideration to the least sensitive time of day for the closest receivers, providing respite periods as necessary;
- Scheduling construction to minimise multiple use of the noisiest equipment or plant items where practicable;
- Strategic positioning of plant items and work areas to reduce the noise emission to noise sensitive receptors, where possible;

- Ensuring construction machinery engine covers are closed, equipment is well maintained and silencers/mufflers are used, including routine maintenance for major items of construction equipment that are significant construction noise contributors;
- Provision of awareness training for contractors in environmental noise issues, as described above.
- Community consultation with local residents/businesses to assist in the alleviation of community concerns. Previous experience on similar projects has demonstrated that affected noise sensitive receptors may be willing to endure higher construction noise levels for a shorter duration if they have been provided with sufficient warning in the place of intermittent but extended periods of construction noise at lower levels; and
- Maintaining a suitable complaints register. Should noise complaints be received, they should be immediately investigated and where appropriate, noise monitoring would be undertaken at the locations concerned to determine compliance with the determined construction noise limits. Reasonable and feasible measures would need to be implemented to reduce any noise impacts.

10.3 Construction Vibration

It is recommended that pre-construction vibration trials are considered before the use of vibratory rolling methods on site, as discussed in Section 9.

11 CONCLUSION

Veolia is proposing to develop the Banksmeadow Transfer Terminal (TT) and associated rail infrastructure at an existing industrial site in Banksmeadow, NSW. The Banksmeadow TT would provide the capacity for processing up to 400,000 t of putrescible waste and 100,000 t of non-putrescible waste per annum for transfer to various resource recovery facilities.

WM has undertaken an assessment of potential noise and vibration impacts on surrounding noise sensitive receivers due to the proposal. This assessment has considered noise and vibration impacts from on-site operations, road and rail transportation and construction in accordance with the Director General Requirements (DGRs) and relevant NSW noise guidelines. The findings of the assessment are as follows:

Operational Noise

Operational noise emissions from the site would be expected to fully comply with the relevant INP Project-specific noise levels at all identified receivers with respect to maximum operating conditions. Full compliance is predicted under neutral and prevailing adverse meteorological conditions.

Further to this, given the existing ambient noise levels experienced by the closest residential receivers to the site, operational activities would be expected to rendered inaudible at these localities.

Cumulative Operational Noise

Operational noise from the project would not be expected to result in any material increase in cumulative industrial noise levels experienced by the existing residents.

Sleep Disturbance

Predicted noise levels would be expected to be within the sleep disturbance noise limits established in accordance with the current EPA guidelines.

Off-Site Transportation Noise

During the construction and operational phases, road traffic noise levels are predicted to increase by less than 1 dB and therefore comply with the RNP criteria.

During the operational phase, rail noise levels are predicted to increase by less than 1 dB and therefore comply with the IGANRIP criteria.

Construction Noise

No exceedances of the identified ICNG construction noise criteria are expected at any residential locations.

There is potential for exceedances at the closest commercial and industrial receivers, though given the sensitivity of these sites, any impact is considered to be low. Best practice measures would be adopted throughout the construction phase. These measures would be expected to

be sufficient to appropriately manage of any construction noise impacts on surrounding businesses.

Vibration

No vibration impacts are expected at any residential locations.

No risk of structural damage to the closest commercial/industrial buildings is anticipated.

The use of vibratory rolling methods has the potential to generate exceedance of the identified vibration human comfort criteria at the closest commercial/industrial receivers.

Mitigation

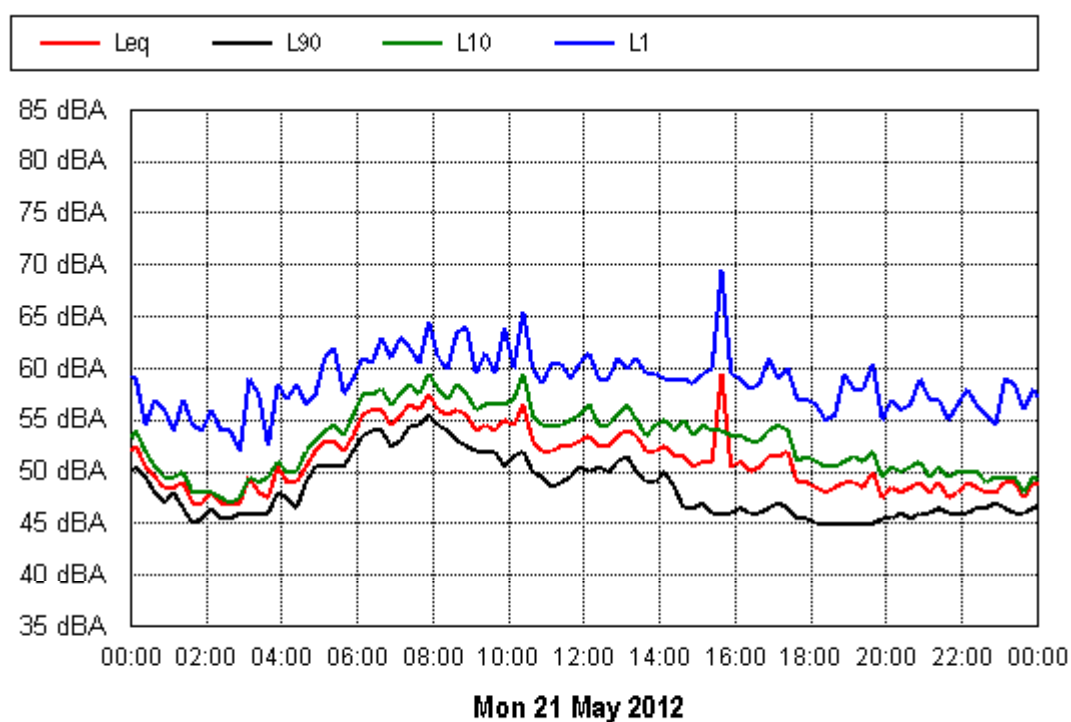
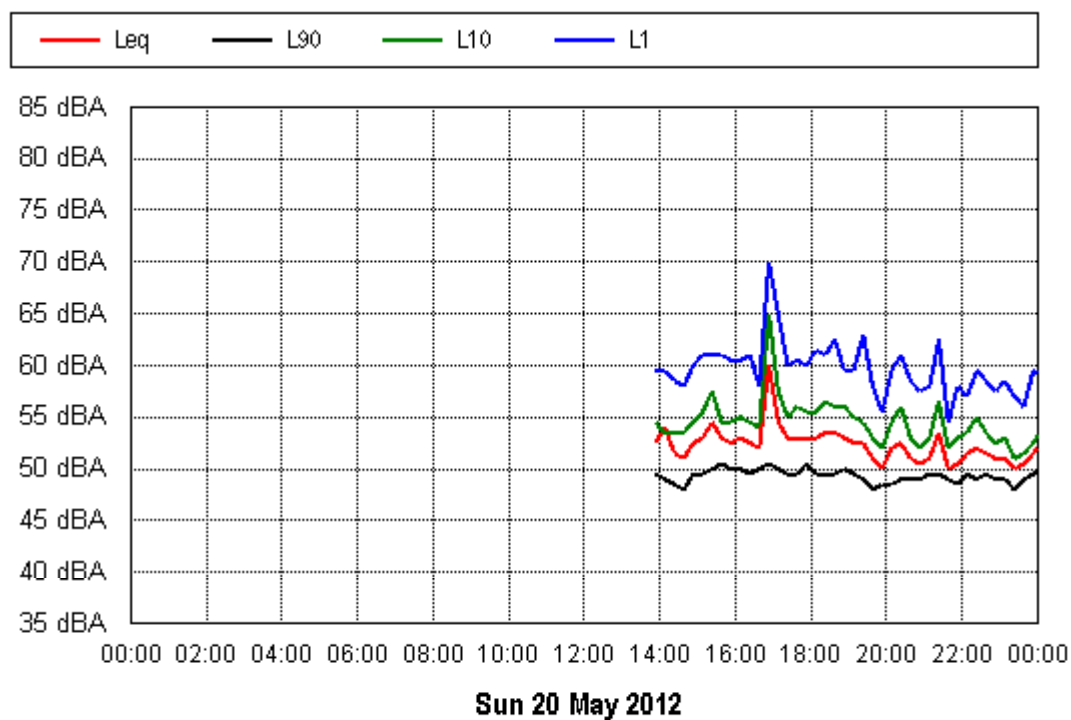
Whilst no specific requirement for mitigation has been identified to control operational noise to satisfactory levels, effective noise management strategies that would be applied have been outlined. These would further reduce the potential for any noise issues arising during operations.

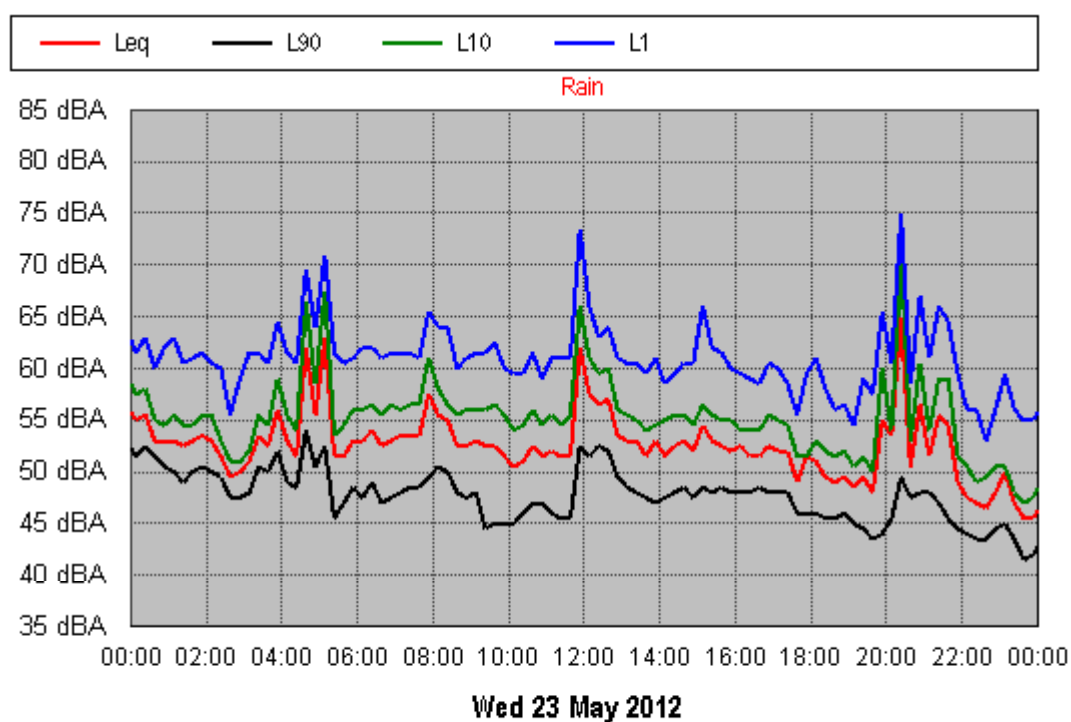
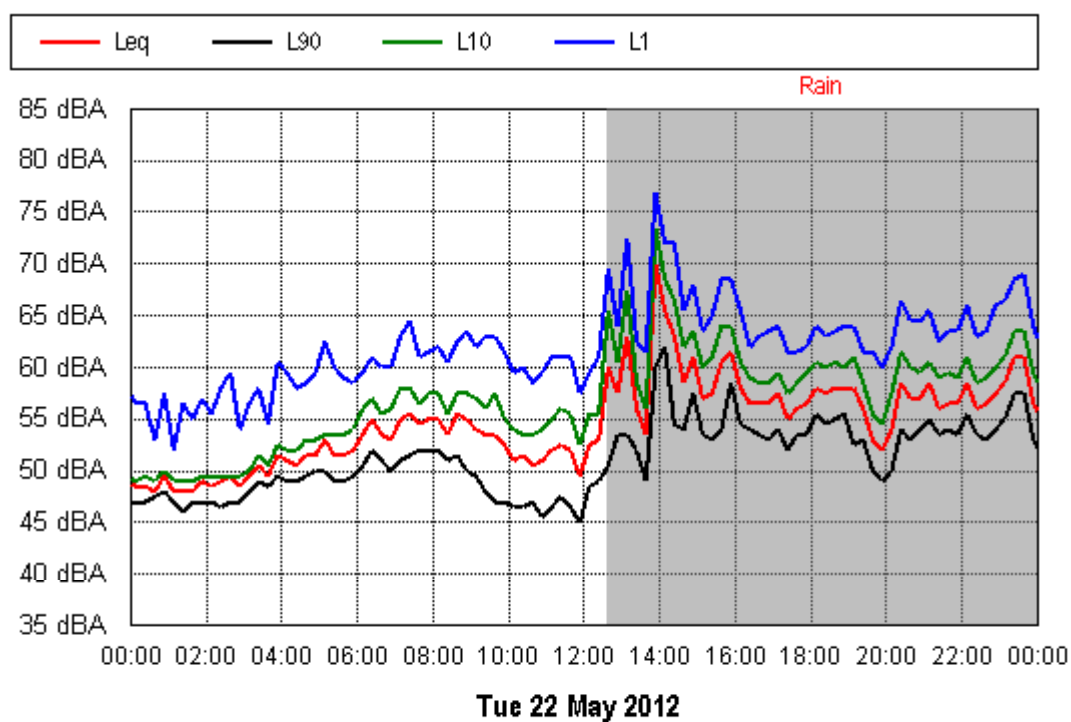
It is recommended that during the construction phase, works should be closely managed and best practice management strategies applied to minimise any potential noise impacts. Recommended noise management strategies, which would reduce the potential for noise issues arising during the construction phase have been identified.

