BORD NA MÓNA

AES Nenagh

Waste Transfer Facility
Nenagh
Co Tipperary

Traffic and Transportation Assessment

January 2017
Revision: A

TOBIN CONSULTING ENGINEERS

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REPORT

PROJECT: **AES Nenagh**

Waste Transfer Facility
Nenagh
Co Tipperary

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1 NON-TECHNICAL SUMMARY

Nenagh Advanced Environmental Solutions Ltd (AES) has an existing waste license by the Environmental Protection Agency to accept 24,750 tonnes of non-hazardous household, commercial and construction and demolition waste at the waste recovery and transfer facility at Springfort Cross, Nenagh under planning permission granted by Tipperary County Council. The traffic and transportation assessment forms part of the planning permission and licence review for a proposed increase in the waste accepted and processed at the facility from the existing to the proposed 30,000 tonnes / annum. The development is located at Springfort Cross on the south western outskirts of Nenagh on the local road the L-1119 Grallagh Road off the regional road network the R445 via the L-1148 Dark Road.

Scoping with Tipperary County Council identified the following junctions for assessment in this report, the existing site access to the waste transfer facility (Junction 1), the local road priority junction L-1119 / L-1148 (Junction 2) and the priority junction to the regional road L-1148 / R445 (Junction 3). As per the *TII Traffic and Transportation Guidelines* the assessment years include the traffic survey year 2016, the operating year 2017 and the design years 2022 and 2032 for both the AM and PM peak hours.

The traffic survey data was undertaken on separate dates for each junction, in June for Junctions 1 and Junction 2 and in September for Junction 3. Review of the traffic count data identified typically high baseflow traffic in June, for robustness the traffic count data was increased to match the highest traffic flows counted. The traffic for the operating year 2017 and the design years 2022 and 2032 were forecasted using the *TII Project Appraisal Guidelines for National Roads Unit 5.3: Travel Demand Projections* for central growth applied to the light vehicles (LV) and heavy vehicles (HV) as per Table 5.3.2.

The traffic generation of the proposed operations are based on an increase in the existing HV only, to account for the increase in operations at the AES facility utilising the weighbridge. A pro rata increase of the existing operations HV was used to determine the trip generations for the proposed development operations. The trip distributions of the proposed operations are based on the existing operation distributions at the junctions. No increase in staff is envisaged as part of this application. A civic amenity forms part of the AES site. There are no proposals to alter the existing civic amenity facilities onsite and the existing operations to this part of the facility will remain as counted in the traffic survey.

All the junctions were modelled using JUNCTION 9 PICADY for the assessment years (i.e. 2017, 2022 and 2032) for the traffic generations for the existing operations and the proposed operations.

The resulting JUNCTION 9 PICADY analysis shows in both the AM and PM peak hours that Junction 1 will operate below the maximum desired RFC of 0.85 and below capacity for all assessment years with

both the existing and proposed operations at the waste transfer facility. The link capacity of the L-1119, L-1148 and the R445 show space capacity.

2 INTRODUCTION

2.1 INTRODUCTION

TOBIN Consulting Engineers Ltd has been appointed by Bord Na Móna, to prepare a Traffic and Transportation Assessment Report for the existing operating waste recovery and transfer facility, Nenagh Advanced Environmental Solutions Limited (AES) Facility, Co. Tipperary for a planning application and license review. The application is for the intensification of operations at the site from the current permitted license volume of 24,750 tonnes/annum to 30,000 tonnes/ annum.

In preparing this report, TOBIN Consulting Engineers has made reference to:

- TII (formerly NRA) 'Traffic and Transport Assessment Guidelines' (May 2014);
- TII DN-GEO-03043 (NRA TD 41-42) 'Geometric Design of Major/Minor Priority Junctions and Vehicular Access to National Roads';
- Department of Transport, Tourism and Sport and the Department of Environment Design Manual for Urban Roads & Streets (DMURS, 2013);
- Department of Transport "Traffic Management Guidelines";
- UK DMRB TA 79/99 'Traffic Capacity of Urban Roads';
- Traffic Signs Manual, Department of Transport, Tourism and Sport (November 2010) and
- TII PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3: Travel Demand Projections Table 5.3.2 Link-Based Growth Rates.

2.2 OBJECTIVES

The objective of this report is to assess the impact the proposed increase in the existing development traffic will have on the existing road network. This report will identify the existing baseflow traffic, baseflow traffic including existing development traffic (i.e. 24,750 tonnes/ annum) and will calculate the expected volume of traffic that will be generated by the proposed increase in waste accepted and processes (i.e. 30,000 tonnes/ annum) to the site; and assess the impact that this traffic will have on the operational capacity of the road network in the vicinity of the development. The junctions to be analysed as part of this report are the following:

Junction 1, Site Access: the existing cross road junction on the L-1119:
Junction 2, Priority Junction: the existing priority junction between the L-1119 / L-1148; and
Junction 3, Priority Junction: the existing priority junction between the L-1148 / R445.

2.3 SCOPING

The proposed operations at the site was scoped with Tipperary County Council (TCC) in late September 2016 with Mr Peter Fee, District Engineer for Nenagh Municipal District. This report has

taken into account the following items raised by Tipperary County Council during the scoping. Among those points agreed were the following;

- Traffic Counts to be undertaken at 3 no. junctions as discussed above in section 2.2.
- Trip generation to be based on existing operations factored to the proposed operational volume.
- Trip distribution to match existing at the junctions assessed.
- Assessment years as per TII guidelines, operational year 2017, design year 2022 (operation year + 5 years) and design year 2032 (operational year + 15 years).
- Growth factors to be based on the TII Project Appraisal Guidelines Unit 5.5: Linked Based Traffic Growth Forecasting, which has recently (October 2016), been superseded by the TII Project Appraisal Guidelines Unit 5.3 Travel Demand Projections Table 5.3.2 for Linked Based Growth Factors.
- There are no committed development or network improvements to be included.
- Road Safety Audit is not required.
- Road signage to be provided to warn road users of the vehicles at the AES facility.

2.4 STUDY METHODOLGY

The study methodology for this report is summarised as follows:

- Scoping documentation discussed with Tipperary County Council (refer to Appendix A).
- Manual classified traffic counts were undertaken at Junction 1 and June 2 in June and at Junction 3 in September 2016. An additional count was undertaken at the civic amenity facility over a 2 week period in November 2016.
- Traffic Calculations:
    - Review of the traffic count data at the two locations was assessed to determine if seasonal adjustment or other adjustments were applicable for the more robust assessment.
    - The baseflow for each peak hour was identify to:
        - Facilitate seasonal / other adjustment to baseflow traffic, independent of the AES operational traffic.
        - Forecast the baseflow traffic for the assessment years (i.e. 2017, 2022 and 2032).
    - Identification of the AES operational traffic independent of the baseflow traffic at each junction, allowed for the pro rata increase in the operational traffic only, for the planned licence tonnage.
- Junction Modelling:
    - using JUNCTIONS 9 Software PICADY for the cross road junction and priority junctions.

- Road link capacity

2.5 STRUCTURE OF THE REPORT

This report is divided into eight chapters:

- Chapter 1 is a Non-Technical Summary.
- Chapter 2 includes this introduction.
- Chapter 3 describes the existing and proposed development, and its location.
- Chapter 4 provides an overview of the existing and proposed traffic conditions, explaining how this information was obtained.
- Chapter 5 outlines the assumptions that have been made in the calculation of traffic generated by the development and the factors used to forecast the future road network traffic.
- Chapter 6 explains the methodology used and the results of the analysis performed on the nominated junctions. An investigation into link capacity is also dealt with in this chapter.
- Chapter 7 addresses issues relating to road safety.
- Chapter 8 conclusions and recommendation of the report.

3 PROPOSED DEVELOPMENT

3.1 SITE LOCATION

The existing AES waste facility is located at Springfort Cross to the west of Nenagh, Co. Tipperary. The site is bounded by local roads and green fields, with the L-1119 to the south, the L-1148 to the east and green fields to the west and north. Access to the AES facility is from the regional road the R445 via the aforementioned local roads. The site location is shown in Figure 3-1.

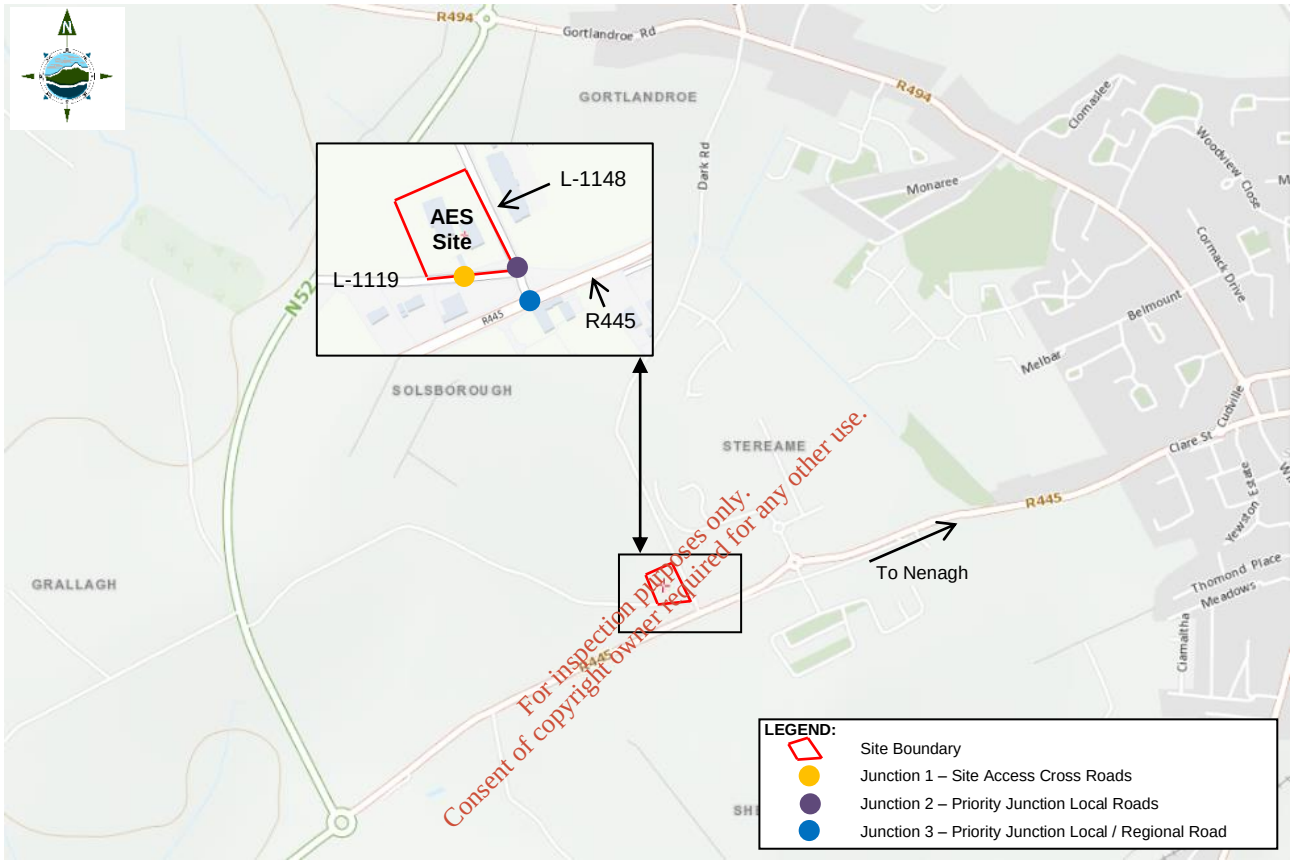


Figure 3-1 Site Location

3.2 DESCRIPTION OF EXISTING DEVELOPMENT

AES is one of the largest waste management companies in Ireland and currently operates 5 waste recovery and transfer facilities, including this site Nenagh AES. This site is licensed to accept 24,750 tonnes per annum of non-hazardous household, commercial and construction and demolition waste. It encompasses 6,855m^2 and operates between the hours of 8.00am to 5.30pm Monday to Friday and 8.00am to 2.00pm on Saturdays. The site is occupied by a processing building, garage, administration building, quarantine area, fuelling station, vehicle / bin wash and weighbridge. The entire site, including the floors of the buildings and the open yard areas, which is paved with concrete. All heavy vehicle access and egress from the western access point or commercial waste entrance. These vehicle are weighed at the weighbridge on arrival and departure.

On site is a small civic amenity area (CAA) with facilities for bottles and clothing banks; skips for timber and metal; and a compactor for general waste. The public accessing the civic amenity are not captured in the weighbridge data. Access to and egress from the CAA is via the AES facility eastern entrance.

3.3 DESCRIPTION OF PROPOSED DEVELOPMENT

It is proposes to increase the waste license from 24,750 tonnes / annum to 30,000 tonnes / annum. As outlined in section 3.2, there are two entrances to the site serving the facility; the eastern for staff and the CAA, with the western for waster recovery and transfer utilising the weighbridge. The existing entrances to the site are to be maintained with no alterations proposed. The existing buildings and ancillary infrastructure have the capacity to accommodate the additional waste volumes; however, as both the planning permission and licences caps the annual waste inputs, planning permission and a licence review are required.

3.4 CUMULATIVE IMPACTS

As per the scoping document, no adjacent developments committed or proposed will have a significant implications on the trip / traffic in this assessment.

It is not anticipated that the waste transfer facility will attract traffic from adjacent sites due to the nature of the development. There is an existing CAA onsite, with current traffic volumes captured in the traffic count survey. As there is no proposal to increase the operations at the CAA part of the AES facility, it is not envisaged that there will be an increase in traffic attracted to the CAA.

4 EXISTING AND PROPOSED TRAFFIC CONDITIONS

4.1 TRAFFIC SURVEY

In order to determine the magnitude of the existing traffic flows, TOBIN used the results of manual classified traffic surveys. The traffic surveys were undertaken on Wednesday the 22nd of June 2016 at Junction 1 and Junction 2 and at Junction 3 on Thursday the 29th of September 2016. The traffic survey provided full turning movements at the junction and distinguished between cars, light good vehicles, buses and heavy good vehicles. At the time of the surveys the waste transfer facility was in operation and the traffic survey data includes for these movements at all junctions (see Appendix B).

Due to the proximity of the commercial waste transfer facility and CAA entrances to the AES facility, the manual classified traffic count include the traffic volumes at both entrances as one arm, the northern arm, at junction 1.The HV[1] are attributed to the commercial element of the AES facility using the weighbridge, with the LV representing the CAA elements and staff.

