Councillors Harris and Kulczycki disclosed at Item 3 of the Agenda "Disclosure of Interest" an Impartiality Interest in the following item in accordance with Regulation 22 of the *Local Government (Model Code of Conduct) Regulations 2021 (WA)*.

12.1 Golden Gateway Local Structure Plan

Voting Requirement	:	Simple Majority
Subject Index	:	116/113
Location/Property Index	:	Various Lots
Application Index	:	N/A
Disclosure of any Interest	:	N/A
Previous Items	:	28 August 2018 Ordinary Council Meeting Item 12.1. 26 February 2019 Ordinary Council Meeting Item 12.6. 23 June 2020 Ordinary Council Meeting Item 12.2. 27 August 2024 Ordinary Council Meeting Item 12.2
Applicant	:	City of Belmont
Owner	:	State Government, Local Government and Various Private Landowners
Responsible Division	:	Development and Communities

Council role

Legislative	Includes adopting local laws, local planning schemes and policies.

Purpose of report

For Council to make a recommendation to the WAPC on the draft Golden Gateway Local Structure Plan (LSP) following public advertising.

Summary and key issues

- The Golden Gateway LSP has been prepared to coordinate the future subdivision, zoning and development of a portion of land in Ascot.
- Council considered the draft LSP following public advertising at the 23 June 2020 Ordinary Council Meeting (OCM). At this meeting, Council resolved to investigate and make modifications to the draft LSP.

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- Following investigations, the following aspects of the draft LSP were modified:
    - The road network;
    - The Central Belmont Main Drain and Public Open Space;
    - Built form controls that consider current and future development feasibility; and
    - The designation of Perth Racing landholdings as subject to a separate planning process.
- At the 27 August 2024 OCM, Council resolved to readvertise the modified draft LSP.
- Advertising occurred for 42 days from 19 September 2024 to 1 November 2024. A total of 34 submissions were received.
- The submissions have been reviewed and there are no substantive changes recommended to the LSP to address the matters raised. However, several minor changes have been identified including:
    - Administrative corrections to table numbers and images;
    - Updates to sustainability provisions to allow alternative measures;
    - Refinements to pedestrian infrastructure investigations;
    - Adjustments to education planning details to address input from the Department of Education; and
    - Amendments to landscaping species.
- It is recommended that Council endorses the revised draft Golden Gateway LSP for approval by the Western Australian Planning Commission (WAPC).

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Note: Cr Kulzycki put forward the following Alternative Motion

Alternative Councillor Recommendation

Kulczycki moved, Sessions seconded

That Council:

1. Pursuant to Schedule 2, Part 4 Clause 20 of the Planning and Development (Local Planning Schemes) Regulations 2015 (WA), recommend the draft Golden Gateway Local Structure Plan (Attachment 12.1.1) and supporting technical appendices (Attachments 12.1.2 through 12.1.6), incorporating the modifications detailed in Attachment 12.1.10, is approved by the Western Australian Planning Commission subject to removing the proposed speed zone of 30 km/hour.
2. Direct the Chief Executive Officer to investigate the provision of a Development Contribution Plan for the purpose of implementing over/underpass infrastructure between the Golden Gateway precinct and Stoneham Street and Great Eastern Highway, and report the preliminary findings to Council for consideration on whether to include this in a future scheme amendment.

Reasons

- The proposed modifications support the City's strategic vision for the Golden Gateway precinct as a vibrant area of residential and mixed-use development.
- Improving pedestrian and cyclist infrastructure, including overpasses or underpasses, will facilitate safer and more efficient movement into and out of the Golden Gateway precinct. This aligns with the draft Local Structure Plan's vision to provide "strengthened connections to the Swan River and Ascot Waters."
- Establishing direct links to the Belmont Trust land offers residents valuable recreational opportunities, enhancing the precinct's appeal. The Belmont Trust Land is intended for public enjoyment and recreation, providing a significant amenity for future residents and visitors.
- By promoting infrastructure that encourages walking and cycling, the motion supports sustainable transport options, potentially reducing traffic congestion and environmental impact.
- Improved accessibility is likely to attract more visitors, thereby expanding the customer base for local businesses and stimulating economic development within the precinct.
- Integrating a Development Contribution Plan within the Local Planning Scheme revision ensures that infrastructure costs are equitably shared among developers, facilitating the timely provision of essential public amenity.

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- Deferring to Main Roads or independent traffic engineers to determine appropriate speed limits ensures that decisions are grounded in evidence-based traffic data and modelling, promoting optimal safety and efficiency.
- Enhanced access to recreational spaces and improved safety measures contribute positively to the health and well-being of current and future residents.

Lost 5 votes to 4

Casting Vote Against: Mayor Rossi

For: Davis, Kulczycki, Marks and Sessions

Against: Harris, Rossi, Ryan and Sekulla

Officer Recommendation

Harris moved, Sessions seconded

That Council, pursuant to Schedule 2, Part 4, Clause 20 of the *Planning and Development (Local Planning Schemes) Regulations 2015*, recommend the draft Golden Gateway Local Structure Plan (Attachment 12.1.1) and supporting technical appendices (Attachments 12.1.2 through 12.1.6), incorporating the modifications detailed in Attachment 12.1.10, is approved by the Western Australian Planning Commission.

Carried 5 votes to 3

For: Davis, Harris, Marks, Ryan and Sessions

Against: Kulczycki, Rossi and Sekulla

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Location

The draft Golden Gateway LSP encompasses land generally bound by Great Eastern Highway (GEH), the Swan River, Resolution Drive (north), Grandstand Road (north), the south-eastern boundary of Ascot Racecourse, Carbine Street and Hardey Road as reflected in Figure 1 below.

Although the Belmont Trust Land is not subject to development controls under the LSP, it is included within the precinct due to its potential for providing public open space and connectivity to the Swan River.

Figure 1: Golden Gateway Local Structure Plan Area (outlined red)

Consultation

The draft Golden Gateway LSP was first advertised in October 2019. Following advertising and consideration of submissions, Council at the 23 June 2020 OCM, resolved to investigate and make modifications to the draft LSP and supporting reports.

At the 27 August 2024 OCM, Council endorsed readvertising of the modified draft LSP. The LSP was advertised for 42 days from 19 September 2024 to 1 November 2024 by:

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- Sending letters to relevant State agencies, previous submitters, and landowners and occupiers of properties outlined in Figure 2. This area is consistent with the previous referral area.
- Publishing a public notice in the 19 September 2024 edition of the PerthNow newspaper.
- Displaying a public notice and information on the City's website, Belmont Connect and at the Civic Centre.
- Erecting one advertising sign along Stoneham Street and one along Resolution Drive; and
- Posting information on the City's Facebook page.

Figure 2: Referral Area

At the close of the advertising period, a total of 34 submissions were received. A summary of the submissions received, and the officer response are included in the Schedule of Submissions contained as Attachment 12.1.8 and Confidential Attachment 12.1.9.

Key matters raised in the submissions relate to:

- Movement network and parking
- Building heights
- Sustainability provisions
- The City's infill targets
- Public open space

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- Landscaping
- Amenity
- Capacity of existing infrastructure to support development.

Strategic Community Plan implications

In accordance with the 2024–2034 Strategic Community Plan:

Key Performance Area: Place

Outcome: 6. Sustainable population growth with responsible urban planning.

Key Performance Area: Performance

Outcome: 11. A happy, well informed and engaged community.

Policy implications

There are no policy implications associated with this report.

Statutory environment

Strategic Planning Framework

Perth and Peel @ 3.5 Million

The State's 'Perth and Peel @ 3.5 Million' impacts upon the statutory direction for the City.

The Perth and Peel region will need to accommodate significant population growth by 2050 with an additional 1.5 million people requiring approximately 800,000 new homes. The 'Perth and Peel @ 3.5 million' strategic planning framework requires 47% of this growth to be delivered through infill developments. It identifies that the City of Belmont population will increase from 37,360 to 60,260 people by 2050 and to accommodate that increase an additional 10,410 dwellings will be required.

Perth and Peel @ 3.5 Million promotes the concept of 'urban corridors' as a way of achieving integrated land use and transport outcomes. Great Eastern Highway is identified as an 'urban corridor' and abuts the Golden Gateway LSP area. The framework suggests that land around urban corridors is appropriate for increased residential densities and mixed land uses.

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City of Belmont Local Planning Strategy

The City of Belmont Local Planning Strategy is the strategic planning document that broadly sets out the long-term planning direction for the City. The Strategy also informed the preparation of Local Planning Scheme No. 15 (LPS 15). The key objectives of the Local Planning Strategy and its supporting sub-strategies as relevant to the Golden Gateway precinct are as follows:

- Enhance the north-west entrance to the City.
- Encourage landmark development.
- Produce a Structure Plan and Implementation Plan for the locality.
- Utilise the development process to rationalise and improve traffic access to commercial properties along GEH.
- Provide for higher density residential development along GEH, in addition to mixed use, landmark buildings that create an entry statement and a high standard of urban amenity.
- Acknowledge that Ascot Racecourse and the Swan River are 'strategic tourism sites' of State significance to benefit future tourism development.
- Recognise the importance of the river for transport, commerce, tourism and leisure as well as its conservation values.

Great Eastern Highway Urban Corridor Strategy

The GEH Urban Corridor Strategy was endorsed by Council at the 22 October 2024 OCM (Item 12.3). The Strategy establishes a 'vision' for the GEH corridor and proposes a series of implementation strategies to deliver this. It identifies four precincts along GEH and provides guidance on their development. Precinct 2 includes the section of GEH between Belmont Avenue and Hardey Road, of which the northern side of the highway falls within the Golden Gateway precinct.

The Strategy identifies this area as an 'activity node', which is envisioned to be developed as a creative hub comprising a mixture of commercial uses, civic spaces, offices, professional and technical service uses. Cafes and restaurants are also envisaged to emerge as the local workforce grows and will also be supported by higher density residential development.

Activity Centre Planning Strategy

The Activity Centre Planning Strategy (ACPS) has been prepared to guide the future planning and coordination of activity centres within the City of Belmont.

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The ACPS identifies a future local centre within the Golden Gateway precinct, which includes a portion of Perth Racing's land.

Statutory Planning Framework

Metropolitan Region Scheme

Under the Metropolitan Region Scheme (MRS), the area is primarily zoned 'Urban', with a portion of land abutting the Swan River reserved for 'Parks and Recreation' and located within the Swan River Development Control Area. Great Eastern Highway, which abuts the precinct, is reserved as a 'Primary Regional Road' under the MRS and is controlled by Main Roads Western Australia (MRWA).

Planning and Development Act 2005 (WA)

Part 10, Division 3, Section 153 of the *Planning and Development Act 2005* (WA) provides for the Commission to impose conditions as part of a subdivision approval for four lots or more which requires:

- A portion of land to be set aside for parks, recreation grounds or open space.
- A landowner to make a payment to the local government in lieu of providing public open space.

Section 154 of the Act requires money received by a local government to be paid into a separate reserve account established and maintained under the *Local Government Act 1995* (WA). The Act requires this money to be applied:

- For the purchase of land for parks, recreation grounds or open spaces by the local government in the vicinity of which it was received.
- In repaying any loans raised by the local government for the purchase of such land.
- With the approval of the Minister for the improvement or development as parks, recreation grounds or open spaces vested in or administered by the local government for those purposes.

Planning and Development (Local Planning Schemes) Regulations 2015 (WA)

Part 4, Schedule 2 – Deemed Provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015* (WA) (the Regulations) outlines the procedure for the preparation, advertising and consideration of a structure plan. The key requirements under Part 4 of the Regulations are as follows:

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- The local government must advertise a structure plan for at least 42 days unless otherwise approved by the WAPC.
- Within 60 days (or an alternative date agreed to by Department of Planning, Lands and Heritage) from the last day for making submissions, the local government must consider all submissions made on the proposed structure plan and prepare a report for the WAPC which includes the following:
    - A list of the submissions considered by the local government;
    - Any comments by the local government in respect of those submissions;
    - A schedule of any proposed modifications to address issues raised in the submissions;
    - The local government's assessment of the proposal based on appropriate planning principles; and
    - A recommendation by the local government on whether the proposed structure plan should be approved by the WAPC.
- If the WAPC is not given a report on a proposed structure plan they may make a decision on the proposed structure plan in the absence of a report. In making a decision, the WAPC may request technical advice or further information from the local government and if the local government fails to provide this, the WAPC may obtain the information themselves. If the WAPC incur any costs during this process, they may seek to recover these from the local government.
- The local government may advertise any modifications proposed to the structure plan to address issues raised by submissions; however it cannot advertise modifications on more than one occasion without approval from the WAPC.
- On receipt of a report on a proposed structure plan from the local government, the WAPC must within 120 days, consider the plan and determine whether to approve the structure plan, require the structure plan to be modified or refuse the structure plan.
- The WAPC may direct the local government to readvertise the structure plan where it considers that major modifications have been made; however, it cannot direct the local government to readvertise the structure plan on more than one occasion.

It should be noted that the Regulations stipulate that a local government cannot advertise modifications more than once without approval from the WAPC. Therefore, the LSP cannot be advertised again unless consent from the WAPC is provided.

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Local Planning Scheme No. 15

Private landholdings within the precinct are predominantly zoned 'Mixed Use' under LPS 15, with parcels of Perth Racing land zoned 'Place of Public Assembly'. In addition, the open drain abutting Resolution Drive is reserved as 'Parks and Recreation' and various parcels of Crown land and road reserves are reserved as 'Local Roads' under LPS 15. Figure 3 illustrates the existing zoning of the precinct.

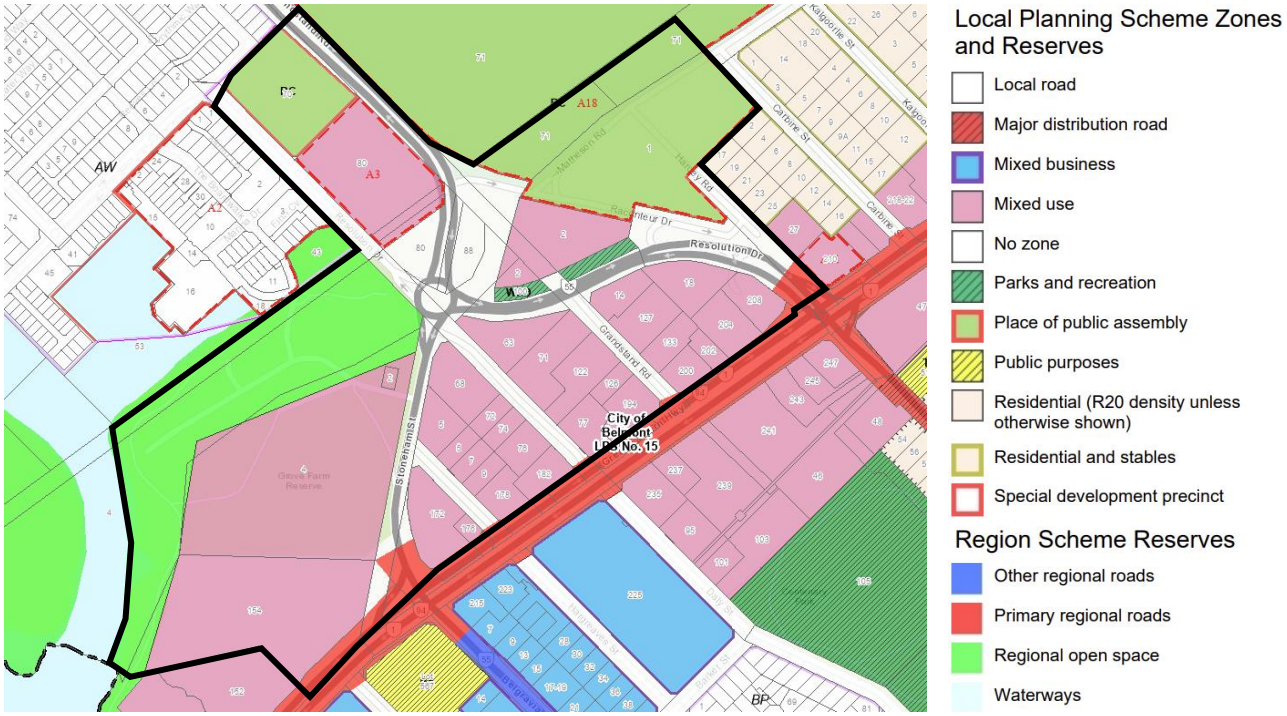

Figure 3: Extract of Scheme map

State Planning Policy 7.3 – Residential Design Codes

The Residential Design Codes (R-Codes) establish built form controls for all residential development within Western Australia and are used in the assessment of residential development and subdivision proposals. Volume 1 of the R-Codes establishes standards for single houses, grouped dwellings, and multiple dwellings up to R60. Volume 2 of the R-Codes specifically relates to multiple dwelling developments at the R80 code and above.

Liveable Neighbourhoods

Liveable Neighbourhoods is an operational policy that guides planning in greenfield and large urban infill areas. It provides guidance on the design of movement networks, activity centres, subdivision design and public open space provision.

Liveable Neighbourhoods typically requires a minimum contribution of 10% of the gross subdivisible area to be given up free of cost for public open space.

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However, in the case of mixed-use development, there is no minimum requirement for the provision of public open space. Instead, Liveable Neighbourhoods outlines that public open space contribution is to be determined by the WAPC on a case-by-case basis having regard to:

- The amount of mixed uses proposed and the potential number of residents;
- The amount of public open space available in 300m of the mixed-use area;
- The proportion of the mixed-use area likely to be used for non-residential purposes; and
- The level of innovation and quality of the resultant urban form in neighbourhood and town centres.

Background

Golden Gateway Precinct

In 2008, the Golden Gateway precinct was identified as a key strategic area due to its prominent position on GEH and at the north-western 'gateway' of the City of Belmont. It was recognised that there was significant potential for high quality mixed commercial and residential development in the location, however existing site access constraints and land fragmentation made it apparent that coordinated planning was required in the form of a structure plan.

Golden Gateway Local Structure Plan

The LSP was prepared to address the following:

- The proposed zoning, reservation and density coding of land within the precinct, and prescribe the suitability of certain land uses.
- Built form controls including plot ratio, minimum and maximum building height, setbacks and car parking requirements.
- The provision of public open space and public realm improvements.
- The identification of a road hierarchy and movement network for vehicles, pedestrians and cyclists, as well as the consideration of street design and traffic management.
- Strategies for the management and treatment of stormwater runoff within the precinct.

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- The identification of infrastructure and servicing requirements for the redevelopment of the precinct.
- Requirements to facilitate implementation of the draft LSP.

Council resolved to advertise the draft LSP at the 26 February 2019 OCM.

At the 23 June 2020 OCM, Council resolved to investigate various matters and undertake a number of modifications prior to readvertising. Following investigations, the draft LSP was revised with key modifications relating to:

- The road network;
- The Central Belmont Main Drain and Public Open Space;
- Built form controls that consider current and future development feasibility; and
- The designation of Perth Racing landholdings as subject to a separate planning process.

A detailed description of these modifications is included in the Minutes of the 27 August 2024 OCM (Attachment 12.1.7). At the August 2024 OCM, Council resolved to readvertise the modified draft LSP. Advertising occurred for 42 days from 19 September 2024 to 1 November 2024.

The following attachments are associated with this report:

- Attachment 12.1.1 contains a copy of the draft LSP.
- Attachments 12.1.2, 12.1.3, 12.1.4, 12.1.5, and 12.1.6 include the technical appendices.
- Attachment 12.1.7 contains a copy of the 27 August 2024 OCM Minutes.
- Attachment 12.1.8 contains a copy of the Schedule of Submissions.
- Attachment 12.1.9 is a confidential attachment and is a schedule of submissions with submitters names and addresses.
- Attachment 12.1.10 contains a copy of the Schedule of Modifications.
- Attachment 12.1.11 is a confidential attachment and is a consultant's feasibility study.

Report

Several important aspects need to be considered, including procedural requirements, the current planning framework, and matters raised in submissions.

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Procedural Considerations

There are several key procedural considerations that are applicable to this matter. These are set out below.

Proper and Orderly decision making

It is important that the Council undertakes its role in providing a recommendation to the WAPC based on sound planning principles.

This approach is reiterated in the structure plan section of the Regulations, which outlines that the consideration of the matter is to be based on planning principles. The primary planning principle that applies to decision making in this context is that of proper and orderly planning.

This means decisions are approached in a manner that is disciplined, methodical, logical, and systematic, and not haphazard or capricious.

In the context of Council's role in making a recommendation, this principle highlights the importance of ensuring that decisions are based on well supported information, aligned with the broader planning framework and grounded in a strong planning rationale.

Taking a proper and orderly approach to reaching a recommendation ensures that the Council's recommendation cannot be easily dismissed.

Timeframes

The City is required to consider all submissions and prepare a report for the WAPC within 60 days of the close of advertising, unless an extended timeframe has been granted. The WAPC has granted an extension to the City until 28 February 2025. Consequently, Council cannot defer this matter beyond the February OCM.

Scope of role

It should be noted that the draft LSP cannot be advertised again unless directed by the WAPC. Therefore, the scope of Council's role at this stage is to provide a recommendation to the WAPC.

If no recommendation is made by Council, the WAPC can determine the matter without Council's input or views. Furthermore, the City may be liable for any costs incurred by the WAPC in finalising the matter.

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Current Planning Framework

When considering this LSP, it is important to note that the current planning framework under LPS 15 does not contain provisions relating to the following matters:

- Height
- Density
- Plot ratio
- Built form controls.

While many submitters have raised concerns about the above matters, it is important to clarify that this plan seeks to provide guidance on these matters, as there are currently no prescribed limits under the existing planning framework. This context is helpful to consider when reviewing the matters raised in the submissions below.

Traffic

Several submissions raised concerns regarding:

- Increased traffic congestion and delays at key intersections;
- Suitability of pedestrian crossing points on Stoneham Street and GEH;
- Reliance on alternative modes of transport; and
- The adequacy of parking provisions.

These matters are further discussed below.

Traffic Congestion

Several submissions raised concerns about increased traffic and congestion, specifically roundabout safety and delays crossing GEH at Stoneham Street and Resolution Drive. In response, the following points are relevant:

- A Movement and Access Strategy has been prepared to assess the existing and proposed road network during weekday peak hours across various land use scenarios.
- The Stoneham Street/GEH/Belgravia Street and the Resolution Drive/GEH/Hardey Road intersections currently experience varying levels of congestion.
- The Stoneham Street intersection sees the GEH approaches operating with acceptable to moderate delays, with Belgravia/Stoneham Streets

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experiencing poor to very poor delays. The Resolution Drive intersection has the GEH approaches operating at moderate delays, with Hardey Road/Resolution Drive experiencing moderate to poor delays. By 2041, the level of service at both intersections is projected to decrease, irrespective of development within the Golden Gateway precinct. This is reflective of the regional level role of these intersections within the broader road network.

- Modelling indicates that the roundabout at Grandstand Road, Resolution Drive, and Stoneham Street will continue to operate satisfactorily. While the performance of the roundabout will decrease due to development within the Golden Gateway precinct, the intersection will maintain an acceptable level of service.
- While the roundabout at Waterway Crescent, Garratt Road, and Grandstand Road lies outside the scope of this LSP, modelling shows that Grandstand Road will maintain adequate capacity in 2041.
- The precinct consists of both local and regional roads. The responsibility of regional roads and regional level traffic network functionality ultimately rests with MRWA.
- It is important to note that significant development can already occur within the precinct. The LSP is intended to coordinate this development, rather than provide for increased development potential.
- Dependant on size, scale and number of vehicle movements, future developments may require a Traffic Impact Assessment or Statement. This will allow the specific potential traffic impacts to be further considered.

In light of the above, no modifications are required to the LSP.

Pedestrian Crossing of Stoneham Street and Great Eastern Highway

The Movement and Access Strategy proposes several improvements to pedestrian infrastructure, including reducing traffic speeds, enhancing path connectivity, increasing tree canopy coverage to create a more pleasant walking environment, and upgrading crossing points (visualised in Figure 4). Submitters raised concerns about pedestrian crossing points at Stoneham Street and GEH, as outlined further below.

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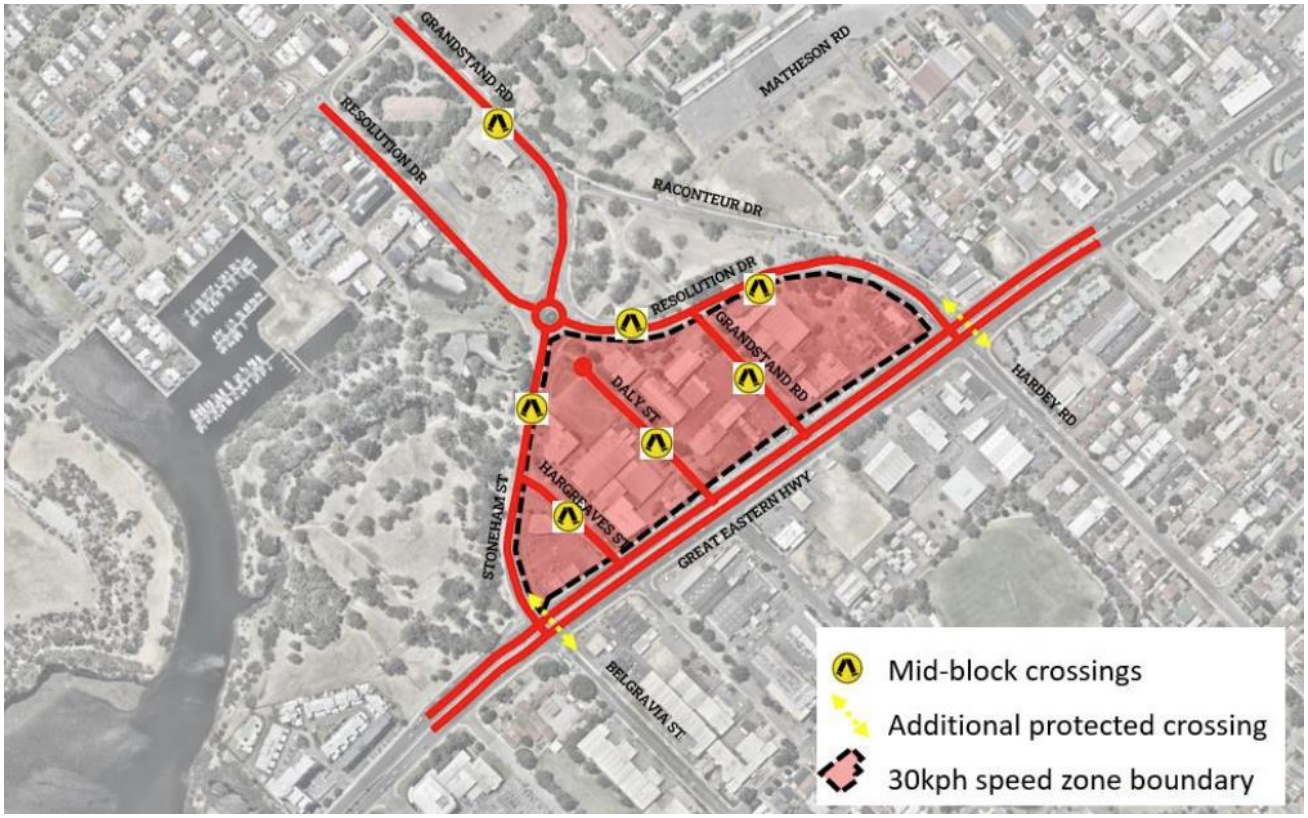

Figure 4: Recommended Pedestrian and Cyclist Facilities

Stoneham Street

Several submitters raised concerns about crossing Stoneham Street, with some suggesting an overpass or underpass, and one proposing that Stoneham Street be converted into parkland. In response, the following points are relevant:

- Stoneham Street cannot be converted into parkland, as it is essential for efficient vehicle access through the precinct.
- The Movement and Access Strategy recommends improvements to pedestrian crossing points, which, in addition to the pedestrian crossing at the traffic lights of Stoneham Street and GEH, proposes a mid-block crossing on Stoneham Street.
- There may be an opportunity to establish a pedestrian overpass or underpass across Stoneham Street to improve connectivity. This infrastructure would require detailed design and further investigation, including the preparation of a funding strategy. The funding strategy could involve establishing a Development Contribution Area, enabling the inclusion of the overpass or underpass as an infrastructure item in a Development Contribution Plan, funded by future developers. Updates to the LSP and the Movement and Access Strategy are proposed to reflect this.

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Having regard to the above, safe pedestrian crossing points on Stoneham Street are addressed by the LSP and proposed modifications.

Great Eastern Highway

Currently, signalised pedestrian crossings on GEH are only available at the intersections with Resolution Drive/Hardey Road and Stoneham Street/Belgravia Street on the western approach. Several submissions requested improved pedestrian crossings along the GEH corridor, with one proposing an underpass and another advocating for an overpass. The Movement and Access Strategy recommends investigating additional protected crossings (traffic signals with refuge islands). Furthermore, the GEH Urban Corridor Strategy identifies a potential overpass near Daly Street. As such no modifications are required to the LSP. If the LSP is approved by the WAPC, the City will work with MRWA to explore options for improving pedestrian crossing points.

Reliance on Alternative Modes of Transport

Several submissions raised concerns about relying on alternative modes of transport, with one questioning how the City will encourage the use of public transportation. In response, the following points regarding public transport are relevant:

- The Golden Gateway precinct is currently serviced by bus routes 293, 940, 998, and 999. Route 940 also operates at high frequency (every
- 10–15 minutes) along GEH, traveling between Elizabeth Quay Bus Station and Redcliffe Station. Bus Route 293 also operates along GEH, adjacent to the precinct providing a service between Belmont Forum and Redcliffe Station. Routes 998 and 999 form the Circle route, providing a
- high-frequency connection (typically every 10–15 minutes) around Perth, linking inner suburbs, major activity centres, key land uses, and public transport hubs.
- The precinct is adequately serviced by bus routes to and from key destinations. Bus stops for these routes are identified on Figure 5.

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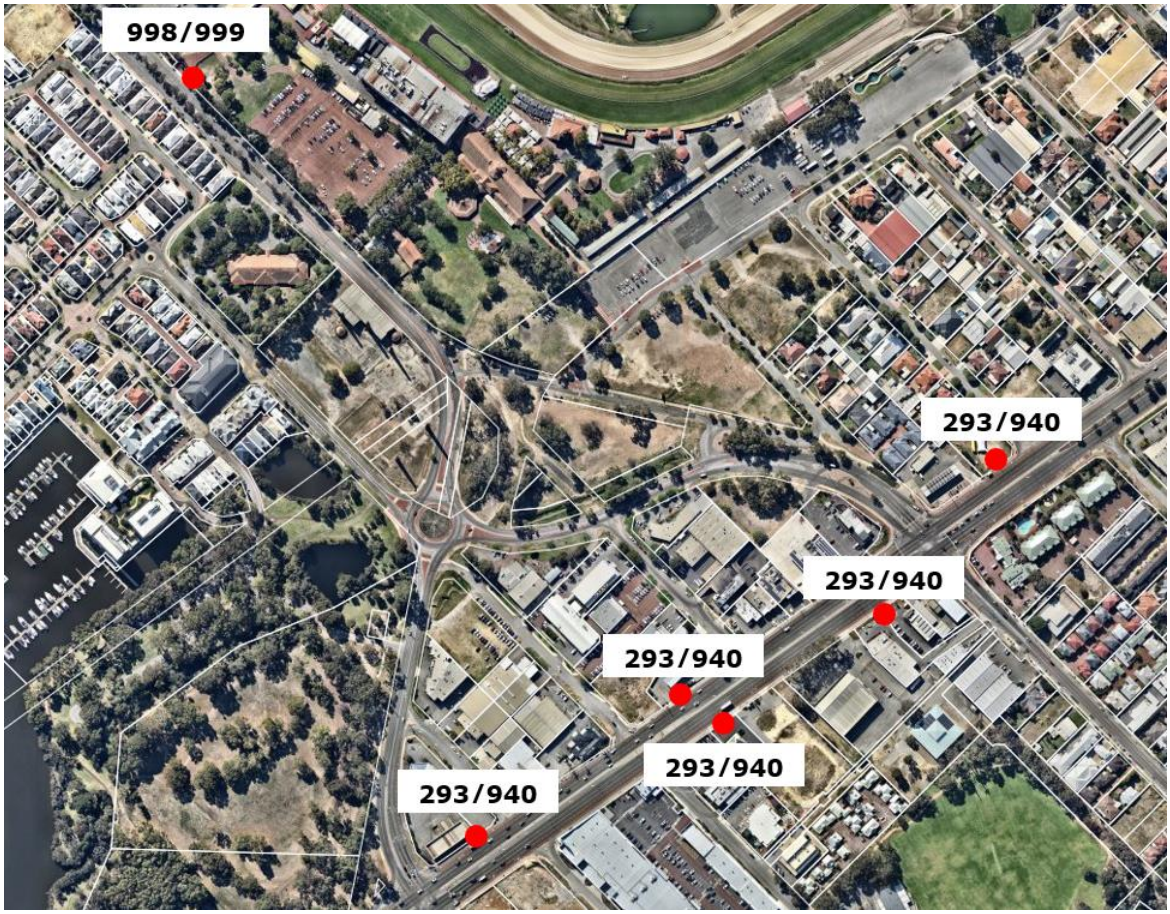

Figure 5: Bus Stop Locations

- There are opportunities for increased service levels in the future. Therefore, the LSP advocates for improved bus services and the exploration of other transit options, such as a superbus or trackless tram. The City's ACPS also supports these initiatives, with actions to monitor land use and collaborate with the Public Transport Authority (PTA) to assess the need for additional transport services as development progresses.
- The City's ACPS also includes an action to implement travel behaviour programs to encourage the use of alternative modes of transport.

Additionally, the draft LSP includes other measures to promote the use of alternative modes of transport which will be further investigated including:

- A 30km/h speed zone across the precinct (excluding Grandstand Road and Stoneham Street as main traffic routes) to enhance the walking and cycling environment.
- Raised zebra crossings for improved pedestrian safety.
- Completion of shared path networks and long-term cycling routes.
- Increased tree canopy coverage to create a more pleasant walking and cycling environment.

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- Facilitating local amenities within a short and pleasant walking or cycling distance.
- Facilitating a bike/electric scooter and car share scheme for private developments.

These strategies aim to support a sustainable and well-connected precinct. Accordingly, no modifications to the LSP are required.

Parking

The draft LSP contains minimum parking requirements. Submitters raised concerns about the adequacy and suitability of these standards, citing potential on-street parking issues within Ascot Waters and competition between commercial and residential bays. In response, the following points are relevant:

- The proposed residential parking standards are consistent with the State Planning Policy 7.3 - Residential Design Codes. As a State Planning Policy, a subservient planning instrument it is not appropriate for this LSP to exceed these requirements. It is considered that there are no factors in the precinct that present a reasonable planning basis to do so.
- The proposed non-residential parking standards are consistent with LPS 15. It is noted that these existing scheme standards exceed the recently WAPC endorsed, Non-Residential Car Parking Rates for Perth and Peel.
- The proposed parking standards are deemed appropriate given the proximity of future development to high-frequency transit routes.
- The draft LSP also aims to reduce reliance on private vehicles by enhancing pedestrian and cyclist connections and advocating for improvements to public transport.
- For mixed-use developments, the draft LSP requires residential parking above one bay per dwelling and at least 50% of non-residential parking to be unallocated communal bays, enabling shared use between residential and commercial needs. Developers must prepare a Car Parking Strategy to manage these bays, including access hours, signage, and monitoring.
- Developers may exceed the minimum parking provisions if additional spaces are designed for future conversion into habitable or usable space. This requirement may be waived if compliance is impractical or would result in a less desirable outcome.
- The City can monitor parking in the precinct and surrounding areas as development progresses.

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- Development proposals will all require a planning application and parking will be assessed for each of these on a case-by-case basis.

Having regard to the above, the parking standards included within the draft LSP are considered appropriate and don't require modification.

Building Heights

Following a review of the draft GEH Urban Corridor Strategy at the September 2023 OCM (Item 12.2), Council directed officers to investigate building scales to ensure they align with current market conditions and future trends. As detailed below, these investigations were completed, and the revised plan was advertised with 15-storeys along GEH and 10-storeys for the remaining land bound by Resolution Drive, Stoneham Street, and GEH, as visualised in Figure 6.

Figure 6: Building Height Plan

Several submissions raised the following concerns regarding the proposed building heights:

- They would be inconsistent with the character of the surrounding locality.
- Such development could occur elsewhere.
- The recent 8-storey development at 16 Marina Drive was referenced as setting a precedent, suggesting this should be the maximum height allowed.

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- The 23 June 2020 Council decision to amend the LSP to include 6 and
- 9-storey heights was cited, with submitters advocating for these heights to be retained.
- The City may be prioritising developer profits over community benefits or acting in its own interests as a landowner in the precinct.

In response to these concerns, the following points are relevant:

- The LSP aims to guide and coordinate future development within the precinct, rather than drive intensification. Currently, there are no specific building height controls in place, apart from the height limits in relation to Perth Airport aircraft operations.
- The area subject to development controls under the draft LSP is a distinct precinct, located approximately 200m from Ascot Waters and well separated from the Residential and Stables area. Therefore, development can occur within the precinct without impacting the amenity of the surrounding areas as discussed further in the Amenity section.
- Perth and Peel @ 3.5 Million encourages urban consolidation along key urban corridors, supporting increased density and development in areas like the Golden Gateway precinct.
- The proposed heights align with existing developments along the Great Eastern Highway Corridor, such as the 20-storey building at 31 Rowe Avenue and the previously approved 16-storey building at the corner of GEH and Belgravia Street. Additionally, the heights align with those for adjacent properties within the GEH Urban Corridor Strategy as illustrated in Figures 7 and 8.

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Figure 7: Corridor Strategy building heights – Precinct 2

Figure 8: Corridor Strategy building heights – Precinct 3

- Investigations in line with Council's direction at the September 2023 OCM highlighted several important considerations including:

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  - Feasibility is currently severely impacted by inflated construction costs and builder capacity constraints. As a result, the viability of apartment projects depends heavily on an increase in property values.
  - Although construction costs continue to rise, market values are not increasing at the same rate. Sites with higher density and building height provisions are likely to be feasible sooner.
  - Without realistic and feasible development controls, developers may submit proposals that exclude residential components or pursue land uses misaligned with the precinct's objectives, such as 'Service Station,' 'Warehouse (self-storage),' or 'Fast Food/Takeaway Outlet'.

- Based on these factors, heights of 10 and 15-storeys with plot ratios of 3:1 and 5:1, respectively, are recommended. These recommendations are supported by input from a property and economic consultant engaged by the City, and the consultant's report has been provided as Confidential Attachment 12.1.11).
- The controls in the draft LSP have been formed considering current and likely future development conditions and to facilitate development over the lifetime of the LSP. Not considering these factors and advancing a plan that cannot realistically be implemented or facilitate development would serve no planning purpose.

In summary, the proposed building heights have been developed through a cogent and methodical process. Considering the above, no modifications are required to the LSP.

Sustainability

The draft LSP promotes sustainability through initiatives such as expanding the urban tree canopy in line with the City's Urban Forest Strategy, retaining vegetation, using low-water plants, and encouraging water harvesting and passive irrigation. Additionally, the LSP includes the opportunity to achieve an additional 5-storeys in building height if certain sustainability and open space criteria are met.

The specific sustainability criteria for the additional building height include:

- Provision of an area of publicly accessible private open space.
- Double glazed windows for all dwellings.

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- The planting of an additional native tree on site, with a pot size between 100L and 200L.
- Provision of conduits and capacity within the electrical distribution system and metering for future electric vehicle charging for each unit.
- A minimum of two electric vehicle charging bays within the development.
- Provision for shared sustainable transport measures, such as electric bikes, scooters, and vehicles.
- A minimum one-star above the energy efficiency requirements for the relevant class of building, as specified in the Nationwide House Energy Rating Scheme (NatHERS).
- Installation of a photovoltaic solar panel system that provides at least 1kW of energy per dwelling.

Several submissions raised concerns about the additional building height criteria, including:

- That all developments should feature excellent design and a high level of sustainability, not just those utilising the additional height.
- Questioning the adequacy of electric vehicle charging infrastructure and recommending that Level 1 charging be required for all bays. They also suggested the inclusion of solar battery storage.
- Requested flexibility in meeting the additional building height criteria, citing challenges in achieving 1kW of solar per dwelling and feasibility issues related to double glazing.

In response:

- All proposals within the precinct will be assessed against Volume 2 of the R-Codes, which includes requirements for tree canopy, deep soil areas, solar access, natural ventilation, energy efficiency, and water conservation. Proposals will also undergo review by the City's Design Review Panel to ensure alignment with the ten design principles of State Planning Policy 7.0, including sustainability. Sustainability will therefore be central to all proposals.
- As a State Planning Policy, a subservient planning instrument such as this LSP should not seek to exceed these requirements. It may only be reasonable if it is optional, and accompanied by a corresponding benefit or compromise. To encourage future development to incorporate these features, the LSP proposes the opportunity for an additional 5-storeys in building height. This approach is consistent with the way other local

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governments have structured their plans to deliver sustainability principles and encourage responsible urban development.

- The WAPC's Electric Vehicle Charging Infrastructure Position Statement supports the inclusion of Level 1 vehicle charging (standard household socket) for all dwellings. However, the installation of conduits and metering to enable future electric vehicle charging provides a greater
- long-term benefit, as it allows for easier upgrades to Level 2 or higher chargers. While Level 1 charging may meet basic needs, it is often insufficient for regular EV use due to slower charging times. Retrofitting a Level 1 system to accommodate Level 2 chargers can be complex and costly, making pre-installed Level 2 infrastructure a more practical option.
- A modification has been proposed to allow flexibility in sustainability requirements by permitting alternative or innovative measures that achieve equal or greater outcomes.
- While battery storage could enhance sustainability, officers note that it is an emerging technology in apartment complexes and presents complexities at this time. However, developers may consider it as an alternative measure.
- Adequate roof space is expected to accommodate 1kW of solar per dwelling. Standard solar panels typically require 5–7m^2 per kW, while high-efficiency panels require approximately 4–5 square metres per kW. For 100 dwellings, this equates to a maximum of 700m^2 of solar panels. For comparison, the 92-unit building at 5 Hawksburn Road, with 1,300m^2 of roof space, has more than enough capacity for 1kW of solar per dwelling and other plant equipment. It is also noted that the requirement for 1kW of solar per dwelling is already required in The Springs under Local Planning Policy No. 7.
- Double glazing is considered a reasonable measure and is included as a standard feature in newly constructed apartments within The Springs.

In summary, the draft LSP incorporates robust sustainability measures to ensure that all proposals align with relevant State Planning Policies. A modification is proposed to allow flexibility, which may result in developers proposing other innovative sustainability measures.

Infill Targets

The Perth and Peel @ 3.5 Million Central Sub Regional Planning Framework requires the City of Belmont to deliver an additional 6,100 dwellings by 2031 and 10,410 dwellings by 2050.

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Several submissions have raised concerns about these targets and the level of development proposed within the area. One submitter suggested that the City should not bear sole responsibility for meeting regional infill targets, while another highlighted that density targets apply city-wide. This submitter also points to 16 Marina Drive in Ascot as a significant contributor to the City meeting its density targets. In response, the following points are relevant:

- While Perth and Peel @ 3.5 Million sets targets for each sub-region, it assigns specific targets to individual local governments, which are required to demonstrate how they will deliver additional housing. The City of Belmont is responsible for meeting its assigned targets.
- Although the density target applies city-wide, Perth and Peel @ 3.5 Million encourages urban consolidation in specific areas, including activity centres, urban corridors, and station precincts. The Golden Gateway precinct, located along the GEH corridor and near a future activity centre, is a suitable area for additional density.
- Infill development will continue gradually within traditional suburban areas through subdivision and land assembly.
- Whilst the City has been able to meet its density targets to date this is largely attributed to development within The Springs precinct.
- With most lots in The Springs now developed, the City of Belmont will need to ensure that strategic projects, such as the draft LSP, are in place to create additional housing opportunities and that incremental development of existing zoned land continues. Without this occurring, meeting its density targets may otherwise become challenging.
- 16 Marina Drive accounted for only 2% of dwellings delivered between 2011 and 2021, and Ascot as a whole contributed 7%. The majority of Belmont's infill occurred in The Springs, and without it, the City would have fallen short of its targets.

While the City has successfully met infill targets to date, projects like the Golden Gateway LSP are necessary to ensure there is a long-term pathway to continue to do so. It is important to note that the Golden Gateway LSP is not the sole initiative to do this, and forms part of a broader approach that includes continued infill development and other projects across the City such as the Redcliffe Station Precinct and the broader GEH Corridor.

Public Open Space

Several submissions raised concerns regarding public open space within the precinct, including a perceived lack of public open space to accommodate new residents and requests for a 10% contribution in line with Liveable

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Neighbourhoods. One submission requested the City retain existing parkland or create new areas while others expressed concern about relying on the Belmont Trust Land for public open space.

The following responses are provided to these comments:

- While Liveable Neighbourhoods typically requires a 10% public open space contribution, this standard does not apply to mixed-use precincts such as Golden Gateway. It requires consideration of existing public open space within 300m of the site. In this case, this includes the Swan River, Belmont Trust Land, and Ascot Kilns.
- In addition to the above, the closure of the Daly Street road reserve provides an opportunity to deliver 525m^2 of new public open space areas within the precinct.
- The Belmont Trust Land is governed by a Declaration of Trust, which requires its use for public enjoyment and recreation. The LSP acknowledges this as an opportunity, with the potential for cash-in-lieu contributions to enhance its function as public open space, subject to Ministerial approval.

In light of the above, no modifications are required to the LSP.

Landscaping

Two submissions requested that the City consider native tree species within the precinct. One of these submissions also raised concerns about the species list in the Public Realm Strategy.

Officers reviewed the proposed species list and note that most species align with the City's *Street Tree Planting Palette 2024*, except for:

- Corymbia calophylla (Marri)
- Phoenix canariensis (Canary Palm)
- Tipuana tipu (South American Rosewood)
- Corymbia ficifolia (Red Flowering Gum)
- Eucalyptus caesia. (Gungurru)

The listed species are generally suitable, except for the Canary Palm, which requires a lengthy establishment period and high ongoing maintenance. Consequently, the schedule of modifications recommends removing the Canary Palm from the Public Realm Strategy's species list.

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Amenity Concerns

Submitters raised several concerns about amenity, including potential loss of character, noise, visual impact, overshadowing, and privacy. In response, the following points are relevant:

- The current amenity level within the Golden Gateway Precinct is relatively low, characterised by unkempt sites, fast food outlets, warehouses, service stations, motor vehicle wash, and open-air parking (see Figures 9-12). The precinct also lacks a distinctive character or sense of place that requires preservation.

Figure 9 – Open Air Vehicle Storage on the corner of Hargreaves Street, GEH and Stoneham Street

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Figure 10 – Vacant Site at the Corner of Daly Street and Stoneham Street

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Figure 11– Motor Vehicle Wash along Grandstand Road

Figure 12 – Service Station along Great Eastern Highway

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- As shown in Figure 13, the precinct subject to development controls under the LSP is separated from Ascot Waters and the Residential and Stables area by Stoneham Street, Resolution Drive, and the Belmont Trust Land. As a result, development is not expected to negatively impact the character, sense of place, or amenity of these areas.

Figure 13 – Separation to Ascot Waters and the residential and stables area

- Noise and privacy concerns were non-specific. Given the separation between the precinct to Ascot Waters and the Residential and Stables area, in addition to the future controls that will be applicable to development, these concerns are not considered to be substantiated.
- Future overshadowing will be directed southward, ensuring no impact on Ascot Waters or the Residential and Stables area.
- Only a limited number of properties in Ascot Waters may have brief views of the future development in line with the proposed controls. However, it is a well-established planning principle that visibility alone does not equate to a detrimental impact on amenity.
- Individual proposals for future development will be subject to assessment, during which the specifics of the proposal, including any potential impacts, will be evaluated against the entire planning framework.

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Overall, development within the precinct is expected to have minimal impact on the area's amenity and will likely enhance it. In light of this, no modifications are required to the LSP.

Infrastructure

Several submissions raised concern that current infrastructure and services would be inadequate to service increased development. In response, it should be noted that an Infrastructure Assessment Report has been prepared in support of the draft LSP. The report clearly indicates that the necessary infrastructure to support future development is either already in place or can be located or provided as required. Additionally, Water Corporation has advised that required upgrades to water and wastewater infrastructure to service the extent of the LSP proposal have been captured in the Infrastructure Assessment Report.

Having regard to the above, infrastructure needs for the proposed development can be effectively met and no modifications are required to the LSP.

Administrative Modifications

Following advertising and a review of the draft LSP, minor administrative changes are recommended as follows:

- Update table numbers and references throughout the LSP report.
- Update Section 3.3.8 to correctly label the cross-section images.
- Update Section 3.6 – Education Facilities to reflect advice received from the Department of Education.

Conclusion

The Golden Gateway LSP has been prepared to coordinate the future subdivision, zoning, and development of land within the precinct. Development undertaken in accordance with the draft LSP is expected to be of high quality and enhance the amenity of the area.

The submissions have been reviewed, and there are no substantive changes recommended to LSP to address the matters raised. However, several minor changes have been identified, including:

- Administrative corrections to table numbers and images;
- Updates to sustainability provisions to allow alternative measures;

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- Refinements to pedestrian infrastructure investigations;
- Adjustments to education planning details to address input from the Department of Education; and
- Amendments to landscaping species.

It is recommended that Council support the draft LSP with modifications, with a recommendation that it is approved by the WAPC.

Financial implications

There are no financial implications evident at this time.

Environmental implications

Environmental implications associated with the LSP are outlined in the Environmental Assessment Report (Attachment 12.1.3).

Social implications

The LSP proposes a number of upgrades to the public realm which is intended to improve the overall amenity of the area.

Attachment details

Attachment No and title
1. Golden Gateway Local Structure Plan [**12.1.1** - 73 pages]
2. Bushfire Management Plan [**12.1.2** - 23 pages]
3. Environmental Assessment Report [**12.1.3** - 34 pages]
4. Movement and Access Strategy [**12.1.4** - 342 pages]
5. Infrastructure Assessment Report [**12.1.5** - 34 pages]
6. Public Realm Strategy [**12.1.6** - 26 pages]
7. Extract of Ordinary Council Meeting 27 August 2024 Minutes [**12.1.7** - 25 pages]
8. Schedule of Submissions [**12.1.8** - 31 pages]
9. CONFIDENTIAL REDACTED - Schedule of Submissions (Confidential matter in accordance with Local Government Act 1995 (WA) Section 5.23(2)(b)) [**12.1.9** - 31 pages]
10. Schedule of Modifications [**12.1.10** - 1 page]
11. CONFIDENTIAL REDACTED - Consultant Report (Confidential matter in accordance with Local Government Act 1995 (WA) Section 5.23(2)(e)) [**12.1.11** - 151 pages]

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Taylor Burrell Barnett

GOLDEN GATEWAY
STRUCTURE PLAN

Prepared for **City of Belmont**
Prepared by **Taylor Burrell Barnett**

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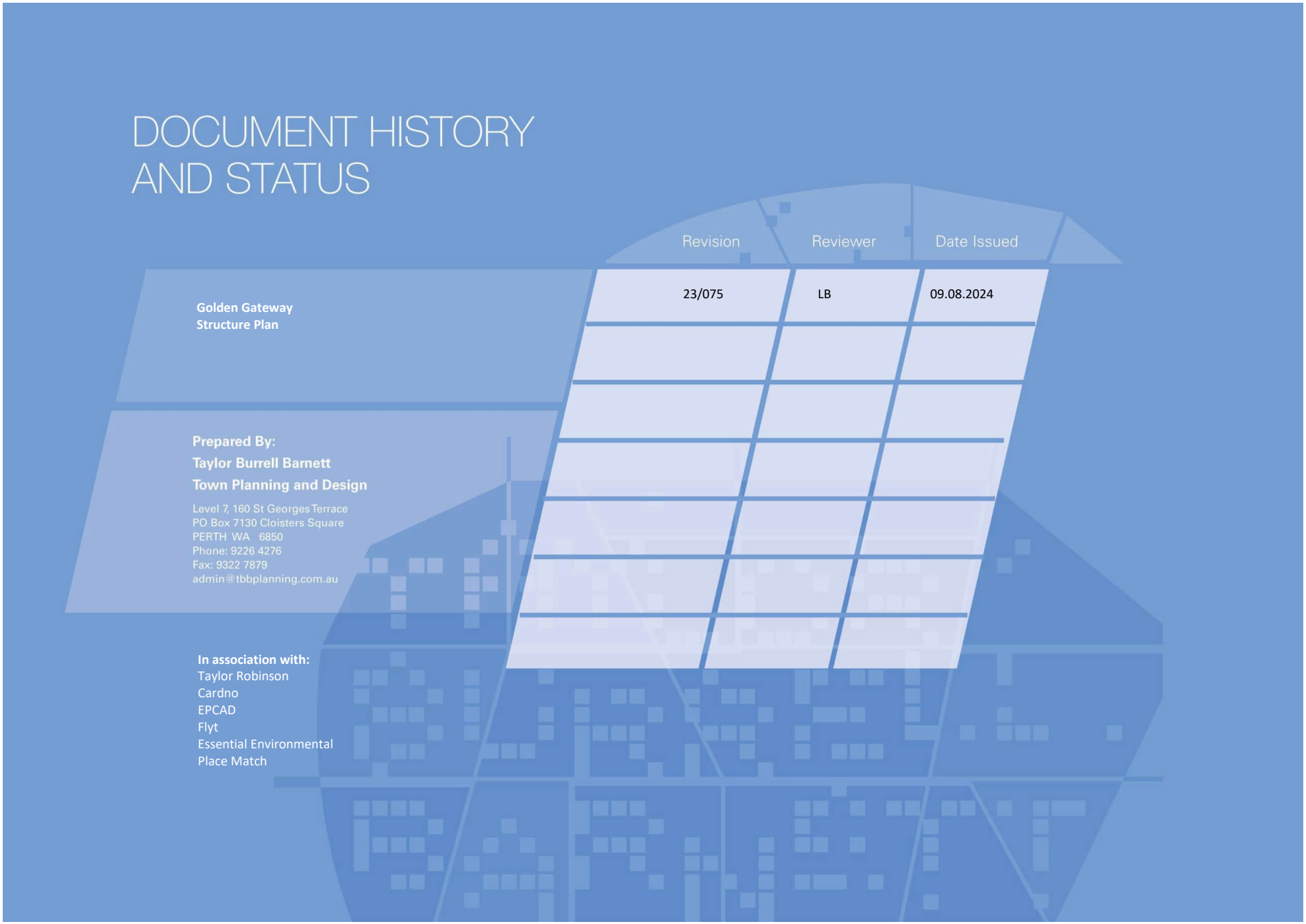

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ENDORSEMENT

This Structure Plan is prepared under the provision of the **City of Belmont Local Planning Scheme No. 15**

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

…… Date

Signed for and on behalf of the Western Australian Planning Commission

……

an officer of the Commission duly authorised by the Commission pursuant to section 16 of the Planning and Development Act 2005 for that purpose, in the presence of:

…… Witness

…… Date

…… Date of Expiry

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TABLE OF AMENDMENTS

Amendment No.	Summary of the Amendment	Amendment Type	Date Approved by WAPC

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EXECUTIVE SUMMARY

This Structure Plan is prepared to guide the subdivision and development of land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan map (hereafter referred to as 'Golden Gateway' or 'Structure Plan area').

The subject land is located:

- Within the municipality of the City of Belmont;
- Approximately 5 kilometres (km) north-east of the Perth Central Business District (CBD) 3km north of Belmont Forum and mixed business area and 5km north-east of Victoria Park entertainment precinct; and
- Approximately 2.5km east of Graham Farmer Freeway and 2km west of Tonkin Highway.

The subject land encompasses a mix of uses comprising mixed business, retail (food and beverage), public uses associated with the Western Australian Turf Club (WATC), Ascot Racecourse and Ascot Kilns, Belmont Charitable Trust Land and Swan River environs. The remainder of the subject land is largely undeveloped and devoid of vegetation.

The development of the Belmont Charitable Trust Land, Ascot Kilns and WATC sites are subject to separate planning processes.

The Ascot Kilns site is owned by the Western Australian Planning Commission (WAPC) and is the subject of a draft Local Development Plan (LDP) and draft Local Planning Policy (LPP) that was considered for final approval by Council at its meeting of 12 December 2017. The draft LDP and LPP details the intended future planning vision for this site with regards to proposed land uses, built form, development standards and the retention of the majority of the heritage listed kilns and chimney structures.

The Belmont Charitable Trust Land is owned by the City of Belmont and managed by the 'Belmont Trust'. This land is not subject to any formal statutory planning processes at this stage and nor is there a specific timeline for the future planning of this land. The future consideration for this land is dependent upon the 'Belmont Trust'.

Land owned by the WATC is subject to a separate planning process.

The Structure Plan proposes development of land for:

- Commercial/Retail uses;
- Residential purposes comprising medium and high residential densities;
- Public Open Space (POS) including foreshore reserve; and
- Access streets.

Item	Data	Structure Plan Ref. (Section No.)
Total area covered by the Structure Plan	30.9223 ha	1.2.3
Area subject to controls under this Structure Plan	22.8822 ha	1.2.3
Area subject to separate planning process	8.0401 ha	1.2.3
Area of each land use proposed: • Residential • Mixed Use	**Hectares** 4.2473 ha 1.7578 ha	3.3
Estimated No. of Dwellings	2,268	3.3.1.1
Estimated Residential Site Density	378 Dwellings per site/ha	4.1.2.1
Estimated Population	4,082 persons	3.3.1.1
No. of High Schools	N/A	3.6
No. of Primary Schools	N/A	3.6
Estimated Commercial Floor Space	6,979m² nett lettable area	3.3.2.2
Estimated Retail Floor Space	1,200m² nett lettable area	3.3.2.2
Estimated area and percentage of Public Open Space (Local Parks)	0.2% 0.0525ha 1 park	3.3.7
Estimated area of natural area (existing Parks and Recreation Reservation)	4.5556 ha	3.3.7

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PART ONE IMPLEMENTATION

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1 STRUCTURE PLAN AREA

This Structure Plan shall apply to the Golden Gateway Precinct, being the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan map (**Plan 1**). The provisions of this Structure Plan apply to all land within this area, except for land designated as subject to a separate planning process on **Plan 1**.

2 OPERATION

This Structure Plan commences operation on the date it is approved by the Western Australian Planning Commission (WAPC).

3 STAGING

The staging of subdivision and development will be primarily influenced by the timing of land rationalisation. As most of the developable land is fragmented and privately owned, the actual timing and sequence of development will be subject to market demand and individual development intentions. Land within the northern section of the subject land is less constrained by land ownership, with the WA Turf Club (WATC) and WAPC owning the majority of this land, however is subject to a separate planning process.

Servicing infrastructure required to support future development of the subject land is either in place or can be relocated/provided to service the subject land and as such is not regarded as an impediment to staging.

The modification of Daly Street into a cul-de-sac will be a trigger to enable development within the Daly Street Precinct.

Table 1 below provides an outline of the key triggers for enabling development within various parts of the Structure Plan area.

TABLE 1: STAGING TRIGGERS

STAGING TRIGGERS	PRECINCTS	COMMENT
1. Planning Framework implementation - Scheme Rezoning, Structure Plan approval	• Ascot Kilns	No subdivision or development to be approved until the planning framework is in effect.
2. Closure of Daly Street	• Daly Street	The connection of Daly Street and Stoneham Street will be closed and redundant road reserve converted to public open space
3. Progressive rationalisation of private landholdings	• Great Eastern Highway, Stoneham Street, Daly Street and Resolution Drive	
4. Progressive upgrade to roads and adjacent verges	• Great Eastern Highway, Stoneham Street, Daly Street and Resolution Drive	Development may be permitted to occur prior to upgrades subject to contribution towards upgrade works in cash or in king (where appropriate).

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4 SUBDIVISION AND DEVELOPMENT REQUIREMENTS

This Structure Plan comprises the plans outlined below:

- **Plan 1 – Structure Plan Map**
  Outlines the zones, reserves and residential densities applicable within the Structure Plan area.

- **Plan 2 – Precinct Plan**
  Identifies development precincts within the Structure Plan area, for the purpose of defining specific development criteria.

- **Plan 3 – Building Height Plan**
  Depicts the intended building heights within the Structure Plan area. All development should demonstrate compliance with the Building Height Plan.

4.1 LAND USE ZONES/RESERVES

The Structure Plan Map (**Plan 1**) outlines the following zones and reserves applicable within the Structure Plan area:

- Mixed use.
- Local roads.
- Parks and Recreation.

Land use permissibility within the subject land shall accord with the land use permissibility of the corresponding zone/reserve listed above, as specified in Table 1 of the City of Belmont Local Planning Scheme No. 15 (LPS 15) to the extent that the zoning of the land under LPS 15 permits. The Responsible Authority should also have due regard for the uses listed as "Unacceptable" under the following zoning statements.

4.1.1 MIXED USE (R-AC0)

The Mixed Use zone is intended to facilitate the development of a mix of varied, but compatible, land uses including residential, offices, retail, commercial, civic and entertainment uses, in a highly integrated built form environment.

The objectives of the Mixed Use area are to:

- Provide a diversity of land uses and housing types.

- Provide for development that contributes to the creation of a high quality public realm and creates a sense of identity and character.

- Provide local retail/commercial facilities to the subject land as well as the broader locality.

It is envisaged that the Mixed Use zone will predominantly accommodate residential development in the form of multiple dwellings With non-residential development comprising of active land uses (i.e. restaurant, café, shop) on ground level. The 'mixed use' designation provides the flexibility for land uses to change and evolve over time in response to market conditions.

4.1.1.1 LAND USE PERMISSIBILITY

Land use permissibility shall generally be in accordance with the corresponding zone in the Zoning Table in LPS 15. However, having regard for the amenity for future residents the following uses are considered to be Unacceptable in the subject land and should not be approved:

- Auction Mart
- Caretakers Dwelling
- Fast Food Outlet / Lunch Bar
- Home Store
- Garden Centre
- Industry - Light
- Industry - Service

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- Motor Vehicle Repair
- Night Club
- Radio or TV Installation
- Restricted Premises
- Service Station
- Single House
- Vet Hospital
- Warehouse

Furthermore, 'Shop' is an Additional Use in the Mixed Use zone within the subject land.

Residential development within the Mixed Use zone shall be in accordance with the 'R-AC0' code and associated standards as set out in **Table 2**: Precinct Development Table for the relevant Precinct.

4.1.1.2 DWELLING TARGET

The dwelling targets for the Mixed Use zone is/are:

378 dwellings per site/ha

4.1.1.3 DENSITY

Plan 1 (Structure Plan) assigns a R-AC0 density code to the subject area.

4.1.2 PARKS AND RECREATION

The foreshore reserve and Belmont Charitable Trust Land are included in the Structure Plan Area for context only. No specific works or requirements are required under the Structure Plan for these areas. The Belmont Trust Land is for public recreation and enjoyment, further planning work will need to be undertaken to ensure adequate access to the site, and an appropriate interface with surrounding development.

Acknowledging the role that the Belmont Charitable Trust plays within the Structure Plan area, the Structure Plan provides for the collection of cash-in-lieu to be used for the upgrading of the Belmont Charitable Trust Land. The City can then make an application to the Minister for Planning under s.154(2)(c) of the *Planning and Development Act 2005* for approval to do this.

This does not preclude consideration being given to the allocation of land for additional POS where a developer chooses to do so at subdivision stage. The amount of cash or land to be provided would likely be based on the equivalent value of land which would otherwise be required, however this will ultimately be determined by the City of Belmont and the WAPC.

Within the balance of the Structure Plan Area, Public Open Space (POS) is to be provided generally in accordance with **Plan 1** and should be vested in the Crown and managed by the Local Government. POS within the Structure Plan area will be provided by the closure of Daly Street and the conversion of closed land, primarily serving a passive recreation and pedestrian connectivity function. The development of land included within the Swan and Canning River Development Control Area will be subject to the approval of the Department of Biodiversity, Conservation and Attractions (DBCA).

4.1.3 LOCAL ROADS

4.1.3.1 EXISTING ROADS

Existing local roads are to be upgraded to reflect an inner urban street character, featuring on-street parking, high quality landscape and pedestrian facilities. The existing 20m reserve width shall be maintained to ensure that the street serves a high quality public realm function in addition to facilitating local traffic movement.

It is not anticipated that additional roads will be required, however the introduction of additional roads within the Structure Plan Area may occur through possible future subdivision and in accordance with Part 10 of the Planning & Development Act 2005. Any new roads are to be designed to a residential standard in accordance with the requirements of the Local Government. Road reserve widths shall be 20m, to reflect similar characteristics to the existing road system, unless an alternative design is supported by the Local Government and approved by the WAPC.

Daly Street will be partially closed and converted to a cul-de-sac consistent with the Main Roads Western Australia Access Strategy for Great Eastern Highway. Redundant road reserve will be converted to POS.

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4.2 DEVELOPMENT REQUIREMENTS

4.2.1 PRECINCT DEVELOPMENT REQUIREMENTS

The following precincts have been established to ensure that the Structure Plan Area is developed in a comprehensive and integrated manner having regard to desired character, preferred land uses, residential density, built form and public realm design principles:

- Precinct 1: Great Eastern Highway
- Precinct 2: Stoneham Street
- Precinct 3: Daly Street
- Precinct 4: Resolution Drive
- Precinct 5: Ascot Kilns

4.2.1.1 STATEMENTS OF INTENT

Precinct 1: Great Eastern Highway

The Great Eastern Highway Precinct will present itself as a strong, unified commercial and mixed-use edge. Active, commercial uses shall be provided at ground level and above with residential development to occupy upper storeys.

The visual prominence of the Great Eastern Highway frontage will require sensitive architectural treatment to ensure that the built form contributes positively to the aesthetic quality of the area. Two landmark sites are located at the eastern and western ends of the Precinct and these should seek to optimise the intrinsic benefits of a gateway position that responds to existing view corridors along Great Easter Highway.

Precinct 2: Stoneham Street

The Stoneham Street Precinct, whilst still remote from the river front, will be the primary interface between the Golden Gateway development and the river.

Understanding that planning for Belmont Charitable Trust Land is yet to be undertaken, it is recommended that any future planning should maintain strong physical links between the river and the future Golden Gateway population and workforce.

Development addressing Stoneham Street is to provide an appropriate interface to the Belmont Charitable Trust Land to ensure a high standard of visual amenity and surveillance within a mixed use environment. The aspect towards the river may be attractive for food and beverage uses, which should be accommodated. Active, commercial uses shall be provided at ground level and above with residential development to occupy upper storeys.

A tree-lined promenade along Hargreaves Street will create a unique vista with the Belmont Charitable Trust Land and the Swan River.

Precinct 3: Daly Street

The Daly Street Precinct will perform an important connective function between the remaining precincts adjacent to Great Eastern Highway. Mixed use development is encouraged; however, the ultimate land use mix should not rely upon passing traffic given the planned closure of the Daly Street and Stoneham Street intersection.

Daly Street is defined by numerous disparate landholdings that could be amalgamated to unlock the development potential of this precinct, and proposals for development should investigate the highest and best use of land.

Precinct 4: Resolution Drive

Buildings at the intersection of Resolution Drive and Stoneham Street should leverage its location as the northern 'arrival' point to Golden Gateway.

Active, commercial uses shall be provided at ground level and above with residential development to occupy upper storeys. Trees will line either side of the southern portion of Grandstand Road (between Great Eastern Highway and Resolution Drive) to create an attractive pedestrian environment.

Precinct 5: Ascot Kilns

This precinct is characterised by the historic kilns and landmark chimney stacks that are of considerable State heritage significance. Development will therefore have a strong heritage and landscape focus, using built form to celebrate and frame the historic structures, and to secure their ongoing preservation.

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This precinct is the subject of separate Local Planning Policy (LPP) and Local Development Plan (LDP).

4.2.1.2 PRECINCT STANDARDS AND REQUIREMENTS

Table 2: Precinct Development Table outlines the standards and requirements for subdivision and development in the corresponding precincts designated on **Plan 2** Precinct Plan. Building height requirements should be read in conjunction with **Plan 3** Building Height Plan.

In addition to the Precinct Development Table, Design Guidelines may be adopted to provide further guidance for subdivision and development of the precinct pursuant to Section 5.1.

In relation to Precinct 5 Ascot Kilns, development standards and requirements in this Structure Plan should be read in conjunction with the Ascot Kilns Design Guidelines and LDP. The Ascot Kilns LDP should identify the requirement for a minimum of 10% POS to be delivered on site.

TABLE 2: PRECINCT DEVELOPMENT TABLE

Precinct		R-Code	Min. height	Max. height	Min. boundary setback	Min. street setback	Max. street setback	Plot ratio (Plot Ratio with Additional Height)
1	Great Eastern Highway	R-AC0	Podium: 2 storeys Tower: 7 storeys	Podium: 5 storeys Tower: 15 storeys	Podium: Nil Tower: as per State Planning Policy 7.3 Residential Design Codes Volume 2 - Apartments	Podium: Nil Tower: 3m	Podium: Nil Tower: N/A	5.0:1 (6.5:1)
2	Stoneham Street	R-AC0	Podium: 2 storeys Tower: 5 storeys	Podium: 3 storeys Tower: 10 storeys	Podium: Nil Tower: as per State Planning Policy 7.3 Residential Design Codes Volume 2 - Apartments	Podium: Nil Tower: 3m	Podium: Nil Tower: N/A	3.0:1 (5.0:1)
3	Daly Street	R-AC0	Podium: 2 storeys Tower: 5 storeys	Podium: 3 storeys Tower: 10 storeys	Podium: Nil Tower: as per State Planning Policy 7.3 Residential Design Codes Volume 2 - Apartments	Podium: Nil Tower: 3m	Podium: Nil Tower: N/A	3.0:1 (5.0:1)
4	Resolution Drive	R-AC0	Podium: 2 storeys Tower: 5 storeys	Podium: 3 storeys Tower: 10 storeys	Podium: Nil Tower: as per State Planning Policy 7.3 Residential Design Codes Volume 2 - Apartments	Podium: Nil Tower: 3m	Podium: Nil Tower: N/A	3.0:1 (5.0:1)
5	Ascot Kilns	R-AC0	Refer to Ascot Kilns Design Guidelines and Local Development Plan	Refer to Ascot Kilns Design Guidelines and Local Development Plan	Refer to Ascot Kilns Design Guidelines and Local Development Plan	Refer to Ascot Kilns Design Guidelines and Local Development Plan	Refer to Ascot Kilns Design Guidelines and Local Development Plan	N/A

Notes:

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1. *Minimum and maximum building heights specified for tower components are inclusive of podium levels.*
2. *An additional 5 storeys in height can be considered subject to satisfying development requirements in section 4.2.2.2*
3. *This table is to be read in conjunction with the more detailed provisions of a LPP, where relevant.*
4. *In relation to Precinct 5 Ascot Kilns, this table is to be read in conjunction with the Ascot Kilns Design Guidelines and LDP.*

4.2.2 GENERAL DEVELOPMENT REQUIREMENTS

Development within the subject precinct shall be generally in accordance with the standards and requirements of the City's Local Planning Scheme and any relevant State Planning Policy, Local Development Plan and Local Planning Policy, having regard to the provisions contained within this structure plan.

Proposed variations to the standards and requirements of the City's Local Planning Scheme, any relevant State Planning Policy, Local Planning Policy, Local Development Plan or the provisions of this structure plan are to be outlined within a development application and will be considered by the Responsible Authority with due regard to the intent and purpose of the standards.

4.2.2.1 PARKING

Car parking should be provided in accordance with LPS 15 and the relevant R-Codes subject to the following variations:

1. The Local Government wishes to encourage innovative approaches to car parking provision, such as reciprocity, car-pooling programs or other innovations, that may result in reduced parking provision where appropriate.

   The Responsible Authority will consider approving a reduced parking provision where it can be demonstrated that an alternative parking proposal is sound and will result in a reduction in parking demand. Any proposed variation should be supported by a parking demand assessment undertaken by a suitably qualified professional.

2. The following specific requirements apply:

   a) For Mixed Use development, all residential parking in excess of 1 bay per dwelling, and at least 50% of the minimum required parking for non-residential uses shall be made available for general use of either residential or non-residential uses (these bays represent unallocated communal parking bays).

   b) Mixed Use development that proposes parking as outlined in 2a) above should be required, as a condition of Development Approval, to prepare a Car Parking Strategy that addresses the management of the unallocated communal parking provision, including:

      i. The hours during which parking bays shall be made available for general public access.

      ii. Location, signage and monitoring of usage of the unallocated communal parking bays.

   The provision of car parking that is in excess of the minimum required for the site will only be approved where it is designed to be adaptable for future conversion into habitable floor space, or other useable space for communal or private usage. In order for parking to be considered adaptable, it must be shown as located in a position that is suitable for an alternative use, not included in individual strata titles and constructed to comply with habitable floorspace standards.

   This requirement may be waived if it can be demonstrated that complying with the requirement would not be practical or would result in a less desirable outcome.

4.2.2.2 BUILDING HEIGHT

Minimum and maximum building heights within the Structure Plan Area are to be in accordance with the ranges identified in **Table 2** and on **Plan 3.**

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All sites within the Structure Plan area may incorporate an additional 5 storeys in height, above the maximum identified in **Table 2** at the discretion of the decision maker subject to the following:

- The production of an exceptionally high quality of design, as determined by the appointed design review panel; and
- Incorporate the following:
    - An area of publicly accessible private open space; and
    - 100% of windows containing double glazing; and
    - Provide an additional tree on-site above what is required by State Planning Policy 7.3 Volume 2 – Apartment Design Code. The tree must be a native species with a pot size of between 100L – 200L; and
    - Provide conduits and capacity within the electrical distribution system and metering or future provision of electric car charging for each unit within the development; and
    - Provide a minimum of two electric vehicle charging bays within the development; and
    - Provide shared sustainable transport measures for the development that may include the provision of electric bikes, scooters and vehicle/s; and
    - Achieve a Nationwide House Energy rating Scheme (NatHERS) star rating of a minimum of one star in excess of the current energy efficiency rating for the dwelling shall be certified by a suitably qualified and accredited energy assessor using accredited software and shall be provided a the development application stage; and
    - Install a photovoltaic solar panel system that can provide the equivalent of at least 1Kw energy per dwelling.

Notwithstanding the provisions of **Table 2** and **Plan 3**, maximum building heights are subject to compliance with the Airports (Protection of Airspace) Regulations 1996.

Information on Obstacle Limitations Surfaces is available at https://www.perthairport.com.au/Home/corporate/planning-and-projects/airspace-protection.

4.2.2.3 LANDMARK SITES

Landmark site locations have been identified on **Plan 3.** These sites have been located in response to priority view lines and public vistas. They define local character and maximise legibility through high quality pedestrian scale, development of these sites is strongly recommended to respond to existing sight lines and maximise street presence.

Elements of design that should be investigated include articulation adjacent to, and above, the street level, building proportion that maximises the perception of bulk from a distance, intrinsic quality of materials that produce interest for pedestrians, detail that is revealed in proximity to the development and interesting distribution of mass.

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5 OTHER REQUIREMENTS

5.1 SCHEME AMENDMENT

An amendment to the City of Belmont's LPS 15 will be required to apply the R-AC0 density code over the subject land and to exclude land uses that would be permissible within the Mixed Use zone as identified in section 4.1.1.1. This will also need to provide for the 'Shop' land use as an additional use.

5.2 INFRASTRUCTURE FUNDING STRATEGY

The City of Belmont may establish an appropriate funding strategy for the provision of infrastructure within the Structure Plan Area. The strategy may include the introduction of a Development Contribution Area (DCA) through LPS 15, under which a Development Contribution Plan (DCP) can be implemented to contribute to the funding of public infrastructure necessary to facilitate development in the Structure Plan Area.

Infrastructure items that would be eligible to be funded under a DCP should be in accordance with State Planning Policy 3.6 Development Contributions for Infrastructure (SPP 3.6).

5.3 BUSHFIRE MANAGEMENT

This Structure Plan is supported by a Bushfire Management Plan (BMP), which is contained at **Appendix A**.

Where appropriate, development will have regard to the Bushfire Attack Level (BAL) Assessment contained in this Report and be determined in accordance with Schedule 2, Part 10A of the Planning and Development (Local Planning Schemes) Regulations 2015 and section 6.3 of SPP 3.7 Planning in Bushfire Prone Areas (SPP 3.7).

An LDP is required to be prepared for all lots with a BAL of 12.5 or greater.

Where a subdivision application includes land with a BAL of 12.5 or greater, the Local Government shall recommend to the WAPC that a condition be imposed on the grant of subdivision approval for a notification to be placed on the Certificate of Title to suitably respond to the following:

"That a lot with a bushfire attack level BAL rating of 12.5 or higher is subject to a BMP."

5.4 ABORIGINAL HERITAGE

A search of the Department of Planning, Lands & Heritage (DPLH) Aboriginal Heritage Enquiry System identifies one site within the northern/western portion of the subject land (Site ID 3753).

Should the Aboriginal Heritage Site identified as meeting the requirements of section 5 of the Aboriginal Heritage Act 1972 (AHA) be proposed to be disturbed in any way, an application must first be made and consent granted under section 18 of the AHA.

Furthermore, where applicable, an Aboriginal Heritage Management Plan shall be prepared and implemented prior to subdivision of any land affecting the identified site.

5.5 NOISE ATTENUATION

An acoustic assessment shall be undertaken and included as part of any application to demonstrate that the proposed design will meet the internal noise level requirements of State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4).

In accordance with SPP 5.4 a notification shall be required to be placed on the Certificate of Title for lots where dwellings are exposed to traffic noise that exceeds the outdoor "Noise Target" as defined in SPP 5.4.

5.6 DESIGN REVIEW PANEL

Any application for development within the Structure Plan area will be referred to the City's Design Review Panel for evaluation.

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6 ADDITIONAL INFORMATION

Table 4 below outlines additional information that will be required at future approval stages. Additional information requirements may not be limited to those listed; the City or WAPC may require other information in relation to particular proposals.

TABLE 4: MANAGEMENT PLANS, REPORTS AND STRATEGIES

Additional information	Approval stage	Approving Authority
Water Management		
Local Water Management Strategy (LWMS)	Documented in Structure Plan and to be considered as part of Structure Plan process. Implementation as part of UWMP	WAPC, City, DWER
Urban Water Management Plan (UWMP)	Condition of subdivision	WAPC, City, DWER
Environment		
Environmental Assessment Report	Documented in Structure Plan Implementation via Subdivision	WAPC, City, OEPA,
Fire Management Plan	Condition of subdivision	WAPC, City
Foreshore Management Plan	Condition of Subdivision	WAPC, City, DBCA
Landscape Management Plan	Condition of subdivision	City
Aboriginal Heritage Management Plan	Condition of subdivision	DPLH
Acoustic Report (Noise Attenuation)	Condition of planning approval	City
Acid Sulphate Soils	Condition of Subdivision	DWER
Investigation for soil and groundwater contamination	Condition of Subdivision	WAPC, City
Identification and protection of vegetation worthy of protection	Condition of Subdivision	WAPC, City
Erosion and Sediment Management Plan	Condition of Subdivision	WAPC, City
Engineering		
Servicing Report	Documented in Structure Plan Condition of Subdivision	City, Water Corp, Western Power, ATCO Gas
Geotechnical	Condition of Subdivision	City
Other		
Local Development Plan(s)	Condition of subdivision if deemed necessary by City	City

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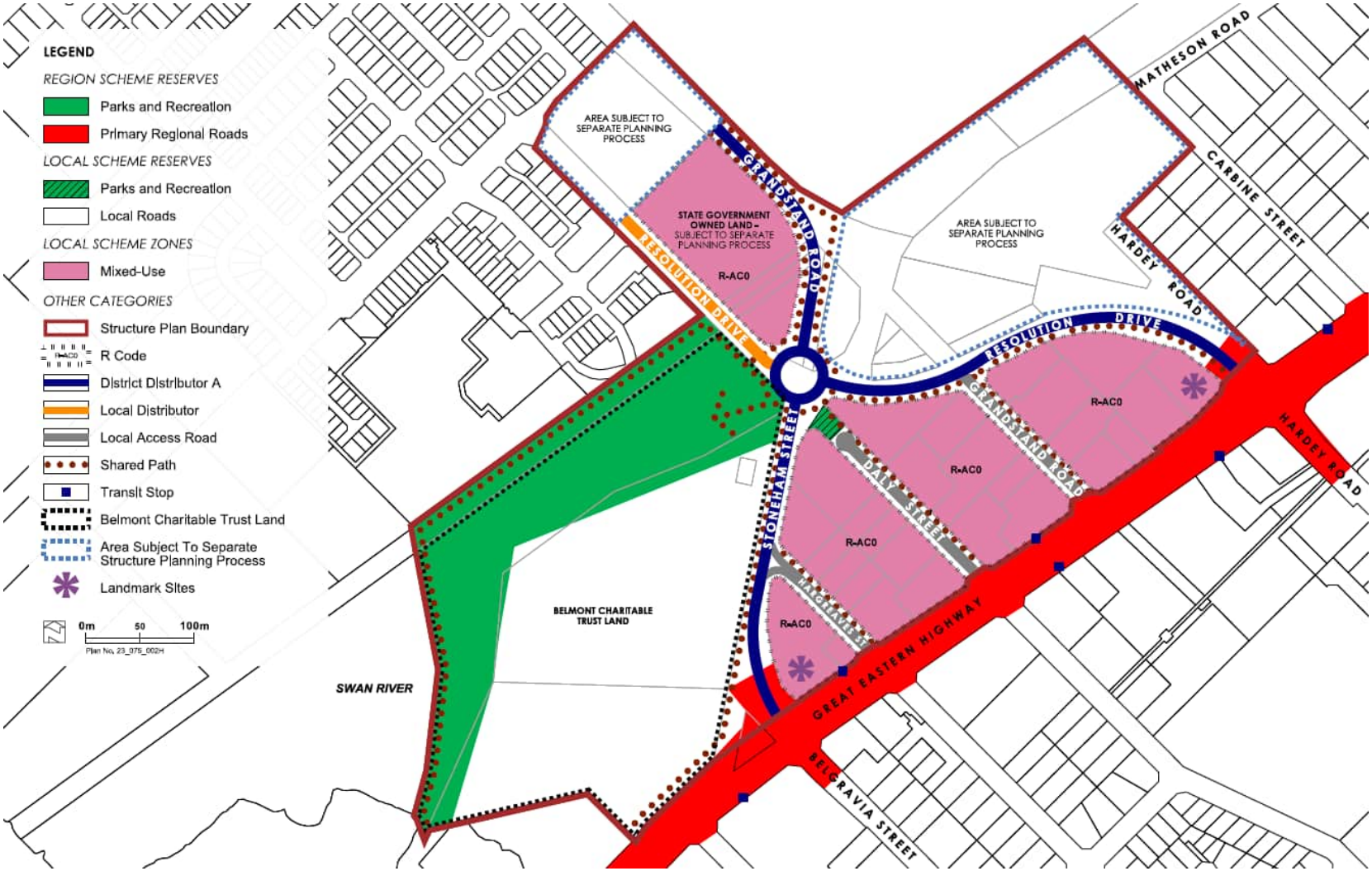

Plan 1- Structure Plan

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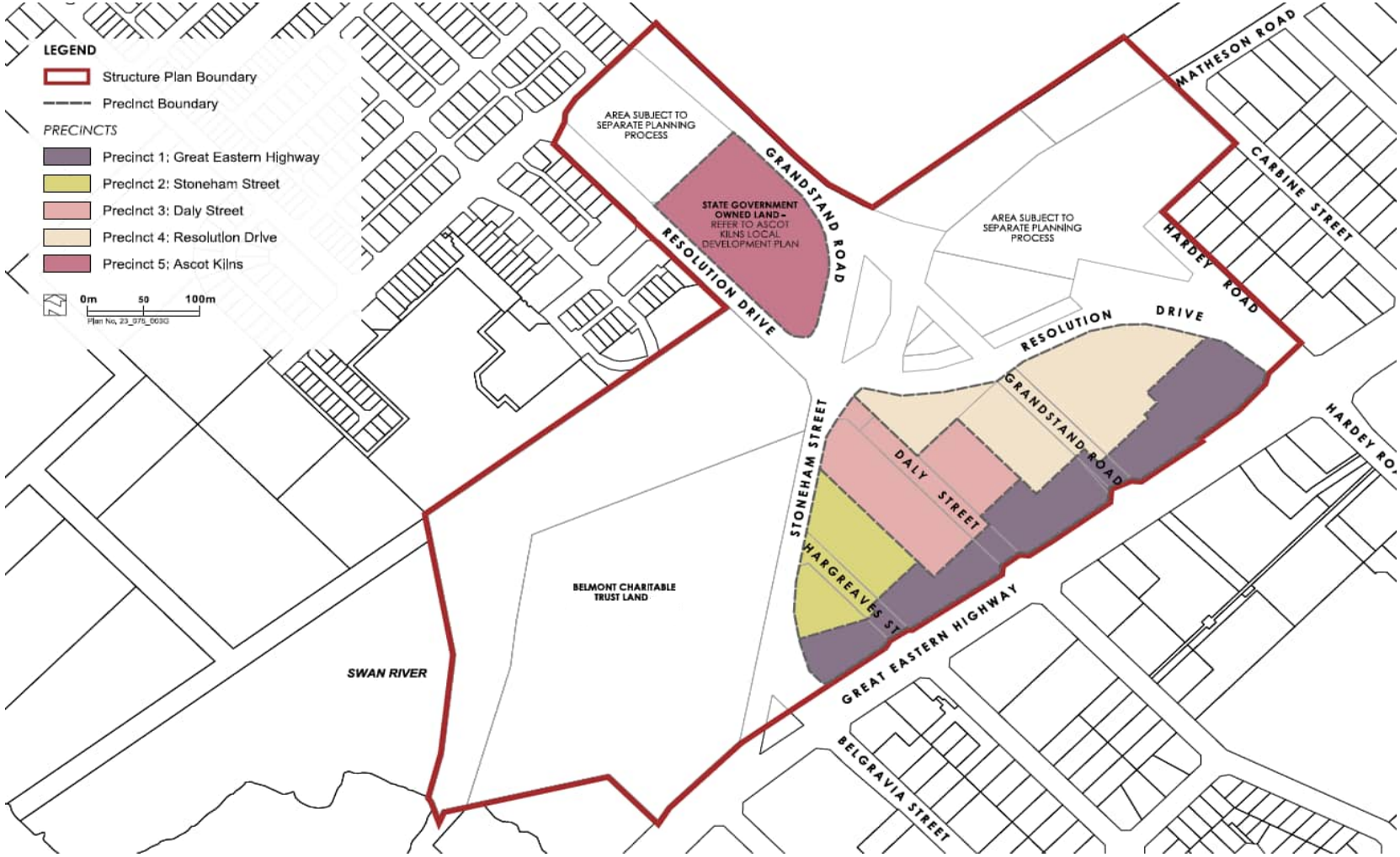

Plan 2 - Precinct Plan

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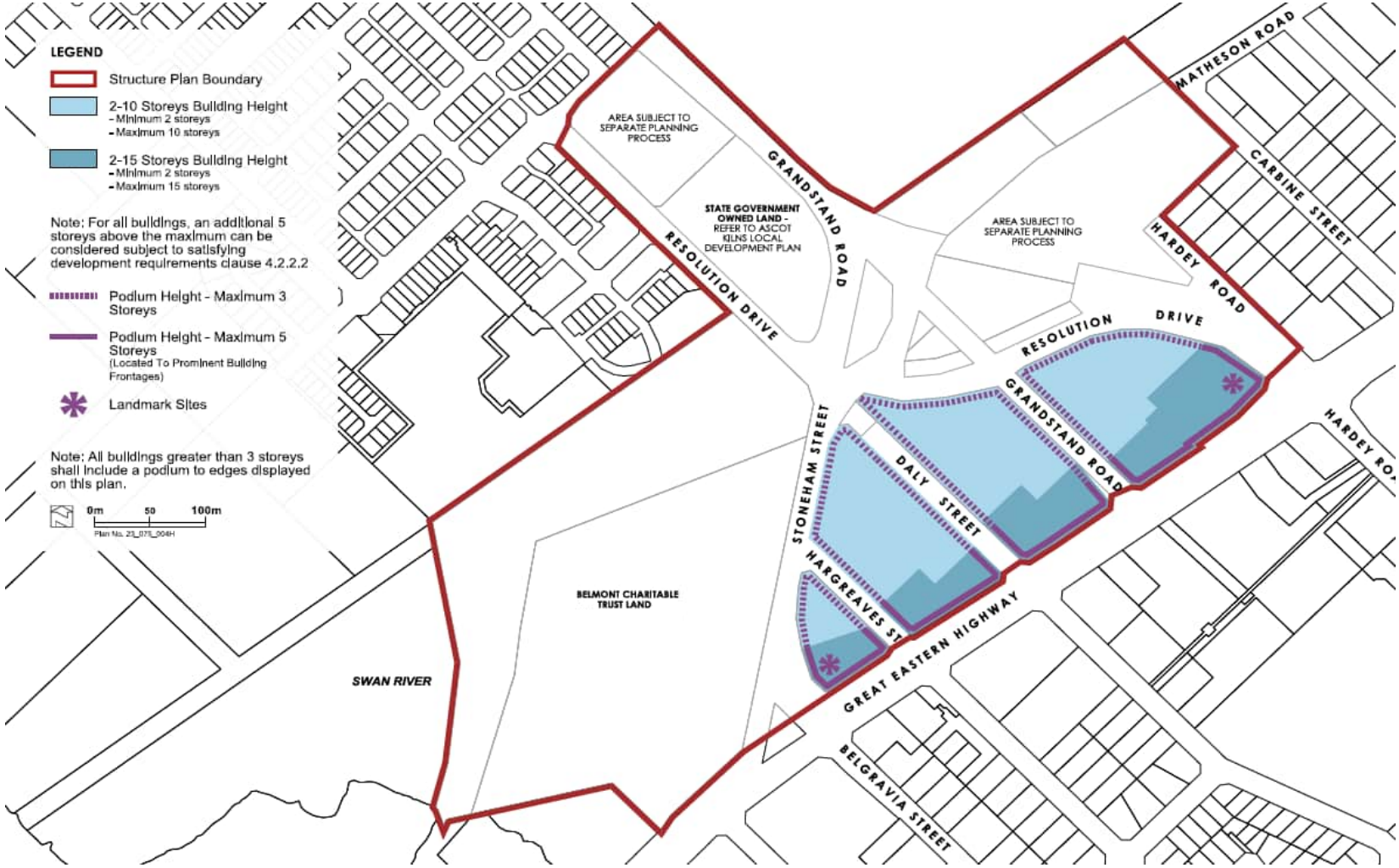

Pan 3 - Building Height Plan

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PART TWO
EXPLANATORY INFORMATION

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1 PLANNING BACKGROUND

1.1 INTRODUCTION AND PURPOSE

This report has been prepared to provide a technical explanation for the provisions contained in Part 1- Implementation of the Golden Gateway Structure Plan.

The Structure Plan outlines the development vision for the ultimate development of the Golden Gateway Precinct (the subject land) and establishes key requirements. The Structure Plan also includes information regarding the development of the public realm and assesses the proposed development in context with the surrounding physical and natural environment.

The Project Team, responsible for preparing the information contained within this report, (in consultation with the City of Belmont and relevant Service Authorities) include those detailed in **Table 1.**

TABLE 1: PROJECT TEAM RESPONSIBILITIES

Project Role	Consultant
Town Planning and Urban Design	Taylor Burrell Barnett
Architectural	Taylor Robinson Chaney Broderick
Civil Engineering	Cardno
Environment Management and Hydrology	Urbaqua
Traffic and Transport	Flyt
Landscape	EPCAD
Community Engagement	Place Match
Bush Fire Management	Urbaqua

1.2 LAND DESCRIPTION

1.2.1 LOCATION

The location and extent of the subject land is outlined in **Figure 1.** The subject land is located at the axis of the key movement corridors of Great Eastern Highway, Stoneham Street, Grandstand Road and Resolution Drive and includes key strategic sites such as Belmont Charitable Trust Land, Ascot Kilns and Western Australian Turf Club (WATC) headquarters and associated land.

Figure 2 shows the subject land's district context. The land is located approximately 5 kilometres (km) north-east of the Perth Central Business District (CBD), 3km north of Belmont Forum and mixed business area, and 5km north-east of Victoria Park entertainment precinct. Within its immediate context, the subject land is located adjacent the Swan River and Ascot Racecourse.

It is also well connected to regional movement networks such as the Graham Farmer Freeway and Tonkin Highway. The Garratt Road Bridge also provides a key connection to the north across the Swan River.

Within the local context, the subject land can be regarded as lacking in basic convenience shopping facilities. The BP Service Station located on the corner of Great Eastern Highway and Resolution Drive and delicatessen located at Epsom Avenue approximately 2km south-east of the subject land provide the nearest local conveniences. However, the nearest neighbourhood centres (supermarkets) are Eastgate Commercial Centre, Kooyong Road, approximately 2.5km to the south-west, or Belvidere Street approximately 2.5km to the south. Additional services are located approximately 3km to the north-west of the subject land at Maylands Shopping Centre (neighbourhood centre) or 3km to the south at Belmont Forum (Secondary Centre).

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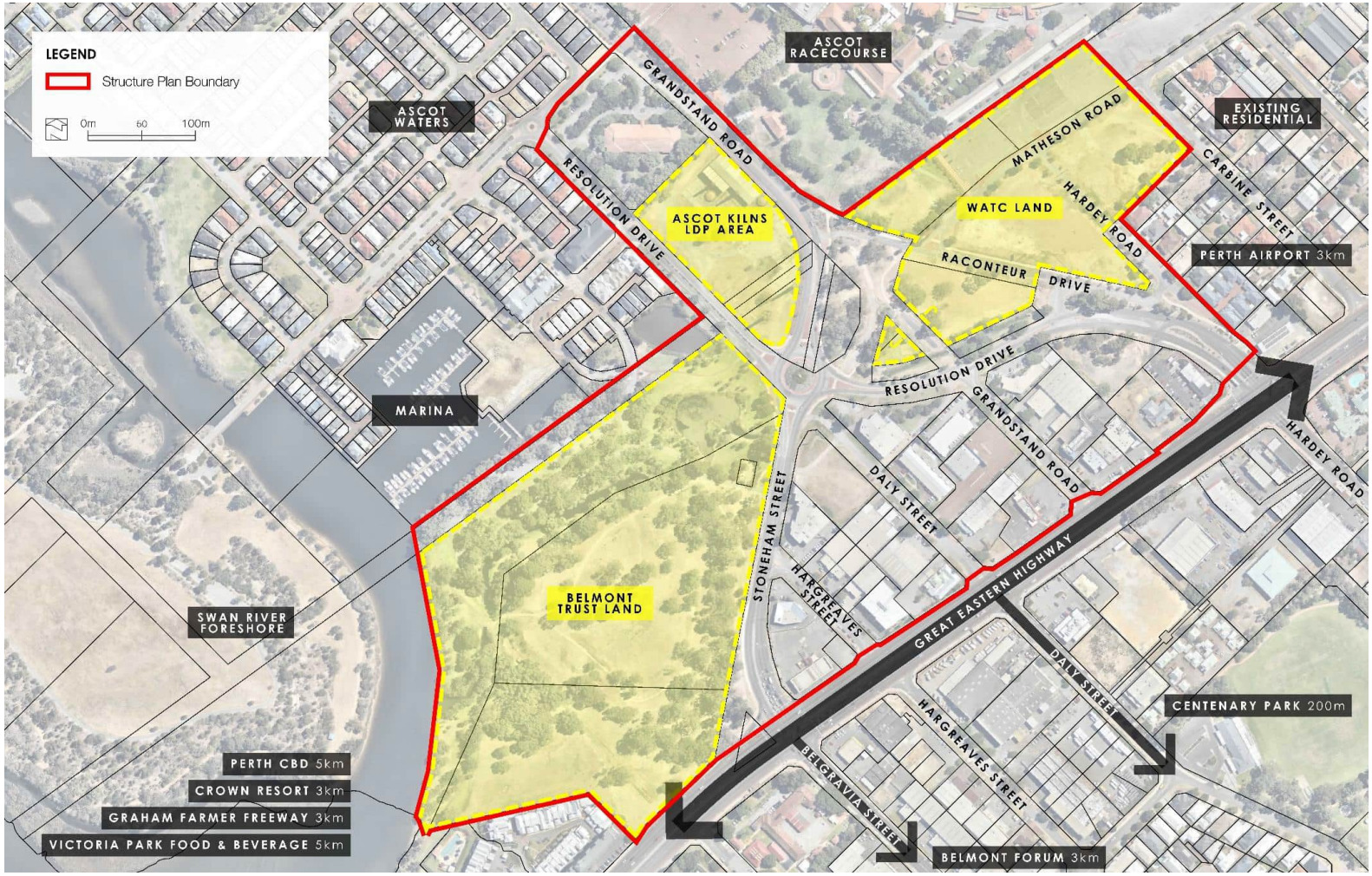

Figure 1 – Location Plan

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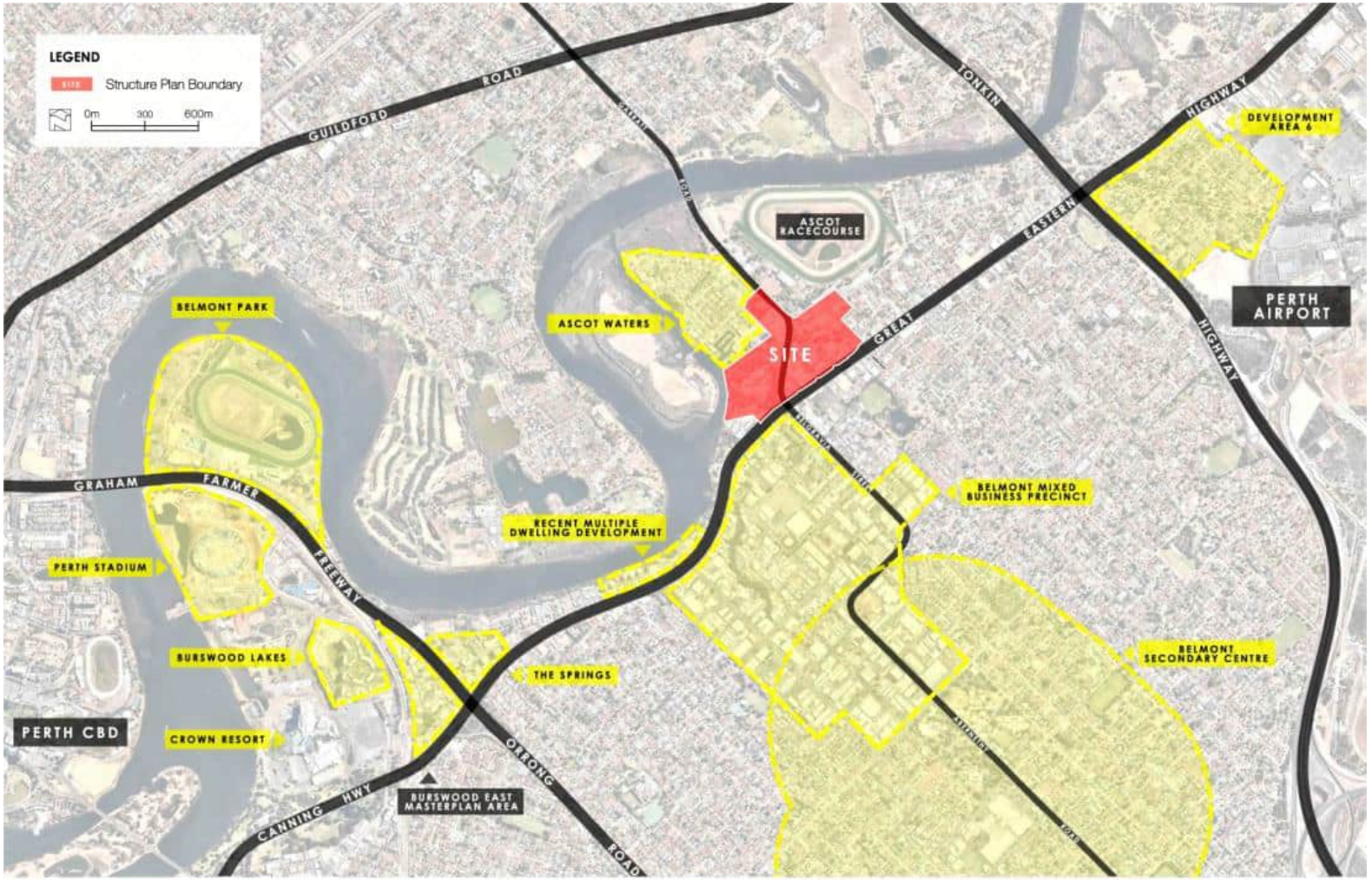

Figure 2 – District Context Plan

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1.2.2 LAND USE

The subject land can be divided into four areas based on existing uses (refer **Figure 3**):

1. The area bounded by Great Eastern Highway, Stoneham Street and Resolution Drive is characterised by predominately mixed business development and small pockets of retail (food and beverage) uses along Great Eastern Highway;

2. The western portion of the subject land encompassing the Belmont Charitable Trust Land is largely cleared within the central portion with mature vegetation around the periphery. The site was historically used as a baseball field;

3. The northern portion of the subject land is partially developed with the WATC Headquarters and Ascot kilns and chimney stacks; and

4. The remainder of the subject land within the north-eastern corner is largely undeveloped and comprises a number of existing road reserves and WATC-owned land used for overflow parking on racing event days.

The development of the Belmont Charitable Trust Land, Ascot Kilns sites and the WATC land are subject to separate planning processes.

Figure 3 – Site Plan

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1.2.3 LEGAL DESCRIPTION AND OWNERSHIP

The subject land is approximately 23.9871 hectares (ha) in area comprising the land identified in **Table 2** and **Figure 4**.

TABLE 2: LAND TENURE

Lot/Reserve	Landowner	Plan Number	Volume/Folio	Area (ha)
1 Resolution Drive	City of Belmont	P76257	2835/27	0.3642
5 Resolution Drive	City of Belmont	D64041	1776/785	4.1919
642 Great Eastern Highway	City of Belmont	P66341	2763/431	2.6481
950 Marina Drive / R52200	State of WA (City of Belmont)	P73752	LR3165/863	0.5843
512 Marina Drive / R51911	State of WA (City of Belmont)	P39786	LR3025/38	0.7749
513 The Boardwalk / R51911	State of WA (City of Belmont)	P32861	LR3025/39	0.2621
10417 Grandstand Road / R38783	State of WA (Water Corporation)	P185797	LR3048/920	0.1059
12645 Grandstand Road / R45069	State of WA (Water Corporation)	P15104	LR3064/783	0.2181
3 Grandstand Road	The Chairman of the Committee of the Western Aus Turf Club	D55346	1742/278	0.0351
13 Grandstand Road	The Chairman of the Committee of the Western Aus Turf Club	D26760	1883/670	0.7316
51Raconteur Drive	The Chairman of the Committee of the Western Aus Turf Club	P15104	1883/668	0.6940
100 Raconteur Drive	The Chairman of the Committee of the Western Aus Turf Club	P60341	2723/304	2.5726
452 Grandstand Road	The Chairman of the Committee of the Western Aus Turf Club	P60339	2723/355	1.1441
7705 Matheson Road	The Chairman of the Committee of the Western Aus Turf Club	P209359	1789/567	
1 Grandstand Road	State Planning Commission	D55346	1742/276	0.2452
197 Grandstand Road	State Planning Commission	P2635	1754/354	0.3927
236 Grandstand Road	State Planning Commission	P2635	1754/354	0.8925
237 Grandstand Road	WA Planning Commission	P2635	2117/791	0.9796
713 Grandstand Road	WA Planning Commission	D93557	2117/790	1.2806
707 Great Eastern Highway	Eurokars Australia Holdings Pty Ltd	P67257	2750/217	0.4767
709 Great Eastern Highway	Australian Postal Commission	P67258	1122/816	0.0551
1 Stoneham Street	5 Stoneham Road Belmont (Strata Scheme)	D41222	SP20374	0.2373
43 Hargreaves Street	Tarfield Holdings Pty Ltd	P2294	1582/988	0.1012
44 Hargreaves Street	Tarfield Holdings Pty Ltd	P2294	1582/989	0.1012

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Lot/Reserve	Landowner	Plan Number	Volume/Folio	Area (ha)
45 Hargreaves Street	Jones, ED & Moore, JR	P2294	1977/545	0.1012
1 Great Eastern Highway	Ascot Grove (Strata Scheme)	P72552	SP65435	0.1966
60 Daly Street	Qube Ascot Development Ltd	D73791	1801/608	0.3934
36 Daly Street	Motwil Pty Ltd	P2294	1582/987	0.1012
35 Daly Street	Motwil Pty Ltd	P2294	1582/986	0.1012
650 Daly Street	76, 78 Daly Street, Belmont (Strata Scheme)	D59457	SP10988	0.2024
714 Great Eastern Highway	TLC Carousel Holdings Pty Ltd	P67260	2753/447	0.2033
52 Daly Street	SMC Pneumatics Australia Pty Ltd	D68380	1839/787	0.3798
801 Daly Street	Capital Growth Holdings Pty Ltd	P403687	2907/899	0.2440
21 Daly Street	Ashguard Pty Ltd	D78708	1892/169	0.2332
22 Grandstand Road	Ashguard Pty Ltd	D78708	1892/170	0.2031
23 Grandstand Road	Starttime Pty Ltd	D78708	1892/171	0.3731
11 Grandstand Road	The Easter Investment Pty Ltd	D17872	1182/103	0.1011
800 Great Eastern Highway	F&S Enterprises Pty Ltd	P403687	2907/898	0.2833
100 Resolution Drive	Dening Zhou Management Pty Ltd	D73202	1800/401	0.2071
101 Grandstand Road	127-129 Grandstand Street Belmont (Strata Scheme)	D73202	SP15951	0.3126
500 Grandstand Road	Kwik 'N' Kleen Pty Ltd	D90797	2076/935	0.3568
501 Great Eastern Highway	Sunlight Food Pty Ltd	D90797	2076/937	0.1063
502 Great Eastern Highway	Worldfirst Enterprises Pty Ltd	D90797	2076/938	0.1788
730 Great Eastern Highway	Novell Properties Pty Ltd	P67267	2753/474	0.3574
100 Great Eastern Highway	Selden Pty Ltd	P73087	2840/325	0.2622

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Figure 4 - Land Tenure

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1.3 PLANNING FRAMEWORK

1.3.1 ZONING AND RESERVATIONS

1.3.1.1 METROPOLITAN REGION SCHEME

The subject land is predominately zoned 'Urban' under the Metropolitan Region Scheme (MRS) (refer **Figure 5**).

Land abutting the Swan River within the subject land is reserved 'Parks and Recreation' and is situated within the 'Swan and Canning River Development Control Trust' area.

The south-eastern boundary abuts 'Primary Regional Roads' (PRR) reservation (Great Eastern Highway) directly to the south. This PRR reservation also extends north into the subject land at Stoneham Street and Grandstand Road.

The majority of the surrounding area is zoned 'Urban', whilst Ascot Racecourse is zoned 'Private Recreation'.

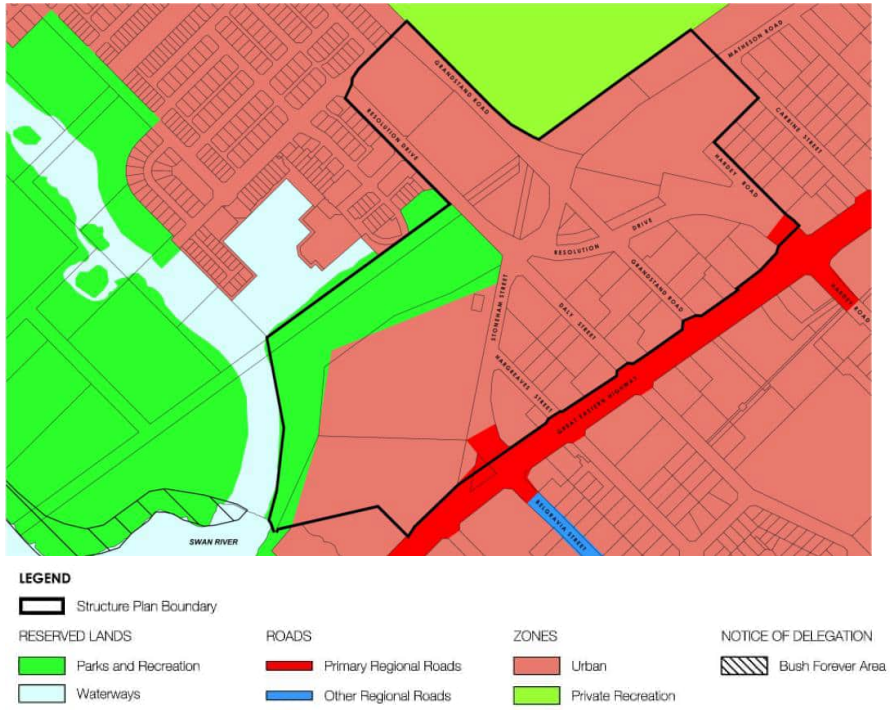

Figure 5 - MRS Zoning

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1.3.1.2 CITY OF BELMONT LOCAL PLANNING SCHEME NO. 15

The subject land is predominantly zoned 'Mixed Use' under the City of Belmont's Local Planning Scheme No. 15 (LPS 15) (refer **Figure 6**).

Land within the north-eastern portion associated with Ascot Racecourse is zoned 'Place of Public Assembly – Racecourse' and identified with an 'Additional Use (A18)'. Land within the north-western portion of the subject land is also zoned 'Place of Public Assembly – Racecourse' associated with the WATC Headquarters (Lee-Steere House).

Consistent with the reservations under the MRS, the western portion of land abutting the Swan River is reserved 'Parks and Recreation' and Great Eastern Highway is reserved 'Primary Regional Roads' along with connecting sections of Stoneham Street and Hargreaves Street.

A stretch of land along Resolution Drive is reserved as Local Scheme Reserve - 'Parks and Recreation: Water supply sewerage and drainage'. This land contains a Water Corporation drain.

Land to the south of Great Eastern Highway, within proximity to Belgravia Street is predominantly zoned 'Mixed Business' with portions also zoned 'Mixed Use'.

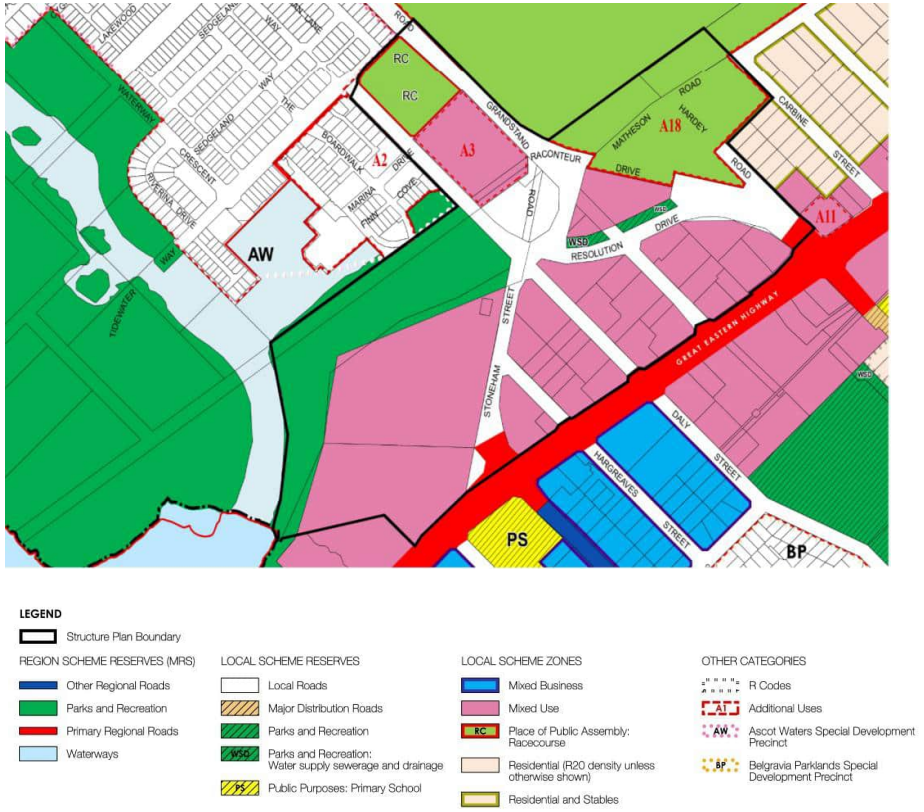

Figure 6 – LPS 15 Zoning

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1.3.2 PLANNING STRATEGIES

1.3.2.1 PERTH AND PEEL@3.5MILLION

Perth and Peel@3.5million Planning Framework is a strategic suite of documents to guide future land uses through urban consolidation, integrated infrastructure and development, co-location of services and the strategic location of employment opportunities.

The subject land is located in the Central sub-region of the *Perth and Peel @3.5million Planning Framework* document.

The population in the Central sub-region is projected to grow by more than 468,000 people between 2011 and 2050 — from around 783,000 to nearly 1.2 million people. It is expected that more than 285,000 additional jobs will be accommodated in the Central subregion up to 2050.

The Central sub-region is expected to supply an additional 215,000 dwellings under the Framework, with 10,410 dwellings to be provided within the City of Belmont.

The Framework identifies Great Eastern Highway as an 'urban corridor' and Grandstand Road-Stoneham Street continuing into Hardey Road as a 'high frequency public transit' (refer **Figure 7**).

The Framework states that corridors should be the focus for investigating increased densities, with potential for mixed land uses where appropriate. The presence of existing or planned high-quality public transport is an important consideration in determining whether a corridor is suitable for a more-compact and diverse urban form.

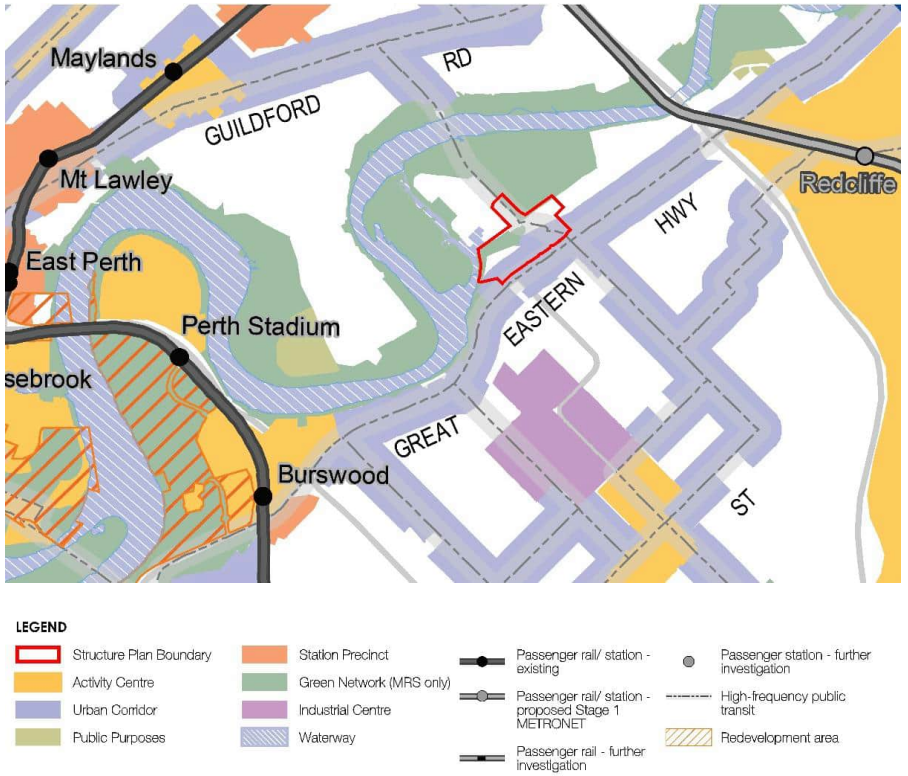

Figure 7 – Central Sub-regional Planning Framework

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1.3.3 PLANNING POLICIES

1.3.3.1 STATE PLANNING POLICIES

SPP 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning

State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4) seeks to minimise the adverse impact of transport noise, without placing unreasonable restrictions on noise-sensitive residential development. SPP 5.4 is applied where the proposal includes:

- A proposed new noise-sensitive development in the vicinity of an existing or future major road, rail or freight handling facility.
- A proposed new major road or rail infrastructure project in the vicinity of existing or future noise sensitive and uses.
- A proposed major redevelopment of existing major road or rail infrastructure in the vicinity of existing or future noise-sensitive land uses.
- A proposed new freight handling facility.

Great Eastern Highway is identified as a 'primary freight road' under SPP 5.4. Therefore, for any subdivision or development proposed within the threshold distance of Great Eastern Highway (200m) an acoustic report is required to be prepared and submitted with a development application.

Ascot Kilns Local Development Plan (Draft)

The draft Ascot Kilns Local Development Plan (LDP) and draft Local Planning Policy (LPP) was considered by Council for final approval at its Ordinary Council meeting of 12 December 2017.

The draft Ascot Kilns LDP and draft LPP proposes a vision to guide and coordinate future development across the 1.6ha former Bristile Kiln site. The draft LDP proposes the following outcomes:

- Creation of two development sites for residential apartments and some commercial uses within proposed building envelopes.
- Provision of an active edge component fronting onto the kilns cluster (promoting small-scale retail and hospitality).
- Development scale influenced by the surrounding lower scale residential context and the chimney stacks.
- Maintaining physical and visual access to the heritage structures from key aspects.
- Potential for integration of the heritage structures within future development sites to maximise opportunities for adaptive reuse and innovative design solutions.

Local Planning Policy 11 Public Art Contribution Policy

The City of Belmont's Local Planning Policy No. 11 (LPP 11) outlines the requirements for the provision of public art by the developer to protect and enhance the utility, amenity and identity of the public domain.

The City of Belmont requires all development proposals within the Policy Area of a value greater than $4.5 million to provide public art in accordance with the described method for determining public art contributions. The cost of any public art shall be no less than one percent of the value of the eligible proposal and provided in kind or alternatively, the Council may accept a cash-in-lieu payment.

A portion of the subject land falls within Precinct 4 – Great Eastern Highway Precinct of LPP 11 with the balance (excluding Ascot Kilns LDP area) situated within Precinct 5 – Swan River Foreshore.

1.3.4 PRE LODGEMENT CONSULTATION

A key component of the concept planning for the subject land has been stakeholder and community consultation and engagement. The DPLH has also been a key stakeholder in the concept planning process given the presence of the Ascot Kilns site within the Golden Gateway Precinct. The WATC have also been consulted separately given its significant landholding within the subject land, albeit subject to a separate planning process.

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As part of the consultation and engagement strategy, three workshops were held during May 2016 and a fourth workshop in November 2016:

1. City of Belmont Council Staff Workshop (6 May 2016 – 22 participants)
2. Business and Landowners Workshop (26 May 2016 – 5 participants)
3. Community and Residents Workshop (31 May – 32 participants).
4. Combined Business/Landowners and Community/Residents Workshop (7 November 2016).

In addition to the above workshops, two online surveys were conducted by the City of Belmont (May and November 2016) to provide the community with the opportunity to provide additional comments. Feedback received was consistent with feedback provided at the various workshops as summarised below.

1.3.4.1 STAKEHOLDER WORKSHOPS

Overall, the overwhelming priority was the preservation and enhancement of POS both within Belmont Charitable Trust Land and throughout the remainder of the development. The emphasis was placed on the enhancement of active POS supported by recreational amenity and infrastructure.

Overall, residential development within the Golden Gateway Precinct was supported with varying degrees of density and height, however careful integration with existing residential to the north and east is paramount.

Other priorities included the creation of a destination / attraction for the City of Belmont and identification of 'place' qualities that will need to be considered in subsequent planning stages.

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2 SITE CONDITIONS AND CONSTRAINTS

An Environmental Assessment Report was prepared by Urbaqua to support the Structure Plan. This report is included as **Appendix B**.

2.1 ENVIRONMENTAL ASSETS AND CONSTRAINTS

2.1.1 VEGETATION

No vegetation of conservation significance is located within the subject land. Due to historic clearing, commercial and recreational activities, the vegetation within the subject land is largely degraded. The subject land does contain some mature trees and these will be retained where possible.

Bush Forever Area 313 (Swan River Salt Marshes) is located to the north and west of the subject land. Surrounding this area, the Department of Water and Environmental Regulation (DWER) has mapped an Environmentally Sensitive Area described as 'Temperate Saltmarsh' and listed as 'vulnerable' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This area is an important habitat for local and migratory bird species, however is largely disconnected from the subject land.

2.1.2 FLORA

A search of the EPBC Protected Matters Database was undertaken to identify flora species of conservation significance potentially occurring within a 2km radius of the subject land.

The search identified two 'endangered' species under the EPBC Act (*Caladenia huegelii* King Spider-orchid and *Lepidossperma rostratum* Beacked Lepidosperma) and one critically endangered species (*Darwinia foetida* Muchea Bell*)*.

2.1.3 FAUNA

A search of the EPBC Protected Matters Database was undertaken to identify fauna species of conservation significance potentially occurring within a 2km radius of the subject land.

The search identified three species of 'endangered' status under the EPBC Act and seven 'vulnerable' species.

As a result of existing uses, the subject land supports limited or no remnant vegetation with a lack of intact understorey vegetation. The subject land therefore provides little, to no, fauna habitat of significant value to native fauna. The vegetation within Belmont Trust Land may provide important habitat for local and migratory birds.

2.2 LANDFORM AND SOILS

2.2.1 LANDSCAPE AND TOPOGRAPHY

The subject land is generally flat and grades gently from 6 metres (m) Australian Height Datum (AHD) in the south-east to 3mAHD in the west. A few low points exist within the centre of the subject land at approximately 1-2mAHD.

The surface geology is described broadly as Guildford formation: Alluvial sand and clay with shallow-marine and estuarine lenses and local basal conglomerate. Two-thirds of the north-western portion of the subject land is classified as Ms2 – Sandy Silt, which has a low permeability, and eastern third as S8 – Sand.

2.2.2 ACID SULFATE SOILS

A review of DWER acid sulfate soils (ASS) risk mapping identifies approximately two-thirds of the subject land, predominantly the area coinciding with surface geology Ms2-Sandy Silt, as containing a Class I 'high to moderate' risk of ASS and the remainder, coinciding with S8-Sand, classified as Class II 'moderate to low' risk occurring within 3m of the natural soil surface.

Given the Class I classification, an ASS investigation will be carried out where works are proposed in these areas consistent with the DWER Guidelines. Should ASS be present within the subject land, all site works must be carried out in accordance with an ASS management plan approved by DWER.

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2.2.3 CONTAMINATED SITES

A search of the DWER Contaminated Sites database found a portion of the subject land as 'Possibly Contaminated – Investigation Required'.

2.3 GROUNDWATER AND SURFACE WATER

2.3.1 GROUNDWATER

Based on the DWER Ground Water Atlas, maximum groundwater levels are within 3m of the natural surface through the northern and central portions of the subject land, with groundwater flowing in a north-westerly direction toward the Swan River. As this drain is located adjacent to land owned by Perth Racing, they may explore opportunities for integration of the drain with future development as part of the planning they are progressing for their landholdings.

2.3.2 SURFACE WATER

A Water Corporation open drain is located within the centre of the subject land. The open drain is approximately 150m in length and directs flows of runoff from the eastern urban and industrial areas to piped drainage under the Stoneham Street / Resolution Drive roundabout to a compensation basin to the west of the subject land before travelling through a further 350m of open drain to the Swan River.

The Swan River is located adjacent to the western portion of the subject land. The DWER Floodway mapping indicates that a large area in the northern portion of the subject land lies within the Swan River 100 year average reoccurrence interval (ARI) flood fringe. Protection of the Swan River's environmental attributes will require the provision of a 50m buffer to the banks of the River consistent with its designation as an environmentally protected area and conservation category wetland (CCW) is generally applied.

The subject land also abuts the Swan and Canning River Development Control Area. The Department of Biodiversity, Conservation and Attractions Corporate Policy 49: Planning for Stormwater Affecting the Swan Canning Development Control Area provides further planning provisions to improve water quality, habitat, community benefits and amenity of the river system through stormwater management.

2.4 BUSHFIRE HAZARD

A very small portion of the subject land is identified as being located within a 'Bush Fire Prone Area' adjacent the Swan River and as such, a BMP has been prepared by Urbaqua in support of the Structure Plan (refer **Appendix A**). The BMP is a strategic level plan which identifies the bushfire protection measures to be applied to development on the subject site to accommodate compliance with:

- State Planning Policy 3.7 Planning in Bushfire Prone Areas;
- Guidelines for Planning in Bushfire Prone Areas; and
- Australian Standard for the construction of buildings in bushfire-prone areas (AS3959-2009).

As part of the BMP, a Bushfire Attack Level (BAL) Contour Map has been prepared which identifies the worst case BAL in relation to the subject land. The BAL Contour Map identifies a BAL of 'Low' across the majority of the subject land and a small portion of BAL-12.5 within the Belmont Charitable Trust Land. Given the Structure Plan does not propose development within the foreshore area subject to BAL-12.5 (or wider Belmont Charitable Trust Land), it is anticipated that any bushfire hazards can be appropriately managed.

It is expected that bushfire hazard assessment will be further refined as part of future subdivision or development stages in order to accurately assess the bushfire risk posed by surrounding classified vegetation and determine specific radiant heat exposure levels (and associated BAL) for future lots created within the Structure Plan area, as required.

2.5 HERITAGE

2.5.1 ABORIGINAL

A search of the Department of Planning, Lands & Heritage (DPLH) Aboriginal Heritage Enquiry System identifies one site occurring within the northern/western portion of the subject land.

Site ID 3753 – Registered site, Name: Perth, Type: Historical, mythological, hunting place, named place, natural feature.

Prior to disturbance of the above site, an application is to be made for consent to use the land under section 18 of the AHA.

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2.5.2 EUROPEAN

The Ascot Kilns and chimneys were included on the State Heritage List in 2003 and are also included on the City's Local Heritage Survey and List. The Kilns were first built in 1930, manufacturing terracotta, stoneware and steel products. The draft Ascot Kilns LDP celebrates and enhances the site's heritage significance and maintenance.

The old Matheson Road railway line has historic value for its association with the rail link which connected Belmont to Perth and Guildford. This site is contained on the City's Local Heritage Survey. Where possible, development should recognise and interpret its significance.

2.6 EXISTING MOVEMENT NETWORK

The subject land benefits from a surrounding movement network that features access to key regional road connections, a high frequency public transport corridor and high-quality shared path cycling links.

2.6.1 GREAT EASTERN HIGHWAY

The subject land is bounded by Great Eastern Highway to the south which provides access to the west towards the Perth CBD, Graham Farmer Freeway and onto South Perth, Melville and Fremantle via Canning Highway. To the east, Great Eastern Highway provides access to Perth Airport, Tonkin/Roe Highway and onto Guildford, Midland and the Swan Valley.

Great Eastern Highway is classified as a 'Primary Distributor' under the Main Roads WA (MRWA) Functional Road Hierarchy and is regarded as one of the State's principal transport corridors carrying over 54,000 vpd, based on 2018 traffic counts.

Great Eastern Highway (between Kooyong Road in Rivervale to Tonkin Highway in Redcliffe) was subject to significant upgrade works between June 2011 and February 2013. These works included:

- Widening Great Eastern Highway, from four to six lanes, between Kooyong Road (Rivervale) and Tonkin Highway (Redcliffe) – a distance of 4.2 km;
- Constructing a central median for the full length of the project;
- Upgrading all major intersections to include dedicated turning movements;
- Providing U-turn facilities at key locations in order to maintain access to businesses fronting the Highway;
- Incorporating bus priority lanes into key intersections;
- Providing dedicated on-road cycling facilities;
- Constructing footpaths for pedestrians; and
- Relocating, replacing and protecting service utilities such as telecommunications, water, power and gas.

2.6.2 INTERNAL ROADS

The localised road network includes a network of local distributor and access roads providing access to key regional and district roads such as Great Eastern Highway and the Garret Road bridge. Grandstand Road, Resolution Drive and Stoneham Street are classified as 'District Distributor A' roads under the MRWA Functional Road Hierarchy. These are generally described as follows:

- Grandstand Road (20m road reserve) – a four lane road with a central median, running north-south within the subject land, connecting the Garratt Road crossing of the Swan River with Great Eastern Highway via Stoneham Street or Resolution Drive;
- Stoneham Street (20-25m road reserve) – a four lane road without a central median, running north-south within the subject land, connecting Grandstand Road/Resolution Drive with Great Eastern Highway and Belgravia Street; and
- Resolution Drive (22-47m road reserve) – a two lane with a central median, running east-west within the subject land, connecting Grandstand Road/Stoneham Street with Great Eastern Highway and Hardey Road.

All of these roads are under the control of the City of Belmont. The following roads are classified as 'Local Roads' under the MRWA Functional Road Hierarchy and are also under the control of the City of Belmont.

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- Hargreaves Street (20m road reserve) – a two lane road without a central median, running north-west to south-east within the subject land, providing a connection between Stoneham Street (no right turn out) and Great Eastern Highway (left in/left out only);
- Daly Street (20m road reserve) – a two lane road without a central median, running north-west to south-east within the subject land, providing a connection between Stoneham Street (left out only onto Stoneham Street) and Great Eastern Highway (left in/left out only);
- Grandstand Road (south) (20m road reserve) – a two lane road without a central median, running north-west to south-east within the subject land, providing a connection between Resolution Drive and Great Eastern Highway (left in/left out only); and
- Raconteur Drive (20m road reserve) – operates as a one-way road from Grandstand Road to Matheson Road and is currently closed at the Grandstand Road intersection outside of event periods at Ascot Racecourse. Two-way access between Resolution Drive and Matheson Road is possible via the eastern extent of Resolution Drive.

2.6.3 PEDESTRIAN NETWORK AND CYCLING

2.6.3.1 PEDESTRIAN NETWORK

The extent and quality of the existing pedestrian infrastructure within, and surrounding, the subject land (with the exception of Great Eastern Highway) is poor and of a standard commensurate with the nature of existing development across the subject land (i.e. primarily light industrial/commercial unit style development).

However, Great Eastern Highway bordering the subject land to the south features good quality footpaths on both sides of the corridor. Within the vicinity of the subject land, the safe crossing of Great Eastern Highway by pedestrians is facilitated via traffic signal-controlled intersections at both Stoneham Street/Belgravia Street and Resolution Drive/Hardey Road intersections with Great Eastern Highway.

Each of the major road corridors running through the subject land (Grandstand Road, Resolution Drive and Stoneham Street) include footpaths along one side of the street – Grandstand Road along the eastern side adjacent to the Ascot Racecourse, Raconteur Drive along the northern side to connect to Grandstand Road, Resolution Drive along the eastern side adjacent to the Ascot Waters development and Stoneham Street along the western side adjacent to the Belmont Charitable Trust Land. There is an existing gap in pedestrian connectivity along Resolution Drive, opportunities to enhance connectivity may be explored by the City as part of a broader approach to infrastructure upgrade.

Local access streets (Hargreaves Street and southern section of Grandstand Road) providing access in a northerly direction from Great Eastern Highway are car dominated with no existing footpaths present. A footpath is located on Daly Street.

2.6.3.2 CYCLING

A number of existing shared paths and cycling connections are located within the subject land along primary routes, including Stoneham Street, Raconteur Drive and Grandstand Road. There is demand to upgrade facilities on Stoneham Street and Resolution Drive. Protected bicycle lanes and a shared path on Resolution Drive is essential, however the provision of 'on street' bicycle lanes on Stoneham Street will require further investigation dependent on the ultimate form of the road reserve.

A number of shared paths are also located within the Ascot Waters development directly to the north of the subject land. The Graham Farmer Freeway Principal Shared Path (PSP) is also located within close proximity to the subject land providing regional cycling connections and can be accessed via the shared path along the southern side of the Swan River.

The extent and quality of the existing cycling infrastructure within and surrounding the subject land is of a high standard, largely as a result of the Great Eastern Highway upgrades. Local connections are provided along Stoneham Street, Resolution Drive and Grandstand Road and further to the north within the Ascot Waters development. Regional connections are provided via high quality shared use paths along the Swan River Foreshore (via Belmont Charitable Trust Land towards the Graham Farmer Freeway PSP to access Perth CBD).

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2.6.4 PUBLIC TRANSPORT

A number of existing bus routes operate within, or in close proximity to, the subject land. These include the Circle Route (998/999) via Raconteur Drive/Grandstand Road providing connections north to destinations including Bayswater Station, Morley Bus Station/Shopping Centre and south to destinations including Belmont Forum Shopping Centre, Oats Street Station and Curtin University.

In addition, existing bus routes (293 and 940) operate along high frequency bus corridor of Great Eastern Highway, providing connections east to destinations including Redcliffe Train Station, Perth Airport, Guildford, Midland and to the west to destinations including Victoria Park Transfer Station and Perth CBD.

Pedestrian access to existing public transport facilities is considered average with no bus stops currently located within the subject land. The closest bus stops are located on Grandstand Road immediately to the north of the subject land (close to the main pedestrian entry/exit to Ascot Racecourse). There are options to make improvements to public transport access if land uses within the subject land change over time to support additional public transport patronage.

2.7 ROAD TRAFFIC NOISE

As discussed in section 1.3.3.1, SPP 5.4 sets out specific requirements for addressing potential noise impacts from major transport arteries on adjacent noise-sensitive uses.

It has been identified that Great Eastern Highway, Resolution Drive and Grandstand Road are all likely to require consideration under SPP 5.4. In this respect any subdivision or development proposed adjacent to these roads will require an acoustic assessment to be undertaken and included as part of any application to demonstrate that the proposed design will meet the internal noise level requirements of SPP 5.4.

2.8 EXISTING INFRASTRUCTURE AND SERVICING

2.8.1 WATER SUPPLY

The Serpentine Trunk Main is located along Grandstand Road and Daly Street. A 915 steel distribution main is also located along Grandstand Road through the subject land. Existing development within the subject land is well serviced with a mixture of 100, 150 and 200 dia reticulation pipes made of asbestos cement, cast iron, PVC and steel.

2.8.2 WASTEWATER

Wastewater infrastructure general to the Ascot area is serviced by gravity style wastewater drainage infrastructure. A mixture of concrete and plastic arterial pipes on grade service all areas to local pump stations throughout the City of Belmont.

Lots within, and surrounding, the subject land are serviced by two main arterial sewer routes; a 225mm collector flowing north to south and a 225mm collector flowing east to west. Both collectors flow to the Redcliffe Pump Station 5 located on Stoneham Street. The Redcliffe Pump Station 5 collects all sewerage west of the Ascot Racecourse within the Ascot suburb and discharges it to the Redcliffe Pump Station 2 located on Abernethy Road.

2.8.3 POWER SUPPLY

Data obtained from the Western Power Network Mapping Tool indicates that the subject land is serviced by the Belmont Substation and the forecast network capacity for 2015 is >30MVA. There are High and Low Voltage power lines in the vicinity of the subject land.

2.8.4 GAS SUPPLY

Correspondence from ATCO Gas identifies Medium Pressure (MLP) gas mains (pressure indicated at 70kPa) along the majority of roads within the subject land.

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2.8.5 TELECOMMUNICATIONS

The subject land is well serviced by telecommunications infrastructure with optical fibre running in or adjacent to the subject land. This infrastructure is owned by various telecommunications providers including Telstra, Optus and others. The National Broadband Network (NBN) has been rolled out in the subject area.

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3 STRUCTURE PLAN

3.1 VISION AND OBJECTIVES

3.1.1 VISION

The objectives and design principles underpinning the Golden Gateway Structure Plan have been formulated around the following vision:

"The development of the Golden Gateway will transform this degraded and fragmented area into a vibrant precinct of residential and mixed use development, with strengthened connections to the Swan River and Ascot Waters, that derive best value from these attributes while respecting the area's rich culture and heritage."

3.1.2 OBJECTIVES

The overarching objectives for the Golden Gateway Precinct as established by the project team and reinforced through stakeholder engagement are as follows:

1. Improve **self-containment of facilities** – reduce car dependence
2. Improve people's connection to the **Swan River**
3. Create accessible, quality **public realm** within the precinct
4. Ensure **heritage values** are retained
5. Identify **appropriate uses/densities** in conjunction with **infrastructure improvement**
6. Optimise value of strategic sites – **planning certainty**

3.2 DESIGN PREPARATION

The Structure Plan design has been informed by a thorough analysis of the existing site conditions and the potential opportunities and issues offered by the location. The key outcomes of this analysis are noted in **Figures 8 and 9** and described overleaf:

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3.2.1 OPPORTUNITIES

Land use

1. Opportunity for residential development to be accommodated in the precinct given the accessibility to high amenity riverside amenity.
2. Opportunity for retail convenience and food and beverage land uses to be integrated into development outcomes.
3. Potential for higher density development given precinct location, proximity to high amenity open space destinations, Perth CBD, localised employment and high frequency public transport.
4. Existing primary school adjacent the precinct offers opportunity to attract a diverse demographic, including young families.
5. Consider mixed use development in core area to broaden activity opportunities and long term transition of the precinct, and to offer improved amenities for the existing Ascot community.

Built form

1. Opportunity for landmark building form and massing to inner core areas to perform key gateway functions.
2. Future building form to appropriately interface with adjacent public realm.
3. Local activity hub potential within the precinct providing local centre retail, cafe/mini main street offerings in a shared street atmosphere.
4. Existing street block depths south of Resolution Drive are well suited for typical multiple dwelling apartment development parcels.

Public realm

1. Existing character and destination status of adjacent Swan River open space provides significant public amenity and recreation opportunities for future residents.
2. Promote pedestrian and cycle network connectivity through the site to strengthen access to the Swan River for both the existing Ascot community as well as future residents in the Golden Gateway Precinct.
3. Significant tree canopies within the Belmont Charitable Trust Land and peripheral open space offer significant ‘green horizon’ views to the precinct.
4. Opportunity to provide strong open space ‘cross-link’ as a ‘green ribbon’ link to the Swan River.
5. Celebrate the heritage significance of the Ascot Kilns and the potential for integration of the heritage structures to maximise amenity for residents.

Movement

1. Utilise existing local street network of Hargreaves Street, Daly Street and Grandstand Road to deliver a robust structure for future development access and vehicle circulation.
2. Generous existing road reserve dimensions provide ability for reconfigured pedestrian friendly streetscapes offering shade trees, soft landscaping and convenient on-street parking embayments.
3. Potential for alteration to the priority road network of Stoneham Street and Resolution Drive for the benefits of precinct consolidation and integration, in particular, the potential to downgrade priority of Stoneham Street for benefits to foster a stronger relationship between the Ascot community and the Swan River.
4. Investigate alternative road alignments that celebrate key view lines of surrounding visual features and future gateway elements.

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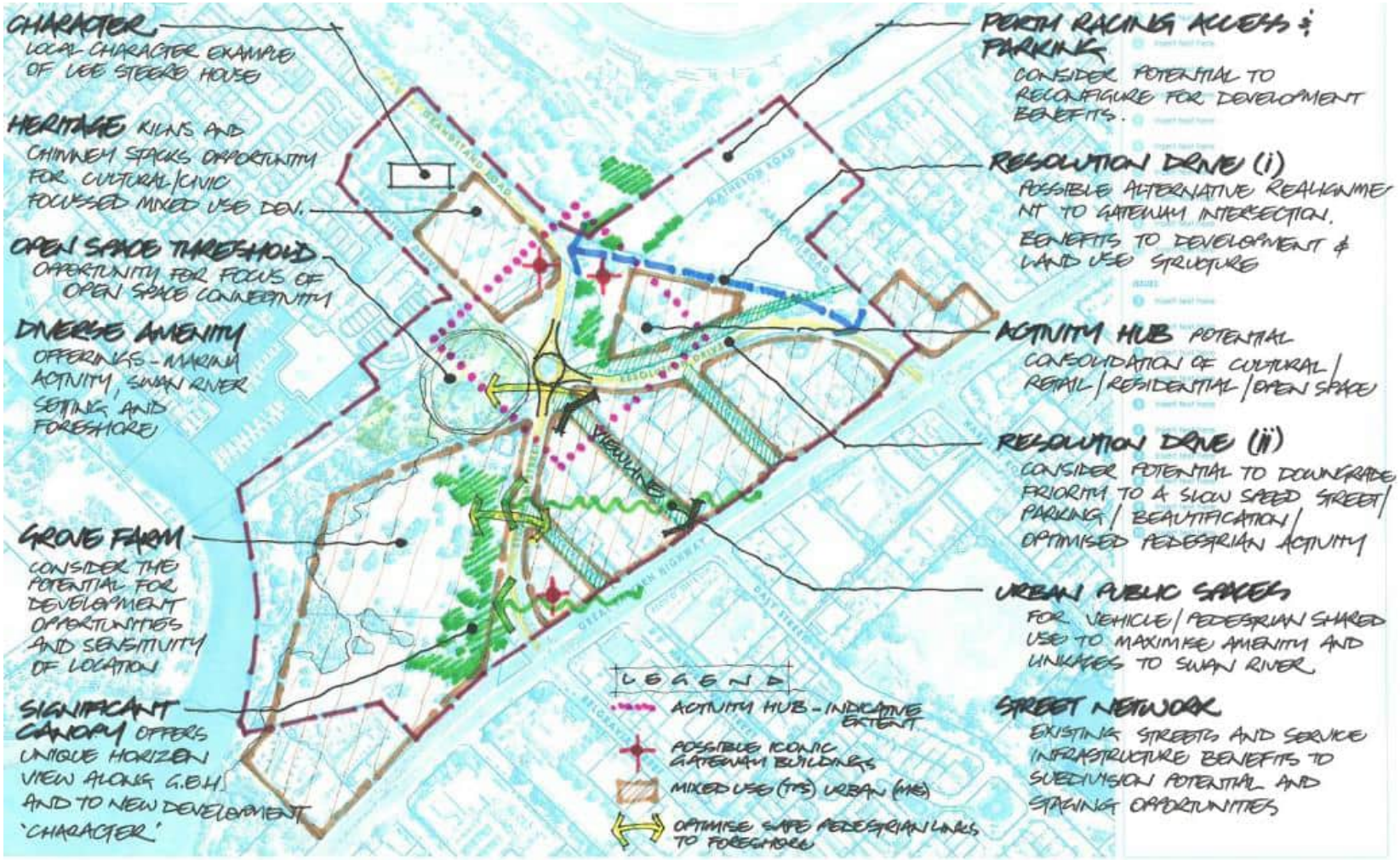

Figure 8 - Opportunities

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3.2.2 ISSUES AND CONSTRAINTS

Land use

1. Service corridor extends northwards through Grandstand Road alignment.
2. Overland stormwater drainage, controlled by Water Corporation, extends east- west through the subject land located immediately north of Resolution Drive.
3. Careful consideration of existing residential development on periphery of precinct area.
4. Development adjacent Great Eastern Highway may be subject to noise attenuation.

Built form

1. Proposed development of Kilns area, which is subject to a Local Development Plan, to be considered in surrounding built form design.
2. Perth Airport restrictions based on flight path contours will potentially limit maximum building height.
3. Existing development is largely commercial and is located on a fractured land tenure base of multiple cadastral parcels.
4. Some future development may require land assembly to maximise development potential and desirable outcomes, and to rationalise redundant public reserves.

Public realm

1. Chimney locations in the Ascot Kilns area to be considered, surrounding public spaces and view lines should respect and celebrate these historic features.
2. Existing significant trees to be considered for integration into public realm, where appropriate.
3. Informal open space node to Hardey Road (east) to be considered, recognising relative disconnection of this area from other POS to the south of Resolution Drive.
4. Limited or no availability of suitable quality water from the superficial aquifer for the purpose of irrigation within the Golden Gateway area.

Movement

1. Existing roundabout impinges on precinct assimilation for all adjoining land quadrants.
2. Limited connection opportunities available to residents north of Resolution Drive.
3. Stoneham Street and its multi-lane configuration acts as a pedestrian barrier for development to interact with the POS area.

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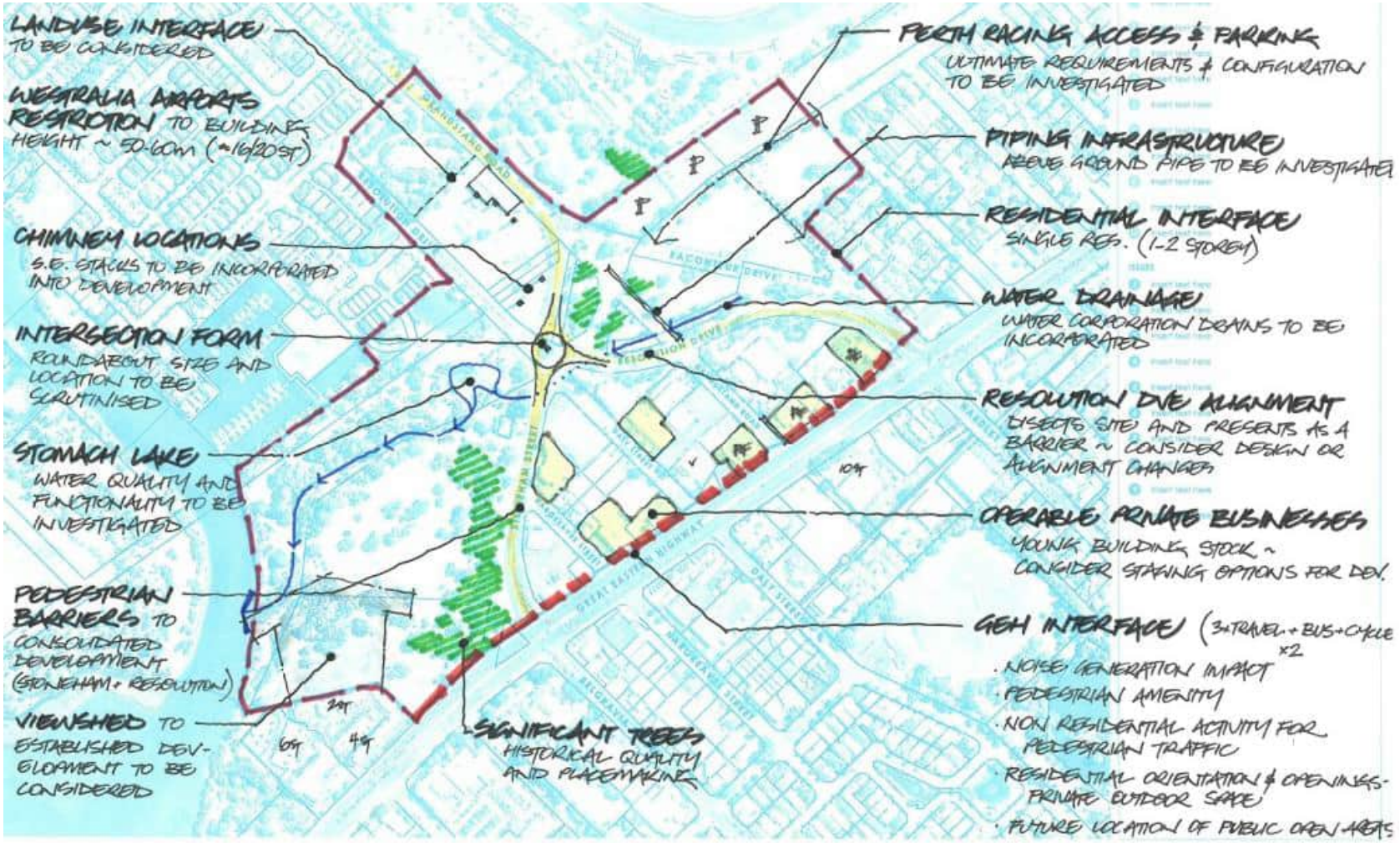

Figure 9 – Issues and Constraints

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3.2.2.1 CONCEPT PLAN DEVELOPMENT – SITE ANALYSIS

One of the main challenges in testing development scenarios was to address the significant disunification of the precinct created by the heavily engineered road system, and the impact this has on local connectivity between the Precinct and the areas main natural attribute – the Swan River.

Figures 10 and **11 below** were produced to stimulate discussion, during the stakeholder engagement process, about ways in which the physical barrier to the Swan River could be removed, or at least, reduced. The stakeholder engagement process produced a number of specific considerations for the initial design phase to develop scenarios (refer **Figure 12**).

Figure 10 - Existing access and connectivity summary

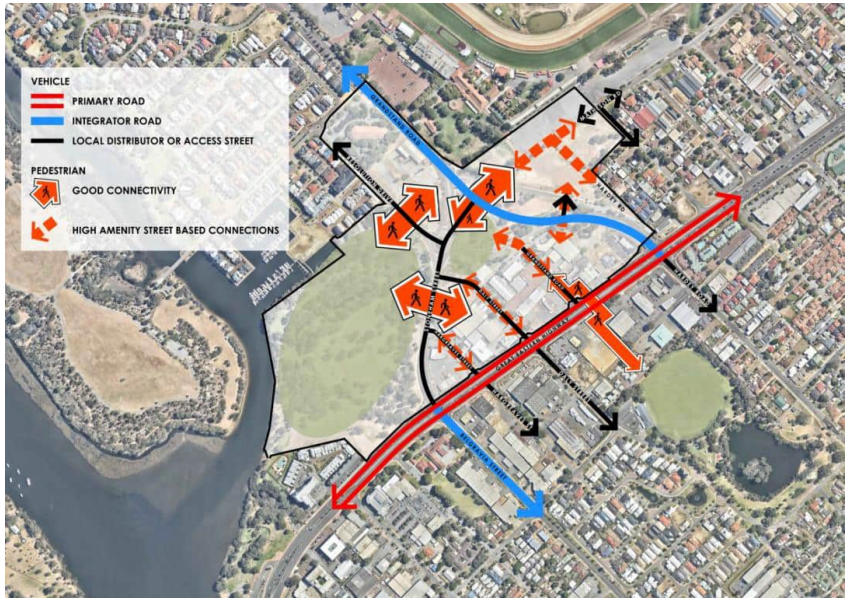

Figure 11 - Opportunity through altered vehicle priority for improved connectivity and access – to be considered further in design scenario testing

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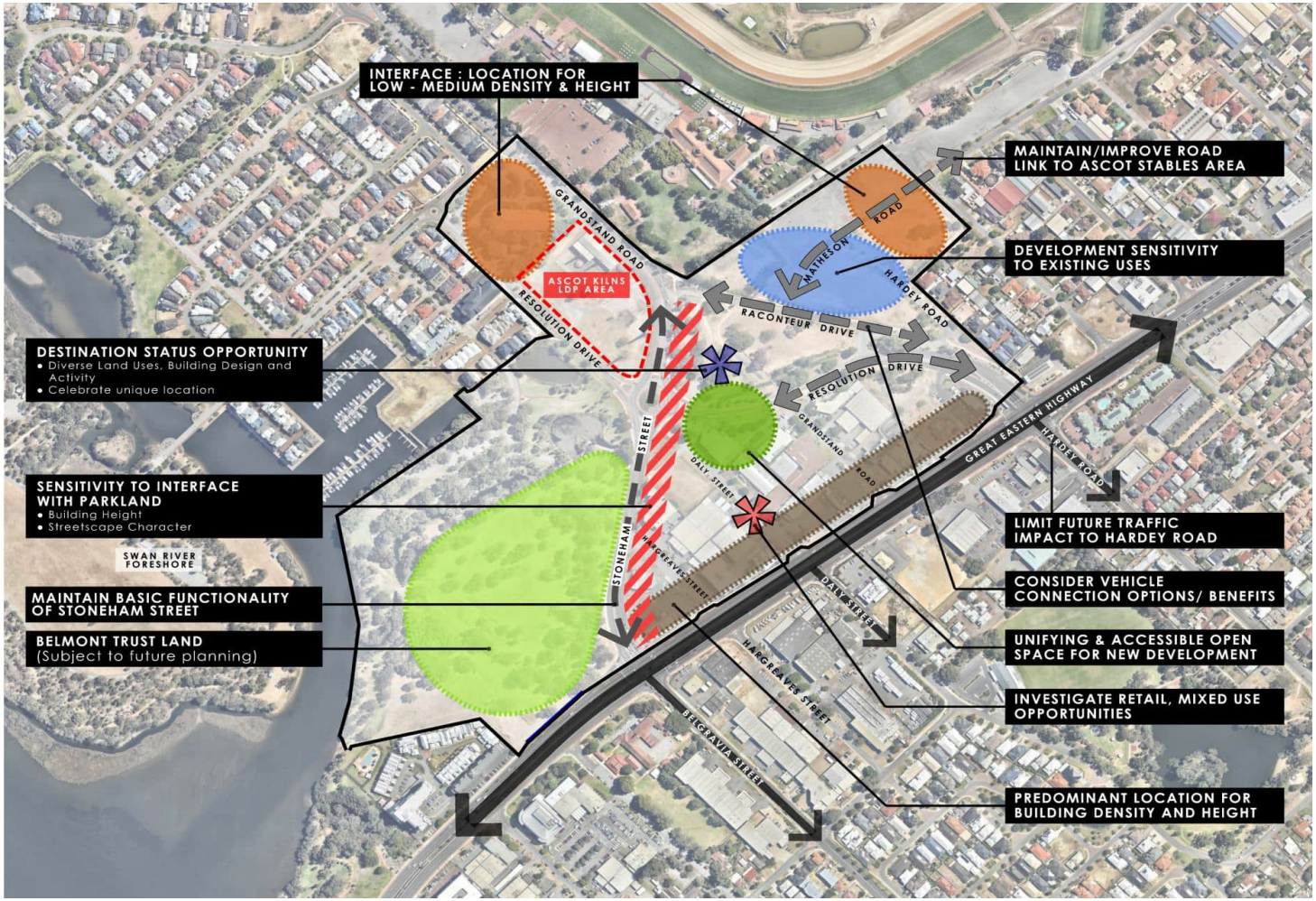

Figure 12 - Community engagement design feedback (summarised)

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3.2.3 CONCEPT SCENARIO FORMULATION

Analysis of the subject land and key design principles resulted in the preparation of three development scenarios for testing and stakeholder discussion (refer **Figure 13**). The initial phase of high level scenario testing involved the preparation of Framework Diagrams, exploring structural opportunities and benefits to the following:

- **Landuse** – preferred structure and location.
- **Circulation** – enhancing connections, preferred hierarchy with future flexibility & rigour.
- **Character** – celebrating local qualities for unique place setting and to enhance the existing amenity.

Preliminary sketches exploring alternative land use and movement structures

The Framework Diagrams were discussed and analysed with the community and Council technical officers as key elements for the next phase of scenario evaluation. Various scenarios achieved the project objectives better than others, particularly with regard to public amenity and community integration with the Swan River foreshore.

Preliminary sketches developing framework scenarios

The next phase of scenario refinement resulted in the examination of appropriate land uses, building forms and public realm to test the structural opportunities and benefits for each of the scenarios**.** These were then evaluated by the project team and the community via design workshops and web based consultation sessions.

Preliminary design scenarios

In summary, Scenario A evaluates the development opportunities for the precinct whilst maintaining the existing road network. This scenario highlights the limitations this has on development consolidation and for connectivity of future residents with the foreshore amenity.

Scenario B evaluates the development outcome where the existing road priorities of Stoneham Street and Resolution Drive are modified to improve integration of the precinct's residents with the adjacent public amenity.

Scenario C evaluates an outcome where the original road alignment of Raconteur Drive is used to maximise future integration opportunities for development west of this road and consolidation of the precinct's future residents.

Scenario evaluation outcome

This scenario evaluation process led to the refined design outcome produced in the preferred scenario.

The preferred scenario was informed by detailed public response to the preliminary scenarios at the community workshops, and through other stakeholder contribution. That preferred scenario was further tested and developed into the preferred Golden Gateway concept, described in detail in section 3.2.4.

It should be noted that through the preparation of the Structure Plan, further assessment of the proposed movement network was undertaken in relation to the potential impacts on the Stoneham Street-Belgravia Street and Resolution Drive-Hardey Road corridors. Based on this assessment and in conjunction with MRWA, it was considered that any modifications to the redistribution of traffic flows (i.e. via Resolution Drive) would not be supported.

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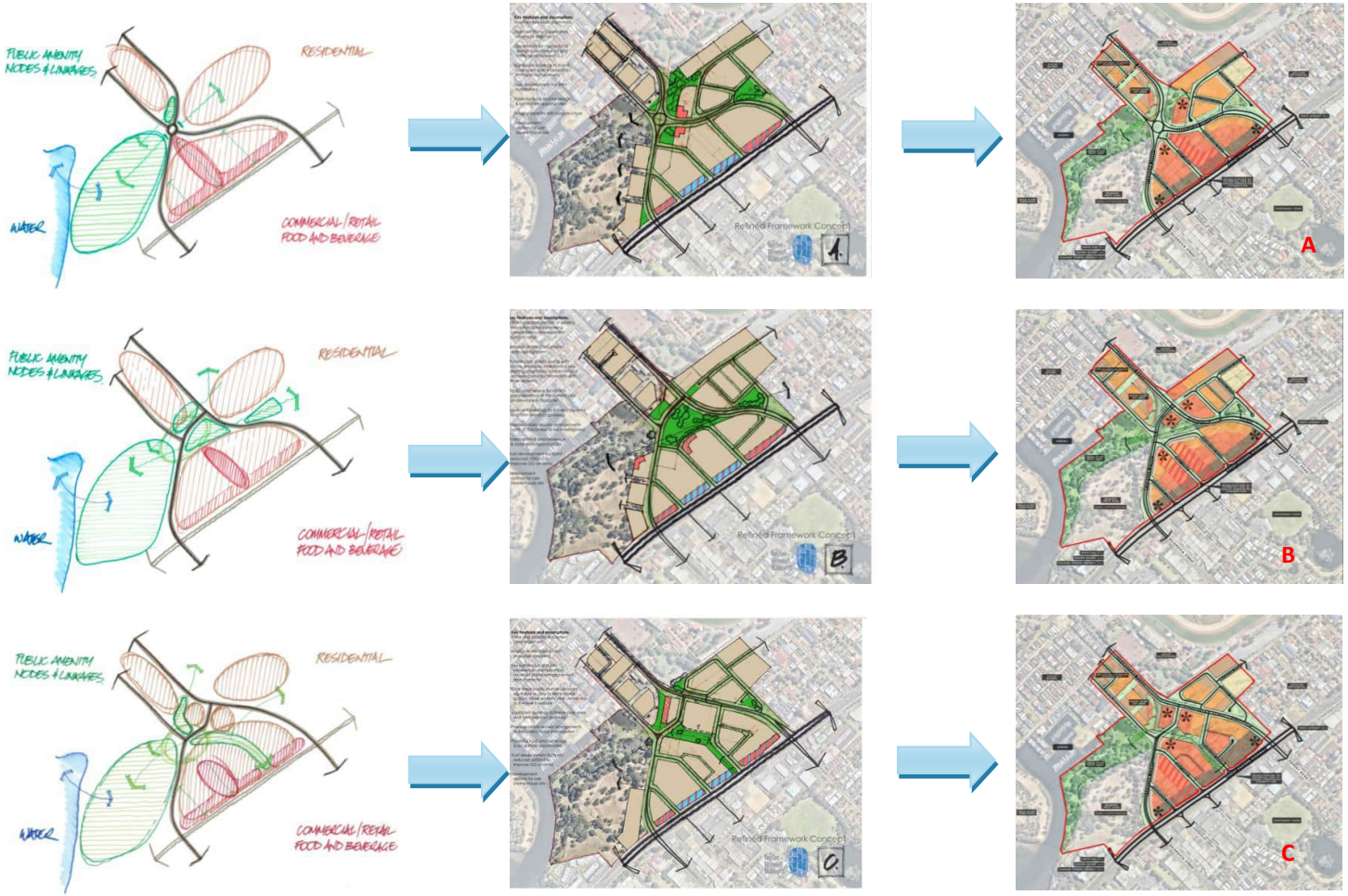

Preliminary sketches exploring alternative land use and movement structures

Preliminary sketches developing framework scenarios

Preliminary design scenarios

Figure 13 – Evolution of Design Scenarios

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3.2.4 DEVELOPMENT CONCEPT PLAN

To support the formal Structure Plan included in Part 1 – Implementation, a Development Concept Plan was prepared to illustrate the development intent. The original Development Concept Plan that formed part of the advertised version of the Structure Plan document (**Figure 14**) was based on the preferred scenario that evolved from the Scenario Evaluation process.

Figure 14 – Original Development Concept Plan

Post-advertising Design Review

Following the public comment period, and having regard to the comments received from the community and government agencies, the City commissioned a review of the Movement and Access Strategy. The revised strategy (contained in **Appendix C**) recommended an amended movement network that is more closely aligned with the existing infrastructure. As a consequence of this, and other feedback received, the following key changes are proposed to the structure plan:

1. Adopting the movement network modifications recommended in the revised Movement and Access Strategy;
2. Removal of planning detail from land owned by the Western Australian Turf Club;
3. Removal of the linear open space proposed over the Water Corporation drainage alignment; and
4. Alteration of building height provisions.

In accordance with this direction the Development Concept has also been revised to maintain consistency with the Structure Plan (refer **Figure 15**). It should be noted that this graphical representation is indicative only and serves to illustrate a long term, mature development scenario. Its primary purpose is to graphically communicate the ultimate vision and intent underpinning the Structure Plan.

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Figure 15 – Development Concept Plan

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Key concept features

The key features of the Development Concept Plan are outlined as follows:

Access and connectivity

- Integrate Golden Gateway with the broader Belmont catchment.
- Minimise the barrier of Stoneham Street by formalising pedestrian movement opportunities.
- Enhance vehicle accessibility and circulation benefits offered by the existing movement framework.
- Reconfigure road network for enhanced development consolidation and precinct character benefits.

Planning and land use

- Sensitively integrate residential development of increased density with the surrounding area.
- Convenience retail, shops, restaurants and cafes located 'parkside', and within a pedestrian friendly street environment, to take advantage of the unique amenity and population growth of the location.
- Moderate building height and density to the residential interfaces of the precinct, providing an appropriate transition to existing development.
- Provide flexibility for commercial mixed-use development along Great Eastern Highway.
- Contemplate development controls to foster appropriate multi-level development to support denser living options.
- Opportunity for diversification of uses – facilities, amenity, destination uses and attractions.

Built Form

- The height and scale of new buildings will form an appropriate relationship with their environment and context, including adjacent residents.
- Use building form to create a more comfortable and characterful environment, enhancing the gateway location, particularly adjacent the public realm.
- Consider suitable building form and locations to enhance the precinct's outcomes.
- Retail opportunities promoted for improved sustainability outcomes of the precinct and adjacent residents.

Public realm

- Enhancement of existing public streets, utilising the wide reserve widths to produce unique character and pedestrian comfort.
- Prioritise the retention of established tree canopies where achievable.

Destination Planning

- Capitalise on the opportunity to leverage subject land's exceptional destination qualities.
- Creation of framework / strategies to support detailed place planning, investment attraction and place management.
- Creation of framework / strategies that will attract a diverse mix of uses, attracting visitors across different times of the day and week.

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Images: Building Form Inspiration Images

Above: Introduce transitional building height to development edges.

Above: Corner site development addressing both street frontages, with 3 storey podium height to building edges and mixed height elsewhere on site.

Above: Example of a 4 storey residential building detailing an appropriate level of articulation and surveillance through the use of balconies and architectural elements. Also illustrates an acceptable treatment to site retaining at lot edges.

Above: Example of 5 storey mixed use building featuring retail/food and beverage uses at the ground level and residential living above producing a sustainable and active development outcome. In addition, this illustrates the beneficial outcome for buildings to interact with key mature trees available within the proposed Golden Gateway public realm.

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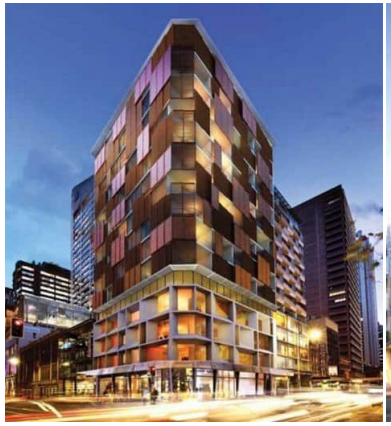
Left: Example of 8 storey buildings with suitable levels of architectural detail, material and artwork to achieve an appropriate response for Golden Gateway.
Right: Example of 10 storey building illustrating an appropriate podium design detail and landscape amenity.



Left: A 15 storey buildings providing an outstanding response to its corner location.
Right: A 8 storey building examples incorporating desirable podium design and setback to tower element(s).

Above: Landmark buildings providing exceptional architectural gateways into the Golden Gateway precinct.

Above: Example of appropriate response to podium requirements to achieve active and enjoyable streetscapes with building mass setback into the site.

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3.3 LAND USE

Golden Gateway will provide for a diverse range of land uses. The primary land use within the Structure Plan Area is residential, supplemented by commercial uses and local open space. A summary of the land uses and areas is provided in **Table 3**.

TABLE 3: LAND USE

Zone / Reserve	Area (Ha)
Mixed Use	1.7578
Residential	4.2473
Parks and Recreation	4.5556
Public Open Space	0.0525
Local Roads	4.7542

As outlined in Part 1 and **Plan 2**, the subject land has been divided into Precincts.

A statement of intent for each Precinct is described in Part 1 together with development standards to ensure that the intent of each Precinct is achieved.

3.3.1 RESIDENTIAL

Due to the proximity of high amenity areas such as POS and future areas of activity such as Great Eastern Highway, Stoneham Street and Resolution Drive, a density code of R-AC0 is proposed.

The R-AC0 coding has been applied to all land within the Mixed Use zone and it is considered that the Structure Plan and the R-Codes provides sufficient guidance on built form outcomes.

Part 1 – Implementation also stipulates maximum plot ratios applicable within the Mixed Use zone.

3.3.1.1 DWELLING PRODUCT TYPE, MIX AND YIELD

It is envisaged that Golden Gateway will accommodate primarily multiple dwellings to contribute to the desired scale and density of the development.