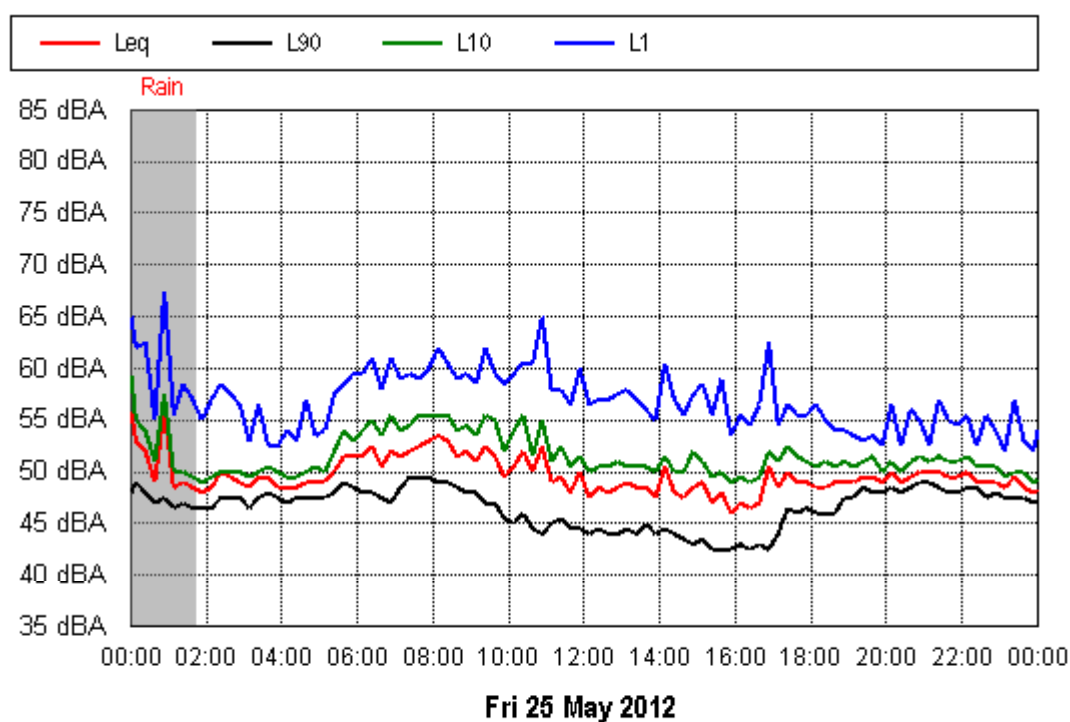
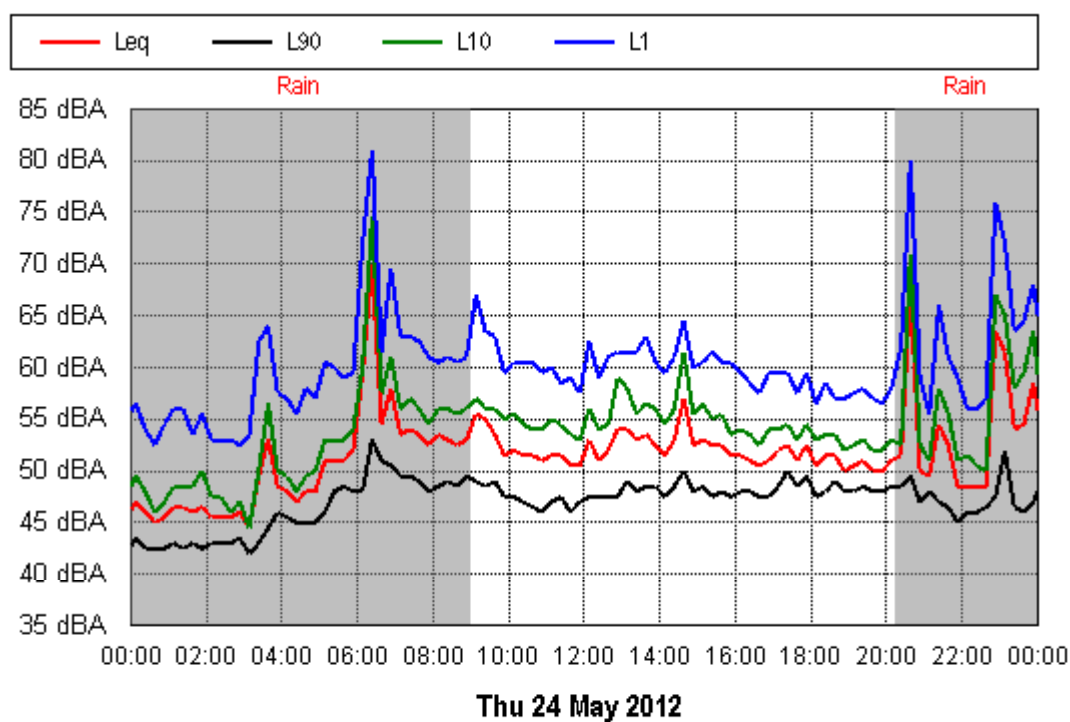
It is recommended to undertake pre-construction vibration monitoring trials, to ensure the vibration levels occurring from proposed vibratory rolling are acceptable to the neighbouring commercial/industrial receivers.

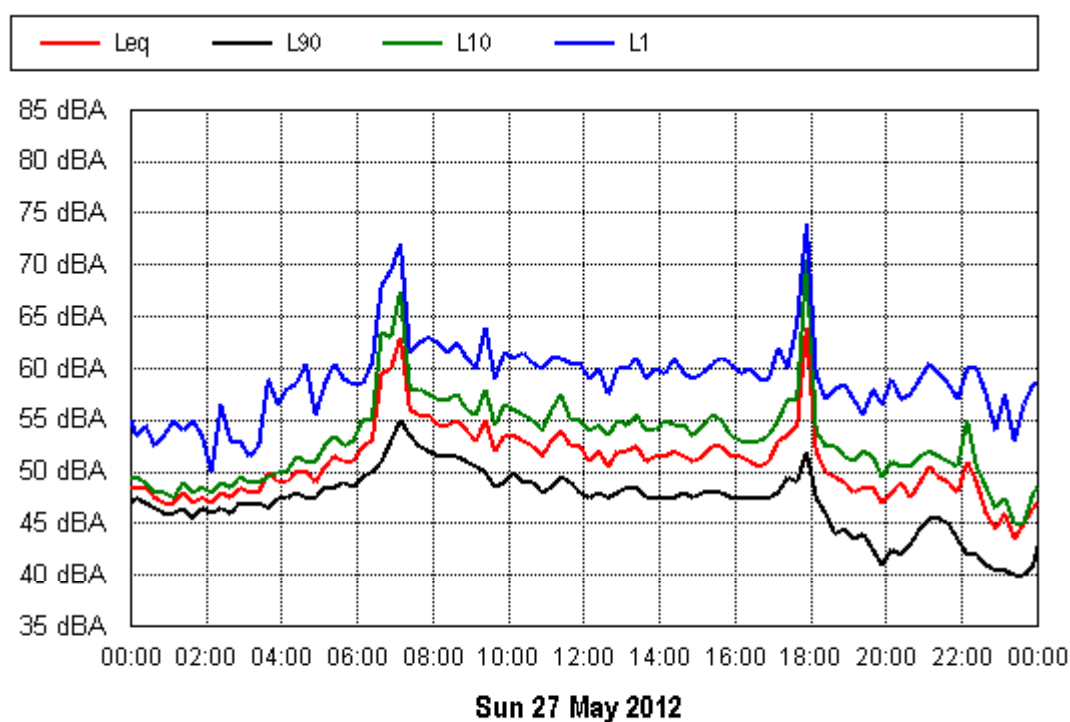
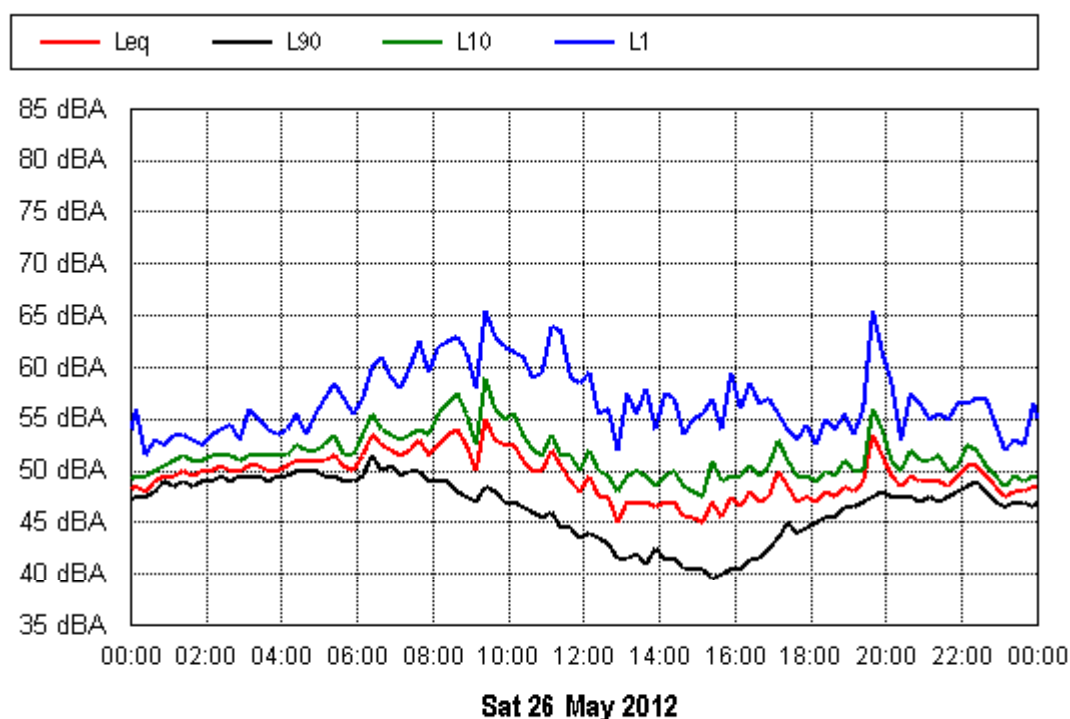
APPENDIX A

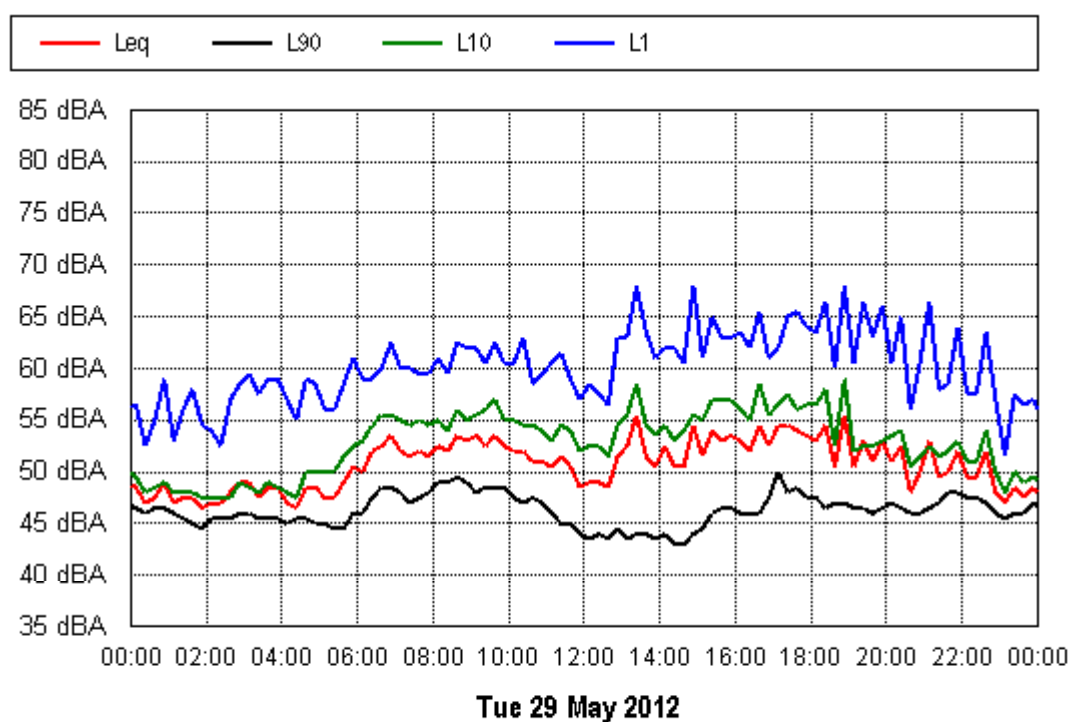
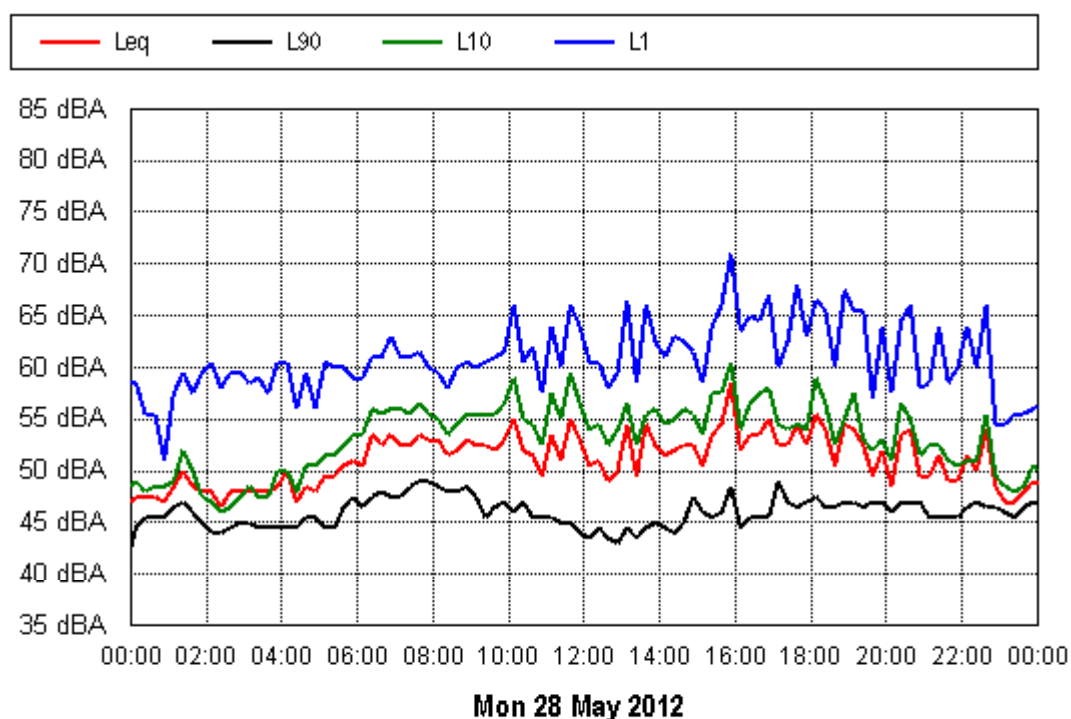
NOISE MEASUREMENT RESULTS

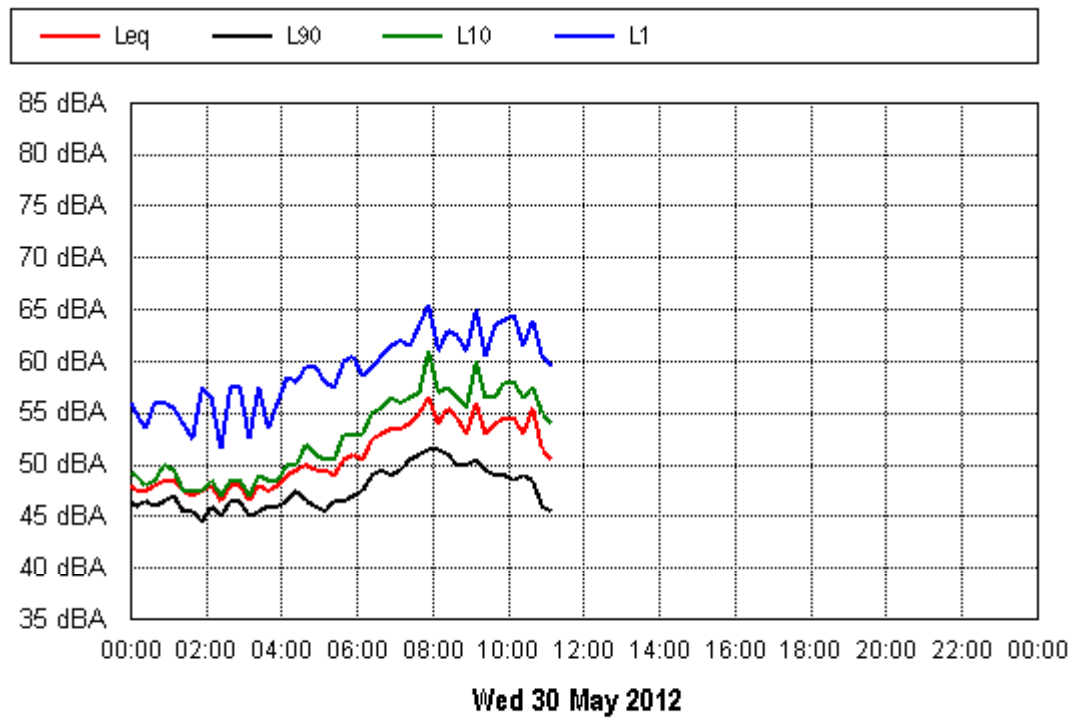
Project: 13035-A Banksmeadow WTS**Location: 70 Denison St****Filter: A**

