

Harrison Transportation

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239

19 February 2018

Roger Pryce
Caro Ltd
153 Hill Road
RD2
Te Aroha 3392

Dear Roger

Proposed Quarry Hill Road Te Aroha – Transportation Assessment.

Harrison Transportation has prepared a Transportation Assessment Report for a proposed quarry at 153 Hill Road Te Aroha. That report is dated September 2017. Council has, in their letter of 31 October 2017, requested further information. This report provides the requested information on traffic matters.

1. State Highway Intersections

Council has requested an assessment of the safety and efficiency of the two State Highway intersections. Since the request for further information was prepared, it has been agreed that heavy vehicles will only access the quarry from the southern end of Rawhiti Road. An assessment is therefore only required of the southern intersection of Rawhiti Road and SH26.

1.1. Sight Distances

The Austroads “*Guide to Road Design Part 4A: Unsignalised and Signalised Intersections*”, specifies the required safe intersection sight distances (SISD) based on the design speed on the main road. A design speed of 100km/h in each direction has been adopted for this assessment. The compliance of the available sight distances with the Austroads requirements is given in the following table.

Direction	Design Speed (km/h)	Sight Distance (m)		Complies?
		Required	Available	
To the North	100	248	247	No
To the South	100	248	201	No

Table 1: Sight Distances at the Intersection of SH26 and Rawhiti Road.

Table 1 shows the available sight distances at the intersection do not comply. The sight distance to the north is however within practical measuring tolerances while the sight distance to the south could be increased to approximately 230m with the removal of a tree located on the inside of the curve. The available sight lines at the intersection are shown on the following photographs.



Photograph 1: Sight Line to the North.



Photograph 2: Sight Line to the South.

The photographs show that the sight lines are limited by the trees located on the inside of the curve.

While the main body of the Austroads Guide uses normal design domain (NDD) values, the Guide also states:

“it is also acknowledged that situations will arise where it may not always be practical or possible to achieve all the relevant NDD values (e.g. in constrained locations), in which case road agencies may consider the use of values outside of the NDD values.”

Appendix A of the Austroads Guide contains extended design domain (EDD) values that through research and/or operating experience, have been found to provide a suitable solution in constrained situations. The Guide states that EDD may be considered when:

- Reviewing the geometry of existing intersections.
- New intersections are being retrofitted on existing roads in constrained locations.
- Improving the standard of existing intersections in constrained locations.
- Building temporary intersections.

As the current assessment is reviewing the geometry of an existing intersection, the use of the EDD criteria is considered appropriate in this instance.

An assessment using the Austroads EDD criteria, with an observation time of 1.5s and a reaction time of 2.0s, identifies that a minimum sight distance of 183m is required. The available sight distances of 247m to the north and 201m to the south comply with this requirement. It is therefore assessed that the available sight distances are sufficient to ensure the safe operation of the intersection.

1.2. Provision for Right Turn Movements

The expected peak hour turning movements at the intersection of Rawhiti Road and SH26 have been assessed on the basis of the traffic volume on SH26 as given in the NZTA Traffic Data Booklet and the latest traffic count data for Rawhiti Road. The peak hour volumes on SH26 and Rawhiti Road have been taken as 10% of the ADT, with a bias of 60% of turning traffic to and from the south and the remaining 40% to and from the north.

The expected peak hour traffic generation of the proposed quarry has been taken as 6veh/h, which is the expected peak hour traffic generation on the days that the quarry will operate. It is noted that the annual average peak hour traffic generation is 1veh/h, however the use of the higher figure provides a conservative assessment.

The expected turning movements are given in the following figure.

