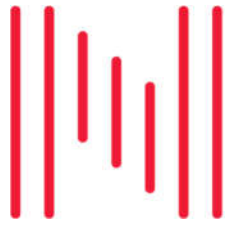




Appendix D

Integrated Transport Assessment



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Integrated Transport Assessment

Prepared for

**ROLLESTON
INDUSTRIAL
DEVELOPMENTS LTD**

**1491 Springs Road
Lincoln**

October 2020



Integrated Transport Assessment
Prepared for

Rolleston Industrial Developments Ltd

1491 Springs Road
Lincoln

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Introduction

1. Rolleston Industrial Developments Ltd has commissioned Novo Group to prepare an Integrated Transport Assessment (ITA) for a Plan Change at 1491 Springs Road, south of Lincoln.
2. This report provides an assessment of the transport aspects of the proposed Plan Change. It also describes the transport environment in the vicinity of the site, describes the transport related components of the proposal. It has been prepared broadly in accordance with the Integrated Transportation Assessment Guidelines specified in New Zealand Transport Agency Research report 422, November 2010.
3. It is proposed to develop the site primarily for residential use, plus a small commercial zone is also proposed. It is anticipated that the site will accommodate up to 2,000 residential Lots. Primary vehicle access will be taken from Springs Road and it is proposed this will link through to Moirs Lane and then Ellesmere Road. Secondary accesses will be provided to Collins Road, Liffey Springs Drive and potentially the internal road networks of the Te Whāriki and Verdeco Park subdivisions.
4. The site location (to the south of Lincoln) is illustrated in **Figure 1** and a copy of the proposed Outline Development Plan (ODP) is included in **Appendix 1**.

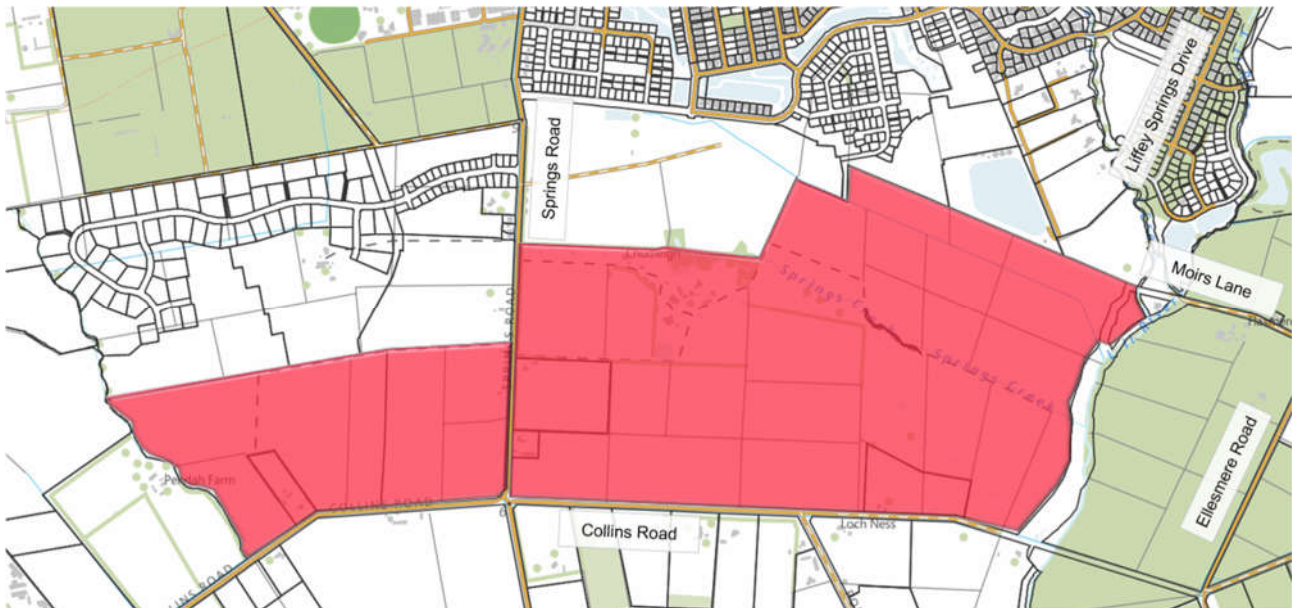


Figure 1: Site Location



Transport Environment

Road Links

Springs Road

5. **Table 1** sets out the transport details of Springs Road in the vicinity of the application site.

Table 1: Springs Road Details

Key Feature or Characteristic	Comment
Road Classification	Collector Road from Gerald Street to 800m north of Collins Road. Local Road south of this.
Cross-Section Description	6.2m sealed carriageway for the section outside the application site. The segments outside Verdeco Park and Te Whāriki are being upgraded to provide a 12.8m carriageway with footpaths on both sides. See Figure 2 and Figure 3 for images.
Traffic Volumes	1,531 vehicles per day ¹ .
Speed	60km/hr from south of the Verdeco Park access heading north. 100km/hr to the south of this.
Cycling Infrastructure	It is understood that the eastern footpath on Springs Road will be a shared path.
Pedestrian Infrastructure	Footpaths on both sides of the road where the carriageway has been upgraded. No footpaths in the rural sections of Springs Road.
Public Transport	None
Road Safety	One non-injury crash at the Springs Road / Anaru Road intersection where a driver u-turning on Springs Road hit a vehicle as they failed to check the road was clear.



Figure 2: Springs Road (Urbanised Area)



Figure 3: Springs Road (Rural Area)

¹ From the Mobile Road website.



Collins Road

6. **Table 2** sets out the transport details of Collins Road in the vicinity of the application site.

Table 2: Collins Road Details

Key Feature or Characteristic	Comment
Road Classification	Local Road.
Cross-Section Description	The section west of Springs Road has a 6m sealed carriageway. The section east of Springs Road has a 6.2m wide sealed carriageway for approximately 935m and then is a 4.2m wide metalled road for a further 540m before terminating.
Traffic Volumes	740 vehicles per day ² west of Springs Road and 85 vehicles per day east of Springs Road.
Speed	100km/hr.
Cycling, Pedestrian and Public Transport Infrastructure	None
Road Safety	One non-injury crash at the intersection with Springs Road, where a driver lost control after negotiating the bend.



Figure 4: Collins Road West of Springs Road



Figure 5: Collins Road East of Springs Road

² From the Mobile Road website.



Ellesmere Road

7. **Table 3** sets out the transport details of Ellesmere Road in the vicinity of the application site.

Table 3: Ellesmere Road Details

Key Feature or Characteristic	Comment
Road Classification	Local Road south of Edward Street and Arterial Road north of Edward Street.
Cross-Section Description	The section south of Edward Street has a 6m sealed carriageway and grass berms beyond this.
Traffic Volumes	1,968 vehicles per day ³ south of Edward Street and 81 to 110 vehicles per hour in the peak hours.
Speed	80km/hr.
Cycling, Pedestrian and Public Transport Infrastructure	None
Road Safety	No crashes have been reported in the most recent five-year period available.

Moirs Lane

8. **Table 4** sets out the transport details of Moirs Lane in the vicinity of the application site.

Table 4: Moirs Lane Details

Key Feature or Characteristic	Comment
Road Classification	Local Road.
Cross-Section Description	This road is sealed for a length of approximately 50m from the stop-controlled intersection with Ellesmere Road. The carriageway is approximately 6.4m wide. This is then a 3.7m wide metalled track to the west of this.
Traffic Volumes	Estimated a 40 vehicles per day and four vehicles per hour based on this road currently serving four residential properties.
Speed	100km/hr.
Cycling, Pedestrian and Public Transport Infrastructure	Provides a cycle connection to the Little River Cycle Route, which crosses Ellesmere Road at the intersection with Moirs Lane.
Road Safety	No crashes have been reported in the most recent five-year period available.

³ From the Mobile Road website.



Key Intersections

Springs Road / Ellesmere Junction Road / Gerald Street Roundabout

9. This intersection is a four-arm roundabout, as illustrated in **Figure 6**. Traffic counts were undertaken at this intersection from 07:00 to 09:00 and 16:00 to 18:00 on Thursday 15th October 2020. The peak hour traffic volumes are contained on the traffic diagrams in **Appendix 2**.



Figure 6: Springs Road / Ellesmere Junction Road / Gerald Street Roundabout

10. A SIDRA model has been created of this intersection to identify the existing traffic capacity. The results of this intersection model are included in **Appendix 3**. As a broad summary, the model results indicate that:
- i. The intersection operates satisfactorily in the AM peak hour, with an overall Level of Service of B⁴. Similarly, the worst Level of Service for any turning movement is C. The degrees of saturation are also considered to be within acceptable limits⁵; and
 - ii. The intersection operates satisfactorily in the PM peak hour, again with an overall Level of Service of B. Similarly, the worst Level of Service for any turning movement is C. The degrees of saturation are also considered to be within acceptable limits.
11. The Selwyn District Council Long Term Plan commits funding to the upgrading of this intersection to traffic signals between 2018 to 2028. However, we understand that funding is being reviewed by the Council and this signalisation project may be pushed further into the future.

⁴ Where Level of Service A is considered excellent, E is considered to be at capacity and F is over-capacity.

⁵ A practical limit for degree of saturation on non-signalised intersections is considered to 0.85, as large queues and delays can occur above this value.

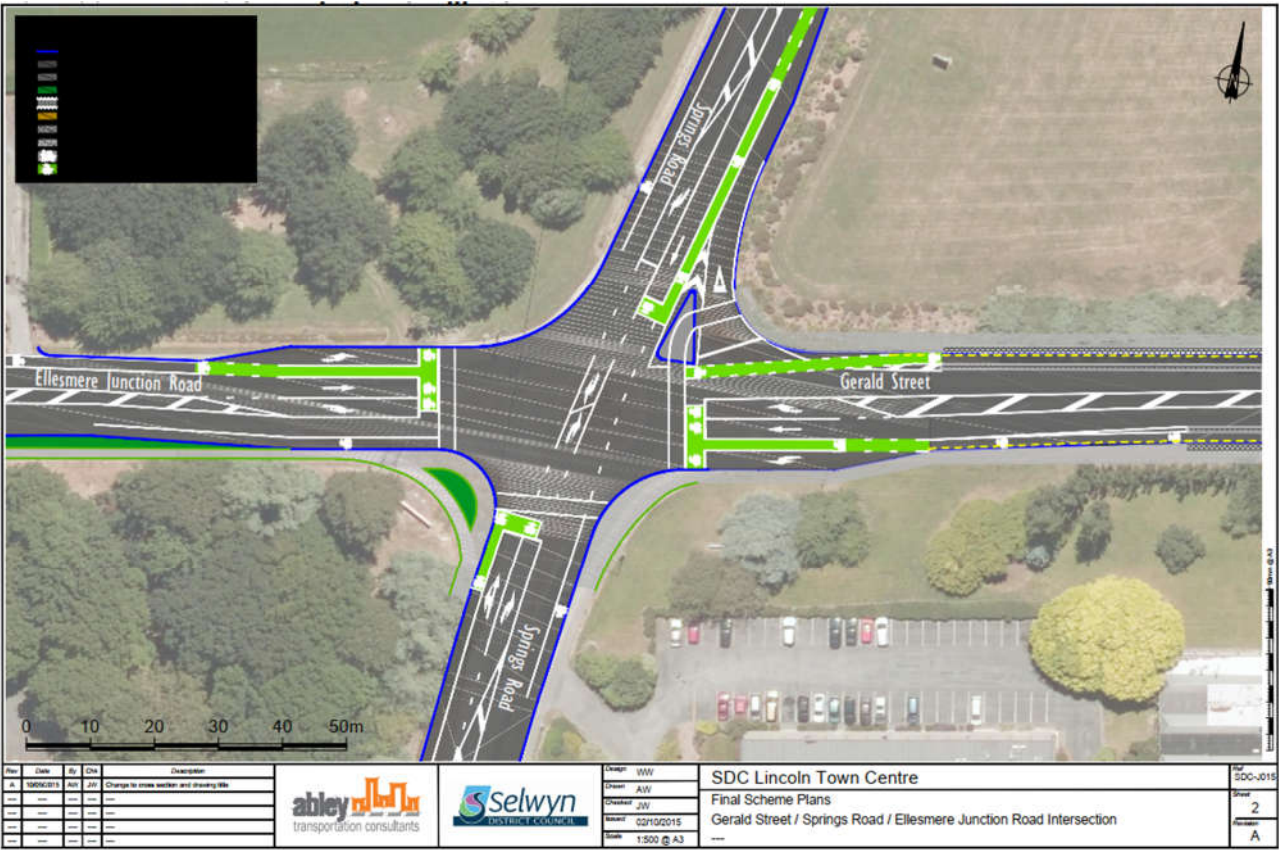


Figure 7: Springs Road / Ellesmere Junction Road / Gerald Street Intersection – Council Upgrade

12. The NZ Transport Agency Crash Analysis System (CAS) has been reviewed to identify crashes that have been reported within 100m of the Springs Road / Ellesmere Junction Road / Gerald Street roundabout in the most recent five-year period available. **Figure 8** is the collision diagram at this intersection.

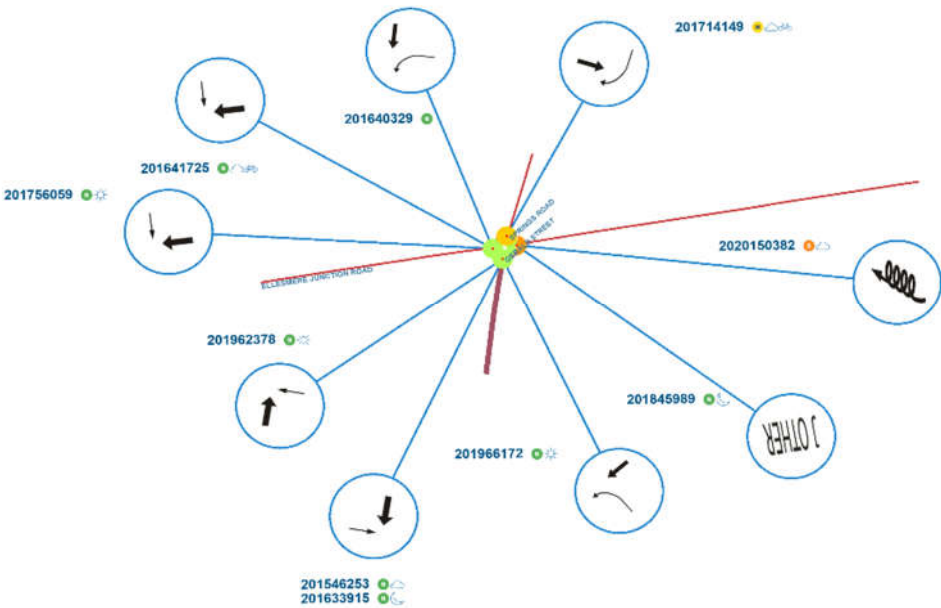


Figure 8: Springs Road / Ellesmere Junction Road / Gerald Street Roundabout Collision Diagram



13. Ten crashes were reported at this intersection, including one severe injury crash, one minor injury crash and eight non-injury crashes. These crashes are summarised as follows:
 - i. A serious injury crash where a driver evading police lost control and hit a power pole;
 - ii. A minor injury crash and non-injury crash where a southbound driver on Springs Road entered the roundabout and hit a cyclist that was circulating;
 - iii. Three non-injury crashes where a southbound vehicle (on Springs Road) failed to give-way to circulating traffic (alcohol was a contributing factor in one of these crashes);
 - iv. A non-injury crash where a westbound vehicle (on Gerald Street) failed to give-way to circulating traffic and crashed; and
 - v. Three non-injury crashes where a northbound vehicle (on Springs Road) failed to give-way to circulating traffic.

Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

14. This is a four arm priority controlled intersection, with the northern and southern arms both being stop-controlled (both Ellesmere Road approaches), as illustrated in **Figure 9**.



Figure 9: Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

15. Traffic counts were undertaken at this intersection from 07:00 to 09:00 and 16:00 to 18:00 on Tuesday 20th October 2020. The peak hour traffic volumes are contained on the traffic diagrams in **Appendix 4**. It is noted that the dominant traffic flows at the intersection are the left turn from Edward Street to Ellesmere Road north and vice versa. This indicates that Ellesmere Road is being used as a route to / from Christchurch by residents of Lincoln.



16. A SIDRA model has been created of this intersection to identify the existing traffic capacity. The results of this intersection model are included in **Appendix 5**. As a broad summary, the model results indicate that:
 - i. The intersection operates satisfactorily in the AM peak hour. The worst Level of Service for any turning movement is B. The degrees of saturation are also considered to be within acceptable limits; and
 - ii. The intersection operates satisfactorily in the PM peak hour. Again, the worst Level of Service for any turning movement is B. The degrees of saturation are also considered to be within acceptable limits.
17. The Selwyn District Council Long Term Plan includes upgrading this intersection to a roundabout between 2018 to 2028.
18. The NZTA CAS database has been reviewed to identify crashes that have been reported within 100m of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection within the most recent five-year period available. This indicated two non-injury crashes, as per the following collision diagram.

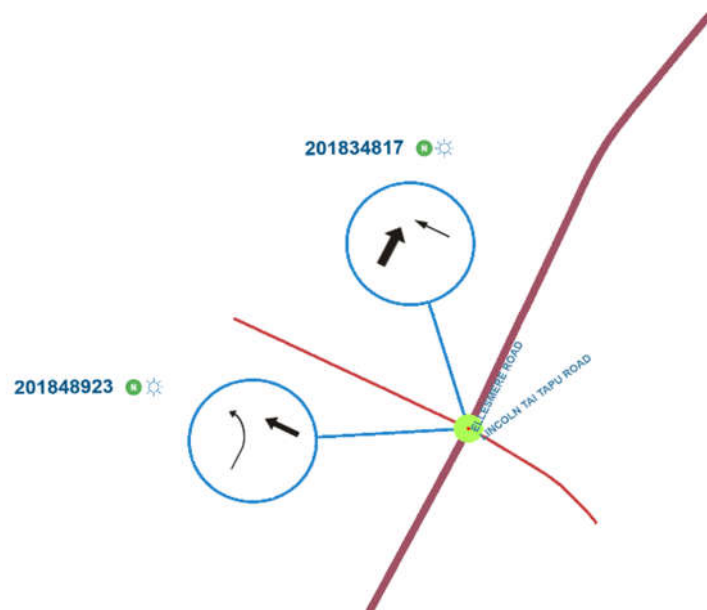


Figure 10: Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Collision Diagram

19. The above crashes both occurred when northbound vehicles on Ellesmere Road failed to give-way to westbound traffic on Lincoln Tai Tapu Road.

Adjacent Subdivisions

Verdeco Park

20. The Verdeco Park subdivision is located on the western side of Springs Road to the north of the application site, as illustrated in **Figure 11**.

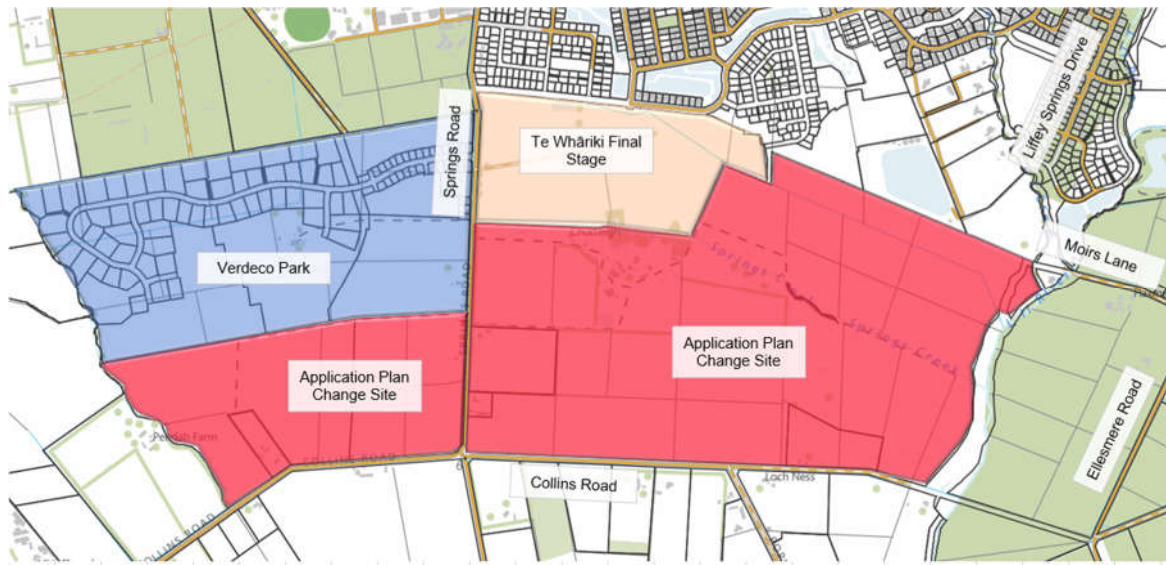


Figure 11: Adjacent Subdivisions

21. This subdivision is understood to comprise 225 sections, of which approximately 22 appeared to be constructed and occupied at the time of writing this report. The ODP for this site includes links for a potential bypass that connects to Ellesmere Junction Road via Weedons Road. The potential bypass route is consistent with that sought in the Lincoln Structure Plan⁶ (see **Figure 12**) and is highlighted in **Figure 13**⁷.

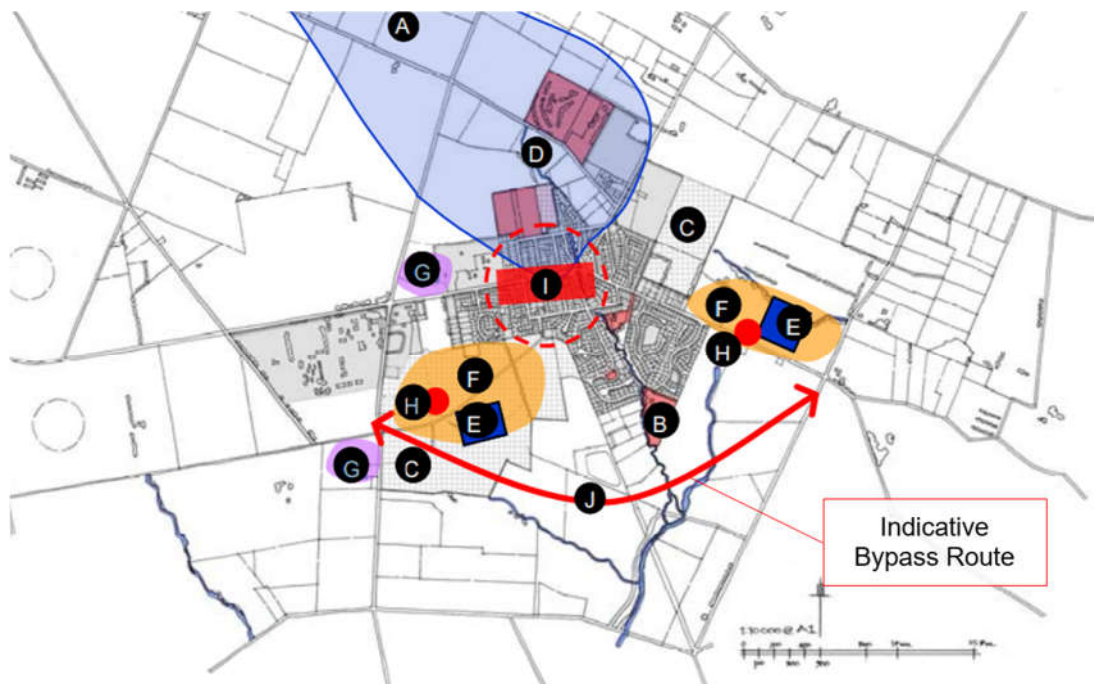


Figure 12: Extract of Lincoln Structure Plan

⁶ Lincoln Structure Plan by Selwyn District Council dated May 2008.

⁷ Extract from Outline Development Plan Area 5 in Township Appendix E37 of the Operative Selwyn District Plan.



Figure 13: Verdec Park ODP & Bypass Route

Te Whāriki

22. It is understood that the Te Whāriki subdivision will be in the order of 1,200 residential Lots when complete, although it is currently approximately 80% complete. This subdivision has access to Springs Road and Gerald Street via Vernon Drive and West Belt. Southfield Drive also links to Edward Street opposite Eastfield Drive.
23. The ODP for this site also includes a potential bypass route that would continue the segment from Verdec Park. This is illustrated in **Figure 14**⁸. However, that route stops at the eastern boundary of the subdivision and is unable to complete the bypass route.

⁸ Extract from Outline Development Plan Area 1 in Township Appendix E37 of the Operative Selwyn District Plan.

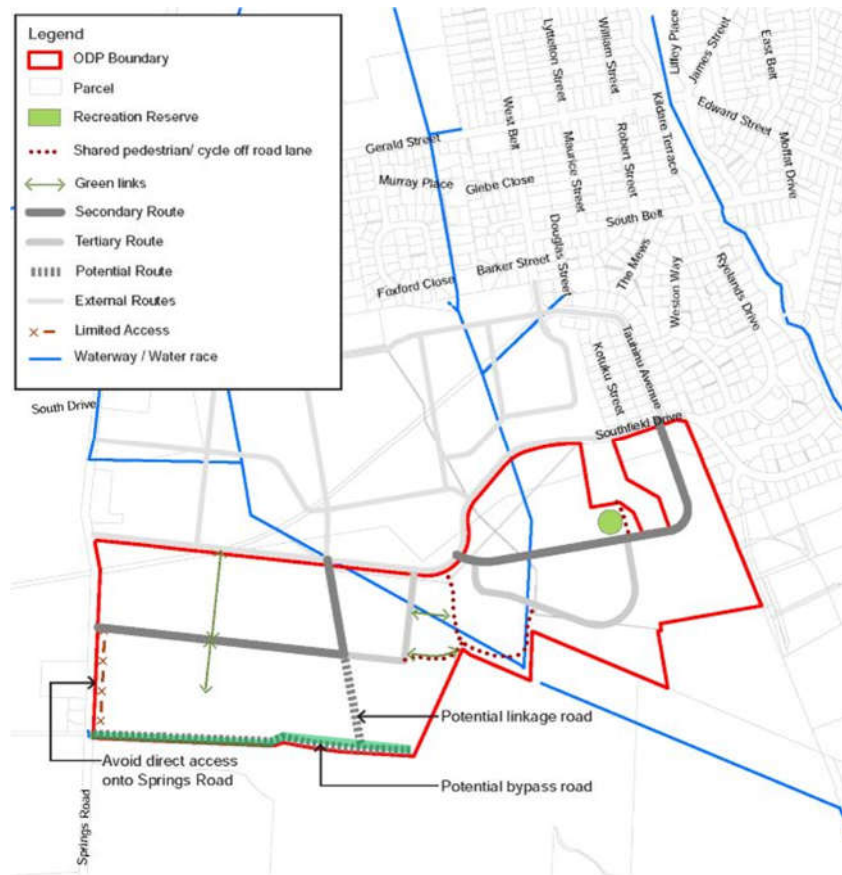


Figure 14: Te Whāriki ODP & Bypass Route

The Proposal

24. The proposed Plan Change would enable up to 2,000 residential lots and a small commercial zone to be established at the application site. A copy of the ODP is included in **Figure 15** and included in more detail in **Appendix 1**.
25. The following sets out the transport details of the proposed Plan Change.
26. Unless otherwise stated, it is proposed to adopt the transport provisions of the Operative District Plan or Proposed District Plan, whichever is relevant at the time.