In order to undertake an analysis of the junctions, it was first necessary to determine the peak hours by convert the raw traffic survey data, into a common index known as passenger car units (PCU's). This was undertaken by applying a factor to all surveyed traffic movements to take account of the composition of the different types of vehicle. This factoring calculation assumes 1 car / LV[2] = 1 PCU, 1 HV (type OGV1) = 1.5 PCU's, 1 HV (type OGV2) = 2.3 PCU's and 1 bus (PSV) = 2 PCU's in accordance with TRL RR67. Review of the traffic survey data converted to PCU indicated that the peak traffic at the largest junction, Junction 3, between 08:15 to 09:15 and 17:00 to 18:00hrs.

4.2 EXISTING ROAD NETWORK

The AES site accesses at Junction 1, are located to the north of the Grallagh local road, L-1119[3], with a designated speed limit of 60km/h. Traffic arrives to the site from the east via the priority junction with the L-1119 / L-1148 Dark Road (Junction 2) and from the R445 priority junction with the L-1148 (Junction 3) to the south. Refer to Figure 3-1 and Image 1 below.

Image 1– Westbound towards the Site Access and O'Brien's Garage on the L-1119

[1] HV – heavy vehicle
[2] LV- light vehicle
[3] Local Road L-1119 Grallagh is referred to as L-6059 in the Traffic Count Data

4.2.1 Junction 1 – Existing Cross Road Junction, AES Site Access / Grallagh Road L-1119 / O'Brien's Garage

The existing development has two accesses to the north of the L-1119, with the western access servicing the waste transfer facility (commercial entrance) and the eastern access servicing the civic amenity area and on-site staff car parking. Adjacent to the site is O'Brien's Garage access. These existing accesses have been assessed as a single 4 arm cross road junction with the L-1119. Refer to Image 1 and 2.

At the AES site accesses, the carriageway is approximately 7.0m wide, with the AES boundary wall set back from the road edge for visibility along the northern edge of the L-1119. Grass verges are present to both sides of the site along this road edge with a kerb edge commencing east of the site towards Junction 2. To the south of the L-1119 in the vicinity of the O'Brien's entrance, a hardshoulder is located to the west of the entrance and a continuous footway linking to the R445 to the east. West of these accesses, the L-1119 narrows on approach to a right bend in the horizontal road alignment and to the east the carriageway increases in width on approach to Junction 2.

Road markings are present along the centreline of the carriageway passing the site with double yellow lines to the road edge west of O'Brien's Garage. No street lighting is present at this junction but is present at Junction 2, located approximately 30m east of the AES eastern access.

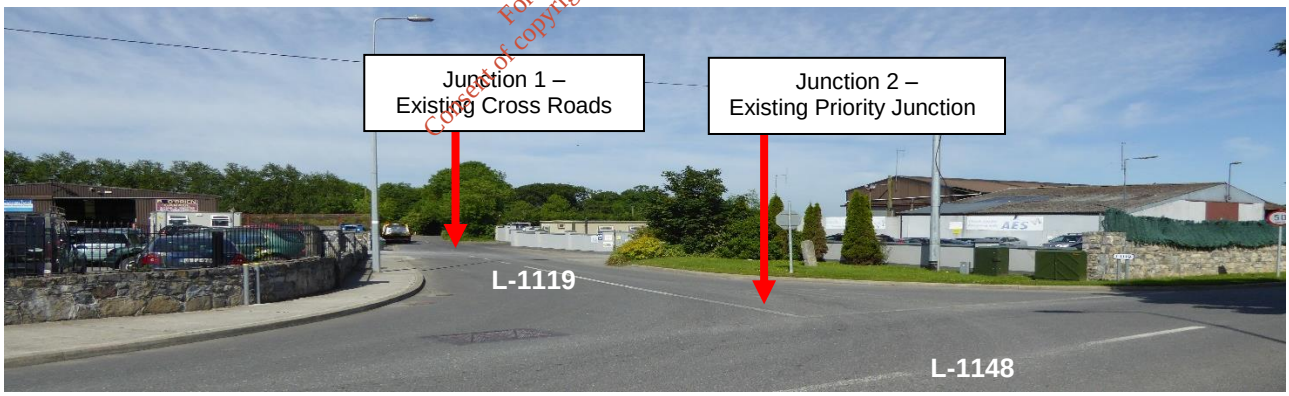


Image 2 – Westbound towards Junction 1 and Junction 2 from the L-1148

4.2.2 Junction 2 – Existing Priority Junction, L-1119 Grallagh Road / L-1148 Dark Road

Junction 2 is an existing priority junction east of the AES site on the L-1119 with the local road, L-1048 Dark Road. The junction is located within a 60km/h designated speed limit. As shown on Image 2, the minor road, L-1119, has a footway to the south and kerbed grass verge to the north. On approach to the junction, the minor arm is splayed from a 3.4m wide lane to 11.9m at the stop line. Road markings and signage are present.

The major arm of the junction, the L-1148 Dark Road, has a typical road cross section of 6.0m to the north of the junction and 9.3m to the south of the junction where it approaches Junction 3 at the R445. North of the minor arm, the speed limit is designated as a 50km/h with grass verge to the western road edge and 1.8m footway to the east. South of the minor road, footways are present ono both sides of the carriageway. Central road markings are present on the L-1148 and street lighting is present at the junction.

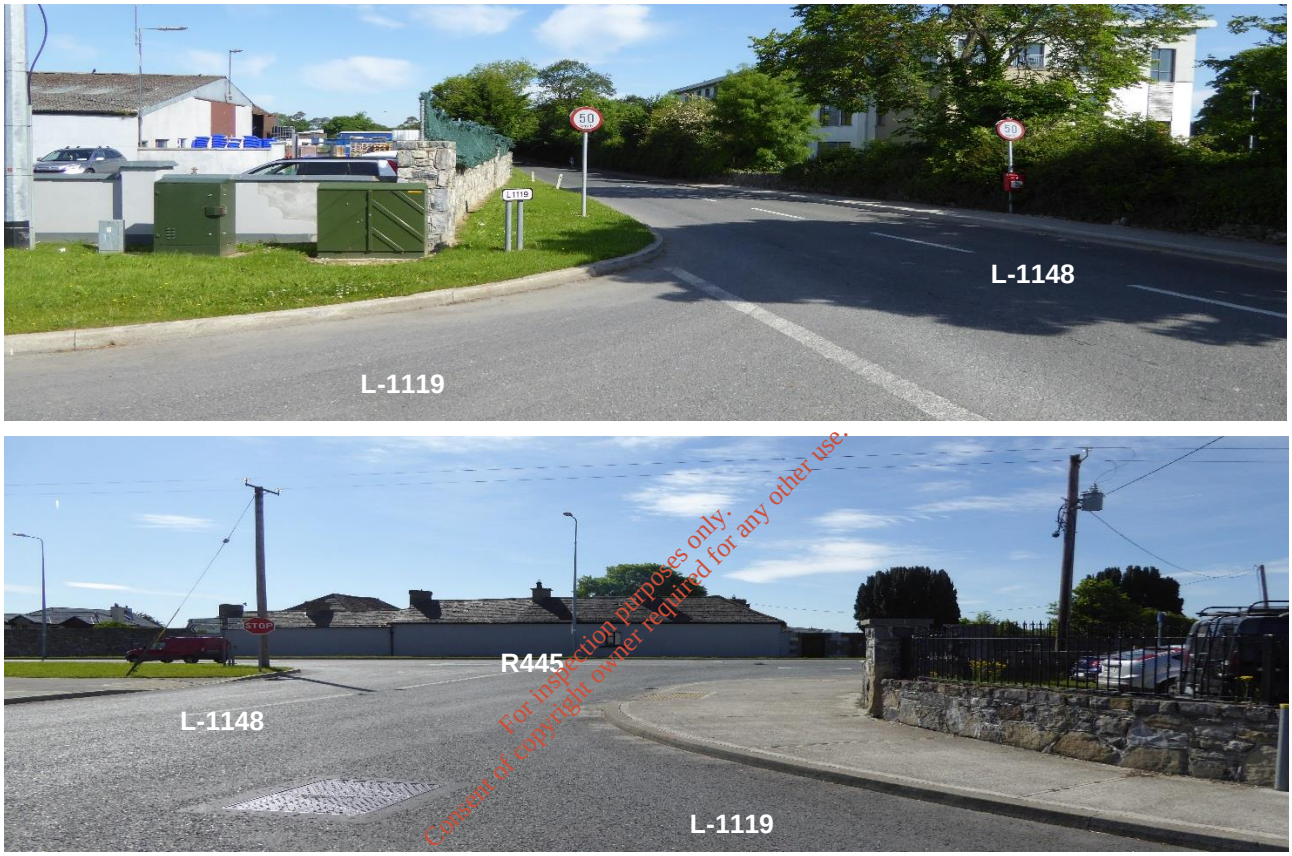


Image 3 – Junction 2 visibility to the north and visibility to the south

The required visibility requirements for a designated 60km/h road is 2.4m x 65m in accordance with Table 4.2 of DMURS. As seen in Image 3, the visibility is available to the north but to the south is interrupted by the junction with the R445 (Junction 3).

4.2.3 Junction 3 – Priority Junction, L-1148 Dark Road / R445

Junction 3, is an existing priority junction located approximately 30m south of Junction 2, at the junction of the L-1148 with the R445. The designated speed limit on the L-1148 and the R445 is 60km/h. On the minor arm approach, L-1148, the lane wide splays from 3.4m to 14.2m at the R445 accommodating vehicles turning both right and left at the junction onto the R445. Footways are present to both side of the L-1148 at the junction. Road marking signage and street lighting are also present, as evident in Image 3.

Image 4 – Eastbound on the R445 towards the priority junction with the L-1148, Junction 3

The regional road, the R445, is the major arm with traffic flows east to Nenagh Town Centre and west to the roundabout junction at the N52. The R445 is a two-way single carriageway with right turn ghost-island, hatch marking, traffic calming and uncontrolled pedestrian crossing point, as shown in Image 4. Typical through flow lane widths are 3.7m with a 3.1m right turn lane. As evident in the image, road marking, signage and street lighting is present at this junction.

Image 5 – Junction 3 visibility to the east from the L-1148

The required visibility requirements for a designated 60km/h road is 2.4m x 65m in accordance with Table 4.2 of DMURS. As seen in Image 6 and 6, the visibility is available to the east and west of the junction.

Image 6 – Junction 3 visibility to the west from the L-1148

4.3 PROPOSED NETWORK IMPROVEMENTS

No road network improvement were identified in the scoping with the Council for inclusion in this assessment.

4.4 PROPOSED SITE ACCESS JUNCTION / ROAD NETWORK

The traffic and transportation assessment is based on assessment of an existing site access and the impact on the existing road network junctions in the vicinity of the site. There are no proposals for a new site access or road network.

The Council identified in the scoping of the TTA the recommendation for additional signage in the vicinity of the AES facility to provide advance warning to motorists and other road users of the HV movements. This is discussed in section 7.

5 TRIP GENERATION AND DISTRIBUTION

5.1 SEASONAL ADJUSTMENT

In order to undertake an analysis of the key junctions, it is sometimes necessary to apply a correction factor to convert the traffic count data into seasonally adjusted traffic flows to take account of the seasonal variation that is experienced with traffic volumes. The traffic counts undertaken include for baseflow traffic and the existing operations at the facility on each day of the surveys. To determine the baseflow traffic only, the existing operations were removed prior to seasonal adjusted.

A review of traffic count information available from Transport Infrastructure Ireland (TII) Live Traffic Counters was undertaken. The traffic counter selection was based on proximity to the site, as below:

- TMU N65 050.0 W 'N65 *Between Portumna and Borrisokane, Ballycasey, Co. Tipperary*'
- TMU N62 050.0 N 'N62 *Between Roscrea and Birr, Sharavgue, Co. Offaly*'
- TMU N62 010.0 S 'N62 *Between Roscrea and Templemore, Lismakin, Co. Tipperary*'

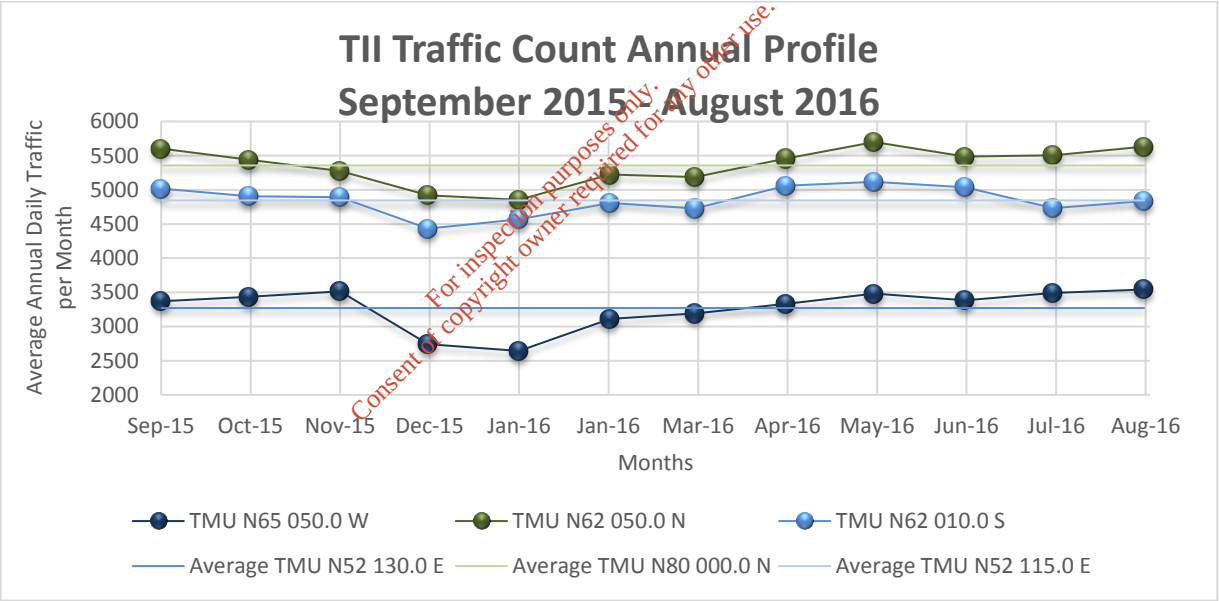


Figure 5-1 Graph of TII Annual Traffic Counter Information

A comparison was undertaken between the TII traffic count information for the day of the survey in June and September against the annual average daily traffic (AADT) for the previous year. The traffic count on the day of the survey in June and September was typically higher than the average of the year, which did not required seasonal adjustment (see Appendix C).

5.2 EXISTING BASEFLOW & DEVELOPMENT TRAFFIC

A further review of the traffic count data for both AM and PM peak hours was undertaken at a midpoints between the three junctions and it was identified that the traffic varies slightly for both LV and HV, as the traffic counts were undertaken on two different dates (see Figure 5-2 and Figure 5-3). This is assumed

to be based on the variation in both the seasonal baseflow and the development operations, see Figure 5-1 and Figure 5-4.

