City Of Whittlesea Council

Impact Assessment Report for the Shenstone Park Precinct Structure Plan

December 2017

Executive summary

GHD Pty Ltd (GHD) has been engaged by City of Whittlesea (CoW) to prepare an Impact Assessment Report for the Shenstone Park Precinct Structure Plan (PSP) and associated investigation area to the south and east of the PSP boundary.

The focus of this assessment was to conduct necessary technical investigations and to prepare an Impact Assessment Report, which considers air quality (dust and odour), noise and vibration impacts at the following sites:

- Existing Barro Group Woody Hill Quarry located within the Shenstone Park PSP boundary
- Approved basalt quarry (Phillips Quarry) located immediately south of the Shenstone Park PSP boundary
- Future Yarra Valley Water (YVW) Wollert sewerage treatment plant (STP) also located immediately south of the Shenstone Park PSP boundary

The assessments of the quarries and the STP within this report have been undertaken in line with the land use locations and existing approvals as set out within the North Growth Corridor Plan (2012) and Northern Quarries Investigation Area Addendum (2015).

This Impact Assessment Report is to be used by CoW to inform a detailed precinct-based design that will respond to the constraints on future land use posed by the operations at the two quarries and the STP.

The focus of this study is in three parts:

- Review of available environmental, planning, quarry and STP operations information in consultation with stakeholders
- Technical dust, noise, vibration and blasting assessments of current and approved quarry operations, combined with technical odour assessment of future STP operations to identify site-specific off-site impacts in the Shenstone Park PSP area
- Provide recommendations for management and/or mitigation of environmental risks on land uses in a planning context.

Threshold Distances

Separation distances for land surrounding the future YVW STP are not included in the planning scheme however, the recommended separation distances listed in the EPA Guidelines 1518 (Recommended separation distances for industrial residual air emissions) apply and are discussed further in this study.

Default Buffers

In the case of existing industries and uses, the EPA recommends separation distances that should be considered when preparing a planning scheme, planning scheme amendment or planning permit application.

A buffer (separation) distance is a planning instrument used to provide separation of sensitive land uses (i.e. residential, schools, hospitals and recreation reserves) from existing industrial premises with the potential for offsite emissions (odour or dust) that can cause disamenity in the event of an upset/malfunction. Note that the buffers are for upset[1] operational conditions only routine emissions must meet EPA SEPP (Air Quality Management) guidelines and have no impact offsite.

GHD has assessed and mapped all the recommended default buffers for the identified potential odour and dust emitting sources as well as areas of increased risk for the quarries and potential STP. This default buffer analysis shows that a portion of the PSP will be within the recommended default buffers from each industry.

Site Specific Variation to Default Buffer

Two criteria that allow for site specific variations which would have the biggest impact in varying the default buffers are considered to be size of the facility (de-rating a default buffer) and local meteorology (directional buffer). GHD considers that the relevant buffer for the active quarry area and approved quarry area with blasting should be the default 500 m buffer irrespective of the throughput of the quarry. The derating is not appropriate for the existing or approved quarry in relation to blasting.

However, GHD considers that the directional buffer would apply to the default 500 m buffer given that the default buffer accounts for possible transport of dust particles, which would be subject to meteorological influences. The local meteorology would only apply during daytime hours for the quarries as blasting would only occur during the daytime.

DEDJTR advice[2] indicates that a 200 m radial buffer distance from the extraction boundary of the extraction area is sufficient to mitigate against safety issues from flyrock during blasting, which GHD agrees with. This buffer is to be radial as flyrock component will be independent of wind speed and direction as the projectile speed of flyrock is much larger than the wind speed.

The directional buffer assessment shows that the default buffer can be retracted and extended in the directions of good and poor dispersion. A large extension of the default buffer occurs to the east and northeast into the PSP, while the default buffer is retracted in the west due to anticipated meteorology conditions.

Quantitative Dust Impact Assessment

Dust dispersion modelling was undertaken for dust impacts from the two quarries using a number of conservative assumptions. The criterion for PM_{10} extends onto Shenstone Park PSP land for both quarries. However, the criterion was predicted to be met at all existing sensitive receptors and well contained within the default and directional separation distances for each quarry.

Noise and Vibration Impact Assessment

It is understood that the Woody Hill Quarry operates during the night-time period between the hours of 6:00 am and 7:00 am Monday to Friday and also during the evening period on Saturday afternoons after 1:00 pm. Therefore noise from this quarry must be assessed across all three time periods (Day, Evening, Night), refer to Table 22.

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[1] Upset conditions refer to unintended emissions which do not occur under routine operations. Upsets may occur due to extreme weather conditions, mechanical breakdowns/malfunctions or operational failures.

[2] Meeting with DEDJTR on 17 October 2017

It is expected that the daytime noise levels generated from the Woody Hill Quarry will require a buffer of up to approximately 900 m from the existing extraction area at Woody Hill Quarry to meet the daytime criteria of 48 dB(A), prior to any noise mitigation measures being implemented.

Further encroachment of the proposed Shenstone Park PSP occurs due to the Phillips Quarry whose operational hours are permitted as follows:

'The extraction of stone for commercial purposes, crushing, screening operation of treatment plants and the cartage of material by road, may only occur between the hours of:

- *7:00 am and 6:00 pm Monday to Friday*
- *7:00 am and 1:00 pm Saturdays: and*
- *Not on any gazetted public holiday'*

The operational hours for the Phillip quarry therefore fall within the daytime noise criteria of 48 dB(A) and therefore it is expected the site will require approximately a 300 m buffer in order to meet the day time criteria, prior to any noise mitigation being implemented.

Blast generated noise is very dependent on site specific constants and can vary significantly based on the blast methodology being used. Onsite measurements would be required prior to any future development to understand the air blast overpressure from each quarry's operation and what restrictions this would have on future development.

It is expected that any vibrational impact from blasting at either the Woody Hill Quarry or Phillips Quarry would require a distance of approximately 550 m from the extraction boundary to provide sufficient attenuation for a blast with an MIC of approximately 100 kg.

Given the existing quarry will remain throughout the precinct development, the quarry asset owner will not be obligated to comply with the SEPP N-1 noise policy for any future sensitive receiver built within the vicinity.

Development may still be able to occur within the 900 m buffer following appropriate mitigation either at the quarry or via building acoustic treatments at the sensitive receiver location. Discussion with the asset owner may need to be undertaken to provide effective as well as agreed noise mitigation measures for the quarry, as necessary.
Should a control at source noise mitigation strategy not be possible or practicable, it is not uncommon that the indoor amenity of sensitive receivers subject to operational noise be acoustically treated using a control at receiver strategy, via building acoustic treatment. However, the limitation of this strategy is that it would not preserve the outdoor amenity of the receiver unless a combination control such as noise control at transmission be implemented.

Mitigation Measures

Noise mitigation strategies can generally be divided into four different areas from the most to the least preferred (NSW INP, 2000):

1. *Land-use Controls* (separating the location of noise-producing activities from sensitive areas)
2. *Control at Source* (reduce the noise output of the source to provide protection surrounding environment)
3. *Control in Transmission* (reduce noise level at the receiver but not necessarily the environment surrounding the source, e.g. noise barrier, etc.)
4. *Receiver Control* (localised acoustic treatment at sensitive receiver)

Recommended Buffers

From the assessment, the following is recommended (refer to Figure 32) to provide a visual display of the impact assessments undertaken as part of this report):

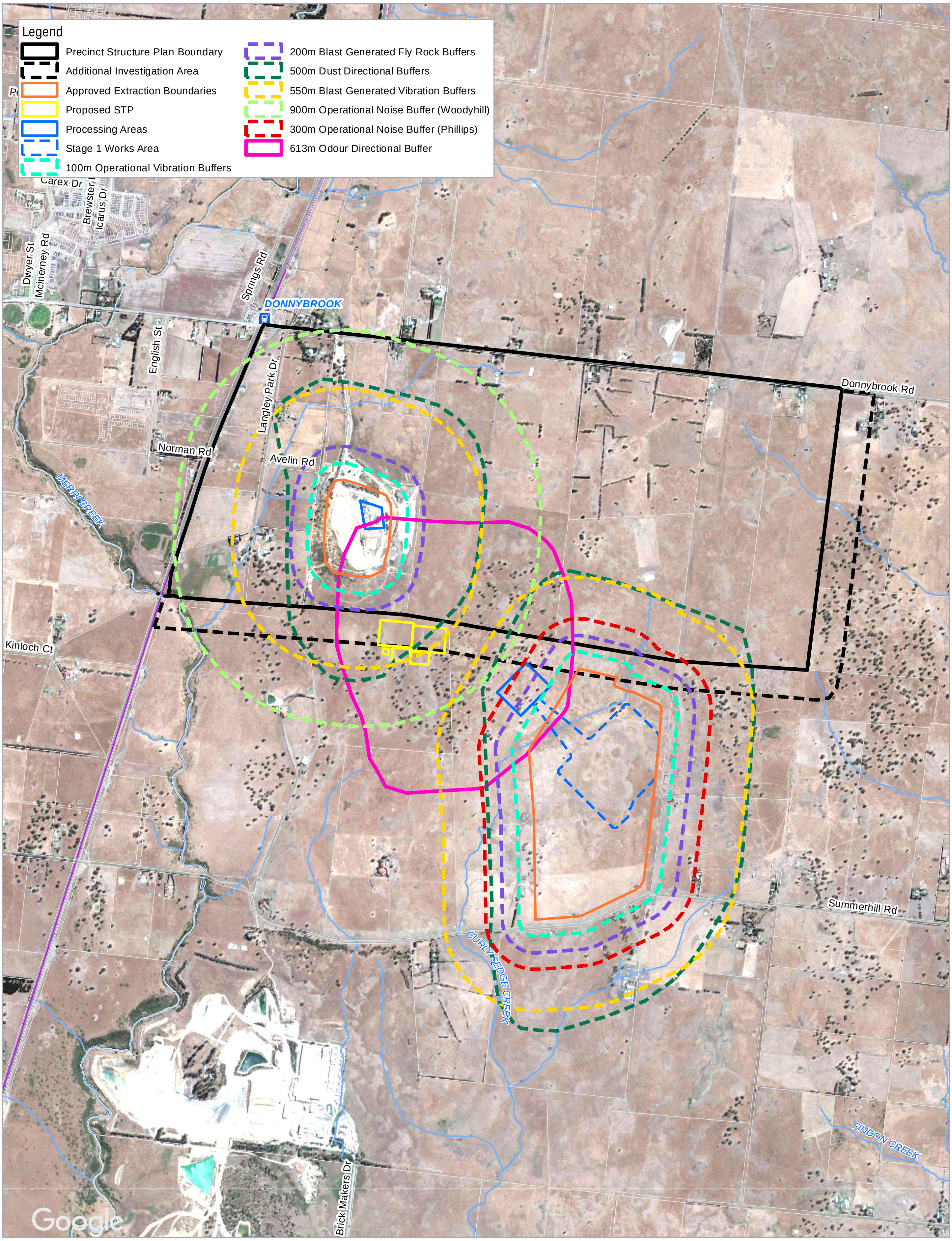
- 500 m dust directional buffers from the approved extraction area boundary
- 613 m odour directional buffer for the proposed Wollert STP
- Operational noise buffer for the Woody Hill Quarry of 900 m from the approved extraction area boundary prior to any operational noise mitigation being implemented
- Operational noise buffer for the Phillips Quarry of 300 m from the approved extraction area boundary prior to any operational noise mitigation being implemented
- 100 m operational vibration buffer from the approved extraction area boundary
- Blast generated flyrock 200 m buffer from the approved extraction area boundary
- Blast generated vibration 550 m buffer from the approved extraction area boundary
- Blast generated noise is very dependent on site specific constants and can vary significantly based on the blast methodology being used. Onsite measurements would be required prior to any future development to understand the air blast overpressure from each quarry's operation and what restrictions this would have on future development.

The intent of the buffers from the quarries and STP, would be to restrict additional sensitive land use intensification in these buffer areas (including land inside and outside of the PSP), due to the risks from dust, odour, operational noise, operational vibration, and blast related flyrock, noise and vibration.

The inclusion of buffer controls within the PSP should achieve separation of non-compatible uses and delineate land available for urban development.

The PSP planning process must protect significant assets, whilst enabling sustainable development to occur. Inappropriate planning may adversely impact the operations and viability of the quarries and STP into the future and, in turn, impact the amenity and health of the community.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.3 and the assumptions and qualifications contained throughout the report.



Paper Size ISO A4

0 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

City of Whittlesea

Existing Buffer Areas

Project No. 31-35311
Revision No. A
Date 24/11/2017

Figure 32

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Print date: 24 Nov 2017 - 14:30

Data source: Data Source: Image - Google, DigitalGlobe dated 2017/07/10 and VicMap, DELWP (2017). Created by: lrsmith

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Glossary

Term	Definition
AQMS	Air Quality Monitoring Station, capable of recording wind speed, wind direction, temperature and wind variability.
Background Noise Level	For a day, evening or night period means the arithmetic average of the L_{A90} levels for each hour of that period for which the commercial, industrial or trade premises under investigation normally operates. The background level shall include all noise sources except noise from commercial, industrial or trade premises which appear to be intrusive at the point where the background level is measured.
dB	Unit of measurement for Sound Pressure Level known as a decibel.
dB(A)	'A-weighted' decibel measurement. Developed in the 1930s as a way to represent the sound frequency sensitivity of the human ear.
De-rating	Decreasing the original set of parameters, for example, a buffer zone distance, through determining the actual impacts that operational conditions of a process will have on the area.
Default buffer (separation) distance	The minimum distance as specified in EPA guidelines from the source of an industry emission (dust or odour) required to minimise impact in the event of a process malfunction at the source. Buffer distances are specified for a range of industries and the distance is selected based on EPA experience with upsets/malfunctions for those industries.
Drainage flows	The flow of air down drainage lines (river valleys, stream lines etc). Outside daylight hours, these flows generally have high stability, so that any contaminant released into such flows will be poorly dispersed.
EPA	Environment Protection Authority.
Encumbered land	Land that is constrained for development purposes.
Fugitive emissions	Emissions of gases or vapours due to leaks and other unintended releases of gases. The sources of fugitive emissions can be myriad and are hard to capture.
Ground borne vibration	Ground borne vibration is vibration transmitted from source to receiver via the medium of the ground.
GHD	GHD Pty Ltd
Interim criteria	Criteria relating to that specific point in time.
$L_{A90 \text{ (Time)}}$	The A-weighted arithmetic average sound pressure level that is exceeded for 90 percent of the time over which a given sound is measured. This is considered to represent the background noise.
$L_{A10 \text{ (Time)}}$	The A-weighted arithmetic average of the sound pressure level that is exceeded for 10 percent of the measurement period. This is considered representative of the average maximum noise.
$L_{Aeq \text{ (Time)}}$	Equivalent sound pressure level is the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring. This is considered representative of the ambient noise.
$L_{Amax \text{ (Time)}}$	The maximum A-weighted sound pressure level over a specified period of time.
$L_{Amin \text{ (Time)}}$	The minimum A-weighted sound pressure level over a specified period of time.

Term	Definition
Nuisance	A negative effect of a process or action that has the potential to cause inconvenience or annoyance to a person.
OU	Odour units, whereby one odour unit corresponds with the concentration of an odorant or blend of odorants that can be detected by 50% of a panel of people selected to be representative of the general population.
PEM – Mining and Extractive Industries	Protocol for Environmental Management, as incorporated in the State Environment Protection Policy (Air Quality) for Victoria, which sets out a methodology to assess potential impacts from mining and extractive industries.
PPV	Peak particle velocity. Current practices for assessments of the risk of structural damage to buildings use measurements of peak particle velocity (PPV) in millimetres per second.
Reverse amenity issues	Reverse amenity refers to the situation where sensitive land uses threaten to encroach into the buffer of an existing industry premises.
RMS	Root mean square
SEPP N-1	State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1.
Sensitive land use	A sensitive land use can be defined as any dwelling; caretakers house; library; educational institution; religious facility; childcare centre; kindergarten; hospital; surgery or other medical institution including an institutional home; informal outdoor recreation sites, commercial and/or retail activity (such as any, hotel, motel, caravan park or tourist establishment).
Sensitive receptor (noise)	Noise sensitive area, as defined under the SEPP N-1, means: - *That part of the land within the apparent boundaries of any piece of land which is within a distance of 10 m outside the external walls of any of the following buildings – Dwelling (except caretaker's house) and residential building.* - *That part of the land within the apparent boundaries of any piece of land on which is situated any of the following buildings which is within a distance of 10 m outside the external walls of any dormitory, ward or bedroom of such buildings – caretaker's house, hospital, hotel, institutional home, motel, reformative institution, tourist establishment, work release hostel.*
Short-term vibration	Vibration that occurs so infrequently that it does not cause structural fatigue nor does it produce resonance in the structure.
Sound Pressure Level (SPL)	The Sound Pressure level is the change in air pressure above and below the average atmospheric pressure (amplitude) cause by a passing pressure wave; this is then converted to decibels and can be abbreviated as SPL or L_p.
Sound Power Level (PWL)	This is defined as the average rate at which sound energy is radiated from a sound source and is measured in watts (W). The Sound Power Level can be abbreviated as PWL or L_w.
Throughput	The secondary and waste effects as a result of a process of production.
TSP	Total Suspended Particles; the mass concentration of all particles of contaminants (aerosols) in the air typically less than 40 µm in aerodynamic odour.
Upset conditions	Upset conditions refers to unintended emissions, which do not occur under routine operations. Upsets may occur due to extreme weather conditions, mechanical breakdowns/malfunctions or operational failures.

Term	Definition
VdB	Vibration velocity in decibel
VDV	Vibration dose value. As defined in BS6472:1992, the vibration dose value is given by the fourth root of the integral of the fourth power of the frequency weighted acceleration.
Vibration	The variation of the magnitude of a quantity which is descriptive of the motion or position of a mechanical system, when the magnitude is alternately greater and smaller than some average value or reference. Vibration can be measured in terms of its displacement, velocity or acceleration. The common units for velocity are millimetres per second (mm/s).
V_{rms}	The vibration velocity presented as a root mean square value
Wake influences	Disturbed air downwind from a building or similar structure affecting the free stream wind direction, speed and turbulence.

1. Introduction

1.1 Study objective

GHD Pty Ltd (GHD) has been engaged by City of Whittlesea (CoW) to prepare an Impact Assessment Report for the Shenstone Park Precinct Structure Plan (PSP) and associated investigation area to the south and east of the PSP boundary. The impact assessment is to consider the air quality (dust and odour), noise and vibration impacts of:

1. Existing mudstone quarrying operations at the Barro Group Woody Hill Quarry, which is located within the Shenstone Park PSP boundary
2. Approved basalt quarry (Phillips Quarry) located immediately south of the PSP
3. Proposed Yarra Valley Water (YVW) Wollert sewerage treatment plant (STP) also located immediately south of the PSP

The assessments of the quarries and the STP within this report have been informed by the pattern of land use and the existing approvals as set out within the North Growth Corridor Plan (2012) and Northern Quarries Investigation Area Addendum (2015).

The impact assessments will assist in assessing those areas that are or will be subject to, impact from the quarries' operations and the STP and to inform future land use planning associated with the development of the Shenstone Park PSP. This information may then be used by CoW and VPA to establish appropriate strategic land use plans in response to these existing and potential emissions sources. The CoW is managing the preparation of the Shenstone Park PSP in partnership with the VPA.

The PSP planning process is designed to protect significant earth resources and state significant infrastructure, whilst enabling sustainable urban development as established in Plan Melbourne and the North Growth Corridor Plan, to occur. Inappropriate land use planning may adversely impact the operations and viability of the quarries and STP in the future and conversely impact the amenity and health of the future community within the PSP. Separation distances are a mechanism by which to prevent certain land uses and developments (i.e. sensitive/residential land use) from establishing in certain areas. They are a means of ensuring land use conflict is minimised and incompatible land uses are carefully managed.

The establishment of compatible land uses and/or accommodating industrial uses in contemporary cities is an increasingly significant issue in the development of cities, presenting a two-fold challenge:

- A risk to future newly developed sensitive uses being subjected to adverse amenity impacts from existing nearby industry
- The encroachment of sensitive uses into the buffer areas of existing industries, which may result in requirements on the industries to mitigate the impacts at the source (reverse amenity)

A separation distance is often facilitated through the application of land use planning controls. GHD understands this work will form a key component for the CoW and the VPA to draw upon in preparing the PSP.

1.2 Scope of assessment

The objective of this commission is to conduct necessary technical investigations and to prepare an Impact Assessment Report. This will be used by CoW and the VPA to inform a detailed precinct-based design that will respond to the required separation distances at the two quarries and the STP.

The investigations included the following:

- Review of available environmental, planning, quarry and STP operations information in consultation with stakeholders
- Air, noise, vibration and blasting impact assessments of all approved quarry operations to identify site-specific off-site impacts in the PSP area
- Air impact assessment of the proposed STP operations, to identify site-specific offsite impacts in the PSP area
- Analysis of environmental risks (air, noise and vibration) and the impacts of such risks on sensitive and non-sensitive land uses and buildings
- Provide advice on the potential lifespan of both quarries
- Provide recommendations for management and/or mitigation of environmental risks on land uses

1.3 Limitations and assumptions

This report has been prepared by GHD for City of Whittlesea and may only be used and relied on by City of Whittlesea. GHD otherwise disclaims responsibility to any person other than City of Whittlesea arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described throughout this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by City of Whittlesea and project stakeholders, which GHD has not independently verified or checked. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information. GHD disclaims liability for the identification of all relevant industries and any subsequent industries that may have been overlooked.

The opinions, conclusions and any recommendations in this report are based on information obtained from site inspection undertaken at or in connection with, specific areas. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, existing surrounding industries, services and vegetation, etc. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

The assessment in this report was based on on-site inspections undertaken by GHD on 4 August 2017 and onsite monitoring between 25 August 2017 and 6 September 2017. It is the nature of environmental assessment that all variation in environmental conditions as well as the existing Woody Hill Quarry operating conditions cannot be assessed and all uncertainty concerning the conditions of the ambient air and noise environment cannot be eliminated. In addition, it is not the intention of this assessment to cover every element of the air and noise environment but rather to conduct the assessment with consideration to the prescribed work scope. Professional judgement must be expected in the investigation and interpretation of observations.

The Department of Economic Development, Jobs. Transport and Resources (DEDJTR) was contacted during preparation of this assessment for specific information pertaining to the two quarries, however DEDJTR were not able to provide this without the approval of the work authority holder and referred GHD to the Work Plan for Woody Hill.

Input relating to operational details for the quarries were sought from stakeholders. Where there was no provision of information, GHD has made a number of assumptions for the impact assessments.

Given the lack of available information pertaining to the Phillips Quarry, GHD has assumed that the approved Phillips quarry will be similar to the existing Woody Hill Quarry for both air and noise impact assessments.

Thus the assessment findings and recommendations in the absence of this information are estimates only. Council should endeavour to source the relevant information from the quarry operator/s and revise/update this assessment once available.

This report does has not assessed any existing or proposed expansion plans for Woody Hill Quarry or Phillips Quarry.

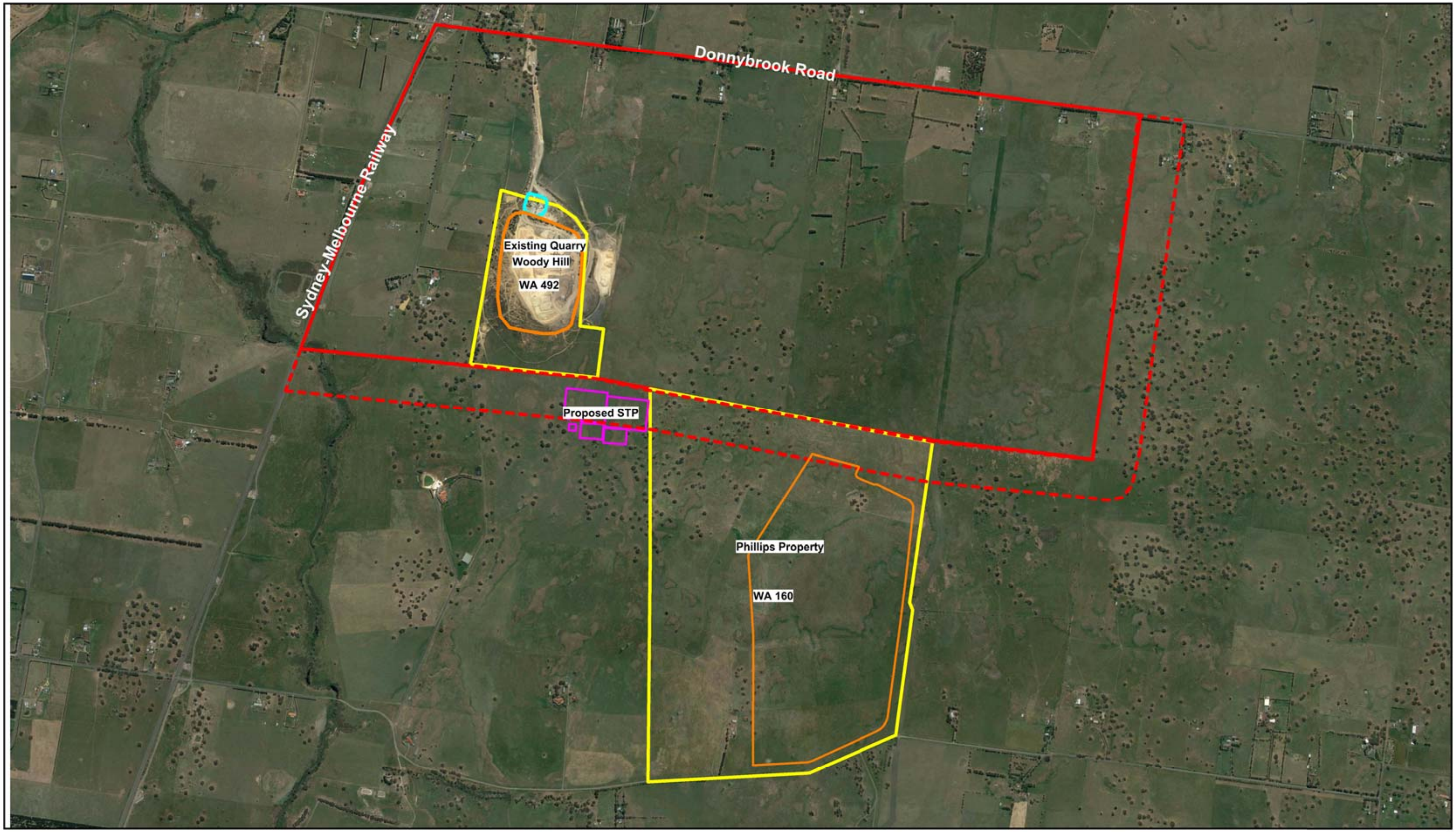
YVW were contacted during preparation of this assessment and preliminary plans and sizing of the STP was provided. YVW has not yet decided on the type of equipment the plant would utilise at the time of preparation of this report. GHD is therefore not able to model accurately the offsite odour impact. Any modelling would be have serious limitations and could potentially limit YVW operations in the future. Again Council should endeavour to source the relevant information from the operator and revise/update this assessment once available.

2. Precinct description

2.1 Precinct location

The Shenstone Park PSP is approximately 614 hectares in size and is bounded by Donnybrook Road to the north, the Wollert suburb boundary to the south, the Urban Growth Boundary to the east and the Sydney/Melbourne railway corridor to the west. The precinct lies immediately south of the Donnybrook/Woodstock PSP area and immediately east of the English Street PSP area. The primary focus of this study is the investigation area shown in Figure 1.

Land to the south of the existing quarry site is zoned Rural Conservation (Schedule 1) due to existing biodiversity values. The biodiversity values are centred on Curly Sedge Creek. The application of an Environmental Significance Overlay (Schedule 4) (ESO4) also seeks to protect native vegetation and identify areas where urban development is not appropriate.



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0 250 500 750

metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Proposed STP
- Concrete Batching Plant

CLIENTS | PEOPLE | PERFORMANCE

City of Whittlesea
Shenstone Park PSP-Impact Assessment

Investigation Area

Job Number	3135311
Revision	A
Date	20/11/2017

Figure 1

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Google Earth Imagery 2017. Created by: M.A

3. Existing planning and land use characteristics

3.1 Strategic planning policy

Relevant State and local planning policy is identified below.

3.1.1 Plan Melbourne 2017-2050: Metropolitan Planning Strategy

Plan Melbourne 2017-2050 (Plan Melbourne), released on 11 March 2017, sets out the Victorian Government's vision for the city to 2050.

Direction 1.4 Support the productive use of land and resources in Melbourne's non-urban areas

Policy 1.4.2 Identify and protect extractive resources (such as stone and sand) important for Melbourne's future needs.

This policy considers urban encroachment and the incompatible development, which may constrain extractive resources, including quarries. The policy states the *'long-term supply of extractive resource materials at competitive prices, current extractive industries must be protected and future extractive resource areas must be identified'*.

Direction 6.3 Integrate urban development and water cycle management to support a resilient and liveable city

Policy 6.3.3. Protect water, drainage and sewerage assets

Under this policy, sewerage infrastructure assets, including sewerage treatment plants, are documented to be under pressure from encroaching sensitive and incompatible land uses, including urban encroachment. This policy considers land area buffers around these assets and other appropriate management measures, to ensure protection from urban encroachment.

3.1.2 North Growth Corridor Plan

The VPA Growth Corridor Plans establish a high-level spatial framework for land use and transport planning across each of the four metropolitan growth corridors. The North Growth Corridor Plan covers the Shenstone Park PSP area and provides direction for future development.

Section 5.7 of the Growth Corridor Plan, June 2012, states that *'the North Corridor Plan ensures that approved and operational quarries are protected from encroachment by sensitive land uses'*.

The plan also identifies the Woody Hill and Phillips quarries and land to be used for 'non-urban/utilities' with a note stating that the *'boundary and size of the sewerage treatment plant to be determined'*.

3.1.3 State Planning Policy Framework

The State Planning Policy Framework (SPPF), contained within all Victorian Planning Schemes, sets the direction for future growth and development of Victoria.

The SPPF includes a number of references to planning for the location of potentially conflicting land uses and their relationship to each other. The following clauses are relevant to this study as they have a focus on industrial land use and sensitive land uses.

Clause 10 established the operation of the SPPF and seeks to ensure that the objectives of planning in Victoria (as set out in Section 4 of the *Planning and Environment Act 1987*) are fostered through appropriate land use policies and practices, which integrate relevant environmental, social and economic factors in the interest of net community benefit and sustainable development.

Clause 11 relates to settlement and seeks to anticipate and respond to the needs of existing and future communities, through appropriately zoned and serviced land for housing, employment, recreation and open space, commercial and community facilities and infrastructure. This clause also seeks to prevent environmental problems created by siting incompatible land uses close together.

Clause 11.02 Urban growth

Clause 11.02-1 Supply of Urban Land - seeks to ensure the sufficient supply of urban land is available for residential, commercial, retail, industrial, recreational, institutional and other community uses. This includes planning to accommodate projected population growth over at least a 15-year period and provide clear direction on locations where growth should occur.

The planning for urban growth considerations are to include (but not limited to):

- The neighbourhood character and landscape considerations
- The limits of land capability and natural hazards and environmental quality
- Maintaining access to productive natural resources and an adequate supply of well-located land for energy generation, infrastructure and industry
- Restricting low-density rural residential development that would compromise future development at higher densities

The policy emphasises that planning and supply of urban land must consider relevant Victorian Government population projections and land supply estimates.

Clause 11.02-2 Structure planning – considers the facilitation of the orderly development of urban areas.

Included within this clause is the development of Growth Area Framework Plans that include (but not limited to) the identification of:

- The boundaries of individual communities, landscape values and as appropriate the need for discrete urban breaks and how land uses in these breaks will be managed
- Appropriate uses for areas described as constrained, including quarry buffers

Clause 11.02-3 Planning for growth areas – seeks to ensure urban growth close to transport corridors and services and provide efficient and effective infrastructure to create benefits for sustainability while protecting primary production, major sources of raw materials and valued environmental areas.

Clause 11.02-4 Sequencing of development – considers the management and sequence of the development in growth areas, so services are available from early in the life of new communities.

Clause 13.04 Noise and Air

Clause 13.04-1 Noise abatement – seeks to ensure that development is not prejudiced and community amenity is not reduced by noise emissions. Measures for achieving noise abatement include using a range of building design, urban design and land use separation techniques as appropriate to the land use functions and character of the area.

Clause 13.04-2 Air quality – considers wherever possible, suitable separation between land uses that reduce amenity and sensitive land uses.

Clause 14 Natural Resource Management

Clause 14.03 Resource exploration and extraction – seeks to encourage exploration and extraction of natural resources in accordance with acceptable environmental standards and to provide a planning approval process that is consistent with the relevant legislation.

The clause notes that the opportunity for exploration and extraction of natural resources should be protected in instances where this is consistent with the overall planning considerations and application of acceptable environmental practice.

The clause specifies that planning permit applications should clearly define buffer areas appropriate to the nature of the proposed extractive uses, which are to be owned or controlled by the proponent of an extractive industry. Buffer areas between extractive activities and sensitive land uses should be determined based on the following considerations:

- *'Appropriate limits on effects can be met at the sensitive locations using practical and readily available technology*
- *Whether a change of land use in the vicinity of the extractive industry is proposed*
- *Use of land within the buffer areas is not limited by adverse effects created by the extractive activities*
- *Performance standards identified under the relevant legislation*
- *Types of activities within land zoned for public use'*

Clause 17.02 Industry

Clause 17.02-1 – Industrial land development – considers the identification of land for industrial development in urban growth areas. Land suitable for this purpose includes:

- *'Good access for employees, freight and road transport is available*
- *Appropriate buffer areas can be provided between the proposed industrial land and nearby sensitive land uses'*

This clause notes that existing industrial areas should be protected and careful planning be undertaken, where possible, to facilitate further industrial development. The following additional strategies are to be considered under this clause:

- *'Provide an adequate supply of industrial land in appropriate locations including sufficient stocks of large sites for strategic investment*
- *Protect industrial activity in industrial zones from the encroachment of unplanned commercial, residential and other sensitive uses which would adversely affect industry viability*
- *Encourage industrial uses that meet appropriate standards of safety and amenity to locate within activity centres*
- *Avoid approving non-industrial land uses, which will prejudice the availability of land for future industrial requirements, in identified industrial areas'*

Clause 17.02-2 – Design of industrial development – seeks to facilitate the sustainable development and operation of industry and research and development activity.

This clause considers the requirement for substantial threshold distances are located in the core of industrial areas and encourages activities with minimal threshold requirements to locate towards the perimeter of the industrial area.

Further, the clause considers the adequate separation and buffer areas between sensitive uses and offensive or dangerous industries and quarries are to be provided to ensure that residents are not affected by adverse environmental effects, nuisance or exposure to hazards.

Additional consideration is recommended to be given to the minimisation of inter-industry conflict and encourage like industries to locate within the same area.

Clause 19.03 Development infrastructure

Clause 19.03-2 Water supply sewerage and drainage – considers the planning for the provision of water supply, sewerage and drainage services that efficiently and effectively meet State and community needs and protect the environment.

Clause 19.03-5 Waste and resource recovery – seeks to reduce waste and maximise resource recovery, to subsequently minimise environmental, community amenity and public health impacts and reduce reliance on landfills.

The following additional strategies are to be considered under this clause:

- *'Protect waste and resource recovery infrastructure against encroachment from incompatible land uses by ensuring buffer areas are defined, protected and maintained*
- *Ensure waste and resource recovery facilities are sited, designed, built and operated so as to minimise impacts on surrounding communities and the environment*
- *Enable waste and resource recovery facilities to locate in close proximity in order to share separation distances, reduce the impacts of waste transportation and improve the economic viability of resource recovery'.*

3.1.4 Local Planning Policy Framework

The Local Planning Policy Framework (LPPF) consists of Council's Municipal Strategic Statement (MSS) and Local Planning Policies. Local Planning Policies are tools used to implement the objectives and strategies of the MSS. The MSS is a concise statement of the key strategic planning, land use and development objectives guided by state policies at the local level, and includes the strategies and actions for achieving the objectives.

The following sections of Council's MSS are relevant to this assessment:

- **Clause 21.02-1 Municipal Profile (General Overview)** – The City of Whittlesea has been traditionally characterised by its rapidly expanding residential areas and its continuing focus as an urban growth area.
- **Clause 21.02-2 Locational and Regional Context** – The City of Whittlesea is the third fastest and largest growing municipality in Victoria and the sixth largest in Australia.
- **Clause 21.04-2 Urban Growth** – rapid urban growth requires continued careful management to ensure that longer-term strategic approaches to the allocation of land uses are not compromised by incremental decision making.

In this regard, it is critical that development is appropriately managed. Furthermore, housing development must continue to be appropriately planned in locations where infrastructure planning can be undertaken effectively and where suitable measures are provided to minimise adverse amenity impacts from industry and future rail infrastructure.

Objective 1 – To effectively manage urban growth – Strategy 1.6 – Provide for suitable separation of new residential areas from industry, to minimise the potential for adverse amenity impacts.

- **Clause 21.06-3 Resource exploration and extraction** – The extractive industry provides valuable economic benefits for the municipality, having a number of associated economic investment and indirect employment benefits.

The need for extractive industries to be located close to existing and proposed markets is to be balanced with other competing needs, including the protection of areas of environmental significance and surrounding amenity. Extractive industries can have significant impacts on the landform, air quality, biodiversity and water resources of an area.

Objective 1 – To safeguard the amenity and environment of land surrounding extractive industries – Strategy 1.1 - Provide appropriate separation distances, or buffers between extractive industry operations and sensitive uses on nearby land.

- **Clause 21.07 Environmental Risk** – The City of Whittlesea is characterised by its expanding urban areas and urban-rural fringe, with well over half of the municipality being rural. Rural areas support various farming enterprises, lifestyle properties, water supply catchments, extractive industry, conservation areas and tourist attractions.
- **Clause 21.09-1 Housing (Capacity and Location)** – The City of Whittlesea is expected to attract continued urban growth well into the future in accordance with the City's status as a preferred growth area of metropolitan significance.
- **Clause 21.10-1 Employment Opportunities** – Objective 1 – Strategy 1.8 – Provide adequate separation and buffer areas between sensitive land uses and high impact industries such as extractive industry and landfill.

The following Local Planning Policies are relevant to this assessment:

- **Clause 22.09 Industrial Development Policy** – Objective – To achieve well designed, quality industrial developments that are suitably located so as to meet stated economic development objectives.

The identification in Council's MSS of the importance of adequate separation and buffer areas provides a clear policy direction, which in turn allows further land use planning controls to be implemented. Implementing these planning controls assists to achieve the stated objectives and strategies.

3.2 Existing land uses

Figure 2 shows the current planning scheme zones of the PSP area and surrounding land. The existing and proposed industrial uses are currently subject to the following zones:

- Barro Group Woody Hill Quarry – Special Use Zone Schedule 4 (SUZ4)
- Approved basalt quarry (Phillips Quarry) – Special Use Zone Schedule 4 (SUZ4)
- Yarra Valley Water Wollert STP – Rural Conservation Zone Schedule 1 (RCZ1)

Additional land use zones in the PSP, the associated investigation area and designated buffers include:

- Farming Zone (FZ)
- Green Wedge Zone (GWZ)
- Urban Growth Zone (UGZ)

Land in the north area of the City of Whittlesea is predominately rural with some rural-residential areas. The non-urban areas are characterised by forest, farming, cattle grazing and animal husbandry.

3.3 Sensitive land uses

The definition of a sensitive receptor or sensitive land use is defined by the EPA[3] as *'any land uses which require a particular focus on protecting the beneficial uses of the air environment relating to human health and well-being, local amenity and aesthetic enjoyment, for example residential premises, child care centres, pre-schools, primary schools, education centres or informal outdoor recreation sites'.*

Note that this definition was expanded in 2013 from that in the previous EPA separation distance guidelines in that "informal recreation sites" are now included whereas the previous definition had an exclusion ("…and other similar uses involving the presence of individual people for extended periods except in the course of their employment or for recreation"). However, the workplace continues to be excluded as a sensitive land use.

While there is no definition for a 'sensitive use' in the planning scheme, Clause 45.03 Environmental Audit Overlay includes the following requirement:

'Before a sensitive use (residential, child care centre, pre-school centre or primary school) commences …'

The definition of sensitive use provided by the EPA takes a broader view of sensitive uses to that in the planning scheme by encompassing those uses identified in Clause 45.03 and adding informal recreation areas as a sensitive use.

3.3.1 Existing sensitive land uses

Figure 4 shows the sensitive uses (as defined under the Environmental Protection Regulations 1518) in close proximity to the investigation area. From an assessment of aerial imagery, there are a number of assumed dwellings within the identified buffers surrounding the existing and approved quarry operations, and proposed STP.

3.3.2 Potential sensitive land uses

Under the Whittlesea planning scheme the use of land for a quarry is best defined as 'Earth and Energy Resources Industry' which is *'land used for the exploration, removal or processing of natural earth or energy resources'*. It includes stone extraction and stone exploration.

A STP may be included under the broader definition of *'Utility Installation'* which is defined as *'land used to collect, treat, or dispose of storm or flood water, sewage, or sullage'*, or *'Minor Utility Installation'* if the plant would only be required to service a neighbourhood.

It should be noted that current land use zones in proximity to the existing and approved quarries and proposed STP allow a number of land uses, which are potentially susceptible to adverse amenity impacts, to be established 'as of right' based on existing zone provisions.

A brief examination of potential for the establishment of sensitive uses in proximity to the existing and proposed industry uses is provided in Table 1.

There are also a number of scenarios where buildings and works associated with an 'as of right' land use, could also be undertaken 'as of right' without any requirements for a planning permit. This indicates that there is potential for amenity susceptible uses and development to occur in proximity to the existing and approved quarries and proposed STP without requiring approval for either the use of the land or buildings and works. Under the existing zoning regime, this has the potential to allow the existing, approved and proposed industry uses to be encroached by sensitive land uses, which could ultimately jeopardise its continuing operation, establishment, or future expansion.

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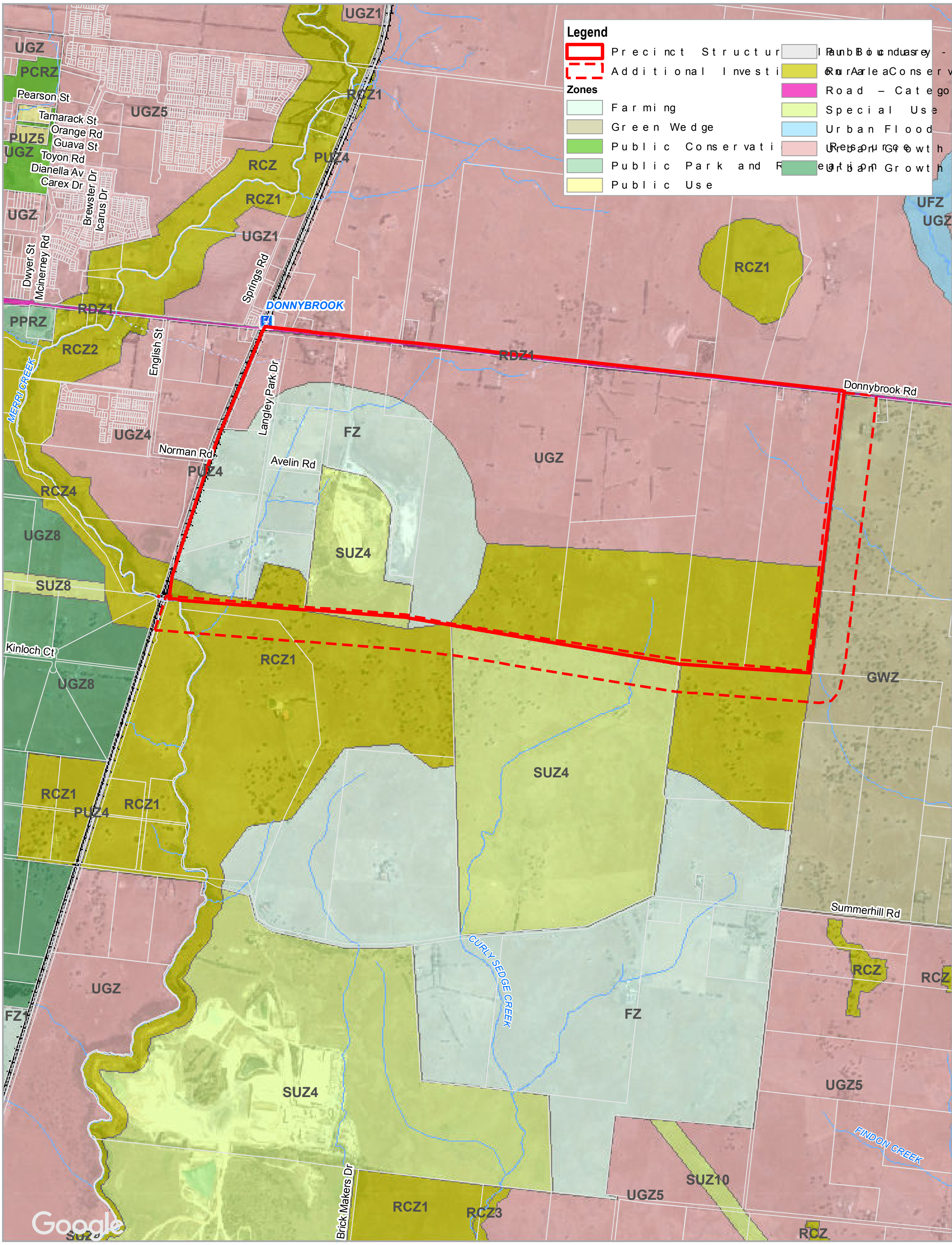
[3] EPAV 2013 "Recommended separation distances for industrial residual air emissions" Pubn. 1518, March 2013

This is particularly of concern within the Farming Zone and Rural Conservation Zone as these zones adjoin land directly surrounding the existing and approved quarry operations and proposed STP.

Table 1 Potential amenity susceptible uses in proximity to existing and approved quarries and proposed STP

Zone	Potential amenity susceptible use	Associated buildings and works permit triggers
Farming Zone (FZ)	Dwelling, Dependent person's unit, Bed & breakfast, and Informal outdoor recreation are Section 1 'as of right' uses, subject to conditions. Camping and caravan park, Dependent person's unit and Dwelling (if the Section 1 condition is not met), Emergency services facility, Group accommodation, Host farm, Leisure and recreation, Market, Place of assembly, Primary School, Residential hotel, Restaurant, Secondary school and Winery are Section 2 'discretionary' uses. Decision guidelines for Section 2 uses generally only require consideration of how proposed uses would affect agricultural values (i.e. not nearby industrial type uses).	Buildings and works triggered only for Section 2 uses. Dwelling, Dependent person's unit, Bed & breakfast, and Informal outdoor recreation do not require a permit.
Rural Conservation Zone Schedule 1 (RCZ1)	Bed & breakfast and Informal outdoor recreation are Section 1 uses, subject to conditions. Dependent person's unit, Dwelling, Emergency services facility, Group accommodation, Host farm, Market, Primary school, Residential hotel, Restaurant, Secondary school and Winery are Section 2 'discretionary' uses.	Buildings and works triggered only for Section 2 uses. Bed & breakfast, and Informal outdoor recreation do not require a permit.
Urban Growth Zone (UGZ)	*Part A – Provision for Land Where No Precinct Structure Plan Applies* Dwelling, Dependant person's unit, Bed & breakfast, and Informal outdoor recreation are Section 1 'as of right' uses, subject to conditions. Camping and caravan park, Dependent person's unit and Dwelling (if the Section 1 condition is not met), Display home, Education centre, Emergency services facility and Winery are Section 2 'discretionary' uses.	Buildings and works triggered only for Section 2 uses. Dwelling, Dependent person's unit, Bed & breakfast, and Informal outdoor recreation do not require a permit.
Green Wedge Zone (GWZ)	Bed & breakfast and Informal outdoor recreation are Section 1 uses, subject to conditions. Camping and caravan park, Dependent person's unit, Dwelling, Exhibition centre, Function centre, Group accommodation, Hall, Host farm, Indoor recreation facility, Leisure and recreation, Major sports and recreation facility, Market, Place of assembly, Place of worship, Primary school, Research and development centre- Research centre, Residential building, Residential hotel, Restaurant, Restricted place of assembly, Secondary school are Section 2 'discretionary' uses.	Buildings and works triggered only for Section 2 uses. Bed & breakfast, and Informal outdoor recreation do not require a permit.
Special Use Zone Schedule 4 (SUZ4)	Schedule 4 of the SUZ is for 'Earth and Energy Resources Industry'. Informal outdoor recreation is a Section 1 use. Caretaker's house, Dependent person's unit, Leisure and recreation, and Place of assembly are Section 2 'discretionary' uses.	A permit is required to construct a building, or construct or carry out works.