Figure 15: Proposed ODP Layout

Site Layout

Access Intersections

27. The proposed ODP enables the connection of the proposed Lincoln bypass through the site, linking to Ellesmere Road. It is noted that the subdivision layout anticipated for the Te Whāriki subdivision does not include this link, so the Plan Change would contribute to the provision of the bypass in a manner that might not otherwise be achieved.
28. The two Plan Change intersections with Springs Road are anticipated to be roundabouts. These will be designed at a later stage when it is understood whether the potential bypass would be completed and when the traffic volumes associated with this are known. This potential bypass intersection is closer than 151m from proposed Te Whāriki Stage 4 intersection, with approximately 100m spacing from centre to centre in a 60km/hr zone.
29. The Moirs Lane / Ellesmere Road intersection will also require upgrading. These roads are proposed to be upgraded and the intersection will need to tie in with the new cross-sections, with Ellesmere Road continuing to have the priority in the short-term. However, the predominant traffic volumes will be to / from Moirs Lane, so there would be value in realigning the priorities as part of completing the bypass route.
30. The three intersections with Collins Road are proposed to be priority-controlled T-intersections. The need for a right turn bay or other intersection treatments will be determined at subdivision stage, although there is sufficient space to accommodate upgrades in these locations.



31. The sight distances at the intersections will be confirmed at subdivision stage, although these are anticipated to comply as the road alignments are straight and flat, or on the outside of bend (in the case of the western Collins Road intersection).
32. No direct access is proposed to Springs Road, as is consistent with the other subdivisions in this area. Direct access is proposed to Collins Road to assist with the subdivision integrating with the existing area.

Potential Access Links

33. Potential traffic access links are indicated to Verdecos Park, Te Whāriki and Liffey Springs Road on the ODP. These links are intended to assist with permeability and connectivity for the subdivision. That said, provision of these links is outside of the control of the Plan Change as they all rely on third party land.

Road Standards

34. The road cross-sections and intersection spacings within the Plan Change area are proposed to comply with the requirements of the District Plan. It is proposed that the bypass route would be constructed as a Collector Road, with the remainder of roads identified on the ODP being constructed as either Local Major or Local Intermediate roads.

Pedestrian & Cycle Links

35. The existing 2.5m shared path on the eastern side of Springs Road will be continued to Collins Road. This will then extend east along Collins Road to the boundary of the subdivision.
36. Greenlink connections are provided within Outline Development Plan area. These also include links to the Greenlinks in Verdecos Park and Te Whāriki to provide a connected and continuous facility.

Off-Site Transport Improvements

Springs Road / Ellesmere Junction Road / Gerald Street Intersection

37. As will be described later in this report, it is proposed to provide a further of the planned and funded improvements to the Springs Road / Ellesmere Junction Road / Gerald Street Intersection to better accommodate the predicted traffic generated this Plan Change, as well as the existing volumes on the network. The form of upgrade is anticipated to be dependent on whether the bypass route is constructed. The form of upgrade will be discussed in greater detail at paragraph 70.

Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

38. The Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection is not anticipated to require upgrading as a result of this Plan Change. However, there would be benefits in undertaking this upgrade and development contributions would be able to bring forward the Council's roundabout proposal.

Springs Road

39. It is proposed to upgrade Springs Road along the Plan Change boundary to provide a 60km/hr Collector Road consistent with that being provided by the existing subdivisions.



Collins Road

40. It is proposed to upgrade Collins Road along the Plan Change boundary to the District Plan standard for a 60km/hr Local Road.

Moirs Lane

41. Moirs Lane will be upgraded to a 50km/hr Collector Road consistent with the requirements of the requirements of the District Plan where sufficient width is available. It is noted that the road corridor of Moirs Lane varies between approximately 18m (toward the western end) and 13.5m (at the intersection with Ellesmere Road. This means compromises in cross-section will be required.
42. Given the above, the minimum proposed will be a 7.0m carriageway with minimum 1.5m sealed shoulders on both sides. The northern side of the road will need to incorporate the Little River Rail Trail as an off-road facility.

Ellesmere Road

43. Ellesmere Road is proposed to remain an 80km/hr rural road with shoulders. No footpath or cycle facilities are proposed as these users are anticipated to use alternate routes. The exception to this is the provision of a safe crossing facility for the existing Little River Rail Trail.
44. The proposed cross-section for this road is discussed further at paragraph 81.

Traffic Generation & Distribution

Traffic Generation

45. The traffic generation of residential activities is typically based on an 85th percentile rate of 0.9 vehicles per dwelling in the peak hours and 8.2 vehicles per dwelling per day⁹. However, it is considered that the location of the Plan Change site may lead to spreading of traffic generation, with some vehicles leaving early to commute to Rolleston and Christchurch, whilst other leave later having dropped children at school in Lincoln.
46. The TRICS database has been reviewed to identify the traffic generation of villages in the UK. This is considered to be a reasonable proxy for Lincoln given there are local facilities provided, but the majority of employment will be further afield. The TRICS data is contained in **Appendix 6**. This indicates traffic generation rates of between 0.53 and 0.55 vehicles per dwelling per hour in the peaks and 4.88 vehicles per dwelling per day.
47. **Table 5** sets out the assumed traffic generation rates of residential activity in Lincoln, which is considered to be a balance between the two data sources. This assumes a rate of 0.7 vehicles per dwelling per hour, to acknowledge that the traffic generation may not be as low as the UK sourced data.

⁹ Based on Outer Suburban dwellings in the NZTA Research Report 453 – *Trips and Parking Related to Land Use*.



Table 5: Assumed Residential Traffic Generation Rates

Time Period	Arrivals	Departures	Total
AM Peak Hour	0.175	0.525	0.7
PM Peak Hour	0.441	0.259	0.7
Daily	3.5	3.5	7.0

48. Furthermore, it has been assumed that traffic associated with the commercial area would not generate noticeable volumes to the external transport network. The intention of these areas is that they would be internal only, attracting pass-by traffic on the way to / from work. These facilities are also intended to reduce the distance to small scale shopping opportunities (such as to a dairy) to encourage walking and cycling, rather than driving further for the same facilities.
49. The following tables set out the predicted traffic generation associated with the Plan Change site, as well as Verdeco Park and the remainder of Te Whāriki. This uses the traffic generation rates set out in **Table 5**.

Table 6: Plan Change Traffic Generation – 2,000 Lots

Time Period	Arrivals	Departures	Total
AM Peak Hour	350	1,050	1,400
PM Peak Hour	882	518	1,400
Daily	7,000	7,000	14,000

Table 7: Verdeco Park Traffic Generation – 203 Lots

Time Period	Arrivals	Departures	Total
AM Peak Hour	36	107	142
PM Peak Hour	90	53	142
Daily	711	711	1,421

Table 8: Te Whāriki Traffic Generation – 240 Lots

Time Period	Arrivals	Departures	Total
AM Peak Hour	42	126	168
PM Peak Hour	106	62	168
Daily	840	840	1,680



Distribution

50. The Distribution of traffic to the wider transport network has been based on Census data for Journey to Work of people living in Lincoln. This also assumes that vehicles would use predominantly Shands Road to access the Christchurch Southern Motorway, as this route avoids Prebbleton and has good access to the State highway interchange.
51. **Table 9** sets out the distribution of traffic on the wider road network (on the basis that it all leaves Lincoln). This is based on assumptions regarding the quickest route to get to the various locations based on the surrounding road network

Table 9: Wider Area Distribution

Location	Percentage
Shands Road (to / from north)	43%
Springs Road (to / from north)	19%
Ellesmere Junction Road (to / from west)	11%
Ellesmere Road (to / from north and east)	26%
Collins Road (to / from south and west)	1%
Total	100%

52. The traffic from Verdec Park and Te Whāriki has been added to the key intersections as included in **Appendix 2** (Springs Road / Ellesmere Junction Road / Gerald Street Roundabout) and **Appendix 4** (Ellesmere Road / Edward Street / Lincoln Tai Tapu Road). This has then been added to the existing traffic volumes to create future baseline traffic volumes. These are the volumes that will be used to determine the baseline operation of these intersections (prior to accounting for the proposed Plan Change) in the following sections.
53. The traffic generation from the proposed Plan Change has also been added to the key intersections, as included in **Appendix 2** and **Appendix 4**. These are the volumes that will be used to determine the intersection operation with the proposed Plan Change in place in the following sections.

Assessment of Effects

54. Key matters for the assessment of transport effects associated with the proposed Plan Change are considered to be:
- Parking & Loading:** Whether the District Plan rules adequately provide for the layout and provision of car parking and loading at the application site;
 - Access Arrangements:** Where the accesses are anticipated to operate safely and efficiently and whether the District Plan rules adequately provide for access. Also, the internal roading pattern proposed in the ODP and the associated rules and formation standards; and



- iii. **Wider Network Effects:** Whether the effects of the proposed activity can be satisfactorily accommodated by the surrounding road network. Whether the proposed Plan Change will be accessible by a range of transport modes.

55. The above matters are assessed in turn in the following sections.

Parking & Loading

56. The District Plan rules regarding parking and loading will be adopted for this Plan Change. This is considered to be sufficient to confirm that parking and loading will be satisfactorily provided for in a functional and practical manner.

Access Arrangements

Site Accesses

57. The engineering details of the proposed access arrangements are yet to be determined, although it is considered there will be sufficient space to accommodate satisfactory intersections. The intersections will be designed to comply with relevant design standards, including sight line requirements. These will also be subject to road safety audit requirements to confirm they are anticipated to operate safely.
58. The passing volumes on Springs Road and Collins Road are considered to be sufficiently low that the access intersections can be designed that will accommodate the predicted traffic volumes.
59. The only anticipated non-compliance for the access arrangements is with regard to the proposed northern Springs Road access, which will be approximately 100m from the proposed southern intersection to Te Whāriki. That southern Te Whāriki intersection will primarily accommodate traffic coming to / from the north of the proposed subdivision, so these volumes are unlikely to interact with the proposed Plan Change intersection.
60. Overall, it is considered that satisfactory intersections to accommodate access can be designed and constructed.

Internal Access Roads

61. The internal access roads and intersections are proposed to comply with the District Plan requirements and will again be subject to road safety audits. This is considered to be sufficient to confirm the internal network will operate safely and efficiently.
62. Access to individual properties is also proposed to comply with the District Plan requirements. Any non-compliances will either be sought at subdivision stage or addressed on an individual basis and the effects of this on safety and efficiency considered at that stage.
63. The above is considered to be sufficient to confirm that the internal transport network will be safe and efficient.



Wider Effects

Springs Road / Ellesmere Junction Road / Gerald Street Roundabout

Existing Intersection Arrangement

64. The base traffic model of the Springs Road / Ellesmere Junction Road / Gerald Street roundabout has been updated with the Baseline traffic volumes, which account for the yet to be completed Verdeco Park and Te Whāriki subdivisions. The results of this model are included in **Appendix 7** and these indicate that:
- i. The intersection operates satisfactorily in the AM peak hour, with an overall Level of Service of B. The worst Level of Service for any turning movement is C. However, the degree of saturation for the Springs Road northern approach is at 0.86, which is over the practical capacity threshold of 0.85 and indicates that this approach is likely to incur significant delays and queuing with small changes to the traffic volumes; and
 - ii. The intersection operates satisfactorily in the PM peak hour, with an overall Level of Service of B. The worst Level of Service for any turning movement is D, which occurs on the Springs Road northern approach. However, the degree of saturation for the Springs Road northern approach is at 0.879, which is again over the practical capacity threshold of 0.85.
65. The above indicates that the existing intersection is effectively at capacity (or slightly over-capacity) with the completion of the existing subdivisions on Springs Road.
66. The Plan Change traffic has been added to the roundabout model and these results are included in **Appendix 8**. These results indicate that:
- i. The intersection is over-capacity in the AM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north and south approaches. The degree of saturation for the Springs Road north and south approaches at 1.296 and 1.393 respectively, meaning these approaches are unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted; and
 - ii. The intersection is over-capacity in the PM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north and south approaches, as well as Ellesmere Junction Road. The degree of saturation for these approaches is between 1.131 and 1.522, meaning these approaches are again unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted.
67. Given the above, it is apparent that the existing roundabout cannot accommodate the predicted traffic volumes and an intersection upgrade will be required.

Council Intersection Arrangement

68. The Council's proposed signalised intersection arrangement has been modelled, using the traffic volumes that include the proposed Plan Change traffic. This is to determine whether the currently planned and funded intersection could accommodate the Plan Change traffic. The results of this model are included in **Appendix 9**, which indicate:
- i. The intersection is over-capacity in the AM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north, Gerald Street and Ellesmere Junction Road



approaches. The degree of saturation for the for all approaches is between 1.194 and 1.590, meaning these approaches are unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted; and

- ii. The intersection is over-capacity in the PM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north, Gerald Street and Ellesmere Junction Road approaches. The degree of saturation for the for these approaches is between 1.460 and 1.502, meaning these approaches are unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted.
69. Given the above results, it is apparent that further improvements to this proposed intersection upgrade would be required. That said, the final form of that upgrade is likely to be dependent on whether the Lincoln bypass is constructed, as this will reduce the traffic through the Springs Road / Ellesmere Junction Road / Gerald Street intersection. It is noted that the proposed Plan Change would contribute a significant element to that bypass in so far as to provides the connection from Springs Road through to Ellesmere Road.

Potential Intersection Arrangement

70. **Figure 16** is a concept arrangement to understand whether an intersection upgrade could be constructed that would lead to the Springs Road / Ellesmere Junction Road / Gerald Street intersection operating satisfactorily.

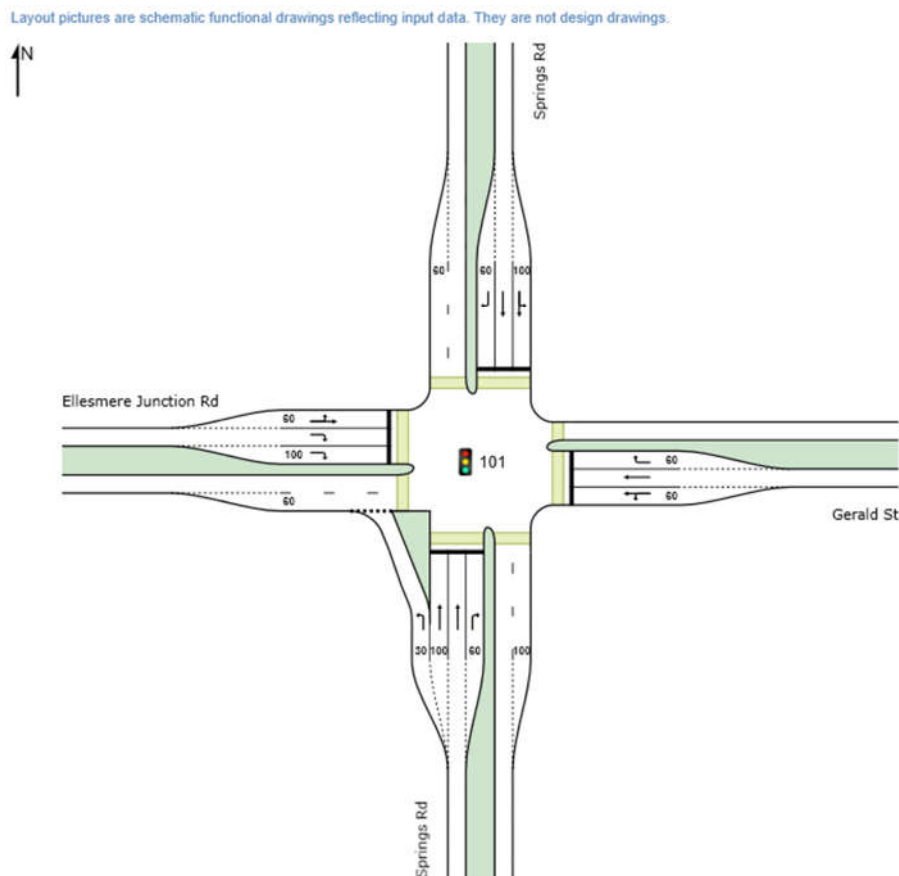


Figure 16: Springs Rd / Ellesmere Junction Rd / Gerald St – Concept Traffic Signals



71. It should be noted that the above intersection arrangement is conceptual only and the proposed arrangement would extend beyond the existing road reserve, as does the currently planned intersection upgrade for this intersection. However, this has been used as the basis of intersection modelling to understand whether a solution to the traffic capacity constraint at this location could be developed.
72. Traffic modelling results of the above intersection arrangement with the Plan Change traffic added to the network are included in **Appendix 10**. These indicate:
 - i. The intersection operates satisfactorily in the AM peak hour, with an overall Level of Service of D. The worst Level of Service for any turning movement is E, which occurs on the right turns from Springs Road and Gerald Street. The degrees of saturation are less than 0.9, which is considered to be practical limit for traffic signal intersections; and
 - ii. The intersection operates satisfactorily in the PM peak hour, with an overall Level of Service of D. The worst Level of Service for any turning movement is E, which occurs on the right turns from Springs Road and Gerald Street. The degrees of saturation are again less than 0.9.
73. The above confirms that a traffic signal intersection could be constructed at this location that would have sufficient capacity to accommodate the predicted traffic volumes from this intersection. The form, timing and contribution to the construction of the upgrade will need to be agreed with the Council, in conjunction with other stakeholders. It is anticipated that this upgrade would be required from early occupation of this Plan Change given the roundabout is predicted to be slightly over-capacity upon completion of the existing subdivisions.
74. There remains the possibility that a lesser intersection upgrade is required should the bypass route be completed. Again, this is a matter for further discussion with Council regarding timeframes. However, Plan Changes to date have contemplated and provided for a bypass (particularly the Verdecos Park Plan Change). This proposed Plan Change would construct the link between Springs Road and Ellesmere Road, which would contribute a significant portion of the bypass route.

Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

75. The base traffic model of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection has been updated with the Baseline traffic volumes, which account for the yet to be completed Verdecos Park and Te Whāriki subdivisions. The results of this model are included in **Appendix 11** and these indicate that:
 - i. The intersection operates satisfactorily in the AM peak hour. The worst Level of Service for any turning movement is B. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period; and
 - ii. The intersection operates satisfactorily in the PM peak hour. The worst Level of Service for any turning movement is B. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period.
76. The above indicates that the existing intersection is predicted to operate satisfactorily with the completion of the existing subdivisions on Springs Road.
77. The Plan Change traffic has been added to the roundabout model and these results are included in **Appendix 12**. These results indicate that:

- i. The intersection operates satisfactorily in the AM peak hour. The worst Level of Service for any turning movement is C. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period; and
- ii. The intersection operates satisfactorily in the PM peak hour. The worst Level of Service for any turning movement is D. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period. That said, the Ellesmere Road north approach is predicted to be at a degree of saturation of 0.843, which suggests the Plan Change would effectively take this intersection to its limit of capacity.

Potential Intersection Arrangement

78. Given the above results, it is apparent that an intersection upgrade is not required at this location as a result of this Plan Change. That said, it is understood that Council has a plan to install a roundabout at this location. This roundabout would benefit the capacity of the intersection with the Plan Change in place (noting the above results) as well as provide a safer intersection. The primary movement from the Plan Change would be through movements on the minor arms, which are typically the least safe movements at cross-roads.
79. We do not have a design for the proposed roundabout, although the following has been assumed for the purposes of confirming that a roundabout could be constructed in this location.

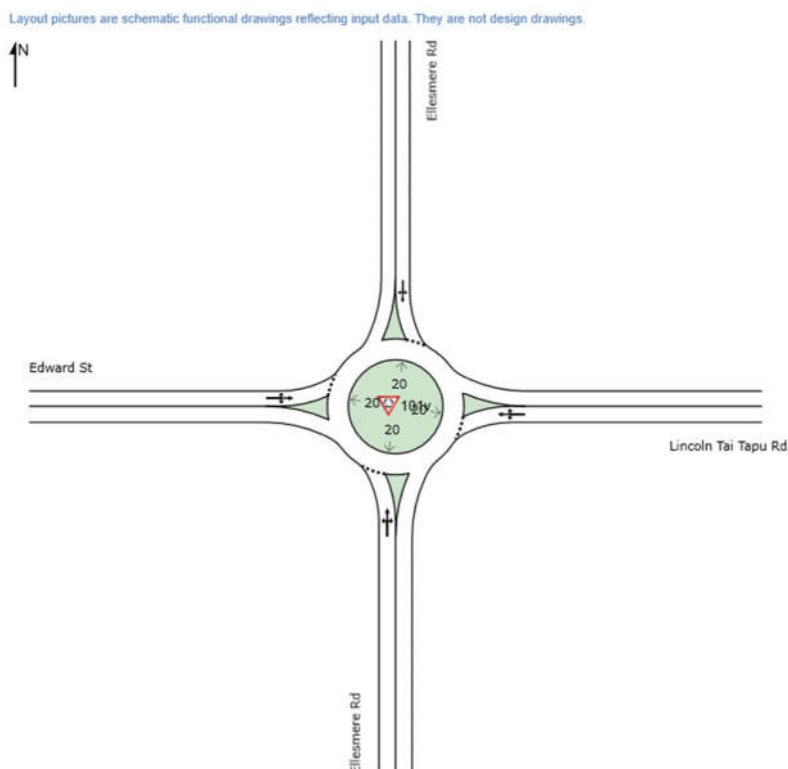


Figure 17: Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd – Roundabout Concept

80. Traffic capacity results for the above roundabout with the Plan Change traffic added to the road network are included in **Appendix 13**. These indicate that the proposed roundabout could comfortably accommodate the predicted traffic volumes.



Ellesmere Road

81. Ellesmere Road currently accommodates a traffic volume of approximately 2,000 vehicles per day. This road has a sealed carriageway of approximately 6m plus grass berms at present.
82. The provision of a connection through the Plan Change site from Springs Road to Ellesmere Road will increase the traffic volumes on this route. The traffic distribution assumed that 26% of traffic from Verdecos Park would use Ellesmere Road, as would 26% of traffic from the Plan Change site. These two subdivisions would therefore increase traffic volumes on Ellesmere Road by approximately 370 vehicles per day and 3,600 vehicles per day respectively. These volumes would be further increased with the completion of the potential bypass route. This leads to a potential traffic volume of in the order of 6,000 vehicles per day.
83. The cross-section of this road will need to be upgraded to accommodate this increase in traffic. That said, the road will still be largely rural in nature and it is not proposed to provide dedicated pedestrian or cycle facilities. Austroads *Guide to Road Design Part 3 – Geometric Design* recommends the following cross-section for rural roads that accommodate greater than 3,000 vehicles per day:
 - i. Traffic lanes: 7.0m (i.e. two 3.5m traffic lanes); and
 - ii. Total Shoulder of 2.5m on both sides, including 1.5m minimum sealed shoulders.
84. It is envisaged that Ellesmere Road would be upgraded to meet this standard between Edward Street and Moirs Lane.

Accessibility

85. The proposed site will include pedestrian and cycle links within the Plan Change area and linkages to off-site facilities. This includes links to the Te Whāriki subdivision, which means the existing commercial centre on Vernon Drive will be approximately 1.6km from the centre of the Plan Change site. This equates to a walk of approximately 20 minutes or a six-minute bike ride. These are considered to be comfortable distances to walk / cycle.
86. The Plan Change will also provide a small local commercial area that is intended to provide for everyday shopping and further reduce the need to travel by car for local trips.
87. The above is considered to be sufficient to confirm that the site has access to a range of everyday facilities without the need to drive.

Summary & Conclusion

Summary

88. The Plan Change proposed would enable the development of up to 2,000 residential Lots plus a small commercial zone to be established at the application site. These activities are predicted to generate in the order of 1,400 vehicle movements per hour in the peak hours and 14,000 vehicle movements per day.
89. Primary access to the Plan Change site would be via two roundabouts on Springs Road. The northern roundabout has the potential to form part of a Lincoln bypass route, with the Plan Change road layout providing a connection from Springs Road to Ellesmere Road (via Moirs Lane). The remainder of the



bypass route has been accounted for in the Verdeco Park subdivision. The site would also have accesses to Collins Road.

90. Road cross-section upgrades are proposed as described in detail earlier in this report so as to accommodate the predicted traffic volumes from the Plan Change site.
91. The Ellesmere Junction Road / Springs Road / Gerald Street roundabout has been identified as being at capacity with the completion of the current subdivisions in Lincoln. The inclusion of traffic associated with this Plan Change would lead that intersection to being over-capacity and an upgrade will be required. Council has already planned and funded a traffic signal-controlled intersection at this location and a potential revised layout has been identified that would accommodate the Plan Change traffic. There is potential that a lesser upgrade would be required if the Lincoln bypass were to be completed, with the proposed Plan Change including internal roading that is intended to facilitate this bypass. As such, the final form of the intersection arrangement needs to be agreed with Council.
92. The traffic capacity of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection has been assessed. This intersection can operate satisfactorily with the proposed Plan Change traffic added to the network. That said, the Council has a proposal to upgrade this intersection to a roundabout and this would reduce the traffic safety effects of the proposed Plan Change at this location.

Conclusion

93. Overall, it is considered that the transport effects of the proposed Plan Change will be acceptable on the surrounding transport network subject to undertaking the off-site improvements outlined in this report.