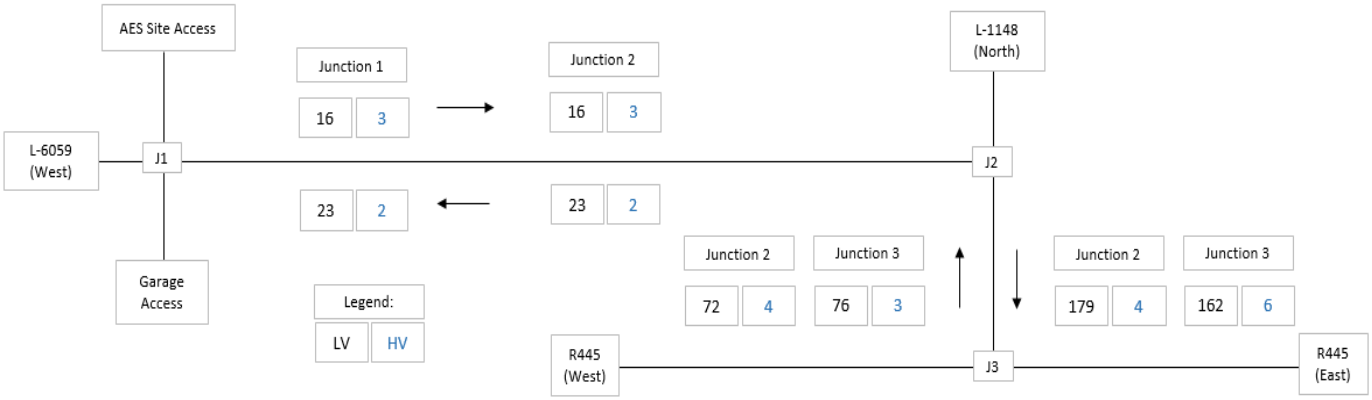


Figure 5-2 Traffic Count Distributions at Junction 1, Junction 2 and Junction 3 AM peak hour

The AM peak hour traffic count LV volumes are larger in June (i.e. Junction 2) than in September (i.e. Junction 3) as shown in Figure 5-2. The HVs are slightly higher when measured in September (i.e. Junction 3) with 9 HV movements versus 8 HV movements in June (i.e. Junction 2).

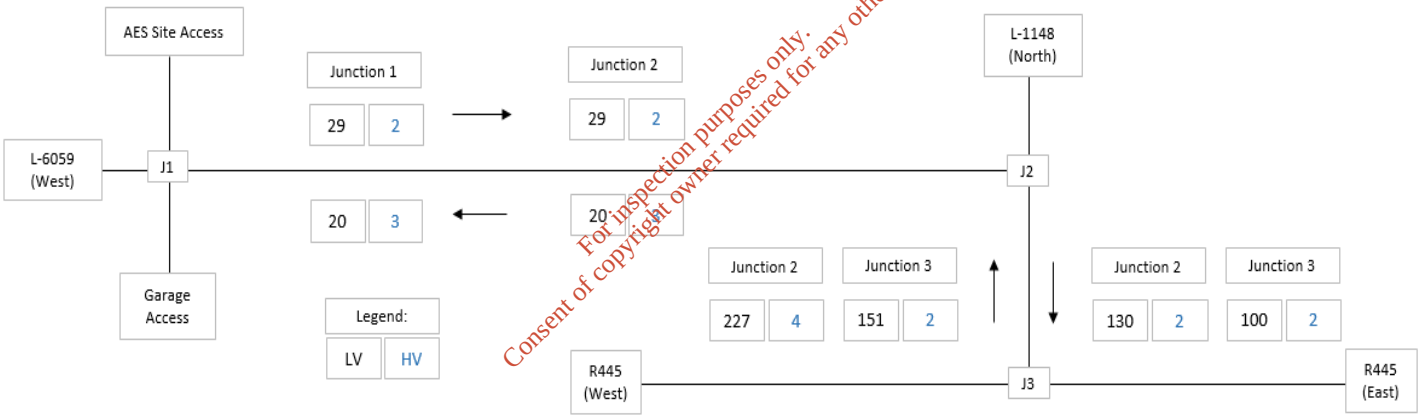


Figure 5-3 Traffic Count Distributions at Junction 1, Junction 2 and Junction 3 PM peak hour

The PM peak hour traffic counts show larger movements in June (i.e. Junction 2) than in September at (i.e. Junction 3) (see Figure 5-3).

On the dates of the surveys, the existing operations at the site were ongoing and included in the traffic count data. The existing operations account for the processing of 24,398 tonnes per annum at the AES facility from June 2015 to May 2016 (excluding the civic amenity areas which are not measured by the weighbridge). The variation evident in these traffic figures, are assumed to be associated with the variation in the monthly weighbridge data (see Figure 5-4). The variations are minimal, varying by one weighbridge ticket on average per month, between June and September. The peak occurs in March with 2 additional weighbridge tickets than average, resulting in an additional 4 HV movements throughout the day.

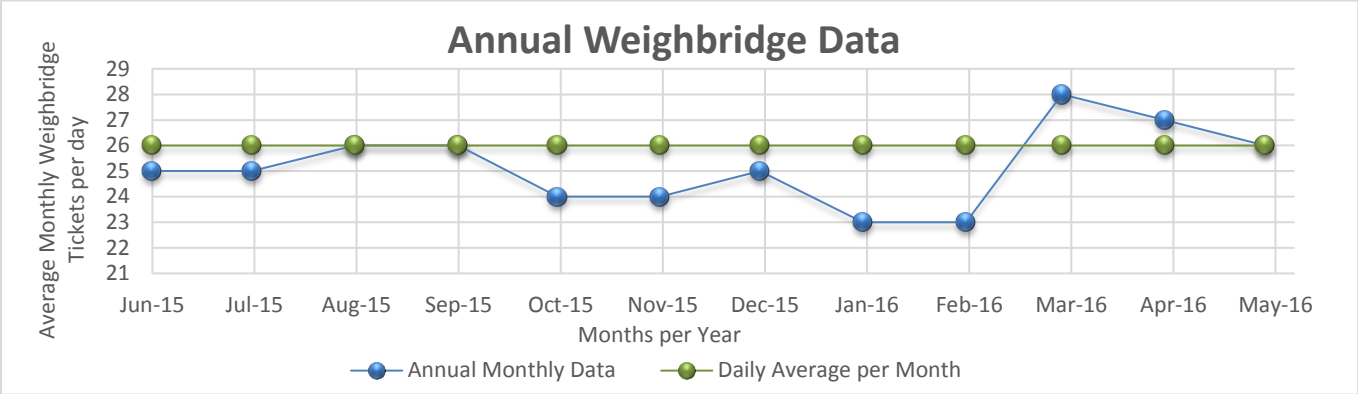


Figure 5-4 Graph of Average Daily Annual Weighbridge Data per Month

The review of the traffic count data passing the midway point compared to the seasonal adjustment indicates increasing the traffic flow to match the largest flows is more robust than seasonal adjustment. The review of the weighbridge monthly data indicated only slight variations over the year, for this reason no modification was applied to the weighbridge data. For these reason, the traffic count baseflow data at each junction was **modified** to the largest flow and not seasonally adjusted.

As shown in Figure 5-5, the traffic counts were **modified** to match the largest flows. The flows were distributed as per existing distributions at the junctions. The same procedure was also undertaken for the PM peak hour traffic as shown in Figure 5-6. Details of the modified traffic counts are shown in Appendix C.

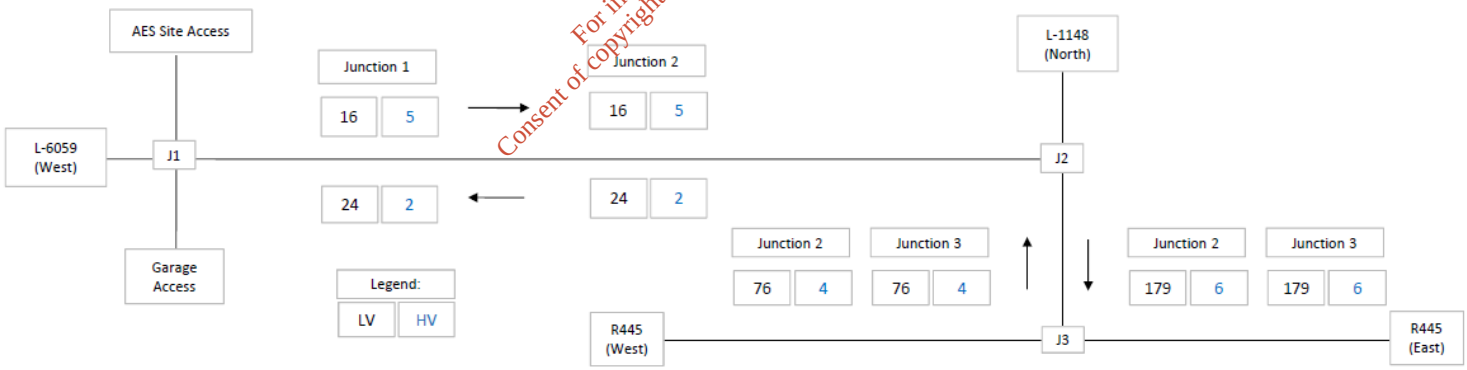


Figure 5-5 Traffic Count Distributions Modified to match largest directional flow AM peak hour

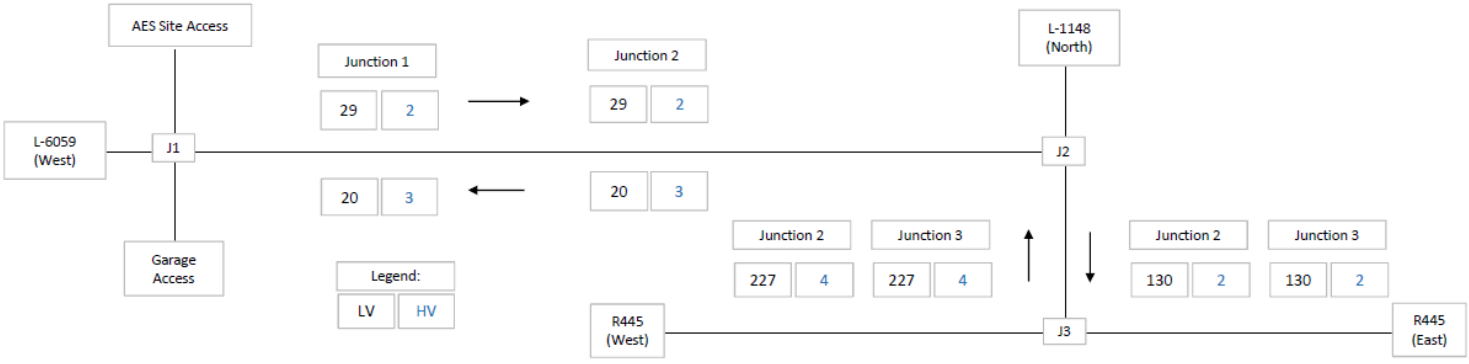


Figure 5-6 Traffic Count Distributions Modified to match largest directional flow PM peak hour

5.3 OPENING / OPERATIONAL AND DESIGN YEAR FLOWS

In accordance with TII guidelines, the capacity assessment is based on the existing traffic conditions forecast for the operating year in 2017, the design year 2022 (+5 years) and design year 2032 (+ 15 years). The forecast traffic in this assessment, is based on the **modified** traffic count baseflow traffic only, as the operations at the facility are to be scaled up independently of the baseflow traffic to reflect the proposed increase in volume to be processed at the site.

For the proposed operational year 2017 and design years 2022 and 2032, traffic volumes on the road network were derived by applying a growth factor to the modified traffic counts. Annual growth indices were updated in October 2016 by the TII in the *Project Appraisal Guidelines Unit 5.3 table 5.3.2 Link-based Growth Rates*, with annual indices and central annual growth factors shown for the Mid-West (North Tipperary) Region 5 indicated in Table 5-1 below. The derived growth factors were applied to 2016 modified baseflow to determine background traffic flows for the assessment years. Details of the forecasted baseflow traffic counts are shown in the origin destination matrices in Appendix E.

Central Growth Factor Region 5 – Mid-West: North Tipperary			
	2017	2022	2032
LV	1.0099	1.0609	1.1479
HV	1.0237	1.1509	1.4125

Table 5-1 Growth Factors for light vehicle (LV) and heavy vehicles (HV) for all design years

5.4 TRIP GENERATION AND DISTRIBUTION

5.4.1 TRIP GENERATION

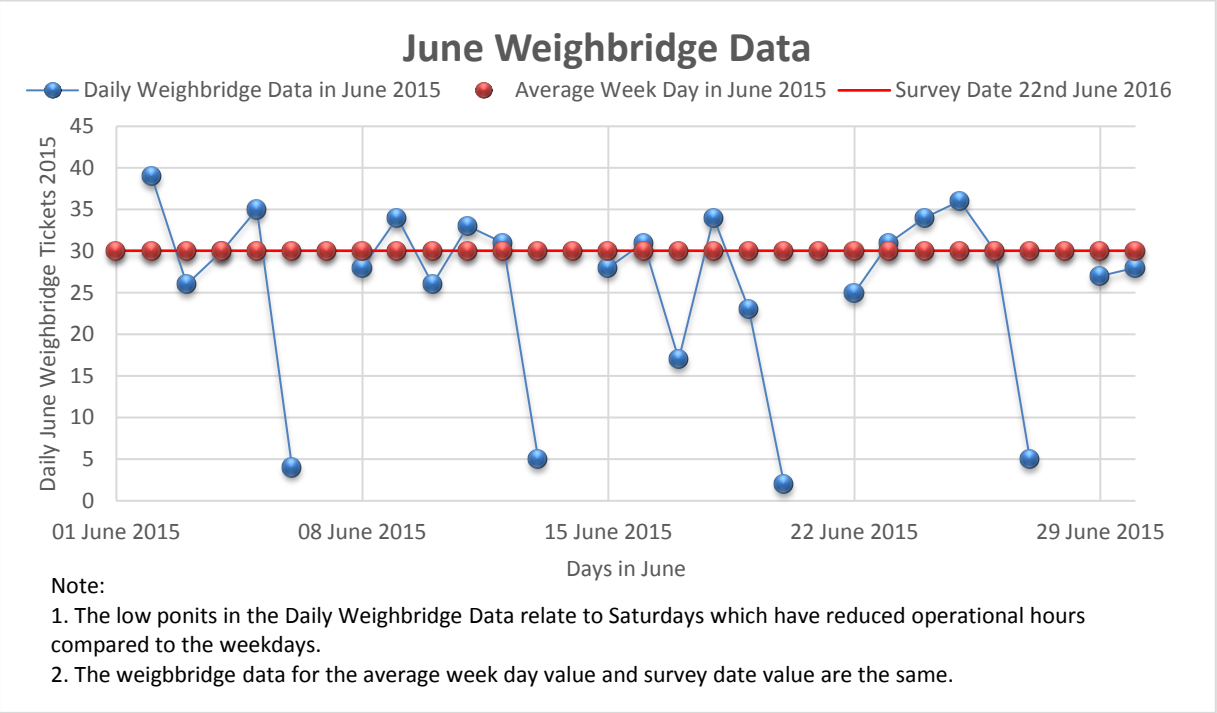
5.4.1.1 Trip Generation Committed Development

No committed development was identified during the scoping with the Council.