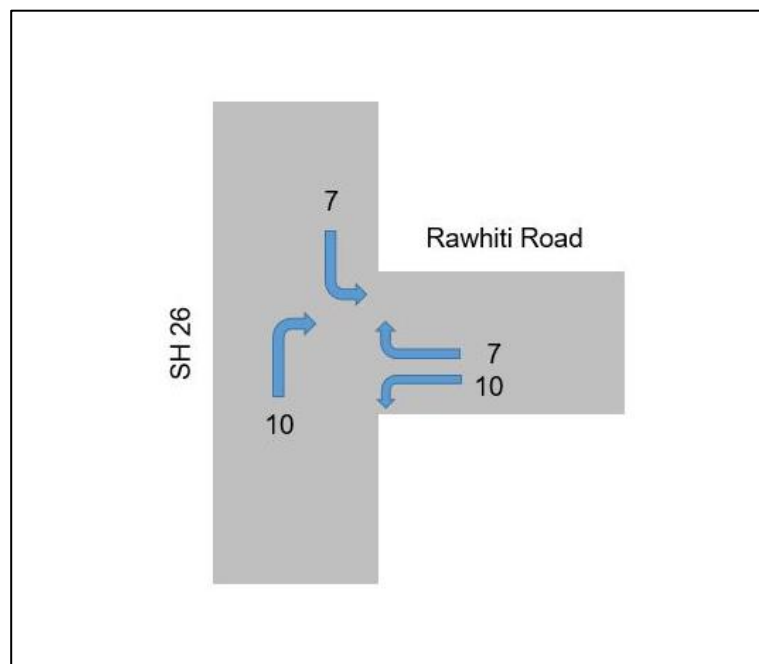


Figure 1: Expected Peak Hour Turning Movements (veh/h).

Figure 1 shows that the predominant turning movements are expected to be the right turn in and the left turn out of Rawhiti Road.

The intersection does not presently have a right turn bay provided. Recommendations for the provision of right turn bays at intersections are given in the Austroads *“Guide to Road Design Part 6: Intersections, Interchanges and Crossings”*. The assessment of the requirements for a right turn bay during the peak period is shown on the following figure.

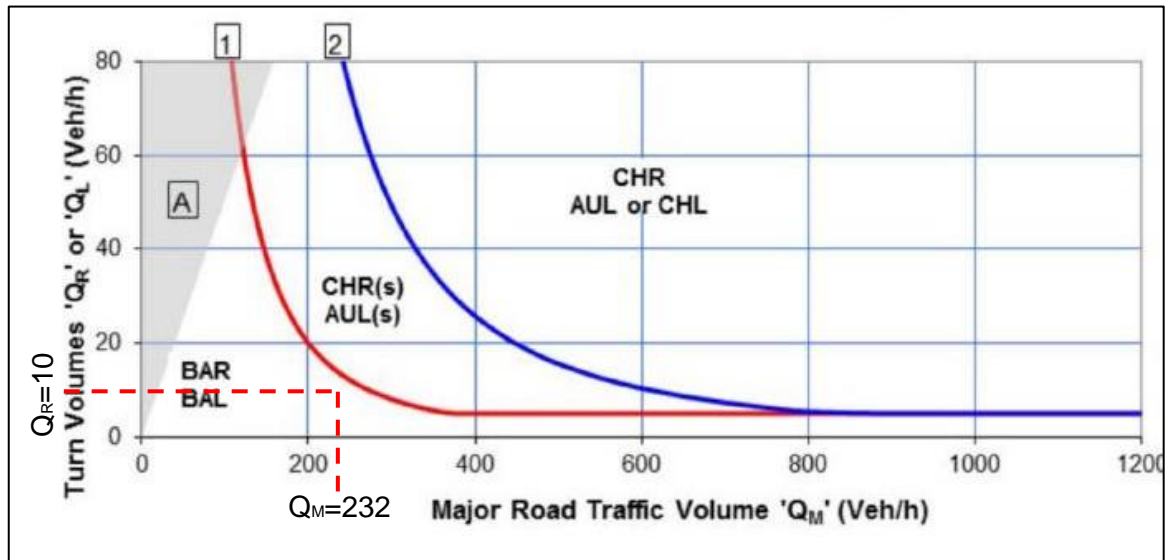


Figure 2: Warrant for Right Turn Bay.

Figure 2 shows that the provision of a right turn bay is not warranted.

1.3. Operational Performance

The expected peak hour operational performance of the intersection has been assessed on the basis of the turning movement volumes given in Section 1.2 of this report. The expected operational performance is summarised in the following table.

Approach	Degree of Saturation	Average Delay (s)	Queue (veh)	Level of Service
SH26 South	0.070	0.7	0.1	A
Rawhiti Road	0.018	11.1	0.1	B
SH26 North	0.068	0.5	0.0	A

Table 2: Intersection Operational Performance.

Table 2 shows that all movements are expected to operate efficiently with low delays, minimal queues and a high level of service.