The estimated yield is indicative only, based on the build-out potential under the Structure Plan. With respect to dwellings, the ultimate yield and product mix will be determined by the type of development pursued by proponents and will be subject to the market conditions at the time, although the Structure Plan does impose minimum development parameters (for setbacks and heights) as well as maximums. The ultimate yield and product mix will be determined during the construction and development phase.

The Development Concept Plan suggests a potential yield of at least 2,268 dwellings. This could accommodate a total population of up to 4,082 assuming an average household size of 1.8 people.

3.3.2 OTHER LAND USES

3.3.2.1 COMMERCIAL

Commercial development in Golden Gateway will service the surrounding residential catchment and racing activities and optimise the value of the precinct's highly visible and connected location. The anticipated yield for the precinct estimates a total of 6979m^2 commercial (non-retail) floorspace (GFA).

It is envisaged that commercial activity will be mostly focused within the Great Eastern Highway Precinct (Precinct 1) and will likely occupy the first 1-2 levels of buildings across the precinct.

Development of commercial space is only likely to proceed based on its commercial feasibility and the prevailing market conditions at the time of development.

In order to foster the progressive and timely development of the precinct, it is not intended that commercial uses will be mandated within the Mixed Use areas; however ground level design should be adaptable to enable land use to change over time.

3.3.2.2 RETAIL

The existing residential areas of Ascot Waters and the stables area presently suffer a lack of local shopping facilities, with the BP Service Station on the corner of Resolution Drive and Great Eastern Highway providing the only nearby outlet for basic convenience items. Development of the Golden Gateway Precinct provides an opportunity to establish a local centre for the benefit of the precinct as well as the broader local catchment.

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The Mixed Use zone permits non-residential development and this is encouraged at ground level, it is anticipated that some discrete retail development will occur to service the local population.

The City of Belmont has prepared an Activity Centre Planning Strategy (ACPS) to guide the future planning and coordination of activity centres. The ACPS states that a new local centre is proposed to be established within the Golden Gateway precinct with 1,200m^2 of retail floor space and that its location will be guided by future detailed planning. Due to land fragmentation within the Structure Plan area it may be appropriate to locate the local centre on WATC land. This would however be subject to further detailed planning. Given this, a specific local centre location has not been designated within the Structure Plan area.

3.3.3 LAND USES

Part 1 – Implementation of this Structure Plan refers to corresponding zones within the Zoning Table of LPS 15 to determine land use permissibility within the various precincts. It does, however, stipulate some exclusions (uses that are considered Unacceptable, notwithstanding that they are listed as a discretionary use in the Zoning Table). Having regard for the amenity of future residents the unacceptable uses include:

- Auction Mart
- Caretakers Dwelling
- Fast Food Outlet / Lunch Bar
- Home Store
- Garden Centre
- Industry - Light
- Motor Vehicle Repair
- Night Club
- Radio or TV Installation
- Restricted Premises
- Service Station
- Single House
- Vet Hospital
- Warehouse

These uses have been excluded as they are considered to be inconsistent with the vision and objectives of the Structure Plan, and approval of such uses would compromise the urban fabric envisaged for the area.

Furthermore, 'Shop' is an Additional Use in the Mixed Use zone within the subject land.

3.3.4 BUILDING HEIGHT

Maximum building height limits apply to satisfy relevant protection of airspace, airport facilities and surfaces regulations due to the proximity of Perth Airport. Development must comply with maximum building height limitations as indicated on the Obstacle Limitations Surfaces (OLS) Ultimate Surfaces Map – maximum height of 61mAHD within the majority of the subject land, equating to approximately 19 storey buildings. The remainder of the subject land is located within the 'conical surface', being the 5% slope to 61mAHD.

Cygnet West were engaged to investigate development feasibility and built form controls along Great Eastern Highway and within the Structure Plan area. The building heights have been informed by their input and recommendations. Accordingly, a maximum building height of 15 storeys is encouraged along Great Eastern Highway given the prominence of this location and level of commercial activity envisaged for this precinct, with a maximum height of 10 storeys elsewhere. All sites within the Structure Plan area may incorporate an additional 5 storeys in height, above the maximum identified in **Table 2**. Achievement of additional height is subject to the discretion of the decision maker and will need to:

- The production of an exceptionally high quality of design, as determined by the appointed design review panel; and
- Incorporate the following:
    - An area of publicly accessible private open space; and
    - 100% of windows containing double glazing; and
    - Provide an additional tree on-site above what is required by State Planning Policy 7.3 Volume 2 – Apartment Design Code. The tree must be a native species with a pot size of between 100L – 200L; and

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- Provide conduits and capacity within the electrical distribution system and metering or future provision of electric car charging for each unit within the development; and
- Provide a minimum of two electric vehicle charging bays within the development; and
- Provide shared sustainable transport measures for the development that may include the provision of electric bikes, scooters and vehicle/s; and
- Achieve a Nationwide House Energy rating Scheme (NatHERS) star rating of a minimum of one star in excess of the current energy efficiency rating for the dwelling shall be certified by a suitably qualified and accredited energy assessor using accredited software and shall be provided a the development application stage; and
- Install a photovoltaic solar panel system that can provide the equivalent of at least 1Kw energy per dwelling.

In order to ensure development is built to a sufficient scale to facilitate the density envisaged for Golden Gateway, and to achieve the desired urban design outcomes, it is also considered appropriate to set minimum building heights. Priority should be given to the relationship of ground floor uses and building design with the public domain to ensure that considerations such as activation, passive surveillance and appropriate combination of uses are optimised.

A maximum podium height of 3 storeys applies (2 storey minimum) unless within the Great Eastern Highway Precinct, in which case a maximum podium height of 5 storeys applies. Podium elements are encouraged to relate to and activate the street, with the levels above the podium to be sufficiently setback.

Minimum and maximum building heights for podium and tower elements across the subject land are shown on **Plan 3** (Part 1).

3.3.5 LANDMARK SITES

There are two key locations situated at the termination of key view lines and sites highly visible from outside of Golden Gateway, thereby acting as landmarks for the development. These sites will also act as key nodes located along important pedestrian movement connections and will assist in linking these sites with the public realm.

Landmark sites have been identified as shown in **Plan 3** taking into consideration view corridors, overshadowing impacts and amenity considerations. In this regard, higher buildings are located at key corners of Great Eastern Highway and Stoneham Street and Resolution Drive.

Landmark sites should also be designed incorporating architectural or sculptural features with a point of difference, and will be reviewed by the City's Design Review Panel as a component of a Development Application.

3.3.6 CAR PARKING

The City wishes to encourage innovative approaches to car parking provision, such as reciprocity, carpooling programs or other innovations, that may result in reduced parking provision where appropriate, consistent with contemporary State Planning Policy. In this respect, the Structure Plan applies the car parking rates that are set out in the relevant R-Codes, and will also enable the Responsible Authority to consider approving a reduced parking provision where it can be demonstrated that an alternative parking proposal is sound and will result in a reduction in parking demand. Any proposed variation should be supported by a parking demand assessment undertaken by a suitably qualified professional.

An integrated approach to parking provision will be encouraged within Mixed Use and Multiple Dwelling development, in order to make the most efficient use of parking provision and to encourage use of alternative (public) transport modes where appropriate. In this respect special provisions are proposed to challenge the 'business-as-usual' approach to car parking design. The proposed parking provision is consistent with State Planning Policy 7.3 Volume 2 – Apartment Design. The following specific requirements are to be applied:

a) For Mixed Use development, all residential parking in excess of 1 bay per dwelling, and at least 50% of the minimum required parking for non-residential uses shall be made available for general use of either residential or non-residential uses (these bays represent unallocated communal parking bays).

b) Mixed Use development that proposed parking as outlined in 2a) above should be required, as a condition of Development Approval, to prepare a Car Parking Strategy that addresses the management of the unallocated communal parking provision, including:

    I. The hours during which parking bays shall be made available for general public access; and

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II. Location, signage and monitoring of usage of the unallocated communal parking bays.

c) The provision of car parking that is in excess of the minimum required for the site will only be approved where it is designed to be adaptable for future conversion into habitable floor space, or other useable space communal or private usage. In order for parking to be considered adaptable, it must be shown as located in a position that is suitable for an alternative use, not included in individual strata titles and constructed to comply with habitable floorspace standards.

This requirement may be waived if it can be demonstrated that complying with the requirement would not be practical or would result in a less desirable outcome.

3.3.7 PUBLIC OPEN SPACE

The total POS provision is commensurate with the composition of land uses and having regard to the surrounding site context.

It should be noted that the subject land is well located within an existing urban context comprising of significant public parkland associated with the Swan River and portion of the Belmont Charitable Trust Land provided for public recreational value. As the subject land is generally constrained from providing more functional POS, and as there is a significant existing provision, it is proposed that contributions be sought for the upgrade of POS already supplied within the Belmont Charitable Trust Land.

A POS calculation has been prepared in accordance with Liveable Neighbourhoods (LN), as detailed in **Table 5**, including applicable deductions. In accordance with LN, a total of 1.5186ha of Open Space is required to be provided (**Figure 16**).

In the case of mixed use development, there is no minimum requirement for the provision of POS under LN. LN states that the appropriate POS contribution for mixed use development will be determined by the WAPC on a case by case basis.

It is proposed that approximately 0.0525ha of local public open space be provided as result of the closure of Daly Street. The proposed provision is less than the standard POS requirement of 10% POS for residential development under LN, however the proposed provision is considered appropriate for a mixed-use precinct. Furthermore, the City's POS Strategy also sets out minimum standards of land area provision for POS based on current best practice and ease of accessibility to available open space for both residential and non-residential areas. The subject land falls within the Ascot study area of the Strategy which concludes that whilst active open space provision is considered low, the area is well equipped for passive recreational activities largely as a result of the Regional Open Space associated with the Swan River foreshore to service its local needs.

Consistent with the assessment provided in the City's POS Strategy, the subject land is well located within an existing urban context allowing the future residents to take advantage of a variety of established recreation and leisure opportunities associated with the nearby Swan River and environs.

There is also the potential for the cash-in-lieu to be collected for the upgrade of the Belmont Charitable Trust Land, subject to the approval of the Minister for Planning under s154(2)(c) of the *Planning and Development Act 2005*.

Although subject to a separate planning process, the Ascot Kilns LDP will identify and provide for 10% of gross subdivisible area as POS. There may also be opportunities for public open space on a portion of Perth Racing's landholdings. This may be investigated as part of the separate planning work they are undertaking.

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Figure 16 – Open Space Provision

TABLE 5: PUBLIC OPEN SPACE SCHEDULE

PUBLIC OPEN SPACE (ha)		
Gross Site Area		**23.9871**
DEDUCTIONS		
D1 Parks and Recreation Reservation (existing)	4.5556	
D2 Road reserves (existing)	4.1930	
Total Deductions		8.7486
Gross Subdivisible Area		**15.2385**
Creditable Public Open Space Required @ 10%		**1.52385**
PUBLIC OPEN SPACE PROVISION		
Unrestricted Public Open Space		
POS 1	0.0525	
Total Unrestricted Public Open Space		**0.0525**
Restricted Public Open Space		Nil
TOTAL CREDITED PUBLIC OPEN SPACE		**0.0525**
PERCENTAGE OF PUBLIC OPEN SPACE PROVIDED		**0.2%**

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3.3.8 PUBLIC REALM PROVISION

A Public Realm Strategy was prepared in support of the Structure Plan (refer **Appendix E**) to develop a clear vision, principles and objectives to inform development of the public realm.

Existing local streetscapes are predominantly reflective of the commercial environment, particularly within the commercial 'triangle'. The standard of verge maintenance ranges from good quality reticulated lawns through to poorly maintained verges damaged by random, uncontrolled, overflow parking. The extent and quality of the existing pedestrian infrastructure within, and surrounding, the Structure Plan is of a standard commensurate with the nature of existing development across the Structure Plan area (i.e. primarily light industrial/commercial unit style development). The extent and quality of the existing cycling infrastructure within and surrounding the site is of a high standard, partly as a result of the Great Eastern Highway upgrades.

The Public Realm Strategy sets out to provide a high quality urban framework that promotes pedestrian circulation, accommodates vehicles in a safe and logical manner and is an environment that presents a desirable destination to live, work and recreate. Placemaking should inform the detailed design of spaces throughout the precinct. The spaces need to be able to facilitate and accommodate diverse uses that may emerge from community social investment. Places across the site will achieve a successful balance between physical attributes, the vehicle circulation and dynamic social, cultural and economic vitality. Its inherent qualities are strongly related to its proximity to the Swan River and its heritage related to the Ascot Kilns.

The key public realm areas are set out in the following pages.

Examples of Public Art, Rain Gardens & Swale Designs in an Urban Context (Jolimont Parkside Walk)

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Road and street treatments

Road hierarchies and overall legibility of the subject land will be reinforced by the type of tree planting associated with the scale of the road. The paving treatments within all streets and roads will feature a consistent material palette to reinforce the distinctive character of the area.

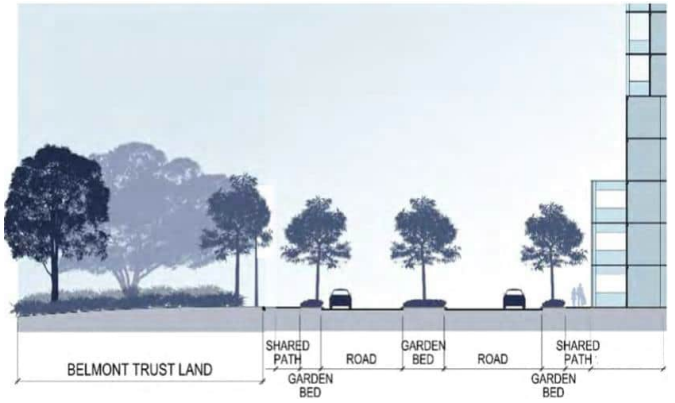
Resolution Drive and Stoneham Street.

Whilst Resolution Drive and Stoneham Street will be largely vehicle dominated, the landscape aesthetic will be dominated by tree planting of larger species, creating a canopy boulevard along its length. Verge and median planting will create a formalised sinuous corridor of canopy trees that are recognisably different to the scale and nature of other landscapes in the area (refer **Figure 17**). Street trees will be planted to create a boulevard aesthetic the length of the street, aiding in wayfinding.

Resolution Drive

Stoneham Street

Resolution Drive



Stoneham Street

Figure 17 – Resolution Drive and Stoneham Street (Plan Extract and Indicative Section

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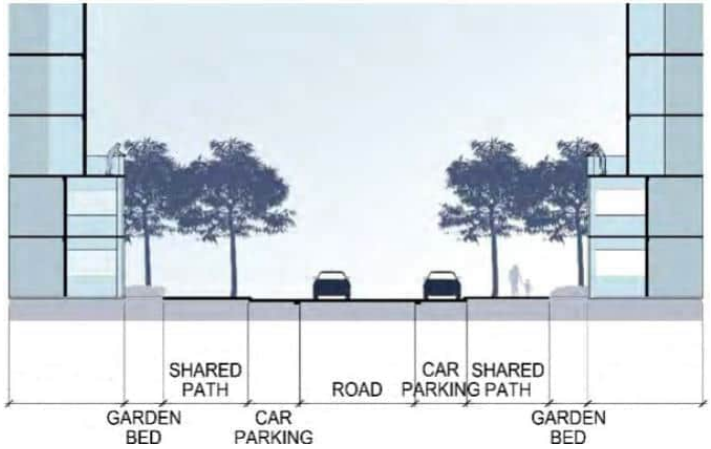
Central Streets

Hargreaves Street, Daly Street and Grandstand Road will comprise street tree planting that is not monoculture but uses a mix of street trees in varying combinations, to provide a dynamic and varied street tree canopy (refer to Section 10.3 of the Public Realm Strategy for proposed tree species). These streets will extend the overall public realm character established within the precinct but in a simpler manner. Street tree planting is proposed to create a canopied streetscape and to be positioned abutting the parallel parking embayments (refer to **Figure 18**).



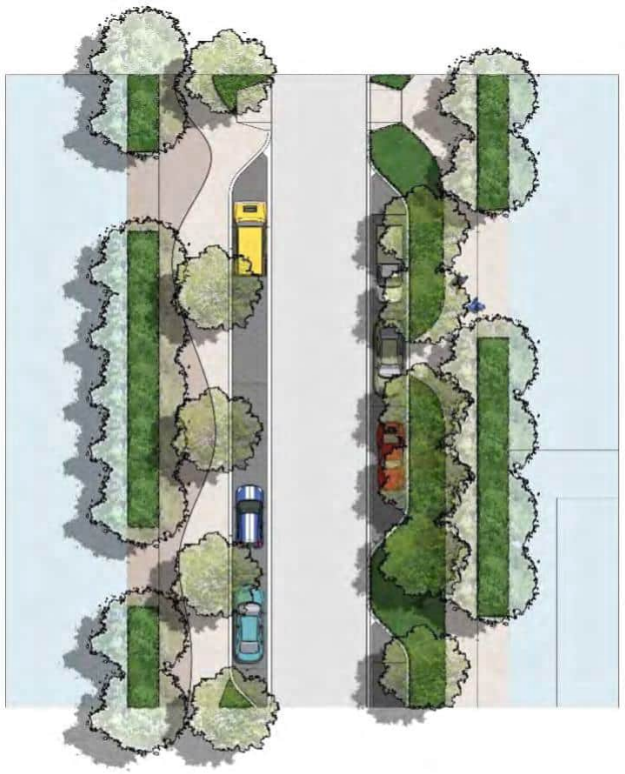


Figure 18 – Central Streets (Plan Extract and Indicative Section

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3.3.9 LANDSCAPE DESIGN

3.3.9.1 DESIGN OBJECTIVES – AN URBAN LANDSCAPE

As a busy location, the public realm offers the opportunity to be transformative, linking uses and people to the nearby valued Swan River, its parklands and the heritage and interest of the Ascot Kilns.

The public realm spaces made up of streets and a park, combine to be a defining element of this location, that importantly the users, employees and residents will experiences and define the qualities of the public realm.

The overall landscape design objectives for the public spaces are set out below:

Identifiable character

- Create a contemporary urban environment that promotes safe and easy pedestrian experiences.
- Create new diverse urban landscapes that reflect the subject land's unique characteristics and close links to the river parklands.
- Create spaces that encourage and accommodate local community use and engagement.
- Establish an aesthetic that promotes positive development and investment in the location.
- Celebrate the heritage significance of the Ascot Kilns.

Valuable Landscapes

- Create a microclimate in public realm spaces and streets which encourages use and enjoyment.
- Provide key views and relationships that assist in orientation and legibility.
- Create highly utilised and valued public realm streets and spaces.

Environmental/Sustainability

- Create a durable urban landscape.
- Reduce urban heat sink characteristics.
- Create urban tree canopy (in compliance with the City of Belmont's Urban Forest Strategy 2014 and the The Canopy Plan 2019-2024).
- Retain vegetation wherever practical.
- Promote the use of low water demand plants.
- Pursue water harvesting, passive irrigation and integrated urban water management.

3.3.9.2 INTEGRATED DRAINAGE MANAGEMENT

The use and promotion of Water Sensitive Urban Design (WSUD) techniques and approaches are to be utilised wherever possible throughout the subject land. The space for nutrient stripping is limited. As the urban area is not producing a nutrient load, the focus is on slowing runoff and reducing hydrocarbons. The use of linear and incidental 'rain gardens' and 'nutrient sinks' can be implemented discretely within paving in streets and areas of open space. These devices should be fully integrated with the road drainage promoting passive irrigation of street tree vegetation and controlling hydrocarbon runoff.

Within the context of a dense inner urban area, the design of these WSUD devices need not be natural in appearance but can be incorporated within the urban public realm infrastructure as a contemporary feature.

It is intended that the POS space within the redundant portion of the Daly Street road reserve will contain soft landscape areas. These areas present an opportunity to accommodate local drainage that is managed through swale type structures that infiltrate water and passively irrigate trees and other vegetation used in the public realm. This will be subject to further investigation and more detailed design at a later stage.

The use of permeable pavements and porous asphalt treatments in key locations is recommended, possibly associated with lower level threshold treatments of road junctions, should be incorporated as a component of the approach to integrated drainage management.

In order to deliver wider environmental sustainability objectives, as well as providing attractive places in which residents and visitors can enjoy, consideration should be given to the conservation of water resources and quality of groundwater. The use of water efficiency measures is encouraged and should promote the investigation of best management practices for irrigation of public open space.

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The availability and quality of groundwater within the LSP area is limited at this stage. This will affect the ability of the City of Belmont to irrigate the proposed vegetation within the public realm areas. Therefore, due to the limitation of groundwater for irrigation purposes, the future irrigation of vegetation within the POS and public realm areas will need to be supplied by other sources. This may include scheme water, stormwater, irrigation (by agreement) from the Western Australian Turf Club's (now operating as Perth Racing) artesian groundwater licence, a new irrigation lake or other irrigation strategies will need to be investigated in the future. The City may encourage developers to consider the irrigation of abutting verge vegetation and street trees to ensure the high quality natural amenity of the public realm is maintained. Alternatively, non-irrigated (dry) landscape may need to be considered for the public realm areas.

3.4 MOVEMENT NETWORK

A Movement and Access Strategy was prepared by Flyt in support of the Structure Plan (refer **Appendix C**). This Strategy has been prepared using the requirements set out within the WAPC Transport Impact Assessment Guidelines (August 2016) Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans.

3.4.1 ROAD NETWORK AND TRAFFIC MANAGEMENT DEVICES

As outlined within this report, the Structure Plan proposes to retain the broad framework of the existing road network and primary traffic flows in order to achieve the desired development outcome, apart from Daly Street that will become a cul-de-sac. The remainder of Daly Street will be identified as POS.

The proposed changes to the existing road network and associated road hierarchy are outlined in **Figure 19** overleaf**.**

3.4.2 TRAFFIC FORECASTS

As outlined in the Movement and Access Strategy, the following new vehicle trips are anticipated to be generated by the proposed development:

- **AM peak hour traffic:**
    - Inbound 259 vehicles
    - Outbound 480 vehicles
    - **TOTAL 739 vehicles**
- **PM peak hour traffic:**
    - Inbound 405 vehicles
    - Outbound 334 vehicles
    - **TOTAL 739 vehicles**

In summary, based on the application of standard assessment techniques as outlined in the report, the proposed development results in a slight reduction in road network performance in 2041 in the PM peak period at the Resolution Drive - Great Eastern Highway intersection.

The Stoneham Street - Great Eastern Highway modelling shows that by 2041 under the base scenario (i.e. without Golden Gateway development), all approaches (other than Belgravia Street approach) would operate over capacity during the AM peak and during the PM peak at all approaches. Factoring in the proposed Golden Gateway development, the degree of saturation on the Stoneham Street and Great Eastern Highway approach increases, however the level of service remains unchanged.

Acknowledging the current and existing background traffic growth rates the focus of the Structure Plan is to facilitate the enhancement of pedestrian and cycle connections. The increase in resident population can also serve as a catalyst in a step change in public transport use in the local area.

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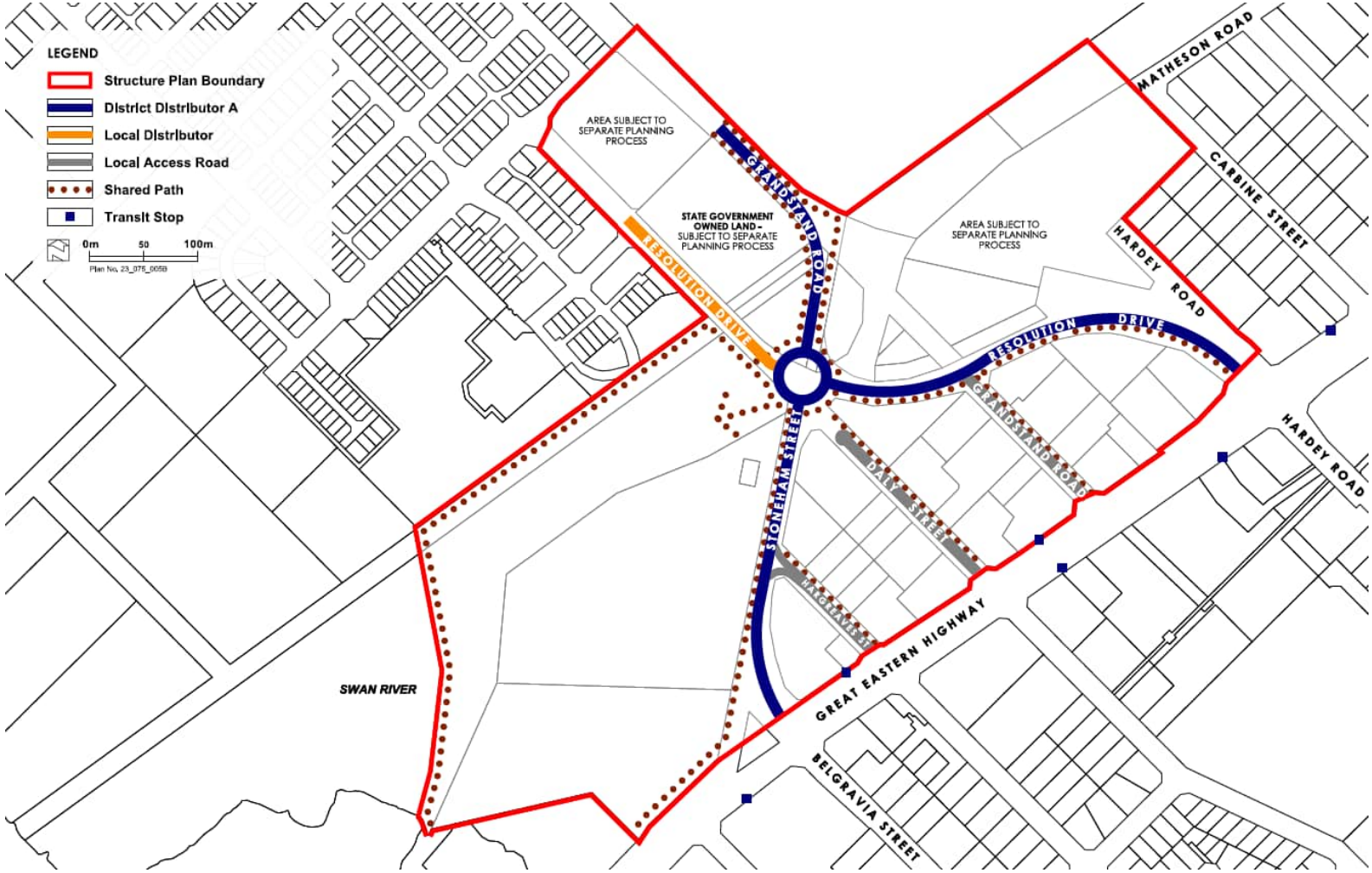

Figure 19 - Movement Network

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3.4.3 PEDESTRIAN AND CYCLING NETWORK

All existing shared paths surrounding and through the subject land will be maintained, furthermore a 20% reduction in car driver and car passenger mode share is sought. Strategies to affect this change include:

- Implementation of a precinct wide 30km/h speed zone (excluding Grandstand and Stoneham Street as the main through route for traffic) to improve the environment for walking and cycling.
- Raised zebra crossings, with the crossing at footpath level creating a raised plateau speed hump for vehicles.
- Completing gaps in the shared path network and implementing the long term cycle network routes through the precinct.
- Increasing the tree canopy coverage along all roads within the precinct to create a pleasant environment for walking and cycling.
- Ensuring there are a variety of local amenities within a short and pleasant walking or biking distance.
- The introduction of a bike or electric scooter share scheme.
- The introduction of a car share scheme.
- The imposition of a parking cap for residential and commercial uses
- Lobby the Public Transport Authority to improve bus services to the Structure Plan area and explore the potential of other transit options such as a superbus of trackless tram.

3.4.4 PUBLIC TRANSPORT

High level discussions with the Public Transport Authority (PTA) has informed the proposed changes anticipated for the existing public transport network as discussed below. The introduction of the rail connection from central Perth to High Wycombe, including a park 'n' ride station at Redcliffe Train Station, resulted in the removal of four of the five existing bus routes operating along the Great Eastern Highway corridor. These were replaced with bus routes 293 and 940.

Currently the only bus routes that pass through the Structure Plan area are the circle route bus services 998 and 999 which are high frequency routes that travel along Grandstand Road and Resolution Drive, and then continue to Hardey Road. There are currently no bus stops for the circle route within the Structure Plan area, with the closest bus stops located on Grandstand Road immediately to the north of the Structure Plan area close to main pedestrian access for Ascot Racecourse.

High frequency bus route 940 operates along Great Eastern Highway which forms the southern boundary of the Structure Plan area and operates between Elizabeth Quay Bus Station and Redcliffe Station. Bus route 293 between Redcliffe Station and High Wycombe Station also travels along Great Eastern Highway (east of Belgravia Street) and along Belgravia Street.

The PTA has indicated that, if sufficient public transport demand was generated by large scale development of the subject land, they would consider the option of operating a bus service which connected the subject land and Perth CBD with a bus service that utilised the internal road network. However this would be contingent upon the proposed development generating the requisite public transport demand to warrant the investment in such a service.

3.5 WATER MANAGEMENT

3.5.1 STORMWATER MANAGEMENT

The key objectives for stormwater management are:

- Protection of wetlands and waterways (receiving environments) from the impacts of urban runoff.
- Protection of infrastructure and assets from flooding and inundation.

The following planning measures are adopted to achieve the above objectives:

- Residential, industrial or commercial premises in existing or proposed areas must maintain floor levels at 500 mm above the 100yr ARI in the Swan River and 300 mm above the 100yr ARI in the local drainage system.
- Runoff from events greater than the 1yr ARI interval event and up to the 5yr ARI event in residential areas and 10yr ARI event in commercial/industrial areas are to be managed in accordance with the serviceability requirements of Australian Rainfall and Runoff (Engineers Australia, 2001) minor/major system.
- Stormwater in excess of the capacity of on-site retention systems will be conveyed through the existing drainage system consisting of local road drainage, Central Belmont Main Drain Basin and compensating basin.
- Major flood runoff (1% AEP) will be conveyed via overland flow within the road reserve to the compensating basin and drain prior to discharging to the Swan River.

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- The design of the redeveloped urban areas should incorporate current best practice in WSUD to mitigate the potential impacts on regional water quantity and quality from redevelopment and the legacy conditions within the catchment.
- Retrofitting of stormwater management systems to achieve improved water quality outcomes should be maximised through the installation of biofilters (raingardens), amended soils and the use of structural controls to address litter, sediment and vegetative materials at source.
- Modification of the existing Central Belmont Main Drain and local drainage systems to suit the urban form whilst maintaining drainage capacity and peak flow rates.
- WSUD and best management practices promoting on-site retention of the first 15mm of rainfall for small rainfall events.

3.5.2 GROUNDWATER MANAGEMENT

The key objectives for groundwater management are:

- Protecting infrastructure and assets from flooding and inundation by high seasonal groundwater levels, perching and/or soil moisture.
- Protecting groundwater dependent ecosystems from the impacts of urban runoff.
- Managing and minimising changes in groundwater levels and groundwater quality following redevelopment.

The following planning measures are adopted to achieve the above objectives:

- Retain existing surface levels as a minimum to ensure adequate separation.
- Limit basements in areas of shallow groundwater.
- Use of subsoil drainage below bio-retention areas, raingardens and tree pits to minimise local groundwater rise.

Groundwater levels provide potential clearance for basements to be installed, with two storey basements possible closer to Great Eastern Highway. Detailed designs of any infrastructure below the existing surface level (such as basements) may include tanking or other forms of damp-proofing. Any temporary lowering groundwater for construction, either for basements or sewer, may require dewatering licences from DWER.

3.6 EDUCATION FACILITIES

Existing education facilitates located within close proximity to the subject land include the following:

- Belmont Primary School is located at the intersection of Great Eastern Highway and Belgravia Street.
- Redcliffe Primary School is located approximately 3km to the east.
- St Maria Goretti's Catholic School is located approximately 2.5km to the east.
- Maylands Peninsula Primary School is located approximately 2.5km to the north.
- Belmont City College is located approximately 3km to the south.

Given the nature of the development and anticipated demographic it is anticipated that there will be limited additional demand for education facilities generated in the precinct. The Golden Gateway Precinct is well located within an existing urban context allowing future residents to take advantage of existing education facilities.

3.7 EMPLOYMENT

Given the subject land's strategic location close to existing employment opportunities in the Belmont mixed business area, proximity to Perth CBD and commercial land uses along Great Eastern Highway, the area already enjoys a high rate of employment self-sufficiency, therefore additional employment generating land uses are not considered necessary to improve local employment opportunity. The non-residential uses anticipated for the Golden Gateway Precinct will generate a small amount of locally-based employment; however, the main purpose of these uses is to provide local services and to optimise the value of its highly visible and connected location.

3.8 INFRASTRUCTURE COORDINATION, SERVICING AND STAGING

An Infrastructure Assessment Report was prepared by Cardno in support of the Structure Plan (refer **Appendix D**).

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3.8.1 WATER SUPPLY

Water Corporation does not foresee any issues with servicing the proposed scheme with potable water. Initial advice from the Water Corporation has confirmed the following with regards to required upgrades:

- Water Corporation will upgrade the headworks, pipe equal to or greater than 300mm diameter and pump stations, as and when required.
- Water Corporation recommends a consolidated approach to the requesting and programming of works to minimise disruptions and maximise cost efficiencies. Water Corporation recommends any reticulation reinforcement or new work should be managed by the City of Belmont due to the fractured land ownership within the area. It is recommended that a working group between the City of Belmont and Water Corporation is set up in order to help plan and coordinate precinct development and staging with any Water Corporation trunk infrastructure capital works.

3.8.2 WASTEWATER

The proposed development will have significant impacts to the current wastewater infrastructure. It is not envisaged the existing Redcliffe Pump Station 5 will have sufficient capacity with a shortfall of 9.09 L/s to service the proposed development and will require a significant upgrade. This would require the upgrade of the existing pumping station to a larger type 40. A type 40 pumping station is a station capable of a 40 L/s service consisting of two pump-sets located in a common wet-well constructed from 2500mm internal diameter precast concrete pipes. Redcliffe Pump Station 2 will likely have capacity, however further planning should be coordinated with the Water Corporation to ascertain other timing of other developments in the area.

3.8.3 POWER SUPPLY

The Belmont substation servicing the subject land falls under the Cannington load area. Western Power's Annual Planning Report 2015/16 states "no substation capacity shortfall is forecast in the Cannington load area over the next five years." This takes into account committed, and most likely to occur, network expansion plans for the area. The Western Power Network Mapping Tool indicates that there is >30MVA spare capacity in the network until at least 2036 based on current and forecast demand.

3.8.4 GAS SUPPLY

Correspondence received from ATCO Gas advised that the existing infrastructure can support the proposed development.

3.8.5 TELECOMMUNICATIONS

The infrastructure within a development will be installed by the developer. Alternatively, Telstra can be engaged to install infrastructure within a development at the developer's expense.

Telstra's commercial pit and pipe service will generally not be offered in developments where NBN Co has confirmed agreement to install NBN Co fibre within a development stage.

3.8.6 WATER CORPORATION MAIN DRAIN

Stormwater in excess of the capacity of on-site retention systems will be conveyed through the existing drainage system consisting of local road drainage, Central Belmont Main Drain Basin and compensating basin. No changes to the Central Belmont Main Drain are proposed.

Future planning of the WATC land should provide for an appropriate interface with the Central Belmont Main Drain.

3.9 IMPLEMENTATION

3.9.1 SCHEME AMENDMENT TO FACILITATE STRUCTURE PLAN

An amendment to the City of Belmont's LPS 15 will be required to apply the R-AC0 density code over the subject land and to exclude land uses that would be permissible within the Mixed Use zone and identified in section 4.1.1.1. This Amendment will also need to provide for the 'Shop' land use as an additional use.

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3.9.2 INFRASTRUCTURE FUNDING STRATEGY

The City of Belmont may establish an appropriate funding strategy for the Structure Plan Area. As part of the strategy, a Development Contribution Area (DCA) within LPS 15, under which a Development Contribution Plan (DCP) may be implemented to contribute to the funding of the public infrastructure requirements to facilitate development in the Structure Plan Area will be considered.

Infrastructure items that would be eligible to be funded under a DCP should be in accordance with State Planning Policy 3.6 Development Contributions for Infrastructure (SPP 3.6) and may include:

- Great Eastern Highway pedestrian crossing.
- Land for public open space and community facilities.
- Landscape treatment for all public realm areas, including local roads.

This Structure Plan will inform any future DCP, particularly in relation to the proposed upgrades to roads and intersection treatments as determined by the Movement and Access Strategy contained at **Appendix C** and the Public Realm Strategy contained at **Appendix E**.

3.9.3 LAND ASSEMBLY

There are various statutory processes required to deliver and facilitate development of the subject land, including amendments to LPS 15. Following adoption of the Structure Plan, subdivision and amalgamation applications can be lodged with the WAPC in the normal manner to assemble the land appropriately. Amalgamation is also likely to occur to enable land rationalisation. The subdivision/amalgamation process may be necessary to create some key elements of the project, primarily for the amalgamation of land parcels as shown on **Figure 20** overleaf.

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Figure 20 – Implementation

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APPENDIX A
BUSHFIRE MANAGEMENT PLAN

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APPENDIX B
ENVIRONMENTAL ASSESSMENT REPORT

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APPENDIX C
MOVEMENT AND ACCESS STRATEGY

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APPENDIX D
INFRASTRUCTURE ASSESSMENT REPORT

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APPENDIX E
PUBLIC REALM STRATEGY

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Golden Gateway Structure Plan

Bushfire Management Plan

Prepared for City of Belmont

By Urbaqua

June 2018

urbaqua
land and water solutions

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This Bushfire Management Plan provides strategic assessment of the subject site only. A subsequent Bushfire Management Plan and/or Bushfire Attack Level (BAL) Assessment may be required to support future development applications. The recommendations contained in this report are considered to be prudent minimum standards only, based on the author's experience as well as standards prescribed by relevant authorities. It is expressly stated that Urbaqua and the author do not guarantee that if such standards are complied with or if a property owner exercises prudence, that a building or property will not be damaged or that lives will not be lost in a bush fire.

Fire is an extremely unpredictable force of nature. Changing climatic factors (whether predictable or otherwise) either before or at the time of a fire can also significantly affect the nature of a fire and in a bushfire prone area it is not possible to completely guard against bushfire.

Further, the growth, planting or removal of vegetation; poor maintenance of any fire prevention measures; addition of structures not included in this report; or other activity can and will change the bushfire threat to all properties detailed in the report. The achievement of the level of implementation of fire precautions will depend on the actions of the landowner or occupiers of the land, over which Urbaqua has no control. If the proponent becomes concerned about changing factors then a Bushfire Management Plan should be requested.

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EXECUTIVE SUMMARY

This bushfire management plan has been undertaken to support structure planning for the Golden Gateway Precinct in the City of Belmont (Figure 1).

A small portion of the subject land is identified as a bush fire prone area, designated by the Fire and Emergency Services (FES) Commissioner. This report has been prepared to meet the requirements of *State Planning Policy 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) (2015) and the *Guidelines for Planning in Bushfire Prone Areas*, Version 1.1 (WAPC, 2017).

This plan provides advice consistent with the nature of a strategic proposal. Details in this report are consistent with *State Planning Policy 3.7: Planning for Bushfire Prone Areas* (WAPC, 2015) and the *Guidelines for Planning in Bush Fire Prone Areas* and associated appendices (V1.3, WAPC, 2017).

A vegetation class assessment was conducted for the subject land and adjacent areas for a minimum of 150 metres. As the road and lot layout is known, a bushfire attack level (BAL) assessment was undertaken and a BAL contour plan has been developed to show the indicative future BALs. This information may be used to guide the future development of the site, consistent with *AS3959 Construction of buildings in Bushfire Prone Areas*.

Bushfire risk to the areas proposed for future development is BAL-LOW. There is insufficient risk to warrant specific construction requirements.

The bushfire mitigation and management strategies outlined in this management plan comply with the acceptable solutions of control for each of the Bushfire Protection Criteria detailed in *Guidelines for Planning in Bushfire Prone Areas* (2017).

It is therefore considered that this bushfire management plan demonstrates compliance with the objectives and provisions of *State Planning Policy 3.7: Planning in Bushfire Prone Areas*.

This bushfire management plan is to be endorsed by the City of Belmont and is required to be reviewed and updated where necessary.

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1 INTRODUCTION

The City of Belmont has engaged Urbaqua to prepare a Bushfire management plan to support preparation of a local structure plan for the Golden Gateway project area (Figure 1) in the City of Belmont (Figure 2).

A portion of the subject land is identified as a bush fire prone area, designated by the Fire and Emergency Services (FES) Commissioner (Figure 3). This report has been prepared to meet the requirements of *State Planning Policy 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) (2015) and the *Guidelines for Planning in Bushfire Prone Areas* (V1.3, WAPC, 2017).

Any identified bushfire risk will be addressed as part of the future development approvals process, consistent with the requirements of *State Planning Policy 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) (2015), the Building Code of Australia and *Australian Standards (AS3959-2009): Construction of buildings in bushfire prone area* where these apply.

1.1 Proposal details

The subject land consists of approximately 31.8 hectares of land in the vicinity of Great Eastern Hwy, Resolution Dr, Grandstand Rd and Stoneham St in Ascot.

The Golden Gateway Precinct includes a large portion of 'Mixed use' land, which encompasses the historical Ascot's Bristle beehive kilns and chimney stacks and portions of the Ascot Racecourse. The precinct also contains approximately 5.3 ha of Parks and Recreation reserve which covers Belmont Trust Land. There is also a small portion of Parks and Recreation: water supply sewerage and drainage reserve, which is under the control of the Water Corporation.

The Golden Gateway Precinct will provide for a diverse range of land uses. The primary land use within the Structure Plan area is residential, supplemented by commercial uses and local open space

1.1.1 Planning background

The majority of the study area is zoned 'Urban' under the Metropolitan Region Scheme, with a portion zoned for 'Mixed use' and reserved for 'Parks and Recreation' under City of Belmont Local Planning Scheme No. 15.

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Figure 1: Development concept plan and proposed zoning (Source: TBB)

City of Belmont: Golden Gateway - Bushfire Management Plan

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Figure 2: Subject land

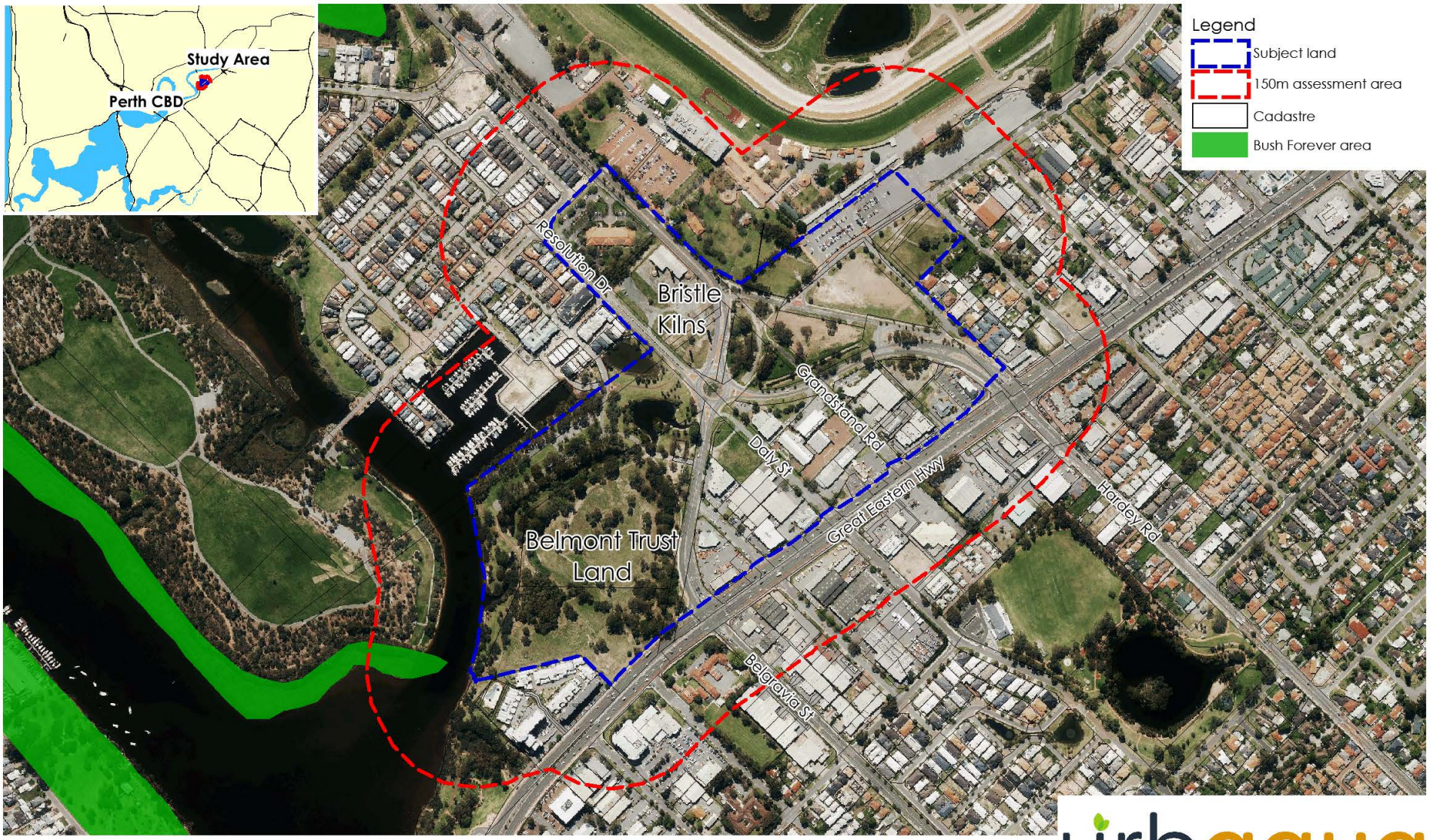

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Figure 3: Map of Bushfire Prone Areas for the subject site (Source: DFES, 2018)

1.2 Bushfire management guidelines, specifications and minimum standards

Specifications or standards relevant to this bushfire management plan are derived from and consistent with:

- *Fire and Emergency Services Act 1998*
- *Bush Fires Act 1954*
- *Planning and Development (local planning Scheme amendment) Regulations 2015*
- State Planning Policy 3.7: Planning in Bushfire Prone Areas (WAPC, 2015);
- *Guidelines for Planning for Bushfire Prone Areas* and appendices, Version 1.3 (WAPC, 2017)
- Australian Standards (AS3959-2009): *Construction of buildings in bushfire prone areas*; and
- City of Belmont Fire Break Notice 2017-2018.

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2 ENVIRONMENTAL CONSIDERATIONS

The subject land has been used predominantly for commercial purposes for over 50 years. The Golden Gateway Precinct includes the historical Ascot's Bristle beehive kilns and chimney stacks and portions of the Ascot Racecourse. The subject land also contains a large proportion of managed parkland which borders the Swan River. The Belmont Trust Land in the western portion of the study area was historically used for sporting purposes such baseball fields and is now maintained as parkland by the City. There are no significant environmental values located within the subject land.

Bush Forever site 313, Swan River Salt Marshes is located within the 150m assessment area. This area is separated from the subject land by the Swan River, which is approximately 70m wide at this point. The remaining areas within 150m of the subject land have no significant environmental values. They include Ascot Racecourse, Belmont Park Primary school, residential housing and commercial areas.

2.1 Native Vegetation – modification and clearing

The vegetation in the study area has been highly modified. Although mature trees remain in many parts of the subject land, the undergrowth has been cleared and is maintained in a modified landscaped, parkland state.

Although the grassland which covers the Belmont Trust land is managed and maintained by the City of Belmont, a small portion of regrowth exists where the tree trunks are too close together to permit mowing. This land is proposed to be developed in the future, although the development concept is not yet known. The City will continue to maintain the Belmont Trust Land in a low fire hazard state.

Some bushfire risk exists as a result of vegetation within and adjacent to Bush Forever Area 313 (Swan River Salt Marshes) located to the north west of the subject land. This vegetation is separated from the subject land; however, by a branch of the Swan River. It is also noted that the majority of vegetation on the island is maintained in a low fuel state. Where shrubs and trees exist, there is no understory and the fine fuel load is less than 2tonnes/ha.

Plate 1: Fine fuel load less than 2 tonnes/ha on the island adjacent the subject land

Vegetation also exists around a drain on the south-western side of the Ascot Quays Apartment Hotel. This vegetation is outside the subject land but within 150m of the structure plan area. The

vegetation is less than 20m in width on each side of the drain and the understory is managed (irrigated) grassland. This vegetation is not considered to represent a bushfire hazard.

2.2 Re-vegetation/Landscape Plans

No revegetation is proposed within the subject land.

Some landscaping of road reserves, open space and car parks is proposed. This will consist of individual trees without understory or managed parkland and as such is not considered to have the potential to create a fire hazard.

3 BUSHFIRE ASSESSMENT RESULTS

3.1 Assessment Inputs

In order to identify the potential bushfire risks, it is necessary to describe the bushfire problem associated with the subject land. The assessment takes into consideration the:

- the topography and slope of the subject land;
- type and classification of vegetation present on and adjacent to the subject land;
- distances between the classifiable vegetation; and
- current and proposed future land use.

3.1.1 Slope

The study area has generally flat topography and grades gently from 6mAHD in the south-east to 3mAHD in the west. The study area has a few low points of approximately 1-2mAHD through the centre of the study area, as shown in Figure 4.

The effective slope (that is the slope that will affect the behaviour of an approaching bushfire) underneath the vegetation across the River to the west is upslope.

Slope is therefore not considered to be a factor in terms of increasing bushfire hazard.

3.1.2 Current and future land use

The subject land comprises four key precincts:

- The area bounded by Great Eastern Highway, Stoneham Street and Resolution Drive is characterised by predominately mixed business development and small pockets of retail (food and beverage) uses along Great Eastern Highway;
- The western portion of the subject land encompassing the Belmont Trust Land (Grove Farm Reserve) is previously cleared with large mature trees sparsely located around the reserve. Grove Farm Reserve was historically used for recreation purposes, specifically a baseball field;
- The northern portion of the subject land is partially developed with the WA Turf Club Headquarters and Ascot kilns and chimney stacks; and
- The remainder of the subject land within the north-eastern corner is largely undeveloped and comprises a number of existing road reserves and WA Turf Club owned land used for overflow parking on racing event days.

The Golden Gateway Precinct will provide for a diverse range of land uses. The primary land use within the Structure Plan area is residential, supplemented by commercial uses and local open space.

3.1.3 Vegetation types

On the basis of a site visit on 13 March 2018, vegetation at the site and within 150m was assessed. Vegetation within 100m was classified according to the descriptions provided in AS 3959 – 2009, and includes the following three vegetation types:

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- Class B Woodland – Low woodland (B7): Low trees and shrubs 2-10m high; foliage cover less than 10%. Dominated by eucalypts and Acacias. Often have a grassy understorey or low shrubs. Acacias and Casuarina woodlands grade to Atriplex shrublands in the arid and semi-arid zones.
- Low threat vegetation – AS3959 2.2.3.2(b) - Single area of vegetation less than 1ha and not within 100m of other areas of vegetation being classified.
- Low threat vegetation – AS3959 2.2.3.2(f) - grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks.

The vegetation within the subject land and 150m surrounding is shown in Table 1 and Figure 4.

Table 1: Vegetation classification

Photo point		Vegetation class	Vegetation type	Description
1 Plot 1		Low Threat Exclusion Clause 2.2.3.2 (f)	Ascot Racecourse	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks
2 Plot 2		Low Threat Exclusion Clause 2.2.3.2 (f)	Ascot Racecourse	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks
3 Plot 3		Low Threat Exclusion Clause 2.2.3.2 (f)	Managed parkland	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks

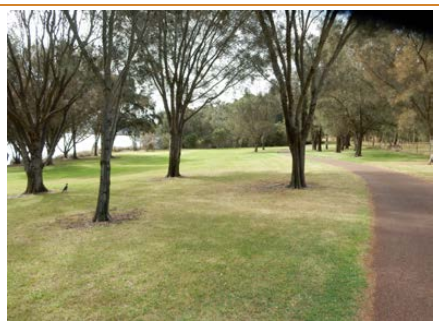
Photo point		Vegetation class	Vegetation type	Description
4 Plot 3		Low Threat Exclusion Clause 2.2.3.2 (f)	Managed parkland	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks
5 Plot 3		Low Threat Exclusion Clause 2.2.3.2 (f)	Managed parkland	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks
6 Plot 4		Low Threat Exclusion Clause 2.2.3.2 (f)	Public reserve maintained in low threat state	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks
7 Plot 4		Low Threat Exclusion Clause 2.2.3.2 (f)		Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks

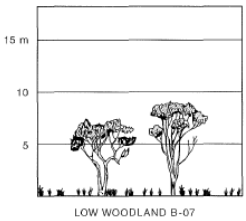
Photo point		Vegetation class	Vegetation type	Description
8 Plot 8		Low Threat Exclusion Clause 2.2.3.2(b)	Regrowth	Single area of vegetation less than 1ha and not within 100m of other areas of vegetation being classified
9 Plot 5		Class B: Woodland  LOW WOODLAND B-07	B07 - Low Woodland	Low trees and shrubs 2-10m high; foliage cover less than 10%. Dominated by eucalypts and Acacias. Often have a grassy understorey or low shrubs. Acacias and Casuarina woodlands grade to Atriplex shrublands in the arid and semi-arid zones.
10 Plot 6		Low Threat Exclusion Clause 2.2.3.2 (f)	Drain	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks
11 Plot 6		Low Threat Exclusion Clause 2.2.3.2 (f)	Managed parkland	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks

Photo point		Vegetation class	Vegetation type	Description
12 Plot 7		Low Threat Exclusion Clause 2.2.3.2 (f)	Commercial office landscaping	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks
13 Plot 8		Low Threat Exclusion Clause 2.2.3.2 (f)	Primary school	Grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks

3.2 Assessment outputs

Consistent with Appendix Two of the *Guidelines for Planning in Bushfire Prone Areas* (V1.3, WAPC, 2017), as this bushfire management plan is to support an application where the indicative development footprint is known, a Bushfire Attack Level (BAL) assessment has been undertaken in accordance with Method 1 of AS3959: Construction of buildings in bushfire prone areas. Table 2 provides a summary of the assessment.

Table 2: BAL assessment summary

Plot	Vegetation Classification	Effective Slope	Separation Distance to the Classified Vegetation (m)	Hazard Level
6	Woodland (B)	Upslope	70m to the edge of the Parks and Recreation Reserve and 108m to the edge of the proposed development area (Belmont Trust Land)	BAL-LOW

A BAL contour map has been created for the proposed development which shows indicative BAL ratings for the site (Figure 5) consistent with Appendix 3 of the *Guidelines for Planning in Bushfire Prone Areas* (V1.3, WAPC, 2017). The BAL contour map was prepared on the basis of FDI 80; the vegetation classification shown in Table 1; and slope shown on Figure 4. An excerpt from AS3959 is provided in Table 3.

Table 3: Excerpt from AS 3959, Table 2.4.3, Distance (m) of the site from the predominant vegetation class

FDI 80 (1090 K)	Vegetation classification and slope
Bushfire attack levels (BALs)	Class B: Woodland - Upslope and flat land
BAL-FZ	<10 m
BAL-40	10-<14
BAL-29	14-<20
BAL-19	20-<29
BAL-12.5	29-<100
BAL-LOW	Beyond 100m

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Figure 4: Post-development vegetation classification

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Data source: CoB, Landgate. Created by: AT. Projection: MGA: zone 50.

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0 140 m

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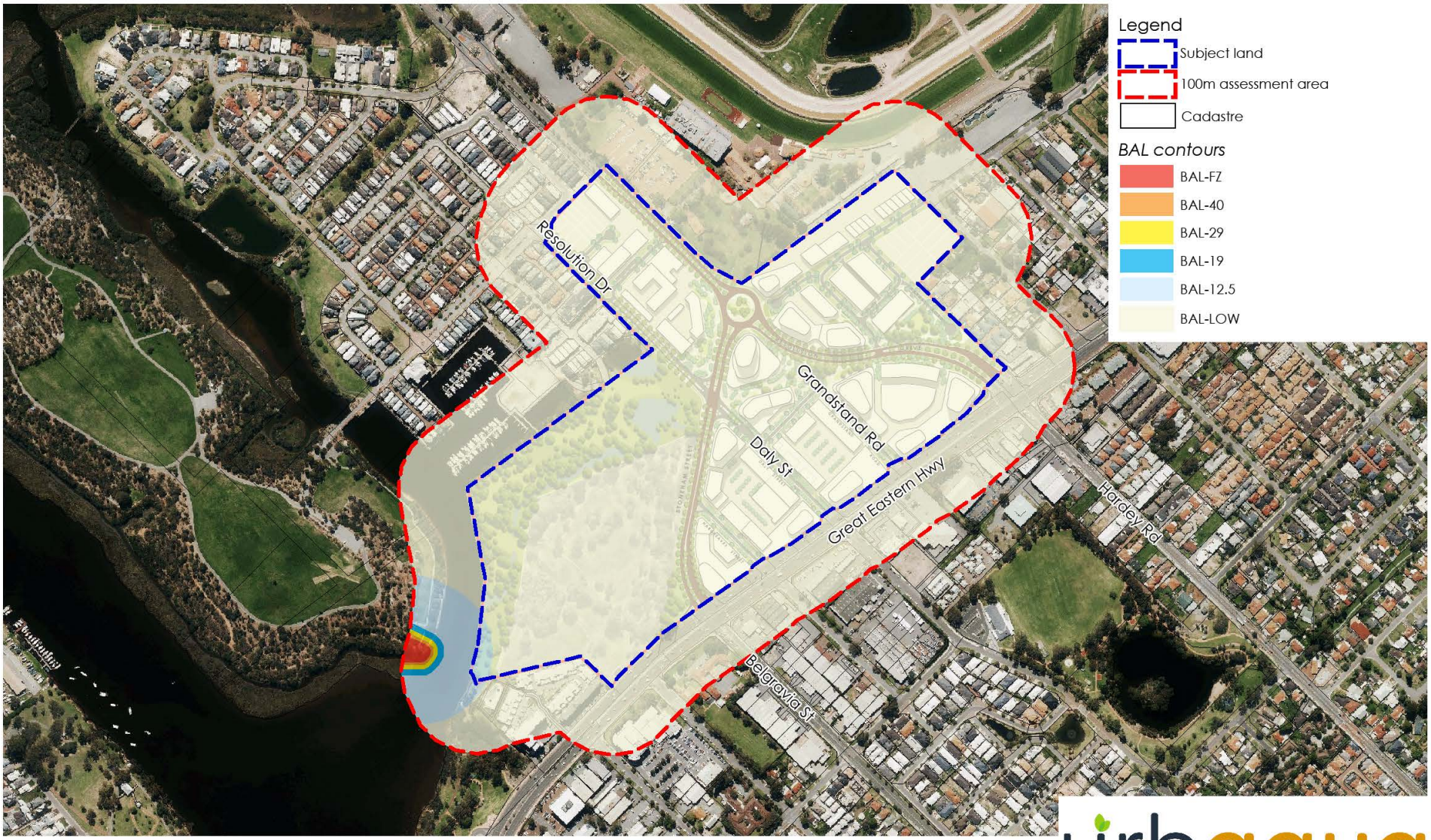
Figure 5: BAL contour map



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4 IDENTIFICATION OF BUSHFIRE HAZARD ISSUES

The subject land is adjacent to an area of vegetation which has the potential to create a bushfire risk.

It is considered that the bushfire risk to the proposed development can be adequately managed through appropriate location and siting and design of development, as well as necessary vehicular access and water supply which will be provided to the development.

Bushfire hazard to the proposed development is therefore considered to be low. This conclusion is substantiated further below.

4.1 Location

After development, the subject land will not contain any vegetation that is considered to be a bushfire hazard.

Although fire risk exists from vegetation adjacent to the subject land, the subject land is not subject to BAL-40 or BAL-FZ and therefore this proposal does not result in the intensification of any development in areas that are subject to extreme hazard.

4.2 Siting and design of development

Bushfire risk from vegetation outside the subject land is likely to remain as this vegetation is associated with significant environmental values (Bush Forever Site 313). It is noted that the Swan River establishes sufficient separation between the bushfire hazard and the edge of subject land to achieve BAL ratings of BAL-12.5 and less, consistent with Method 1 of AS3959. It is noted that the public open space reserve provides a further separation such that the land to be developed in the future (the Belmont Trust Land) is rated at BAL-LOW.

As no proposed areas of development will be subject to BAL-40 or BAL-FZ, it is considered that development has been sited to avoid areas of extreme bushfire risk. All habitable dwellings will be constructed to meet the requirements of *AS3959 Construction of buildings in Bushfire Prone Areas* where necessary.

4.3 Vehicular access

The subject site is afforded excellent access from an integrated regional (existing and future) road network. The subject land is bounded by Great Eastern Highway to the south which provides access to the west towards the Perth CBD, Graham Farmer Freeway and onto South Perth, Melville and Fremantle via Canning Highway. To the east, Great Eastern Highway provides access to Perth Airport, Tonkin/Roe Highway and onto Guildford, Midland and the Swan Valley. These networks provide excellent access to and egress from the subject land.

The proposed local road network provides for at least two different access and egress routes to the proposed residential and commercial areas. The localised road network includes a network of local distributor and access roads providing access to key regional and district roads such as Great Eastern Highway and the Garret Road bridge which include Grandstand Road, Resolution Drive and Stoneham Street.

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All roads and transport infrastructure will be designed and constructed to meet the requirements of the *Guidelines for Planning in Bushfire Prone Areas* (Version 1.3 WAPC, 2017) Appendix Four, Table 4, as replicated in Table 4 below.

Table 4: Vehicular access technical requirements (WAPC, 2017)

Technical Requirement	Public road	Cul-de-sac	Private driveway	Emergency access way	Fire service access routes
Minimum trafficable surface (m)	6	6	4	6	6
Horizontal clearance (m)	6	6	6	6	6
Vertical clearance (m)	4	N/A	4.5	4.5	4.5
Maximum grade over <50m	1 in 10	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15	15
Maximum cross fall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius (m)	8.5	8.5	8.5	8.5	8.5
Additional specialist requirements					

4.4 Water

The proposed development is currently serviced by a reticulated water supply, together with fire hydrants, in accordance with the specifications of the Water Corporation and Department of Fire and Emergency Services (DFES).

Contractors or others carrying out building or other works at the site must not cover hydrants and/or the markings indicating their location. In the event activities occur that do result in hydrants or markings being covered, damaged, or removed, it will be the responsibility of the relevant contractor to rectify the situation.

5 ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA

The subject land is adjacent to an area of bushfire risk. Bushfire risk mitigation and management measures have been identified to reduce bushfire risk to achieve the objectives of SPP3.7, as previously outlined in Section 3.

The bushfire risk mitigation strategies proposed comply with the acceptable solutions for each of the Bushfire Protection Criteria detailed in *Guidelines for Planning in Bushfire Prone Areas* (2017). They are summarised in Table 5.

5.1 Compliance Table

Table 5: Bushfire protection criteria assessment

Element	Acceptable solution	Compliance	
1. Location	A1.1 Development location	☑	No development is proposed in areas subject to BAL-40 or BAL-FZ.
2. Siting and design of development	A2.2 Asset Protection Zone	☑	No development will be subject to BAL-40 or BAL-FZ. Habitable buildings will be constructed in accordance with AS3959.
3. Vehicular Access	A3.1 Two access routes	☑	Short and long term public access is provided which ensures a minimum 2 access routes are provided at all times.
	A3.2 Public road	☑	All public roads meet the requirements of Table 4 of Appendix 4 of the Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017)
	A3.3 Cul-de-sac	☑	N/A – no cul-de-sacs are proposed.
	A3.4 Battle-axe	☑	N/A - No battle-axe lots are proposed.
	A3.5 Private driveway longer than 50m	☑	N/A - No lots have driveways greater than 50m in length.
	A3.6 Emergency access way	☑	N/A – No emergency access ways are proposed
	A3.7 Fire service access routes	☑	The existing road network provides appropriate fire service access routes.
	A3.8 Firebreak widths	☑	N/A
4. Water	A4.1 Reticulated areas	☑	The development is currently serviced by reticulated water and fire hydrants which meet Water Corporation and DFES specifications
	A4.2 Non-reticulated areas	☑	N/A
	A4.3 Individual lots within non-reticulated areas	☑	N/A

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5.2 Bushfire management strategies

As the area proposed for development is greater than 100m from any classifiable vegetation (due to the presence of the Parks and Recreation Reserve), no bushfire management strategies are considered necessary.

There is insufficient risk to warrant specific construction requirements.

It is noted that any new roads will be constructed to meet Main Roads and Local Government requirements and that water and hydrants are provided to DFES and Water Corporation standards.

5.3 Certification by Bushfire Consultant

I, Shelley Shepherd, certify that at the time of inspection, the BAL ratings contained within this BMP are correct.

The Bushfire Attack Level to the proposed development area is BAL-LOW. There is insufficient risk to warrant specific construction requirements and no specific management actions are required to mitigate bushfire risk to the proposed development area.

Signature: _____ Date: 2 May 2018

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Client: City of Belmont

Report	Version	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
Draft report	V1	SSh	HBr	Electronic	2 May 2018
Final Report	V2	SSh	HBr	Electronic	21 June 2018

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Environmental Report: Golden Gateway

Prepared for City of Belmont

By Essential Environmental

June 2018

Document Set ID: 6149413
Version: 1, Version Date: 11/06/2026

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EXECUTIVE SUMMARY

The City of Belmont has engaged Essential Environmental to prepare an environmental report to support structure planning vicinity of Great Eastern Hwy, Resolution Dr, Grandstand Rd and Stoneham St, Ascot, within the City of Belmont.

This report provides an analysis of the environmental constraints and considerations to development and proposes broad approaches to mitigate any impacts and/or constraints on the basis of future land use.

The majority of the site has been historically cleared, although a number of significant trees have been established predominantly along driveways and boundaries and within the Grove Farm Reserve. The study area abuts a small section of the Swan River, which is a Bush Forever site, a conservation category wetland, and an environmentally sensitive area. Development of the study area will require adequate management of bushfire risk (the subject of a separate management plan) and potential impacts on fauna species.

In addition, a range of management strategies have been proposed to effectively manage or mitigate potential environmental impacts caused as a result of the development. Proposed management actions are summarised in the table below. It is considered that urban development of the site is an acceptable land use given the current environmental condition and lack of significance of the site, and in consideration of the proposed management strategies outlined in this report.

Issue	Action	Frequency	Responsibility
Preconstruction phase			
Contamination	Complete preliminary site investigation for contamination in accordance with Contaminated Sites Act 2003 should areas of known contamination be disturbed.	Once	Developer
Acid sulfate soils	Complete self-assessment checklist and consider need for a preliminary site assessment.	Once	Developer Consistent with DPLH and DWER guidelines
Vegetation and flora	Clearly delineate POS areas and trees to be retained.	Once	Licensed Surveyor (Developer)
Fauna and habitat	All site staff to participate in Environment, Health and Safety inductions which provide requirements for management of significant fauna and reporting procedures for environmental incidents.	Once	Developer and Construction contractor

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Issue	Action	Frequency	Responsibility
Water management	Refer the local structure plan to the Department of Biodiversity, Conservation and Attractions as it contains a portion of land within and abutting the Swan River Trust Development Control Area. A Local water management strategy will be completed and used as the basis for detailed design. Following approval of the LWMS, UWMP(s) will be prepared prior to subdivision for approval by City of Belmont.	Once	Developer/City of Belmont Developer, in accordance with SPP 2.9: Water Resources
Bushfire	A Bushfire Management Plan will be prepared to support the LSP. The Bushfire Management Plan will be revised and implemented at subdivision.	Once	Developer, in accordance with SPP 3.7: Planning in Bushfire Prone Areas
Construction phase			
Soils and topography	Ground disturbing activities should be kept to a minimum and carried out 'as required' (in stages) immediately prior to lots being released for sale as part of a 'staged' development of the site.	Ongoing during construction phase.	Construction Contractor (Developer)
Contamination	Management of any identified contamination in accordance with the Contaminated Sites Act 2003.	Ongoing during construction phase.	Construction Contractor (Developer)
Acid sulfate soils	Management of any identified ASS consistent with DPLH and DWER guidelines.	Ongoing during construction phase.	Construction Contractor (Developer)
Vegetation and flora	Maintain markings and fencing around vegetation and trees to be retained. Cleared vegetation to be mulched and stored on site.	Ongoing during construction phase.	Construction Contractor (Developer)
Fauna and habitat	Undertake clearing in the direction of the river to allow fauna to escape.	Ongoing during construction phase.	Construction Contractor (Developer)
Water management	Manage sediment transport to waterways and drainage systems consistent with the LWMS.	Ongoing during construction phase.	Construction Contractor (Developer)

Issue	Action	Frequency	Responsibility
Aboriginal heritage	In the event a site is discovered, all work in the area will cease and the Department of Planning, Lands and Heritage will be contacted.	Ongoing during construction phase.	Construction Contractor (Developer)
Construction impacts	Ensure dust and sediment runoff is adequately managed. Ensure appropriate waste disposal of building materials.	Ongoing during construction phase.	Construction Contractor (Developer)
Post construction phase			
Soils and topography	Landscape or stabilise cleared areas immediately.	Once	Construction Contractor (Developer)
Vegetation and flora	Inspect fencing (if applicable) and replace if required. Ensure ongoing maintenance of retained vegetation and any revegetation areas / native landscaping prior to handover.	6 months Ongoing until handover.	Developer until hand over to City of Belmont

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1 INTRODUCTION

The City of Belmont has engaged Essential Environmental to prepare an environmental report to support structure planning in the vicinity of Great Eastern Hwy, Resolution Dr, Grandstand Rd and Stoneham St, Ascot, within the City of Belmont.

This report provides an analysis of the environmental constraints and considerations to development and proposes broad approaches to mitigate any impacts and/or constraints on the basis of likely future commercial, mixed use and residential land use.

1.1 Study area

The study area consists of approximately 31.8 hectares of land in the vicinity of Great Eastern Hwy, Resolution Dr, Grandstand Rd and Stoneham St in Ascot. The study area currently comprises of a mixture of commercial lots, the heritage listed Ascot Brick Works and public open space (Figure 1).

The study area has 4 distinct regions: (i) the south-eastern commercial area, bound by Great Eastern Hwy, Resolution Dr and Stoneham St; (ii) west where Grove Farm Reserve is bound by Great Eastern Hwy and public open space adjacent to the Swan River; (iii) largely undeveloped land, with exception of local distributor roads, through the centre of the study area; and (iv) most northern portion within which is located the Perth Racing Administration Office.

1.2 Methodology

This report considers the following environmental aspects of the study area to inform preparation of a local structure plan and the future development of the area:

- Topography, soils (including acid sulfate soils), contamination;
- Vegetation, flora and fauna and bushfire risk;
- Water resources; and
- Heritage.

The following information has been provided on the basis of a desktop investigation only, using data and information that is publically available. No attempt has been made to ground-truth the information at this stage.

1.3 Previous environmental assessments and key requirements

Limited environmental assessment has been undertaken for the site to date.

The following City of Belmont strategic and planning documents are considered relevant to this environmental report:

- City of Belmont Environmental Plan 2010-2016;
- City of Belmont Local Planning Scheme No. 15 scheme report supporting document: Environment;
- City of Belmont Local Planning Scheme No. 15 scheme report supporting document: Heritage.

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- City of Belmont Local Planning Scheme No. 15 scheme report supporting document: Public Open Space.
- Belmont Foreshore Precinct Plan
- City of Belmont Street Trees Plan 2013.

There are a number of pieces of legislation, which govern management of the environment and have been considered as part of this assessment. These are listed in Table 1.

Table 1: Relevant environmental legislation

Legislation	Summary of relevant intent
Aboriginal Heritage Act 1972	Protects significant Aboriginal heritage, registered or unregistered.
Biosecurity and Agriculture Management Act 2007	Provides for the management of declared pests.
Contaminated Sites Act 2003	Requires the reporting of potential contaminated sites to the Department of Water and Environment Regulation.
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) (EPBC Act)	Provides protection for Matters of National Environmental Significance (MNES).
Environmental Protection Act 1986	Provides protection for the environment as well as the licencing of prescribed premises and regulation of the clearing of remnant vegetation.
Fire and Emergency Services Act 1998	Provides for the management of bushfire risk.
Heritage of Western Australia Act 1990	Protection of places listed by the Heritage Council of WA.
Swan and Canning Rivers Management Act 2006	Establishes the Swan Canning River park and provides for the assessment of planning proposals within this area by the Swan River Trust Board.
Wildlife Conservation Act 1950 (WC Act)	Protects species of flora & fauna and communities that are listed.

The following environmental policies are also considered relevant to the management of potential environmental impacts on the site:

- EPA Guidance Statement No. 33 – Environmental Guidance for Land Development (EPA, 2008);
- Better Urban Water Management (WAPC, 2008); and
- Liveable Neighbourhoods (WAPC, 2011).

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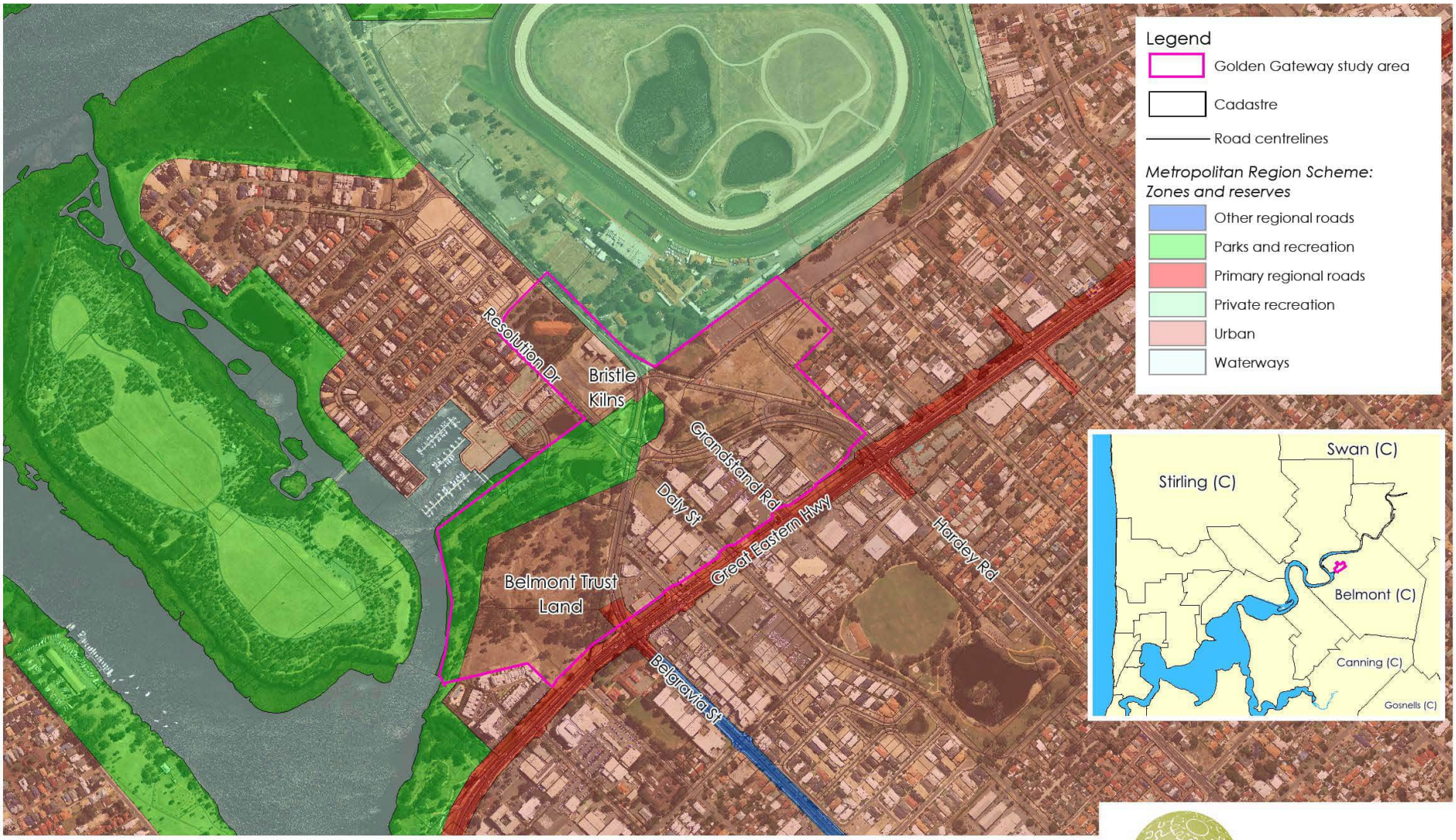
City of Belmont: Golden Gateway - Desktop environmental report
Figure 1: Study area location



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2 PROPOSED DEVELOPMENT

2.1 Planning context

The majority of the study area is zoned 'Urban' under the Metropolitan Region Scheme, with a portion zoned for 'Mixed use' and reserved for 'Parks and Recreation' under the City of Belmont Local Planning Scheme No. 15 (Figure **2**).

The City of Belmont Local Planning Scheme No. 15, adopted in December 2011, provides a district level framework to guide more detailed planning for the City. It requires local structure plans to be prepared to provide the level of detailed planning required to facilitate subdivision and development within the scheme area. The Western Australian Planning Commission and the City of Belmont are preparing a local structure plan to guide land use and development outcomes for the Golden Gateway precinct, the subject land.

The Golden Gateway Precinct includes a large portion of 'Mixed use' land, which encompasses the historical Ascot's Bristle beehive kilns and chimney stacks and portions of the Ascot Racecourse. The precinct also contains approximately 5.3 ha of Parks and Recreation reserve which covers the Belmont Trust Land. There is also a small portion of Parks and Recreation: water supply sewerage and drainage reserve, which is under the control of the Water Corporation.

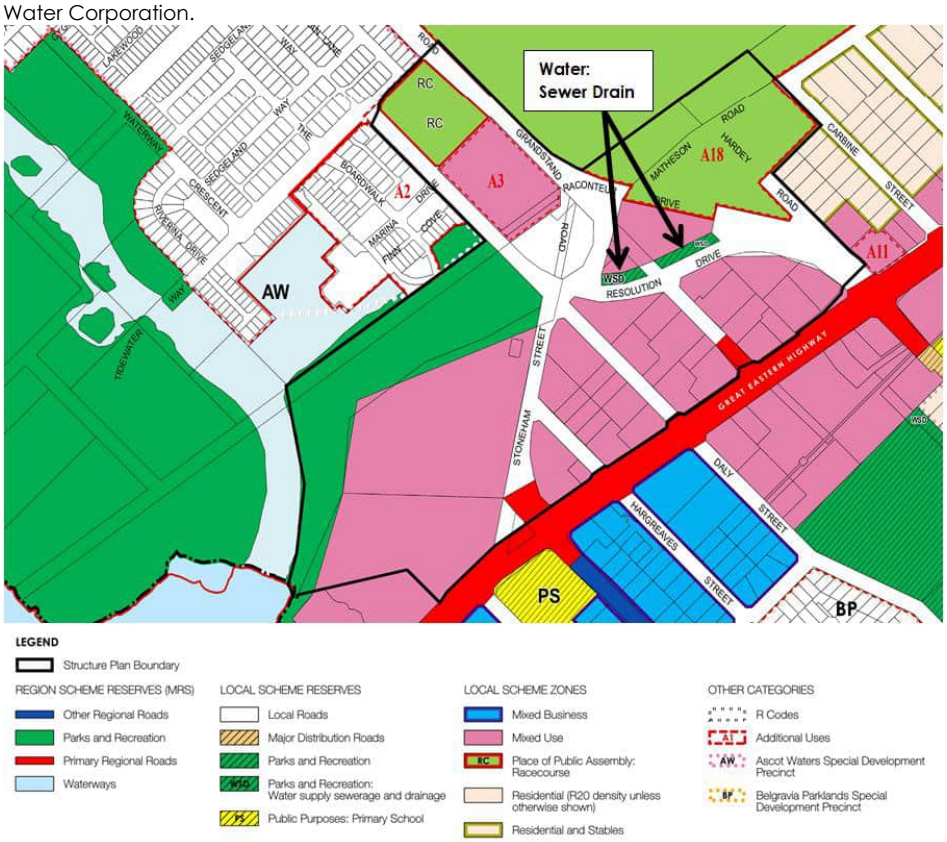

Figure 2: Local Planning Scheme

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3 EXISTING ENVIRONMENT

A desktop environmental investigation of the study area has been undertaken, the findings of which are presented below.

3.1 Land use context

3.1.1 Historical land use

Historical aerial photography from Landgate suggests the land has been used for commercial purposes for over 50 years, with the majority of lots being approximately 1/3 hectare, accommodating warehouse facilities and such, predominantly adjacent to Great Eastern Hwy. The northern portion of the study area contains the Bristle kilns and Brick Works, which were established in 1929 and ceased operation in 1982 (Heritage Council, WA). The western portion of the study area, over the Belmont Trust Land, was historically used for sporting purposes such baseball fields (Clark, 1952), and more recently as a temporary worksite for development in the area, such as the widening of the Great Eastern Hwy.

3.1.2 Current land use

Commercial property still exists adjacent to Great Eastern Hwy south of Resolution Dr and Stoneham St. East of Stoneham St, the Belmont Trust Land is largely cleared and vacant with large mature trees sparsely located though the middle of the reserve. The perimeter of the reserve is lined with small to large mature trees such as *Brachychiton acerifolius* (Illawarra Flame Tree) and *Eucalyptus grandis* (Flooded Gum).

The north and east of Resolution Dr contains a parcel of land approximately 5 hectares in size that is largely vacant, with the exception of a few mature trees, used as overflow parking servicing the Ascot Racecourse. This portion of land, as shown in Figure **2**, also accommodates a 150 m Water Corporation open channel drain, which discharges via piped drainage under the Stoneham St/Resolution Drive roundabout into the Ascot Waters compensation basin on the north-western boundary of the study area. North of the Ascot Waters Compensation Basin is a second compensation basin servicing the Ascot Waters development. This compensation basin is herein referred to as 'Northern Drainage Lake'. The northern portion of the site contains the Perth Racing Administration Offices.

The Belmont Foreshore Precinct Plan (City of Belmont, 2014) was prepared to guide development and landuse within the river setting and ensure that the landscape values of the river system are conserved or enhanced. The study area, particularly Belmont Trust Land and public open space contains areas identified as parkland within the precinct plan, characterised by open lawns surrounding large individual trees. The precinct plan outlines strategic recommendations that will need to be incorporated into future planning of the Belmont Trust Land.

3.2 Topography, geology and soils

The study area has generally flat topography and grades gently from 6mAHD in the south-east to 3mAHD in the west. The study area has a few low points of approximately 1-2mAHD through the centre of the study area, as shown in Figure 3.

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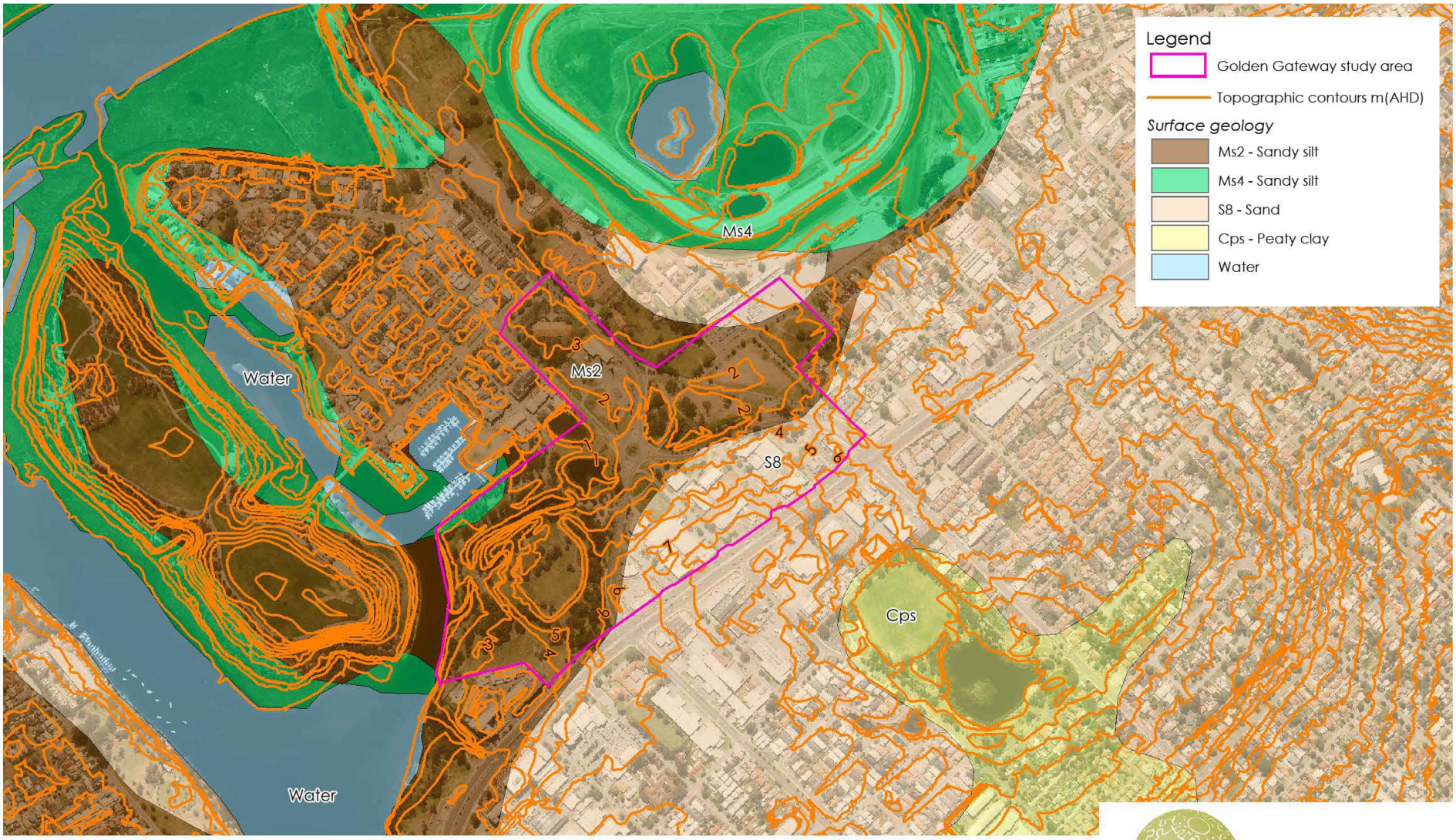
Figure 3: Topography and surface geology



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3.2.1 Geology

The surface geology is described broadly as Guildford formation: Alluvial sand and clay with shallow-marine and estuarine lenses and local basal conglomerate (WA surface geology 1:250,000 scale geological maps, Geological Survey of WA, and Geoscience Australia).

As shown in Figure 3, two-thirds of the north-western portion of the study area is classified as Ms2 – Sandy Silt, and the eastern third is classified as S8 – Sand, with a small portion of peaty clay adjacent to the Ascot Waters marina, described as follows:

- Ms2 – Sandy Silt: strong brown to mild grey, mottled, blocky, disseminated fine sand, hard when dry, variable clay content. This soil type is historically resourced for clay bricks and tile manufacture. It has a low permeability and low potential for erosion. Sandy Silt has a low shrink swell potential, however is prone to flooding.
- S8 – Sand: very light grey at surface, yellow at depth, fine to medium grained, sub rounded quartz, moderately well sorted. Sand of eolian origin is used for construction purposes with a high permeability and low erosion potential. Well drained given a low water table.
- Cps – Peaty Clay: dark grey and black with variable sand content of lacustrine origin. This soil has low permeability, high erosion potential, and is prone to flooding.

3.2.2 Acid sulfate soils

A review of Department of Water and Environmental Regulation acid sulfate soils (ASS) risk mapping identifies two-thirds of the study area, predominantly the area coinciding with surface geology Ms2-Sandy Silt (see 3.2.1), as containing a Class I 'high to moderate' risk of ASS and the remainder, coinciding with S8-Sand, classified as Class II 'moderate to low' risk occurring within 3 m of the natural soil surface (Figure 3).

In 2009, Douglas Partners undertook an Acid Sulfate Soil investigation and Waste Classification investigation to assess the soil conditions of the Ascot Water Compensation Basin because the City intended to increase the size of the basin. The results of the investigation indicate the basin contains ASS, which are generally located at and below the groundwater table (approximately 1.5 m below ground level) (Douglas Partners, 2009). Should the soil below the groundwater table be exposed or groundwater be lowered for future development, further investigation of ASS is likely to be required.

Consistent with Department of Water and Environmental Regulation guidelines, sites should be investigated for ASS if any of the following works are proposed:

- ASS disturbing subdivision or development that is subject to conditional approval requiring the investigation and management of ASS;
- soil or sediment disturbance of 100 m^3 or more in an area depicted on an ASS risk map as Class I 'high to moderate risk of ASS occurring within 3 m of natural soil surface' (e.g. construction of roads, foundations, installation of underground infrastructure, drainage works, land forming works, dams and aquaculture ponds or sand or gravel extraction);
- soil or sediment disturbance of 100 m^3 or more with excavation from below the natural watertable in an area depicted on an ASS risk map as Class II 'moderate to low risk of ASS occurring within 3 m of natural soil surface but high to moderate risk of ASS beyond 3 m of natural soil surface';
- lowering of the watertable, whether temporary or permanent (e.g. for groundwater abstraction, dewatering, installation of new drainage, modification to existing drainage), in areas depicted in an ASS risk map as Class I 'high to moderate risk of

actual acid sulfate soils (AASS) or potential acid sulfate soils (PASS) occurrence' or Class II 'moderate to low risk of AASS or PASS occurrence within 3 m of natural soil surface';
- any dredging operations;
- extractive industry works (e.g. mineral sand mining) in any of the areas listed in Table 1 of the guidelines; and
- flood mitigation works, including construction of levees and flood gates in any of the areas listed in Table 1 of the guideline.

Given the Class I classification for ASS, it is recommended that a self-assessment checklist is completed for the study area. Some investigation for ASS will be required if any of the above works are proposed in Class 1 areas. Investigations should be undertaken consistent with Department of Water and Environmental Regulation guidelines: *Identification and investigation of acid sulfate soils and acidic landscapes* (DER, 2015).

If ASS is found to be present at the site, all site works must be carried out in accordance with a Department of Water and Environmental Regulation-approved ASS management plan.

3.2.3 Contaminated sites

DWER Contaminated sites database

A search of the Department of Water and Environmental Regulation Contaminated Sites database found no contaminated sites within the study area. Lot 5 Resolution Drive (160 Stoneham Street) is listed as "Possibly Contaminated, Investigation Required".

Ascot Water compensation basin

In 2009, Douglas Partners undertook a waste classification assessment at Lot 5 Stoneham St, corner of Resolution Dr and Stoneham St to assess the occurrence of acid sulphate soils; assess the nature and suitability of the soil for re-use; and assess the waste classification of the soil to be excavated, as the City of Belmont intended to increase the size of the current Ascot Waters Basin by approximately 4000 m^2.

A Preliminary and Detailed Site Investigation (PSI/DSI) was also undertaken in 2012 (GHD, 2013), and a subsequent Site Management Plan was developed. Soil and groundwater contamination were investigated to assess risk to ecological and human receptors in accordance with the Department of Water and Environment Regulation. A summary of the contamination issues identified through these investigations are as follows:

- Soil - Inorganic
  - Samples were tested for metals (As, Ca, Mn, Hg, Ni, Pb, Zn, Al, Fe). Exceedances of Ecological Investigation Levels (EIL, as per DER guidelines) were minimal, so metals were considered to be low risk to ecological receptors in the basin's current state. Metals were also below Health Investigation Levels (HIL-E), with the exception of lead. Further sampling indicated this was a localised test result.
  - Douglas Partners reported Asbestos Containing Materials (ACM) at several bores from 0 to 2 m below ground level (BGL). ACM was also found in samples collected at greater than 0.5 m BGL. However, no samples were taken near the surface profile (less than 0.3 m BGL) and the exposure pathway for the community or workers is considered incomplete. Overall, asbestos is considered low risk in its current state, however, further investigation needs to be undertaken.

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Figure 4: Acid sulfate soil risk

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  - Organic
    - Both Douglas Partners and GHD reports indicate that encountered hydrocarbons were localised in nature and not considered to pose a risk to ecological or human receptors. However, works such as excavation would increase risk, and appropriate precautions should be taken.
- Groundwater
  - Inorganic
    - Three groundwater bores were sampled to test for Fe, Zn, Ni, NH_3, NO_2, Total Nitrogen and Total Phosphorous. Concentrations of Zn, NH_3, and Ni were reported marginally above ANZECC guidelines in all bores, and Fe concentrations were recorded 20 times above ANZECC guidelines. The exceedances are considered characteristic of winter conditions in the Swan River and natural soils in the locality (e.g. iron). Therefore, these results are not considered to reflect any potential risk to ecological or human receptors.
  - Organic
    - All samples were analysed for BTEX, Total Recoverable Hydrocarbons (TRH) and Polycyclic Aromatic Hydrocarbons (PAH). These were all reported below the DER Domestic Non-potable water criteria (GHD, 2013).

Based on these results, it is understood that the basin in its current state does not propose a risk to ecological or human receptors. Management guidelines provided in the Site Management Plan are effectively for the management of the basin expansion works and the City of Belmont have not proceeded with increasing the basin size.

3.3 Flora, fauna and vegetation

3.3.1 Conservation areas

There are no Bush Forever sites within the study area.

Bush Forever site 313, Swan River Salt Marshes, exists to the north and west of the study area, as shown on Figure 5. The closest proximity of the Bush Forever site to the study area is adjacent to the Belmont Trust Land at the south-western boundary. Apart from this point, the study area is largely disconnected from the Bush Forever site.

An environmentally sensitive area, as mapped by the Department of Water and Environmental Regulation surrounds the Bush Forever site as described above. This area is described as 'Temperate Saltmarsh' and listed as 'vulnerable' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Temperate salt marshes are an important habitat for local and migratory bird species (Department of Environment, 2015).

3.3.2 Flora

Searches of the EPBC Protected Matters Search Tool and the former Department of Parks and Wildlife (now Department of Biodiversity, Conservation and Attractions) NatureMap database were undertaken to identify flora species of conservation significance potentially occurring within a 2 km buffer of the study area. Results are outlined in Table 2.

Table 2: Conservation significant flora likely to occur in the study area

Taxa	Common name	Conservation status	
		WC Act	EPBC Act
Dillwynia dillwynioides	-	Priority 3	
Johnsonia sericea	Waldjumi	Priority 4	
Caladenia huegelii	King Spider-orchid		Endangered
Darwinia foetida	Muchea Bell		Critically endangered
Lepidossperma rostratum	Beaked Lepidosperma		Endangered

3.3.3 Fauna

Searches of the EPBC Protected Matters Search Tool and the Department of Biodiversity, Conservation and Attractions NatureMap database were undertaken to identify fauna species of conservation significance potentially occurring within a 2 km buffer of the study area. Results are outlined in Table 3.

Table 3: Conservation significant fauna known or likely to occur in the study area

Taxa	Common name	Conservation status	
		WC Act	EPBC Act
Calyptorhynchus latirostris	Carnaby's Balck Cockatoo	Rare or likely to become extinct	Endangered
Calidris ferruginea	Curlew Sandpiper	Rare or likely to become extinct	-
Caretta caretta	Loggerhead Turtle	-	Endangered
Chelonia mydas	Green Turtle	-	Vunerable
Dermochelys coriacea	Leatherback Turtle	-	Endangered
Natator depressus	Flatback Turtle	-	Vunerable
Diomedea epomophora epomophora	Southern Royal Albatross	-	Vunerable
Dioedea exulans (sensu lato)	Wandering Albatross	-	Vunerable
Pachyptila turtur subantarctia	Fairy Prion	-	Vunerable
Thalassarche cauta steadi	White-capped Albatross	-	Vunerable
Dasyurus geoggroii	Chuditch	-	Vunerable
Actitis hypoleucos	Common Sandpiper	Protected under international agreement	-
Ardea modesta	Eastern Great Egret	Protected under international agreement	-
Merops ornatus	Rainbow Bee-eater	Protected under international agreement	-
Tringa nebularia	Common Greenshank	Protected under international agreement	-
Falco peregrinus	Peregrine Falcon	Specially protected fauna	-
Oxyura australis	Blue-billed Duck	Priority 4	

WC=Wildlife Conservation Act 1950
EPBC=Environmental Protection and Biodiversity Conservation 1999

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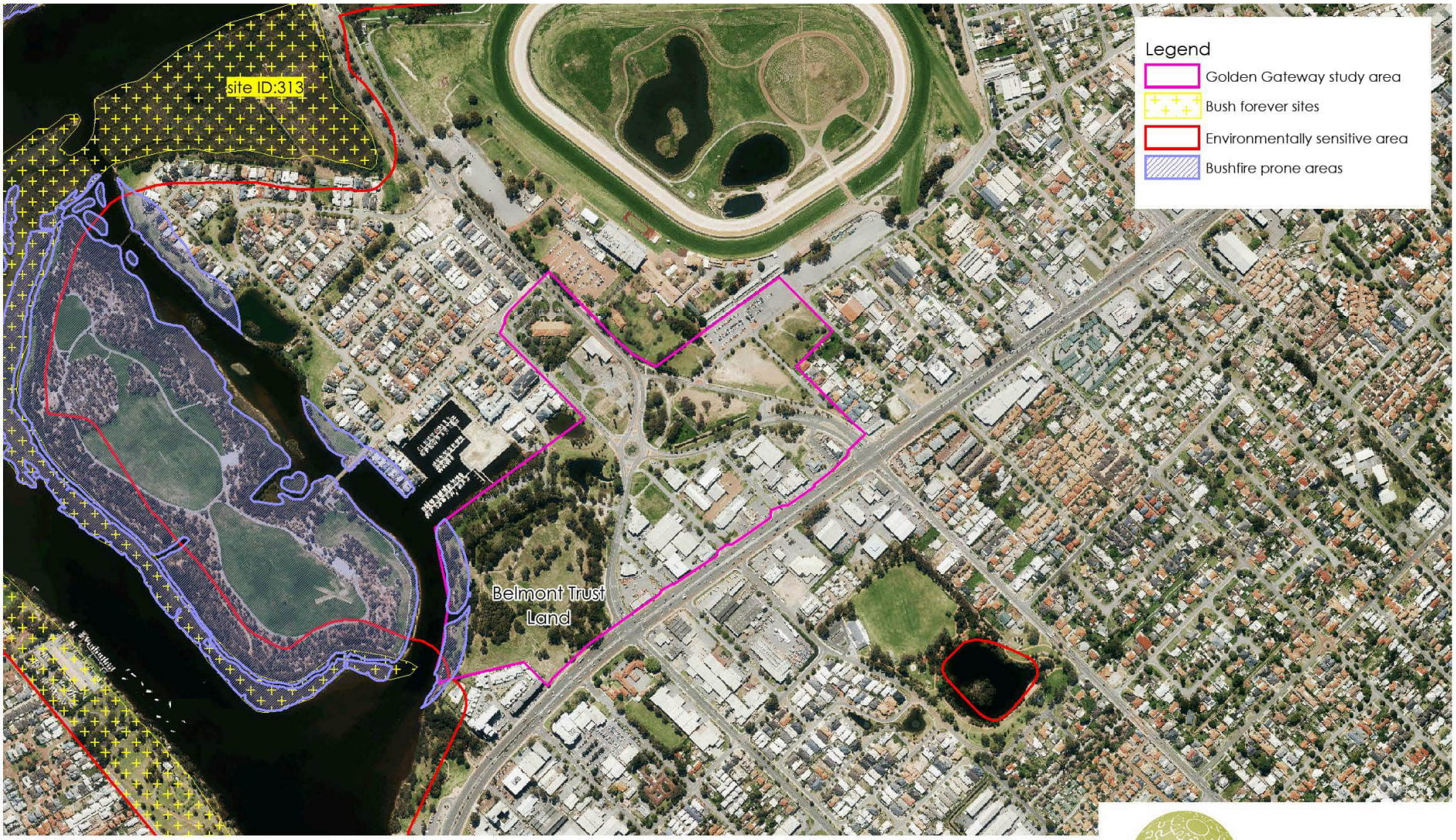
Figure 5: Vegetation



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3.3.4 Bushfire risk

A portion of the study area along the banks of the Swan River is identified as a Bush Fire Prone Area (Figure 5), as designated by the Fire and Emergency Services (FES) Commissioner. Accordingly, any planning and development in the area must consider bushfire risk and the requirements of *State Planning Policy 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) (2015).

The *Guidelines for Planning in Bushfire Prone Areas* (WAPC, 2015) refer to the need for a Bushfire Hazard Level assessment and Bushfire Attack Level Contour Map where possible to support strategic planning proposals in Bushfire Prone Areas. It is understood that this is being addressed separately from this report for the structure plan area.

3.4 Water resources

3.4.1 Public Drinking Water Source Area

There are no Public Drinking Water Source Areas within the study area.

3.4.2 Surface water resources

The Swan River is adjacent to the western portion of the study area (Belmont Trust Land). The Swan River holds significant ecological value because it provides habitat for local and migratory birds and other fauna, with the majority of the River being identified as a conservation category wetland and environmentally protected area. Furthermore, the Swan River provides important social value for visual amenity, and recreation on the river and its reserves. The Swan River also holds significant Aboriginal and European heritage values.

The Department of Water and Environmental Regulation Floodway mapping indicates that a large area in the northern portion of the study area lies within the Swan River 100 year average reoccurrence interval (ARI) flood fringe (Figure 6).

A Water Corporation open drain exists at the centre of the study area. The open drain is approximately 150 m in length and directs runoff flows from the eastern urban and industrial areas to piped drainage under the Stoneham St/Resolution Drive roundabout to the Ascot Waters compensation basin (Figure 6). The compensation basin allows for dissipation of energy, mixing of water for oxygenation and sediment control before flowing through a further 350 m of open drain to the Swan River. A contaminated sites investigation was conducted by GHD and a Site Management Plan was subsequently developed in 2013 for the expansion of the compensation basin. The investigation identified issues of leachable metals, PAH and TPH fractions, and asbestos (see section 3.2.4).

North of the Ascot Waters Compensation Basin is a second compensation basin servicing the Ascot Water development, the Northern Drainage Lake. The Northern Drainage Lake has experienced water quality issues in the past with two fish kill incidents occurring during July and September 2012. The first incident involved approximately 300 fish deaths and the latter 100-150 fish deaths. No incidents have occurred since 2012. No water quality monitoring was undertaken by the City (pers, comm. Nicole Davey – City of Belmont coordinator-environment, 1 August 2016). However, investigations were undertaken by the Swan River Trust in 2012 in response to the fish kills. Water quality testing indicated low concentrations of algae, and higher concentrations of organic matter resulting in oxygen-depleted water. In addition, it was identified that fish often become trapped in backwaters such as this lake. It was concluded

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that a combination of the above factors resulted in the fish kill incidents (pers. comms. Swan River Trust: Rivers Systems Branch, 23 August 2016).

A portion of the site is located within the Swan River Trust Development Control area (Figure 6). Land use planning and development within the Development Control Area is subject to approval of the Department of Biodiversity, Conservation and Attractions under Part 5 of the *Swan and Canning Rivers Management Act 2006* and the *Swan and Canning Rivers Management Regulations 2007*. This area includes the waterways of the Swan and Canning rivers and the adjoining parks and recreation reserves.

All development plans and applications for this area should be referred to Parks and Wildlife for advice in accordance with Clause 30A of the Metropolitan Region Scheme.

3.4.3 Groundwater resources

The study area is within the Perth groundwater area and City of Belmont sub-area. The Department of Water and Environmental Regulation's Water Register shows no available allocation within the study area, as shown in Table 4.

Table 4: Groundwater resource allocation and availability (as of January 2016)

Management Area	Management Sub Area	Resource	Allocation Limit	Allocated Volume	Remaining Volume
Perth	City of Belmont	Perth - Superficial Swan	1,497,000	2,243,830	-746,830

The City of Belmont currently has a groundwater licence allocation of 1,171,200 kL (licence no. 157042) located south-west of the study area along the Swan River.

It can be inferred from the groundwater levels in the Department of Water and Environmental Regulation's Perth Ground Water Atlas that maximum groundwater levels are within 3 m of the natural surface through the northern and central portions of the study area, with groundwater flowing in a north-westerly direction toward the Swan River.

A search of the Department of Water and Environmental Regulation Water Information Network (WIN) bores showed a few bores located within the vicinity of the study area; however, none of the bores have current monitoring data. The most recently sampled bore was in 2011(ID: 616 71004) situated 500 m east and hydrologically upstream of the study area showing a groundwater level 4.5 m below ground level (BGL). Consideration of this information together with that of another bore closer to the study area (ID: 616 05266), which has last recorded data from 1999 of 4 m BGL, indicates that the groundwater level may be lower than the mapped groundwater atlas level. Two other bores located north of the study area (ID: 616 05225 and ID: 616 05224), which have data from 1996 record groundwater at approximately 3 m BGL. These bores are part of the Ascot Waters development, which topographically sits approximately 2 m higher than the northern section of the study area and has been built-up for the purposes of the development. Therefore, it is reasonable to conclude that the groundwater level of these bores is less likely to be representative of the groundwater level within the study area than the surrounding locations.

It is noted that water resources and urban water management will be specifically addressed by the local water management strategy, which is being prepared to support the structure plan.

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Figure 6: Water resources

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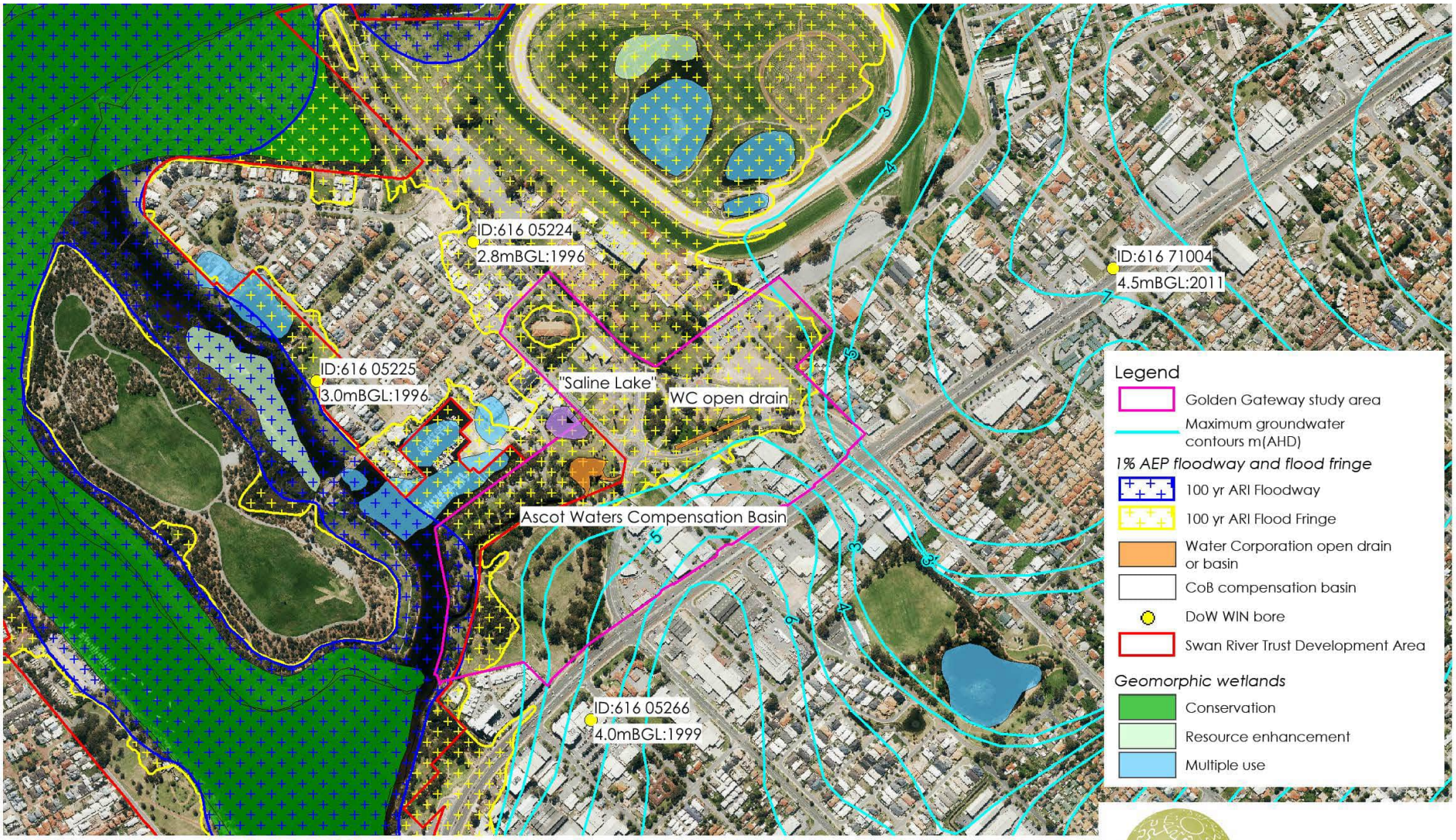

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3.5 Heritage

3.5.1 Aboriginal heritage

A search of the Department of Planning, Lands and Heritage aboriginal heritage enquiry system showed one site overlaying the study area (Figure 7):

- Site ID 3753 – Registered site, Name: Perth, Type: Historical, mythological, hunting place, named place, natural feature.

One other site is adjacent to the study area, however not within the boundary, site ID 3536 - Registered site, Name: Swan River, Type: mythological.

3.5.2 European heritage

The Bristle Kilns are beehive and tunnel kilns, with associated chimney and floor ducts, located at 197 Grandstand Rd Ascot. The Kilns were first built in 1930, manufacturing terracotta, stoneware and steel products. Production ceased in 1982 (Heritage Council, 2012). The Kilns and chimneys remain and were placed on the State Heritage List in 2003. The Bristle Kilns are a visually striking feature of the area and are viewed as an asset for restoration by the community (Strutt, 2015).

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Figure 7: Heritage

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4 FINDINGS AND RECOMMENDATIONS

The following section presents findings of the desktop environmental assessment of the study area. It highlights a number of environmental issues, which should be considered as part of the preparation of the local structure plan and future development of the site. These relate primarily to:

- A portion of the site being within the Swan River Trust Development Control Area;
- Proximity to the Swan River and potential for offsite impacts on values;
- Bushfire risk;
- Contamination and water quality management in the compensating basins; and
- Soils and acid sulfate soils.

Key recommendations to address these issues are provided below.

4.1 Soils and topography

The north-western portion, approximately two-thirds of the largely undeveloped area, is classified as Sandy Silt (Ms2), which has a low permeability and will need to be considered with regards to runoff and stormwater disposal.

In order to reduce the potential for erosion and sediment transport to drains and the River, ground disturbing activities should be kept to a minimum and carried out 'as required' (in stages) immediately prior to lots being released for sale as part of a 'staged' development of the site. Where land is cleared, the area should be stabilised (e.g. through landscaping/ stabilising materials/dust suppression) as soon as possible.

4.2 Acid Sulfate Soils

Approximately two-thirds of the study area is mapped as being High to Moderate ASS Risk (<3 m from the surface). The WAPC *Acid Sulfate Soils Planning Guidelines* (WAPC, 2008) indicates that "acid sulphate soils are technically manageable in the majority of cases".

It is recommended that a self-assessment checklist is completed for the study area. ASS Investigation and, if required, Management Plans should be prepared at subdivision stage once the detailed design of the site is finalised. This should be undertaken in accordance with the Acid Sulphate Soils Guideline Series: *Identification and Investigation of Acid Sulphate Soils and Acidic Landscapes* (DER, 2015a) and *Treatment and Management of Soils and Water in Acid Sulphate Soil Landscapes* (DER, 2015b).

4.3 Surrounding land use and buffer requirements

The Swan River is the most important environmental attribute in proximity to the study area. Protection of the environmental values associated with the River requires consideration of compatible adjacent land uses that limit impacts. The provision of a 50 m buffer to the banks of the Swan River consistent with its designation as an environmentally protected area and conservation category wetland is generally applied.

Any proposal within the Swan River Trust Development Control Area that is likely to impact on the water quality and/or values of the Swan River should be referred to the Department of Biodiversity, Conservation and Attractions. It is recommended that consultation occur with the

Department of Biodiversity, Conservation and Attractions, Rivers and Estuaries Branch as part of the preparation of the local structure plan.

4.4 Vegetation and flora

The vegetation on the site is degraded and the site does not contain any areas with an intact understorey. No Declared Rare Flora are likely to be on the site and no priority species are likely to be present. It is recommended that no further vegetation assessment of the site is required and therefore, protected flora is not an impediment to the development of the area.

It is recommended that, as part of the detailed design process, any trees that can be retained in street verges, landscaped areas, parking areas and in road/entry areas should be identified and included in the detailed design plans for the area. Mature trees to be retained must be identified and clearly marked prior to commencement of any pre-construction activities.

4.5 Fauna and habitat

Due to historic clearing, urbanisation activities, and lack of native remnant vegetation across the majority of the study area, particularly the understorey, any fauna habitat is considered of low value to native fauna. This is with the exception of the portion of the study area that abuts the Swan River, where the foreshore area may provide important habitat for local and migratory birds.

To minimise impacts to fauna resulting from any clearing activities, the following management strategies are proposed:

- During construction, the extent of authorised clearing will be clearly defined and demarcated to avoid accidental clearing;
- Loud noises (e.g. air horns) will be made just prior to commencement of clearing;
- Clearing works will occur in the direction of a conservation area where possible, to allow animals time to escape;
- If any injured or distressed fauna are encountered during site works the Site Supervisor will be instructed to immediately call the Department of Biodiversity, Conservation and Attractions' Wildcare Hotline (08) 9474 9055, to allow for the closest appropriate registered wildlife rehabilitator to attend the site; and
- Where possible, local native species will be planted along road verges and median strips in and near conservation areas and strategic ecological linkages to enhance the value of the linkage to fauna.

4.6 Flood protection, groundwater and water quality management

As the development is partly within the Swan River Trust Development Control Area, planning and development should consider Department of Biodiversity, Conservation and Attractions' *Corporate policy statement no. 42: Planning for land use, development and permitting affecting the Swan Canning Development Control Area* (June 2016) and other relevant policies. Development may be subject to a Part 5; Clause 30A(2)a or Clause 30A(2)b application process.

A portion of the study area is also within the 100 year ARI flood fringe. Any development in the flood fringe should not impact on the risk of upstream flooding.

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Limited assessment of groundwater levels has been undertaken at this stage. As shown on Figure 6, the maximum groundwater contours from the Department of Water and Environmental Regulation's Perth Groundwater Atlas (2004) only extends to the southern portion of the study area and local groundwater bores have limited information. It is recommended to further investigate groundwater levels.

Surface water and groundwater management will be described in the Local Water Management Strategy and any future Urban Water Management Plans that will be prepared for each stage of development. Therefore, potential impacts on surface water and groundwater can be mitigated and managed in order to achieve the objectives of *State Planning Policy 2.9: Water Resources* (WAPC, 2006).

A Local Water Management Strategy is being prepared in accordance with *Better Urban Water Management* (WAPC, 2008) to address the following:

- Identification of the site's current hydrological regime and existing environment;
- Identification of the constraints within the development area which may affect the design of the development with respect to urban stormwater drainage and management of groundwater;
- A description of the stormwater management strategy for minor and major events, including details on the proposed management practices to be employed;
- Identification and description of mechanisms to protect the water regime, including water quality and water levels. This will include a discussion of the overarching engineering principles that will be employed to mitigate any impact from run-off, groundwater and water quality issues, and ensure that the environment and the development will not be adversely impacted upon;
- Identification of the proposed water supply (including irrigation requirements) and wastewater disposal;
- Identification of monitoring requirements and derivation of agreed performance criteria for the urban water management system; and
- Identification of contingency measures to be implemented in the event that the system is not achieving agreed performance targets.

4.7 Heritage

A buffer area of a site of Aboriginal heritage has been identified to cross the boundary of the study area. All contractors working on the development will need to be made aware of their responsibilities under the *Aboriginal Heritage Act 1972* with regard to finding potential archaeological sites. In the event that a site is discovered, all work in the area will cease and the Department of Planning, Lands and Heritage will be contacted.

The Bristle Kilns are on the State Heritage list and future land use planning will need to take this into consideration.

4.8 Construction impacts

Construction activities need to be managed to minimise the impact to nearby Swan River, surrounding residents and the retained vegetation on-site. Impacts can include:

- Nuisance dust generation during bulk earthworks;
- Disturbance of ASS during earthworks and/or installation of services;

- Silt and sediment runoff to waterways and drains from uncontrolled runoff during site works;
- Inadvertent damage to trees and other vegetation earmarked for retention;
- Impacts to new stormwater drainage systems and existing environmentally sensitive areas from wind- and water-borne sediment during construction; and
- Inappropriate disposal of waste building material and poor housekeeping on building sites leading to wind-blown litter.

All of these potential impacts are manageable through appropriate engineering design and/or good site management practices.

4.9 Conclusion, constraints and opportunities

Several significant environmental constraints to the proposed development have been identified as follows:

- risks associated with urban stormwater runoff to the Swan River (sections 3 and 4);
- contamination risks associated with Ascot Water Compensation Basin, which will need to be considered if future work on the basin is to be undertaken (section 3.2.4);
- contamination risks associated with the Northern Drainage Lake, which may need to be considered because of previous fish kills in the lake (section 3.4.2); and
- the associated bushfire risk of the north-western portion of the study area, which will need to consider the requirements of *State Planning Policy 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) (2015) (section 3).

Two figures have been developed to show the environmental constraints (Figure 8) and environmental opportunities (Figure 9). As summarised above, the environmental constraints include soil of low permeability and ASS risk to the majority of the study area. Further to this, the geology of the site may have created a perched groundwater table, and in conjunction with the close proximity of the study area to the receiving water body, groundwater levels are inferred to be close to the surface. The topography of the study area generally directs surface water flows toward the centre and south-westerly toward the Swan River, an environmentally sensitive area and conservation category wetland.

Although the Swan River is identified as an environmental constraint due to its protection requirements, the opportunities the River provides to the study area are of exceptional significance. The Swan River has long been valued for its social, recreational and visual amenity and would provide a substantial opportunity for increased land value. This can also be said for the mature trees within the study area, which provide visual amenity and urban heat island mitigation. Furthermore, deep rooted trees help maintain hydraulic control of the groundwater table by reducing recharge and using groundwater via transpiration, and promote soil stability and erosion control, especially at the river banks and at any other points where a water body receives inundation. The compensation basins identified in Figure 9 are also an opportunity for rehabilitation for improved visual amenity, flora and fauna habitat and upstream pre-treatment of surface and/or groundwater before discharge to the Swan River.

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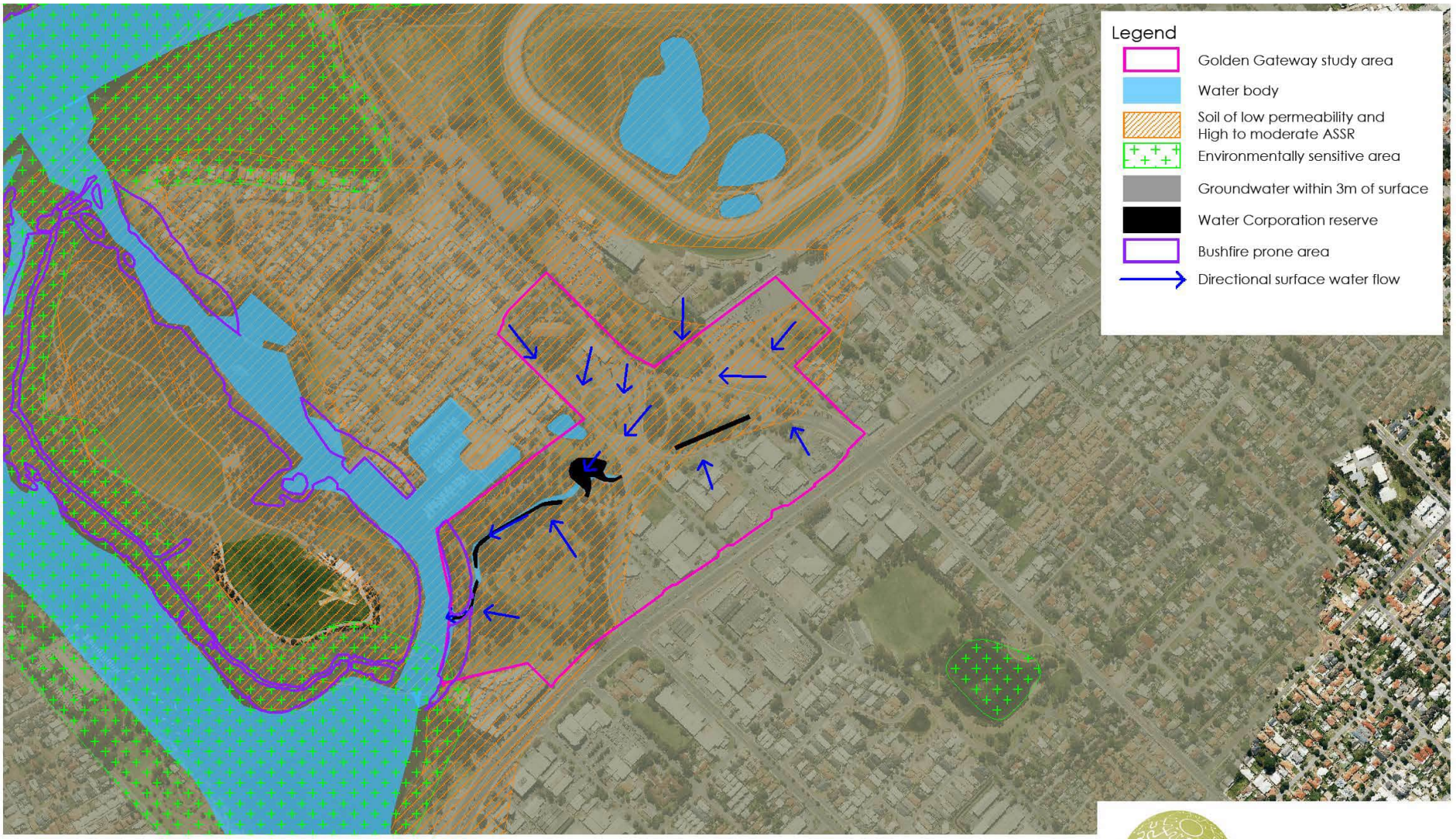
City of Belmont: Golden Gateway - Desktop environmental report
Figure 8: Environmental constraints



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City of Belmont: Golden Gateway - Desktop environmental report
Figure 9: Environmental opportunities

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5 IMPLEMENTATION STRATEGY

Table 5 provides a preliminary schedule of activities, which should be undertaken at Preconstruction, Construction and Post-construction phases of the project to mitigate and manage potential impacts to the environment. This advice is based on the current predominantly desktop assessment contained within this report. More detailed management measures should be determined as part of more detailed investigation and planning as the proposed development progresses.

Table 5: Implementation strategy

Issue	Action	Frequency	Responsibility
Preconstruction phase			
Contamination	Complete preliminary site investigation for contamination in accordance with Contaminated Sites Act 2003 should areas of known contamination be disturbed.	Once	Developer
Acid sulfate soils	Complete self-assessment checklist and consider need for a preliminary site assessment.	Once	Developer - Consistent with DPLH and DWER guidelines
Vegetation and flora	Clearly delineate POS areas and trees to be retained.	Once	Licensed Surveyor (Developer)
Fauna and habitat	All site staff to participate in Environment, Health and Safety inductions, which provide requirements for management of significant fauna and reporting procedures for environmental incidents.	Once	Developer and Construction contractor
Water management	Refer the local structure plan to the Department of Biodiversity, Conservation and Attractions as it contains a portion of land within and abutting the Swan River Trust Development Control Area. A Local water management strategy will be completed and used as the basis for detailed design. Following approval of the LWMS, UWMP(s) will be prepared prior to subdivision for approval by City of Belmont.	Once	Developer/City of Belmont Developer, in accordance with SPP 2.9: Water Resources
Bushfire	A Bushfire Management Plan will be prepared to support the LSP. The Bushfire Management Plan will be revised and implemented at subdivision.	Once	Developer, in accordance with SPP 3.7: Planning in Bushfire Prone Areas

Issue	Action	Frequency	Responsibility
Construction phase			
Soils and topography	Ground disturbing activities should be kept to a minimum and carried out 'as required' (in stages) immediately prior to lots being released for sale as part of a 'staged' development of the site.	Ongoing during construction phase.	Construction Contractor (Developer)
Contamination	Management of any identified contamination in accordance with the Contaminated Sites Act 2003.	Ongoing during construction phase.	Construction Contractor (Developer)
Acid sulfate soils	Management of any identified ASS consistent with DPLH and DWER guidelines.	Ongoing during construction phase.	Construction Contractor (Developer)
Vegetation and flora	Maintain markings and fencing around vegetation and trees to be retained. Cleared vegetation to be mulched and stored on site.	Ongoing during construction phase.	Construction Contractor (Developer)
Fauna and habitat	Undertake clearing in the direction of the river to allow fauna to escape.	Ongoing during construction phase.	Construction Contractor (Developer)
Water management	Manage sediment transport to waterways and drainage systems consistent with the LWMS.	Ongoing during construction phase.	Construction Contractor (Developer)
Aboriginal heritage	In the event a site is discovered, all work in the area will cease and the Department of Planning, Lands and Heritage will be contacted.	Ongoing during construction phase.	Construction Contractor (Developer)
Construction impacts	Ensure dust and sediment runoff is adequately managed. Ensure appropriate waste disposal of building materials.	Ongoing during construction phase.	Construction Contractor (Developer)
Post construction phase			
Soils and topography	Landscape or stabilise cleared areas immediately.	Once	Construction Contractor (Developer)
Vegetation and flora	Inspect fencing (if applicable) and replace if required. Ensure ongoing maintenance of retained vegetation and any revegetation areas / native landscaping prior to handover.	6 months Ongoing until handover.	Developer until hand over to City of Belmont

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Client: City of Belmont

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				Copies	Date
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Draft – amendments to study area	V2	RM	SSh	Electronic	31 August 2016
Final	V3	SSh	HBr	Electronic	3 May 2018
Amended Final	V4	SSh	HBr	Electronic	21 May 2018
Final Amendments	V5	SSh	HBr	Electronic	25 June 2018

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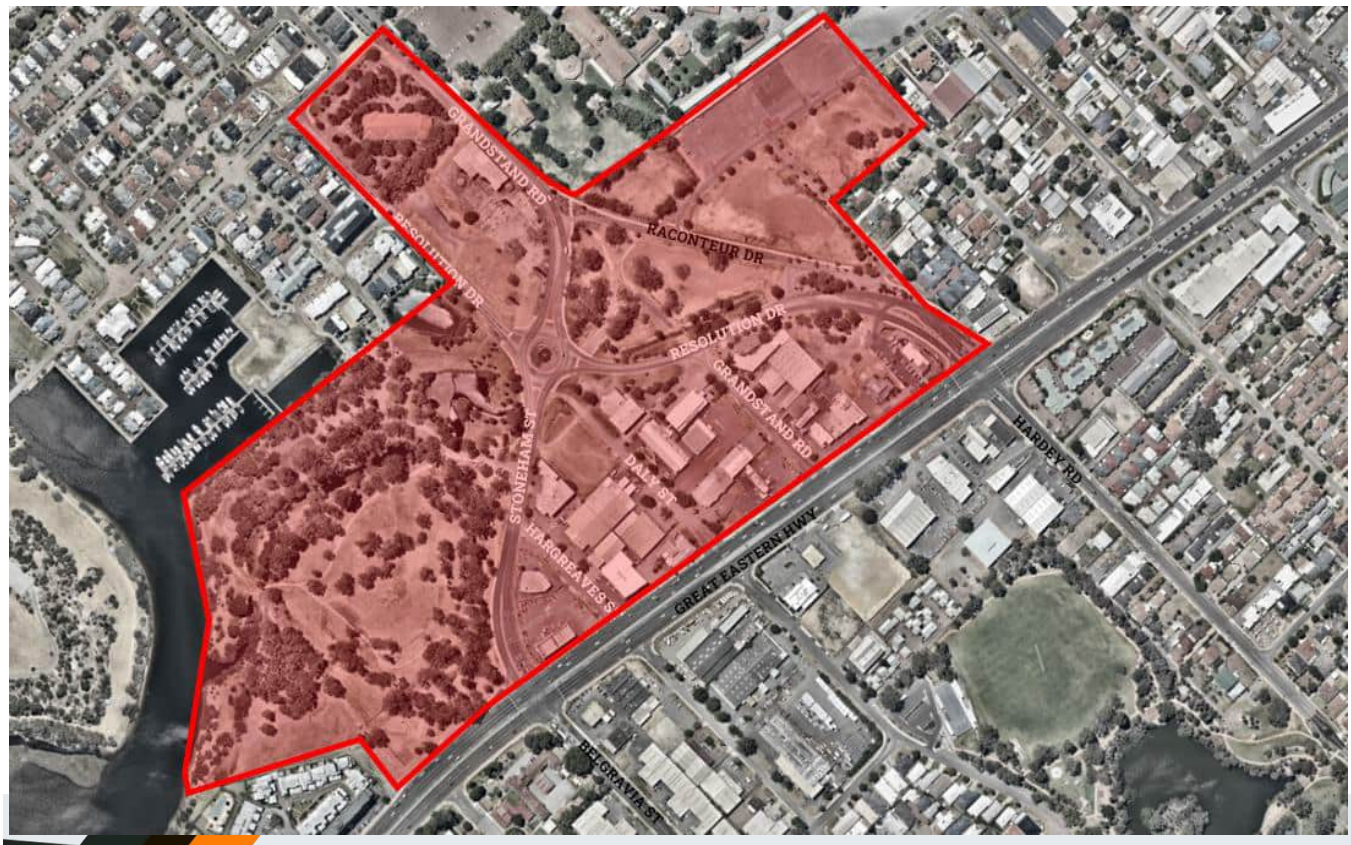

Golden Gateway Local Structure Plan
Movement and Access Strategy

FINAL REPORT

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PROJECT	81113-581-FLYT-REP-0005 Modelling and Amendments to Golden Gateway LSP Movement and Access Strategy			
Revision	Description	Originator	Review	Date
0	Draft	CXS	MDR	24/11/2022
1	Issue	CXS	MDR	20/12/2022
2	Revised Structure Plan	CXS	MDR	1/07/2024
3	Addressed City of Belmont comments	CXS	MDR	2/08/2024

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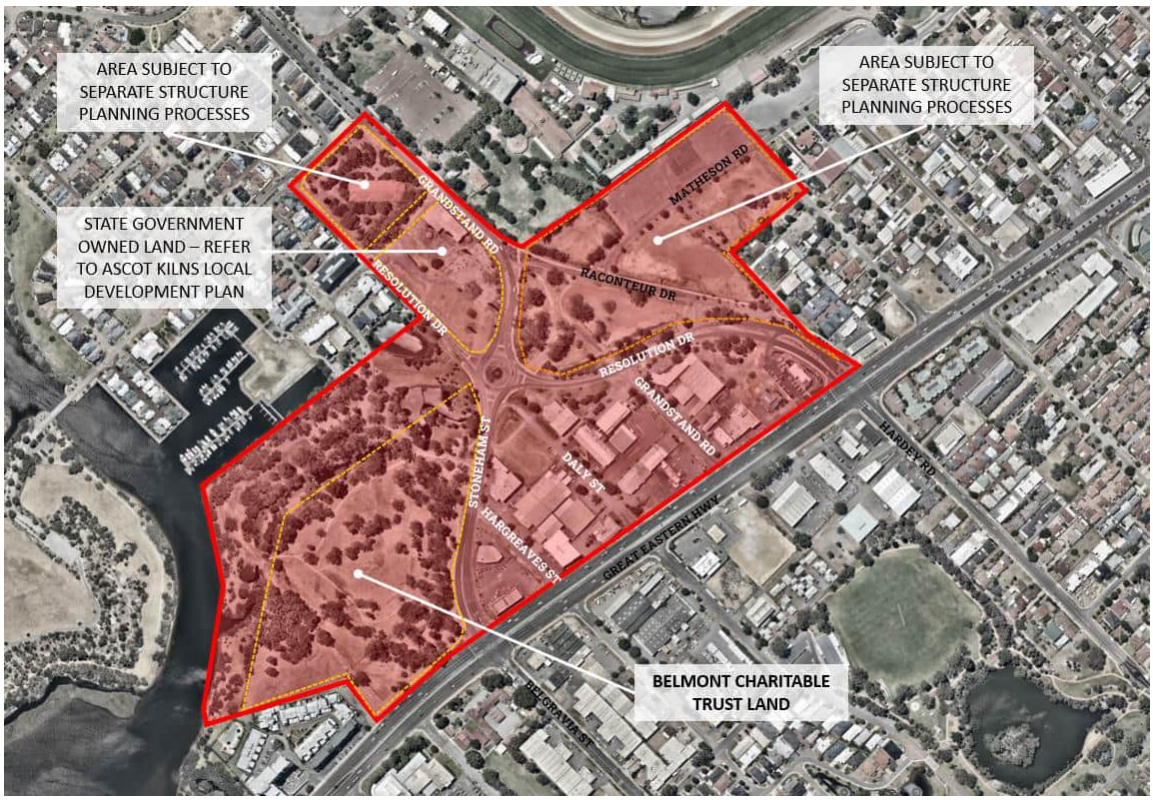
EXECUTIVE SUMMARY

This Movement and Access Strategy has been prepared by Flyt in support of a Local Structure Plan (LSP) which has been prepared for the Golden Gateway Precinct in the City of Belmont.

The Golden Gateway Precinct is bounded by Ascot Racecourse to the north/northeast, Hardey Road to the east, Great Eastern Highway to the south, Swan River to the west and Ascot Waters residential estate to the west/northwest. The Local Structure Plan boundary includes Ascot Kilns and the Belmont Trust land and a portion of the Perth Racing landholdings.



Perth Racing commissioned PJA to prepare a Traffic Impact Assessment to support the Ascot Racecourse Local Structure Plan. Output from that report (including land uses, road network and forecast traffic volumes) has been used to inform this Movement and Access Strategy.

The Golden Gateway Precinct Movement Network retains the road alignment in its existing configuration apart from Daly Street which will become a cul-de-sac. The remainder of Daly Street will be identified as Public Open Space (POS).

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Role and Performance of Key Roads

Great Eastern Highway

Great Eastern Highway will remain in its current form. No changes are proposed to the existing road connections with Great Eastern Highway nor the forms of intersections between Great Eastern Highway and connecting roads.

Stoneham Street

Stoneham Street will be the primary interface between the Golden Gateway precinct and the Swan River. Stoneham Street will continue to be a major district road corridor and provide for high capacity traffic movements. Stoneham Street will be retained as a four lane divided road (two lanes in each direction).

The intersection of Stoneham Street with Resolution Drive and Grandstand Road will remain as a two-lane roundabout. The intersection of Stoneham Street with Hargreaves Street will remain in its current configuration and there will be no intersection with Daly Street as it will become a cul-de-sac.

Resolution Drive

Resolution Drive will remain on its existing alignment. The form of Resolution Drive as a two lane divided road (one lane in each direction) will be retained, however additional lanes will develop on the approach and exit from the Great Eastern Highway intersection, as per the existing lane arrangement.

Grandstand Road (north)

Grandstand Road (north) will remain in its current alignment and configuration as a four lane divided road (with two lanes in each direction). The roundabout controlled intersection with Stoneham Street and Resolution Drive will remain.

Hargreaves Street

Hargreaves Street will continue along its existing alignment providing a connection between Great Eastern Highway (permitting left in left out movements only) and Stoneham Street. The intersection with Stoneham Street will remain.

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Hargreaves Street is proposed as a two-lane road with on-street parking where appropriate. Its current width of 12.5m should be reduced to 7m, with embayed parking.

Daly Street

Daly Street will continue along its existing alignment however it will become a cul-de-sac south of Stoneham Street, with the remainder of Daly Street to be identified as Public Open Space. The intersection with Great Eastern Highway (permitting left in left out movements only) will remain.

Daly Street is proposed as a two-lane road with on-street parking where appropriate. Daly Street's current width is 8m; this could be reduced to 7m. On-street parking would need to be embayed. Daly Street has been identified as a secondary route under the Long Term Cycle Network, which could take the form of a shared path, protected bike path or safe active street. The bike path should continue through the public open space.

Grandstand Road (south)

Grandstand Road will continue along its existing alignment providing a connection between Great Eastern Highway (permitting left in left out movements only) and Resolution Drive where it has a full movement intersection.

Grandstand Road is proposed as a two-lane road with on-street parking where appropriate. It is currently 12.5m wide and should be reduced to 7m, with embayed parking.

Memorial Drive

Memorial Drive and its intersection with Stoneham Street will remain unchanged.

Road Network Performance

SIDRA modelling of the existing road network under existing traffic volumes demonstrates that the signalised intersections along the Great Eastern Highway corridor are congested in each of the peak hours. While Great Eastern Highway currently operates at a level of service C and D, the side roads, particularly Stoneham Street, Belgravia Street, and Hardey Road currently operate at a level of service E or F in the peak periods. The Resolution Drive approach currently operates at a level of service D. The side roads experience congestion as more than half of the traffic signal green time is allocated to Great Eastern Highway. This congestion is expected to continue as traffic volumes increase.

The SIDRA Network modelling for the road network demonstrates that the level of congestion in 2021 and 2031 is generally consistent with the congestion predicted for the 2021 and 2031 existing road network scenarios. The internal roads are predicted to operate well within their capacity.

Similarly, the SIDRA Network modelling for build out of the Golden Gateway precinct demonstrates that the level of congestion along Great Eastern Highway in 2041 is consistent with the congestion predicted for the 2041 existing road network scenarios. Congestion along the Resolution Drive approach to Great Eastern Highway is predicted to increase in the AM peak period, while congestion along the Stoneham Street approach to Great Eastern Highway will increase in the PM peak period. Internal roads and intersections are predicted to operate within their capacity.

To understand how the road network performs under an Ascot event, the existing road network was evaluated using 2021 traffic volumes plus Melbourne Cup event traffic. The proposed road network was tested using 2021 traffic volumes plus Melbourne Cup event traffic, 2031 traffic volumes with development traffic plus Melbourne Cup event traffic and 2041 traffic volumes with development traffic plus Melbourne Cup event traffic.

The addition of Ascot event traffic to this busy PM peak increases the congestion in this period. Traffic exiting an event at Ascot is predicted to cause local congestion where this traffic joins the external road network, at the intersection of Raconteur Drive and Resolution Drive.

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1. INTRODUCTION

1.1 Movement and Access Strategy

This Movement and Access Strategy has been prepared by Flyt in support of a Local Structure Plan (LSP) which has been prepared for the Golden Gateway Precinct in the City of Belmont.

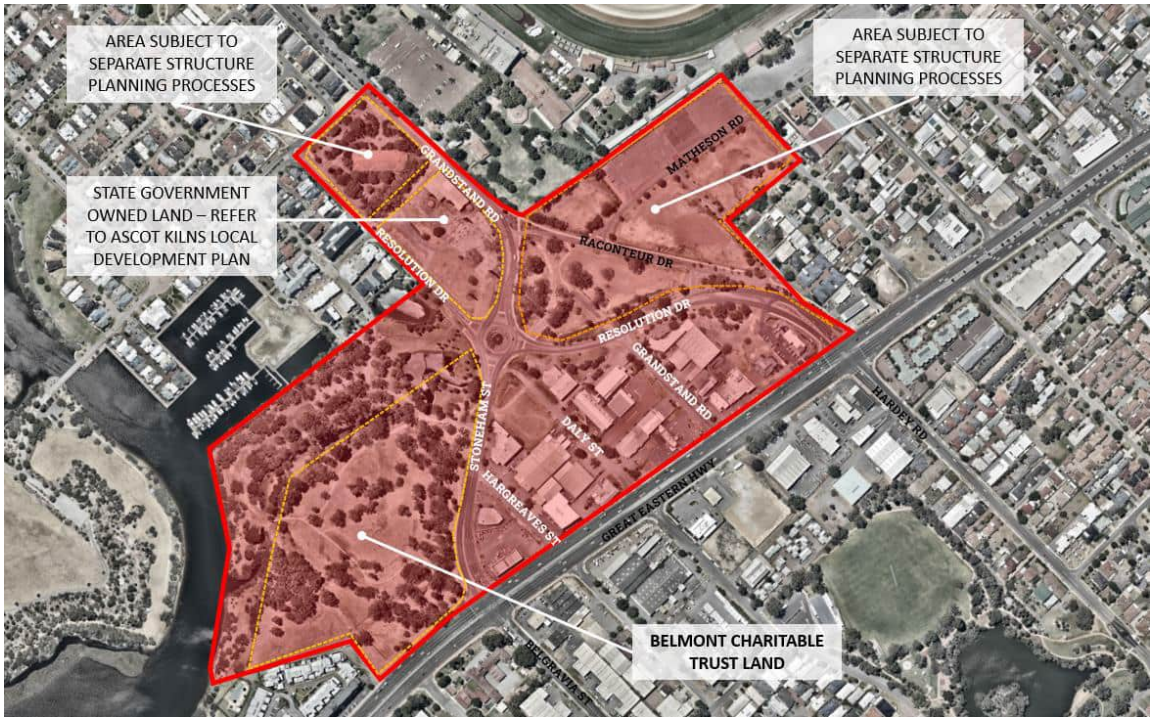
This Strategy has been prepared using the requirements set out within the Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines (August 2016) Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans.

The Local Structure Plan boundary includes the Belmont Trust land, Ascot Kilns and a portion of the Perth Racing landholdings. Ascot Kilns and the Perth Racing landholdings are subject to separate planning processes. Future traffic associated with redevelopment of the Perth Racing landholdings (as documented by PJA in their May 2024 Traffic Impact Assessment to support the Ascot Racecourse Local Structure Plan) has been considered in this Movement and Access Strategy.

1.2 Structure Plan

The Golden Gateway Precinct is located within the City of Belmont and the Local Structure Plan area is bounded by Ascot Racecourse to the north/northeast, Hardey Road to the east, Great Eastern Highway to the south, Swan River to the west and Ascot Waters residential estate to the west/northwest. The Local Structure Plan boundary is shown in Figure 1 and includes Ascot Kilns, Belmont Trust land and a portion of the Perth Racing landholdings. The Golden Gateway Structure Plan doesn't include controls for land subject to separate planning processes. This Movement and Access Strategy has made a distinction between the structure plan area and the subject land area.

Figure 1 – Golden Gateway Structure Plan Area (source: City of Belmont)



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The draft Local Structure Plan is shown in Figure 2, with the proposed land uses outlined in Table 1.

Figure 2 – Golden Gateway Structure Plan (source: City of Belmont)

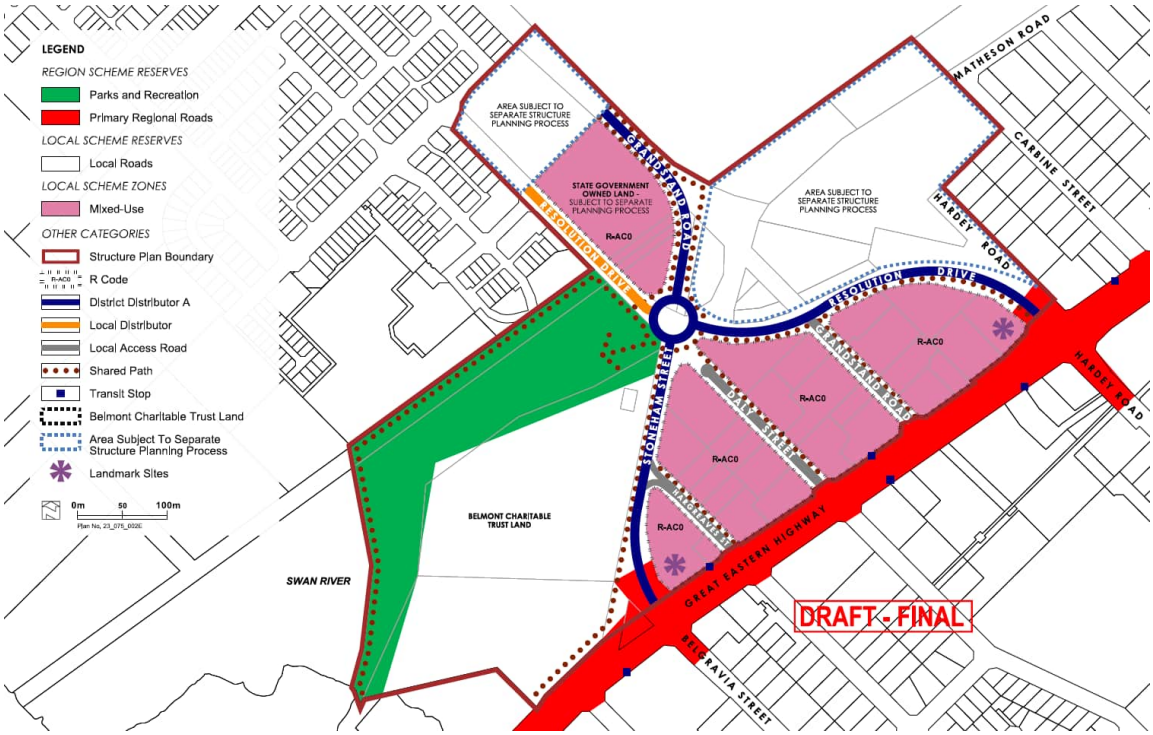

Table 1 – Proposed Structure Plan Land Uses

Land Use	Yield
Residential - Multiple dwelling	2,268 dwellings
Non Residential - Commercial	6,979 m^2 NLA
No Residential - Retail	1,200 m^2 NLA

This Structure Plan shall apply to the Golden Gateway Precinct, being the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan map. The provisions of this Structure Plan apply to all land within this area, except for land designated as subject to a separate planning process.

1.3 Key Issues

The issues examined within this Movement and Access Strategy are:

- The impact of the Structure Plan on the local transport network based on the requirements set out in the Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines (August 2016) Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans.
- Addressing issues set out within the Structure Plan report and the form of development of the site; and
- Consideration of the impact of development based on existing and future transport networks in the Golden Gateway locality.

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1.4 Background Information

In 2008, the Golden Gateway precinct was identified as a key strategic area due to its prominent position on Great Eastern Highway at the north-western 'gateway' to the City of Belmont. It was recognised this location had significant potential for high quality mixed commercial and residential development.

The precinct is impacted by access constraints and land fragmentation, making it apparent that coordinated planning was required. The draft Golden Gateway Local Structure Plan was therefore prepared to coordinate the future subdivision, zoning, and development of the area.

The draft Golden Gateway LSP was considered by the Belmont Council at an Ordinary Council Meeting held on June 23rd, 2020. In response to submissions received, Council resolved to require several modifications to the LSP, including to the road network.

1.5 Report Structure

This Movement and Access Strategy has been structured to conform to the requirements of the WAPC Transport Impact Assessment Guidelines for the assessment of Structure Plan proposals. This introduction section forms the first of nine sections in this Movement and Access Strategy. The remaining sections cover:

- Structure Plan Outline
- Existing Transport Environment.
- Movement Network
- Analysis of Transport Network
- Conclusions

2. STRUCTURE PLAN OUTLINE

2.1 Regional Context

The Golden Gateway Precinct is located within the City of Belmont and the Local Structure Plan area is bounded by Ascot Racecourse to the north/northeast, Hardey Road to the east, Great Eastern Highway to the south, Swan River to the west and Ascot Waters residential estate to the west/northwest. The Local Structure Plan boundary is shown in Figure 3. The LSP site includes the Belmont Trust Land, which currently consists of open parkland with a foreshore along the Swan River and includes the Ascot Kilns Local Development Plan (LDP) area.

Figure 3 – Golden Gateway LSP Area Regional Context (source: Google Maps)

The site is located approximately 8km to the east of the Perth CBD, along the southern foreshore of the Swan River. It is 4km from Perth Airport Domestic Terminal (Qantas), 9km from Perth International/Domestic Terminals and 3.5km from Belmont Forum Shopping Centre.

The movement network surrounding the site features key regional road connections, a high frequency public transport corridor and high-quality shared path pedestrian and cycling links.

The site benefits from good access to the regional road network, with Great Eastern Highway along the southern boundary of the site. To the west Great Eastern Highway provides access to the Perth CBD and onto South Perth, Melville, and Fremantle via Canning Highway. To the east Great Eastern Highway provides access to Perth Airport and onto Guildford, Midland, and the Swan Valley. The site is close to the Garratt Road bridge crossing of the Swan River (approximately 1km north of the site), which provides access to Bayswater, Maylands, Mount Lawley, and suburbs north of Perth CBD.

Ascot Racecourse is located immediately to the northeast of the site. The racecourse is regarded as Perth's premier racecourse and holds several featured Group Race meetings annually. These race meetings attract crowds of varying sizes and on key race days such as the Melbourne Cup and Perth Cup, vehicle access to and from the racecourse can cause local congestion.

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Existing shared path cycling connections run through the LSP site alongside Stoneham Street, Raconteur Drive and Grandstand Road. Both shared paths and local bicycle friendly routes run through the Ascot Waters development to the north of the LSP site. The site is located close to regional cycling connections with the Graham Farmer Freeway Principal Shared Path (PSP) easily accessed via the shared path along the southern side of the Swan River.

Existing bus routes operate close to or through the LSP site. These include the Circle Route (via Resolution Drive and Grandstand Road) providing connections north to destinations including Bayswater Station, Morley Bus Station/Shopping Centre and south to destinations including Belmont Forum Shopping Centre, Oats Street Station, and Curtin University. In addition, existing bus routes operate along Great Eastern Highway providing connections east to destinations including Redcliffe Station and High Wycombe Station and to the west to destinations including the Victoria Park Transfer Station and Elizabeth Quay Bus Station.

2.2 Proposed Land Uses

The Golden Gateway LSP is comprised of three overarching land uses, residential dwellings, commercial space, and retail space. It is proposed that the three land uses will primarily be provided in mixed-use development sites across the Golden Gateway LSP area. The split of the three land uses is shown in Table 2.

Table 2 - Proposed Structure Plan Land Uses

Land Use	Yield
Residential - Multiple dwelling	2,268 dwellings
Non Residential - Commercial	6,979 m^2 NLA
No Residential - Retail	1,200 m^2 NLA

As noted in the Structure Plan Report, the LSP has been formulated around the following vision:

> *"The development of the Golden Gateway will transform this degraded and fragmented area into a vibrant precinct of residential and mixed use development, with strengthened connections to the Swan River and Ascot Waters, with uses, density and built form that derive best value from these attributes while respecting the area's rich culture and heritage."*

The overarching objectives for the Golden Gateway Precinct as established by the project team and reinforced through stakeholder engagement include:

- Improve self-containment of facilities – reduce car dependence;
- Improve people's connection to the Swan River;
- Create accessible, quality public realm within the precinct; and
- Identify appropriate uses/densities in conjunction with infrastructure improvements.

To achieve the above objectives, the project team identified several opportunities that the Golden Gateway precinct presents, they include:

- Land use:
  - Opportunity for residential development to be accommodated in the precinct given the accessibility to high quality riverside amenity;
  - Opportunity for retail convenience and food and beverage land uses to be integrated into development outcomes;
  - Potential for higher density development given precinct location, proximity to high amenity open space destinations, Perth central business district, localised employment, and high frequency public transport;

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  - An existing primary school adjacent the precinct offers opportunity for family friendly dwelling diversity; and
  - Opportunities to consider mixed use land use for development in core area to broaden activity opportunities and long term transition of the precinct.
- Movement:
  - Opportunity to utilise existing local street network of Hargreaves Street, Daly Street and Grandstand Road (south) to deliver a robust structure for future development access and vehicle circulation; and
  - Generous existing road reserve dimensions provide ability for reconfigured pedestrian friendly streetscapes offering shade trees, soft landscaping, and convenient on-street parking embayments;

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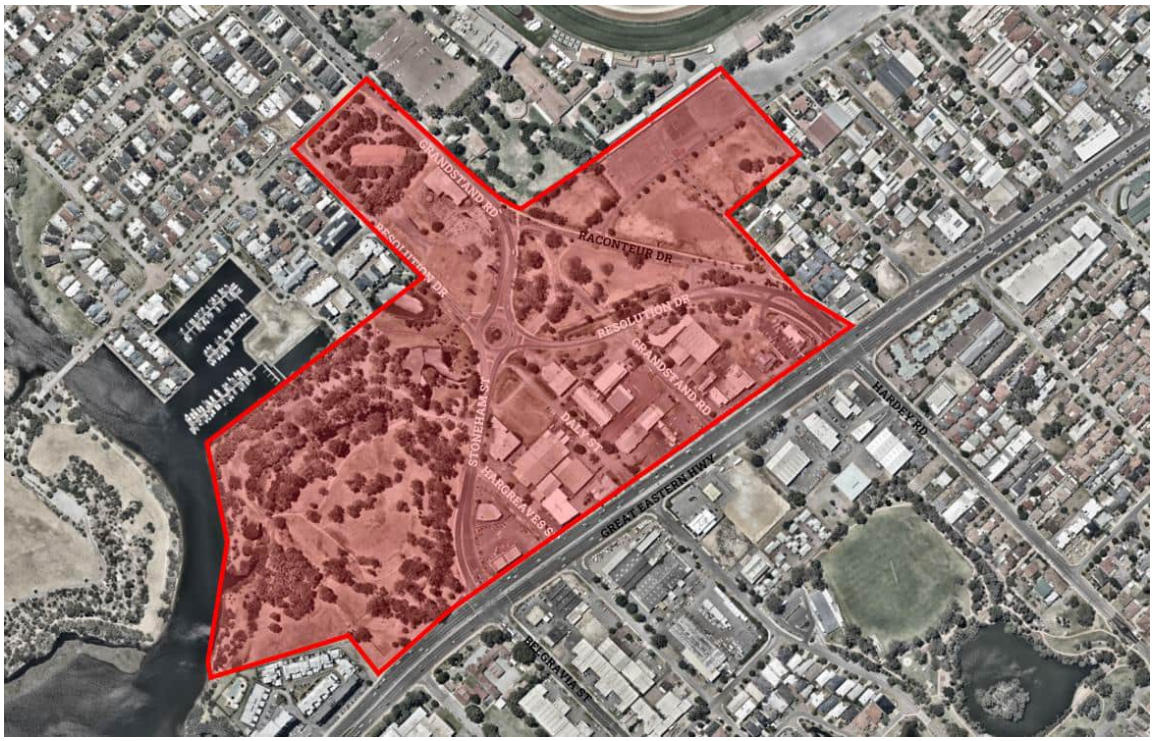
3. EXISTING TRANSPORT ENVIRONMENT

3.1 Existing Land Uses

The Golden Gateway Precinct is bounded by Ascot Racecourse to the north/northeast, Hardey Road and Carbine Street to the east, Great Eastern Highway to the south, Swan River to the west and Ascot Waters residential estate to the west/northwest, as shown in Figure 4.

Figure 4 – Golden Gateway LSP Area in Context to Surrounding Development (source: Google Maps)



The developed section of the site, between Great Eastern Highway, Stoneham Street and Resolution Drive, consists of a range of light industrial and commercial units, and various fast-food outlets and service stations fronting Great Eastern Highway. Other areas of the precinct generally consist of undeveloped land.

The Ascot Kilns area between Resolution Drive and Grandstand Road is subject to a separate Local Development Plan (LDP) process, however traffic generated from the proposed Ascot Kilns LDP area has been considered within this assessment.

3.2 Pedestrian Network

The extent and quality of the existing pedestrian infrastructure within and surrounding the Golden Gateway precinct is of a standard commensurate with the extent of existing development and form of land uses across the site, i.e., there are several existing undeveloped lots and those that are developed primarily accommodate light industrial/ commercial unit style development. The existing local pedestrian infrastructure can be summarised as follows for the major road network and minor road network.

3.2.1 Pedestrian Infrastructure along Major Corridors

Great Eastern Highway runs along the southern boundary of the LSP area and is a significant regional road connection within the Perth metropolitan road network. There are 2.5m wide footpaths on both sides of Great Eastern Highway. Within the vicinity of the LSP site, crossing of Great Eastern Highway by pedestrians is facilitated via traffic signal controlled intersections at both Stoneham Street/Belgravia Street and Resolution Drive/Hardey Road intersections with Great Eastern Highway. At both signalised intersections, the protected crossing of Great Eastern Highway is only available on the western approach. Pedestrians wishing to cross Great Eastern Highway from the eastern approaches will have to cross 3 sides of the intersection in order to do so.

Three of the four major road corridors running through the Golden Gateway precinct (Grandstand Road, Raconteur Drive, and Stoneham Street) have footpaths along one side of the street – Grandstand Road along the eastern side of the street adjacent to the Ascot Racecourse, Raconteur Drive along the northern side of the street to connect to Grandstand Road, and Stoneham Street along the western side of the street adjacent to the Belmont Trust Land.

There is a footpath along some sections of Resolution Drive. The section adjacent to the Ascot Waters development has a footpath along the southwestern side, and the section immediately north of Great Eastern Highway has a footpath on each side. Between the roundabout controlled intersection of Stoneham Street, Grandstand Road, and Resolution Drive and 100m north of the signalised intersection with Great Eastern Highway, Resolution Drive has no footpaths on either side.

3.2.2 Pedestrian Infrastructure along Minor Road Corridors

The minor roads within the LSP site (Hargreaves Street, Daly Street, and the southern section of Grandstand Road) are located between Great Eastern Highway and Resolution Drive/Stoneham Street and provide access to the light industrial/commercial units in this area of the LSP.

Most of these minor streets do not have footpaths, which reinforces the dominance of the private car. Daly Street is the exception and has a footpath on the eastern side.

3.2.3 Pedestrian Accessibility

Walk Score is a commercial product that measures the walkability of a location based on the distance to nearby amenities and pedestrian facilities. The Walk Score walkability assessment tool considers the development site to be "car dependent" where most daily errands require a car, with a walk score ranging between 43-48 out of 100, as shown in Figure 5.

Figure 5 – Walk Score Rating for Golden Gateway LSP Site (source: walkscore.com)

3.3 Cycling Network

The extent and quality of the existing cycling infrastructure within and surrounding the Golden Gateway LSP site is of a high standard with local and regional links. The local and regional cycling network is shown in Figure 6.

Good on road cycling routes for experienced and confident cyclists are located along Great Eastern Highway adjacent to the Golden Gateway precinct. High quality shared use paths are located along one side of Stoneham Street, Raconteur Drive, and the northern section of Grandstand Road although there are gaps in the connectivity.

High quality shared use paths are also located along the Swan River Foreshore (via the Belmont Trust Land towards the Graham Farmer Freeway PSP to access Perth City), and along the shoreline within the Ascot Waters development. Some streets within the Ascot Waters development have been identified as local cycle friendly routes.

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Figure 6 – Existing Cycling Network in Relation to the Golden Gateway LSP Site (source: DoT / City of Belmont)

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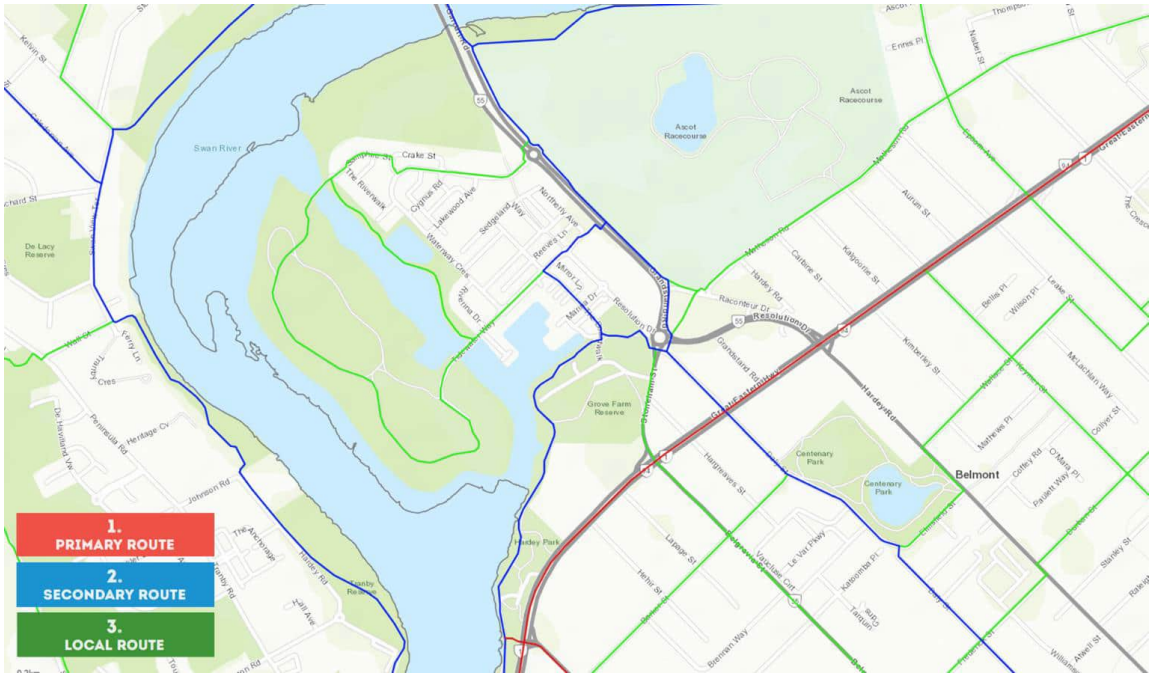
The Long Term Cycle Network (LTCN) in the vicinity of the Golden Gateway precinct is shown in Figure 7. The LTCN identifies the function of a route (primary, secondary, or local) instead of dictating what form (shared paths, bicycle only lanes, protected on-street bicycle lane or safe active streets) it should take. Function considers the type of activities that take place along a route, and the level of existing and potential demand. A route's built form is based on the characteristics of the environment, including space availability, topography, traffic conditions (speed, volumes), primary users, and so on.

Primary routes form the spine of the cycle network, connecting major destinations of regional importance. Secondary routes are those with a moderate level of demand, providing connections between primary routes and major activity centres. Local Routes are located in local residential areas and provide access between higher order routes and local amenities).

Within the LSP site, Great Eastern Highway is identified as a future Primary Route, Daly Street and Grandstand Road north are both future Secondary Routes while Belgravia Street, Stoneham Street and Matheson Road form a future Local Route.

Figure 7 – Long Term Cycling Network in vicinity of Golden Gateway (source: DoT)



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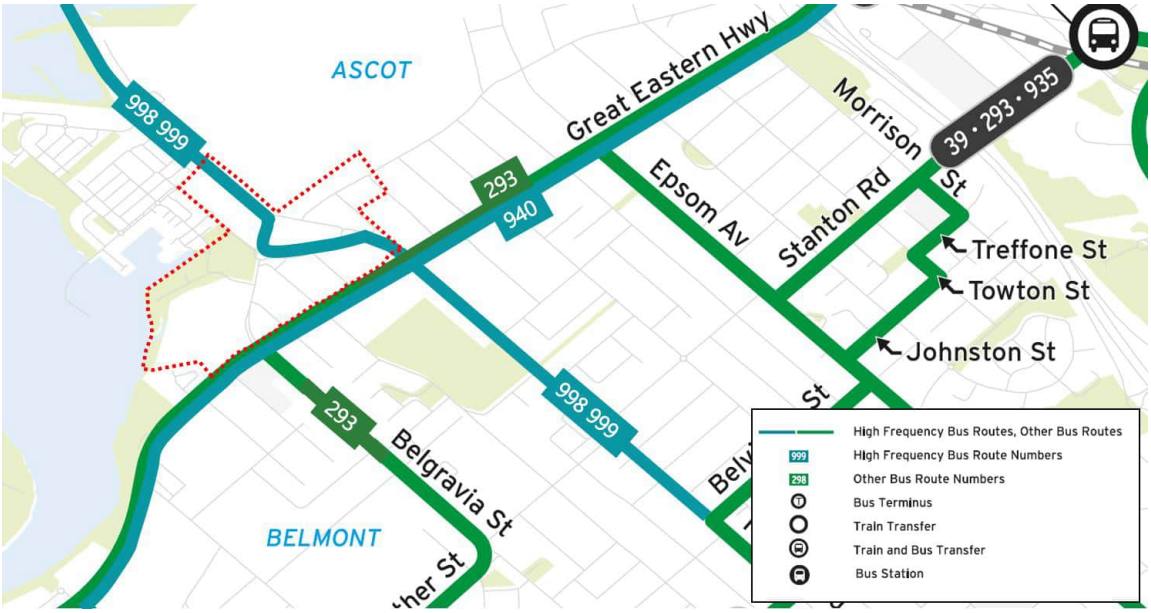
3.4 Public Transport

There is an average level of public transport accessibility for roads around the periphery of the Golden Gateway precinct. Great Eastern Highway and Grandstand Road/Resolution Drive are serviced by regular bus services, as shown in Figure 8. Additional bus services and stops along local roads may be implemented in the future if land uses within the Golden Gateway site intensify over time.

Figure 8 – Existing Public Transport Network in Relation to the Golden Gateway LSP Site (source: Transperth / City of Belmont)



Currently the only bus routes that pass through the site are the circle route bus services 998 and 999 which are high frequency routes that travel along Grandstand Road (northern section) and Resolution Drive, and then continue to Hardey Road. There are 128 circle route bus services per weekday which travel through the site. There are currently no bus stops for the circle route within the Golden Gateway precinct, with the closest bus stops located on Grandstand Road immediately to the north of the LSP area close to the main pedestrian access for Ascot Racecourse. Bus stops are also located on Hardey Road, 50m to the south of Great Eastern Highway.

Circle route services provide a high frequency orbital connection around Perth, linking inner suburbs, major activity centres, key land uses and public transport hubs including Belmont Forum, Oats Street Station, Curtin University, Murdoch Activity Centre, Fremantle, Cottesloe, Claremont, UWA, QEII Medical Centre, Stirling Station, and Morley.

