

BLACKWOOD SQUARE SHD

EIAR Volume 3 – Part A



MH18062
Blackwood Square SHD
F01
21 November 2019


REPORT

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Final	Planning	Various	Leah Kenny	Helena Gavin	21/11/2019

Approval for issue

Helena Gavin



22 November 2019

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Prepared by:

Prepared for:

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Preface

The structure of the EIS is laid out in the preface of each volume for clarity. It consists of three volumes as follows:

Volume I: Non-Technical Summary

A non-technical summary of the information contained within **Volume I**.

Volume II: Environmental Impact Assessment Report

This is the main volume of the EIS. It provides information on the location and scale of the proposed development, details on design and impacts on the environment (both positive and negative) as a result of the proposals.

Volume III: Technical Appendices

Specialists' technical data and other related reports are contained within **Volume III**. **Volume III** comprises parts A and B. Part A includes 11 no. appendices associated with various specialisms. Part B includes verified views associated with Chapter 12 Landscape only.

APPENDICES

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APPENDIX 2.1 PROJECT SCOPING AND CONSULTATION

Pre-Planning Meeting Minutes 5th March 2019

Helena Gavin
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From: Paul OBrien <Paul.OBrien@fingal.ie>
Sent: Thursday 7 March 2019 11:44
To: Helena Gavin <helena.gavin@rpsgroup.com>
Cc: Claire McVeigh <Claire.McVeigh@fingal.ie>; Gemma Carr <Gemma.ECarr@fingal.ie>; Niall Thornton <Niall.Thornton@fingal.ie>; Phillip Grobler <Phillip.Grobler@fingal.ie>
Subject: Northwood Meeting Notes

CAUTION: This email originated from outside of RPS.

Hello Helena,

Apologies for the delay in sending these on, but I have been side tracked with other meetings in here. I think the notes are clear enough but if you have any queries please contact me.

Regards

Paul

Paul O'Brien | Executive Planner
Swords Area
Fingal County Council | Planning & Strategic Infrastructure Department
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Fhine Gall
Fingal County
Council



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t? cosc ar aon nochtadh, c?ipe?il, d?ileadh, n? aon ghn?omh a dh?anamh n? a fh?g?il ar l?r i dtaca leis an r?omhphost agus d'fh?adfadh sin a bheith m?dhleathach. M? t? an r?omhphost seo faighte agat tr? dhearmad, cuir an seolt?ir n? itservicedesk@fingal.ie ar an eolas. N? f?idir cumars?id idirl?n a r?th? a bheith sl?n n? saor ? earr?id? mar d'fh?adfadh faisn?is a bheith idircheaptha, truailithe, caillte , scriosta, n? teacht d?anach n? neamhioml?n . D? bhr? sin , n? f?idir linn glacadh le freagracht as aon earr?id? n? easnaimh at? sa teachtaireacht seo , n? aon iat?n , a th?inig chun cinn mar thoradh ar an tarchur r?omhphoist . T? an teachtaireacht cuardaithe ag bogearra? Frithv?reas

Title: Northwood, Santry S.247

Meeting Date: 5th March 2019

Site Location: Northwood, Santry.

Attendees: **List attached.**

The proposed development was presented and the following are the main issues raised/ subsequently commented on.

1. Design and layout of development:

The development will provide for a total of 332 apartment units consisting of:

- 1 Number: One Bedroom unit
- 277 Number: Two Bedroom units
- 54 Number: Three Bedroom units

- A total of 1,030 sq m of retail floor area – 4 to 5 units.
- Childcare facility of 324 sq m
- Basement level providing for car parking and storage.
- Apartments are intended to be sold on the market.
- Issue of gym within the apartment block – Will be referred to the EHO for comment.

The development consist of four blocks (A to D) providing for 7 storeys with a penthouse 8 storey level. Design will be similar to that in Bridgefield to the north of the site. Details provided on the elevational treatment and indicated on submitted plans. A plaza is to be provided to the west/ south west of the south. This will be suitable for outdoor dining and amenity. The site will include screening to the west – interface with Gulliver’s Retail Park.

The site area is given as 1.5 hectares thereby providing a density of 221 units per hectare.

2. Site Issues:

- The site is zoned ME – Metro Economic Corridor.
- The proposed Metrolink route is to the west of the site adjacent to the old Ballymun Road. Existing public transport provision in the area is on the Swords Road, Ballymun Road and Santry Avenue.
- Requirement for a Masterplan on these lands – Applicant to address how it will not prejudice this.
- Within the Outer Airport Noise Zone (OANZ) – Applicant to provide full noise assessment and suitable mitigation measures.

3. Water Services:

- Contact has been made with Irish Water regarding pre-connection agreement.
- Attenuation in tank to the north of the site, existing for Bridgefield has capacity. Will look at other means of attenuation – tree pits, swales etc.

- A pumping station will be required for drainage from the basement, rest will be gravity fed.
- Ensure that all consents are obtained.

4. Transportation and parking:

- Traffic counts have been undertaken in locations agreed with by Transportation Planning. Results are under preparation.
- Car parking requirement is 634 according to Development Plan. This may be reduced to 386 spaces but has to be justified with suitable detail.
- Parking spaces shall provide for electric charging/ be future proofed for this.
- 2 bicycle parking spaces per unit, suitably secured.
- Crèche parking and set down areas to be provided and include staff parking. Should not allow for reverse manoeuvres.
- Contribution towards upgrade of Northwood Avenue/ Ballymun Road Junction. This will provide for SCATS controlled signals.

5. Landscaping and open space:

5.1 Existing trees:

- Santry and Northwood are subject to a TPO – Noted.
- Require full tree survey, Arborist Report ensuring full details on the protection of trees. This report will inform the layout and set back/buffer required for these protected trees.
- The proposed landscaping /treatment of the ditch in the vicinity of the existing trees needs further discussion between the drainage consultants and the arborist. In general ditches in public areas attract dumping and anti-social behaviour. If possible, it would be best if the ditch can be filled and the area grassed.
- Full details of any proposed 'No dig solution' paths should be referenced in the Arborist's report.

5.2 Street trees:

- Requirement for minimum rooting volume of 16 cubic metres in constructed tree pits.
- Detail of the constructed tree pit to be provided.
- No services within 2.5m of proposed trees.
- No street tree within 7m of lamp standards

5.3 Landscape plan:

The landscape plan shall include the following:

- Services including proposed lamp standards.
- Area (in sq. metres) of open space and playground provision in accordance with Development Plan standards.
- Outline of constructed tree pit area.
- Playground surface and equipment to be in accordance with BS EN 1176 and 1177. Play equipment to be provided / accessible for disabled users. (N.B. - Details of management maintenance to be included – RoSPA certification (or equivalent) frequency of checks and record keeping)
- No incidental grass margins (less than 1 metre in width) which are unsustainable to maintain.

- Naturalised bulb planting and use of pollinator friendly species (in accordance with the National Pollinator Plan)
 - Proposed tree planting to reflect where possible the tree species of the adjoining designed landscape of Santry Park.
 - Further consideration is required on proposed landscaping adjoining Gulliver Retail Park – in order to create a substantial visual separation/ green buffer zone between the vast area of car parking and the proposed apartment units.
 - The development will provide for a 'Green Route' through the southern edge of the site and continue through the Gulliver car park in the direct of the Old Ballymun Road. Will include cycle and pedestrian route with landscaping.
 - Bin stores, bike stores and sub-stations shall not be located on or directly adjoining open space areas (to avoid anti-social activity)
 - The Open Space Design Statement to clearly state how public open space provision and playground provision as well as communal open space provision is being dealt with. Emphasis to be given on the usability of the open space areas for various age groups.
7. Taking in charge drawing – Should design the services and open space to taking in charge standard.
8. Public Art to be provided following agreement with Fingal County Council Arts Office.
9. Other Assessments:
- Appropriate Assessment
 - EIS
 - Noise Assessment – OANZ.
 - Archaeology
 - Daylight and shadow assessments.
 - Design Statement – DMS03 of the Fingal Development Plan 2017 – 2023.
 - Longer term at construction stage – May require a crane use strategy having regard to the proximity of the development to the airport.

Conclusion:

The applicant agreed to consider these matters and another meeting is to be arranged before progressing to next stage.

Attendees

Planning Authority (FCC):

Paul O'Brien Executive Planner,
Claire McVeigh Senior Executive Planner,
Niall Thornton Thornton Senior Executive Engineer,
Gemma Carr Senior Executive Parks Superintendent,
Philip Grobler

Applicant (Cosgrave): Michael Cosgrave
Applicant's Planners (RPS): Helena Gavin,
Applicant's Planners (RPS): Mike Higgins
Applicant's Architects (MCORM): Gerard O Neill
Applicant's Engineers (JBB): Gary Flood
Applicant's Landscape Architect (KFLA) Simone Kennedy

APPENDIX 2.2 PROJECT SCOPING AND CONSULTATION

Pre-Planning Meeting Minutes 2nd May 2019

Helena Gavin
Director - Planning
T +353 1 488 2900
E helena.gavin@rpsgroup.com

From: Paul OBrien <Paul.OBrien@fingal.ie>
Sent: Friday 17 May 2019 10:47
To: Helena Gavin <helena.gavin@rpsgroup.com>
Cc: Claire McVeigh <Claire.McVeigh@fingal.ie>
Subject: Northwood

CAUTION: This email originated from outside of RPS.

Hi Helena,

Sorry I was meant to do up quick notes on this. There are no major issues from my point of view. I think we covered the main issues in the last meeting.

Regards

Paul

Paul O'Brien | Executive Planner
Swords Area
Fingal County Council | Planning & Strategic Infrastructure Department
County Hall | Main Street | Swords | Co. Dublin | Eircode: K67 X8Y2
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faighte agat tr? dheardmad, cuir an seolt?ir n? itservicedesk@fingal.ie ar an eolas. N? f?idir cumars?id idirl?n a r?th? a bheith sl?n n? saor ? earr?id? mar d'fh?adfadh faisn?is a bheith idircheaptha, truaillithe, cailte , scriosta, n? teacht d?anach n? neamhioml?n . D? bhr? sin , n? f?idir linn glacadh le freagracht as aon earr?id? n? easnaimh at? sa teachtaireacht seo , n? aon iat?n , a th?inig chun cinn mar thoradh ar an tarchur r?omhphoist . T? an teachtaireacht cuardaithe ag bogearra? Frithv?reas

Title: Northwood, Santry S.247

Meeting Date: 2nd May 2019

Site Location: Northwood, Santry.

Attendees: **List attached.**

The proposed development was presented with modifications and updates from the meeting of the 5th of March 2019. The following are the main issues raised/ subsequently commented on.

1. Design and layout of development:

The development will provide for a total of 332 apartment units. The site is slightly increased from 1.5 hectares to 1.8 hectares; this is primarily through the inclusion of a pedestrian/ green route from the site through the Gulliver's Car Park to the site of the Metrolink stop. The route to be at grade with extensive tree/ shrub planting. Suitable lighting will be approved along this route. The applicant was advised that the lighting should be of a different type to that of the existing car park.

- The blocks range in height from 7 to 8 storeys (7 with setback). Issue of 45 m with regards to the airport.
- Retail and other commercial uses at ground floor level.
- Colonnade on the south elevation.
- Use of sedum on the roof. To be set in 40 m sections to act as a fire break etc.

2. Surface water drainage:

- Ditch with trees on the roadside. There is a potential to fill this ditch to provide for additional surface water drainage.
- May use Stormtech for water attenuation.
- Use of permeable paving and attenuation tank.

3. Parks and Green Infrastructure:

- Reinforced grasstech to be used for fire access in certain locations. Need for a root barrier in the vicinity of trees.
- Lighting to be indicated on all submitted plans. Should include details on the depth of the light standard etc. below GL.
- Need for a softer edge along the western boundary.
- 16 cubic metres constructed tree pits.
- Issue of falls etc. in amenity areas especially those not taken in charge.
- Playground to centre of the site should be universally accessible – make allowance for this. Location of the playground with regards to apartment units to be carefully considered.
- Play facilities to be in accordance with apartment guidelines.

4. Car parking and transport:

- One car parking space per unit to be provided.
- Make provision (ducting or charging points) for electric cars.

5. Other issues:

- Environmental Impact screening – sub threshold but consider issue of cumulative impacts of development.
- AA screening.

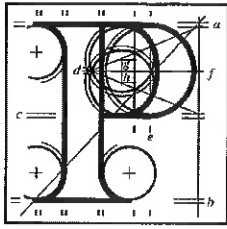
Attendees

Planning Authority (FCC):

Paul O'Brien Executive Planner,
Niall Thornton Senior Executive Engineer,
Gemma Carr Senior Executive Planner,
Applicant (Cosgrave): Michael Cosgrave
Applicant's Planners (RPS): Helena Gavin,
Applicant's Planners (RPS): Mike Higgins
Applicant's Architects (MCORM): Gerard O'Neill
Applicant's Engineers (JBB): Gary Flood

APPENDIX 2.3 PROJECT SCOPING AND CONSULTATION

ABP Opinion and ABP Record of Meeting



An
Bord
Pleanála

Planning and Development (Housing) and Residential Tenancies Act 2016

Notice of Pre-Application Consultation Opinion

Case Reference: ABP-305029-19

Proposed Development: 332 apartments, creche and associated site works.

Former Santry Demesne, off Northwood Avenue, Santry, Dublin 9.

An Bord Pleanála has considered the issues raised in the pre-application consultation process and, having regard to the consultation meeting and the submission of the planning authority, is of the opinion that the documents submitted with the request to enter into consultations constitute a reasonable basis for an application for strategic housing development.

Furthermore, pursuant to article 285(5)(b) of the Planning and Development (Strategic Housing Development) Regulations 2017, the prospective applicant is hereby notified that, in addition to the requirements as specified in articles 297 and 298 of the Planning and Development (Strategic Housing Development) Regulations 2017, the following specific information should be submitted with any application for permission:

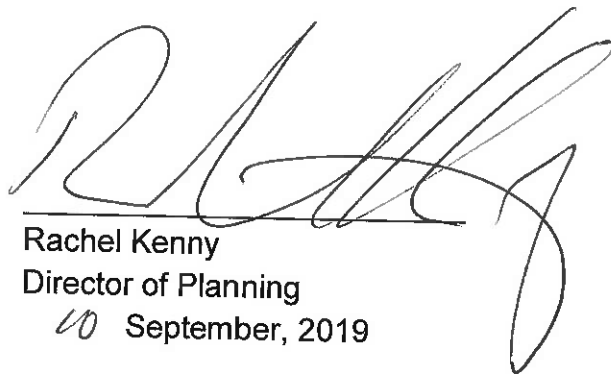
1. A detailed landscaping plan integrating any relevant recommendations from Arborist Report, the surface water requirements and compliance with the appropriate provision of play facilities for all areas and delineation of all public, semi-private and private spaces and any areas which may be taken in charge in the future inter alia the public open space along the east of the site.
2. Details of all materials proposed for buildings, open spaces, paved areas, boundary and retaining walls and a building life cycle report in accordance with section 6.3 of the Sustainable Urban Housing: Design Standards for New Apartments (2018).

3. A report that addresses issues of residential amenity (both existing residents of adjoining development and future occupants), specifically with regards to overlooking, overshadowing and overbearing. The report shall include full and complete drawings illustrating daylight and sunlight analysis for existing and proposed apartments and all open space areas.
4. Details of all areas designated for waste for both residential and commercial and the compliance with the minimum areas and recycling facilities in accordance with section 4.8 and 4.9 of the Sustainable Urban Housing: Design Standards for New Apartments (2018).
5. A detailed schedule of accommodation which indicates consistency with relevant standards in the Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities' (2018) including a report which addresses the use of the residential support facilities.
6. A detailed report providing a rationale for the provision of an appropriate unit mix which provides consistency with the standards in the development and/ or the relevant standards in the Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities' (2018) whichever is justified as necessary.
7. Submission of a car parking strategy including justification for the inclusion of proposed car parking numbers, indicating the allocation for designated car parking spaces for retail, commercial and/or residential, illustrating the location of any car parking spaces outside the red line, if any, and the proposed management of these spaces. The strategy shall also include details of any areas which are applicable for car club facilities and details for electric vehicle charging.
8. Inclusion of a cycling strategy in any traffic impact assessment, detailing the appropriate provision of bicycle parking in line with national and/or local standards and include details of all surface parking ensuring appropriate longevity and shelter.
9. Childcare demand analysis, including but not restricted to the justification for size of the proposed crèche, having regard to the existing childcare facility in the residential development to the north, the likely demand and use for childcare places and the accommodation of additional requirement resulting from the proposed development.
10. Inclusion of a Social and Community Audit of the schools in the vicinity in particular school going children.
11. A Site Specific Management Plan which includes details on management of the retail units, communal areas, public space, residential amenity and apartments.

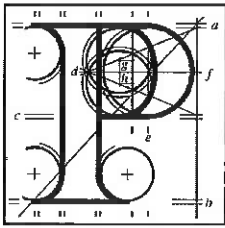
12. The information referred to in article 299B (1)(b)(ii)(II) and article 299B(1)(c) of the Planning and Development Regulations 2001-2018 should be submitted as a standalone document.

Also, pursuant to article 285(5)(a) of the Planning and Development (Strategic Housing Development) Regulations 2017, the prospective applicant is informed that the following authorities should be notified in the event of the making of an application arising from this notification in accordance with section 8(1)(b) of the Planning and Development (Housing) and Residential Tenancies Act 2016:

1. Transport Infrastructure Ireland
2. National Transport Authority
3. Irish Water
4. Dublin County Childcare Committee
5. Commission for Energy Regulation
6. Irish Aviation Authority
7. Dublin Airport Authority



Rachel Kenny
Director of Planning
10 September, 2019



An
Bord
Pleanála

Record of Meeting ABP-305029-19

Case Reference / Description	332 apartments, creche and associated site works. Former Santry Demesne, off Northwood Avenue, Santry, Dublin 9.		
Case Type	Section 5 Pre-Application Consultation Request		
Date:	2 nd September 2019	Start Time	11:35 a.m.
Location	Offices of An Bord Pleanála	End Time	12:55 p.m.
Chairperson	Rachel Kenny	Executive Officer	Ciaran Hand

Representing An Bord Pleanála:

Rachel Kenny, Director of Planning
Karen Hamilton, Planning Inspector
Ciaran Hand, Executive Officer
Hannah Cullen, Executive Officer – observing

Representing Prospective Applicant:

Helena Gavin, Project Planner
Mike Higgins, Project Planner
Gerry O' Neill, Project Architect
Garry Flood, Project Engineer
Simone Kennedy, Project Landscape Architect
Andy Worsnopp, Project Arborist
Mick Cosgrove, Developer
Shane Geraghty, Daylight & Sunlight

Representing Planning Authority

Regina Thompson, Planner
Claire McVeigh, Senior Executive Planner
Gemma Carr, Senior Executive Parks Superintendent

Niall Thornton, Executive Engineer
Darragh Sheedy, Executive Engineer

Introduction

The representatives of An Bord Pleanála (ABP) welcomed the prospective applicant, Planning Authority (PA) and introductions were made. The procedural matters relating to the meeting were as follows:

- The written record will be placed on the pre-application consultation file and will be made public, along with that file, should an application arise following the conclusion of this consultation process,
- ABP received a submission from the PA on 27th August 2019 providing the records of consultations held pursuant to section 247 and its written opinion of considerations related to proper planning and sustainable development that may have a bearing on ABP's decision,
- The consultation meeting will not involve a merits-based assessment of the proposed development,
- The meeting will focus on key site-specific issues at strategic overview level, and whether the documents submitted require further consideration and/or amendment in order to constitute a reasonable basis for an application,
- Key considerations will be examined in the context of the statutory development plan for the area and section 28 Ministerial Guidelines where relevant,
- A reminder that neither the holding of a consultation or the forming of an opinion shall prejudice ABP or the PA concerned in relation to any other of their respective functions under the Planning Acts or any other enactments and cannot be relied upon in the formal planning process or in legal proceedings.

The ABP representatives acknowledged the letter dated 31st July 2019 formally requesting pre-application consultations with ABP. Prospective applicant advised of the need to comply with definition of SHD as set out in the Act of 2016, in relation to thresholds of development. It was also noted that the Inspector dealing with the pre-application consultation request would be different to who would deal with the application when it was submitted. Recording of the meeting is prohibited.