Project: 13035-A Banksmeadow WTS**Location: 70 Denison St****Filter: A**

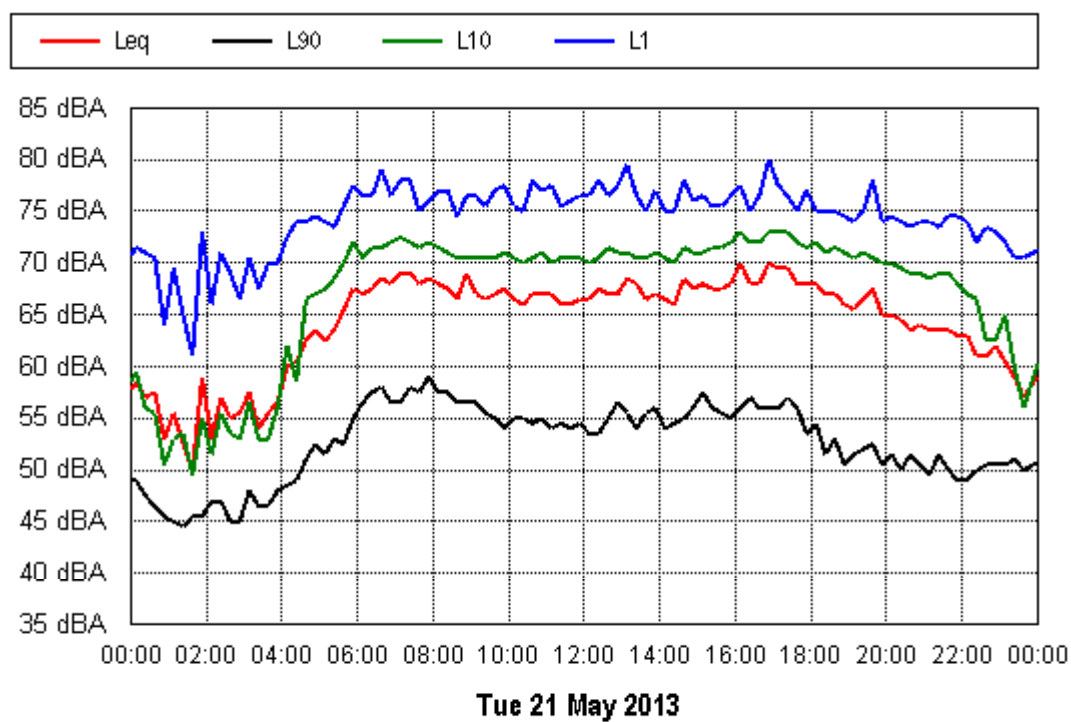
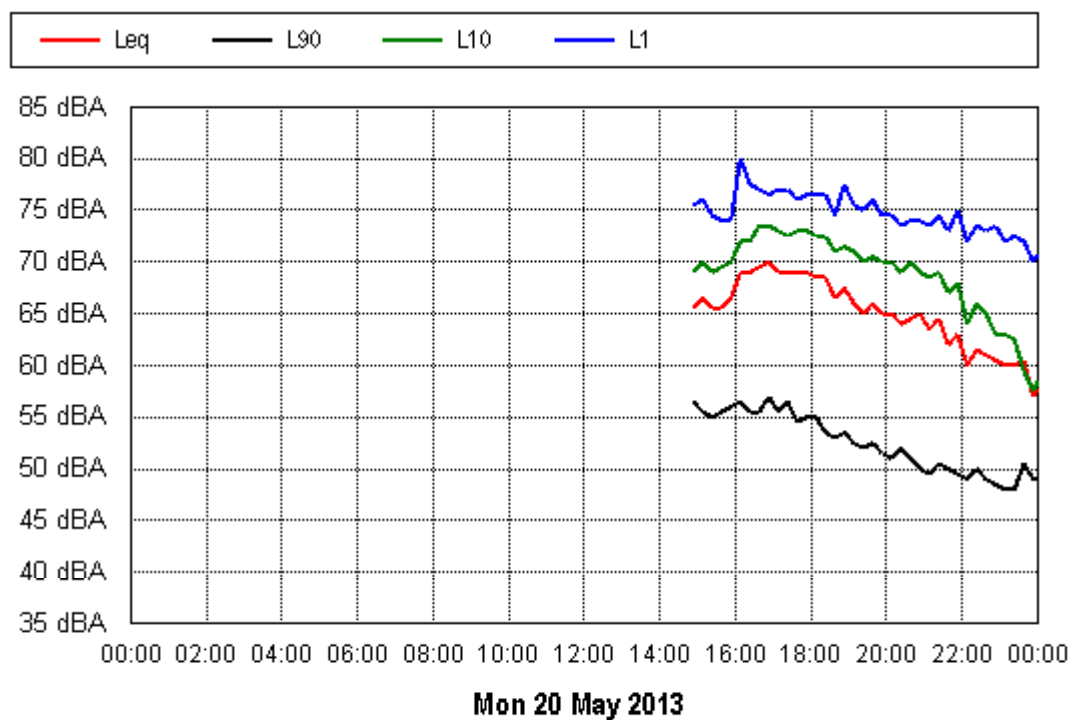
Project: 13035-A Banksmeadow WTS**Location: 70 Denison St****Filter: A**

Project: 13035-A Banksmeadow WTS**Location: 70 Denison St****Filter: A**

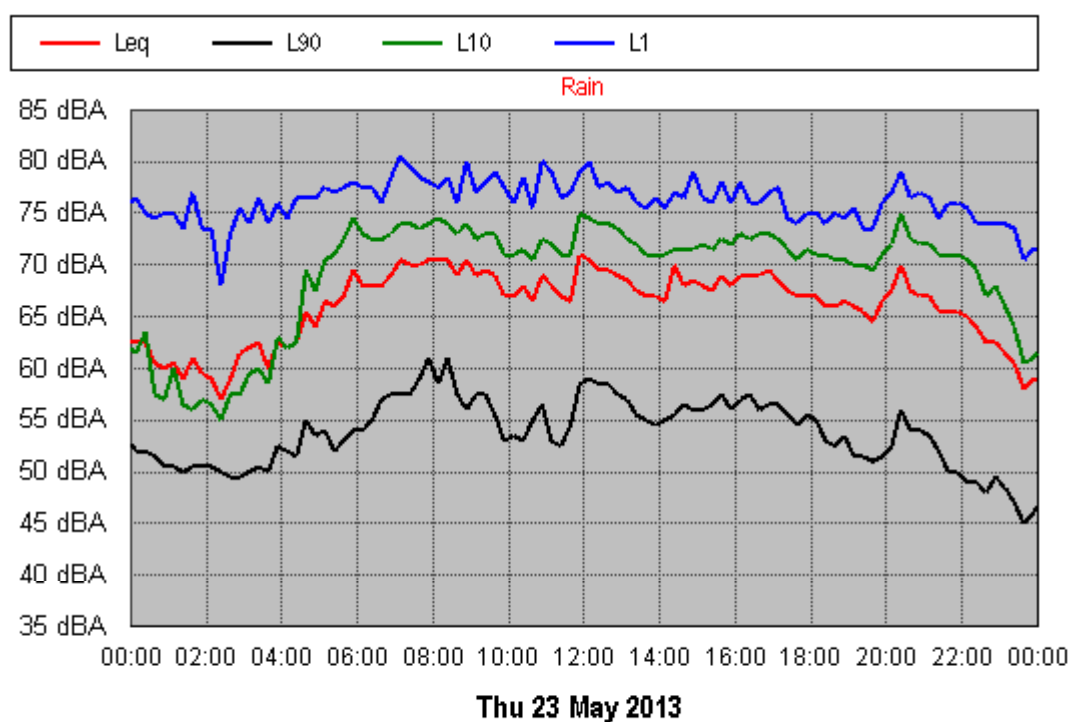
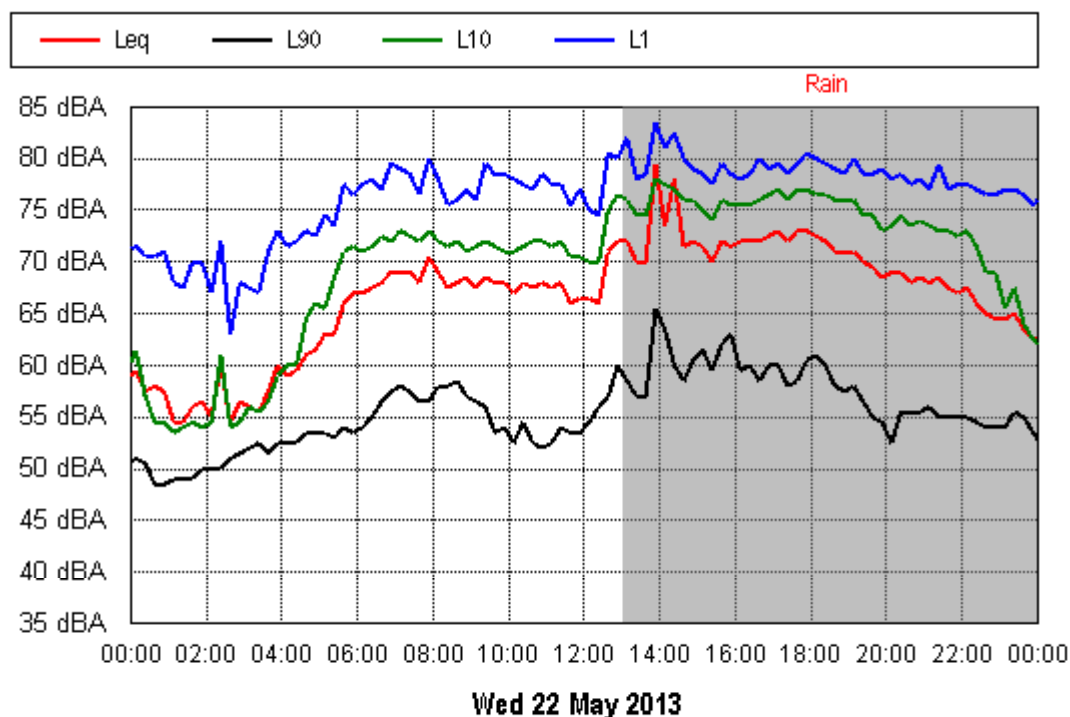
Project: 13035-A Banksmeadow WTS**Location: 70 Denison St****Filter: A**

Project: 13035-A Banksmeadow WTS**Location: 70 Denison St****Filter: A**

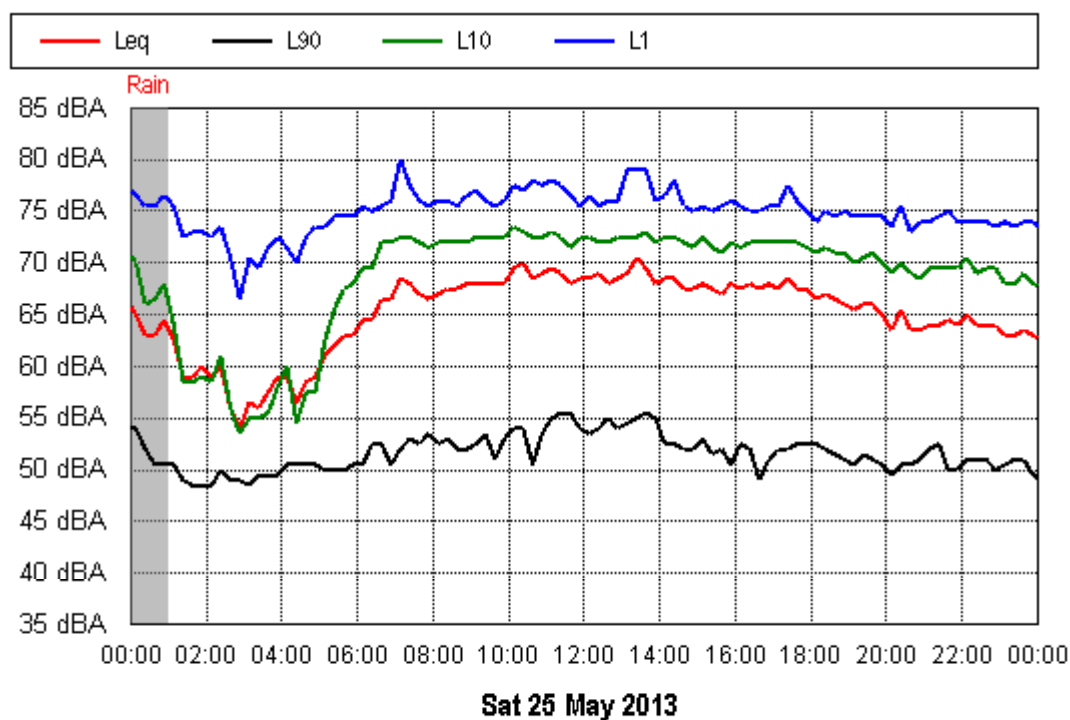
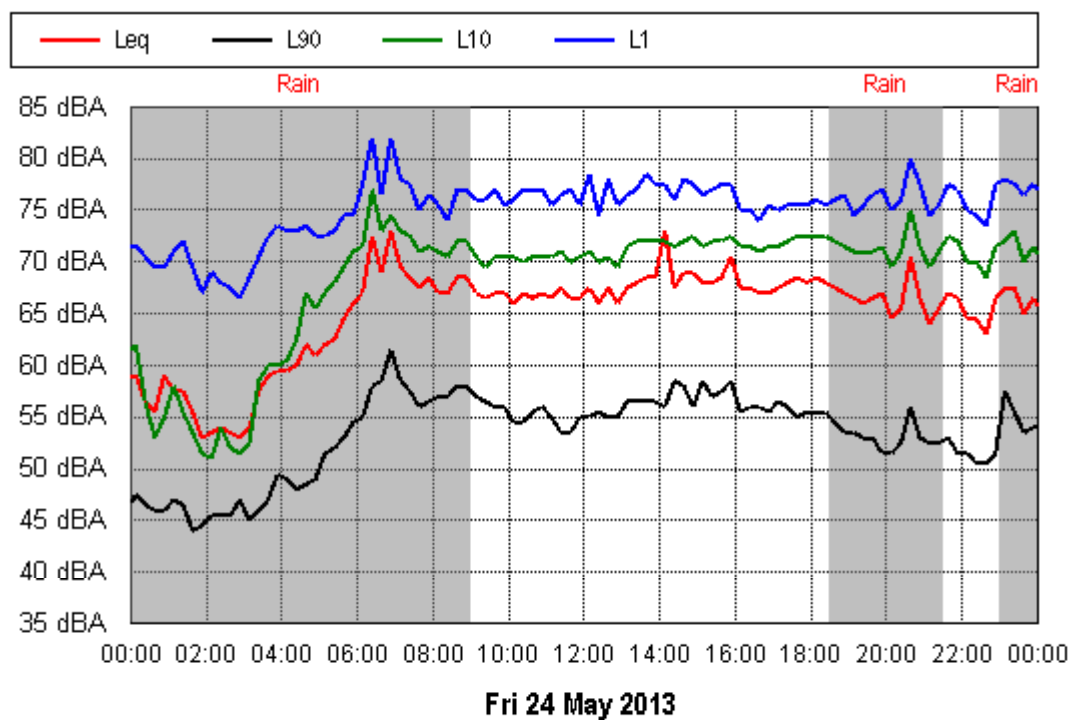
Project: 13035-A Banksmeadow WTS
Location: 30 Beauchamp Rd Banksmeadow
Filter: A