High frequency bus route 940 operates along Great Eastern Highway which forms the southern boundary of the site, with a total of 101 daily services to Perth and 103 services to Redcliffe. This bus route operates between Elizabeth Quay Bus Station and Redcliffe Station, travelling along St Georges/Adelaide Terrace, Victoria Park Transfer Station, and Great Eastern Highway adjacent to the Golden Gateway LSP site.

Bus route 293 between Redcliffe Station and High Wycombe Station also travels along Great Eastern Highway (east of Belgravia Street) and along Belgravia Street. There are 18 services in each direction per day.

More detail of bus route services and frequencies is provided in Table 3.

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Table 3 – Bus frequency and service numbers (source: Transperth)

Weekday Summary					
Route	Direction	No. Services	AM / PM Peak Frequency	Saturday Summary	Sunday / Public Holiday Summary
998	CircleRoute - clockwise	64 services 6.06am to 10.11pm	AM peak every 12 mins PM peak every 15 mins	47 services, every 15 mins from 7.15am to 6.59pm	23 services, half hourly from 7.47am to 6.45pm
998	CircleRoute - anticlockwise	60 services 6.53am to 9.53pm	AM peak every 12 mins PM peak every 15 mins	43 services, every 15 mins from 7.40am to 5.37pm, then half hourly until 7.36pm	22 services, half hourly from 8.40am to 7.10pm
940	To Perth	101 services 4.54am to 11.37pm	AM peak every 10 mins PM peak every 10 mins	59 services, every 15 mins from 7.15am to 6.47pm, then half hourly	53 services, every 15 mins from 9.15am to 6.44pm, half hourly until 10.21
	To Redcliffe	103 services 5.25am to 11.51pm	AM peak every 10 mins PM peak every 10 mins	59 services, every 15 mins from 8.04am to 8.04pm, then half hourly	53 services, every 15 mins from 8.53am to 7.07pm, half hourly until 10.41
293	To High Wycombe	18 services 5.32am to 5.37pm	AM peak every 30 mins PM peak every 20 mins	No services	No services
	To Redcliffe	18 services 5.53am to 5.33pm	AM peak every 20 mins PM peak every 30 mins	No services	No services

3.5 Road Network

The road network in the vicinity of the Golden Gateway precinct includes the major regional through route of Great Eastern Highway and a network of district and local roads on either side of the Great Eastern Highway corridor, as shown in Figure 9.

Figure 9 – Road Network in vicinity of Golden Gateway Precinct (source: MRWA)

The Main Roads WA (MRWA) Functional Road Hierarchy surrounding the Golden Gateway precinct is shown in Figure 10. Details of each road hierarchy type are set out in Table 4. The speed zoning in the vicinity of the Golden Gateway precinct is shown in Figure 11.

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Table 4 - MRWA Road Hierarchy Criteria (source: MRWA)

		ROAD TYPES				
	CRITERIA AND ACTIVITY	PRIMARY DISTRIBUTOR	DISTRICT DISTRIBUTOR CATEGORY "A"	DISTRICT DISTRIBUTOR CATEGORY "B"	LOCAL DISTRIBUTOR/ INDUSTRIAL ROAD	ACCESS ROAD
1	Predominant Activity	Major networks e.g. freeways	Important network	Less important network	Minor network	Limited access to traffic. Forms part of local distribution network
2	Intersections	Controlled with appropriate measures e.g. grade separation, high speed traffic management measures	Controlled with appropriate measures E.g. traffic signals	Controlled with appropriate Local Area Traffic Management	Controlled with minor Local Area Traffic Management	Self controlling with minor measures
3	Indicative Traffic Volume (except semi-rural areas)	Above 15 000 vehicles per day	Above 8000 vehicles per day	Above 6000 vehicles per day	Maximum desirable volume: 6000 vehicles per day	Maximum desirable volume: 3000 vehicles per day
4	Frontage Access Allowed	None on Controlled Access Hwys Limited on other routes	Prefer not to have residential access and limited commercial access, generally via service roads	Residential and commercial access due to its historic status Prefer to limit when and where possible	Yes, except at intersections where side entry is preferred and traffic signals are involved	Yes
5	Pedestrians Allowed	Preferably none at grade. Crossing should be controlled	With positive measures for control and safety e.g. pedestrian signals	With appropriate measures for control and safety e.g. median/islands refuges	With minor safety measures	Yes
6	Recommended Operating Speed	60 – 110 km/h (depending on design characteristics)	60 – 80 km/h	60 – 70 km/h	50 - 60 km/h	50 km/h (desired speed)
7	Buses Allowed	Yes	Yes	Yes	Yes	If required
8	Parking Allowed	No	Generally no. Clearways where necessary	Not preferred. Clearways where necessary	Yes	Yes
9	Truck Routes	Yes	Yes	Yes	Only to service properties	Only to service properties
10	Responsibility	Main Roads Western Australia	Local Government	Local Government	Local Government	Local Government

Ideally, every road should meet all the criteria of one RH type.
However, many roads meet some of the criteria appropriate to different road types and are difficult to define.
Where precise definition of the road type is difficult, comparison with roads of similar role in other local government areas may assist.

Figure 10 - Road Hierarchy in Vicinity of the Golden Gateway Precinct (source: MRWA)

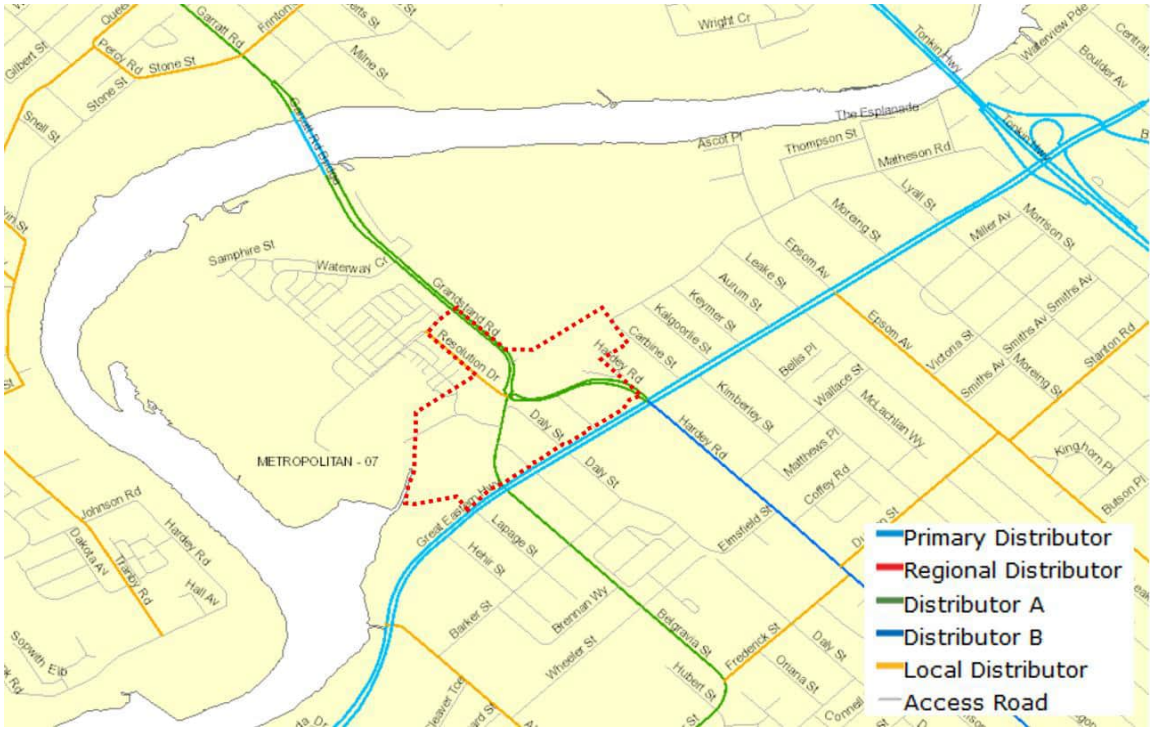

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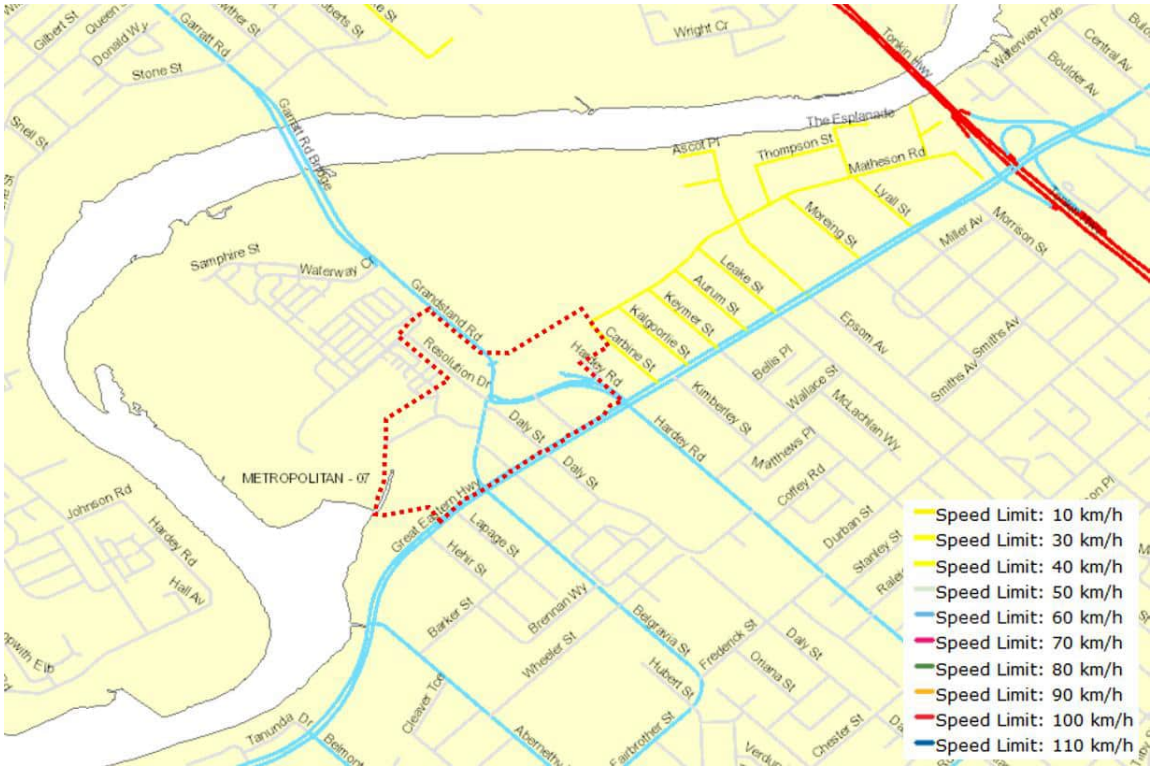
Figure 11 - Speed Limits in Vicinity of the Golden Gateway Precinct (source: MRWA)



3.5.1 Regional Roads

Great Eastern Highway

Great Eastern Highway runs along the southern boundary of the Golden Gateway precinct. It is one of the State's principal transport corridors and is designated as a Primary Distributor under the control of MRWA. The most recent traffic counts for the section of Great Eastern Highway bordering the Golden Gateway precinct, collected by MRWA in 2018, reveal a two-way traffic volume of over 54,000 vehicles per day (vpd). The posted speed limit is 60km/h.

A typical cross section of Great Eastern Highway is shown in Figure 12.

Figure 12 – Cross section of Great Eastern Highway corridor– looking east, west of Hargreaves St (source: Google Street View)

Great Eastern Highway is constructed with an on-road cycle lane, a bus lane, and 3 general traffic lanes in each direction, separated by a median which varies in width between 2.5m and 6m (with the reduced width adjacent to right turning lanes), all within a road reserve width which varies between 40 and 45m.

The median reduces to 2.5m to accommodate right turning lanes in advance of the signalised intersections at Stoneham Street / Belgravia Street and Resolution Drive / Hardey Road. The bus lane is constant in the westbound carriageway, however within the eastbound carriageway there is a bus lane for 170m of the 500m total length between the signalised intersections with Stoneham Street / Belgravia Street and Resolution Drive / Hardey Road.

Garratt Road Bridge

The Garratt Road Bridge, located 1km to the north of the Golden Gateway precinct, is one of only 8 traffic bridges across the Swan River between Fremantle and Guildford. The section of Garratt Road along the bridge is designated as a Primary Distributor under the control of MRWA. The posted speed limit is 60km/h. In the most recent traffic counts, undertaken by MRWA in 2018, the bridge was found to carry approximately 16,700 vpd, with 8,800 vpd northbound and 7,900 vpd southbound.

3.5.2 District Roads

The Golden Gateway Precinct has three key district road connections running through the site: Grandstand Road, Stoneham Street and Resolution Drive. Belgravia Street is the continuation of Stoneham Street to the south of Great Eastern Highway and the Golden Gateway site, while Hardey Road is the continuation of Resolution Drive south of Great Eastern Highway.

Grandstand Road

Grandstand Road is a District Distributor A road, running north south within the site, connecting to the Garratt Road Swan River crossing in the north and to Great Eastern Highway (via either Stoneham Street or Resolution Drive) to the south. It is constructed as a four-lane dual carriageway, with a median of varying width between 2 and 4.5m, as shown in Figure 13. Grandstand Road is constructed within a 20m road reserve. The posted speed limit is 60km/h. The most recent two-way traffic count (collected by MRWA in 2018) at the Garratt Road Bridge was 16,700 vehicles per day (vpd).

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Figure 13 – Cross section of Grandstand Road – looking southeast, south of Waterway Cr (source: Google Street View)

Stoneham Street

Stoneham Street is a District Distributor A road, running north-south within the site, between the roundabout controlled intersection of Grandstand Road with Resolution Drive and the signalised intersection of Great Eastern Highway with Belgravia Street. It is constructed as a four-lane undivided road, within a 20m road reserve, as shown in Figure 14. The posted speed limit is 60km/h. The most recent two-way traffic count for Stoneham Street (collected by MRWA in 2018) to the north of Great Eastern Highway was 14,270 vpd.

Figure 14 – Cross section of Stoneham Street – looking northeast, south of Memorial Dr (source: Google Street View)

Resolution Drive (Great Eastern Highway to Stoneham Street)

Resolution Drive is a District Distributor A road, running east-west within the site, connecting Grandstand Road and Stoneham Street with Great Eastern Highway and Hardey Road. Between the intersection of Stoneham Street / Grandstand Road and the intersection with Raconteur Drive, Resolution Drive is constructed as a single lane in each direction separated by a 2m median, as shown in Figure 15.

Figure 15 – Cross section of Resolution Drive– looking northeast, east of Grandstand Rd south (source: Google Street View)

Between Raconteur Drive and Great Eastern Highway, Resolution Drive is constructed with 2 lanes in each direction, separated by a 10m median. The cross section for this part of Resolution Drive is shown in Figure 16.

Figure 16 – Cross section of Resolution Drive– looking southeast, northwest of Great Eastern Highway (source: Google Street View)

The road reserve width varies between 22m and more than 60m.The posted speed limit is 60km/h. The most recent two-way traffic count for Resolution Drive to the north of Great Eastern Highway (collected by MRWA in 2022) was 7,860 vpd.

Belgravia Street

To the south of the Golden Gateway precinct, Belgravia Street is the southern approach to the signalised intersection of Great Eastern Highway with Stoneham Street. Belgravia Street is classified as a District Distributor A. The most recent two-way traffic count for Belgravia Street to the south of Great Eastern Highway (collected by MRWA in 2022) was 14,640 vpd.

Belgravia Street is constructed with 3 northbound lanes and 2 southbound lanes within a road reserve which varies between 24m (closest the signalised intersection) and 21m. Further to the south Belgravia Street has no median (or turning lanes) and the road reserve is 20m. Belgravia Street has a posted speed limit of 60km/h. The section of Belgravia Street to the south of Great Eastern Highway, adjacent to Belmont Primary School, is a school zone, where a 40kph speed limit applies between 7:30 and 9:00 AM and between 2:30 and 4:00 PM on weekdays.

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Hardey Road (south of Great Eastern Highway)

To the south of the Golden Gateway precinct, Hardey Road is the southern approach to the signalised intersection of Great Eastern Highway with Resolution Drive. Hardey Road is constructed as 3 northbound lanes and 2 southbound lanes, separated by a painted median and within a 25m road reserve. Further to the south Hardy Road reduces to a kerb side parking lane and single traffic lane in each direction, separated by a 2m median and within a 20m road reserve. Hardey Road is classified as a District Distributor B, with a posted speed limit of 60km/h. The most recent two-way traffic count for Hardey Road to the south of Great Eastern Highway (collected by MRWA in 2019) was 8,270 vpd.

3.5.3 Local Roads

The Golden Gateway Precinct has seven local road connections running through the site: Hargreaves Street, Daly Street, Grandstand Road (south), Resolution Drive (northwest), Memorial Drive, Raconteur Drive and Matheson Road. These local roads are all classified as Access Streets (except for Resolution Drive which is a local distributor), with posted speed limits of 50km/h.

Hargreaves Street

Hargreaves Street is a 12.5m wide single carriageway road, within a 20m road reserve. Parking is permitted on both sides of the road. Hargreaves Street runs northwest-southeast between Stoneham Street and Great Eastern Highway. The intersection with Stoneham Street is restricted to left and right in, and left out only movements, while the intersection with Great Eastern Highway permits only left in left out movements. A cross section of Hargreaves Street is shown in Figure 17.

Figure 17 – Cross section of Hargreaves St, north of Great Eastern Hwy, looking south (source: Google Street View)

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Daly Street

Daly Street is an 8m wide road, within a 20m road reserve. Parking is permitted on both sides of the road. Daly Street runs northwest-southeast between Stoneham Street and Great Eastern Highway. The intersection with Stoneham Street is restricted to left out only movements. The intersection with Great Eastern Highway permits only left in left out movements. A cross section of Daly Street is shown in Figure 18.

Figure 18 – Cross section of Daly St, north of Great Eastern Hwy, looking south (source: Google Street View)

Grandstand Road (south)

Grandstand Road (south) is a 12.5m wide single carriageway road, within a 20m road reserve. Parking is permitted on both sides of the road. Grandstand Road (south) runs northwest-southeast between Resolution Drive and Great Eastern Highway. All movements are permitted at the intersection with Resolution Drive, while the intersection with Great Eastern Highway permits only left in left out movements. A cross section of Grandstand Road (south) is shown in Figure 19.

Figure 19 – Cross section of Grandstand Rd (south), north of Great Eastern Hwy, looking south (source: Google Street View)

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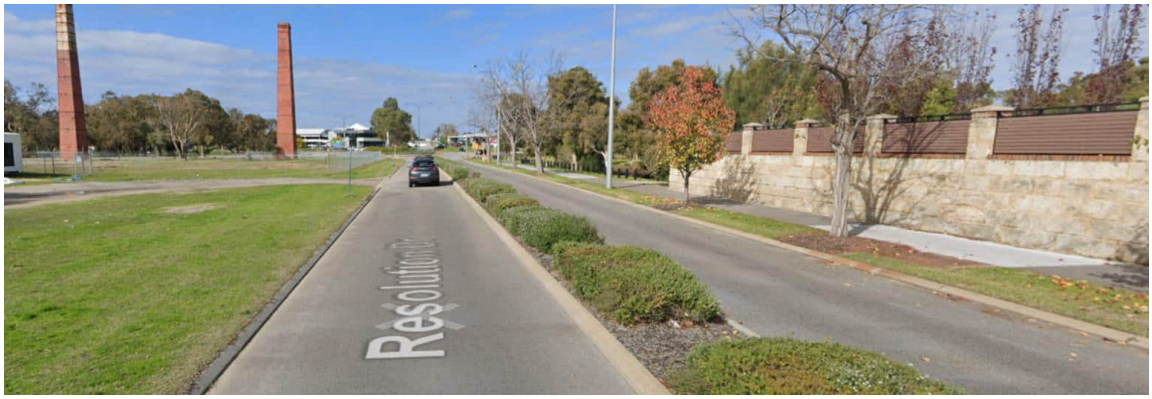
Resolution Drive

The section of Resolution Drive to the west of the roundabout intersection with Stoneham Street and Grandstand Road is classified as a local distributor, providing the main access for the Ascot Waters residential development. It is constructed as two 4.5m wide lanes separated by a 2m median, within a 20m road reserve. On-street parking is not permitted on either side of the road. Resolution Drive has three intersections along its 300m length, all full movement roundabouts. The Ascot Kilns area is immediately to the northeast of Resolution Drive. A cross section of Resolution Drive is shown in Figure 20.

Figure 20 – Cross section of Resolution Dr (northwest) north of Stoneham St, looking south (source: Google Street View)



Memorial Drive

Memorial Drive is a 6m wide road constructed through the Belmont Trust land at the western end of the Golden Gateway precinct. Memorial Drive provides a minor connection to the southern portion of the Ascot Waters development. Low fence posts either side of Memorial Drive prevent on-street parking. A cross section of Memorial Drive is shown in Figure 21.

Figure 21 – Cross section of Memorial Dr west of Stoneham St, looking east (source: Google Street View)

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3.6 Existing Traffic Volumes

Traffic volume data was obtained from the following sources:

- SCATS traffic volumes and signal data from September 2021 for the two signal controlled intersections:
  - Great Eastern Highway/Stoneham Street/Belgravia Street Intersection
  - Great Eastern Highway/Resolution Drive/Hardey Road Intersection
- Peak hour and 12 hour intersection turning counts (derived from video surveys in February 2018) for the two signal controlled intersections:
  - Great Eastern Highway/Stoneham Street/Belgravia Street Intersection
  - Great Eastern Highway/Resolution Drive/Hardey Road Intersection
- Volume, classification, and speed data collected in September 2021 from midblock loop detectors for the following sites:
  - Daly Street near Great Eastern Highway
  - Daly Street near Stoneham Street
  - Hargreaves Street near Great Eastern Highway
  - Hargreaves Street near Stoneham Street
  - Grandstand Road near Great Eastern Highway
  - Grandstand Road near Resolution Drive
- Peak hour turning counts and queue length observations from a video survey collected in September 2021 at the roundabout intersection of Grandstand Road/Resolution Drive/Stoneham Street roundabout.
- Mid-block traffic counts for Great Eastern Highway, Stoneham Street, Resolution Drive, Belgravia Street, Hardey Road and Garratt Road Bridge collected by MRWA in 2018, 2019, 2020 and 2022 and obtained from Traffic Map.

3.6.1 SCATS Signal Data

All MRWA's traffic signals in the metropolitan area are connected to SCATS (Sydney Co-ordinated Adaptive Traffic System). This is an adaptive urban traffic management system that synchronises traffic signals to optimise traffic flow across a whole city, region, or corridor. SCATS can provide vehicle count data (through loop detectors in each lane) and traffic signal phase data (a record of green, amber, and red times for each signal phase).

SCATS signal data for the two signalised intersections was provided by Main Roads. This data included:

- SCATS monitor and timing screenshots,
- Phase and Signal Group history data, and
- Offset data between sites.

SCATS data was obtained for the 5 weekdays between Monday September 6th and Friday September 10th 2021, which coincided with the dates of the roundabout survey and the local road loop detector counts. These weekdays were outside of school holidays and no major works or disruptions to the local or regional road network were noted.

The AM and PM peak hours were found to occur between 7:45 and 8:45am, and between 16:15 and 17:15pm.

The SCATS graphics for each of the signalised intersections are shown in Figure 22 and Figure 23.

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Figure 22 – Great Eastern Highway/Stoneham Street/Belgravia Street SCATS graphic (source: Main Roads WA)

Figure 23 – Great Eastern Highway/Resolution Drive/Hardey Road SCATS graphic (source: Main Roads WA)

The relevant peak hour data was extracted and processed to calculate the average cycle time for each intersection.

The calculation set out in the Main Roads WA Guidelines *Appendix A – Signal Data Information for Modelling – Version 1.1, Section A.2.3* was used to calculate the average cycle time and phase lengths during the peak hours. The calculated green, amber and red timings for each signalised intersection are shown in Table 5.

Table 5 – Signalised Intersection peak hour phase times

Intersection	AM Phase Times (seconds)			PM Phase Times (seconds)		
	Green	Amber	Red	Green	Amber	Red
Great Eastern Hwy / Stoneham St / Belgravia St		134s			139s	
Signal Phase A (Great Eastern Highway)	62	4	2.5	56	4	2.5
Signal Phase D (Belgravia Street)	17	4	3	29	4	3
Signal Phase E (Stoneham Street)	19	4	3	14	4	3
Signal Phase F (GEH right turns)	9	4	3	13	4	3
Great Eastern Hwy / Resolution Dr / Hardey Rd		134s			139s	
Signal Phase A (Great Eastern Highway)	67	4	3	63	4	3
Signal Phase D (Hardey Road)	14	4	3.5	19	4	3.5
Signal Phase E (Resolution Drive)	10	4	3.5	8	4	3.5
Signal Phase F (GEH right turns)	13	4	3.5	19	4	3.5

The signal phase data reveals that each of the signalised intersections has four phases per signal cycle in the peak hours. Phase A is where the green time is allocated to Great Eastern Highway through and left turning traffic. Phase D is the next phase, with green time allocated to traffic movements from the southern intersection approach (Belgravia Street and Hardey Road). Phase E allocates green time to traffic movements from the northern intersection approach (Stoneham Street and Resolution Drive). Finally, Phase F allocates green time to the right turn movements from Great Eastern Highway.

These most recent signal cycle lengths are significantly longer than the cycle lengths recorded in November 2020 as part of an earlier assessment. The AM peak period average signal cycle time increased by 14s seconds from 120 to 134 seconds while the PM peak average signal cycle time increased by 19 seconds from 120 to 139 seconds. Most of the increased green time was given to phase A which is for Great Eastern Highway through and left turning traffic. These increases were most notable at the intersection of Great Eastern Highway with Hardey Road and Resolution Drive where over 95% of the additional green time in each peak hour was allocated to Great Eastern Highway traffic and not side roads.

3.6.2 Signalised Intersection Turn Counts

SCATS signal data provides traffic volumes at 15 minute intervals for each traffic lane through an intersection. Where a lane permits shared turning movements, on site observations are required to determine an accurate split between the permitted turning movements. For the intersections of Great Eastern Highway with Stoneham Street / Belgravia Street and Resolution Drive / Hardey Road there are multiple shared lanes.

SCATS traffic volume data was obtained for the 5 weekdays between Monday September 6th and Friday September 10th 2021, which coincides with the dates of the roundabout survey and the local road loop detector counts. The AM and PM peak hours were found to occur between 7:45 and 8:45am, and between 16:15 and 17:15pm.

For the shared lanes, the proportion of vehicles making each movement was determined from the video surveys undertaken by MRWA in February 2018.

Peak hour traffic turning volumes at the intersection of Great Eastern Highway / Stoneham Street / Belgravia Street are illustrated in Figure 24 (for the AM peak) and Figure 25 (for the PM peak).

Figure 24 – Great Eastern Highway/Stoneham Street/Belgravia Street AM Peak Hour Turn Counts (source: Main Roads WA)

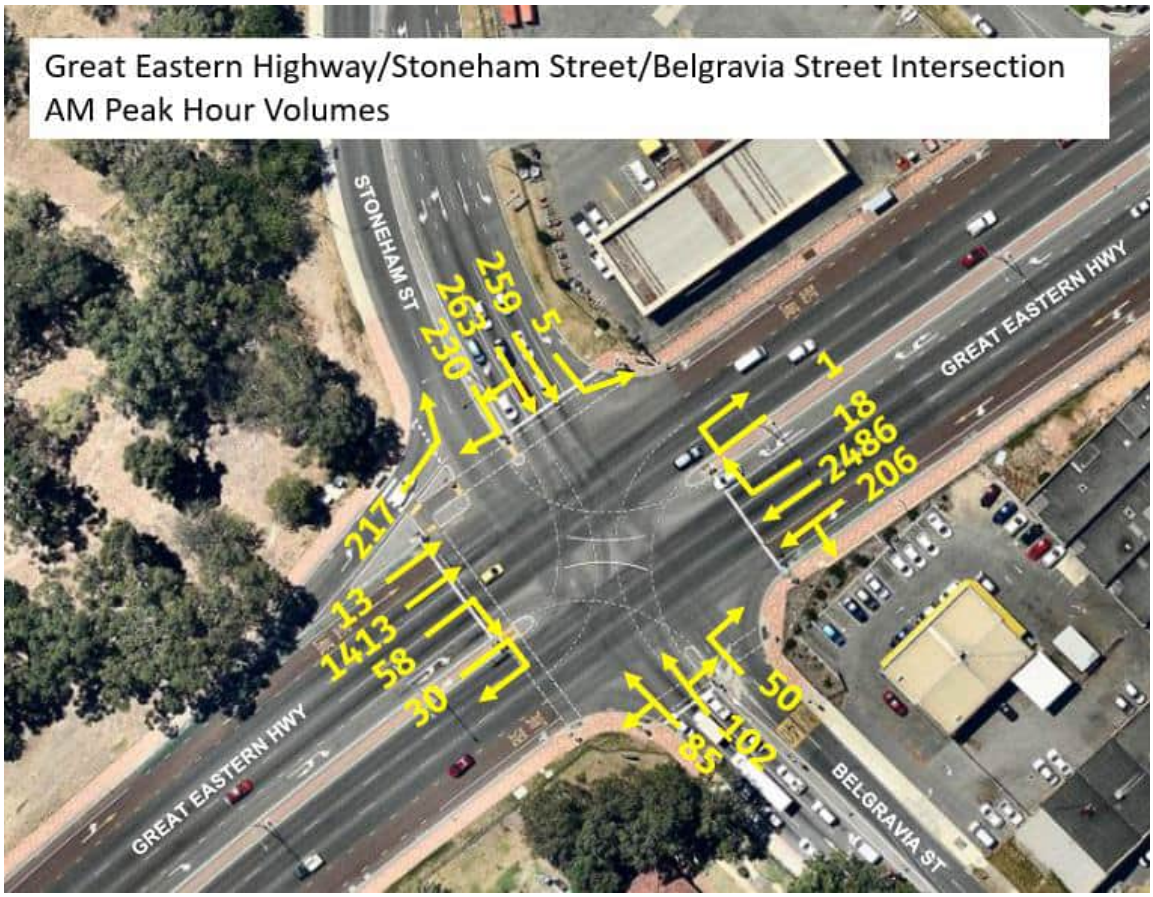

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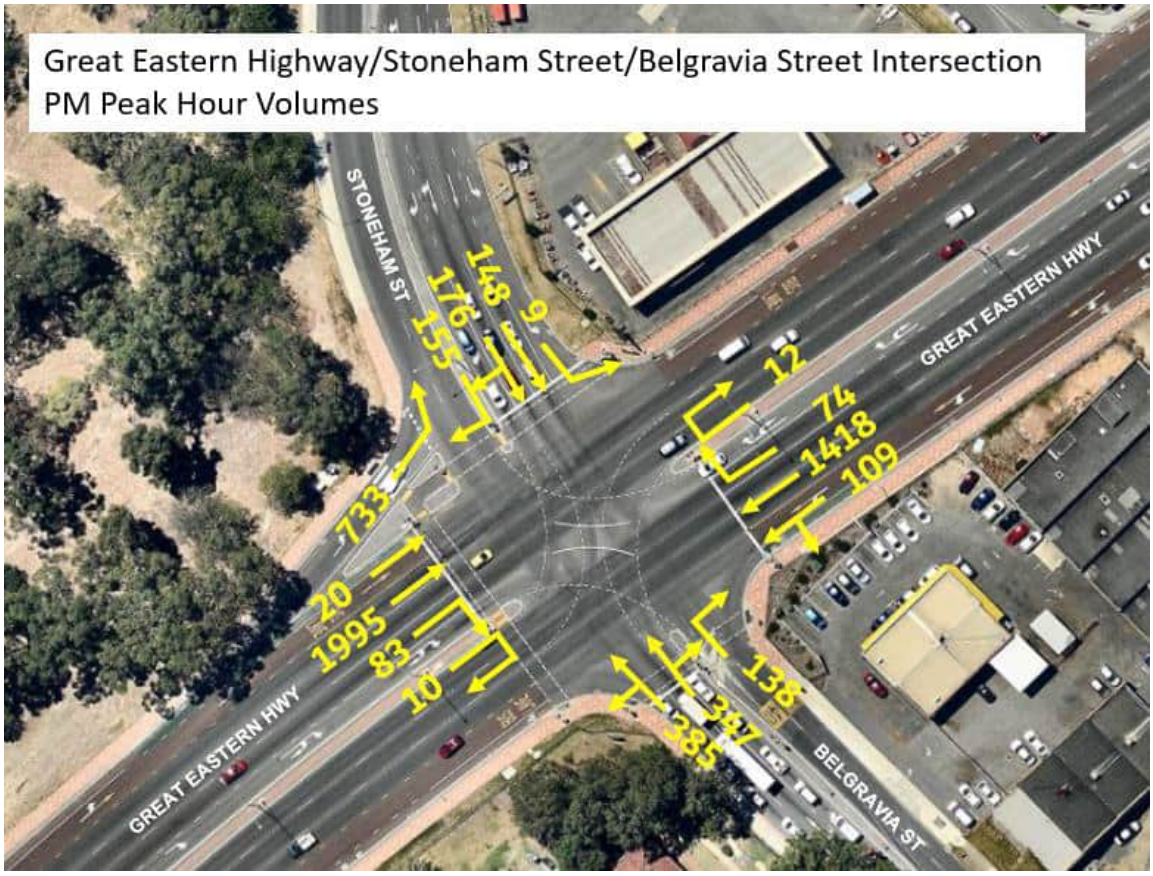
Figure 25 – Great Eastern Highway/Stoneham Street/Belgravia Street PM Peak Hour Turn Counts (source: Main Roads WA)



Peak hour traffic turning volumes at the intersection of Great Eastern Highway / Resolution Drive / Hardey Road are illustrated in Figure 26 (for the AM peak) and Figure 27 (for the PM peak).

Figure 26 – Great Eastern Highway/Resolution Drive/Hardey Road AM Peak Hour Turn Counts (source: Main Roads WA)

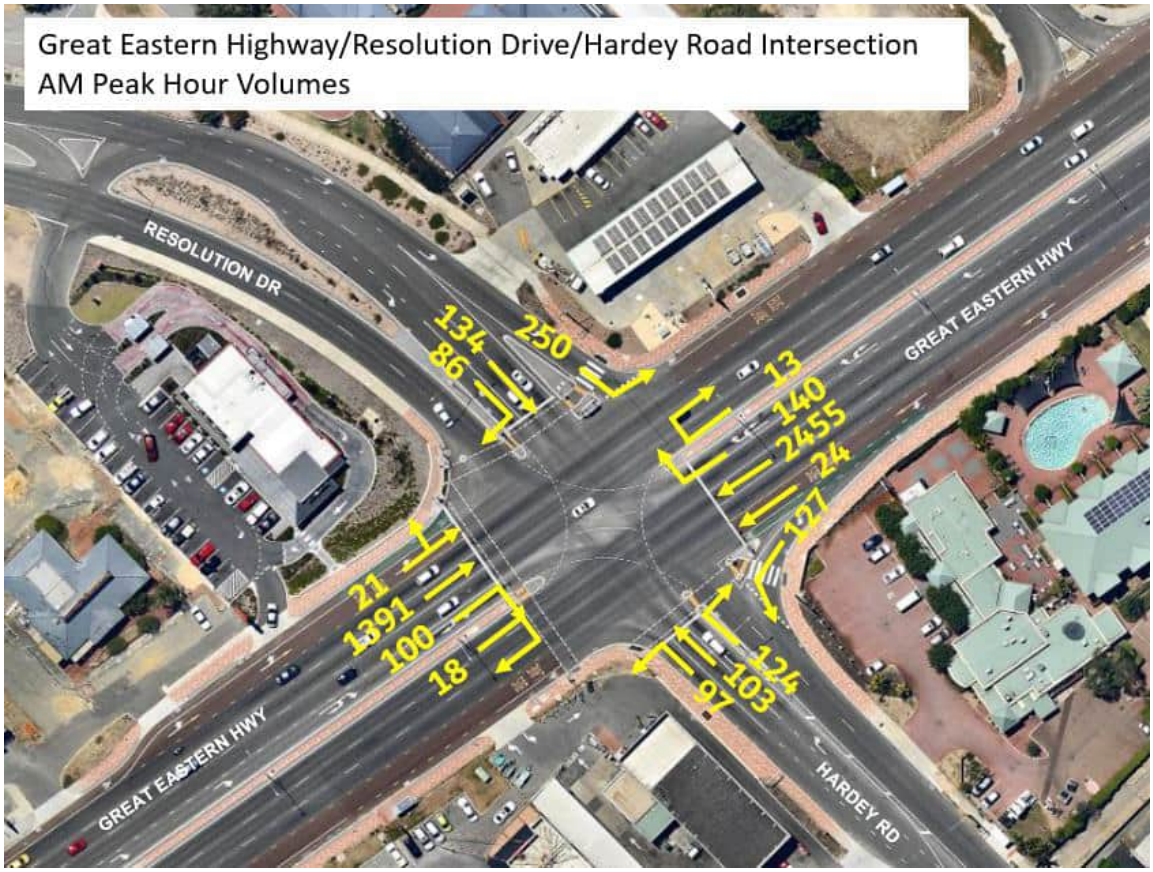


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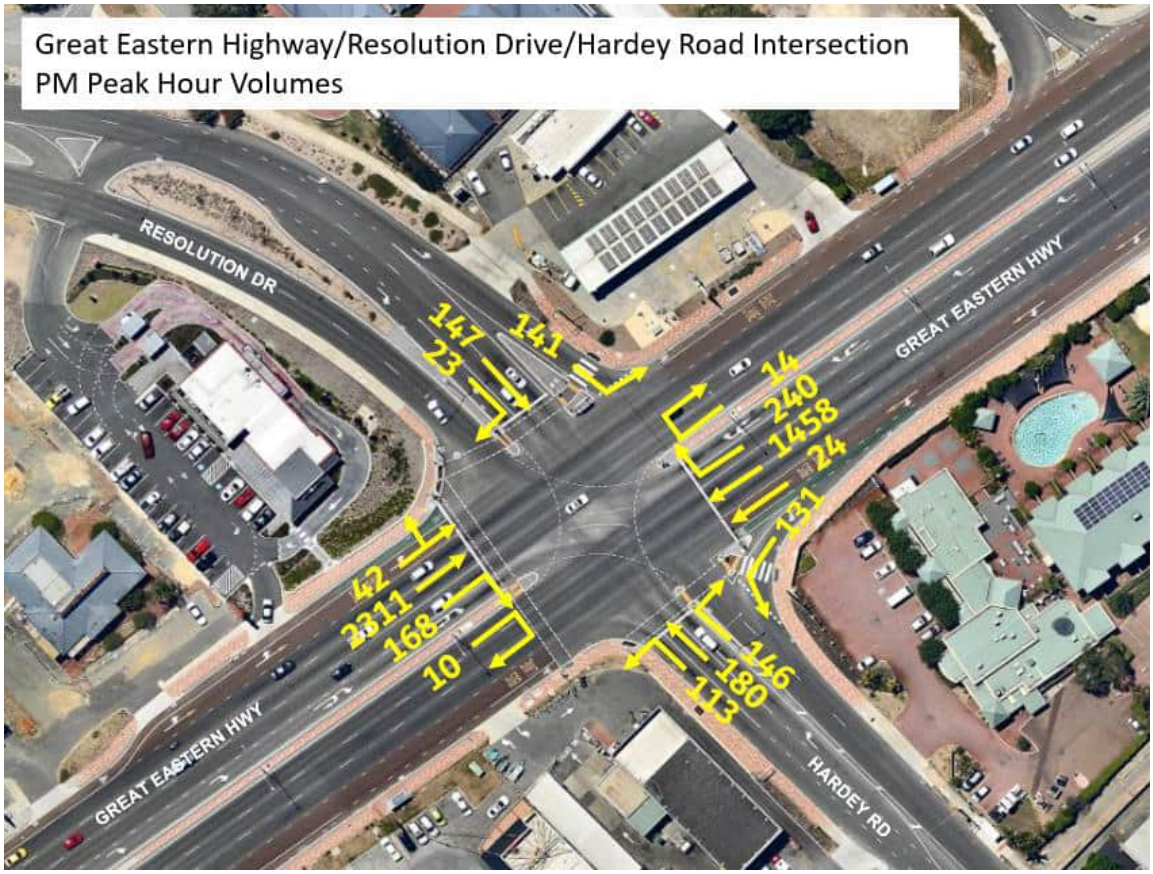
Figure 27 – Great Eastern Highway/Resolution Drive/Hardey Road PM Peak Hour Turn Counts (source: Main Roads WA)



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3.6.3 City of Belmont Local Road Traffic Count Data

To gain an understanding of the level of traffic generated by existing land uses within the precinct, the City of Belmont collected mid-block traffic data for selected local roads between Wednesday September 8th and Friday September 10th, 2021.

The location of the traffic counters is shown in Figure 28. Weekday and peak hour traffic volumes by direction for each count site are summarised in Table 6.

Figure 28 - Local Road Network Traffic Count Locations

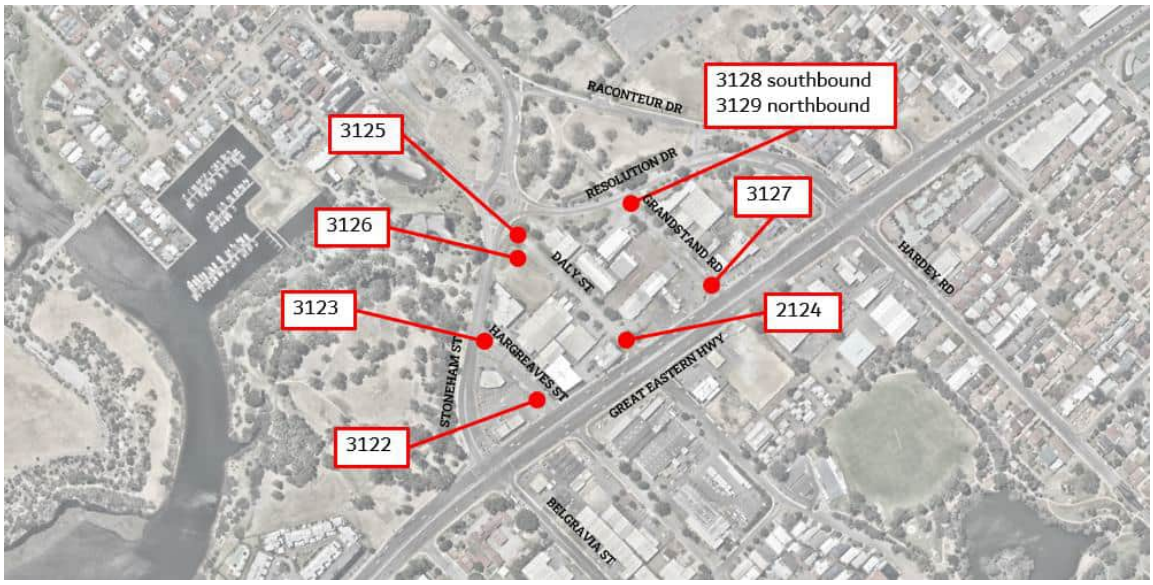

Table 6 – Local Road Network September 2021 Average Weekday Traffic Volumes (source: City of Belmont)

Road Name	Location	Average Weekday Volumes				
		Daily (vpd)	By Direction	Daily (vpd)	AM Peak (vph)	PM Peak (vph)
Hargreaves St	3122 North of GEH	278	Northbound	74	15	3
			Southbound	204	11	24
	3123 South of Stoneham St	330	Northbound	90	3	12
			Southbound	240	19	24
Daly St	3124 North of GEH	595	Northbound	375	18	17
			Southbound	220	5	18
	3125 South of Stoneham St	215	Northbound	188	4	25
Daly St link to Stoneham St	3126 East of Stoneham St		Eastbound	9	1	1
			Westbound	18	3	2
Grandstand Rd	3127 North of GEH	1,043	Northbound	323	20	20
			Southbound	720	30	50
	3128 South of Resolution Dr	1,482	Southbound	657	69	39
	3129 South of Resolution Dr		Northbound	825	40	90

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The collected traffic data shows that Hargreaves Street carries higher traffic volumes at the northern end rather than the end closer to Great Eastern Highway, however the difference is within 20%. For Daly Street, the highest traffic volumes were observed at the Great Eastern Highway end, with volumes more than 2.5 times those recorded south of Stoneham Street. Grandstand Road was observed to carry higher traffic volumes south of Resolution Drive than to the north of Great Eastern Highway.

All existing traffic volumes are well within the capacity of local access roads, which is in the order of 3,000 vpd.

Grandstand Road carries the highest volumes of the local road network. The higher traffic volumes along Grandstand Road are primarily a result of the land uses at the southern end of Grandstand Road (fronting Great Eastern Highway), which are predominantly fast food outlets which generate a high volume of vehicle movements, particularly around lunch time and afternoon peak periods.

Not all the existing precinct traffic uses the local roads to access properties; there are 2 existing crossovers onto Stoneham Street (serving two properties, both of which also have access to Hargreaves Street) and 5 crossovers onto Resolution Drive (serving 4 properties where 2 also have access to Daly Street and one property which also has access to Great Eastern Highway). There are a further three properties with direct access to Great Eastern Highway (2 properties which also have access to Grandstand Road). There are only three properties which do not have any access to the local roads. Therefore, while the local road counts will not include all development traffic, it will provide a reasonable lower estimate of precinct traffic volumes.

A sum of precinct entry and exit traffic movements on local roads is presented in Table 7.

Table 7 – Existing Precinct Traffic Entry and Exit Movements to Local Roads September 2021 (source: City of Belmont)

Precinct Movements	Road	Average Weekday Volumes		
		Daily (vpd)	AM Peak (vph)	PM Peak (vph)
IN	From Great Eastern Hwy	772	53	40
	From Stoneham St	249	20	25
	From Resolution Dr	657	69	39
	Total	1,678	142	104
OUT	To Great Eastern Hwy	1,144	46	92
	To Stoneham St	296	10	39
	To Resolution Dr	825	40	90
	Total	2,265	96	221

The local road count data shows that the existing land uses within the precinct are generating at least 4,000 vpd, probably closer to 4,500 vpd, with 1,678 local road entry movements and 2,265 local road exit movements. The imbalance between entry and exit movements can be explained by there being several crossovers on Great Eastern Highway, Resolution Drive and Stoneham Street which allow direct entry and exit movements to the precinct which were not counted.

3.6.4 City of Belmont Peak Hour Turning Movement Data

Peak hour turning counts at the roundabout controlled intersection of Grandstand Road / Resolution Drive / Stoneham Street were obtained from a video survey undertaken Wednesday September 8th, 2021. Queue lengths were also observed.

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The survey was completed using a video camera erected on a mast located between the southwest of the intersection.

The peak period turning movement survey collected full turning movement data at the roundabout (including u-turns), with the data collected for light and heavy vehicles in 15-minute time periods. To determine the actual peak hour, volumes were collected for a ninety minute period between:

- AM – 7:45am and 9:15am.
- PM – 3:45pm and 5:15pm.

Figure 29 shows the turning movement data for the AM peak hour of 7:45 am to 8:45am, and Figure 30 shows the turning movement data for the PM peak hour of 4pm to 5pm.

Figure 29 - September 2021 AM Peak Hour Turning Volumes at Grandstand Road/Resolution Drive/Stoneham Street Intersection

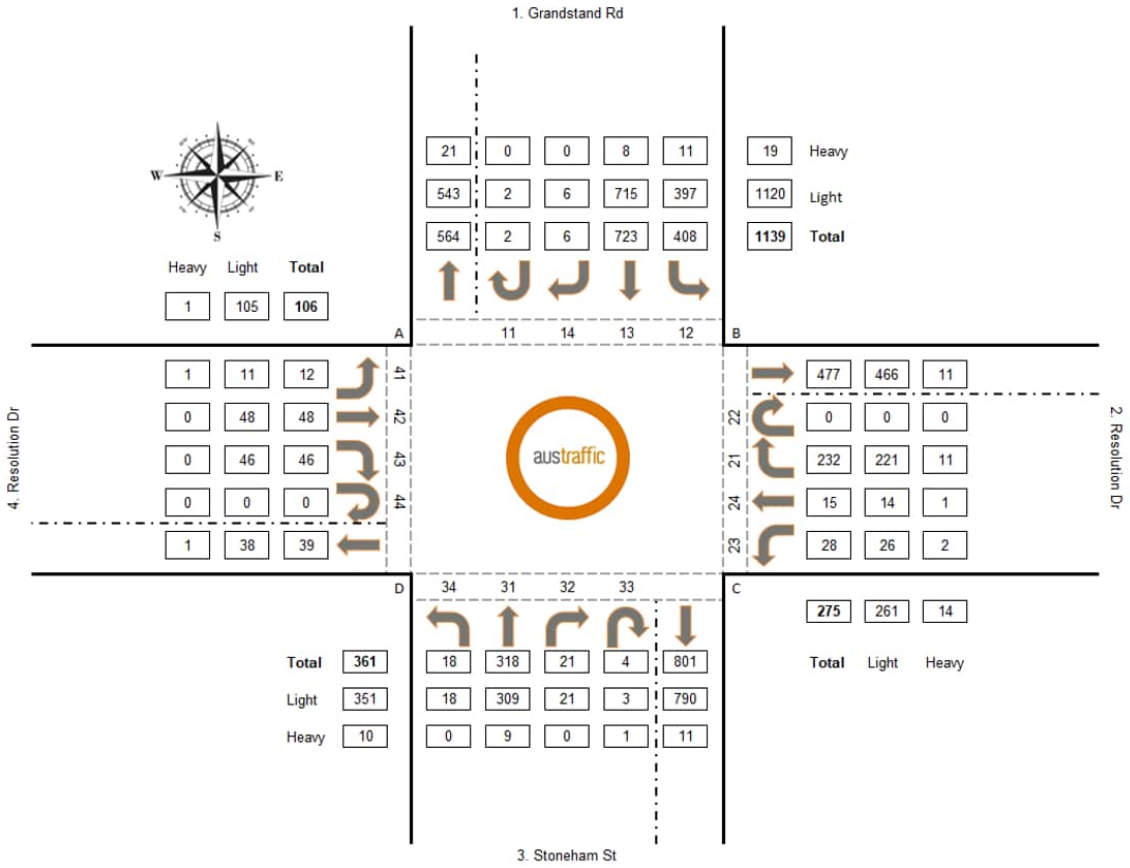

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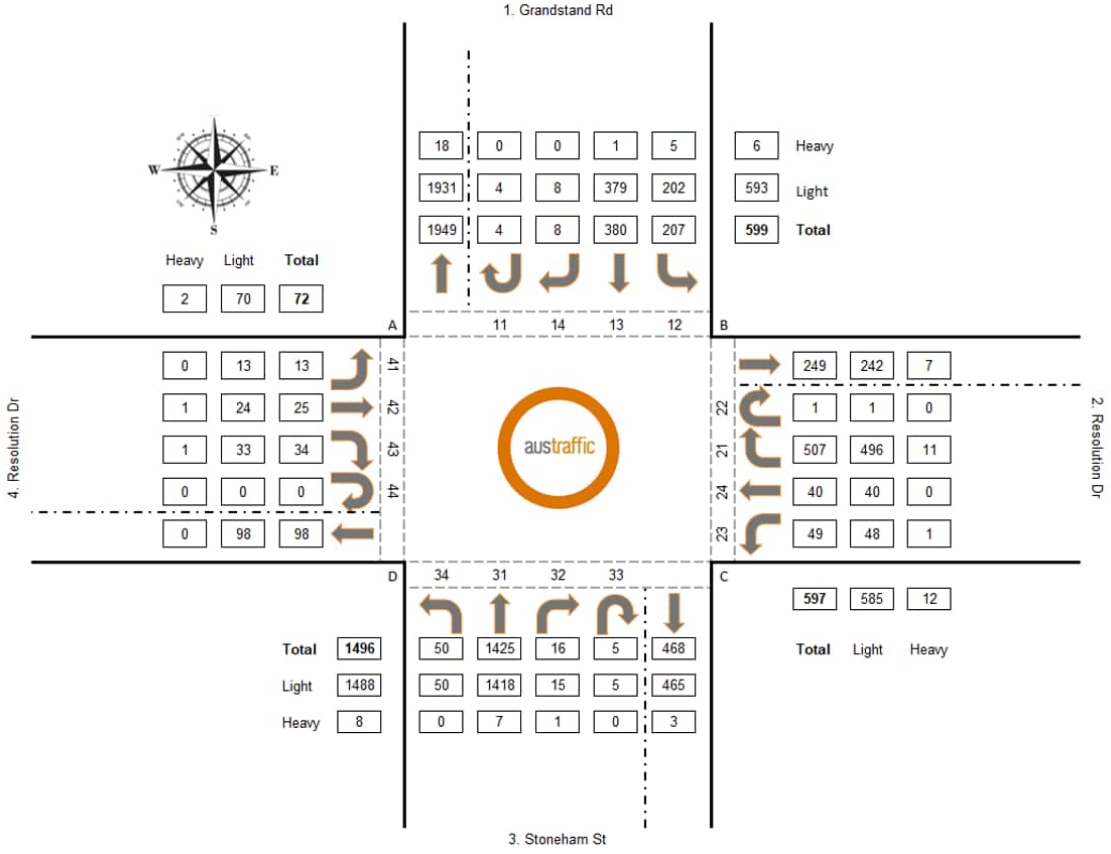
Figure 30 – September 2021 PM Peak Hour Turning Volumes at Grandstand Road / Resolution Drive / Stoneham Street Intersection



Observed queue lengths for the AM peak are presented in Figure 31. In the AM peak the longest queues were observed on the single lane Resolution Drive eastern approach to the roundabout, and on Grandstand Road. The video images also reveal the queue back along Stoneham Street from the signalised intersection of Great Eastern Highway/Stoneham Street/Belgravia Street sometimes reaches back to the roundabout. Still images from the AM peak video survey are shown in Figure 32, showing typical queuing and an instance of the queue back from the Great Eastern Highway/Stoneham Street/Belgravia intersection reaching back to the roundabout.

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Figure 31 - September 2021 AM Peak Hour Observed Queues at Grandstand Road/Resolution Drive/Stoneham Street Intersection

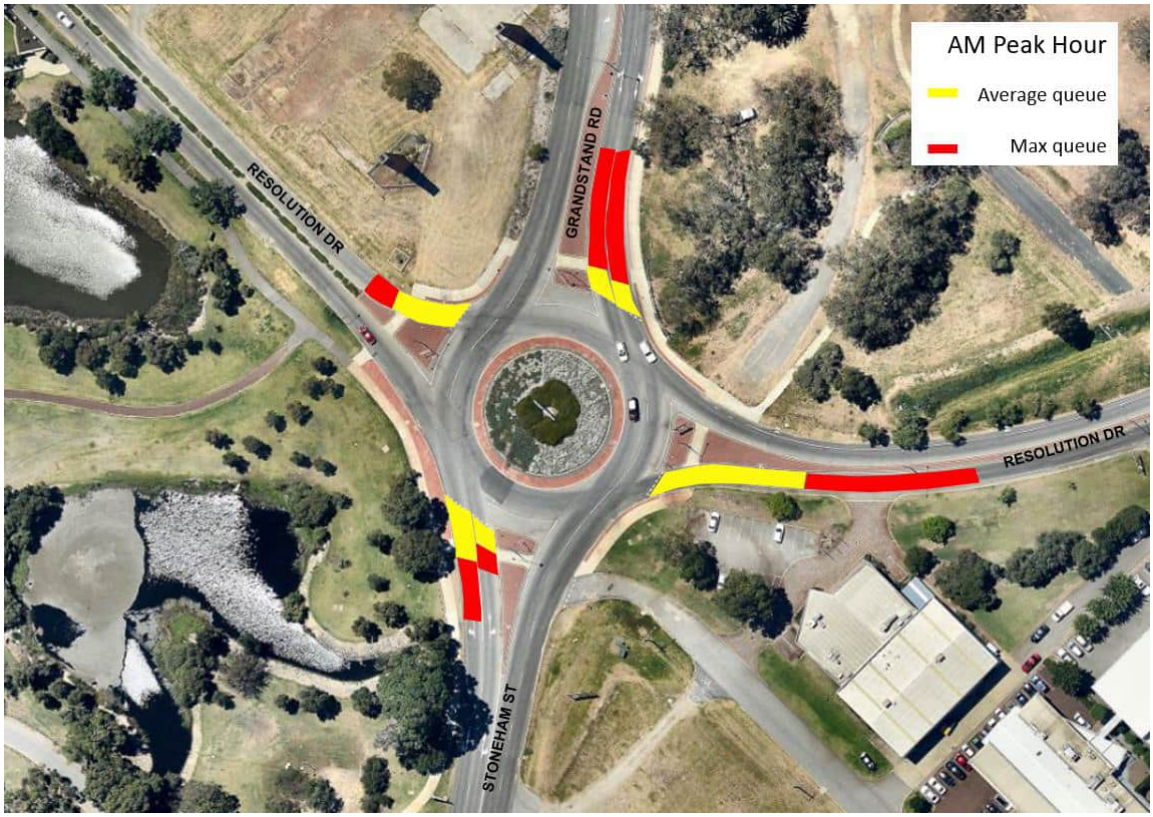

Figure 32 - September 2021 AM Peak Hour Still Images from Video Survey

Observed queue lengths for the PM peak are presented in Figure 33. In the PM peak the longest queues were observed on the single lane Resolution Drive eastern approach to the roundabout, and the two Stoneham Street approach lanes (from the south).

It should be noted that due to the viewing angle of the survey video camera, it is not possible to see the full extent of queuing on the Stoneham Street approach to the roundabout in the PM peak. The viewing angle only allowed the first 7 vehicles in the queue to be observed. The queue does not exceed this length in the AM peak hour, only in the PM peak.

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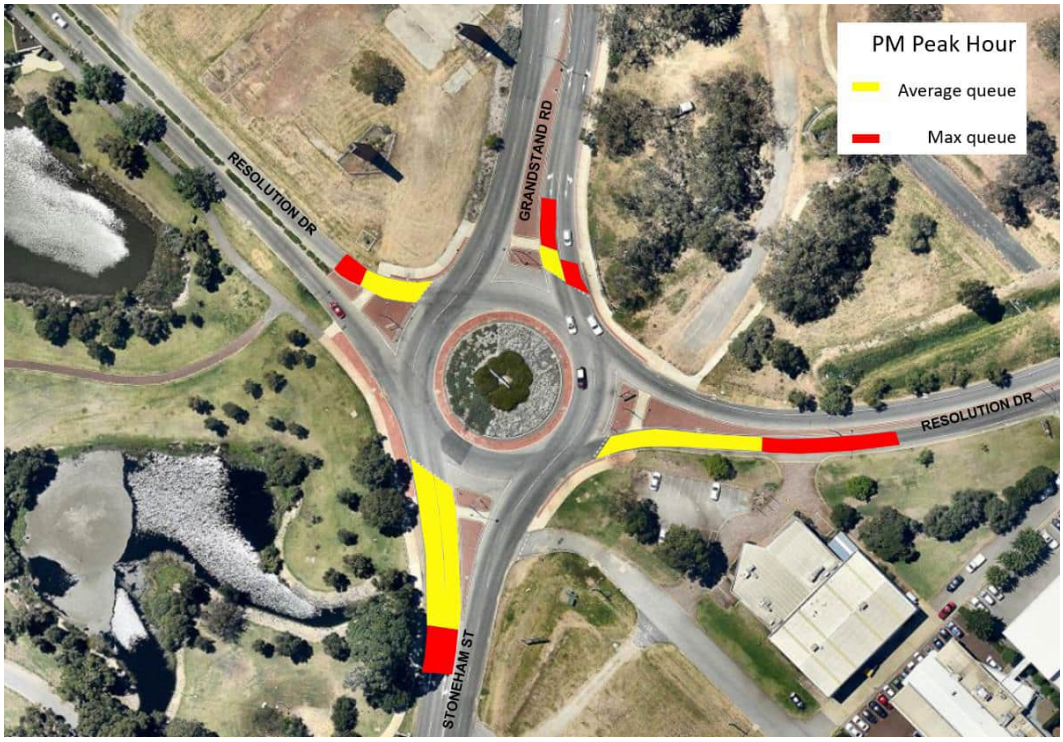
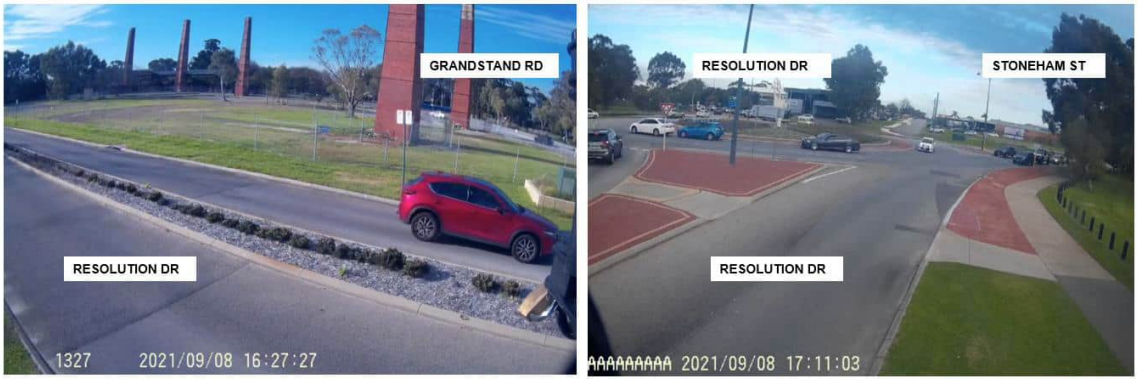
Figure 33 - September 2021 PM Peak Hour Observed Queues at Grandstand Road/Resolution Drive/Stoneham Street Intersection



Still images from the PM peak video survey are shown in Figure 34, showing typical queuing.

Figure 34 - September 2021 PM Peak Hour Still Images from Video Survey



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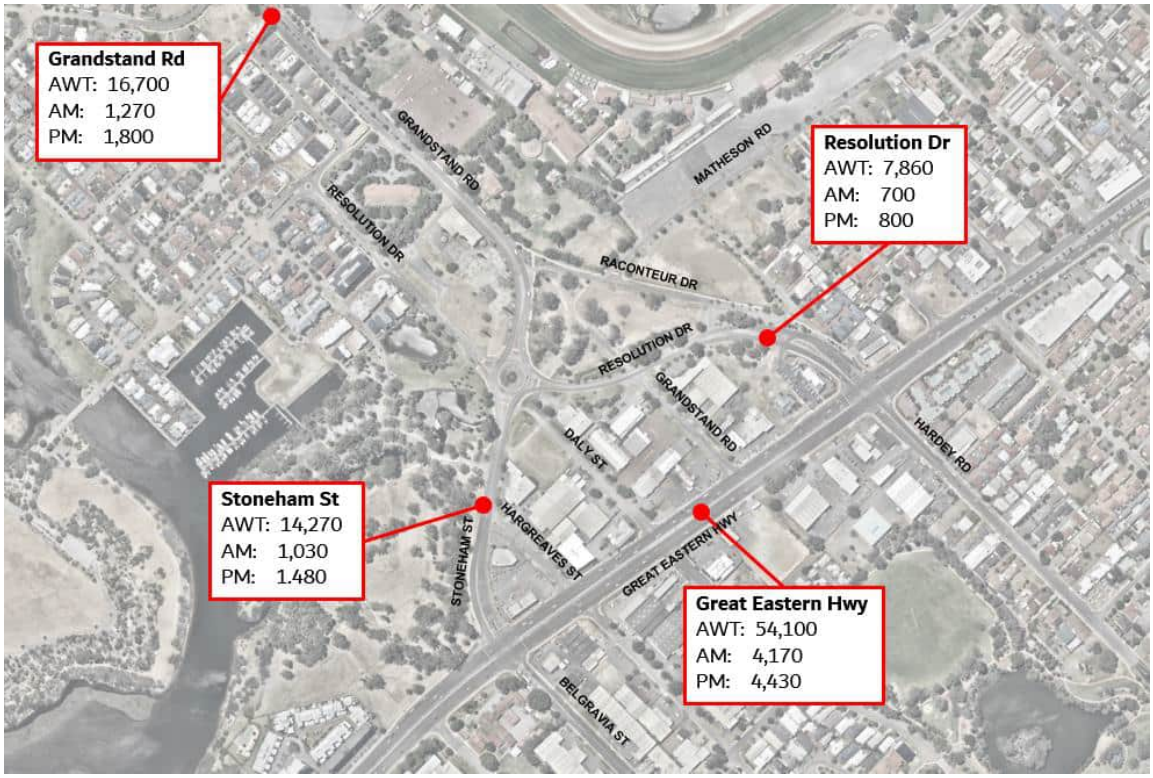
3.6.5 Mid-block Traffic Volumes

Mid-block traffic counts for the regional and district level roads including Great Eastern Highway, Stoneham Street, Resolution Drive and Garratt Road Bridge (Grandstand Road) were sourced from Traffic Map. These counts are all from the 2018/2019 period, with the exception of Resolution Drive where the counts are from 2021/2022 and are presented in Figure 35.

Figure 35 – Two-way Mid-block Volumes (source: Main Roads WA)



3.6.6 Mid-block Great Eastern Highway Traffic Volumes

Traffic volumes at two sites along Great Eastern Highway (site 3404 north of Abernethy Road and site 7938 west of Aurum Street) were extracted from Traffic Map to determine historic growth trends. Between 2018 and 2020, traffic volumes along Great Eastern Highway reduced, as illustrated in Figure 36. The extent of the reduction is demonstrated in Table 8.

The 2020 counts are the most recent counts, and were undertaken in February 2020, before there was a temporary Covid-19 related reduction in traffic volumes.

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Figure 36 – Great Eastern Highway Growth Trends (source: Main Roads WA)

Table 8 – Great Eastern Highway Traffic Volume Trends (source: Main Roads WA)

Site	Year	Northbound/Eastbound	Southbound/Westbound	Both Directions
3404	2018	29,295	29,400	58,695
	2020	28,132	27,897	56,029
	Change	-8.71%	-9.80%	-9.25%
7938.	2018	29,559	29,746	59,305
	2020	26,548	27,065	53,613
	Change	-10.19%	-9.01%	-9.6%

3.6.7 Key Considerations - Existing Traffic Volumes

Great Eastern Highway is a regional road carrying a high volume of traffic over the day and in each of the peak hours. The two signalised intersections within the precinct, of Great Eastern Highway with Stoneham Street / Belgravia Street and Great Eastern Highway with Resolution Drive / Hardey Road are congested, with peak hour signal cycle times of up to 139 seconds (this is the time taken for all required traffic signal phases to run once). This signal cycle time (of 2 minutes and 19 seconds) causes long queues to form.

For the district level roads, Stoneham Street carries twice the amount of traffic as Resolution Drive, over the course of an entire day and in each peak period. This is partly due to signage to the north of the roundabout intersection of Grandstand Road / Resolution Drive / Stoneham Street which advises traffic destined for Midland and the Airport to use Resolution Drive to access Great Eastern Highway while traffic for Belmont is advised to use Stoneham Street.

Local roads within the precinct all carry low traffic volumes, well within their capacity. Of the local roads Grandstand Road carries the highest volumes.

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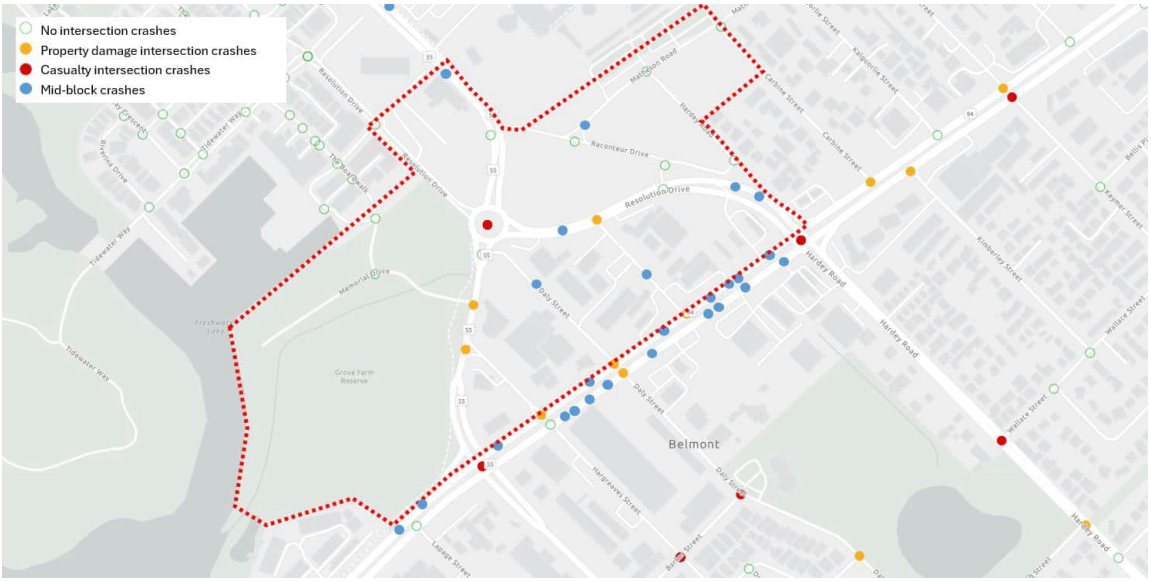
3.7 Existing Crash Data

Intersection and mid-block crash history for the roads bordering and within the Golden Gateway precinct were obtained from Main Roads WA. The location of road crashes in the vicinity of the precinct is shown in Figure 37. This data is for the five-year period ending Friday June 28th, 2024.

Figure 37 - Location of road crashes (Source: Main Roads WA)



3.7.1 Intersection Crashes

In the five-year period there were 135 reported crashes at intersections within or adjacent to the Golden Gateway precinct, as summarised in Table 9. Crash types include:

- Rear end — where a vehicle collides with the rear of another vehicle.
- Right angle — where colliding vehicles approach from adjacent approaches of the intersection.
- Right turn through — where a vehicle turns right in front of an oncoming vehicle.
- Sideswipe — where a vehicle collides with the side of another vehicle.
- Hit object — where a single vehicle hits an object which is not a vehicle

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Table 9 – Intersection crash summary for 5 years to June 2024 (source: Main Roads WA)

Intersection	Crash Type	Severity
Great Eastern Hwy / Stoneham St / Belgravia St – traffic signals	**49 reported crashes** 41 Rear end 5 Sideswipe 2 Right angle 1 Hit object	43% Property damage major 43% Property damage minor 12% Medical 2% Hospital
Great Eastern Hwy / Resolution Dr / Hardey Rd – traffic signals	**64 reported crashes** 50 Rear End 6 Right angle 4 Other 2 Sideswipe 2 Right turn through	47% Property damage major 38% Property damage minor 13% Medical 3% Hospital
Great Eastern Hwy / Hargreaves St – left in left out priority controlled intersection	1 Hit object	100% Property damage minor
Great Eastern Hwy / Daly St – left in left out priority controlled intersection	1 Rear End	100% Property damage major
Great Eastern Hwy / Grandstand Rd – left in left out priority controlled intersection	**4 reported crashes** 3 Right Angle 1 Rear End	75% Property damage major 25% Property damage minor
Stoneham St / Resolution Dr / Grandstand Rd – roundabout	**11 reported crashes** 4 Right angle 3 Rear end 2 Sideswipe 2 Other	55% Property damage minor 36% Property damage major 9% Medical
Stoneham St / Memorial Dr – Priority controlled T intersection	1 Sideswipe	100% Property damage minor
Stoneham St / Hargreaves St – Priority controlled T intersection	1 Rear End 1 Right turn through	100% Property damage major
Resolution Dr / Grandstand Rd – Priority controlled T intersection	1 Hit object 1 Rear End	50% Property damage minor 50% Property damage major

3.7.2 Midblock Crashes

In the same five-year period, there were 23 reported midblock crashes along the roads bordering and within the Golden Gateway precinct, as summarised in Table 10.

Table 10 – Mid-block crash summary for 5 years to June 2024 (source: Main Roads WA)

Road	Section	Crash Summary	Severity and Analysis
Great Eastern Highway	Stoneham St to Hargreaves St – eastbound carriageway	1 Sideswipe same direction	Low severity - property damage only
	Hargreaves St to Daly St – eastbound carriageway	1 Rear End	Crash required medical treatment
	Daly St to Grandstand Rd – eastbound carriageway	1 Rear End	Low severity - property damage only

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Road	Section	Crash Summary	Severity and Analysis
Great Eastern Highway	Grandstand Rd to Resolution Dr – eastbound carriageway	2 Rear End 1 Right Angle 1 Sideswipe same direction	Low severity - property damage only
	Hardey Rd to Daly St – westbound carriageway	3 Rear End 2 Sideswipe same direction	80% property damage only 20% required medical treatment
	Daly St to Hargreaves St – westbound carriageway	4 Rear End	75% property damage only 25% required medical treatment
Grandstand Rd (north)	Resolution Dr to northern boundary of Golden Gateway precinct – northbound carriageway	1 Sideswipe same direction	Low severity - property damage only
	Resolution Dr to northern boundary of Golden Gateway precinct – southbound carriageway	1 Sideswipe same direction	Low severity - property damage only
Daly Street	Great Eastern Hwy to Stoneham St	1 Sideswipe same direction	Low severity - property damage only Crash involved parking
Grandstand Rd (south)	Great Eastern Hwy to Resolution Dr	1 Hit object	Low severity - property damage only Crash involved parking

3.7.3 Crash Summary

For the roads bordering and within the Golden Gateway precinct, the biggest road safety issue is rear end crashes at the two signalised intersections with Great Eastern Highway, where the crash rate is higher than expected for intersections of their nature. This is due in part to the high volume of traffic carried by Great Eastern Highway in comparison to the other streets, and because rear end crashes are often the most common crash type at signalised intersections.

Crashes at the intersections of Great Eastern Hwy / Stoneham St / Belgravia St and Great Eastern Hwy / Resolution Dr / Hardey Rd account for 71.5% of all crashes for the roads bordering and within the Golden Gateway precinct

This indicates that the precinct is bordered by a busy regional route. There is no safety issue within the precinct, with all mid-block and intersection crash rates well within the expected ranges.

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4. MOVEMENT NETWORK

4.1 Original Movement Network

The original Movement Network for the Golden Gateway precinct LSP, as documented in Flyt's *Local Structure Plan Movement and Access Strategy Report* (dated June 2018), is reproduced as Figure 38. This included a portion of the Perth Racing landholding.

Figure 38 – Original Golden Gateway Precinct Movement Network (Source: City of Belmont)

Elements of original Movement Network included:

- The realignment of Resolution Drive along the historical Raconteur Drive alignment;
- Relocation of the existing Stoneham St/ Resolution Drive/ Grandstand Road roundabout to 125m northeast of its current location;
- Maintain Grandstand Road standard as four lane divided (two lanes in each direction) and realigned Resolution Drive as two lane divided (one lane in each direction);

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- One intersection along Resolution Drive (between Great Eastern Highway and Grandstand Road) for access to northern area of precinct;
- Introduction of four-way traffic signal control at intersection of Stoneham Street with Resolution Drive and Daly Street, with controlled pedestrian / cycle crossings across all four intersection approaches;
- Maintain alignment of Hargreaves Street and Daly Street, realign Grandstand Road (south) at midway point to connect to Daly Street (no connection to Resolution Drive);
- Introduction of indirect connection of Matheson Road to realigned Resolution Drive;
- Stoneham Street to remain four lane divided road (with two lanes in each direction);
- Shared paths were proposed along Stoneham Street, Resolution Drive, Grandstand Road, Hargreaves Street, Daly Street and Matheson Road; and
- No changes proposed to Great Eastern Highway.

The draft Golden Gateway LSP was considered by the Belmont Council at an Ordinary Council Meeting held on June 23rd, 2020. In response to submissions received, Council resolved to require several modifications to the LSP, including to the road network to address the following issues raised in submissions:

- Matheson Road becoming a through road to provide access for Perth Racing.
- Access and egress associated with Ascot Waters.
- The extension of Grandstand Road through private property.

4.2 Revised Road Network

Many iterations of the road network have been produced and tested; however, the final option has been developed on the basis of the following directives from the City of Bemont:

- Road network to exclude Perth Racing land holdings.
- Resolution Drive link to be maintained (to service existing businesses and future development sites) within the existing road reserve and not Water Corporation land.
- Stoneham Street is to remain as the primary route through the precinct, rather than Raconteur Drive.
- Daly Street to terminate prior to the intersection with Stoneham Street, with creation of cul-de-sac. The remainder of Daly Street will be identified as Public Open Space (POS).

The proposed road network is displayed as Figure 39.

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Figure 39 – Proposed Road Network

4.3 Proposed Pedestrian and Cycle Facilities

Reducing traffic speeds improves road safety for all and removes a major barrier to walking and cycling. A precinct wide 30km/h speed zone should be implemented (excluding Grandstand Road and Stoneham Street as the main through route for traffic) to improve the environment for walking and cycling.

All existing shared paths surrounding and through the Golden Gateway precinct should be maintained and additional shared paths should be provided along Hargreaves Street, Grandstand Road (south), and along the sections of Resolution Drive that currently don't have any paths. These will provide connectivity between the Great Eastern Highway on-road bike lanes and the shared path network along Stoneham Street.

Tree canopy coverage should be increased along all roads within the precinct to create a pleasant environment for walking and cycling.

Other options to further encourage the use of active transport modes include the introduction of a bike or electric scooter share scheme.

Main Roads WA are responsible for the layout and signal phasing at traffic signal controlled intersections. At the signalised intersections of Great Eastern Highway with Resolution Drive/ Hardey Road and Stoneham Street/ Belgravia Street, protected pedestrian crossing of Great Eastern Highway is only available on the western intersection approach. The City should investigate the provision of protected pedestrian crossing of Great Eastern Highway on both sides of these intersections.

Roundabouts are generally good for cars, reducing crash severity and minimising delays, however they can present barriers for accessibility by pedestrians and cyclists. Crossing during peak periods can be a real issue as there is no interruption in the traffic stream as would occur at a signalised intersection. Mid-block crossing facilities should be

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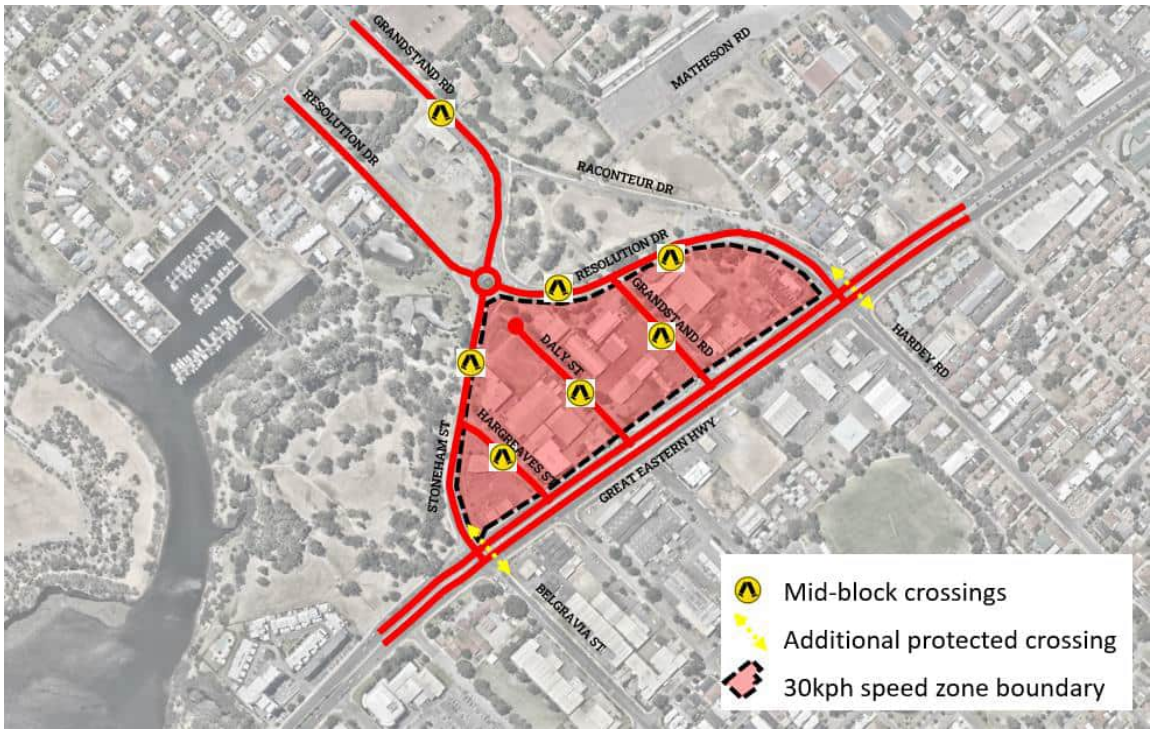
provided along Stoneham Street, Resolution Drive, Raconteur Drive and Grandstand Road (north), as shown in Figure 40.

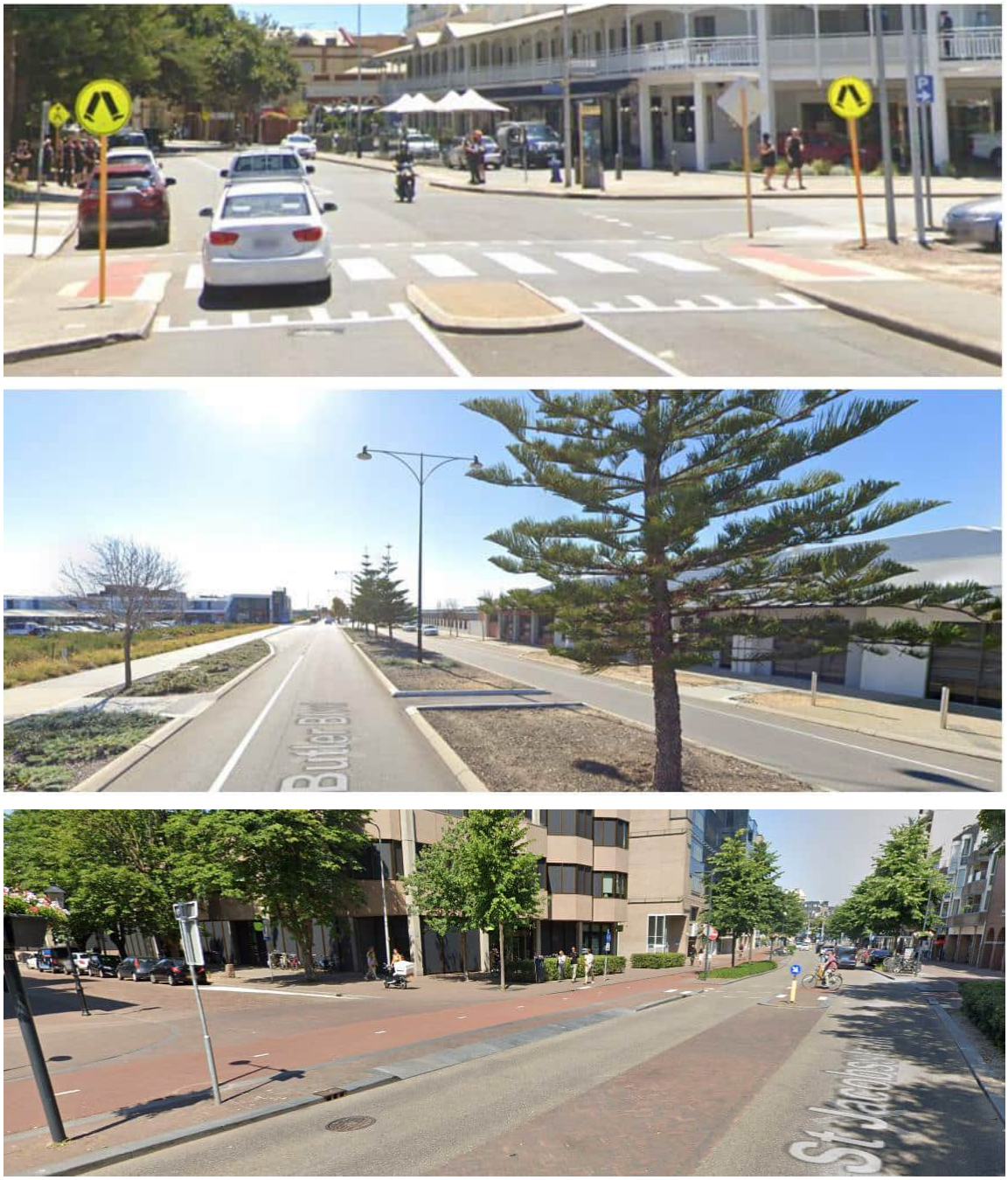
Figure 40 – Recommended Pedestrian and Cyclists Facilities



Possible types of pedestrian crossing treatments are shown in Figure 41. These include:

- Raised zebra crossings, with the crossing at footpath level creating a raised plateau speed hump for vehicles;
- Kerb ramps and median refuges or cut throughs; and
- Shared paths having continuity and priority at side street intersections.

Figure 41 – Possible Pedestrian Crossing Treatments

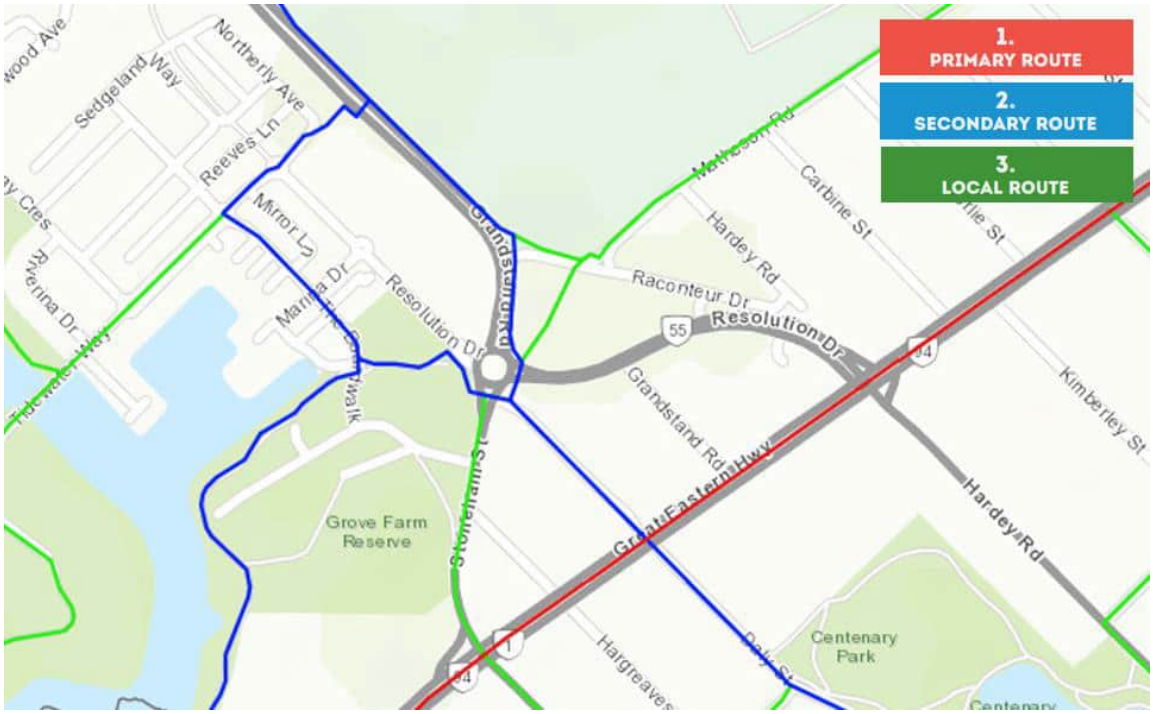


The planned pedestrian and cyclist network should be consistent with the long term cycle network (LTCN), as reproduced in Figure 42. The streets within the precinct which have been identified as LTCN routes, and the appropriate form of infrastructure are outlined in Table 11.

Table 11 – Form of LTCN within Precinct

Hierarchy	Road	Appropriate Form
Primary	Great Eastern Highway	• shared paths • separated bike and pedestrian paths • protected bicycle lanes (uni or bi-directional) • safe active streets
Secondary	Daly Street, Grandstand Road (north), path through Belmont Trust land	
Local	Stoneham Street, Matheson Road, section of Raconteur Drive, future route through triangle of land between Resolution Drive, Grandstand Road, and Raconteur Drive	

Figure 42 – Long Term Cycle Network Near Precinct (source: Department of Transport)



4.4 Proposed Public Transport

To facilitate higher density development in the Golden Gateway precinct, a step change in public transport provision and public transport use will be required to ensure residents, employees and visitors have the potential to travel to/from Golden Gateway by a sustainable form of transport.

The Public Transport Authority has indicated that, if sufficient public transport demand was generated by large scale development of the Golden Gateway precinct, they would consider the option of operating a bus service between the Golden Gateway precinct and central Perth – utilising the internal road network within the Golden Gateway precinct. The bus service would originate/terminate within the Golden Gateway precinct.

This would be contingent upon the Golden Gateway precinct generating the requisite public transport demand to warrant the investment in such a service.

It is recommended that the City lobby the PTA to improve bus services to the precinct and explore the potential of other transit options such as a superbus or trackless tram.

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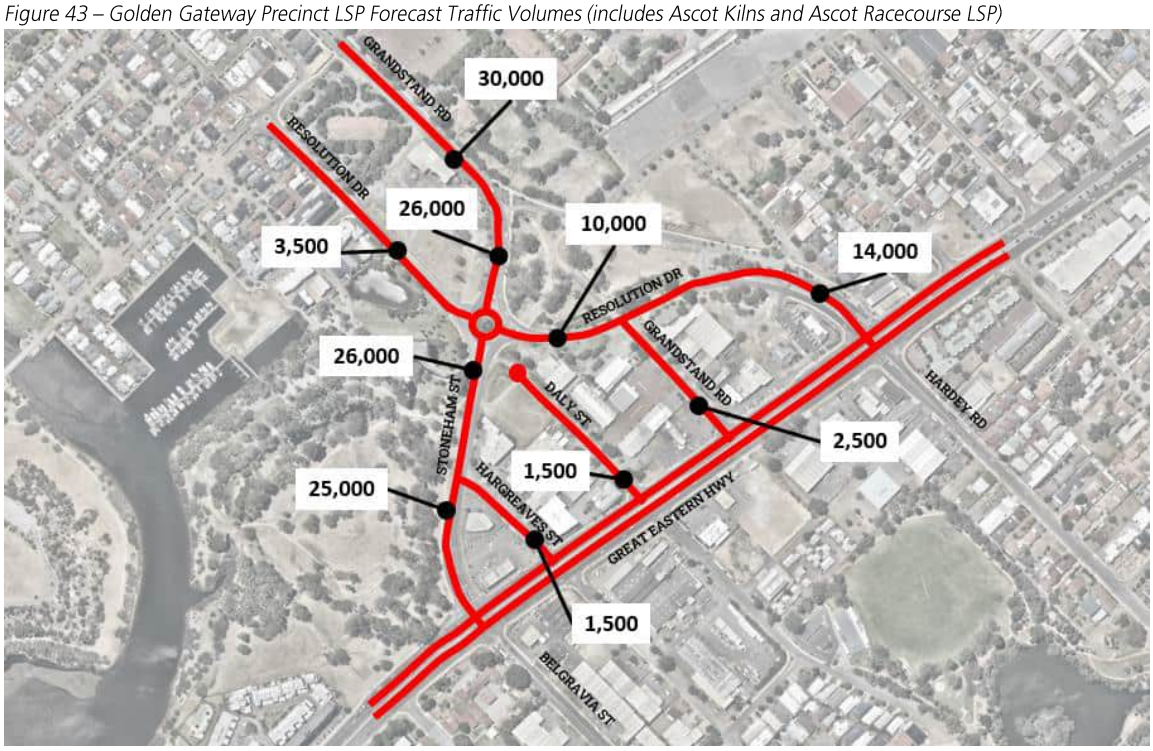
4.5 Role and Function of Key Roads

4.5.1 Forecast Traffic Volumes

The forecast traffic volumes for 2041 are shown in Figure 43. These forecasts include through traffic (traffic that does not originate or terminate in the Golden Gateway precinct), as well as traffic generated by the development of the Ascot Kilns site and the Ascot Racecourse LSP area.

Figure 43 – Golden Gateway Precinct LSP Forecast Traffic Volumes (includes Ascot Kilns and Ascot Racecourse LSP)



4.5.2 Road Hierarchy

The proposed road hierarchy is shown in Figure 44. This includes:

- Primary Distributor
  - Great Eastern Highway
- Distributor A
  - Stoneham Street
  - Grandstand Road (north)
  - Section of Resolution Drive immediately north of Great Eastern Highway
- Local Distributor
  - Northern section of Resolution Drive
- Access Roads
  - Hargreaves Street
  - Daly Street
  - Grandstand Road (south)
  - Matheson Road
  - Hardey Road (between Great Eastern Highway and Matheson Road)

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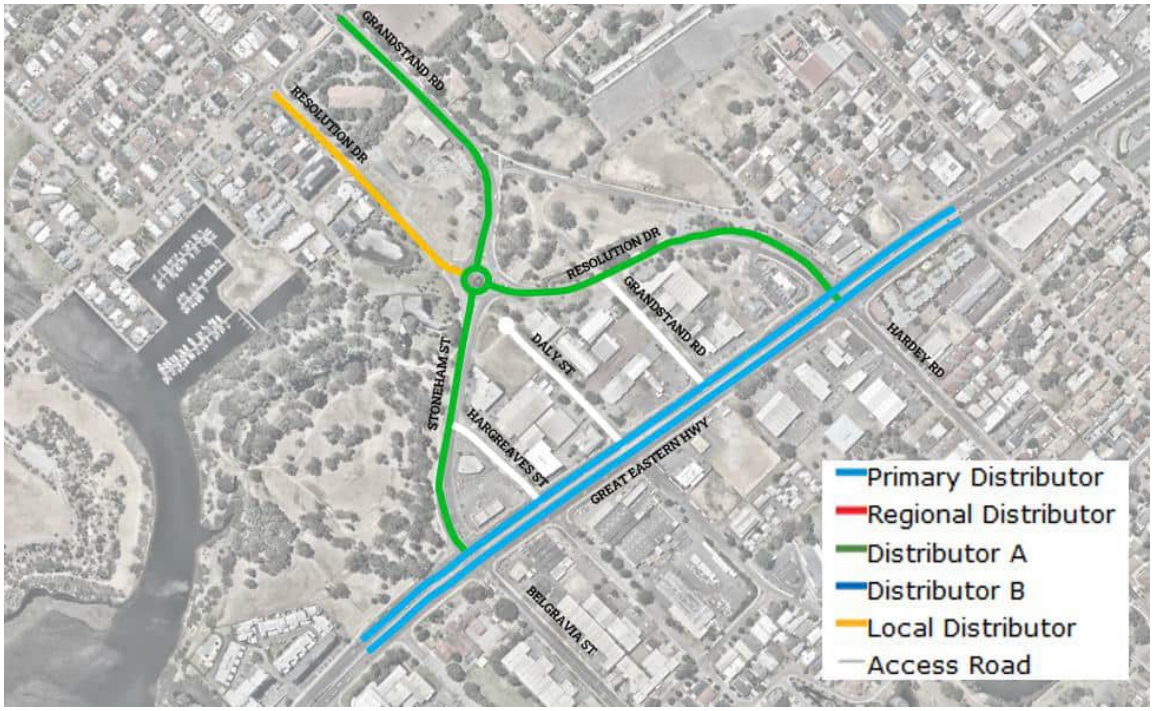
Figure 44 – Golden Gateway Precinct LSP Road Hierarchy



4.5.3 Great Eastern Highway

The Great Eastern Highway corridor will present itself as a strong, unified commercial and mixed-use edge to the Golden Gateway precinct.

Great Eastern Highway will remain in its current form. No changes are proposed to the existing road connections with Great Eastern Highway nor the forms of intersections between Great Eastern Highway and connecting roads.

4.5.4 Stoneham Street

Stoneham Street will be the primary interface between the Golden Gateway precinct and the Swan River. It is proposed that future planning for the Belmont Trust Land, located to the west of Stoneham Street, should ensure strong physical links are maintained between the Swan River and future Golden Gateway population and workforce.

Stoneham Street will continue to be a major district road corridor and provide for high capacity traffic movements. Forecast traffic volumes for 2041 range between 25,000 vpd and 26,000 vpd, with the higher traffic volumes carried close to the intersection with Resolution Drive. The form of Stoneham Street will be retained as a four lane divided road (two lanes in each direction) with a median on approaches to main intersections and a painted dividing line mid-block.

The road reserve width is only 20m, which allows for four lanes at 3.3m wide, and 3.4m verges either side, or only 2.4m verges if a 2m median island is included. If Stoneham Street were being built as part of a new development, the minimum required road reserve would be at least 33m.

The intersection of Stoneham Street with Resolution Drive and Grandstand Road will remain as a two-lane roundabout. The intersection of Stoneham Street with Hargreaves Street will remain in its current configuration and there will be no intersection with Daly Street as it will become a cul-de-sac.

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4.5.5 Resolution Drive

Resolution Drive will remain on its existing alignment. The form of Resolution Drive as a two lane divided road (one lane in each direction) will be retained, however additional lanes will develop on the approach and exit from the Great Eastern Highway intersection, as per the existing lane arrangement.

Forecast traffic volumes for 2041 range between 10,500 vpd (east of the roundabout controlled intersection with Grandstand Road) and 14,000 vpd (north of Great Eastern Highway).

4.5.6 Grandstand Road (north)

Grandstand Road (north) will remain in its current alignment and configuration as a four lane divided road (with two lanes in each direction). Grandstand Road is forecast to carry 30,000 vpd by 2041.

The roundabout controlled intersection with Stoneham Street and Resolution Drive will remain.

4.5.7 Hargreaves Street

Hargreaves Street will continue along its existing alignment providing a connection between Great Eastern Highway (permitting left in left out movements only) and Stoneham Street. The intersection with Stoneham Street will remain.

Hargreaves Street is forecast to carry 1,500 vpd by 2041. It is proposed as a two-lane road with on-street parking where appropriate. Its current width of 12.5m should be reduced to 7m, with embayed parking.

4.5.8 Daly Street

Daly Street will continue along its existing alignment however it will become a cul-de-sac south of Stoneham Street, with the remainder of Daly Street to be identified as Public Open Space. The intersection with Great Eastern Highway (permitting left in left out movements only) will remain.

Daly Street is forecast to carry 1,500 vpd by 2041. Daly Street is proposed as a two-lane road with on-street parking where appropriate. Daly Street's current width is 8m; this could be reduced to 7m. On-street parking would need to be embayed.

Daly Street has been identified as a secondary route under the Long Term Cycle Network, which could take the form of a shared path, protected bike path or safe active street. The treatment should continue through the public open space.

4.5.9 Grandstand Road (south)

Grandstand Road will continue along its existing alignment providing a connection between Great Eastern Highway (permitting left in left out movements only) and Resolution Drive where it has a full movement intersection.

Grandstand Road (south) is forecast to carry 2,500 vpd by 2041. Grandstand Road is proposed as a two-lane road with on-street parking where appropriate. It is currently 12.5m wide and should be reduced to 7m, with embayed parking.

4.5.10 Memorial Drive

Memorial Drive and its intersection with Stoneham Street will remain unchanged.

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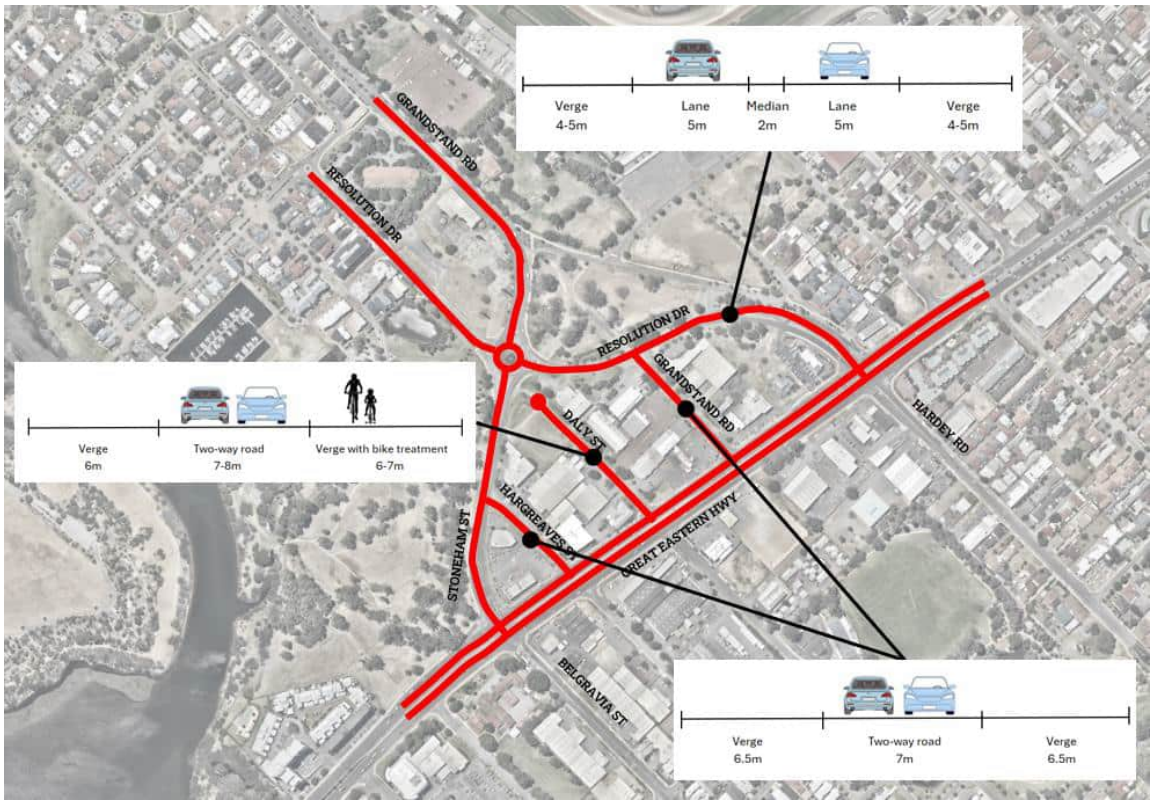
4.6 Road Cross Sections

The proposed road cross sections are shown in Figure 45.

Figure 45 – Proposed Road Cross Sections Golden Gateway Development



4.7 Intersection Controls

The proposed intersection controls are shown in Figure 46.

In the AM peak hour, the intersection of Stoneham Street with Hargreaves Street will be impacted by queuing along Stoneham Street, back from the intersection with Great Eastern Highway It is recommended "KEEP CLEAR" pavement markings be applied to this intersection to ensure vehicles are able enter the Stoneham Street northbound and southbound traffic streams.

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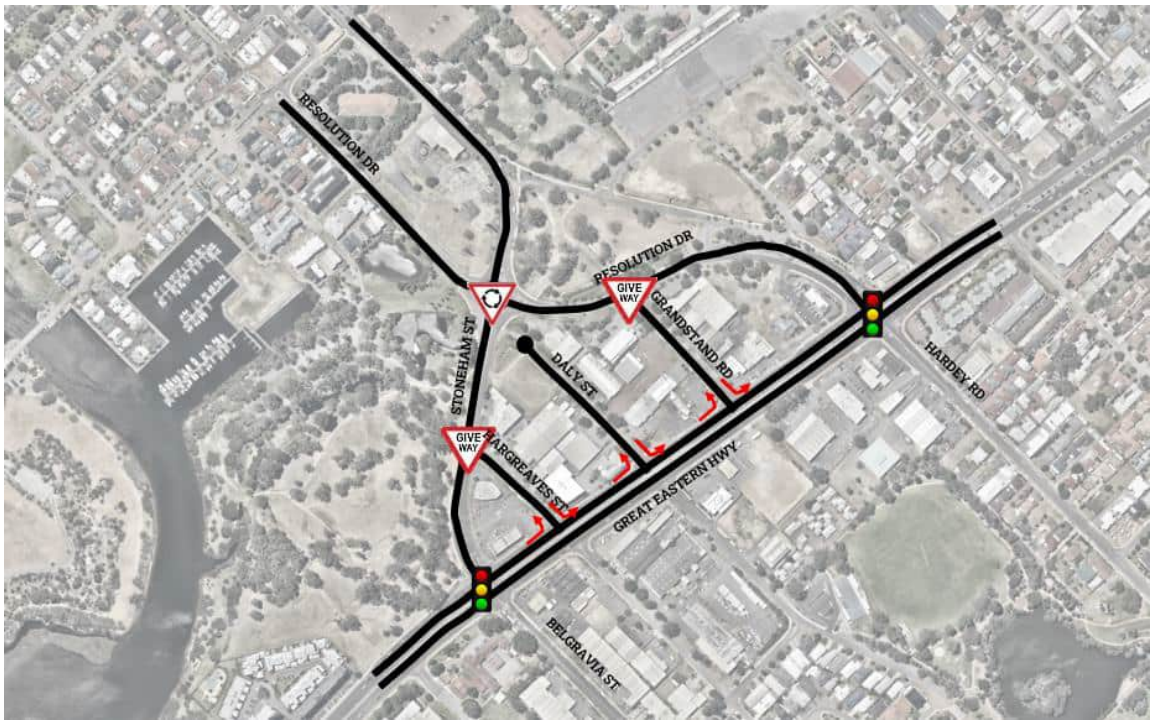
Figure 46 – Proposed Intersection Controls for Golden Gateway Development



4.8 Parking and Planning Controls

To reduce the car dependence of the Golden Gateway Precinct and to maximise the use of active transport modes, it is recommended the City consider the imposition of a parking cap.

The required residential parking outlined in the existing Structure Plan follows the recommendations of the Residential Design Codes Volume 2 – Apartments and provides minimum and maximum parking rates. Any parking proposed in excess of the minimum provision must be capable of potential future conversion into habitable floor space.

It is recommended that commercial parking also be subject to a maximum rate.

Other innovative approaches include the encouragement of reciprocal parking, possible car share schemes, bike and electric scooter hire schemes, and the mandatory provision of safe and secure parking for bikes, electric scooters, and other micro mobility devices (including charging stations).

The City is also able to impose an ambitious mode share target for this development. From 2021 Census data, the existing car driver and car passenger mode share for the journey to work from the Ascot area is estimated at 56%, with 11.8% using public transport and 1% using active modes. Approximately 13.3% worked from home and 9.6% did not work at all. The trip generation rates used in this assessment assumed a 20% reduction in car use. A more ambitious car driver and passenger mode share target would need to be supported by a comprehensive range of strategies to increase public transport ridership, and use of active modes and micro mobility devices.

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5. ANALYSIS OF TRANSPORT NETWORK

The weekday peak hour performance of the existing and proposed movement networks has been assessed for the years 2021, 2031 (interim) and 2041 (ultimate).

Potential traffic associated with the Ascot Racecourse LSP and Ascot Kilns Local Development Plan has also been included. Land use and trip generation data for the Ascot Racecourse LSP area have been extracted from the Traffic Impact Assessment prepared by PJA in May 2024.

Traffic performance at an Ascot Racecourse weekday event day has also been investigated.

5.1 Form of Assessment

The traffic assessment has been undertaken using the SIDRA Network platform, which is able to model the operation of the entire Golden Gateway movement network and can consider the impact of congestion and queuing at adjacent intersections.

5.2 Assessment Scenarios

A SIDRA Network assessment has been undertaken for the AM and PM period in each of the following scenarios:

- Base year (2021) with existing road network;
- Base year (2021) with proposed road network;
- Interim forecast year (2031) with existing road network;
- Interim forecast year (2031) with proposed road network and 25% of Ascot Kilns and Golden Gateway development, 50% of Ascot Racecourse development complete;
- Ultimate forecast year (2041) with existing road network;
- Ultimate forecast year (2041) with proposed road network and 100% of development complete.

Seven scenarios for an Ascot Racecourse event day have been assessed for a single PM peak period:

- 2021 event day with existing road network;
- 2021 event day with proposed road network;
- 2031 event day with proposed road network and 25% of Ascot Kilns and Golden Gateway development, 50% of Ascot Racecourse development complete;
- 2041 event day with proposed road network and 100% of development complete.

5.3 Assessment Time Period

The assessment has been undertaken for an average weekday AM peak hour, found to occur from 7:30am to 8:30am, and the PM peak hour, between 4:30pm and 5:30pm.

For an event at Accost Racecourse, the 2021 calendar of events was reviewed. During 2021, 49 events were scheduled; 20 events on weekdays (mainly Wednesdays, with a single event on a Tuesday and another on a Friday), 28 events on Saturdays and a single event was scheduled on a Sunday. Events are held 9 months of the year, with no racing over the winter months of June, July, and August. The three busiest event days are the Melbourne Cup (held on a Tuesday), Railway Stakes and Perth Cup (both held on Saturdays).

Weekday and weekend traffic volumes were compared for Great Eastern Highway, Stoneham Street, Resolution Drive and Garratt Road. For all sites, weekend peak hour volumes are less than weekday volumes. For this reason, it was decided to assess a Melbourne Cup event at Ascot Racecourse during the regular PM peak hour (between 4:30pm and 5:30pm).

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5.4 Background Traffic Growth

Background or through traffic is traffic that does not originate or terminate in the Golden Gateway precinct, but instead travels through the precinct, or adjacent to the precinct, on regional and district roads such as Great Eastern Highway, Stoneham Street, Resolution Drive and Grandstand Road (north).

To estimate the future growth of background traffic, historic traffic growth has been investigated. Traffic volumes along the section of Great Eastern Highway between Stoneham Street and Resolution Drive (site 1012) have reduced from 64,800 vpd in 2014 to 54,100 vpd in 2018, a reduction of 16.5% over the 4 year period. Similarly at sites 3404 and 7938 (along Great Eastern Highway to the west and east of the Golden Gateway precinct respectively), daily traffic volumes on Great Eastern Highway reduced by more than 9% over the two year period between 2018 and 2020. Despite these reductions, background traffic volumes are expected to increase over time.

Along road corridors where intersections currently operate close to capacity during peak hours, any traffic growth will see an increase in the duration of the peak period (as there is no capacity for this growth to occur during the existing peak hours). This phenomenon is called peak spreading. As daily traffic volumes continue to increase, the proportion of the total daily traffic occurring during the morning and afternoon peak hours reduces. This also results in the growth in peak hour traffic being less than the growth in daily traffic volumes.

Despite the recent reduction in traffic volumes along Great Eastern Highway, an annual peak hour growth rate of 0.5% has been assumed. This represents an increase of 5.1% between 2021 and 2031 and an increase of 10.5% between 2021 and 2041. The peak hour growth rate has been applied to all through traffic (excluding buses) travelling on regional and district roads such as Great Eastern Highway, Stoneham Street, Resolution Drive and Grandstand Road (north).

5.5 Trip Generation Assumptions

The proposed land uses within the Golden Gateway Local Structure Plan area are reproduced in Table 12. This table also includes land uses for the Ascot Kilns development site, and the Ascot Racecourse Local Structure Plan area.

Table 12 – Proposed Structure Plan Land Uses

Development Area	Yield
Golden Gateway	2,268 dwellings, 6,979 m^2 NLA commercial, 1,200 m^2 NLA retail
Ascot Kilns	250 dwellings, 512m^2 GFA commercial
Ascot Racecourse Area A	390 unit retirement village
Ascot Racecourse Area D	41 dwellings, 2,100m^2 childcare centre for up to 90 children
Ascot Racecourse Area E	3,400m^2 retail, 9,600m^2 commercial plus jockey heath Equine Centre

The traffic assessment has considered two different time periods for development of the Golden Gateway precinct: 2031 and 2041. By 2031 it is assumed that 25% of the total yield will be redeveloped, with 75% of the existing commercial development retained.

For the Ascot Racecourse Local Structure Plan area, the Transport Impact Assessment prepared by PJA stated that the redevelopment would be completed by 2036, therefore it is assumed that 50% would be completed by 2031.

By 2041 it is assumed that all redevelopment will be complete.

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5.5.1 Residential

The WAPC's Transport Impact Assessment Guidelines Volume 5 – Technical Guidance suggest peak hour trip rates for residential land uses. The residential trip rates are based on the Perth and Regions Travel Surveys (PARTS) data averaged over the range of dwelling types. The recommended rate for residential land use is 0.8 vehicle trips per dwelling for the AM and PM peak hours.

These rates are considered high, given they represent an average of the entire Metropolitan area and include a high proportion of detached dwellings rather than dwellings in mixed use developments. Surveys of apartment developments undertaken by Flyt for the Department of Lands Planning and Heritage (DLPH) within inner and middle suburbs revealed peak hour vehicle trip rates of between 0.13 and 0.33 per dwelling, as shown in Table 13.

Table 13 also lists the Walk Score and Transit Score for each development surveyed so that the walkability and public transport accessibility of each site can be compared to that of the proposed development. The average peak hour trip rate for the 3 'middle suburb' apartment developments was found to be 0.27 trips per apartment, with the range between 0.23 and 0.33. The 3 surveyed middle suburb sites have a Walk Score range of 47 - 65 (compared to 43 - 48 for the Golden Gateway precinct) and a Transit Score range of 41 - 53 (compared to 47 for the Golden Gateway precinct). This would indicate residential development within the precinct would most likely generate a similar level of trips to the 3 surveyed middle suburb sites.

Table 13 – Apartment peak hour trip rates from DLPH surveys

Development	Address	Inner/ Middle	Walk Score	Transit Score	No. Apartments	No. Car Bays	Peak Hr Trip Rate (per unit)
Eastgate	76 Newcastle Street, Perth	Inner	96	99	53	65	0.23
x 2	143 Adelaide Terrace, Perth	Inner	86	81	200	328	0.13
Depot	65 Brewer Street, Highgate	Inner	91	93	35	39	0.31
Lakeside	134 Mounts Bay Road, Perth	Inner	57	92	30	31	0.13
Abode	6 Campbell Street, West Perth	Inner	94	86	86	76	0.13
Rivershores	2 Doepel Street, North Fremantle	Middle	65	53	58	122	0.33
Ceresa	12 Tanunda Drive, Rivervale	Middle	49	41	113	228	0.23
Westend	33 Blythe Avenue, Yokine	Middle	47	48	36	50	0.25
Average of all (inner/ middle) developments							**0.19**
Average of middle suburb developments							**0.27**

The nature of the development and the site's walkability and public transport accessibility has led to the adoption of a peak hour trip rate of 0.3 trips per multiple dwelling. The resulting peak hour trip rates are shown in Table 14.

Table 14 – Residential Peak hour trip rates

Land Use	AM Peak IN	AM Peak OUT	PM Peak IN	PM Peak OUT
Multiple dwelling	0.075	0.225	0.1875	0.1125

As discussed in Section 4.8, car parking controls can be used to reduce car dependency, in conjunction with safe and continuous routes for bikes, electric scooters and other micro mobility devices, and an increased provision of public transport services. A variety of local amenities within a short and pleasant walking or biking distance will also encourage trips by active transport modes and micro mobility devices.

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A 20% reduction in residential vehicle trips to/from the site has been assumed given the proposed parking controls, improvements to the pedestrian and cyclist network and the enhanced public transport provision.

5.5.2 Non Residential

Trip rates for the non-residential (commercial and retail) land uses have been sourced from the WAPC Guidelines. The resulting peak hour trip rates for the retail and commercial land uses are shown in Table 15.

Table 15 – Commercial and Retail Peak hour trip rates (per 100m² NLA)

Land Use	AM Peak IN	AM Peak OUT	PM Peak IN	PM Peak OUT
Commercial	1.6	0.4	0.4	1.6
Retail	1.0	0.25	2.0	2.0

In addition to the above it was assumed that 10% of retail and commercial employees would live within the Golden Gateway precinct and as such total commercial and retail vehicle trips were reduced by 10% (approximately 20 employees) to reflect an internal walk trip rather than an external vehicle trip.

5.5.3 Ascot Special Event

As discussed in Section 5.3, the PM peak hour (between 4:30pm and 5:30pm) on Melbourne Cup Day was selected as the Ascot Racecourse special event to be modelled. This is because traffic leaving the event coincides with the regular PM peak hour.

On Melbourne Cup Days, Transperth operate bus services to and from Ascot, as shown in Table 16. This demonstrates that 9am to 2pm are the main times for travel to Ascot, while 3:15pm to 7pm are the main times for travel from Ascot.

Table 16 – Melbourne Cup Event Bus Services

Service	To Ascot	From Ascot
To / from Burswood Station	Every 10 minutes from 9am to 1:50pm	Every 10 minutes from 3:30pm to 7:45pm
To / from Fremantle Station	Every 30 minutes from 9:30am to 1pm	Every 30 minutes from 3:30pm to 6:30pm
To / from Meltham Station	Every 10 minutes from 9:30am to 1:50pm	Every 10 minutes from 3:15pm to 7pm

There are two main parking areas for event patrons, the northern car parks accessed from the north and the Matheson Road car parks (plus overflow parking areas) which are accessed from the south. It is estimated that the Matheson Road car parks and overflow parking areas have capacity for 880 vehicles. Assuming the vehicles leave in a constant stream between 3:30pm and 6:30pm, there would be 293 vehicle exiting movements per hour.

5.5.4 Existing Trip Generation

Based on the City of Belmont counts of existing vehicle activity along local streets (as documented in Section 3.6.3), the estimated vehicle trips generated by the existing land uses on a non-event day at Ascot are shown in Table 17.

Table 17 – Existing Precinct Estimated Traffic Generation

Time Period	Inbound	Outbound	Total
Daily traffic	1,700	2,300	4,000
AM Peak hour	142	104	246
PM Peak hour	96	221	317

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For the 2031 forecast years, 25% of the existing precinct traffic volumes will be removed from the road network before the Golden Gateway Precinct volumes are added. For the 2041 forecast years, all of the existing precinct traffic volumes will be removed from the road network.

5.5.5 Ultimate Trip Generation

For the ultimate build out of the Golden Gateway precinct (including the Ascot Kilns development) assumed to occur by 2041, a total of 753 trips are forecast to be generated in the AM peak hour (270 trips to the site and 483 trips from the site) and 782 trips are forecast to be generated in the PM peak hour (426 trips to the site and 356 trips from the site), as summarised in Table 18.

The traffic generation for the Ascot Racecourse LSP area has been extracted from the Traffic Impact Assessment prepared by PJA in May 2024. A total of 300 AM peak hour trips and 623 PM peak hour trips are forecast for the ultimate development. The forecast Ascot Racecourse LSP traffic represents 28.5% of total forecast AM peak hour traffic volumes, and 44.3% of total forecast PM peak hour volumes.

Table 18 – Ultimate development land uses

Land Use	AM Peak IN	AM Peak OUT	PM Peak IN	PM Peak OUT
Golden Gateway	247	436	387	326
Ascot Kilns	22	47	39	30
Sub Total	270	483	426	356
Ascot Racecourse Area A	29	88	78	39
Ascot Racecourse Area D	28	44	33	23
Ascot Racecourse Area E	89	22	217	233
Ascot Sub Total	146	154	328	295
Total	**416**	**637**	**754**	**651**

5.5.6 10 Year Trip Generation

By 2031 it is assumed that 25% of Ascot Kilns and Golden Gateway development will be redeveloped, with 75% of the existing commercial uses retained. Based on the Ascot Racecourse LSP Traffic Impact Assessment, the Perth Racing Landholdings is expected to be fully developed by 2036, therefore it is assumed that by 2031 50% of the Ascot Racecourse LSP will be complete.

The 2031 forecast is for 185 trips to be generated in the AM peak hour (65 trips to the site and 120 trips from the site) with 185 trips forecast to be generated in the PM peak hour (101 trips to the site and 84 trips from the site), as summarised in Table 19.

Table 19 – 10-year development land uses

Land Use	AM Peak IN	AM Peak OUT	PM Peak IN	PM Peak OUT
Golden Gateway	62	109	97	82
Ascot Kilns	6	12	10	7
Ascot Racecourse	73	77	164	148
Total	**140**	**198**	**271**	**237**
Existing land uses (75% retained)	**106**	**78**	**72**	**166**

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5.6 Trip Distribution

Trips to and from the Golden Gateway precinct were distributed according to the relative proportion of existing vehicle volumes travelling to and from the precinct along each route in each of the peak hours, with a slight reassignment of trips to/from Hardey Road south to Belgravia Street.

Regional through traffic is assigned to the existing major routes.

The AM peak distribution of trips to and from the precinct is shown in Figure 47, while the PM peak is shown in Figure 48.

Figure 47 – Distribution of AM Peak Trips to and from the Precinct Ultimate Development

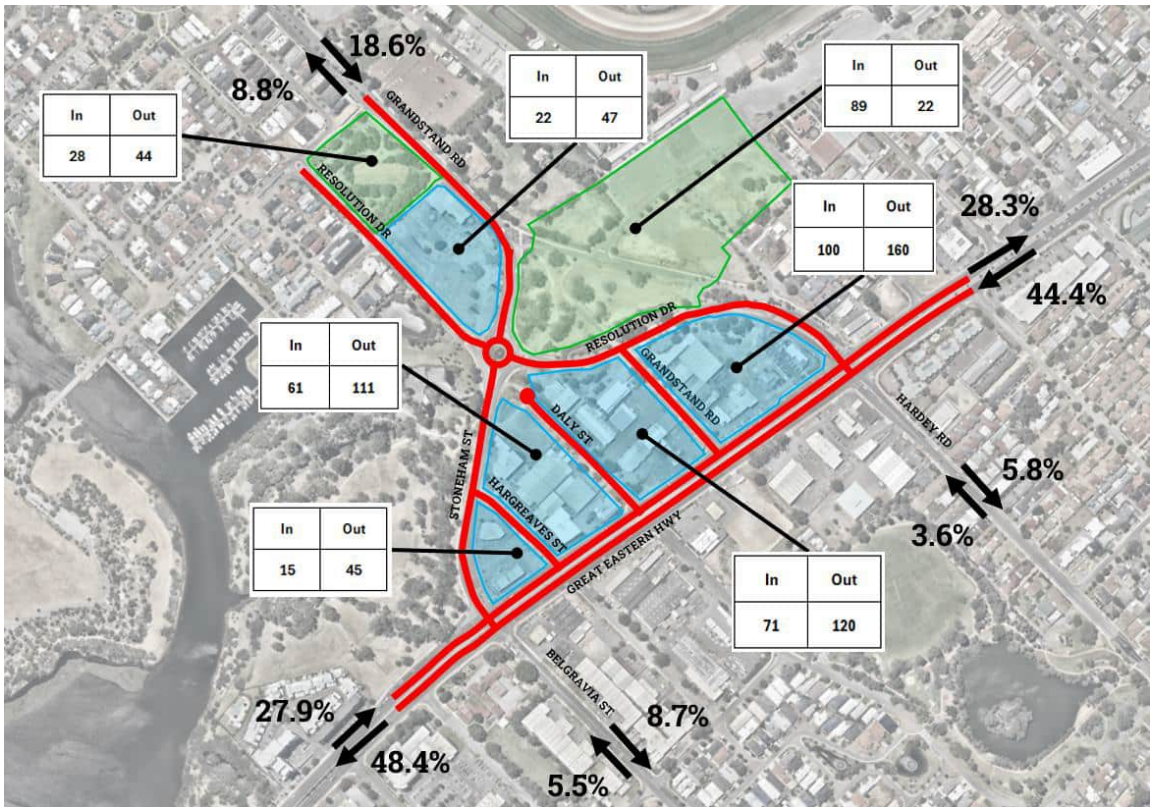

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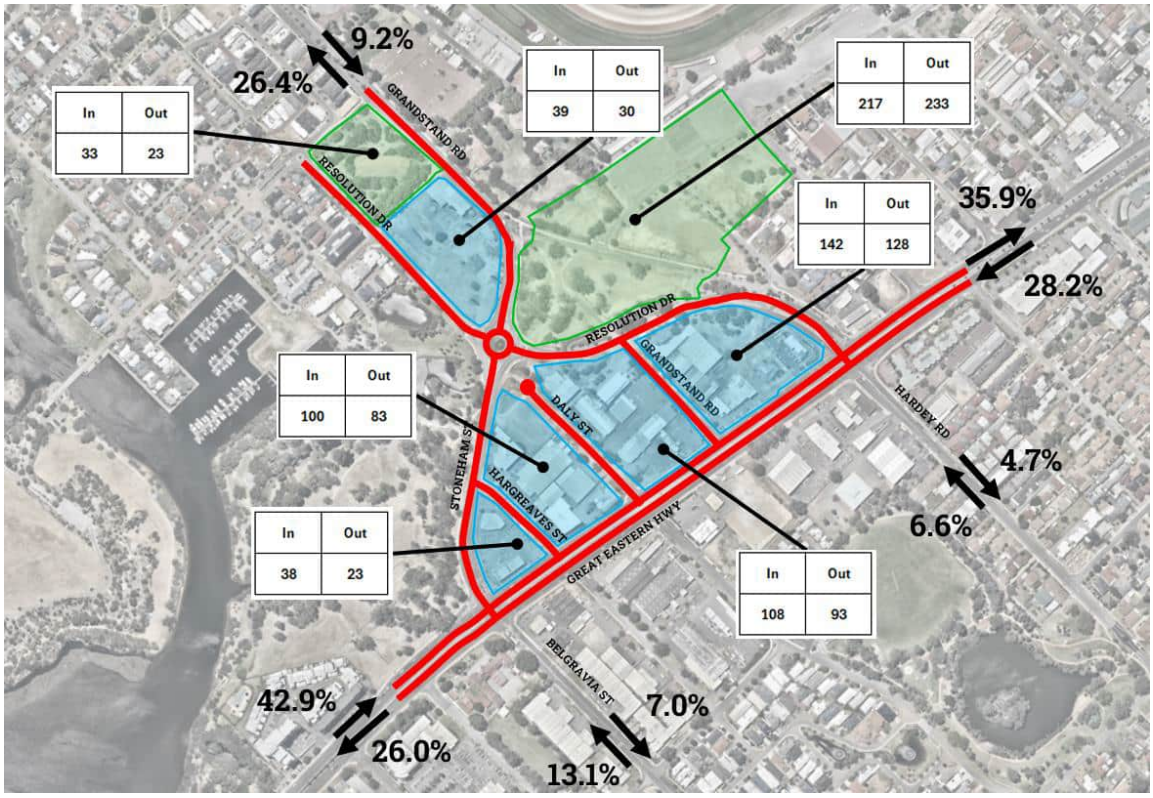
Figure 48 – Distribution of PM Peak Trips to and from the Precinct Ultimate Development



The existing peak hour traffic to and from Hargreaves Street, Daly Street and Grandstand Road will also be reduced by 25%, to reflect the traffic to and from the 75% of existing precinct land uses which are expected to be retained.

Forecast turning traffic volumes for the intersections within the precinct which have been derived from the traffic generation and distribution processes are outlined in Appendix 8.

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5.7 SIDRA Network Modelling

SIDRA is a modelling tool that can be used to assess the performance of an individual intersection, or a network of intersections. The SIDRA models have been developed in accordance with Main Roads' Operational Modelling Guidelines.

The performance of the overall network and individual intersections is expressed as a level of service. Level of service ranges from A to F, where A is the highest level of performance (unimpeded traffic flow, minimal delay) and F is the lowest (high levels of congestion, extreme delays, demand exceeds capacity). The level of service designation is based on delay. The Highway Capacity Manual sets out the ranges of delay for each level of service, which differs slightly between signalised and non-signalised intersections, and is reproduced in Table 20.

Table 20 – Level of Service Ranges for Signalised, Roundabout and Priority Controlled Intersections

Ranges of Delay for each Level of Service and Intersection Type (seconds)			
LoS	Signalised	Roundabout	Give Way / Stop Sign
A	0 - 10	0 – 10	0 - 10
B	10 - 20	10 – 20	10 - 15
C	20 - 35	20 – 35	15 - 25
D	35 - 55	35 – 50	25 - 35
E	55 - 80	50 – 70	35 - 50
F	80+	70+	50+

5.7.1 Base Network Modelling

To gain an understanding of the existing performance of the road network, and the impact of continued traffic growth on this performance, the following three scenarios have been assessed for the AM and PM peak periods:

- Existing road network, with 2021 volumes (no Golden Gateway development);
- Existing road network, with 2031 volumes (no Golden Gateway development); and
- Existing road network, with 2041 volumes (no Golden Gateway development).

The SIDRA predicted AM peak hour performance of the existing network with 2021, 2031 and 2041 forecast volumes (without any Golden Gateway redevelopment traffic) is shown in Figure 49.

The SIDRA predicted PM peak hour performance of the existing network with 2021, 2031 and 2041 forecast volumes (without any Golden Gateway redevelopment traffic) is shown in Figure 50.

The SIDRA predicted queue storage ratios (showing the 95th percentile queues) of the existing network with 2021, 2031 and 2041 volumes is shown in Figure 51 for the AM peak hour and Figure 52 for the PM peak hour.

The SIDRA predicted level of service for the signalised intersections of Great Eastern Highway/Stoneham Street/ Belgravia Street, Great Eastern Highway/Resolution Drive/Hardey Road, and the roundabout controlled intersection of Stoneham Street/Grandstand Road/Resolution Drive for 2021, 2031 and 2041 volumes are summarised in Table 21.

Detailed SIDRA Network output for these intersections is displayed in Appendix 1 (for 2021), Appendix 2 (for 2031) and Appendix 3 (for 2041).

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Table 21 – SIDRA Predicted Intersection Approach Level of Service – Base Network

Approach	AM Peak			PM Peak		
	2021	2031	2041	2021	2031	2041
Great Eastern Hwy / Stoneham St / Belgravia St						
Belgravia St	E	E	E	E	E	E
Great Eastern Hwy east	D	F	F	D	D	D
Stoneham St	F	F	F	E	E	E
Great Eastern Hwy west	C	C	C	C	C	D
Great Eastern Hwy / Resolution Dr / Hardey Rd						
Hardey Rd	E	E	E	E	E	E
Great Eastern Hwy east	C	D	F	D	D	D
Resolution Dr	D	D	E	D	E	E
Great Eastern Hwy west	C	C	C	D	D	E
Stoneham St / Grandstand Rd / Resolution Dr						
Resolution Dr east	B	B	B	B	B	B
Grandstand Rd north	A	A	A	A	A	A
Resolution Dr west	A	A	A	B	B	B
Stoneham St south	A	A	A	A	B	B

The SIDRA Network base modelling demonstrates that the signalised intersections along the Great Eastern Highway corridor are congested in each of the peak hours. While the Great Eastern Highway approaches currently operate at a level of service C and D, the side roads, particularly Stoneham Street, Belgravia Street, and Hardey Street currently operate at a level of service E of F in the peak periods. The side roads experience congestion as more than half of the traffic signal green time is allocated to Great Eastern Highway. This congestion is expected to continue as volumes increase, with regional background traffic growth predicted to cause the Great Eastern Highway eastern approaches to operate at LOS F in the 2041 AM peak.

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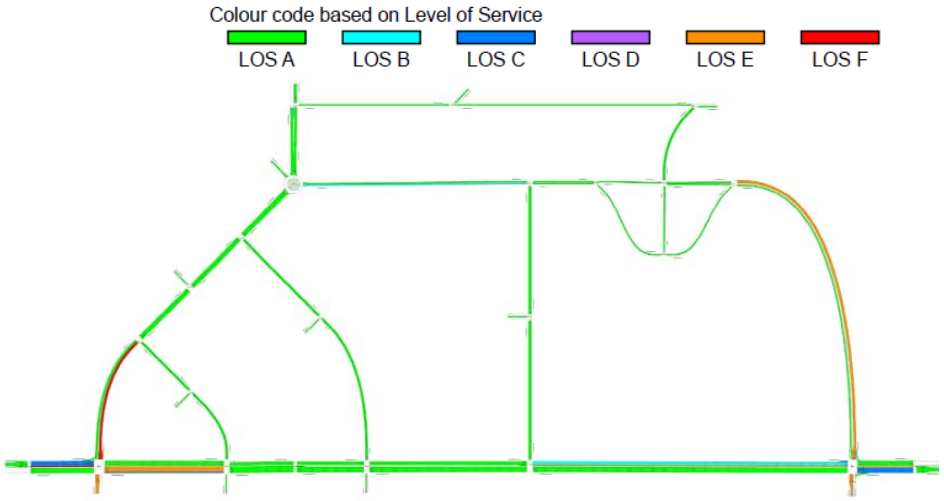
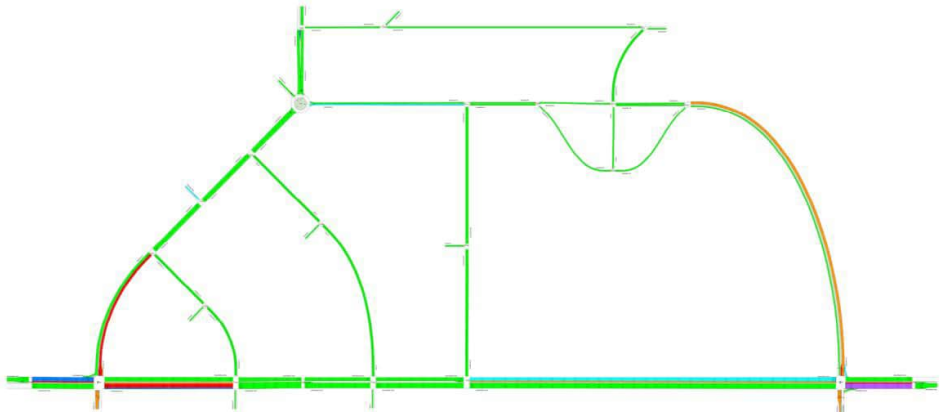
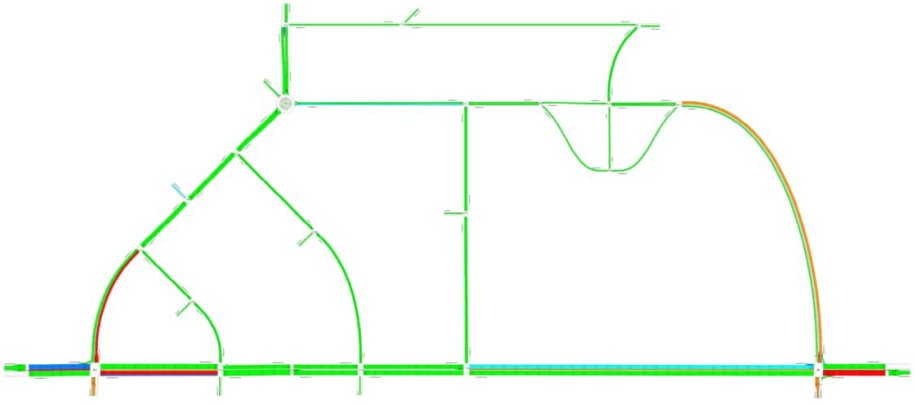
Figure 49 – SIDRA Output Network Level of Service AM Peak – Base Network



2021 Volumes

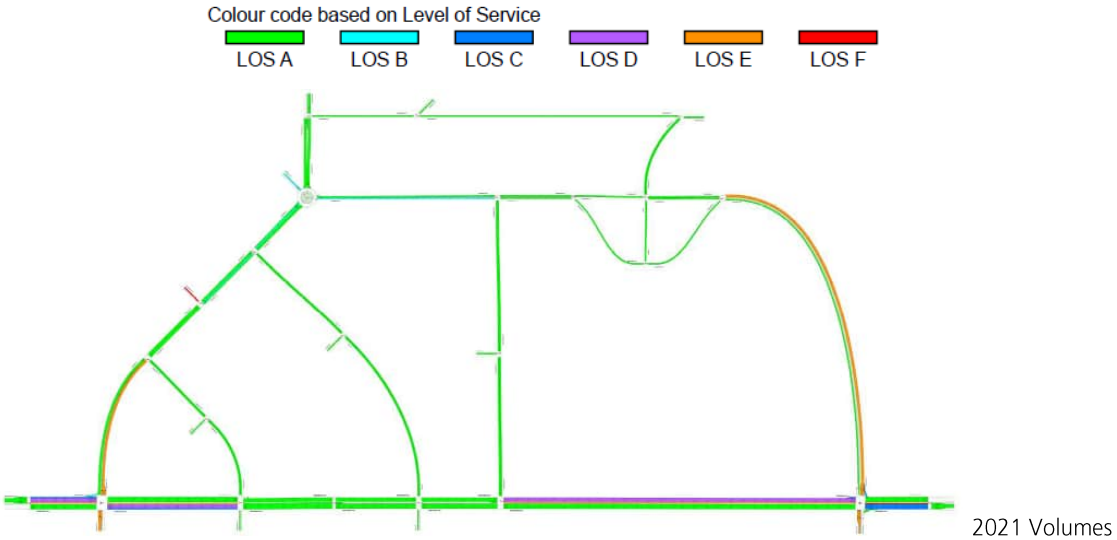


2031 Volumes

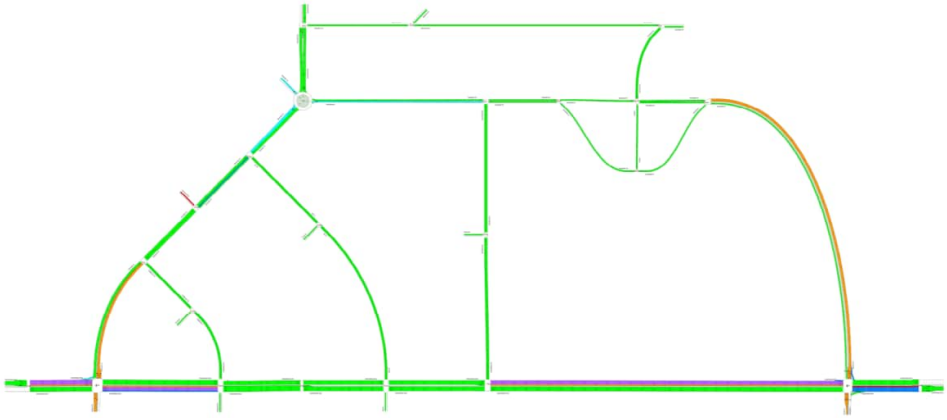


2041 Volumes

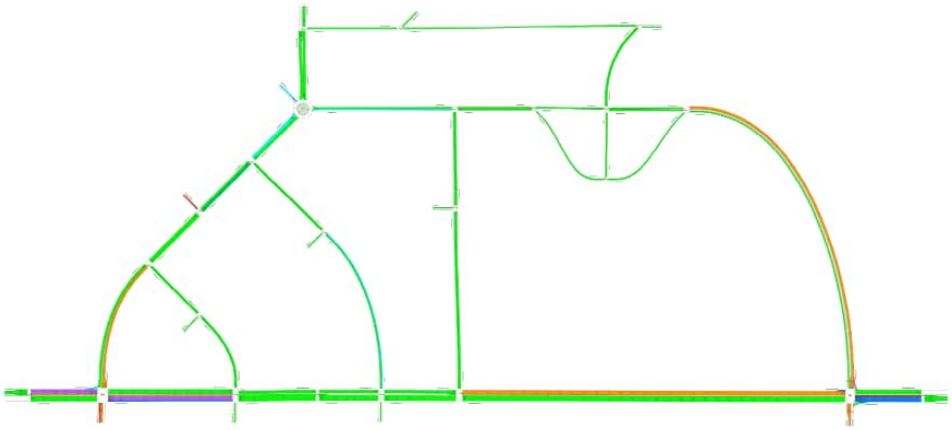
Figure 50 – SIDRA Output Network Level of Service PM Peak – Base Network



2021 Volumes

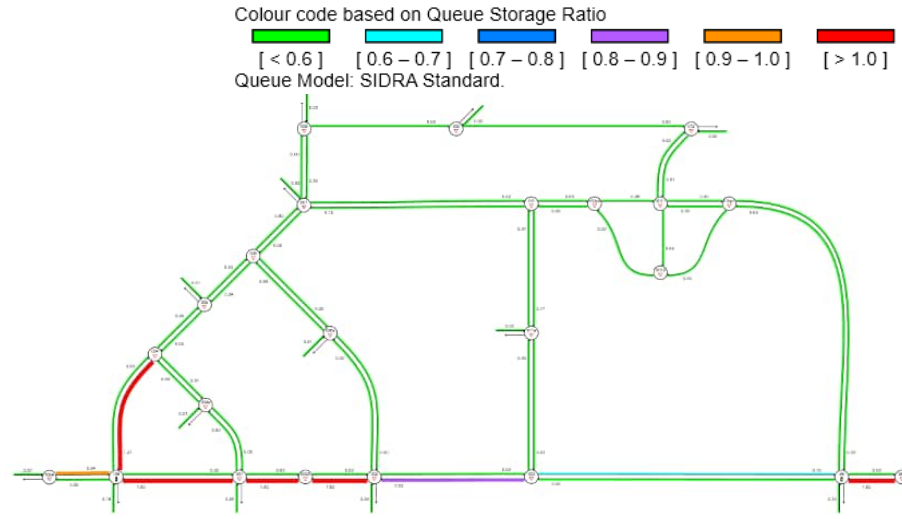


2031 Volumes

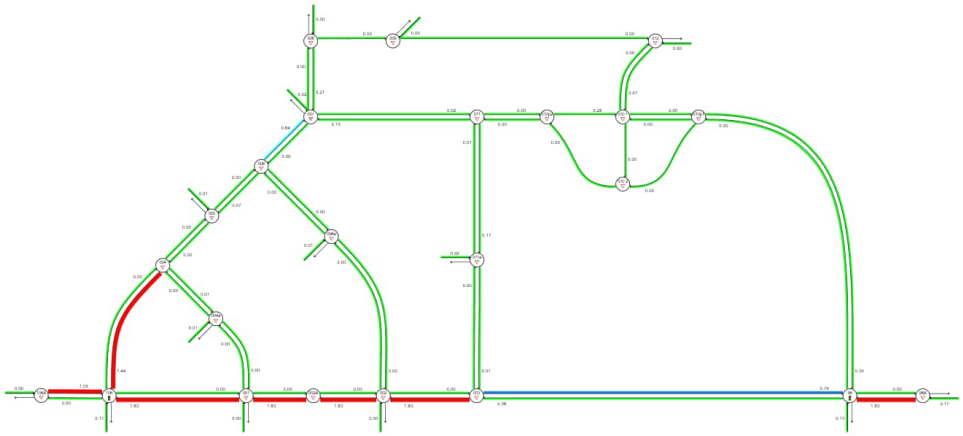


2041 Volumes

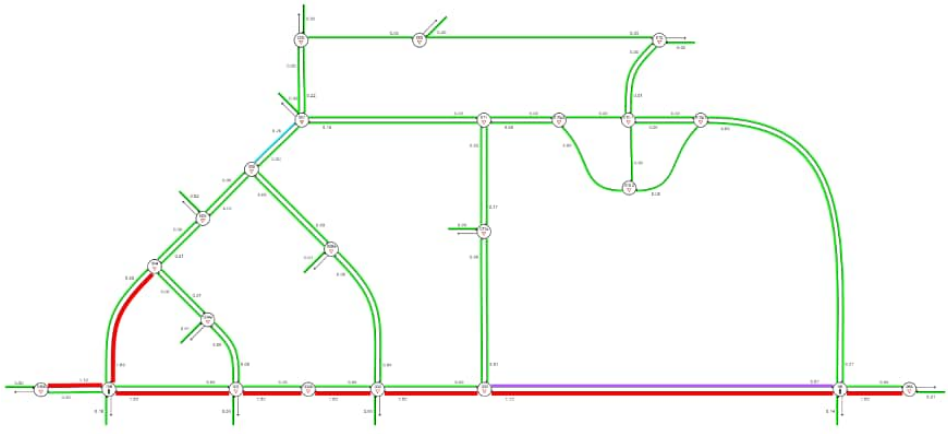
Figure 51 – SIDRA Output Network Queue Storage Ratio AM Peak – Base Network



2021 Volumes



2031 Volumes



2041 Volumes

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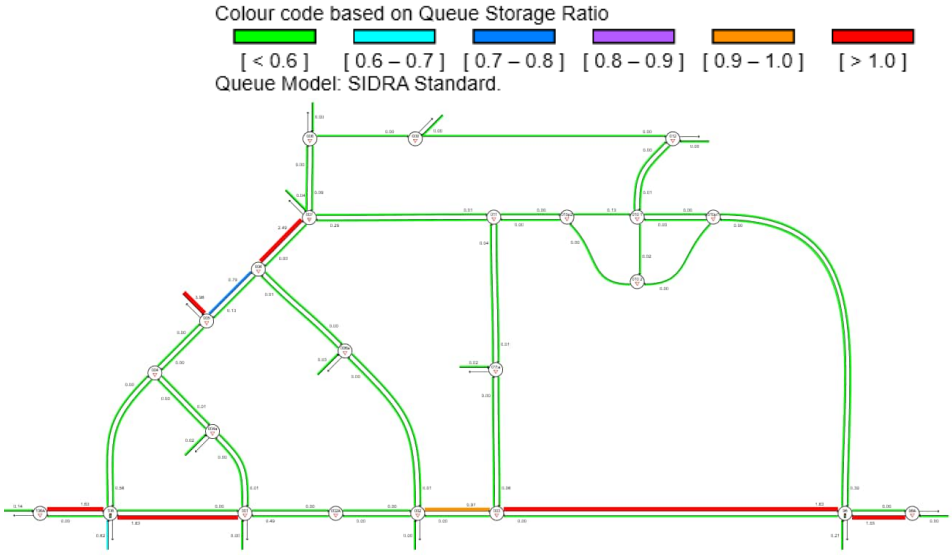
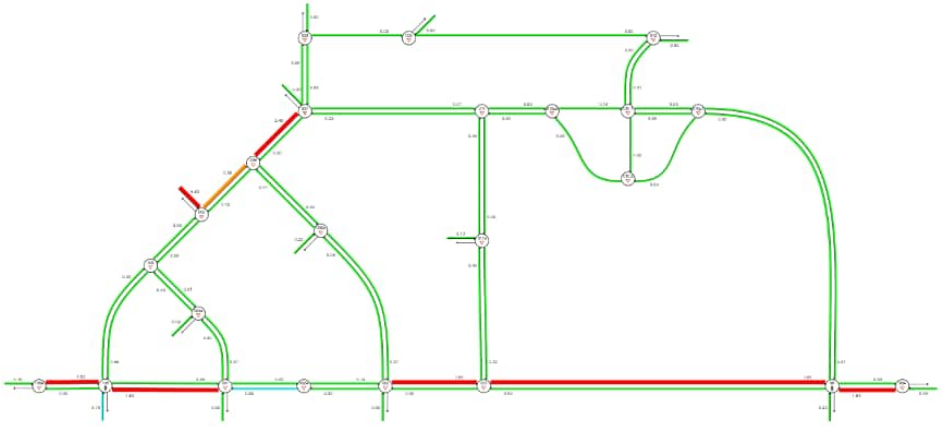
Figure 52 – SIDRA Output Network Queue Storage Ratio PM Peak – Base Network



2021 Volumes



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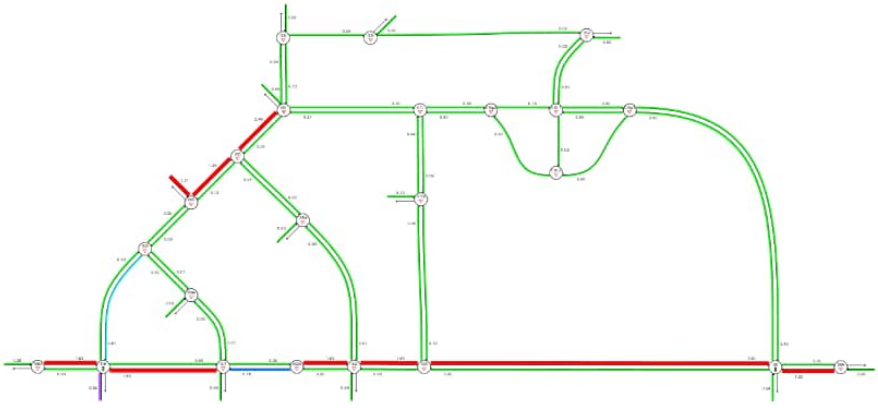

2041 Volumes

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5.7.2 Forecast Year - Proposed Road Network and Development

The proposed road network has been tested for three scenarios, as follows:

- Base year (2021) with proposed road network and no intensification of land use (existing traffic volumes);
- Forecast year (2031) with proposed road network and 25% of Ascot Kilns and Golden Gateway development, 50% of Ascot Racecourse development complete (and 75% of the existing commercial development retained);
- Forecast year (2041) with proposed road network and 100% of development complete.

The SIDRA predicted AM peak hour performance for the 2021, 2031 and 2041 land uses are shown in Figure 53, while the predicted PM peak hour performance for the 2021, 2031 and 2041 land uses are shown in Figure 54.

The SIDRA predicted queue storage ratios are shown in Figure 55 for the AM peak hour and Figure 56 for the PM peak hour.

The SIDRA predicted level of service for the signalised and roundabout controlled intersections in the proposed road network are summarised in Table 22.

Detailed SIDRA Network output for these intersections is displayed in Appendix 4 (2021 Proposed Road Network), Appendix 5 (2031 land uses with proposed road network) and Appendix 6 (2041 land uses with proposed road network).

Table 22 – SIDRA Predicted Intersection Approach Level of Service

Approach	2021		2031		2041	
	AM	PM	AM	PM	AM	PM
Great Eastern Hwy / Stoneham St / Belgravia St						
Belgravia St	E	E	E	E	E	F
Great Eastern Hwy east	D	D	F	D	F	D
Stoneham St	F	E	F	F	F	F
Great Eastern Hwy west	C	C	C	C	C	D
Great Eastern Hwy / Resolution Dr / Hardey Rd						
Hardey Rd	E	E	E	E	E	E
Great Eastern Hwy east	C	D	E	F	F	F
Resolution Dr	D	D	D	D	E	E
Great Eastern Hwy west	C	D	C	D	C	E
Stoneham St / Grandstand Rd / Resolution Dr						
Resolution Dr east	B	B	B	B	F	B
Grandstand Rd north	A	A	A	A	B	A
Resolution Dr west	A	B	A	B	A	B
Stoneham St south	A	B	A	B	A	B

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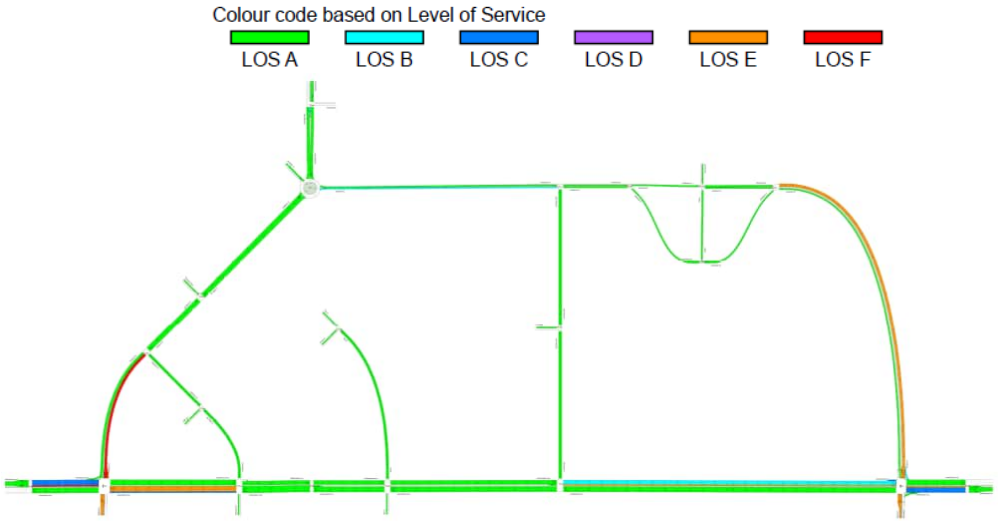
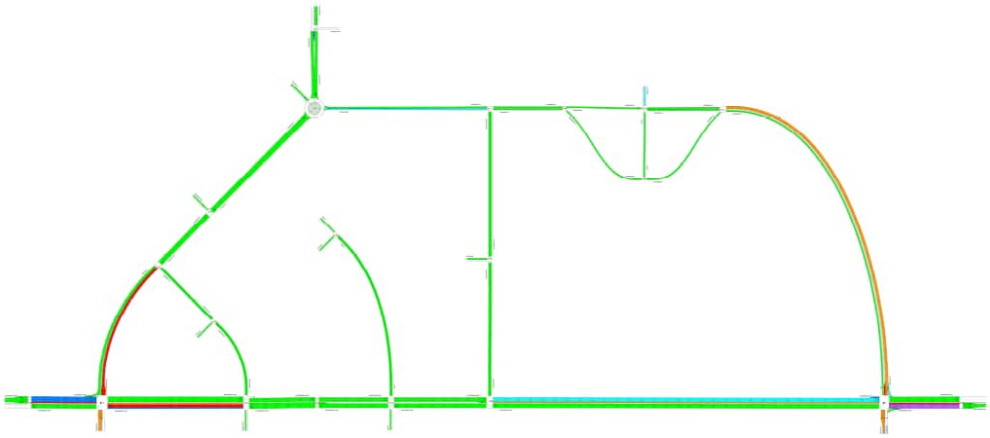
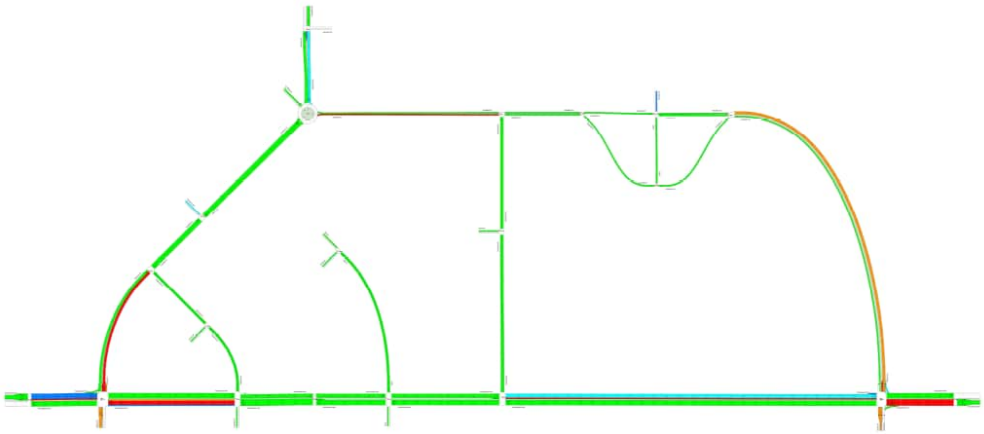
Figure 53 – SIDRA Output Network Level of Service AM Peak Proposed Road Network



2021 Land Uses



2031 Land Uses



2041 Land Uses

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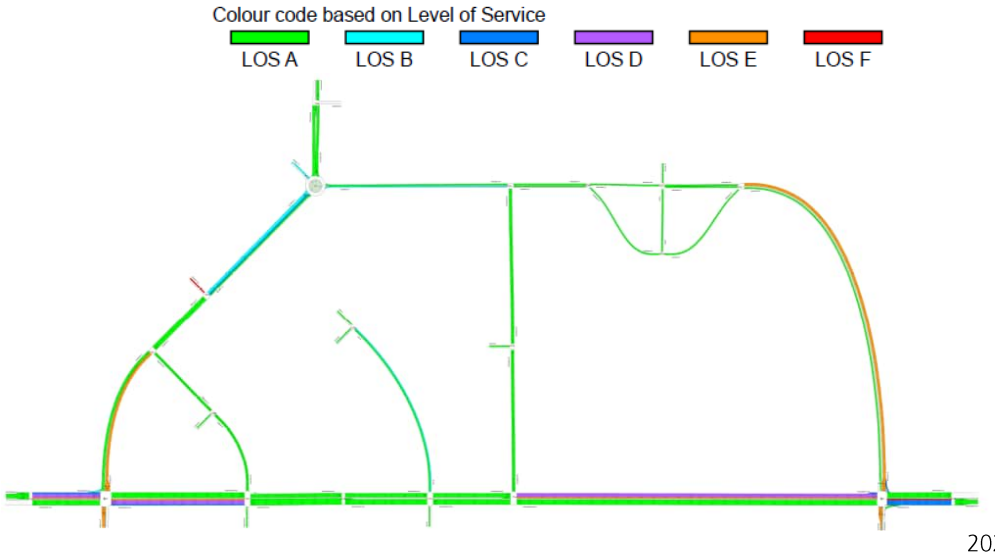
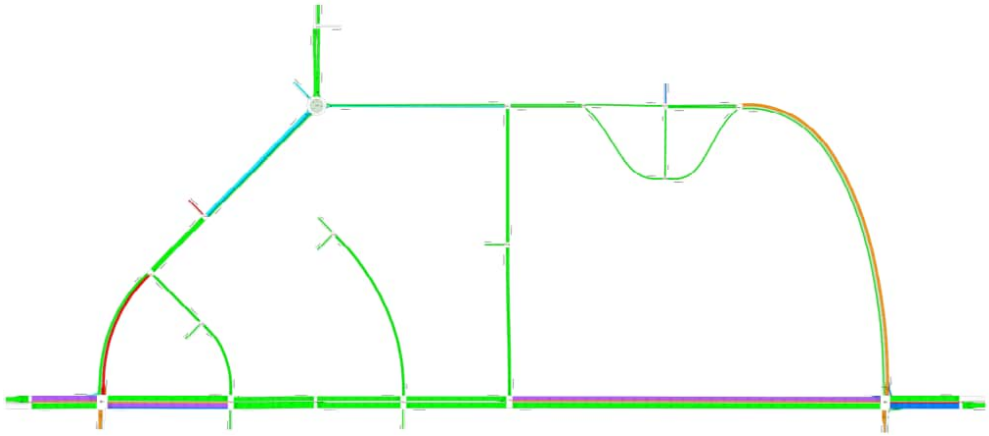
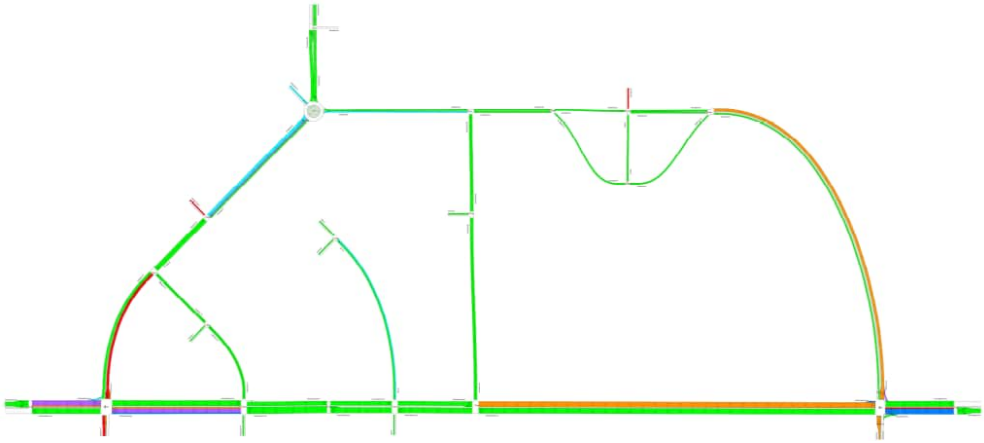
Figure 54 – SIDRA Output Network Level of Service PM Peak Proposed Road Network



2021 Land Uses



2031 Land Uses



2041 Land Uses

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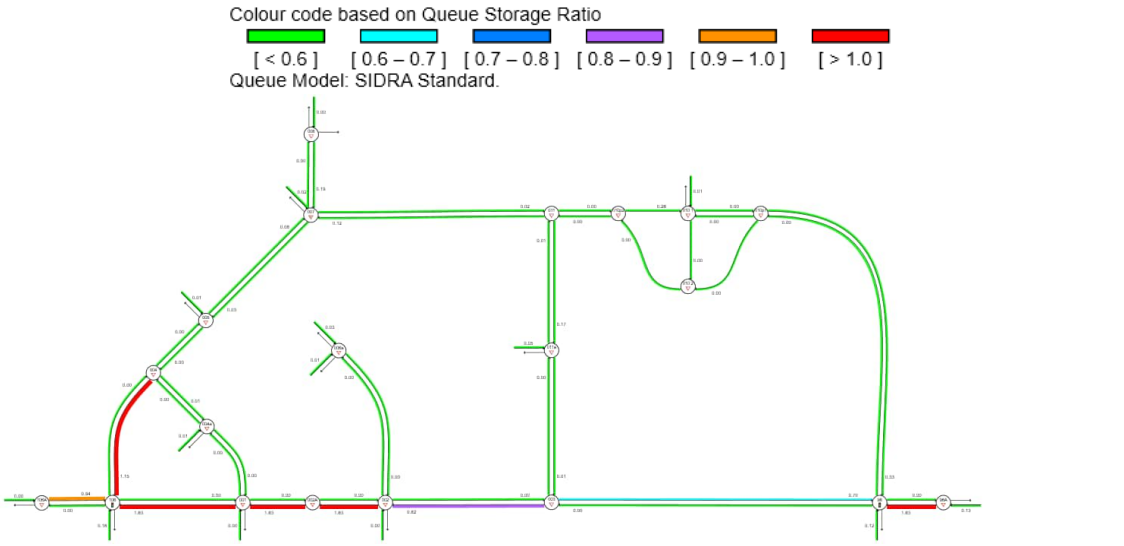
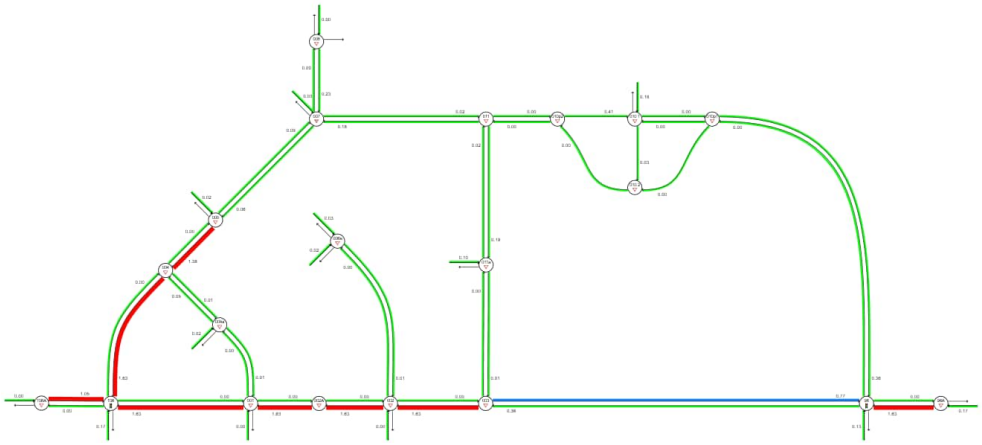
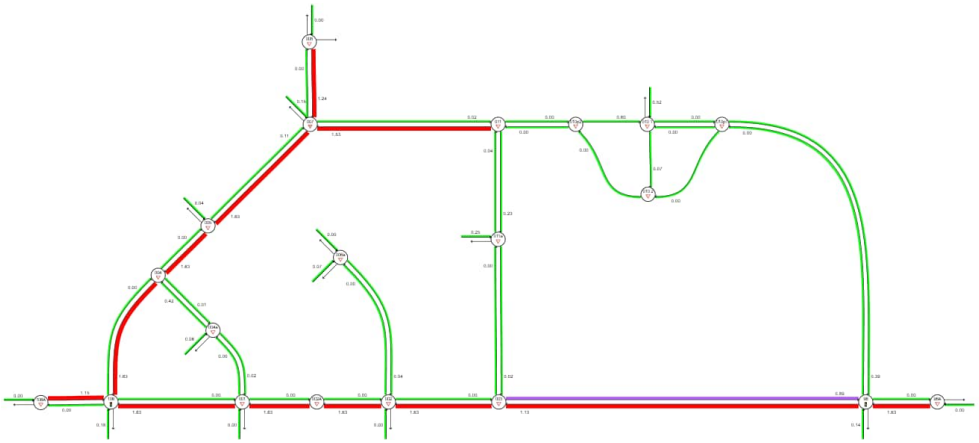
Figure 55 – SIDRA Output Network Queue Storage Ratio AM Peak Proposed Road Network



2021 Land Uses



2031 Land Uses



2041 Land Uses

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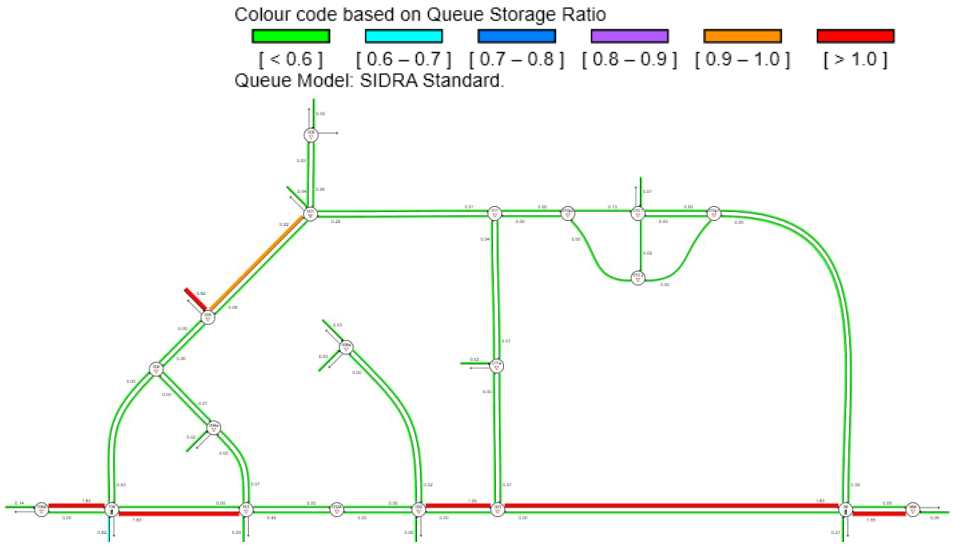
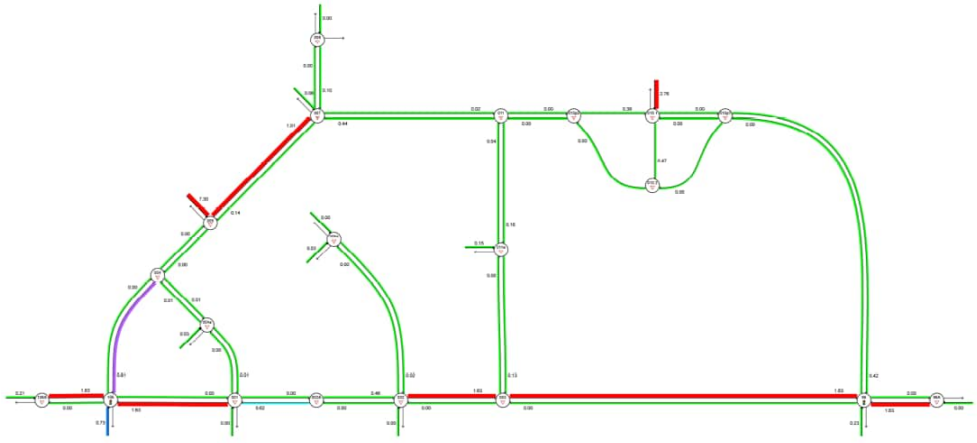
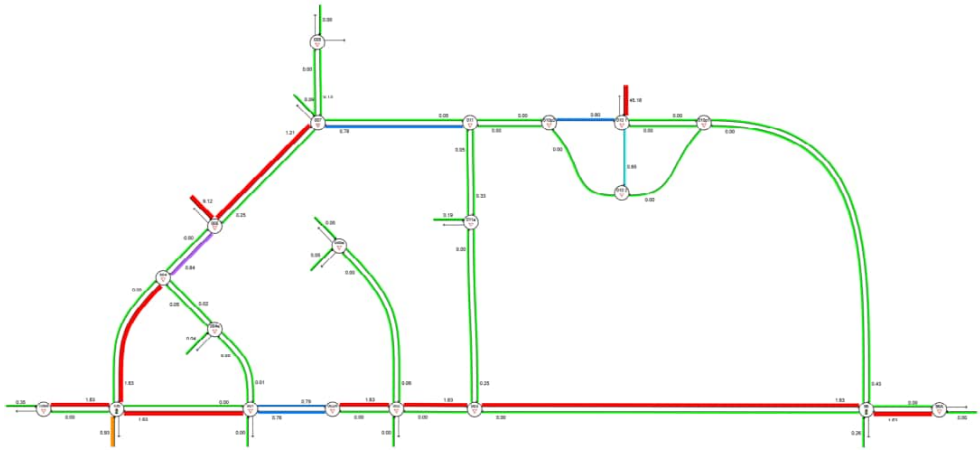
Figure 56 – SIDRA Output Network Queue Storage Ratio PM Peak Proposed Road Network



2021 Land Uses



2031 Land Uses



2041 Land Uses

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The SIDRA Network modelling of the proposed road network demonstrates that the level of congestion in 2021 and 2031 is generally consistent with the congestion predicted for the 2021 and 2031 existing road network scenario. The internal roads are predicted to operate well within their capacity.