5.4.1.2 Trip Generation Existing Development

The existing operations account for the processing of 24,398 tonnes per annum at the AES facility. On the traffic count survey dates at the facility site access, the facility was in operation and the operational traffic for the waste transfer facility and the CAA was included in the traffic count data. The traffic count at the site entrance was undertaken in June of 2016. As previously mentioned, the maximum weighbridge traffic (i.e. waste transfer traffic) occurs in March (see Figure 5-4).

In Figure 5-7, the daily weighbridge data over the month of June 2015 and the average day (excluding weekends due to reduced operational hours) in June 2015 were plotted. A comparison was undertaken with the total traffic movements to the site as per the traffic count in June 2016 (i.e. incoming movements corresponding to the weighbridge data). As seen in this figure, the day of the traffic count is the same as the average in June of 2015 (see Appendix D).



Note:
1. The low ponits in the Daily Weighbridge Data relate to Saturdays which have reduced operational hours compared to the weekdays.
2. The weigbbridge data for the average week day value and survey date value are the same.

Figure 5-7 Graph of June 2015 Weighbridge Data indicating Traffic Movements to site on date of survey at Junction 1 in June 2016

As per the baseflow traffic, the existing operational traffic was modified to the largest flows passing the midway point between the junctions (see Appendix C). This results in the average trip generation at the site being brought forward to be assessed.

The existing traffic to the CAA is independent of the weighbridge traffic and is typically light vehicles (LV). The high proportion of LV at the site on the day of the survey is attributed to LV visiting the CAA. To support this assumption, a 2 week traffic count was undertaken at the CAA, which identified 628 visits over a 2 week period in November. Comparing the average of the two week survey against the 12 hour traffic count data indicates that the traffic count has a larger number of LV's than the 2 week survey, 184 compared to 126 movements respectively. This comparison indicates that the traffic count data gives a more robust number of visits to the CAA.

A profile of the movements to the CAA on the day of the traffic count was generated, see Figure 5-8. The peak movements of LVs at the CAA occur outside the junction assessment peak hours of 08:15-09:15 and 17:00-18:00 (see Appendix D). To account for variations in the CAA profile and for a more robust assessment, the peak CAA traffic in the AM and PM have been used for the existing development trip generations.

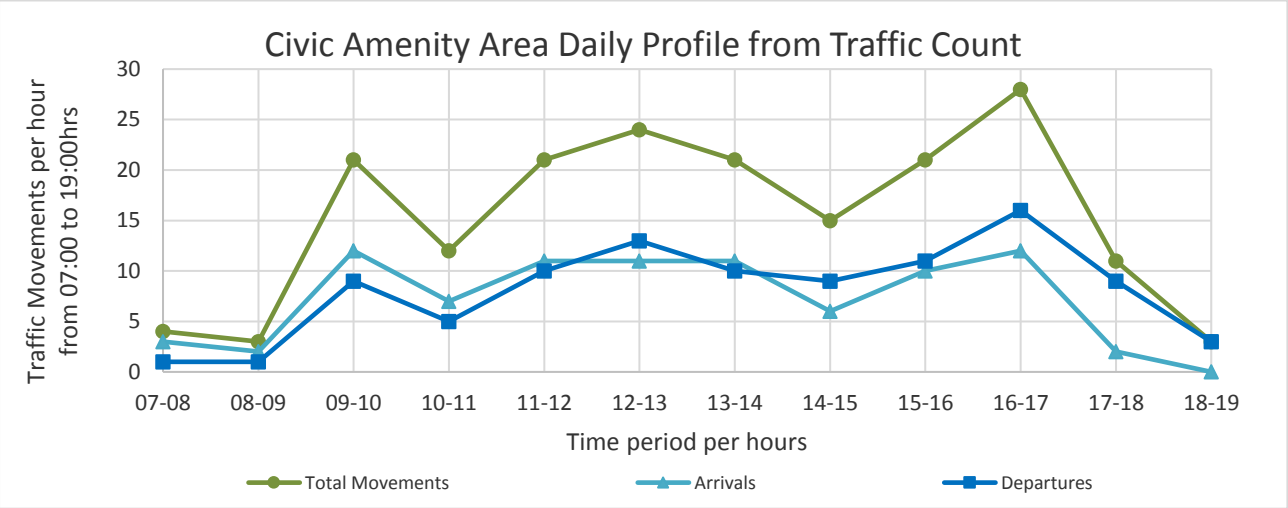


Figure 5-8 Graph of the Traffic Profile at the Civic Amenity Area

5.4.1.3 Trip Generation Proposed Development

At the site, the weighbridge measures the material forming part of the waste recycling and transfer operations. The material to the civic amenity site is not measured using the weighbridge. The trip generation of the proposed development for the waste recycling and transfer operation is based on weighbridge data at the site with the civic amenity being addressed independently.

The volume of traffic expected to be generated during the AM and PM peak hours for the proposed developments were established based on a percentage increase of the existing traffic operations at the site. The existing operations account for 24,398 tonnes / annual, with the proposal to increase the licensed operations by a further 5,250 tonnes / annum from 24,750 tonnes / annum to 30,000 tonnes / annum. The percentage increase is 123%, to pro rata the existing weighbridge operations to the proposed operations. This increase was applied to the HV only, as the LV are assumed to relate to staff and civic amenity traffic.

As previously mentioned there are no proposals to expand the existing civic amenity area or for additional staff. The proposed development generated traffic for the LV's will hence remain as per the existing as discussed in section 5.4.1.2.

5.4.2 TRIP DISTRIBUTION

The trip distributions of the proposed generated traffic is to match existing distributions at the junctions.

5.4.2.1 Trip Distribution of Existing Development Generated Traffic

The modified baseflow traffic with the existing operational traffic is distributed as per the existing junction distributions for design years and both peak hours. Figure 5-9 to Figure 5-12 show the AM peak hour

with Figure 5-13 to Figure 5-16 representing the PM peak traffic generation and distributions. Origin destination matrices are provided in Appendix E for each junction and their peak hour.

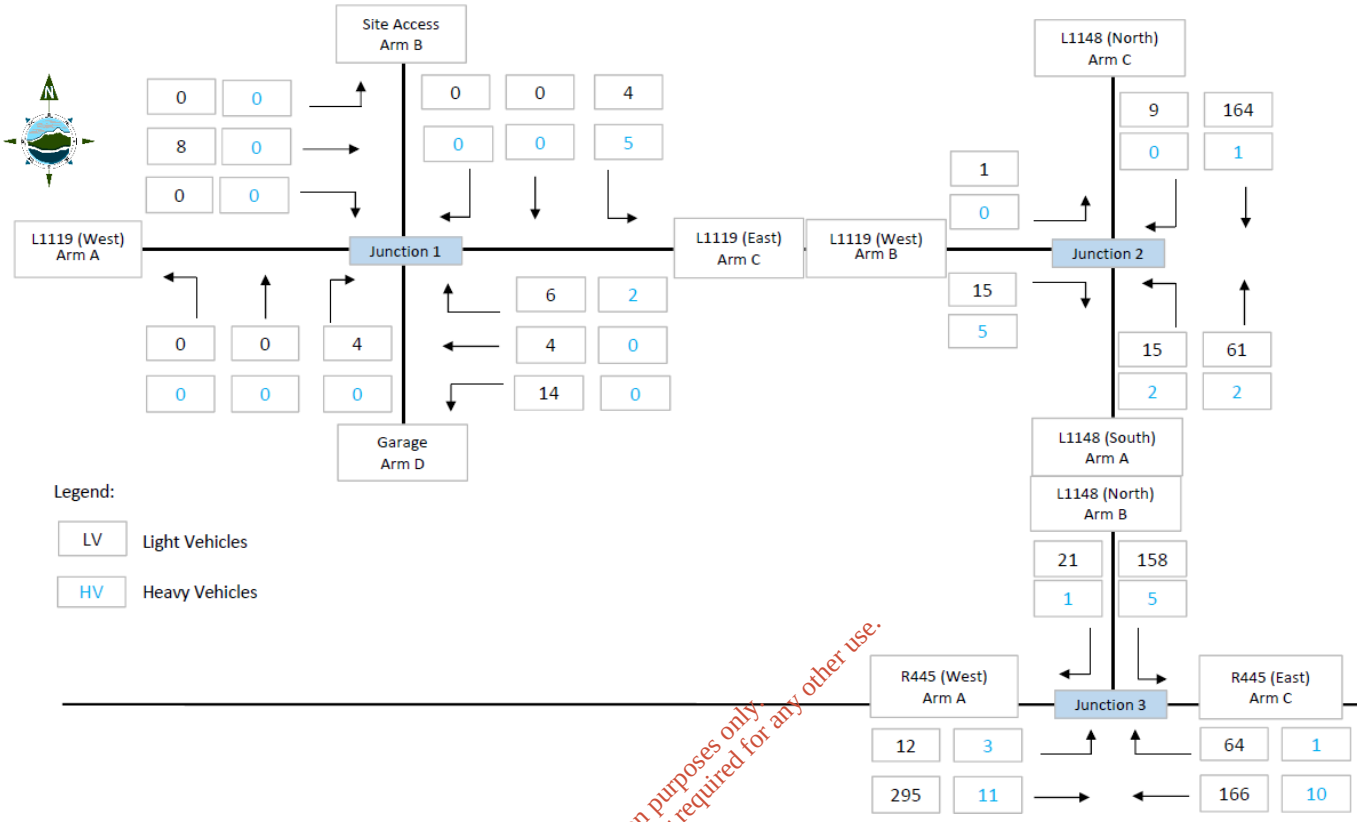


Figure 5-9 Baseflow Traffic Generation and Distribution, Existing Year 2016 - AM peak hour

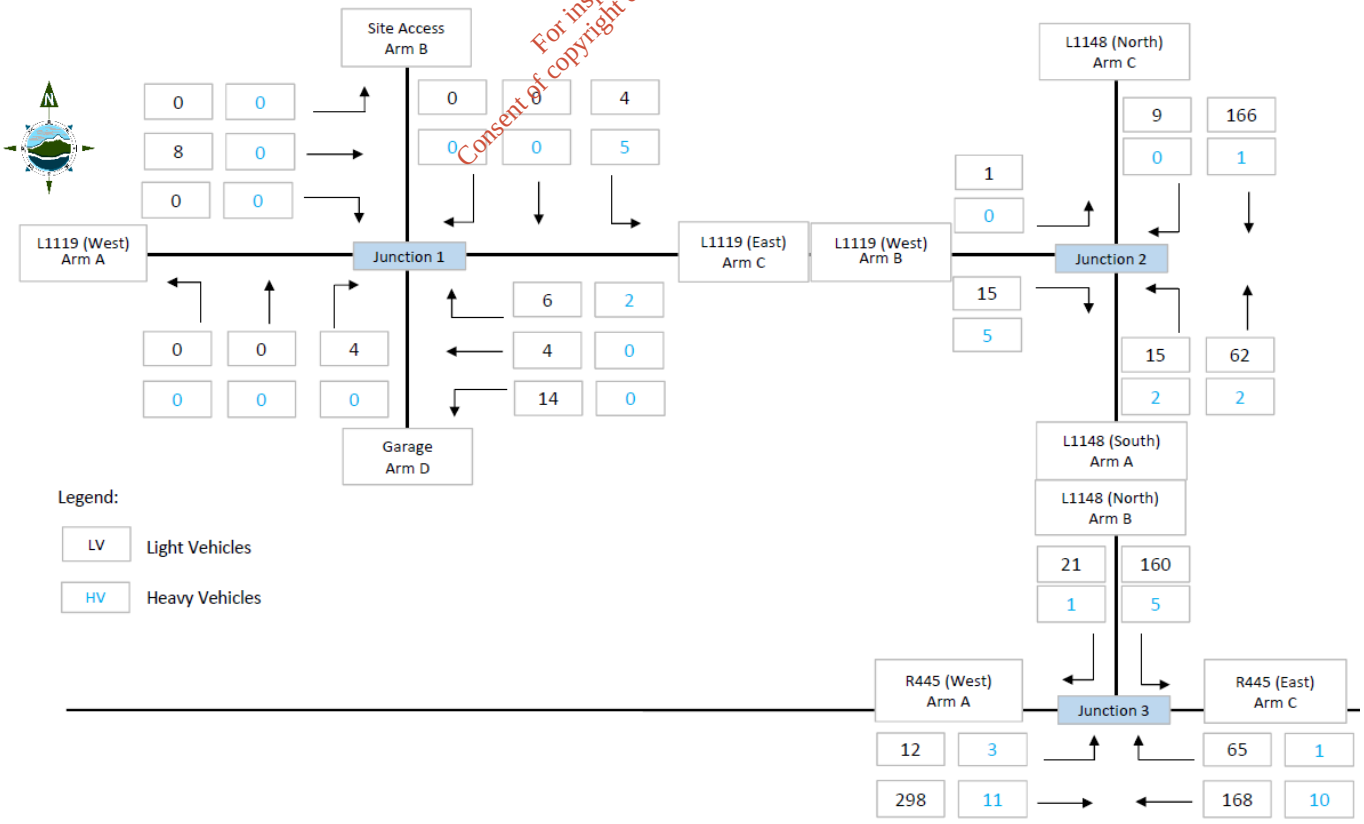


Figure 5-10 Baseflow Traffic Generation and Distribution, Operational Year 2017 - AM peak hour