1.4. Safety

A search of the NZTA Crash Analysis System (CAS) was carried out as part of the transportation assessment report. The search covered the five-year period 2012 to 2016, with available data for 2017 also included. The search area consisted of the full length of Rawhiti Road including both the northern and southern intersections with SH26. One crash was recorded at the northern intersection of SH26 and Rawhiti Road, but no crashes at the southern intersection.

This crash search at the southern intersection of SH26 and Rawhiti Road has since been extended to cover the 10-year period 2008 to 2017. This extended search identified one crash at the intersection, which involved a northbound vehicle on SH26, not realising that the northern section of SH26 had been closed and that a detour was in place, losing control while braking and attempting to turn right onto Rawhiti Road. The crash report states that the signage for the detour was inadequate. While the extended crash history has identified one crash at this intersection it does not indicate any inherent road safety issues with the intersection.

Given that there is no significant crash history at the southern intersection of SH26 and Rawhiti Road, that appropriate sight distances are available, that the volume of the right turn movement is low and that the intersection is expected to operate efficiently with low delays, minimal queues and a high level of service, any effects on the safety of the intersection are assessed as negligible.

2. Pavement Impacts

Council has requested an assessment of the pavement impacts. This assessment will be provided by others.

3. Manoeuvring Area

Council has requested a site plan illustrating the manoeuvring area, gates and queuing spaces. A plan is attached showing the proposed access to the site. The plan shows that the access is located directly off the end of Hill Road, so that vehicles will travel straight through between the road and the access, with no significant turning or manoeuvring required. The access is proposed to be 6.0m wide, which will extend a distance of approximately 30m inside the property boundary. The proposed width is sufficient for the two-way movement of heavy vehicles, with the two-way section of driveway inside the boundary acting as a passing bay, allowing an outbound vehicle to stop within the site and to wait if necessary for an inbound vehicle on Hill Road.

The transportation assessment report identified an expected peak hour traffic generation of up to 6veh/h. This is the equivalent of one inbound vehicle movement and one outbound vehicle movement every 20 minutes. Given this very low level of traffic generation, the provision of queuing space for one vehicle is assessed as appropriate.

4. Passing Bays

Council has requested that the entry and exit tapers to the passing bays be shown and that the passing bays at RP920 and RP1025 be connected. A review of the proposed passing bays has been carried out, with two additional passing bays now proposed, as well as incorporating Council's comments. The revised passing bays are as follows:

- RP0.0, right hand side, on the approach to the intersection with Rawhiti Road. This will allow a vehicle to enter Hill Road while a vehicle is waiting to turn out.
- RP225, right hand side, as previously proposed.
- RP380, right hand side. This was previously at RP430 but has been moved to provide better visibility into the dip.

- RP650, right hand side, as previously proposed.
- RP920 and RP1025, right hand side, combined into a single passing bay.
- RP1310, right hand side, an additional passing bay.
- An additional passing bay immediately within the site.

The above locations are indicative. It is recommended that the final locations be inspected by Council's roading engineers prior to construction, so that any minor adjustments to the location that may be required can be carried out.

All passing bays are proposed to be provided on the right hand side of the carriageway, for use by westbound trucks. As Hill Road generally rises towards the east, this will provide priority to the uphill movement, which will typically require the laden trucks to give way to the empty trucks.

It is also noted that the proposed passing bays are generally located either on the crest of a vertical curve or on a relatively flat grade. This will minimise any need for trucks to undertake a hill start, with any consequent damage to the pavement.

Photographs looking both eastbound and westbound from each passing bay are appended to this report.

5. Intersection Control

Council has asked whether either Stop or Give Way control will be provided at the intersection of Hill Road and Rawhiti Road. The requirements for either Stop or Give Way control are given in the "Manual of Traffic Signs and Markings" (MOTSAM) as follows:

Stop Control:

"at blind intersections where lack of visibility makes it unsafe to approach the intersection at a speed greater than 10 km/h. Note: It is unsafe to approach an intersection at more than 10 km/h if, from a point 9 metres from the intersection limit line on a controlled approach, a driver cannot see a vehicle on an uncontrolled approach at a distance (metres) of 1.2 times the speed (km/h) exceeded by 15% of vehicles on the priority route"

Give Way Control:

(a) at all crossroads that do not have visibility constraints requiring RG-5 STOP signs,

(b) at intersections of an unusual layout, or with an unusual traffic pattern, to clearly define who should give way,

(c) where it is otherwise desirable to override the normal application of the normal priority rule, eg most T-intersections with arterial streets

On the basis of an 85th percentile operating speed on Rawhiti Road of 100km/h, then a Stop sign is required when the visibility at a point 9.0m from the limit line is less than 120m. The available sight lines taken at a height of 1.25m are shown on the following photographs.