The SIDRA Network modelling of the proposed road network and full build out of the Golden Gateway precinct demonstrates that the level of congestion is 2041 is generally consistent with the congestion predicted for the 2041 existing road network scenario, with added congestion along Resolution Drive associated with the development of the Ascot Racecourse landholdings. Congestion along the Resolution Drive approach to Great Eastern Highway is predicted to increase in the AM peak period, while congestion along the Stoneham Street approach to Great Eastern Highway will increase in the PM peak period. The other internal roads are predicted to operate well within their capacity.

5.7.3 Ascot Event Modelling

To understand how the road network performs under as Ascot event, the following four scenarios have been assessed:

- Existing road network, 2021 PM peak volumes with Melbourne Cup event traffic;
- Proposed road network, 2021 PM peak volumes with Melbourne Cup event traffic;
- Proposed road network, 2031 PM peak background volumes and development traffic with Melbourne Cup event traffic;
- Proposed road network, 2041 PM peak background volumes and development traffic with Melbourne Cup event traffic.

The SIDRA predicted PM peak hour performance of an Ascot Melbourne Cup event with 2021 volumes (existing network and proposed network) is shown in Figure 57. The SIDRA predicted PM peak hour performance of an Ascot Melbourne Cup event with the proposed network and 2031 and 2041 volumes are shown in Figure 58. The SIDRA predicted level of service for the signalised and roundabout controlled intersections in the existing network and proposed road network are summarised in Table 23.

Detailed SIDRA Network output for these intersections is displayed in Appendix 7.

Table 23 – SIDRA Predicted Intersection Approach Level of Service – Ascot Event

Approach	Existing Network 2021 vols + event	Proposed Network 2021 vols + event	Proposed Network 2031 vols + event	Proposed Network 2041 vols + event
Great Eastern Hwy / Stoneham St / Belgravia St				
Belgravia St	E	E	E	F
Great Eastern Hwy east	D	D	D	D
Stoneham St	E	E	F	F
Great Eastern Hwy west	C	C	C	D
Great Eastern Hwy / Resolution Dr / Hardey Rd				
Hardey Rd	E	E	E	E
Great Eastern Hwy east	D	D	F	F
Resolution Dr	E	E	E	E
Great Eastern Hwy west	D	D	D	E
Stoneham St / Grandstand Rd / Resolution Dr				
Resolution Dr east	B	B	B	B
Grandstand Rd north	A	A	A	A
Resolution Dr west	B	B	B	B
Stoneham St south	A	B	B	B

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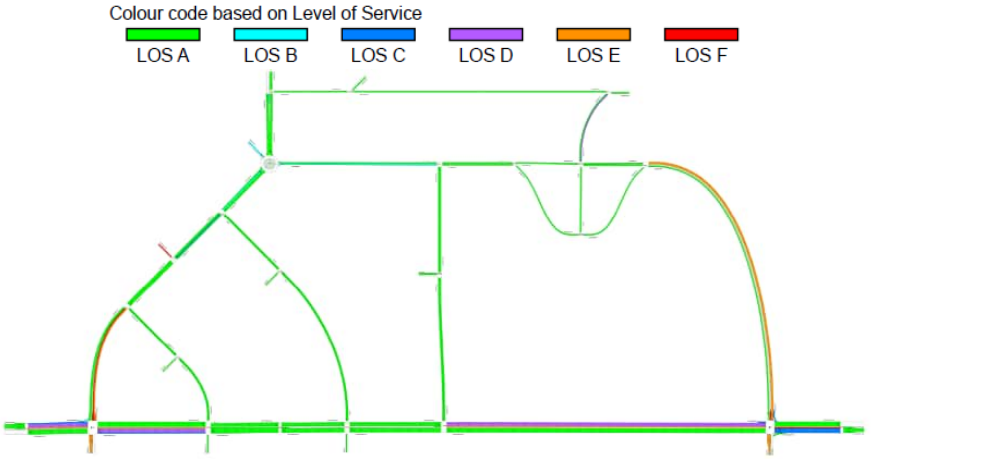
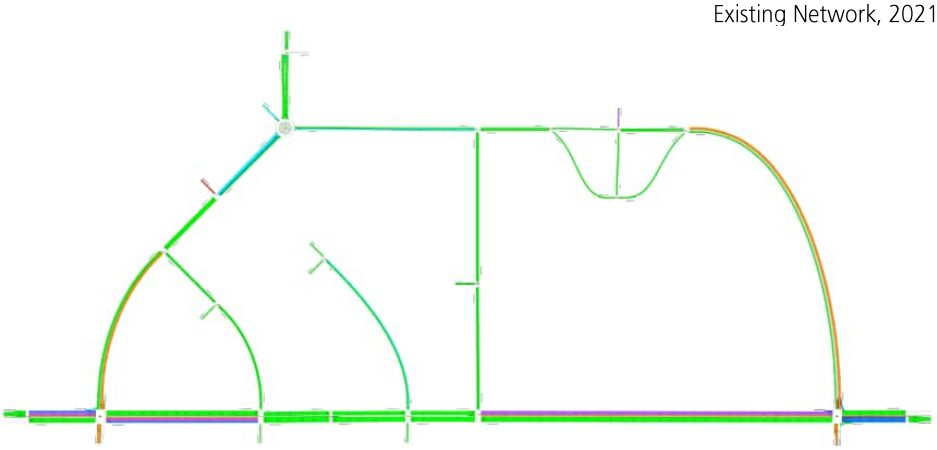
Figure 57 – SIDRA Output Network Level of Service Ascot Event PM Peak with 2021 Volumes



Existing Network, 2021 Volumes



Proposed Network, 2021 Volumes

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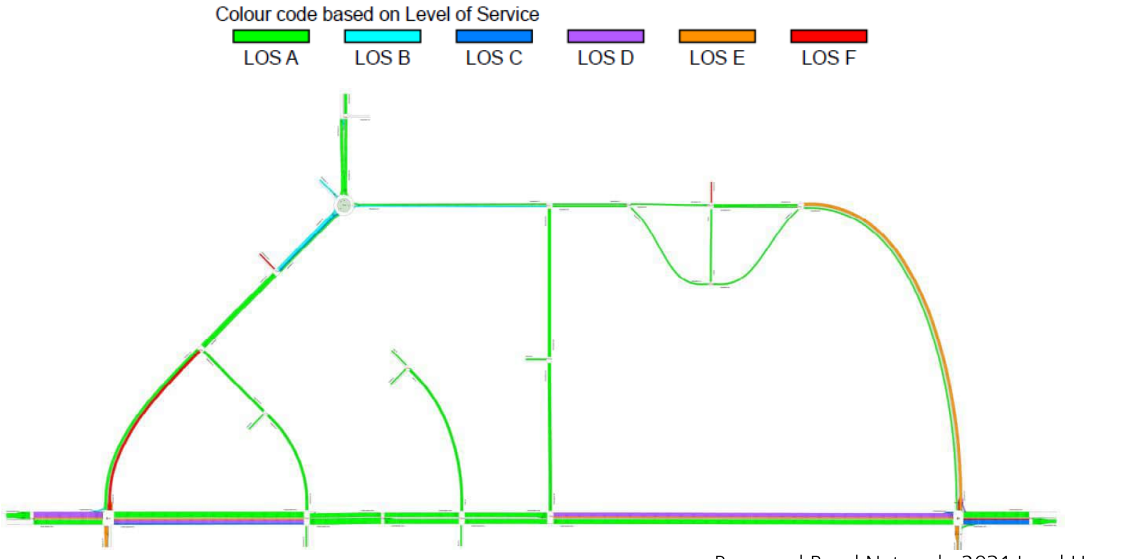
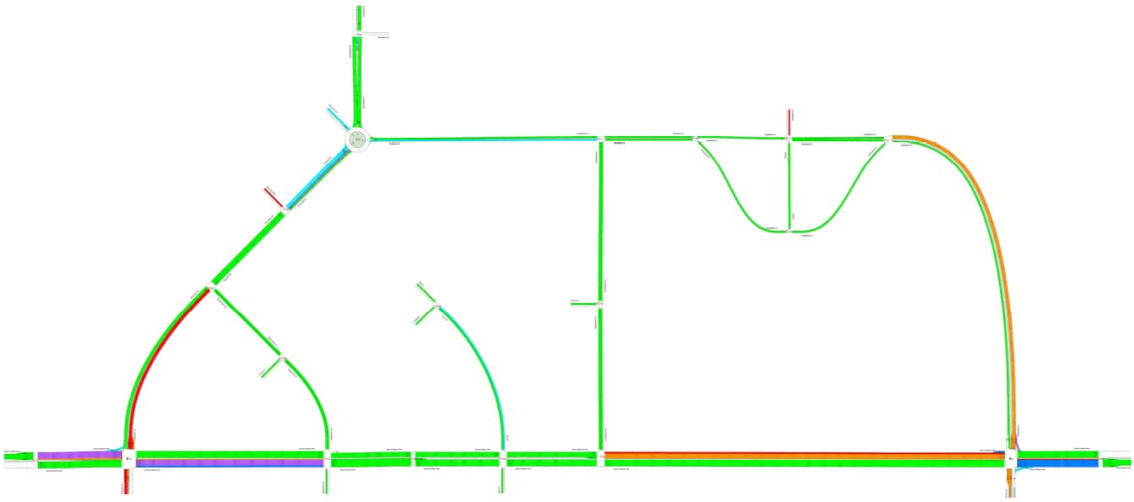
Figure 58 – SIDRA Output Network Level of Service Ascot Event PM Peak Proposed Network with Development Volumes



Proposed Road Network, 2031 Land Uses



Proposed Road Network, 2041 Land Uses

The SIDRA Network base modelling demonstrates that the signalised intersections along the Great Eastern Highway corridor are congested in each of the peak hours. While the Great Eastern Highway approaches currently operate at a level of service C and D, the side roads, particularly Stoneham Street, Belgravia Street, and Hardey Street currently operate at a level of service E of F in the peak periods. The side roads experience congestion as more than half of the traffic signal green time is allocated to Great Eastern Highway.

The addition of Ascot event traffic to this busy PM peak increases the congestion in this period. Traffic exiting an event at Ascot is predicted to cause local congestion where this traffic joins the external road network, at the intersection of Raconteur Drive and Resolution Drive.

6. CONCLUSIONS

6.1 Golden Gateway Local Structure Plan Context

The Golden Gateway Precinct is located within the City of Belmont and the LSP area is bounded by Ascot Racecourse to the north/northeast, Hardey Road to the east, Great Eastern Highway to the south, Swan River to the west and Ascot Waters residential estate to the west/northwest.

The Golden Gateway LSP is comprised of three main land uses, residential dwellings (approximately 2,268 dwellings), commercial space (6,979m^2 NLA) and retail space (1,200m^2 NLA). It is proposed that the three land uses will primarily be provided in mixed-use development sites across the Golden Gateway LSP area.

As noted in the Structure Plan Report, the LSP has been formulated around the following vision:

> *"The development of the Golden Gateway will transform this degraded and fragmented area into a vibrant precinct of residential and mixed use development, with strengthened connections to the Swan River and Ascot Waters, with uses, density and built form that derive best value from these attributes while respecting the area's rich culture and heritage."*

The overarching objectives for the Golden Gateway Precinct as established by the project team and reinforced through stakeholder engagement include:

- Improve self-containment of facilities – reduce car dependence;
- Improve people's connection to the Swan River;
- Create accessible, quality public realm within the precinct; and
- Identify appropriate uses/densities in conjunction with infrastructure improvements.

6.2 Conclusions

The weekday peak hour performance of the existing, and proposed movement networks under a range of Golden Gateway land use scenarios has been assessed. Traffic performance at an Ascot Racecourse event day has also been investigated.

6.2.1 Background Growth in Traffic

Traffic volumes along the section of Great Eastern Highway between Stoneham Street and Resolution Drive (site 1012) have reduced from 64,800 vpd in 2014 to 54,100 vpd in 2018, a reduction of 16.5% over the 4 year period. Similarly at sites 3404 and 7938 (along Great Eastern Highway to the west and east of the Golden Gateway precinct respectively), daily traffic volumes on Great Eastern Highway reduced by between 1.4% and 4.3% over the two year period between 2018 and 2020. Despite these reductions, background traffic volumes are expected to increase over time.

As traffic volumes continue to increase, the proportion of total traffic occurring during the morning and afternoon peak hours reduces. This phenomenon is called peak spreading, and results in a lengthening of the peak period. This also results in the growth in peak hour traffic being less than the growth in daily traffic volumes.

An annual peak hour growth rate of 0.5% has been assumed. This represents an increase of 5.1% between 2021 and 2031 and an increase of 10.5% between 2021 and 2041. The peak hour growth rate has been applied to all through traffic (excluding buses) travelling on regional and district roads such as Great Eastern Highway, Stoneham Street, Resolution Drive and Grandstand Road (north). The growth in regional peak hour traffic, without any development traffic, is predicted to lead to the deterioration of signalised intersection operation to level of service F by 2041 in the AM peak hour.

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6.2.2 Intersection Performance

Stoneham Street/Great Eastern Highway Intersection

This intersection currently operates at an overall level of service D in both the AM and PM peak. The Great Eastern Highway approaches operate at a level of service C/D, which is particularly good given the traffic volumes. Belgravia Street and Stoneham Street operate at a level of service E/F.

As traffic volumes increase over time (without the inclusion of traffic associated with the development of the Golden Gateway precinct) the performance of the intersection will decrease, particularly in the AM peak hour, where a level of service F is predicted by 2041 (the PM peak hour is still predicted to operate at a level of service D).

When traffic associated with the development of the Golden Gateway precinct and Ascot Racecourse landholdings is included, the performance of the Belgravia Street and Stoneham Street approaches decreases. The overall intersection level of service in 2041 is predicted to be F in the AM peak hour, and E in the PM peak hour.

Resolution Drive/Great Eastern Highway Intersection

This intersection currently operates at an overall level of service C in the AM and D in the PM peak. The Great Eastern Highway approaches operate at a level of service C in the AM peak hour and D in the PM peak hour, which is very good given the traffic volumes. Hardey Road and Resolution Drive operate at a level of service D/E.

As traffic volumes increase over time (without the inclusion of traffic associated with the development of the Golden Gateway precinct) the performance of the intersection will decrease, particularly in the AM peak hour, where a level of service F is predicted by 2041, while a level of service E is predicted for the PM peak hour.

When traffic associated with the development of the Golden Gateway precinct and Ascot Racecourse landholdings is included, the performance of the Resolution Drive approach decreases in the AM peak, as does the Great Eastern Highway east approach (westbound) in the PM peak hour. The overall intersection level of service in 2041 is predicted to be F in both the AM and PM peak hours.

Grandstand Road/Resolution Drive/Stoneham Street Intersection

This roundabout controlled intersection currently operates at an overall level of service A in both the AM and PM peak, with all approaches operating at a level of service A/B.

As traffic volumes increase over time (without the inclusion of traffic associated with the development of the Golden Gateway precinct) the performance of the intersection is predicted to maintain a level of service A by 2041 in the AM peak hour and decrease to a level of service B in the PM peak hour.

When traffic associated with the development of the Golden Gateway precinct and Ascot Racecourse landholdings is included, the performance of the Resolution Drive approach to the roundabout reduces, however the overall intersection level of service is predicted to be C in the AM peak hour and B in the PM peak hour in 2041. Traffic volumes along Resolution Drive are forecast to increase with the development of the Ascot Racecourse landholdings, with the most traffic intensive developments (Ascot Racecourse Area E) to be accessed via Resolution Drive.

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6.2.3 Pedestrian, Cycle and Public Transport Networks

The future development of the Golden Gateway Structure Plan would not only transform the pedestrian and cycle connections throughout the precinct, but also provide a resident population that could be the catalyst in a step change in public transport service provision across the local area.

To achieve the 20% reduction in car driver and car passenger mode share, the following strategies are recommended:

- Implementation of a precinct wide 30km/h speed zone (excluding Grandstand Road and Stoneham Street as the main through route for traffic) to improve the environment for walking and cycling
- Completing gaps in the shared path network and implementing the long term cycle network routes through the precinct.
- Increasing the tree canopy coverage along all roads within the precinct to create a pleasant environment for walking and cycling.
- Ensuring there are a variety of local amenities within a short and pleasant walking or biking distance.
- The introduction of a bike or electric scooter share scheme.
- The introduction of a car share scheme.
- The imposition of a parking cap for residential and commercial uses.
- The City should lobby the PTA to improve bus services to the precinct and explore the potential of other transit options such as a superbus or trackless tram

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Appendix 1 – SIDRA Network Output 2021 Existing Network

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NETWORK SUMMARY

Network: N101 [2021 AM Peak (Network Folder: General)]

New Network
Network Category: (None)

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS D					
Speed Efficiency	0.58					
Travel Time Index	5.34					
Congestion Coefficient	1.72					
Travel Speed (Average)	34.7	km/h			35.1	km/h
Travel Distance (Total)	10603.9	veh-km/h			16521.7	pers-km/h
Travel Time (Total)	305.4	veh-h/h			470.2	pers-h/h
Desired Speed (Program)	59.8	km/h				
Demand Flows (Total for all Sites)	47016	veh/h			75212	pers/h
Arrival Flows (Total for all Sites)	47016	veh/h			75212	pers/h
Demand Flows (Entry Total)	6526	veh/h				
Midblock Inflows (Total)	98	veh/h				
Midblock Outflows (Total)	-90	veh/h				
Percent Heavy Vehicles (Demand)	4.3	%				
Percent Heavy Vehicles (Arrival)	4.3	%				
Degree of Saturation	1.001					
Control Delay (Total)	127.01	veh-h/h			183.54	pers-h/h
Control Delay (Average)	9.7	sec			8.8	sec
Control Delay (Worst Lane)	109.3	sec				
Control Delay (Worst Movement)	109.6	sec			109.6	sec
Geometric Delay (Average)	0.6	sec				
Stop-Line Delay (Average)	9.1	sec				
Ave. Queue Storage Ratio (Worst Lane)	1.00					
Total Effective Stops	10215	veh/h			19053	pers/h
Effective Stop Rate	0.22		0.96	per km	0.25	
Proportion Queued	0.20				0.18	
Performance Index	893.5				893.5	
Cost (Total)	15229.39	$/h	1.44	$/km	15229.39	$/h
Fuel Consumption (Total)	1348.6	L/h	127.2	mL/km		
Fuel Economy	12.7	L/100km				
Carbon Dioxide (Total)	3199.2	kg/h	301.7	g/km		
Hydrocarbons (Total)	0.280	kg/h	0.026	g/km		
Carbon Monoxide (Total)	3.288	kg/h	0.310	g/km		
NOx (Total)	7.463	kg/h	0.704	g/km		

Network Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 5 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.0% 0.0% 0.0%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	22,567,680	veh/y	36,101,960	pers/y
Delay	60,963	veh-h/y	88,101	pers-h/y
Effective Stops	4,903,093	veh/y	9,145,675	pers/y
Travel Distance	5,089,875	veh-km/y	7,930,398	pers-km/y
Travel Time	146,599	veh-h/y	225,674	pers-h/y
Cost	7,310,108	$/y	7,310,108	$/y
Fuel Consumption	647,308	L/y		
Carbon Dioxide	1,535,624	kg/y		
Hydrocarbons	135	kg/y		
Carbon Monoxide	1,578	kg/y		
NOx	3,582	kg/y		

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia AM 2021 (Site Folder: 2021 AM Peak)] **Network: N101 [2021 AM Peak (Network Folder: General)]**

GEH / Stoneham St / Belgravia St
Traffic signals
2021 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	60	5.0	60	5.0	0.371	65.2	LOS E	5.1	38.4	0.96	0.77	0.96	12.2
2	T1	107	8.4	107	8.4	* 0.371	59.6	LOS E	5.2	39.8	0.96	0.75	0.96	13.2
3	R2	70	10.0	70	10.0	0.334	65.2	LOS E	4.3	34.1	0.95	0.76	0.95	12.2
Approach		237	8.0	237	8.0	0.371	62.7	LOS E	5.2	39.8	0.96	0.76	0.96	12.6
East: Great Eastern Hwy														
4	L2	194	5.7	194	5.7	0.280	28.6	LOS C	8.7	66.7	0.65	0.73	0.65	24.3
5	T1	2486	4.5	2486	4.5	* 0.934	55.7	LOS E	17.8	130.6	1.00	1.06	1.18	6.0
6	R2	18	5.6	18	5.6	0.171	72.1	LOS E	1.2	9.6	0.98	0.70	0.98	4.9
6u	U	1	0.0	1	0.0	0.171	73.8	LOS E	1.2	9.6	0.98	0.70	0.98	4.9
Approach		2699	4.6	2699	4.6	0.934	53.9	LOS D	17.8	130.6	0.97	1.04	1.14	7.1
North: Stoneham St														
7	L2	6	16.7	6	16.7	0.031	60.2	LOS E	0.3	3.3	0.89	0.66	0.89	8.1
8	T1	293	4.1	293	4.1	* 1.001	108.2	LOS F	24.1	169.0	1.00	1.21	1.63	11.4
9	R2	459	0.4	459	0.4	1.001	109.6	LOS F	21.7	152.7	1.00	1.13	1.57	5.1
Approach		758	2.0	758	2.0	1.001	108.7	LOS F	24.1	169.0	1.00	1.16	1.59	7.8
West: Great Eastern Hwy														
10	L2	217	1.4	217	1.4	0.141	6.6	LOS A	1.6	11.0	0.18	0.60	0.18	31.6
11	T1	1426	5.3	1426	5.3	0.431	20.8	LOS C	12.7	94.5	0.55	0.48	0.55	15.8
12	R2	58	3.4	58	3.4	* 0.797	80.4	LOS F	6.3	44.6	1.00	0.89	1.27	12.9
12u	U	30	0.0	30	0.0	0.797	82.0	LOS F	6.3	44.6	1.00	0.89	1.27	5.1
Approach		1731	4.7	1731	4.7	0.797	22.0	LOS C	12.7	94.5	0.53	0.52	0.54	15.8
All Vehicles		5425	4.4	5425	4.4	1.001	51.8	LOS D	24.1	169.0	0.83	0.88	1.01	9.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey AM 2021 (Site Folder: 2021 AM Peak)] **Network: N101 [2021 AM Peak (Network Folder: General)]**

GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	97	2.1	97	2.1	0.514	67.8	LOS E	6.5	48.3	0.99	0.79	0.99	15.3
2	T1	108	5.6	108	5.6	0.514	61.7	LOS E	6.5	45.9	0.98	0.77	0.98	17.0
3	R2	124	4.0	124	4.0	* 0.626	69.2	LOS E	8.0	59.3	1.00	0.81	1.02	15.4
Approach		329	4.0	329	4.0	0.626	66.3	LOS E	8.0	59.3	0.99	0.79	1.00	15.9
East: Great Eastern Hwy														
4	L2	127	4.7	127	4.7	0.089	7.8	LOS A	1.3	9.1	0.22	0.61	0.22	45.2
5	T1	2479	4.8	2479	4.8	* 0.693	26.7	LOS C	22.2	163.2	0.81	0.73	0.81	13.0
6	R2	140	7.1	140	7.1	* 0.857	79.3	LOS E	11.0	83.1	1.00	0.95	1.30	5.2
6u	U	13	0.0	13	0.0	0.857	80.9	LOS F	11.0	83.1	1.00	0.95	1.30	5.2
Approach		2759	4.9	2759	4.9	0.857	28.8	LOS C	22.2	163.2	0.80	0.74	0.81	13.6
North: Resolution Dr														
7	L2	250	2.0	250	2.0	0.424	15.4	LOS B	7.2	51.8	0.53	0.73	0.53	21.5
8	T1	134	7.5	134	7.5	0.611	67.7	LOS E	5.7	40.0	1.00	0.77	1.02	19.1
9	R2	86	1.2	86	1.2	* 0.628	74.0	LOS E	5.7	40.4	1.00	0.79	1.04	6.3
Approach		470	3.4	470	3.4	0.628	41.0	LOS D	7.2	51.8	0.75	0.75	0.76	16.2
West: Great Eastern Hwy														
10	L2	8	0.0	8	0.0	0.030	23.8	LOS C	0.7	7.3	0.53	0.50	0.53	21.1
11	T1	1391	6.0	1391	6.0	0.495	18.3	LOS B	14.9	111.4	0.54	0.48	0.54	22.5
12	R2	100	1.0	100	1.0	0.638	70.3	LOS E	7.7	54.1	1.00	0.81	1.03	19.0
12u	U	18	0.0	18	0.0	0.638	71.9	LOS E	7.7	54.1	1.00	0.81	1.03	8.1
Approach		1517	5.6	1517	5.6	0.638	22.4	LOS C	14.9	111.4	0.58	0.51	0.58	21.4
All Vehicles		5075	4.9	5075	4.9	0.857	30.4	LOS C	22.2	163.2	0.74	0.68	0.75	16.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution AM 2021 (Site Folder: 2021 AM Peak)]

Network: N101 [2021 AM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 AM Peak
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	28	7.1	28	7.1	0.358	6.8	LOS A	1.9	13.9	0.69	0.88	0.70	29.3
6a	R1	15	6.7	15	6.7	0.358	12.1	LOS B	1.9	13.9	0.69	0.88	0.70	39.3
6	R2	232	4.7	232	4.7	0.358	13.2	LOS B	1.9	13.9	0.69	0.88	0.70	29.3
Approach		275	5.1	275	5.1	0.358	12.5	LOS B	1.9	13.9	0.69	0.88	0.70	30.0
North: Grandstand Rd														
7	L2	408	2.7	408	2.7	0.405	3.9	LOS A	2.7	19.0	0.33	0.50	0.33	33.6
9a	R1	723	1.1	723	1.1	0.405	8.7	LOS A	2.7	19.0	0.34	0.57	0.34	31.0
9b	R3	6	0.0	6	0.0	0.405	11.2	LOS B	2.6	18.6	0.34	0.59	0.34	46.7
9u	U	2	0.0	2	0.0	0.405	12.4	LOS B	2.6	18.6	0.34	0.59	0.34	30.3
Approach		1139	1.7	1139	1.7	0.405	7.0	LOS A	2.7	19.0	0.34	0.54	0.34	31.9
NorthWest: Resolution Dr														
27b	L3	12	8.3	12	8.3	0.113	4.3	LOS A	0.5	3.3	0.50	0.60	0.50	35.7
27a	L1	48	0.0	48	0.0	0.113	3.3	LOS A	0.5	3.3	0.50	0.60	0.50	35.7
29	R2	46	0.0	46	0.0	0.113	9.3	LOS A	0.5	3.3	0.50	0.60	0.50	35.7
Approach		106	0.9	106	0.9	0.113	6.0	LOS A	0.5	3.3	0.50	0.60	0.50	35.7
SouthWest: Stoneham St														
30	L2	18	0.0	18	0.0	0.151	2.1	LOS A	0.8	6.0	0.42	0.43	0.42	47.1
30a	L1	318	2.8	318	2.8	0.151	2.2	LOS A	0.8	6.0	0.42	0.46	0.42	31.1
32a	R1	21	0.0	21	0.0	0.151	6.3	LOS A	0.8	5.8	0.43	0.49	0.43	30.3
32u	U	4	25.0	4	25.0	0.151	10.3	LOS B	0.8	5.8	0.43	0.49	0.43	30.3
Approach		361	2.8	361	2.8	0.151	2.5	LOS A	0.8	6.0	0.43	0.46	0.43	33.1
All Vehicles		1881	2.3	1881	2.3	0.405	6.9	LOS A	2.7	19.0	0.41	0.58	0.42	31.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Version: 1, Version Date: 11/06/2026

NETWORK SUMMARY

Network: N101 [2021 PM Peak (Network Folder: General)]

New Network
Network Category: (None)

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS D					
Speed Efficiency	0.51					
Travel Time Index	4.57					
Congestion Coefficient	1.96					
Travel Speed (Average)	30.5	km/h			31.5	km/h
Travel Distance (Total)	11447.1	veh-km/h			16730.4	pers-km/h
Travel Time (Total)	375.0	veh-h/h			531.8	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	50964	veh/h			75154	pers/h
Arrival Flows (Total for all Sites)	50628	veh/h			74750	pers/h
Demand Flows (Entry Total)	7292	veh/h				
Midblock Inflows (Total)	577	veh/h				
Midblock Outflows (Total)	-234	veh/h				
Percent Heavy Vehicles (Demand)	2.2	%				
Percent Heavy Vehicles (Arrival)	2.2	%				
Degree of Saturation	1.504					
Control Delay (Total)	182.04	veh-h/h			247.62	pers-h/h
Control Delay (Average)	12.9	sec			11.9	sec
Control Delay (Worst Lane)	490.9	sec				
Control Delay (Worst Movement)	531.6	sec			531.6	sec
Geometric Delay (Average)	0.7	sec				
Stop-Line Delay (Average)	12.2	sec				
Ave. Queue Storage Ratio (Worst Lane)	1.59					
Total Effective Stops	14496	veh/h			20918	pers/h
Effective Stop Rate	0.29		1.27	per km	0.28	
Proportion Queued	0.23				0.22	
Performance Index	1146.1				1146.1	
Cost (Total)	16864.10	$/h	1.47	$/km	16864.10	$/h
Fuel Consumption (Total)	1394.0	L/h	121.8	mL/km		
Fuel Economy	12.2	L/100km				
Carbon Dioxide (Total)	3292.4	kg/h	287.6	g/km		
Hydrocarbons (Total)	0.309	kg/h	0.027	g/km		
Carbon Monoxide (Total)	3.462	kg/h	0.302	g/km		
NOx (Total)	4.021	kg/h	0.351	g/km		

Network Model Variability Index (Iterations 3 to N): 0.7 %
Number of Iterations: 6 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.4% 0.3% 0.2%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	24,462,720	veh/y	36,073,730	pers/y
Delay	87,379	veh-h/y	118,860	pers-h/y
Effective Stops	6,958,220	veh/y	10,040,540	pers/y
Travel Distance	5,494,583	veh-km/y	8,030,580	pers-km/y
Travel Time	179,984	veh-h/y	255,284	pers-h/y
Cost	8,094,768	$/y	8,094,768	$/y
Fuel Consumption	669,123	L/y		
Carbon Dioxide	1,580,361	kg/y		
Hydrocarbons	148	kg/y		
Carbon Monoxide	1,662	kg/y		
NOx	1,930	kg/y		

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia PM 2021 (Site Folder: 2021 PM Peak)] — **Network: N101 [2021 PM Peak (Network Folder: General)]**

GEH / Stoneham St / Belgravia St
Traffic signals
2021 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	200	0.5	200	0.5	0.812	66.7	LOS E	21.8	154.2	1.00	0.91	1.11	12.2
2	T1	416	1.4	416	1.4	* 0.812	60.6	LOS E	21.8	154.2	1.00	0.92	1.11	13.0
3	R2	254	1.2	254	1.2	0.666	60.5	LOS E	16.0	113.7	0.98	0.84	0.98	12.9
Approach		870	1.1	870	1.1	0.812	62.0	LOS E	21.8	154.2	0.99	0.90	1.07	12.8
East: Great Eastern Hwy														
4	L2	102	3.9	102	3.9	0.195	34.3	LOS C	5.5	44.9	0.69	0.71	0.69	22.3
5	T1	1442	2.6	1442	2.6	0.617	35.6	LOS D	18.4	130.6	0.86	0.76	0.86	8.9
6	R2	74	2.7	74	2.7	0.525	72.3	LOS E	5.8	41.5	1.00	0.78	1.00	4.9
6u	U	12	0.0	12	0.0	0.525	74.0	LOS E	5.8	41.5	1.00	0.78	1.00	4.9
Approach		1630	2.6	1630	2.6	0.617	37.5	LOS D	18.4	130.6	0.85	0.76	0.85	9.6
North: Stoneham St														
7	L2	9	0.0	9	0.0	0.046	66.9	LOS E	0.5	3.7	0.93	0.67	0.93	7.4
8	T1	224	0.0	213	0.0	* 0.804	71.8	LOS E	11.3	79.1	1.00	0.90	1.18	15.6
9	R2	255	2.0	243	2.1	0.804	77.2	LOS E	10.7	76.2	1.00	0.89	1.16	7.1
Approach		488	1.0	465 N1	1.1	0.804	74.5	LOS E	11.3	79.1	1.00	0.89	1.17	11.3
West: Great Eastern Hwy														
10	L2	733	0.4	733	0.4	0.615	12.8	LOS B	19.7	138.8	0.52	0.73	0.52	21.9
11	T1	2015	3.2	2015	3.2	* 0.777	35.0	LOS C	22.7	163.2	0.84	0.75	0.85	10.5
12	R2	83	0.0	83	0.0	* 0.549	72.8	LOS E	6.3	43.8	1.00	0.78	1.00	14.0
12u	U	10	0.0	10	0.0	0.549	74.4	LOS E	6.3	43.8	1.00	0.78	1.00	5.6
Approach		2841	2.4	2841	2.4	0.777	30.5	LOS C	22.7	163.2	0.76	0.75	0.77	12.3
All Vehicles		5829	2.2	5806 N1	2.2	0.812	40.7	LOS D	22.7	163.2	0.84	0.78	0.87	11.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey PM 2021 (Site Folder: 2021 PM Peak)] **Network: N101 [2021 PM Peak (Network Folder: General)]**

GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	113	0.0	113	0.0	0.488	66.4	LOS E	8.0	55.7	0.97	0.79	0.97	15.6
2	T1	180	2.8	180	2.8	*0.644	62.5	LOS E	11.1	79.4	1.00	0.82	1.00	16.8
3	R2	146	2.7	146	2.7	0.591	67.7	LOS E	9.5	68.7	0.99	0.81	0.99	15.7
Approach		439	2.1	439	2.1	0.644	65.2	LOS E	11.1	79.4	0.99	0.81	0.99	16.1
East: Great Eastern Hwy														
4	L2	131	0.0	131	0.0	0.092	9.0	LOS A	1.8	12.4	0.26	0.62	0.26	45.5
5	T1	1482	3.0	1482	3.0	0.451	27.4	LOS C	18.1	128.8	0.73	0.64	0.73	12.8
6	R2	240	0.4	240	0.4	*0.967	100.7	LOS F	22.1	155.4	1.00	1.08	1.50	4.2
6u	U	15	0.0	15	0.0	0.967	102.3	LOS F	22.1	155.4	1.00	1.08	1.50	4.2
Approach		1868	2.4	1868	2.4	0.967	36.1	LOS D	22.1	155.4	0.73	0.70	0.80	12.0
North: Resolution Dr														
7	L2	141	3.5	141	3.5	0.265	30.0	LOS C	5.8	42.3	0.70	0.75	0.70	13.4
8	T1	147	3.4	147	3.4	*0.738	73.1	LOS E	6.7	46.7	1.00	0.81	1.10	18.2
9	R2	23	0.0	23	0.0	0.191	74.5	LOS E	1.5	10.6	0.96	0.71	0.96	6.3
Approach		311	3.2	311	3.2	0.738	53.7	LOS D	6.7	46.7	0.86	0.77	0.91	16.0
West: Great Eastern Hwy														
10	L2	22	0.0	22	0.0	0.063	28.9	LOS C	1.6	15.5	0.59	0.58	0.59	17.8
11	T1	2331	2.8	2331	2.8	*0.894	38.3	LOS D	36.4	261.1	0.92	0.90	1.00	13.4
12	R2	168	1.8	168	1.8	0.746	70.6	LOS E	13.0	91.3	1.00	0.86	1.09	18.9
12u	U	22	0.0	22	0.0	0.746	72.2	LOS E	13.0	91.3	1.00	0.86	1.09	8.1
Approach		2543	2.7	2543	2.7	0.894	40.6	LOS D	36.4	261.1	0.92	0.90	1.00	14.1
All Vehicles		5161	2.6	5161	2.6	0.967	41.9	LOS D	36.4	261.1	0.86	0.81	0.92	13.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution PM 2021 (Site Folder: 2021 PM Peak)]

Network: N101 [2021 PM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 PM Peak
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	49	2.0	49	2.0	0.610	6.9	LOS A	4.9	35.2	0.70	0.87	0.83	29.1
6a	R1	40	0.0	40	0.0	0.610	12.0	LOS B	4.9	35.2	0.70	0.87	0.83	40.0
6	R2	507	2.2	507	2.2	0.610	13.4	LOS B	4.9	35.2	0.70	0.87	0.83	29.1
Approach		596	2.0	596	2.0	0.610	12.7	LOS B	4.9	35.2	0.70	0.87	0.83	30.0
North: Grandstand Rd														
7	L2	207	2.4	207	2.4	0.208	3.6	LOS A	1.2	8.6	0.24	0.48	0.24	34.5
9a	R1	380	0.3	380	0.3	0.208	8.4	LOS A	1.2	8.6	0.24	0.55	0.24	31.8
9b	R3	8	0.0	8	0.0	0.208	10.9	LOS B	1.2	8.3	0.25	0.57	0.25	47.5
9u	U	4	0.0	4	0.0	0.208	12.1	LOS B	1.2	8.3	0.25	0.57	0.25	31.1
Approach		599	1.0	599	1.0	0.208	6.8	LOS A	1.2	8.6	0.24	0.52	0.24	32.9
NorthWest: Resolution Dr														
27b	L3	13	0.0	13	0.0	0.190	9.7	LOS A	1.0	7.3	0.87	0.93	0.87	28.8
27a	L1	25	4.0	25	4.0	0.190	9.0	LOS A	1.0	7.3	0.87	0.93	0.87	28.8
29	R2	34	2.9	34	2.9	0.190	15.0	LOS B	1.0	7.3	0.87	0.93	0.87	28.8
Approach		72	2.8	72	2.8	0.190	11.9	LOS B	1.0	7.3	0.87	0.93	0.87	28.8
SouthWest: Stoneham St														
30	L2	50	0.0	47	0.0	0.756	8.7	LOS A	3.5	24.9	0.95	1.03	1.29	34.2
30a	L1	1425	0.5	1338	0.5	0.756	9.4	LOS A	3.5	24.9	0.95	1.05	1.31	14.2
32a	R1	16	6.2	15	6.6	0.756	14.3	LOS B	3.5	24.9	0.95	1.08	1.34	13.7
32u	U	5	0.0	5	0.0	0.756	17.9	LOS B	3.5	24.9	0.95	1.08	1.34	13.7
Approach		1496	0.5	1404 N1	0.6	0.756	9.5	LOS A	3.5	24.9	0.95	1.05	1.31	15.4
All Vehicles		2763	1.0	2671 N1	1.0	0.756	9.7	LOS A	4.9	35.2	0.74	0.89	0.95	24.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Appendix 2 – SIDRA Network Output 2031 Existing Network

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NETWORK SUMMARY

Network: N101 [2031 AM Peak (Network Folder: General)]

New Network
Network Category: (None)

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS D					
Speed Efficiency	0.51					
Travel Time Index	4.58					
Congestion Coefficient	1.95					
Travel Speed (Average)	30.6	km/h			31.6	km/h
Travel Distance (Total)	11123.4	veh-km/h			17145.1	pers-km/h
Travel Time (Total)	363.3	veh-h/h			542.6	pers-h/h
Desired Speed (Program)	59.8	km/h				
Demand Flows (Total for all Sites)	49353	veh/h			78017	pers/h
Arrival Flows (Total for all Sites)	49329	veh/h			77988	pers/h
Demand Flows (Entry Total)	6820	veh/h				
Midblock Inflows (Total)	89	veh/h				
Midblock Outflows (Total)	-30	veh/h				
Percent Heavy Vehicles (Demand)	4.2	%				
Percent Heavy Vehicles (Arrival)	4.2	%				
Degree of Saturation	1.052					
Control Delay (Total)	175.44	veh-h/h			244.61	pers-h/h
Control Delay (Average)	12.8	sec			11.3	sec
Control Delay (Worst Lane)	138.6	sec				
Control Delay (Worst Movement)	138.9	sec			138.9	sec
Geometric Delay (Average)	0.6	sec				
Stop-Line Delay (Average)	12.2	sec				
Ave. Queue Storage Ratio (Worst Lane)	1.00					
Total Effective Stops	11920	veh/h			21255	pers/h
Effective Stop Rate	0.24		1.07	per km	0.27	
Proportion Queued	0.21				0.19	
Performance Index	1039.4				1039.4	
Cost (Total)	17614.30	$/h	1.58	$/km	17614.30	$/h
Fuel Consumption (Total)	1505.3	L/h	135.3	mL/km		
Fuel Economy	13.5	L/100km				
Carbon Dioxide (Total)	3569.9	kg/h	320.9	g/km		
Hydrocarbons (Total)	0.321	kg/h	0.029	g/km		
Carbon Monoxide (Total)	3.619	kg/h	0.325	g/km		
NOx (Total)	8.302	kg/h	0.746	g/km		

Network Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 5 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.0% 0.0% 0.0%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	23,689,440	veh/y	37,448,070	pers/y
Delay	84,210	veh-h/y	117,415	pers-h/y
Effective Stops	5,721,724	veh/y	10,202,420	pers/y
Travel Distance	5,339,232	veh-km/y	8,229,638	pers-km/y
Travel Time	174,372	veh-h/y	260,425	pers-h/y
Cost	8,454,863	$/y	8,454,863	$/y
Fuel Consumption	722,563	L/y		
Carbon Dioxide	1,713,534	kg/y		
Hydrocarbons	154	kg/y		
Carbon Monoxide	1,737	kg/y		
NOx	3,985	kg/y		

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia AM 2031 (Site Folder: 2031 AM Peak)] **Network: N101 [2031 AM Peak (Network Folder: General)]**

GEH / Stoneham St / Belgravia St
Traffic signals
2031 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	63	4.8	63	4.8	0.387	65.4	LOS E	5.4	40.1	0.96	0.77	0.96	12.2
2	T1	112	8.0	112	8.0	* 0.387	59.7	LOS E	5.5	41.7	0.96	0.76	0.96	13.2
3	R2	73	9.6	73	9.6	0.347	65.3	LOS E	4.5	35.4	0.96	0.77	0.96	12.1
Approach		248	7.7	248	7.7	0.387	62.8	LOS E	5.5	41.7	0.96	0.76	0.96	12.6
East: Great Eastern Hwy														
4	L2	204	5.9	204	5.9	0.297	29.4	LOS C	9.3	71.0	0.67	0.74	0.67	23.9
5	T1	2612	4.5	2612	4.5	* 0.998	87.4	LOS F	17.8	130.6	1.00	1.24	1.40	4.0
6	R2	19	5.3	19	5.3	0.179	72.2	LOS E	1.3	10.1	0.98	0.71	0.98	4.9
6u	U	1	0.0	1	0.0	0.179	73.9	LOS E	1.3	10.1	0.98	0.71	0.98	4.9
Approach		2836	4.6	2836	4.6	0.998	83.1	LOS F	17.8	130.6	0.97	1.20	1.34	4.8
North: Stoneham St														
7	L2	5	0.0	5	0.0	0.019	59.0	LOS E	0.3	2.0	0.88	0.65	0.88	8.2
8	T1	308	4.2	308	4.2	* 1.052	137.4	LOS F	28.9	202.2	1.00	1.33	1.82	9.2
9	R2	482	0.4	482	0.4	1.052	138.9	LOS F	26.1	183.6	1.00	1.23	1.77	4.0
Approach		795	1.9	795	1.9	1.052	137.8	LOS F	28.9	202.2	1.00	1.27	1.78	6.2
West: Great Eastern Hwy														
10	L2	228	1.3	228	1.3	0.149	6.7	LOS A	1.8	12.6	0.19	0.61	0.19	31.3
11	T1	1496	5.3	1496	5.3	0.463	21.9	LOS C	14.1	104.6	0.58	0.51	0.58	15.2
12	R2	61	3.3	61	3.3	* 0.842	82.6	LOS F	6.8	48.0	1.00	0.93	1.35	12.6
12u	U	32	0.0	32	0.0	0.842	84.3	LOS F	6.8	48.0	1.00	0.93	1.35	5.0
Approach		1817	4.7	1817	4.7	0.842	23.1	LOS C	14.1	104.6	0.55	0.54	0.57	15.3
All Vehicles		5696	4.4	5696	4.4	1.052	70.7	LOS E	28.9	202.2	0.84	0.98	1.14	6.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey AM 2031 (Site Folder: 2031 AM Peak)] **Network: N101 [2031 AM Peak (Network Folder: General)]**

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	102	2.0	102	2.0	0.538	68.0	LOS E	6.8	50.7	0.99	0.79	0.99	15.3
2	T1	113	5.3	113	5.3	0.538	61.9	LOS E	6.8	50.7	0.99	0.78	0.99	16.9
3	R2	130	3.8	130	3.8	* 0.655	69.7	LOS E	8.5	62.5	1.00	0.82	1.04	15.3
Approach		345	3.8	345	3.8	0.655	66.7	LOS E	8.5	62.5	0.99	0.80	1.01	15.8
East: Great Eastern Hwy														
4	L2	133	4.5	133	4.5	0.094	8.0	LOS A	1.4	10.1	0.23	0.61	0.23	45.0
5	T1	2605	4.8	2605	4.8	* 0.881	42.5	LOS D	22.2	163.2	0.94	0.95	1.06	8.9
6	R2	147	7.5	147	7.5	* 0.905	85.1	LOS F	12.2	92.0	1.00	1.01	1.41	4.9
6u	U	14	0.0	14	0.0	0.905	86.7	LOS F	12.2	92.0	1.00	1.01	1.41	4.9
Approach		2899	4.9	2899	4.9	0.905	43.3	LOS D	22.2	163.2	0.91	0.94	1.04	9.8
North: Resolution Dr														
7	L2	262	1.9	262	1.9	0.459	16.7	LOS B	8.2	58.8	0.57	0.74	0.57	20.4
8	T1	140	7.1	140	7.1	0.636	68.0	LOS E	5.9	41.9	1.00	0.78	1.03	19.1
9	R2	90	1.1	90	1.1	* 0.851	81.5	LOS F	6.5	46.1	1.00	0.91	1.31	5.8
Approach		492	3.3	492	3.3	0.851	43.1	LOS D	8.2	58.8	0.77	0.78	0.84	15.6
West: Great Eastern Hwy														
10	L2	8	0.0	8	0.0	0.030	23.9	LOS C	0.7	7.3	0.53	0.50	0.53	21.1
11	T1	1459	6.0	1459	6.0	0.520	18.6	LOS B	16.0	119.9	0.55	0.49	0.55	22.3
12	R2	105	1.0	105	1.0	0.700	71.9	LOS E	8.3	58.0	1.00	0.84	1.09	18.7
12u	U	19	0.0	19	0.0	0.700	73.5	LOS E	8.3	58.0	1.00	0.84	1.09	8.0
Approach		1591	5.6	1591	5.6	0.700	22.8	LOS C	16.0	119.9	0.59	0.52	0.60	21.2
All Vehicles		5327	4.9	5327	4.9	0.905	38.6	LOS D	22.2	163.2	0.81	0.79	0.89	13.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution AM 2031 (Site Folder: 2031 AM Peak)] — **Network: N101 [2031 AM Peak (Network Folder: General)]**

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 AM Peak
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	29	6.9	29	6.9	0.382	7.2	LOS A	2.1	15.5	0.72	0.91	0.76	28.8
6a	R1	16	6.3	16	6.3	0.382	12.5	LOS B	2.1	15.5	0.72	0.91	0.76	38.9
6	R2	242	4.5	242	4.5	0.382	13.6	LOS B	2.1	15.5	0.72	0.91	0.76	28.8
Approach		287	4.9	287	4.9	0.382	12.9	LOS B	2.1	15.5	0.72	0.91	0.76	29.6
North: Grandstand Rd														
7	L2	426	2.6	426	2.6	0.425	3.9	LOS A	2.9	20.5	0.34	0.51	0.34	33.4
9a	R1	759	1.1	759	1.1	0.425	8.7	LOS A	2.9	20.5	0.36	0.57	0.36	30.9
9b	R3	6	0.0	6	0.0	0.425	11.2	LOS B	2.8	20.0	0.36	0.59	0.36	46.5
9u	U	2	0.0	2	0.0	0.425	12.5	LOS B	2.8	20.0	0.36	0.59	0.36	30.2
Approach		1193	1.6	1193	1.6	0.425	7.0	LOS A	2.9	20.5	0.35	0.55	0.35	31.8
NorthWest: Resolution Dr														
27b	L3	13	7.7	13	7.7	0.120	4.4	LOS A	0.5	3.5	0.51	0.61	0.51	35.5
27a	L1	50	0.0	50	0.0	0.120	3.4	LOS A	0.5	3.5	0.51	0.61	0.51	35.5
29	R2	48	0.0	48	0.0	0.120	9.4	LOS A	0.5	3.5	0.51	0.61	0.51	35.5
Approach		111	0.9	111	0.9	0.120	6.1	LOS A	0.5	3.5	0.51	0.61	0.51	35.5
SouthWest: Stoneham St														
30	L2	19	0.0	19	0.0	0.160	2.1	LOS A	0.9	6.4	0.43	0.44	0.43	47.0
30a	L1	334	2.7	334	2.7	0.160	2.3	LOS A	0.9	6.4	0.44	0.47	0.44	30.9
32a	R1	22	0.0	22	0.0	0.160	6.4	LOS A	0.9	6.3	0.44	0.50	0.44	30.1
32u	U	4	25.0	4	25.0	0.160	10.4	LOS B	0.9	6.3	0.44	0.50	0.44	30.1
Approach		379	2.6	379	2.6	0.160	2.6	LOS A	0.9	6.4	0.44	0.47	0.44	32.9
All Vehicles		1970	2.2	1970	2.2	0.425	7.0	LOS A	2.9	20.5	0.43	0.59	0.44	31.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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NETWORK SUMMARY

Network: N101 [2031 PM Peak (Network Folder: General)]

New Network
Network Category: (None)

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS E					
Speed Efficiency	0.45					
Travel Time Index	3.90					
Congestion Coefficient	2.22					
Travel Speed (Average)	26.9	km/h			28.5	km/h
Travel Distance (Total)	11965.4	veh-km/h			18550.5	pers-km/h
Travel Time (Total)	444.0	veh-h/h			650.6	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	53437	veh/h			85765	pers/h
Arrival Flows (Total for all Sites)	52906	veh/h			85106	pers/h
Demand Flows (Entry Total)	7638	veh/h				
Midblock Inflows (Total)	391	veh/h				
Midblock Outflows (Total)	-23	veh/h				
Percent Heavy Vehicles (Demand)	2.1	%				
Percent Heavy Vehicles (Arrival)	2.1	%				
Degree of Saturation	1.937					
Control Delay (Total)	241.83	veh-h/h			330.15	pers-h/h
Control Delay (Average)	16.5	sec			14.0	sec
Control Delay (Worst Lane)	875.1	sec				
Control Delay (Worst Movement)	912.1	sec			912.1	sec
Geometric Delay (Average)	0.7	sec				
Stop-Line Delay (Average)	15.7	sec				
Ave. Queue Storage Ratio (Worst Lane)	2.35					
Total Effective Stops	16273	veh/h			27080	pers/h
Effective Stop Rate	0.31		1.36	per km	0.32	
Proportion Queued	0.24				0.21	
Performance Index	1320.4				1320.4	
Cost (Total)	20345.79	$/h	1.70	$/km	20345.79	$/h
Fuel Consumption (Total)	1528.9	L/h	127.8	mL/km		
Fuel Economy	12.8	L/100km				
Carbon Dioxide (Total)	3609.7	kg/h	301.7	g/km		
Hydrocarbons (Total)	0.344	kg/h	0.029	g/km		
Carbon Monoxide (Total)	3.718	kg/h	0.311	g/km		
NOx (Total)	4.218	kg/h	0.353	g/km		

Network Model Variability Index (Iterations 3 to N): 0.6 %
Number of Iterations: 9 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.1% 0.0% 0.0%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	25,649,760	veh/y	41,167,300	pers/y
Delay	116,076	veh-h/y	158,471	pers-h/y
Effective Stops	7,811,153	veh/y	12,998,270	pers/y
Travel Distance	5,743,401	veh-km/y	8,904,247	pers-km/y
Travel Time	213,118	veh-h/y	312,269	pers-h/y
Cost	9,765,982	$/y	9,765,982	$/y
Fuel Consumption	733,861	L/y		
Carbon Dioxide	1,732,659	kg/y		
Hydrocarbons	165	kg/y		
Carbon Monoxide	1,785	kg/y		
NOx	2,025	kg/y		

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2031 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	210	0.5	210	0.5	0.866	71.9	LOS E	24.7	174.2	1.00	0.96	1.19	11.4
2	T1	437	1.4	437	1.4	* 0.866	65.9	LOS E	24.7	174.2	1.00	0.98	1.20	12.2
3	R2	267	1.1	267	1.1	0.700	61.3	LOS E	17.0	121.0	0.98	0.85	0.99	12.7
Approach		914	1.1	914	1.1	0.866	65.9	LOS E	24.7	174.2	1.00	0.94	1.14	12.2
East: Great Eastern Hwy														
4	L2	107	3.7	107	3.7	0.201	34.4	LOS C	5.8	46.6	0.69	0.72	0.69	22.3
5	T1	1514	2.4	1514	2.4	0.648	36.2	LOS D	18.4	130.6	0.87	0.77	0.87	8.8
6	R2	78	2.6	78	2.6	0.555	72.5	LOS E	6.1	44.0	1.00	0.78	1.00	4.9
6u	U	13	0.0	13	0.0	0.555	74.3	LOS E	6.1	44.0	1.00	0.78	1.00	4.9
Approach		1712	2.5	1712	2.5	0.648	38.0	LOS D	18.4	130.6	0.87	0.77	0.87	9.4
North: Stoneham St														
7	L2	9	0.0	8	0.0	0.044	66.9	LOS E	0.5	3.6	0.93	0.67	0.93	7.4
8	T1	234	0.0	218	0.0	* 0.822	72.8	LOS E	11.7	81.6	1.00	0.92	1.21	15.5
9	R2	267	1.9	249	2.0	0.822	78.0	LOS E	11.1	78.6	1.00	0.90	1.19	7.0
Approach		510	1.0	475 N1	1.1	0.822	75.4	LOS E	11.7	81.6	1.00	0.91	1.19	11.2
West: Great Eastern Hwy														
10	L2	770	0.4	770	0.4	0.649	13.5	LOS B	22.2	155.9	0.55	0.74	0.55	21.2
11	T1	2115	3.2	2115	3.2	* 0.819	37.5	LOS D	22.7	163.2	0.87	0.80	0.90	9.9
12	R2	87	0.0	87	0.0	* 0.579	73.0	LOS E	6.6	46.3	1.00	0.78	1.00	14.0
12u	U	11	0.0	11	0.0	0.579	74.7	LOS E	6.6	46.3	1.00	0.78	1.00	5.5
Approach		2983	2.3	2983	2.3	0.819	32.5	LOS C	22.7	163.2	0.79	0.79	0.81	11.7
All Vehicles		6119	2.1	6084 N1	2.1	0.866	42.4	LOS D	24.7	174.2	0.86	0.81	0.91	11.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey PM 2031 (Site Folder: 2031 PM Peak)] **Network: N101 [2031 PM Peak (Network Folder: General)]**

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	119	0.0	119	0.0	0.511	66.7	LOS E	8.4	58.6	0.98	0.80	0.98	15.6
2	T1	188	2.7	188	2.7	* 0.675	63.1	LOS E	11.7	84.0	1.00	0.83	1.02	16.7
3	R2	153	2.6	153	2.6	0.618	68.0	LOS E	10.0	72.2	0.99	0.81	0.99	15.6
Approach		460	2.0	460	2.0	0.675	65.6	LOS E	11.7	84.0	0.99	0.82	1.00	16.0
East: Great Eastern Hwy														
4	L2	138	0.0	138	0.0	0.098	9.3	LOS A	2.0	13.7	0.27	0.62	0.27	45.3
5	T1	1557	2.9	1557	2.9	0.474	27.7	LOS C	19.3	137.4	0.74	0.65	0.74	12.7
6	R2	251	0.4	251	0.4	* 1.013	122.4	LOS F	23.2	163.2	1.00	1.16	1.66	3.5
6u	U	16	0.0	16	0.0	1.013	124.1	LOS F	23.2	163.2	1.00	1.16	1.66	3.5
Approach		1962	2.3	1962	2.3	1.013	39.3	LOS D	23.2	163.2	0.74	0.72	0.83	11.1
North: Resolution Dr														
7	L2	147	3.4	146	3.4	0.281	33.9	LOS C	6.5	47.0	0.74	0.76	0.74	12.2
8	T1	154	3.2	153	3.3	* 0.769	73.7	LOS E	7.0	49.1	1.00	0.82	1.12	18.1
9	R2	24	0.0	24	0.0	0.199	74.6	LOS E	1.6	11.0	0.96	0.71	0.96	6.3
Approach		325	3.1	324 N1	3.1	0.769	55.8	LOS E	7.0	49.1	0.88	0.79	0.94	15.6
West: Great Eastern Hwy														
10	L2	23	0.0	23	0.0	0.064	28.9	LOS C	1.6	15.8	0.59	0.59	0.59	17.8
11	T1	2444	2.7	2443	2.7	* 0.938	48.4	LOS D	36.4	261.1	0.97	1.01	1.13	11.1
12	R2	176	1.7	176	1.7	0.721	69.6	LOS E	12.6	88.7	1.00	0.85	1.06	19.1
12u	U	11	0.0	11	0.0	0.721	71.2	LOS E	12.6	88.7	1.00	0.85	1.06	8.2
Approach		2654	2.6	2653 N 1	2.6	0.938	49.7	LOS D	36.4	261.1	0.97	1.00	1.12	12.0
All Vehicles		5401	2.5	5399 N 1	2.5	1.013	47.7	LOS D	36.4	261.1	0.88	0.87	0.99	12.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 PM Peak
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	51	2.0	51	2.0	0.642	7.4	LOS A	5.5	39.5	0.74	0.91	0.89	28.5
6a	R1	42	0.0	42	0.0	0.642	12.6	LOS B	5.5	39.5	0.74	0.91	0.89	39.4
6	R2	529	2.1	527	2.1	0.642	13.9	LOS B	5.5	39.5	0.74	0.91	0.89	28.5
Approach		622	1.9	619 N1	1.9	0.642	13.3	LOS B	5.5	39.5	0.74	0.91	0.89	29.4
North: Grandstand Rd														
7	L2	217	2.3	217	2.3	0.219	3.7	LOS A	1.3	9.2	0.25	0.48	0.25	34.4
9a	R1	398	0.3	398	0.3	0.219	8.4	LOS A	1.3	9.2	0.25	0.55	0.25	31.8
9b	R3	8	0.0	8	0.0	0.219	10.9	LOS B	1.3	8.9	0.25	0.57	0.25	47.4
9u	U	4	0.0	4	0.0	0.219	12.1	LOS B	1.3	8.9	0.25	0.57	0.25	31.0
Approach		627	1.0	627	1.0	0.219	6.8	LOS A	1.3	9.2	0.25	0.53	0.25	32.8
NorthWest: Resolution Dr														
27b	L3	14	0.0	14	0.0	0.212	10.2	LOS B	1.1	8.2	0.88	0.93	0.88	28.3
27a	L1	26	3.8	26	3.8	0.212	9.5	LOS A	1.1	8.2	0.88	0.93	0.88	28.3
29	R2	36	2.8	36	2.8	0.212	15.5	LOS B	1.1	8.2	0.88	0.93	0.88	28.3
Approach		76	2.6	76	2.6	0.212	12.5	LOS B	1.1	8.2	0.88	0.93	0.88	28.3
SouthWest: Stoneham St														
30	L2	53	0.0	48	0.0	0.794	10.4	LOS B	3.5	24.9	1.00	1.11	1.44	32.0
30a	L1	1498	0.5	1366	0.5	0.794	11.1	LOS B	3.5	24.9	1.00	1.13	1.46	12.5
32a	R1	17	5.9	16	6.4	0.794	16.2	LOS B	3.5	24.9	0.99	1.16	1.48	12.0
32u	U	5	0.0	5	0.0	0.794	19.7	LOS B	3.5	24.9	0.99	1.16	1.48	12.0
Approach		1573	0.5	1434 N1	0.6	0.794	11.2	LOS B	3.5	24.9	1.00	1.13	1.46	13.6
All Vehicles		2898	1.0	2757 N1	1.0	0.794	10.7	LOS B	5.5	39.5	0.76	0.94	1.04	23.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Appendix 3 – SIDRA Network Output 2041 Existing Network

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NETWORK SUMMARY

Network: N101 [2041 AM Peak (Network Folder: General)]

New Network
Network Category: (None)

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS E					
Speed Efficiency	0.38					
Travel Time Index	3.07					
Congestion Coefficient	2.66					
Travel Speed (Average)	22.5	km/h			23.7	km/h
Travel Distance (Total)	11607.3	veh-km/h			17725.7	pers-km/h
Travel Time (Total)	515.8	veh-h/h			749.4	pers-h/h
Desired Speed (Program)	59.8	km/h				
Demand Flows (Total for all Sites)	51917	veh/h			81094	pers/h
Arrival Flows (Total for all Sites)	51745	veh/h			80887	pers/h
Demand Flows (Entry Total)	7152	veh/h				
Midblock Inflows (Total)	217	veh/h				
Midblock Outflows (Total)	-156	veh/h				
Percent Heavy Vehicles (Demand)	4.2	%				
Percent Heavy Vehicles (Arrival)	4.2	%				
Degree of Saturation	1.158					
Control Delay (Total)	315.01	veh-h/h			435.33	pers-h/h
Control Delay (Average)	21.9	sec			19.4	sec
Control Delay (Worst Lane)	224.8	sec				
Control Delay (Worst Movement)	224.8	sec			224.8	sec
Geometric Delay (Average)	0.6	sec				
Stop-Line Delay (Average)	21.3	sec				
Ave. Queue Storage Ratio (Worst Lane)	1.00					
Total Effective Stops	15104	veh/h			25604	pers/h
Effective Stop Rate	0.29		1.30	per km	0.32	
Proportion Queued	0.21				0.20	
Performance Index	1291.3				1291.3	
Cost (Total)	23857.12	$/h	2.06	$/km	23857.12	$/h
Fuel Consumption (Total)	1811.6	L/h	156.1	mL/km		
Fuel Economy	15.6	L/100km				
Carbon Dioxide (Total)	4293.3	kg/h	369.9	g/km		
Hydrocarbons (Total)	0.415	kg/h	0.036	g/km		
Carbon Monoxide (Total)	4.242	kg/h	0.365	g/km		
NOx (Total)	9.748	kg/h	0.840	g/km		

Network Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 5 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.0% 0.0% 0.0%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	24,920,160	veh/y	38,924,930	pers/y
Delay	151,205	veh-h/y	208,960	pers-h/y
Effective Stops	7,249,894	veh/y	12,289,960	pers/y
Travel Distance	5,571,491	veh-km/y	8,508,312	pers-km/y
Travel Time	247,562	veh-h/y	359,700	pers-h/y
Cost	11,451,420	$/y	11,451,420	$/y
Fuel Consumption	869,555	L/y		
Carbon Dioxide	2,060,780	kg/y		
Hydrocarbons	199	kg/y		
Carbon Monoxide	2,036	kg/y		
NOx	4,679	kg/y		

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia AM 2041 (Site Folder: 2041 AM Peak)] **Network: N101 [2041 AM Peak (Network Folder: General)]**

GEH / Stoneham St / Belgravia St
Traffic signals
2041 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	66	4.5	66	4.5	0.408	65.5	LOS E	5.7	42.4	0.97	0.77	0.97	12.2
2	T1	118	8.5	118	8.5	* 0.408	59.9	LOS E	5.7	44.1	0.97	0.76	0.97	13.1
3	R2	78	10.3	78	10.3	0.373	65.6	LOS E	4.8	38.3	0.96	0.77	0.96	12.1
Approach		262	8.0	262	8.0	0.408	63.0	LOS E	5.7	44.1	0.96	0.77	0.96	12.6
East: Great Eastern Hwy														
4	L2	214	5.6	214	5.6	0.309	29.5	LOS C	9.7	74.3	0.67	0.74	0.67	23.8
5	T1	2744	4.4	2744	4.4	* 1.048	119.5	LOS F	17.8	130.6	1.00	1.41	1.61	3.0
6	R2	20	5.0	20	5.0	0.187	72.2	LOS E	1.4	10.6	0.98	0.71	0.98	4.9
6u	U	1	0.0	1	0.0	0.187	73.9	LOS E	1.4	10.6	0.98	0.71	0.98	4.9
Approach		2979	4.5	2979	4.5	1.048	112.7	LOS F	17.8	130.6	0.97	1.36	1.54	3.6
North: Stoneham St														
7	L2	6	0.0	6	0.0	0.023	59.1	LOS E	0.3	2.4	0.89	0.66	0.89	8.2
8	T1	323	4.0	323	4.0	* 1.103	173.8	LOS F	32.6	228.5	1.00	1.46	2.03	7.5
9	R2	506	0.4	506	0.4	1.103	175.7	LOS F	31.3	219.8	1.00	1.34	1.97	3.2
Approach		835	1.8	835	1.8	1.103	174.1	LOS F	32.6	228.5	1.00	1.38	1.99	4.9
West: Great Eastern Hwy														
10	L2	239	1.3	239	1.3	0.157	6.7	LOS A	1.9	13.3	0.19	0.61	0.19	31.3
11	T1	1568	5.2	1568	5.2	0.487	22.1	LOS C	15.1	112.2	0.59	0.52	0.59	15.0
12	R2	64	3.1	64	3.1	* 0.877	85.3	LOS F	7.2	51.1	1.00	0.96	1.42	12.3
12u	U	33	0.0	33	0.0	0.877	86.9	LOS F	7.2	51.1	1.00	0.96	1.42	4.8
Approach		1904	4.6	1904	4.6	0.877	23.5	LOS C	15.1	112.2	0.56	0.55	0.58	15.1
All Vehicles		5980	4.3	5980	4.3	1.103	90.7	LOS F	32.6	228.5	0.84	1.08	1.27	5.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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Document Set ID: 6149413
Version: 1, Version Date: 11/06/2026

MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey AM 2041 (Site Folder: 2041 AM Peak)] **Network: N101 [2041 AM Peak (Network Folder: General)]**

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	107	1.9	107	1.9	0.562	68.2	LOS E	7.2	53.1	0.99	0.79	0.99	15.3
2	T1	118	5.1	118	5.1	0.562	62.1	LOS E	7.2	53.1	0.99	0.78	0.99	16.9
3	R2	136	3.7	136	3.7	* 0.684	70.3	LOS E	9.0	65.8	1.00	0.83	1.06	15.2
Approach		361	3.6	361	3.6	0.684	67.0	LOS E	9.0	65.8	0.99	0.81	1.02	15.8
East: Great Eastern Hwy														
4	L2	141	5.0	141	5.0	0.101	8.4	LOS A	1.7	11.8	0.25	0.61	0.25	44.5
5	T1	2736	4.8	2736	4.8	* 1.099	165.0	LOS F	22.2	163.2	1.00	1.65	1.92	2.5
6	R2	153	7.2	153	7.2	* 0.936	91.2	LOS F	13.2	99.3	1.00	1.05	1.50	4.6
6u	U	14	0.0	14	0.0	0.936	92.8	LOS F	13.2	99.3	1.00	1.05	1.50	4.6
Approach		3044	4.9	3044	4.9	1.099	153.7	LOS F	22.2	163.2	0.97	1.57	1.82	3.1
North: Resolution Dr														
7	L2	274	1.8	274	1.8	0.494	18.1	LOS B	9.3	66.4	0.61	0.76	0.61	19.3
8	T1	147	6.8	147	6.8	0.666	68.3	LOS E	6.3	44.2	1.00	0.79	1.05	19.0
9	R2	95	1.1	95	1.1	* 1.158	224.8	LOS F	12.7	89.8	1.00	1.29	2.35	2.2
Approach		516	3.1	516	3.1	1.158	70.5	LOS E	12.7	89.8	0.79	0.87	1.06	10.4
West: Great Eastern Hwy														
10	L2	9	0.0	9	0.0	0.032	23.9	LOS C	0.7	7.5	0.53	0.51	0.53	20.9
11	T1	1531	6.0	1531	6.0	0.547	18.9	LOS B	17.3	129.5	0.57	0.51	0.57	22.1
12	R2	110	0.9	110	0.9	0.775	74.6	LOS E	9.0	62.8	1.00	0.89	1.18	18.3
12u	U	20	0.0	20	0.0	0.775	76.2	LOS E	9.0	62.8	1.00	0.89	1.18	7.7
Approach		1670	5.6	1670	5.6	0.775	23.3	LOS C	17.3	129.5	0.60	0.54	0.62	20.9
All Vehicles		5591	4.8	5591	4.8	1.158	101.5	LOS F	22.2	163.2	0.84	1.15	1.34	5.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution AM 2041 (Site Folder: 2041 AM Peak)]

Network: N101 [2041 AM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 AM Peak
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	31	6.5	31	6.5	0.413	7.8	LOS A	2.4	17.6	0.74	0.93	0.82	28.2
6a	R1	16	6.3	16	6.2	0.413	13.0	LOS B	2.4	17.6	0.74	0.93	0.82	38.3
6	R2	254	4.7	254	4.7	0.413	14.2	LOS B	2.4	17.6	0.74	0.93	0.82	28.2
Approach		301	5.0	301	5.0	0.413	13.5	LOS B	2.4	17.6	0.74	0.93	0.82	28.9
North: Grandstand Rd														
7	L2	446	2.7	446	2.7	0.449	4.0	LOS A	3.1	22.4	0.36	0.51	0.36	33.2
9a	R1	797	1.1	797	1.1	0.449	8.8	LOS A	3.1	22.4	0.38	0.57	0.38	30.7
9b	R3	7	0.0	7	0.0	0.449	11.3	LOS B	3.1	21.8	0.38	0.60	0.38	46.3
9u	U	2	0.0	2	0.0	0.449	12.5	LOS B	3.1	21.8	0.38	0.60	0.38	30.0
Approach		1252	1.7	1252	1.7	0.449	7.1	LOS A	3.1	22.4	0.37	0.55	0.37	31.6
NorthWest: Resolution Dr														
27b	L3	13	7.7	13	7.7	0.129	4.5	LOS A	0.5	3.8	0.52	0.62	0.52	35.4
27a	L1	53	0.0	53	0.0	0.129	3.5	LOS A	0.5	3.8	0.52	0.62	0.52	35.4
29	R2	51	0.0	51	0.0	0.129	9.5	LOS A	0.5	3.8	0.52	0.62	0.52	35.4
Approach		117	0.9	117	0.9	0.129	6.2	LOS A	0.5	3.8	0.52	0.62	0.52	35.4
SouthWest: Stoneham St														
30	L2	20	0.0	20	0.0	0.171	2.2	LOS A	1.0	7.0	0.45	0.45	0.45	46.9
30a	L1	351	2.8	351	2.8	0.171	2.3	LOS A	1.0	7.0	0.46	0.48	0.46	30.6
32a	R1	23	0.0	23	0.0	0.171	6.5	LOS A	0.9	6.8	0.46	0.51	0.46	29.8
32u	U	4	25.0	4	25.0	0.171	10.4	LOS B	0.9	6.8	0.46	0.51	0.46	29.8
Approach		398	2.8	398	2.8	0.171	2.6	LOS A	1.0	7.0	0.46	0.48	0.46	32.6
All Vehicles		2068	2.3	2068	2.3	0.449	7.1	LOS A	3.1	22.4	0.45	0.60	0.46	31.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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NETWORK SUMMARY

Network: N101 [2041 PM Peak (Network Folder: General)]

New Network
Network Category: (None)

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS E					
Speed Efficiency	0.38					
Travel Time Index	3.10					
Congestion Coefficient	2.64					
Travel Speed (Average)	22.7	km/h			24.5	km/h
Travel Distance (Total)	12510.3	veh-km/h			19071.6	pers-km/h
Travel Time (Total)	552.2	veh-h/h			777.8	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	56031	veh/h			87878	pers/h
Arrival Flows (Total for all Sites)	55259	veh/h			86914	pers/h
Demand Flows (Entry Total)	8011	veh/h				
Midblock Inflows (Total)	431	veh/h				
Midblock Outflows (Total)	-44	veh/h				
Percent Heavy Vehicles (Demand)	2.1	%				
Percent Heavy Vehicles (Arrival)	2.1	%				
Degree of Saturation	2.596					
Control Delay (Total)	340.05	veh-h/h			448.22	pers-h/h
Control Delay (Average)	22.2	sec			18.6	sec
Control Delay (Worst Lane)	1466.0	sec				
Control Delay (Worst Movement)	1499.0	sec			1499.0	sec
Geometric Delay (Average)	0.7	sec				
Stop-Line Delay (Average)	21.4	sec				
Ave. Queue Storage Ratio (Worst Lane)	3.10					
Total Effective Stops	18075	veh/h			28702	pers/h
Effective Stop Rate	0.33		1.44	per km	0.33	
Proportion Queued	0.24				0.22	
Performance Index	1566.8				1566.8	
Cost (Total)	24160.01	$/h	1.93	$/km	24160.01	$/h
Fuel Consumption (Total)	1722.5	L/h	137.7	mL/km		
Fuel Economy	13.8	L/100km				
Carbon Dioxide (Total)	4065.9	kg/h	325.0	g/km		
Hydrocarbons (Total)	0.394	kg/h	0.031	g/km		
Carbon Monoxide (Total)	4.064	kg/h	0.325	g/km		
NOx (Total)	4.660	kg/h	0.373	g/km		

Network Model Variability Index (Iterations 3 to N): 20.6 %
Number of Iterations: 7 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.9% 0.7% 0.3%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	26,894,880	veh/y	42,181,630	pers/y
Delay	163,225	veh-h/y	215,145	pers-h/y
Effective Stops	8,675,784	veh/y	13,776,860	pers/y
Travel Distance	6,004,929	veh-km/y	9,154,381	pers-km/y
Travel Time	265,053	veh-h/y	373,325	pers-h/y
Cost	11,596,800	$/y	11,596,800	$/y
Fuel Consumption	826,816	L/y		
Carbon Dioxide	1,951,608	kg/y		
Hydrocarbons	189	kg/y		
Carbon Monoxide	1,951	kg/y		
NOx	2,237	kg/y		

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia PM 2041 (Site Folder: 2041 PM Peak)] — **Network: N101 [2041 PM Peak (Network Folder: General)]**

GEH / Stoneham St / Belgravia St
Traffic signals
2041 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	221	0.5	221	0.5	0.927	83.3	LOS F	29.1	205.6	1.00	1.04	1.32	10.1
2	T1	460	1.5	460	1.5	*0.927	77.5	LOS E	29.1	205.6	1.00	1.07	1.34	10.7
3	R2	280	1.1	280	1.1	0.758	63.4	LOS E	18.4	130.8	0.99	0.87	1.05	12.4
Approach		961	1.1	961	1.1	0.927	74.7	LOS E	29.1	205.6	1.00	1.01	1.25	11.0
East: Great Eastern Hwy														
4	L2	112	3.6	112	3.6	0.208	34.5	LOS C	6.0	48.3	0.70	0.72	0.70	22.2
5	T1	1591	2.5	1591	2.5	0.682	36.9	LOS D	18.4	130.6	0.89	0.79	0.89	8.6
6	R2	82	2.4	82	2.4	0.578	72.7	LOS E	6.4	46.0	1.00	0.78	1.00	4.9
6u	U	13	0.0	13	0.0	0.578	74.4	LOS E	6.4	46.0	1.00	0.78	1.00	4.9
Approach		1798	2.5	1798	2.5	0.682	38.7	LOS D	18.4	130.6	0.88	0.79	0.88	9.3
North: Stoneham St														
7	L2	10	0.0	9	0.0	0.048	67.0	LOS E	0.6	3.9	0.93	0.67	0.93	7.3
8	T1	246	0.0	224	0.0	*0.848	74.4	LOS E	12.2	85.5	1.00	0.94	1.25	15.2
9	R2	280	2.1	256	2.3	0.848	79.5	LOS E	11.6	82.3	1.00	0.92	1.22	6.9
Approach		536	1.1	489 N1	1.2	0.848	76.9	LOS E	12.2	85.5	1.00	0.93	1.23	11.0
West: Great Eastern Hwy														
10	L2	810	0.4	810	0.4	0.686	14.3	LOS B	23.2	163.2	0.59	0.76	0.59	20.4
11	T1	2220	3.2	2220	3.2	*0.866	42.2	LOS D	22.7	163.2	0.90	0.87	0.98	9.0
12	R2	92	0.0	92	0.0	*0.608	73.4	LOS E	7.0	48.9	1.00	0.79	1.02	13.9
12u	U	11	0.0	11	0.0	0.608	75.1	LOS E	7.0	48.9	1.00	0.79	1.02	5.5
Approach		3133	2.3	3133	2.3	0.866	36.0	LOS D	23.2	163.2	0.83	0.84	0.88	10.7
All Vehicles		6428	2.1	6381 N1	2.1	0.927	45.7	LOS D	29.1	205.6	0.88	0.86	0.96	10.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey PM 2041 (Site Folder: 2041 PM Peak)] **Network: N101 [2041 PM Peak (Network Folder: General)]**

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	125	0.0	125	0.0	0.536	66.9	LOS E	8.8	61.6	0.98	0.80	0.98	15.6
2	T1	197	2.5	197	2.5	*0.708	64.0	LOS E	12.4	89.1	1.00	0.85	1.05	16.5
3	R2	161	2.5	161	2.5	0.650	68.5	LOS E	10.6	76.5	1.00	0.82	1.01	15.5
Approach		483	1.9	483	1.9	0.708	66.2	LOS E	12.4	89.1	0.99	0.83	1.02	15.9
East: Great Eastern Hwy														
4	L2	145	0.0	145	0.0	0.104	9.5	LOS A	2.1	15.0	0.28	0.62	0.28	45.0
5	T1	1636	2.9	1636	2.9	0.500	28.1	LOS C	20.6	146.9	0.75	0.66	0.75	12.5
6	R2	263	0.4	263	0.4	*1.062	152.7	LOS F	23.2	163.2	1.00	1.25	1.85	2.8
6u	U	17	0.0	17	0.0	1.062	154.3	LOS F	23.2	163.2	1.00	1.25	1.85	2.8
Approach		2061	2.3	2061	2.3	1.062	43.7	LOS D	23.2	163.2	0.75	0.74	0.87	10.1
North: Resolution Dr														
7	L2	155	3.9	154	3.9	0.305	38.7	LOS D	7.3	53.6	0.80	0.77	0.80	10.9
8	T1	160	3.1	159	3.1	*0.798	74.4	LOS E	7.3	51.4	1.00	0.84	1.15	18.0
9	R2	25	0.0	25	0.0	0.207	74.7	LOS E	1.6	11.4	0.96	0.71	0.96	6.3
Approach		340	3.2	338[N1]	3.3	0.798	58.1	LOS E	7.3	53.6	0.90	0.80	0.97	15.1
West: Great Eastern Hwy														
10	L2	24	0.0	24	0.0	0.066	28.9	LOS C	1.6	16.0	0.59	0.59	0.59	17.7
11	T1	2564	2.7	2563	2.7	*0.985	68.2	LOS E	36.4	261.1	1.00	1.15	1.29	8.4
12	R2	185	1.6	185	1.6	0.755	70.8	LOS E	13.4	94.4	1.00	0.87	1.10	18.9
12u	U	11	0.0	11	0.0	0.755	72.4	LOS E	13.4	94.4	1.00	0.87	1.10	8.1
Approach		2784	2.6	2783[N] 1	2.6	0.985	68.1	LOS E	36.4	261.1	0.99	1.12	1.27	9.3
All Vehicles		5668	2.5	5665[N] 1	2.5	1.062	58.5	LOS E	36.4	261.1	0.90	0.94	1.08	10.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution PM 2041 (Site Folder: 2041 PM Peak)]

Network: N101 [2041 PM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 PM Peak
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	54	1.9	53	1.9	0.672	8.0	LOS A	6.1	43.9	0.77	0.95	0.96	27.8
6a	R1	44	0.0	43	0.0	0.672	13.2	LOS B	6.1	43.9	0.77	0.95	0.96	38.7
6	R2	554	2.2	542	2.2	0.672	14.5	LOS B	6.1	43.9	0.77	0.95	0.96	27.8
Approach		652	2.0	638 N1	2.0	0.672	13.9	LOS B	6.1	43.9	0.77	0.95	0.96	28.7
North: Grandstand Rd														
7	L2	230	3.5	230	3.5	0.232	3.7	LOS A	1.4	9.9	0.26	0.48	0.26	34.3
9a	R1	417	0.2	417	0.2	0.232	8.4	LOS A	1.4	9.9	0.26	0.55	0.26	31.7
9b	R3	9	0.0	9	0.0	0.232	10.9	LOS B	1.4	9.5	0.26	0.58	0.26	47.3
9u	U	4	0.0	4	0.0	0.232	12.2	LOS B	1.4	9.5	0.26	0.58	0.26	30.9
Approach		660	1.4	660	1.4	0.232	6.8	LOS A	1.4	9.9	0.26	0.53	0.26	32.8
NorthWest: Resolution Dr														
27b	L3	14	0.0	14	0.0	0.230	10.7	LOS B	1.2	9.0	0.89	0.94	0.89	27.8
27a	L1	28	3.6	28	3.6	0.230	10.1	LOS B	1.2	9.0	0.89	0.94	0.89	27.8
29	R2	37	2.7	37	2.7	0.230	16.1	LOS B	1.2	9.0	0.89	0.94	0.89	27.8
Approach		79	2.5	79	2.5	0.230	13.0	LOS B	1.2	9.0	0.89	0.94	0.89	27.8
SouthWest: Stoneham St														
30	L2	55	0.0	49	0.0	0.833	12.6	LOS B	3.5	24.9	1.00	1.18	1.58	29.3
30a	L1	1575	0.5	1398	0.6	0.833	13.4	LOS B	3.5	24.9	1.00	1.20	1.61	10.7
32a	R1	18	5.6	16	6.2	0.833	18.7	LOS B	3.5	24.9	1.00	1.23	1.63	10.3
32u	U	6	0.0	5	0.0	0.833	22.1	LOS C	3.5	24.9	1.00	1.23	1.63	10.3
Approach		1654	0.5	1469 N1	0.6	0.833	13.5	LOS B	3.5	24.9	1.00	1.20	1.61	11.7
All Vehicles		3045	1.1	2845 N1	1.2	0.833	12.0	LOS B	6.1	43.9	0.77	0.98	1.13	21.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Appendix 4 – SIDRA Network Output 2021 Proposed Road Network

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NETWORK SUMMARY

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

Proposed Network
2021 Traffic Volumes
Network Category: Proposed Design 1

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS D					
Speed Efficiency	0.58					
Travel Time Index	5.37					
Congestion Coefficient	1.71					
Travel Speed (Average)	34.9	km/h			35.3	km/h
Travel Distance (Total)	10611.7	veh-km/h			16520.4	pers-km/h
Travel Time (Total)	304.0	veh-h/h			468.2	pers-h/h
Desired Speed (Program)	59.8	km/h				
Demand Flows (Total for all Sites)	45822	veh/h			73780	pers/h
Arrival Flows (Total for all Sites)	45822	veh/h			73780	pers/h
Demand Flows (Entry Total)	6528	veh/h				
Midblock Inflows (Total)	104	veh/h				
Midblock Outflows (Total)	-77	veh/h				
Percent Heavy Vehicles (Demand)	4.3	%				
Percent Heavy Vehicles (Arrival)	4.3	%				
Degree of Saturation	0.986					
Control Delay (Total)	125.39	veh-h/h			181.56	pers-h/h
Control Delay (Average)	9.9	sec			8.9	sec
Control Delay (Worst Lane)	101.2	sec				
Control Delay (Worst Movement)	101.5	sec			101.5	sec
Geometric Delay (Average)	0.6	sec				
Stop-Line Delay (Average)	9.2	sec				
Ave. Queue Storage Ratio (Worst Lane)	1.00					
Total Effective Stops	10175	veh/h			19002	pers/h
Effective Stop Rate	0.22		0.96	per km	0.26	
Proportion Queued	0.20				0.18	
Performance Index	893.5				893.5	
Cost (Total)	15191.53	$/h	1.43	$/km	15191.53	$/h
Fuel Consumption (Total)	1355.4	L/h	127.7	mL/km		
Fuel Economy	12.8	L/100km				
Carbon Dioxide (Total)	3215.4	kg/h	303.0	g/km		
Hydrocarbons (Total)	0.283	kg/h	0.027	g/km		
Carbon Monoxide (Total)	3.308	kg/h	0.312	g/km		
NOx (Total)	7.476	kg/h	0.705	g/km		

Network Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 5 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.0% 0.0% 0.0%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	21,994,560	veh/y	35,414,210	pers/y
Delay	60,188	veh-h/y	87,151	pers-h/y
Effective Stops	4,883,829	veh/y	9,120,820	pers/y
Travel Distance	5,093,591	veh-km/y	7,929,785	pers-km/y
Travel Time	145,919	veh-h/y	224,734	pers-h/y
Cost	7,291,933	$/y	7,291,933	$/y
Fuel Consumption	650,606	L/y		
Carbon Dioxide	1,543,384	kg/y		
Hydrocarbons	136	kg/y		
Carbon Monoxide	1,588	kg/y		

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NOx	3,589	kg/y

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2021 AM Peak with proposed road network
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	60	5.0	60	5.0	0.371	65.2	LOS E	5.1	38.4	0.96	0.77	0.96	12.2
2	T1	107	8.4	107	8.4	* 0.371	59.6	LOS E	5.2	39.8	0.96	0.75	0.96	13.2
3	R2	70	10.0	70	10.0	0.334	65.2	LOS E	4.3	34.1	0.95	0.76	0.95	12.2
Approach		237	8.0	237	8.0	0.371	62.7	LOS E	5.2	39.8	0.96	0.76	0.96	12.6
East: Great Eastern Hwy														
4	L2	194	5.7	194	5.7	0.280	28.6	LOS C	8.7	66.7	0.65	0.73	0.65	24.3
5	T1	2486	4.5	2486	4.5	* 0.934	55.7	LOS E	17.8	130.6	1.00	1.06	1.18	6.0
6	R2	18	5.6	18	5.6	0.171	72.1	LOS E	1.2	9.6	0.98	0.70	0.98	4.9
6u	U	1	0.0	1	0.0	0.171	73.8	LOS E	1.2	9.6	0.98	0.70	0.98	4.9
Approach		2699	4.6	2699	4.6	0.934	53.9	LOS D	17.8	130.6	0.97	1.04	1.14	7.1
North: Stoneham St														
7	L2	7	14.3	7	14.3	0.035	60.2	LOS E	0.4	3.7	0.89	0.67	0.89	8.1
8	T1	293	4.1	293	4.1	* 0.986	100.4	LOS F	22.9	160.3	1.00	1.18	1.57	12.1
9	R2	452	0.4	452	0.4	0.986	101.5	LOS F	20.6	144.6	1.00	1.10	1.52	5.5
Approach		752	2.0	752	2.0	0.986	100.7	LOS F	22.9	160.3	1.00	1.13	1.53	8.3
West: Great Eastern Hwy														
10	L2	217	1.4	217	1.4	0.141	6.6	LOS A	1.6	11.0	0.18	0.60	0.18	31.6
11	T1	1426	5.3	1426	5.3	0.431	20.8	LOS C	12.7	94.5	0.55	0.48	0.55	15.8
12	R2	58	3.4	58	3.4	* 0.797	80.4	LOS F	6.3	44.6	1.00	0.89	1.27	12.9
12u	U	30	0.0	30	0.0	0.797	82.0	LOS F	6.3	44.6	1.00	0.89	1.27	5.1
Approach		1731	4.7	1731	4.7	0.797	22.0	LOS C	12.7	94.5	0.53	0.52	0.54	15.8
All Vehicles		5419	4.4	5419	4.4	0.986	50.6	LOS D	22.9	160.3	0.83	0.87	1.00	9.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 AM Peak with proposed road network
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	97	2.1	97	2.1	0.514	67.8	LOS E	6.5	48.3	0.99	0.79	0.99	15.3
2	T1	108	5.6	108	5.6	0.514	61.7	LOS E	6.5	45.9	0.98	0.77	0.98	17.0
3	R2	124	4.0	124	4.0	* 0.626	69.2	LOS E	8.0	59.3	1.00	0.81	1.02	15.4
Approach		329	4.0	329	4.0	0.626	66.3	LOS E	8.0	59.3	0.99	0.79	1.00	15.9
East: Great Eastern Hwy														
4	L2	127	4.7	127	4.7	0.089	7.9	LOS A	1.4	9.6	0.23	0.61	0.23	45.0
5	T1	2479	4.8	2479	4.8	* 0.693	26.7	LOS C	22.2	163.2	0.81	0.73	0.81	13.0
6	R2	140	7.1	140	7.1	* 0.857	79.3	LOS E	11.0	83.1	1.00	0.95	1.30	5.2
6u	U	13	0.0	13	0.0	0.857	80.9	LOS F	11.0	83.1	1.00	0.95	1.30	5.2
Approach		2759	4.9	2759	4.9	0.857	28.8	LOS C	22.2	163.2	0.80	0.74	0.81	13.6
North: Resolution Dr														
7	L2	250	2.0	250	2.0	0.425	15.4	LOS B	7.2	51.8	0.53	0.73	0.53	21.5
8	T1	134	7.5	134	7.5	0.611	67.7	LOS E	5.7	40.0	1.00	0.77	1.02	19.1
9	R2	86	1.2	86	1.2	* 0.628	74.0	LOS E	5.7	40.4	1.00	0.79	1.04	6.3
Approach		470	3.4	470	3.4	0.628	41.0	LOS D	7.2	51.8	0.75	0.75	0.76	16.2
West: Great Eastern Hwy														
10	L2	8	0.0	8	0.0	0.030	23.8	LOS C	0.7	7.3	0.53	0.50	0.53	21.1
11	T1	1395	6.0	1395	6.0	0.497	18.3	LOS B	15.0	112.0	0.54	0.48	0.54	22.5
12	R2	104	1.0	104	1.0	0.658	70.7	LOS E	8.0	56.2	1.00	0.82	1.05	19.0
12u	U	18	0.0	18	0.0	0.658	72.3	LOS E	8.0	56.2	1.00	0.82	1.05	8.1
Approach		1525	5.6	1525	5.6	0.658	22.5	LOS C	15.0	112.0	0.58	0.51	0.58	21.4
All Vehicles		5083	4.9	5083	4.9	0.857	30.5	LOS C	22.2	163.2	0.74	0.68	0.75	16.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 AM Peak with proposed road network
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	28	7.1	28	7.1	0.358	6.8	LOS A	1.9	13.9	0.69	0.88	0.70	29.3
6a	R1	15	6.7	15	6.7	0.358	12.1	LOS B	1.9	13.9	0.69	0.88	0.70	39.3
6	R2	232	4.7	232	4.7	0.358	13.2	LOS B	1.9	13.9	0.69	0.88	0.70	29.3
Approach		275	5.1	275	5.1	0.358	12.5	LOS B	1.9	13.9	0.69	0.88	0.70	30.0
North: Grandstand Rd														
7	L2	408	2.7	408	2.7	0.405	3.9	LOS A	2.7	19.0	0.33	0.50	0.33	33.6
9a	R1	723	1.1	723	1.1	0.405	8.7	LOS A	2.7	19.0	0.34	0.57	0.34	31.0
9b	R3	6	0.0	6	0.0	0.405	11.2	LOS B	2.6	18.6	0.34	0.59	0.34	46.7
9u	U	2	0.0	2	0.0	0.405	12.4	LOS B	2.6	18.6	0.34	0.59	0.34	30.3
Approach		1139	1.7	1139	1.7	0.405	7.0	LOS A	2.7	19.0	0.34	0.54	0.34	31.9
NorthWest: Resolution Dr														
27b	L3	12	8.3	12	8.3	0.113	4.3	LOS A	0.5	3.3	0.50	0.60	0.50	35.7
27a	L1	48	0.0	48	0.0	0.113	3.3	LOS A	0.5	3.3	0.50	0.60	0.50	35.7
29	R2	46	0.0	46	0.0	0.113	9.3	LOS A	0.5	3.3	0.50	0.60	0.50	35.7
Approach		106	0.9	106	0.9	0.113	6.0	LOS A	0.5	3.3	0.50	0.60	0.50	35.7
SouthWest: Stoneham St														
30	L2	18	0.0	18	0.0	0.151	3.8	LOS A	0.8	6.0	0.42	0.43	0.42	44.8
30a	L1	318	2.8	318	2.8	0.151	3.5	LOS A	0.8	6.0	0.42	0.46	0.42	35.2
32a	R1	21	0.0	21	0.0	0.151	8.7	LOS A	0.8	5.8	0.43	0.49	0.43	34.6
32u	U	4	25.0	4	25.0	0.151	12.6	LOS B	0.8	5.8	0.43	0.49	0.43	34.6
Approach		361	2.8	361	2.8	0.151	3.9	LOS A	0.8	6.0	0.43	0.46	0.43	36.0
All Vehicles		1881	2.3	1881	2.3	0.405	7.1	LOS A	2.7	19.0	0.41	0.58	0.42	32.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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NETWORK SUMMARY

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

Proposed Network
2021 Traffic Volumes
Network Category: Proposed Design 1

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS D					
Speed Efficiency	0.51					
Travel Time Index	4.59					
Congestion Coefficient	1.95					
Travel Speed (Average)	30.7	km/h			31.6	km/h
Travel Distance (Total)	11461.9	veh-km/h			16737.6	pers-km/h
Travel Time (Total)	373.8	veh-h/h			530.1	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	48965	veh/h			72755	pers/h
Arrival Flows (Total for all Sites)	48738	veh/h			72482	pers/h
Demand Flows (Entry Total)	7296	veh/h				
Midblock Inflows (Total)	587	veh/h				
Midblock Outflows (Total)	-225	veh/h				
Percent Heavy Vehicles (Demand)	2.3	%				
Percent Heavy Vehicles (Arrival)	2.3	%				
Degree of Saturation	1.475					
Control Delay (Total)	180.62	veh-h/h			245.88	pers-h/h
Control Delay (Average)	13.3	sec			12.2	sec
Control Delay (Worst Lane)	464.6	sec				
Control Delay (Worst Movement)	504.4	sec			504.4	sec
Geometric Delay (Average)	0.8	sec				
Stop-Line Delay (Average)	12.5	sec				
Ave. Queue Storage Ratio (Worst Lane)	1.54					
Total Effective Stops	14517	veh/h			20940	pers/h
Effective Stop Rate	0.30		1.27	per km	0.29	
Proportion Queued	0.24				0.23	
Performance Index	1167.5				1167.5	
Cost (Total)	16827.04	$/h	1.47	$/km	16827.04	$/h
Fuel Consumption (Total)	1395.6	L/h	121.8	mL/km		
Fuel Economy	12.2	L/100km				
Carbon Dioxide (Total)	3296.1	kg/h	287.6	g/km		
Hydrocarbons (Total)	0.311	kg/h	0.027	g/km		
Carbon Monoxide (Total)	3.464	kg/h	0.302	g/km		
NOx (Total)	4.031	kg/h	0.352	g/km		

Network Model Variability Index (Iterations 3 to N): 0.2 %
Number of Iterations: 5 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.3% 0.2% 0.2%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	23,503,200	veh/y	34,922,310	pers/y
Delay	86,698	veh-h/y	118,024	pers-h/y
Effective Stops	6,968,119	veh/y	10,051,170	pers/y
Travel Distance	5,501,712	veh-km/y	8,034,062	pers-km/y
Travel Time	179,401	veh-h/y	254,466	pers-h/y
Cost	8,076,979	$/y	8,076,979	$/y
Fuel Consumption	669,870	L/y		
Carbon Dioxide	1,582,124	kg/y		
Hydrocarbons	149	kg/y		
Carbon Monoxide	1,663	kg/y		

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NOx	1,935 kg/y

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2021 PM Peak with proposed road network
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	200	0.5	200	0.5	0.812	66.7	LOS E	21.8	154.2	1.00	0.91	1.11	12.2
2	T1	416	1.4	416	1.4	* 0.812	60.6	LOS E	21.8	154.2	1.00	0.92	1.11	13.0
3	R2	254	1.2	254	1.2	0.666	60.5	LOS E	16.0	113.7	0.98	0.84	0.98	12.9
Approach		870	1.1	870	1.1	0.812	62.0	LOS E	21.8	154.2	0.99	0.90	1.07	12.8
East: Great Eastern Hwy														
4	L2	102	3.9	102	3.9	0.195	34.3	LOS C	5.5	44.9	0.69	0.71	0.69	22.3
5	T1	1442	2.6	1442	2.6	0.617	35.6	LOS D	18.4	130.6	0.86	0.76	0.86	8.9
6	R2	74	2.7	74	2.7	0.525	72.3	LOS E	5.8	41.5	1.00	0.78	1.00	4.9
6u	U	12	0.0	12	0.0	0.525	74.0	LOS E	5.8	41.5	1.00	0.78	1.00	4.9
Approach		1630	2.6	1630	2.6	0.617	37.5	LOS D	18.4	130.6	0.85	0.76	0.85	9.6
North: Stoneham St														
7	L2	9	0.0	9	0.0	0.046	66.9	LOS E	0.5	3.7	0.93	0.67	0.93	7.4
8	T1	211	0.0	201	0.0	* 0.762	70.1	LOS E	10.5	73.5	1.00	0.87	1.13	15.9
9	R2	242	2.1	231	2.2	0.762	75.6	LOS E	10.0	70.8	1.00	0.86	1.11	7.2
Approach		462	1.1	440 N1	1.1	0.762	72.9	LOS E	10.5	73.5	1.00	0.86	1.12	11.5
West: Great Eastern Hwy														
10	L2	733	0.4	733	0.4	0.615	12.8	LOS B	19.7	138.8	0.52	0.73	0.52	21.9
11	T1	2015	3.2	2015	3.2	* 0.777	35.0	LOS C	22.7	163.2	0.84	0.75	0.85	10.5
12	R2	83	0.0	83	0.0	* 0.549	72.8	LOS E	6.3	43.8	1.00	0.78	1.00	14.0
12u	U	10	0.0	10	0.0	0.549	74.4	LOS E	6.3	43.8	1.00	0.78	1.00	5.6
Approach		2841	2.4	2841	2.4	0.777	30.5	LOS C	22.7	163.2	0.76	0.75	0.77	12.3
All Vehicles		5803	2.2	5781 N1	2.2	0.812	40.4	LOS D	22.7	163.2	0.84	0.78	0.86	11.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 PM Peak with proposed road network
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	113	0.0	113	0.0	0.488	66.4	LOS E	8.0	55.7	0.97	0.79	0.97	15.6
2	T1	180	2.8	180	2.8	* 0.644	62.5	LOS E	11.1	79.4	1.00	0.82	1.00	16.8
3	R2	146	2.7	146	2.7	0.591	67.7	LOS E	9.5	68.7	0.99	0.81	0.99	15.7
Approach		439	2.1	439	2.1	0.644	65.2	LOS E	11.1	79.4	0.99	0.81	0.99	16.1
East: Great Eastern Hwy														
4	L2	131	0.0	131	0.0	0.093	9.2	LOS A	1.9	13.0	0.27	0.62	0.27	45.3
5	T1	1482	3.0	1482	3.0	0.451	27.4	LOS C	18.1	128.8	0.73	0.64	0.73	12.8
6	R2	240	0.4	240	0.4	* 0.967	100.7	LOS F	22.1	155.4	1.00	1.08	1.50	4.2
6u	U	15	0.0	15	0.0	0.967	102.3	LOS F	22.1	155.4	1.00	1.08	1.50	4.2
Approach		1868	2.4	1868	2.4	0.967	36.1	LOS D	22.1	155.4	0.73	0.70	0.80	12.0
North: Resolution Dr														
7	L2	141	3.5	141	3.5	0.265	30.0	LOS C	5.8	42.3	0.70	0.75	0.70	13.4
8	T1	147	3.4	147	3.4	* 0.738	73.1	LOS E	6.7	46.7	1.00	0.81	1.10	18.2
9	R2	23	0.0	23	0.0	0.191	74.5	LOS E	1.5	10.6	0.96	0.71	0.96	6.3
Approach		311	3.2	311	3.2	0.738	53.7	LOS D	6.7	46.7	0.86	0.77	0.91	16.0
West: Great Eastern Hwy														
10	L2	22	0.0	22	0.0	0.063	28.9	LOS C	1.6	15.5	0.59	0.58	0.59	17.8
11	T1	2345	2.8	2345	2.8	* 0.899	39.2	LOS D	36.4	261.1	0.92	0.91	1.01	13.1
12	R2	182	1.6	182	1.6	0.798	73.1	LOS E	14.4	100.9	1.00	0.89	1.15	18.5
12u	U	22	0.0	22	0.0	0.798	74.7	LOS E	14.4	100.9	1.00	0.89	1.15	7.9
Approach		2571	2.6	2571	2.6	0.899	41.9	LOS D	36.4	261.1	0.93	0.91	1.02	13.8
All Vehicles		5189	2.5	5189	2.5	0.967	42.5	LOS D	36.4	261.1	0.86	0.82	0.93	13.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 PM Peak with proposed road network
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	49	2.0	49	2.0	0.610	6.9	LOS A	4.9	35.2	0.70	0.87	0.83	29.1
6a	R1	40	0.0	40	0.0	0.610	12.0	LOS B	4.9	35.2	0.70	0.87	0.83	40.0
6	R2	507	2.2	507	2.2	0.610	13.4	LOS B	4.9	35.2	0.70	0.87	0.83	29.1
Approach		596	2.0	596	2.0	0.610	12.7	LOS B	4.9	35.2	0.70	0.87	0.83	30.0
North: Grandstand Rd														
7	L2	207	2.4	207	2.4	0.209	3.6	LOS A	1.2	8.6	0.24	0.48	0.24	34.5
9a	R1	380	0.3	380	0.3	0.209	8.4	LOS A	1.2	8.6	0.24	0.55	0.24	31.8
9b	R3	8	0.0	8	0.0	0.209	10.9	LOS B	1.2	8.3	0.25	0.57	0.25	47.5
9u	U	4	0.0	4	0.0	0.209	12.1	LOS B	1.2	8.3	0.25	0.57	0.25	31.1
Approach		599	1.0	599	1.0	0.209	6.8	LOS A	1.2	8.6	0.24	0.52	0.24	32.9
NorthWest: Resolution Dr														
27b	L3	13	0.0	13	0.0	0.191	9.7	LOS A	1.0	7.3	0.87	0.93	0.87	28.8
27a	L1	25	4.0	25	4.0	0.191	9.0	LOS A	1.0	7.3	0.87	0.93	0.87	28.8
29	R2	34	2.9	34	2.9	0.191	15.0	LOS B	1.0	7.3	0.87	0.93	0.87	28.8
Approach		72	2.8	72	2.8	0.191	12.0	LOS B	1.0	7.3	0.87	0.93	0.87	28.8
SouthWest: Stoneham St														
30	L2	50	0.0	47	0.0	0.759	10.6	LOS B	10.4	73.2	0.96	1.03	1.30	36.4
30a	L1	1425	0.5	1343	0.5	0.759	10.8	LOS B	10.4	73.2	0.96	1.06	1.32	23.8
32a	R1	16	6.3	15	6.6	0.759	16.8	LOS B	9.8	68.8	0.96	1.08	1.35	23.0
32u	U	5	0.0	5	0.0	0.759	20.3	LOS C	9.8	68.8	0.96	1.08	1.35	23.0
Approach		1496	0.5	1410 N1	0.6	0.759	10.8	LOS B	10.4	73.2	0.96	1.06	1.32	24.5
All Vehicles		2763	1.0	2677 N1	1.0	0.759	10.4	LOS B	10.4	73.2	0.74	0.89	0.96	27.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Appendix 5 – SIDRA Network Output 2031 Proposed Road Network

NETWORK SUMMARY

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

Proposed Network
25% of Ascot Kilns and Golden Gateway development
50% of Ascot Racecourse development
Network Category: Future Conditions 1

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS E					
Speed Efficiency	0.46					
Travel Time Index	3.98					
Congestion Coefficient	2.18					
Travel Speed (Average)	27.4	km/h			28.9	km/h
Travel Distance (Total)	11381.5	veh-km/h			18343.7	pers-km/h
Travel Time (Total)	415.3	veh-h/h			634.8	pers-h/h
Desired Speed (Program)	59.8	km/h				
Demand Flows (Total for all Sites)	49837	veh/h			87594	pers/h
Arrival Flows (Total for all Sites)	49582	veh/h			86309	pers/h
Demand Flows (Entry Total)	7118	veh/h				
Midblock Inflows (Total)	82	veh/h				
Midblock Outflows (Total)	-86	veh/h				
Percent Heavy Vehicles (Demand)	4.2	%				
Percent Heavy Vehicles (Arrival)	4.2	%				
Degree of Saturation	1.201					
Control Delay (Total)	220.28	veh-h/h			311.22	pers-h/h
Control Delay (Average)	16.0	sec			13.0	sec
Control Delay (Worst Lane)	259.0	sec				
Control Delay (Worst Movement)	260.5	sec			260.5	sec
Geometric Delay (Average)	0.7	sec				
Stop-Line Delay (Average)	15.3	sec				
Ave. Queue Storage Ratio (Worst Lane)	1.00					
Total Effective Stops	12962	veh/h			26984	pers/h
Effective Stop Rate	0.26		1.14	per km	0.31	
Proportion Queued	0.22				0.19	
Performance Index	1201.3				1201.3	
Cost (Total)	20328.28	$/h	1.79	$/km	20328.28	$/h
Fuel Consumption (Total)	1612.2	L/h	141.7	mL/km		
Fuel Economy	14.2	L/100km				
Carbon Dioxide (Total)	3821.2	kg/h	335.7	g/km		
Hydrocarbons (Total)	0.352	kg/h	0.031	g/km		
Carbon Monoxide (Total)	3.836	kg/h	0.337	g/km		
NOx (Total)	8.452	kg/h	0.743	g/km		

Network Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 5 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.0% 0.0% 0.0%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	23,921,760	veh/y	42,045,120	pers/y
Delay	105,733	veh-h/y	149,385	pers-h/y
Effective Stops	6,221,603	veh/y	12,952,480	pers/y
Travel Distance	5,463,101	veh-km/y	8,804,996	pers-km/y
Travel Time	199,334	veh-h/y	304,696	pers-h/y
Cost	9,757,576	$/y	9,757,576	$/y
Fuel Consumption	773,852	L/y		
Carbon Dioxide	1,834,172	kg/y		

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Hydrocarbons	169	kg/y
Carbon Monoxide	1,842	kg/y
NOx	4,057	kg/y

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	63	4.8	63	4.8	0.396	65.4	LOS E	5.5	41.1	0.96	0.77	0.96	12.2
2	T1	116	7.8	116	7.8	* 0.396	59.8	LOS E	5.6	42.6	0.96	0.76	0.96	13.2
3	R2	76	9.2	76	9.2	0.360	65.4	LOS E	4.7	36.8	0.96	0.77	0.96	12.1
Approach		255	7.5	255	7.5	0.396	62.9	LOS E	5.6	42.6	0.96	0.77	0.96	12.6
East: Great Eastern Hwy														
4	L2	204	5.9	204	5.9	0.297	29.4	LOS C	9.3	71.0	0.67	0.74	0.67	23.9
5	T1	2612	4.5	2612	4.5	* 0.998	87.4	LOS F	17.8	130.6	1.00	1.24	1.40	4.0
6	R2	19	5.3	19	5.3	0.179	72.2	LOS E	1.3	10.1	0.98	0.71	0.98	4.9
6u	U	1	0.0	1	0.0	0.179	73.9	LOS E	1.3	10.1	0.98	0.71	0.98	4.9
Approach		2836	4.6	2836	4.6	0.998	83.1	LOS F	17.8	130.6	0.97	1.20	1.34	4.8
North: Stoneham St														
7	L2	6	0.0	6	0.0	0.023	59.1	LOS E	0.3	2.4	0.89	0.66	0.89	8.2
8	T1	325	4.0	325	4.0	* 1.190	243.5	LOS F	32.6	228.5	1.00	1.68	2.38	5.5
9	R2	570	0.4	570	0.4	1.190	246.2	LOS F	32.5	228.5	1.00	1.52	2.34	2.3
Approach		901	1.7	901	1.7	1.190	244.0	LOS F	32.6	228.5	1.00	1.57	2.35	3.5
West: Great Eastern Hwy														
10	L2	250	1.2	250	1.2	0.164	6.7	LOS A	2.0	14.0	0.19	0.61	0.19	31.3
11	T1	1500	5.3	1500	5.3	0.466	21.9	LOS C	14.2	105.6	0.58	0.51	0.58	15.2
12	R2	61	3.3	61	3.3	* 0.842	82.6	LOS F	6.8	48.0	1.00	0.93	1.35	12.6
12u	U	32	0.0	32	0.0	0.842	84.3	LOS F	6.8	48.0	1.00	0.93	1.35	5.0
Approach		1843	4.6	1843	4.6	0.842	22.9	LOS C	14.2	105.6	0.55	0.54	0.57	15.4
All Vehicles		5835	4.3	5835	4.3	1.190	88.1	LOS F	32.6	228.5	0.84	1.03	1.23	5.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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Document Set ID: 6149413
Version: 1, Version Date: 11/06/2026

MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	102	2.0	102	2.0	0.538	68.0	LOS E	6.8	50.7	0.99	0.79	0.99	15.3
2	T1	116	5.2	116	5.2	0.538	62.0	LOS E	7.0	49.7	0.99	0.78	0.99	16.9
3	R2	130	3.8	130	3.8	* 0.655	69.7	LOS E	8.5	62.5	1.00	0.82	1.04	15.3
Approach		348	3.7	348	3.7	0.655	66.7	LOS E	8.5	62.5	0.99	0.80	1.01	15.8
East: Great Eastern Hwy														
4	L2	133	4.5	133	4.5	0.094	8.2	LOS A	1.5	10.6	0.24	0.61	0.24	44.8
5	T1	2605	4.8	2605	4.8	* 0.881	42.5	LOS D	22.2	163.2	0.94	0.95	1.06	8.9
6	R2	205	5.4	205	5.4	* 1.201	258.9	LOS F	22.0	163.2	1.00	1.53	2.48	1.6
6u	U	14	0.0	14	0.0	1.201	260.5	LOS F	22.0	163.2	1.00	1.53	2.48	1.6
Approach		2957	4.8	2957	4.8	1.201	57.0	LOS E	22.2	163.2	0.91	0.98	1.13	7.6
North: Resolution Dr														
7	L2	283	1.8	283	1.8	0.488	16.6	LOS B	9.0	64.2	0.58	0.75	0.58	20.5
8	T1	144	6.9	144	6.9	0.653	68.2	LOS E	6.1	43.2	1.00	0.79	1.04	19.1
9	R2	90	1.1	90	1.1	* 0.851	81.5	LOS F	6.5	46.1	1.00	0.91	1.31	5.8
Approach		517	3.1	517	3.1	0.851	42.2	LOS D	9.0	64.2	0.77	0.79	0.84	15.8
West: Great Eastern Hwy														
10	L2	29	0.0	29	0.0	0.053	24.1	LOS C	1.4	12.2	0.54	0.60	0.54	19.7
11	T1	1481	5.9	1481	5.9	0.528	18.7	LOS B	16.5	123.2	0.56	0.50	0.56	22.2
12	R2	114	0.9	114	0.9	0.746	73.2	LOS E	9.0	63.2	1.00	0.86	1.14	18.5
12u	U	19	0.0	19	0.0	0.746	74.8	LOS E	9.0	63.2	1.00	0.86	1.14	7.9
Approach		1643	5.4	1643	5.4	0.746	23.3	LOS C	16.5	123.2	0.60	0.53	0.61	21.0
All Vehicles		5465	4.8	5465	4.8	1.201	46.1	LOS D	22.2	163.2	0.81	0.82	0.94	11.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	92	2.2	86	2.0	0.473	8.3	LOS A	3.0	21.9	0.77	0.96	0.91	28.1
6a	R1	25	4.0	23	3.7	0.473	13.6	LOS B	3.0	21.9	0.77	0.96	0.91	38.9
6	R2	254	4.3	235	4.3	0.473	14.9	LOS B	3.0	21.9	0.77	0.96	0.91	28.1
Approach		371	3.8	344 N1	3.7	0.473	13.1	LOS B	3.0	21.9	0.77	0.96	0.91	29.1
North: Grandstand Rd														
7	L2	447	2.5	447	2.5	0.459	4.2	LOS A	3.2	22.8	0.42	0.54	0.42	32.7
9a	R1	783	1.0	783	1.0	0.459	9.0	LOS A	3.2	22.8	0.43	0.60	0.43	30.3
9b	R3	6	0.0	6	0.0	0.459	11.5	LOS B	3.1	22.2	0.43	0.62	0.43	45.9
9u	U	2	0.0	2	0.0	0.459	12.8	LOS B	3.1	22.2	0.43	0.62	0.43	29.6
Approach		1238	1.5	1238	1.5	0.459	7.3	LOS A	3.2	22.8	0.42	0.58	0.42	31.1
NorthWest: Resolution Dr														
27b	L3	13	7.7	13	7.7	0.154	4.5	LOS A	0.6	4.6	0.52	0.63	0.52	35.2
27a	L1	61	0.0	61	0.0	0.154	3.4	LOS A	0.6	4.6	0.52	0.63	0.52	35.2
29	R2	67	0.0	67	0.0	0.154	9.5	LOS A	0.6	4.6	0.52	0.63	0.52	35.2
Approach		141	0.7	141	0.7	0.154	6.4	LOS A	0.6	4.6	0.52	0.63	0.52	35.2
SouthWest: Stoneham St														
30	L2	26	0.0	26	0.0	0.172	3.9	LOS A	1.0	7.1	0.44	0.44	0.44	44.6
30a	L1	339	2.7	339	2.7	0.172	3.5	LOS A	1.0	7.1	0.45	0.47	0.45	34.6
32a	R1	37	0.0	37	0.0	0.172	8.7	LOS A	1.0	6.9	0.45	0.51	0.45	33.8
32u	U	4	25.0	4	25.0	0.172	12.7	LOS B	1.0	6.9	0.45	0.51	0.45	33.8
Approach		406	2.5	406	2.5	0.172	4.1	LOS A	1.0	7.1	0.45	0.47	0.45	35.6
All Vehicles		2156	2.0	2129 N1	2.1	0.473	7.6	LOS A	3.2	22.8	0.49	0.62	0.51	31.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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NETWORK SUMMARY

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

Proposed Network
25% of Ascot Kilns and Golden Gateway development
50% of Ascot Racecourse development
Network Category: Future Conditions 1

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS E					
Speed Efficiency	0.37					
Travel Time Index	2.96					
Congestion Coefficient	2.73					
Travel Speed (Average)	21.9	km/h			23.3	km/h
Travel Distance (Total)	12303.7	veh-km/h			20451.0	pers-km/h
Travel Time (Total)	562.7	veh-h/h			877.0	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	54040	veh/h			106812	pers/h
Arrival Flows (Total for all Sites)	52903	veh/h			102661	pers/h
Demand Flows (Entry Total)	8051	veh/h				
Midblock Inflows (Total)	393	veh/h				
Midblock Outflows (Total)	-21	veh/h				
Percent Heavy Vehicles (Demand)	2.1	%				
Percent Heavy Vehicles (Arrival)	2.1	%				
Degree of Saturation	2.581					
Control Delay (Total)	351.88	veh-h/h			517.73	pers-h/h
Control Delay (Average)	23.9	sec			18.2	sec
Control Delay (Worst Lane)	1454.1	sec				
Control Delay (Worst Movement)	1490.4	sec			1490.4	sec
Geometric Delay (Average)	0.8	sec				
Stop-Line Delay (Average)	23.1	sec				
Ave. Queue Storage Ratio (Worst Lane)	2.94					
Total Effective Stops	17637	veh/h			41732	pers/h
Effective Stop Rate	0.33		1.43	per km	0.41	
Proportion Queued	0.26				0.25	
Performance Index	1633.8				1633.8	
Cost (Total)	26843.04	$/h	2.18	$/km	26843.04	$/h
Fuel Consumption (Total)	1713.5	L/h	139.3	mL/km		
Fuel Economy	13.9	L/100km				
Carbon Dioxide (Total)	4043.5	kg/h	328.6	g/km		
Hydrocarbons (Total)	0.395	kg/h	0.032	g/km		
Carbon Monoxide (Total)	4.018	kg/h	0.327	g/km		
NOx (Total)	4.326	kg/h	0.352	g/km		

Network Model Variability Index (Iterations 3 to N): 2.2 %
Number of Iterations: 10 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 7.1% 0.7% 0.6%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	25,939,200	veh/y	51,269,760	pers/y
Delay	168,904	veh-h/y	248,512	pers-h/y
Effective Stops	8,465,573	veh/y	20,031,340	pers/y
Travel Distance	5,905,771	veh-km/y	9,816,458	pers-km/y
Travel Time	270,083	veh-h/y	420,966	pers-h/y
Cost	12,884,660	$/y	12,884,660	$/y
Fuel Consumption	822,470	L/y		
Carbon Dioxide	1,940,881	kg/y		

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Hydrocarbons	190	kg/y
Carbon Monoxide	1,929	kg/y
NOx	2,077	kg/y

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	210	0.5	210	0.5	0.883	74.3	LOS E	25.8	182.0	1.00	0.98	1.22	11.1
2	T1	447	1.3	447	1.3	* 0.883	68.3	LOS E	25.8	182.0	1.00	1.01	1.23	11.8
3	R2	272	1.1	272	1.1	0.713	61.7	LOS E	17.4	124.1	0.99	0.85	1.01	12.7
Approach		929	1.1	929	1.1	0.883	67.8	LOS E	25.8	182.0	1.00	0.96	1.16	11.9
East: Great Eastern Hwy														
4	L2	107	3.7	107	3.7	0.201	34.4	LOS C	5.8	46.6	0.69	0.72	0.69	22.3
5	T1	1514	2.4	1514	2.4	0.648	36.2	LOS D	18.4	130.6	0.87	0.77	0.87	8.8
6	R2	78	2.6	78	2.6	0.555	72.5	LOS E	6.1	44.0	1.00	0.78	1.00	4.9
6u	U	13	0.0	13	0.0	0.555	74.3	LOS E	6.1	44.0	1.00	0.78	1.00	4.9
Approach		1712	2.5	1712	2.5	0.648	38.0	LOS D	18.4	130.6	0.87	0.77	0.87	9.4
North: Stoneham St														
7	L2	10	0.0	9	0.0	0.048	67.0	LOS E	0.6	3.9	0.93	0.67	0.93	7.3
8	T1	240	0.0	215	0.0	* 0.967	95.7	LOS F	16.2	113.3	1.00	1.11	1.55	12.6
9	R2	366	1.4	333	1.5	0.967	99.4	LOS F	15.1	107.3	1.00	1.08	1.51	5.6
Approach		616	0.8	557 N1	0.9	0.967	97.4	LOS F	16.2	113.3	1.00	1.08	1.52	8.5
West: Great Eastern Hwy														
10	L2	819	0.4	819	0.4	0.687	13.9	LOS B	23.2	163.2	0.58	0.76	0.58	20.7
11	T1	2132	3.1	2132	3.1	* 0.829	38.4	LOS D	22.7	163.2	0.88	0.82	0.92	9.7
12	R2	87	0.0	87	0.0	* 0.579	73.0	LOS E	6.6	46.3	1.00	0.78	1.00	14.0
12u	U	11	0.0	11	0.0	0.579	74.7	LOS E	6.6	46.3	1.00	0.78	1.00	5.5
Approach		3049	2.3	3049	2.3	0.829	32.9	LOS C	23.2	163.2	0.80	0.80	0.83	11.5
All Vehicles		6306	2.0	6247 N1	2.0	0.967	45.3	LOS D	25.8	182.0	0.87	0.84	0.95	10.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	119	0.0	119	0.0	0.523	66.8	LOS E	8.6	60.0	0.98	0.80	0.98	15.6
2	T1	195	2.6	195	2.6	* 0.690	63.5	LOS E	12.0	86.3	1.00	0.84	1.03	16.6
3	R2	153	2.6	153	2.6	0.618	68.0	LOS E	10.0	72.2	0.99	0.81	0.99	15.6
Approach		467	1.9	467	1.9	0.690	65.8	LOS E	12.0	86.3	0.99	0.82	1.01	16.0
East: Great Eastern Hwy														
4	L2	138	0.0	138	0.0	0.099	9.5	LOS A	2.0	14.3	0.28	0.62	0.28	45.0
5	T1	1557	2.9	1557	2.9	0.474	27.7	LOS C	19.3	137.4	0.74	0.65	0.74	12.7
6	R2	367	0.3	367	0.3	* 1.442	464.7	LOS F	23.2	163.2	1.00	1.91	3.18	0.9
6u	U	16	0.0	16	0.0	1.442	466.4	LOS F	23.2	163.2	1.00	1.91	3.18	0.9
Approach		2078	2.2	2078	2.2	1.442	107.1	LOS F	23.2	163.2	0.76	0.88	1.16	4.5
North: Resolution Dr														
7	L2	187	2.7	186	2.7	0.348	34.7	LOS C	8.5	61.1	0.77	0.77	0.77	11.9
8	T1	159	3.1	158	3.2	* 0.793	74.2	LOS E	7.3	50.9	1.00	0.83	1.15	18.0
9	R2	24	0.0	24	0.0	0.198	74.6	LOS E	1.6	10.9	0.96	0.71	0.96	6.3
Approach		370	2.7	368 N1	2.7	0.793	54.3	LOS D	8.5	61.1	0.88	0.80	0.94	15.3
West: Great Eastern Hwy														
10	L2	39	0.0	39	0.0	0.083	29.2	LOS C	2.2	20.1	0.60	0.63	0.60	17.3
11	T1	2454	2.7	2453	2.7	* 0.945	51.0	LOS D	36.4	261.1	0.98	1.03	1.15	10.7
12	R2	191	1.6	191	1.6	0.777	71.8	LOS E	14.0	98.5	1.00	0.88	1.12	18.8
12u	U	11	0.0	11	0.0	0.777	73.4	LOS E	14.0	98.5	1.00	0.88	1.12	8.0
Approach		2695	2.6	2694 N1	2.6	0.945	52.2	LOS D	36.4	261.1	0.97	1.02	1.14	11.6
All Vehicles		5610	2.4	5607 N1	2.4	1.442	73.8	LOS E	36.4	261.1	0.89	0.93	1.12	8.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	171	0.6	153	0.6	0.721	8.9	LOS A	7.5	53.2	0.81	0.98	1.07	27.3
6a	R1	55	0.0	48	0.0	0.721	14.1	LOS B	7.5	53.2	0.81	0.98	1.07	38.5
6	R2	550	2.0	483	2.2	0.721	15.4	LOS B	7.5	53.2	0.81	0.98	1.07	27.3
Approach		776	1.5	684 N1	1.7	0.721	13.9	LOS B	7.5	53.2	0.81	0.98	1.07	28.4
North: Grandstand Rd														
7	L2	252	2.0	252	2.0	0.247	3.9	LOS A	1.4	10.0	0.31	0.50	0.31	34.0
9a	R1	409	0.2	409	0.2	0.247	8.6	LOS A	1.4	10.0	0.32	0.57	0.32	31.1
9b	R3	8	0.0	8	0.0	0.247	11.1	LOS B	1.4	9.7	0.32	0.59	0.32	46.8
9u	U	4	0.0	4	0.0	0.247	12.4	LOS B	1.4	9.7	0.32	0.59	0.32	30.5
Approach		673	0.9	673	0.9	0.247	6.9	LOS A	1.4	10.0	0.32	0.54	0.32	32.3
NorthWest: Resolution Dr														
27b	L3	14	0.0	14	0.0	0.251	9.8	LOS A	1.4	9.7	0.88	0.94	0.88	28.7
27a	L1	32	3.1	32	3.1	0.251	9.1	LOS A	1.4	9.7	0.88	0.94	0.88	28.7
29	R2	47	2.1	47	2.1	0.251	15.1	LOS B	1.4	9.7	0.88	0.94	0.88	28.7
Approach		93	2.2	93	2.2	0.251	12.2	LOS B	1.4	9.7	0.88	0.94	0.88	28.7
SouthWest: Stoneham St														
30	L2	62	0.0	56	0.0	0.784	11.0	LOS B	11.5	80.6	0.98	1.06	1.36	35.8
30a	L1	1511	0.5	1341	0.5	0.784	11.2	LOS B	11.5	80.6	0.98	1.08	1.38	23.1
32a	R1	53	1.9	51	2.0	0.784	17.1	LOS B	10.7	75.7	0.98	1.11	1.40	22.2
32u	U	5	0.0	4	0.0	0.784	20.8	LOS C	10.7	75.7	0.98	1.11	1.40	22.2
Approach		1631	0.5	1453 N1	0.6	0.784	11.4	LOS B	11.5	80.6	0.98	1.08	1.38	23.8
All Vehicles		3173	0.9	2903 N1	1.0	0.784	11.0	LOS B	11.5	80.6	0.79	0.93	1.04	27.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Appendix 6 – SIDRA Network Output 2041 Proposed Road Network

NETWORK SUMMARY

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

Proposed Network
100% of Ascot Kilns, Golden Gateway and Ascot Racecourse development
Network Category: Future Conditions 2

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS F					
Speed Efficiency	0.28					
Travel Time Index	1.94					
Congestion Coefficient	3.64					
Travel Speed (Average)	16.4	km/h			18.9	km/h
Travel Distance (Total)	12315.3	veh-km/h			21191.1	pers-km/h
Travel Time (Total)	750.1	veh-h/h			1121.4	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	55967	veh/h			113744	pers/h
Arrival Flows (Total for all Sites)	54666	veh/h			106097	pers/h
Demand Flows (Entry Total)	7968	veh/h				
Midblock Inflows (Total)	216	veh/h				
Midblock Outflows (Total)	-185	veh/h				
Percent Heavy Vehicles (Demand)	3.9	%				
Percent Heavy Vehicles (Arrival)	3.9	%				
Degree of Saturation	1.793					
Control Delay (Total)	528.98	veh-h/h			733.22	pers-h/h
Control Delay (Average)	34.8	sec			24.9	sec
Control Delay (Worst Lane)	769.5	sec				
Control Delay (Worst Movement)	771.1	sec			771.1	sec
Geometric Delay (Average)	0.8	sec				
Stop-Line Delay (Average)	34.1	sec				
Ave. Queue Storage Ratio (Worst Lane)	1.00					
Total Effective Stops	19512	veh/h			43399	pers/h
Effective Stop Rate	0.36		1.58	per km	0.41	
Proportion Queued	0.23				0.20	
Performance Index	1919.1				1919.1	
Cost (Total)	34790.18	$/h	2.82	$/km	34790.18	$/h
Fuel Consumption (Total)	2211.6	L/h	179.6	mL/km		
Fuel Economy	18.0	L/100km				
Carbon Dioxide (Total)	5234.0	kg/h	425.0	g/km		
Hydrocarbons (Total)	0.531	kg/h	0.043	g/km		
Carbon Monoxide (Total)	4.978	kg/h	0.404	g/km		
NOx (Total)	10.187	kg/h	0.827	g/km		

Network Model Variability Index (Iterations 3 to N): 50.4 %
Number of Iterations: 10 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 54.0% 40.5% 31.8%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	26,864,160	veh/y	54,597,310	pers/y
Delay	253,909	veh-h/y	351,946	pers-h/y
Effective Stops	9,365,632	veh/y	20,831,730	pers/y
Travel Distance	5,911,321	veh-km/y	10,171,720	pers-km/y
Travel Time	360,062	veh-h/y	538,271	pers-h/y
Cost	16,699,290	$/y	16,699,290	$/y
Fuel Consumption	1,061,558	L/y		
Carbon Dioxide	2,512,333	kg/y		
Hydrocarbons	255	kg/y		

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Carbon Monoxide	2,390 kg/y
NOx	4,890 kg/y

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	66	4.5	66	4.5	0.428	65.7	LOS E	6.0	44.8	0.97	0.78	0.97	12.2
2	T1	127	7.9	127	7.9	* 0.428	60.1	LOS E	6.1	46.4	0.97	0.77	0.97	13.1
3	R2	92	8.7	92	8.7	0.428	66.0	LOS E	6.1	46.4	0.97	0.78	0.97	12.0
Approach		285	7.4	285	7.4	0.428	63.3	LOS E	6.1	46.4	0.97	0.77	0.97	12.5
East: Great Eastern Hwy														
4	L2	214	5.6	214	5.6	0.309	29.5	LOS C	9.7	74.3	0.67	0.74	0.67	23.8
5	T1	2744	4.4	2744	4.4	* 1.048	119.5	LOS F	17.8	130.6	1.00	1.41	1.61	3.0
6	R2	20	5.0	20	5.0	0.187	72.2	LOS E	1.4	10.6	0.98	0.71	0.98	4.9
6u	U	1	0.0	1	0.0	0.187	73.9	LOS E	1.4	10.6	0.98	0.71	0.98	4.9
Approach		2979	4.5	2979	4.5	1.048	112.7	LOS F	17.8	130.6	0.97	1.36	1.54	3.6
North: Stoneham St														
7	L2	6	0.0	6	0.0	0.023	59.1	LOS E	0.3	2.4	0.89	0.66	0.89	8.2
8	T1	376	3.5	369	3.3	1.388	410.7	LOS F	32.6	228.5	1.00	2.12	3.08	3.4
9	R2	806	0.2	777	0.2	* 1.589	589.2	LOS F	32.5	228.5	1.00	2.16	3.62	1.0
Approach		1188	1.3	1151 N1	1.2	1.589	529.3	LOS F	32.6	228.5	1.00	2.14	3.43	1.6
West: Great Eastern Hwy														
10	L2	286	1.0	286	1.0	0.188	6.9	LOS A	2.5	17.5	0.21	0.61	0.21	30.9
11	T1	1584	5.2	1584	5.2	0.495	22.3	LOS C	15.6	115.4	0.59	0.52	0.59	15.0
12	R2	64	3.1	64	3.1	* 0.877	85.3	LOS F	7.2	51.1	1.00	0.96	1.42	12.3
12u	U	33	0.0	33	0.0	0.877	86.9	LOS F	7.2	51.1	1.00	0.96	1.42	4.8
Approach		1967	4.4	1967	4.4	0.877	23.2	LOS C	15.6	115.4	0.56	0.56	0.58	15.2
All Vehicles		6419	4.0	6382 N1	4.0	1.589	158.1	LOS F	32.6	228.5	0.85	1.23	1.56	3.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	107	1.9	107	1.9	0.562	68.2	LOS E	7.2	53.1	0.99	0.79	0.99	15.3
2	T1	123	4.9	123	4.9	0.562	62.3	LOS E	7.5	53.0	0.99	0.79	0.99	16.9
3	R2	136	3.7	136	3.7	* 0.684	70.3	LOS E	9.0	65.8	1.00	0.83	1.06	15.2
Approach		366	3.6	366	3.6	0.684	67.0	LOS E	9.0	65.8	1.00	0.81	1.02	15.8
East: Great Eastern Hwy														
4	L2	141	5.0	141	5.0	0.103	8.9	LOS A	1.9	13.0	0.26	0.62	0.26	44.0
5	T1	2736	4.8	2736	4.8	* 1.098	164.5	LOS F	22.2	163.2	1.00	1.65	1.92	2.5
6	R2	321	3.4	321	3.4	* 1.793	769.5	LOS F	22.5	163.2	1.00	2.35	4.13	0.6
6u	U	14	0.0	14	0.0	1.793	771.1	LOS F	22.5	163.2	1.00	2.35	4.13	0.6
Approach		3212	4.6	3212	4.6	1.793	220.8	LOS F	22.5	163.2	0.97	1.68	2.07	2.1
North: Resolution Dr														
7	L2	315	1.6	315	1.6	0.567	19.7	LOS B	11.8	84.0	0.67	0.78	0.67	18.2
8	T1	155	6.5	155	6.5	0.700	68.8	LOS E	6.7	46.9	1.00	0.80	1.07	18.9
9	R2	95	1.1	95	1.1	* 1.158	224.8	LOS F	12.7	89.8	1.00	1.29	2.35	2.2
Approach		565	2.8	565	2.8	1.158	67.6	LOS E	12.7	89.8	0.82	0.87	1.06	10.7
West: Great Eastern Hwy														
10	L2	94	0.0	94	0.0	0.123	24.9	LOS C	3.6	28.2	0.56	0.68	0.56	18.6
11	T1	1608	5.7	1608	5.7	0.577	19.5	LOS B	19.2	143.1	0.59	0.53	0.59	21.6
12	R2	135	0.7	135	0.7	0.902	84.8	LOS F	11.7	82.0	1.00	1.00	1.41	16.7
12u	U	20	0.0	20	0.0	0.902	86.5	LOS F	11.7	82.0	1.00	1.00	1.41	6.9
Approach		1857	5.0	1857	5.0	0.902	25.3	LOS C	19.2	143.1	0.63	0.58	0.66	19.9
All Vehicles		6000	4.5	6000	4.5	1.793	136.5	LOS F	22.5	163.2	0.85	1.21	1.48	4.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	272	0.7	230	0.5	1.040	74.4	LOS F	26.3	188.0	1.00	2.63	5.60	7.4
6a	R1	40	2.5	33	1.8	1.040	79.8	LOS F	26.3	188.0	1.00	2.63	5.60	13.0
6	R2	288	4.2	231	4.0	1.040	81.1	LOS F	26.3	188.0	1.00	2.63	5.60	7.4
Approach		600	2.5	494 N1	2.2	1.040	77.9	LOS F	26.3	188.0	1.00	2.63	5.60	7.8
North: Grandstand Rd														
7	L2	481	2.5	481	2.5	0.887	9.2	LOS A	9.2	65.7	0.60	0.78	0.84	25.9
9a	R1	841	1.1	841	1.1	0.887	15.5	LOS B	17.5	124.0	0.55	0.83	0.85	23.7
9b	R3	7	0.0	7	0.0	0.887	19.2	LOS B	17.5	124.0	0.52	0.87	0.86	37.0
9u	U	2	0.0	2	0.0	0.887	20.4	LOS C	17.5	124.0	0.52	0.87	0.86	22.6
Approach		1331	1.6	1331	1.6	0.887	13.2	LOS B	17.5	124.0	0.57	0.81	0.85	24.5
NorthWest: Resolution Dr														
27b	L3	13	7.7	13	7.7	0.337	4.7	LOS A	3.7	26.3	0.56	0.68	0.56	34.7
27a	L1	84	0.0	84	0.0	0.337	3.6	LOS A	3.7	26.3	0.56	0.68	0.56	34.7
29	R2	103	0.0	103	0.0	0.337	9.7	LOS A	3.7	26.3	0.56	0.68	0.56	34.7
Approach		200	0.5	200	0.5	0.337	6.8	LOS A	3.7	26.3	0.56	0.68	0.56	34.7
SouthWest: Stoneham St														
30	L2	37	0.0	37	0.0	0.198	3.9	LOS A	1.2	8.7	0.47	0.45	0.47	44.3
30a	L1	361	2.8	361	2.8	0.198	3.5	LOS A	1.2	8.7	0.48	0.48	0.48	34.0
32a	R1	53	0.0	53	0.0	0.198	8.8	LOS A	1.1	8.2	0.48	0.52	0.48	33.1
32u	U	4	25.0	4	25.0	0.198	12.7	LOS B	1.1	8.2	0.48	0.52	0.48	33.1
Approach		455	2.4	455	2.4	0.198	4.3	LOS A	1.2	8.7	0.48	0.48	0.48	35.3
All Vehicles		2586	1.9	2480 N1	1.9	1.040	23.9	LOS C	26.3	188.0	0.64	1.10	1.70	17.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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NETWORK SUMMARY

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

Proposed Network
100% of Ascot Kilns, Golden Gateway and Ascot Racecourse development
Network Category: Future Conditions 2

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS F					
Speed Efficiency	0.21					
Travel Time Index	1.24					
Congestion Coefficient	4.73					
Travel Speed (Average)	12.6	km/h			9.0	km/h
Travel Distance (Total)	13290.8	veh-km/h			23661.1	pers-km/h
Travel Time (Total)	1053.8	veh-h/h			2637.6	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	60977	veh/h			147359	pers/h
Arrival Flows (Total for all Sites)	57804	veh/h			128564	pers/h
Demand Flows (Entry Total)	9017	veh/h				
Midblock Inflows (Total)	462	veh/h				
Midblock Outflows (Total)	-28	veh/h				
Percent Heavy Vehicles (Demand)	1.9	%				
Percent Heavy Vehicles (Arrival)	2.0	%				
Degree of Saturation	5.150					
Control Delay (Total)	816.98	veh-h/h			2187.72	pers-h/h
Control Delay (Average)	50.9	sec			61.3	sec
Control Delay (Worst Lane)	3771.4	sec				
Control Delay (Worst Movement)	3805.1	sec			3805.1	sec
Geometric Delay (Average)	0.9	sec				
Stop-Line Delay (Average)	50.0	sec				
Ave. Queue Storage Ratio (Worst Lane)	18.18					
Total Effective Stops	21877	veh/h			110223	pers/h
Effective Stop Rate	0.38		1.65	per km	0.86	
Proportion Queued	0.27				0.34	
Performance Index	2552.0				2552.0	
Cost (Total)	76466.39	$/h	5.75	$/km	76466.39	$/h
Fuel Consumption (Total)	2437.1	L/h	183.4	mL/km		
Fuel Economy	18.3	L/100km				
Carbon Dioxide (Total)	5745.3	kg/h	432.3	g/km		
Hydrocarbons (Total)	0.593	kg/h	0.045	g/km		
Carbon Monoxide (Total)	5.158	kg/h	0.388	g/km		
NOx (Total)	5.053	kg/h	0.380	g/km		

Network Model Variability Index (Iterations 3 to N): 32.1 %
Number of Iterations: 10 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 8.3% 7.3% 6.2%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	29,268,960	veh/y	70,732,220	pers/y
Delay	392,152	veh-h/y	1,050,106	pers-h/y
Effective Stops	10,501,030	veh/y	52,906,890	pers/y
Travel Distance	6,379,566	veh-km/y	11,357,320	pers-km/y
Travel Time	505,843	veh-h/y	1,266,068	pers-h/y
Cost	36,703,870	$/y	36,703,870	$/y
Fuel Consumption	1,169,816	L/y		
Carbon Dioxide	2,757,749	kg/y		
Hydrocarbons	285	kg/y		
Carbon Monoxide	2,476	kg/y		

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NOx	2,426 kg/y

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	221	0.5	221	0.5	0.964	95.6	LOS F	32.8	231.9	1.00	1.11	1.42	9.0
2	T1	480	1.5	480	1.5	* 0.964	90.0	LOS F	32.8	231.9	1.00	1.15	1.45	9.4
3	R2	300	1.0	300	1.0	0.884	74.5	LOS E	22.1	157.1	1.00	0.97	1.25	10.9
Approach		1001	1.1	1001	1.1	0.964	86.6	LOS F	32.8	231.9	1.00	1.08	1.38	9.7
East: Great Eastern Hwy														
4	L2	112	3.6	112	3.6	0.208	34.5	LOS C	6.0	48.3	0.70	0.72	0.70	22.2
5	T1	1591	2.5	1591	2.5	0.682	36.9	LOS D	18.4	130.6	0.89	0.79	0.89	8.6
6	R2	82	2.4	82	2.4	0.578	72.7	LOS E	6.4	46.0	1.00	0.78	1.00	4.9
6u	U	13	0.0	13	0.0	0.578	74.4	LOS E	6.4	46.0	1.00	0.78	1.00	4.9
Approach		1798	2.5	1798	2.5	0.682	38.7	LOS D	18.4	130.6	0.88	0.79	0.88	9.3
North: Stoneham St														
7	L2	10	0.0	9	0.0	0.046	66.9	LOS E	0.5	3.7	0.93	0.67	0.93	7.4
8	T1	284	0.0	241	0.0	1.225	273.8	LOS F	32.6	228.5	1.00	1.64	2.50	4.9
9	R2	575	1.0	473	1.3	* 1.283	326.9	LOS F	32.2	228.5	1.00	1.67	2.68	1.7
Approach		869	0.7	723 N1	0.8	1.283	306.2	LOS F	32.6	228.5	1.00	1.65	2.60	2.7
West: Great Eastern Hwy														
10	L2	912	0.3	912	0.3	0.768	15.7	LOS B	23.2	163.2	0.67	0.79	0.67	19.1
11	T1	2288	3.1	2288	3.1	* 0.900	47.8	LOS D	22.7	163.2	0.94	0.94	1.06	8.1
12	R2	92	0.0	92	0.0	* 0.608	73.4	LOS E	7.0	48.9	1.00	0.79	1.02	13.9
12u	U	11	0.0	11	0.0	0.608	75.1	LOS E	7.0	48.9	1.00	0.79	1.02	5.5
Approach		3303	2.2	3303	2.2	0.900	39.8	LOS D	23.2	163.2	0.86	0.89	0.95	9.9
All Vehicles		6971	1.9	6824 N 1	2.0	1.283	74.5	LOS E	32.8	231.9	0.90	0.97	1.17	6.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	125	0.0	125	0.0	0.560	67.2	LOS E	9.3	64.8	0.98	0.80	0.98	15.6
2	T1	212	2.4	212	2.4	*0.740	64.9	LOS E	13.2	94.4	1.00	0.86	1.07	16.3
3	R2	161	2.5	161	2.5	0.650	68.5	LOS E	10.6	76.5	1.00	0.82	1.01	15.5
Approach		498	1.8	498	1.8	0.740	66.6	LOS E	13.2	94.4	1.00	0.83	1.03	15.9
East: Great Eastern Hwy														
4	L2	145	0.0	145	0.0	0.105	10.1	LOS B	2.3	16.1	0.30	0.63	0.30	44.4
5	T1	1636	2.9	1636	2.9	0.500	28.1	LOS C	20.6	146.9	0.75	0.66	0.75	12.5
6	R2	583	0.2	583	0.2	*2.247	1174.9	LOS F	23.3	163.2	1.00	2.66	4.70	0.4
6u	U	17	0.0	17	0.0	2.247	1176.5	LOS F	23.3	163.2	1.00	2.66	4.70	0.4
Approach		2381	2.0	2381	2.0	2.247	316.0	LOS F	23.3	163.2	0.79	1.16	1.72	1.6
North: Resolution Dr														
7	L2	231	2.6	206	2.9	0.389	40.3	LOS D	10.2	73.5	0.83	0.79	0.83	10.6
8	T1	165	3.0	158	3.2	*0.794	74.3	LOS E	7.3	51.1	1.00	0.83	1.15	18.0
9	R2	25	0.0	25	0.0	0.205	74.6	LOS E	1.6	11.3	0.96	0.71	0.96	6.3
Approach		421	2.6	389 N1	2.8	0.794	56.3	LOS E	10.2	73.5	0.91	0.80	0.97	14.6
West: Great Eastern Hwy														
10	L2	88	0.0	88	0.0	0.141	29.9	LOS C	4.2	34.0	0.62	0.69	0.62	16.5
11	T1	2564	2.7	2563	2.7	*1.002	78.5	LOS E	36.4	261.1	1.00	1.20	1.35	7.4
12	R2	204	1.5	204	1.5	0.825	74.7	LOS E	15.4	108.1	1.00	0.91	1.18	18.3
12u	U	11	0.0	11	0.0	0.825	76.3	LOS E	15.4	108.1	1.00	0.91	1.18	7.7
Approach		2867	2.5	2866 N1	2.5	1.002	76.7	LOS E	36.4	261.1	0.99	1.16	1.32	8.4
All Vehicles		6167	2.3	6134 N1	2.3	2.247	167.5	LOS F	36.4	261.1	0.90	1.11	1.43	4.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	403	0.2	282	0.3	0.856	14.2	LOS B	13.2	94.1	0.97	1.22	1.60	22.8
6a	R1	79	0.0	58	0.0	0.856	19.4	LOS B	13.2	94.1	0.97	1.22	1.60	33.8
6	R2	581	2.1	439	2.6	0.856	20.8	LOS C	13.2	94.1	0.97	1.22	1.60	22.8
Approach		1063	1.2	779 N1	1.6	0.856	18.3	LOS B	13.2	94.1	0.97	1.22	1.60	23.9
North: Grandstand Rd														
7	L2	318	2.5	318	2.5	0.301	4.2	LOS A	1.8	12.8	0.40	0.53	0.40	33.4
9a	R1	440	0.2	440	0.2	0.301	9.0	LOS A	1.8	12.8	0.41	0.61	0.41	30.3
9b	R3	9	0.0	9	0.0	0.301	11.5	LOS B	1.8	12.3	0.42	0.63	0.42	46.0
9u	U	4	0.0	4	0.0	0.301	12.8	LOS B	1.8	12.3	0.42	0.63	0.42	29.7
Approach		771	1.2	771	1.2	0.301	7.1	LOS A	1.8	12.8	0.41	0.58	0.41	31.6
NorthWest: Resolution Dr														
27b	L3	14	0.0	14	0.0	0.357	11.2	LOS B	2.0	14.5	0.90	0.98	0.99	27.3
27a	L1	46	2.2	46	2.2	0.357	10.5	LOS B	2.0	14.5	0.90	0.98	0.99	27.3
29	R2	67	1.5	67	1.5	0.357	16.5	LOS B	2.0	14.5	0.90	0.98	0.99	27.3
Approach		127	1.6	127	1.6	0.357	13.7	LOS B	2.0	14.5	0.90	0.98	0.99	27.3
SouthWest: Stoneham St														
30	L2	79	0.0	72	0.0	0.828	12.1	LOS B	13.8	97.1	1.00	1.09	1.44	34.5
30a	L1	1601	0.5	1388	0.6	0.828	12.3	LOS B	13.8	97.1	1.00	1.12	1.47	21.8
32a	R1	90	1.1	88	1.1	0.828	18.3	LOS B	12.9	91.3	1.00	1.15	1.50	20.9
32u	U	6	0.0	5	0.0	0.828	22.0	LOS C	12.9	91.3	1.00	1.15	1.50	20.9
Approach		1776	0.5	1553 N1	0.6	0.828	12.7	LOS B	13.8	97.1	1.00	1.12	1.47	22.6
All Vehicles		3737	0.9	3230 N1	1.0	0.856	12.7	LOS B	13.8	97.1	0.85	1.01	1.23	24.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Appendix 7 – SIDRA Network Output Ascot Event

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NETWORK SUMMARY

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

Proposed Network
2021 Traffic Volumes with Ascot Weekday Event
Network Category: Proposed Design 1

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS E					
Speed Efficiency	0.49					
Travel Time Index	4.33					
Congestion Coefficient	2.04					
Travel Speed (Average)	29.2	km/h			24.6	km/h
Travel Distance (Total)	11825.6	veh-km/h			18838.1	pers-km/h
Travel Time (Total)	404.7	veh-h/h			764.6	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	50952	veh/h			97205	pers/h
Arrival Flows (Total for all Sites)	50676	veh/h			96874	pers/h
Demand Flows (Entry Total)	7697	veh/h				
Midblock Inflows (Total)	587	veh/h				
Midblock Outflows (Total)	-306	veh/h				
Percent Heavy Vehicles (Demand)	2.5	%				
Percent Heavy Vehicles (Arrival)	2.5	%				
Degree of Saturation	1.646					
Control Delay (Total)	205.18	veh-h/h			441.88	pers-h/h
Control Delay (Average)	14.6	sec			16.4	sec
Control Delay (Worst Lane)	617.1	sec				
Control Delay (Worst Movement)	656.8	sec			656.8	sec
Geometric Delay (Average)	0.8	sec				
Stop-Line Delay (Average)	13.8	sec				
Ave. Queue Storage Ratio (Worst Lane)	5.61					
Total Effective Stops	15837	veh/h			53953	pers/h
Effective Stop Rate	0.31		1.34	per km	0.56	
Proportion Queued	0.25				0.36	
Performance Index	1333.1				1333.1	
Cost (Total)	23442.75	$/h	1.98	$/km	23442.75	$/h
Fuel Consumption (Total)	1482.2	L/h	125.3	mL/km		
Fuel Economy	12.5	L/100km				
Carbon Dioxide (Total)	3502.1	kg/h	296.1	g/km		
Hydrocarbons (Total)	0.338	kg/h	0.029	g/km		
Carbon Monoxide (Total)	3.678	kg/h	0.311	g/km		
NOx (Total)	4.318	kg/h	0.365	g/km		

Network Model Variability Index (Iterations 3 to N): 0.5 %
Number of Iterations: 5 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 0.4% 0.7% 0.2%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	24,456,960	veh/y	46,658,310	pers/y
Delay	98,486	veh-h/y	212,104	pers-h/y
Effective Stops	7,601,861	veh/y	25,897,650	pers/y
Travel Distance	5,676,289	veh-km/y	9,042,264	pers-km/y
Travel Time	194,267	veh-h/y	366,984	pers-h/y
Cost	11,252,520	$/y	11,252,520	$/y
Fuel Consumption	711,444	L/y		
Carbon Dioxide	1,681,014	kg/y		
Hydrocarbons	162	kg/y		
Carbon Monoxide	1,765	kg/y		

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NOx	2,073 kg/y

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	200	0.5	200	0.5	0.812	66.7	LOS E	13.4	94.5	1.00	0.91	1.11	12.2
2	T1	416	1.4	416	1.4	* 0.812	60.6	LOS E	13.4	94.5	1.00	0.92	1.11	13.0
3	R2	254	1.2	254	1.2	0.666	60.5	LOS E	9.8	69.7	0.98	0.84	0.98	12.9
Approach		870	1.1	870	1.1	0.812	62.0	LOS E	13.4	94.5	0.99	0.90	1.07	12.8
East: Great Eastern Hwy														
4	L2	118	3.4	118	3.4	0.233	34.9	LOS C	4.1	33.9	0.71	0.72	0.71	22.2
5	T1	1507	3.0	1507	3.0	0.642	36.1	LOS D	11.3	80.0	0.87	0.77	0.87	8.8
6	R2	74	2.7	74	2.7	0.525	72.3	LOS E	3.5	25.4	1.00	0.78	1.00	4.9
6u	U	12	0.0	12	0.0	0.525	74.0	LOS E	3.5	25.4	1.00	0.78	1.00	4.9
Approach		1711	3.0	1711	3.0	0.642	37.8	LOS D	11.3	80.0	0.86	0.77	0.86	9.6
North: Stoneham St														
7	L2	9	0.0	8	0.0	0.045	66.9	LOS E	0.3	2.2	0.93	0.67	0.93	7.4
8	T1	211	0.0	199	0.0	* 0.843	74.1	LOS E	7.4	51.9	1.00	0.94	1.24	15.3
9	R2	292	1.7	278	1.8	0.843	79.3	LOS E	7.0	49.6	1.00	0.92	1.22	6.9
Approach		512	1.0	486 N1	1.0	0.843	76.9	LOS E	7.4	51.9	1.00	0.92	1.22	10.6
West: Great Eastern Hwy														
10	L2	741	1.5	741	1.5	0.625	12.8	LOS B	12.4	87.8	0.52	0.73	0.52	21.8
11	T1	2015	3.2	2015	3.2	* 0.778	35.0	LOS C	13.9	100.0	0.84	0.75	0.85	10.5
12	R2	83	0.0	83	0.0	* 0.549	72.8	LOS E	3.8	26.8	1.00	0.78	1.00	14.0
12u	U	10	0.0	10	0.0	0.549	74.4	LOS E	3.8	26.8	1.00	0.78	1.00	5.6
Approach		2849	2.7	2849	2.7	0.778	30.5	LOS C	13.9	100.0	0.76	0.75	0.77	12.3
All Vehicles		5942	2.4	5916 N1	2.4	0.843	41.0	LOS D	13.9	100.0	0.84	0.79	0.88	11.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	113	0.0	113	0.0	0.488	66.4	LOS E	4.9	34.1	0.97	0.79	0.97	15.6
2	T1	180	2.8	180	2.8	* 0.644	62.5	LOS E	6.8	48.7	1.00	0.82	1.00	16.8
3	R2	146	2.7	146	2.7	0.591	67.7	LOS E	5.8	42.1	0.99	0.81	0.99	15.7
Approach		439	2.1	439	2.1	0.644	65.2	LOS E	6.8	48.7	0.99	0.81	0.99	16.1
East: Great Eastern Hwy														
4	L2	131	0.0	131	0.0	0.094	9.5	LOS A	1.2	8.3	0.28	0.62	0.28	45.0
5	T1	1482	3.0	1482	3.0	0.451	27.4	LOS C	11.1	78.9	0.73	0.64	0.73	12.8
6	R2	240	0.4	240	0.4	* 0.967	100.7	LOS F	13.5	95.2	1.00	1.08	1.50	4.2
6u	U	15	0.0	15	0.0	0.967	102.3	LOS F	13.5	95.2	1.00	1.08	1.50	4.2
Approach		1868	2.4	1868	2.4	0.967	36.1	LOS D	13.5	95.2	0.73	0.70	0.80	12.0
North: Resolution Dr														
7	L2	287	1.7	287	1.7	0.533	34.0	LOS C	8.4	60.2	0.81	0.81	0.81	12.1
8	T1	170	2.9	170	2.9	0.851	76.1	LOS E	4.9	34.4	1.00	0.87	1.21	17.7
9	R2	104	7.7	104	7.7	* 0.912	90.6	LOS F	5.0	37.2	1.00	0.99	1.47	5.3
Approach		561	3.2	561	3.2	0.912	57.3	LOS E	8.4	60.2	0.90	0.86	1.06	12.9
West: Great Eastern Hwy														
10	L2	22	0.0	22	0.0	0.063	28.9	LOS C	1.0	9.5	0.59	0.58	0.59	17.8
11	T1	2345	2.8	2345	2.8	* 0.899	39.2	LOS D	22.3	160.0	0.92	0.91	1.01	13.1
12	R2	182	1.6	182	1.6	0.798	73.1	LOS E	8.8	61.8	1.00	0.89	1.15	18.5
12u	U	22	0.0	22	0.0	0.798	74.7	LOS E	8.8	61.8	1.00	0.89	1.15	7.9
Approach		2571	2.6	2571	2.6	0.899	41.9	LOS D	22.3	160.0	0.93	0.91	1.02	13.8
All Vehicles		5439	2.6	5439	2.6	0.967	43.4	LOS D	22.3	160.0	0.86	0.82	0.95	13.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	99	1.0	99	1.0	0.667	7.5	LOS A	2.4	17.6	0.75	0.91	0.92	28.5
6a	R1	40	0.0	40	0.0	0.667	12.7	LOS B	2.4	17.6	0.75	0.91	0.92	39.6
6	R2	513	3.3	513	3.3	0.667	14.1	LOS B	2.4	17.6	0.75	0.91	0.92	28.5
Approach		652	2.8	652	2.8	0.667	13.0	LOS B	2.4	17.6	0.75	0.91	0.92	29.4
North: Grandstand Rd														
7	L2	207	2.4	207	2.4	0.208	3.6	LOS A	0.5	3.5	0.24	0.48	0.24	34.5
9a	R1	380	0.3	380	0.3	0.208	8.4	LOS A	0.5	3.5	0.24	0.55	0.24	31.8
9b	R3	8	0.0	8	0.0	0.208	10.9	LOS B	0.5	3.4	0.25	0.57	0.25	47.5
9u	U	4	0.0	4	0.0	0.208	12.1	LOS B	0.5	3.4	0.25	0.57	0.25	31.1
Approach		599	1.0	599	1.0	0.208	6.8	LOS A	0.5	3.5	0.24	0.52	0.24	32.9
NorthWest: Resolution Dr														
27b	L3	13	0.0	13	0.0	0.193	9.8	LOS A	0.4	3.0	0.87	0.93	0.87	28.7
27a	L1	25	4.0	25	4.0	0.193	9.1	LOS A	0.4	3.0	0.87	0.93	0.87	28.7
29	R2	34	2.9	34	2.9	0.193	15.1	LOS B	0.4	3.0	0.87	0.93	0.87	28.7
Approach		72	2.8	72	2.8	0.193	12.1	LOS B	0.4	3.0	0.87	0.93	0.87	28.7
SouthWest: Stoneham St														
30	L2	50	0.0	46	0.0	0.769	11.0	LOS B	4.3	30.8	0.97	1.06	1.35	35.7
30a	L1	1433	1.0	1334	1.1	0.769	11.2	LOS B	4.3	30.8	0.97	1.08	1.37	23.2
32a	R1	16	6.3	15	6.7	0.769	17.3	LOS B	4.1	28.7	0.97	1.11	1.39	22.4
32u	U	5	0.0	5	0.0	0.769	20.8	LOS C	4.1	28.7	0.97	1.11	1.39	22.4
Approach		1504	1.1	1400 N1	1.1	0.769	11.3	LOS B	4.3	30.8	0.97	1.08	1.37	23.8
All Vehicles		2827	1.5	2723 N1	1.5	0.769	10.8	LOS B	4.3	30.8	0.76	0.91	1.00	27.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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NETWORK SUMMARY

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

Proposed Network
25% of Ascot Kilns and Golden Gateway development
50% of Ascot Racecourse development
Network Category: Future Conditions 1

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS E					
Speed Efficiency	0.32					
Travel Time Index	2.49					
Congestion Coefficient	3.08					
Travel Speed (Average)	19.3	km/h			5.4	km/h
Travel Distance (Total)	12505.2	veh-km/h			22006.4	pers-km/h
Travel Time (Total)	646.3	veh-h/h			4045.4	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	55958	veh/h			130718	pers/h
Arrival Flows (Total for all Sites)	54150	veh/h			124681	pers/h
Demand Flows (Entry Total)	8372	veh/h				
Midblock Inflows (Total)	415	veh/h				
Midblock Outflows (Total)	-44	veh/h				
Percent Heavy Vehicles (Demand)	2.3	%				
Percent Heavy Vehicles (Arrival)	2.4	%				
Degree of Saturation	2.781					
Control Delay (Total)	430.97	veh-h/h			3617.80	pers-h/h
Control Delay (Average)	28.7	sec			104.5	sec
Control Delay (Worst Lane)	1634.5	sec				
Control Delay (Worst Movement)	1670.6	sec			1670.6	sec
Geometric Delay (Average)	0.8	sec				
Stop-Line Delay (Average)	27.8	sec				
Ave. Queue Storage Ratio (Worst Lane)	42.18					
Total Effective Stops	20603	veh/h			196336	pers/h
Effective Stop Rate	0.38		1.65	per km	1.57	
Proportion Queued	0.26				0.38	
Performance Index	2048.7				2048.7	
Cost (Total)	114524.00	$/h	9.16	$/km	114524.00	$/h
Fuel Consumption (Total)	1871.5	L/h	149.7	mL/km		
Fuel Economy	15.0	L/100km				
Carbon Dioxide (Total)	4417.5	kg/h	353.2	g/km		
Hydrocarbons (Total)	0.453	kg/h	0.036	g/km		
Carbon Monoxide (Total)	4.322	kg/h	0.346	g/km		
NOx (Total)	4.760	kg/h	0.381	g/km		

Network Model Variability Index (Iterations 3 to N): 4.3 %
Number of Iterations: 10 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 9.5% 1.0% 0.7%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	26,859,840	veh/y	62,744,830	pers/y
Delay	206,865	veh-h/y	1,736,543	pers-h/y
Effective Stops	9,889,336	veh/y	94,241,200	pers/y
Travel Distance	6,002,488	veh-km/y	10,563,090	pers-km/y
Travel Time	310,212	veh-h/y	1,941,774	pers-h/y
Cost	54,971,540	$/y	54,971,540	$/y
Fuel Consumption	898,303	L/y		
Carbon Dioxide	2,120,378	kg/y		

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Hydrocarbons	217	kg/y
Carbon Monoxide	2,075	kg/y
NOx	2,285	kg/y

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	210	0.5	210	0.5	0.883	74.3	LOS E	15.8	111.5	1.00	0.98	1.22	11.1
2	T1	447	1.3	447	1.3	* 0.883	68.3	LOS E	15.8	111.5	1.00	1.01	1.23	11.8
3	R2	272	1.1	272	1.1	0.713	61.7	LOS E	10.7	76.1	0.99	0.85	1.01	12.7
Approach		929	1.1	929	1.1	0.883	67.8	LOS E	15.8	111.5	1.00	0.96	1.16	11.9
East: Great Eastern Hwy														
4	L2	123	3.3	119	3.4	0.214	34.6	LOS C	3.8	30.5	0.70	0.72	0.70	22.2
5	T1	1579	2.8	1562	2.8	0.673	36.7	LOS D	11.2	80.0	0.88	0.79	0.88	8.7
6	R2	78	2.6	78	2.6	0.555	72.5	LOS E	3.8	27.0	1.00	0.78	1.00	4.9
6u	U	13	0.0	13	0.0	0.555	74.3	LOS E	3.8	27.0	1.00	0.78	1.00	4.9
Approach		1793	2.8	1771 N 1	2.8	0.673	38.4	LOS D	11.2	80.0	0.88	0.78	0.88	9.4
North: Stoneham St														
7	L2	10	0.0	9	0.0	0.047	66.9	LOS E	0.3	2.3	0.93	0.67	0.93	7.3
8	T1	240	0.0	212	0.0	* 1.017	119.1	LOS F	11.7	82.2	1.00	1.21	1.72	10.5
9	R2	416	1.2	364	1.4	1.017	122.6	LOS F	10.9	77.7	1.00	1.16	1.69	4.6
Approach		666	0.8	585 N1	0.8	1.017	120.5	LOS F	11.7	82.2	1.00	1.17	1.69	6.9
West: Great Eastern Hwy														
10	L2	827	1.3	827	1.3	0.697	14.0	LOS B	14.1	100.0	0.59	0.76	0.59	20.6
11	T1	2132	3.1	2132	3.1	* 0.830	38.5	LOS D	13.9	100.0	0.88	0.82	0.92	9.7
12	R2	87	0.0	87	0.0	* 0.579	73.0	LOS E	4.1	28.4	1.00	0.78	1.00	14.0
12u	U	11	0.0	11	0.0	0.579	74.7	LOS E	4.1	28.4	1.00	0.78	1.00	5.5
Approach		3057	2.6	3057	2.6	0.830	33.0	LOS C	14.1	100.0	0.80	0.80	0.83	11.5
All Vehicles		6445	2.2	6342 N 1	2.3	1.017	47.7	LOS D	15.8	111.5	0.87	0.85	0.97	10.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	119	0.0	119	0.0	0.523	66.8	LOS E	5.3	36.8	0.98	0.80	0.98	15.6
2	T1	195	2.6	195	2.6	* 0.690	63.5	LOS E	7.4	52.9	1.00	0.84	1.03	16.6
3	R2	153	2.6	153	2.6	0.618	68.0	LOS E	6.1	44.2	0.99	0.81	0.99	15.6
Approach		467	1.9	467	1.9	0.690	65.8	LOS E	7.4	52.9	0.99	0.82	1.01	16.0
East: Great Eastern Hwy														
4	L2	138	0.0	138	0.0	0.099	9.8	LOS A	1.3	9.0	0.29	0.62	0.29	44.7
5	T1	1557	2.9	1557	2.9	0.474	27.7	LOS C	11.8	84.2	0.74	0.65	0.74	12.7
6	R2	367	0.3	367	0.3	* 1.442	464.7	LOS F	14.2	100.0	1.00	1.91	3.18	0.9
6u	U	16	0.0	16	0.0	1.442	466.4	LOS F	14.2	100.0	1.00	1.91	3.18	0.9
Approach		2078	2.2	2078	2.2	1.442	107.1	LOS F	14.2	100.0	0.76	0.88	1.16	4.5
North: Resolution Dr														
7	L2	333	1.5	276	1.8	0.513	37.2	LOS D	8.4	59.7	0.83	0.81	0.83	11.3
8	T1	182	2.7	168	2.4	* 0.838	75.6	LOS E	4.8	33.6	1.00	0.86	1.19	17.8
9	R2	105	7.6	83	7.7	0.729	80.1	LOS F	3.6	27.2	1.00	0.84	1.15	5.9
Approach		620	2.9	527 N1	2.9	0.838	56.2	LOS E	8.4	59.7	0.91	0.83	1.00	13.3
West: Great Eastern Hwy														
10	L2	39	0.0	39	0.0	0.083	29.2	LOS C	1.4	12.3	0.60	0.63	0.60	17.3
11	T1	2454	2.7	2453	2.7	* 0.945	51.0	LOS D	22.3	160.0	0.98	1.03	1.15	10.7
12	R2	191	1.6	191	1.6	0.777	71.8	LOS E	8.6	60.3	1.00	0.88	1.12	18.8
12u	U	11	0.0	11	0.0	0.777	73.4	LOS E	8.6	60.3	1.00	0.88	1.12	8.0
Approach		2695	2.6	2694 N1	2.6	0.945	52.2	LOS D	22.3	160.0	0.97	1.02	1.14	11.6
All Vehicles		5860	2.4	5766 N1	2.5	1.442	73.4	LOS E	22.3	160.0	0.89	0.93	1.12	8.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	221	0.5	180	0.5	0.743	9.3	LOS A	3.3	23.3	0.83	1.01	1.12	27.0
6a	R1	55	0.0	47	0.0	0.743	14.5	LOS B	3.3	23.3	0.83	1.01	1.12	38.2
6	R2	556	3.1	477	3.1	0.743	15.9	LOS B	3.3	23.3	0.83	1.01	1.12	27.0
Approach		832	2.2	703 N1	2.2	0.743	14.1	LOS B	3.3	23.3	0.83	1.01	1.12	27.9
North: Grandstand Rd														
7	L2	253	2.0	253	2.0	0.247	3.9	LOS A	0.6	4.0	0.31	0.50	0.31	34.0
9a	R1	409	0.2	409	0.2	0.247	8.6	LOS A	0.6	4.0	0.32	0.57	0.32	31.1
9b	R3	8	0.0	8	0.0	0.247	11.1	LOS B	0.6	3.9	0.32	0.59	0.32	46.8
9u	U	4	0.0	4	0.0	0.247	12.4	LOS B	0.6	3.9	0.32	0.59	0.32	30.5
Approach		674	0.9	674	0.9	0.247	6.9	LOS A	0.6	4.0	0.32	0.54	0.32	32.3
NorthWest: Resolution Dr														
27b	L3	14	0.0	14	0.0	0.252	9.8	LOS A	0.5	3.9	0.88	0.94	0.88	28.7
27a	L1	32	3.1	32	3.1	0.252	9.1	LOS A	0.5	3.9	0.88	0.94	0.88	28.7
29	R2	47	2.1	47	2.1	0.252	15.1	LOS B	0.5	3.9	0.88	0.94	0.88	28.7
Approach		93	2.2	93	2.2	0.252	12.2	LOS B	0.5	3.9	0.88	0.94	0.88	28.7
SouthWest: Stoneham St														
30	L2	62	0.0	56	0.0	0.784	11.0	LOS B	4.6	32.7	0.98	1.06	1.36	35.8
30a	L1	1519	1.0	1341	1.1	0.784	11.2	LOS B	4.6	32.7	0.98	1.08	1.38	23.2
32a	R1	53	1.9	51	2.0	0.784	17.0	LOS B	4.3	30.5	0.99	1.11	1.40	22.3
32u	U	5	0.0	4	0.0	0.784	20.7	LOS C	4.3	30.5	0.99	1.11	1.40	22.3
Approach		1639	1.0	1452 N1	1.1	0.784	11.4	LOS B	4.6	32.7	0.98	1.08	1.38	23.9
All Vehicles		3238	1.3	2923 N1	1.4	0.784	11.0	LOS B	4.6	32.7	0.79	0.93	1.06	27.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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NETWORK SUMMARY

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

Proposed Network
100% of Ascot Kilns, Golden Gateway and Ascot Racecourse development
PLUS Ascot Weekday Event
Network Category: Future Conditions 2

Network Performance - Hourly Values						
Performance Measure	**Vehicles**		**Per Unit Distance**		**Persons**	
Network Level of Service (LOS)	LOS F					
Speed Efficiency	0.18					
Travel Time Index	0.90					
Congestion Coefficient	5.53					
Travel Speed (Average)	10.8	km/h			1.9	km/h
Travel Distance (Total)	13387.1	veh-km/h			24751.5	pers-km/h
Travel Time (Total)	1241.6	veh-h/h			12827.9	pers-h/h
Desired Speed (Program)	59.7	km/h				
Demand Flows (Total for all Sites)	62890	veh/h			171847	pers/h
Arrival Flows (Total for all Sites)	58430	veh/h			148809	pers/h
Demand Flows (Entry Total)	9453	veh/h				
Midblock Inflows (Total)	456	veh/h				
Midblock Outflows (Total)	-253	veh/h				
Percent Heavy Vehicles (Demand)	2.1	%				
Percent Heavy Vehicles (Arrival)	2.3	%				
Degree of Saturation	5.264					
Control Delay (Total)	1001.38	veh-h/h			12266.10	pers-h/h
Control Delay (Average)	61.7	sec			296.7	sec
Control Delay (Worst Lane)	3874.2	sec				
Control Delay (Worst Movement)	3907.8	sec			3907.8	sec
Geometric Delay (Average)	0.9	sec				
Stop-Line Delay (Average)	60.8	sec				
Ave. Queue Storage Ratio (Worst Lane)	91.45					
Total Effective Stops	26132	veh/h			360279	pers/h
Effective Stop Rate	0.45		1.95	per km	2.42	
Proportion Queued	0.28				0.43	
Performance Index	3244.5				3244.5	
Cost (Total)	358181.80	$/h	26.76	$/km	358181.80	$/h
Fuel Consumption (Total)	2720.9	L/h	203.2	mL/km		
Fuel Economy	20.3	L/100km				
Carbon Dioxide (Total)	6415.3	kg/h	479.2	g/km		
Hydrocarbons (Total)	0.708	kg/h	0.053	g/km		
Carbon Monoxide (Total)	5.649	kg/h	0.422	g/km		
NOx (Total)	5.577	kg/h	0.417	g/km		

Network Model Variability Index (Iterations 3 to N): 31.4 %
Number of Iterations: 10 (Maximum: 10)
Largest change in Lane Degrees of Saturation or Queue Storage Ratios for the last three Network Iterations: 8.3% 5.9% 4.5%
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: Standard Left.