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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GHD

City of Whittlesea
Shenstone Park PSP - Impact Assessment

Planning Zones

Project No.	31-35311
Revision No.	-
Date	12 Oct 2017

FIGURE 2

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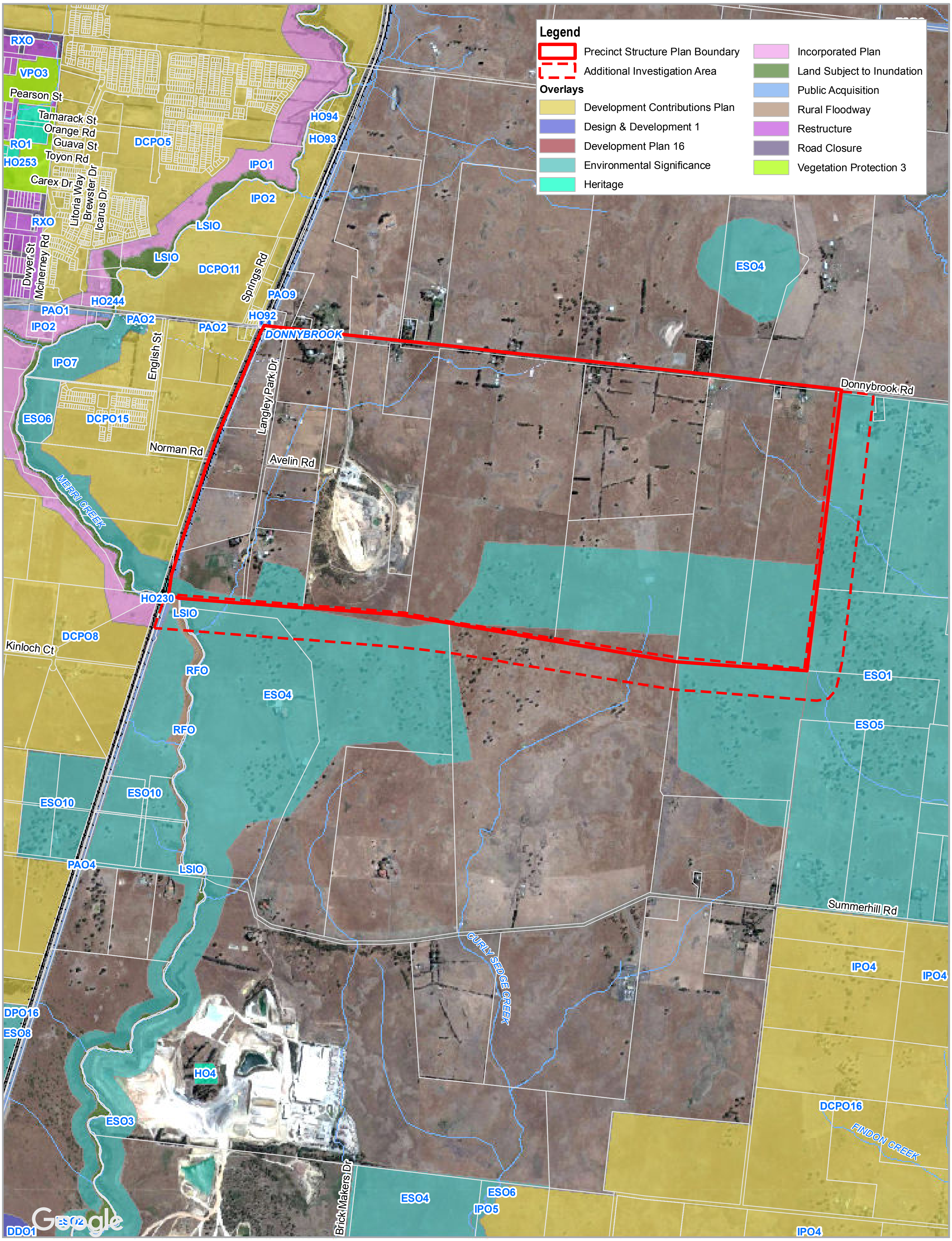
Data source: Data Source: Image © 2016 Google, DigitalGlobe dated 2017/07/10 and VicMap, DELWP (2017).. Created by: lrsmith



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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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City of Whittlesea
Shenstone Park PSP - Impact Assessment

Project No.	31-35311
Revision No.	-
Date	12 Oct 2017

Planning Overlays

FIGURE 3

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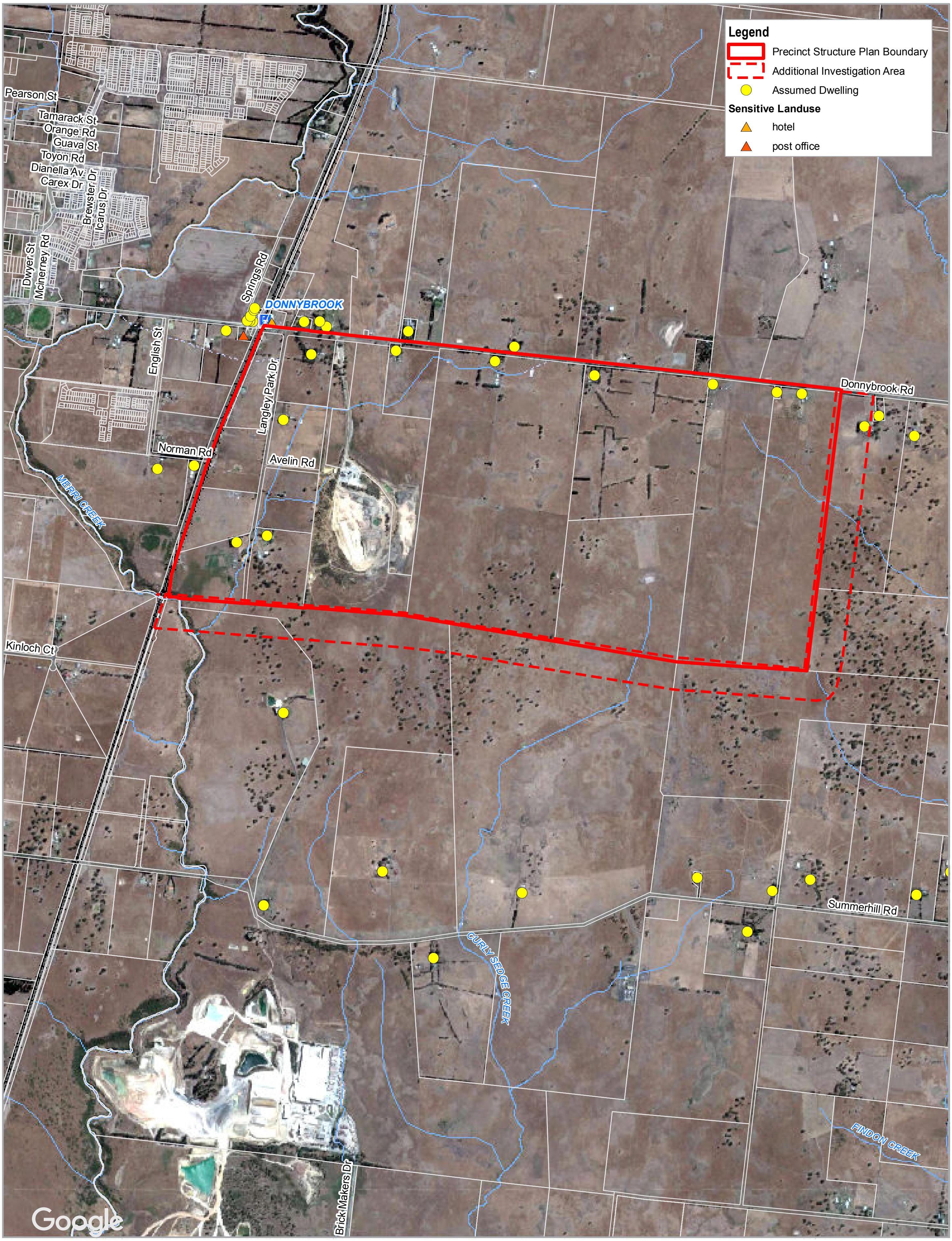

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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GHD

City of Whittlesea
Shenstone Park PSP - Impact Assessment

Project No. 31-35311
Revision No. -
Date 12 Oct 2017

Sensitive Land Use

FIGURE 4

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Data source: Data Source: Image © 2016 Google, DigitalGlobe dated 2017/07/10 and VicMap, DELWP (2017).. Created by: lrsmith

4. Identification of relevant existing and proposed industries

4.1 Quarries

Specific information regarding the detailed operations at the existing and approved quarries was not available at the time of this report. However, a preliminary description is provided, based on:

1. The existing Work Plan for Woody Hill Quarry
2. The planning permit for the proposed Phillips Quarry
3. The 1993 Phillips Quarry Extraction Approval Plan
4. Information supplied by CoW
5. The perimeter site visits conducted by GHD on 25 August 2017 and 6 September 2017, and from aerial photos

Figure 1 shows the location of the existing and approved quarries.

DEDJTR was contacted during preparation of this assessment for specific information pertaining to the two quarries, however DEDJTR were not able to provide this without the approval of the work authority holder and referred GHD to the Work Plan.

All relevant stakeholders were contacted during the preparation of this assessment to provide inputs pertaining to operations. Where there was no provision of information, GHD has made a number of assumptions for the impact assessments.

4.1.1 Woody Hill Quarry

Land in the west segment of the Shenstone Park PSP area contains the existing Barro Woody Hill Quarry. A copy of the Work Plan[4] was provided to GHD. The existing quarrying operations include extraction of mudstone rock and is subject to Work Authority 492. A planning permit is not required for the site, as it is currently operating under an existing use right. The site consists of several quartz veins interspersing the Silurian sediments, predominantly silt shales. Basalt underlies the shales and other sedimentary rocks. The estimated volume of material within the proposed extraction area was 2.7 million cubic meters in-situ back in 2003. Current extraction is 150,000 tonnes per year for low- grade crushed rocks and sub base type material primarily for road construction. This would give a working life of approximately 30 years from 2003.

The existing stone extraction area is smaller than the current Work Authority boundary.

The existing extraction techniques are a combination of soft rock and more conventional drill and blast. Typically, material is ripped and pushed with a dozer and scraper. Drill and blasting[5] is used for the harder material. It is expected that at the end of extraction, the hill will be completely removed and the final surface topography essentially flat.

Mobile plant used for extracting and processing rock includes dozers, excavators, off-road haul trucks, wheel loaders, mobile screening units and road registered tipping trucks. A grader is used at times during rehabilitation works and maintenance of the access road. A water cart is also used to control dust. Road registered tip trucks are used to transport material from the site.

[4] Bell Cochrane and Associates, Work Plan for mudstone extraction, Extractive Industries Work Authority 492 prepared for Mitchell Sand and Gravel Pty Ltd, 12th February 2003
[5] DEDJTR email dated 20 July 2017, confirming blasting does occur at WA 492

The work plan states that there is no fixed plant on site. The processing and crushing plant is portable/relocatable and brought to the site as the need arises. Typically, the plant consists of a primary and secondary crusher and a series of control and product screens.

The process of extraction within WA 492 is assumed to be typical of a Stone Processing Plant as described in Chapter 11 of AP-42, and shown in Figure 5 (USEPA, 2004). It is assumed the operator proposes to supply only the coarser grades of aggregate, and neither a tertiary nor a fines crusher (as presented in the Typical Flow Diagram of Figure 5) will be used for quarry operations. Instead, processed rock would pass through a screen to separate aggregate into the various sizes.

The hours of operation are from 6.00 am to 6.00 pm Monday to Saturday.

An active quarry normally generates dust from blasting, rock breaking, loading, haul road traffic and wind erosion over the quarry site.

Figure 5 Proposed indicative process flow diagram[6]

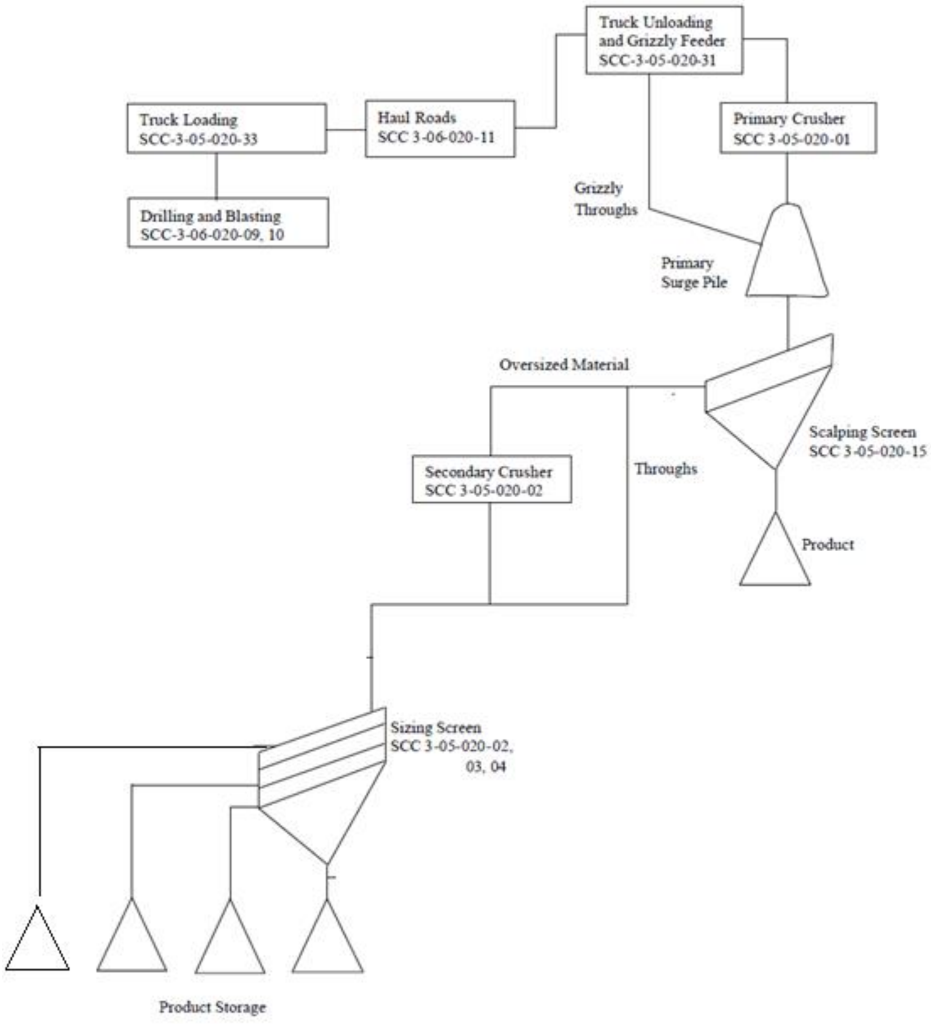


Figure 11.19.2-1. Typical stone processing plant

[6] Taken from AP 42A, Ch 11.19.2 - Minerals Products Industry Fig 11.19.2-1)

Concrete Batching Plant

There is also an existing concrete batching plant, north of the current approved extraction area.

The concrete batching plant is located on a paved concrete area. This paved area contains silos, storage bins, conveyor system with loading sock connected to hopper, concrete truck parking area and raw feed stockpiles.

Typical concrete batching plant operations include the delivery of cement by road tanker, which is then pneumatically transferred to silos. Sand and aggregate are transferred by truck from the onsite stockpiles in a damp condition to in-ground bins. Transfer from the bins is metered onto a bin conveyor and transferred to the loading tower via a covered conveyor and then into an agitator. Cement and water are mixed with the aggregate in the agitator and batches are checked before loading into delivery trucks through a rubber, loading sock.

Note that the internal roads within the quarry site, surrounding and connecting to the concrete pad where the concrete batching plant is located, appear not to be sealed, which would increase dust generation.

Dust Management Plan (DMP)

Information regarding the Quarry DMP was not available when preparing this report. The DMP would include defined management measures at the concrete batching plant, rock crushing facility and general active quarry. To minimise dust emissions at these operations, the DMP would be expected to focus on three main areas of potential dust sources:

- Across whole site – internal roads and areas with no vegetation on boundary of the site
- Quarry area – blasting and loading
- Rock crushing/screening facility operations – material transfer points, conveyors and stockpiles
- Concrete batching plant - material transfer points and stockpiles

If Barro implement and maintain their dust management procedures at the quarry, then offsite dust impacts would be minimised, thereby reducing the potential for dust complaints.

The downwind impact of residual emissions, for example during process upset or malfunction conditions, is minimised using buffer distances. These do not replace dust management practices by individual industrial operators.

Note that individual activities on the site may require a buffer distance and that these would be measured from the boundary of the extent of that particular activity.

4.1.2 Phillips Property

Approved Basalt Quarry

The approved basalt ‘Phillips Property’ quarry is located beyond the southern boundary of the PSP at 430 Summerhill Road, Donnybrook.

There is a town planning permit for this site issued in 1999, City of Whittlesea TPP 704901. This permit allows for the extraction of the basalt rock stone resource from a large extraction area-subject to Work Authority 160. Figure 1 shows the approved extraction area. The approved extraction boundary indicates that the extraction areas will utilise the eastern portion of the Work Authority area. The Planning Permit also designates an approximate Stage 1 extraction area and processing area. The approval also includes a crushing and screening plant and blasting to be utilised during extraction.

It is assumed that the process of extraction within WA 160 would operate according to the Typical Stone Processing Plant from Chapter 11 of AP-42, shown in Figure 5 (USEPA, 2004) above.

The volume of material and proposed throughout were unavailable at the time of this report. Therefore, advice on the potential lifespan of the quarry was not able to be assessed.

The proposed hours of operation are from 7.00 am to 6.00 pm Monday to Friday and 7.00 am to 1.00 pm Saturdays.

4.2 Wollert Sewage Treatment Plant

The proposed Wollert Sewerage Treatment Plan (STP) (immediately southeast of the Woody Hill Quarry) to be operated by Yarra Valley Water (YVW) is shown in Figure 1. The site will be predominantly a sewer mine[7] for the generation of recycled water. However, YVW will also be investigating opportunities for further resource recovery. YVW has been in preliminary discussions with an industrial customer who has advised they may require 20 ML/day of recycled water, hence the sizing projections in Table 2.

The storage ponds of the sewerage treatment plant will be located within the Shenstone Park PSP area on Langley Park Drive.

GHD understands that planning for the plant is at the conceptual stage with the plant projected to come online after 2028:

- YVW expects that some form of mechanised biological process will be used with only indicative layouts being provided to GHD – refer to Appendix A
- There was no specific information available regarding the type of equipment or process the plant would utilise
- The following size (equivalent populations at defined time horizons) in Table 2 were provided to GHD by YVW

Table 2 Size of Wollert STP[8]

Year		2028	2033
Without Large industrial Customer	EP	70,000	120,000
	ML/day	10	18
With Large industrial Customer	EP	190,000	230,000
	ML/day	30	38

[7] Sewer mining is the process of tapping into a wastewater system, (either before or after the wastewater treatment plant), and extracting wastewater, which is then treated and used as recycled water.
[8] Email dated 21 July 2017 from Simon Newbery Manager Sewer Growth Planning

5. Existing environment

5.1 Meteorology

The local meteorology at the site is affected by broader regional patterns of synoptic pressure and wind with embedded weather systems. Synoptic features vary in intensity and location according to the season. For instance, during summer a high-pressure belt is usually found over or just to the south of Australia, bringing warm weather while the subtropical easterlies cover most of the continent. In winter, the subtropical high-pressure belt is usually located further north over the continent, allowing westerly winds and occasional to frequent strong cold fronts to affect southern Australia.

5.2 Choice of meteorological dataset

Ideally, a five-year dataset recorded at hourly intervals is required to fully characterise annual average, diurnal and seasonal variations in wind climate. The nearest meteorological dataset is from the BoM automatic weather station (AWS) located at Melbourne Airport, approximately 16 km southwest of the PSP. There was a temporary EPA air quality monitoring station (AQMS) located at Craigieburn. The data from the Craigieburn site did not cover a whole year during the measurement period (measurement period 13 October 2003 – 24 June 2004). GHD considers the dataset from Craigieburn to be more representative because it is closer to the PSP, however given data was not available for one entire year, and given EPA now require five years of meteorological data to be used in dispersion modelling assessments, GHD has compared this dataset with Melbourne Airport to validate the use this assessment. This comparison is presented in Appendix B. The comparison shows that the wind directions experienced at Craigieburn are very similar to that experienced at Melbourne Airport.

5.3 AERMET

5.3.1 Meteorological data file construction

Atmospheric dispersion modelling for regulatory purposes requires a set of meteorological data that is representative of conditions at the site to be put into the modelling software. GHD has used data from the BoM AWS at Melbourne Airport. Data from the year 2012 to 2016 was used, as this period is the most recent five years available. The meteorological parameters provided in the file include:

- Temperature
- Wind Speed
- Wind Direction
- Cloud coverage
- Ceiling height

5.3.2 AERMET usage

The AERMOD meteorological processor, AERMET, was used to construct the AERMOD meteorological files based on the BoM data. This was undertaken in strict accordance with EPA publication *Construction of input meteorological data files for EPA Victoria's regulatory air pollution model (AERMOD)* (Publication 1550). AERMET was used in 'on-site' observation mode using the input data detailed above and appropriate land use categorisations for the site.

The Non-Default option of "Adjust Surface Friction Velocity (ADJ_U*)" was applied. This was applied to be consistent with the EPA Victoria's approved the use of the LOWWIND3 option in AERMOD to better resolve the dispersion associated with light wind conditions, in line with current US EPA AERMOD usage guidance advice.

5.3.3 Land usage

The land surrounding the site was divided into one sector for the determination of atmospheric turbulence values in the dispersion modelling. These are summarised in Table 3.

Table 3 Applied land use categorisation (EPAV 2014a, Appendix B)

Wind sector (degrees)	Land category (EPAV 2014a)	Season (average year)	Albedo	Bowen ratio	Surface roughness
0 to 360	Shrub Land (non-arid region)	Summer / Autumn Winter / Spring	0.18 / 0.18 0.18 / 0.18	1.0 / 1.5 1.5 / 1.0	0.3 / 0.3 0.3 / 0.3

5.4 Wind pattern

The local meteorology largely determines the pattern of offsite odour and/or dust impact on receptors (houses, businesses and industry). The effect of wind on dispersion patterns can be examined using the wind and stability class distributions at the site. The winds at a site are most readily displayed by means of wind rose and stability distribution plots, giving the distribution of winds and the wind speeds from these directions as well as the distribution of the stability classes.

The features of particular interest in this assessment are: (i) the dominant wind directions and (ii) the relative incidence of stable light wind conditions that yield minimal mixing (defines peak impacts from ground-based sources).

Figure 6 shows the annual average wind rose for Melbourne Airport for the period 2012-2016, and the following features can be seen:

- Annual average wind speed of 5.4 m/s
- Winds are most prevalent from the north and south
- Winds are least prevalent for the east
- There is an north-south axis of wind direction aligned to the Merri Creek
- Light winds are more prevalent from the southwest
- The observed wind speed distribution indicates that the largest proportion of high wind speeds (> 6 m/s) are from the north, while the largest proportion of light winds (<2 m/s) are from the southwest

The seasonal variation within the annual pattern given in Figure 6 can be shown by seasonal wind roses as given in Figure 7.

There are several significant seasonal features:

- In winter, the winds are predominantly from the north; this observation reflects cool air drainage flows from the hills and mountains from the surrounding land in the north including the squeeze through the Kilmore Gap, as well as with pre-frontal (stronger) winds associated with the synoptic winter westerlies.
- In summer, the vast majority of winds are from the south reflecting weak sea breezes in the afternoon and evening from the Victorian coast combined with the synoptic sub-tropical ridge migrating to the south of this location during the warmer months of the year.

Autumn and spring are transitional seasons with a mixture of both winter and summer observations, with peak incidences from the north in autumn and in spring.

The seasonal incidence of high winds (>6 m/s) is greatest in winter, and the lowest in spring, while the incidence of light (<2 m/s) winds is greatest in autumn, followed by summer and least in winter. As with the annual winds, there is a lack of easterly winds in all seasons although winds south of east can occur in summer.

The direction and high proportion of light winds in autumn is a mixture between north, south and southwest. These drainage flows are likely to be associated with high stability.

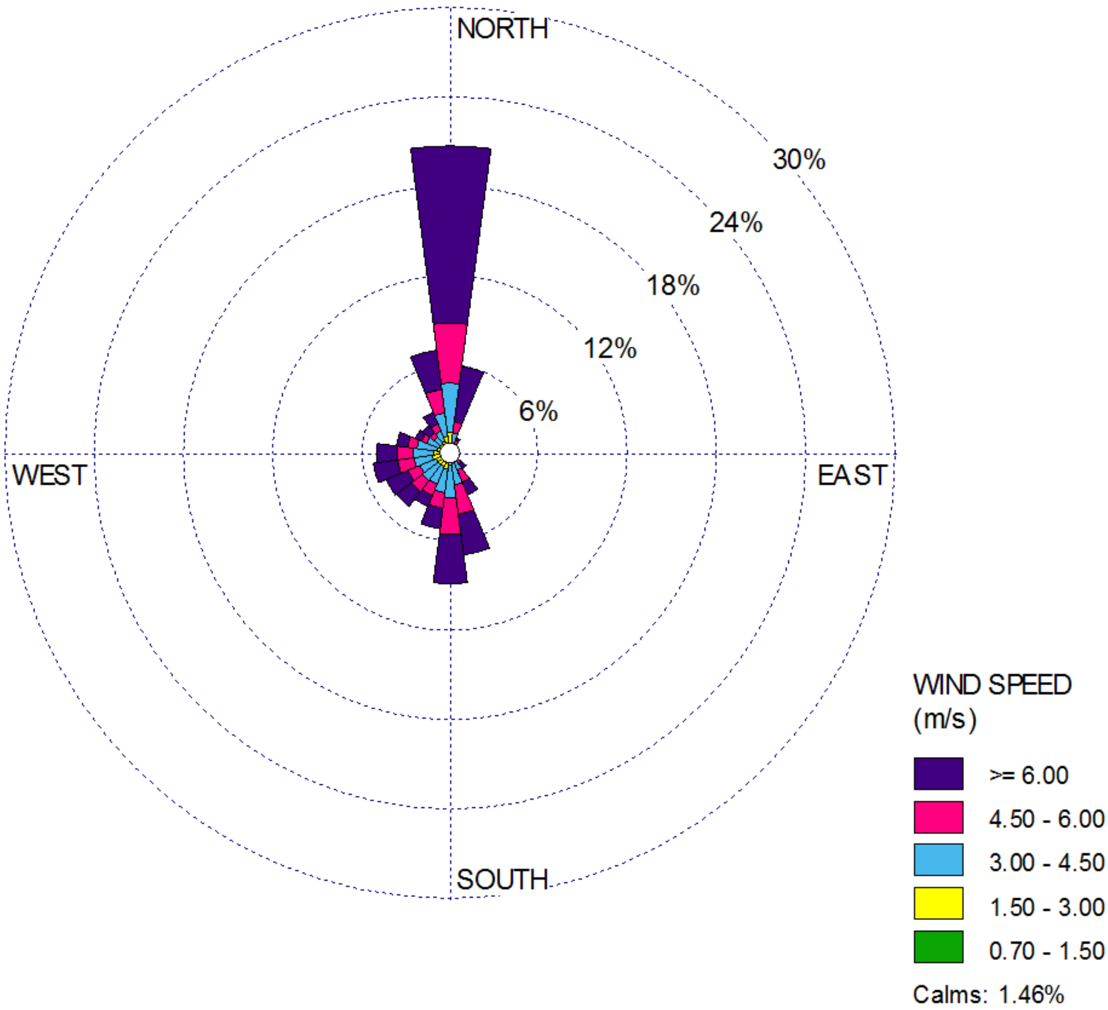


Figure 6 Annual wind rose – Melbourne Airport

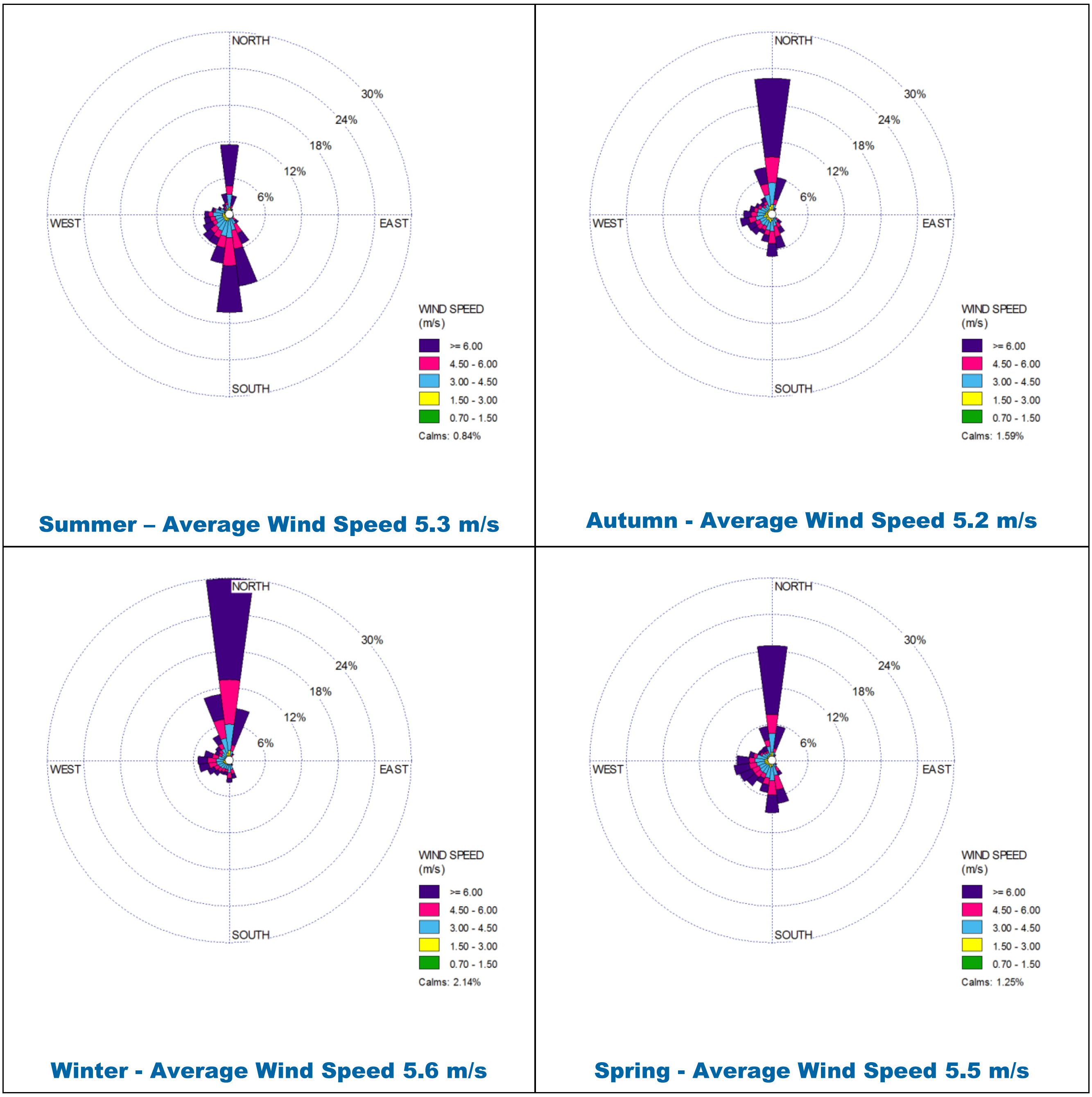


Figure 7 Seasonal wind roses – Melbourne Airport

5.5 Pattern of atmospheric stability

5.5.1 Incidence of stable conditions

Atmospheric stability substantially affects the capacity of a pollutant such as gas, particulate matter or odour to disperse into the surrounding atmosphere upon discharge and is a measure of the amount of turbulent energy in the atmosphere.

There are six Pasquill–Gifford classes (A-F) used to describe atmospheric stability, and these classes are grouped into three stability categories; stable (classes E-F), neutral (class D), and unstable (classes A-C). The climate parameters of wind speed, cloud cover and insolation are used to define the stability category as shown in Table 4, and as these parameters vary diurnally, there is a corresponding variation in the occurrence of each stability category. Stability is most readily displayed by means of stability rose plots, giving the frequency of winds from different directions for various stability classes A to F.

Table 4 Stability category relationship to wind speed, and stability characteristics

Stability Category	Wind Speed Range (m/s) [a]	Stability Characteristics
A	0 – 2.8	Extremely unstable atmospheric conditions, occurring near the middle of day, with very light winds, no significant cloud
B	2.9 – 4.8	Moderately unstable atmospheric conditions occurring during mid-morning/mid-afternoon with light winds or very light winds with significant cloud
C	4.9 – 5.9	Slightly unstable atmospheric conditions occurring during early morning/late afternoon with moderate winds or lighter winds with significant cloud
D	≥6	Neutral atmospheric conditions. Occur during the day or night with stronger winds or during periods of total cloud cover, or during the twilight period
E	3.4 – 5.4 [b]	Slightly stable atmospheric conditions occurring during the night-time with significant cloud and/or moderate winds
F	0 – 3.3 [b]	Moderately stable atmospheric conditions occurring during the night-time with no significant cloud and light winds

a. Data sourced from the Turner's Key to the P-G stability Categories, assuming a Net Radiation Index of +4 for daytime conditions (between 10:00 am and 6:00 pm) and –2 for night-time conditions (between 6:00 pm and 10:00 am)

b. Assumed to only occur at night, during Net Radiation Index categories of –2.

The incidence of stable conditions can be viewed by means of a stability distribution plot.

Figure 8 shows the frequency distribution of stability classes for the entire data period. Noting that a neutral atmosphere (D) is the dominate stability state of the atmosphere comprising of approximately 65% incidence while the A, B and C class contribute unstable atmospheres approximately 17% of the time and the stable E and F conditions contributing approximately 18%.

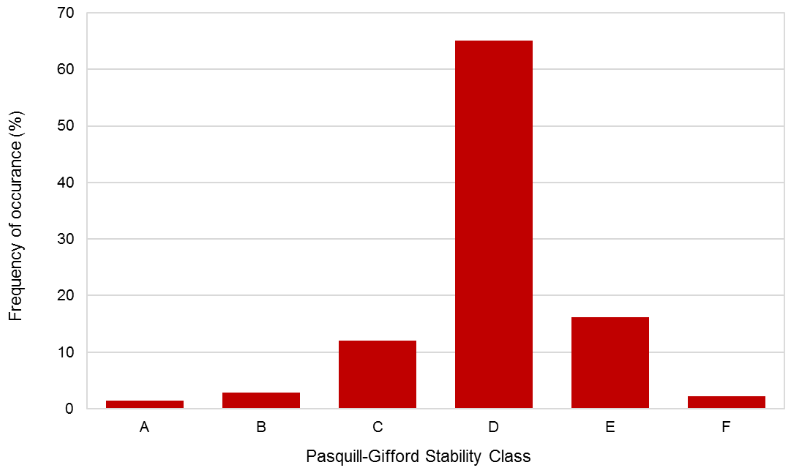


Figure 8 Annual stability distribution – Melbourne Airport

5.5.2 Summary

The directional incidence of poor dispersion is focussed to the east, northeast and south and consequently, the zone of odour impact will be extended to the east, northeast and south.

5.6 Background air quality

Schedule C Part B 3 (a) of the SEPP(AQM) states '*that Proponents required to include background data where no appropriate hourly background data exists must add the 70th percentile of one year's observed hourly concentrations as a constant value to the predicted maximum concentration from the model simulation. In cases where a 24-hour averaging time is used in the model, the background data must be based on 24-hour averages'.*

Section 3.3 of PEM 2007 states that '*The assessment of emissions from area sources must consider local air quality (i.e., existing air quality) in the vicinity of the mining or extractives operations. The assessment criteria are used to assess the total concentration of background plus emissions arising from activities on the site. Emissions from the mine or quarry must be managed to ensure that the cumulative impacts of all sources (including the mine or quarry) in the local area do not pose a risk to the health and amenity of local residents and that the beneficial uses specified in the SEPP (AQM) are protected'.*

Section 3.4 of the PEM 2007 also states 'For Level 2 assessments data collected by EPA that is considered representative of the location where the mining or extractives operation is proposed can be used. In some circumstances, representative data may not be available and some monitoring may be required. Contact EPA regarding availability of data'.

There is no known suitable background dust monitoring data available in Donnybrook, or even in a similar area in Victoria. Therefore, the adopted 24 hour PM_{10} background concentration was determined from the PEA AQMS at Deer Park between 2010 and 2015[9]. Only data during periods when the wind originates from the northwest and/or north was used. An average 24 hour PM_{10} concentration was determined for the years 2010 to 2015 and the 70th percentile calculated. A 24 hour $PM_{2.5}$ concentration was derived from the measured PM_{10} based on the ratio $PM_{2.5}$ to PM_{10} (approximately 25%) in rural areas where the major sources of particulate matter are from agricultural activities or unpaved roads.

The adopted background PM_{10} and $PM_{2.5}$ concentrations are presented in Table 5.

Table 5 Background Particulate Matter

Pollutant	Averaging Period	Concentration (µg/m^3)
PM10	24 hour	14.8
PM2.5	24 hour	3.7

5.7 Local noise and vibration sources

Site inspections of the site and the surrounding area were conducted by GHD on 4 August 2017 and 6 September 2017, during the day, evening and night time. This was supplemented in this assessment using aerial imagery.

The onsite inspection indicated that the ambient noise environment at the Shenstone Park PSP site was dominated by traffic noise associated with Donnybrook Road, involving several heavy vehicle pass-by movements servicing the nearby Woody Hill Quarry as well as development construction works within the Mickleham area (west of Donnybrook).

[9] Golder Associates, Air Quality Impact Assessment Tylden Quarry Expansion, Fulton Hogan, September 2016

The following audible local noise sources were observed during the inspection:

- Traffic noise associated with Donnybrook Road – dominant noise source
- Train noise (including freight trains) from the west of the PSP site – occasionally audible
- Woody Hill Quarry operational noise – occasionally audible within the PSP site, depending on the distance from the quarry boundary
- Aircraft flyover occasionally audible
- Insect, birds and frogs
- Wind in trees and dry grass

During the site inspections, there were no local neighbourhood activities that have the potential to cause significant vibration impacts to the PSP site. However, GHD understands from the Work Plan and DEDJTR that the Woody Hill Quarry and Phillips Quarry operations may involve blasting, which would have the potential to generate air blast overpressure and ground-borne vibration impacts at the PSP site. GHD did not observe any blasting activity being undertaken during the site inspections.

5.8 Background noise monitoring

Both long-term (unattended) and short-term (attended) noise measurements were conducted between 25 August 2017 and 6 September 2017 to define the existing background noise levels and to characterise the current noise sources within the vicinity of the PSP.

5.8.1 Instrumentation

Noise monitoring instrumentation was in current National Association of Testing Authorities (NATA) calibration at the time of use. All instruments were field-checked and calibrated both before and after noise measurements were undertaken. No discrepancies equal to or greater than 1 dB were noted throughout the measurement exercise as is required under Section 5.6 of Australian Standard AS 1055.1:1997 *Acoustics – Description and measurement of environmental noise Part 1: General procedures* (Standards Australia, 1997).

Noise instrument calibration was conducted using a Bruel & Kjaer IEC Class 1 acoustic calibrator model 4231.

Unattended noise monitoring was undertaken using environmental noise loggers capable of measuring continuous sound pressure levels and logging L_{A90} and L_{Aeq} noise descriptors (refer to Glossary). Details of the unattended monitoring instruments used are summarised in Table 6.

Table 6 Unattended noise monitor equipment details

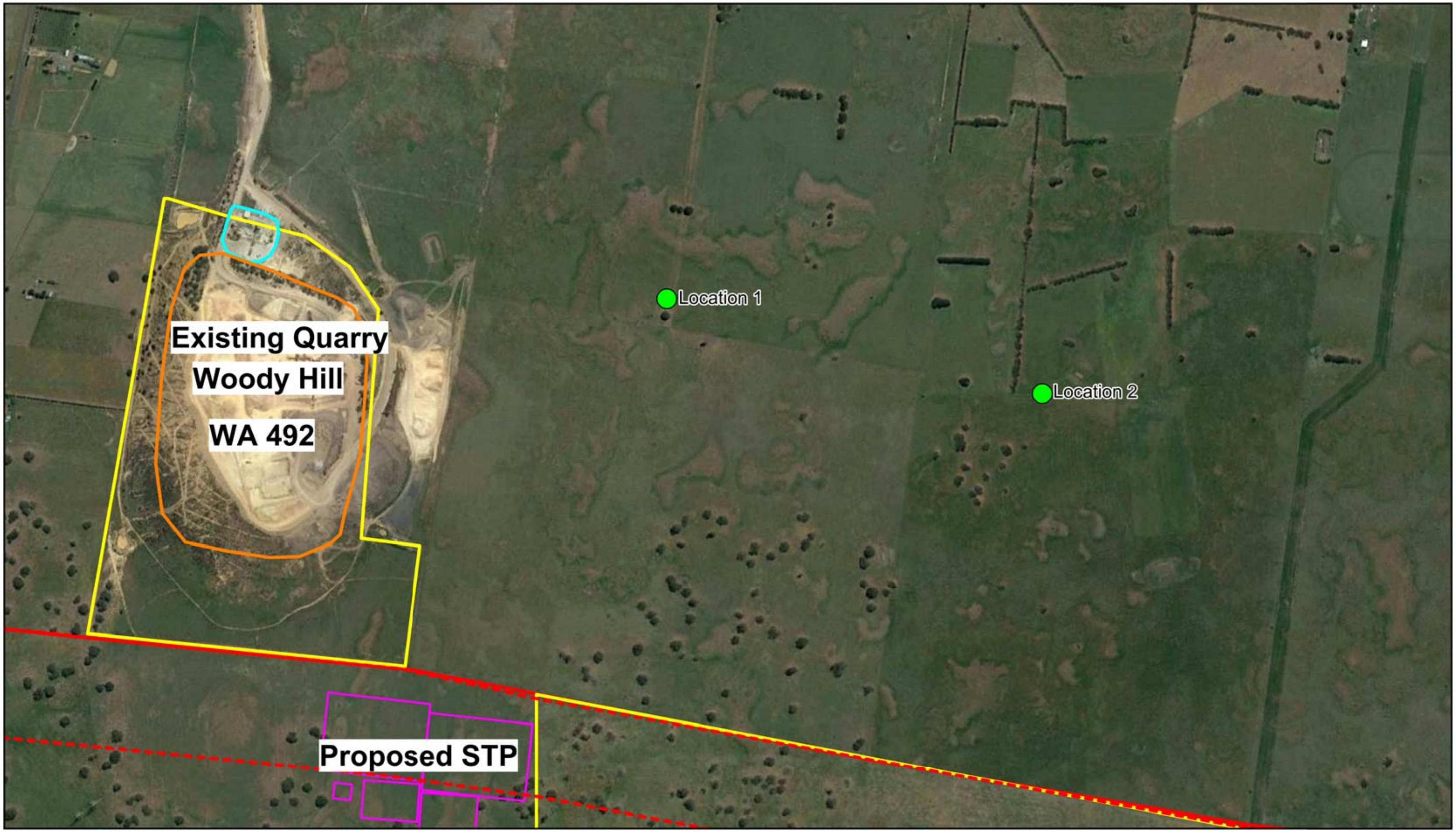
Model	SVAN 955	SVAN 955
Serial no.	27613	27615
Type	1	1
Start date	25 August 2017	25 August 2017
Finish date	6 September 2017	6 September 2017
Pre-measurement calibration check (94.0 db @ 1000 Hz)	94.0	94.0
Post-measurement calibration check (94.0 db @ 1000 Hz)	94.6	94.2
Time interval	15 minutes	15 minutes

Model	SVAN 955	SVAN 955
Frequency weighting	A	A
Time response	Fast	Fast
Engineering units	dB(A) SPL re:20 µPa	dB(A) SPL re:20 µPa

5.8.2 Unattended noise monitoring

Figure 9 shows the locations of the unattended noise monitoring, positions within the project site boundary. These locations were selected based on the following considerations:

- **Location 1 (960 Donnybrook Road)** – The monitoring location is located at a distance of approximately 400 m from the Woody Hill Quarry eastern boundary. This location was selected to assess the background noise environment within the PSP potentially affected by the quarry operational noise.
- **Location 2 (1030 Donnybrook Road)** – The monitoring location is located at a distance of approximately 1.25 km from the Woody Hill Quarry eastern boundary. This location was selected to assess the background noise environment within the PSP in the absence of operational noise from the quarry. Prior to selection of this monitoring location, GHD was advised by the tenant that operational noise from the Woody Hill Quarry was not audible at the property site.
- The monitoring locations were located away from Donnybrook Road, to minimise traffic noise influence in the background, to allow for a worst-possible case project noise criteria to allow protection from noise at potential future receivers located further from Donnybrook Road.



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metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Proposed STP
- Concrete Batching Plant
- Unattended Noise Monitoring Locations

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City of Whittlesea
Shenstone Park PSP-
Impact Assessment

Unattended Noise
Monitoring Locations

Job Number	3135311
Revision	A
Date	20/11/2017

Figure 9

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Google Earth Imagery 2017. Created by: M.A

5.8.3 Attended noise measurements

Attended background noise measurements were taken at the noise monitoring locations (loggers) on a tripod to supplement the unattended monitoring data.

Attended noise measurements were conducted using a Type-1 Bruel & Kjaer 2270 sound level meter (SLM), which conforms to the requirements of Australian Standards *IEC 61672.1-2004: Electroacoustic – Sound level meters Part 1: Specifications* (IEC 61672.1, 2004). The SLM was calibrated in the field before and after the measurements using a Bruel & Kjaer IEC Class 1 acoustic calibrator model 4231. No discrepancies equal or greater than 1 dB were noted throughout the measurement exercise as is required under section 5.6 of AS 1055.1:1997.

Table 7 provides details of the attended noise measurement equipment used for the assessment.

Table 7 Attended noise measurement equipment details

Measurement date	Equipment type	Equipment model	Serial number	Class (Type)	Octave band frequency mode	Weighting and response time	Calibration in dB @ 1000 Hz	
							Pre cal.	Post cal.
25 August 2017	Sound level meter (SLM)	Bruel & Kjaer 2270	3009634	1	1/3 Octave	A/Fast	93.5*	93.6*
25 August 2017	Preamplifier	Bruel & Kjaer ZC0032	25389	1	1/3 Octave	A/Fast	93.5*	93.6*
25 August 2017	Microphone	Bruel & Kjaer 4189	3086784	1	1/3 Octave	A/Fast	93.5*	93.6*
25 August 2017	Acoustic calibrator	Bruel & Kjaer 4231	2560035	-	-	-	-	-

* Calibration referenced to 94.0 dB at 1,000 Hz

5.8.4 Meteorological conditions

Current Victorian guidelines do not provide an explanation of what meteorological conditions would cause an environmental noise measurement to be considered unusable. Australian Standard *AS 1055.1:1997: Acoustics – Description and measurement of environmental noise* specifies that "*Where the maximum wind speed exceeds 5 m/s at the measurement position and noise measurement are* (sic) *required caution should be applied and special windscreens should be utilised*" (AS 1055.1:1997, p. 11).

The *NSW Industrial Noise Policy* (NSW INP, 2000) provides more detailed guidance on which meteorological conditions are suitable for monitoring and these have been adopted in this report. NSW INP, 2000 stipulates that "*noise monitoring should not be conducted (or data should be excluded) when average wind speed (over 15-minute periods or shorter) at microphone height are greater than 5 m/s, or when rainfall occurs*" (NSW INP, 2000, p. 26).

Rainfall and wind speed during the period of noise measurements were checked using the nearest Bureau of Meteorology (BoM) automatic weather station (AWS) situated at Melbourne Airport (AWS No. 086282), which is located approximately 16 km to the southwest of the project site.

The BoM weather monitoring data is taken at a standard measurement height of 10 m (mast height), which was then corrected down to a height of 1.5 m (height of noise logger microphone), using the standard logarithmic profile of wind speed with height in a neutral atmosphere (US EPA, February 2000). It is calculated that the wind speed at a height of 1.5 m is approximately 25 per cent weaker than the wind speed at a height of 10 m.

Average 15-minute noise measurements where the AWS wind speed was greater than 5 m/s or whenever rainfall occurred were both defined as ‘adverse weather’ conditions and were excluded from the background noise assessment.

5.8.5 Noise monitoring results

Time periods are broken into day, evening and night-time intervals, as described in Table 8. Table 9 and Table 10 summarise the results of the background noise monitoring measured continuously over each hour of the day, evening and night-time periods, as per Schedule C3.1 of the SEPP N-1. The results in this table are representative of background noise (L_{A90}) and the ambient noise (L_{Aeq}) levels during each respective time period. No façade adjustment was applied to the monitoring data, as the microphone was located in a free-field position.

Table 8 Prescribed assessment periods

Period	Time	Source
Day	7.00 am – 6.00 pm (Mon – Fri) 7.00 am – 1.00 pm (Sat)	(EPA Victoria, 2008)
Evening	6.00 pm – 10.00 pm (Mon – Fri) 1.00 pm – 10.00 pm (Sat) 7.00 am – 10.00 pm (Sun)	
Night	10.00 pm – 7.00 am	

Table 9 Summary of unatttended noise monitoring results at Location 1 (960 Donnybrook Rd)

Monitoring period	Background $L_{A90, 1hour}$ dB(A)				Ambient L_{Aeq} dB(A)		
	Day time	Evening	Night time	Night time (filtered to exclude Mon to Fri 6 am to 7 am)	Day time	Evening	Night time
Friday 25 August 2017		--	33	33		--	46
Saturday 26 August 2017	45	39	37	37	51	46	47
Sunday 27 August 2017	N/A	35	33	32	N/A	48	45
Monday 28 August 2017	43	29	34	33	50	40	47
Tuesday 29 August 2017	43	41	37	36	50	48	48
Wednesday 30 August 2017	47	32	30	28	53	38	45

Monitoring period	Background $L_{A90, 1hour}$ dB(A)				Ambient L_{Aeq} dB(A)		
	Day time	Evening	Night time	Night time (filtered to exclude Mon to Fri 6 am to 7 am)	Day time	Evening	Night time
Thursday 31 August 2017	40	36	34	32	49	43	47
Friday 1 September 2017	--	43	--	--	--	48	--
Saturday 2 September 2017	--	--	--	--	--	--	--
Sunday 3 September 2017	N/A	--	39	39	N/A	--	49
Monday 4 September 2017	--	--	--	--	--	--	--
Tuesday 5 September 2017	--	--	38	37	--	--	48
Wednesday 6 September 2017	--				--		

"N/A" denotes no daytime prescribed hours under Sunday.

"--" denotes data excluded due to potentially spurious results caused by construction noise, existing site operation, adverse weather conditions, extraneous noise events, insufficient data or no data available.

L_{Aeq} overall values were based on logarithmic average and L_{A90} overall values were based on arithmetic value.

Where a cell in the table contains no information, no monitoring occurred during this period due to the timing of deployment and retrieval of the noise measurement equipment.

The background noise levels (L_{A90}) for the night-time period in Table 9 have been filtered to exclude the 6 am to 7 am (Monday to Friday) period, due to the potential for influence from operation of the existing Woody Hill Quarry (refer to section 4.1.1), and to allow for comparison between the two logging locations and for deriving the noise criteria in section 8.1.

Table 10 Summary of unatttended noise monitoring results at Location 2 (1030 Donnybrook Rd)

Monitoring period	Background $L_{A90, 1hour}$ dB(A)			Ambient L_{Aeq} dB(A)		
	Day time	Evening	Night time	Day time	Evening	Night time
Friday 25 August 2017		--	35		--	45
Saturday 26 August 2017	41	39	37	49	57	46
Sunday 27 August 2017	N/A	35	33	N/A	51	43
Monday 28 August 2017	38	31	37	45	42	45
Tuesday 29 August 2017	41	42	38	49	48	45
Wednesday 30 August 2017	45	33	31	50	41	41
Thursday 31 August 2017	36	37	38	47	45	46
Friday 1 September 2017	--	43	--	--	48	--
Saturday 2 September 2017	--	--	--	--	--	--
Sunday 3 September 2017	N/A	--	38	N/A	--	47
Monday 4 September 2017	--	--	--	--	--	--
Tuesday 5 September 2017	--	--	38	--	--	45
Wednesday 6 September 2017	--			--		

"N/A" denotes no daytime prescribed hours under Sunday.

"--" denotes data excluded due to potentially spurious results caused by construction noise, existing site operation, adverse weather conditions, extraneous noise events, insufficient data or no data available.

L_{Aeq} overall values were based on logarithmic average and L_{A90} overall values were based on arithmetic value.

Where a cell in the table contains no information, no monitoring occurred during this period due to the timing of deployment and retrieval of the noise measurement equipment.

Results are also presented in a graphical format in Appendix C. The attended background noise measurement results are provided in Table 11. Note that there was no Woody Hill Quarry operational noise audible at the time of GHD site visit at both monitoring locations.