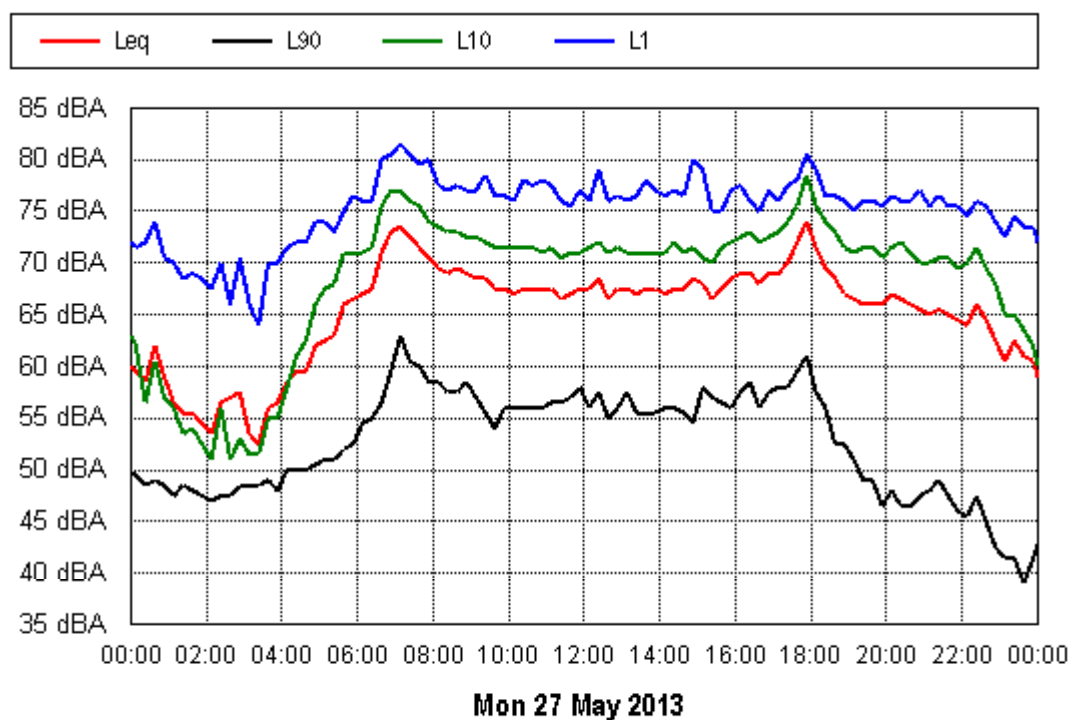
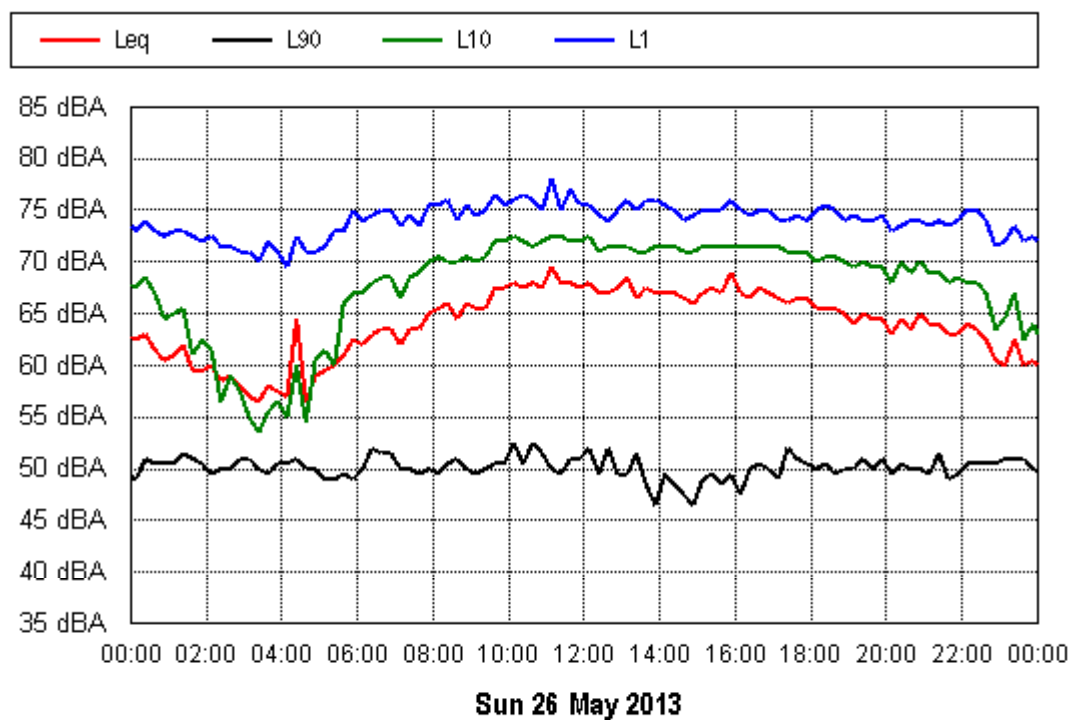
Project: 13035-A Banksmeadow WTS
Location: 30 Beauchamp Rd Banksmeadow
Filter: A



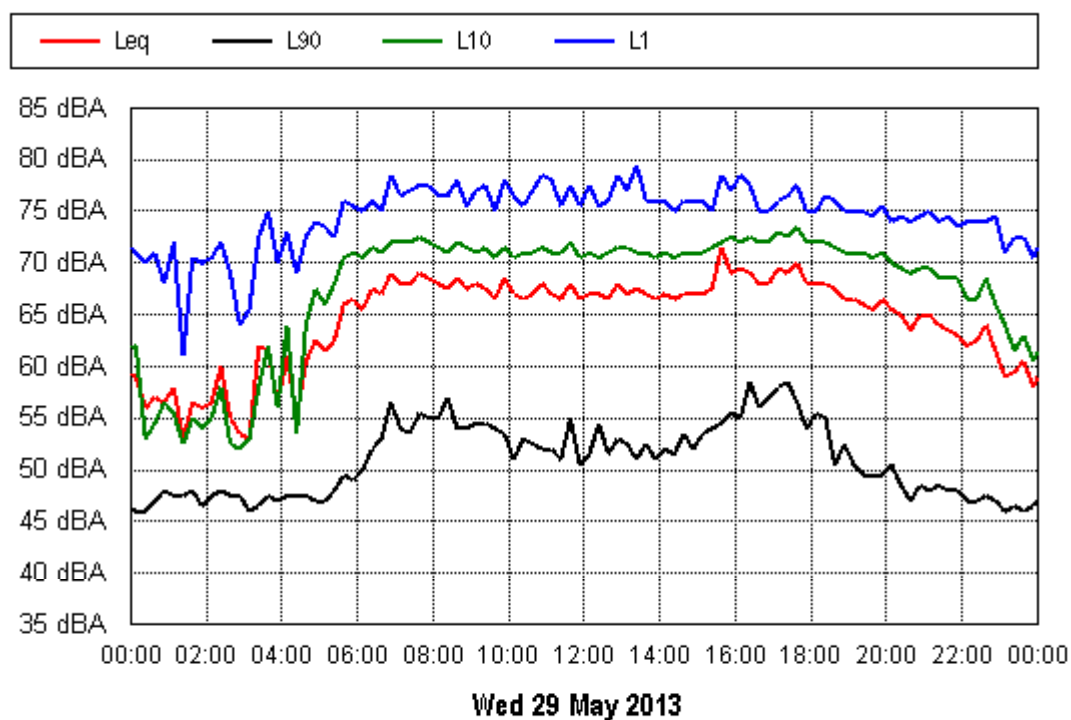
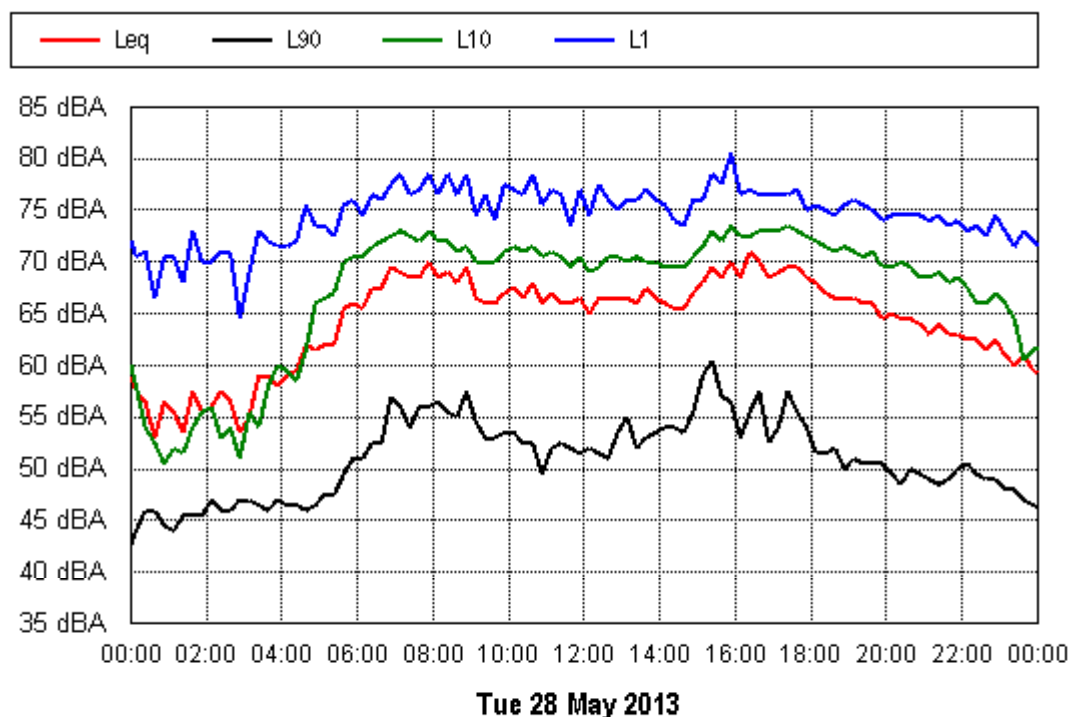
Project: 13035-A Banksmeadow WTS
Location: 30 Beauchamp Rd Banksmeadow
Filter: A



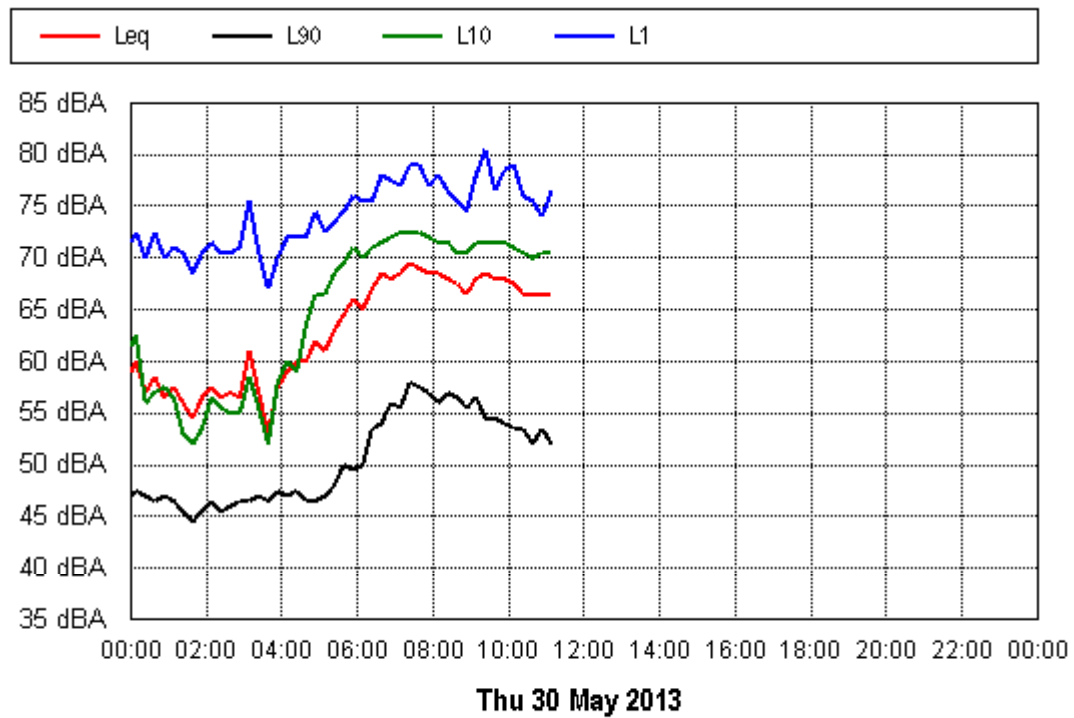
Project: 13035-A Banksmeadow WTS
Location: 30 Beauchamp Rd Banksmeadow
Filter: A



Project: 13035-A Banksmeadow WTS
Location: 30 Beauchamp Rd Banksmeadow
Filter: A



Project: 13035-A Banksmeadow WTS
Location: 30 Beauchamp Rd Banksmeadow
Filter: A



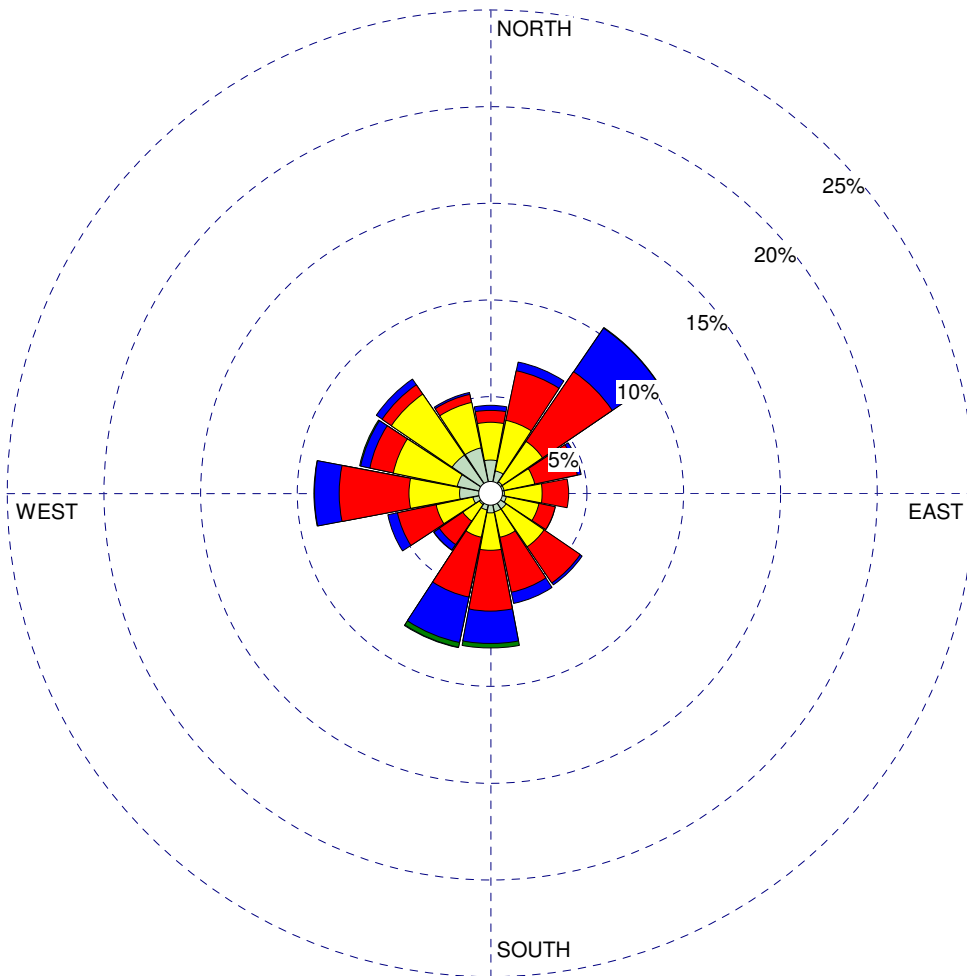
APPENDIX B

WIND ROSES GENERATED FROM TAPM RESULTS

WIND ROSE PLOT:

**Annual Windrose - All Times
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**

COMMENTS:

DATA PERIOD:

**Start Date: 1/1/2012 - 00:00
End Date: 12/31/2012 - 23:00**

COMPANY NAME:

MODELER:

CALM WINDS:

0.74%

TOTAL COUNT:

8784 hrs.