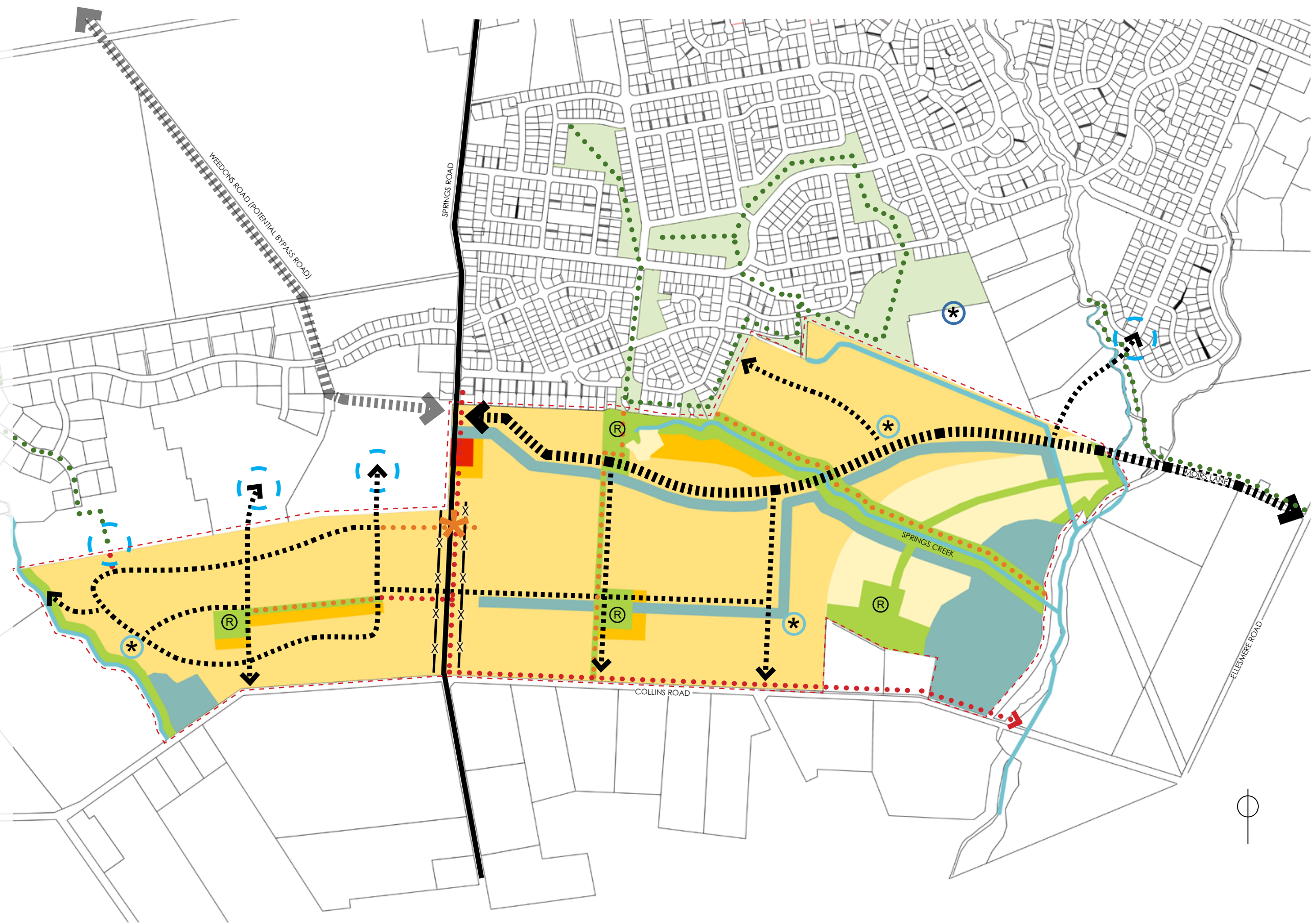
Appendix 1

Outline Development Plan

OUTLINE DEVELOPMENT PLAN (ODP)


LEGEND

- Plan Change Boundary
- Living Z**
 - General Residential Density (Minimum 12 Households/Ha)
 - Medium Residential Density (Minimum 15 Households/Ha)
- Living X**
 - Large Lot Residential
- Business**
 - Commercial / Business
- Potential Bypass Road
- Primary Road
- Secondary Road
- Possible Green Link & Cycleway
- 2.5m Shared Path (off road)
- Possible Future Connection
- Recreation Reserve (R)
- Green Link
- Existing Green Link
- Existing Green Space
- Stormwater Management
- Waterway
- Stock Underpass Turned into Pedestrian Link
- Avoid access onto Springs Road from either side
- Existing Allendale Pump Station and Emergency Storage
- Indicative Waste Water Pump Station





LANDUSE AND DENSITY

LEGEND


 Plan Change Boundary

Living Z

 General Residential Density
(Minimum 12 Households/Ha)

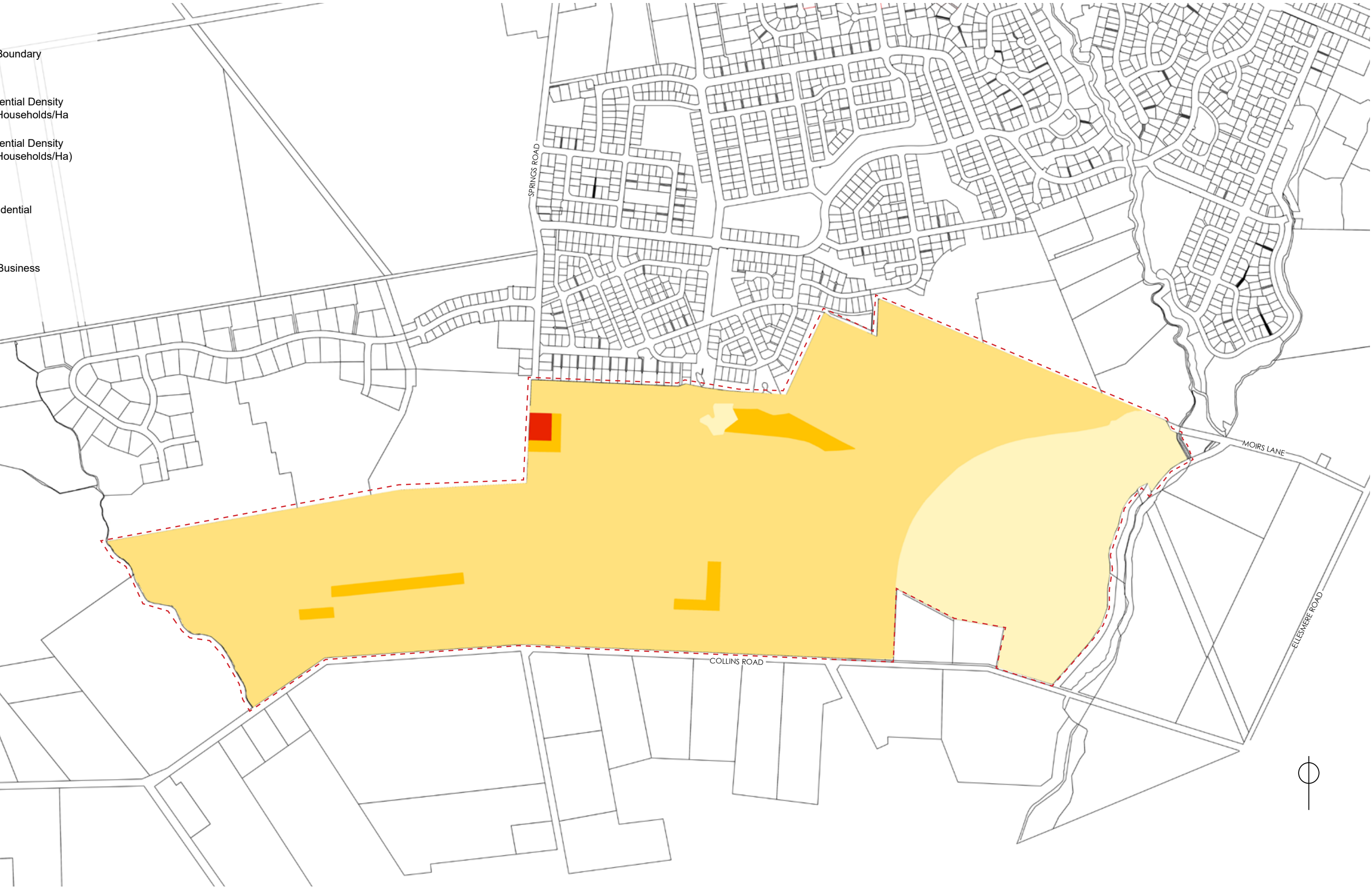
 Medium Residential Density
(Minimum 15 Households/Ha)

Living X

 Large Lot Residential

Business

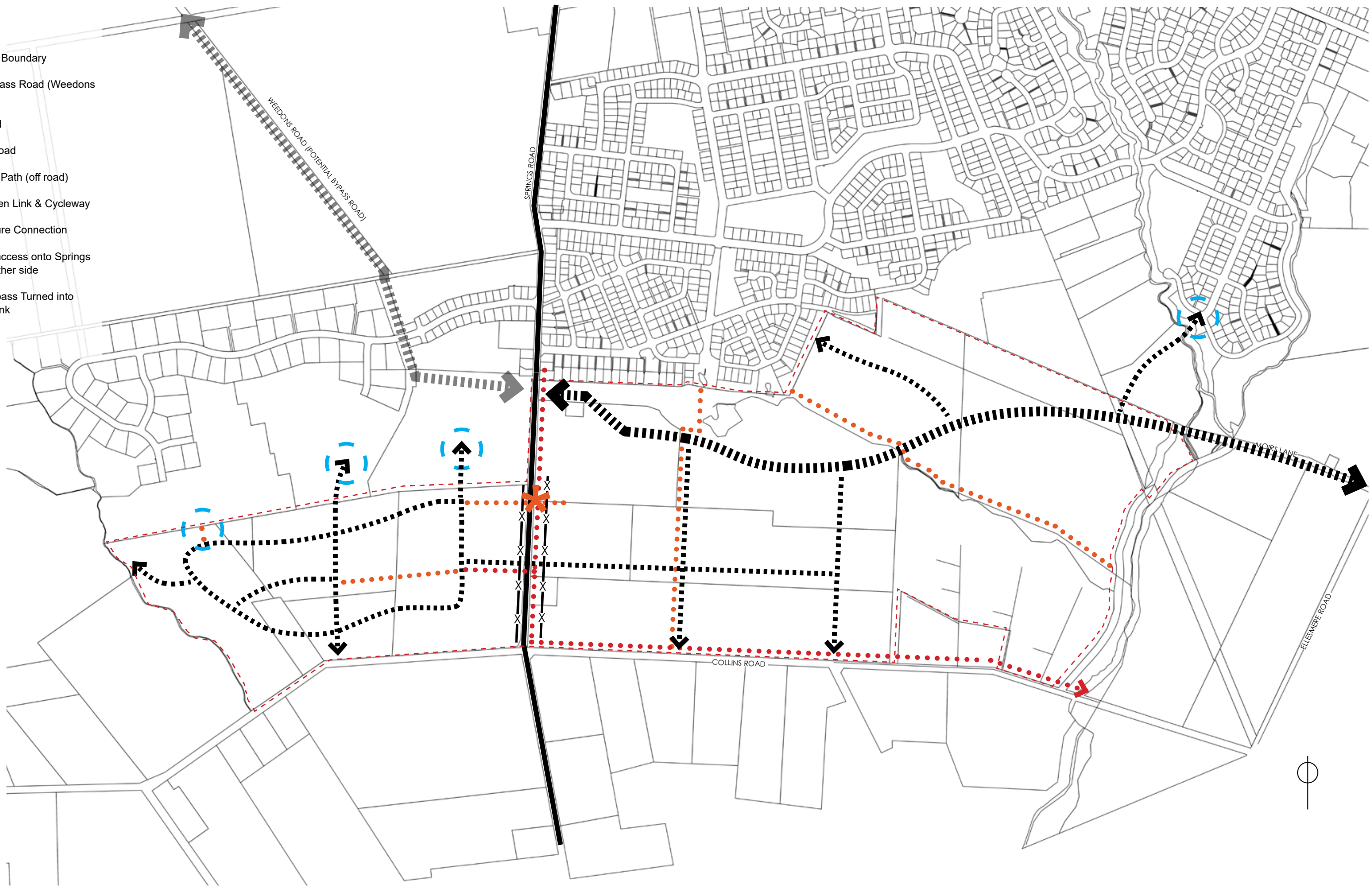
 Commercial / Business



MOVEMENT AND CONNECTIVITY

LEGEND

- Plan Change Boundary
- Potential Bypass Road (Weedons Road)
- Primary Road
- Secondary Road
- 2.5m Shared Path (off road)
- Possible Green Link & Cycleway
- Possible Future Connection
- Avoid direct access onto Springs Road from either side
- Stock Underpass Turned into Pedestrian Link



GREEN / OPEN SPACE NETWORK







LEGEND

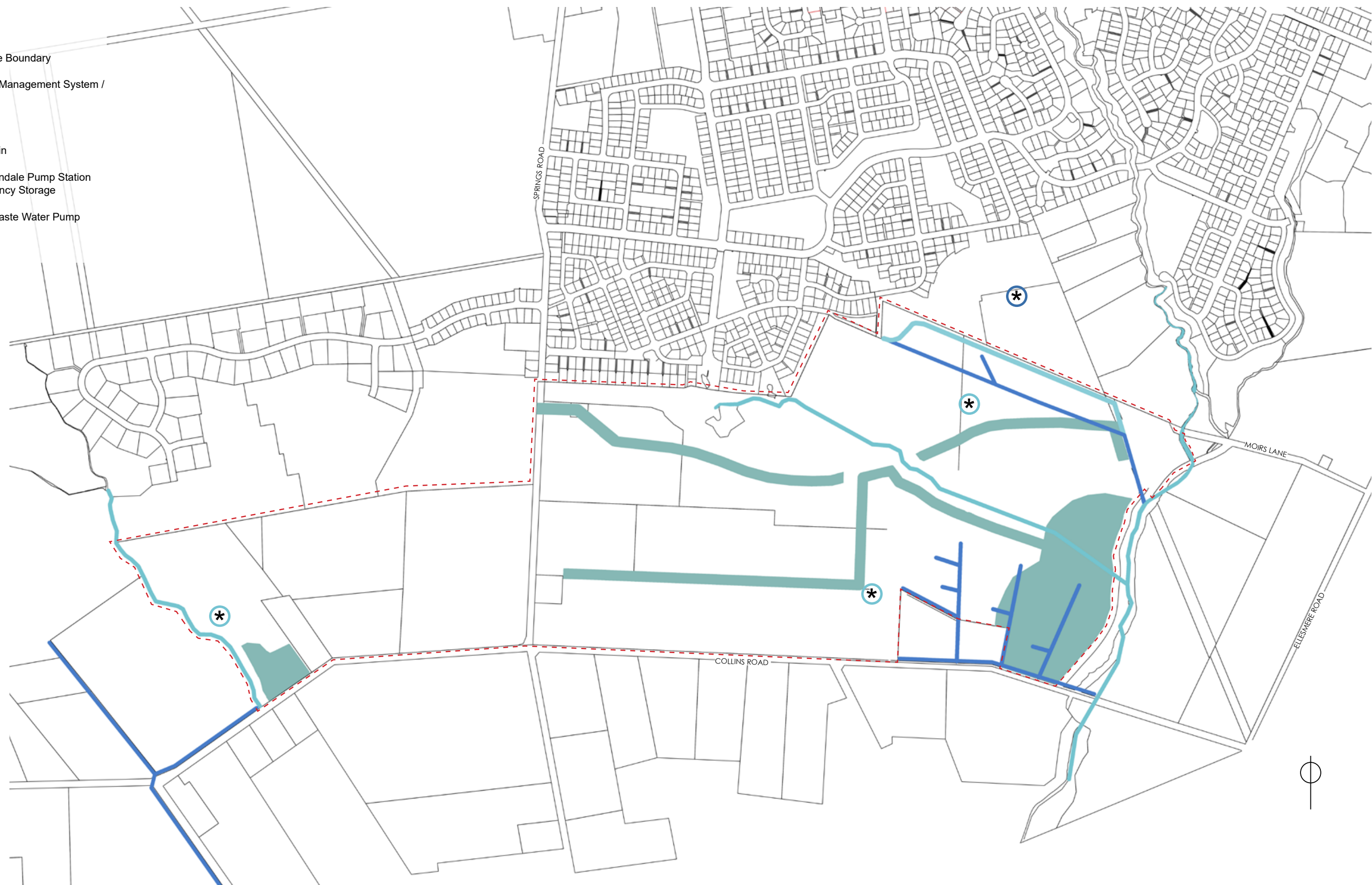
- Plan Change Boundary
- Recreation Reserve
- Existing Green Space
- Green Link
- Existing Green Link
- 500m and 800m Walkable Catchment



BLUE NETWORK

LEGEND

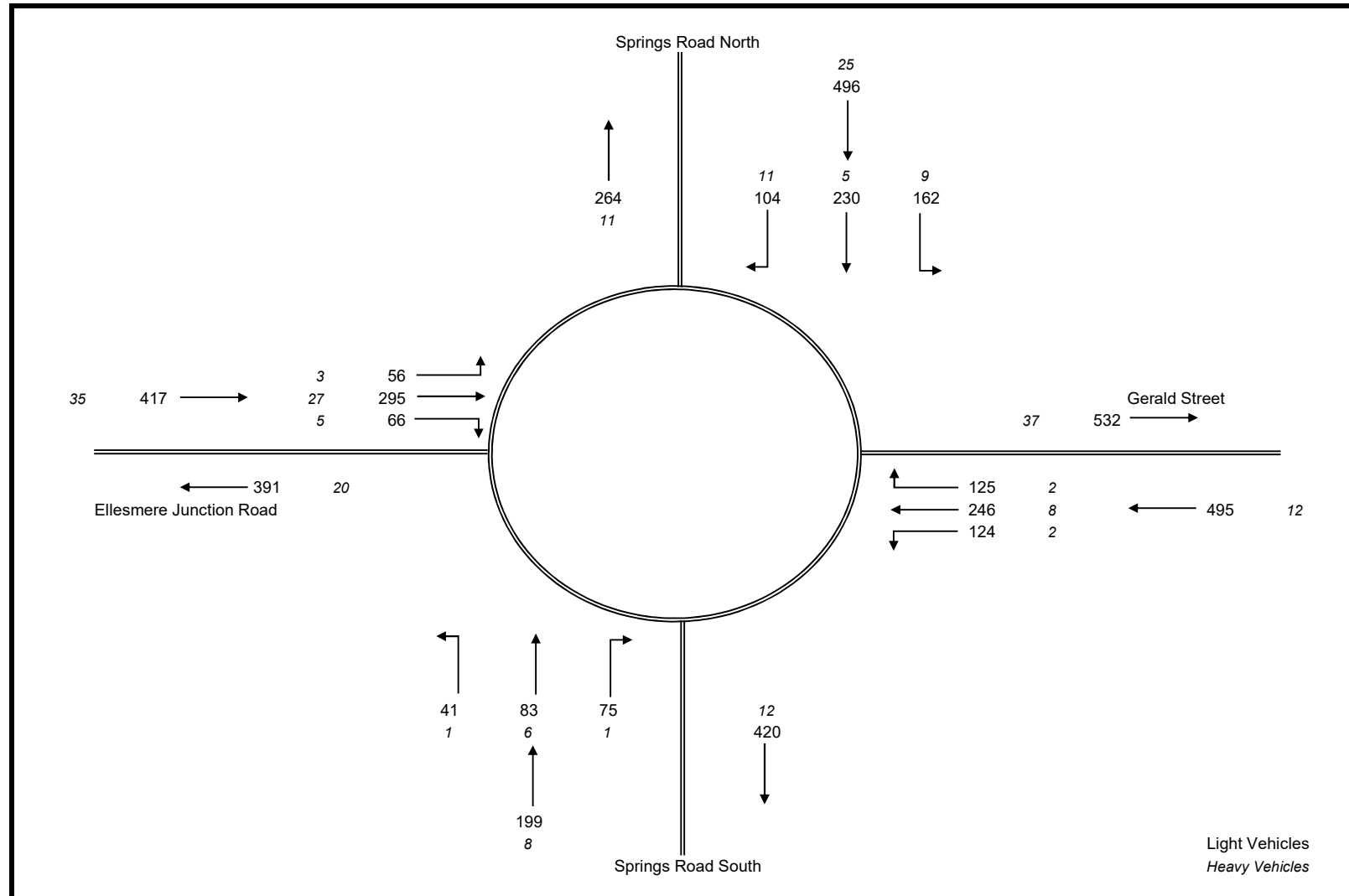
-  Plan Change Boundary
-  Stormwater Management System / Areas
-  Waterway
-  Existing Drain
-  Existing Allendale Pump Station and Emergency Storage
-  Indicative Waste Water Pump Station