Table 11 Summary of attended background noise measurement results

Measurement location	Period	Starting measurement date & start time in (hh:mm)	Measurement duration (mm:ss)	Background noise levels L_{A90} dB(A)	Ambient noise levels L_{Aeq} dB(A)	Maximum noise levels L_{Amax} dB(A)	Minimum noise levels L_{Amin} dB(A)	Comments
At logger location 2 (1030 Donnybrook Rd)	Daytime	25 August 2017 (5:28 pm)	15:00	31	39	58	29	• Background noise environment was dominated by traffic noise associated with Donnybrook Road • Occasional noise from birds, frogs, cow(s) • Occasional aircraft flyover noise in distance
At logger location 1 (960 Donnybrook Rd)	Evening	25 August 2017 (9:00 pm)	15:00	36	45	60	33	• Background noise environment was dominated by traffic noise associated with Donnybrook Road and frogs • Occasional noise from birds • Occasional train noise • Occasional aircraft flyover noise in distance
At logger location 2 (1030 Donnybrook Rd)	Evening	25 August 2017 (9:45 pm)	15:00	38	43	60	33	• Background noise environment was dominated by traffic noise associated with Donnybrook Road and frogs • Occasional train noise in distance • Occasional aircraft flyover noise in distance
At logger location 1 (960 Donnybrook Rd)	Night-time	25 August 2017 (10:30 pm)	15:00	35	43	59	31	• Background noise environment was dominated by traffic noise associated with Donnybrook Road and frogs • Occasional train noise • Occasional aircraft flyover noise in distance
At logger location 2 (1030 Donnybrook Rd)	Night-time	25 August 2017 (11:00 pm)	15:00	35	39	54	32	• Background noise environment was dominated by traffic noise associated with Donnybrook Road and frogs • Occasional train noise • Occasional aircraft flyover noise in distance • Industrial noise in distance, from the south

6. Buffer assessment

This section applies the generic separation distances for quarries and STPs as specified in EPA Publication 1518. The separation distances are based on EPA experience, as to the range at which complaints are received in the event of an upset drop to a minimum. It does not take account of the specific operations of the two quarries (one existing, one approved) and the proposed STP in question. These are addressed for dust, noise, vibration, blasting and odour impacts in sections 7, 8, 9, 10 and 12 respectively.

It should be noted that these latter assessments are to quantify the impact of **routine** operations at quarry and STP operations, whereas the buffer assessment gives the required separation under **upset/malfunction** conditions, in order to minimise impact at sensitive land uses. The criteria to be met for routine emissions are more stringent than that provided by a separation distance because the likelihood of exposure to an upset/malfunction is very much lower than to routine emissions.

While the quantitative assessments are specific to the operation in question, the results cannot be translated to a process-specific separation distance without also characterising: (i) the factor of increase of the emission above routine levels during the upset, (ii) the likely duration of the upset, and (iii) the upset event 'return interval'.

6.1 The importance of buffer distances

When there is an inadequate separation distance between an industry and sensitive land uses, remedial action to alleviate offsite impacts may be uneconomic. Therefore, the viability of the industry is jeopardised and the off-site effects are not alleviated. Provision of adequate separation distances seeks to avoid these situations.

Two classes of buffer distance guidelines are relevant in the context of planning in Victoria, namely threshold distance and separation distance.

Threshold Distance

Where there is an industrial use **proposed** on a land parcel, then the provisions of Clause 52.10[10] under the Victorian Planning Provisions (VPPs) as specified in the relevant planning scheme, will apply. In effect, if the industry is specified in the Table to the Clause, then the corresponding threshold distance to the nearest Residential Zone, Capital City Zone or Docklands Zone must be met. A planning permit may be sought to reduce the minimum separation distance; however, the proponent will need to demonstrate that potential offsite impacts would be negligible. However, the use of land for a quarry or sewerage treatment plant are not categorised as industrial uses and therefore are not included in the Table to Clause 52.10. Clause 52.09 of the Particular Provisions manage use of land for Stone Extraction and Extractive Industry Interest Areas, which apply to use and development of land for the quarries. The purpose of this clause is:

- *'To ensure that use and development of land for stone extraction does not adversely affect the environment or amenity of the area during or after extraction.*
- *To ensure that excavated areas can be appropriately rehabilitated.*
- *To ensure that sand and stone resources, which may be required by the community for future use, are protected from inappropriate development.'*

[10] Victorian Planning Provisions, Clause 52.10 "Uses with Adverse Amenity Potential"

The provisions of the clause apply to the use and development of land within 500 m of stone extraction.

Separation Distance

In the case of an **existing** industrial use, the use of zoning mechanisms (i.e. industrial zones, the Special Use Zones (SUZ)) or planning overlays (i.e. an Environmental Significance Overlay), specified in the relevant planning scheme, allow for industrial activities with potential offsite impacts to be identified, and where required, separation distances between the industrial emission point and nearest proposed sensitive land uses may be defined. The EPA[11] separation distances should be considered when preparing a planning scheme, planning scheme amendment or planning permit application.

The EPA separation distances are recommendations only (guidelines) and cannot be enforced except by implementation in the planning scheme.

A separation distance between potentially incompatible uses can be applied via the Planning Scheme (via a Planning Scheme Amendment) to provide separation of sensitive land uses (i.e. residential, schools, hospitals and recreation reserves) from existing industrial premises with the potential for offsite emissions (odour or dust) that can cause disamenity in the event of an upset/malfunction.

Under routine operations, SEPP (AQM) objectives should be met and odour/dust impacts should be confined onsite by the implementation of environmental management practices. Unlike routine emissions, unintended emissions are often intermittent or episodic and may originate at or near ground level. Separation distances seek to avoid the consequence of upset industrial residual air emissions.

The purpose of the EPA separation distance guidelines is to provide recommended minimum separation distances between odour or dust emitting industrial land uses and sensitive land uses. Accordingly, the relevant sections of the guideline for this assessment are to:

- Provide clear direction on which land uses require separation
- Inform and support strategic land use planning decisions
- Prevent new sensitive land uses from impacting on existing industrial uses
- Prevent new or expanded industrial land uses from impacting on existing sensitive land uses
- Identify compatible land uses that can be established within a separation distance area

The separation distances are to be scribed as per EPA Guidelines Method 1 (Urban method). This method requires that the separation distance be measured from the activity boundary of the industry to the property boundary of the sensitive land use, i.e. this activity boundary of the industry is a convex polygon containing the activities of the industry.

Note that noise, vibration, ambient and hazardous air pollutants are not considered in the separation guideline. Other regulations, polices and guidance relevant to the consideration of land use separation for protection from the above impacts include:

- State Environment Protection Policy Air Quality Management (SEPP-AQM)
- State Environment Protection Policy (Control of Noise from Commence, Industry and Trade) No. N-1)
- Land Use Planning Near Major Hazard Facilities, WorkSafe, 2010

[11] EPA Victoria Publication 1518 dated March 2013

- Victoria Planning Provisions (VPPs), Department of Planning and Community Development
- EPA Victoria: State Environment Protection Policy – Control of Noise from Commerce, Industry and Trade No. N-1 (SEPP N-1)
- EPA Victoria: State Environment Protection Policy – Control of Music Noise from Public Premises No. N-2 (SEPP N-2)
- EPA Victoria: Noise Control Guidelines Publication 1254 (2008)
- Victorian Government: Passenger Rail Infrastructure Noise Policy (April 2013)
- Australian Standards AS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors
- Australian Standard AS 3671:1989 Acoustics – Road Traffic Noise Intrusion, Building Site and Construction
- Australian Standard AS 2631.2:2014 – Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration – vibration in buildings (1 Hz to 80 Hz)
- Australian Standard 2436:2010 – Guide to noise and vibration control on construction, demolition and maintenance sites

6.2 Default separation distances

In this case, the EPA Victoria (EPA) recommended separation distance guidelines that apply to existing industries in the vicinity of the subject site are the relevant current guidelines to inform planning for land uses within the PSP.

EPA has published[12] recommended separation distances for selected industry categories (EPA Guidelines) that replace the earlier buffer guideline. Separation distances can be used to define zones of land offsite from the industry premises, which are constrained from development for sensitive land uses.

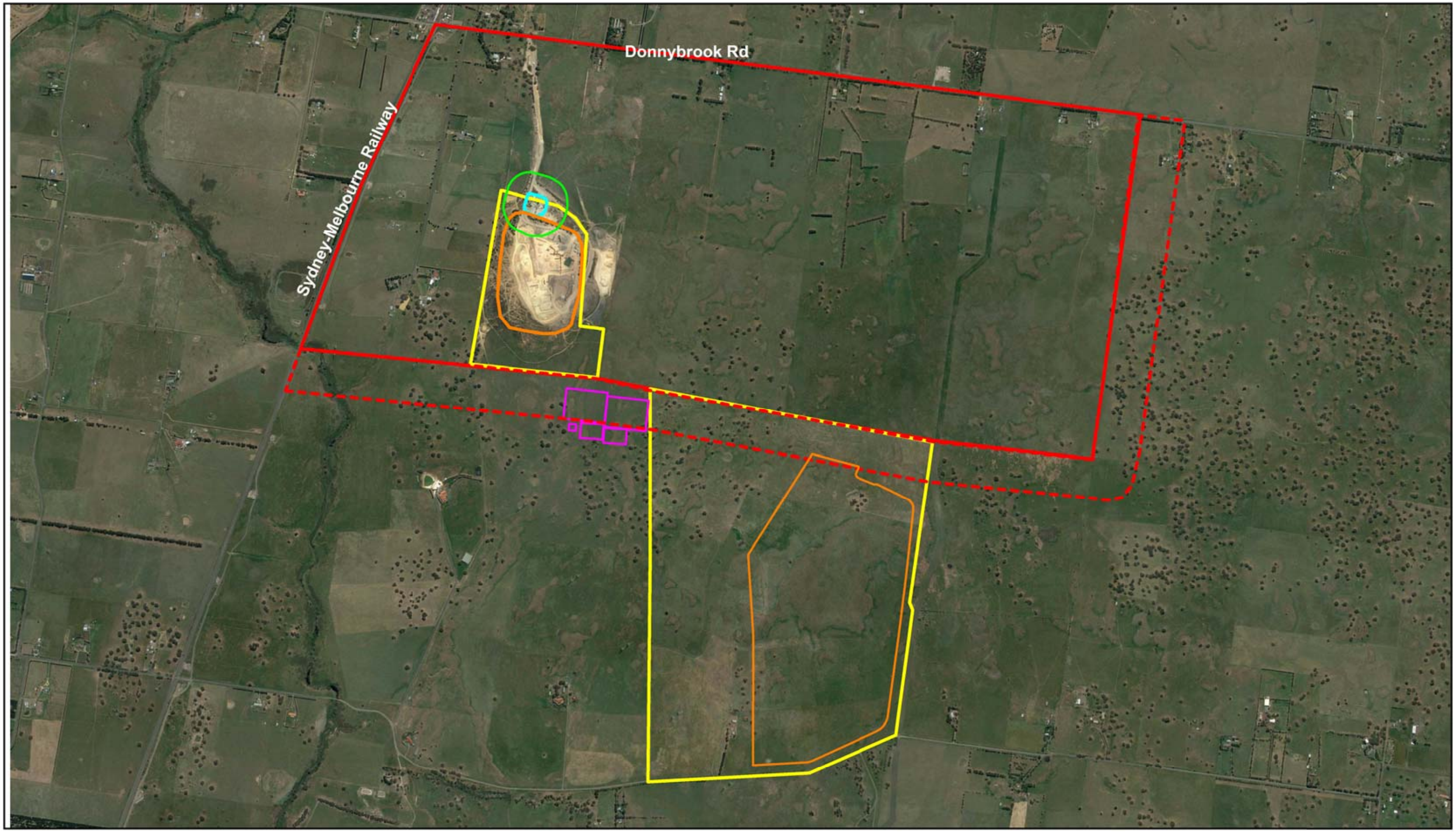
GHD has applied the EPA separation distances to the existing, approved and proposed industries for the purposes of defining the appropriate separation distances required. The EPA separation distances will apply to the two facilities once they are operational.

The default buffers presented in this assessment have been scribed from the activity boundaries as required in the EPA's separation guidelines (Method 1 'Urban Method').

6.2.1 Concrete batching plant

Under the EPA buffer guideline, a concrete batching plant is recommended to require a buffer of 100 m. The 100 m buffer distance has been applied to the existing concrete batching plant in Figure 10. Figure 10 shows that the buffer extends beyond existing Work Authority area, however is well clear of any existing sensitive receptors.

[12] EPAV 2013 "Recommended separation distances for industrial residual air emissions" Pubn. 1518, March 2013



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metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Proposed STP
- Concrete Batching Plant
- 100 m Default Buffer

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City of Whittlesea
Shenstone Park PSP-Impact Assessment

Concrete batching plant buffer - Woody Hill

Job Number	3135311
Revision	A
Date	20/11/2017

Figure 10

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Google Earth Imagery 2017. Created by: M.A

6.2.2 Quarry processing plant

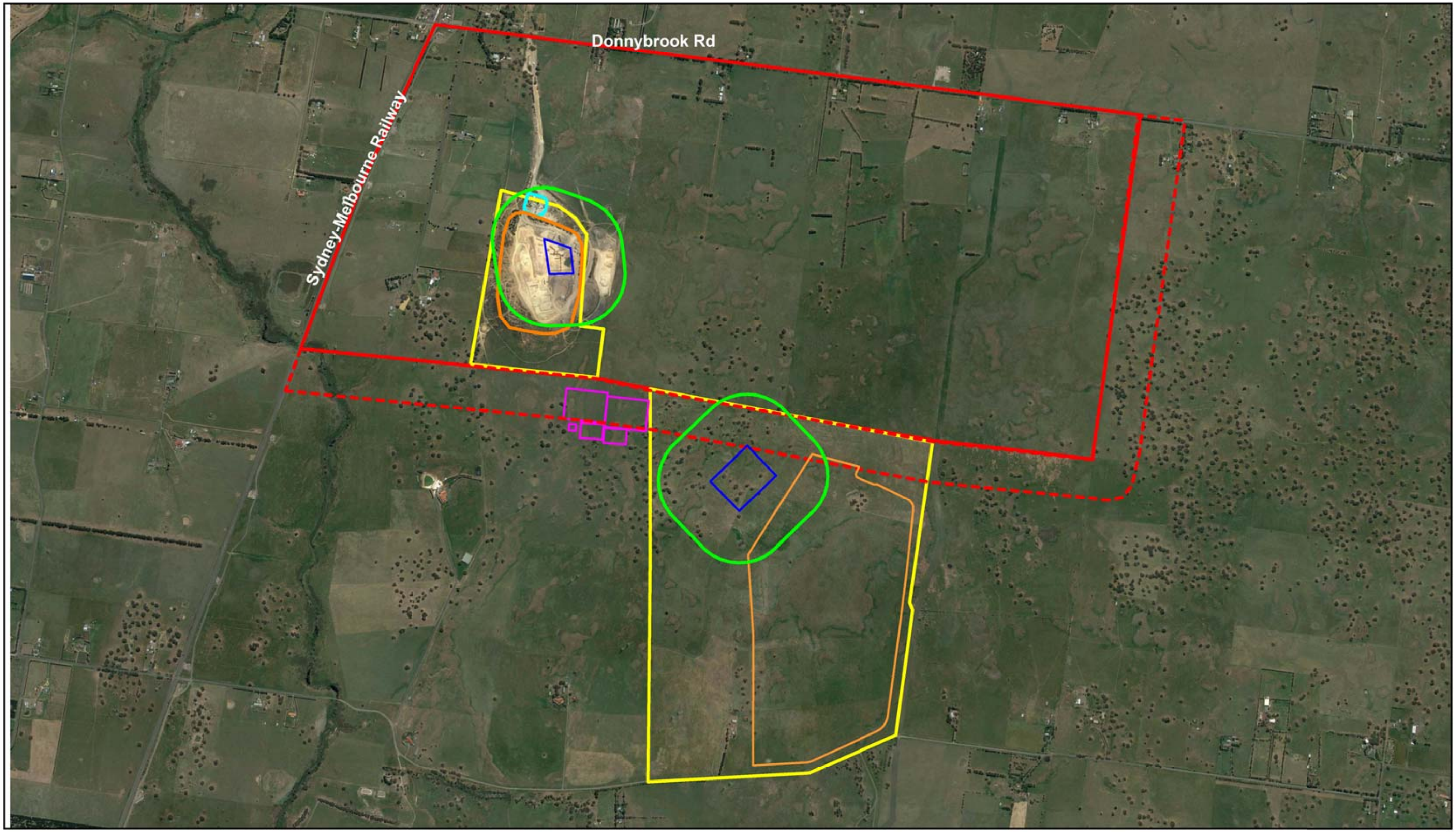
Rock crushing and screening is listed under the quarry category cited in the guideline under 'quarry - without blasting' - and is set a buffer of 250 m.

Woody Hill Quarry

Figure 11 shows the 250 m buffer applied to the envelope of the crushing and screening plant is mostly contained within the Works Authority with a small extension ~ 90 m over the eastern boundary onto PSP land.

Phillips Quarry

Figure 11 shows the 250 m buffer applied to the envelope of the proposed crushing and screening plant is mostly contained within the Works Authority boundary with a small extension ~ 100 m to the north onto PSP land.



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metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Proposed STP
- Concrete Batching Plant
- Processing Plant
- Default 250 m Buffer

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City of Whittlesea
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Impact Assessment

Job Number | 3135311
Revision | A
Date | 20/11/2017

Processing Plant Buffers

Figure 11

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6.2.3 Active quarry with blasting

From the guideline, an active quarry with blasting has a recommended buffer of 500 m. Though not specified in the guideline, the 250 m difference in separation distance applying to blasting activities at 500 m and auxiliary activities, has been interpreted to account for dust particles associated with the blast that can be transported further distances[13]. Prior to receipt of this advice, GHD had assumed that the doubling to 500 m was to account for the possibility of flyrock extending to that distance.

Note that the buffer as per Method 1 in the EPA guideline requires it to be drawn from the envelope of potential sources. GHD has taken this envelope to be the envelope of the existing and approved extraction boundaries for the two quarries rather than the Work Authority boundary.

Further information on blast related impacts from quarry operations are discussed in sections 10, 11, and 12 in this report.

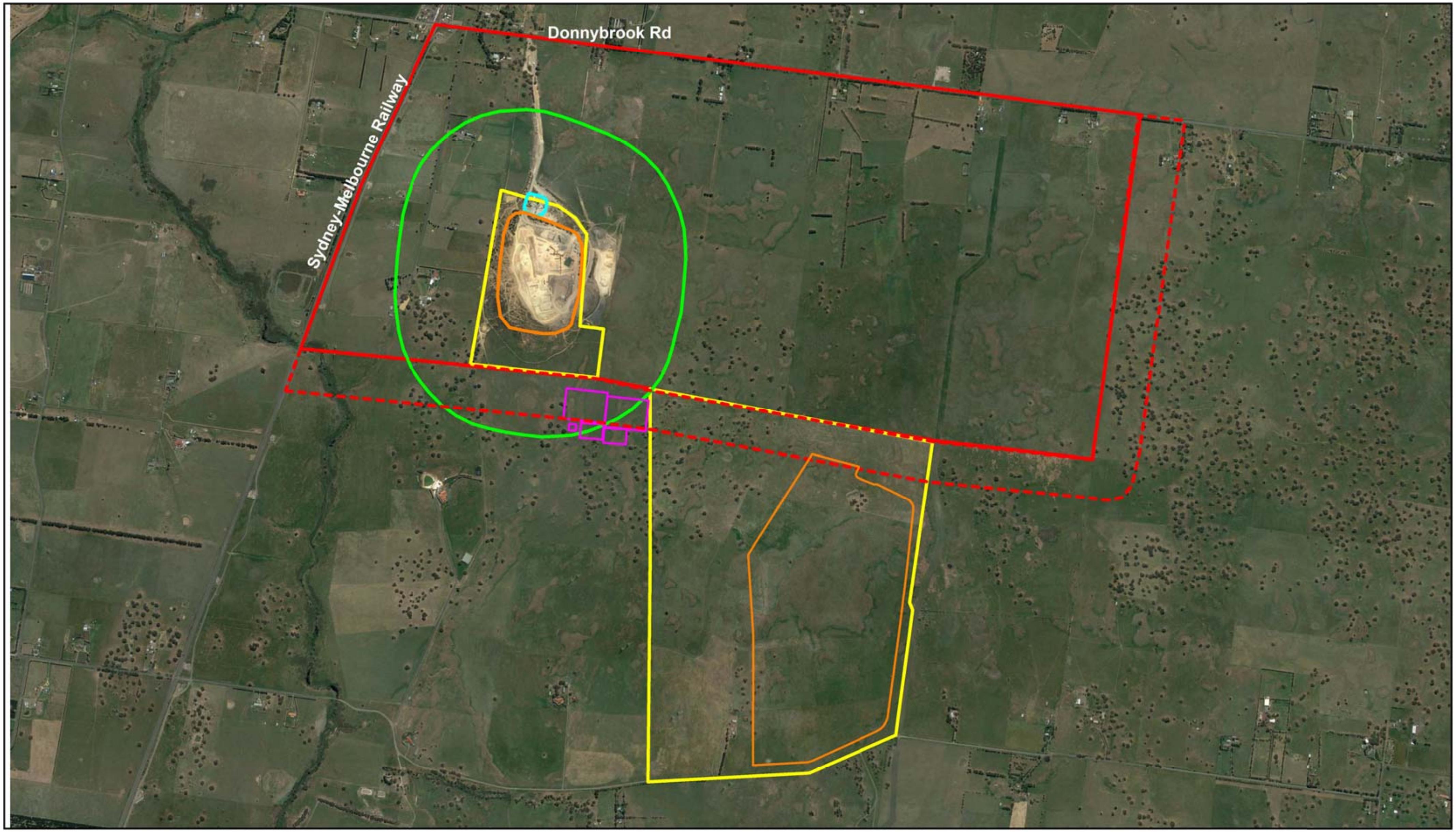
Woody Hill Quarry

Figure 12 shows the 500 m buffer applied to the envelope of the existing extraction area within the existing Work Authority 492 boundary. The buffer extends beyond the site boundary in every direction encompassing two existing sensitive receptors. The 500 m buffer extends approximately 500 m east from the WA boundary onto the PSP land.

Phillips Quarry

Figure 13 shows the 500 m buffer applied to the envelope of the approved extraction area within the Work Authority 160 boundary. The buffer extends beyond the WA boundary in every direction except for the west, including a substantial portion (extending some 320 m) of the southern section of the PSP.

[13] EPA email advice dated 02/11/2017 from Paul Torre - Senior Applied Scientist - Air & Odour / Principal Expert - Air



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metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Concrete Batching Plant
- Proposed STP
- Default 500 m Buffer

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City of Whittlesea
Shenstone Park PSP-Impact Assessment

Woody Hill Active Quarry Buffers

Job Number	3135311
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Date	20/11/2017

Figure 12

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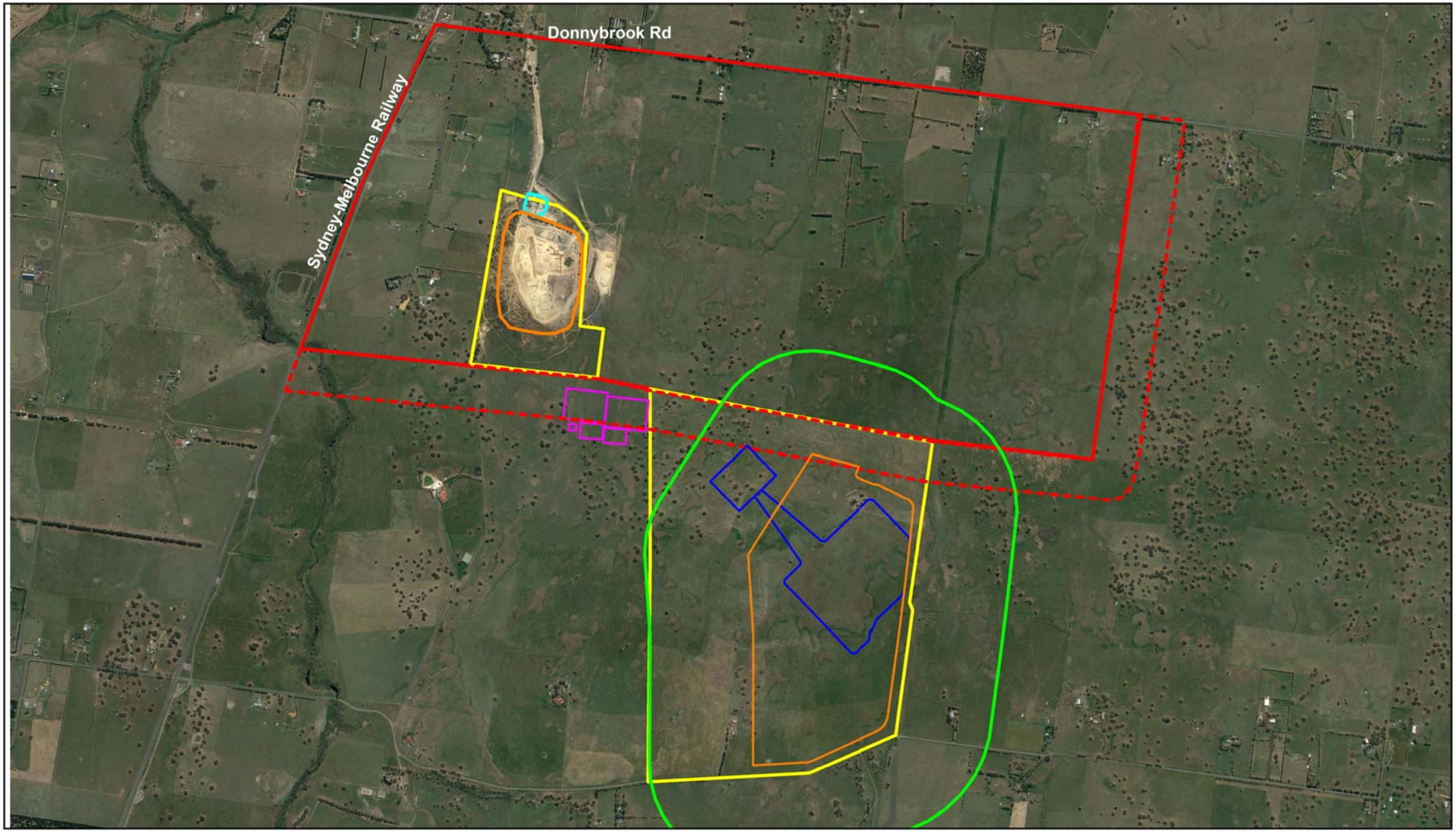

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metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N
W E
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LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Concrete Batching Plant
- Proposed STP
- Default 500 m Buffer
- Proposed Stage 1 plus processing plant

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City of Whittlesea
Shenstone Park PSP-
Impact Assessment

Phillips Active
Quarry Buffers

Job Number | 3135311
Revision | A
Date | 20/11/2017

Figure 13

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6.2.4 Wollert STP

The separation distances for sewage treatment plants are given as a function of the size of the population they serve and the type of treatment process. The equations in Table 12 (Table 6 of publication 1518) are recommended when considering proposals for new and existing sewage treatment plants.

Table 12 Separation distances for sewage treatment plants (in metres)

Type of installation	Separation distance (n= equivalent population)
Mechanical/ biological wastewater plants	$=10n^{1/3}$
Aerobic pondage systems	$=5n^{1/2}$
Facultative Ponds	$=10n^{1/2}$
Disposal areas for secondary treated effluent by spray irrigation	200 m
Disposal areas for secondary treated effluent by flood irrigation	50 m

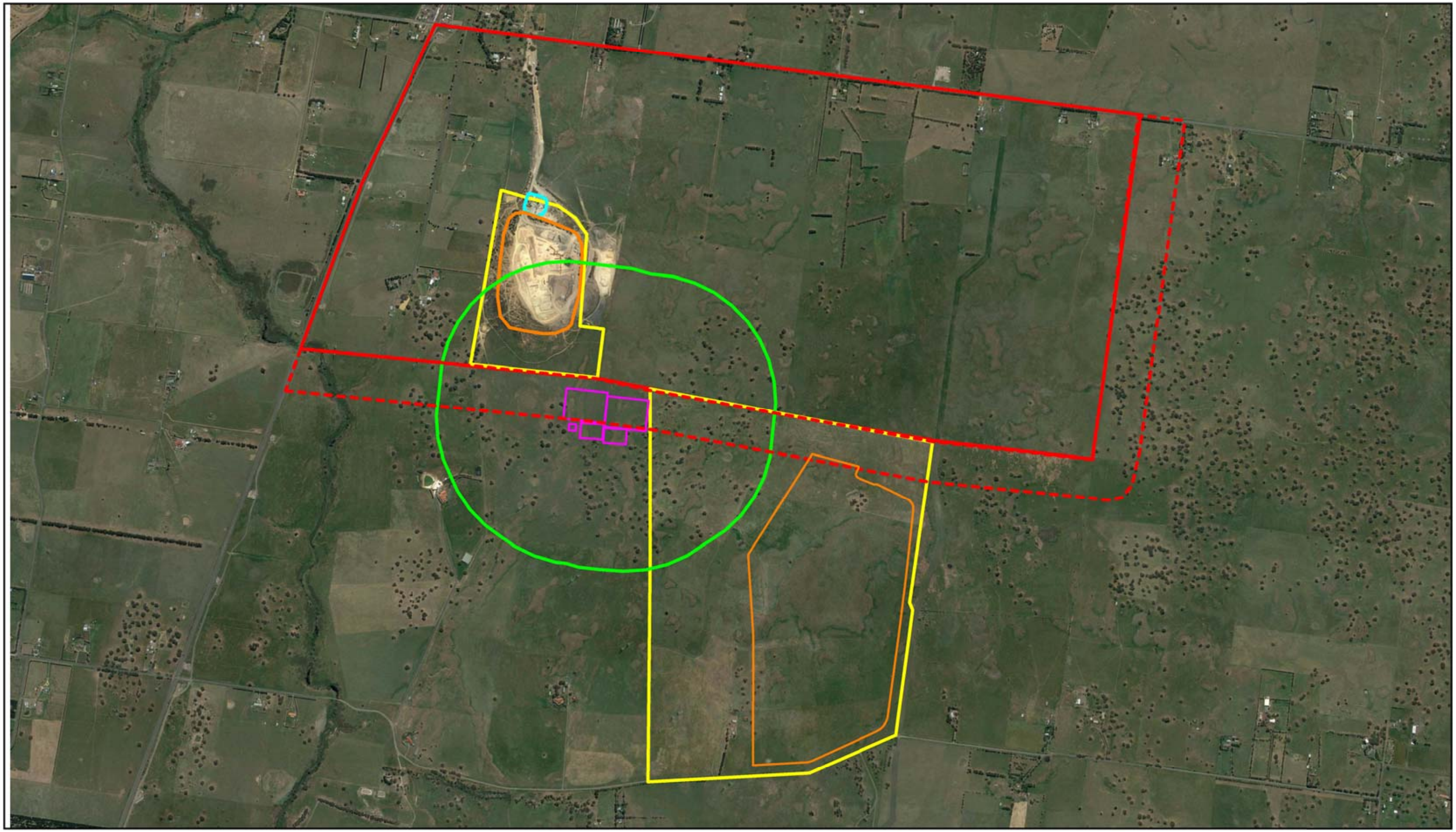
The proposed Wollert STP would be classified as a mechanical/ biological STP. In scribing the buffer for the STP, the proposed envelope of the component unit processes (as supplied by YVW) has been used by GHD.

The buffer distances for the population projections is presented in Table 13 below.

Table 13 Separation distances for Wollert STP

Year	Equivalent Population (ep)	Mechanical/biological wastewater plants separation distance (m)
2028 (without large industrial customer)	70,000	412
2028 (with large industrial customer)	190,000	575
2033 (without large industrial customer)	120,000	493
2033 (with large industrial customer)	230,000	613

In order to plan for the largest possible configuration proposed by YVW, the 613 m separation distance should be applied to the proposed plant. Figure 14 shows that this buffer extends 550 m into the southern margin of the PSP.



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0 250 500 750

metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Concrete Batching Plant
- Proposed STP
- Default 613 m Buffer

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City of Whittlesea
Shenstone Park PSP-Impact Assessment

Wollert STP
Buffer (year 2033)

Job Number	3135311
Revision	A
Date	20/11/2017

Figure 14

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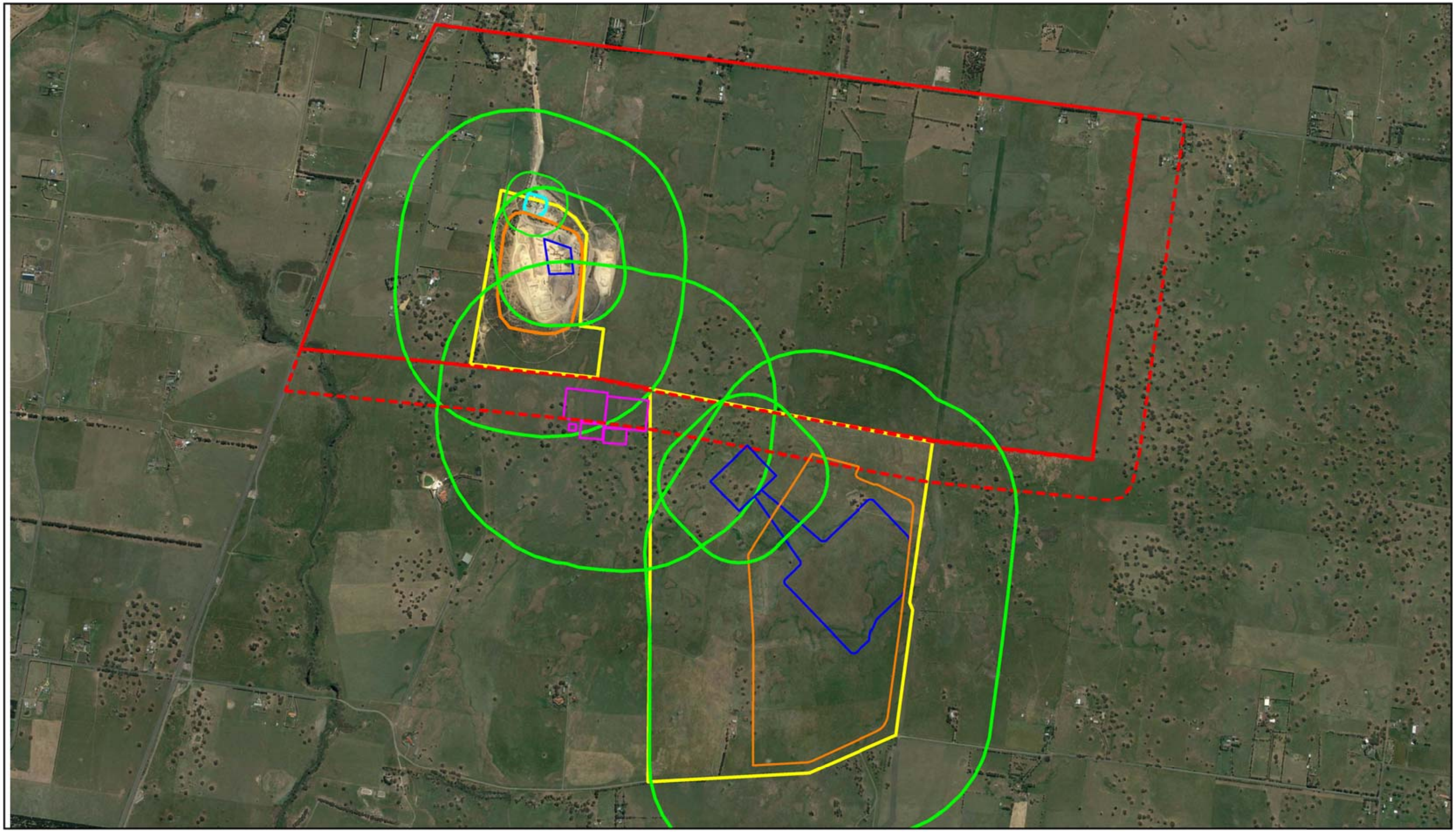
6.3 Default buffer summary

The PSP includes and is abutted by special use zoned land, on which a number of existing industries operate that attract a buffer distance. The portions of the PSP land which lie outside the buffer from a given industrial premises, indicates that emissions from routine operations from that premises should not give rise to disamenity, as the emission rate under upset conditions will be significantly higher than during routine operations. The purpose of a default buffer is to minimise impact at offsite sensitive land uses from unintended emissions in the event of a process upset or malfunction.

However, whether or not land is encroached by a buffer does not dictate the consequent amenity experience. Buffers are standardised distances that assume the industry is operated under ‘good practice’ conditions that are typical of the industry. Most buffers in the EPA guidelines are not specified as a function of the operation’s size (with the exceptions of STPs, broiler farms and composting operations) and none explicitly take into account the effect of site-specific meteorological conditions. These two factors greatly affect emissions and subsequent dilution respectively, and can vary significantly between premises in the same industry category. Emissions during an upset/malfunction can thus extend beyond the buffer boundary, at levels that could cause disamenity.

Application of the EPA default buffer distances indicates that there are portions of the PSP that are constrained from sensitive land uses by these buffers refer to Figure 15.

The EPA do allow for site-specific variation to the default buffer distances and this is presented in section 6.4.



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metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Concrete Batching Plant
- Proposed STP
- Default Buffers

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City of Whittlesea
Shenstone Park PSP-Impact Assessment

All default Buffers

Job Number | 3135311
Revision | A
Date | 20/11/2017

Figure 15

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6.4 Considerations for site-specific variation to default buffers

The EPA allows for site-specific variation to the default buffer distance for a given industry and identifies six criteria to consider in Table 4 of the guideline. These criteria are:

- Transitioning of the industry – If the industry has any plans to transition out of the area a reduced buffer can be negotiated for those industries.
- Plant equipment and operation – If the plant has a high standard of emission technology or has evidence of no upset or malfunctions occurring then a reduced buffer would be more appropriate.
- Environmental risk assessment (ERA) – An ERA would need to be completed to assess this option, this will require specific knowledge of process operations and emission rates.
- Size of the plant – If the throughput is small for the particular industry compared to large examples within their industry then it would be possible to de-rate the buffers based on throughput.
- Topography or meteorology – Site-representative meteorology can be used to produce directional buffers. Refer to section 6.4.4 for all the identified constraining industries nearby.
- Likelihood of IRAEs – The likelihood of residual emissions from the identified industries would need to be assessed once specific operational information was obtained regarding their operations including how frequently upset conditions occur, and the assessment would rely on a detailed complaint history from the residential area encompassed within the default buffer.

It is likely that some of the factors listed above could vary the default buffer, if specific operational details about the industry are known, which is addressed below.

6.4.1 Transitioning of the industry

The separation guidelines also state that under the Victorian Planning Provisions (VPPs) industrial land uses have rights, which enable the industry to operate, provided they comply with relevant regulations. Where a planning authority is undertaking a process of significant land use change, such as development of a PSP, it should consult with potentially affected industries in order to develop a staged implementation plan that allows for the smooth transition of land uses over time.

The separation guidelines allow the recommended separation distances to be varied (i.e. reduced) for site-specific cases. One of the criteria for varying the separation distances is the case of “transitioning of the industry”. In this case, it is unlikely that the Woody Hill Quarry will be transitioning in the near future given they have reserves until 2033. Given the approved Phillips quarry and proposed Wollert STP are yet to be operational, it is unlikely that they will come and go in a short period of time, hence appropriate planning mechanisms should be put in place to protect these industries from sensitive use encroachment – a notion supported by Clause 14.03 of State Planning Policy – *Resource exploration and extraction*. The policy contains the following strategies:

- Protect the opportunity for exploration and extraction of natural resources where this is consistent with overall planning considerations and application of acceptable environmental practice
- Provide for the long-term protection of natural resources in Victoria
- Recognise the possible need to provide infrastructure for the exploration and extraction of natural resources

6.4.2 Plant equipment and operation

If the plant has a high standard of emission technology or has evidence of no upset or malfunctions occurring (or they occur very rarely) then a reduced buffer would be more appropriate. This information would require cooperation from the industry.

6.4.3 De-rating a default buffer – allowance for plant size

The default buffers are normally set for the larger examples of each industry, so that where there is a large variation in industry throughput, the default value can be derated to allow for this. The logic is that where a given premises has a throughput much lower than the larger examples of that industry, then either: (i) the size of an upset (and consequential impact) will be smaller, or (for a modular process unit) the likelihood that a process upset will occur is much reduced. Hence, for a given degree of protection from offsite impact, the buffer can be reduced. GHD has developed a method[14] to derate the default buffer based on a measure of throughput.

Note that the same method was adopted by EPA in the guideline for wastewater treatment plants. It is also adopted via the Victorian Broiler Code for meat chicken production and for composting operations via the EPA Composting guidelines[15].

Given the buffers for STPs already account for size, derating based on throughput could only apply to the quarries. However, the separation distance required for blasting at the active quarry face will be independent of throughput, as only either the frequency of blasting, or the linear extent of each blast will reduce with throughput. The default 500 m to allow for blasting will remain unaltered, as it is not tenable to reduce this distance on the basis that the blasts would be less frequent for a small quarry.

GHD considers that the appropriate buffer for the active quarry area with blasting is the default 500 m buffer, irrespective of the throughput of the quarry. A reduction in the default value could only be contemplated based on specific information on the blast sequence to be adopted at each site.

6.4.4 Local meteorology - directional buffer

In conducting this assessment, those industries requiring buffers based on their potential for offsite dust impact located in or near the site, have been identified. The potential for a dust impact within the site is reliant on dust emissions from a premises coinciding with:

- A wind direction placing elements of the sensitive uses directly downwind
- The occurrence of a 'spike' in emissions from the premises
- The occurrence of 'poor dispersion' conditions for odour
- Either the occurrence of 'good dispersion' conditions i.e. strong winds able to erode exposed dusty surfaces, thereby increasing dust emission rates
- Or the occurrence of 'poor dispersion' i.e. light stable winds for mechanically generated dust sources, thereby increasing dust levels downwind because of poor dispersion in the dust plume

These factors can at least in part be assessed for the candidate industry premises and the likelihood of their concurrence can be estimated.

[14] Clarey P, Pollock T 'Integrating Separation Distances with Dispersion Modelling' Enviro 04, 28 March – 1 April, darling harbour, Sydney
[15] EPAV 2015 "Designing, constructing and operating composting facilities", Pubn. 1588, March 2015

The default buffers are normally applied as a radial distance scribed from the envelope of potential odour and/or dust sources at the premises as detailed in section 6.2. In effect, a radial buffer distance is resorted to in situations where there is no information on the local meteorology, i.e. the directions of good and poor dispersion are unknown. When site-representative meteorology is available, then these directions of good and poor dispersion can be assessed, and the default buffer can respectively be retracted and extended. When this is done, the directional buffer formed serves to provide the same degree of protection from upset odour and/or dust events, independent of the direction of the sensitive land use from the emitting premises.

Section 9.2 of the EPA buffer guideline allows for site-specific variation based on topographical or meteorological features, which will affect dispersion of industrial residual air emissions. GHD has developed an approach to provide directionally dependent buffers based on the dispersive ability of the atmosphere, as assessed using atmospheric dispersion modelling (Clarey & Pollock, 2004).

Where site-representative meteorological data is available, the directions of good and poor dispersion can be identified as shown in section 5. Further, if the 12-month dataset is configured to a dispersion model format (deriving atmospheric stability category) then dispersion modelling can be conducted using a nominal air source emission rate to assess the directional change in extent from a default radial buffer[16].

The buffer so formed is sized to have the same enclosed area as the radial default buffer and is termed a directional buffer. A directional buffer has the advantage that the protection afforded by its separation is independent of the direction from the source.

This was performed using the Melbourne Airport meteorological dataset and adopting a nominal 10 m x 10 m area source with a nominal emission rate. The 99.5% contour that provides the same enclosed area as a 500 m radius circle (i.e. 785,398 m^2) was selected and is presented in Table 14. From Table 14, it is seen that the extent of the contour is greater than the all-direction mean of 500 m towards the south-southeast – out to 705 m. Similarly, the extent of the contour to the west is significantly less than 500 m, down to 200 m. The contour effectively gives the departure from the fixed 500 m radius that would be required if an equal exposure to disamenity was to be given in the event of an upset/malfunction at any of the potential odour/dust emitting sites.

Table 14 Directional Variation in 500 m Default Buffer in Response to Local Meteorology – Melbourne Airport (all hours)

Direction Sector	Degrees	Range (m)	% of mean range	Direction Sector	Degrees	Range (m)	% of mean range
N	0	505	101	S	180	625	125
	15	585	117		195	415	83
	30	620	124		210	305	61
NE	45	655	131	SW	225	240	48
	60	610	122		240	205	41
	75	630	126		255	200	40
E	90	610	122	W	270	200	40
	105	640	128		285	200	40
	120	660	132		300	230	46

[16] Clarey P, Pollock T "Integrating Separation Distances with Dispersion Modelling" Enviro 04, 28 Mar – 1 April, Darling harbour, Sydney

Direction Sector	Degrees	Range (m)	% of mean range	Direction Sector	Degrees	Range (m)	% of mean range
SE	135	630	126	NW	315	285	57
	150	705	141		330	395	79
	165	680	136		345	400	80

Note: Directional buffers only apply to those emissions that are carried offsite by the ambient wind. Buffers for fine dust can be influenced by the directional effect of local meteorology.

Based on advice from EPA, the separation distance for blasting at the active quarry face, is not independent of wind speed and direction, as the blast may create particles that can be transported further downwind. Therefore, GHD considers that such 'dust plumes' will be subject to meteorological influences and therefore the directional buffers will need to be presented for each of the quarries. However, given blasting only occurs during the daytime, the directional buffer has been calculated for daytime hours only, as opposed to the all hours directional buffer presented above.

Note that the flyrock component will be independent of wind speed and direction as the projectile speed of flyrock is much larger than the wind speed.

The directional buffer for all hours however would apply to odour from the STP, as odour is subject to directions of good and poor dispersion at all hours of the day, thus the default buffer can be retracted and extended respectively.

The daytime directional buffer that provides the same enclosed area as a 500 m radius circle (i.e. 785,398 m^2) is presented in Table 15. Table 14 shows the extent of the contour is greater than the all-direction mean of 500 m towards the south, out to 640 m. Similarly, the extent of the contour to the west is significantly less than 500 m, down to 219 m. The contour effectively gives the departure from the fixed 500 m radius that would be required if an equal exposure to disamenity was to be given in the event of an upset/malfunction during the day at the quarry when blasting occurs.

Table 15 Directional Variation in 500 m Default Buffer in Response to Local Meteorology – Melbourne Airport (daytime hours)

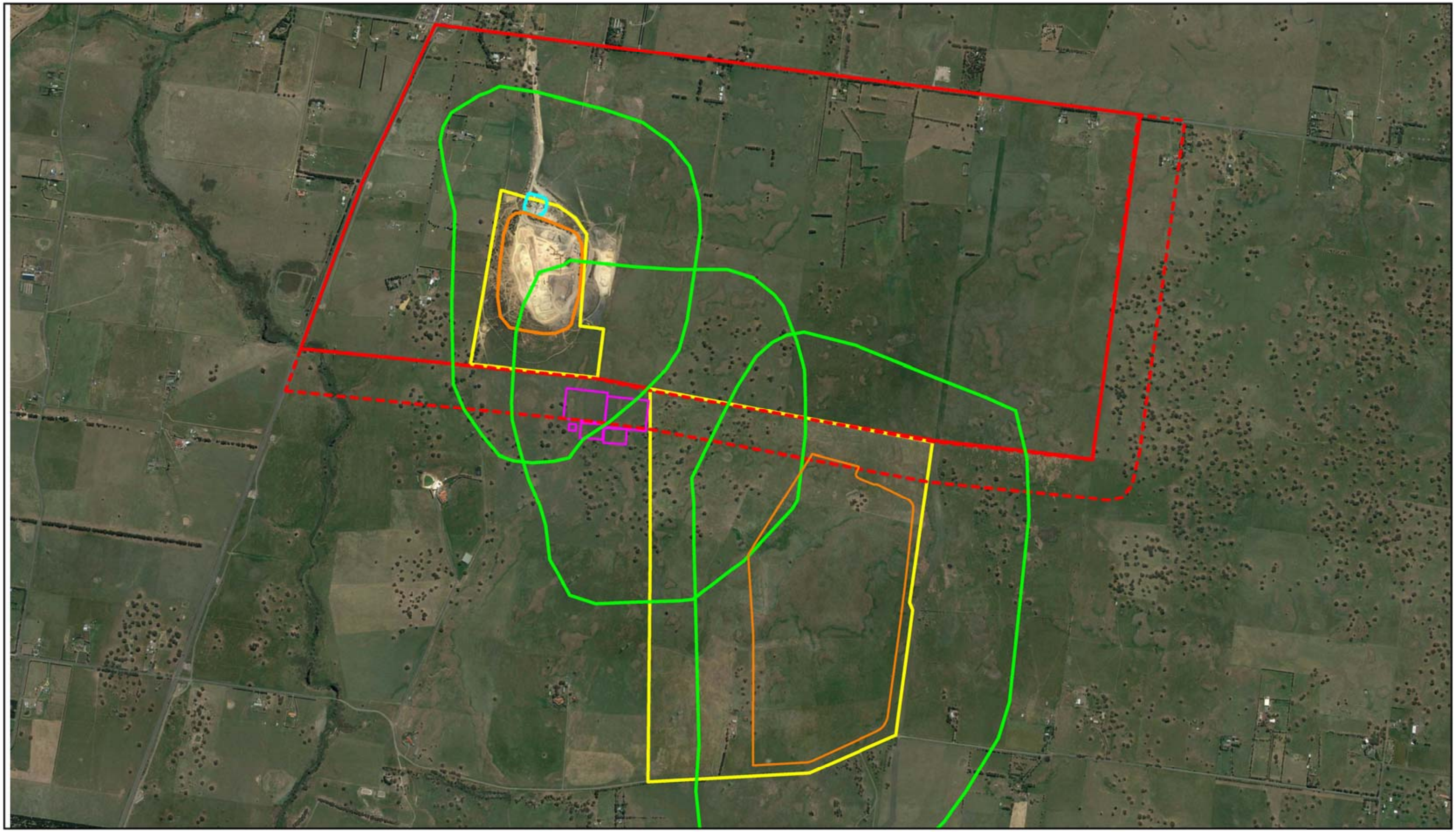
Direction Sector	Degrees	Range (m)	% of mean range	Direction Sector	Degrees	Range (m)	% of mean range
N	0	612	122	S	180	640	128
	15	625	125		195	524	105
	30	625	125		210	407	81
NE	45	625	125	SW	225	293	59
	60	625	125		240	245	49
	75	600	120		255	219	44
E	90	555	111	W	270	231	46
	105	522	104		285	242	48
	120	487	97		300	327	65
SE	135	475	95	NW	315	479	96
	150	490	98		330	565	113
	165	546	109		345	608	122

Directional Buffer Constraints

Figure 16 shows that the directional buffers for the existing operations at Woody Hill, approved extraction area at Phillips Quarry and the proposed STP. Figure 16 shows that the directional buffers all extend further than the default buffers to the east and northeast, encompassing additional land within the PSP compared to the default buffers. A significant reduction to the west is seen for each of the three sites.

6.4.5 Likelihood of IRAEs

The likelihood of residual air emissions from the industries would need to be assessed once specific operational information was obtained regarding their operations, including how frequently upset conditions occur (this requires cooperation from the industry).