Agenda

- 1. Development Strategy for the site to include inter alia:**
 - **Quality and design of public/ semi- public open space provision including the provision of play facilities in line with apartment guidelines,**
 - **Daylight and sunlight analysis for existing apartments and apartments to the north of the site,**
 - **Access and appropriate provision of refuse for residential and commercial.**
 - **Housing mix, SPPR 1 and the inclusion of a Housing Need and Demand Assessment (HNDA).**
- 2. Quantum and quality of the provision of shared services, childcare and residential amenity provision.**
- 3. Quantum and justification for car parking provision.**
- 4. Any other matters.**

1. Development Strategy for the site to include inter alia:

- **Quality and design of public/ semi- public open space provision including the provision of play facilities in line with apartment guidelines,**
- **Daylight and sunlight analysis for existing apartments and apartments to the north of the site,**
- **Access and appropriate provision of refuse for residential and commercial.**
- **Housing mix, SPPR 1 and the inclusion of a Housing Need and Demand Assessment (HNDA).**

ABP sought further elaboration/discussion on:

- Usability of the play area to the east of the site considering the location within the protected trees which will remain
- Management of all play areas and the provision of recreation facilities for all ages
- Daylight and sunlight analysis in relation to the impact on the existing buildings to the northern of the site and the proposed units within the scheme along the north
- Design of the interface between the commercial and retail, in particular the refuse areas and the apartments on the ground floor
- Noise impact of the retail unit on residential
- Treatment of the drop off points at the crèche and basement
- Apartment mix and justification for the high number of two beds units

Planning Authority's comments:

- A play area of 500m² is needed for small children
- The area of 136m² for younger children is acceptable however the quality could be improved
- Location of the play area under the trees is a concern
- Ensure that the trees are protected and use of Stormtech is appropriate
- The ditch could be used as storage for water
- There is attenuation and a discharge at Santry river
- Water quality has improved
- In regard to daylight/sunlight the applicant needs to be conscious of the 8-storey element
- If trees are being included it needs to be shown how much shadowing occurs
- There is more opportunity to provide the public realm
- Ensure that refuse collections are separate from the crèche drop off areas
- The applicant should submit a supporting retail statement within the uses proposed in the schemes
- Development plan standard for housing mix is different to the national requirements

Prospective Applicant's response:

- Position of the play area can be examined
- The whole scheme will be private and managed
- The south of the site will be redesigned to allow more sunlight into the courtyard
- Shadow diagrams show no negative impact and additional documentation will be submitted
- VSC method is being carried out

- The trees are oak, ash and sycamore and therefore will have a minimal impact on sunlight analysis
- The ADF levels are currently being done
- Interface between the retail units and parking can be examined
- The retail units will be triple glazed, ventilation for units will be appropriate and uses will be restricted to have limited impact on residential amenity
- Heat recovery is being used and there is natural ventilation
- Operating hours will be managed
- There will be no units containing late night take-away
- The management report will address the access points and crèche collections
- There is a good unit mix in the surrounding areas

Further ABP comments:

- Examine the location of the play area integrate with any management plan
- Address what is being done with the ditch/open space area
- The single aspect north facing apartments at Block D needs to be examined
- Detail the treatment of the access points at the crèche and basement
- In regard to retail units – ensure future proofing
- Submit a rationale as to why 89% of apartments are 2-beds
- There is no further information sought at application stage

2. Quantum and quality of the provision of shared services, childcare and residential amenity provision.

ABP sought further elaboration/discussion on:

- The size, use and management of shared services
- The size and scale of the existing and proposed crèche
- School provision in the area

Planning Authority's comments:

- Detail the shared services
- Outline the desire lines

Prospective Applicant's response:

- Shared services are private for the residents
- The courtyard is only for occupants
- There is an existing crèche provided for housing units with 32 spaces and 72 are proposed in the scheme
- Schools have been assessed and additional analysis will be included to identify future capacity

Further ABP comments:

- Justify the need for a scale of the crèche
- The provision of the residential amenity must be commensurate with size of the scheme

3. Quantum and justification for car parking provision.

ABP sought further elaboration/discussion on:

- Basement parking and potential deficit in the quantum provided.
- Car Club spaces
- Shared spaces and use of adjoining car park for the scheme
- Electric charging points
- Financial Contribution for the upgrade of junctions in the vicinity of the site

Planning Authority's comments:

- Justification for a lack of 29 spaces should be included
- Ducting should be in place
- A financial contribution for a junction upgrade under section 48 is needed
- Bicycle access to the basement needs to be designed to standards
- Stackable cycle parking spaces should be investigated
- Visitor bicycle parking should have a roof and be secured

Prospective Applicant's response:

- Provision has been made for electric charge points and provision of charging can be done when a resident obtains a grant
- There are GoCar spaces
- Parking is 10% below the PA's minimum standards
- A Transport Impact Assessment will be provided as part of the EIAR although can also be submitted as a separate stand-alone document

Further ABP comments:

- If standards are different for cycle or car parking a rationale will be required
- If a contribution is being sought for the upgrade of junctions the Planning Authority should detail this provision
- The PA should submit details of any specific financial contribution required for the upgrade of junctions

4. Any other matters

ABP comments:

- Submit a rationale for the ESB substation at the entrance
- Clarify in relation to the external stairs on drawings from the basement at east Block D
- Detail of NIS screening
- Ensure the futureproofing of space and apartment units

Planning Authority's comments:

- Detail the materials being used in relation to their distinctiveness and place making
- Submit a drawing showing what is public open space having regard to the possible provision of future taking in charge
- There should not be a monotony of height, variation of the buildings will allow sunlight and daylight through

- This location is not going to be landmark although distinctiveness is required
- In regard to Irish Water ensure that all consents for third party lands are sought

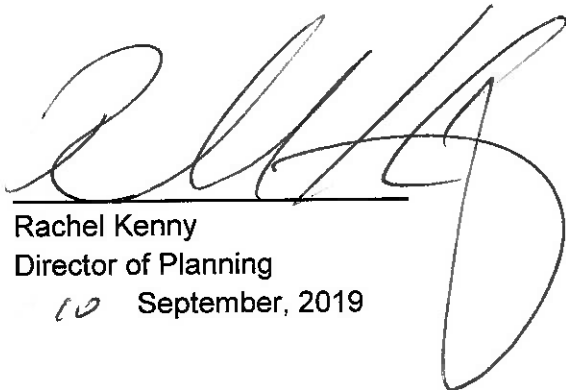
Applicants Comments:

- The substation is for electricity and the possibility of screening will be investigated
- External stairs from the basement at east block D is an error
- Stage 1 screening is being done
- The same brick is being used and distinctiveness will be outlined
- The aim is to build up the height towards a landmark building to the south of the site

Conclusions

The representatives of ABP emphasised the following:

- There should be no delay in making the planning application once the public notice has been published
- Sample notices, application form and procedures are available on the ABP website
- Irish Water would like prospective applicants to contact Irish Water at cdsdesignqa@water.ie **between the Pre-Application Consultation and Application stages**, to confirm details of their proposed development and their proposed design.
- The email address to which applicants should send their **applications** to Irish Water as a prescribed body is spatialplanning@water.ie



Rachel Kenny
Director of Planning
10 September, 2019

APPENDIX 6.1 BIODIVERSITY

Ecological Valuation Criteria

Examples of Ecological Evaluation

Ecological Valuation Criteria

International Importance:

- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.
- Proposed Special Protection Area (pSPA).
- Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).
- Features essential to maintaining the coherence of the Natura 2000 Network.¹
- Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.
- Resident or regularly occurring populations (assessed to be important at the national level)² of the following:
 - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and / or
 - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.
- Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
- World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
- Biosphere Reserve (UNESCO Man & The Biosphere Programme).
- Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
- Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
- Biogenetic Reserve under the Council of Europe.
- European Diploma Site under the Council of Europe.
- Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).³

¹ See Articles 3 and 10 of the Habitats Directive.

² It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

³ Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).

Ecological Valuation Criteria

National Importance:

- Site designated or proposed as a Natural Heritage Area (NHA).
- Statutory Nature Reserve.
- Refuge for Fauna and Flora protected under the Wildlife Acts.
- National Park.
- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
- Resident or regularly occurring populations (assessed to be important at the national level)⁴ of the following:
 - Species protected under the Wildlife Acts; and/or
 - Species listed on the relevant Red Data list.
- Site containing 'viable areas'⁵ of the habitat types listed in Annex I of the Habitats Directive.

County Importance:

- Area of Special Amenity.⁶
- Area subject to a Tree Preservation Order.
- Area of High Amenity, or equivalent, designated under the County Development Plan.
- Resident or regularly occurring populations (assessed to be important at the County level)⁷ of the following:
 - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
 - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
 - Species protected under the Wildlife Acts; and/or
 - Species listed on the relevant Red Data list.
- Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
- County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local Biodiversity Action Plan (BAP) if this has been prepared.
- Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
- Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (higher value):

⁴ It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

⁵ A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

⁶ It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

⁷ It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County importance where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

Ecological Valuation Criteria

- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;
- Resident or regularly occurring populations (assessed to be important at the Local level)⁸ of the following:
 - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
 - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
 - Species protected under the Wildlife Acts; and/or
 - Species listed on the relevant Red Data list.
- Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value):

- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;
- Sites or features containing non-native species that are of some importance in maintaining habitat links.

⁸ It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

APPENDIX 7.1 WATER (HYDROLOGY)

Ground Investigations Report



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Ground Investigations Ireland

Santry Demense Northwood

Ground Investigation Report

DOCUMENT CONTROL SHEET

Project Title	Santry Demense Northwood
Engineer	JB Barry
Project No	8454-02-19
Document Title	Ground Investigation Report

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A	Final	E Byrne	A McDonnell	F McNamara	Dublin	29 th April 2019



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APPENDICES

Appendix 1	Site Location Plan
Appendix 2	Cable Percussion Borehole Records
Appendix 3	Laboratory Testing

1.0 Preamble

On the instructions of JB Barry Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between the 1st to the 4th of April 2019 at the site of the proposed residential development in Santry, Dublin 9.

2.0 Overview

2.1. Background

It is proposed to construct a new residential development with associated services, access roads and car parking at the proposed site. The site is currently a greenfield site and is situated off Northwood Avenue in Santry. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 4 No. Cable Percussion boreholes to a maximum depth of 8.00m BGL
- Geotechnical and Environmental Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.

The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.

The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed.

Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.

Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60° cone.

The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil.

The cable percussion borehole logs are provided in Appendix 2 of this Report.

3.3. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.

Geotechnical testing consisting of Moisture Content, Atterberg Limits and Particle Size Distribution tests were carried out in NMTL's Geotechnical Laboratory in Carlow.

Environmental testing consisting of the Rilta suite for assessing sample contaminants were carried out by Jones Environmental Laboratory in the UK.

The results of the laboratory testing is included in Appendix 3 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil/Surfacing
- Made Ground
- Cohesive Deposits

TOPSOIL/SURFACING: Topsoil or Tarmacadam was encountered in all the exploratory holes and was present to a maximum depth of 0.20m BGL.

MADE GROUND: Made Ground deposits were encountered in all the exploratory holes beneath the Topsoil and was present to a relatively consistent depth of between 0.40m and 0.90m BGL. These deposits were described generally as *grey fine to coarse angular Gravel Fill* and *brown slightly sandy Clay with rare red brick fragments*.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground in all the exploratory holes. They were described typically as *brown sandy slightly gravelly CLAY* overlying a *grey slightly sandy gravelly CLAY with occasional cobbles* and finally a *dark grey/black slightly sandy gravelly CLAY with occasional cobbles*. The strength of the cohesive deposits typically increased with depth and was stiff below 2.60m BGL in all the exploratory holes. These deposits had occasional cobble and boulder content where noted on the exploratory hole logs.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors.

4.3. Laboratory Testing

The results of the Waste Acceptance Criterial Test Suite are presented with the individual parameter limits for "Inert" "Non Hazardous" and "Hazardous" as outlined within European Council Directive 1999 131/EC Article 16 Annex II, "Criteria and procedures for the acceptance of waste at landfills". The intended disposal site should be consulted to ensure compliance with their specific requirements. The results from the completed laboratory testing is included in Appendix 3 of this report.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

An allowable bearing capacity of 125 kN/m² is recommended for conventional strip or pad foundations on the stiff cohesive deposits at a minimum depth of 2.60m BGL.

A ground bearing floor slab is recommended to be based on the stiff cohesive deposits with an appropriate depth of compacted hardcore specified by the consulting engineer and in accordance with the limits and guidelines in SR21:214 and/or NRA SRW CL808 Type E granular stone fill.

The pH and sulphate testing carried out indicate that pH results are near neutral and that the water soluble sulphate results is low when compared to the guideline values from BRE Special Digest 1:2005. The samples tested classify the soil as a Design Sulphate Level DS-1.

The possibility for variation in the depth of the made ground in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete.

5.3. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

Any excavations in the Made Ground deposits will require to be appropriately battered or the sides supported.

Any material to be removed off site should be disposed of to a suitably licenced landfill.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan

SE 2

BH1

FFL = 58.30

BH2

FFL = 58.93

E 310925.000
N 240790.000

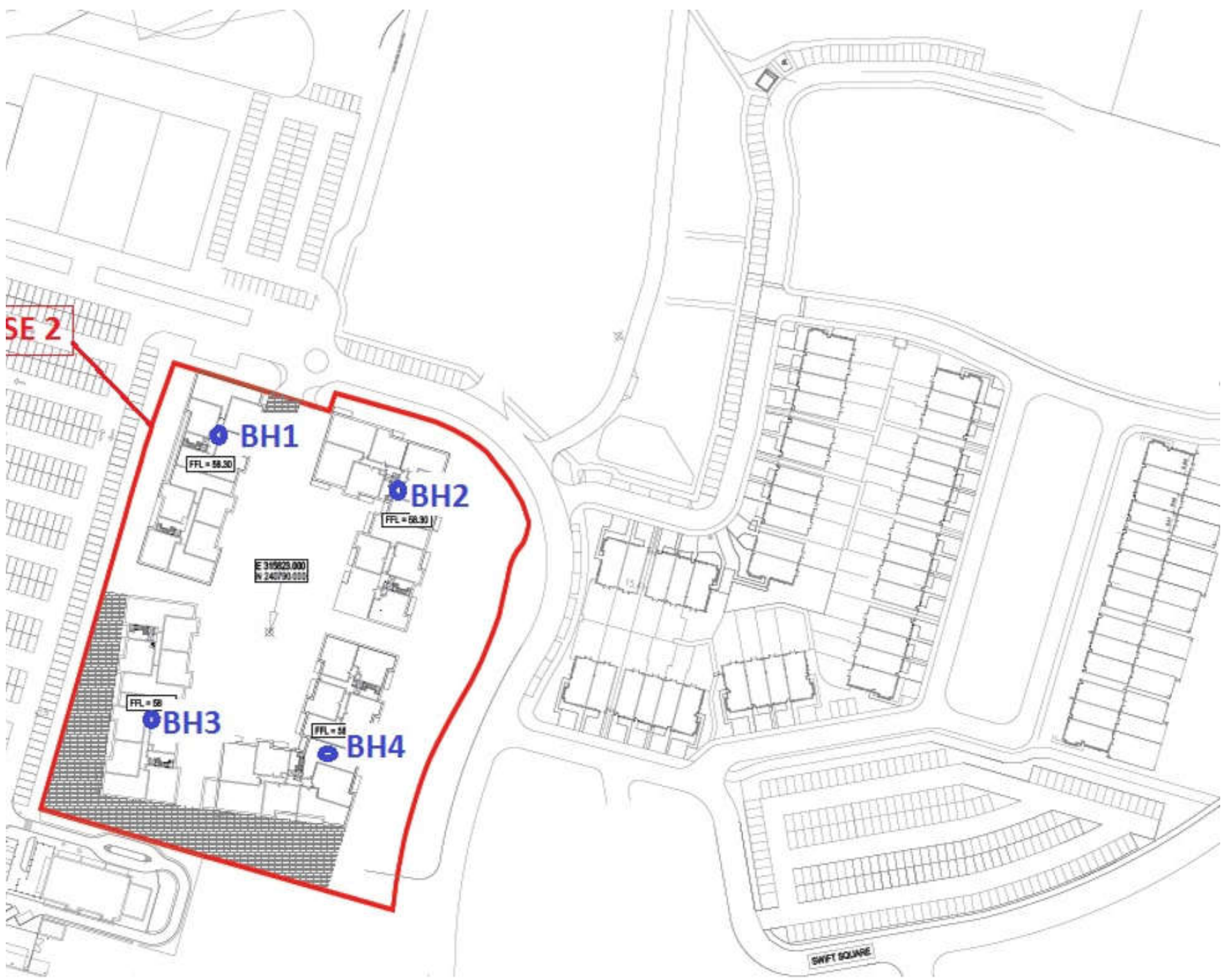
BH3

FFL = 58

BH4

FFL = 58

SWIFT SQUARE



APPENDIX 2 – Cable Percussion Borehole Records



Ground Investigations Ireland Ltd

www.gii.ie

Site
Santry Demense Northwood

Borehole Number
BH01

Machine : Dando 2000	Casing Diameter 200mm cased to 7.00m	Ground Level (mOD)	Client	Job Number 8454-02-19
Method : Cable Percussion	Location	Dates 03/04/2019	Engineer JB Barry	Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B					0.10 (0.30) 0.40	TARMACADAM MADE GROUND: Grey fine to coarse angular Gravel Fill		
1.00-1.45 1.00	SPT(C) N=25 B			2,4/6,7,6,6		(0.50) 0.90	MADE GROUND: Light brown slightly sandy Clay with rare red brick fragments Soft to firm light brown slightly gravelly CLAY. Gravel is subangular to subrounded		
2.00-2.45 2.00	SPT(C) N=7 B			1,2/2,1,2,2		1.50	Soft to firm dark brown sandy slightly gravelly CLAY. Gravel is subangular to subrounded		
3.00	B			Water strike(1) at 2.70m, rose to 2.50m in 20 mins, sealed at 3.40m. 2,4/4,6,8,9		2.60	Stiff brown sandy slightly gravelly CLAY. Gravel is angular to subrounded		▼1
3.00-3.45	SPT(C) N=27				3.10 (0.30) 3.40	Stiff grey silty gravelly CLAY		▼1	
4.00-4.45 4.00	SPT(C) N=49 B			5,7/9,12,13,15		(2.60)	Stiff dark grey/black slightly sandy gravelly CLAY with occasional subrounded cobbles. Gravel is subangular to subrounded		
5.00-5.45 5.00	SPT(C) N=50 B			6,7/11,14,19,6		6.00	Stiff brown slightly sandy gravelly CLAY with occasional subrounded cobbles. Gravel is subangular to subrounded		
6.00-6.45 6.00	SPT(C) N=50 B			8,11/14,17,19		(1.00)	Stiff brown slightly sandy gravelly CLAY with occasional subrounded cobbles. Gravel is subangular to subrounded		
7.00-7.25 7.00	SPT(C) 50/100 B			12,15/17,33		7.00	Complete at 7.00m		

Remarks Borehole backfilled upon completion	Scale (approx) 1:50	Logged By S. Connolly
Figure No. 8454-02-19.BH01		



Ground Investigations Ireland Ltd
www.gii.ie

Site
Santry Demense Northwood

Borehole Number
BH02

Machine : Dando 2000	Casing Diameter 200mm cased to 4.70m	Ground Level (mOD)	Client	Job Number 8454-02-19
Method : Cable Percussion	Location	Dates 04/04/2019	Engineer JB Barry	Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B			Water strike(1) at 0.40m, rose to 0.30m in 20 mins, sealed at 2.10m.		0.10 (0.30) 0.40	TARMACADAM MADE GROUND: Grey fine to coarse angular Gravel Fill		▼1
1.00-1.45 1.00	SPT(C) N=6 B			1,1/2,1,1,2		(1.40)	Soft to firm light brown slightly silty gravelly CLAY. Gravel is subangular to subrounded		
2.00-2.45 2.00	SPT(C) N=16 B			1,2/2,4,4,6		1.80 (0.30) 2.10	Firm grey slightly silty slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded		
3.00-3.45 3.00	SPT(C) N=41 B			4,5/6,9,11,15		(1.10) 3.20	Stiff grey slightly sandy gravelly CLAY with occasional subrounded cobbles. Gravel is subangular to subrounded		▼2
4.00-4.40 4.00	SPT(C) 50/250 B			7,9/14,17,19		(1.40) 4.60 4.70	Stiff dark grey/black slightly sandy gravelly CLAY with occasional subrounded cobbles. Gravel is subangular to subrounded		
4.70	B			Water strike(2) at 4.70m, rose to 3.20m in 20 mins. 25/50			OBSTRUCTION: Presumed boulder		▼2
4.70-4.90	SPT(C) 50/50						Complete at 4.70m		

Remarks Borehole backfilled upon completion Chiselling from 4.60m to 4.70m for 1 hour.	Scale (approx)	Logged By
	1:50	S. Connolly
	Figure No. 8454-02-19.BH02	



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Site
Santry Demense Northwood