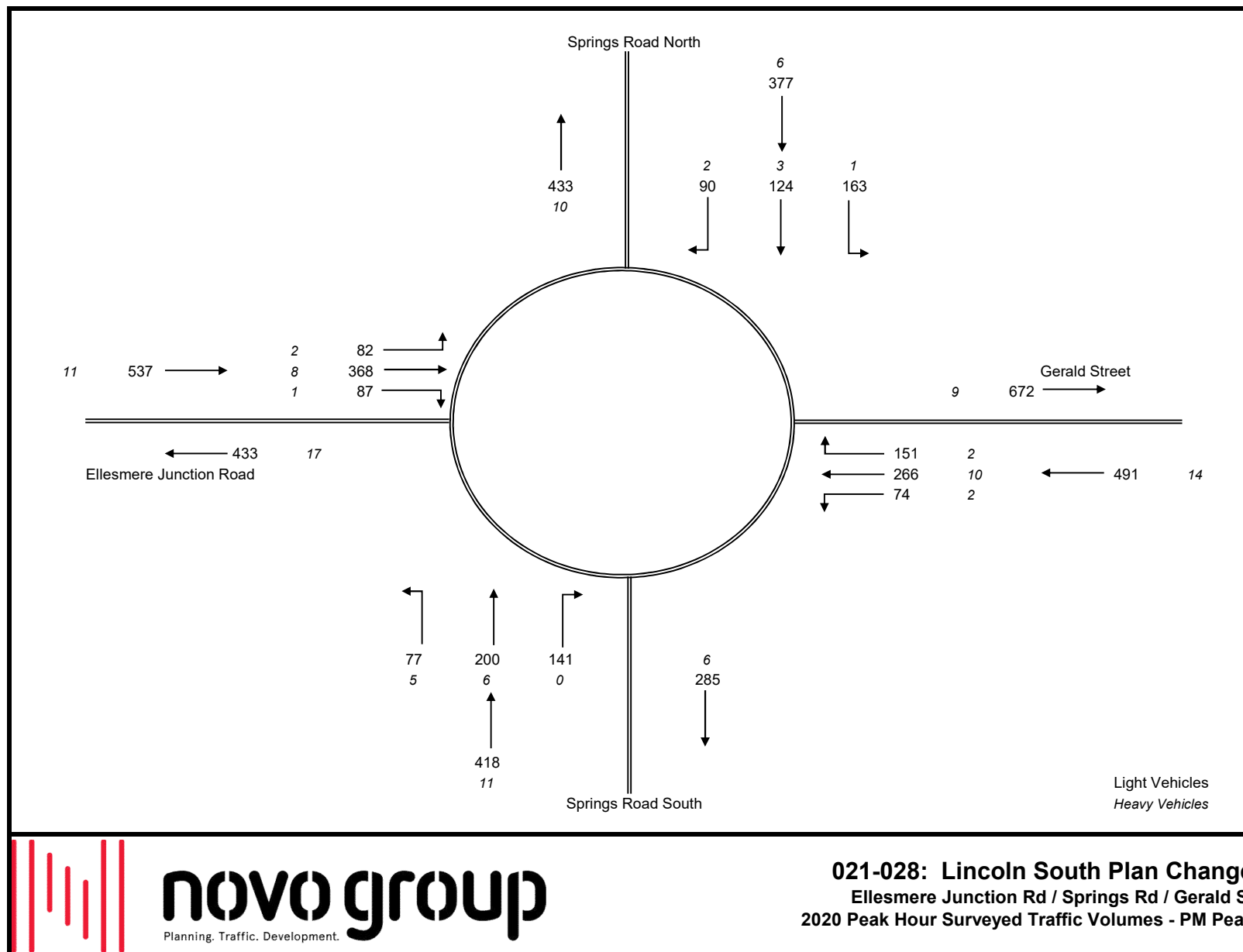


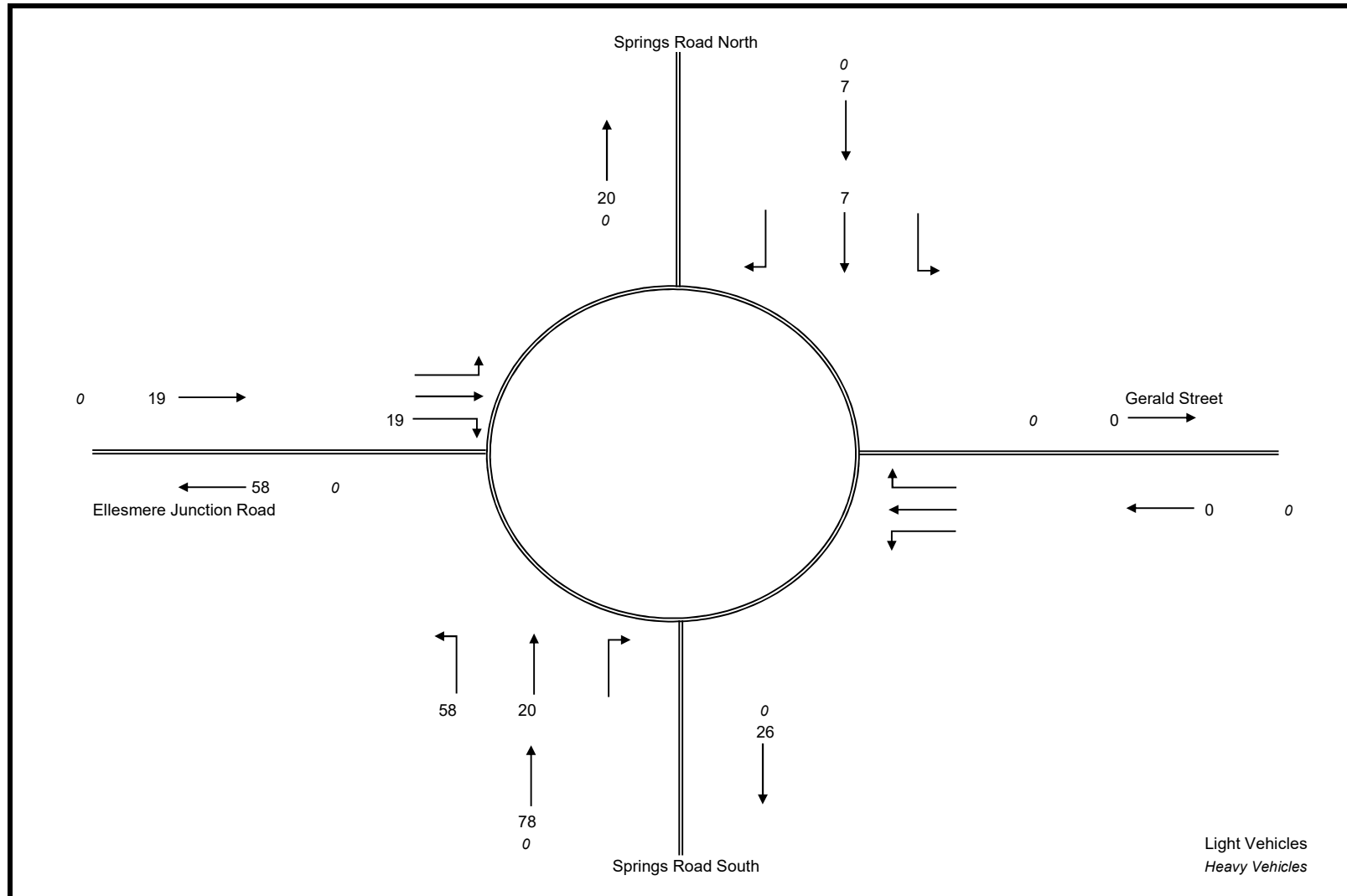


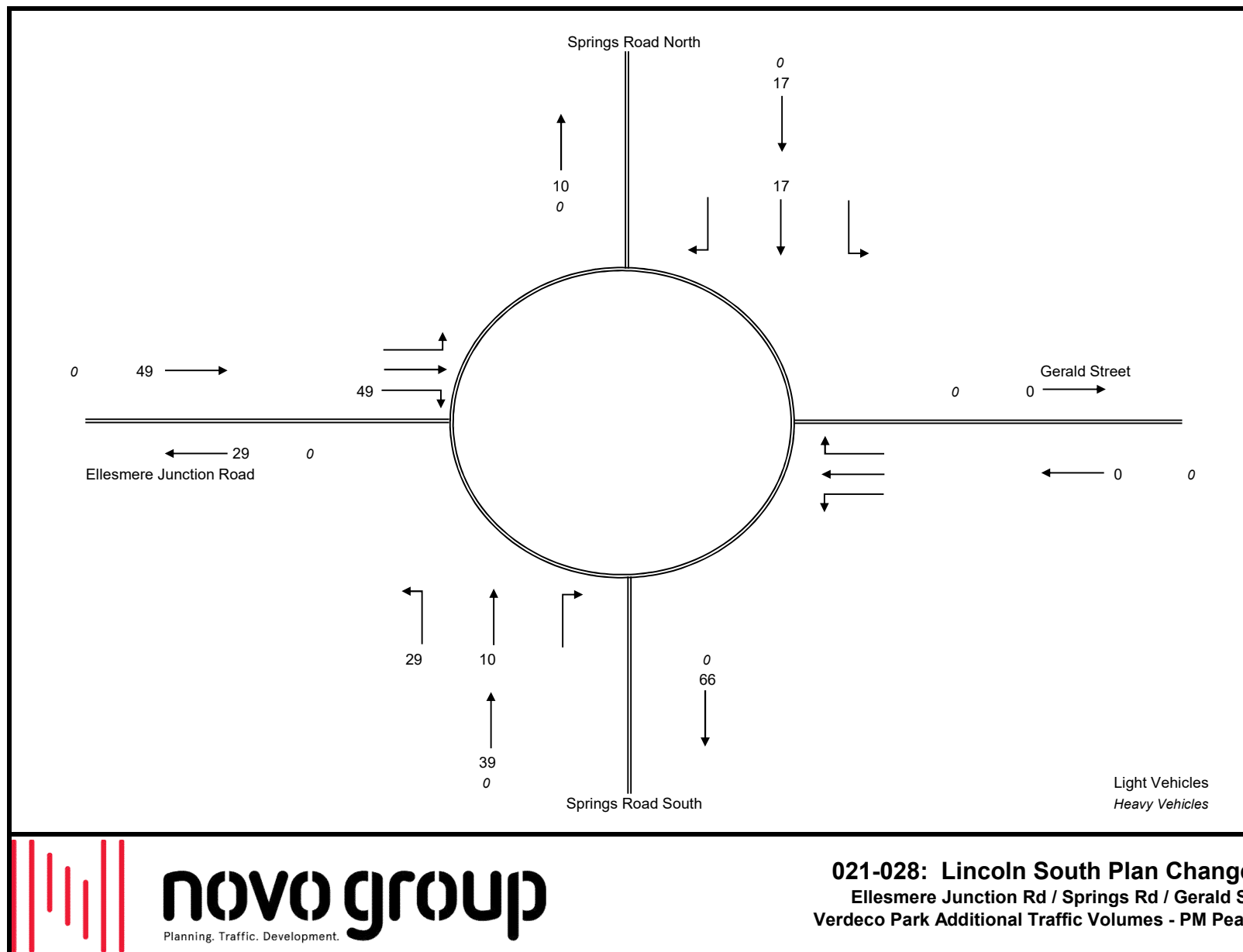
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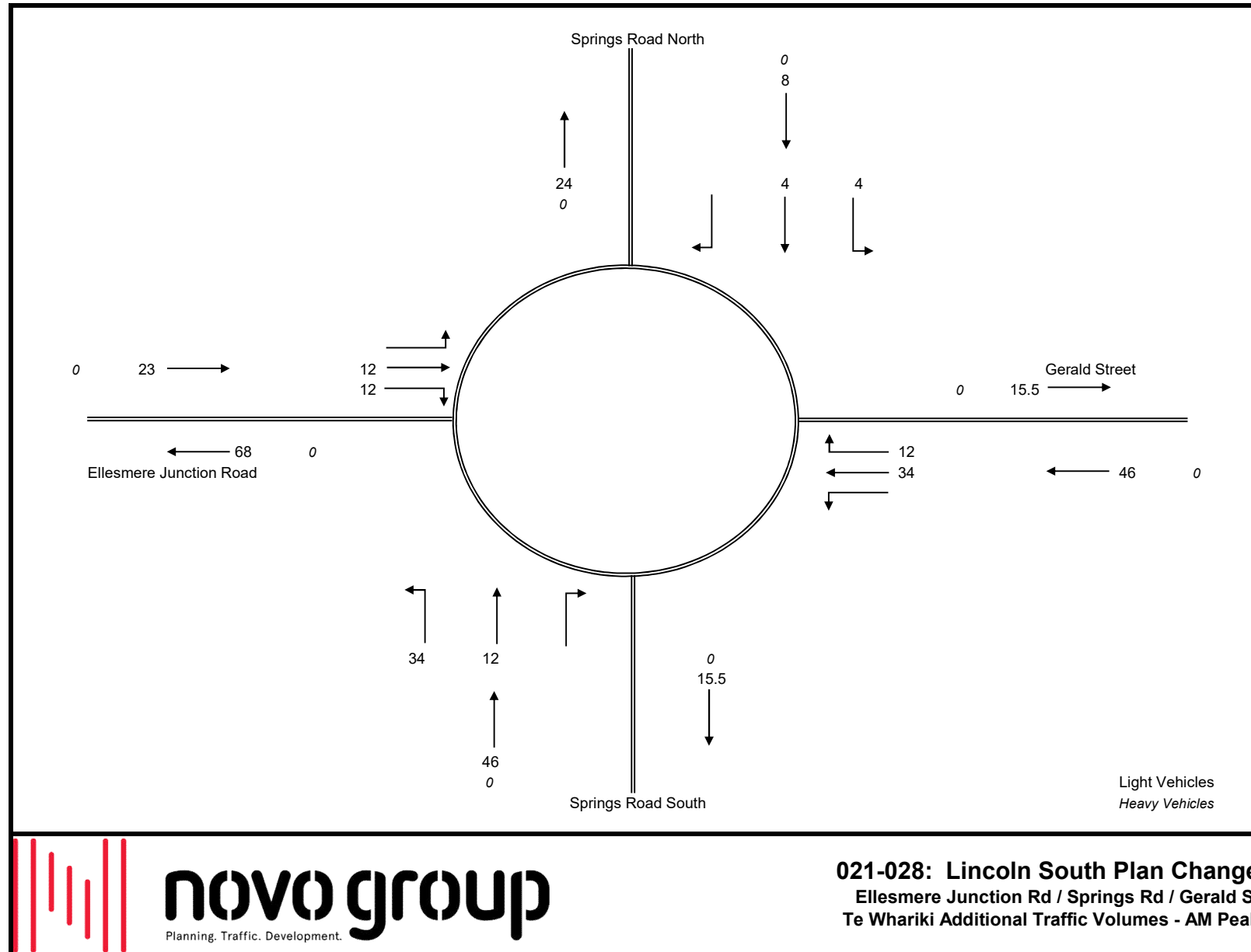
Springs Rd / Ellesmere Junction Rd / Gerald St Traffic Volumes

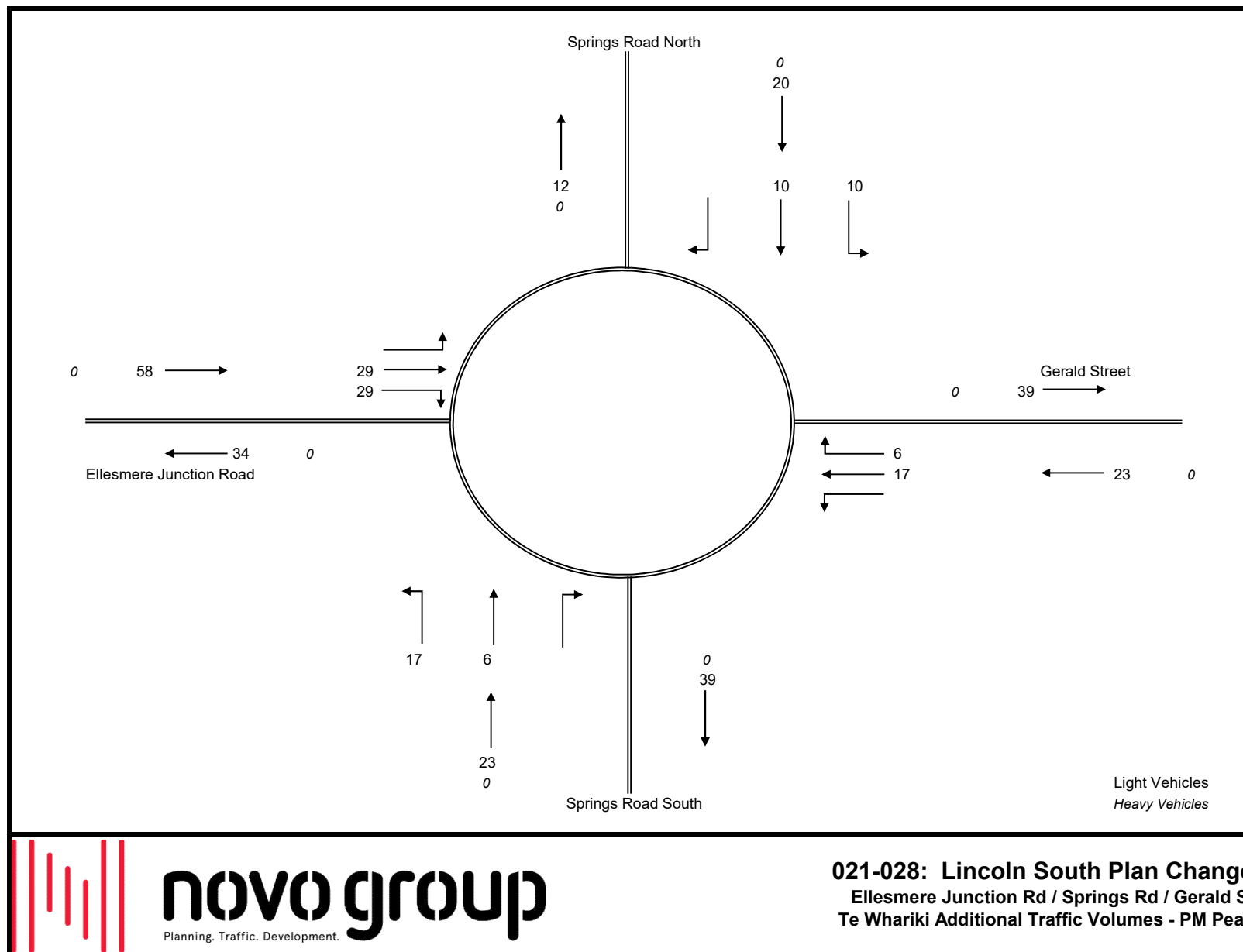


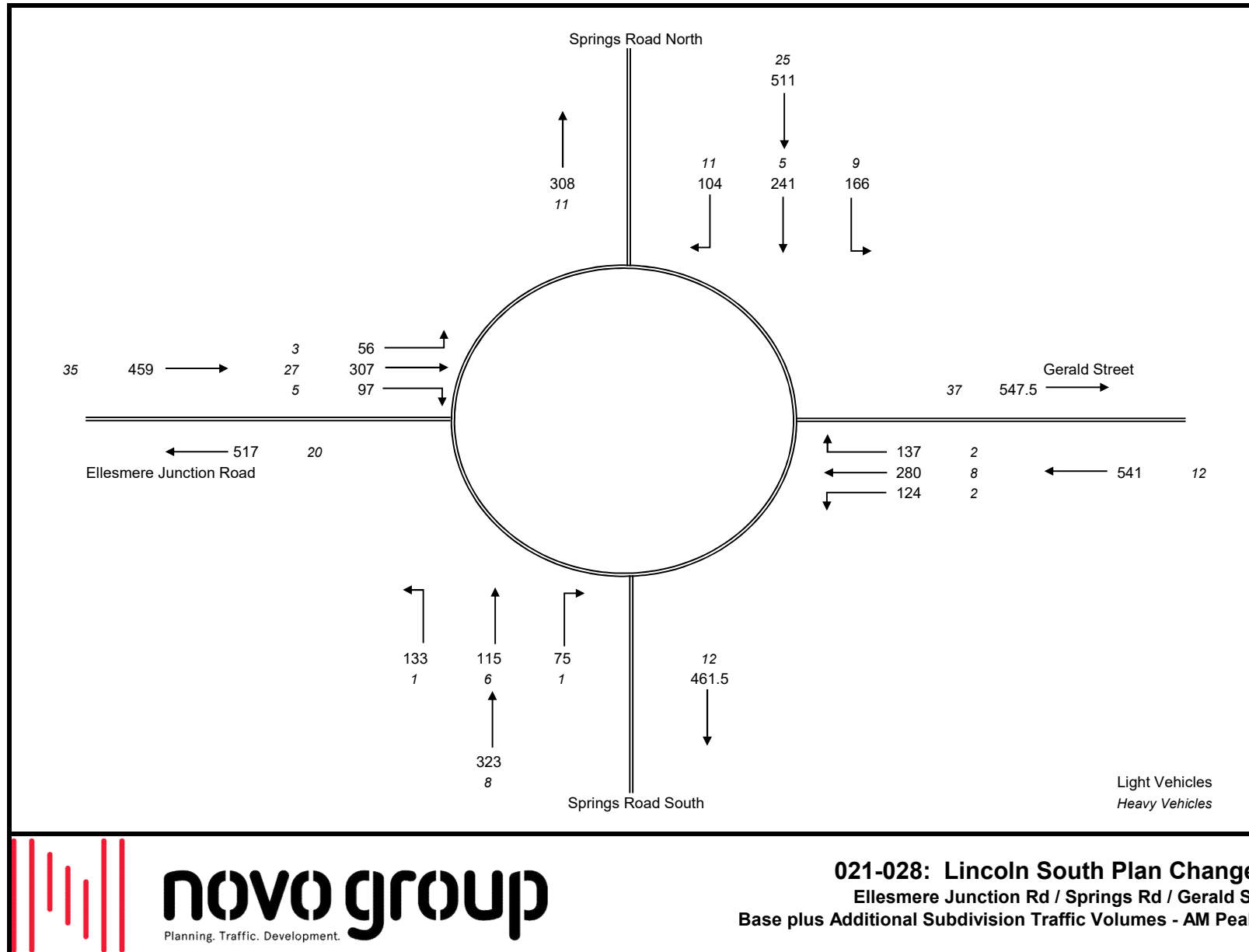


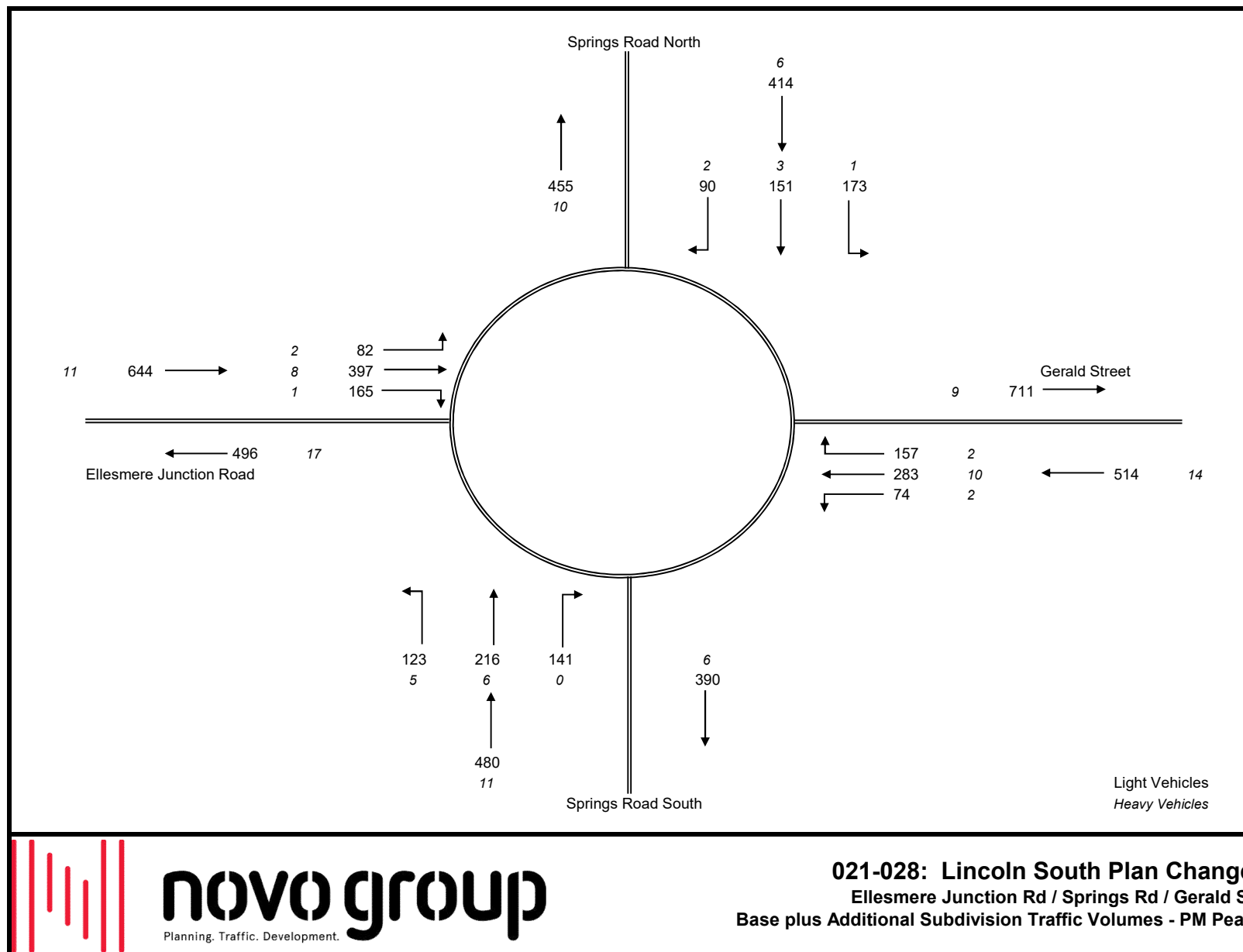


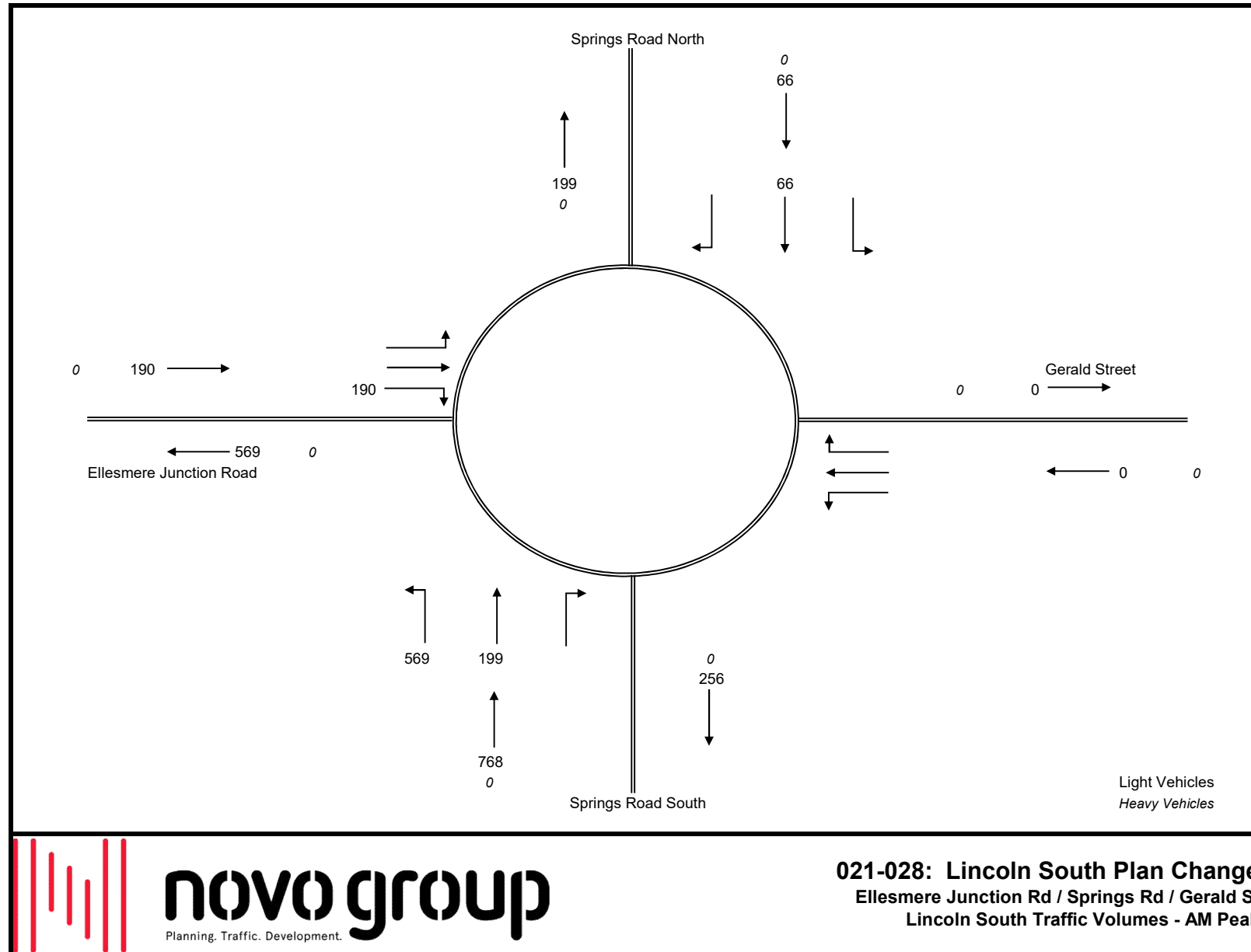


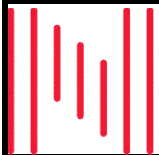
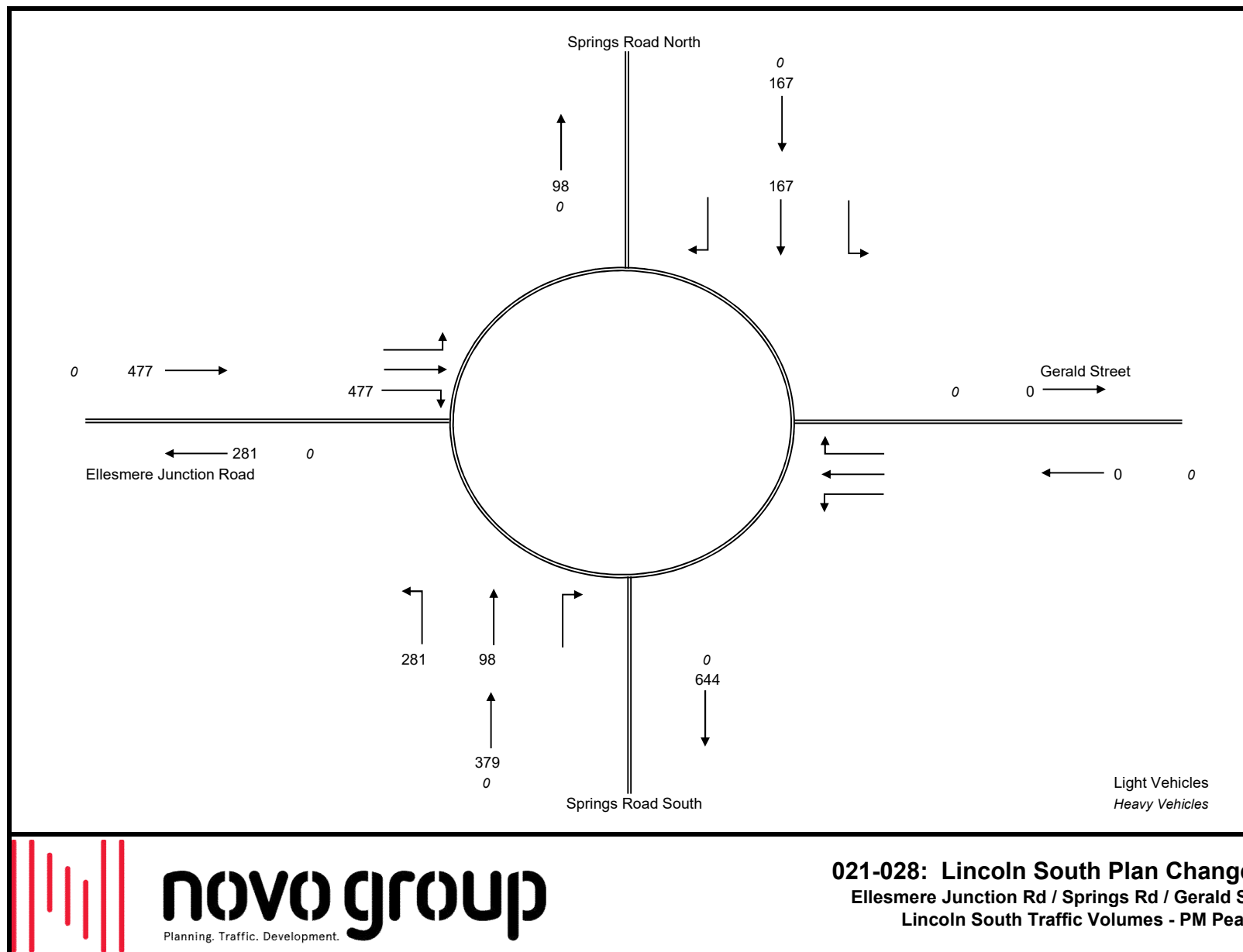