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0 250 500 750

metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Concrete Batching Plant
- Proposed STP
- Directional Buffers

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Job Number 3135311
Revision A
Date 20/11/2017

Directional Buffers

Figure 16

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7. Dust impact assessment – quarries

7.1 Regulatory requirements

The Environment Protection Act 1970 (EP Act) is the primary legislative document that governs the protection of the environment in Victoria. Pursuant to the EP Act, the air quality environment is protected by the following policies:

- State Environment Protection Policy (Ambient Air Quality) February 1999 (SEPP (AAQ))
- State Environment Protection Policy (Ambient Air Management) December 2001 (SEPP (AQM))

In addition to the SEPP (AQM), the Protocol for Environmental Management: Mining and Extractive Industries (PEM 2007) was developed to set out the requirements for emissions to air from mining and extractive operations.

7.2 Mining PEM

The impact of emissions from the mining and extraction of stone/sand (quarrying) industry is required to be assessed by reference to the criteria set out in the Mining and Extractive Industry PEM[17]. The PEM defines the EPA Victoria and the Department of Environment and Primary Industries (DEPI)[18] requirements for quarries. The PEM requires an assessment at one of three levels, depending on (i) the scale of the operation and (ii) the location of the site in relation to surrounding residences. Table 16 shows the categorisation of the assessment level based on these two factors.

Table 16 Criteria to determine assessment level (Table 1 of Mining PEM)

Mine Operation Surrounding land use	Large mine or quarry greater than 500,000 tonnes/yr extraction	Medium mine or quarry between 150,000 and 500,000 tonnes/yr extraction	Small mine or quarry between 50,000 and 150,000 tonnes/yr extraction	Mine or quarry with yearly extraction below 50,000 tonnes
Urban Area	Level 1	Level 1	**Level 2**	No assessment – application of best-practice management
Rural Area close to residences (<500 m from the limit of work described in the approved DPI work plan or final EES.	Level 1	Level 2	Level 3	No assessment – application of best-practice management
Rural Area (>500 m from the limit of work described in the approved DPI work plan or final EES.	Level 2	Level 3	No assessment – application of best-practice management	No assessment – application of best-practice management

Given Shenstone Park PSP is proposed to become an urbanised area with sensitive land uses, with the throughput for both quarries would classify them as 'small', a Level 2 assessment was undertaken for this project.

[17] EPA Victoria 2007, 'Protocol for Environmental Management, Mining and Extractive Industries', Publication 1191, December 2007

[18] DEPI is now renamed as the Energy & Earth Resources Development Division of the Department of Sustainability, Development & Business Innovation (DSDBI)

7.3 What is dust?

Dust particles may be solid matter or liquid droplets (aerosol). Particle sizes are measured in micrometres (or micron, µm) which equals 1/1000 of a millimetre. Particle levels are measured in terms of the total mass of particles in a cubic metre of air, in units of micrograms per cubic metre (µg/m^3).

Coarse particles (> 40 µm) typically drop out of the air column forming a deposit on horizontal surfaces. These deposits can pose a nuisance and buffers are sized to avoid this impact. Fine particles remain suspended in the air column and are categorised into:

- Total suspended (TSP) (< 40 µm)
- Inhalable (< 10 µm)
- Inspirable (<2.5 µm) fractions.

Small dust particles can penetrate into the lung to cause harm. Particles can aggravate existing lung and heart diseases, and sometimes cause premature death. Airborne particles have also been associated with decreases in lung function, worsening of asthma and alteration in the body's defences and lung clearance mechanisms. Sensitive members of the population include the elderly, children and people with existing lung or heart disease.

Particles can result from combustion of all types (e.g. wood smoke, engine emissions). They are emitted from industrial processes, motor vehicles, domestic fuel burning, industrial and domestic incineration. Dust particles can be entrained into the air as cars and trucks travel on roads, especially unpaved roads. Natural sources of particles include bushfires, windblown dust and salt spray from the oceans.

7.4 Victorian dust criteria

Victorian EPA in SEPP-AQM provide dust concentration design criteria for $PM_{2.5}$, PM_{10} and TSP. Of these, the PM_{10} criterion (80 µg/m^3, 1 -hour average, 99.9th percentile) is generally the most stringent. TSP has the criterion 330 µg/m^3, 3-minute average, 99.9th percentile.

Air-shed air quality goals relating to dust are also specified in SEPP – Ambient Air Quality (AAQ). The current 24-hour average for PM_{10} is 50 µg/m^3. There are also advisory reporting standards for $PM_{2.5}$, which are 25 µg/m^3 (24-hours average) and 8 µg/m^3 (one-year average).

The relevant dust criteria for non-point sources of dust are specified in the Mining and Extractive Industries Protocol for Environmental Management (PEM), these being:

- PM_{10} at 60 µg/m^3, 24 hour average
- $PM_{2.5}$ at 36 µg/m3, 24 hour average
- Nuisance deposited dust, 4 g/m^2/month (including background)

There is negligible silica in basalt so that there is not expected to be offsite exposure to RCS from the quarry operations. A series of occupational surveys (i.e. onsite exposure) conducted in the 1990s at Boral quarries by Kilpatrick and Associates, gave a direct measure of the likely percentage crystalline silica in $PM_{2.5}$ dust emissions from their basalt quarry sites. The surveys were conducted to gauge the potential exposure of quarry workers in different activities. The percentage of RCS in the $PM_{2.5}$ samples taken from the breathing zone of the workers was found to be approximately ~ 1%.

Given PM_{10} is the lead indicator (i.e. critical constraint) for quarry impacts, GHD has conducted dispersion modelling for this constituent only.

7.5 Woody Hill Quarry

7.5.1 Existing operations

GHD has made a number of assumptions regarding the operations of the quarry based on similar quarry operations.

7.5.2 Scenarios

Existing Operations were modelled for Woody Hill (i.e. what they have approval for under existing WA 492)

7.5.3 Emissions inventory

Emissions rates for the fine fraction (PM_{10}) of dust emissions were developed from a number of published references, including:

- National Pollutant Inventory (NPI) Emissions Estimation Technique Manual for Mining and Processing of Non-Metallic Minerals, Version 2.0
- USEPA AP-42 Chapter 11.19.2 – Crushed Stone Processing and Pulverized Mineral Processing, version 8/04
- Air Pollution Engineering Manual (Buonicore & Davis, 1992)

Where emission factor data was not available in the NPI, GHD sourced emission factors from AP42 and Buonicore & Davis.

Process emission rates are expressed as kg per tonne processed for static sources such as crushing, screening, conveyor transfer, dumping and loading. For mobile sources such as haul trucks, emission rates are expressed as kg per vehicle kilometre travelled (VKT), and for dozers emissions are expressed as kg per hour of operation.

These references allow for various levels of dust control to be accounted for. Where water spray bars are installed at crushers, screens or conveyor transfer points, a reduction factor of between 70% and 90% can be applied to the uncontrolled emissions rate (Davis, 1992). Given GHD was not provided any specific operational detail we have assumed no controls of the crushers, screens or conveyor points.

A list of source emission rate data for PM_{10} is provided in Appendix E.

The mean PM_{10} emissions rates for all identified process and erosion sources relevant to the maximum operational scenario (assumed to be 200 tph based on similar quarries) are summarised in Table 18 into the relevant process categories. The mean PM_{10} emission rates have been presented as the published upper limit maximum emission factors without controls applied.

7.5.4 Excavation of rock

The quarry Work Plan states that mudstone is extracted from the quarry by ripping of soft rock, and for isolated hard pockets, by more conventional drill and blasting Typically material is ripped and pushed with a dozer and scraper and then loaded onto haul trucks by excavators. It has been assumed that water spraying is undertaken to reduce the dust emissions from these sources. Extracted rock is transported to the crushing and screening plant (described below). The operation of each mobile plant generates dust, as does the transportation of the rock along haul roads. Emission rates from these sources were obtained from the National Pollutant Inventory (NPI) (Environment Australia, 2000) and are listed in Appendix E.

Wheel generated dust from trucks entering and leaving the site and haul trucks moving between the pit and crushing plant, overburden stockpiles and bunding areas have been included in the model. Line volume sources have been used to model the estimated truck routes onsite. The estimated distance travelled has been based on the extraction rate, size of haul trucks and average number of trucks entering and leaving the site.

A grader has also be included to maintain the haul roads.

It has also been assumed that water is applied to unpaved roads, resulting in dust control equivalent to Level 1 watering as defined in the NPI Emission EET for Mining (>1 litres/m^2/hr).

The following mobile equipment has been assumed:

- Hyundai 770-7A wheel loaders (bucket size 5 m^3) x 5
- Hitachi EX800 excavator (bucket size 5.5 m^3) x 2
- Mine haul truck (Volvo A40) dump truck (30 m^3 capacity) x 1
- Quad dogs with 35 tonne payload x 1.5/hr
- Grader x 1

Blasting can also create airborne dust and has been included in the dispersion modelling for PM_{10}. As a worse case assessment, GHD has assumed blasting occurs once per month at 12 pm.

7.5.5 Processing of rock

The site currently uses mobile equipment for all crushing and screening. A primary crusher (jaw) accepts all extracted stone and removes scalps. Stone is then gradually sized and screened out through the primary crusher, secondary crusher and screen deck to different aggregate sizes and fines.

Within the rock processing, sources of dust are:

- From the screens (including fine screens)
- Conveyor transfer points
- Operating crushers (jaw and impact)
- Loading of the stockpiles
- Loading aggregate from stockpiles for transport off-site

Inputs described in Table 17 were combined to define the overall emission rate for crushing in Table 18.

Table 17 Crushing throughputs assumed for modelling

Dust Source	Max throughput (tph)
Primary Crusher	200
Secondary Crusher	160

Processing of stone assumed the following equipment:

- Primary Crusher
- Secondary Crusher
- Screening
- Fines Screening

7.5.6 Other dust sources

Wind generated dust is also produced from stockpiles and barren land. The amount of dust generated is dependent on wind speed, moisture content and erodability.

For modelling of exposed (non- vegetated) areas, wind generated dust was assessed using the standard emission factor from NPI of 0.2 kg/ha/hr.

Each transfer point of rock would also be a source of emissions. This occurs when rock is transferred from excavators to dump trucks, from trucks to mobile plant, and when it is loaded and unloaded from haul trucks. Five transfer points were used in the modelling to represent these interactions between various fixed and mobile plant. Whilst this number may vary depending on operations, as evident from Table 18, it provides a comparatively low percentage of overall dust emissions, at just 0.1 g/s per transfer point.

Dry depletion has not been accounted for in the model. Previous assessments conducted by GHD (refer to the New Chiltern Quarry Air Quality Assessment, GHD, 2009) have shown that accounting for dry depletion when assessing PM_{10} for a rock quarry marginally reduces the impacts from the quarry dust plume. Not including dry depletion adds to the level of conservatism in this assessment.

Table 18 Summary of dust emission rates for proposed maximum operation scenario (at 200 tph)

Activity		Typical Operating Hours	Mean Emission Rate during operation, without controls (g/s)	% of Total Emissions
Rock Winning	Dumping	6 am – 6 pm	0.24	66%
	Excavator	6 am – 6 pm	2.33	
	Loading	6 am – 6 pm	0.09	
	Blasting[1]	Once per month for 1 hr	0.86	
	Haul Roads	6 am – 6 pm	0.26	
	Grader	6 am – 6 pm	0.06	
Plant	Primary Crushing	6 am – 6 pm	0.07	34%
	Secondary Crushing	6 am – 6 pm	0.05	
	Screening	6 am – 6 pm	0.24	
	Fines Screening	6 am – 6 pm	1.60	
Transfer Points (x5)		6 am – 6 pm	0.01	0.1%
Wind Erosion (product stockpile area and haul roads)[1]		24 hours	0.2	3%
		TOTAL	**5.81 g/s**	
Notes [1] Based on an open area of 36,000 m^2				

7.5.7 PM2.5

The emission rates of PM_{10} from the sources modelled can be factored to give the $PM_{2.5}$ (respirable fraction of fine dust) emission rates by reference to a background document cited in the USEPA AP-42 Chapter 11.19.2 – Crushed Stone Processing and Pulverised Mineral Processing. In this, dust emission rates are given as a function of particle size in micron for the controlled operations of; screening, tertiary crushing, fines crushing and conveyor transfer points.

The corresponding $PM_{2.5}/PM_{10}$ emission rate ratios were 0.13, 0.25, 0.125 and 0.33 respectively. Proportioning these ratios to the calculated PM_{10} emission rates for each category of operation (as given in Table 18) gives a site mean $PM_{2.5}/PM_{10}$ emission ratio of 0.18. This ratio could be used to proportion the PM_{10} modelling results so that predicted $PM_{2.5}$ levels could be presented.

However, given PM_{10} is the most critical constituent for quarry assessments, only PM_{10} impacts have been presented for the scenarios.

7.5.8 Respirable crystalline silica (RCS)

There is negligible silica in mudstone and basalt, therefore minimal offsite exposure to RCS from the quarry operations. Previous assessments by GHD for rock/stone quarries have analysed the mean percentage of RCS as around 1% of $PM_{2.5}$ (refer to Leongatha South Quarry Air Quality assessment, GHD, 2010).

7.5.9 Model set up

The EPA Victoria approved dispersion model AERMOD was used to predict offsite dust levels of PM_{10} associated with the above scenarios. Contour plots of predicted peak levels of PM_{10} resulting from the quarry emissions including background PM_{10} levels was assessed by applying a representative 70^{th} percentile background concentration and adding that value to the quarry 'signal' contours.

Dispersion modelling was conducted for the existing approved operations outlined in section 7.5.2.

The AERMOD simulations were run with model settings outlined in Table 19. The model was set up using emissions from Table 18. This represents the maximum expected throughput of 200 tph operating at all hours within the production times of 6 am to 6 pm. Actual operations would be at significantly lower average throughputs, with expected maximum daily throughputs of around 500 tonnes, which equates to an average hourly throughput of around 50 tph. As such, predicted maximum concentrations are highly conservative and are based on the coincidence of worst-case dispersion conditions coinciding with maximum quarry operations. Sources are listed in Table 18 with their locations shown in Figure 17. These locations provide an indicative estimate of source locations, however the actual locations will vary around the site but are not expected to significantly alter the patterns of dispersion presented below.

Table 19 AERMOD settings

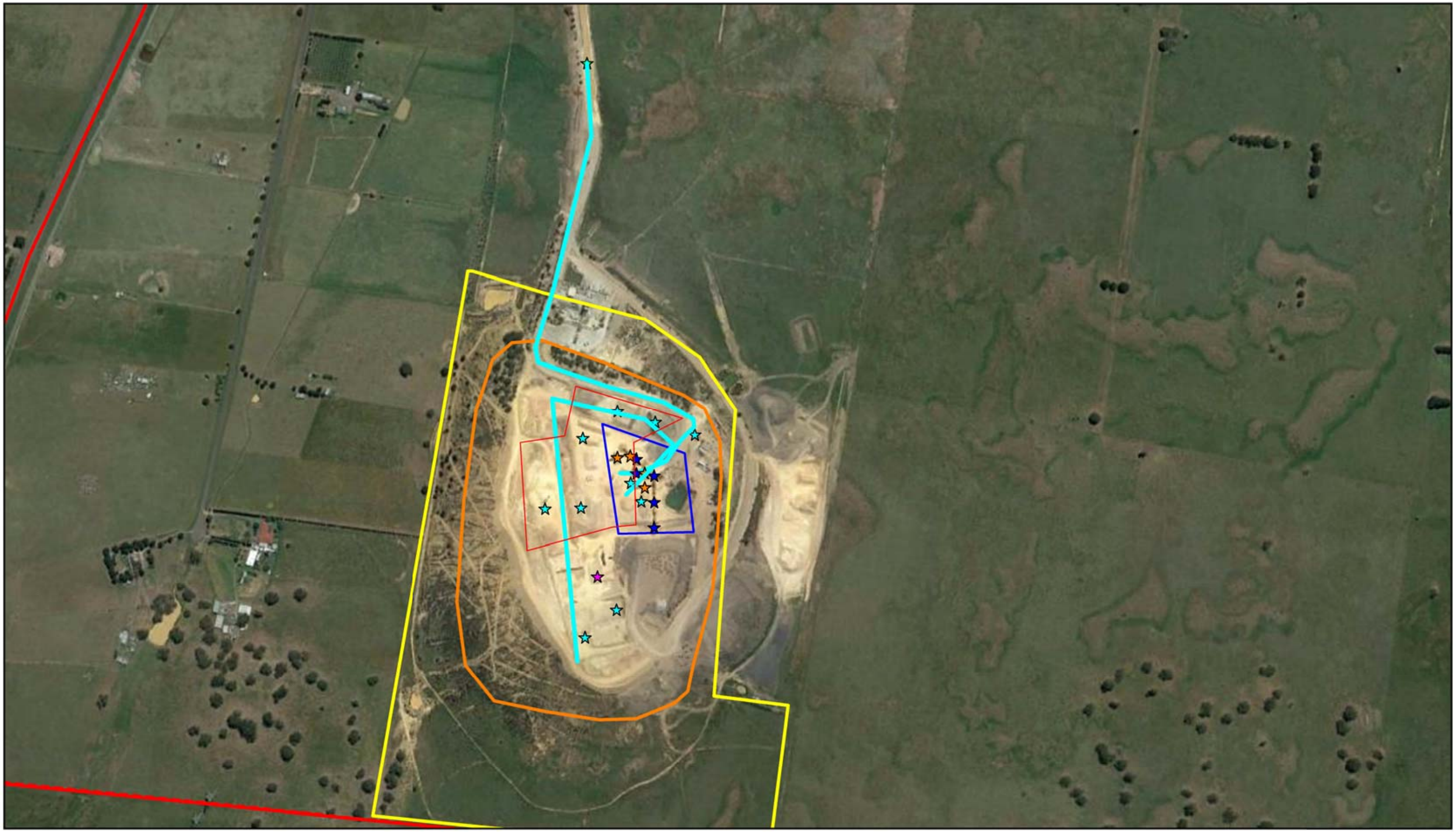
Parameter
Five 12 month meteorological datasets for the site for years 2012, 2013, 2014, 2015 and 2016 used for Melbourne Airport:
A 5 km x 5 km square receptor grid, centred over the each of the seven sites, using a grid resolution of 50 metres.
An averaging period of 24 hours.
Given that the topography of the broader region surrounding the site is relatively flat and the model domain of interest is confined to the near-field (e.g. site boundary and nearest receptors), the effects of terrain on dispersion were considered negligible and therefore not included in this assessment.
Rural dispersion coefficients.
Low wind adjustment factor, LOWWIND3, applied, as per latest USEPA guidance.
A surface roughness height of 0.1 metres was used, flat rural.

Sources were defined in AERMOD according to the specifications outlined in Table 20. All volume sources were placed within the appropriate stage boundaries and were input as variable emissions sources dependent on the hour of day, whereby emissions were only applied between the hours of 6 am and 6 pm. The unsealed roads consisting of haul roads and the access road were input as line volume sources according to USEPA regulatory standards.

Table 20 AERMOD source characteristics

Source of Emissions	Source Type	Source Properties			
Excavator, Dumping, Grader, Loading, Transfer Points	Volume	2 m release height	4 m side length	1 m Initial lateral dispersion	1 m initial vertical dispersion
Primary Crusher, Secondary Crusher	Volume	3 m release height	20 m side length	5 m initial lateral dispersion	1.5 m initial vertical dispersion
Screening and Fines Screening	Volume	1 m release height	2 m side length	0.5 m initial lateral dispersion	0.5 m initial vertical dispersion
Haul Roads	Line Volume	Separated 2W configuration*	3 m vehicle width	4 m vehicle height	Factor of 1.7*
Blasting	Volume	2 m release height	4 m side length	1 m Initial lateral dispersion	7 m initial vertical dispersion
Wind Erosion	Area	Ground level release			
Notes * US EPA regulatory standard configuration					

Further details about the model configuration are given in the AERMOD input text file shown in Appendix F.



1:8,000	
0 80 160 240	
metres (at A4)	

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- Processing Plant
- Wind Erosion
- Haul/ Access Roads
- Location of Mobile Source
- Location of Fixed Source
- Transfer Point
- Blasting

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City of Whittlesea
Shenstone Park PSP-
Impact Assessment

Location of modelled
sources - Woody Hill

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Figure 17

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7.5.10 PM10 predicted peak off-site impact

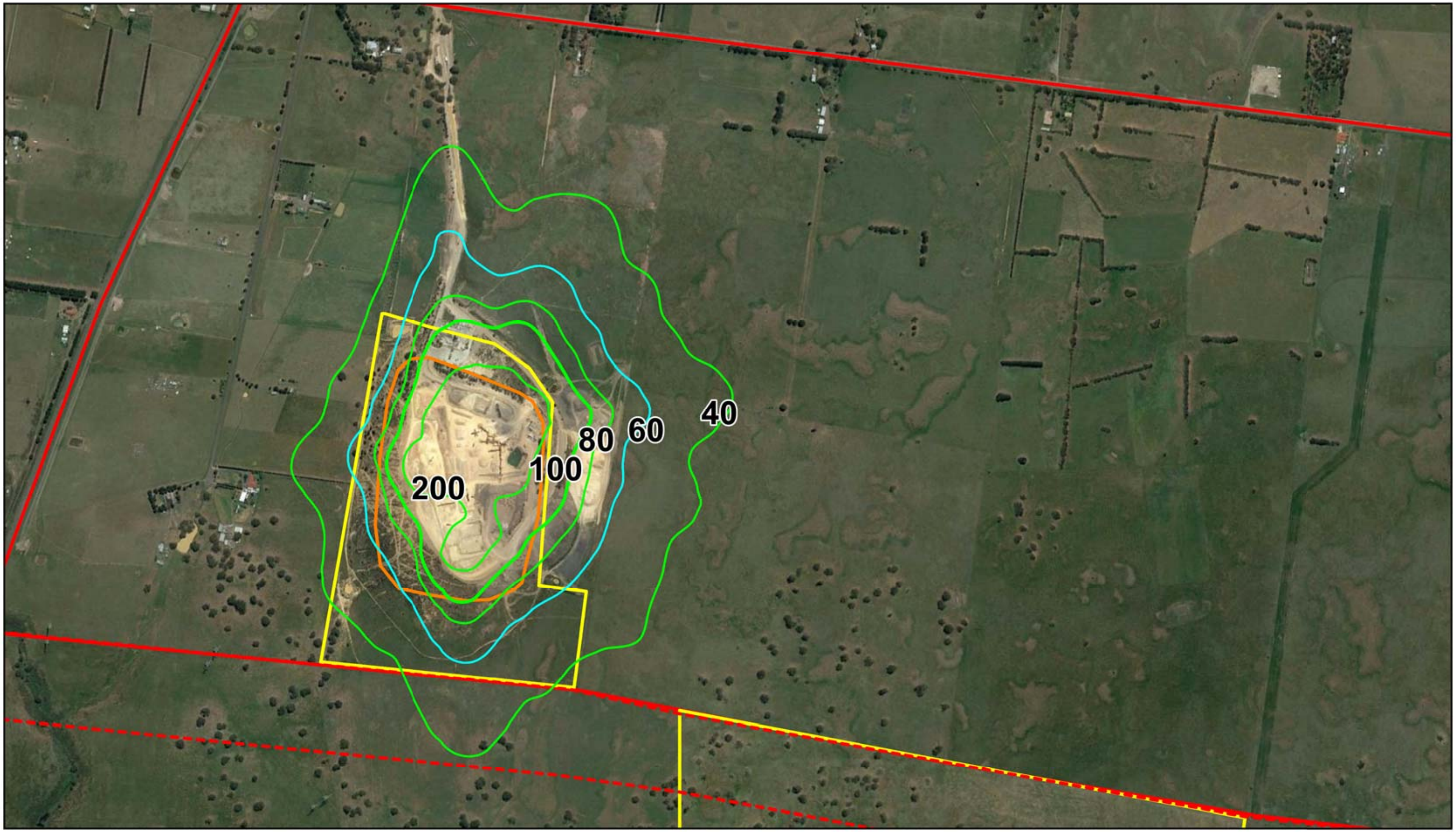
Existing Operations

Figure 18 shows the predicted theoretical maximum 24-hour concentration of PM_{10} based on a throughput of 200 tph and assuming a conservative background 70%ile level of 14.8 µg/m^3. The criterion for PM_{10} (60 µg/m^3) extends approximately 230 m east and 240 m north beyond the work authority approved boundary. In all other directions the criterion is contained either within the work authority or the site boundary. This is shown in Figure 18 by the blue isopleth.

Note that actual quarry emissions would reduce these predicted concentrations based on an average throughput of 50 tph.

All existing residents are below the criteria and well within the acceptable levels, even with the added background PM_{10} level (15 µg/m^3).

The 60 µg/m^3 criterion is well contained within the default separation distance for the quarry.



0 125 250 375
metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Peak Predicted PM10 Concentration ug/m3
- PM10 criterion - 60 ug/m3

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City of Whittlesea
Shenstone Park PSP-
Impact Assessment

Job Number | 3135311
Revision | A
Date | 22/09/2017

Woody Hill Existing Opertions -
PM10 predicted peak off-site impact

Figure 18

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7.5.11 Potential for further reductions and possible mitigation

A number of conservative assumptions have been used in the prediction of maximum dust impacts from the quarry. These include:

- Assuming full quarry operations every day of the year, instead of Monday to Saturday
- Using the maximum assumed throughput of 200 tph for peak quarry operations, when average throughput is likely to be around 50 tph
- Not accounting for dry depletion, whereby larger particle sizes within the PM_{10} range would settle faster and result in marginally lower concentrations of PM_{10}

In addition to this, modelling of PM_{10} has assumed that no controls have been placed on sources of dust emissions at the quarry, to estimate the maximum dust impacts, with the exception of haul road watering. It is likely that Barro would implement dust management practices for product handling and storage in accordance with BPEM (Best Practice Environmental Management) measures for each industry to mitigate dust onsite. This includes water sprays and a water cart in and around the plant and stockpile area. According to the NPI, this would result in further reductions of 50% for loading and unloading stockpiles, wind erosion from stockpiles and hauling, and up to 70% reductions for unloading.

7.6 Phillips Quarry

7.6.1 Approved operations

Given the absence of an available Work Plan, detailed operations for the proposed quarry were unavailable at the time of this assessment. In lieu of any specific information pertaining to planned operations at Phillips Quarry, GHD has assumed the impacts will be similar to Woody Hill due to the extraction of similar materials.

7.6.2 Scenarios

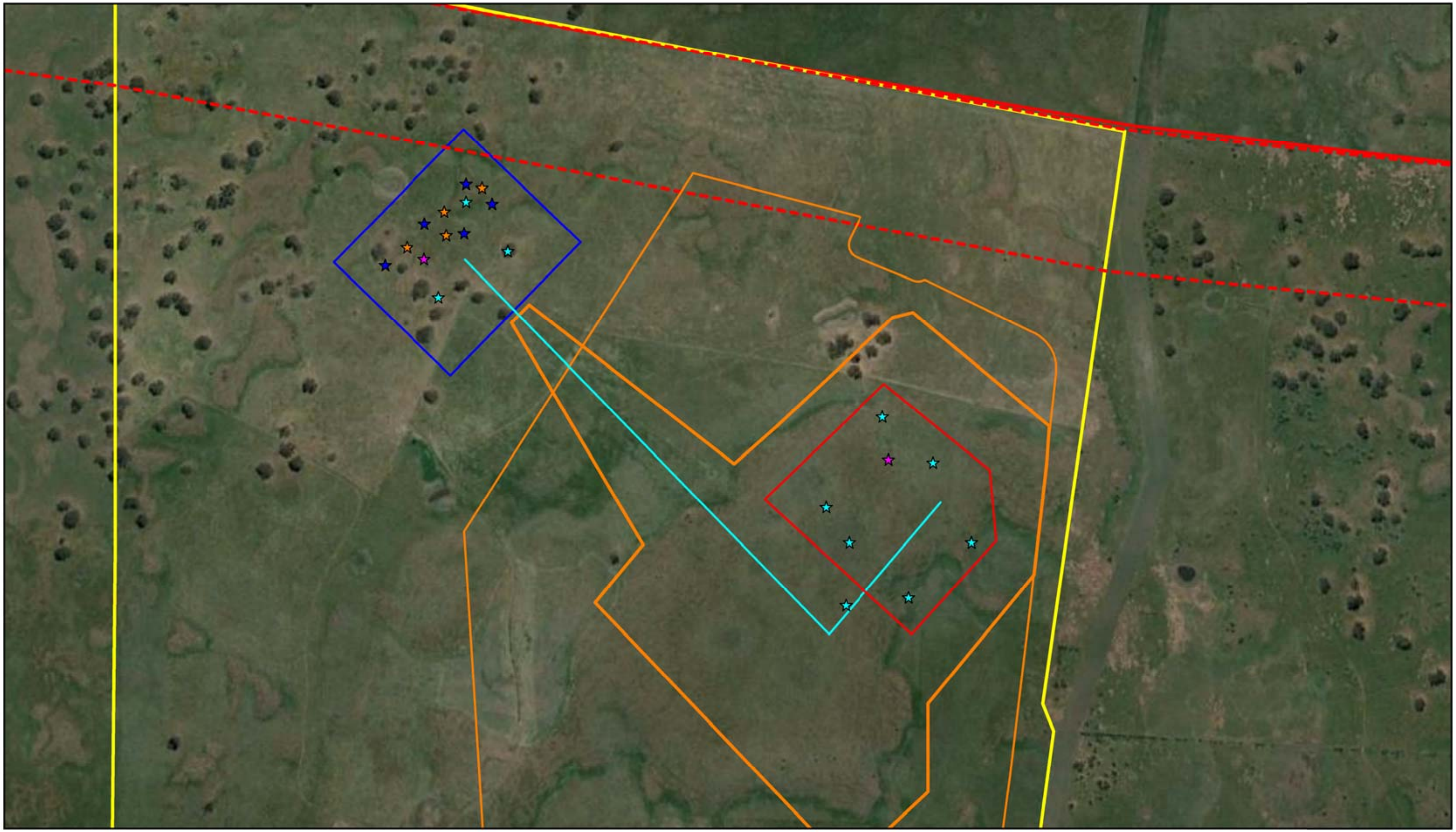
The approved extraction area is the designated quarry pit, which GHD has modelled namely:

- Phillips ''Approved' Scenario (i.e. Stage 1)

7.6.3 Emissions Inventory

The emission inventory assumed the same mobile plant and fixed plant as the Woody Hill Quarry, therefore refer to sections 7.5.3 to 7.5.6 for an overview of emission factors and rates used in the dispersion modelling.

Figure 19 shows the location of sources for the modelled scenario.



0 70 140 210 metres (at A4)	
Map Projection: Universal Transverse Mercator Horizontal Datum: Geocentric Datum of Australia 1994 Grid: Map Grid Of Australia, Zone 55	

N W E S

LEGEND

- Processing Plant
- Wind Erosion
- Haul/ Access Roads
- Location of Mobile Source
- Location of Fixed Source
- Transfer Point
- Blasting

GHD

CLIENTS | PEOPLE | PERFORMANCE

City of Whittlesea
Shenstone Park PSP-
Impact Assessment

Location of modelled sources - Approved Phillips Quarry

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Date | 20/11/2017

Figure 19

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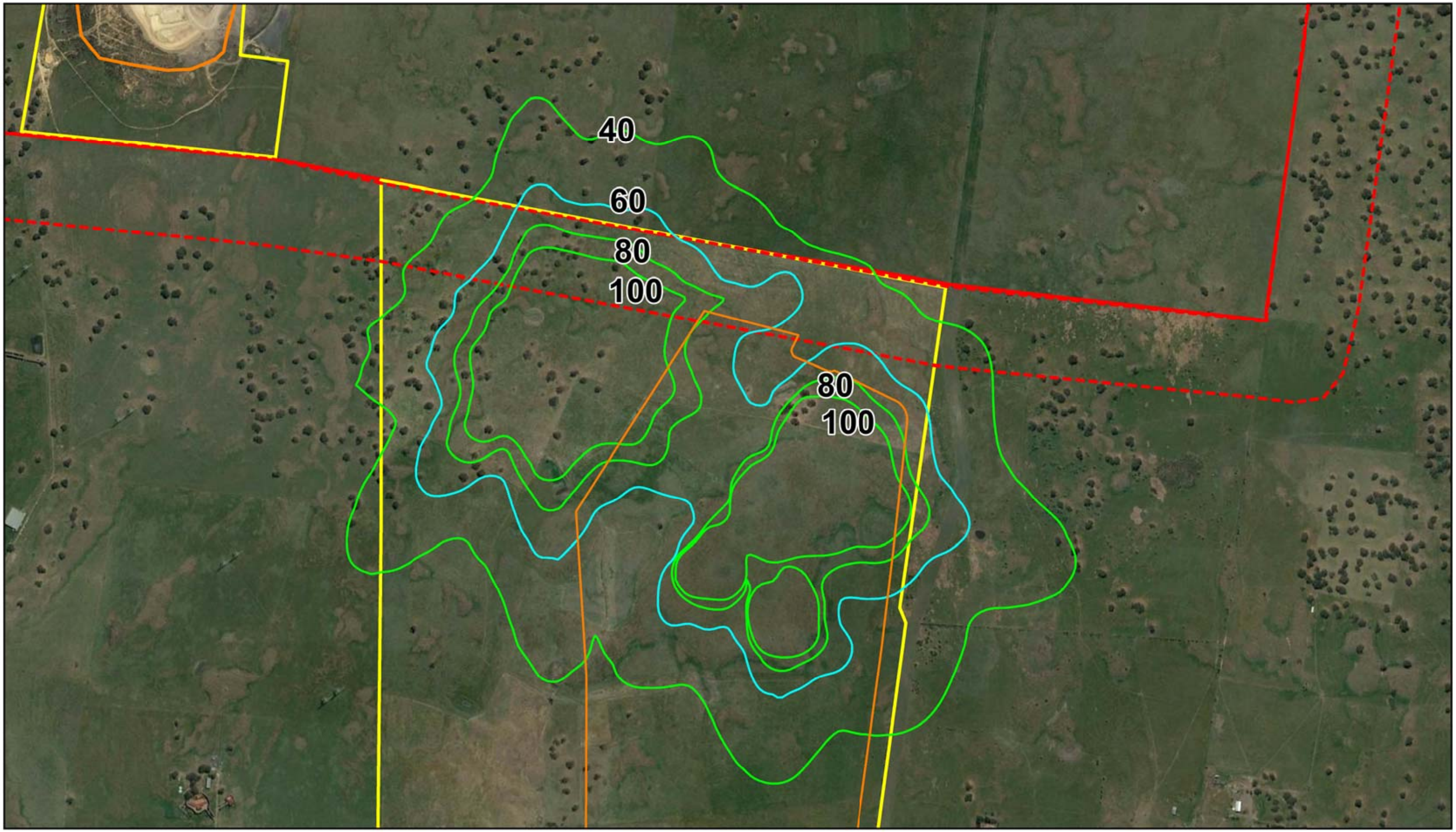
7.6.4 Predicted offsite impact

AERMOD was configured using the same setup as discussed in section 7.5.9.

Figure 20 shows the predicted theoretical maximum 24-hour concentration of PM_{10} for scenario 1 (Stage 1 extraction footprint) based on a throughput of 200 tph and assuming a conservative background 70%ile level of 14.8 µg/m^3. The criterion for PM_{10} (60 µg/m^3) exceeds the work authority boundary, extending approximately 50 m north into the PSP. This is shown in Figure 20 by the blue isopleth. The 60 µg/m^3 criterion is well contained within the default separation distance for the quarry.

Note that actual quarry emissions would reduce these predicted concentrations based on an average throughput of 50 tph.



LEGEND

- PSP Boundary
- Additional Investigation Area
- Work Authority Boundary
- Approved Extraction Boundary
- Peak Predicted PM10 Concentration ug/m3
- PM10 Criterion 60 ug/m3

0 125 250 375
metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N W E S

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City of Whittlesea
Shenstone Park PSP-
Impact Assessment

Job Number | 3135311
Revision | A
Date | 20/11/2017

Approved Phillips Quarry - PM10 predicted peak off-site impact

Figure 20

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7.6.5 Potential for further reductions and possible mitigation

A number of conservative assumptions have been used in the prediction of maximum dust impacts from the quarry. These include:

- Assuming full quarry operations every day of the year, instead of Monday to Saturday
- Using the maximum assumed throughput of 200 tph for peak quarry operations
- Not accounting for dry depletion, whereby larger particle sizes within the PM_{10} range would settle faster and result in marginally lower concentrations of PM_{10}
- Any reductions based on depth of excavation works have not been accounted for, whereby some dust emissions would deposit within the pit due to its depression below the natural land surface. Some dispersion models explicitly account for this 'pit retention' factor.

In addition to this, modelling of PM_{10} has assumed that no controls have been placed on sources of dust emissions at the quarry, to estimate the maximum dust impacts, with the exception of haul road watering. It is likely that dust management practices for product handling and storage in accordance with BPEM (Best Practice Environmental Management) measures for each industry to mitigate dust on site would be implemented. This includes water sprays and a water cart in and around the plant and stockpile area. According to the NPI, this would result in further reductions of 50% for loading and unloading stockpiles, wind erosion from stockpiles and hauling, and up to 70% reductions for unloading trucks.

7.7 Cumulative impacts

It should be expected that the two quarries would excavate concurrently at some stage. Individual assessment of the quarries for the existing and approved scenarios has identified the impacts each will have on the PSP and it is assumed that this information can be overlayed.

From the dispersion modelling, it can be concluded that the PM_{10} criterion will not extend to encompass any land outside of the default 500 m buffers for the quarries. Thus no additional constraints within the PSP should they be operating cumulatively. Note that this is based in the assumption that the proposed quarry will be similar to the existing quarry.

8. Noise impact assessment (non-blasting)

The operation of Barro Group Woody Hill Quarry and the approved Philips Quarry would have the potential to generate environmental noise impacts at the Shenstone Park PSP site.

The purpose of this noise assessment is to assess the likelihood of impact from the existing mudstone quarrying operations at the Barro Group Woody Hill Quarry and the impacts from the approved basalt quarry (Phillips Quarry) located immediately south of the PSP.

8.1 Legislation, Policy and Guidelines

The Victorian Government provides guidance on operational noise levels for industry in Victoria with one mandatory policy for metropolitan areas and one guideline for regional areas as follows:

- *State Environment Protection Policy – Control of Noise from Commerce, Industry and Trade No. N-1* (SEPP N-1) (Victorian Government, 1989) for metropolitan areas throughout Victoria
- *Noise from Industry in Regional Victoria (NIRV): Recommended Maximum Noise Levels From Commerce, Industry and Trade Premises in Regional Victoria* (EPA publication 1411) (EPA Victoria, 2011)

The SEPP N-1 policy is applicable for industry located in a Major Urban Area (MUA), with the potential to impact nearby sensitive receivers. A '*Major Urban Area*' is defined as:

- *The part of Melbourne that is within the SEPP N-1 boundary (refer to Figure 21), or*
- *The part of Melbourne that extends beyond the SEPP N-1 boundary, but is within the Planning Urban Growth Boundary (UGB) (refer to Figure 21)*

The areas outside the MUA boundaries are managed by the NIRV guideline. The NIRV guideline is applicable for industry located in a *Rural Area*, with the potential to create noise impacts at nearby sensitive receiver locations. A *'Rural Area'* is defined as:

- *Land that is not within a 'Major Urban Area', including land in cities or towns with a population below 7,000 and rural locations outside 'Major Urban Areas.'*

In addition, NIRV makes provision for land located outside the SEPP N-1 boundary that has a population greater than 7000 to be assessed against the SEPP N-1 methodology.

For this assessment, the PSP site and the assessed quarries are all located within Urban Growth and SEPP N-1 boundaries (refer to Figure 21).

Hence, the surrounding industrial noise has been assessed in accordance with the SEPP N-1 policy.

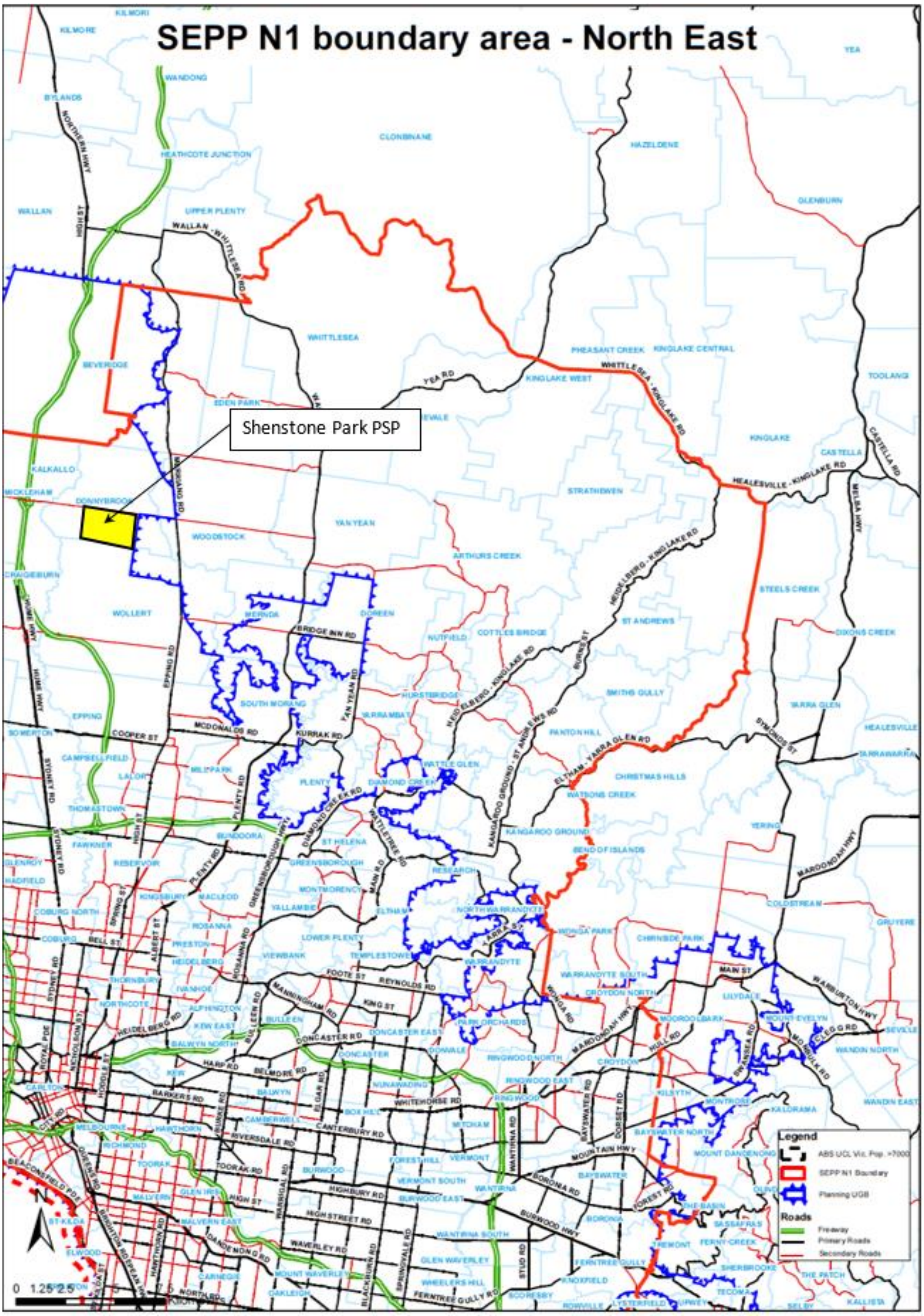


Figure 21 Areas covered by SEPP N-1 and planning UGB (EPA Victoria, 2013)

8.1.1 SEPP N-1

Noise from industry within Melbourne's Planning UGB must comply with SEPP N-1. SEPP N-1 provides limits on noise impacts on residential and other noise-sensitive uses and should be applied when siting or designing new or expanded industry or plant, and when government authorities are assessing applications for new and expanding industry.

SEPP N-1 sets the maximum noise limit allowed in a noise sensitive area emanating from commercial/industrial premises depending on the time of day, evening, or nigh, land use zoning, and existing background noise levels.

The first step in assessing the noise limit is to calculate the prescribed upper noise limit (Zoning Level or Zoning Limit) for the particular land use according with Schedule B2 of the SEPP N-1. Once the zoning level has been developed, the background level is assessed as to whether the background levels are neutral (i.e. not significantly higher or lower than the zoning level) or otherwise. If the background level is neutral, the noise limit adopted is the zoning level. If, on the other hand, the background level is significantly lower or higher than the zoning level then the noise limit is reduced or increased accordingly.

Section 8.1.2 details the derivation of SEPP N-1 noise limits applicable for the project site.

8.1.2 Determination of SEPP N-1 zoning levels

Schedule B2 of the SEPP N-1 outlines how zoning levels for a day period, evening period and night period must be determined using the following equations:

$$Day\ period: zoning\ level = 18\ \times Influencing\ Factor + 50$$

$$Evening\ period: zoning\ level = 17\ \times Influencing\ Factor + 44$$

$$Night\ period: zoning\ level = 17\ \times Influencing\ Factor + 39$$

Where, the Influencing Factor (IF) is calculated using the following formula:

$$IF = \frac{1}{2}\frac{\left(area\ type\ 3 + {}^{1}/_{2}\,(area\ type\ 2)\right)}{(total\ area\ of\ circle)}\ 140m\ circle + \frac{1}{2}\frac{\left(area\ type\ 3 + {}^{1}/_{2}\,(area\ type\ 2)\right)}{(total\ area\ of\ circle)}\ 400m\ circle$$

The two concentric circles of diameter 140 m and 400 m must be drawn or reproduced to scale on the relevant map, centered on the measurement point in the noise sensitive area. The area of all the SEPP N-1 Type 2 and 3 zones and reservations must be measured for each of the two circles from the same map. Following the above procedures and the identified land use zonings in section 3, the calculated zoning levels are then calculated as detailed in Table 21 for this project.

Table 21 Calculated SEPP N-1 zoning levels at the Shenstone Park PSP

Nearby sensitive receiver location	Period	Influencing factor	SEPP N-1 zoning levels dB(A)
Shenstone Park PSP site	Day	0.00	50
	Evening		44
	Night		39

8.1.3 Derived SEPP N-1 noise limits

Using the Zoning Levels in Table 21 and the measured background noise levels in section 5.8.5, the SEPP N-1 noise limits applicable for the project site can be derived in accordance with Schedule B1 and B3 of the SEPP N-1. The applicable noise limits are presented in Table 22.

The Woody Hill Quarry hours of operation are from 6.00 am to 6.00 pm Monday to Saturday and it is expected the approved Phillips Quarry hours of operation will be from 7.00 am to 6.00 pm Monday to Friday and 7.00 am to 1.00 pm Saturdays.

The Woody Hill Quarry will be required to meet the night-time period criteria between 6.00 am and 7.00 am because the night-time criteria is from 10:00 pm to 7:00 am Monday to Friday. The daytime period is 7:00 am to 6:00 pm, Monday to Friday, and Saturday 7:00 am to 1:00 pm. The evening time criteria applies after 1:00 pm on Saturday to 6;00 pm.

The Phillips Quarry will be required to meet the daytime period criteria only based on the proposed operational hours within the EPA defined daytime period.

The night time limits are considered the most stringent criteria to be met at the identified sensitive receivers. Generally, if the night-time criteria can be met by the Woody Quarry then the day and evening measurements can also be met from this type of operation.

Table 22 Derived SEPP N-1 industrial noise criteria for the Shenstone Park PSP

Sensitive receivers location	Period	Influencing factor	SEPP N-1 zoning levels dB(A)	Measured background noise levels dB(A)L_{90}	Background classification (refer to section 5.8.5)	SEPP N-1 noise limits dB(A)$L_{eq(30mins)}$
Shenstone Park PSP	Day	0.00	50	36	Low background	48
	Evening		44	29	Low background	40
	Night		39	28	Low background	37

Note that due to the wide variety of background noise monitoring results, the lowest background noise levels for each of the period have been adopted.

8.2 Industrial noise assessment methodology

Noise modelling was undertaken using the Computer Aided Noise Abatement (CadnaA) (Ver. 2017 MR (BMP Set)) noise modelling software to predict the effects of airborne industrial noise from the existing as well as the proposed quarries, and produce noise impact contours for the adjacent PSP site.

The noise impact contours would then be used to help assess the separation distances (buffers) that could be applied to the quarries and STP, to inform future land use planning associated with the development of the Shenstone Park PSP. This information would then be used by CoW and VPA to manage potential land use conflicts into the future. The CoW is managing the preparation of the Shenstone Park PSP in partnership with the VPA.

CadnaA is a computer program for the calculation, assessment and prognosis of noise propagation. CadnaA calculates environmental noise propagation according to a number of different algorithms. In this assessment ISO 9613-2, "*Acoustics – Attenuation of sound during propagation outdoors"* was utilised (ISO, 1996). Propagation calculations using ISO 9613 take into account sound intensity losses due to hemispherical spreading, atmospheric absorption and ground absorption.

The ISO 9613-2 algorithm also takes into account the presence of a well-developed moderate ground based temperature inversion, such as that which commonly occurs on clear, calm nights or during 'downwind' conditions, which are favourable to sound propagation.

The noise assessment has been modelled based on available data at the time of this report.

In the absence of quarry specific data, onsite plant and equipment with the potential to be a major noise source, fixed equipment locations, mobile equipment routes, quantity of equipment, and nature of industrial operation, were based on information illustrated in the publicly available aerial imagery at the time of this report, as well as GHD site boundary inspections.

The following general settings were used in the model:

- Ground absorption was taken into account in the calculations. A general ground absorption coefficient of 0.75 was used throughout the model to represent the surrounding ground type comprising of predominantly vegetative grassland areas.
- All sensitive receptors were modelled at 1.5 m height above ground, in accordance with AS 1055: Acoustics – Description and measurement of environmental noise.
- Site topography and three-dimensional terrain with 1 m contour resolution have been used in the model.

8.3 Assessment scenarios

The noise assessment was undertaken for the following modelling scenarios:

- Scenario 1: Woody Hill Existing Scenario (i.e. approval under the existing WA 492)
- Scenario 2: Phillips Scenario (i.e. Stage 1 pit and processing plant)
- Scenario 3: Combined Woody Hill Existing Operation (including the concrete batching plant) and Stage 1 of the Phillips Quarry operation

8.4 General modelling assumptions

The following general assumptions have been made in undertaking all noise modelling assessment in this report.

- The modelled quarry equipment is assumed to be the same for all modelling quarry scenarios in section 8.3. Hence, it is also assumed that the number of fixed and mobile equipment modelled for the existing Woody Hill Quarry would be the same for the approved Phillips Quarry.
- Existing ground topographical contour conditions will be used for assessing all modelling scenarios, due to the absence of quarry site-specific topographical contour data.