Network Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total for all Sites)	30,187,200	veh/y	82,486,660	pers/y
Delay	480,662	veh-h/y	5,887,729	pers-h/y
Effective Stops	12,543,320	veh/y	172,933,700	pers/y
Travel Distance	6,425,829	veh-km/y	11,880,740	pers-km/y
Travel Time	595,962	veh-h/y	6,157,413	pers-h/y
Cost	171,927,200	$/y	171,927,200	$/y

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Fuel Consumption	1,306,047	L/y
Carbon Dioxide	3,079,337	kg/y
Hydrocarbons	340	kg/y
Carbon Monoxide	2,712	kg/y
NOx	2,677	kg/y

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MOVEMENT SUMMARY

Site: 106 [GEH Stoneham Belgravia PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Belgravia St														
1	L2	221	0.5	221	0.5	0.964	95.6	LOS F	20.1	142.1	1.00	1.11	1.42	9.0
2	T1	480	1.5	480	1.5	* 0.964	90.0	LOS F	20.1	142.1	1.00	1.15	1.45	9.4
3	R2	300	1.0	300	1.0	0.884	74.5	LOS E	13.5	96.2	1.00	0.97	1.25	10.9
Approach		1001	1.1	1001	1.1	0.964	86.6	LOS F	20.1	142.1	1.00	1.08	1.38	9.7
East: Great Eastern Hwy														
4	L2	128	3.1	119	3.4	0.229	34.8	LOS C	4.0	33.0	0.70	0.72	0.70	22.2
5	T1	1656	2.8	1621	2.7	0.693	37.1	LOS D	11.3	80.0	0.89	0.80	0.89	8.6
6	R2	82	2.4	82	2.4	0.578	72.7	LOS E	3.9	28.2	1.00	0.78	1.00	4.9
6u	U	13	0.0	13	0.0	0.578	74.4	LOS E	3.9	28.2	1.00	0.78	1.00	4.9
Approach		1879	2.8	1836 N1	2.7	0.693	38.8	LOS D	11.3	80.0	0.89	0.79	0.89	9.3
North: Stoneham St														
7	L2	10	0.0	9	0.0	0.046	66.9	LOS E	0.3	2.3	0.93	0.67	0.93	7.4
8	T1	284	0.0	236	0.0	1.199	252.8	LOS F	20.0	140.0	1.00	1.59	2.41	5.3
9	R2	625	1.0	481	1.2	* 1.303	344.6	LOS F	19.7	140.0	1.00	1.70	2.76	1.6
Approach		919	0.7	725 N1	0.8	1.303	311.5	LOS F	20.0	140.0	1.00	1.65	2.62	2.7
West: Great Eastern Hwy														
10	L2	920	1.2	920	1.2	0.778	15.9	LOS B	14.1	100.0	0.68	0.79	0.68	19.0
11	T1	2288	3.1	2288	3.1	* 0.901	48.0	LOS D	13.9	100.0	0.94	0.94	1.07	8.0
12	R2	92	0.0	92	0.0	* 0.608	73.4	LOS E	4.3	30.0	1.00	0.79	1.02	13.9
12u	U	11	0.0	11	0.0	0.608	75.1	LOS E	4.3	30.0	1.00	0.79	1.02	5.5
Approach		3311	2.4	3311	2.4	0.901	39.9	LOS D	14.1	100.0	0.87	0.90	0.96	9.8
All Vehicles		7110	2.1	6873 N1	2.2	1.303	75.0	LOS E	20.1	142.1	0.91	0.98	1.18	6.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 96 [GEH Resolution Hardey PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hardey Rd														
1	L2	125	0.0	125	0.0	0.560	67.2	LOS E	5.7	39.7	0.98	0.80	0.98	15.6
2	T1	212	2.4	212	2.4	*0.740	64.9	LOS E	8.1	57.9	1.00	0.86	1.07	16.3
3	R2	161	2.5	161	2.5	0.650	68.5	LOS E	6.5	46.9	1.00	0.82	1.01	15.5
Approach		498	1.8	498	1.8	0.740	66.6	LOS E	8.1	57.9	1.00	0.83	1.03	15.9
East: Great Eastern Hwy														
4	L2	145	0.0	145	0.0	0.105	10.1	LOS B	1.4	9.9	0.30	0.63	0.30	44.4
5	T1	1636	2.9	1636	2.9	0.500	28.1	LOS C	12.6	90.0	0.75	0.66	0.75	12.5
6	R2	583	0.2	583	0.2	*2.247	1174.9	LOS F	14.3	100.0	1.00	2.66	4.70	0.4
6u	U	17	0.0	17	0.0	2.247	1176.5	LOS F	14.3	100.0	1.00	2.66	4.70	0.4
Approach		2381	2.0	2381	2.0	2.247	316.0	LOS F	14.3	100.0	0.79	1.16	1.72	1.6
North: Resolution Dr														
7	L2	373	1.6	235	2.5	0.444	41.1	LOS D	7.3	52.4	0.85	0.80	0.85	10.4
8	T1	188	2.7	159	1.9	*0.793	74.2	LOS E	4.5	31.2	1.00	0.83	1.14	18.0
9	R2	106	7.5	60	8.1	0.530	77.2	LOS E	2.5	19.1	1.00	0.76	1.00	6.1
Approach		667	2.8	455 N1	3.1	0.793	57.5	LOS E	7.3	52.4	0.92	0.81	0.97	13.5
West: Great Eastern Hwy														
10	L2	88	0.0	88	0.0	0.141	29.9	LOS C	2.6	20.9	0.62	0.69	0.62	16.5
11	T1	2564	2.7	2563	2.7	*1.002	78.4	LOS E	22.3	160.0	1.00	1.20	1.35	7.4
12	R2	204	1.5	204	1.5	0.825	74.7	LOS E	9.4	66.2	1.00	0.91	1.18	18.3
12u	U	11	0.0	11	0.0	0.825	76.3	LOS E	9.4	66.2	1.00	0.91	1.18	7.7
Approach		2867	2.5	2866 N1	2.5	1.002	76.7	LOS E	22.3	160.0	0.99	1.16	1.32	8.4
All Vehicles		6413	2.3	6200 N1	2.4	2.247	166.4	LOS F	22.3	160.0	0.90	1.11	1.42	4.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Project: C:\Users\Claire\Flyt Pty Ltd Dropbox\Flyt Pty Ltd Team Folder\Projects\81113-581 - Golden Gateway Update\3_Project Docs\Modelling \Computer Models\SIDRA\Base Model\Golden Gateway Options July 2024.sip9

Document Set ID: 6149413
Version: 1, Version Date: 11/06/2026

MOVEMENT SUMMARY

Site: 007 [Stoneham Grandstand Resolution PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Resolution Dr														
4a	L1	453	0.2	281	0.3	0.846	13.6	LOS B	5.1	36.1	0.96	1.20	1.55	23.2
6a	R1	79	0.0	54	0.0	0.846	18.9	LOS B	5.1	36.1	0.96	1.20	1.55	34.3
6	R2	587	3.1	432	3.2	0.846	20.3	LOS C	5.1	36.1	0.96	1.20	1.55	23.2
Approach		1119	1.7	768 N1	1.9	0.846	17.7	LOS B	5.1	36.1	0.96	1.20	1.55	24.2
North: Grandstand Rd														
7	L2	318	2.5	318	2.5	0.301	4.2	LOS A	0.7	5.2	0.40	0.53	0.40	33.4
9a	R1	440	0.2	440	0.2	0.301	9.0	LOS A	0.7	5.2	0.41	0.61	0.41	30.3
9b	R3	9	0.0	9	0.0	0.301	11.5	LOS B	0.7	5.0	0.42	0.63	0.42	46.0
9u	U	4	0.0	4	0.0	0.301	12.8	LOS B	0.7	5.0	0.42	0.63	0.42	29.7
Approach		771	1.2	771	1.2	0.301	7.1	LOS A	0.7	5.2	0.41	0.58	0.41	31.6
NorthWest: Resolution Dr														
27b	L3	14	0.0	14	0.0	0.359	11.3	LOS B	0.8	5.9	0.91	0.98	0.99	27.3
27a	L1	46	2.2	46	2.2	0.359	10.5	LOS B	0.8	5.9	0.91	0.98	0.99	27.3
29	R2	67	1.5	67	1.5	0.359	16.5	LOS B	0.8	5.9	0.91	0.98	0.99	27.3
Approach		127	1.6	127	1.6	0.359	13.8	LOS B	0.8	5.9	0.91	0.98	0.99	27.3
SouthWest: Stoneham St														
30	L2	79	0.0	71	0.0	0.824	11.8	LOS B	5.4	38.7	1.00	1.08	1.43	34.9
30a	L1	1609	1.0	1395	1.1	0.824	12.0	LOS B	5.4	38.7	1.00	1.11	1.45	22.1
32a	R1	90	1.1	88	1.1	0.824	18.0	LOS B	5.1	36.2	1.00	1.14	1.48	21.2
32u	U	6	0.0	5	0.0	0.824	21.6	LOS C	5.1	36.2	1.00	1.14	1.48	21.2
Approach		1784	1.0	1559 N1	1.1	0.824	12.4	LOS B	5.4	38.7	1.00	1.11	1.45	22.9
All Vehicles		3801	1.2	3225 N1	1.5	0.846	12.4	LOS B	5.4	38.7	0.84	1.00	1.21	25.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Project: C:\Users\Claire\Flyt Pty Ltd Dropbox\Flyt Pty Ltd Team Folder\Projects\81113-581 - Golden Gateway Update\3_Project Docs\Modelling \Computer Models\SIDRA\Base Model\Golden Gateway Options July 2024.sip9

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Appendix 8 – Forecast Turning Volumes

APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

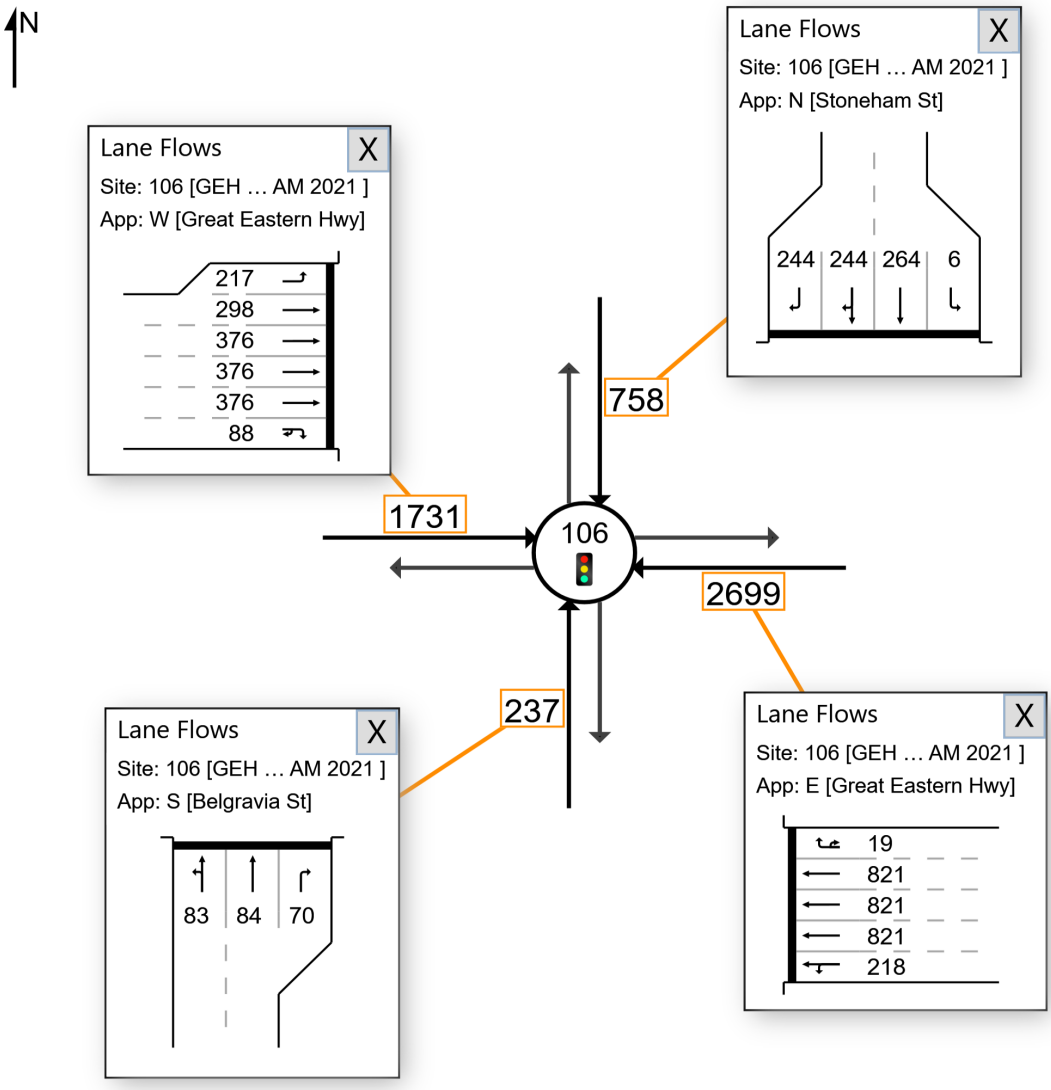
Site: 106 [GEH Stoneham Belgravia AM 2021 (Site Folder: 2021 AM Peak)]

Network: N101 [2021 AM Peak (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2021 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

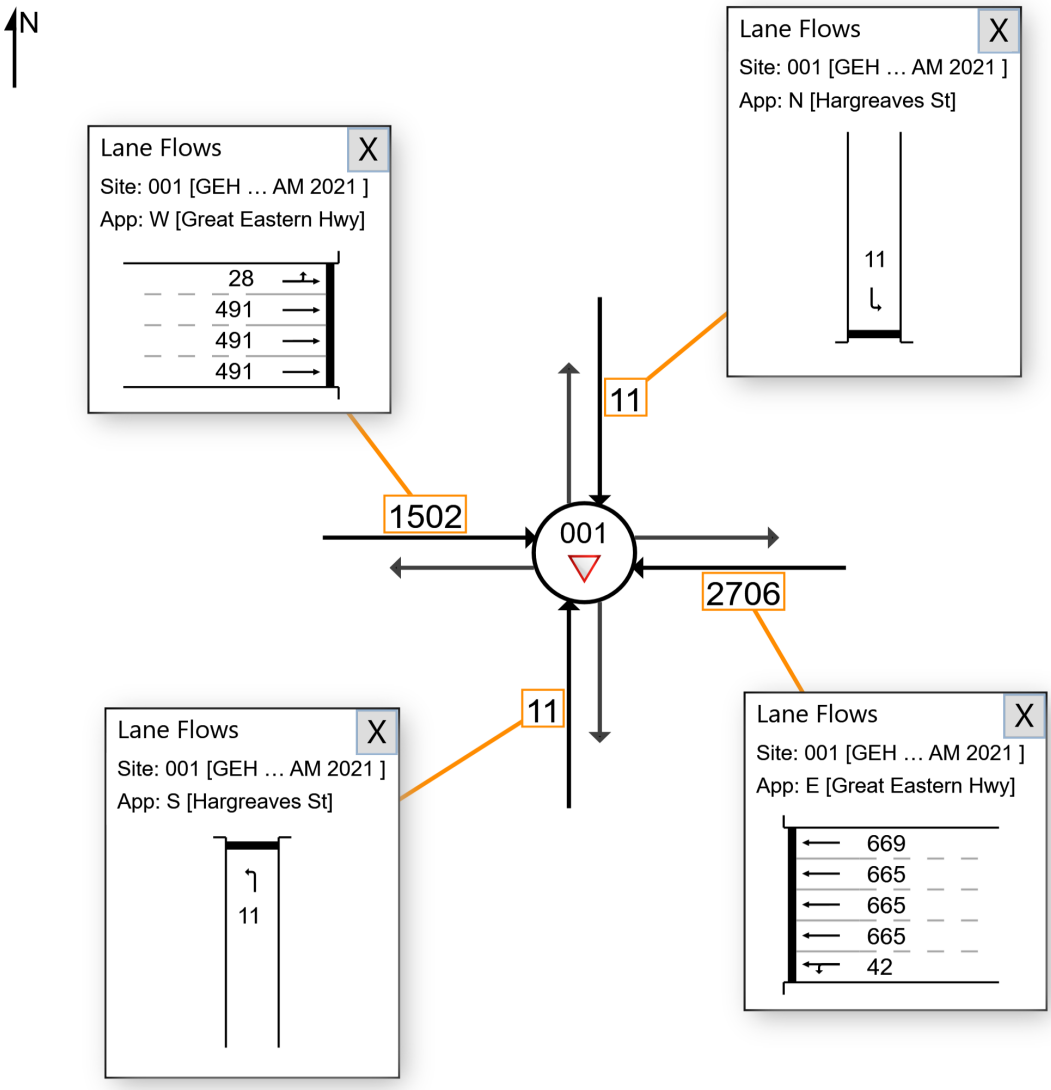
Site: 001 [GEH Hargreaves AM 2021 (Site Folder: 2021 AM Peak)]

Network: N101 [2021 AM Peak (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2021 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly AM 2021 (Site Folder: 2021 AM Peak)]

Network: N101 [2021 AM Peak (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2021 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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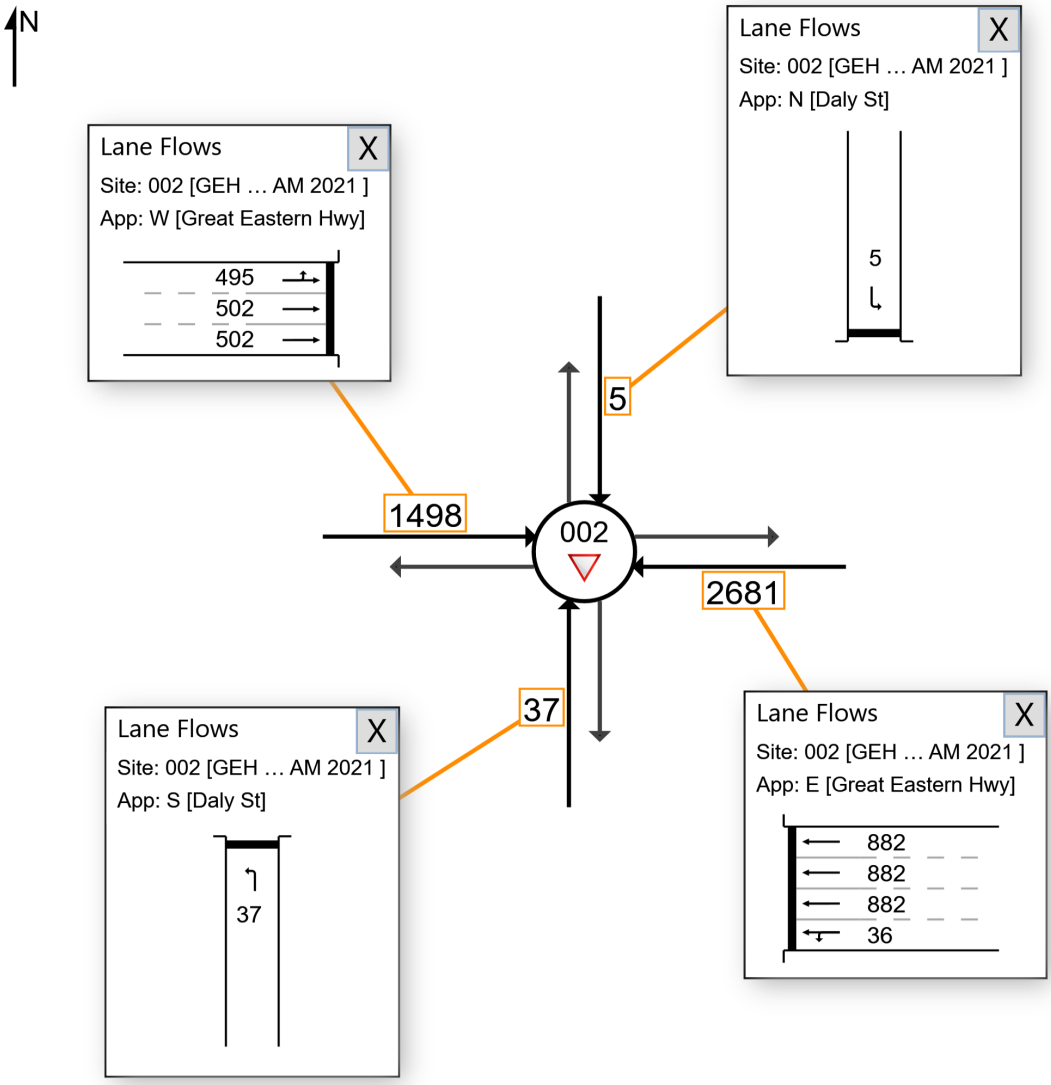

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand AM 2021 (Site Folder: 2021 AM Peak)]

Network: N101 [2021 AM Peak (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2021 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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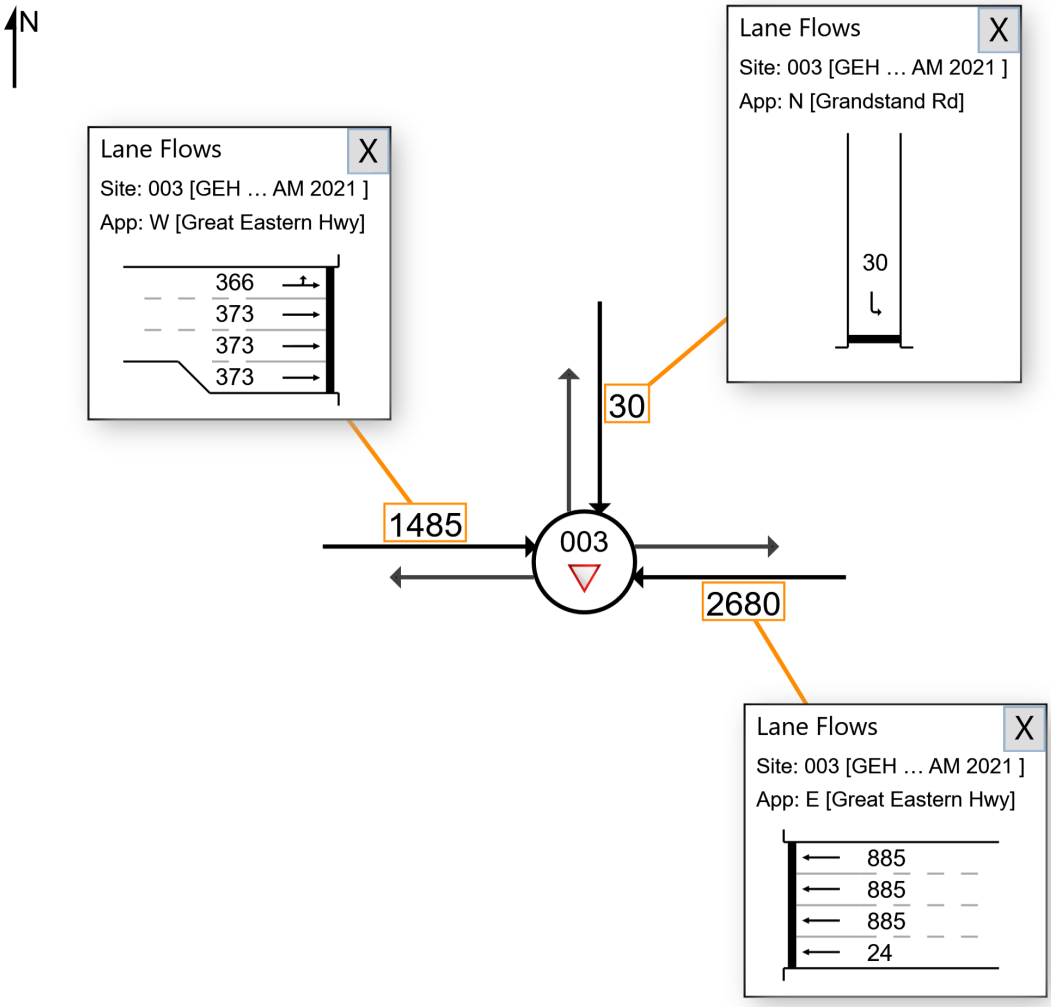

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey AM 2021 (Site Folder: 2021 AM Peak)]

Network: N101 [2021 AM Peak (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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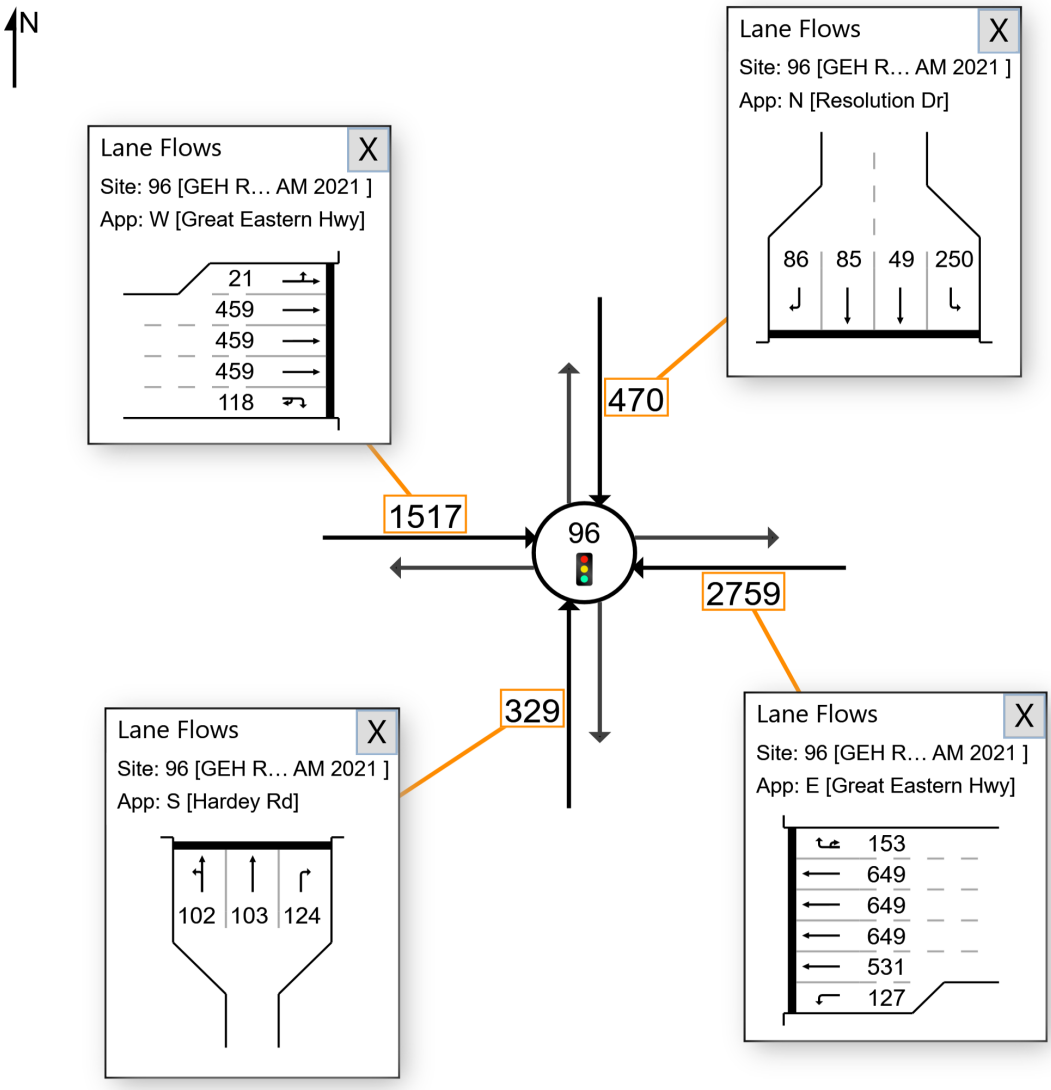

Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves AM 2021 (Site Folder: 2021 AM Peak)] **Network: N101 [2021 AM Peak (Network Folder: General)]**

Stoneham St / Hargreaves St
All in Left out, Give Way
2021 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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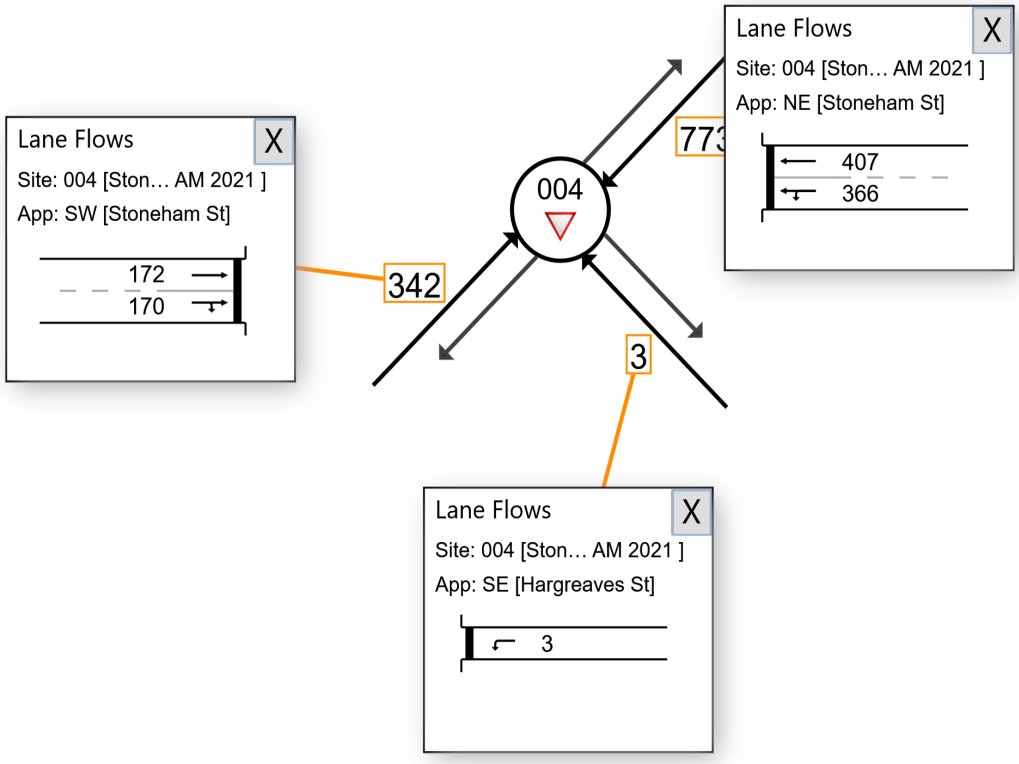

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

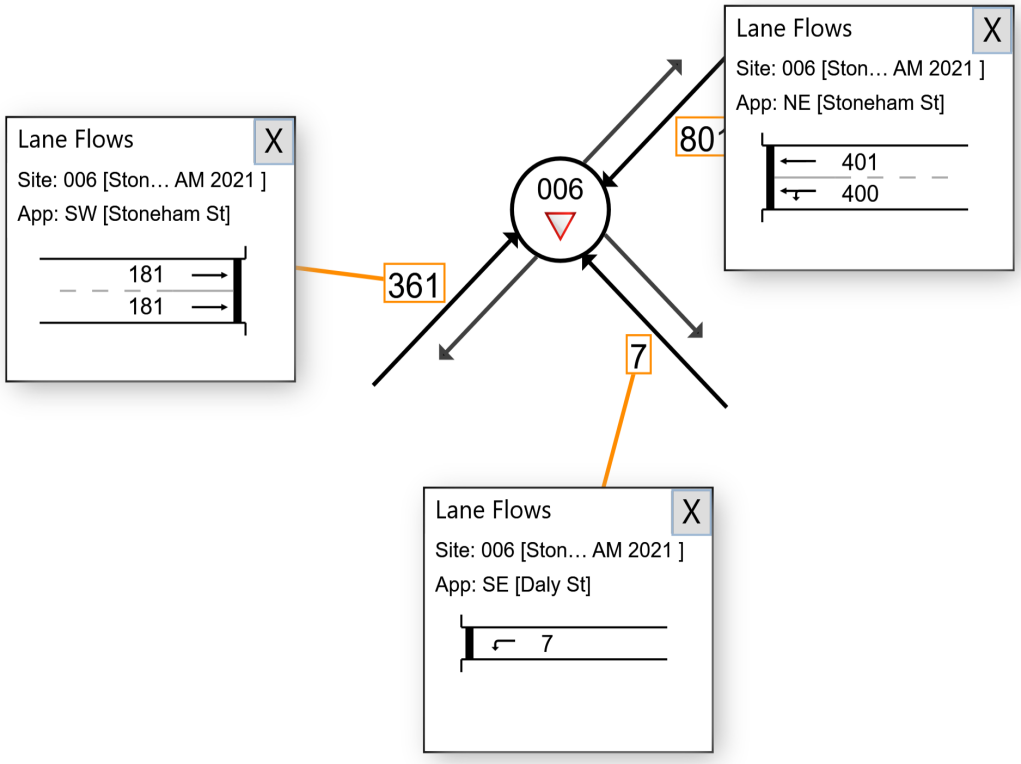
Site: 006 [Stoneham Daly AM 2021 (Site Folder: 2021 AM Peak)]

Network: N101 [2021 AM Peak (Network Folder: General)]

Stoneham St / Daly St
Left out only, Give Way
2021 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution AM 2021 (Site Folder: 2021 AM Peak)]

Network: N101 [2021 AM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 AM Peak
Site Category: Existing Design
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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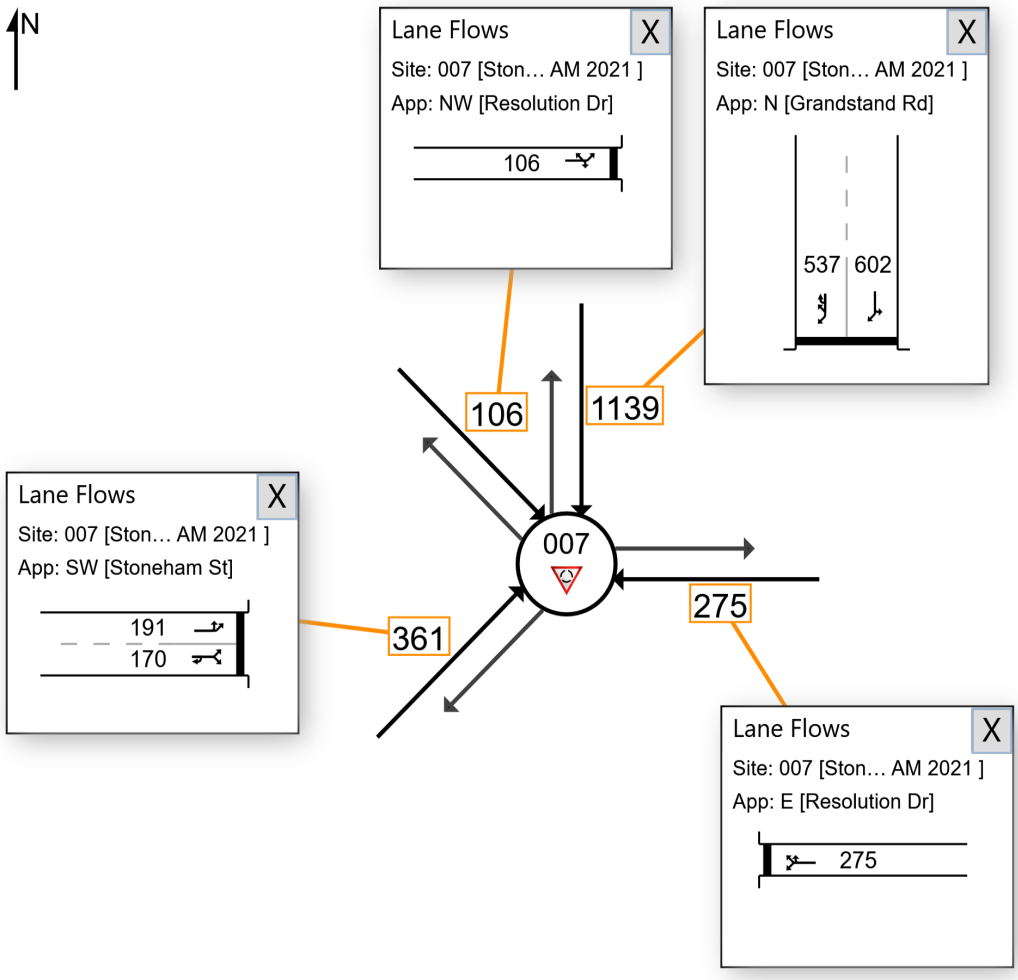

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand AM 2021 (Site Folder: 2021 AM Peak)] **Network: N101 [2021 AM Peak (Network Folder: General)]**

Resolution Dr / Grandstand Rd
Give Way
2021 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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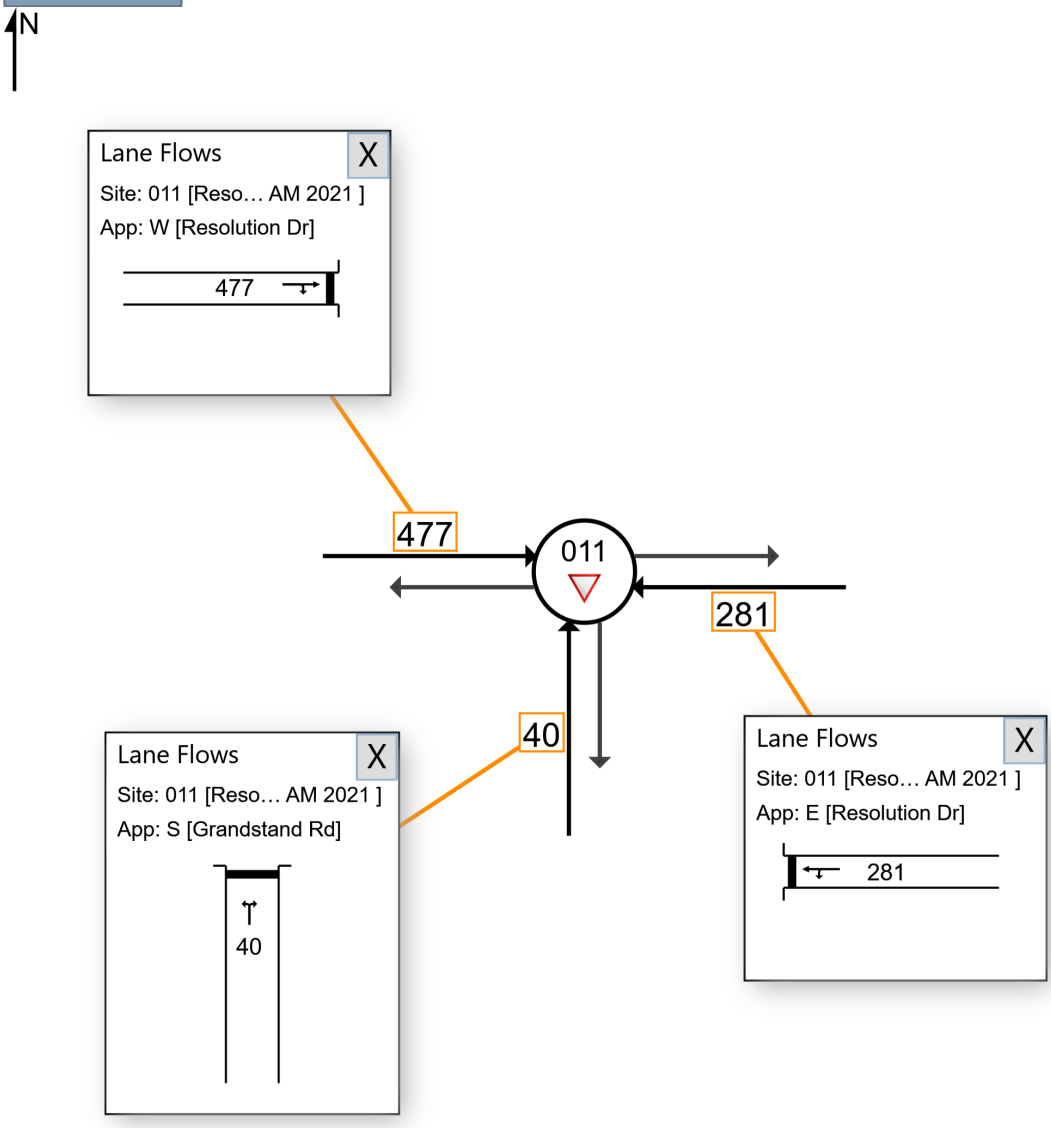

Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia PM 2021 (Site Folder: 2021 PM Peak)]

Network: N101 [2021 PM Peak (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2021 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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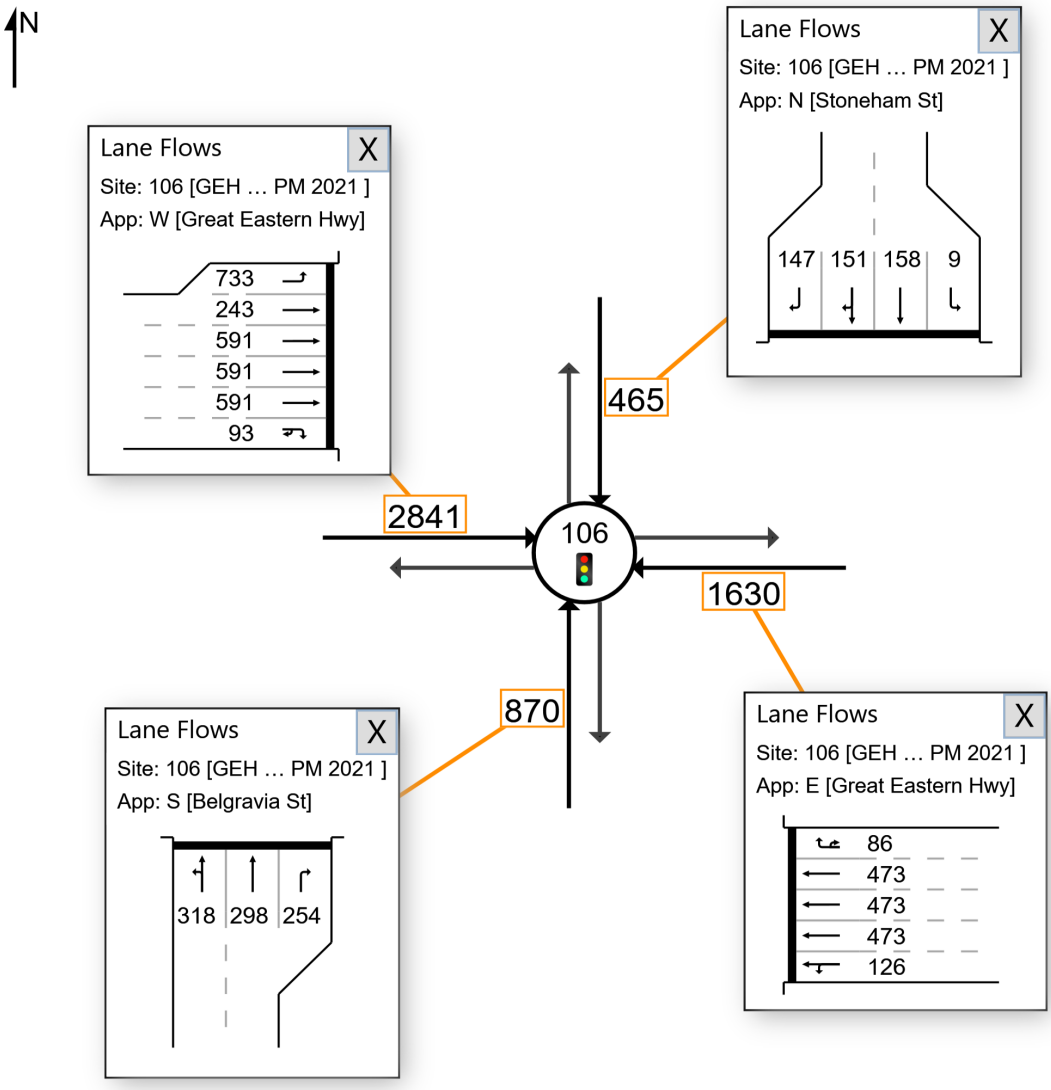

Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves PM 2021 (Site Folder: 2021 PM Peak)]

Network: N101 [2021 PM Peak (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2021 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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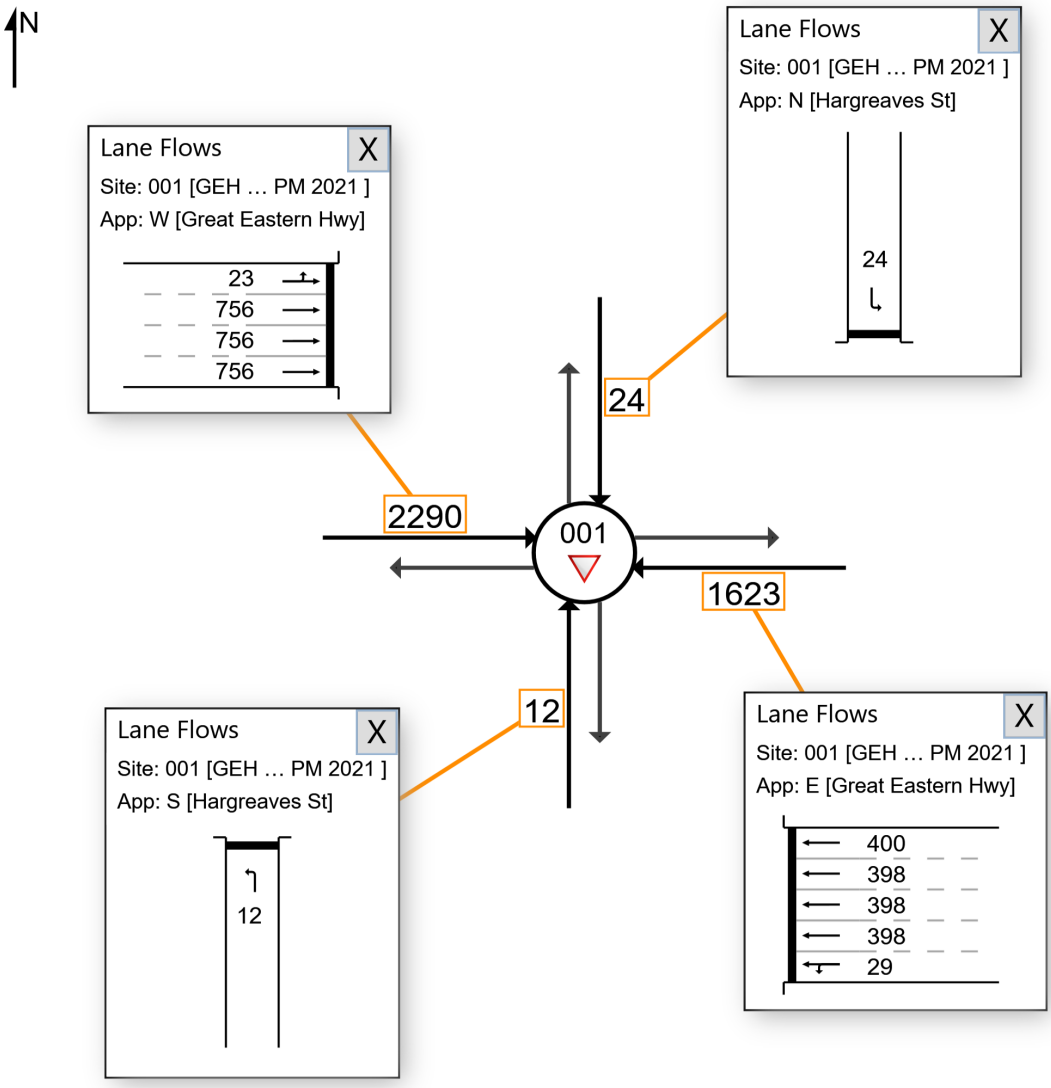

Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly PM 2021 (Site Folder: 2021 PM Peak)]

Network: N101 [2021 PM Peak (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2021 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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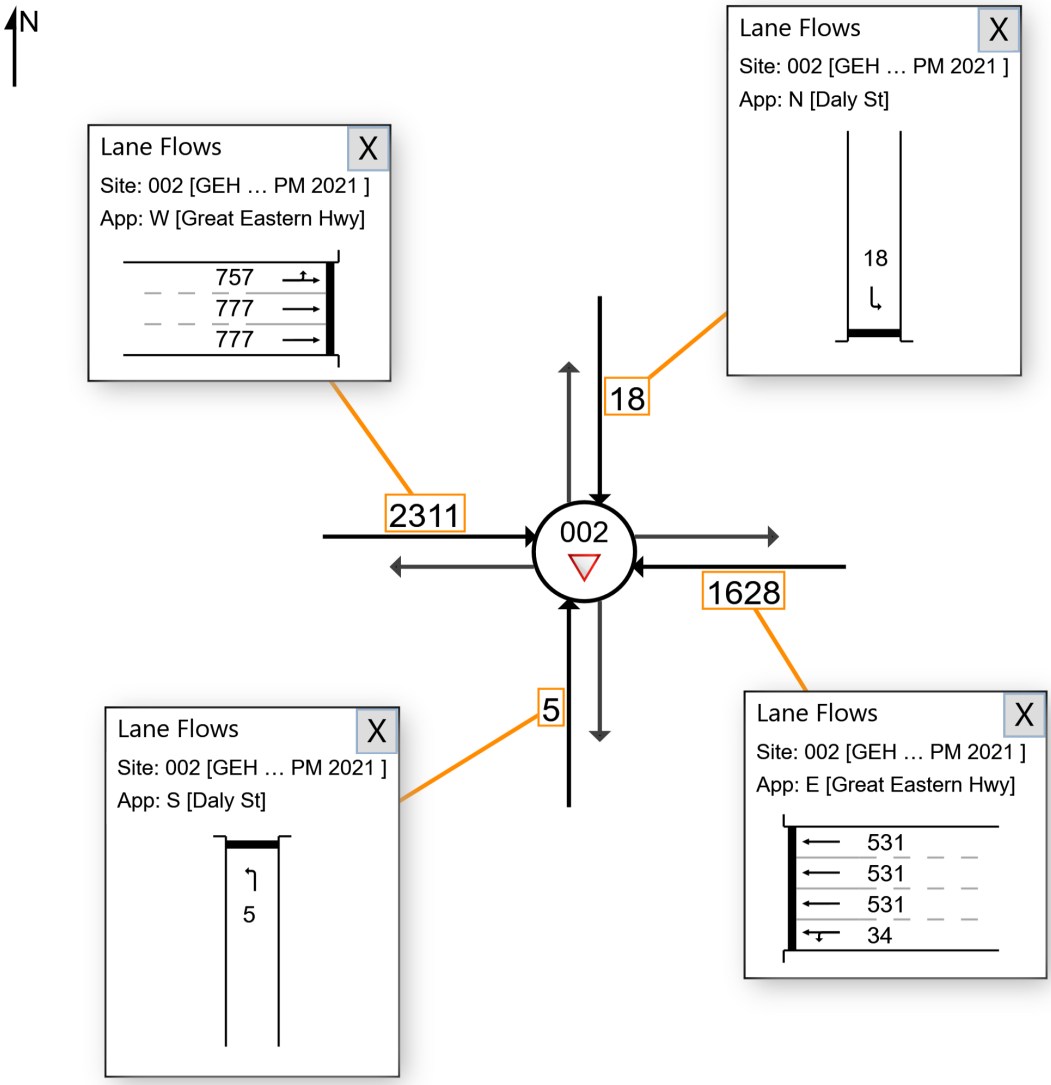

Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand PM 2021 (Site Folder: 2021 PM Peak)]

Network: N101 [2021 PM Peak (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2021 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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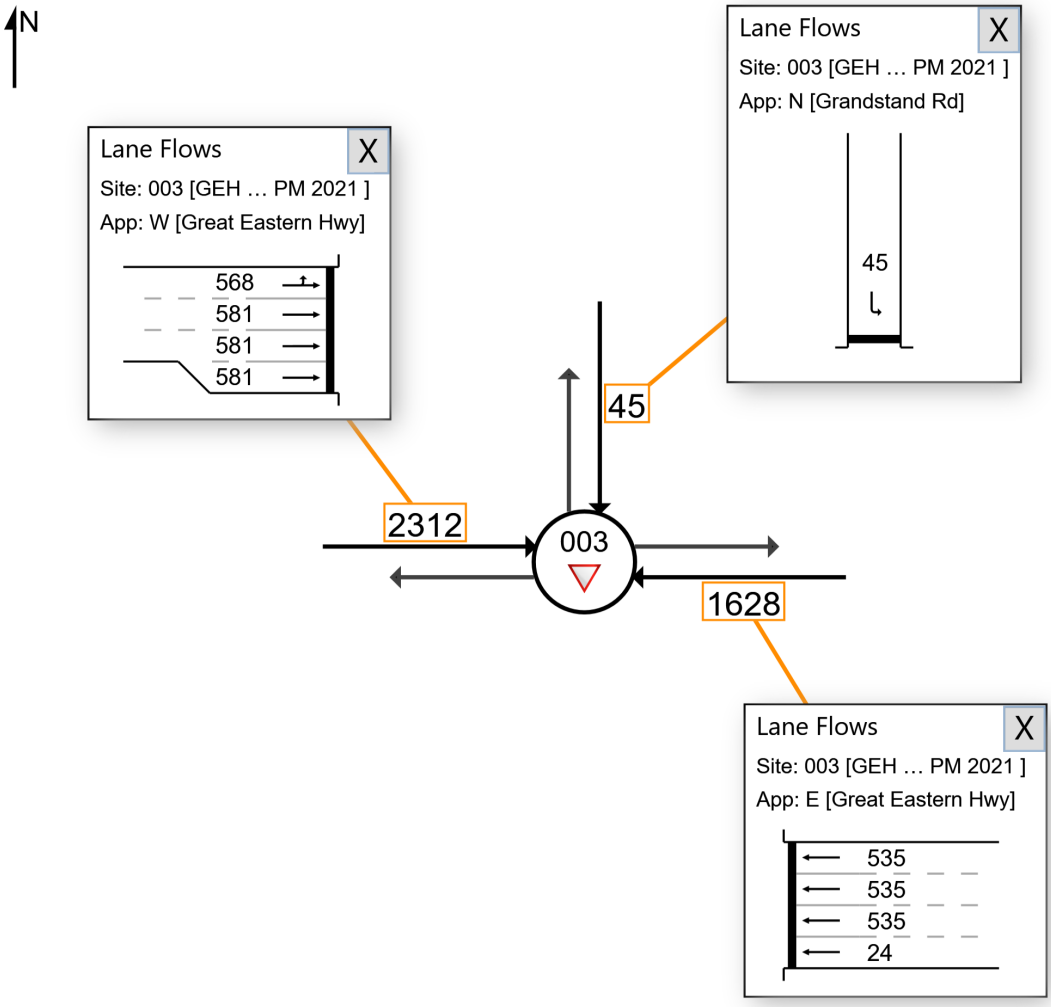

Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey PM 2021 (Site Folder: 2021 PM Peak)]

Network: N101 [2021 PM Peak (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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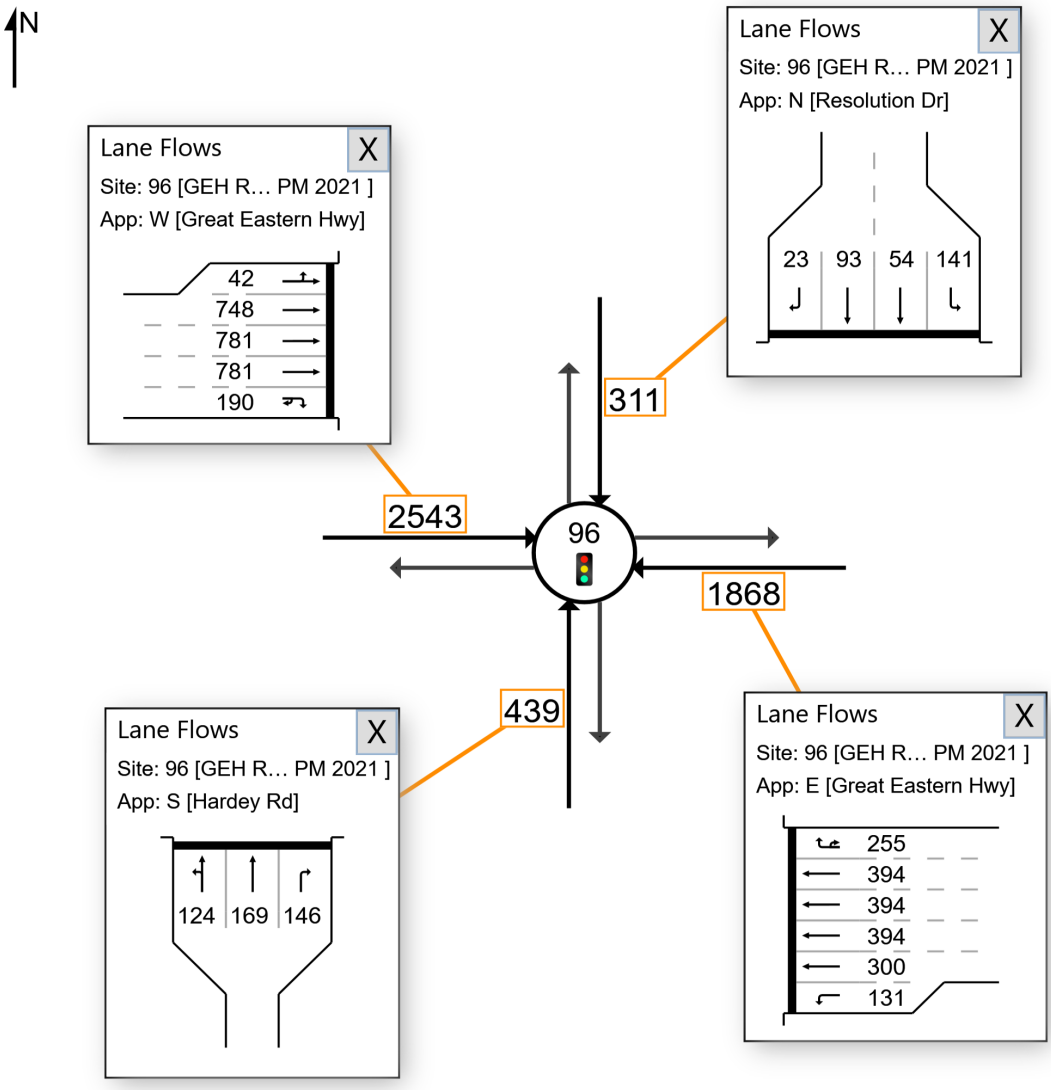

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves PM 2021 (Site Folder: 2021 PM Peak)]

Network: N101 [2021 PM Peak (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2021 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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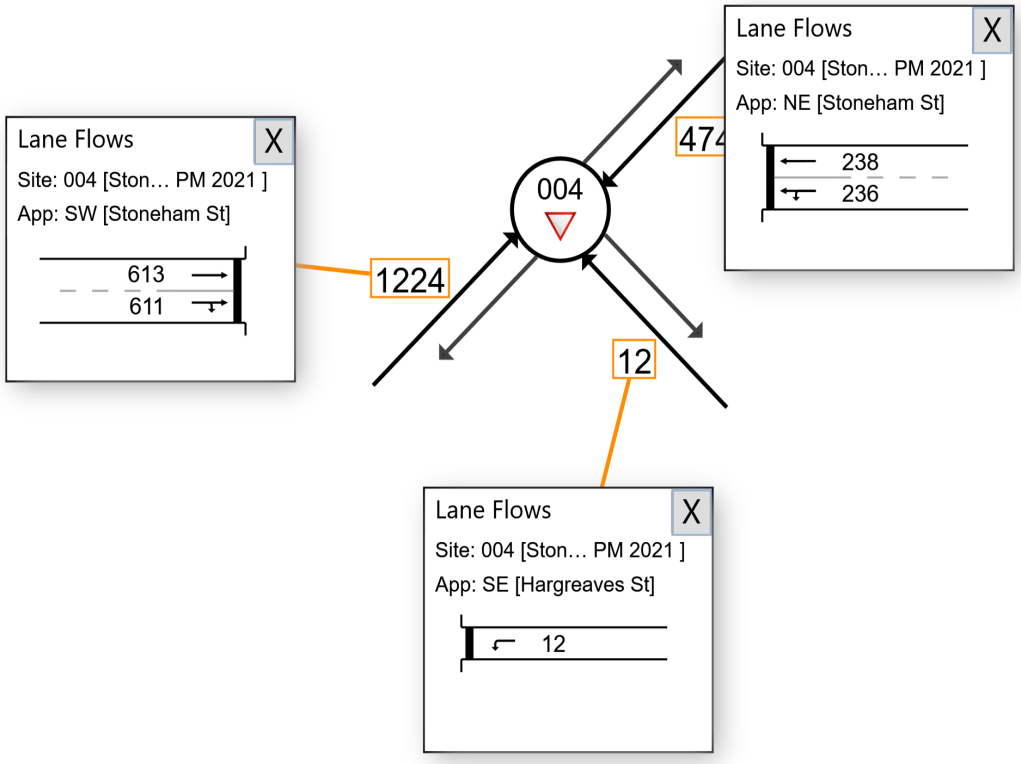

Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 006 [Stoneham Daly PM 2021 (Site Folder: 2021 PM Peak)]

Network: N101 [2021 PM Peak (Network Folder: General)]

Stoneham St / Daly St
Left out only, Give Way
2021 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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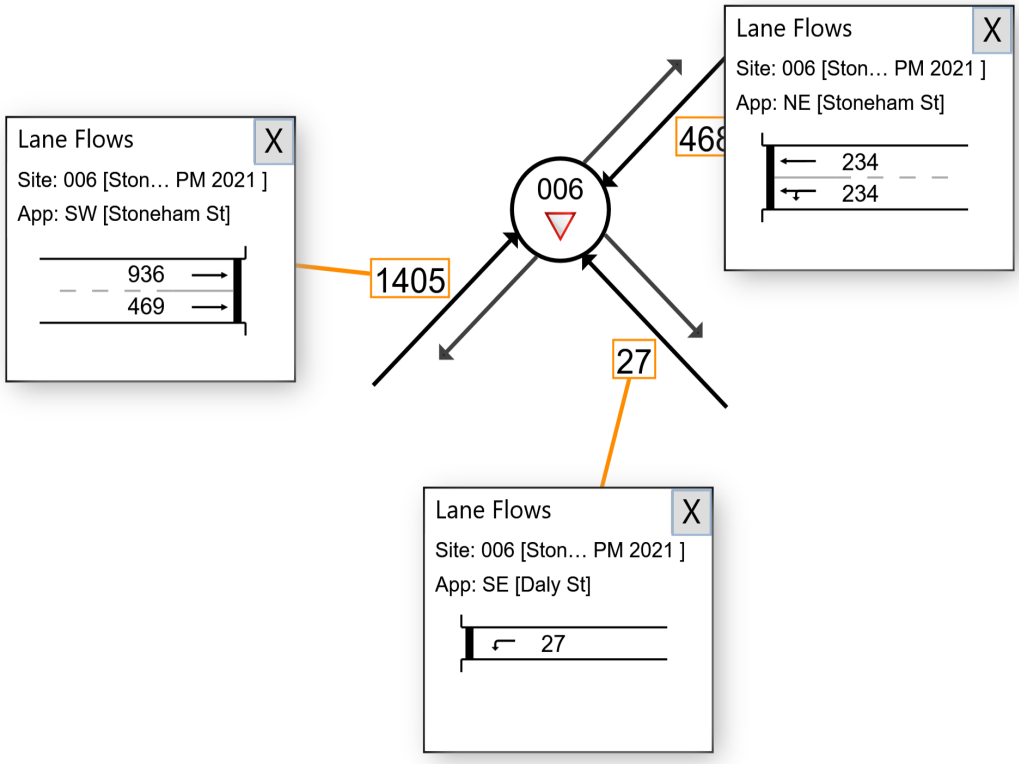

Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

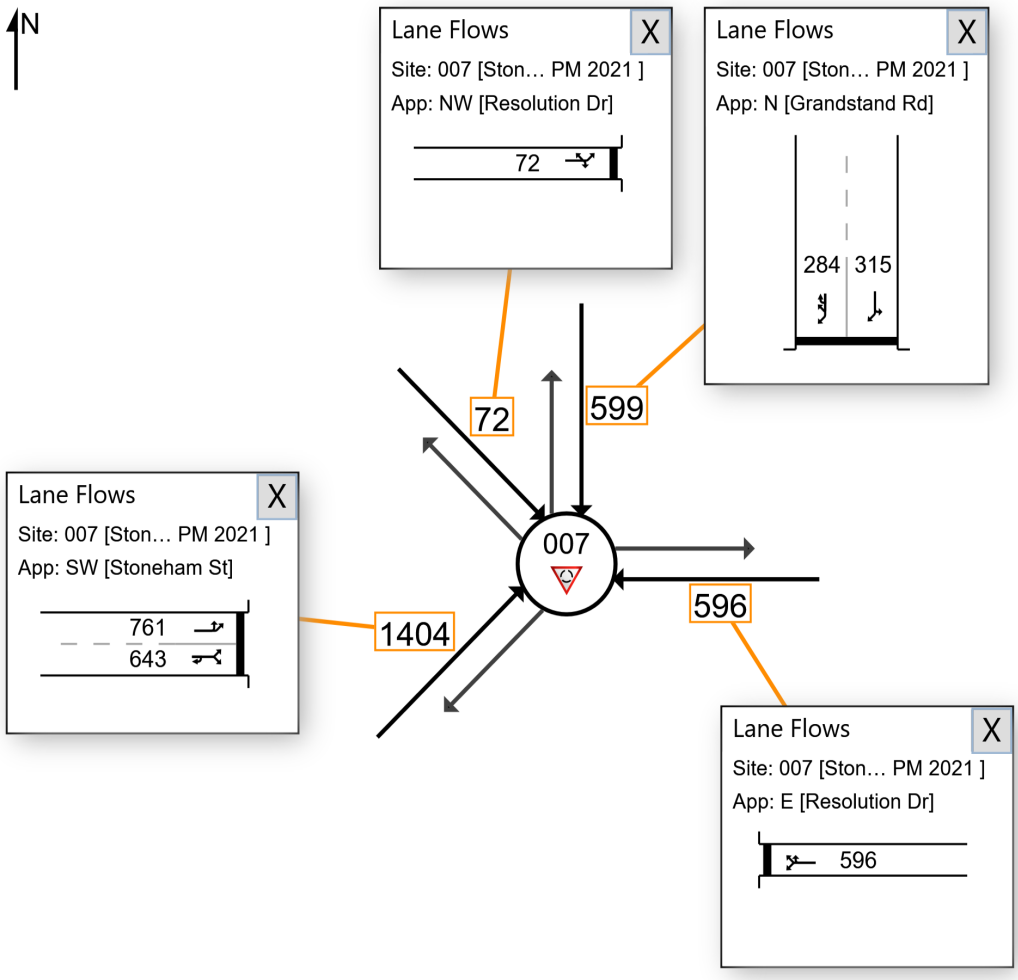
Site: 007 [Stoneham Grandstand Resolution PM 2021 (Site Folder: 2021 PM Peak)]

Network: N101 [2021 PM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 PM Peak
Site Category: Existing Design
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

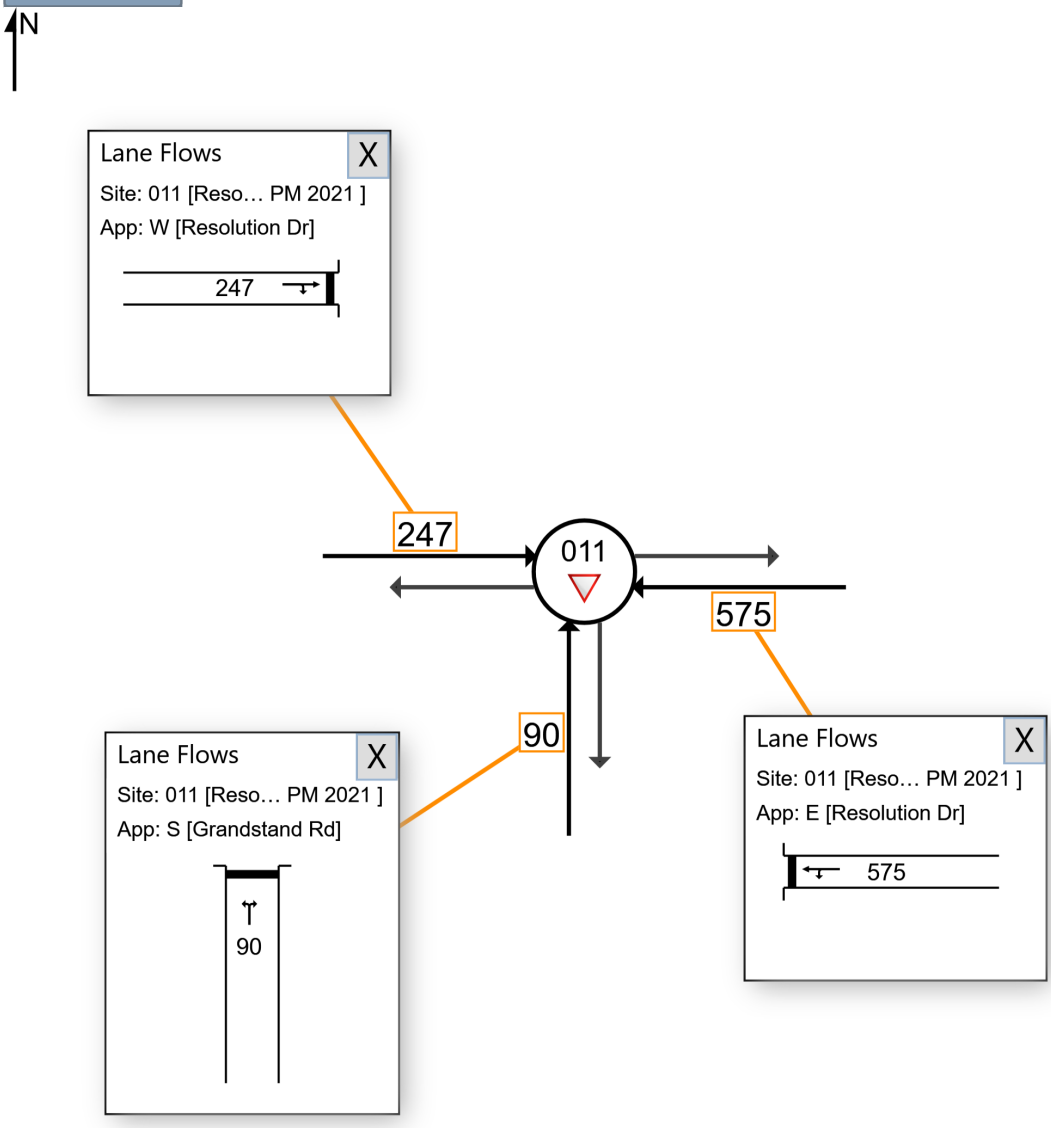
All Movement Classes

Site: 011 [Resolution Grandstand PM 2021 (Site Folder: 2021 PM Peak)] **Network: N101 [2021 PM Peak (Network Folder: General)]**

Resolution Dr / Grandstand Rd
Give Way
2021 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

Document Set ID: 6149413
Version: 1, Version Date: 11/06/2026

APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia AM 2031 (Site Folder: 2031 AM Peak)] **Network: N101 [2031 AM Peak (Network Folder: General)]**

GEH / Stoneham St / Belgravia St
Traffic signals
2031 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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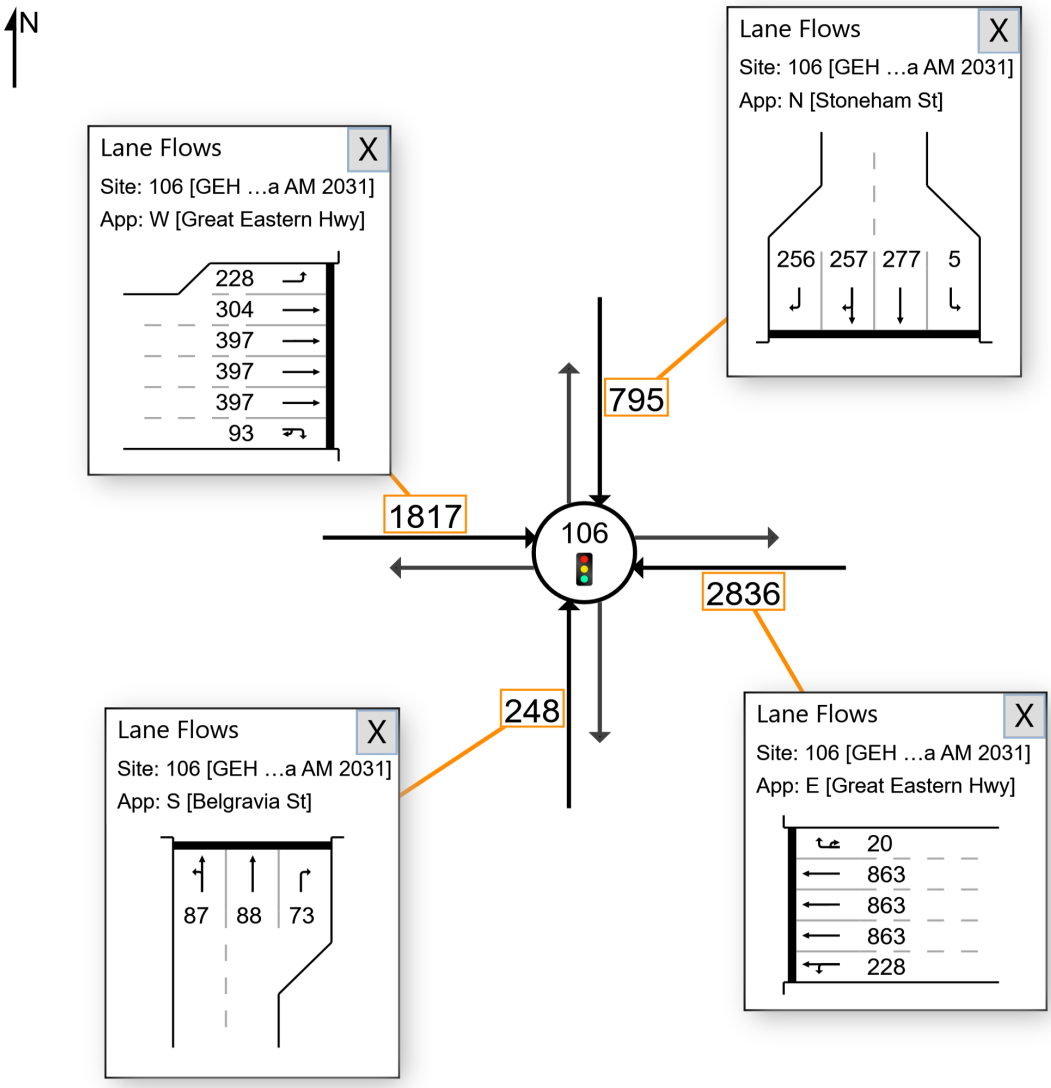

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves AM 2031 (Site Folder: 2031 AM Peak)]

Network: N101 [2031 AM Peak (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2031 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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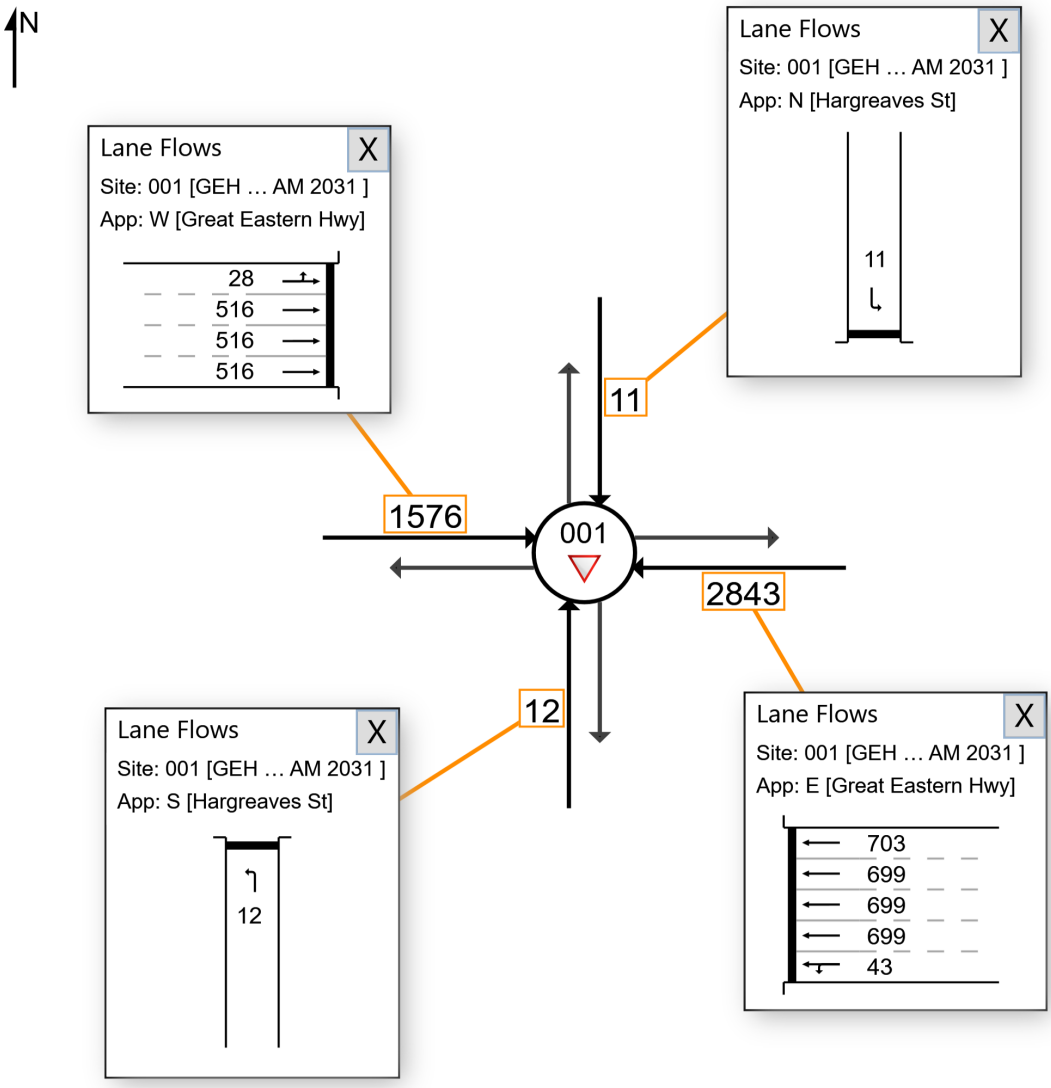

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Document Set ID: 6149413
Version: 1, Version Date: 11/06/2026

APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly AM 2031 (Site Folder: 2031 AM Peak)]

Network: N101 [2031 AM Peak (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2031 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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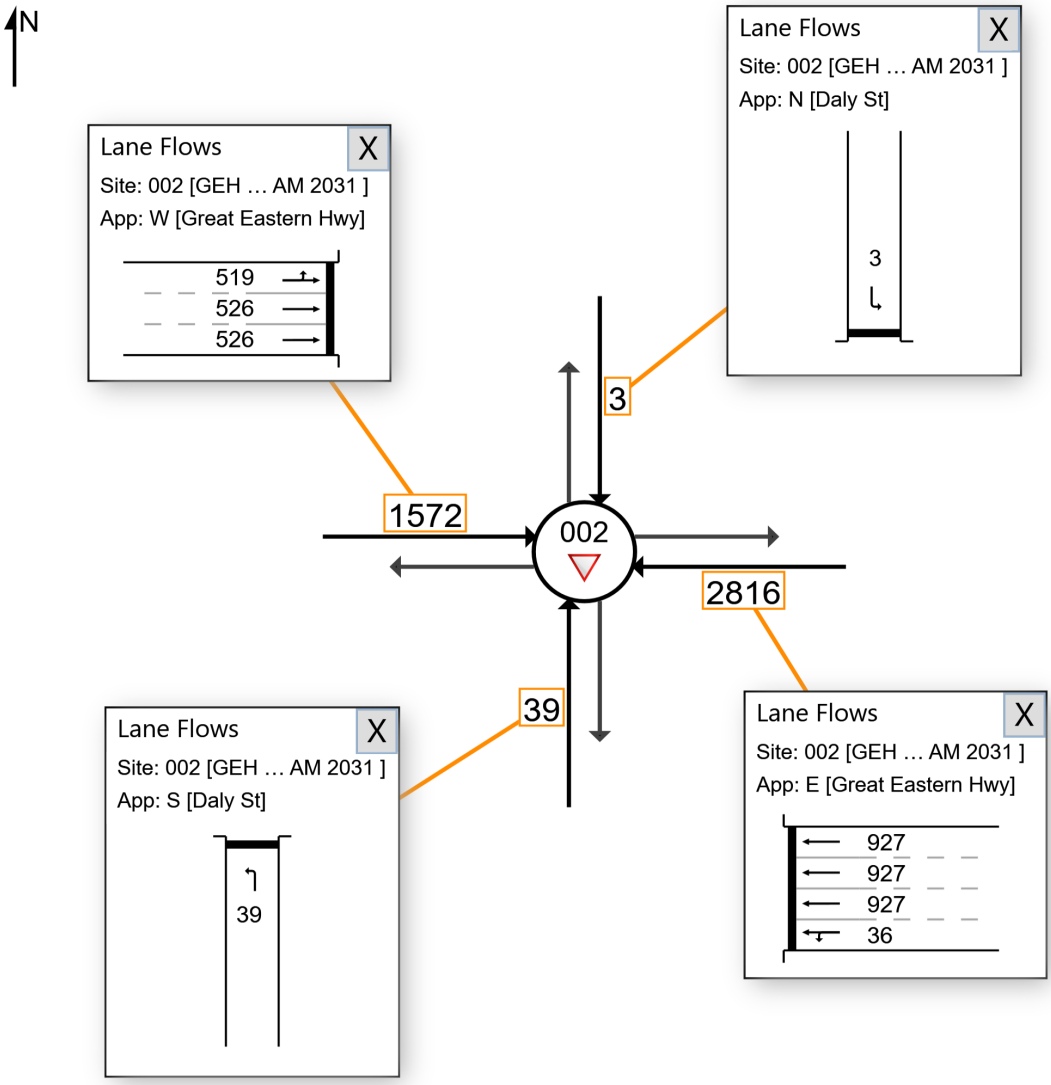

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand AM 2031 (Site Folder: 2031 AM Peak)]

Network: N101 [2031 AM Peak (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2031 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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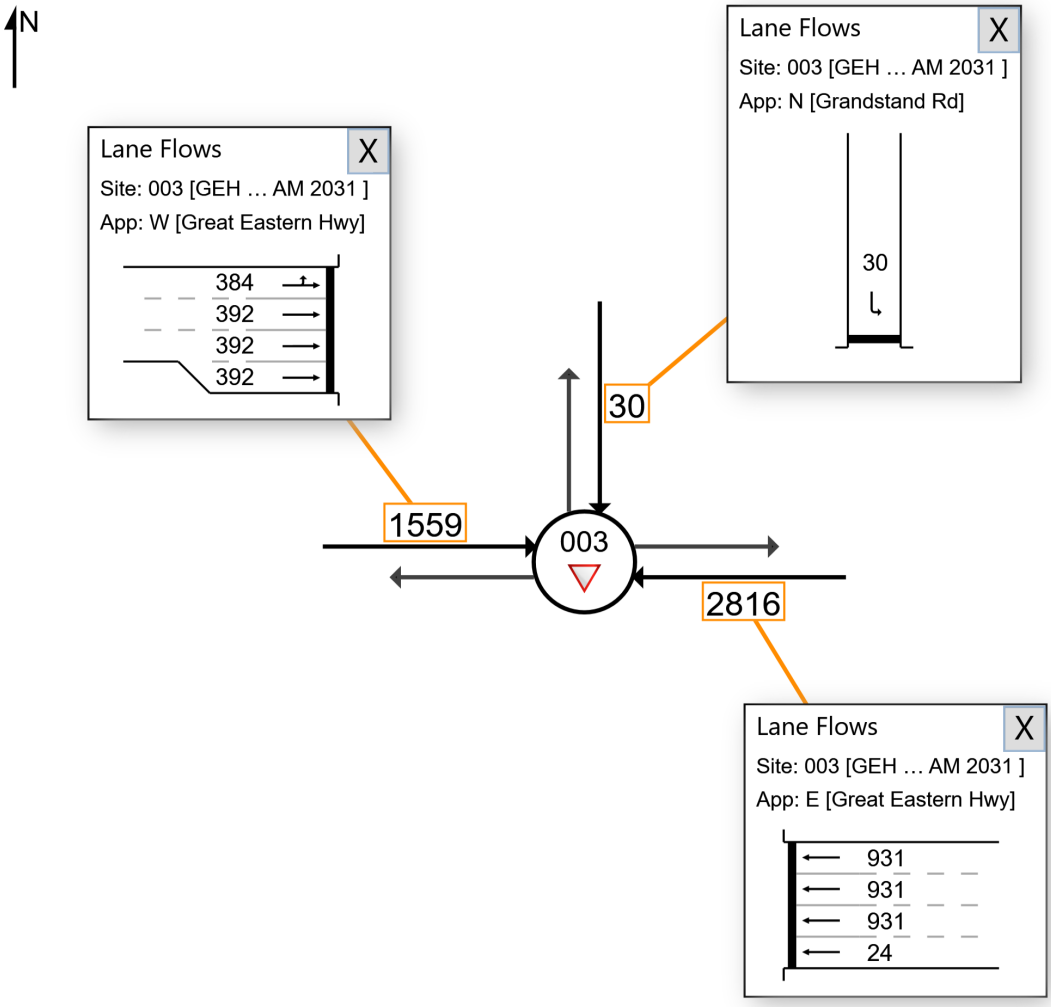

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey AM 2031 (Site Folder: 2031 AM Peak)]

Network: N101 [2031 AM Peak (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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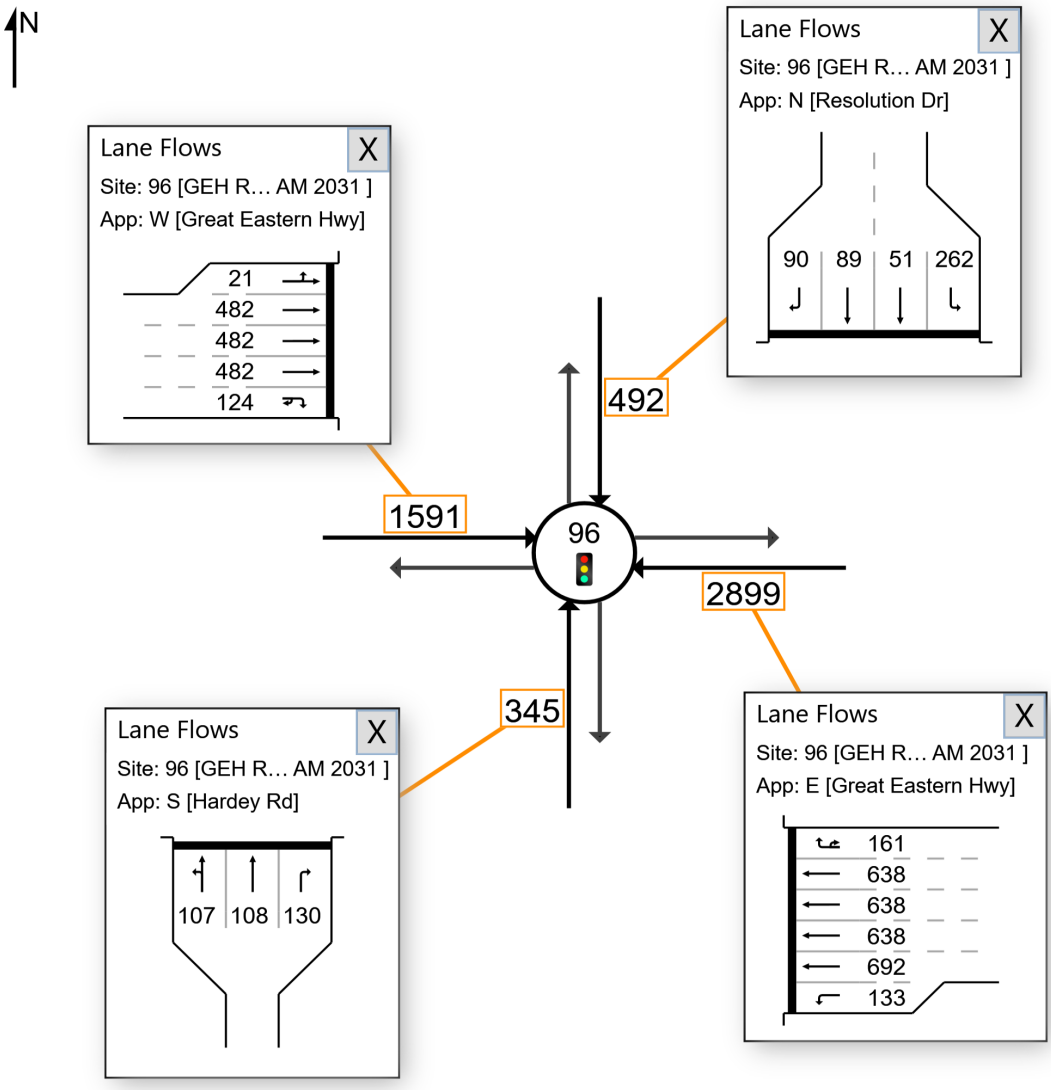

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves AM 2031 (Site Folder: 2031 AM Peak)] **Network: N101 [2031 AM Peak (Network Folder: General)]**

Stoneham St / Hargreaves St
All in Left out, Give Way
2031 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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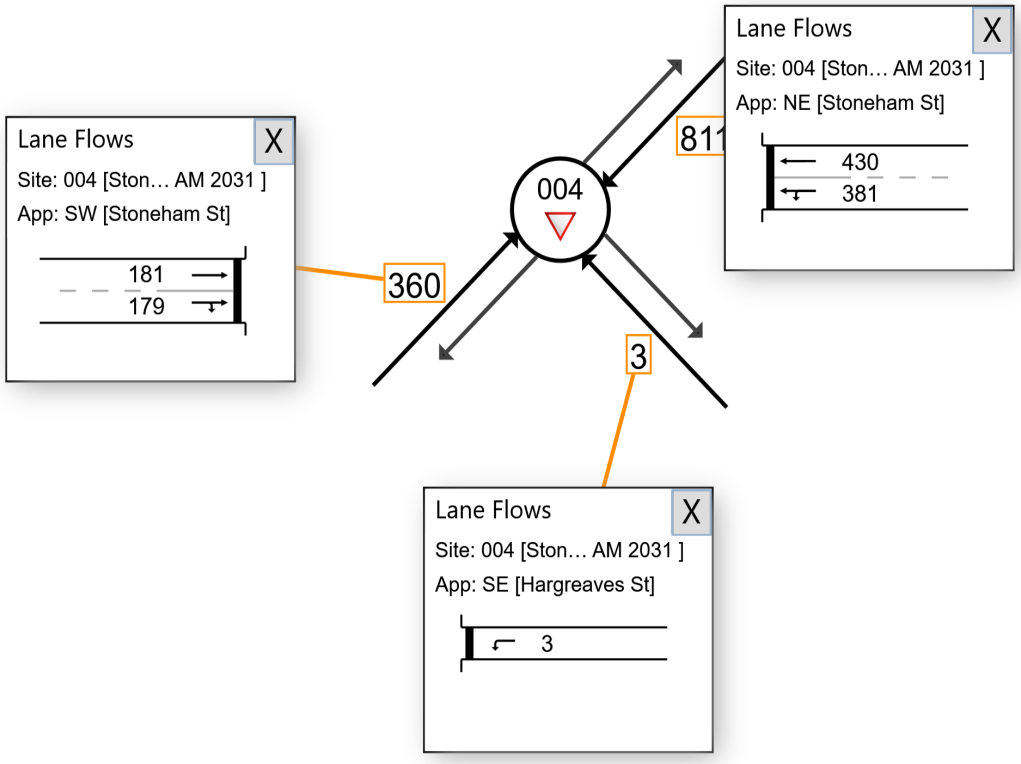

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 006 [Stoneham Daly AM 2031 (Site Folder: 2031 AM Peak)]

Network: N101 [2031 AM Peak (Network Folder: General)]

Stoneham St / Daly St
Left out only, Give Way
2031 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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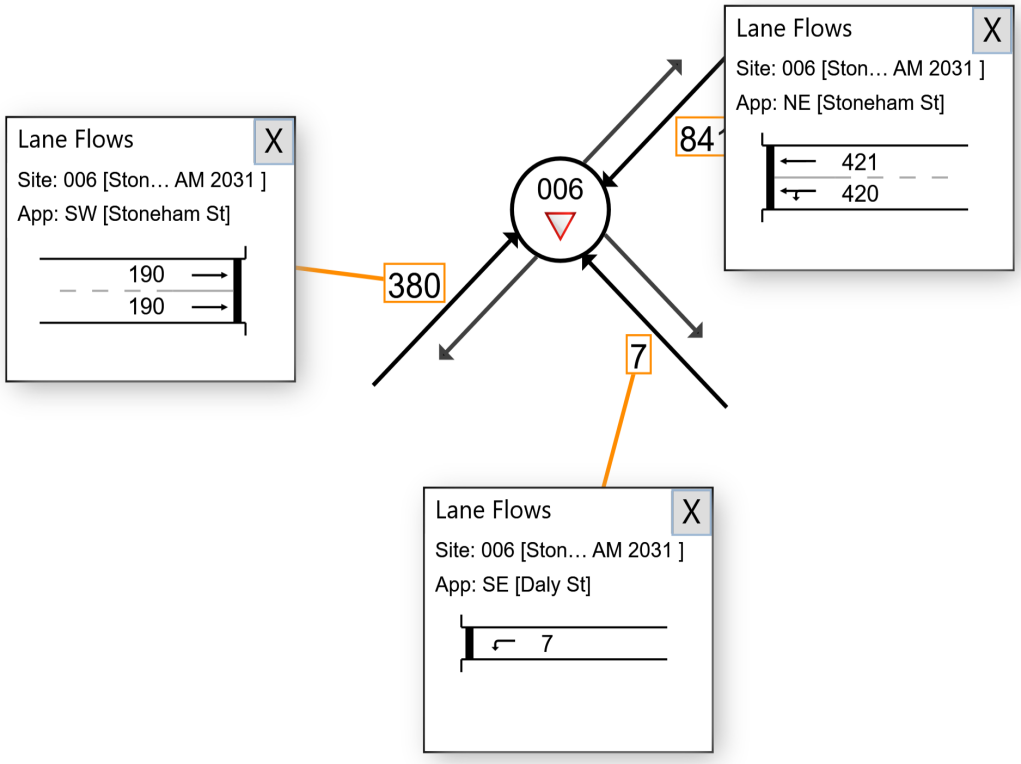

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution AM 2031 (Site Folder: 2031 AM Peak)]

Network: N101 [2031 AM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 AM Peak
Site Category: Existing Design
Roundabout

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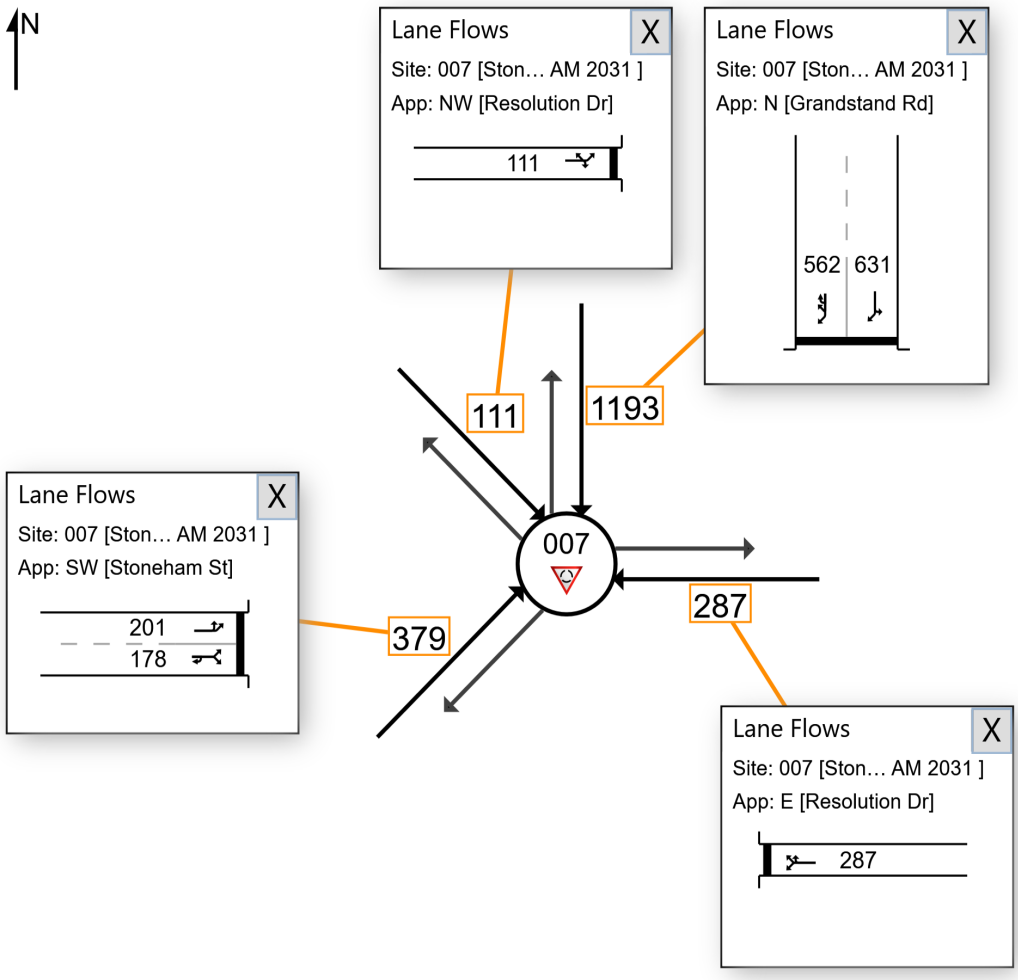

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand AM 2031 (Site Folder: 2031 AM Peak)] **Network: N101 [2031 AM Peak (Network Folder: General)]**

Resolution Dr / Grandstand Rd
Give Way
2031 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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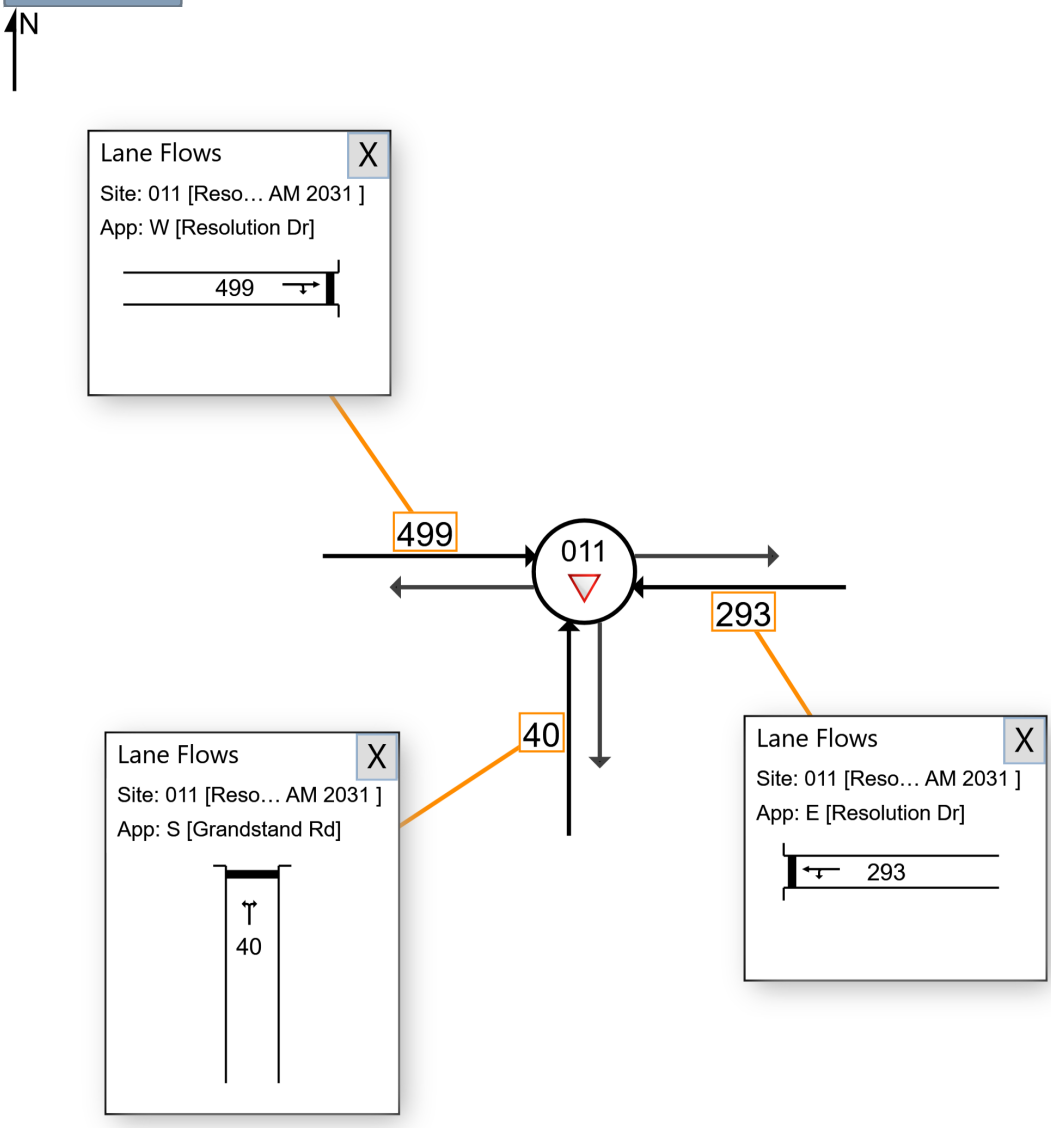

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2031 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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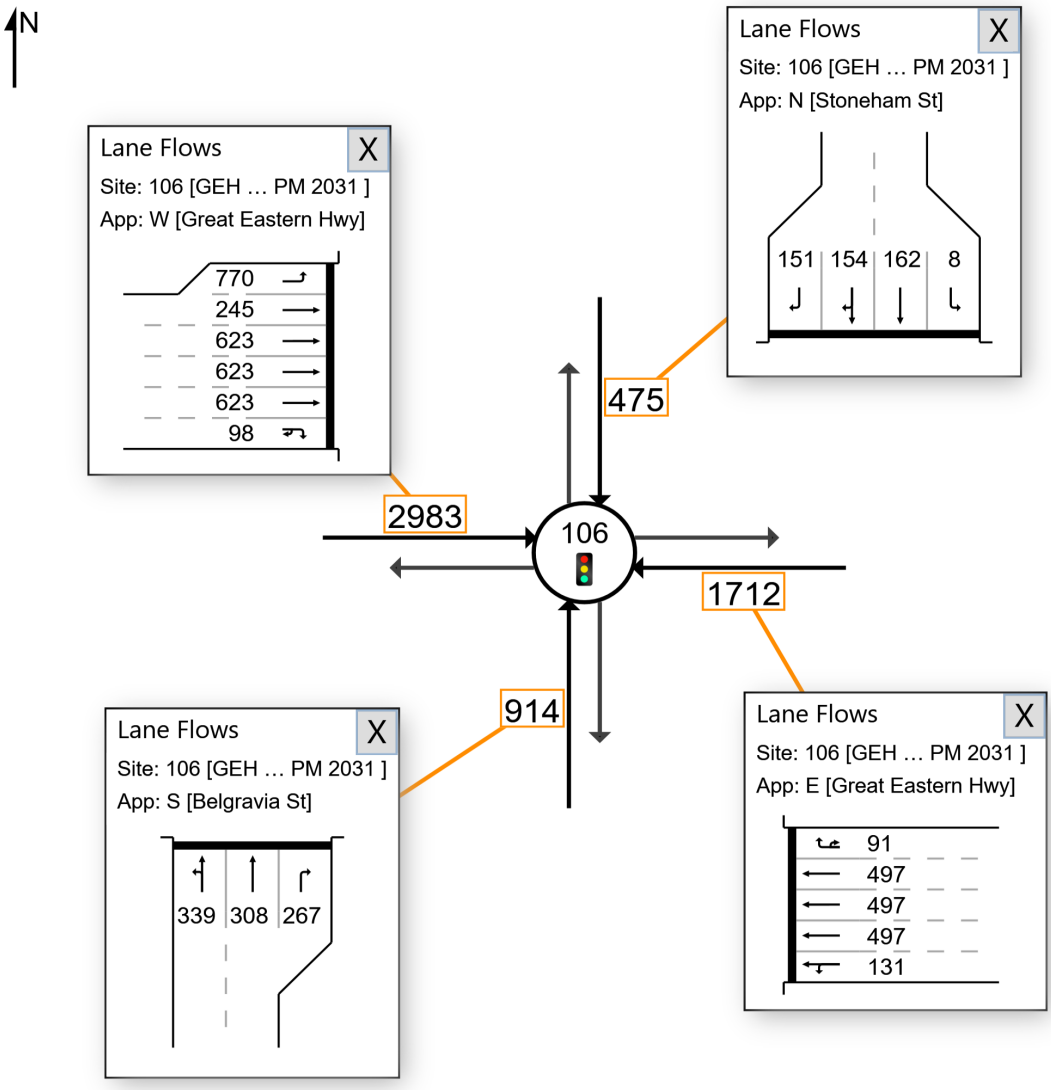

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2031 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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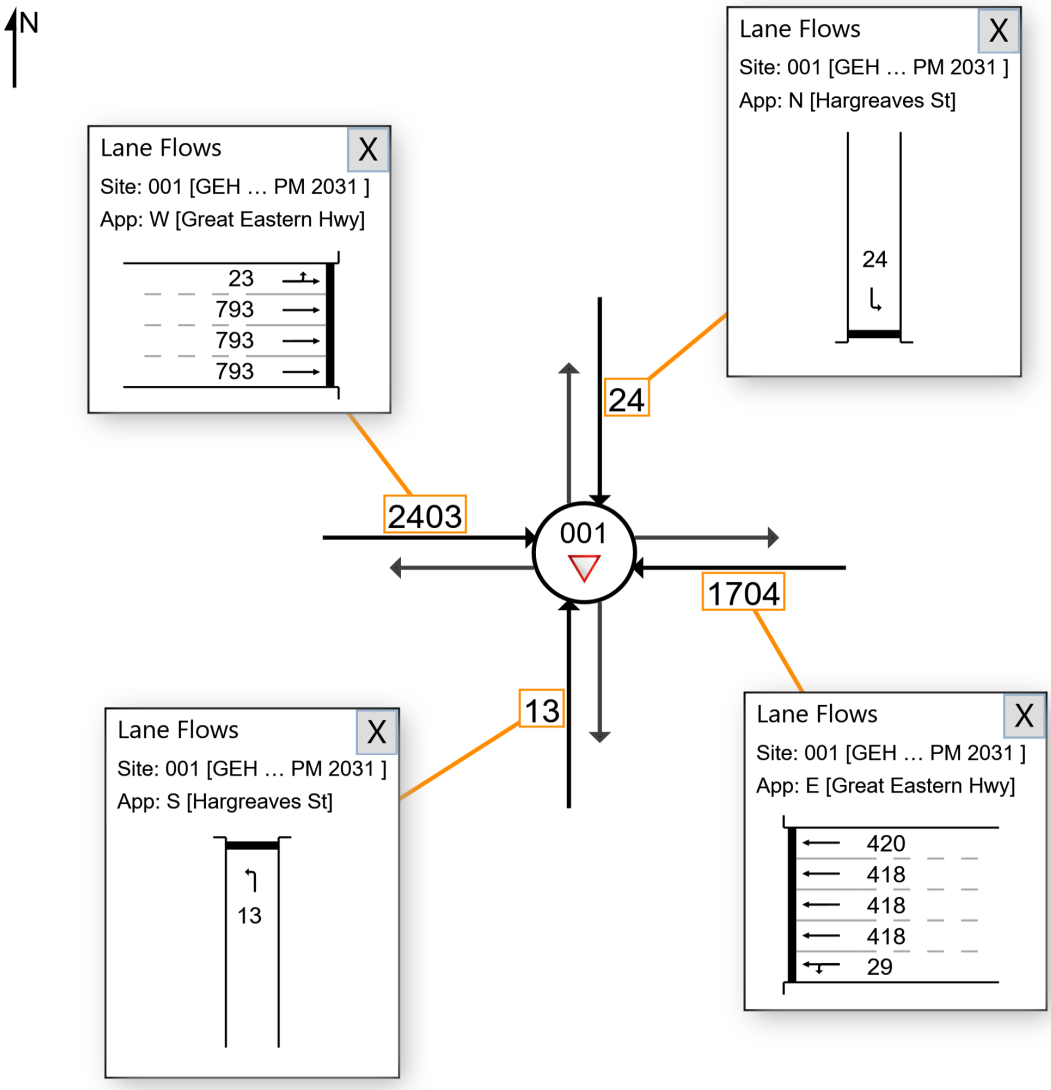

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2031 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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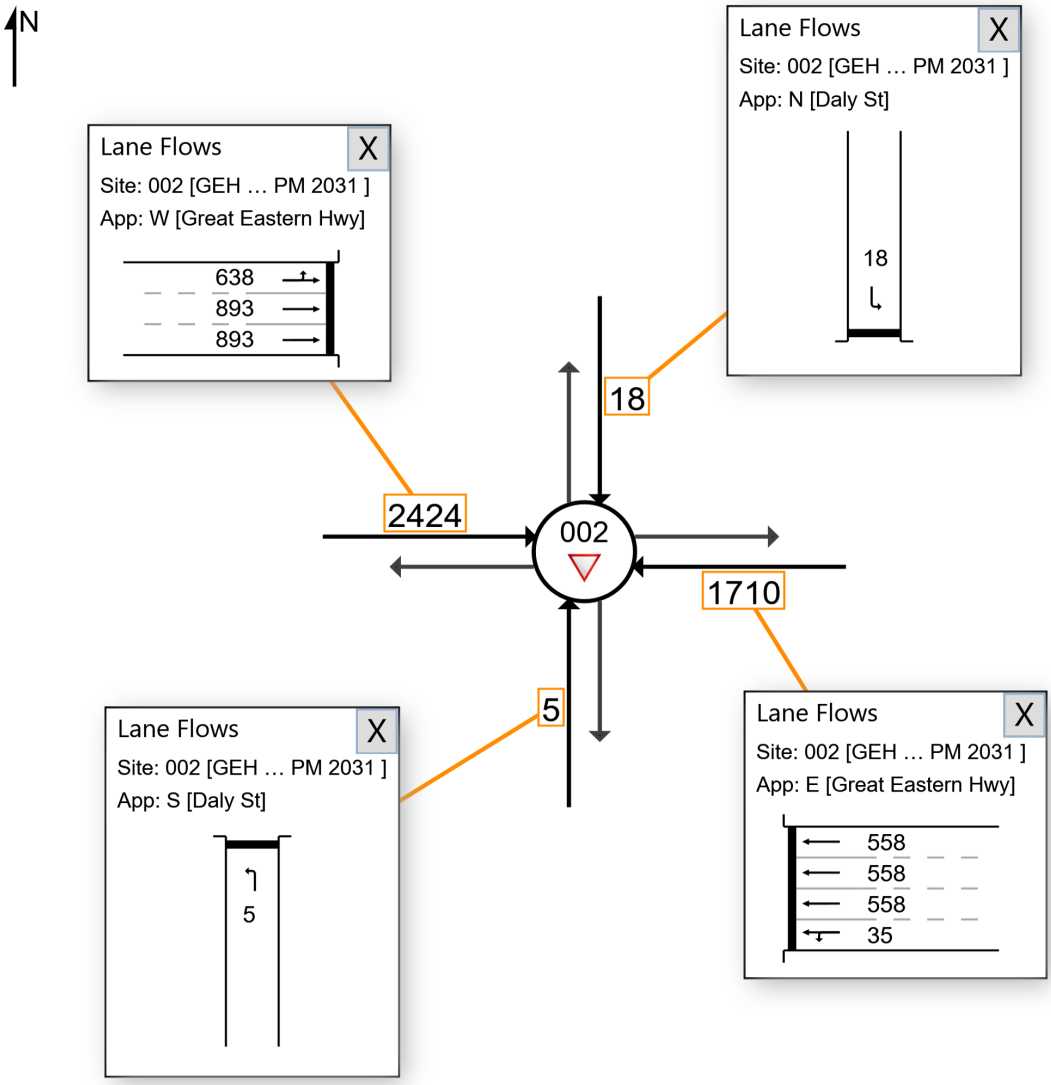

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2031 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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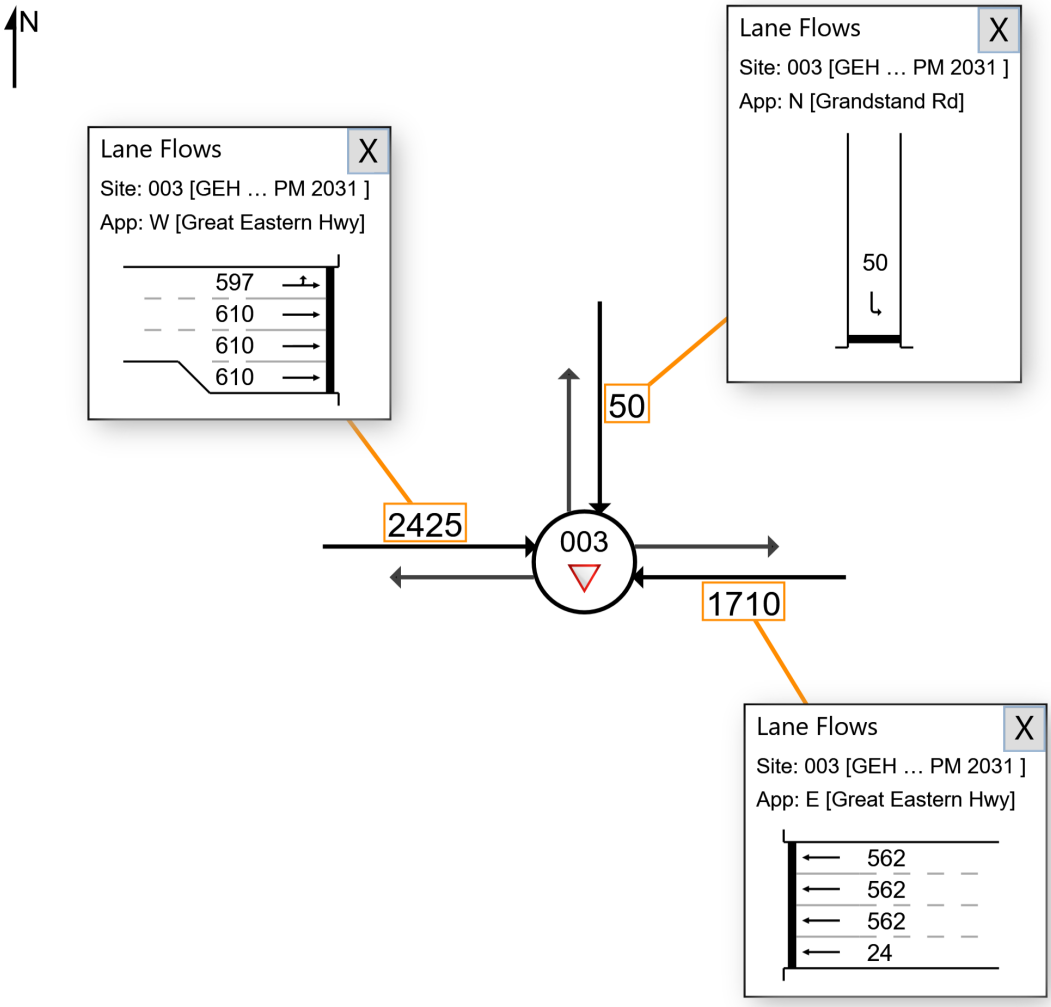

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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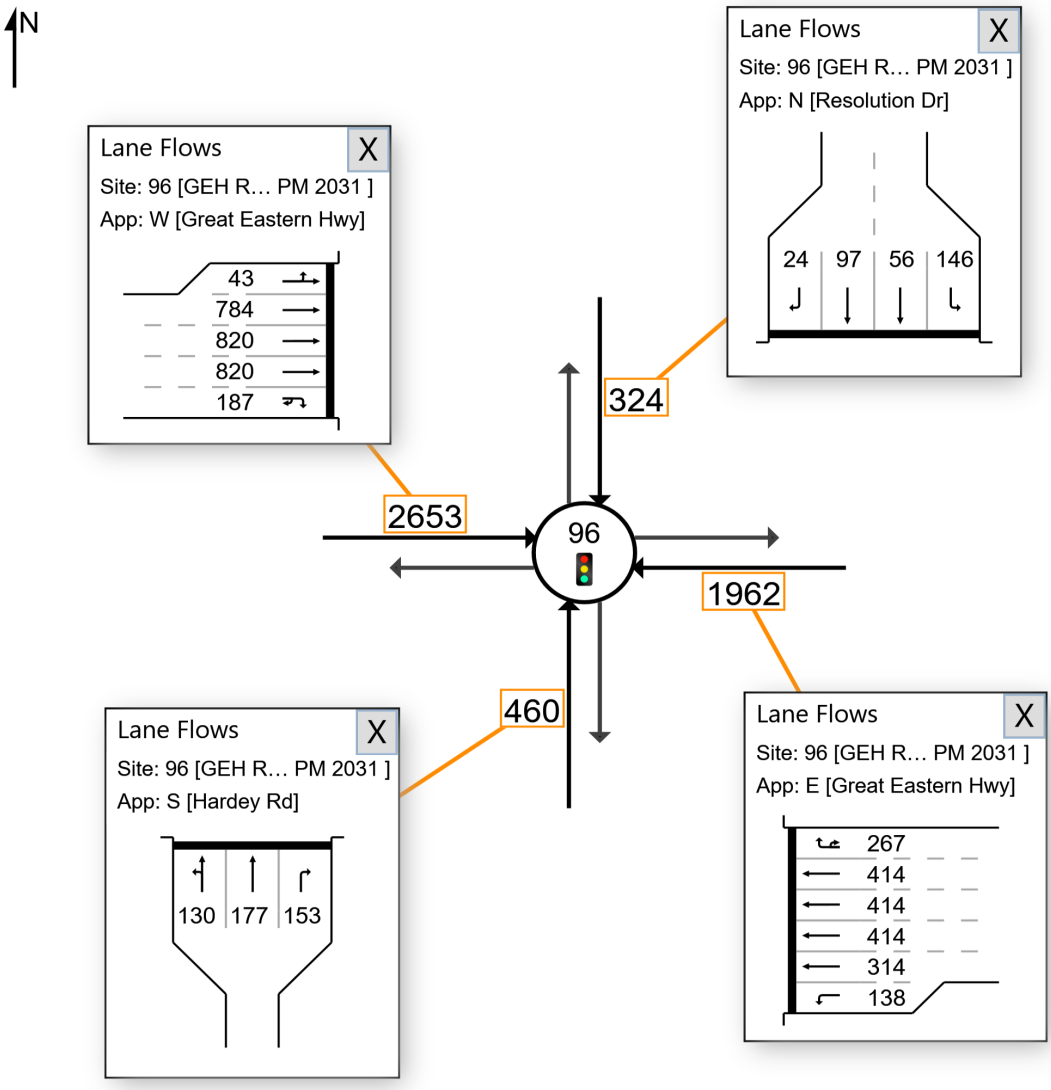

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2031 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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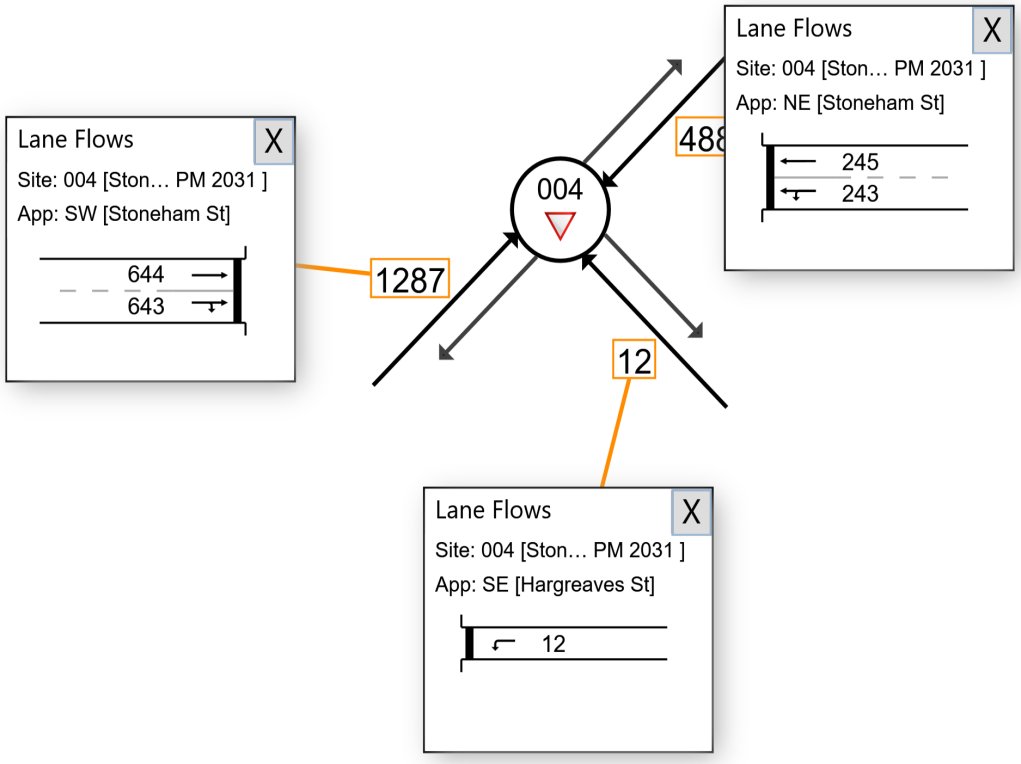

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 006 [Stoneham Daly PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

Stoneham St / Daly St
Left out only, Give Way
2031 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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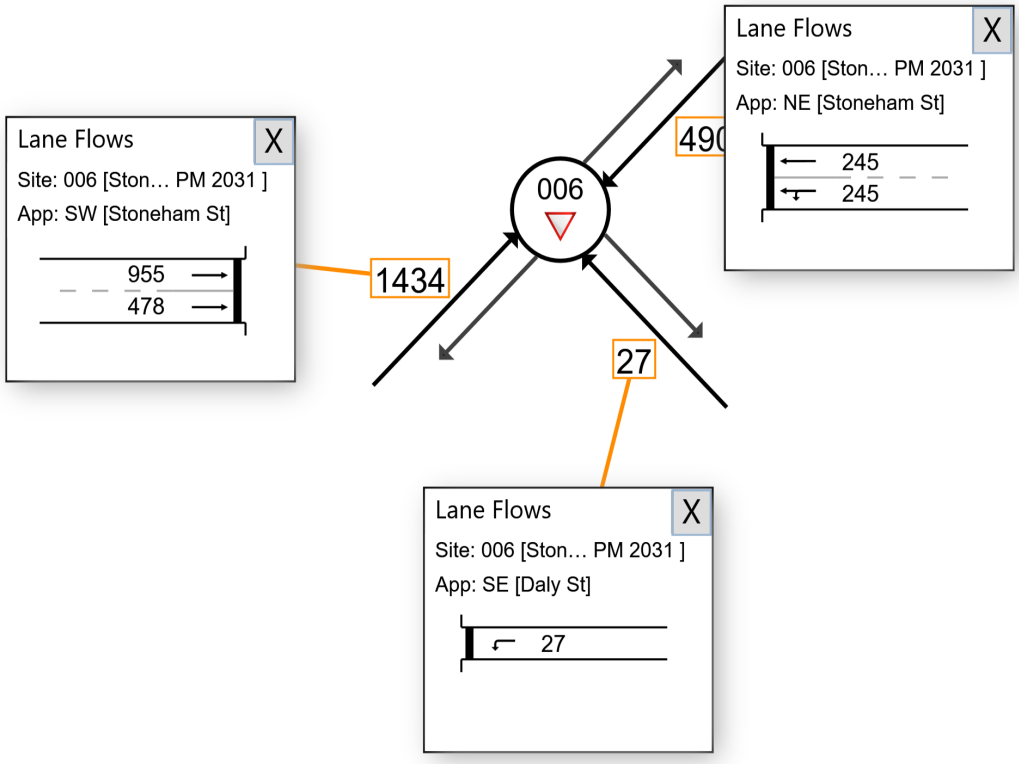

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution PM 2031 (Site Folder: 2031 PM Peak)]

Network: N101 [2031 PM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 PM Peak
Site Category: Existing Design
Roundabout

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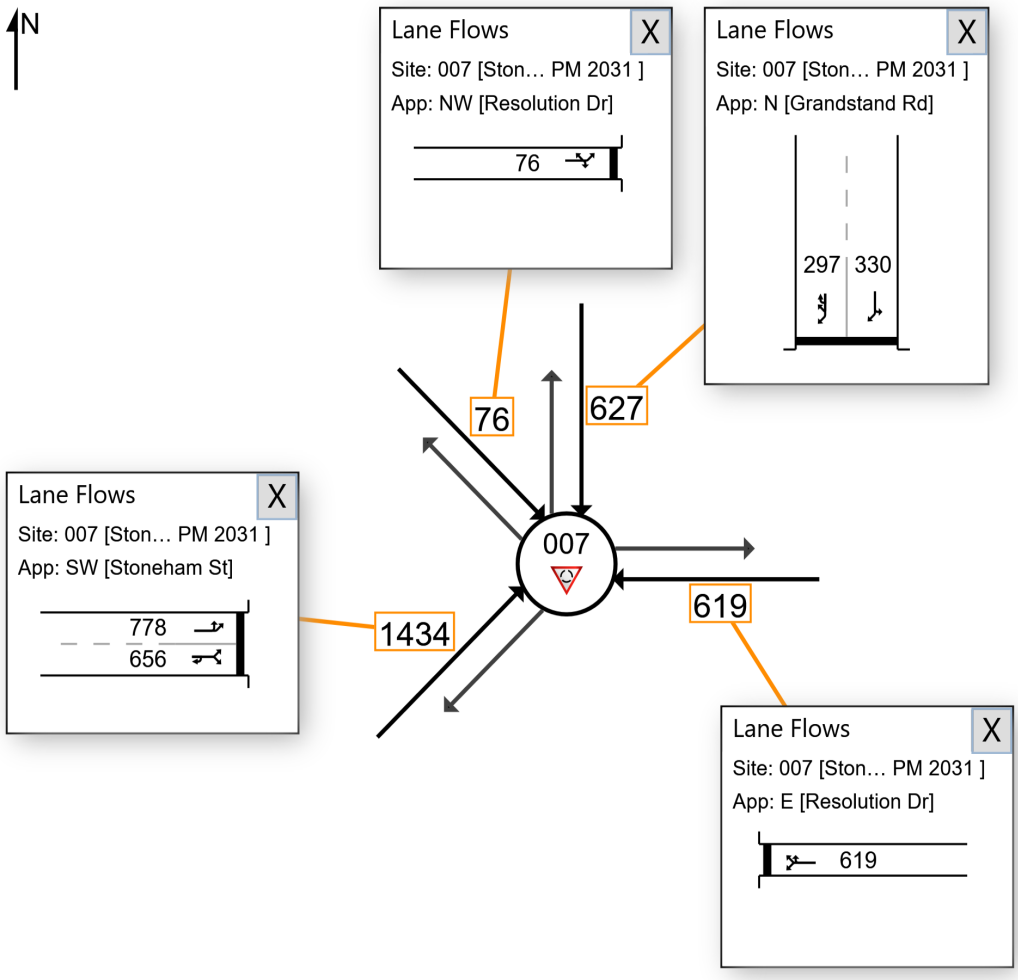

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand PM 2031 (Site Folder: 2031 PM Peak)] **Network: N101 [2031 PM Peak (Network Folder: General)]**

Resolution Dr / Grandstand Rd
Give Way
2031 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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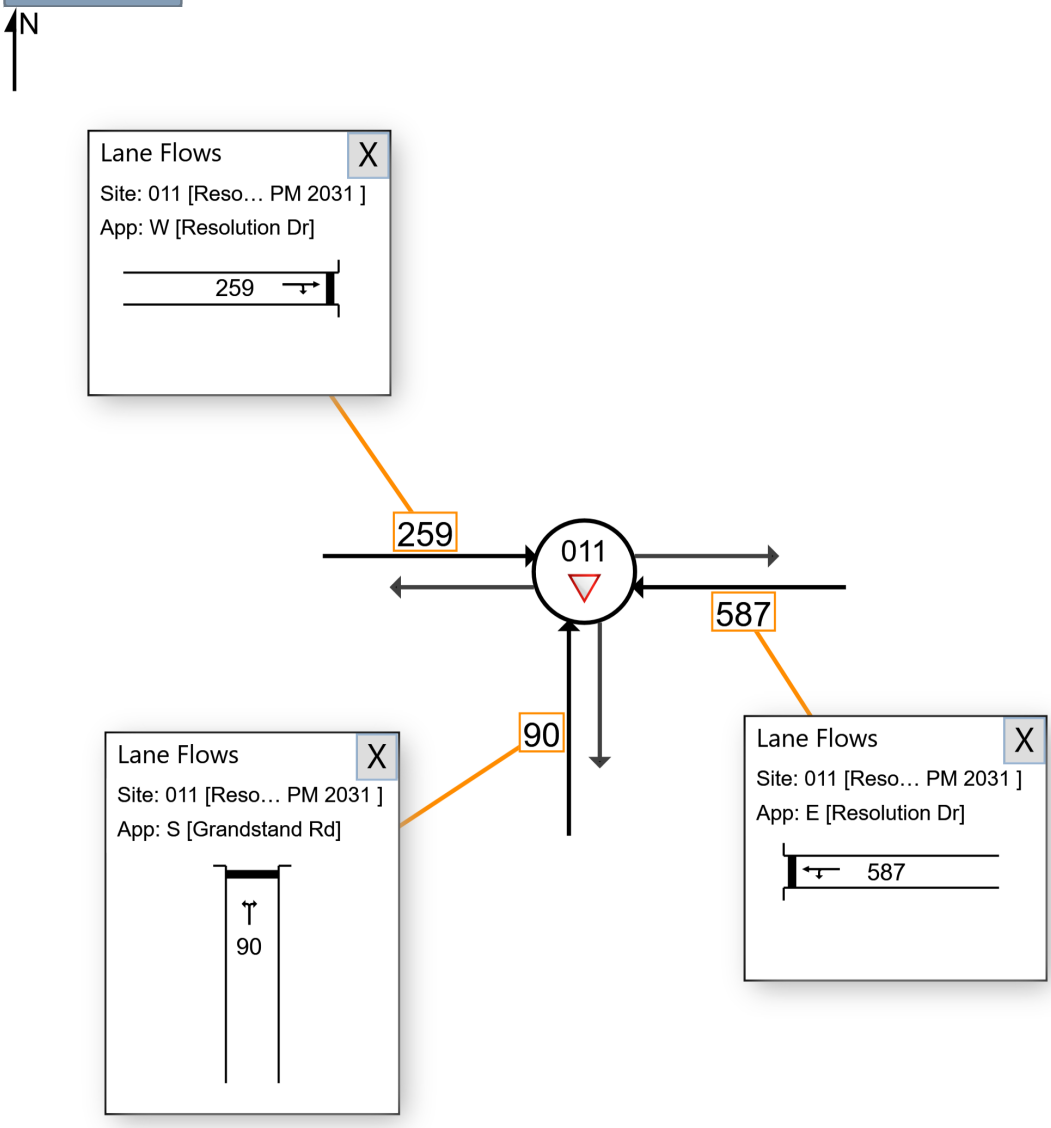

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia AM 2041 (Site Folder: 2041 AM Peak)]

Network: N101 [2041 AM Peak (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2041 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

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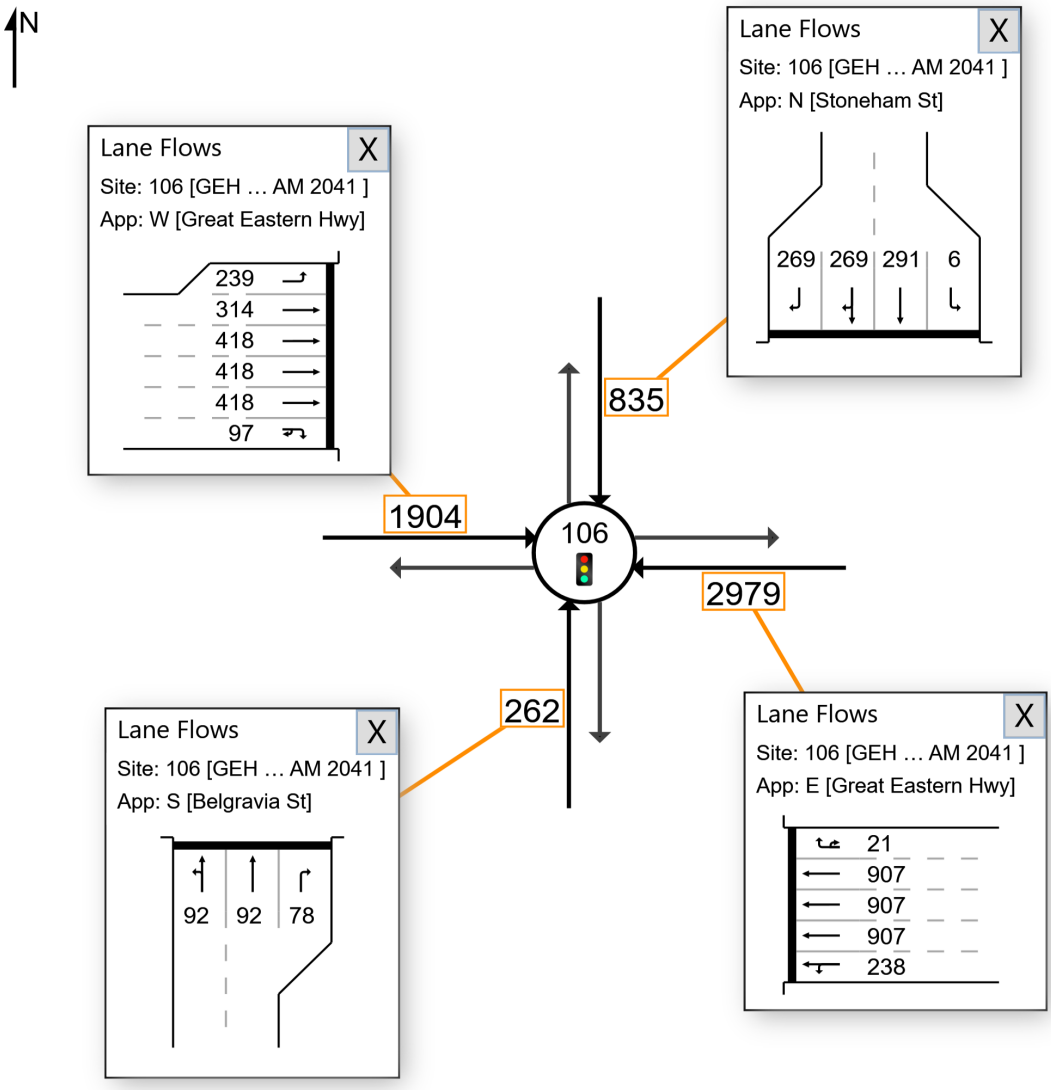

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves AM 2041 (Site Folder: 2041 AM Peak)]

Network: N101 [2041 AM Peak (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2041 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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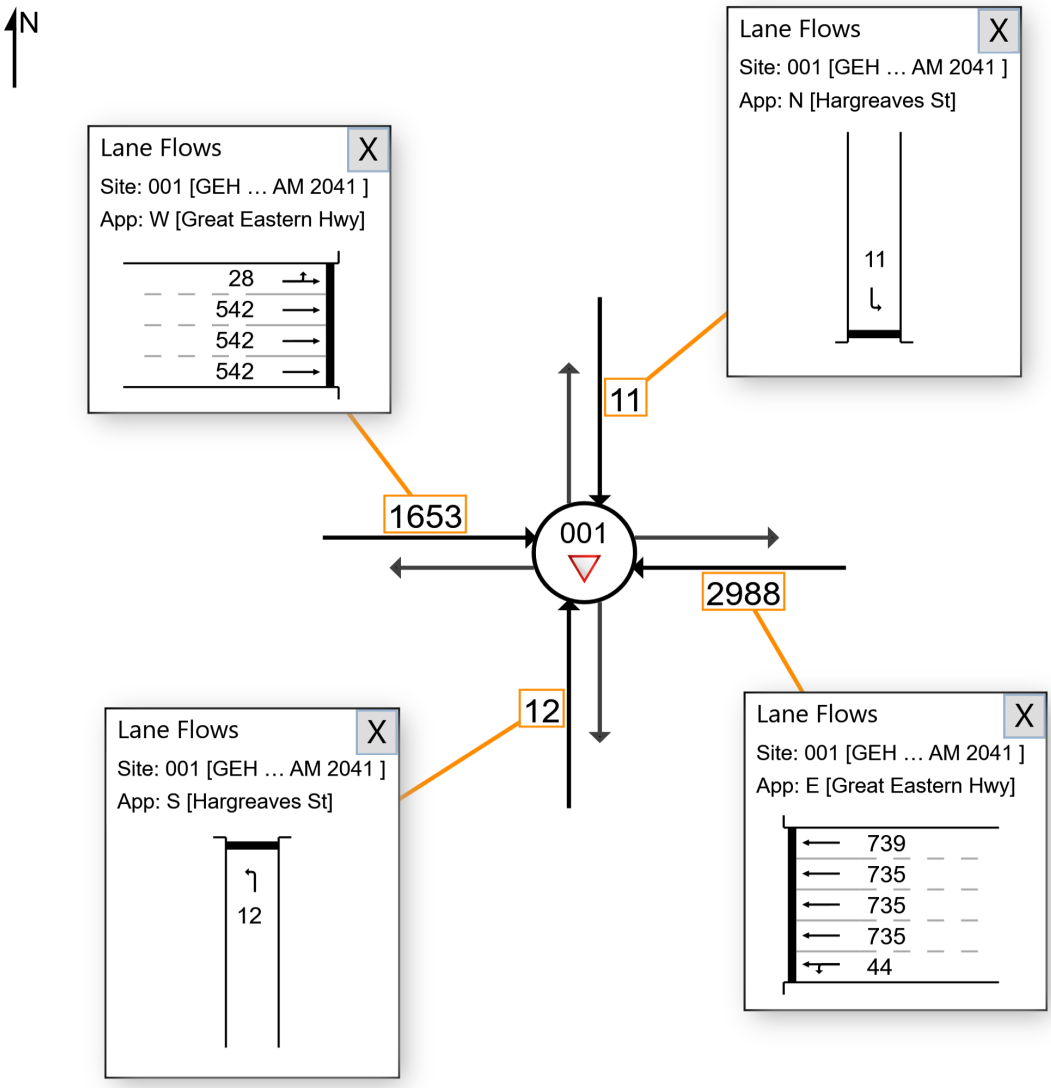

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Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly AM 2041 (Site Folder: 2041 AM Peak)]

Network: N101 [2041 AM Peak (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2041 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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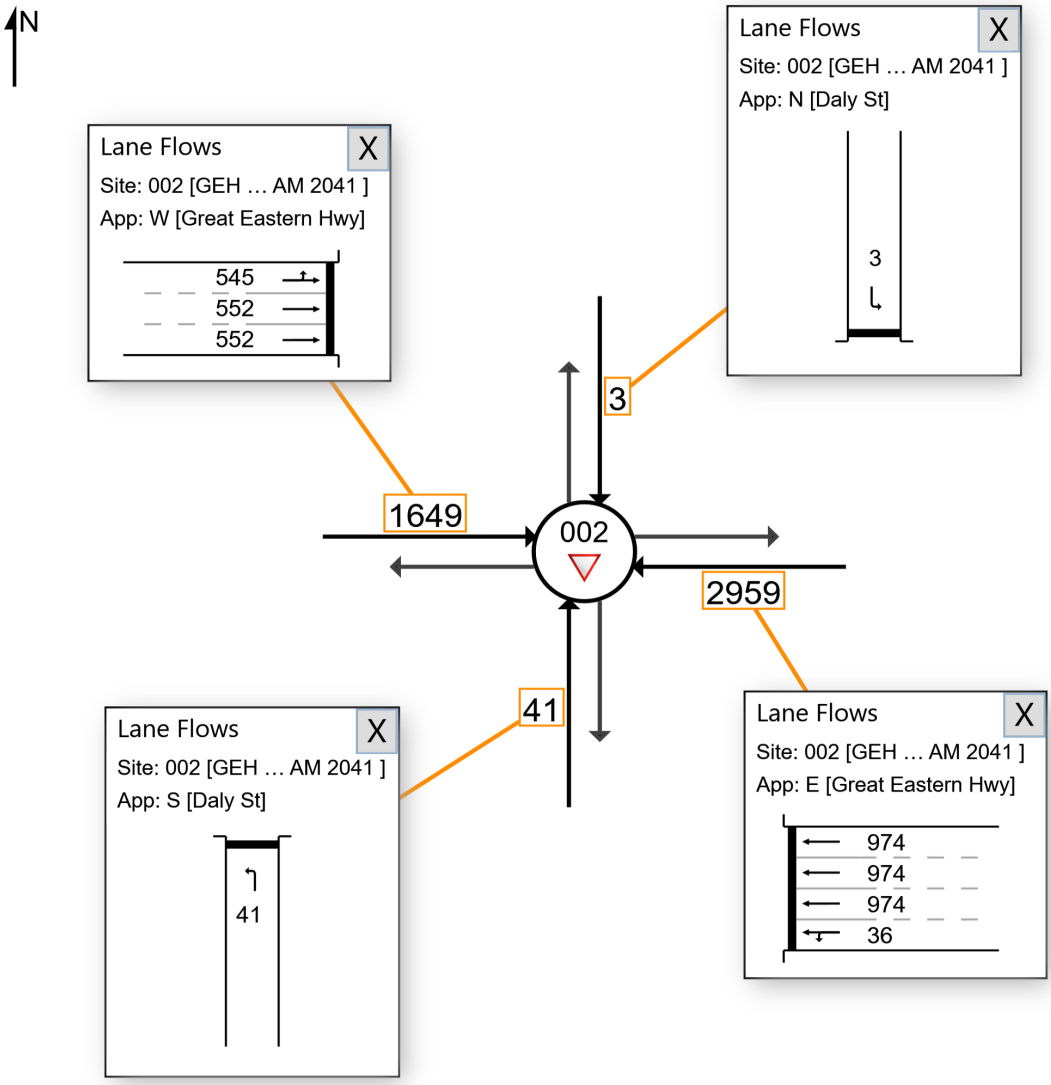

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Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand AM 2041 (Site Folder: 2041 AM Peak)]

Network: N101 [2041 AM Peak (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2041 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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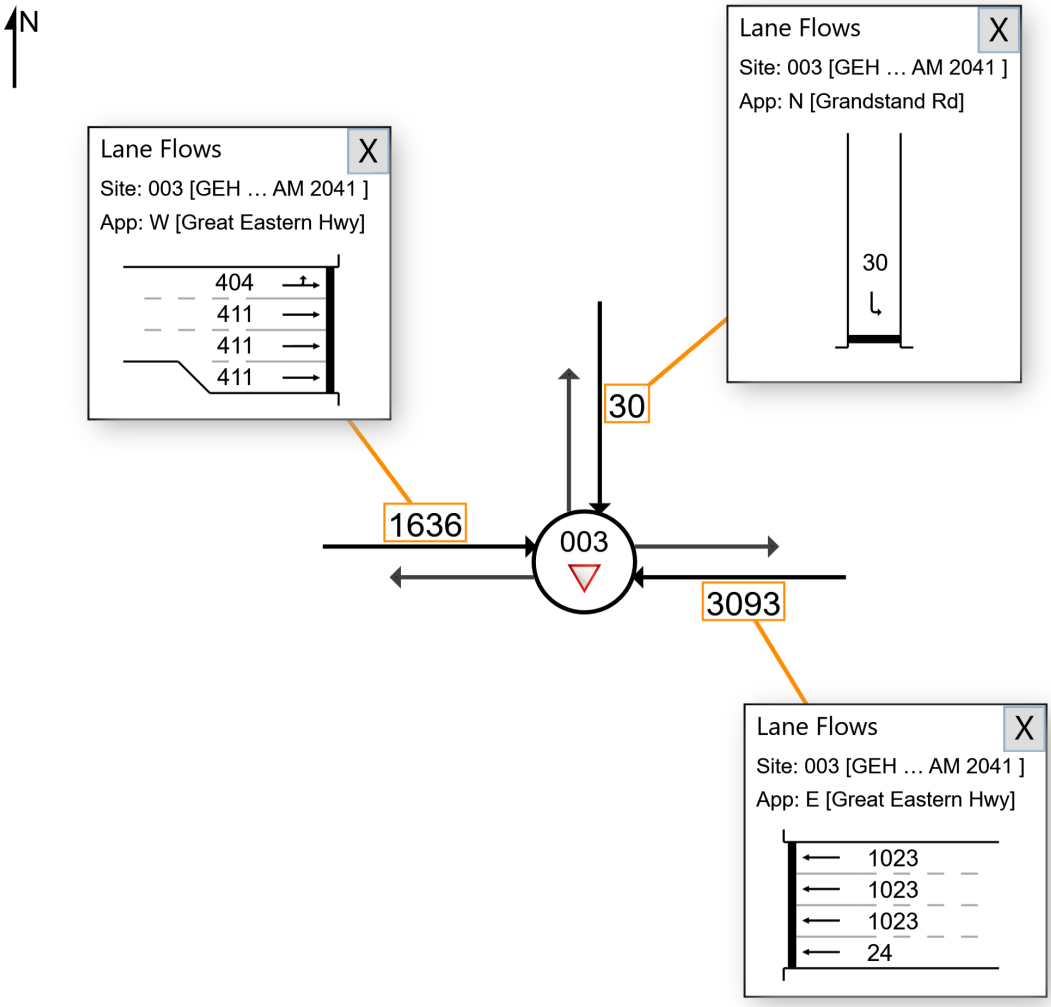

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Document Set ID: 6149413
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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey AM 2041 (Site Folder: 2041 AM Peak)]

Network: N101 [2041 AM Peak (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 AM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

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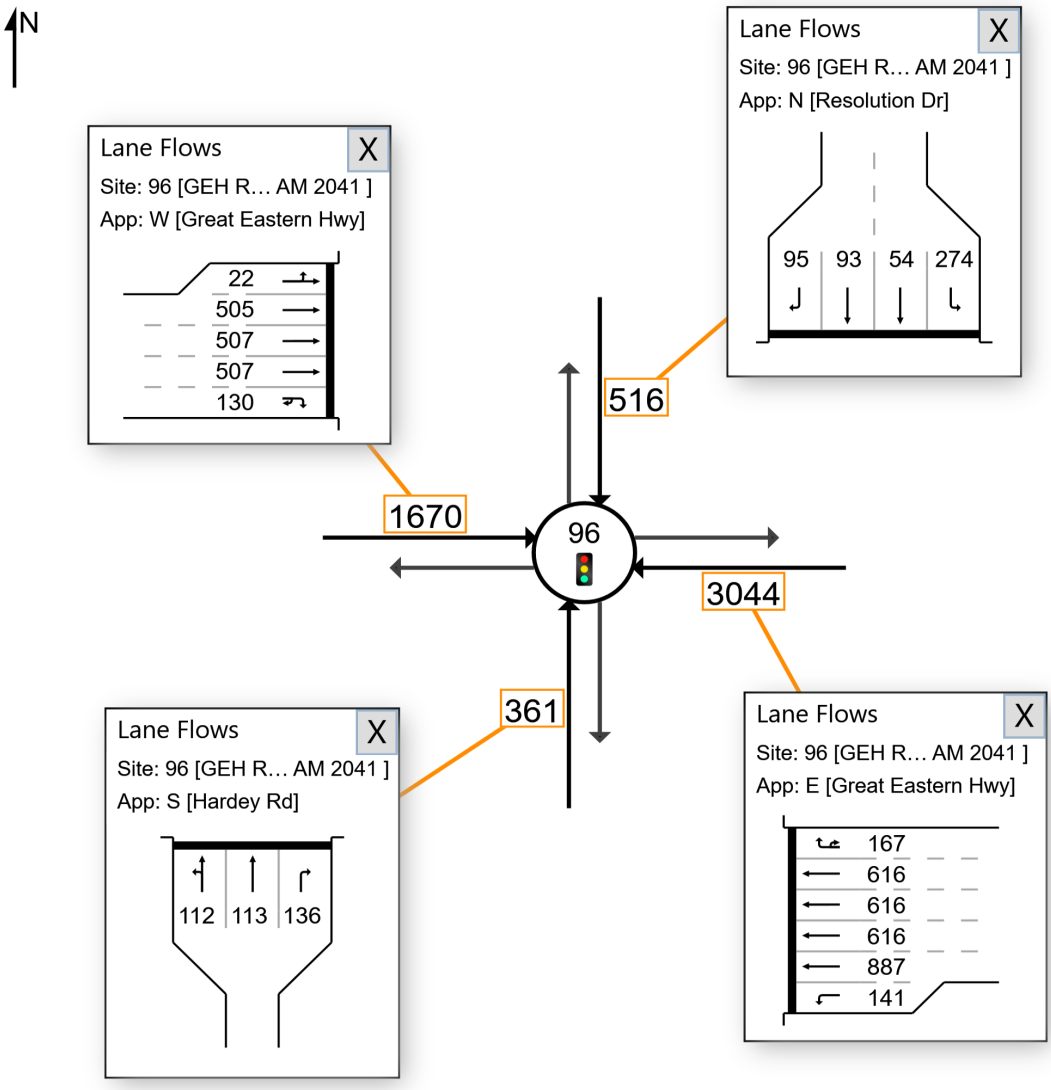

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves AM 2041 (Site Folder: 2041 AM Peak)] **Network: N101 [2041 AM Peak (Network Folder: General)]**

Stoneham St / Hargreaves St
All in Left out, Give Way
2041 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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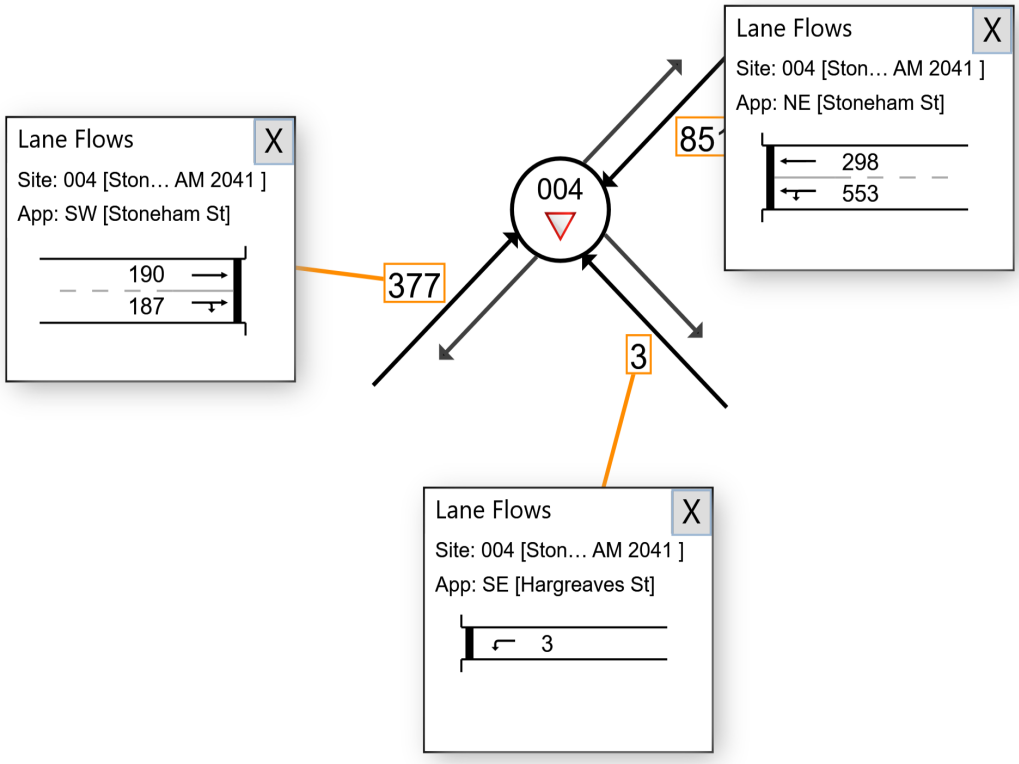

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 006 [Stoneham Daly AM 2041 (Site Folder: 2041 AM Peak)]

Network: N101 [2041 AM Peak (Network Folder: General)]

Stoneham St / Daly St
Left out only, Give Way
2041 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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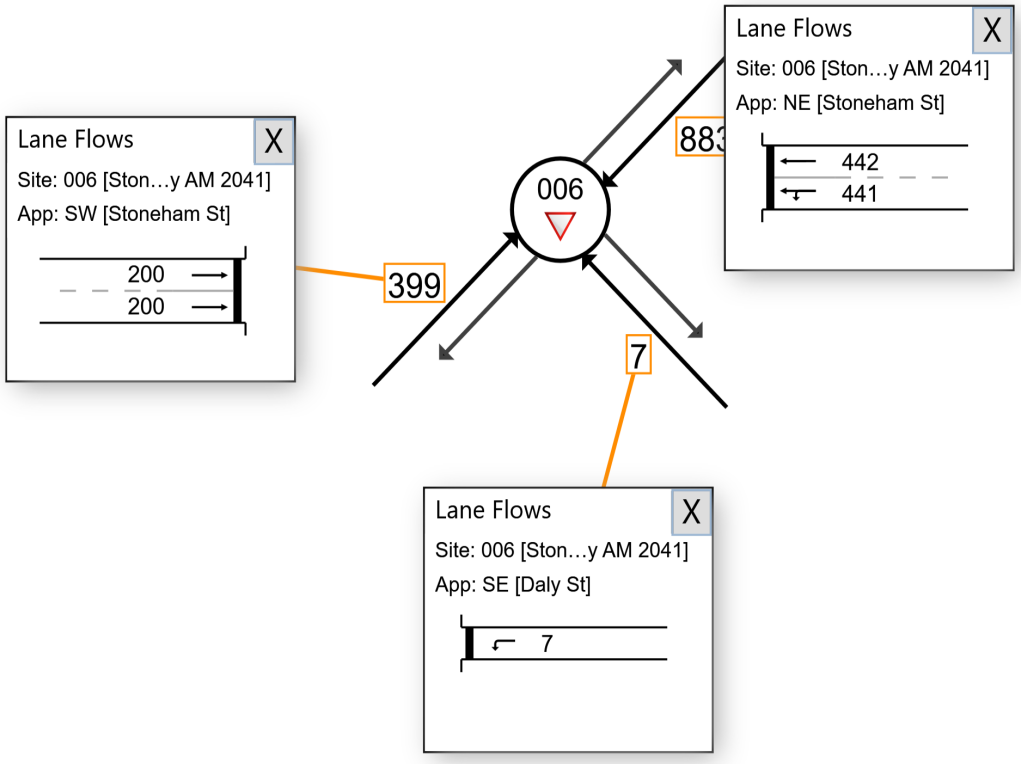

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution AM 2041 (Site Folder: 2041 AM Peak)]

Network: N101 [2041 AM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 AM Peak
Site Category: Existing Design
Roundabout

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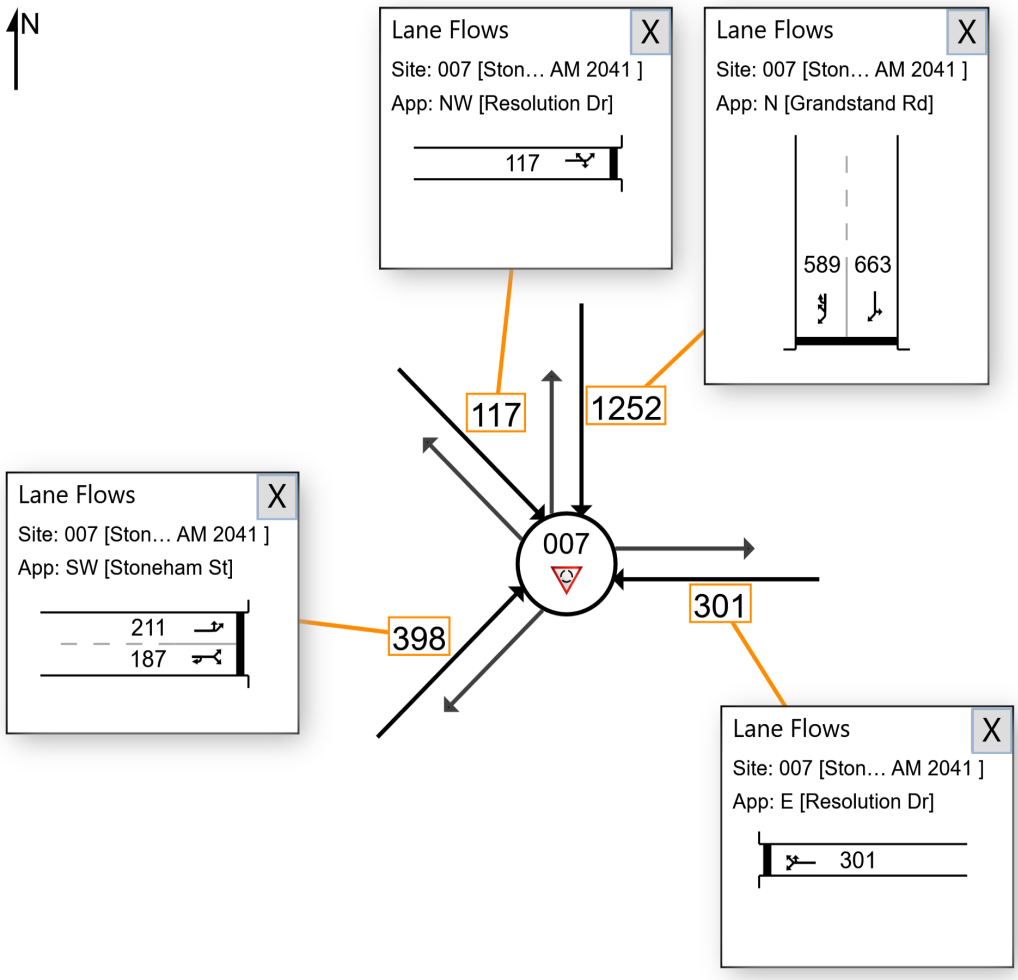

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand AM 2041 (Site Folder: 2041 AM Peak)] **Network: N101 [2041 AM Peak (Network Folder: General)]**