Photograph 3: Sight Line to the North.



Photograph 4: Sight Line to the South.

Photograph 3 shows that, on the day of the site visit, the visibility to the north was partially restricted by tall grass growing on the berm. While the tall grass restricts the visibility for car drivers, it is noted that the majority of vehicles associated with the quarry are expected to be trucks and that the typical eye height for a truck driver, at 2.4m, is higher than that of a car driver. While sight distance measurements were not able to be taken at the eye height of a truck driver, it is expected that the driver will be able to see over the top of the tall grass and will therefore have visibility in excess of the required 120m. It is therefore assessed that Stop Control is not required.

As the intersection does not have an unusual layout, and the low traffic volumes do not require any change to the normal priority rule, it is assessed that Give Way control is not required.

6. Traffic Count Data

Council has requested more recent traffic count data. These counts were undertaken by Opus, on behalf of Council, during November 2017. Both the latest and the previous traffic count data is summarised in the following table.

Road	Date of Count	ADT (veh/day)
Hill Road	May 2007	93
	November 2017	79
Rawhiti Road (South of Hill Road)	November 2015	299
	October 2017	296
	November 2017	282
Rawhiti Road (North of Hill Road)	September 2009	97
	November 2017	118

Table 3: Traffic Count Data.

Table 3 shows that the ADT on both Hill Road and Rawhiti Road south of Hill Road has decreased slightly when compared to the previous data. The ADT Rawhiti Road north of Hill Road has however increased slightly. Overall, it is assessed that the ADT has not changed significantly and that this change will not significantly alter the results of the transportation assessment.

7. Conclusion

This report has been prepared to provide the additional transportation information requested by Council.

An assessment of the intersection of Rawhiti Road and SH26 has identified that:

- The available sight distances at the intersection are sufficient to ensure the safe operation of the intersection.
- The expected turning movements at the intersection do not warrant the provision of a right turn bay.
- The intersection is expected to operate efficiently with low delays, minimal queues and a high level of service.
- There is no significant crash history at the intersection.

It is therefore assessed that any effects on the future safety of the intersection are negligible.

The access is proposed to be 6.0m wide, which is sufficient for the two-way movement of heavy vehicles. This will act as a passing bay, allowing an outbound vehicle to stop within the site and to wait if necessary for an inbound vehicle on Hill Road.

The proposed provision of passing bays has been revised, with all passing bays proposed to be provided on the right hand side of the carriageway, for use by westbound trucks. The proposed passing bays are generally located on the crest of a vertical curve or on a

relatively flat grade which will minimise any need for trucks to undertake a hill start and any consequent damage to the pavement.

While tall grass at the intersection of Hill Road and Rawhiti Road restricts the visibility for car drivers, the majority of vehicles associated with the quarry are expected to be trucks. It is expected that the additional height of the truck will provide additional visibility for truck drivers. It is therefore assessed that Stop Control is not required.

Similarly, as the intersection does not have an unusual layout, it is assessed that Give Way control is not required.

The most recent traffic count data shows that the ADT has not changed significantly from that given in the transportation assessment report.

We trust that this report provides sufficient information, however, if you have any further queries please do not hesitate to contact us.

Yours sincerely,

A handwritten signature in purple ink, appearing to read 'Bruce Harrison', followed by a small dot.