8.5 Equipment modelled

Table 23 details the primary noise generating equipment assumed to be used within the quarry sites and the corresponding sound power levels used in the noise model. Equipment noise data was obtained from the following sources:

- Australian Standard AS 2436:2010 (reconfirmed 2016) – *Guide to noise and vibration control on construction, demolition and maintenance sites*
- BSI British Standards BS 5228.1:2009 – *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* (BS 5228.1, 2009)
- Engineering Noise Control (ENC) software
- GHD internal database and past project experience

Table 23 Modelled equipment Sound Power Levels SWL (10^{-12} Watt)

Plant item	Quantity of equipment used within the model	Source height (m)	L_w dB(A) per unit	Octave centre frequency (Hz)/dB(linear)									Data source
				31.5	63	125	250	500	1000	2000	4000	8000	
Fixed equipment													
Primary crusher	1	6	113	107	115	114	111	107	108	106	101	96	Albury Waste Management Centre
Secondary crusher	1	6	113	107	115	114	111	107	108	106	101	96	Albury Waste Management Centre
Open conveyor	As per the aerial imagery	Assumed as per the aerial imagery	83/m	93	80	81	81	83	77	72	63	55	Clermont Coal Project
Screener	2	2	108	110	110	107	104	103	103	101	97	96	Kitsault Mine Project
Stacker/reclaimer	1	6	108	98	98	103	100	97	94	92	89	81	Kitsault Mine Project
Concrete batching plant	1	10	113	107	106	103	111	111	107	106	98	98	GHD Database
Mobile power crusher and screener	1	3	103	100	101	103	102	101	97	95	92	86	Hi-Quality Bulla Quarry Project – CR019
Mobile equipment													
Loader	5	2.5	114	108	105	108	111	112	108	105	103	94	Bengalla Development Project - Loader L1800
Haul truck	Refer to modelling assumptions	4	117	120	123	121	117	114	111	109	104	97	Ensham Central Project - CAT 773/777
Grader	1	2.5	110	110	111	113	113	106	99	102	99	91	Moranbah South Project CAT 14H or equivalent
Excavator	2	2.5	107	110	113	106	105	105	101	99	96	91	BS5228-1:2009 – Appendix C.2 Ref no 14
Truck and Dog	Refer to modelling assumptions	3	104	110	114	108	104	101	99	96	92	85	Hi-Quality Bulla Quarry Project
Water cart truck	1	2.5	87	84	92	81	77	80	84	80	74	69	Albury Waste Management Centre
Concrete Mixer Truck	Refer to modelling assumptions	2.5	87	84	92	81	77	80	84	80	74	69	Albury Waste Management Centre

8.6 Woody Hill Quarry noise assessment

8.6.1 Model assumptions

A number of conservative assumptions have been used in the prediction of operational noise impacts from the quarry. These include:

- Assuming full quarry operations Monday to Saturday from 6 am to 6 pm
- Assume continuous operation with 1.5 truck movements per hour on haul roads
- Conveyors were all modelled uncovered
- The concrete batching plant was modelled in continuous operation
- No reduction in noise due to pit depth and landform shielding has been modelled for Scenario 1
- The concrete batching plant has also been modelled in its existing location, which is assumed to be unchanged during the life of the quarry

In addition to this, modelling of noise has assumed that no controls have been placed on noise emissions at the quarry. Reversing beepers have not been modelled.

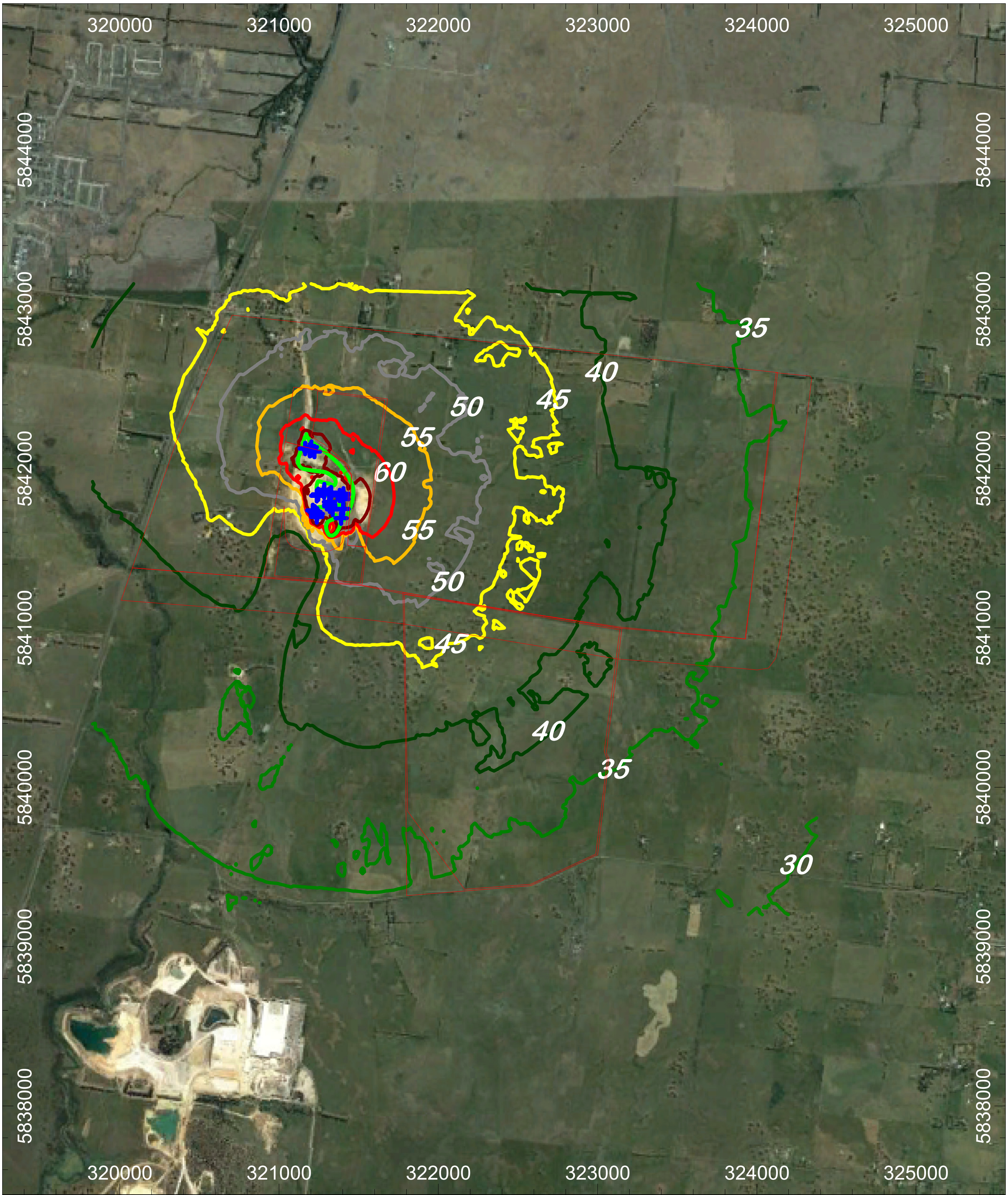
8.6.2 Assessment

Resulting noise contours, in five-decibel increments for the noise assessments outlined above are shown in Figure 22.

The results when compared to the daytime criteria of 48 dB(A) show predicted exceedances for Scenario 1 beyond the site's extraction boundary of up to approximately 900 meters

Hence, it is recommended a 900 m buffer around the approved extraction area from the Woody Hill Quarry be prescribed prior to any noise mitigation being implemented.

The 900 m buffer at Woody Hill Quarry is due to the elevated location of existing noise sources combined with the concrete batching plant noise. It is expected that as the hill is removed via quarry operations, exposure to noise will vary, but ultimately reduce with a decrease in elevation, to a level similar to that of the proposed Phillips Quarry with the inclusion of the concrete batching plant. The concrete batching plant noise may increase somewhat as the shielding from the existing hill disappears through quarrying.



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Shenstone Park PSP Project
Predicted Industrial Noise Impact Contour
Woody Hill Existing Scenario (i.e approval under the existing WA 492)

ISO 9613 Algorithm
Predicted Noise Contours: 5 dB(A)Leq(1 hour) SPL re:20µPa
Contour Elevation: 1.5 m
Note: This figure was re-produced based on assumptions and limitations stipulated in this GHD noise report.

Image sourced from Google Earth©
Whilst every care has been taken to prepare this map. GHD make no representations or warranties about its accuracy, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

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Figure 22 Woody Hill Existing Scenario (i.e. approval under the existing WA 492

8.7 Phillips Quarry Noise assessment

8.7.1 Model assumptions

A number of conservative assumptions have been used in the prediction of operational noise impacts from the Phillips Quarry. These include:

- Assuming full quarry operations from 7:00 am to 6:00 pm Monday to Friday and 7:00 am to 1:00 pm Saturdays, i.e. daytime criteria only
- Assume continuous operation with 1.5 truck movements per hour on haul roads
- Conveyors were all modelled uncovered
- The concrete batching plant was not modelled as part of the scenario
- No reduction in noise due to pit depth and landform shielding has been modelled

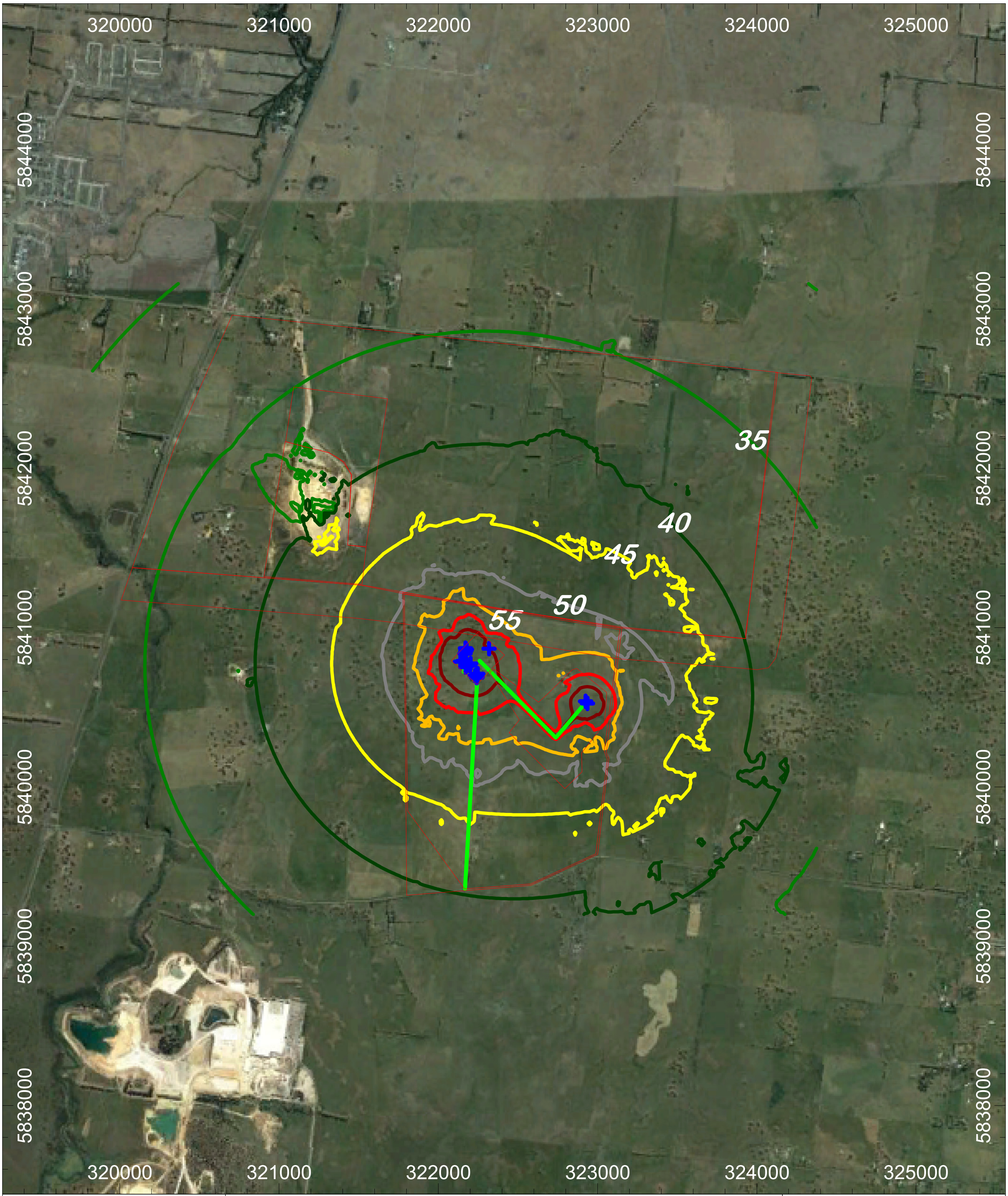
In addition to this, modelling of noise has assumed that no controls have been placed on noise emissions at the quarry. Reversing beepers have not been modelled.

8.7.2 Assessment

Resulting noise contours, in five-decibel increments for the noise assessment are shown in Figure 23. Phillips Quarry is not expected to operate outside of the normal EPA defined daytime operating hours.

When compared to the daytime criteria the modelling shows predicted exceedances beyond the site’s boundary of up to approximately 300 meters for the Phillips Quarry operation.

Hence, it is recommended a 300 m buffer around the approved extraction area from the Phillips Quarry be prescribed prior to any noise mitigation being implemented.



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Shenstone Park PSP Project
Predicted Industrial Noise Impact Contour
Phillips Scenario (i.e. stage 1 pit and processing plant)

ISO 9613 Algorithm
Predicted Noise Contours: 5 dB(A)Leq(1 hour) SPL re:20µPa
Contour Elevation: 1.5 m
Note: This figure was re-produced based on assumptions and limitations stipulated in this GHD noise report.

GHD

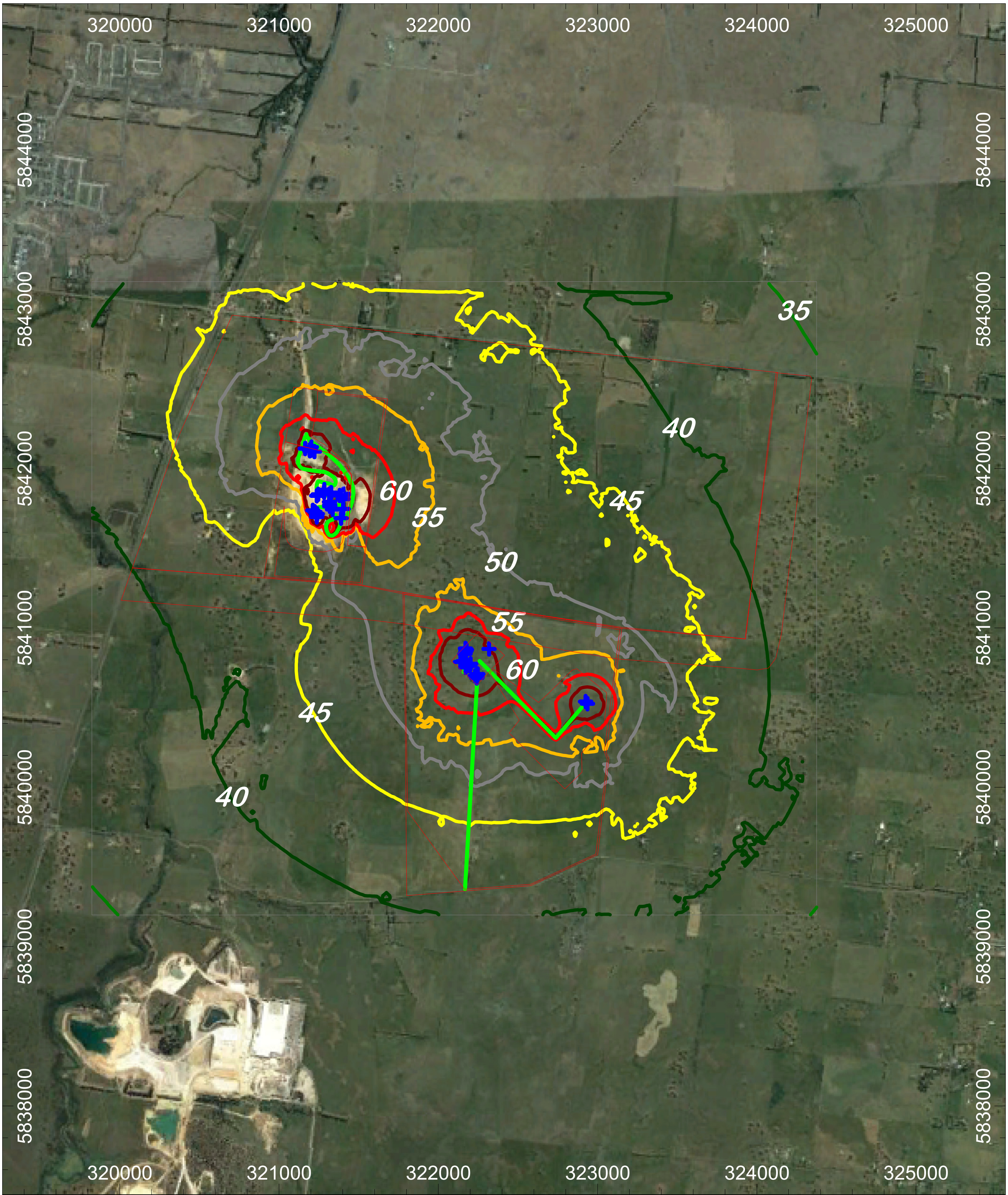
Figure 23 Phillips Scenario (i.e. stage 1 pit and processing plant)

8.8 Cumulative impacts

It should be expected that the two quarries (Woody Hill and Phillips) would be excavated concurrently. Individual assessment of the quarries have identified the impacts each would have on the PSP separately and it is assumed that this information can be overlayed.

To understand what the potential cumulative impact may be, a noise model was run combining the existing Woody Hill Quarry operation and concrete batching plant together with the Stage 1 scenario for the Phillips Quarry. The resulting cumulative assessment is indicative only and will require an understanding of the timing for construction of the Phillips Stage 1 pit and ROM pad, and the operating stage of the Woody Hill Quarry. Should the two quarries be operating simultaneously, it is likely a large portion of the terrain around the Woody Hill Quarry will have changed in such a way to affect the shielding and source height characteristics in the model.

Figure 24 shows the combined operations of Woody Hill Quarry, the concrete batching plant, and Stage 1 of the Phillips Quarry operation running simultaneously during the daytime period.



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Shenstone Park PSP Project
Predicted Industrial Noise Impact Contour
Combined Woody Quarry and Phillips Quarry (i.e. stage 1 pit and processing plant)

ISO 9613 Algorithm
Predicted Noise Contours: 5 dB(A)Leq(1 hour) SPL re:20µPa
Contour Elevation: 1.5 m
Note: This figure was re-produced based on
assumptions and limitations stipulated in this GHD noise report.

Figure 24 Combined Woody Hill Existing Operation (including the concrete batching plant) and Stage 1 of the Phillips Quarry operation

8.9 Noise mitigation strategies

It is understood that the existing quarry has some years remaining for its operational life and will therefore remain throughout the precinct development, and hence there would not be the obligation for the quarry asset owner to comply with the SEPP N-1 noise policy for any future sensitive receiver built within the vicinity.

Discussion with the asset owner may need to be undertaken to provide effective as well as agreed noise mitigation measures for the quarry, as necessary.

Should a control at source noise mitigation strategy not be possible or practicable, it is not uncommon that the indoor amenity of sensitive receivers subject to quarry operational noise be acoustically treated using a control at receiver strategy, via building acoustic treatment. However, the limitation of this strategy is that it would not preserve the outdoor amenity of the receiver unless a combination control such as noise control at transmission be implemented.

Development may still be able to occur within the 900 m buffer following appropriate mitigation either at the quarry or via building acoustic treatments at the sensitive receiver location. Without mitigation at the source, ambient levels would remain the same and so some consideration of this would be required during planning as to what type of use was appropriate within the 900 m buffer. The mitigation strategies provided below are in-principle mitigation measures only, and each new sensitive use coming into the area would need to review and design for their site-specific requirements.

Noise mitigation strategies can generally be divided into four different areas from the most to the least preferred (NSW INP, 2000):

1. *Land-use Controls* (separating the location of noise-producing activities from sensitive areas)
2. *Control at Source* (reduce the noise output of the source to provide protection surrounding environment)
3. *Control in Transmission* (reduce noise level at the receiver but not necessarily the environment surrounding the source, e.g. noise barrier, etc.
4. *Receiver Control* (localised acoustic treatment at sensitive receiver)

8.9.1 Land-use controls

There are several strategies involved in using the land-use control measures:

- **Setbacks strategy** (e.g. open space design adjacent to noisy industries, busy road and/or railway corridor to provide noise reduction through setback distances to residential uses).
- **Setback distances** between the noise source and the noise sensitive receiver could be one of the treatments in reducing the noise exposure level at the proposed PSP. A setback strategy would also be effective in mitigating ground-borne vibration impacts from the nearby Donnybrook Road, quarry blasting activities, or other vibration sources.
- **Building locations and height controls** for example, taller buildings could be located adjacent to primary noise sources to provide noise shielding effect to residential uses or the overall PSP.
- **Expansion of cycle and pedestrian facilities**, to discourage the use of motor vehicles and encourage the use of bicycles, scooters or walking, which would result in less noise emission within the area.
- **Impose acoustic control planning conditions on new developments**, this could be in the form of a council's planning permit conditions, specifying acoustic treatment on noise sensitive developments.

8.9.2 Control at source

There are several strategies involved in using the Control at Source measure.

- Promoting the use of low pavement surfaces on new roads or the resurfacing of existing roads. The type of road surface has a significant effect on the level of noise generated by the tyre/road interface. Austroads Technical Report "*Austroads Review Report: Traffic Noise/Long-life Surfacings*" (Austroads, January 2011) provides relative noise emission levels of conventional road surfacings in Australia, based on studies conducted by (Campbell & Isles, 2001), (Parnell, 2006) and (Samuels, 2008) (refer to Table 24).

Table 24 Relative noise emission levels of conventional surfacings in Australia

Surfacing type	Noise level variation dB(A)		
	Traffic Noise	Individual vehicles pass-by noise	
		Cars	Trucks
Size 14 single/single seal	+4.0	+4.0	+4.0
Size 7 single/single seal	+1.0	-	-
Portland cement concrete (PCC) tyned and dragged	0 to +3.0	+1.0 to +3.5	=1.0 to +1.0
Cold overlay	+2.0	+2.0	+2.0
Dense Graded Asphalt (DGA)	0	0	0
Portland Cement Concrete (PCC): exposed aggregate	-0.5 to -3.0	-0.1	-6.7
Stone Mastic Asphalt (SMA)	-2.0 to -3.5	-2.2	-4.3
Open Graded Asphalt (OGA)	0 to -4.5	-0.2 to -4.2	-4.9

In general, sealed surfaces would not be recommended for low noise surfacing purposes, as they tend to generate higher traffic noise levels compared to asphalt surfacing. Similarly, to concrete surfacing, they tend to generate higher noise levels than asphalt surfacing. However there are a number of surface treatments that could be applied to reduce road noise levels, such as tyning or hessian dragging in a longitudinal direction to improve pavement unevenness (Austroads, January 2011).

Moreover, ageing of pavement and its construction quality could affect the noise performance. Austroads Research Report: "*Austroads Research Report: Modelling, Measuring and Mitigating Road Traffic Noise. AP-R277/05*" (Austroads, 2005) states: "*It should also be noted that the noise generation characteristics of surfacings changes over time in particular as the wear, weathering and roughness of the road changes. In addition, noise generated from open graded asphalt pavement types will also increase as the voids within the surface become clogged over time. As an example,* (Dash, Bryce, Moran, & Samuels, 2001) *indicate that the clogging of surface voids in open-graded asphalt may lead to noise level increases of around 4 dB(A).*" Table 25 details the change in acoustic performance of road pavement due to ageing.

Table 25 Change in acoustic performance due to aging

Road surface	Noise level variation dB(A)		
	When fresh	Several years old	Change
Sprayed seal	+4	+2	-2
Dense Graded Asphalt (DGA)	0	+1	+1
Open Graded Asphalt (OGA)	-4	-2	+2

The installation of traffic calming schemes, such as speed humps, runabouts, etc., Austroads Research Report (Austroads, 2005) has provided factors to consider in designing traffic calming schemes, which are detailed in Table 26.

Table 26 Factors to consider in design of traffic calming schemes (Austroads, 2005)

Factor	Consideration
Distance between devices	Distance between traffic calming devices should promote constant speed along the road. Acceleration followed by braking and swerving can increase community annoyance where devices are spaced too far apart.
Height of device	Raised devices, such as mid-block platforms and speed humps have strong traffic calming effects. However, the height of the device can limit its effectiveness. A 3 cm increase in height can provide the equivalent noise increase of moving the device 40 m closer to the noise receiver.
Chicanes	Chicanes can reduce speed annoyance, however they do not reduce the sense of danger that a calming device should achieve. This is mostly a result of noise generated by swerving and acceleration.
Roundabouts	Roundabouts generally provide the greatest benefit in noise reduction. Noise from roundabouts appears to create less community annoyance than other traffic calming devices.
Mid-block platforms	Mid-block platforms are not effective at reducing speed annoyance. Squeaking noise, caused mostly by the vertical displacement of the device, tends to increase noise annoyance at sensitive receivers. This can be reduced by keeping the device height lower than 75 mm.
Speed humps	Speed humps have noticeably lower annoyance levels than mid-block platforms, although device height should be lower than 75 mm to minimise potential annoyance.
Driver behaviour	Implementation of traffic calming devices should be aimed for the minority of drivers who ‘challenge’ devices, as these drivers create the most noise. Measures that reduce line of sight may be more effective than those that create a vehicle disturbance.
Traffic volume and mix	Traffic volume and mix, particularly at night-time (between 10:00 pm – 7:00 am) may affect noise annoyance to sensitive receivers. Unladen heavy vehicles and light trucks crossing these devices can cause sleep disturbance in the early morning hours.
Pavement surface	Contrasting pavement surfaces such as cobblestones or rumbled pavements, often used to highlight devices, can increase the noise at the tyre/road interface.
Emergency vehicle access	It should be noted that emergency vehicle access and response time must be carefully considered when designing and installing calming devices. Emergency vehicles, particularly ambulances, have more difficulty with vertical devices such as speed humps than with horizontal devices such as chicanes.

Additional controls may include:

- Smooth any gaps or uneven rail track joints in the area close to the sensitive receivers. This would not only provide reduction in noise impact, but also vibration impact to the nearby sensitive receivers
- Traffic management to reduce the need for multiple heavy vehicle deliveries to one location
- Acoustic treatment to specific noise sources from specific nearby industry

8.9.3 Control in transmission

The noise reduction strategy used to control in noise transmission usually involves the installation of noise barriers. Noise barriers may include an existing feature, such as:

- An elevated road or a natural slope (e.g. earth mound)
- A purpose designed feature such as a solid boundary fence
- A purpose designed feature of the building, such as a partially enclosed carport
- A purpose designed building which acts as a barrier block

In general, the noise barrier should provide sufficient screening to avoid direct line of sight between the shielded noise sources and the protected sensitive receivers. Noise barriers would not be effective in reducing noise impacts if the line of sight from the noise source to the residence is not reduced. Hence, it may not be practical to install a noise barrier for elevated receivers.

8.9.4 Receiver control

There are several strategies involved in using the Receiver Control measure:

- Building orientation layout. This involves configuring the development's floor plan to have sleeping areas/habitable areas facing away from the noise sources
- Minimise lightweight external wall construction facing the dominating noise sources
- Thicker glazing construction for the window façade
- Minimise window size and maximise masonry external wall construction
- Minimise the use of openable window construction
- Configure any discharge/intake duct grill layout (above ceiling level) facing away from the noise sources
- Balustrade/balcony design/configuration to avoid direct line of sight from the balcony to the noise sources (this shall be confirmed following the design of the development and landscape layout)
- Installation of foam rubber pad along the required building foundation plate, where necessary, depending the magnitude of the potential exposed vibration across the building structures

9. Vibration impact assessment (non-blasting)

The operation of Barro Group Woody Hill Quarry and the approved Philips Quarry would have the potential to generate environmental vibration impacts onto the Shenstone Park PSP site.

The purpose of this vibration assessment is to assess the likelihood of impact from the existing mudstone quarrying operations at the Barro Group Woody Hill Quarry and approved basalt quarry (Phillips Quarry) located immediately south of the PSP.

9.1 Legislation, Policy and Guidelines

9.1.1 Human comfort

In the absence of any local guidelines, human comfort vibration criteria have been set with consideration to the NSW EPA *Environmental Noise Management – Assessing Vibration: A Technical Guideline (AVTG)* (NSW EPA, February 2006). British Standard 6472:2008, *Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources Other than Blasting* (BS 6472, 2008) is recognised by the NSW EPA AVTG as the preferred standard for assessing ‘human comfort’.

BS 6472:2008 is commonly recognised in Australia as the preferred standard for assessing human comfort criteria for residential receptors. Table 27 includes the acceptable values of vibration dose for residential receptors during daytime and night-time periods.

These values represent the best judgement available at the time the standard was published and may be used for both vertical and horizontal vibration, providing that they are correctly weighted. As there is a range of values for each category, it is clear that the judgement can never be precise.

Table 27 Vibration dose value (VDV) ranges and probabilities for adverse comment to intermittent vibration ($m/s^{1.75}$)

Location	Low probability of adverse comment[a]	Adverse comment possible	Adverse comment probable[b]
Residential buildings 16 hours day (7.00 am to 11.00 pm)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hour night (11.00 pm to 7.00 am)	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Notes:
[a] Below these ranges adverse comment is not expected.
[b] Above these ranges adverse comment is very likely.

BS 6472 outlines vibration limits, which would cause minimal adverse reactions from the occupant and does not consider the short term duration of the likelihood of construction activity of the project. Hence, whilst the assessment of response to vibration in BS 6472 is based on VDV, for construction related vibration, it is considered more appropriate to provide guidance in terms of peak particle velocity (PPV) in millimetres per second, since this parameter is likely to be more routinely measured based on the concern over potential building damage.

BS 5228-2:2009 *Code of Practice for Noise and Vibration on Construction and Open Sites – Part 2: Vibration* (BS 5228.2, 2009) recommends that the guidance values presented in Table 28 are more appropriate for construction works as it is easier to assess the intermittent vibration criteria against peak value rather than a dose value. BS 5228.2 also recognises that higher vibration levels are tolerable for short-term construction projects as undue restriction on vibration levels can substantially prolong construction works and result in greater annoyance.

Humans are capable of detecting vibration at levels, which are well below those causing risk of damage to a building. The degree of perception for humans is suggested by the vibration level categories given in BS 5228-2:2009, as shown in Table 28.

Table 28 Guidance on the effects of vibration levels (BS 5228.2)

Approximate vibration level	Typical degree of perception
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Based on Table 28, the human response to vibration could be summarised as:

- A vibration level in the range between 0.14 mm/s to 0.3 mm/s would generate low probability of adverse comment or complaints
- A vibration level in the range between 0.3 mm/s to 1 mm/s would generate the possibility of adverse comment or complaints
- A vibration level greater than 1 mm/s would likely cause adverse comment or complaint

The vibration limits in Table 28 have been adopted for this assessment.

9.1.2 Structural damage

Currently, there is no Australian Standard that sets the criteria for the assessment of building or other structural damage caused by vibration. Australian Standard 2436:2010 – *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites;* does refer to the control of vibration in Section 4.8.1. The supplied information in AS 2436 is general in nature and refers to other standards and guidelines if a more detailed assessment is required, i.e. quantification of vibration exposure. British Standard BS 7385.2:1993 – *Evaluation and Measurement for Vibration in Buildings: Part 2 – Guide to Damage Levels from Ground Borne Vibration* and British Standard BS 5228.2:2009 – *Code of Practice for Noise and Vibration Control on Construction and Open Sites: Part 2 Vibration*; are referenced in AS 2436 as being able to supply detailed vibration quantification.

Additional to the detailed British Standards, the German Standard *DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of Vibration on Structures* (German Standards, 1999) provides more stringent vibration criteria as opposed to BS 7385.2:1993 for above ground structures, but less stringent criteria for below ground structures when compared to BS 5228.2:2009. Therefore, a combination of the German and British Standards is recommended, in the absence of specific criteria being supplied by the asset owner, as shown in Table 29.

Table 1 of Section 5 of DIN 4150.3:1999 presents guideline values for the maximum absolute value of the velocity "*at the foundation and in the plane of the highest floor of various types of building. Experience has shown that if these values are compiled 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.*"

Measured values exceeding those listed in Table 29 "*… does not necessarily lead to damage; should they be significantly exceeded, however further investigations are necessary.*"

Table 29 Guidance values for short-term vibration on structures

Line	Type of structure	Guideline values for velocity v(t)[a] (mm/s)		
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz[b]
At grade structures (DIN 4150.3:1999)				
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design.	20	20 to 40	40 to 50
2	Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10
Underground structures (BS 5228.2:2009)				
Competent structure such as steel or concrete pipeline		30		
Dilapidated brickwork		15		

[a] The term vi refers to vibration levels in any of the x, y or z axis..

[b] Where frequencies are above 100 Hz the values given in this column may be used as minimum values.

The vibration criteria presented in German Standard DIN 4150.3:1999 exceeds the human comfort criteria presented in Table 28. Therefore, for facilities that people occupy the human comfort criteria should override the structure damage criteria for the assessment of any vibration.

9.2 Vibration Assessment

9.2.1 Woody Hill Quarry Operational Vibration Assessment (Non-Blast)

Many of the types of equipment used in the quarry are similar in nature to those used in construction activities such as loaders, trucks and excavators and some of the equipment used has the potential to generate vibration.

Energy from the types of equipment used in the quarry is transmitted into the ground and transformed into vibrations, which attenuate with distance. The magnitude and attenuation of ground vibration is dependent on:

- The efficiency of the energy transfer mechanism of the equipment (i.e. impulsive, reciprocating, rolling or rotating equipment)
- The frequency characteristics of the vibrations produced
- The impact medium stiffness (where vibrations are passing through)
- The type of wave (surface or body)
- The ground type and topography (i.e. transmissivity and trough isolation effects)

Due to the above factors, there is an inherent variability in ground vibration predictions without site-specific measurement data. In lieu of Woody Hill Quarry based information, the NSW RTA *Environmental Noise Management Manual (ENMM) 2001* (RTA NSW, 2001) provides typical construction equipment ground vibration levels at 10 m.

The ENMM states that: "*in obtaining an initial indication of likely vibration levels, it can be assumed that the vibration level is inversely proportional to distance. Note, however, that field data show a wide variation in distance attenuation, with the distance relationship generally varying between* $d^{-0.8}$ *and* $d^{-1.6}$ *rather than being fixed at* d^{-1}*.*", where *d*=distance.

The rate of vibration attenuation can be calculated from the following regression analysis formula:

$$V = kd^{-n}$$

Where:

V = PPV (peak particle velocity)

d = Distance

n = attenuation exponent. The value of n generally lies between 0.8 and 1.6 with a relatively common value of 1.5[19].

k = Velocity (PPV) at d=1 unit of distance

The predicted ground vibrations at various distances are shown in Table 30 for typical equipment used at quarries and in construction of haul roads and movement of earthen materials.

Given the distances involved between site works and the nearest receivers, vibrations affecting human comfort and building integrity are not expected to be an issue.

[19] Construction Vibrations: State of the Art (Wiss, 1981)

Table 30 Predicted construction equipment vibration levels (mm/s PPV)

Plant item[20]	Human perception preferred criteria (mm/s PPV) *(maximum criteria)*		Predicted ground vibration (mm/s PPV)				
	Day	Night	10 m	50 m	100 m	200 m	500 m
15 t roller	0.28 *(0.56)*	0.2 *(0.4)*	7.5	0.7	0.2	0.1	<0.1
Dozer	0.28 *(0.56)*	0.2 *(0.4)*	3.3	0.3	0.1	<0.1	<0.1
7 t compactor	0.28 *(0.56)*	0.2 *(0.4)*	6.0	0.5	0.2	0.1	<0.1
Excavator[21]	0.28 *(0.56)*	0.2 *(0.4)*	3.6	0.3	0.1	<0.1	<0.1
Grader[22]	0.28 *(0.56)*	0.2 *(0.4)*	2.0	0.2	0.1	<0.1	<0.1

9.2.2 Phillips Quarry Operational Vibration Assessment (Non-Blast)

The Phillips Quarry is expected to use many of the types of equipment currently used in the Woody Hill Quarry similar vibrational impacts as those outlined in section 9.2.1 would occur at the Phillips Quarry.

9.3 Cumulative impacts

It should be expected that the two quarries would, at some point be, excavated concurrently. Individual assessment of the quarries for various scenarios relating to vibration have not been undertaken as the impacts are not expected to be significant enough to impact at sensitive receiver locations.

9.4 Summary

It is expected that any vibrational impact from equipment such as graders or excavators onsite within both the Woody Hill Quarry and the Phillips Quarry would be not be perceptible by a human beyond a distance of approximately 100 m from the work authority boundary.

It is also unlikely that operational vibrations from the Woody Hill Quarry and the Phillips Quarry would be perceptible in residential environments after 50 m from the work authority boundary.

Given the distances involved between site works and the most likely future location of receivers, vibrations affecting human comfort and building integrity are not expected to be an issue beyond 100 m from each quarry's work authority boundary.

Hence, it is recommended a 100 m operational (non-blast) vibration buffer around the approved work authority area for both the Woody Hill Quarry and the Phillips Quarry therefore be prescribed.

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[20] NSW RTA Environment noise management manual
[21] The predicted ground vibration values were based on data stipulated in Cenek.P.D, et al. *Ground vibration from road construction* (May 2012) Research paper.
[22] Tynan, A.E. Ground Vibrations. Damaging effects to Buildings. Australian Road Research Board 1973

10. Blast generated fly rock

Fly rock and fly (other debris) occur when the explosive energy from the gas expansion in a blast event is vented violently into the atmosphere, and forces rocks and debris to be thrown outward from the blast location.

The major cause of fly rock is due to incorrectly drilled and stemmed charges or natural weakness in rocks causing premature gas venting. However, there are a number of contributing factors as outlined in AS 2187.2:2006 *Explosives – storage and use of explosives*, as follows:

- Weak rock structure
- Insufficient front row blast hole burdens
- Stemming depth
- Initiation sequence
- Blast hole diameter
- Blast pattern shape, or
- Stemming material

Generally, through carefully implemented control measures, most fly rock can be contained within the active pit area to approximately 50 m in front of the face. Industry practice is to allow at least a factor of four times this distance as a safety factor.

DEDJTR's advice[23] indicates that a 200 m radial buffer distance from the boundary of the extraction area is sufficient to mitigate against safety issues from fly rock during blasting.

This 200 m buffer is to be radial in shape as the fly rock component will be independent of wind speed and direction due to the projectile speed of fly rock.

[23] Meeting with DEDJTR on 17 October 2017

11. Blast generated noise

The operation of the existing mudstone quarrying operations at the Barro Group Woody Hill Quarry and the approved basalt quarry (Phillips Quarry) located immediately south of the PSP, would have the potential to generate environmental blast noise impacts onto the Shenstone Park PSP site. This section discusses the potential impacts.

Air blast is the pressure wave (sound) produced by a blast event being transmitted through the air causing a pressure change at the human ear. The sources of air blast include:

- A small air pressure pulse generated by the ground vibration
- A direct air pressure pulse from rock movement
- A direct air pressure pulse from blast gas venting

An air blast can be heard when the frequencies are within the normal human hearing range of between 20 Hz and 20 kHz and can travel large distance during temperature inversions causing sound waves to reflect back to ground long distances from the source.

Air blast frequencies below the natural human hearing range (low frequency) are often noticed by residents as pressure waves that cause rattling of windows and sliding doors.

Air blast is normally heard after the ground vibration, as the waves travelling in the ground move faster than those through the air. Air blast is known to cause more complaints than vibration.

11.1 Legislation, Policy and Guidelines

11.1.1 Blast overpressure

Guidance on potential blast overpressure (noise) is provided from the Australian and New Zealand Environment Council (ANZEC) *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (1990).* This guideline recommends noise and vibration limits for human comfort for residential dwellings as shown in Table 31.

Table 31 Recommended ANZEC 1990 Blasting limits for residential dwellings (human comfort)

Parameter	Vibration Criteria
Maximum level	115 dB(lin) peak
Allowances	The level of 115 dB may be exceeded on up to 5% of the total number of blasts over a period of 12 months, but never over 120 dB(lin) peak.

Table J5.4(A) of AS 2187.2 – 2006 provides a slight variation on the ANZEC guideline to differentiate between operations lasting less than 12 months and longer term operations, as well as providing guidance on criteria for occupied non-sensitive sites, such as factories and commercial premises, refer to Table 32.

Table 32 Air Blast Limits for Human Comfort Chosen By some regulatory authorities (Table J5.4(A) of AS 2187.2 – 2006)

Category	Type of blasting operations	Peak sound pressure level (dBL)
Human Comfort Limits		
Sensitive Site*	Operations lasting longer than 12 months or more than 20 blasts	115 dBL for 95% blasts per year. 120 dBL maximum unless agreement is reached with occupier that a higher limit may apply.
Sensitive Site*	Operations lasting for less than 12 months or less than 20 blasts	120 dBL for 95% blasts. 125 dBL maximum unless agreement is reached with occupier that a higher limit may apply.
Occupied non-sensitive sites, such as factories and commercial premises	All blasting	125 dBL maximum unless agreement is reached with occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacturer's specifications or levels that can be shown to adversely affect the equipment operation.

*A sensitive site is defined under AS 2187.2 as including houses and low rise residential buildings, hospitals, theatres, schools, etc., occupied by people.

Table J5.4(B) of AS 2187.2 – 2006 provides recommended air blast limits for structural damage control, refer to Table 33.

Table 33 Air Blast Limits for damage control (Table J5.4(B) of AS 2187.2 – 2006)

Category	Type of blasting operations	Peak sound pressure level (dBL)
Damage Control Limits		
Structures that include masonry, plaster and plasterboard in their construction and also unoccupied structures of reinforced concrete or steel construction	All blasting	133 dBL maximum unless agreement is reached with owner that a higher limit may apply.
Service structure such as pipelines power lines and cables located above the ground.	All blasting	Limit to be determined by structural design methodology

11.2 Blast Generated Noise Assessment

Ground blast overpressure was estimated using the distance relationship calculation outlined in AS 2187.2 – 2006.

$$P = K_a \left(\frac{R}{Q^{1/3}}\right)^a$$

Where

P= pressure in kilopascals

R=distance from charge, in metres

Q=explosive charge mass, in Kg

K_a=Site constant

a=Site exponent

The standard recommends a site constant of K_a=10 to 100 and site exponent of a=-1.45. Air blast is proportional to the cube root of the charge mass. A variety of factors are important in reducing the noise level (blast overpressure) from the blast event such as the blast design parameters such as charge size, stemming height, delay timing and site specific site constants.

A preliminary assessment of air blast overpressure impacts was considered using the three site constants of K_a=10, K_a=50 , and K_a=100 and site exponent of a=-1.45. Blast distances are taken as distance from charge, however for the purpose of this report assume as being taken at the extraction limit boundary, as this would likely be the worst-case scenario.

As the blast size Maximum Instantaneous Charge (MIC) is unknown at this stage, the equation above was used to identify possible MIC values based on the receiver distance and air blast criteria at sensitive receivers.

Further analysis was undertaken to compare the airblast overpressure in relation to the MIC quantum using the same formula, however taken from the standpoint of change selection. Three charge quantum's of Q=10, Q=50, and Q=100 and a site exponent of a=-1.45 were assessed for a range of K_a values.

Air blast overpressure predictions are presented in Figure 25 through Figure 30 below.

The variation in buffer distance demonstrated by the range of K_a and MIC values indicates that the residential development is feasible providing the blasts are implemented appropriately at the quarry. It is recommended that site constants be confirmed using small test blasts to further refine the predictions. Historical blast monitoring results may also be useful in this regard.

Figure 25 Airblast Overpressure at Distance Over Various Maximum Instantaneous Charge (MIC) Quantum in Kilograms (where, K_a=10, and a=-1.45)

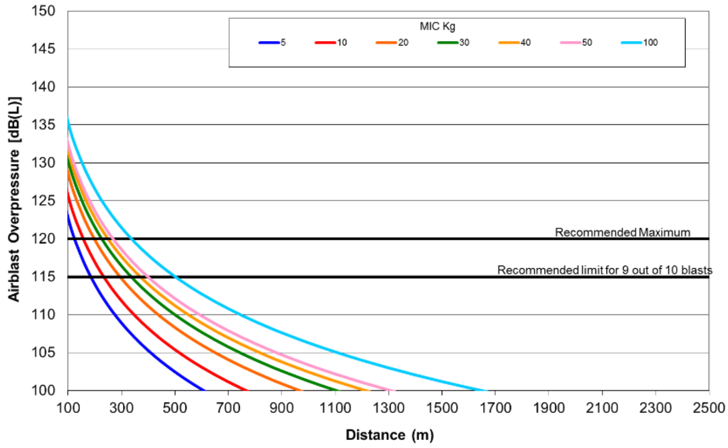


Figure 26 Airblast Overpressure at Distance Over Various Maximum Instantaneous Charge (MIC) Quantum in Kilograms (where, K_a =50, and a=-1.45)

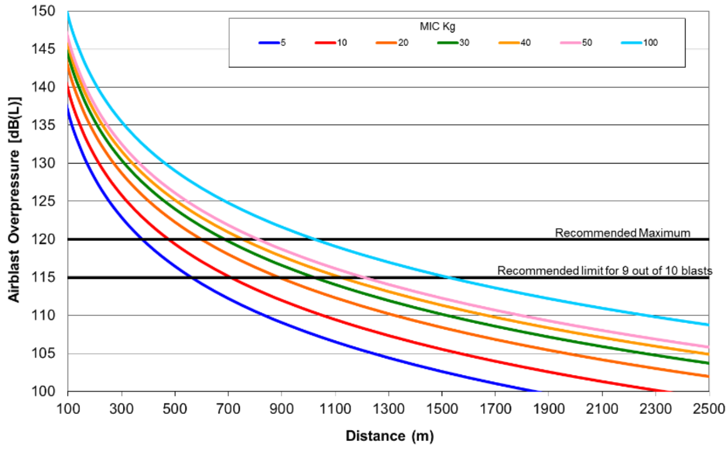


Figure 27 Airblast Overpressure at Distance Over Various Maximum Instantaneous Charge (MIC) Quantum in Kilograms (where, K_a =100, and a=-1.45)

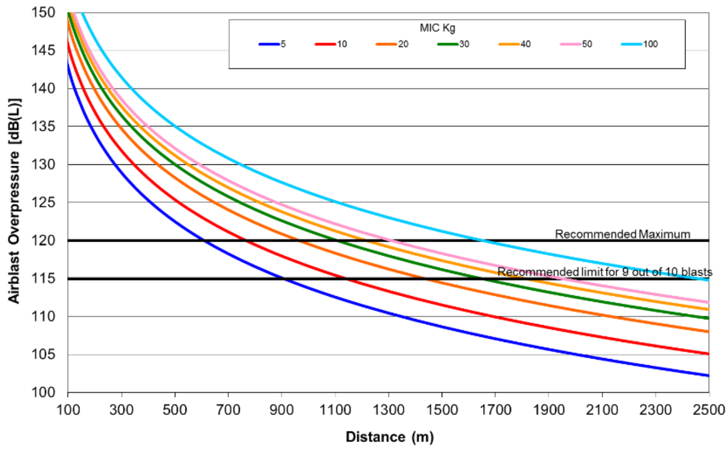


Figure 28 Airblast Overpressure at Distance Over Various Site Constants (K_a) (where, Q=10, and a=-1.45)

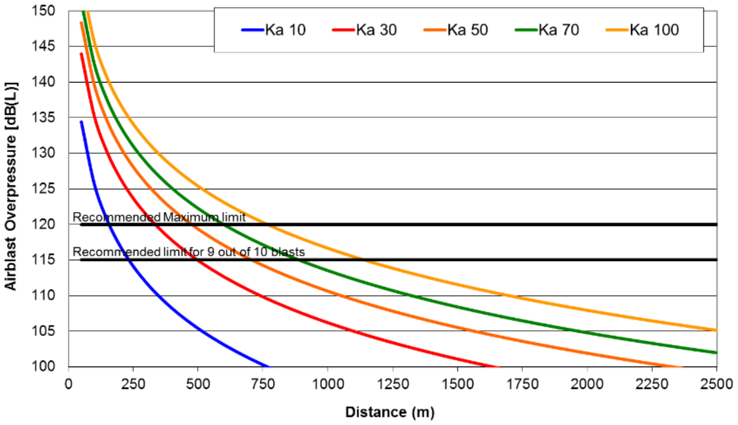


Figure 29 Airblast Overpressure at Distance Over Various Site Constants (K_a) (where, Q=50, and a=-1.45)

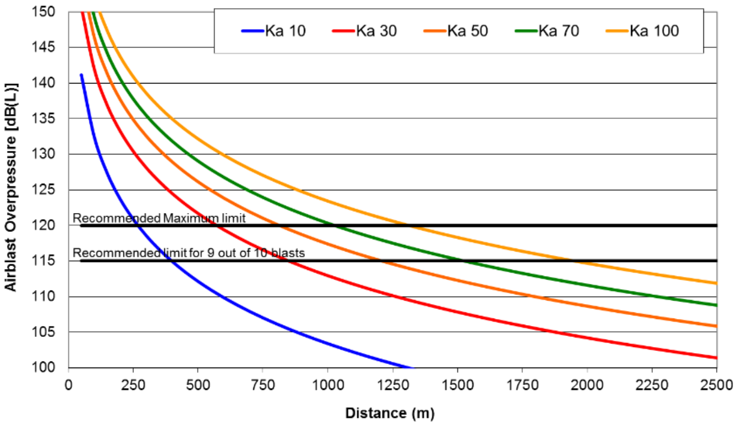
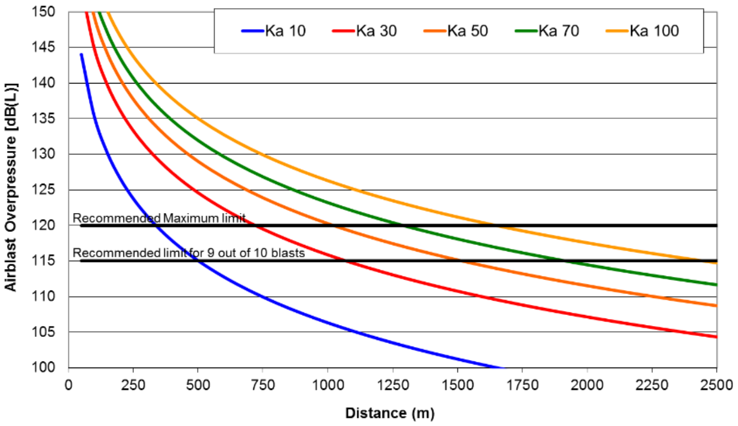


Figure 30 Airblast Overpressure at Distance Over Various Site Constants (K_a) (where, Q=100, and a=-1.45)



11.3 Summary

The predictions summarised in Figure 25 through Figure 30 show the high sensitivity of blast overpressure to the various blast design parameters and site constants. The variation in buffer distance demonstrated by the range of K_a and MIC values indicates that the residential development is feasible providing the blasts are implemented appropriately at the quarry. It is recommended that site constants are confirmed using small test blasts to further refine the predictions. Historical blast monitoring results may also be useful in this regard.