Borehole Number
BH03

Machine : Dando 2000	Casing Diameter 200mm cased to 4.50m	Ground Level (mOD)	Client	Job Number 8454-02-19
Method : Cable Percussion	Location	Dates 01/04/2019	Engineer JB Barry	Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B					(0.20) 0.20 (0.30) 0.50	TOPSOIL POSSIBLE MADE GROUND: Brown slightly sandy gravelly Clay with occasional subrounded cobbles. Gravel is angular Stiff brown slightly sandy gravelly CLAY with occasional subrounded cobbles. Gravel is subangular to subrounded		
1.00-1.45 1.00	SPT(C) N=17 B			1,2/3,4,5,5		(2.00)			
2.00-2.45 2.00	SPT(C) N=29 B			3,4/6,6,7,10		2.50			
3.00-3.45 3.00	SPT(C) N=29 B			2,2/4,6,8,11		(1.90)	Stiff dark grey/black slightly sandy gravelly CLAY with occasional subrounded cobbles. Gravel is subangular to subrounded		▼1
4.00	B			Water strike(1) at 4.00m, rose to 3.00m in 20 mins.		4.40			▽1
4.00-4.40	SPT(C) 50/250			6,8/11,15,16,8		4.50	OBSTRUCTION: Presumed boulder Complete at 4.50m		

Remarks Borehole backfilled upon completion Chiselling from 4.40m to 4.50m for 1 hour.	Scale (approx)	Logged By
	1:50	S. Connolly
	Figure No. 8454-02-19.BH03	



Ground Investigations Ireland Ltd
www.gii.ie

Site
Santry Demense Northwood

Borehole Number
BH04

Machine : Dando 2000	Casing Diameter 200mm cased to 8.00m	Ground Level (mOD)	Client	Job Number 8454-02-19
Method : Cable Percussion	Location	Dates 01/04/2019	Engineer JB Barry	Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B					(0.20) 0.20 (0.30) 0.50	TOPSOIL POSSIBLE MADE GROUND: Brown slightly sandy slightly gravelly Clay Firm to stiff brown sandy slightly gravelly CLAY. Gravel is subangular to subrounded		
1.00-1.45 1.00	SPT(C) N=15 B			1,2/2,3,5,5		1.20 (1.10)	Stiff brown slightly sandy gravelly CLAY with occasional subrounded cobbles. Gravel is subangular to subrounded		
2.00-2.45 2.00	SPT(C) N=27 B			3,4/4,5,7,11		2.30	Stiff dark grey/black slightly sandy gravelly CLAY with occasional subrounded cobbles. Gravel is angular to subrounded		
3.00-3.45 3.00	SPT(C) N=50 B			8,10/12,14,11,13					
4.00-4.45 4.00	SPT(C) N=50 B			11,12/13,15,11,11					
5.00-5.45 5.00	SPT(C) N=50 B			9,9/11,14,12,13		(5.70)			
6.00	B			Water strike(1) at 6.00m, sealed at 7.00m.					∇1
6.00-6.45	SPT(C) N=50			8,10/12,12,14,12					
7.00-7.45 7.00	SPT(C) N=50 B			7,14/10,12,13,15					
8.00-8.30 8.00	SPT(C) 50/150 B			12,15/17,25,8		8.00	Complete at 8.00m		

Remarks Borehole backfilled upon completion	Scale (approx)	Logged By
	1:50	EB
	Figure No. 8454-02-19.BH04	

APPENDIX 3 – Laboratory Testing



Exova Jones Environmental

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Attention : Aisling McDonnell
Date : 7th May, 2019
Your reference : 8454-02-19
Our reference : Test Report 19/6562 Batch 1
Location : Santry Demense Northwood
Date samples received : 23rd April, 2019
Status : Final report
Issue : 1

Eight samples were received for analysis on 23rd April, 2019 of which eight were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Where Waste Acceptance Criteria Suite (EC Decision of 19 December 2002 (2003/33/EC)) has been requested, all analyses have been performed using the relevant EN methods where they exist.

Compiled By:

Phil Sommerton BSc

Project Manager

Client Name: Ground Investigations Ireland
Reference: 8454-02-19
Location: Santry Demense Northwood
Contact: Aisling McDonnell
JE Job No.: 19/6562

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24						
Sample ID	BH01	BH01	BH02	BH02	BH03	BH03	BH04	BH04						
Depth	0.50	1.00	1.00	2.00	0.50	1.00	1.00	2.00						
COC No / misc														
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T						
Sample Date	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1	1						
Date of Receipt	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019						
											LOD/LOR	Units	Method No.	
TPH CWG														
Aliphatics														
>C5-C6 #	<0.1 ^{SV}	<0.1	<0.1	<0.1 ^{SV}	<0.1 ^{SV}	<0.1 ^{SV}	<0.1	<0.1			<0.1	mg/kg	TM36/PM12	
>C6-C8 #	<0.1 ^{SV}	<0.1	<0.1	<0.1 ^{SV}	<0.1 ^{SV}	<0.1 ^{SV}	<0.1	<0.1			<0.1	mg/kg	TM36/PM12	
>C8-C10	<0.1 ^{SV}	<0.1	<0.1	<0.1 ^{SV}	<0.1 ^{SV}	<0.1 ^{SV}	<0.1	<0.1			<0.1	mg/kg	TM36/PM12	
>C10-C12 #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			<0.2	mg/kg	TMS/PM8/PM16	
>C12-C16 #	<4	<4	<4	<4	<4	<4	<4	<4			<4	mg/kg	TMS/PM8/PM16	
>C16-C21 #	<7	<7	<7	<7	<7	<7	<7	<7			<7	mg/kg	TMS/PM8/PM16	
>C21-C35 #	<7	<7	<7	<7	<7	<7	<7	<7			<7	mg/kg	TMS/PM8/PM16	
>C35-C40	<7	<7	<7	<7	<7	<7	<7	<7			<7	mg/kg	TMS/PM8/PM16	
Total aliphatics C5-40	<26	<26	<26	<26	<26	<26	<26	<26			<26	mg/kg	TMS/PM8/PM16/PM12/PM15	
>C6-C10	<0.1 ^{SV}	<0.1	<0.1	<0.1 ^{SV}	<0.1 ^{SV}	<0.1 ^{SV}	<0.1	<0.1			<0.1	mg/kg	TM36/PM12	
>C10-C25	<10	<10	<10	<10	<10	<10	<10	<10			<10	mg/kg	TMS/PM8/PM16	
>C25-C35	<10	<10	<10	<10	<10	<10	<10	<10			<10	mg/kg	TMS/PM8/PM16	
Aromatics														
>C5-EC7 #	<0.1 ^{SV}	<0.1	<0.1	<0.1 ^{SV}	<0.1 ^{SV}	<0.1 ^{SV}	<0.1	<0.1			<0.1	mg/kg	TM36/PM12	
>EC7-EC8 #	<0.1 ^{SV}	<0.1	<0.1	<0.1 ^{SV}	<0.1 ^{SV}	<0.1 ^{SV}	<0.1	<0.1			<0.1	mg/kg	TM36/PM12	
>EC8-EC10 #	<0.1 ^{SV}	<0.1	<0.1	<0.1 ^{SV}	<0.1 ^{SV}	<0.1 ^{SV}	<0.1	<0.1			<0.1	mg/kg	TM36/PM12	
>EC10-EC12 #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			<0.2	mg/kg	TMS/PM8/PM16	
>EC12-EC16 #	<4	<4	<4	<4	<4	<4	<4	<4			<4	mg/kg	TMS/PM8/PM16	
>EC16-EC21 #	<7	<7	<7	<7	<7	<7	<7	<7			<7	mg/kg	TMS/PM8/PM16	
>EC21-EC35 #	<7	<7	<7	<7	<7	<7	<7	<7			<7	mg/kg	TMS/PM8/PM16	
>EC35-EC40	<7	<7	<7	<7	<7	<7	<7	<7			<7	mg/kg	TMS/PM8/PM16	
Total aromatics C5-40	<26	<26	<26	<26	<26	<26	<26	<26			<26	mg/kg	TMS/PM8/PM16/PM12/PM15	
Total aliphatics and aromatics(C5-40)	<52	<52	<52	<52	<52	<52	<52	<52			<52	mg/kg	TMS/PM8/PM16/PM12/PM15	
>EC6-EC10 #	<0.1 ^{SV}	<0.1	<0.1	<0.1 ^{SV}	<0.1 ^{SV}	<0.1 ^{SV}	<0.1	<0.1			<0.1	mg/kg	TM36/PM12	
>EC10-EC25	<10	<10	<10	<10	<10	<10	<10	<10			<10	mg/kg	TMS/PM8/PM16	
>EC25-EC35	<10	<10	<10	<10	<10	<10	<10	<10			<10	mg/kg	TMS/PM8/PM16	
MTBE #	<5 ^{SV}	<5	<5	<5 ^{SV}	<5 ^{SV}	<5 ^{SV}	<5	<5			<5	ug/kg	TM31/PM12	
Benzene #	<5 ^{SV}	<5	<5	<5 ^{SV}	<5 ^{SV}	<5 ^{SV}	<5	<5			<5	ug/kg	TM31/PM12	
Toluene #	<5 ^{SV}	<5	<5	<5 ^{SV}	<5 ^{SV}	<5 ^{SV}	<5	<5			<5	ug/kg	TM31/PM12	
Ethylbenzene #	<5 ^{SV}	<5	<5	<5 ^{SV}	<5 ^{SV}	<5 ^{SV}	<5	<5			<5	ug/kg	TM31/PM12	
m/p-Xylene #	<5 ^{SV}	<5	<5	<5 ^{SV}	<5 ^{SV}	<5 ^{SV}	<5	<5			<5	ug/kg	TM31/PM12	
o-Xylene #	<5 ^{SV}	<5	<5	<5 ^{SV}	<5 ^{SV}	<5 ^{SV}	<5	<5			<5	ug/kg	TM31/PM12	
PCB 28 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/kg	TM17/PM8	
PCB 52 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/kg	TM17/PM8	
PCB 101 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/kg	TM17/PM8	
PCB 118 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/kg	TM17/PM8	
PCB 138 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/kg	TM17/PM8	
PCB 153 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/kg	TM17/PM8	
PCB 180 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/kg	TM17/PM8	
Total 7 PCBs #	<35	<35	<35	<35	<35	<35	<35	<35			<35	ug/kg	TM17/PM8	

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 8454-02-19
Location: Santry Demense Northwood
Contact: Aisling McDonnell
JE Job No.: 19/6562

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24					
Sample ID	BH01	BH01	BH02	BH02	BH03	BH03	BH04	BH04					
Depth	0.50	1.00	1.00	2.00	0.50	1.00	1.00	2.00					
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T					
Sample Date	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019					
											LOD/LOR	Units	Method No.
Natural Moisture Content	31.8	27.0	17.0	21.0	20.0	19.0	9.7	24.6			<0.1	%	PM4/PM0
Moisture Content (% Wet Weight)	24.1	21.3	14.5	17.4	16.6	16.0	8.9	19.7			<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			<0.3	mg/kg	TM38/PM20
Chromium III	54.0	49.4	40.5	37.5	39.9	40.4	25.5	27.3			<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	1.97	1.02	0.42	0.55	0.92	0.78	0.42	0.49			<0.02	%	TM21/PM24
pH #	8.29	8.39	8.60	8.85	8.11	8.11	8.78	8.84			<0.01	pH units	TM73/PM11
Mass of raw test portion	0.1205	0.1147	0.1062	0.1072	0.1135	0.1098	0.1061	0.1047				kg	NONE/PM17
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09				kg	NONE/PM17

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 8454-02-19
Location: Santry Demense Northwood
Contact: Aisling McDonnell
JE Job No.: 19/6562

Report : EN12457_2
Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24								
Sample ID	BH01	BH01	BH02	BH02	BH03	BH03	BH04	BH04								
Depth	0.50	1.00	1.00	2.00	0.50	1.00	1.00	2.00								
COC No / misc																
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T								
Sample Date	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019								
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1	1	1	1								
Date of Receipt	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019	23/04/2019								
										Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.	
Solid Waste Analysis																
Total Organic Carbon #	1.97	1.02	0.42	0.55	0.92	0.78	0.42	0.49		3	5	6	<0.02	%	TM21/PM24	
Sum of BTEX	<0.025 ^{SV}	<0.025	<0.025	<0.025 ^{SV}	<0.025 ^{SV}	<0.025 ^{SV}	<0.025	<0.025		6	-	-	<0.025	mg/kg	TM31/PM12	
Sum of 7 PCBs #	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035		1	-	-	<0.035	mg/kg	TM17/PM8	
Mineral Oil	<30	<30	<30	<30	<30	<30	<30	<30		500	-	-	<30	mg/kg	TM5/PM8/PM16	
PAH Sum of 6 #	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22		-	-	-	<0.22	mg/kg	TM4/PM8	
PAH Sum of 17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64		100	-	-	<0.64	mg/kg	TM4/PM8	
CEN 10:1 Leachate																
Arsenic #	0.027	<0.025	<0.025	<0.025	<0.025	0.026	<0.025	<0.025		0.5	2	25	<0.025	mg/kg	TM30/PM17	
Barium #	0.10	<0.03	0.05	0.06	0.23	0.27	0.07	0.05		20	100	300	<0.03	mg/kg	TM30/PM17	
Cadmium #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		0.04	1	5	<0.005	mg/kg	TM30/PM17	
Chromium #	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015		0.5	10	70	<0.015	mg/kg	TM30/PM17	
Copper #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07		2	50	100	<0.07	mg/kg	TM30/PM17	
Mercury #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		0.01	0.2	2	<0.0001	mg/kg	TM61/PM0	
Molybdenum #	0.11	0.02	0.10	0.09	0.05	0.06	0.05	0.23		0.5	10	30	<0.02	mg/kg	TM30/PM17	
Nickel #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		0.4	10	40	<0.02	mg/kg	TM30/PM17	
Lead #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		0.5	10	50	<0.05	mg/kg	TM30/PM17	
Antimony #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		0.06	0.7	5	<0.02	mg/kg	TM30/PM17	
Selenium #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		0.1	0.5	7	<0.03	mg/kg	TM30/PM17	
Zinc #	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		4	50	200	<0.03	mg/kg	TM30/PM17	
Total Dissolved Solids #	1410	980	830	1140	2280	1689	1030	550		4000	60000	100000	<350	mg/kg	TM20/PM0	
Dissolved Organic Carbon	60	30	<20	<20	<20	<20	<20	<20		500	800	1000	<20	mg/kg	TM60/PM0	
Mass of raw test portion	0.1205	0.1147	0.1062	0.1072	0.1135	0.1098	0.1061	0.1047		-	-	-		kg	NONE/PM17	
Dry Matter Content Ratio	74.5	78.2	84.9	84.3	79.5	82.1	84.7	85.8		-	-	-	<0.1	%	NONE/PM4	
Leachant Volume	0.869	0.875	0.884	0.883	0.877	0.88	0.884	0.885		-	-	-		l	NONE/PM17	
Eluate Volume	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		-	-	-		l	NONE/PM17	
pH #	8.29	8.39	8.60	8.85	8.11	8.11	8.78	8.84		-	-	-	<0.01	pH units	TM73/PM11	
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		1	-	-	<0.1	mg/kg	TM26/PM0	
Fluoride	5	4	<3	<3	<3	<3	<3	<3		-	-	-	<3	mg/kg	TM173/PM0	
Sulphate as SO4 #	99	14	36	26	934	503	48	40		1000	20000	50000	<5	mg/kg	TM38/PM0	
Chloride #	26	12	4	<3	<3	<3	<3	<3		800	15000	25000	<3	mg/kg	TM38/PM0	

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 19/02/8454
Location: Santry Demense Northwood
Contact: Aisling McDonnell

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

Signed on behalf of Jones Environmental Laboratory:



Ryan Butterworth
 Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
19/6562	1	BH01	0.50	2	27/04/2019	General Description (Bulk Analysis)	soil.stones
					27/04/2019	Asbestos Fibres	NAD
					27/04/2019	Asbestos ACM	NAD
					27/04/2019	Asbestos Type	NAD
					27/04/2019	Asbestos Level Screen	NAD
19/6562	1	BH01	1.00	5	27/04/2019	General Description (Bulk Analysis)	soil.stones
					27/04/2019	Asbestos Fibres	NAD
					27/04/2019	Asbestos ACM	NAD
					27/04/2019	Asbestos Type	NAD
					27/04/2019	Asbestos Level Screen	NAD
19/6562	1	BH02	1.00	8	27/04/2019	General Description (Bulk Analysis)	soil.stones
					27/04/2019	Asbestos Fibres	NAD
					27/04/2019	Asbestos ACM	NAD
					27/04/2019	Asbestos Type	NAD
					27/04/2019	Asbestos Level Screen	NAD
19/6562	1	BH02	2.00	11	27/04/2019	General Description (Bulk Analysis)	soil.stones
					27/04/2019	Asbestos Fibres	NAD
					27/04/2019	Asbestos ACM	NAD
					27/04/2019	Asbestos Type	NAD
					27/04/2019	Asbestos Level Screen	NAD
19/6562	1	BH03	0.50	14	27/04/2019	General Description (Bulk Analysis)	soil.stones
					27/04/2019	Asbestos Fibres	NAD
					27/04/2019	Asbestos ACM	NAD
					27/04/2019	Asbestos Type	NAD
					27/04/2019	Asbestos Level Screen	NAD
19/6562	1	BH03	1.00	17	27/04/2019	General Description (Bulk Analysis)	soil.stones
					27/04/2019	Asbestos Fibres	NAD
					27/04/2019	Asbestos ACM	NAD
					27/04/2019	Asbestos Type	NAD
					27/04/2019	Asbestos Level Screen	NAD
19/6562	1	BH04	1.00	20	27/04/2019	General Description (Bulk Analysis)	soil.stones
					27/04/2019	Asbestos Fibres	NAD
					27/04/2019	Asbestos ACM	NAD

Client Name: Ground Investigations Ireland
 Reference: 19/02/8454
 Location: Santry Demense Northwood
 Contact: Aisling McDonnell

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
19/6562	1	BH04	1.00	20	27/04/2019	Asbestos Type	NAD
					27/04/2019	Asbestos Level Screen	NAD
19/6562	1	BH04	2.00	23	27/04/2019	General Description (Bulk Analysis)	soil-stones
					27/04/2019	Asbestos Fibres	NAD
					27/04/2019	Asbestos ACM	NAD
					27/04/2019	Asbestos Type	NAD
					27/04/2019	Asbestos Level Screen	NAD

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 19/6562

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Exova Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

Appendix - Methods used for WAC (2003/33/EC)

JE Job No.: 19/6562

Leachate tests	
10l/kg; 4mm	I.S. EN 12457-2:2002 Specified particle size; water added to L/S ratio; capped; agitated for 24 ± 0.5 hours; eluate settled and filtered over 0.45 µm membrane filter.
Eluate analysis	
As	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ba	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cd	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cr total	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cu	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Hg	I.S. EN 13370 rec. EN 1483 (CVAAS)
Mo	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ni	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Pb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Sb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Se	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Zn	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Chloride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Fluoride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Sulphate	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Phenol index	I.S. EN 13370 rec. ISO 6439 (4-Aminoantipyrine spectrometric methods after distillation)* (BY HPLC - Jones Env)
DOC	I.S. EN 1484
TDS	I.S. EN 15216
Compositional analysis	
TOC	I.S. EN 13137 Method B: carbonates removed with acid; TOC by combustion.
BTEX	GC-FID
PCB7**	I.S. EN 15308 analysis by GC-ECD.
Mineral oil	I.S. EN 14039 C10 to C40 analysis by GC-FID.
PAH17***	I.S. EN 15527 PAH17 analysis by GC-MS
Metals	I.S. EN 13657 - Aqua regia digestion: EN ISO 11885 (ICP-OES)
Other	
Dry matter	I.S. EN 14346 sample is dried to a constant mass in an oven at 105 ± 3 °C; Method B Water content by direct Karl-Fischer-titration and either volumetric or coulometric detection.
LOI	I.S. EN 15169 Difference in mass after heating in a furnace up to 550 ± 25 °C.
ANC	CEN/TS 15364 Determined by amounts of acid or base needed to cover the pH range
<p>Notes:</p> <p>*If not suitable due to LOD, precision, etc., any other suitable method can be used, e.g. AFS, ICP-MS</p> <p>**PCB-28, PCB-52, PCB-101, PCB-118, PCB-138, PCB-153 and PCB-180</p> <p>***Naphthalene, Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Coronene, Dibenzo(a,h)anthracene, Fluorene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene and Pyrene.</p>	

JE Job No: 19/6562

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes

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Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM17	Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM31	Modified USEPA 8015B. Determination of Methylterbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methylterbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes

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Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060, APHA Standard Methods for Examination of Water and Wastewater 5310B, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM0	No preparation is required.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM17	Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

APPENDIX 9.1 AIR QUALITY & CLIMATE

Ambient Air Quality Standards

Ambient Air Quality Standards

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time which was the issue of acid rain. As a result of this sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002), and has set limit values which came into operation on 17th June 2002. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM₁₀, 40% for the hourly and annual limit value for NO₂ and 26% for hourly SO₂ limit values. The margin of tolerance commenced from June 2002, and started to reduce from 1 January 2003 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, has published limit values for both carbon monoxide and benzene in ambient air. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08 which has been transposed into Irish Law as S.I. 180 of 2011. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. Provisions were also made for the inclusion of new ambient limit values relating to PM_{2.5}. The margins of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regards to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for PM_{2.5} are included in Directive 2008/50/EC. The approach for PM_{2.5} was to establish a target value of 25 µg/m³, as an annual average (to be attained everywhere by 2010) and a limit value of 25 µg/m³, as an annual average (to be attained everywhere by 2015), coupled with a target to reduce human exposure generally to PM_{2.5} between 2010 and 2020. This exposure reduction target will range from 0% (for PM_{2.5} concentrations of less than 8.5 µg/m³ to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 µg/m³). Where the AEI is currently greater than 22 µg/m³ all appropriate measures should be employed to reduce this level to 18 µg/m³

by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008 - 2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 µg/m³ was set to be complied with by 2015 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO_x (NO and NO₂) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_x such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NO_x limit for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km² of surrounding area.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

Air Dispersion Modelling

The inputs to the DMRB model consist of information on road layouts, receptor locations, annual average daily traffic movements, annual average traffic speeds and background concentrations (UK DEFRA 2016a). Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data.