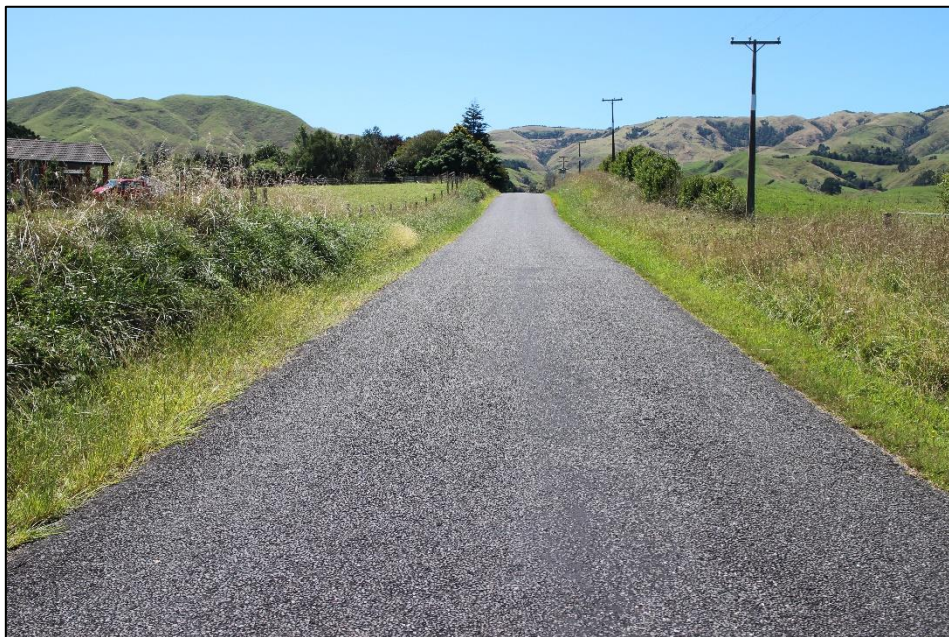
Bruce Harrison

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Eastbound Photographs



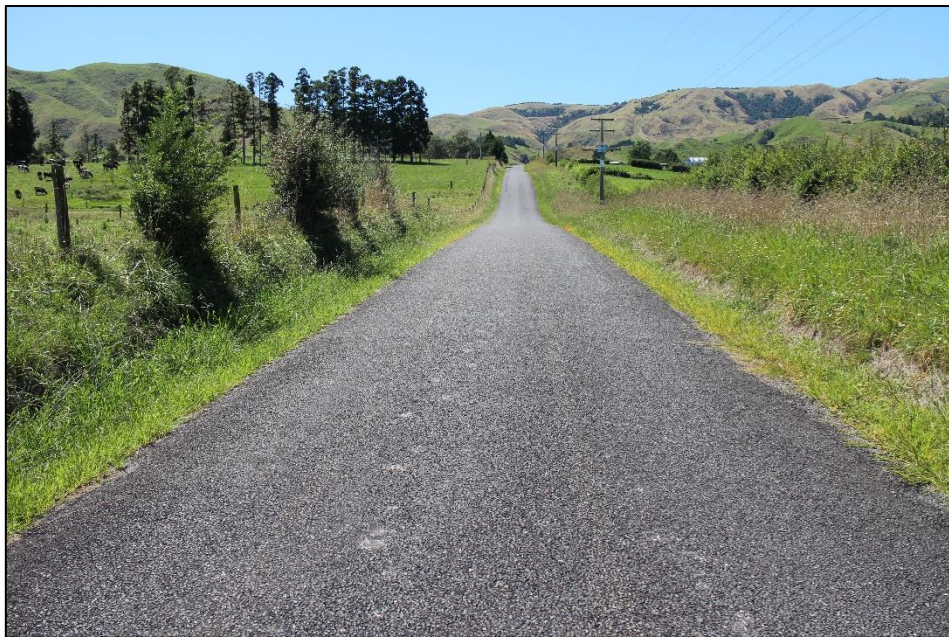
Photograph 5: RP0.0.



Photograph 6: RP225.