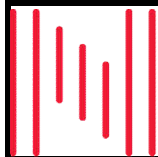
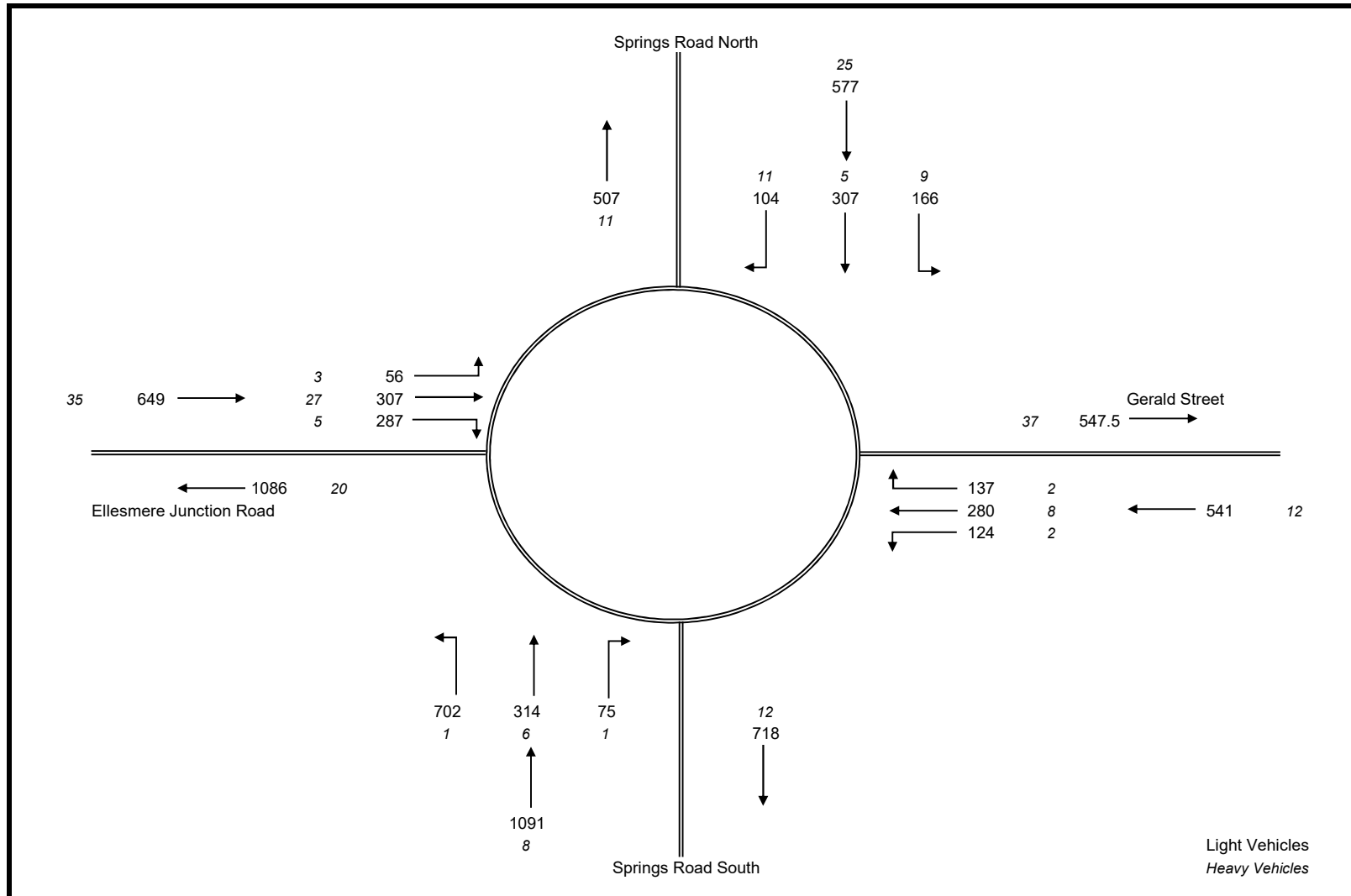






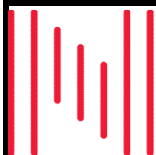
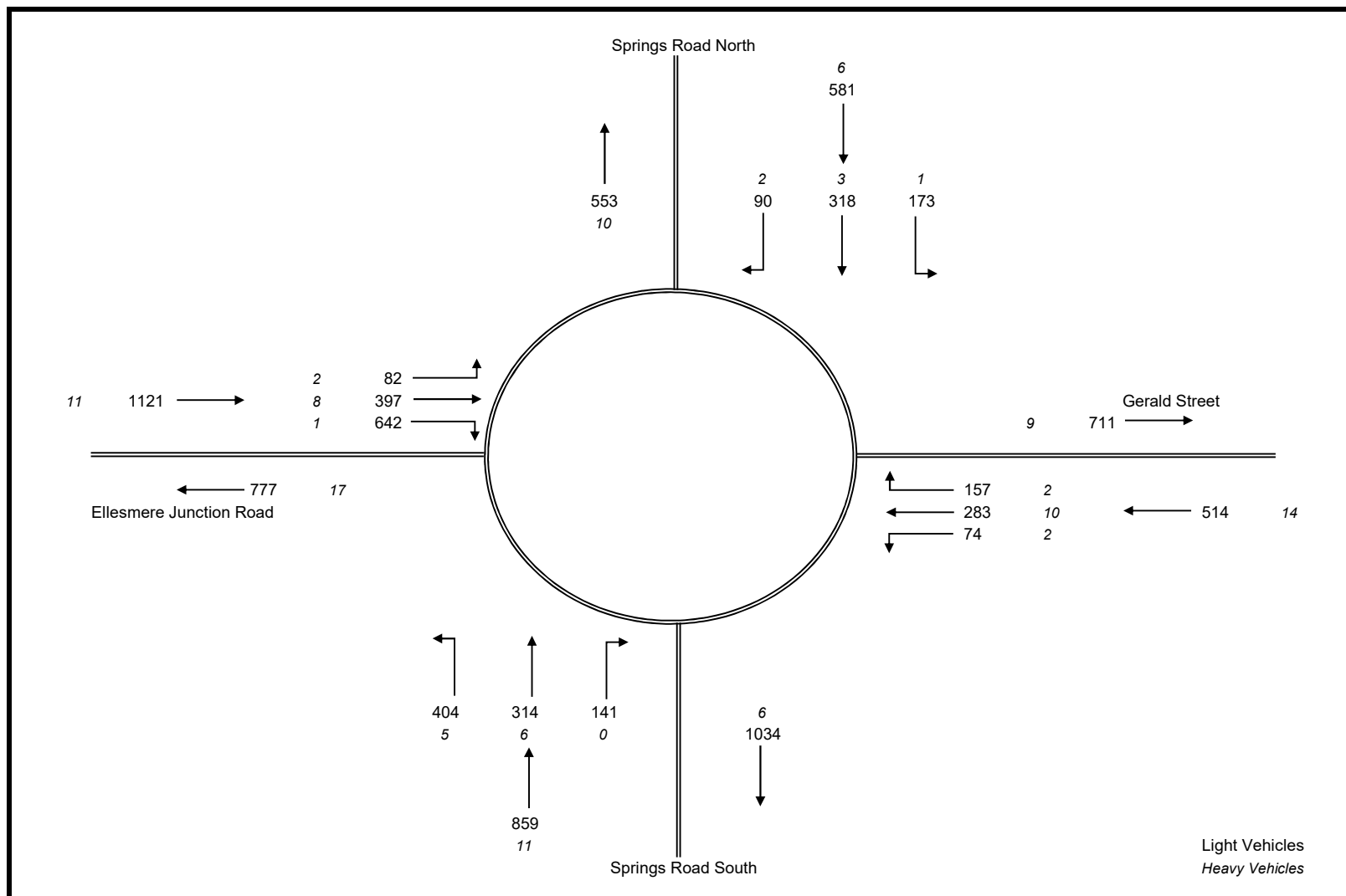
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Planning. Traffic. Development.

021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Lincoln South Traffic Volumes - PM Peak



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021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Lincoln South Traffic Volumes - AM Peak



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021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Lincoln South Traffic Volumes - PM Peak



Appendix 3

Springs Rd / Ellesmere Junction Rd / Gerald St Operation - Existing



MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Base (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Dep. Sat. v/c	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh. v/c]	85% BACK OF QUEUE [m]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		Total veh/h	HV veh/h	Total veh/h	% HV									
South: Springs Rd														
1	L2	42	1	44	2.4	0.261	7.0	LOS A	1.5	10.5	0.63	0.75	0.63	51.2
2	T1	89	6	94	6.7	0.261	7.3	LOS A	1.5	10.5	0.63	0.75	0.63	52.2
3	R2	76	1	80	1.3	0.261	16.9	LOS B	1.5	10.5	0.63	0.75	0.63	52.1
Approach		207	8	218	3.9	0.261	8.6	LOS A	1.5	10.5	0.63	0.75	0.63	52.0
East: Gerald St														
4	L2	126	2	133	1.6	0.577	8.2	LOS A	5.2	36.9	0.80	0.85	0.89	50.9
5	T1	254	8	267	3.1	0.577	8.5	LOS A	5.2	36.9	0.80	0.85	0.89	51.8
6	R2	127	2	134	1.6	0.577	12.2	LOS B	5.2	36.9	0.80	0.85	0.89	51.6
Approach		507	12	534	2.4	0.577	9.3	LOS A	5.2	36.9	0.80	0.85	0.89	51.5
North: Springs Rd														
7	L2	171	9	180	5.3	0.789	16.0	LOS B	10.9	79.6	0.99	1.21	1.54	44.9
8	T1	235	5	247	2.1	0.789	16.0	LOS B	10.9	79.6	0.99	1.21	1.54	45.8
9	R2	115	11	121	9.6	0.789	22.3	LOS C	10.9	79.6	0.99	1.21	1.54	45.4
Approach		521	25	548	4.8	0.789	16.9	LOS B	10.9	79.6	0.99	1.21	1.54	45.5
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.468	6.5	LOS A	3.2	24.2	0.62	0.68	0.62	51.8
11	T1	322	27	339	8.4	0.468	6.8	LOS A	3.2	24.2	0.62	0.68	0.62	52.7
12	R2	71	5	75	7.0	0.468	16.6	LOS B	3.2	24.2	0.62	0.68	0.62	52.5
Approach		452	35	476	7.7	0.468	7.4	LOS A	3.2	24.2	0.62	0.68	0.62	52.6
All Vehicles		1687	80	1776	4.7	0.789	11.7	LOS B	10.9	79.6	0.79	0.90	0.98	49.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Alcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Base (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Dep. Satn	Aver. Delay	Level of Service	95% BACK-OF-QUEUE	Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver. Speed km/h
		[Total veh/h	HV / veh/h	[Total veh/h	HV / %	veh	sec		[Veh. veh				
South: Springs Rd													
1	L2	82	5	86	6.1	0.543	9.1	LOS A	4.2	0.76	0.89	0.87	50.1
2	T1	206	6	217	2.9	0.543	9.1	LOS A	4.2	0.76	0.89	0.87	51.3
3	R2	141	0	148	0.0	0.543	12.8	LOS B	4.2	0.76	0.89	0.87	51.1
Approach		429	11	452	2.6	0.543	10.3	LOS B	4.2	0.76	0.89	0.87	51.0
East: Gerald St													
4	L2	76	2	80	2.6	0.503	6.3	LOS A	3.7	0.64	0.69	0.64	51.6
5	T1	276	10	291	3.6	0.503	6.5	LOS A	3.7	0.64	0.69	0.64	52.6
6	R2	153	2	161	1.3	0.503	10.3	LOS B	3.7	0.64	0.69	0.64	52.4
Approach		505	14	532	2.8	0.503	7.6	LOS A	3.7	0.64	0.69	0.64	52.4
North: Springs Rd													
7	L2	164	1	173	0.6	0.675	15.8	LOS B	7.0	0.95	1.13	1.33	46.1
8	T1	127	3	134	2.4	0.675	16.2	LOS B	7.0	0.95	1.13	1.33	47.0
9	R2	92	2	97	2.2	0.675	20.0	LOS C	7.0	0.95	1.13	1.33	46.7
Approach		383	6	403	1.6	0.675	17.0	LOS B	7.0	0.95	1.13	1.33	46.5
West: Ellesmere Junction Rd													
10	L2	84	2	88	2.4	0.680	11.8	LOS B	7.6	0.90	1.00	1.17	48.8
11	T1	376	8	396	2.1	0.680	12.0	LOS B	7.6	0.90	1.00	1.17	49.7
12	R2	88	1	93	1.1	0.680	15.8	LOS B	7.6	0.90	1.00	1.17	49.5
Approach		548	11	577	2.0	0.680	12.6	LOS B	7.6	0.90	1.00	1.17	49.6
All Vehicles		1855	42	1963	2.3	0.680	11.6	LOS B	7.6	0.81	0.92	0.99	49.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Alcelik M3D).

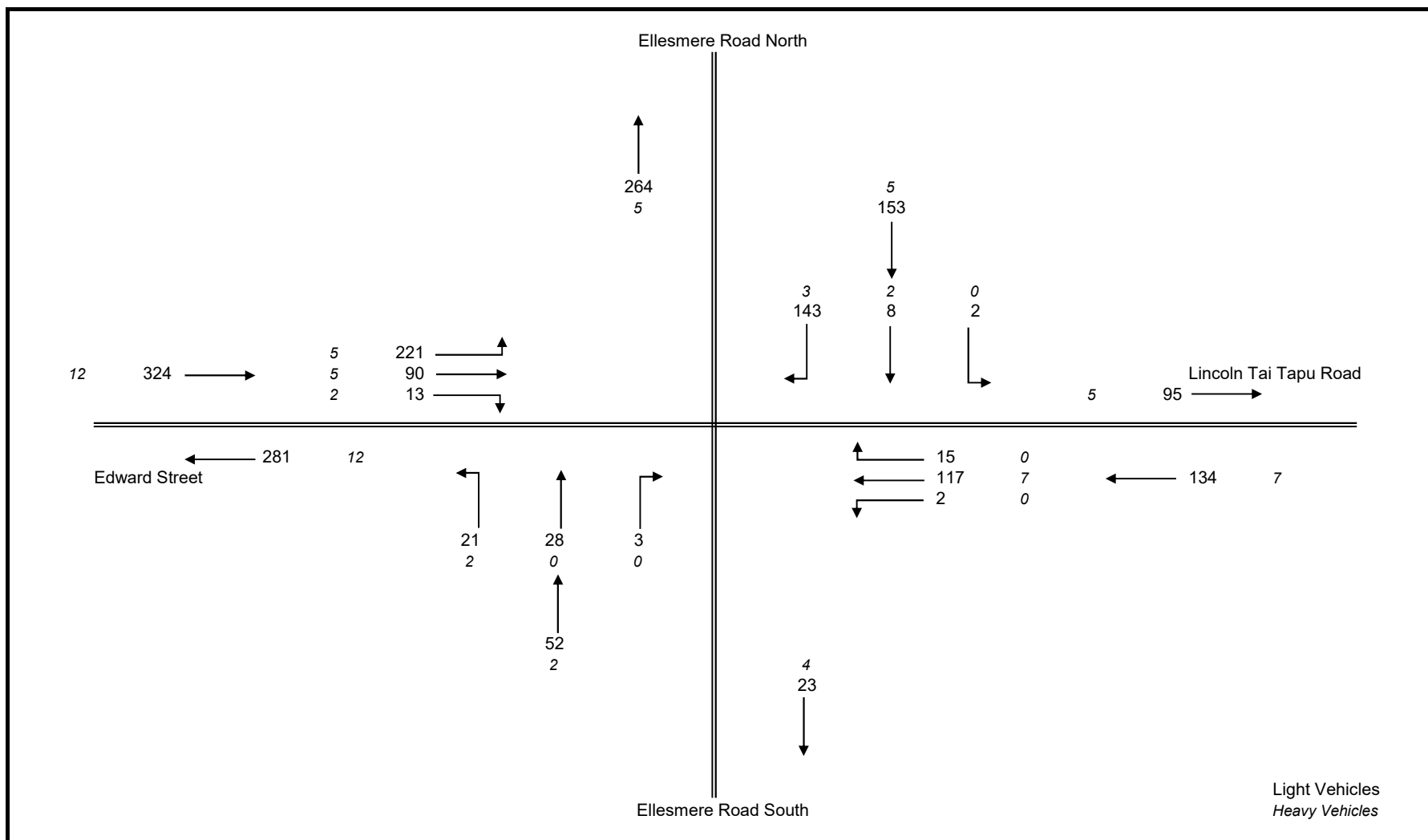
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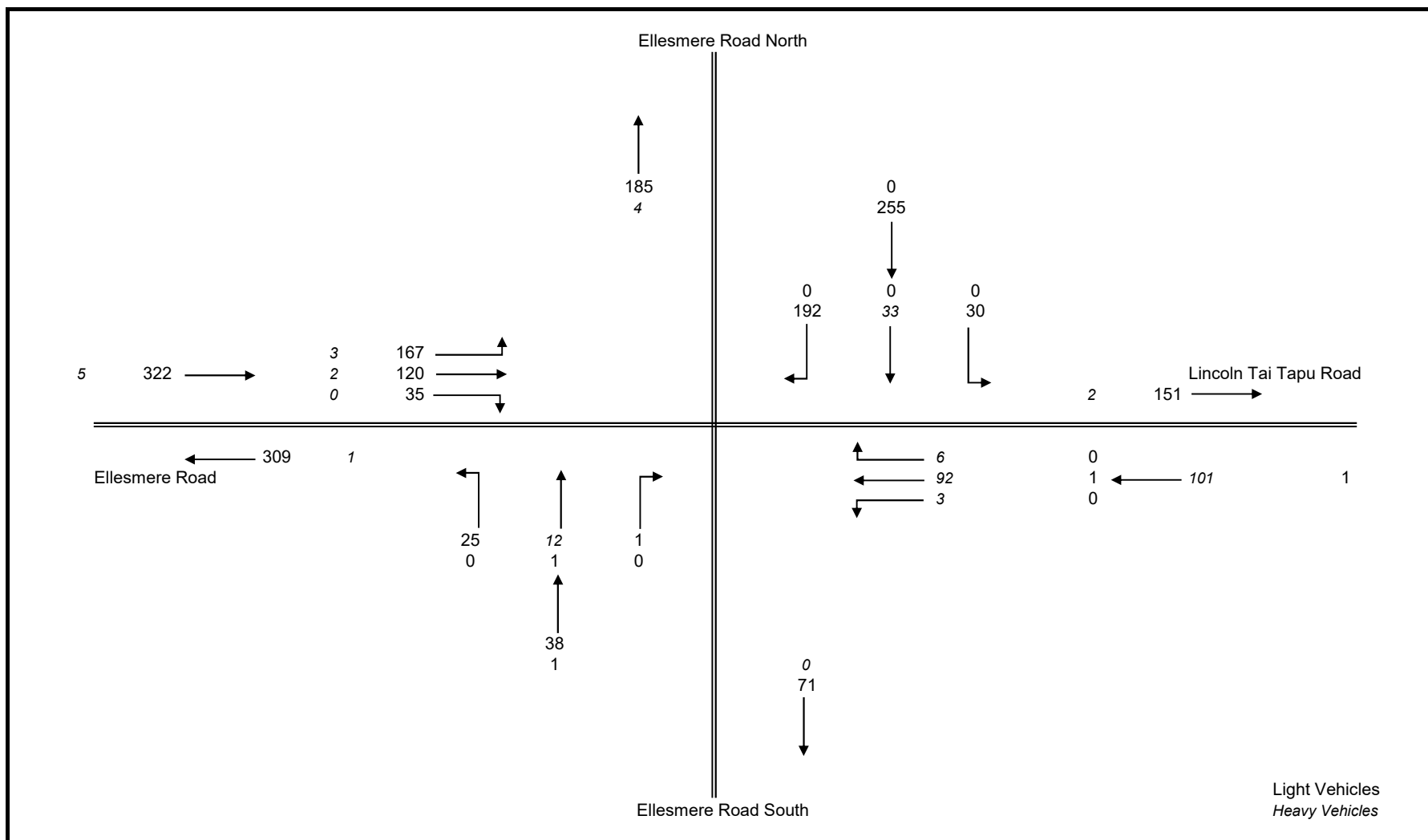
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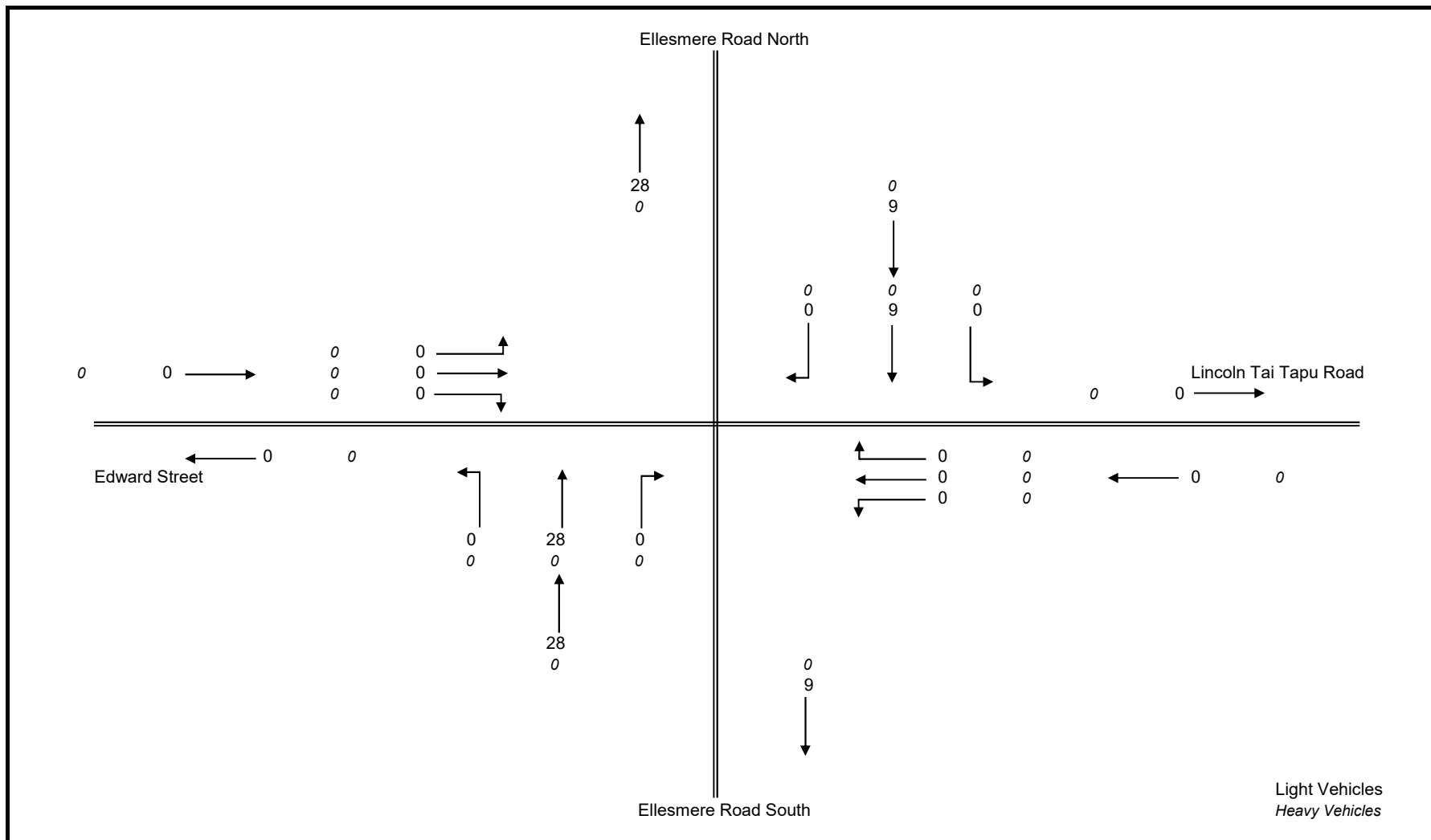