Resolution Dr / Grandstand Rd
Give Way
2041 AM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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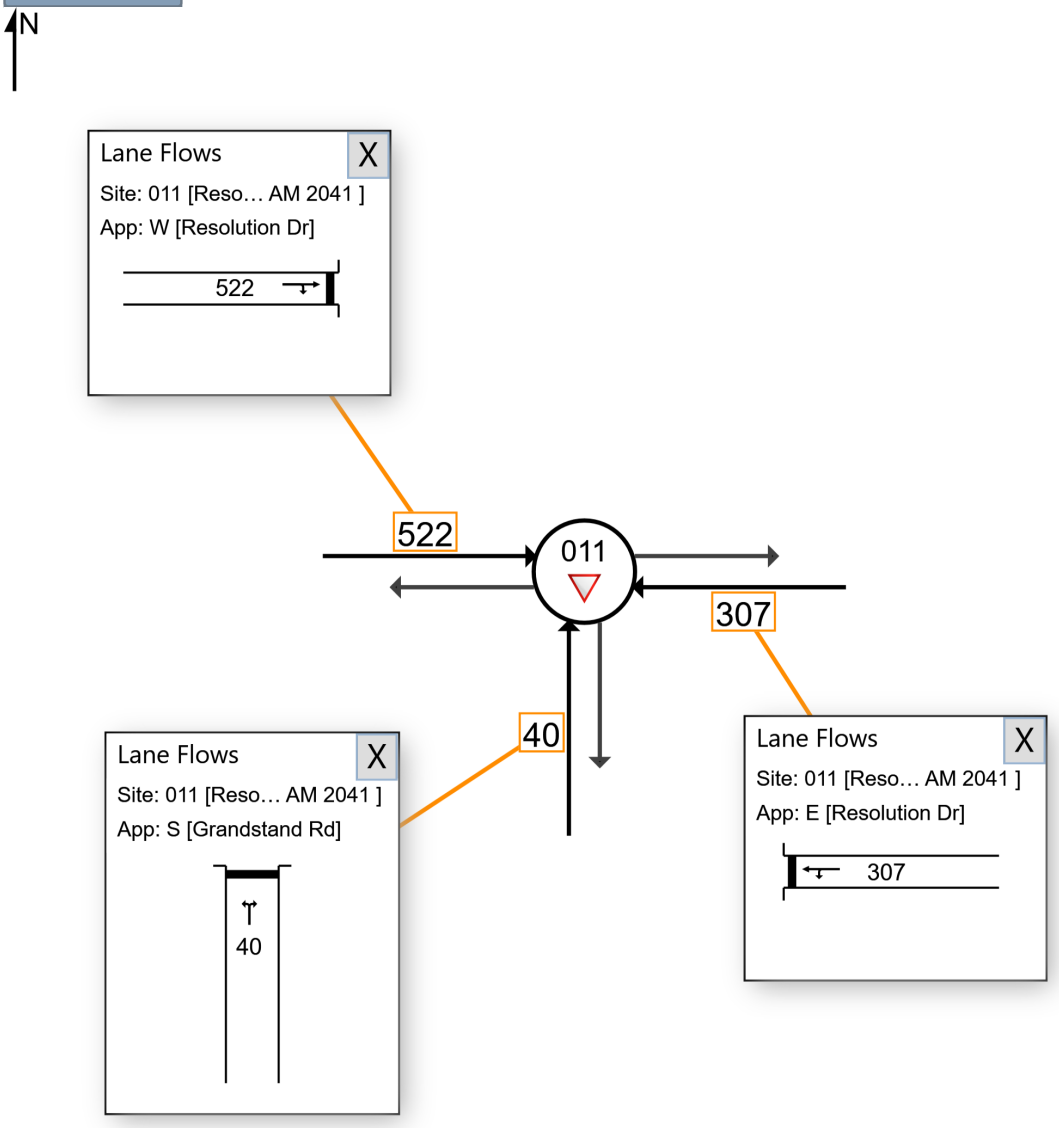

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia PM 2041 (Site Folder: 2041 PM Peak)]

Network: N101 [2041 PM Peak (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2041 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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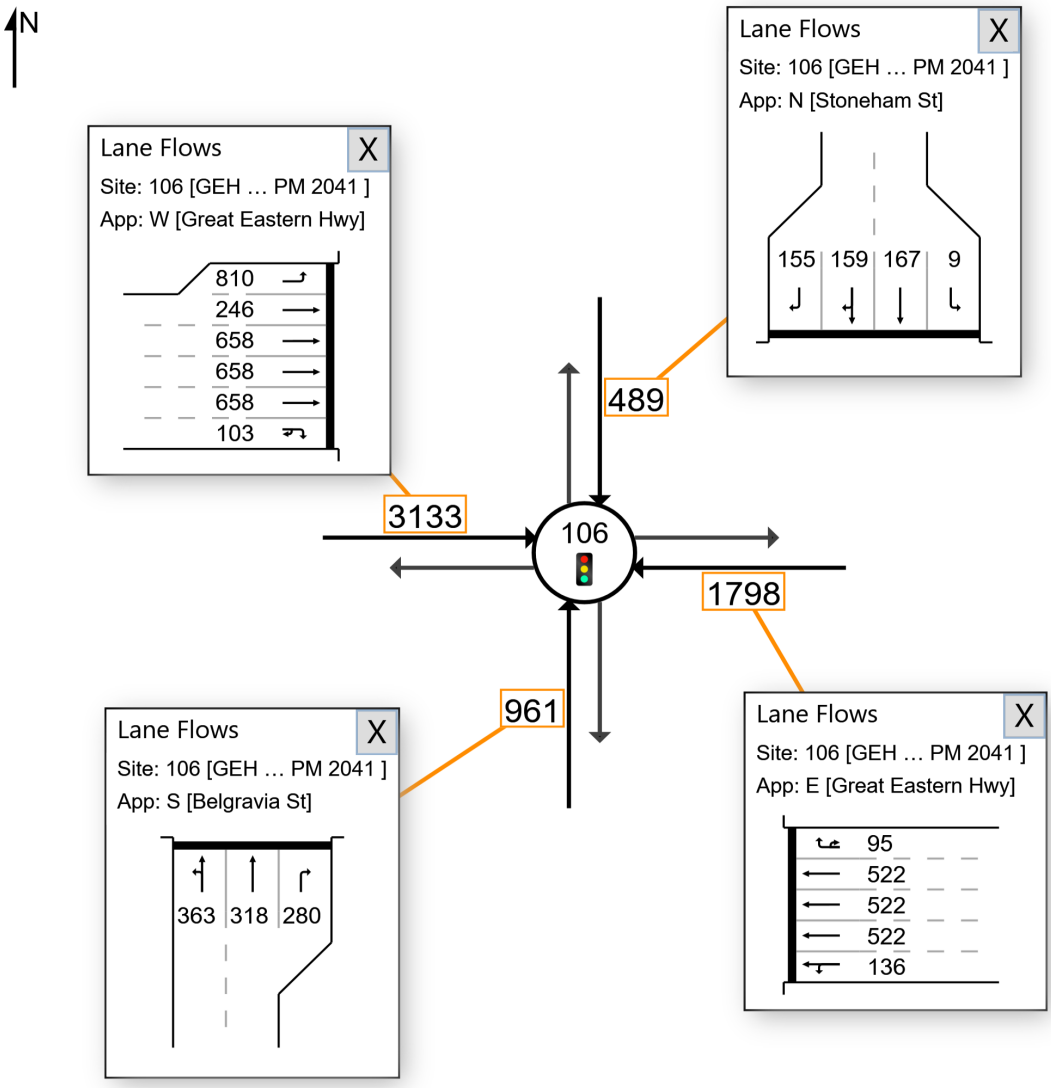

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves PM 2041 (Site Folder: 2041 PM Peak)]

Network: N101 [2041 PM Peak (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2041 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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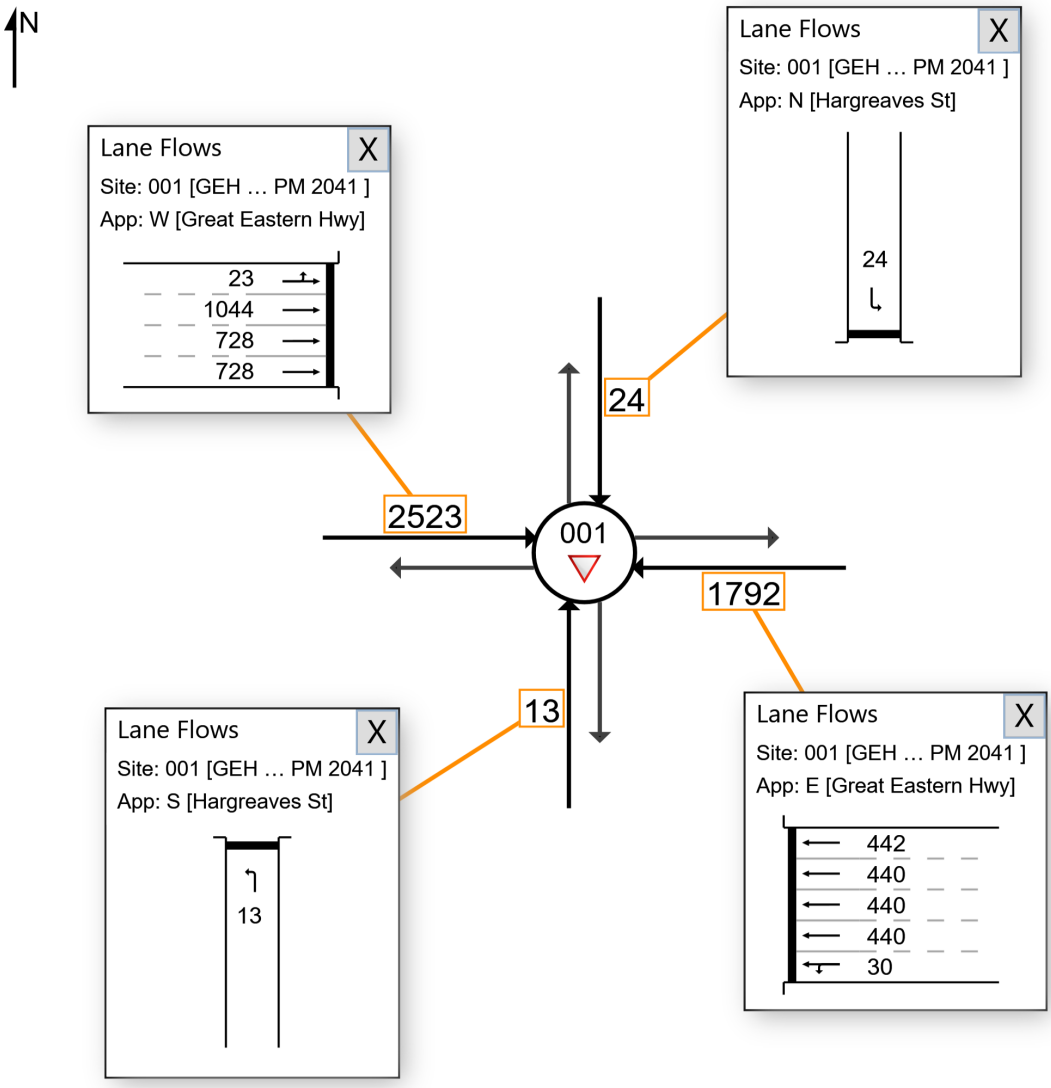

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly PM 2041 (Site Folder: 2041 PM Peak)]

Network: N101 [2041 PM Peak (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2041 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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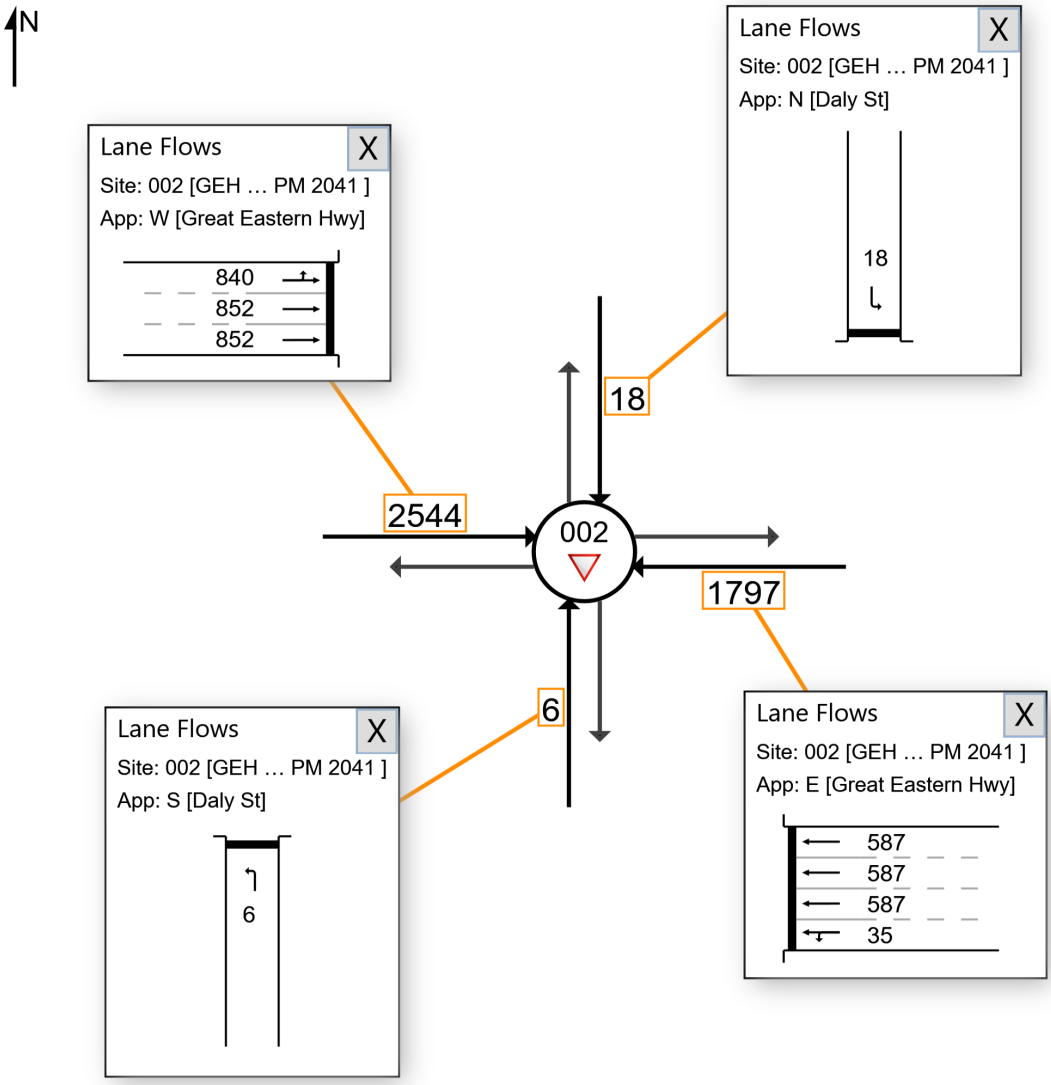

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Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand PM 2041 (Site Folder: 2041 PM Peak)]

Network: N101 [2041 PM Peak (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2041 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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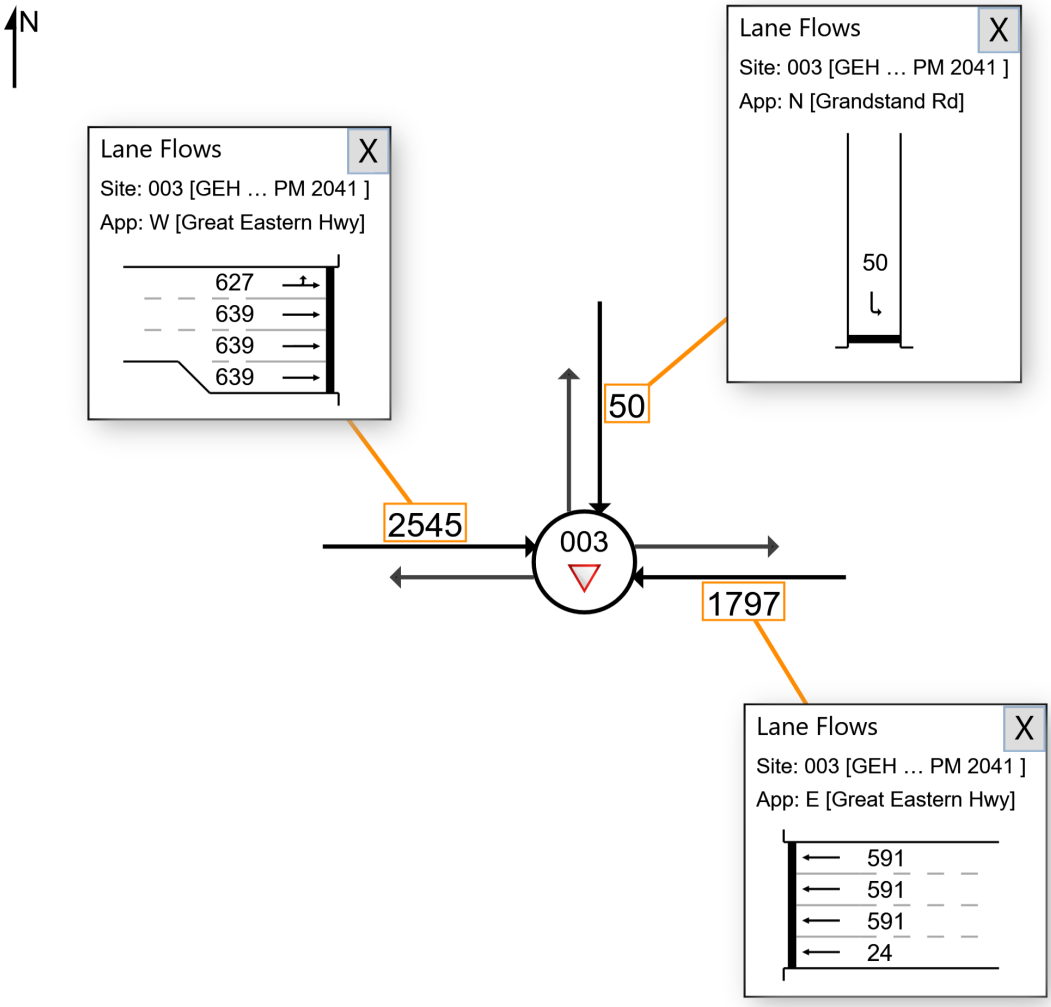

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Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey PM 2041 (Site Folder: 2041 PM Peak)]

Network: N101 [2041 PM Peak (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 PM Peak
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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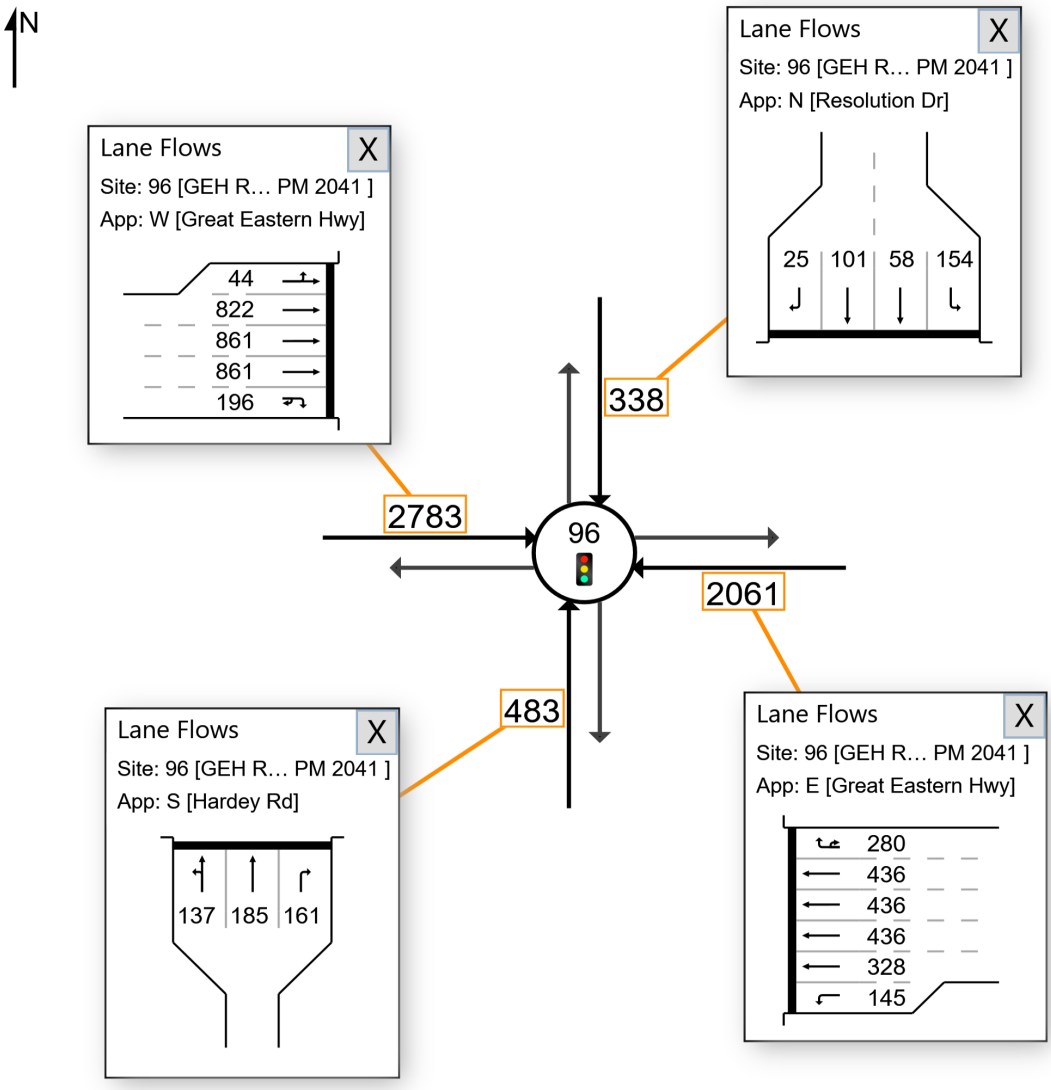

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves PM 2041 (Site Folder: 2041 PM Peak)]

Network: N101 [2041 PM Peak (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2041 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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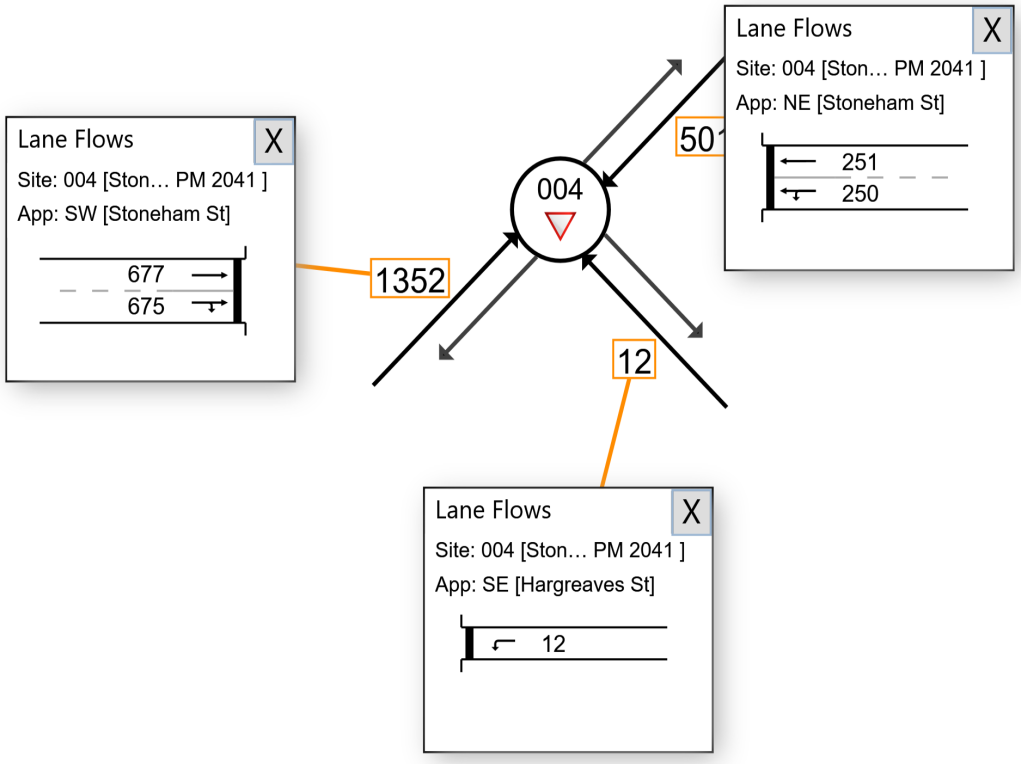

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 006 [Stoneham Daly PM 2041 (Site Folder: 2041 PM Peak)]

Network: N101 [2041 PM Peak (Network Folder: General)]

Stoneham St / Daly St
Left out only, Give Way
2041 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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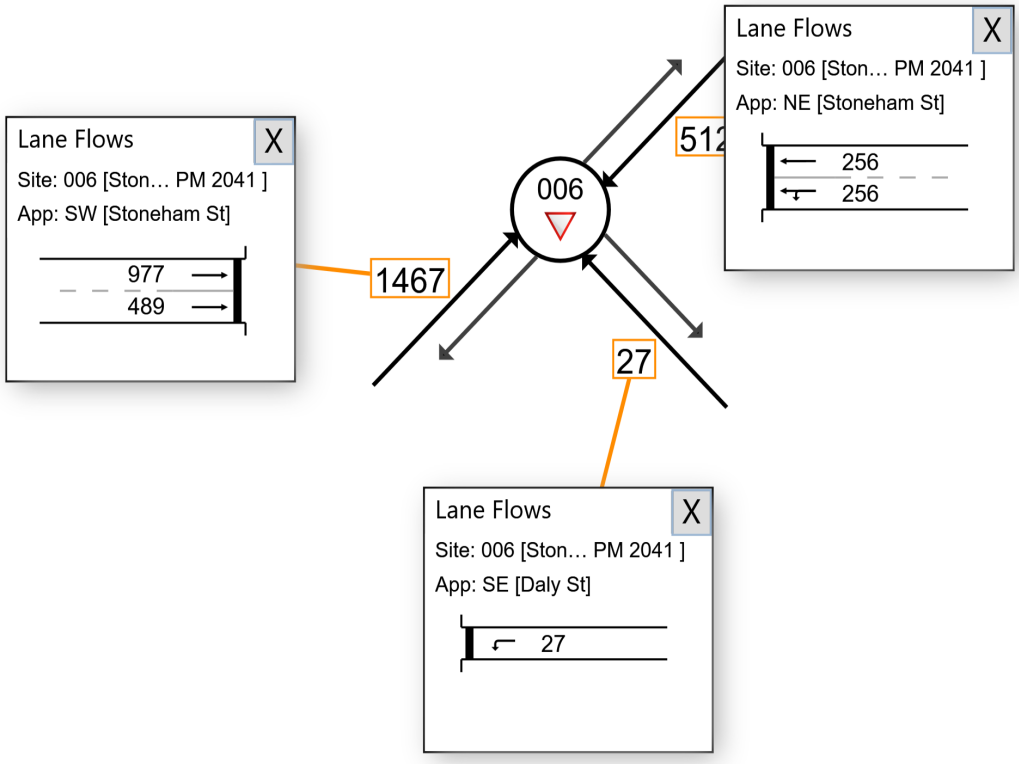

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution PM 2041 (Site Folder: 2041 PM Peak)]

Network: N101 [2041 PM Peak (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 PM Peak
Site Category: Existing Design
Roundabout

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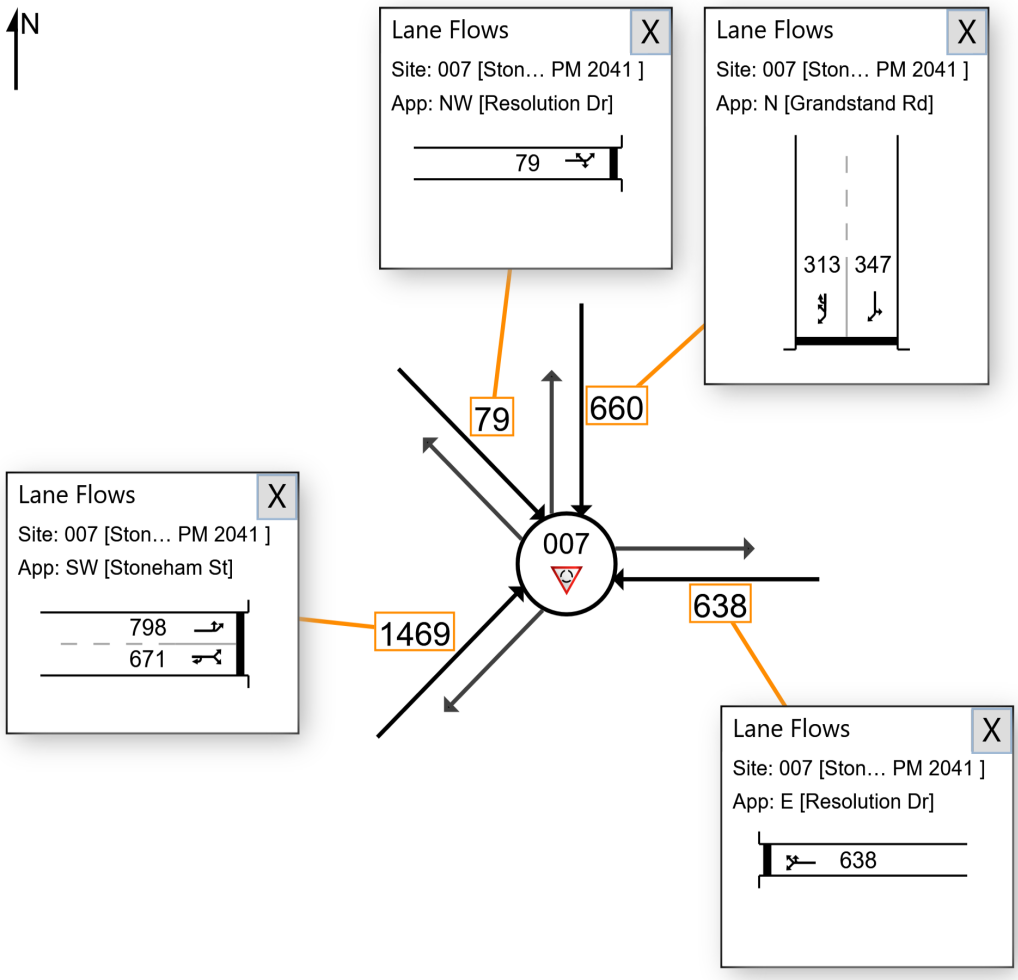

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand PM 2041 (Site Folder: 2041 PM Peak)] **Network: N101 [2041 PM Peak (Network Folder: General)]**

Resolution Dr / Grandstand Rd
Give Way
2041 PM Peak
Site Category: Existing Design
Give-Way (Two-Way)

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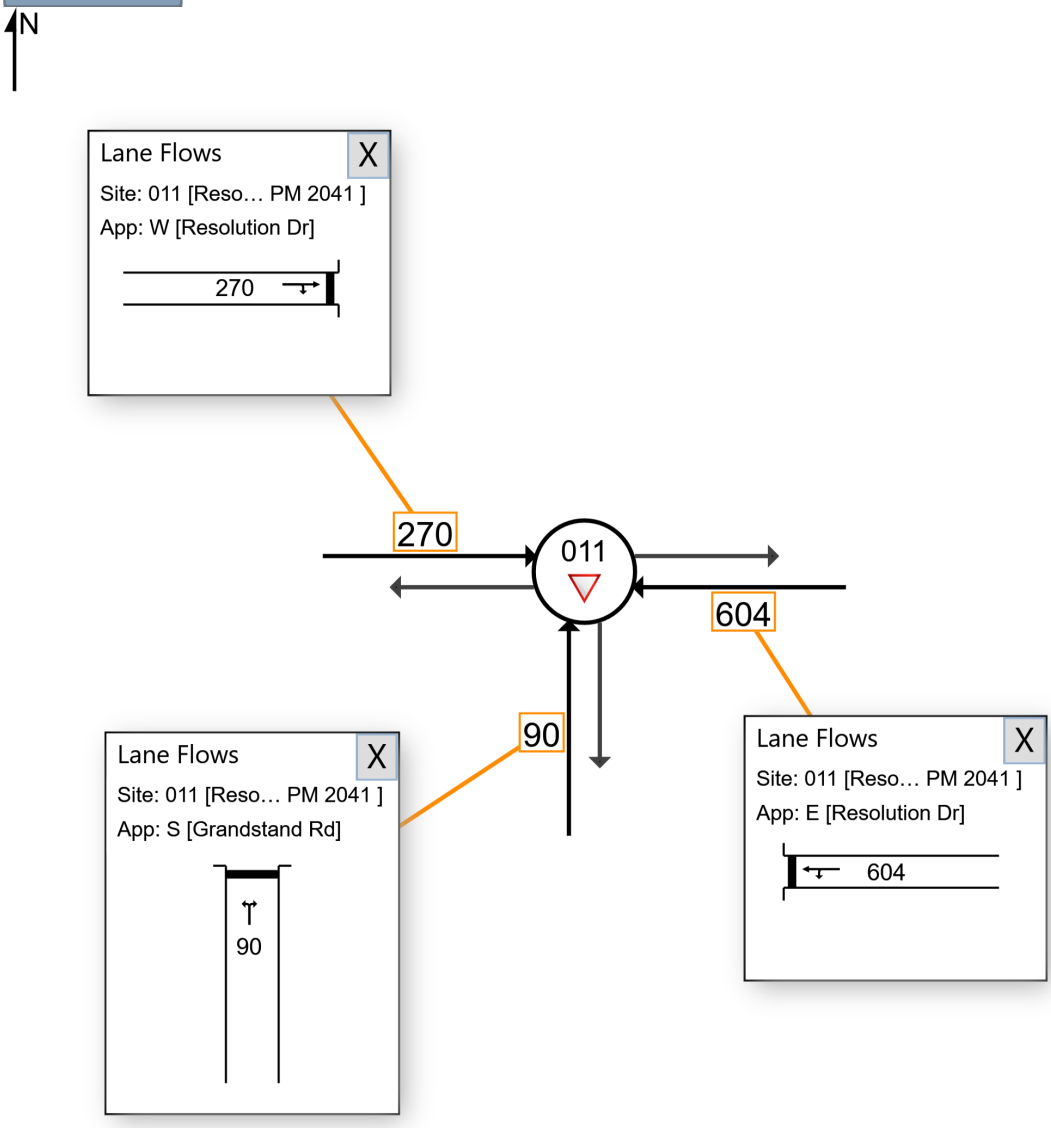

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2021 AM Peak with proposed road network
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

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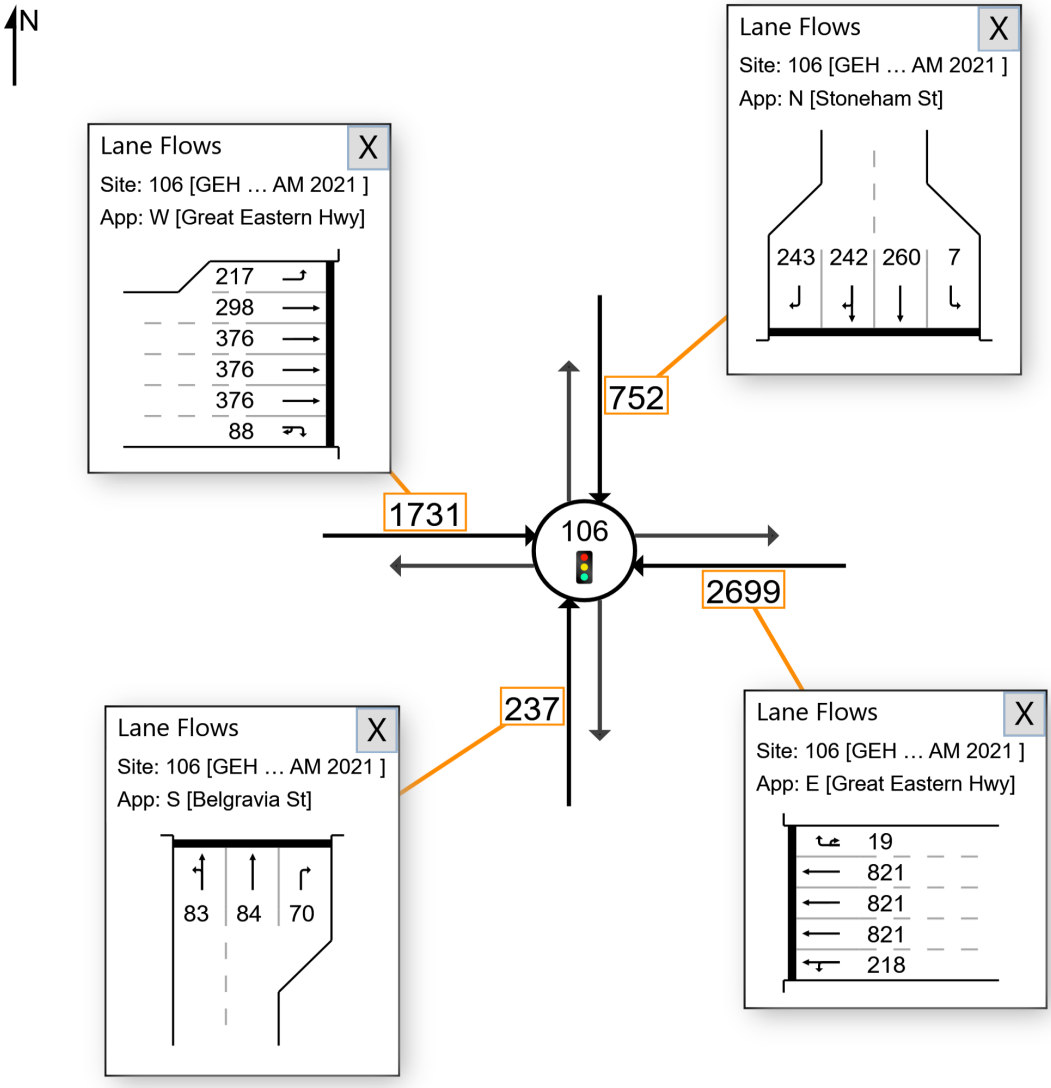

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2021 AM Peak with proposed road network
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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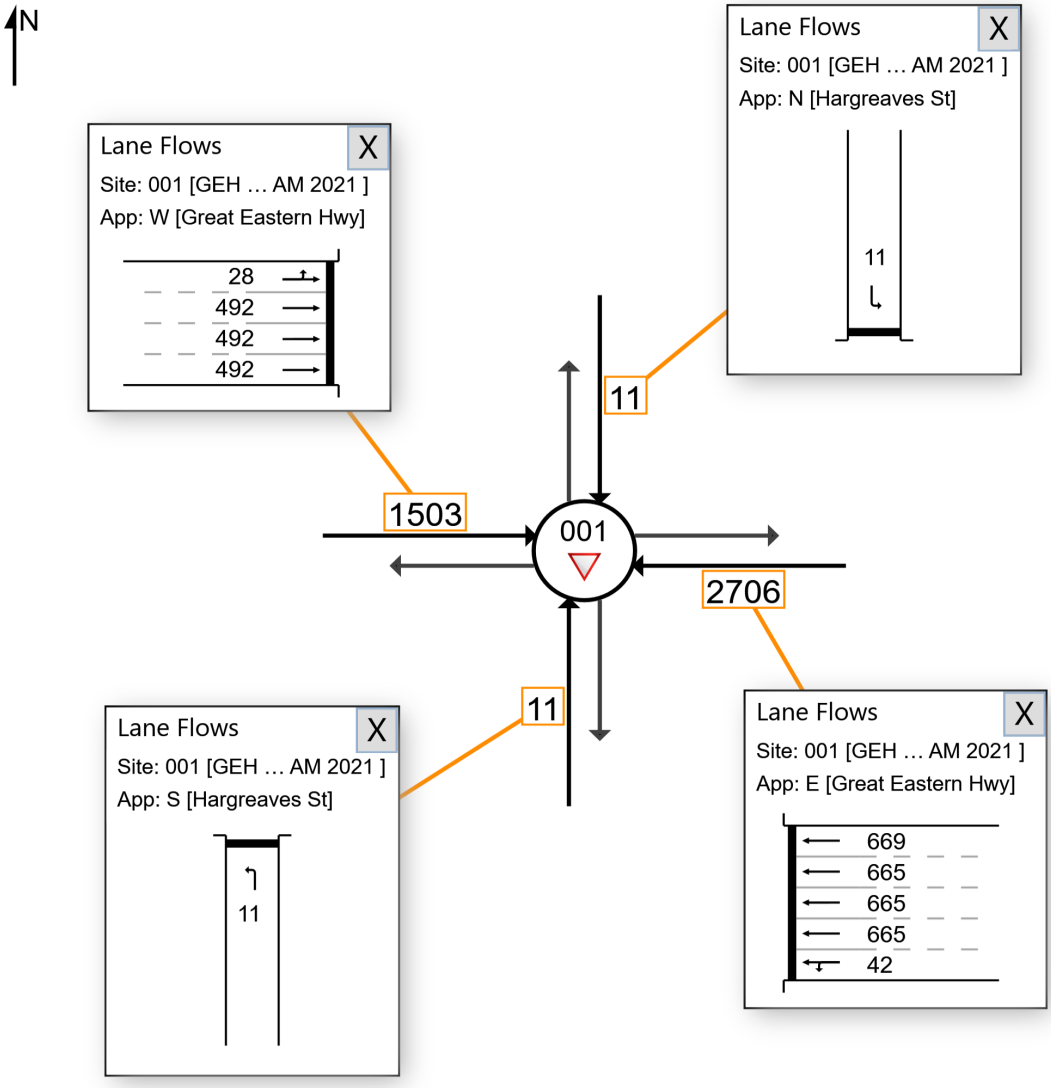

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2021 AM Peak with proposed road network
Site Category: Existing Design
Give-Way (Two-Way)

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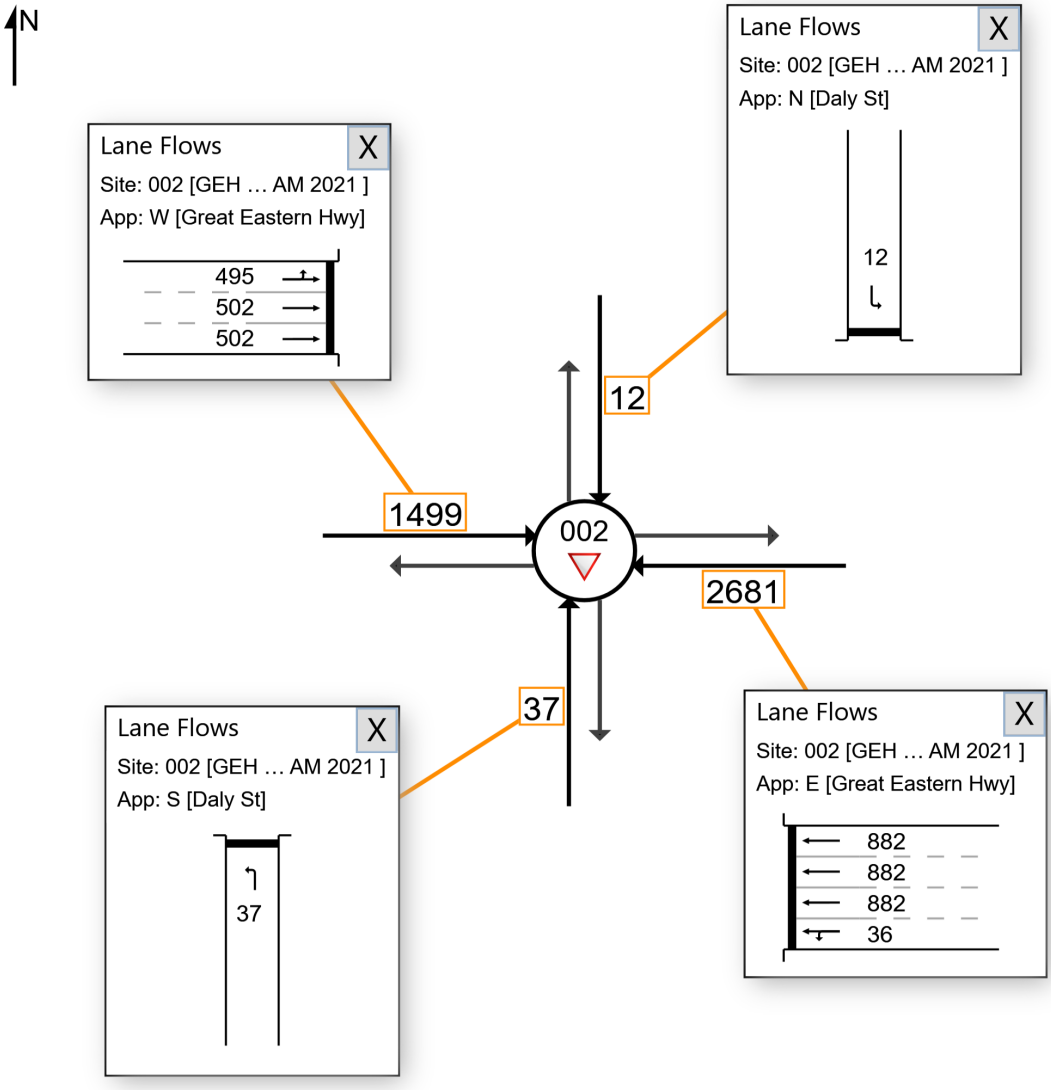

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2021 AM Peak with proposed road network
Site Category: Existing Design
Give-Way (Two-Way)

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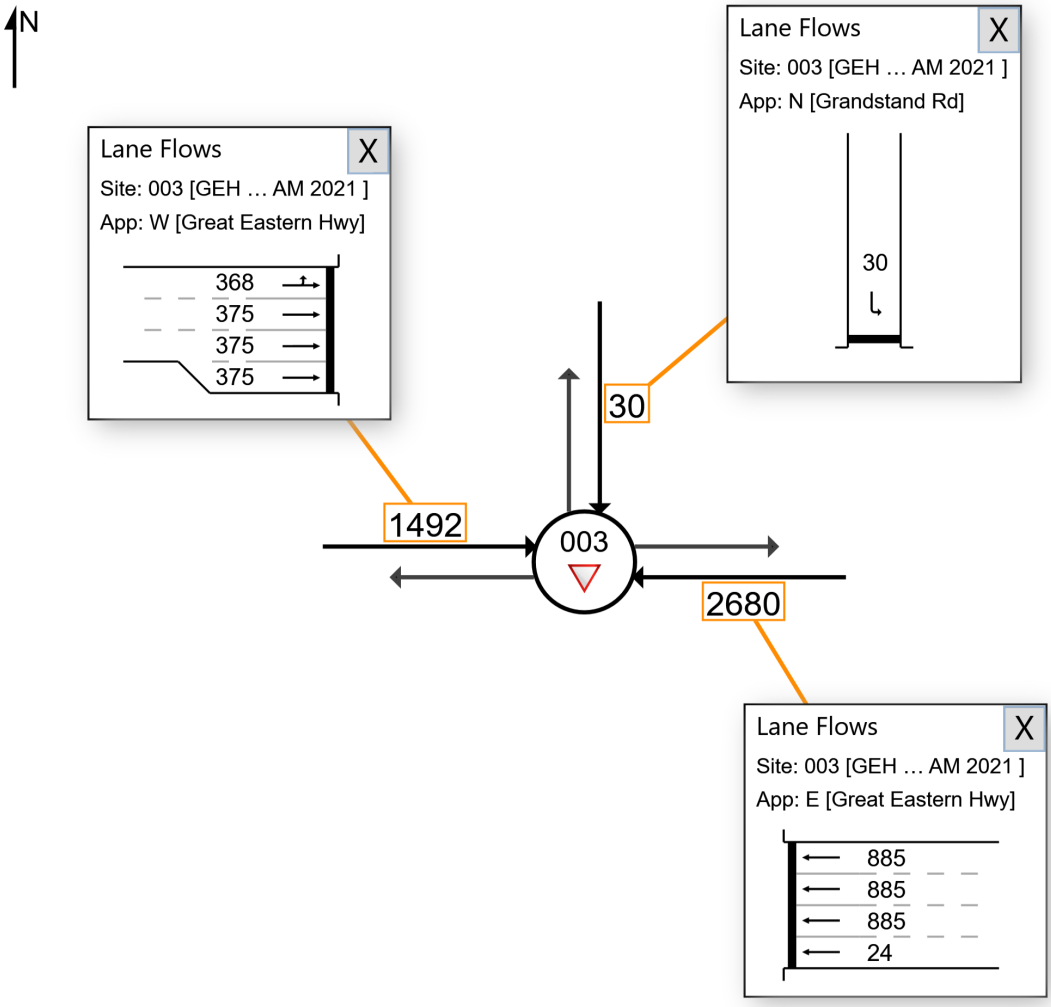

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

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GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 AM Peak with proposed road network
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

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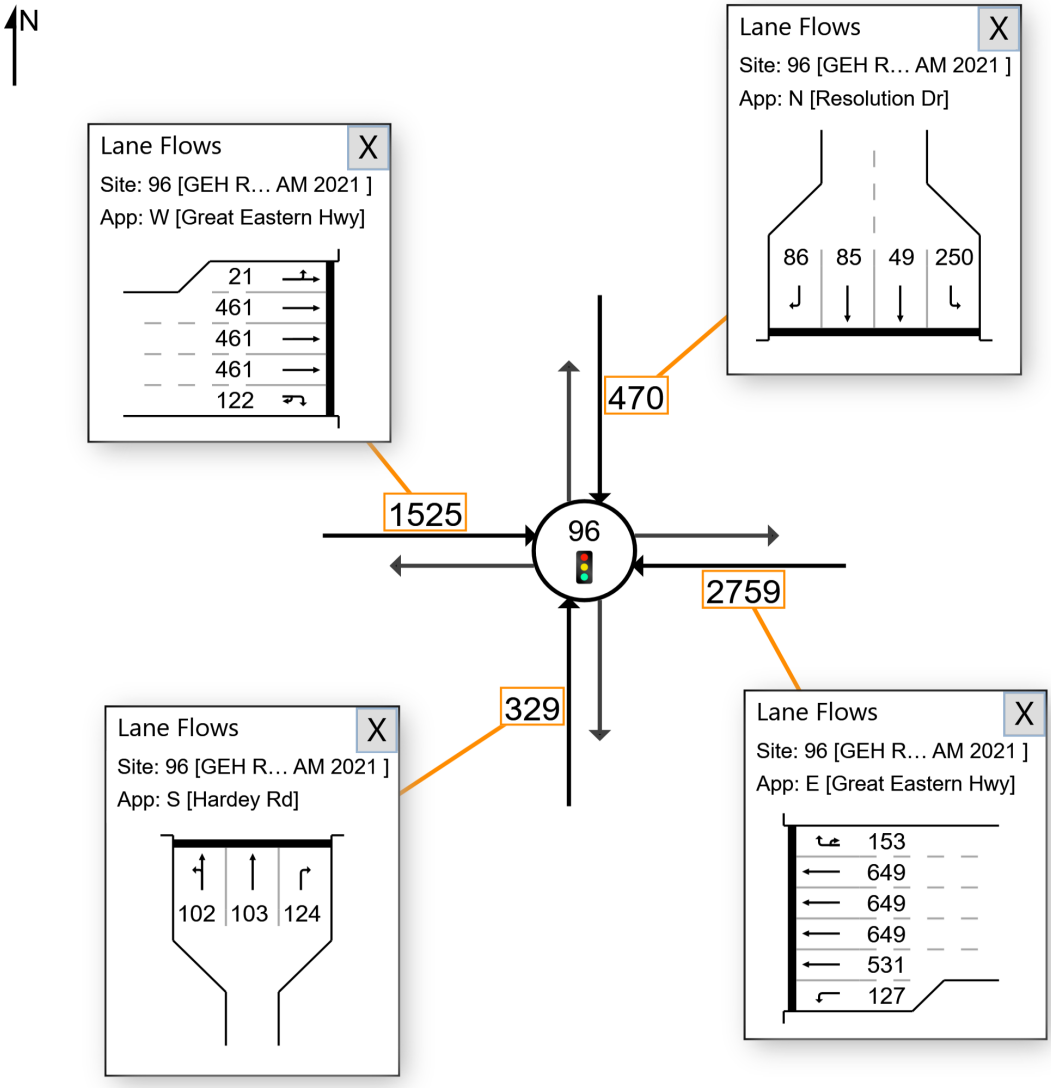

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2021 AM Peak with proposed road network
Site Category: Existing Design
Give-Way (Two-Way)

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Click and drag popup boxes to move to preferred positions.

Close All Popups

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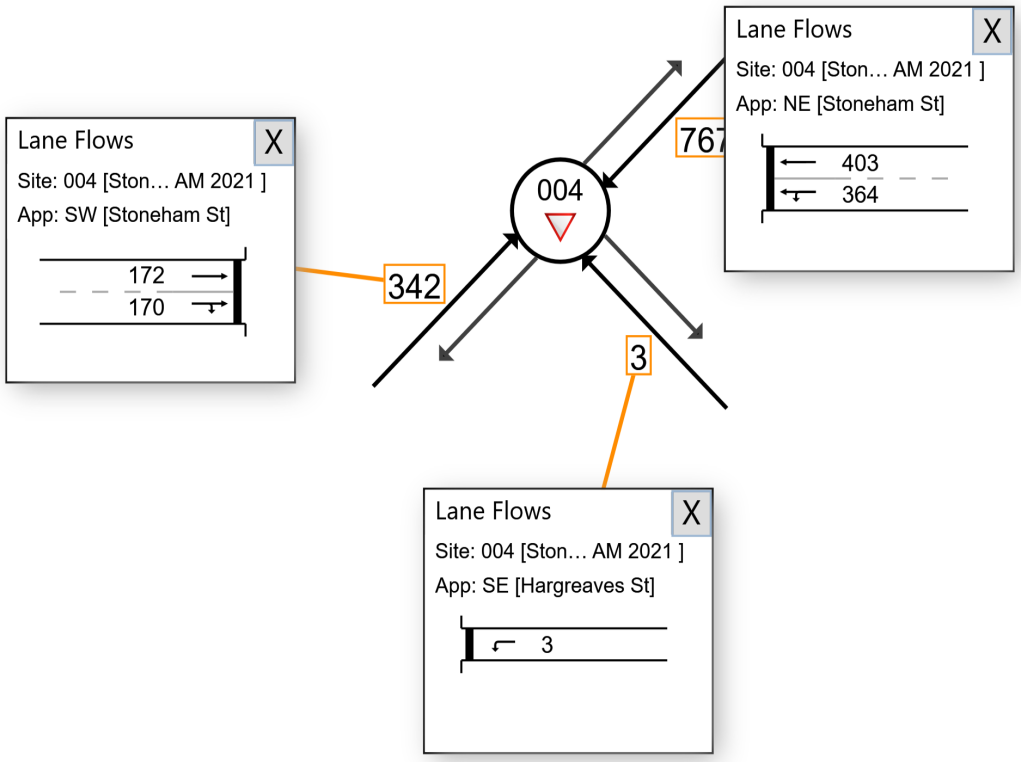

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 AM Peak with proposed road network
Site Category: Existing Design
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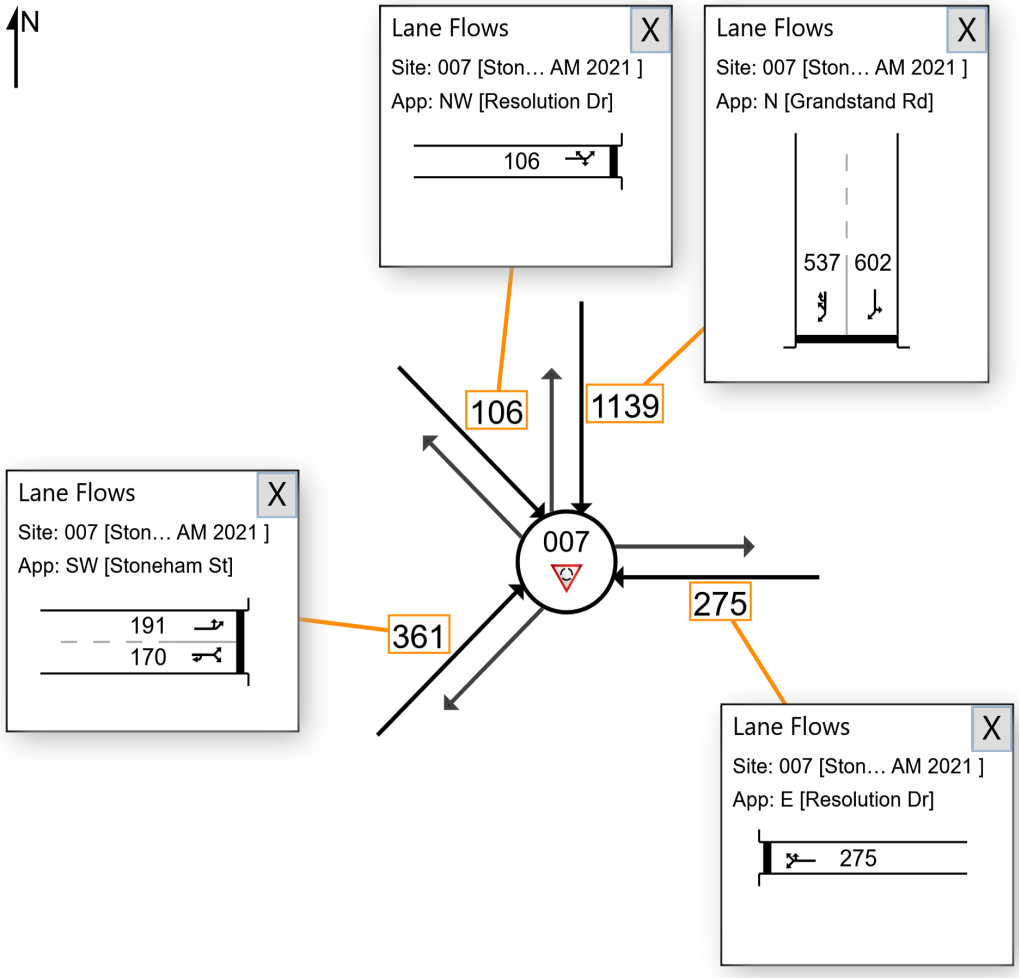

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Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand AM 2021 (Site Folder: 2021 AM Peak Proposed Network)]

Network: N101 [2021 AM Peak Proposed Network (Network Folder: General)]

Resolution Dr / Grandstand Rd
Give Way
2021 AM Peak with proposed road network
Site Category: Existing Design
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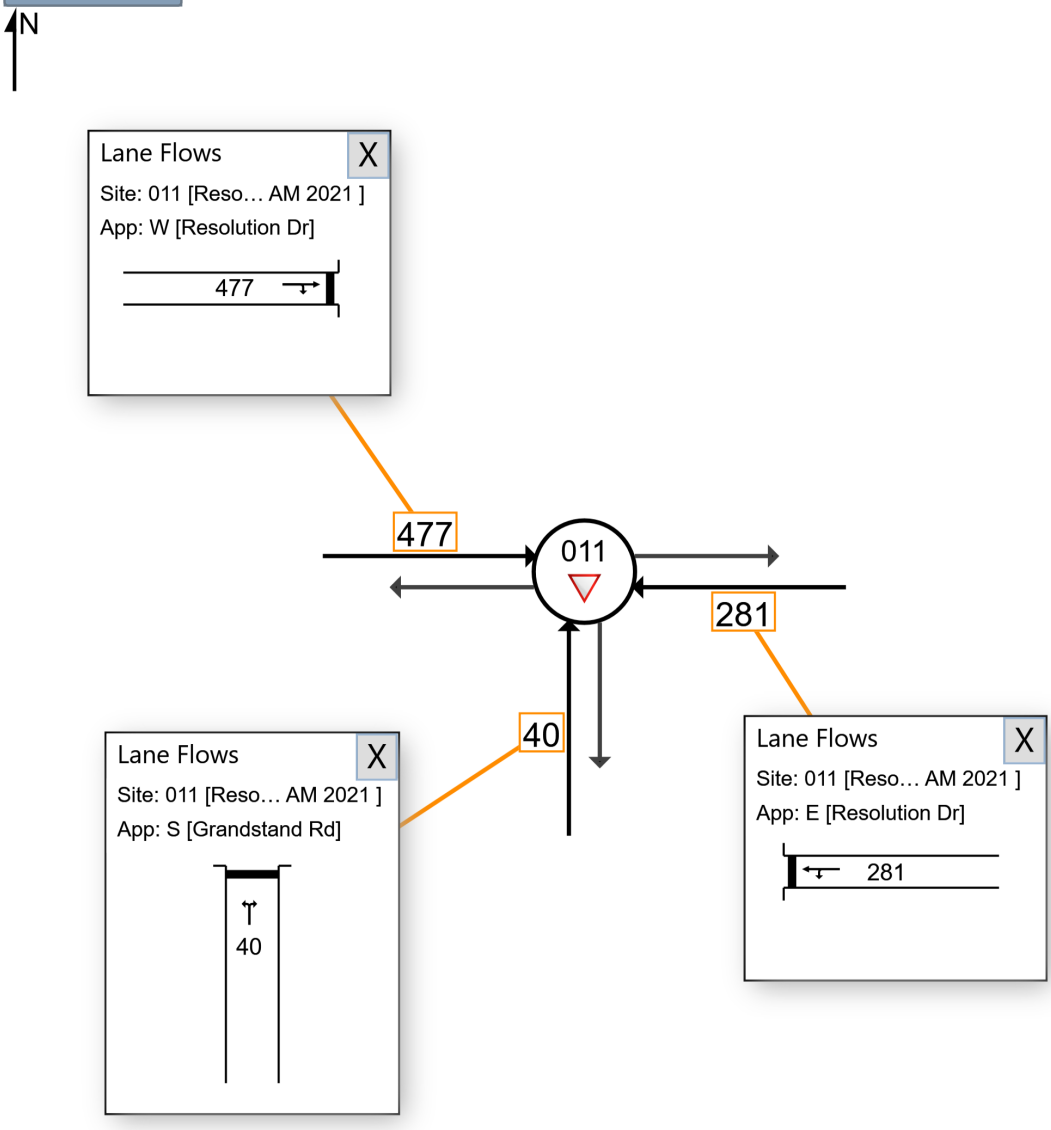

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

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Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2021 PM Peak with proposed road network
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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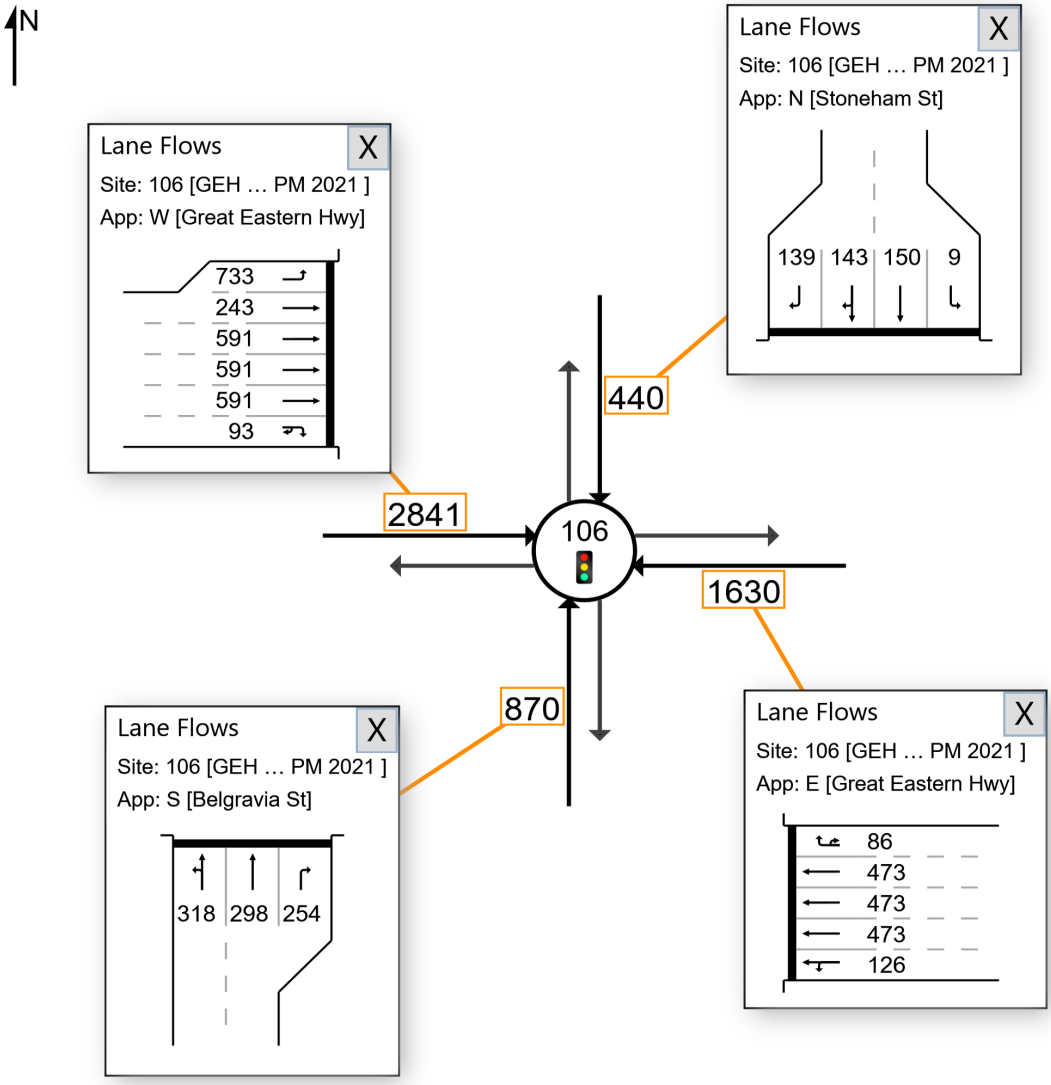

Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows

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Version: 1, Version Date: 11/06/2026

APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2021 PM Peak with proposed road network
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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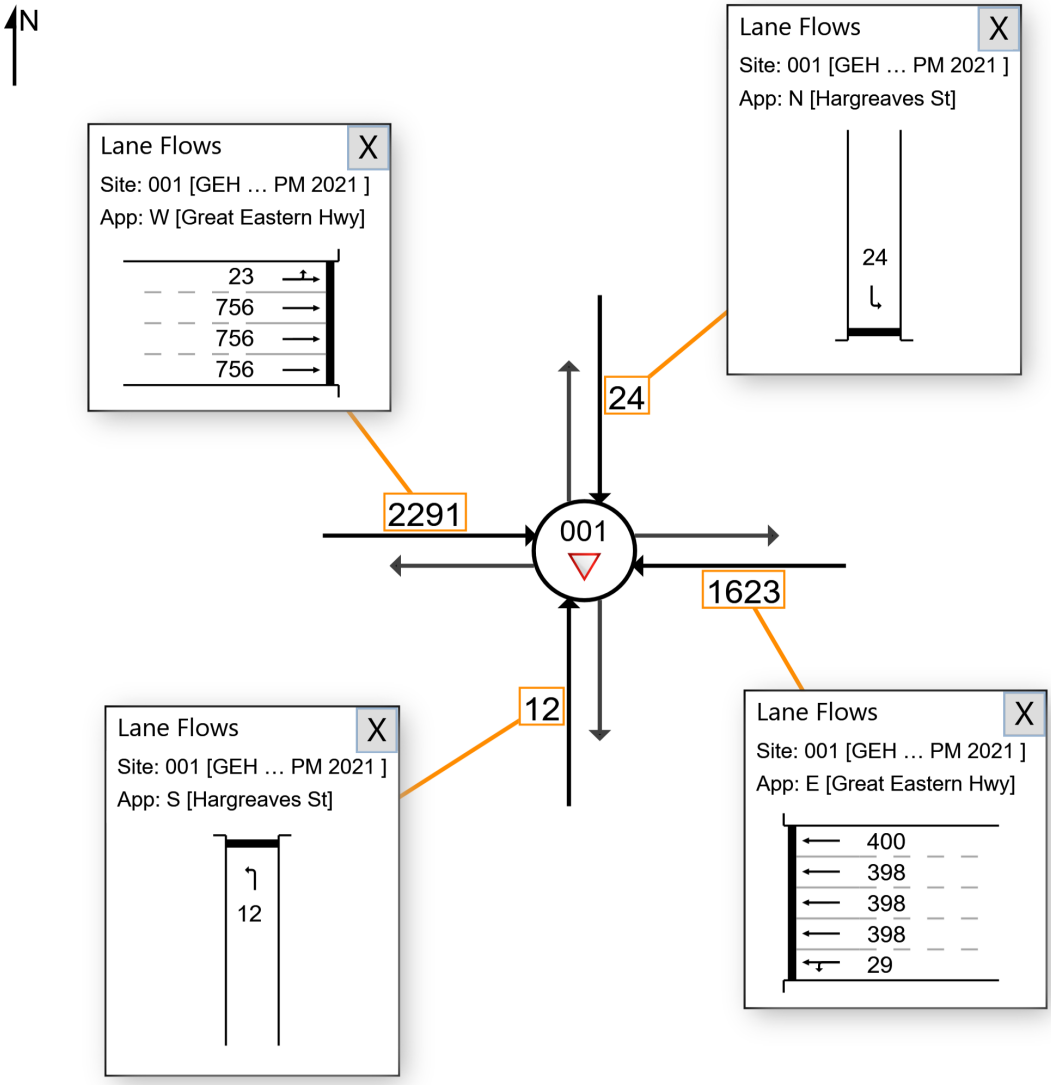

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2021 PM Peak with proposed road network
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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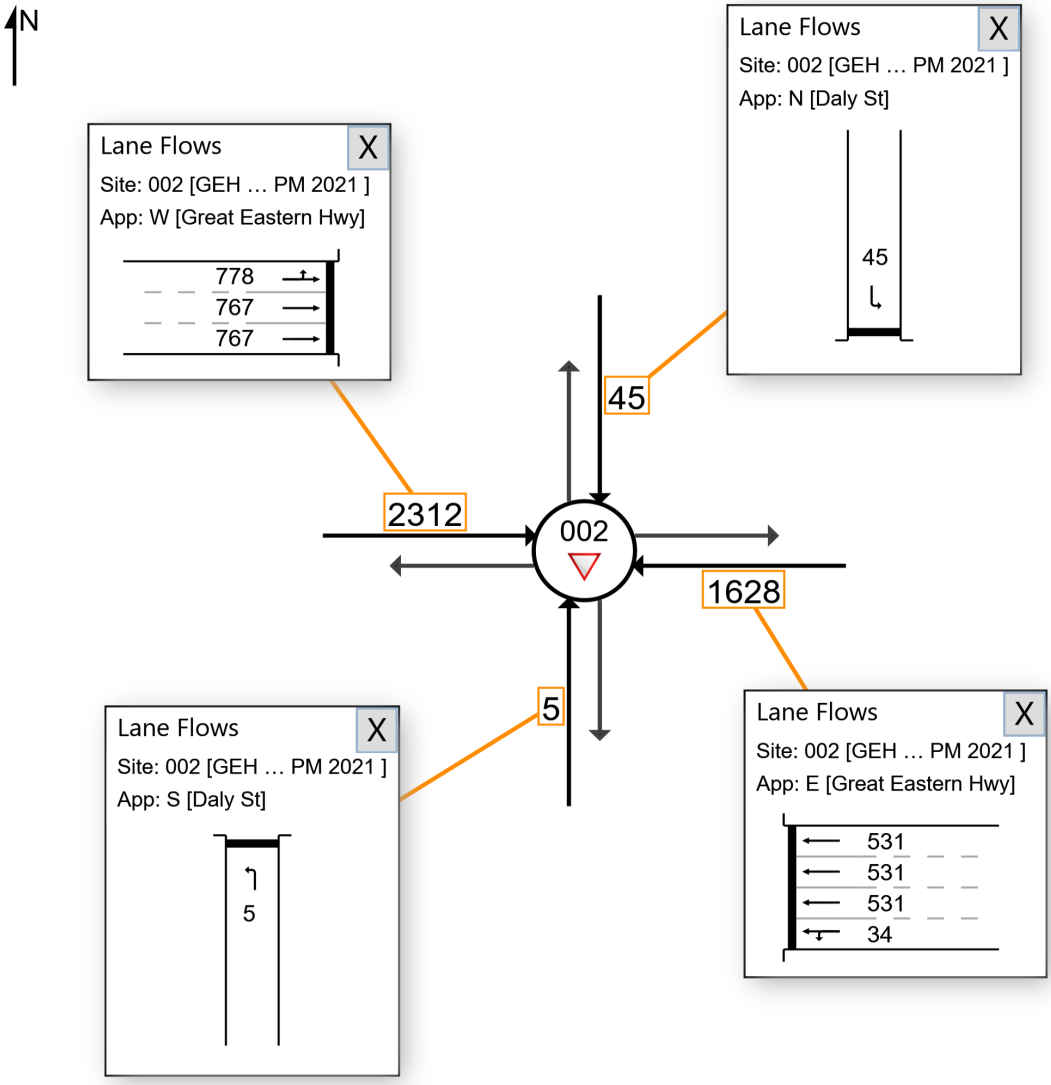

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2021 PM Peak with proposed road network
Site Category: Existing Design
Give-Way (Two-Way)

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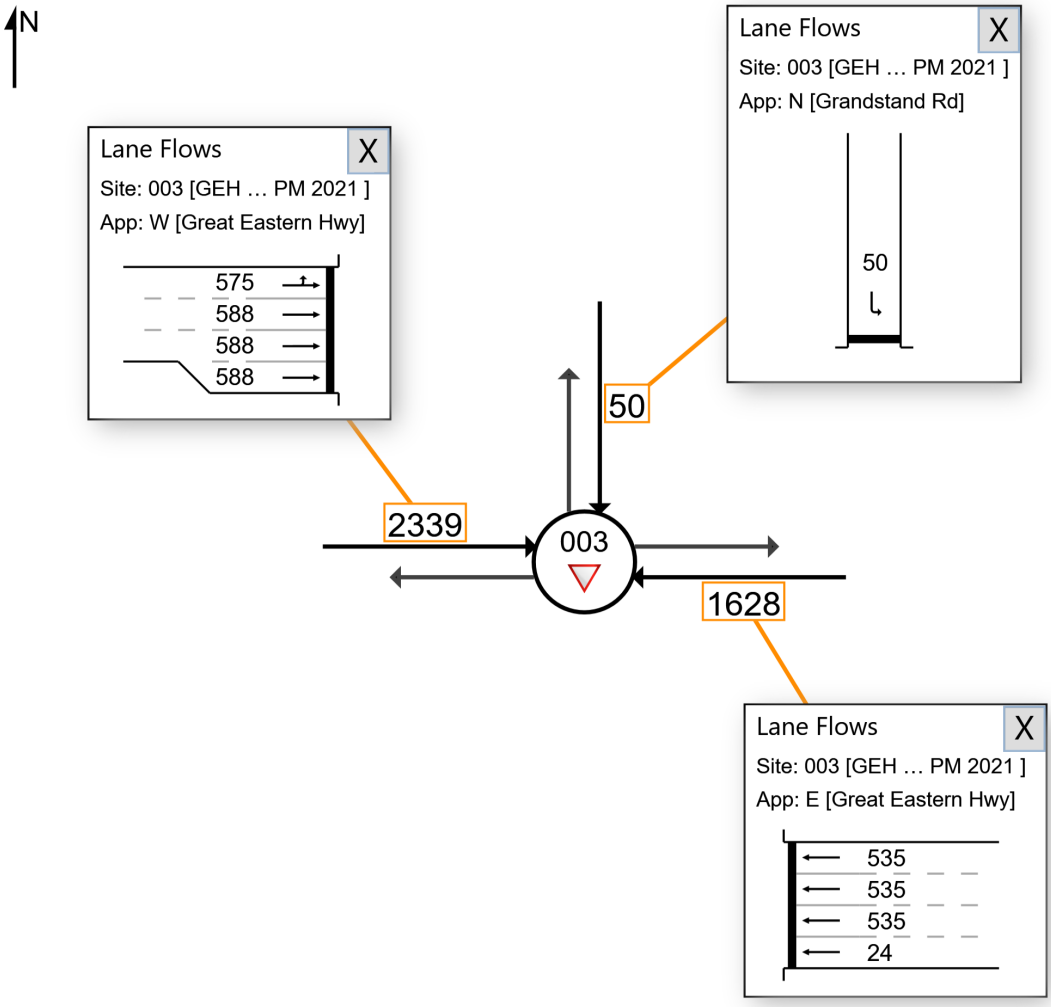

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 PM Peak with proposed road network
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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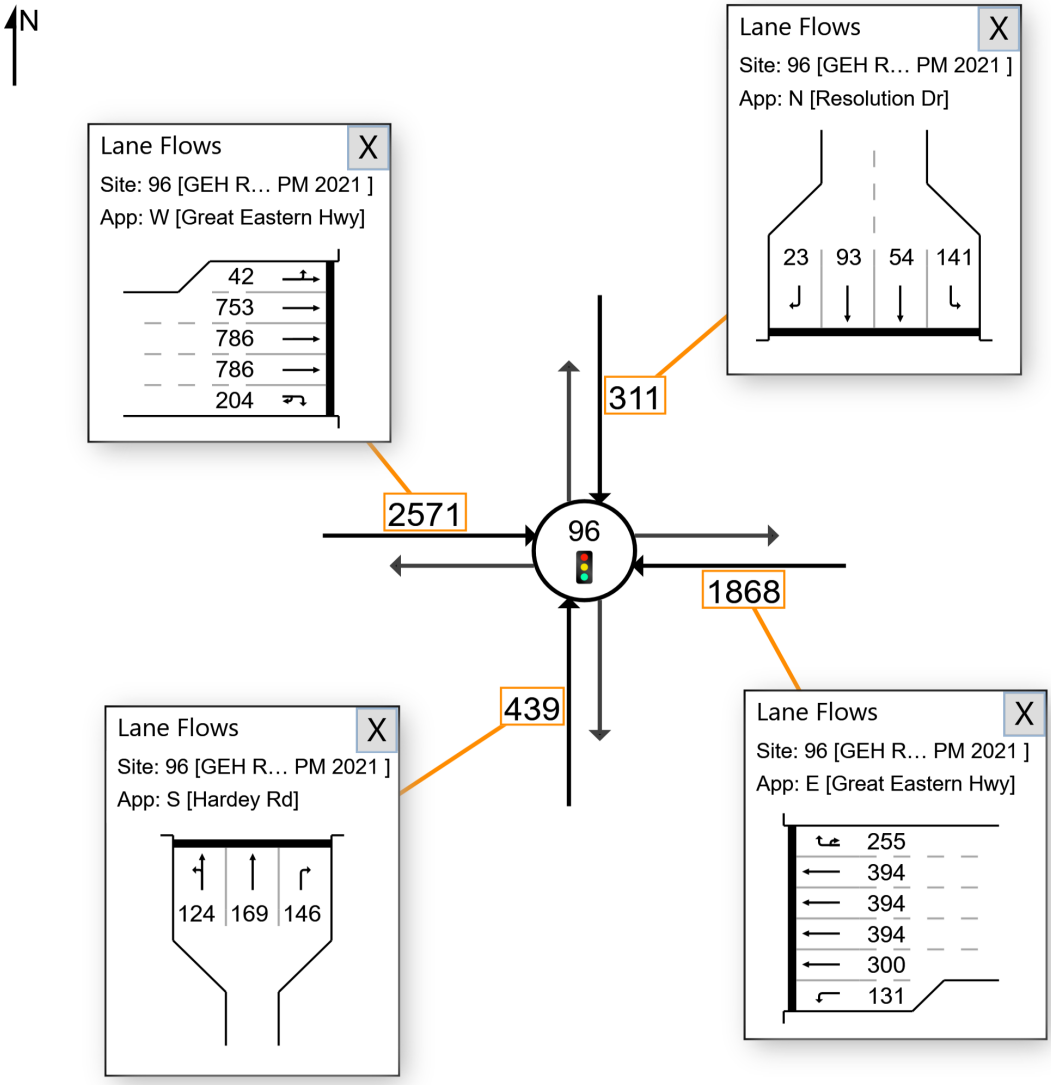

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2021 PM Peak with proposed road network
Site Category: Existing Design
Give-Way (Two-Way)

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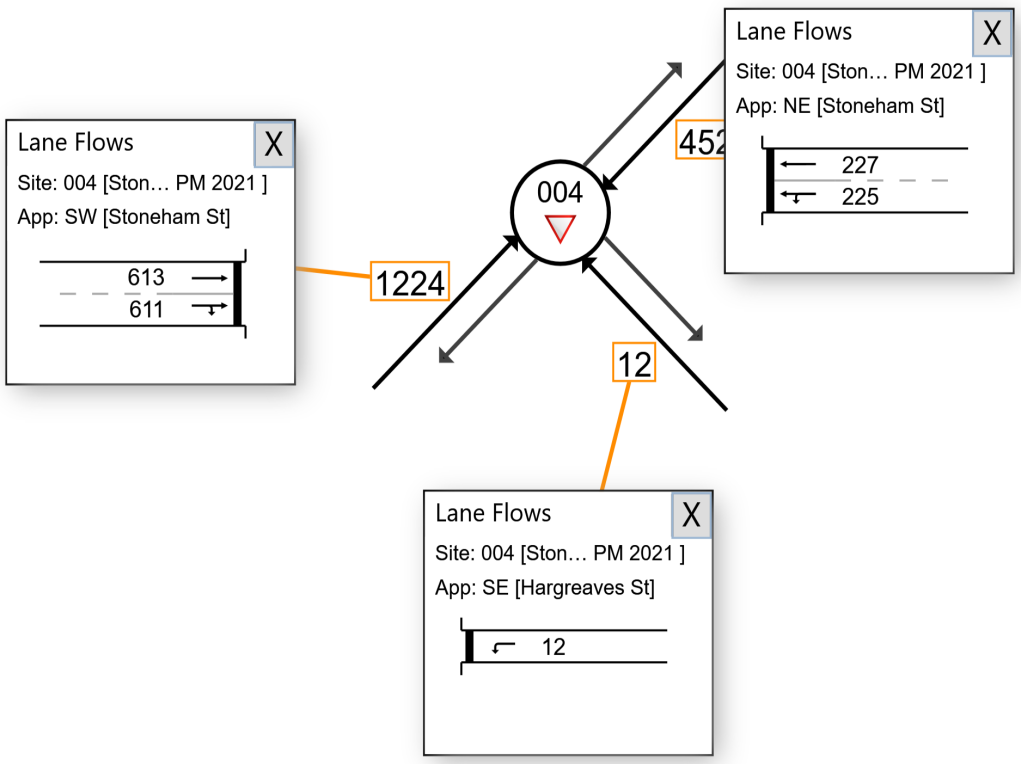

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 PM Peak with proposed road network
Site Category: Existing Design
Roundabout

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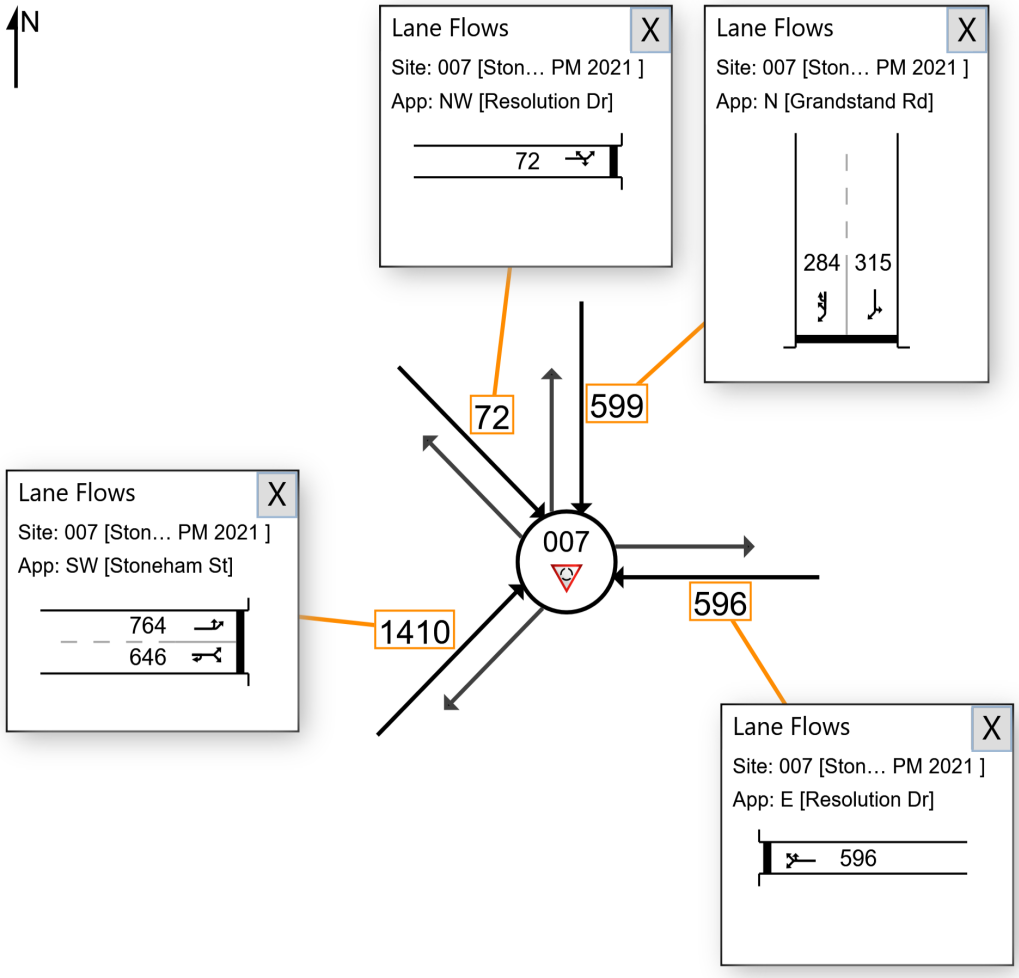

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand PM 2021 (Site Folder: 2021 PM Peak Proposed Network)]

Network: N101 [2021 PM Peak Proposed Network (Network Folder: General)]

Resolution Dr / Grandstand Rd
Give Way
2021 PM Peak with proposed road network
Site Category: Existing Design
Give-Way (Two-Way)

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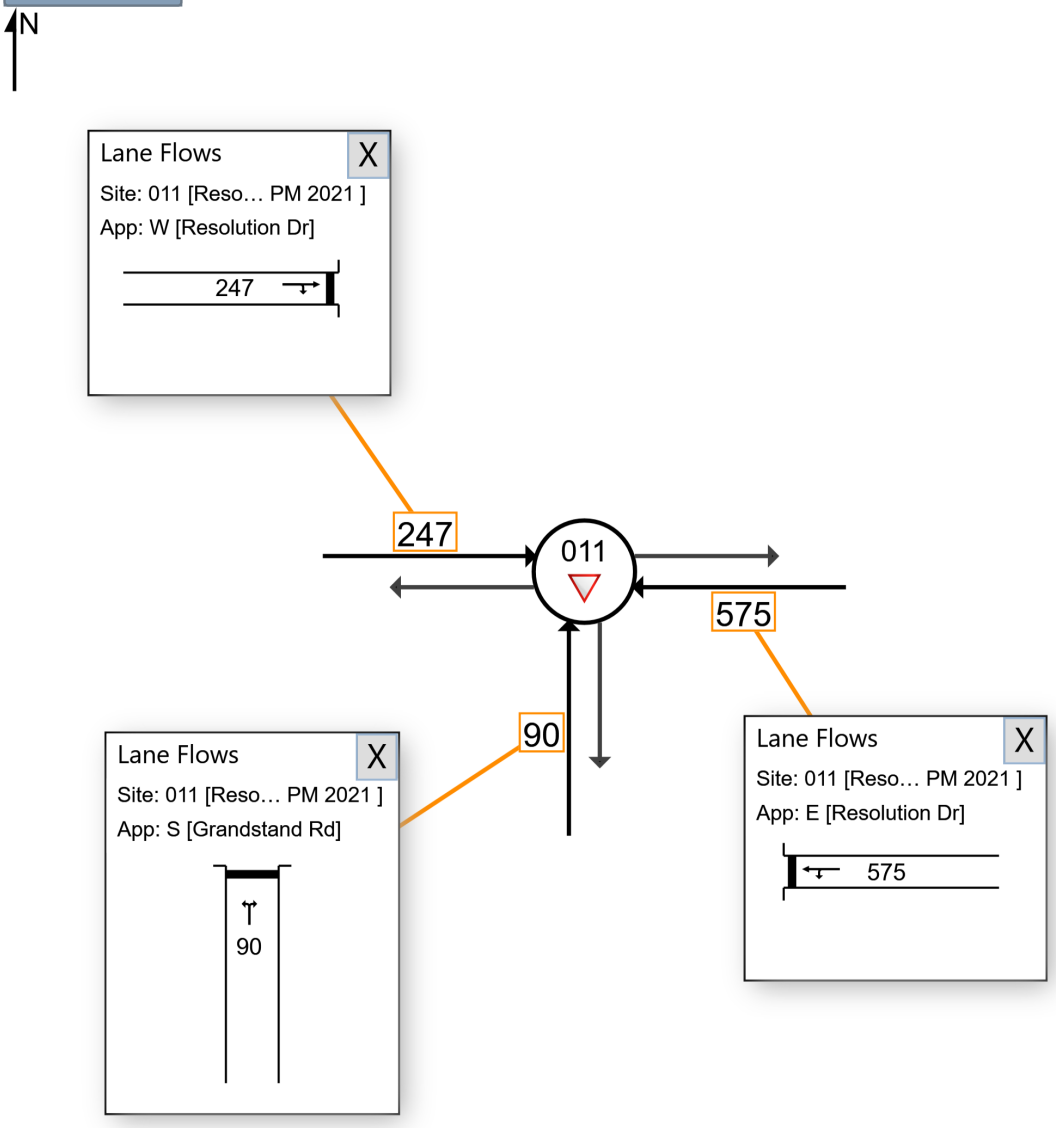

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

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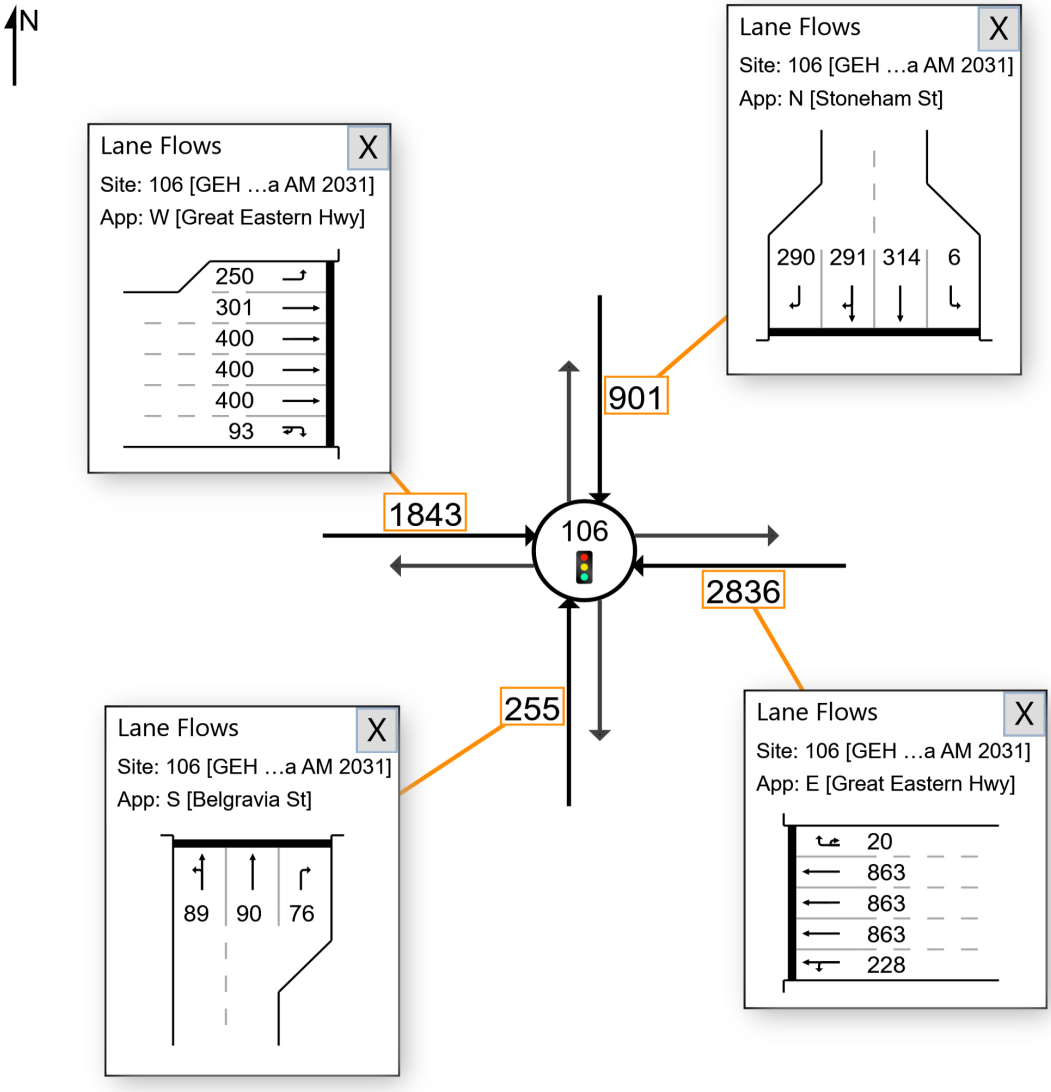

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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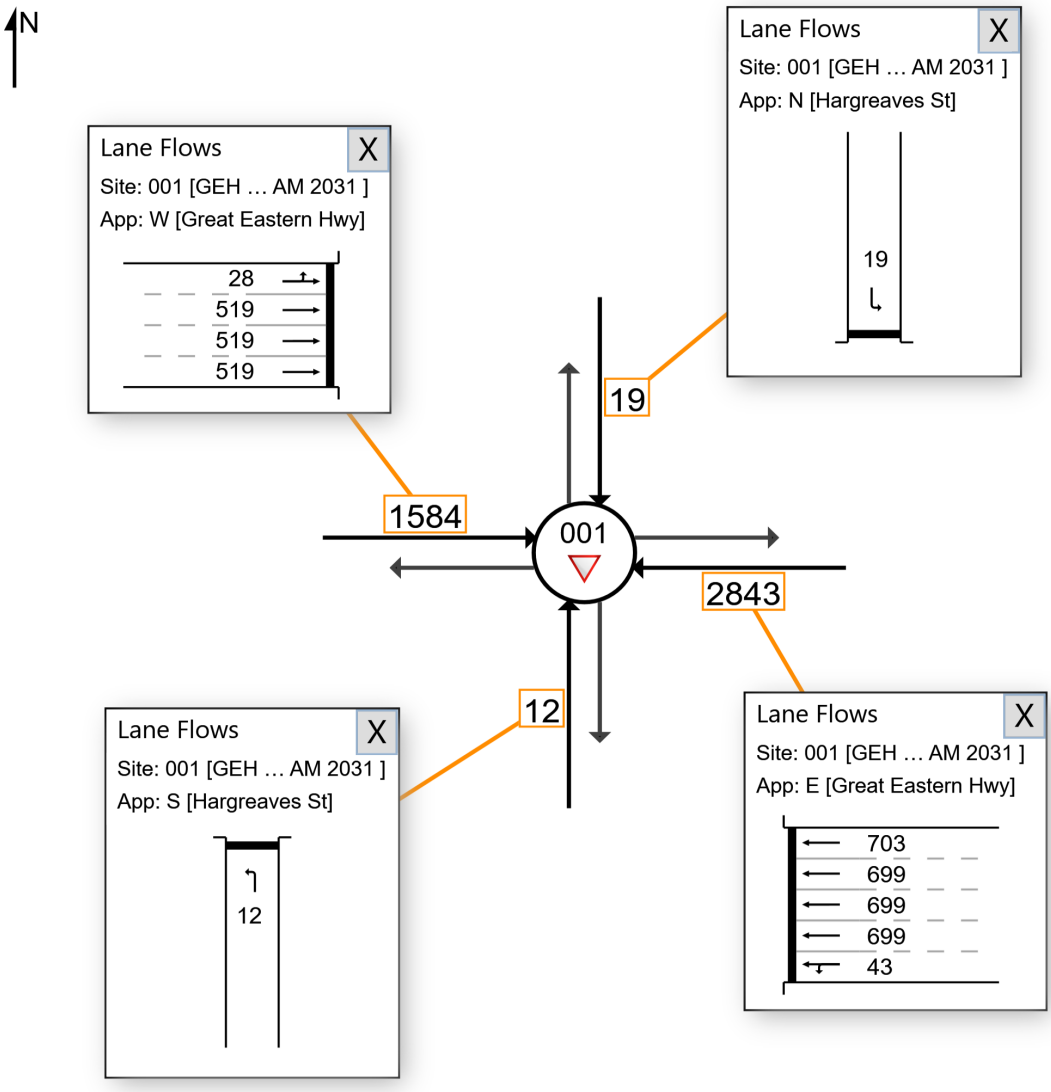

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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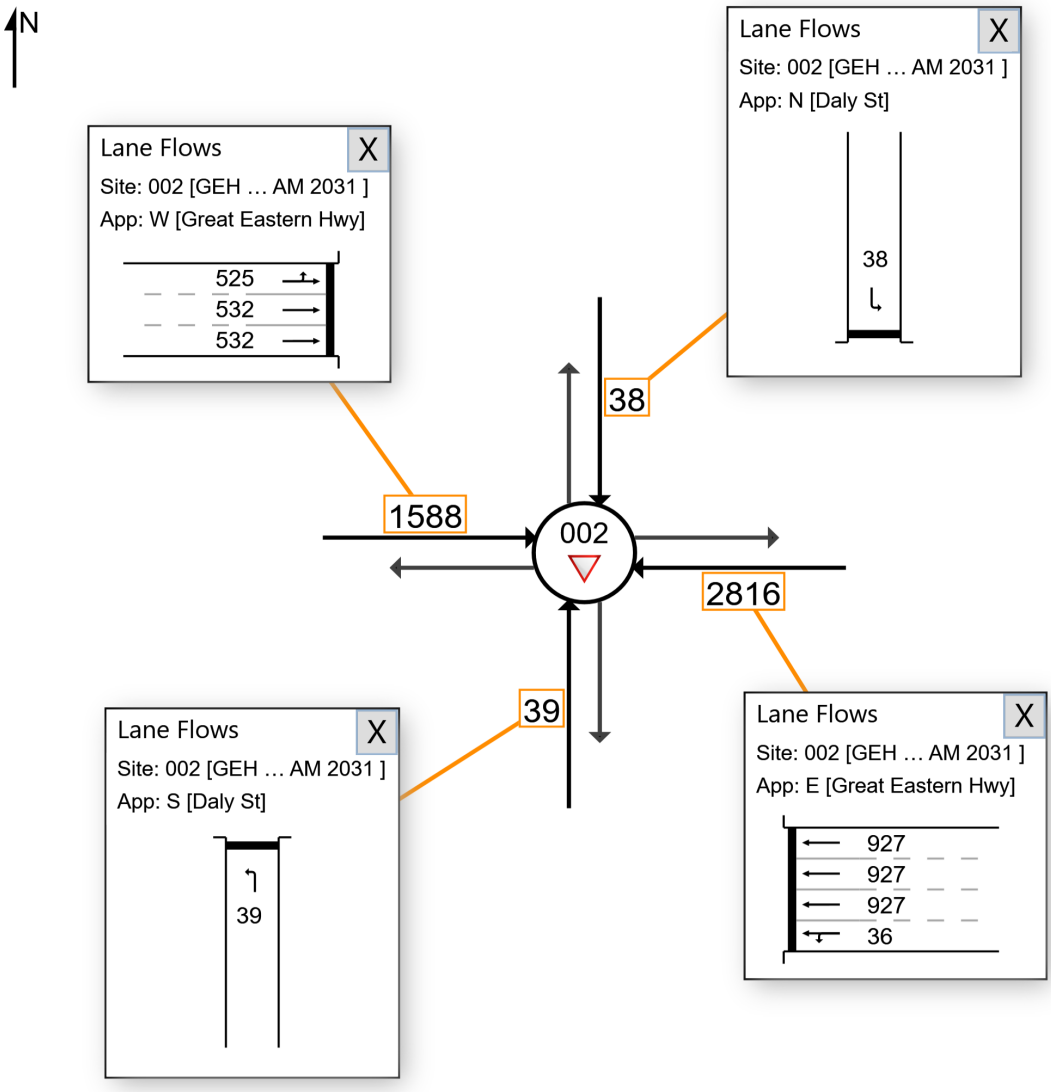

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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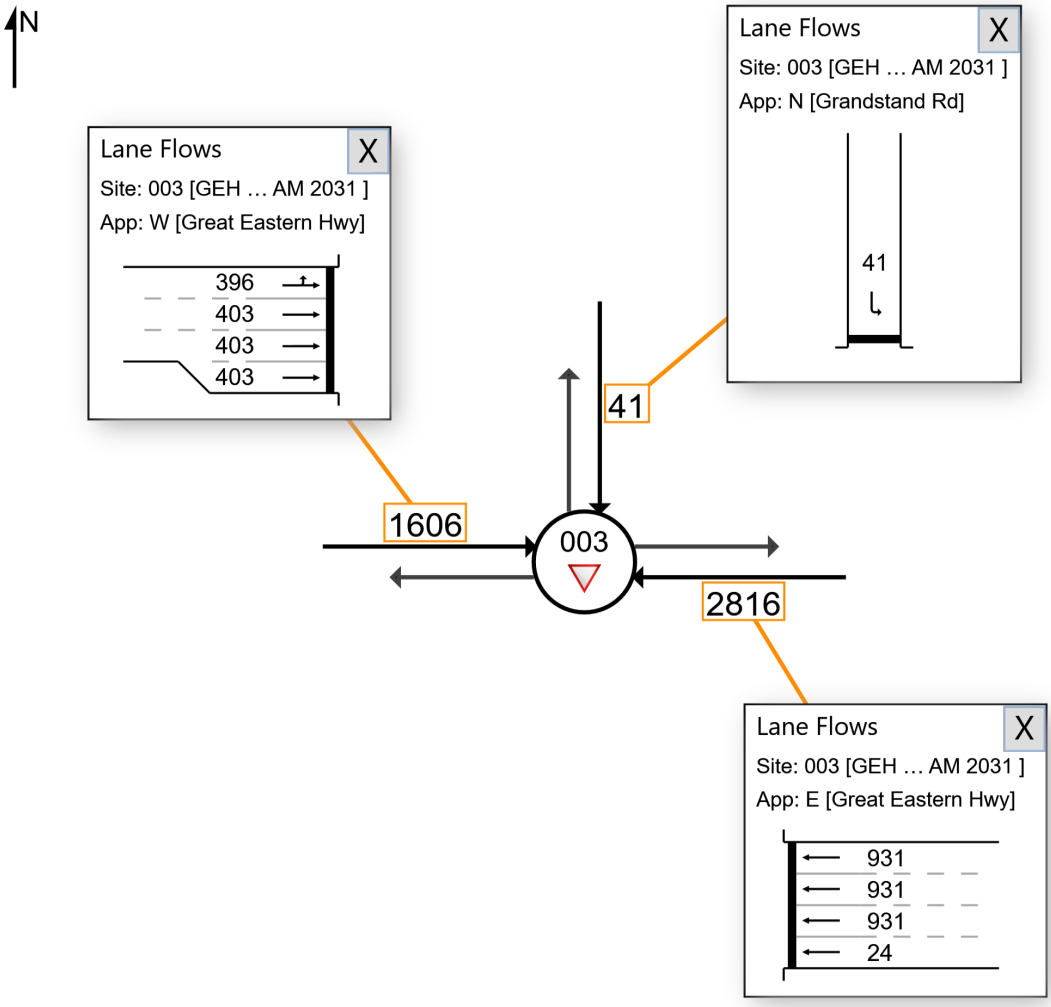

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

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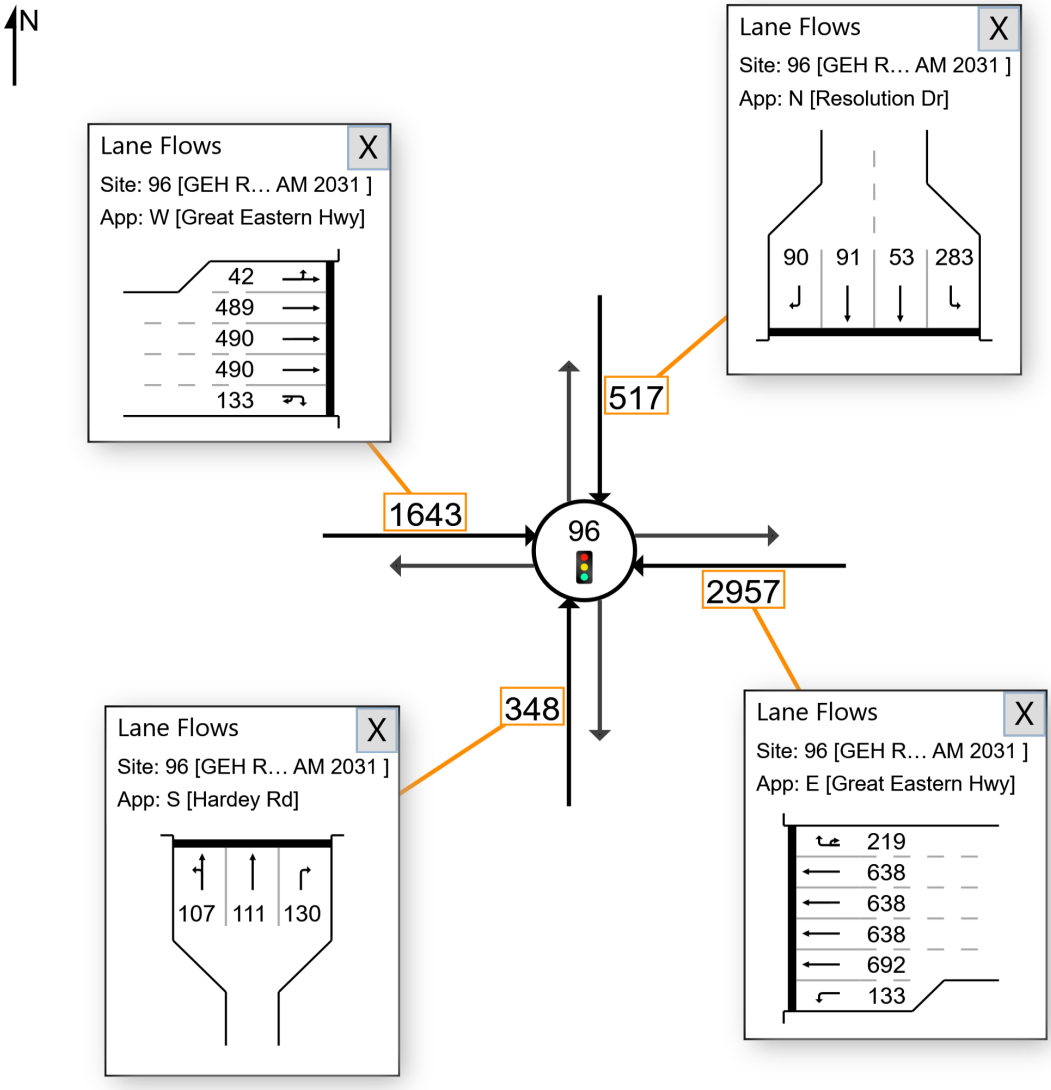

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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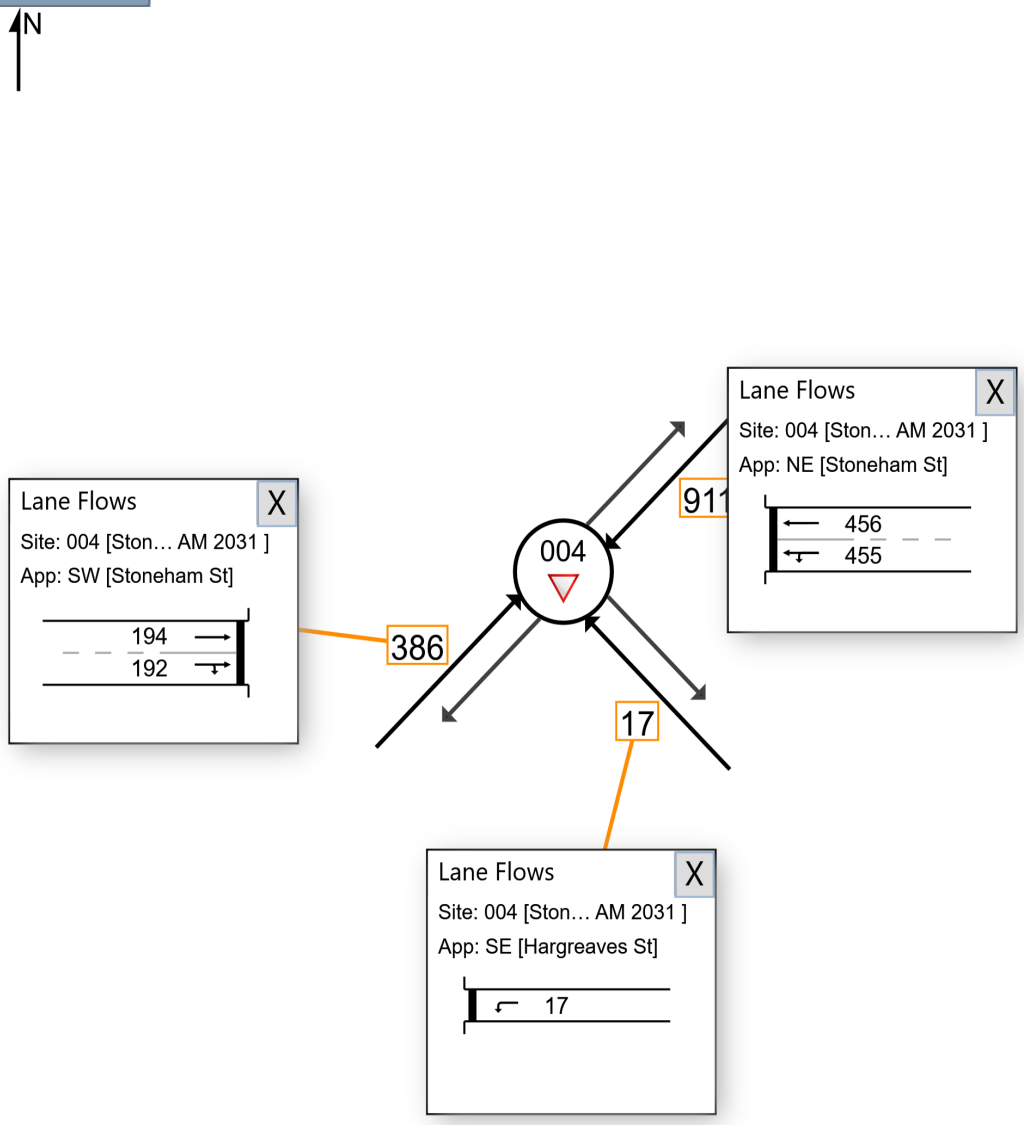

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

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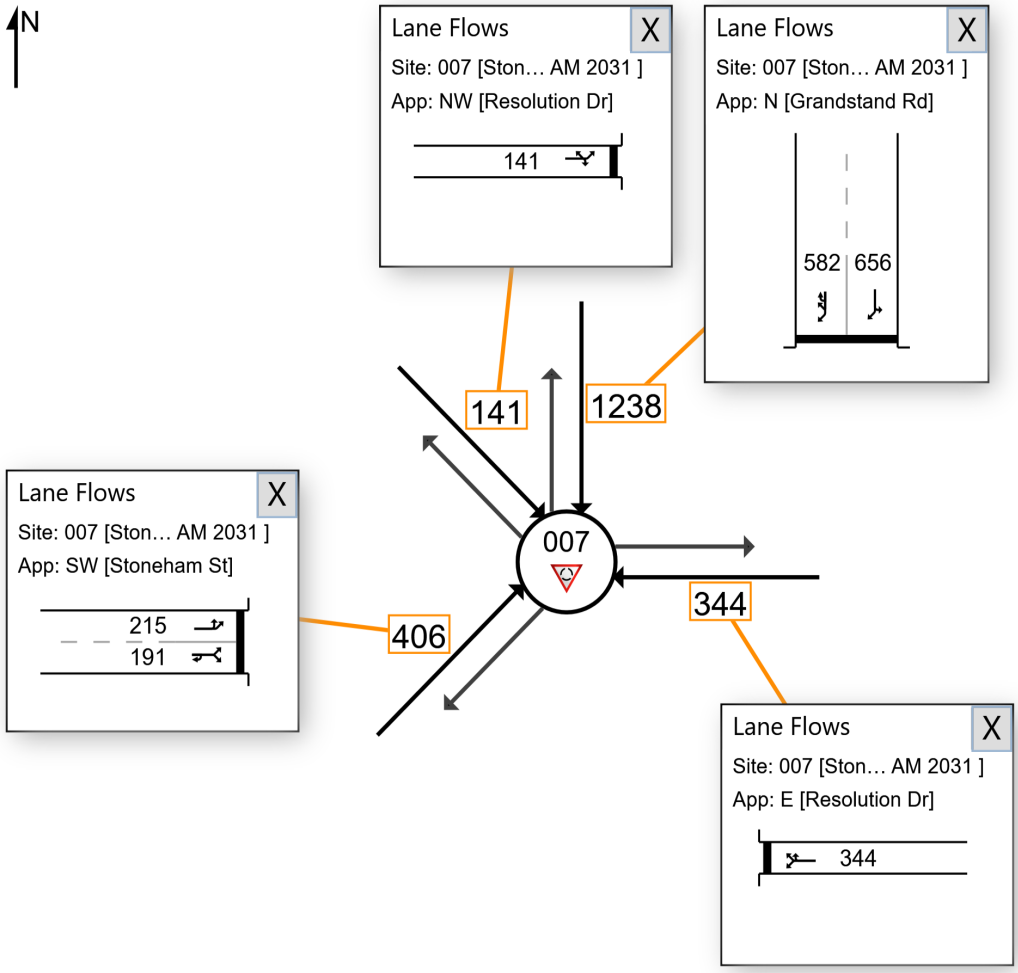

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Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand AM 2031 (Site Folder: 2031 AM Peak Proposed Network and Land Uses)]

Network: N101 [2031 AM Peak Proposed Network and Land Use (Network Folder: General)]

Resolution Dr / Grandstand Rd
Give Way
2031 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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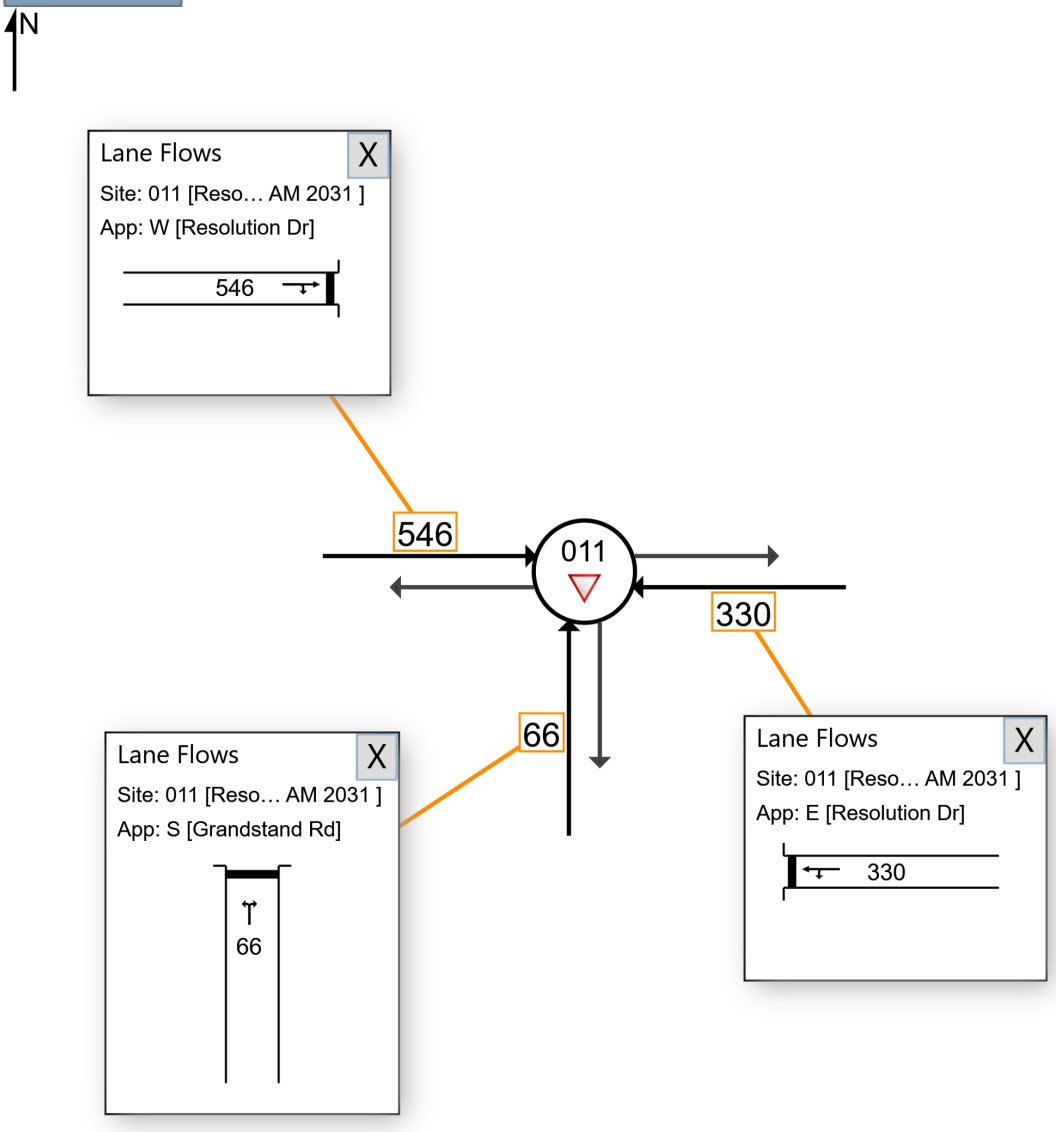

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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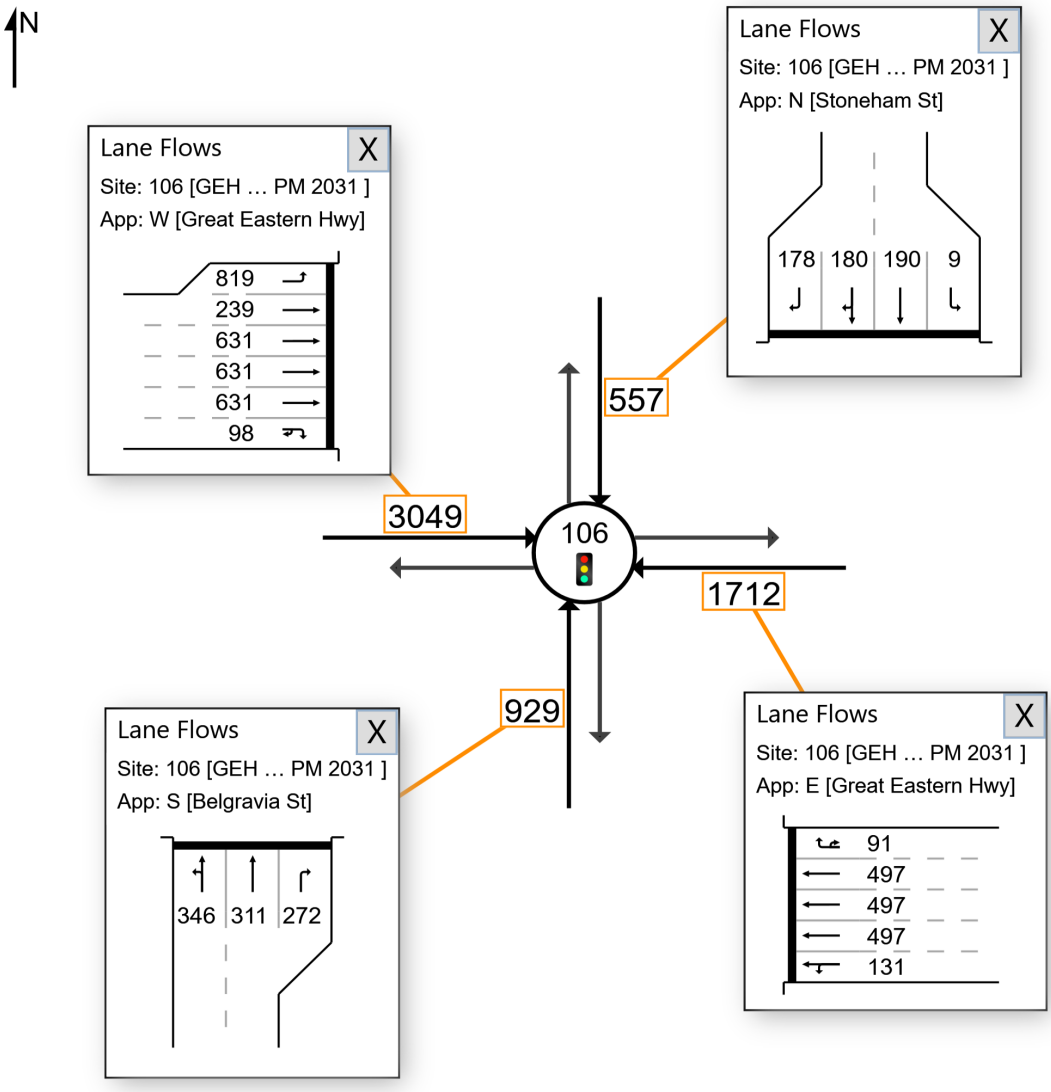

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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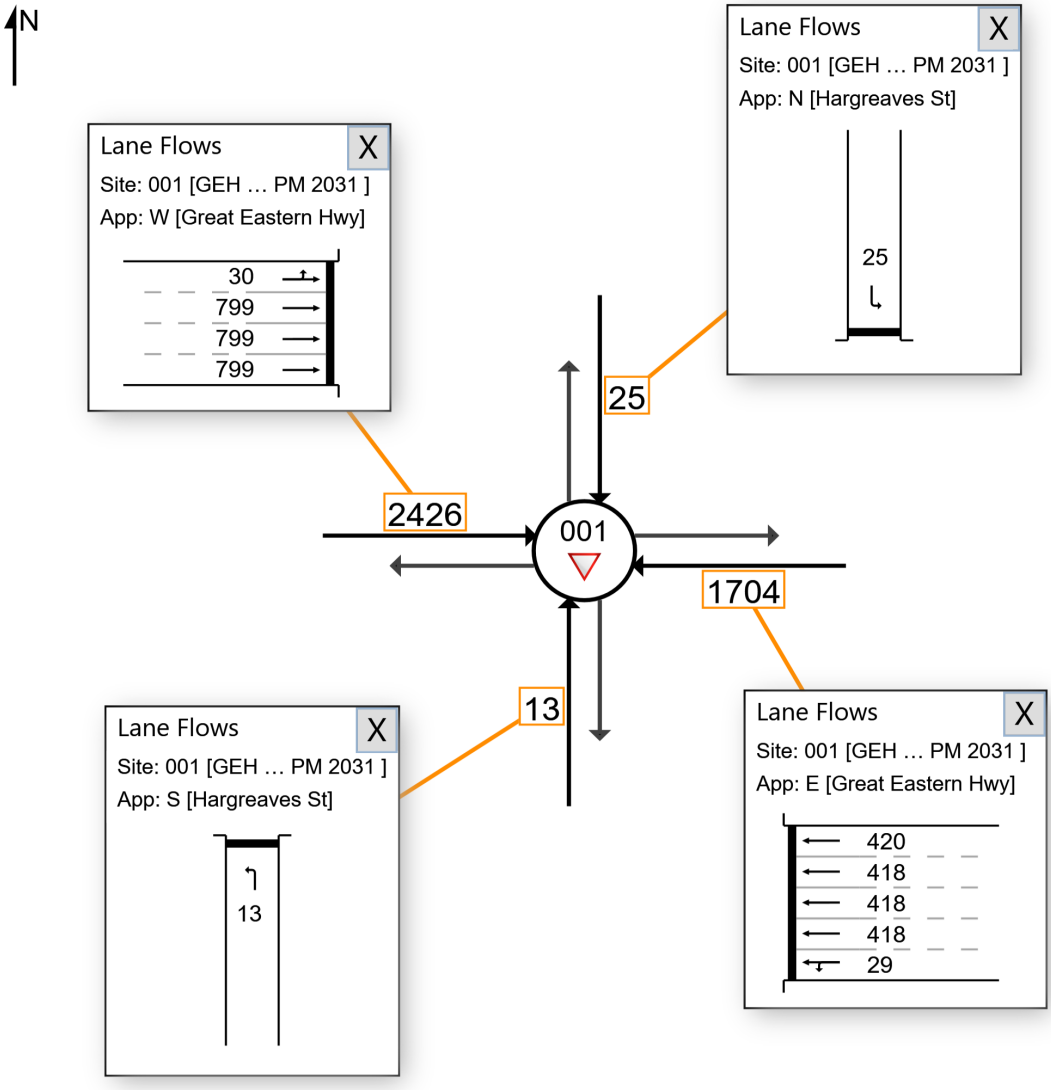

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Document Set ID: 6149413
Version: 1, Version Date: 11/06/2026

APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

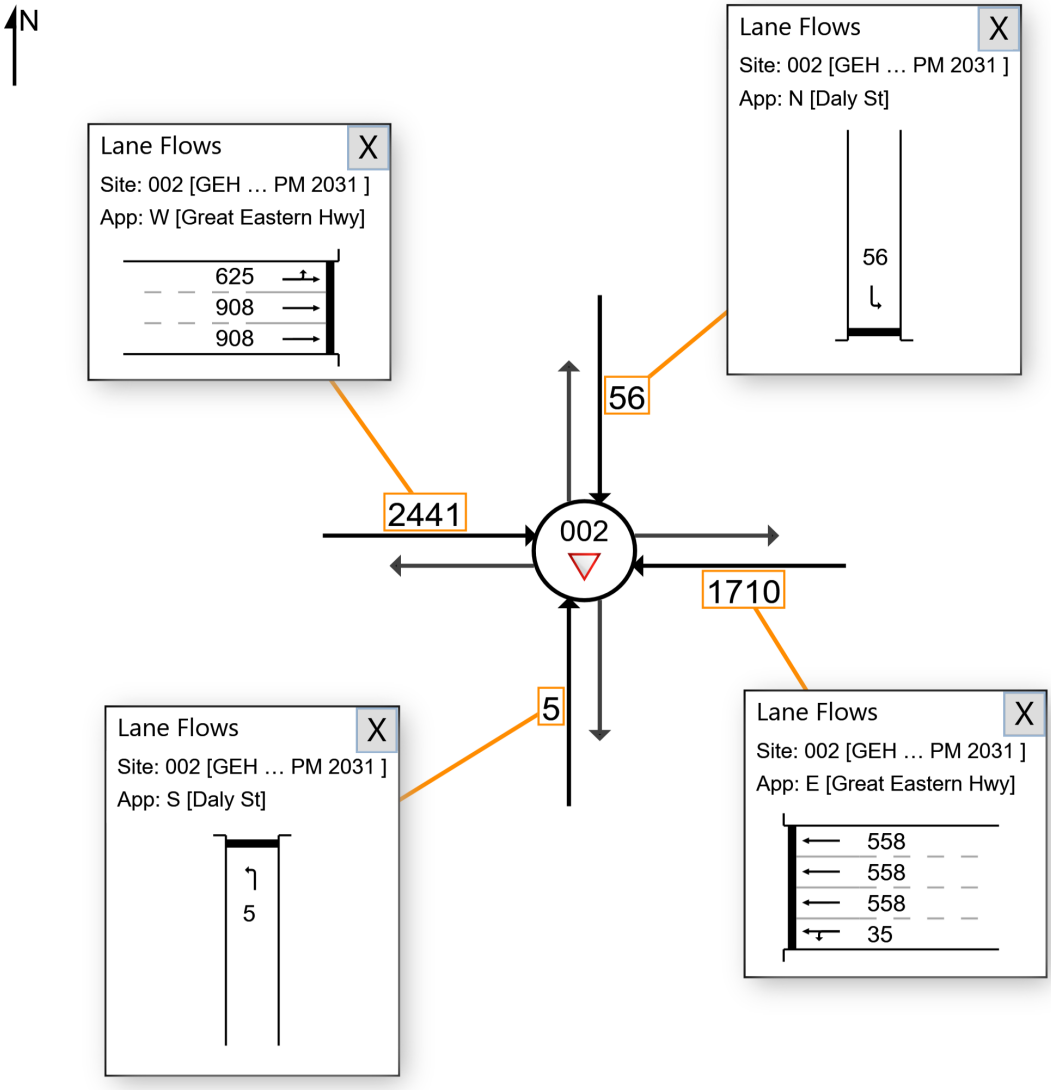
Site: 002 [GEH Daly PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



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Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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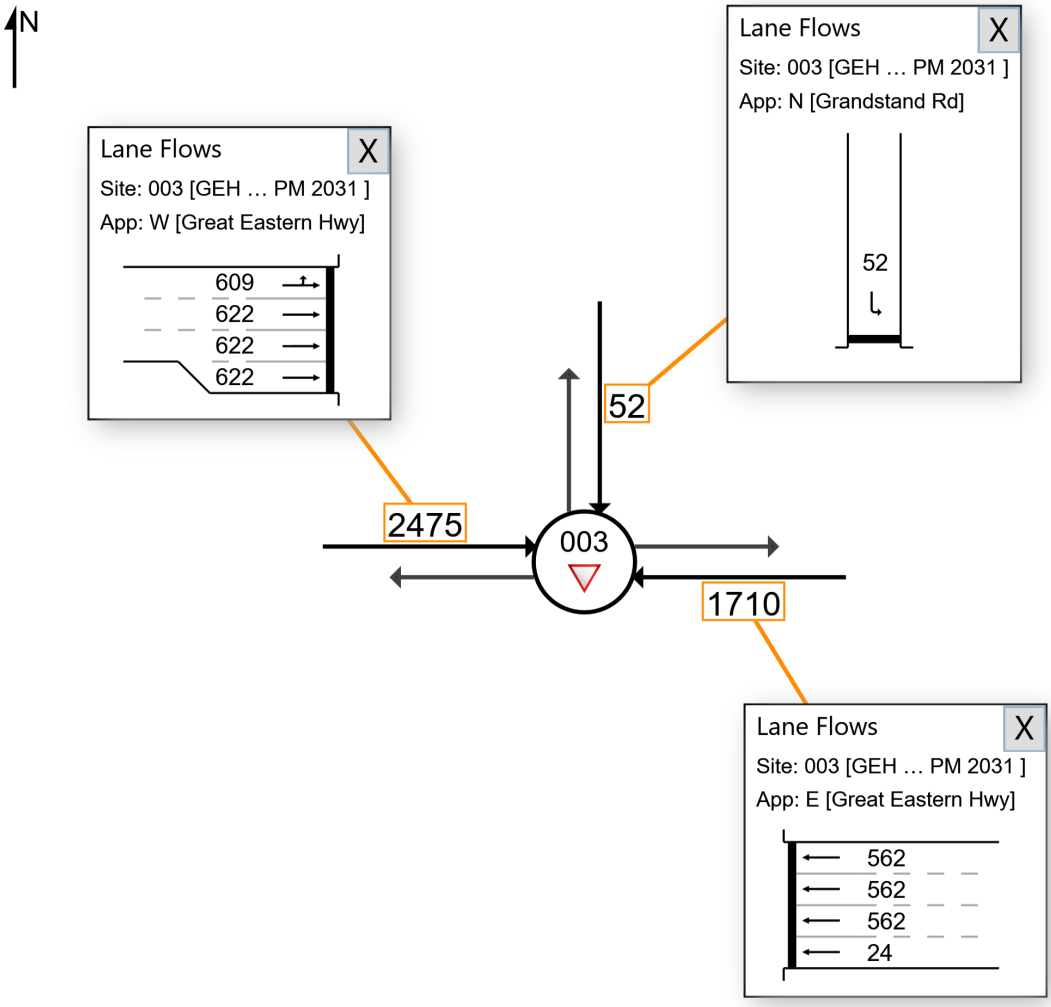

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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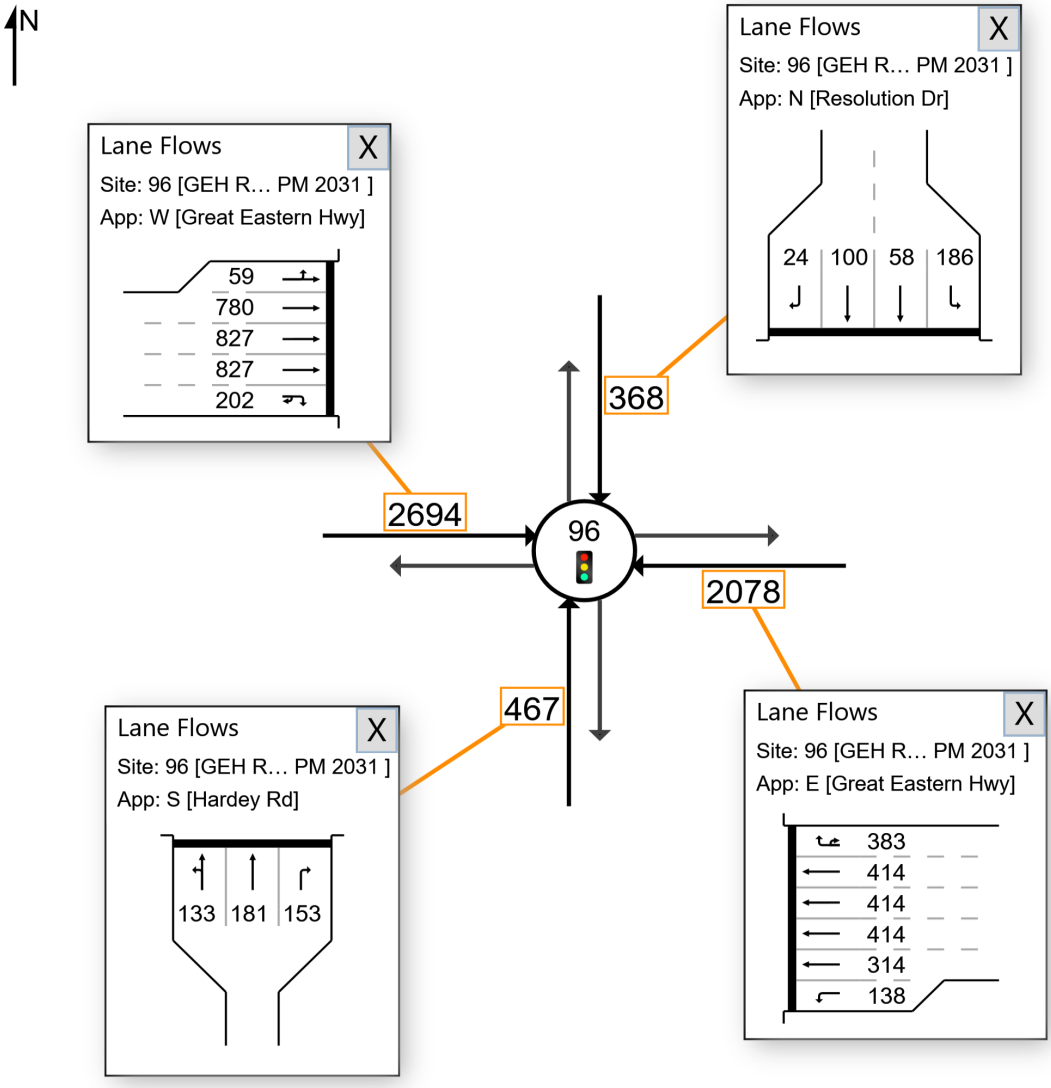

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Document Set ID: 6149413
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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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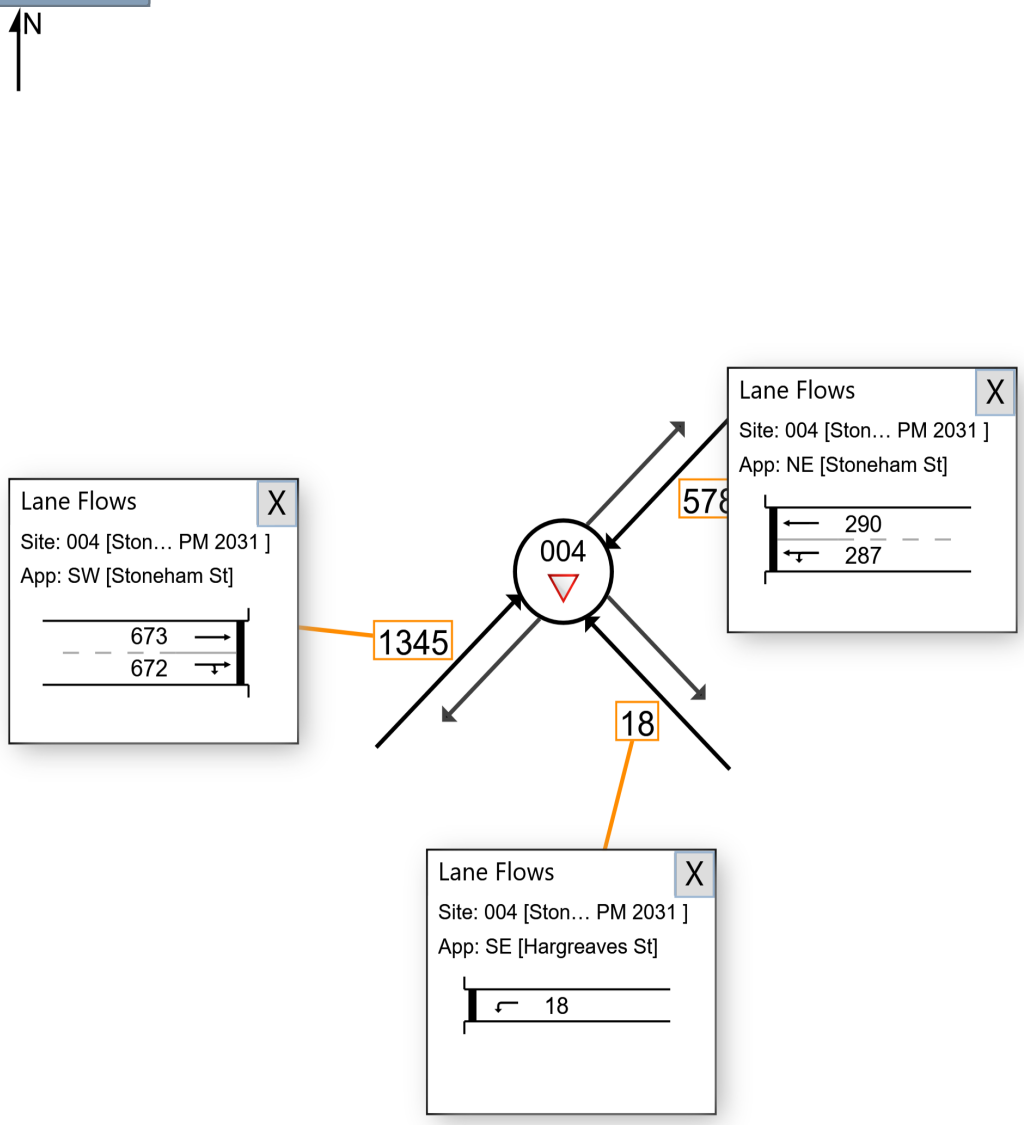

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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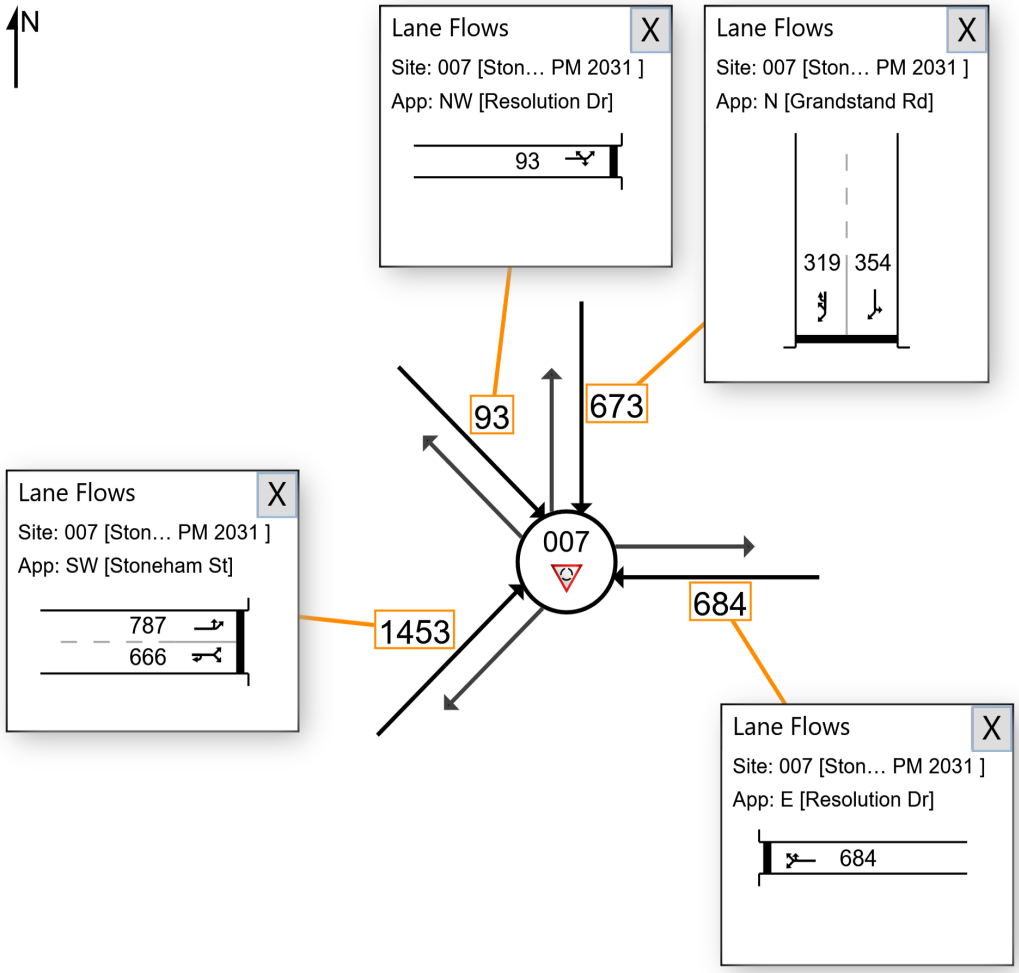
Close All Popups



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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand PM 2031 (Site Folder: 2031 PM Peak Proposed Network and Land Uses)]

Network: N101 [2031 PM Peak Proposed Network and Land Use (Network Folder: General)]

Resolution Dr / Grandstand Rd
Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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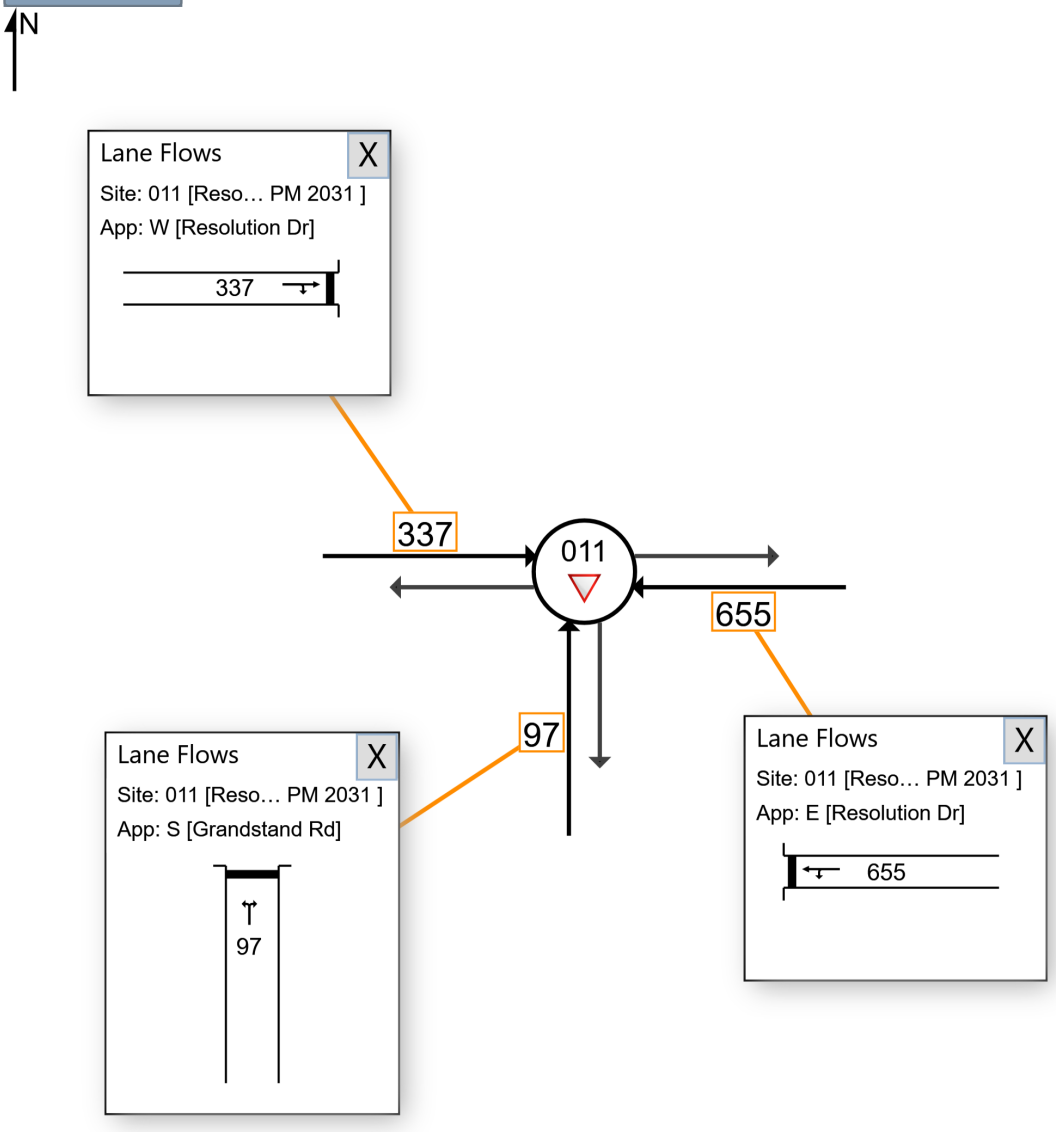

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 135 seconds (Site User-Given Phase Times)

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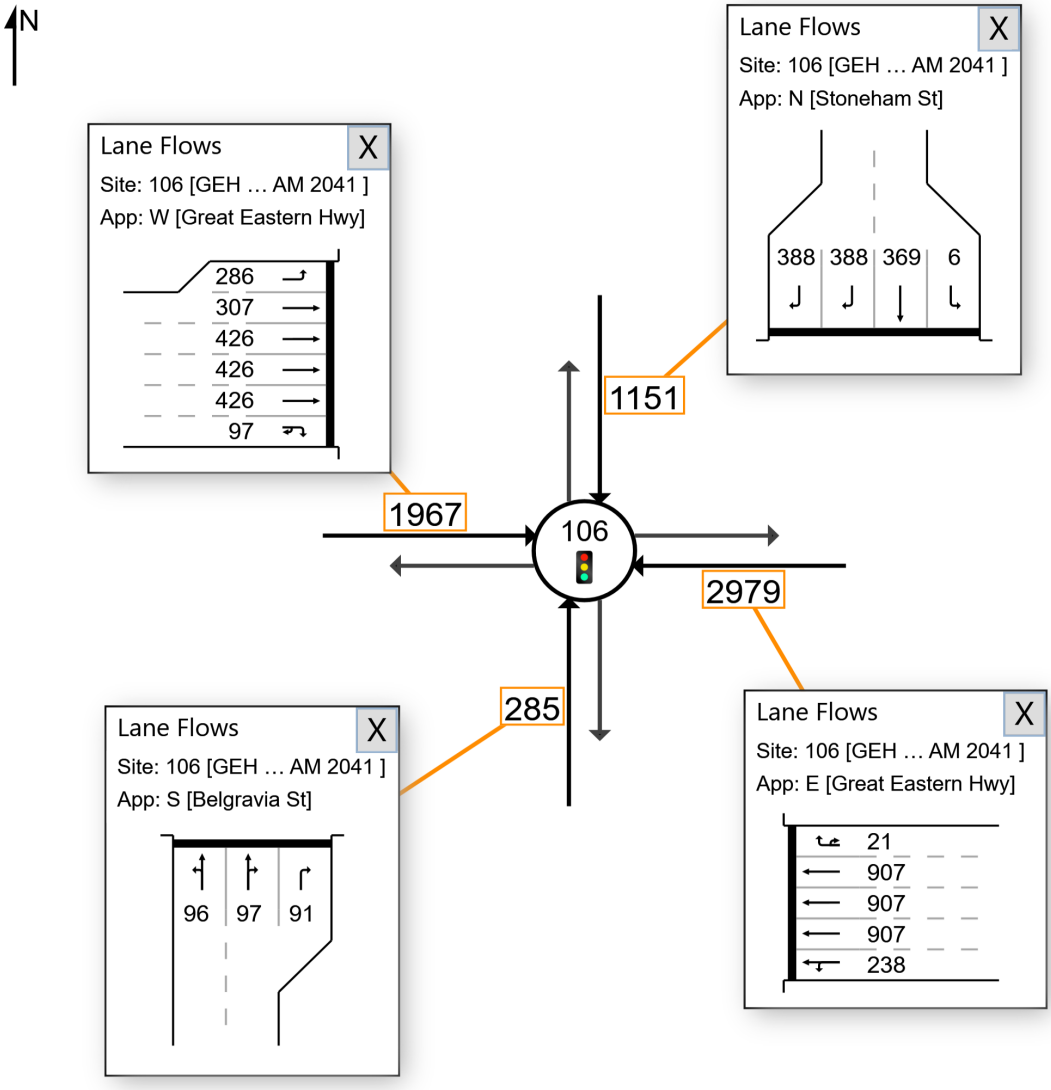

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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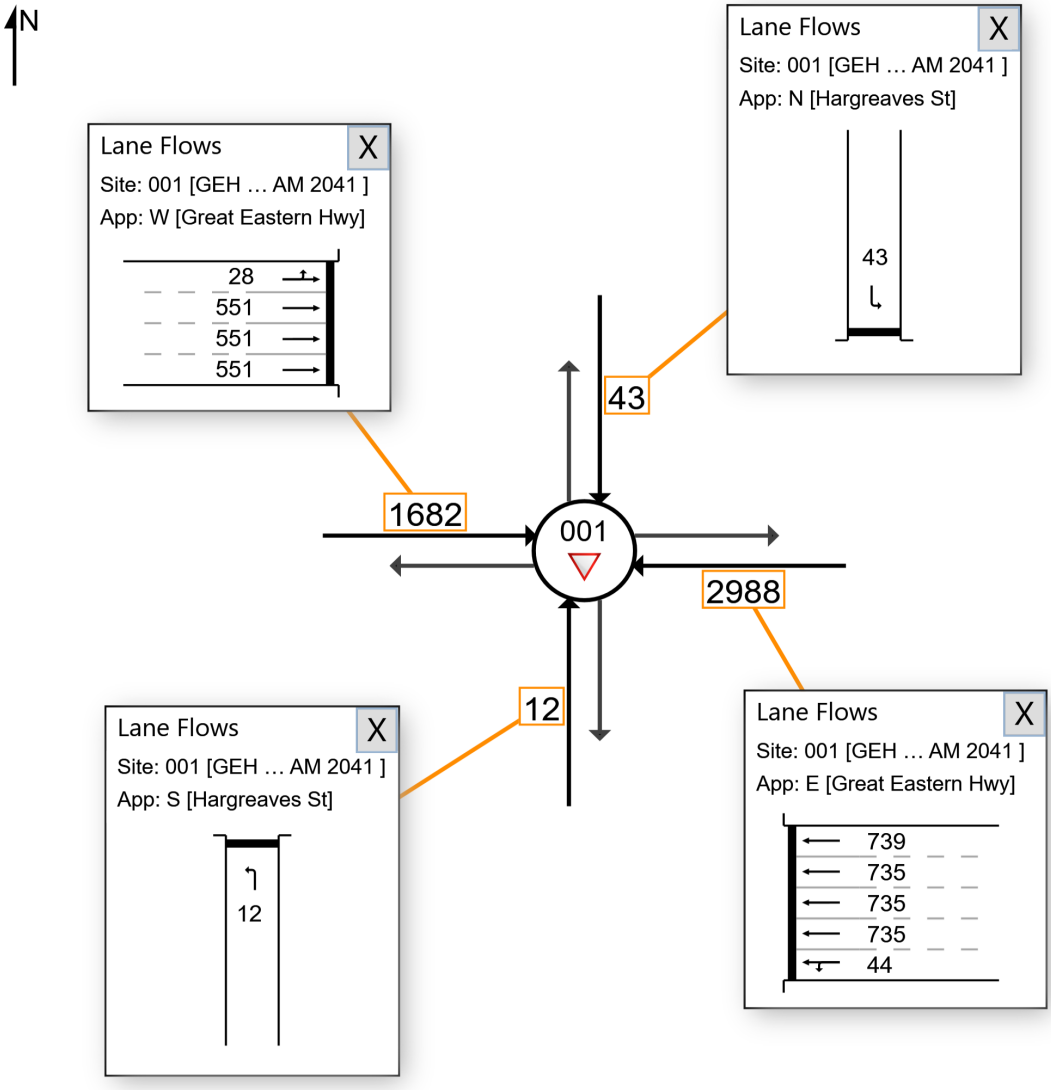

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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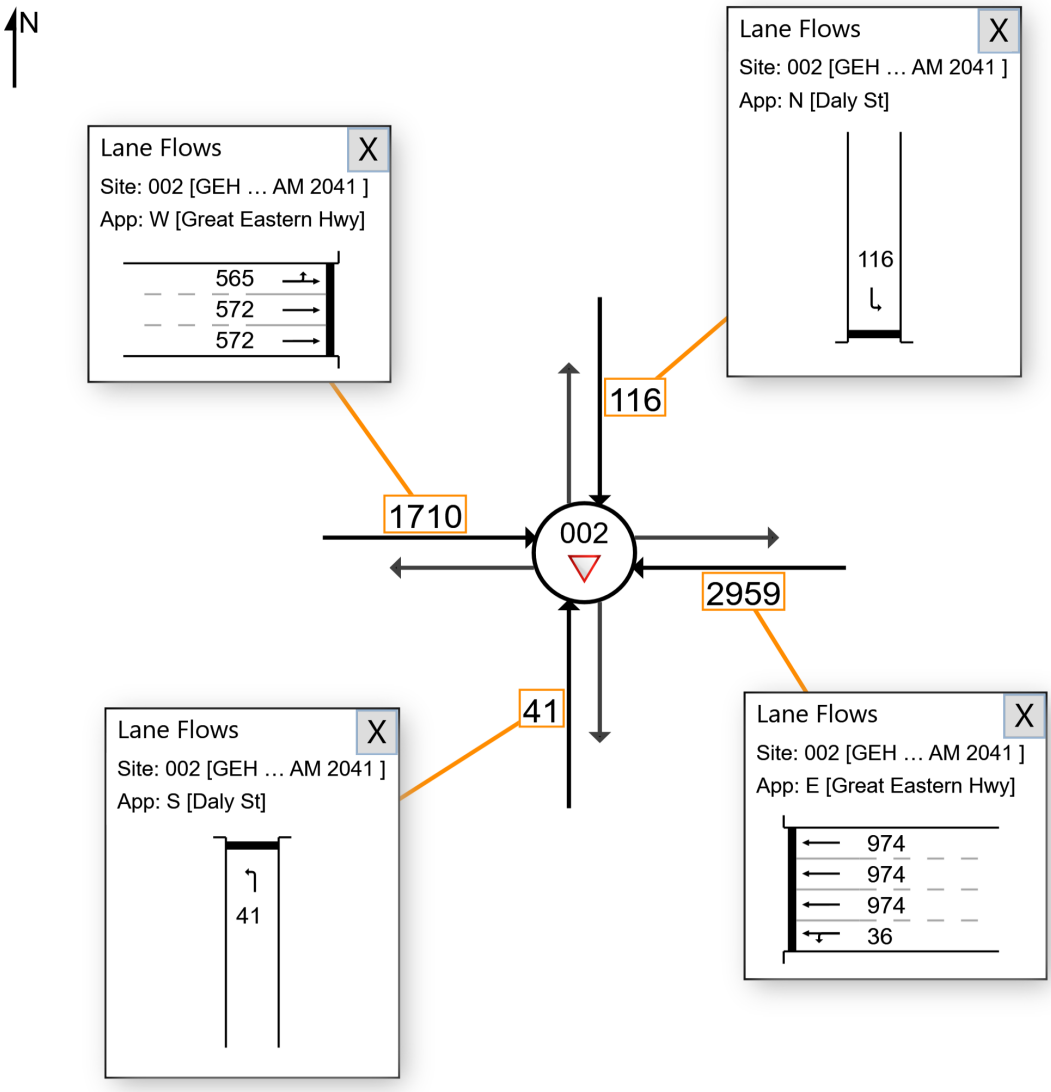

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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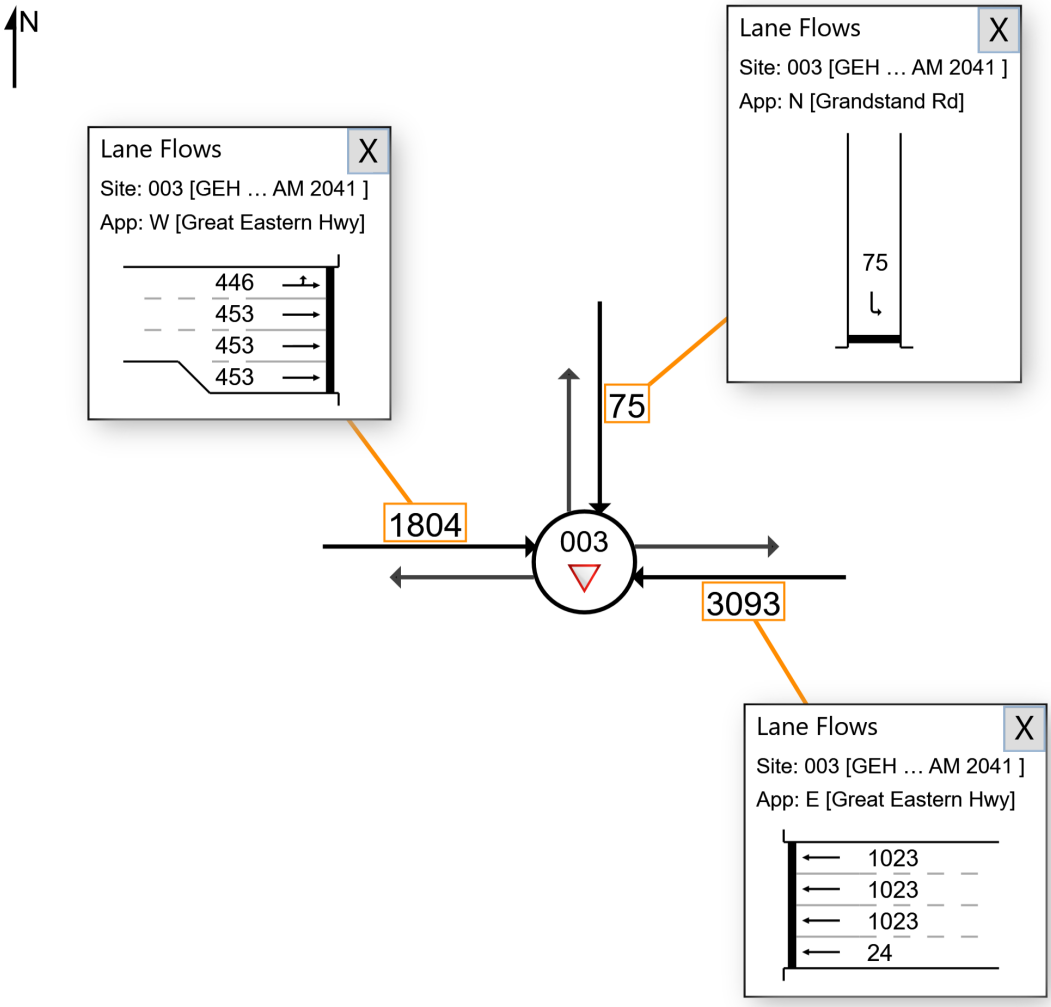

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 134 seconds (Site User-Given Phase Times)

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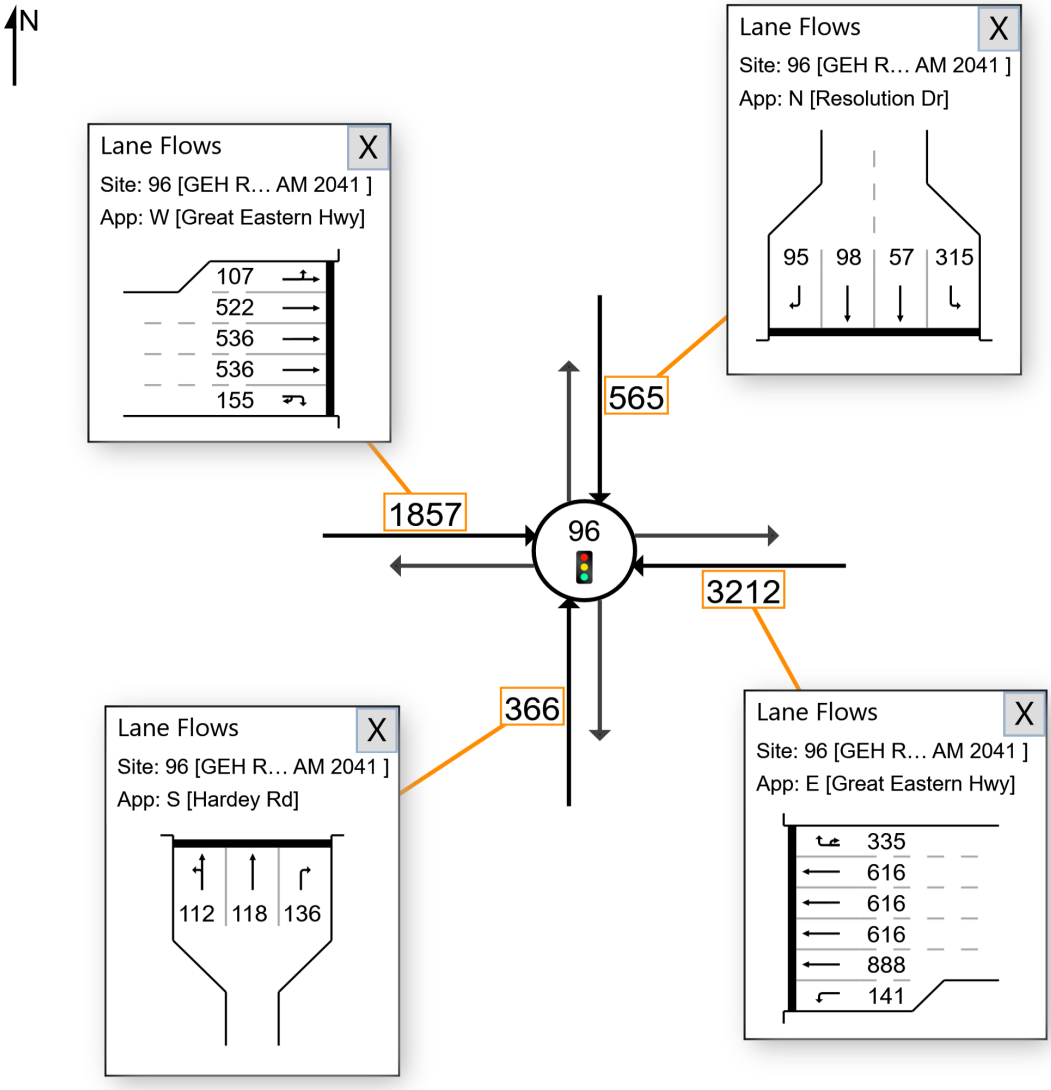

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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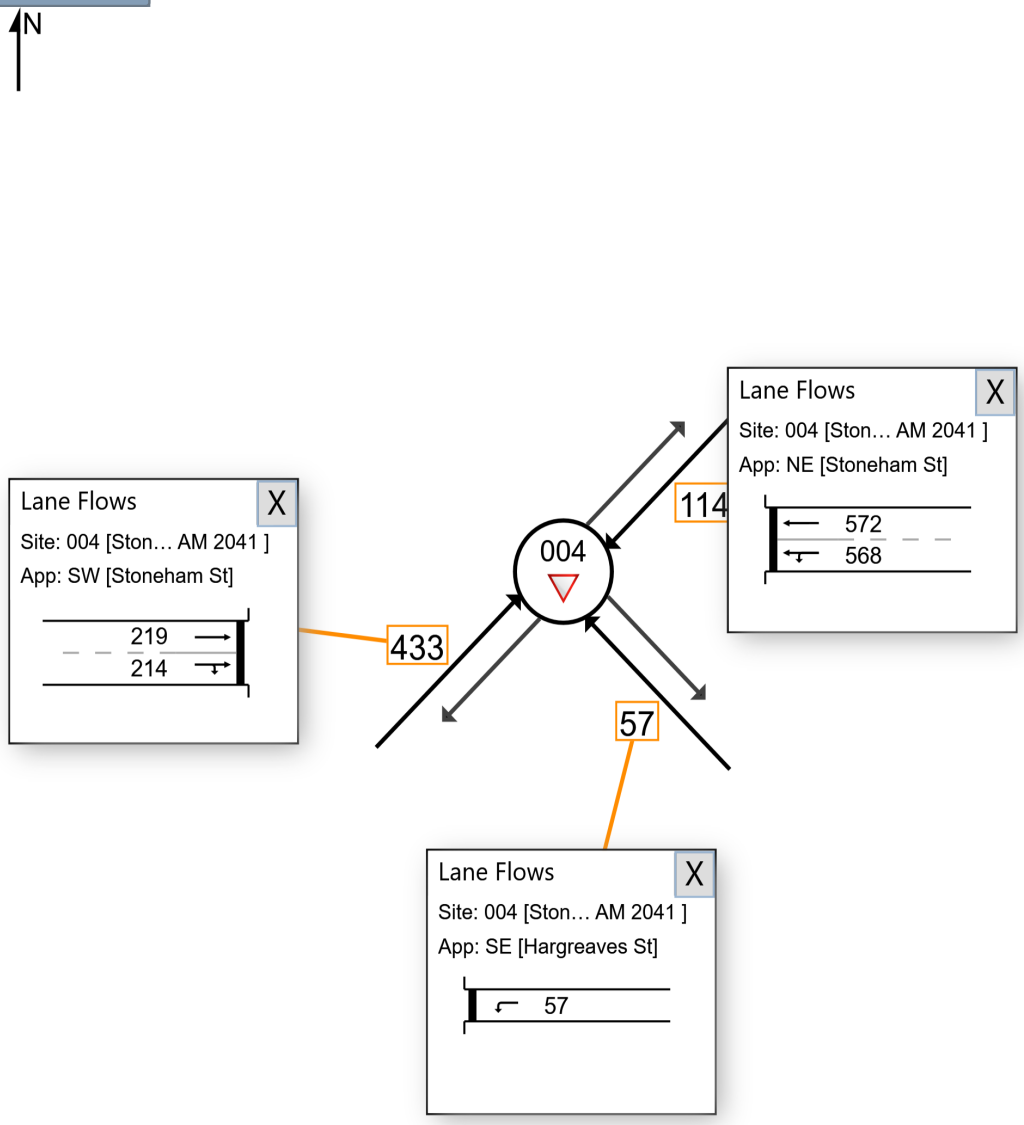