The DMRB has recently undergone an extensive validation exercise (UK DEFRA 2016b) as part of the UK's Review and Assessment Process to designate areas as Air Quality Management Areas (AQMAs). The validation exercise was carried out at 12 monitoring sites within the UK DEFRA's national air quality monitoring network. The validation exercise was carried out for NO_x, NO₂ and PM₁₀, and included urban background and kerbside/roadside locations, "open" and "confined" settings and a variety of geographical locations (UK DEFRA 2016b).

In relation to NO₂, the model generally over-predicts concentrations, with a greater degree of over-prediction at "open" site locations. The performance of the model with respect to NO₂ mirrors that of NO_x showing that the over-prediction is due to NO_x calculations rather than the NO_x:NO₂ conversion. Within most urban situations, the model overestimates annual mean NO₂ concentrations by between 0 to 40% at confined locations and by 20 to 60% at open locations. The performance is considered comparable with that of sophisticated dispersion models when applied to situations where specific local validation corrections have not been carried out.

The model also tends to over-predict PM₁₀. Within most urban situations, the model will over-estimate annual mean PM₁₀ concentrations by between 20 to 40%. The performance is comparable to more sophisticated models, which, if not validated locally, can be expected to predict concentrations within the range of $\pm 50\%$.

Thus, the validation exercise has confirmed that the model is a useful screening tool for the Second Stage Review and Assessment, for which a conservative approach is applicable (UK DEFRA 2016b).

APPENDIX 9.2 AIR QUALITY & CLIMATE

TII Significant Criteria

Transport Infrastructure Ireland Significance Criteria

Table B1 - Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	Annual Mean NO ₂ / PM ₁₀	No. days with PM ₁₀ concentration > 50 µg/m ³	Annual Mean PM _{2.5}
Large	Increase / decrease ≥4 µg/m ³	Increase / decrease >4 days	Increase / decrease ≥2.5 µg/m ³
Medium	Increase / decrease - <4 µg/m ³	2 Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m ³
Small	Increase / decrease 0.4 - <2 µg/m ³	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m ³
Imperceptible	Increase / decrease <0.4 µg/m ³	Increase / decrease <1 day	Increase / decrease <0.25 µg/m ³

Table B2 - Air Quality Impact Significance Criteria For Annual Mean NO₂ and PM₁₀ and PM_{2.5} Concentrations at a Receptor

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration ^{Note 1}		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m ³ of NO ₂ or PM ₁₀) (≥25 µg/m ³ of PM _{2.5})	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m ³ of NO ₂ or PM ₁₀) (22.5 - <25 µg/m ³ of PM _{2.5})	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m ³ of NO ₂ or PM ₁₀) (18.75 - <22.5 µg/m ³ of PM _{2.5})	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m ³ of NO ₂ or PM ₁₀) (<18.75 µg/m ³ of PM _{2.5})	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m ³ of NO ₂ or PM ₁₀) (≥25 µg/m ³ of PM _{2.5})	Slight Beneficial	Moderate Beneficial	Substantial Beneficial

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration ^{Note 1}		
	Small	Medium	Large
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m ³ of NO ₂ or PM ₁₀) (22.5 - <25 µg/m ³ of PM _{2.5})	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m ³ of NO ₂ or PM ₁₀) (18.75 - <22.5 µg/m ³ of PM _{2.5})	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m ³ of NO ₂ or PM ₁₀) (<18.75 µg/m ³ of PM _{2.5})	Negligible	Negligible	Slight Beneficial

Table B3 - Air Quality Impact Significance Criteria For Changes to Number of Days with PM10 Concentration Greater than 50 µg/m³ at a Receptor

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration ^{Note 1}		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration ^{Note 1}		
	Small	Medium	Large
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

APPENDIX 9.3 AIR QUALITY & CLIMATE

Dust Minimisation Measures

Dust Minimisation Plan

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland, the UK (IAQM 2014, BRE 2003, Scottish Office 1996 and UK ODPM 2002). and the USA (USEPA 1997).

Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.

At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see **Error! Reference source not found.** for the windrose for Dublin Airport). As the prevailing wind is predominantly westerly to south-westerly, locating construction compounds and storage piles downwind of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (BRE 2003, UK ODPM 2002). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods where care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;
- At all times, the procedures put in place will be strictly monitored and assessed.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

Site Roads / Haulage Routes

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80%(UK ODPM 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- Access gates to the site shall be located at least 10m from sensitive receptors, where possible;
- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use;
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

Land Clearing / Earth Moving

Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.

During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust;

During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.

Storage Piles

The location and moisture content of storage piles are important factors which determine their potential for dust emissions.

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors;
- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK ODPM 2002);
- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads shall be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- At the main site traffic exits, a wheel wash facility shall be installed, if feasible. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

Summary of Dust Mitigation Measures

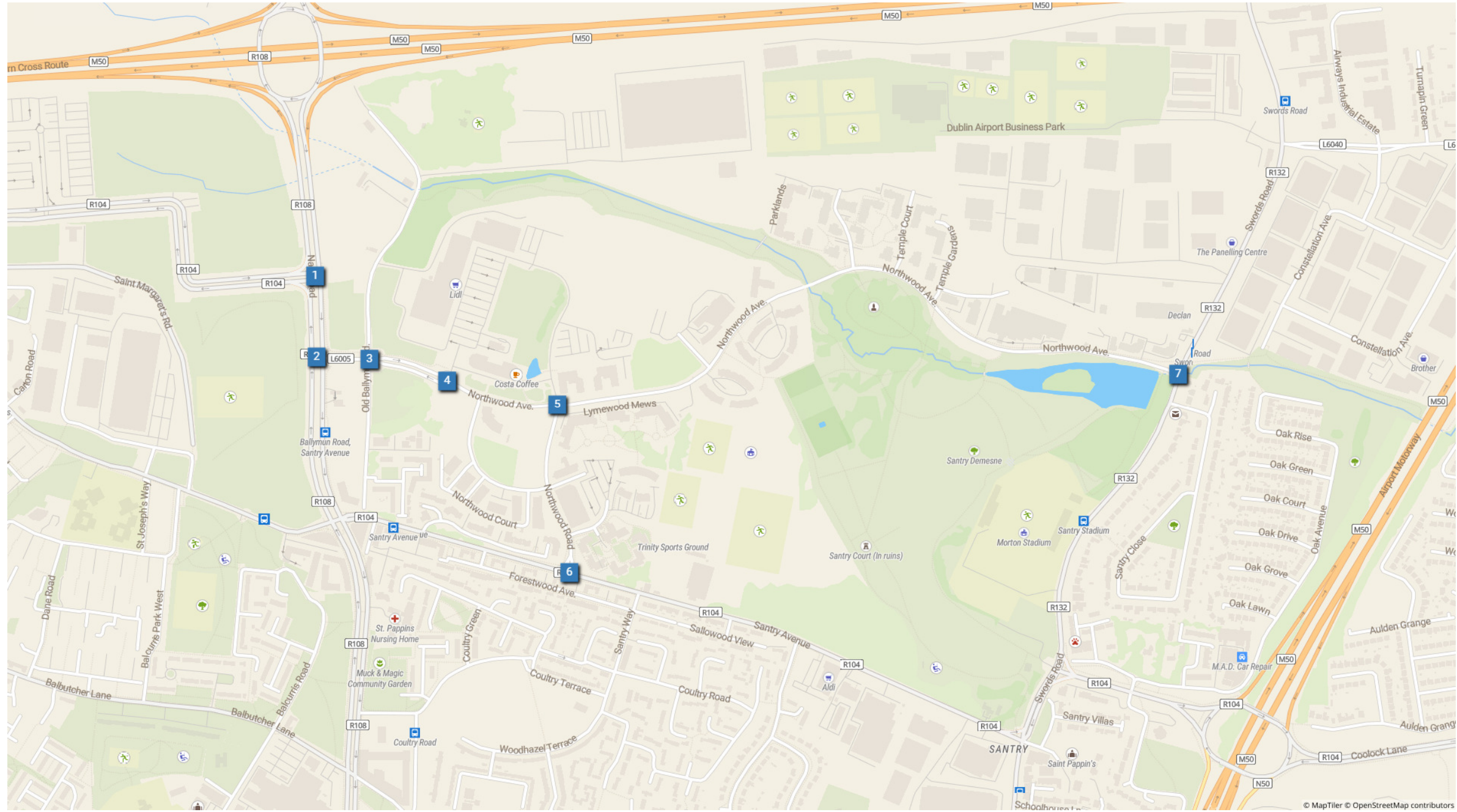
The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

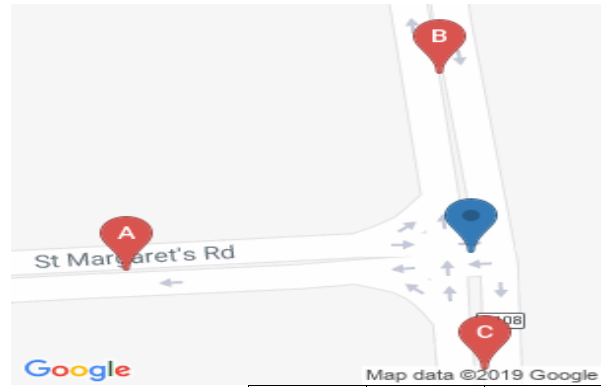
- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;
- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and

The specification of effective measures to deal with any complaints received

APPENDIX 13.1 MATERIAL ASSETS: TRAFFIC AND TRANSPORT

Turning Movement Survey





IDASO

Survey Name: 029 19025 Northwood
Site: 1
Location: St Margaret's Rd
Date: 12-Feb-2019

TIME	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3
07:00	5	25	25	200	120	25	10	5	35	30
07:15	10	25	25	180	130	20	25	10	50	45
07:30	5	25	25	220	200	25	20	5	65	50
07:45	5	35	30	170	160	55	35	15	90	70
08:00	5	40	35	300#	300#	35	50	5	125#	90
08:15	15	35	35	300#	300#	45	15	5	80	55
08:30	5	40	30	300#	300#	40	35	5	85	50
08:45	5	45	30	200	240	40	25	0	125#	70
09:00	5	30	25	300#	300#	30	20	0	125#	100
09:15	0	25	25	180	120	15	15	10	115'*	125#
09:30	0	15	20	170	130	20	30	10	75	50
09:45	0	20	15	180	140	25	20	15	50	40
10:00	15	10	15	150	100	30	20	5	55	35
10:15	15	15	10	75	50	40	50	0	50	30
10:30	5	25	15	100	75	35	40	0	40	35
10:45	5	20	20	90	50	30	30	0	50	30
11:00	5	20	20	100	80	35	50	5	40	30
11:15	10	20	20	30	30	20	45	0	50	25
11:30	15	15	15	45	35	25	35	5	50	40
11:45	20	55	45	120	80	30	40	5	45	35
12:00	5	55	45	110	70	30	30	0	125#	125#
12:15	10	35	40	45	35	25	45	0	125#	70
12:30	15	45	40	50	30	45	50	0	55	40
12:45	10	55	55	45	30	50	65	15	40	30

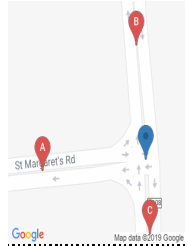
TIME	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3
13:00	0	20	25	120	70	25	55	0	50	40
13:15	15	25	35	120	80	35	50	0	80	45
13:30	15	40	40	90	45	50	30	0	50	35
13:45	20	60	50	55	40	45	55	15	40	35
14:00	10	40	40	60	40	35	40	0	45	40
14:15	0	35	35	90	50	40	35	5	45	35
14:30	0	20	25	90	90	25	25	0	30	30
14:45	25	25	35	60	40	30	40	0	55	45
15:00	40	25	20	130	70	55	35	0	45	40
15:15	55	40	35	120	80	30	40	0	125#	50
15:30	35	45	40	140	100	25	25	0	55	45
15:45	20	30	35	120	90	40	50	0	70	45
16:00	55	40	45	130	100	20	20	0	65	40
16:15	45	50	45	150	120	35	30	0	125#	55
16:30	50	35	30	100	110	25	25	0	80	40
16:45	60	50	60	130	100	30	30	0	65	60
17:00	0	60	60	90	70	45	30	10	125#	125#
17:15	75	50	40	110	90	35	25	15	125#	125#
17:30	35	35	40	160	140	25	20	0	125#	125#
17:45	35	30	30	95	70	40	30	10	125#	125#
18:00	30	40	35	60	45	35	30	0	125#	125#
18:15	50	30	30	90	65	40	30	0	55	40
18:30	25	35	40	45	30	30	30	10	60	40
18:45	25	40	30	40	30	25	25	5	40	40

Queue's are measured in meters

Cannot be seen from camera

- + Signifies queue stretches to a minimum length of x and beyond the view of the camera
- # Signifies queue stretches to the next significant junction
- * Indicates an estimated queue length due to obscured vision.

Queue lengths are compiled from CCTV observations and are therefore subject to the limitations of the camera view.



IDASO

Survey Name: 029 19025 Northwood
Site: 1
Location: St Margaret's Rd
Date: 12-Feb-2019

Large data table with columns for Time, Direction (A=>A, A=>B, A=>C, B=>A, B=>B, B=>C, C=>A, C=>B, C=>C), and various traffic volume metrics (P/C, M/C, CAR, LGV, OGV1, OGV2, PSV, TOT, PCU).



IDASO

Survey Name: 029 19025 Northwood
Site: 2
Location: R108 / Northwood Ave
Date: 12-Feb-2019

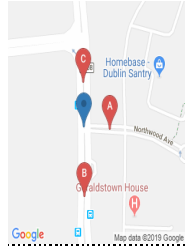
TIME	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3
07:00	15	20	25	10	30	15	40	30	50	50
07:15	20	60#	40	5	20	0	25	30	50	40
07:30	15	45	25	0	20	15	30	40	40	60
07:45	20	15	30	30	10	0	20	30	125#	70
08:00	15	60#	40	10	50	10	20	20	80	125#
08:15	15	60#	40	25	20	10	25	30	125#	125#
08:30	10	60#	40	5	30	5	80	40	125#	60
08:45	15	30	20	15	30	15	80	60	125#	50
09:00	10	60#	40	10	35	30	50	20	30	20
09:15	10	50	30	15	30	15	50	40	100	30
09:30	20	60#	40	15	35	5	30	20	50	40
09:45	20	60#	30	15	10	0	50	20	30	40
10:00	15	60#	30	5	20	10	20	25	25	30
10:15	20	60#	35	5	15	5	25	20	30	40
10:30	15	60#	25	0	15	5	20	15	20	25
10:45	15	30	30	10	15	5	10	20	25	30
11:00	10	40	35	15	20	5	20	30	15	10
11:15	25	40	35	10	20	5	15	15	20	20
11:30	15	40	20	15	20	10	25	10	25	30
11:45	15	30	20	10	20	15	20	15	20	20
12:00	20	30	20	15	20	10	35	10	15	20
12:15	20	50	15	0	20	25	20	15	30	20
12:30	10	40	20	10	20	10	30	20	20	25
12:45	25	50	30	10	20	10	25	30	15	30

TIME	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3
13:00	25	30	40	5	30	20	45	30	20	30
13:15	20	50	30	20	25	20	20	15	20	15
13:30	25	60#	30	15	35	20	30	15	30	25
13:45	30	60#	20	15	30	25	110	25	20	20
14:00	50	60#	30	20	30	10	30	10	30	20
14:15	20	60#	40	10	40	5	30	15	30	20
14:30	30	60#	40	15	30	25	30	15	20	15
14:45	30	60#	30	10	20	5	25	15	30	125#
15:00	20	60#	25	10	25	20	30	25	50	30
15:15	40	60#	25	0	20	10	30	10	40	30
15:30	30	60#	40	10	30	15	35	15	25	15
15:45	15	60#	45	5	40	10	30	10	20	15
16:00	50	60#	35	15	110	15	30	5	20	25
16:15	30	60#	30	5	20	20	40	15	20	15
16:30	20	50	40	5	110	15	30	15	30	20
16:45	20	60#	40	15	115	15	35	20	25	35
17:00	50	60#	40	5	150	30	40	15	20	15
17:15	60#	60#	40	15	165	130	30	10	15	10
17:30	60#	60#	40	10	130	20	40	15	35	25
17:45	40	60#	30	15	70	20	40	15	10	15
18:00	30	60#	20	10	100	20	30	15	40	20
18:15	20	60#	40	5	120	15	35	10	20	15
18:30	20	50	30	5	30	15	10	10	15	10
18:45	20	50	30	15	20	15	15	5	15	35

Queue's are measured in meters

- Cannot be seen from camera
- + Signifies queue stretches to a minimum length of x and beyond the view of the camera
- # Signifies queue stretches to the next significant junction
- * Indicates an estimated queue length due to obscured vision.

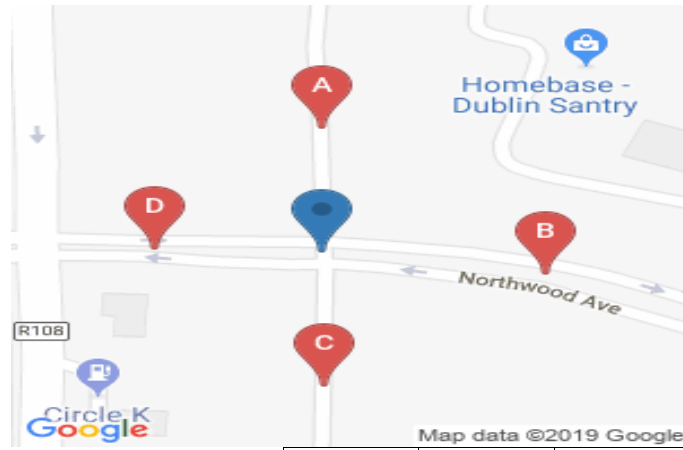
Queue lengths are compiled from CCTV observations and are therefore subject to the limitations of the camera view.



IDASO

Survey Name: 029 19025 Northwood
Site: 2
Location: R108 / Northwood Ave
Date: 12-Feb-2019

Large data table with columns for Time, P/C, M/C, CAR, LGV, OGV1, OGV2, PSV, TOT, and various vehicle counts for different directions (A=>A, A=>B, A=>C, B=>A, B=>B, B=>C, C=>A, C=>B, C=>C).



IDASO

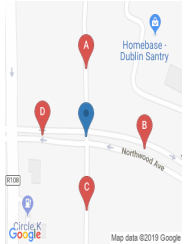
Survey Name: 029 19025 Northwood
Site: 3
Location: Northwood Ave
Date: 12-Feb-2019

TIME	A1	A2	B1	B2	C1	D1	D2	D3		TIME	A1	A2	B1	B2	C1	D1	D2	D3
07:00	0	10	40	60	5	50	30	10		13:00	0	15	40	40	5	60#	50	10
07:15	0	25	75	75	5	40	40	10		13:15	0	20	30	55	10	50	50	10
07:30	10	15	60	75	10	60#	60#	10		13:30	10	25	35	75	5	40	50	20
07:45	15	15	20	30	5	60#	60#	5		13:45	5	25	40	75	10	60#	60#	15
08:00	15	20	30	50	5	40	60#	5		14:00	10	30	40	60	10	60#	50	15
08:15	10	30	70	70	10	60#	60#	5		14:15	0	20	70	40	5	50	40	20
08:30	10	20	20	20	15	60#	60#	5		14:30	0	20	70	30	10	60#	60#	5
08:45	0	25	20	20	15	60#	60#	10		14:45	0	20	30	70	15	50	50	5
09:00	0	30	20	70	10	60#	60#	10		15:00	5	25	30	40	5	30	50	5
09:15	0	30	15	25	10	60#	60#	5		15:15	0	45	30	50	10	30	50	10
09:30	0	15	15	35	10	60#	60#	5		15:30	0	15	20	60	25	60#	50	5
09:45	5	20	20	40	10	60#	60#	5		15:45	0	25	60	95	10	40	50	10
10:00	5	20	15	30	5	50	60#	10		16:00	0	30	40	120#	25	30	40	5
10:15	0	35	10	40	5	50	40	5		16:15	10	15	25	120#	10	30	60#	5
10:30	0	15	30	55	15	25	35	0		16:30	5	15	30	70	5	40	30	10
10:45	0	10	25	45	5	50	40	5		16:45	5	10	40	120#	15	50	40	10
11:00	20	20	20	60	5	60#	60#	10		17:00	5	45	50	120#	5	40	50	10
11:15	0	35	30	70	15	60#	40	10		17:15	10	15	70	120#	15	60#	60#	10
11:30	10	15	20	40	10	40	35	10		17:30	0	25	40	120#	10	60#	60#	10
11:45	0	20	30	20	5	30	50	5		17:45	0	20	50	120#	15	40	60#	5
12:00	0	20	20	30	5	40	50	5		18:00	0	30	40	120#	10	30	60#	5
12:15	0	20	40	60	15	50	60#	5		18:15	0	20	30	70	5	10	30	5
12:30	5	25	30	50	10	50	40	10		18:30	0	15	30	60	5	50	40	5
12:45	0	15	25	40	10	60#	60#	5		18:45	0	25	20	35	10	20	40	5

Queue's are measured in meters

- Cannot be seen from camera
- + Signifies queue stretches to a minimum length of x and beyond the view of the camera
- # Signifies queue stretches to the next significant junction
- * Indicates an estimated queue length due to obscured vision.