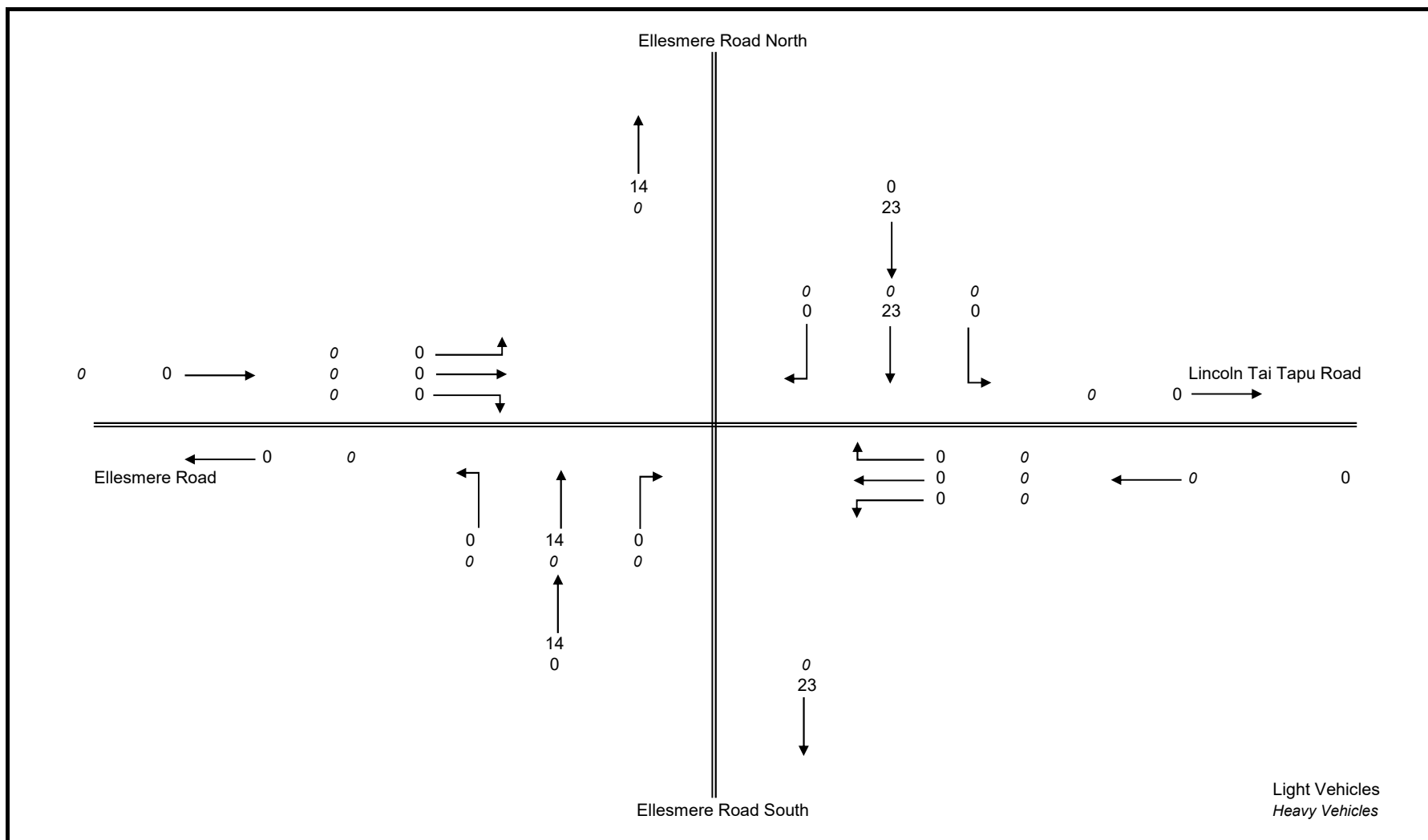
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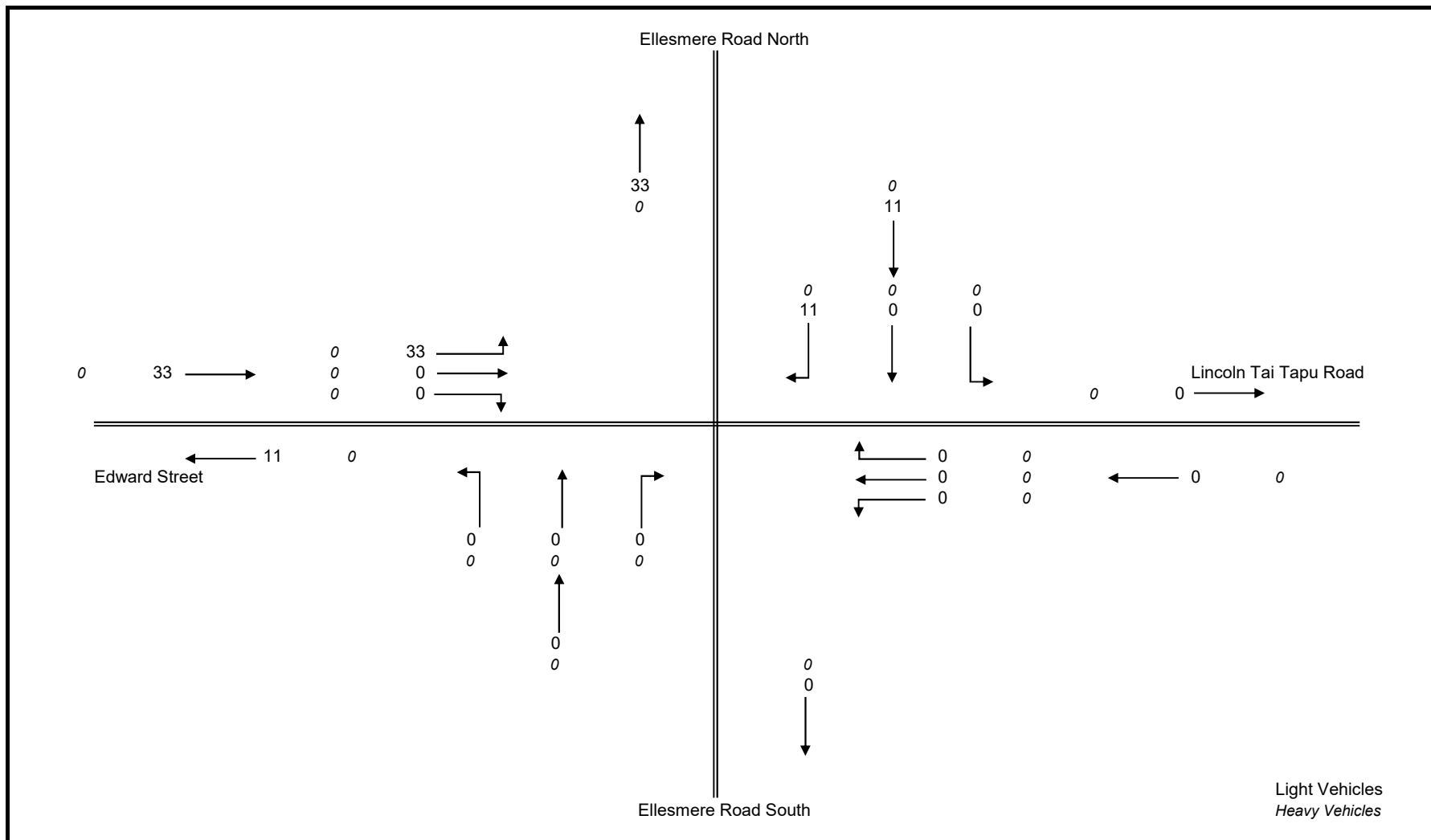
Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Traffic Volumes