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

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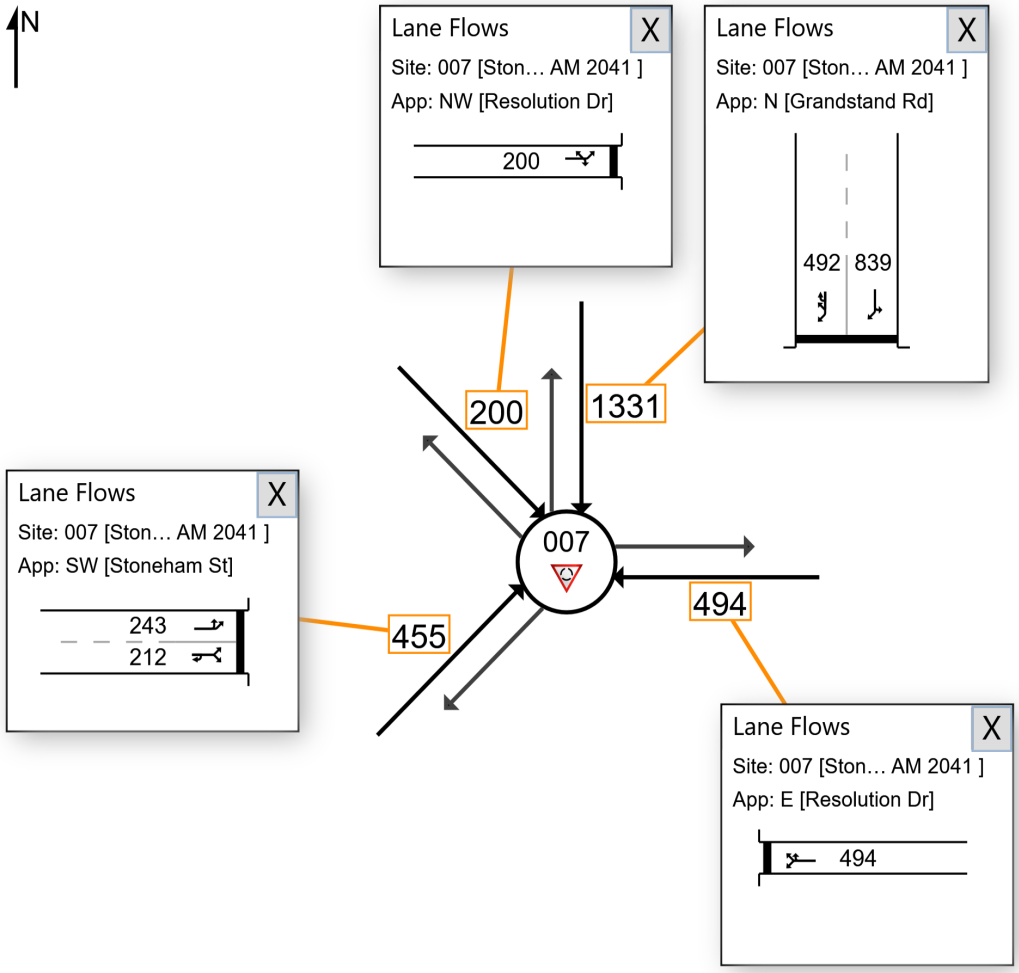

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand AM 2041 (Site Folder: 2041 AM Peak Proposed Network and Land Uses)]

Network: N101 [2041 AM Peak Proposed Network and Land Use (Network Folder: General)]

Resolution Dr / Grandstand Rd
Give Way
2041 AM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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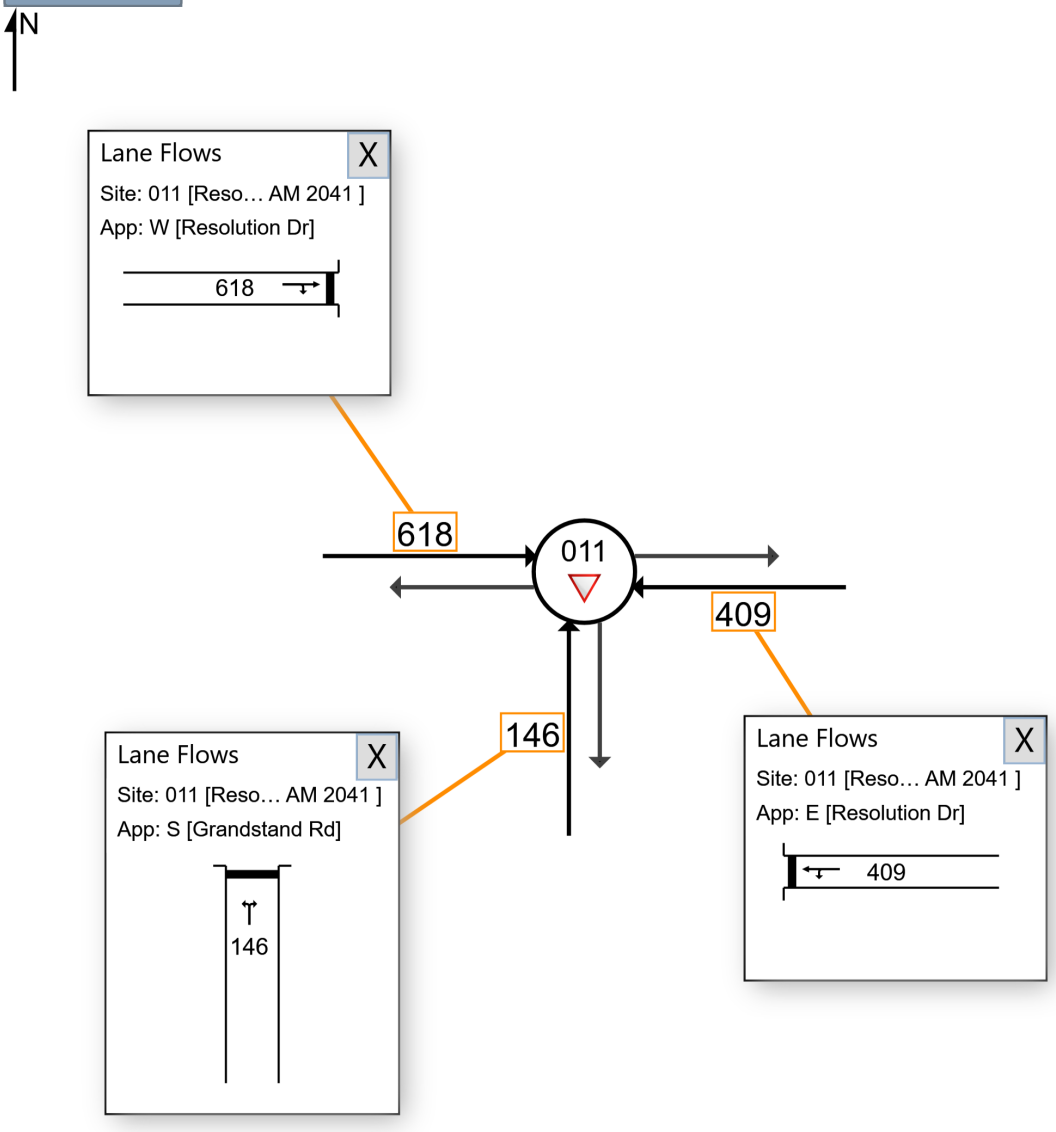

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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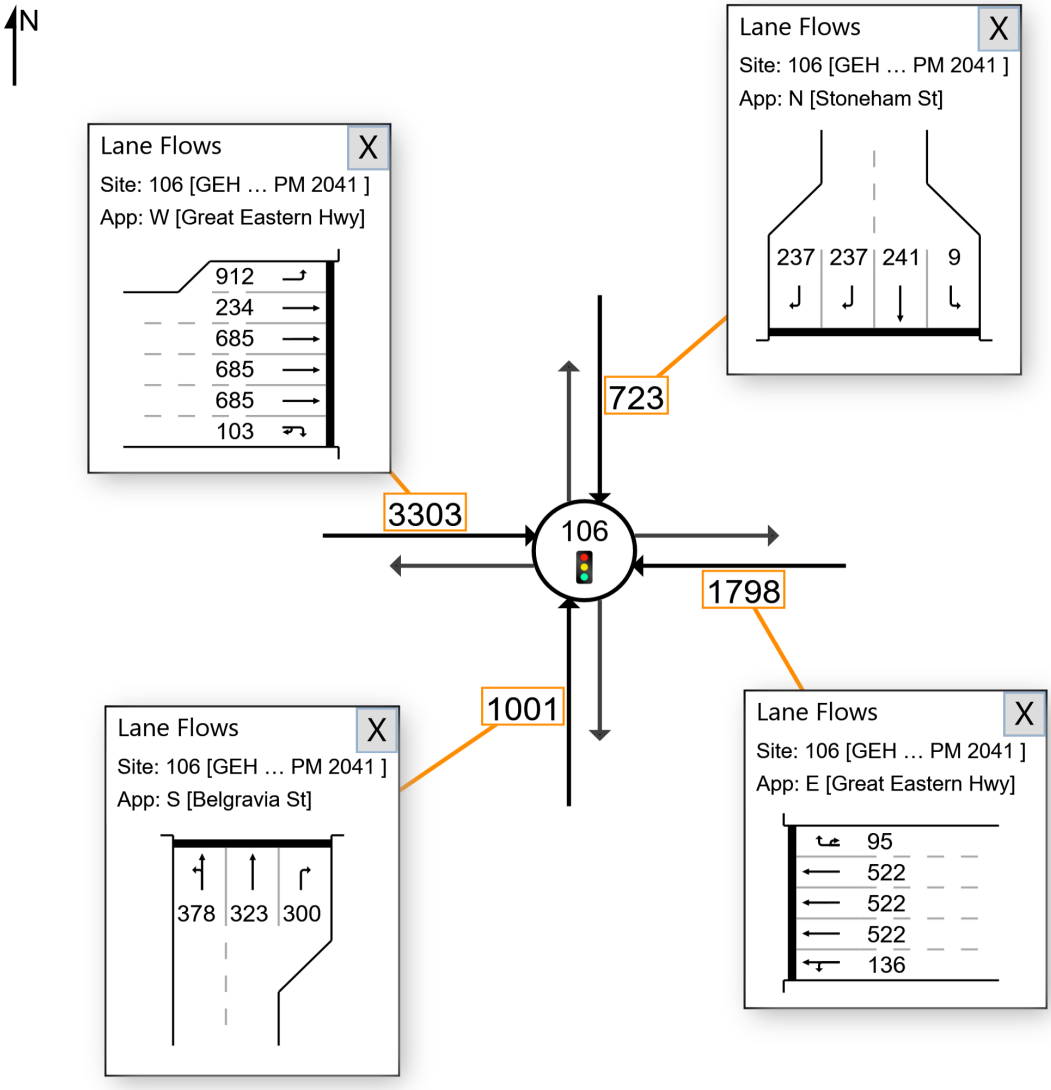

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Document Set ID: 6149413
Version: 1, Version Date: 11/06/2026

APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

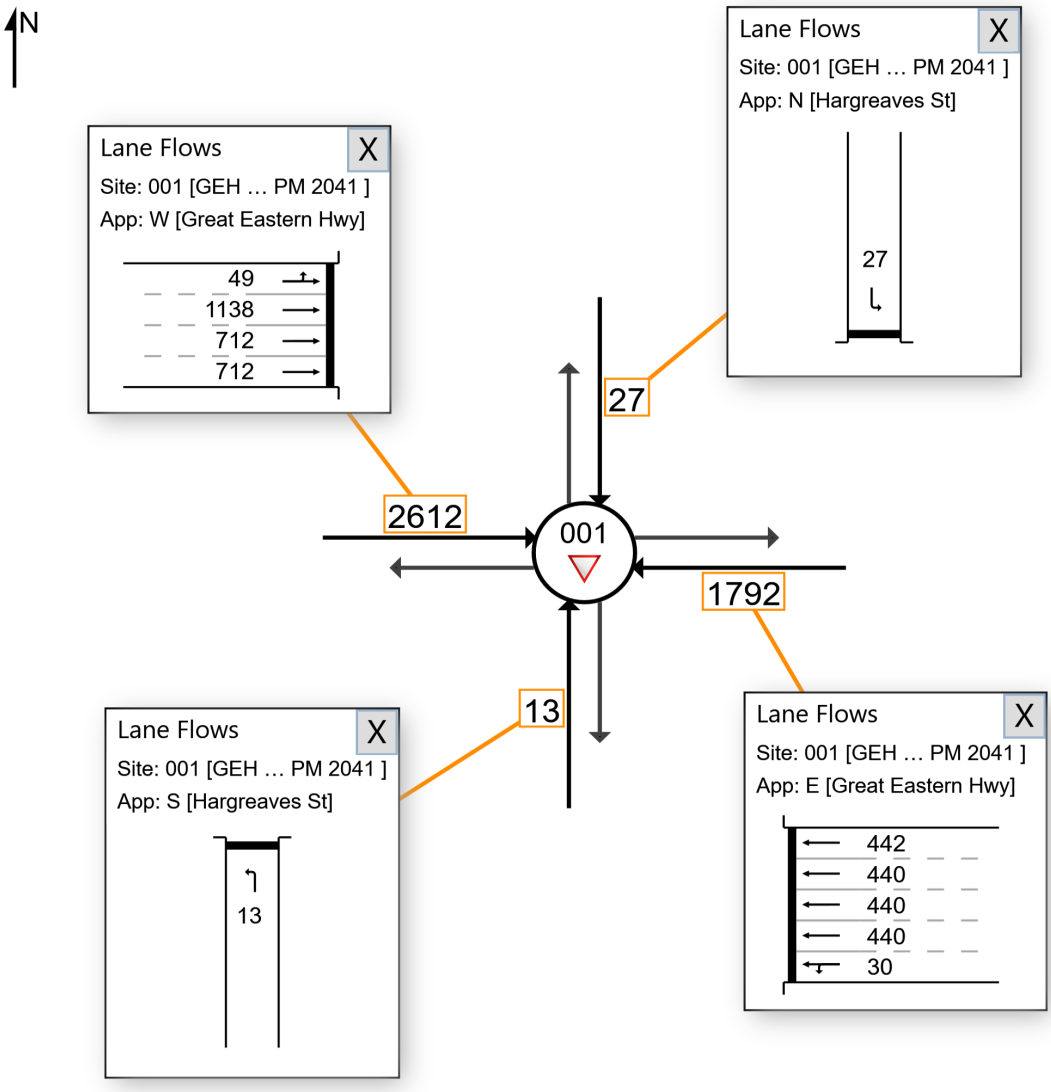
Site: 001 [GEH Hargreaves PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



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Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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Document Set ID: 6149413
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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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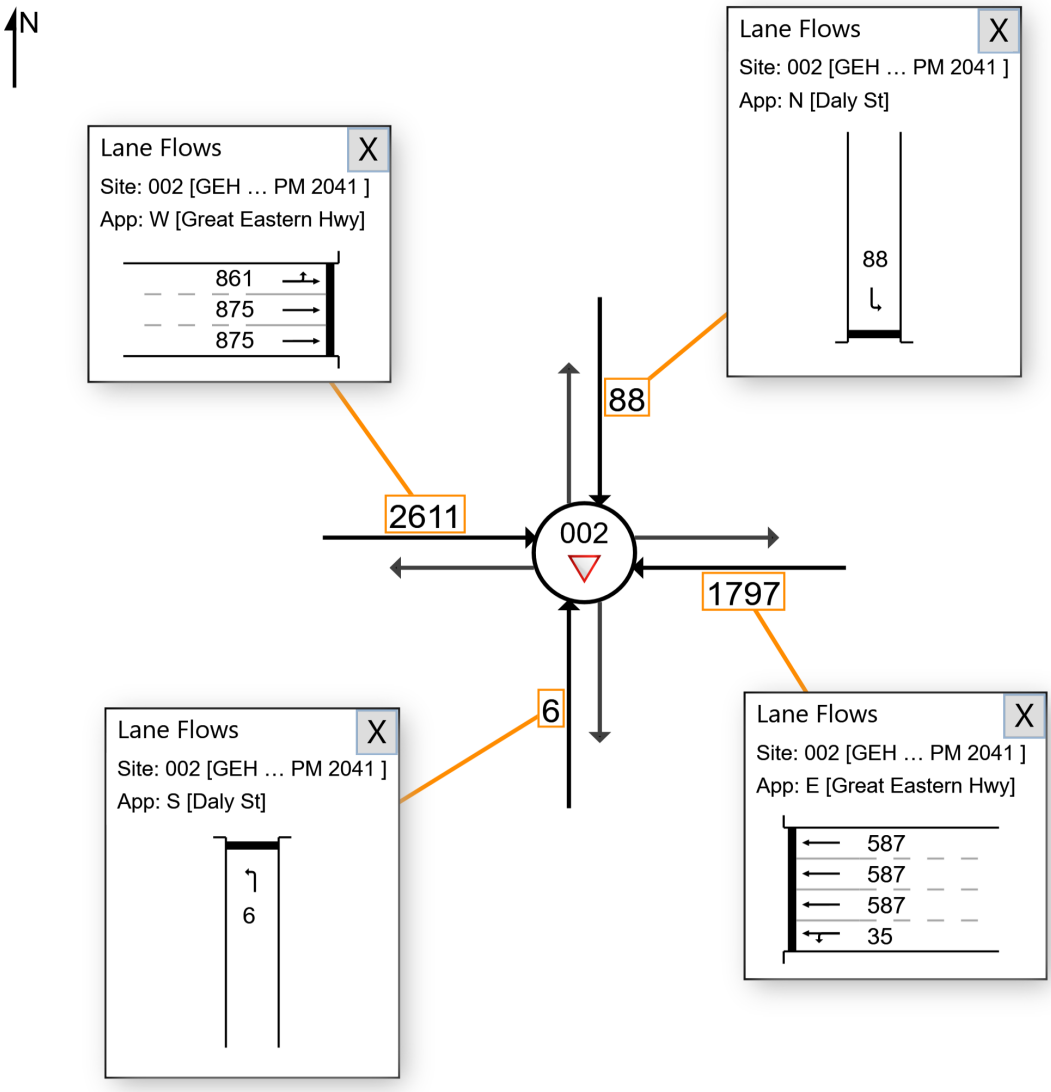

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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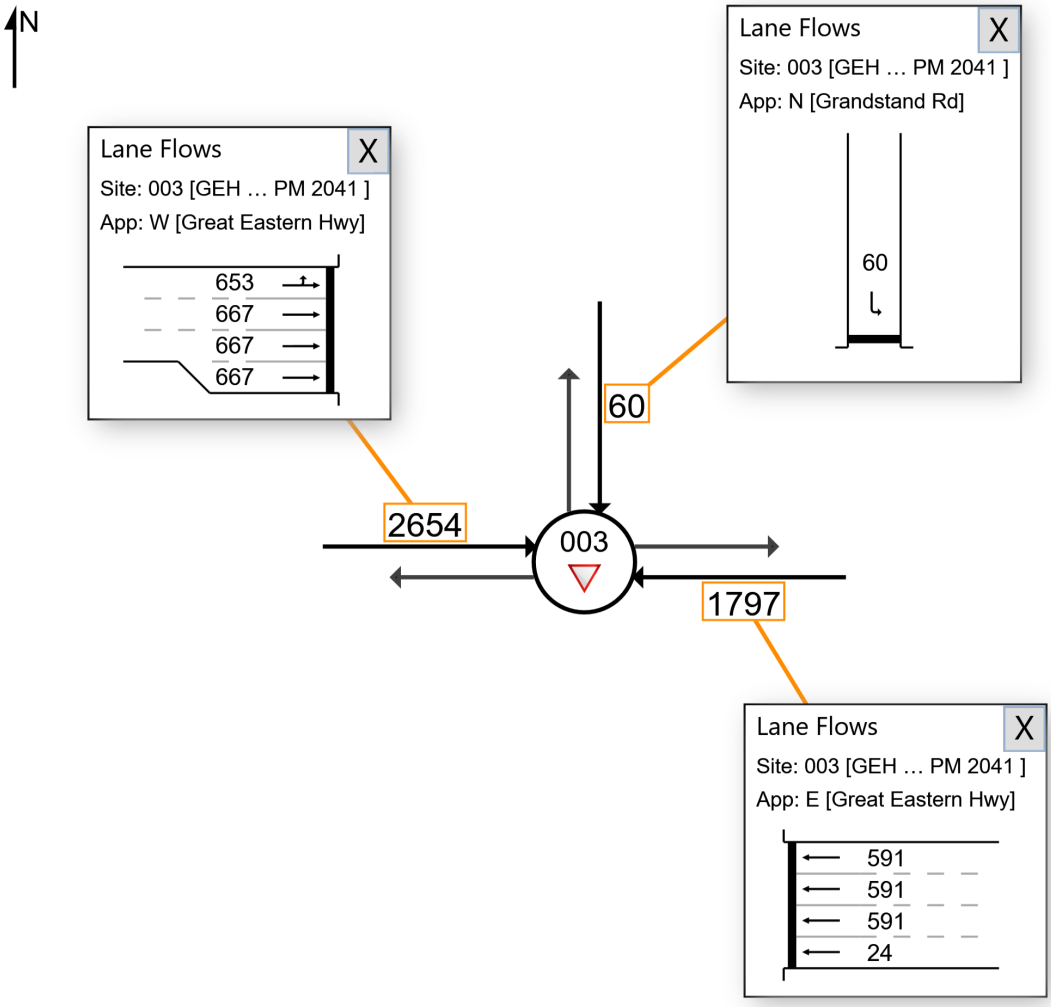

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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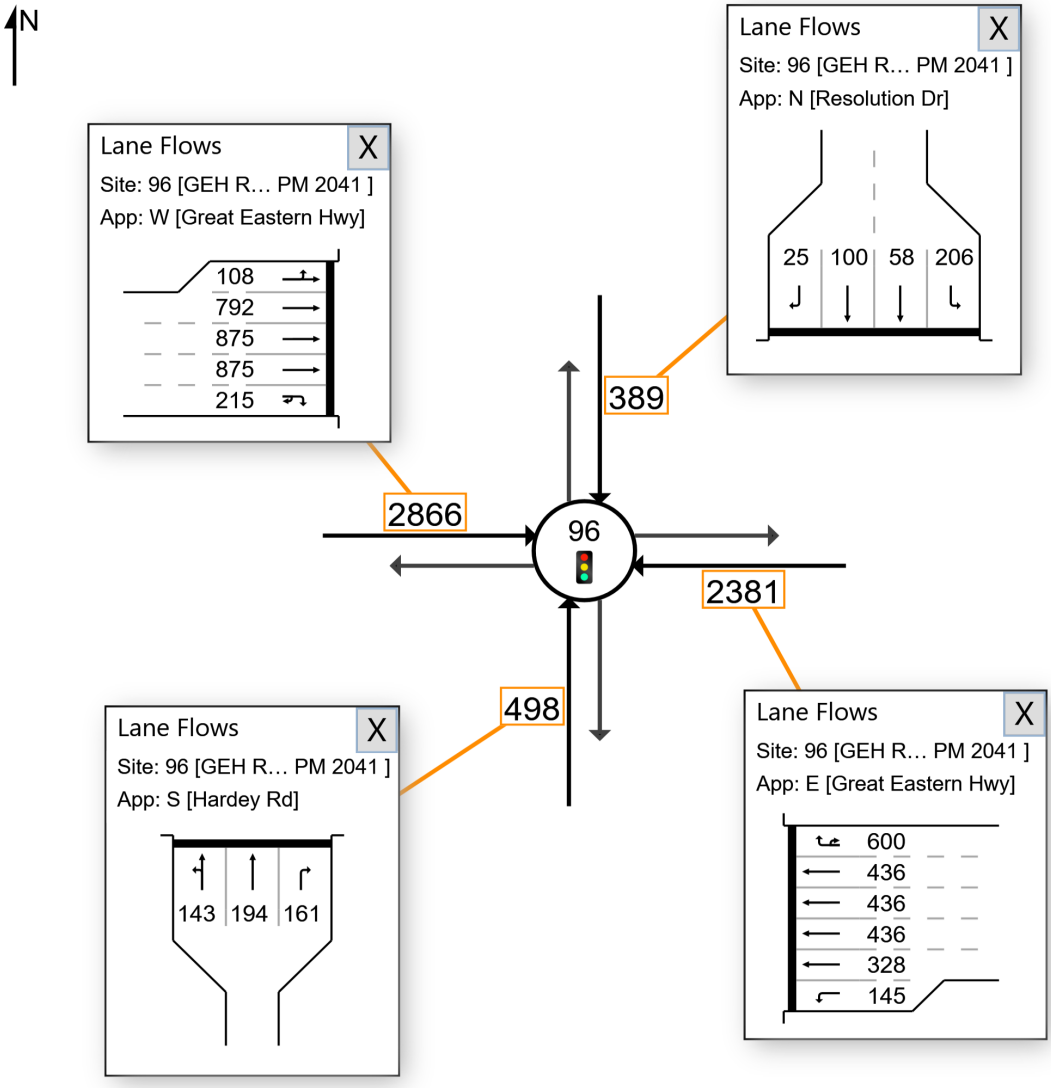

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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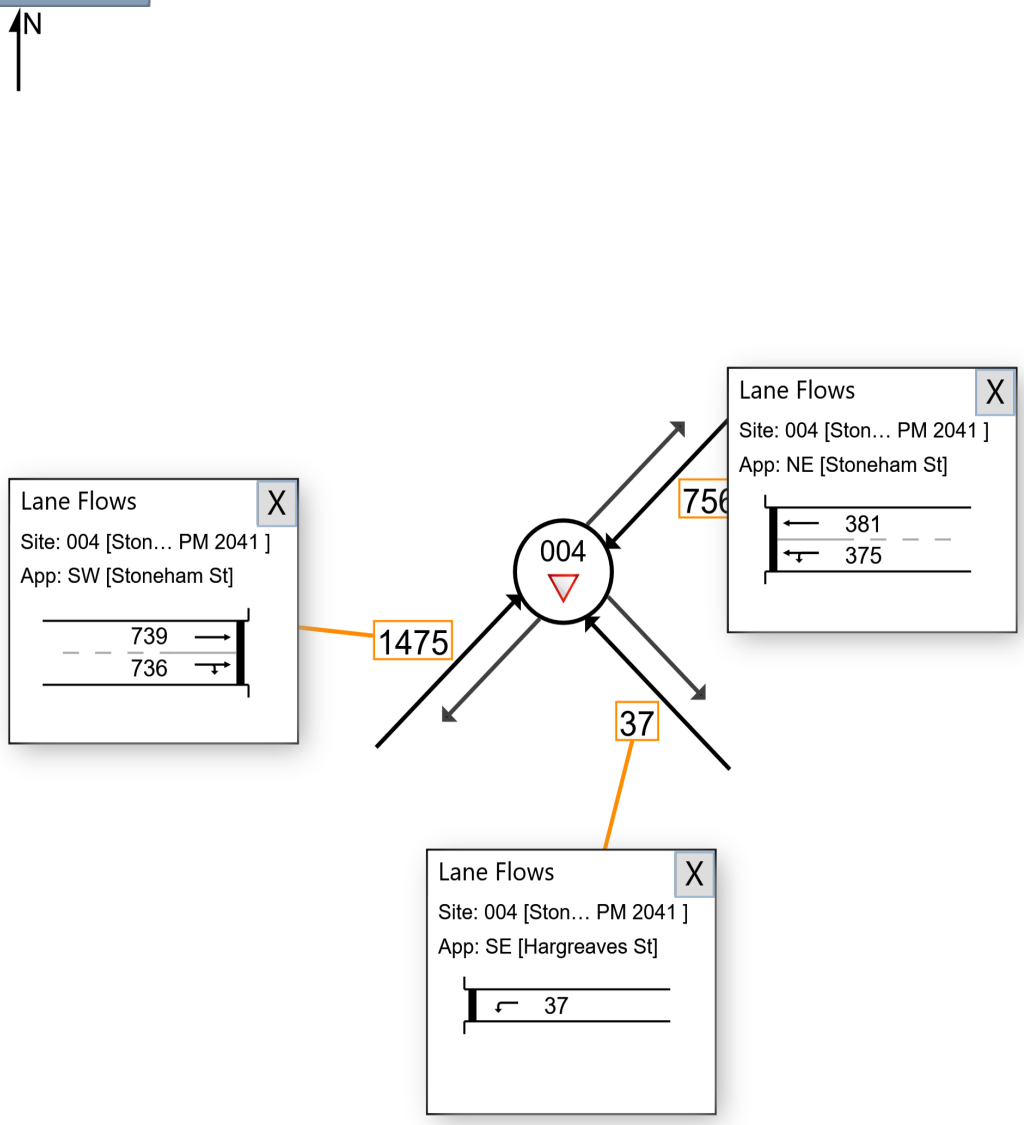

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

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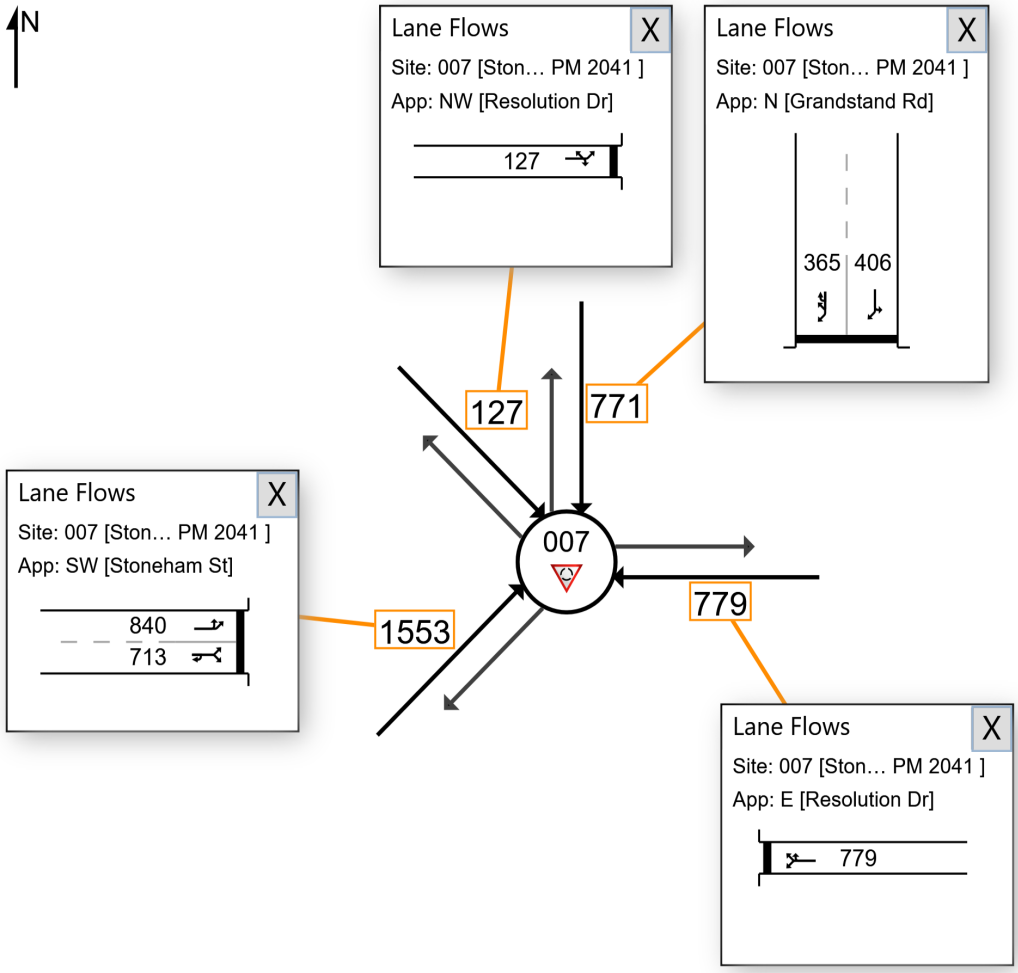

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand PM 2041 (Site Folder: 2041 PM Peak Proposed Network and Land Uses)]

Network: N101 [2041 PM Peak Proposed Network and Land Use (Network Folder: General)]

Resolution Dr / Grandstand Rd
Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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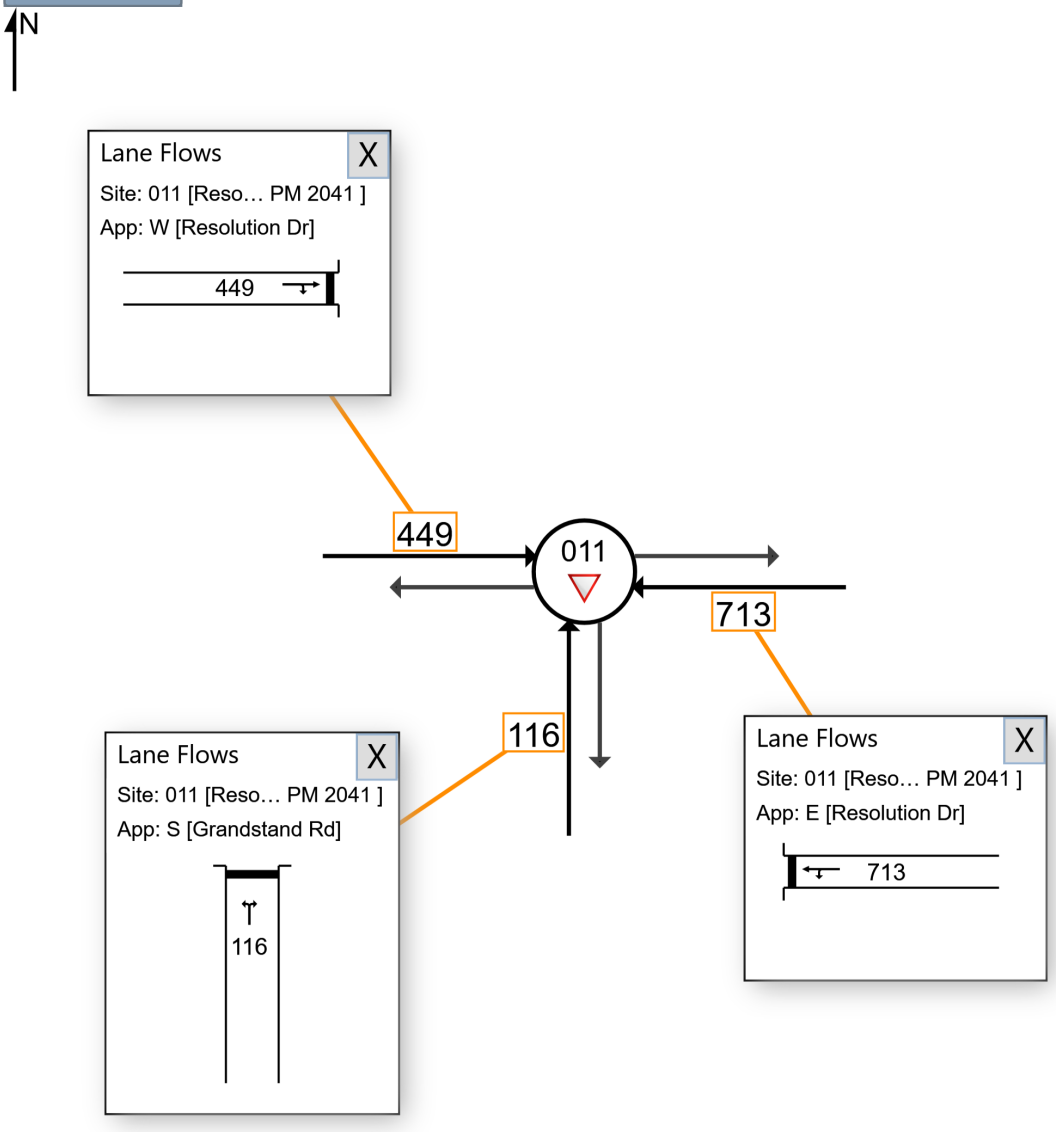

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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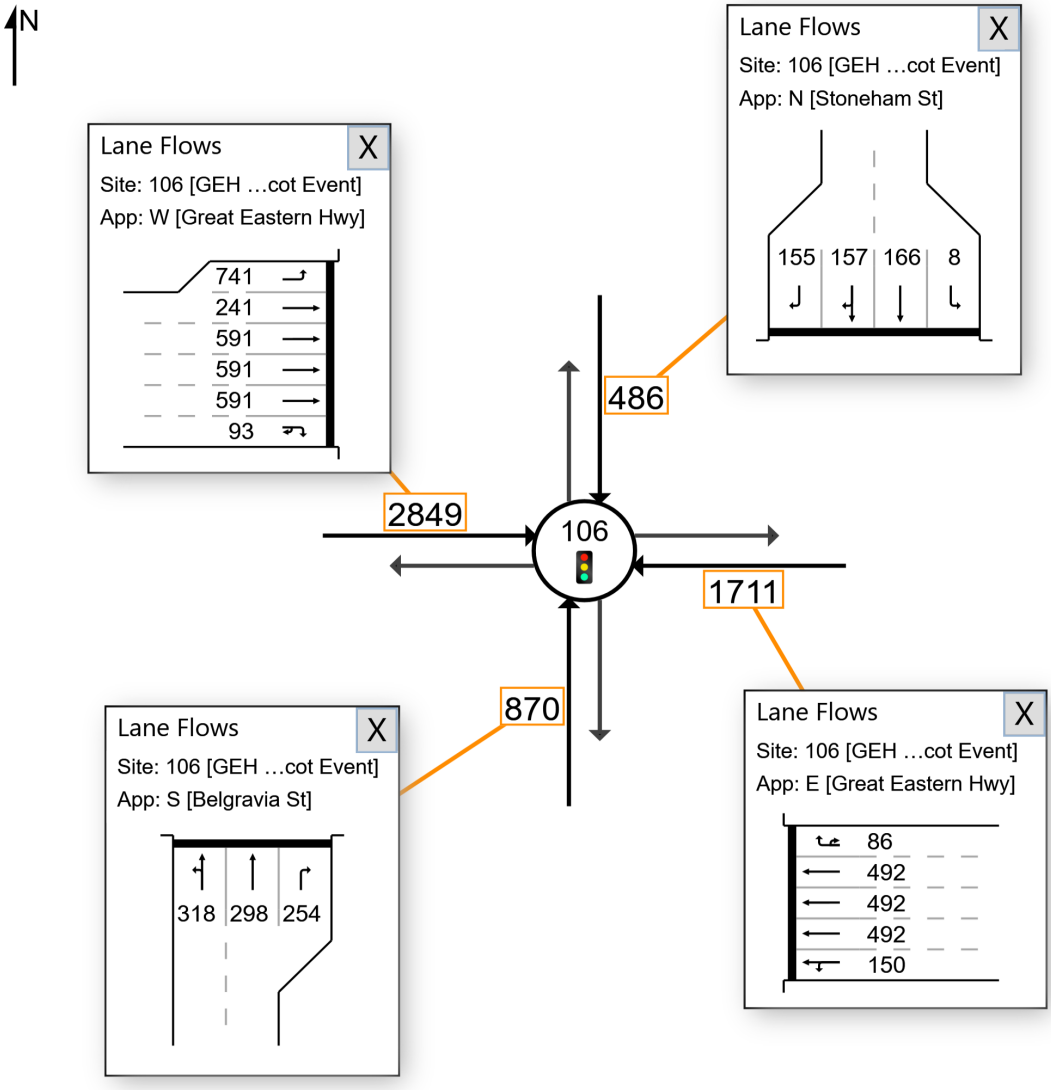

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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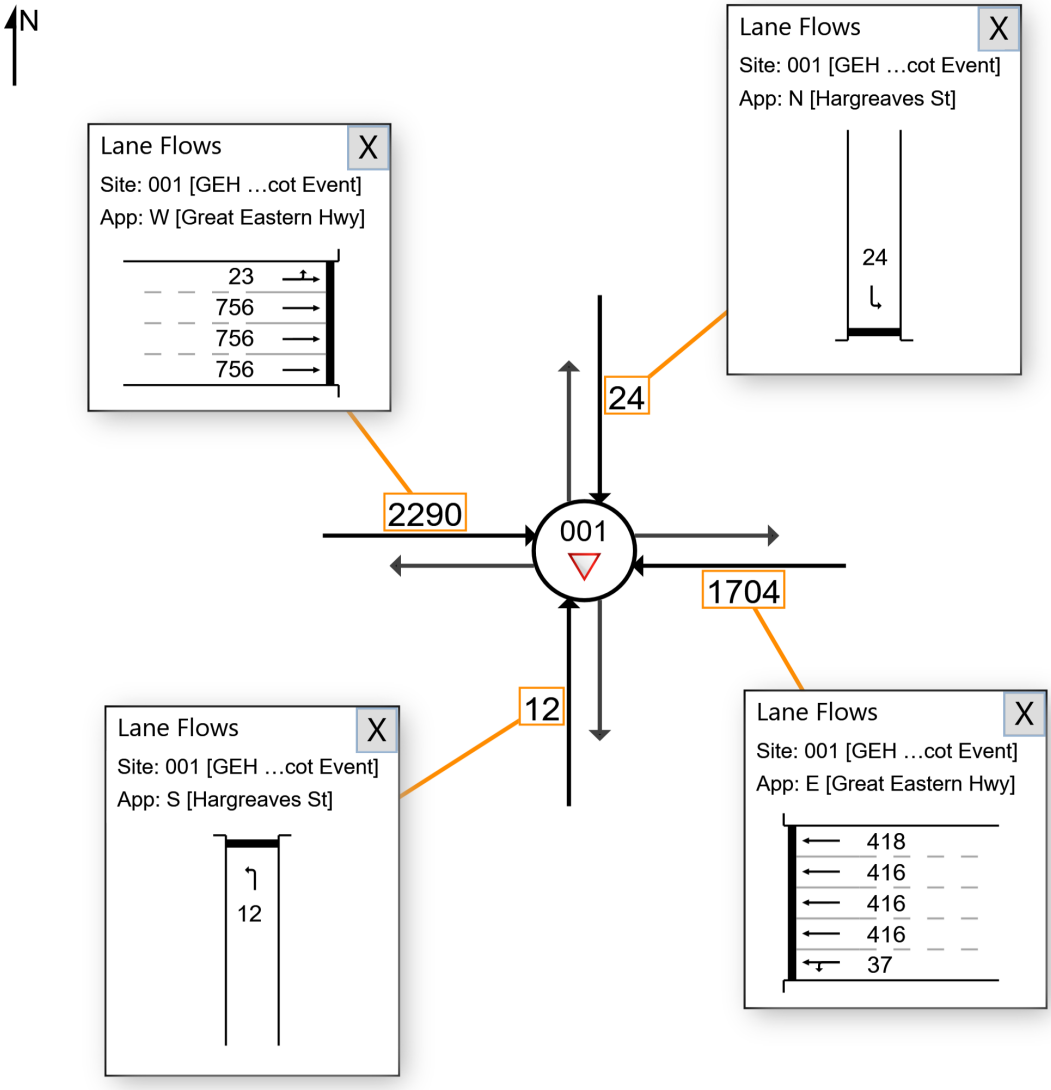

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Give-Way (Two-Way)

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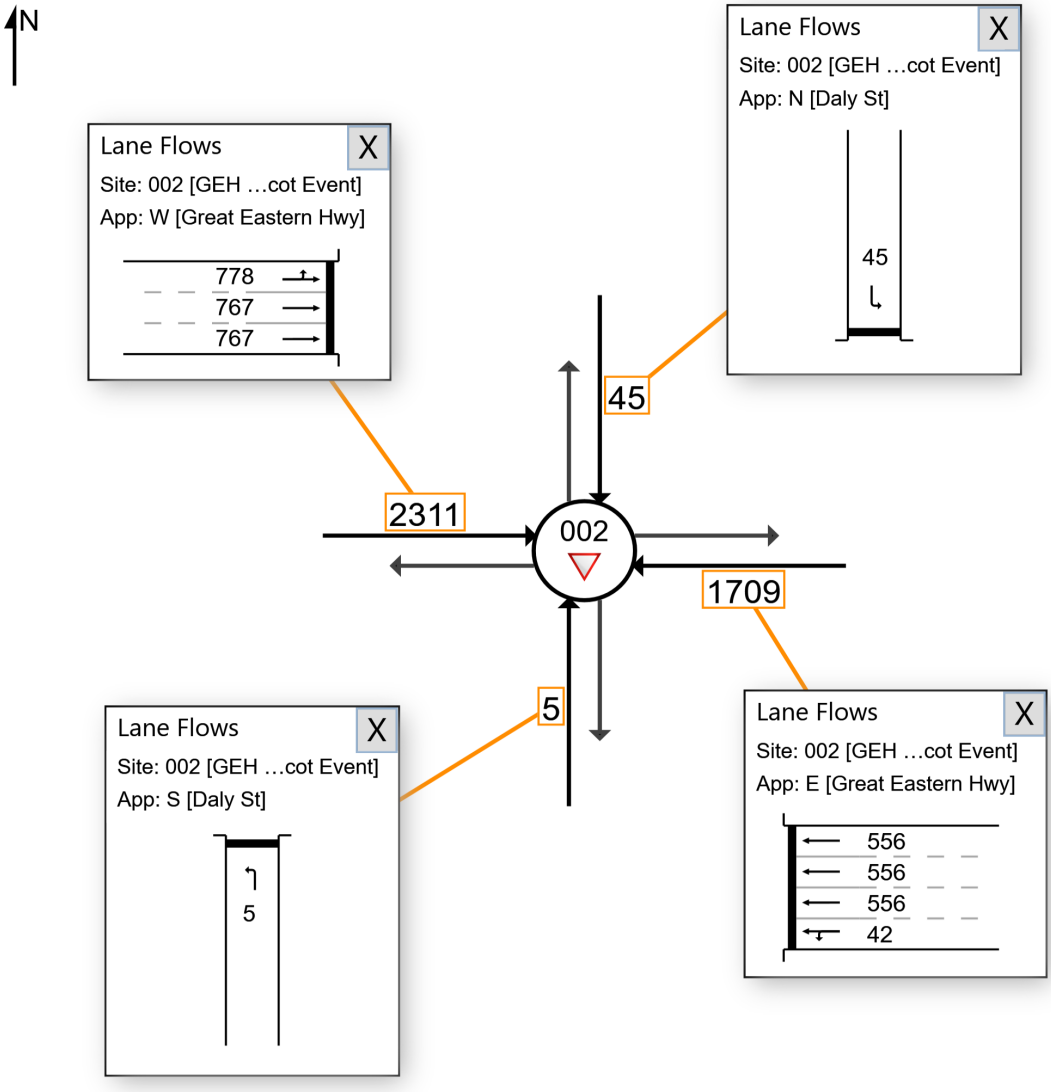

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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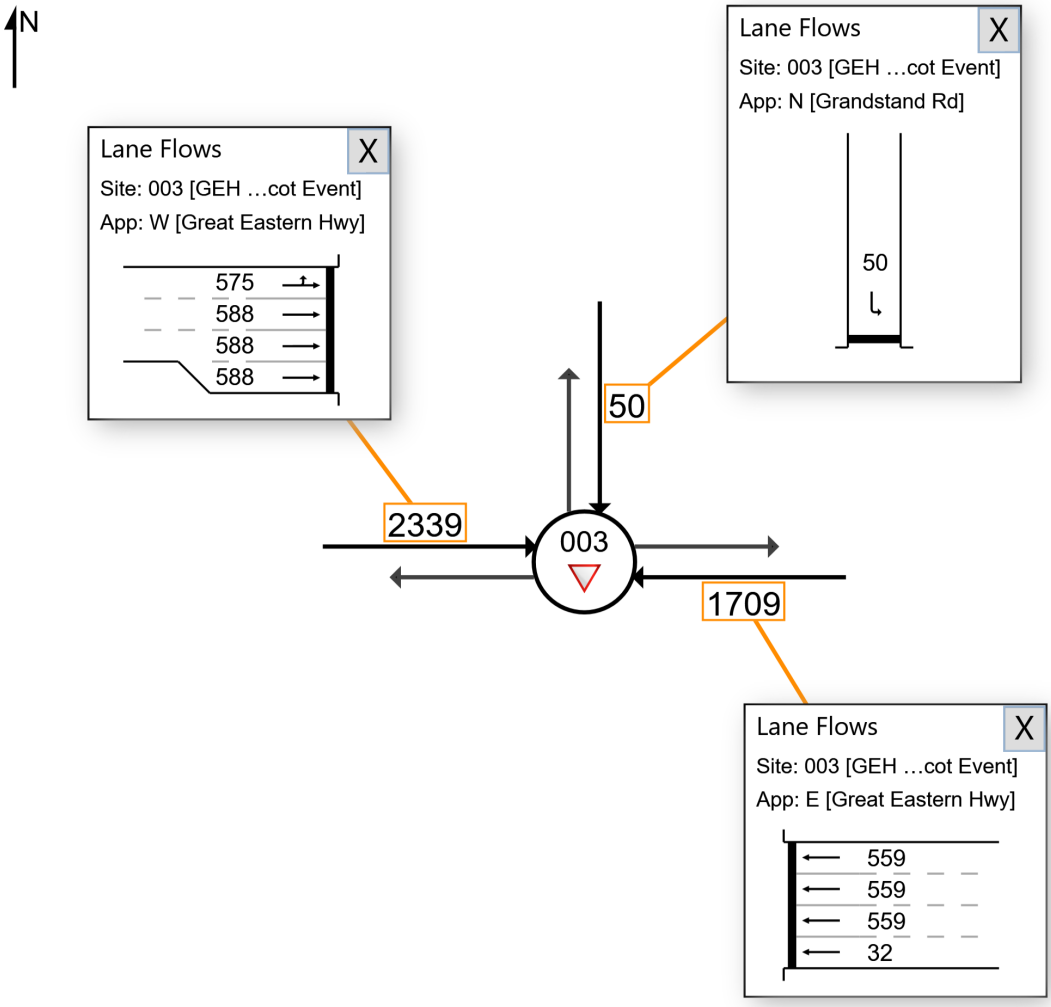

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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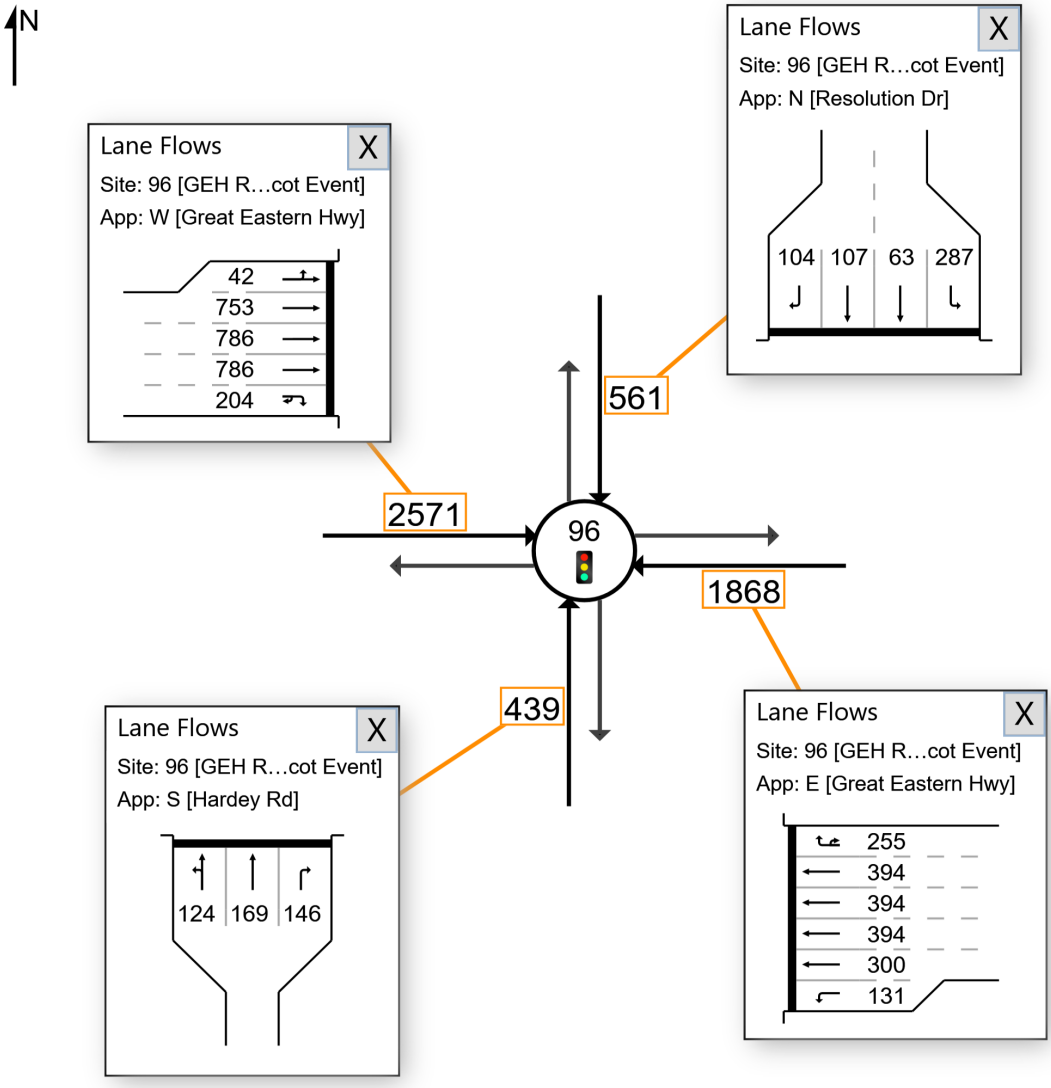

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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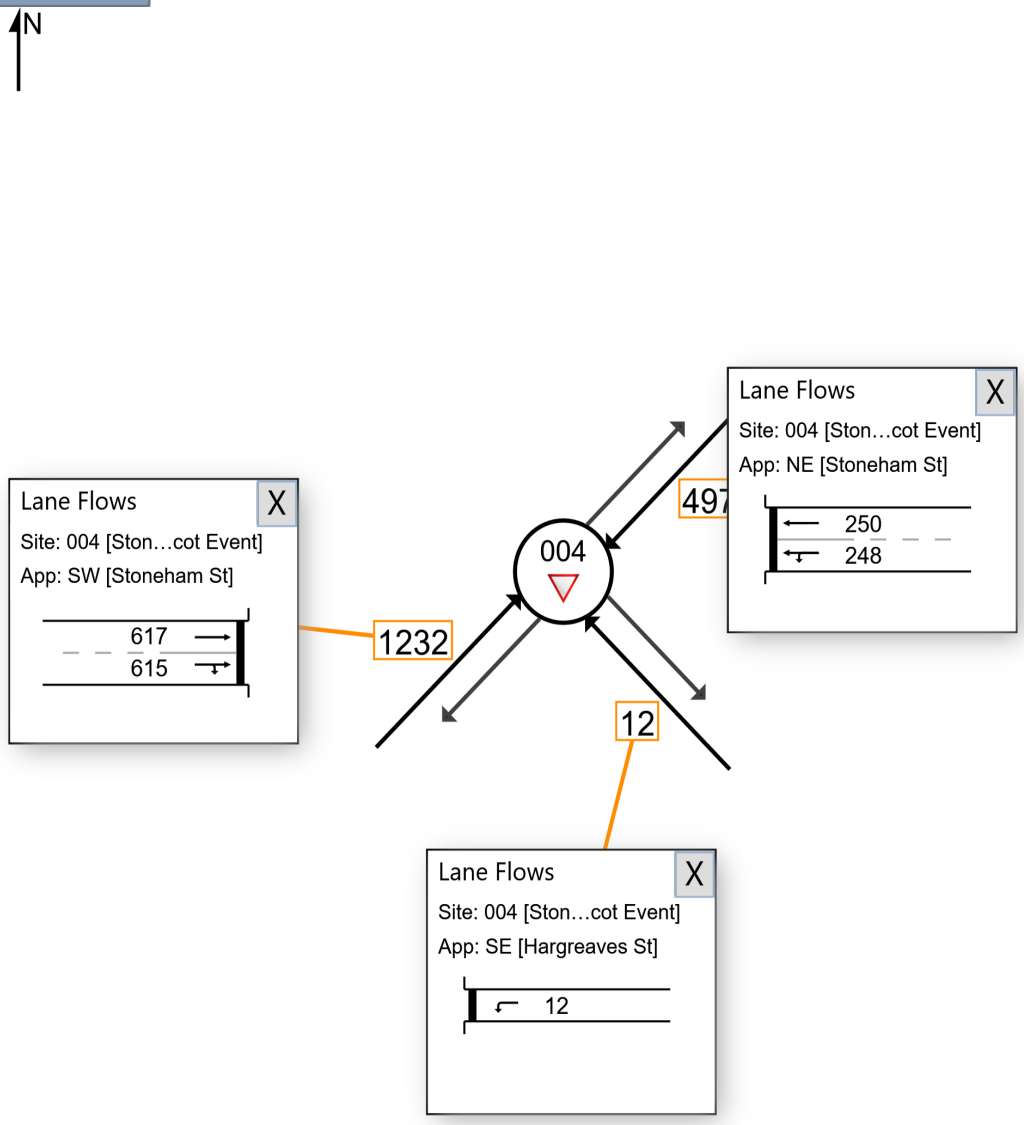

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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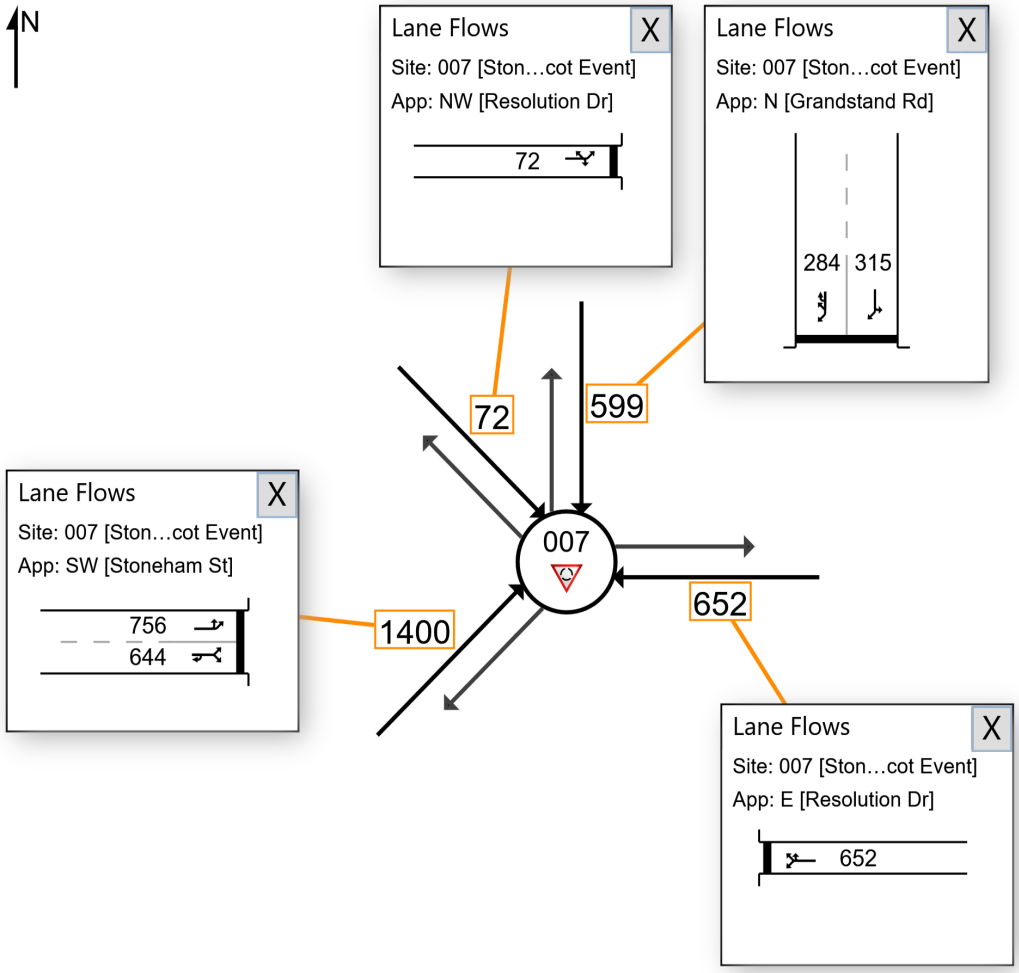

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand PM 2021 Ascot Event (Site Folder: 2021 PM Peak Proposed Network ASCOT TEST)]

Network: N101 [2021 PM Peak Proposed Network Ascot Weekday Event (Network Folder: General)]

Resolution Dr / Grandstand Rd
Give Way
2021 PM Peak with proposed road network Ascot Event
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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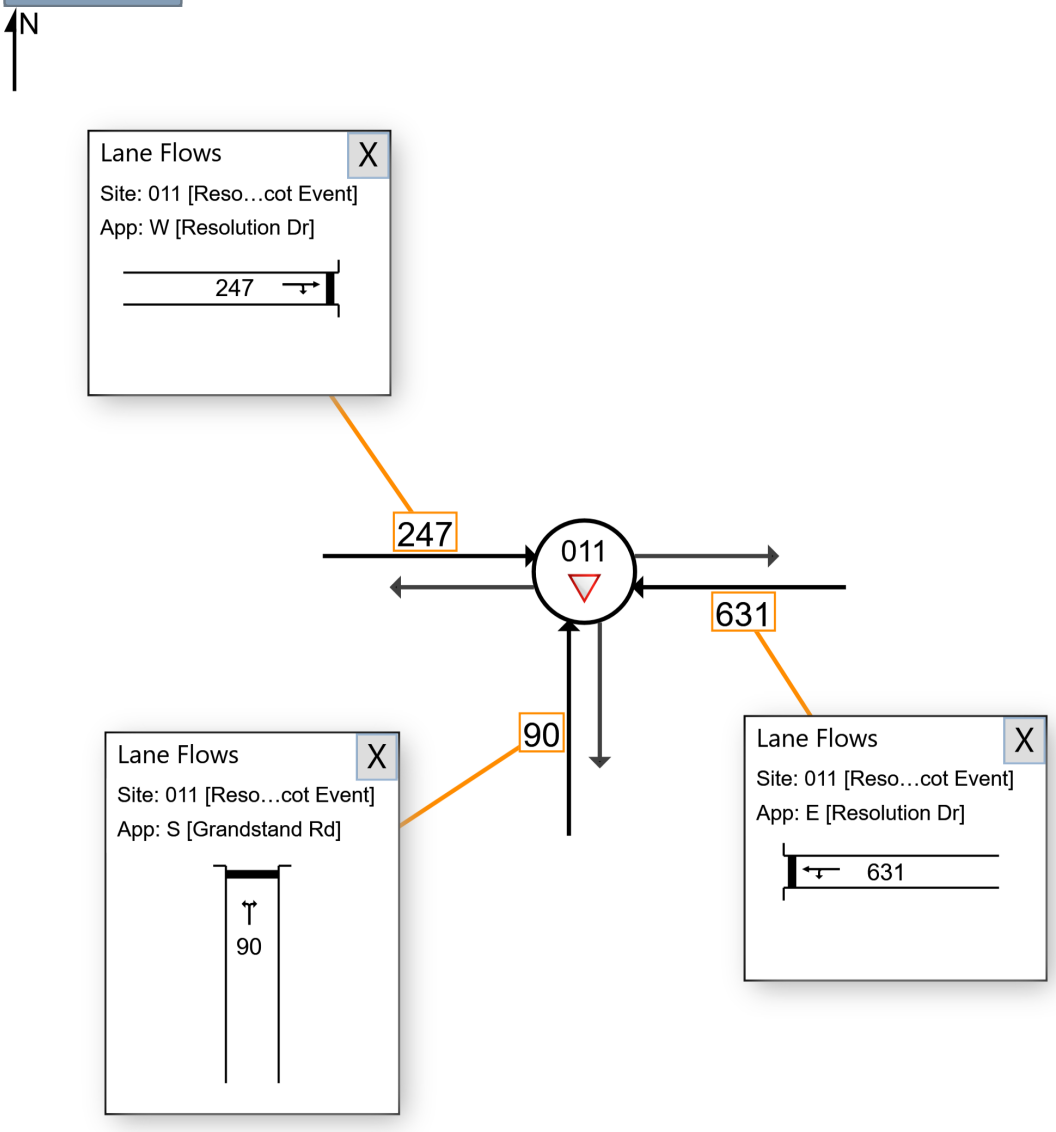

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Version: 1, Version Date: 11/06/2026

APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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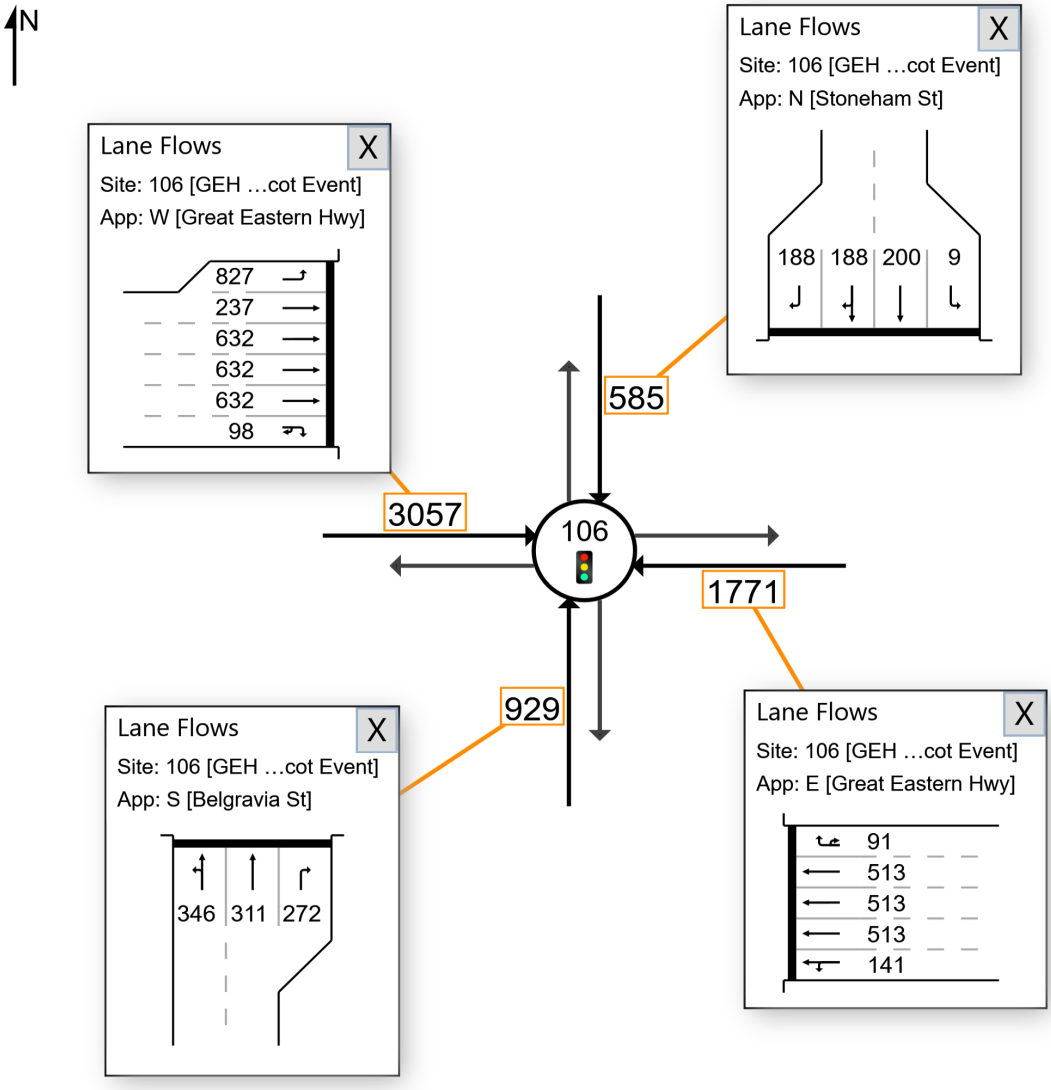
Click and drag popup boxes to move to preferred positions.

Close All Popups



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Document Set ID: 6149413
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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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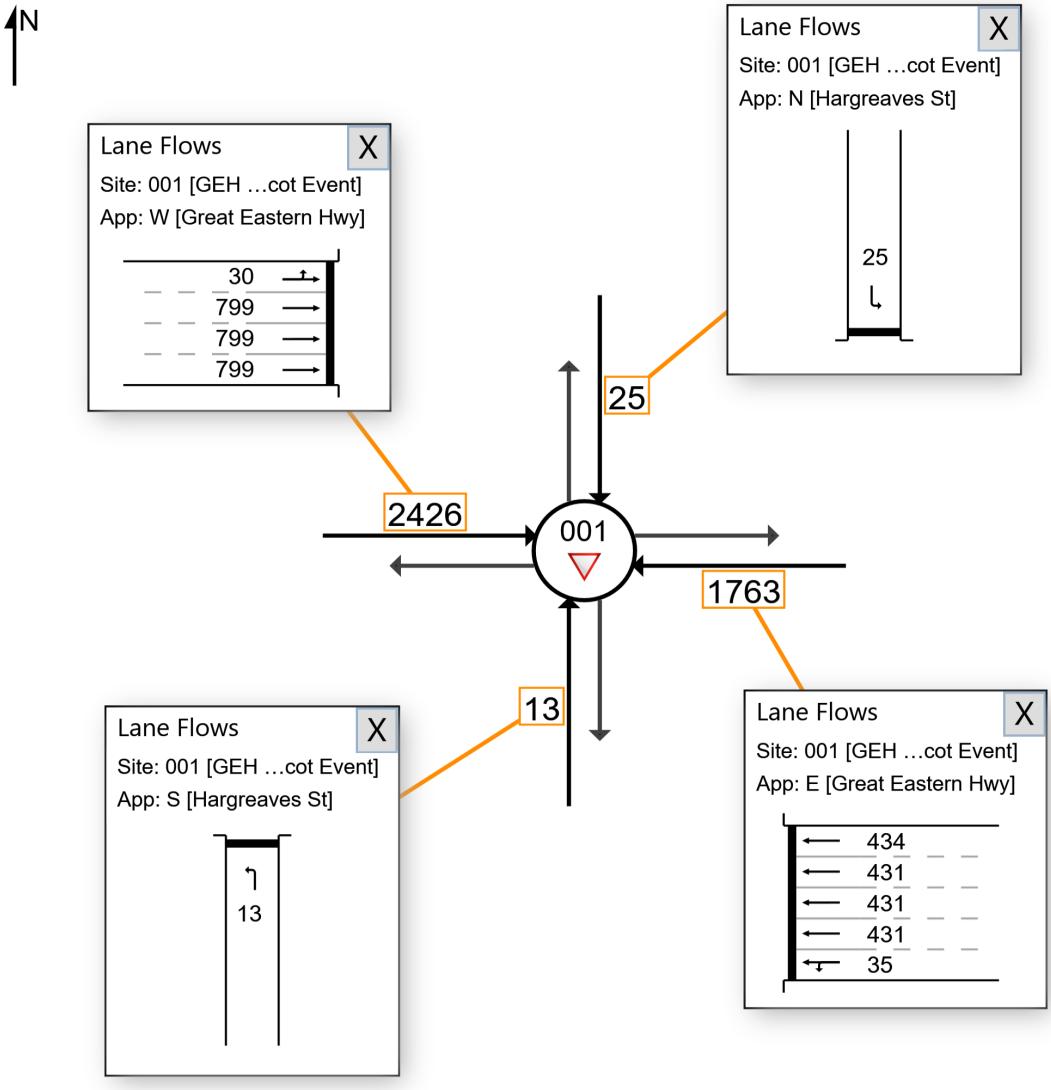

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Document Set ID: 6149413
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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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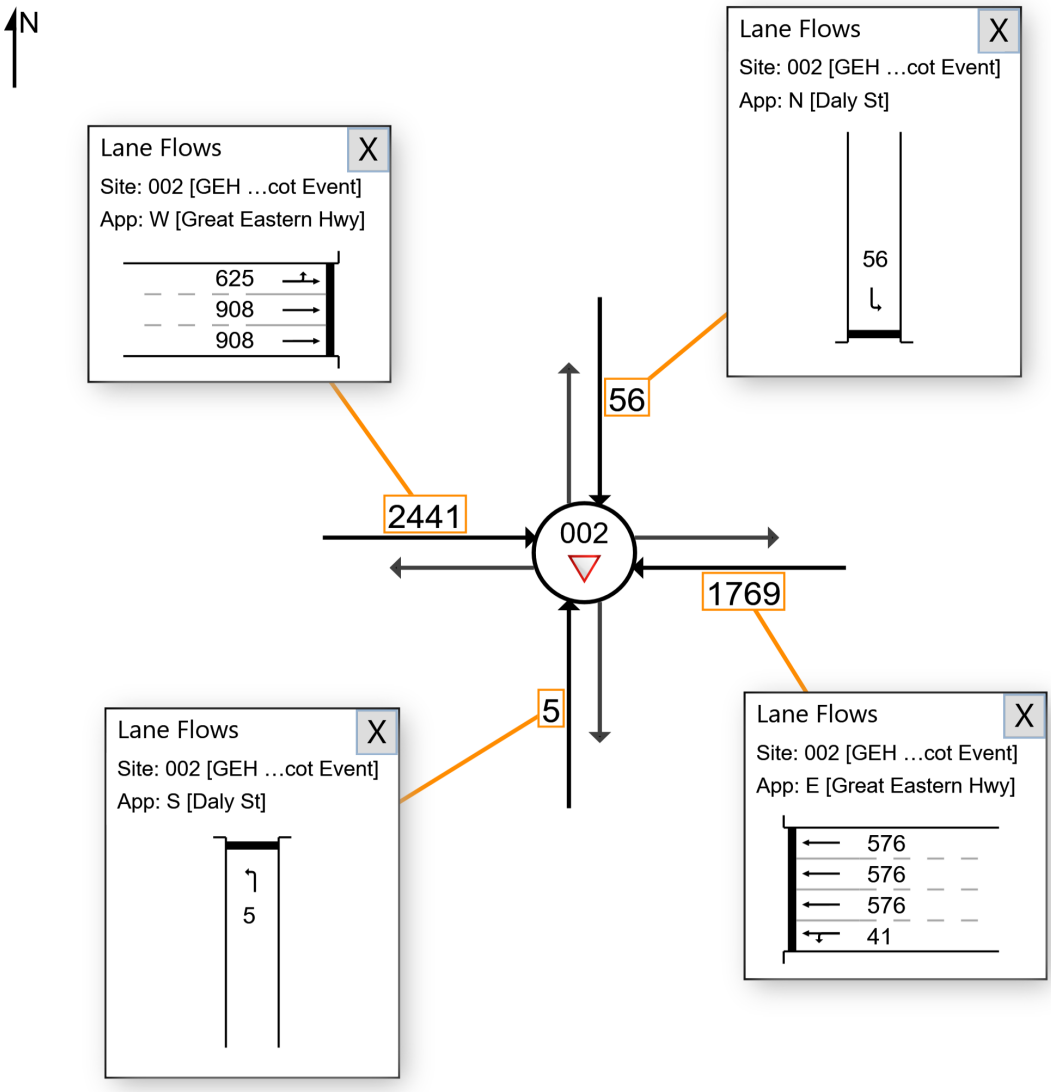

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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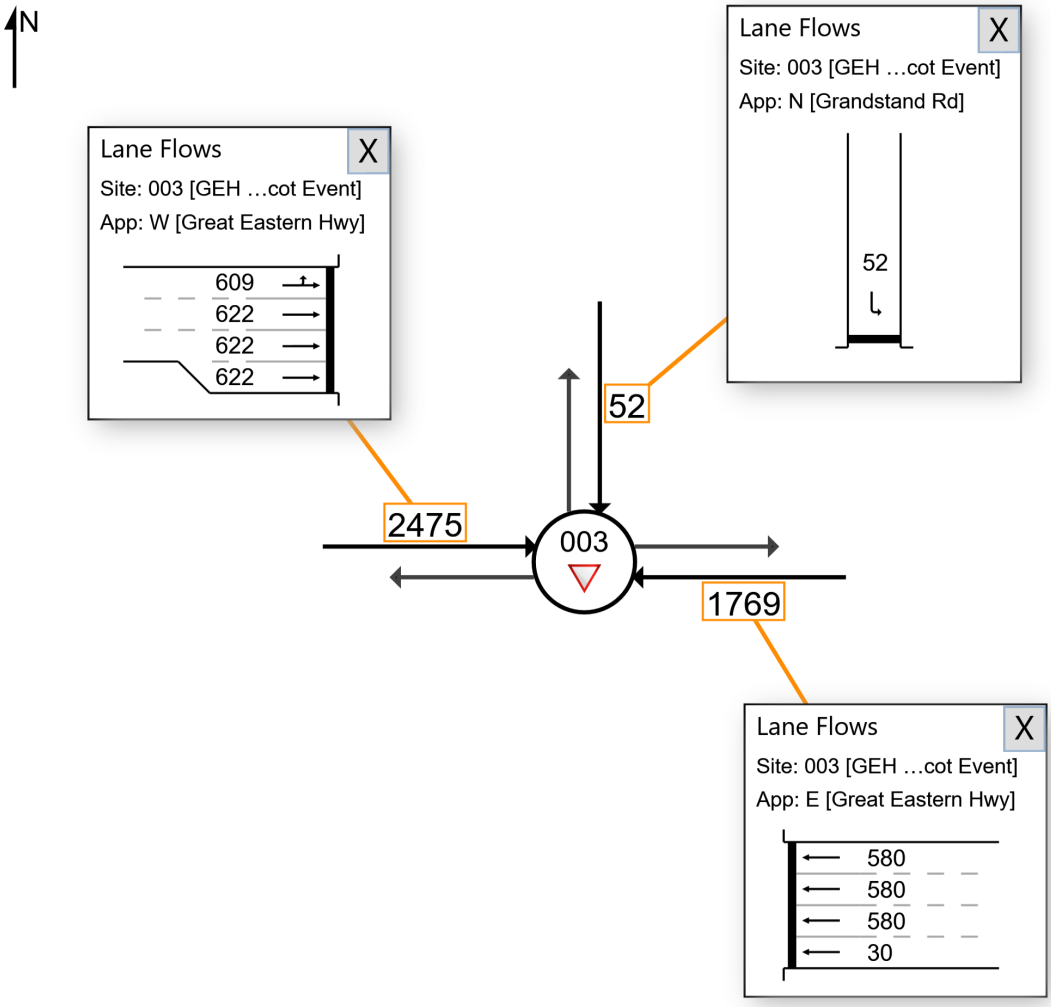

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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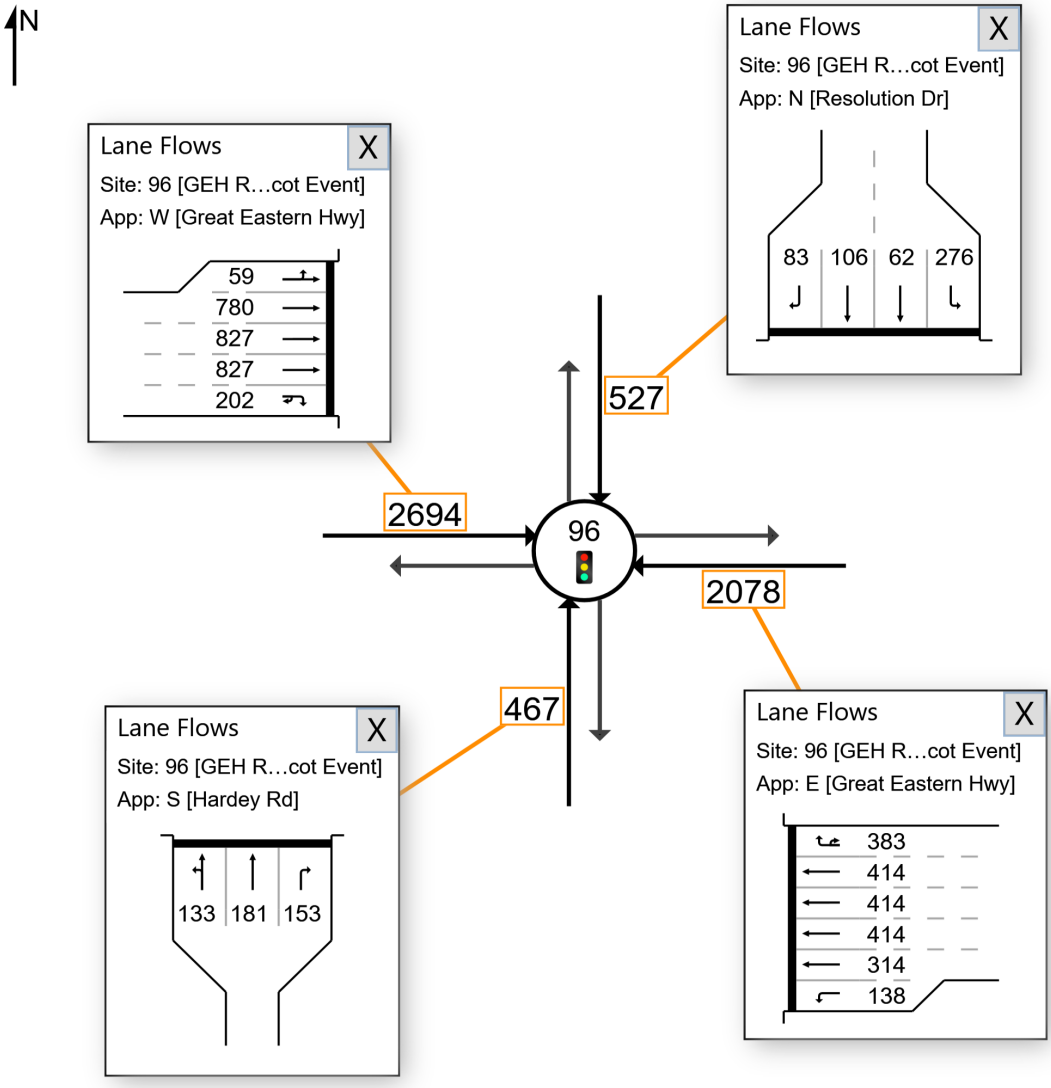

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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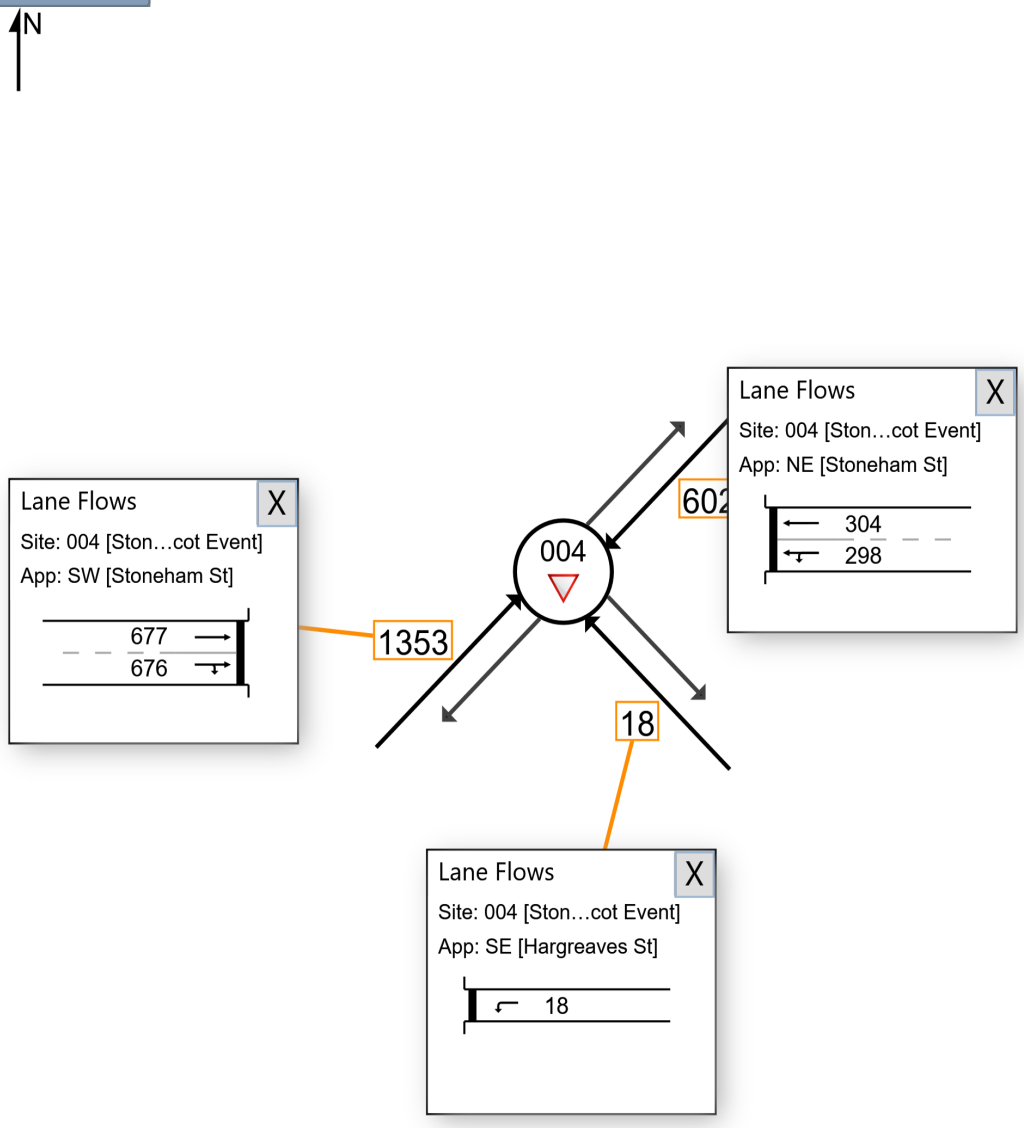

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

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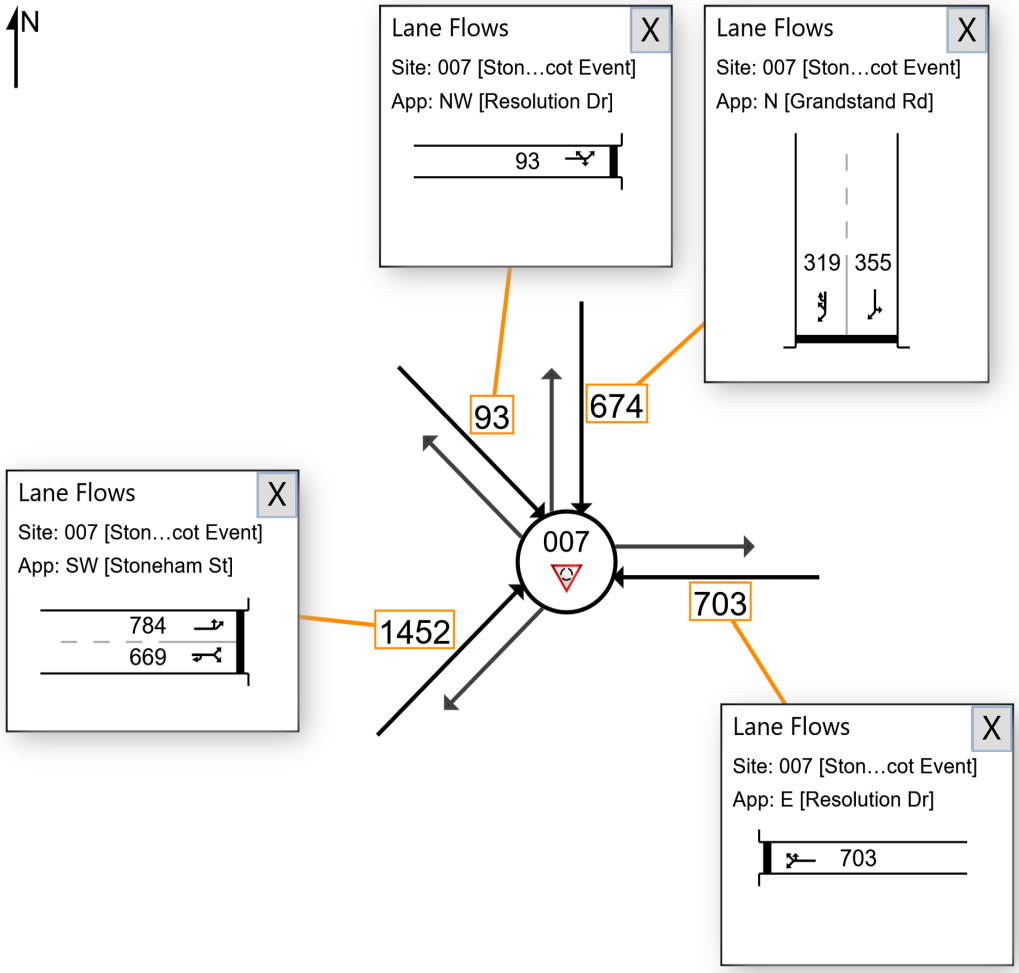

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand PM 2031 Ascot Event (Site Folder: 2031 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2031 PM Peak Proposed Networkand Land Use Ascot Weekday Event (Network Folder: General)]

Resolution Dr / Grandstand Rd
Give Way
2031 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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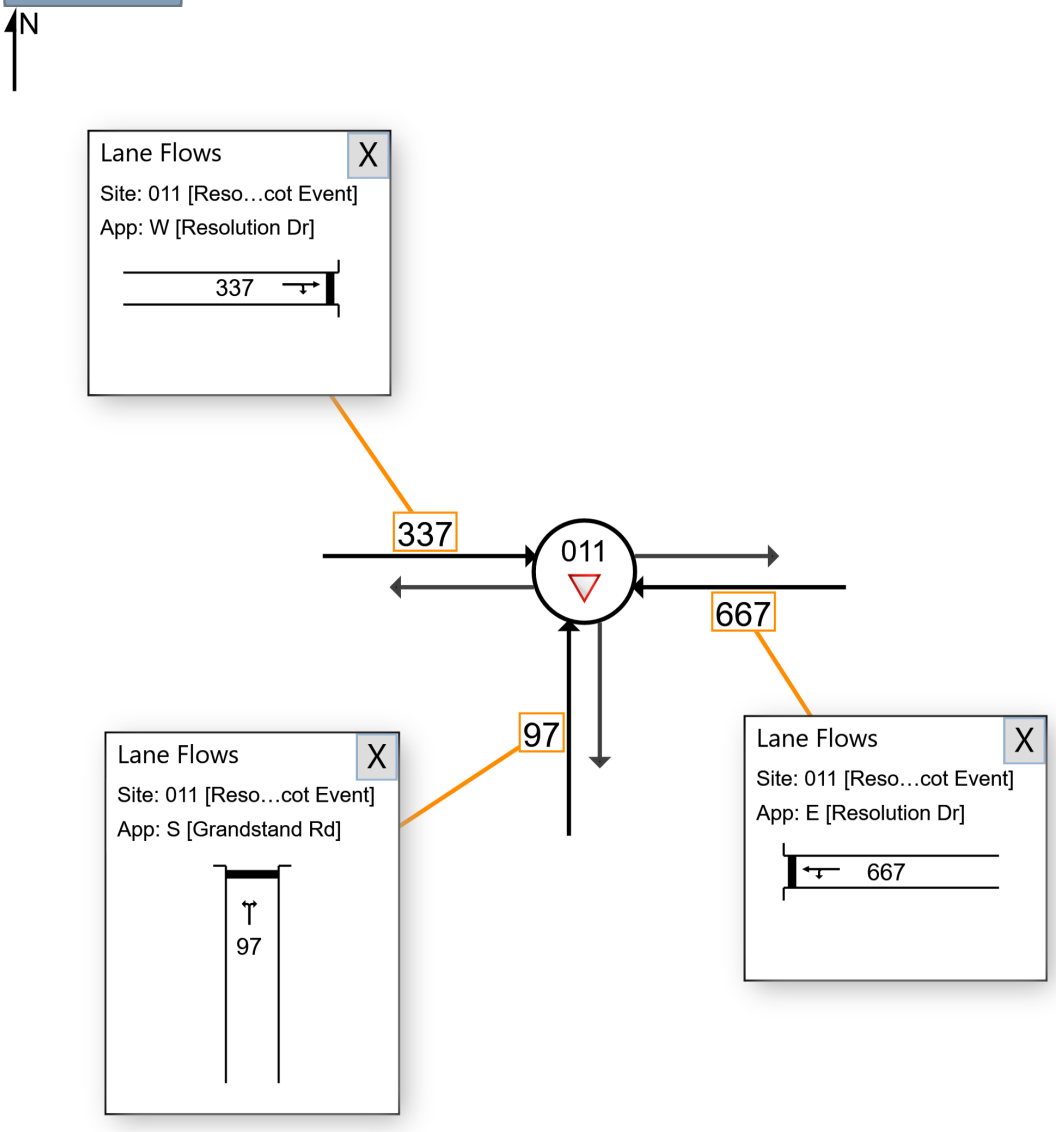

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 106 [GEH Stoneham Belgravia PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Stoneham St / Belgravia St
Traffic signals
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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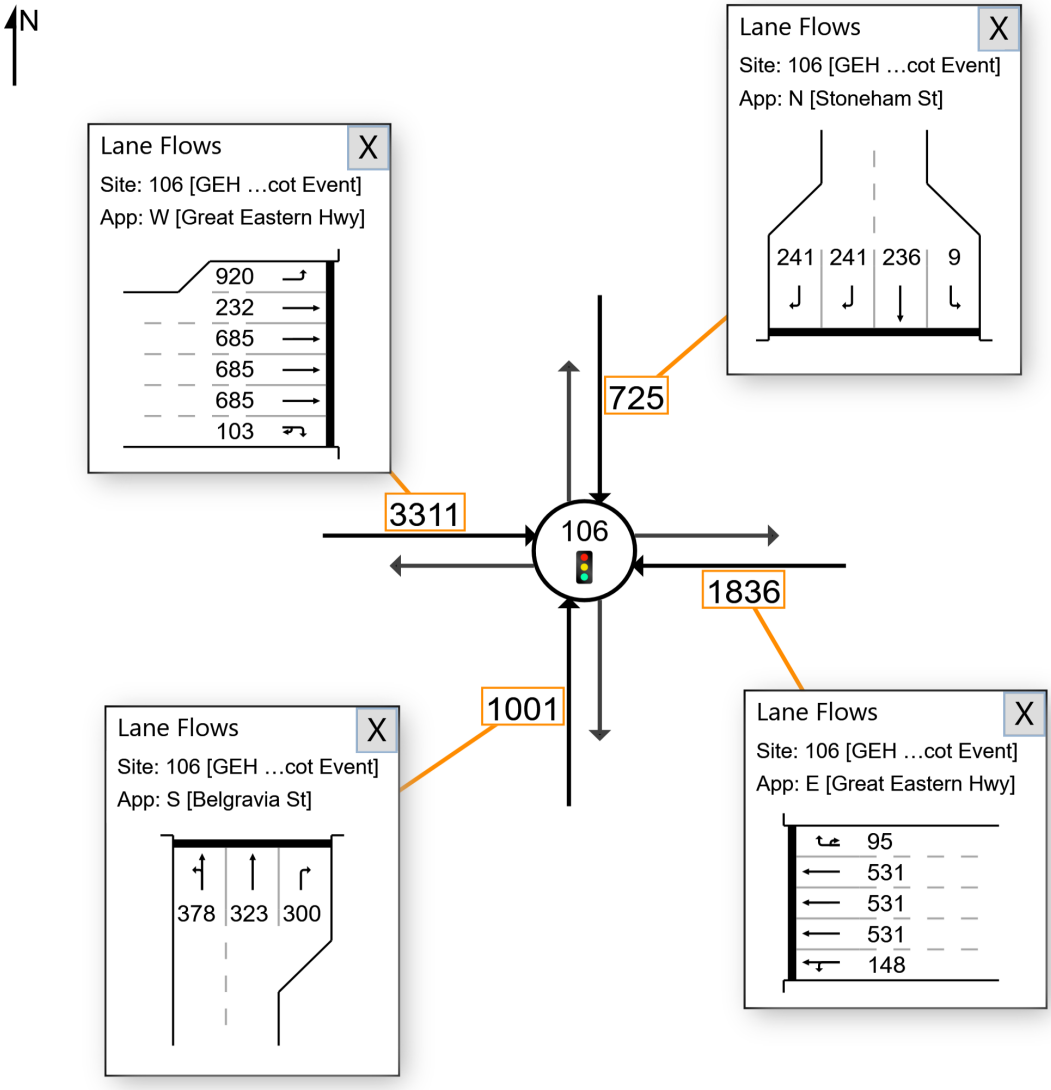

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 001 [GEH Hargreaves PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Hargreaves St
Left in Left out, Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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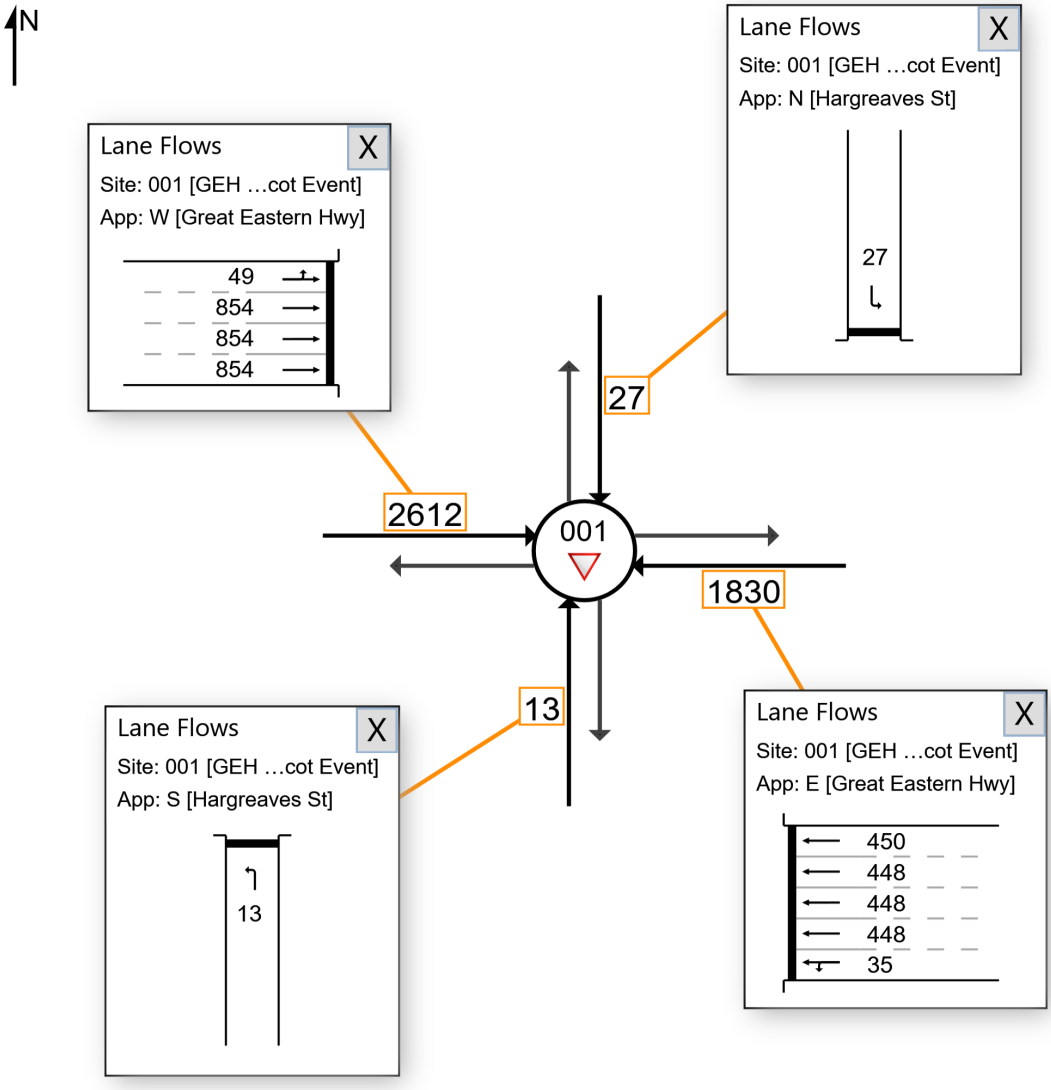

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 002 [GEH Daly PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Daly St
Left in Left out, Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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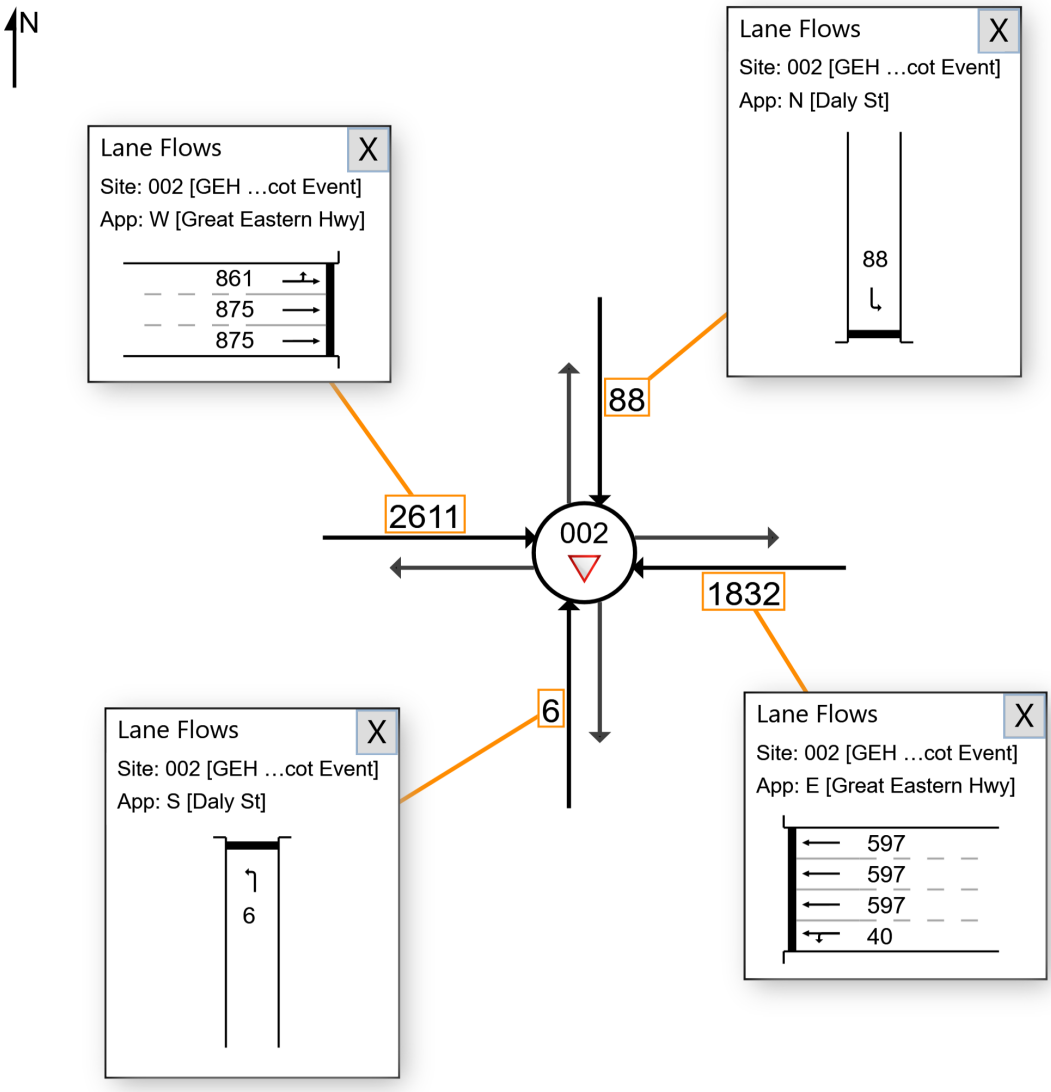

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 003 [GEH Grandstand PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Grandstand Rd
Left in Left out, Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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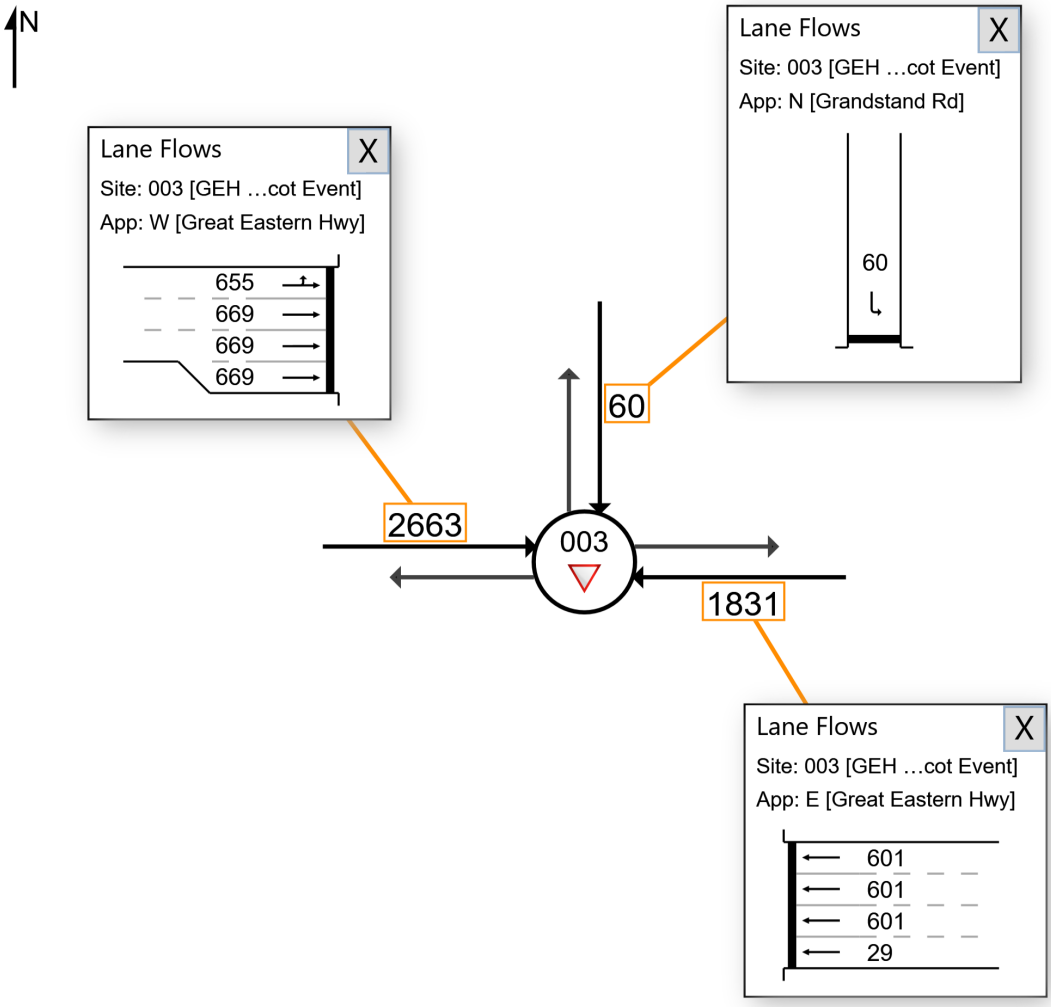

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 96 [GEH Resolution Hardey PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

GEH / Resolution Dr / Hardey Rd
Traffic signals
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 139 seconds (Site User-Given Phase Times)

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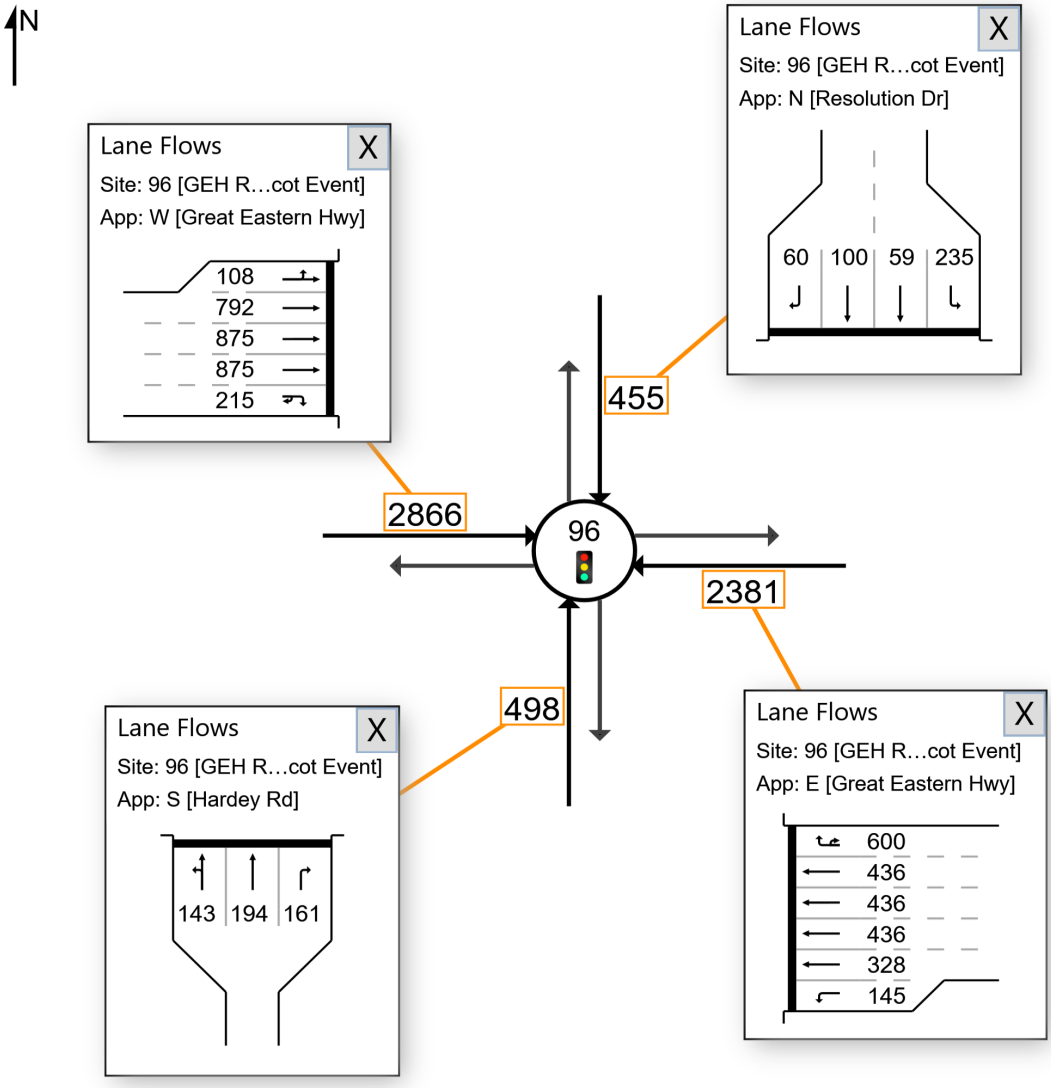

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 004 [Stoneham Hargreaves PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

Stoneham St / Hargreaves St
All in Left out, Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
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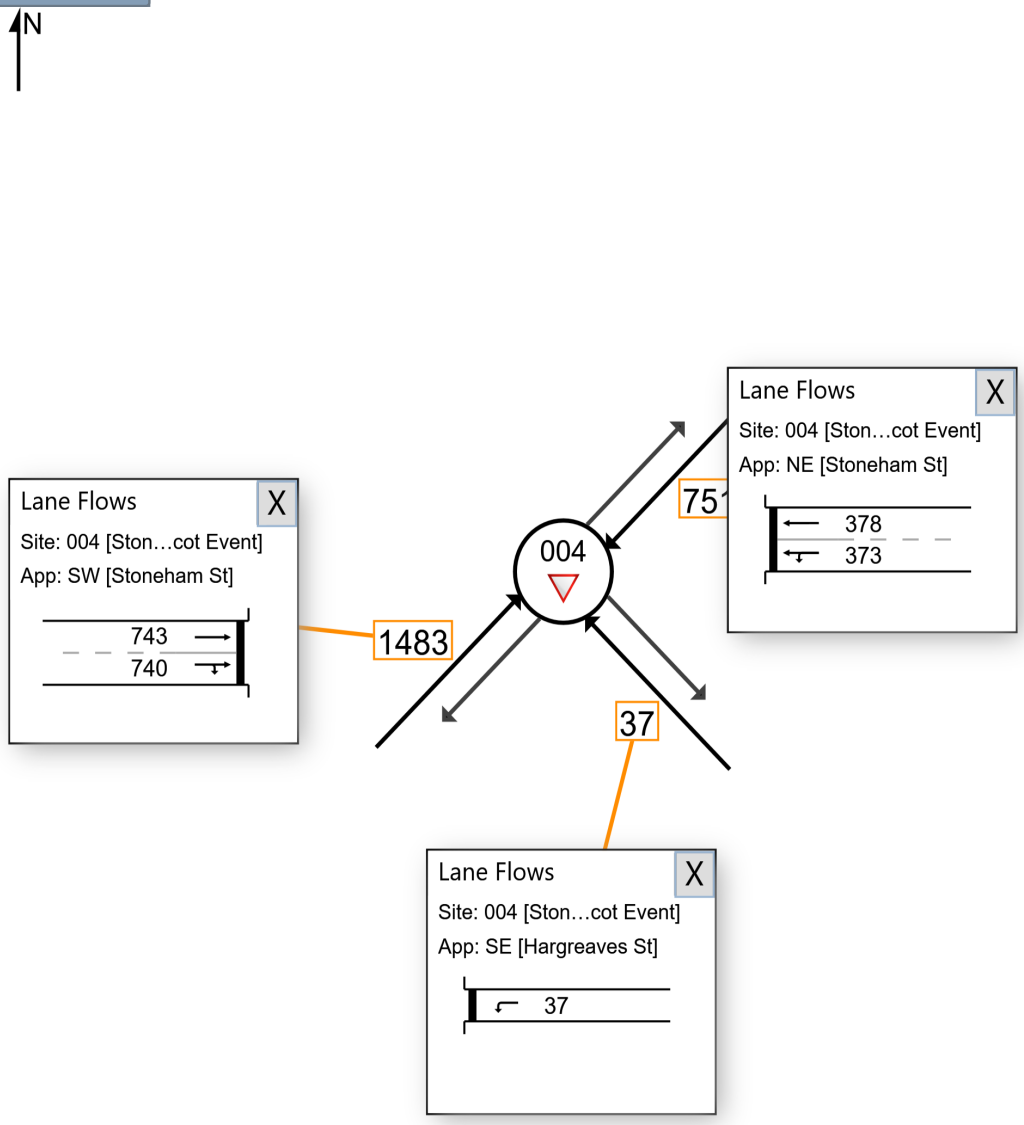

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 007 [Stoneham Grandstand Resolution PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

Stoneham St / Grandstand Rd / Resolution Dr
Roundabout
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Roundabout

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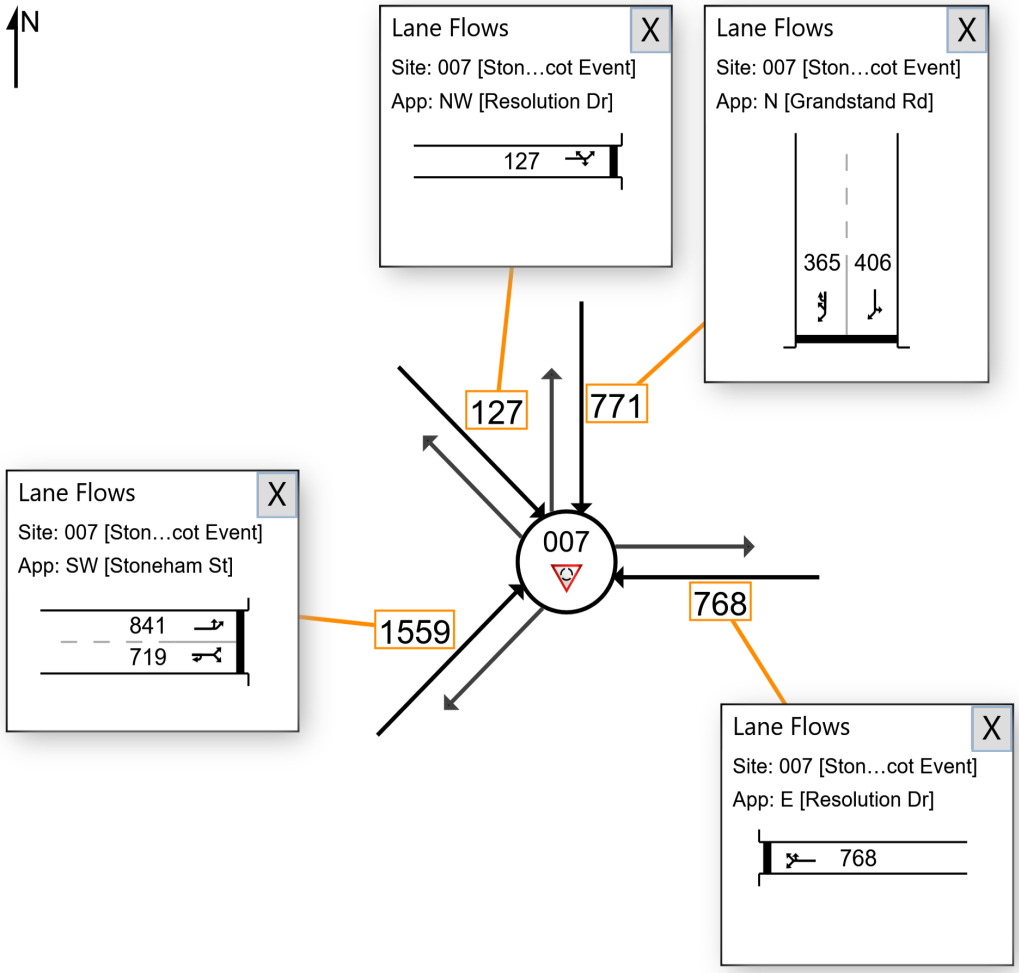
Click and drag popup boxes to move to preferred positions.

Close All Popups



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Some reduced upstream exit flow rates exist due to capacity constraint applied to oversaturated approach lanes. See Arrival Flows in Lane Summary reports.

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APPROACH LANE FLOWS

Lane flow rates based on arrival flows including the effect of capacity constraint in Site analysis (veh/h)

All Movement Classes

Site: 011 [Resolution Grandstand PM 2041 Ascot Event (Site Folder: 2041 PM Peak Proposed Network and Land Uses ASCOT TEST)]

Network: N101 [2041 PM Peak Proposed Network and Land Use Ascot Weekday Event (Network Folder: General)]

Resolution Dr / Grandstand Rd
Give Way
2041 PM Peak with proposed road network and land uses
Site Category: Existing Design
Give-Way (Two-Way)

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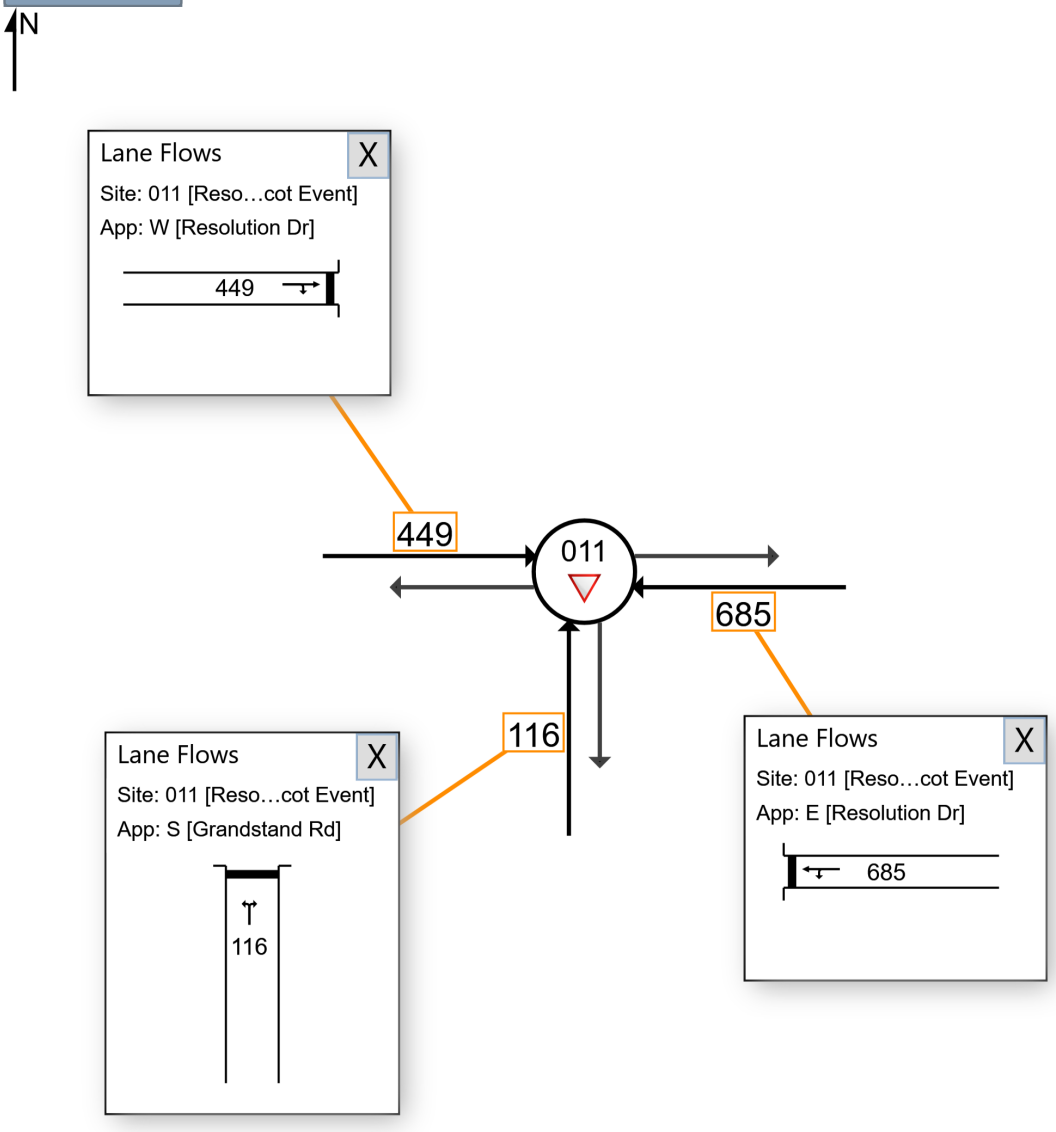

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Infrastructure Assessment Report

Golden GatewayPrecinct

Prepared for
City of Belmont

5 May 2017

Cardno
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Document Set ID: 6149413
Version: 1, Version Date: 11/06/2026

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Executive Summary

The Golden Gateway Structure Plan provides a framework for the redevelopment of the Golden Gateway Precinct area into a “major growth area by 2031”.

Through close liaison with the relevant service providers, Cardno has researched and reported on the current capacity of the infrastructure and services within the Golden Gateway area. Cardno has also provided detailed findings and recommendations regarding the future infrastructure and servicing requirements that are needed to accommodate the redevelopment of the area as proposed by the Structure Plan.

In summary, Cardno’s assessment of the Golden Gateway Precinct in terms of required infrastructure for the Golden Gateway Structure Plan area is as follows:

- The Golden Gateway Precinct area faces a shortage in wastewater infrastructure to service the proposed increase in residential and commercial activity.
- There is currently capacity in the existing HV feeders to supply the proposed development with power. However, Western Power advise power capacity cannot be reserved, and that subject to other developments in the area, a new HV feeder may be required to fully support the development.
- Upgrades other than the required major infrastructure upgrades as outlined in this report infrastructure will be rolled out in response to new development within the subject area.
- It is recommended that a working group between the City of Belmont and Water Corporation is set up in order to help plan and coordinate precinct development and staging with any Water Corporation trunk infrastructure capital works.
- National Broadband Network (NBN) Co. has not yet rolled their infrastructure across the Golden Gateway Precinct. It is recommended that the City of Belmont liaise with NBN Co. as per the *Best practice guide for Councils when initially dealing with NBN Co* document.

In conclusion, based on advice received by Cardno from the relevant service authorities, there should be no reason from a servicing point of view that the Golden Gateway Precinct Structure Plan could not be implemented with the proposed infrastructure upgrades outlined in this report.

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1 Background

1.1 Introduction

Cardno was engaged to assist the City of Belmont, in conjunction with the Department of Planning to undertake an infrastructure and services strategy for the Golden Gateway precinct, Ascot. The strategy will help guide the preparation of a Local Structure Plan over the area.

The scope of works includes:

- Review of planned growth area;
- Provide analysis of existing services infrastructure, including;
  - Water;
  - Sewer;
  - Power;
  - Gas; and
  - Telecommunications
- Identification of future service demands;
- Liaison and engagement of services providers; and
- Development of reports.

Cardno assessed the infrastructure to inform the City on decisions around the long-term provision of electrical energy, natural gas, potable water, wastewater disposal, along with high speed data /telecommunications for the growth areas.

The findings and advice presented in this report is based on Cardno's observations, experience from similar projects and responses from various service providers and stakeholders.

The investigations and preparation of this report have largely been based on preliminary advice from the various Service Authorities. The information is current as of April 2017 and is subject to change as development proceeds.

1.2 Location

The subject area is located in Ascot, and is generally bounded by Great Eastern Highway, Stoneham Street, Grandstand Road and Resolution Drive. It includes the Belmont Trust Land, a portion of the Ascot Racecourse site as well as the Western Australian Turf Club headquarters and Ascot Kilns. The extent of the subject area is shown in **Figure 1-1**.

Figure 1-1 Golden Gateway Subject Area

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2 Water

Water Corporation Western Australia is the state authority regulating the distribution infrastructure for water reticulation in the area.

2.1 Existing Infrastructure

The Serpentine Trunk Main runs along Grandstand Road and Daly Street. There is also a 915 steel distribution main running along Grandstand Road through the subject area. The existing lots are well serviced with a mixture of 100, 150 and 200 dia reticulation pipes made of asbestos cement, cast iron, PVC and steel.

Cardno Drawing *CW942300-CI-SK2* in **Appendix A** shows the location of the existing power infrastructure within and adjacent to the subject area.

2.2 Required Infrastructure

The Golden Gateway Precinct is located in the Supply Scheme area. It is difficult to ascertain exactly what capacity the current infrastructure network has without full water network modelling carried out by Water Corporation. However, Water Corporation does not foresee any issues with servicing the proposed scheme with potable water at the time of this report.

Exact water infrastructure upgrades will be determined when Water Corporation carries out full water network modelling. Water Corporation has advised that water reticulation planning and modelling will be done after Structure Plan and rezoning is confirmed, effectively at development application phase. The Water Corporation provided initial advice to Cardno and in their advice; they offered the following key points.

- Water Corporation will upgrade the headwork's, pipe equal to or greater than 300mm diameter and pump stations, as and when required. However, headwork's charges will be charged to the developer. Minor reticulation works, typically pipework less than 300mm diameter, are to be funded directly by the developer.
- All temporary works associated with any development within the Golden Gateway Precinct is to be funded directly by the developer.
- Redevelopment areas within the Golden Gateway Precinct need to integrate water efficiency technology and design approaches into the area and buildings in line with Water Corporation's 'Water Forever 2009" document. This will require a local water management strategy that includes local scale water balancing and identifying water efficiency measures such as; rainwater reuse, appropriate fittings, irrigation smart systems, planting and soil types and drainage collection and reuse.
- Water Corporation advises that a Development Area Plan be commissioned to support development in the Golden Gateway Precinct and submitted to Water Corporation once the Structure Plan has been finalised. This should include a plan identifying the proposed development, densities and likely staging and timeframe. Accompanying this should be a water management strategy outlining how water efficiencies are to be met along with engineering plans detailing proposed works and estimates. The water efficiency targets are to be determined by the City of Belmont in consultation with Water Corporation. Water Corporation runs a Waterwise Development Program that enables developments that have applied water efficient principles to be recognised and endorsed by Water Corporation.
- Water Corp recommends a consolidated approach to the requesting and programming of works to minimise disruptions and maximise cost efficiencies. Water Corporation recommends any reticulation reinforcement or new work should be managed by the City of Belmont due to the fractured land ownership within the area. It is recommended that a working group between the City of Belmont and Water Corporation is set up in order to help plan and coordinate precinct development and staging with any Water Corporation trunk infrastructure capital works.

Additionally, Water Corporation have advised that some existing cast iron water mains will need to be replaced as they are ageing and to increase capacity necessitated by increased demand arising from the proposed higher density development. These may need to be replaced by the developer or alternatively a request can be put to the Water Corporation cast iron replacement program.

Identification of required infrastructure upgrades requires detailed water modelling and more specific demand inputs. Water reticulation planning will be done after Structure Plan and rezoning is confirmed.

3 Wastewater

The Water Corporation (WC) of Western Australia is the main service provider regulating the distribution, storage and disposal infrastructure for wastewater in the Ascot area.

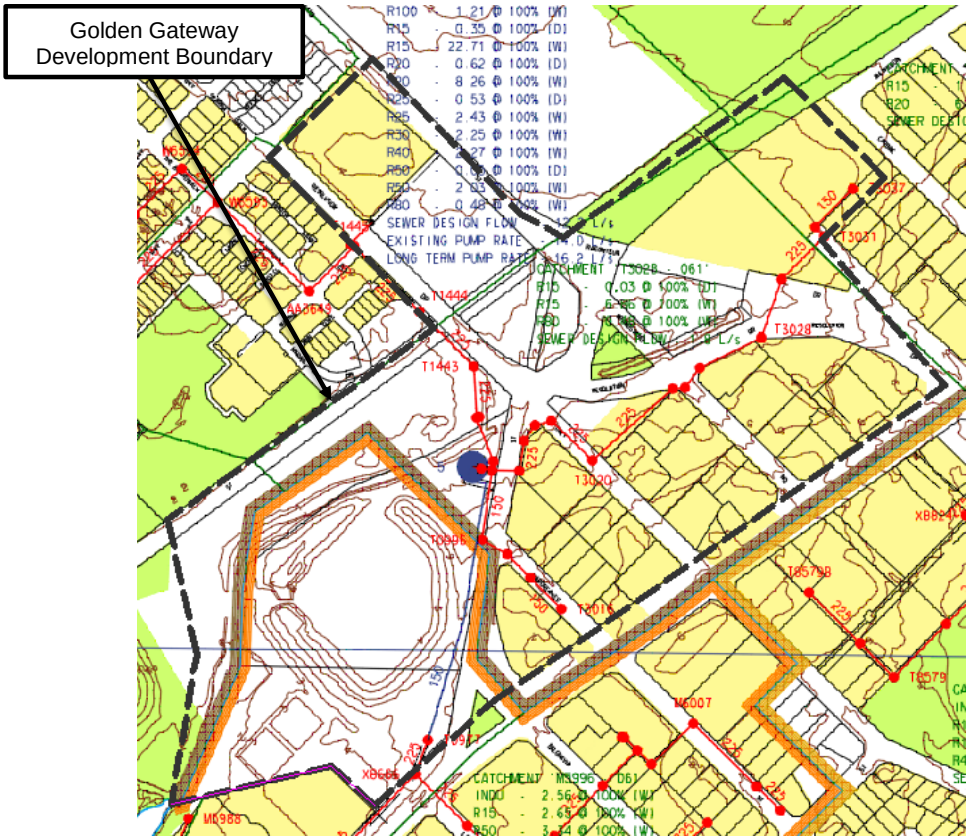
Wastewater infrastructure general to Ascot area is serviced by gravity style wastewater drainage infrastructure. A mixture of concrete and plastic arterial pipes on grade service all areas to local pump stations throughout the City of Belmont.

3.1 Existing Infrastructure

Lots within and surrounding the proposed Golden Gateway Structure plan are serviced by two main arterial sewer routes; a 225mm collector flowing north to south and a 225mm collector flowing east to west. Both collectors flow to the Redcliffe Pump Station 5 located on Stoneham Street. The Redcliffe P.S 5 collects all sewerage west of the Ascot raceway within the Ascot Suburb and discharges it to the Redcliffe Pump Station 2 located on Abernethy Road.

Refer to Cardno Drawing *CW942300-CI-SK1* in **Appendix A** for further details and drawings for the wastewater infrastructure in this area.

Figure 3-1 Existing Sewer Infrastructure



3.2 Future Demand

Table 3-1 identifies the additional sewer demand estimated for the proposed Golden Gateway re-zoning structure plan.

Table 3-1 Local Scheme Zone Sewer Demand

Local Scheme Zones	Area (ha)	Additional Dwellings (No.)*	Additional Sewer Demand (L/s)**
Mixed-Use (R-AC0)	10.3	1648	9.15
Residential (R20)	0.88	18	0.19
Residential (R40)	1.73	70	0.61
Residential (R100)	1.57	157	1.34
Total		**1893**	**11.29**

* Refer Table 4.4 of DS 50 for Design & Construction Requirements for Gravity Sewers DN150 to DN600

**Capacity based on Water Corporation DS50 Table 4.1.

3.2.2 Service Capacity

Service Capacity has been analysed for Redcliffe P.S 5 and Redcliffe P.S 2 to determine if the stations have adequate capacity to service the proposed Golden Gateway development

Table 3-2 Pump Station Service Capacity

Pumping Station	Additional Flow (L/s)	P.S Existing Sewer Flow (L/s)	Long Term P.S. Capacity (L/s)	Future Capacity / [Shortfall] (L/s)
Redcliffe PS 5	11.29	14.0	16.2	[9.09 L/s]
Redcliffe PS 2	11.29	20.1	37.0	5.61 L/s

As per **Table 3-2** the proposed development will have significant impacts to the current wastewater infrastructure. It is not envisaged the existing Redcliffe PS5 will have sufficient capacity with a shortfall of 9.09 L/s to service the proposed development and will require a significant upgrade. Redcliffe PS 2 will likely have capacity however further planning should be co-ordinated with the Water Corporation to ascertain other timing of other developments in the area.

3.3 Required Infrastructure

Due to wastewater flows increasing due to the high density development, a number of upgrades will be required to headworks infrastructure in the area. These include increasing the capacity of the Stoneham Street Wastewater Pump Station as well as a number of sewer mains. These will be scheduled in the Water Corporation Capital Investment Program at the appropriate time.

4 Power Supply

4.1 Existing Infrastructure

Power distribution and production is managed by Western Power. Data obtained from the Western Power *Network Mapping Tool* indicates that the area is serviced by the Belmont Substation and the forecast network capacity for 2015 is >30MVA, as shown in **Figure 4-1**. There are High and Low Voltage power lines in the vicinity of the site.

Figure 4-1 Existing Power Network Capacity
(Source: http://ncmt.westernpower.com.au/index.cfm)

Cardno Drawing *CW942300-CI-SK6* in **Appendix A** shows the location of the existing power infrastructure within and adjacent to the subject area.

4.2 Required Infrastructure

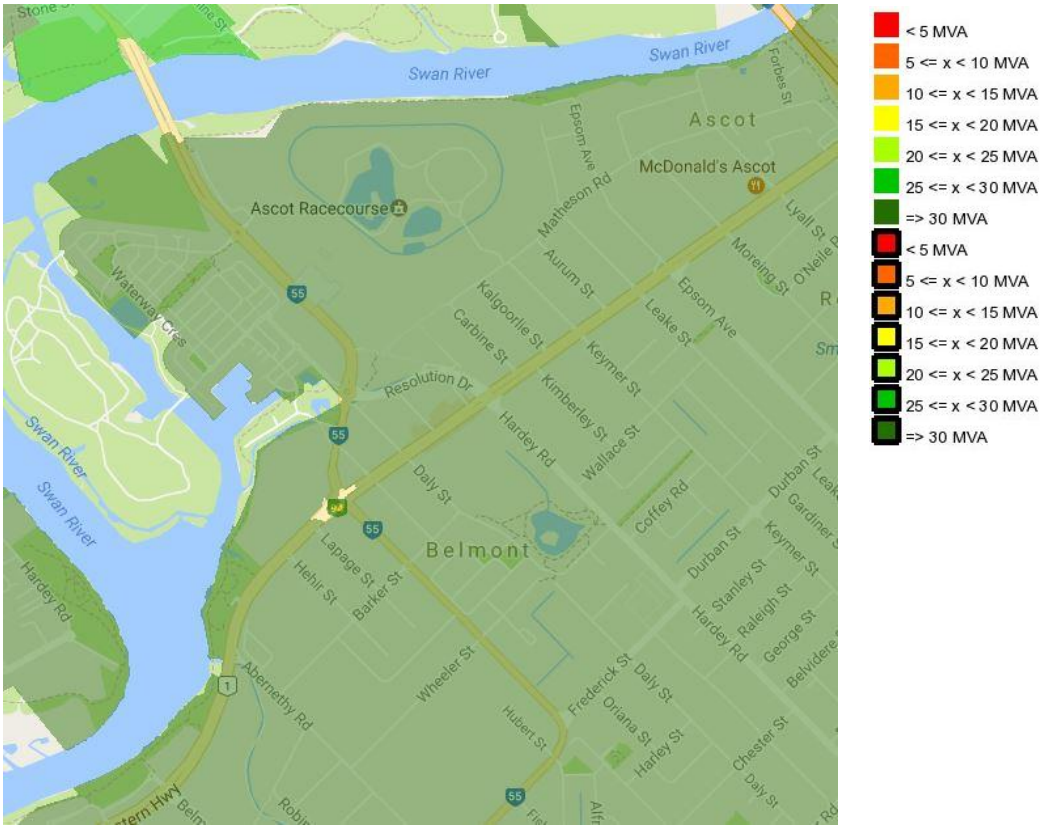
Maximum power requirement for the development has been calculated using Western Power's online Design Maximum Demand calculator. The estimated demand for the development is shown in **Table 4-1** below.

Table 4-1 Estimated Maximum Power Demand

Proposed Lot Use	Number of Units/Dwellings	Max. Demand/Unit (kVA)	Approx. Estimated Demand (kVA)
Single Dwelling Units	18	4.7	84.6
Grouped Residential (5-10 Units)	70	3.5	245
Grouped Residential (Over 10 Units)	1805	3.1	5,596
Mixed Use Commercial	1	2,400kVA	2,400
Total Development			**8,325.6**

Belmont substation falls under the Cannington load area. Western Power's *Annual Planning Report 2015/16* states "no substation capacity shortfall is forecast in the Cannington load area over the next five years." This takes into account committed and most likely to occur network expansion plans for the area. The Western Power *Network Mapping Tool* indicates that there is >30MVA spare capacity in the network until at least 2036 based on current and forecast demand (see **Figure 4-2**).

Figure 4-2 Forecast Power Network Capacity 2036
(Source: http://ncmt.westernpower.com.au/index.cfm)

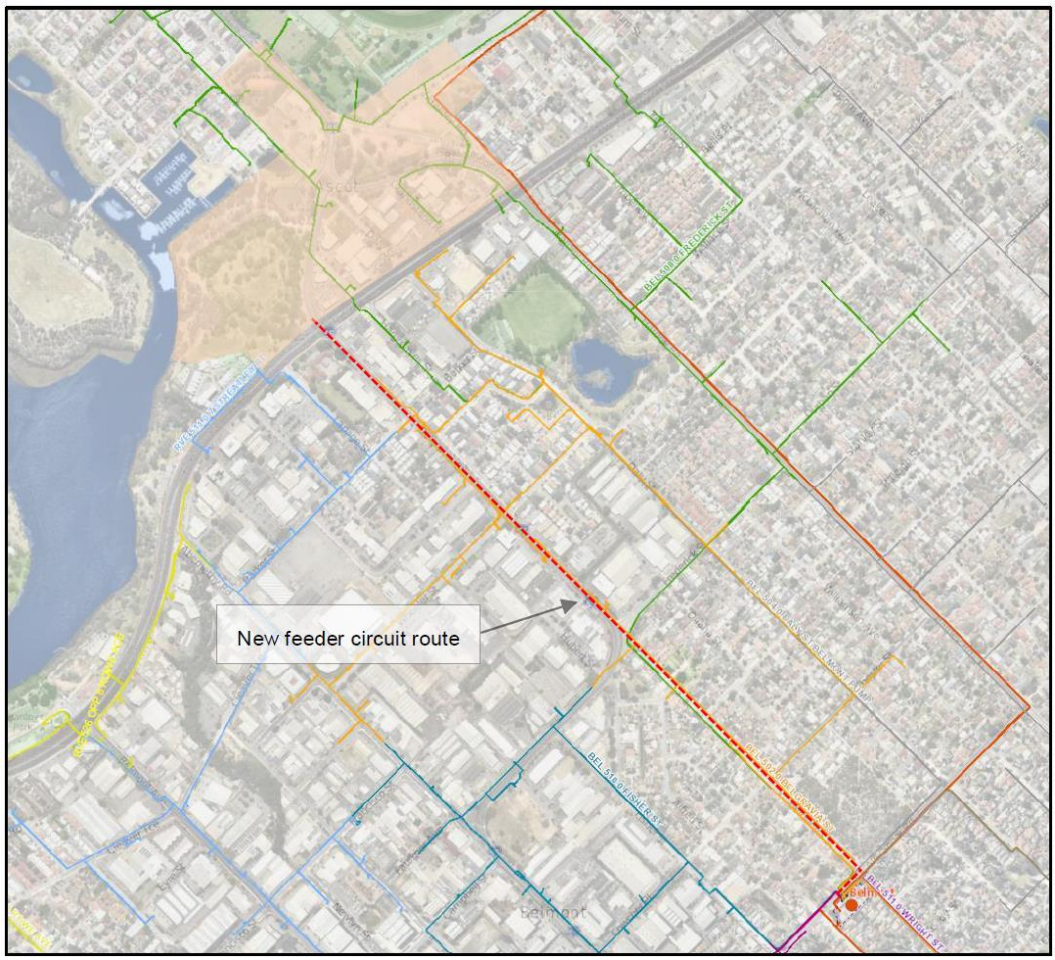


Western Power has completed a feasibility report for the proposed development, which is attached in Appendix B. Western Power has advised the following:

"Network analysis has identified that there sufficient capacity on the present configured network, and new feeder circuit would not be required as there are adequate spare capacity available on the BEL508 and surrounding feeders (BEL502 & RVE526) to fully accommodate the 8.325MVA total load. However, as the load growth to the redevelopment area is not expected till 2031, it is deemed reasonable that the provision to install a new 2km long feeder from BEL to entirely supply the 8.325MVA load may be required."

The proposed route of a new feeder from the Belmont Substation is shown in **Figure 4-3**.

Figure 4-3 Proposed Western Power Feeder Route
(Source: Western Power Feasibility Report – MF010862 – Golden Gateway Precinct, May 2017)



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5 Gas

5.1 Existing Infrastructure

Gas infrastructure and distribution in Western Australia is managed by ATCO Gas Australia.

Correspondence from ATCO Gas identifies Medium Pressure gas mains (pressure indicated at 70kPa) along most roads within the subject site.

Cardno Drawing *CW942300-CI- SK4* in **Appendix A** contains information on gas infrastructure in the vicinity of the area.

5.2 Required Infrastructure

Correspondence received from Atco Gas advised that the existing infrastructure can support the proposed development as outlined in the Structure Plan.

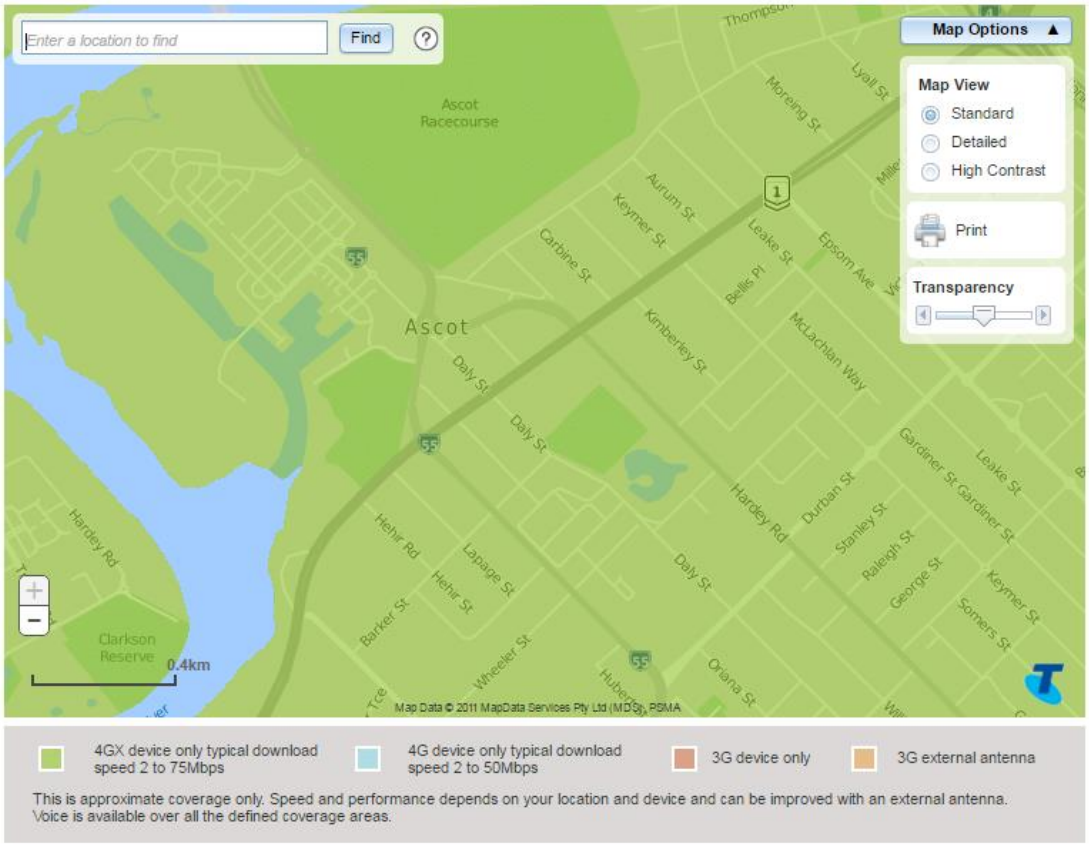
6 Communications

6.1 Existing Infrastructure

The subject area is well serviced by telecommunications infrastructure with optical fibre running in or adjacent to all precincts. This infrastructure is owned by various telecommunications providers including Telstra, Optus and others.

Refer to Cardno Drawing *CW942300-CI-SK5* in **Appendix A** for a detailed plan of the fibre optic cable locations.

Figure 6-1 Telstra Mobile Network Coverage
(Source: www.telstra.com.au/coverage-networks/our-coverage)



Mobile network coverage in the area is well serviced with 4G covering the entire subject area under the Telstra network (as shown in **Figure 6-1**); other network providers may vary.

The National Broadband Network (NBN) has yet to be rolled out in the subject area. However, NBN Co have advised that fibre to the node (FTTN) technology rollout has been planned for October-December 2017.

6.2 Required Infrastructure

6.2.1 Telstra

Should a developer wish to register a development with Telstra smart communities; this must be done twelve weeks prior to construction.

The infrastructure within a development will be installed by the developer. Alternatively, Telstra can be engaged to install infrastructure within a development at the developer's expense.

Telstra's commercial pit and pipe service will generally not be offered in developments where NBN Co has confirmed agreement to install NBN Co fibre within a development stage.

6.2.2 NBN

As NBN is still in the planning phase, it is recommended that the City of Belmont liaise with NBN Co as per the *Best practice guide for Councils when initially dealing with NBN Co* document published by the Australian Local Government Association and NBN Co.

In line with the new *Telecommunications Infrastructure in New Developments* policy, NBN is required to recover part of the cost of deploying network infrastructure by applying a deployment contribution charge. These deployment charges only apply to developers and builders.

- A charge of $400 per premises in multi dwelling units (MDUs).
- A charge of $600 per premises within a single dwelling unit (SDU).

A backhaul contribution charge may also apply to the development, NBN will clarify this requirement when the developer submits his application.

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APPENDIX A

EXISTING INFRASTRUCTURE

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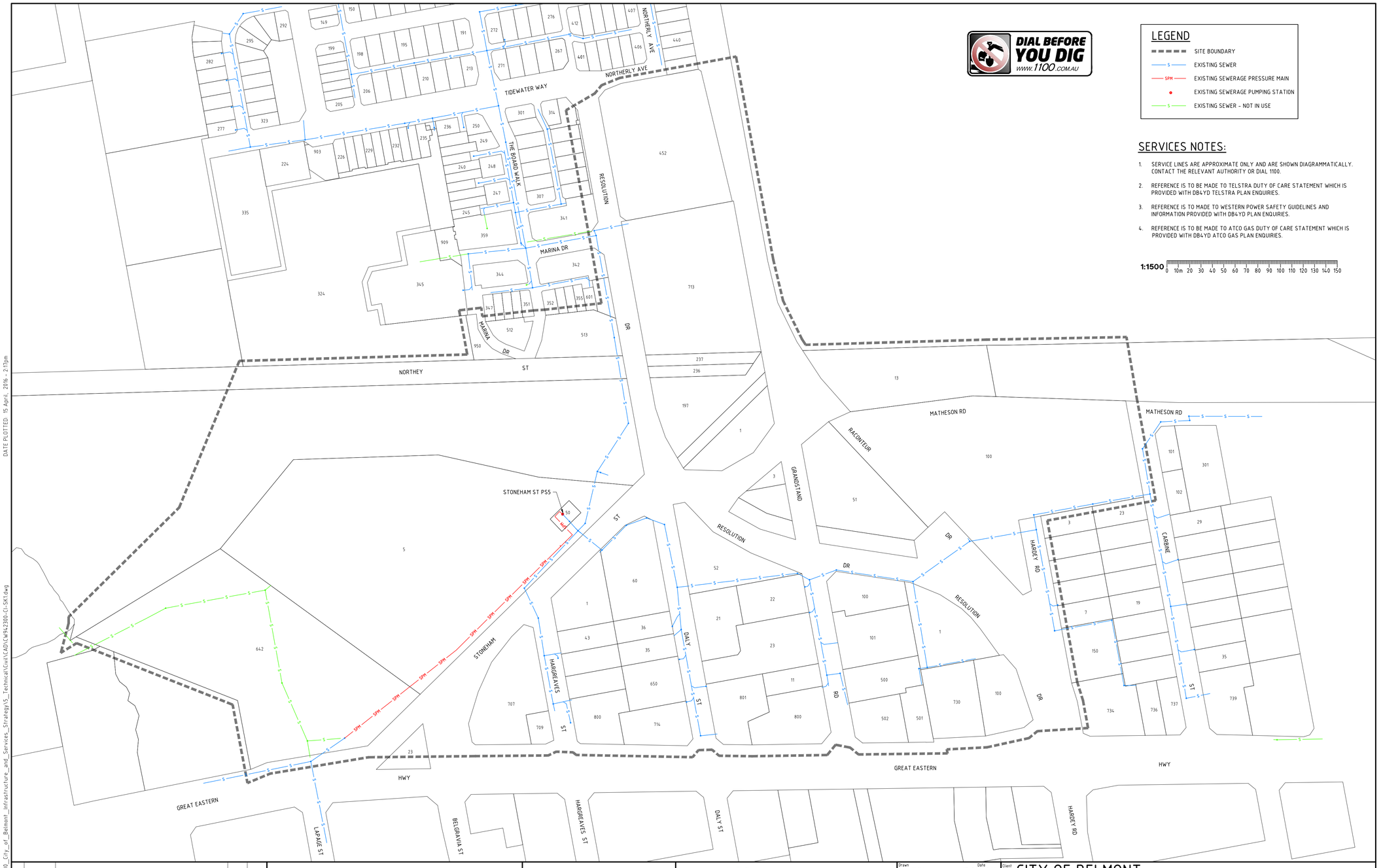

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Project: GOLDEN GATEWAY PRECINCT
Title: EXISTING SEWER SERVICE PLAN
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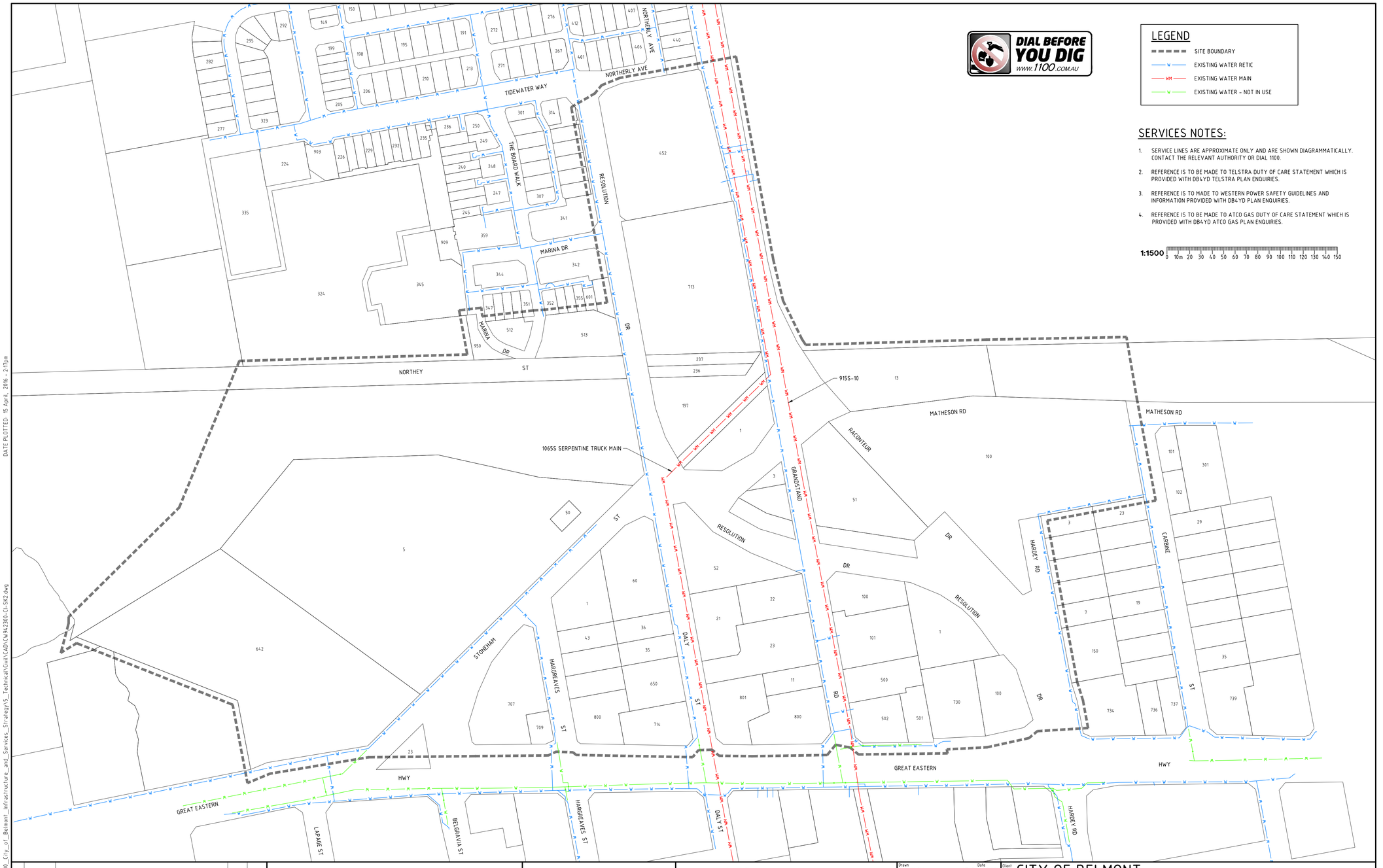

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Project: GOLDEN GATEWAY PRECINCT
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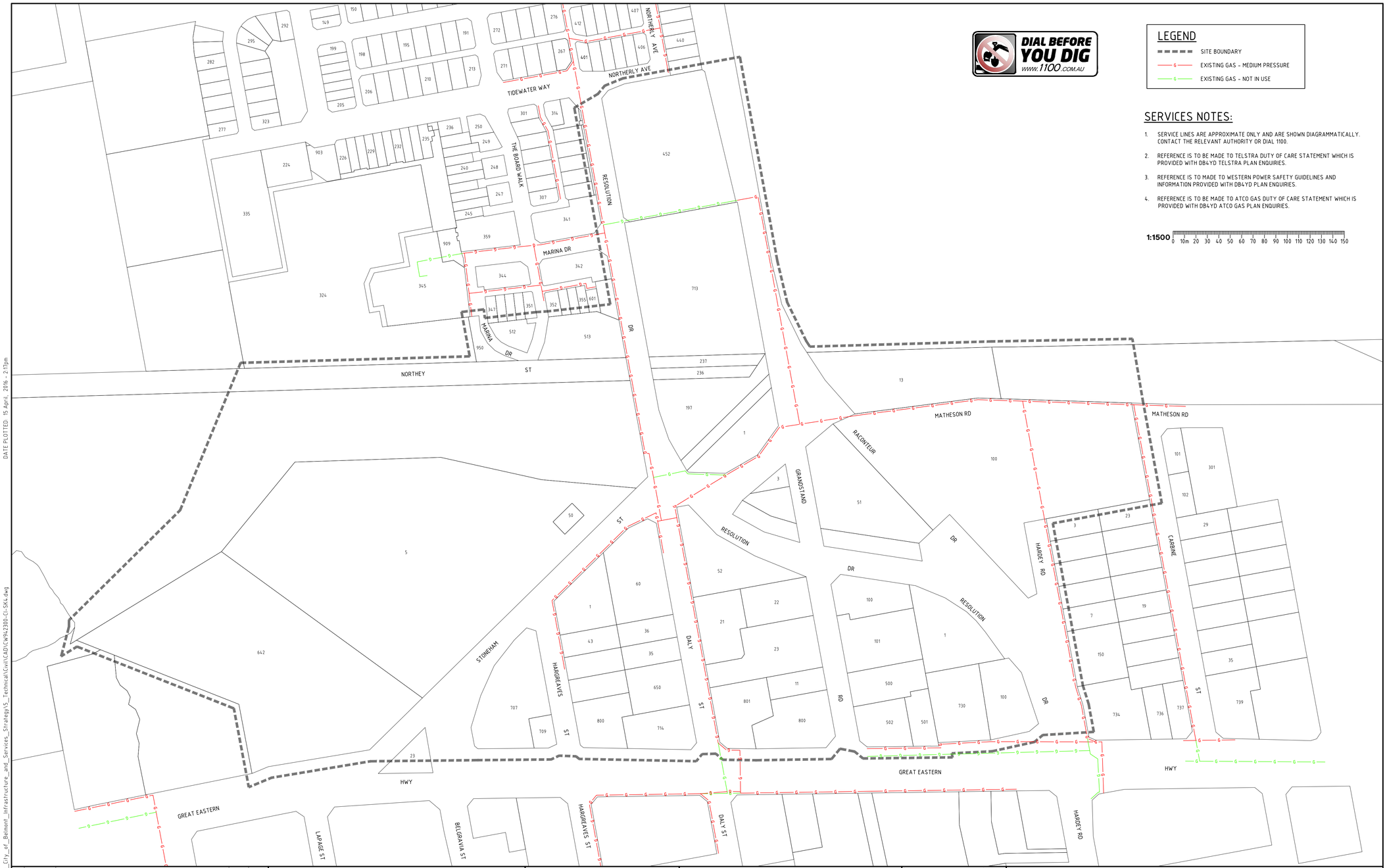

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Approved	PR	Date 15.04.2016

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Project: GOLDEN GATEWAY PRECINCT
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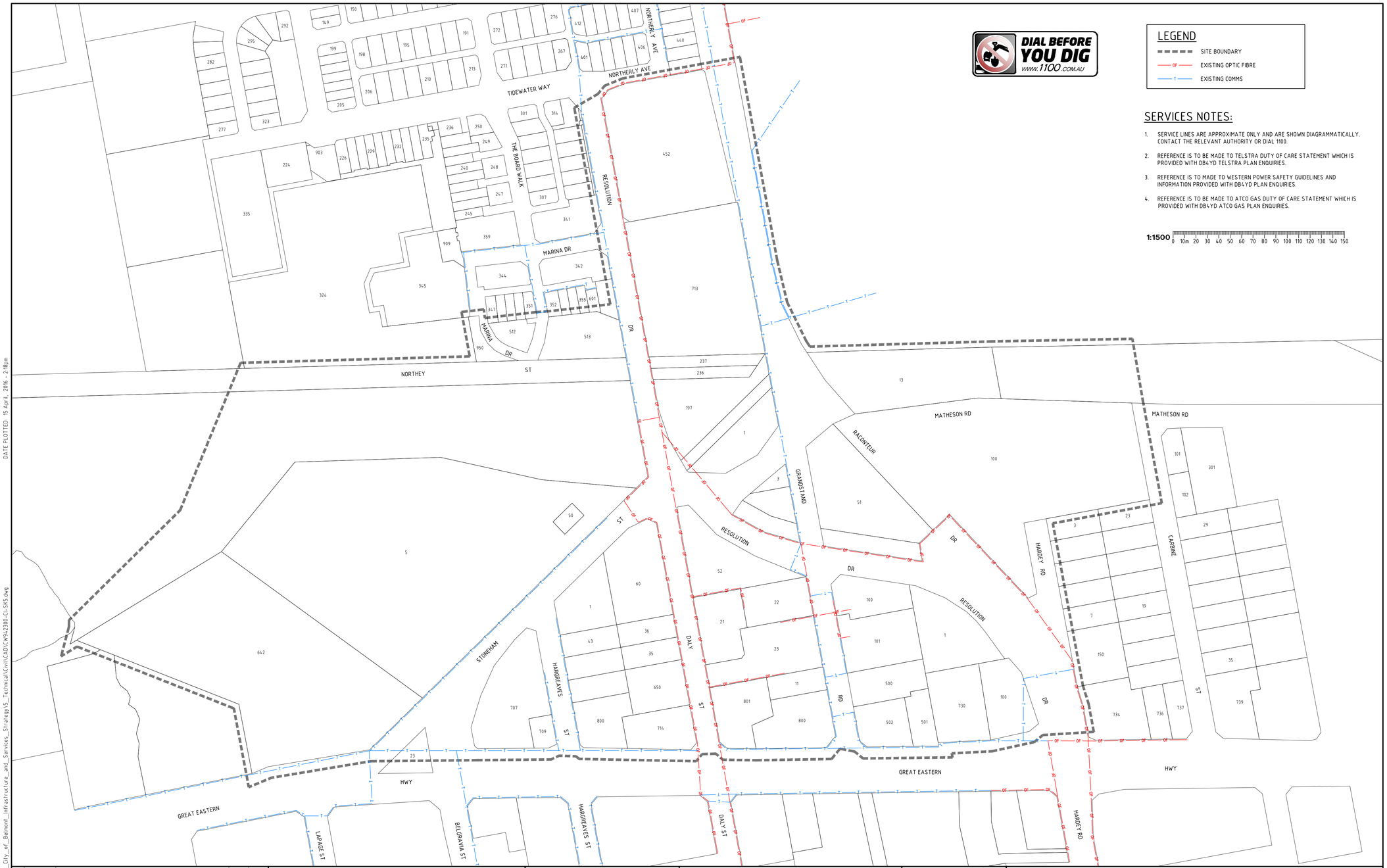

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LEGEND

- SITE BOUNDARY
- TD — EXISTING POWER OVERHEAD – TRANSMISSION
- O/H — EXISTING POWER OVERHEAD – HIGH VOL
- O/H — EXISTING POWER OVERHEAD – LOW VOL
- HV — EXISTING POWER UNDERGROUND – HIGH VOL
- LV — EXISTING POWER UNDERGROUND – LOW VOL

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Project: GOLDEN GATEWAY PRECINCT
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Date: 15.04.2016 | Datum: A.H.D | Scale: 1:1500 | Size: A1
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APPENDIX B

WESTERN POWER FEASIBILITY STUDY

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Feasibility Report

MF010862 – Golden Gateway Precinct

Large Mixed-Use Development – 8.325MVA Supply Options

5/05/2017

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A525

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Prepared by:

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Distribution Network Design Officer

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1 Introduction

1.1 Background

Cardno has submitted a feasibility study on behalf of the City of Belmont, in conjunction with the Department of Planning to undertake an infrastructure and services strategy for the Golden Gateway Precinct in Ascot. The strategy will help guide the preparation for the Local Structure Plan over the area. Cardno is seeking information on the available network capacity to supply the Golden Gateway Precinct.

1.2 Purpose

The proposed outcomes from the feasibility study are;

- Desktop network assessment on the nearby distribution HV networks to determine the available capacity from these networks.
- Network planning capacity assessment (Distribution & Transmission) to determine available capacity from zone substations within proximity to the development.
- High level scope of works for the transmission and distribution works required to provide up to 8.325MVA of capacity (if reinforcement or extension is required).