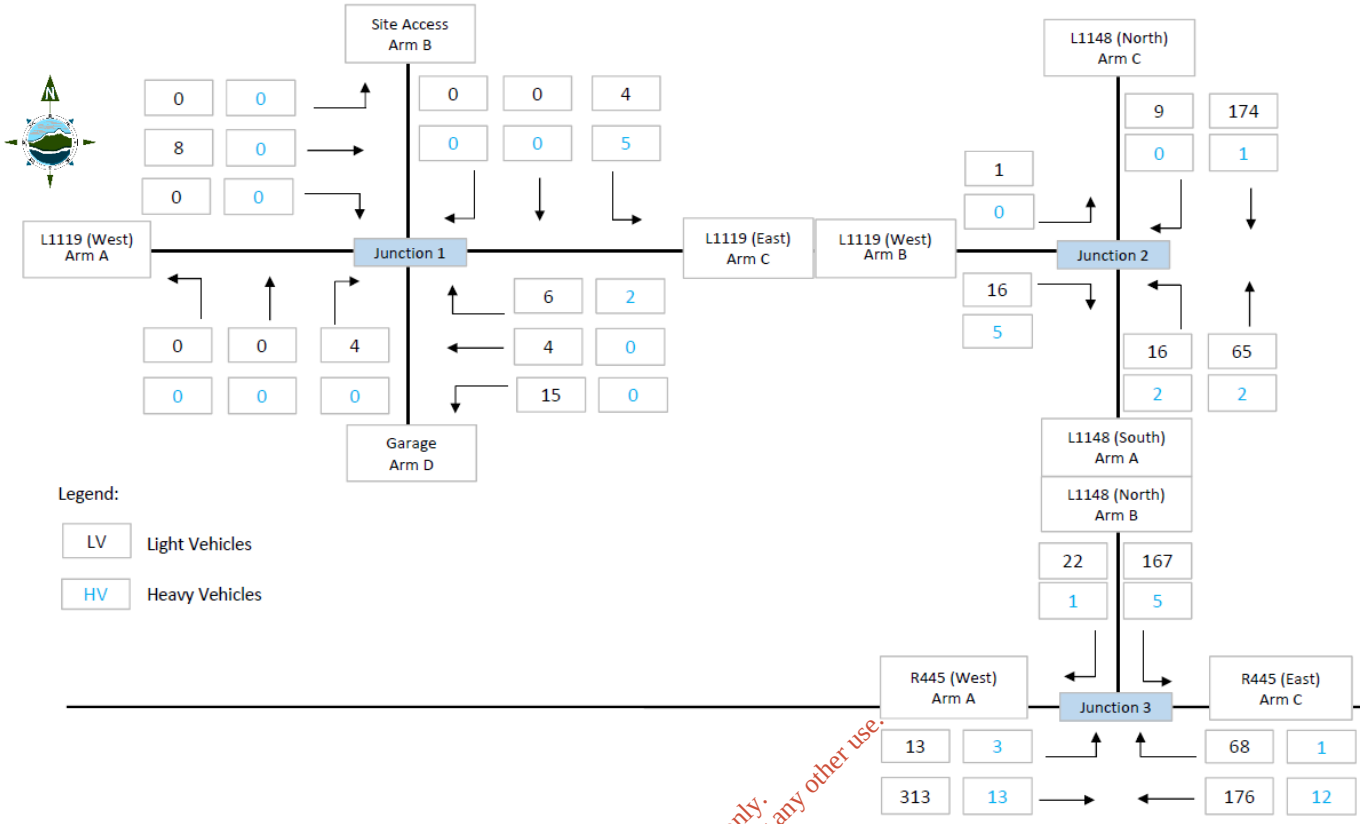


Figure 5-11 Baseflow Traffic Generation and Distribution, Design Year 2022 - AM peak hour

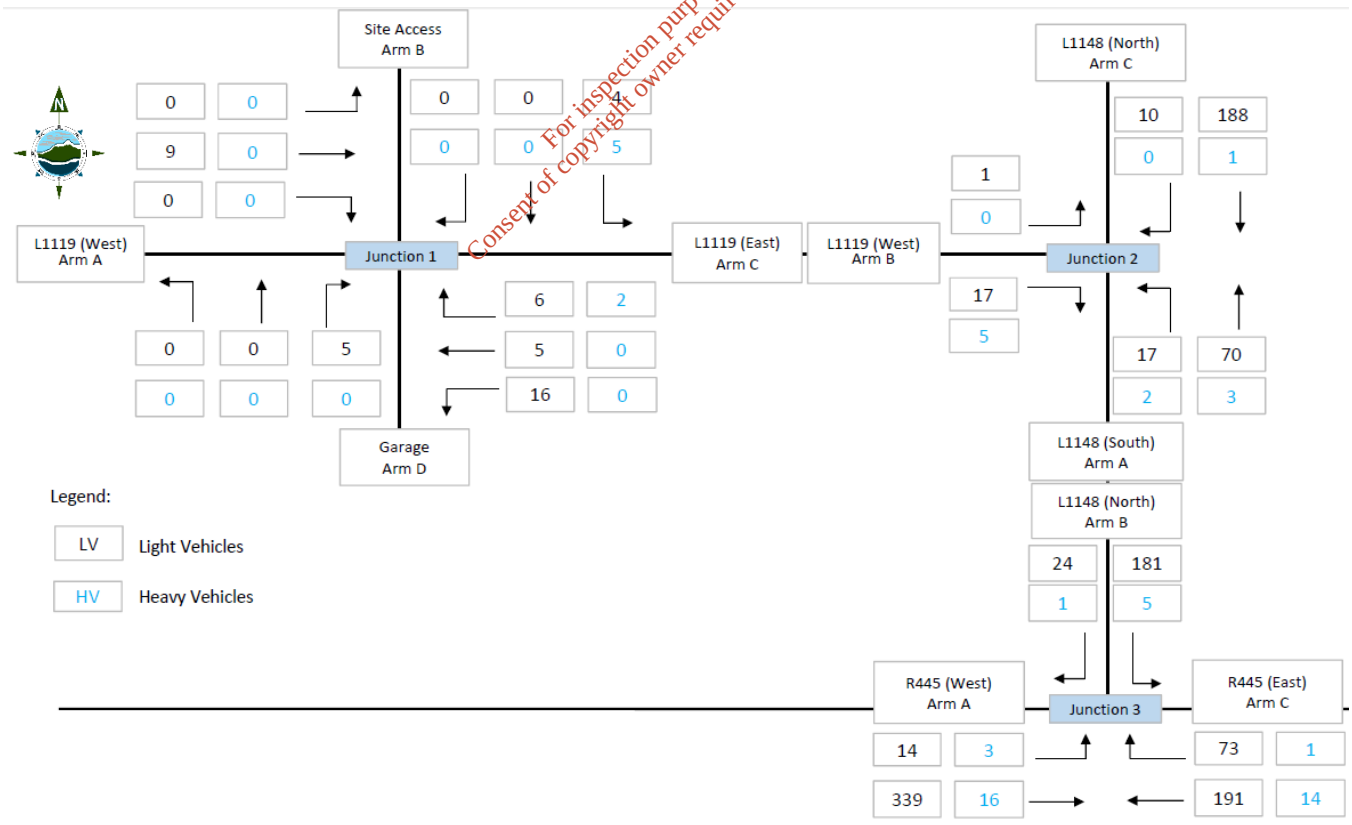


Figure 5-12 Baseflow Traffic Generation and Distribution, Design Year 2032 – AM peak hour

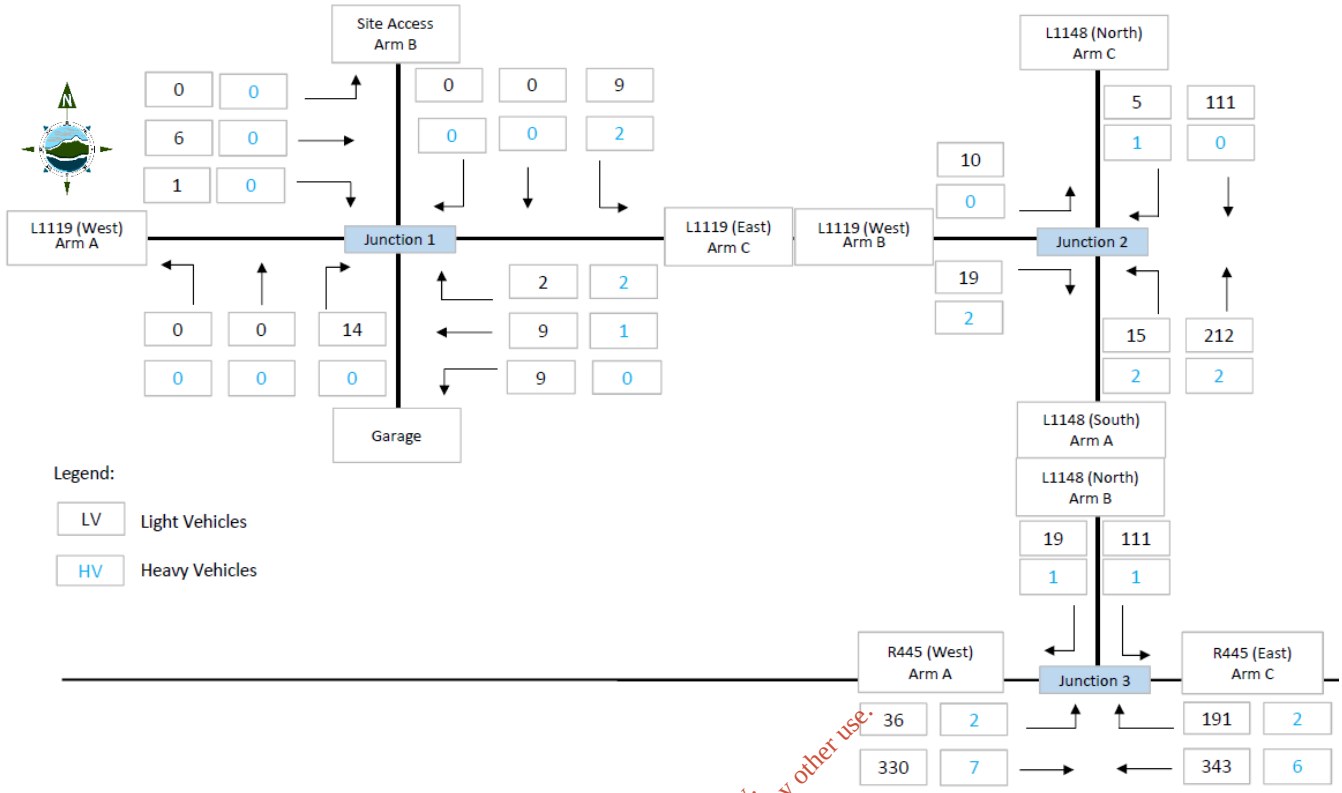


Figure 5-13 Baseflow Traffic Generation and Distribution, Existing Year 2016 - PM peak hour

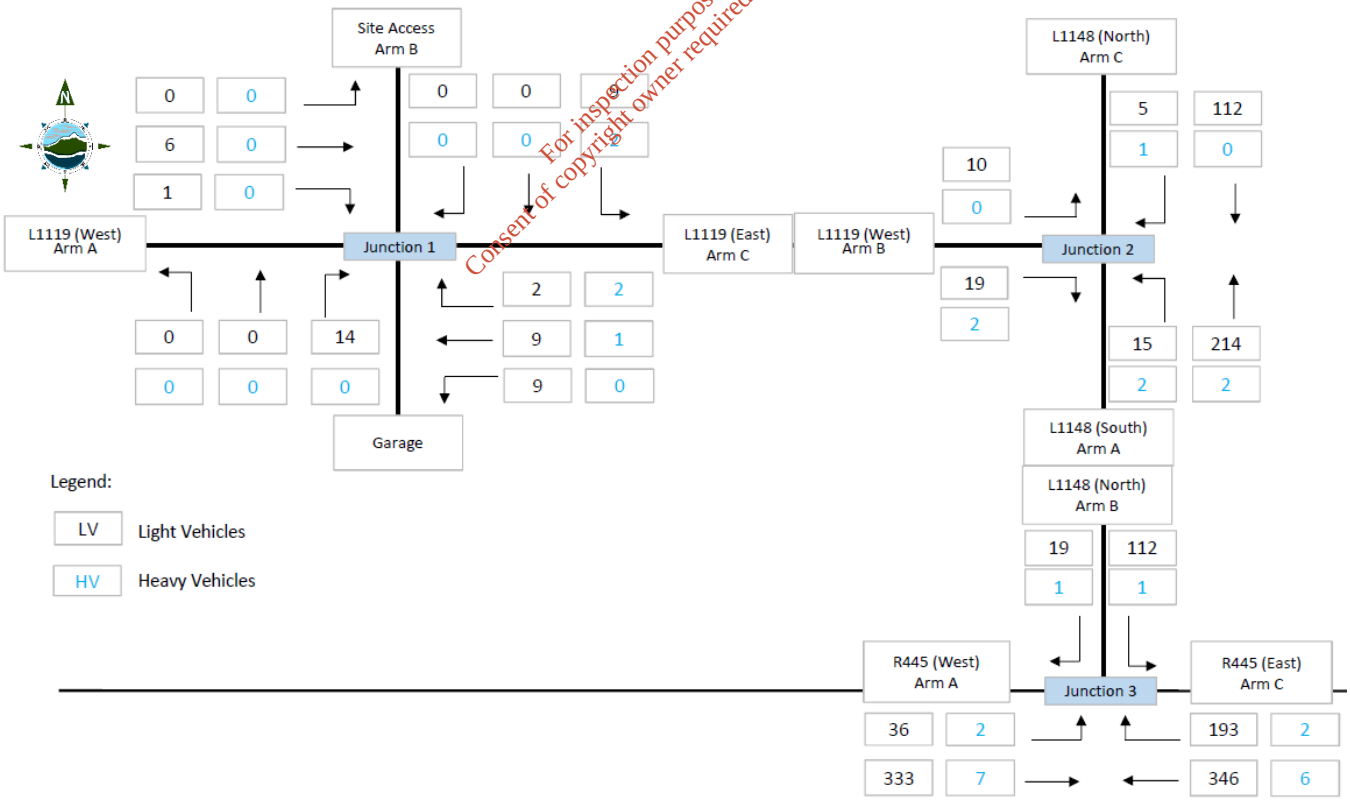


Figure 5-14 Baseflow Traffic Generation and Distribution, Operational Year 2017 - PM peak hour