AVG. WIND SPEED:

3.53 m/s

DATE:

9/25/2013

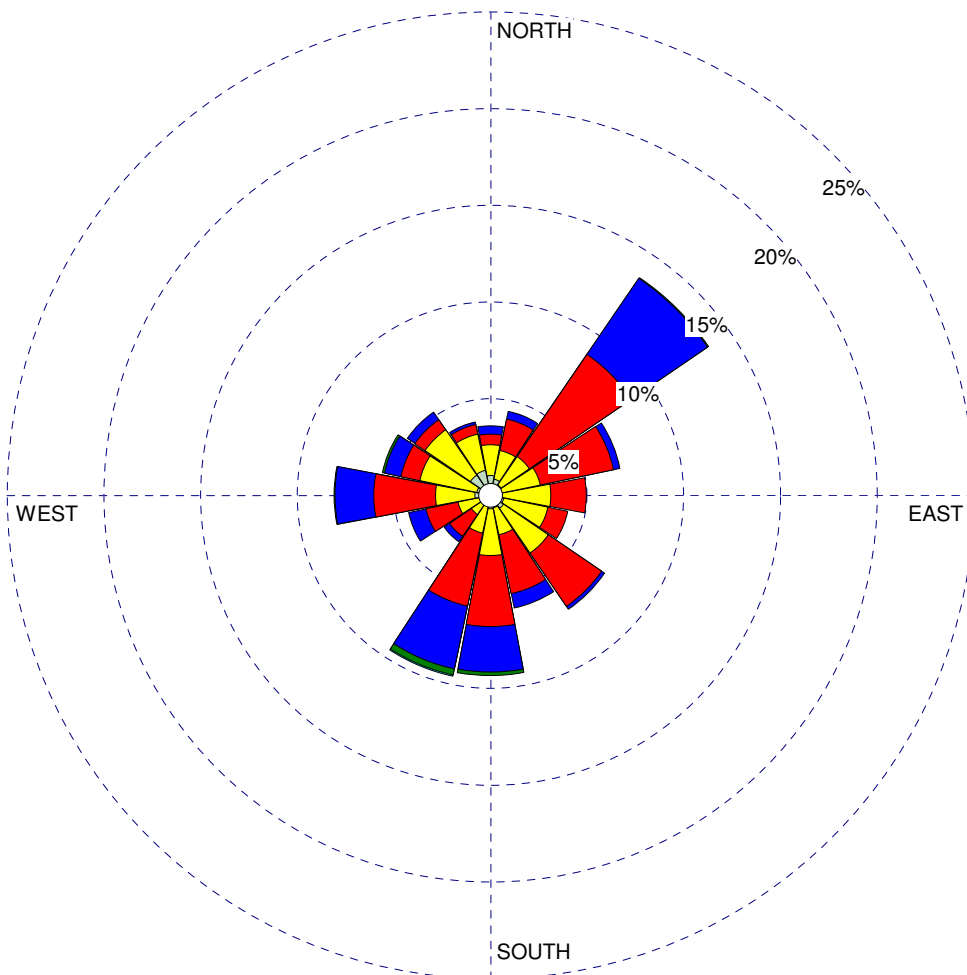
PROJECT NO.:

13035

WIND ROSE PLOT:

**Annual Windrose - 7.00am - 6.00pm
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**

COMMENTS:

DATA PERIOD:

**Start Date: 1/1/2012 - 07:00
End Date: 12/31/2012 - 18:00**

COMPANY NAME:

MODELER:

CALM WINDS:

0.46%

TOTAL COUNT:

4392 hrs.

AVG. WIND SPEED:

3.99 m/s

DATE:

9/25/2013

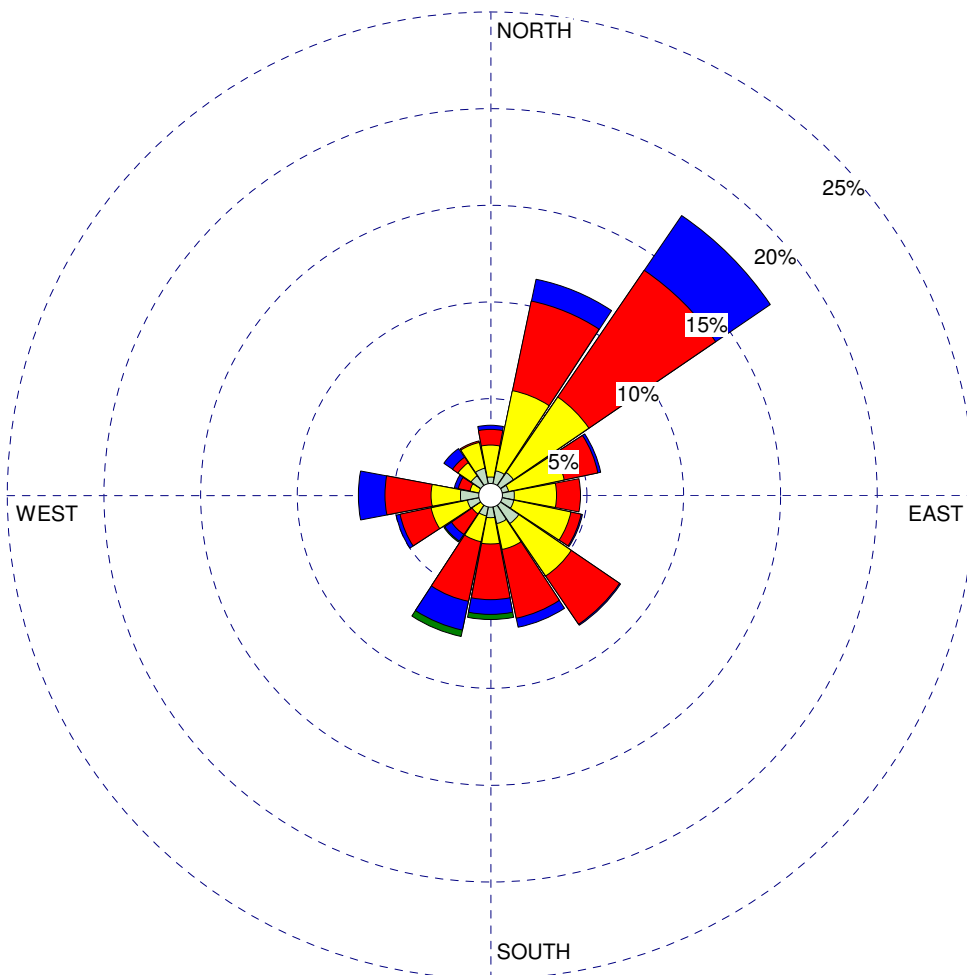
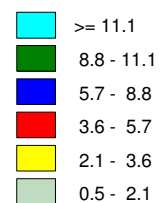
PROJECT NO.:

13035

WIND ROSE PLOT:

**Annual Windrose - 6.00pm - 10.00pm
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)****WIND SPEED
(m/s)**

Calms: 0.75%

COMMENTS:

DATA PERIOD:

**Start Date: 1/1/2012 - 18:00
End Date: 12/31/2012 - 21:00**

COMPANY NAME:

MODELER:

CALM WINDS:

0.75%

TOTAL COUNT:

1464 hrs.

AVG. WIND SPEED:

3.57 m/s

DATE:

9/25/2013

PROJECT NO.:

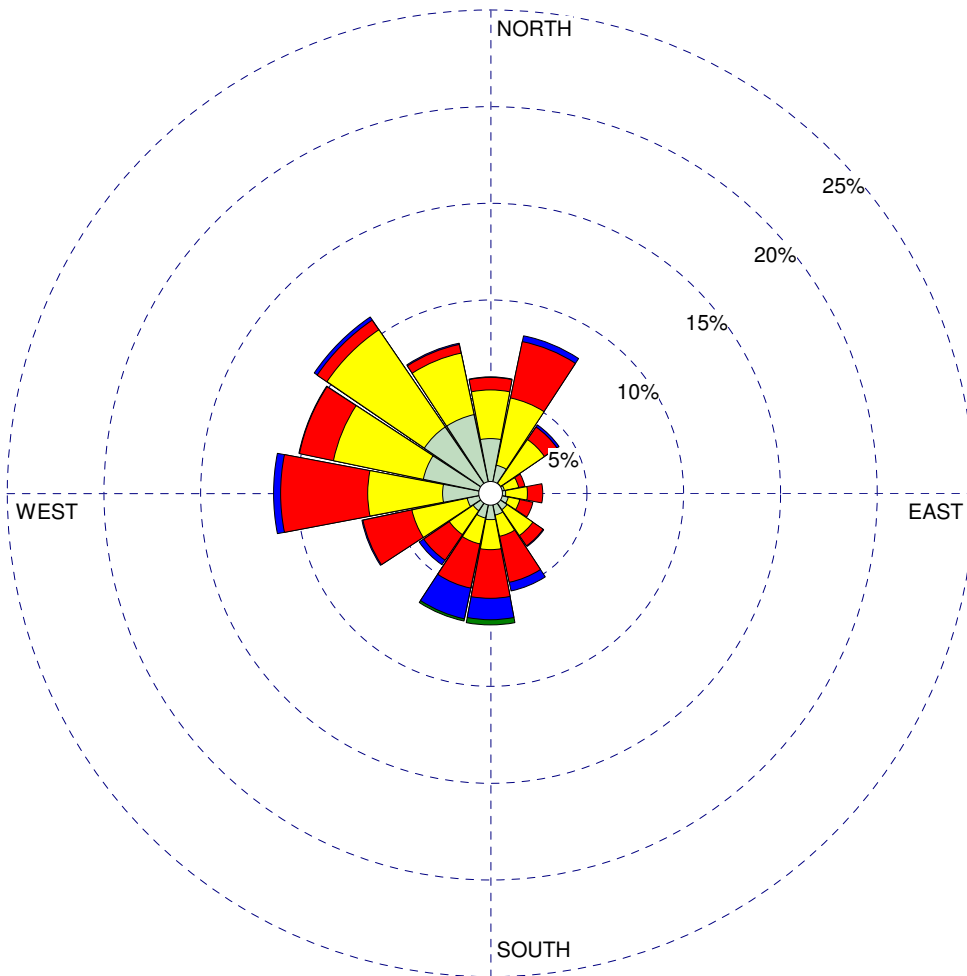
13035

WIND ROSE PLOT:

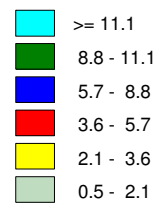
**Annual Windrose - 10.00pm - 07.00am
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**



**WIND SPEED
(m/s)**



Calms: 1.06%

COMMENTS:

DATA PERIOD:

**Start Date: 1/1/2012 - 00:00
End Date: 12/31/2012 - 23:00**

COMPANY NAME:

MODELER:

CALM WINDS:

1.06%

TOTAL COUNT:

3294 hrs.

AVG. WIND SPEED:

2.95 m/s

DATE:

9/25/2013

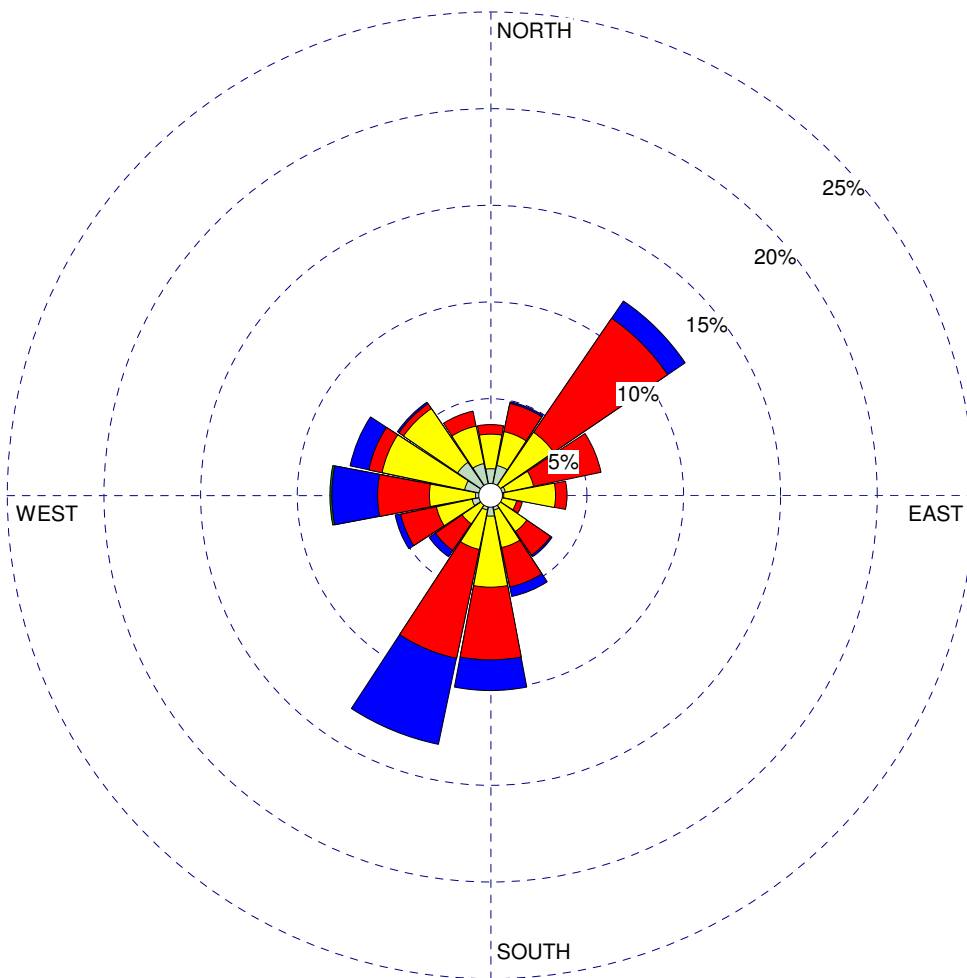
PROJECT NO.:

13035

WIND ROSE PLOT:

**Autumn Windrose - 07.00am - 06.00pm
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**

COMMENTS:

DATA PERIOD:

**Start Date: 3/1/2012 - 07:00
End Date: 5/31/2012 - 17:00**

COMPANY NAME:

MODELER:

CALM WINDS:

0.49%

TOTAL COUNT:

1012 hrs.