1.3 Scope of Study

The activities that will be undertaken to achieve the specified outcomes are;

1. Network Configuration Assessment
2. Network Impact Assessment
3. Western Power Scope of Works

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2 Study Activities

2.1 Activity 1 – Network Configuration Assessment

The proposed development are is set amongst the BEL508 22kV feeder network emanating from the Belmont zone substation (BEL) located approximately 2.0km south. The BEL508 22kV feeder along with three other HV feeder networks (BEL502, RVE511 & RVE526) are the only networks within close proximity to the redevelopment (figure 1).

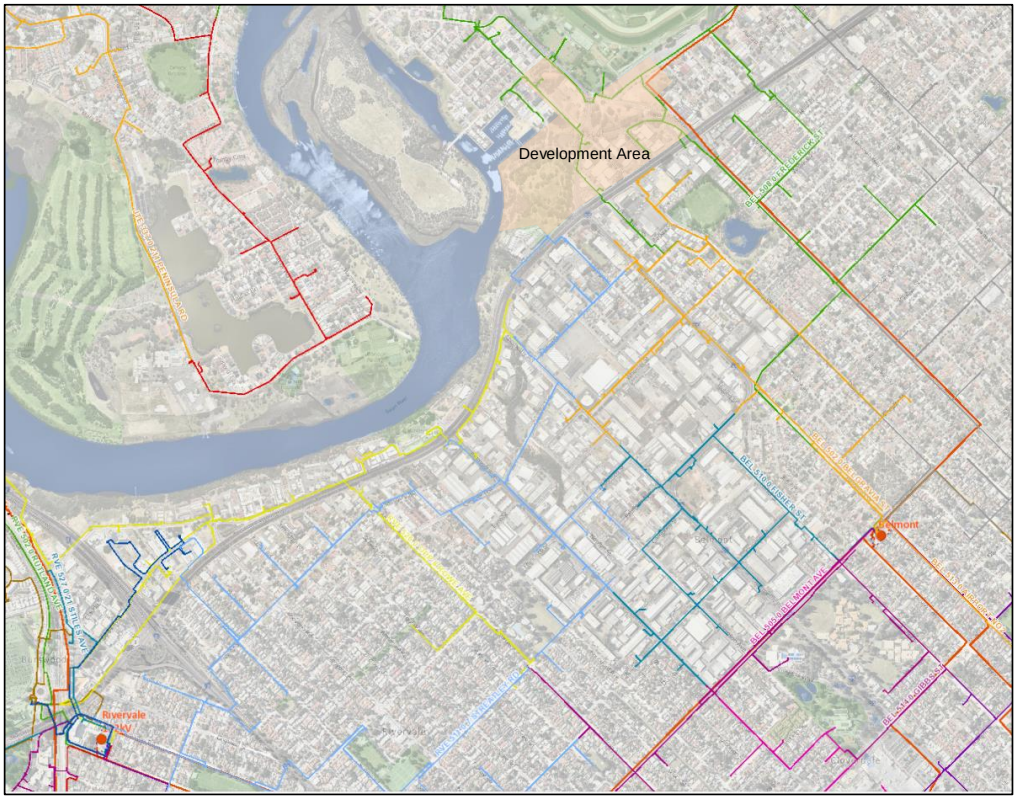

Figure 1 - Existing Distribution HV Network

2.2 Activity 2 – Network Impact Assessment

2.2.1 Transmission

Network analysis was carried out on the closet zone substation to the redevelopment area. It has been identified that there is sufficient spare NCR capacity available from BEL to cater for this 8.325MVA undiversified load. The load forecast chart for BEL is provided in figure 2.

Currently, BEL is supplied from the Cannington Terminal via BEL-KDL 81 line and BEL-RVE/WE 81 line (with the pre-contingency being BEL-NT/EP 81 line open). In connecting this load, it is not expected for the affected 132 kV transmission lines to experience the issue relating to the thermal over-loading or under-voltage, during the N-1 contingency. As well, connection of this customer load is not expected to trigger any voltage instability issues in the load area, hence this load is cleared to connect to the Western Power BEL network.

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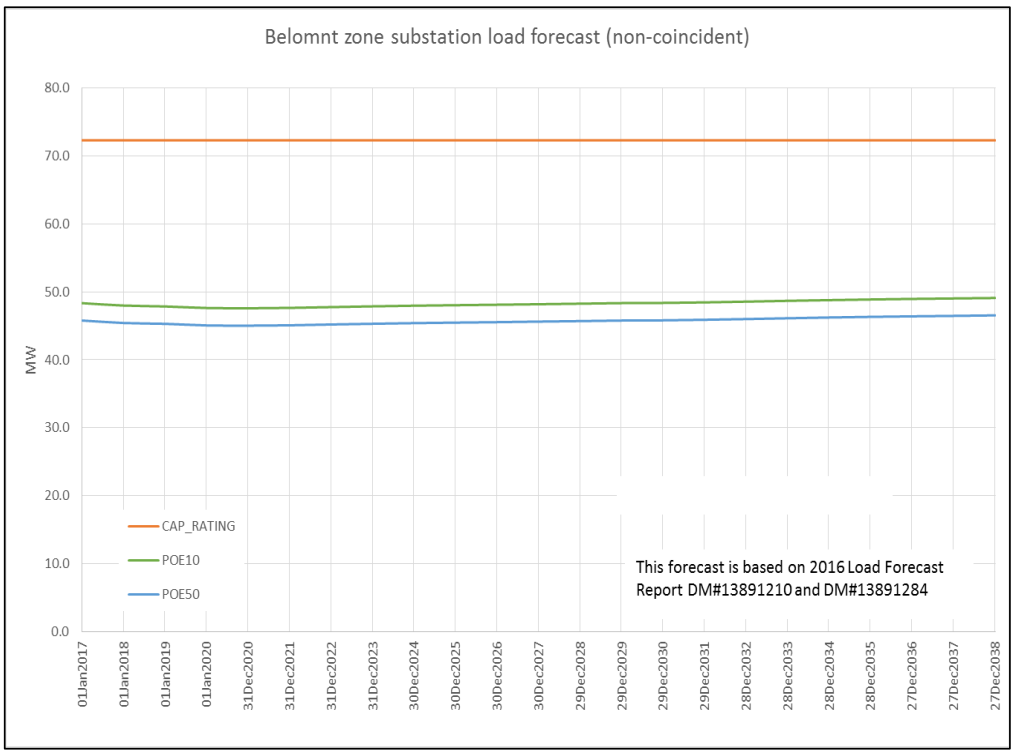

Figure 2 - BEL Zone Substation Forecast

2.2.2 Distribution

The entire redevelopment area is currently supplied by the BEL508 Frederick St feeder, including three other feeder networks (BEL502, RVE511 and RVE526) within close proximity. Based on the BEL508 feeder load readings (figure 3), there is approx. 3MVA of spare capacity available at this point of time that can be directly connected into. Additional network capacity can also be made available by network reconfiguration or extension, provided that there are significant spare capacity available on the nearby feeders at the time of connection. Hence, it is likely that the first few stages of development area can via supplied without any major network extension or reconfiguration.

Due to the expected timing of the power uptake, there is no certainty what spare capacity will still be available on the BEL508 feeder and other feeders around the proposed redevelopment area. Hence, it is not feasible to estimate what network extension will be required to create sufficient network capacity to supply the 8.325MVA load. An alternative option is to install of a new feeder from BEL to the proposed development boundary, near the intersection between Great Eastern Hwy and Stoneham St, to supply the entire 8.325MVA load. The new feeder circuit is likely to be installed along Belgravia St which will require approximately 2km of 400mm2 Al XLPE 22kV cable. Although there is no spare feeder circuits available at BEL, arrangement can be made (such as double feeders termination) to allow new feeder connections to the BEL.

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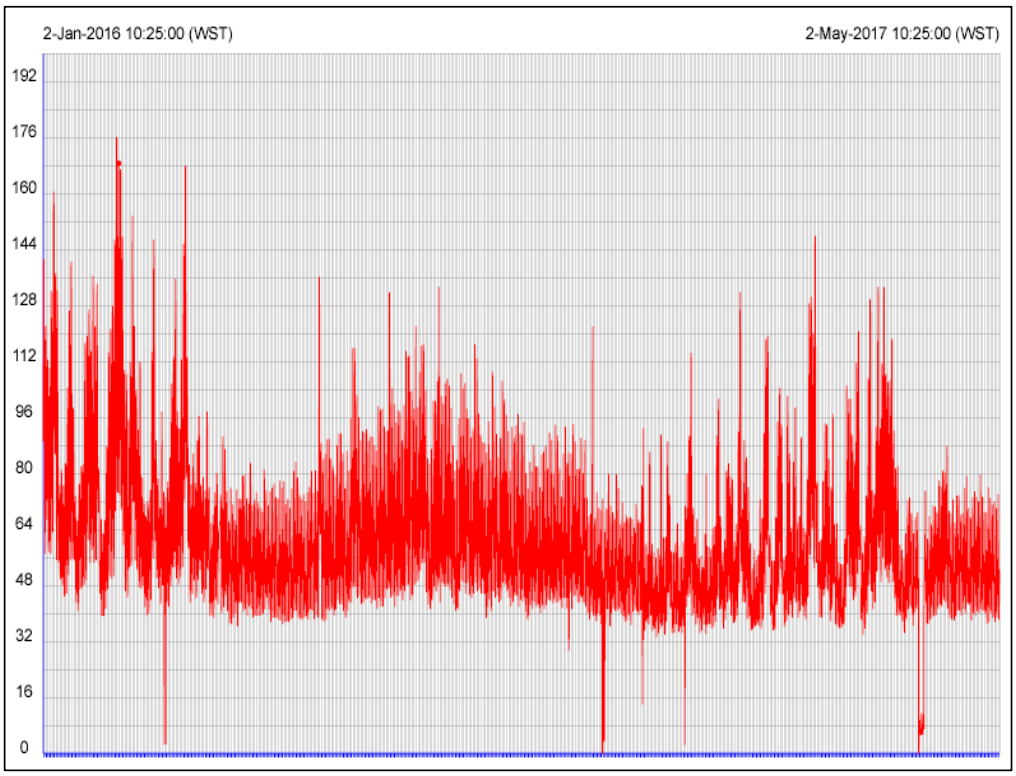

Figure 3 - BEL508 Feeder Utilisation

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3 Technical Evaluation

3.1 Supply Options

3.1.1 Overview

As stated in section 2.2.2 of this report, there is approximately 3MVA of spare capacity available on the BEL508 Frederick St feeder with the opportunity to utilise the surrounding feeders (BEL502 & RVE526) to fully accommodate the total 8.325MVA load until either exhausted by the customer's development or other competing applications. A new feeder circuit can be provided for further capacity beyond the existing HV networks capacity limitations.

Considering the above information, there are two design options which have been identified to meet the customers' requirements;

1. Utilise the remaining capacity available on the BEL508 feeder and other nearby HV networks until exhausted. The scope of works for this option cannot be defined due to the unknown load uptake and location of connections to the redevelopment area.

2. Once depleted, install approximately 2.0km of new underground cable from the BEL to the redevelopment area expected along Belgravia St.

3.1.2 Site Map

Figure 4 - Proposed Western Power Scope of Works

3.1.3 Western Power Scope of Works

With reference to the site map in section 3.1.2 of the document, the Western Power scope of works for the new feeder extension is as follows;

- The connection of the new circuit into the BEL zone substation.
- Cable installation by a combination of open trenching and directional drilling from the BEL to the corner of Great Eastern Hwy and Stoneham St.
- Cable jointing, including testing and commissioning.

3.1.4 Third Party Approvals

If any of the surrounding HV feeders are to be extended or a new feeder circuit is installed from BEL then it is likely that the proposed cable route will need to cross under the Great Eastern Fwy. This instalment of new cable will require the approval from Main Roads. The underground cable route will be determined when a formal application has been received and detailed planning studies have been conducted.

3.1.5 Assumptions

The customer contribution and scope of works are dependent on the following assumptions;

- No other connection requests and changes to network conditions prior to the formal application for this connection.
- The proposed design solution, estimated cost (non-binding) is based on the desktop information only & is subject to detailed design investigation.
- All new underground cables are assumed to be installed in at the Western Power standard depth (i.e. 850mm deep from finished level) and in the Western Power standard alignment (0-500m from property boundaries) apart from road crossings.
- Drilling depth of electrical cables under roadways must be between 1000 and 1500mm of ground level.
- Allowance of polypipe included for the proposed cable route where cable is crossing under roadway or deemed rock ground conditions.
- Main Roads approval is granted for works associated on Great Eastern Hwy
- The proposed works receive no objection from all involved parties (which may include local authorities, private land owners and/or other utilities).
- The interconnection works required within the development site boundary are not considered in the study.
- The load assessment on the submission of the formal application will support the customers load request.
- Environmental studies have not been undertaken for the purpose of this report.
- Detailed Load Flow and Power Quality studies have not been undertaken for this study.

4 Conclusions and Recommendations

Network analysis has identified that there sufficient capacity on the present configured network, and new feeder circuit would not be required as there are adequate spare capacity available on the BEL508 and surrounding feeders (BEL502 & RVE526) to fully accommodate the 8.325MVA total load. However, as the load growth to the redevelopment area is not expected till 2031, it is deemed reasonable that the provision to install a new 2km long feeder from BEL to entirely supply the 8.325MVA load may be required.

Applicants need to be aware that the information herein is provided in good faith and is accurate at the time of issue. Power systems are dynamic in nature, due to the connection of new users and changes in consumer behaviour. As such, Western Power's distribution electricity networks will change over time - this may have a bearing on the amount of reinforcement required to accommodate new developments.

As capacity cannot be reserved, it is possible that requirements will also be altered resulting in a variation in power infrastructure requirements. There may be other competing applications for new loads or upgrades which may use the available spare capacity.

Please be aware that Western Power's response may become out-of-date, resulting in a significant variation in power infrastructure requirements. To provide a firm connection proposal and cost, a formal application to Western Power will need to be made, in accordance with current connection policies.

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About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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Golden Gateway
PUBLIC REALM STRATEGY

July 2024

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DOCUMENT HISTORY AND STATUS

Golden Gateway - Public Realm Strategy

THIS REPORT WAS ORIGINALLY PRODUCED BY TAYLOR BURRELL BARNETT (TBB) ON BEHALF OF THE CITY OF BELMONT (COB). THIS HAS SINCE BEEN AMENDED BY THE CITY OF BELMONT.

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EXECUTIVE SUMMARY

This Public Realm Strategy has been prepared as part of the suite of detailed strategies and studies supporting the Local Structure Plan (LSP) for the Golden Gateway precinct in Belmont.

The purpose of this Strategy is to develop a clear vision, principles and objectives to inform development of the public realm. The design intent and functional requirements for elements of the public realm as articulated in this overarching framework will inform further detailed planning, design and management. Any graphical representations included in this Strategy are indicative only and demonstrate how the public realm could be developed.

The strategy creates an approach to the public realm that will create a distinctive urban character. The public realm will accommodate pedestrians and vehicles in a safe uncluttered manner and the streets and spaces will be shaded by trees that will form a strong visual landscape framework.

Existing local streetscapes are predominantly reflective of the commercial environment, particularly within the commercial 'triangle'. The standard of verge maintenance ranges from good quality reticulated lawns through to poorly maintained verges damaged by random, uncontrolled, overflow parking.

The extent and quality of the existing pedestrian infrastructure within, and surrounding, the site is of a standard commensurate with the nature of existing development across the subject land (i.e. primarily light industrial/commercial unit style development). Each of the major road corridors running through the precinct (Grandstand Road, Resolution Drive and Stoneham Street) include footpaths along one side of the street. The extent and quality of the existing cycling infrastructure within and surrounding the site is of a high standard, partly as a result of the Great Eastern Highway upgrades.

The Strategy sets out to provide a high quality urban framework that promotes pedestrian circulation, accommodates vehicles in a safe and logical manner and is an environment that presents a desirable destination to live, work and recreate. Placemaking should inform the detailed design of spaces throughout the precinct. The spaces need to be able to facilitate and accommodate diverse uses that may emerge from community social investment.

Places across the site will achieve a successful balance between physical attributes, the vehicle circulation and dynamic social, cultural and economic vitality. Its inherent qualities are strongly related to its proximity to the Swan River and its heritage related to the Ascot Kilns.

In accordance with best practice, the public realm should be designed to maximise universal access for all members of the community. Designs will need to comply with prevailing legislation but should also strive to safely accommodate ease of safe use encouraging full accessibility through all areas.

The strategy for the site comprises a number of different public realm space types ranging from the public open space (POS) area in the redundant portion of the Daly Street road reserve, boulevard high-use roads, and small streets. A cohesive approach across the public realm will consist of an urban landscape that reinforces a fluid and flowing spatial arrangement starting from the river parklands and extending this character throughout the subject land.

In terms of implementation, under normal circumstances, the development of the public realm is typically undertaken by a private developer/s as part of their private land subdivision process; however, given that the majority of the public realm already exists in the form of Crown Reserves (e.g. existing road reserves and Parks and Recreation reserved land) and the private land is under fragmented ownership, the City of Belmont will need to assume responsibility for implementing the Public Realm Strategy. The cost of this work and any mechanism to recover cost from private landowners through a Developer

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Contribution Plan or alternative funding mechanism to be determined by the City will require further consideration.

It is not anticipated that public realm improvements will be implemented at once, rather it should be progressively rolled out commensurately with the delivery of other key infrastructure particularly the modification of Daly Street into a cul-de-sac and subdivision works that may be required to create the environment for private redevelopment.

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1. INTRODUCTION

1.1 PURPOSE

This Public Realm Strategy has been prepared as part of the suite of detailed strategies and studies supporting the Local Structure Plan (LSP) for the Golden Gateway precinct in Belmont (refer **Figure 1**). The Public Realm Strategy does not apply to land designated as subject to further detailed planning by the Structure Plan. It is expected that the public realm for these land parcels will be carefully considered through further detailed planning.

The creation of a high quality and functional public realm, in the streets and open spaces, is a pivotal element in planning for a more intensified urban environment to create a liveable and well connected community.

The Public Realm Strategy has been developed in conjunction with the Golden Gateway Development Concept Plan that ultimately forms the cornerstone of the Golden Gateway LSP.

This document summarises the main issues/opportunities and design outcomes for the creation of a public realm, similar to the concept of an urban village. The purpose of this report is to inform the LSP and should be read in conjunction with it.

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Figure 1 - Local Structure Plan (Plan 1)

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1.2 SITE CONTEXT

The subject land is located approximately 5 kilometres (km) north east of the Perth Central Business District (CBD), 3 km north of Belmont Forum and 5 km north east of Victoria Park entertainment precinct (refer **Figure 2**). It is close to the Swan River and Ascot Racecourse and forms a triangular land parcel that is well connected to the regional roads. Further details on the planning context and background can be found in the LSP Part Two, Section 1 Planning Background.

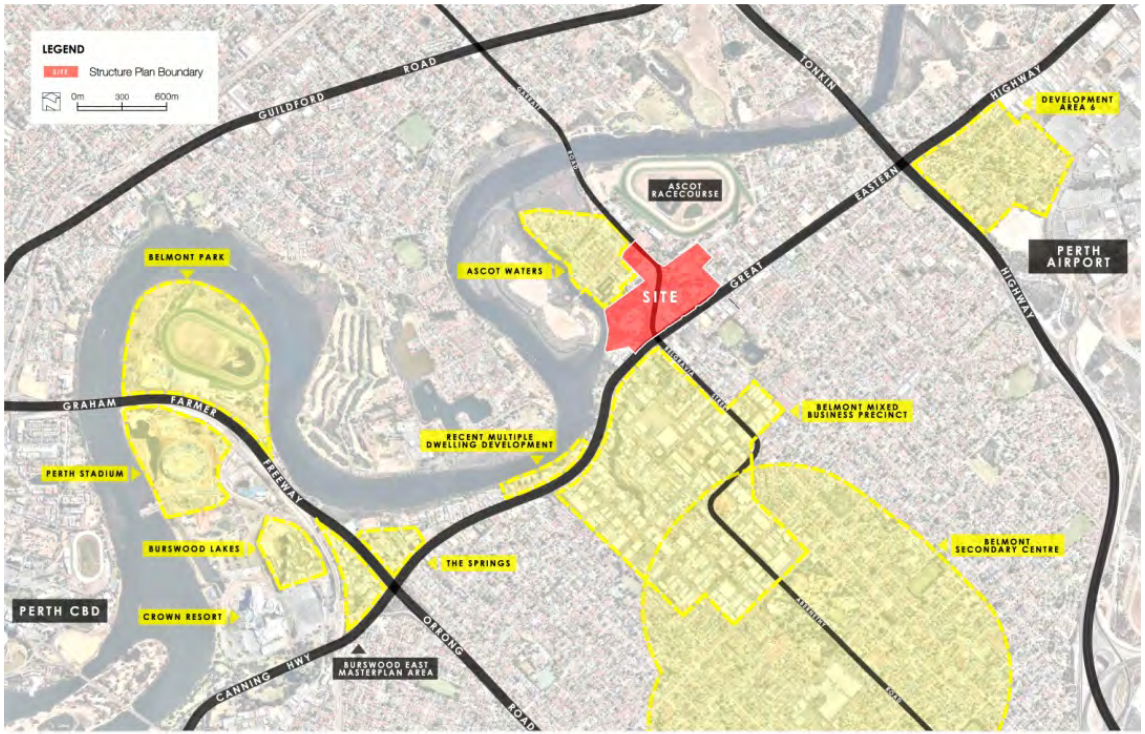

Figure 2 - Site Context Plan

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2. SITE ANALYSIS

2.1 URBAN FORM

The existing urban form of the site is very much influenced by its strategic location at the axis of a number of key movement corridors, dominated by Great Eastern Highway, Stoneham Street and Resolution Drive. The 'triangle' of land bounded by these roads contains a mix of office and commercial uses, including some more intensive retail/food and beverage outlets towards the eastern edge at Resolution Drive and Great Eastern Highway.

Outside of the 'triangle', the remainder of the LSP area consists of a number of different sub-precincts with very diverse functions and characteristics. These include a mix of land uses, including the administration headquarters of the WA Turf Club (WATC), the Ascot Kilns, overflow parking for the Ascot Racecourse, a substantial riverfront area held by the Belmont Trust, and a patchwork of residual government landholdings created by the past realignment of Resolution Drive and Stoneham Street.

While the existing urban form is largely unremarkable, the key features that are notable, in terms of future planning, include:

1. The Ascot Kilns, in particular the chimneys, which present an important visual and historical reference point in the precinct (refer **Figure 3**); and

2. The Belmont Trust land, which presents an opportunity for a strong public link to the Swan River, albeit presently isolated by Stoneham Street (refer **Figure 4**).

2.2 STREETSCAPE

Existing local streetscapes are predominantly reflective of the commercial environment, particularly within the commercial 'triangle' (refer **Figure 5**). The existing road reserves are typically 20m wide with wide carriageways to accommodate commercial vehicle movement as well as on-street parking. The standard of verge maintenance ranges from good quality reticulated lawns through to poorly maintained verges damaged by uncontrolled overflow parking.

Figure 3 - The Ascot Kilns Chimneys

Figure 4 - Belmont Trust Land

Figure 5 - Typical 'Commercial' Streetscape

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In 2014 Great Eastern Highway was widened/upgraded to improve regional traffic movement. The result is a heavily engineered, highly efficient arterial road, with four lanes of through-traffic, increasing to 6-7 lanes in places where there are long turning pockets and bus/cycle lanes at the intersections.

The footpath is approximately 3m wide and occupies the whole verge from kerb to boundary, with no street trees or other landscaping, as illustrated in **Figure 6**. This combined with the significant traffic activity immediately adjacent, presents an unappealing environment for pedestrians.

Resolution Drive and Stoneham Street are also heavily engineered arterial roads that offer little attraction to the pedestrian, although the Stoneham Street environment is somewhat softened by its interface with heavy vegetation along the periphery of the Belmont Trust land and the landscaped drainage area to the north.

Figure 6 - Great Eastern Highway

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2.3 MOVEMENT AND ACCESS

2.3.1 VEHICLE MOVEMENT

The LSP report provides a detailed analysis of the existing and proposed vehicle movement network. From a public realm perspective the key factors are as follows:

- The regional road system, comprising Great Eastern Highway, Stoneham Street, Resolution Drive and Grandstand Road, offer excellent connections in all directions; however, they also serve to segregate parts of the precinct, and isolate the site from the most attractive existing public realm asset, being the Swan River foreshore.
- The local road system, particularly through the commercial 'triangle', provide a high level of access and permeability for both vehicles and pedestrians, and offers an effective framework for future development of the site; and
- The local road system features wide (20m) road reserves, which, if retained, offer opportunities to design high standard streetscapes, with generous space available to devote to landscaping, pedestrians, street parking etc.
- Local access streets (Hargreaves Street and Grandstand Road (southern section) providing access in a northerly direction from Great Eastern Highway with poor pedestrian amenity and no existing footpaths present.

2.3.2 PEDESTRIAN NETWORK

The extent and quality of the existing pedestrian infrastructure within, and surrounding, the site (with the exception of Great Eastern Highway) is poor and of a standard commensurate with the nature of existing development across the subject land (i.e. primarily light industrial/commercial unit style development).

However, Great Eastern Highway bordering the site to the south features good quality footpaths on both sides of the corridor, although as previously mentioned, it is not a particularly appealing environment for pedestrians.

Within the vicinity of the site, the safe crossing of Great Eastern Highway by pedestrians is facilitated via traffic signal controlled intersections at both Stoneham Street/Belgravia Street and Resolution Drive/Hardey Road intersections with Great Eastern Highway.

Each of the major road corridors running through the precinct (Grandstand Road, Resolution Drive and Stoneham Street) include footpaths along one side of the street – Grandstand Road along the eastern side adjacent to the Ascot Racecourse, Raconteur Drive along the northern side to connect to Grandstand Road, Resolution Drive along the eastern side adjacent to the Ascot Waters development and Stoneham Street along the western side adjacent to the Belmont Trust land.

2.3.3 CYCLING

The extent and quality of the existing cycling infrastructure within and surrounding the site is of a high standard, partly as a result of the Great Eastern Highway upgrades.

A number of existing shared paths and cycling connections are located along primary routes, including Stoneham Street, Raconteur Drive and Grandstand Road providing local connections. There is demand to upgrade facilities on Stoneham Street and Resolution Drive. Protected bicycle lanes and a shared path on Resolution Drive is essential.

A number of shared paths are also located within the Ascot Waters development directly to the north-west of the site. The Graham Farmer Freeway Principal Shared Path (PSP) provides regional cycling connections and can be accessed via the shared path along the southern side of the Swan River.

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3. DESIGN OBJECTIVES

3.1 AN URBAN LANDSCAPE

The site forms an important gateway announcing the City of Belmont when approached from the south-west and north-east. The site is traversed with major roads and as discussed, its triangular form presents challenges in vehicular circulation and pedestrian accessibility. This location currently presents as a transient place that is passed through, however the design of the public realm will result in the creation of a cohesive network of spaces enabling the locality to be an identifiable place.

As a busy location, the public realm offers the opportunity to be transformative, linking uses and people to the nearby valued Swan River, its parklands and the heritage and interest of the Ascot Kilns.

The public realm spaces made up of streets and a park, combine to be a defining element of this location, that importantly the users, employees and residents will experience and define the qualities of the public realm.

The overall landscape design objectives for the public spaces are set out below:

3.2 IDENTIFIABLE CHARACTER

- Create a contemporary urban environment that promotes safe and easy pedestrian experiences.
- Create new diverse urban landscapes that reflect the subject land's unique characteristics and close links to the river parklands.
- Create spaces that encourage and accommodate local community use and engagement.
- Establish an aesthetic that promotes positive development and investment in the location.
- Celebrate the heritage significance of the Ascot Kilns.

3.3 VALUABLE LANDSCAPES

- Create a microclimate in public realm spaces and streets which encourages use and enjoyment.
- Provide key views and relationships that assist in orientation and legibility.
- Create highly utilised and valued public realm streets and spaces.

3.4 ENVIRONMENTAL/SUSTAINABILITY

- Create a durable urban landscape.
- Reduce urban heat sink characteristics.
- Create urban tree canopy (in compliance with The City of Belmont's Urban Forest Strategy 2014 and The Canopy Plan 2019-2024).
- Retain vegetation wherever practical.
- Promote the use of low water demand plants.
- Pursue water harvesting, passive irrigation and integrated urban water management.

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4. PUBLIC REALM OVERALL APPROACH

The site comprises a number of different public realm space types ranging from the POS area in the redundant portion of the Daly Street road reserve, boulevard high-use roads, and small streets.

A cohesive approach across the public realm will consist of an urban landscape that reinforces a fluid and flowing spatial arrangement starting from the river parklands and extending this character throughout the subject land. The creation of smaller pockets of activity and open space will be defined by street trees, tree groups and sinuous tree lines. Pedestrian spaces will be sheltered by a substantial tree canopy and vehicular routes flanked by boulevard plantings. A unified paving design and materials for pedestrian areas will extend throughout the subject land. This will both unify and delineate the different pedestrian and vehicular spaces.

Placemaking should inform the detailed design of spaces throughout the precinct. The spaces need to be able to facilitate and accommodate diverse activities that may emerge from community social investment. The location and development of the public spaces will be achieved through the successful balance between physical attributes, the vehicle circulation and dynamic social, cultural and economic vitality. The site's inherent qualities are strongly related to its proximity to the Swan River and its heritage related to the Ascot Kilns. It is the intention that distinctive physical spaces will be encouraged to evolve beyond the design, responding to the growing community and social and commercial opportunities. Spaces will consolidate a strong identity and character that is easily recognised by local users and visitors.

In accordance with best practice, the public realm should be designed to maximise universal access for all members of the community. Designs will need to comply with prevailing legislation but should also strive to safely accommodate ease of safe use encouraging full accessibility through all areas.

To reduce maintenance and water consumption, where possible, consideration should be made as to the use of hard surfaces or low water alternatives instead of turf. Water harvesting of hard surfaces is also exploited where possible using swales, channels and ground amendments to reduce the need for overall water consumption.

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5. PARKS

POS is to be provided generally in accordance with the development Concept Plan included as **Figure 7** and should be vested in the Crown and managed by the local government. The development of land included within the Swan River Trust Development Control Area will be subject to the approval of the Department of Biodiversity, Conservation and Attractions (DBCA). The POS is to provide for both informal active and passive recreation uses. These uses will not utilise large spaces for sports but provide activities for the community that may include a children's play area, walking paths, and grassed spaces for recreation purposes. The POS areas may accommodate stormwater generated from the proposed development of the site and this will be designed in such a manner that its function as local open space is not compromised.

Figure 7 - Development Concept Plan

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5.1 FORESHORE RESERVE

The 'Foreshore Reserve' creates a valued open space adjacent to the Swan River. The nature of the space, its future and development, is controlled largely by the Belmont Trust and is not the subject of this Public Realm Strategy but will be addressed by a separate study.

5.2 DALY STREET PARK

Daly Street is proposed to be converted into a cul-de-sac, in line with the Main Roads Western Australia vehicle access strategy for this section of Great Eastern Highway. This change presents a unique opportunity to create a POS area over the now redundant road reserve, as depicted in **Figure 7** on the previous page.

The new park will establish a vital connection to the Foreshore Reserve, enhancing the recreational space available to residents. This area may consist of native planting, walkways, children's play areas, and space for recreational activities. This transformation will not only improve local amenities but also strengthen the integration between the residential area and the natural beauty and POS function of the Foreshore Reserve.

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6. ROADS AND STREET TREATMENTS

6.1 GENERAL

Road hierarchies and overall legibility of the subject land will be reinforced by the type of tree planting associated with the scale of the road. The paving treatments within all streets and roads will feature a consistent material palette to reinforce the distinctive character of the area.

The scale and robust nature of proposed street tree species relate to the potential scale and height of built form. Street trees have an important role in the urban environment, improving microclimate and urban heat sink characteristics, reducing storm runoff rates and contributing to the character and qualities of neighbourhoods. The detailed design of roads will need to ensure the provision of adequate soil volumes within road reserves to ensure sufficient root development for street trees.

6.2 ROAD TREATMENTS

Road hierarchies and overall legibility of the precinct can be enhanced with the use of varied road and footpath paving treatments. Consideration should be given to the use of block pavers at road junctions or to create varying precincts within the development.

The selected paving treatments of local streets should emphasise the overall precinct character. All paving detailing at junctions and associated with pedestrian circulation should address both the need to reduce traffic speeds, manage drainage and create a distinctive character. Raised tables can be used to provide traffic calming and to add texture to the urban streetscape reinforcing a character that promotes pedestrian safety.

Cycle lanes throughout the site will be red asphalt except where they are incorporated into areas of feature pedestrian paving where colour differentials will relate to paving patterns, and if necessary, lanes defined by studs. Paving material changes will be used to accentuate areas such as major pedestrian road crossings, civic areas and hazards. Parking bays should be differentiated from the road reserve through the use of alternative paving treatments as shown in **Figure 8**.

The materials used for road pavement can assist with drainage management within the area. This may include the use of permeable paving and/or porous brick paving and/or porous asphalt. These materials can play a significant role in managing drainage in a water sensitive manner and where 'soft' open space is not an extensive feature of this location.

Figure 8 - Material Palette (illustration of indicative paving material palette, colour, type)

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6.3 RESOLUTION DRIVE AND STONEHAM STREET

Whilst Resolution Drive and Stoneham Street will be largely vehicle dominated, the landscape aesthetic will be dominated by tree planting of larger species, creating a canopy boulevard along its length. Verge and median planting will create a formalised sinuous corridor of canopy trees that are recognisably different to the scale and nature of other landscapes in the area (refer **Figure 9**). Street trees will be planted to create a boulevard aesthetic the length of the street, aiding in wayfinding (refer to section 10.2 for proposed tree species).

Figure 9 - Resolution Drive and Stoneham Street (Plan Extract and Indicative Section)

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6.4 CENTRAL STREETS

Hargreaves Street, Daly Street and Grandstand Road will comprise street tree planting that is not a monoculture but uses a mix of street trees (refer **Figure 10**) in varying combinations, to provide a dynamic and varied street tree canopy (refer to section 10.3 for proposed tree species). These streets will extend the overall public realm character established within the precinct but in a simpler manner. Street tree planting is proposed to create a canopied streetscape and to be positioned abutting the parallel parking embayments.

6.5 GATEWAYS

In key locations within the streetscape and public realm, highlight tree species will be used to create a visual accent. This can aid in creating distinctive spaces, and provide physical cues within a legible street network. These highlight species will be used to create gateways, focal points or to emphasise uses. The specific location for these gateways will be subject to more detailed investigation and planning at a later stage. Refer to section 10.4 for proposed tree species.

Figure 10 - Central Streets (Plan Extract and Indicative Section)

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7. INTEGRATED DRAINAGE MANAGEMENT

The use and promotion of Water Sensitive Urban Design (WSUD) techniques and approaches are to be utilised wherever possible throughout the site. The space for nutrient stripping is limited. As the urban area is not producing a nutrient load, the focus is on slowing runoff and reducing hydrocarbons. The use of linear and incidental 'rain gardens' and 'nutrient sinks' as demonstrated below and overleaf can be implemented discretely within paving in streets and areas of open space. These devices should be fully integrated with the road drainage promoting passive irrigation of street tree vegetation and controlling hydrocarbon runoff.

Within the context of a dense inner urban area, the design of these WSUD devices need not be natural in appearance but can be incorporated within the urban public realm infrastructure as a contemporary feature as demonstrated below and overleaf.

It is intended that the POS space within the redundant portion of the Daly Street road reserve will contain soft landscape areas. These areas present an opportunity to accommodate local drainage that is managed through swale type structures that infiltrate water and passively irrigate trees and other vegetation used in the public realm. This will be subject to further investigation and more detailed design at a later stage.

The use of permeable pavements and porous asphalt treatments in key locations is recommended, possibly associated with lower level threshold treatments of road junctions, should be incorporated as a component of the approach to integrated drainage management.

Examples of Rain Gardens & Swale Designs in an Urban Context (Jolimont Parkside Walk)

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Source: https://watersensitivecities.org.au/content/evolving-concept-wsud-statutory-land-planning/

Source: http://www.water.wa.gov.au/urban-water/urban-development/urban-water-design

Source: http://tclf.org/sites/default/files/microsites/landscape-patronage/riverbank-park.html

Source: https://landscapeperformance.org/case-study-briefs/randall-childrens-hospital

Source: http://www.landezine.com/index.php/2012/10/edinburgh-gardens-raingarden-by-ghd-pty-ltd/edinburgh-gardens-raingarden-by-ghd-pty-ltd-01/

Source: http://www.sfestuary.org/projects/detail.php?projectID=41

Examples of Rain Gardens and Swale Designs in an Urban Context

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8. STREET FURNISHING

Street furniture should be a selected single suite of items that are consistent across the site. The furniture should be reflective of the heritage and character of the area and located where it can function as more than a single use. For example, seats and benches should be located in a manner to restrict undesired errant access to protect and guide pedestrians as well as performing their obvious use. All furnishing will be from the same suite so that bicycle storage, seats and bollards are seen as one cohesive design style.

Source : EPCAD image library – Public access way by Hassel

Source : EPCAD image library

Source : EPCAD image library

Source : EPCAD image library – artwork by Marcus Canning and Christian de Vietri

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9. PUBLIC ART

Public art enhances spaces, makes places, adds to the community enjoyment of space and has a significant role to play within the Precinct. Public art can be of a scale that in itself is a focal point of interest, defining character and being a reason for space. Public art can also be an intimate smaller installation that relates to people when using areas of rest and repose, such as seating areas. The creation of 'place' can be enhanced through a sense of identity provided by the artworks. The creation of identifiable landmarks that can be observed and experienced as both a pedestrian and vehicle user can aid in legibility of the development. Importantly, in this location, creative installations could interpret the cultural and historic narrative of the area and enable strong connections with its context.

Source: EPCAD image library – Jolimont Parkside Walk

Source : EPCAD image library – Public access way by Hassel

Source : EPCAD image library

Source : EPCAD image library – artwork by Marcus Canning and Christian de Vietri

Source : EPCAD image library

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10. GOLDEN GATEWAY TREE SPECIES

10.1 PARK AND CIVIC SPACE SPECIES

Corymbia calophylla: Marri (large fruiting nuts) 30m+H	
Eucalyptus sideroxylon "Rosea" : Red Ironbark 15 -25m H	
Pheonix canariensis: Canary Palm 15m+	
Platanus x acerifolia: Spanish or London Plane 20 – 30m	
Tipuana tipu: South American Rosewood 7m	

10.2 STONEHAM STREET AND RESOLUTION DRIVE

Angophora costata: Smooth barked apple 15 – 25m high	
Eucalyptus sideroxylon "Rosea" : Red Ironbark 15 - 25m H	
Corymbia calophylla: Marri (large fruiting nuts) 30m+H	

10.3 CENTRAL STREETS

American Sweetgum or Liquidambar 12 – 18m high	
Eucalyptus torquate:	
Corymbia ficifolia: Red flowering Gum 8-15m	
Eucalyptus caesia	
Jacaranda mimosaefolia: Jacaranda	

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10.4 HIGHLIGHT SPECIES (GATEWAYS)

Lophostemon confertus: Queensland Box	
Pheonix canariensis: Canary Palm 15m+	
Platanus x acerifolia: Spanish or London Plane 20 – 30m	
Tipuana tipu: South American Rosewood 7m	

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11. IMPLEMENTATION

11.1 LANDSCAPE CONSTRUCTION AND MANAGEMENT

The public realm areas in the Golden Gateway area, will primarily be in government ownership; consequently, the City of Belmont will need to assume responsibility for implementing the Public Realm Strategy. However, given the significant potential for private redevelopment that is to be generated through the Golden Gateway LSP, it may be possible to recover some or all of the implementation cost from private development through development contributions or other funding mechanisms.

The LSP states that the City of Belmont could establish a funding strategy for the LSP Area. As part of the strategy, a Development Contribution Area (DCA) within LPS 15, under which a Development Contribution Plan (DCP) may be implemented to contribute to the funding of the public infrastructure requirements to facilitate development in the LSP Area would be considered.

Infrastructure items that would be eligible to be funded under a DCP should be in accordance with State Planning Policy 3.6 Development Contributions for Infrastructure (SPP 3.6) and may include:

- Land for POS and community facilities; and
- Landscape treatment for all public realm areas, including local roads.

Furthermore, detailed design of spaces throughout the precinct is encouraged through placemaking opportunities that emerge from community social investment.

11.2 WATER MANAGEMENT

Further to the recommendations of Section 7, in order to deliver wider environmental sustainability objectives, as well as providing attractive places in which residents and visitors can enjoy, consideration should be given to the conservation of water resources and quality of groundwater. The use of water efficiency measures is encouraged and should promote the investigation of best management practices for irrigation of POS.

The availability and quality of groundwater within the LSP area is limited at this stage. This will affect the ability of the City of Belmont to irrigate the proposed vegetation within the public realm areas. Therefore, due to the limitation of groundwater for irrigation purposes, the future irrigation of vegetation within the POS and public realm areas will need to be supplied by other sources. This may include scheme water, stormwater, irrigation (by agreement) from the Western Australian Turf Club's (now operating as Perth Racing) artesian groundwater licence, a new irrigation lake or other irrigation strategies will need to be investigated in the future. The City may encourage developers to consider the irrigation of abutting verge vegetation and street trees to ensure the high quality natural amenity of the public realm is maintained. Alternatively, non-irrigated (dry) landscape may need to be considered for the public realm areas.

11.3 STAGING

It is not anticipated that the entire landscape masterplan be implemented at once. It is anticipated that the work will be undertaken in stages and progressively rolled out commensurately with the delivery of other key infrastructure, particularly the various road realignments and subdivision works that are required to create the environment for private redevelopment.

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These works would create the framework enabling the public realm works to be implemented. Priority should be given to establishing Daly Street as a cul-de-sac and developing the redundant portion of the road reserve as POS. Following that, streetscape upgrades should occur to set the scene for future redevelopment.

The Golden Gateway LSP includes an indicative staging strategy. The public realm delivery should work in parallel with this program.

A Landscape Management Plan will be prepared at each stage of the infrastructure works. Each Landscape Management Plan will address the landscape design, implementation and ongoing maintenance of landscape elements within the site, and should reflect the public realm principles contained in this Strategy.

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7.29pm The Manager Governance and Legal departed the meeting.

7.30pm The Manager Governance and Legal joined the meeting.

7.31pm Cr Sekulla joined the meeting.

Cr Kulczycki disclosed at Item 3 of the Agenda "Disclosure of Interest" an Impartiality Interest in the following item in accordance with Regulation 22 of the *Local Government (Model Code of Conduct) Regulations 2021*.

12.2 Draft Golden Gateway Local Structure Plan

Voting Requirement	:	Simple Majority
Subject Index	:	116/113
Location/Property Index	:	Various Lots
Application Index	:	N/A
Disclosure of any Interest	:	N/A
Previous Items	:	28 August 2018 Ordinary Council Meeting Item 12.1 26 February 2019 Ordinary Council Meeting Item 12.6 23 June 2020 Ordinary Council Meeting Item 12.2
Applicant	:	City of Belmont
Owner	:	State Government, Local Government and Various Private Landowners
Responsible Division	:	Development and Communities

Council role

Legislative	Includes adopting local laws, local planning schemes and policies.

Purpose of report

For Council to consider the updated draft Golden Gateway Local Structure Plan (LSP) for the purpose of public consultation.

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Summary and key issues

- The draft Golden Gateway LSP has been prepared to coordinate the future subdivision, zoning and development of a portion of land in Ascot.
- Council considered the draft LSP following public advertising at the 23 June 2020 Ordinary Council Meeting (OCM). At this meeting, Council resolved to investigate and make modifications to the draft LSP.
- Following investigations, the draft LSP has been revised, with key modifications relating to:
  - The road network;
  - The Central Belmont Main Drain and public open space;
  - Built form controls that consider current and future development feasibility; and
  - The designation of Perth Racing landholdings as subject to a separate planning process.
- It is recommended that Council support the modifications and
- re-advertising of the draft Golden Gateway LSP.

Officer Recommendation

Sekulla moved, Kulczycki seconded

That Council endorses the modified draft Golden Gateway Local Structure Plan for public advertising in accordance with *Schedule 2, Part 4, Clause 18 and Clause 19(2) of the Planning and Development (Local Planning Schemes) Regulations 2015 (WA)*.

Carried Unanimously 7 votes to 0

For: Davis, Kulczycki, Marks, Rossi, Ryan, Sekulla and Sessions

Against: Nil

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Location

The draft Golden Gateway LSP encompasses land generally bound by Great Eastern Highway, the Swan River, Resolution Drive (north), Grandstand Road (north), the south-eastern boundary of Ascot Racecourse, Carbine Street and Hardey Road as reflected in Figure 1 below.

Although the Belmont Trust Land is not subject to development controls under the LSP, it is included within the precinct due to its potential for providing public open space and connectivity to the Swan River.

Figure 1: Golden Gateway Local Structure Plan area (outlined red)

Consultation

The draft Golden Gateway LSP was advertised in October 2019. Following advertising and consideration of submissions, Council resolved to investigate and make modifications to the draft LSP and supporting reports and readvertise these documents.

The *Planning and Development (Local Planning Schemes) Regulations 2015 (WA)* requires a local government to advertise a structure plan for 42 days by publishing:

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- The proposed structure plan;
- A notice of the proposed structure plan; and
- Any accompanying material in relation to the proposed structure plan.

Additionally, the local government may advertise a structure plan by notifying affected owners and occupiers and erecting signs on the land.

Should Council endorse the modified LSP for advertising, it will be advertised by:

- Sending letters to landowners and occupiers within and surrounding the precinct, including all properties in Ascot Waters and the Residential and Stables area.
- Sending letters to Government Agencies.
- Sending letters to those who previously lodged a submission.
- Placing a notice in the Perth Now Newspaper.
- Displaying a notice and information on the City's website and the Belmont Connect webpage.

It should be noted that the *Planning and Development (Local Planning Schemes) Regulations 2015 (WA)* stipulate that a local government cannot advertise modifications more than once without approval from the Western Australian Planning Commission (WAPC). Therefore, this will be the final opportunity to advertise the LSP without the need to seek WAPC approval.

Strategic Community Plan implications

In accordance with the 2024–2034 Strategic Community Plan:

Key Performance Area: Place

Outcome: 6. Sustainable population growth with responsible urban planning.

Key Performance Area: Performance

Outcome: 11. A happy, well informed and engaged community.

Policy implications

There are no policy implications associated with this report.

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Statutory environment

Strategic Planning Framework

Perth and Peel @ 3.5 Million

The State's 'Perth and Peel @ 3.5 Million' impacts upon the statutory direction for the City.

The Perth and Peel region will need to accommodate significant population growth by 2050 with an additional 1.5 million people requiring approximately 800,000 new homes. The 'Perth and Peel @ 3.5 million' strategic planning framework requires 47% of this growth to be delivered through infill developments. It identifies that the City of Belmont population will increase from 37,360 to 60,260 people by 2050 and to accommodate that increase an additional 10,410 dwellings will be required.

Perth and Peel @ 3.5 Million promotes the concept of 'urban corridors' as a way of achieving integrated land use and transport outcomes. Great Eastern Highway is identified as an 'urban corridor' and abuts the Golden Gateway LSP area. The framework suggests that land around urban corridors is appropriate for increased residential densities and mixed land uses.

City of Belmont Local Planning Strategy

The City of Belmont Local Planning Strategy (2011) is the strategic planning document that broadly sets out the long-term planning direction for the City. The Strategy also informed the preparation of Local Planning Scheme No. 15 (LPS 15). The key objectives of the Local Planning Strategy and its supporting sub-strategies as relevant to the Golden Gateway precinct are as follows:

- Enhance the north-west entrance to the City.
- Encourage landmark development.
- Produce a Structure Plan and Implementation Plan for the locality.
- Utilise the development process to rationalise and improve traffic access to commercial properties along Great Eastern Highway.
- Provide more pedestrian crossing points along Great Eastern Highway.
- Provide for higher density residential development along Great Eastern Highway, in addition to mixed use, landmark buildings that create an entry statement and a high standard of urban amenity.
- Acknowledge that Ascot Racecourse and the Swan River are 'strategic tourism sites' of State significance to benefit future tourism development.

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- Recognise the importance of the river for transport, commerce, tourism and leisure as well as its conservation values.

Draft Great Eastern Highway Urban Corridor Strategy

The Strategy establishes a 'vision' for the Great Eastern Highway corridor and proposes a series of implementation strategies to deliver this. It identifies four precincts along Great Eastern Highway and provides guidance on their development. Precinct 2 includes the section of Great Eastern Highway between Belmont Avenue and Hardey Road, of which the northern side of the highway falls within the Golden Gateway precinct.

The Strategy identifies this area as an 'activity node', which is envisioned to be developed as a creative hub comprising a mixture of commercial uses, civic spaces, offices, professional and technical service uses. Cafes and restaurants are also envisaged to emerge as the local workforce grows and will also be supported by higher density residential development.

Council endorsed modifications to and re-advertising of the draft Great Eastern Highway Urban Corridor Strategy at the 26 September 2023 OCM. The document was advertised from 27 June 2024 until 26 July 2024.

The draft Golden Gateway LSP and the draft Great Eastern Highway Urban Corridor Strategy will be coordinated to ensure both documents present a consistent direction for future development.

City of Belmont Activity Centre Planning Strategy

The Activity Centre Planning Strategy (ACPS) has been prepared to guide the future planning and coordination of activity centres within the City of Belmont. The ACPS identifies a future local centre within the Golden Gateway precinct, which includes a portion of Perth Racing's land.

Statutory Planning Framework

Metropolitan Region Scheme

Under the Metropolitan Region Scheme (MRS), the area is primarily zoned 'Urban', with a portion of land abutting the Swan River reserved for 'Parks and Recreation' and located within the Swan River Development Control Area. Great Eastern Highway, which abuts the precinct, is reserved as a 'Primary Regional Road' under the MRS and is controlled by Main Roads Western Australia (MRWA).

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Planning and Development Act 2005 (WA)

Part 10, Division 3, Section 153 of the *Planning and Development Act 2005 (WA)* provides for the Commission to impose conditions as part of a subdivision approval for four lots or more which requires:

- A portion of land to be set aside for parks, recreation grounds or open space.
- A landowner to make a payment to the local government in lieu of providing public open space.

Section 154 of the Act requires money received by a local government to be paid into a separate reserve account established and maintained under the *Local Government Act 1995 (WA).* The Act requires this money to be applied:

- For the purchase of land for parks, recreation grounds or open spaces by the local government in the vicinity of which it was received.
- In repaying any loans raised by the local government for the purchase of such land.
- With the approval of the Minister for the improvement or development as parks, recreation grounds or open spaces vested in or administered by the local government for those purposes.

Planning and Development (Local Planning Schemes) Regulations 2015 (WA)

Part 4, Schedule 2 – Deemed Provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015 (WA)* (the Regulations) outlines the procedure for the preparation, advertising and consideration of a structure plan. The key requirements under Part 4 of the Regulations are as follows:

- The local government must advertise a structure plan for at least 42 days unless otherwise approved by the WAPC.
- Within 60 days from the last day for making submissions, the local government must consider all submissions made on the proposed structure plan and prepare a report for the WAPC which includes the following:
  - A list of the submissions considered by the local government;
  - Any comments by the local government in respect of those submissions;
  - A schedule of any proposed modifications to address issues raised in the submissions;

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  - The local government's assessment of the proposal based on appropriate planning principles; and
  - A recommendation by the local government on whether the proposed structure plan should be approved by the WAPC.
- If the WAPC is not given a report on a proposed structure plan they may make a decision on the proposed structure plan in the absence of a report. In making a decision, the WAPC may request technical advice or further information from the local government and if the local government fails to provide this, the WAPC may obtain the information themselves. If the WAPC incur any costs during this process, they may seek to recover these from the local government.
- The local government may advertise any modifications proposed to the structure plan to address issues raised by submissions; however it cannot advertise modifications on more than one occasion without approval from the WAPC.
- On receipt of a report on a proposed structure plan from the local government, the WAPC must within 120 days, consider the plan and determine whether to approve the structure plan, require the structure plan to be modified or refuse the structure plan.
- The WAPC may direct the local government to readvertise the structure plan where it considers that major modifications have been made; however, it cannot direct the local government to readvertise the structure plan on more than one occasion.

Local Planning Scheme No. 15

Private landholdings within the precinct are predominantly zoned 'Mixed Use' under LPS 15, with parcels of Perth Racing land zoned 'Place of Public Assembly'. In addition, the open drain abutting Resolution Drive is reserved as 'Parks and Recreation' and various parcels of Crown land and road reserves are reserved as 'Local Roads' under LPS 15. Figure 2 illustrates the existing zoning of the precinct.

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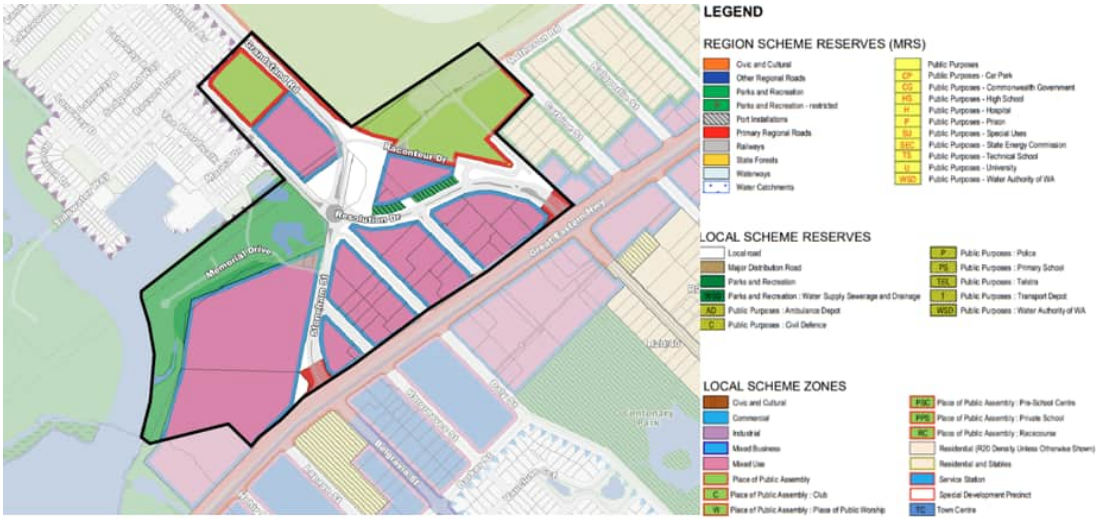

Figure 2: Extract of Scheme map

State Planning Policy 7.3 – Residential Design Codes

The Residential Design Codes (R-Codes) establish built form controls for all residential development within Western Australia and are used in the assessment of residential development and subdivision proposals. Volume 1 of the R-Codes establishes standards for single houses, grouped dwellings, and multiple dwellings up to R60. Volume 2 of the R-Codes specifically relates to multiple dwelling developments at the R80 code and above.

Liveable Neighbourhoods

Liveable Neighbourhoods is an operational policy that guides planning in greenfield and large urban infill areas. It provides guidance on the design of movement networks, activity centres, subdivision design and public open space provision.

Liveable Neighbourhoods typically requires a minimum contribution of 10% of the gross subdivisible area to be given up free of cost for public open space. However, in the case of mixed-use development, there is no minimum requirement for the provision of public open space. Instead, Liveable Neighbourhoods outlines that public open space contribution is to be determined by the WAPC on a case-by-case basis having regard to:

- The amount of mixed uses proposed and the potential number of residents;
- The amount of public open space available in 300m of the mixed-use area;

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- The proportion of the mixed-use area likely to be used for non-residential purposes; and
- The level of innovation and quality of the resultant urban form in neighbourhood and town centres.

Background

Golden Gateway Precinct

In 2008, the Golden Gateway precinct was identified as a key strategic area due to its prominent position on Great Eastern Highway and at the north-western 'gateway' of the City of Belmont. It was recognised that there was significant potential for high quality mixed commercial and residential development in the location, however existing site access constraints and land fragmentation made it apparent that coordinated planning was required in the form of a structure plan.

Draft Golden Gateway Local Structure Plan

The draft Golden Gateway LSP was prepared to address the following:

- The proposed zoning, reservation and density coding of land within the precinct, and prescribes the suitability of certain land uses.
- Built form controls including plot ratio, minimum and maximum building height, setbacks and car parking requirements.
- The provision of public open space and public realm improvements.
- The identification of a road hierarchy and movement network for vehicles, pedestrians and cyclists, as well as the consideration of street design and traffic management.
- Strategies for the management and treatment of stormwater runoff within the precinct.
- The identification of infrastructure and servicing requirements for the redevelopment of the precinct.
- Requirements to facilitate implementation of the draft LSP.

Council resolved to advertise the draft structure plan at the 26 February 2019 OCM.

At the 23 June 2020 OCM, Council resolved to investigate various matters and undertake a number of modifications prior to readvertising. Council's resolution is contained as Attachment 12.2.8. A table of Council's requested

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investigations/modifications to the draft Structure Plan and the corresponding officer comment is contained as Attachment 12.2.9.

The following attachments are associated with this report:

- A copy of the updated LSP is included as Attachment 12.2.1.
- Attachment 12.2.2 through 12.2.6 include the technical appendices.
- Attachment 12.2.7 contains a copy of the 23 June 2020 OCM minutes.

Report

The revised draft LSP contains the following key modifications:

- The designation of Perth Racing landholdings as subject to a separate planning process;
- The road network;
- Built form controls that consider current and future development feasibility; and
- The Central Belmont Main Drain and public open space.

These matters are discussed in further detail below.

Area to which the Structure Plan Applies

The 'core' of the Golden Gateway precinct contains land parcels of fragmented ownership. The remainder of the precinct encompasses the Ascot Kilns site and Belmont Trust Land, as well as several land parcels owned by Perth Racing. These areas will be further discussed below.

Perth Racing Landholdings

Perth Racing are seeking to progress a planning framework for their landholdings to guide future development. This includes several of their lots located within the Golden Gateway precinct, as outlined in Figure 3.

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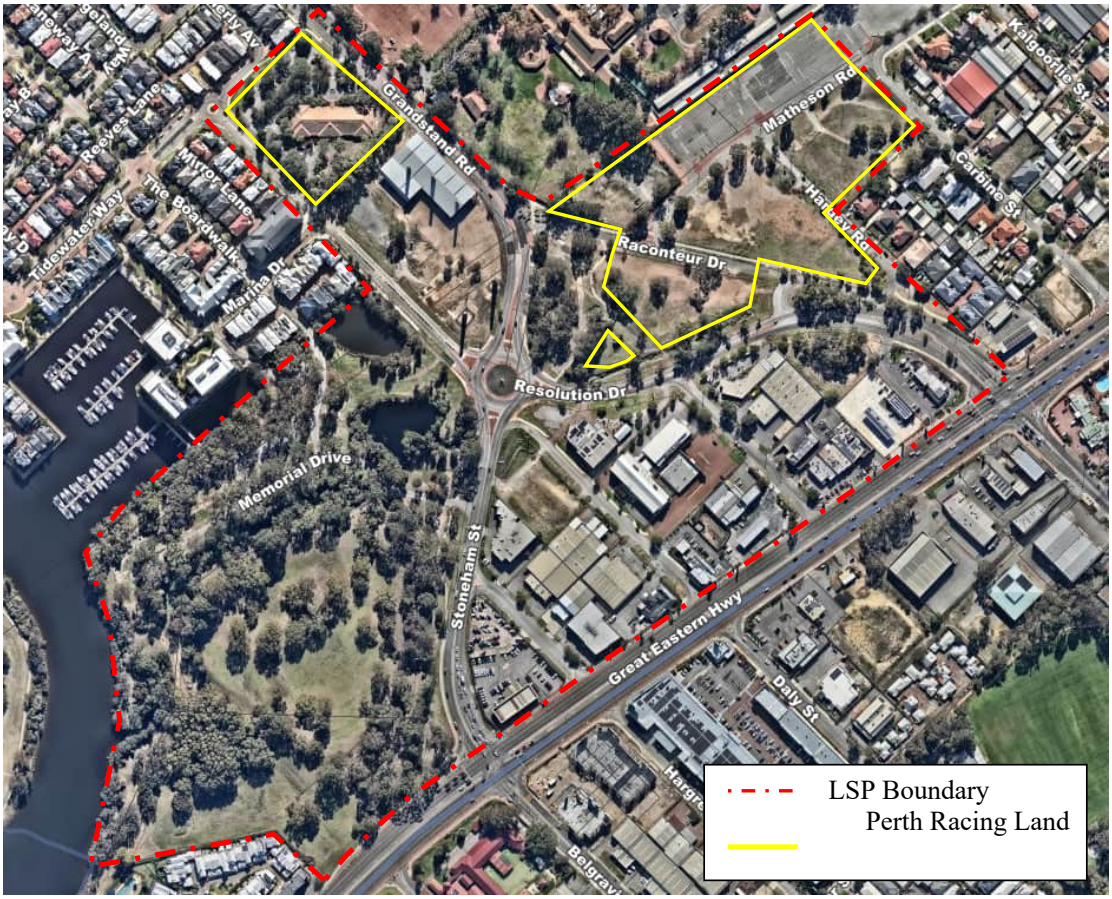

Figure 3: Perth Racing land subject to separate planning process

Following discussions with Perth Racing and the Department of Planning Lands and Heritage (DPLH), it is deemed appropriate to designate Perth Racing's land within the Golden Gateway precinct for further detailed planning. This approach allows Perth Racing to conduct their own planning while enabling the LSP to progress. Retaining Perth Racing's land within the broader LSP boundary ensures that future planning for both areas is coordinated holistically. Various modifications have been made to the document, including updates to Plan 2 – Precinct Plan, the Building Height Plan, the Precinct Development Table, and textual revisions throughout to account for this.

Belmont Trust Land

The Belmont Trust Land is subject to a Declaration of Trust which requires the land to be provided for public enjoyment and recreation.

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In the June 2020 report to Council, officers noted the following regarding the Belmont Trust Land:

- The future use/development of the land for public enjoyment and recreation would have implications for the wider Golden Gateway precinct, such as public open space, access and traffic. It would be appropriate to consider these matters holistically rather than in isolation, which could be achieved by way of a later amendment to the LSP.
- The land provides a connection between the Swan River, the Golden Gateway precinct and the wider area.

To provide further clarification regarding the Belmont Trust Land, Council resolved to:

(a) Replace references to the Belmont Trust Land with Belmont Charitable Trust Land.

(b) Include text within the draft Local Structure Plan that explains that the Belmont Trust Land is for public recreation and enjoyment, and further planning work needs to be undertaken at a later date to ensure adequate access to the site, and an appropriate interface with the surrounding properties.

These modifications have been incorporated into the document.

The relationship between the Belmont Trust Land and public open space within the Golden Gateway precinct will be further detailed in the Public Open Space and Central Belmont Main Drain heading of the report.

Ascot Kilns

At the 23 June 2020 OCM, Council resolved to amend all plans within the draft LSP to identify the Kilns site as being owned by the State Government. Council also resolved to stipulate that the Ascot Kilns site requires a Local Development Plan and a minimum 10% public open space area. These modifications have been made to the document.

Road Network

The draft LSP originally proposed the following changes to the road network:

- Realigning Resolution Drive.
- Converting the existing roundabout at Stoneham Street, Grandstand Road and Resolution Drive to traffic signals.

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- Proposing a new roundabout at the connection of Resolution Drive, Grandstand Road and Stoneham Street.
- Realigning Grandstand Road through private property to connect to Daly Street.

A comparison of the existing road network against the original proposal is shown in Figure 4 below.

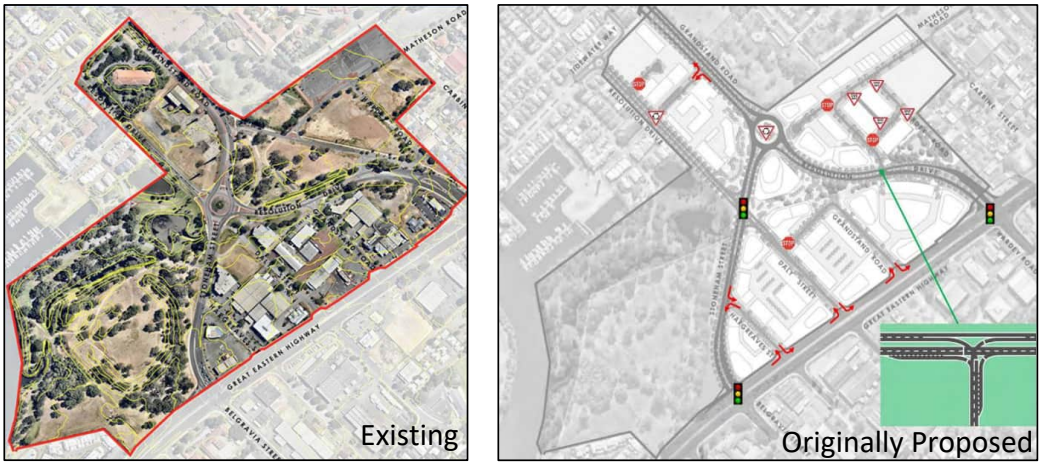

Figure 4: Existing and originally proposed road network

Following public advertising of the draft LSP, Council resolved at the 23 June 2020 OCM to require the following:

- Explore an alternative route for Grandstand Road to avoid traversing through private property.
- Investigate an alternative treatment for the intersection of Resolution Drive, Grandstand Road and Stoneham Street. This was due to MRWA not supporting the traffic signals.
- Reflect Matheson Road as being subject to further planning and investigation at a later date.
- Request Perth Racing keep the gate providing access between Raconteur Drive and Matheson Road shut into the future.

Various alternative road network options have been explored to address the above matters. This has resulted in the following:

- Grandstand Road is no longer proposed to run through private property and will instead remain in its existing location.

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- Traffic lights are no longer proposed at the intersection of Resolution Drive, Grandstand Road and Stoneham Street. This results in the previously proposed roundabout at the intersection being removed.
- Access to Perth Racing's land, including Matheson Road, will be further investigated by Perth Racing as part of planning for their landholdings. In the meantime, gates providing access between Raconteur Drive and Matheson Road will remain shut.
- Resolution Drive will be retained in its current alignment to ensure appropriate permeability through the precinct.
- Daly Street will be closed and configured into a cul-de-sac (refer to Figure 5) to address the hazardous intersection of Daly Street and Stoneham Street, which is close to the roundabout. This change aligns with the MRWA vehicle access strategy for this section of Great Eastern Highway.

Figure 5: Amended/proposed road network

An amended Movement and Access Strategy evaluates the performance of current and proposed movement networks during weekday peak hours under various land use scenarios. In summary, by 2041, the draft structure plan predicts a minor decrease in road network performance at the intersections of Great Eastern Highway and Resolution Drive/Stoneham Street. However, modelling shows that these intersections will exceed capacity regardless of the Golden Gateway development. Thus, the reduced performance is not solely due to the precinct's redevelopment but is also significantly attributed to regional growth.

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Ultimately, the responsibility for monitoring traffic flows and associated queuing for Great Eastern Highway and undertaking improvements to address issues to improve performance rests with MRWA.

Development Feasibility

The draft LSP originally proposed a maximum building height of 15 storeys along Great Eastern Highway and 10 storeys for all other land bound by Resolution Drive, Stoneham Street, and Great Eastern Highway as reflected in Figure 6 below.

Figure 6: Original building heights

At the 23 June 2020 OCM, Council resolved to reduce building heights to nine storeys along Great Eastern Highway and six storeys for all other land bound by Resolution Drive, Stoneham Street, and Great Eastern Highway.

At the September 2023 OCM, Council reviewed the draft Great Eastern Highway Corridor Strategy and directed officers to investigate building scales to ensure these align with current market conditions and future trends. These investigations were undertaken, and the key findings are as follows:

- Feasibility is currently severely impacted by inflated construction costs and builder capacity constraints.
- As a result, the viability of apartment projects depends heavily on an increase in property values.

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- Although construction costs continue to rise, market values are not increasing at the same rate.
- Sites with higher density and building height provisions are likely to be feasible sooner.
- In the absence of viable development controls, there is a risk that proposals will be submitted without a residential component, or developers will pursue land uses that do not align with the objectives of the precinct. Examples of this include 'Service Station', 'Warehouse (self-storage facilities)' and 'Fast Food/Takeaway Outlet'.
- Considering these factors, heights of 10 and 15 storeys and plot ratios of 3:1 and 5:1 respectively are recommended. These controls were supported by input from a property and economic consultant engaged by the City. A copy of the consultant's report is contained as a confidential attachment (Attachment 12.2.10) as it contains commercially sensitive information.

These controls are more likely to facilitate desirable land uses that incorporate a residential component.

The above heights are proposed by the draft LSP are shown in Figure 7.

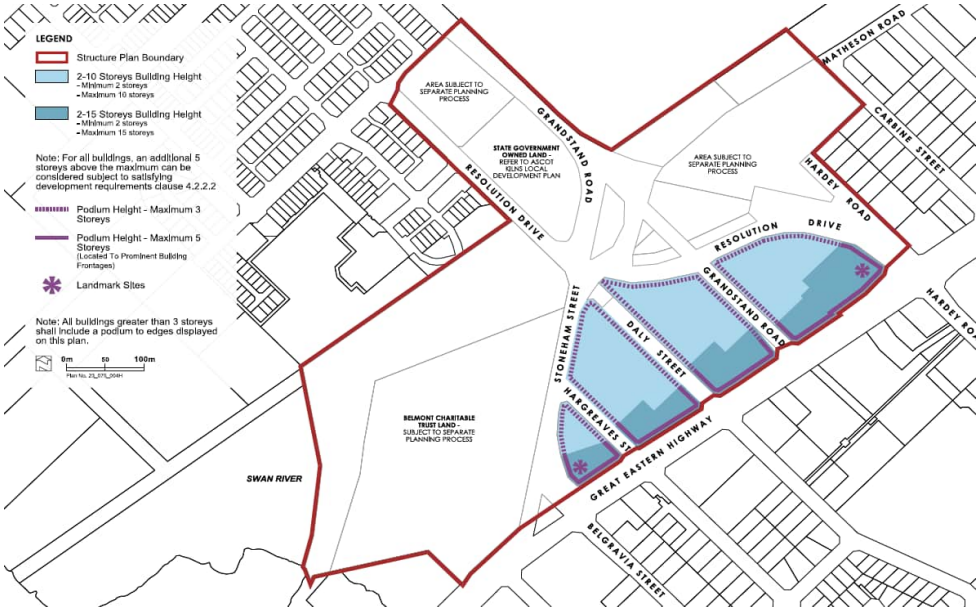

Figure 7: Updated Building Height Plan

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To enhance the delivery of a high-amenity and sustainable precinct, building heights can be increased from 10 to 15 storeys and from 15 to 20 storeys respectively if the following criteria are met:

- An area of publicly accessible private open space;
- All windows double glazed;
- Provision of an additional tree on-site above what is required by State Planning Policy 7.3 Volume 2 – Apartment Design Code. The tree must be a native species with a pot size of between 100L – 200L;
- Provision of conduits and capacity within the electrical distribution system and metering or future provision of electric car charging for each unit within the development;
- Provision of a minimum of two electric vehicle charging bays within the development
- Provision for shared sustainable transport measures for the development that may include the electric bikes, scooters and vehicle/s;
- Achieving a Nationwide House Energy Rating Scheme (NatHERS) star rating of a minimum of one star above the current energy efficiency requirements of the Building Codes of Australia for the relevant class of building. The energy efficiency rating for the dwelling shall be certified by a suitably qualified and accredited energy assessor using accredited software and shall be provided at the development application stage; and
- Installation of a photovoltaic solar panel system that can provide the equivalent of at least 1Kw energy per dwelling.

Similar measures are used by other local governments and are contained within strategic planning documents.

Currently, there are no specified building height limits under LPS 15 for the Mixed Use zone, which makes up the dominant portion of land within the precinct. Introducing the proposed heights through the LSP provides the community and developers with further certainty regarding future development within the precinct. The proposed building heights balance development feasibility with appropriate built form outcomes.

Public Open Space and Central Belmont Main Drain

Public open space within the precinct was originally proposed to be achieved through the piping of the Central Belmont Main Drain and Resolution Drive realignment. A portion of public open space was also proposed on Perth

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Racing's land adjacent to Hardey Road. This is shown in Figure 8 and provided 6,974m^2 of public open space within the precinct.

Figure 8: Original public open space layout

In regard to public open space and the Central Belmont Main Drain, the following is relevant:

- The piping of the Central Belmont Main Drain was premised on a Water Corporation report from 2009 that proposed the drain be piped to improve safety.
- More recently, the Department of Biodiversity, Conservation and Attractions and Water Corporation both have concerns with the piping as they consider this would not maintain or improve ecological values of the drain.
- There is currently not enough land on either side of the drain to convert it into a living stream, meaning that the drain must remain in its existing configuration.
- Resolution Drive is required to remain in its existing configuration eliminating the opportunity for public open space.
- The area adjacent to Hardey Road is owned by Perth Racing and is not designated by the draft LSP as public open space Given this, Perth

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Racing may designate this land as public open space as part of the planning for their landholdings.

Considering the above points, alternative public open space opportunities have been explored for the precinct. This has led to the identification of the redundant Daly Street road reserve, providing 525m^2 of public open space (see Figure 9). This area of public open space provides a connection to the Belmont Trust Land and adjacent Swan River foreshore.

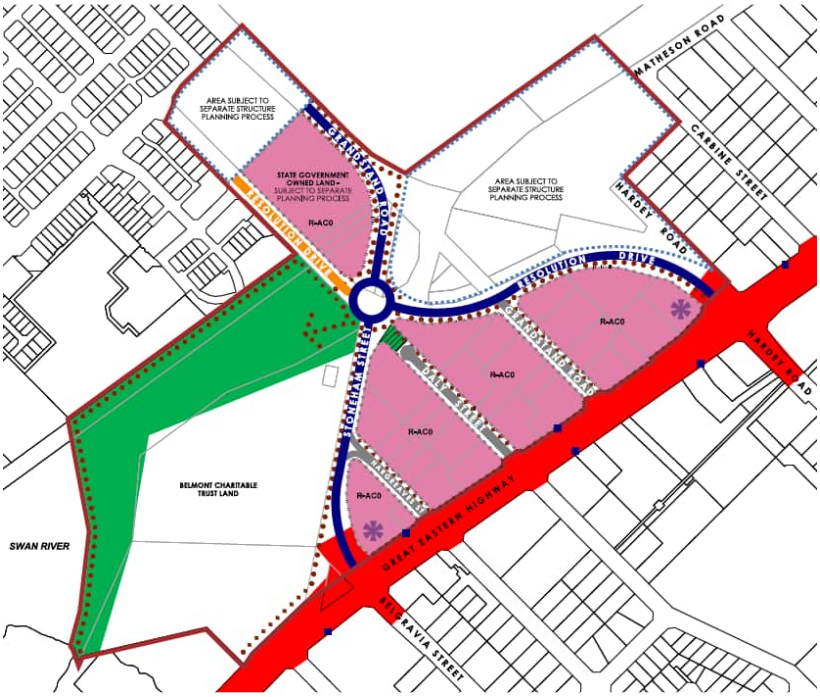

Figure 9: Revised public open space layout

Additional open space opportunities also exist within the precinct including the Belmont Trust Land, Ascot Kilns Site, and on private development sites as follows:

- The Belmont Trust land offers significant opportunities for public open space and a connection to the Swan River for future residents. Use of cash collected in lieu of public open space for the upgrading of the Belmont Trust Land requires approval from the Minister for Planning. The public open space section of the LSP has been updated to reflect this.
- The future redevelopment of the Ascot Kilns site presents an opportunity for public open space. Therefore, consistent with Council's 2020 resolution, the updated LSP requires the preparation of a Local Development Plan for the Ascot Kilns site, designating 10% of the area as public open space. It is noted that the draft Ascot Kilns Local

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Development Plan concept proposed areas of public open space and communal private open space as reflected in Figure 10 below.

Figure 10: Draft Ascot Kilns Local Development Plan Concept

- Private development sites may present an opportunity for the establishment of additional open space areas. Therefore, as detailed in previous sections of this report, the LSP has been updated to include criteria that may encourage developers to provide publicly accessible private open space. These spaces have been successfully implemented in various areas including in West Perth, Melbourne and London as reflected in the images below.

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Figure 11: Publicly accessible private open space at 1204 Hay Street, West Perth

Figure 12: Publicly accessible private open space at Melbourne Quarter (699 Collins Street, Docklands)

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Figure 13: Publicly accessible private open space at Granary Square, Kings Cross, London

Together, these initiatives are anticipated to increase the amount and quality of public open space within the precinct.

In light of this, the 525m^2 area of public open space designated by the LSP is considered acceptable.

Local Centre

The draft LSP originally designated a Local Centre along Daly Street, designed in a main street format with approximately 1,200m^2 of retail floorspace.

The City's ACPS does not designate a specific site for a future local centre. Instead, the ACPS supports the development of a 1,200m^2 local centre within the broader Golden Gateway precinct with an anchor supermarket and complimentary shops and restaurants/cafes.

Considering the existing built form and land fragmentation along Daly Street, it is appropriate to provide opportunity for the development of a local centre within the broader area. Consequently, the LSP no longer identifies Daly Street as the Centre's location or designates it as a main street.

Procedural Considerations

The draft LSP is to be progressed according to the Regulations, which requires the advertising, consideration and determination of structure plans. The Regulations also establish processing timeframes which can only be varied subject to WAPC approval.

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The Regulations stipulate that a local government can readvertise a structure plan once, unless otherwise approved by the WAPC. Therefore, this will be the last time that the document can be advertised, unless the WAPC provides permission to advertise it again. There is a risk that the WAPC will not consent to further advertising.

At the close of the advertising period, officers will consider the submissions and provide a recommendation to Council. If no decision is made on how to progress the draft LSP following advertising, the WAPC may determine how the draft LSP is to be progressed and may do so without referring to or considering the City's assessment and recommendation. The City may be liable to the WAPC for the costs the WAPC incurs during this process.

Conclusion

Following Council's 23 June 2020 resolution, investigations led to several changes to the draft LSP. These changes encompassed designating Perth Racing landholdings for detailed planning, adjusting the road network, revising public open space allocation, removing the specific location for the local centre, and updating built form and development controls. Updates were also made to the Movement and Access Strategy and Public Realm Strategy to align with the revised LSP.

It is recommended that Council adopt the modified LSP for the purpose of public advertising.

Financial implications

All costs associated with the preparation and advertising of the draft LSP are met by the Planning Services' operational budget.

Environmental implications

Environmental implications associated with the draft LSP are outlined in the Environmental Assessment Report (Attachment 12.2.3).

Social implications

The draft LSP proposes a number of upgrades to the public realm which is intended to improve the overall amenity of the area.

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Attachment details

Attachment No and title
1. Golden Gateway Local Structure Plan [**12.2.1** - 73 pages]
2. Bushfire Management Plan [**12.2.2** - 23 pages]
3. Environmental Assessment Report [**12.2.3** - 34 pages]
4. Movement and Access Strategy [**12.2.4** - 342 pages]
5. Infrastructure Assessment Report [**12.2.5** - 34 pages]
6. Public Realm Strategy [**12.2.6** - 26 pages]
7. Extract of 23 June 2020 Ordinary Council Meeting Minutes [**12.2.7** - 63 pages]
8. Council's Resolution [**12.2.8** - 4 pages]
9. Table of Council's Resolution with Corresponding Officer's Comments [**12.2.9** - 14 pages]
10. CONFIDENTIAL - Consultant Report (Confidential matter in accordance with the *Local Government Act 1995 (WA)* section 5.23(e)) [**12.2.10** - 151 pages]

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Schedule of Submissions

1	Public Submitter	**Raises Concerns** Considers that infrastructure, access and amenities are already stretched to the limit.	Refer to Infrastructure and Movement sections of the report. Regarding amenities, it is unclear what the submitter is referring to.
2	Public Submitter	**Raises Concerns** Considers that building heights will hinder views coming into the estate and look out of place with the rest of Ascot.	It is unclear how redevelopment in the precinct will obstruct views coming into the Ascot Waters estate. For further information regarding building height, refer to Building Height section of the report.
3	Public Submitter	**Supports subject to Modifications and Raises Concerns** Supports the plan overall, finding it well thought out. Suggests prioritising shared cars in high-rise developments over e-scooters or e-bikes, as it's easier for people to own and store bikes or scooters, while access to shared cars would be more beneficial. Supports cash in lieu for enhancing The Trust Land. Advocates for a pedestrian and bike underpass between Resolution Drive and Stoneham Street to improve safety when crossing Great Eastern Highway, and agrees that improvements to crossing Stoneham Street, as mentioned, are necessary. Additionally, raises concerns about the roundabout at Waterway Crescent and Grandstand Road, noting it is dangerous and causes delays during peak hours. Urges the Council to address this issue, especially with the potential for increased traffic in the growing Gateway area.	Noted It is important to retain flexibility in transportation options. E-scooters, e-bikes, and shared cars each serve different needs and preferences, and all offer benefits for residents. Some may prefer or rely on the convenience of shared e-scooters or e-bikes, while others may benefit more from access to shared cars. As such, maintaining a balance of options will ensure a more adaptable and inclusive approach that can cater to a variety of lifestyle choices and transportation needs. Noted. Refer to Movement section of the Report. This section of Grandstand Road is outside the scope of this Structure Plan and the Movement and Access Strategy. Refer to Movement section of the report.
4	Public Submitter	**Raises Concerns** Raises concern with the proposed development heights and states that impacts such as congestion, traffic, security and parking issues from an increase in people has not been explained. States that the surveys seem to have been conducted back in 2022 on smaller numbers. Questions if Council is satisfied that none of the land is owned or has related parties of councillors.	For comments relating to congestion, traffic and parking, refer to Movement section of the Report. Regarding traffic counts, the Movement and Access Strategy uses the most recent available data. In terms of security, development in line with the draft Structure Plan is expected to enhance safety in the area. Currently, several land uses within the precinct are largely inactive, and the absence of residents limits ongoing activity, reducing opportunities for passive surveillance. It is noted that the City owns 18 Resolution Drive, Ascot, which is subject to the Draft LSP. Please note that there is nothing unusual or not permitted under planning legislation for a local government to prepare a structure plan that includes City owned land. Furthermore, this does not

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			constitute a personal interest for individual elected members and does not require a declaration under the Local Government Act 1995.
		Questions why the use of Belmont Trust land has not been resolved and what is proposed to meet the trust declaration requirements. Notes that this land has sat vacant for many years and should be put to use for the public open space it was designed for.	The Belmont Trust Land is governed by a declaration of trust, which requires its use for public enjoyment and recreation. The future use and development of this land will be determined by the trustees having regard to the declaration of trust.
5	Public Submitter	**Raises Concerns** States that the primary concern is traffic management in the area, highlighting previous correspondence with the City about traffic volumes and speeds in the Ascot Residential and Stables area. Notes that along Carbine Street, there are 15 children under the age of 11 who frequently play along the street. Mentions that drivers use Carbine Street as a shortcut to avoid queues on Great Eastern Highway, cutting through Matheson Road. Expresses worry that it's only a matter of time before a child or horse is seriously injured. Mentions that the City conducted traffic counts but believes they were timed before Christmas and New Year's to produce data not reflective of typical traffic loads. States that additional development will increase traffic and speeding in the area. Points out that there is often dead wildlife along Matheson Road, likely due to speeding vehicles. Additionally, expresses concern over building heights, stating that 15 storeys would bring more patrons, increase traffic, and create an eyesore out of place with surrounding buildings. Suggests that 9 or 10 storeys should be the maximum height and that the number of tall buildings should be limited. Believes there are other areas along Great Eastern Highway that could be developed with less impact on the surrounding area.	Noted. Refer to below comments and Movement section of the report. Access off Grandstand Road and Resolution Drive into the Residential and Stables area is currently controlled by Perth Racing with gates. Perth Racing's landholdings are subject to the Ascot Racecourse Precinct Structure Plan which further considers vehicle access and movements within this area. It is not anticipated that future development within the Golden Gateway precinct will result in 'rat running' through the Residential and Stables zone, due to proximity to Great Eastern Highway. Traffic counts along Carbine Street were conducted over a three-day period from 29 December 2020. The counts did not show any abnormal patterns, and it is unlikely that conducting them at a different time would have revealed significant differences. It is also unclear how development under the draft Golden Gateway Local Structure Plan will impact traffic volumes and safety in the residential and stables area. Refer to Movement and Building height sections of the Report.
6	Public Submitter	**Raises Concerns** Opposes the plan and states that the documentation contains inconsistencies. Expects all interested parties who have a perceived or actual conflict to declare them. Considers that infrastructure has not been designed to handle increased densities and this may lead to outages.	It is unclear what inconsistencies are being referred to. It is unclear what conflicts are being referred to. It is noted that the City owns 18 Resolution Drive, Ascot, which is subject to the Draft LSP. Please note that there is nothing unusual or not permitted under planning legislation for a local government to prepare a structure plan that includes City owned land. Furthermore, this does not constitute a personal interest for individual elected members and does not require a declaration under the Local Government Act 1995. Refer to Infrastructure section of the Report

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		Raises concern about the Resolution Drive roundabout stating that it is difficult to exit the estate without risking a collision.	Refer to Movement Section of the Report.
		Questions whether the Emergency Management Plan adequately address a catastrophic event such as a Swan River storm surge. States the Emergency Management Plan needs to address the risks posed by high EV ownership within a water locked estate.	The Structure Plan includes measures to protect infrastructure and assets from flooding and inundation.
		Concerned that recharging lithium devices within the precinct will impact the petrol station fuel supplies along Great Eastern Highway.	The charging of lithium devices within future developments is not anticipated to pose a risk to fuel stations along Great Eastern Highway.
		Considers that this is not simply about opposing development. States that there is more to lose and little to gain. In relation to this, raises the following issues: • increased Council and water rates	It is unclear why Council and water rates would increase as a result of development within the precinct. Future development would increase the City's rate base.
		• decreased amenity	Refer to Amenity section of the report.
		• issues with noise	Refer to Amenity section of the report.
		• traffic	Refer to Movement section of the Report.
		• Parking while there is little to gain.	Refer to Movement section of the Report.
		Considers that the plan does not address issues worsened since COVID, such as: • labour and construction supply shortages	There are currently labour and construction supply shortages across Australia. High construction costs and builder shortages are affecting feasibility. As detailed in the building height section of the report, the height controls proposed by the Structure Plan are designed to facilitate feasible development over the life of the structure plan. There would be no planning purpose in preparing a plan which cannot reasonably facilitate development in accordance with its provisions.
		• Poor-quality builds due to cheap materials	The quality of builds is not relevant to this Structure Planning process, and sits under separate Building Code of Australia and the Building Act requirements.
		• Affordable housing for Australians	The current housing/affordability crisis is largely a result of the limited availability of housing. The draft Golden Gateway Local Structure Plan is a strategic planning project that aims to facilitate the delivery of a diverse range of dwellings that cater to both the existing and future population.
		• Efficient transit routes and emergency services access	As detailed in the Movement section of the report, the road network is considered adequate to support future development in accordance with the draft Structure Plan. In terms of emergency services access, it is not

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			considered that future development in accordance with the draft Structure Plan would impact emergency services access to the precinct or surrounding areas.
		• Reliable supply of utilities. Wishes to retain the amenity that existed in 2001.	Refer to Infrastructure section of the Report. Refer to Amenity section of the Report.
7	Public Submitter	**Raises Concerns** States that the area along Great Eastern Highway is becoming more populated but facilities have not kept up. Uses shopping as an example and states that there is no supermarket for residents in the Rivervale and Ascot area with the nearest being in Victoria Park and Belmont. Requests that Council prioritises development proposals that include supermarkets within the Golden Gateway precinct as this will improve the liveability of the area. States that a library and leisure centre with a swimming pool and sauna facility close to high density areas will make such areas more desirable. Considers that the plan should include a rail line or light rail to cater for increasing apartments and residents without increasing traffic. Suggests more transit orientated development.	The draft Local Structure Plan addresses this by providing for the development of a local centre within the precinct. This aligns with the City's Activity Centre Planning Strategy, which supports a 1,200m² local centre with an anchor supermarket, complementary shops, and cafés/restaurants. These services will meet the day-to-day needs of both current and future residents of the area. The Faulkner Civic Precinct already provides major community facilities including a leisure centre and library in a central location. Private developers may choose to provide such facilities within the Golden Gateway precinct as part of future development proposals. Section 3.4.3 of the Structure Plan states that the City will lobby Main Roada WA, Public Transport Authority and Department of Transport for enhanced bus services and explore options like a superbus or trackless tram.
8	Public Submitter	**Raises Concerns** Considers that the proposed development poses a significant threat to the local environment, particularly the Swan River and surrounding green spaces. States that increased construction and urbanisation could lead to pollution and habitat destruction, adversely affecting local wildlife and the natural beauty of the area. Considers that the current infrastructure, especially wastewater management, is insufficient to support the proposed increase in residential and commercial activity. States that this could lead to overburdened systems, resulting in frequent outages and reduced quality of life for existing residents. Considers that the development will likely exacerbate traffic congestion on Great Eastern Highway and surrounding roads leading to longer commute times, higher	An Environmental Impact Assessment Report has been prepared in support of the Structure Plan. It concludes that as a result of existing uses, the subject land supports limited or no remnant vegetation with a lack of intact understorey vegetation. The subject land therefore provides little to no, fauna habitat of significant value to native fauna. Regarding pollution, the Structure Plan advocates for the use and promotion of Water Sensitive Urban Design techniques wherever possible. As the urban area will not produce a nutrient load, the focus will be on slowing runoff and reducing hydrocarbons. Rain gardens and nutrient sinks can be implemented within the precinct to promote passive irrigation of street tree vegetation and controlling hydrocarbon runoff. The Structure Plan has also been referred to the Department of Biodiversity Conservation and Attractions and the Department of Water and Environmental Regulation. No concerns were raised by these departments. Refer to Infrastructure section of the Report. Refer to Movement section of the report.

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		accident rates, and increased air pollution, negatively impacting the health and well-being of the community. Considers that development may lead to the displacement of long-standing residents and businesses, disrupting the social fabric of the community. States that the character and heritage of Ascot could be lost in favour of high-density, commercialised spaces that do not reflect the area's unique identity.	It is unclear why or how residents would be displaced as a result of development within the precinct. While businesses may choose to relocate, landowners will still have the option to develop, just as they can under the current 'Mixed Use' zoning. Refer to Building Height and Amenity sections of the Report.
9	Public Submitter	**Supports subject to Modifications** States that the commitment to housing in this excellent location is commendable from the City, and should help in easing the housing crisis while providing affordable places to live in Belmont. Raises concern over the lack of pedestrian access to the adjacent Belmont Trust land and asks if an overpass over Stoneham Street could be funded by future development. States that the Public Transport Authority should be encouraged to provide bus stops and Main Roads should be encouraged to improve at-grade crossings on Resolution Drive and Great Eastern Highway. States that Mixed use development in the triangle could make for a good neighbourhood if done well. Notes that housing is important, and the thousands of potential residents of this area are the beneficiaries of this plan. Hopes that Council considers their needs as well as the valid concerns of current nearby residents.	Noted Refer to Movement Section of the Report. Following approval of the Structure Plan, the City will liaise with Main Roads Western Australia about improvements to pedestrian crossing points along Great Eastern Highway. The Structure Plan also advocates for improved bus services within the precinct and the exploration of other transit options, such as a superbus or trackless tram. Noted Noted.
10	Public Submitter	**Raises Concerns** States that the Golden Gateway Local Structure Plan has many good features but raises concerns with the proposed building heights. Considers that heights should revert back to the previous plan of 6 and 9 storeys. Considers that the additional 5 storey height requirement doesn't make sense because all structures should be built with excellent design and sustainability features. States that Belmont doesn't have to carry the ball for the whole region to fulfill its infill targets and nor should the City be concerned with developer profits more than the desires and requirements of its residences. Considers that there are current traffic, pedestrian and safety issues that should be addressed before adding high rise and the associated increase in people, cars, traffic etc.	Refer to Building Height section of the report. Refer to Sustainability section of the report. Refer to Infill targets and Building height sections of the report. Refer to Movement section of the Report.
11	Public Submitter	**Raises Concerns** Is aware of the need for more housing stock, and considers that Council has good intentions to provide a 'golden' gateway area that Belmont can be proud of.	Noted

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		Supportive of high-quality sustainable development of the area but is concerned with several aspects of the plan.	Noted
		Opposed to the additional 5 storey height allowance and states that this will allow all buildings to be 15 storeys which undermines the intention of the maximum heights in the first place.	If developers take advantage of the additional height criteria, buildings could be 20 storeys along Great Eastern Highway and 15 storeys elsewhere. Each development may or may not wish to take up the additional five storeys which is considered a commensurate trade off for the additional requirements that need to be met. These measures will further enhance the delivery of a high amenity and sustainable precinct.
		Considers that some of the additional height criteria is inappropriate or should be included as minimum standards for all development. States the following concerns: • Planting an extra tree or providing electric scooters is trivial.	While this requirement may seem trivial of itself and when looked at in isolation, it is just one requirement among others that would all need to be met in order for the additional height to be considered.
		• An 'area of public open space' is vague and could result in tiny spaces.	The City has chosen not to provide guidance on the design and size of these spaces to provide developers with a level of flexibility. The appropriateness of each space will be considered on a case-by-case basis against the intent of the bonus criteria.
		• Any building on Great Eastern Highway should be provided within double glazing in the first place. Considers that Australia is behind the rest of the world on this.	The requirement for double glazing is above and beyond what would typically be required. The bonus criteria seeks to achieve improved sustainability outcomes.
		• The provision of two electric vehicle charging bays for up to 20 storeys is insufficient. Considers that this would be better if all cars could charge slowly, than two bays with a fast charger. States that the DPLH position paper supports this and says that all assigned bays should support Level 1 Trickle Charging. States that this should be a minimum requirement for buildings as opposed to a developer incentive.	Refer to Sustainability section of the report.
		• Considers that the 1kW solar per dwelling is the only requirement that may pose a challenge. Calculates that 1kW of solar panel is roughly $1,000.00 and 4 square metres of collecting area, so 100 dwellings would need 400 square metres and cost approximately $100,000.00.	Refer to Sustainability section of the report.
		• Suggests solar batteries be considered as an additional requirement.	Refer to Sustainability section of the report.
		Recommends reconsidering tree species with preference for drought resistant Australian native species that can handle acidic soils. Considers this would be an easy win to connect the built surrounds to the land of the Noongar Whadjuk people and would be attractive to ecologically aware community focussed families, and would communicate a forward thinking vision to potential developers. Raises the following concerns with tree species: • Plane tree is a well known allergen that causes health issues.	It is considered that the species list strikes an appropriate balance between native and non-native species. Plane Tree is included on the City's tree species list and is therefore considered appropriate for the precinct.

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		• Canary island palms require maintenance by arborists, or they start to look awful, and are susceptible to Fusarium wilt and cane beetles (although not in WA). • Jacarandas are a pest due to their destructive root system, thirst for water, and trip hazard from slimy flowers on the ground. More importantly, many people hate them as they make a lot of mess dropping flowers and leaves. States that the recent plantings of natives by the City of Belmont in Ascot Waters and the roundabout look amazing and give a glimpse of what is possible. Considers that there is poor pedestrian access from the precinct to the Swan River and surrounding land. Suggests solving this through an underpass or a bridge across Stoneham Street or reclaiming Stoneham Street for parkland. Mentions that it is unfortunate Perth Racing Land, DPLH land and the Ascot Kilns site are subject to separate planning processes. States that these sites abut existing residential areas, and will form the interface between Golden Gateway and existing residences. Requests clarification on how Local Planning Policy No. 19 – Short Term Rental Accommodation will apply to the Structure Plan and asks if Short Term Rental Accommodation uses will be allowed within the precinct. Mentions that the Structure Plan contains two tables labelled 'Table 2'.	Refer to Landscaping section of the report. Jacaranda is included on the City's tree species list and is therefore considered appropriate for the precinct. Noted. Refer to Movement section of the report. Consideration will be given to how each precinct interacts with each other through the separate planning processes. Members of the public will also be provided with the opportunity to comment on any future planning for the Ascot Kilns site. Regarding Perth Racing's land, the draft Ascot Racecourse Precinct Structure Plan was advertised for public comment from 24 October 2024 until 6 December 2024. Short Term Rental Accommodation uses may be considered in the precinct and will be evaluated against Local Planning Policy No. 19. However, the area west of Grandstand Road does not meet the locational criteria, as it is within 400m of Belmont Primary School and over 400m from an existing tourist accommodation on Great Eastern Highway. Furthermore, development in the precinct is expected to comprise multiple dwellings. The policy does not support ad hoc short-term rental accommodation in multiple dwellings unless an entire floor is designated for this use. Refer to Schedule of Modifications.
12	Public Submitter	**Raises Concerns** Concerned that heights could reach 15 to 20 storeys. Acknowledges the need for infill and responsible development but states that the proposed heights are ill-suited to the unique character and charm of the community. States that 6 to 9 storeys, which were already beyond the scale of what many residents found reasonable, have been exceeded and this is a serious threat to the very essence of what makes this area special. States that Ascot, particularly the area surrounding Resolution Drive, Stoneham Street, and the Great Eastern Highway, is a place where community and tranquillity intersect. The low-density housing, ample greenery, and the open space along the Ascot Kilns precinct create an environment that fosters connection among residents and allows the natural beauty of the area to shine.	Refer to Building Height section of the report. Development bound by Resolution Drive, Stoneham Street and Great Eastern Highway currently contains warehouses, offices, fast food/takeaway outlets, a motor vehicle wash and a service station. It is considered that future development in accordance with the Structure Plan will enhance the amenity of the area and may provide opportunities for increased open space (10% open space on the Ascot Kilns site and open space resulting from the closure of Daly Street), and the upgrading of open space on the Belmont Trust land.

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		Pushing the development to heights of 20 storeys would irrevocably change the landscape, casting long shadows both literally and figuratively over the local community.	Refer to Amenity section of the report.
		Considers adding an estimated 4,082 new residents will strain limited infrastructure and services, especially when the plan only allows for one parking bay per apartment. States that this is not sufficient, particularly when modern families often have more than one car and visitors are also part of everyday life.	Refer to Infrastructure and Movement sections of the report.
		Considers the additional vehicles will spill onto surrounding streets, further congesting an area already struggling with traffic issues, particularly around Great Eastern Highway and the adjacent roads. Mentions that the Movement and Access Strategy proposed in the plan does not adequately address these concerns, as it overlooks the realities of accommodating this vast increase in both population and vehicles.	Refer to Movement section of the report.
		Considers the increased building heights will disrupt the aesthetic and visual appeal of the neighbourhood. Instead of preserving Ascot's low-rise, suburban feel, the towering structures would dominate the skyline, reducing the area's character to one of faceless high-rises. These taller buildings would dwarf the existing homes and create an uncomfortable, imposing environment for long-term residents who value their peace and privacy. Questions if this is truly the direction we want to take – sacrificing the serene and residential quality of life for the sake of developer profits.	Refer to Amenity section of the report.
		Raises concern about sustainability and open space and requests Council enforce the inclusion of at least 10% public open space, as the Ascot Kilns and Parry Field Action Group has rightly suggested. Considers this is the bare minimum required to maintain any semblance of the natural beauty the area is known for.	Refer to the Public Open and Sustainability sections of the report.
		States sustainable design features must not be an afterthought and should be at the forefront of any large-scale development. Also states that tall buildings consume significant energy and resources, and without stringent requirements for sustainability, we risk further environmental degradation in a time when responsible urban planning is more important than ever.	Refer to Sustainability section of the Report.
		Raises the following questions: • The promise of new cafes and shops might sound appealing, but are they worth the trade-off? Is a coffee shop on the ground floor of a towering building worth the sacrifice of Ascot's unique character, its liveability, and the peace that residents currently enjoy? • Is the priority here truly the well-being of the community or the financial gain of developers? • The acknowledgement at the September Ordinary Council Meeting that these heights increases were proposed to "track rising construction costs" is a red flag – are we allowing our town planning to be driven by financial pressure rather than thoughtful consideration of what is best for our neighbourhood?	Refer to Amenity section of the Report Refer to Building Height section of the Report. Refer to Building Height section of the Report.
		Urges Council to reconsider the proposed building heights. Is not opposed to progress but states progress must respect the history, character, and sustainability of the Ascot community. Considers that limiting development to 6 storeys along Resolution Drive and Stoneham Street, and 9 storeys on Great Eastern Highway, as set out in the original draft, is a far more balanced approach that allows for growth while preserving	Refer to Building Height and Amenity sections of the Report. Regarding Heritage, the draft Structure Plan will have no impact on existing heritage.

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		what makes Ascot so special. Suggests not rushing to concrete over heritage and sense of place for short-term gains and instead working together to ensure that development is in harmony with community values and the environment.	
13	Public Submitter	**Raises Concerns** Expresses concern regarding the draft development. States that the City of Belmont is a remarkable part of the City of Perth and to change the precinct with high rise buildings will only increase the volume of undesirables to the area. Concerned that crime will increase in the area. States that Ascot Waters is a location that requires protection because of its uniqueness. States that services in Ascot Waters need to be updated and modernised and that the plan needs to be specific with the uniqueness of the area. Requests to not change the outlook to every other area and to think outside the square and be the City of Belmont all are wanting.	At this stage no development is proposed. The Structure Plan provides a framework against which future development proposals will be assessed. There is no evidence to suggest that anti-social behaviour would increase as a result of the draft Structure Plan. Refer to Amenity section of the Report. The draft Structure Plan doesn't relate to land within Ascot Waters. The precinct subject to development controls under the structure plan is a separate area with a different character. It is unclear what the submitter is referring to. Future development within the precinct is expected to enhance the area's amenity, creating a high quality urban environment for living, working and recreation.
14	Public Submitter	**Supports subject to Modifications** Commends Council for taking a progressive step toward building a sustainable future for the residents of Ascot. States that this is long overdue, especially considering that Council with suburbs along the foreshore from Fremantle to Applecross and neighboring Burswood have been implementing similar measures for over a decade. Welcomes the prospect of development which will significantly enhance Ascot's appeal. Considers that Ascot should always be the Jewel in the Belmont Council crown, and in turn, the City of Belmont should be the flagship for the eastern corridor of Perth. To ensure the development creates a true community, the following measures are suggested: 1. Sustainable Hub: Implement best practices to establish Ascot as a leader in sustainability. This includes using the latest technology, such as solar panels for street lighting, artificial plants and trees made of recycled material with integrated cameras for safety of its citizens, park benches made from recycled plastics, and designated charging stations for electric vehicles (EVs). I also believe it would be beneficial to have EV stations within Ascot Waters. 2. Parry Field Integration: Remove the fencing around Parry Field, plant mature trees, and clean up the land to make it usable and integrated with the Golden Gateway development. This could include better walkways and cycling paths, BBQ facilities, and gazebos. 3. Community Amenities : Provide a small IGA grocery shop and a local bar but with a restriction of no more than 80 patrons to ensure it remains a small community pub rather than an entertainment venue that might attract undesirable elements.	Noted Noted Infrastructure within public spaces will be subject to further detailed planning at a later stage. Further information regarding sustainability is included in the Sustainability section of the Council Report. The Belmont Trust Land is governed by a declaration of trust, which requires its use for public enjoyment and recreation. The future use and development of this land will be determined by the trustees having regard to the declaration of trust. The Structure Plan provides for the development of a 1,200m^2 local centre within the Golden Gateway precinct and aims to facilitate active land uses and businesses on the ground floor of developments. Regarding a small

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		4. High-Quality Apartments: Ensure the highest build quality for the apartments (while meeting state requirements for affordable housing) that is aimed at high-end units with a 5-star energy rating, like those in South Perth. 5. Community Infrastructure : Construct a flyover or footbridge to assist the high proportion of seniors in Ascot with crossing Stoneham Street and Great Eastern Highway. To effectively integrate Ascot with its surroundings, the Kilns should be a central feature, as it is currently underutilised despite significant investment in its restoration. Additionally, suggests that the Kilns could be transformed into a valuable community asset, and the open space may be considered for future residential opportunities. Suggests that the Council implement necessary changes to the existing road infrastructure, as retaining the current roundabout is an inadequate compromise. Suggests relocating the roundabout to Grandstand Road with three outlets—allowing left turns at Resolution, straight-through access to Grandstand, and a right exit into the Golden Gateway development—which would facilitate direct access to Great Eastern Highway. This would enable Stoneham Street to become a local-only road, creating a more pedestrian-friendly environment.	bar, the choice to do so will be at the discretion of developers and will be assessed by the City of Belmont. Proponents will need to have regard to sustainability provisions in the R-Codes and Local Planning Policy 7.0. The structure plan builds on these requirements by requiring a higher standard of development for developers seeking an additional 5 storeys. Additionally, proposals will be reviewed by the City's Design Review Panel to ensure high-quality design. Refer to Movement section of the Report. Future development of the Ascot Kilns site will be subject to a separate planning process led by the Department of Planning Lands and Heritage. The draft LSP proposes the preparation of a Local Development Plan for the site, which includes a 10% public open space requirement. Main Roads Western Australia did not support the originally proposed traffic lights for this location. As a result, the most practical option is to retain the roundabout in its current configuration, with Stoneham Street maintaining its existing function. However, as outlined in the Movement section of the Council Report, the Structure Plan has been updated to address pedestrian crossing points on Stoneham Street.
15	Public Submitter	**Supports subject to Modifications** Expresses support for the Golden Gateway Local Structure Plan subject to a number of modifications. Notes that the Daly Street Precinct is proposed to have a maximum podium height of 3 storeys and tower 10 storeys. Questions the commercial viability of two bonus height requirements as follows: • 100% of windows containing double glazing: There needs to be some flexibility provided in this requirement given not every apartment will require double glazing for noise attenuation. One side of the building may be exposed to high traffic volumes while the other side of the building is located adjacent local streets. Given the cost involved for such a requirement to be provided for a 15-storey building, some degree of flexibility is warranted to allow for a site-specific planning assessment to be undertaken. Should such a built form requirement be governed by the National Construction Code (NCC). • Install a photovoltaic solar panel system that can provide the equivalent of at least 1Kw energy per dwelling. Generating 1Kw energy per dwelling may require 3-4 panels per apartment. This requirement may not be physically possible to comply with given limited roof space and need to accommodate both solar panels and plant and the complexity of fixing vertical panels to walls. Some flexibility is required to accommodate the different built forms and emerging technology in terms of solar collection and energy generation.	Noted. Refer to Sustainability section of report. Refer to previous comment.

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16	Public Submitter	**Supports** States that the new look proposed by the Structure will be amazing and that those who oppose the plan forget that their property was once dirt. Encourages the City to progress the plan as it will add massive value to the area. Commends the City and reaffirms support.	Noted
17	Public Submitter	**Raises Concerns** Considers Great Eastern Highway looks like a concrete jungle and notes more is proposed. States the more interesting building styles and designs are required. Requests building heights to remain with what already exists and that no more than 10 storeys is appropriate. Notes that traffic congestion getting across Great Eastern Highway near Belmont Primary School is already difficult and can take many light changes to get through. Requests clarification on what is being done to manage this. Notes traffic in peak hours on Garrat Road is a bottle neck and questions what is being done to manage this with increased traffic Questions what is being considered to manage existing public transport along Great Eastern Highway with increased passenger numbers. Questions what is being done to bring more public transport along Grandstand Road direct to the City of Belmont for local City workers. States that the City should retain some parkland in the precinct or create new playground areas for kids. Raises concern about 1 car bay per apartment and questions if this is adequate. Requests no more service stations in the area because there are too many. States that they are looking forward to new and interesting commercial opportunities for the community. States dining options and family friendly brewery would be good.	 Development within the precinct is anticipated to enhance the local amenity. Major proposals will be reviewed by the City's Design Review Panel to ensure high-quality building design. Refer to Building Height section of Report. Refer to Movement Section of Report. Garratt Road is outside the scope of this Structure Plan and the Movement and Access Strategy. As made clear by the Movement and Access Strategy, increased vehicle movements is most attributed to regional growth not development within the Golden Gateway precinct. As mentioned in the Movement section of the Report, the Structure Plan states that PTA will be advocated to provide improved bus services and exploration of other transit options such as a superbus or trackless tram. Provision of public transport to the Civic Centre is outside the scope of this structure plan. Public Open Space will be provided in the precinct with future development of these spaces being guided by the City's Public Realm Strategy. Please refer to the Public Open Space section of the Report for further detail. Refer to Movement section of Report. As detailed in the Council Report, the Structure Plan proposes feasible development controls to facilitate high quality developments. Without appropriate development controls, developers will be more likely to submit proposals that exclude residential components or pursue land uses misaligned with the precinct's objectives, such as 'Service Station', 'Warehouse' or 'Fast Food/Takeaway Outlet'. The Structure Plan also identifies the opportunity for a local centre to establish within the precinct and encourages active land uses at ground level.
18	Public Submitter	**Raises Concerns** States building heights set out in the original draft Golden Gateway Structure Plan should remain unchanged. Considers that 10-20 storey buildings are unnecessary and will be an ugly visual blight to all residents of Ascot, Ascot Waters and Belmont.	Refer to Building Height and Amenity section of the Report.

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		States all new developments should incorporate sustainability design features regardless of building height. Requests the City to consider mandating mixed use developments for all planned residential developments to bring amenities closer to residents and to make efficient use of land and reduce dependency on private vehicles. Requests no added lanes for Resolution Drive (west) leading into Ascot Waters. States traffic calming measures should be added to this stretch of roads to reduce the speed of vehicles entering from Stoneham Street and Resolution Drive east.	Refer to Sustainability section of the report. The Structure Plan includes statements of intent which seek to encourage active commercial uses at ground level for Precincts 1, 2 and 4. It is envisaged that the 'Mixed Use' zone will accommodate residential development in the form of multiple dwellings with supporting non-residential development on ground level. Resolution Drive (west) will continue to be a local distributor road with no added lanes. Development within the Golden Gateway precinct is not anticipated to generate a need for traffic calming measures leading into Ascot Waters.
19	Public Submitter	**Raises Concerns** Does not support the current draft of the Golden Gateway Local Structure Plan. States there are numerous issues with the plan, including but not limited to: • Increase in building heights from 6 and 9 storeys to 20 storeys. • Lack of public open space to accommodate new residents. • Increased traffic congestion. • Availability of public services such as schools. • Street lighting. • Street parking to accommodate new residents. • Lack of focus on environment and sustainability factors for the new buildings and surrounds.	Noted. Refer to Building Height section of report. Refer to Public Open space section of report. Refer to Movement section of report. The Structure Plan was referred to the Department of Education. The Department has advised that they will continue to monitor student enrolment and ensure that residential growth corresponds with the provision of public schools in the locality. There are existing street lights within the precinct. The adequacy of these and needs for improvements will be further investigated following consideration of the Structure Plan. Refer to Movement section of report. Refer to Sustainability section of the Council Report.
20	Public Submitter	**Raises Concerns** Considers that the draft structure plan appears to focus on profit for developers by encouraging developers to build higher structures in return for more green space and adherence to green principles. Questions whether the City's own planning guides stipulates a minimum 10% green space for all developments. Considers all structures regardless of their height should provide the highest green building principles particularly given the City of Belmont has the least tree canopy in the Perth metropolitan area.	Developer profits are not a planning consideration and were not considered when preparing the draft Structure Plan or modifications to the draft Structure Plan. Further detail is included in the Building Heights section of the report. Refer to Public Open Space section of report. Refer to Sustainability section of report.

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		Questions how the City would encourage the use of public transportation.	Refer to Movement section of report.
		Questions how the City would facilitate ease of pedestrian access.	Refer to Movement section of report.
		Contends that the traffic study lacks clarity and is aged.	Specific concerns relating to the clarity of the traffic study are not provided. Regarding age of the study, it has recently been updated to address modifications to the Structure Plan.
		Questions why the height of structures is proposed to be changed.	Detailed reasons are included in the report presented at the 27 August 2024 Ordinary Council Meeting and further discussed in the Building Height section of the report.
		Questions why profit for developers is the only driver.	Developer profits are not a planning consideration and were not considered when preparing the draft Structure Plan or modifications to the draft Structure Plan. Further detail is included in the Building Heights section of the report.
		Questions what and where is the contemporary and current evidence that building costs have risen to such an extent that it has not kept pace with housing prices in the Perth metropolitan area.	Refer to graph included in the Building Height section of the report.
		Requests amending the structure plan to align with the original draft document building heights (six and nine storeys in their respective places). Considers this would align better with other structures along this part of the Great Eastern Highway precinct.	Refer to Building Height section of report.
20	Public Submitter	**Supports subject to Modifications and Raises Concerns** Supports the development of the Golden Gateway precinct if building heights are limited to 6 storeys along Resolution Drive and Stoneham Street and 9 storeys on Great Eastern Highway. Notes these are the heights specified in the original draft Golden Gateway Local Structure Plan. Urges the City of Belmont to rescind the current draft and limit building heights to no more than 6 storeys on Resolution Drive and Stoneham Street and 9 storeys on Great Eastern Highway.	Refer to Building Height section of report.
		States new mixed use businesses will provide positive benefits to existing residents of Ascot and surrounding areas, and assist the City in addressing targets for urban infill and densification set by the State Government.	Noted
		Does not support the revised building heights or the additional height criteria that will provide for an additional five storeys if developers provide sustainable design features or public open space. States the reasons for this position are as follows: • In 2024 during a global climate crisis, all developments in the City of Belmont should be required to incorporate sustainable design features, regardless of building height.	Refer to Sustainability section of report.
		• All new developments should contain 10% public open space and a comprehensive strategy that will retain or enhance tree canopy.	Refer to Public Open Space. Regarding tree canopy, there are limited trees within the area due to most of it being built up. However, as part of future development, landscaping will be required. The structure plan includes a public realm strategy that includes recommended landscaping treatments.

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		• Residents have expressed on-going issues regarding traffic and congestion along Grandstand Road since prior to the time that Craig Care was proposed and subsequently built at 52 Grandstand Road. Despite this, nothing has been done to address this. It is increasingly difficult to leave the Ascot Waters estate during peak hours by car, or to cross Grandstand Road on foot to access the 999/998 bus route.	While the section of Grandstand Road referenced by the submitter lies outside the LSP area and is therefore beyond the scope of this project, modelling indicates that it will maintain adequate capacity in 2041.
		• Increasing height limits as proposed in the current draft of the GGLSP will only make this problem worse, with the addition of an estimated 4,082 new residents, which more than doubles the current population of Ascot.	Refer to Movement section of report.
		• The Movement and Access Strategy specified in the GGLSP is insufficient and relies on residents of new buildings to take public transportation, carpool, or cycle. This might make sense in locations along the train line, such as near Redcliffe Station. In the Golden Gateway area, however, a movement plan that relies on public transportation and carpooling is naïve at best.	Refer to Movement section of report.
		• While apartment parking allocation in the GGLSP conforms to the minimum State requirements, it is unreasonable to assume that residents will only have 1 car per apartment. This strongly suggests that residents will compete for parking bays intended for customers of mixed-use businesses, and in surrounding areas.	Refer to Movement section of report.
		States that at the 24 September Ordinary Council Meeting it was learnt that the principal driver behind the increase in building heights is that market property values have not tracked rising costs of construction. Considers the City of Belmont effectively told residents that developer profits are being prioritised over concerns of residents regarding congestion and traffic. Believes this is backwards. States that facilitating developer profits should not be a priority or a driving consideration when planning new developments and that the City should prioritise the needs of residents when planning new developments.	Developer profits are not a planning consideration and were not considered when preparing the draft Structure Plan or modifications to the draft Structure Plan. Further detail is included in the Building Heights section of the report.
21	Public Submitter	**Raises Concerns** Concerned with current infrastructure/roads/parks if 15 to storeys is allowed within the precinct. States that the current high road noise will be further exacerbated with double the amount of people living in the area. States that the City did not allow a raised fence to protect privacy, reduce noise and reduce road dust and dirt that floods the back patio. Considers there should be a study for both noise and dust impacts on those houses. Has some support for the Ascot Kilns and Parry Field Action Group options, provided the City allows for noise and dust reduction for the 16 houses that back onto Grandstand Road opposite Ascot Racecourse.	While the submitter did not provide specific concerns, it should be noted that the Structure Plan and supporting reports include information on the adequacy of infrastructure, roads, and public open space. For further information, refer to Public Open Space, Movement and Infrastructure sections of the report. The submitter's property backs onto Grandstand Road, a Distributor Road, where some vehicle noise is expected. However, this noise is not solely attributed to future development within the Golden Gateway precinct. Furthermore, dust concerns are not relevant to this Structure Plan. Should the submitter wish to make changes to their property for dust and noise mitigation, they are welcome to provide details for the City's consideration.
22	Public Submitter	**Raises Concerns**	

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		Considers that heights of 10 to 15 storeys is not appropriate and is out of step with all building heights in the area. Suggests reinstating the previous draft which called for apartments with ground floor commercial businesses of between 6 and 9 storeys. Notes their opinion that the City of Belmont has prioritised developer profits ahead of its current residents. Considers that because there are limited public transport opportunities, residents will be required to drive leading to increased congestion on Grandstand Road, Great Eastern Highway and adjacent roads. States that because the City has a low urban canopy percentage, it is time for the City to take a proactive approach to urban greening, instead of doing the bare minimum. Considers this development is an opportunity for the City to step up its urban biodiversity initiatives. States that at the very least, all development in the area should include at least 10% public open space and incorporate sustainable design features. Considers all tree plantings should be Australian Native trees that provide adequate shade.	Refer to Building Height section of the report. Developer profits are not a planning consideration and were not considered when preparing the draft Structure Plan or modifications to the draft Structure Plan. Further detail is included in the Building Heights section of the report. Refer to Movement section of the report. The structure plan includes a public realm strategy that includes recommended landscaping treatments. Additionally, any future residential development will be required to comply with the minimum tree planting requirements contained within the Residential Design Codes. Tree planting requirements for commercial proposals are being further investigated as part of the preparation of a new local planning scheme. Refer to Public Open Space, Landscaping and Sustainability section of the report.
23	Public Submitter	**Raises Concerns** Questions what parking survey samples were used when considering the proposal. Considers that each dwelling will require more than one car parking bay as demonstrated in the surrounding areas of Belmont and Ascot. Questions what improvements are being considered to cater for this uplift in vehicle usage in the area. Considers the traffic flow in the area is dangerous with narrow roads and high vehicle volumes and this is expected to get worse. Questions if there are any anticipated costings to rate payers to improve the existing road network to handle the anticipated increased population. Questions if environmental studies have been undertaken with a view to the future impact on the existing environment. Considers the proposed population increase will put pressure on the sensitive and fragile environment with increasing noise levels and disturbance of the wetland area.	There is no requirement for parking surveys to be undertaken as part of the draft Structure Plan. For further detail about parking, refer to the Movement section of the report. Details of the road network are contained within the Movement and Access Strategy. Further details are included in the Movement section of the report. Refer to Movement section of the report. Modelling has not identified a need for road network improvements. However, improvements to cyclist and pedestrian infrastructure as well as public open space will be further explored as part of the preparation of an appropriate funding strategy. An environmental study has been prepared in support of the Structure Plan. It demonstrates that there will no impact on the environment.
24	Public Submitter	**Raises Concerns** Is opposed to the proposed height increases above the original heights of 9 stories on Great Eastern Highway and 6 stories in the rest of the triangle. States the reasons for this are:	

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		1. Considers that the pretext that additional height is required to make development profitable ignores the below examples. Considers these buildings would not have been constructed if they were not profitable: • the recent construction of the Aged Care 5 stories, • 150 East building 6 stories, • Marina apartments Ascot Waters 9 stories, • Cnr Belmont ave and GEH 9 stories, • Quest apartment 9 stories • Aloft Hotel 13 stories	Construction of each of the submitter's examples occurred prior to or during 2020. Refer to Building Height section of Council report for details on how the market has changed since that time.
		2. Is opposed to development increases when the Ascot Racecourse is proposing additional residential, aged care and commercial development in the area. Considers there isn't adequate infrastructure to handle the increased housing and commercial development and states traffic, parking, power, sewerage etc are all inadequate. States there is no suggested solutions to traffic volumes and the road system.	Refer to Infrastructure and Movement sections of the report.
		3. Considers future households will not use public transport and will need two vehicles. States traffic and parking will spill into Ascot Waters.	Refer to Movement section of the report.
		Considers Council is dealing with residents of Ascot Waters with contempt. States the area was intended to be an upmarket area, but now Council is disregarding this by crowding it out with skyscrapers and 11,000 people and thousands of cars.	Refer to Amenity section of the report.
25	Public Submitter	**Raises Concerns** States that allowing 15 storey buildings along Great Eastern Highway will create a barrier that psychologically isolates those residents living on the southern side of Great Eastern Highway from the river and that traffic density is already a physical barrier.	The draft Structure Plan will not isolate or provide a barrier to residents on the south side of Great Eastern Highway from accessing the river. The precinct is proposed to be converted into a high quality, mixed use precinct with streetscape improvements, new areas of open space and landscaping that will make the area more amenable for pedestrians and cyclists.
		States that the southern side of Great Eastern Highway comprises lower socio-economic dwellings and fewer small retail shops. Considers this area is less attractive to buyers of real estate and that it would be beneficial to facilitate access to new retail outlets in the Golden Gateway precinct. Recommends installing an underpass or pedestrian bridge over Great Eastern Highway.	Refer to comments relating to pedestrian crossing points of Great Eastern Highway included in the Movement section of the Council report.
		Considers that private developers of multi-storey residential buildings tend to make streets very narrow and do not allocate enough parking for short term or visitor needs and uses East Perth, Rivervale and Victoria Park as examples. Recommends the City set aside land for public parking to service commercial/retail outlets.	The adequacy of parking for future developments will be further considered through the development application process.
26	Public Submitter	**Raises Concerns**	

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		States that the draft plan supersedes the earlier plan because it did not include proper consultation with other landowner stakeholders and has been expanded to make it more attractive to developers. Surprised by these two aspects and states that the main concern is that the plan will result in overcrowding and overdeveloping a relatively small area along the busy corridor between Guildford Road and Great Eastern Highway, a route which already struggles with the amount of passing traffic. Considers the plan cannot be considered in isolation from the draft Ascot Racecourse Precinct Structure Plan. Notes the following: • The draft Golden Gateway Local Structure Plan is estimated to cover some 4.2473ha, yield an additional 4,082 persons and 'at least 2,268' new dwellings, among which are high-rise buildings of 10-15 storeys. Within the plan, it is proposed to construct three 'landmark' buildings, each of which could be taken to as high as 20 storeys. • Residential provision in the draft Ascot Racecourse Precinct Structure Plan will cover an area of 0.94ha and is estimated to yield an additional 920 people in 400 dwellings. There may be an additional 'vertical residential living village to accommodate retiring members of the horse racing industry' that will also serve as a 'landmark' in the locality. So, more people and another potential 20-storey building. Considers that retirees would not be eager to live in a high rise building that will be subject to periodical fire alarm testing and use of stairs in the case of an evacuation. Mentions that according to the 2021 census, the entire suburb of Ascot covers some 400ha with 3,095 residents and 1,421 dwellings. The combined additional population from the two structure plans would suggest at least a 162% increase in Ascot's population shoehorned into an area that is only some 3% of the size of the total suburb. States that buildings should be kept at levels that complement the local environment. Mentions that at considerable cost and care the Council has recently refurbished the Ascot Kilns chimneys and questions why anyone is considering overshadowing these historical destinations with the possible construction of two 20 storey buildings next door.	The previous version of the structure plan underwent extensive consultation in the same manner as the current version (same mail out). It should be noted that the City has undertaken more consultation on this project than required under the Planning and Development (Local Planning Schemes) Regulations 2015. Perth Racing are progressing a planning framework for their landholdings to guide future development. This includes several of their lots located within the Golden Gateway precinct. Following discussions with Perth Racing and the Department of Planning Lands and Heritage (DPLH), it is deemed appropriate to designate Perth Racing's land within the Golden Gateway precinct for further detailed planning. This approach allows Perth Racing to conduct their own planning while enabling the LSP to progress. Retaining Perth Racing's land within the broader LSP boundary ensures that future planning for both areas is coordinated holistically. The draft Golden Gateway Local Structure Plan considers possible development on Perth Racing's land. For example, the Movement and Access Strategy considers anticipated vehicle movements resulting from development and events at Ascot Racecourse. Noted. Noted. Comments related to housing choice in the Ascot Racecourse precinct are not relevant to this Structure Plan. The Structure Plan is looking to put additional controls in place to guide development. It should be noted that development can currently occur in the absence of these controls with no limitation on building height. Refer to Building Height section of the Council report. The Ascot Kilns site is owned by the Department of Planning Lands and Heritage. Restoration of the Kilns has been funded and coordinated by the State Government. The structure plan does not propose 20 storey buildings adjacent to the Kilns. Instead, the precinct is well separated from the Kilns. Regarding overshadowing, the Ascot Kilns site is located

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			north of where development under the draft Structure Plan will occur. As a result, no overshadowing will occur.
		Mentions that the draft Structure Plan proposes buildings of between 10-15 storeys three of which are landmark buildings and would attract the potential for an additional five storey bonus. Considers the use of the word 'bonus' is an overt reference to financial benefit being given precedence over social welfare. Asks that Council take more care not to overshadow the environmental integrity of the area.	Refer to Building Height and Amenity sections of Council report. 15 storeys is recommended for lots fronting Great Eastern Highway and 10 storeys for all other land bound by Great Eastern Highway, Stoneham Street and Resolution Drive. A five storey bonus applies to all sites if developers provide open space and sustainability initiatives. The appropriateness of the 5 storey height criteria is further discussed in the Sustainability section of the Council report.
		Feels compelled to observe that Belmont City or someone within it has a fixation about what has previously been labelled an 'iconic' building that will apparently herald a dramatic entry to Belmont. Notes that on page 5 of the draft Structure Plan it talks about the need for buildings at the intersection of Resolution Drive and Stoneham Street to leverage their location as the northern 'arrival' point to Golden Gateway and mentions that similar wording is used in the Ascot Racecourse Precinct Structure Plan when describing the retirement building. Astonished that it echoes language used when Council was involved in developing the site which is now Craig Care Ascot Waters. States that Council stated a desire for an iconic building that capitalises on its position at the northern gateway to the City of Belmont. Questions what the real benefit of that is going to be to Belmont.	The landmark sites have been identified in response to key view lines and their visibility from outside the Golden Gateway precinct. Landmark sites will contribute to the local character and amenity of the area by incorporating architectural features with a point of difference. These proposals will also be evaluated by the City's Design Review Panel as part of future development applications.
		States that the City should be aware of the impact of increased traffic in the area. Mentions that Garratt Road is very busy and peak hour tailbacks are often a feature for traffic heading toward Guildford Road. States more people living along the Corridor is going to mean more vehicles.	Garratt Road is outside the scope of this Structure Plan and the Movement and Access Strategy. As made clear by the Movement and Access Strategy, increased vehicle movements is most attributed to regional growth not development within the Golden Gateway precinct.
		Mentions that two of the three landmark sites are proposed to be built on an already busy roundabout which will exacerbate the growing difficulty of road use.	The two landmark sites are proposed at the intersection of Resolution Drive and Great Eastern Highway and the intersection of Stoneham Street and Great Eastern Highway. No landmark sites are proposed at the roundabout.
		States Garratt Road Bridge is on the State Heritage List. Is sure that there is an expectation that traffic will ease once work on the Tonkin Highway is completed, but says nonetheless there will be much heavier traffic across those adjacent bridges than they were ever designed to handle.	Garratt Road Bridge is the responsibility of Main Roads Western Australia who have not raised concerns with the City about the volume of traffic using the bridge.
		States that the Structure Plan should be realistic about people and their use of vehicles and notes that apartment blocks will apparently provide 0.75 of a parking bay for every 1 bedroom apartment and 1 parking bay for 2 bedroom apartments. Considers this means that one in every four 1 bedroom apartments will have a dedicated car parking space and only one person in any 2 bedroom apartment will be able to park a car.	Refer to Movement section of the Council report.
		Appreciates that there is a desire to change behaviours and agrees that this is a positive approach, but does not think it will work because behavioural change will not	Refer to Movement section of the Council report.

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		occur before the Structure Plan comes to fruition. Mentions that in East Perth, residents in Adelaide Terrace shuffle their cars around available bays or park further away from their apartments at great inconvenience to residents of those other locations. Considers this is bound to occur in the vicinity of Golden Gateway if practical parking solutions are not made available for all residents of new apartments. Is aware that the City of Belmont's Sustainable Transport Plan is currently under review and that public consultation closed on 30 October 2024. Trusts that it includes research of behaviours in areas of existing high rise development. Invites Council members to take the short drive along Wicca Street between Wright Street and Sydenham Street. States that since the completion of a 4 storey apartment development (65 Wicca Street), cars now park on both sides of the street, making it chaotic to navigate. Considers the availability of high frequency public transport is hyped as a key attraction to encourage car-less residents. Believes the actual corridor between Great Eastern Highway and Guildford is served by one bus every 15 minutes in each direction with the capacity for 82 passengers (110 if the bus is articulated). States that according to the Public Transport Authority website, three bus routes go along Great Eastern Highway too. Questions if that is likely to be sufficient. States public transport has to be able to take people where they want to go and considers this is not easy to achieve in Perth. States changing behaviour around personal car use is not going to happen unless viable alternatives or incentives (such as free public transport) are offered. Finds the advice in the draft Structure Plan about specific requirements to be applied around parking for mixed use and multiple dwelling development very confusing. Considers that making residential parking bays available for general public access at certain times is not practical and that in Eastern Perth shared use was not positive despite that area having greater public transport options. States the project could be a standout example of urban development if executed sympathetically and that there is no question that Perth needs more accommodation for current and future population growth. Requests the plan be reconsidered because it concentrates so many people and such high buildings into one relatively small area. Finds it hard to believe there are no other sites within the council area where similar developments can be undertaken to provide sufficient distance between people and buildings that are more thoughtful for the environment. States Perth is currently considered one of the world's most desirable cities in which to live because of its environment, weather and healthy outdoors lifestyle. Considers that overcrowding a suburb that many tourists will pass on their way into the City is unlikely to see that reputation being maintained.	The Sustainable Transport Plan will investigate travel behaviours but with a primary purpose of finding opportunities to promote active transport and public transport use. Parking for this development was provided in accordance with the Residential Design Codes. Any safety concerns regarding the parking of vehicles can be provided in writing to the City's Rangers. The Great Eastern Highway corridor is serviced by routes 293 and 940 providing connections to Redcliffe Train Station, Perth Airport, Guildford, Midland, Victoria Park Transfer Station and Perth CBD. Routes 998 and 999 via Raconteur Drive/Grandstand Road provide connections to Bayswater Station, Morley Bus Station, Morely shopping Centre, Belmont Forum Shopping Centre, Oats Street Station and Curtin University. It is considered the existing bus network provides a suitable level of connectivity to surrounding areas. However, increased residents in the area may provide a catalyst for the City to advocate to the Public Transport Authority for improved service in the area. The City does not have the ability to offer free public transport. This would rest with the state government. A condition of development approval will require a Car Parking Strategy to ensure appropriate management and operation. The Golden Gateway precinct is a unique opportunity within the City of Belmont to create a northwest gateway to the City of Belmont. The precinct is separated from existing residential areas by roads and is serviced by high frequency transport routes that provides connections to surrounding areas. As previously stated, the draft Structure Plan is likely to result in a high amenity precinct that is attractive to both residents and visitors.
27	Public Submitter	**Support Subject to Modifications and Raises Concerns**	

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		Believes in progress, states that owners within high rise in Ascot Waters will benefit from progressive building policies and does not oppose high rise developments. Believes the precedent has been set for 8 storeys within the area and that this should be the maximum allowed. Considers that building heights shouldn't be changed because construction companies would be more interested in the projects. States lifestyle balanced with progress is the most important item to be considered. States the impact on infrastructure, not only on water/sewerage etc, but traffic should be considered.	Noted. Refer to Building Height section of Council report. Refer to Infrastructure and Movement sections of Council report.
28	Public Submitter	**Raises Concerns** Asks why two structure plans have been prepared and considers that both areas need to be and should be addressed as a whole. Considers that by separating the two land areas there are now two inconsistent policies proposed. States that it appears the WATC has more control over their land usage than current landowners and residents and believes the decision not to realign Resolution Drive is evidence of this. Considers the explanations are vague and the area is a mess of multiple junctions and wasted land use. States the new plans still split the area into islands with poor connections and that the WATC structure plan appears to include commercial use adjacent to proposed residential use in the Golden Gateway Local Structure Plan. Believes it is a fallacy that apartment owners should be restricted to a single car bay or restricted access to on-site parking. Would like to see changes to planning policies. To encourage better land use, those downsizing and families, the experience and amenity of apartments should be as good as, if not better than typical landowners. States that one of the negatives of moving to an apartment is the lack of parking and states that people cannot be forced to use public transport. Considers that 2 bays minimum for every resident in a multi-unit dwelling should be standard. States this will avoid families with children or visitors having to park their cars on the street or in public car parks as happens now. Considers current policies make sense if the apartments are built within 500m of a train or bus interchange and are sized to suite fist homeowners and couples. States Ascot does not meet this criteria. Concerned that the opportunity to avoid uncontrolled street and public open space parking by residents is being overlooked.	The draft Golden Gateway Local Structure Plan has not been prepared to guide future development of Perth Racing's landholdings. As the landowner, it is appropriate for Perth Racing to progress their future plan themselves. Both structure plans will be reviewed having regard for the other to ensure compatible development outcomes. Any development within the City of Belmont is guided by the relevant planning framework (local planning scheme, local planning polices, state planning polices and structure plans where relevant). Council decided not to realign Resolution Drive because the original alignment would have intersected private land, making its implementation uncertain. The two structure plans are considered to relate to one another. For example, the draft Golden Gateway Local Structure Plan proposes a local centre within the precinct. Perth Racing has expressed interest in establishing this centre on their land to serve the surrounding community and future residents of the Golden Gateway precinct. The mix of residential and commercial uses within the precinct is expected to complement the development of the centre. Officers and Council will further consider the nature of development on Perth Racing's land through the assessment of their structure plan. Refer to Movement section of Council report.

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		States that the needs of various groups (those downsizing and families) should be considered and that better land use within the metropolitan area should occur for the expected population growth.	The draft Structure Plan is considered to support development that caters to a diverse range of residents. It identifies a local centre as appropriate within the precinct and promotes mixed-use development, incorporating both commercial and residential uses. Future residential development will be assessed against Volume 2 of the R-Codes, including requirements for dwelling mix.
29	Public Submitter	**Raises Concerns** States the Structure Plan has benefits and issues that will impact residents in proximity to the area bound by Great Eastern Highway, Resolution Drive and Stoneham Street. Notes the previous heights decided by Council and those proposed by this revision. States that at the September Ordinary Council Meeting, it was acknowledged that the height increase is due to market property values not tracking the rising construction costs and that labour costs and shortage of housing were also mentioned. Believes the City of Belmont is prioritising developer profits above concerns of residents such as traffic congestion and parking. Mentions the following results if the Structure Plan is implemented: • An estimated 4,082 additional residents would be added to Ascot's current population of only 3095 (Census 2021 data). • Apartments would be required to have only 1 parking bay following State guidelines, so families with additional cars could potentially use parking bays intended for customers of new commercial businesses and street parking <u>Benefits of the Golden Gateway Local Structure Plan:</u> Lists the following benefits: • New cafes and shops will be near residential areas. • Assist the City in meeting State targets for urban infill and densification to address the housing shortage. • Trees will be planted along Resolution Drive and Stoneham Street. <u>Issues with the Golden Gateway Local Structure Plan:</u> • Considers that increased congestion on Grandstand Road, Great Eastern Highway, and adjacent roads, along with associated noise levels, will impact high-traffic areas. • Believes there will be additional parking issues as Golden Gateway residents may compete for commercial and street parking bays. States that while encouraging public transport, cycling, walking, or alternatives to cars is a positive idea, certain population groups may be unable to use these alternatives. • Considers that the Structure Plan's limited parking and promotion of alternative transport could restrict who can rent or own property in the area. For example, families with multiple young adults, each owning a car, may struggle to find	Noted Refer to Building Height section of the report. Developer profits are not a planning consideration and were not considered when preparing the draft Structure Plan or modifications to the draft Structure Plan. Noted Refer to Movement section of Council Report. Noted Refer to Movement section of Council report. Regarding noise, vehicle noise can be expected within the area. However, this noise is not solely attributed to future development within the Golden Gateway precinct. Refer to Movement section of Council report. The R-Codes include provisions on dwelling mix, and applications will be assessed against its minimum parking requirements. However, as with all

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		parking bays, and senior or disabled residents may not be able to rely on public transport, cycling, or walking. • Believes that a shortage of parking will affect new commercial businesses in this development. • States that traffic lights on the highway turn yellow or red before reaching the opposite side, adding to the issue. • Considers that crossing Stoneham Street to access new commercial businesses could become more challenging, especially during peak times from 6:45 am to 9 am and from 3:30 pm to 5:30 pm. • States that the mixed-use building category in the plan permits a reduction in Public Open Space from 10% in residential areas to 3.47%. Notes that Liveable Neighbourhoods would require a total of 1.5186 hectares of open space, while the Structure Plan proposes only approximately 0.0525 hectares due to the closure of Daly Street. Considers this inadequate for a mixed-use precinct, as it impacts greenery and relaxation areas for residents and business customers. • States that under the Perth and Peel@3.5 million Planning Framework, 10,410 dwellings will be provided within the City of Belmont by 2050.Expresses concern about the City targeting an estimated 2,268 dwellings (21% of the 10,410 total) for this area when the target applies to the entire City of Belmont. Believes Ascot's contribution to the current 32% progress is due to Marina apartments built after 2011, the baseline year. • Considers that the City may have a vested interest in this development, as it owns lots 1 and 5 on Resolution Drive and may be taking steps to benefit itself and developers. • States that the high concentration of concrete buildings contributes to heat generation, with temperature increases reported annually in Perth. Refers to updates to the 2013 "Where Are All The Trees," Australia's benchmark report on urban green canopy cover, which tracks changes in greenery and identifies ways to mitigate future heatwaves, urban heat island effects, and extreme weather. Notes that the City is rated as "Most Vulnerable," despite increasing its canopy cover by 3.1%. Believes planting some trees along Resolution Drive and	developments, if a dwelling does not meet an individual's needs, it is expected that the person would not choose to purchase it. There is no evidence to suggest there will be a shortage of parking within this precinct. Parking will need to be provided in accordance with the R-Codes or the City's Local Planning Scheme. As part of development approvals, the City may request parking demand assessments where a variation to the parking requirements is sought, or a Car Parking Strategy to demonstrate appropriate management of unallocated communal bays. Phasing of traffic signals is the responsibility of MRWA. Improvements to pedestrian crossing points along Stoneham Street are addressed by the Structure Plan. Refer to Movement section of Council report for further detail. Refer to Public Open space section of Council report. Refer to Infill Targets section of Council report. The City of Belmont hasn't developed the planning framework with development aspirations for its landholding in mind. It is noted that the City owns 18 Resolution Drive, Ascot, which is subject to the Draft LSP. Please note that there is nothing unusual or not permitted under planning legislation for a local government to prepare a structure plan that includes City owned land. Furthermore, this does not constitute a personal interest for individual elected members and does not require a declaration under the Local Government Act 1995.It should be noted that the Structure Plan puts further development controls in place than what is currently applied through Local Planning Scheme No. 15. The precinct is not currently heavily vegetated and is mostly built up. The Structure Plan proposes improvements to landscaping, open space and the public realm to improve the urban environment and reduce the urban heat island effect.

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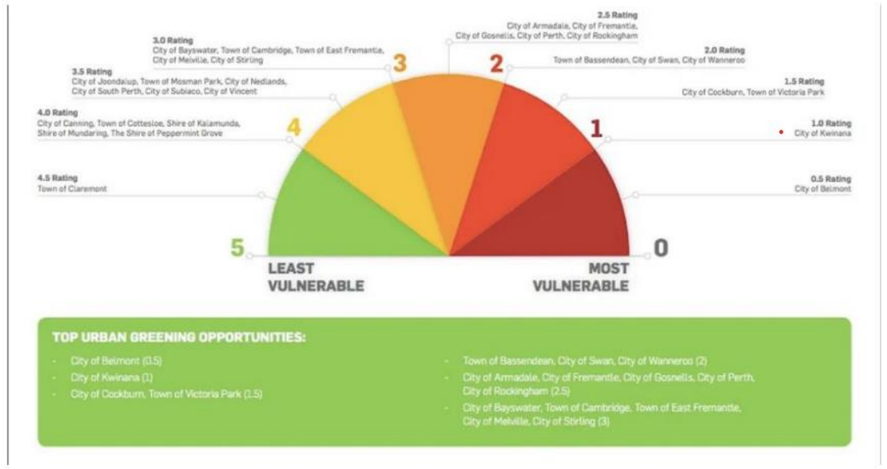
		Stoneham Street will not offset increased heat exposure from the high-density structures proposed. **Areas most at risk from extreme heat**  • Considers that the plan refers to other documents with inconsistencies, such as the Draft Great Eastern Highway Urban Plan, which allows buildings up to 15 storeys from Belmont Avenue to Hardy Road, and the City's Activity Planning Strategy (Part 1), which projects a population change of 1,840 people for Ascot from 2021 to 2041. Notes the Draft Structure Plan's estimated 4,082 additional people in this small area represents a 132% increase in Ascot's overall population. • States that the council stands to benefit from this proposal through collected rates and the land it owns in the area. Considers that the council may not prioritise the area's aesthetics, opting instead for high-density "concrete jungles" to benefit itself and developers. Believes the consultation process occurs as a formality, without genuine consideration of community concerns.	A base height of 15 storeys is proposed along Great Eastern Highway consistent with the Great Eastern Highway Urban Corridor Strategy. The bonus of 5 storeys is also consistent with the Strategy which provides for additional building height subject to particular criteria being met. The figure of 1,890 people included in the Activity Centre Planning Strategy is a population forecast, not a target. This forecast, provided by Forecast ID, does not account for development within the Golden Gateway precinct, except for approximately 254 dwellings at 68 Daly Street. Therefore, the Structure Plan can propose population numbers in excess of these forecasts. It is anticipated that the forecasts will be updated should the Golden Gateway Local Structure Plan be approved. The City of Belmont hasn't developed the planning framework with development aspirations for its landholding in mind. It is noted that the City owns 18 Resolution Drive, Ascot, which is subject to the Draft LSP. Please note that there is nothing unusual or not permitted under planning legislation for a local government to prepare a structure plan that includes City owned land. Furthermore, this does not constitute a personal interest for individual elected members and does not require a declaration under the Local Government Act 1995.It should be noted that the Structure Plan puts further development controls in place than what is currently applied through Local Planning Scheme No. 15. Officers and Council are required to genuinely consider the community's feedback in preparing a recommendation to the WAPC.

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		Raises the below concluding points: • Considers that building heights should remain at six storeys along Resolution Drive and Stoneham Street and nine storeys on Great Eastern Highway, as set out in the original draft of the Golden Gateway Structure Plan. States that this would also provide certainty to developers, as the City has recently allowed the construction of Bell Air apartments at nine storeys. • States that the City's target under the Perth and Peel@3.5 million Planning Framework is 10,410 dwellings by 2050 and that 32% (3,331 dwellings) of this target has already been achieved. • Believes there is a significant concern about the City targeting an estimated 2,268 dwellings (21% of the 10,410 target) for this land area when the target is meant for the entire City of Belmont. Considers it important to note that Ascot contributed to the current 32% because the Marina apartments were built after 2011, the baseline year. • Believes the City may have a vested interest in this development, as it owns lots 1 and 5 on Resolution Drive and may be prioritising its own and developer interests. • Considers that all mixed-use development in the area should include 10% public open space and incorporate sustainable design features, regardless of building height. This is particularly important given that the City is ranked as "Most Vulnerable" in terms of heat risk due to limited greenery. States that, with extensive experience as a retired Occupational Hygienist in the mining industry, the health impact of extreme heat is understood and believes the City's focus on construction costs, developer certainty, and housing shortages overlooks the health impact of high concentrations of concrete buildings on generated heat. • Believes that traffic congestion and parking issues associated with an estimated 4,082 new residents would exacerbate ongoing concerns of current residents. Considers that simply monitoring or modelling parking use after the fact is unacceptable, as this approach is costly and often ineffective in addressing the problem. • Considers that traffic congestion will contribute to pollution levels (chemical and physical) that could impact the health of local residents in the proposed Structure Plan area.	Refer to Building Height section of Council report. Refer to Infill Targets section of Council report. Refer to Infill Targets section of Council report. The City of Belmont hasn't developed the planning framework with development aspirations for its landholding in mind. It is noted that the City owns 18 Resolution Drive, Ascot, which is subject to the Draft LSP. Please note that there is nothing unusual or not permitted under planning legislation for a local government to prepare a structure plan that includes City owned land. Furthermore, this does not constitute a personal interest for individual elected members and does not require a declaration under the Local Government Act 1995.It should be noted that the Structure Plan puts further development controls in place than what is currently applied through Local Planning Scheme No. 15. Refer to Public Open Space section of Council report. The precinct is not currently heavily vegetated and is mostly built up. The Structure Plan proposes improvements to landscaping, open space and the public realm to improve the urban environment and reduce the urban heat island effect. Refer to Movement section of Council report. Increasing densities along major transport corridors is consistent with contemporary planning practices advocated for by Perth and Peel @ 3.5 Million which seeks to locate people in close proximity to services and

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		• States some residents may not be able to rely on public transport, cycling, or walking due to age, disability, physical impairments, weather conditions (e.g., heat, rain), or lack of nearby public transport stops. Considers that limiting parking to one bay per dwelling could disadvantage certain population groups. • Suggests that the City or State Government could encourage alternative transport use by providing incentives, such as partially funded electric bikes or scooters or Council rate discounts for those who demonstrate public transport usage.	public transport opportunities. This aims to promote the use of alternative modes of transport such as public transport, walking and cycling. Refer to Movement section of Council report. Increased residents in the area may provide a catalyst for the City to advocate to the Public Transport Authority for improved service in the area. Other strategies to promote alternative modes of transport will be further investigated through the review of the City's Sustainable Transport Plan.
30	Public Submitter	**Raises Concerns** <u>State Government Planning Changes</u> States it is not apparent that the City has taken into account the impact of the latest raft of changes by the State Government to Planning laws and regulations when preparing the latest Local Structure Plan. Given much of the proposed development area has been designated for high rise developments, states that it is almost certain developers will bypass the City when putting forward their development plans. Considers this will result in Council having little to no impact on any final decisions. Believes recent decisions made the by the State Government do not place a strong emphasis on the preferences of Council's and their residents. On the basis of the above, encourages stricter controls be imposed. Considers the draft Structure Plan would be welcomed by developers for all the wrong reasons. <u>Density</u> States the City has applied the highest density code to the majority of the area and that little to no explanation has been provided as to why this is necessary or why a mix of density codes has not been applied. Considers that to state that buildings will be 9-15 storeys with the possibility of an extra 5 if certain concessions are made is very misleading. States that developers will ask for the highest number of storeys and this will inevitably mean 20 storeys close to Great Eastern Highway and 15 storeys elsewhere and that developers may seek approval for even greater heights.	While officers are aware of recent planning reforms, it is unclear what the submitter is specifically referring to. Development proposals may be referred to the Development Assessment Panel, based on their estimated cost. In these cases, City of Belmont planners will assess the proposal against the structure plan and provide a responsible authority report to the Panel, which includes two of the City's Councillors. Decision-makers will be required to consider the structure plan in their deliberations. An unreasonable planning framework will carry little weight with the DAP, while well-founded and reasonable controls are likely to carry more weight. Given that the draft controls are soundly justified, they are less likely to be varied, offering both the Council and the community greater certainty regarding the precinct's future development. The proposed R-ACO density code is not the highest code that can be applied but provides for precinct specific planning requirements. 15 storeys is recommended for lots fronting Great Eastern Highway and 10 storeys for all other land bound by Great Eastern Highway, Stoneham Street and Resolution Drive. A five storey bonus applies to all sites if developers provide open space and sustainability initiatives. The appropriateness of the 5 storey height criteria is further discussed in the

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			Sustainability section of the Council report. Additional commentary relating to the developer profits is included in the Building Height section.
		Believes that if the Structure Plan is approved, similar heights will occur in areas marked 'subject to separate planning process'. Concerned this may be a deliberate ploy and that no consideration has been given to the possibility in the Plan and how this might impact the overall area.	Building heights over Perth Racing's land is shown in the draft Ascot Racecourse Precinct Structure Plan as 6, 3 and 2 storeys respectively. Council will consider building heights when this Structure Plan is presented to Council. Building Heights for the Ascot Kilns land will be considered by Council when a Local Development Plan is received.
		<u>Application of Concessions</u> Concerned that the City is prepared to approve up to an additional 5 storeys on the basis of vague assurances. Fails to see how the City can clarify these concessions as worthy of extra consideration and considers these should be incorporated into the basic design requirements of all new buildings.	Refer to Sustainability section of Council report.
		States that there have been recent decisions by external approval boards whereby the so call 'concessions' have been minimised or even removed. Believes the City has a unique opportunity to ensure new buildings will last well into the future and be leading examples of what can be achieved through high quality Planning principles. Concerned that without stricter controls it is inevitable that developers will not take the initiative and the City and users will be the poorer for it.	The Structure Plan aims to facilitate high-quality development. Applications will be assessed against the R-Codes, including landscaping and sustainability requirements. Proposals will also undergo review by the City's Design Review Panel to ensure alignment with the ten design principles of State Planning Policy 7.0 – Design of the Built Environment. To exceed these standard requirements, incentives, such as additional height, must be provided.
		<u>Social Issues</u> States the City has not considered the impact of the overall development on residents, visitors and the City overall and that nowhere else in the City are there height or density provisions similar to what is being proposed in the Golden Gateway precinct. Questions whether the City has a broader plan or if the City is maximising income and revenue for the various players or if it is a case of laziness just to get something approved to meet a target deadline.	The Golden Gateway precinct's unique location, adjacent to Great Eastern Highway and separated from residential areas, makes it well-suited for the proposed density and height. The Perth and Peel planning framework supports higher-density development along key corridors like Great Eastern Highway to promote urban consolidation. All development applications will be reviewed by the Design Review Panel (DRP) to ensure high-quality, innovative designs.
		Believes the proposed densities lend themselves to many social issues and problems in the future and that the plan does nothing to mitigate these issues. Considers this shows the looseness of the Plan provisions and that residents are being left with only vague assurances that developers will be encouraged to provide innovative designs. States history shows this is very rarely met by developers unless they are required to do so.	There is no evidence to suggest the proposed densities will result in social issues. Further information regarding building height and amenity is provided in the relevant sections of the Council report.
		<u>Public Open Space</u> Considers that the Belmont Trust Land cannot be relied on for Public Open Space because there has been no decision about what is going to happen with this land and that this should be acknowledged in the plan. Believes it is highly likely that when a decision is made, it will include a trade off that some of this land is developed in order to include some other concessions for the remaining land. States assurances of this will not happen because Council is not the deciding body on these matters.	The Belmont Trust Land is subject to a declaration of trust which requires this land to be used for public enjoyment and recreation. Further details relating to this land are included within the Council Report.
		<u>Road/Traffic</u> States that the report from Flyt bases its projections on data from 2021 and that no explanation has been provided for using old data. Believes there is also no real	A revised Movement and Access Strategy has been prepared in support of the Structure Plan which uses the latest available data sets.

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		acknowledgement of the difficulty in negotiating the area around the racecourse when there is a major event and that the report does not account for increases in traffic associated with Perth Racing's development aspirations.	The Movement and Access Strategy includes data about the future and current road network performance (further details included in the Movement section of the Council report). It also includes assessment of the road network factoring in Perth Racing's development and traffic on event days.
		Finds it hard to believe that it will take up until 2041 for traffic congestion problems to be noticeable.	The results of the traffic assessment are detailed in the Movement and Access Strategy. The findings indicate that there will be a level of congestion in the area prior to 2041 however this will occur regardless of development within the Golden Gateway precinct.
		Considers the reliance on people using public transport and bicycles to fix traffic problems is naïve and without merit. States no mention was made regarding increasing problems with e-scooters and e-bicycles and that some Council's are actually removing them from use as a result. Believes these modes of transport and car share and trackless trams is not the solution.	As outlined in the structure plan and the Movement section of the Council report, future development could act as a catalyst for enhancing alternative transport options in the area, including improved public transport services. While concerns about e-scooters and e-bicycles are acknowledged, these modes, when properly managed, can significantly reduce car dependency and help alleviate traffic congestion.
		Believes stating there is a plan to reduce car dependence is nothing more than reducing parking requirements for developers. States recent history has shown this results in increased congestion and illegal and nuisance parking and that this results in reduced liveability and increased costs for managing future problems.	Parking requirements are consistent with Volume 2 of the R-Codes. Further commentary is included in the Movement section of the Council report.
		States the reference to "investigate alternative road alignment" has the potential to have a significant impact on the Structure Plan and that without any idea of what it will look like, everyone is going in blind and placing their faith in the City and Main Roads that everything will be alright. States this is unacceptable.	This phrase is included in Part 2 of the Structure Plan and describes opportunities identified in the early stages of preparing the Structure Plan. Council considered a previous version of the Structure Plan at the 23 June 2020 Ordinary Council Meeting. A result of Council's decision is that the road network is now proposed to remain in its existing configuration apart from Daly Street which will be converted into a cul-de-sac.
		<u>Water Availability.</u> States the plan says there is limited or no availability of quality water from the aquifer for irrigation. Questions how assurances regarding maximising public open space can be believed, whether provided by the City or developers.	Due to the limitation of groundwater for irrigation purposes, the future irrigation of vegetation within the public open space and public realm areas will need to be supplied by other sources. This may include scheme water, stormwater, irrigation (by agreement) from the Western Australian Turf Club's artesian groundwater licence, a new irrigation lake or other irrigation strategies will need to be investigated in the future. The City may encourage developers to consider the irrigation of abutting verge vegetation and street trees to ensure the high quality natural amenity of the public realm is maintained. Alternatively, non irrigated (dry) landscape may need to be considered for the public realm areas.
		<u>Contaminated Sites</u> States no mention has been made of contaminated sites and that it is important these are identified because they will have a major impact on what is proposed. Believes it will not be the developer who pays but the City and its ratepayers.	There are no contaminated sites within the precinct. Lot 5 Resolution Drive (160 Stoneham Street) is listed as "possibly contaminated, Investigation Required." The implementation strategy identifies it is the responsibility of developers to complete preliminary site investigation for contamination in accordance with the Contaminated Sites Act 2003 should areas of known contamination be disturbed.
		<u>Summary</u> States it is possible to achieve housing targets while maintaining a healthy balance for the Structure Plan Area that preserves the amenity of the surrounding area in keeping	Noted.

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		with the character of the area and providing a benefit to the community. Considers there is opportunity that with a clear vision and an innovative approach, the City can achieve a unique community focussed community that is liveable and sustainable. States that in order to do so in the current environment where the State Government has severely impacted the ability of Councils to achieve what the community needs and/or wants, it is essential that the Plan imposes strict, high level conditions on developers. Council, through this Plan, cannot leave the door open for developers to put forward plans that are totally out of step not only for the residents but the overall Perth community.	Future development proposals will be assessed in accordance with the Structure Plan, Local Planning Scheme and the Residential Design Codes. Additionally proposals will be reviewed by the City's Design Review Panel.
31	Public Submitter	**Supports Subject to Modifications** Mentions that the client's land comprises the Ascot Racecourse complex, administration buildings, and other associated buildings surrounding the racecourse. On behalf of Perth Racing, it is mentioned that the draft Ascot Racecourse Precinct Structure Plan ('Draft PSP') was recently submitted to the City for assessment. States that the Draft PSP is currently undergoing public consultation, which is expected to conclude on 6 December 2024, ahead of the Council's consideration of and recommendation to the DPLH on the Draft PSP in early 2025. **Duplication** Given the recent submission of the Draft PSP, requests that Perth Racing's land be excluded from the GGLSP entirely and that the 'Structure Plan Boundary' depicted on Plan 1 – Structure Plan Map be modified to remove Perth Racing's landholdings. This amendment is requested to ensure that there is no duplication of planning framework or deferral to other documents and/or frameworks, and to apply subdivision and development standards solely to the land in which the Structure Plan relates. **Provisions** Mentions that, should the City consider the need for 'common provisions' to apply to both the Golden Gateway and Precinct E of the Draft PSP, both Structure Plans should replicate the same provisions, rather than duplicating provisions for the one landholding. <u>Parking</u> States that the proposed Parking provisions in the Draft GGLSP (Clause 4.2.2.1) defer to LPS 15 standards or a parking strategy, whereas the Draft PSP provides parking standards that are consistent with the Department of Planning, Lands and Heritage ('DPLH') draft Interim Guidance Document on car parking requirements for non-residential land uses in Perth and Peel (Draft Interim Guidance Document) and reflects the most recent direction on parking provided by the State Government. Requests that, should 'common provisions' be included within both documents, consistency with the Draft Interim Guidance Document be maintained. <u>Infrastructure Funding</u> Mentions that Clause 5.2 of the Draft GGLSP allows for the City to establish an appropriate funding strategy through the introduction of a Development Contribution	Noted The decision to retain Perth Racing's land within the precinct was done in consultation with officers at the Department of Planning Lands and Heritage. This approach allows Perth Racing to conduct their own planning while enabling the LSP to progress. Retaining Perth Racing's land within the broader LSP boundary ensures that future planning for both areas is coordinated holistically. It should be noted that the draft Structure Plan designates Perth Racing landholding as subject to a separate planning process. Accordingly, no development provisions (such as parking) applied through the structure plan will be applicable to land owned by Perth Racing. Officers consider it appropriate to apply parking requirements in line with the existing statutory planning framework. The City will review parking requirements through the preparation of a new local planning scheme Given Perth Racing's land is designated as being subject to a separate planning process, infrastructure funding arrangements applied through the Golden Gateway Local Structure Plan will not apply to Perth Racing's land.

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		Area and a Development Contribution Plan ('DCP'). States that Part Two of the Draft GGLSP outlines that funding may include: • Great Eastern Highway pedestrian crossing • Land for Public open space and community facilities • Landscape treatment for all public realm areas, including local roads Given that the Draft PSP does not extend towards Great Eastern Highway, does not include land required for public open space, and proposes improvements to the public realm, it is requested that these provisions not be duplicated as a 'common provision' between both Structure Plans.	
32	Department of Education	The proposed Structure Plan area falls within the student enrolment intake area of Belmont Primary School. Whilst the subject primary school is currently operating within the student accommodation capacity, the potential delivery of residential development within the Structure Plan area would still have an impact on the student enrolment demand of the locality and capacity of the primary school in the long term. It is worth noting that every new residential development or intensification of residential density create demand for, or on, public schools, with this demand potentially extending beyond the boundaries of a structure plan. Whilst the Department acknowledges the planning merits of infill development, it is critical to balance the residential growth and resultant student population with public school provision in the locality. If there are insufficient provisions of public schools, this will result in significantly overcrowded school sites, insufficient parking for drop-offs and pick-ups, traffic management issues for the local community, and compromised education outcomes for students. With reference to Part 2, section 3.6 'Education Facilities' of the draft Golden Gateway Local Structure Plan Report, the Department does not support the commentary in that the future development within the Structure Plan would have 'limited additional demand for education facilities'. It should be highlighted that the public school demand is dependent on, amongst other things, gentrification of the locality, size and capacity of the local public school site/s, future or potential urban growth areas and compliance with the prescribed ratio of 1 public primary school site for every 1500 dwellings as per the Western Australian Planning Commission's Operational Policy 2.4 – Planning for School Sites. Preliminary analysis at this stage indicates that Belmont Primary School would be under student enrolment pressure in the long term. With the school site being restricted in size (1.46 hectares in lieu of a standard 4 ha standalone primary school site), future expansion or augmentation of the school (e.g. off site early childhood facility) may be required in the future to ensure its capability of catering for the long-term student demand in the Ascot-Belmont area. Notwithstanding this, the Department has no in-principle objections to the Structure Plan subject to the above matters being addressed. The Department will continue to monitor the student enrolment demand as development progresses within the Structure Plan and ensure that the residential growth corresponds accordingly with the provision of public schools in the locality. It is essential that the Department and the City of Belmont collaborate on future school planning within the municipality to adequately provide for the educational needs of the Town in the future.	Noted Noted Refer to Administrative Modifications section of Council Report and Schedule of Modifications Noted Noted

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33	Water Corporation Locked Mail Bag 2, Osborne Park WA 6916	Major water and wastewater infrastructure upgrades are required for this area to service the extent of the structure plan proposal. The upgrades have been captured in the Servicing Report produced by Cardno. Key pieces of the network upgrade will be conducted by Water Corporation as part of the Capital Investment 5 year Program. Other upgrades will be completed as required once development applications for larger buildings go through the planning process.	Noted
34	Main Roads Western Australia PO Box 6202, East Perth WA 6892	**Vehicle Access Strategy** Current "Vehicle Access Strategy" for Great Eastern Highway abutting the proposed Local Structure Plan (LSP) site is to be maintained as per the Plan no. 16339-13. **Bus Priority Lane** It is recommended to investigate the feasibility for continuous east-bound bus priority lane along the Great Eastern Highway between Stoneham Street and Resolution Drive as part of the mitigation measures to reduce impacts on bus queue jump lane and existing intersections performance due to proposed LSP. **Movement and Access Strategy - Further Information Required** 'Movement and Access Strategy' report prepared by Flyt (revision 3, dated 2 August 2024) is recommended to be revised addressing the followings: <u>Pedestrian Connectivity</u> Section 4.3 updates required: • Assess and determine necessary upgrades to pedestrian facilities at the intersections of Great Eastern Highway with Resolution Drive/Hardey Road and Stoneham Street/Belgravia Street. • Consider the increased pedestrian demand due to the 2,268 dwellings within the walking catchment, especially towards Belmont Primary School, therefore the report should be amended. <u>Alternative Pedestrian Treatments:</u> • Model the above treatments within SIDRA to evaluate their viability. • Assess geometric requirements, land boundaries, and potential signal modifications. • Detail mechanisms for future delivery this information would be required to inform costings for a development contribution plan. <u>Local Roads Connectivity</u> Performance Assessment: • Evaluate the performance of local road intersections with Great Eastern Highway, Stoneham Street, and Resolution Drive. • Determine necessary upgrades such as turn pockets, staged-turning facilities, and civil modifications to enforce left-in/left-out movements etc. Speed Zone Assessment: • Main Roads are responsible for speed zones. The proposed 30km/hr speed zone in section 4.3 requires a further assessment and approval from Main Roads Traffic Management Services.	The Structure Plan proposes vehicle access consistent with the Vehicle Access Strategy. Given Great Eastern Highway is under the care and control of Main Roads Western Australia, it is appropriate for them to undertake these investigations. The Movement and Access Strategy already recommends the City investigate protected crossings. As Main Roads Western Australia is responsible for pedestrian crossings on Great Eastern Highway, the City of Belmont will need to liaise with them. The Movement and Access Strategy considers the increase in pedestrian numbers and includes recommended improvements to pedestrian infrastructure. As the exact nature and timing of potential pedestrian upgrades is uncertain, the need for modelling will be reassessed when specifics are known. These aspects will be further considered at a later stage when the City develops a funding strategy for the structure plan. No changes are proposed to the local road intersections with Great Eastern Highway, Stoneham Street or Resolution Drive (with the exception of the closure of the Daly Street connection to Stoneham Street). The existing intersection configurations were found to operate with acceptable levels of service for the 2031 and 2041 forecast scenarios, therefore there is no need to undertake further analysis. Noted. This will occur at a later stage.

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		<u>SIDRA Assessment</u> Network Model Coordination: • SIDRA network model is required to be co-ordinated for the existing two signalised intersections to observe any changes due to any proposed scenarios. Bus Lane Vehicle Distribution: • Modify vehicle distribution along the bus lane to reflect SCATS volume, which indicating a lower proportion of vehicles using the bus lane compared to regular through lanes. **Noise** • Noise sensitive land uses located adjacent to the Primary Regional Road reservation are required to implement acoustic attenuation measures in accordance with WAPC State Planning Policy 5.4 – Road and Rail Noise. A noise report complying with State Planning Policy 5.4 is to be prepared for any future proposals for noise sensitive development within the SPP 5.4 trigger distance of Great Eastern Highway.	Due to the size of each network model, with 20 sites, co-ordination between the two signalised intersections makes the models unstable. The network models represent a worst case, with the phase times identical to the base year models. The bus lane usage has been reviewed and updated, with particular emphasis on the two signalised intersections along Great Eastern Highway. Noted. This will be addressed through the development application process.

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Schedule of Modifications

Document	Modification No.	Section/Page	Change
Structure Plan Report	1	6 Additional Information - Page 10 1.1 Introduction and Purpose – Page 15 1.2.3 Legal Description and Ownership – Page 19 3.3 Land Use – Page 47 3.3.7 Public Open Space – Page 51	Update Table Numbers and references in text.
Structure Plan Report	2	4.2.2.2 Building Height – Page 7 3.3.4 Building Height – Page 48	Insert "alternative measures can be considered at the discretion of the decision maker provided they have an equal or greater sustainability outcome."
Structure Plan Report	3	3.3.8 Public Realm Provision – Road and Street Treatments – Page 53	Correctly label the cross section images (currently the label of "Resolution Drive" is over the Stoneham Street cross section and vice versa).
Structure Plan Report	4	3.4.3 Pedestrian and Cycling Network – Page 58 3.9.2 Infrastructure Funding Strategy – Page 61	Reference the investigation of a pedestrian overpass or underpass across Stoneham Street through the preparation of an Infrastructure Funding Strategy.
Structure Plan Report	5	3.6 Education Facilities – Page 59	Delete *"given the nature of the development and anticipated demographic it is anticipated that there will be limited additional demand for education facilities generated in the precinct."* After *"The Golden Gateway Precinct is well located within an existing urban context allowing future residents to take advantage of existing education facilities"* insert "*The Department of Education has indicated that Belmont Primary School is expected to face enrolment pressure in the long term. They will continue to monitor enrolment demand as development progresses within the Structure Plan and ensure residential growth aligns with the availability of public schools in the area."*
Public Realm Strategy	6	Golden Gateway Tree Species – Page 21&22	Delete Pheonix canariensis: Canary Palm 15m+ from the planting list.

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