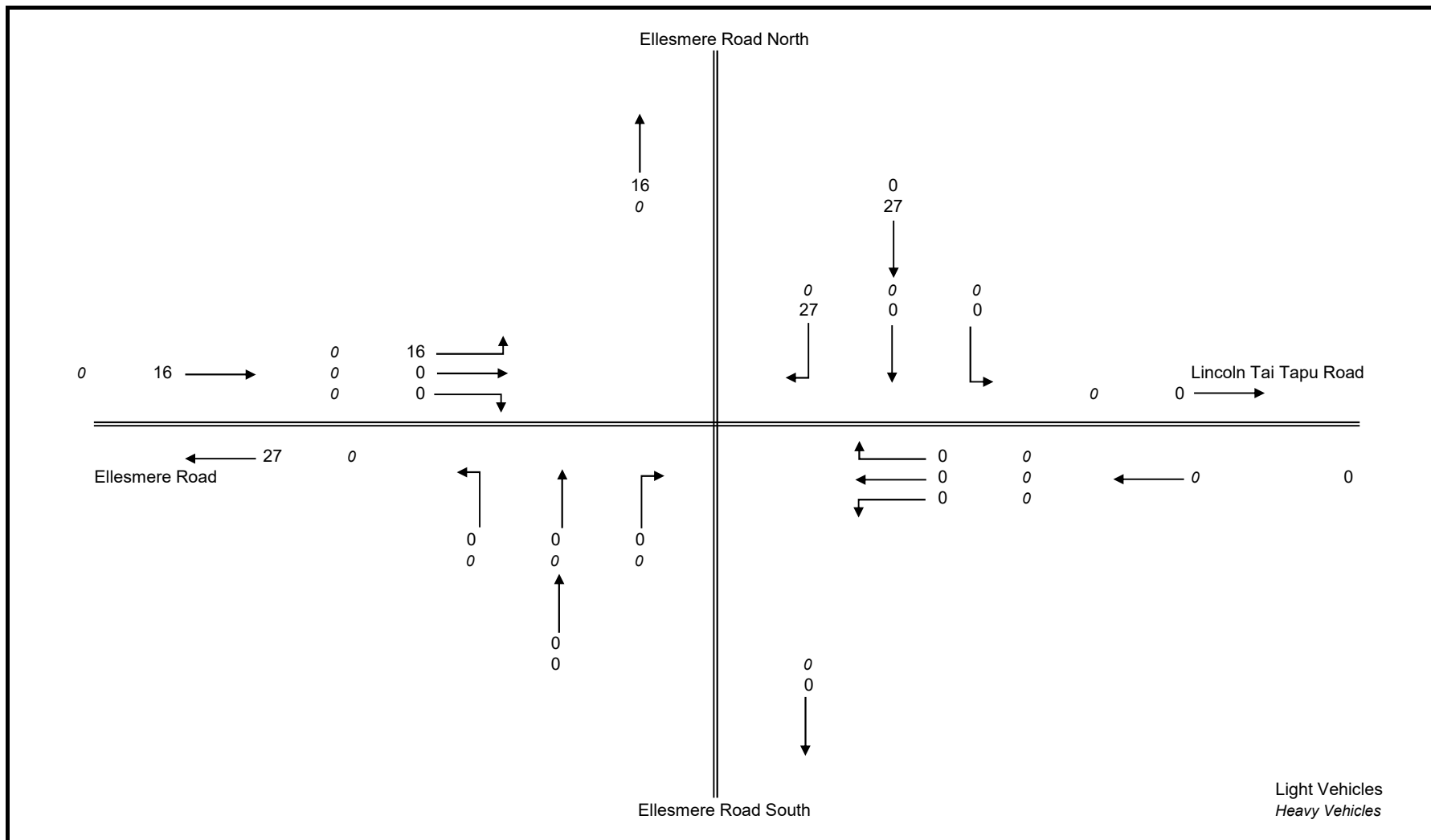


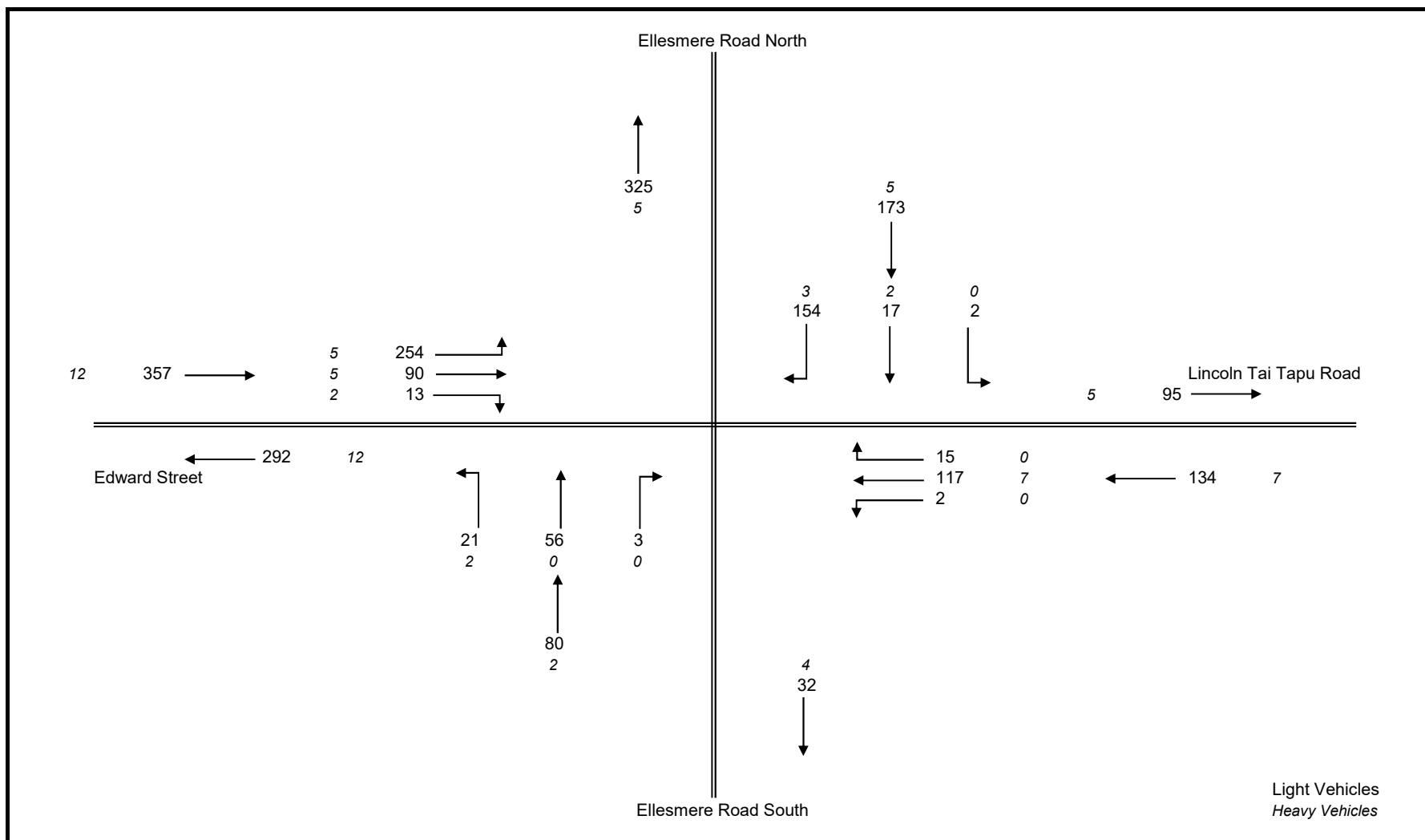


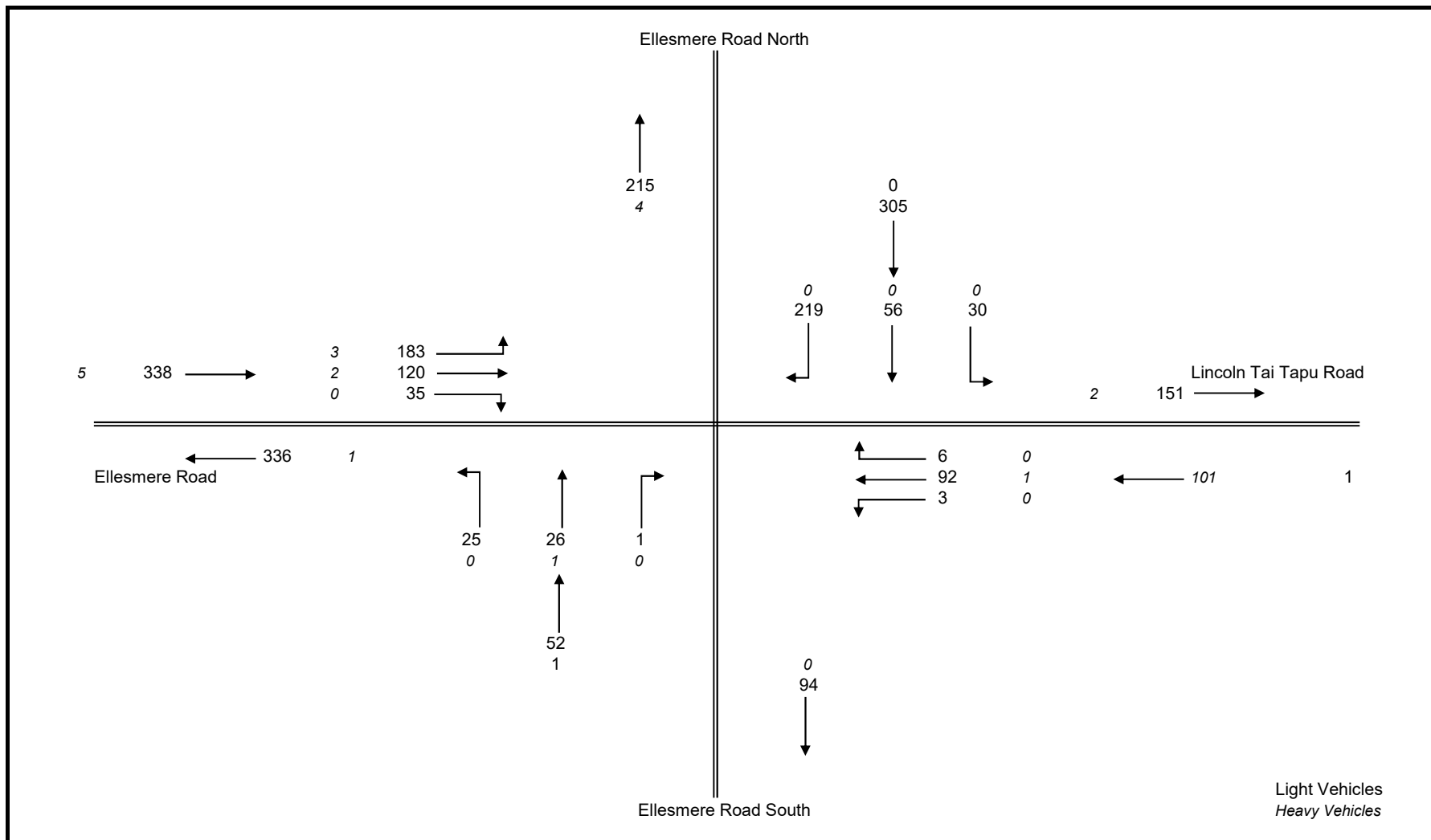


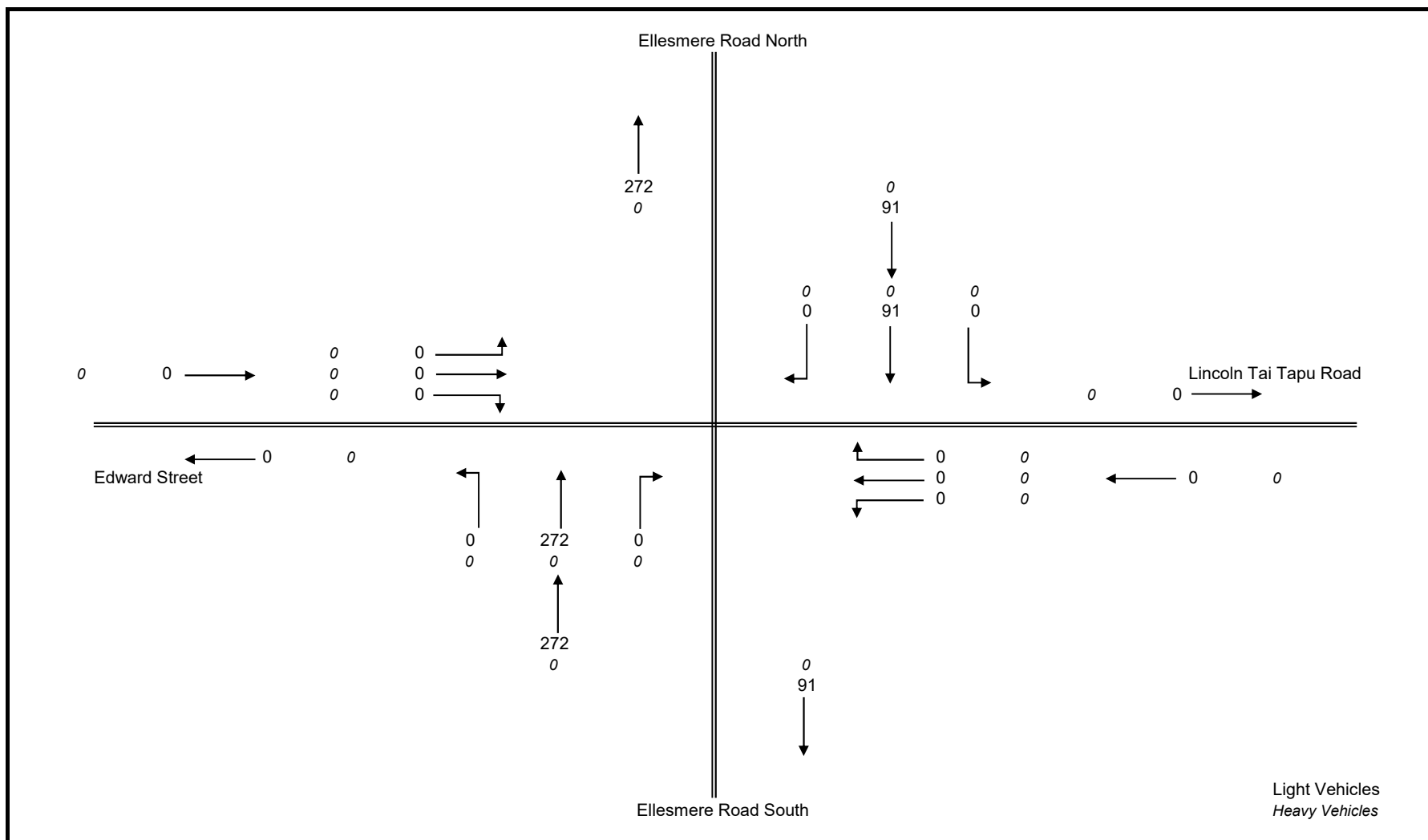


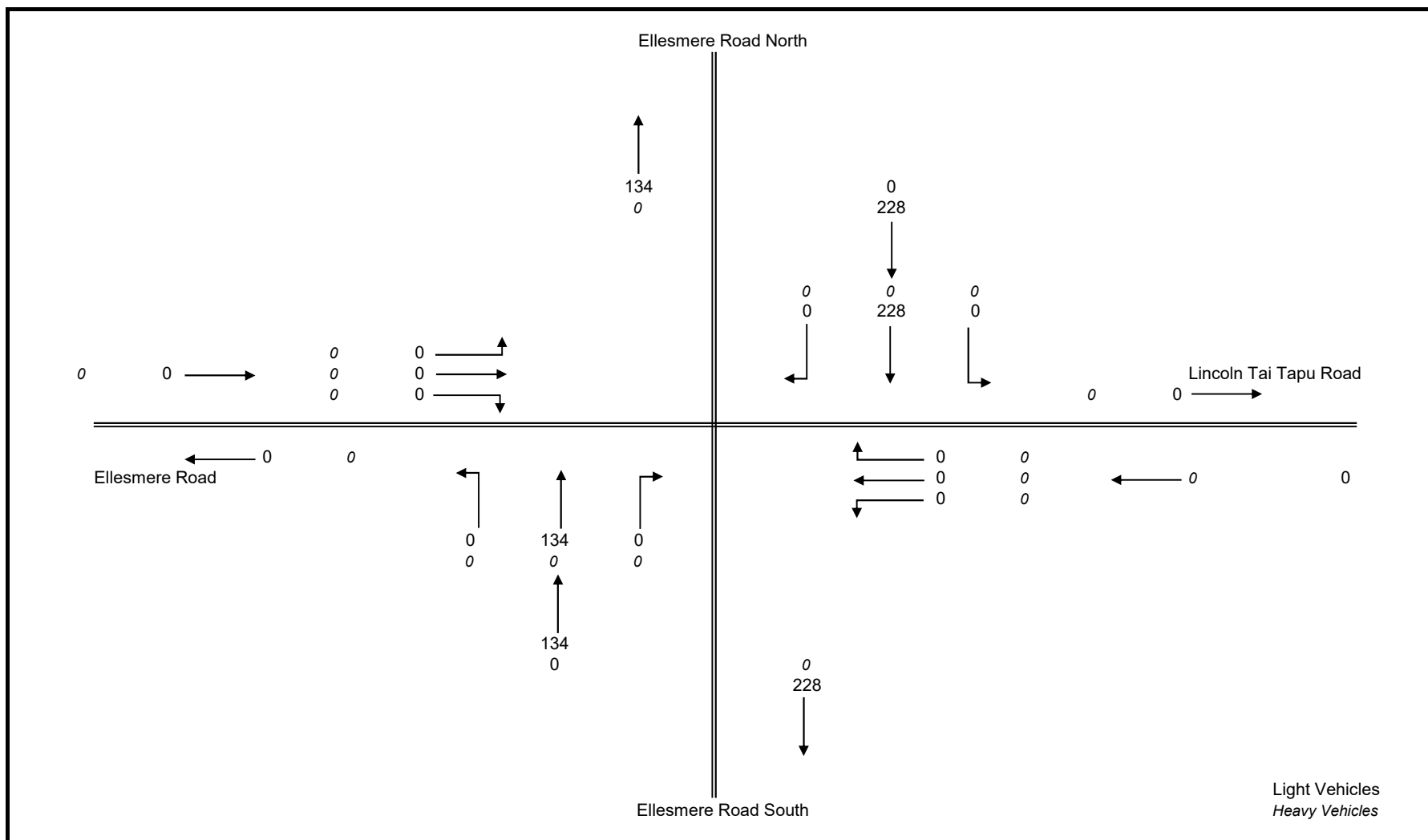


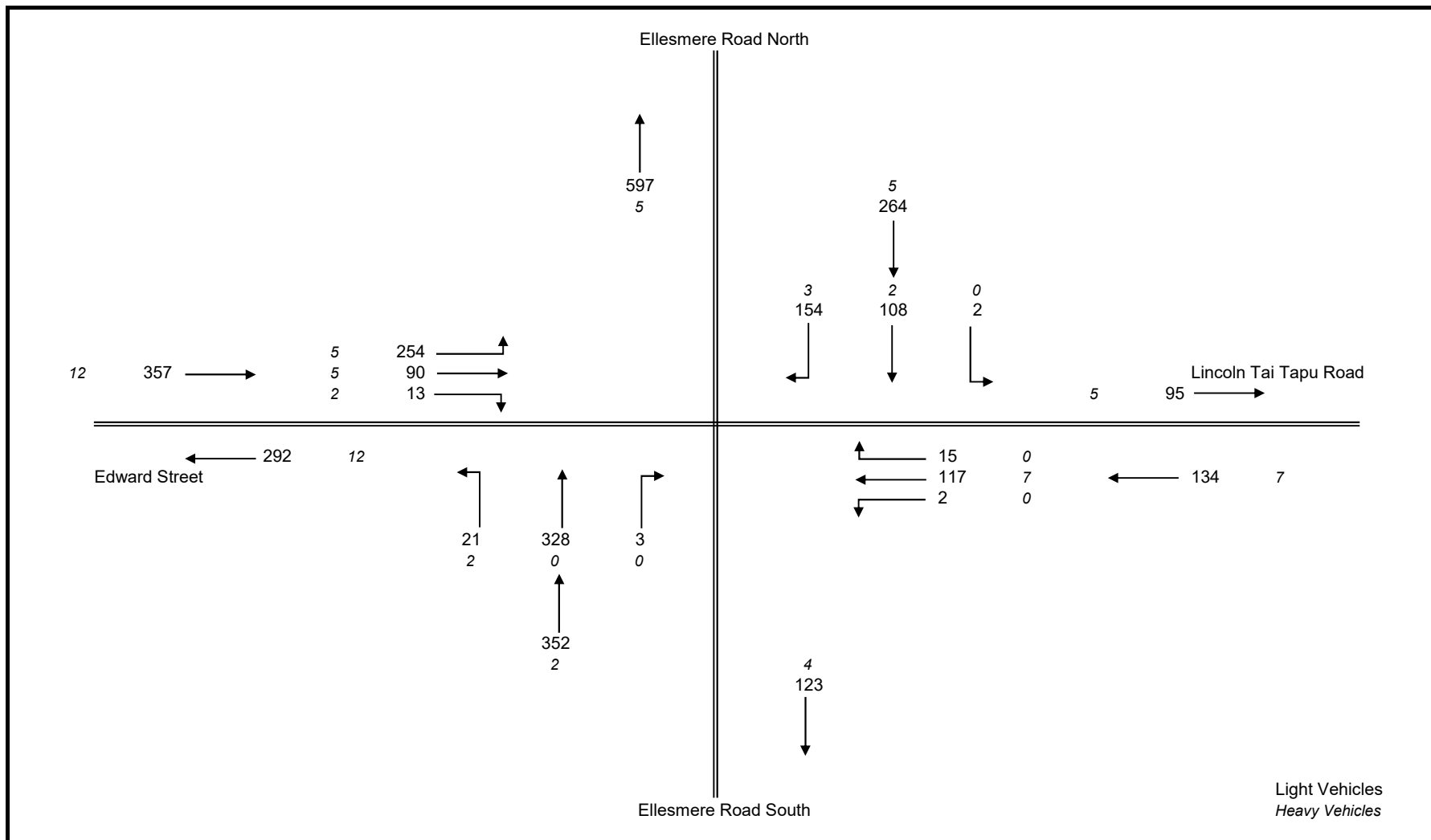


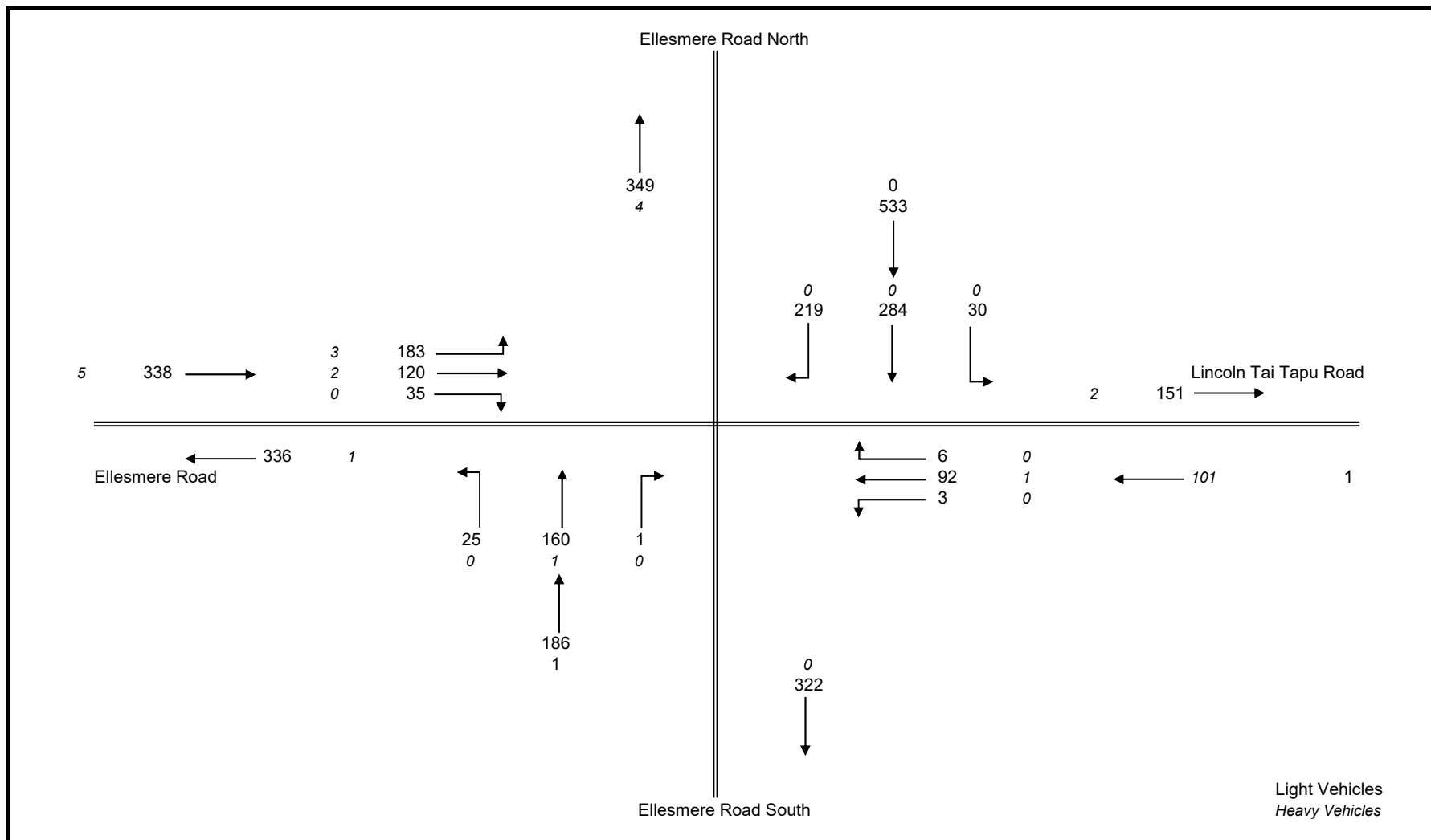














Appendix 5

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Operation – Existing



MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 AM Base (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance												
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Stain	Aver. Delay	Level of Service	95% BACK OF QUEUE	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV / veh/h	[Total veh/h	HV / %	vc	sec		[Veh. veh	Dot / m		
South: Ellesmere Rd												
1	L2	23	2	24	8.7	0.069	9.8	LOS A	0.2	1.8	0.32	59.5
2	T1	28	0	29	0.0	0.069	11.6	LOS B	0.2	1.8	0.32	61.8
3	R2	3	0	3	0.0	0.069	10.0	LOS B	0.2	1.8	0.32	61.7
Approach		54	2	57	3.7	0.069	10.8	LOS B	0.2	1.8	0.32	60.8
East: Lincoln Tai Tapu Rd												
4	L2	2	0	2	0.0	0.082	8.1	LOS A	0.1	1.0	0.11	72.6
5	T1	124	7	131	5.6	0.082	0.2	LOS A	0.1	1.0	0.11	77.6
6	R2	15	0	16	0.0	0.082	7.8	LOS A	0.1	1.0	0.11	72.0
Approach		141	7	148	5.0	0.082	1.1	NA	0.1	1.0	0.11	76.9
North: Ellesmere Rd												
7	L2	2	0	2	0.0	0.273	9.5	LOS A	1.1	7.8	0.52	60.7
8	T1	10	2	11	20.0	0.273	12.9	LOS B	1.1	7.8	0.52	55.1
9	R2	146	3	154	2.1	0.273	12.3	LOS B	1.1	7.8	0.52	59.7
Approach		158	5	166	3.2	0.273	12.3	LOS B	1.1	7.8	0.52	59.4
West: Edward St												
10	L2	226	5	238	2.2	0.194	7.0	LOS A	0.2	1.3	0.04	66.7
11	T1	95	5	100	5.3	0.194	0.1	LOS A	0.2	1.3	0.04	71.9
12	R2	15	2	16	13.3	0.194	7.5	LOS A	0.2	1.3	0.04	62.4
Approach		336	12	354	3.6	0.194	5.1	NA	0.2	1.3	0.04	67.9
All Vehicles		689	26	725	3.8	0.273	6.4	NA	1.1	7.8	0.19	66.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Alcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 PM Base (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Dep. Satn	Aver. Delay	Level of Service	95% BACK-OF-QUEUE	Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver. Speed
		[Total veh/s]	[HV] veh/s]	[Total veh/s]	[HV] %]	veh	sec		[Veh. satn] veh				km/h
South: Ellesmere Rd													
1	L2	25	0	26	0.0	0.042	9.2	LOS A	0.2	0.22	0.93	0.22	62.6
2	T1	13	1	14	7.7	0.042	11.8	LOS B	0.2	0.22	0.93	0.22	59.9
3	R2	1	0	1	0.0	0.042	10.4	LOS B	0.2	0.22	0.93	0.22	62.1
Approach		39	1	41	2.6	0.042	10.1	LOS B	0.2	0.22	0.93	0.22	61.6
East: Lincoln Tai Tapu Rd													
4	L2	3	0	3	0.0	0.057	7.8	LOS A	0.1	0.07	0.06	0.07	73.3
5	T1	93	1	98	1.1	0.057	0.1	LOS A	0.1	0.07	0.06	0.07	76.4
6	R2	6	0	6	0.0	0.057	7.6	LOS A	0.1	0.07	0.06	0.07	72.6
Approach		102	1	107	1.0	0.057	6.8	NA	0.1	0.07	0.06	0.07	77.9
North: Ellesmere Rd													
7	L2	30	0	32	0.0	0.383	10.1	LOS B	2.0	0.49	1.00	0.59	60.8
8	T1	33	0	35	0.0	0.383	11.7	LOS B	2.0	0.49	1.00	0.59	60.5
9	R2	192	0	202	0.0	0.383	12.5	LOS B	2.0	0.49	1.00	0.59	60.3
Approach		255	0	268	0.0	0.383	12.1	LOS B	2.0	0.49	1.00	0.59	60.4
West: Edward St													
10	L2	170	3	179	1.8	0.186	7.1	LOS A	0.3	0.07	0.38	0.07	67.5
11	T1	122	2	128	1.6	0.186	0.1	LOS A	0.3	0.07	0.38	0.07	72.6
12	R2	35	0	37	0.0	0.186	7.0	LOS A	0.3	0.07	0.38	0.07	67.7
Approach		327	5	344	1.5	0.186	4.5	NA	0.3	0.07	0.38	0.07	69.4
All Vehicles		723	7	761	1.0	0.383	6.9	NA	2.0	0.23	0.58	0.28	66.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard

Gap-Acceptance Capacity: SIDRA Standard (Alcèkik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Appendix 6

TRICS Residential Trip Rates

Calculation Reference: AUDIT-191301-201024-1030

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
 Category : A - HOUSES PRIVATELY OWNED
TOTAL VEHICLES

Selected regions and areas:

02	SOUTH EAST	
	IW ISLE OF WIGHT	1 days
	KC KENT	2 days
	WS WEST SUSSEX	1 days
03	SOUTH WEST	
	SM SOMERSET	2 days
04	EAST ANGLIA	
	CA CAMBRIDGESHIRE	1 days
	SF SUFFOLK	1 days
05	EAST MIDLANDS	
	LE LEICESTERSHIRE	1 days
09	NORTH	
	TW TYNE & WEAR	1 days
12	CONNAUGHT	
	CS SLIGO	2 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: No of Dwellings
 Actual Range: 8 to 207 (units:)
 Range Selected by User: 0 to 5000 (units:)

Parking Spaces Range: All Surveys Included

Parking Spaces per Dwelling Range: All Surveys Included

Bedrooms per Dwelling Range: All Surveys Included

Percentage of dwellings privately owned: All Surveys Included

Public Transport Provision:

Selection by: Include all surveys

Date Range: 01/01/12 to 19/11/19

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Tuesday	4 days
Thursday	4 days
Friday	4 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	12 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaken using machines.

Selected Locations:

Neighbourhood Centre (PPS6 Local Centre)	11
Free Standing (PPS6 Out of Town)	1

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Village	11
Out of Town	1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

C3 12 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 500m Range:

All Surveys Included

Population within 1 mile:

1,000 or Less	3 days
1,001 to 5,000	6 days
5,001 to 10,000	2 days
10,001 to 15,000	1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,000 or Less	2 days
25,001 to 50,000	3 days
50,001 to 75,000	3 days
75,001 to 100,000	2 days
125,001 to 250,000	1 days
250,001 to 500,000	1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	1 days
1.1 to 1.5	7 days
1.6 to 2.0	4 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No 12 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present 12 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1	CA-03-A-06	MIXED HOUSES	CAMBRIDGESHIRE
	CRAFT'S WAY		
	NEAR CAMBRIDGE		
	BAR HILL		
	Neighbourhood Centre (PPS6 Local Centre)		
	Village		
	Total No of Dwellings:	207	
	Survey date: FRIDAY	22/06/18	Survey Type: MANUAL
2	CS-03-A-03	MIXED HOUSES	SLIGO
	TOP ROAD		
	STRANDHILL		
	STRANDHILL		
	Neighbourhood Centre (PPS6 Local Centre)		
	Village		
	Total No of Dwellings:	30	
	Survey date: THURSDAY	27/10/16	Survey Type: MANUAL
3	CS-03-A-04	DETACHED & SEMI-DETACHED	SLIGO
	R292		
	STRANDHILL		
	Neighbourhood Centre (PPS6 Local Centre)		
	Village		
	Total No of Dwellings:	63	
	Survey date: THURSDAY	27/10/16	Survey Type: MANUAL
4	IW-03-A-01	DETACHED HOUSES	ISLE OF WIGHT
	MEDHAM FARM LANE		
	NEAR COWES		
	MEDHAM		
	Free Standing (PPS6 Out of Town)		
	Out of Town		
	Total No of Dwellings:	72	
	Survey date: TUESDAY	25/06/19	Survey Type: MANUAL
5	KC-03-A-05	DETACHED & SEMI-DETACHED	KENT
	ROCHESTER ROAD		
	NEAR CHATHAM		
	BURHAM		
	Neighbourhood Centre (PPS6 Local Centre)		
	Village		
	Total No of Dwellings:	8	
	Survey date: FRIDAY	22/09/17	Survey Type: MANUAL
6	KC-03-A-08	MIXED HOUSES	KENT
	MAIDSTONE ROAD		
	CHARING		
	Neighbourhood Centre (PPS6 Local Centre)		
	Village		
	Total No of Dwellings:	159	
	Survey date: TUESDAY	22/05/18	Survey Type: MANUAL
7	LE-03-A-02	DETACHED & OTHERS	LEICESTERSHIRE
	MELBOURNE ROAD		
	IBSTOCK		
	Neighbourhood Centre (PPS6 Local Centre)		
	Village		
	Total No of Dwellings:	85	
	Survey date: THURSDAY	28/06/18	Survey Type: MANUAL
8	SF-03-A-06	DETACHED & SEMI-DETACHED	SUFFOLK
	BURY ROAD		
	KENTFORD		
	Neighbourhood Centre (PPS6 Local Centre)		
	Village		
	Total No of Dwellings:	38	
	Survey date: FRIDAY	22/09/17	Survey Type: MANUAL

LIST OF SITES relevant to selection parameters (Cont.)

9	SM-03-A-02	MIXED HOUSES	SOMERSET
	HYDE LANE NEAR TAUNTON CREECH SAINT MICHAEL Neighbourhood Centre (PPS6 Local Centre) Village Total No of Dwellings: 42 <i>Survey date: TUESDAY 25/09/18</i> <i>Survey Type: MANUAL</i>		
10	SM-03-A-03	MIXED HOUSES	SOMERSET
	HYDE LANE NEAR TAUNTON CREECH ST MICHAEL Neighbourhood Centre (PPS6 Local Centre) Village Total No of Dwellings: 41 <i>Survey date: TUESDAY 25/09/18</i> <i>Survey Type: MANUAL</i>		
11	TW-03-A-03	MIXED HOUSES	TYNE & WEAR
	STATION ROAD NEAR NEWCASTLE BACKWORTH Neighbourhood Centre (PPS6 Local Centre) Village Total No of Dwellings: 33 <i>Survey date: FRIDAY 13/11/15</i> <i>Survey Type: MANUAL</i>		
12	WS-03-A-07	BUNGALOWS	WEST SUSSEX
	EMMS LANE NEAR HORSHAM BROOKS GREEN Neighbourhood Centre (PPS6 Local Centre) Village Total No of Dwellings: 57 <i>Survey date: THURSDAY 19/10/17</i> <i>Survey Type: MANUAL</i>		

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED
TOTAL VEHICLES
 Calculation factor: 1 DWELLS
 BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	12	70	0.065	12	70	0.250	12	70	0.315
08:00 - 09:00	12	70	0.165	12	70	0.383	12	70	0.548
09:00 - 10:00	12	70	0.163	12	70	0.226	12	70	0.389
10:00 - 11:00	12	70	0.145	12	70	0.172	12	70	0.317
11:00 - 12:00	12	70	0.153	12	70	0.193	12	70	0.346
12:00 - 13:00	12	70	0.187	12	70	0.198	12	70	0.385
13:00 - 14:00	12	70	0.186	12	70	0.176	12	70	0.362
14:00 - 15:00	12	70	0.208	12	70	0.190	12	70	0.398
15:00 - 16:00	12	70	0.216	12	70	0.189	12	70	0.405
16:00 - 17:00	12	70	0.284	12	70	0.183	12	70	0.467
17:00 - 18:00	12	70	0.362	12	70	0.168	12	70	0.530
18:00 - 19:00	12	70	0.260	12	70	0.153	12	70	0.413
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:	2.394			2.481			4.875		

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

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

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Parameter summary

Trip rate parameter range selected:	8 - 207 (units:)
Survey date range:	01/01/12 - 19/11/19
Number of weekdays (Monday-Friday):	12
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

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



Appendix 7

Springs Rd / Ellesmere Junction Rd / Gerald St Operation - Baseline



MOVEMENT SUMMARY

Site: 101 Springs Rd / Ellesmere Rd - 2020 AM Base + Subdivisions (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Dep. Satn v/c	Aver. Delay sec	Level of Service	95% BACK-OF-QUEUE [Veh. veh]	Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver. Speed km/h
		[Total veh/h]	[HV] veh/h	[Total veh/h]	[HV] %								
South: Springs Rd													
1	L2	114	1	120	0.9	0.411	7.7	LOS A	2.6	0.73	0.82	0.74	51.2
2	T1	121	6	127	5.0	0.411	8.0	LOS A	2.6	0.73	0.82	0.74	52.2
3	R2	76	1	80	1.3	0.411	11.7	LOS B	2.6	0.73	0.82	0.74	52.0
Approach		311	8	327	2.6	0.411	8.8	LOS A	2.6	0.73	0.82	0.74	51.8
East: Gerald St													
4	L2	126	2	133	1.6	0.652	9.8	LOS A	6.7	0.87	0.94	1.05	49.9
5	T1	288	8	303	2.8	0.652	10.1	LOS B	6.7	0.87	0.94	1.05	50.9
6	R2	139	2	146	1.4	0.652	13.8	LOS B	6.7	0.87	0.94	1.05	50.7
Approach		553	12	582	2.2	0.652	10.9	LOS B	6.7	0.87	0.94	1.05	50.6
North: Springs Rd													
7	L2	175	9	184	5.1	0.860	24.4	LOS C	14.6	1.00	1.36	1.89	41.7
8	T1	246	5	259	2.0	0.860	24.5	LOS C	14.6	1.00	1.36	1.89	42.4
9	R2	115	11	121	9.6	0.860	26.8	LOS C	14.6	1.00	1.36	1.89	42.1
Approach		536	25	564	4.7	0.860	25.4	LOS C	14.6	1.00	1.36	1.89	42.1
West: Ellesmere Junction Rd													
10	L2	59	3	62	5.1	0.534	7.4	LOS A	4.2	0.70	0.75	0.73	51.3
11	T1	334	27	352	8.1	0.534	7.7	LOS A	4.2	0.70	0.75	0.73	52.2
12	R2	102	5	107	4.9	0.534	11.4	LOS B	4.2	0.70	0.75	0.73	52.0
Approach		495	35	521	7.1	0.534	8.4	LOS A	4.2	0.70	0.75	0.73	52.1
All Vehicles		1895	80	1995	4.2	0.860	14.0	LOS B	14.6	0.84	0.89	1.15	48.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Alc¸elik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Base + Subdivisions (Site Folder: Springs Ellesmere)]
New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Sat. 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
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %									
South: Springs Rd														
1	L2	128	5	135	3.9	0.645	16.7	LOS B	6.0	43.1	0.85	0.99	1.07	49.1
2	T1	222	6	234	2.7	0.645	16.9	LOS B	6.0	43.1	0.85	0.99	1.07	50.2
3	R2	141	0	148	0.0	0.645	14.5	LOS B	6.0	43.1	0.85	0.99	1.07	50.0
Approach		491	11	517	2.2	0.645	11.9	LOS B	6.0	43.1	0.85	0.99	1.07	49.8
East: Gerald St														
4	L2	76	2	80	2.6	0.578	8.1	LOS A	5.0	35.6	0.76	0.83	0.84	50.8
5	T1	293	10	308	3.4	0.578	8.3	LOS A	5.0	35.6	0.76	0.83	0.84	51.8
6	R2	159	2	167	1.3	0.578	12.1	LOS B	5.0	35.6	0.76	0.83	0.84	51.6
Approach		528	14	556	2.7	0.578	9.4	LOS A	5.0	35.6	0.76	0.83	0.84	51.6
North: Springs Rd														
7	L2	174	1	183	0.6	0.879	34.8	LOS C	14.6	103.2	1.00	1.44	2.18	37.3
8	T1	154	3	162	1.9	0.879	35.1	LOS D	14.6	103.2	1.00	1.44	2.18	37.9
9	R2	92	2	97	2.2	0.879	39.0	LOS D	14.6	103.2	1.00	1.44	2.18	37.7
Approach		420	6	442	1.4	0.879	35.8	LOS D	14.6	103.2	1.00	1.44	2.18	37.6
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.835	18.3	LOS B	13.9	98.9	1.00	1.24	1.66	44.8
11	T1	405	8	426	2.0	0.835	18.5	LOS B	13.9	98.9	1.00	1.24	1.66	45.6
12	R2	166	1	175	0.6	0.835	22.2	LOS C	13.9	98.9	1.00	1.24	1.66	45.4
Approach		655	11	689	1.7	0.835	19.4	LOS B	13.9	98.9	1.00	1.24	1.66	45.4
All Vehicles		2094	42	2204	2.0	0.879	18.4	LOS B	14.6	103.2	0.90	1.12	1.42	45.9
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).														
Queue Model: SIDRA Standard.														
Gap-Acceptance Capacity: SIDRA Standard (Alcizelik M3D).														
The LOS values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.														