AVG. WIND SPEED:

3.63 m/s

DATE:

9/25/2013

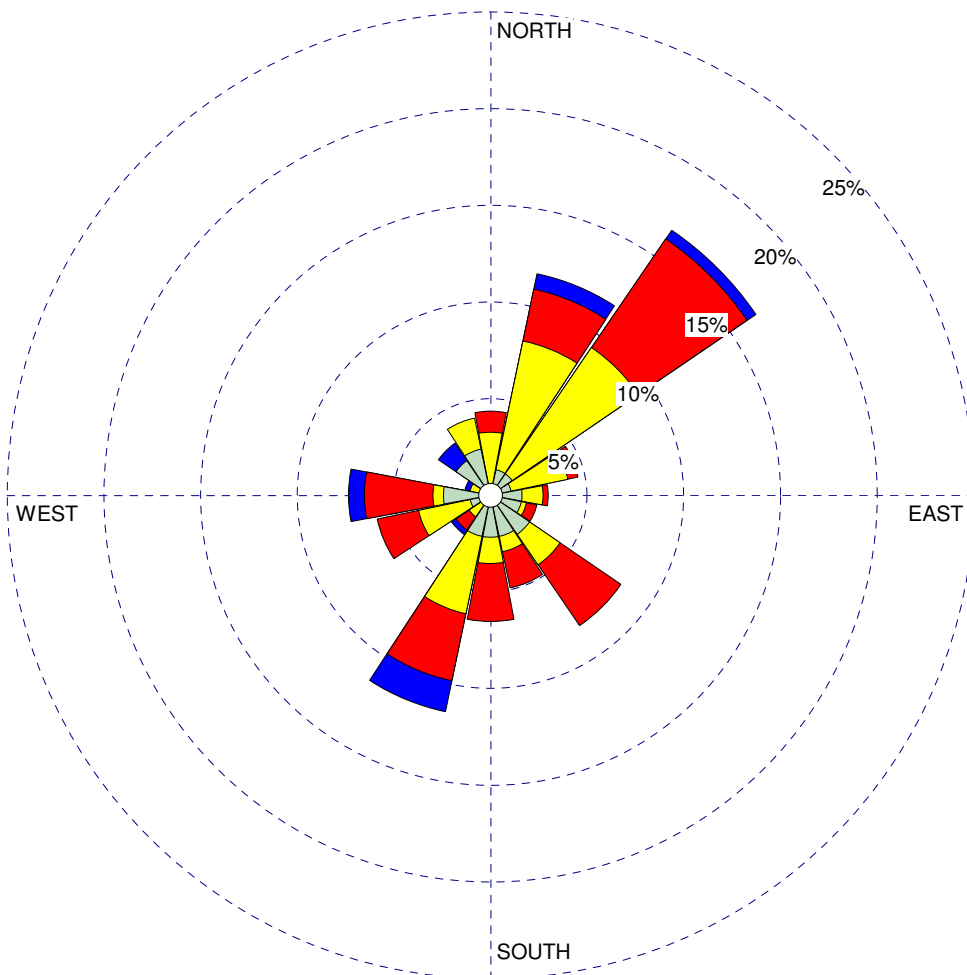
PROJECT NO.:

13035

WIND ROSE PLOT:

**Autumn Windrose - 06.00pm - 10.00pm
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**

COMMENTS:

DATA PERIOD:

**Start Date: 3/1/2012 - 18:00
End Date: 5/31/2012 - 21:00**

COMPANY NAME:

MODELER:

CALM WINDS:

1.90%

TOTAL COUNT:

368 hrs.

AVG. WIND SPEED:

3.08 m/s

DATE:

9/25/2013

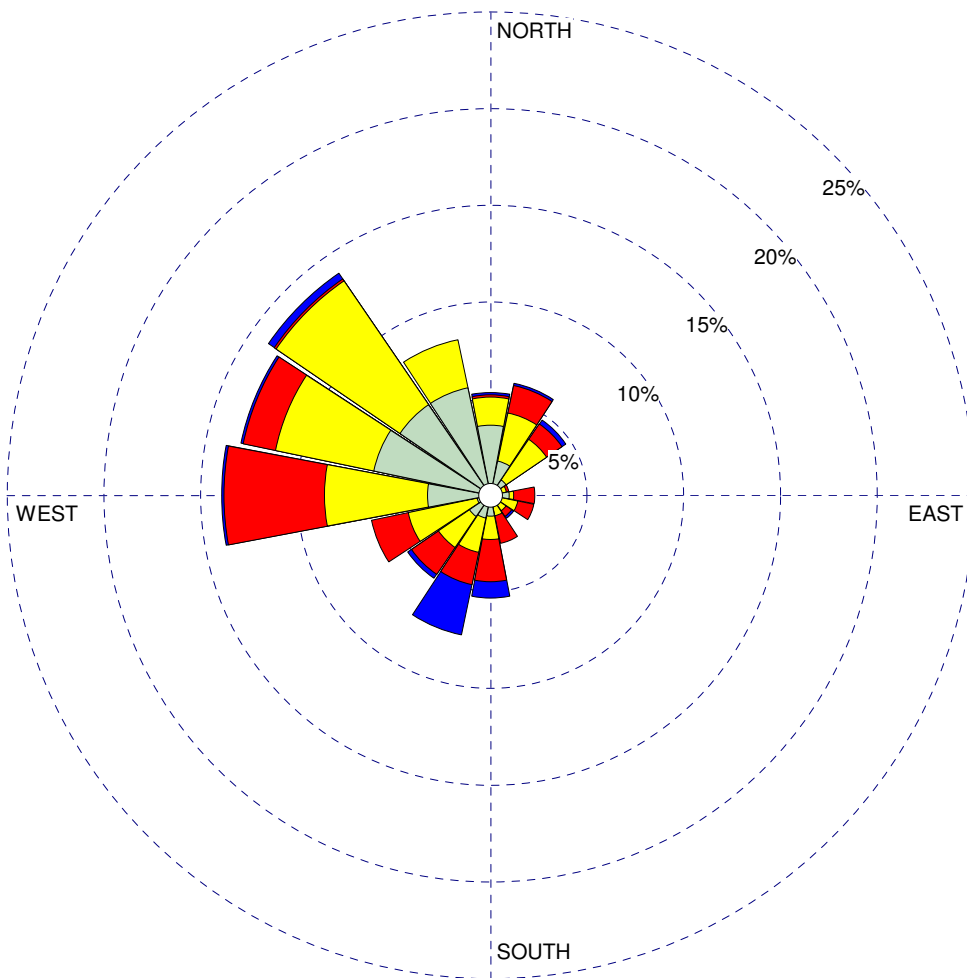
PROJECT NO.:

13035

WIND ROSE PLOT:

**Autumn Windrose - 10.00pm - 07.00am
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**

COMMENTS:

DATA PERIOD:

**Start Date: 3/1/2012 - 00:00
End Date: 5/31/2012 - 23:00**

COMPANY NAME:

MODELER:

CALM WINDS:

1.21%

TOTAL COUNT:

828 hrs.

AVG. WIND SPEED:

2.81 m/s

DATE:

9/25/2013

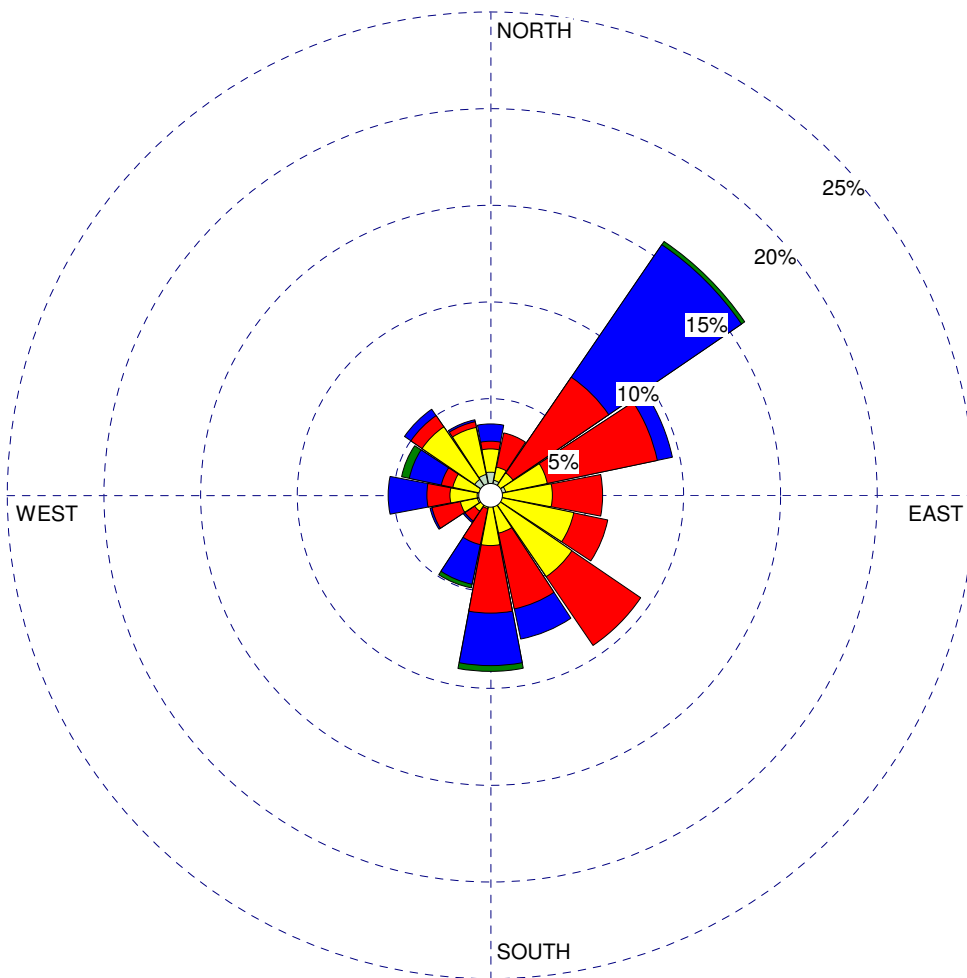
PROJECT NO.:

13035

WIND ROSE PLOT:

**Spring Windrose - 7.00am - 6.00pm
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**

COMMENTS:

DATA PERIOD:

**Start Date: 9/1/2012 - 07:00
End Date: 11/30/2012 - 17:00**

COMPANY NAME:

MODELER:

CALM WINDS:

0.30%

TOTAL COUNT:

1001 hrs.

AVG. WIND SPEED:

4.13 m/s

DATE:

9/25/2013

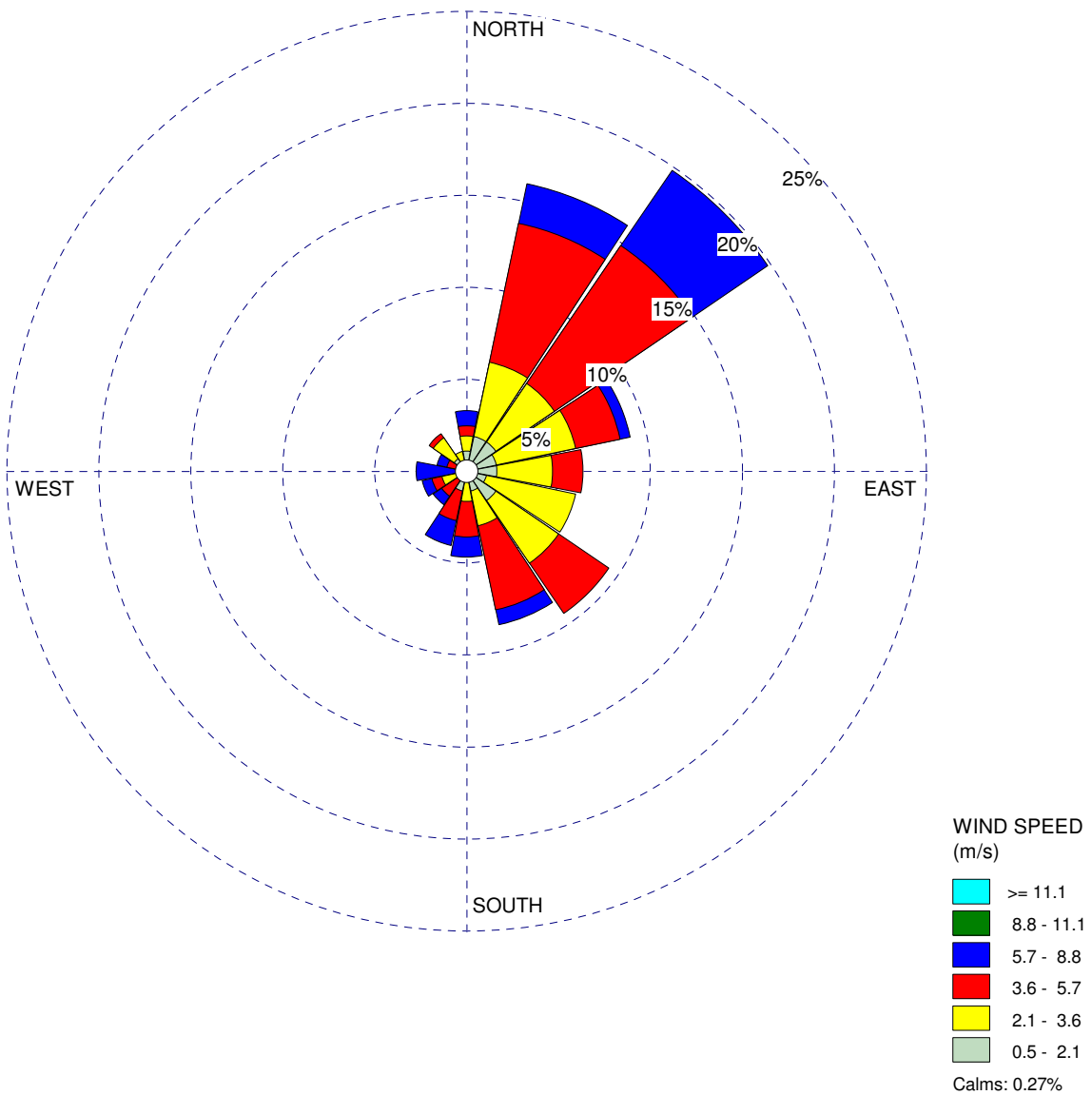
PROJECT NO.:

13035

WIND ROSE PLOT:

**Spring Windrose - 6.00pm - 10.00pm
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**

COMMENTS:

DATA PERIOD:

**Start Date: 9/1/2012 - 18:00
End Date: 11/30/2012 - 21:00**

COMPANY NAME:

MODELER:

CALM WINDS:

0.27%

TOTAL COUNT:

364 hrs.

AVG. WIND SPEED:

3.76 m/s

DATE:

9/25/2013

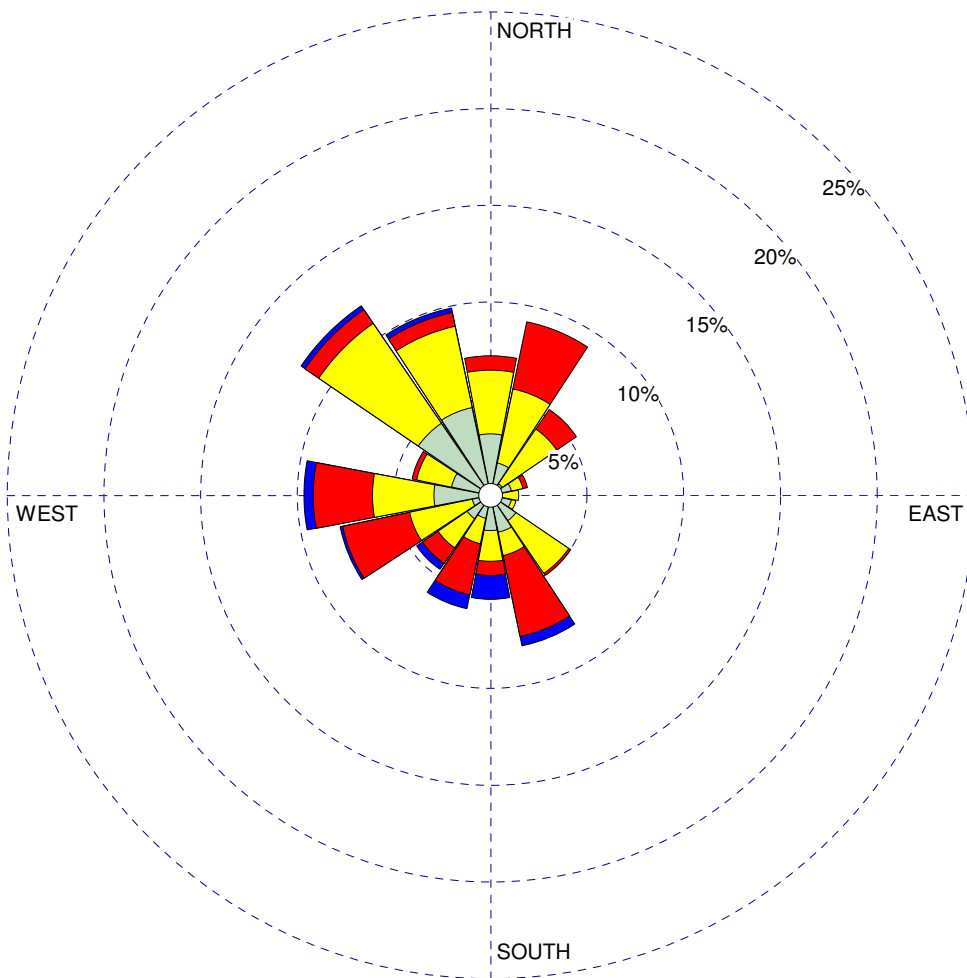
PROJECT NO.:

13035

WIND ROSE PLOT:

**Spring Windrose - 10.00pm - 7.00am
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**

COMMENTS:

DATA PERIOD:

**Start Date: 9/1/2012 - 00:00
End Date: 11/30/2012 - 23:00**

COMPANY NAME:

MODELER:

CALM WINDS:

1.10%

TOTAL COUNT:

819 hrs.