Air blast is a short-lived impact of approximately one second per blast however even when prepared for the sound, people at sensitive receiver locations are often still startled during its occurrence, hence it is impart for quarry operators to provide good community liaison with adequate pre warning prior to blast events using a warning siren or similar technology.

Over a 12 month period, where blasting occurs one time per month, the total air blast overpressure time would amount to approximately 12 seconds per year.

12. Blast generated vibration

The operation of the existing mudstone quarrying operations at the Woody Hill Quarry, approved basalt quarry (Phillips Quarry) located immediately south of the PSP, would have the potential to generate environmental blast vibration impacts onto the Shenstone Park PSP site. This section discusses the potential impacts from this type of impact.

12.1 Legislation, Policy and Guidelines

12.1.1 Blast vibration

Guidance on potential blast overpressure (noise) is provided from the Australian and New Zealand Environment Council (ANZEC) *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (1990).* This guideline recommends noise and vibration limits for human comfort for residential dwellings as shown in Table 34.

Table 34 Recommended ANZEC 1990 Blasting limits for residential dwellings (human comfort)

Parameter	Vibration Criteria
Maximum level	5 mm/s PPV
Allowances	The level of 5 mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months, but never over 10 mm/s.
Long term	It is recommended that a level of 2 mm/s (PPV) be considered as the long-term regulatory goal.

AS 2187.2 – 2006 *Explosives – Storage and use, Part 2: Use of explosives* references to British Standard, BS 7385-2 – 1993 *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration for* guidance values to limit cosmetic and minor building structural damage. These limits are shown in

Table 35 Transient vibration guide values for cosmetic damage (BS 7385-2)

Line	Type of building	PPV in frequency of predominant pulse	
		4 Hz to 15 Hz	15Hz and above
1	Reinforced or framed structures. Industry and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structure. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Requirements for building vibration may not be sufficient to cover high-rise buildings, buildings with long span floors, specialist structures including hospitals or those with sensitive equipment. These cases require special consideration, which may include measurement on the structure itself with particular attention given to suspended floors. Further consideration will also be required in relation to underground services including pipes and cables. For heritage structures this assessment has adopted the DIN 4150-3: 1999 criteria found in Table 29 as ‘line 3’ structures.

12.1.2 Buried pipework

GHD understand a 35 m wide gas and fuel commission easement exists to the east of the Phillips Quarry. Based on the City of Whittlesea Planning Permit 704901 issued for the quarry, a 300 mm high-pressure gas main is buried within the easement boundary.

DIN 4150-3:1999 – *Structural Vibration Part 3: Effects of vibration on* structures provides guidance on the effect of short-term vibration on buried pipework such as may occur through blasting. Table 36 includes the acceptable values of vibration from DIN 4150-3:1999 in mm/s for short-term vibration on buried pipework. The values provided are based on measurements to be taken on the pipe surface.

The guideline values provided in Table 36 can be reduced by 50% without further analysis when assessing the impact of long-term vibrational impacts on the pipework.

Table 36 Guideline values for short-term vibration on buried pipework

Line	Pipe material	Guideline values for velocity measured on the pipe, v_i, in mm/s
1	Steel (including welded pipes)	100
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal with or without flange)	80
3	Masonry, plastic	50

12.1.3 Phillips Quarry planning permit

The Phillips Quarry Planning Permit states the following with regard to the 300 mm gas transmission pressure pipeline to the east of the site:

> *'Any blasting carried out on the land must ensure that the vibration level at the 300 mm transmission pressure pipeline (located to the east of the subject site) does not exceed 75 mm/sec.'*
>
> However, GHD would expect from past experience that the gas utility company may require a 20 mm/s limit for vibration at the pipeline.

12.2 Vibration assessment

Blasting may be required during the quarrying process. Depending on the actual ground conditions encountered, there is potential that sensitive receivers if developed too close to the quarry may exceed the blasting vibration limits for sensitive receivers.

Ground vibration was estimated using the distance relationship calculation outlined in AS 2187.2 – 2006.

$$V = K_g \left(\frac{R}{Q^{1/2}}\right)^{-B}$$

Where

V= ground vibration as a vector peak particle velocity in mm/s

R=distance between charge and point of measurement, in metres

Q=maximum instantaneous charge (effective charge mass delay), in Kg

K_g=Site constant related to rock properties

B=Site exponent

The standard recommends a site constant of K_g=1140 and site exponent of B=1.6 for average conditions when blasting is to be carried out in free face conditions, however the resulting vibration predictions are a median value with 50% probability of exceedance and actual vibration levels may vary from 40 percent to 400 percent of the predictions.

For a preliminary assessment scenario for vibration impacts, blasting was considered to occur at extraction limit boundary. As blast size Maximum Instantaneous Charge (MIC) is unknown at this stage, the equation was used to identify possible MIC values based on the receiver distance and vibration criteria levels. Ground vibration predictions are presented in Table 37, where pink outline values above the long-term regulatory goal of 2 mm/s.

Further assessment comes from Table J7.3.1 of AS 2187.2:2006 which outlines the 2 m/s, 5 m/s, and 10 mm/s criteria outline in the ANZEC guideline as well as a 25 mm/s criteria for occupied non-sensitive sites, such as factories and commercial premises, refer to Table 38.

British Standard BS 6472-2 provides in Table B.1 data from measurements of blast vibrations at three maximum instantaneous charge levels of 75 kg, 100 kg, and 120 kg. The produced charts shows compliance with the ANZEC short-term guideline generally occurs around a distance of 550 m.

Table 37 Predicted blast ground vibration PPV, mm/s (AS 2187.2:2006)

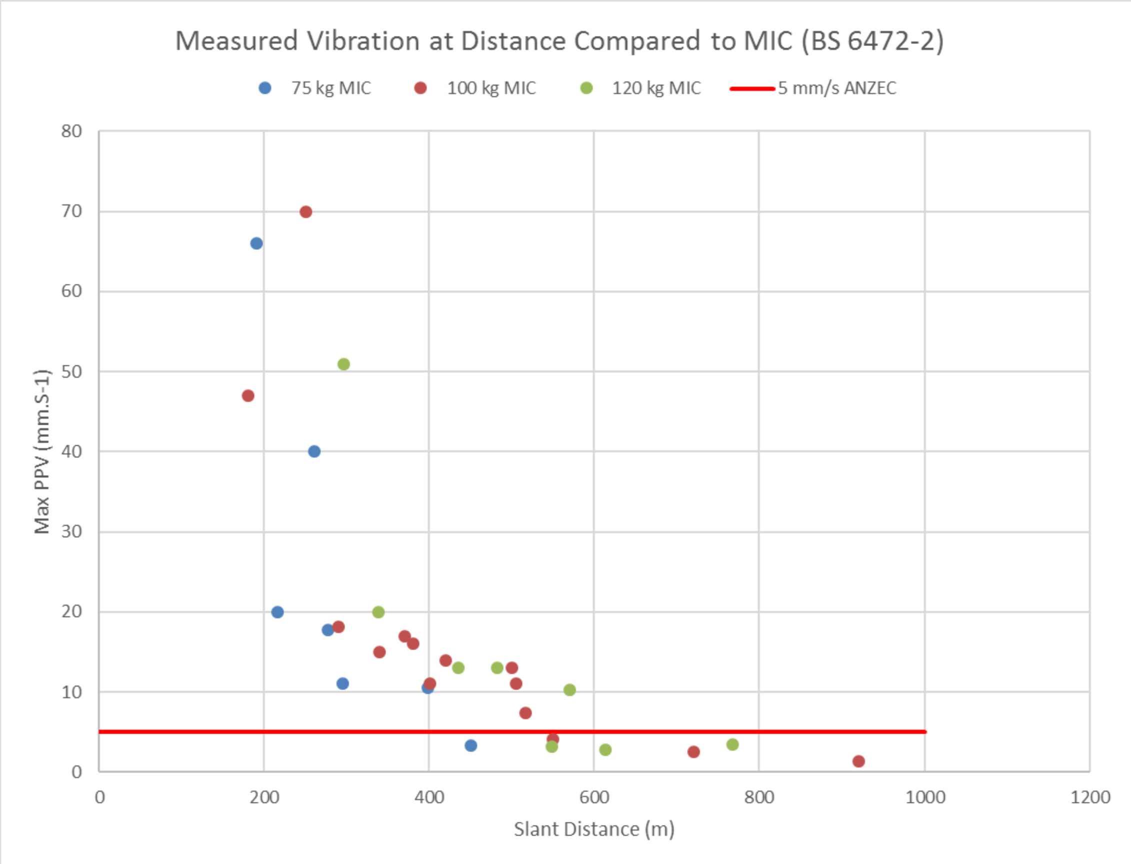
Distance to nearest blast location (m)	Predicted Blast Ground Vibration PPV (mm/s)									
	site constant K(ground) = 1140 MIC (kg)									
	0.5	1.0	2.0	5.0	10	20	30	40	50	100
50	1.25	2.18	3.80	7.90	13.76	23.95	33.13	41.71	49.86	86.81
100	0.41	0.72	1.25	2.61	4.54	7.90	10.93	13.76	16.45	28.64
150	0.22	0.38	0.65	1.36	2.37	4.13	5.71	7.19	8.60	14.97
200	0.14	0.24	0.41	0.86	1.50	2.61	3.61	4.54	5.43	9.45
250	0.10	0.17	0.29	0.60	1.05	1.82	2.52	3.18	3.80	6.61
300	0.07	0.12	0.22	0.45	0.78	1.36	1.88	2.37	2.84	4.94
350	0.06	0.10	0.17	0.35	0.61	1.06	1.47	1.85	2.22	3.86
400	0.04	0.08	0.14	0.28	0.49	0.86	1.19	1.50	1.79	3.12
450	0.04	0.06	0.11	0.23	0.41	0.71	0.99	1.24	1.48	2.58
500	0.03	0.05	0.10	0.20	0.35	0.60	0.83	1.05	1.25	2.18
550	0.03	0.05	0.08	0.17	0.30	0.52	0.71	0.90	1.08	1.87
600	0.02	0.04	0.07	0.15	0.26	0.45	0.62	0.78	0.94	1.63
650	0.02	0.04	0.06	0.13	0.23	0.40	0.55	0.69	0.82	1.43
700	0.02	0.03	0.06	0.12	0.20	0.35	0.49	0.61	0.73	1.27
750	0.02	0.03	0.05	0.10	0.18	0.31	0.44	0.55	0.65	1.14
800	0.01	0.03	0.04	0.09	0.16	0.28	0.39	0.49	0.59	1.03
850	0.01	0.02	0.04	0.08	0.15	0.26	0.36	0.45	0.54	0.93
900	0.01	0.02	0.04	0.08	0.13	0.23	0.32	0.41	0.49	0.85
950	0.01	0.02	0.03	0.07	0.12	0.22	0.30	0.38	0.45	0.78

Distance to nearest blast location (m)	Predicted Blast Ground Vibration PPV (mm/s)									
	site constant K(ground) = 1140 MIC (kg)									
	0.5	1.0	2.0	5.0	10	20	30	40	50	100
1000	0.01	0.02	0.03	0.07	0.11	0.20	0.27	0.35	0.41	0.72
1050	0.01	0.02	0.03	0.06	0.11	0.18	0.25	0.32	0.38	0.67
1100	0.01	0.02	0.03	0.06	0.10	0.17	0.24	0.30	0.35	0.62

Table 38 Free Face Vibration at Distance Compared to MEC (AS 2187.2:2006)

Vibration (VPPV) mm/s	Estimated maximum effective charge per delay, kg													
	Distance, m													
	1	5	10	20	30	50	80	100	150	200	300	500	800	1000
2	-	0.010	0.035	0.145	0.3	0.9	2.3	3.6	8	14	32	90	230	360
5	0.001	0.030	0.110	0.450	1.0	2.8	7.2	11.3	25	45	100	280	720	1,130
10	0.003	0.070	0.270	1.050	2.4	6.7	17.2	26.9	60	105	240	670	1,720	2,700
25	0.008	0.210	0.840	3.400	7.6	21.0	54.0	84.2	190	340	760	2,100	5,400	8,400

Figure 31 Measured Vibration at Distance Compared to MIC (BS 6472-2)



12.3 Summary

It is expected that any vibrational impact from blasting at either the Woody Hill Quarry or Phillips Quarry would require a distance of approximately 550 m from the extraction boundary to provide sufficient attenuation for a blast with MIC of approximately 100 kg to meet the 2 mm/s (PPV) long-term regulatory goal.

13. Quantitative odour impact assessment – Wollert STP

13.1 What is odour

Odour as defined by the Victorian EPA is as follows: *"An odour is perceived when chemicals in gas form stimulate the human olfactory system (your nose). The human nose has hundreds of receptors, each coded by unique DNA to detect different odours, and therefore accounting for the fact that different people have different sensitivities and reactions to smell. Scientists also suggest that the sense of smell is intimately associated with the formation of memories. Reactions to odours can be very subjective. A smell may be pleasant to one person and unpleasant to someone else. This can make the objective assessment of odour difficult to achieve".*

13.2 Victorian odour criterion

The SEPP (AQM) requires that no person pollute the atmosphere to make it offensive to the senses of human beings. For new or expanded industrial premises, the SEPP (AQM) requires that Design Criteria (DC) specified for a wide range of pollutants be met at the 99.9th percentile level. The DC is normally expressed as a concentration that must not be exceeded in the environment. Where a pollutant's DC is based on toxicity, then the DC must be met both within and outside the premises boundaries. However, when the DC is based on odour threshold (i.e. the pollutant is an odorant), then the DC need only be met at and beyond the premises site boundary.

The DC for mixed odorants is specified in Schedule A to the SEPP (AQM), where under 'unclassified' indicators the DC for 'general odour' is set to one odour unit (OU). Part C to Schedule C of the SEPP (AQM) requires that the predicted maximum concentration of pollutant should not exceed the 9th highest in the 100 highest table of model results – or the 99.9th percentile level.

However, in the last revision of SEPP (AQM) in December 2001, an odour limit relaxation was allowed for intensive animal husbandry in rural areas (i.e. piggeries, broiler farms, cattle feedlots) where the criterion was set to 5 OU at 99.9th percentile (refer to footnote 9 to Schedule A of SEPP (AQM)).

The legislation does not restrict the emission of odour beyond the boundaries of the premises. The restriction only applies to odour that is offensive or adversely affects local amenity or aesthetic enjoyment (beneficial uses set out in the SEPP) of the air environment. To this end, a discharge of offensive odour from a premise that does not impact on humans is unlikely to be a breach of the Act or breach of standard licence or notice conditions.

13.3 What is offensive odour?

The Environment Protection Act does not define the term ‘offensive to the senses of human beings’. The SEPP expands the concept of beneficial uses to include impacts to local amenity or aesthetic enjoyment. People experience odours differently, so only the individual being affected can claim that the odour is offensive (affecting their amenity or aesthetic enjoyment). EPA can only trigger an investigation into an odour complaint when odour is reported by a community member as being offensive. Offensive odour affects the general life, health and wellbeing of an individual, as a result of the intensity, character, frequency and duration of the odour. The basis for acting against offensive odours may vary according to where the odour occurs. As an example, the normal agricultural odours present in a rural environment may not be considered offensive in an open paddock, but may be considered offensive in a residential area.

13.4 Wollert STP

13.4.1 Description of proposed treatment at Wollert STP

No description of the proposed Wollert STP was available at the time of this assessment.

GHD understands that YVW’s plans are at such an early stage (construction maybe in 10 years) they have not yet decided on the type of equipment the plant would utilise. In such a case, GHD would not be able to model accurately the offsite odour impact. Any modelling would be have serious limitations and could potentially limit YVW operations in the future.

YVW has also specified that there may be a large unknown industrial client (that they are in discussions with currently). This adds to the complexity as standard odour emission rates taken from STPs serving residential populations would not apply. The odour emission rates resulting from the domestic/industrial blend of influent to the STP would not be able to be quantified.

In the absence of the STP design, the buffer specified by the EPA buffer guideline based on the estimated equivalent population (ep) shown in Table 13 is the appropriate tool to be used for planning around the STP. GHD has assessed the directional buffer using local meteorology. Section 6.2.4 details the default separation distance to apply to the STP and section 6.4.4 analyses the directional buffer once local meteorology is applied to the default distance.

14. Future land use planning considerations

14.1 Key findings and development constraints

This report has highlighted that potential amenity impacts from existing and proposed industries, and encroachment of incompatible land uses, must be managed through the development of the PSP and planning controls for the precinct. Protecting significant assets whilst enabling sustainable development to occur is important, as incompatible land uses may adversely impact the operations and viability of the quarries and STP into the future and in turn impact the amenity and health of the community.

Dust and odour

Using the EPA recommended separation distance guidelines GHD has assessed all the recommended default buffers for the identified potential odour and dust emitting sources. The assessment has identified the portion of Shenstone Park PSP land where the EPA recommended separation distances would be applied. Planning for the precinct should address:

1. Risk to future newly developed sensitive uses of being subjected to unacceptable odour, noise or dust impacts during either routine or upset events on in certain other circumstances.
2. The encroachment of sensitive uses on the buffer areas of existing industries may result in unachievable or unreasonable requirements on the industries to mitigate the impacts at the source.

The PSP planning process must protect significant earth resources, whilst enabling sustainable urban development as established in Plan Melbourne and the North Growth Corridor Plan to occur. Inappropriate planning may adversely impact the operations and viability of the quarries and STP into the future and conversely impact the amenity and health of the future community within the PSP.

The existing operations were assessed for the Woody Hill Quarry and the approved Phillips Quarry. From the EPA guideline, an active quarry with blasting has a recommended buffer of 500 m. Though not specified in the guideline, the 250 m difference in separation distance applying to blasting activities at 500 m and auxiliary activities appears to account for possible transport of dust particles.

The default 500 m buffers applied to the extraction boundaries for both quarries and default 613 m default STP buffer extend much further than the buffers for the concrete batching plant (at Woody Hill) and rock processing plant, at 100 m and 250 m respectively.

The EPA also allow for site-specific variation to the default buffer distance for a given industry and identifies six criteria to consider in Table 4 of the guideline. It is likely that some of the factors listed in that table could vary the default buffer, if specific operational details about the industry is known.

Two criteria that allow for site specific variations which would have the biggest impact in varying the default buffers are considered to be size of the facility (de-rating a default buffer) and local meteorology (directional buffer).

GHD considers that the relevant buffer for the active quarry area and approved quarry area with blasting should be the default 500 m buffer irrespective of the throughput of the quarry. The derating is not appropriate for the existing or approved quarry in relation to blasting.

However, GHD considers that the directional buffer would apply to the default 500 m buffer given that the default buffer accounts for possible transport of dust particles, which would be subject to meteorological influences. The local meteorology would only apply during daytime hours for the quarries as blasting would only occur during the daytime.

DEDJTR's advice[24] indicates that a 200 m radial buffer distance from the extraction boundary of the extraction area is sufficient to mitigate against safety issues from flyrock during blasting, which GHD agrees with. This buffer is to be radial as the flyrock component will be independent of wind speed and direction as the projectile speed of flyrock is much higher than the wind speed.

The directional buffer assessment shows that the default buffer can be retracted and extended in the directions of good and poor dispersion. A large extension of the default buffer occurs to the east and northeast into the PSP, while the default buffer is retracted in the west due to anticipated meteorology conditions.

Dust dispersion modelling was also undertaken for dust impacts from the two quarries. The criterion for PM_{10} (60 µg/m3) did marginally extend onto PSP land. The PM_{10} 24 hour criterion was predicted to be met at all existing sensitive receptors, and was predicted to be contained within the default and directional separation distances for the various scenarios for each quarry.

In order to manage the conflicts between land uses, there must be a balance between selecting measures that sufficiently mitigate amenity impacts, and avoiding over regulation and therefore impacting on the ability to achieve other objectives, such as urban growth and environmental sustainability. However, in this instance due to the adverse amenity impacts anticipated by the operation on the existing quarry a conservative and cautious approach to any form of urban intensification surrounding the existing and future industries is the preferred approach.

Noise and Vibration

Noise from the operation of the Woody Hill Quarry was audible at the noise logger located within the property at 960 Donnybrook Road.

Noise levels noted at this logger location are consistent with those predicted in modelling (Figure 22), suggesting a good fit of the model to the current existing conditions occurring at the quarry, noting there is some conservatism in the model and also in the noise criteria to ensure adequate protection.

It is expected that the daytime noise levels generated from the Woody Hill Quarry will require a buffer of up to approximately 900 m from the existing extraction area at Woody Hill Quarry to meet the daytime criteria of 48 dB(A), prior to any noise mitigation measures being implemented. Further encroachment of the PSP occurs due to the proposed Phillips Quarry operation to the south, with Stage 1 requiring a 300 m buffer in order to meet the day time criteria of 48 dB(A).

Generally, through carefully implemented control measures, most flyrock can be contained within the active pit area to approximately 50 m in front of the face. Industry practice is to allow at least a factor of four times this distance as a safety factor, this indicates that a 200 m radial buffer distance from the extraction boundary is sufficient to mitigate against safety issues.

Blast generated noise is very dependent on site specific constants and can vary significantly based on the blast methodology being used. Onsite measurements would be required prior to any future development to understand the air blast overpressure from each quarry's operation and what restrictions this would have on future development.

[24] Meeting with DEDJTR on 17 October 2017

It is expected that any vibrational impact from blasting at either the Woody Hill Quarry or Phillips Quarry would require a distance of approximately 550 m from the extraction boundary to provide sufficient attenuation for a blast with an MIC of approximately 100 kg.

Given the existing quarry will remain throughout the precinct development, the quarry asset owner will not be obligated to comply with the SEPP N-1 noise policy for any future sensitive receiver built within the vicinity.

Development may still be able to occur within the 900 m buffer following appropriate mitigation either at the quarry or via building acoustic treatments at the sensitive receiver location. Discussion with the asset owner may need to be undertaken to provide effective as well as agreed noise mitigation measures for the quarry, as necessary.
Should a control at source noise mitigation strategy not be possible or practicable, it is not uncommon that the indoor amenity of sensitive receivers subject to operational noise be acoustically treated using a control at receiver strategy, via building acoustic treatment. However, the limitation of this strategy is that it would not preserve the outdoor amenity of the receiver unless a combination control such as noise control at transmission be implemented.

Noise mitigation strategies have been identified into four different areas from the most to the least preferred (NSW INP, 2000):

- *Land-use Controls* (separating the location of noise-producing activities from sensitive areas)
- *Control at Source* (reduce the noise output of the source to provide protection surrounding environment)
- *Control in Transmission* (reduce noise level at the receiver but not necessarily the environment surrounding the source, e.g. noise barrier, etc.
- *Receiver Control* (localised acoustic treatment at sensitive receiver)

Use of mitigation strategies involving land-use control such as:

- A setback strategy (e.g. Non sensitive uses adjacent to noisy industries, busy road and/or railway corridor to provide noise reduction through setback distances to residential and other sensitive uses).
- Use of acoustic control planning conditions on new developments will enable a blending of light industrial, commercial and residential lands uses to occur along the buffer boundary, allowing staged development to occur.

14.2 Recommended buffers

Figure 32 (aerial base map) provides a visual display of the impact assessments undertaken as part of this report.

Figure 32 shows the following information:

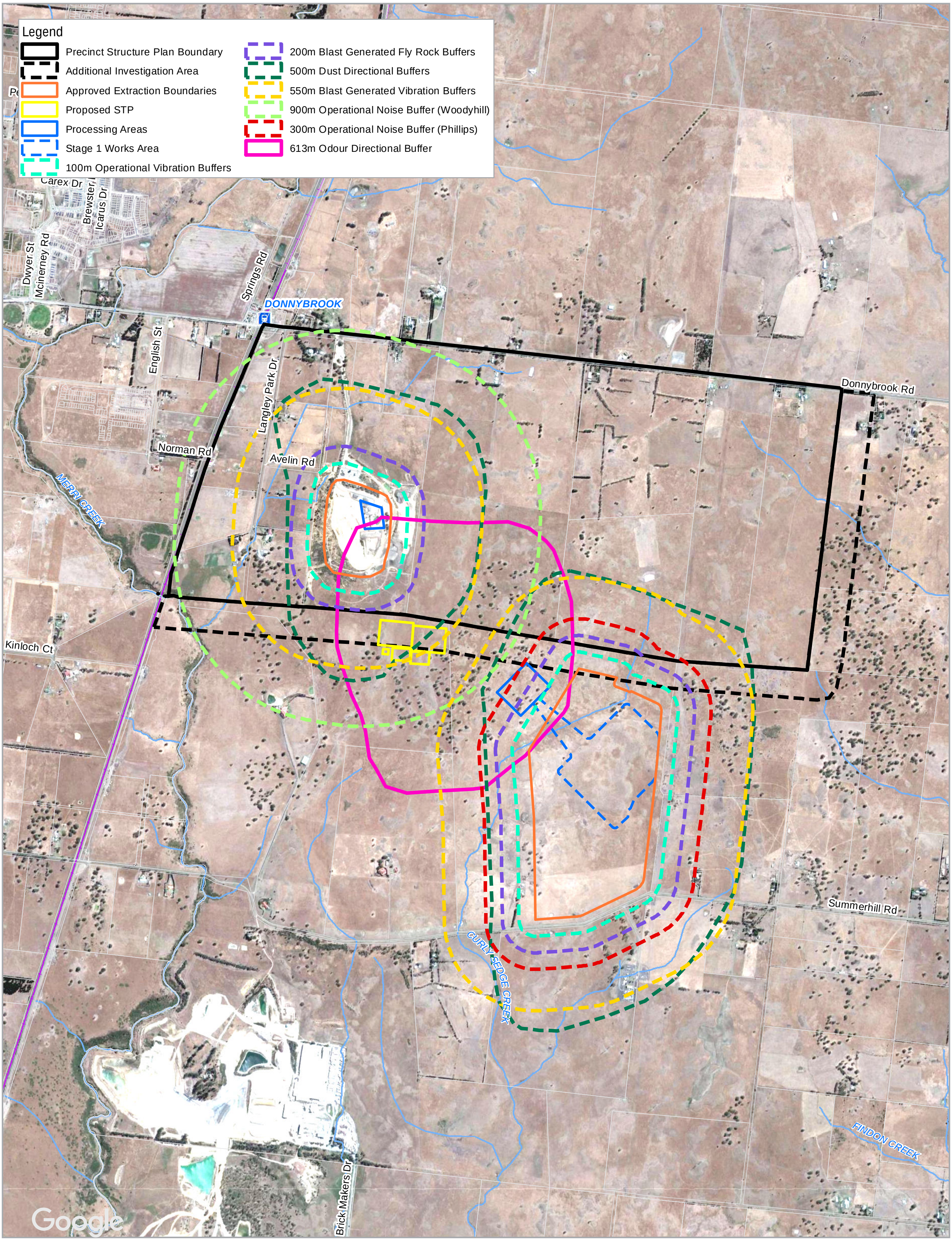
- 500 m dust directional buffers from the approved extraction area boundary
- 613 m odour directional buffer for the proposed Wollert STP
- Operational noise buffer for the Woody Hill Quarry of 900 m from the approved extraction area boundary prior to any operational noise mitigation being implemented
- Operational noise buffer for the Phillips Quarry of 300 m from the approved extraction area boundary prior to any operational noise mitigation being implemented
- 100 m Operational vibration buffer from the approved extraction area boundary
- Blast generated flyrock buffer of 200 m from the approved extraction area boundary

- Blast generated noise would require empirical measurements prior to any proposed development to assess the site specific conditions experienced during a blast event. Any proposed development would be limited by the requirement to achieve 115 dB(linear) at the proposed development location.
- Blast generated vibration buffer of 550 m for Woody Hill and Phillips quarries from the approved extraction area boundary for an MIC of approximately 100 kg to meet the 2 mm/s (PPV) long-term regulatory goal for human comfort.

The intent of the buffers from the quarries and STP, would be to restrict additional sensitive land use intensification in these buffer areas (including land inside and outside of the PSP), due to the risks from, dust, odour, operational noise and vibration, blast noise, blast vibration, and blast generated flyrock.

The inclusion of buffer controls within the PSP should achieve separation of non-compatible uses and delineate land available for urban development.

The PSP planning process must protect significant assets, whilst enabling sustainable development to occur. Inappropriate planning may adversely impact the operations and viability of the quarries and STP into the future and, in turn, impact the amenity and health of the community.



Paper Size ISO A4

0 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

City of Whittlesea

Existing Buffer Areas

Project No. 31-35311
Revision No. A
Date 24/11/2017

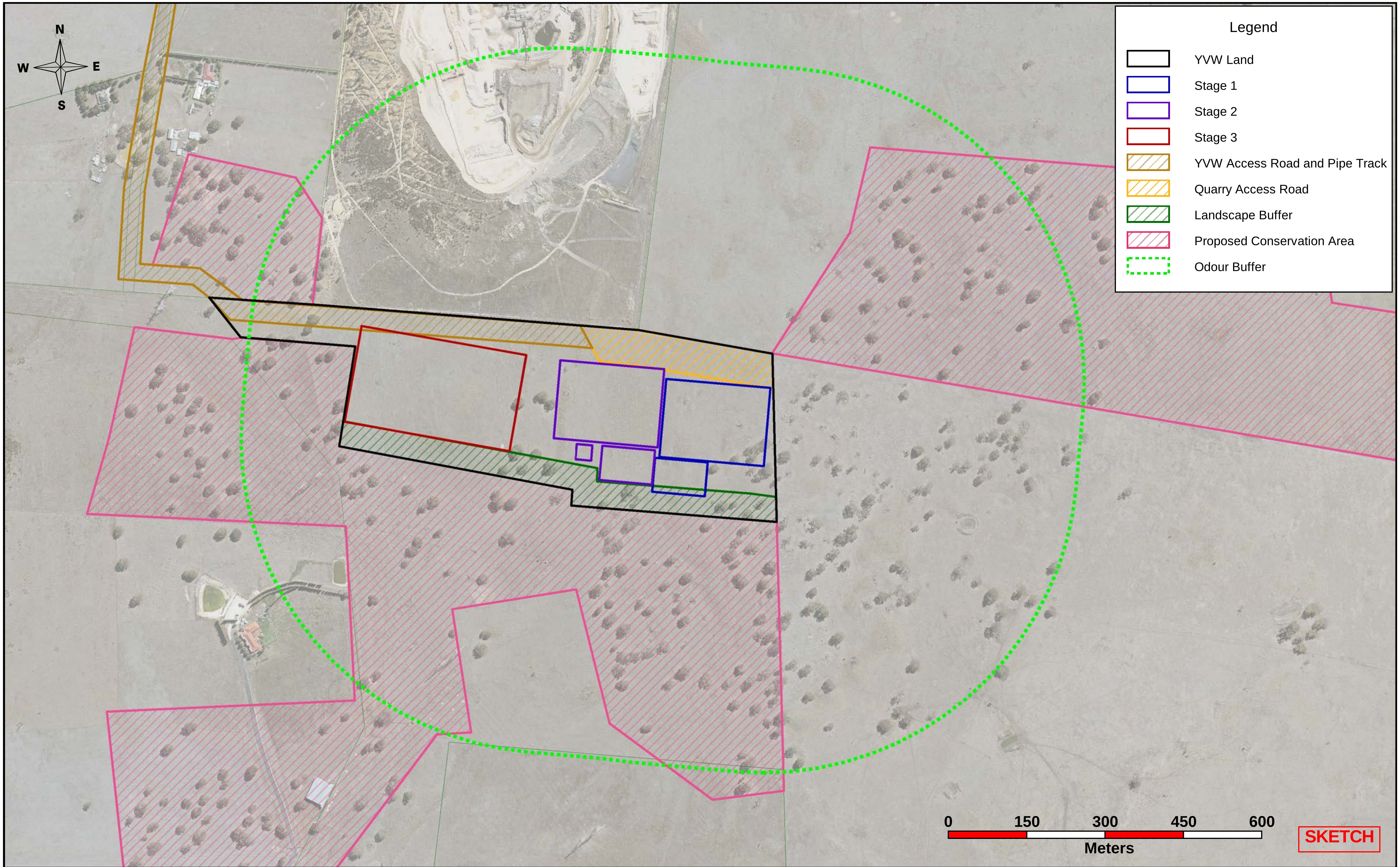
Figure 32

G:\31\35311\GIS\Maps\Deliverables\3135311_KBM_A4P.mxd
Print date: 24 Nov 2017 - 14:30

Data source: Data Source: Image - Google, DigitalGlobe dated 2017/07/10 and VicMap, DELWP (2017). Created by: lrsmith

Appendices

Appendix A – Wollert Treatment Plant Layouts



Yarra Valley Water

JACOBS

11th Floor, 452 Flinders Street
MELBOURNE, VIC 3000
AUSTRALIA

Tel: +61 3 8668 3000
Fax: +61 3 8668 3001
Web: www.jacobs.com

WOLLERT TREATMENT PLANT
LAYOUTS
SITE 2 - 40 ML

Project No.: IS0803GV	**Sketch No.:** IS0803GV-SK-02
Scale: As Shown	**Issue:** For Information Only
Drawn by: CMurphy	**Date:** 22.09.2016
Checked by: MHoneyman	**Date:** 22.092.2016

Appendix B – Meteorological data comparison

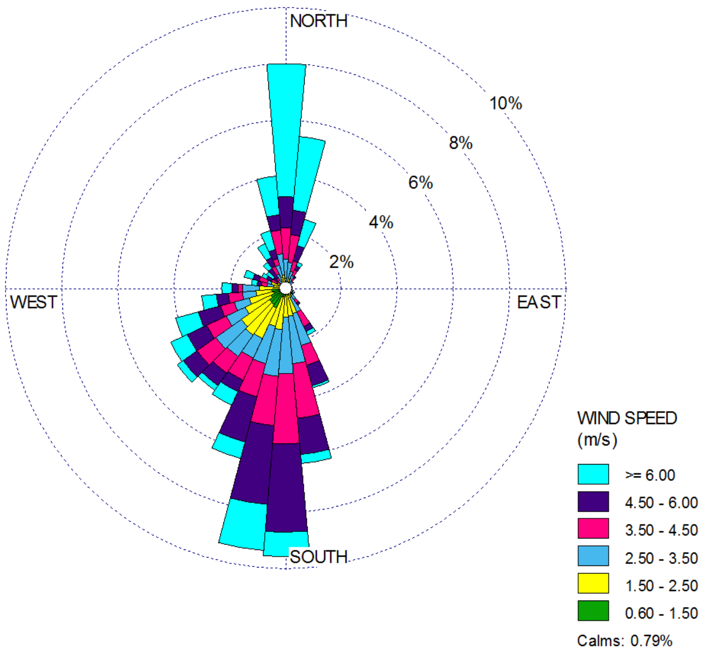


Figure B1 Windrose for Craigieburn - 13 October 2003 to 24 May 2004 - Average wind speed 4.1 m/s

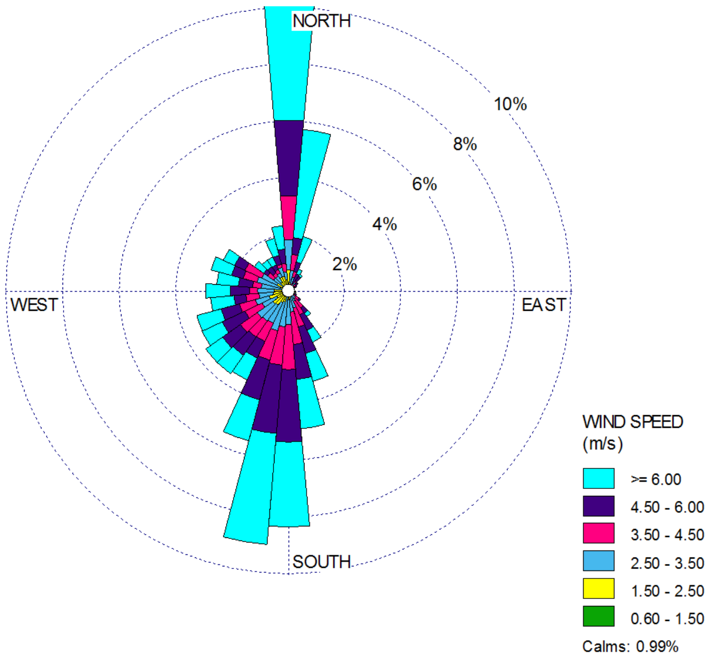


Figure B2 Windrose for Melbourne Airport - 13 October 2003 to 24 May 2004 – Average wind speed 5.1 m/s

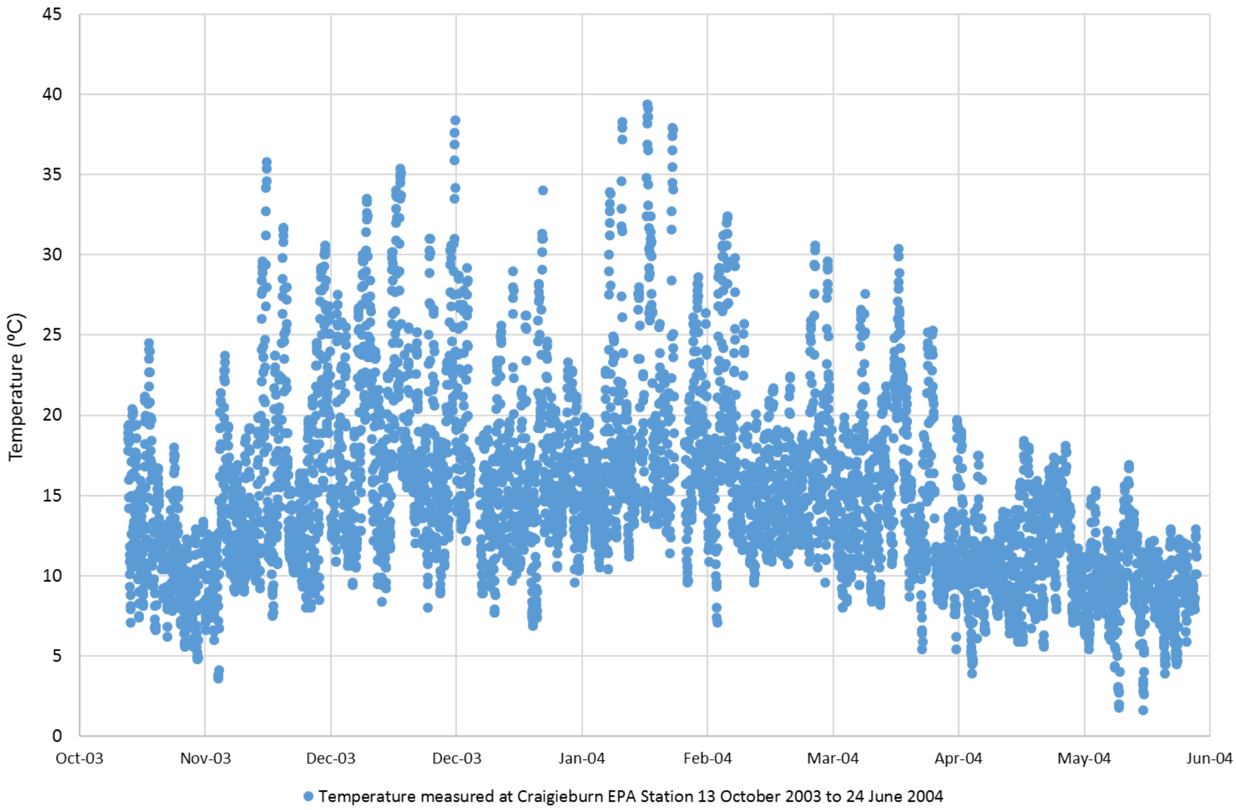


Figure B3 Temperature at Craigieburn - 13 October 2003 to 24 June 2004 – Average temperature 14.8 °C

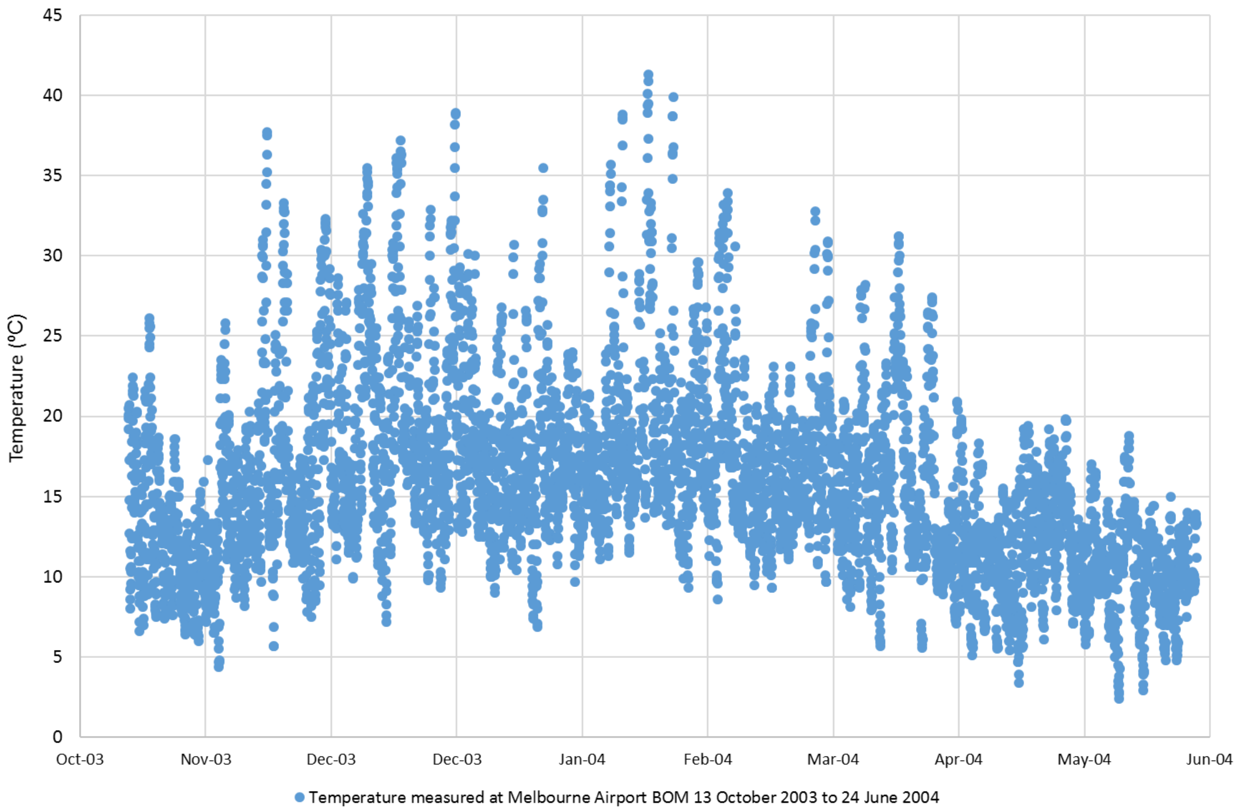
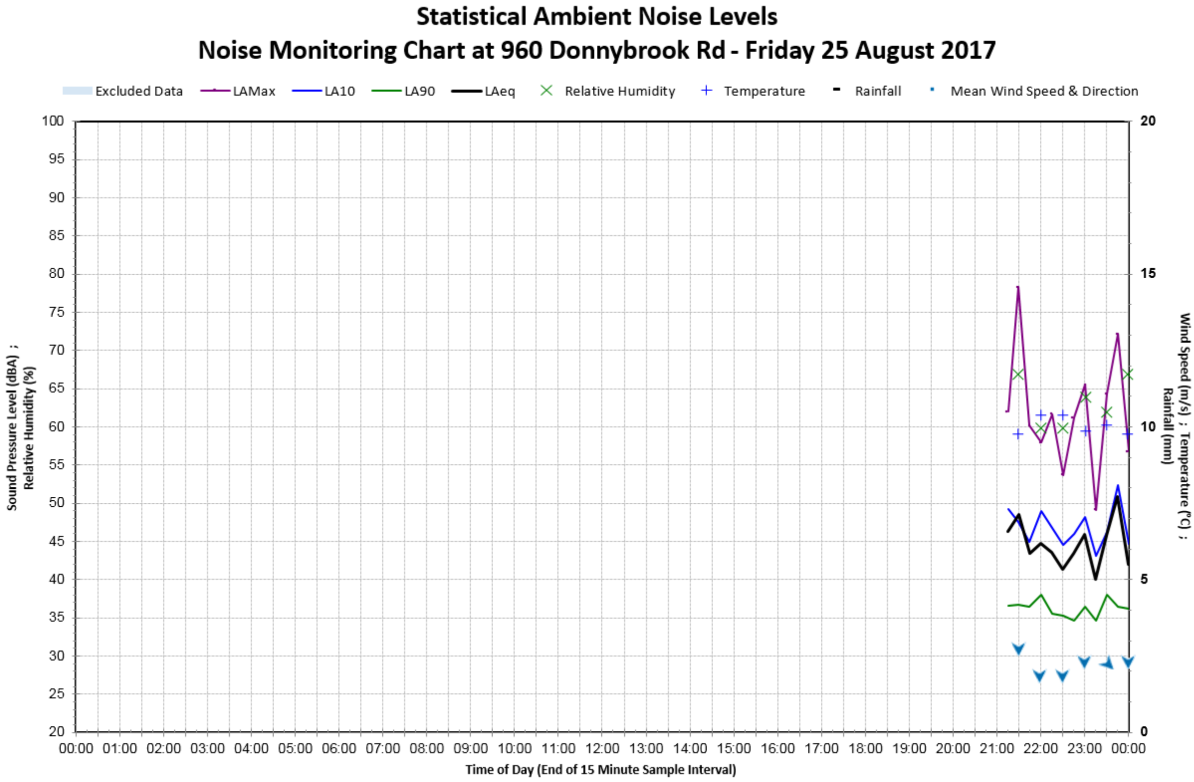
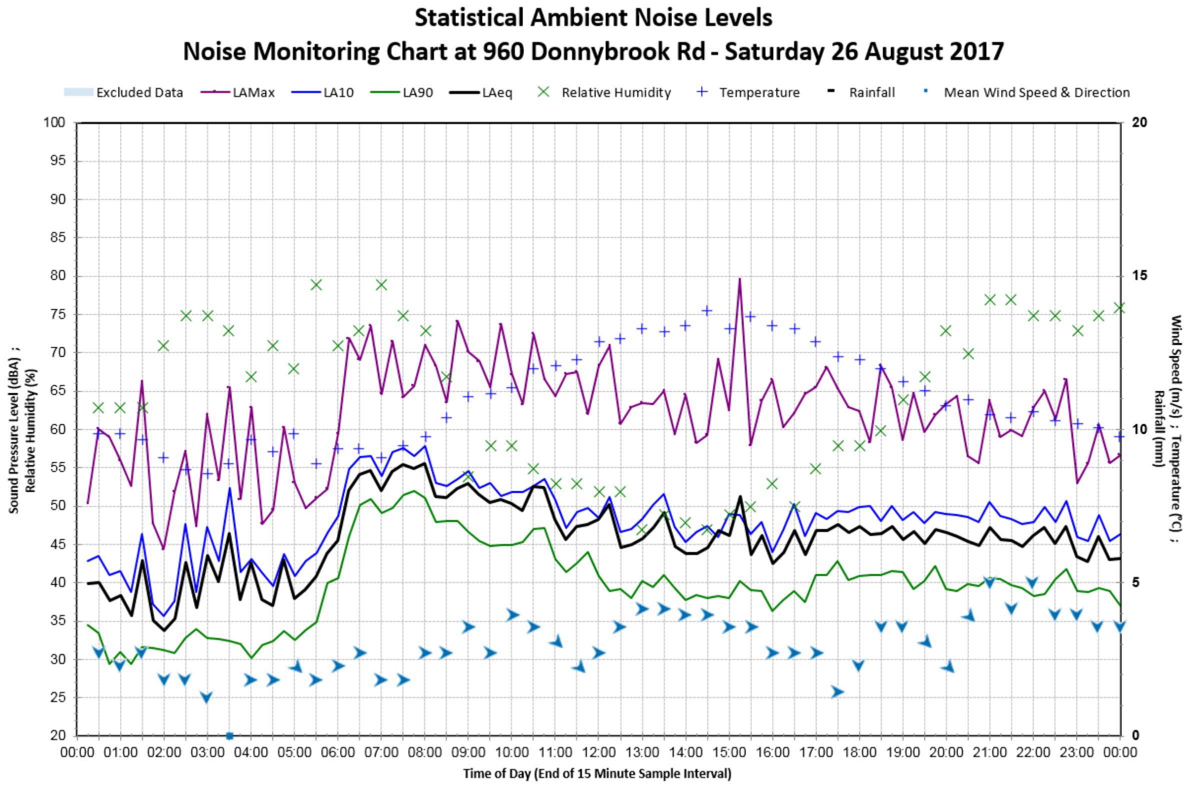


Figure B4 Temperature at Craigieburn - 13 October 2003 to 24 June 2004 – Average temperature 15.7 °C