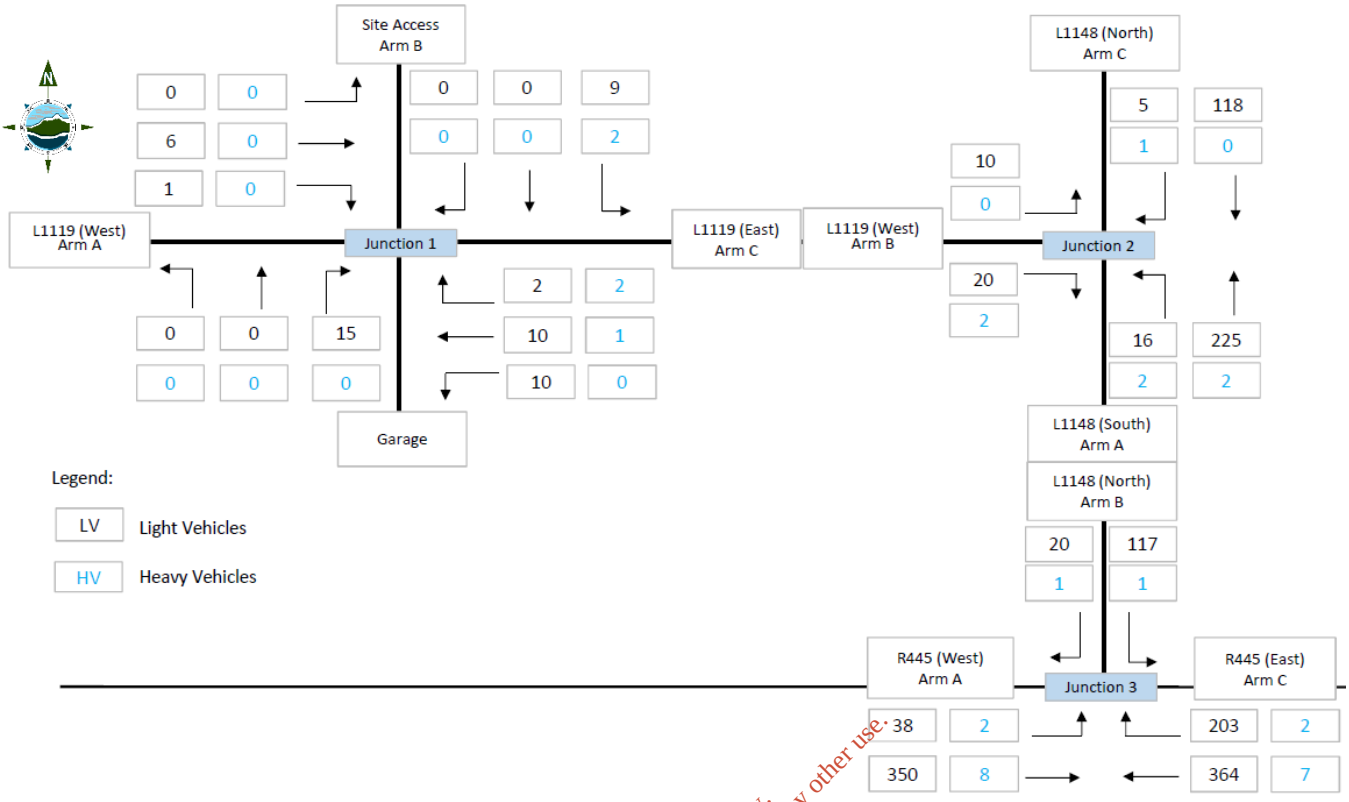


Figure 5-15 Baseflow Traffic Generation and Distribution, Design Year 2022 - PM peak hour

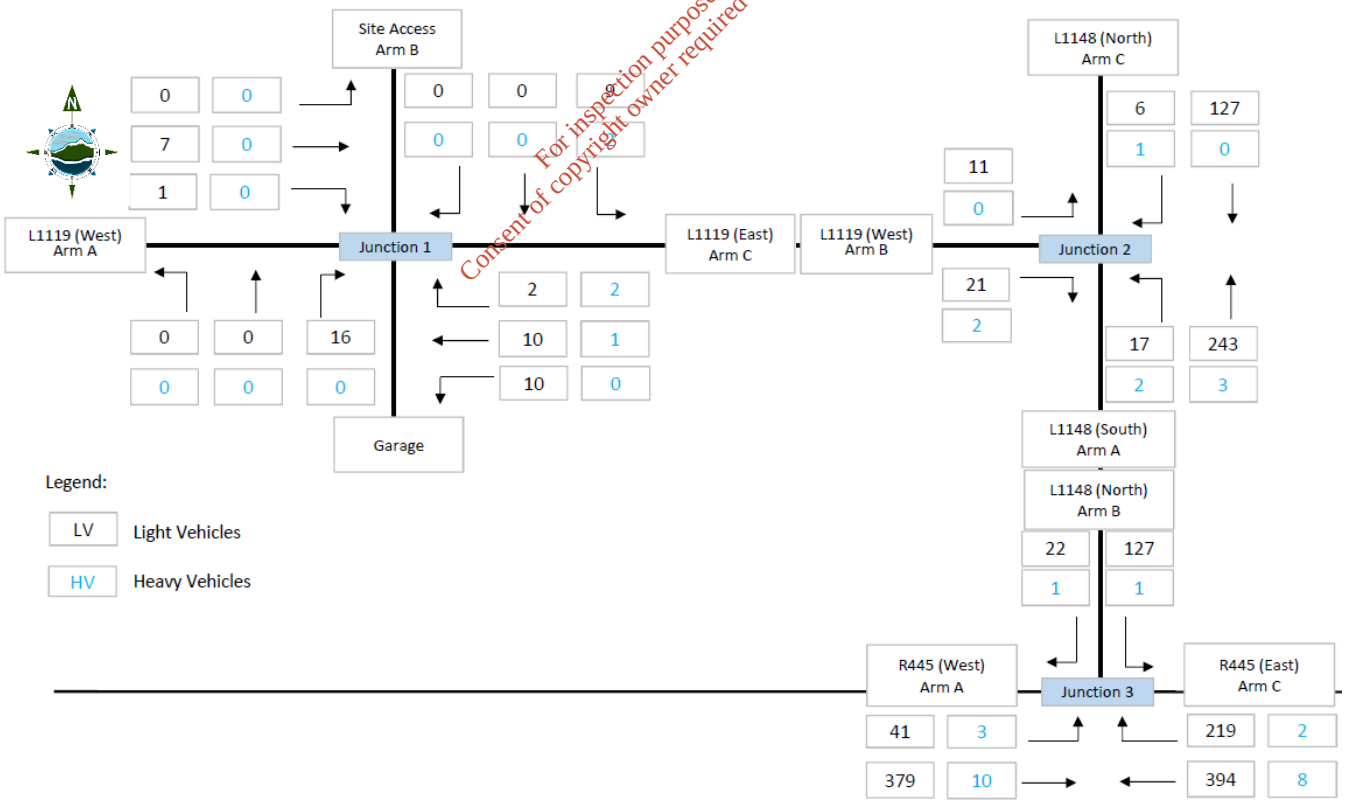


Figure 5-16 Baseflow Traffic Generation and Distribution, Design Year 2032 – PM peak hour

5.4.2.2 Trip Distribution of Proposed Development Generated Traffic

The modified baseflow traffic with the proposed operational traffic is distributed as per the existing junction distributions, for the operational year 2017 and design years 2022 and 2032 for both the AM and PM peak hours. Figure 5-17 to Figure 5-19, represent the AM peak hour design year, with Figure 5-20 to Figure 5-22 representing the PM peak hour. Origin destination matrices are provided in Appendix E for each junction.

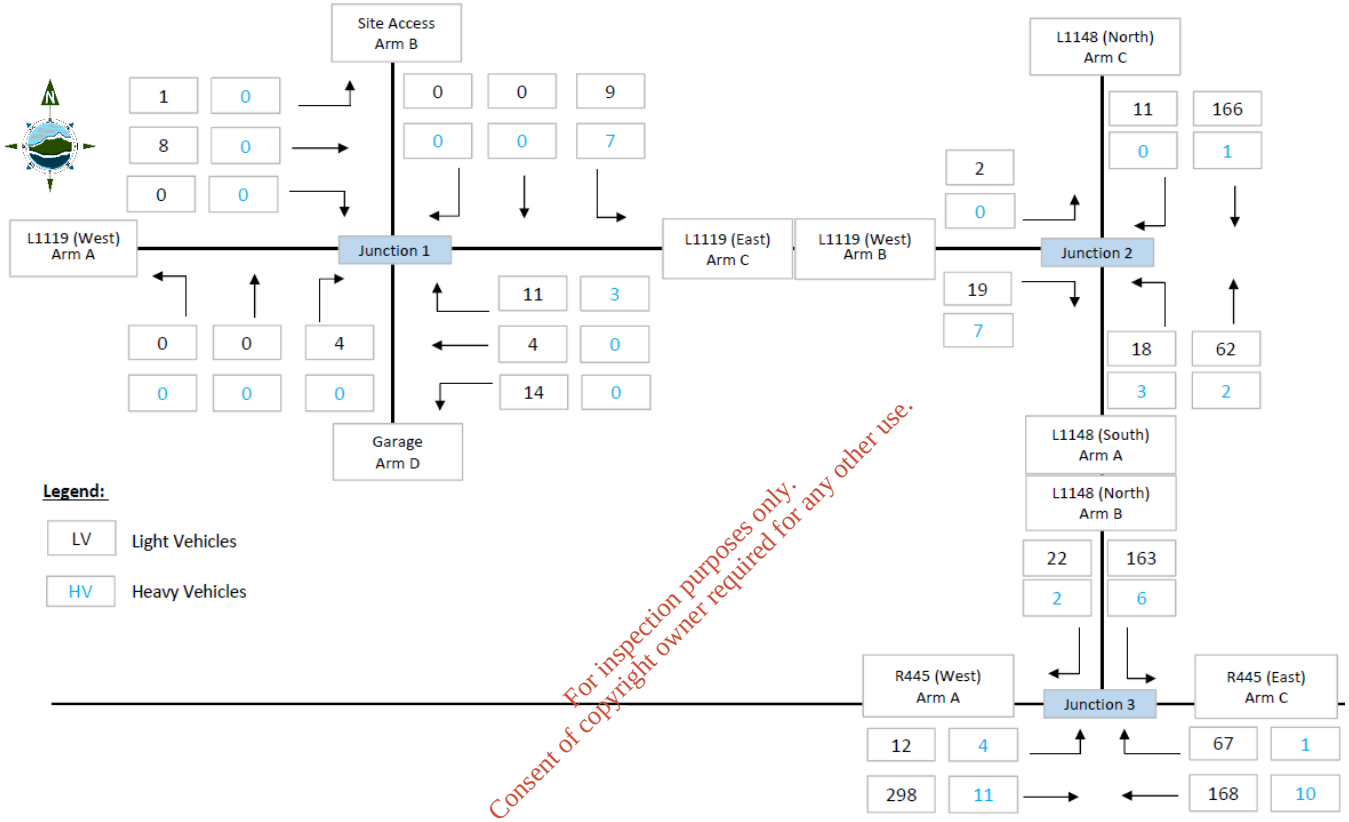


Figure 5-17 Proposed Development Generation and Distribution Traffic, Operational Year 2017 - AM peak hour

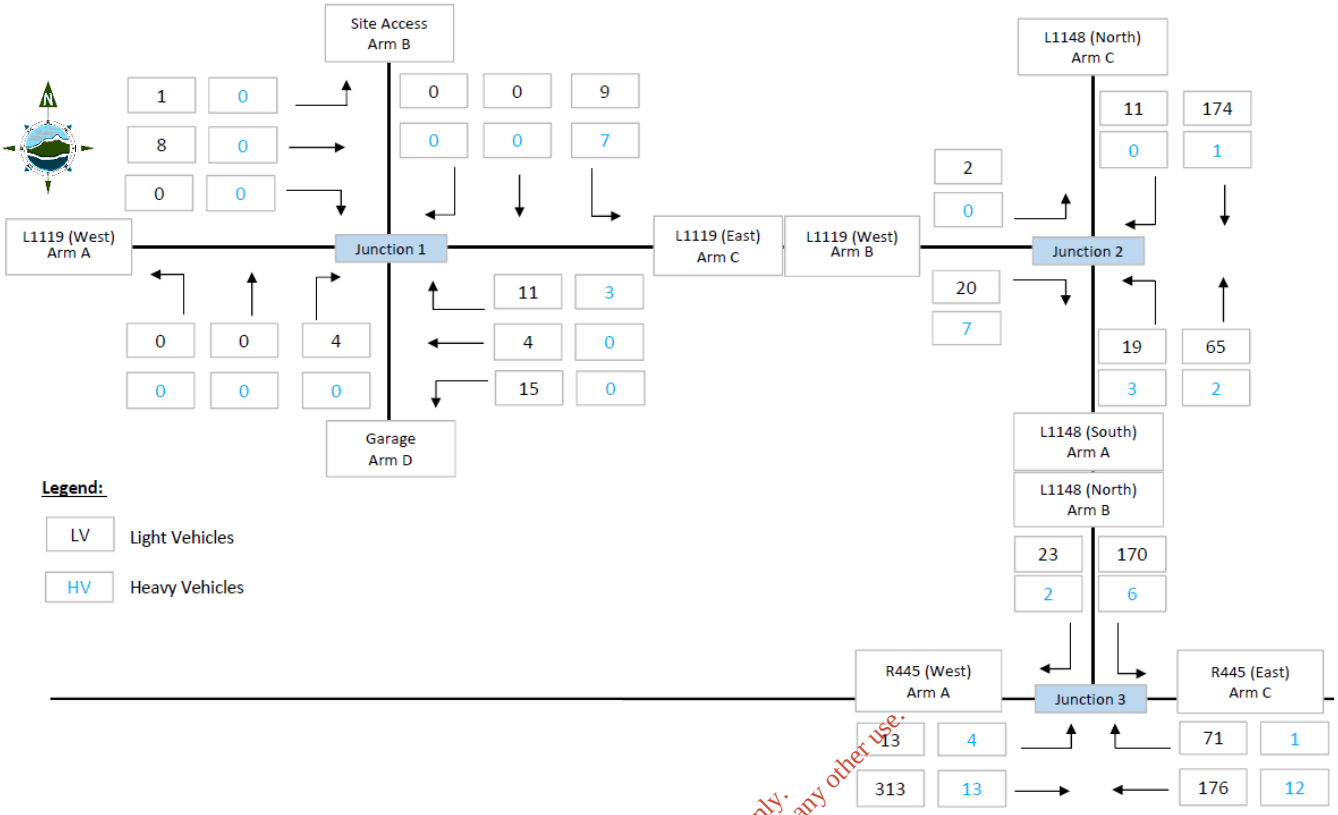


Figure 5-18 Proposed Development Generation and Distribution Traffic, Design Year 2022 - AM peak hour