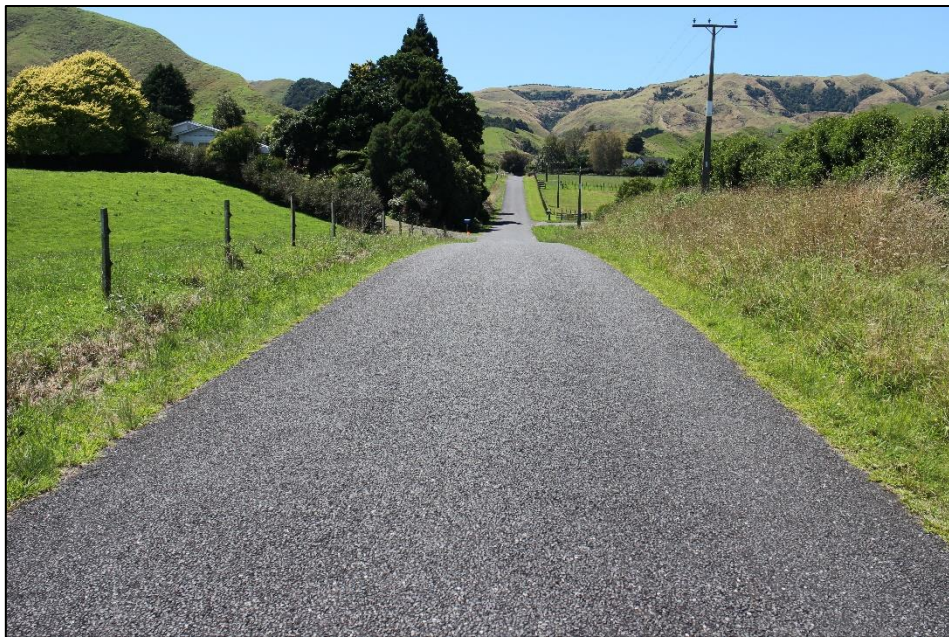
Photograph 7: RP380.



Photograph 8: RP650.



Photograph 9: RP920.



Photograph 10: RP1025.



Photograph 11: RP1310.



Photograph 12: RP1530.

Westbound Photographs



Photograph 13: RP1530.



Photograph 14: RP1310.



Photograph 15: RP1025.



Photograph 16: RP920.



Photograph 17: RP650.



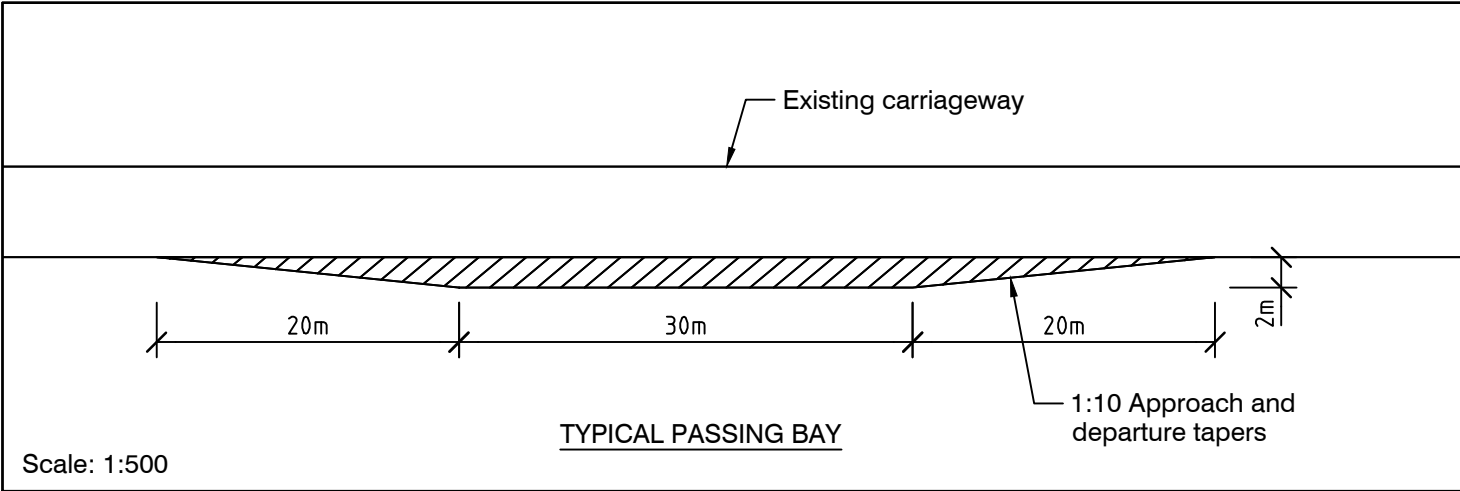
Photograph 18: RP380.



Photograph 19: RP225.



Photograph 20: RP0.0.



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Design	BH	Job No.		DRAWING No	
Drawn	JT	239	CAD File	Y295	01
Checked	BH		Plot Date	20.02.18	
Date	20.09.17	Drawing No.		Rev.No.	SCALE 1:4000 @ A3
Drawing	1 of 1	239-01			