Appendix C – Unattended noise monitoring charts 1

Noise monitoring charts for 960 Donnybrook Road


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Friday 25 August 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Saturday 26 August 2017
Excluded Data
LAMax
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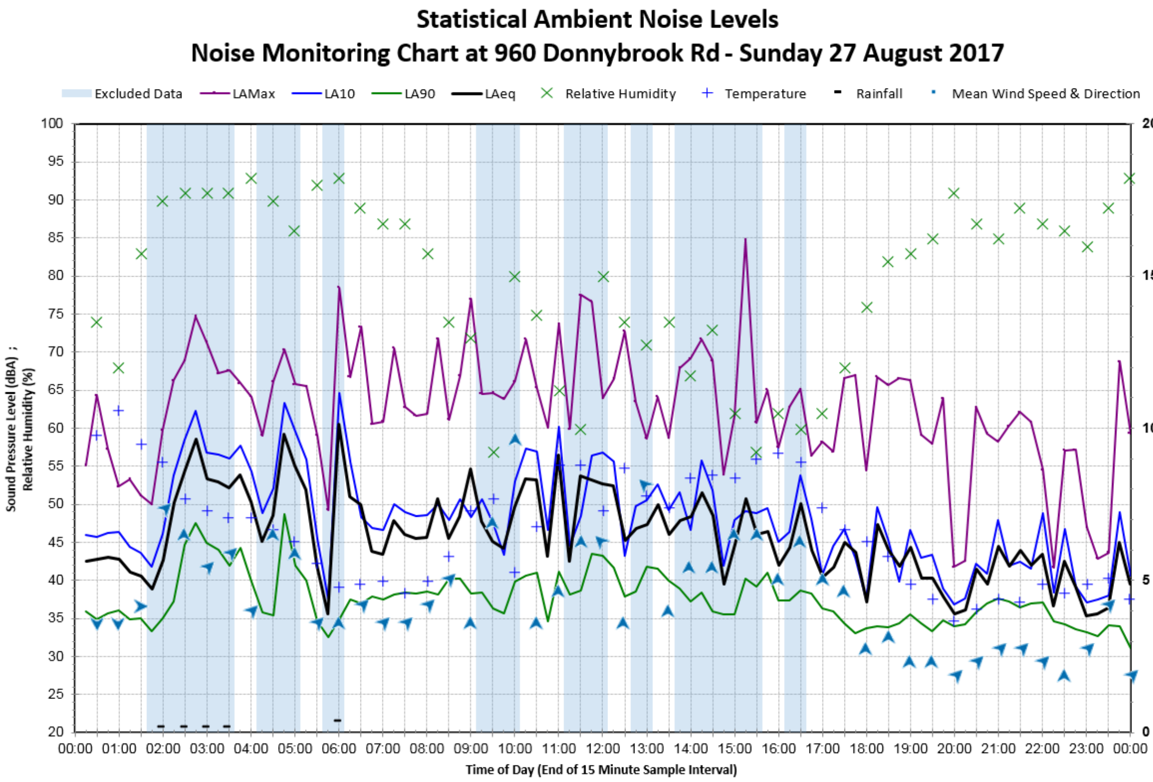
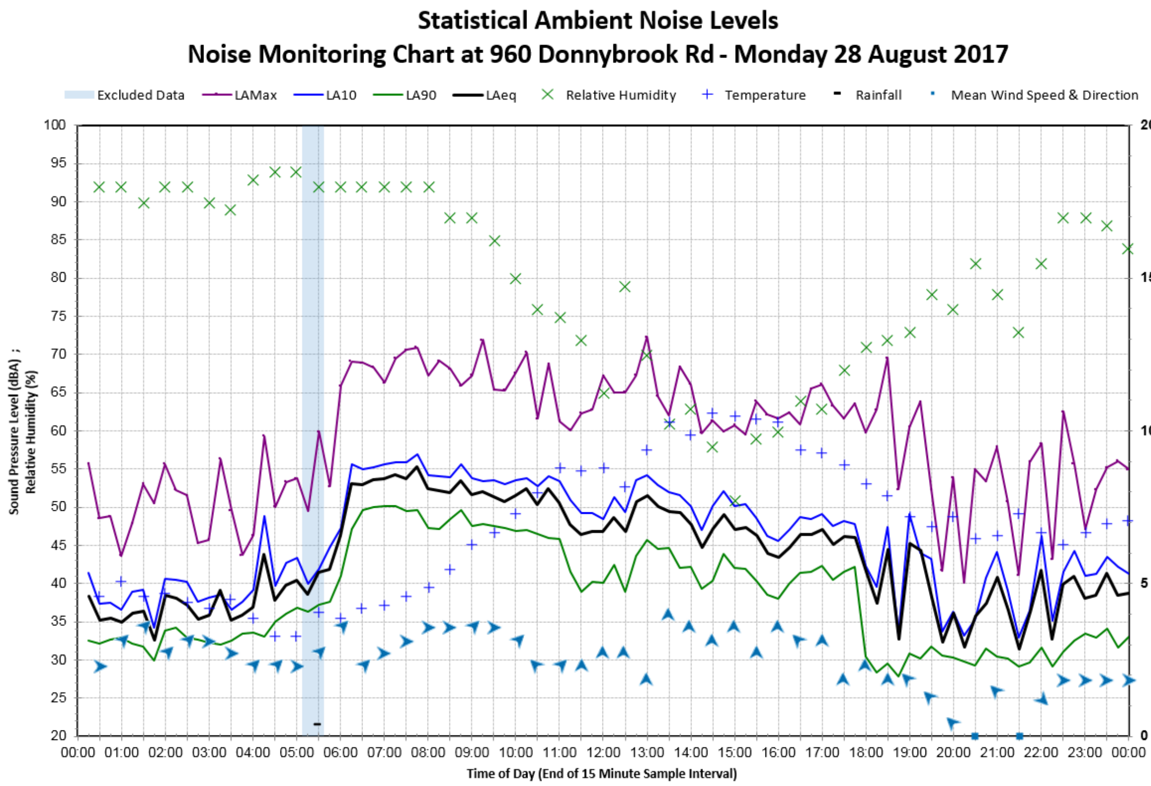
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Sunday 27 August 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Monday 28 August 2017
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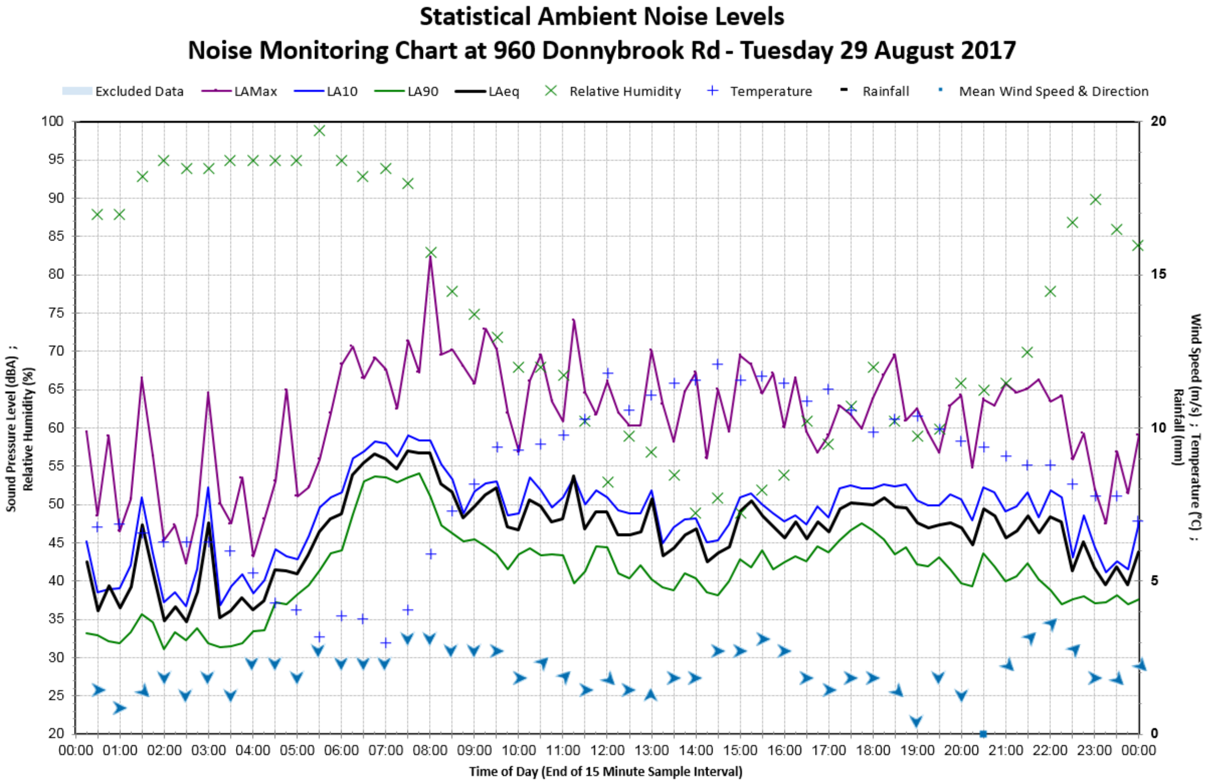
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Tuesday 29 August 2017
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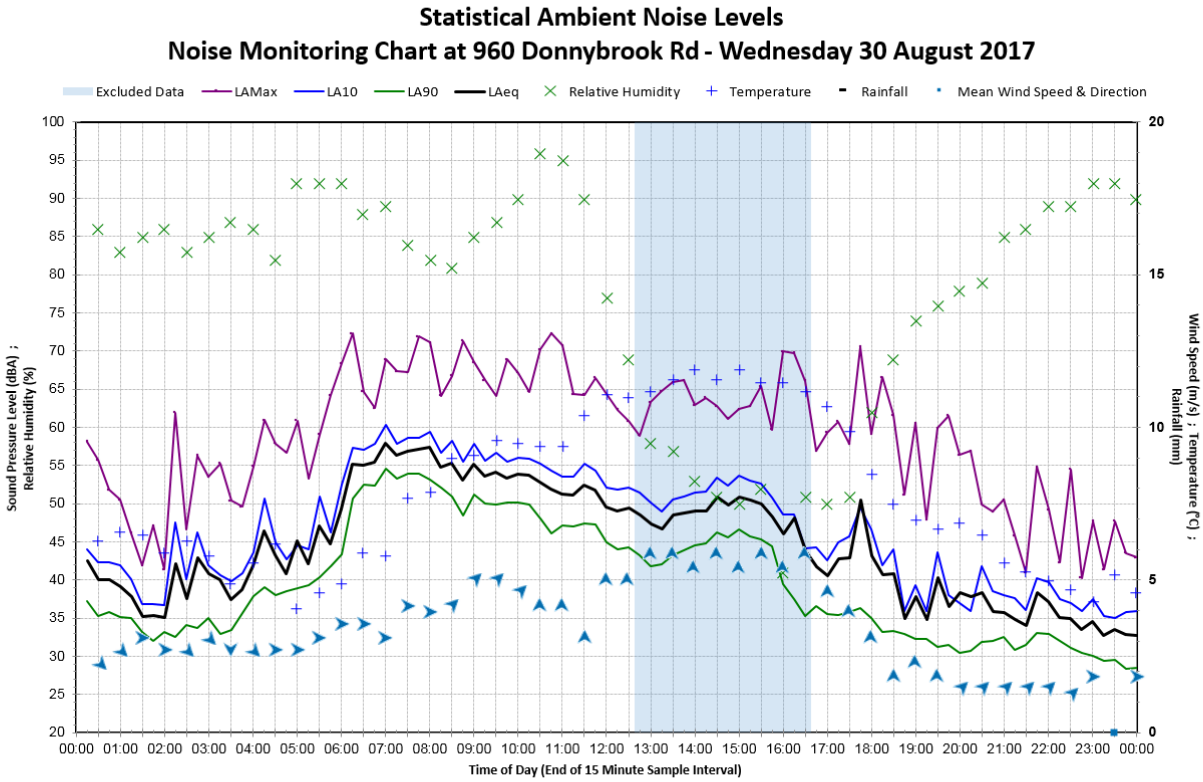
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Wednesday 30 August 2017
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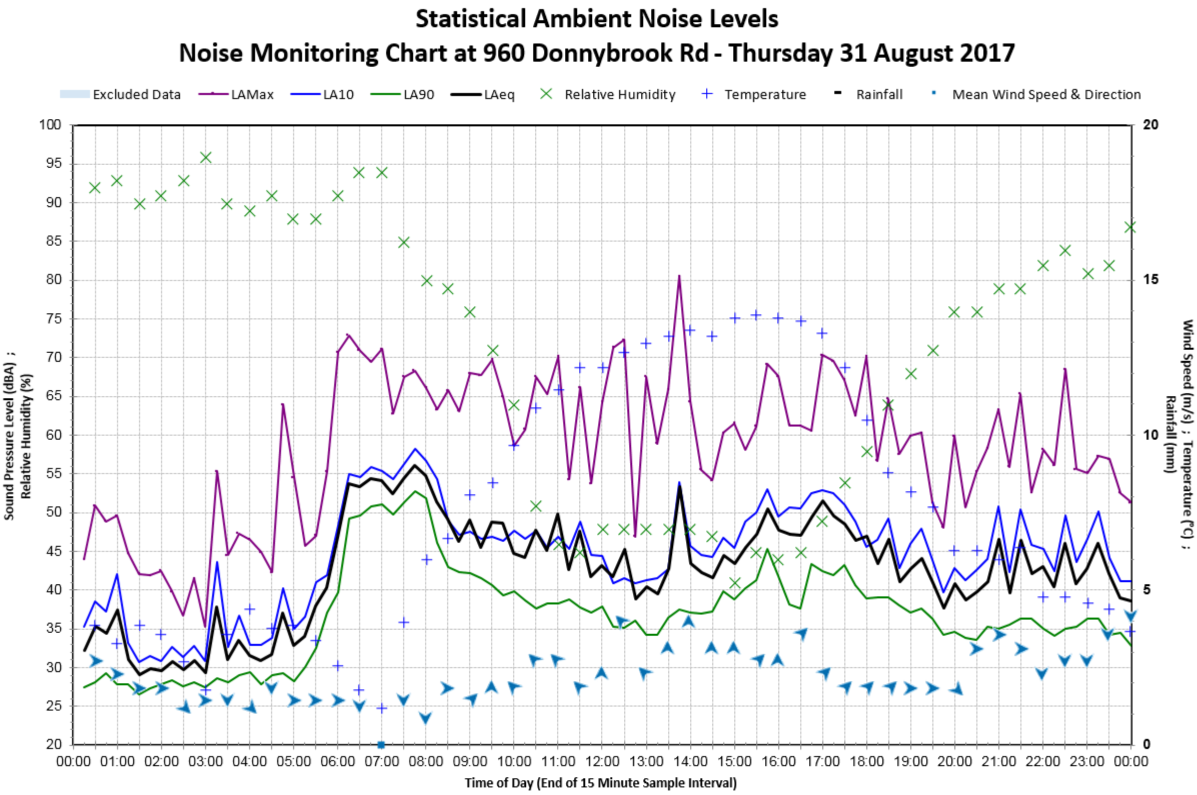
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Thursday 31 August 2017
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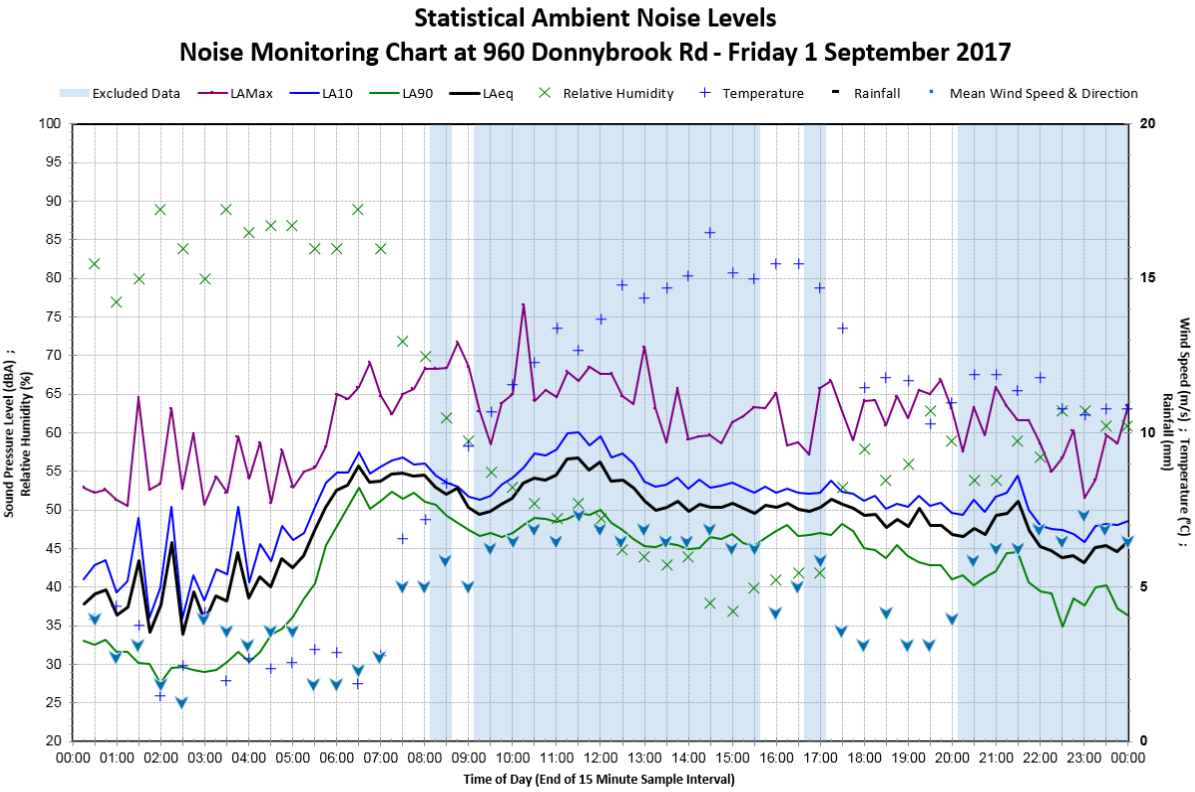
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Friday 1 September 2017
Excluded Data
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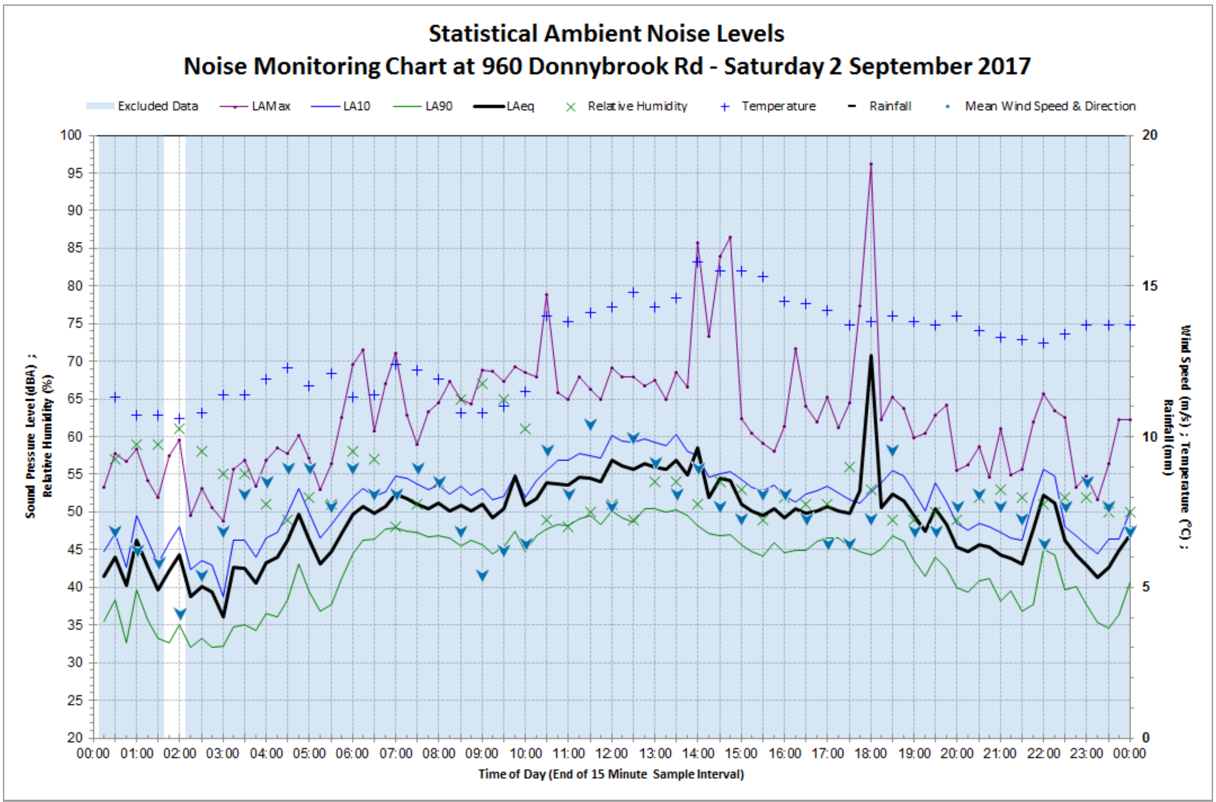
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)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Noise Monitoring Chart at 960 Donnybrook Rd - Saturday 2 September 2017
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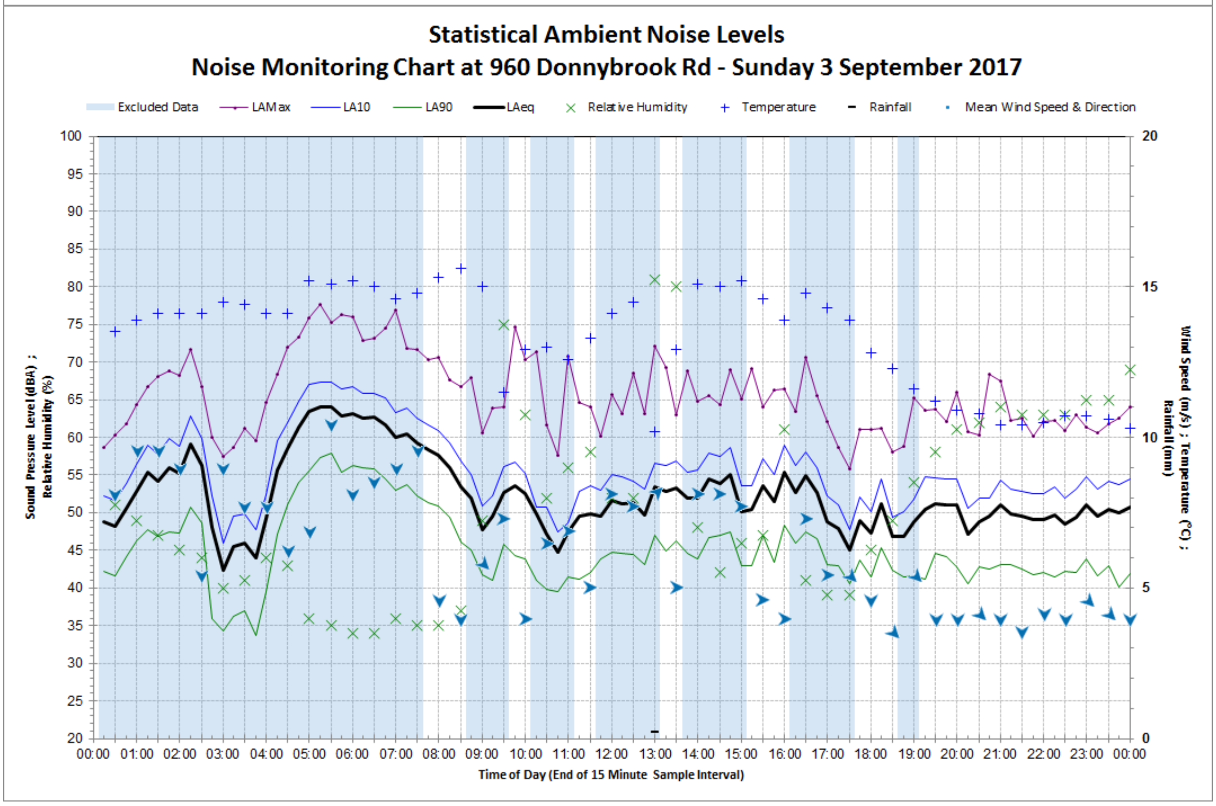
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Sunday 3 September 2017
Excluded Data
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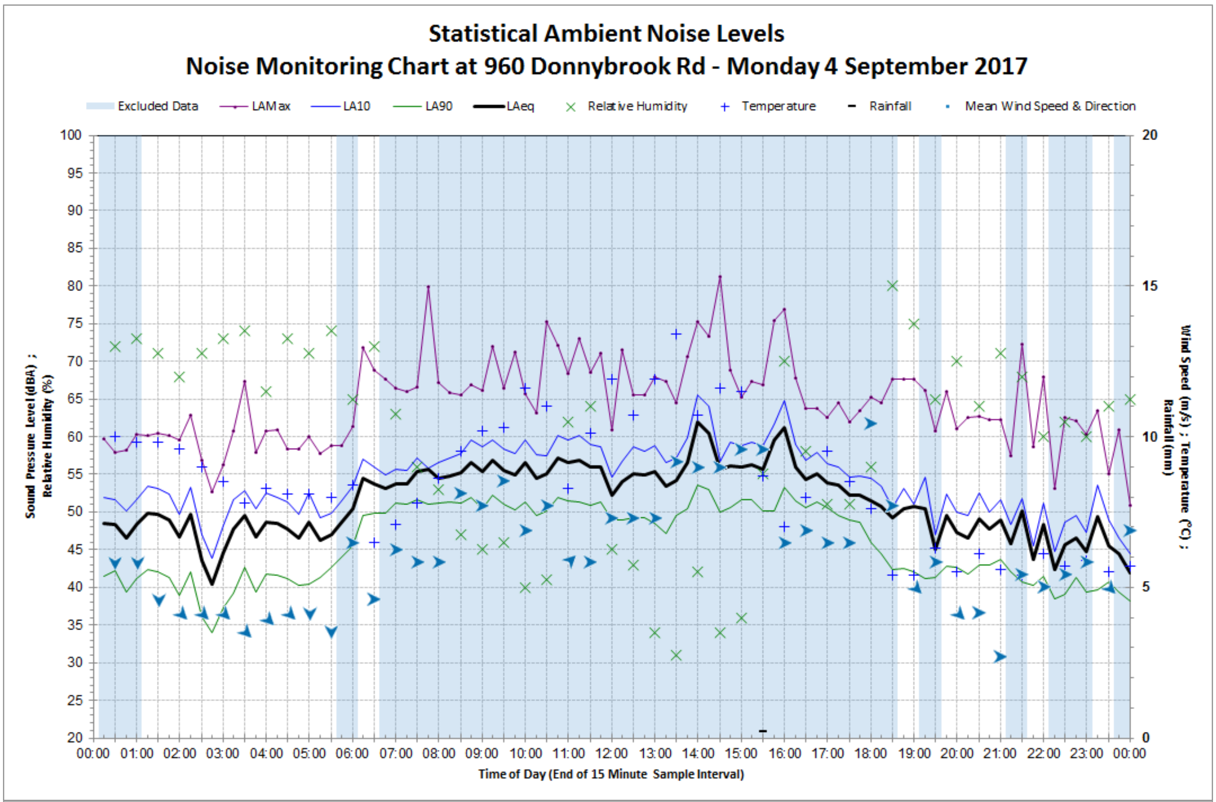
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 960 Donnybrook Rd - Monday 4 September 2017
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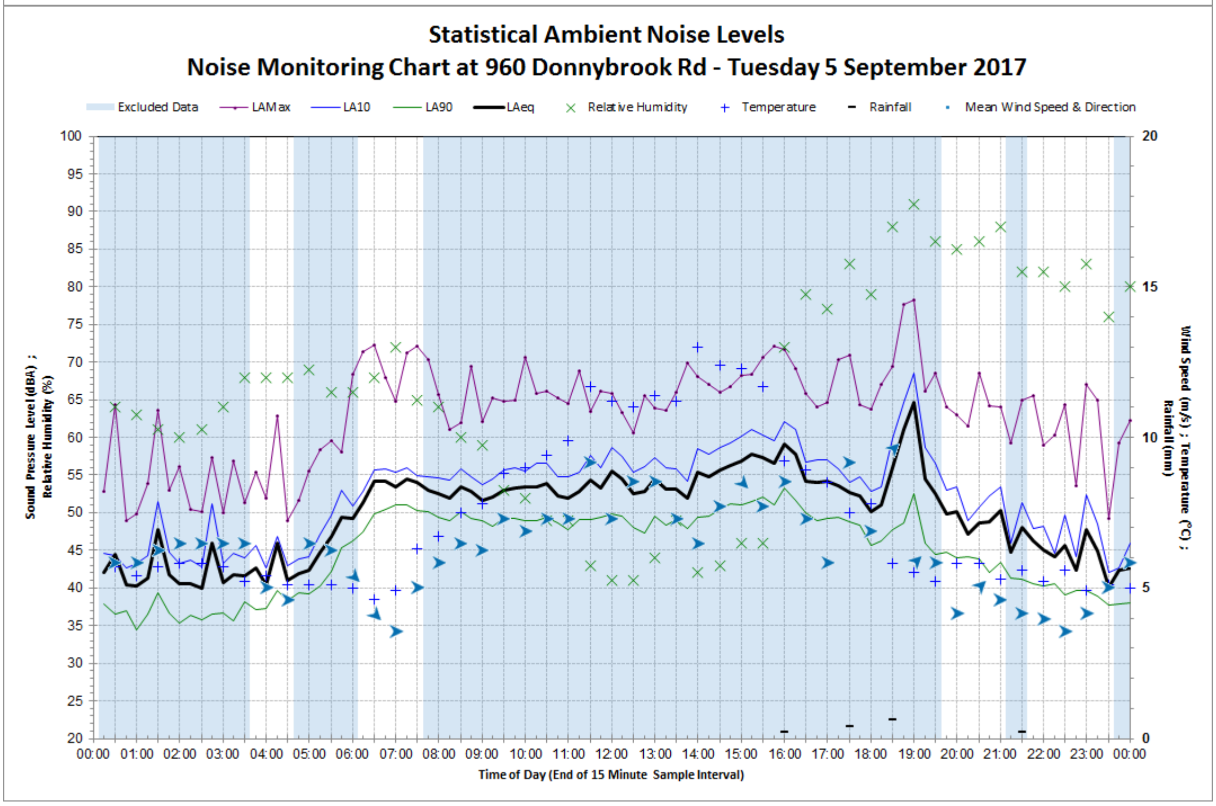
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)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Noise Monitoring Chart at 960 Donnybrook Rd - Tuesday 5 September 2017
Excluded Data
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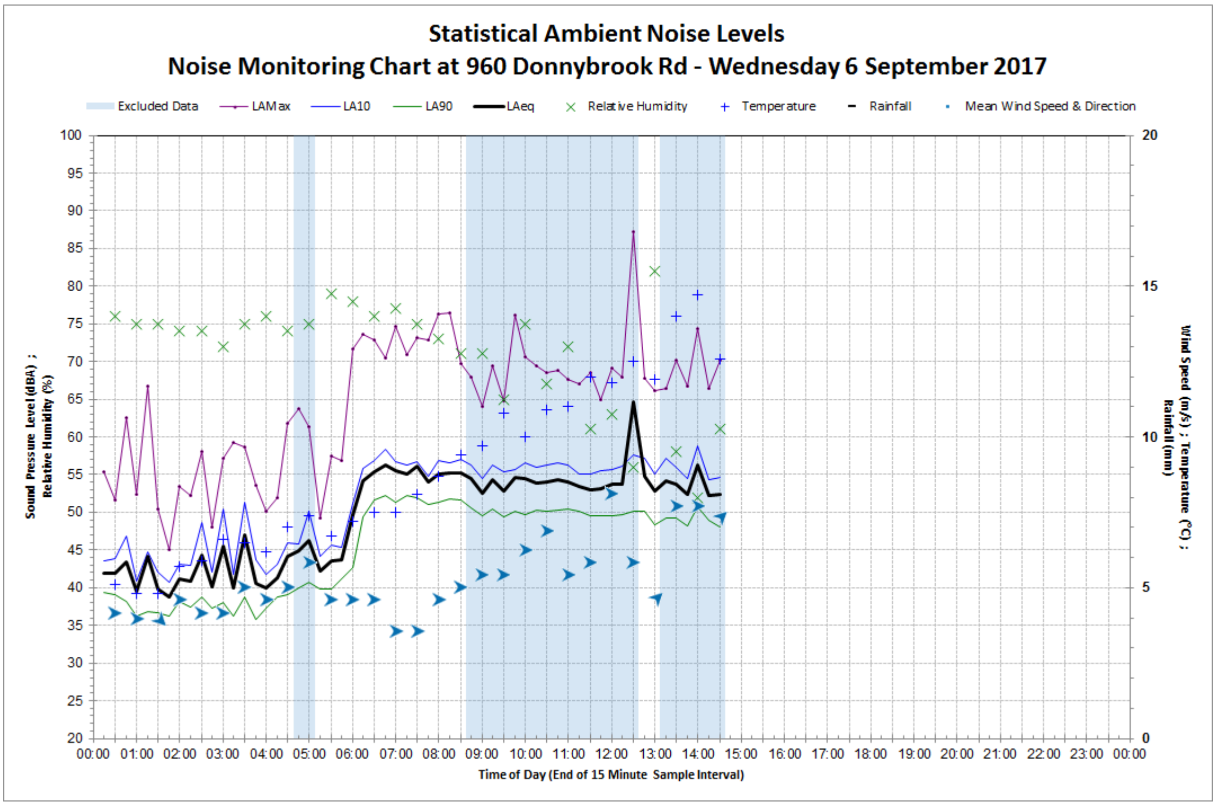
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)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Noise Monitoring Chart at 960 Donnybrook Rd - Wednesday 6 September 2017
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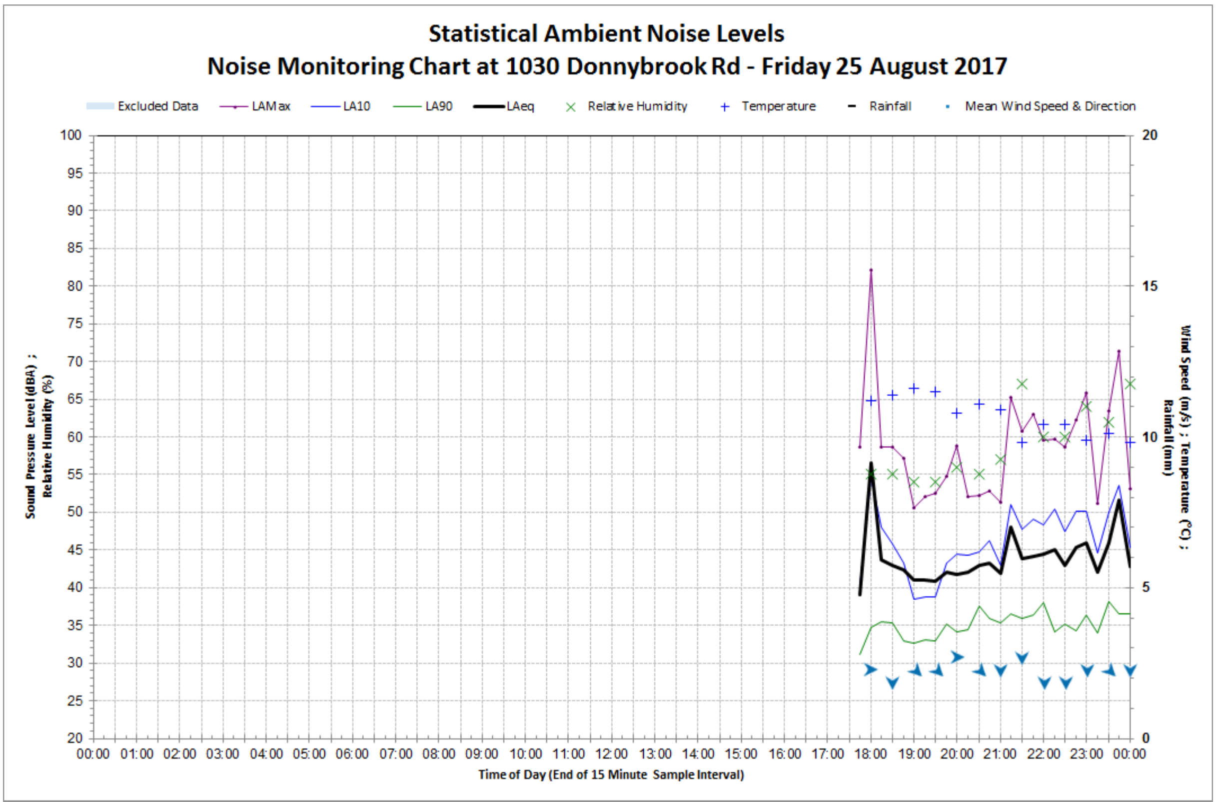
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

Appendix D – Unattended noise monitoring charts 2

Noise monitoring charts for 1030 Donnybrook Road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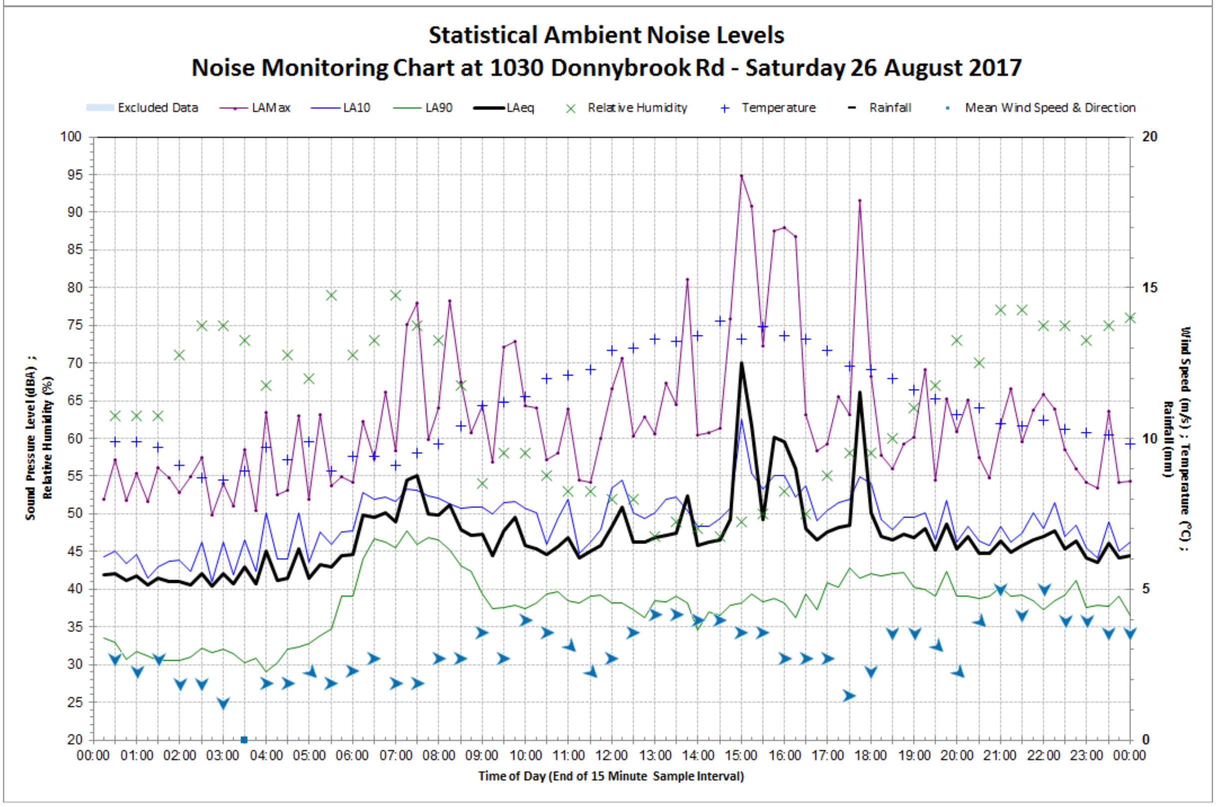
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)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Noise Monitoring Chart at 1030 Donnybrook Rd - Saturday 26 August 2017
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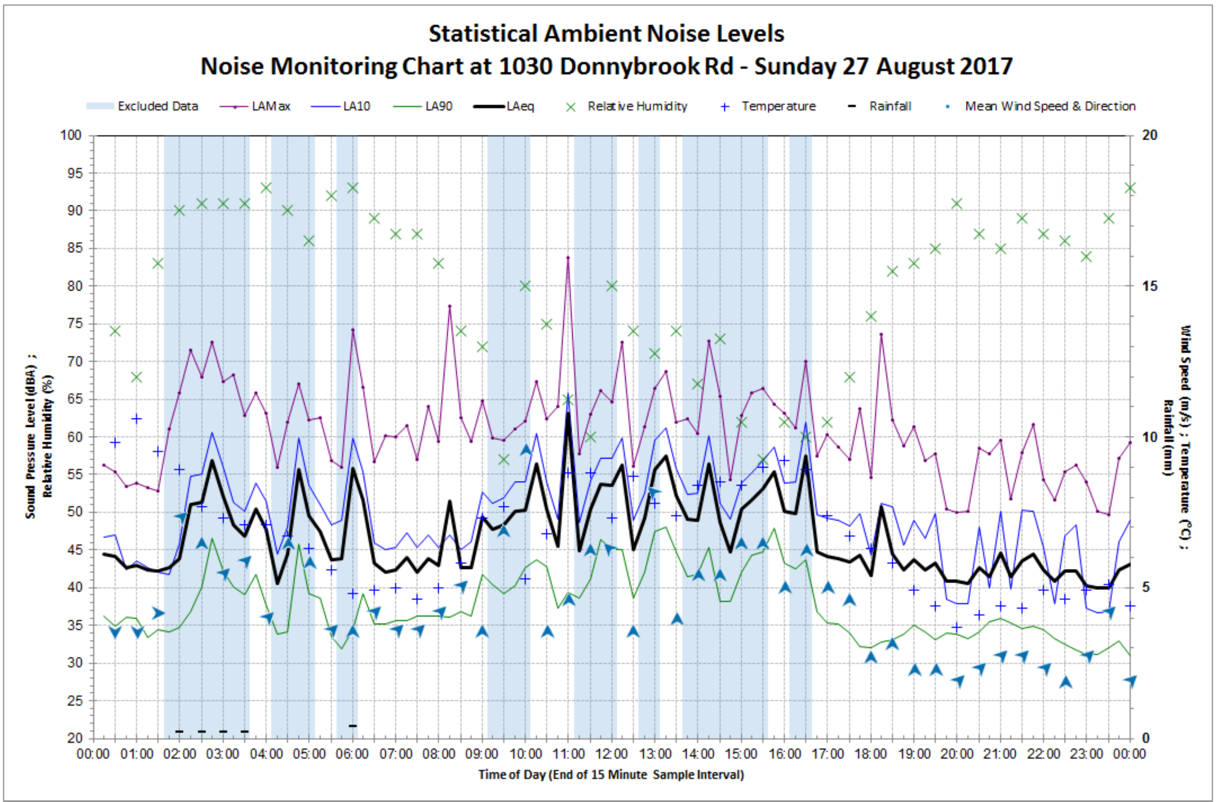
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)



Statistical Ambient Noise Levels
Noise Monitoring Chart at 1030 Donnybrook Rd - Sunday 27 August 2017
Excluded Data
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LA10
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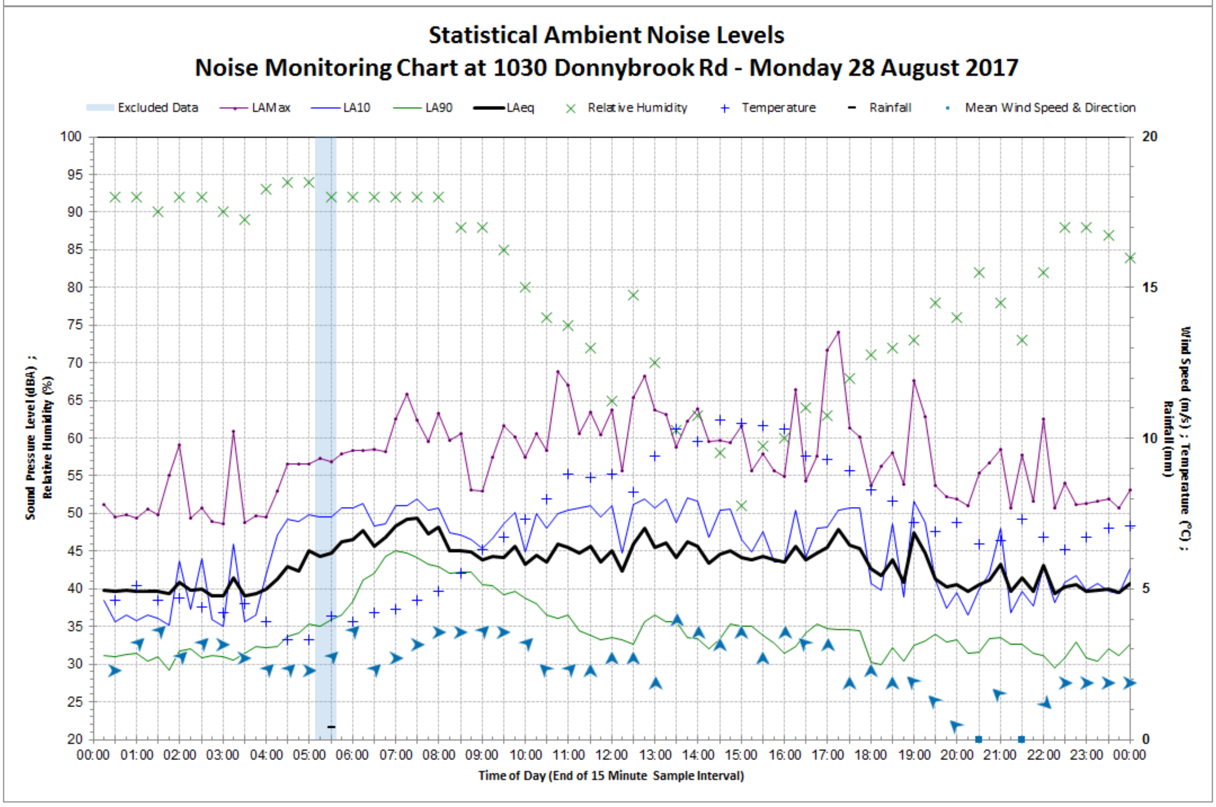
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)