AVG. WIND SPEED:

2.78 m/s

DATE:

9/25/2013

PROJECT NO.:

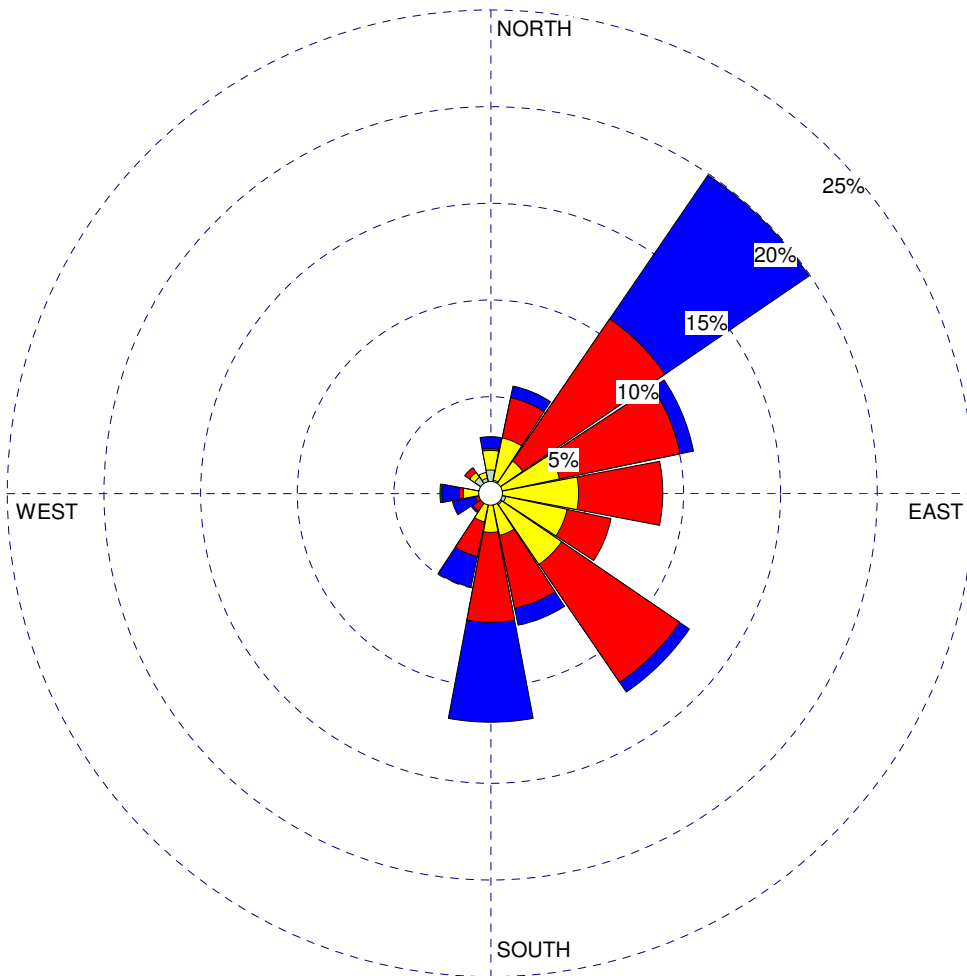
13035

WIND ROSE PLOT:

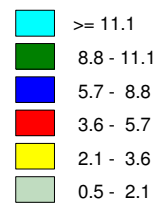
Summer Windrose - 07.00am - 06.00pm
(Calmet Extracted)

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)



Calms: 0.30%

COMMENTS:

DATA PERIOD:

Start Date: 1/1/2012 - 07:00
End Date: 12/31/2012 - 17:00

COMPANY NAME:

MODELER:

CALM WINDS:

0.30%

TOTAL COUNT:

990 hrs.

AVG. WIND SPEED:

4.25 m/s

DATE:

9/25/2013

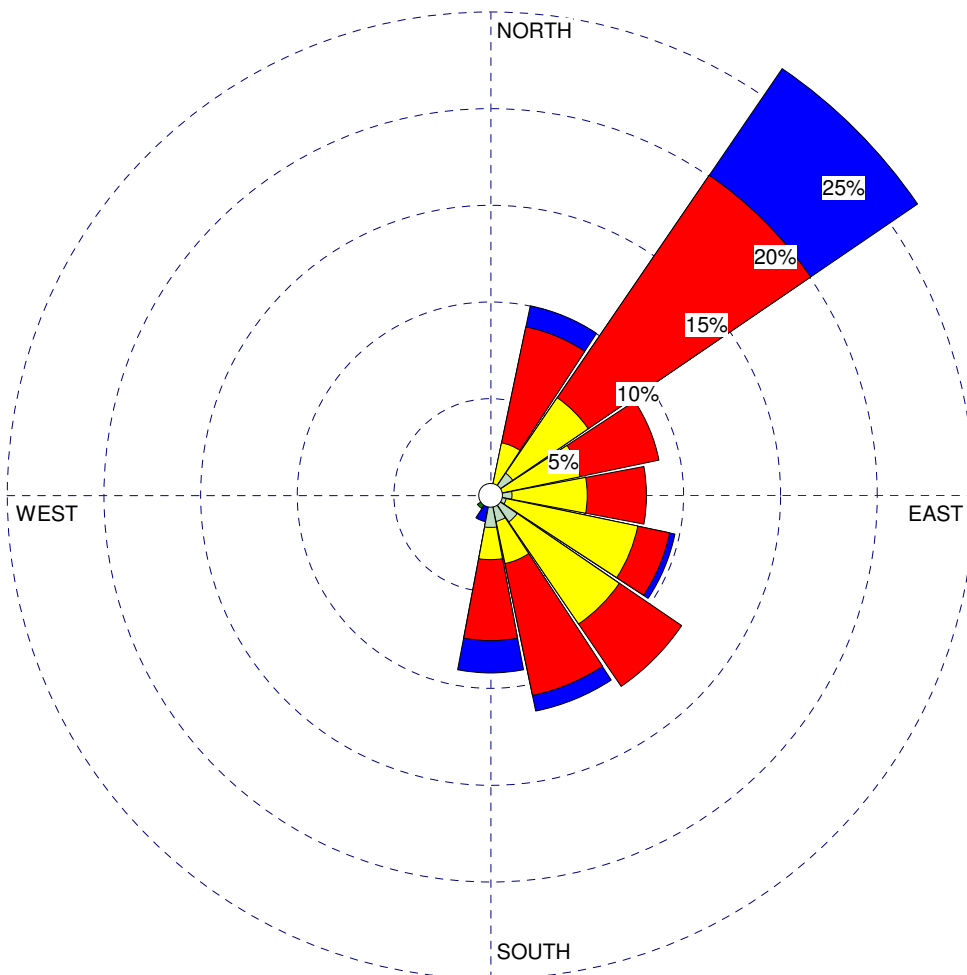
PROJECT NO.:

13035

WIND ROSE PLOT:

**Summer Windrose - 06.00pm - 10.00pm
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**

COMMENTS:

DATA PERIOD:

**Start Date: 1/1/2012 - 18:00
End Date: 12/31/2012 - 21:00**

COMPANY NAME:

MODELER:

CALM WINDS:

0.83%

TOTAL COUNT:

360 hrs.

AVG. WIND SPEED:

3.91 m/s

DATE:

9/25/2013

PROJECT NO.:

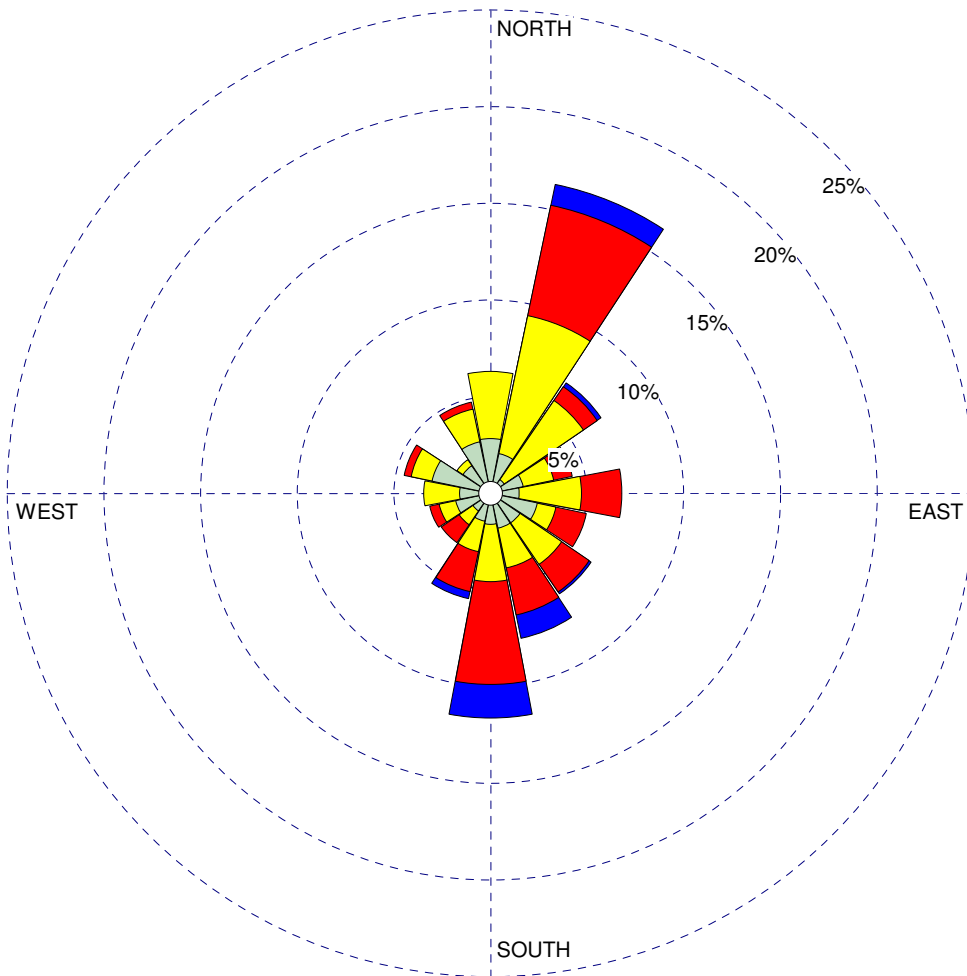
13035

WIND ROSE PLOT:

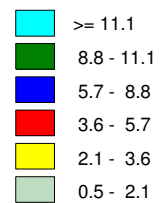
Summer Windrose - 10.00pm - 07.00am
(Calmet Extracted)

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)



Calms: 1.97%

COMMENTS:

DATA PERIOD:

Start Date: 1/1/2012 - 00:00
End Date: 12/31/2012 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:

1.97%

TOTAL COUNT:

810 hrs.

AVG. WIND SPEED:

2.86 m/s

DATE:

9/25/2013

PROJECT NO.:

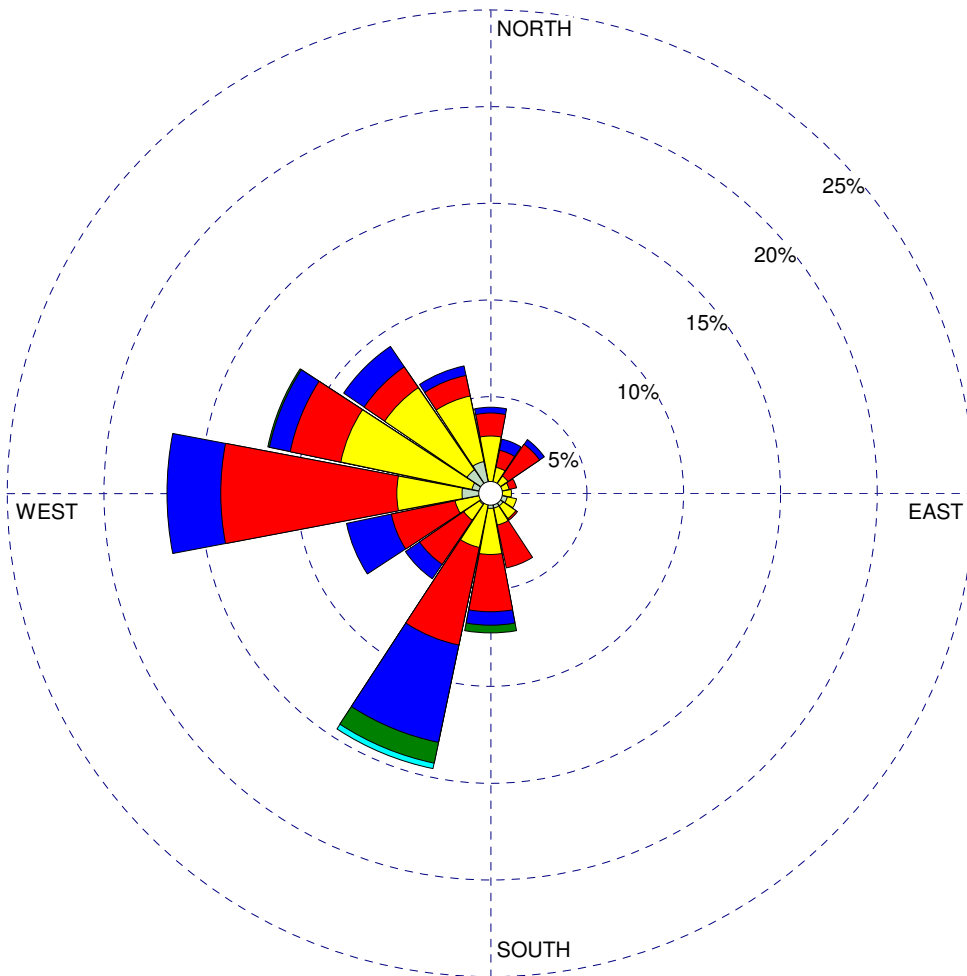
13035

WIND ROSE PLOT:

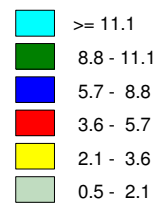
Winter Windrose - 7.00am - 6.00pm
(Calmet Extracted)

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)



Calms: 0.79%

COMMENTS:

DATA PERIOD:

Start Date: 6/1/2012 - 07:00
End Date: 8/31/2012 - 17:00

COMPANY NAME:

MODELER:

CALM WINDS:

0.79%

TOTAL COUNT:

1012 hrs.