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Alcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Appendix 8

Springs Rd / Ellesmere Junction Rd / Gerald St Operation – With Subdivision



MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Base + Plan Change (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Dep. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/s]	[HV] veh/s	[Total veh/s]	[HV] %	v/c	sec		[Veh. satn] veh				
South Springs Rd													
1	L2	703	1	740	0.1	1.393	366.5	LOS F	223.1	1.00	7.14	15.72	8.5
2	T1	320	6	337	1.9	1.393	366.8	LOS F	223.1	1.00	7.14	15.72	8.5
3	R2	76	1	80	1.3	1.393	370.5	LOS F	223.1	1.00	7.14	15.72	8.5
Approach		1099	8	1157	0.7	1.393	366.9	LOS F	223.1	1.00	7.14	15.72	8.5
East Gerald St													
4	L2	126	2	133	1.6	0.744	14.8	LOS B	9.1	0.96	1.15	1.41	46.8
5	T1	268	8	303	2.8	0.744	15.1	LOS B	9.1	0.96	1.15	1.41	47.6
6	R2	139	2	146	1.4	0.744	16.8	LOS B	9.1	0.96	1.15	1.41	47.4
Approach		553	12	582	2.2	0.744	16.0	LOS B	9.1	0.96	1.15	1.41	47.3
North Springs Rd													
7	L2	175	9	184	5.1	1.296	292.5	LOS F	107.8	1.00	4.58	10.44	10.3
8	T1	312	5	328	1.6	1.296	292.5	LOS F	107.8	1.00	4.58	10.44	10.3
9	R2	115	11	121	9.6	1.296	296.9	LOS F	107.8	1.00	4.58	10.44	10.3
Approach		602	25	634	4.2	1.296	293.3	LOS F	107.8	1.00	4.58	10.44	10.3
West Ellesmere Junction Rd													
10	L2	59	3	62	5.1	0.814	14.7	LOS B	12.7	0.99	1.11	1.45	46.4
11	T1	334	27	352	6.1	0.814	15.0	LOS B	12.7	0.99	1.11	1.45	47.1
12	R2	292	5	307	1.7	0.814	18.6	LOS B	12.7	0.99	1.11	1.45	47.1
Approach		685	35	721	5.1	0.814	16.5	LOS B	12.7	0.99	1.11	1.45	47.1
All Vehicles		2939	80	3094	2.7	1.393	204.1	LOS F	223.1	0.99	4.08	8.62	13.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Base + Plan Change (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Req. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		Total veh/s	veh/s	Total veh/s	HV %	veh/s	sec		ftm. veh	ftm.			km/h
South: Springs Rd													
1	L2	409	5	431	1.2	1.131	136.6	LOS F	88.2	624.0	3.73	7.55	16.1
2	T1	320	6	337	1.9	1.131	136.8	LOS F	88.2	624.0	3.73	7.55	16.3
3	R2	141	0	148	0.0	1.131	142.5	LOS F	88.2	624.0	3.73	7.55	16.2
Approach		870	11	916	1.3	1.131	139.3	LOS F	88.2	624.0	3.73	7.55	16.2
East: Gerald St													
4	L2	76	2	80	2.6	0.774	17.9	LOS B	10.3	73.9	1.24	1.59	44.9
5	T1	293	10	308	3.4	0.774	16.2	LOS B	10.3	73.9	1.24	1.59	45.6
6	R2	159	2	167	1.3	0.774	21.9	LOS C	10.3	73.9	1.24	1.59	45.5
Approach		528	14	556	2.7	0.774	19.3	LOS B	10.3	73.9	1.24	1.59	45.5
North: Springs Rd													
7	L2	174	1	183	0.6	1.464	442.9	LOS F	138.9	980.7	5.31	12.79	7.2
8	T1	321	3	338	0.9	1.464	443.2	LOS F	138.9	980.7	5.31	12.79	7.2
9	R2	92	2	97	2.2	1.464	447.1	LOS F	138.9	980.7	5.31	12.79	7.2
Approach		587	6	618	1.0	1.464	443.7	LOS F	138.9	980.7	5.31	12.79	7.2
West: Ellesmere Junction Rd													
10	L2	84	2	88	2.4	1.522	483.6	LOS F	275.9	1947.3	8.09	18.02	6.7
11	T1	405	8	426	2.0	1.522	483.8	LOS F	275.9	1947.3	8.09	18.02	6.8
12	R2	643	1	677	0.2	1.522	487.6	LOS F	275.9	1947.3	8.09	18.02	6.8
Approach		1132	11	1192	1.0	1.522	486.0	LOS F	275.9	1947.3	8.09	18.02	6.8
All Vehicles		3117	42	3281	1.3	1.522	302.2	LOS F	275.9	1947.3	5.19	11.33	10.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Alkcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



Appendix 9

Springs Rd / Ellesmere Junction Rd / Gerald St Council Traffic Signals Operation



MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Council (Site Folder: Springs Ellesmere)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Req. Sat. V/C	Aver. Delay (sec)	Level of Service	95% BACK OF QUEUE [ft. veh]	Queue	Effective Stop Rate	Aver. No. Cycles	Aver. Stop Length (min)
		[Tot. veh]	[HV]	[Tot. veh]	[HV]	%							
South: Springs Rd													
1	L2	703	1	740	0.1	1.317	344.4	LOS F	184.1	1296.5	1.99	2.98	8.8
2	T1	320	6	337	1.9	★ 1.317	338.8	LOS F	184.1	1296.5	1.99	2.98	8.9
3	R2	76	1	80	1.3	0.745	71.6	LOS E	5.1	35.8	0.85	1.21	27.2
Approach		1099	8	1157	0.7	1.317	323.9	LOS F	184.1	1296.5	1.91	2.85	9.3
East: Gerald St													
4	L2	126	2	133	1.6	1.020	123.1	LOS F	11.9	84.5	1.18	1.96	19.6
5	T1	288	8	303	2.8	★ 1.590	581.7	LOS F	65.8	471.7	2.36	3.99	5.5
6	R2	139	2	146	1.4	0.637	61.4	LOS E	8.5	59.9	0.82	1.02	29.5
Approach		553	12	582	2.2	1.590	348.4	LOS F	65.8	471.7	1.70	2.78	8.7
North: Springs Rd													
7	L2	175	9	184	5.1	0.144	10.3	LOS B	3.0	21.9	0.35	0.35	50.6
8	T1	312	5	328	1.6	0.375	22.5	LOS C	12.4	87.9	0.70	0.70	43.8
9	R2	115	11	121	9.6	★ 1.194	248.2	LOS F	16.3	123.4	1.46	2.68	11.4
Approach		602	25	634	4.2	1.194	61.7	LOS E	16.3	123.4	0.78	0.96	29.2
West: Ellesmere Junction Rd													
10	L2	59	3	62	5.1	0.219	53.7	LOS D	3.2	23.5	0.75	0.91	31.4
11	T1	334	27	352	8.1	★ 1.309	337.5	LOS F	57.8	432.4	2.07	3.04	8.9
12	R2	292	5	307	1.7	1.135	198.3	LOS F	37.0	262.8	1.35	2.30	13.6
Approach		685	35	721	5.1	1.309	253.7	LOS F	57.8	432.4	1.65	2.54	11.2
All Vehicles		2839	80	3084	2.7	1.590	258.1	LOS F	184.1	1296.5	1.58	2.38	11.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Appl. M30).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

★ Critical Movement (Signal Timing)



MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Council (Site Folder: Springs Ellesmere)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Req Satn	Aver Delay	Level of Service	95% BACK OF QUEUE	Prop Que	Effective Stop Rate	Aver No Cycles	Aver Spent	
		Total veh/s	HV %	Total veh/s	HV %	v/c	sec		[10th velt]		per velt		min	
South: Springs Rd														
1	L2	409	5	431	1.2	1.460	472.3	LOS F	151.7	1075.5	1.00	2.39	3.53	
2	T1	320	6	337	1.9	1.460	466.8	LOS F	151.7	1075.5	1.00	2.39	3.53	
3	R2	141	0	148	0.0	1.370	395.0	LOS F	26.2	183.5	1.00	1.72	3.34	
Approach		870	11	916	1.3	1.460	457.7	LOS F	151.7	1075.5	1.00	2.28	3.50	
East: Gerald St														
4	L2	76	2	80	2.6	0.351	58.7	LOS E	4.4	31.5	0.96	0.77	0.96	
5	T1	293	10	308	3.4	1.502	504.3	LOS F	62.4	449.6	1.00	2.27	3.73	
6	R2	159	2	167	1.3	0.727	63.5	LOS E	10.0	70.7	1.00	0.85	1.10	
Approach		528	14	556	2.7	1.502	307.4	LOS F	62.4	449.6	0.99	1.63	2.54	
North: Springs Rd														
7	L2	174	1	183	0.6	0.164	12.3	LOS B	3.6	25.5	0.42	0.67	0.42	
8	T1	321	3	338	0.9	0.853	37.4	LOS D	16.6	116.8	0.89	0.77	0.89	
9	R2	92	2	97	2.2	0.908	80.3	LOS F	6.6	47.2	1.00	0.99	1.55	
Approach		587	6	618	1.0	0.908	36.7	LOS D	16.6	116.8	0.77	0.77	0.86	
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.157	37.6	LOS D	3.7	26.7	0.76	0.74	0.76	
11	T1	405	8	426	2.0	0.832	45.7	LOS D	24.3	172.9	0.95	0.92	1.07	
12	R2	643	1	677	0.2	1.494	504.2	LOS F	138.3	969.3	1.00	1.92	3.66	
Approach		1132	11	1192	1.0	1.494	305.6	LOS F	138.3	969.3	0.96	1.47	2.52	
All Vehicles		3117	42	3281	1.3	1.502	297.7	LOS F	151.7	1075.5	0.94	1.59	2.48	
													9.9	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard

Gap-Acceptance Capacity: SIDRA Standard (Alcizellik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Critical Movement (Signal Timing)



Appendix 10

Springs Rd / Ellesmere Junction Rd / Gerald St Upgraded Traffic Signals Operation



MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM (Site Folder: Springs Ellesmere)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK-OF-QUEUE	Prop. Que	Effective Stop Ratio	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	s/c		[Veh. veh				
South: Springs Rd													
1	L2	703	1	740	0.1	0.646	15.5	LOS B	19.6	0.58	0.76	0.58	46.6
2	T1	320	6	337	1.9	0.583	44.9	LOS D	12.9	0.93	0.77	0.93	34.7
3	R2	76	1	80	1.3	0.652	68.8	LOS E	4.9	1.00	0.81	1.10	27.9
Approach		1099	8	1157	0.7	0.652	27.7	LOS C	19.6	0.71	0.76	0.72	41.6
East: Gerald St													
4	L2	126	2	133	1.6	0.333	48.8	LOS D	6.6	0.89	0.78	0.89	32.9
5	T1	288	8	303	2.8	0.770	50.2	LOS D	17.4	0.99	0.90	1.07	33.0
6	R2	139	2	146	1.4	0.682	63.2	LOS E	8.6	1.00	0.83	1.07	28.1
Approach		553	12	582	2.2	0.770	53.4	LOS D	17.4	0.97	0.85	1.03	31.9
North: Springs Rd													
7	L2	175	9	184	5.1	0.397	44.6	LOS D	9.2	0.87	0.80	0.87	34.1
8	T1	312	5	328	1.6	0.695	41.9	LOS D	16.7	0.94	0.80	0.94	35.6
9	R2	115	11	121	9.6	0.597	62.0	LOS E	7.0	1.00	0.90	1.00	29.4
Approach		602	25	634	4.2	0.695	46.5	LOS D	16.7	0.93	0.80	0.93	33.8
West: Ellesmere Junction Rd													
10	L2	59	3	62	5.1	0.710	41.5	LOS D	20.3	0.90	0.79	0.90	37.1
11	T1	334	27	352	8.1	0.710	35.1	LOS D	20.3	0.90	0.79	0.90	37.8
12	R2	292	5	307	1.7	0.624	46.1	LOS D	9.6	0.87	0.79	0.87	34.0
Approach		685	35	721	5.1	0.710	46.4	LOS D	20.3	0.89	0.79	0.89	36.0
All Vehicles		2939	80	3094	2.7	0.770	38.3	LOS D	20.3	0.84	0.79	0.86	36.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Algelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

• Critical Movement (Signal Timing)



MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM (Site Folder: Springs Ellesmere)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance													
Mov. ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Dep. Satn	Aver. Delay	Level of Service	95% BACK-OF-QUEUE	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV veh/h]	[Total veh/h]	[HV %]	veh	sec		[Veh. Satn veh]				km/h
South: Springs Rd													
1	L2	409	5	431	1.2	0.393	11.5	LOS B	7.8	0.41	0.68	0.41	50.5
2	T1	320	6	337	1.9	0.843	58.1	LOS E	15.4	0.98	0.90	1.14	30.8
3	R2	141	0	148	0.0	0.872	74.0	LOS E	9.6	1.00	0.96	1.37	26.8
Approach		870	11	916	1.3	0.872	38.6	LOS D	15.4	0.71	0.81	0.83	36.7
East: Gerald St													
4	L2	76	2	80	2.6	0.297	52.5	LOS D	5.5	0.89	0.76	0.89	32.9
5	T1	293	10	308	3.4	0.745	50.3	LOS D	16.0	0.98	0.87	1.04	32.9
6	R2	159	2	167	1.3	0.839	70.2	LOS E	10.7	1.00	0.92	1.28	27.5
Approach		528	14	556	2.7	0.839	56.6	LOS E	16.0	0.98	0.87	1.09	31.1
North: Springs Rd													
7	L2	174	1	183	0.6	0.500	51.3	LOS D	10.1	0.93	0.81	0.93	32.2
8	T1	321	3	338	0.9	0.875	58.0	LOS E	20.9	1.00	1.01	1.24	30.5
9	R2	92	2	97	2.2	0.353	55.9	LOS E	5.2	0.94	0.78	0.94	30.9
Approach		587	6	618	1.0	0.875	56.2	LOS E	20.9	0.97	0.91	1.10	31.1
West: Ellesmere Junction Rd													
10	L2	84	2	88	2.4	0.865	48.0	LOS D	29.0	0.90	0.91	1.05	34.5
11	T1	405	8	426	2.0	0.865	42.5	LOS D	29.0	0.90	0.91	1.05	35.1
12	R2	643	1	677	0.2	0.770	47.1	LOS D	23.6	0.93	0.85	0.96	33.9
Approach		1132	11	1192	1.0	0.865	45.6	LOS D	29.0	0.92	0.88	1.00	34.4
All Vehicles		3117	42	3281	1.3	0.875	47.6	LOS D	29.0	0.88	0.86	0.99	33.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard

Gap-Acceptance Capacity: SIDRA Standard (Alcayk M3D)

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)



Appendix 11

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Operation - Baseline



MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 AM Base + Subdivisions (Site Folder: Ellesmere Edward)]
New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Sat	Aver. Delay	Level of Service	95% BACK-OF-QUEUE	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	[HV]	[Total veh/h]	[HV]	v/c	sec		[Veh. veh]				
South: Ellesmere Rd													
1	L2	23	2	24	8.7	0.117	9.9	LOS A	0.4	0.38	0.97	0.38	59.0
2	T1	56	0	59	0.0	0.117	12.1	LOS B	0.4	0.38	0.97	0.38	61.2
3	R2	3	0	3	0.0	0.117	10.2	LOS B	0.4	0.38	0.97	0.38	61.1
Approach		82	2	86	2.4	0.117	11.4	LOS B	0.4	0.38	0.97	0.38	60.6
East: Lincoln Tai Tapu Rd													
4	L2	2	0	2	0.0	0.083	8.3	LOS A	0.1	0.12	0.08	0.12	72.5
5	T1	124	7	131	5.6	0.083	8.2	LOS A	0.1	0.12	0.08	0.12	77.6
6	R2	15	0	16	0.0	0.083	8.0	LOS A	0.1	0.12	0.08	0.12	71.9
Approach		141	7	148	5.0	0.083	1.2	NA	0.1	0.12	0.08	0.12	76.9
North: Ellesmere Rd													
7	L2	2	0	2	0.0	0.322	9.8	LOS A	1.4	0.55	1.03	0.65	59.9
8	T1	19	2	20	10.5	0.322	12.7	LOS B	1.4	0.55	1.03	0.65	58.8
9	R2	157	3	165	1.9	0.322	13.2	LOS B	1.4	0.55	1.03	0.65	58.9
Approach		178	5	187	2.8	0.322	13.1	LOS B	1.4	0.55	1.03	0.65	58.7
West: Edward St													
10	L2	259	5	273	1.9	0.212	7.0	LOS A	0.2	0.04	0.46	0.04	66.6
11	T1	95	5	100	5.3	0.212	8.1	LOS A	0.2	0.04	0.46	0.04	71.6
12	R2	15	2	16	13.3	0.212	7.5	LOS A	0.2	0.04	0.46	0.04	62.2
Approach		369	12	388	3.3	0.212	5.3	NA	0.2	0.04	0.46	0.04	67.6
All Vehicles		770	26	811	3.4	0.322	7.0	NA	1.4	0.21	0.58	0.23	66.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are not applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Alcizelik M3D).
HV (%) values are calculated for All Movement Classes of all Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 PM Base + Subdivisions (Site Folder: Ellesmere Edward)]
New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES [Total veh/h]		DEMAND FLOWS [Total HV] %		Deg Satn v/c	Aver Delay sec	Level of Service	95% BACK-OF-QUEUE [Veh. veh]	Effective Stop Rate	Prop Speed km/h	Aver No. Cycles	Aver Speed km/h
South: Ellesmere Rd													
1	L2	25	0	26	0.0	0.063	9.2	LOS A	0.2	1.6	0.26	0.26	62.2
2	T1	27	1	28	3.7	0.063	11.6	LOS B	0.2	1.6	0.26	0.26	60.8
3	R2	1	0	1	0.0	0.063	10.7	LOS B	0.2	1.6	0.26	0.26	61.8
Approach		53	1	56	1.9	0.063	10.5	LOS B	0.2	1.6	0.26	0.26	61.5
East: Lincoln Tai Tapu Rd													
4	L2	3	0	3	0.0	0.057	7.8	LOS A	0.1	0.4	0.07	0.07	73.3
5	T1	93	1	98	1.1	0.057	0.1	LOS A	0.1	0.4	0.07	0.07	78.4
6	R2	6	0	6	0.0	0.057	7.7	LOS A	0.1	0.4	0.07	0.07	72.6
Approach		102	1	107	1.0	0.057	0.8	NA	0.1	0.4	0.07	0.07	77.9
North: Ellesmere Rd													
7	L2	30	0	32	0.0	0.469	10.6	LOS B	2.8	19.7	0.54	0.74	59.9
8	T1	56	0	59	0.0	0.469	12.5	LOS B	2.8	19.7	0.54	0.74	59.6
9	R2	219	0	231	0.0	0.469	13.6	LOS B	2.8	19.7	0.54	0.74	59.4
Approach		305	0	321	0.0	0.469	13.1	LOS B	2.8	19.7	0.54	0.74	59.5
West: Edward St													
10	L2	186	3	196	1.6	0.195	7.0	LOS A	0.3	2.4	0.07	0.07	67.5
11	T1	122	2	128	1.6	0.195	0.1	LOS A	0.3	2.4	0.07	0.07	72.5
12	R2	35	0	37	0.0	0.195	7.0	LOS A	0.3	2.4	0.07	0.07	67.6
Approach		343	5	361	1.5	0.195	4.6	NA	0.3	2.4	0.07	0.07	69.2
All Vehicles		803	7	845	0.9	0.469	7.7	NA	2.8	19.7	0.26	0.34	65.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Alcizell M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Appendix 12

**Edward St / Ellesmere Rd /
Lincoln Tai Tapu Rd Operation –
With Subdivision**



MOVEMENT SUMMARY

Site: 101 [Edward St/ Ellesmere Rd - 2020 AM Base + Plan Change (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Sat	Aver. Delay	Level of Service	95% BACK OF QUEUE	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	[HV] veh/h	[Total veh/h]	[HV] %	veh	sec		veh				
South: Ellesmere Rd													
1	L2	23	2	24	8.7	0.569	12.1	LOS B	3.9	0.64	1.12	1.05	55.8
2	T1	328	0	345	0.0	0.569	15.7	LOS C	3.9	0.64	1.12	1.05	57.8
3	R2	3	0	3	0.0	0.569	14.1	LOS B	3.9	0.64	1.12	1.05	57.7
Approach		354	2	373	0.6	0.569	15.5	LOS C	3.9	0.64	1.12	1.05	57.7
East: Lincoln Tai Tapu Rd													
4	L2	2	0	2	0.0	0.083	8.3	LOS A	0.1	0.12	0.08	0.12	72.5
5	T1	124	7	131	5.6	0.083	0.2	LOS A	0.1	0.12	0.08	0.12	77.6
6	R2	15	0	16	0.0	0.083	8.0	LOS A	0.1	0.12	0.08	0.12	71.9
Approach		141	7	148	5.0	0.083	1.2	NA	0.1	0.12	0.08	0.12	76.9
North: Ellesmere Rd													
7	L2	2	0	2	0.0	0.595	12.6	LOS B	3.7	0.70	1.15	1.24	54.9
8	T1	110	2	116	1.8	0.595	15.0	LOS C	3.7	0.70	1.15	1.24	54.3
9	R2	157	3	165	1.9	0.595	21.8	LOS C	3.7	0.70	1.15	1.24	54.1
Approach		269	5	283	1.9	0.595	19.0	LOS C	3.7	0.70	1.15	1.24	54.2
West: Edward St													
10	L2	259	5	273	1.9	0.212	7.0	LOS A	0.2	0.04	0.46	0.04	66.6
11	T1	95	5	100	5.3	0.212	0.1	LOS A	0.2	0.04	0.46	0.04	71.6
12	R2	15	2	16	13.3	0.212	7.5	LOS A	0.2	0.04	0.46	0.04	62.2
Approach		369	12	388	3.3	0.212	5.3	NA	0.2	0.04	0.46	0.04	67.6
All Vehicles		1133	26	1193	2.3	0.595	11.2	NA	3.9	0.39	0.78	0.65	61.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are not applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Alcizelk M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 PM Base + Plan Change (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance												
Mov ID	Turn	INPUT VOLUMES [Total veh]	HV %	DEMAND FLOWS [Total veh]	Deg. Sat. V/C	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. m]	Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed km/h
South, Ellesmere Rd												
1	L2	25	0	26	0.285	9.3	LOS A	1.1	0.43	1.00	0.44	61.4
2	T1	161	1	169	0.285	11.9	LOS B	1.1	0.43	1.00	0.44	60.9
3	R2	1	0	1	0.285	14.1	LOS B	1.1	0.43	1.00	0.44	61.0
Approach		187	1	197	0.265	11.6	LOS B	1.1	0.43	1.00	0.44	61.0
East, Lincoln Tai Tapu Rd												
4	L2	3	0	3	0.057	7.8	LOS A	0.1	0.07	0.06	0.07	73.3
5	T1	93	1	98	0.057	0.1	LOS A	0.1	0.07	0.06	0.07	78.4
6	R2	6	0	6	0.057	7.7	LOS A	0.1	0.07	0.06	0.07	72.6
Approach		102	1	107	0.057	0.8	NA	0.1	0.07	0.06	0.07	77.9
North, Ellesmere Rd												
7	L2	30	0	32	0.843	17.7	LOS C	12.3	0.78	1.38	2.14	52.5
8	T1	284	0	299	0.843	20.5	LOS C	12.3	0.78	1.38	2.14	52.3
9	R2	219	0	231	0.843	25.1	LOS D	12.3	0.78	1.38	2.14	52.1
Approach		533	0	561	0.843	22.2	LOS C	12.3	0.78	1.38	2.14	52.2
West, Edward St												
10	L2	186	3	196	0.195	7.0	LOS A	0.3	0.07	0.39	0.07	67.5
11	T1	122	2	128	0.195	0.1	LOS A	0.3	0.07	0.39	0.07	72.5
12	R2	35	0	37	0.195	7.0	LOS A	0.3	0.07	0.39	0.07	67.6
Approach		343	5	361	0.195	4.6	NA	0.3	0.07	0.39	0.07	69.2
All Vehicles		1165	7	1226	0.6	13.4	NA	12.3	0.45	0.91	1.07	59.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are not applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Algelik M30).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Appendix 13

**Edward St / Ellesmere Rd /
Lincoln Tai Tapu Rd
Roundabout Operation – With
Subdivision**



MOVEMENT SUMMARY

Site: 101v [Edward St / Ellesmere Rd - 2020 AM Base + Plan Change - Conversion (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/s]	[HV] veh/s	[Total veh/s]	[HV] %	vc	sec		[Veh. / veh]				
South: Ellesmere Rd													
1	L2	23	2	24	8.7	0.357	8.2	LOS A	2.4	0.60	0.66	0.60	60.9
2	T1	328	0	345	0.0	0.357	8.5	LOS A	2.4	0.60	0.66	0.60	64.8
3	R2	3	0	3	0.0	0.357	13.1	LOS B	2.4	0.60	0.66	0.60	64.4
Approach		354	2	373	0.6	0.357	8.5	LOS A	2.4	0.60	0.66	0.60	64.5
East: Lincoln Tai Tapu Rd													
4	L2	2	0	2	0.0	0.147	7.4	LOS A	0.9	0.52	0.62	0.52	63.3
5	T1	124	7	131	5.6	0.147	8.2	LOS A	0.9	0.52	0.62	0.52	63.3
6	R2	15	0	16	0.0	0.147	12.6	LOS B	0.9	0.52	0.62	0.52	64.5
Approach		141	7	148	5.0	0.147	8.6	LOS A	0.9	0.52	0.62	0.52	63.4
North: Ellesmere Rd													
7	L2	2	0	2	0.0	0.229	6.4	LOS A	1.7	0.41	0.60	0.41	62.4
8	T1	110	2	116	1.8	0.229	7.1	LOS A	1.7	0.41	0.60	0.41	63.4
9	R2	157	3	165	1.9	0.229	11.7	LOS B	1.7	0.41	0.60	0.41	62.9
Approach		269	5	283	1.9	0.229	9.8	LOS A	1.7	0.41	0.60	0.41	63.1
West: Edward St													
10	L2	259	5	273	1.9	0.408	8.5	LOS A	3.1	0.70	0.73	0.70	63.2
11	T1	95	5	100	5.3	0.408	9.2	LOS A	3.1	0.70	0.73	0.70	63.8
12	R2	15	2	16	13.3	0.408	14.1	LOS B	3.1	0.70	0.73	0.70	60.8
Approach		369	12	388	3.3	0.408	8.9	LOS A	3.1	0.70	0.73	0.70	63.2
All Vehicles		1133	26	1193	2.3	0.408	9.0	LOS A	3.1	0.58	0.66	0.58	63.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Alcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101V [Edward St / Ellesmere Rd - 2020 PM Base + Plan Change - Conversion (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Dep. Sat. (veh)	Aver. Delay (sec)	Level of Service	95% BACK OF QUEUE [veh]	95% BACK OF QUEUE [Dist. m]	Prop. Que.	Effective Stop Rate	Aver. No. Cycles	Aver. Speed (km/h)
		[Total veh/h]	[HV]	[Total veh/h]	[HV]	(%)								
South: Ellesmere Rd														
1	L2	25	0	26	0.0	0.0	7.6	LOS A	1.2	8.5	0.56	0.63	0.56	63.7
2	T1	161	1	169	0.6	0.6	8.3	LOS A	1.2	8.5	0.56	0.63	0.56	65.0
3	R2	1	0	1	0.0	0.0	12.8	LOS B	1.2	8.5	0.56	0.63	0.56	64.8
Approach		187	1	197	0.5	0.5	8.2	LOS A	1.2	8.5	0.56	0.63	0.56	64.9
East: Lincoln Tai Tapu Rd														
4	L2	3	0	3	0.0	0.0	9.2	LOS A	0.9	6.1	0.70	0.71	0.70	62.4
5	T1	93	1	98	1.1	1.1	9.9	LOS A	0.9	6.1	0.70	0.71	0.70	63.5
6	R2	6	0	6	0.0	0.0	14.4	LOS B	0.9	6.1	0.70	0.71	0.70	63.5
Approach		102	1	107	1.0	1.0	10.1	LOS B	0.9	6.1	0.70	0.71	0.70	63.5
North: Ellesmere Rd														
7	L2	30	0	32	0.0	0.0	7.0	LOS A	4.1	28.7	0.56	0.62	0.56	62.4
8	T1	284	0	299	0.0	0.0	7.7	LOS A	4.1	28.7	0.56	0.62	0.56	63.8
9	R2	219	0	231	0.0	0.0	12.3	LOS B	4.1	28.7	0.56	0.62	0.56	63.5
Approach		533	0	581	0.0	0.0	9.5	LOS A	4.1	28.7	0.56	0.62	0.56	63.6
West: Edward St														
10	L2	186	3	196	1.6	1.6	6.8	LOS A	2.2	15.7	0.48	0.59	0.48	64.0
11	T1	122	2	128	1.6	1.6	7.5	LOS A	2.2	15.7	0.48	0.59	0.48	65.6
12	R2	35	0	37	0.0	0.0	12.0	LOS B	2.2	15.7	0.48	0.59	0.48	65.6
Approach		343	5	361	1.5	1.5	7.6	LOS A	2.2	15.7	0.48	0.59	0.48	64.7
All Vehicles		1165	7	1226	0.6	0.6	8.8	LOS A	4.1	28.7	0.55	0.62	0.55	64.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Alcizelk M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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