Queue lengths are compiled from CCTV observations and are therefore subject to the limitations of the camera view.

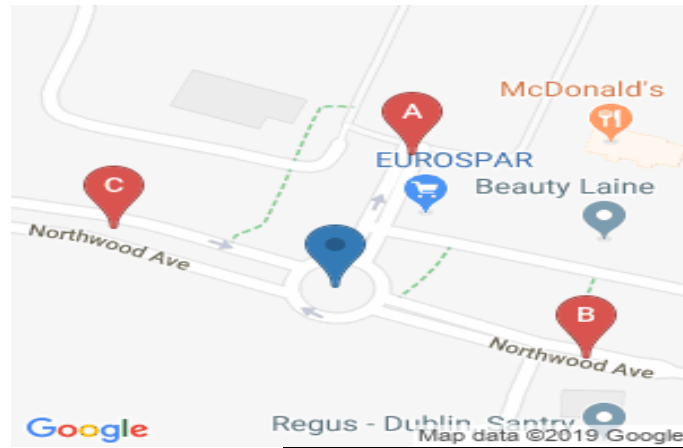


IDASO

Survey Name: 029 19025 Northwood
Site: 3
Location: Northwood Ave
Date: 12-Feb-2019

Large data table with columns for Time, P/C, M/C, CAR, LGV, OGV1, OGV2, PSV, TOT, and various vehicle counts for different directions (A=>A, A=>B, A=>C, A=>D, B=>A, B=>B, B=>C, B=>D, C=>A, C=>B).

C=>C										C=>D										D=>A										D=>B										D=>C										D=>D																														
PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT		PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT		PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT		PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT		PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT		PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT																						
1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	3.3	0	0	8	5	0	0	0	0	19	29.3	0	0	8	5	0	0	0	0	19	29.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	3	4.3	0	0	4	8	1	7	0	0	20	33.6	1	1	79	15	4	1	0	0	101	110.4	0	0	6	5	0	0	0	0	11	13.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	10	1	0	1	0	0	12	13.8	0	0	6	1	1	8	0	0	16	27.4	1	1	123	17	0	0	1	0	142	150.7	0	0	3	3	1	0	0	0	7	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1.0	0	0	5	0	0	4	0	0	9	14.2	2	1	132	7	2	0	0	0	144	146.3	0	0	2	1	0	0	0	0	3	3.5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.2	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	6	6.5	0	0	7	0	1	1	0	0	9	10.8	1	1	170	10	1	1	0	0	184	189.4	0	0	3	1	0	0	1	0	5	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	6	6	0	0	3	1	2	7	0	0	13	23.6	3	0	162	17	2	0	0	0	184	191.1	0	0	3	0	0	0	0	0	3	3	0	0	0	1	1	0	0	0	2	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	0	3	2	1	0	0	6	7.5	0	0	4	1	1	7	0	0	13	23.1	0	1	197	11	2	1	0	0	212	219.2	0	0	4	0	0	0	0	0	4	4	0	0	0	0	0	1	0	0	1	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4.9	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5	5	0	0	4	1	2	6	0	0	13	22.3	1	1	223	8	1	0	0	0	234	237.1	0	0	9	1	2	1	0	0	13	15.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
17.1	0	0	0	0	0	0	0	0	0	0	0	0	19	3	0	0	0	22	22	0	0	18	1	1	1	0	0	44	79.8	3	3	732	48	1	0	0	0	814	836.2	0	0	19	0	0	0	1	0	25	39.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.4	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	5	7.3	0	0	4	0	0	5	0	0	9	15.3	1	0	162	16	0	0	0	0	179	186.2	0	0	7	2	0	0	0	0	9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4.5	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	4	0	0	4	1	6	4	0	0	15	23.7	1	1	149	18	0	2	1	0	172	183.2	0	0	3	0	1	0	0	0	4	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	4	5	2	0	3	2	2	9	0	0	18	30.1	0	1	96	6	0	1	0	0	104	107.7	0	0	4	1	0	0	0	0	5	5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	0	0	5	6	0	0	5	2	2	10	0	0	19	34	1	0	111	17	3	0	0	0	132	141.2	0	0	7	0	0	0	0	0	7	7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5.9	0	0	0	0	0	0	0	0	0	0	0	0	11	4	2	1	0	18	22.3	2	0	16	5	10	28	0	0	61	103.3	3	2	518	57	3	3	1	0	587	618.3	0	0	21	3	1	0	0	0	25	27	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	1	1	1	4	0	0	6	13.6	0	0	77	3	0	0	0	0	82	88.5	0	0	3	1	0	0	0	0	4	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.2	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	5	5.5	1	0	2	1	1	4	0	0	9	14.4	1	0	90	10	2	1	0	0	104	110.5	0	0	0	1	0	0	0	0	1	1.5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1.5	0	0	3	0	2	6	0	0	11	19.8	0	0	58	12	2	0	0	0	72	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	5	6	1	0	3	0	2	8	0	0	14	24.6	2	0	90	10	0	0	0	0	102	105.4	0	0	1	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4.2	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	11	13	0	0	3	0	2	6	0	0	15	22	0	0	115	0	0	0	0	0	360	378.2	0	0	9	0	0	0	0	0	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	2.5	0	0	4	0	1	10	0	0	15	28.5	0	0	72	8	0	1	0	0	81	86.3	0	0	1	1	0	1	0	0	3	4.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	3	4	2	0	0	1	0	5	0	0	8	13.4	0	0	74	9	0	1	0	0	84	89.8	0	0	2	1	0	1	0	0	4	5.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	3	1	2	5	0	0	11	19	0	0	52	9	2	0	0	0	63	68.5	0	0	4	2	0	0	0	0	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	6	6.5	0	0	6	2	2	9	0	0	19	32.7	0	0	74	15	2	0	0	0	91	99.5	0	0	1	2	0	0	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11.8	0	0	0	0	0	0	0	0	0	0	0	0	9	3	1	0	0	12	15	0	0	2																																																										



IDASO

Survey Name: 029 19025 Northwood
Site: 4
Location: Northwood Ave
Date: 12-Feb-2019

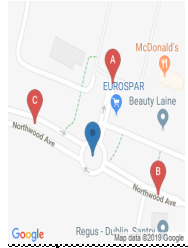
TIME	A1	B1	B2	C1	C2
07:00	5	10	0	5	0
07:15	10	5	5	20	15
07:30	5	15	10	15	25
07:45	10	10	0	10	15
08:00	10	10	10	5	25
08:15	10	5	5	15	75
08:30	20	5	10	35	95
08:45	25	5	10	30	80
09:00	15	10	10	25	70
09:15	20	10	5	35	50
09:30	15	10	10	20	15
09:45	10	10	10	25	30
10:00	15	5	5	15	20
10:15	15	5	15	10	20
10:30	10	10	10	15	20
10:45	15	10	10	10	20
11:00	30	10	10	10	15
11:15	20	5	10	5	10
11:30	20	15	5	10	15
11:45	15	10	15	15	10
12:00	20	10	5	15	20
12:15	15	10	10	20	30
12:30	15	15	10	15	10
12:45	20	15	15	20	25

TIME	A1	B1	B2	C1	C2
13:00	45	10	15	50	85
13:15	45	15	10	30	75
13:30	20	15	15	20	45
13:45	30	10	15	20	30
14:00	35	15	5	10	20
14:15	25	10	5	15	20
14:30	10	10	15	15	15
14:45	20	10	15	25	10
15:00	20	15	15	20	10
15:15	20	15	15	15	10
15:30	25	20	10	10	15
15:45	25	15	10	30	20
16:00	30	10	15	15	40
16:15	15	15	15	20	15
16:30	30	10	15	10	10
16:45	30	35	30	15	40
17:00	45	40	70	20	30
17:15	45	20	65	10	15
17:30	45	45	85	20	20
17:45	30	50	30	10	15
18:00	15	20	15	15	15
18:15	20	20	10	10	15
18:30	20	10	10	15	25
18:45	15	15	10	10	15

Queue's are measured in meters

- Cannot be seen from camera
- + Signifies queue stretches to a minimum length of x and beyond the view of the camera
- # Signifies queue stretches to the next significant junction
- * Indicates an estimated queue length due to obscured vision.

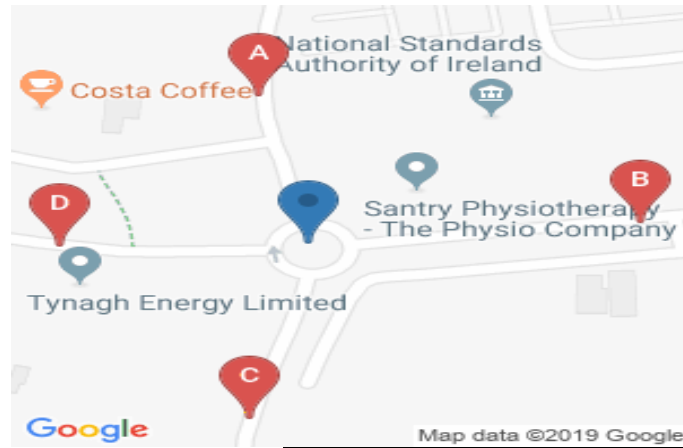
Queue lengths are compiled from CCTV observations and are therefore subject to the limitations of the camera view.



IDASO

Survey Name: 029 19025 Northwood
Site: 4
Location: Northwood Ave
Date: 12-Feb-2019

Large data table with columns for Time, P/C, M/C, CAR, LGV, OGV1, OGV2, PSV, TOT, and various PCU values for different directions (A=>A, A=>B, A=>C, B=>A, B=>B, B=>C, C=>A, C=>B, C=>C).



IDASO

Survey Name: 029 19025 Northwood
Site: 5
Location: Northwood Ave
Date: 12-Feb-2019

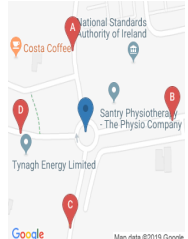
TIME	A1	A2	B1	B2	C1	C2	D1	D2
07:00	5	0	5	0	5	5	5	5
07:15	10	0	0	0	5	10	10	10
07:30	10	5	5	5	10	10	10	15
07:45	5	0	0	5	5	10	15	20
08:00	10	0	0	5	10	5	10	15
08:15	10	0	0	0	10	10	15	25
08:30	5	0	5	0	20	0	10	15
08:45	5	0	10	5	10	10	15	15
09:00	5	10	5	5	5	10	10	20
09:15	5	10	0	5	5	15	15	30
09:30	0	5	5	10	5	10	10	5
09:45	10	5	5	5	5	5	15	5
10:00	10	5	5	5	5	5	10	5
10:15	5	0	10	5	5	5	10	5
10:30	5	0	10	5	5	10	10	5
10:45	5	0	10	0	5	10	5	10
11:00	10	5	5	0	5	5	5	0
11:15	10	5	10	5	10	0	15	0
11:30	5	0	0	0	15	10	15	5
11:45	5	0	15	10	5	10	5	5
12:00	5	5	5	10	5	5	5	5
12:15	5	5	5	5	10	5	0	0
12:30	5	5	5	10	5	10	5	10
12:45	0	15	5	10	20	5	10	15

TIME	A1	A2	B1	B2	C1	C2	D1	D2
13:00	5	15	0	10	10	10	15	10
13:15	10	0	10	0	10	20	5	15
13:30	10	5	5	5	10	10	5	15
13:45	5	5	0	0	10	5	10	15
14:00	5	0	5	10	15	15	15	5
14:15	5	10	5	5	5	0	10	5
14:30	5	5	10	0	10	5	5	10
14:45	5	5	5	0	10	10	10	20
15:00	5	5	5	15	5	10	5	15
15:15	5	10	10	5	10	10	5	10
15:30	10	5	0	0	10	5	10	5
15:45	10	0	10	10	5	5	5	10
16:00	5	5	0	5	5	5	5	5
16:15	10	5	5	5	10	10	20	10
16:30	10	10	0	20	10	15	10	25
16:45	10	15	5	15	5	15	20	15
17:00	10	10	15	10	10	10	10	25
17:15	5	10	15	15	10	25	10	10
17:30	15	10	5	25	10	15	15	20
17:45	5	10	5	10	15	20	5	10
18:00	15	10	10	5	5	10	10	45
18:15	5	5	5	15	15	20	15	10
18:30	10	5	0	10	10	10	10	10
18:45	10	5	10	5	5	5	5	15

Queue's are measured in meters

- Cannot be seen from camera
- + Signifies queue stretches to a minimum length of x and beyond the view of the camera
- # Signifies queue stretches to the next significant junction
- * Indicates an estimated queue length due to obscured vision.

Queue lengths are compiled from CCTV observations and are therefore subject to the limitations of the camera view.

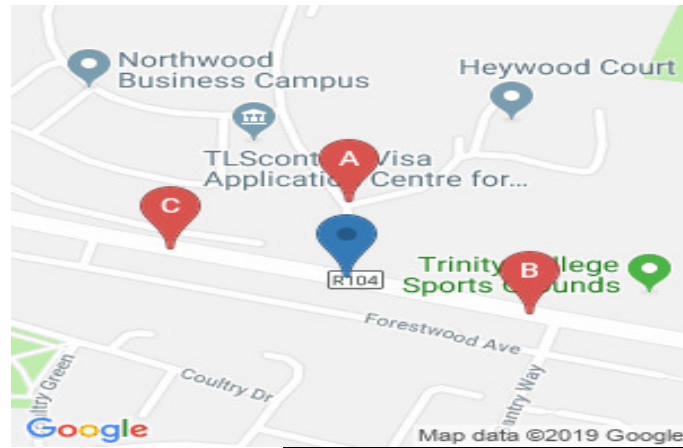


IDASO

Survey Name: 029 19025 Northwood
Site: 5
Location: Northwood Ave
Date: 12-Feb-2019

Large data table with columns for TIME, P/C, M/C, CAR, LGV, OGV1, OGV2, PSV, TOT, and various PCU values for different categories (A=>A, A=>B, A=>C, A=>D, B=>A, B=>B, B=>C, B=>D, C=>A, C=>B).

C=>C										C=>D										D=>A										D=>B										D=>C										D=>D									
PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU					
11.7	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	12	0	0	3	0	0	0	0	3	0	0	0	2	2	0	39	45.6	0	0	9	0	0	0	0	9	9	0	0	0	0	0	0	0	0								
10.2	0	0	0	0	0	0	0	0	0	0	1	15	1	0	0	0	17	16.7	0	0	16	1	1	0	0	18	19	0	1	28	10	2	1	0	42	48.7	0	0	12	0	0	0	0	12	12	0	0	0	0	0	0	0	0						
30	0	0	0	0	0	0	0	0	0	0	6	24	3	1	0	0	34	31.2	0	0	15	1	1	0	0	18	18.2	0	0	41	10	0	0	0	51	56	0	0	21	1	0	0	0	22	22.5	0	0	0	0	0	0	0	0	0					
38.5	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	25	25	0	0	24	0	0	0	0	24	24	1	0	56	3	0	0	0	60	60.7	0	0	13	3	0	0	0	16	17.5	0	0	0	0	0	0	0	0	0					
32.3	0	0	0	0	0	0	0	0	0	0	1	15	0	0	0	0	17	15.6	0	0	41	0	0	0	0	41	41	0	1	43	4	2	0	0	50	52.4	0	0	17	2	1	0	0	20	21.5	0	0	0	0	0	0	0	0	0					
13	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	13	13	0	0	41	3	0	0	0	44	45.5	0	0	56	9	2	0	0	67	72.5	0	0	14	3	0	0	0	17	18.5	0	0	0	0	0	0	0	0	0					
21	0	0	0	0	0	0	0	0	0	0	2	18	2	0	0	0	22	21.4	0	0	1	42	1	0	0	0	44	43.9	0	1	42	1	0	0	0	86	90.5	0	0	18	2	0	0	0	20	21	0	0	0	0	0	0	0	0	0				
35.7	0	0	0	0	0	0	0	0	0	0	1	16	1	0	0	0	18	17.7	3	0	44	0	0	0	0	47	44.6	0	0	70	9	0	0	0	79	83.5	0	0	27	3	1	0	0	31	33	0	0	0	0	0	0	0	0	0					
12	0	0	0	0	0	0	0	0	0	0	1	62	3	0	0	0	7	69.7	3	0	108	0	0	0	0	176	175	1	0	246	20	0	0	0	282	298.7	0	0	29	10	0	0	0	88	94	0	0	0	0	0	0	0	0	0					
27.7	0	0	0	0	0	0	0	0	0	0	0	14	3	0	0	0	17	18.5	1	0	24	0	0	0	0	25	24.2	0	1	64	7	0	0	0	72	74.9	0	0	10	2	0	0	0	12	13	0	0	0	0	0	0	0	0	0					
35.9	0	0	0	0	0	0	0	0	0	0	1	24	0	0	0	0	25	24.2	0	1	21	1	0	0	0	23	22.9	0	0	72	8	1	3	0	84	92.4	0	0	22	4	0	0	0	26	28	0	0	1	0	0	0	0	1	1					
19.7	0	0	0	1	0	0	0	1	1.5	0	0	17	1	0	0	0	18	18.5	0	1	10	1	0	0	0	12	11.9	0	0	45	4	0	1	0	50	53.3	0	0	12	1	0	0	0	13	13.5	0	0	2	0	0	0	0	2	2					
24.7	0	0	0	0	0	0	0	0	0	0	0	15	2	0	0	0	17	18	0	0	19	1	0	0	0	20	20.5	0	0	43	8	1	0	0	52	56.5	0	0	19	1	1	0	0	21	22	0	0	0	0	0	0	0	0	0					
108	0	0	0	1	0	0	0	1	1.5	1	0	70	6	0	0	0	77	79.2	1	2	74	3	0	0	0	80	79.5	0	1	224	27	2	4	0	258	277.1	0	0	63	8	1	0	0	72	76.5	0	0	3	0	0	0	0	3	3					
12	0	0	0	0	0	0	0	0	0	0	0	13	2	1	0	0	16	17.2	0	0	6	0	0	0	0	6	6	0	0	55	8	0	0	0	63	67	0	0	8	0	0	0	0	10	11	0	0	0	0	0	0	0	0	0					
11.5	0	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0	19	19	0	0	9	0	1	0	0	10	10.5	0	0	48	7	2	1	0	58	63.8	0	0	13	2	0	0	0	15	16	0	0	1	0	0	0	1	1						
9.1	0	0	1	0	1	0	0	2	2.5	0	0	10	2	0	0	0	14	13	0	0	3	1	0	0	0	4	4.5	0	0	33	5	5	0	0	43	48	0	0	23	1	0	0	0	24	24.5	0	0	0	1	0	0	0	1	1.5					
14.7	0	0	0	0	0	0	0	0	0	0	1	13	0	0	0	0	14	13.2	0	0	7	0	0	0	0	7	7	0	0	44	5	0	0	0	49	51.5	0	0	14	1	0	0	0	15	15.5	0	0	1	0	0	0	0	1	1					
45.5	0	0	1	0	0	0	0	2.5	0	0	0	55	1	0	0	0	61	62.7	0	0	23	1	0	0	0	27	27	0	0	80	25	0	0	0	113	120.2	0	0	4	25	1	0	0	64	67	0	0	0	0	0	0	0	0	0					
16	0	0	0	0	0	0	0	0	0	0	0	16	3	0	0	0	19	20.1	0	0	5	0	0	0	0	5	5	0	0	42	7	2	1	0	52	57.8	0	0	14	1	0	0	0	15	15.5	0	0	1	0	0	0	0	1	1					
15.5	0	0	0	0	0	0	0	0	0	0	1	18	2	2	0	0	23	24.2	0	0	3	0	0	0	0	3	3	1	0	39	11	0	1	0	52	58	0	0	14	1	0	0	0	15	15.5	0	0	0	0	0	0	0	0	0					
14.5	0	0	0	0	0	0	0	0	0	0	2	16	3	0	0	0	21	20.9	0	0	6	2	0	0	0	8	9	0	0	40	10	0	0	0	50	55	0	0	14	2	0	0	0	16	17	0	0	0	0	1	0	0	1.5						
18.5	0	0	0	0	0	0	0	0	0	0	0	18	3	0	0	0	21	22.5	0	0	7	1	0	0	0	8	8.5	0	0	41	7	1	0	0	49	53	0	0	18	1	0	0	0	19	19.5	0	0	1	0	0	0	0	1	1					
23.2	0	0	2	0	0	0	0	2	2	0	0	16	2	0	0	0	18	19	0	0	4	1	0	0	0	5	5.5	1	0	53	6	1	1	0	62	66	0	0	22	0	0	0	0	22	22	0	0	0	0	0	0	0	0	0					
12.5	0	0	0	0	0	0	0	0	0	0	0	21	3	1	0	0	25	27	0	0	2	0	0	0	0	2	2	1	0	50	4	3	0	0	58	60.7	0	0	14	3	0	0	0	17	18.5	0	0	1	0	0	0	0	1	1					
22.5	0	0	0	0	0	0	0	0	0	0	0	16	2	0	0	0	18	19	0	0	3	0	0	0	0	3	3	0	0	39	6	0	0	0	45	48	0	0	14	1	0	0	0	15	15.5	0	0	0	0	0	0	0	0	0					
18.5	0	0	0	0	0	0	0	0	0	0	1	12	1	0	0	0	14	13.7	0	0	8	2	0	0	0	10	11	0	0	45	8	0	1	0	54	59.3	0	0	25	0	0	0	0	25	25	0	0	0	0	0	0	0	0	0					
76.7	0	0	2	0	0	0	0	2	2	1	0	65	8	1	0	0	75	78.7	0	0	17	3	0	0	0	20	21.5	2	0	187	24	4	2	0	219	234	0	0	75	4	0	0	0	79	81	0	0	1	0	0	0	0	1	1					
20.9	0	0	1	0	0	0	0	1	1	1	0	23	4	0	0	1	29	31.2	0	0	11	0	0	0	0	11	11	1	1	43	9	0	1	0	55	59.4	0	0	15	2	1	0	0	18	19.5	0	0	1	0	0	0	0	1	1					
17	0	0	0	0	0	0	0	0	0	0	0	26	2	0	0	0	28	29	0	0	12	0	0	0	0	12	12	1	0	56	14	2	1	0	74	82.5	0	0	24	3	0	0	0	27	28.5	0	0	0	0	0	0	0	0	0	0				
26	0	0	0	0	0	0	0	0	0	0	0	18	2	1	0	0	21	22.5	0	0	5	0	0	0	0	5	5	1	0	68	6	0	0	0	76	79.5	0	0	19	3	0	0	0	22	23.5	0	0	0	0	0	0	0	0	0	0				
24.5	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	0	24	24	0	0	10	2	0	0	0	12	13	0	1	66	8	1	0	0	76	79.9	0	0	29	0	0	0	0	29	29	0	0	0	0	0	0	0	0	0	0				
88.4	0	0	1	0	0	0	0	1	1	1	0	91	8	1	0	1	102	106.7	0	0	38	2	0	0	0	40	41	3	2	233	37	3	3	0	281	301.3	0	0	87	8	1	0	0	96	100.5	0	0	1	0	0	0	0	1	1					
18	0	0	0	0	0	0	0	0	0	0	0	23	0	0	0	0	23	23.5	0	0	6	1	0	0	0	6	6	0	0																														