AVG. WIND SPEED:

3.97 m/s

DATE:

9/25/2013

PROJECT NO.:

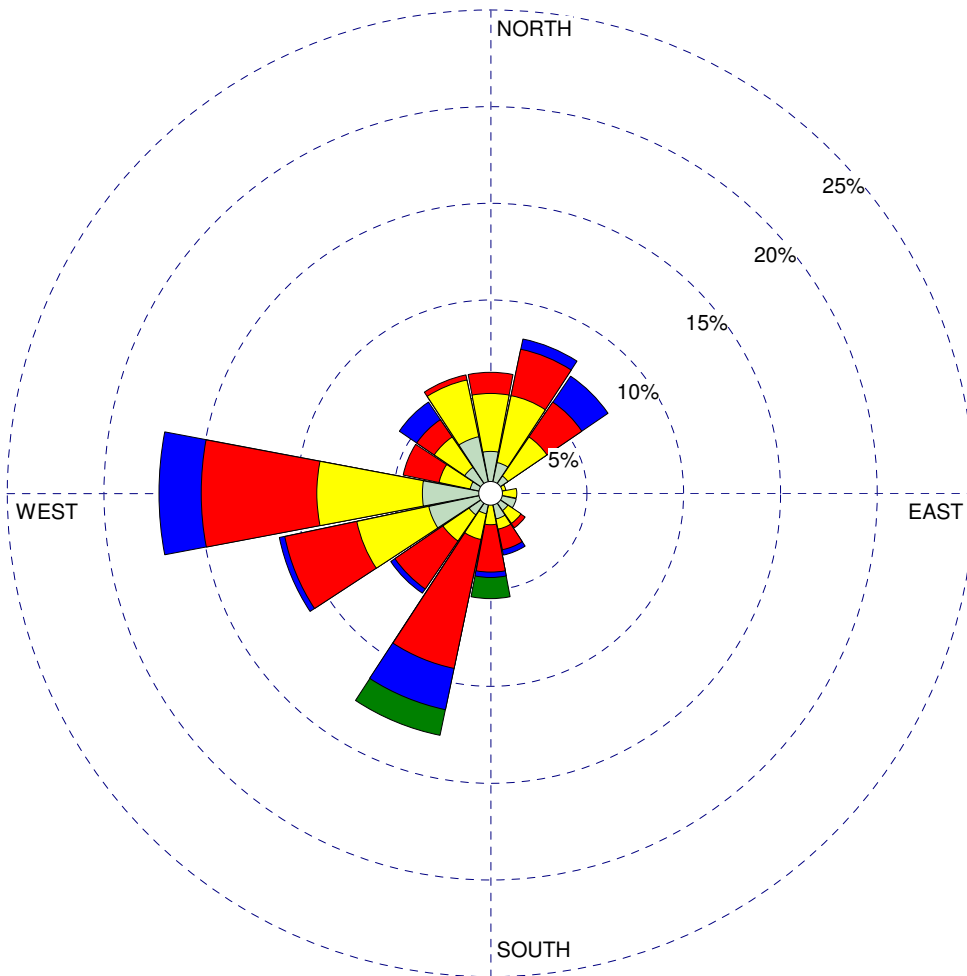
13035

WIND ROSE PLOT:

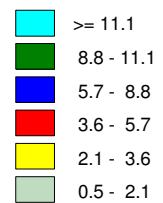
Winter Windrose - 6.00pm - 10.00pm
(Calmet Extracted)

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)



Calms: 0.00%

COMMENTS:

DATA PERIOD:

Start Date: 6/1/2012 - 18:00
End Date: 8/31/2012 - 21:00

COMPANY NAME:

MODELER:

CALM WINDS:

0.00%

TOTAL COUNT:

368 hrs.

AVG. WIND SPEED:

3.52 m/s

DATE:

9/25/2013

PROJECT NO.:

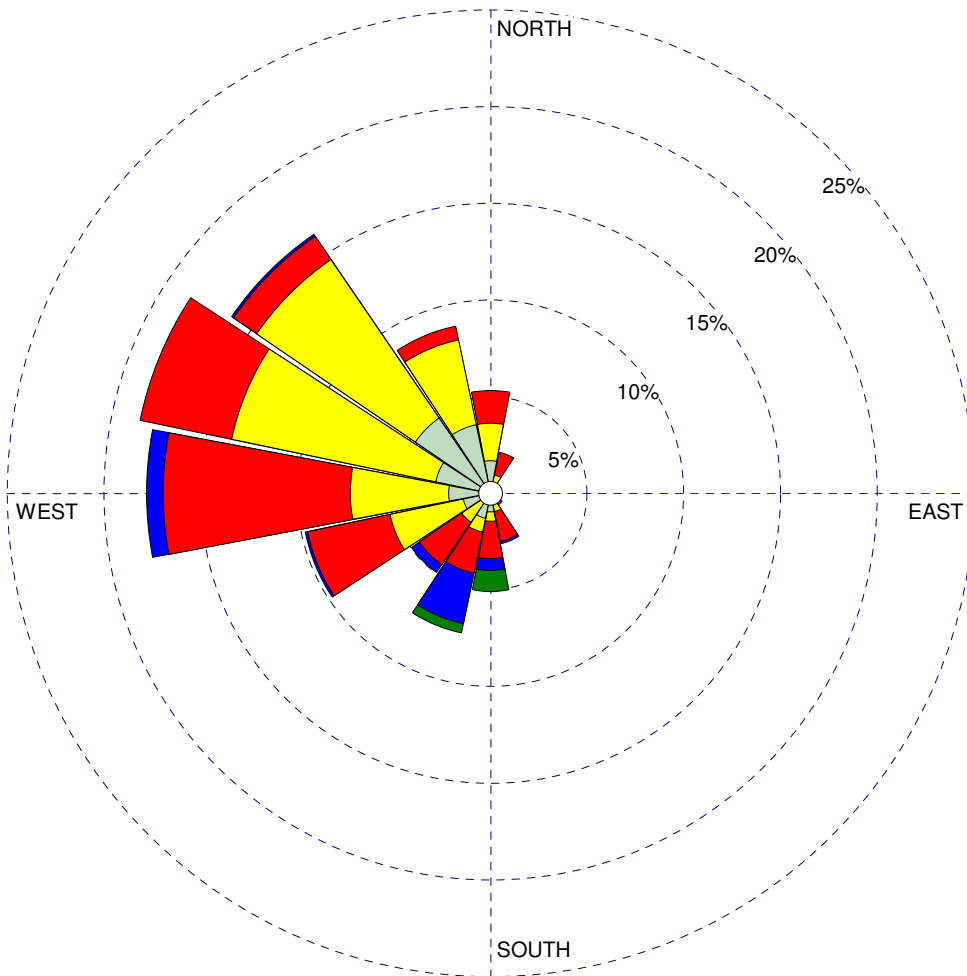
13035

WIND ROSE PLOT:

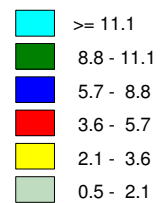
**Winter Windrose - 10.00pm - 7.00am
(Calmet Extracted)**

DISPLAY:

**Wind Speed
Direction (blowing from)**



**WIND SPEED
(m/s)**



Calms: 0.00%

COMMENTS:

DATA PERIOD:

**Start Date: 6/1/2012 - 00:00
End Date: 8/31/2012 - 23:00**

COMPANY NAME:

MODELER:

CALM WINDS:

0.00%

TOTAL COUNT:

828 hrs.

AVG. WIND SPEED:

3.32 m/s

DATE:

9/25/2013

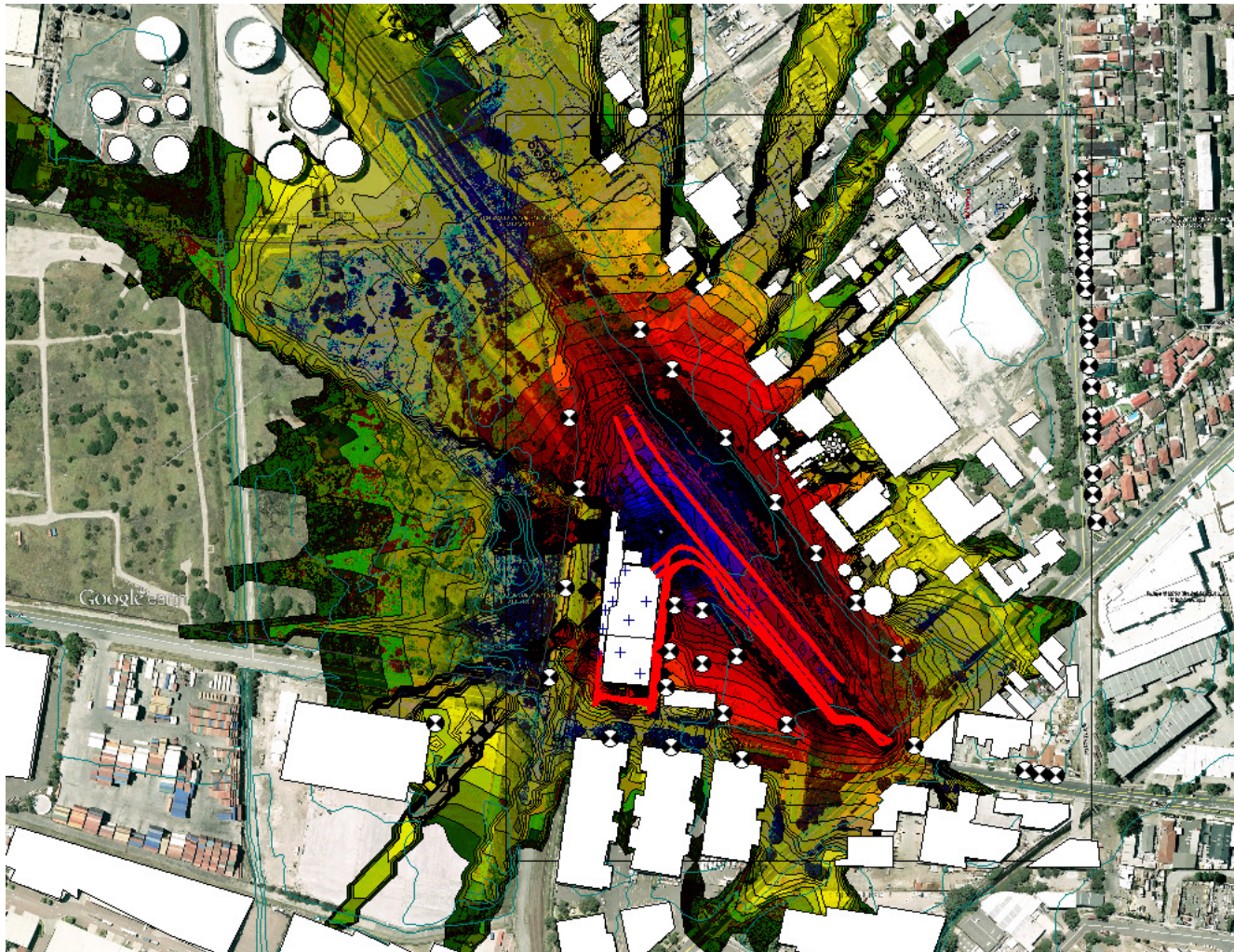
PROJECT NO.:

13035

APPENDIX C

OPERATIONAL NOISE CONTOURS
Night-time $L_{Aeq,15min}$ Noise Levels
(Adverse Meteorological Conditions)

**Predicted $L_{Aeq,15min}$ Operational Noise Contours
Night-time, Adverse Meteorological Conditions (F Class Stability)**



Outer contour represents $L_{Aeq,15min}$ 40 dBA

APPENDIX D

REPORT LIMITATIONS

Wilkinson Murray Pty Ltd (WM) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Veolia Environmental Services (Australia) Pty Ltd (Veolia) and only those third parties who have been authorised in writing by WM to rely on the report.

It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal.

The methodology adopted and sources of information used by WM are outlined in this report. WM has made no independent verification of this information beyond the agreed scope of works and WM assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to WM was false.

This report was prepared between September to October 2013 and is based on the conditions encountered and information reviewed at the time of preparation. WM disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

APPENDIX E

SITE LAYOUT PLANS



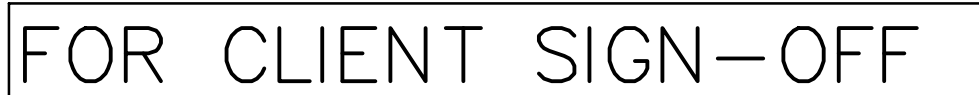
1. DESIGN RL'S TO BE CONFIRMED. RL'S SHOWN ON PLAN ARE INDICATIVE ONLY AND SUBJECT TO FINAL CIVIL DESIGN.
2. COMPLIANCE WITH SET BACK AND FIRE BRIGADE ACCESS IS TO BE CONFIRMED WITH LOCAL AUTHORITIES BY VEOLIA.
3. DRAWING INTENDED AS CONCEPT ONLY. FINAL DETAILS SUBJECT TO DETAILED DESIGN.
4. FL DENOTES FINISHED LEVEL, EX DENOTES EXISTING LEVEL

5.		DENOTES FINISHED RL 5.5 APPROX (VARIES)
6.		DENOTES FINISHED RL 4.8 APPROX
7.		DENOTES FINISHED RL VARIES 8.00-8.80 APPROX (2% CROSS FALL)

8. CONTAINER LAYOUT IS INDICATIVE ONLY AND IS SUBJECT TO VEOLIA'S OPERATIONAL DISCRETION.

FOR CLIENT SIGN-OFF

C	REVISED AND RE-ISSUED FOR CLIENT SIGN OFF				24.07.19
B	ISSUED FOR CLIENT SIGN OFF				11.07.19
A	ISSUED FOR INFORMATION				16.05.13
Issue	Description			Date	
PRELIMINARY NOT TO BE USED FOR CONSTRUCTION					
Scales	1500 @ A0		Current Issue Signatures		
Original Size	A0		Drawn J.W.	Designed A.S.	
Height Datum Grid	AHD		Checked	Approved	
Filename:	A4005622-A001-C.dwg				
Client					
 VEOLIA ENVIRONMENTAL SERVICES					
HYDER CONSULTING PTY LTD					
 ABN 76 104 485 289 Level 5, 241 Walker St North Sydney NSW 2060 Australia Tel: +61 (0)2 8907 9000 Fax: +61 (0)2 8907 9001 www.hyderconsulting.com © Copyright reserved					
Project					
BANKSMEADOW TRANSFER TERMINAL INTERMODEL					
Title					
SITE LAYOUT OPTION 1					
Drawing No.	Project No.		Issue		
A001	A4005622		C		



B	REVISED & RE-ISSUED FOR CLIENT SIGN-OFF							24-07-13	
A	ISSUED FOR CLIENT SIGN-OFF							11-07-13	
Issue	Description							Date	
Status PRELIMINARY NOT TO BE USED FOR CONSTRUCTION									
Scales	1:200 @ A0	Current Issue Signatures							
Original Size	A0	Drawn	JM	Designed	AS				
Height		Checked							
Datum	AHD	Approved							
Grid									
Filename:	AA005622-A002-B.dwg								
Client  VEOLIA ENVIRONMENTAL SERVICES									
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Project BANKSMEADOW TRANSFER TERMINAL INTERMODEL									
Title	ARCHITECTURAL LAYOUT SHEET 1								
Drawing No.	Project No.							Issue	
A002	AA005622							A	