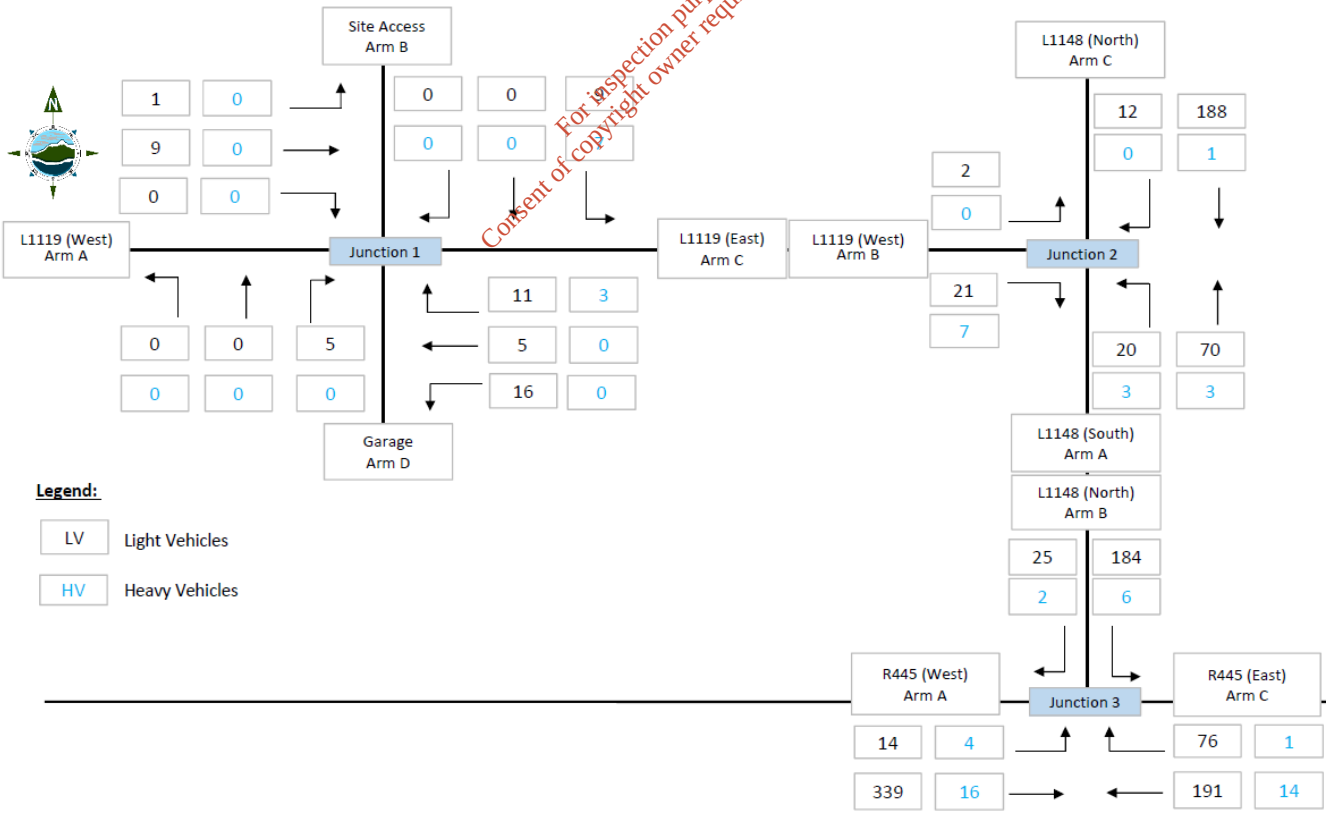


Figure 5-19 Proposed Development Generation and Distribution Traffic, Design Year 2032 - AM peak hour

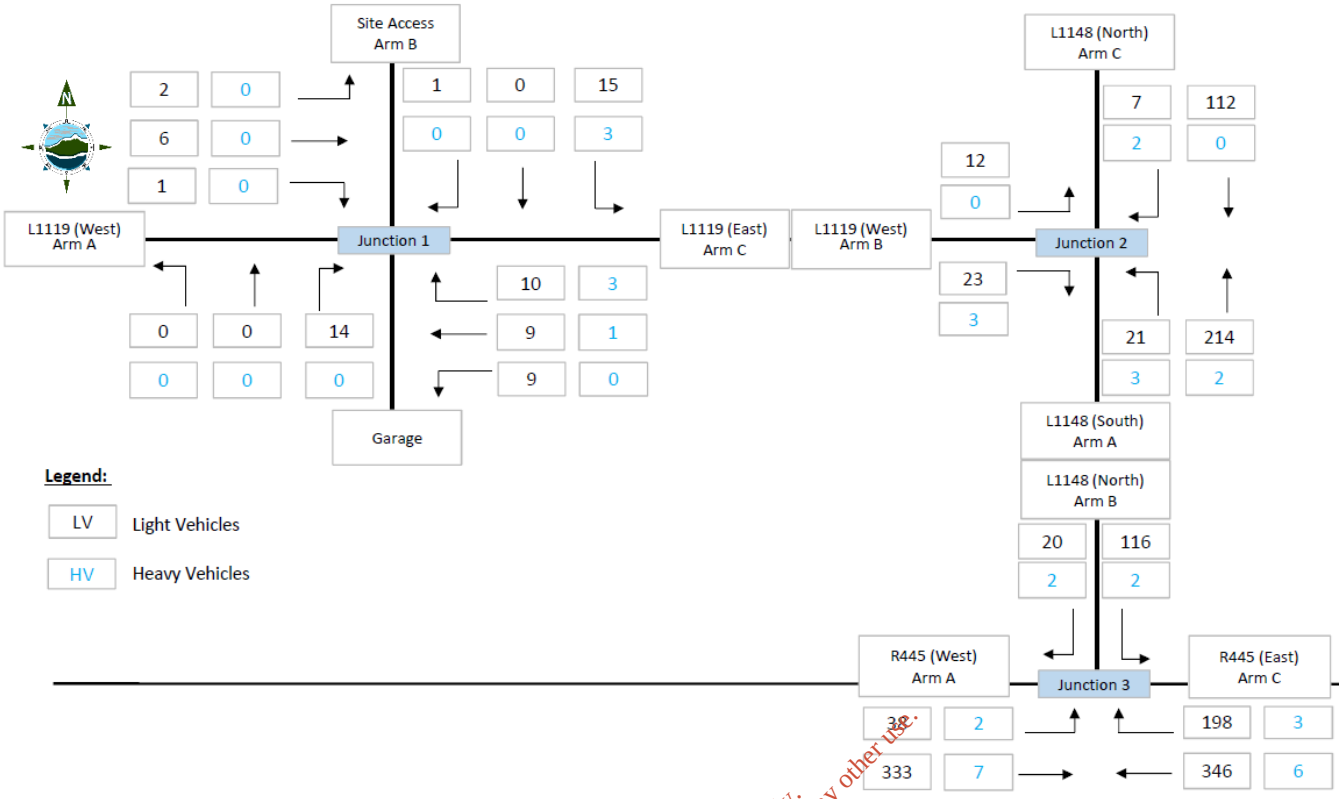


Figure 5-20 Proposed Development Generation and Distribution Traffic, Operational Year 2017 - PM peak hour

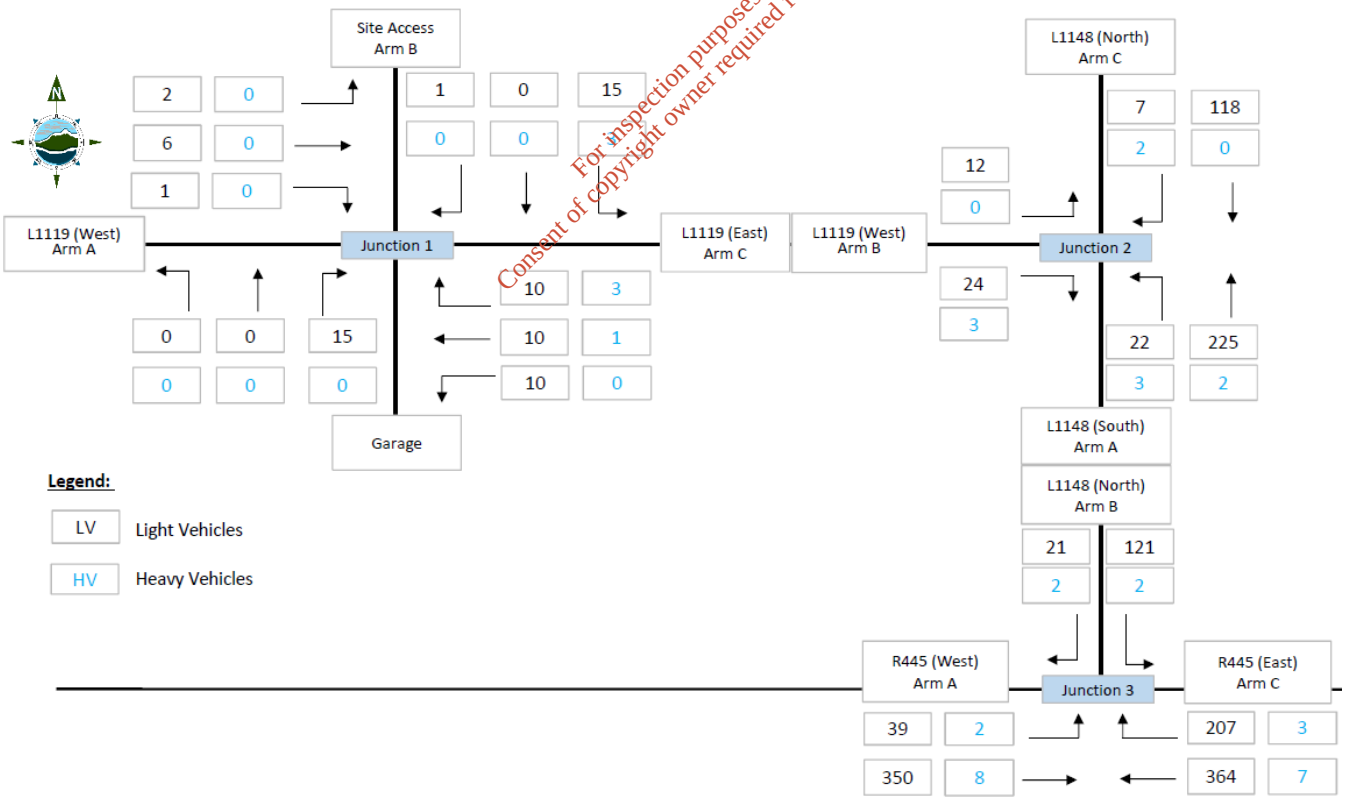


Figure 5-21 Proposed Development Generation and Distribution Traffic, Design Year 2022 - PM peak hour

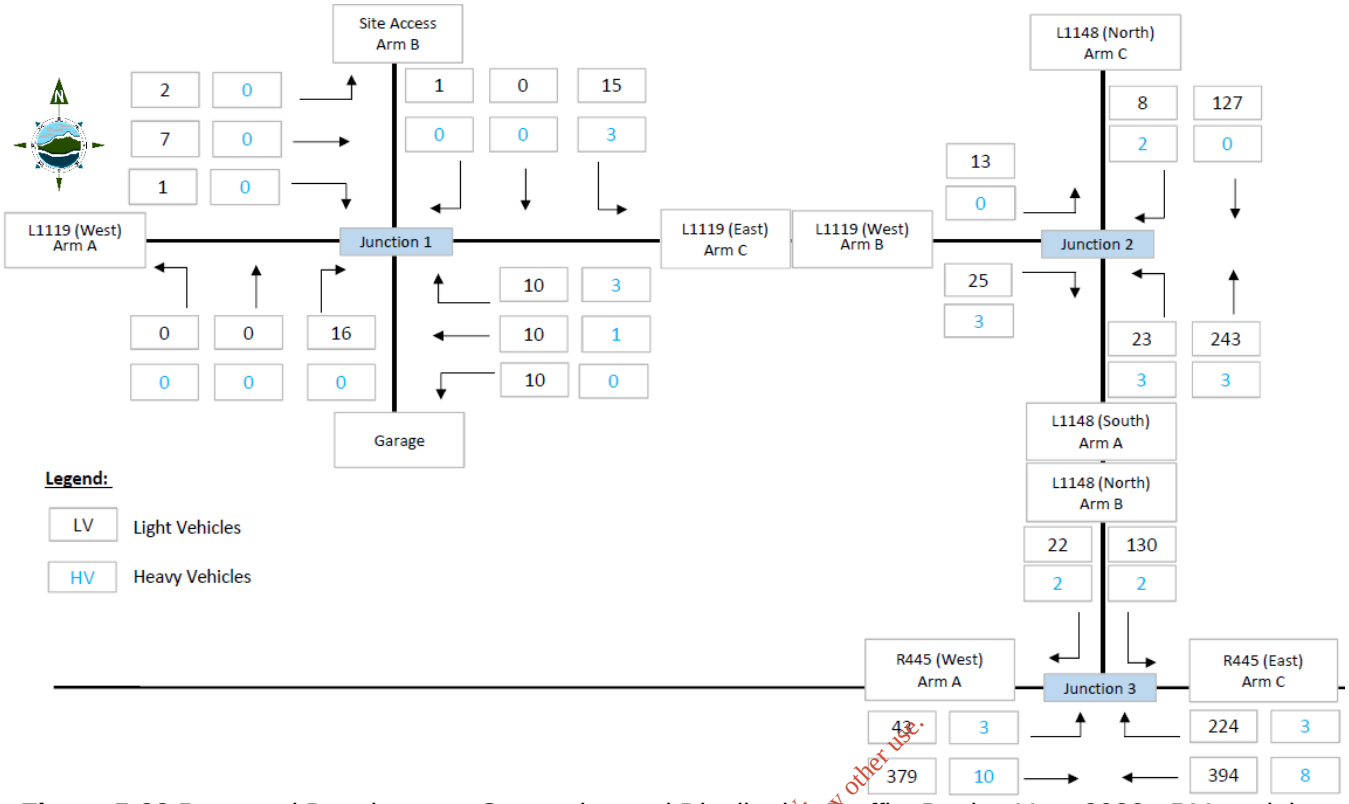


Figure 5-22 Proposed Development Generation and Distribution Traffic, Design Year 2032 - PM peak hour

6 ROAD IMPACT

6.1 JUNCTION ANALYSIS

6.1.1 *Introduction and Methodology*

The existing site access junction (Junction 1), existing priority junction (Junction 2) and the existing priority junction (Junction 3) have been analysed using the Transport Research Laboratory (TRL) computer program JUNCTION 9 PICADY, a widely accepted tool used for the analysis of uncontrolled junctions.

The key parameters examined in the results of the analysis are the Ratio of Flow to Capacity Value (RFC value – desirable value for PICADY should be no greater than 0.85 and values over 1.00 indicate the approach arm is over capacity), the maximum queue length on any approach to the junctions and the average delay for each vehicle passing through the junction during the modelled period.