Statistical Ambient Noise Levels
Noise Monitoring Chart at 1030 Donnybrook Rd - Monday 28 August 2017
Excluded Data
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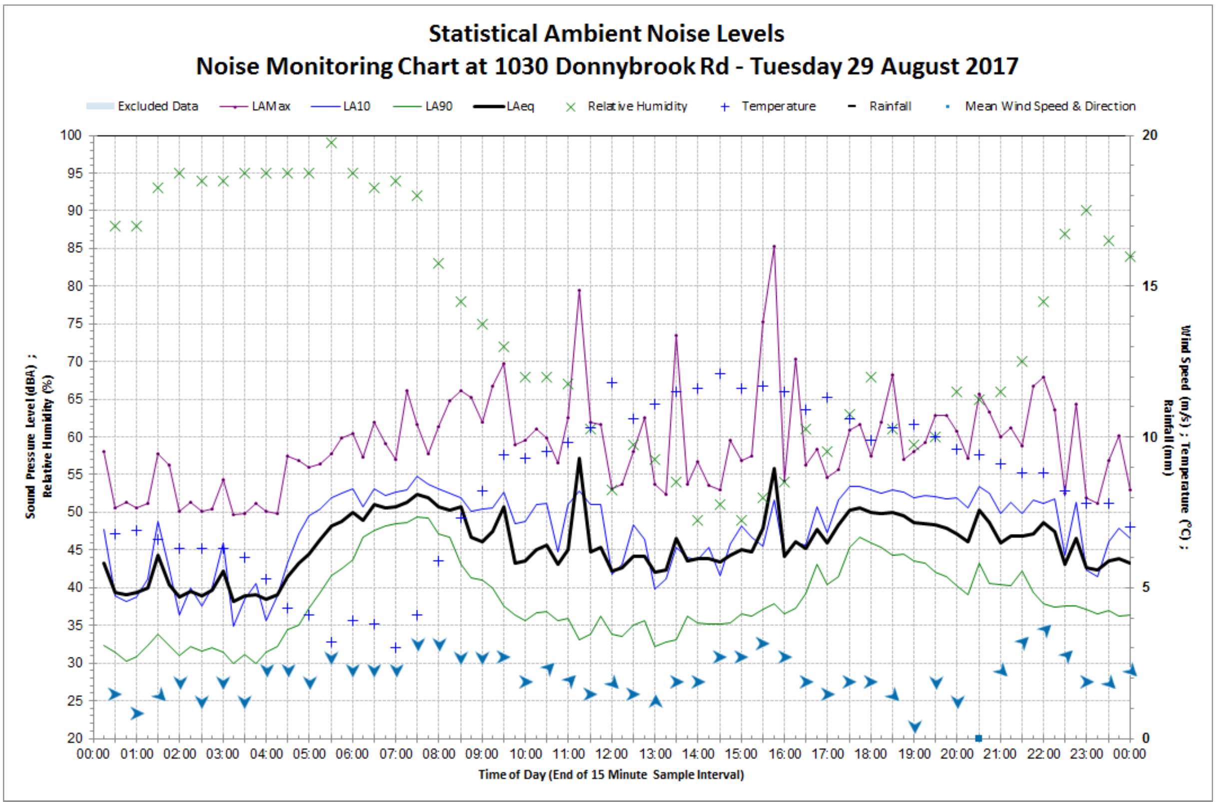
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 1030 Donnybrook Rd - Tuesday 29 August 2017
Excluded Data
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LA10
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LAeq
Relative Humidity
Temperature
Rainfall
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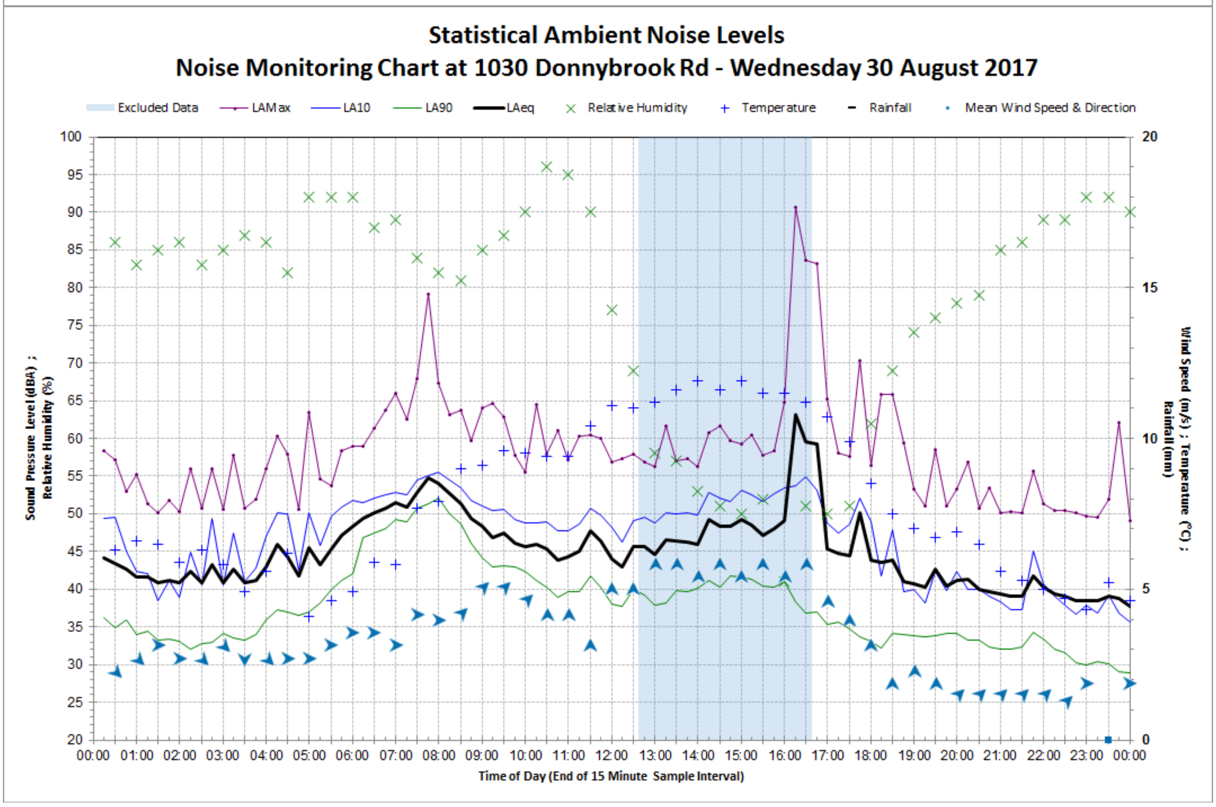
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 1030 Donnybrook Rd - Wednesday 30 August 2017
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Temperature
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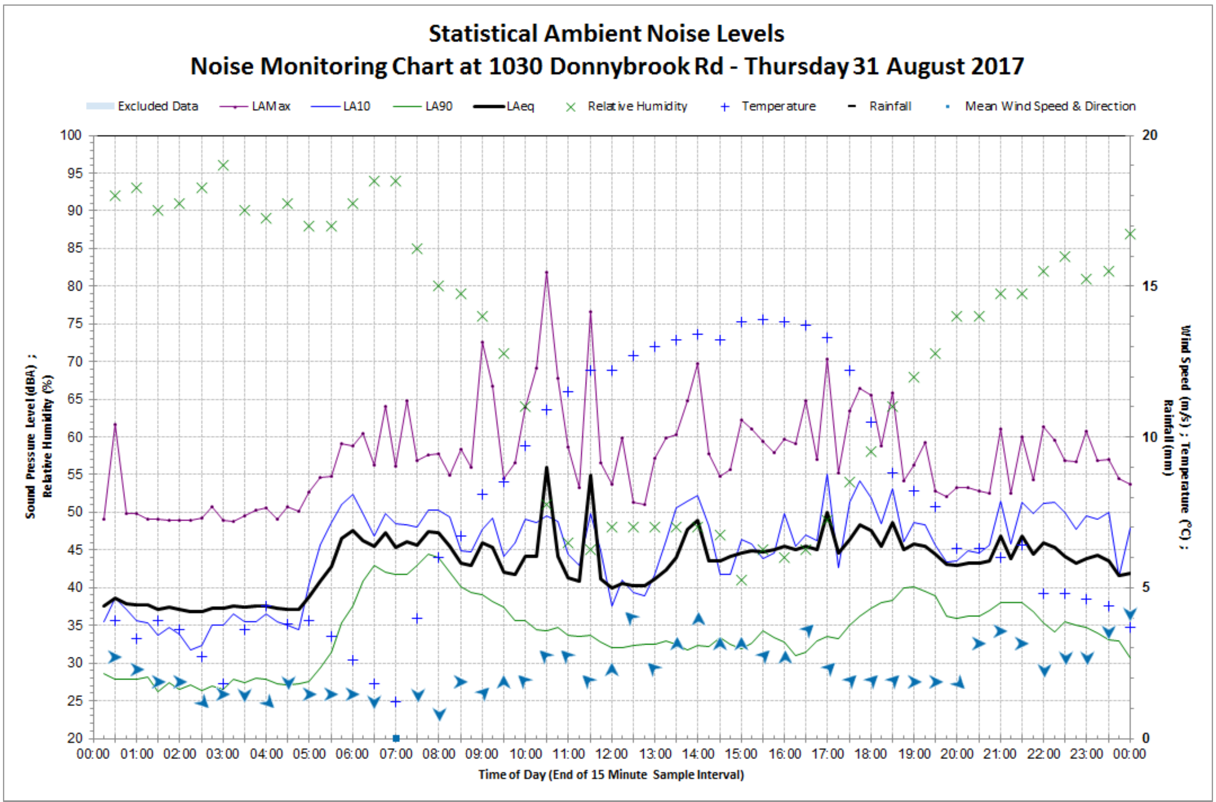
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)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Temperature
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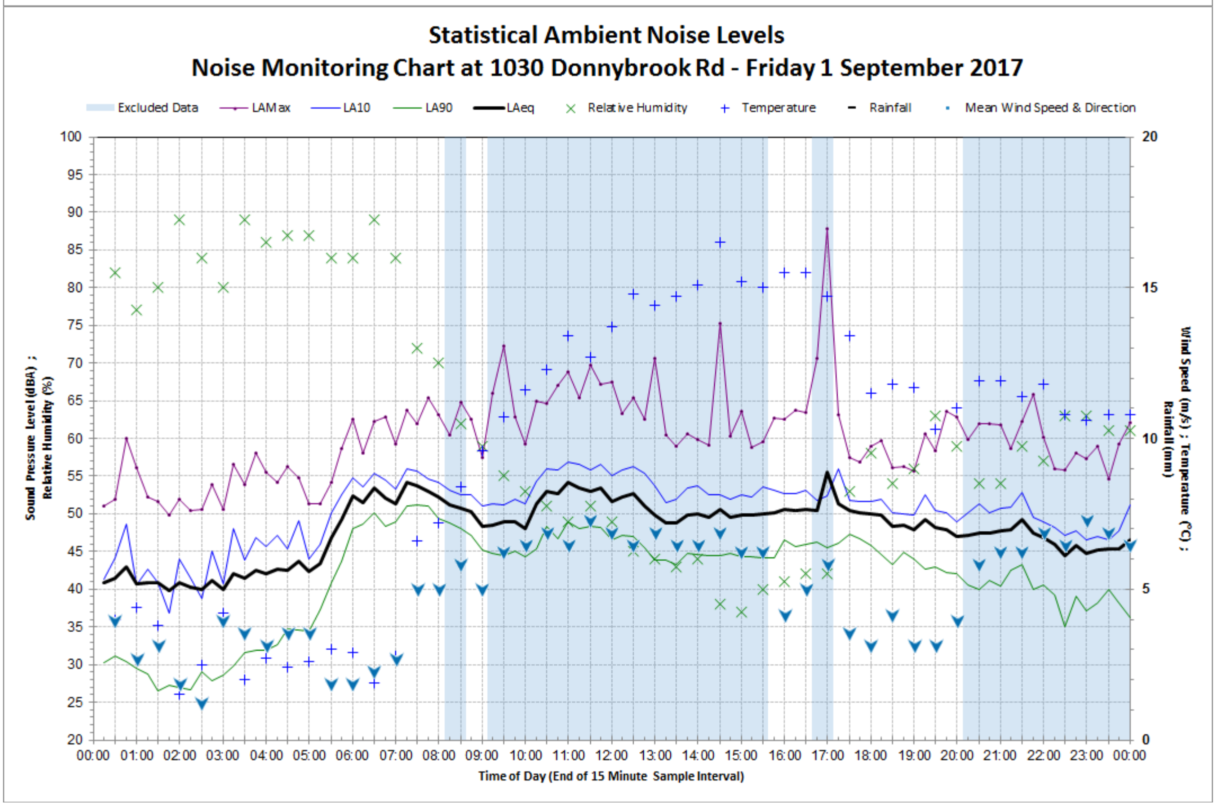
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 1030 Donnybrook Rd - Friday 1 September 2017
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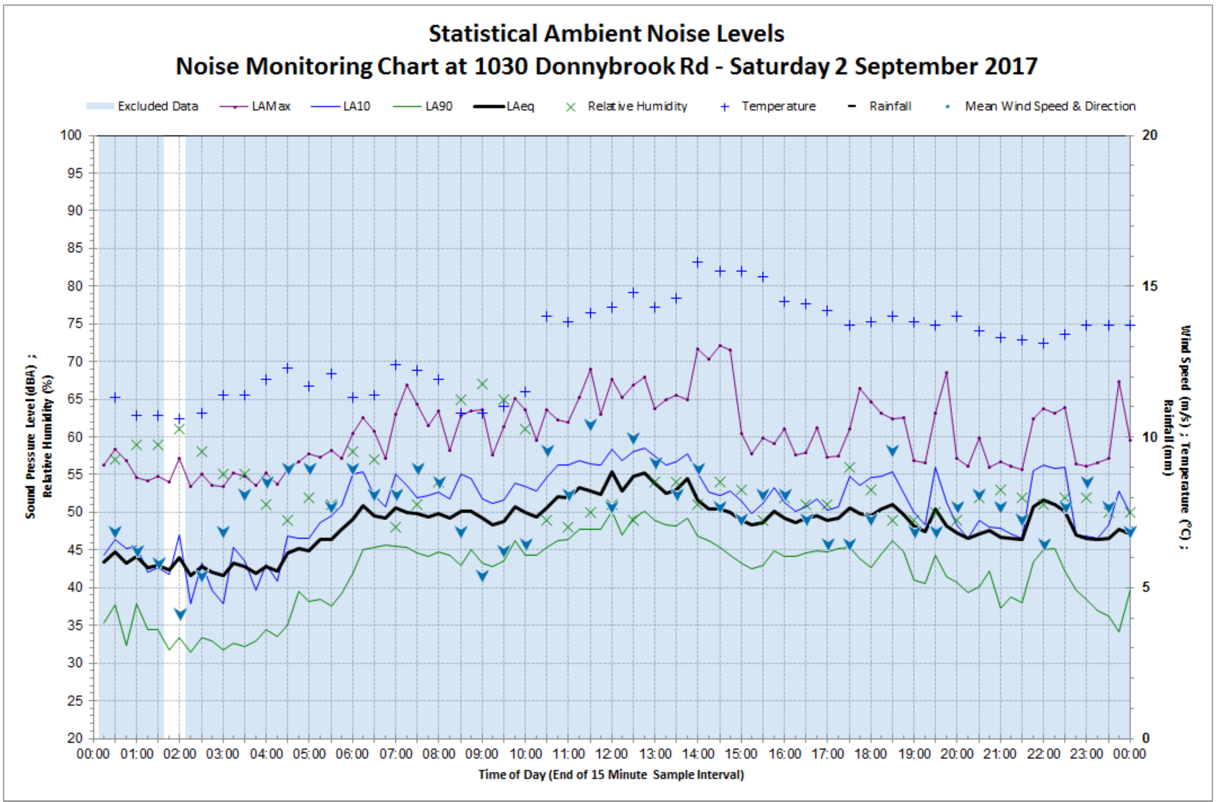
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 1030 Donnybrook Rd - Saturday 2 September 2017
Excluded Data
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LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
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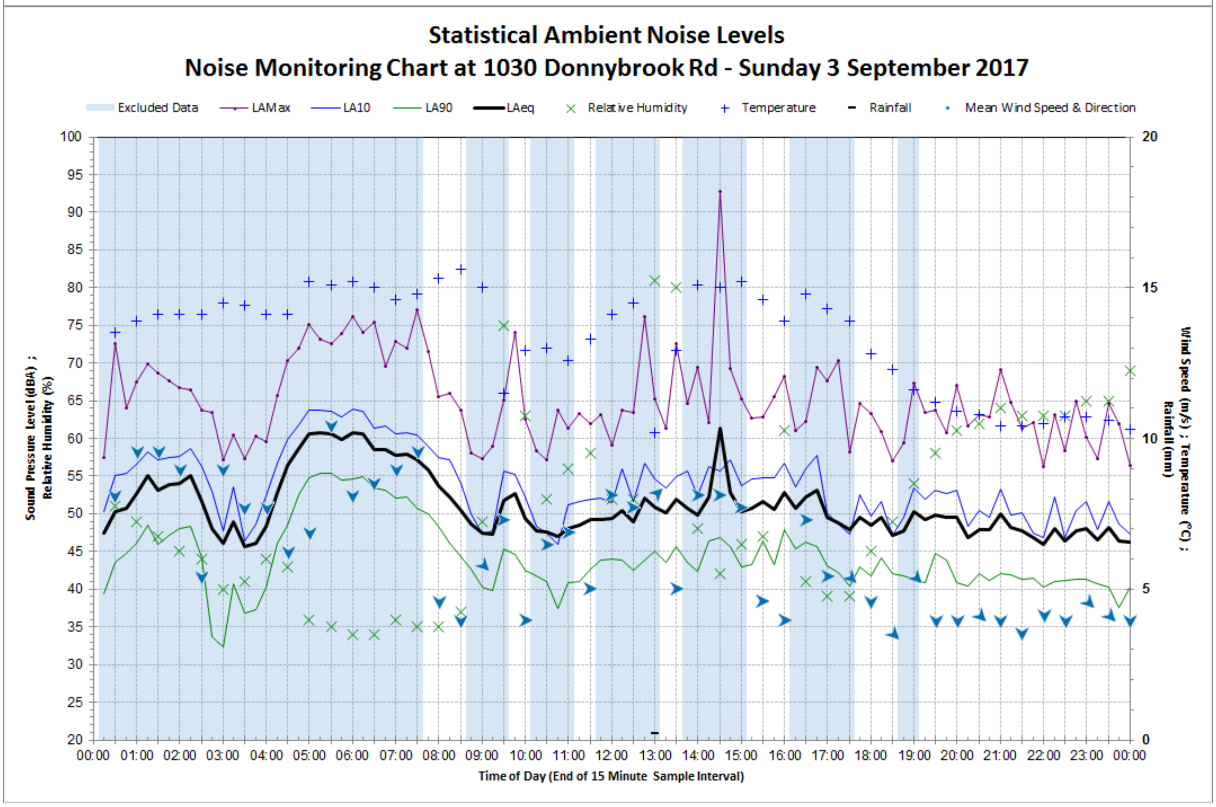
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)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LAeq
Relative Humidity
Temperature
Rainfall
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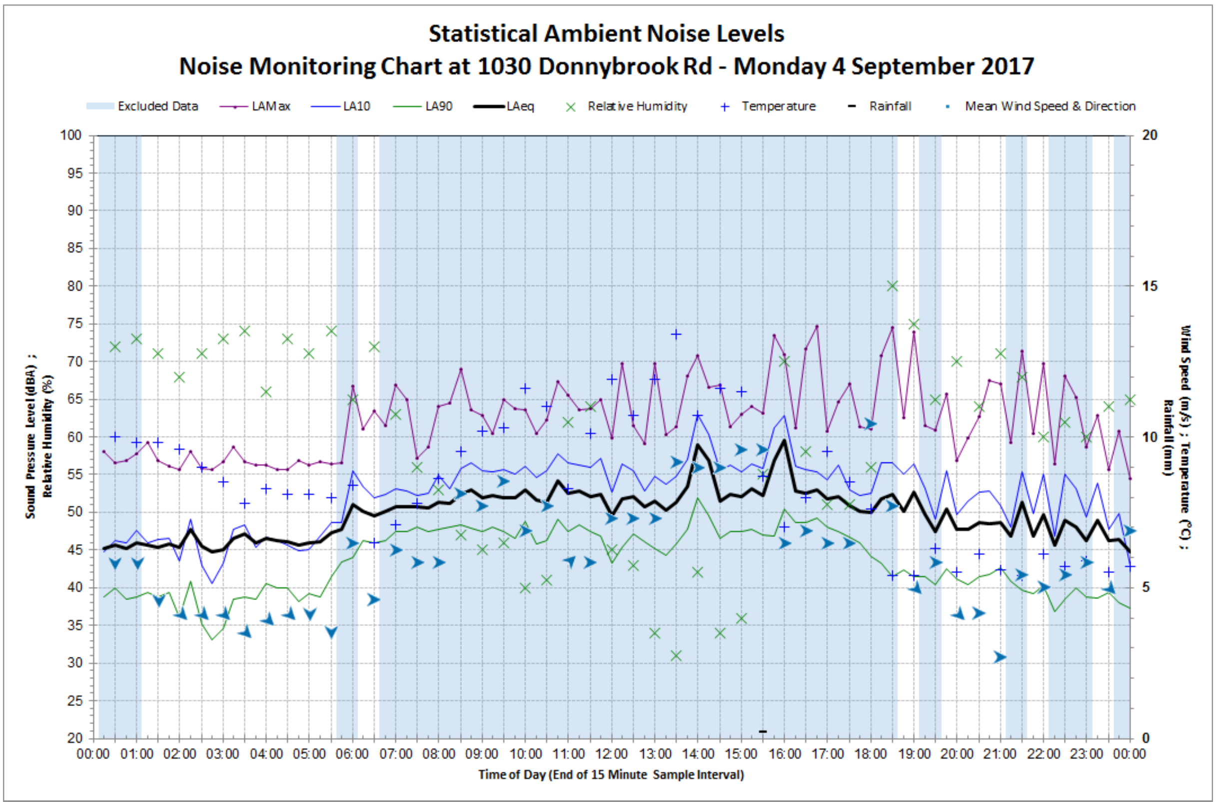
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 1030 Donnybrook Rd - Monday 4 September 2017
Excluded Data
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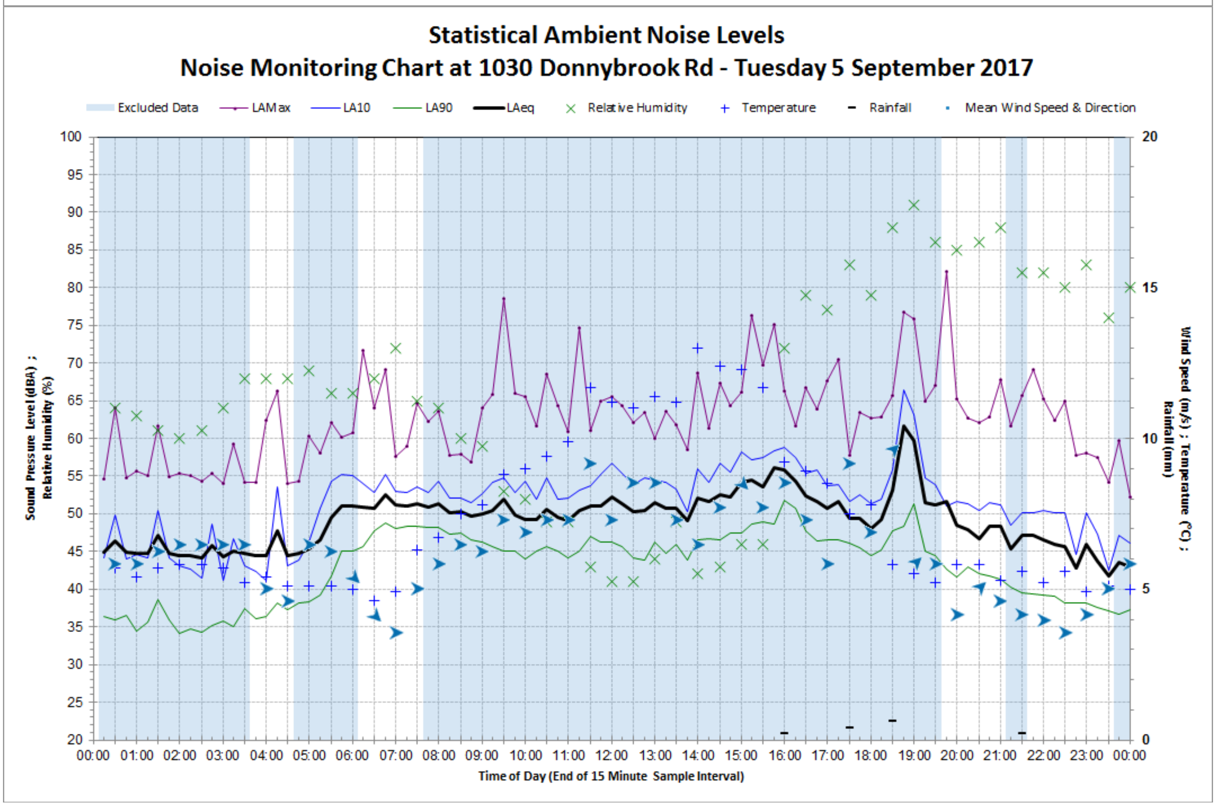
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 1030 Donnybrook Rd - Tuesday 5 September 2017
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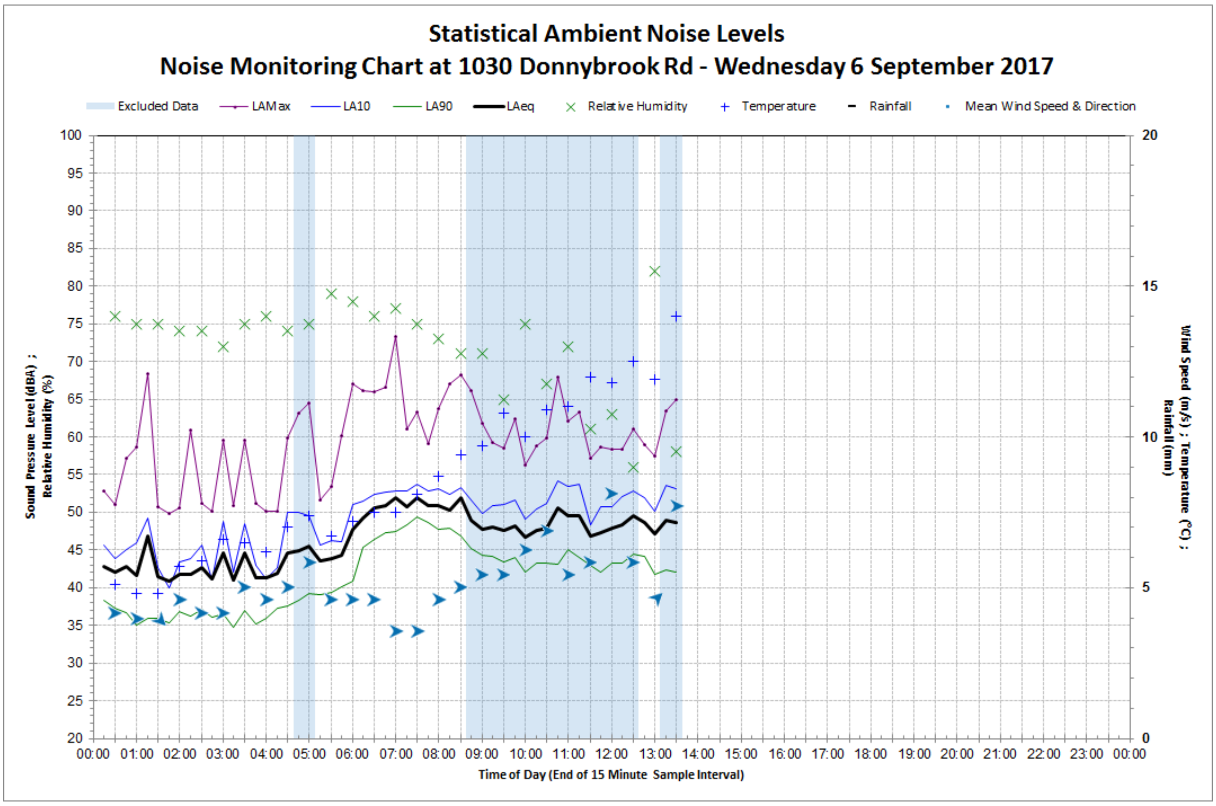
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Noise Monitoring Chart at 1030 Donnybrook Rd - Wednesday 6 September 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

Appendix E – Dust emission factors

Emission factors used for the assessment of PM_{10};

Activity	Source	Emission Factor	Reference
Winning	Excavator	0.012 kt/t	NPI 2012
	Dump Truck	0.0043 kg/t	NPI 2012
	Grader	0.085 kg/VKT	NPI 2012
	Loading	0.0017 kg/t	NPI 2012
	Wheel Generated Dust	1.25 kg/VKT	NPI 2012
Processing	Conveyor Transfer	0.00015 kg/t	NPI 2012
	Primary Crusher	0.0012 kg/t	AP-42
	Secondary Crusher	0.0012 kg/t	AP-42
	Screening	0.0043 kg/t	AP-42
	Fines Screening	0.036 kg/t	AP-42
Other	Blasting	3.0780 kg/blast	NPI 2012
	Misc. Transfer Points	0.00015 kg/t	NPI 2012
	Wind Blown	0.2 kg/ha/h	NPI 2012

Notes

* Emission factor for PM_{10} primary and secondary crushing from AP42 (tertiary crusher)

Appendix F – AERMOD INPUT file

```
**
****************************************
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** AERMOD Input Produced by:
** AERMOD View Ver. 9.2.0
** Lakes Environmental Software Inc.
** Date: 20/09/2017
** File: G:\31\35311\Tech\AERMOD\Woody Hill\woody_hill\woody_hill.ADI
**
****************************************
**
**
****************************************
** AERMOD Control Pathway
****************************************
**
**
CO STARTING
   TITLEONE G:\31\35311\Tech\AERMOD\Woody Hill\woody_hill\woody_hill.isc
   TITLETWO PM10 Woody Hill
   MODELOPT CONC FLAT BETA LOWWIND3
   AVERTIME 24
   POLLUTID PM_10
   RUNORNOT RUN
   ERRORFIL woody_hill.err
CO FINISHED
**
****************************************
** AERMOD Source Pathway
****************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
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** DESCRSRC Excavator1
   LOCATION EXC2         VOLUME     321297.000  5841846.000          0.0
** DESCRSRC Excavator
   LOCATION EXC3         VOLUME     321314.000  5841818.000          0.0
** DESCRSRC Excavator
   LOCATION EXC4         VOLUME     321222.000  5841913.000          0.0
** DESCRSRC Excavator1
   LOCATION EXC5         VOLUME     321165.000  5841803.000          0.0
** DESCRSRC Excavator1
   LOCATION EXC6         VOLUME     321279.000  5841649.000          0.0
** DESCRSRC Excavator
   LOCATION EXC7         VOLUME     321231.000  5841605.000          0.0
** DESCRSRC Excavator
   LOCATION DUMP         VOLUME     321275.000  5841957.000          0.0
** DESCRSRC DUMP TRUCK
   LOCATION LOAD         VOLUME     321334.000  5841941.000          0.0
** DESCRSRC LOADING
   LOCATION TP1          VOLUME     321335.000  5841777.000          0.0
** DESCRSRC TRANSFER POINT
   LOCATION TP2          VOLUME     321334.000  5841817.000          0.0
** DESCRSRC TRANSFER POINT
   LOCATION TP3          VOLUME     321333.000  5841858.000          0.0
** DESCRSRC TRANSFER POINT
   LOCATION TP4          VOLUME     321306.000  5841861.000          0.0
** DESCRSRC TRANSFER POINT
   LOCATION TP5          VOLUME     321305.000  5841883.000          0.0
** DESCRSRC TRANSFER POINT
   LOCATION GRADE        VOLUME     321221.000  5841806.000          0.0
** DESCRSRC GRADER
   LOCATION PRIMC        VOLUME     321319.000  5841840.000          0.0
** DESCRSRC PRIMARY CRUSHER
   LOCATION SECC         VOLUME     321319.000  5841862.000          0.0
** DESCRSRC secondary CRUSHER
   LOCATION SCREEN       VOLUME     321296.000  5841887.000          0.0
** DESCRSRC screening
   LOCATION FINES        VOLUME     321276.000  5841885.000          0.0
** DESCRSRC fines screening
   LOCATION BLAST        VOLUME     321248.000  5841700.000          0.0
** DESCRSRC blasting
** ------------------------------------------------------------------------
** Line Source Represented by Separated Volume Sources
** LINE VOLUME Source ID = STCK1
** DESCRSRC
** PREFIX
** Length of Side = 10.00
** Configuration = Separated
** Emission Rate = 0.26
** Vertical Dimension = 6.80
** SZINIT = 3.16
** Nodes = 4
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** 321220.000, 5841568.000, 0.00, 2.00, 9.09
** 321173.000, 5841973.000, 0.00, 2.00, 9.09
** 321318.000, 5841944.000, 0.00, 2.00, 9.09
** 321291.000, 5841828.000, 0.00, 2.00, 9.09
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   LOCATION L0000001     VOLUME   321219.424 5841572.967 0.0
   LOCATION L0000002     VOLUME   321217.170 5841592.386 0.0
   LOCATION L0000003     VOLUME   321214.916 5841611.805 0.0
   LOCATION L0000004     VOLUME   321212.663 5841631.225 0.0
   LOCATION L0000005     VOLUME   321210.409 5841650.644 0.0
   LOCATION L0000006     VOLUME   321208.156 5841670.064 0.0
   LOCATION L0000007     VOLUME   321205.902 5841689.483 0.0
   LOCATION L0000008     VOLUME   321203.648 5841708.902 0.0
   LOCATION L0000009     VOLUME   321201.395 5841728.322 0.0
   LOCATION L0000010     VOLUME   321199.141 5841747.741 0.0
   LOCATION L0000011     VOLUME   321196.888 5841767.161 0.0
   LOCATION L0000012     VOLUME   321194.634 5841786.580 0.0
   LOCATION L0000013     VOLUME   321192.380 5841805.999 0.0
   LOCATION L0000014     VOLUME   321190.127 5841825.419 0.0
   LOCATION L0000015     VOLUME   321187.873 5841844.838 0.0
   LOCATION L0000016     VOLUME   321185.619 5841864.258 0.0
   LOCATION L0000017     VOLUME   321183.366 5841883.677 0.0
   LOCATION L0000018     VOLUME   321181.112 5841903.096 0.0
   LOCATION L0000019     VOLUME   321178.859 5841922.516 0.0
   LOCATION L0000020     VOLUME   321176.605 5841941.935 0.0
   LOCATION L0000021     VOLUME   321174.351 5841961.354 0.0
   LOCATION L0000022     VOLUME   321180.674 5841971.465 0.0
   LOCATION L0000023     VOLUME   321199.844 5841967.631 0.0
   LOCATION L0000024     VOLUME   321219.014 5841963.797 0.0
   LOCATION L0000025     VOLUME   321238.184 5841959.963 0.0
   LOCATION L0000026     VOLUME   321257.354 5841956.129 0.0
   LOCATION L0000027     VOLUME   321276.524 5841952.295 0.0
   LOCATION L0000028     VOLUME   321295.695 5841948.461 0.0
   LOCATION L0000029     VOLUME   321314.865 5841944.627 0.0
   LOCATION L0000030     VOLUME   321314.293 5841928.074 0.0
   LOCATION L0000031     VOLUME   321309.861 5841909.033 0.0
   LOCATION L0000032     VOLUME   321305.429 5841889.992 0.0
   LOCATION L0000033     VOLUME   321300.997 5841870.951 0.0
   LOCATION L0000034     VOLUME   321296.565 5841851.911 0.0
   LOCATION L0000035     VOLUME   321292.133 5841832.870 0.0
** End of LINE VOLUME Source ID = STCK1
   LOCATION WIND         AREAPOLY   321210.000  5841993.000          0.0
** DESCRSRC wind erosion
** --------------------------------------------------------------------
** Line Source Represented by Adjacent Volume Sources
** LINE VOLUME Source ID = ROAD2
** DESCRSRC
** PREFIX
** Length of Side = 10.00
** Configuration = Adjacent
** Emission Rate = 0.26
** Vertical Dimension = 6.80
** SZINIT = 3.16
** Nodes = 4
** 321280.000, 5841861.000, 0.00, 2.00, 4.65
** 321387.000, 5841940.000, 0.00, 2.00, 4.65
** 321148.000, 5842040.000, 0.00, 2.00, 4.65
** 321218.000, 5842494.000, 0.00, 2.00, 4.65
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   LOCATION L0000036     VOLUME   321284.022 5841863.970 0.0
   LOCATION L0000037     VOLUME   321292.067 5841869.910 0.0
   LOCATION L0000038     VOLUME   321300.112 5841875.849 0.0
   LOCATION L0000039     VOLUME   321308.157 5841881.789 0.0
   LOCATION L0000040     VOLUME   321316.202 5841887.729 0.0
   LOCATION L0000041     VOLUME   321324.247 5841893.668 0.0
   LOCATION L0000042     VOLUME   321332.292 5841899.608 0.0
   LOCATION L0000043     VOLUME   321340.337 5841905.548 0.0
   LOCATION L0000044     VOLUME   321348.382 5841911.487 0.0
   LOCATION L0000045     VOLUME   321356.426 5841917.427 0.0
   LOCATION L0000046     VOLUME   321364.471 5841923.367 0.0
   LOCATION L0000047     VOLUME   321372.516 5841929.306 0.0
   LOCATION L0000048     VOLUME   321380.561 5841935.246 0.0
   LOCATION L0000049     VOLUME   321385.158 5841940.771 0.0
   LOCATION L0000050     VOLUME   321375.933 5841944.630 0.0
   LOCATION L0000051     VOLUME   321366.708 5841948.490 0.0
   LOCATION L0000052     VOLUME   321357.483 5841952.350 0.0
   LOCATION L0000053     VOLUME   321348.258 5841956.210 0.0
   LOCATION L0000054     VOLUME   321339.033 5841960.070 0.0
   LOCATION L0000055     VOLUME   321329.808 5841963.930 0.0
   LOCATION L0000056     VOLUME   321320.583 5841967.789 0.0
   LOCATION L0000057     VOLUME   321311.358 5841971.649 0.0
   LOCATION L0000058     VOLUME   321302.133 5841975.509 0.0
   LOCATION L0000059     VOLUME   321292.908 5841979.369 0.0
   LOCATION L0000060     VOLUME   321283.683 5841983.229 0.0
   LOCATION L0000061     VOLUME   321274.458 5841987.089 0.0
   LOCATION L0000062     VOLUME   321265.233 5841990.949 0.0
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   LOCATION L0000063     VOLUME   321256.008 5841994.808 0.0
   LOCATION L0000064     VOLUME   321246.783 5841998.668 0.0
   LOCATION L0000065     VOLUME   321237.558 5842002.528 0.0
   LOCATION L0000066     VOLUME   321228.333 5842006.388 0.0
   LOCATION L0000067     VOLUME   321219.108 5842010.248 0.0
   LOCATION L0000068     VOLUME   321209.883 5842014.108 0.0
   LOCATION L0000069     VOLUME   321200.657 5842017.968 0.0
   LOCATION L0000070     VOLUME   321191.432 5842021.827 0.0
   LOCATION L0000071     VOLUME   321182.207 5842025.687 0.0
   LOCATION L0000072     VOLUME   321172.982 5842029.547 0.0
   LOCATION L0000073     VOLUME   321163.757 5842033.407 0.0
   LOCATION L0000074     VOLUME   321154.532 5842037.267 0.0
   LOCATION L0000075     VOLUME   321148.445 5842042.885 0.0
   LOCATION L0000076     VOLUME   321149.969 5842052.768 0.0
   LOCATION L0000077     VOLUME   321151.493 5842062.651 0.0
   LOCATION L0000078     VOLUME   321153.016 5842072.535 0.0
   LOCATION L0000079     VOLUME   321154.540 5842082.418 0.0
   LOCATION L0000080     VOLUME   321156.064 5842092.301 0.0
   LOCATION L0000081     VOLUME   321157.588 5842102.184 0.0
   LOCATION L0000082     VOLUME   321159.112 5842112.067 0.0
   LOCATION L0000083     VOLUME   321160.636 5842121.951 0.0
   LOCATION L0000084     VOLUME   321162.159 5842131.834 0.0
   LOCATION L0000085     VOLUME   321163.683 5842141.717 0.0
   LOCATION L0000086     VOLUME   321165.207 5842151.600 0.0
   LOCATION L0000087     VOLUME   321166.731 5842161.483 0.0
   LOCATION L0000088     VOLUME   321168.255 5842171.367 0.0
   LOCATION L0000089     VOLUME   321169.779 5842181.250 0.0
   LOCATION L0000090     VOLUME   321171.302 5842191.133 0.0
   LOCATION L0000091     VOLUME   321172.826 5842201.016 0.0
   LOCATION L0000092     VOLUME   321174.350 5842210.900 0.0
   LOCATION L0000093     VOLUME   321175.874 5842220.783 0.0
   LOCATION L0000094     VOLUME   321177.398 5842230.666 0.0
   LOCATION L0000095     VOLUME   321178.922 5842240.549 0.0
   LOCATION L0000096     VOLUME   321180.446 5842250.432 0.0
   LOCATION L0000097     VOLUME   321181.969 5842260.316 0.0
   LOCATION L0000098     VOLUME   321183.493 5842270.199 0.0
   LOCATION L0000099     VOLUME   321185.017 5842280.082 0.0
   LOCATION L0000100     VOLUME   321186.541 5842289.965 0.0
   LOCATION L0000101     VOLUME   321188.065 5842299.848 0.0
   LOCATION L0000102     VOLUME   321189.589 5842309.732 0.0
   LOCATION L0000103     VOLUME   321191.112 5842319.615 0.0
   LOCATION L0000104     VOLUME   321192.636 5842329.498 0.0
   LOCATION L0000105     VOLUME   321194.160 5842339.381 0.0
   LOCATION L0000106     VOLUME   321195.684 5842349.265 0.0
   LOCATION L0000107     VOLUME   321197.208 5842359.148 0.0
   LOCATION L0000108     VOLUME   321198.732 5842369.031 0.0
   LOCATION L0000109     VOLUME   321200.255 5842378.914 0.0
   LOCATION L0000110     VOLUME   321201.779 5842388.797 0.0
   LOCATION L0000111     VOLUME   321203.303 5842398.681 0.0
   LOCATION L0000112     VOLUME   321204.827 5842408.564 0.0
   LOCATION L0000113     VOLUME   321206.351 5842418.447 0.0
   LOCATION L0000114     VOLUME   321207.875 5842428.330 0.0
   LOCATION L0000115     VOLUME   321209.399 5842438.213 0.0
   LOCATION L0000116     VOLUME   321210.922 5842448.097 0.0
   LOCATION L0000117     VOLUME   321212.446 5842457.980 0.0
   LOCATION L0000118     VOLUME   321213.970 5842467.863 0.0
   LOCATION L0000119     VOLUME   321215.494 5842477.746 0.0
   LOCATION L0000120     VOLUME   321217.018 5842487.630 0.0
** End of LINE VOLUME Source ID = ROAD2
   BACKGRND ANNUAL 14.8
   BACKUNIT UG/M3
** Source Parameters **
   SRCPARAM EXC1             0.33     2.000     1.000     1.000
   SRCPARAM EXC2             0.33     2.000     1.000     1.000
   SRCPARAM EXC3             0.33     2.000     1.000     1.000
   SRCPARAM EXC4             0.33     2.000     1.000     1.000
   SRCPARAM EXC5             0.33     2.000     1.000     1.000
   SRCPARAM EXC6             0.33     2.000     1.000     1.000
   SRCPARAM EXC7             0.33     2.000     1.000     1.000
   SRCPARAM DUMP             0.24     2.000     1.000     1.000
   SRCPARAM LOAD             0.09     2.000     1.000     1.000
   SRCPARAM TP1              0.01     2.000     1.000     1.000
   SRCPARAM TP2              0.01     2.000     1.000     1.000
   SRCPARAM TP3              0.01     2.000     1.000     1.000
   SRCPARAM TP4              0.01     2.000     1.000     1.000
   SRCPARAM TP5              0.01     2.000     1.000     1.000
   SRCPARAM GRADE            0.06     2.000     1.000     1.000
   SRCPARAM PRIMC            0.07     3.000     5.000     1.500
   SRCPARAM SECC             0.05     3.000     5.000     1.500
   SRCPARAM SCREEN           0.24     1.000     0.500     0.500
   SRCPARAM FINES             1.6     1.000     0.500     0.500
   SRCPARAM BLAST            0.86     2.000     7.000     1.000
** LINE VOLUME Source ID = STCK1
   SRCPARAM L0000001     0.0074285714      2.00       9.09      3.16
   SRCPARAM L0000002     0.0074285714      2.00       9.09      3.16
   SRCPARAM L0000003     0.0074285714      2.00       9.09      3.16
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   SRCPARAM L0000004     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000005     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000006     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000007     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000008     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000009     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000010     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000011     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000012     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000013     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000014     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000015     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000016     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000017     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000018     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000019     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000020     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000021     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000022     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000023     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000024     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000025     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000026     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000027     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000028     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000029     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000030     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000031     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000032     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000033     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000034     0.0074285714      2.00      9.09      3.16
   SRCPARAM L0000035     0.0074285714      2.00      9.09      3.16
** ---------------------------------------------------------------------
   SRCPARAM WIND           5.6E-06     1.000        8
   AREAVERT WIND         321210.000 5841993.000 321376.000 5841947.000
   AREAVERT WIND         321363.000 5841906.000 321301.000 5841908.000
   AREAVERT WIND         321306.000 5841781.000 321138.000 5841737.000
   AREAVERT WIND         321125.000 5841904.000 321194.000 5841916.000
** LINE VOLUME Source ID = ROAD2
   SRCPARAM L0000036     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000037     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000038     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000039     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000040     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000041     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000042     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000043     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000044     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000045     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000046     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000047     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000048     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000049     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000050     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000051     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000052     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000053     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000054     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000055     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000056     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000057     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000058     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000059     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000060     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000061     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000062     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000063     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000064     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000065     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000066     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000067     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000068     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000069     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000070     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000071     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000072     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000073     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000074     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000075     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000076     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000077     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000078     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000079     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000080     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000081     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000082     0.0030588235      2.00      4.65      3.16
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   SRCPARAM L0000083     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000084     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000085     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000086     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000087     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000088     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000089     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000090     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000091     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000092     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000093     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000094     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000095     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000096     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000097     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000098     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000099     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000100     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000101     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000102     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000103     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000104     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000105     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000106     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000107     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000108     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000109     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000110     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000111     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000112     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000113     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000114     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000115     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000116     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000117     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000118     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000119     0.0030588235      2.00      4.65      3.16
   SRCPARAM L0000120     0.0030588235      2.00      4.65      3.16
** --------------------------------------------------------------------

** Variable Emissions Type: "By Hour-of-Day (HROFDY)"
** Variable Emission Scenario: "Scenario 2"
   EMISFACT DUMP         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT DUMP         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT DUMP         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT DUMP         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT EXC1         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT EXC1         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT EXC1         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT EXC1         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT EXC2         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT EXC2         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT EXC2         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT EXC2         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT EXC3         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT EXC3         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT EXC3         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT EXC3         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT EXC4         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT EXC4         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT EXC4         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT EXC4         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT EXC5         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT EXC5         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT EXC5         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT EXC5         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT EXC6         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT EXC6         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT EXC6         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT EXC6         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT EXC7         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT EXC7         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT EXC7         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT EXC7         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT FINES        HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT FINES        HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT FINES        HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT FINES        HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT GRADE        HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT GRADE        HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT GRADE        HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT GRADE        HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT LOAD         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT LOAD         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT LOAD         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT LOAD         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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EMISFACT PRIMC         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT PRIMC         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT PRIMC         HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT PRIMC         HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT SCREEN        HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT SCREEN        HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT SCREEN        HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT SCREEN        HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT SECC          HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT SECC          HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT SECC          HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT SECC          HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000001      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000001      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000001      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000001      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000002      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000002      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000002      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000002      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000003      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000003      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000003      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000003      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000004      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000004      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000004      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000004      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000005      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000005      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000005      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000005      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000006      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000006      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000006      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000006      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000007      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000007      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000007      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000007      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000008      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000008      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000008      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000008      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000009      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000009      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000009      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000009      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000010      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000010      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000010      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000010      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000011      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000011      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000011      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000011      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000012      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000012      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000012      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000012      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000013      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000013      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000013      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000013      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000014      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000014      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000014      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000014      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000015      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000015      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000015      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000015      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000016      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000016      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000016      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000016      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000017      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000017      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000017      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000017      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000018      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000018      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000018      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000018      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000019      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000019      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
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EMISFACT L0000019     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000019     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000020     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000020     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000020     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000020     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000021     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000021     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000021     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000021     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000022     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000022     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000022     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000022     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000023     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000023     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000023     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000023     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000024     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000024     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000024     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000024     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000025     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000025     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000025     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000025     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000026     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000026     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000026     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000026     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000027     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000027     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000027     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000027     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000028     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000028     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000028     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000028     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000029     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000029     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000029     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000029     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000030     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000030     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000030     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000030     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000031     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000031     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000031     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000031     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000032     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000032     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000032     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000032     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000033     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000033     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000033     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000033     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000034     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000034     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000034     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000034     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000035     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000035     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000035     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000035     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT TP1          HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT TP1          HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT TP1          HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT TP1          HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT TP2          HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT TP2          HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT TP2          HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT TP2          HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT TP3          HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT TP3          HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT TP3          HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT TP3          HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT TP4          HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT TP4          HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT TP4          HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT TP4          HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT TP5          HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT TP5          HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT TP5          HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT TP5          HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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EMISFACT L0000036      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000036      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000036      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000036      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000037      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000037      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000037      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000037      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000038      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000038      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000038      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000038      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000039      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000039      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000039      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000039      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000040      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000040      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000040      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000040      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000041      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000041      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000041      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000041      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000042      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000042      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000042      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000042      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000043      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000043      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000043      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000043      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000044      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000044      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000044      HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
EMISFACT L0000044      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000045      HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
EMISFACT L0000045      HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
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   EMISFACT L0000110     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000110     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000111     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000111     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000111     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000111     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000112     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000112     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000112     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000112     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000113     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000113     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000113     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000113     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000114     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000114     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000114     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000114     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000115     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000115     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000115     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000115     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000116     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000116     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000116     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000116     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000117     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000117     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000117     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000117     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000118     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000118     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000118     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000118     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000119     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000119     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000119     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000119     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000120     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT L0000120     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000120     HROFDY 1.0 1.0 1.0 1.0 1.0 0.0
   EMISFACT L0000120     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0

** Variable Emissions Type: "By Month / Hour / Seven Days (MHRDOW7)"
** Variable Emission Scenario: "Scenario 3"
** Month = January;  Day of Week = Monday
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   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = February;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = March;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = April;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = May;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = June;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = July;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = August;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = September;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = October;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = November;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = December;  Day of Week = Monday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = January;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = February;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = March;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = April;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = May;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = June;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = July;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = August;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = September;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = October;  Day of Week = Tuesday
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST         MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
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   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = November;  Day of Week = Tuesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = December;  Day of Week = Tuesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = January;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = February;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = March;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = April;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = May;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = June;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = July;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = August;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = September;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = October;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = November;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = December;  Day of Week = Wednesday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = January;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = February;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = March;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = April;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = May;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = June;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = July;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = August;  Day of Week = Thursday
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   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = September;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = October;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = November;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = December;  Day of Week = Thursday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = January;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = February;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = March;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = April;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = May;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = June;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = July;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = August;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = September;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = October;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = November;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = December;  Day of Week = Friday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = January;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = February;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = March;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = April;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = May;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
```

```
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = June;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = July;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = August;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = September;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = October;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = November;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = December;  Day of Week = Saturday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = January;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = February;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = March;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = April;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = May;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = June;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = July;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = August;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = September;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = October;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = November;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
** Month = December;  Day of Week = Sunday
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT BLAST        MHRDOW7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
   SRCGROUP SRCGP1   BLAST DUMP EXC1 EXC2 EXC3 EXC4 EXC5 EXC6 EXC7 FINES
   SRCGROUP SRCGP1   GRADE LOAD PRIMC SCREEN SECC TP1 TP2 TP3 TP4 TP5
   SRCGROUP SRCGP2   L0000001 L0000002 L0000003 L0000004 L0000005 L0000006
   SRCGROUP SRCGP2   L0000007 L0000008 L0000009 L0000010 L0000011 L0000012
   SRCGROUP SRCGP2   L0000013 L0000014 L0000015 L0000016 L0000017 L0000018
   SRCGROUP SRCGP2   L0000019 L0000020 L0000021 L0000022 L0000023 L0000024
   SRCGROUP SRCGP2   L0000025 L0000026 L0000027 L0000028 L0000029 L0000030
   SRCGROUP SRCGP2   L0000031 L0000032 L0000033 L0000034 L0000035 L0000036
   SRCGROUP SRCGP2   L0000037 L0000038 L0000039 L0000040 L0000041 L0000042
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   SRCGROUP SRCGP2   L0000043 L0000044 L0000045 L0000046 L0000047 L0000048
   SRCGROUP SRCGP2   L0000049 L0000050 L0000051 L0000052 L0000053 L0000054
   SRCGROUP SRCGP2   L0000055 L0000056 L0000057 L0000058 L0000059 L0000060
   SRCGROUP SRCGP2   L0000061 L0000062 L0000063 L0000064 L0000065 L0000066
   SRCGROUP SRCGP2   L0000067 L0000068 L0000069 L0000070 L0000071 L0000072
   SRCGROUP SRCGP2   L0000073 L0000074 L0000075 L0000076 L0000077 L0000078
   SRCGROUP SRCGP2   L0000079 L0000080 L0000081 L0000082 L0000083 L0000084
   SRCGROUP SRCGP2   L0000085 L0000086 L0000087 L0000088 L0000089 L0000090
   SRCGROUP SRCGP2   L0000091 L0000092 L0000093 L0000094 L0000095 L0000096
   SRCGROUP SRCGP2   L0000097 L0000098 L0000099 L0000100 L0000101 L0000102
   SRCGROUP SRCGP2   L0000103 L0000104 L0000105 L0000106 L0000107 L0000108
   SRCGROUP SRCGP2   L0000109 L0000110 L0000111 L0000112 L0000113 L0000114
   SRCGROUP SRCGP2   L0000115 L0000116 L0000117 L0000118 L0000119 L0000120
   SRCGROUP SRCGP3   WIND
   SRCGROUP SRCGP4   PRIMC SCREEN SECC FINES
   SRCGROUP ALL      BACKGROUND
SO FINISHED
**
****************************************
** AERMOD Receptor Pathway
****************************************
**
**
RE STARTING
   GRIDCART UCART1 STA
                     XYINC 318950.00 91 50.00 5839500.00 91 50.00
   GRIDCART UCART1 END
RE FINISHED
**
****************************************
** AERMOD Meteorology Pathway
****************************************
**
**
ME STARTING
   SURFFILE "..\..\..\Meteorology\Melbourne Airport\SITE ouputs\3135311.SFC"
   PROFFILE "..\..\..\Meteorology\Melbourne Airport\SITE ouputs\3135311.PFL"
   SURFDATA 0 2012
   UAIRDATA 11111111 2012
   SITEDATA 11111111 2012
   PROFBASE 10.0 METERS
ME FINISHED
**
****************************************
** AERMOD Output Pathway
****************************************
**
**
OU STARTING
   RECTABLE ALLAVE 1ST 3RD 5TH
   RECTABLE 24 1ST 3RD 5TH
** Auto-Generated Plotfiles
   PLOTFILE 24 ALL 1ST woody_hill.AD\24H1GALL.PLT 31
   PLOTFILE 24 SRCGP1 1ST woody_hill.AD\24H1G001.PLT 32
   PLOTFILE 24 SRCGP2 1ST woody_hill.AD\24H1G002.PLT 33
   PLOTFILE 24 SRCGP3 1ST woody_hill.AD\24H1G003.PLT 34
   PLOTFILE 24 SRCGP4 1ST woody_hill.AD\24H1G004.PLT 35
   PLOTFILE 24 ALL 3RD woody_hill.AD\24H3GALL.PLT 36
   PLOTFILE 24 SRCGP1 3RD woody_hill.AD\24H3G001.PLT 37
   PLOTFILE 24 SRCGP2 3RD woody_hill.AD\24H3G002.PLT 38
   PLOTFILE 24 SRCGP3 3RD woody_hill.AD\24H3G003.PLT 39
   PLOTFILE 24 SRCGP4 3RD woody_hill.AD\24H3G004.PLT 40
   PLOTFILE 24 ALL 5TH woody_hill.AD\24H5GALL.PLT 41
   PLOTFILE 24 SRCGP1 5TH woody_hill.AD\24H5G001.PLT 42
   PLOTFILE 24 SRCGP2 5TH woody_hill.AD\24H5G002.PLT 43
   PLOTFILE 24 SRCGP3 5TH woody_hill.AD\24H5G003.PLT 44
   PLOTFILE 24 SRCGP4 5TH woody_hill.AD\24H5G004.PLT 45
   SUMMFILE woody_hill.sum
OU FINISHED
**
****************************************
** Project Parameters
****************************************
** PROJCTN  CoordinateSystemUTM
** DESCPTN  UTM: Universal Transverse Mercator
** DATUM    World Geodetic System 1984
** DTMRGN   Global Definition
** UNITS    m
** ZONE     -55
** ZONEINX  0
**
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