IDASO

Survey Name: 029 19025 Northwood
Site: 6
Location: Forestwood Ave / Santry Ave
Date: 12-Feb-2019

TIME	A1	A2	B1	B2	C1	C2	TIME	A1	A2	B1	B2	C1	C2
07:00	10	5	15	5	10	15	13:00	20	10	35	20	10	110
07:15	10	10	15	10	10	20	13:15	25	10	15	25	5	60
07:30	15	20	30	15	10	30	13:30	20	10	25	20	5	40
07:45	15	20	30	10	20	35	13:45	20	5	35	10	15	40
08:00	25	20	30	30	5	50	14:00	10	15	55	15	10	60
08:15	10	20	40	25	10	60	14:15	30	5	65	15	5	50
08:30	45	10	30	25	10	130	14:30	25	5	40	10	10	55
08:45	25	10	25	10	30	130	14:45	10	15	30	20	15	65
09:00	20	15	40	30	55	120	15:00	15	10	35	30	5	100
09:15	15	10	30	20	15	60	15:15	20	15	30	20	10	65
09:30	10	10	35	10	10	55	15:30	25	5	50	15	10	45
09:45	15	5	55	20	10	50	15:45	20	15	30	15	20	55
10:00	10	5	40	5	10	60	16:00	20	15	55	30	10	65
10:15	20	5	20	15	15	30	16:15	10	15	65	20	10	50
10:30	25	10	30	15	15	40	16:30	20	35	65	15	10	60
10:45	15	30	40	10	5	50	16:45	40	35	60	30	10	100
11:00	15	5	30	10	5	35	17:00	30	50	75	55	40	130+
11:15	10	10	20	15	5	30	17:15	40	40	110	45	15	100
11:30	15	10	30	15	5	40	17:30	30	60	120+	30	10	60
11:45	15	10	50	15	5	40	17:45	40	30	90	30	20	100
12:00	20	5	30	15	5	60	18:00	35	25	55	30	15	55
12:15	20	15	10	5	10	40	18:15	25	25	60	25	15	65
12:30	20	15	30	15	5	35	18:30	25	15	45	35	10	55
12:45	15	5	50	15	20	120	18:45	15	20	15	20	10	50

Queue's are measured in meters

- Cannot be seen from camera
- + Signifies queue stretches to a minimum length of x and beyond the view of the camera
- # Signifies queue stretches to the next significant junction
- * Indicates an estimated queue length due to obscured vision.

Queue lengths are compiled from CCTV observations and are therefore subject to the limitations of the camera view.



IDASO

Survey Name: 029 19025 Northwood
Site: 7
Location: Northwood Ave / Swords Rd
Date: 12-Feb-2019

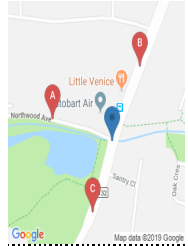
TIME	A1	A2	B1	B2	B3	C1	C2
07:00	25	30	20	25	10	15	25
07:15	25	30	40	50	15	25	40
07:30	20	45	45	150	20	35	100
07:45	45	50	40	70	50	30	110
08:00	35	40	30	130	40	45	120
08:15	55	45	50	180+	30	35	70
08:30	60	55	30	80	50	50	200+
08:45	85	50	20	70	45	40	200+
09:00	40	30	15	150	30	60	120
09:15	60	55	20	100	25	50	200+
09:30	50	30	15	65	20	40	60
09:45	30	25	15	70	20	30	110
10:00	30	25	30	55	15	45	60
10:15	35	30	15	50	25	40	80
10:30	30	35	25	130	15	25	40
10:45	30	50	15	60	10	20	50
11:00	20	35	20	55	25	20	45
11:15	30	40	20	100	30	45	70
11:30	50	35	15	70	15	30	100
11:45	35	40	20	80	20	25	80
12:00	40	25	10	80	30	20	50
12:15	30	50	20	90	20	30	100
12:30	30	40	30	180+	50	30	60
12:45	25	30	30	180+	40	30	110

TIME	A1	A2	B1	B2	B3	C1	C2
13:00	30	30	30	180+	60	30	105
13:15	30	50	20	135	20	50	80
13:30	50	45	30	130	20	30	120
13:45	35	25	20	100	20	30	130
14:00	30	50	15	145	20	60	80
14:15	35	55	15	130	20	35	70
14:30	40	40	20	70	25	30	120
14:45	45	50	15	60	35	45	70
15:00	35	30	15	70	25	40	90
15:15	50	30	30	55	25	30	80
15:30	30	45	20	120	60	45	110
15:45	30	20	20	75	15	40	90
16:00	35	45	20	180+	30	40	50
16:15	40	100	20	130	30	30	60
16:30	40	125	15	150	30	40	80
16:45	35	170	10	150	25	30	65
17:00	50	200+	10	180+	55	50	170
17:15	50	200+	150	180+	70	50	170
17:30	55	200+	40	180+	55	40	120
17:45	50	200+	75	180+	70	40	130
18:00	60	150	40	180+	50	60	130
18:15	30	40	50	135	20	30	70
18:30	40	60	20	90	30	20	30
18:45	25	40	15	60	20	20	40

Queue's are measured in meters

- Cannot be seen from camera
- + Signifies queue stretches to a minimum length of x and beyond the view of the camera
- # Signifies queue stretches to the next significant junction
- * Indicates an estimated queue length due to obscured vision.

Queue lengths are compiled from CCTV observations and are therefore subject to the limitations of the camera view.



IDASO

Survey Name: 029 19025 Northwood
Site: 7
Location: Northwood Ave / Swords Rd
Date: 12-Feb-2019

Table with columns for Time, P/C, M/C, CAR, LGV, OGV1, OGV2, PSV, TOT, and PCU for various directions (A=>A, A=>B, A=>C, B=>A, B=>B, B=>C, C=>A, C=>B, C=>C). Rows represent time intervals from 07:00 to 18:45.

APPENDIX 13.2 MATERIAL ASSETS: TRAFFIC AND TRANSPORT

TRICS Output

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
VEHICLES

Calculation factor: 1 TOTBED

Estimated TRIP rate value per 697 TOTBED shown in shaded columns

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS				DEPARTURES				TOTALS			
	No. Days	Ave. TOTBED	Trip Rate	Estimated Trip Rate	No. Days	Ave. TOTBED	Trip Rate	Estimated Trip Rate	No. Days	Ave. TOTBED	Trip Rate	Estimated Trip Rate
00:00 - 01:00												
01:00 - 02:00												
02:00 - 03:00												
03:00 - 04:00												
04:00 - 05:00												
05:00 - 06:00												
06:00 - 07:00												
07:00 - 08:00	44	130	0.023	16.121	44	130	0.087	60.821	44	130	0.110	76.942
08:00 - 09:00	44	130	0.028	19.175	44	130	0.106	74.133	44	130	0.134	93.308
09:00 - 10:00	44	130	0.034	23.938	44	130	0.051	35.296	44	130	0.085	59.234
10:00 - 11:00	44	130	0.028	19.541	44	130	0.038	26.502	44	130	0.066	46.043
11:00 - 12:00	44	130	0.034	23.693	44	130	0.037	26.136	44	130	0.071	49.829
12:00 - 13:00	44	130	0.046	31.998	44	130	0.042	29.556	44	130	0.088	61.554
13:00 - 14:00	44	130	0.042	28.945	44	130	0.044	30.777	44	130	0.086	59.722
14:00 - 15:00	44	130	0.042	29.067	44	130	0.042	29.189	44	130	0.084	58.256
15:00 - 16:00	44	130	0.053	36.639	44	130	0.036	25.037	44	130	0.089	61.676
16:00 - 17:00	44	130	0.065	45.310	44	130	0.039	26.991	44	130	0.104	72.301
17:00 - 18:00	44	130	0.098	68.515	44	130	0.041	28.456	44	130	0.139	96.971
18:00 - 19:00	44	130	0.087	60.699	44	130	0.043	29.678	44	130	0.130	90.377
19:00 - 20:00												
20:00 - 21:00												
21:00 - 22:00												
22:00 - 23:00												
23:00 - 24:00												
Total Rates:			0.580	403.641			0.606	422.572			1.186	826.213

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: $COUNT/TRP*FACT$. Trip rates are then rounded to 3 decimal places.

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Parameter summary

Trip rate parameter range selected:	10 - 780 (units:)
Survey date date range:	01/01/11 - 05/06/18
Number of weekdays (Monday-Friday):	44
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	1
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 01 - RETAIL/I - SHOPPING CENTRE - LOCAL SHOPS
VEHICLES

Calculation factor: 100 sqm

Estimated TRIP rate value per 1006 SQM shown in shaded columns

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS				DEPARTURES				TOTALS			
	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate
00:00 - 01:00												
01:00 - 02:00												
02:00 - 03:00												
03:00 - 04:00												
04:00 - 05:00												
05:00 - 06:00												
06:00 - 07:00	1	540	1.296	13.041	1	540	1.296	13.041	1	540	2.592	26.082
07:00 - 08:00	10	1180	2.204	22.172	10	1180	1.856	18.675	10	1180	4.060	40.847
08:00 - 09:00	10	1180	2.899	29.164	10	1180	2.357	23.707	10	1180	5.256	52.871
09:00 - 10:00	10	1180	3.806	38.289	10	1180	3.213	32.320	10	1180	7.019	70.609
10:00 - 11:00	10	1180	3.806	38.289	10	1180	3.408	34.281	10	1180	7.214	72.570
11:00 - 12:00	10	1180	4.145	41.700	10	1180	4.399	44.258	10	1180	8.544	85.958
12:00 - 13:00	10	1180	5.289	53.212	10	1180	5.044	50.739	10	1180	10.333	103.951
13:00 - 14:00	10	1180	4.662	46.902	10	1180	4.654	46.816	10	1180	9.316	93.718
14:00 - 15:00	10	1180	4.408	44.343	10	1180	4.493	45.196	10	1180	8.901	89.539
15:00 - 16:00	10	1180	3.933	39.568	10	1180	4.196	42.212	10	1180	8.129	81.780
16:00 - 17:00	10	1180	4.230	42.553	10	1180	3.993	40.165	10	1180	8.223	82.718
17:00 - 18:00	10	1180	4.247	42.723	10	1180	4.789	48.181	10	1180	9.036	90.904
18:00 - 19:00	10	1180	4.569	45.964	10	1180	4.815	48.437	10	1180	9.384	94.401
19:00 - 20:00	8	1397	3.938	39.620	8	1397	4.225	42.502	8	1397	8.163	82.122
20:00 - 21:00	8	1397	2.694	27.104	8	1397	3.070	30.886	8	1397	5.764	57.990
21:00 - 22:00	6	1103	2.812	28.287	6	1103	3.099	31.176	6	1103	5.911	59.463
22:00 - 23:00												
23:00 - 24:00												
Total Rates:			58.938	592.931			58.907	592.592			117.845	1185.523

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: $COUNT/TRP*FACT$. Trip rates are then rounded to 3 decimal places.

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Parameter summary

Trip rate parameter range selected:	260 - 3837 (units: sqm)
Survey date date range:	01/01/11 - 23/03/18
Number of weekdays (Monday-Friday):	10
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 04 - EDUCATION/D - NURSERY
VEHICLES

Calculation factor: 100 sqm

Estimated TRIP rate value per 321 SQM shown in shaded columns

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS				DEPARTURES				TOTALS			
	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate
00:00 - 01:00												
01:00 - 02:00												
02:00 - 03:00												
03:00 - 04:00												
04:00 - 05:00												
05:00 - 06:00												
06:00 - 07:00	2	328	0.152	0.489	2	328	0.000	0.000	2	328	0.152	0.489
07:00 - 08:00	19	383	1.870	6.002	19	383	1.017	3.266	19	383	2.887	9.268
08:00 - 09:00	19	383	4.235	13.594	19	383	3.286	10.548	19	383	7.521	24.142
09:00 - 10:00	19	383	2.159	6.929	19	383	2.104	6.753	19	383	4.263	13.682
10:00 - 11:00	19	383	0.577	1.854	19	383	0.454	1.456	19	383	1.031	3.310
11:00 - 12:00	19	383	0.839	2.692	19	383	0.577	1.854	19	383	1.416	4.546
12:00 - 13:00	19	383	1.389	4.458	19	383	1.746	5.605	19	383	3.135	10.063
13:00 - 14:00	19	383	1.031	3.310	19	383	1.347	4.325	19	383	2.378	7.635
14:00 - 15:00	19	383	0.880	2.825	19	383	0.811	2.604	19	383	1.691	5.429
15:00 - 16:00	19	383	1.072	3.443	19	383	1.320	4.237	19	383	2.392	7.680
16:00 - 17:00	19	383	1.746	5.605	19	383	1.897	6.091	19	383	3.643	11.696
17:00 - 18:00	19	383	2.970	9.533	19	383	3.547	11.387	19	383	6.517	20.920
18:00 - 19:00	18	396	0.225	0.721	18	396	0.870	2.794	18	396	1.095	3.515
19:00 - 20:00	1	400	0.000	0.000	1	400	0.000	0.000	1	400	0.000	0.000
20:00 - 21:00												
21:00 - 22:00												
22:00 - 23:00												
23:00 - 24:00												
Total Rates:			19.145	61.455			18.976	60.920			38.121	122.375

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: $COUNT/TRP*FACT$. Trip rates are then rounded to 3 decimal places.

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Parameter summary

Trip rate parameter range selected:	150 - 750 (units: sqm)
Survey date date range:	01/01/11 - 12/07/18
Number of weekdays (Monday-Friday):	19
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	1
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE for Land Use 07 - LEISURE/K - FITNESS CLUB (PRIVATE)
VEHICLES

Calculation factor: 100 sqm

Estimated TRIP rate value per 126 SQM shown in shaded columns

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS				DEPARTURES				TOTALS			
	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip Rate
00:00 - 01:00												
01:00 - 02:00												
02:00 - 03:00												
03:00 - 04:00												
04:00 - 05:00												
05:00 - 06:00												
06:00 - 07:00	16	3753	0.836	1.053	16	3753	0.048	0.061	16	3753	0.884	1.114
07:00 - 08:00	16	3753	0.558	0.703	16	3753	0.566	0.713	16	3753	1.124	1.416
08:00 - 09:00	16	3753	0.841	1.060	16	3753	0.654	0.825	16	3753	1.495	1.885
09:00 - 10:00	16	3753	1.281	1.614	16	3753	0.581	0.732	16	3753	1.862	2.346
10:00 - 11:00	16	3753	0.993	1.251	16	3753	0.831	1.047	16	3753	1.824	2.298
11:00 - 12:00	16	3753	0.603	0.760	16	3753	1.024	1.290	16	3753	1.627	2.050
12:00 - 13:00	16	3753	0.560	0.705	16	3753	0.873	1.100	16	3753	1.433	1.805
13:00 - 14:00	16	3753	0.610	0.768	16	3753	0.754	0.951	16	3753	1.364	1.719
14:00 - 15:00	16	3753	0.580	0.730	16	3753	0.556	0.701	16	3753	1.136	1.431
15:00 - 16:00	16	3753	0.836	1.053	16	3753	0.683	0.860	16	3753	1.519	1.913
16:00 - 17:00	16	3753	1.174	1.479	16	3753	0.856	1.079	16	3753	2.030	2.558
17:00 - 18:00	16	3753	1.684	2.121	16	3753	0.981	1.236	16	3753	2.665	3.357
18:00 - 19:00	16	3753	1.547	1.949	16	3753	1.442	1.817	16	3753	2.989	3.766
19:00 - 20:00	16	3753	1.023	1.288	16	3753	1.540	1.941	16	3753	2.563	3.229
20:00 - 21:00	16	3753	0.545	0.686	16	3753	1.234	1.555	16	3753	1.779	2.241
21:00 - 22:00	15	3443	0.106	0.134	15	3443	0.817	1.030	15	3443	0.923	1.164
22:00 - 23:00	3	2668	0.025	0.031	3	2668	0.250	0.315	3	2668	0.275	0.346
23:00 - 24:00												
Total Rates:			13.802	17.385			13.690	17.253			27.492	34.638

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: $COUNT/TRP*FACT$. Trip rates are then rounded to 3 decimal places.

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Parameter summary

Trip rate parameter range selected:	404 - 9000 (units: sqm)
Survey date date range:	01/01/11 - 27/09/17
Number of weekdays (Monday-Friday):	16
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

APPENDIX 13.3 MATERIAL ASSETS: TRAFFIC AND TRANSPORT

Sample Traffic Modelling Output File

_____ O S C A D Y 5 _____

Analysis Program: Release 3.0 (Jan 2008)

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THE USER OF THIS COMPUTER PROGRAM FOR THE SOLUTION OF AN ENGINEERING PROBLEM IS
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.Run with file:- "C:\Documents and Settings\obyrrner\Desktop\Northwood\Junction 6 - Santry Ave\J6 2021 AM Peak.voi" at 08:48:21 on
Thursday, 30 May 2019

.FILE PROPERTIES

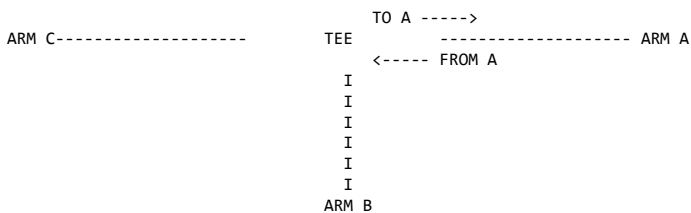
RUN TITLE: Northwood - Junction 6 AM Peak
LOCATION: Northwood
DATE: 29/05/2019
CLIENT: Cosgrove
ENUMERATOR: obyrrner [LIBRARYMONRD]
JOB NUMBER: 19205
STATUS:
DESCRIPTION:

**** ERROR AND WARNING MESSAGES ****
=====

No errors or warnings in the data.

.TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS Arm A - Santry Ave WEST
ARM B IS Arm B - Northwood Road
ARM C IS Arm C - Santry Ave EAST

.GEOMETRIC DATA

I	DATA ITEM	I	ARM A	I	ARM B	I	ARM C	I
I	GRADIENT	I	0.0 %	I	0.0 %	I	0.0 %	I
I		I		I		I		I
I	NUMBER OF LANES	I	1	I	1	I	1	I
I		I		I		I		I

J6 2021 AM Peak NoDev.txt

I	PERMITTED MOVEMENTS	LANE 1	I	LS	I	L R	I	SR	I
I			I		I		I		I
I	TOTAL EXIT WIDTH FOR STRAIGHT-		I		I		I		I
I	AHEAD VEHICLES FROM THIS ARM		I	N/A	I	N/A	I	N/A	I
I			I		I		I		I
I	LANE WIDTHS	LANE 1	I	3.00 M	I	3.50 M	I	3.30 M	I
I			I		I		I		I
I	LEFT TURN RADII	LANE 1	I	15.0 M	I	20.0 M	I	N/A	I
I			I		I		I		I
I	RIGHT TURN RADII	LANE 1	I	N/A	I	20.0 M	I	20.0 M	I
I			I		I		I		I
I	OPPOSING TRAFFIC MOVEMENTS		I		I		I	STRAIGHT	I
I			I		I		I		I
I	STORAGE BEYOND	LANE 1	I	0.0 VEHS	I	0.0 VEHS	I	3.0 VEHS	I
I	STOPLINE		I		I		I		I

EXIT WIDTH FOR IMAGINARY ARM D = 50.10

I	FLARES	I	ADJACENT LANE	I	STORAGE (PCU)	I	RATIO SF THIS BAY	I
I	~~~~~	I		I		I	/SF ADJACENT LANE	I
I	ARM A; BAY 1	I	1	I	8	I	1.00	I
I	ARM B; BAY 1	I	1	I	5	I	1.00	I
I	ARM C; BAY 1	I	1	I	4	I	1.00	I

.TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 07.45 TO 09.15
 PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 08.00 TO 09.00

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

Northwood - Junction 2

I		I	TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)	I
I	FROM/TO	I	ARM A ARM B ARM C	I
I	ARM A	I	0.0 138.0 461.0	I
I	ARM B	I	60.0 0.0 149.0	I
I	ARM C	I	426.0 125.0 0.0	I

I	TIME PERIOD	I	ARM	I	VEHICLE TYPE PROPORTIONS	I
I		I		I	CARS AND MEDIUM HEAVY BUSES AND MOTOR PEDAL	I
I		I		I	LIGHT GOODS GOODS GOODS COACHES CYCLES CYCLES	I
I	08.00-09.00	I	A	I	0.990 0.000 0.010 0.000 0.000 0.000	I
I		I	B	I	0.990 0.010 0.000 0.000 0.000 0.000	I
I		I	C	I	0.960 0.020 0.020 0.000 0.000 0.000	I

.DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

I	ENTRY/EXIT FLOWS	I	ARM	I	TIME WHEN FLOW STARTS TO RISE	I	TIME WHEN TOP OF PEAK IS REACHED	I	TIME WHEN FLOW STOPS FALLING	I	RATE OF FLOW (VEH/MIN) BEFORE PEAK	I	AT TOP OF PEAK	I	AFTER PEAK
I	ENTRY	I	A	I	08.00	I	08.30	I	09.00	I	7.49	I	11.23	I	7.49
I		I	B	I	08.00	I	08.30	I	09.00	I	2.61	I	3.92	I	2.61
I		I	C	I	08.00	I	08.30	I	09.00	I	6.89	I	10.33	I	6.89

.SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- VEHICLE ACTUATED MODE

MAXIMUM CYCLE TIME- 120.0 SECONDS

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
 END = 2.9

I DATA ITEM	I STAGE 1	I STAGE 2	I STAGE 3	I STAGE 4
I LANES ON GREEN: ARM A	I 1	I	I	I
I B	I	I	I 1	I
I C	I 1	I 1	I	I
I MINIMUM GREEN TIME (SECS)	I 5.0	I 10.0	I 5.0	I 10.0
I PRECEDING INTERSTAGE	I 5.0	I 5.0	I 5.0	I 5.0

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

I TIME	I MOVEMENT	I DEMAND (VEHS/MIN)	I SAT FLOW (PCU/HR)	I SAT FLOW (VEHS/MIN)	I EFFECTIVE TRUE (SECS)	I GREEN-TIME FLARE+NOTIONL (SECS)	I CAPACITY (VEHS /MIN)
I 08.00-08.15							
I A 1	L S	8.94	1871.9	30.80	52.3	68.9	21.39
I B 1	L R	3.12	1827.9	30.31	9.8	19.6	6.00
I C 1	S R	8.22	1554.9	25.01	67.3	75.7	19.10
I 08.15-08.30							
I A 1	L S	10.95	1871.9	30.80	59.1	75.7	21.42
I B 1	L R	3.82	1827.9	30.31	12.7	22.5	6.27
I C 1	S R	10.07	1493.7	24.03	74.1	82.5	18.23
I 08.30-08.45							
I A 1	L S	10.95	1871.9	30.80	59.1	75.7	21.42
I B 1	L R	3.82	1827.9	30.31	12.7	22.5	6.27
I C 1	S R	10.07	1493.7	24.03	74.1	82.5	18.23
I 08.45-09.00							
I A 1	L S	8.94	1871.9	30.80	52.3	68.9	21.39
I B 1	L R	3.12	1827.9	30.31	9.8	19.6	6.00
I C 1	S R	8.22	1554.9	25.01	67.3	75.7	19.10

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

I TIME	I MOVEMENT	I DEMAND EXCL 2-WHEEL (VEHS/MIN)	I CAPACITY (VEHS/MIN)	I DEGREE OF SAT (RFC)	I QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	I QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	I GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
I 08.00-08.15							
I A 1	L S	8.94	21.39	0.418	2.3	7.2	34.4
I B 1	L R	3.12	6.00	0.520	2.5	5.0	37.9
I C 1	S R	8.22	19.10	0.430	1.2	4.6	17.7
I 08.15-08.30							
I A 1	L S	10.95	21.42	0.511	3.2	9.4	47.8
I B 1	L R	3.82	6.27	0.609	3.5	6.7	52.0
I C 1	S R	10.07	18.23	0.553	1.9	6.2	28.4
I 08.30-08.45							
I A 1	L S	10.95	21.42	0.511	3.2	9.4	47.8
I B 1	L R	3.82	6.27	0.609	3.5	6.7	52.2
I C 1	S R	10.07	18.23	0.553	1.9	6.2	28.4
I 08.45-09.00							
I A 1	L S	8.94	21.39	0.418	2.3	7.2	34.4
I B 1	L R	3.12	6.00	0.520	2.5	5.0	38.3
I C 1	S R	8.22	19.10	0.430	1.2	4.6	17.8

* Note * You have specified a flare or bay in which the storage is too large to fully discharge over the green time for the approach. The NEEG has been reduced to allow for this. The affected bay is:-
 BAY 1; on arm B; and it is Adjacent to lane 1

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF MEAN (PHASE AVERAGED) *	VEHICLES IN QUEUE MAXIMUM (AT END OF RED) +	
08.15	1	2.3	7.2	**+++++
08.30	1	3.2	9.4	*****
08.45	1	3.2	9.4	*****
09.00	1	2.3	7.2	**+++++

.QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF MEAN (PHASE AVERAGED) *	VEHICLES IN QUEUE MAXIMUM (AT END OF RED) +	
08.15	1	2.5	5.0	****+
08.30	1	3.5	6.7	*****
08.45	1	3.5	6.7	*****
09.00	1	2.5	5.0	****+

.QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF MEAN (PHASE AVERAGED) *	VEHICLES IN QUEUE MAXIMUM (AT END OF RED) +	
08.15	1	1.2	4.6	*++++
08.30	1	1.9	6.2	**++++
08.45	1	1.9	6.2	**++++
09.00	1	1.2	4.6	*++++

.QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (08.00-09.00)

I	STREAM	I	TOTAL DEMAND (EXCL 2-WHEEL) (VEH)	I	137.5	I	137.5	I	37.9	I	0.28	I	37.9	I	0.28	I
I		I	(VEH/H)	I	459.3	I	459.3	I	126.5	I	0.28	I	126.6	I	0.28	I
I		I	(VEH)	I	148.4	I	148.4	I	128.6	I	0.87	I	129.0	I	0.87	I
I		I	(VEH)	I	59.8	I	59.8	I	51.8	I	0.87	I	51.9	I	0.87	I
I		I	(VEH)	I	424.4	I	424.4	I	71.4	I	0.17	I	71.4	I	0.17	I
I		I	(VEH)	I	124.5	I	124.5	I	21.0	I	0.17	I	21.0	I	0.17	I
I	ALL	I	1353.9	I	1353.9	I	437.1	I	0.32	I	437.8	I	0.32	I		I

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
 * INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
 * THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
 * THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
 * A LARGE QUEUE AT THE END OF THE TIME PERIOD.

***** OSCADY 5 run completed

===== end of file =====

_____ O S C A D Y 5 _____

Analysis Program: Release 3.0 (Jan 2008)

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.Run with file:- "C:\Documents and Settings\obyrrner\Desktop\Northwood\Junction 6 - Santry Ave\J6 2021 AM Peak WITHDev.voi" at
08:51:25 on Thursday, 30 May 2019

.FILE PROPERTIES

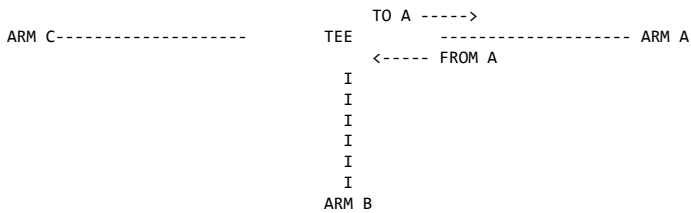
RUN TITLE: Northwood - Junction 6 AM Peak
LOCATION: Northwood
DATE: 29/05/2019
CLIENT: Cosgrove
ENUMERATOR: obyrrner [LIBRARYMONRD]
JOB NUMBER: 19205
STATUS:
DESCRIPTION:

**** ERROR AND WARNING MESSAGES ****
=====

No errors or warnings in the data.

.TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS Arm A - Santry Ave WEST
ARM B IS Arm B - Northwood Road
ARM C IS Arm C - Santry Ave EAST

.GEOMETRIC DATA

I	DATA ITEM	I	ARM A	I	ARM B	I	ARM C	I
I	GRADIENT	I	0.0 %	I	0.0 %	I	0.0 %	I
I		I		I		I		I
I	NUMBER OF LANES	I	1	I	1	I	1	I
I		I		I		I		I

I	PERMITTED MOVEMENTS	LANE 1	I	LS	I	L R	I	SR	I
I			I		I		I		I
I	TOTAL EXIT WIDTH FOR STRAIGHT-		I		I		I		I
I	AHEAD VEHICLES FROM THIS ARM		I	N/A	I	N/A	I	N/A	I
I			I		I		I		I
I	LANE WIDTHS	LANE 1	I	3.00 M	I	3.50 M	I	3.30 M	I
I			I		I		I		I
I	LEFT TURN RADII	LANE 1	I	15.0 M	I	20.0 M	I	N/A	I
I			I		I		I		I
I	RIGHT TURN RADII	LANE 1	I	N/A	I	20.0 M	I	20.0 M	I
I			I		I		I		I
I	OPPOSING TRAFFIC MOVEMENTS		I		I		I	STRAIGHT	I
I			I		I		I		I
I	STORAGE BEYOND	LANE 1	I	0.0 VEHS	I	0.0 VEHS	I	3.0 VEHS	I
I	STOPLINE		I		I		I		I

EXIT WIDTH FOR IMAGINARY ARM D = 50.10

I	FLARES	I	ADJACENT LANE	I	STORAGE (PCU)	I	RATIO SF THIS BAY	I
I	~~~~~	I		I		I	/SF ADJACENT LANE	I
I	ARM A; BAY 1	I	1	I	8	I	1.00	I
I	ARM B; BAY 1	I	1	I	5	I	1.00	I
I	ARM C; BAY 1	I	1	I	4	I	1.00	I

.TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 07.45 TO 09.15
 PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 08.00 TO 09.00

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

Northwood - Junction 2

I		I	TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)	I
I	FROM/TO	I	ARM A ARM B ARM C	I
I	ARM A	I	0.0 144.0 461.0	I
I	ARM B	I	66.0 0.0 164.0	I
I	ARM C	I	426.0 132.0 0.0	I

I	TIME PERIOD	I	ARM	I	VEHICLE TYPE PROPORTIONS	I
I		I		I	CARS AND MEDIUM HEAVY BUSES AND MOTOR PEDAL	I
I		I		I	LIGHT GOODS GOODS GOODS COACHES CYCLES CYCLES	I
I	08.00-09.00	I	A	I	0.990 0.000 0.010 0.000 0.000 0.000	I
I		I	B	I	0.990 0.010 0.000 0.000 0.000 0.000	I
I		I	C	I	0.960 0.020 0.020 0.000 0.000 0.000	I

.DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

I	ENTRY/EXIT FLOWS	I	ARM	I	TIME WHEN FLOW STARTS TO RISE	I	TIME WHEN TOP OF PEAK IS REACHED	I	TIME WHEN FLOW STOPS FALLING	I	RATE OF FLOW (VEH/MIN) BEFORE PEAK	I	AT TOP OF PEAK	I	AFTER PEAK
I	ENTRY	I	A	I	08.00	I	08.30	I	09.00	I	7.56	I	11.34	I	7.56
I		I	B	I	08.00	I	08.30	I	09.00	I	2.88	I	4.31	I	2.88
I		I	C	I	08.00	I	08.30	I	09.00	I	6.97	I	10.46	I	6.97

.SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- VEHICLE ACTUATED MODE

MAXIMUM CYCLE TIME- 120.0 SECONDS

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
 END = 2.9

DATA ITEM	STAGE 1	STAGE 2	STAGE 3	STAGE 4
LANES ON GREEN: ARM A	1			
B			1	
C	1	1		
MINIMUM GREEN TIME (SECS)	5.0	10.0	5.0	10.0
PRECEDING INTERSTAGE	5.0	5.0	5.0	5.0

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

TIME	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE TRUE (SECS)	GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
08.00-08.15							
A 1	L S	9.03	1870.5	30.77	49.2	65.7	20.92
B 1	L R	3.43	1827.9	30.31	10.5	20.4	6.38
C 1	S R	8.33	1544.4	24.85	64.2	72.6	18.65
08.15-08.30							
A 1	L S	11.06	1870.5	30.77	56.4	72.9	20.96
B 1	L R	4.20	1827.9	30.31	13.7	23.6	6.67
C 1	S R	10.20	1479.0	23.79	71.4	79.8	17.72
08.30-08.45							
A 1	L S	11.06	1870.5	30.77	56.4	72.9	20.96
B 1	L R	4.20	1827.9	30.31	13.7	23.6	6.67
C 1	S R	10.20	1479.0	23.79	71.4	79.8	17.72
08.45-09.00							
A 1	L S	9.03	1870.5	30.77	49.2	65.7	20.92
B 1	L R	3.43	1827.9	30.31	10.5	20.4	6.38
C 1	S R	8.33	1544.4	24.85	64.2	72.6	18.65

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

TIME	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.00-08.15							
A 1	L S	9.03	20.92	0.432	2.4	7.3	36.7
B 1	L R	3.43	6.38	0.538	2.7	5.3	40.4
C 1	S R	8.33	18.65	0.447	1.3	4.7	19.4
08.15-08.30							
A 1	L S	11.06	20.96	0.528	3.4	9.7	51.3
B 1	L R	4.20	6.67	0.630	3.7	7.2	55.9
C 1	S R	10.20	17.72	0.576	2.1	6.5	31.6
08.30-08.45							
A 1	L S	11.06	20.96	0.528	3.4	9.7	51.3
B 1	L R	4.20	6.67	0.630	3.7	7.2	56.2
C 1	S R	10.20	17.72	0.576	2.1	6.5	31.7
08.45-09.00							
A 1	L S	9.03	20.92	0.432	2.4	7.3	36.7
B 1	L R	3.43	6.38	0.538	2.7	5.3	40.8
C 1	S R	8.33	18.65	0.447	1.3	4.7	19.5

QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	MEAN (PHASE AVERAGED)	NUMBER OF VEHICLES IN QUEUE (AT END OF RED)
---------------------	------	-----------------------	---

	*	+
08.15	1	2.4 7.3 **++++
08.30	1	3.4 9.7 ***+++++
08.45	1	3.4 9.7 ***+++++
09.00	1	2.4 7.3 **++++

.QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF MEAN (PHASE AVERAGED)	VEHICLES IN QUEUE (AT END OF RED)	
		*	+	
08.15	1	2.7	5.3	****+
08.30	1	3.7	7.2	*****+
08.45	1	3.7	7.2	*****+
09.00	1	2.7	5.3	****+

.QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF MEAN (PHASE AVERAGED)	VEHICLES IN QUEUE (AT END OF RED)	
		*	+	
08.15	1	1.3	4.7	*****
08.30	1	2.1	6.5	*****+
08.45	1	2.1	6.5	*****+
09.00	1	1.3	4.7	*****

.QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (08.00-09.00)

I STREAM	I	I TOTAL DEMAND (EXCL 2-WHEEL)	I	I * QUEUEING * DELAY	I	I * INCLUSIVE QUEUEING * DELAY	I	I	I
		(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)		
I A-B	I	143.5	143.5	41.9	0.29	41.9	0.29	I	I
I A-C	I	459.3	459.3	134.1	0.29	134.2	0.29	I	I
I B-C	I	163.4	163.4	137.9	0.84	138.3	0.85	I	I
I B-A	I	65.7	65.7	55.5	0.84	55.6	0.85	I	I
I C-A	I	424.4	424.4	77.9	0.18	78.0	0.18	I	I
I C-B	I	131.5	131.5	24.2	0.18	24.2	0.18	I	I
I ALL	I	1387.7	1387.7	471.4	0.34	472.2	0.34	I	I

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
 * INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
 * THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
 * THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
 * A LARGE QUEUE AT THE END OF THE TIME PERIOD.

***** OSCADY 5 run completed
 ===== end of file =====

_____ O S C A D Y 5 _____

Analysis Program: Release 3.0 (Jan 2008)

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.Run with file:- "C:\Documents and Settings\obyrrner\Desktop\Northwood\Junction 7 Swords Road\J7 2021 AM Peak NoDev.voi" at 09:18:12 on
Thursday, 30 May 2019

.FILE PROPERTIES

RUN TITLE: Northwood - Junction 7 AM Peak
LOCATION: Northwood
DATE: 29/05/2019
CLIENT: Cosgrove
ENUMERATOR: obyrrner [LIBRARYMONRD]
JOB NUMBER: 19205
STATUS:
DESCRIPTION:

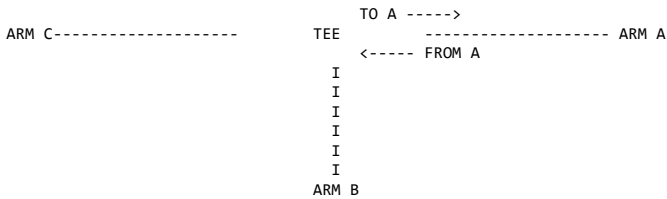
**** ERROR AND WARNING MESSAGES ****

=====

No errors or warnings in the data.

.TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS Arm A - Swords Road South
ARM B IS Arm B - Northwood Avenue
ARM C IS Arm C - Swords Road North

.GEOMETRIC DATA

I	DATA ITEM	I	ARM A	I	ARM B	I	ARM C	I
I	GRADIENT	I	0.0 %	I	0.0 %	I	0.0 %	I
I		I		I		I		I
I	NUMBER OF LANES	I	2	I	1	I	1	I
I		I		I		I		I
I	PERMITTED MOVEMENTS LANE 1	I	L	I	L R	I	SR	I
I		I	S	I		I		I
I		I		I		I		I
I	TOTAL EXIT WIDTH FOR STRAIGHT-	I		I		I		I
I	AHEAD VEHICLES FROM THIS ARM	I	N/A	I	N/A	I	N/A	I
I		I		I		I		I

I	LANE WIDTHS	LANE 1	I	3.00 M	I	3.50 M	I	3.00 M	I
I		LANE 2	I	3.00 M	I	0.00 M	I	0.00 M	I
I			I		I		I		I
I	LEFT TURN RADII	LANE 1	I	9.0 M	I	20.0 M	I	N/A	I
I			I		I		I		I
I	RIGHT TURN RADII	LANE 1	I	N/A	I	20.0 M	I	20.0 M	I
I			I		I		I		I
I	OPPOSING TRAFFIC MOVEMENTS		I		I		I	STRAIGHT	I
I			I		I		I		I
I	STORAGE BEYOND STOPLINE	LANE 1	I	0.0 VEHS	I	0.0 VEHS	I	2.0 VEHS	I
I			I		I		I		I

EXIT WIDTH FOR IMAGINARY ARM D = 50.10

I	FLARES	I	ADJACENT LANE	I	STORAGE (PCU)	I	RATIO SF THIS BAY	I
I	~~~~~	I		I		I	/SF ADJACENT LANE	I
I	ARM B; BAY 1	I	1	I	6	I	1.00	I
I	ARM C; BAY 1	I	1	I	6	I	1.00	I

.TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 07.45 TO 09.15
 PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 08.00 TO 09.00

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

Northwood - Junction 2

I		I	TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)	I
I	FROM/TO	I	ARM A ARM B ARM C	I
I	ARM A	I	0.0 126.0 465.0	I
I	ARM B	I	218.0 0.0 220.0	I
I	ARM C	I	485.0 165.0 0.0	I

I	TIME PERIOD	I	ARM	I	VEHICLE TYPE	I	PROPORTIONS	I
I		I		I	CARS AND MEDIUM HEAVY BUSES AND MOTOR PEDAL	I		I
I		I		I	LIGHT GOODS GOODS GOODS COACHES CYCLES CYCLES	I		I
I	08.00-09.00	I	A	I	0.990 0.010 0.000 0.000 0.000 0.000	I		I
I		I	B	I	0.980 0.010 0.010 0.000 0.000 0.000	I		I
I		I	C	I	0.990 0.010 0.000 0.000 0.000 0.000	I		I

.DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

I	ENTRY/EXIT FLOWS	I	ARM	I	TIME WHEN FLOW STARTS TO RISE	I	TIME WHEN TOP OF PEAK IS REACHED	I	TIME WHEN FLOW STOPS FALLING	I	RATE OF FLOW (VEH/MIN) BEFORE PEAK	I	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	I	RATE OF FLOW (VEH/MIN) AFTER PEAK	I
I	ENTRY	I	A	I	08.00	I	08.30	I	09.00	I	7.39	I	11.08	I	7.39	I
I		I	B	I	08.00	I	08.30	I	09.00	I	5.47	I	8.21	I	5.47	I
I		I	C	I	08.00	I	08.30	I	09.00	I	8.13	I	12.19	I	8.13	I

.SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- VEHICLE ACTUATED MODE

MAXIMUM CYCLE TIME- 120.0 SECONDS

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
 END = 2.9

I	DATA ITEM	I	STAGE 1	I	STAGE 2	I	STAGE 3	I	STAGE 4	I
I	LANES ON GREEN: ARM A	I	1 2	I		I		I		I
I		I		I		I	1	I		I

	C	I 1	I 1	I	I	I
MINIMUM GREEN TIME (SECS)		10.0	10.0	15.0	10.0	
PRECEDING INTERSTAGE		5.0	5.0	5.0	5.0	

DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

TIME	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE TRUE GREEN-TIME (SECS)	GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)
I 08.00-08.15							
A 1	L	1.88	1641.4	27.22	35.3		10.68
2	S	6.94	2055.0	34.08	35.3		13.37
B 1	L R	6.54	1827.9	29.93	17.7	29.5	9.80
C 1	S R	9.70	1302.3	21.60	50.3	63.1	15.15
I 08.15-08.30							
A 1	L	2.30	1641.4	27.22	55.1		12.50
2	S	8.50	2055.0	34.08	55.1		15.65
B 1	L R	8.01	1827.9	29.93	27.9	39.7	9.90
C 1	S R	11.88	1234.7	20.48	70.1	82.9	14.15
I 08.30-08.45							
A 1	L	2.30	1641.4	27.22	55.1		12.50
2	S	8.50	2055.0	34.08	55.1		15.65
B 1	L R	8.01	1827.9	29.93	27.9	39.7	9.90
C 1	S R	11.88	1234.7	20.48	70.1	82.9	14.15
I 08.45-09.00							
A 1	L	1.88	1641.4	27.22	35.3		10.68
2	S	6.94	2055.0	34.08	35.3		13.37
B 1	L R	6.54	1827.9	29.93	17.7	29.5	9.80
C 1	S R	9.70	1302.3	21.60	50.3	63.1	15.15

QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

TIME	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
I 08.00-08.15							
A 1	L	1.88	10.68	0.176	0.6	1.7	8.7
2	S	6.94	13.37	0.519	2.7	6.7	41.1
B 1	L R	6.54	9.80	0.667	4.4	8.7	65.9
C 1	S R	9.70	15.15	0.640	2.9	7.1	42.9
I 08.15-08.30							
A 1	L	2.30	12.50	0.184	0.8	2.5	11.4
2	S	8.50	15.65	0.543	3.7	9.6	55.5
B 1	L R	8.01	9.90	0.809	7.7	14.2	114.8
C 1	S R	11.88	14.15	0.840	6.4	12.3	95.2
I 08.30-08.45							
A 1	L	2.30	12.50	0.184	0.8	2.5	11.4
2	S	8.50	15.65	0.543	3.7	9.6	55.5
B 1	L R	8.01	9.90	0.809	7.8	14.2	117.5
C 1	S R	11.88	14.15	0.840	6.5	12.4	99.4
I 08.45-09.00							
A 1	L	1.88	10.68	0.176	0.6	1.7	8.7
2	S	6.94	13.37	0.519	2.8	6.7	41.2
B 1	L R	6.54	9.80	0.667	4.5	8.7	67.8
C 1	S R	9.70	15.15	0.640	2.9	7.1	44.3

QUEUES FOR ARM A

TIME SEGMENT	LANE	MEAN (PHASE AVERAGED)	MAXIMUM (AT END OF RED)	VEHICLES IN QUEUE
08.15	2	2.7	6.7	*****
	1	0.6	1.7	**
08.30	2	3.7	9.6	*****
	1	0.8	2.5	**
08.45	2	3.7	9.6	*****

	1	0.8	2.5	*++
09.00	2	2.8	6.7	***++++
	1	0.6	1.7	*+

.QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF MEAN (PHASE AVERAGED)	VEHICLES MAXIMUM (AT END OF RED)	IN QUEUE
08.15	1	4.4	8.7	*****
08.30	1	7.7	14.2	*****
08.45	1	7.8	14.2	*****
09.00	1	4.5	8.7	*****

.QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF MEAN (PHASE AVERAGED)	VEHICLES MAXIMUM (AT END OF RED)	IN QUEUE
08.15	1	2.9	7.1	***++++
08.30	1	6.4	12.3	*****
08.45	1	6.5	12.4	*****
09.00	1	2.9	7.1	***++++

.QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (08.00-09.00)

I STREAM	I	TOTAL DEMAND (EXCL 2-WHEEL)	I	* QUEUEING * DELAY	I	* INCLUSIVE QUEUEING * DELAY	I
I	I	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
I A-B	I	125.5	I 125.5	I 40.3	I 0.32	I 40.3	I 0.32
I A-C	I	463.2	I 463.2	I 193.3	I 0.42	I 193.6	I 0.42
I B-C	I	219.2	I 219.2	I 183.8	I 0.84	I 184.3	I 0.84
I B-A	I	217.2	I 217.2	I 182.1	I 0.84	I 182.6	I 0.84
I C-A	I	483.2	I 483.2	I 210.3	I 0.44	I 210.5	I 0.44
I C-B	I	164.4	I 164.4	I 71.5	I 0.44	I 71.6	I 0.44
I ALL	I	1672.6	I 1672.6	I 881.3	I 0.53	I 882.9	I 0.53

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
 * INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
 * THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
 * THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
 * A LARGE QUEUE AT THE END OF THE TIME PERIOD.

***** OSCADY 5 run completed

===== end of file =====

OSCADY 5

Analysis Program: Release 3.0 (Jan 2008)

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.Run with file:- "C:\Documents and Settings\obyerner\Desktop\Northwood\Junction 7 Swords Road\J7 2021 AM Peak WITHDev.voi" at 09:20:04 on Thursday, 30 May 2019

.FILE PROPERTIES

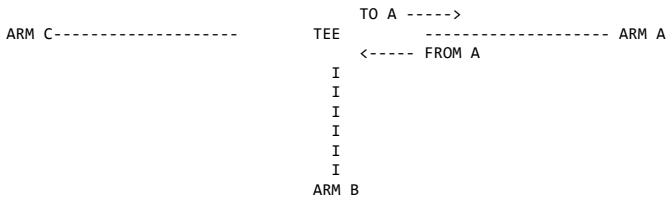
RUN TITLE: Northwood - Junction 7 AM Peak
LOCATION: Northwood
DATE: 29/05/2019
CLIENT: Cosgrove
ENUMERATOR: obyerner [LIBRARYMONRD]
JOB NUMBER: 19205
STATUS:
DESCRIPTION:

**** ERROR AND WARNING MESSAGES ****
=====

No errors or warnings in the data.

.TRAFFIC SIGNAL JUNCTION ANALYSIS

INPUT DATA



ARM A IS Arm A - Swords Road South
ARM B IS Arm B - Northwood Avenue
ARM C IS Arm C - Swords Road North

.GEOMETRIC DATA

Table with 8 columns: I, DATA ITEM, I, ARM A, I, ARM B, I, ARM C, I. Rows include GRADIENT, NUMBER OF LANES, PERMITTED MOVEMENTS (LANE 1, LANE 2), and TOTAL EXIT WIDTH FOR STRAIGHT-AHEAD VEHICLES FROM THIS ARM.

I	LANE WIDTHS	LANE 1	I	3.00 M	I	3.50 M	I	3.00 M	I
I		LANE 2	I	3.00 M	I	0.00 M	I	0.00 M	I
I			I		I		I		I
I	LEFT TURN RADII	LANE 1	I	9.0 M	I	20.0 M	I	N/A	I
I			I		I		I		I
I	RIGHT TURN RADII	LANE 1	I	N/A	I	20.0 M	I	20.0 M	I
I			I		I		I		I
I	OPPOSING TRAFFIC MOVEMENTS		I		I		I	STRAIGHT	I
I			I		I		I		I
I	STORAGE BEYOND STOPLINE	LANE 1	I	0.0 VEHS	I	0.0 VEHS	I	2.0 VEHS	I
I			I		I		I		I

EXIT WIDTH FOR IMAGINARY ARM D = 50.10

I	FLARES	I	ADJACENT LANE	I	STORAGE (PCU)	I	RATIO SF THIS BAY	I
I	~~~~~	I		I		I	/SF ADJACENT LANE	I
I	ARM B; BAY 1	I	1	I	6	I	1.00	I
I	ARM C; BAY 1	I	1	I	6	I	1.00	I

.TRAFFIC DEMAND DATA

DEMAND PROFILES ARE SYNTHESISED USING THE ** ODTAB ** OPTION

DEMAND DATA SUPPLIED BETWEEN TIMES - 07.45 TO 09.15
 PERIOD OF INTEREST (FOR QUEUE AND DELAY CALCULATIONS) - 08.00 TO 09.00

THE FOLLOWING DATA HAS BEEN INPUT

TRAFFIC SCALING FACTOR HAS BEEN SET TO 100 %

Northwood - Junction 2

I		I	TOTAL TRAFFIC DEMAND (VEHICLES / HOUR)	I
I	FROM/TO	I	ARM A ARM B ARM C	I
I	ARM A	I	0.0 182.0 465.0	I
I	ARM B	I	241.0 0.0 243.0	I
I	ARM C	I	485.0 172.0 0.0	I

I	TIME PERIOD	I	ARM	I	VEHICLE TYPE	I	PROPORTIONS	I
I		I		I	CARS AND MEDIUM HEAVY BUSES AND MOTOR PEDAL	I		I
I		I		I	LIGHT GOODS GOODS GOODS COACHES CYCLES CYCLES	I		I
I	08.00-09.00	I	A	I	0.990 0.010 0.000 0.000 0.000 0.000	I		I
I		I	B	I	0.980 0.010 0.010 0.000 0.000 0.000	I		I
I		I	C	I	0.990 0.010 0.000 0.000 0.000 0.000	I		I

.DATA DETERMINED FOR USE IN SYNTHESIS OF DEMAND PROFILES ARE AS FOLLOWS-

I	ENTRY/EXIT FLOWS	I	ARM	I	TIME WHEN FLOW STARTS TO RISE	I	TIME WHEN TOP OF PEAK IS REACHED	I	TIME WHEN FLOW STOPS FALLING	I	RATE OF FLOW (VEH/MIN) BEFORE PEAK	I	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	I	RATE OF FLOW (VEH/MIN) AFTER PEAK	I
I	ENTRY	I	A	I	08.00	I	08.30	I	09.00	I	8.09	I	12.13	I	8.09	I
I		I	B	I	08.00	I	08.30	I	09.00	I	6.05	I	9.08	I	6.05	I
I		I	C	I	08.00	I	08.30	I	09.00	I	8.21	I	12.32	I	8.21	I

.SIGNAL TIMING DETAILS FOR SIGNAL SET 1

TIMING OPTION- VEHICLE ACTUATED MODE

MAXIMUM CYCLE TIME- 120.0 SECONDS

GLOBAL EFFECTIVE GREEN DISPLACEMENTS - START = 1.4
 END = 2.9

I	DATA ITEM	I	STAGE 1	I	STAGE 2	I	STAGE 3	I	STAGE 4	I
I	LANES ON GREEN: ARM A	I	1 2	I		I		I		I
I		I	B	I		I	1	I		I

I	C	I	1	I	1	I	I	I	I
I		I		I		I		I	
I	MINIMUM GREEN TIME (SECS)	I	10.0	I	10.0	I	15.0	I	10.0
I		I		I		I		I	
I	PRECEDING INTERSTAGE	I	5.0	I	5.0	I	5.0	I	5.0

.DEMAND AND CAPACITY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

I	TIME	MOVEMENT	DEMAND (VEHS/MIN)	SAT FLOW (PCU/HR)	SAT FLOW (VEHS/MIN)	EFFECTIVE TRUE (SECS)	GREEN-TIME FLARE+NOTIONL (SECS)	CAPACITY (VEHS /MIN)	I
I	ARM	LANES							I

I	08.00-08.15								I
I	A 1	L	2.72	1641.4	27.22	35.6		10.45	I
I	2	S	6.94	2055.0	34.08	35.6		13.08	I
I	B 1	L R	7.22	1827.9	29.93	20.1	31.9	10.31	I
I	C 1	S R	9.81	1280.3	21.23	50.6	63.4	14.52	I

I	08.15-08.30								I
I	A 1	L	3.33	1641.4	27.22	53.4		12.12	I
I	2	S	8.50	2055.0	34.08	53.4		15.18	I
I	B 1	L R	8.85	1827.9	29.93	29.6	41.4	10.32	I
I	C 1	S R	12.01	1208.2	20.04	68.4	81.3	13.57	I

I	08.30-08.45								I
I	A 1	L	3.33	1641.4	27.22	53.4		12.12	I
I	2	S	8.50	2055.0	34.08	53.4		15.18	I
I	B 1	L R	8.85	1827.9	29.93	29.6	41.4	10.32	I
I	C 1	S R	12.01	1208.2	20.04	68.4	81.3	13.57	I

I	08.45-09.00								I
I	A 1	L	2.72	1641.4	27.22	35.6		10.45	I
I	2	S	6.94	2055.0	34.08	35.6		13.08	I
I	B 1	L R	7.22	1827.9	29.93	20.1	31.9	10.31	I
I	C 1	S R	9.81	1280.3	21.23	50.6	63.4	14.52	I

.QUEUE AND DELAY INFORMATION FOR EACH 15 MINUTE TIME SEGMENT BETWEEN 08.00 AND 09.00

I	TIME	MOVEMENT	DEMAND EXCL 2-WHEEL (VEHS/MIN)	CAPACITY (VEHS/MIN)	DEGREE OF SAT (RFC)	QUEUE AT END OF SEGMENT MEAN (PHASE AVERAGED) (VEHS/LANE)	MAXIMUM (END OF RED) (VEHS/LANE)	QUEUEING DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	I
I	ARM	LANES								I

I	08.00-08.15									I
I	A 1	L	2.72	10.45	0.260	0.9	2.6	14.1		I
I	2	S	6.94	13.08	0.531	2.9	7.0	43.6		I
I	B 1	L R	7.22	10.31	0.701	5.0	9.7	74.2		I
I	C 1	S R	9.81	14.52	0.675	3.3	7.7	49.2		I

I	08.15-08.30									I
I	A 1	L	3.33	12.12	0.274	1.2	3.8	18.4		I
I	2	S	8.50	15.18	0.560	3.9	9.9	58.7		I
I	B 1	L R	8.85	10.32	0.858	9.0	16.0	134.1		I
I	C 1	S R	12.01	13.57	0.885	7.9	13.8	115.4		I

I	08.30-08.45									I
I	A 1	L	3.33	12.12	0.274	1.2	3.8	18.4		I
I	2	S	8.50	15.18	0.560	3.9	9.9	58.7		I
I	B 1	L R	8.85	10.32	0.858	9.2	16.2	140.3		I
I	C 1	S R	12.01	13.57	0.885	8.2	14.0	125.7		I

I	08.45-09.00									I
I	A 1	L	2.72	10.45	0.260	0.9	2.6	14.1		I
I	2	S	6.94	13.08	0.531	2.9	7.0	43.8		I
I	B 1	L R	7.22	10.31	0.701	5.1	9.8	77.5		I
I	C 1	S R	9.81	14.52	0.675	3.3	7.7	51.9		I

.QUEUES FOR ARM A

TIME SEGMENT ENDING	LANE	NUMBER OF VEHICLES IN QUEUE		
		MEAN (PHASE AVERAGED)	MAXIMUM (AT END OF RED)	
		*	+	
08.15	2	2.9	7.0	*****
	1	0.9	2.6	***
08.30	2	3.9	9.9	*****
	1	1.2	3.8	***
08.45	2	3.9	9.9	*****

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1      1.2      3.8      *+++
09.00  2      2.9      7.0      ***++++
1      0.9      2.6      **+
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.QUEUES FOR ARM B

TIME SEGMENT ENDING	LANE	NUMBER OF MEAN (PHASE AVERAGED)	VEHICLES MAXIMUM (AT END OF RED)	IN QUEUE
		*	+	
08.15	1	5.0	9.7	*****+++++
08.30	1	9.0	16.0	*****+++++
08.45	1	9.2	16.2	*****+++++
09.00	1	5.1	9.8	*****+++++

.QUEUES FOR ARM C

TIME SEGMENT ENDING	LANE	NUMBER OF MEAN (PHASE AVERAGED)	VEHICLES MAXIMUM (AT END OF RED)	IN QUEUE
		*	+	
08.15	1	3.3	7.7	***+++++
08.30	1	7.9	13.8	*****+++++
08.45	1	8.2	14.0	*****+++++
09.00	1	3.3	7.7	***+++++

.QUEUEING DELAY INFORMATION OVER WHOLE PERIOD (08.00-09.00)

I	STREAM	I	TOTAL DEMAND	I	* QUEUEING *	I	* INCLUSIVE QUEUEING *	I
I	I	I	(EXCL 2-WHEEL)	I	* DELAY *	I	* DELAY *	I
I	I	I	(VEH)	I	(VEH/H)	I	(MIN)	I
I	I	I	(VEH)	I	(VEH/H)	I	(MIN)	I
I	A-B	I	181.3	I	181.3	I	65.0	I
I	A-C	I	463.2	I	463.2	I	204.7	I
I	B-C	I	242.1	I	242.1	I	214.0	I
I	B-A	I	240.1	I	240.1	I	212.2	I
I	C-A	I	483.2	I	483.2	I	252.6	I
I	C-B	I	171.3	I	171.3	I	89.6	I
I	ALL	I	1781.2	I	1781.2	I	1038.1	I

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
 * INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
 * THESE WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

* TOTAL GEOMETRIC DELAY INCLUDES DELAY SUFFERED BY VEHICLES STILL QUEUEING AT THE END OF THE WHOLE TIME PERIOD.
 * THE SUM OF DELAYS FOR EACH SEGMENT AND THE TOTAL GEOMETRIC DELAY WILL BE SIGNIFICANTLY DIFFERENT ONLY IF THERE IS
 * A LARGE QUEUE AT THE END OF THE TIME PERIOD.

***** OSCADY 5 run completed
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