JUNCTION 9 PICADY requires the following input data:

- Basic modelling parameters (usually peak hour traffic counts synthesised over a 90 minute model period)
- Geometric parameters (including lane numbers & widths, visibility, storage provision etc)
- Traffic demand data (usually peak hour origin/destination table with composition of heavy goods vehicles input[4]).

The origin / destination traffic demand tables for all the different scenarios tested for the analysed junctions are provided in Appendix E.

6.1.2 Assessment Time and Years

The performance of the junction has been analysed for the critical AM and PM peak hours for the current year, year of operation of the proposed intensifications, expected to be 2017, and the design years of the development in 2022 and 2032 (i.e. 5 years and 15 years beyond the expected operation of the proposed intensification).

6.1.3 Analysis Results

A summary of the junctions analysed using Junctions 9 PICADY are included in Appendix F. The results of the PICADY analysis are discussed in sections 6.1.3.1, 6.1.3.2 and 6.1.3.3.

[4] Traffic volumes input into JUNCTION 9 were in total number of vehicles with a percentage input for HV's

6.1.3.1 Junction 1 – Existing Cross Road Junction, AES Site Access / Grallagh Road L-1119 / O'Brien's Garage

The JUNCTION 9 PICADY analysis results for the existing Junction 1, for the AM and PM peak hours are provided in detail in Appendix G.

The results indicate that the existing site access junction, Junction 1, will operate below the maximum desirable RFC of 0.85 up to and including the design year of 2032 (+15 years) with the inclusion of the proposed operational generated traffic for both the AM and PM peak hours.

For the existing operations, the maximum RFC at Junction 1 occurs on Arm D, the Garage arm, in the PM peak hour of 2032, with an RFC of 0.04, indicating the junction will operate significantly below capacity. In the AM peak hour for all assessment years of the existing operations, the maximum RFC is 0.02 and occurs on Arm B (AES entrance). The largest delay for a vehicle at this junction is the same for all assessment years and is 9.26 seconds. This delay occurs in the AM peak on Arm B, with a single vehicle awaiting gap acceptance before performing a turning movement onto the L-1119. No queue is experienced on any of the arms of this junction for the existing operations.

The proposed operations will result in maximum RFCs of 0.04 indicating the junction will operate significantly below capacity. In the AM peak hour this occurs on Arm B (AES entrance) and in the PM peak this occurs on arms B and D (Garage arm). In comparison to the existing operations, this indicates that the proposed intensification of the operations will result in a slight increase in the AM peak RFC by 0.02, while the PM peak RFC will remain the same. The delay on Arm B in the AM peak hour has reduced slightly to 8.69 seconds from 9.26 seconds (existing operations), however, the delay on Arm D (Garage arm) has increased slightly from 7.76 seconds (existing operations) to 7.81 seconds for the proposed operations. The intensification of the proposed operations will not result in a queue on any of the arms of the junction.

In summary, no queue is experience on the arms of the junction in either of the existing and proposed assessments. The RFC values are significantly lower than the maximum desired of 0.85 RFC, with the junction operating well within capacity. The proposed operations at the site will not significantly impact on this junction's capacity.

6.1.3.2 Junction 2 – Existing Priority Junction, L-1119 Grallagh Road / L-1148 Dark Road

The JUNCTION 9 PICADY analysis results for the existing Junction 2, for the AM and PM peak hours are provided in detail in Appendix H.

The results indicate that the existing priority junction, Junction 2, will operate below the maximum desirable RFC of 0.85, up to and including the design year of 2032 (+15 years) with the inclusion of the proposed operational generated traffic for both the AM and PM peak hours.

The existing operations has a maximum RFC in the AM peak of 0.05 and of 0.06 in the PM peak for the design year 2032, both occurring on Arm B, the L-1119. The highest delays at the junction coincide with these RFC's with 9.47 seconds and 9.17 seconds experienced in the AM and PM peak hours. The maximum queue length on this arm is 0.1 vehicles for both peak hours (i.e. less than 1 vehicle).

The intensification of the AES operations almost doubles the RFCs to 0.08 on arm B, the L-1119, for both peak hours and will still be significantly below junction capacity. The delay at the junction will slightly increases in both peak hours, however, as per the existing it remains below 10 seconds on arm B. The queue length of 0.1 vehicles (i.e. less than 1 vehicle) remains the same for both the existing and proposed operations.

The RFC values are significantly lower than the maximum desired of 0.85 RFC, with the junction operating well within capacity. The proposed operations at the site will not significantly impact on the junction capacity. There are no queues (i.e. less than 1 vehicle) at this junction.

6.1.3.3 Junction 3 – Priority Junction, L-1148 Dark Road / R445

The JUNCTION 9 PICADY analysis results for the existing Junction 3, for the AM and PM peak hours are provided in detail in Appendix I.

The results indicate that the existing priority junction, Junction 3, will operate below the maximum desirable RFC of 0.85, up to and including the design year of 2032 (+15 years) with the inclusion of the proposed operational generated traffic for both the AM and PM peak hours.

For existing operations on the road network, the largest RFCs are experienced in the AM peak on Arm B, the junction's minor arm and in the PM peak on Arm C, the R445 westbound from Nenagh to the junction. In the AM of 2032, the high volume of inbound traffic to Nenagh in conjunction with the large number of left turners onto the R445 (i.e. in the same direction) results in the largest delay on Arm B of 10.6 seconds for this movement in comparison to the right turn movement from this arm with a delay of 7.97 seconds. The maximum RFC in the AM is in 2032 on traffic stream B-C (left turn Nenagh inbound) of 0.31. The maximum queue lengths in 2016 and 2022 is 0.4 vehicles and increases to 0.5 vehicles in 2032 on traffic stream B-C.

In the PM peak the impact of the existing operations on the road network has a maximum RFC of 0.38 in the design year 2032 for traffic stream C-B, right turners from the R445 outbound from Nenagh to the

L-1148 Dark Road. This RFC indicates that the junction is well within its capacity. The 0.38 RFC on this arm is attributed to the larger flows on the regional road, R445, which are evenly distributed through flows with the right turn movements facilitated by gap acceptance in this flow. The delay for this stream is 9.07 seconds, however, the higher delay occurs on stream B-A (i.e. left turn from Dark Road to Nenagh inbound) of 14.23 seconds. The maximum queue lengths in 2016 and 2022 is 0.5 vehicle and increases slightly to 0.6 vehicle in 2032 on traffic stream C-B.

The impact of the proposed operations on the road network will be within the junction capacity and will have a similar impact on the traffic streams. The maximum RFC occurs in the AM on Stream B-C and in the PM on Stream C-B, with RFC values of 0.32 and 0.039 respectively in the design year 2032. The largest delay at the junction occurs at Stream B-A (left turners from the minor road inbound to Nenagh) in both AM and PM peak hours, with delays of 11.02 seconds and 15.08 seconds respectively. The maximum queue length is experienced in 2032 in the AM, for right turners from the minor road to the R445 of 0.5 vehicle and of 0.6 for right turners inbound on the R445 from Nenagh to the minor road.

The RFC values are lower than the maximum desired of 0.85 RFC, with the junction operating well within capacity. The proposed operations at the site will not significantly impact on the junction's capacity. Less than one vehicle (0.6 vehicles) queuing at the junction occurs in the design year 2032, which will have the largest traffic volumes at the junction.

6.2 LINK CAPACITY

Link capacity assessments were undertaken with reference to UK DMRB TA 79/99.

6.2.1 LINK CAPACITY – L-1119 Grallagh Road

The Grallagh Road, L-1119, is a local road and can be classified as road type UAP3, 'variable standard road carrying mixed traffic with frontage access, side roads, bus stops and at-grade pedestrian crossings, more than 2 with side roads per km'. UK DMRB TA 79/99 estimates that the one-way hourly capacity of the road is 1110 vehicles for UAP3 for a 6.75m carriageway. The analysis carried out in this report estimates that the maximum hourly one-way flow on the local road in the design year of 2032 is 41 vehicles eastbound from Junction 1 to Junction 2 during the PM peak. Therefore the local road will operate with 96% spare capacity.

6.2.2 LINK CAPACITY – L-1148 Dark Road

The Dark Road, L-1148, is a local road and can be classified as road type UAP3, 'variable standard road carrying mixed traffic with frontage access, side roads, bus stops and at-grade pedestrian crossings, more than 2 with side roads per km'. UK DMRB TA 79/99 estimates that the one-way hourly capacity of the road is 900 vehicles for UAP3 for a 6.0m carriageway. The analysis carried out in this report estimates that the maximum hourly one-way flow on the local road in the design year of 2032 is

273 vehicles northbound from Junction 3 to Junction 2 during the PM peak. Therefore the local road will operate with 70% spare capacity.

6.2.3 LINK CAPACITY – R445

The R445 regional road can be classified as road type UAP3, 'variable standard road carrying mixed traffic with frontage access, side roads, bus stops and at-grade pedestrian crossings, more than 2 with side roads per km'. UK DMRB TA 79/99 estimates that the one-way hourly capacity of the R445 is 1470 vehicles for UAP3 with 2 lanes and carriageway width of 7.3m. The analysis carried out in this report estimates that the maximum hourly one-way flow on the R445 in the design year of 2032 is 629 vehicles westbound to junction 3 during the PM peak. Therefore the R445 will operate with 57% spare capacity.

7 OTHER ROAD ISSUES

7.1 ROAD SAFETY

The site accesses to the AES facility at Nenagh are existing with no proposals to alter the junction onto the local road, the L-1119. As these accesses are located within a designated speed limit of 60km/h the *Design Manual for Urban Roads and Streets (DMURS, 2013)* is applicable. The visibility splays requirements from DMURS are 2.4 x 59 metres (and 65m on bus routes) for this designated speed limit, with a reduction in the 'x-distance'[5] from 2.4m to 2.0m in difficult circumstances.

At the commercial access (i.e. western entrance) of the AES facility, the required visibility of 2.0m x 59m is achievable to the east and can be achieved to the west on clearance of the overgrown hedgerow bounding the adjacent green field.

At the entrance to the civic amenity area, the visibility of 2.0m x 59m is achievable to the west. Junction 2 is located approximately 35m east of this entrance and the inter-visibility is currently obscured by the vegetation at the raised planter to the east of the entrance. Maintenance of the raised planter vegetation below a maximum height of 1.05m will achieve clear intervisibility of Junction 2. It is envisaged that the speed on approach to the site entrances from the east will be less than the designated speed limit due to the proximity of Junction 2. To improve safety at the junction it is recommended that additional signage be provided to warn road users of the slow moving large vehicles ahead. See Figure 7-1 for example.

Figure 7-1 Example of Traffic Sign

A Road Safety Audit was not requested by Tipperary County Council at the site access during the scoping.

An investigation of road collision data from the Road Safety Authority website (source: http://www.rsa.ie/RSA/Road-Safety/Our-Research/Ireland-Road-Collisions/) (see Figure 7-2 for map) indicates that there was no major collision recorded in the vicinity of the site. Approximately, 650m west of the AES site on the L-1119; and 500m and 550m west of Junction 3 on the R445, minor collisions occurred in 2009, 2008 and 2011 respectively. No incidents of major / fatal collision and no collisions involving vulnerable road users were identified.

[5] X-distance is the distance measured from the nearside edge of the major arm back along the minor arm of the junction.

Ireland Road Collisions

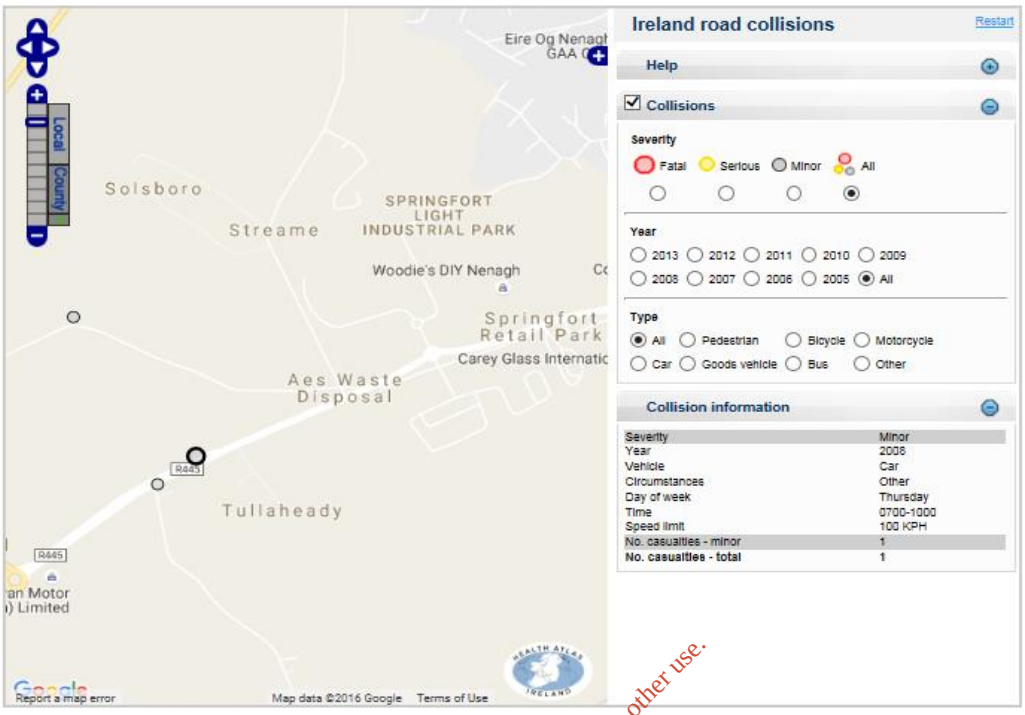


Figure 7-2 RSA Irish Road Collision Statistics

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

Assessment of all the junctions, were undertaken using the modelling software JUNCTION 9 PICADY. The assessment was carried out for both AM and PM peak hours for the existing operations and the proposed operations on the road network. The scenarios assessed include the existing year, proposed operational year of intensification at the AES facility and the design years: plus 5 and 15 years.

- The model results indicate that Junction 1 to 3 will operate below the maximum desired RFC of 0.85 and well within capacity for all design years for both existing and proposed operations. The maximum queue length observed by the model is less than one vehicle in all cases. The maximum delays on the arm of the junctions vary, with the maximum delay of 15.08 seconds occurring in the PM peak hour for the design year 2032 at the priority junction with the R445, Junction 3.
- Spare link capacity is available on the road network (i.e. L-1119, L-1148 and R445) in the vicinity of the Nenagh AES facility including for the proposed intensification of operations on the road network.

8.2 RECOMMENDATIONS

This report recommends that:

- Visibility splays at the existing site access junction are be maintained and kept free of all obstacles which may cause a visual obstruction.
- To improve safety at the existing junction to the AES facility, advanced warning signs to be provided. These signs will provide warning to road users of the potential of encountering slow moving large vehicles to / from the facility.